

RSA facilitated by the Transportation Safety Resource Center (TSRC) at the Rutgers Center for Advanced Infrastructure and Transportation (CAIT) in partnership with the North Jersey Transportation Planning Authority (NJTPA) and Union County with funding provided by FHWA and NJDOT

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INTRODUCTION

WHAT IS A ROAD SAFETY AUDIT (RSA)?

CAIT's Transportation Safety Resource Center (TSRC) offers a statewide Road Safety Audit (RSA) service at no charge to New Jersey towns and counties. Interested parties can request RSA surveys conducted by a team of engineers, planners, and law-enforcement officers to help municipalities and counties make cost-effective safety improvements.

A multidisciplinary team of professionals offers assessments on roadway issues such as pedestrian and bicycle safety, intersection analyses, rural roads, human factors, speed management, sign visibility, and retroreflectivity standards.

RSAs include data-driven considerations and analysis of crashes. To determine the best safety solutions, RSA professionals perform incisive crash data evaluations on the target area using Plan4Safety, TSRC's award-winning crash database and software. The Plan4Safety tool belongs to the New Jersey Department of Transportation and is maintained by the Rutgers Transportation Safety Resource Center.

The RSA team provides a final report that includes long-term and short-term countermeasure recommendations that fit within the requestor's budget. Furthermore, RSAs pay off. According to the Federal Highway Administration (FHWA), countermeasures applied after RSAs can reduce crashes by about 60 percent.

For more information, contact Andy Kaplan, Safety Program Manager, at andy.kaplan@rutgers.edu.

DISCLAIMER

A Road Safety Audit report provided by the Center for Advanced Infrastructure and Transportation staff does not constitute an engineering report. The agency responsible for design and construction should consult a professional engineer licensed in the State of New Jersey in preparing construction documents to implement any of the safety countermeasures in the report.

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the New Jersey Department of Transportation or the Rutgers Center for Advanced Infrastructure and Transportation. This report does not constitute a standard, specification, or regulation. This document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program, in the interest of information exchange. The US government assumes no liability for the contents or use thereof.

EXECUTIVE SUMMARY

The Road Safety Audit (RSA) along Wood Avenue in Linden, Union County, was chosen as a result of the 2015 NJTPA network screening of crashes on county and municipal roadways. The Network Screening ranking was created utilizing the database in Plan4Safety of New Jersey Department of Transportation, developed and maintained by Rutgers Transportation Safety Resource Center. The crashes were weighted according to severity. The list of the pedestrian corridor rankings put the corridor between Linden Avenue and Evergreen Street at number three in Union County. On the list of pedestrian spots, Elizabeth Avenue ranked number two in Union County. The RSA process helped to identify safety issues, evaluate risks and suggest countermeasures. This document is the final report for the RSA conducted in Linden. The result, detailed in this report, is a summary of the corridor's safety history from 2011-2013 (pedestrian crash history includes the years 2009-2010) and a listing of recommended improvements that were created by the RSA team.

Wood Avenue (CR 617) is a heavily traveled east-west roadway, an Urban Minor Arterial. It connects the Garden State Parkway (to the west of the RSA corridor) with US Routes 1&9 (to the east of the RSA corridor). The cross section of the roadway on the eastern half of the RSA corridor is 56' wide with two lanes and parking, although the lanes are very wide and often function as two lanes in each direction. The cross section on the west is similar, but only 42' wide. The speed limit is 25 mph.

There are numerous commercial properties and small businesses along the wider eastern half of the corridor, including the Linden municipal offices. The western half is residential, with some commercial properties on the corners, and an elementary school. There is frequent NJ Transit bus traffic along Wood Avenue and on Elizabeth Street. Of the eleven intersections, only two of them are unsignalized.

Linden is interested in widening the sidewalks in the commercial section, while maintaining 14-foot wide lanes and parking. Accommodations for bicyclists will need to be addressed at some point, but is not part of the RSA recommendations. The pedestrian environment and pedestrian ability to cross at intersections will be improved with better crossing times, ADA ramps, accessible push buttons, highly visible crosswalks, and bulbouts. Other recommendations include better pedestrian and vehicle lighting, lane delineation with improved signage, and improved sight distance at intersections.

1.0 CORRIDOR DESCRIPTION AND ANALYSIS

1.1 SITE SELECTION

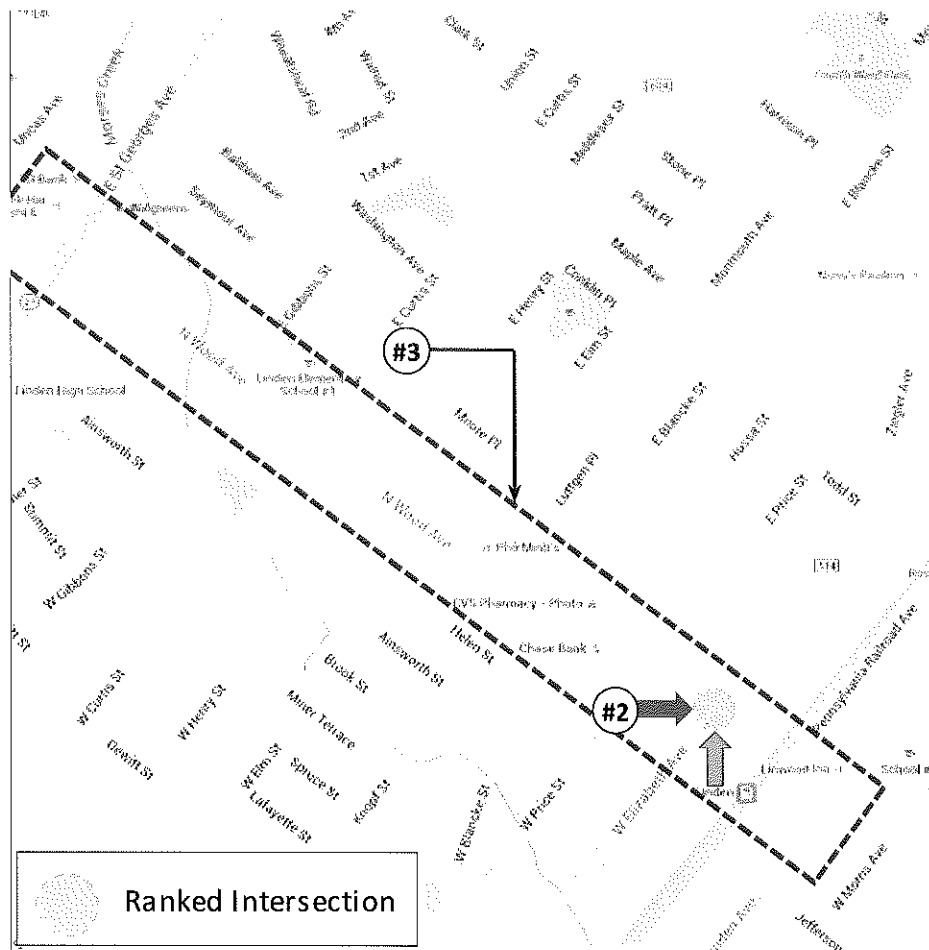


Figure 1 – Identified Priority High Crash Locations

As a result of a network screening analysis completed by TSRC for NJTPA, Union County requested that a Road Safety Audit be conducted in this corridor to improve safety for pedestrians. The network screening revealed that the intersection of Elizabeth Avenue and Wood Avenue ranked number two in Union County and number eight in all of the NJTPA region for pedestrian spots. The corridor from Linden Avenue to Evergreen Place ranked number three in Union County for pedestrian corridors. Since the intersection with St. Georges Avenue (NJ 27) is a state intersection, the RSA corridor was limited to the segment of Wood Avenue from Linden Avenue to Gesner Street.

Symbol	Safety Focus	NJTPA Ranking	County Ranking
	Pedestrian Spot	8	2
	Pedestrian Corridor	31	3
	Intersection Spot	-	28

Figure 2 – Rankings of Identified Priority High Crash Locations

1.2 TRAFFIC VOLUMES

The 2012 traffic count for Wood Avenue near Elizabeth Avenue was 19,292. The 2012 traffic count for Elizabeth Avenue, just west of Wood Avenue, was 12,758. (See Appendix B.)

1.3 TRANSIT SERVICE

There are bus stops almost every block.

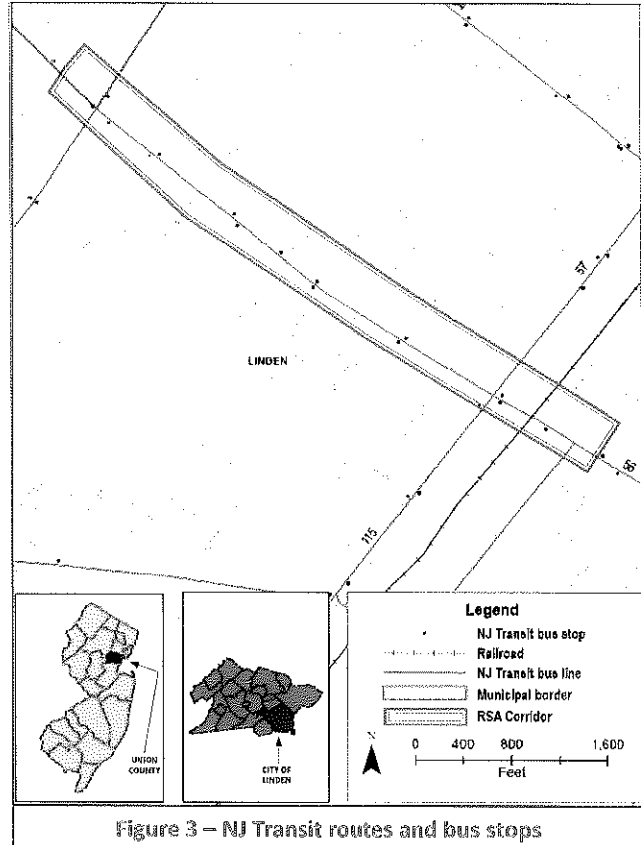
Three bus routes run in this area:

Route 56—Elizabeth to Tremley: runs along the Wood Avenue RSA corridor

Route 57—Elizabeth to Linden: runs along Wood Avenue east of Elizabeth Avenue, and then turns north on Elizabeth Avenue

Route 94—Bloomfield to Linden: runs along Elizabeth Avenue and on Wood Avenue between Linden Avenue and Elizabeth Avenue

There are a significant number of people using these bus lines, especially to get to work. Route 94 is especially busy with 30 daily trips during the week. Routes 56 and 57 run less often.



1.4 AREA CHARACTERISTICS

Wood Avenue extends 1.5 miles, between Route 1&9 to the east, and the Garden State Parkway to the west. It is located a few miles south of Route 22 and I-78. The NJ Turnpike is less than two miles to the east. (See map on following page.) The eastern part of Wood Avenue, a vibrant commercial district, is comprised of many small businesses and includes the Linden Train Station and the Linden Municipal Complex. The lanes are wide with very active parking on both sides of the street. There is a lot of loading and unloading of trucks to the local businesses, with no designated loading zones, so many trucks are parked close to the intersection or double parked.

The nature of Wood Avenue changes toward the western side, after Henry Street, where it becomes primarily residential. The roadway narrows, but still has two lanes with parking on both sides. This section includes an elementary school between Curtis Street and Gibbons Street and a high school on Gesner Street, two blocks south of Wood Avenue.

As seen in Figure 4, only a small percentage take public transportation to work.

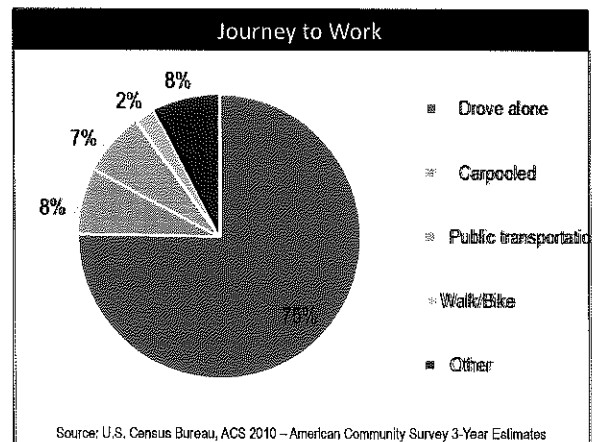


Figure 4 – Journey to Work

1.5 CROSS SECTION GEOMETRY



Figure 6 – From Linden Avenue to Henry Street

The eastern section is approximately 56 feet wide with one lane in each direction, parking on both sides and sidewalks. As this section is a very busy commercial district, there is frequent movement in and out of the parking spaces. The only dedicated left turn lane on Wood Avenue is at Elizabeth Avenue northbound. The travel lanes are not delineated and often function as two lanes in each direction, or as room for passing. Wood Avenue changes to a narrower cross-section west of Henry Street.

The western section, from Henry Street to Gesner Street, is approximately 42-feet wide. There is one lane in each direction, parking on both sides of the roadway, and sidewalks.



Figure 7 – From Henry Street to Gesner Street

1.6 INTERSECTION CHARACTERISTICS

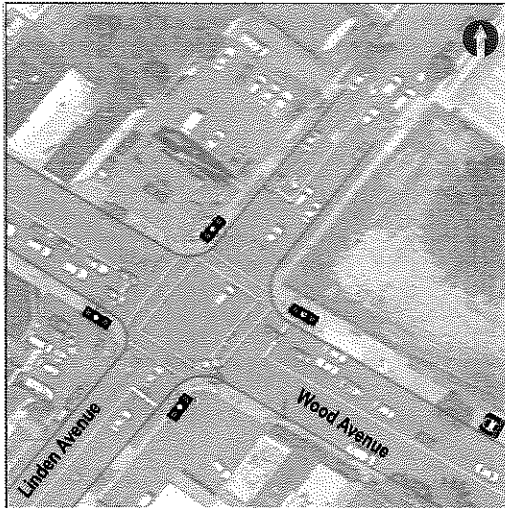


Figure 8 – Intersection of Linden Avenue and Wood Avenue

Linden Avenue

- Signalized Intersection
- Wood Avenue: Wide cross section with no lane delineation.
- Linden Avenue: dedicated left turn lane on northern leg

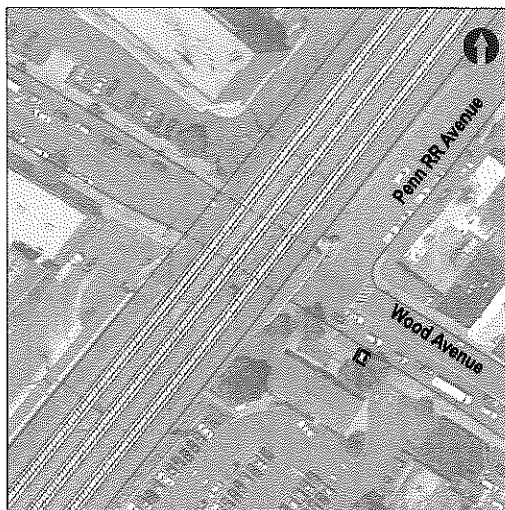


Figure 9 – Intersection of Penn RR Avenue and Wood Avenue

Penn RR Avenue:

- T-Intersection
- One-way roadway away from Wood Avenue
- Unsignalized
- Marked crosswalk south of intersection
- Linden train station on south side of Wood Avenue

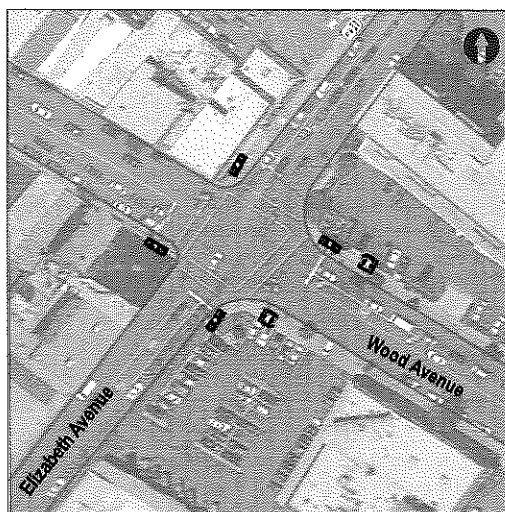


Figure 10 – Intersection of Elizabeth Avenue and Wood Avenue

Elizabeth Avenue

- Signalized
- One lane in each direction
- Dedicated left-turn lanes
- Businesses on west side of intersection
- Parking lot with small strip mall on southeast corner
- Parking lot with office building on northeast corner

1.5 INTERSECTION CHARACTERISTICS (CONTINUED)

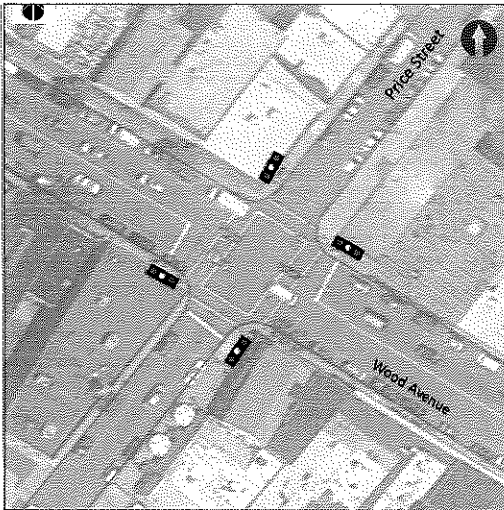


Figure 11 – Intersection of Price Street and Wood Avenue

Price Street

- Signalized Intersection
- Wood Avenue approximately 56' wide
- Price Street one way northbound
- Businesses on three corners
- South corner has fenced-in, empty lot

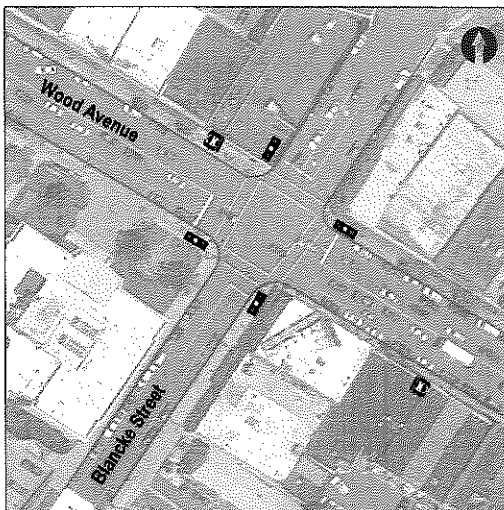


Figure 12 – Intersection of Blancke Street and Wood Avenue

Blancke Street

- Signalized Intersection
- Wood Avenue approximately 56' wide
- Blancke St has dedicated left-turn lane for southbound travel
- Businesses on three corners
- West corner has Linden Municipal complex

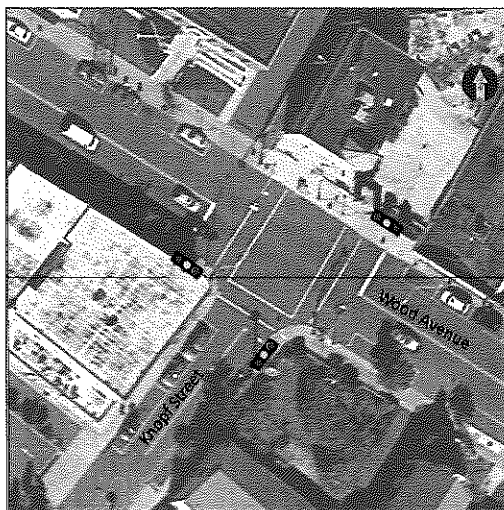


Figure 13 – Intersection of Knopf Street and Wood Avenue

Knopf Street

- T-Intersection
- Signalized
- South corner has a church
- Businesses on west corner and north side of Wood Avenue
- Post office on north side of Wood Avenue

1.5 INTERSECTION CHARACTERISTICS (CONTINUED)

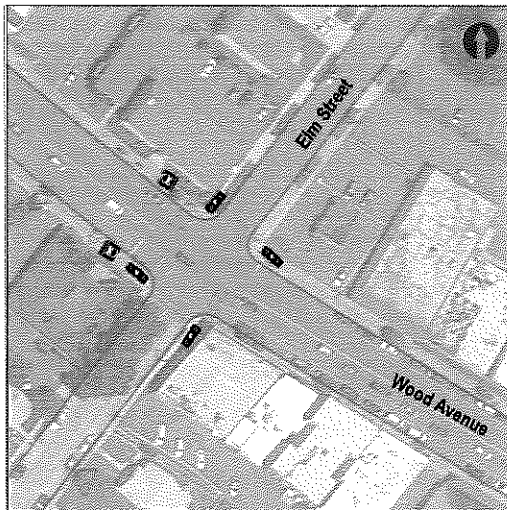


Figure 14 – Intersection of Elm Street and Wood Avenue

Elm Street

- Signalized
- One lane in each direction
- Retail and small offices on all four corners

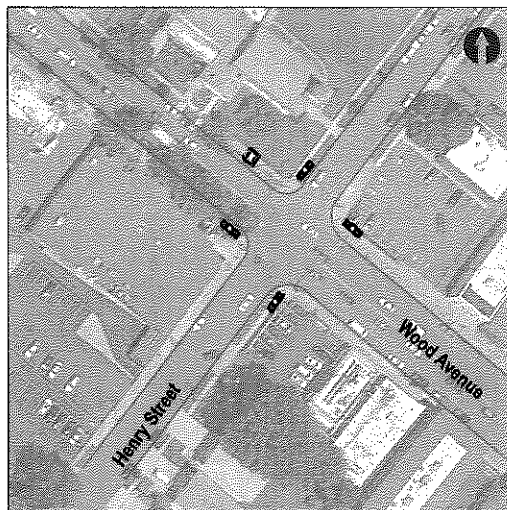


Figure 15 – Intersection of Henry Street and Wood Avenue

Henry Street:

- Signalized
- East side of intersection is approximately 56' wide
- West side of intersection is approximately 42' wide
- Change from east to west, from retail/business to more residential
- East side has small parking lots for 7-Eleven and Dunkin Donuts
- West side has a church and a bank

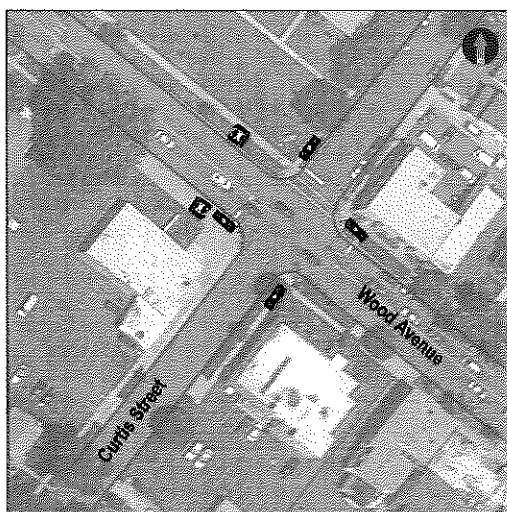


Figure 16 – Intersection of Curtis Street and Wood Avenue

Curtis Street:

- Signalized
- Elementary School #1 located on north side of Wood Avenue between Curtis Street and Gibbons Street
- Small businesses on three corners
- Crossing guard for school
- Wood Avenue—No Turn on Red, weekdays 8 am–4 pm

1.5 INTERSECTION CHARACTERISTICS (CONTINUED)

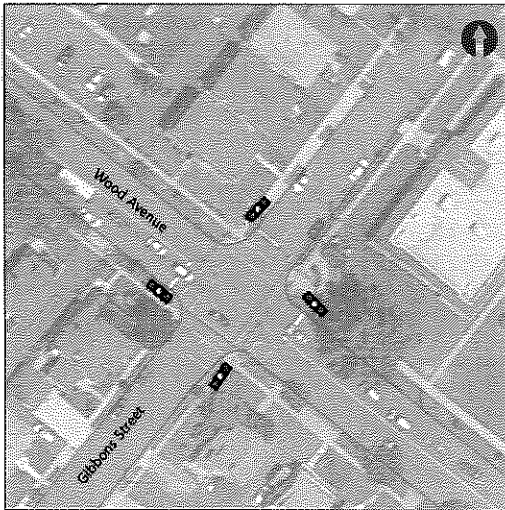


Figure 17 – Intersection of Gibbons Street and Wood Avenue

Gibbons Street

- Signalized
- Elementary School #1 located on north side of Wood Avenue between Curtis Street and Gibbons Street
- Residential on three of the corners

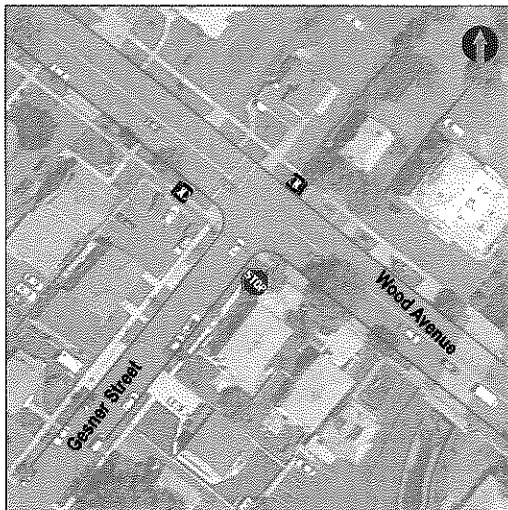


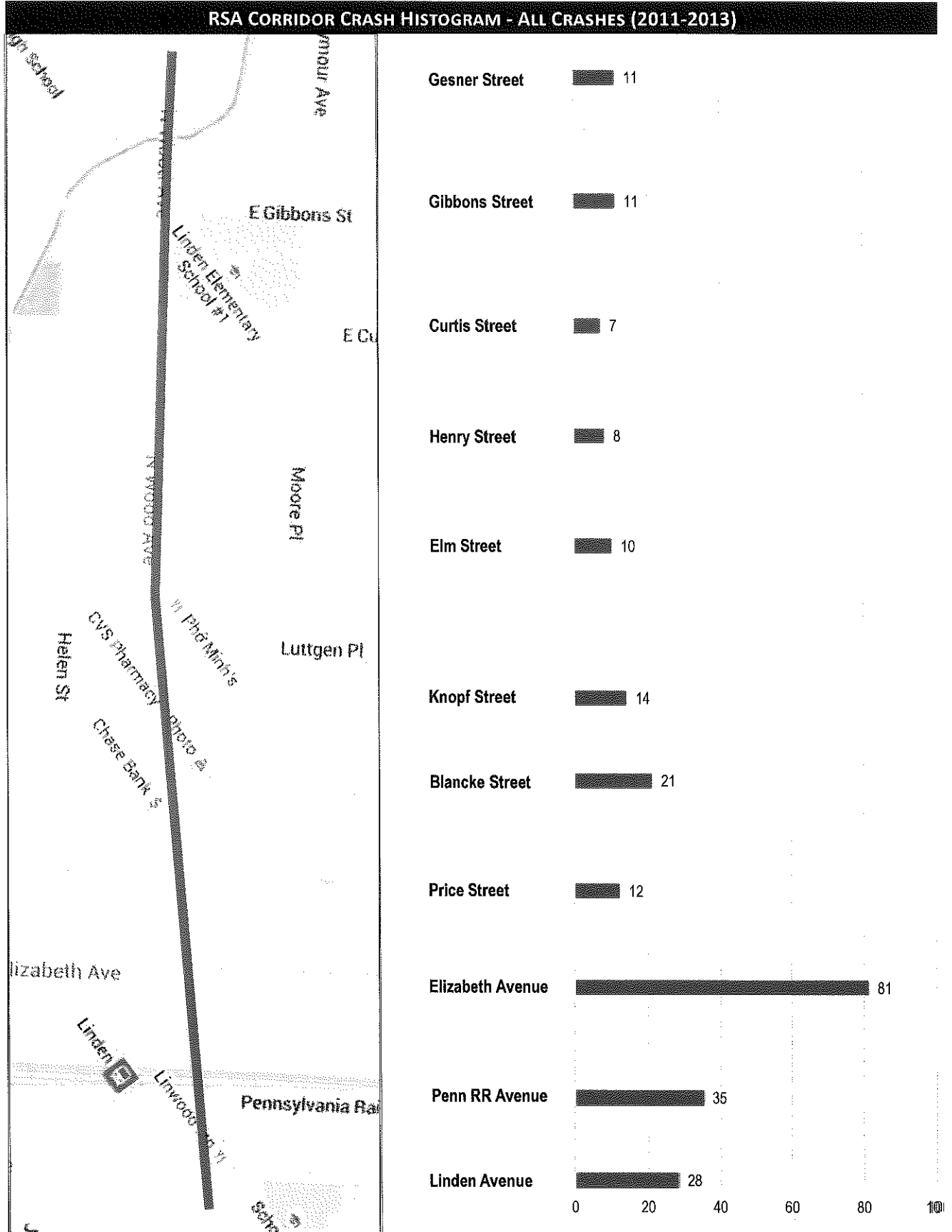
Figure 18 – Intersection of Gesner Street and Wood Avenue

Gesner Street

- T-Intersection
- Stop controlled
- Residential
- High school one block south

2.0 CRASH FINDINGS – WOOD AVENUE CORRIDOR

2.1 NUMBER OF CRASHES BY INTERSECTION AND TYPE (for detailed crash data see p. 39)



RSA AREA – CRASH SUMMARY - PEDESTRIANS AND PEDCYCLISTS (2009 – 2013)

Crash Type	#
Pedestrian	35
Pedalcyclist	5
Total	39

Crash Year	#
2009	9
2010	6
2011	7
2012	8
2013	9
Total	39

Severity	#
Property Damage Only (PDO)	3
Pain	22
Moderate Injury	9
Incapacitating Injury	3
Fatal	2
Total	39

Month	#
January	5
February	2
March	2
April	2
May	1
June	1
July	4
August	4
September	2
October	6
November	4
December	6
Total	39

Intersection	#
At intersection	22
Not at intersection	17
At or Near Railroad	-
Total	39

Surface Condition	#
Dry	29
Wet	10
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	39

Light Condition	#
Daylight	19
Dawn	2
Dusk	1
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	14
Dark – Street Lights On/ Spot	3
Total	39

Day	#
Monday	6
Tuesday	7
Wednesday	6
Thursday	8
Friday	6
Saturday	5
Sunday	1
Total	39

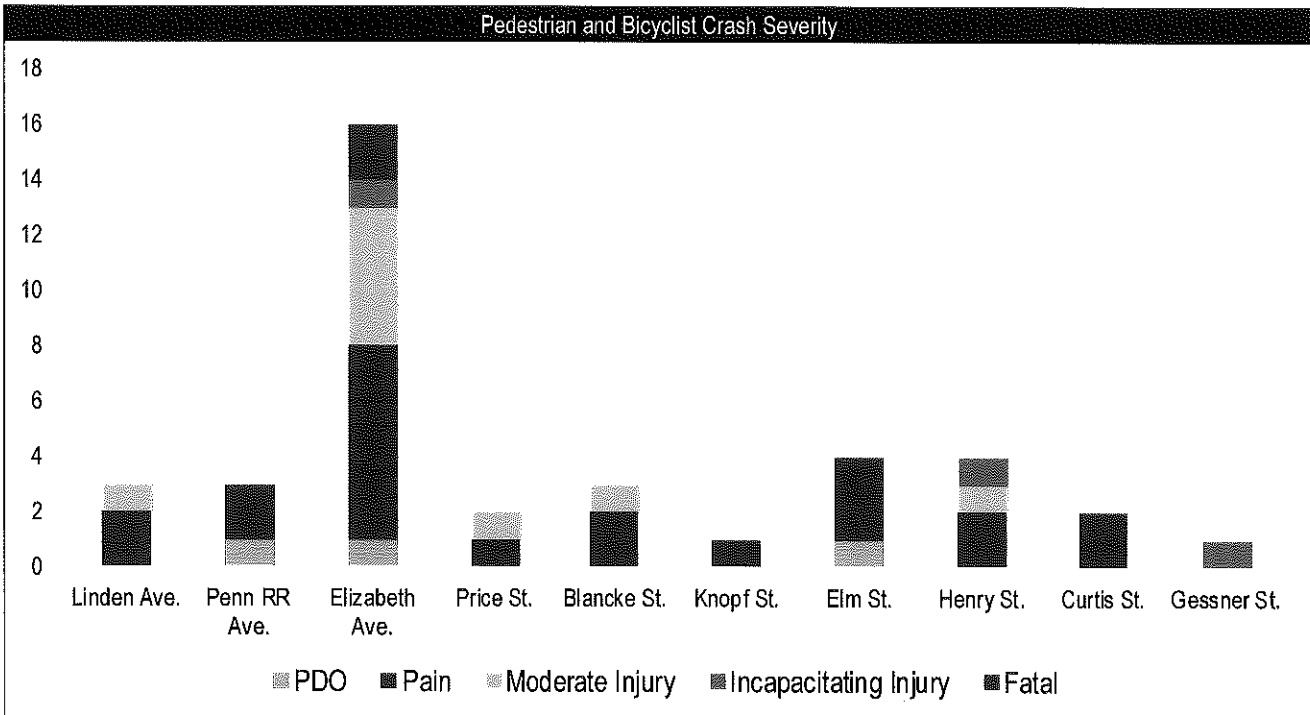


Figure 19 – RSA Corridor Pedestrian Crash Severity by Intersection

2.2 TEMPORAL TRENDS 238 CRASHES IN THREE YEARS

The following charts compare the crashes at along the Wood Avenue RSA corridor to Union County crashes during 2011–2013 in order to give a frame of reference. In terms of the time of day, crashes were over-represented from 12 p.m.–4 p.m. At Elizabeth Avenue specifically, they are overrepresented from 12 p.m.–8 pm. Crashes occurred more frequently on Fridays, and crashes occurred more frequently during the winter months. The crash frequency decreased in 2012 and increased slightly in 2013.

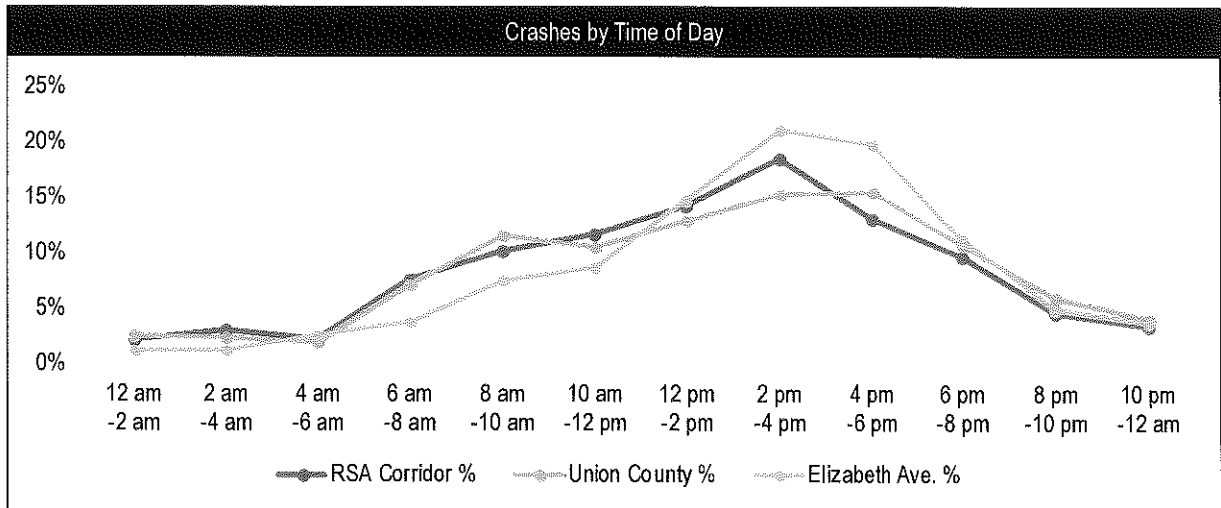


Figure 20 – Crashes by Time of Day

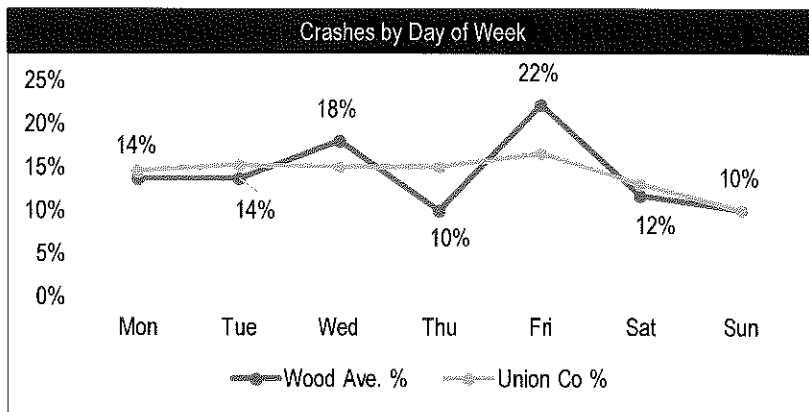


Figure 21 – Crashes by Day of Week

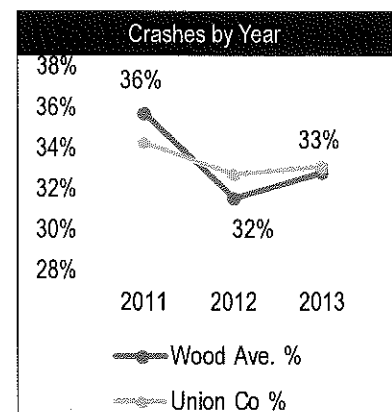


Figure 22 – Crashes by Year

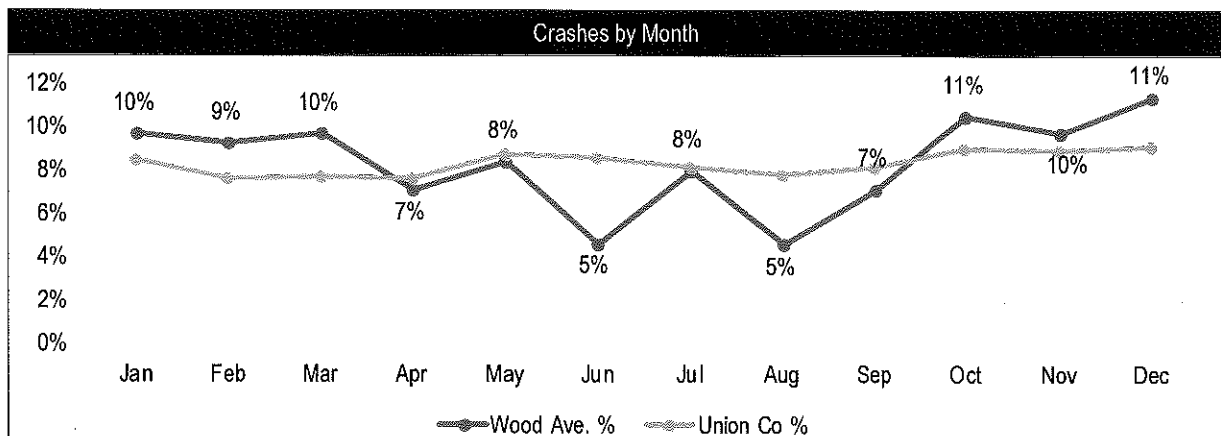


Figure 23 – Crashes by Month

2.3 CRASH TYPE AND SEVERITY

The predominant crash types are same-direction and right-angle crashes. These did not result in significant injury (two moderate injuries out of 203 crashes). Both left-turn and pedestrian crashes are significantly overrepresented when compared to Union County during the same time period. Most of these did result in injuries.

Crash Type 2011–2013	Count in RSA Area	% Crash Type in RSA Area	% of Crash Type in Union County
Same Direction - Rear End	72	30%	29%
Same Direction - Side Swipe	32	13%	15%
Right Angle	19	8%	14%
Opposite Direction - Head On/Angular	2	1%	1%
Struck Parked Vehicle	22	9%	14%
Left Turn / U Turn	19	8%	2%
Backing	15	6%	8%
Fixed Object	31	13%	10%
Pedestrian	23	10%	2%
Pedalcyclist	1	0%	1%
Other	2	1%	4%
TOTAL	238	100%	100%

Figure 24 -- Crash Type compared to Union County

Severity	All Other Crashes	Pedestrians	Pedalcyclist	TOTAL
Fatal	-	2	-	2
Incapacitated	-	2	-	2
Moderate Injury	6	5	-	11
Complaint of Pain	31	12	1	44
Property Damage Only	177	2	-	179
TOTAL	214	23	1	238

(Many of the right-angle crashes had been coded incorrectly and were reassigned as left-turn crashes for analysis).

Two of the twenty-three pedestrian crashes were fatal and two were incapacitating injuries. Of the eleven moderate injuries, almost half were pedestrian crashes with the other eight crashes from a variety of crash types. In one of them, the westbound vehicle went through the intersection on an amber light.

Figure 25 – Severity compared to Union County

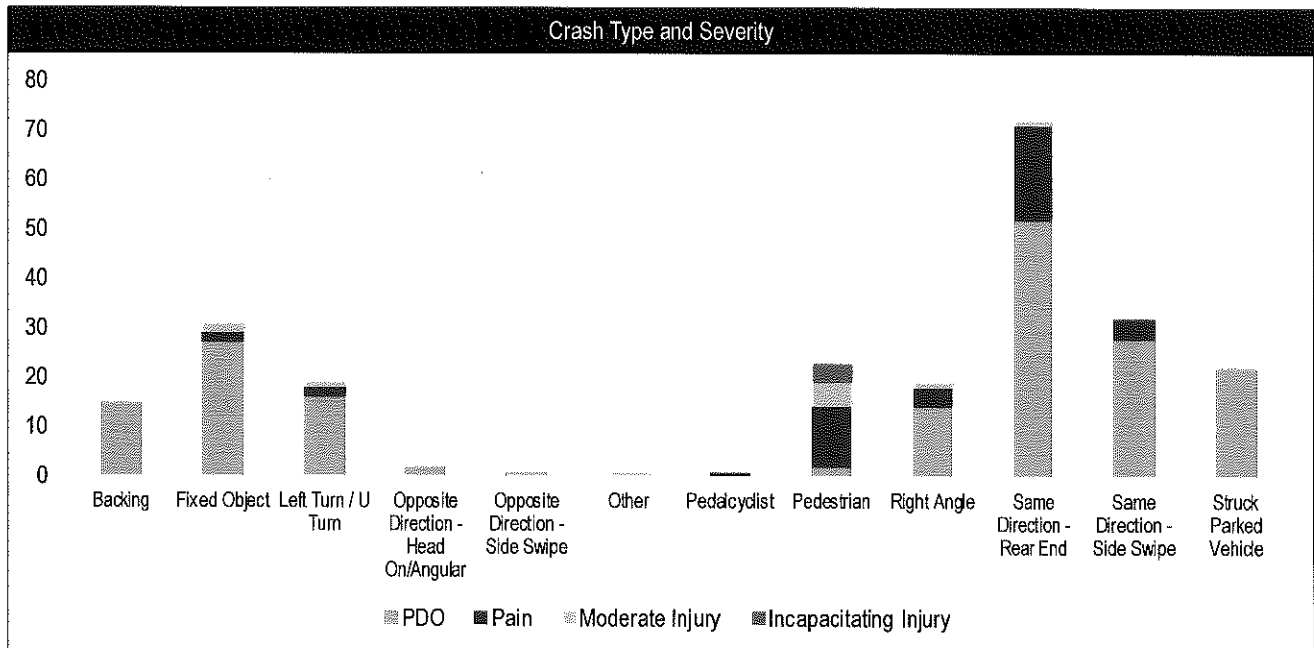


Figure 26 -- Crash type vs. severity

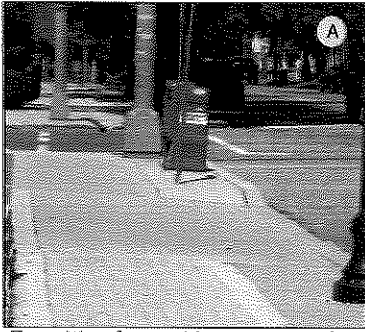
3.0 IDENTIFIED ISSUES

Ref #	Issues List
Corridorwide	
Pedestrians	
1	Pedestrian accommodations, such as ramps and detectable warning surfaces, are not fully ADA-compliant.
2	Some of the ramps appeared to have ponding issues.
3	Pedestrian clearing times appear to be too short in some locations.
4	Pedestrian pushbuttons were located too far away from the ramp, and not according to design standards.
5	Signage for pedestrian push buttons was confusing; push button for Wood Avenue only while side streets were on recall.
6	Pedestrians were observed crossing against the signal, when the opposing left-turn traffic had a green arrow. At some intersections the pedestrians could not see the green arrow.
7	There is no consistency in crosswalk style and many are not high visibility.
8	Many of the sidewalks surfaces are uneven and there is no consistency of sidewalk surface throughout the corridor.
9	Pavement in some of the crosswalks was a tripping hazard.
10	Low-hanging branches impede pedestrian movement.
11	There is a lack of pedestrian-level lighting.
12	There is a significant amount of mid-block crossing.
13	Transit-oriented development will increase pedestrian traffic.
Operations	
14	There was a lot of double parking, especially for truck loading/unloading.
15	Left turns, in and out of driveways, increases vehicle conflict.
16	Left turns at the intersections were difficult to make.
17	The wide lanes increase driver confusion due to lack of lane delineation, especially at traffic signals.
Traffic Signals	
18	Signal heads aren't located over the lane of travel; the near-right, far-left placement is inconsistent.
19	Tall mounted cameras do not function.
20	Traffic signals are not as visible as they could be.
Signage	
21	Truck route signage is confusing and inconsistent.
22	Some signs are faded or in disrepair.
23	Some of the sign posts were not breakaway.
24	Some of the "No Turn on Red" signs were too far back from the intersection.
25	Some of the signs were lacking in reflectivity.
26	There is no school-zone signage.
Pavement and Pavement Markings	
27	Sidestreets are lacking centerline striping and stop bars.
28	The striping and pavement markings are faded in some locations.
29	Pavement condition, especially at the intersections, is in poor condition.
Visibility	
30	Overall vehicle and pedestrian lighting appears to be insufficient, especially at the intersections.
31	Buses obstruct sight distances.
Bicycle Accommodations	
32	Many cyclists travel on the sidewalks.
33	There are no bicycle accommodations.
34	Some of the inlet grates are not bicycle-safe.
Maintenance	
35	Some of the street lights are missing.

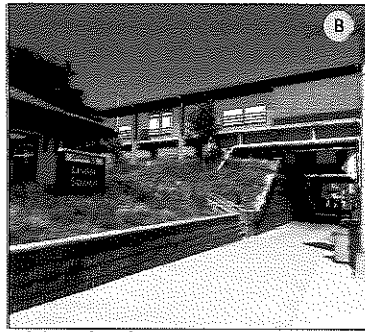
Ref #	Issues List
36	There are some abandoned utility facilities and twisted poles.
37	Trees at the south end of the corridor are small, and the tree holes are too small for growth.
38	Some pedestrian heads have malfunctioning audio.
	Bus
39	There are bus stops almost every block.
Linden Avenue	
	Operations
40	The left-turning radius is such that vehicles affect the opposing lane of traffic.
	Truck Traffic
41	There is a large volume of truck traffic.
42	Truck-warning signage is too near the bridge, and insufficiently visible, to meaningfully warn truck drivers that they need an alternate route if over-height.
43	Warning heights seem off.
44	The right-turn radius is tight for trucks, and they drive over the curb.
	Pedestrian Facilities
45	The pedestrian signal timing is insufficient for pedestrian crossing.
	Signage
46	There is a sign of unknown purpose: "260 foot".
	Visibility
47	Parking too close to intersection limits sight distance.
48	Left-turn sight distance is an issue.
	Maintenance
49	There is a missing visor on a signal head
Penn RR Avenue	
	Detectors and Signage
50	RRFB isn't functioning (between Linden Ave. and the RR bridge)
51	Overhead height detectors are not reliable.
	Pedestrian Facilities
52	Pedestrians cross in many locations under (and adjacent to) the bridge.
53	Pedestrian access to the train station on the northwest side driveway is inadequate.
54	The roadway width in the vicinity of the marked crosswalk is wide, and lanes are not clearly delineated, which can result in shadow crashes.
55	Southbound drivers have limited visibility of the crosswalk south of the bridge.
	Visibility
56	It is difficult for southbound drivers to see the crosswalk because of the bridge (both the physical structure and low lighting).
57	It is difficult to see the actual bridge height, due to the overhang on the westbound approach.
58	The dark paint under the bridge affects visibility.
	Infrastructure
59	The driveway into the train station parking lot is not clearly delineated.
Elizabeth Avenue	
	Geometry
60	The receiving lanes are very wide, which can cause driver confusion.
61	The long left-turn bay on the southbound approach can cause shadow-effect crashes.

Ref #	Issues List
62	The wide single lane functions as two lanes.
63	There is a dedicated left-turn arrow, but no left-turning bay.
64	The left turns on all approaches have negative offset, which produces shadow effect.
65	The radii, especially on the east side, create difficulty for turning trucks.
	Pedestrians
66	Poor pedestrian behavior increases safety risk.
67	Crosswalks aren't parallel, and they're wide.
68	Pedestrians can't see the left-turn arrow, and often cross when they are prohibited.
	Visibility
69	Buildings close to the road on the southwest corner affect sight distance.
70	Parking up to the corners impedes visibility.
71	Crossing guards are in the road, blocking traffic and obscuring visibility.
72	There is a cobra head missing on the west corner of Wood Avenue.
	Signage
73	The "No Left Turn" sign is missing from Carvel.
	Price Street
	Pedestrian Facilities
74	The pedestrian sign for the pushbutton is crooked.
75	The pedestrian signal for the northbound approach is not working.
	Traffic Signals
76	There is no near-side traffic signal for Price Street.
	Elm Street
	Traffic Signals
77	One of the visors was broken off.
	Curtis Street
	Pedestrian Facilities
78	There was a utility pole in the northwest corner, which limits full pedestrian access.
79	The stairs exiting onto the sidewalk from Elementary School #1 are midblock, between Curtis and Gibbons, and this encourages the children to cross Wood Avenue midblock.
	Gesner Street
	Driver Behavior
80	There is a significant amount of speeding.
81	Drivers are not yielding to pedestrians.
	Pedestrian Facilities
82	There is no curb ramp at the northern end of the crosswalk on Wood Avenue.
83	There are a lot of youths crossing here, as the high school is one block south of the intersection.
84	Some of the crosswalks are missing.
	Pedestrian Facilities
85	The bus stop is in the intersection.

ISSUE VISUALS - OVERALL



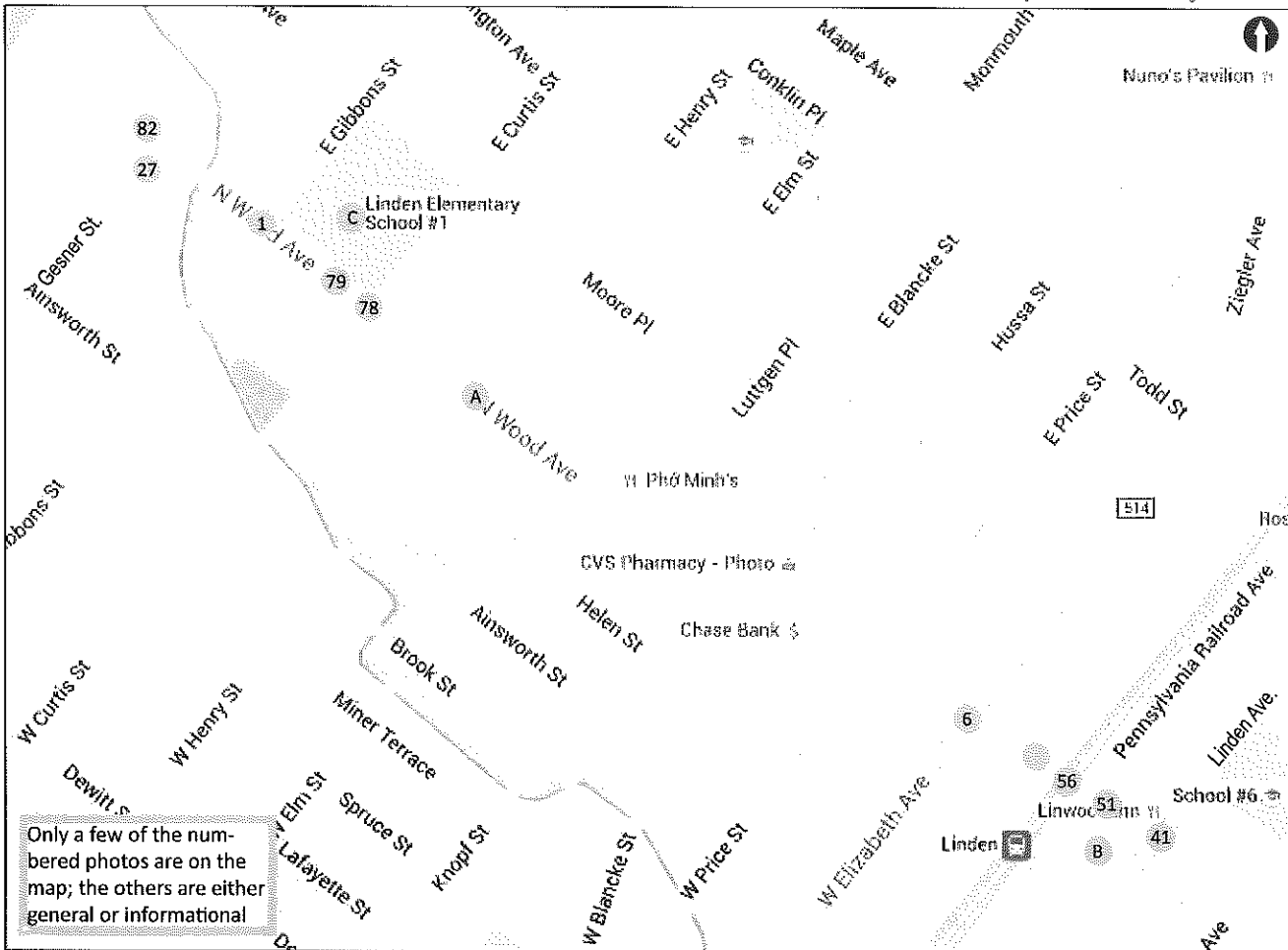
Transition from wider cross section to narrower one



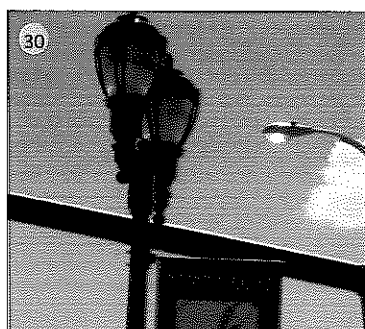
A lot of pedestrian activity around the Linden train station



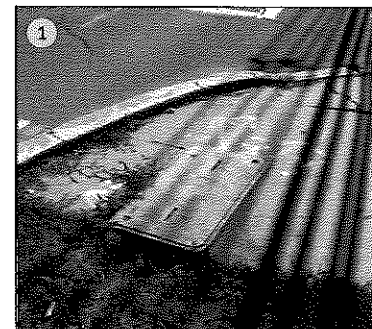
Elementary school with a lot of pedestrian activity



No lane delineation or stop bar

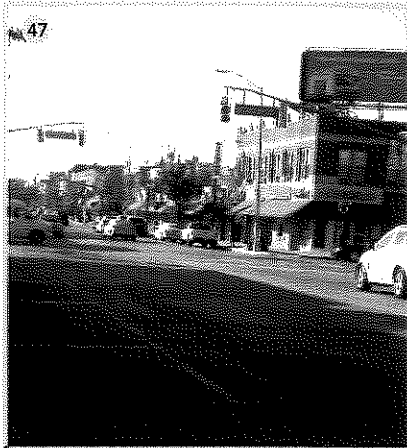


There is insufficient lighting

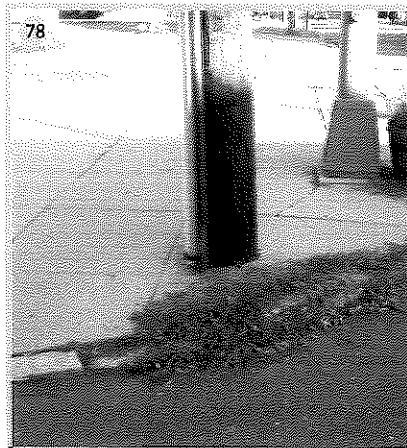


No truncated domes

VISUALIZING ISSUES - GENERAL



Parking near intersection limits sight distance



Pole in the middle of pedestrian landing



Crossing time insufficient in some crosswalks



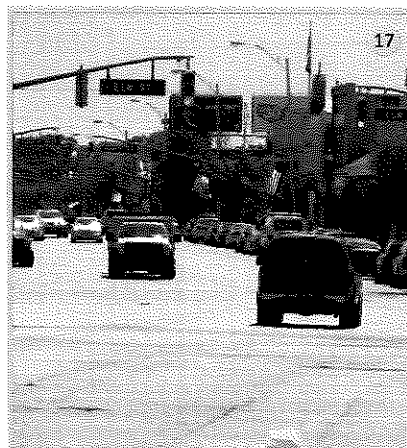
Significant amount of mid-block crossings



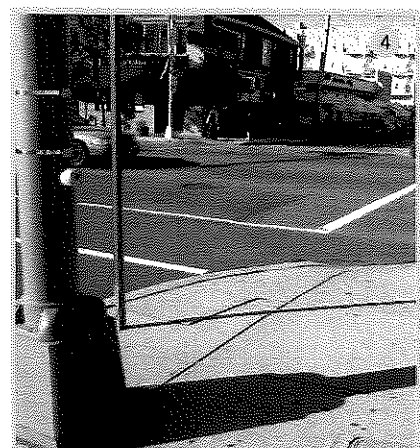
No bicycle accommodations



No bicycle facilities; many cyclists use sidewalks.

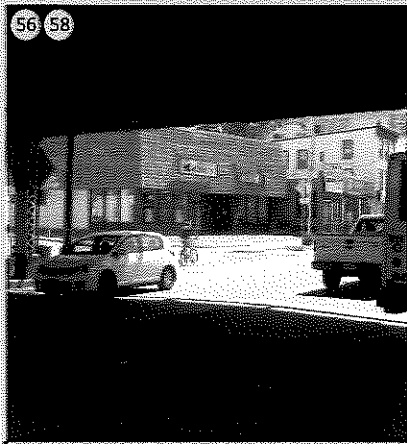


Wide roadway is not clearly delineated

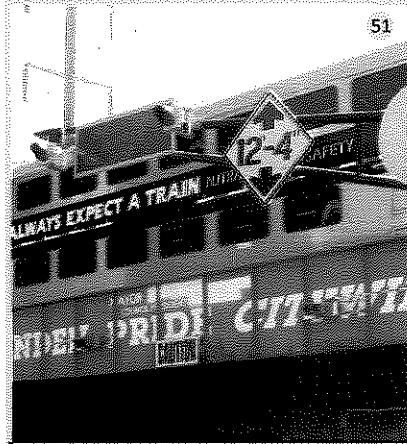


Pedestrian push buttons not near crosswalks

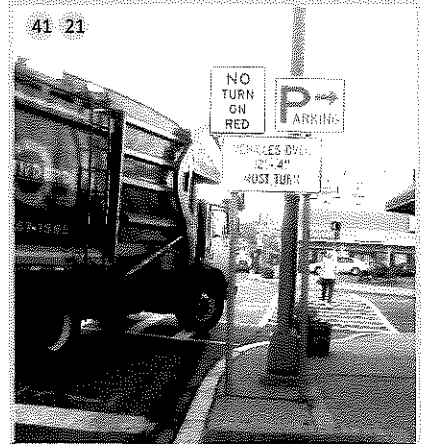
VISUALIZING ISSUES - SITE SPECIFIC



Poor visibility under the bridge



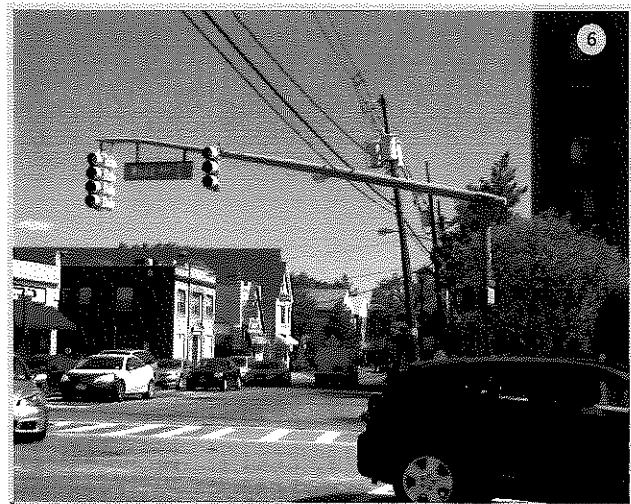
Overhead height detectors are not reliable



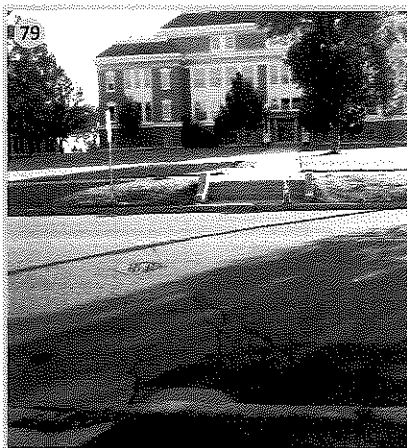
High volume of truck traffic



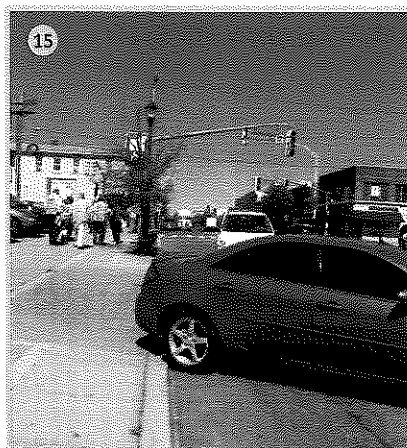
There is no depressed curb or ramp at end of crosswalk



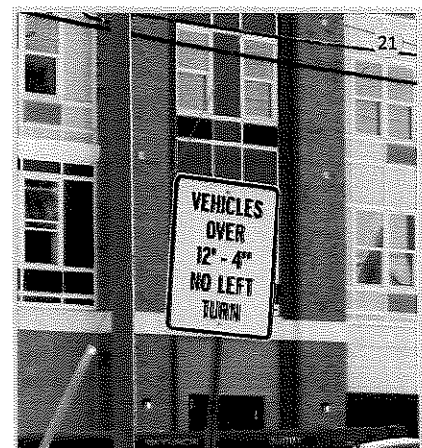
Pedestrians cannot see that opposing traffic has green arrow, and they cross against pedestrian walk signal



Sidewalk exiting school encourages midblock crossing



Many turns in and out of driveways create conflict



Signage for truck alternate route is insufficient and confusing

4.0 RECOMMENDATIONS

Rec. #	Recommendations List	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref. #
Corridorwide						
Pedestrians						
1	Plan for full ADA compliance by scheduling upgrades of existing ramps and curbs at crosswalks.	Medium	Medium	\$\$	Union Co.	1
2	Check signal timing for pedestrian crossing (evaluate pedestrian recall, lead pedestrian interval, or split phasing).	Med./High	Medium	\$\$	Union Co.	3,6,12
3	Consider the installation of bulbouts, either concrete or texturized paint.	Med./High	Medium	\$\$	Union Co.	3,12
4	Replace malfunctioning chirps in pedestrian heads.	Medium	Short	\$	Union Co.	38
5	Install high visibility crosswalks, consistent throughout the corridor.	Medium	Medium	\$	Union Co.	7
6	Revise the location of the pedestrian pushbuttons to be adjacent to the ramps.	Medium	Med-Long	\$\$	Union Co.	4
7	Widen the sidewalks south of Henry Street.	Medium	Med-Long	\$\$\$	Union Co.	13
Operations						
8	Continuing discussion is needed to evaluate the optimal cross section for all roadway users.	High	Medium	\$	Union Co.	12,13,17
9	Narrow the roadway cross section between the RR and Henry Street by widening the sidewalk.	Med./High	Long	\$\$\$	Union Co.	13, 17
10	Installing lane edge lines will create a visibly delineated lane.	Med./High	Short	\$	Union Co.	17
11	Consider narrowing the 14-foot wide lanes to 12-foot, and adding a 4-foot wide painted median.	High	Long	\$\$\$	Union Co.	17
12	Install head-to-head left turn lanes.	Med-High	Medium	\$\$	Union Co.	16
(#3)	Consider the installation of bulbouts, of either concrete or texturized paint.					
13	Post and enforce all restricted movements.	Medium	Short	\$	Linden	14, 47, 70
14	Create dedicated loading zones, using hatching or time-restricted loading.	Medium	Medium	\$\$	Linden	14
15	If loading zones are allocated and parking is reduced, create incentives for off-street parking.	Medium	Medium	\$\$	Linden	14
Signage						
16	Professional engineering staff should review the use and application of signage to ensure uniform application throughout the corridor.	Med-Low	Medium	\$\$	Union Co.	21, 24,
17	Update all signs to retroreflective and ensure that they have breakaway posts.	Med-Low	Medium	\$\$	Union Co.	22, 23, 25
18	Install school-zone signs.	Medium	Short	\$	Union Co.	26
19	Insure that all "NO LEFT TURN" signs are posted.	High	Short	\$	Union Co.	73
Visibility						
20	Professional staff should conduct a formal engineering review of existing lighting conditions to evaluate where both vehicle-level lighting and pedestrian-level lighting can be enhanced.	Med-High	Med-Long	\$\$\$	Union Co.	30
21	Review ordinance prohibiting parking adjacent to the intersection and consider eliminating parking spaces within 25 feet of the intersections.	Medium	Short	\$	Linden	70
Pavement and Pavement Markings						
22	Re-stripe faded pavement markings.	Medium	Medium	\$\$	Union Co.	28
23	Install hatching at bus stops and at fire hydrants..	Medium	Medium	\$\$	Union Co.	14, 47
Traffic Signal						
24	Evaluate prospect of split phasing or lead pedestrian crossing if appropriate.	High	Medium	\$\$	Union Co.	3

Rec. #	Recommendations List	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref. #
25	Install backplates with retroreflective borders.	Medium	Short	\$	Union Co.	20
26	Evaluate the placement of the signal heads and improve consistency if possible.	Med-Low	Med-Long	\$\$\$	Union Co.	18
	Bicycle Facilities					
27	Consider the installation of sharrows to increase awareness of bicycle use.	Med-Low	Short	\$	Union Co.	32, 33
28	Install bike racks along the corridor and increase number at the train station.	Low	Short	\$\$	Union Co.	33
29	Review the county-wide bicycle study from 2007.	Low	Short	\$	Union Co.	33
30	Replace inlet grates with bicycle-safe ones..	Medium	Short	\$\$	Union Co.	34
31	Evaluate ways to accommodate bicyclists, such as a bike lane in one direction or parallel bike route	Med./High	Med-Long	\$\$\$	Union Co.	32, 33
	Bus					
32	Evaluate the locations of the bus stops and consider consolidating them. (This may open up locations for loading zones.)	Medium	Medium	\$\$	NJ Transit & Union Co.	39
	Maintenance					
33	Evaluate ponding issue especially at pedestrian ramps.	Low	Medium	\$\$	Union Co.	2
34	Replace missing overhead lights.	High	Medium	\$	Union Co.	35
35	Trim low-hanging branches over the sidewalks.	Low	Short	\$	Linden	10
36	Remove all abandoned utility facilities.	Low	Short	\$	Union Co.	36
37	Improve condition of the trees, especially at the southern end; street trees provide positive safety benefits for drivers.	Low	Medium	\$\$	Linden	37
Linden Avenue						
	Pedestrian Facilities					
1	Check signal timing for pedestrian crossing times.	Med-High	Medium	\$\$	Union Co.	45
	Operations					
2	Install head-to-head left-turn lanes.	Med-High	Medium	\$\$	Union Co.	16
3	Move Wood Avenue stop bar back, to better accommodate left turn.s	Medium	Short	\$	Union Co.	40
4	Consider doing a truck count to evaluate the significance of the large volume of trucks.	Med-Low	Medium	\$\$	Union Co.	41
	Geometry					
5	Widen the radius and create mountable curb for turning trucks.	Medium	Medium	\$\$	Union Co.	44
	Signage					
6	Truck warning signs are needed in advance of Linden Avenue for northbound trucks.	High	Medium	\$\$	Union Co.	42
	Maintenance					
7	Repair/replace signal visor.	Medium	Short	\$	Union Co.	49
Penn RR Avenue						
	Pedestrian Facilities					
1	Install fencing along the sidewalk, under the bridge, to prevent pedestrians from crossing the roadway there, especially north of the bridge.	Med-High	Med-Long	\$\$\$	Union Co.	52
2	Extend the platform on the northwest side to make a pedestrian bridge over the street.	High	Long	\$\$\$	NJ Transit?	52
3	Consider installing a pedestrian refuge island with sign.	Med-High	Medium	\$\$	Union Co.	52, 54
4	Repair/replace the existing Rectangular Rapid Flash Beacon (RRFB).	High	Med-Short	\$\$	Union Co.	50, 55

Rec. #	Recommendations List	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref. #
5	Consider the installation of actuated crossing.	Med-High	Medium	\$\$	Union Co.	52, 54, 55, 56
6	Consider installation of a mid-block pedestrian refuge island northwest of the bridge, or a median island not designated for pedestrians.	Med-High	Medium	\$\$	Union Co.	52
7	Install sidewalk across driveway entrance to train station.	Low	Med-Short	\$\$	Linden	53
8	Coordinate with the planning study between NJ Transit and NJTPA for pedestrian access to the train station.	High	Long	\$\$	Union Co.	13, 52, 54, 55
	Visibility					
9	Consider the installation of an in-road lighted crosswalk or a HAWK.	High	Long	\$\$\$	Union Co.	55
10	Consider the installation of a pedestrian crossing sign in the road.	Medium	Short	\$	Union Co.	55
11	Evaluate how to improve lighting under the bridge, during the daytime, so shadows don't reduce visibility.	Med-High	Medium	\$\$	Union Co.	56, 57, 58
12	Consider painting the area under the bridge a light color to improve visibility.	Med-High	Long	\$\$\$	Union Co.	58
	Operations					
13	Narrow the width near the crosswalk so cars don't bypass each other; clearly delineate one lane in each direction.	Med-High	Medium	\$\$	Union Co.	12, 17
	Signage					
14	Relocate "Caution" sign out from under the overhang.	Med-Low	Short	\$	Union Co.	56
15	Fix the over-height detectors so they function reliably.	High	Medium	\$\$	Union Co.	51
	Train Station					
16	Contact NJTPA about a NJ Transit Train Station study and what improvements and revisions are being planned around the Linden train station.	High	Medium	\$\$	NJTPA & Union Co.	13, 52, 54, 55
	Infrastructure					
17	Consider the installation of a concrete median from the bridge to Elizabeth Avenue.	Med-high	Medium	\$\$	Union Co.	52
Elizabeth Avenue						
	Pedestrians					
18	Consider the installation of a signal head (pedestal or side-mounted) at the far left side, to make pedestrians more aware of the left-turn arrow and the walk prohibition.	High	Med-Long	\$\$\$	Union Co.	68
19	School crossing guard training program (VTC)	High	Medium	\$\$	Linden & VTC	66
	Operations					
20	Consider the installation of head-to-head left-turn lanes. A right-turn lane could be added on westbound approach. (The bus stop problem should be solved before considering any turning lanes.)	Medium	Medium	\$\$	Union Co.	16, 60, 62, 63, 64
21	Minimize turn radius on the east side.	Medium	Medium	\$\$	Union Co.	65
	Maintenance					
22	Replace the missing cobra head.	High	Short	\$	Union Co.	72
23	Replace the "No Left Turn" sign from Carvel parking lot.	Medium	Short	\$	Union Co.	67
	Price Street					
	Traffic Signal					
1	Repair/replace the near-side pedestrian signal on the northbound approach.	High	Short	\$	Union Co.	75
2	Consider installing near-side signal heads or reconfiguring traffic signal design.	High	Medium	\$\$	Union Co.	76

Rec. #	Recommendations List	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref. #
	Operations					
3	Turning counts are needed to evaluate installing head-to-head left-turn lanes.	Medium	Medium	\$\$	Union Co.	16
	Elm Street					
1	Replace broken visor.	Medium	Short	\$	Union Co.	77
	Henry Street					
	Operations					
1	Install bulbout; this would be the last one on the eastern portion of the corridor, as the cross-section narrows to the west.	Med-High	Medium	\$\$	Union Co.	12, 17
	Traffic Signal					
2	Add school-zone signage.	Med-High	Short	\$	Union Co.	26
	Curtis Street					
	Pedestrian Facilities					
1	Remove the pole between the curb ramps to improve pedestrian access.	Medium	Long	\$\$\$	Union Co.	78
	Between Curtis and Gibbons					
1	Remove the steps from the elementary school to the sidewalk.	High	Long	\$\$\$	Linden	79
2	Consider installing a "V" sidewalk to channel children toward the crosswalks.	Medium	Long	\$\$\$	Linden	79
3	Consider placing a physical barrier across from the steps to prevent children from crossing Wood at that location.	High	Medium	\$\$	Linden	79
4	Add flashing school-zone signage before the school, in both directions.	High	Medium	\$\$	Union Co.	79
	Gesner Street					
	Pedestrian Facilities					
1	Install high-visibility crosswalks across Wood Avenue.	Med-High	Medium	\$\$	Union Co.	83, 84
2	Add a crosswalk across Gesner Street.	Medium	Short	\$	Union Co.	83, 84
3	Install RRFB or HAWK.	Med-High	Med-Long	\$\$\$	Union Co.	83
4	Consider the installation of a median refuge island.	Med-High	Medium	\$\$	Union Co.	83
5	Construct a depressed curb and ramp at Wood Avenue crosswalk.	Med-High	Medium	\$\$	Union Co.	82
6	Consider the installation of a bulbout in the "T" area.	Med-High	Medium	\$\$	Union Co.	83
	Pavement Markings					
7	Install stop bar and centerlines on Gesner Street.	Medium	Short	\$	Union Co.	24
8	Consider "school zone" pavement markings.	Medium	Medium	\$\$	Union Co.	83
9	Consider crosshatching the intersection.	Medium	Medium	\$\$	Union Co.	80, 81
	Signage					
10	Install bright strips on the sign posts.	Med-Low	Short	\$	Union Co.	25
11	Install "school zone" signage.	Medium	Med-Short	\$	Union Co.	26
	Bus					
12	The location of the bus stop needs to be addressed within the broader discussion of bus stops along the corridor.	Medium	Medium	\$\$	Union Co & NJ Transit	85

5.0 RECOMMENDATIONS - GRAPHICS

LINDEN AVENUE TO PENN RR AVENUE



- High-visibility crosswalks
- In-road lighting at Penn RR Avenue crosswalk to Linden Train Station
- Concrete (preferable) or painted median at Penn RR Avenue crosswalk
- Pedestrian refuge island at median
- Improved truck signage warning about bridge height and alternate route prior to Linden Avenue for northbound trucks
- Hatching in front of train station, to prevent parking and to delineate one lane of travel
- Concrete (preferable) or painted median under bridge
- Improved visibility under bridge: painted lighter color, better lighting
- Fencing along sidewalks under bridge to prevent pedestrian crossing
- Painted median north of bridge terminating at left-turn lane
- Optional: addition of crosswalk north of bridge

ELIZABETH AVENUE TO PRICE STREET



- Revised cross section:
 - Additional 4-6 feet sidewalk width on each side
 - One twelve-foot lane in each direction
 - Four-foot painted median
 - Parking both sides of street
- Bulbouts at intersections without left-turn lanes: will prevent parking near intersection, will prevent shadow phenomenon, could shorten sidewalk depending on crosswalk placement
- High-visibility crosswalks
- Pedestrian refuge island
- Improved truck signage warning about bridge height and alternate route
- Option: left-turn lanes at Blancke Street—remove painted median and revise bulbouts

BLANCHE STREET TO KNOPF STREET



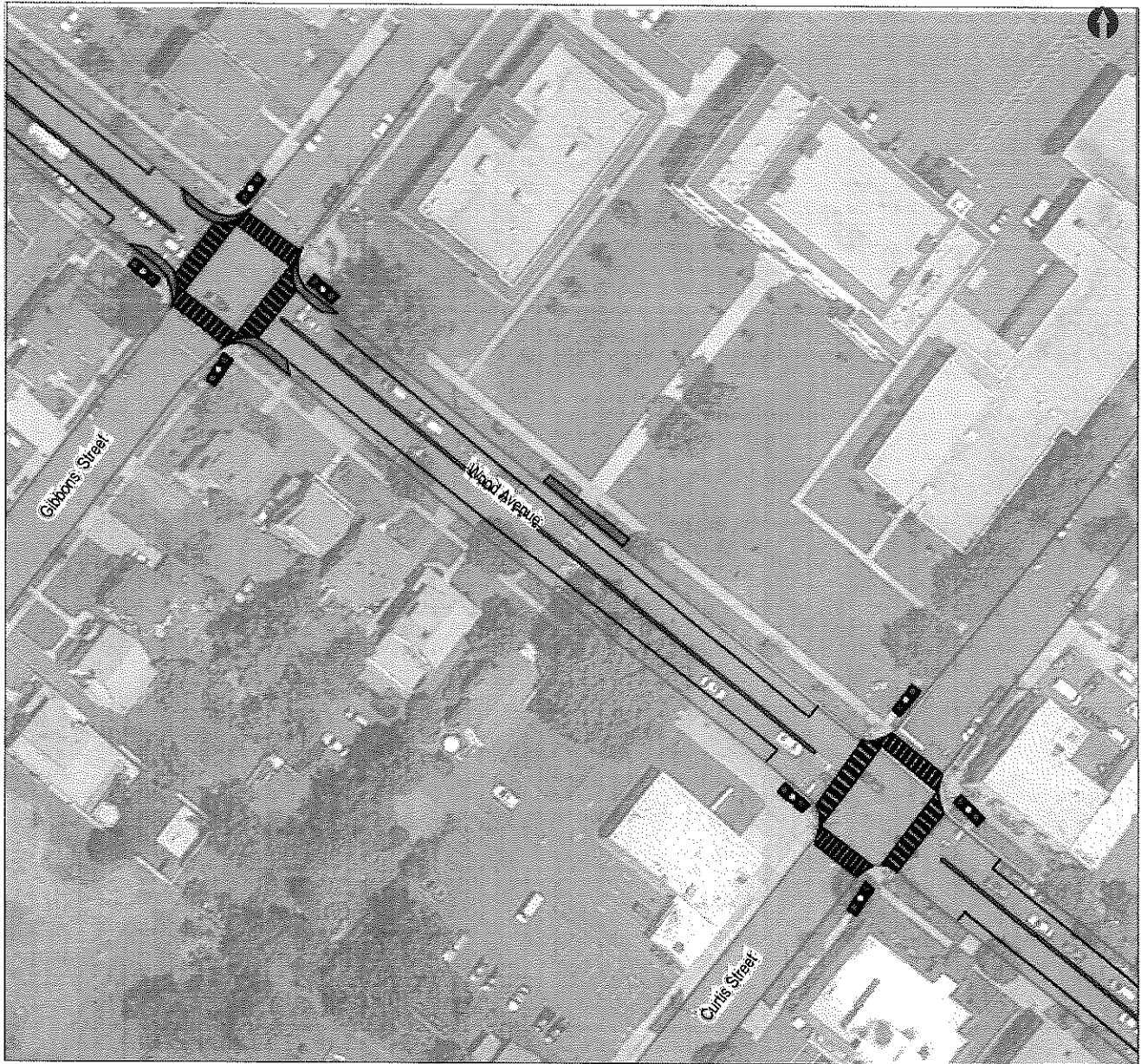
- Revised cross section:
 - Additional 4-6 feet sidewalk width on each side
 - One twelve-foot lane in each direction
 - Four-foot painted median
 - Parking both sides of street
- Bulbouts at intersections without left-turn lanes: will prevent parking near intersection, will prevent shadow phenomenon, could shorten sidewalk depending on crosswalk placement
- High visibility crosswalks
- Pedestrian refuge island
- Improved truck signage warning about bridge height and alternate route
- Option: left-turn lanes: remove painted median and revise bulbouts

ELM STREET TO HENRY STREET

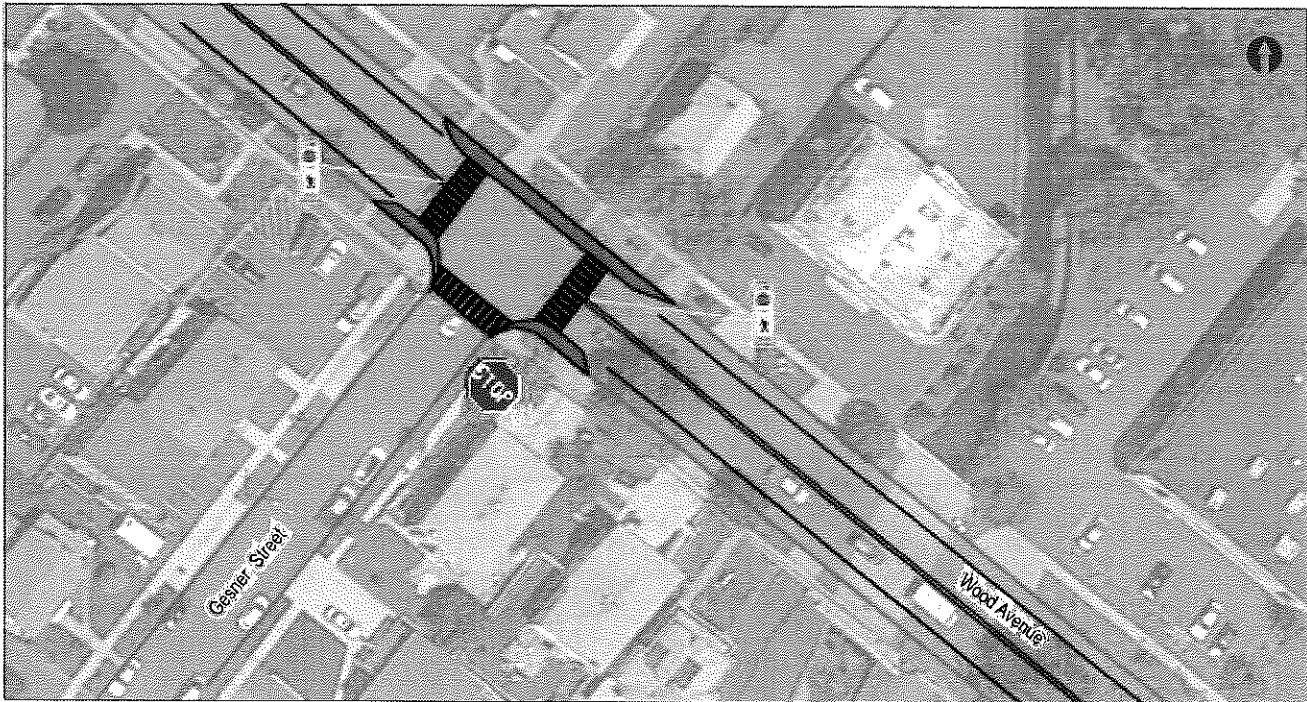


- Revised cross section up to Henry Street:
 - Additional 4-6 feet sidewalk width on each side
 - One twelve-foot lane in each direction
 - Four-foot painted median
 - Parking both sides of street
- Bulbouts at intersections without left-turn lanes: will prevent parking near intersection, will prevent shadow phenomenon, could shorten sidewalk depending on crosswalk placement
- High-visibility crosswalks
- Pedestrian refuge island
- Improved truck signage warning about bridge height and alternate route
- Option: left-turn lanes—remove painted median and revise bulbouts
- West of Henry Street: clearly delineate lane lines and permitted parking

CURTIS STREET TO GIBBONS STREET



- Option: Bulbouts at intersections will prevent parking near intersection, will prevent shadow phenomenon, could shorten sidewalk depending on crosswalk placement
- High-visibility crosswalks
- Option: left-turn lanes—remove painted median and revise bulbouts
- Delineate lane lines and permitted parking
- To prevent children from crossing the street at the midblock school sidewalk, a small wall or fence could be installed or the sidewalk could be revised to a “V” to encourage them toward the intersections



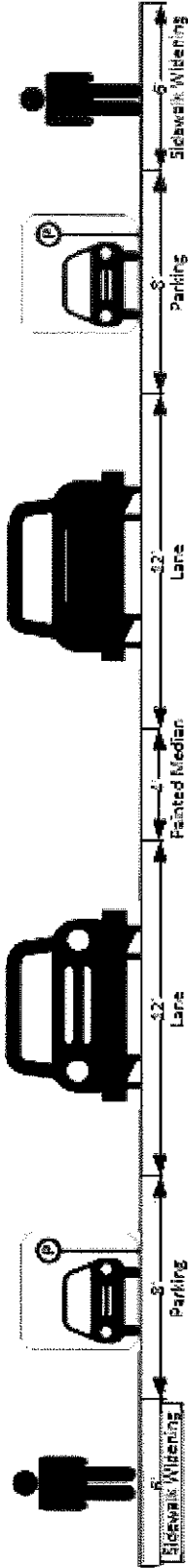
- Bulbouts at intersection will prevent parking near intersection, will prevent shadow phenomenon, could shorten sidewalk depending on crosswalk placement
- High-visibility crosswalks
- Option: left-turn lane, westbound
- Delineate lane lines and permitted parking
- Pedestrian crossing signs in the roadway
- Signage to indicate the adjacent school (high school)

OPTION: BIKE LANES



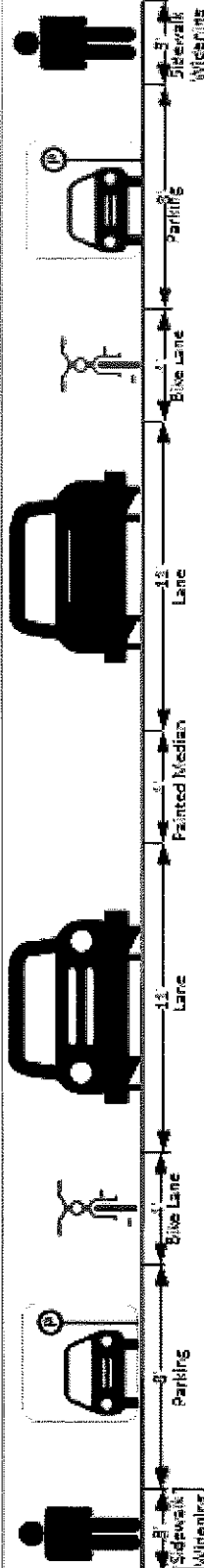
- Lanes: Eleven-foot lanes in each direction
- Median: Four-foot painted median
- Bike lanes: Four-foot-wide dedicated bike lane in each direction
- Parking on both sides of road
- Sidewalk widening: three feet on each side of roadway
- High-visibility crosswalks

CROSS SECTION RECOMMENDATION



- One 12' lane in each direction
- Painted Median: would allow for 14' lanes for emergency vehicles and trucks while visually helping to narrow lanes
- Wider Sidewalks: improved pedestrian environment, more compact driving environment
- Parking: existing parking maintained on both sides of roadway
- Sidewalk widening: six feet on each side of roadway

CROSS SECTION OPTION WITH BICYCLE LANES

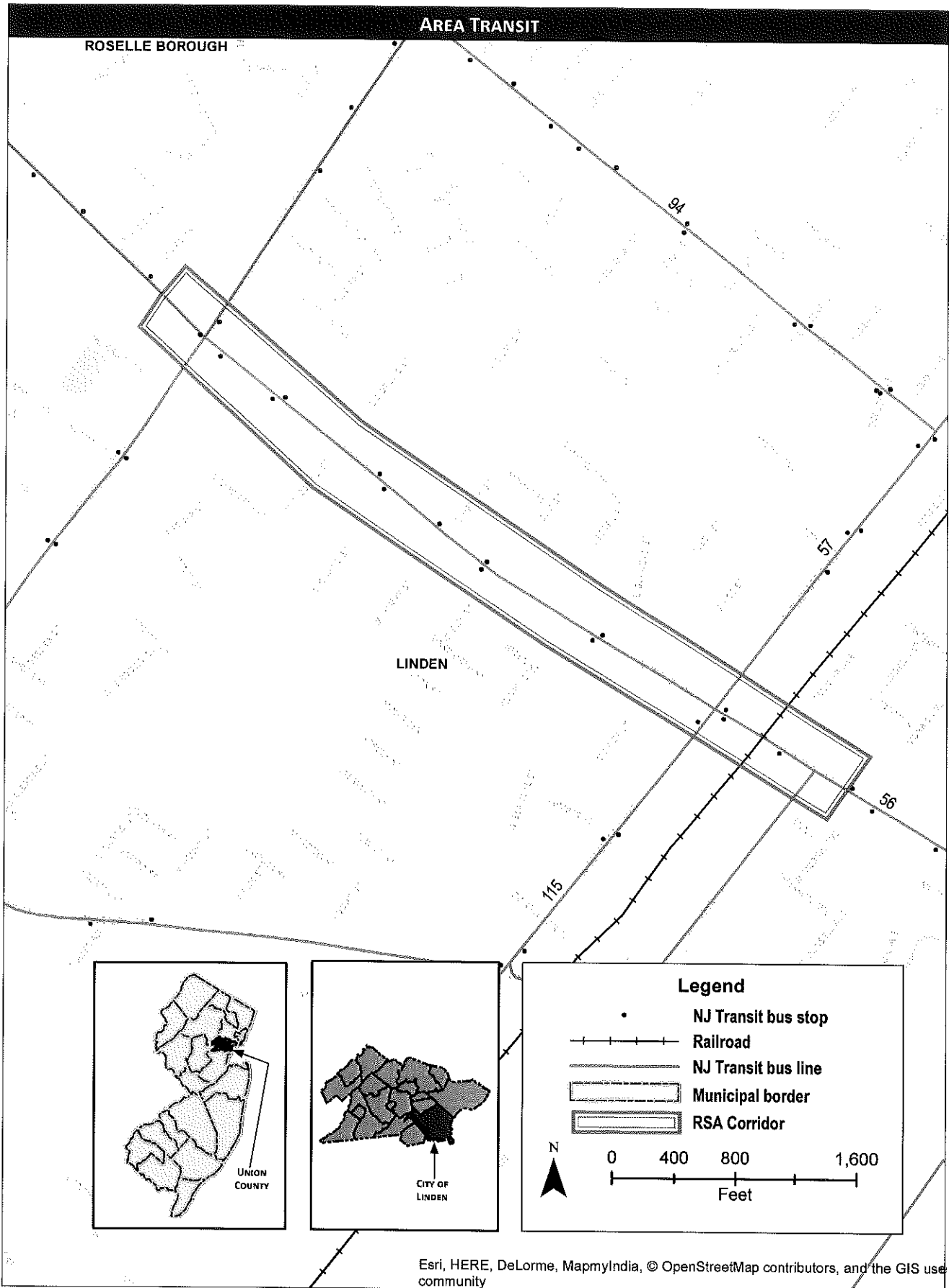


- One 11' lane in each direction
- Painted median: would allow for 13' lanes for emergency vehicles and trucks while visually helping to narrow lanes
- Parking: existing parking maintained on both sides of roadway
- Sidewalk widening: three feet on each side of roadway
- Four-foot bicycle lanes on each side of roadway

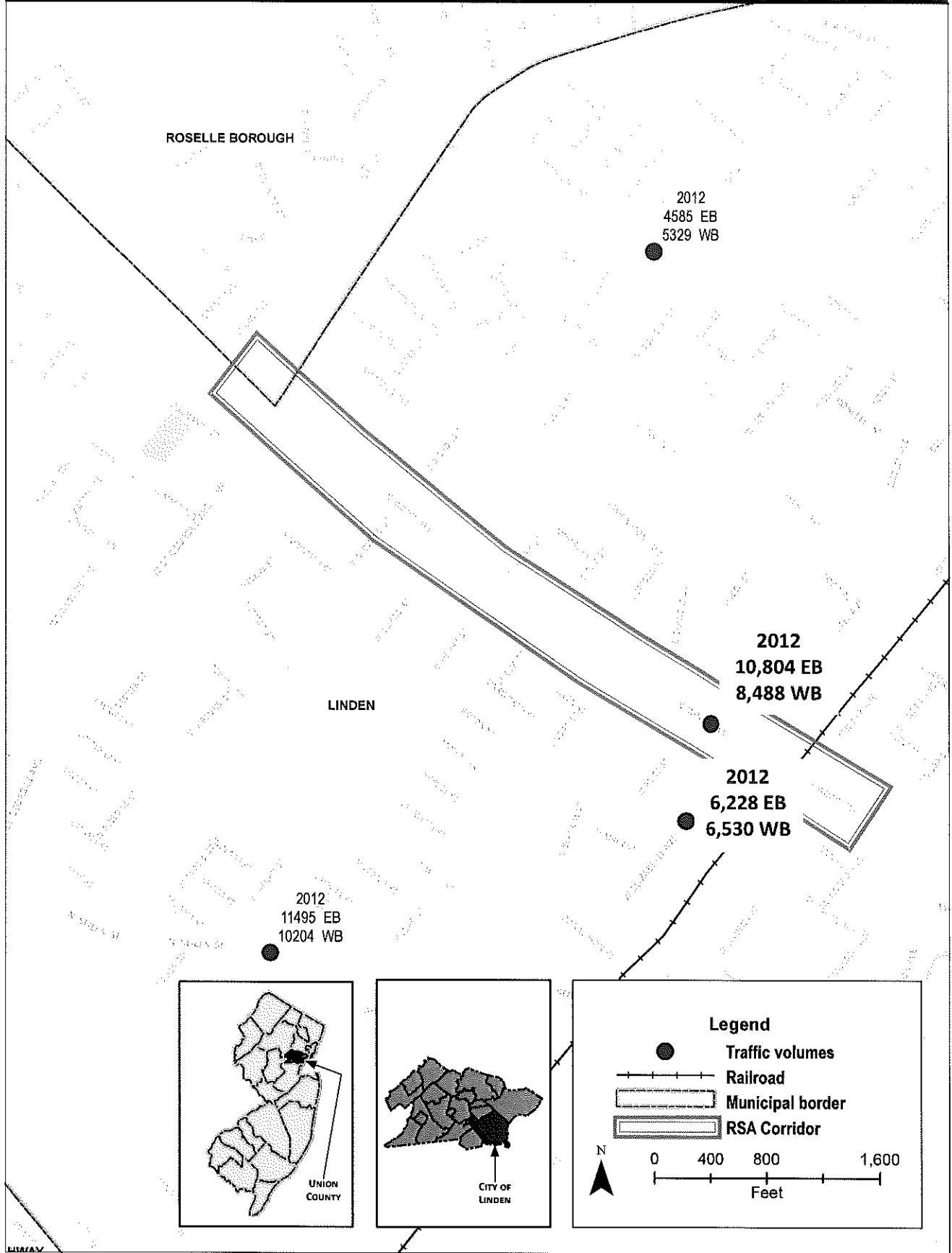
APPENDIX A – RSA TEAM

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Rebecca Mejia	Boswell Engineering	rmejia@boswellengineering.com
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APPENDIX B – AREA MAPS



TRAFFIC VOLUMES



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RSA AREA – CRASH SUMMARY - ALL CRASH TYPES (2011–2013)

Crash Type	#
Same Direction – Rear End	72
Same Direction – Side Swipe	32
Right Angle	19
Opposite Direction – Head On/ Angular	2
Opposite Direction – Side Swipe	1
Struck Parked Vehicle	22
Left Turn / U-Turn	19
Backing	15
Encroachment	-
Overtuned	-
Fixed Object	31
Animal	-
Pedestrian	23
Pedalcyclist	1
Non-fixed Object	-
Railcar – Vehicle	-
Other	1
Total	238

Month	#
January	23
February	22
March	23
April	17
May	20
June	11
July	19
August	11
September	17
October	25
November	23
December	27
Total	238

Crash Year	#
2011	85
2012	75
2013	78
Total	238

Light Condition	#
Daylight	194
Dawn	39
Dusk	4
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	1
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	238

Intersection	#
At intersection	78
Not at intersection	159
At or Near Railroad	1
Total	238

Surface Condition	#
Dry	173
Wet	3
Snowy	5
Icy	0
Slush	47
Water – Standing/ Moving	10
Sand, Mud, Dirt	-
Oil	-
Total	238

Severity	#
Property Damage Only (PDO)	179
Pain	44
Moderate Injury	11
Incapacitating Injury	2
Fatal	2
Total	238

Day	#
Monday	33
Tuesday	33
Wednesday	43
Thursday	24
Friday	53
Saturday	28
Sunday	24
Total	238

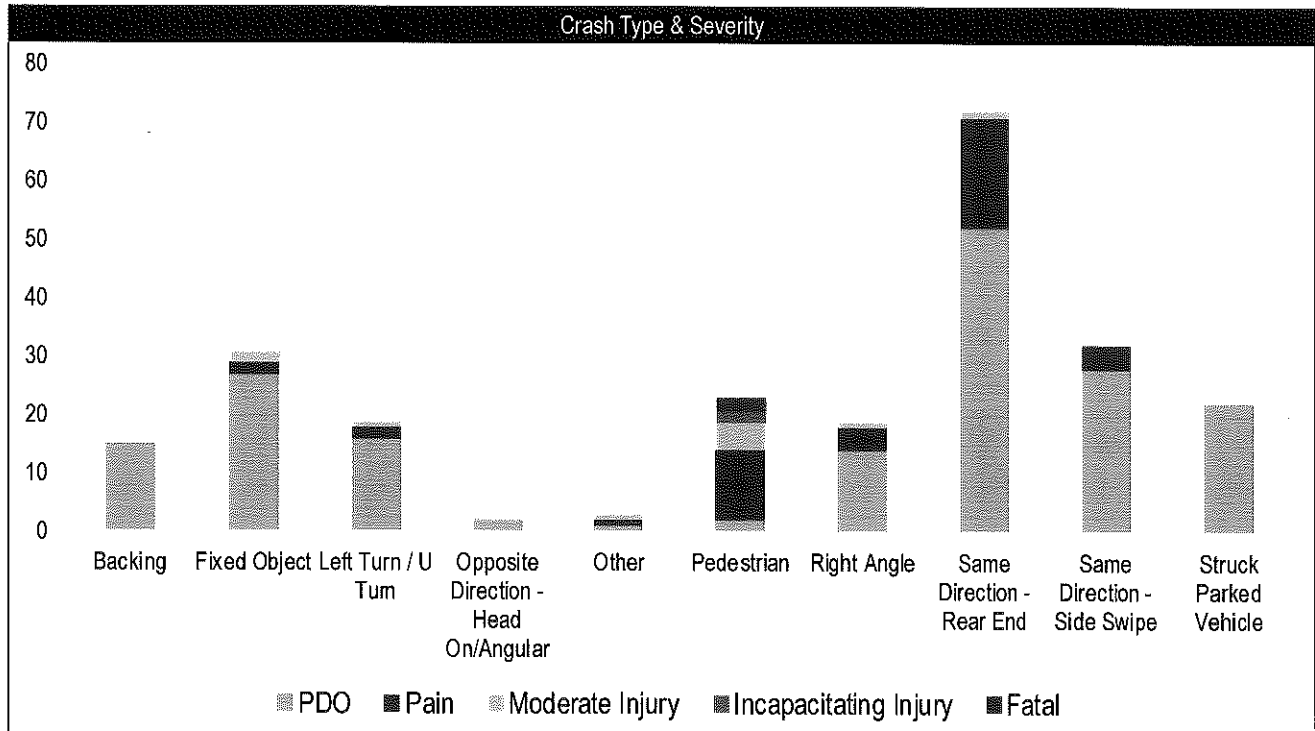
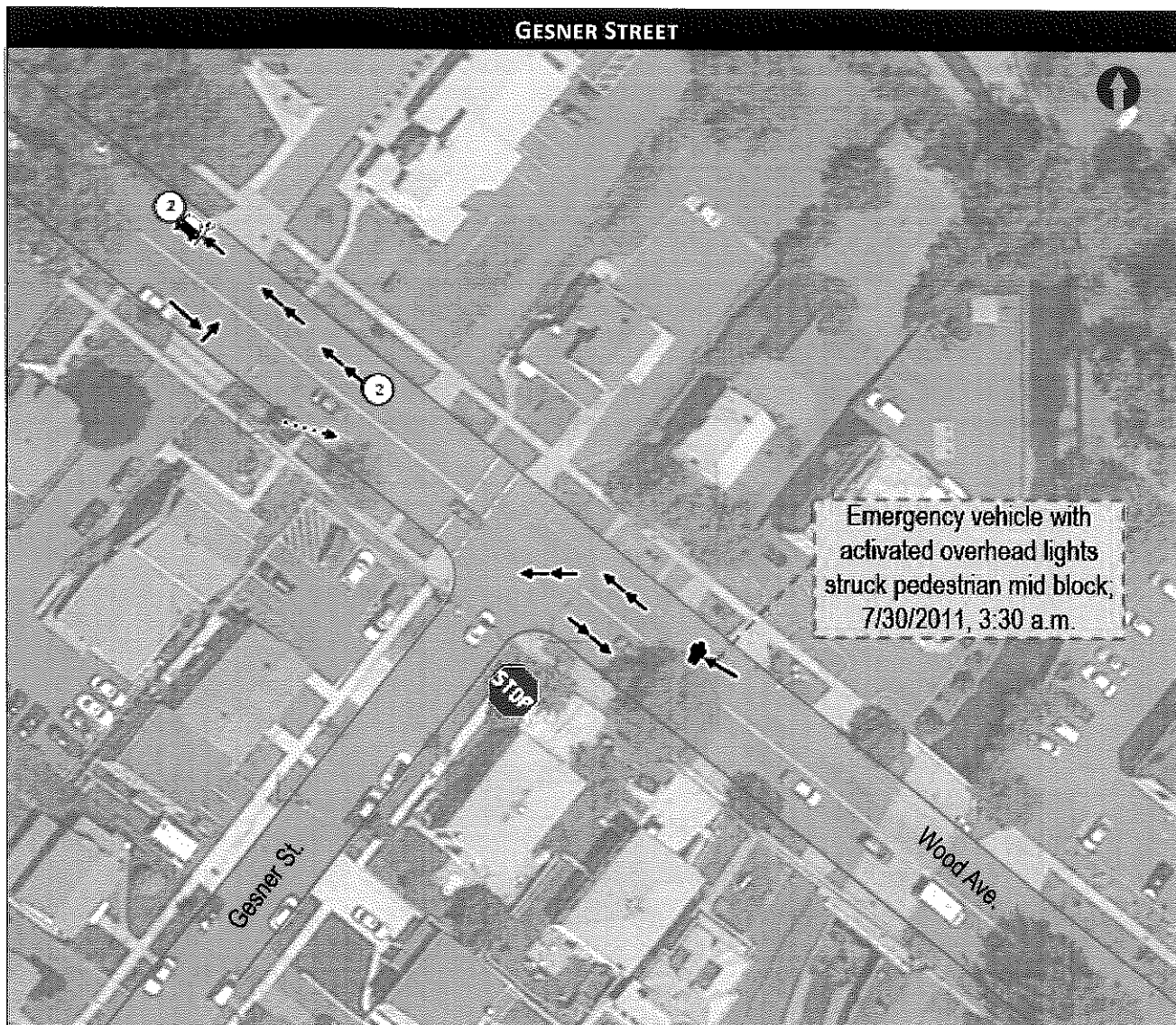



Figure 27 – RSA Corridor Crash Type and Severity

APPENDIX C – CRASH DATA & DIAGRAMS















All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

 = Incapacitating Injury

LEGEND

 Right angle	 Same direction - Side swipe
 Cyclist	 Same direction - Rear End
 Pedestrians	 Struck parked vehicle
 Backing	 Fixed-object
 Left-turn	 Opposite direction - Head on/angular
 Other	 Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

GESNER STREET (2011 – 2013)

Crash Type	#
Same Direction – Rear End	6
Same Direction – Side Swipe	-
Right Angle	1
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	2
Left Turn / U-Turn	-
Backing	1
Encroachment	-
Overtuned	-
Fixed Object	-
Animal	-
Pedestrian	1
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	11

Month	#
January	1
February	-
March	-
April	-
May	2
June	-
July	1
August	1
September	-
October	4
November	1
December	1
Total	11

Severity	#
Property Damage Only (PDO)	9
Pain	1
Moderate Injury	-
Incapacitating Injury	1
Fatal	-
Total	11

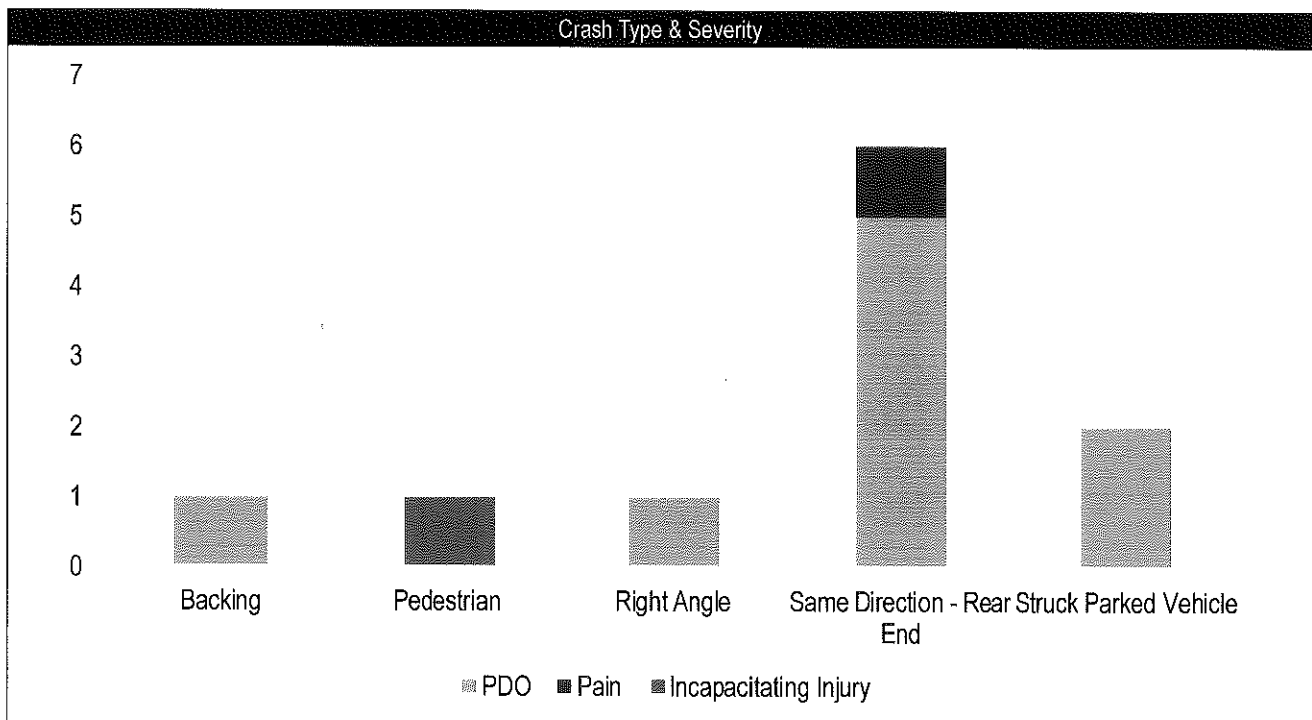
Crash Year	#
2011	4
2012	4
2013	3
Total	11

Intersection	#
At intersection	-
Not at intersection	11
At or Near Railroad	-
Total	11

Surface Condition	#
Dry	10
Wet	1
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	11

Light Condition	#
Daylight	8
Dawn	-
Dusk	1
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	1
Dark – Street Lights On/ Spot	1
Dark – Street Lights Off	-
Other	-
Total	11

Day	#
Monday	2
Tuesday	4
Wednesday	-
Thursday	-
Friday	3
Saturday	1
Sunday	1
Total	11



GIBBONS STREET















All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

 = Complaint of pain

LEGEND

 Right angle	 Same direction - Side swipe
 Cyclist	 Same direction - Rear End
 Pedestrians	 Struck parked vehicle
 Backing	 Fixed-object
 Left-turn	 Opposite direction - Head on/angular
 Other	 Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

GIBBONS STREET- CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	4
Same Direction – Side Swipe	1
Right Angle	3
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	-
Left Turn / U-Turn	1
Backing	-
Encroachment	-
Overtuned	-
Fixed Object	2
Animal	-
Pedestrian	-
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	11

Month	#
January	2
February	-
March	-
April	4
May	-
June	-
July	1
August	1
September	-
October	1
November	2
December	-
Total	11

Severity	#
Property Damage Only (PDO)	10
Pain	1
Moderate Injury	-
Incapacitating Injury	-
Fatal	-
Total	11

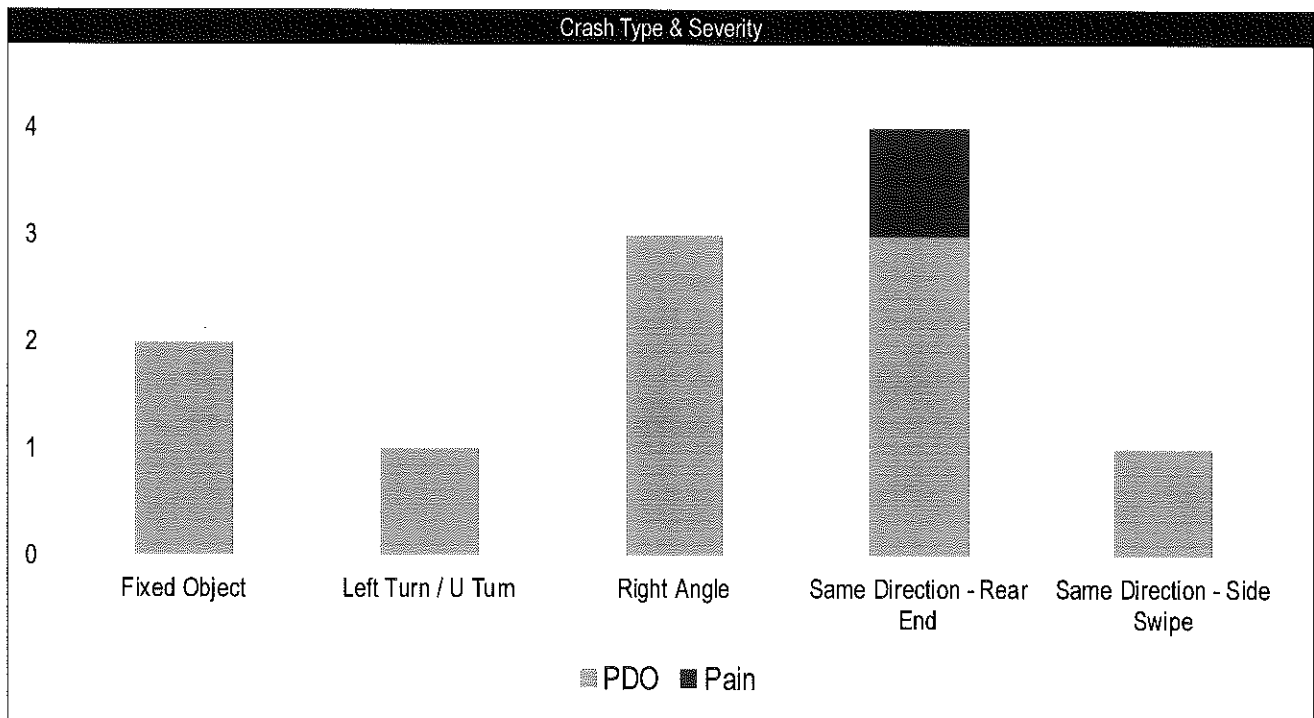
Crash Year	#
2011	4
2012	3
2013	4
Total	11

Intersection	#
At intersection	7
Not at intersection	4
At or Near Railroad	-
Total	11

Surface Condition	#
Dry	9
Wet	2
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	11

Light Condition	#
Daylight	9
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	2
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	11

Day	#
Monday	2
Tuesday	3
Wednesday	2
Thursday	1
Friday	-
Saturday	1
Sunday	2
Total	11



CURTIS STREET















All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

-  = Moderate injury
-  = Complaint of pain

LEGEND

 Right angle	 Same direction - Side swipe
 Cyclist	 Same direction - Rear End
 Pedestrians	 Struck parked vehicle
 Backing	 Fixed-object
 Left-turn	 Opposite direction - Head on/angular
 Other	 Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

CURTIS STREET – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	3
Same Direction – Side Swipe	1
Right Angle	1
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	-
Left Turn / U-Turn	1
Backing	-
Encroachment	-
Overtuned	-
Fixed Object	-
Animal	-
Pedestrian	1
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	7

Month	#
January	-
February	-
March	-
April	-
May	1
June	1
July	1
August	-
September	1
October	1
November	1
December	1
Total	7

Severity	#
Property Damage Only (PDO)	3
Pain	3
Moderate Injury	1
Incapacitating Injury	-
Fatal	-
Total	7

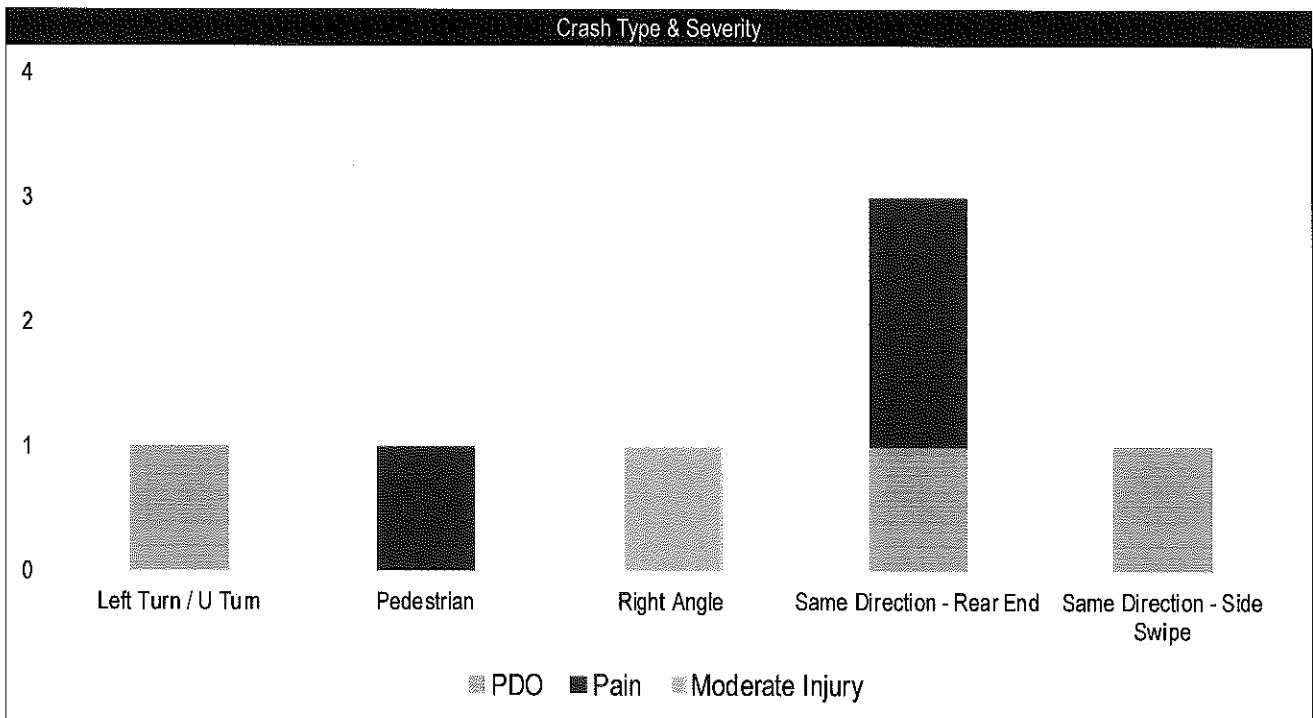
Crash Year	#
2011	2
2012	3
2013	2
Total	7

Intersection	#
At intersection	4
Not at intersection	3
At or Near Railroad	-
Total	7

Surface Condition	#
Dry	7
Wet	-
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	7

Light Condition	#
Daylight	5
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	2
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	7

Day	#
Monday	-
Tuesday	-
Wednesday	1
Thursday	2
Friday	-
Saturday	2
Sunday	2
Total	7



HENRY STREET



All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

- = Incapacitating Injury
- = Moderate injury
- = Complaint of pain

LEGEND

- Right angle
- Cyclist
- Pedestrians
- Backing
- Left-turn
- Other
- Same direction - Side swipe
- Same direction - Rear End
- Struck parked vehicle
- Fixed-object
- Opposite direction - Head on/angular
- Opposite direction - Side Swipe

Google Imagery, 2014

Crash diagrams based on reports retrieved from NJDOT

HENRY STREET – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	2
Same Direction – Side Swipe	1
Right Angle	2
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	-
Left Turn / U-Turn	1
Backing	-
Encroachment	-
Overtaken	-
Fixed Object	1
Animal	-
Pedestrian	1
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	8

Month	#
January	1
February	1
March	2
April	-
May	1
June	-
July	-
August	-
September	-
October	-
November	1
December	2
Total	8

Severity	#
Property Damage Only (PDO)	5
Pain	2
Moderate Injury	1
Incapacitating Injury	-
Fatal	-
Total	8

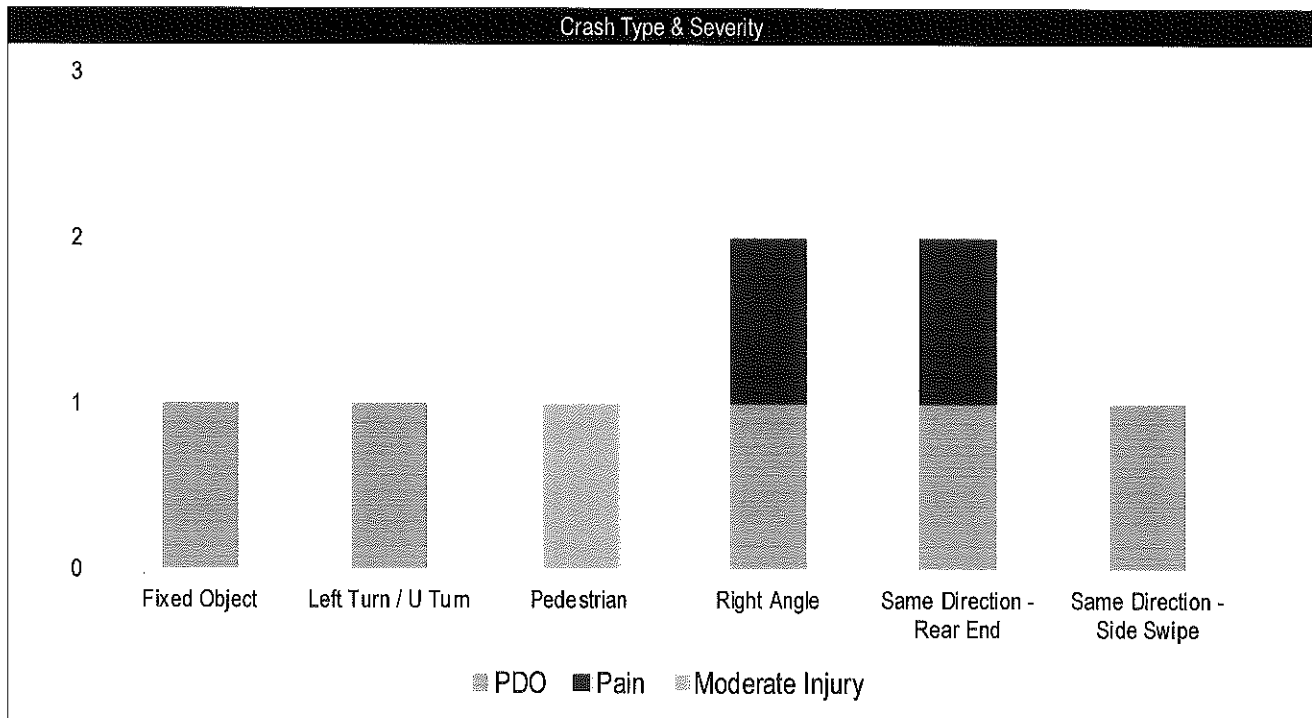
Crash Year	#
2011	3
2012	2
2013	3
Total	8

Intersection	#
At intersection	6
Not at intersection	2
At or Near Railroad	-
Total	8

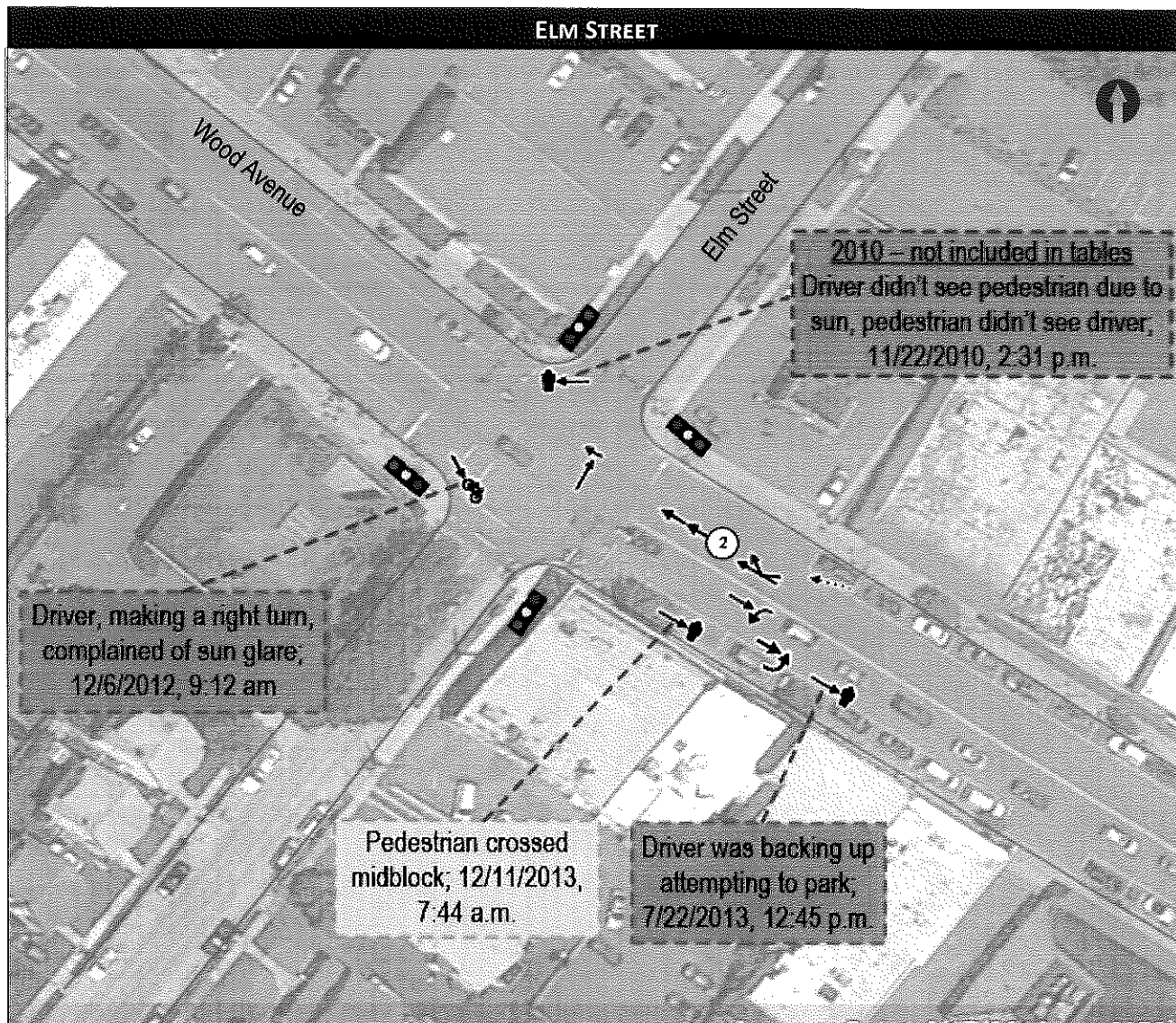
Surface Condition	#
Dry	5
Wet	3
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	8

Light Condition	#
Daylight	5
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	3
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	8

Day	#
Monday	1
Tuesday	2
Wednesday	-
Thursday	1
Friday	3
Saturday	1
Sunday	-
Total	8



ELM STREET



All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

- = Complaint of pain
- = Property damage only

LEGEND

Right angle	Same direction - Side swipe
Cyclist	Same direction - Rear End
Pedestrians	Struck parked vehicle
Backing	Fixed-object
Left-turn	Opposite direction - Head on/angular
Other	Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

ELM STREET – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	2
Same Direction – Side Swipe	1
Right Angle	1
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	-
Left Turn / U-Turn	2
Backing	1
Encroachment	-
Overtuned	-
Fixed Object	-
Animal	-
Pedestrian	2
Pedalcyclist	1
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	10

Month	#
January	2
February	-
March	2
April	1
May	1
June	-
July	1
August	-
September	1
October	-
November	-
December	2
Total	10

Severity	#
Property Damage Only (PDO)	6
Pain	4
Moderate Injury	-
Incapacitating Injury	-
Fatal	-
Total	10

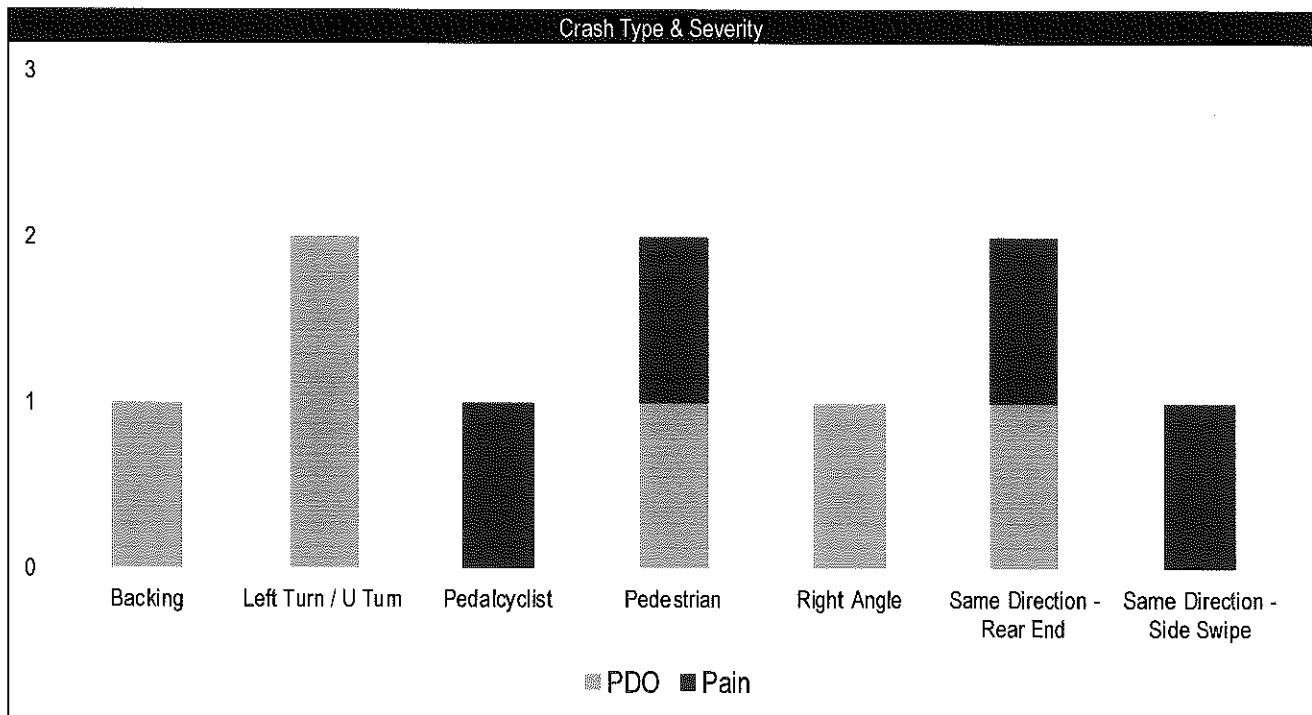
Crash Year	#
2011	-
2012	4
2013	6
Total	10

Intersection	#
At intersection	2
Not at intersection	8
At or Near Railroad	-
Total	10

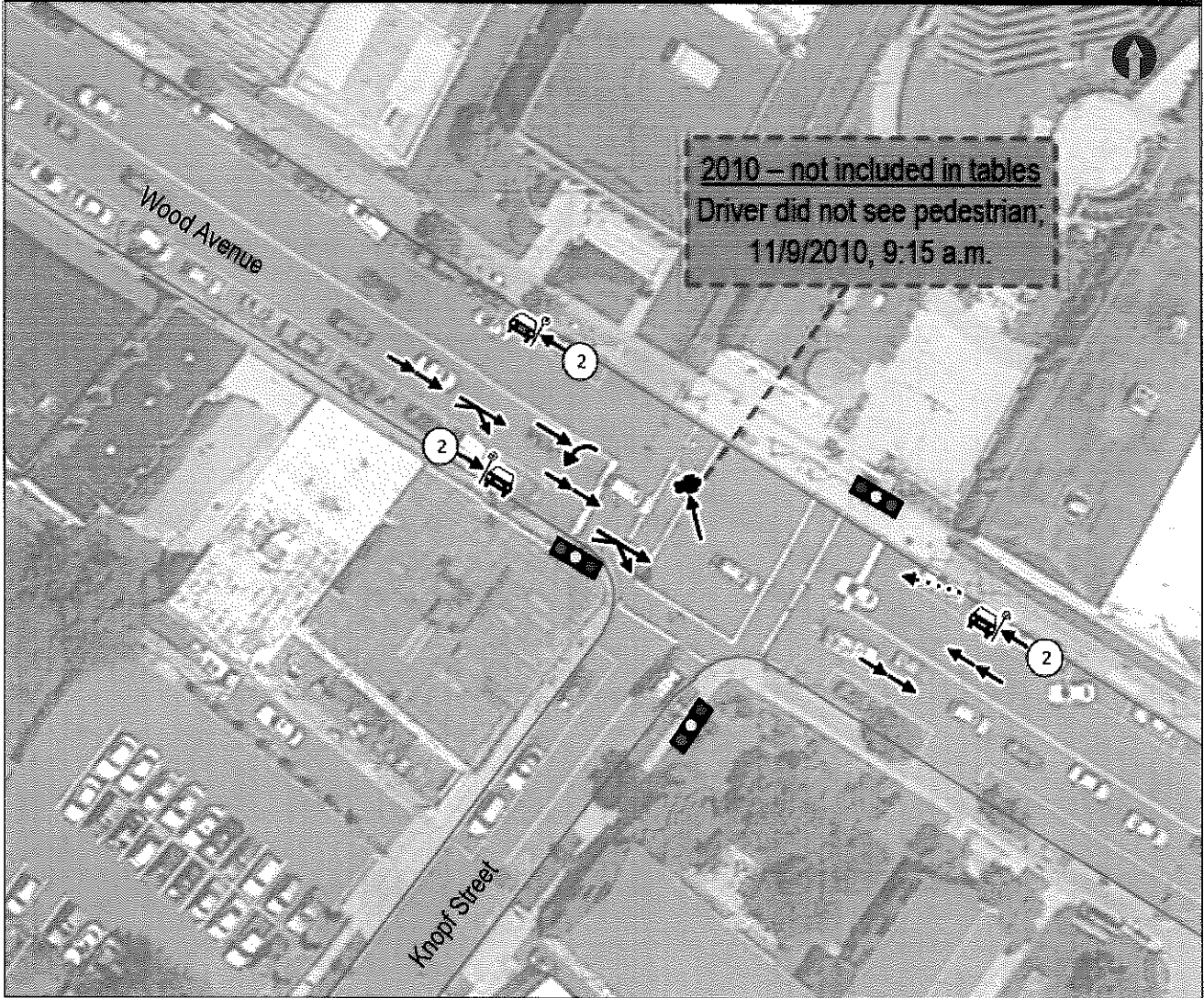
Surface Condition	#
Dry	8
Wet	2
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	10

Light Condition	#
Daylight	8
Dawn	1
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	1
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	10

Day	#
Monday	2
Tuesday	1
Wednesday	2
Thursday	2
Friday	2
Saturday	1
Sunday	-
Total	10



KNOPF STREET















All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

 = Complaint of pain

LEGEND

	Right angle		Same direction - Side swipe
	Cyclist		Same direction - Rear End
	Pedestrians		Struck parked vehicle
	Backing		Fixed-object
	Left-turn		Opposite direction - Head on/angular
	Other		Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

KNOPF STREET – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	4
Same Direction – Side Swipe	2
Right Angle	-
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	6
Left Turn / U-Turn	1
Backing	1
Encroachment	-
Overtuned	-
Fixed Object	-
Animal	-
Pedestrian	-
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	14

Month	#
January	-
February	2
March	2
April	-
May	-
June	1
July	2
August	-
September	2
October	1
November	1
December	3
Total	14

Severity	#
Property Damage Only (PDO)	14
Pain	-
Moderate Injury	-
Incapacitating Injury	-
Fatal	-
Total	14

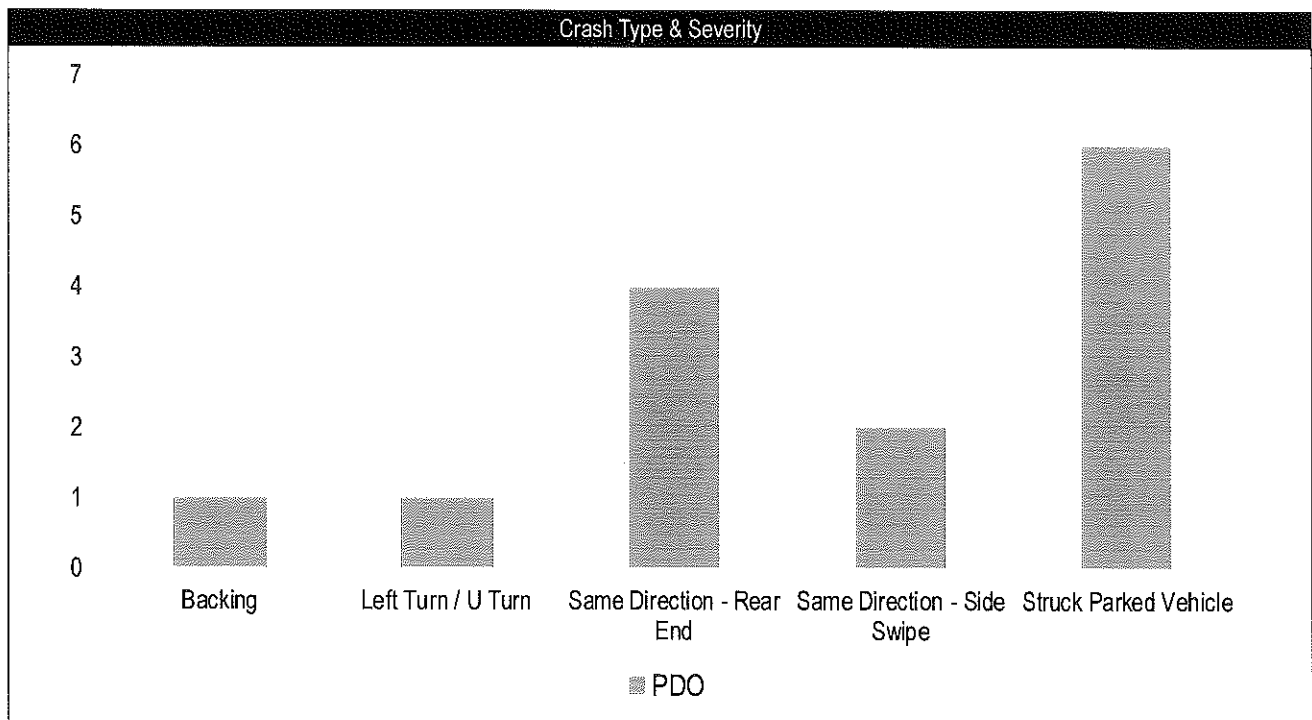
Crash Year	#
2011	4
2012	4
2013	6
Total	14

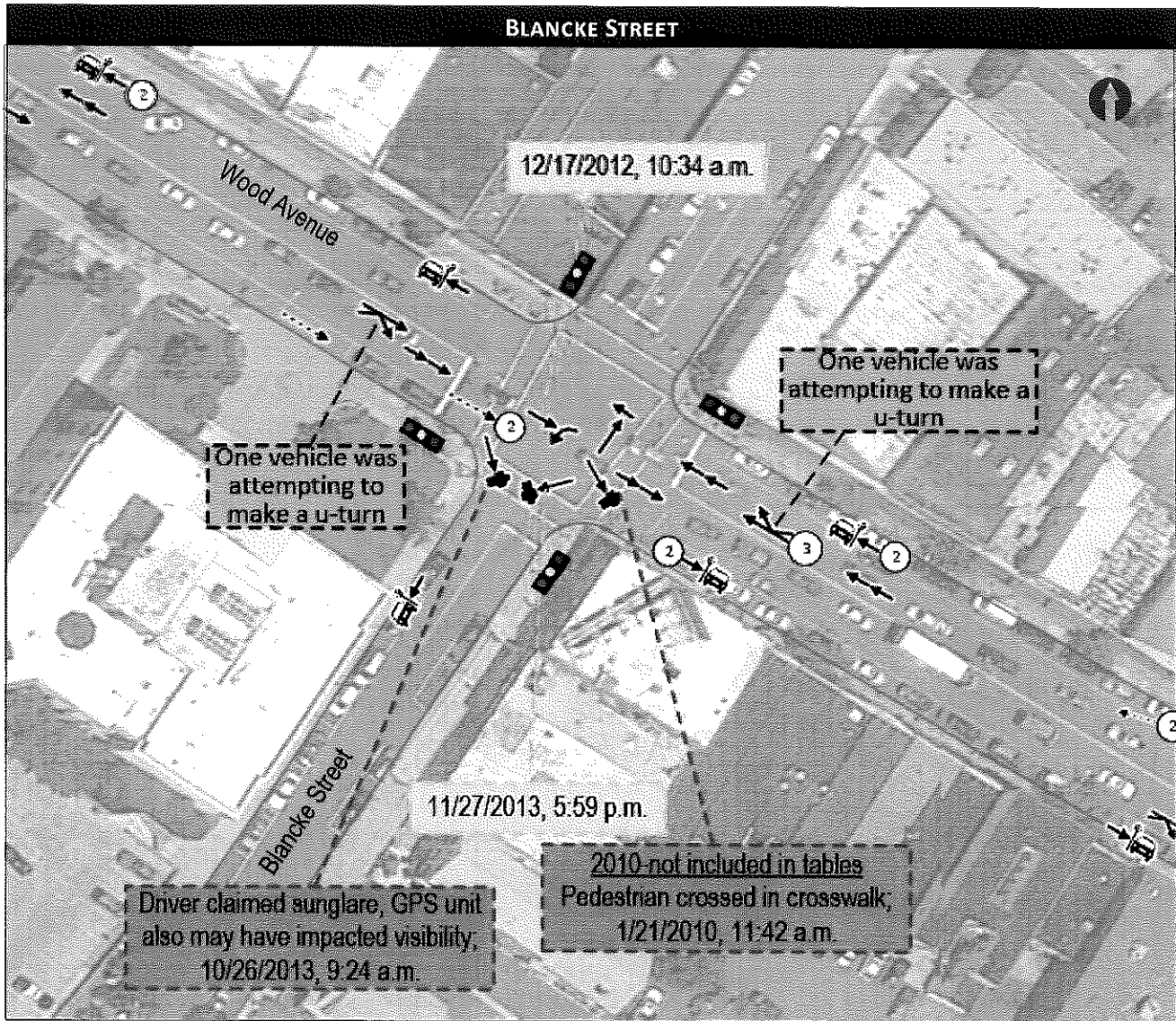
Intersection	#
At intersection	2
Not at intersection	12
At or Near Railroad	-
Total	14

Surface Condition	#
Dry	11
Wet	2
Snowy	-
Icy	-
Slush	1
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	14

Light Condition	#
Daylight	11
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	3
Dark – Street Lights On/ Spot	0
Dark – Street Lights Off	-
Other	-
Total	14

Day	#
Monday	2
Tuesday	4
Wednesday	2
Thursday	2
Friday	3
Saturday	-
Sunday	1
Total	14





All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

- = Moderate injury
- = Complaint of pain

LEGEND

Right angle	Same direction - Side swipe
Cyclist	Same direction - Rear End
Pedestrians	Struck parked vehicle
Backing	Fixed-object
Left-turn	Opposite direction - Head on/angular
Other	Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

BLANCHE STREET – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	4
Same Direction – Side Swipe	4
Right Angle	1
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	6
Left Turn / U-Turn	1
Backing	3
Encroachment	-
Overtuned	-
Fixed Object	-
Animal	-
Pedestrian	2
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	21

Month	#
January	3
February	-
March	1
April	2
May	2
June	-
July	1
August	2
September	1
October	5
November	2
December	2
Total	21

Severity	#
Property Damage Only (PDO)	14
Pain	5
Moderate Injury	2
Incapacitating Injury	-
Fatal	-
Total	21

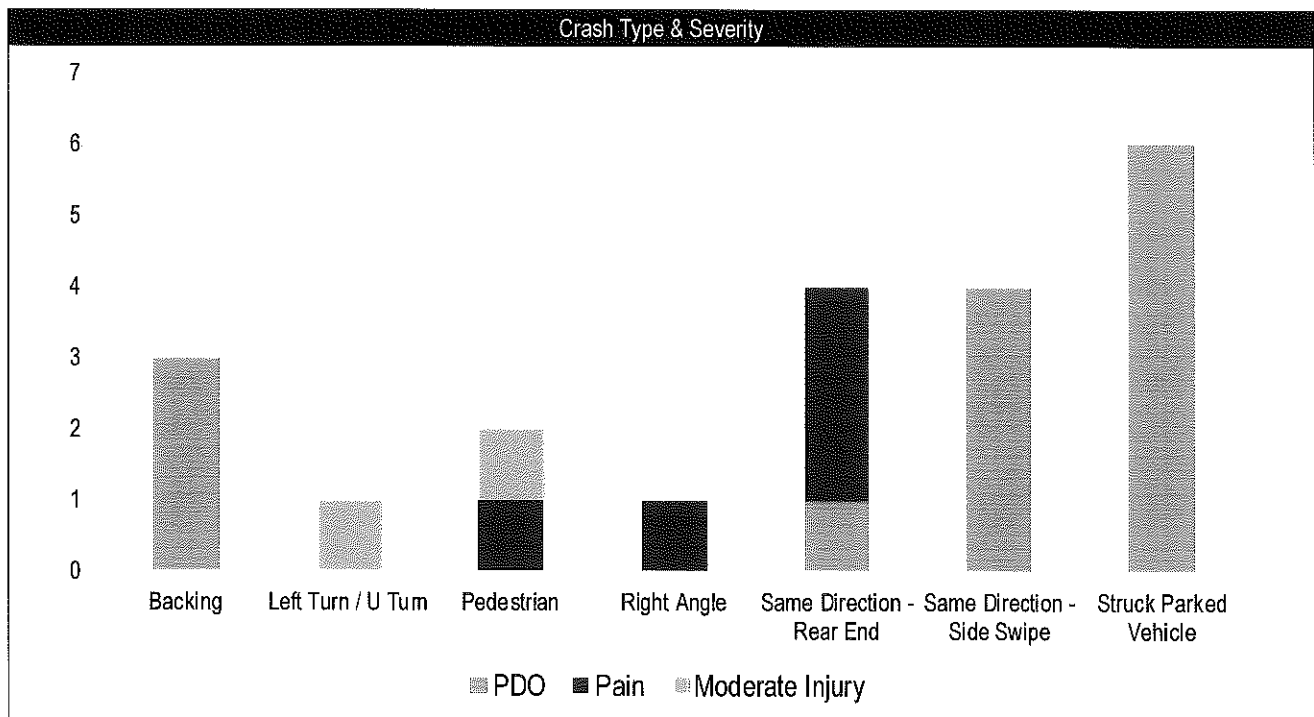
Crash Year	#
2011	8
2012	4
2013	9
Total	21

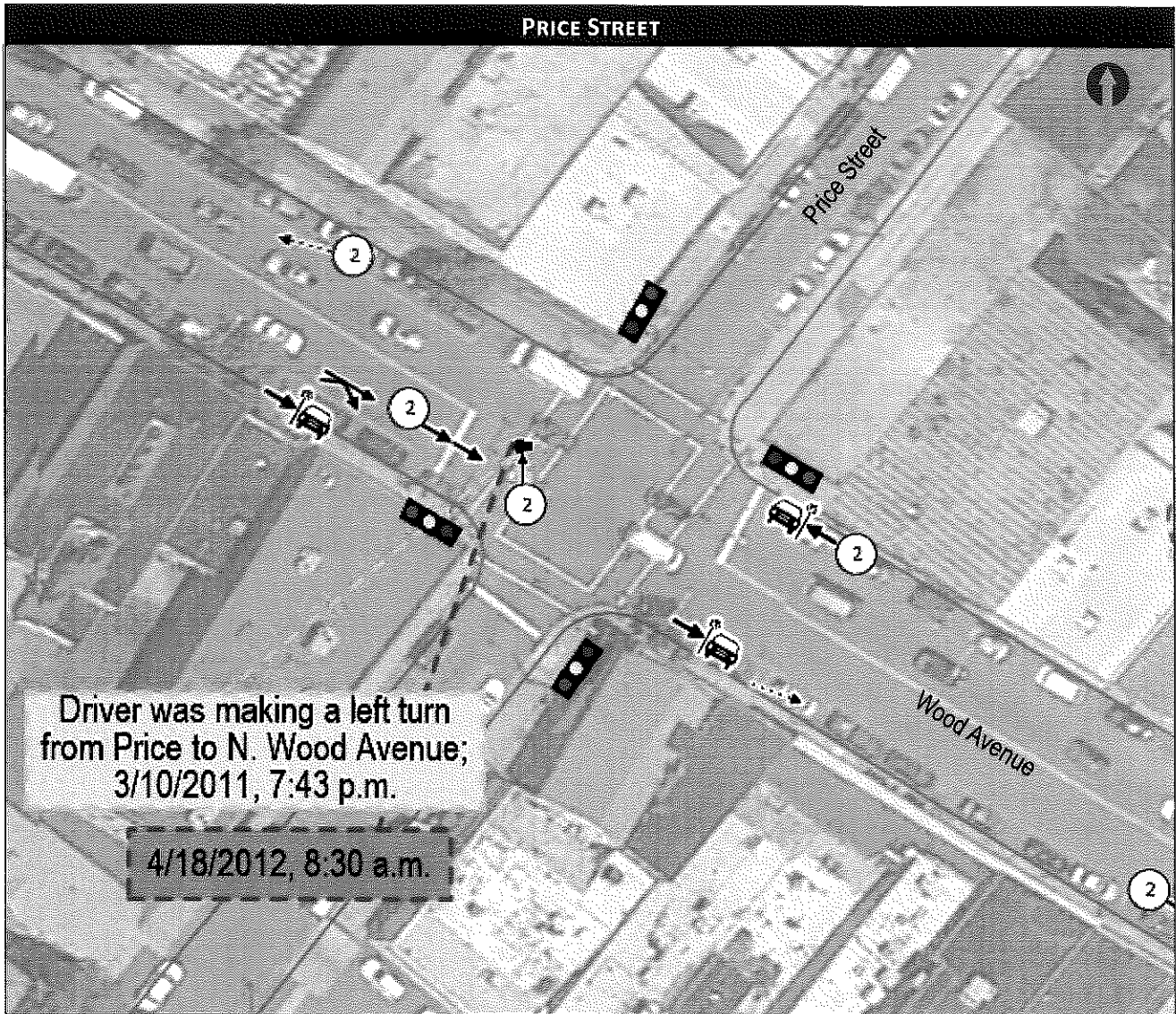
Intersection	#
At intersection	10
Not at intersection	11
At or Near Railroad	-
Total	21

Surface Condition	#
Dry	19
Wet	1
Snowy	1
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	21

Light Condition	#
Daylight	18
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	3
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	21


Day	#
Monday	6
Tuesday	2
Wednesday	5
Thursday	-
Friday	2
Saturday	5
Sunday	1
Total	21

















All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

-  = Moderate injury
-  = Complaint of pain

LEGEND

 Right angle	 Same direction - Side swipe
 Cyclist	 Same direction - Rear End
 Pedestrians	 Struck parked vehicle
 Backing	 Fixed-object
 Left-turn	 Opposite direction - Head on/angular
 Other	 Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

PRICE STREET – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	2
Same Direction – Side Swipe	1
Right Angle	-
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	4
Left Turn / U-Turn	-
Backing	3
Encroachment	-
Overtuned	-
Fixed Object	-
Animal	-
Pedestrian	2
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	12

Month	#
January	-
February	2
March	2
April	1
May	2
June	1
July	-
August	1
September	1
October	1
November	-
December	1
Total	12

Severity	#
Property Damage Only (PDO)	9
Pain	2
Moderate Injury	1
Incapacitating Injury	-
Fatal	-
Total	12

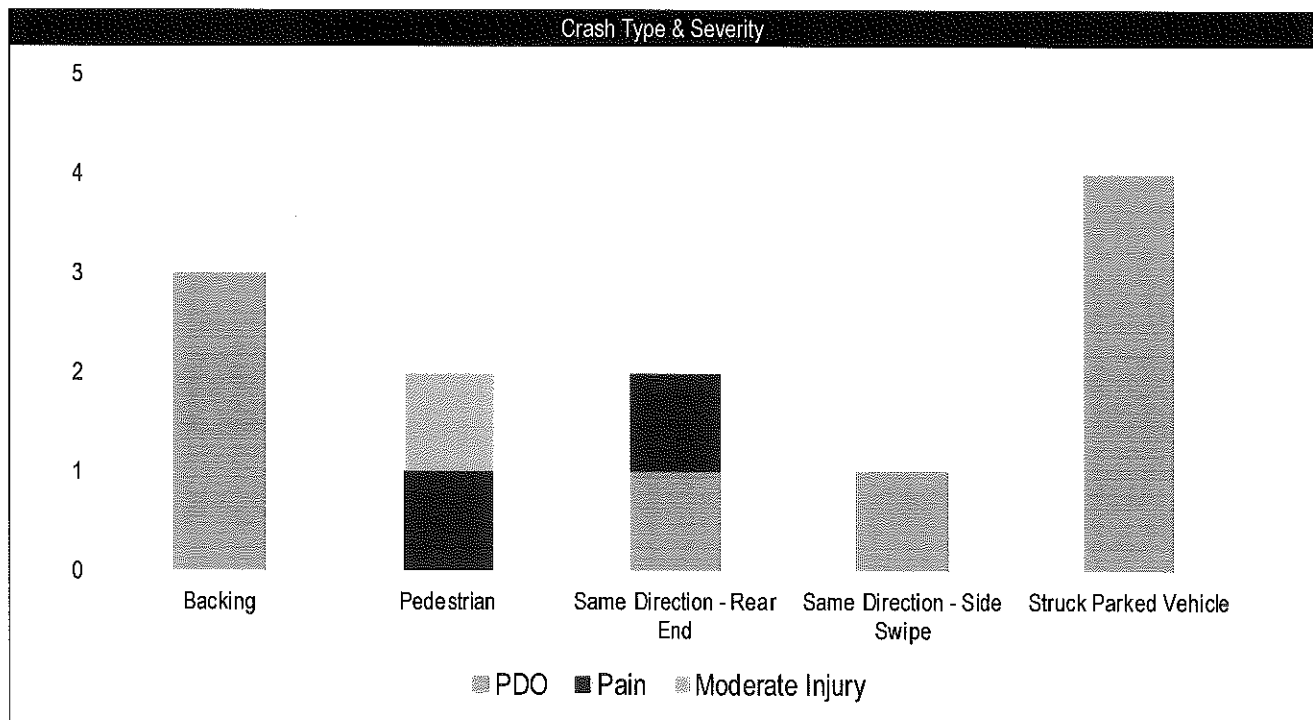
Crash Year	#
2011	6
2012	4
2013	2
Total	12

Intersection	#
At intersection	3
Not at intersection	9
At or Near Railroad	-
Total	12

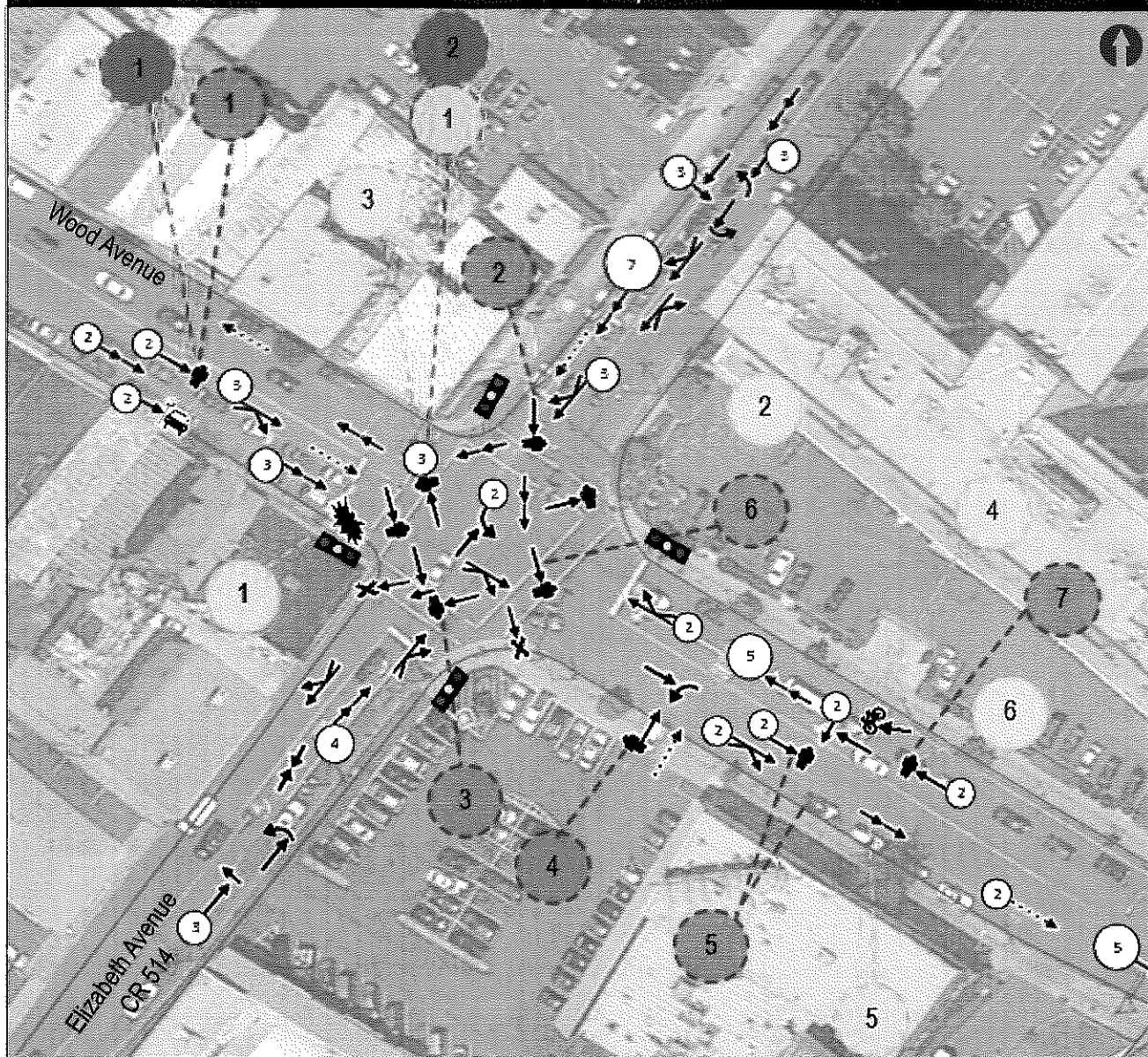
Surface Condition	#
Dry	9
Wet	3
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	12

Light Condition	#
Daylight	10
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	2
Dark – Street Lights On/ Spot	-
Dark – Street Lights Off	-
Other	-
Total	12

Day	#
Monday	1
Tuesday	1
Wednesday	4
Thursday	3
Friday	2
Saturday	-
Sunday	1
Total	12



ELIZABETH AVENUE/CR 514



All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

- = Fatal
- = Incapacitating Injury
- = Moderate injury
- = Complaint of pain
- = Property damage only

LEGEND	
Right angle	Same direction - Side swipe
Cyclist	Same direction - Rear End
Pedestrians	Struck parked vehicle
Backing	Fixed-object
Left-turn	Opposite direction - Head on/angular
Other	Opposite direction - Side Swipe

Google Imagery, 2014

Crash diagrams based on reports retrieved from NJDOT

PDO

- 1 Driver did not see pedestrian in crosswalk, should have been pain injury, 1/11/2013, 5:44 p.m.

Pain

- 1 Pedestrian emerged from parked car midblock, 12/28/2012, 10:07 p.m.
- 2 2009- not in tables
Funeral procession turning left, pedestrian did not see vehicle, 8/8/2009, 11:26 a.m.
- 3 Driver couldn't see pedestrian due to rain and headlight glare, 5/24/2013, 9:36 p.m.
- 4 2009-not in tables
Vehicle backed up into pedestrian, 4/15/2009, 8:12 p.m.
- 5 Confrontation between driver and pedestrian, 10/22/2013, 7:36 a.m.
- 6 Pedestrian crossed west in crosswalk, 12/19/2011, 4:50 p.m.
- 7 Pedestrian crossed midblock, 9/2013, 5:11 p.m.

Moderate Injury

- 1 Upon turning, right passenger door opened and child fell out, 3/13/2011, 6:49 p.m.
- 2 2009 - not in tables
Driver stated medication may have been a factor, 10/19/2009, 12:46 p.m.
- 3 2009 - not in tables
Pedestrian not in crosswalk, 7/9/2009, 5:58 p.m.
- 4 2010 - not in tables
Bicycle crossing roadway midblock, 7/23/2010, 2:34 p.m.
- 5 Pedestrian crossing midblock, wearing dark clothing, 12/12/2013, 6:51 a.m.
- 6 2009 - not in tables
Pedestrian running to catch train, 1/22/2009, 5:25 p.m.

Incapacitating Injury

- 1 Pedestrian crossed when Wood Ave. light turned green, left arrow for Elizabeth, 9/26/2012, 5:02 p.m.

Fatal

- 1 Unknown if pedestrian slipped on wet pavement and then vehicle ran him over, 11/22/2011, 7:11 p.m.
- 2 Two pedestrians were injured, 10/25/2011, 6:20 p.m.

ELIZABETH AVENUE – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	26
Same Direction – Side Swipe	14
Right Angle	9
Opposite Direction – Head On/ Angular	1
Opposite Direction – Side Swipe	1
Struck Parked Vehicle	2
Left Turn / U-Turn	8
Backing	6
Encroachment	-
Overtaken	-
Fixed Object	3
Animal	-
Pedestrian	10
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	1
Total	81

Month	#
January	9
February	11
March	5
April	4
May	4
June	3
July	7
August	4
September	9
October	6
November	9
December	10
Total	81

Severity	#
Property Damage Only (PDO)	58
Pain	17
Moderate Injury	3
Incapacitating Injury	1
Fatal	2
Total	81

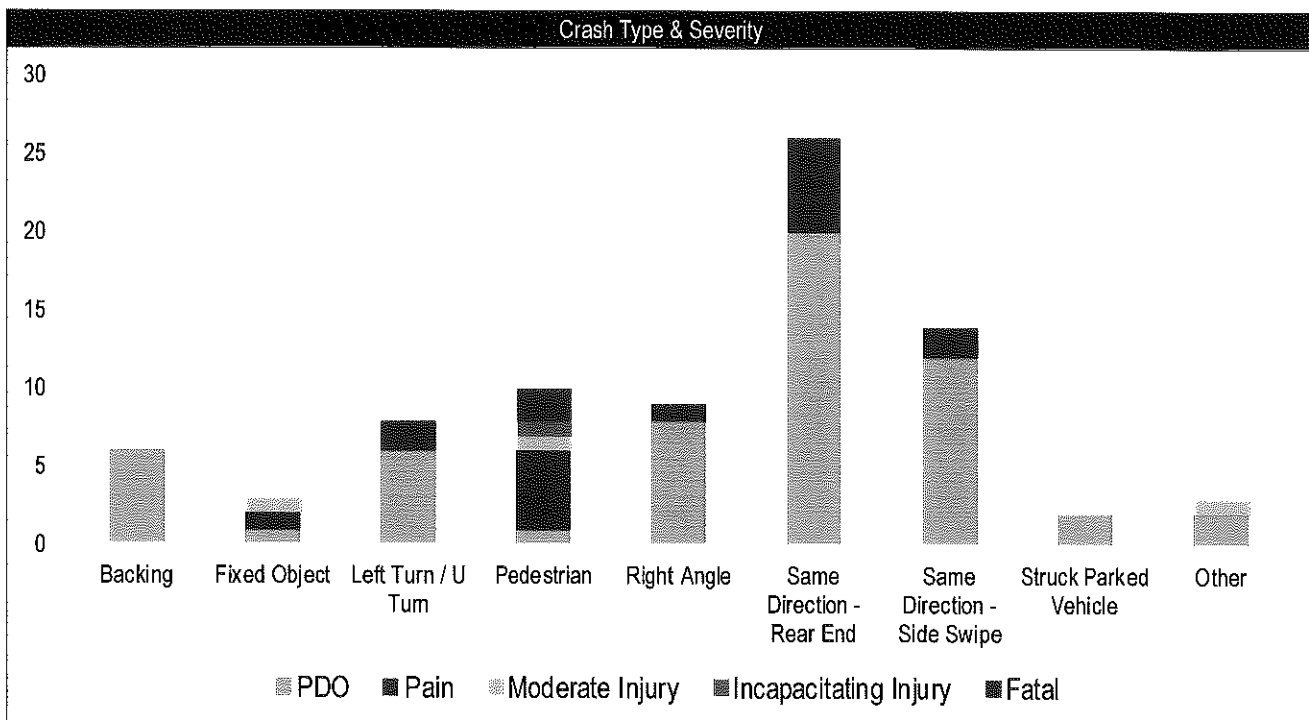
Crash Year	#
2011	29
2012	20
2013	32
Total	81

Intersection	#
At intersection	25
Not at intersection	56
At or Near Railroad	-
Total	81

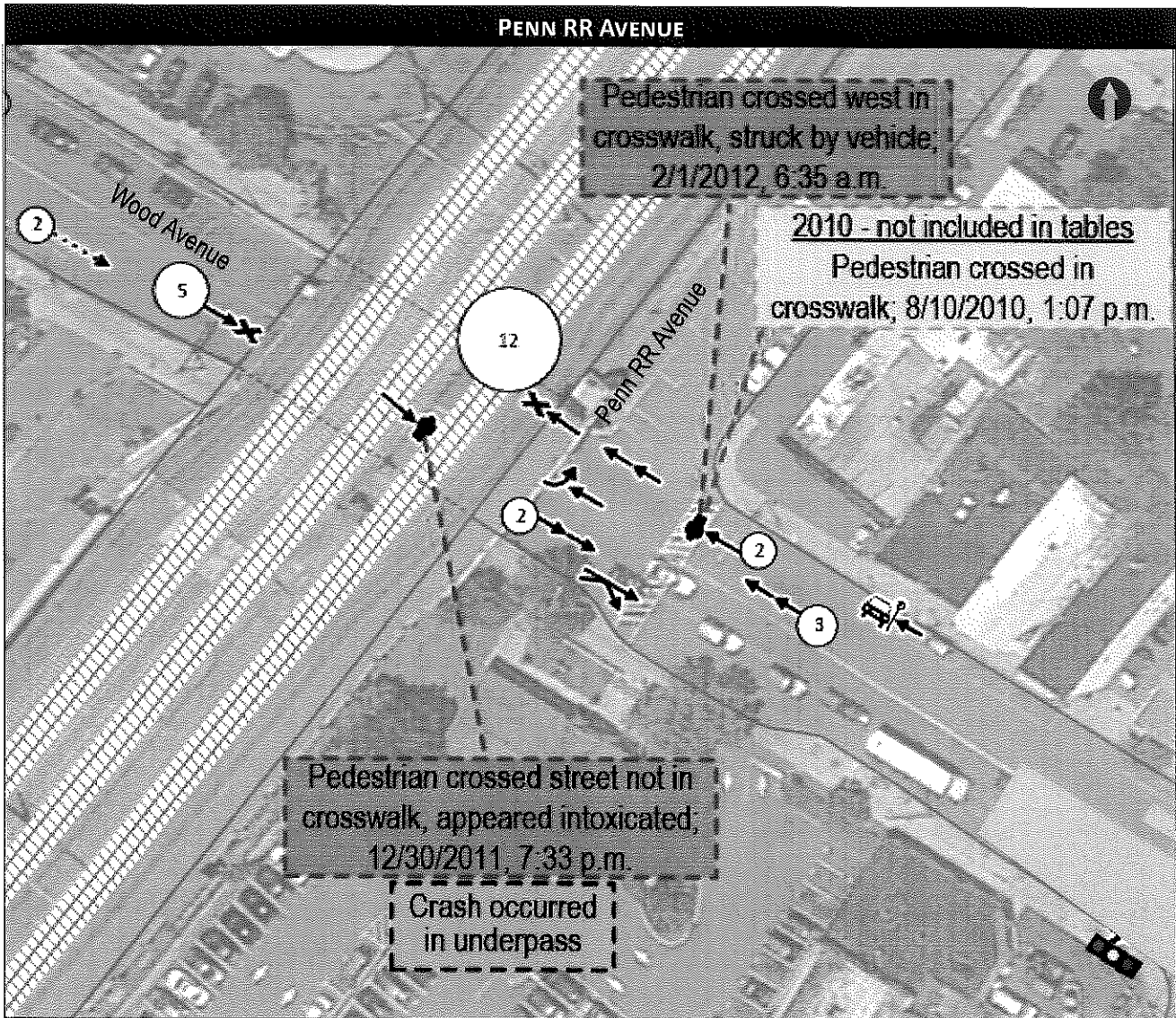
Surface Condition	#
Dry	65
Wet	15
Snowy	1
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	81

Light Condition	#
Daylight	53
Dawn	2
Dusk	3
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	16
Dark – Street Lights On/ Spot	7
Dark – Street Lights Off	-
Other	-
Total	81

Day	#
Monday	10
Tuesday	8
Wednesday	14
Thursday	7
Friday	21
Saturday	11
Sunday	10
Total	81



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All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

- = Complaint of pain
- = Property damage only

LEGEND

Right angle	Same direction - Side swipe
Cyclist	Same direction - Rear End
Pedestrians	Struck parked vehicle
Backing	Fixed-object
Left-turn	Opposite direction - Head on/angular
Other	Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

PENN RR AVENUE – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	6
Same Direction – Side Swipe	1
Right Angle	-
Opposite Direction – Head On/ Angular	-
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	1
Left Turn / U-Turn	2
Backing	-
Encroachment	-
Overtuned	-
Fixed Object	23
Animal	-
Pedestrian	2
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	35

Month	#
January	3
February	4
March	2
April	4
May	3
June	2
July	3
August	1
September	2
October	4
November	2
December	5
Total	35

Severity	#
Property Damage Only (PDO)	31
Pain	4
Moderate Injury	-
Incapacitating Injury	-
Fatal	-
Total	35

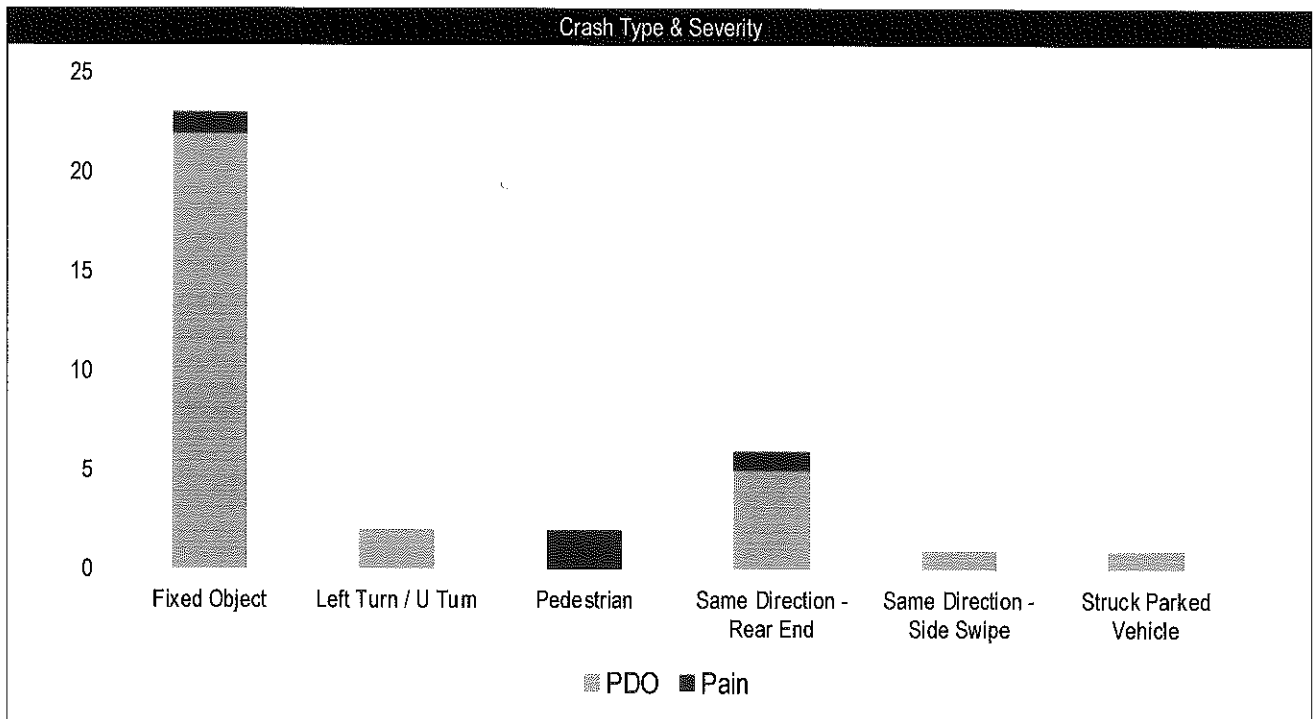
Crash Year	#
2011	14
2012	14
2013	7
Total	35

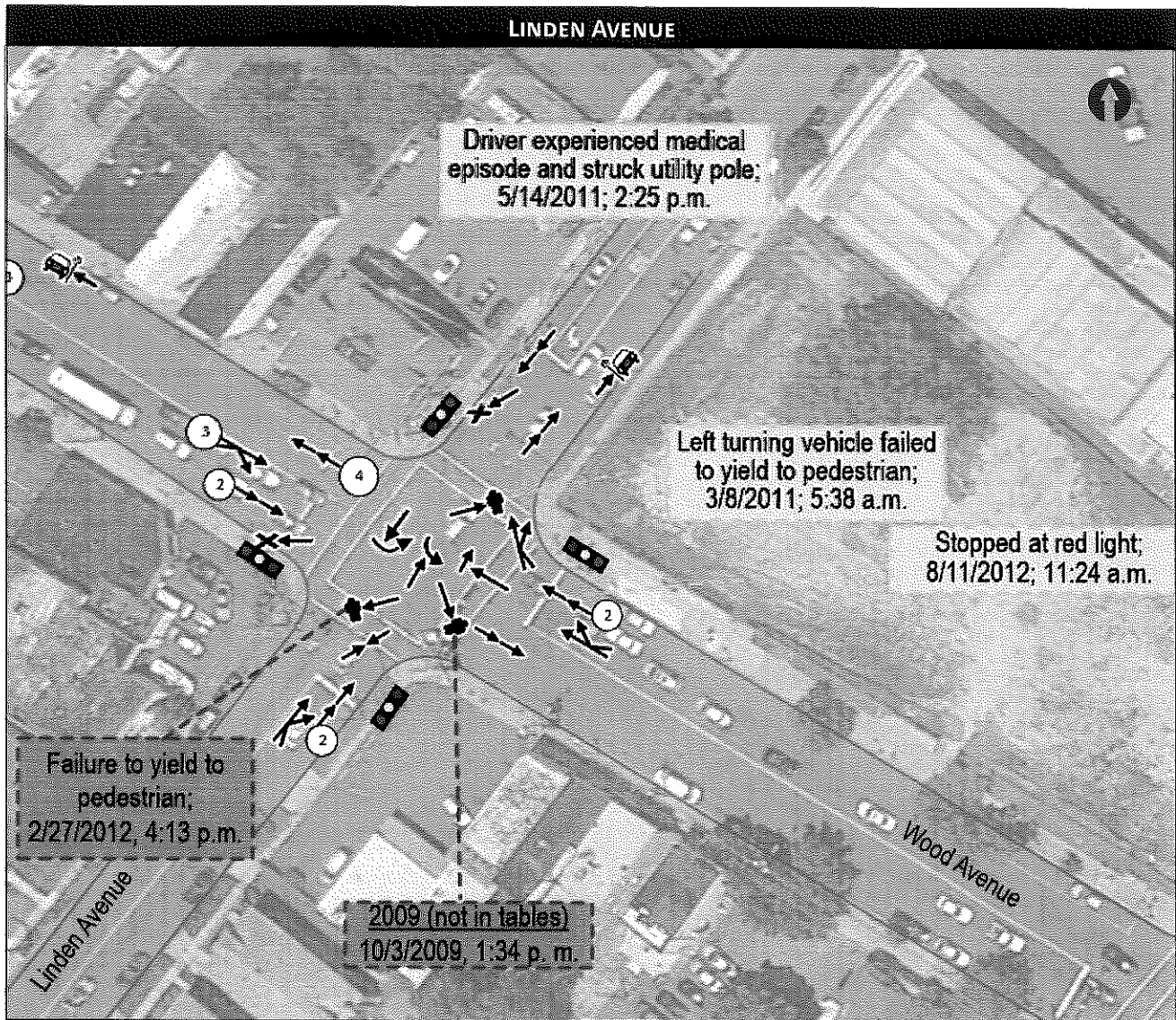
Intersection	#
At intersection	7
Not at intersection	27
At or Near Railroad	1
Total	35

Surface Condition	#
Dry	27
Wet	6
Snowy	2
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	35

Light Condition	#
Daylight	26
Dawn	-
Dusk	-
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	8
Dark – Street Lights On/ Spot	1
Dark – Street Lights Off	-
Other	-
Total	35



Day	#
Monday	2
Tuesday	3
Wednesday	10
Thursday	3
Friday	10
Saturday	2
Sunday	5
Total	35

















All pedestrian and cyclist crashes from 2009–2013 have a brief crash narrative included in the diagram and are color coded by severity.

Additionally, any other crash type having a severity of "moderate injury" or greater has a color-coded narrative.

-  = Moderate injury
-  = Complaint of pain

LEGEND

 Right angle	 Same direction - Side swipe
 Cyclist	 Same direction - Rear End
 Pedestrians	 Struck parked vehicle
 Backing	 Fixed-object
 Left-turn	 Opposite direction - Head on/angular
 Other	 Opposite direction - Side Swipe

Google Imagery, 2014
Crash diagrams based on reports retrieved from NJDOT

LINDEN AVENUE – CRASH SUMMARY (2011 – 2013)

Crash Type	#
Same Direction – Rear End	13
Same Direction – Side Swipe	6
Right Angle	1
Opposite Direction – Head On/ Angular	1
Opposite Direction – Side Swipe	-
Struck Parked Vehicle	1
Left Turn / U-Turn	2
Backing	-
Encroachment	-
Overtaken	-
Fixed Object	2
Animal	-
Pedestrian	2
Pedalcyclist	-
Non-fixed Object	-
Railcar – Vehicle	-
Other	-
Total	28

Month	#
January	2
February	2
March	7
April	1
May	4
June	3
July	2
August	1
September	-
October	2
November	4
December	-
Total	28

Severity	#
Property Damage Only (PDO)	20
Pain	5
Moderate Injury	3
Incapacitating Injury	-
Fatal	-
Total	28

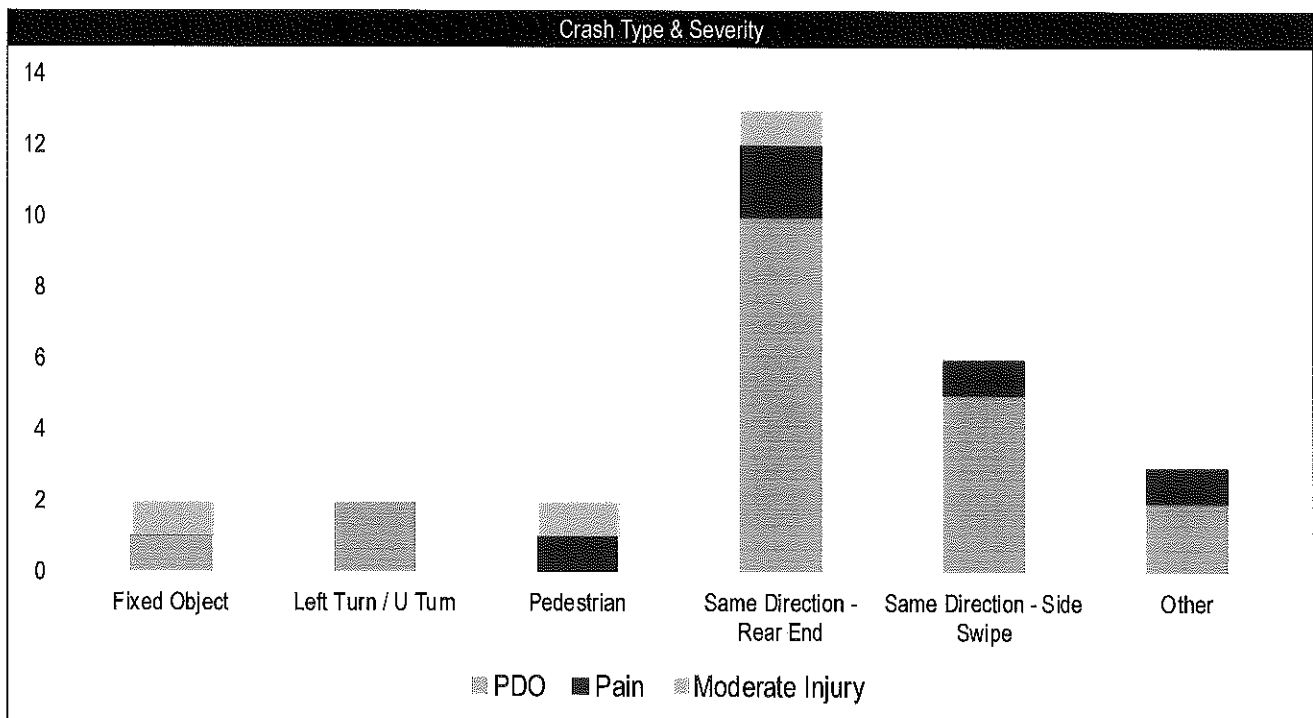
Crash Year	#
2011	11
2012	13
2013	4
Total	28

Intersection	#
At intersection	11
Not at intersection	17
At or Near Railroad	-
Total	28

Surface Condition	#
Dry	24
Wet	4
Snowy	-
Icy	-
Slush	-
Water – Standing/ Moving	-
Sand, Mud, Dirt	-
Oil	-
Total	28

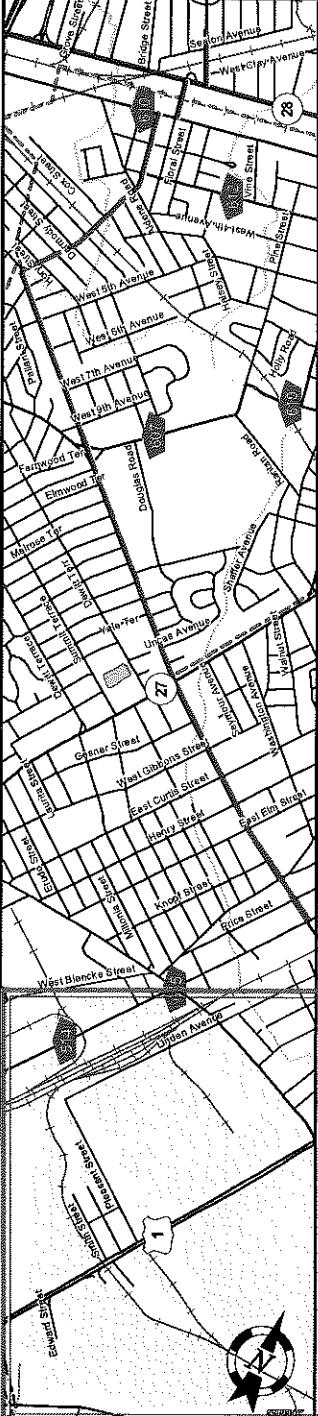
Light Condition	#
Daylight	20
Dawn	-
Dusk	1
Dark – No Street Lights	-
Dark – Street Lights On/ Continuous	6
Dark – Street Lights On/ Spot	1
Dark – Street Lights Off	-
Other	-
Total	28

Day	#
Monday	5
Tuesday	5
Wednesday	3
Thursday	3
Friday	7
Saturday	4
Sunday	1
Total	28



Mile Posts: 2.000 - 4.640

UNION COUNTY 617 (South to North)



Secondary Direction	Primary Direction	Pavement	Shoulder	Number of Lanes	Speed Limit	Street Name
						(4.64) 1ST AVENUE (4.55) E 2RD AVE W 2RD AVE (4.47) W 3RD AVENUE (4.42) ALDENE RD (4.30) COX ST (4.30) (4.22) CHRISTIAN STREET (4.17) DERMODY STREET (4.12) DIETZ STREET (4.07) HORY STREET (4.02) MYRTLE ST (3.97) BERLANT AVENUE (3.93) TRINITY PL E 5TH AVE W 5TH AVE (3.87) (3.78) W 6TH AVE (3.65) W 7TH AVE (3.55) E 9TH AVE W 9TH AVE (3.48) RARITAN ROAD (3.42) ROSEWOOD TER (3.37) ELMWOOD TER LOCKWOOD DR (3.32) ROBBINWOOD TER WILLOW LN (3.26) MELROSE TER (3.31) CETAAR LN (3.23) EDGEWOOD RD (3.26) (3.18) PALMSADE RD (3.13) SWARTHMORE RD (3.10) BROOKLAWN AVE (3.07) PRINCETON RD (3.03) HARVARD RD (3.02) SHERMAN AVE (2.99) YALE TERR (2.97) WOODSIDE AVE (2.93) GRANT AVE (2.88) LUMCAE AVE (2.83) EVERGREEN PL (2.77) ST GEORGES AVENUE (2.77) (2.65) GESSNER ST (2.61) STREAM (2.58) GIBBONS STREET (2.47) CURTIS STREET (2.39) HENRY STREET (2.31) ELM STREET (2.20) KNOPP ST (2.14) W BLANCHE ST HUSSA ST (2.07) PRICE STREET

Street Name	Jurisdiction	Functional Class	Federal Aid - NHS Sy	Control Section	Speed Limit	Number of Lanes	Med. Type	Med. Width	Pavement	Shoulder	Traffic Volume	Traffic Sta. ID	Structure No.	Enlarged View
Amsterdam Avenue	Roselle Boro. Union Co													
North Wood Avenue	County	Urban Minor Arterial	\$TP		25	2	None	0			60	0		
South Wood Avenue	Lincoln City, Union Co													

MP 4.64 = Bgln Coloc. With Co. 610 MP 6.79
MP 4.64-4.69 See Co. 610 MP 6.79-6.84

Date last inventoried: May 2012

SRI = 20000617

APPENDIX E – TRAFFIC COUNTS

County Of Union
Traffic Bureau

Page 1

Site Code: 23090
Station ID: Wood Ave.
Wood Avenue
100' west of Edgewood Road
13LL-WOODAVE-VOL

Start Time	09-Sep-13		10-Sep-13		11-Sep-13		12-Sep-13		13-Sep-13		14-Sep-13		15-Sep-13	
	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	91	79	47	33	57	54	115	93	*	*	*	*	*	*
02:00	47	33	36	26	37	36	47	44	*	*	*	*	*	*
03:00	33	26	33	26	36	24	36	42	*	*	*	*	*	*
04:00	45	36	45	36	66	54	66	45	*	*	*	*	*	*
05:00	175	139	175	139	177	135	177	137	*	*	*	*	*	*
06:00	470	326	470	326	454	338	454	352	*	*	*	*	*	*
07:00	714	523	714	523	742	525	742	524	*	*	*	*	*	*
08:00	714	439	714	439	719	481	719	460	*	*	*	*	*	*
09:00	530	444	530	444	440	373	440	408	*	*	*	*	*	*
10:00	477	405	477	405	462	364	462	384	*	*	*	*	*	*
11:00	448	385	448	385	435	423	340	384	*	*	*	*	*	*
12:00 PM	530	467	530	467	498	473	498	470	*	*	*	*	*	*
01:00	494	450	494	450	504	475	504	485	*	*	*	*	*	*
02:00	592	546	592	546	623	497	623	499	*	*	*	*	*	*
03:00	676	574	676	574	637	562	637	522	*	*	*	*	*	*
04:00	599	595	599	595	660	620	660	568	*	*	*	*	*	*
05:00	615	673	615	673	586	700	586	608	*	*	*	*	*	*
06:00	598	561	598	561	588	612	588	608	*	*	*	*	*	*
07:00	510	533	510	533	534	542	534	586	*	*	*	*	*	*
08:00	372	395	372	395	396	402	396	538	*	*	*	*	*	*
09:00	330	342	330	342	351	343	351	398	*	*	*	*	*	*
10:00	222	232	222	232	242	249	242	340	*	*	*	*	*	*
11:00	123	176	123	176	161	172	161	240	*	*	*	*	*	*
Total	0	0	6089	5629	9527	8567	3645	2821	0	0	9430	8465	0	0
Day	11:00	11:00	12028	11000	13094	13094	6466	6466	0	0	17895	17895	0	0
AM Peak	Vol.	448	385	714	523	742	525	742	07:00	07:00	07:00	07:00	0	0
PM Peak	Vol.	1500	1700	1600	1700	1700	1700	1500	15:00	17:00	15:00	17:00	0	0
	Vol.	576	673	660	700	660	700	656	656	686	656	686	0	0
Comb. Total		0	12028	18094	6466	6466	17895	17895	0	0	17895	17895	0	0
ADT		ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196	ADT 12,196