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DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

JANUARY 2010

CR 622

NORTH OLDEN AVENUE

Road Safety Audit

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The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals and the public with the common vision of making a great region even greater. Shaping the way we live, work and play, DVRPC builds consensus on improving transportation, promoting smart growth, protecting the environment, and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region — leading the way to a better future.

The symbol in our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole. The diagonal line represents the Delaware River and the two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for the findings and conclusions herein, which may not represent the official views or policies of the funding agencies.

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Executive Summary

This document is the final report for the CR 622 (North Olden Avenue) Road Safety Audit (RSA). This project represents a step towards implementation of the Delaware Valley Regional Planning Commission's (DVRPC) Safety Action Plan. In fiscal year 2009, two RSAs were conducted on New Jersey's county route system as part of DVRPC's Transportation Safety Program. These RSAs improve and promote transportation safety on the region's roadways while maintaining mobility. An RSA is an effective way of identifying crash-causing issues and effective solutions utilizing a nontraditional approach.

The RSA process began by identifying a hierarchy of county routes based on crash frequency using Plan4Safety, the New Jersey Department of Transportation (NJDOT) crash analysis tool. County-specific and region-wide lists of five-mile county route segments were distributed to county partners. Each county recommended candidates from their list for consideration in the program. Through thoughtful collaborations with the Mercer County Planning and Engineering divisions, a subsection of CR 622 (North Olden Avenue) was chosen for the RSA. The five-mile section of this route that resulted from the initial analysis ranked first in crash frequency for the three-year analysis period of 2005–2007. Mercer County recommended a 1.1 mile subsection of the five-mile corridor to complement work on adjacent sections of North Olden Avenue.

The CR 622 RSA was conducted on Wednesday, March 25, 2009. The pre-audit and post-audit meetings were held at the Mercer County Agricultural Extension Service, 930 Spruce Street, Trenton, New Jersey. The audit team of 12 participants included representation from the Mercer County Planning and Engineering divisions, NJDOT, New Jersey Division of Highway Traffic Safety (NJDHTS), Greater Mercer Transportation Management Association (GMTMA), New Jersey Transit, Ewing Township Police, Mercer County Department of Transportation, and DVRPC.

One of the most important recommendations from this effort targets a corridor-wide issue. The audit revealed that the two-way-left-turn-lane (TWLTL) is being misused as a lane for bypassing congestion in the through lanes, and this situation is likely contributing to crash frequency. The five-lane configuration of North Olden Avenue provides a high level of through-put and allows for nearly unlimited left turn opportunities. With this level of access comes an increase in the number of conflict points. The recommended strategy is to modify the continuous TWLTL to only allow left turns where there are driveways or side streets. This modification, combined with an access management plan that calls for consolidation of driveways and access between adjacent parcels (where possible), will reduce the number of conflict points ensuring safer exchanges to and from North Olden Avenue and cut down on misuse of the center lane. In addition to the corridor-wide recommendations, there is an examination of issues and recommended improvements at four locations including the Arctic Parkway and Prospect Street intersections.

The recommendations were developed collaboratively among the roadway owners and local stakeholders from the study task force with DVRPC serving as facilitator. The study partners have expressed interest in implementing many of the recommendations as time and funds allow. Many of the maintenance items, which are typically low cost, can be addressed without additional engineering.

CHAPTER 1

Introduction

As the final report for the CR 622 (North Olden Avenue) RSA, this document represents a step towards implementation of DVRPC's Regional Safety Action Plan. The RSA process utilizes a nontraditional approach to address crash problems through an intensive and collaborative forum. The North Olden Avenue RSA is one of two RSAs conducted on New Jersey's county route system as part of DVRPC's annual transportation safety work program. Since NJDOT focuses mainly on the state system routes, DVRPC's focus on county routes in New Jersey gives attention to corridors that are regionally significant and not typically considered by the state.

Using Plan4Safety, DVRPC queried NJDOT's crash database for a list of county-specific five-mile county route segments that experienced a high crash frequency during the three-year study period. The section of North Olden Avenue that resulted from this analysis ranked number one in crash frequency in the county. Mercer County then recommended a 1.1 mile subsection of the corridor to complement work completed on adjacent sections of North Olden Avenue.

What is a Road Safety Audit (RSA)?

An RSA is a formal safety performance examination of an existing or future road or intersection by a multi-disciplinary audit team. Road safety audits can be used on any size project, from minor maintenance to mega-projects, and can be conducted on facilities with a history of crashes or during the design phase of a new roadway or planned upgrade. To date, DVRPC has mostly used the tool on roadways of five miles in length or less where there is a demonstrated history of crashes.

The road safety audit program is conducted to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for, a high frequency of motor vehicle crashes, or an identifiable pattern of crash types. The emphasis is placed on identifying low-cost, quick-turnaround safety improvements to address issues where possible, though not excluding more complex strategies. Implementation of improvement strategies identified through this process may be eligible for Local Federal Aid Safety funds. Because the RSA process is adaptable to local needs and conditions, recommendations can be implemented incrementally as time and resources permit.

Prior to the one-day audit event, DVRPC collects and analyzes relevant data, including: crash cluster and corridor-wide crash summary analyses, day- and nighttime video of the roadway, traffic volume data, intersection turning movement volume data, and aerial

photographs. DVRPC staff also conducts a pre-audit field visit to examine conditions and take photographs. The identified crash clusters became focus areas during the audit of CR 622.

The audit event has three basic components which the audit team participates in:

- Pre-audit - a review of study location characteristics and crash analysis;
- Field visit – the study team examines conditions along the corridor, preferably on foot; and
- Post-audit – the study team shares findings, and develops a list of problems and potential strategies.

Following the event, DVRPC staff compiles the identified problems and potential strategies into a matrix. This document is sent back to the audit team for verification. Upon approval from the team, the matrix is incorporated into a technical report. This is then distributed to all audit participants and coordinating agencies for advancement to the implementation stage.

The CR 622 (North Olden Avenue) Audit Event

The safety audit was conducted on Wednesday, March 25, 2009. The pre-audit and post-audit meetings were held at the Mercer County Agricultural Extension Service, 930 Spruce Street, Trenton, New Jersey. Due to the short length of the study corridor, the audit was able to be completed in one day. The audit team of 12 participants included representation from local, county, regional, and state levels. The Federal Highway Administration and the Bicycle Coalition of Greater Philadelphia were both invited but representatives were unable to attend. See Appendix A for the list of audit team members.

The pre-audit meeting—an overview of the study area and an examination of crash history—began at 8:30 AM. A video showing the corridor under nighttime conditions was also shown. Next was the field visit, when the audit team walked the corridor and examined conditions to identify safety issues. After lunch the team returned to the meeting room for the post-audit session where problems were defined and countermeasures discussed.

CHAPTER 2

Corridor Description and Analysis

Study Location

The study area consists of approximately 1.1 miles of CR 622 from just east of the Parkside Avenue intersection, eastward to Princeton Avenue, all within Ewing Township, New Jersey. This stretch of North Olden Avenue is commercial; no residential units with frontage on the corridor are located in the study section. Strip shopping centers are situated alongside larger installations like the Capitol Plaza, Home Depot, and a car dealership.

Roadway Characteristics

CR 622 (North Olden Avenue) is classified as an urban minor arterial. The corridor study section has a five-lane configuration throughout most of its length; it has two travel lanes per direction with a TWLTL and no shoulders. At the southeastern end of the corridor the roadway transitions to a four-lane divided cross-section; the TWLTL is replaced by a grass median. This change in geometry facilitates access to the Capitol Plaza from eastbound North Olden Avenue where a left-turn channel and traffic signal are in place. Although the horizontal alignment is mostly straight, North Olden Avenue follows a slight downgrade from Princeton Avenue west, down to Arctic Parkway. The speed limit is posted at 40 MPH. There are signalized intersections at US 206 (Princeton Avenue), CR 639 (Arctic Parkway), and at CR 627 (Prospect Street). There are also two unsignalized intersections. Sidewalks are consistently available from beyond the western end of the study area eastward until the beginning of the four-lane divided section. Generally speaking, sidewalk condition is in need of maintenance at various locations throughout. In addition, there are utility cut-outs and telephone poles intermittently placed which create obstructions for pedestrians and present real hazards for the handicapped, elderly people, or people pushing baby strollers. A study area map is included in Appendix B.

Traffic Volumes

Total volume counts were taken in the spring of 2009 specifically for the RSA. The resulting data shows consistent traffic volumes along the corridor. This section of North Olden Avenue has an average annual daily traffic count of approximately 29,000 vehicles with nearly equal volumes by direction. A traffic volume map is included in Appendix B.

Turning movement counts were taken at two signalized locations. At both locations the predominant movement is through traffic on North Olden Avenue. At Arctic Parkway the most significant turning movements are from Arctic Parkway onto Olden Avenue, in both directions. The peak hours identified at this location are 7:45-8:45 AM, and 4:45-5:45 PM (see Appendix C for complete turning movement data). At the Prospect Street intersection two turning movements were predominant. Northbound Prospect Street traffic turning right onto Olden Avenue eastbound/southbound and the North Olden Avenue westbound/northbound traffic turning left onto Prospect Street southbound were heavy movements. The identified peak hours were 7:45-8:45 in the morning and 4:30-5:30 in the evening, both closely aligning with typical commuting hours. See Appendix F for complete turning movement data.

Transit Service

There is only one transit route that passes through the study area. The NJ Transit #601 bus follows a north-south alignment and serves the study corridor along North Olden Avenue between Prospect Street and Parkside Avenue (not in the study area). Marked bus stops are located near the Parkside Avenue intersection and near the Prospect Street intersection. According to NJ Transit's ridership data collected in July of 2007, the #601 bus carries an average of 1,104 passengers per weekday, 557 passengers on Saturdays, and drops to 313 on Sundays. Data specific to this section of the route was not available.

Crash Findings

The crash experience on this section of North Olden Avenue was largely concentrated into a 0.38 mile section of the study corridor basically between Arctic Parkway and Prospect Street (182 of the 197 crashes occurred within this section). According to the NJDOT crash database, there were 197 reportable crashes between 2005 and 2007 along the study area section of CR 622 (North Olden Avenue). Reportable crashes are crashes that result in a fatality, injury, and/or property damage of $500 or more. A comprehensive analysis of the corridor-wide crash data is shown in Appendix B. Of the three-year total, 70 crashes occurred in 2005 (36%), 59 in 2006 (30%), and 68 in 2007 (34%); this demonstrates a consistent yearly crash experience.

When analyzing crash frequency by month, the fewest crashes occurred in May (12). January had the highest number with 24. The monthly mean was 16 crashes. Crashes were concentrated on weekdays which, when combined, account for over 80% of the corridor total. Thirteen crashes occurred on Sunday, and 37 on Tuesday, representing the corridor low and high by day of week respectively. It is not uncommon for retail areas to have higher weekend crash concentrations, yet the opposite is true along North Olden Avenue. This corridor is a heavily traveled commuter route and provides a direct path across the county—both of which help explain the higher weekday crash totals. On the contrary, when considering crashes by time of day the distribution is more indicative of a commercial/retail environment. There is only a minor spike in crashes during the morning commute. Between late morning and 8 PM is when the bulk of the crashes occurred.

Comparing the study area crash statistics with state averages puts the crash experience in perspective and allows for examination of overrepresentations by various categories. For this analysis DVRPC utilized the Crash Summary Report developed by the NJDOT's Bureau of Safety Programs which provides statewide crash percentages for various crash characteristics summarized by roadway type. Specifically, Total Crashes for County Road System 2007 was used. Appendices B through F contain full summary details for each respective focus area.

Road surface and light condition crash distributions were consistent with state averages for county routes. Regarding severity, there were no fatal crashes. Sixty-six crashes (33.5%) involved an injury and the balance were property damage only (66.5%).

Several collision types exceeded state averages along North Olden Avenue during the three-year analysis period. The most common collision type along the corridor was rear-end crashes, accounting for 34 percent, which was just above the state average of 30.6 percent. Rear-end crashes tend to be common along signalized roadways. Angle collisions (24%) were the second most common and were above the state average of 19.6 percent. Angle crashes involve drivers traveling in angular directions to one another; e.g.: northbound collides with westbound. This collision type is often used to describe crashes that result from a driver leaving a business driveway and colliding with a driver traveling in the through lane. The Olden Avenue corridor has many driveways, some of which are duplicative. This issue and its related crash implications are discussed in the corridor-wide issues table in Chapter 3. Same direction sideswipes also exceeded the state average (18.8% vs. 11.4%), 37 were recorded. This overrepresentation may be related to the two through lane configuration which allows frequent passing and weaving, increasing the likelihood of a sideswipe collision. Though not very significant regarding total number of crashes at 21 (10.6 %), left-turn/u-turn crashes were almost double the state average of 5.66 percent. The five-lane cross-section with two-way-left-turn-lane allows drivers to make permissive left turns at virtually every driveway and intersecting street. This situation of plentiful access can become problematic when drivers are crossing two lanes of oncoming traffic while turning left into a driveway. One way to address this is to consolidate driveways and to calm the through traffic.

Four pedestrian and three bicycle crashes were recorded during the study period. In the absence of volume counts for these modes, crash frequency serves as an indication of usage. Although the sidewalks are less than ideal in some locations, pedestrian crashes are most common when attempting to cross the street, especially at unsignalized intersections, or at mid-block. Because the signals are

located so far apart, pedestrians often resort to crossing directly to their destination rather than going out of their way to utilize a crosswalk or access a signalized intersection. This is also discussed in the corridor-wide issues table.

CHAPTER 3

Findings and Recommendations

The following section summarizes the findings, recommendations, and priorities for the CR 622 (North Olden Avenue) Road Safety Audit. The tables show corridor-wide and site-specific safety issues and recommendations. Addressing these recommendations will contribute to the overall safety of the roadway. High priority recommendations are highlighted in yellow. Given fiscal constraints, they may have to be considered one at a time or in small groups. Coordination and collaboration is required among the Mercer County departments.

Table 1: Corridor-wide Issues and Strategies

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Access Management			
1. The two-way left turn lane (TWLTL) is being misused as a lane for by-passing congested traffic lanes, and this situation may be contributing to crash frequency;	1a. Increase enforcement to target improper passing, weaving, speeding, and improper use of the TWLTL;	High	High (temporary benefit)
2a. Duplicative and seemingly unregulated driveways for business access adds conflict points to Olden Avenue and contributes to the crash frequency along the study corridor;	1b. Upgrade the corridor with colored and/or textured (e.g.: thermo-plastic) pavement markings to distinguish the appropriate left-turn opportunities in the TWLTL, and to discourage inappropriate use of the in-between sections as a travel lane;	Low	High
2b. Duplicative driveways also present additional conflict points for pedestrians;	2. Develop access management plan to identify and eliminate duplicative driveways and regulate the size and operations of driveways, not only on individual sites but also shared access between multiple sites for both vehicular and pedestrian traffic;	Medium	High
2c. Visually, many driveways are poorly delineated;			
2d. Insufficient building setbacks in some locations make circulation in parking areas problematic, especially when combined with entering and exiting vehicles.			
3a. Very tight turning radii for vehicles making right turns into or out of Olden Avenue causes drivers to slow dramatically;	3. Consider narrowing the lane widths, especially the TWLTL, which appears to be unnecessarily wide, to slow traffic and improve safety.	Medium	High
3b. Exiting some driveways can be problematic due to compromised sight distance and high speed of through traffic on Olden Avenue.			

Table 1 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Pedestrian Environment			
1. Uneven, damaged, excessively pitched, and missing sidewalk blocks throughout, especially between Capitol Plaza and Princeton Avenue; along Olden Avenue eastbound dirt and debris are accumulating on sidewalk and compromising the sidewalk width;	1. Sidewalks need repair and general maintenance; add missing sidewalk segments; address the excessive slope of the sidewalks through maintenance;	Medium	Medium
2. Sidewalk obstructed by utility poles throughout and sidewalks narrow to accommodate manholes along the road's edge;	2. Evaluate the cost/benefit of mitigating the telephone pole obstructions by either relocating the poles (very costly), or adding more sidewalk area to allow for safer circumnavigation of the poles and manholes (likely less costly); this will also address the manhole obstructions;	High	High
3. The number and width of driveways expose pedestrians to more vehicular conflict points with traffic;	3. Implement access management plan to reduce the number and size of driveways;	High	High
4. Intermittently missing ADA ramps at intersections	4. Add ADA ramps where missing;	Low	Medium
5. Vehicles parked alongside the sidewalk in parking lots partially obstruct the pedestrian path;	5. Enforce on-site parking regulations to prevent parked vehicles from obstructing the sidewalk;	Medium	High
6. Crash data reveals pedestrian crashes in the mid-block; field visit revealed great distances between formal crossing opportunities at signalized intersections; frequent pedestrian crossings are common near shopping areas;	6. Consider a mid-block crossing in vicinity of ShopRite plaza; combine with a bus shelter where appropriate;	Low	Low
7. Numerous pedestrian crashes along this relatively short study segment of Olden Avenue.	7. Investigate details of the pedestrian crashes in search of trends or commonalities that can be mitigated through safety improvements.	Low	Medium
Bicyclist Environment			
1. Three bicycle crashes occurred within the study segment of Olden Avenue. Neither shoulder nor any space at all is provided to accommodate bicyclists on Olden Avenue; a few bicyclists were observed riding on the sidewalk during the field visit.	1. The cartway of Olden Avenue seems wide enough that narrower lanes would adequately accommodate motor vehicles and allow striping for shoulders, which would provide a space for cyclists and provide traffic calming benefits, the proposed access management strategies (above) would also benefit cyclists.	Medium	High
Drainage			
1. Evidence of blocked storm water drainage.	1. Revisit maintenance schedule to ensure regular drainage clearing.	Low	High
Congestion			
1. Significant congestion especially during the PM peak period.	1. Revisit signal timing plans and optimize as needed; investigate signal coordination.	Low	High

Table 1 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Striping and Signing			
1. Faded and sometimes missing lane markings and signs.	1a. Striping needs general maintenance and will receive an update during the scheduled repaving of Olden Avenue; 1b. Upgrade street name signs.	Low Low	High High
Sun Glare			
1. Sun glare compromises view of signals and inhibits safe driving, especially westbound in PM.	1. Install backing plates on existing signals; include backing plates in signal upgrade plans.	Low	High

Source: DVRPC

Table 2: Site Specific Issues and Strategies

Site Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Arctic Parkway Intersection and Vicinity			
1. The right-turn slip ramp from Arctic Parkway southbound onto Olden Avenue westbound is reportedly the site of many rear-end crashes coded to Arctic Parkway (not part of the original RSA crash analysis);	1. A cursory follow-up analysis of crashes on Arctic Parkway revealed 13 rear-end crashes coded at the Olden Avenue intersection; more analysis is needed to determine northbound or southbound direction of travel;	Low	Medium
2. Sight distance for traffic turning right from Arctic Parkway southbound onto Olden Avenue westbound is compromised by the severe angle at which the slip ramp meets Olden Avenue;	2. Restripe the Arctic Parkway southbound right turn slip ramp to Olden Avenue westbound to make it more perpendicular to improve sight distance;	Medium	High
3. Motorists were observed not to stop at the crosswalks for the Arctic Parkway right-turn slip ramps (northbound and southbound);	3. Enhance signs and crossing pavement markings for the Arctic Parkway southbound leg to improve pedestrian safety. Also, consider relocating the northbound slip ramp crossing further north along Arctic Parkway as well as add appropriate crossing amenities (signal heads, push buttons, striping);	Low	High

Table 2 (continued)

Site Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
4. The driveway access to the strip mall is located in relatively close proximity to the Arctic Parkway southbound right-turn slip ramp creating a weave/turning conflict point which the crash data revealed as problematic (this driveway currently allows two-way traffic). Motorists entering the site from this driveway appear to have difficulty maneuvering within the site and Ewing Police reported several crashes related to this condition;	4. Convert the driveway to right-in/right-out-only to eliminate problematic left-turns—this can be accomplished by either extending the concrete median beyond the driveway, or using a channelized island or eliminate the driveway access altogether;	High	High
5. Significant number of rear-end crashes on both Olden Avenue approaches to the intersection was revealed in the data analysis;	5. Investigate causes of this crash frequency by examining time of day trends, contributing circumstances, and severity;	Low	Medium
6. The study team reported that eastbound traffic en-route to Spruce Street and points northeast often bypasses the signal at Arctic Parkway by turning left at 5th Street—unsignalized, located in advance of Arctic Parkway—which also leads to Spruce Street;	6. Consider signal retiming and optimization to allow more left turns at Arctic Parkway; consider traffic calming/engineering enhancements to reduce speeding on the 5th Street cut-through route; consider changing protected left-turn phase to protected/permissive and measure impacts to operations and safety;	Low	Low
7. High concentration of eastbound sideswipe crashes at this location may be related to lane changing as drivers attempt to position themselves approaching the Arctic Parkway signalized intersection.	7. Consider improved lane markings and possibly a right-turn access lane for the Home Depot driveway which is also controlled by the Arctic Parkway signal; evaluate for safety benefits. **NOTE:** Mercer County is in the process of updating the Prospect Street and Arctic Parkway intersections of Olden Avenue which will include upgrades to pedestrian signals, removal of signal posts in the median and possible signal optimization and coordination.	Medium	Medium
5th Street			
1. Sight distance is compromised looking east from 5th Street due to a private sign and garbage receptacle obstructing the viewshed;	1a. Remove/relocate the private sign and garbage receptacle;	Low	High
	1b. Consider modifying the 5th Street approach using striping for improved sight distance;	Medium	Medium

Table 2 (continued)

Site Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
2. 5th and 6th Streets are very close to each other on Olden Avenue and are connected to each other via two additional side streets parallel to Olden Avenue; this duplication unnecessarily creates an extra conflict point;	2. Consider making 5th Street one-way, as half of a one-way pair with 6th Street serving the other direction, to improve access management and reduce conflict opportunities and thus potential crashes;	Medium	Medium
3. No ADA curb ramps or crosswalk striping across 5th Street;	3. Add ADA curb ramps and a pedestrian crosswalk;	Medium	High
4. Eastbound near the creek between 5th Street and Arctic Parkway there is a large slab of asphalt in the sidewalk.	4. Remove the unneeded asphalt to improve the pedestrian way.	Low	High
Between 5th and 6th			
1. Crash analysis revealed a concentration of pedestrian crashes in the vicinity of the retail shops, grocery store;	1. Consider a mid-block pedestrian crossing in this vicinity to connect land uses on either side of Olden Avenue;	Medium	High
2. Aldi grocery store has duplicative access points: from 5th and 6th Streets, and from Olden Avenue located mid-way between 5th and 6th Streets.	2. Consider elimination of grocery store driveway along Olden Avenue to reduce the number of conflict points along Olden Avenue; this will minimally impact access to the store.	Medium	High
6th Street			
1. No ADA curb ramps or crosswalk striping across 6th Street.	1. Add ADA curb ramps and a pedestrian crosswalk.	Medium	High
Prospect Street Intersection			
1. Of the 47 total crashes, 21 were same direction rear-end crashes which occurred mostly at the approaches to the intersection—this may be related to congestion;	1. Evaluate the safety and operational benefits of signal optimization and coordination;	Low	High
2. Turns into and out of driveways near the intersection, especially left-turns, may be contributing to the angle and left-turn crash problem in the vicinity of the intersection;	2. Consider access management controls to prevent left-turns into and out of businesses; e.g.: extend the concrete median;	Medium	High
3. Duplicative driveways in the vicinity of the intersection may be contributing to the crash frequency;	3. Connect adjacent businesses for improved, safer access, and consolidate and/or eliminate driveways where possible; review current standards and update if necessary;	High	High

Table 2 (continued)

Site Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
4. Outdated storm water drainage grate in the vicinity of the intersection presents safety issue for bicyclists.	4. Replace with bicycle compatible drainage grate.	Low	High
	NOTE: Mercer County is in the process of updating the Prospect Street and Arctic Parkway intersections of Olden Avenue which will include upgrades to pedestrian signals, removal of signal posts in the median and possible signal optimization and coordination.		

Source: DVRPC

CHAPTER 4

Conclusion

The RSA is conducted to generate improvement recommendations and countermeasures for roadway segments or intersections demonstrating a history of, or potential for, motor vehicle crashes. The safety recommendations identified during the audit and documented in this report, should improve the safety of the study area. Many of the strategies identified can be implemented through routine maintenance. The full impact of the improvement strategies will be realized when they are combined. Time and budget constraints will dictate the implementation schedule.

Engineering strategies alone will not eliminate the traffic safety issues identified along the study corridor. Education, with support from a targeted enforcement campaign, is an effective approach for addressing the driver behaviors that lead to crashes. Policy or legislative actions can provide the legal weight needed to motivate people to be safer, more conscientious drivers. Thus, employing a multi-pronged approach and engaging the appropriate stakeholders will be the most effective course of actions to advance the goal of improved safety on North Olden Avenue.

APPENDIX A

Audit Team

Audit Team

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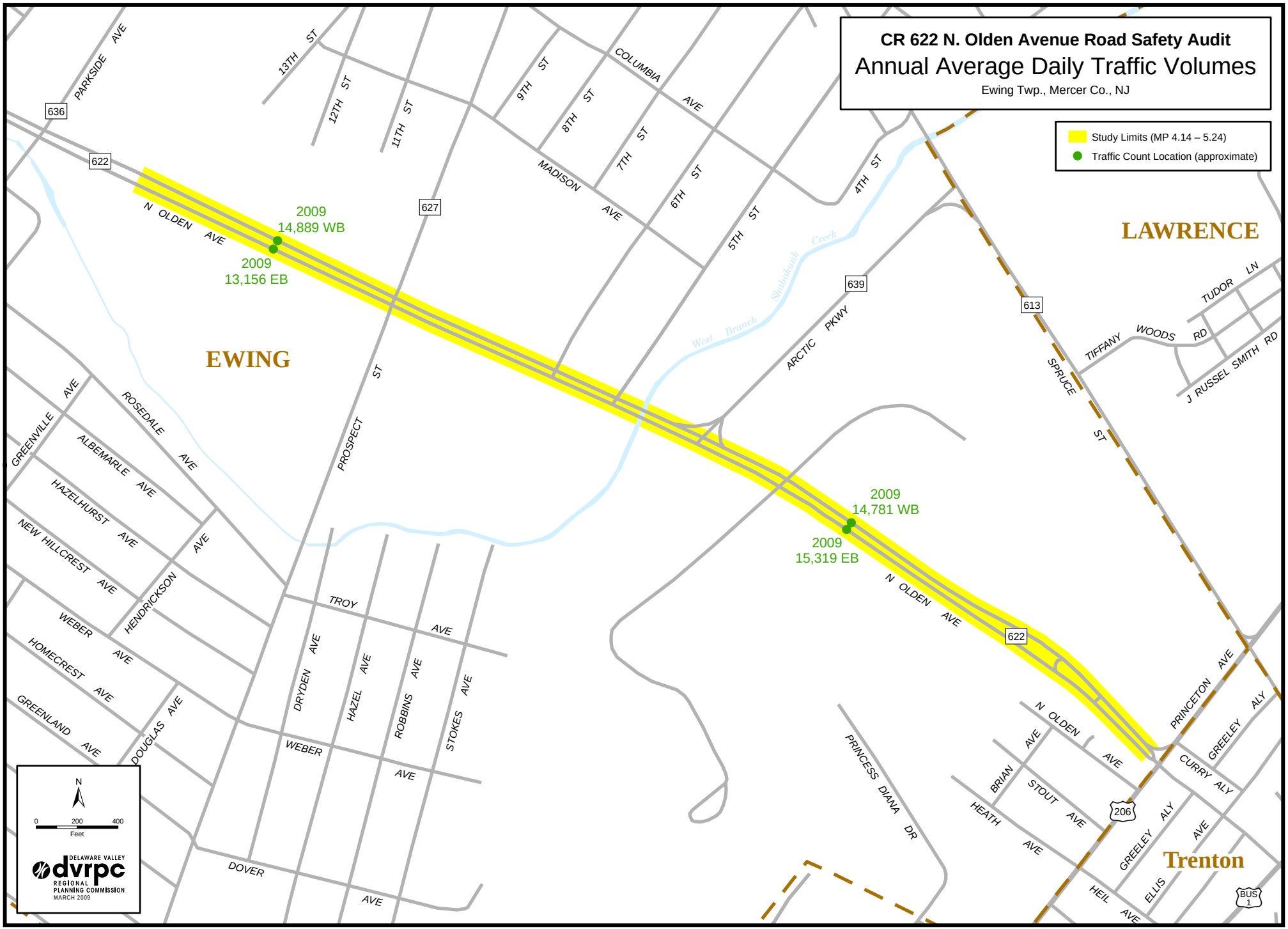
APPENDIX B

Corridor-wide Data

- Study Area Map
- Traffic Volume Map
- Crash Summary
- Crashes by Mile Post
- Site Photos


CR 622 N. Olden Avenue Road Safety Audit
Study Area
Ewing Twp., Mercer Co., NJ
Study Limits (MP 4.14 – 5.24)
EWING
LAWRENCE
Trenton
N OLDEN AVE
636
622
627
639
613
206
BUS 1
PARKSIDE AVE
MADISON AVE
COLUMBIA AVE
PROSPECT ST
SPRUCE ST
ARCTIC PKWY
PRINCETON AVE
PRINCESS DIANA DR
DOVER AVE
TROY AVE
HAZELHURST AVE
NEW HILLCREST AVE
HOMECREST AVE
GREENLAND AVE
GREENVILLE AVE
ALBEMARLE AVE
ROSEDALE AVE
HENDRICKSON AVE
WEBER AVE
DRYDEN AVE
HAZEL AVE
ROBBINS AVE
STOKES AVE
BRIAN AVE
HEATH AVE
STOUT AVE
GREELEY AVE
HEIL AVE
ELLIS AVE
TIFFANY WOODS RD
TUDOR LN
J RUSSEL SMITH RD
N
0 200 400
Feet
Aerial Imagery: NJOIT, 2007
DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION
MARCH 2009


CR 622 N. Olden Avenue Road Safety Audit
Annual Average Daily Traffic Volumes
Ewing Twp., Mercer Co., NJ
Study Limits (MP 4.14 – 5.24)
Traffic Count Location (approximate)
EWING
LAWRENCE
Trenton
2009
14,889 WB
2009
13,156 EB
2009
14,781 WB
2009
15,319 EB
N OLDEN AVE
622
636
627
639
613
206
BUS 1
PARKSIDE AVE
13TH ST
12TH ST
11TH ST
9TH ST
8TH ST
7TH ST
6TH ST
5TH ST
4TH ST
COLUMBIA AVE
MADISON AVE
ARCTIC PKWY
SPRUCE ST
TIFFANY WOODS RD
TUDOR LN
J RUSSEL SMITH RD
West Branch Shabakunk Creek
PROSPECT ST
GREENVILLE AVE
ROSEDALE AVE
ALBEMARLE AVE
HAZELHURST AVE
NEW HILLCREST AVE
HENDRICKSON AVE
WEBER AVE
HOMECREST AVE
GREENLAND AVE
DOUGLAS AVE
TROY AVE
DRYDEN AVE
HAZEL AVE
ROBBINS AVE
STOKES AVE
WEBER AVE
DOVER AVE
PRINCESS DIANA DR
N OLDEN AVE
BRIAN AVE
HEATH AVE
STOUT AVE
PRINCETON AVE
GREELEY ALY
CURRY ALY
GREELEY AVE
ELLIS ALY
HEIL AVE
N
0 200 400
Feet
DELAWARE VALLEY
dvrpc
REGIONAL PLANNING COMMISSION
MARCH 2009

CRASH SUMMARY

County Route 622 MP 4.14 - 5.24
Ewing Township, Mercer County
01/01/2005 THRU 12/31/2007

TOTAL CRASHES: 197

SEVERITY	COUNT	% OF TOTAL	2007 Average
Fatal	0	0.00%	
Injury	66	33.50%	28.29%
Property Damage	131	66.50%	
Total	**197**		

INTERSECTION	COUNT	% OF TOTAL	2007 Average
At Signalized Intersection	27	13.71%	
At Unsignalized Intersection	11	5.58%	
Between Intersections	159	80.71%	61.21%
Railroad Crossing	0	0.00%	
Total	**197**		

COLLISION TYPE	COUNT	% OF TOTAL	2007 Average
Same Dir.-Rear End	67	34.01%	30.63%
Same Dir.-Sideswipe	37	18.78%	11.39%
Angle	47	23.86%	19.58%
Head On	3	1.52%	
Parked Vehicle	1	0.51%	
Left Turn / U Turn	21	10.66%	5.66%
Backing	4	2.03%	
Encroachment	1	0.51%	0.41%
Overturned	0	0.00%	
Fixed Object	8	4.06%	
Animal	0	0.00%	
Pedestrian	4	2.03%	1.82%
Pedalcycle	3	1.52%	0.96%
Non-Fixed Object	0	0.00%	
Unknown	0	0.00%	
Other	1	0.51%	
Total	**197**		

SURFACE CONDITION	COUNT	% OF TOTAL	2007 Average
Dry	147	74.62%	
Wet Surface	40	20.30%	19.00%
Snow	6	3.05%	2.10%
Ice	4	2.03%	
Unknown	0	0.00%	
Other	0	0.00%	
Total	**197**		

LIGHT	COUNT	% OF TOTAL	2007 Average
Day	146	74.11%	70.94%
Dusk	6	3.05%	2.60%
Night	45	22.84%	
Dawn	0	0.00%	
Unknown	0	0.00%	
Total	**197**		

Note:
The 2007 average reflects all crashes recorded on the county route system during that year. It is standard practice to use only the most recent year of statewide data when making a comparison since yearly fluctuations regarding system-wide data are typically insignificant.

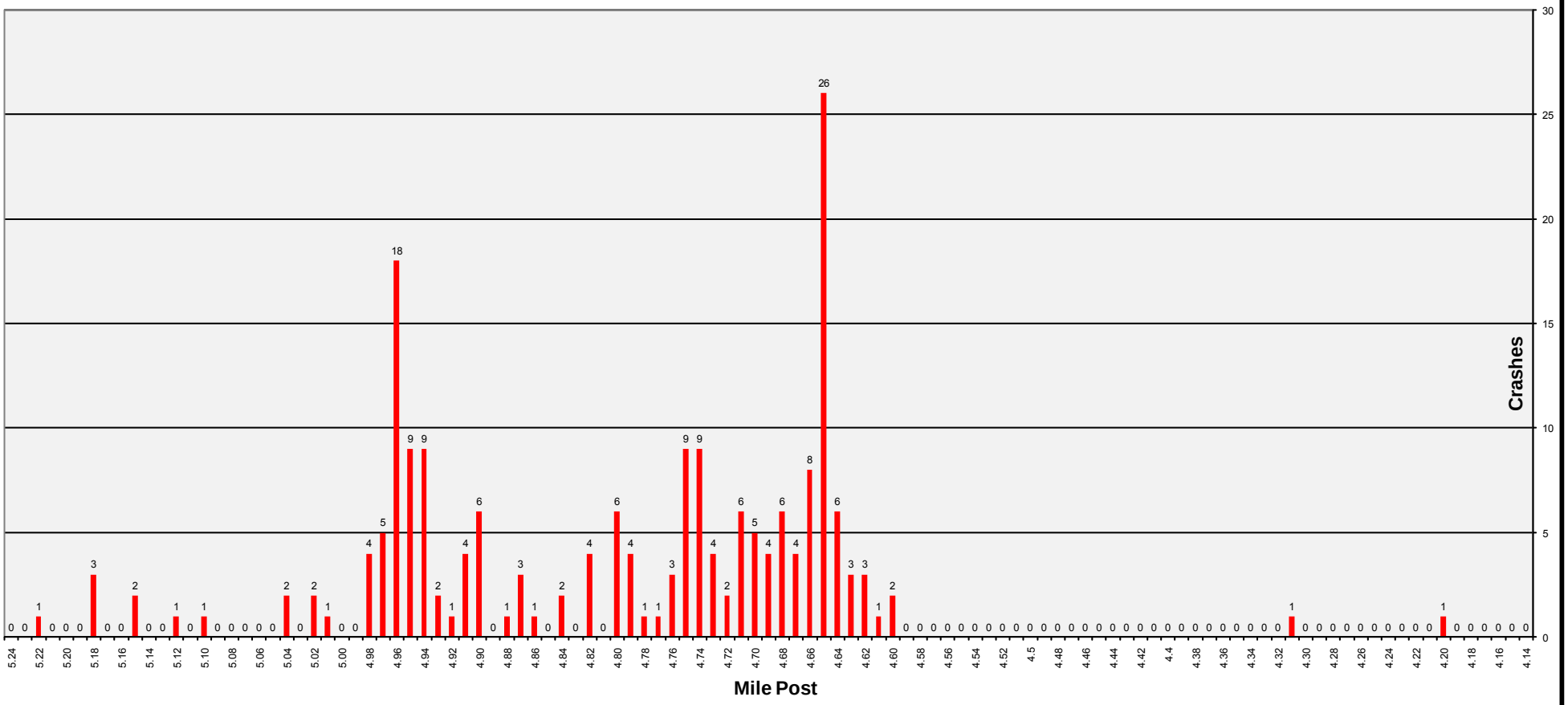
Length of Segment 1.1 miles
Number of Years 3
AADT 28,000 - combined directions

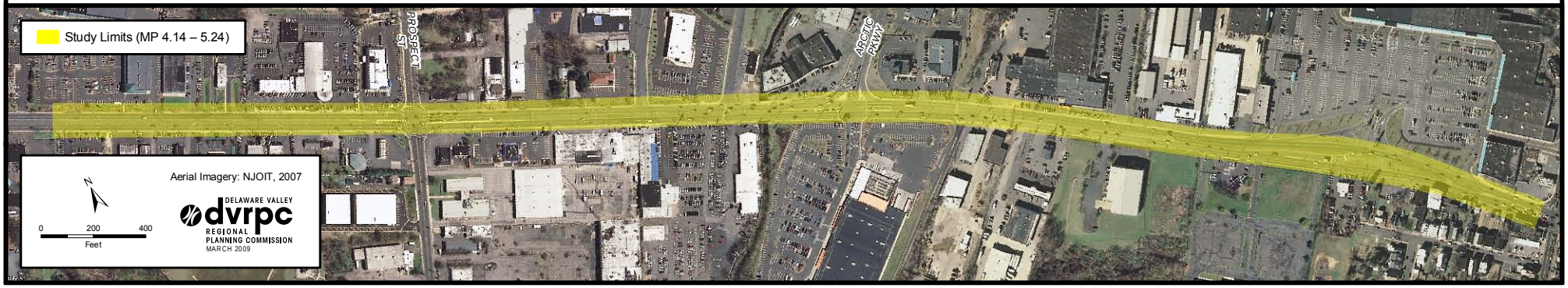
Source: DVRPC, NJDOT

CR 622 N. Olden Avenue Road Safety Audit

Crashes by Mile Post: 2005 - 2007

Ewing Twp., Mercer Co., NJ





Driveways

Pedestrian Conditions

Bicyclists Conditions

Left Turns

APPENDIX C

CR 622 (North Olden Avenue) at Arctic Parkway

Location-Specific Data:

- Aerial Map
- Crash Summary
- Collision Diagram
- Turning Movement Diagram
- Site Photos

1. CR 622 North Olden Avenue at Arctic Parkway

Mile Post 4.64 – 4.69

COLLISION TYPE	
Rear End	25
Sideswipe	9
Angle	13
Head On	1
Left Turn / U Turn	5
Fixed Object	1
total	54
INTERSECTION	
At Intersection	16
Between Intersections	38
total	54

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CRASH SUMMARY

CR 622 N. Olden Avenue at Arctic Parkway
MP 4.64 - 4.69
Data Years: 2005 - 2007

TOTAL CRASHES: **54**

SEVERITY	COUNT	% OF TOTAL	2007 Average
Fatal	0	0.00%	0.25%
Injury	20	37.04%	28.29%
Property Damage	34	62.96%	71.46%
Total	**54**	100.00%	

COLLISION TYPE	COUNT	% OF TOTAL	2007 Average
Same Dir.-Rear End	25	46.30%	30.63%
Same Dir.-Sideswipe	9	16.67%	11.39%
Angle	13	24.07%	19.58%
Head On	1	1.85%	3.37%
Parked Vehicle	0	0.00%	5.39%
Left Turn / U Turn	5	9.26%	5.66%
Backing	0	0.00%	2.20%
Encroachment	0	0.00%	0.41%
Overturned	0	0.00%	0.71%
Fixed Object	1	1.85%	12.76%
Animal	0	0.00%	3.97%
Pedestrian	0	0.00%	1.82%
Pedalcycle	0	0.00%	0.96%
Non-Fixed Object	0	0.00%	0.41%
Unknown	0	0.00%	0.09%
Other	0	0.00%	0.65%
Total	**54**	100.00%	

INTERSECTION	COUNT	% OF TOTAL	2007 Average
At Intersection	16	29.63%	38.75%
Between Intersections	38	70.37%	61.21%
Railroad Crossing	0	0.00%	0.04%
Total	**54**	100.00%	

SURFACE CONDITION	COUNT	% OF TOTAL	2007 Average
Dry	40	74.07%	75.43%
Wet Surface	12	22.22%	19.00%
Snow	1	1.85%	2.10%
Ice	1	1.85%	2.29%
Unknown	0	0.00%	0.30%
Other	0	0.00%	0.88%
Total	**54**	100.00%	

LIGHT	COUNT	% OF TOTAL	2007 Average
Day	41	75.93%	70.94%
Dusk	3	5.56%	2.60%
Night	10	18.52%	24.80%
Dawn	0	0.00%	1.25%
Unknown	0	0.00%	0.41%
Total	**54**	100.00%	

Note:
The 2007 average reflects all crashes recorded on the county route system during that year. It is standard practice to use only the most recent year of statewide data when making a comparison since yearly fluctuations regarding system-wide data are typically insignificant.

Length of Segment 264 feet
Number of Years 3
AADT 28,000 - combined directions

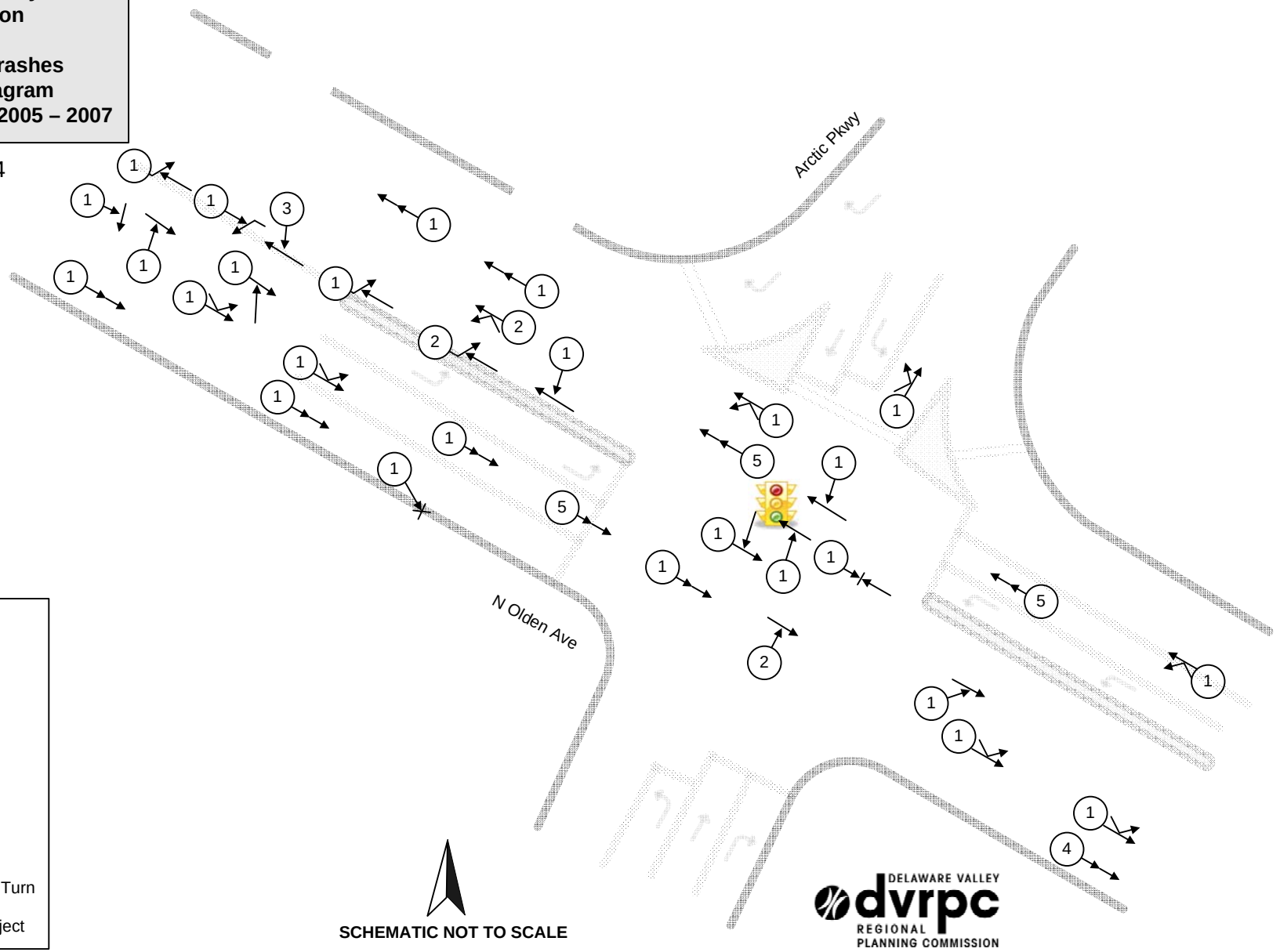
Source: DVRPC, NJDOT

Road Safety Audit
CR 622

North Olden Avenue &
Arctic Parkway
Intersection

Reportable Crashes
Collision Diagram
Crash Data Years 2005 – 2007

Total Crashes = 54



Legend

- (1) = # Crashes
- Rear End
- Sideswipe
- Head-On
- Angle
- Left Turn / U Turn
- Hit Fixed Object

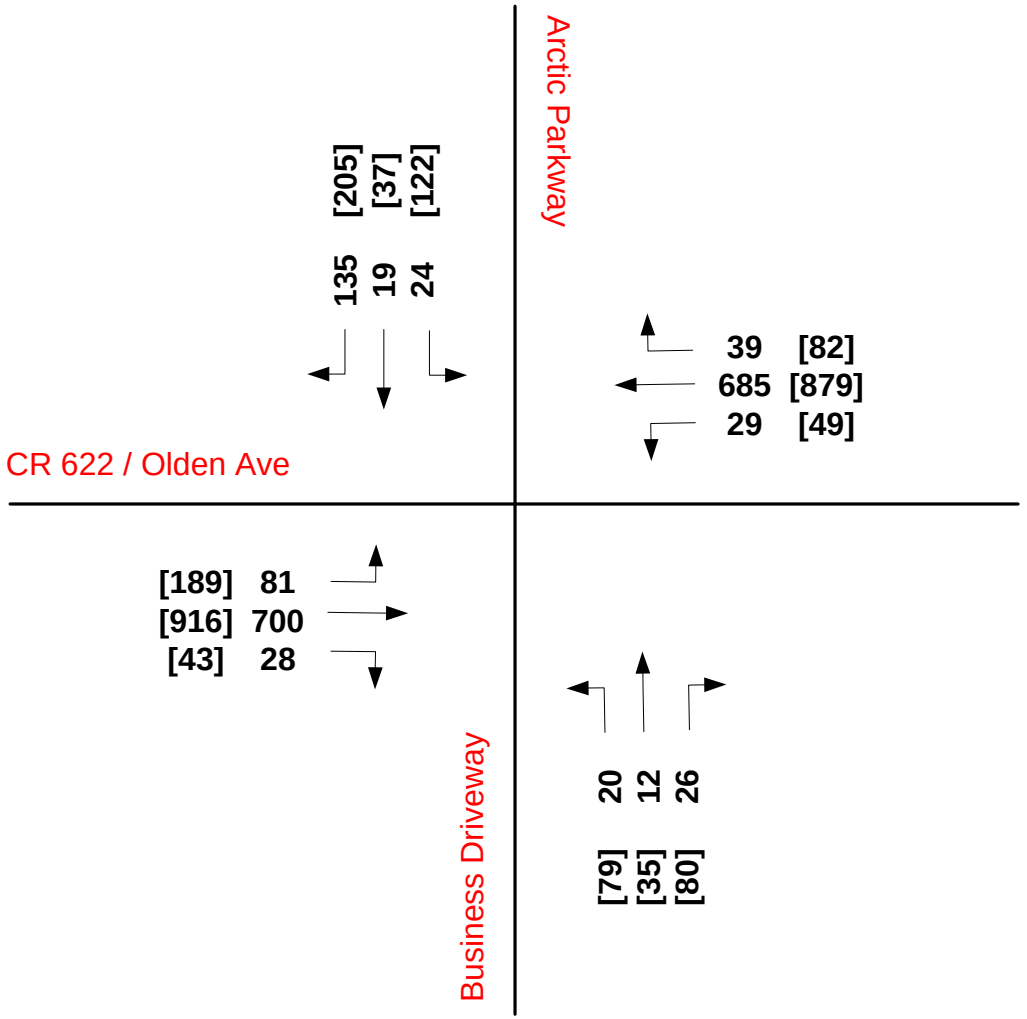
SCHEMATIC NOT TO SCALE

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CR 622 / North Olden Avenue and Arctic Parkway Intersection

Peak Hour Turning Movement Counts

Peak Hours
AM: 7:45 - 8:45
PM: [4:45 - 5:45]



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

North Olden Avenue at Arctic Parkway

APPENDIX D

CR 622 (North Olden Avenue) in the Vicinity of 5th Street

Location-Specific Data:

- Aerial Map
- Crash Summary
- Collision Diagram
- Site Photos

2. CR 622 North Olden Avenue in the Vicinity of 5th Street

Mile Post 4.70 – 4.75

COLLISION TYPE	
Rear End	6
Sideswipe	10
Angle	9
Pedalcycle	2
Left Turn / U Turn	3
Fixed Object	3
Parked Vehicle	1
Encroachment	1
total	35
INTERSECTION	
At Intersection	4
Between Intersections	31
total	35

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CRASH SUMMARY

CR 622 N. Olden Avenue in the Vicinity of 5th Street
MP 4.70 - 4.75
Data Years: 2005 - 2007

TOTAL CRASHES: **35**

SEVERITY	COUNT	% OF TOTAL	2007 Average
Fatal	0	0.00%	0.25%
Injury	10	28.57%	28.29%
Property Damage	25	71.43%	71.46%
Total	**35**	100.00%	

INTERSECTION	COUNT	% OF TOTAL	2007 Average
At Intersection	4	11.43%	38.75%
Between Intersections	31	88.57%	61.21%
Railroad Crossing	0	0.00%	0.04%
Total	**35**	100.00%	

COLLISION TYPE	COUNT	% OF TOTAL	2007 Average
Same Dir.-Rear End	6	17.14%	30.63%
Same Dir.-Sideswipe	10	28.57%	11.39%
Angle	9	25.71%	19.58%
Head On	0	0.00%	3.37%
Parked Vehicle	1	2.86%	5.39%
Left Turn / U Turn	3	8.57%	5.66%
Backing	0	0.00%	2.20%
Encroachment	1	2.86%	0.41%
Overturned	0	0.00%	0.71%
Fixed Object	3	8.57%	12.76%
Animal	0	0.00%	3.97%
Pedestrian	0	0.00%	1.82%
Pedalcycle	2	5.71%	0.96%
Non-Fixed Object	0	0.00%	0.41%
Unknown	0	0.00%	0.09%
Other	0	0.00%	0.65%
Total	**35**	100.00%	

SURFACE CONDITION	COUNT	% OF TOTAL	2007 Average
Dry	29	82.86%	75.43%
Wet Surface	6	17.14%	19.00%
Snow	0	0.00%	2.10%
Ice	0	0.00%	2.29%
Unknown	0	0.00%	0.30%
Other	0	0.00%	0.88%
Total	**35**	100.00%	

LIGHT	COUNT	% OF TOTAL	2007 Average
Day	30	85.71%	70.94%
Dusk	1	2.86%	2.60%
Night	4	11.43%	24.80%
Dawn	0	0.00%	1.25%
Unknown	0	0.00%	0.41%
Total	**35**	100.00%	

Note:
The 2007 average reflects all crashes recorded on the county route system during that year. It is standard practice to use only the most recent year of statewide data when making a comparison since yearly fluctuations regarding system-wide data are typically insignificant.

Length of Segment 264 feet
Number of Years 3
AADT 28,000 - combined directions

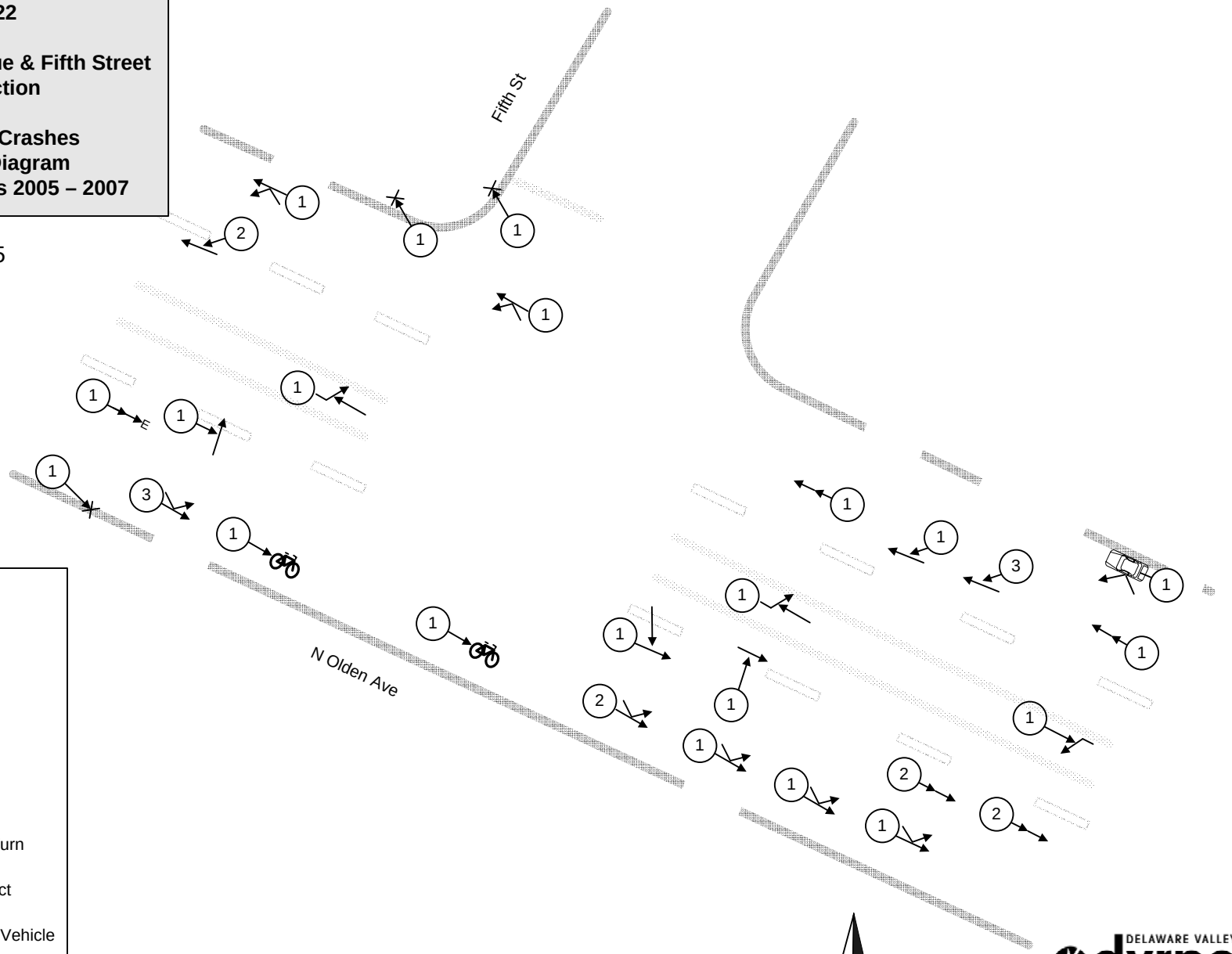
Source: DVRPC, NJDOT

Road Safety Audit
CR 622

North Olden Avenue & Fifth Street Intersection

Reportable Crashes
Collision Diagram
Crash Data Years 2005 – 2007

Total Crashes = 35



Legend

(1) = # Crashes

- Rear End
- Sideswipe
- Angle
- Left Turn / U Turn
- Hit Fixed Object
- Struck Parked Vehicle
- E Encroachment
- Pedalcyclist

SCHEMATIC NOT TO SCALE

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

North Olden Avenue in the Vicinity of 5th Street

APPENDIX E

CR 622 (North Olden Avenue) in the Vicinity of 6th Street

Location-Specific Data:

- Aerial Map
- Crash Summary
- Collision Diagram
- Site Photos

3. CR 622 North Olden Avenue in the Vicinity of 6th Street

Mile Post 4.76 – 4.92

COLLISION TYPE	
Rear End	8
Sideswipe	5
Angle	10
Pedestrian	3
Head On	2
Left Turn / U Turn	6
Fixed Object	1
Backing	1
Other	1
total	37
INTERSECTION	
At Intersection	4
Between Intersections	33
total	37

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CRASH SUMMARY

CR 622 N. Olden Avenue in the Vicinity of 6th Street
MP 4.76 - 4.92
Data Years: 2005 - 2007

TOTAL CRASHES: 37

SEVERITY	COUNT	% OF TOTAL	2007 Average
Fatal	0	0.00%	0.25%
Injury	13	35.14%	28.29%
Property Damage	24	64.86%	71.46%
Total	**37**	100.00%	

COLLISION TYPE	COUNT	% OF TOTAL	2007 Average
Same Dir.-Rear End	8	21.62%	30.63%
Same Dir.-Sideswipe	5	13.51%	11.39%
Angle	10	27.03%	19.58%
Head On	2	5.41%	3.37%
Parked Vehicle	0	0.00%	5.39%
Left Turn / U Turn	6	16.22%	5.66%
Backing	1	2.70%	2.20%
Encroachment	0	0.00%	0.41%
Overturned	0	0.00%	0.71%
Fixed Object	1	2.70%	12.76%
Animal	0	0.00%	3.97%
Pedestrian	3	8.11%	1.82%
Pedalcycle	0	0.00%	0.96%
Non-Fixed Object	0	0.00%	0.41%
Unknown	0	0.00%	0.09%
Other	1	2.70%	0.65%
Total	**37**	100.00%	

INTERSECTION	COUNT	% OF TOTAL	2007 Average
At Intersection	4	10.81%	38.75%
Between Intersections	33	89.19%	61.21%
Railroad Crossing	0	0.00%	0.04%
Total	**37**	100.00%	

SURFACE CONDITION	COUNT	% OF TOTAL	2007 Average
Dry	25	67.57%	75.43%
Wet Surface	9	24.32%	19.00%
Snow	3	8.11%	2.10%
Ice	0	0.00%	2.29%
Unknown	0	0.00%	0.30%
Other	0	0.00%	0.88%
Total	**37**	100.00%	

LIGHT	COUNT	% OF TOTAL	2007 Average
Day	22	59.46%	70.94%
Dusk	1	2.70%	2.60%
Night	14	37.84%	24.80%
Dawn	0	0.00%	1.25%
Unknown	0	0.00%	0.41%
Total	**37**	100.00%	

Note:
The 2007 average reflects all crashes recorded on the county route system during that year. It is standard practice to use only the most recent year of statewide data when making a comparison since yearly fluctuations regarding system-wide data are typically insignificant.

Length of Segment 845 feet
Number of Years 3
AADT 28,000 - combined directions

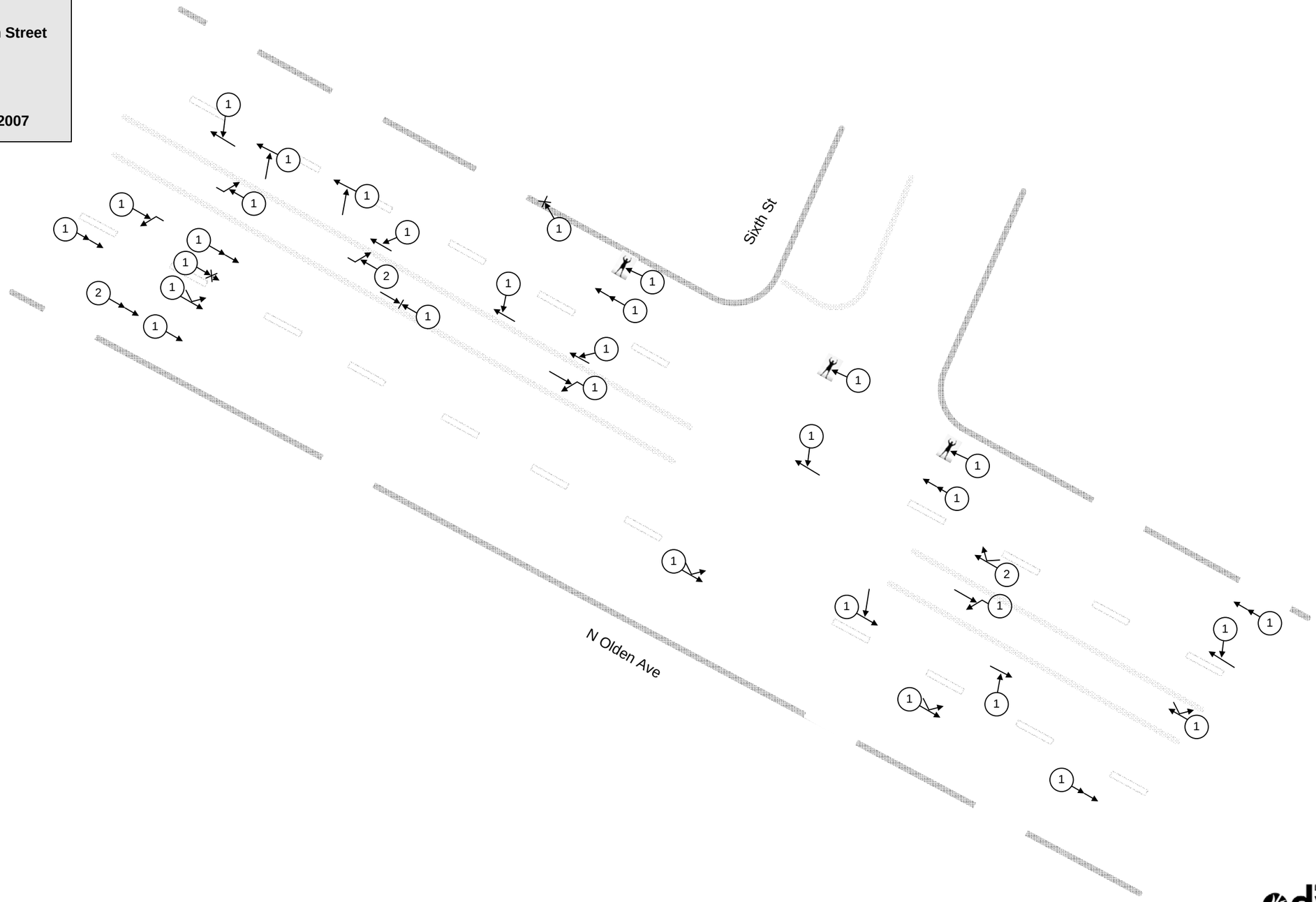
Source: DVRPC, NJDOT

Road Safety Audit
CR 622

North Olden Avenue & Sixth Street Intersection

Reportable Crashes
Collision Diagram
Crash Data Years 2005 – 2007

Total Crashes = 37
Pedestrian Crashes = 3



SCHEMATIC NOT TO SCALE

Legend

- (1) = # Crashes
- Opposite Direction Sideswipe
- Rear End
- Sideswipe
- Head-On
- Angle
- Left Turn / U Turn
- Hit Fixed Object
- Hit Pedestrian
- Backing
- Other

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

North Olden Avenue in the Vicinity of 6th Street

APPENDIX F

CR 622 (North Olden Avenue) at Prospect Street

Location-Specific Data:

- Aerial Map
- Crash Summary
- Collision Diagram
- Turning Movement Diagram
- Site Photos

4. CR 622 North Olden Avenue Prospect Street

Mile Post 4.93 – 4.98

COLLISION TYPE	
Rear End	21
Sideswipe	6
Angle	11
Backing	3
Left Turn / U Turn	4
Fixed Object	1
Pedalcycle	1
total	47
INTERSECTION	
At Intersection	14
Between Intersections	33
total	47

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CRASH SUMMARY

CR 622 N. Olden Avenue at Prospect Street
MP 4.93 - 4.98
Data Years: 2005 - 2007

TOTAL CRASHES: 47

SEVERITY	COUNT	% OF TOTAL	2007 Average
Fatal	0	0.00%	0.25%
Injury	16	34.04%	28.29%
Property Damage	31	65.96%	71.46%
Total	**47**	100.00%	

INTERSECTION	COUNT	% OF TOTAL	2007 Average
At Intersection	14	29.79%	38.75%
Between Intersections	33	70.21%	61.21%
Railroad Crossing		0.00%	0.04%
Total	**47**	100.00%	

COLLISION TYPE	COUNT	% OF TOTAL	2007 Average
Same Dir.-Rear End	21	44.68%	30.63%
Same Dir.-Sideswipe	6	12.77%	11.39%
Angle	11	23.40%	19.58%
Head On	0	0.00%	3.37%
Parked Vehicle	0	0.00%	5.39%
Left Turn / U Turn	4	8.51%	5.66%
Backing	3	6.38%	2.20%
Encroachment	0	0.00%	0.41%
Overturned	0	0.00%	0.71%
Fixed Object	1	2.13%	12.76%
Animal	0	0.00%	3.97%
Pedestrian	0	0.00%	1.82%
Pedalcycle	1	2.13%	0.96%
Non-Fixed Object	0	0.00%	0.41%
Unknown	0	0.00%	0.09%
Other	0	0.00%	0.65%
Total	**47**	100.00%	

SURFACE CONDITION	COUNT	% OF TOTAL	2007 Average
Dry	37	78.72%	75.43%
Wet Surface	6	12.77%	19.00%
Snow	2	4.26%	2.10%
Ice	2	4.26%	2.29%
Unknown	0	0.00%	0.30%
Other	0	0.00%	0.88%
Total	**47**	100.00%	

LIGHT	COUNT	% OF TOTAL	2007 Average
Day	37	78.72%	70.94%
Dusk	1	2.13%	2.60%
Night	9	19.15%	24.80%
Dawn	0	0.00%	1.25%
Unknown	0	0.00%	0.41%
Total	**47**	100.00%	

Note:

The 2007 average reflects all crashes recorded on the county route system during that year. It is standard practice to use only the most recent year of statewide data when making a comparison since yearly fluctuations regarding system-wide data are typically insignificant.

Length of Segment 264 feet

Number of Years 3

AADT 28,000 - combined directions

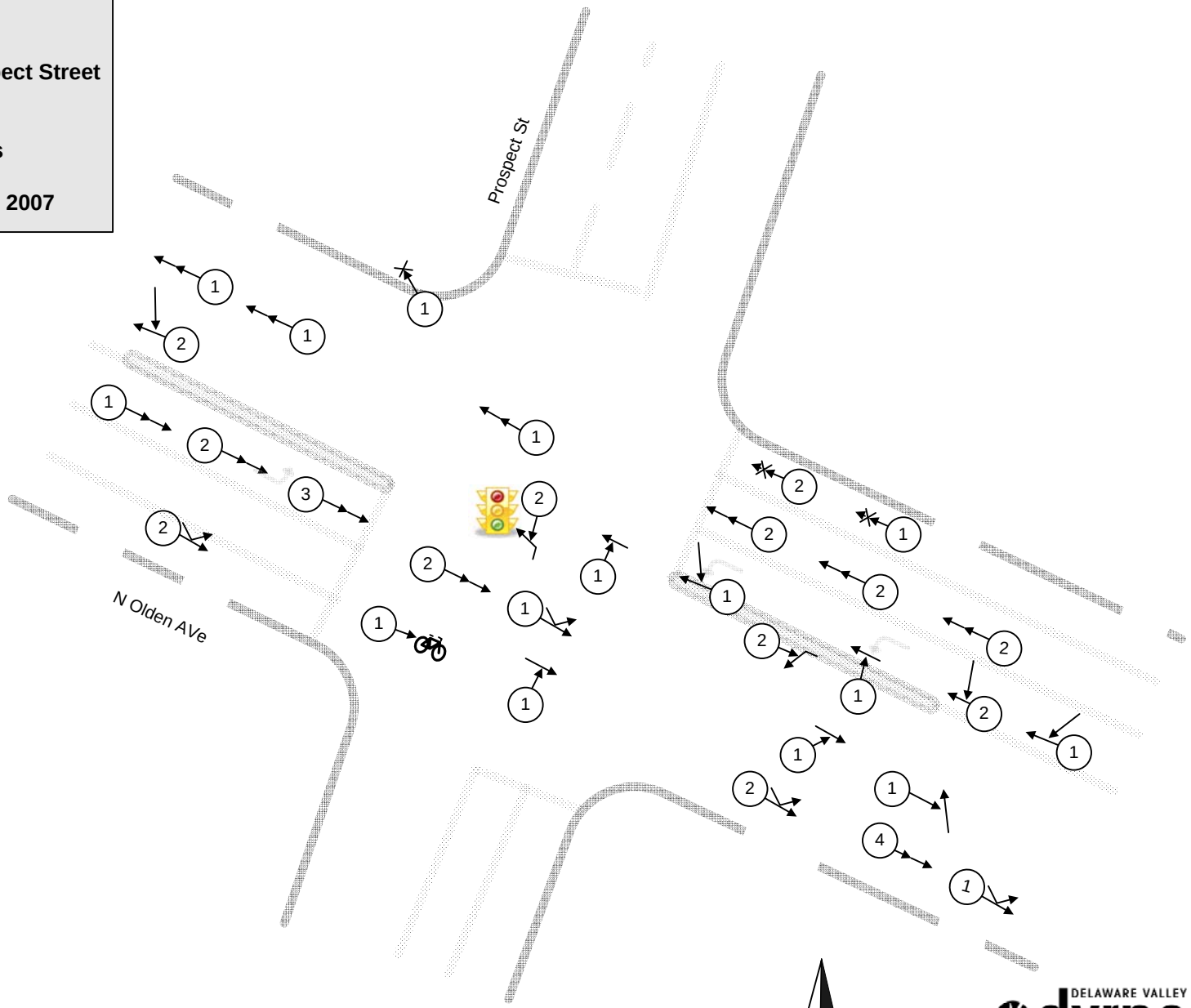
Source: DVRPC, NJDOT

Road Safety Audit
CR 622

North Olden Avenue & Prospect Street Intersection

Reportable Crashes
Collision Diagram
Crash Data Years 2005 – 2007

Total Crashes = 47



Legend

- (1) = # Crashes
- Rear End
- Sideswipe
- Angle
- Left Turn / U Turn
- Hit Fixed Object
- Backing
- Pedalcyclist

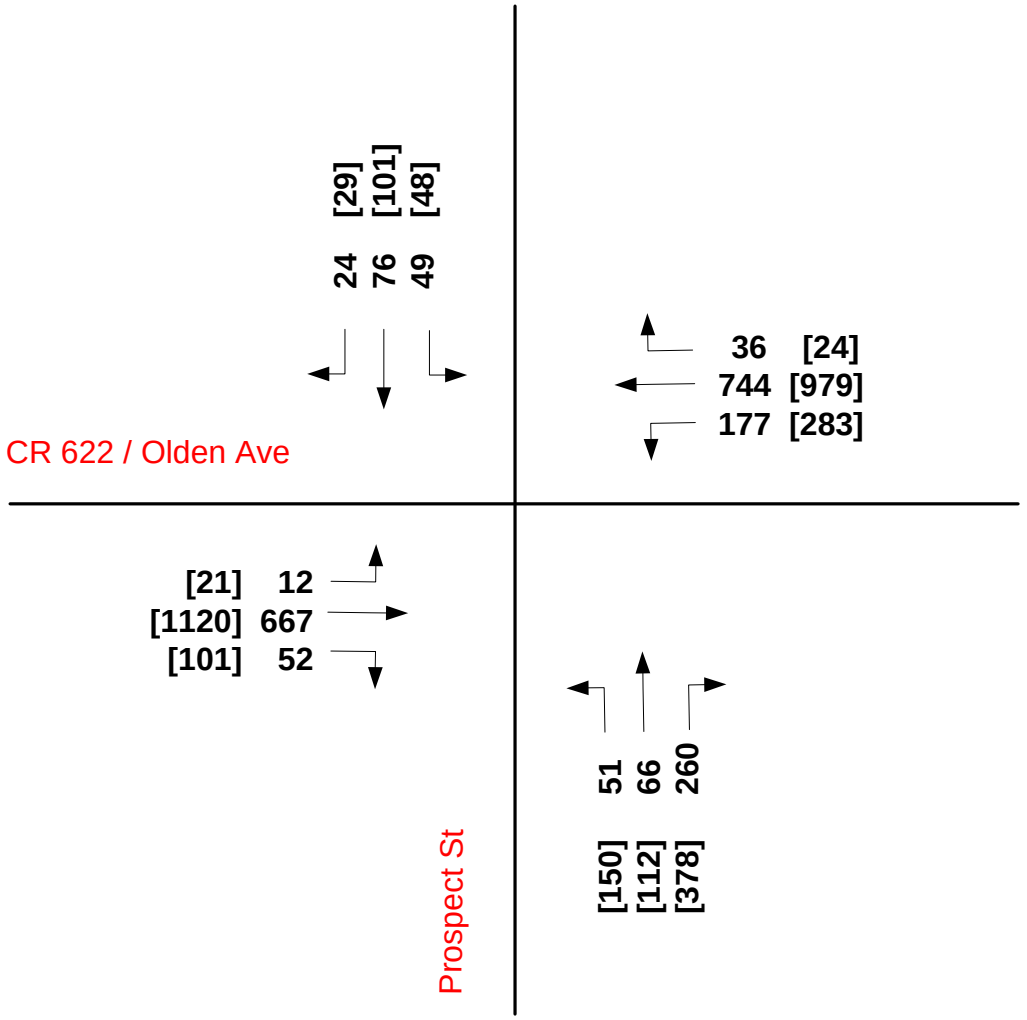
SCHEMATIC NOT TO SCALE

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CR 622 / North Olden Avenue and Prospect Street Intersection

Peak Hour Turning Movement Counts

Peak Hours
AM: 7:45 - 8:45
PM: [4:30 - 5:30]



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

North Olden Avenue at Prospect Street

Publication Title:	CR 622 (North Olden Avenue) Road Safety Audit
Publication Number:	09021
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Key Words: Road safety audit, RSA, crashes, injuries, fatalities, issues, strategies, traffic signal, coordination, engineering, enforcement, education, stakeholders, prioritize, intersection, speed limit, traffic volumes, stakeholders, audit team, geometry, pavement markings, signs, crosswalk, sidewalk, curb ramp, two-way-left-turn-lane, CR 622, North Olden Avenue

Abstract: This report documents the process and findings of the CR 622 (North Olden Avenue) Road Safety Audit (RSA) undertaken by the Delaware Valley Regional Planning Commission (DVRPC). The report details safety issues identified by the audit team at the study location and remedial strategies to address them. The goal of the audit is to generate improvement recommendations and countermeasures for the study area in an effort to reduce the incidence of motor vehicle crashes. Emphasis is placed on identifying low-cost, quick turnaround safety projects to address the identified issues where possible. This project represents a step towards implementation of the DVRPC's Regional Safety Action Plan. Implementation of improvement strategies may be eligible for Local Federal Safety Funds.

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