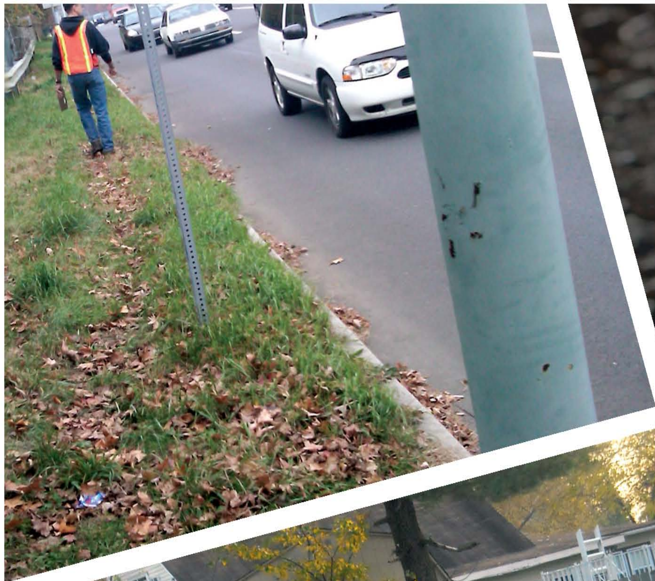

LEVITTOWN PARKWAY

ROAD SAFETY AUDIT

DECEMBER 2010

DELAWARE VALLEY
dvrpc
REGIONAL PLANNING COMMISSION

PENNDOT

LEVITTOWN PARKWAY

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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 a 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 while the diagonal bar signifies the Delaware River. 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.

Table of Contents

Figures and Tables

Appendices

APPENDIX E

APPENDIX F

APPENDIX G

APPENDIX H

Executive Summary

This document is the final report for the Levittown Parkway (SR 2051) Road Safety Audit (RSA). This project represents a step towards implementation of the Delaware Valley Regional Planning Commission's (DVRPC's) Safety Action Plan and the Pennsylvania Department of Transportation's Strategic Highway Safety Plan (SHSP). This event was conducted in the first half of Fiscal Year 2010 as part of DVRPC's Transportation Safety Program. An RSA is an effective way of identifying crash-causing trends and appropriate countermeasures utilizing a nontraditional approach that promotes transportation safety while maintaining mobility.

The Pennsylvania Department of Transportation (PennDOT), as well as all state departments of transportation, are required to develop an SHSP in order to draw on federal safety funds according to the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the current federal transportation legislation. In Pennsylvania, each district's required safety plan is incorporated in the state's SHSP.

Over the last four fiscal years, DVRPC has been coordinating with PennDOT District 6-0 to conduct road safety audits on corridors identified on their Section 148 Highway Safety Improvement Program (HSIP) that are eligible for dedicated funding but not already programmed. To date, over 20 corridors in the region have been addressed in urban, suburban, and rural settings. The rural corridors fall under a portion of the HSIP called "high-risk rural roads" according to the federal guidelines. The Levittown Parkway RSA process began when the District selected the 1.9 mile corridor for study from their current HSIP list. Note that the corridor study section is known locally as Levittown Parkway in the southern section, and South Oxford Valley Road in the northern section, though the state route designation of SR 2051 remains consistent throughout. For simplicity the entire study corridor section is referred to as Levittown Parkway within this document.

The Levittown Parkway (SR 2051) RSA was conducted on Tuesday, November 10, 2009. The pre-audit and post-audit meetings were held at the Bristol Township Municipal Building, 2501 Bath Road, Bristol Township, Pennsylvania. Due to the short length of the study corridor, the team was able to complete the audit in one day. The audit team of 10 participants included representation from Bristol Township administration, Bristol Township Police Department, Bucks County Planning Commission, PennDOT District 6-0, the South Eastern Pennsylvania Transportation Authority (SEPTA), the Federal Highway Administration (FHWA), and DVRPC. The Bicycle Coalition of Greater Philadelphia was invited but unable to attend. See Appendix A for the list of audit team members.

One of the locations that the audit team spent a good deal of time discussing is at the eastern end of the study corridor in the Levittown section, where the Parkway is two lanes per direction and divided by a grass median. Of particular concern were the median breaks that provide access across the Parkway. These breaks, at most two car lengths long and a travel lane wide, provide storage for drivers waiting to complete a left turn into a neighborhood side street. The reverse movement is just as common as drivers exit the neighborhoods to access the far side of the Parkway, using these openings as a staging area while they wait for a gap in oncoming traffic. These openings are problematic by design as they are closely spaced, frequent, and lead to compromised sight distance when two or more drivers occupy them at the same time. The group observed that not all of these openings may be necessary, as some are duplicative. It was clear that this entire section of the study corridor needs careful thought and would benefit from a collaborative effort between local leaders and PennDOT in developing an access management plan.

Another identified corridor-wide problem was the lack of adequate and continuous sidewalks throughout the study section. Although they can be found in several locations, consistent sidewalk design and continuity are lacking. Similarly, accommodations for bicyclists are nearly non-existent. Though the roadway does not provide enough width to add a bike lane under the current configuration, a road diet, if deemed appropriate, would provide the needed width while calming traffic through the corridor. This idea was explored by the committee as a long-term strategy for consideration. A more attainable short-term alternative to accommodating bicyclists would be a multi-use bike route using existing parallel streets through the adjacent neighborhoods designated with signs and possibly striping.

Site-specific issues, organized by sub-areas, are also discussed in the Findings and Recommendations chapter. Each sub-area is represented graphically on an aerial view map and has a corresponding table on the opposite page; there are seven sub-areas. This layout is designed to assist the reader in locating identified safety issues.

The recommendations herein were developed collaboratively with roadway owners and local stakeholders from the study task force; DVRPC served 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.

C H A P T E R 1

Introduction

As the final report for the Levittown Parkway (SR 2051) RSA, this document represents a step towards implementation of DVRPC's Safety Action Plan. The RSA process utilizes a nontraditional approach to address crash problems through an intensive and collaborative forum. The Levittown Parkway RSA is one of two RSAs conducted on Pennsylvania's state road system as part of DVRPC's FY 2010 transportation safety work program. With assistance from the PennDOT District 6-0 Office, DVRPC utilized crash data summaries and crash record resumes from the Pennsylvania Crash Data Analysis and Retrieval Tool (CDART) for the crash analysis portion of the audit.

What is a Road Safety Audit?

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.

A road safety audit 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 or other federal safety monies. 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, daytime 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 concentrations became focus areas during the audit of the Levittown Parkway study area.

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

- Pre-audit – the study team reviews 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 Levittown Parkway (SR 2051) Audit Event

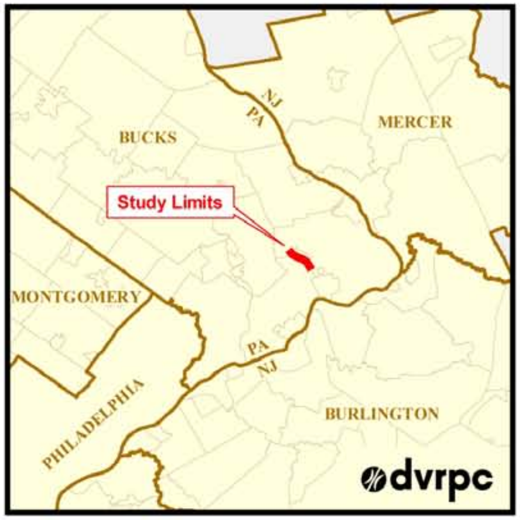
The one-day road safety audit was conducted on Tuesday, November 10, 2009. The pre-audit and post-audit meetings were held at the Bristol Township Municipal Building, 2501 Bath Road, Bristol Township, Pennsylvania. The audit team of 10 participants included representation from local, county, regional, state, and federal levels. The Bicycle Coalition of Greater Philadelphia was invited but 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.

C H A P T E R   2

Corridor Description and Analysis

Study Location



The study area consists of approximately 1.9 miles of SR 2051 from the intersection of Mill Creek Parkway northwest to the intersection of Southway Drive/Hood Boulevard, serving both Falls and Bristol Townships, Bucks County. The southeastern half of Levittown Parkway is predominantly residential, and the northwestern half, from the New Falls Road intersection, is commercial. Though the frontage varies throughout the study section, there is dense residential development beyond the roadway. Levittown Parkway serves local trips and is an important connector between US Route 1 and US Route 13 (Bristol Pike).

Roadway Characteristics

Levittown Parkway (SR 2051) is classified as an urban minor arterial. The corridor study section has two basic cross-section types. From Mill Creek Parkway to New Falls Road (southeastern half), the roadway is a four-lane configuration: two travel lanes per direction with a grass median that contains intermittent breaks to allow for cross-overs. From the New Falls Road intersection to Southway Drive/Hood Boulevard, the four-lane configuration continues but with a mix of dedicated left-turn lanes and a two-way left-turn lane (TWLTL). Shoulders are missing from the entire corridor. Levittown Parkway's horizontal alignment follows a gradual S-curve, and there is a rise in elevation moving northwest. The speed limit is posted at 40 MPH. There are six signalized intersections and multiple driveway curb cuts along this section. Sidewalks are inconsistently available throughout the northwestern half of the corridor—several missing links were identified—and no sidewalks are provided in the southeastern section. Sidewalk conditions vary from newly installed to needing maintenance.

Traffic Volumes

Existing volume counts from the DVRPC database were utilized for the audit. The data shows traffic volumes along the corridor to be in the range of 8,000 – 10,000 vehicles per direction per day on average. A 2008 annual average daily traffic (AADT) count near the intersection of New Falls Road recorded just over 8,000 vehicles per direction. Further northwest, between Olds Boulevard and Southway Drive/Hood Boulevard, a 2006 AADT count of just over 10,000 per direction vehicles was recorded. The increase at this northern location may be reflective of the more densely developed commercial area.

Turning movement counts were taken during the fall of 2009 at five signalized locations along the study corridor: 1) at Mill Creek Parkway, 2) at New Falls Road, 3) at Queen Anne Drive, 4) at Olds Boulevard, and 5) at Southway Drive/Hood Boulevard. Mill Creek Parkway, located at the southeastern end of the study corridor, mainly serves as a collector for neighborhood traffic. The peak hours were identified as 7:00 – 8:00 AM and 4:45 – 5:45 PM. Through movements on Mill Creek Parkway were nearly equal to those on Levittown Parkway. The most significant turning movements were the left turns from Mill Creek Parkway eastbound to Levittown Parkway northbound at 191 in the AM peak hour and 160 in the PM peak hour. Surprisingly, the highest overall volume movement was through traffic on Mill Creek Parkway westbound during the afternoon peak hour at 457 vehicles. Turning movement counts for the intersection can be found in Appendix C.

The New Falls Road intersection, located approximately halfway between the study end points, serves both residential and commercial traffic and marks the beginning of the more densely developed commercial area. The peak hours were identified as 8:00–9:00 AM and 4:45 – 5:45 PM. The heaviest overall movement at this intersection is through traffic on Levittown Parkway southbound at 904 vehicles during the PM peak period, almost twice the next highest movement (Levittown parkway northbound PM peak at 554.) The most significant turning movement was left turns from New Falls Road eastbound to Levittown parkway northbound at 259 vehicles during the PM peak, with the close second being right turns from Levittown Parkway southbound to New Falls Road westbound at 234 during the PM peak period. Turning movement counts for the intersection can be found in Appendix D.

The Queen Anne Drive intersection, which serves predominantly residential neighborhoods, showed an overall increase in through traffic on Levittown Parkway and a major reduction in turning movement volumes as compared to the New Falls Road intersection area. The peak hours were identified as 8:00–9:00 AM and 5:00–6:00 PM. The heaviest overall movement at this intersection was through traffic on Levittown Parkway southbound at 1,067 vehicles during the PM peak period, closely rivaled by northbound PM peak through movements at 916. The highest turn movement volume—left turns from Queen Anne Drive westbound to Levittown Parkway southbound—was 98 vehicles per hour during the evening peak period. Turning movement counts for the intersection can be found in Appendix E.

Olds Boulevard, much like Queen Anne Drive, serves predominantly residential traffic and showed a decrease in cross-street volume also. The peak hours were identified as 7:00 – 8:00 AM and 4:45 – 5:45 PM. Combined traffic movements on Levittown Parkway were generally two or more times greater than the combined movements on Olds Boulevard, the greatest contrast among any of the intersections measured in the study corridor. Another contrast is between the AM and PM peak period volumes along Olds Boulevard westbound, where the PM through movement volume (165) was more than two times greater than the AM volume (67), and the PM right turn volume (218) was more than three times the AM volume (67). These discrepancies may be reflective of the shopping center rear-entrance located on Olds Boulevard north of the intersection. The heaviest overall movement at this intersection was through traffic on Levittown Parkway northbound at 740 vehicles during the PM peak period. Turning movement counts for the intersection can be found in Appendix F.

Lastly, turning movement counts were recorded at the intersection of Southway Drive/Hood Boulevard, which marks the northwestern terminus of the study corridor. Much like Olds Boulevard, this cross-street is a collector for residential trips, though it also provides secondary access to the same shopping center served by Olds Boulevard. The peak hours were identified as 7:15–8:15 AM and 5:45–6:45 PM. Turning movement counts for the intersection can be found in Appendix G.

Transit Service

There are two SEPTA bus lines that provide service to the study area, though neither traverses the entire study corridor length exclusively on Levittown Parkway. Both lines operate Monday through Saturday with one-hour headways and no service on Sundays. Service hours generally cover the AM peak through PM peak commuting times.

The SEPTA #127 bus, serving locales between the Neshaminy Mall and the City of Trenton, New Jersey, follows Levittown Parkway northwest to New Falls Road, where it turns right onto New Falls Road eastbound. At the intersection of Hood Boulevard, the #127 bus turns left, following Hood Boulevard to Olds Boulevard, where it turns left again. The #127 then rejoins Levittown Parkway northbound, where it exits the study area. Multiple marked bus stops can be found along its route.

SEPTA's #128 bus line also begins its route at the Neshaminy Mall, but instead follows a different path that terminates at the Oxford Valley Mall. The #128 also follows Levittown Parkway northbound to the New Falls Road intersection, where it turns left onto New Falls Road westbound and exits the study area. Like the #127, marked bus stops can be found at key locations throughout the study area.

Crash Findings

According to the PennDOT crash database, there were 135 reportable crashes during years 2004 to 2008 along the study area section of Levittown Parkway. Reportable crashes are crashes that result in a fatality, injury, and/or require a vehicle to be towed from the scene. A comprehensive analysis of the corridor-wide crash data is shown in Appendix B. Of the five-year total, 18 crashes occurred in 2004 (13 percent), 34 in 2005 (25 percent), 45 in 2006 (33 percent), 25 in 2007 (19 percent), and 13 in 2008 (10 percent).

When analyzing crash frequency by month, the fewest crashes occurred in February, March, and April, when six crashes were recorded per month. January had the highest number with 18. Despite this wide disparity, the remainder of the year was fairly consistent, hovering around 13 per month on average. Crashes concentrations by weekday show no consistent trend. Sunday, Tuesday, Thursday, and Saturday crash totals fell between 14 and 18 per day, while the remaining three days showed totals between 21 and 26. These daily fluctuations reveal little about driving patterns or possible crash trends. When considering crashes by time of day, the distribution favors the seven-hour period from 12:00 noon to 7:00 PM when 54 percent of the crashes occurred. This is likely related to the mid-day trips generated by the dense retail area of the northwestern part of the study corridor. There is also a noteworthy spike in crashes during the morning commute at between 8:00 AM and 9:00 AM; nine crashes were recorded.

Crash distributions by road surface and weather condition showed no anomalies as 82 percent of the crashes occurred on a dry road surface and 87 percent during clear weather conditions. Sixty-five percent of the crashes occurred under daylight conditions, and 26 percent with street lights on.

Regarding severity, there were two fatal crashes that claimed four lives, 92 injury crashes, and 41 property damage-only crashes. Of the injury crashes, seven were major, eight were moderate, and 34 were minor. Of the remaining crashes, 40 were considered “unknown severity,” and three were coded as “unknown if injured.” The location of each fatal crash was examined during the field visit.

The three highest collision type concentrations were angle (54 percent), rear-end (22 percent), and hit-fixed-object crashes (13 percent), which, when combined, account for approximately 89 percent of the crash total. In Pennsylvania a crash is coded as angle when two vehicles collide in an angular way, sometimes referred to as a T-bone crash. What is not indicated in this description is the pre-crash action that led to the collision—important information when trying to identify a crash trend. The analysis of the associated police reports for this RSA revealed that almost half of the 74 angle crashes involved a left-turn movement, i.e., drivers were moving toward each other from opposite travel directions when one driver turned left in front of the other, resulting in a collision. These details are important because left-turn crashes, especially those occurring at signalized intersections, may be mitigated by implementing a dedicated left-turn phase. This determination can only be made after conducting a focused study on an individual intersection that considers level of service in addition to safety. Of the five signalized intersections examined during the audit, angle crashes were the predominant collision type at four of them, and rear-end crashes at the fifth. At the time of the study, each of these intersections had dedicated left-turn lanes, and either protected only, or protected-permitted left-turn accommodations. Another common cause of angle crashes is red-light running.

Rear-end crashes—accounting for 22 percent (31)—tend to be common along signalized roadways, especially those with recurring congestion. With such a relatively small number of rear-end crashes, it is not immediately apparent that congestion was a primary cause for the identified rear-end crash frequency. Hit-fixed-object (HFO) crashes often occur when drivers leave the road, either completely or just swerving into the shoulder. The police report analysis showed that the predominant driver actions among the 18 hit fixed object crashes on Levittown parkway were “speeding,” or “driving too fast for conditions.”

Three pedestrian crashes and no bicycle crashes were recorded during the study period. With the consistent four-lane cross-section mid-block, and the five-lane cross-section at the intersections, pedestrian crossings can be long for the handicapped, the elderly and young children. It should be noted that pedestrian crossing signals and push buttons were available at many of the signalized intersections.

Environmental Justice Technical Analysis

The quantitative method of analysis developed in the original report *“…and Justice for All”: DVRPC’s Strategy for Fair Treatment and Meaningful Involvement of All People* (Publication No.: 01022) in September 2001, and subsequent updates, rely primarily upon available U.S. Census data. The eight degrees of disadvantage are: minorities, Hispanics, the disabled, car-less households, impoverished households, female heads of household with children, elderly over 75 years of age, and limited English proficiency households. Each census tract is compared to the regional threshold to assess whether it meets or exceeds the average.

Levittown Parkway Road Safety Audit Study Area

The Degrees of Disadvantage Map can be used as an indicator of Environmental Justice (EJ) sensitive areas and populations. Improvement projects recommended in these areas should be evaluated concerning the extent to which they may impact sensitive populations. This project-level review process is governed by National Environmental Policy Act (NEPA) procedures, which now incorporate EJ concerns.

Nine census tracts surrounding the Levittown Parkway study area in Bristol Township and Falls Township of Bucks County were evaluated. According to 2000 U.S. Census figures, the nine census tracts’ total population is 38,320 residents. The following text summarizes the demographic information derived from this EJ data.

- None of the study area tracts meet the regional threshold populations for non-Hispanic minorities, car-less households, and female heads of household with children;
- One tract meets the regional threshold population for poverty;
- Six tracts meet the regional threshold population for Physically Disabled;
- One tract meets the regional threshold population for Hispanic population;
- Three tracts meet the regional threshold population for Elderly population;
- One tract meets the regional threshold population for population with Limited English Proficiency;

Considerations Regarding the Study Corridor Residents

The most notable EJ-sensitive demographic groups in this study area are the physically disabled and elderly populations, meeting the regional threshold in six and three of nine census tracts, respectively. The 2000 U.S. Census definition of disabled highlights mobility challenges. The physically disabled population often relies on alternative modes of transportation for all mobility needs. The same often also applies to the elderly, defined in this analysis as populations over 75 years of age, because rates of driving decrease with an increase in age. The mobility of the physically disabled and elderly populations is dramatically impacted by the quality of the pedestrian network, the connectivity of navigable sidewalks, and the availability and accessibility of services and employment.

The combined census tract population for the study area (nine tracts around the parkway) is 38,320 people. The elderly are 5.7 percent of this population, or 3,264 people. With a regional threshold of 6.6 percent, the total study area is below the regional threshold by 0.9 percent. However, three of the nine tracts in the study area exceed the regional threshold. The total population in these three tracts is 569 people. This represents 8.5 percent of the population in these three tracts, which is 1.9 percent higher than the regional threshold. For these three tracts, the elderly population is 1.28 times the regional threshold (or 128 percent of the regional threshold).

The physically disabled are 8.5 percent of this population, or 2,191 people. With a regional threshold of 7.7 percent, the total study area exceeds the regional threshold by 0.8 percent, which is 1.1 times the regional threshold (or 110 percent of the regional threshold). Six of the nine tracts in the study area exceed the regional threshold. The total population in these six tracts is 2,599 people. This represents 9.3 percent of the population in these six tracts, which is 1.6 percent higher than the regional threshold. For these six tracts, the physically disabled population is 1.2 times the regional threshold (or 120 percent).

CHAPTER 3

Findings and Recommendations

The tables and figures on the following pages summarize the findings, recommendations, and priorities for the Levittown Parkway (SR 2051) RSA, and additional background information for each section is documented in the appendices. The section begins with site-specific safety issues and recommendations and includes a corresponding aerial map indicating the relative location of each identified issue (where possible). This is followed by a table listing corridor-wide issues. Each includes general ratings for level of effort and proposed safety benefit. Level of effort generally refers to construction costs and considerations but not time and effort involved in the public process that would be necessary for some improvements. An example that illustrates this is the lengthy process typically involved in changing or eliminating a problematic roadway access point, versus the fairly straightforward construction work required to close a driveway. Those improvements that are described as requiring low effort and yielding a high safety benefit are highlighted.

It is estimated that implementing these recommendations will contribute to the overall safety of the roadway. Given fiscal constraints, recommendations may have to be considered one at a time or in small groups. Note that potential strategies that call for further study do have a safety benefit in that they are the next step toward a more detailed and appropriate safety improvement.

Appendix H contains a scope of work and benefit-to-cost ratio calculations for select priority improvements based on the predominant trends and/or significant crash locations identified through the RSA process. Being the roadway owner, PennDOT District 6-0 uses the findings of the RSA as a guide for designing improvements to address these issues. Whereas the RSA findings are numerous, PennDOT uses its experience in safety engineering to determine which issues from the table will yield the highest safety benefit when addressed using the limited safety funds available. Specifically, they've identified eight issues which were identified as priorities by the audit team including the need for a corridor access management plan, inconsistent pedestrian accommodations, and drainage issues. The scope of work document is included in the final report to expedite implementation at which time PennDOT is ready to advance this work.

Table 1: Panel 1 (Mill Creek Parkway to Crabtree Turn)

Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 1 (Mill Creek Parkway to Crabtree Turn)			
1. Evidence of pavement rutting along the Parkway southbound;	1. Repair damaged pavement during scheduled maintenance;	Low	Medium
2. Dual-stripe crosswalks are in place at the Mill Creek Parkway intersection but pedestrian heads are missing;	2. Upgrade crosswalk to continental, provide pedestrian signal heads with countdown timers;	Low	Medium
3. High percentage of angle crashes may be related to signal timing;	3. Conduct a signal timing evaluation to ensure it is optimized;	Low	Medium
4. Lack of curbing provides unlimited, uncontrolled access to backyards; there was evidence of use that may present crash safety issues;	4. Eliminate access, investigate prohibiting the active use of the greenway/right-of-way due to its proximity to Levittown Parkway, e.g. yard sale, recreation;	Medium	High
5. Damaged drainage inlet along Parkway northbound at mid-block, near northern edge of aerial photo;	5. Repair drainage inlet and ensure it is a bicycle-safe design;	Medium/High	Medium
6. Penn Lane/Willow Wood Way/Crabtree Turn – bus stops are at each location but no pedestrian facilities are provided to properly access them;	6. Provide a pedestrian accommodation between neighborhood streets and bus stop pad location, and provide bus stop pad;	Medium	Medium
7. Median openings at Willow Wood Way and Crabtree Turn are narrow and don't provide adequate queuing area, making left turns across parkway especially dangerous;	7. Cons ult determinations of access management plan evaluation. If these are to remain open, redesign for better/safer left turn accommodations;	Medium	High
8. No sidewalks provided between bus stop on Mill Creek Parkway and the intersection; goat path is evident.	8. Provide a pedestrian walkway between the intersection and the bus stop.	Medium	Medium

Source: DVRPC December 2010

Figure 1: Panel 1 (Mill Creek Parkway to Crabtree Turn)

dvrpc

Aerial Imagery: DVRPC, 2005

Table 2: Panel 2 (Crabtree Turn to Crabtree Drive)

Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 2 (Crabtree Turn to Crabtree Drive)			
1. Drainage issues – evidence of standing water near Crabtree Turn; dilapidated drain box between Willow Wood Turn and Magnolia Drive;	1. Address the drainage issues during scheduled maintenance, replace damaged drainage inlet using bicycle-friendly design;	Medium/High	High
2. Evidence of a pedestrian trail between Willow Wood Turn and Magnolia Drive;	2. As per the corridor-wide recommendation, add pedestrian accommodation between side streets along the Parkway section of the corridor;	Medium	Medium
3. There is a utility substation located between houses along the corridor where an informal parking area was identified in the grass area;	3. Establish a dedicated parking area to accommodate maintenance activities as current situation presents a safety issue;	Medium	Low/Medium
4. Evidence of trees being hit near Crabtree Turn;	4. Evaluate strategies for keeping motorists on the roadway;	Medium	High
5. Transit access point is lacking along Willow Wood Drive southbound;	5. Evaluate adding a bus bump out to utilize the existing green space along the road's edge;	Medium	High
6. Accel/decel lanes do not provide adequate width and length to be used properly and pose a safety concern as currently designed;	6. Eliminate the accel/decel lanes, or widen to appropriate width and length. Also, consider installing a left-turn lane in the median for Willow Wood Drive;	Medium	High
7. Turning from Magnolia Drive to the Parkway southbound there are tire tracks in the grass median suggesting improper use as an accel lane. Also, vehicles turning left from the Parkway onto Magnolia Drive are also leaving the paved surface and damaging the grass median;	7. Provide dedicated accel lane for southbound traffic existing Magnolia Drive, consider a redesign of the median to better accommodate turns;	High	High
8. Median openings for Crabtree Drive and Magnolia Drive are spaced too closely to each other causing limited visibility for vehicles at Crabtree Drive to the left through the curve;	8. Close Crabtree Drive median access to the Parkway and convert to right-in right-out only;	High	High
9. Observed speed is seemingly inconsistent with context (topography, curve and hill). *Not shown on map*	9. Narrow to one lane in each direction through hill/curve section (between Magnolia Dr. and Holly Turn, and maybe further); consider road diet from New Falls Road south to slow traffic to and from the hill.	Medium	High

Source: DVRPC December 2010

Figure 2: Panel 2 (Crabtree Turn to Crabtree Drive)

dvrpc

Aerial Imagery: DVRPC, 2005

Table 3: Panel 3 (Crabtree Drive up through the hill and curve)

Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 3 (Crabtree Drive up through the hill and curve)			
1. Considerable slopes within median create a non-recoverable crash area;	1. Extend guide rail in median to reduce cross-over crashes;	Medium	High
2. Tire traction compromises through the horizontal and vertical curve areas combined with seemingly high speeds make this area crash prone—this is supported by crash data;	2. Install high-friction pavement treatment on curve and measure the superelevation of the curve and redesign if necessary, install transverse and edge-line rumble strips to slow traffic through the curve, install optical speed bars to further slow and warn drivers of topography hazards;	Medium	High
3. Lack of advance notice for church driveways after the curve along the Parkway northbound;	3. Improve signage through curve northbound to warn of church driveways ahead;	Low	High
4. Duplicative driveway for northernmost church;	4. Redesign parking lot access to eliminate one driveway thus eliminating a conflict point;	Medium	High
5. Superelevation (or lack of) makes navigating the curve difficult for drivers;	5. Evaluate the superelevation rates through the curve and modify as appropriate;	Medium	Medium
6. Pedestrians and bicyclists are not accommodated throughout the curved portion of the Parkway.	6. Physical restrictions through the curve make providing for pedestrians difficult; consider: (a) eliminating the two through lanes (which encourage higher speeds) and designate the space to pedestrians and bicyclists, or (b) creating a pedestrian/bike alternate route through the neighborhoods that parallel the Parkway (see Bicyclist Environment under Corridor-wide Issues)	High	High
7. Observed speed is seemingly inconsistent with context (topography, curve, and hill). *Not shown on map.*	7. Narrow to one lane in each direction through hill/curve section (between Magnolia Dr. and Holly Turn, and maybe further); consider road diet from New Falls Road south to slow traffic to and from the hill.	Medium	High

Source: DVRPC December 2010

Figure 3: Panel 3 (Crabtree Drive up through the hill and curve)

Levittown Parkway Road Safety Audit

Falls Township and Bristol Township, Bucks Co., PA

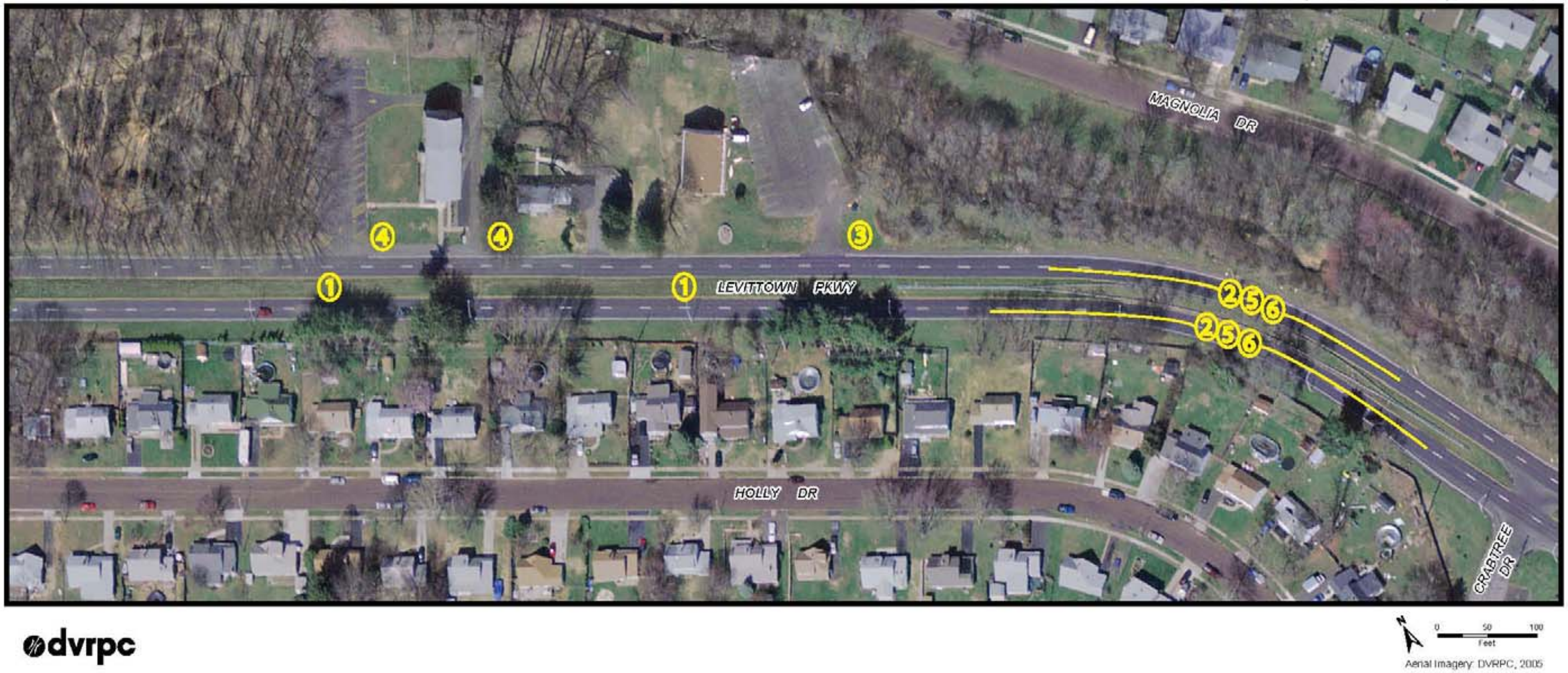


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Table 4: Panel 4 (top of hill through to New Falls Road)

Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 4 (top of hill through to New Falls Road)			
1. Duplicative business access points at the intersection of the Parkway and New Falls Road;	1. Work with property owners on a modified access plan that accommodates patrons without complicating access from the Parkway;	Medium	High
2. Major pavement rutting at the intersection;	2. Repair pavement issues during scheduled maintenance;	Low	Medium
3. Intersection geometry is wide and slightly skewed possibly contributing to hit fixed object crashes;	3. Install “elephant tracks” pavement markings through intersection to guide left turns;	Low	High
4. The yellow phase on Levittown Parkway is short and there is no delay for opposing traffic providing inadequate time for pedestrians to cross;	4. Evaluate the signal timing at New Falls Road and modify to appropriate crossing time for pedestrians; consider extra time for pedestrians due to the wide crossing;	Medium	High
5. Pedestrian signal head on the southwest corner is difficult for pedestrians and drivers to see, push buttons not properly assigned to appropriate crossing direction, and pedestrian buttons are unclear;	5. Properly align signal heads and push buttons; add pedestrian countdown signal heads;	Medium	Medium
6. Mixed signal head types create visual clutter and may be confusing to motorists;	6. Evaluate need for upgraded signal heads;	Medium	Medium
7. Damaged drainage inlet box on the northeast corner;	7. Repair drainage inlet, upgrade to bicyclist-friendly design;	Medium/High	High
8. Sight distance is compromised at Holly Turn for drivers turning left onto the Parkway northbound due to the vertical curve to the south; driver speed at this location further complicates the issue (this was the sight of a fatal crash during the study period). This is also a pedestrian crossing location used to access the bus stop located on the other side of the Parkway;	8. Redesign the median opening at Holly Turn to prohibit left turns onto the Parkway northbound; this can be accomplished while still allowing both right-in right-out turns from Levittown Parkway southbound, and left turns into Holly Turn from the Parkway northbound. Consider creating a refuge in the median for pedestrians crossing the Parkway;		
9. Sidewalk is missing along the Parkway both northbound and southbound, and there is evidence of a goat path;	9. Provide sidewalk, and make this section a priority in a corridor-wide pedestrian improvement plan;	High	High
10. Pedestrian signal and crosswalk on north New Falls Rd are adequate, but pedestrians cannot see the traffic signal and thus cannot negotiate the timing;	10. Relocate signals and provide a countdown signal head for pedestrians.	Medium	Medium
11. The SEPTA Route 128 Bus does not have a stop on the Parkway before turning onto New Falls Road, which could limit attractiveness of this line for riders.	11. Investigate value of adding bus stops on the Route 128 Bus along the Parkway.	Low	Medium

Source: DVRPC December 2010

Figure 4: Panel 4 (top of hill through to New Falls Road)

Levittown Parkway Road Safety Audit

Falls Township and Bristol Township, Bucks Co., PA

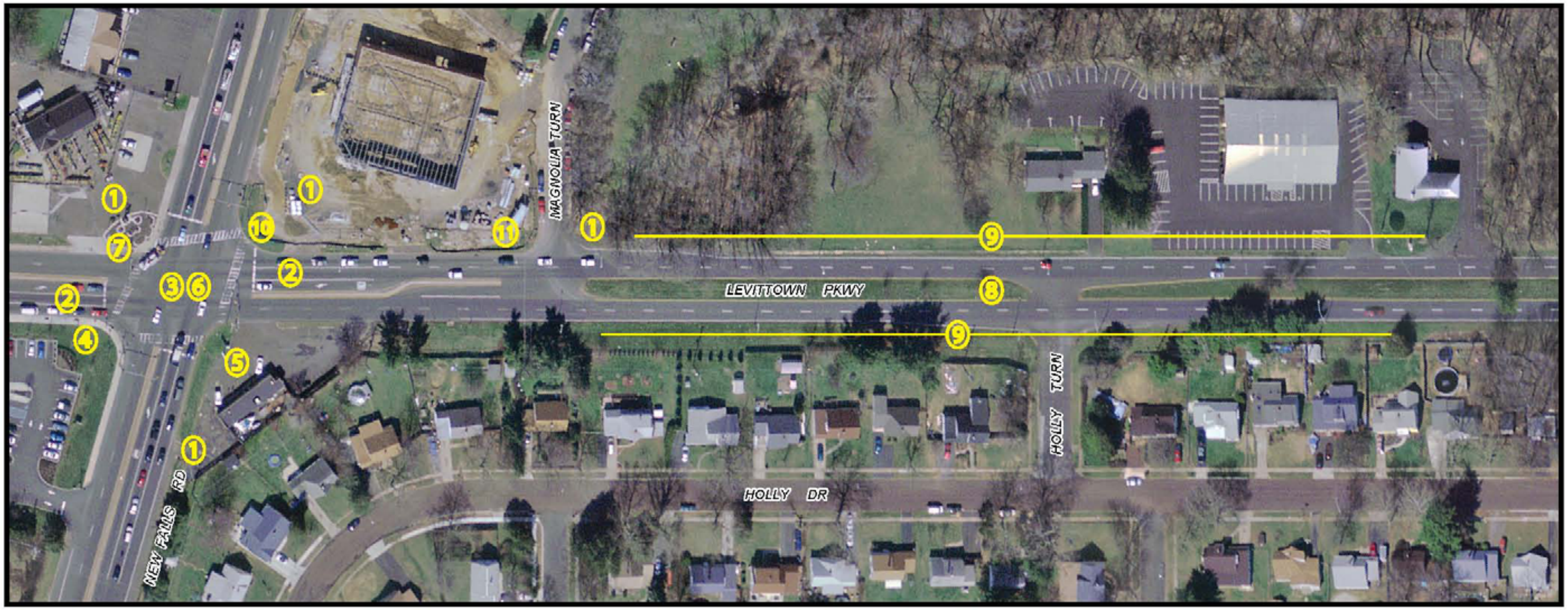

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Table 5: Panel 5 (New Falls Road through Queen Anne Drive)

Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 5 (New Falls Road through Queen Anne Drive)			
1. A drainage problem was identified along the north side of Queen Anne Drive;	1. Address drainage problem during scheduled maintenance;	Low	Medium
2. Missing pedestrian signal opposite YMCA along southbound South Oxford Valley;	2. Add missing pedestrian signal head;	Medium	Medium
3. Bank access via left-turn lane from South Oxford Valley Road northbound is poorly aligned and presents opportunities for conflicts with drivers exiting the residential frontage road along southbound South Oxford Valley Road; .	3. Extend northern end of the median divider south to better channel vehicles into the bank access thus prohibiting misuse and reducing the potential for conflicts. Consider closing the median altogether at this location; this will provide added storage for vehicles turning left at New Falls Road;	Medium	Medium
4. There is a mid-block handicap crossing sign on Queen Anne Drive (north of the intersection) but no pavement marking;	4. Add pavement markings at handicap crossing over Queen Anne Drive;	Low	High
5. Pedestrian push button is too far from signal on Queen Anne Drive (near YMCA);	5. Relocate pedestrian push button to proper place;	Low	Medium
6. Street signs located too far back to see along Queen Anne Drive;	6. Relocate signs for maximum visibility;	Low	High
7. Several left-turn conflicts were noted in the data analysis due to motorists making illegal lefts out of the YMCA lot;	7. Increase the deflection of the right-turn-only channel to prevent drivers from leaving the YMCA lot and making an illegal left turn, and add a “No Left Turn” sign for vehicles exiting the YMCA;	Medium	High
8. The area presence loop detectors extend beyond the stop bar and into the crosswalk on the Queen Anne Drive westbound approach;	8. Move stop bar toward the intersection at the Queen Anne Drive westbound approach in order to contain the loop detectors within the stop bar and out of the pedestrian crossing;	Low	Medium
9. Pedestrian signal heads are missing for crossing Queen Anne Drive along the west side of the intersection.	9. Add missing pedestrian signal heads.	Medium	Medium

Source: DVRPC December 2010

Figure 5: Panel 5 (New Falls Road through Queen Anne Drive)

Levittown Parkway Road Safety Audit
Falls Township and Bristol Township, Bucks Co., PA

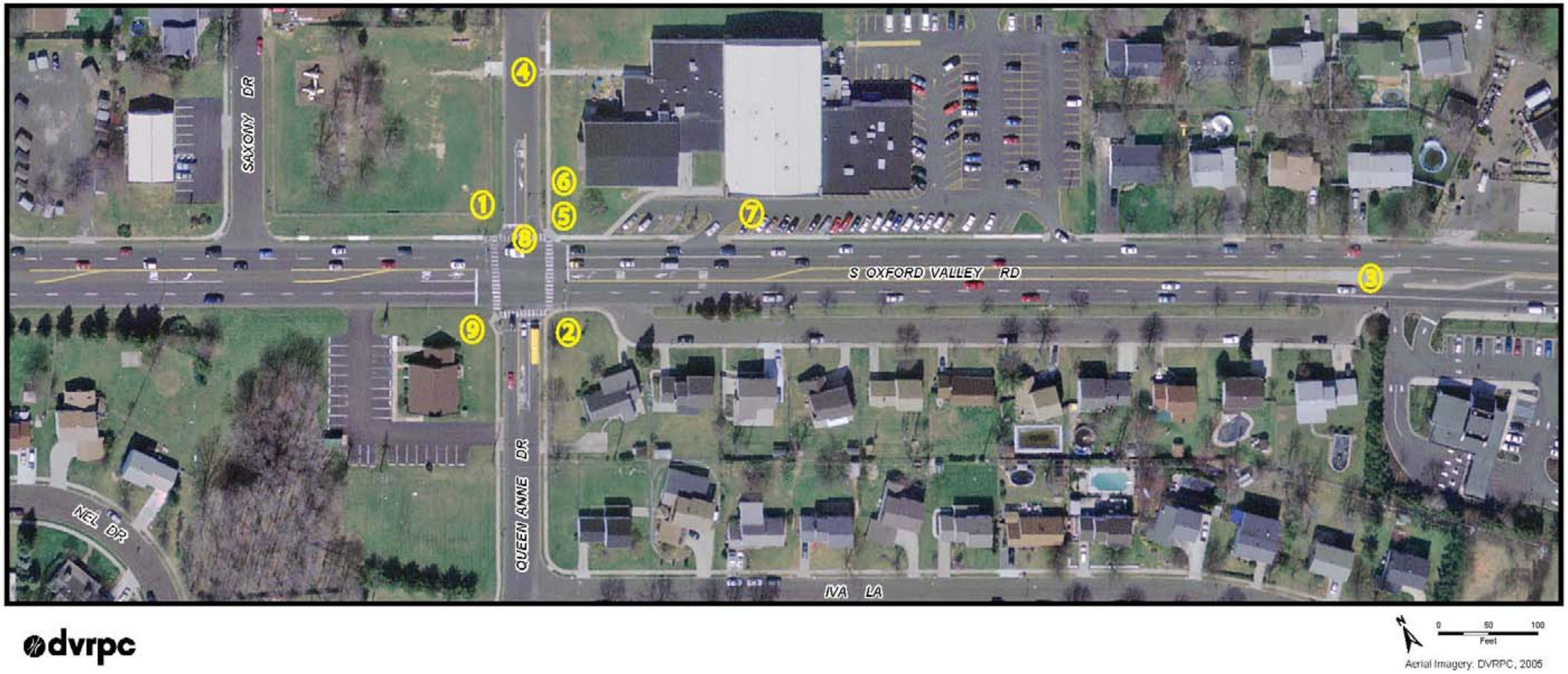

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Table 6: Panel 6 (Fairbridge Drive to Olds Boulevard)

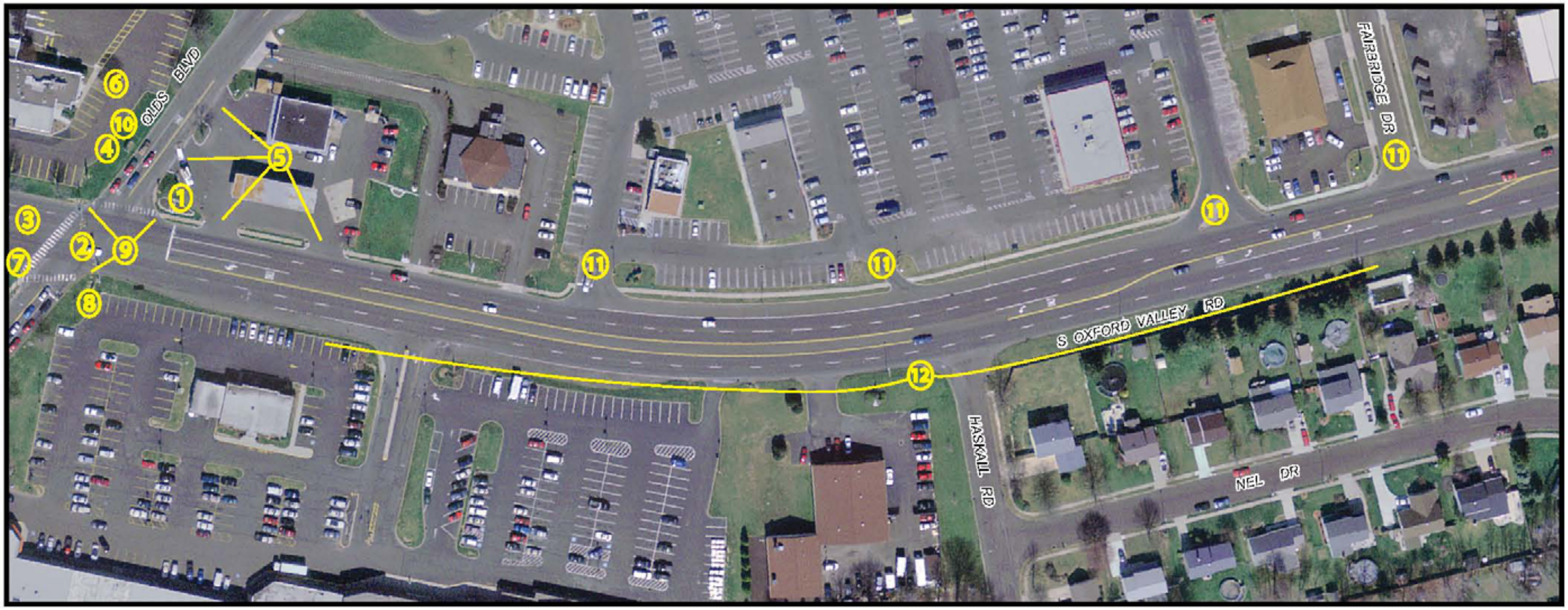
Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 6 (Fairbridge Drive to Olds Boulevard)			
1. Turning radius going right on Olds Boulevard from South Oxford Valley Road northbound is very tight, especially for trucks, as evidenced by the adjacent signal head that has been hit multiple times. Missing pedestrian actuation on the northeast corner;	1. Evaluate the right-turn radius and adjust to accommodate larger vehicles---possibly cutting back the island at the corner of the gas station property. Add missing actuation to pedestrian signal;	Medium	Medium
2. Multiple signal heads along Olds Boulevard westbound creates some confusion; short yellow phases do not allow adequate pedestrian crossing time;	2. Evaluate signal heads and amend as necessary to reduce visual clutter; evaluate signal timing, check for appropriate pedestrian crossing allowance—adjust as needed;	Medium	High
3. Long pedestrian crossing distance over South Oxford Valley Road along north side;	3. Realign the crosswalk to make the crossing more perpendicular and thus shorter. This will require modification to the signal locations and operation;	Medium	Medium
4. No sidewalk along Olds Boulevard where bus stop is located;	4. Install missing sidewalk piece to connect to bus stop;	Medium	Medium
5. Duplicative access points for gas station create unnecessary additional conflict point;	5. Consolidate access points and internalize where possible;	Medium	Medium
6. Discontinuous sidewalk near Wachovia bank doesn't connect with frontage;	6. Add missing sidewalk connection;	Medium	Medium
7. Broken inlet grate on the northwest corner of Olds Boulevard and South Oxford Valley Road intersection;	7. Repair damaged drainage inlet and upgrade to bicyclist-friendly design;	Medium/High	Medium
8. Pedestrian crossing over southwest corner of Olds Boulevard intersection is unclear (3 signal heads);	8. Relocate pedestrian push button to proper place and provide pedestrian signal head;	Low	Medium
9. ADA ramps are missing from intersection;	9. Add ADA ramps where needed;	Medium	Medium
10. Bus stop on North Olds Boulevard blocks the right through-lane;	10. Evaluate feasibility of a bus pull off at this location.	Low	Medium
11. Missing pedestrian crosswalks over driveways along South Oxford Valley Road northbound;	11. Add continental crosswalks at every opportunity;	Low	High
12. Missing pedestrian accommodations along all of South Oxford Valley Road southbound.	12. Install sidewalks and crosswalks along entire section.	High	High

Source: DVRPC December 2010

Figure 6: Panel 6 (Fairbridge Drive to Olds Boulevard)

Levittown Parkway Road Safety Audit

Falls Township and Bristol Township, Bucks Co., PA



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Aerial Imagery: DVRPC, 2005

Table 7: Panel 7 (Olds Boulevard through Southway Drive/Hood Boulevard)

Site-Specific Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Panel 7 (Olds Boulevard through Southway Drive/Hood Boulevard)			
1. Gaps in sidewalk along northbound side of South Oxford Valley Road and no sidewalk along southbound side just north of the Olds Boulevard intersection;	1. Replace missing sidewalk along both sides of South Oxford Valley Road;	Medium	Medium
2. No pedestrian crossing through planted median along South Oxford Valley Road northbound over shopping center access;	2. Continue pedestrian crossing through the planted median to retain consistent pedestrian accommodations;	Low	High
3. Backwards/unwarranted guide rail along southbound South Oxford Valley opposite the shopping center access (painted green);	3. Remove unnecessary guide rail if deemed a safety hazard;	Low	Medium
4. Damaged inlet grate between apartment complexes along South Oxford Valley Road southbound;	4. Repair damaged drainage inlet and upgrade to bicyclist-friendly design;	Medium/High	Medium
5. Inadequate pedestrian crossing time for crossing Hood Boulevard;	5. Evaluate pedestrian phase, adjust accordingly;	Low	High
6. Drivers heading southbound/westbound on Hood Boulevard approaching the intersection were observed encroaching into the pedestrian crossing in an attempt to make a right turn on red.	6. Prohibit right turn on red at this location.	Low	Medium

Source: DVRPC December 2010

Figure 7: Panel 7 (Olds Boulevard through Southway Drive/Hood Boulevard)

Levittown Parkway Road Safety Audit

Falls Township and Bristol Township, Bucks Co., PA

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Table 8: Corridor-wide Issues and Strategies

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Access Management			
1. Within the southern section of the corridor the closely spaced median openings present two major safety concerns. First, there are no left-turn lanes within the narrow openings, causing an obstruction of the through lanes while drivers wait for a gap in traffic to turn left. Second, left turns out of the unsignalized side streets are also problematic because drivers need to cross over two lanes of oncoming traffic, then through the median opening, and then merge into traffic. The situation is worsened when drivers are forced to share the inadequate queuing space while trying to access opposite directions of the Parkway. In some cases these openings may be duplicative;	1. It is recommended that Bristol Township, in collaboration with PennDOT, develop an access management plan that identifies those access points that need to be retained, and the duplicative points that should be closed. Also, accommodate selected openings with dedicated left turn lanes (opposing where necessary) in an effort to create safer access points with better sight distance;	Medium	High
2. Observed speed appears to be too fast for the context, especially given the density of median openings;	2. Consider traffic calming and/or context sensitive solutions to appropriately modify traffic speed; consider enhanced speed enforcement;	Medium	High
3. Two through lanes in each direction may not be needed in the southern portion of the Parkway. This seemingly extra capacity may be contributing to aggressive driving and higher average speeds.	3. Consider re-striping portions of the Parkway to one through lane to better match the context and to address aggressive driving and reduce speeds and to accommodate bicyclists.	Medium	High
Signals/Turning Movements			
1. The safety of pedestrians crossing at signalized intersections is compromised by the accommodation of right turns on the red signal. Many of the intersections are at skewed angles. By allowing right turns on red, drivers enter the crosswalks to gain sight distance of oncoming drivers before they turn on red, thus blocking the pedestrian crosswalk;	1. Consider prohibiting right turns on red at some locations to discourage drivers from entering the intersection and potentially conflicting with pedestrians in the crosswalk. Proximity of the stop bar to the intersection may need to be reconsidered and moved further back from the intersection to account for the intersection angle;	Medium	High
2. There are some intersections where the intersection geometry, cross-section width, placement/alignment of crosswalks, and pedestrian/bus passenger traffic create the potential for pedestrian/driver conflicts.	2. This issue is examined in detail in tables 1, 4, 6, and 7 in the Site-Specific Issues and Strategies section; recommendations include providing better connections between transit stops and walkways, repositioning of	NA	NA

Table 8 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
	crosswalks, and general upgrade of pedestrian facilities where needed.		
Light Poles 1. Street light poles are very close to the roadway, especially in the Parkway section, increasing the probability of a hit-fixed-object crash.	1. Consider a relocation plan in an effort to reduce the opportunities for hit-fixed-object crashes.	High	Medium
Signs 1. Street name signs are difficult to see due to size and placement; some were missing or damaged.	1. Conduct a sign inventory to replace or upgrade signs where necessary (see 2010 Manual on Uniform Traffic Control Devices for new lettering guidelines).	Medium	Medium
Striping/Roadway Markings			
1. Edge-line stripe is faded or overgrown especially, in the Parkway section.	1. Re-stripe edge-line during regular maintenance.	Low	High
Pedestrian Environment 1. Sidewalks are completely missing from both sides of the Parkway section; condition of existing sidewalks is substandard in spots;	1. Install sidewalks where missing; repair damaged sidewalks;	Medium /High	Medium
2. Americans with Disabilities Act (ADA) compliant curb ramps are missing or substandard in several locations;	2. Replace and/or upgrade ADA ramps where necessary;	Medium	Medium
3. Lack of sidewalk connectivity and appropriate pedestrian signage, and lack of pedestrian connections between roadway frontage and commercial properties;	3. Inventory the corridor to identify all breaks in continuity of pedestrian access and prioritize for improvement; add pedestrian signs where missing;	Medium	High
4. Short pedestrian phases and no pedestrian countdown signal heads for majority of the signalized crossings; some pedestrian signal heads not aimed properly;	4. Inventory the corridor's signalized intersections and evaluate pedestrian crossing amenities and allotted time at each; implement upgrades and repairs where necessary in effort to create corridor-wide consistency;	Medium	High
5. Only basic (two-stripe) crosswalk striping is provided at most crossings; crosswalk striping is largely inconsistent;	5. Upgrade all basic crossings to continental-style crossings;	Low	Medium
6. Lack of pedestrian facilities at unsignalized intersections.	6. Identify unsignalized locations where pedestrian facilities are missing or substandard and upgrade where necessary.	Medium	Medium

Table 8 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Bicyclist Environment			
1. No accommodations are available for bicyclists and roadway shoulders are not provided along much of the corridor, and no feasible alternate route is available;	1. Multi-use trail (possible detour into neighborhoods – Magnolia Drive around curve NB, for example); ideas for consideration:		
	• Create a Westside bike route - 2.7 mi (about 11 minute ride) between Mill Creek Parkway and Southway Drive along these connected streets: Crabtree Drive-Holly Drive-Keston Drive-Concord Lane-Fernwood Lane-Linda Lane-Buck Drive-Southway Drive to intersection with South Oxford Valley Road;	Medium	High
	• Create a side path in green space along corridor northbound from Mill Creek Parkway to Magnolia Drive, then transition across parkway (consider signal to aid safe crossing) to other side and continue to New Falls Road intersection;	High	High
2. Observed traffic speed is inconsistent with safe bicycling;	2. A road diet would calm speeds and provide space for bicycle accommodations; consider enhanced speed enforcement where possible;	High	High
3. Bicycle-incompatible drainage grates were identified at several locations;	3. Upgrade drainage inlets to bicyclist-compatible versions (culvert replacement = high level of effort);	Medium/ High	Medium
4. Lack of bicycle parking facilities at shopping centers;	4. Conduct inventory of retail establishments to identify suitable locations for bicycle parking accommodations;	Low	Low
5. Channelized right-turn lanes at intersections squeeze out bicyclists.	5. Improve intersections to better accommodate bicyclists (best practices can be seen in Philadelphia).	Medium	Medium
Pavement			
1. Evidence of wear and rutting at intersections was identified during the field visit;	1. Repair pavement during scheduled maintenance;	Low	Medium
2. Skid marks were observed at various locations.	2. Replace selected sections with anti-skid pavement during scheduled maintenance.	Low	High
Drainage			
1. Debris gathering along roadside within the Parkway section and evidence of ponding;	1. Inventory corridor to identify drainage problem areas and design grading changes to improve drainage;	Medium	Medium
2. Several broken drainage inlets were identified.	2. Repair or replace damaged drainage grates; upgrade to bicyclist-safe designs.	Medium/ High	Medium

aTable 8 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
	crosswalks, and general upgrade of pedestrian facilities where needed.		
Light Poles 1. Street light poles are very close to the roadway, especially in the Parkway section, increasing the probability of a hit-fixed-object crash.	1. Consider a relocation plan in an effort to reduce the opportunities for hit-fixed-object crashes.	High	Medium
Signs 1. Street name signs are difficult to see due to size and placement; some were missing or damaged.	1. Conduct a sign inventory to replace or upgrade signs where necessary (see 2010 Manual on Uniform Traffic Control Devices for new lettering guidelines).	Medium	Medium
Striping/Roadway Markings			
1. Edge-line stripe is faded or overgrown especially, in the Parkway section.	1. Re-stripe edge-line during regular maintenance.	Low	High
Pedestrian Environment 1. Sidewalks are completely missing from both sides of the Parkway section; condition of existing sidewalks is substandard in spots;	1. Install sidewalks where missing; repair damaged sidewalks;	Medium /High	Medium
2. Americans with Disabilities Act (ADA) compliant curb ramps are missing or substandard in several locations;	2. Replace and/or upgrade ADA ramps where necessary;	Medium	Medium
3. Lack of sidewalk connectivity and appropriate pedestrian signage, and lack of pedestrian connections between roadway frontage and commercial properties;	3. Inventory the corridor to identify all breaks in continuity of pedestrian access and prioritize for improvement; add pedestrian signs where missing;	Medium	High
4. Short pedestrian phases and no pedestrian countdown signal heads for majority of the signalized crossings; some pedestrian signal heads not aimed properly;	4. Inventory the corridor's signalized intersections and evaluate pedestrian crossing amenities and allotted time at each; implement upgrades and repairs where necessary in effort to create corridor-wide consistency;	Medium	High
5. Only basic (two-stripe) crosswalk striping is provided at most crossings; crosswalk striping is largely inconsistent;	5. Upgrade all basic crossings to continental-style crossings;	Low	Medium
6. Lack of pedestrian facilities at unsignalized intersections.	6. Identify unsignalized locations where pedestrian facilities are missing or substandard and upgrade where necessary.	Medium	Medium

.Table 8 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Bicyclist Environment			
1. No accommodations are available for bicyclists and roadway shoulders are not provided along much of the corridor, and no feasible alternate route is available;	1. Multi-use trail (possible detour into neighborhoods – Magnolia Drive around curve NB, for example); ideas for consideration:		
	• Create a Westside bike route - 2.7 mi (about 11 minute ride) between Mill Creek Parkway and Southway Drive along these connected streets: Crabtree Drive-Holly Drive-Keston Drive-Concord Lane-Fernwood Lane-Linda Lane-Buck Drive-Southway Drive to intersection with South Oxford Valley Road;	Medium	High
	• Create a side path in green space along corridor northbound from Mill Creek Parkway to Magnolia Drive, then transition across parkway (consider signal to aid safe crossing) to other side and continue to New Falls Road intersection;	High	High
2. Observed traffic speed is inconsistent with safe bicycling;	2. A road diet would calm speeds and provide space for bicycle accommodations; consider enhanced speed enforcement where possible;	High	High
3. Bicycle-incompatible drainage grates were identified at several locations;	3. Upgrade drainage inlets to bicyclist-compatible versions (culvert replacement = high level of effort);	Medium/ High	Medium
4. Lack of bicycle parking facilities at shopping centers;	4. Conduct inventory of retail establishments to identify suitable locations for bicycle parking accommodations;	Low	Low
5. Channelized right-turn lanes at intersections squeeze out bicyclists.	5. Improve intersections to better accommodate bicyclists (best practices can be seen in Philadelphia).	Medium	Medium
Pavement			
1. Evidence of wear and rutting at intersections was identified during the field visit;	1. Repair pavement during scheduled maintenance;	Low	Medium
2. Skid marks were observed at various locations.	2. Replace selected sections with anti-skid pavement during scheduled maintenance.	Low	High
Drainage			
1. Debris gathering along roadside within the Parkway section and evidence of ponding;	1. Inventory corridor to identify drainage problem areas and design grading changes to improve drainage;	Medium	Medium
2. Several broken drainage inlets were identified.	2. Repair or replace damaged drainage grates; upgrade to bicyclist-safe designs.	Medium/ High	Medium

.Table 8 (continued)

Corridor-wide Issue	Potential Strategy	Level of Effort	Estimated Safety Benefit
Traffic Speed/Context			
1. The speed of traffic in the Parkway section was observed to be excessive for the setting.	1. Conduct a speed evaluation to identify the current 85th percentile speed of traffic. Based on analysis results, make safety and traffic calming improvements to slow traffic to a more reasonable speed; supplement with targeted enforcement and an advertising campaign.	Medium	High
Transit			
1. Lack of sidewalk connectivity to and from bus stops;	1. Identify missing connections and work with property owners on ways to accommodate sidewalks;	Medium	Medium
2. Lack of bus turnouts and many of the acceleration/deceleration (accel/decel) lanes along the corridor provide inadequate room for buses to pull over;	2. Widen existing accel/decel lanes to accommodate buses. (PennDOT prefers the use of accel lanes over decel lanes due to the conflicts that are created when a vehicle pulls around a stopped bus to make a right turn in front of the bus);	Medium	Low
3. Buses remain in travel lanes while exchanging passengers, causing risky passing conditions and problematic right turn movements for vehicles queued behind the bus desiring to turn right into the intersection;	3. Inventory bus stops and move to far side of intersections where appropriate. Stops would ideally be on far side of unsignalized intersections;	Low	Medium
4. Many bus stop signs were missing or faded.	4. Repair or replace bus stop signs where necessary.	Low	Low

Source: DVRPC December 2010

The following issues were expressed by the audit team as personal safety priorities for the study corridor:

- Turnouts for buses
- Pedestrian access
- Consolidate median breaks
- Road diet/pedestrian accommodations
- Posted speed limit seems high and should be evaluated for appropriateness given the context and the observed speed
- Access management
- Utilize shoulder for multi-modal use

CHAPTER 4

Conclusions

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 when implemented. 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, but time and budget constraints may 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 Levittown Parkway (SR 2051).

APPENDIX A

Audit Team

Name	Agency	Email
Jeff Bartlett	Bristol Township	JBartlett@bristoltownship.org
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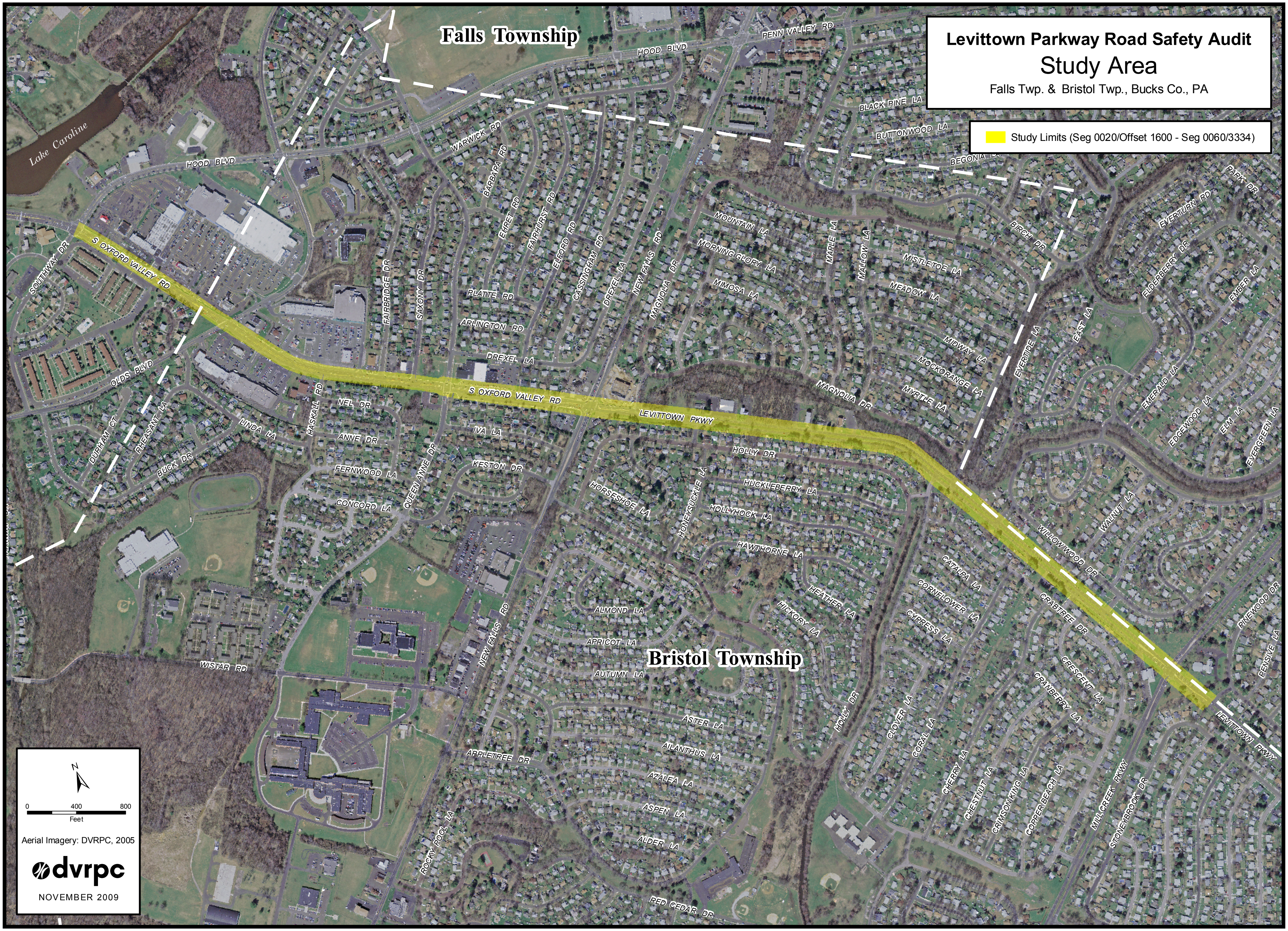
Karyn Vandervoort	US DOT / FHWA, Pennsylvania Division	karyn.vandervoort@dot.gov

APPENDIX B

Corridor-wide Data

- Study Area Map
- Traffic Volume Map
- Transit Map
- Crash Summary
- Crash Concentrations by 100 Feet: 2004-2008
- Site Photos


Levittown Parkway Road Safety Audit
Study Area
Falls Twp. & Bristol Twp., Bucks Co., PA
Study Limits (Seg 0020/Offset 1600 - Seg 0060/3334)
Falls Township
Bristol Township
Lake Caroline
HOOD BLVD
PENN VALLEY RD
BLACK PINE LA
BUTTONWOOD LA
BEGONIA LA
WARWICK RD
BARBARA RD
ELBERT RD
FAIRHURST RD
ELWOOD RD
CASSINGHAM RD
DREXEL LA
NEW FALLS RD
MAGNOLIA DR
MOUNTAIN LA
MORNING GLORY LA
MIMOSA LA
MAPLE LA
MALLOW LA
MISTLETOE LA
MEADOW LA
BIRCH DR
MIDWAY LA
MOCKORANGE LA
MYRTLE LA
EVERTIDE LA
EAST LA
EVERTURN RD
ELDERBERRY DR
EMBER LA
PARK DR
EMERALD LA
EDGEWOOD LA
ELM LA
EVERGREEN LA
S OXFORD VALLEY RD
SOUTHWAY DR
FAIRBRIDGE DR
SAXONY DR
PLATTE RD
ARLINGTON RD
DREXEL LA
LEVITTOWN PKWY
OLDS BLVD
DURHAM CT
PHEASANT LA
BUCK DR
LINDA LA
HASKALL RD
NEL DR
ANNE DR
FERNWOOD LA
CONCORD LA
QUEEN ANNE DR
IVA LA
KESTON DR
HOLLY DR
HUCKLEBERRY LA
HORSESHOE LA
HONEYSUCKLE LA
HOLLYHOCK LA
HAWTHORNE LA
HEATHER LA
HICKORY LA
WILLOWWOOD DR
WALNUT LA
CATALPA LA
CORNFLOWER LA
CYPRESS LA
CRABTREE DR
CRESCENT LA
CRANBERRY LA
PINEWOOD DR
PENSIVE LA
LEVITTOWN PKWY
ALMOND LA
APRICOT LA
AUTUMN LA
ASTER LA
ALANTHUS LA
AZALEA LA
ASPEN LA
ALDER LA
APPLETREE DR
ROCKY POOL LA
RED CEDAR DR
WISTAR RD
HOLLY DR
CLOVER LA
CORAL LA
CHERRY LA
CHESTNUT LA
CRIMSON KING LA
COPPER BEACH LA
MILLCREEK PKWY
STONEYBROOK DR
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Aerial Imagery: DVRPC, 2005
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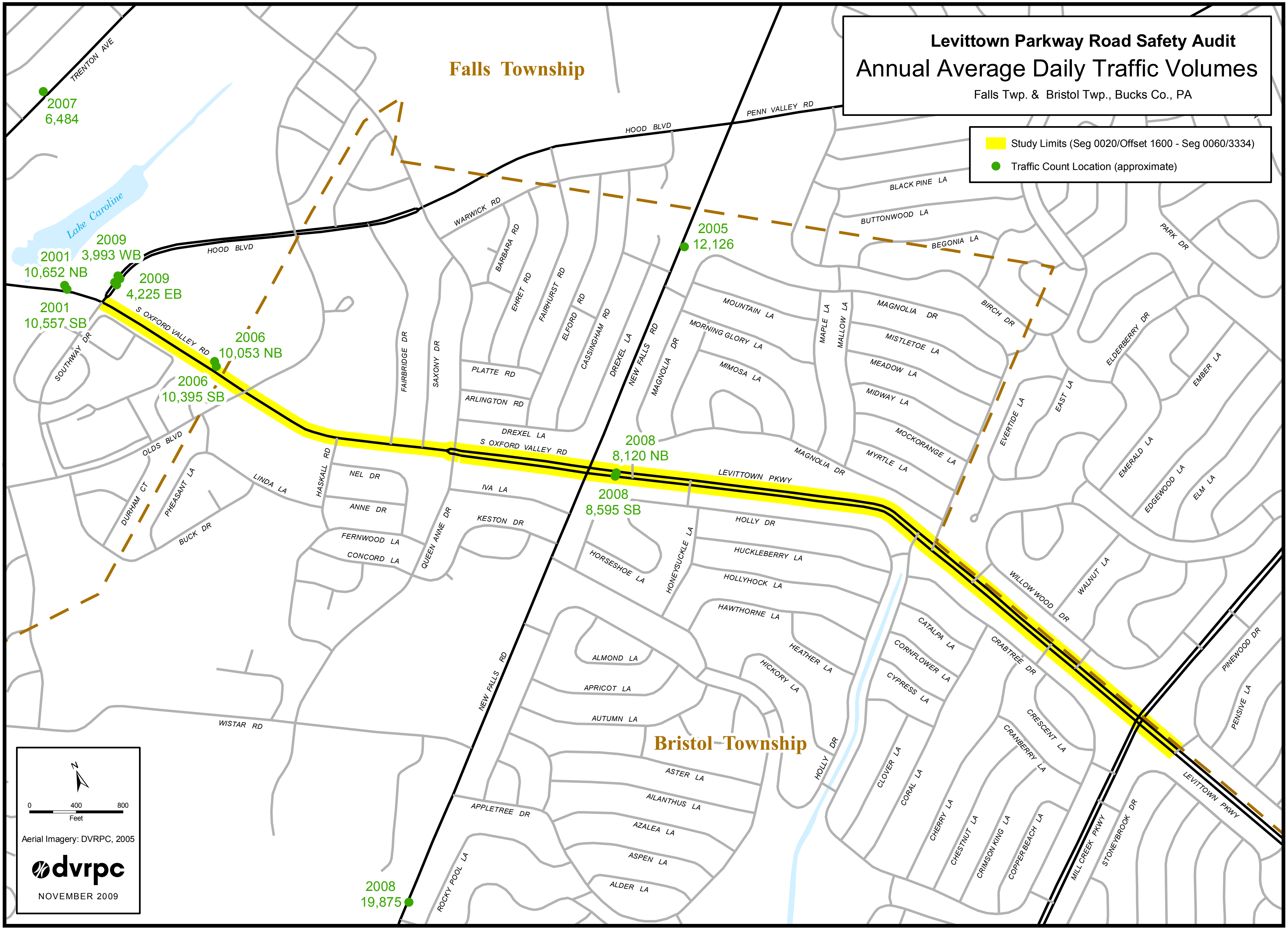
NOVEMBER 2009


Levittown Parkway Road Safety Audit
Annual Average Daily Traffic Volumes
Falls Twp. & Bristol Twp., Bucks Co., PA
Study Limits (Seg 0020/Offset 1600 - Seg 0060/3334)
Traffic Count Location (approximate)
Falls Township
Bristol Township
Lake Caroline
2007
6,484
2001
10,652 NB
2009
3,993 WB
2009
4,225 EB
2001
10,557 SB
2006
10,053 NB
2006
10,395 SB
2005
12,126
2008
8,120 NB
2008
8,595 SB
2008
19,875
TRENTON AVE
HOOD BLVD
PENN VALLEY RD
WARWICK RD
S OXFORD VALLEY RD
LEVITTOWN PKWY
NEW FALLS RD
OLDS BLVD
WISTAR RD
MILL CREEK PKWY
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800
Feet
Aerial Imagery: DVRPC, 2005
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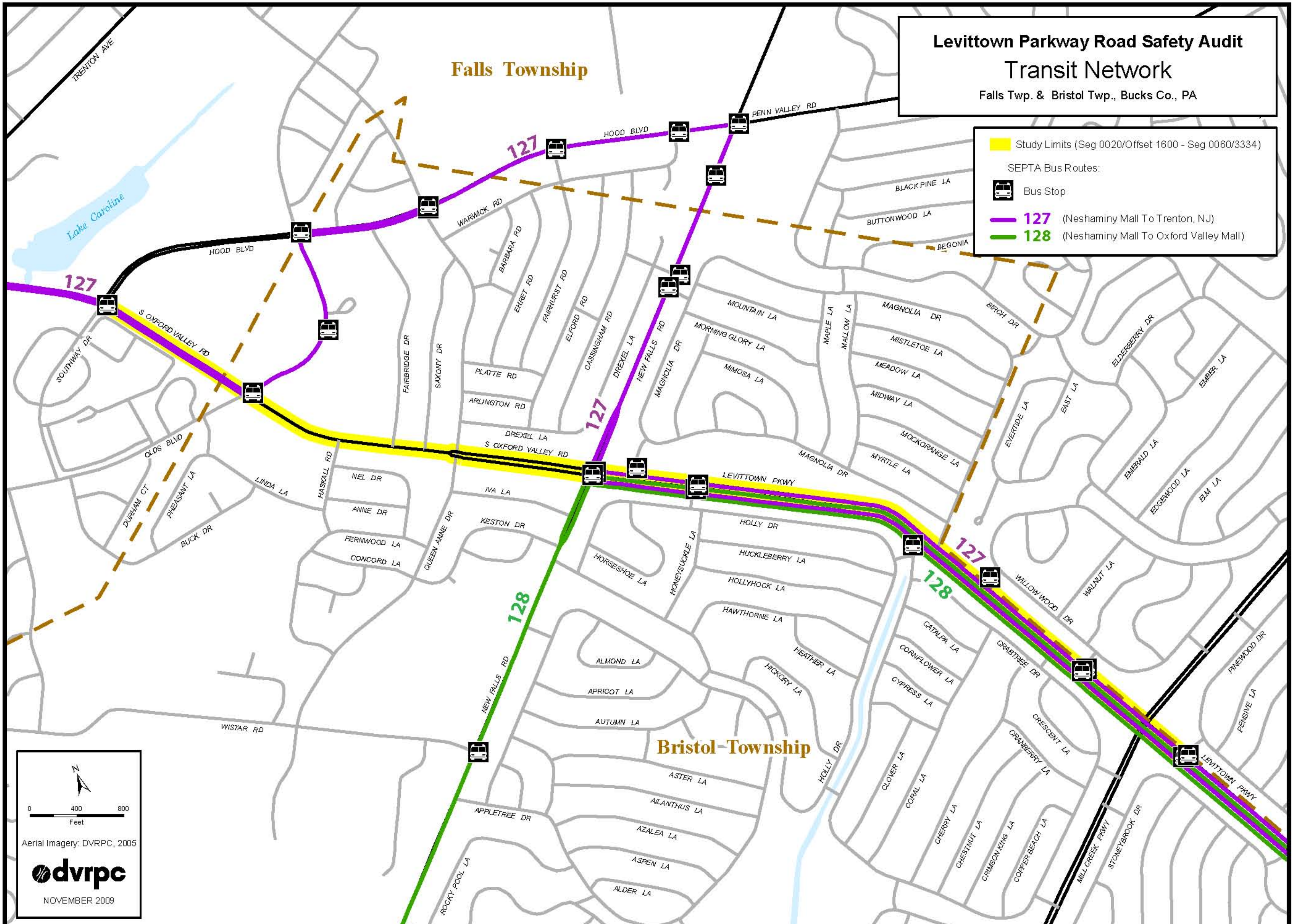
NOVEMBER 2009



Levittown Parkway Road Safety Audit
Transit Network
Falls Twp. & Bristol Twp., Bucks Co., PA
Study Limits (Seg 0020/Offset 1600 - Seg 0060/3334)
SEPTA Bus Routes:
Bus Stop
127 (Neshaminy Mall To Trenton, NJ)
128 (Neshaminy Mall To Oxford Valley Mall)
Falls Township
Bristol Township
Lake Caroline
HOOD BLVD
S OXFORD VALLEY RD
LEVITTOWN PKWY
NEW FALLS RD
PENN VALLEY RD
WISTAR RD
MILL CREEK PKWY
TRENTON AVE
127
128
N
0 400 800
Feet
Aerial Imagery: DVRPC, 2005
dvrpc
NOVEMBER 2009

CR09123 BUCKS COUNTY SR2051 0020/1600 - 0060/3334 (RSA)

Date Range: 1/1/2004 to 12/31/2008

Area of Interest: (In County 09 On State Route 2051(P) Between Segment 0020 Offset 1600 and Segment 0060 Offset 3334) or (In County 09 On State Route 2051(S) Between Segment 0021 Offset 1600 and Segment 0061 Offset 3334)

USER_ID/QUERY ID: rfrancisco/ 0620091022002

PENNDOT

MONTH OF YEAR

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
CRASHES	18	6	6	6	12	14	15	11	12	14	12	9	135
PCT	13%	4%	4%	4%	8%	10%	11%	8%	8%	10%	8%	6%	100%

DAY OF WEEK

	SUN	MON	TUE	WED	THR	FRI	SAT	
CRASHES	15	21	14	25	16	26	18	135
PCT	11%	15%	10%	18%	11%	19%	13%	100%

HOUR OF DAY

	00	01	02	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	99	
CRASHES	1	1	1	2	2	2	9	3	3	6	14	6	12	8	12	8	13	6	5	9	5	5	2	135
PCT	0%	0%	0%	1%	1%	1%	6%	2%	2%	4%	10%	4%	8%	5%	8%	5%	9%	4%	3%	6%	3%	3%	1%	100%

YEAR

	CRASHES	PCT
2004	18	13%
2005	34	25%
2006	45	33%
2007	25	18%
2008	13	9%
TOTAL	135	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	74	54%
REAR END	31	22%
HIT FIX OBJ	18	13%
HEAD ON	3	2%
NON COLL	3	2%
PEDESTRIAN	3	2%
SAME DIR SS	2	1%
UNKNOWN	1	0%
TOTAL	135	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
FATAL	2	1%
MAJOR	7	5%
MODERATE	8	5%
MINOR	34	25%
UNK SEVERITY	40	29%
UNK IF INJURED	3	2%
PDO	41	30%
TOTAL	135	100%

SEVERITY COUNT

	PERSONS
FATALITIES	4
MAJOR	7
MODERATE	10
MINOR	50
UNK SEVERITY	69
UNK IF INJURED	8

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	127	40%
RUNNING RED LIGHT	29	9%
IMPROPER/CARELESS TURN	23	7%
TOO FAST FOR CONDITION	19	6%
DRIVER WAS DISTRACTED	14	4%
IMPROPER ENTRANCE HWY	13	4%
OTHER IMPROPER DRIVING	13	4%
PROCEED W/O CLEARANCE	13	4%
UNKNOWN	10	3%
SPEEDING	8	2%
AFFECTED PHYSICAL COND	7	2%
DRIVER INEXPERIENCED	7	2%
OTHERS	33	10%
TOTAL	316	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	166	63%
SUV	40	15%
VAN	22	8%
SMALL TRUCK	21	7%
MOTORCYCLE	11	4%
PEDALCYCLE	2	0%
BUS	1	0%
TOTAL	263	100%

ROAD CONDITION

	CRASHES	PCT
DRY	111	82%
WET	18	13%
OTHER	2	1%
SNOW	2	1%
ICE PATCH	1	0%
SND/GRVL	1	0%
TOTAL	135	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	89	65%
STREET LIGHTS	36	26%
DUSK	5	3%
DARK	3	2%
DAWN	2	1%
TOTAL	135	100%

WEATHER

	CRASHES	PCT
CLEAR	118	87%
RAIN	13	9%
SNOW	3	2%
FOG	1	0%
TOTAL	135	100%

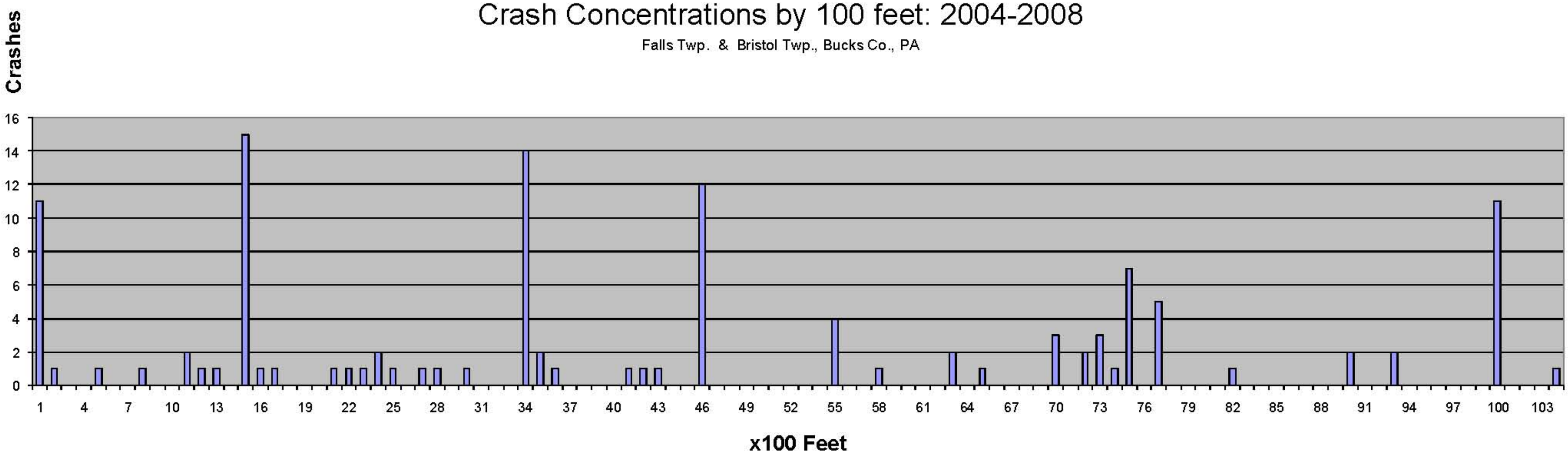
ENVIR/ROADWAY FACTORS

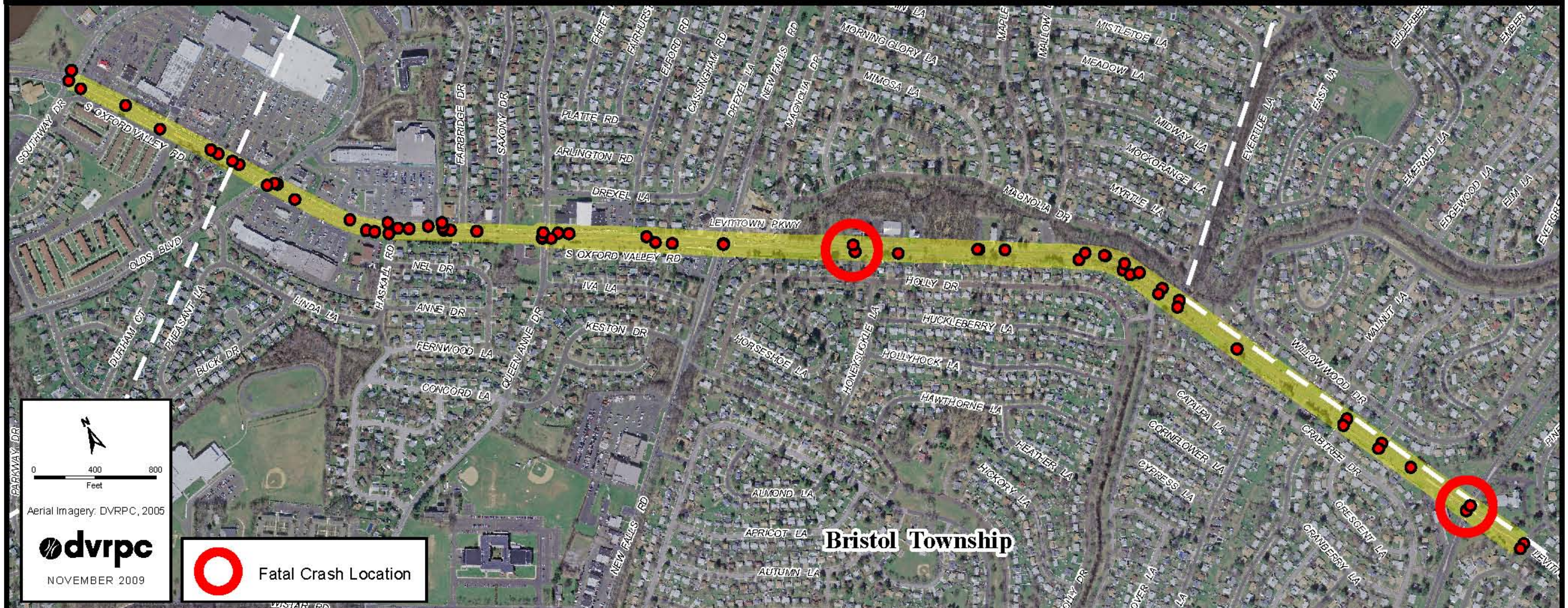
	FACTORS	PCT
NONE	119	86%
SLIPPERY ICE/SNOW	6	4%
OTHER WEATHER COND	3	2%
OTHER ENVIR FACTOR	2	1%
OTHER RDWY FACTOR	2	1%
UNKNOWN	2	1%
ANIMAL IN RDWY	1	0%
SUBSTANCE ON RDWY	1	0%
WORK ZONE RELATED	1	0%
TOTAL	137	100%

Levittown Parkway Road Safety Audit

Crash Concentrations by 100 feet: 2004-2008

Falls Twp. & Bristol Twp., Bucks Co., PA

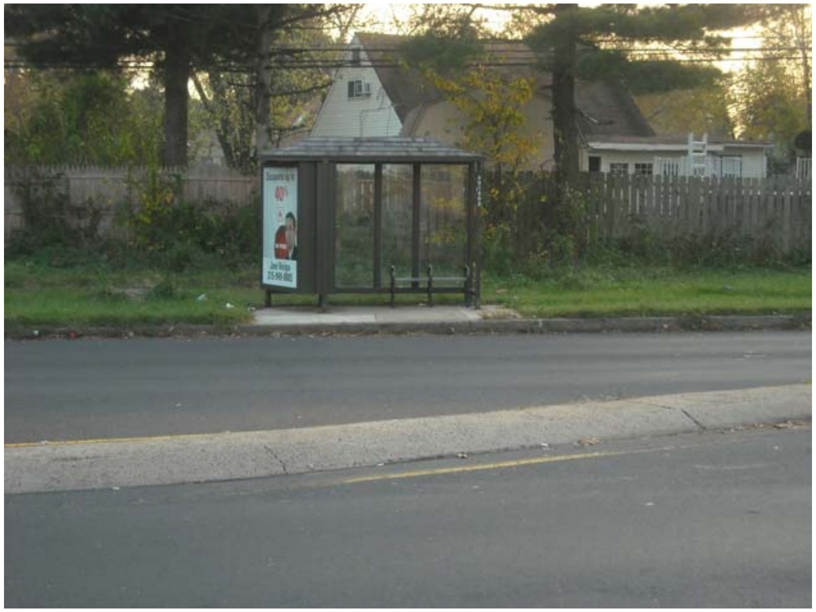




Drainage

Access Management

Transit



Traffic Speed/Context

Pavement

Signs


30
MPH


USE
CROSSWALK


Levittown Pkwy
Oxford Valley Rd
CLEANERS


SPEED
LIMIT
40

Pedestrian Environment

Bicyclist Environment

Light Poles

APPENDIX C

Levittown Parkway (SR 2051) at Mill Creek Parkway

Location-Specific Data

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

1. Levittown Parkway (SR 2051) at Mill Creek Parkway
Segment 20/2090 to Segment 21/2096

COLLISION TYPE	
Angle	7
Rear-end	1
Left Turn Involved (Angle)	1
Hit Fixed Object	1
Hit Pedestrian (Angle)	1
Total	**11**
SEVERITY COUNT (people)	
Fatalities	2
Major	0
Moderate	1
Minor	4
Unk Severity	11
Unk If Injured	0
Total	**18**

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Levittown Pkwy (SR 2051) Road Safety Audit

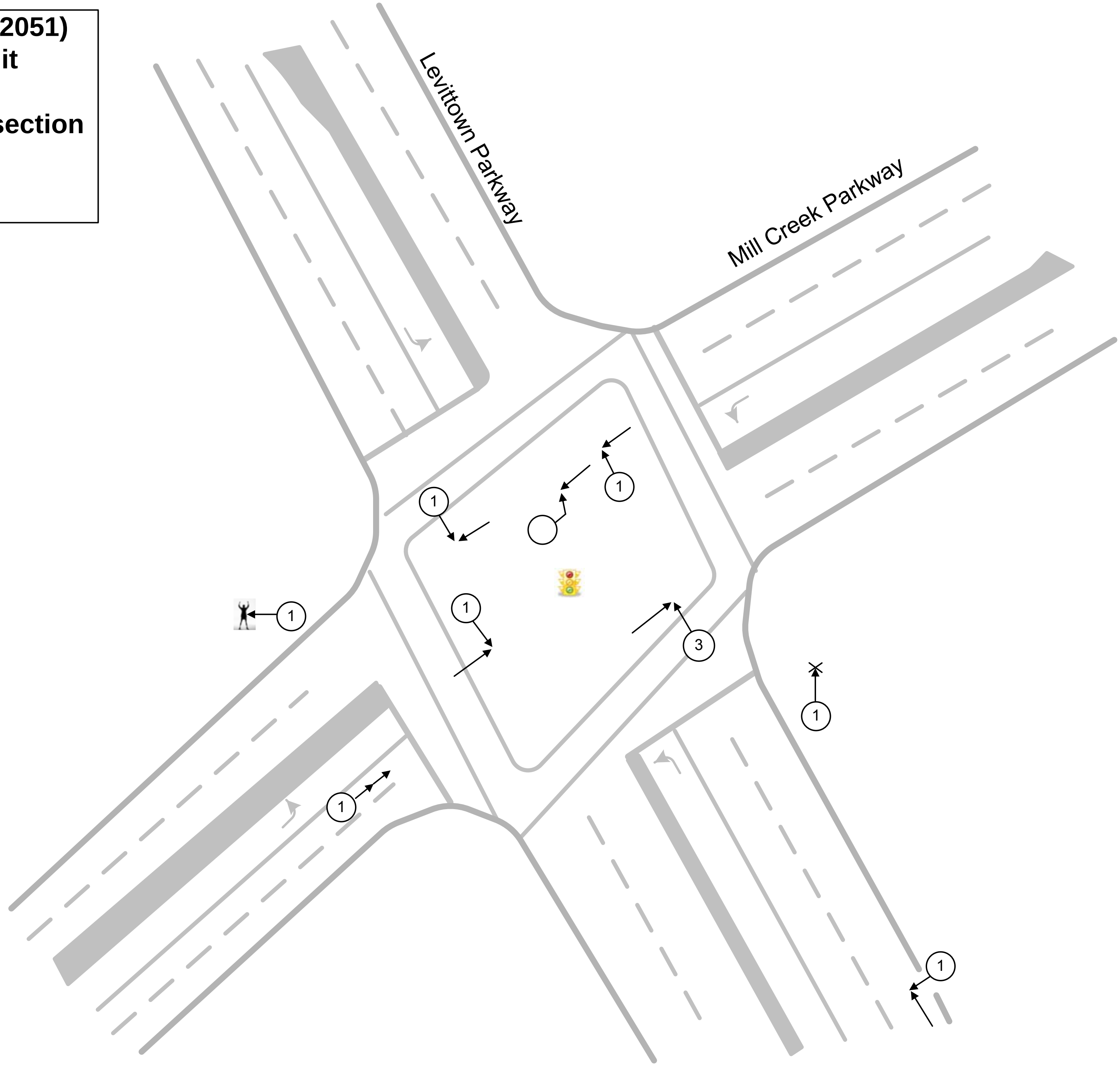
Mill Creek Pkwy Intersection

2004 - 2008
Collision Diagram

Total Crashes = 11
Pedestrian Crashes = 1
Fatalities = 2

Legend

- 1 — # Crashes
- Rear End
- Angle
- Left Turn Involved
- Hit Fixed Object
- Hit Pedestrian



DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

NOVEMBER 2009

CR09129 Bucks County SR2051 0020/2090 - 0020/2096

Date Range: 1/1/2004 to 12/31/2008

Area of Interest: (In County 09 On State Route 2051(P) Between Segment 0020 Offset 2090 and Segment 0020 Offset 2096) or (In County 09 On State Route 2051(S) Between Segment 0021 Offset 2090 and Segment 0021 Offset 2096)

USER_ID/QUERY ID: rfrancisco/ 0620091102007

PENNDOT

MONTH OF YEAR

	JAN	FEB	MAR	MAY	JUL	AUG	SEP	OCT	NOV	
CRASHES	1	1	1	1	1	1	2	1	2	11
PCT	9%	9%	9%	9%	9%	9%	18%	9%	18%	100%

DAY OF WEEK

	SUN	MON	WED	THR	FRI	SAT	
CRASHES	3	1	3	1	2	1	11
PCT	27%	9%	27%	9%	18%	9%	100%

HOUR OF DAY

	08	12	15	16	22	
CRASHES	1	3	2	4	1	11
PCT	9%	27%	18%	36%	9%	100%

YEAR

	CRASHES	PCT
2005	4	36%
2006	5	45%
2007	2	18%
TOTAL	11	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	7	63%
REAR END	2	18%
HEAD ON	1	9%
HIT FIX OBJ	1	9%
TOTAL	11	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
FATAL	1	9%
MODERATE	1	9%
MINOR	3	27%
UNK SEVERITY	5	45%
PDO	1	9%
TOTAL	11	100%

SEVERITY COUNT

	PERSONS
FATALITIES	2
MAJOR	0
MODERATE	1
MINOR	4
UNK SEVERITY	11
UNK IF INJURED	0

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	13	48%
RUNNING RED LIGHT	7	25%
AFFECTED PHYSICAL COND	1	3%
DRIVER WAS DISTRACTED	1	3%
OTHER IMPROPER DRIVING	1	3%
SPEEDING	1	3%
TAILGATING	1	3%
TOO FAST FOR CONDITION	1	3%
TURN FROM WRONG LANE	1	3%
TOTAL	27	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	12	50%
VAN	5	20%
SMALL TRUCK	4	16%
SUV	2	8%
BUS	1	4%
TOTAL	24	100%

ROAD CONDITION

	CRASHES	PCT
DRY	8	72%
WET	2	18%
OTHER	1	9%
TOTAL	11	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	10	90%
STREET LIGHTS	1	9%
TOTAL	11	100%

WEATHER

	CRASHES	PCT
CLEAR	9	81%
RAIN	2	18%
TOTAL	11	100%

ENVIR/ROADWAY FACTORS

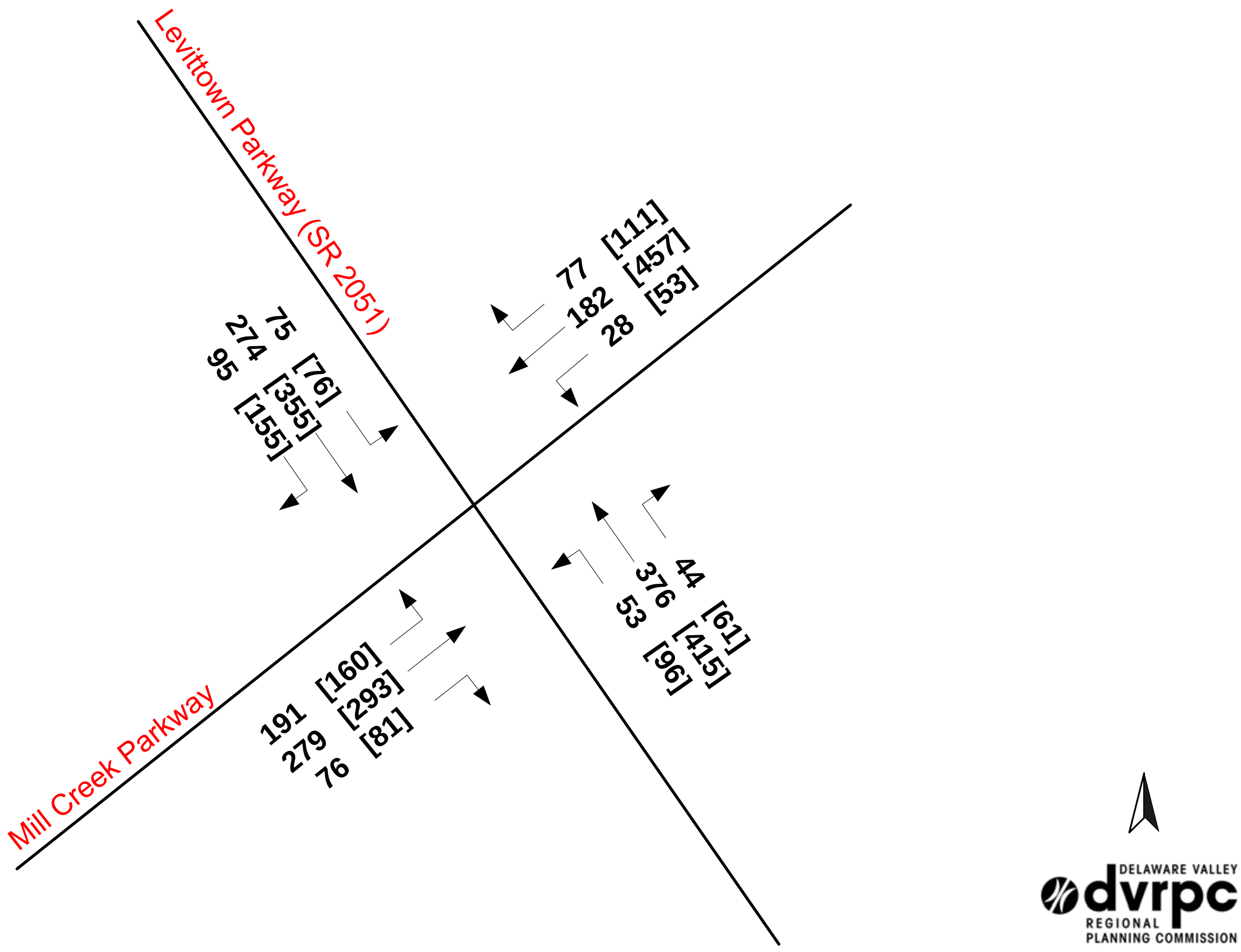
	FACTORS	PCT
NONE	10	90%
OTHER WEATHER COND	1	9%
TOTAL	11	100%

Levittown Parkway (SR 2051) Road Safety Audit

Mill Creek Parkway Intersection

Peak Hour Turning Movement Counts

Peak Hours
AM: 7:00 - 8:00
PM: [4:45 - 5:45]
November 2009



Mill Creek Parkway

APPENDIX D

Levittown Parkway (SR 2051) at New Falls Road

Location-Specific Data

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

2. Levittown Parkway (SR 2051) at New Falls Road
Segment 50/0 to Segment 51/0

COLLISION TYPE	
Angle	5
Rear-end	5
Hit Fixed Object	3
Total	**13**
SEVERITY COUNT (people)	
Fatalities	0
Major	1
Moderate	0
Minor	6
Unk Severity	5
Unk If Injured	0
Total	**12**

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Levittown Pkwy (SR 2051)
Road Safety Audit

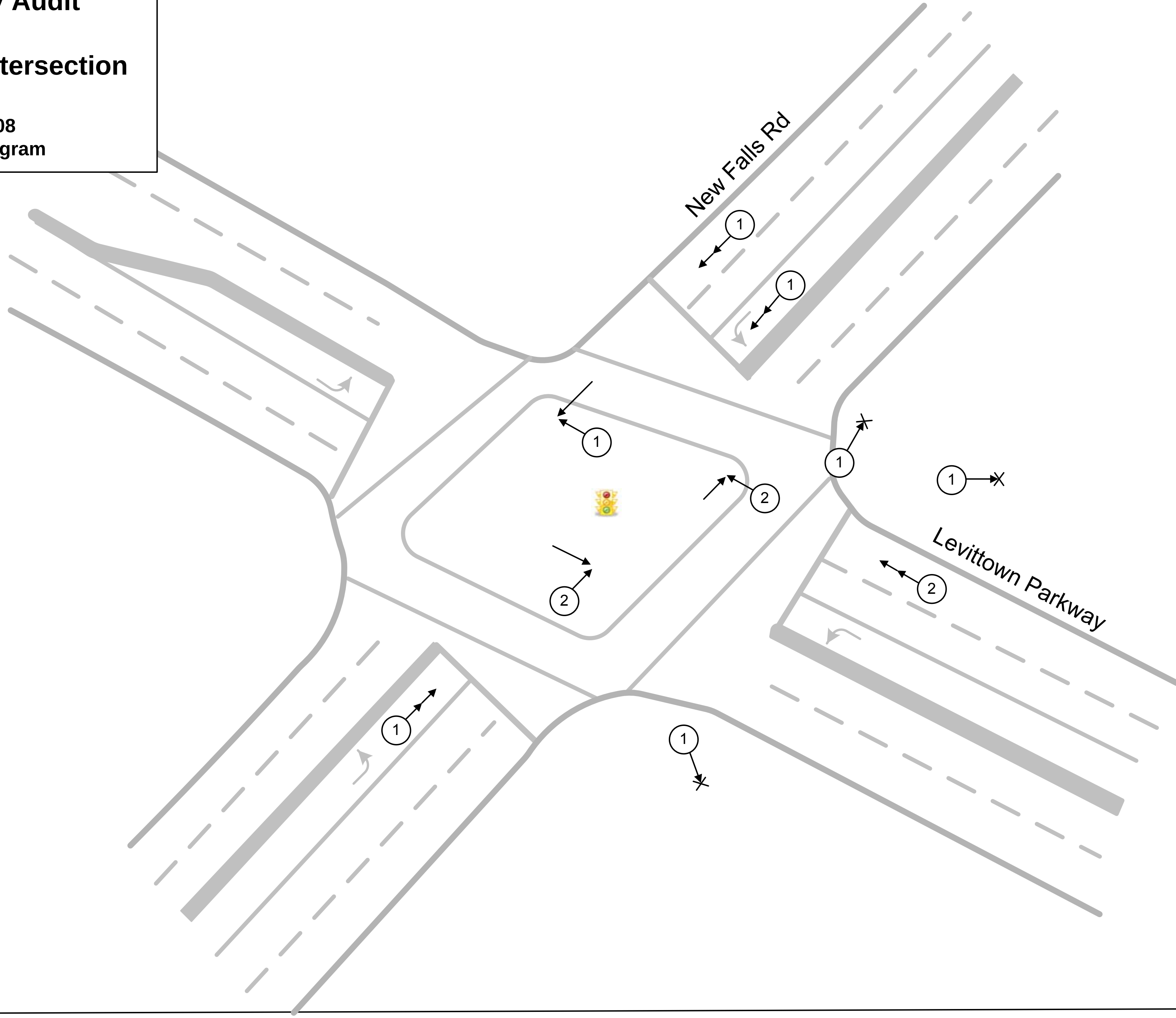
New Falls Rd Intersection

2004 - 2008
Collision Diagram

Total Crashes = 13
Fatalities = 0

Legend

- ① # Crashes
- Rear End
- Angle
- Hit Fixed Object



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

NOVEMBER 2009

CR09129 Bucks County SR2051 0050/0000 - 0050/0000

Date Range: 1/1/2004 to 12/31/2008

Area of Interest: (In County 09 On State Route 2051(P) Between Segment 0050 Offset 0 and Segment 0050 Offset 0) or (In County 09 On State Route 2051(S) Between Segment 0051 Offset 0 and Segment 0051 Offset 0)

USER_ID/QUERY ID: rfrancisco/ 0620091102006

PENNDOT

MONTH OF YEAR

	JAN	FEB	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
CRASHES	3	1	1	1	1	2	2	1	1	13
PCT	23%	7%	7%	7%	7%	15%	15%	7%	7%	100%

DAY OF WEEK

	SUN	MON	TUE	WED	SAT	
CRASHES	3	3	1	3	3	13
PCT	23%	23%	7%	23%	23%	100%

HOUR OF DAY

	01	05	08	11	14	15	16	18	22	23	
CRASHES	1	2	1	1	2	1	1	2	1	1	13
PCT	7%	15%	7%	7%	15%	7%	7%	15%	7%	7%	100%

YEAR

	CRASHES	PCT
2004	2	15%
2005	2	15%
2006	5	38%
2007	2	15%
2008	2	15%
TOTAL	13	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	5	38%
REAR END	5	38%
HIT FIX OBJ	3	23%
TOTAL	13	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
MAJOR	1	7%
MINOR	5	38%
UNK SEVERITY	3	23%
PDO	4	30%
TOTAL	13	100%

SEVERITY COUNT

	PERSONS
FATALITIES	0
MAJOR	1
MODERATE	0
MINOR	6
UNK SEVERITY	5
UNK IF INJURED	0

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	12	42%
RUNNING RED LIGHT	3	10%
DRIVER WAS DISTRACTED	2	7%
IMPROPER/CARELESS TURN	2	7%
UNKNOWN	2	7%
AFFECTED PHYSICAL COND	1	3%
DRIVER INEXPERIENCED	1	3%
FAILR MAINT PROP SPEED	1	3%
OTHER IMPROPER DRIVING	1	3%
PROCEED W/O CLEARANCE	1	3%
SPEEDING	1	3%
TOO FAST FOR CONDITION	1	3%
TOTAL	28	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	15	60%
SUV	5	20%
MOTORCYCLE	2	8%
VAN	2	8%
SMALL TRUCK	1	4%
TOTAL	25	100%

ROAD CONDITION

	CRASHES	PCT
DRY	12	92%
WET	1	7%
TOTAL	13	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	7	53%
STREET LIGHTS	5	38%
DUSK	1	7%
TOTAL	13	100%

WEATHER

	CRASHES	PCT
CLEAR	12	92%
RAIN	1	7%
TOTAL	13	100%

ENVIR/ROADWAY FACTORS

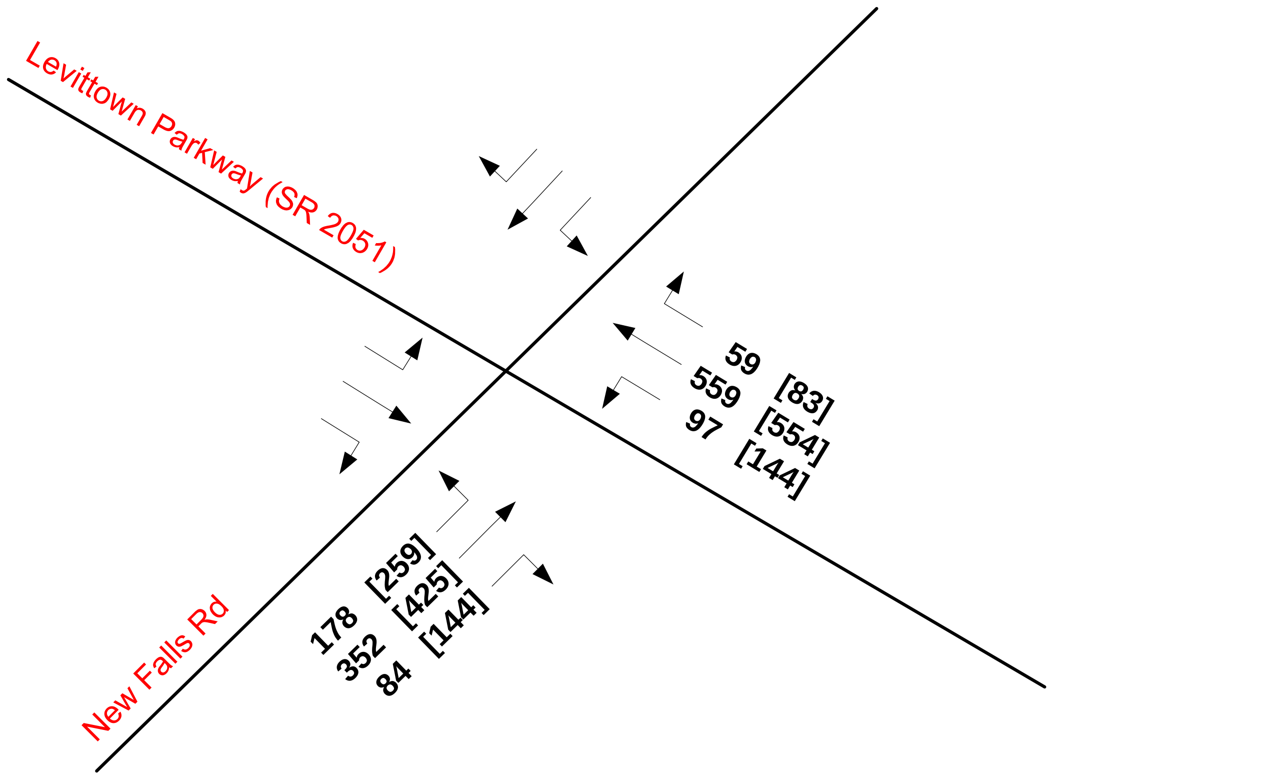
	FACTORS	PCT
NONE	12	92%
OTHER RDWY FACTOR	1	7%
TOTAL	13	100%

Levittown Parkway (SR 2051) Road Safety Audit

New Falls Rd Intersection

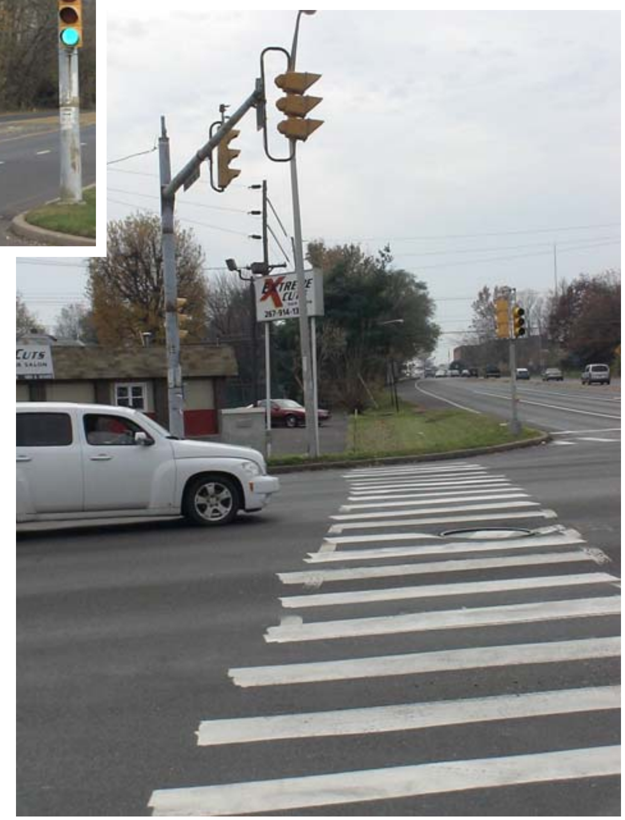
Peak Hour Turning Movement Counts

Peak Hours
AM: 8:00 – 9:00
PM: [4:45 – 5:45]
November 2009



NOVEMBER 2009

New Falls Road Intersection



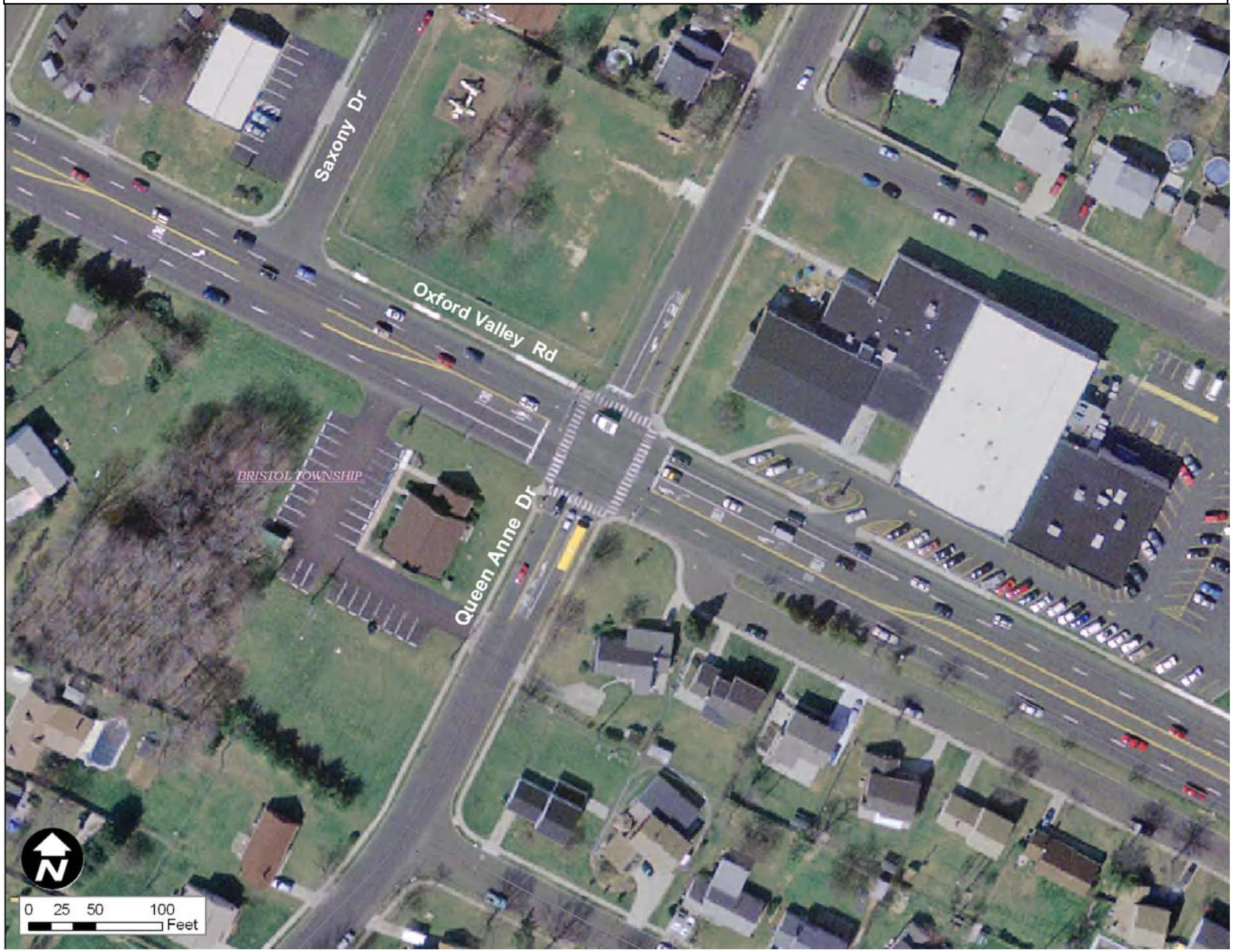
APPENDIX E

Levittown Parkway (SR 2051) at Queen Anne Drive

Location-Specific Data

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

3. Levittown Parkway (SR 2051) at Queen Anne Dr
Segment 50/1015 to Segment 60/0000



COLLISION TYPE	
Rear-end	8
Angle	6
Left Turn Involved (Angle)	2
Left Turn Involved (Head-on)	1
Bike (Head-on)	1
Bike (Angle)	1
Total	**19**
SEVERITY COUNT (people)	
Fatalities	0
Major	1
Moderate	2
Minor	10
Unk Severity	11
Unk If Injured	0
Total	**24**

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Levittown Pkwy (SR 2051)
Road Safety Audit

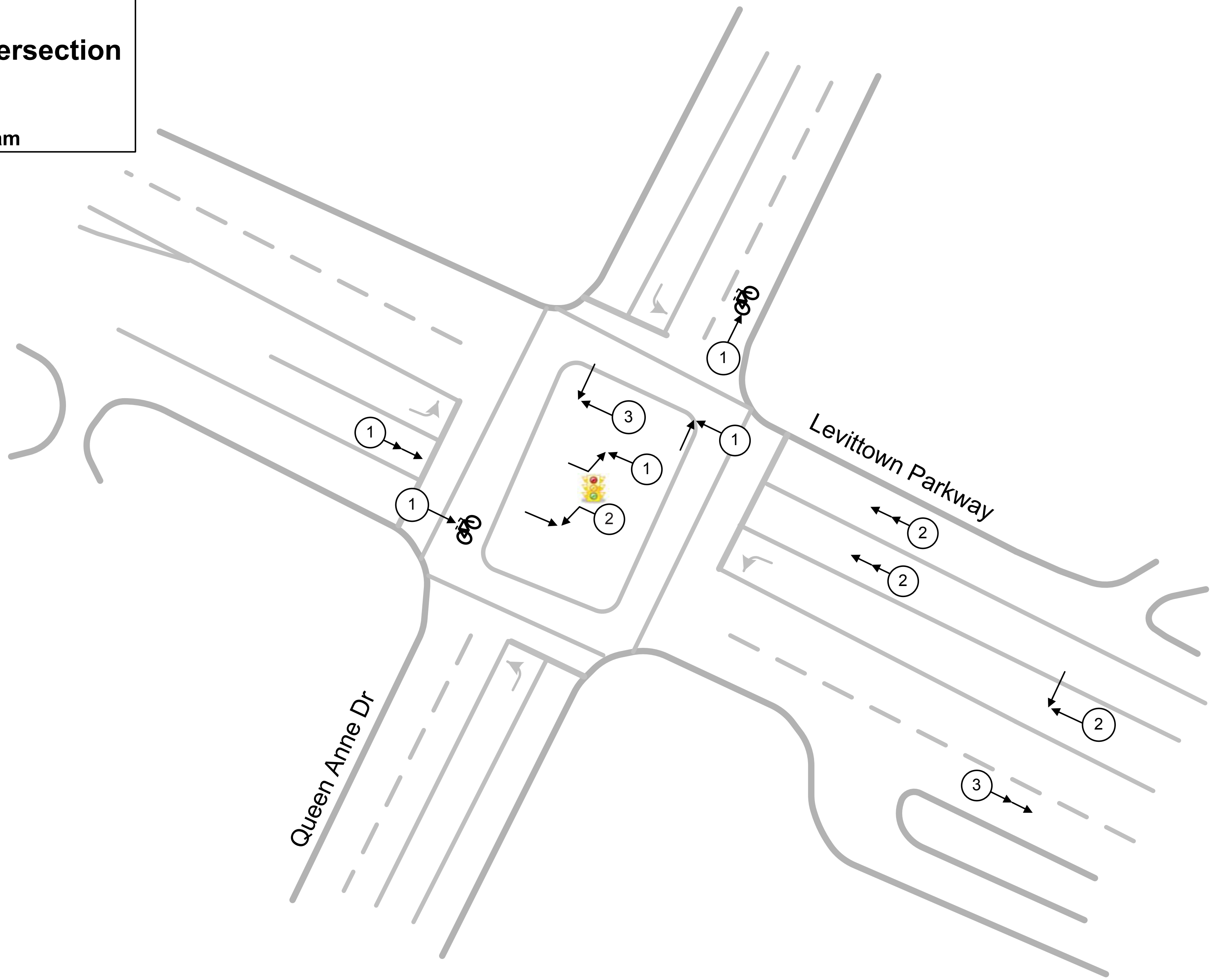
Queen Anne Dr Intersection

2004 - 2008
Collision Diagram

Total Crashes = 19*
Bicycle Crashes = 2
Fatal Crashes = 0
*Total does not reflect summary

Legend

- 1 — # Crashes
- Rear End
- Angle
- Left Turn Involved
- Hit Fixed Object
- Hit Bicycle



DELAWARE VALLEY
dvrpc
REGIONAL PLANNING COMMISSION

NOVEMBER 2009

CR09129 Bucks County SR2051 0050/1015 - 0060/0000

Date Range: 1/1/2004 to 12/31/2008

USER ID/QUERY ID: rfrancisco/ 0620091102005

Area of Interest: (In County 09 On State Route 2051(P) Between Segment 0050 Offset 1015 and Segment 0060 Offset 0) or (In County 09 On State Route 2051(S) Between Segment 0051 Offset 1015 and Segment 0061 Offset 0)

PENNDOT

MONTH OF YEAR

	JAN	FEB	MAR	MAY	JUL	AUG	SEP	NOV	DEC	
CRASHES	2	2	1	3	3	3	1	1	2	18
PCT	11%	11%	5%	16%	16%	16%	5%	5%	11%	100%

DAY OF WEEK

	SUN	MON	TUE	WED	THR	FRI	
CRASHES	1	4	1	5	5	2	18
PCT	5%	22%	5%	27%	27%	11%	100%

HOUR OF DAY

	07	08	09	11	12	14	15	16	17	18	20	22	23	
CRASHES	1	2	2	1	2	1	1	1	1	2	1	2	1	18
PCT	5%	11%	11%	5%	11%	5%	5%	5%	5%	11%	5%	11%	5%	100%

YEAR

	CRASHES	PCT
2004	3	16%
2005	3	16%
2006	8	44%
2007	3	16%
2008	1	5%
TOTAL	18	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	9	50%
REAR END	6	33%
HEAD ON	2	11%
PEDESTRIAN	1	5%
TOTAL	18	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
MAJOR	1	5%
MODERATE	2	11%
MINOR	4	22%
UNK SEVERITY	6	33%
PDO	5	27%
TOTAL	18	100%

SEVERITY COUNT

	PERSONS
FATALITIES	0
MAJOR	1
MODERATE	2
MINOR	10
UNK SEVERITY	11
UNK IF INJURED	0

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	21	50%
RUNNING RED LIGHT	5	11%
DRIVER WAS DISTRACTED	3	7%
IMPROPER/CARELESS TURN	3	7%
IMPROPER ENTRANCE HWY	2	4%
OTHER IMPROPER DRIVING	2	4%
TOO FAST FOR CONDITION	2	4%
DRIVER INEXPERIENCED	1	2%
FAILR MAINT PROP SPEED	1	2%
SPEEDING	1	2%
UNKNOWN	1	2%
TOTAL	42	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	19	50%
SUV	10	26%
VAN	4	10%
SMALL TRUCK	3	7%
PEDALCYCLE	2	5%
TOTAL	38	100%

ROAD CONDITION

	CRASHES	PCT
DRY	14	77%
WET	3	16%
SNOW	1	5%
TOTAL	18	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	12	66%
STREET LIGHTS	5	27%
DARK	1	5%
TOTAL	18	100%

WEATHER

	CRASHES	PCT
CLEAR	15	83%
RAIN	2	11%
SNOW	1	5%
TOTAL	18	100%

ENVIR/ROADWAY FACTORS

	FACTORS	PCT
NONE	16	88%
SLIPPERY ICE/SNOW	1	5%
UNKNOWN	1	5%
TOTAL	18	100%

Levittown Parkway (SR 2051) Road Safety Audit

Queen Anne Dr Intersection

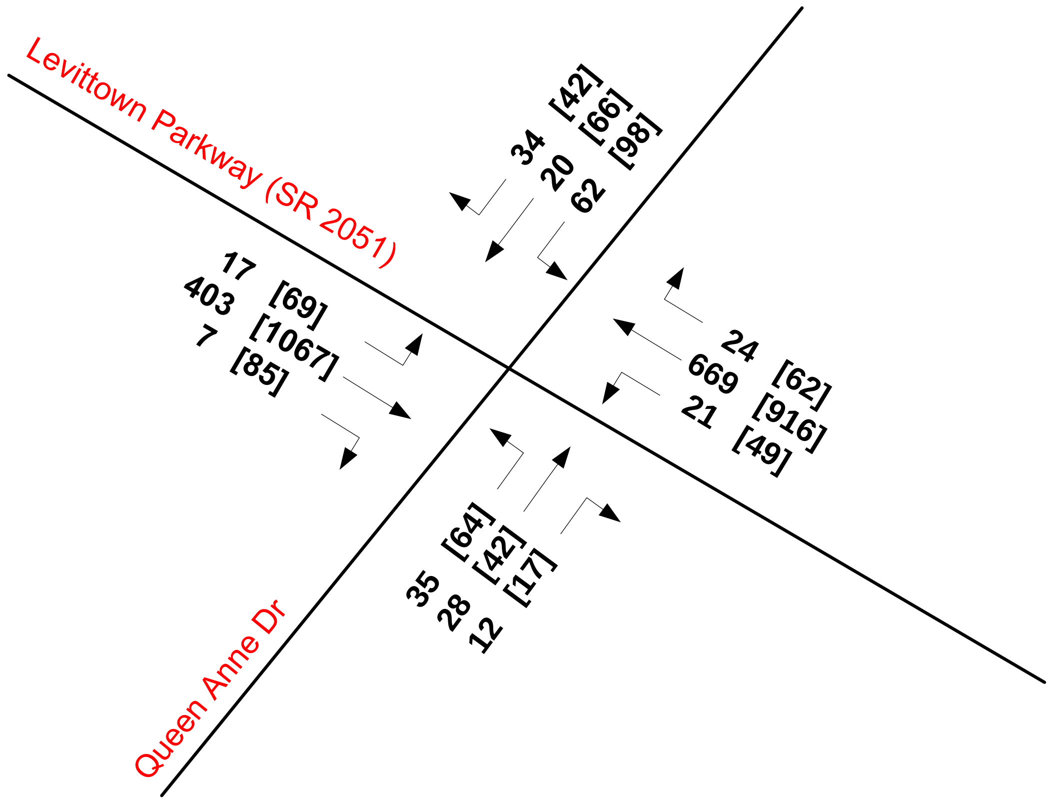
Peak Hour Turning Movement Counts

Peak Hours

AM: 8:00 – 9:00

PM: [5:00 – 6:00]

November 2009



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

NOVEMBER 2009

Queen Anne Drive Intersection

APPENDIX F

Levittown Parkway (SR 2051) at Olds Boulevard

Location-Specific Data

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

4. Levittown Parkway (SR 2051) at Olds Blvd
Segment 60/1858 to Segment 61/1926

COLLISION TYPE	
Angle	10
Rear-end	4
Left Turn Involved (Angle)	2
Total	**16**
SEVERITY COUNT (people)	
Fatalities	0
Major	1
Moderate	1
Minor	7
Unk Severity	13
Unk If Injured	0
Total	**22**

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

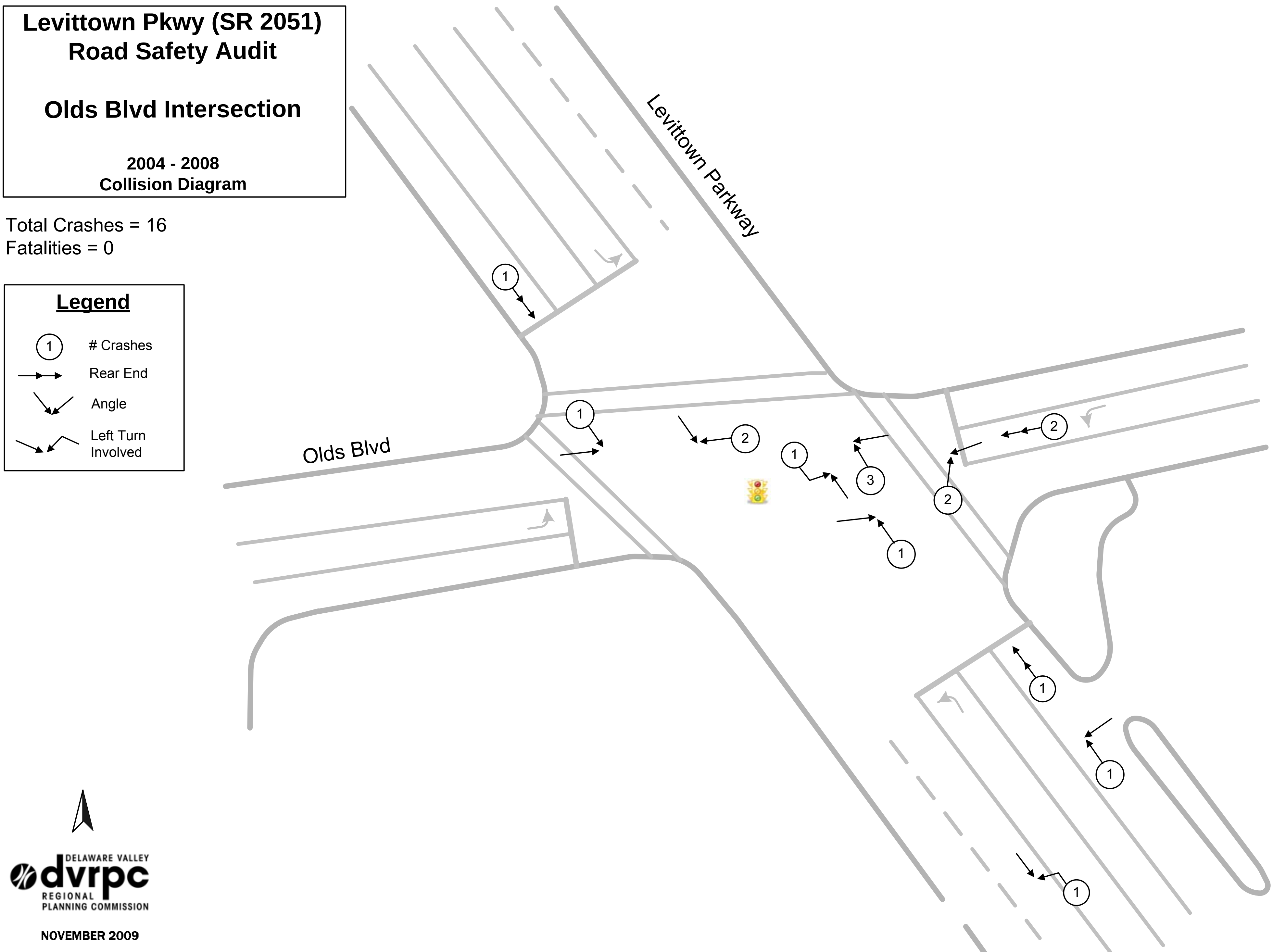
Levittown Pkwy (SR 2051)
Road Safety Audit

Olds Blvd Intersection

2004 - 2008
Collision Diagram

Total Crashes = 16
Fatalities = 0

Legend



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

NOVEMBER 2009

CR09129 Bucks County SR2051 0060/1858 - 0060/1926

Date Range: 1/1/2004 to 12/31/2008

Area of Interest: (In County 09 On State Route 2051(P) Between Segment 0060 Offset 1858 and Segment 0060 Offset 1926) or (In County 09 On State Route 2051(S) Between Segment 0061 Offset 1858 and Segment 0061 Offset 1926)

USER_ID/QUERY ID: rfrancisco/ 0620091102004

MONTH OF YEAR

	JAN	MAR	APR	JUN	JUL	AUG	SEP	NOV	DEC	
CRASHES	2	1	1	4	1	1	3	2	1	16
PCT	12%	6%	6%	25%	6%	6%	18%	12%	6%	100%

DAY OF WEEK

	SUN	MON	TUE	WED	THR	FRI	SAT	
CRASHES	1	1	2	3	2	4	3	16
PCT	6%	6%	12%	18%	12%	25%	18%	100%

HOUR OF DAY

	06	08	13	14	16	17	18	19	20	21	99	
CRASHES	1	2	1	2	1	2	2	1	1	2	1	16
PCT	6%	12%	6%	12%	6%	12%	12%	6%	6%	12%	6%	100%

YEAR

	CRASHES	PCT
2004	2	12%
2005	5	31%
2006	5	31%
2007	4	25%
TOTAL	16	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	12	75%
REAR END	4	25%
TOTAL	16	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
MAJOR	1	6%
MINOR	5	31%
UNK SEVERITY	7	43%
PDO	3	18%
TOTAL	16	100%

SEVERITY COUNT

	PERSONS
FATALITIES	0
MAJOR	1
MODERATE	1
MINOR	7
UNK SEVERITY	13
UNK IF INJURED	0

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	21	52%
RUNNING RED LIGHT	8	20%
DRIVER WAS DISTRACTED	3	7%
IMPROPER/CARELESS TURN	3	7%
TOO FAST FOR CONDITION	3	7%
AFFECTED PHYSICAL COND	1	2%
UNKNOWN	1	2%
TOTAL	40	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	22	59%
SUV	9	24%
SMALL TRUCK	3	8%
VAN	2	5%
MOTORCYCLE	1	2%
TOTAL	37	100%

ROAD CONDITION

	CRASHES	PCT
DRY	13	81%
ICE PATCH	1	6%
OTHER	1	6%
WET	1	6%
TOTAL	16	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	8	50%
STREET LIGHTS	6	37%
DAWN	1	6%
DUSK	1	6%
TOTAL	16	100%

WEATHER

	CRASHES	PCT
CLEAR	14	87%
RAIN	1	6%
SNOW	1	6%
TOTAL	16	100%

ENVIR/ROADWAY FACTORS

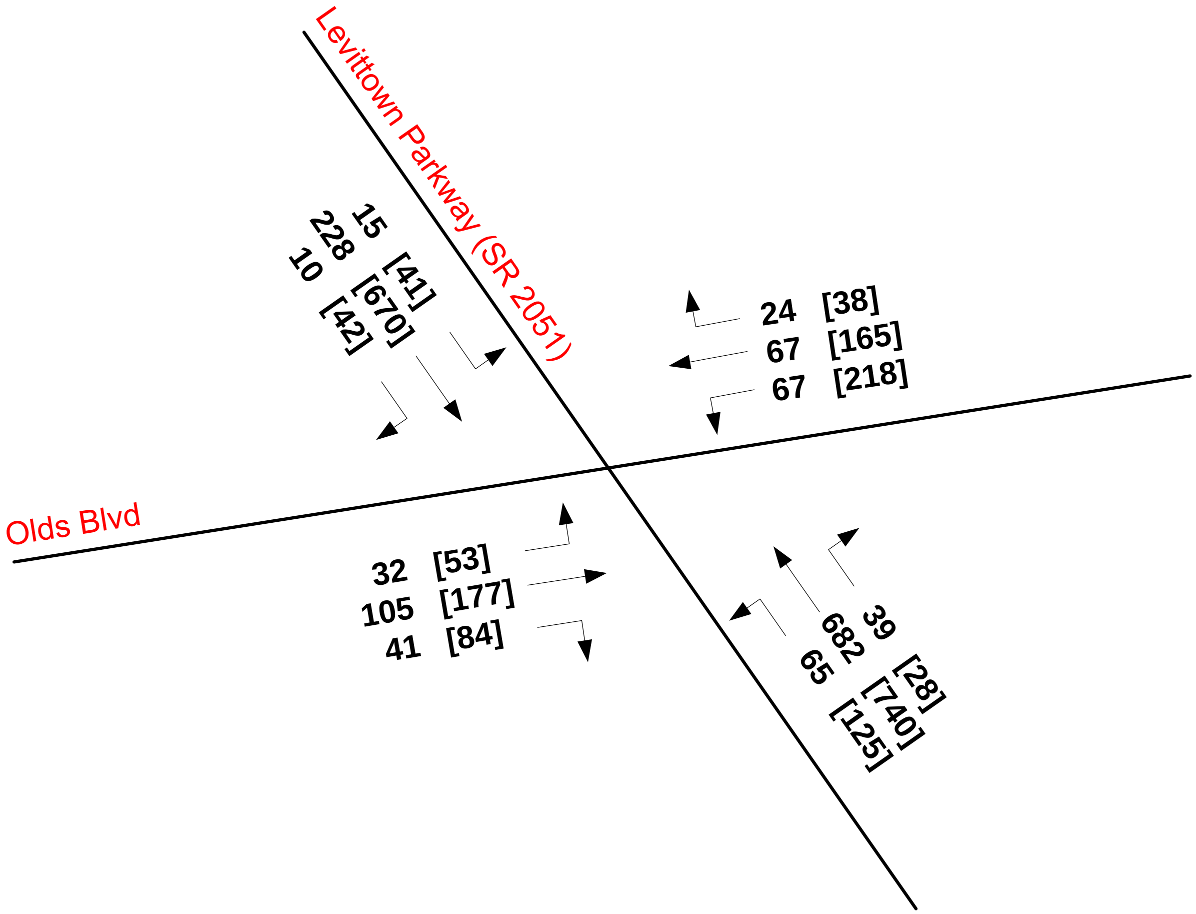
	FACTORS	PCT
NONE	14	87%
SLIPPERY ICE/SNOW	1	6%
WORK ZONE RELATED	1	6%
TOTAL	16	100%

Levittown Parkway (SR 2051) Road Safety Audit

Olds Blvd Intersection

Peak Hour Turning Movement Counts

<u>Peak Hours</u>
AM: 7:00 - 8:00
PM: [4:45 - 5:45]
November 2009



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NOVEMBER 2009

Olds Boulevard Intersection

APPENDIX G

Levittown Parkway (SR 2051) at Southway Drive / Hood Boulevard

Location-Specific Data

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

5. Levittown Parkway (SR 2051) at Southway Dr / Hood Blvd
Segment 60/3334 to Segment 61/3245

COLLISION TYPE	
Angle	5
Rear-end	4
SD Sideswipe	1
Left Turn Involved (Angle)	3
Right Turn Involved (Angle)	1
Total	**14**
SEVERITY COUNT (people)	
Fatalities	0
Major	0
Moderate	2
Minor	3
Unk Severity	5
Unk If Injured	1
Total	**11**

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Levittown Pkwy (SR 2051)
Road Safety Audit

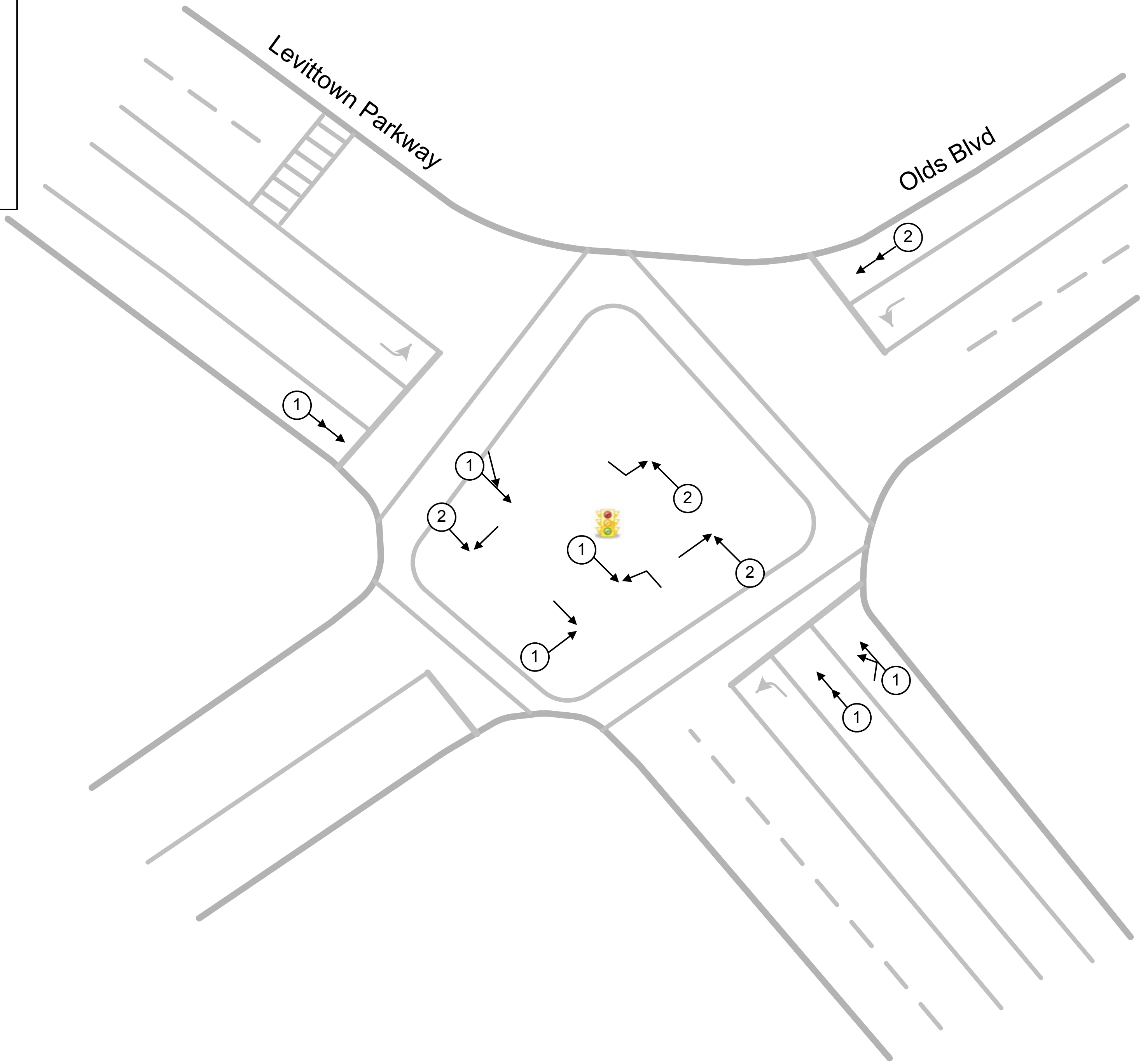
Southway Dr / Hood Blvd Intersection

2004 - 2008
Collision Diagram

Total Crashes = 14
Fatalities = 0

Legend

- ① # Crashes
- Rear End
- Angle
- Left Turn Involved
- Sideswipe
- Right Turn Involved



DELAWARE VALLEY
dvrpc
REGIONAL PLANNING COMMISSION

NOVEMBER 2009

CR09129 Bucks County SR2051 0060/3334 - 0060/03334

Date Range: 1/1/2004 to 12/31/2008

Area of Interest: (In County 09 On State Route 2051(P) Between Segment 0060 Offset 3334 and Segment 0060 Offset 3334) or (In County 09 On State Route 2051(S) Between Segment 0061 Offset 3334 and Segment 0061 Offset 3334)

USER_ID/QUERY ID: rfrancisco/ 0620091102003

PENNDOT

MONTH OF YEAR

	JAN	FEB	MAY	JUN	JUL	AUG	OCT	NOV	
CRASHES	1	1	1	2	3	1	3	2	14
PCT	7%	7%	7%	14%	21%	7%	21%	14%	100%

DAY OF WEEK

	MON	TUE	WED	THR	FRI	SAT	
CRASHES	1	2	3	4	3	1	14
PCT	7%	14%	21%	28%	21%	7%	100%

HOUR OF DAY

	08	11	12	13	14	15	17	18	
CRASHES	2	3	1	2	3	1	1	1	14
PCT	14%	21%	7%	14%	21%	7%	7%	7%	100%

YEAR

	CRASHES	PCT
2004	3	21%
2005	3	21%
2006	2	14%
2007	3	21%
2008	3	21%
TOTAL	14	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	9	64%
REAR END	4	28%
SAME DIR SS	1	7%
TOTAL	14	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
MODERATE	1	7%
MINOR	3	21%
UNK SEVERITY	5	35%
PDO	5	35%
TOTAL	14	100%

SEVERITY COUNT

	PERSONS
FATALITIES	0
MAJOR	0
MODERATE	2
MINOR	3
UNK SEVERITY	5
UNK IF INJURED	1

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	15	40%
RUNNING RED LIGHT	4	10%
DRIVER WAS DISTRACTED	3	8%
IMPROPER/CARELESS TURN	3	8%
SUDDEN SLOWING/STOP	2	5%
TOO FAST FOR CONDITION	2	5%
TURN FROM WRONG LANE	2	5%
CARELESS PASS/LN CHNG	1	2%
DRIVER INEXPERIENCED	1	2%
FAILR MAINT PROP SPEED	1	2%
OTHER IMPROPER DRIVING	1	2%
PROCEED W/O CLEARANCE	1	2%
OTHERS	1	2%
TOTAL	37	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	21	75%
SUV	4	14%
VAN	2	7%
SMALL TRUCK	1	3%
TOTAL	28	100%

ROAD CONDITION

	CRASHES	PCT
DRY	12	85%
WET	2	14%
TOTAL	14	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	13	92%
STREET LIGHTS	1	7%
TOTAL	14	100%

WEATHER

	CRASHES	PCT
CLEAR	12	85%
FOG	1	7%
RAIN	1	7%
TOTAL	14	100%

ENVIR/ROADWAY FACTORS

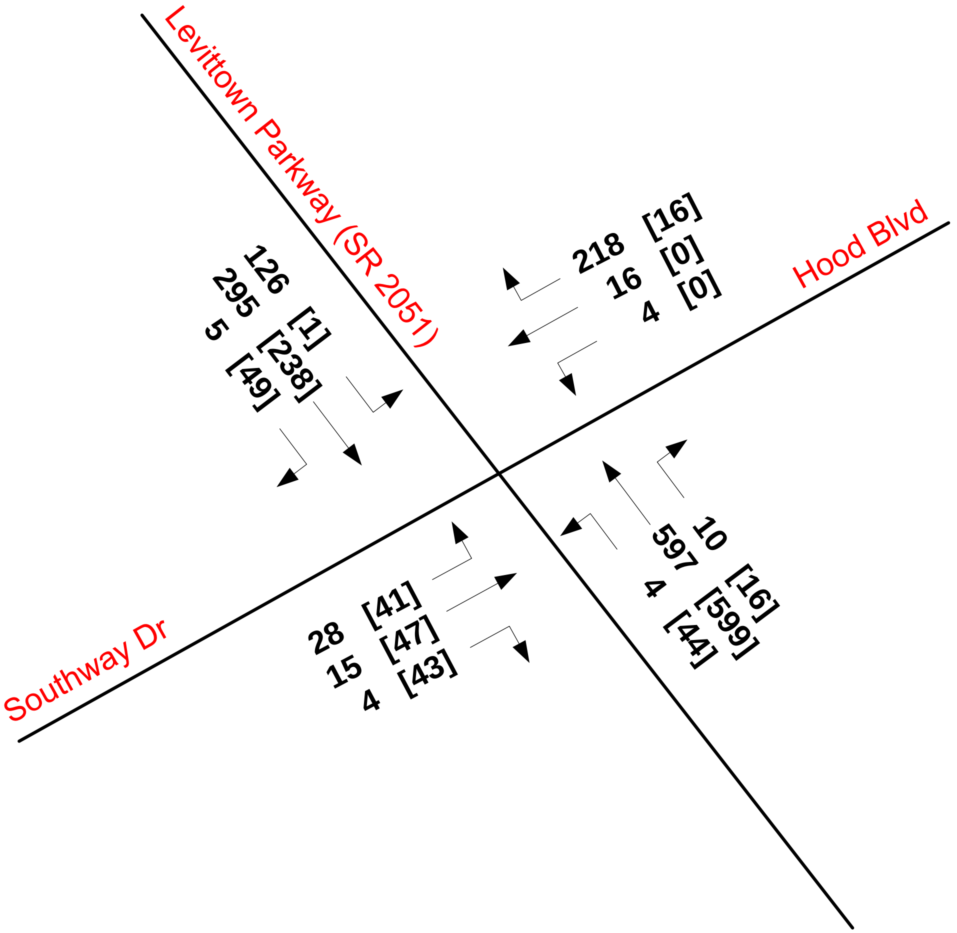
	FACTORS	PCT
NONE	12	85%
OTHER ENVIR FACTOR	1	7%
SLIPPERY ICE/SNOW	1	7%
TOTAL	14	100%

Levittown Parkway (SR 2051) Road Safety Audit

Southway Dr / Hood Blvd Intersection

Peak Hour Turning Movement Counts

<u>Peak Hours</u>
AM: 7:15 – 8:15
PM: [5:45 – 6:45]
November 2009



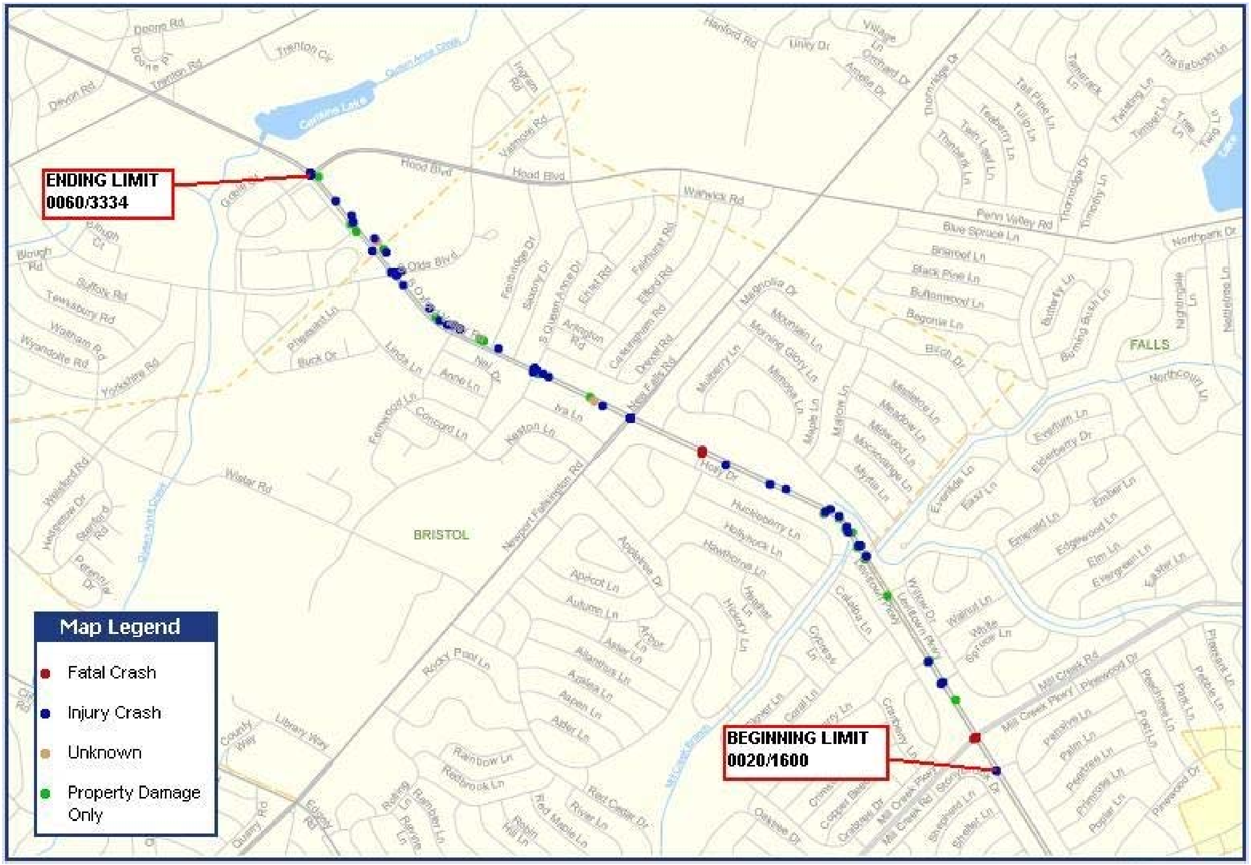
DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

NOVEMBER 2009

Southway Drive/Hood Boulevard Intersection

APPENDIX H

PennDOT District 6-0 Highway Safety Improvement Program Scope of Work – Levittown Parkway (SR 2051) RSA



Project Purpose:

The purpose of this project is to reduce the number of crashes and related injuries and severity of the crashes, which occur along the approximate two mile section of Levittown Parkway between Southway Drive/Hood Boulevard and Mill Creek Parkway, in Bucks County. The anticipated benefits of this project are:

- Minimization of the number of crashes, most specifically angle, rear-end, and hit fixed object type crashes.

Project Scope:

The scope of work for this project was developed from the Road Safety Audit which was conducted in November 2009 and undertaken by DVRPC in conjunction with the Pennsylvania Department of Transportation. A more detailed description of the scope of work is included in the attached cost estimate, and is summarized below:

- Construct a multi-use trail on the south side of the corridor.
- Develop and implement an access management plan for the corridor.
- Install sidewalks where missing and repair damaged sidewalks.
- Address drainage issues along the corridor.
- Upgrade drainage inlets to bicycle compatible versions.
- Conduct sign inventory to replace or upgrade signs.

- Upgrade signal timings/pedestrian timings at signalized intersections
- Repair pavement where necessary.

Benefit-to-Cost Ratio Calculation

The estimated benefit, in terms of crash reductions for this project, is $900,000 per year. See the attached sheet Titled "Levittown Parkway HSIP Benefit Calculations".

The estimated cost for the above scope of work is $3.23 million. See the attached "Cost Estimate Sheet" (three pages). Assuming a 20-year life cycle for this safety project, the annual cost of the project is $161,500.

The project will have an annual benefit-to-cost ratio of $3,230,000: $161,500, or 20 to 1.

LEVITTOWN PARKWAY HSIP BENEFIT CALCULATIONS
Crashes: 2004 through 2008

Crash Type	# of Crashes		Average Cost per Crash[1]	Total	Costs
Angle	74	X	$ 76,000	=	$5,624,000
Rear End	30	X	$ 39,400	=	$1,182,000
Hit Fixed Object	18	X	$ 93,000	=	$1,674,000
Head On	3	X	$ 248,100	=	$ 744,300
Non Collision	3	X	$ 124,100	=	$ 372,300
Pedestrian	3	X	$ 214,700	=	$ 644,100
Sideswipe	2	X	$ 65,300	=	$ 130,600
Other	1	X	$ 39,700	=	$ 39,700
Total 134[2]			Total 5 Year Cost	=	$10,411,000
			Average Annual Cost	=	$ 2.08 million

1 From CDART: Accident Cost by Category Report for Accidents in Years 2004 to 2008.
2 The number of crashes was reduced by 1 which is the number of work zone related crashes.

According to the CDART data, the crash rate for the study corridor ranged from 1.11 to 2.86 times higher than the statewide average homogeneous five-year rate for the same time period. Averaging the crash rates for six sections, results in (1.11+1.15+1.40+1.65+2.37+2.86) = 10.54 ÷ 6 = 1.76.

The corridor experienced an average crash rate that was approximately 1.76 times higher than corridors with similar characteristics during the 2004 through 2008 period. If it is assumed that the planned safety improvements will produce a crash rate (results in a reduction) that is consistent with statewide averages for similar corridors, then the expected crash rate for the post-improvement period will be 1 ÷ 1.76 or 56.8 percent of the current rate. This translates into a post-improvement annual cost of $1.18 million. The expected benefit will be $2.08 million – 1.18 million or $900,000 per year.

COST ESTIMATE:

Intersection / Location	Proposed Work	Construction	Engineering cost	Order of Magnitude Cost Estimate
Mill Creek Parkway to Crabtree Turn	Signal modifications, widen roadway, replace/install inlets, install back to back left turn lanes at Crabtree Turn and Willow Wood Way, install acceleration lanes/shoulder areas.	$503,300	$75,500	$578,800
Crabtree Drive through the hill and curve	Extend guiderail in median to reduce crossover crashes, install high friction pavement treatment on curve, install transverse and edge line rumble strips and optical speed bars to slow traffic, improve signage through curve, evaluate the super-elevation rates through the curves and modify as appropriate.	$117,700	$17,700	$135,400
Top of hill to New Falls Road	Install dotted lane lines through intersection to guide left turns from Parkway to New Falls Road, signal modifications.	$24,300	$3,600	$27,900
New Falls Road to Queen Anne Drive	Close left turn lane into TD Bank, extend left turn lane onto New Falls Road, install pavement markings at handicap crossing over Queen Anne Drive, signal modifications, extend sidewalk and curbing, modify signing.	$56,100	$8,400	$64,500
Fairbridge Drive to Olds Boulevard	Cut back corner island to allow improved access for trucks, signal modifications.	$45,600	$6,800	$52,400

Olds Boulevard to Southway Drive/Hood Boulevard	Remove guide rail, prohibit right turns on red at this intersection for drivers heading southbound on Hood Boulevard, signal modifications.	$24,700 $3,700		$28,400
Corridor Wide	Access management throughout corridor, relocate poles, conduct a sign inventory to replace or upgrade signs, restripe edge line, install sidewalks where missing, replace/upgrade ADA ramps where necessary, install continental crosswalks, pedestrian signs, install multi-use trail, identify and repair drainage problem areas, repair/replace bus stop signs, install bus turnouts.	$1,784,200 $267,6	00	$2,051,800
	Subtotal	$2,555,900	$383,300	$2,939,200
	Contingency (10%)	$255,590	$38,330	$293,920
	Total			**$3,233,120**

This traffic and engineering study is confidential pursuant to 75 Pa.C.S. §3754 and 23 U.S.C.§409 and may not be disclosed or used in litigation without written permission from PennDOT.

Publication Title: Levittown Parkway (SR 2051) Road Safety Audit

Publication Number: 09023

Date Published: December 2010

Geographic Area Covered: Bristol Township and Falls Township, Bucks County, Pennsylvania

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, Levittown Parkway (SR 2051).

Abstract: This report documents the process and findings of the Levittown Parkway (SR 2051) 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 DVRPC's Regional Safety Action Plan. Implementation of improvement strategies may be eligible for Local Federal Safety Funds.

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