DELAWARE VALLEY
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REGIONAL
PLANNING COMMISSION

APRIL 2010

PHOENIXVILLE BOROUGH, CHESTER COUNTY

CONGESTION & CRASH site Analysis Program

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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.

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Executive Summary

The goals of the Congestion and Crash Site Analysis Program (CCSAP) are to improve access and efficiency of the region's transportation system, improve safety and air quality, and reduce congestion through analyses for specific highway locations with demonstrated problems in both New Jersey and Pennsylvania.

Due to their many conflict points, intersections experience more crashes than midblock locations. In addition, the geometry of an intersection can present many issues for the road user. Assuring the efficient operation of intersections is an increasingly important issue as municipalities attempt to maximize roadway capacity to serve the growing demand for travel. The objective is to identify cost-effective improvements that will reduce crashes and congestion.

The Chester County Planning Commission suggested the intersection of Nutt Road (PA 23) and Kimberton Road (PA 113), located in Phoenixville Borough, Pennsylvania, as the candidate location for further study. At the initial field visit, township and county officials requested that the scope of the analysis be expanded to include the three-tenth-mile section of Nutt Road east of Kimberton Road to Mason Street.

The study area is broken into two segments along Nutt Road: Section A (vicinity of the Kimberton Road and Nutt Road intersection) and Section B (vicinity of Nutt Road and Mason Street). A large amount of congestion and crashes have occurred during peak hours along this stretch of Nutt Road. With the help of input from the stakeholders (local, county, and state officials) and the analysis performed by DVRPC, several improvement strategies were developed that would potentially increase the safety and mobility of all road users traveling along Nutt Road between Kimberton Road and Mason Street.

The range of strategies included for Section A are the following: restriping and/or adding crosswalks, modification of traffic lanes by restriping pavement markings, providing better access management at business driveways, and altering traffic signal timing/phasing. Based on traffic and safety issues identified for Section B some of the strategies developed for this section differ from those developed for Section A. These strategies include installing lighting, restriping and/or adding crosswalks and modification of traffic lanes by restriping pavement markings.

Many of the above-mentioned strategies were recommended for implementation. The majority of these improvements were low-cost and short-term solutions to help improve traffic flow and safety of all roadway users along Nutt Road.

CHAPTER 1

Introduction

This technical report provides analysis and recommendations for three-tenths of a mile of Nutt Road (PA 23) between the intersection of Kimberton Road (PA 113) and Mason Street in Phoenixville Borough, Pennsylvania. The recommended strategies cover both safety and operational improvements. The operational improvements pertain to the one signalized intersection in the study area. The operational improvements were modeled and the results compared to existing conditions. It was not possible to model the safety improvements, but they were developed based on professional knowledge and discussions with state, county, and local stakeholders. The resulting recommendations are in the final chapter of the report.

Methodology

The DVRPC study team conducted field visits for the location to observe the issues. Data was then compiled and analyzed. This included crash records data, Average Annual Daily Traffic (AADT) data, turning movement counts, and traffic signal timings. A preliminary field visit and kick-off meeting was held among representatives from the following agencies: Chester County Planning Commission, Phoenixville Borough, Pennsylvania Department of Transportation (PennDOT), TPD Consulting and DVRPC (see Appendix A for list of participants). TPD Consulting was invited to provide information on the planned French Creek Parkway, which will eventually impact the study area. The field visit and kick-off meeting assisted in the identification of problems, with discussion of the study team observations, and provided stakeholder feedback.

The study team conducted follow-up field views to better define the existing conditions and refine the identification of problems. Subsequently, a technical analysis was performed to better understand and quantify the identified transportation problem areas. This included the preparation of collision diagrams displaying crash patterns and conducting a level-of-service (LOS) analysis for existing conditions.

Based on the crash and LOS analyses, a set of improvements was developed that addressed the identified problems.

Findings and preliminary recommendations were presented to stakeholders at a follow-up meeting held at the Phoenixville Borough Municipal Building on May 27, 2009. The purpose of the meeting was to discuss the recommendations and to get stakeholders' perspectives of the practicality on the recommendations.

Level-of-Service (LOS) Analysis

The LOS analysis is a common tool for assessment of transportation facilities and was used extensively for this project. When applied as a measure of performance for an entire or a particular component of an intersection, LOS has a precise meaning: the average delay experienced by a vehicle traveling through the intersection or a specific component of it. The parameters of delay that determine the various LOS categories for a signalized intersection are displayed in Table 1.

A review of the existing conditions and of the various improvement scenarios was conducted using Synchro traffic signal software for the project intersection. Necessary information for determining delay and LOS measures include turning movement counts, roadway geometry, signal timing, and signal actuation plans. The turning movement counts were mostly gathered by DVRPC staff; the signal timing, actuation data, and roadway geometrics were supplied by PennDOT.

Table 1: LOS Designations and Associated Delays

LOS	Signalized Intersection Total Delay per Vehicle (seconds/vehicle)
A - Desirable	≤ 10
B - Desirable	> 10 and ≤ 20
C - Desirable	> 20 and ≤ 35
D - Acceptable	> 35 and ≤ 55
E - Undesirable	> 55 and ≤ 80
F - Unsatisfactory	> 80

Source: Highway Capacity Manual, 2000

For signalized intersections, Synchro calculates a control delay. The control delay is calculated by a percentile delay method. This approach uses formulas from the Highway Capacity Manual (HCM) to calculate delay; however, the final delay measure is taken from an average of the 10th, 30th, 50th, 70th, and 90th percentile volume levels. As a result, the calculated delay is a product of the various operating conditions that a signal may actually encounter.

For the revision of timing plans, Synchro is capable of optimizing intersection splits, cycle lengths, and offsets. These efforts seek to establish a timing plan that provides the most efficient performance that serves an optimal volume of vehicles.

CHAPTER 2

Study Location

The focus of the study as shown in Figure 1 is the intersection of Kimberton Road and Nutt Road. Approximately three-tenths of a mile along Nutt Road between Kimberton Road and Mason Street is also included as part of the study. On a regional level, Nutt Road is one of the main thoroughfares through Phoenixville Borough and connects with several key roads, including Bridge Street (PA 29), Schuylkill Road (PA 724), and US 422. It also provides direct access to Valley Forge Park. Kimberton Road connects Phoenixville to the Lionville and Downingtown areas.

As depicted in Figure 2, the study area has been divided into the following two sections:

Section A: Vicinity of Kimberton Road and Nutt Road Intersection

Kimberton Road is classified as minor arterial. It ends at the intersection with Nutt Road at the western limits of the study area. This intersection is signalized. The fourth leg of the intersection is an access road to the large, Phoenixville Plaza Shopping Center. Kimberton Road consists of a three-lane cross-section, with one dedicated left-turn lane, one through lane, and a channelized right-turn lane that provides access to eastbound Nutt Road. The shopping center access road approach (southbound leg) carries three lanes, including two left-turn lanes and a shared through and right-turn lane. This area also includes a short section of Nutt Road east of the intersection to the railroad overpass. At the intersection of Kimberton Road, Nutt Road carries dedicated left-, through, and right-turn lanes.

Section B: Vicinity of Nutt Road and Mason Street

Nutt Road is classified as a minor arterial and in the study area it runs in an east-west direction from Kimberton Road (western limit) to Mason Street (eastern limit) for a distance of approximately 1,600 feet. East of Kimberton Road, Nutt Road provides a three-lane cross-section containing two travel lanes (one travel lane per direction), a two-way left-turn lane (TWLTL) and no shoulders. Mason Street runs in a north-south direction and is classified as a local road. It has a two-lane cross-section and is stop-controlled.

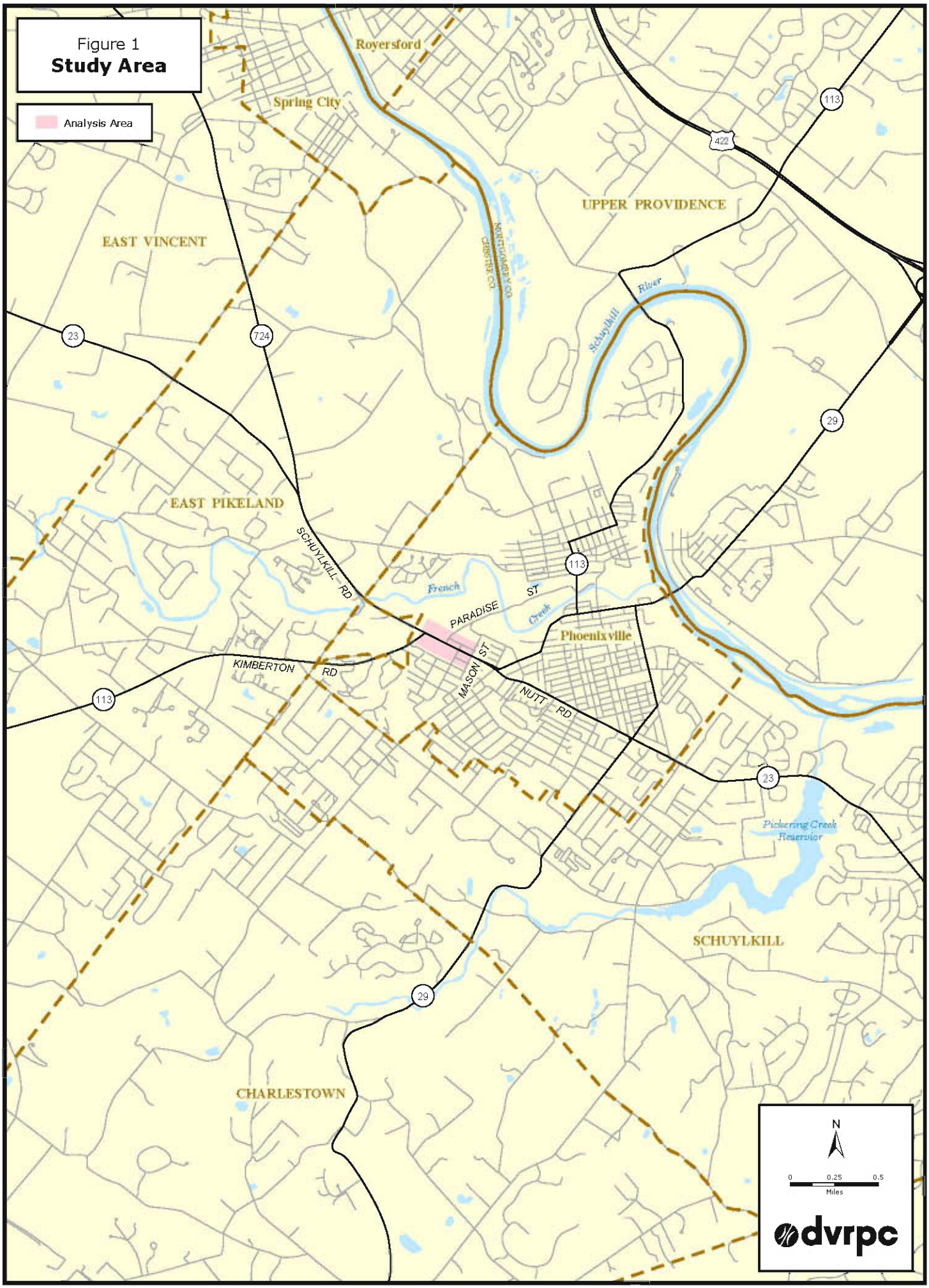
Figure 1
Study Area
Analysis Area
Royersford
Spring City
EAST VINCENT
UPPER PROVIDENCE
EAST PIKELAND
Schuylkill River
SCHUYLKILL RD
PARADISE ST
French Creek
Phoenixville
KIMBERTON RD
MASON ST
NUTT RD
Pickering Creek Reservoir
SCHUYLKILL
CHARLESTOWN
113
422
23
724
29
N
0 0.25 0.5
Miles
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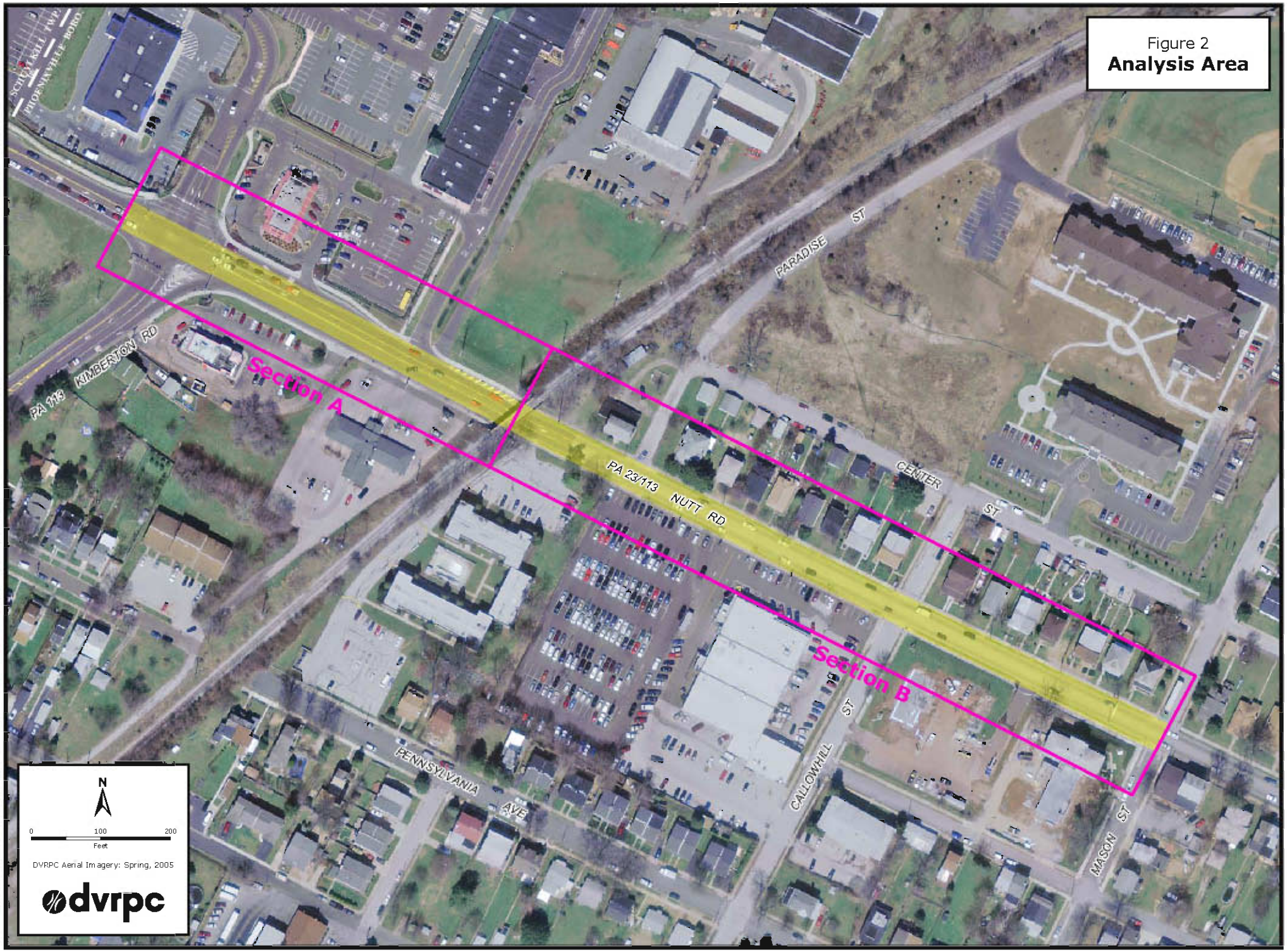
Figure 2
Analysis Area
Section A
Section B
PA 113
KIMBERTON RD
PA 23/113 NUTT RD
PARADISE ST
CENTER ST
PENNSYLVANIA AVE
CALLOWHILL ST
MASON ST
N
0
100
200
Feet
DVRPC Aerial Imagery: Spring, 2005
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CHAPTER 3

Existing Conditions

Nutt Road is a significant regional route that traverses Phoenixville Borough. The study area experiences heavy through and turning movements to and from Kimberton Road. DVRPC traffic counts taken in 2004 on Nutt Road showed an AADT volume of 27,074 vehicles in both directions. Traffic counts taken in 2008 along Kimberton Road showed an AADT volume of 13,108 vehicles.

Peak hours and local input indicate that many commuters pass through the intersection of Kimberton Road and Nutt Road. The following are some of the comments made by municipal and county officials during the field visit and at the kick-off meeting concerning existing vehicular traffic conditions in the study area:

- The intersection of Kimberton Road and Nutt Road experiences significant morning and peak period congestion.
- In the afternoon, there are long traffic queues for westbound Nutt Road traffic turning left onto Kimberton Road. The queues often extend beyond the left-turn lane into the TWLTL as far back as Paradise Street.
- Conflicting turning movements between vehicles turning left out of the shopping center (dual left-turning movements) and northbound right-turning vehicles heading east on Nutt Road.
- The eastbound right lane on Nutt Road ends quickly prior to the railroad overpass which causes issues for merging vehicles.
- Throughout the day there is a steady flow of traffic along Nutt Road (in Section B of the study area). At times it is difficult for vehicles to make a left onto Nutt Road from the side streets.

Signal Timing

The Kimberton Road and Nutt Road intersection is the only signalized intersection in the study area. This semi-actuated signal is incorporated into the closed loop system of Phoenixville. The cycle length in the morning and afternoon is 120 and 100 seconds, respectively. The east-, west- and northbound left turns are permitted-protected. The southbound left turn movement is protected.

Turning Movement Counts

Manual turning movement counts were taken at the intersection. These counts were taken in December 2008 between the hours of 6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM. A peak-hour turning movement diagram is shown in Figure 3. The morning peak-hour is 8:00 AM to 9:00 AM and the afternoon peak-hour is 4:15 PM to 5:15 PM.

During the morning peak-hour approximately 1,800 vehicles traveled through this intersection. The dominant movement in the morning is the through traffic on Nutt Road traveling east. This includes a heavy right-turn (339) movement from northbound Kimberton Road to head east on Nutt Road. Traffic leaving and entering the shopping center access road is fairly light, with 101 vehicles.

During the afternoon peak period, traffic flow in the area increases compared to counts in the morning. In the afternoon approximately 2,500 vehicles traveled through the intersection. The dominant movement is the reverse of that observed in the morning peak. As westbound Nutt Road approaches the intersection, 610 vehicles proceed through it and 351 turn left to travel south on Kimberton Road. In the evening trips generated by the shopping center are notably higher than the morning peak period.

Existing LOS

A LOS analysis was performed for the signalized intersection of Kimberton Road and Nutt Road. Table 2 depicts the existing LOS and vehicle delay associated with the intersection.

As a result of the traffic volume and signal timing, in the morning and afternoon, the southbound shopping center access road approach experiences the highest amount of delay. As shown in Table 2, the wait time for vehicles along this approach averages 36 seconds and 45 seconds in the morning and afternoon, respectively. Compared to the other three approaches, in the morning and afternoon, traffic conditions along the westbound Nutt Road approach perform better, with delays ranging between 10 and 25 seconds, respectively. In the morning, vehicle delay averages 16 seconds. Given the heavy amount of traffic, vehicle delay is doubled in the afternoon, averaging approximately 32 seconds.

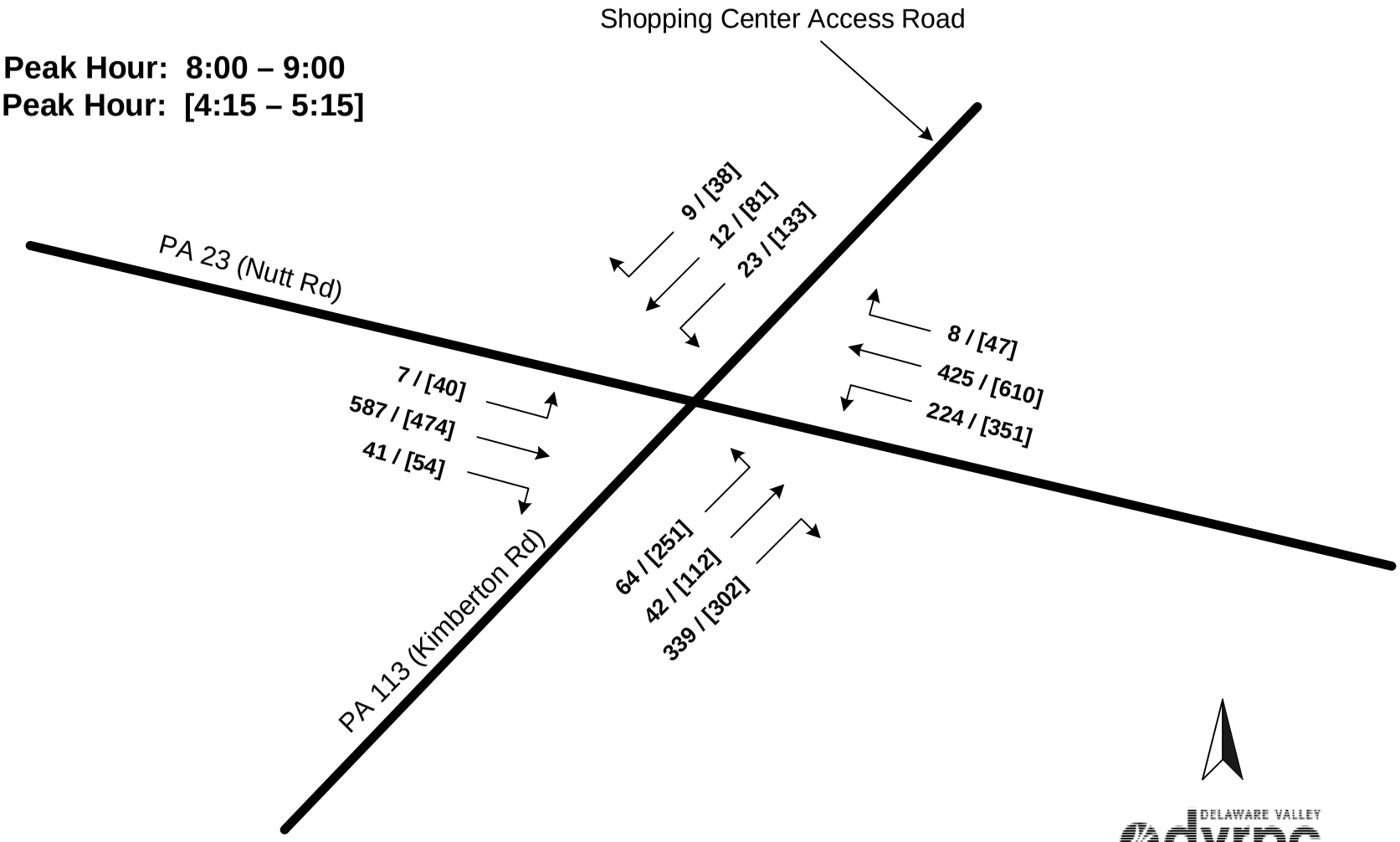
Table 2: Existing LOS Analysis

Kimberton Road and Nutt Road Intersection				
	AM (120 sec.)		PM (100 sec.)	
Direction	Delay (s)	LOS	Delay (s)	LOS
Kimberton Road – northbound	19	B	42	D
Shopping Center Access Road – southbound	36	D	45	D
Nutt Road – eastbound	18	B	26	C
Nutt Road – westbound	10	A	25	C
Total Intersection	**16**	**B**	**32**	**C**

Source: DVRPC, 2009

Figure 3
Peak-Hour Turning Movement Counts

AM Peak Hour: 8:00 – 9:00
PM Peak Hour: [4:15 – 5:15]



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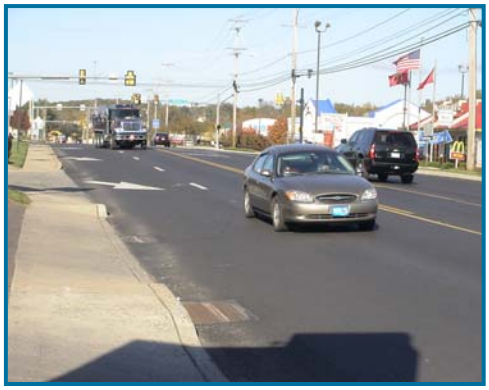
Land Use

The land use surrounding the intersection of Kimberton Road and Nutt Road is commercial. The Phoenixville Plaza Shopping Center and McDonald's Restaurant are located on the north side of the intersection. A Walgreen's Drugstore and Kentucky Fried Chicken (KFC) Restaurant occupy the southwestern and southeastern quadrants of the intersection. The Phoenix Soft Cloth Car Wash is located east of this intersection prior to the railroad overpass. Land use patterns along the Nutt Road and Mason Street vicinity is commercial and residential. Single-family homes border the north side of Nutt Road. An apartment building, a car dealership, and other businesses are located along the south side of Nutt Road.



Commercial area east of the Kimberton Road and Nutt Road intersection (Source: DVRPC)

Residences along the north side of Nutt Road (Source: DVRPC)

Pedestrians

Pedestrian activity is evident throughout the study area. At the follow-up stakeholder meeting, it was mentioned that there is a long wait for pedestrians wanting to cross against vehicles making right-turns from northbound Kimberton Road. During a field visit pedestrians were observed crossing Nutt Road at various mid-block locations between Paradise and Mason Streets.

Sidewalks are located on both sides of Nutt Road, providing access to businesses and the Phoenixville Plaza Shopping Center located near Kimberton Road. Pedestrian crosswalks were generally faded or missing along Nutt Road.

Transit

The SEPTA bus route 99 runs along Nutt Road. Two bus stops are located within the study area. According to SEPTA FY2010 Annual Service Plan there are 1,476 weekday passenger trips on this route. Peak period headways are every half hour and off-peak headways are every hour.

CHAPTER 4

Crash Analysis

This analysis includes all reportable crashes that occurred along Nutt Road between Kimberton Road and Mason Street. The initial analysis revealed two distinct areas of crash concentrations, therefore the study limits were divided into two crash analysis sections.

The main goals of this analysis are to identify problematic locations and highlight crash trends. The collision diagrams (Figures 4 and 5) are graphic representations of the location, collision type, and frequency of vehicular crashes within the study area at each of the focus areas. The crash summary details crash conditions obtained from the police reports for use in identifying crash trends which may be addressed through engineering improvements and other approaches.

Data Description

The crash summaries and data for collision diagrams used in this analysis were derived from reportable crash reports provided by the PennDOT District 6 office. In Pennsylvania a crash is considered reportable when a person is injured or killed, or if a vehicle needs to be towed from the scene. Data from years 2004 through 2008 was utilized. Statistics are summarized in Tables 3 and 4.

Section A: Vicinity of Kimberton Road and Nutt Road Intersection

There were 23 reportable crashes recorded in Section A during the five-year analysis period. According to the crash summary, eight injury crashes and 15 property-damage-only crashes were recorded.

Crash Trends

During the study period (2004 to 2008), crashes ranged between two and seven per year. There were no crashes recorded in April and November, and July had the highest occurrences, with five crashes.

Crash totals were spread evenly through the week, with a slight drop on Friday and Saturday (each with only two crashes). Sunday had the most crashes, with five. Regarding time of day, crashes were spread relatively evenly, with higher concentrations during the evening commute.

Collision Type

The largest percentage of incidents was coded as angle crashes, which represent nearly 50 percent of the total number of crashes. Rear-end crashes were also common, representing nearly 40 percent of all crashes (nine). Table 3 summarizes the crashes by type and Figure 4 illustrates where they occurred.

Table 3: Section A: Vicinity of Kimberton Road and Nutt Road Intersection Crash Data Summary

Collision Type	Section A	
Angle	11	48.0%
Rear-End	9	39.0%
Head-On	1	4.3%
Hit Fixed Object	1	4.3%
Non-Collision	1	4.3%

Source: DVRPC, 2009

Section B: Vicinity of Nutt Road and Mason Street

There were 25 reportable crashes recorded along this section during the five-year analysis period. According to the crash summary, one fatality, 15 injury crashes, and nine property-damage-only crashes were recorded.

Crash Trends

The following years each recorded five crashes: 2004, 2005, and 2007. Eight and two crashes were recorded in 2006 and 2008, respectively. Considering crashes by month, during the five-year period, there were no crashes recorded in February and September. Five crashes were recorded in May and October.

Crash totals were spread evenly through the week, with an increase on Friday and Saturday (with five and six crashes, respectively). Crashes were concentrated during the daytime hours, with a noted increase during the afternoon peak hour. These findings are consistent with the higher peak period volumes common during the morning and evening commutes.

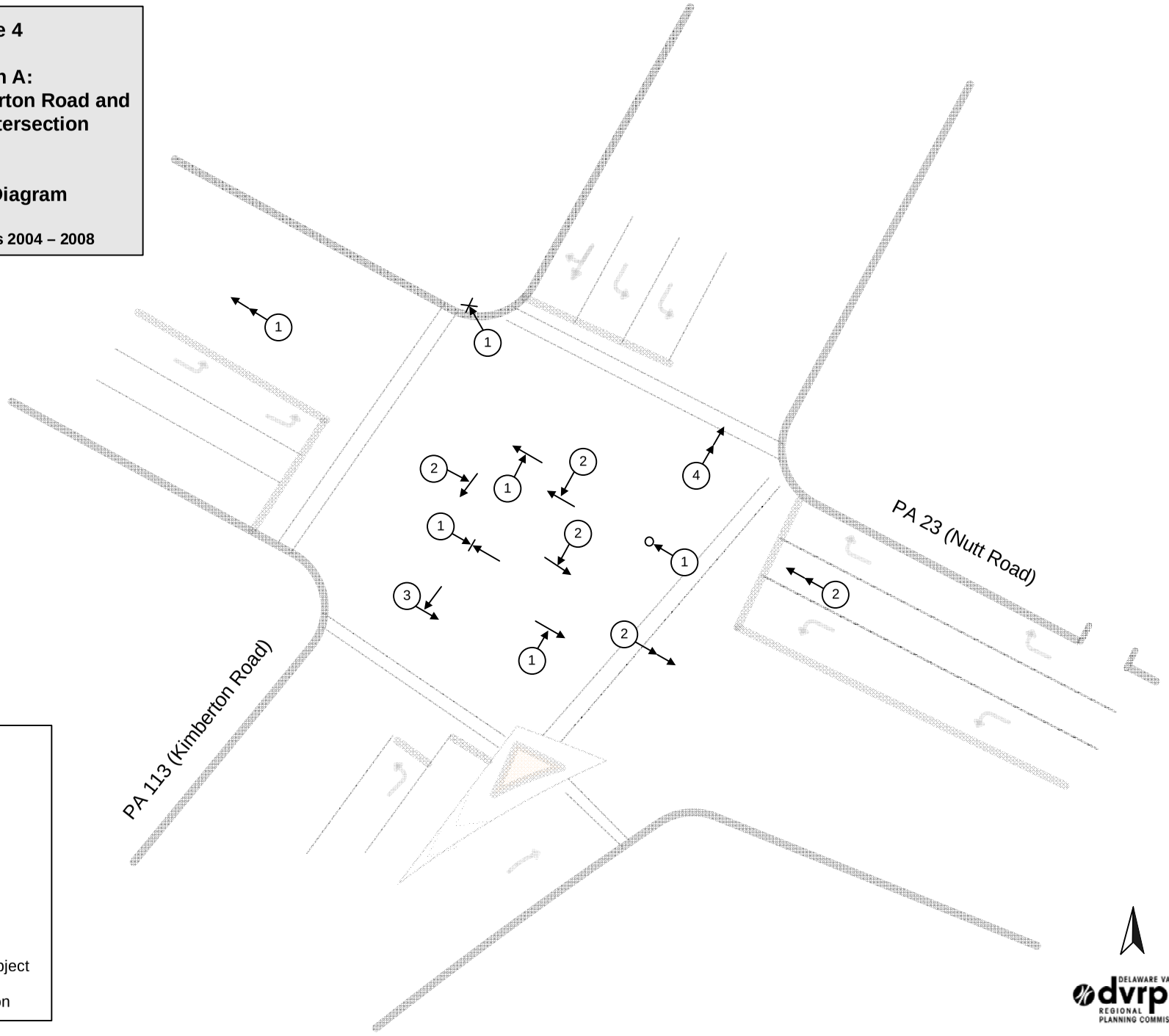
Figure 4

Section A:
Vicinity of Kimberton Road and Nutt Road Intersection

Collision Diagram

Crash Data Years 2004 – 2008

Total Crashes = 23



Collision Type

As indicated in Table 4, rear-end crashes were the predominant crash type, at 64 percent (16 crashes). Eleven of the 16 rear-end crashes occurred in the westbound direction of Nutt Road. One of the two pedestrian crashes involved a fatality. Both pedestrian crashes were located in the vicinity of the rail overpass. See Figure 5 for locations of all crashes.

Table 4: Section B: Vicinity of Nutt Road and Mason Street Crash Data Summary

Collision Type	Section B	
Rear-End	16	64.0%
Hit Fixed Object	4	16.0%
Angle	3	12.0%
Hit Pedestrian	2	8.0%

Source: DVRPC, 2009

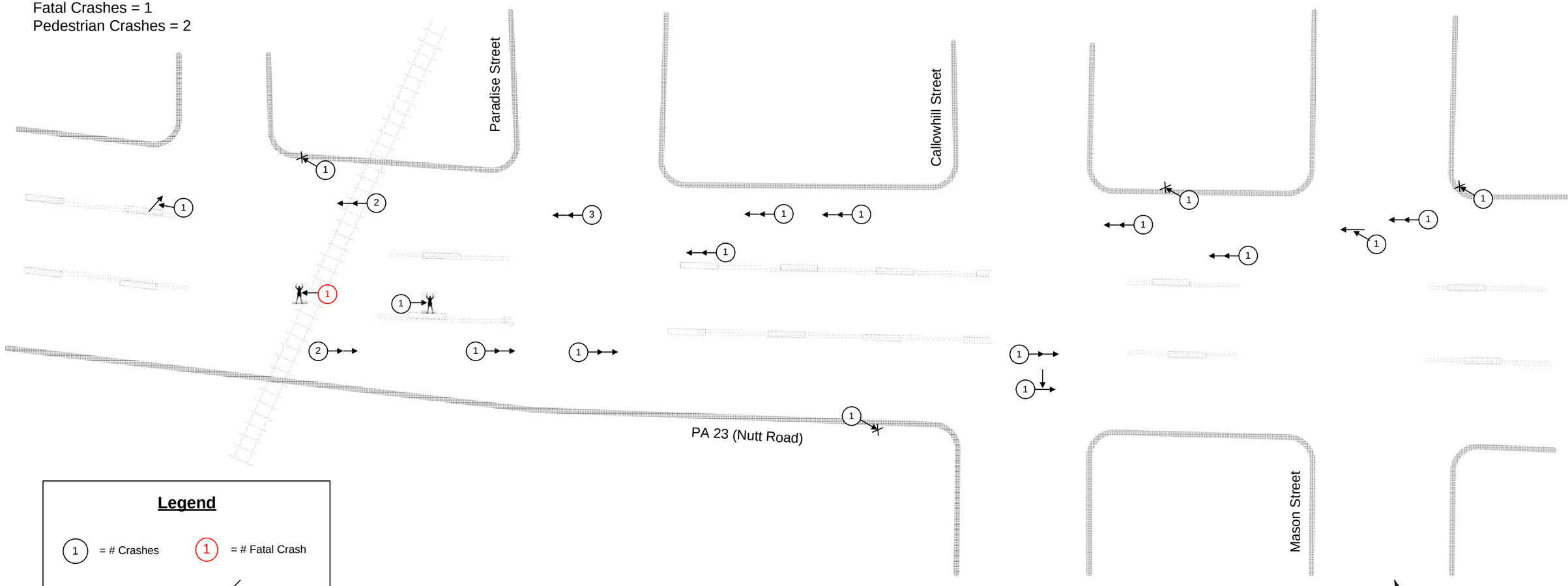
Figure 5

Section B:
Vicinity of Nutt Road and Mason Street

Collision Diagram

Crash Data Years 2004 – 2008

Total Crashes = 25
Fatal Crashes = 1
Pedestrian Crashes = 2



Legend

- 1 = # Crashes
- 1 = # Fatal Crash
- Hit Fixed Object
- Angle
- Hit Pedestrian
- Angle
- Rear-End

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CHAPTER 5

Issues and Potential Improvements

A range of strategies was agreed upon by the study stakeholders for each section of the study area. The strategies developed fell within the following two categories: safety and operational. Safety strategies consist of improvements that enhance and promote safer conditions for all roadway users traveling in the area. Examples of safety strategies include installing signage and adding/modifying existing pavement markings. Operational strategies include altering the traffic signal timing and geometric improvements at the intersection of Kimberton Road and Nutt Road. A LOS analysis was also performed at this intersection to compare existing conditions with conditions if potential strategies were implemented.

Section A: Vicinity of Kimberton Road and Nutt Road Intersection

Issues

- Traffic congestion through the intersection during the morning and afternoon peak-hours.
- Long wait time for pedestrians wanting to cross against vehicles making right-turns from northbound Kimberton Road. This is currently operating as a yield control, which allows continuous vehicle flow. As a result, gaps in traffic when pedestrians can cross are few and inconsistent.
- Conflicting turning movements between vehicles turning left out of the shopping center (dual left-turning movements) and northbound right-turning vehicles heading east on Nutt Road.
- The southbound approach contains two dual left turn lanes. The amount of traffic turning left out of the shopping center is low.
- On the east side of the intersection poor access management, with mulitiple driveways for Phoenix Soft Cloth Car Wash and KFC Restaurant, is a contributing factor to the concentration of rear-end crashes.
- In the afternoon, there are long traffic queues for westbound Nutt Road traffic turning left onto Kimberton Road. The queues often extend beyond the striped left-turn lane into the TWLTL as far back as Paradise Street.

Goals

- Minimize vehicle conflict, particularly among the southbound left-turn movements from the shopping center access road onto eastbound Nutt Road.
- Provide safer driver and pedestrian operations.

Safety Strategies

- Provide better access management at the Phoenix Soft Cloth Car Wash and KFC Restaurant. Properly delineate the driveways near the merge area.
- Restripe and/or add crosswalks at the intersection.
- Extend (restripe) the westbound left-turn lane as far as to Paradise Street. A portion of the TWLTL west of Paradise will be converted to accommodate the extended left-turn lane.

Operational Strategy – Geometric Improvement

- Eliminate (restripe) one of the southbound dual left-turn lanes of the shopping center access road.

Operational Strategies – Signal Improvements

The operational strategies were refined so they could be simulated using Synchro software. The following scenarios were optimized. Summaries and tables are provided for each of the three scenarios. These results are for comparison to the existing LOS conditions documented in Chapter 3.

1. Add a signal to the channelized northbound right-turn lane.
2. Eliminate one of the southbound left-turn lanes.
3. Combine scenarios 1 and 2.

Scenario #1 – Add a signal to the channelized northbound right-turn lane

Currently this lane is yield controlled, which allows for continuous right-turn movements. This scenario will cause right turning vehicles to stop (red light), which will minimize conflicting turning movements between vehicles turning left out of the shopping center. This traffic signal can also help create gaps for pedestrians wanting to cross Kimberton Road.

In the morning, this intersection experiences an overall delay of 24 seconds (LOS C). The highest amount of delay is experienced along the southbound approach, with 41 seconds of delay, which is a five-second increase from existing conditions. Compared with existing conditions, the delay along the remaining approaches increases, with the northbound having the greatest increase of ten seconds.

During the afternoon peak-hour the overall delay for this intersection is 32 seconds. With this scenario, compared to existing conditions, vehicle delay on the northbound approach decreases from 42 seconds to 32 seconds. The east- and westbound approaches have a LOS C. Compared with existing traffic patterns, delay on the southbound approach is increased by 13-seconds, from 45 to 58 seconds.

Table 5: LOS Analysis – Scenario #1

	AM (120 sec.)		PM (100 sec.)	
Direction	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**
Kimberton Road – northbound	29	C	32	C
Shopping Center Access Road – southbound	41	D	58	E
Nutt Road – eastbound	26	C	31	C
Nutt Road – westbound	17	B	26	C
Total Intersection	**24**	**C**	**32**	**C**

Source: DVRPC, 2009

Scenario #2 – Eliminate one of the southbound left-turn lanes

This scenario tests changes in traffic flow if the second lane is removed from the southbound approach for vehicles turning left from the shopping center access road to eastbound Nutt Road. Having dual left-turn lanes may not be justiable given the amount of vehicles turning left out of the shopping center access road. According to the Federal Highway Administration (FHWA) *Signalized Intersections: Informational Guide,* as a rule of thumb, dual left-turn lanes are generally considered when left-turn volumes exceed 300 vehicles per hour. Also while effective in improving intersection capacity, double lefts are not appropriate where left-turning vehicles are not expected to evenly distribute themselves among the lanes[1].

The number of vehicles recorded turning left out of the shopping center is less than half of the volume per hour recommended from FHWA for a dual left-turn lane. Also vehicles using the dual lanes out of the shopping center have to quickly merge on Nutt Road to prepare for the lane drop near the railroad overpass.

During the morning peak period, this intersection experiences an overall delay of 16 seconds (LOS B). Comparing this scenario with existing conditions, there is no change in the delay along the eastbound and westbound approaches, respectively. The delay along the southbound approach is 38 seconds (LOS D), which is a two-second increase from existing conditions.

In the afternoon, overall delay for the intersection is 31 seconds and LOS C. With this scenario, the southbound approach averages over one minute of vehicle delay, which is an 18-second increase compared with existing conditions. The northbound, westbound, and eastbound legs experience an LOS C, with delays ranging between 26 and 30 seconds. Compared with existing conditions, the northbound approach experiences the largest drop in vehicle delay, 42 to 29 seconds.

[1] FHWA. *Signalized Intersections: Informational Guide*, 2004

Table 6: LOS Analysis – Scenario #2

	AM (120 sec.)		PM (100 sec.)	
Direction	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**
Kimberton Road – northbound	19	B	29	C
Shopping Center Access Road – southbound	38	D	63	E
Nutt Road – eastbound	18	B	30	C
Nutt Road – westbound	10	A	26	C
Total Intersection	**16**	**B**	**31**	**C**

Source: DVRPC, 2009

Scenario #3 – Combine scenarios 1 and 2

This scenario combines the changes from scenarios one and two. The results from adding a traffic signal for the northbound right-turn ramp and eliminating one of the southbound left-turn lanes are displayed below.

During the morning peak hour, this intersection operates at LOS C with 24 seconds of delay. Compared with existing conditons the delay along the northbound, eastbound, and westbound approaches increases by ten, eight, and seven seconds, respectively. The southbound approach experiences the greatest amount of delay at 43-seconds, which is a seven-second increase from existing conditions.

For this scenario, the afternoon peak hour LOS for the study intersection is C. The southbound approach experiences the highest amount of delay at 62 seconds (LOS E). This represents a 17-second increase from existing conditions. The LOS along the remaining approaches is C, with delays ranging between 26 and 35 seconds.

Table 7: LOS Analysis – Scenario #3

	AM (120 sec.)		PM (100 sec.)	
Direction	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**
Kimberton Road – northbound	29	C	35	C
Shopping Center Access Road – southbound	43	D	62	E
Nutt Road – eastbound	26	C	30	C
Nutt Road – westbound	17	B	26	C
Total Intersection	**24**	**C**	**33**	**C**

Source: DVRPC, 2009

Conclusions from Scenarios

In all scenarios, the delay during the afternoon peak hour along the northbound approach is reduced by up to 13 seconds. During both peak hours, the delay along the southbound approach increases, which is attributed to the least amount of timing allocated for that leg. Despite conditions at some approaches, the intersection performs at acceptable levels. Installing a traffic signal at the northbound right-turn ramp may be a viable option for improving safety at the intersection; however it is not the most cost effective option. Eliminating one of the southbound left-turn lanes may be the most adequate and affordable improvement to pursue at the intersection of Kimberton Road and Nutt Road.

Section B: Vicinity of Nutt Road and Mason Street

Issues

- Concern about crashes in the area, including one pedestrian fatality.
- Unsafe pedestrain conditions (lack of crosswalks, and poor lighting conditions near the railroad overpass).
- Long wait time for vehicles turning left from the side streets onto Nutt Road.
- Potential conflicts for vehicles utilizing the TWLTL.
  - There are not many locations for left-turns, so the continuous TWLTL is used by some drivers as a travel lane.
- Railroad overpass limits sight distance for motorists and pedestrians.
- French Creek Parkway and the French Creek Center are planned in the future and will substantially increase congestion.

Goals

- Reduce crashes by providing safer driver and pedestrian operations.
- Ease traffic congestion in the area.

Safety Strategies

- Restripe the TWLTL to provide for left-turn movements at select locations only, thus prohibiting misuse as a travel lane.
- Add crosswalks along Nutt Road and the side streets, and at designated crossings of Nutt Road.
- Consider adding lighting, specifically in the area of the railroad overpass.

- Create an educational campaign for pedestrians traveling in the area. This educational campaign would consist of installing signage to discourage mid-block crossing and crossing in the vicinity of the railroad overpass. It would encourage pedestrians to cross Nutt Road at designated crosswalks at intersections. Below are two samples of signage to be used.

R9 – 2

R9 – 3b

Manual on Uniform Traffic Devices (MUTCD), 2009

Operational Strategy

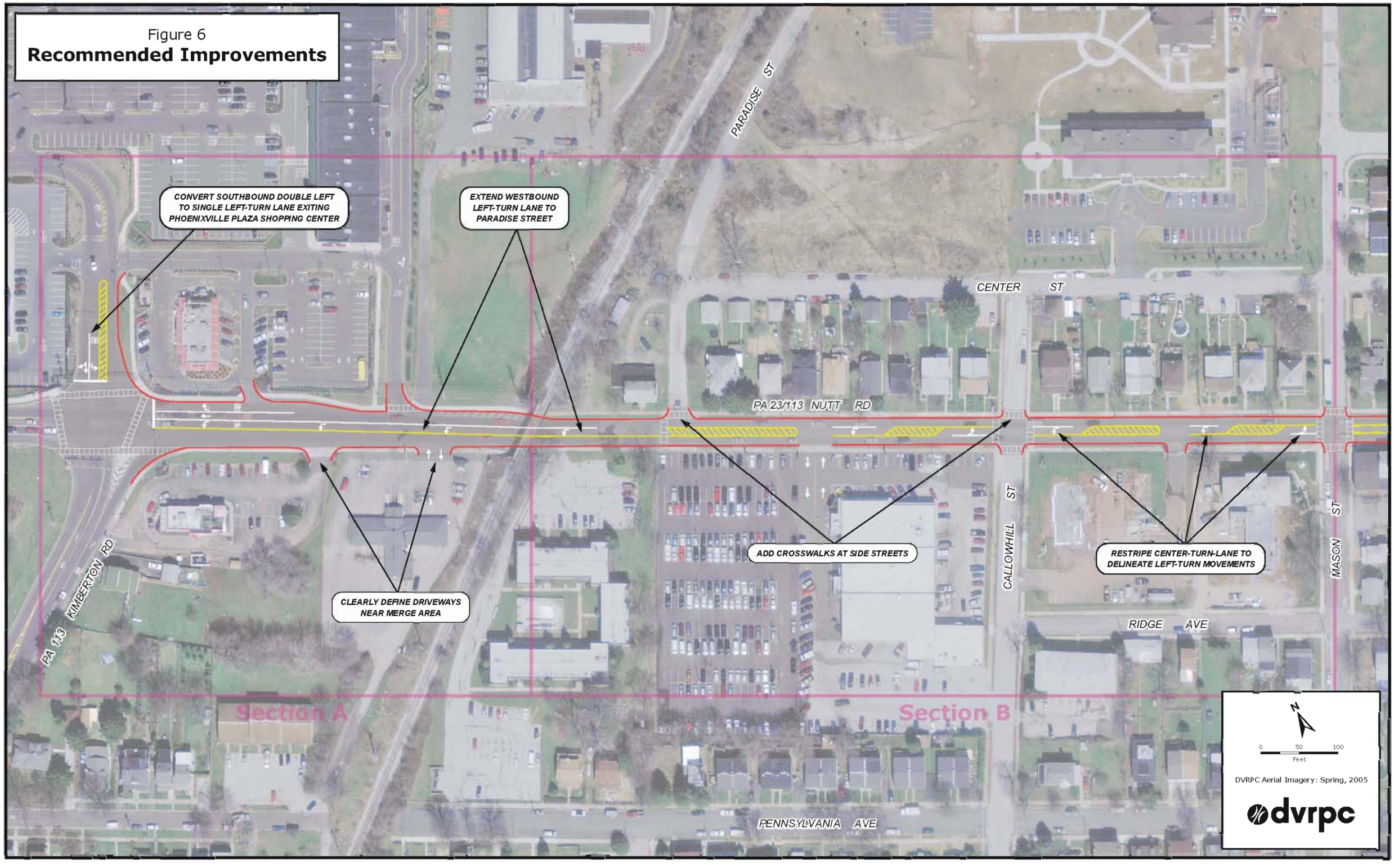
The French Creek Parkway is a proposed roadway that is part of the French Creek Center redevelopment project. It is designed to relieve the resulting traffic congestion at several heavily traveled intersections within downtown Phoenixville Borough. The southern alignment of the French Creek Parkway is planned to connect to Nutt Road via Paradise Street and Mason Street, which encompasses Section B. Signalization is proposed at both intersections.

The French Creek Parkway is currently identified in the DVRPC Long Range Plan and FY10 Transportation Improvement Program (TIP). This project is several years from being completed as it has not yet begun the environmental review process. Given the time frame for implementation, no specific recommendations will be made about it in this report. Ongoing coordination of all stakeholders is very important, but is assumed to happening.

For more information about the FCP, please contact Greg Lebo, P.E. Vice President, TPD Consulting, at glebo@trafficpd.com.

Many of the strategies described in this chapter are graphically depicted in Figure 6.

Figure 6
Recommended Improvements



CHAPTER 6

Recommendations

Representatives from Chester County Planning Commission, Phoenixville Borough, PennDOT, TPD Consulting, and DVRPC worked together and developed a set of recommendations. The agreed-upon recommendations should provide safety and operational benefits within the study area. Given the amount of congestion in the area, the traffic signal at the Kimberton Road and Nutt Road intersection is operating efficiently. Therefore, many of the strategies identified are more safety oriented. These strategies are generally short-term, low-cost, and should be implemented rather quickly. Recommended improvements include adding crosswalks and restriping to modify traffic patterns. Other strategies, such as installing lighting, though important and applicable, may be expensive and require a longer time frame for implementation. A summary of recommended strategies for the Kimberton Road, Nutt Road, and Mason Street area are reflected below in Table 8.

Table 8: Recommended Improvements

	Recommended Improvements
Section A: Vicinity of Kimberton Road and Nutt Road Intersection	
At intersection	■ Restripe the crosswalks (**short-term**) ■ Further investigate the installation of a signal for the Kimberton Road northbound channelized right-turn lane. (**short to medium-term**). ■ Convert (restripe) the southbound double-left to a single left-turn lane from shopping center access road. This may require some alteration of the signal heads (**short-term**)
Between the intersection and the railroad overpass	■ Extend the westbound left-turn lane on Nutt Road to Paradise Street (**short-term**) ■ Define the business driveways on south side of Nutt Road near merge area (**short-term**)
Section B: Vicinity of Nutt Road and Mason Street	
Along Nutt Road between the railroad overpass and Mason Street	■ Restripe the TWLTL to delineate specific left-turn movement areas (**short-term**) ■ Add crosswalks along side streets (**short-term**) ■ Develop an educational campaign for pedestrians **(short-term)**
At railroad overpass (west of Paradise Street)	■ Add lighting (**medium-term**)

Source: DVRPC, 2009

The majority of the strategies identified as potential improvements were recommended. A focus was on the ones that are short-term and could be implemented with relative ease. A few potentially more expensive strategies were also included. Although these improvements would take longer they will likely provide some additional benefit in improving safety and relieving congestion in the area.

APPENDIX A

List of Study Stakeholders

Table A-1: List of Study Stakeholders

Name	Organization
Corporal David Boyer	Phoenixville Borough Police
Vince Cerbone	PennDOT – District 6
Jean Krack	Phoenixville Borough Administration
Greg Lebo	TPD Consulting Inc.
Natasha Manbeck	Chester County Planning Commission
Brian Marshall	Phoenixville Borough Police
Laurie Matkowski	DVRPC
Regina Moore	DVRPC
Chief William Mossman	Phoenixville Borough Police
Kevin Murphy	DVRPC
Randy Waltermyer	Chester County Planning Commission
Brian Watson	Phoenixville Borough Administration

Source: DVRPC

APPENDIX B

References

The following resources were used as references for the information documented in this report.

Internet Resources

- DVRPC Long Range Plan website - www.dvrpc.org/connections/transportation.htm
- DVRPC Transportation Improvement Program website - www.dvrpc.org/tip/pafinal/2009/ches09f.pdf

Publications

- FHWA, Signalized Intersections: Informational Guide, 2004

Contacts for Further Information

- Greg Lebo, P.E. – TPD Consulting for information about French Creek Parkway study

Publication Title:	Congestion and Crash Site Analysis Program – Phoenixville Borough, Chester County
Publication Number:	09016
Date Published:	April 2010
Geographic Area Covered:	Phoenixville Borough, Chester County
Key Words:	Phoenixville Borough, Chester County, Nutt Road, Kimberton Road, PA 23, PA 113, congestion, level of service, intersection, safety, crashes, crash site, traffic signal, roadway, driveway, improvements, turning movements, peak-hour, strategies, access management

Abstract:

This document represents the findings and recommendations for the Chester County Congestion and Crash Site Analysis Project. This project represents an effort to improve the mobility and safety on roadways in the DVRPC region. The goal of the program is to identify cost-effective improvement strategies that will reduce congestion and crashes and improve mobility and safety for all road users.

Working with Chester County Planning Commission, the intersection of Nutt Road (PA 23) and Kimberton Road (PA 113) and a section of Nutt Road to Mason Street were chosen for analysis. This area was identified as having congestion and safety issues. An in-depth crash and level of service analyses were performed to quantify and gain an understanding of the issues. With input from stakeholders, improvement strategies were identified to address the issues. As appropriate, proposed improvement strategies were tested for level of effectiveness.

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