Route 41 Planning Study

SR 0041, Section STY
Chester County, PA

Prepared For
Pennsylvania Department of Transportation
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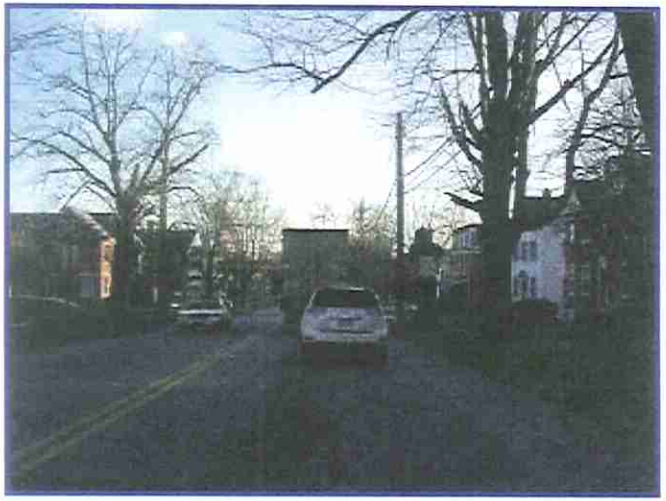

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pennsylvania
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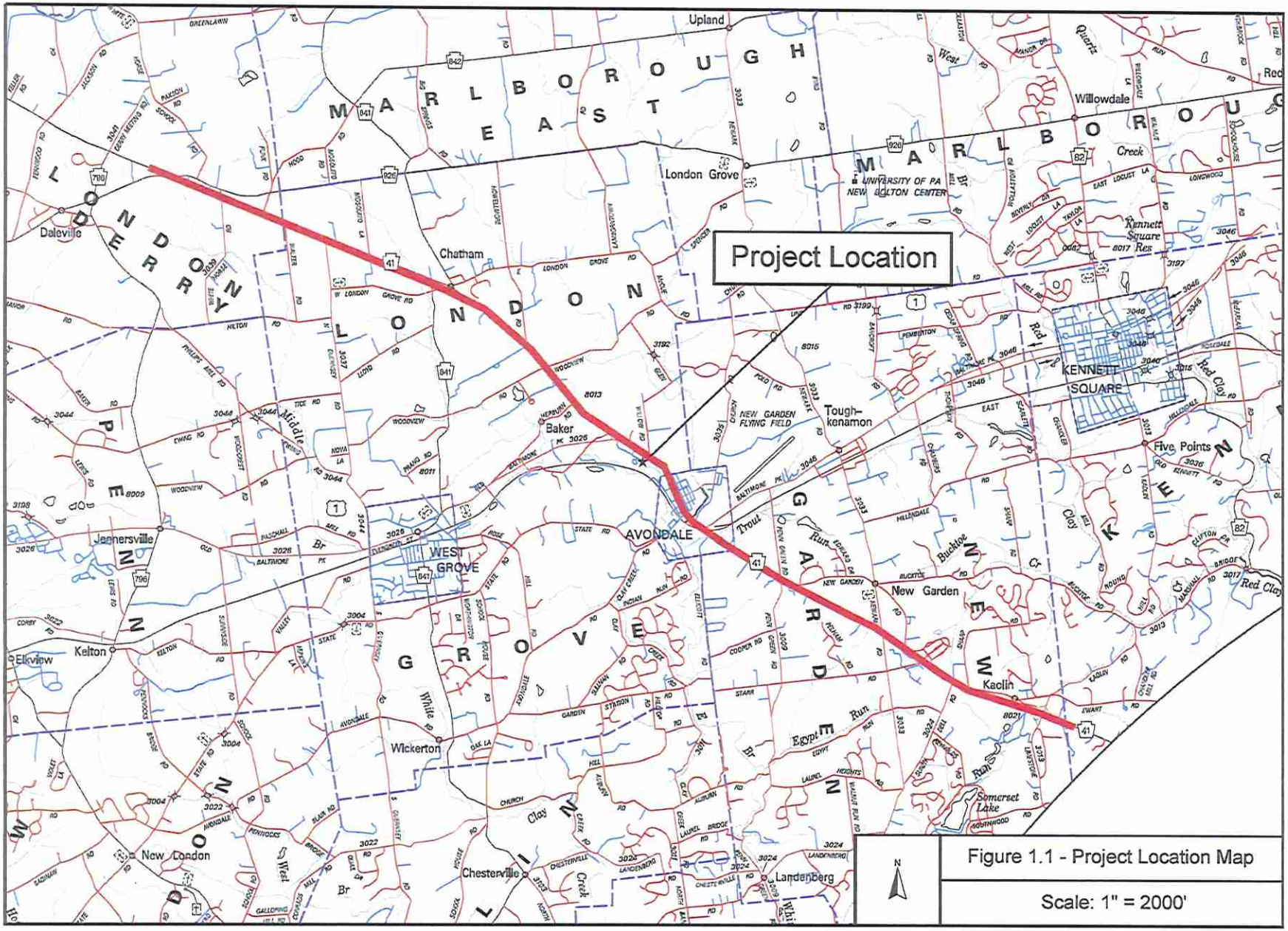
1.0 Introduction

The SR 0041, Section STY, (PA 41 Project) project is located in southern Chester County, Pennsylvania. The project area includes approximately ten miles of PA 41, from the intersection with PA 926 to the Delaware State Line in the following municipalities: Londonderry Township, London Grove Township, Avondale Borough, New Garden Township, and Kennett Township (refer to **Figure 1.1 – Project Location Map**). The PA 41 Project was initiated in 1993 as a result of local planning efforts initiated by municipalities along PA 41 in southern Chester County. Previously, in 1988, the Avon-Grove Regional Planning Commission completed a report that recommended that PA 41 be expanded to four lanes as a result of traffic congestion, circulation and safety. This study was used to place the PA 41 Project on the Pennsylvania Department of Transportation (PennDOT) 12-year capital improvement program.

The PA 41 *Needs Study*, completed in 1994, identified safety, traffic congestion and projected growth, and poor transportation infrastructure as project needs. The *Preliminary Alternatives Analysis* (PAA), completed in May 1999, presented several alternatives to address the project needs as stated in the *Needs Study*. These alternatives included online widening to four lanes, or a combination of online widening with bypass alternatives around Avondale Borough and the Village of Chatham (London Grove Township) (refer to **Appendix A – 1999 Alternative Alignment Plates**).

From 1994 through 2002, environmental studies, agency coordination, engineering design and public involvement activities were ongoing to further refine the option developed in the PAA. In 2004, PennDOT, concerned with the financial status of the transportation program put several projects on hold, including the PA 41 Project. The costs and need for the PA 41 Project were evaluated by PennDOT. It was determined that the study area had changed significantly from the original planning efforts in the 1980s. The projected growth was not occurring as quickly, and the study area had changed from a rural landscape to more of an urban/suburban type of environment.

In 2008, PennDOT and the Federal Highway Administration (FHWA) considered how the study area had changed, and recommended a review of the project needs and options. At that time, it was determined that additional traffic studies and a review of growth projections, as well as the environmental, cultural and social environment would be undertaken and summarized in a revised PAA. Information from previous work would be reviewed, updated and summarized to provide a current context of the study area. In conclusion, this revised PAA summarizes information that can be used by PennDOT and FHWA to determine what type of improvements should be evaluated to address the existing and anticipated project needs.


Project Location
Upland
Willowdale
London Grove
Daleville
Chatham
Baker
Tough-kenamon
KENNETT SQUARE
Five Points
Jennersville
WEST GROVE
AVONDALE
New Garden
Kelton
Elkview
Kaolin
Wickerton
New London
Chesterville
Landenberg
Somerset Lake
Figure 1.1 - Project Location Map
Scale: 1" = 2000'

2.0 Project Background and Need

This section details the PA 41 Project context and need evaluations that were conducted as part of the 1994 Needs Study, the 1999 Preliminary Alternatives Analysis, and presently in this Route 41 Planning Study (2010). The core of the PA 41 Project study area consists of a 10-mile section of existing PA 41 in Chester County, extending from PA 926 in Londonderry Township south to the Pennsylvania/Delaware State line (refer to **Figure 1.1 – Project Location Map**).

2.1 Corridor Context and Need (1994 Evaluations)

Population trends of the study area had been evaluated to develop a corridor context and to analyze the existing and anticipated transportation network needs. The U.S. Census published population statistics for 1990, and Chester County had developed population projections to the year 2030. In 1994, it was projected there would continue to be a population increase in the study area municipalities with London Grove Township experiencing the greatest increase at almost 75 percent by 2030. With limited developable area available, Avondale Borough would experience the least amount of growth. The county's population was also expected to increase by 32 percent in the same period.

Considering population growth, density, and other factors, the transportation deficiencies for a design year of 2020 were presented in detail in the *Final Needs Study, PA 41, Section STY, Avondale Transportation Improvement Project, Chester County, Pennsylvania* in 1994. The project needs of improved safety, traffic capacity, infrastructure and modal interrelationships are outlined below.

2.1.1 Safety

Due to the high usage of PA 41 and the conflict of local and through traffic observed through the study corridor, safety along PA 41 had been identified as a significant concern. A crash analysis indicated that PA 41 south of US Route 1 exhibited a crash rate greater than the statewide average for similar roadways. The fatal crashes that occurred between 1990 and 1993 were located in the section between US Route 1 and PA 926 and four of the five fatal crashes were head-on collisions. This number of fatal crashes equated to a fatality rate greater than the statewide average.

An analysis of the collision types revealed that rear-end crashes accounted for 37 percent of the total reportable crashes. Angle type (27 percent) and hit-fixed-object (18 percent) were other notable types of crashes along the corridor. The major causes of the crashes were tailgating (16 percent), failing to heed to a stopped vehicle (16 percent), and driving on the wrong side of the road (10.5 percent).

2.1.2 Traffic Volumes and Level of Service

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream, and the perception of the condition by motorists. In 1994, the PA 41 corridor was classified as a rural principal arterial. Rural principal arterials should generally be designed for LOS B; however, LOS C can be acceptable in some instances (American Association of State and Highway Transportation Officials [AASHTO] 2004). From a rural two-lane capacity analysis, it was determined that in the peak period, PA 41 was expected to operate in base year conditions at LOS E south of PA 841, except in Avondale which was expected to operate at LOS F, and LOS D north of PA 841 (**Table 2.1**). Using the year 2020 forecasted traffic volumes, similar LOS were expected.

Table 2.1 – Level of Service for the PA 41 Project Study Area (Based on 1994 Evaluations and Rural Analysis)

Segment	1993 ADT[1]	LOS[2]	2020 ADT	2020 LOS No-Build
PA 926 to PA 841	13,100	D	18,000	E
PA 841 to Baltimore Pike (west)	12,800	E	19,300	E
Baltimore Pike (west) to Baltimore Pike (east)	18,600	F	26,100	F
Baltimore Pike (east) to Limestone Road	13,900	E	20,800	E

[1] ADT – Average Daily Traffic
[2] LOS analysis based on roadway segments and the rural nature of the corridor.

Four signalized and seven unsignalized intersections along PA 41 were also analyzed in terms of operating conditions. The LOS for a signalized intersection depends on traffic volumes, signal timing and vehicle progression. For unsignalized intersections, the LOS is based on the availability of gaps in the major street traffic. In year 2020, the

signalized intersections were expected to operate in LOS D or above, while the unsignalized intersections were expected to operate in LOS E or below.

2.1.3 Infrastructure

For the 1994 Needs Study, field observations were conducted along the PA 41 study corridor to assess the existing roadway conditions. The existing infrastructure deficiencies identified are listed as follows:

- Poor pavement condition through the study area.
- The existing shoulders were in poor condition and ranged in width from zero to six feet. These existing narrow shoulders make it difficult for farm equipment to use PA 41.
- Ten intersections along PA 41 in the study area had intersection geometric deficiencies.
- Sight distance deficiencies were located at the intersections of PA 41 with PA 841, Sixth Street, and Church Street.
- Uncontrolled access to adjacent properties existed along PA 41. Uncontrolled access to existing properties causes an interruption in the traffic flow along the corridor, as well as safety deficiencies due to inconsistent turning movements.
- Fixed objects (telephone poles, retaining walls, etc.) were located within the clear zone throughout the corridor. These fixed objects inhibit the motorist's ability to safely recover if inadvertently traveling off the roadway.

2.1.4 Modal Interrelationships

In 1994, there are few choices offered in this corridor apart from motor vehicular transportation. No commuter rail service existed and there was only limited bus service. The nearest park-and-ride lot was located two miles south of the Pennsylvania State line in Delaware. This park-and-ride lot was serviced by the Delaware Administration for Regional Transit (DART). The closest Southeastern Pennsylvania Transit Authority (SEPTA) routes included the R5 rail line in Parkesburg and bus service in West Chester. At that time, SEPTA did not have plans to extend service to the Avondale area.

2.2 Corridor Context and Need (1999 Evaluations)

To address the purpose and need of the PA 41 Project as defined in the 1994 Needs Study, several alternatives were developed. In 1999, a reevaluation of the project needs appeared in the *Phase I Preliminary Alternatives Analysis, SR 0041, Section STY, Avondale Transportation Improvement Project, Chester County, Pennsylvania* (PAA). The reevaluation presented in the PAA affirmed the project needs as stated in the 1994 Needs Study. In general, to address capacity and safety, based on the rural classification of the roadway it was decided to evaluate the benefits and impacts of four lanes of roadway between the Delaware State Line and the intersection of PA 41 with PA 926. Alternatives developed included widening on the existing alignment and the consideration of bypass roadways around Avondale Borough and the Village of Chatham (refer to **Appendix A – 1999 Alternative Alignment Plates**).

2.3 Corridor Context and Need (2009 Evaluations)

2.3.1 Current Corridor Context

PA 41 is a basic two-lane road with an occasional turn lane at select intersections and has three areas with truck climbing lanes (north of Section STY). It is listed on the National Highway System and is classified as an arterial roadway. The speed limit is generally 45 mph with a reduced speed of 35 mph posted in Avondale Borough, and the Villages of Chatham and Cochranville. Near the US Route 30 intersection, PA 41 traverses through a commercial area where a three-lane section exists. US Route 30 from Gap to PA 896 is generally a three-lane roadway with a center turn lane. Its posted speed limit also varies from 35 to 45 mph as it transitions through several "built-up" areas. US Route 30 west of PA 896 is a three-lane signalized corridor for several miles before turning into a limited-access freeway system.

A report was completed in 2002 by the Lancaster County Planning Commission that studied traffic and roadway characteristics from Delaware to Harrisburg, PA. This *Wilmington-Harrisburg Freight Study* (WHFS) included PA 41, US Route 30, and PA 283. The study concludes that while much freight traffic is on this corridor, the majority of the trips are local to the Wilmington-Harrisburg corridor and are not longer haul trips. In fact, interviews indicated that less than 10 percent of the Port of Wilmington truck traffic on the study corridor roads makes the entire trip from Wilmington to Harrisburg. The study also concludes the impact on truck traffic will be minimal if congestion is only reduced in section STY of PA 41.

The above discussion indicates that the section of existing PA 41 (Section STY) under study is currently consistent with the roadways at its logical termini and beyond. While PA 41 does carry a large number of regional trips, it also serves many local trips and property accesses. The current function of PA 41 is a mix between an arterial and a collector functional classification. An arterial's function is to move traffic long distances between major activity areas without providing emphasis on land access. A collector road provides both land access and traffic circulation.

To determine if the function of PA 41 would be expected to change in the future, several planning resources were referenced. These are discussed below.

- **Chester County Transportation Priority Projects 2009** – This report was presented by Chester County representatives to the State Transportation Commission at a public hearing for development of the FY11 Twelve Year Program in September 2009. PA 41 Corridor Safety Improvements was listed as a priority roadway project.
- **Chester County Transportation Improvement Inventory (TII) 2009** – Adopted by the Chester County Planning Commission (CCPC) in July 2009, the TII lists PA 41 from the Delaware State Line to PA 926 for safety improvements under the category of "Major corridor Projects (Funded or Partially Funded)." The TII also lists several other identified transportation needs within the study area, including intersections improvements, a park-and-ride lot at US 1, and a bike lane project along Old Baltimore Pike between Avondale and West Grove.
- ***Landscapes2*: Chester County's Comprehensive Policy Plan** – Adopted by the Chester County Commissioners in November 2009, this plan establishes a blueprint for bringing growth and preservation together in Chester County.
    - **Livable Landscapes:** One of the main elements of the plan is the Livable Landscapes mp, which designates growth areas and rural resource areas. The PA 41 Corridor south of US 1 is designated as a growth area and is defined as a "Suburban Center Landscape" from US 1 to Avondale, "Urban Landscape" within Avondale Borough, and "Suburban Landscape" from Avondale to the Delaware State Line. The Corridor north of US 1 is designated as a rural resource area and is defined as "Agricultural Landscape" with Chatham area identified as a "Rural Center."
    - **Transportation Policies:** PA 41 and US 1 area identified as a "Major Freight Corridors" and US 1 is also identified as a "Major Multi-Modal Corridor." These designations are related to the need for close coordination between various transportation modes and surrounding land uses that are served and supported.

- ***Pennsylvania Mobility Plan*: Statewide Long Range Transportation Plan** – Completed by PennDOT and a 75-member stakeholder Development Team in June 2007, the plan establishes a vision for the State's multimodal transportation system through the year 2030. The plan defines transportation direction and establishes priorities through five goals, which include moving people and goods safely and maximizing the benefit of transportation investments. In the previous statewide plan (PennPlan MOVES!) completed in 2000, the PA 41 corridor was explicitly listed as part of the "Keystone Corridor" and the plan called for enhanced safety and reduced congestion.
- ***Connections 2035*: DVRPC's Long Range Plan** – Adopted by the DVRPC Board in July 2009, this regional long range plan serves as a vision for the Greater Philadelphia region, including Chester County. It is based on core principles of managing growth and protecting resources, creating livable communities, building an energy-efficient economy, and modernizing our transportation system. It serves as a blueprint for investments in the transportation system over the next 25 years. Below are several aspects of the plan that are closely related to the land use context and transportation investments for the PA 41 Corridor:
  - **Land Use Plan:** The PA 41 Corridor south of US 1 is identified as an area of "Existing Development" and "Future Growth," with the exception of the E. Branch of the White Clay Creek identified as part of the "Greenspace Network." North of US 1, the Corridor is predominately identified as "Rural Conservation Lands." The designations are a change from the previous Long Range Plan (*Destination 2030*) that identified the entire study area as predominately "Rural Conservation Lands" and "Greenspace Network."
  - **Planning Areas and Centers:** London Grove and New Garden Townships are identified as "Growing Suburbs" and Avondale is identified as a "Developed Community" and "Rural Center." Londonderry Township at the northern end of the Corridor is identified as a "Rural Area." This is consistent with the previous Long Range Plan (*Destination 2030*) designations.
  - **Major Regional Transportation Projects:** The PA 41 Corridor is not listed as a Major Regional Transportation Project in *Connections 2035*. This is a significant change from the previous Long Range Plan (*Destination 2030*) that listed PA 41 as a Major Regional Transportation Project providing new highway capacity.
- **Lancaster County Long Range Plan (2008)** - This draft document indicates that a corridor project for US Route 30 from Gap to PA 896 is planned with preliminary engineering not funded until after 2017 with construction not prior to 2025. A smaller project to enhance the US Route 30/PA 41 intersection is on the plan for year 2009.

These documents do not indicate that the role of PA 41 in Chester County or its region will change significantly in the future. No plans to widen PA 41 in Delaware exist, and no plans to widen PA 41 north of PA 926 exist on the long range plans. US Route 30 may see capacity improvement, but the nature is not known and will not be known for some time. This shows that the PA 41 corridor from its beginnings in Delaware to its terminus at US Route 30 will generally remain a two-lane road. Whatever option is chosen for the current study area should blend into this system at a minimum at the project termini, if not the entire length.

Clarification:
For planning purposes the study area south of Route 1 is categorized as "suburban." For transportation and census designation, the same area is categorized as "urban." In both cases the area has changed from rural to an area with greater development.

2.3.2 Current Project Needs Analysis

The needs analysis for the PA 41 Project between PA 926 to the north and the Delaware State line to the south was originally completed in 1994. More recent changes in existing and planned land use in the project study area, changes in design setting from rural to urban in the portion of the project south of US Route 1, implementation of intersection improvements in the corridor, and changes in the financial resources available for transportation solutions in Pennsylvania have led to a change in the assessment criteria for this project and require a re-evaluation of the project's purpose and need. Development pressures are placing increasing demands on the existing transportation system. Municipalities comprising the corridor have expressed concern over the volumes of regional through and local traffic and how it is affecting safety throughout the corridor, the environment, and the quality of life of local communities. The following describes the current project purpose and needs.

2.3.2.i Project Purpose

The primary purpose of the PA 41 Project is to provide a safe, efficient and affordable means of accommodating the regional movement of people, goods and services and to provide for local access connections to support the existing communities, businesses, and planned development while minimizing impacts to the community and environment. In order to achieve a safe and efficient transportation network, the following conditions must be met: the study area roadways must provide a highway system that promotes safe, multimodal access to local facilities, the intersections must operate in an acceptable manner, the infrastructure should provide a sound and efficient facility, and the improvements should accommodate reasonable projected traffic volumes.

2.3.2.ii Project Needs

PA 926 Intersection to Chatham	
Observations	**Possible Solutions**
• Sight Distances are bad at PA 926 as well as White House Road from both side roads • Trucks have difficulty reaching top speed by top of crest when pulling out from PA 926 and turning onto PA 41 northbound	• Signalize intersection if it meets ___. • Add street lighting. • Add rumble strips on PA 41 over crest on PA 41 southbound just north of PA 926. • Realign PA 926 so it is not skewed. • Increase sight distance (signage is also blocking sight distance at the PA 926 intersection). • Add warning (flashing yellow) lights. • Add W-series warning signs. • Prohibit turns and redirect them to safer places. • Possibly use a three-lane section from PA 926 to US 1 with turn lanes where needed and two double-yellow stripes where possible. Rumble strips could be used on the double yellow.
PA 841 Intersection and the Chatham Area	
Observations	**Possible Solutions**
• Same general issues as PA 926 intersection to Chatham. • PA 841 intersection is confusing and misaligned.	• Remove island at PA 841 on the south side as it is too narrow. • Add transverse rumble strips going into Chatham on both sides (particularly southbound) to slow down vehicles. • Add curb/sidewalk to narrow up the road way and make it feel like a town (road diet). • Use gateway treatments. • Narrow the roadway. • Signalize PA 841 intersection if it meets warrants • Better channelization is needed to funnel the PA 841 intersection. • The existing pavement markings do not line up and/or some dashed white lines need to be added through curve and intersection area to better guide vehicles through the PA 841intersection. • Roundabout at PA 841. • Use a bypass.

Improve Safety Conditions

In May 2008, PennDOT, Federal Highway Administration, DVRPC and Chester County Planning Commission and the local State Police conducted a safety audit of the project area. The purpose of the audit was to evaluate the Corridor for safety issues and concerns. **Table 2.2** outlines the identified safety concerns and possible solutions.

Table 2.2 – Safety Audit Outline

Overall Corridor Comments		
Observations	**Possible Solutions**	**General Comment from the Trucking Industry**
• Side streets are too narrow at intersections with PA 41. • There are few/no advance warnings for side streets. • Numerous of skid marks were observes throughout corridor. • Travelers are getting mixed signals throughout corridor. PA 41 is not consistently designed (varied speeds, varied roadway widths, varied surroundings, etc.) • Speeds on PA 41 make it difficult to pull-out, especially for trucks. • New developments with more access points have come in since the corridor was originally designed. • Numerous folding stop signs were observed at the signalized intersections. Why are they there? Is power failing often?	• Safety grants. • Grants for local police. • Safe pull over areas for police. • Most thought reducing shoulder width outside of towns was not a good option, particularly in the rural areas. • Provide wider shoulders at the intersections so that vehicles can pass on the right safely. • Widen side road throats to make it easier to turn. • Truck routes around Avondale and Chatham? • Provide areas for police enforcement. • Use raised pavement marker for visibility on double yellow (DY); however review how it would work with the rumble strips.	• Provide left-turn lanes at Sunny Dell Road, Sharp Road, State Street, and Woodview Road. • Provide better coordination of signals in Avondale.

Table 2.2 – Safety Audit Outline (cont.)

Woodview Road/US 1 ramps	
Observations	**Possible Solutions**
• Same general issues as other areas. • Seems unsafe to make a left turn traveling PA 41 southbound.	• Need left turn lane on NB and SB • Side street throat needs to be larger at Woodview Road. • Signal timing adjustment at interchange ramps.
Avondale Area	
Observations	**Possible Solutions**
• Roadway is too large (currently no edge stripe so appears like 17' lane). • Inconsistent usage of curb and sidewalk, stranded small pieces of curb seem to be obstacles more than anything. • Cross walks are worn off at State Street as well as other areas. • State Street need pavement repaired. • Too many signs at Baltimore Pike (south). • Too many signals and they are not labeled at Baltimore Pike (south) (e.g. the 5-head right turn signal westbound needs "right turn signal" sign). • Signs are too low (especially for pedestrian clearance).	• Narrow roadway by using stripes, add bike lane or other). • Research DVRPC Bike lane project. • Use three lane section through Avondale. • Possibly maintain on-street parking for future use. • Use southbound gateway treatment. • Focus on access management. • Install center left turn lane from Baltimore Pike to Ellicott Road. • Need to close off access to abandoned store that is right up against the railroad tracks before the property is bought and reopens. • Can we restrict turns at Ellicot? • Can we restrict turns from Baltimore Pike and make them use Penn Green instead? • Advance signing for intersection (w-series). • Close 1st street. • Clean up signing, pavement markings, etc. particularly at Baltimore Pike (south).

Penn Green and Newark Road Intersection	
Observations	**Possible Solutions**
• Penn Green paint is wearing off. • Check crest sight distance on Penn Green Road west of PA 41. • Pedestrian accommodations lacking. • Left-turning vehicles on the side streets are waiting out in the intersection waiting to turn and through trips are going around them by passing them on the right causing safety problems and confusion at the intersections.	• Need left turn phases on PA 41. • Make through/rights instead of through/lefts on side streets. • Add nearside signals due to the high percentage of trucks. • Add signal ahead sign or red signal ahead light in advance in northbound direction because of the steep grades. • Add beacons at Newark Road because it is the first signal that you reach coming from Delaware. • Check to ensure volume/density operation. • Provide longer yellow times/all red times is needed. • Add westbound right-turn lane at Penn Green Road.
Sunny Dell Road Intersection	
Observations	**Possible Solutions**
• Why was the signal taken out? Was it permanent? Was the signal warranted?	• Align Sharp/Sheehan Road and Sunny Dell Road.
Sharp Road Intersection	
Observations	**Possible Solutions**
• Signing problems. • Two stop signs create confusion. • No channelization.	• Cul-de-sac Sheehan? • Create 2 separate intersections on PA 41? • Realign one into the other? • Could use channelization.
Limestone Road Interchange	
Observations	**Possible Solutions**
• Existing sight distance problem because of the bridge abutment. • Angle of northbound on-ramp seems like yield, but yet is stop controlled. • Overall poor geometry.	• Needs an acceleration lane for the northbound ramp or square the intersection to increase sight distance. • Get rid of grade separation and make it a standard intersection. • Cut off local road to east.

For a 5-year period (2003-2007), 314 crashes occurred. Of these crashes, 37 percent were angle crashes and 35 percent were rear-end crashes. The high occurrence of these two crash types is indicative of a corridor with a high number of turning movements and high number of intersections and driveways. The next highest crash type was hit-fixed-object (HFO) at 10 percent, and then head-on and sideswipe together comprising 11 percent. Also of these 314 crashes, there were nine involving fatalities, 154 involving injuries, and 151 had only property damage or were unknown.

To see how PA 41 compared to similar highways, nine roads with similar traffic, roadway, and roadside features were chosen throughout Pennsylvania for comparison (**Table 2.3**). A summary of this comparison for 2003-2007 is shown below. The comparison shows that PA 41's overall crash rate is slightly above the average, while its fatality rate is twice the average. While the percentages of rear-end, angle, and hit-fixed-object crash varied, these three crash types were always the three highest percentages for all roadways analyzed.

Table 2.3 – Comparison of Crash Statistics

Crash Category	Route 41 Corridor	Average of Nine Similar Roads
Crash Rate (crash per million vehicle mile traveled)	1.20	1.10
Fatality Rate (fatality per million vehicle mile traveled)	0.046	0.020
Percentage Angle crashes	37	21
Percentage Rear-end crashes	35	35
Percentage hit-fixed-object crashes	14	24

Of utmost concern is that nine fatal crashes (11 fatalities) occurred during this 5-year period. These fatalities are spread throughout the corridor and are not grouped at specific locations. As shown in the table above, PA 41's fatality rate is twice the average of the comparison discussed above. When comparing PA 41's fatality rate to the overall statewide average for similar roads, PA 41's rate is approximately four times the average.
To determine where the crashes were occurring, each individual crash occurrence was plotted on the project mapping to determine the high crash areas (refer to **Appendix B – Crash Statistics Plates**). Most crashes are occurring at the major intersections and in the Borough of Avondale, including:

- Limestone Road northbound on-ramp
- Sharp Road Intersection
- Sunny Dell Road Intersection
- Newark Road intersection
- Penn Green Road intersection
- Avondale Borough
- Baltimore Pike (northern) intersection
- PA 841 intersection in Chatham
- PA 926 intersection

Approximately 60 percent of this project corridor is experiencing crash rates below the statewide average for similar roads. Another 30 percent is operating at rates one to two times the statewide average, while 10 percent is experiencing crash rates greater than two times the statewide average. This comparison indicates that the overall safety concern is localized at specific areas.

Safety associated with vehicular speeds is a concern for this corridor. Spot speeds studies completed in October 2007 show that average speeds are well above the posted speed limit, particularly north of US Route 1. Of the 314 crashes, 31 percent involved either a driver action of "too fast for condition" or "tailgating".

Accommodate Future Corridor Mobility

PA 41 is utilized as a regional through highway and a local access road. It passes through several communities and provides access to residential areas, businesses (especially the mushroom industry) and community facilities. PA 41 serves both regional commuting traffic between Pennsylvania and Delaware and the regional truck traffic into southern Chester County, central Pennsylvania, and beyond. Also truck traffic includes numerous "wide-loads" observed frequently along the corridor. During the warmer months it serves as a recreational route for the "beach traffic". Traffic counts, even in October, show this trend as more traffic used PA 41 on the weekend than on a typical weekday. PA 41's regional significance is such that it is recognized as part of the National Highway System.

In order to assess this future mobility need, travel time studies were conducted on PA 41 during the AM, PM and off-peak hours (midday) between PA 926 and the Delaware State Line in October 2007. Average Vehicle Method as described in ITE's *Manual of Transportation Engineering Studies* were utilized. The following table summarizes the average of six test runs in each peak per direction.

Table 2.4 - Travel Time Study Results

Direction	Distance (miles)	Time at Posted Speed Limit (minutes)	Average Actual Travel Time		
			AM (minutes)	Midday (minutes)	PM (minutes)
Northbound	10.5	14.4	15.7	15.2	15.5
Southbound	10.5	14.4	16.6	16.4	17.0

For the southbound direction, the majority of the delay is from US Route 1 south to Baltimore Pike on the south side of Avondale. Small amounts of additional delay are observed south of Avondale. North of US Route 1, travel speeds are consistently higher than the posted speed limit and no delay is typically encountered.

For the northbound direction, the delay starts to grow near Newark Road and continues to increase to US Route 1. North of US Route 1, minimal delay, if any, over the posted speed limit is observed as speeds are typically higher than the posted.

Also, overall the past ten years the Chester County Planning Commission has collected travel time data along PA 41 through the entire County on a yearly basis. In 1998, these studies showed the average peak hour speed to be 41 mph. Since then the average speeds have fluctuated between 36 and 41 mph with no significant trends or changes. In 2009, the average speed was 38 mph.

Since delay is not observed throughout the study area, these travel time results again point to site specific, not corridor wide concerns as for much of the trip along PA 41, motorists are traveling at or above the posted speed limit.

PA 41 also services numerous driveways and businesses and intersections. From the Delaware State line to PA 926, approximately 240 driveways or intersecting roads exist in approximately 10 miles. This high number of connections creates conflicts between the through and local trips. The lack of turning lanes and narrow shoulders force vehicles to queue behind turning vehicles. This line of vehicles can become lengthy because few gaps exist in the oncoming traffic stream for utilization by turning vehicles. Also, it is becoming quite difficult for left-turns to be made from driveways, businesses and intersecting roadways onto PA 41 due to the steady traffic volumes. Seventy-two (72) percent of the crashes associated with this transportation concern are rear-end or angle crashes which further stress the need for defining and clarifying access related issues on this project.

Both commercial and residential development continues to expand in the project study area as part of defined land use planning by the local municipalities. This growth will continue to create local access issues within the PA 41 study corridor that must be addressed as part of the transportation solution. As the traffic volumes and development pressure continue to increase, the conflict between the through trip expectations and local access will continue to increase.

Multi-modal considerations are also part of corridor mobility. Pedestrian and biking facilities and networks will be a consideration, and commuter facilities, such as park and ride opportunities, will be factored into this assessment. A Bike Lane Project planned and designed for Old Baltimore Pike is slated for construction this spring. The project includes stripping a lane for bikes along Old Baltimore Pike and will include the section of Route 41 where it shares a right-of-way (ROW) with Old Baltimore Pike.

Improve Intersection Operation

Previous studies focused the traffic operational analysis on roadway segments and not intersections due to the rural nature of the corridor. However, with the change in corridor context and the addition of more signalized intersections, the traffic flow characteristics and the motorist expectations have changed. In a rural, open road, environment motorists do not expect delays and desire free-flow conditions. Even a small amount of delay can cause driver frustration and decrease their LOS. However, in a more urban setting with numerous signalized intersections, motorists expect delays and can tolerate more disruptions without getting frustrated. Therefore more delay can be tolerated within the acceptable LOS limits. With this change, the more

appropriate way to analyze the PA 41 traffic operations is with intersection analyses and not roadway segments.

During the fall of 2007, 25 intersection counts were conducted as part of the most recent traffic analysis. Counts included documenting where vehicles were turning over an 8-hour time frame. The traffic volumes were projected to 2009 by using a 1.3 percent per year growth rate and then these counts were then used in the level-of-service (LOS) analyses. The 1.3 percent per year growth rate was determined in consultation with the Delaware Valley Regional Planning Commission (DVRPC) and was based on historic trends of the area coupled with future growth projections of the area. Of the 25 intersections studied, none of the intersections currently operate in LOS F, while seven intersections have one or more movements that operate in LOS E or F, which supports a need for intersection improvements (refer to **Appendix C – Level of Service Plates**). For suburban/urban areas, LOS D is generally recognized as the threshold for acceptable LOS.

To evaluate no-build conditions, a 1.3 percent per year growth rate was used to project the traffic to year 2030. Based upon these preliminary traffic volumes, four intersections either would operate in LOS F or be over capacity. These intersections are PA 41/State Street, PA 41/Baltimore Pike (south of Avondale), PA 41/Newark Road, and Limestone Road/Southwood Road. However, 16 of the 25 intersections studied have one or more movements that would operate in LOS E or F, or are over capacity, which supports a need for intersection improvements throughout the corridor.

Improve the Existing Infrastructure

Based on PennDOT's Roadway Management System (RMS), the original concrete pavement of PA 41 has been overlaid two times in the last 10 years following an 8 to 10 year cycle. To further investigate the pavement condition, PennDOT's Systematic Technique to Analyze and Manage Pennsylvania Pavement (STAMPP) data was referenced. The latest pavement survey was completed in August 2007. For the area south of Avondale, paving was completed in 1976, 1986 and 2006. The pavement survey in 2007 indicates cracking and rutting are typically less than two percent of the pavement. For the area north of Avondale, paving was completed in 1986, 1999, and the fall of 2007. The pavement survey in 2007 prior to the repaving showed almost no cracking and six percent rutting. Therefore, based on the condition of pavement overlays between 2000 and 2007, the need for full depth reconstruction has been eliminated.

Another infrastructure concern is the deteriorating sidewalk system in the towns and lack of pedestrian accommodation elsewhere. In addition, four bridge structures exist on PA 41 in the study area. The following summarizes their condition:

- Bridge over Limestone Road - sufficiency rating of 67.9
- Bridge over tributary to White Clay Creek - sufficiency rating of 91.7
- Bridge over White Clay Creek - sufficiency rating of 41.0
- Bridge over US Route 1 - sufficiency rating of 79.8

A sufficiency rating below 50 qualifies for federal replacement funds. A rating between 50 and 80 qualifies for rehabilitation funding. The sufficiency rating is a method of evaluating factors which indicate a bridge's sufficiency to remain in service. The ratings range from 100 percent (entirely sufficient bridge) to 0 percent (deficient bridge). Many factors such as the structure's adequacy and safety, the serviceability and functional obsolescence, and the essentiality of public use are used in the rating. These ratings indicate that there is a need for bridge rehabilitation /reconstruction along the corridor.

The 1994 Needs Study referenced geometric and shoulder deficiencies as an infrastructure need. However, the need was based on the principle that the roadway features did not meet current PennDOT design criteria. Today, this does not constitute a project need since "the inclusion of specified design criteria in this Manual does not imply that existing roadways, which were designed and constructed using different criteria, are either substandard or must be reconstructed to meet the criteria contained herein. Many existing facilities which met the design criteria at the time of their construction are adequate to safely and efficiently accommodate current traffic demands." (PennDOT Design Manual 2). Basically, this need is replaced with the current spot-specific safety and intersection needs.

2.4 Preliminary Alternatives Development (through 1999)

As previously noted in **Section 2.2**, the *Phase I Preliminary Alternatives Analysis, SR 0041, Section STY, Avondale Transportation Improvement Project, Chester County, Pennsylvania* (PAA) (PennDOT 1999) presented several alternatives to address the project needs as stated in the 1994 Needs Study. These alternatives included online (existing alignment) widening to four lanes, or a combination of online widening with four-lane bypass alternatives around Avondale and the

Village of Chatham (London Grove Township) as well as regional alternatives. These alternatives are listed below and depicted on the plates in **Appendix A – 1999 Alternative Alignment Plates**:

No Build Alternative
Complete Online Widening
Northeast Chatham Bypass
Southwest Chatham Bypass 1
Southwest Chatham Bypass 2
US Route 1 Diamond Interchange
US Route 1 Partial Cloverleaf Interchange
US Route 1 Northbound Flyover Interchange
US Route 1 Southbound Flyover Interchange
Northeast Avondale Bypass
Penn Green Road Alternative
Southwest Avondale Bypass 1
Southwest Avondale Bypass 2
Southwest Avondale Bypass 3
Southwest Avondale Bypass 4
Southwest Avondale Bypass 5
Limestone Road Diamond Interchange
Limestone Road Partial Cloverleaf Interchange
Limestone Road Flyover Interchange
Section 4(f) Avoidance Alternative
Regional Alternative
Railroad Enhancement Alternative

In general, to address the deficient rural two-lane level-of-service results, it was decided that the design would include four lanes of roadway between the Delaware State Line and the intersection of PA 41 with PA 926. However, since the time of the 1999 PAA, both the corridor context and project needs have changed. These changes were discussed in **Section 2.3**.

In general, in the 10+ years since the original analysis was completed, the corridor has not experienced a significant change in traffic volumes or travel time as originally predicted. The travel time studies completed by Chester County, discussed in **Section 2.3**, show this "no change" in travel time. During that 10 year period, PennDOT, municipalities, and/or private developers have invested in the corridor with intersection improvements at eight locations and have repaved the corridor in 2006 and 2007. Additional safety improvements such as center and edge line rumble strips have been added to the corridor. The number of roadway segments that exhibit crash rates greater than the statewide average has been reduced. Additionally, based on the condition of pavement overlays between 2000 and 2007, the need for full-depth pavement reconstruction has been eliminated.

In conjunction with the corridor needs assessment changing, the corridor context has changed from the rural two-lane highway setting to the urban/suburban conditions of a signalized corridor with development pressures. While the traffic forecasts from the 1999 PAA have not been realized in the corridor, a sizeable amount of development has occurred. Several housing developments have started just west of Avondale, a shopping center has been built just south of the PA 41/ US

Route 1 interchange, and several single commercial developments such as Wawa, CVS and Walgreens have been constructed within the corridor. Additionally, the corridors north and south of the project study area remain two lane roadways.

Based on the current corridor conditions and an urban/suburban setting, the appropriate traffic analyses should be based on intersection operations, not roadway segments. In a more urban-like setting, such as this corridor, the intersections of the corridor regulate the flow of traffic. Current traffic studies along PA 41 show that capacity issues do not exist between the intersections, but rather are present only at intersections. Based on current needs, four travel lanes are not needed throughout the corridor, but safety and additional capacity is needed at some key intersections. For these reasons, the four-lane options previously studied are not exclusively required as the 1999 PAA stated, and therefore all the options studies in the 1999 PAA are dismissed at this time. This does not mean that similar versions, or even the same options, cannot be studied as part of the current options analyses presented later in this document (**Section 5.0**), but rather the options to be studied should be consistent with the updated project needs and corridor context.

3.0 Environmental Features

The following sections, **3.1 Socioeconomic Context, 3.2 Natural Resource Context, 3.3 Cultural Resources Context** and **3.4 Other Environmental Considerations** describe the existing condition or context of the study area. The information presented below is based on detailed studies completed in 2003. A windshield survey was completed in 2009 to review and update the detailed studies. The information presented is meant to provide a general context for the development of transportation improvements that address the needs identified in **Section 2.0**.

The significant features on the study area that will likely need to be considered in developing a transportation improvement are the planned and future developments, the exceptional value streams and floodplains, endangered and threatened species, agricultural resources and historic resources.

3.1 Socioeconomic Context

Socioeconomic data collected for the study area included an analysis of demographics, land uses and land use plans, and comprehensive plans of the four townships and one borough in the study area. These municipalities, from north to south include the townships of Londonderry and London Grove, Avondale Borough, and the townships of New Garden and Kennett (**Appendix D**).

The method used to complete this evaluation included a literary review of documents and statistics from the U.S. Bureau of the Census, the Chester County Planning Commission (CCPC), the Delaware Valley Regional Planning Commission (DVRPC), municipal planning agencies, school districts, local residents, and field views of the study area.

3.1.1 Population and Housing

The following population figures were prepared by the DVRPC in conjunction with the CCPC, but are based on the U.S. Census 2000. The DVRPC prepared the population projections using a combination of accepted methodologies that are detailed in the technical files.

From 1980 to 1990, the population of Chester County increased by 18.9 percent and from 1990 to 2000 it increased by 15.2 percent. Population forecasts indicate that Chester County will continue to experience a population growth of

approximately 21.7 percent between the years of 2000 to 2020 and an increase of 14.7 percent between 2020 and 2030 **(Table 3.1)**. Of the study area municipalities, London Grove Township is expected to have the highest population growth at 80.2 percent between 2000 and 2030, with Londonderry and New Garden Townships and Avondale Borough projected to grow at 76.8, 69.5 and 52.2 percent respectively. Although only a small portion of Kennett Township is in the study area, the municipality is projected to grow 47.9 percent. Avondale is characterized by medium density mixed land use. The Census projected increase of 580 people over 30 years appears to be high. Discussions with the Mayor of Avondale confirm that the projected increase in population may be high given that most of the undeveloped land in the Borough lies in the floodplain. There are, however, two townhouse developments underway that could add as many as 254 housing units to the borough. One development is currently under construction and is to be built out at 54 units; the second townhouse development is still in the planning phase (200 units) and is to be located in an area currently in use as an active mining site.

Table 3.1 – Population Forecasts for Study Area Municipalities

Municipality	1980	1990	2000	2010	2020	2030	% Change from 2000 to 2030
Chester County	316,660	376,396	433,512	505,095	527,623	605,271	39.6
Kennett Township	4,201	4,624	6,450	7,907	8,741	9,541	79.9
New Garden Township	4,790	5,430	9,080	12,152	13,848	15,393	69.5
Avondale Borough	891	954	1,100	1,149	1,432	1,690	52.2
London Grove Township	3,531	3,922	5,265	7,141	8,367	9,485	80.2
Londonderry Township	1,293	1,243	1,630	2,226	2,569	2,882	76.8

Source: DVRPC, July 2007
U.S. Census Bureau, Census 2000

DVRPC population data and forecasts **(Table 3.1)** show that municipalities in the corridor (with the exception of Avondale Borough which was already a largely built-out local constrained borough) grew at a rapid pace between 1990 and 2000. In the 1980s, the area grew more slowly than the County as a whole. During the 1990s, however, the corridor municipalities began to grow at a more rapid pace than the County. The rapid increase in population for the study area municipalities may be varied, but clearly it is mainly due to the substantial employment growth in the Wilmington, Delaware, and Philadelphia metropolitan areas which consequently drove the continued suburbanization

of the areas surrounding these metropolitan areas. This growth began in the southeastern half of the PA 41 corridor (southeast to US Route 1) which is close to Wilmington and highly accessible to it. The PA 41 corridor became a focus of development pressures for residential construction as a result of Wilmington's economic vitality. This trend was strengthened by the corridor's accessibility to Delaware, principally via PA 41, and to central Chester County and Delaware County via US Route 1. Favorable conditions for development in the corridor also included significant acreage of available land suitable for residential construction with on-site sewage systems that are now at or above capacity, relatively few constraints in terms of topography and natural features, and supportive local development regulations.

Population forecasts **(Table 3.1)** show that the corridor municipalities' growth will continue at a much higher rate than the County. Population is anticipated to occur at a higher pace in London Grove and Londonderry Townships as development pressures increase in the northwest half of the corridor.

In the 1980s, Chester County outpaced the corridor municipalities in housing unit growth **(Table 3.2)**. Kennett followed by New Garden and London Grove Townships exhibited the most housing unit growth within the corridor. In the 1990s, New Garden witnessed the highest growth rate in housing units followed by Kennett, London Grove, Londonderry and then Chester County. Between 2000 and 2008, London Grove exhibited the highest growth rate followed by Londonderry, New Garden and Kennett Townships. The trend within the study area has been an increase in residential land use over the last two decades. Development pressures continue to push residential construction northwestward along the corridor. It is forecasted that there will continue to be an increase in the number of residential housing units and an associated decline in the amount of agricultural land. This will result in ever increasing pressures on the mushroom, corn, and other agricultural operations in the study area. The study area lacks supporting infrastructure, such as water and sewer service, to support many of the planned developments. As a part of the municipal development approval process, new developments must adequately demonstrate the ability to provide proper water and sewer services to the proposed project.

Table 3.2 Housing Units and Land Area by Municipality

Municipality	Land Area		Housing Units				Percent Change			
	Acres (2000)	Sq. Mile (2000)	1980	1990	2000	2008 Estimate*	1980-1990	1980-2000	2000-2008	1980-2008
Chester County	486,064	759.48	110,183	139,597	163,773	194,978	26.7	17.3	19.1	76.9
Londonderry Township	7,347	11.48	386	448	539	754	16.1	20.3	39.9	95.3
London Grove Township	11,070	17.30	1,115	1,310	1,698	2,539	17.5	29.6	49.5	127.7
Avondale Borough	313	0.49	324	347	350	356	7.4	0.9	1.7	9.9
New Garden Township	10,194	15.93	1,549	1,778	2,831	3,936	14.8	59.2	39.0	154.1
Kennett Township	9,929	15.51	1,516	1,835	2,526	3,141	21.0	37.7	24.4	107.2

Source: Chester County Planning Commission, 2008 Population Estimate Data
Source: Population Division, U.S. Census Bureau, Release Date of July 1, 2009
* - Based on adding the number of new housing units from 2000 to 2008 to the number of housing units in 2000 from the US Census.

3.1.2 Land Use and Comprehensive Planning

Information on existing and proposed land use, zoning, and comprehensive planning was gathered through available DVRPC, CCPC and municipal planning documents and interviews with planning officials. The existing planning related documents are listed in the references section of this document (**Section 6.0**). Generally, with the exception of Avondale Borough, the municipalities within the PA 41 Project study corridor have recently adopted updated comprehensive plans, zoning ordinances, and subdivision land regulations. London Grove Township is in the process of adopting an updated comprehensive plan

A substantial amount of land is in agricultural production, some of which is preserved permanently for agriculture through construction easements such as Chester County's easement purchase program, or similar programs sponsored by private land conservation organizations, such as the Brandywine Conservancy.

South of US Route 1 in London Grove, New Garden, and Kennett Townships, and Avondale Borough, are substantial concentrations of urban and suburban residential, commercial, and light industrial uses, as well as agricultural uses, many of which relate to the mushroom industry. Agricultural use is predominant north of US Route 1, with pockets of lower-density residential, commercial, and light-industrial uses concentrated along primary roadways intersecting with PA 41 at the village of Chatham. These urban uses form less than 15 percent of the land area along this segment of corridor.

Existing land use, zoning, and comprehensive plans that contain each municipality's vision serve as critical documents to translate existing conditions into projections for projected and recommended land use. Mapping of existing land use is shown in **Appendix D**. A summary of existing land use in each of the five (5) municipalities in the study area is presented and described as follows:

Londonderry Township (Appendix D Plate 1)

Londonderry Township consists primarily of agricultural land uses with clusters of lower-density, residential areas mixed with commercial uses. The residential and commercial uses are located typically in a linear pattern along the township's roadways, including PA 41. Some light industrial, and two (2) large commercial/office sites occur in the township.

In the northern part of the township, north of PA 41 and adjacent to West Marlborough Township and Highland Township, Londonderry Township is very rural. Occupying approximately 85 percent of the land area, large agricultural tracts define the landscape. Small residential and residential/commercial tracts of land lie along Wertz Road on the northeast border with West Marlborough Township.

Centrally located in the township along PA 41, Fernwood Road, and White Horse School Road, there are a number of large tracts of agricultural lands mixed with commercial/residential land uses, some small wooded areas, one light-industrial facility, and a commercial and office center.

On the eastern edge of the township, near the intersection of PA 41 and PA 926, there is a small cluster of commercial/office and light-industrial uses. This is similar to the pattern found across the municipal line in both West Marlborough and London Grove Townships.

The southernmost section of the township is primarily agricultural, although there are some areas of residential use. Many of these residential areas are clustered in the small community of Daleville and around the intersection of PA 926 and PA 796 (Dalesville-Jennersville Road). Other residential developments have emerged along the southern and western edges of the township.

The southern section of the township has a large wooded area adjacent to residential areas and a large light-industrial site with access from PA 926.

Although agriculture and agriculture-related jobs are projected to decrease due to the continued development of the area, the increase in service jobs to support the increased population is forecasted to outnumber the agricultural job losses. Nonetheless, agriculture is currently the largest land use of the municipalities within the study area. Of the municipalities of the study area, the residential land use category is the second most prominent type of land use.

With regard to future land use, major approved land development plans are limited to major residential developments located west and north of the PA 41/PA 926 intersection.

London Grove Township (Appendix D Plate 1)

Agriculture is still a primary land use in London Grove Township. Croplands form the single largest subcategory in the township, approximately double the existing acreage of land used for pasture. Agricultural operations include mushroom farming, corn production, as well as cattle and horse farms. Also prominent in the township are woodlands, recreational uses, and natural areas.

Residential use forms the largest category of developed acreage in the township including: low-density, single-family dwellings; multi-family dwellings; and mobile home parks. Over 60 percent of the housing stock in London Grove Township is low-density, single-family, detached dwelling built on lots greater than one-half acre. Low to medium density, single-family dwelling situated on lots smaller than one-half acre present about 10 percent of the housing stock and comprise less than one percent of the township land. These areas are clustered around the Borough of West Grove and the Village of Chatham.

The commercial uses in the township are located generally along Old Baltimore Pike between West Grove and Avondale with a few located along PA Route 41 in Chatham. Nearly all are roadside businesses that serve a local

market. A relatively new commercial shopping center complex located between US Route 1 and Baltimore Pike is on the west side of PA 41.

Industrial and institutional uses form less than 2 percent of the available acreage in the township. Industrial uses are located along the railroad tracks, east and west of West Grove along Old Baltimore Pike, along the abandoned railroad tracks, east and west of West Grove along Old Baltimore Pike, and along the abandoned railroad tracks in the Village of Chatham. In addition to churches, schools and municipal facilities, institutional uses include the Stroud Water Research Center, and Chatham Acres, an elderly care facility.

London Grove Township is currently in the process of adopting an update to its comprehensive plan. Approval of the updated plan will be followed by corresponding revisions to the township zoning ordinances and Subdivision and Land Development Ordinances (SALDO) regulations. A Town Center is being planned along PA 41 between US Route 1 and Avondale as part of the township's comprehensive plan update. As discussed, this will require some rezoning which will be undertaken by the township following the adoption of the updated comprehensive plan.

Numerous low to medium density residential and some mixed use developments, located throughout the township, are in various stages of the development approval process. The majority of these developments are not yet approved because they are either still proceeding through the development process, or are on hold due to the lack of sewage capacity at the London Grove Township Municipal Authority Plant. However, township officials anticipate the plant will be "re-rated" soon, allowing for additional capacity and development. In addition, the township may negotiate with Avondale Borough to use some of the borough treatment plants excess capacity.

Approved development plans include:

- London Grove Village - Largely built out, pad sites remain.
- Hills of London Grove – A portion of this single family home development was built, prior to a halt due to the lack of sewage capacity at the township plant.
- Inniscrone PRD – This 6-phase development is under construction. Phases 1, 3 through 6, are approved. Phases 5 and 6 and under construction.
- Briarlea Subdivision – 23 of the 42 single family homes were constructed prior to a halt due to lack of sewage capacity.

- Lamborn Hunt Subdivision – Phase 1 of this 106 single family development has been constructed. Phase 2 is approved but cannot be constructed until the township and municipal authority provide the necessary sewage capacity.
- Fox Chase – 27 of the 53 single family homes were constructed prior to the halt due to lack of sewage capacity.
- Village Greens – 47 homes approved but construction cannot begin until the sewage capacity issue is resolved.
- Green/Porter Subdivision – 75 lots cannot receive final approval until the sewage capacity issue is resolved.

Avondale Borough (Appendix D Plate 2)

Avondale Borough is relatively small and largely residential, with some commercial uses. It also contains areas of agricultural use mostly within the southeastern portion of the community. Single-family, detached dwellings, with some multi-family units are located randomly throughout the borough. However, the majority of the residential uses occur in the western portion of the borough. A few mixed residential/commercial uses occur in the developed portion of the borough, mostly along PA 41.

Other principal uses in the borough include commercial/service/office uses, industrial uses, and a small, dedicated area for recreational use. Most of the borough's commercial/service/office areas and industrial uses exist along the Old Baltimore Pike and PA 41. There are two open space/recreational areas in Avondale; Borough Park along the White Clay Creek, and a green space near Indian Run and the borough's reservoir quarry.

With regard to future land use, two residential townhouse development are planned for the northeast portion of the borough. The smaller of the two consists of approximately 54 units and is under construction. The second development is still in the planning phase (200 units) and is to be located in an area currently in use as an active mining site of special note. The borough recently completed construction of an expansion to their existing sewage treatment plant located on West State Street. This plant currently has excess capacity.

New Garden Township (Appendix D Plate 2)

Although New Garden Township exhibits more suburban uses than most townships in the corridor, agriculture still represents approximately 30 percent of the municipality's land area. Most agricultural uses occur on smaller parcels interspersed with residential, recreational, and wooded areas.

Residential uses represent approximately 20-25 percent of the township's land area, primarily with low- and medium-density, single-family, detached dwellings. However, a smaller proportion of multi-family residential units are present. Some medium-density residential uses are dispersed throughout the township, with several clusters located along Old Baltimore Pike, PA 41, and the Village of Landenberg.

Industrial and commercial uses are located in New Garden Township. Most of the commercial (service/office) and industrial uses exist along Baltimore Pike, PA 41, and Newark Road. Some light-industrial areas exist along the US Route 1 Corridor, scattered throughout the southern portion of the township. The township exhibits concentrations of mixed residential/commercial land uses in select areas, including the Somerset Lake vicinity, the Village of Landenberg, the PA 41 corridor near Avondale Borough, and in the area of the township between Old Baltimore Pike and US Route 1.

The most notable recreational uses are located in the southeastern portion of the township, directly north of PA 41, and in the northwestern portion of the township along US Route 1 Corridor. The New Garden Airfield lies northeast of the Avondale Borough border. In the Somerset Lake vicinity, and near the New Garden Airfield, are a few sizeable natural wooded areas. Smaller natural areas adjacent to residential developments can be found throughout the township.

With regard to future land use, the one major approved development plan is for the White Clay Point Towne Center to be located on the east and west side of PA 41/ Sunny Dell Road intersection. This major retain town center development is to be comprised of commercial and office space with some residential uses, including single family age restricted units.

Kennett Township (Appendix D Plate 2)

PA 41 passes through a small portion of southwestern Kennett Township that is largely agricultural and residential in use. Most of the area consists of smaller agricultural parcels interspersed with a few large agricultural tracts, residential development, and wooded areas.

Very low- and low-density, single-family, detached dwellings are common in this portion of the township, including subdivisions with and without set-asides of permanent open-space. Pockets of medium-density residential areas exist throughout the western portion of the township adjacent to agricultural, recreational, and wooded areas. A smaller number of two-family dwellings are located in this part of the township, and several multi-family residential structures exist along the border with Kennett Square Borough.

Other land uses noted, particularly in this lower western portion of the township, include commercial/services/office, industrial, and wooded areas. Most of this land use lies in the Old Baltimore Pike Corridor around Kennett Square Borough in the northwestern portion of the township. Most of the industrial uses in the township can be found along Old Baltimore Pike on both sides of the Kennett Square Borough line. Woodlands and natural areas are generally interspersed with agricultural and large-lot residential uses.

Less than 20 percent of the township's total acreage is dedicated to recreational, institutional, and utility uses. A portion of this acreage includes small recreational areas adjacent to farmland and natural land areas.

With regard to future land development, there are no approved development plans along the PA 41 corridor.

3.2 Natural Resources Context

3.2.1 Surface Water Resources

The PA 41 study area is located in the White Clay Creek watershed, and is drained by East Branch White Clay Creek, Middle Branch White Clay Creek, Broad Run, Bucktoe Creek, Egypt Run, Trout Run, and several unnamed tributaries. Most of the streams in the study area are considered high quality, as they maintain the designation of exceptional value (EV) or capable of supporting Cold Water Fish (CWF) under Pennsylvania Department of Environmental

Protection regulations. Surface waters located in the vicinity of potential roadway improvements are shown on the plates in **Appendix D**.

The White Clay Creek, including several tributaries and second order streams, was designated as a component of the National Wild and Scenic Rivers System on October 24, 2000. Under the White Clay Creek Wild and Scenic Rivers System Act (Public Law 106-357), 190 miles of river segments of the White Clay Creek and its tributaries have been classified as either scenic or recreational. Within the limits of the PA 41 Project, the White Clay Creek stream sections are classified as recreational river. Recreational uses of water resources in the study area largely consist of fishing opportunities provided by streams in the White Clay Creek watershed. Portions of the East Branch White Clay Creek, Middle Branch White Clay Creek, and Bucktoe Creek are approved trout stocking waters and are stocked by the Pennsylvania Fish and Boat Commission.

Floodplains within the study area are primarily associated with Middle Branch and East Branch White Clay Creek and their tributaries, including Trout Run. Review of navigable waterway inventories for the Philadelphia District of the Army Corps of Engineers indicated that none of the surface waters in the study area are identified as a navigable waterway.

3.2.2 Groundwater Resources

Groundwater wells within Avondale Borough, New Garden Township and London Grove Township draw water primarily from two formations, namely the Setters Quartzite and Wissahickon formations. A number of public water suppliers in the area, including the Avondale Borough Water Department, the London Grove Township Municipal Authority, West Grove Borough (providing to London Grove Township), the Shangrala Water Company, and the Landenburg Water Company (for properties in Kennett Township and New Garden) operate public supply groundwater wells. The remaining public supply wells are operated by such facilities as schools, mobile-home parks, hospitals, or businesses. Additional areas, including residences not connected to a public water supply typically have private groundwater wells.

The entire study area in Pennsylvania is considered to be in the stream flow source zone (an upstream headwaters area that drains into a recharge zone) of the New Jersey Coastal Plain Aquifer System.

3.2.3 Wetlands

Many of the wetlands located in the study area are associated with ponds, streams, rivers and floodplains. Wetlands located in the vicinity of proposed roadway improvements are shown on the plates in **Appendix D**. A variety of wetlands were identified and delineated in the PA 41 Project study area, and included Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), and Palustrine Forested (PFO) wetlands. Some wetlands in the study area have been determined exceptional value (EV) because these wetlands exhibit suitable habitat for the federally threatened bog turtle (*Glyptemys muhlenbergii*). In addition, some wetlands may be classified as exceptional value because they are hydrologically connected to the section of the East Branch White Clay Creek, north of Avondale, which is designated as Exceptional Value.

3.2.4 Vegetation, Wildlife, and Endangered Species

The majority of the study area is dominated by developed landuses, specifically residential and agricultural uses. However, the study area contains small, fragmented stands of mixed forest communities. These fragmented pieces of forested area provide disjunctive habitat for wildlife species within the study area. Study area conditions reflect plant species that are commonly found in the Piedmont Physiographic Region that include red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), spicebush (*Lindera benzoin*), black locust (*Robinia pseudoacacia*), black cherry (*Prunus serotina*), black walnut (*Juglans nigra*) and box elder (*Acer negundo*). Wildlife found within the study area includes species typical of a developed and agricultural landscape such as white-tailed deer (*Odocoileu virginiana*), mourning dove (*Zenaida macroura*), red fox (*Vulpes fulva*), turkey vulture (*Cathartes aura*), Canada goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*) and gray cat bird (*Dumetella carolinensis*). The project is also located in the known range of the federally threatened bog turtle (*Glyptemys muhlenbergii*), and suitable habitat has been identified in the project study area.

3.2.5 Soils, Geology, and Topography

The study area is located in the Piedmont Upland Section of the Piedmont Physiographic Province. This section is characterized by broad, gently rolling hills and valleys, typically ranging from 300-600 feet above sea level. The steepest slopes within the study area are located adjacent to the level floodplains of the East and West Branches of White Clay Creek and Broad Run. The bedrock of the study area is principally schist, gneiss, quartzite, and some saprolite.

The soils within the project study area are classified into two soil associations: the Glenelg-Manor-Chester Association and the Hagerstown-Conestoga-Guthrie Association. The Glenelg-Manor-Chester Association soils are moderately sloping and located on upland areas. These soils are shallow to deep, with silty and channery soils located on schist and gneiss. While the Glenelg-Manor-Chester Association soils are primarily underlain by the Wissahickon Formation, the Hagerstown-Conestoga-Guthrie Association soils, found near Avondale, are underlain by the Cockeysville Marble and composed of deep silty soils, located on limestone bedrock. The Cockeysville Marble is slightly weathered to a shallow depth and is moderately resistant to weathering. The presence of solution channels and sinkholes are likely in areas located on limestone bedrock. Geotechnical studies conducted for this project indicated that, in the project area, the carbonate rock of the Cockeysville Formation is very sound and not prone to developing subsurface voids. However, bedrock pinnacles are present in the project area and could affect excavation and foundation stability.

3.2.6 Agricultural Resources

In spite of the rapid development and growth occurring in the study area, the PA 41 study area has numerous farming operations along PA 41 as well as to the north and south of the existing roadway. Farmlands located in the vicinity of proposed roadway improvements are shown on the plates in **Appendix D**. Farming operations are present in Londonderry, London Grove, New Garden, and Kennett Townships. South of the PA 41/ US Route 1 interchange the majority of these farms are mushroom operations, consisting of mushroom houses, composting wharfs, and packaging facilities. North of the PA 41/US Route 1 interchange farms consist mainly of dairy operations. The remaining farmland within the study area is used primarily for hay, either for the dairy or mushroom operations. Agricultural operations play a large part in the local economy of the townships within the study area. Agricultural Security Areas (ASAs) and Agricultural Conservation Easements have been designated to help protect the prime farmland in this area. A large number of the farms within the study area belong to ASAs. In addition to the ASAs, several farms have been placed in Agricultural Conservation Easements.

Agricultural resources are protected from conversion to non-agricultural uses through enacted Federal and State laws and regulations. These laws and regulations provide incentives to land owners to maintain land in agriculture and direct State and Federal agencies to identify and minimize impacts to farmlands. PennDOT's Publication 324, The Transportation Project Development Process , Agricultural Resources Evaluation Handbook (PennDOT 2003) outlines the process for evaluating agricultural resources in Pennsylvania pursuant to the following legislation.

- Pennsylvania Act 1979-100: Requires PennDOT to obtain approval from the Agricultural Lands Condemnation Approval Board (ALCAB) for the condemnation of productive agricultural land for highway purposes.
- Pennsylvania Act 1981-43 Agricultural Area Security Act: Enables landowners to propose the creation of agricultural areas to local units of government. It also authorizes county government to establish programs for the purchase of agricultural conservation easements. This act requires PennDOT to obtain approval from ALCAB for the condemnation of productive agricultural land within an agricultural security area (ASA) or agricultural conservation easement for highway purposes.
- Pennsylvania Code, Chapter 7, Section 7.301 et seq. Agricultural Land Preservation Policy (ALPP): Created to protected Pennsylvania's "prime agricultural land" from conversion to non-agricultural use. Prime agricultural land is land in active agricultural use that has been devoted to active agricultural use for the preceding three years and falls within one of the priority classes identified below:
  - Priority 1: Preserved farmland
  - Priority 2: ASAs
  - Priority 3: Farmland enrolled in preferential tax assessment
  - Priority 4: Effective agricultural zoning
  - Priority 5: Farmland classified as unique or capability class I, II, III, or IV (USDA).
- 7 USC §4201 Farmland Protection Policy Act (FPPA) of 1981, as amended: The purpose of FPPA is to "minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses". FPPA soils include: prime farmland, unique farmland, farmland of statewide importance and farmland of local importance. The soil types that fall under these categories are determined by the Natural Resource Conservation Service (NRCS).

3.3 Cultural Resource Context

3.3.1 Historic Resources

Information on known and potential historic resources was gathered from existing records located in the Pennsylvania Historical and Museum Commission Bureau for Historic Preservation (BHP) survey and National Register of Historic Places (NRHP) files. Field reconnaissance surveys also were undertaken to confirm previously recorded survey data and to identify additional historic resources in the study corridor. A historic structures survey conducted during the early 1980s by the Chester County Historical Society (CCHS) documented many of the county's historic

resources on either PHRS forms or on an abbreviated survey form developed by the CCHS. The CCHS survey did not provide recommendations regarding NRHP eligibility of documented resources.

A *Historic Context Report* for the project was prepared in February 2001 and *Revised Historic Context* in July 2002. In 2004, the *Southeastern Chester County Mushroom Industry Historic Context* was completed. A National Register eligibility study along PA 41 was prepared for the PA 0041 Corridor Improvement Project (ER #93-4038-029) between 2001 and 2004 in three separate phases.

The first phase of the eligibility study included identification, documentation and evaluation of historic resources located along the On-Line Alternative (*Determination of Eligibility Study: Volume I—Online Widening Alternative*, February 2001). A total of 104 historic resources, including two potential historic districts and 102 individual resources, was documented and evaluated during that phase of the project. Seventeen (17) properties, including two potential historic districts and 15 individual properties, were recommended eligible for listing in the NRHP. The Pennsylvania Historical and Museum Commission (PHMC) concurred that 17 properties, including the two historic districts, were eligible for listing in the NRHP.

The second phase of the eligibility study addressed resources within the Area of Potential Effect (APE) of the off-line bypass options (*Determination of Eligibility Study: Volume II—Off-Line Bypass Alternatives*, November 2002). Sixty-one (61) historic resources were documented and evaluated as part of the off-line bypass options. Four (4) properties were recommended eligible for listing in the NRHP. PHMC concurred that eight properties were eligible for listing in the NRHP and 1 property contributed to the Chatham Historic District. The third phase of the eligibility study addressed additional bypass options, expanded interchange options and side road and intersection improvements that were added subsequent to earlier fieldwork (*Determination of Eligibility Study: Volume II—Off-Line Bypass Alternatives*, November 2002). Fifty-two (52) historic resources were documented and evaluated during the final phase of the project. Sixteen (16) properties were recommended eligible for listing in the NRHP. PHMC concurred that 11 properties were eligible for listing in the NRHP.

The eligibility study resulted in the identification and evaluation of a total of 220 resources 50 years old or older with 36 of these recommended eligible for listing in the NRHP. Including eight previously identified properties (six of those listed in or determined eligible for the NRHP), a total of 42 historic architectural properties were listed in or determined eligible for listing in the NRHP. A *Summary Report of Historic Resources Survey* was completed in

December 2004. These resources are listed in **Table 3.3**, and those located in the vicinity of proposed roadway improvements are shown on the plates in **Appendix D**.

Table 3.3 - Resources 50 Years or Older Located within the Original PA 41 Project Study Area

Property Name	Property Address	PHMC Comment
Londonderry Township		
Blue Ball Tavern	2175 Gap-Newport Pike	Eligible under Criteria A, C, and D (April 1997)
White Horse Inn	162 Hood Road	Eligible under Criteria A and C (April 25, 2001); Concurred with boundaries (September 5, 2002)
William Jones House	2191 Gap-Newport Pike	Eligible under Criterion C (April 25, 2001)
Allan South House	2211 Gap-Newport Pike	Eligible under Criterion C (April 25, 2001); Concurred with boundaries (September 5, 2002)
Lewis Baker Farm	773 Street Road	Eligible under Criteria A and C (November 14, 2003); Concurred with boundaries (January 9, 2004)
London Grove Township		
Chatham Hotel	North side, intersection of PA 41 and London Grove Road in Chatham Village	Eligible under Criteria A and C (May 1994)
Hoopes House	524 Gap-Newport Pike	Eligible under Criterion C (January 22, 2001)
West House	173 Gap-Newport Pike	Eligible under Criterion C (January 22, 2001)
John I. Carter Farm	184 West London Grove Road	Eligible under Criteria A and C (January 2002); Concurred with boundary (December 23, 2002)
Chatham Historic District	Village of Chatham	Eligible under Criterion A, B, and C (April 25, 2001); Concurred with boundaries (May 12, 2003)
Hillview Farm	112 Mosquito Lane	Eligible under Criterion A (September 5, 2002); Concurred with boundary (October 30, 2002)
George B. Sharpe, Sr. House	2592 Gap-Newport Pike	Eligible under Criterion C (April 25, 2001)
Morriseinna	Mansion, "Springhouse," and Schoolhouse	Eligible under Criteria A and C (April 25, 2001); Boundary Revised (August 30, 2004)
Aaron Baker House	605 North Baker Station Road	Eligible under Criteria A and C (December 23, 2002); Concurred with boundary (March 11, 2003)
Hughes Lime Kilns, Quarry and Depot	Multiple	Eligible under Criterion A and C (December 23, 2002); Boundary Revised (August 30, 2004)

Property Name	Property Address	PHMC Comment
John Williamson House	1131 Indian Run Road	Eligible under Criterion C (December 23, 2002)
George W. Lefever Barns	West side of PA 41	Eligible as contributing resource to the Chatham Historic District (November 12, 2002)
Robert A. Reef Mushroom House	509/511 Coatesville Road	Eligible under Criterion A and C (January 9, 2004)
Chatham Acres	Northeast side of West London Grove Road	Eligible under A and C (November 14, 2003); Concurred with boundary (January 9, 2004)
Jesse Pennock House and Barns	157/170 Lloyd Road	Eligible under Criterion C (January 9, 2004)
Avondale Historic District	Borough of Avondale	Eligible under Criterion A and C (April 25, 2001)
William Miller House, Tenant House and Barns	South and west sides Ellicott Road; 205 Ellicott Road; 330 Ellicott Road	Eligible under Criteria A, C, and D (April 25, 2001); Boundary Revised (August 30, 2004)
Philadelphia and Baltimore Central Railroad	London Grove Twp., Borough of Avondale	Eligible under Criteria A (November 14, 2003); Concurred with boundary (January 9, 2004)
New Garden Township		
William Walter House and Chestnut Green School	162 Sheehan Road	Eligible under Criterion A and C (April 25, 2001)
James Mendenhall House	7 & 9 Colonial Farms Dr. 3 & 5 Kaolin Road	Eligible under Criterion C (April 25, 2001); Reaffirmed concurrence with eligibility (September 20, 2002)
Enoch Lewis House and School	291 New Garden Road	Eligible under Criterion B (April 25, 2001)
New Garden Lyceum	290 New Garden Road	Eligible under Criteria A and C (April 25, 2001)
Regester Mushrooms	8760 Gap-Newport Pike	Eligible under Criterion A (September 5, 2002); Concurred with boundaries (October 30, 2002)
Ellis Allen House	251 New Garden Road	Eligible under Criterion C (April 25, 2001); Boundary Revised (August 30, 2004)
Isaac Jackson House	West side of PA 41 at Route 7 interchange	Eligible under Criterion A (April 25, 2001); Concur with boundaries (September 5, 2002)
Leone Pizzini and Sons Mushrooms	810 Penn Green Road	Eligible under A and C (January 9, 2004)
Edward Lafferty House	110/112 Old Limestone Road	Eligible under A and C (January 9, 2004)
P. A. Lafferty and Sons, Inc.	136 Old Limestone Road	Eligible under A and C (January 9, 2004)
Southwood Farms	North side of Old Limestone Road	Eligible under Criteria A and C (January 9, 2004); Concurred on boundaries (March 22, 2004)
A. Alfred Delducl Trust Mushroom House	North side of Old Limestone Road	Eligible under Criteria A and C (January 9, 2004)
Guizetti Mushrooms	722/724 Penn Green Road	Eligible under A and C (November 14, 2003); (add in Gildo D. Guizetti House); Concurred with boundary (January 9, 2004)

Property Name	Property Address	PHMC Comment
John Gioffredi Mushrooms	706 Penn Green Road	Eligible under Criterion A and C (January 9, 2004); Concurred with boundaries (March 22, 2004)
Emedio D. Lanni Mushrooms	East of 713 Penn Green Road	Eligible under Criteria A and C (November 14, 2003); Concurred with boundary (January 9, 2004)
James W. Mendenhall Farm	Jones Farm	Eligible under A and C (November 14, 2003); Concurred with boundary (January 9, 2004)
M & J Mushrooms	Northwest Side of Sunny Dell Road	Eligible under Criterion A and C (January 9, 2004); Concurred with boundary (March 22, 2004)
Mark J. Lafferty Mushrooms	Northeast corner of Limestone/Southwood Roads	Eligible under Criterion A and C (January 9, 2004)
Kennett Township		
Edward Perrone Farm	9159 Gap-Newport Pike	Eligible under Criterion A (September 5, 2002); Concurred with boundaries (October 30, 2002)
Mason/Dixon Line Marker	East side Gap-Newport Pike at State Line	Listed in the NRHP (February 14, 1975)

A field visit in April 2009 identified approximately 30 resources 50 years old or older that have not been previously surveyed within the study area. These resources include private residences and businesses. It appears that the resources lack significance and integrity to warrant further investigation and would be documented within a limited scope. Approximately 5-10 mushroom farms located along PA 41 are now 50 years old or older and would need to be evaluated against the mushroom context.

The field visit also noted that the resources listed in or eligible for listing in the NRHP are extant. Two resources were not accessible during the field visit. The Hughes Lime Kilns, Quarry and Depot was not accessible due to a bridge closure and the Isaac Jackson House was not accessible due to PennDOT District 6-0 maintenance crews completing routine maintenance work along PA 7 at the entrance of the property that day. As five years from the original determination of eligibility studies has passed, those resources previously determined eligible for the NRHP would require further investigation to determine whether they retain integrity to support their NRHP eligibility.

Finally, the field visit noted that three resources that were determined not eligible were no longer extant. The Yeatman Rental House #1 in London Grove Township, the Lauretta Mazza House and Aztec Shop, and the Sunny Dell Schoolhouse in New Garden Township had been demolished.

3.3.3 Archaeological Resources

Preliminary background research and an archaeological field reconnaissance survey were conducted for the original PA 41 Project. Background research conducted at the Pennsylvania Archaeological Site Survey files resulted in the identification of 12 previously recorded, NRHP eligible or potentially eligible prehistoric and/or historic archaeological sites within the study area. *(Note: Site locations are considered sensitive information and therefore are not provided in this document.)*

For the PA 41 Project, a visual inspection of the study area was conducted to determine the present condition of known archaeological sites, to evaluate surface indications for previously unrecorded archaeological sites, to identify locations of extensive disturbance, and to determine current land use conditions. This information was used in conjunction with the data collected from background research to evaluate the potential for encountering prehistoric and/or historic archaeological sites within the study area.

In December 2005, a final draft of the *Phase I Archaeological Survey of the Common Alignment Areas* was completed. The study area for the current Phase I investigations for the PA 41 Project included the common alignment areas of the project corridor. The archaeological investigations for the project were to be completed once a preferred option had been identified through the NEPA process. The common alignment areas consisted of three segments totaling approximately 33,600 linear feet (6.4 miles). The archaeological investigations generally consisted of the excavation of standard shovel tests at 50 ft (15 m) intervals within the cut and fill lines; closer interval testing at 10 ft (3 m) or 20 ft (6.1 ft) was conducted at extant historic structures and the projected locations of historic sites based on historic map information, and to further investigate shovel tests that yielded significant densities or types of artifacts.

Thirty-one historic structures and 13 possible historic site locations were identified within the project corridor during the background research and architectural survey. However, prior disturbance, narrow cut and fill lines, and lack of landowner permission resulted in only 21 standing structures and nine possible historic site locations being tested. Properties that would have been affected by the project activities and have archaeological potential were to be tested once the properties are acquired.

A total of 31 archaeological sites were identified in the common alignment areas of the PA 41 project corridor tested to date; this includes the two sites previously identified in the Phase I field investigations conducted in 2000. The 31 sites include 19 historic sites, 10 prehistoric sites, and two sites with both historic and prehistoric components.

Twenty-one of the standing structures were tested, and thirteen yielded evidence of historic occupation or use of the structure. Nine historic site locations were tested and two yielded evidence of historic occupation. The original location of an historic structure that had been moved was identified. Additional Phase I testing was recommended at one site and Phase II evaluation studies were recommended at eight of the total 31 archaeological sites identified to date within the common alignment areas for the PA 41 improvements.

In April 2009, a field visit noted that three sites had been disturbed. In London Grove Township, Structure 17 had been razed disturbing Historic Site (36CH799) and Prehistoric Site 6 (36CH797). Access was not permitted during the field visit; therefore, it is not known as to the extent of the disturbance to both sites. The third site, Structure 66 (36CH804), is located in New Garden Township. The former schoolhouse had been razed and it appears that the site is disturbed.

3.4 Other Environmental Considerations

3.4.1 Sensitive Waste Sites

Based on background research and field reconnaissance, potential sensitive waste sites have been identified in the study area, such as properties containing underground storage tanks, gas stations, auto repair shops and dry cleaners. Sensitive waste sites located in the vicinity of proposed roadway improvements are shown on the plates in **Appendix D**. The Southern Chester County Landfill (SECCRA) is located just north of PA 41 within the study area.

4.0 Engineering Considerations

4.1 Design

Based on the current project needs and corridor context discussed in **Sections 2.0** of this report, new solutions to address the needs of the PA 41 corridor were developed. These options were developed while considering project needs and the preliminary environmental constraints discussed in **Section 3.0** of this report. The focus on this options analysis is to address the safety and intersection concerns discussed under the project needs. Several improvements have already been made to this corridor since the project inception. These improvements helped improve the safety and mobility of the corridor and addressed many of the project needs from the 1994 studies. These previously completed improvements include the following:

- Repaving the roadway surface
- Lowering of the speed limit from 55mph to 45mph (35mph in the villages)
- Adding centerline and edge line rumble strips
- Adding pull-off areas for enforcement
- Signalization and the addition of left turn lanes at the Newark Road and Penn Green Road intersections with PA 41
- Updated signalization and coordinated timings at the State Street and Baltimore Pike intersections with PA 41
- Reconfiguration and signalization of the PA 41/Baltimore Pike intersection north of Avondale
- Restriping the second through lanes to dedicated left-turn lanes on PA 41 over US Route 1
- Signalization of both US Route 1 ramps with PA 41
- Installation of overhead flashing warning lights for reduced speed in the village of Chatham
- Addition of left-turn lanes at the PA 926 intersection with PA 41.

Based on the current project needs, most of the safety concerns are at intersection locations. This is also consistent with the level-of-service (LOS)/capacity concern isolated at the intersections. One safety concern, the fatalities, is not an isolated problem, but it is not one that follows a pattern. The fatalities are random in nature, and no two occur at the same location. The most consistent feature about the fatality safety concern is excessive speed. As this is a principal arterial with a high percentage of through traffic, the posted speed of 45mph outside of the villages is consistent with the nature of the road. However, speeds well over the posted speeds are regularly recorded. Outside of traffic calming techniques, which are usually not applied to principal arterials outside of villages, increased enforcement is probably the best solution to this

problem. Other solutions, in addition to traffic calming and gateway features in the villages should be investigated along the corridor.

Another study area need of improved infrastructure for pedestrians is an issue that will be addressed on two levels. First, the options discussed below address sidewalks and pedestrian needs with each localized area. However, a more comprehensive solution should be developed by host municipalities. For example, sidewalks would be rebuilt in the vicinity of PA 841 in the Village of Chatham, but not for the entire length of the village. In Pennsylvania, PennDOT does not typically have stand alone projects to repair sidewalks as the maintenance and ownership of the sidewalks usually rests with the host municipality.

A bike lane along Old Baltimore Pike is planned for construction this summer (2010). The bike lane will follow Route 41 from Baltimore Pike in the North to Baltimore Pike south of Avondale.

Another significant improvement project is currently proposed along PA 41 just north of Limestone Road near the White Clay Point development. The approved highway occupancy permit (HOP) improvement for this development includes the following improvements to the study corridor

- Add a northbound lane from the Limestone Road intersection to just north of Sunny Dell Road as a lane add from the Limestone Road on-ramp
- Add a second southbound lane from just north of Sunny Dell Road; it ends as a lane drop to the Limestone Road off-ramp
- Signalization with turn lanes to Sunny Dell Road
- Relocation and signalization with turn lanes to Sharp Road
- Signalization of the PA 41 ramps with Limestone Road

Not only do these HOP improvements address the future capacity needs south of Starr Road along PA 41, they also provide relief to some of the isolated safety concerns along PA 41. These improvements eliminate the safety concerns at the stop-controlled northbound Limestone Road on-ramp and improve general intersection geometry in this part of the study area.

4.2 Description of Options

To address the remaining intersection safety/capacity needs, the following options were developed. As each of these options addressed an isolated need, they have independent utility and can be developed independently of each other. For example, the solution to address the capacity issue at the PA 926 intersection has no influence on the solution to address the capacity/safety solution at the PA 841 intersection. Generally these options keep PA 41, a two-lane roadway except in isolated sections. The current traffic analysis does not show the need for an end-to-end four-lane improvement based on both roadway capacity and travel time studies (PennDOT, 2005). The following discussion presents the options and how they address the project needs (see also **Table 4.1**). Potential environmental impacts of these options are discussed in **Section 5.0** of this report. Refer to **Appendix E** for plates depicting the location of the proposed intersection improvement options.

PA 926/PA 41 Intersection Improvement Area (Appendix E Plate 1)

Based on the 2030 no-build intersection LOS analysis, the PA 926 approaches to this unsignalized intersection will function in LOS F during the peak period. To address this need, signalization would be added to this intersection. No pavement widening or repaving would be necessary as left-turn lanes already exist on PA 41. At this time, it does not appear that a roundabout is appropriate for this intersection due to PA 41's vertical geometry and due to its isolated area in a high speed environment. With signalization, this intersection is expected to operate in LOS B during the 2030 peak periods. Londonderry Township has identified that they prefer a roundabout at this location; coordination with the township should be conducted during the next phase of the project.

PA 841/PA 41 Intersection (Appendix E Plate 2)

Based on the 2030 no-build intersection LOS analysis, the PA 841 approaches to this unsignalized intersection will function in LOS F during the peak period. To address this need, signalization would be added to this intersection. Also to address the safety need, left-turn lanes would be added to PA 41 in both directions. Signalization may have a secondary benefit of helping to reduce vehicle speeds in the village. With signalization and the addition of left turn lanes, this intersection is expected to operate in LOS A and B during the 2030 peak periods. A roundabout was investigated at this intersection to address both the capacity of the intersection and the speeds through the village; however, the roundabout would have potential negative impacts to historic resources. Since signalization meets the project needs with lesser impacts, it should be carried forward to be studied in detail.

Table 4.1 – Summary of Options and Project Needs

Intersection Improvement Area	Project Need			
	Improve Safety Conditions	**Accommodate Future Corridor Mobility**	**Improve Intersection Operation**	**Improve the Existing Infrastructure**
PA 926/PA 41 Intersection	Need: 1-2 times the statewide crash rate; primarily sideswipe and angle crashes. Option: By signalizing, the safety of this cluster location should improve by reducing the probability of the angle crashes and possibly the sideswipe type.	No specific mobility need at this location.	Need: PA 41 would operate at LOS A in 2030 No-Build; PA 926 would operate at LOS E/F in 2030 No-Build Condition. Option: By signalizing the 2030 peak hour LOS on PA 926 would improve to a LOS C. PA 41 would operate at LOS A/B. Overall intersection LOS would become LOS B.	No specific infrastructure need at this location.
PA 841/PA 41 Intersection	Need: 1-2 times the statewide crash rate; primarily rear-end, angle, head on and hit fixed object crashes. Option: By signalizing and adding left-turn lanes, the safety of this cluster location should improve by reducing the probability of the angle and rear-end crashes and possibly the head-on type.	No specific mobility need at this location.	Need: PA 41 would operate at LOS A in 2030 No-Build; PA 841 would operate at LOS F in 2030 No-Build Condition Option: By signalizing the 2030 peak hour LOS on PA 841 would improve to a LOS C. Overall intersection LOS would become LOS B.	Need: sidewalk missing or deteriorated. Option: This improvement would replace curb, provide a pavement overlay and would rebuild a portion of sidewalk in the village of Chatham.

Intersection Improvement Area	Project Need			
	Improve Safety Conditions	**Accommodate Future Corridor Mobility**	**Improve Intersection Operation**	**Improve the Existing Infrastructure**
Woodview Road/PA 41 Intersection	No specific safety need at this location.	No specific mobility need at this location.	Need: PA 41 would operate at LOS A in 2030 No-Build; westbound Woodview road would operate at LOS C/F in 2030 No-Build Condition. Option: With the addition of a left-turn lane on Woodview Road, delay is slightly reduced on Woodview Road. A LOS F on Woodview Road would still remain in 2030 for the 56 forecasted vehicles. PA 41 would still remain free flowing.	No specific infrastructure need at this location.
US Route 1 Ramps/PA 41	No specific safety need at this location.	Need: Northbound PA 41 would operate in over-capacity conditions in the year 2030 PM peak thereby delaying all PA 41 vehicles. Option: With the addition of the PA 41 northbound right turn lane onto the US Route 1 northbound ramp, the over capacity issue for PA 41 would be eliminated.	Need: northbound PA 41 would operate in an over-capacity LOS D in 2030 No-Build PM peak. Option: With the addition of the PA 41 northbound right turn lane, the overall intersection LOS improved from C to B, while the northbound approach would improve from D to B.	No specific infrastructure need at this location.

Intersection Improvement Area	Project Need			
	Improve Safety Conditions	**Accommodate Future Corridor Mobility**	**Improve Intersection Operation**	**Improve the Existing Infrastructure**
PA 41/Baltimore Pike (north) – previous improvement (2008)	Need: Greater than 2 times the statewide crash rate; primarily angle and rear-end crashes. Option: By signalizing and realigning the intersection, safety at this cluster location should improve in almost all aspects.	Need: southbound PA 41 had to stop and yield to Baltimore Pike. Travel time analyses show this area contributes significant delay. Option: By eliminating the stop-condition on southbound PA 41, operations for through vehicles were greatly enhanced.	Need: PA 41 would operate in an over-capacity condition in 2030 No-Build. Option: The deficient LOS observed at the intersection prior to 2008 was improved to LOS B for 2009 and for 2030.	Need: Poor intersection geometry. Option: This option improved the intersection geometry and provided a pavement overlay.
PA 41/State Street to Baltimore Pike	Need: 1-2 times the statewide crash rate; primarily rear-end and angle crashes. Option: By widening PA 41, safety in this portion of this cluster location should be improved by reducing the rear-end and angle crashes.	Need: Travel time studies show that intersections in Avondale cause delay for the through vehicles. Option: The widening would provide more through capacity on PA 41 thereby improving operations for the through traveler. This improvement would remove one of the key bottlenecks along the corridor.	Need: Both State Street and Baltimore Pike intersection would operate over-capacity in 2030 No-Build; Church Street would operate in LOS F. Option: This widening would improve the intersection 2030 peak hour LOS at both State Street and Baltimore Pike to LOS C. Church Street itself would remain at LOS F for the projected 13 vehicles in the PM peak. PA 41 would still remain free flowing at the Church Street intersection.	Need: Deteriorated sidewalk system, structurally deficient bridge over White Clay Creek. Option: This option would provide new curb and sidewalk along the improvement along with pavement widening and overlays. Lastly, the structurally deficient bridge carrying PA 41 over the White Clay Creek would be replaced.

Intersection Improvement Area	Project Need			
	Improve Safety Conditions	**Accommodate Future Corridor Mobility**	**Improve Intersection Operation**	**Improve the Existing Infrastructure**
Newark Road/PA 41 Intersection	Need: Greater than 2 times the statewide crash rate; primarily angle and rear-end crashes. Option: By adding turn lanes to all approaches, the safety of this cluster location should improve by reducing the probability of the angle and rear-end crashes.	Need: Travel time studies show that delay for through traffic occurs in this area. Option: By adding turn lanes to all approaches, the through traveler would experience less delay at this intersection.	Need: The overall intersection would operate in an over-capacity LOS E/F in 2030 No-Build. Option: With the addition of the turn lanes, the overall 2030 peak hour intersection LOS improves to LOS C.	No specific infrastructure need at this location.
Newark Road/Starr Road Intersection	No specific safety need at this location.	No specific mobility need at this location.	Need: The approaches to this four-way stop-controlled intersection would operate in LOS F in 2030 No-Build. Option: By using a signalized intersection or roundabout, the 2030 peak hour intersection LOS improves to LOS B.	No specific infrastructure need at this location.
Starr Road/PA 41 Intersection	No specific safety need at this location.	No specific mobility need at this location.	Need: PA 41 would operate at LOS A in 2030 No-Build; Starr Road would operate at LOS D/F in 2030 No-Build Condition Option: With the addition of signalization and through lanes, the 2030 peak hour LOS on Starr Road improves from LOS F to LOS C. PA 41 would operate in LOS A and B.	No specific infrastructure need at this location.

Intersection Improvement Area	Project Need			
	Improve Safety Conditions	**Accommodate Future Corridor Mobility**	**Improve Intersection Operation**	**Improve the Existing Infrastructure**
White Clay Point Roadway Improvements	Need: While the crash rate is less than the statewide crash rate, clusters occur at Sunny Dell Road, Sharp Road and Limestone Road; primarily angle and rear-end crashes. Option: These developer improvements would improve safety at the cluster locations by removing the westbound ramp stop condition at Limestone Road, by providing turn lanes at Sunny Dell Road and throughout the project and by realigning Sharp Road.	Need: With heavy development pressure in this area, it is anticipated that through trip delays will increase. Option: With the addition of PA 41 through lanes, the through traveler would experience less delay in this area. Also the lane addition at the westbound Limestone Road ramp should greatly reduce delays in the peak hours.	Need: The side roads, including the Limestone Road westbound ramp would be expected to operate in LOS E/F in 2030 No Build. Option: This option improves the LOS at Sunny Dell Road, Sharp Road, the westbound Limestone Road/PA 41 intersection, and the intersections of the PA 41 ramps with Limestone Road. Some LOS E and F's could be expected in the peak hours, but those are on the development driveways. PA 41 would be in LOS D or above.	Need: Poor intersection geometry, particularly at Sharp Road and the westbound Limestone Road ramps. Option: The area from just north of Sunny Dell Road south to Limestone Road would be have pavement widening and overlays. Intersection geometric improvements would also occur throughout.
Limestone Road/Southwood Road Intersection	No specific safety need at this location.	No specific mobility need at this location.	Need: The overall intersection would operate in an over-capacity LOS F/D in 2030 No Build. Option: With the addition of the turn lanes, the overall 2030 peak hour intersection LOS would improve to LOS C/B.	No specific infrastructure need at this location.

Woodview Road/PA 41 Intersection Improvement Area (Appendix E Plate 3)

Based on the 2030 no-build intersection LOS analysis, the westbound Woodview Road approach to this unsignalized intersection will function in LOS F during the peak period. The 2030 traffic volumes on Woodview Road do not appear to meet current traffic signal warrants so alternative means of improving the operating characteristics of the intersection were investigated. The option to address this issue is to add a westbound left-turn lane on Woodview Road. While adding this left-turn lane does not eliminate the LOS F in 2030, it does provide some degree of improvement to the 46 vehicles that are projected to use the westbound approach during the 2030 PM peak period.

US Route 1 Ramps/PA 41 Improvement Area (Appendix E Plate 4)

Based on the 2030 no-build intersection LOS analysis, the left-turn lane on the southbound ramp is anticipated to operate in LOS E near capacity in year 2030 and the PA 41 northbound approach is expected to operate in LOS D, but over capacity (volume to capacity (v/c) ratio = 1.03). To address this capacity issue, a right-turn lane would be added to northbound PA 41 at the US Route 1 northbound ramps. This improves both ramp intersections since the signal timing can be better optimized. The overall intersection LOS are expected to operate at LOS D or above in year 2030 with this improvement.

PA 41/State Street to Baltimore Pike Improvement Area (Appendix E Plate 5)

Based on the 2030 no-build intersection analysis, both the PA41/ State Street and PA 41/ Baltimore Pike intersections will be over capacity during the peak period. Also included in this stretch of road is the structurally deficient bridge carrying PA 41 over the White Clay Creek. To address these multiple issues, the following is proposed. First to address the State Street intersection, a second southbound through lane would be added. This second through lane would be a shared through-left lane. While this does possibly raise a safety concern with left turns being made out of the second through, or passing lane (potential for rear-end collisions), less than 25 vehicles would be expected to turn left in year 2030. In detailed studies for this improvement, further investigation into addressing this left turn should be completed (e.g., prohibiting left turns or providing a left-turn lane). This second southbound through lane would be carried to the Baltimore Pike intersection where it would become a left-turn lane. In the opposite direction, a second northbound lane would be added at the Baltimore Pike intersection. This lane would be carried to the State Street intersection where it would become a left-turn lane onto State Street. This improvement would require total reconstruction of PA 41 between State Street and Baltimore Pike and would include addressing the structure over White Clay Creek. To avoid historic resources, the PA 41 widening would most likely

occur to the east. As a result of these improvements both the State Street and Baltimore Pike intersections are expected to operate in LOS C or above in 2030.

One issue in this roadway segment still would exist. The Church Street approach to PA 41 would still operate in LOS F, even if turn lanes were added to the local road. However, Church Street carries only 31 to 36 vehicles in peak hours and at the currently projected growth could rise to 40-50 vehicles in the 2030 peak hours. It is anticipated that this local road could see an increase in traffic due to future development and as such the traffic impact studies for these future developments should be required to investigate alternative solutions to this intersection, including alternate routes to access PA 41. Due to its proximity to both currently signalized intersections, signalization of Church Street is not recommended.

Newark Road/PA 41 Intersection Improvement Area (Appendix E Plate 6)

Based on the 2030 no-build intersection LOS analysis, the overall signalized intersection will function in LOS F. Currently left-turn lanes exist on PA 41 and right-turn lanes exist on Newark Road. The lane configuration on Newark Road may be the cause of the safety concerns at this intersection due to driver uncertainty and due to a shared left and through lane possibly being a contributing factor in the rear-end accidents. To address these issues, the lane configuration for each approach to the intersection would be separate left, through and right turn lanes. With this improvement, the intersection is expected to operate in LOS C during the 2030 peak periods and the safety issue addressed.

Newark Road/Starr Road Intersection Improvement Area (Appendix E Plate 7)

Based on the 2030 no-build intersection LOS analysis, all approaches to this four-way stop-controlled signalized intersection will function in LOS F during the peak period. To address this need, signalization or a roundabout would be added to this intersection. Based on signalization, the proposed improvement would result in a LOS B for the intersection.

Starr Road/PA 41 Intersection Improvement Area (Appendix E Plate 8)

Based on the 2030 no-build intersection LOS analysis, the Starr Road approaches to this unsignalized intersection will function in LOS F during the peak period. Currently this intersection has turn lanes on all four approaches. To address this need, signalization and a second southbound through lane would be added. The second southbound through lane would extend 1100 feet south of the intersection and would connect to the second southbound through lane currently proposed with the approved highway occupancy permit (HOP) improvement by the White Clay Point development. Also, in

conjunction with this improvement, the second northbound lane proposed by the HOP improvement (end 600 feet south of Starr Road) would be extended to the Starr Road intersection where it would become a left-turn lane onto Starr Road. This would result in PA 41 becoming a four-lane highway from Starr Road south to Limestone Road. The resultant LOS for the Starr Road intersection is year 2030 would be LOS B.

Limestone Road/Southwood Road Intersection Improvement Area (Appendix E Plate 9)

Based on the 2030 no-build intersection LOS analysis, the overall signalized intersection will function in LOS F during the peak period. Currently a right-turn lane exists on southbound Limestone Road. To improve the LOS at this intersection, northbound and eastbound left-turn lanes would be needed. With this improvement, the intersection is expected to operate in LOS C during the 2030 peak periods.

4.3 Conclusion

Each of these isolated improvements addresses a specific safety or capacity concern and can be independently programmed into PennDOT's Transportation Improvement Program as needed. The resultant year 2030 LOS along PA 41 due to these options can be found in **Appendix B – Level of Service Plates**. This 2030 "build" analysis shows that all signalized intersections would operate in LOS D or above during the peak periods.

5.0 Preliminary Options Evaluation

Overall, 13 key environmental resources were evaluated for the preliminary option impact analysis. Each of the proposed improvements has been developed to avoid and/or minimize impacts to key environmental features where feasible. The quantitative analysis contained in this section compares the impacts of each of the proposed intersection options to the key environmental resources identified in the study area. Resources include natural, cultural, and socioeconomic resources. Refer to the plates located in **Appendix D** for illustration of the environmental resources and the proposed intersection improvement areas.

5.1 Impact Analysis

The following discussion presents each of the intersection improvement areas and generally explains the proposed improvements and anticipated resource impacts. Please note that for the purpose of these descriptions, PA 41 is considered oriented in a north to south direction.

PA 926/PA 41 Intersection Improvement Area (Appendix E Plate 1)

Signalization is the key feature proposed for this intersection. Signal poles would be added to each corner, with small paved areas included for pedestrian access to each pole. No repaving would be necessary. At this time, it does not appear that a roundabout is appropriate for this location (signalization of the intersection is not in conformance with Londonderry Township's Official Map, wherein they depict a roundabout in lieu of signalized intersection at the location). Along with the signalization, pedestrian crosswalks with Americans with Disabilities Act (ADA) compliant ramps will be added, thereby improving pedestrian circulation at the intersection. Signalizing the intersection will also improve farmers' ability to maneuver equipment through the intersection.

One of the proposed signal poles may impact a historic property, The Blue Ball Tavern, on the east side of PA 41. This impact would be a minor sliver amount of land adjacent to the shoulder of PA 41 for the placement of a signal pole. The Blue Ball Tavern, located at 2175 Gap-Newport Pike, was determined eligible for listing in the National Register of Historic Places (NRHP) in April 1997 under Criteria A, C, and D. There are no other environmental resource impacts anticipated for this improvement. No additional right-of-way would need to be acquired.

PA 841/PA 41 Intersection Improvement Area (Appendix E Plate 2)

The key features proposed for this improvement area include signalization of the intersection and left-turn lanes added along PA 41. The proposed left-turn lanes would be within the existing curb, or with very minimal widening (anticipated less than 2 feet). Sidewalks would be rebuilt on the west side of intersection and a new sidewalk (5' wide) would be extended only on the west side north of PA 841. Signal poles would be needed on each corner. Signalization would include all approaches to the intersection and would require multiple side street segment phases. Along with the signalization, pedestrian crosswalks with ADA compliant ramps will be added, thereby improving pedestrian circulation at the intersection. Signalizing the intersection will also improve farmers' ability to maneuver equipment through the intersection. Pavement would be milled and paved.

It is anticipated that the property impacts would be strip acquisitions, and not require displacement of any residents or businesses, but the minor curb widening associated with this proposed improvement would have a sliver type impact to the Chatham Village Historic District. The Chatham Village Historic District was determined eligible for listing in the NRHP in April 2001 under Criterion A as a crossroads village and under Criterion C for its architecture. Located within the district, at the intersection, is the individually-eligible Chatham Hotel, determined eligible in 1994 under Criterion A and C., that would be impacted by a sliver acquisition.

Signal poles would be placed at each point of the five-point intersection potentially impacting five resources within the historic district. The gas station, Xpress Stop, located at the junction of PA 41 and West London Grove Road, is a non-contributing resource. However, four contributing resources would be potentially impacted by sliver land acquisitions and it is not anticipated that buildings would be impacted.

- Chatham Hotel located at the junction of PA 41 and East London Grove Road
- 3315 Gap-Newport Pike located along the west side of Gap-Newport Pike (PA 41)
- 205 East London Grove Road located at the northeast corner of Gap-Newport Pike and East London Grove Road
- 200 East London Grove Road located at the southeast corner of Gap-Newport Pike and East London Grove Road

Furthermore, the curb widening on the west side north of PA 841 (Newport Pike) would potentially impact three contributing resources within the historic district. The impacts would only be minor sliver acquisitions of land and not buildings.

- 3315 Gap-Newport Pike

- 3309 Gap-Newport Pike
- 3285 Gap-Newport Pike

Two potential sensitive waste sites also border the proposed improvement area and will require further investigation. They include the Xpress Stop gas station in the northwest quadrant of the intersection and Remley's Service Center along west side of PA 41. There are no other environmental resource impacts anticipated for this option.

Woodview Road/PA 41 Intersection Improvement Area (Appendix E Plate 3)

The key feature proposed for this improvement area includes a left-turn lane on westbound Woodview Road. The eastbound approach to Woodview Road would also be widened to accommodate the additional width so the through movements are continuous. Woodview Road would remain stop sign controlled. While it is anticipated that the left turn lanes will improve through movements along PA 41, the farming community will still only have a stop condition when crossing PA 41 from Woodview Road. New pavement would be provided only on Woodview Road.

The proposed improvements would impact the historic property, Morriseinna, which was determined eligible for the NRHP on April 25, 2001 under Criterion A as a local prominent farm and under Criterion C for its architecture. An option considered at the Woodview Road/PA 41 intersection would require approximately 6,000 square feet of property (no buildings) from the 196.7 acre historic resource. This would create a potential impact on the NRHP-eligible resource.

It is also anticipated that the project may impact less than 50 feet of intermittent stream located in the northeast quadrant of the intersection. Active farmland (0.5 to 1 acre) would be impacted due to the widening, including less than 0.5 acres that have been designated as Agricultural Security Areas (ASAs). There are no other environmental resource impacts anticipated for this improvement.

US Route 1 Ramps/PA 41 Improvement Area (Appendix E Plate 4)

Improvements proposed for this area include a right-turn lane for along northbound PA 41 at the existing signalized intersection. Impacts associated with this option include less than 0.5 acre strip of active farmland located in the southeast corner of the intersection. There are no other environmental resource impacts anticipated for this improvement.

PA 41/State Street to Baltimore Pike Improvement Area (Appendix E Plate 5)

The key features proposed for this improvement area include an additional through lane in each direction along PA 41, and a right-turn lane added on Church Street. The option developed would include a second southbound through lane would be added to PA 41 at State Street and would end at Baltimore Pike as a left-turn lane. A second northbound lane would be added to PA 41 at Baltimore Pike and would end at State Street as a left-turn lane. A right-turn lane would be added to Church Street to enter PA 41 and to northbound PA 41 at Baltimore Pike. Widening of PA 41 would occur mainly to the east, or the northbound side. Pedestrian circulation would be improved with the addition and/or reconstruction of sidewalks, ADA compliant ramps, and crosswalks between State Street and Baltimore Pike. The bridge over East Branch White Clay Creek would be replaced.

The primary impacts are to the Avondale historic district. The Avondale Historic District was determined eligible for listing in the NRHP in April 2001 under Criterion A for its association with the Philadelphia and Baltimore Central Railroad, the development of the mushroom industry, and as a social center for surrounding townships. It is also eligible under Criterion C for its intact representative examples of nineteenth and early-twentieth century architecture. The proposed second southbound through lane between State Street and Baltimore Pike would have a potential impact (displacements) on five buildings located within the historic district. Three resources are non-contributing:

- Bank at the northeast corner of Pennsylvania Avenue and State Street (also considered a commercial displacement)
- Gas Station at the southeast corner of Pennsylvania Avenue and State Street (also considered a commercial displacement)
- Cutone Mushroom located immediately south of 9 Pennsylvania Avenue(also considered a commercial displacement)

Two buildings are contributing resources:

- 3 Pennsylvania Avenue (also considered a residential displacement)
- 9 Pennsylvania Avenue(also considered a residential displacement)

The improvements would also potentially impact the Philadelphia and Baltimore Central Railroad, determined eligible for the NRHP under Criterion A in November 2003 (boundary concurred January 2004). The impact would be from widening PA 41 along the railroad tracks. The tracks would remain.

There will be floodplain and stream impact associated with the replacement of PA 41 bridge over the East Branch White Clay Creek. Approximately less than 100 feet of perennial stream and between 1 to 1.5 acres of floodplain would potentially be impacted.

Eight potential sensitive waste sites also border the proposed improvement and will need further investigation; they include the Sunoco gas station (# 03630183), Rivera's Barber Shop/A&A Auto Tags (formerly Griffonetti's), Gabby Inc. gas station (formerly Gulf gas station), the Maximum Fitness Physical Therapy building (a.k.a. the Weeks Site), PECO substation, Ace Cleaners, CITGO gas station, and Valen's gas station. There are no other environmental resource impacts anticipated for this improvement.

Newark Road/PA 41 Intersection Improvement Area (Appendix E Plate 6)

The key intersection improvements proposed for this area include adding right-turn lanes on PA 41 in both directions and adding left-turn lanes on Newark Road in both directions. PA 41 would be widened in both directions to accommodate the proposed right-turn lanes. The widening of PA 41 would only occur in the northwest and southeast quadrants of the intersection and would not affect the existing left-turn or through lanes on PA 41. Newark Road would be widened to eliminate the shared through-left lanes by providing separate left, through, and right turn lanes for both approaches. Pedestrian circulation would be improved with the addition of crosswalks at the intersection.

There is a mushroom farming operation located in the southeast quadrant that would be encroached upon, and therefore account for less than 0.5 acres of impact to active farmland. This option would potentially displace a commercial business.

Two potential sensitive waste sites also border the proposed improvement and may need to be further investigated; they include the Sunoco and Turkey Hill Gas Stations in the northeast and northwest quadrants respectively. It is anticipated that the proposed grading would impact the existing gas pump islands associated with the Turkey Hill Gas Station. Additional evaluation would be required to determine if the relocation of the pumps is feasible, and therefore impacts to this property are not considered a commercial displacement at this time. There are no other environmental resource impacts anticipated for this improvement.

Newark Road/Starr Road Intersection Improvement Area (Appendix E Plate 7)

This intersection currently operates as a four-way stop controlled intersection. Possible key improvements to this intersection could be signalization or the use of a roundabout. Signalization would only require the installation of poles on each corner with no significant impact identified. A roundabout would impact each quadrant as the intersection would be further widened to accommodate the new roadwork. Both signalization and roundabout options would require strip acquisitions of land from the adjacent residential properties in the southeast and southwest quadrants, however no displacements are anticipated. Pedestrian circulation would be improved with the addition of crosswalks at the signalized intersection. There are no other environmental resource impacts anticipated for this improvement.

Starr Road/PA 41 Intersection Improvement Area (Appendix E Plate 8)

The key features proposed for this improvement area include signalization and the addition of northbound and southbound through lanes on PA 41 from Starr Road south to the 4-lane roadway section that is currently proposed by the White Clay Point development project. PA 41 would be widened to accommodate a second through lane in each direction from Starr Road south to the HOP improvements to be completed by the White Clay Point development. The second southbound lane would extend approximately 1100 ft south of Starr Road, while the northbound lane would start approximately 600 ft south of the intersection. Starr Road would also become signalized. The widening of PA 41 is mainly on the west or southbound side to match the widening from the proposed White Clay Point HOP improvements. Pedestrian circulation would be improved with the addition of ADA compliant ramps and crosswalks at the signalized intersection.

Three potential sensitive waste sites also border the proposed improvement area along the west side of PA 41 and may be a concern; they include the W.L. Gore & Associates site (formerly the American Manufacturing Technologies, Inc.), Brenco Supply, Inc. (currently out of business), and Bavarian Collision. There are no other environmental resource impacts anticipated for this improvement.

Limestone Road/Southwood Road Intersection Improvement Area (Appendix E Plate 9)

Improvements proposed for this area include adding a left-turn lane in both directions along Limestone Road and on eastbound Southwood Road. Both Limestone Road and Southwood Road would be widened to accommodate the proposed left-turn lanes. Pedestrian circulation would be improved with the addition of ADA compliant ramps and crosswalks at the signalized intersection.

One active farmland parcel is located in the north east quadrant of the intersection, currently utilized for mushroom production, may have approximately less than 0.5 acres of strip acquisition, however there are no structure displacements anticipated.

Two potential sensitive waste sites also border the proposed improvement area at the northwest quadrant (Edgecraft Corporation) and the southeast quadrant (unnamed garage structure). There are no other environmental resource impacts anticipated for this improvement.

5.2 Impact Summary

Table 5.1 provides an environmental matrix to illustrate the potential impacts to environmental resources associated with each of the proposed intersection improvement areas.

Table 5.1 – Options Analysis Composite Impacts Matrix

Intersection Improvement Area	Resources												
	Wetlands (acres)	Streams (linear feet)	100-Year Floodplain (acres)	Threatened and Endangered Species Habitat (acres)	Farmlands (acres)	Historic Resource	Historic District	Archaeology Site	Parkland	Potential Sensitive Waste Site	Public Facility and Services	Potential Commercial Displacement	Potential Residential Displacement
PA 926/PA 41 Intersection	0	0	0	0	0	**1**	0	0	0	0	0	0	0
PA 841/PA 41 Intersection	0	0	0	0	0	**7**	**1**	0	0	**2**	0	0	0
Woodview Road/PA 41 Intersection	0	**<50**	0	0	**0.5-1**	**1**	0	0	0	0	0	0	0
US Route 1 Ramps/PA 41	0	0	0	0	**<0.5**	0	0	0	0	0	0	0	0
PA 41/State Street to Baltimore Pike	0	**50-100**	**1-1.5**	0	0	**2**	**1**	0	0	**8**	0	**3**	**2**
Newark Road/PA 41 Intersection	0	0	0	0	**<0.5**	0	0	0	0	2	0	0	0
Newark Road/Starr Road Intersection	0	0	0	0	0	0	0	0	0	0	0	0	0
Starr Road/PA 41 Intersection	0	0	0	0	0	0	0	0	0	3	0	0	0
Limestone Road/Southwood Road Intersection	0	0	0	0	**<0.5**	0	0	0	0	2	0	0	0

5.3 Conclusion

The PA 41 Project has been the subject of various studies since 1993. Previously a Needs Study (1994) and a Preliminary Alternative Analysis (1999) were prepared to document the needs and solutions at the time of analysis. The PA 41 Project was then put on hold in 2002 due to funding constraints. In 2008, the project was reinitiated.

Based on the reevaluation of the current corridor, the context has changed to an urban/suburban setting with numerous signalized intersections. Based on the updated traffic and safety analysis, the project needs have been refined, as follows:

- Improve safety conditions
- Accommodate future corridor mobility
- Improve intersection operations
- Improve existing infrastructure

These needs are mainly focused at isolated areas and are not corridor-wide conditions. Hence, the options presented in the 1999 PAA were dismissed so that new options that address the current project needs could be developed. This does not mean that similar versions, or even the same options, could not be studied as part of the current options analyses, but these options should focus on the current and projected project needs and corridor context.

The Engineering Consideration (**Section 4**) and the Preliminary Options Evaluation (**Section 5**) describe in detail the nine options that were developed to address the project needs. These nine options meet the four project needs stated above by improving safety, mobility, and infrastructure at the isolated locations describe in **Section 2.3**. As each of these options addresses a specific localized need and have independent utility, they can be developed independently of each other. For example, the solution to address the capacity issue at the PA 926 intersection has no influence on the solution to address the capacity/safety solution at the PA 841 intersection. Also, some of these options address immediate needs of the corridor, while others address a forecasted need to be apparent in year 2030. As such, each of these nine options would not have to be programmed for construction immediately, but rather could be phased over time to address the traffic needs as they arise.

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7.0 List of Preparers

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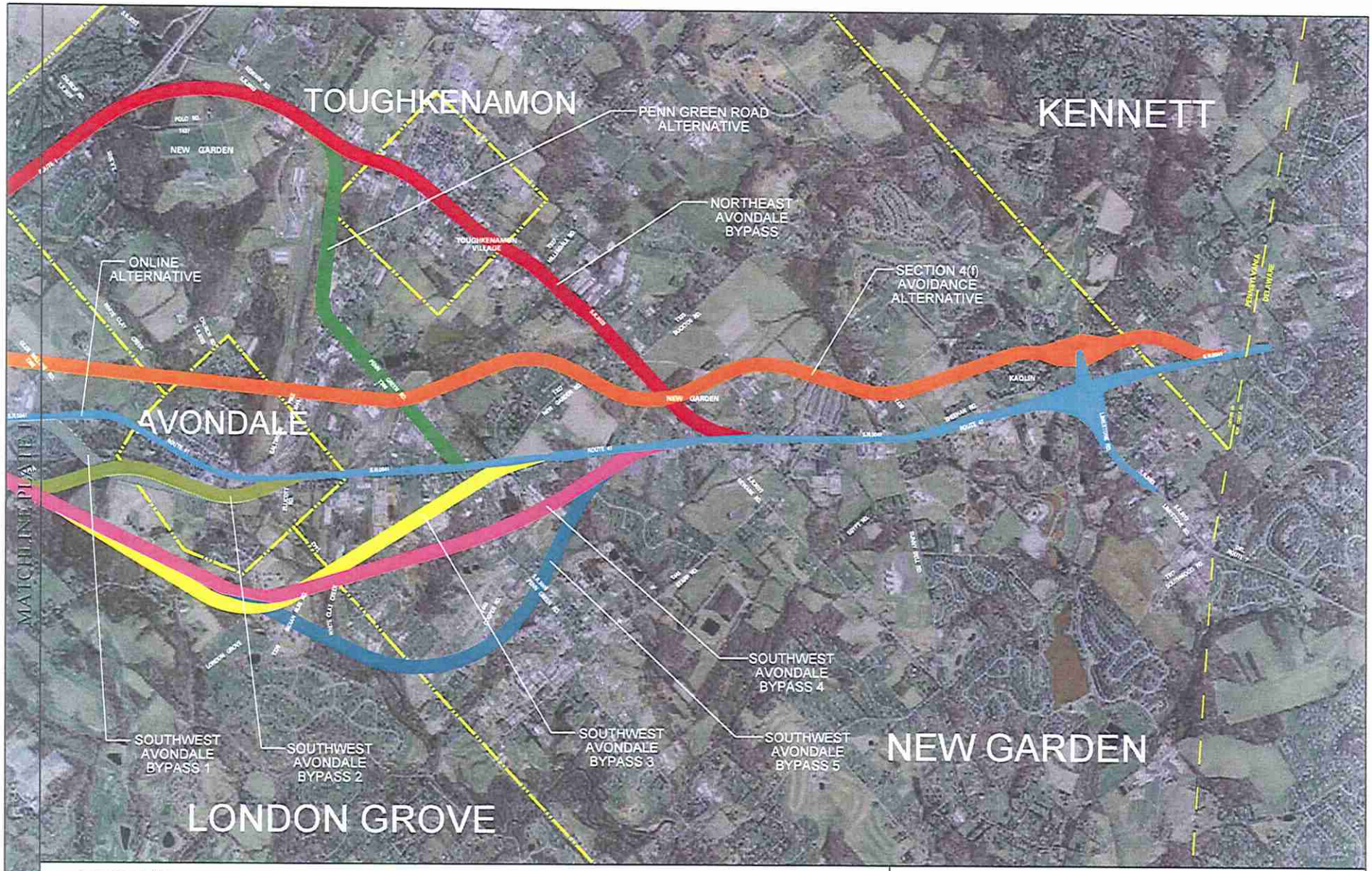
Margaret Parker	Quality Control	B.S./History	18
Mary Raulerson			
J. Benjamin Reiman	Natural Resources	B.S./ Environmental Science	12
Joseph Roman, PE	Project Background and Need, Engineering	B.S./Civil Engineering	8
Kimberly Sebestyen	Archaeological Resources	B.A./Anthropology M.S./American Studies	17

Bruce Thompson	Sensitive Waste, Air, Noise, and Vibration	B.S./Environmental Resource Management	22
Gail Walls	Historic Resources	B.S./English M.S./Historic Preservation	12

Appendix A
1999 Alternative Alignment Plates



LEGEND

- ONLINE ALTERNATIVE
- PENN GREEN ROAD ALTERNATIVE
- SECTION 4(f) AVOIDANCE ALTERNATIVE
- NORTHEAST AVONDALE BYPASS
- SOUTHWEST AVONDALE BYPASS 1
- SOUTHWEST AVONDALE BYPASS 2
- SOUTHWEST AVONDALE BYPASS 3
- SOUTHWEST AVONDALE BYPASS 4
- SOUTHWEST AVONDALE BYPASS 5
- MUNICIPAL BOUNDARIES

AERIAL PHOTOGRAPHIC SOURCE: DVRPC 2005

N

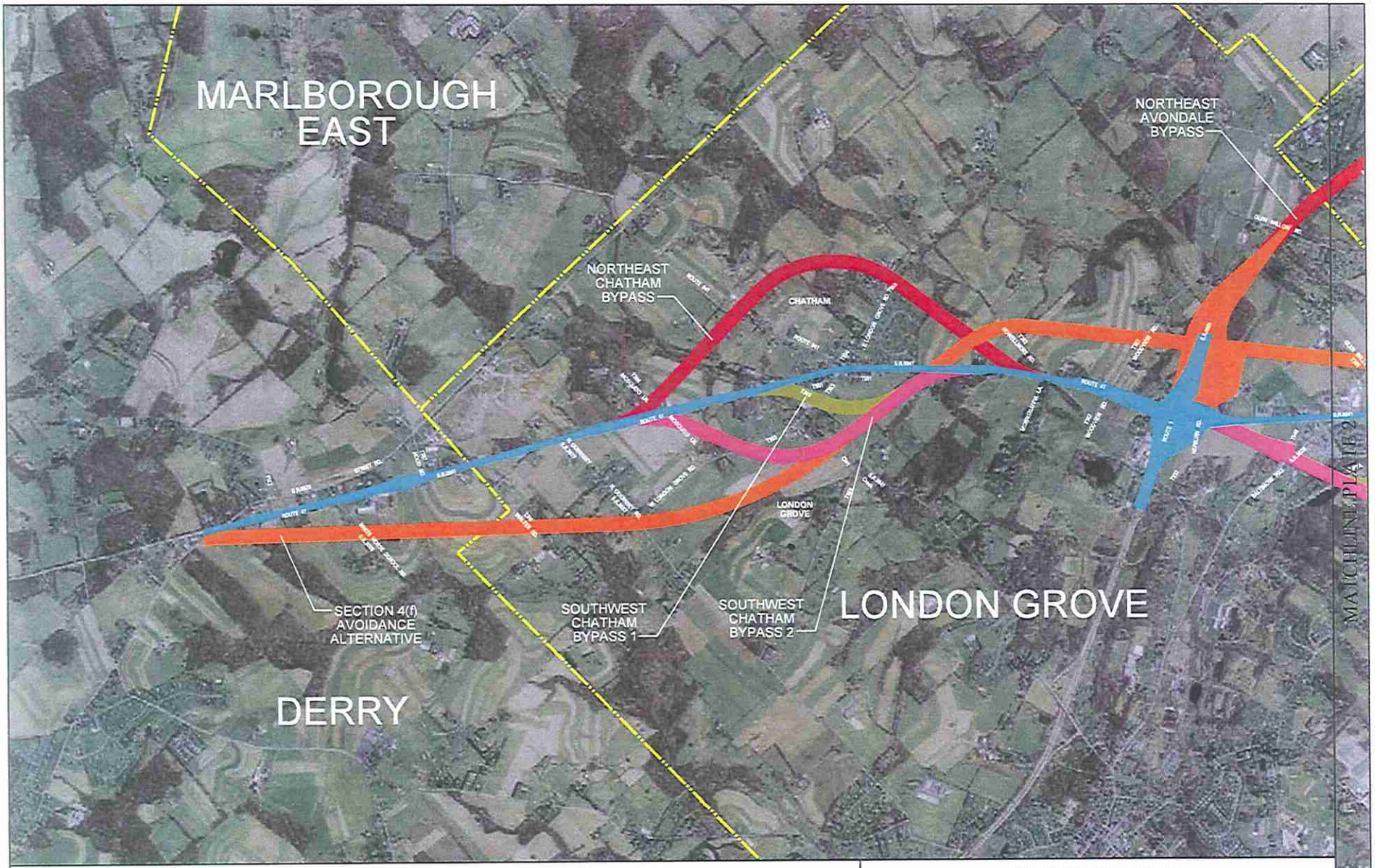
0 1500 3000

SCALE IN FEET

OCTOBER 2009

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVES ANALYSIS
CHESTER COUNTY, PA

1999 ALTERNATIVE ALIGNMENTS - PLATE 2



LEGEND

- ONLINE ALTERNATIVE
- SECTION 4(f) AVOIDANCE ALTERNATIVE
- NORTHEAST CHATHAM BYPASS
- SOUTHWEST CHATHAM BYPASS 1
- SOUTHWEST CHATHAM BYPASS 2
- NORTHEAST AVONDALE BYPASS
- MUNICIPAL BOUNDARIES

AERIAL PHOTOGRAPHIC SOURCE: DVRPC 2005

N

0 1500 3000

SCALE IN FEET

OCTOBER 2009

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVES ANALYSIS
CHESTER COUNTY, PA

1999 ALTERNATIVE ALIGNMENTS - PLATE 1

Appendix B
Crash Statistics Plates

LEGEND

LESS THAN ONE TIMES THE PA STATE AVERAGE IN CRASHES

ONE TO TWO TIMES THE PA STATE AVERAGE IN CRASHES

ABOVE TWO TIMES THE PA STATE AVERAGE IN CRASHES

AERIAL PHOTOGRAPHIC SOURCE: DVRPC 2005
2003-2007 CRASH DATA

N

0 750 1500
SCALE IN FEET

OCTOBER 2009

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVES ANALYSIS
CHESTER COUNTY, PA

CRASH STATISTICS - PLATE 1

LEGEND

AERIAL PHOTOGRAPHIC SOURCE: DVRPC 2005
2003-2007 CRASH DATA

OCTOBER 2009

LESS THAN ONE TIMES THE PA STATE AVERAGE IN CRASHES

ONE TO TWO TIMES THE PA STATE AVERAGE IN CRASHES

ABOVE TWO TIMES THE PA STATE AVERAGE IN CRASHES

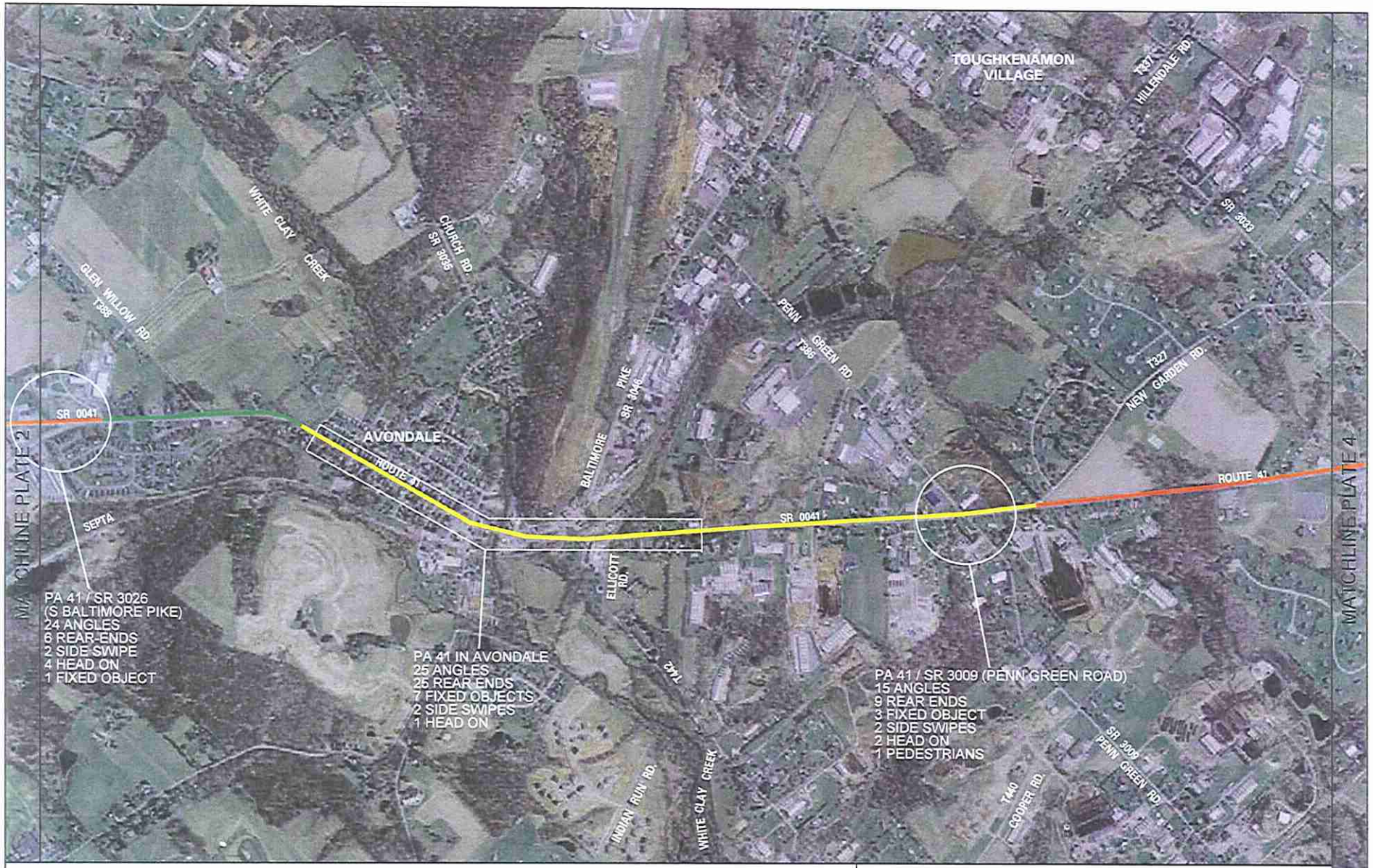
N

0 750 1500

SCALE IN FEET

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVES ANALYSIS
CHESTER COUNTY, PA

CRASH STATISTICS - PLATE 2



LEGEND

LESS THAN ONE TIMES THE PA STATE AVERAGE IN CRASHES

ONE TO TWO TIMES THE PA STATE AVERAGE IN CRASHES

ABOVE TWO TIMES THE PA STATE AVERAGE IN CRASHES

AERIAL PHOTOGRAPHIC SOURCE: DVRPC 2005
2003-2007 CRASH DATA

N

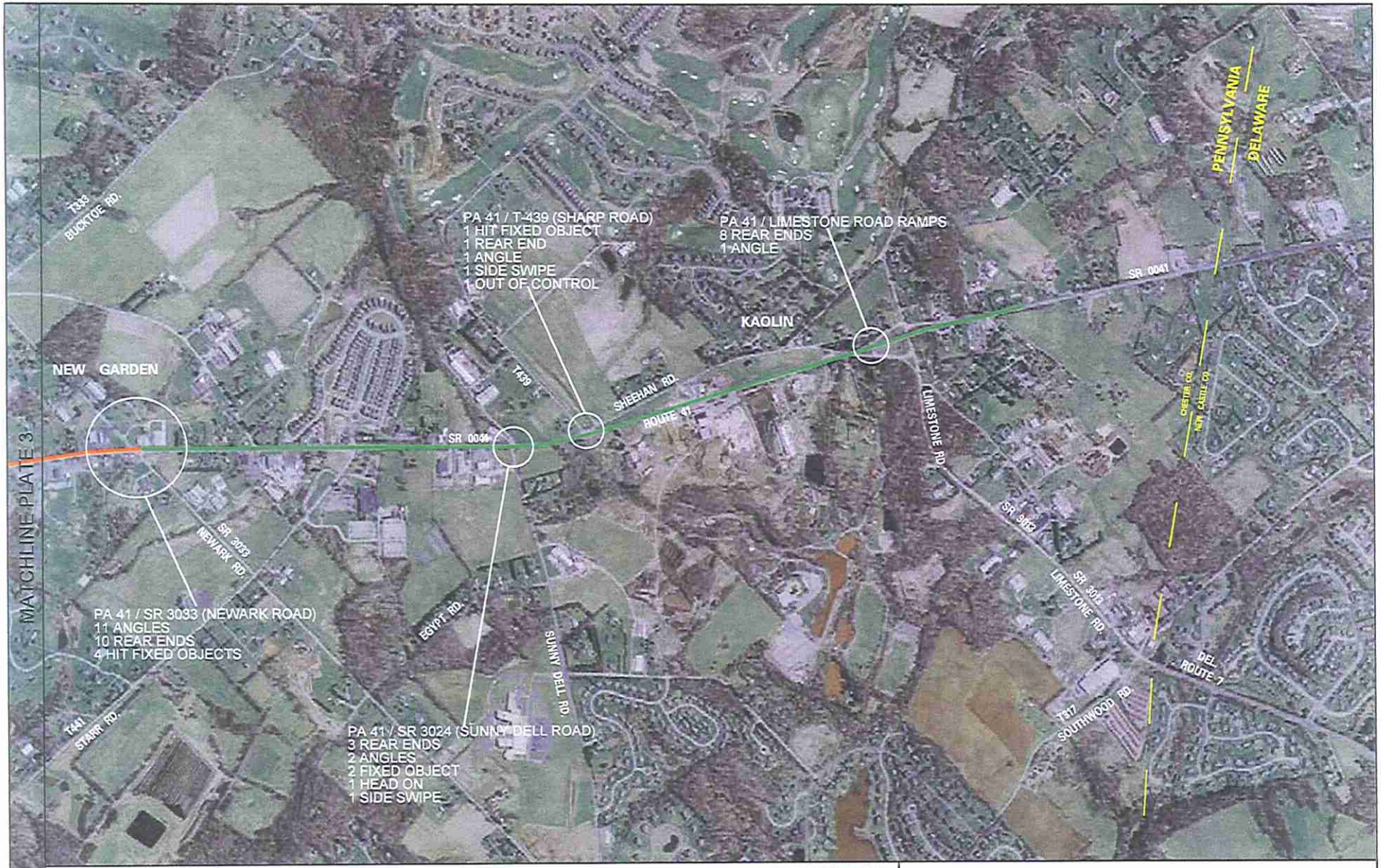
0 750 1500

SCALE IN FEET

OCTOBER 2009

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVES ANALYSIS
CHESTER COUNTY, PA

CRASH STATISTICS - PLATE 3



LEGEND

- LESS THAN ONE TIMES THE PA STATE AVERAGE IN CRASHES
- ONE TO TWO TIMES THE PA STATE AVERAGE IN CRASHES
- ABOVE TWO TIMES THE PA STATE AVERAGE IN CRASHES

AERIAL PHOTOGRAPHIC SOURCE: DVRPC 2005
2003-2007 CRASH DATA

N

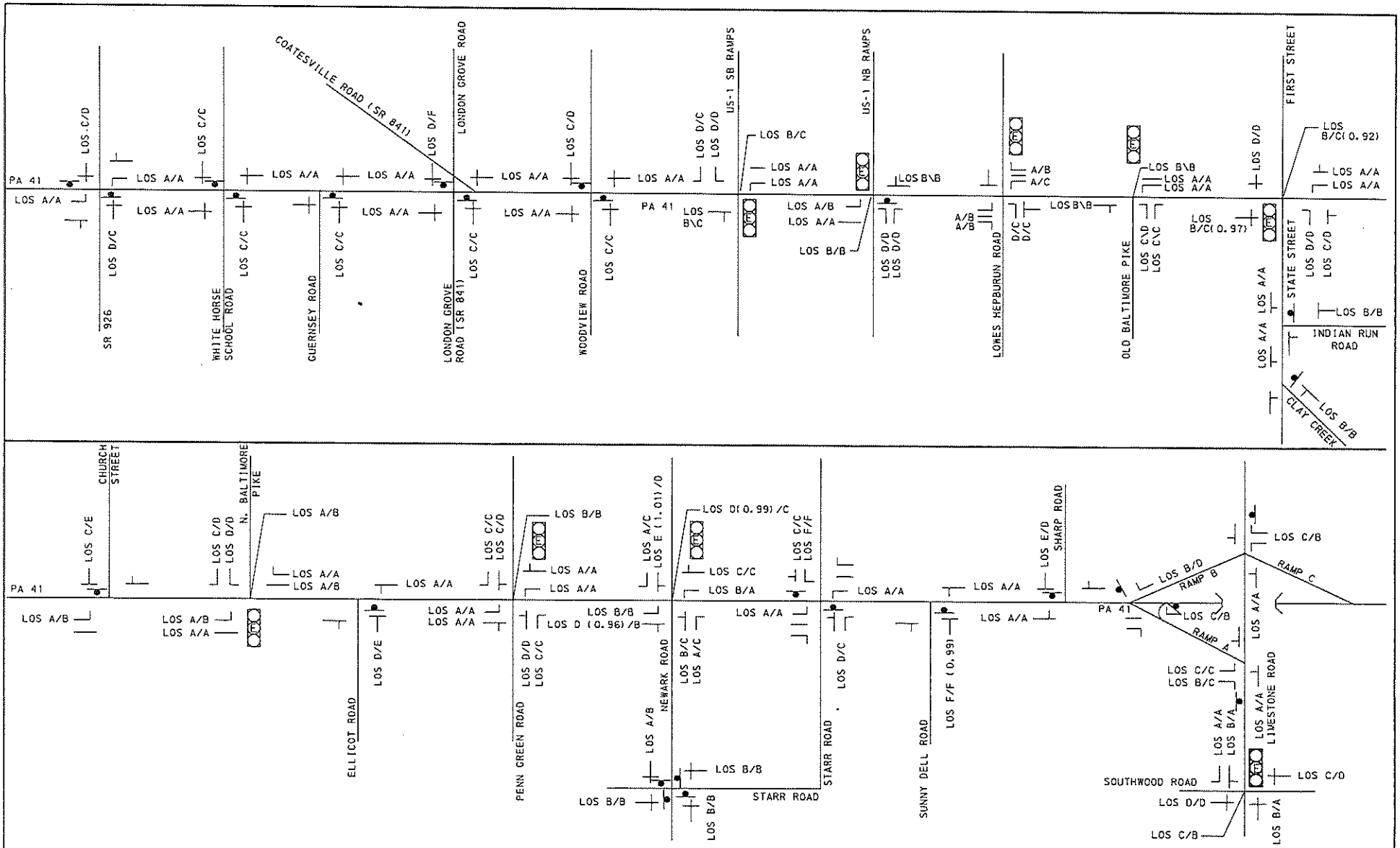
0 750 1500
SCALE IN FEET

OCTOBER 2009

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVES ANALYSIS
CHESTER COUNTY, PA

CRASH STATISTICS - PLATE 4

Appendix C
Level of Service Plates



SR 0041, SECTION STY - PRELIMINARY ALTERNATIVES ANALYSIS

OCTOBER 2009

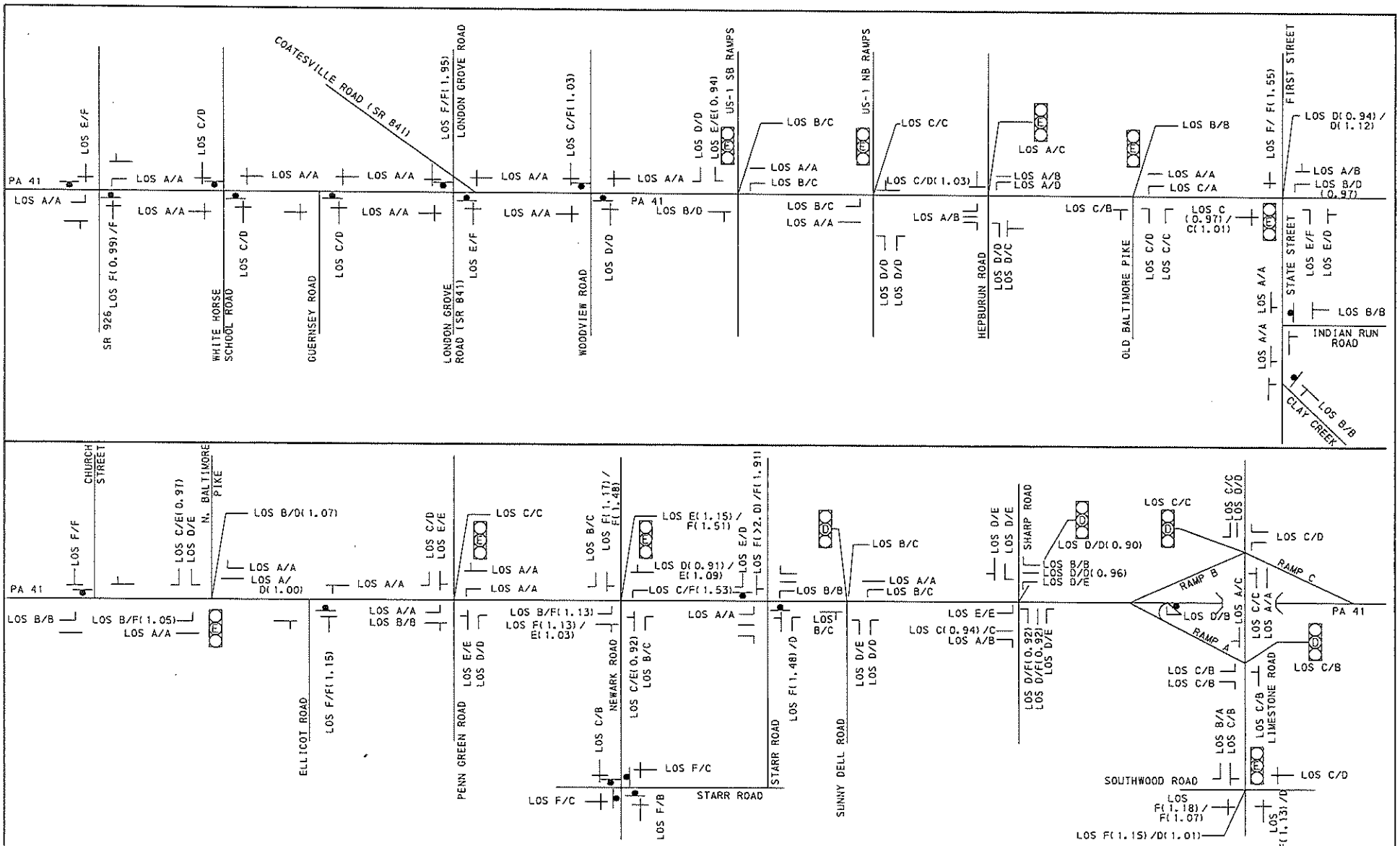
LEGEND

- EXISTING SIGNALIZED INTERSECTION (AUGUST 2009)
- EXISTING STOP CONTROL

LOS B/A(XX) - LOS AM/PM (V/C RATIOS)

EXISTING 2009 AM/PM LEVELS OF SERVICE FOR PA 41

LEVEL OF SERVICE - PLATE 1



SR 0041, SECTION STY - PRELIMINARY ALTERNATIVES ANALYSIS

OCTOBER 2009

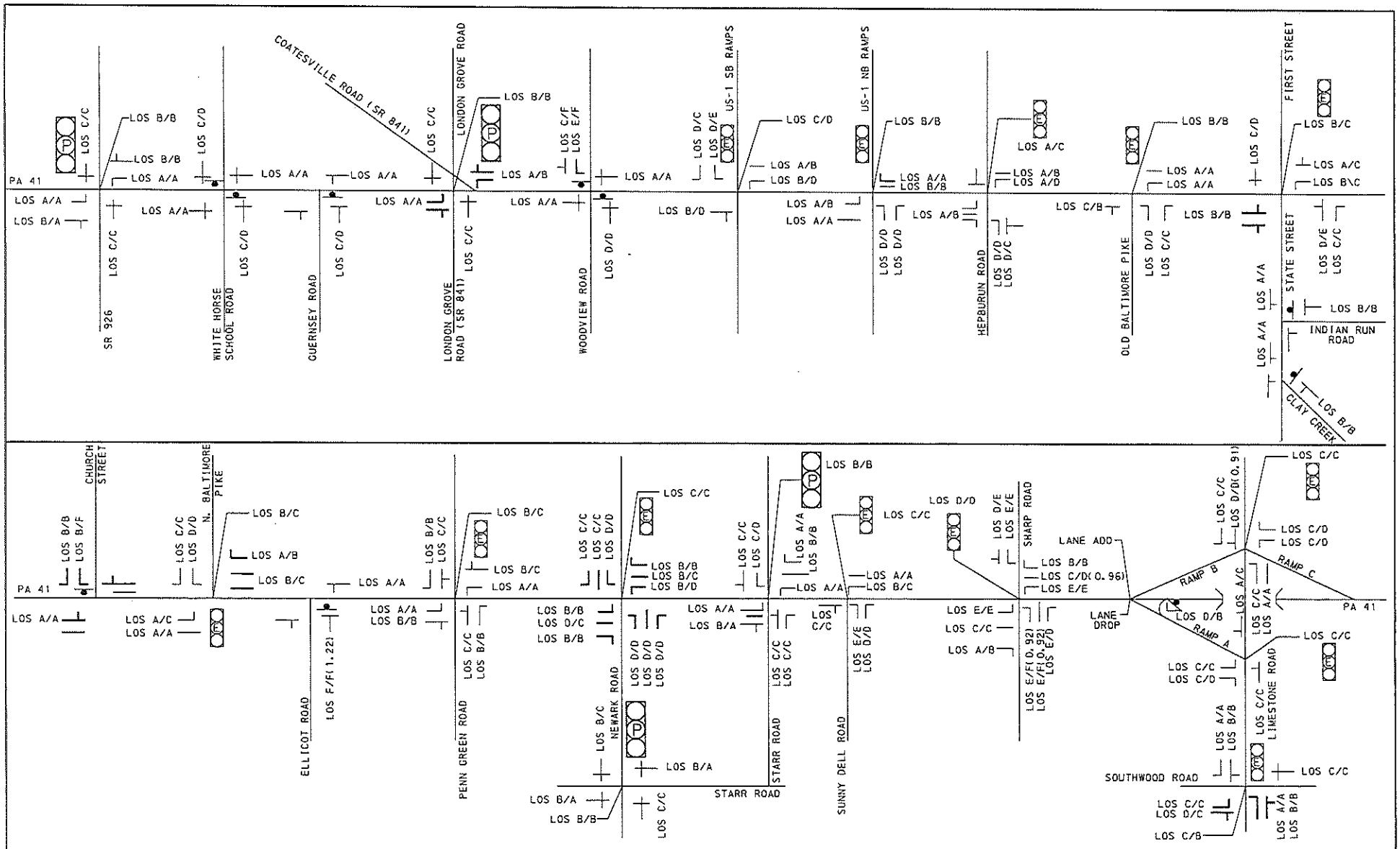
LEGEND

- EXISTING SIGNALIZED INTERSECTION (AUGUST 2009)
- DEVELOPER INSTALLED SIGNALIZED INTERSECTION BY 2030
- EXISTING STOP CONTROL

LOS B/A(XX) - LOS AM/PM (V/C RATIOS)

2030 NO BUILD AM/PM LEVELS OF SERVICE FOR PA 41 (1.3%/YR GROWTH)

LEVEL OF SERVICE - PLATE 2



SR 0041, SECTION STY - PRELIMINARY ALTERNATIVES ANALYSIS

OCTOBER 2009

LEGEND

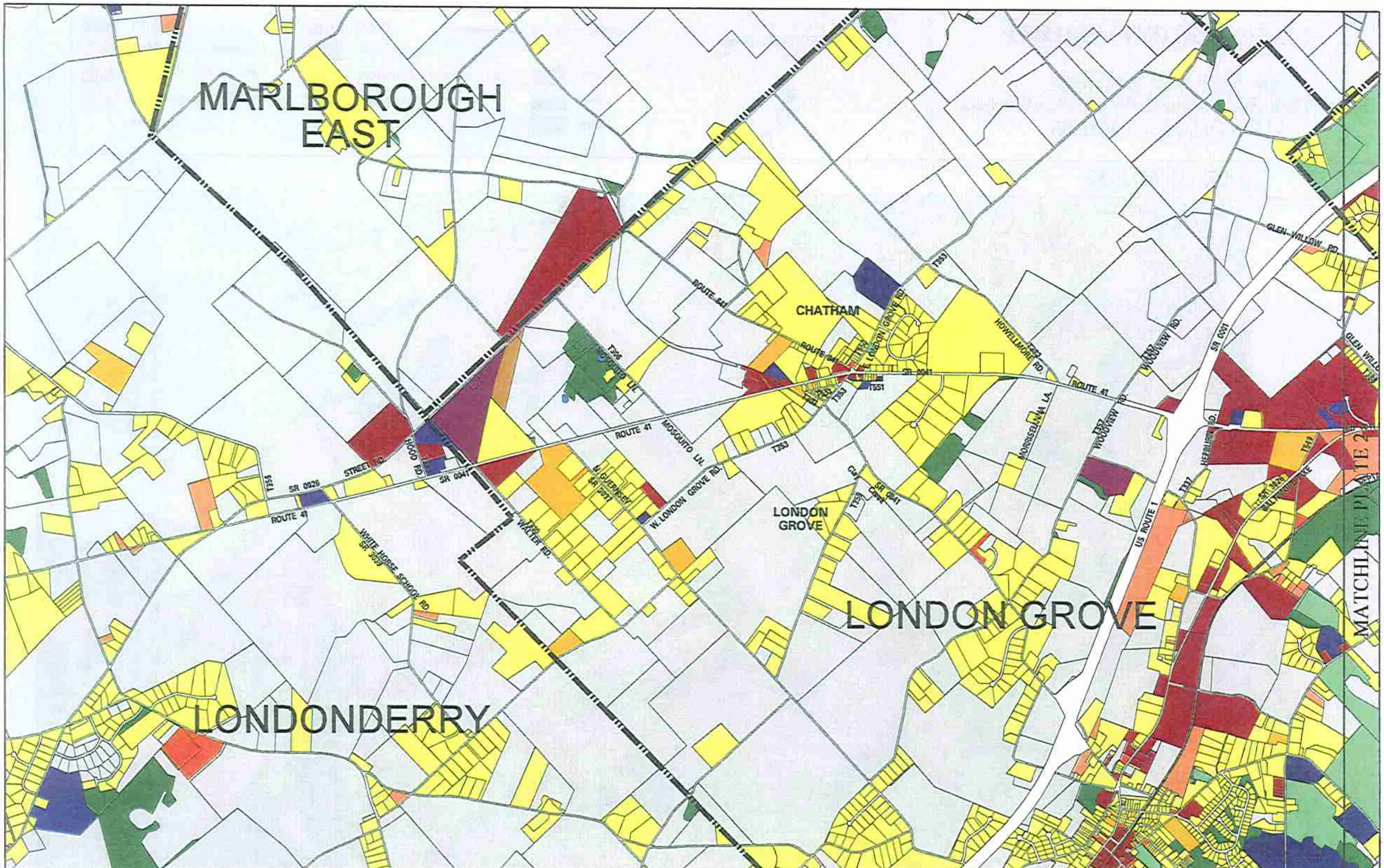
- EXISTING SIGNALIZED INTERSECTION (AUGUST 2009) OR DEVELOPER INSTALLED SIGNAL BY 2030
- DEVELOPER INSTALLED SIGNALIZED INTERSECTION BY 2030
- EXISTING STOP CONTROL
- PROPOSED SIGNALIZED INTERSECTION (2030)
- EXISTING
- TSM IMPROVEMENTS

LOS B/A(XX) - LOS AM/PM (V/C RATIOS)

2030 "TSM" AM/PM LEVELS OF SERVICE FOR PA 41 (1.3%/YR GROWTH)

LEVEL OF SERVICE - PLATE 3

Appendix D
Existing Land Use



LEGEND

Single Family	Agricultural	Water
Two Family Residential	Recreational	Forest
Multi-Family Residential	Commercial / Services / Office	Airport
Residential / Commerical	Institutional	
Industrial	Utility	Municipal Boundary

0 1500 3000
SCALE IN FEET

OCTOBER 2009

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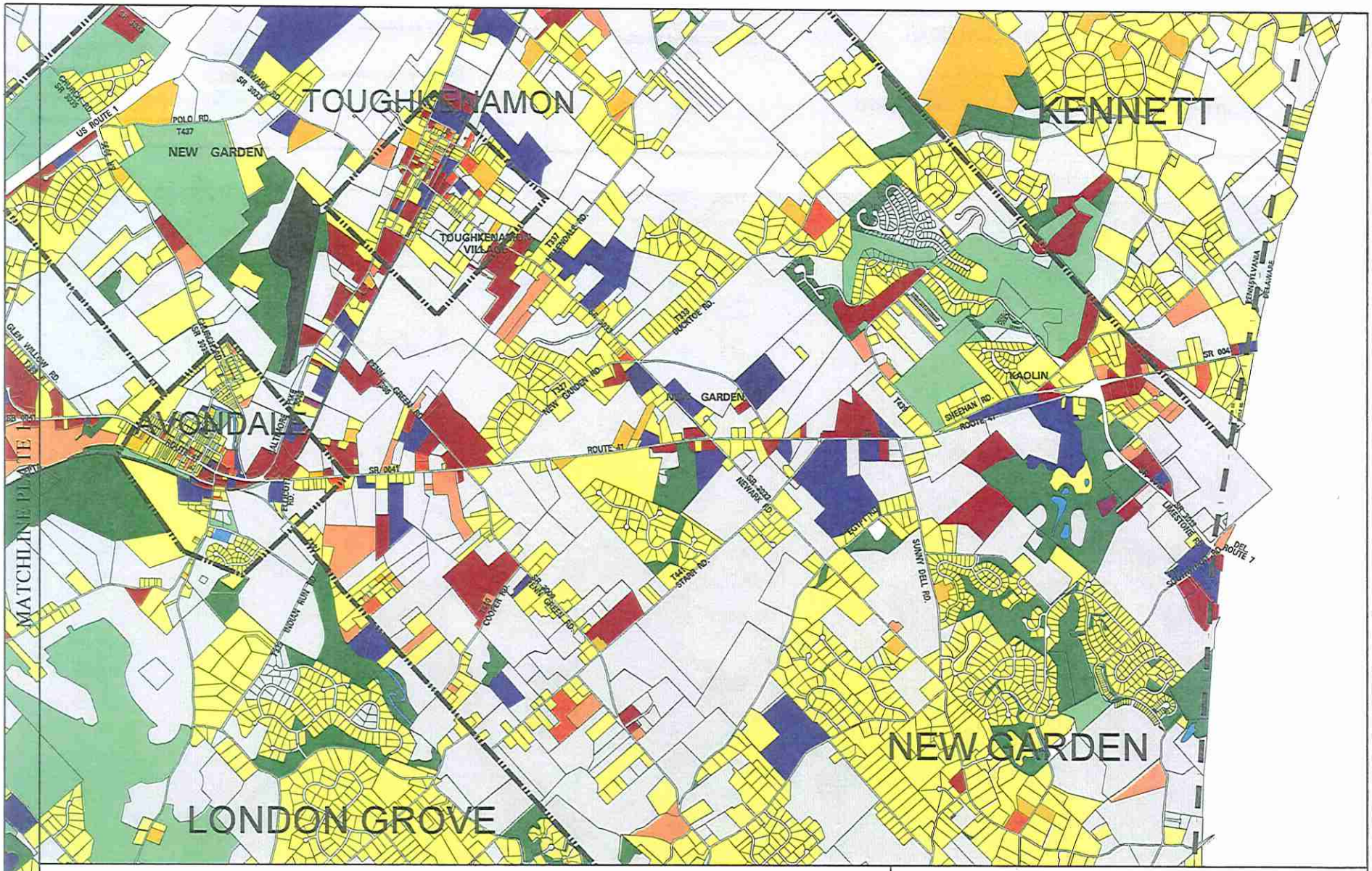
PRELIMINARY ALTERNATIVE ANALYSIS
CHESTER COUNTY, PA

EXISTING LAND USE - PLATE 1



LEGEND

- Single Family
- Two Family Residential
- Multi-Family Residential
- Residential / Commerical
- Industrial
- Agricultural
- Recreational
- Commercial / Services / Office
- Institutional
- Utility
- Water
- Forest
- Airport
- Municipal Boundary

N

0 1500 3000

SCALE IN FEET

OCTOBER 2009

SR 0041, SECTION STY
PRELIMINARY ALTERNATIVE ANALYSIS
CHESTER COUNTY, PA

EXISTING LAND USE - PLATE 2

Appendix E
Intersection Improvement Area Plates

Legend

Improvement Area

Municipal Boundary

Aerial Photograph Source: DVRPC 2005

N

0 750 1500

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Intersection Improvement Areas Index - Plate 1

Legend

Improvement Area

Municipal Boundary

Aerial Photograph Source: DVRPC 2005

N

0 750 1500

Scale in Feet

October 2009

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Preliminary Alternative Analysis
Chester County, PA

Intersection Improvement
Areas Index - Plate 2

Legend

Improvement Area

Municipal Boundary

Aerial Photograph Source: DVRPC 2005

0 750 1500

Scale In Feet

October 2009

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Preliminary Alternative Analysis
Chester County, PA

Intersection Improvement Areas Index - Plate 3

Legend

Improvement Area

Municipal Boundary

Aerial Photograph Source: DVRPC 2005

N

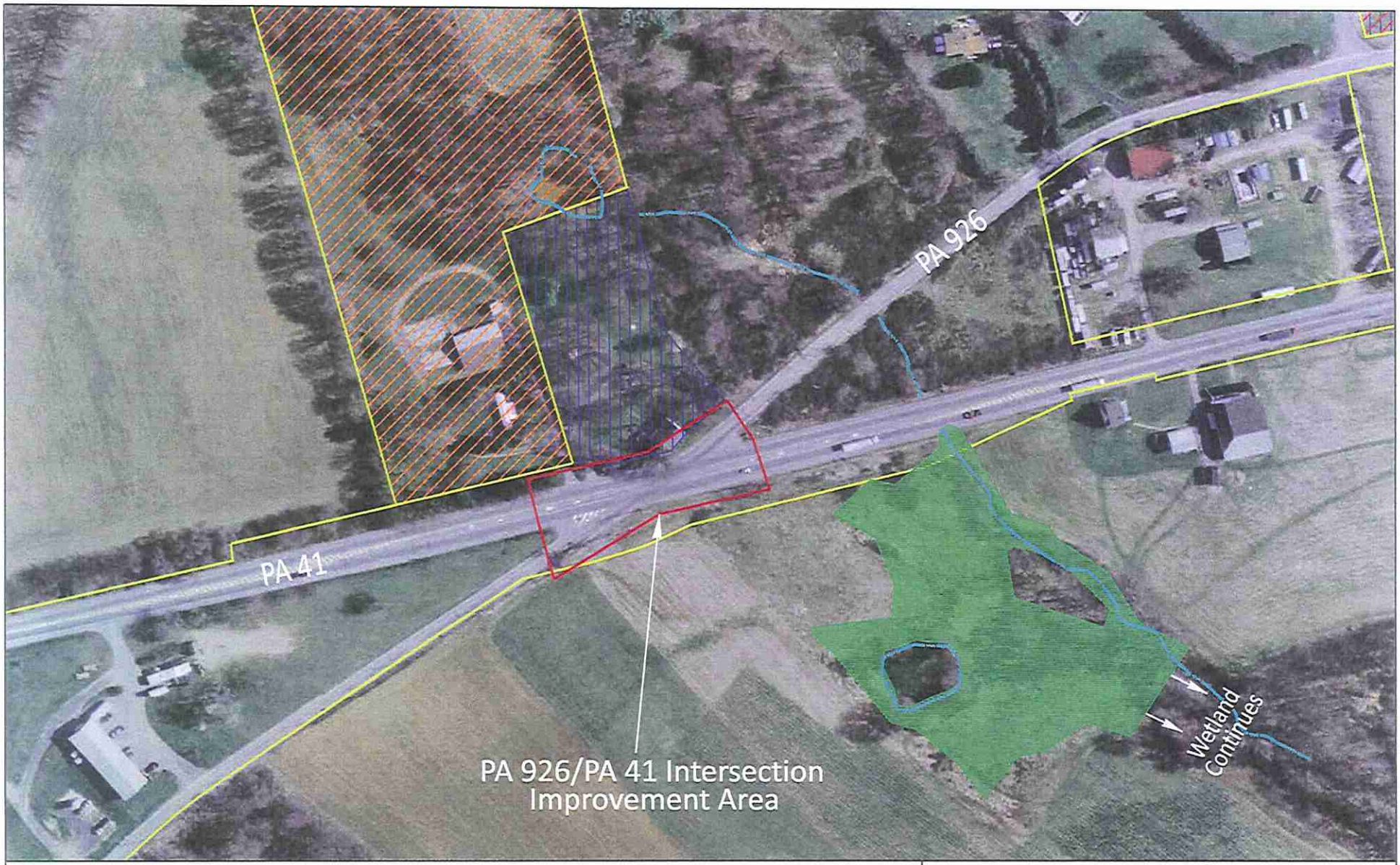
0 750 1500

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Intersection Improvement
Areas Index - Plate 4



Legend

- Improvement Area
- Wetlands
- Streams
- Active Farmland
- Agricultural Security Area
- Conservation Easement
- Historic Resource

Aerial Photograph Source: DVRPC 2005

N

0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

PA 926/PA 41 Intersection
Improvement Area - Plate 1

Legend

- Improvement Area
- Wetlands
- Active Farmland
- Agricultural Security Area
- Sensitive Waste
- Historic Resource
- Historic District

Aerial Photograph Source: DVRPC 2005

N

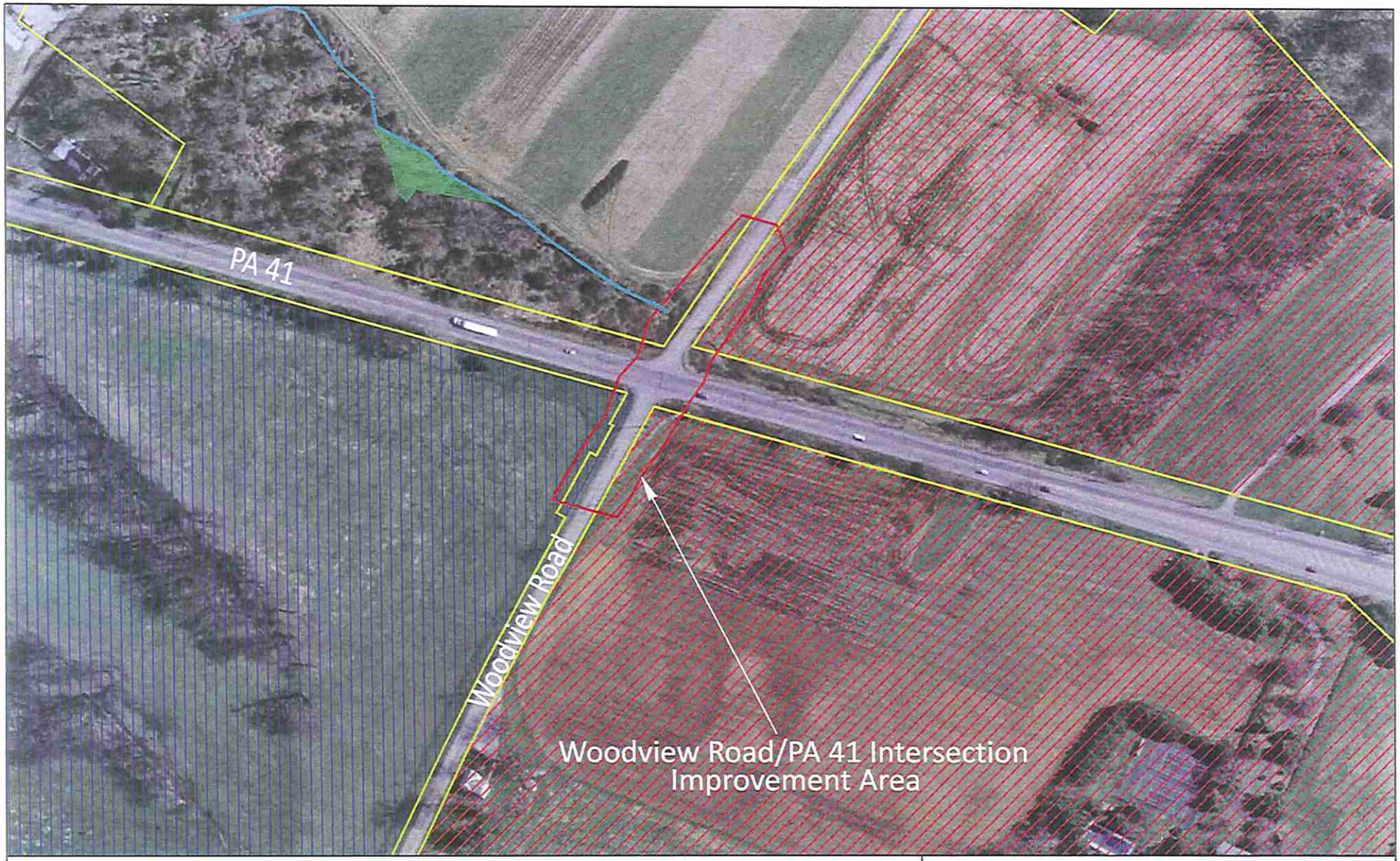
0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

PA 841/PA 41 Intersection
Improvement Area - Plate 2



Legend

- Improvement Area
- Historic Resource
- Wetlands
- Active Farmland
- Agricultural Security Area

Aerial Photograph Source: DVRPC 2005

N

0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Woodview Road/PA 41 Intersection
Improvement Area - Plate 3

Legend

- Improvement Area
- Active Farmland
- Agricultural Security Area
- Corridor Development (After 2005 Aerial Photograph)

Aerial Photograph Source: DVRPC 2005

N

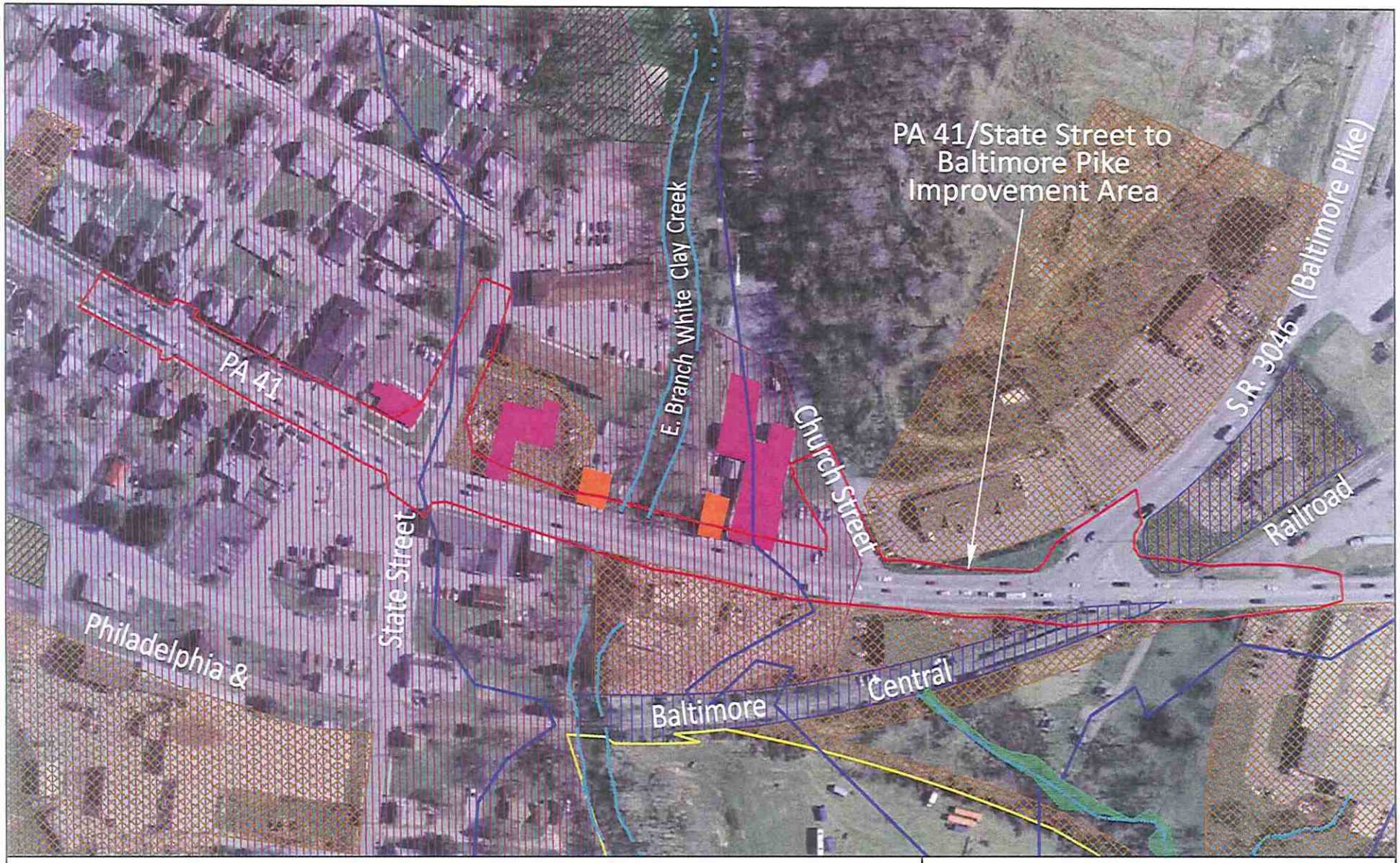
0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

US Route 1/PA 41 Intersection
Improvement Area - Plate 4



Legend

Aerial Photograph Source: DVRPC 2005

October 2009

- Improvement Area
- Wetlands
- Streams
- Floodplain (100 Year)
- Parklands
- Active Farmland
- Sensitive Waste
- Historic Resource
- Historic District
- Residential Displacements
- Commercial Displacements

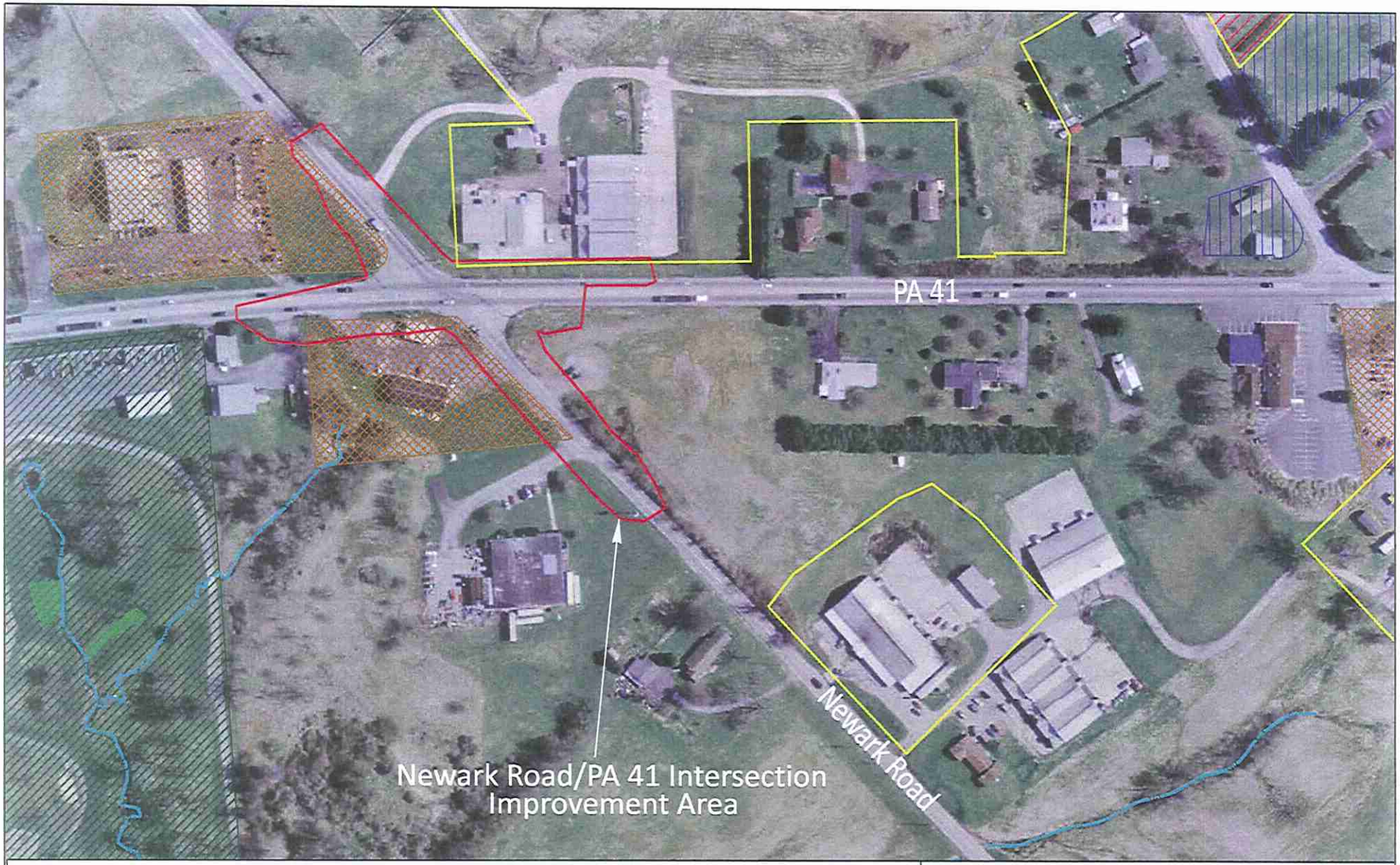
N

0 100 200

Scale In Feet

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

PA 41/State Street to Baltimore Pike
Improvement Area - Plate 5



Legend

- Improvement Area
- Wetlands
- Streams
- Parklands
- Active Farmland
- Agricultural Security Area
- Sensitive Waste
- Historic Resource

Aerial Photograph Source: DVRPC 2005

N

0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Newark Road/PA 41 Intersection
Improvement Area - Plate 6

Legend

- Improvement Area
- Streams
- Active Farmland
- Sensitive Waste

Aerial Photograph Source: DVRPC 2005

N

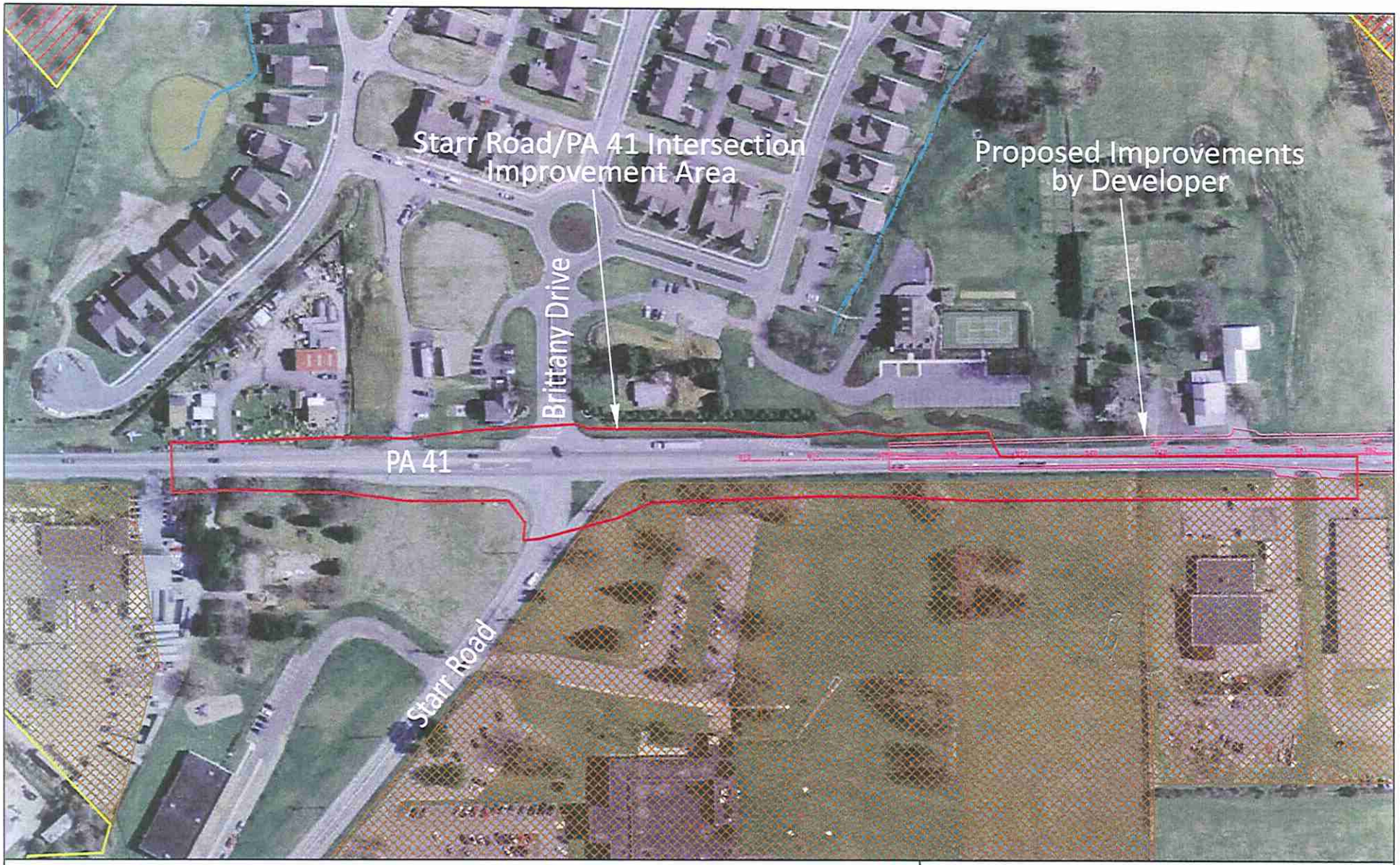
0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Newark Road/Starr Road Intersection
Improvement Area - Plate 7



Legend

- Improvement Area
- Streams
- Active Farmland
- Agricultural Security Area
- Sensitive Waste
- Historic Resource
- Corridor Development (After 2005 Aerial Photograph)

Aerial Photograph Source: DVRPC 2005

N

0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Starr Road/PA 41 Intersection
Improvement Area - Plate 8

Legend

- Improvement Area
- Municipal Boundary
- Active Farmland
- Agricultural Security Area
- Sensitive Waste
- Historic Resource

Aerial Photograph Source: DVRPC 2005

N

0 100 200

Scale In Feet

October 2009

SR 0041, Section STY
Preliminary Alternative Analysis
Chester County, PA

Limestone Road/Southwood Road
Intersection Improvement Area - Plate 9