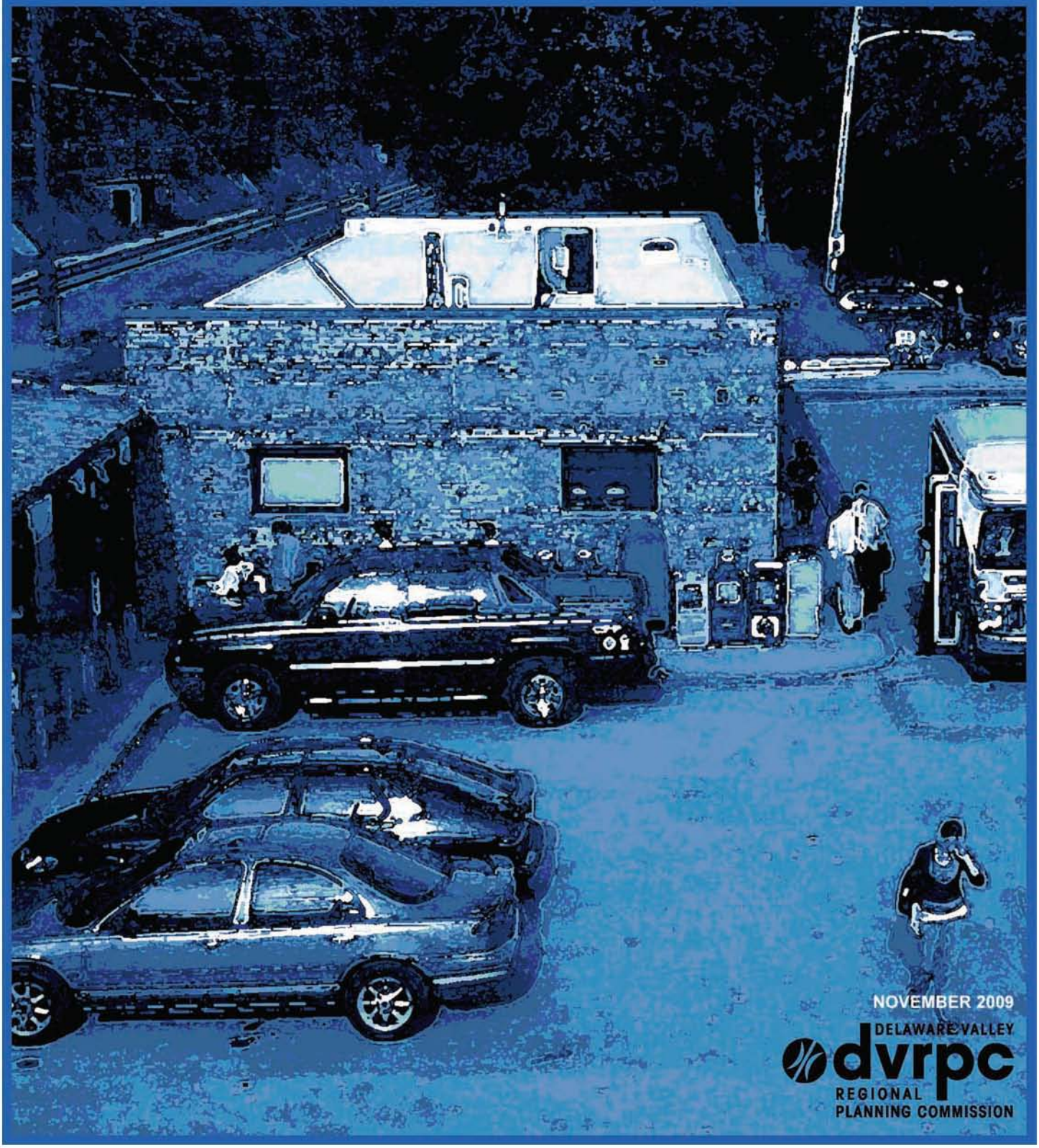
PAOLI STATION

INTERMODAL ACCESS AND PARKING STUDY



NOVEMBER 2009

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

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

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

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

DVRPC fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. DVRPC's website may be translated into Spanish, Russian and Traditional Chinese online by visiting www.dvrpc.org. Publications and other public documents can be made available in alternative languages and formats, if requested. For more information, please call (215) 238-2871.

Table of Contents

Executive Summary 1
- Project Background 2
- Study Area Overview 2
- Project History 3
- Land Use 4
- Employment Centers 6
- Trails 6

CHAPTER 1 9

Vehicular Access 9
- Highway Functional Classification 9
- Annual Average Daily Traffic 11
- Highway Volume-to-Capacity 11
- Turning Movements 11
- Crashes 12
- Commuter Shed 16
- Drive/Park 20
- Kiss-and-Ride/Taxi 21
- Bus Transit 23
- Private Shuttles 26

CHAPTER 2 28

Pedestrian and Bicycle Access 28
- Pedestrian and Bicyclist Counts 28
- Pedestrian and Bicycle Level of Service 36
- Pedestrian Intersection Level of Service 49
- Pedestrian Safety Audit 51

CHAPTER 3 70

Parking Management and Design 70
- Start with a Vision 70
- Station Access 70
- Shared Parking 72
- Parking Management Implementation 73
- Intelligent Transportation Systems Applications in Parking 75
- ADA Accessibility 77
- Sustainability 78
- Parking Design 80

CHAPTER 4 83

Recommendations and Conclusion 83
- Modal Inventory 83
- Recommendations 85
- Conclusion 98

Figures

Figure 1: Paoli Station Area Land Use 5
Figure 2: Paoli Station Area Employment Centers with Major Employers 7
Figure 3: Paoli Station Area Multi-Use Trails 8
Figure 4: Paoli Station Area Highway Functional Classification 10
Figure 5: Paoli Station Area Annual Average Daily Traffic Volumes 13
Figure 6: Paoli Station Area Roadway Volume-to-Capacity Ratio 14
Figure 7: Paoli Station Area Crashes 15
Figure 8: Paoli Station Area Commuter Sheds 17
Figure 9: Vehicles Awaiting Passenger Pick-up at the Northside/Westbound Station Lot 22
Figure 10: Paoli Station Area Transit Service 24
Figure 11: Bus Staging at Paoli Station at the Southside/Eastbound Station Lot 25
Figure 12: Shuttle Staging at Paoli Station at the Southside/Eastbound Station Lot 26
Figure 13: Paoli Station Pedestrian Counts 30
Figure 14: Pedestrian Activity at Paoli Station, Location A 32
Figure 15: Pedestrian Activity at Paoli Station, Location C and D 35
Figure 16: PLOS Sensitivity Analysis 40
Figure 17: BLOS Sensitivity Analysis 41
Figure 18: Paoli Station Area Pedestrian Level of Service 45
Figure 19: Paoli Station Area Bicycle Level of Service 48
Figure 20: Paoli Station Area Pedestrian Intersection Level of Service 50
Figure 21: Pedestrian Safety Audit – Lancaster Avenue from Valley Road to PA 252 56
Figure 22: Pedestrian Safety Audit – Lancaster Avenue from Valley Road to Cedar Hollow Road 61
Figure 23: Pedestrian Safety Audit – North Valley Road 66
Figure 24: Pedestrian Safety Audit – Paoli Pike, Greenwood Avenue, and Paoli Plaza 69
Figure 25: Typical Bus Movement Exiting Station 86
Figure 26: Bus Turning Right onto Lancaster Avenue/US 30 from Greenwood Avenue 86
Figure 27: Congestion Due to Unsignalized Exit at Paoli Station 87
Figure 28: Passengers Access Bus Service in Parking Lot 88
Figure 29: Kiss-and-Ride Connections Take Place in Parking Lot Cartway 89
Figure 30: Unsignalized Crosswalk Between Permit Parking and Station 89
Figure 31: Lack of Curbing to Separate Road and Sidewalk 91
Figure 32: Excessive Curb Cuts Along Lancaster Avenue/US 30 92
Figure 33: Inadequate Crosswalks along Lancaster Avenue/US 30 92
Figure 34: Pedestrian Perception of Risk at Lancaster Avenue/US 30 and Valley Road Intersection 93
Figure 35: Lack of Clarity About Areas for Pedestrians/Vehicles 93
Figure 36: Lack of Buffers from Traffic 94
Figure 37: Obstacles in Walkway 94
Figure 38: Inconsistencies in Sidewalk Width, Paving Materials, and Quality 95
Figure 39: Lack of Sidewalks on North Valley Road 96
Figure 40: Inadequate and Unsafe Crosswalks at Northside/Westbound Station 96
Figure 41: Need for Crosswalks at Central Avenue Intersection 97

Tables

Table 1: Paoli Station Land Use Summary 4
Table 2: Paoli Station Area Commuter Shed Municipal Summary 18
Table 3: Paoli Station Summary of Kiss-and-Ride and Taxi Activity 21
Table 4: Boards and Disembarks for Bus Routes Operating at Paoli Station 23
Table 5: Peak Hour Shuttle Trips at Paoli Station by Connecting Train Time 27
Table 6: PLOS and BLOS Scoring Standards 38

Appendices

APPENDICES

Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics 1
Appendix B: Paoli Station Turning Movement Counts, 15-Minute Intervals 2
Appendix C: Paoli Station Parking Need Assessment 3
Appendix D: Paoli Station Straightline Population Forecast by Municipality, 2005 through 2035 4
Appendix E: Paoli Station Pedestrian Counts, 15-Minute Intervals 5
Appendix F: Sample Commuter Parking Lease 6

Executive Summary

The *Paoli Station Intermodal Access and Parking Study* presents the findings obtained through research conducted as part of the Delaware Valley Regional Planning Commission's (DVRPC) Paoli Transportation Center Planning Assistance – Phase 2 initiative. The *Paoli Station Intermodal Access and Parking Study* was conducted in collaboration with Chester County, Tredyffrin Township, Willistown Township, and SEPTA. The main contribution of the study is an inventory and assessment of access modes which currently arrive, park, idle, and/or leave Paoli Station, which provides access to SEPTA Regional Rail and Amtrak service. Evaluated modes include drive/park, kiss-and-ride, bus, shuttle, bicycle, and pedestrian. Also as part of this study, DVRPC evaluated issues of parking management and identified potential improvements to the current station and future station area.

The *Paoli Station Intermodal Access and Parking Study* finds that Paoli Station is truly a multimodal facility. Based on counts conducted by DVRPC staff during a series of field visits, DVRPC estimated the share of boards attributable to each of the modes utilized at Paoli Station:

- Drive/Park – 44%
- Shuttle – 21%
- Bus – 17%
- Kiss-and-ride – 9%
- Pedestrian – 9%
- Bicycle – 0%

Although Paoli Station passengers access the station through a variety of modes, the transportation network surrounding and within the station provides only poor-to-adequate access for these modes. High traffic volumes, significant numbers of vehicle crashes, and poor pedestrian and bicycle levels of service indicate a need for improvements to the overall transportation network surrounding Paoli Station. The station is not designed to accommodate intermodal transfers or the staging and loading of modes including buses and kiss-and-ride. The *Paoli Station Intermodal Access and Parking Study* provides a detailed assessment of modal operations at the station and provides recommendations for enhancing access for all modes at the current station, as well as the planned Paoli Transportation Center.

Overall, the findings in this report suggest three general principles to guide planning efforts related to intermodal access for both the current and future station. These are:

- Accommodate Kiss-and-Ride, Shuttles, Taxis, and Buses
- Design for Intermodal Transfers
- Improve the Overall Transportation Network

Project Background

This report presents the findings obtained through research conducted as part of the Delaware Valley Regional Planning Commission's (DVRPC) Paoli Transportation Center Planning Assistance – Phase 2 initiative. This effort is the second and final stage of DVRPC currently-programmed work on the Paoli Transportation Center. In Phase 1, conducted in DVRPC Fiscal Year 2008, DVRPC developed two work products, the *Paoli Transportation Center: Funding & Technical Assistance Resource Guide* and a technical memorandum entitled *Paoli Station Parking Needs Assessment*. In both phases, DVRPC also supported development of the Paoli Transportation Center through participation in the Paoli Task Force.

The *Paoli Station Intermodal Access and Parking Study* was conducted in collaboration with Chester County, Tredyffrin Township, Willistown Township, and SEPTA. The main contribution of the study is an inventory and assessment of access modes which currently arrive, park, idle and/or leave Paoli Station. Evaluated modes include drive/park, kiss-and-ride, bus, shuttle, bicycle, and pedestrian. Findings and recommendations related to these modes are presented in this report. Also as part of this study, DVRPC evaluated issues of parking management and design to identify potential improvements to the current station and provide recommendations for the future station area.

This study focuses on trends and challenges exhibited at the existing Paoli Station. The study does not focus on recommendations related to the planned Paoli Transportation Center, because basic elements of the site and circulation plan are still in development. The findings in this study may be used to inform improvements or enhancements at the current station, or to guide design and planning for the future Paoli Transportation Center.

Study Area Overview

Paoli Station is located in Tredyffrin Township, Chester County, Pennsylvania. The planned Paoli Transportation Center straddles both Tredyffrin Township and Willistown Townships. Paoli Station provides access to SEPTA's R5 Regional Rail line and Amtrak's Keystone and Pennsylvanian routes. The study area is made up primarily of residential development, but there is also a fair amount of commercial development centered around the train station on Lancaster Avenue/US 30. The station is accessible by automobile directly from two major roads, US 30 and Valley Road.

The train station is a central feature of the surrounding Paoli community, which is located nineteen miles west of the City of Philadelphia. Extending west from the station is a 30-acre rail car storage yard and maintenance area, the reuse of which is the focus of an ongoing planning process, as well as two major plans [*Paoli Rail Yard and Transportation Center Plan* (1996) and *Paoli Community Master Plan* (2001)].

Paoli Station is the 7th most patronized train station on the SEPTA Regional Rail system, with average weekday boards of 1,282 persons in 2007. The station also provides Amtrak service, with average weekday boards of 186 passengers, also in 2007. The station functions in large part as a park-and-ride station, with 505 parking spaces. However, passengers also access the station via kiss-and-ride, SEPTA bus service, private shuttle service, and by walking or bicycling. Through-traffic volumes on roadways in the vicinity of the station are high, especially along Lancaster Avenue/US 30. The mix of modes and volume of activity surrounding the station creates congestion and sometimes conflict between modes. Also, facilities for some modes are deficient in certain locations in and around the station, adding to congestion and modal conflict.

Project History

Following the discovery of a concentration of polychlorinated biphenyl (PCBs) at the Amtrak-owned rail yard site in 1984, a consortium of public entities including Tredyffrin and Willistown Townships, Chester County, SEPTA, AMTRAK, and the Delaware Valley Regional Planning Commission, initiated a study to investigate alternative reuse concepts for the site. This group convened the Paoli Task Force, a working group of project stakeholders that meet regularly to facilitate project development.

The investigation of alternative reuse concepts culminated in the publication of the *Paoli Rail Yard and Transportation Center Plan* in 1996 by Norman Day and Associates. This report recommended construction of a new, expanded train station 800 feet to the west of the existing station. The Paoli Transportation Center project was placed on DVRPC's Transportation Improvement Program, SEPTA's Long Range Capital Budget, and PennDOT's Twelve Year Plan. Norman Day and Associates also developed a pedestrian and streetscape plan in 1996, entitled *A Conceptual Design Study of the Paoli Pedestrian Environment*, to complement the planned redevelopment of the station.

To accomplish this objective, Tredyffrin and Willistown townships engaged Norman Day and Associates to create a long-range development plan for the Paoli Community incorporating the recommendations from the two 1996 studies. The *Paoli Community Master Plan*, published in 2001, sets a vision for the physical form and functional role of the Paoli Community.

Cleanup of site contaminants was completed in 2005. In 2008, Tredyffrin and Willistown townships adopted ordinance amendments implementing recommendations from the *Paoli Community Master Plan*. Next, Amtrak must select a developer for the rail yard; this decision is pending as this report is being released.

Land Use

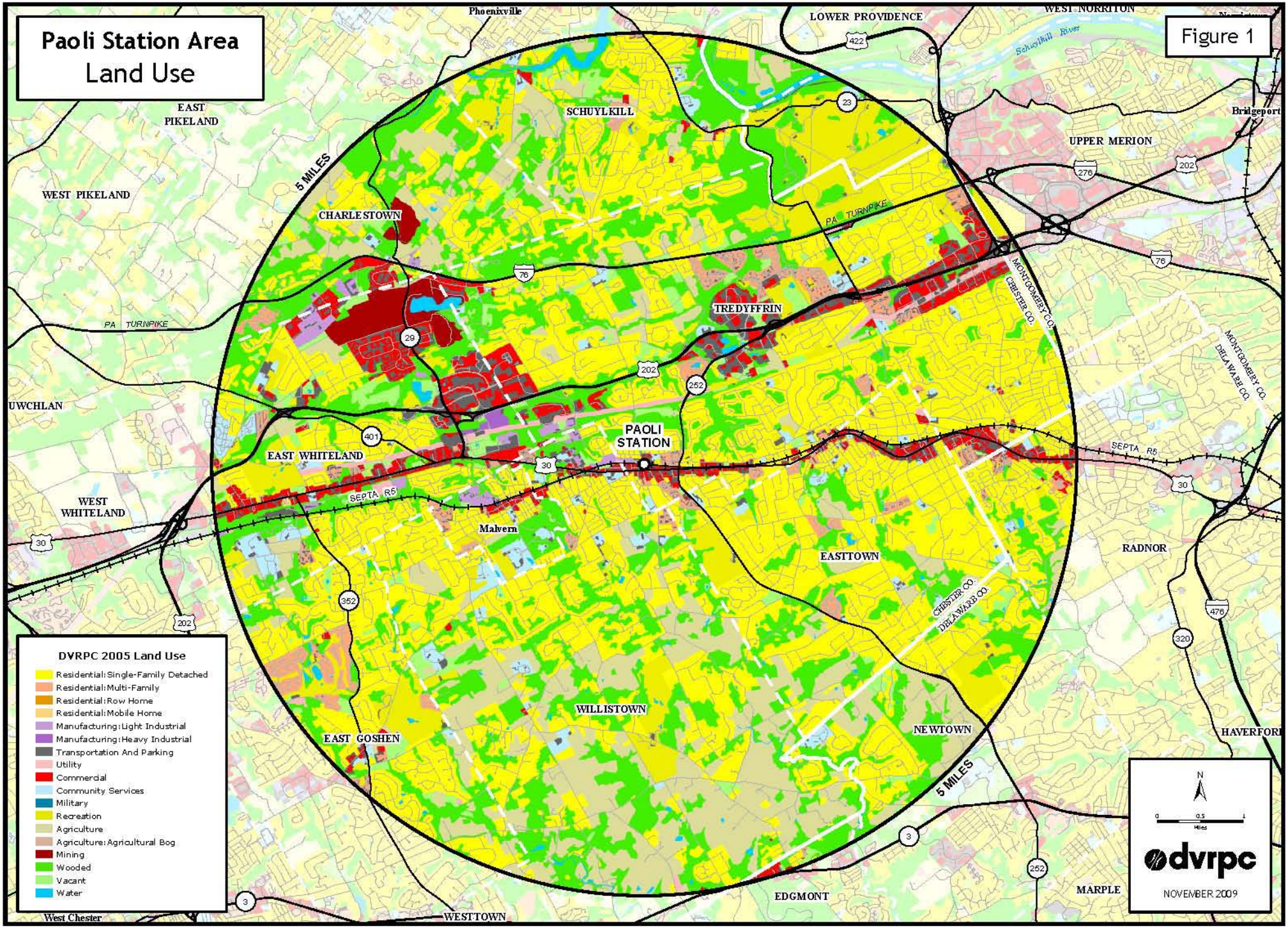
The five mile radius around Paoli Station consists of 50,265 square acres (78.5 square miles) of land area. The majority of land is utilized for single family residential development, with 20,078 acres. In addition, there are 1,142 acres of multi-family residential land uses within the five mile radius around Paoli Station. The large number of residential uses near the station contribute to the strong demand for rail service at Paoli Station and the R5 Paoli/Thorndale route.

The next most-common land uses are wooded lands, with 11,423 acres, and agricultural land, with 6,351 acres. For more information about land use in the Paoli Station vicinity, see Table 1 and Figure 1.

Table 1: Paoli Station Land Use Summary

Land Use	Acres	Square Miles
Residential: Row Home	1	0.00
Residential: Mobile Home	6	0.01
Manufacturing: Heavy Industrial	40	0.06
Manufacturing: Light Industrial	239	0.37
Utility	330	0.52
Water	443	0.69
Mining	466	0.73
Transportation	524	0.82
Community Services	998	1.56
Residential: Multi-Family	1,142	1.78
Vacant	1,450	2.27
Parking	1,658	2.59
Commercial	1,815	2.84
Recreation	3,299	5.15
Agriculture	6,352	9.92
Wooded	11,424	17.85
Residential: Single-Family Detached	20,078	31.37
Total	**50,265**	**78.53**

Source: DVRPC 2009


Paoli Station Area
Land Use
Figure 1
Phoenixville
LOWER PROVIDENCE
WEST NORRITON
Schuylkill River
EAST PIKELAND
SCHUYLKILL
Bridgeport
UPPER MERION
5 MILES
WEST PIKELAND
CHARLESTOWN
PA TURNPIKE
TREDYFFRIN
MONTGOMERY CO.
CHESTER CO.
DELAWARE CO.
UWCHLAN
PAOLI STATION
EAST WHITELAND
SEPTA R5
WEST WHITELAND
Malvern
EASTTOWN
RADNOR
WILLISTOWN
NEWTOWN
HAVERFORD
EAST GOSHEN
EDGMONT
MARPLE
WESTTOWN
West Chester
DVRPC 2005 Land Use
Residential:Single-Family Detached
Residential:Multi-Family
Residential:Row Home
Residential:Mobile Home
Manufacturing:Light Industrial
Manufacturing:Heavy Industrial
Transportation And Parking
Utility
Commercial
Community Services
Military
Recreation
Agriculture
Agriculture:Agricultural Bog
Mining
Wooded
Vacant
Water
N
Miles
dvrpc
NOVEMBER 2009

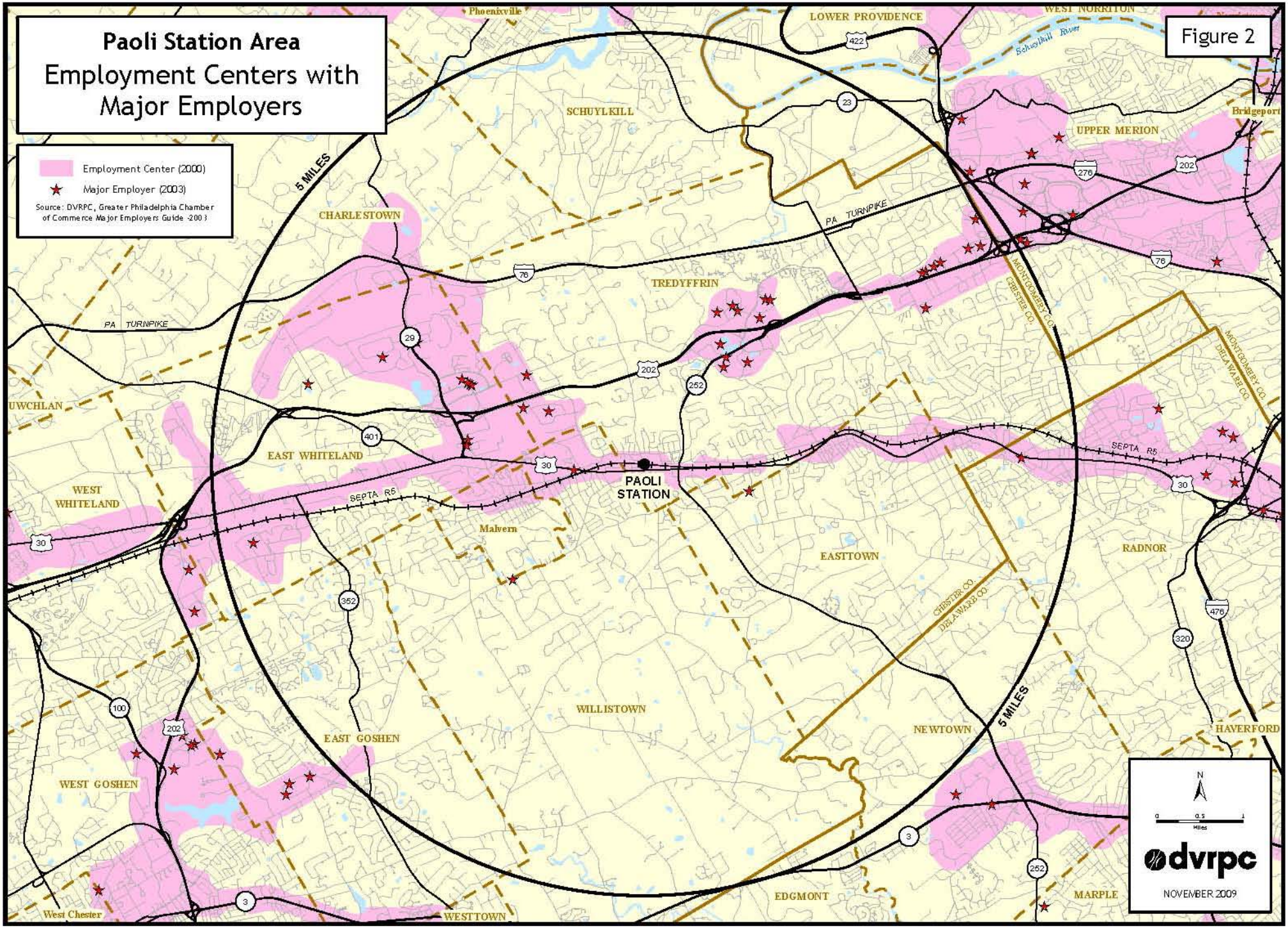
Employment Centers

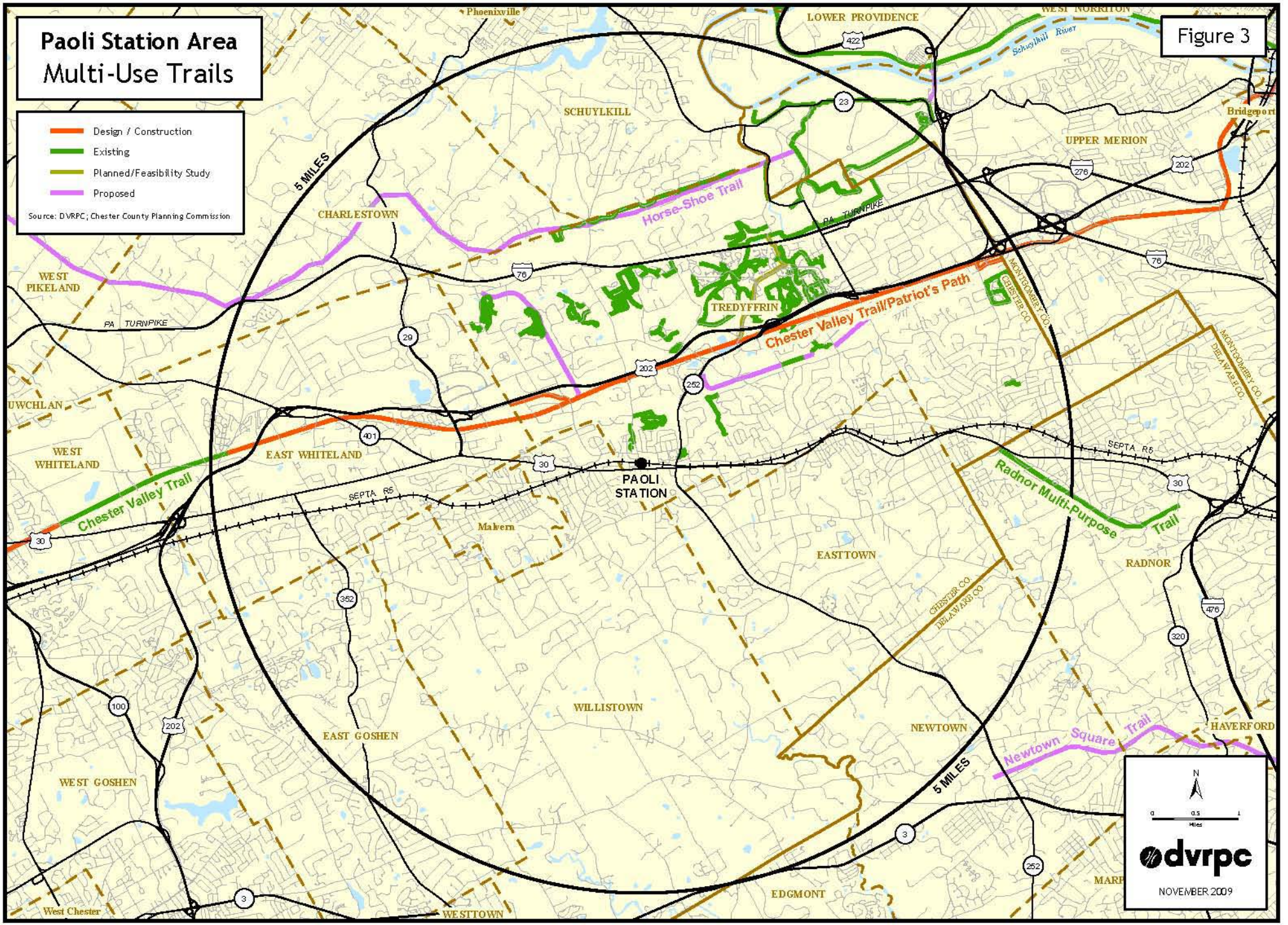
Several major employers (based on the number of employees) are located in the vicinity of Paoli Station, as shown in Figure 2. A number of employers are located along Lancaster Avenue/US 30, making this entire corridor an employment center. Just west of Paoli Station is the Great Valley Corporate Center, located along Morehall Road/PA 29. A number of major employers are located here including Vanguard, the investment services company. The Chesterbrook area, located at the junction of US 202 and PA 252, is another nearby employment center.

These employment centers are major trip generators to and from Paoli Station. Most of these centers are not fully built out and continue to grow, indicating that Paoli Station will continue to play a major role in the area's transportation network.

Trails

Although there are a number of trails within a five mile radius of Paoli Station, none are located in close proximity to the station. The Chester Valley Trail, which is currently in the design/construction stage, runs along the US 202 corridor and links the Great Valley and Chesterbrook areas. Providing linkages between Chester Valley Trail and Paoli Station should be a priority for Tredyffrin and Willistown Townships. Such linkages would create opportunities for alternative transportation such as bicycling for commuters, while enhancing access to recreation for area residents. Trails in the vicinity of Paoli Station are shown in Figure 3.


Paoli Station Area
Employment Centers with Major Employers
Figure 2
Employment Center (2000)
Major Employer (2003)
Source: DVRPC, Greater Philadelphia Chamber of Commerce Major Employers Guide -2003
5 MILES
PAOLI STATION
PA TURNPIKE
SEPTA R5
Phoenixville
LOWER PROVIDENCE
WEST NORRITON
Schuylkill River
SCHUYLKILL
Bridgeport
UPPER MERION
CHARLESTOWN
TREDYFFRIN
UWCHLAN
EAST WHITELAND
WEST WHITELAND
Malvern
EASTTOWN
RADNOR
WILLISTOWN
NEWTOWN
HAVERFORD
EAST GOSHEN
WEST GOSHEN
West Chester
WESTTOWN
EDGMONT
MARPLE
MONTGOMERY CO.
CHESTER CO.
DELAWARE CO.
N
0 0.5 1 Miles
dvrpc
NOVEMBER 2009


Paoli Station Area
Multi-Use Trails
Figure 3
Design / Construction
Existing
Planned/Feasibility Study
Proposed
Source: DVRPC; Chester County Planning Commission
5 MILES
PAOLI STATION
Chester Valley Trail
Chester Valley Trail/Patriot's Path
Horse-Shoe Trail
Radnor Multi-Purpose Trail
Newtown Square Trail
SEPTA R5
PA TURNPIKE
Phoenixville
LOWER PROVIDENCE
SCHUYLKILL
CHARLESTOWN
UPPER MERION
Bridgeport
WEST PIKELAND
TREDYFFRIN
UWCHLAN
WEST WHITELAND
EAST WHITELAND
Malvern
EASTTOWN
RADNOR
WILLISTOWN
NEWTOWN
HAVERFORD
EAST GOSHEN
WEST GOSHEN
EDGMONT
West Chester
WESTTOWN
MONTGOMERY CO.
CHESTER CO.
DELAWARE CO.
dvrpc
NOVEMBER 2009

CHAPTER 1

Vehicular Access

Vehicular access to Paoli Station was assessed using a variety of methods for the following modes:

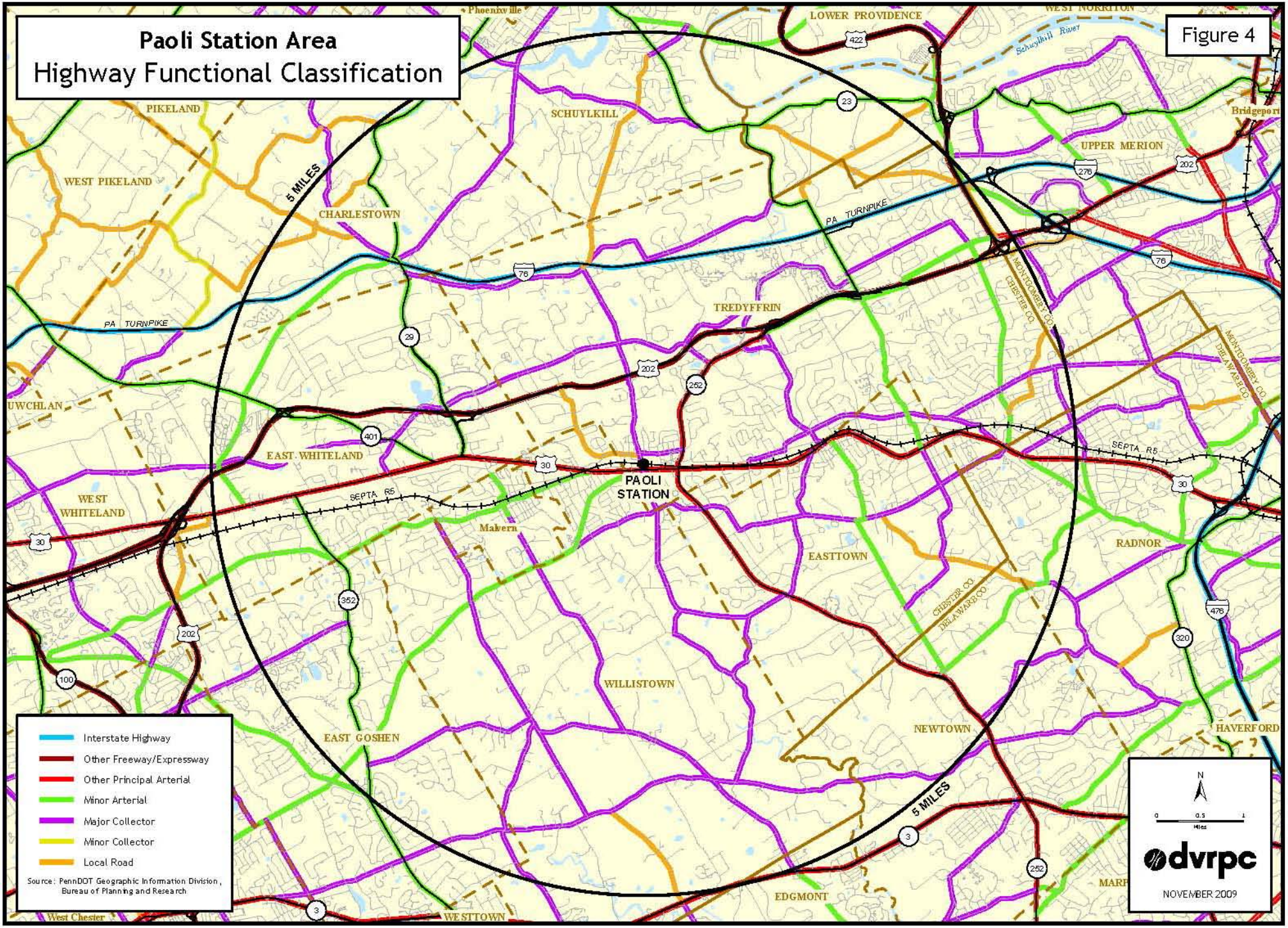
- Drive/park
- Shuttle
- Bus
- Kiss-and-ride and Taxi

The data reported in this study reflect current usage levels at the existing Paoli Station. While these findings may suggest some conclusions for improvements at the existing station, the information is likely to be particularly informative for planning for adequate intermodal access at the future Paoli Transportation Center.

Highway Functional Classification

As shown in Figure 4, Paoli Station boasts excellent highway access. The station is located directly off Lancaster Avenue/US 30, a Principal Arterial. PA 252, located just half a mile east of Paoli Station, is also a Principal Arterial. Valley Road, which in addition to Lancaster Avenue/US 30 provides direct access to Paoli Station, is a Major Collector. Several other roads within close proximity to Paoli Station are Major Collectors, including Sugartown Road, Swedesford Road, and Conestoga Road.

The station is also located within a short driving distance from Interstate Highway 76, as well as US 202, which is classified as an Other Freeway/Expressway (non-Interstate Highway).


Paoli Station Area
Highway Functional Classification
Figure 4
PAOLI STATION
5 MILES
5 MILES
PA TURNPIKE
PA TURNPIKE
SEPTA R5
SEPTA R5
Phoenixville
LOWER PROVIDENCE
WEST NORRITON
Schuylkill River
Bridgeport
PIKELAND
SCHUYLKILL
UPPER MERION
WEST PIKELAND
CHARLESTOWN
TREDYFFRIN
UWCHLAN
EAST WHITELAND
WEST WHITELAND
Malvern
EASTTOWN
RADNOR
WILLISTOWN
NEWTOWN
HAVERFORD
EAST GOSHEN
EDGMONT
WESTTOWN
West Chester
MONTGOMERY CO
CHESTER CO
DELAWARE CO
Interstate Highway
Other Freeway/Expressway
Other Principal Arterial
Minor Arterial
Major Collector
Minor Collector
Local Road
Source: PennDOT Geographic Information Division, Bureau of Planning and Research
N
0
0.5
1
Miles
dvrpc
NOVEMBER 2009

Annual Average Daily Traffic

Annual average daily traffic volumes for roadways in the vicinity of Paoli Station are shown in Figure 5. The greatest traffic volumes are exhibited along major roadways including Interstate Highway 76, US 202, and PA 252. Lancaster Avenue/US 30 also exhibits high traffic volumes.

Highway Volume-to-Capacity

As part of DVRPC's Congestion Management Process (CMP), a Volume-to-Capacity ratio (V/C) for roads in the Delaware Valley region was prepared at a regional planning level of accuracy to indicate which roads are congested. Roads were ranked on a scale from A to E, with A being free-flowing and D/E being very congested. To qualify as a congested roadway in the CMP, the V/C ratio must be greater than or equal to 0.85 at peak hour. This represents a generalized Level of Service E across functional classes. The peak hour is the highest hour of the traffic count rather than a specific hour, as the peak time varies for different roads. The road capacity used was derived from the regional travel model. This analysis is not intended to be precise to the section of road and is only for planning purposes. Roadways qualifying as congested under this framework are shown in Figure 6.

Turning Movements

Vehicle turning movements were recorded by DVRPC staff on Tuesday, March 17, 2009. Counts were conducted during the AM (5:45 AM to 9:00 AM) and PM (3:00 PM to 7:00 PM) commuter rush at the following five locations:

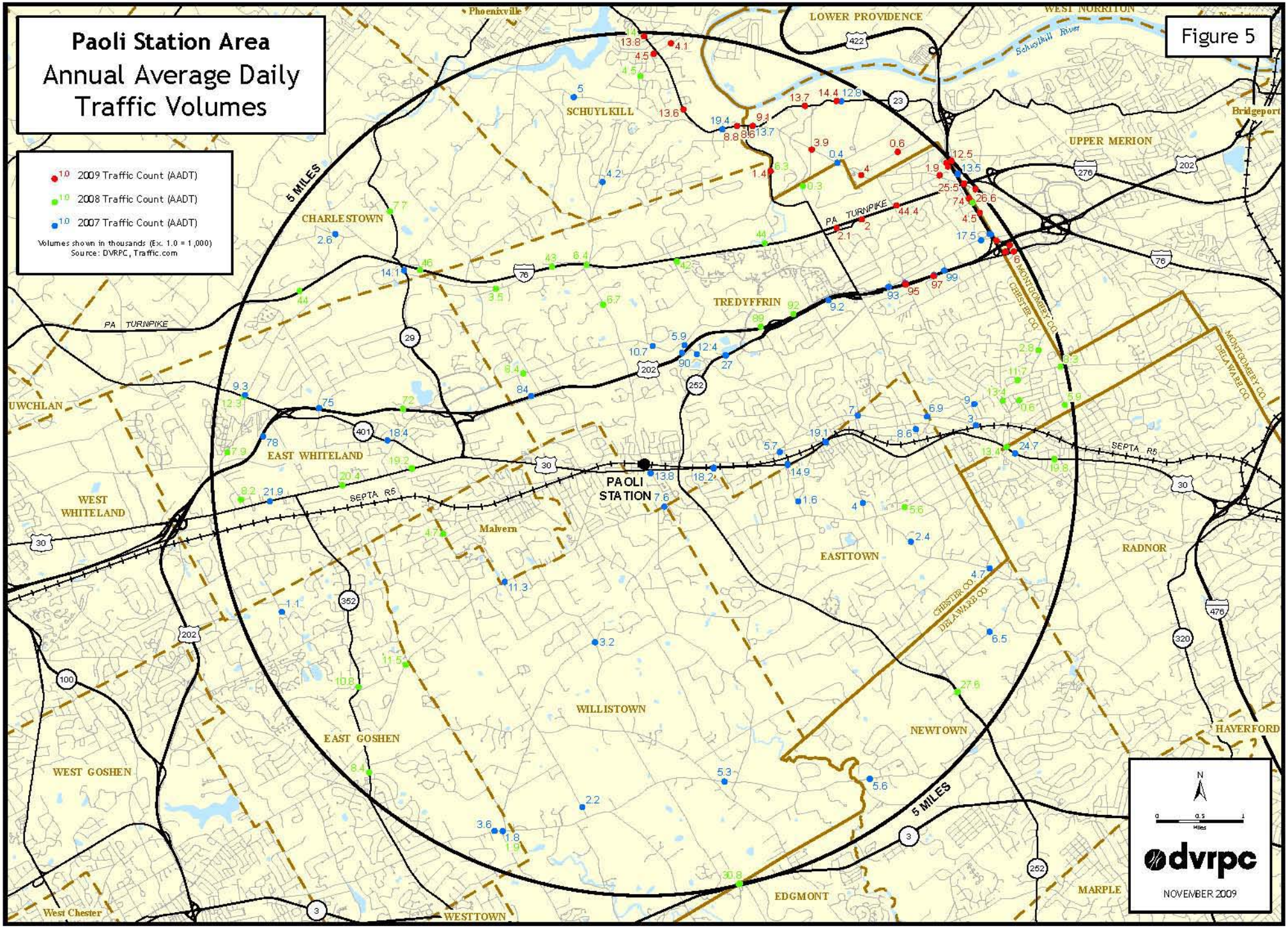
- Location A: Exit from southside/eastbound SEPTA station lot onto Valley Road
- Location B: Exit from northside/westbound SEPTA station lot onto Valley Road
- Location C: Exit from SEPTA permit parking lot onto Valley Road
- Location D: Lancaster Avenue/US 30 and Valley Road
- Location E: Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/US 30

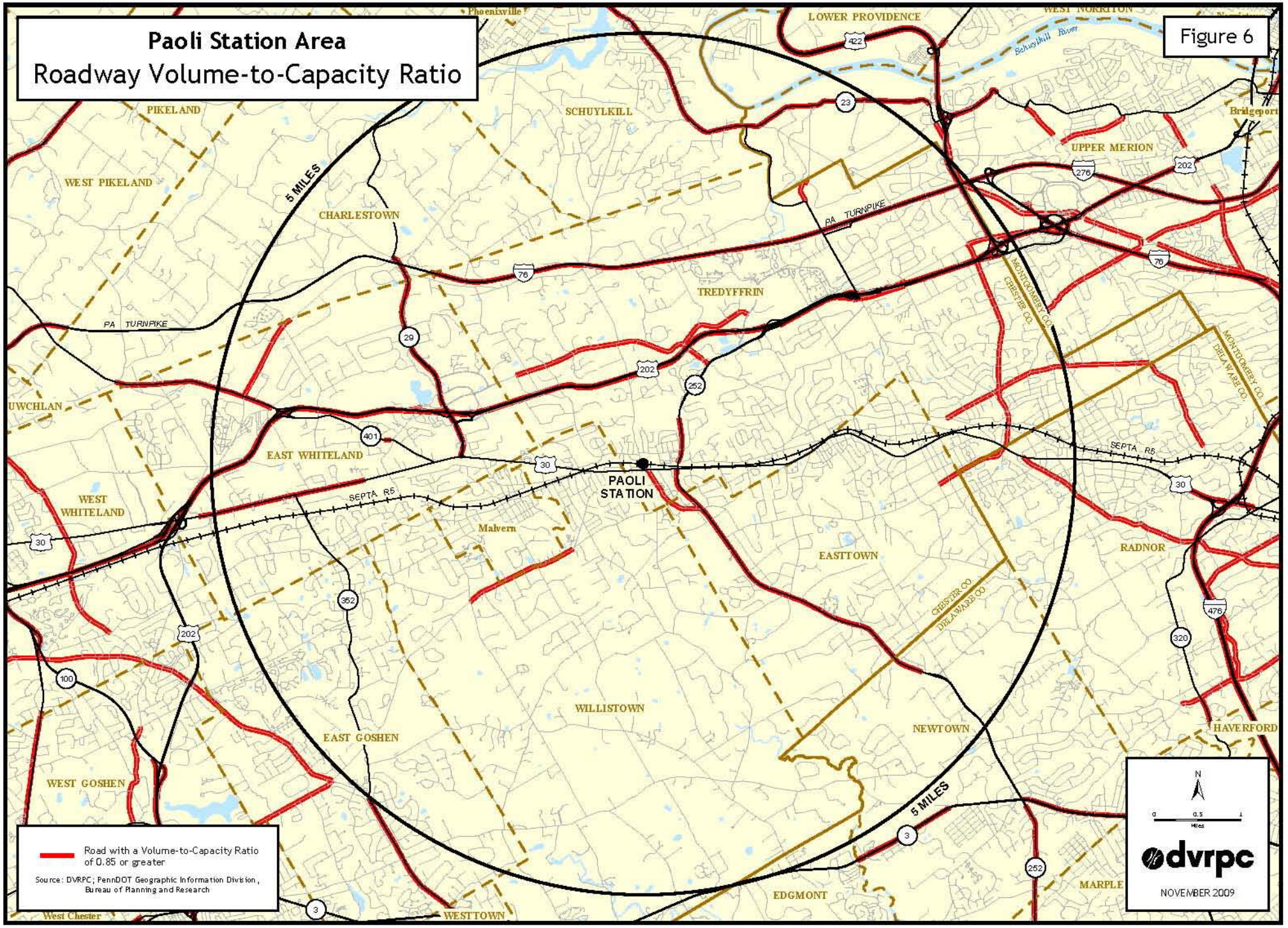
For detailed information about vehicle turning movements, see Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics and Appendix B: Paoli Station Turning Movement Counts, 15-Minute Intervals. In general, the turning movement counts indicate large volumes of traffic moving along Lancaster Avenue/US 30 and Valley Road.

Turning movement counts for vehicles entering and exiting the station vicinity may be compared to the pedestrian count data contained in Chapter 2 of this report to assess areas of pedestrian/vehicle conflict. The most significant areas for pedestrian/vehicle conflict are along the Valley Road access points to both the southside/eastbound SEPTA station lot and the northside/westbound SEPTA station lot. Pedestrians and vehicles enter and exit the station from these locations in significant numbers during the commuter rush, and both areas lack adequate signage, striping, and other improvements that may prevent modal conflicts.

Crashes

The roadways with high traffic volumes in the vicinity of Paoli Station also exhibit the majority of crashes, as shown in Figure 7. The density of crashes along Lancaster Avenue/US 30 and Valley Road, especially near the intersection of these roadways, suggests that safety enhancements would be beneficial here. In spite of the many modes that utilize Paoli Station, no pedestrian/vehicle crashes were reported in the immediate vicinity of the station for the 2001-2007 period. Only one pedestrian/vehicle crash was recorded within a half-mile radius of the station during this period, at Darby Road just south of Lancaster Avenue/US 30.


Paoli Station Area
Annual Average Daily Traffic Volumes
Figure 5
1.0 2009 Traffic Count (AADT)
1.0 2008 Traffic Count (AADT)
1.0 2007 Traffic Count (AADT)
Volumes shown in thousands (Ex. 1.0 = 1,000)
Source: DVRPC, Traffic.com
5 MILES
PAOLI STATION
SCHUYLKILL
LOWER PROVIDENCE
UPPER MERION
CHARLESTOWN
TREDYFFRIN
UWCHLAN
EAST WHITELAND
WEST WHITELAND
Malvern
EASTTOWN
RADNOR
WILLISTOWN
NEWTOWN
HAVERFORD
EAST GOSHEN
WEST GOSHEN
West Chester
WESTTOWN
EDGMONT
MARPLE
Phoenixville
Bridgeport
WEST NORRITON
Schuylkill River
PA TURNPIKE
SEPTA R5
CHESTER CO.
DELAWARE CO.
MONTGOMERY CO.
dvrpc
NOVEMBER 2009

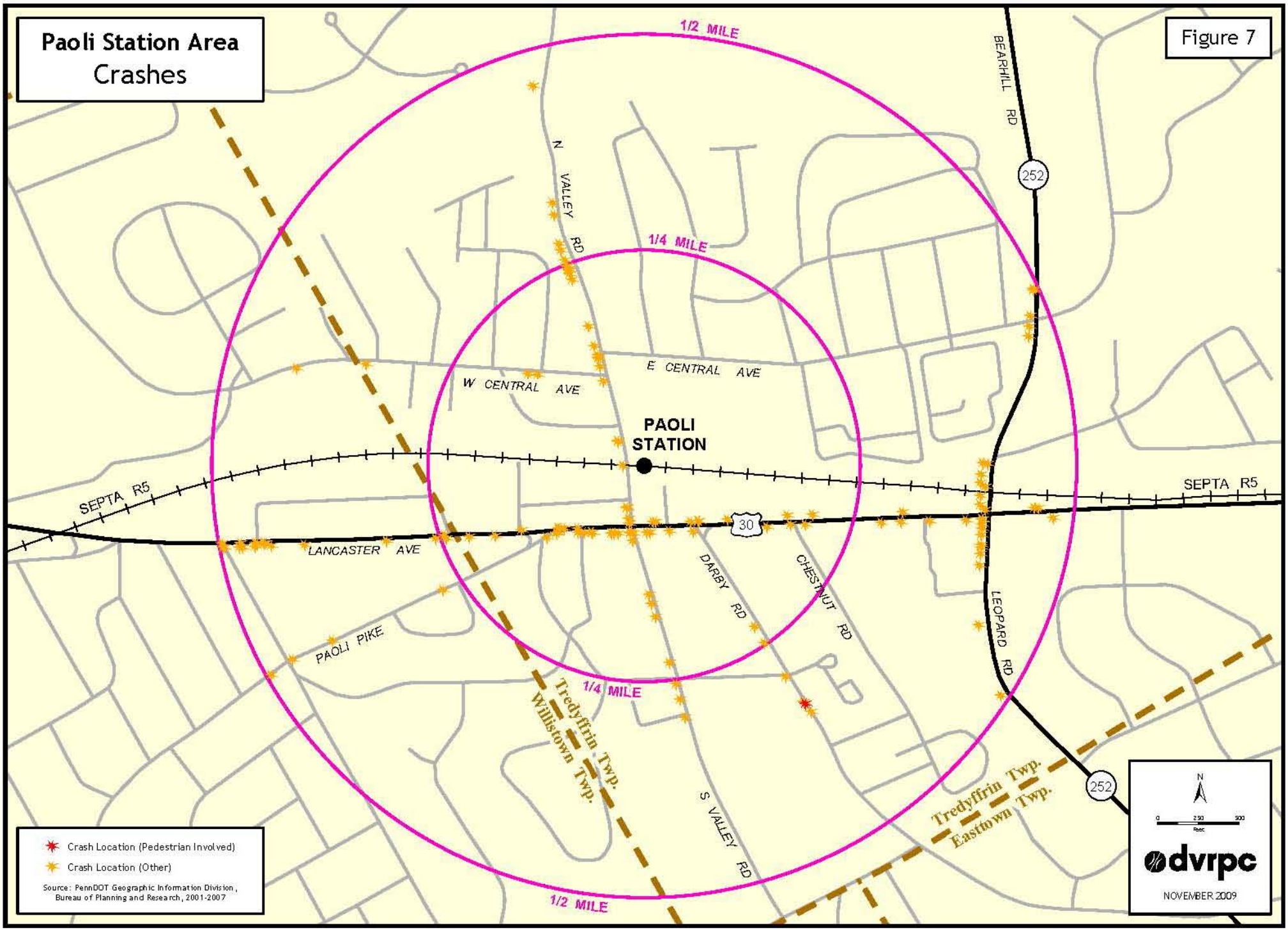

Paoli Station Area
Roadway Volume-to-Capacity Ratio
Figure 6
PAOLI STATION
5 MILES
5 MILES
PIKELAND
WEST PIKELAND
CHARLESTOWN
SCHUYLKILL
LOWER PROVIDENCE
UPPER MERION
TREDYFFRIN
EAST WHITELAND
WEST WHITELAND
UWCHLAN
Malvern
EASTTOWN
RADNOR
WILLISTOWN
NEWTOWN
EAST GOSHEN
WEST GOSHEN
EDGMONT
MARPLE
HAVERFORD
WESTTOWN
West Chester
Bridgeport
PA TURNPIKE
PA TURNPIKE
SEPTA R5
SEPTA R5
MONTGOMERY CO.
CHESTER CO.
DELAWARE CO.
CHESTER CO.
DELAWARE CO.
Schuylkill River
Road with a Volume-to-Capacity Ratio of 0.85 or greater
Source: DVRPC; PennDOT Geographic Information Division, Bureau of Planning and Research
N
0
0.5
1
Miles
dvrpc
NOVEMBER 2009

Commuter Shed

DVRPC conducted and assembled information about the commuter shed for Paoli Station. Commuter shed data provides information about where commuters using Paoli Station are starting their trips (typically their place of residence). This can help in assessing how the level of demand for Paoli Station will change over time. For example, factors such as changes in population growth in areas surrounding Paoli station or future SEPTA or Amtrak station expansions or openings will affect the number of users of Paoli Station. Note that the commuter shed focuses on commuters accessing the station via private automobile, and is therefore particularly helpful in planning for parking needs at the station.

License plate surveys of commuters parked at Paoli Station in 1999, 2006, and 2009 were conducted by DVRPC and Chester County. Each of these surveys sampled one day's station parking by rail patrons to help determine from where SEPTA or Amtrak riders are originating. Using the collected license plate data, PennDOT provided addresses which were then matched in GIS and the points mapped. These address-matched points show the spatial distribution of those parking at the station and thereby define the station sheds. The license plate survey results are mapped in Figure 8: Paoli Station Area Commuter Shed. In general, the map shows that commuting patterns have not changed dramatically over the ten year period for which this data was collected. Although the communities surrounding Paoli have experienced significant growth over this time period, the commuter shed has remained relatively stable. This may suggest that, because of the limited number of parking spaces—most of which are permit spaces—Paoli Station is not currently seen as a viable alternative for commuters in the area. The availability of additional parking may attract an expanded user base.

Table 2: Paoli Station Area Commuter Shed Municipal Summary provides a demographic profile of the municipalities represented in the Paoli commuter shed that are located in the Delaware Valley region. The far majority of plates represented at Paoli Station originated in the Delaware Valley Region. The table shows the year 2005 population estimate and 2035 forecasted population for each municipality corresponding to an address-matched license plate, as well as the percent change between the two. The majority of plates come from rapidly-growing Chester County municipalities. There is evidence to suggest that population growth is outstripping the forecast rates of growth in some of the municipalities. This raises the question as to whether this expanded population is oriented towards employment in Philadelphia (implying potential R5/Amtrak use) or whether these new residents will be oriented towards suburban employment.


Paoli Station Area
Crashes
Figure 7
1/2 MILE
1/4 MILE
1/4 MILE
1/2 MILE
PAOLI STATION
SEPTA R5
SEPTA R5
LANCASTER AVE
W CENTRAL AVE
E CENTRAL AVE
N VALLEY RD
S VALLEY RD
BEARHILL RD
DARBY RD
CHESTNUT RD
LEOPARD RD
PAOLI PIKE
30
252
252
Tredyffrin Twp.
Willistown Twp.
Tredyffrin Twp.
Easttown Twp.
Crash Location (Pedestrian Involved)
Crash Location (Other)
Source: PennDOT Geographic Information Division, Bureau of Planning and Research, 2001-2007
N
dvrpc
NOVEMBER 2009

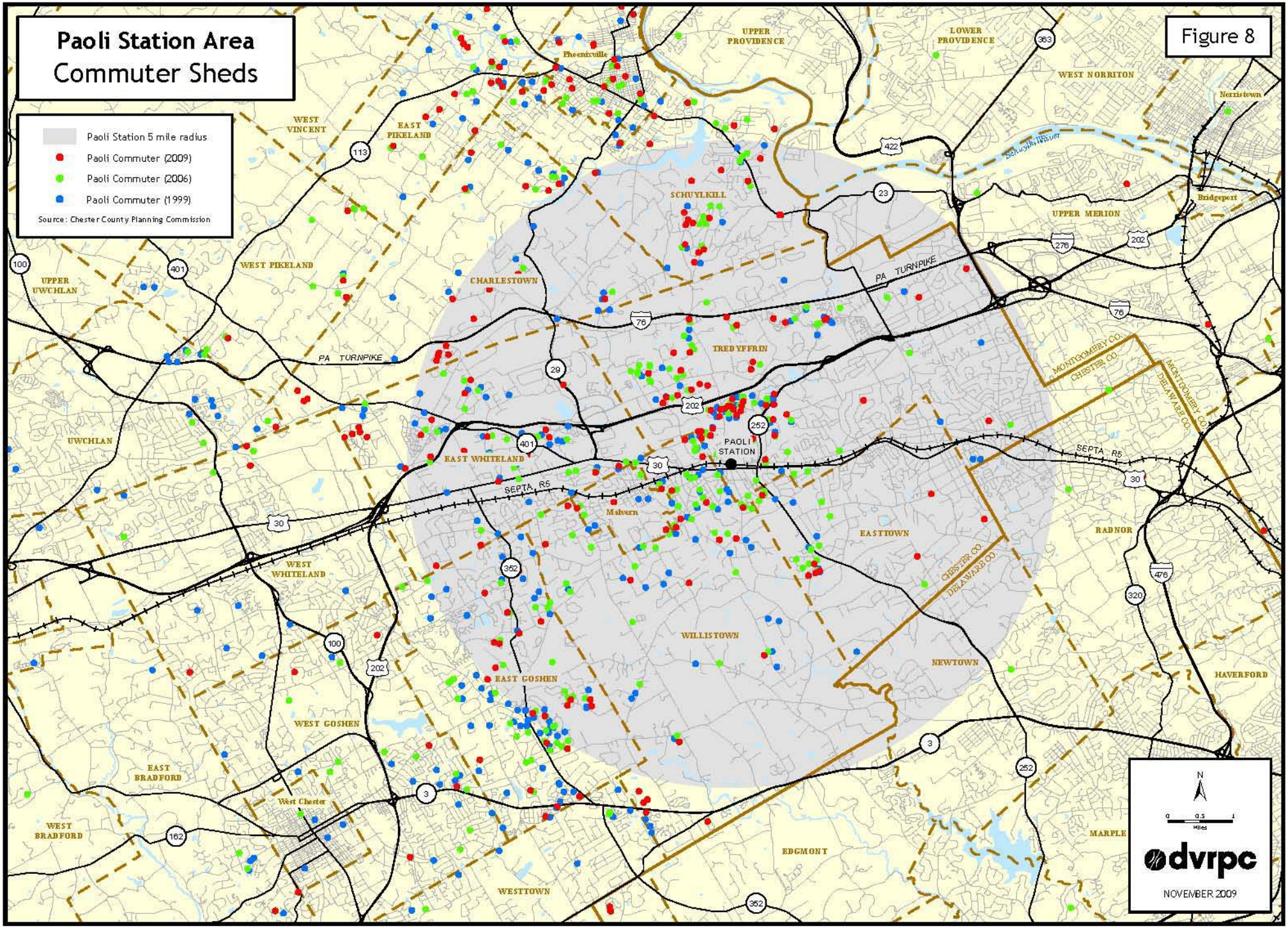

Paoli Station Area
Commuter Sheds
Figure 8
Paoli Station 5 mile radius
Paoli Commuter (2009)
Paoli Commuter (2006)
Paoli Commuter (1999)
Source: Chester County Planning Commission
PAOLI STATION
SEPTA R5
PA TURNPIKE
SCHUYLKILL
CHARLESTOWN
TREDYFFRIN
EAST WHITELAND
WEST WHITELAND
WILLISTOWN
EASTTOWN
NEWTOWN
RADNOR
HAVERFORD
MARPLE
EDGMONT
WESTTOWN
EAST GOSHEN
WEST GOSHEN
WEST BRADFORD
EAST BRADFORD
UWCHLAN
UPPER UWCHLAN
WEST PIKELAND
EAST PIKELAND
WEST VINCENT
UPPER PROVIDENCE
LOWER PROVIDENCE
WEST NORRITON
UPPER MERION
Phoenixville
Malvern
West Chester
Norristown
Bridgeport
MONTGOMERY CO.
CHESTER CO.
DELAWARE CO.
N
0 0.5 1 Miles
dvrpc
NOVEMBER 2009

Table 2: Paoli Station Area Commuter Shed Municipal Summary (Part 1 of 2)

Municipality	Count of Plates	2005 Population Estimate	2035 Population Estimate	Percent Change 05-35
Chester County				
Charlestown Township	18	5,824	8,944	53.57
East Bradford Township	2	10,172	13,498	32.7
East Brandywine Township	1	6,449	9,421	46.08
East Coventry Township	2	5,696	8,061	41.52
East Goshen Township	22	17,843	22,563	26.45
East Pikeland Township	15	6,816	9,684	42.08
East Vincent Township	4	6,444	9,425	46.26
East Whiteland Township	24	10,302	13,173	27.87
Easttown Township	8	10,397	12,577	20.97
Malvern Borough	3	3,099	3,603	16.26
North Coventry Township	1	7,614	8,559	12.41
Phoenixville Borough	19	15,415	17,810	15.54
Schuylkill Township	23	7,637	10,612	38.96
South Coventry Township	4	2,384	2,971	24.62
Spring City Borough	1	3,283	4,111	25.22
Tredyffrin Township	50	29,073	32,778	12.74
Uwchlan Township	1	18,311	23,354	27.54
West Caln Township	1	7,807	10,475	34.17
West Goshen Township	5	21,169	25,918	22.43
West Pikeland Township	5	3,988	5,662	41.98
West Vincent Township	2	3,885	5,044	29.83
West Whiteland Township	3	18,339	22,829	24.48
Willistown Township	21	10,739	12,149	13.13
Chester County Total	*235*	*473,880*	*892,890*	*31.36*
Delaware County				
Radnor Township	1	30,976	31,164	0.61
Ridley Township	1	30,205	29,808	-1.31
Thornbury Township	2	6,884	7,858	14.15
Delaware County Total	*4*	*555,206*	*559,956*	*0.86*

Source: DVRPC 2009

Table 2: Paoli Station Area Commuter Shed Municipal Summary (Part 2 of 2)

Municipality	Count of Plates	2005 Population Estimate	2035 Population Estimate	Percent Change 05-35
Montgomery County				
Collegeville Borough	1	4,750	5,000	5.26
Horsham Township	1	25,222	30,150	19.54
Lower Merion Township	1	58,568	59,947	2.35
Lower Providence Township	1	24,900	30,500	22.49
Perkiomen Township	1	8,342	9,859	18.19
Plymouth Township	1	16,341	17,607	7.75
Red Hill Borough	1	2,371	2,531	6.75
Royersford Borough	1	4,356	5,018	15.2
Skippack Township	1	12,416	18,082	45.63
Upper Merion Township	2	27,400	29,299	6.93
Upper Pottsgrove Township	1	4,956	7,700	55.37
Upper Providence Township	6	18,391	25,587	39.13
Montgomery County Total	*18*	780,544	894,136	14.55
Philadelphia County				
City of Philadelphia	3	1,483,851	1,480,023	-0.26

Source: DVRPC 2009

Drive/Park

The dominant mode of access to Paoli Station is private vehicle driving and parking. Drive/park accounts for approximately 625 (or 44%) of rail boards (including both SEPTA and Amtrak) at Paoli Station. There are 505 parking spaces at Paoli Station with a utilization rate of 95%. Along the SEPTA R5 Paoli/Thorndale line, Paoli has the second-highest number of parking spaces. Exton is first with 513 parking spaces, and Thorndale is third with 456 spaces.

Both permit and daily parking are available at the station. There are 309 permit spaces (with a utilization rate of 92%) located north of the station and west of Valley Road. There are 196 daily spaces (with a utilization of 100%) located east of Valley Road. The majority of daily spaces are located adjacent to the station off Lancaster Avenue/US 30; however, there is also a small daily lot at the northside/westbound station area.

The extremely high utilization rates indicate a demand for expanded parking facilities at the station. The *Paoli Rail Yards and Transit Center Study*, prepared in 1996 by the consultant team led by Norman Day and Associates, estimated a parking need for the redeveloped Paoli Transportation Center of 700 spaces for 2010, which was revised upwards to 1,000 spaces to accommodate mixed-use parking.

In 2008, DVRPC reassessed station parking needs, as described in a technical memorandum entitled *Paoli Station Parking Need Assessment*, which is included in this report as Appendix C. DVRPC forecasted a demand for 717 railroad spaces on opening day in 2010, which was marginally greater than the Norman Day estimate of 700 rail parking spaces. This number does not include parking for the mixed-use development planned for the site. In the same study, DVRPC estimated demand for 2020 at 780 spaces. For this 2009 study, DVRPC utilized the projection model from the 2008 study and calculated demand out to 2035, resulting in a projected demand of 854 railroad spaces. These projections are included as Appendix D: Paoli Station Straightline Population Forecast by Municipality, 2005 through 2035. For planning purposes, the total number of spaces to be included at the new station should accommodate these projected railroad users in addition to projected users of the new mixed-use developments at the site.

Kiss-and-Ride/Taxi

Kiss-and-ride is passenger drop-off/pick-up by private vehicle. Counts of passengers being dropped off and picked up at Paoli Station were conducted in October 2009. Counts were conducted during the AM (5:45 AM to 9:00 AM) and PM (3:00 PM to 7:00 PM) commuter rush. During the AM commuter rush, 100 passenger transfers from kiss-and-ride vehicles to trains occurred, with nearly all passengers being dropped off by vehicle. During the PM rush, passenger pick-up by vehicle accounts for the far majority of kiss-and-ride transfers. Kiss-and-ride accounts for approximately 100 (or 9%) of rail boards at Paoli Station.

Kiss-and-ride activity patterns are concentrated on the northside/westbound station in the morning, and on the southside/eastbound station in the afternoon, as summarized in Table 3. Table 3 also includes counts of taxi transfers at Paoli Station.

Table 3: Paoli Station Summary of Kiss-and-Ride and Taxi Activity

Location	Kiss-and-Ride	Taxi	Total
Southside/Eastbound			
AM	97	4	101
PM	37	1	38
Northside/Westbound			
AM	6	2	8
PM	60	1	61

Source: DVRPC 2009

The existing Paoli Station is not designed to adequately accommodate kiss-and-ride or taxi movements, both of which typically involve a vehicle pulling up as close to the station area as possible to pick up or drop off a passenger. At Paoli Station, kiss-and-ride and taxi passenger pick-ups and drop-offs occur in the same locations where drive/park and shuttle movements take place, creating congestion and conflicts. No staging areas are provided for vehicles waiting to pick up passengers, so these vehicles remain in the parking lot cartway and impede travel for other vehicles. There are no safe, designated pathways by which kiss-and-ride and taxi passengers can move from vehicles to the train.

Figure 9: Vehicles Awaiting Passenger Pick-up at the Northside/Westbound Station Lot

Source: DVRPC 2009

Bus Transit

A number of SEPTA bus routes make connections at or near Paoli Station. Bus transit and shuttle services in the vicinity of Paoli Station are mapped in Figure 10.

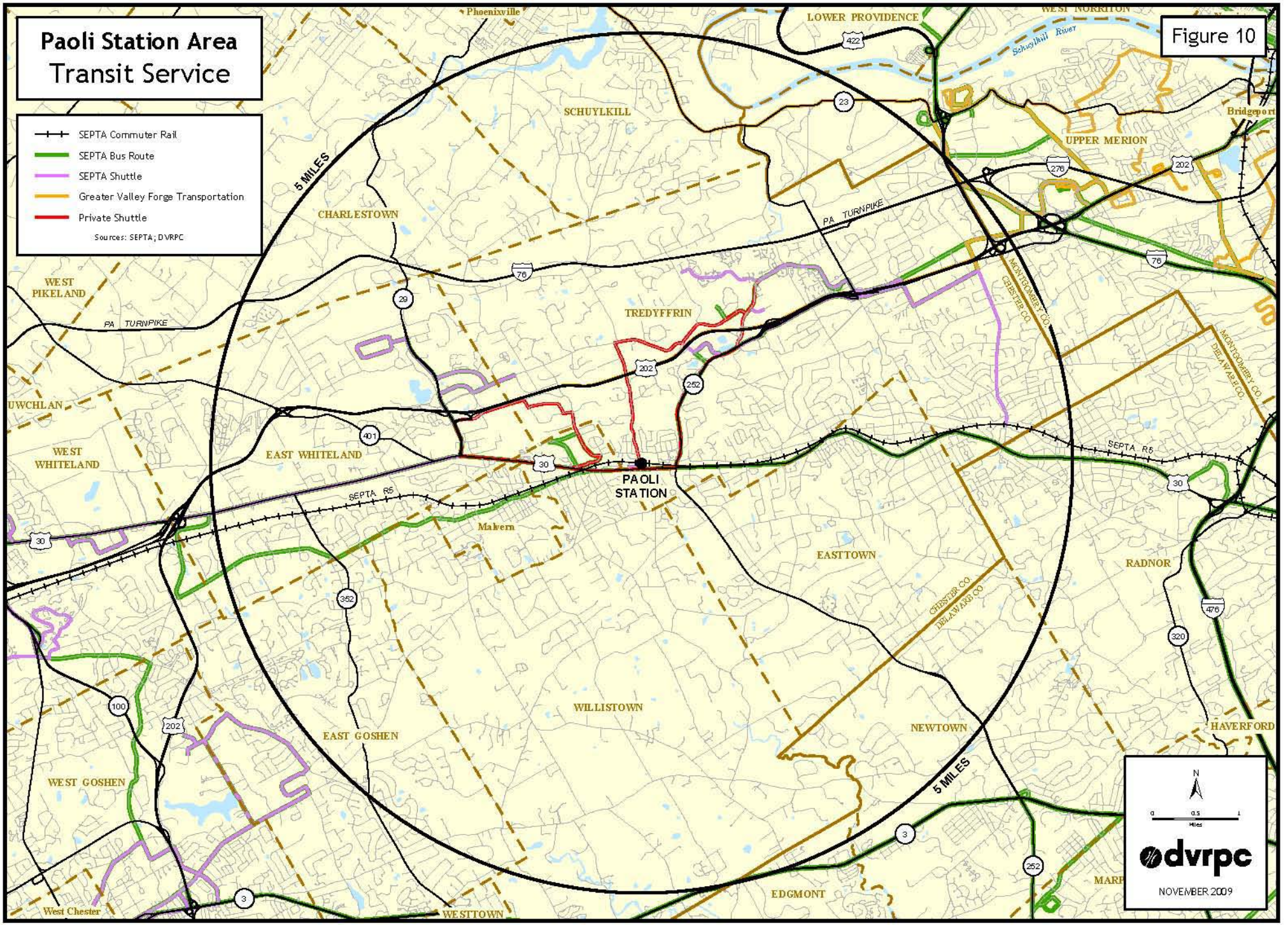
SEPTA bus routes 204, 205, and 206 provide connecting service at the station. SEPTA bus routes 92 and 105 are through-routed, and stop at the intersection of Lancaster Avenue/US 30 and Valley Road near Paoli Station, as well as the intersection of Lancaster Avenue/US 30 and Darby Road.

Average boards and disembarks for bus routes at Paoli Station are provided in Table 4. Buses account for approximately 250 (or 17%) of rail boards at Paoli Station.

Table 4: Boards and Disembarks for Bus Routes Operating at Paoli Station

Weekday			
Route	Board	Disembark	Total
92	19	26	45
105	25	28	53
204	77	74	151
205	25	20	45
206	130	85	215
Total	276	233	509
Saturday			
Route	Board	Disembark	Total
92	7	12	19
105	9	14	23
204	41	33	74
Total	57	59	116
Sunday			
Route	Board	Disembark	Total
204	29	19	48
Total	29	19	48

Source: SEPTA 2008


Paoli Station Area
Transit Service
SEPTA Commuter Rail
SEPTA Bus Route
SEPTA Shuttle
Greater Valley Forge Transportation
Private Shuttle
Sources: SEPTA; DVRPC
Figure 10
5 MILES
PAOLI STATION
SEPTA R5
PA TURNPIKE
Phoenixville
LOWER PROVIDENCE
WEST NORRITON
Schuylkill River
SCHUYLKILL
Bridgeport
UPPER MERION
CHARLESTOWN
WEST PIKELAND
TREDYFFRIN
MONTGOMERY CO.
CHESTER CO.
DELAWARE CO.
UWCHLAN
WEST WHITELAND
EAST WHITELAND
Malvern
EASTTOWN
RADNOR
HAVERFORD
WILLISTOWN
NEWTOWN
EAST GOSHEN
WEST GOSHEN
West Chester
WESTTOWN
EDGMONT
N
0
0.5
1
Miles
dvrpc
NOVEMBER 2009

Bus staging at Paoli Station is inadequate, and bus turning movements are not appropriately provided for. Although there is a dedicated bus staging area in the southside/eastbound station parking lot, the location, design, and dimensions of this staging area are poor. Located in the middle of the parking lot, the staging area does not provide adequate room for the buses that utilize the location, leading to stacking of buses in the cartway where vehicle movement should not be blocked. The height and bulk of buses limits visibility for pedestrians and commuters who use the lot for park/drive purposes, creating an unsafe environment. There are no safe waiting or loading areas for passengers accessing bus service. Rather, passengers are dropped off in the middle of the parking lot.

Buses entering the parking lot face several challenges. Buses heading east along Lancaster Avenue/US 30 must turn into the parking lot without benefit of a designated turning lane. Buses exiting the parking lot cannot negotiate the turn onto Valley Road due to their wider turning movements. Instead, these buses go straight out of the lot into Paoli Plaza, where they turn onto Greenwood Avenue before ultimately accessing Lancaster Avenue/US 30.

Figure 11: Bus Staging at Paoli Station at the Southside/Eastbound Station Lot

Source: DVRPC 2009

Private Shuttles

Field observations and interviews with transportation providers indicate that two employers operate private shuttle services to and from Paoli Station. These employers are Vanguard, the investment management company, whose headquarters are located in the Great Valley area, and Shire Pharmaceuticals, which has a location in the Chesterbrook area. These private shuttle routes are mapped in Figure 10.

Vanguard's shuttle services are operated by Tri-County Transit. According to Vanguard, they operate nine shuttle buses for the morning commuter service and six shuttle buses for the afternoon commuter service. Each shuttle has a 14-seat capacity and makes multiple trips to the station. There are a total of 514 passenger trips each day on the Vanguard shuttles, meaning a little over 250 riders use the shuttles for the morning rush and a little over 250 riders use the shuttle for the afternoon rush. There are approximately 10,270 passenger trips per month on the Vanguard shuttles at Paoli Station. Shire's shuttle services are operated by Eagle Transportation Services and also have 14-seat capacity. Field observations indicate that approximately 50 riders use the Shire shuttles in the morning rush, and 50 use the Shire shuttles in the evening rush. Shuttles account for approximately 300 (or 21%) of rail boards at Paoli Station, making shuttles the second most widely-used mode at Paoli Station after drive/park.

Figure 12: Shuttle Staging at Paoli Station at the Southside/Eastbound Station Lot

Source: DVRPC 2009

Counts conducted on March 17, 2009 identified nearly 70 shuttle trips picking up or dropping off passengers at Paoli Station, as listed in Table 5. This table indicates the number of shuttles for either Vanguard or Shire dropping off or picking up passengers by connecting train times.

As with kiss-and-ride and buses, shuttle staging and loading is not adequately provided for at Paoli Station. Shuttles picking up and dropping off passengers at the southside/eastbound station lot compete with park/drive, bus, kiss-and-ride, and taxi movements. In the northside/westbound station lot, several shuttles were observed turning around in 12-point movements due to the narrow cartway area at this location.

Table 5: Peak Hour Shuttle Trips at Paoli Station by Connecting Train Time

Time/Location	Vanguard	Shire
AM - Northside/Westbound		
6:22 AM	4	0
7:01 AM	4	1
7:31 AM	4	1
7:51 AM	6	1
8:12 AM	4	1
8:28 AM	4	1
8:59 AM	4	0
AM TOTAL	**30**	**5**
PM - Southside/Eastbound		
3:04 PM	4	0
3:34 PM	4	0
4:02 PM	4	0
4:32 PM	6	0
5:01 PM	5	1
5:33 PM	5	1
6:00 PM	4	0
6:34 PM	4	0
PM TOTAL	**31**	**2**

Source: DVRPC, March 2009

CHAPTER 2

Pedestrian and Bicycle Access

This study utilized a variety of quantitative and qualitative approaches to evaluate pedestrian and bicycle access around Paoli Station. Specifically, three main methodologies were employed:

- Counts of pedestrian and bicycle movements at the station
- Pedestrian and bicycle level of service analyses
- Pedestrian safety audit

This section of the report summarizes the findings from these assessments.

Pedestrian and Bicyclist Counts

DVRPC staff conducted counts of vehicles, pedestrians, and bicyclists in the Paoli Station vicinity on Tuesday, March 17, 2009. Counts were conducted during the AM (5:45 AM to 9:00 AM) and PM (3:00 PM to 7:00 PM) commuter rush. These times were selected based on typical working hours and availability of express train service. In addition, DVRPC conducted three additional field visits to Paoli Station in early 2009 to collect additional data.

Bicyclist Counts

During the March 17, 2009 site visit during which formal counts were conducted, DVRPC staff did not observe any bicyclist trips to or from Paoli Station. However, during other field visits to the station, one bicycle was observed at the bike rack located at the south station area (for eastbound train service).

It does not appear that bicycling is a major form of access to the station at this time. Four bicycle racks are available at the station, which accommodate eight bicycles. As indicated in the upcoming section on bicycle level of service, the roadway characteristics in a two-mile radius around the station are not compatible with bicyclist travel. Bicyclist use of Paoli Station is likely to be limited unless bicycle access to the station is improved. With improved access, the mix of residential development, employment centers, and recreational opportunities within comfortable

bicycling distance of Paoli Station suggest that bicycling could be an important alternative modal choice for station users.

Pedestrian Counts

Based on field observations during site visits in October 2009, DVRPC estimated that pedestrians account for approximately 125 (or 9%) of rail boards at Paoli Station.

In addition, pedestrian counts were conducted at five locations during the March 17, 2009 site visit. Pedestrian count data provides information about the way people move around the station area on foot. These counts include pedestrians accessing the station on foot, as well as those transferring between modes on foot. The locations are:

- A) Exit from southside/eastbound SEPTA station lot onto Valley Road
- B) Exit from northside/westbound SEPTA station lot onto Valley Road
- C) Exit from SEPTA permit parking lot onto Valley Road
- D) Lancaster Avenue/US 30 and Valley Road
- E) Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/US 30

These locations are identified in Figure 13. This section summarizes the pedestrian counts for the AM and PM observation periods. Appendix E includes detailed charts with pedestrian counts for 15-minute intervals.

Vehicle turning movement counts were also identified for each of these locations. For information about traffic volumes at these locations, refer to the section on vehicle turning movement counts in Chapter 1 or Appendix A and B.

Paoli Station Area Pedestrian Counts

Figure 13

Count Area	Counts by Location within Intersection*			
	North	South	East	West
A	42 [49]	3 [11]	70 [70]	0 [9]
B	2 [4]	0 [0]	263 [108]	0 [0]
C	24 [18]	267 [45]	4 [0]	0 [42]
D	20 [22]	22 [25]	34 [46]	14 [32]
E	7 [0]	0 [0]	0 [1]	1 [2]

*AM count [PM count]

Location A: Exit from southside/eastbound SEPTA station lot onto Valley Road

At Location A, the exit from southside/eastbound SEPTA station lot onto Valley Road, no pedestrian crosswalk is present. However, pedestrians utilize this area, typically to go from the northside/westbound station area to Lancaster Avenue/US 30 or the parking lot at the southside/eastbound station. Although a formal crosswalk has not been installed at this location, the four crossing areas located here will be described as crosswalks for ease of description.

The most widely-used crossing here is at the east crosswalk. A total of 140 pedestrians were counted crossing here during the observation periods (70 for the AM rush and 70 for the PM rush). These pedestrians are typically traveling between the northside/westbound station area and Lancaster Avenue/US 30 or the southside/eastbound station (to access buses or parking). Since this is also the designated exit for vehicles leaving the southside/eastbound Paoli Station area, this unmarked pedestrian crossing presents pedestrian/vehicle conflicts and safety risks. Due to the high numbers of pedestrians utilizing this crosswalk, striping is recommended at this location.

The second most widely-used crossing at this location is at the north crosswalk. A total of 91 pedestrians were observed crossing here during the observed periods (42 for the AM rush and 49 for the PM rush). These pedestrians are typically traveling between the northside/westbound station area and Paoli Plaza. As will be discussed in further detail in the Pedestrian Safety Audit section, there are severe safety issues related to pedestrians crossing Valley Road at mid-block, non-signalized locations due to the high volumes of traffic traveling down Valley Road combined with the limited visibility caused by the bridge over the rail tracks. Oncoming traffic does not have sufficient warning of pedestrian activity on the roadway; likewise, pedestrians cannot see vehicles moving along Valley Road until they are in close proximity.

Figure 14: Pedestrian Activity at Paoli Station, Location A

Source: DVRPC 2009

Location B: Exit from northside/westbound SEPTA station lot onto Valley Road

At Location B, the exit from northside/westbound SEPTA station lot onto Valley Road, no pedestrian crosswalk is present, but pedestrians still utilize this area, typically to go from the permit parking lot to the southside/eastbound station. The unmarked east crosswalk, which is the entrance for all modes to the northside/westbound station, is heavily utilized by pedestrians. A total of 371 pedestrians were counted crossing here during the observation periods (263 for the AM rush and 108 for the PM rush). Given the high volume of pedestrians and vehicles utilizing this location, the crosswalk should be marked.

Location C: Exit from SEPTA permit parking lot onto Valley Road

At Location C, the exit from the SEPTA permit parking lot onto Valley Road, no pedestrian crosswalk is present, but pedestrians utilize this area, typically to go from the permit parking lot to the southside/eastbound station during the AM rush. There is no way for pedestrians to move between these areas without crossing Valley Road.

At this location, a striped crosswalk is available at the north crosswalk; the east, west, and south sides are not striped. The striped crosswalk is in an ineffectual location because pedestrians cross at the shortest distance, which is the south crosswalk (this is discussed in detail in the Pedestrian Safety Audit section of this report). Since the crosswalk is on the north side, it is unused by the majority of pedestrians. During the AM period, 24 pedestrians used the north crosswalk, while 267 pedestrians used the unmarked south crosswalk. In the PM period, the majority of train passengers disembark on the northside/westbound station, from which they may utilize the platform to access the permit parking lot, rather than crossing Valley Road. During the PM period, 18 pedestrians used the north crosswalk, while 45 pedestrians used the south crosswalk. As with Location A, the limited visibility and high traffic volumes at this location create significant safety issues. The crosswalk should be moved to a more effectual location. The crosswalk should be enhanced through lighting and warning systems for approaching motorists.

Location D: Lancaster Avenue/US 30 and Valley Road

At Location D, the intersection of Lancaster Avenue/US 30 and Valley Road, a striped crosswalk is present. All four segments of this crosswalk are well-utilized by pedestrians. During the AM period, a total of 90 pedestrians were observed using this intersection (20 at north crosswalk, 22 at south crosswalk, 42 at east crosswalk, and 34 at west crosswalk). During the AM period, a total of 90 pedestrians were observed using this intersection (20 at north crosswalk, 22 at south crosswalk, 42 at east crosswalk, and 34 at west crosswalk). During the PM period, a total of 122 pedestrians were observed using this intersection (22 at north crosswalk, 25 at south crosswalk, 45 at east crosswalk, and 46 at west crosswalk). More information about this intersection is available in the intersection level of service analysis later in this chapter.

Location E: Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/US 30

At Location E, the entrance to the southside/eastbound SEPTA station lot from Lancaster Avenue/US 30, no pedestrian crosswalk is present. A small number of pedestrians were observed in this area, which provides access to pedestrians moving between the station and commercial or residential development located to the east of the station. In the AM period, seven pedestrians used the north crosswalk and one pedestrian used the west crosswalk. In the PM period, one pedestrian used the east crosswalk and two pedestrians used the west crosswalk.

Figure 15: Pedestrian Activity at Paoli Station, Location C (top) and D (bottom)

Source: DVRPC 2009

Source: DVRPC 2009

Pedestrian and Bicycle Level of Service

This section presents the results from a set of models that DVRPC used to evaluate access to Paoli Station for pedestrians and bicyclists. The first set of models, the Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) models, score road segments based on their compatibility with non-motorized traffic. These models take into account the physical attributes of the roadways, as well as the intensities of their vehicular traffic. A second model scores signalized intersections (intersection level of service) for compatibility with pedestrian usage. This model looks at traffic intensity and signal cycles.

In employing these tools for analysis, data for a road segment or signalized intersection that influence pedestrian and bicycle comfort, such as the volume and speed of auto traffic, are collected and used as inputs in the models, resulting in a level of service grade or score. In contrast to vehicular LOS measures for a road segment or intersection, bicycle and pedestrian LOS measures relate to comfort and the perception of safety rather than throughput or efficiency.

The basic premise of these assessments is that people will only walk or bicycle to a transit station (as opposed to driving/parking) if they feel they can safely do so and if trips originate within a comfortable distance. Accordingly, pedestrian LOS is assessed within one half mile of Paoli Station. Within this radius, all roads that provide access to the station and collector or arterial routes are evaluated and assigned a PLOS score. Bicycle LOS is assessed within two miles of Paoli Station. Major roadways, typically collector and arterial routes, are evaluated and assigned a BLOS score at the two-mile radius. For the intersection LOS, the two signalized intersections nearest the station were evaluated (Lancaster Avenue/US 30 at Valley Road and Lancaster Avenue/US 30 at Darby Road). The model cannot be applied to unsignalized intersections, such as Lancaster Avenue/US 30 at Paoli Pike.

The PLOS and BLOS studies for Paoli Station build on a 2007 DVRPC report entitled, *Increasing Intermodal Access to Transit, Phase IV*.

PLOS and BLOS for Road Segments

Method and Data Assumptions

The Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) models were developed by Bruce Landis, in collaboration with the Tampa and Miami metropolitan planning organizations as well as the Florida Department of Transportation. The models are used to assess and compare accessibility by non-motorized modes.

Both LOS models rely on the collection of data relating to roadway characteristics that were determined to have a statistically-significant impact on the compatibility of a road segment with nonmotorized travel.

The PLOS model favorably evaluates configurations and improvements that contribute to a feeling of protection by pedestrians from vehicles traveling in the cartway. Data informing the PLOS scoring are:

- Width of the outside auto travel lane
- Availability of on-street parking and presence of parked cars
- Presence and width of sidewalks and planted buffers
- Street tree spacing
- Traffic volume (AADT) and posted speed limit

Data collected to inform the BLOS score are:

- Roadway configuration (including the number of through and turning lanes, lane and shoulder width, and presence/absence of designated bicycle lanes)
- Traffic volume (AADT) and characteristics of traffic (including directional split, the proportion of heavy truck traffic, and the posted speed limit)
- Availability of on-street parking and presence of parked cars
- Pavement condition

Somewhat counterintuitively, the presence of a designated bicycle lane does not impact the BLOS score more positively than an unmarked shoulder, and has a unique impact on the score only where the designated bicycle lane is located to the left of a painted on-street parking lane. Further, the BLOS model does not address the impact on bicycle compatibility of newer, less-traditional strategies, such as shared lane pavement markings (“sharrows”). It should be noted

that the BLOS model evaluates conditions for bicyclists traveling in the cartway rather than on sidewalks (which is typically discouraged or prohibited).

In the case of factors like directional split, pavement condition, and the proportion of heavy truck traffic, default values from the model were used where segment-specific data did not exist, or where there was no basis for changing the default estimate.

Data for each of these factors were input, resulting in a numerical LOS score that corresponds with a range of letter grades. Table 6 (below) depicts the LOS score ranges associated with each LOS grade.

Table 6: PLOS and BLOS Scoring Standards

Numeric LOS Score	LOS Grade
< 1.5	A
> 1.5 and < 2.5	B
> 2.5 and < 3.5	D
> 3.5 and < 4.5	D
> 4.5 and < 5.5	E
> 5.5	F

Source: DVRPC 2007; BLOS Software Documentation 1997

These letter grades are ordinal measures (an ‘A’ is comparatively better than a ‘C,’ etc.), and are scaled based on the original bicyclist and pedestrian field survey research that the two models resulted from. Where PLOS and BLOS scores and grades are referenced in this report, they represent the average score for both sides of all roadway segments. For example, if a given segment had two-foot sidewalks along one side and four-foot sidewalks along the other, an average sidewalk width of three feet was inputted to the PLOS model.

In addition, where relevant characteristics varied along a given road segment (such as in the case of a variable width buffer or sidewalk), the data input was that deemed to be most typical along that segment. Measurement data for all roadways was field collected by DVRPC staff at the half-mile radius and informed by GIS data at the two-mile radius for major roadways (verified and supplemented by aerial photography).

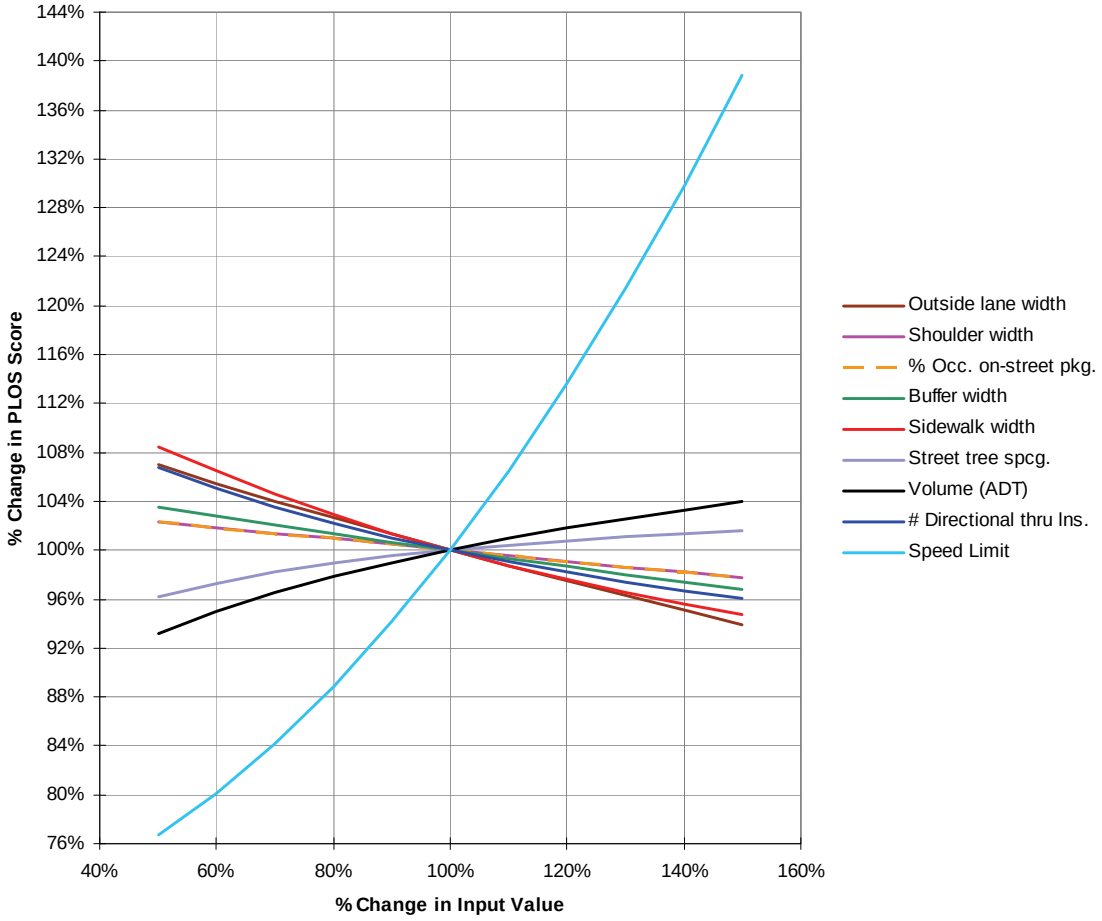
In the case of traffic volumes, where actual field-counted annual average daily traffic volumes were not available for a given roadway segment, volumes were estimated based on counts or modeled values for comparable roadways in the immediate vicinity.

Sensitivity Analysis for PLOS and BLOS Models

The relative impacts of each input characteristic on PLOS and BLOS scores were assessed using a sensitivity analysis (facilitated by the SensIt sensitivity analysis extension for Microsoft Excel). The scores' sensitivities illustrate the observed pedestrian and bicyclist comfort levels that informed the formulation and calibration of both models. For the analysis, baseline (100%) values for each of the inputs represent estimates of typical observed values for which a variation of 50% in either direction would not result in unreasonable values. For analysis of the BLOS model, baseline values include a speed limit of 40 mph, a combined width of the outside lane and shoulder of 16 feet, and 25% occupied on-street parking. In addition to the above speed and parking values, PLOS model baseline values include buffer and sidewalk widths of 4 feet. Both analyses reflect scores for an undivided bidirectional roadway. It is also worth noting that a numerical increase in the LOS score corresponds to a lower (less favorable) LOS grade.

As Figure 16 indicates, by far the most significant value in terms of PLOS scoring is the posted speed limit. This would seem to be consistent with intuition; no typical amount of sidewalk width or buffering will allow pedestrians to feel comfortable with 50-mph traffic. The most significant physical design characteristic of the pedestrian realm appears to be the width of the sidewalk, which the PLOS score is more sensitive to than buffer width and street tree spacing.

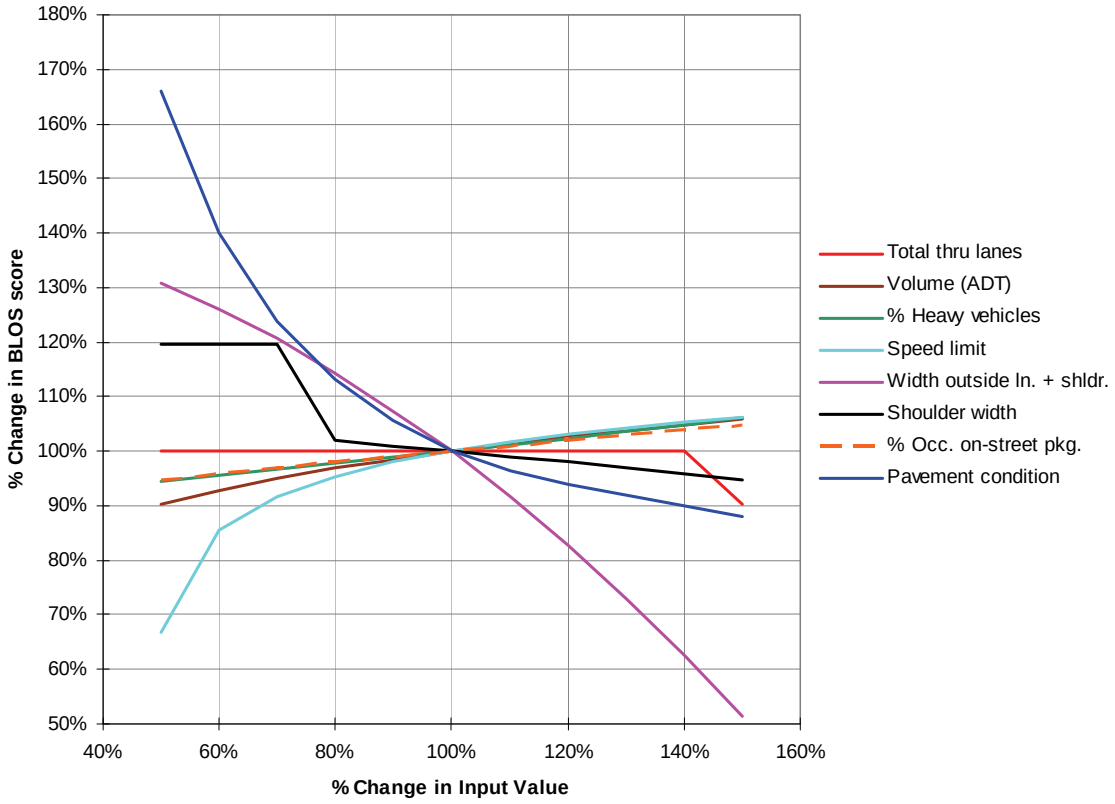
Figure 16: PLOS Sensitivity Analysis



Source: DVRPC 2007; BLOS Software Documentation 1997

In the case of the BLOS model, the two factors with the largest impact on scores are the combined width of the outside lane/shoulder and pavement condition. Note that pavement condition is based on the Federal Highway Administration's (FHWA) five-point pavement surface condition rating, and that the baseline (100%) value reflects a grade of 3 (fair). It is also worth noting that for certain inputs, including pavement rating and the number of through lanes, values other than whole numbers lack a real-world correspondence. However, the sensitivity analysis reflected in Figure 17 nonetheless illustrates the general trend and magnitude of the impacts of changes in the values of these inputs. As with the PLOS model, a roadway's speed limit also has a substantial impact, particularly in the positive direction where a speed limit is reduced.

Figure 17: BLOS Sensitivity Analysis



Source: DVRPC 2007; BLOS Software Documentation 1997

Pedestrian LOS Results and Summary

PLOS area scores were calculated for a radius of one half mile around the existing Paoli Train Station. Although pedestrians are typically willing to walk approximately one quarter mile to transit, a wider area was selected to capture typical walking distances for both the current and planned future station. In addition, because Paoli Station is the end of a fare zone and a key stop for express trains, pedestrians are likely to walk further to access these enhanced transit services. Only roadways that provided access to the station were included in the PLOS analysis.

Table 7 contains the PLOS scores calculated for road segments within a half mile of Paoli Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted in Figure 18.

Overall, access for pedestrians around Paoli Station is not favorable, with an average score of 2.89 and an average PLOS grade of C. Since a PLOS score of 3 reflects a grade of “fair,” pedestrian access in the Paoli Station is below adequate. The character of pedestrian access around Paoli Station is fairly consistent, with no extreme scores of ‘A’ or ‘F.’

Table 7: Paoli Station Area PLOS Summary

Road Name	From	To	PLOS Score	PLOS Grade
Bear Hill Road/252	Lancaster Avenue/US 30	North Edge of Study Area	3.27	C
Cedar Hollow Road	full length	full length	2.87	C
Central Avenue	PA 252	Valley Road	2.35	B
Central Avenue	Valley Road	West Edge of Study Area	2.88	C
Chestnut Road	Lancaster Avenue/US 30	South Edge of Study Area	2.28	B
Circular Avenue	full length	full length	3.35	C
Darby Road	Lancaster Avenue/US 30	South Edge of Study Area	3.23	C
Greenwood Avenue	full length	full length	2.14	B
Lancaster Avenue/US 30	Chestnut Road	Valley Road	1.87	B
Lancaster Avenue/US 30	Chestnut Road	East Edge of Study Area	2.66	C
Lancaster Avenue/US 30	Valley Road	West Edge of Study Area	3.20	C
Leopard Road/PA 252	Lancaster Avenue/US 30	South Edge of Study Area	3.22	C
Paoli Pike	full length	full length	3.18	C
Paoli Plaza	full length	full length	1.90	B
Spring Street	full length	full length	3.44	C
Valley Road	Lancaster Avenue/US 30	Train Station	2.78	C
Valley Road	Train Station	Central Avenue	2.76	C
Valley Road	Central Avenue	North Edge of Study Area	3.86	D
Valley Road	Lancaster Avenue/US 30	South Edge of Study Area	2.73	C
Wistar Road	full length	full length	3.75	D

Source: DVRPC 2009

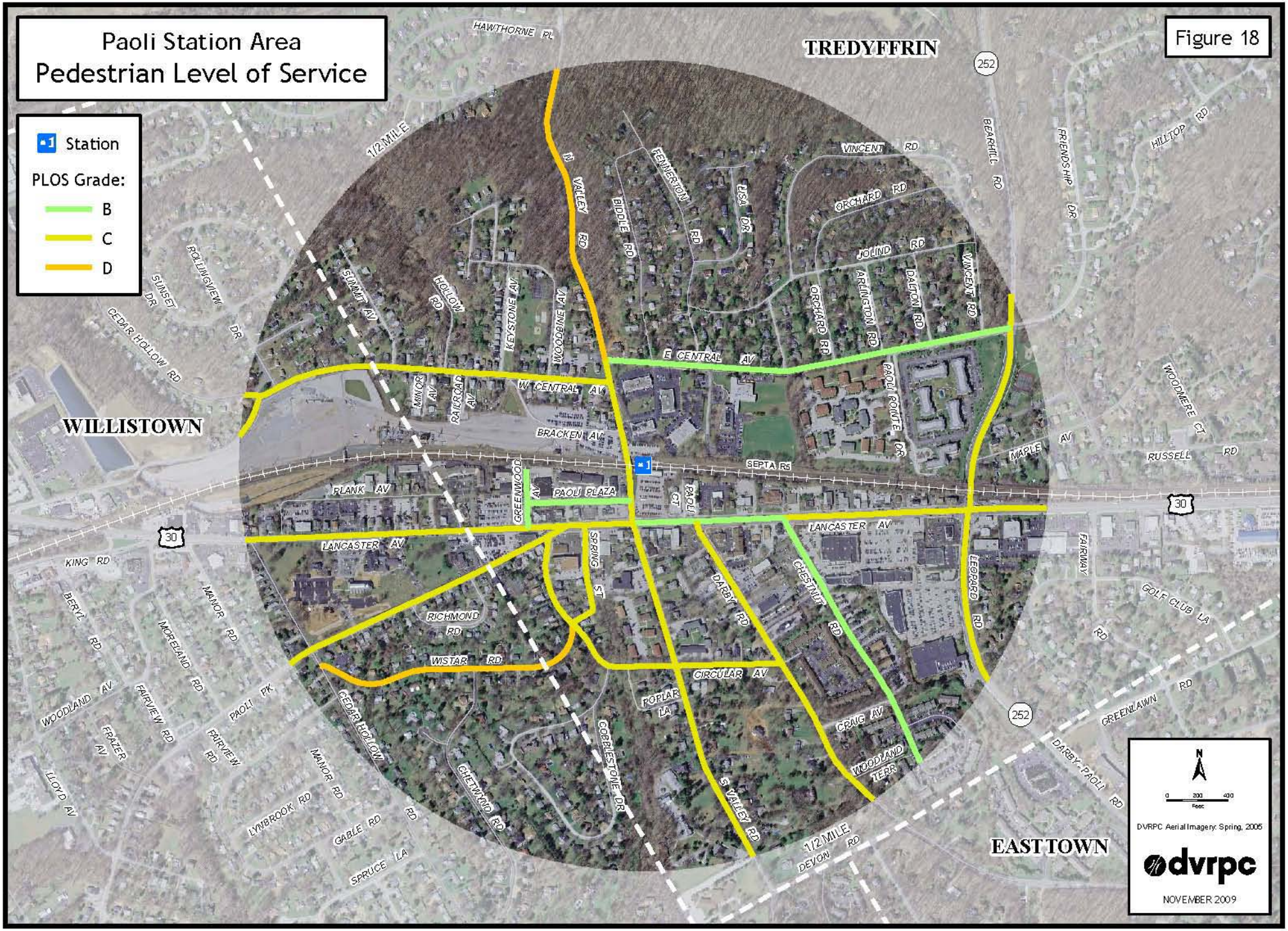
Highest PLOS Score

As depicted in Table 7, Lancaster Avenue/US 30 from Chestnut Road to Valley Road had the highest PLOS score in the Paoli Station area, scoring 1.87 with a grade of ‘B.’ This score reflects the presence of wide sidewalks on both sides of Lancaster Avenue/US 30 in this location, combined with a high percentage of occupied on-street parking, which creates a buffer between pedestrians and traffic. Wide shoulders, street trees, and a wide buffer width also contribute to the high score.

Notably, other segments of Lancaster Avenue/US 30 score poorly in the PLOS analysis. In particular, Lancaster Avenue/US 30 west of Valley Road received a score of 3.20 and a grade of ‘C.’ This lower score reflects the lack of sidewalks on the south side of Lancaster in this area, as well as a shallow buffer and shoulder, no on-street parking, and a lack of street trees. Although one segment of Lancaster Avenue/US 30 scored well in the PLOS analysis, the poor score for another segment serves as a reminder that good pedestrian access can result only from improvements to the overall pedestrian network since most pedestrian trips will involve more than one road or road segment.

Lowest PLOS Score

The lowest PLOS score in the study area occurred on Valley Road north of Central Avenue. With a score of 3.86 and a grade of D, this road segment lacks sidewalks and has narrow shoulders, effectively forcing pedestrians into traffic. This road segment is windy with a dense tree canopy, limiting visibility and creating serious safety issues for pedestrians. As a result, the roadway does not see a significant volume of foot traffic, as indicated by DVRPC fieldwork. This is especially unfortunate given that this is the primary access way to Paoli Station from the north, and Valley Road is expected to play a continued critical role for the redeveloped station area.


Paoli Station Area
Pedestrian Level of Service
Figure 18
Station
PLOS Grade:
B
C
D
TREDYFFRIN
WILLISTOWN
EASTTOWN
1/2 MILE
1/2 MILE
HAWTHORNE PL
N VALLEY RD
BIDDLE RD
FENNERTON RD
USA DR
VINCENT RD
ORCHARD RD
JOLIND RD
ARLINGTON RD
DALTON RD
VINCENT RD
BEARHILL RD
FRIENDSHIP DR
HILLTOP RD
SUMMIT AV
HOLLOW RD
KEYSTONE AV
WOODBINE AV
E CENTRAL AV
W CENTRAL AV
MINOR AV
RAILROAD AV
BRACKEN AV
PAOLI POINTE DR
WOODMERE CT
RUSSELL RD
MAPLE AV
SEPTA R5
PLANK AV
GREENWOOD AV
PAOLI PLAZA
PAOLI CT
LANCASTER AV
LANCASTER AV
SPRING ST
DARBY RD
CHESTNUT RD
LEDGARD RD
FAIRWAY
GOLF CLUB LA
RD
RICHMOND RD
WISTAR RD
CIRCULAR AV
POPLAR LA
CRAIG AV
WOODLAND TERR
S VALLEY RD
COBBLESTONE DR
CHETWOOD RD
CEDAR HOLLOW RD
MANOR RD
LYNBROOK RD
GABLE RD
SPRUCE LA
DEVON RD
GREENLAWN RD
DARBY-PAOLI RD
KING RD
BERYL RD
MORELAND RD
MANOR RD
WOODLAND AV
FAIRVIEW RD
FRAZER AV
PAOLI PK
FAIRVIEW RD
LLOYD AV
SUNSET DR
ROLLINGVIEW DR
CEDAR HOLLOW RD
252
30
30
252
N
0 200 400
Feet
DVRPC Aerial Imagery: Spring, 2005
dvrpc
NOVEMBER 2009

Bicycle LOS Results and Summary

Table 8 contains the BLOS scores calculated for road segments within two miles of Paoli Station. Road segments are arranged alphabetically for ease of reference. These scores are depicted in Figure 19. Only roadways that provided access to the station were included in the PLOS analysis.

Bicycle access in the two mile vicinity of Paoli Station is extremely poor, with the majority of road segments receiving a grade of D, E, and F. Only three road segments received a grade of ‘C’ or fair. No road segments received a score of ‘A’ or ‘B.’ Recall that the two factors with the largest impact on scores for the BLOS model are the width of the outside lane/shoulder and pavement condition. All but two road segments in the Paoli Station BLOS analysis have a pavement condition score of 3.5, so outside lane/shoulder width is a significant explanation for the variations among scores. Roadways with higher traffic volumes and speeds also scored poorly.

Highest BLOS Score

Four road segments earned fair grades of ‘C.’ These include two segments of Cedar Hollow Road (from Swedesford Road to West Central Avenue with score of 2.83 and from Devon Road to Lancaster Avenue/US 30 with score of 2.99). The two other road segments with scores of ‘C’ are Central Avenue from Old Lincoln Highway (score of 2.88) and Russell Road/Maple Road from Old Lancaster Road to North Valley Road (score of 3.07). Although shoulder width has a strong impact on BLOS scores, none of these road segments have particularly wide shoulders. The main commonality among these road segments is that all exhibit relatively low traffic volumes.

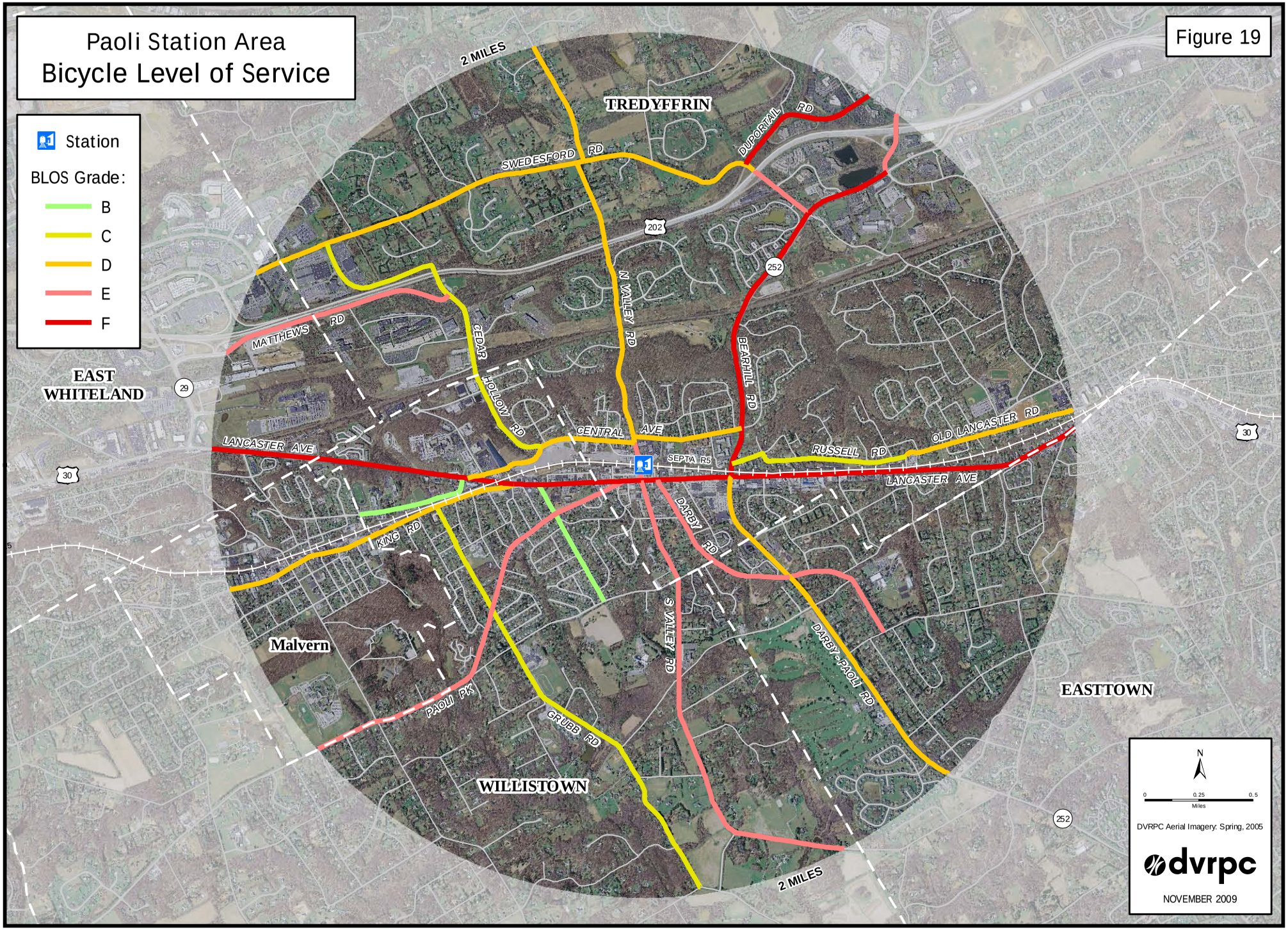
Lowest BLOS Score

The six lowest scores (ranging from 6.01 to 6.58) are all located on road segments along Lancaster Avenue/US 30 and PA 252. These road segments represent all of the ‘F’ grades, with the exception of one: Duportail Road between Chesterbrook Boulevard and Swedesford Road.

Table 8: Paoli Station Area BLOS Summary

Road Name	From	To	BLOS Score	BLOS Grade
Cedar Hollow Road	Swedesford Road	West Central Avenue	2.83	C
Central Avenue	Old Lincoln Highway	Lancaster Ave/US 30	2.88	C
Cedar Hollow Road	Devon Road	Lancaster Ave/US 30	2.99	C
Russell Rd/Maple Ave	Old Lancaster Road	North Valley Road	3.07	C
East Central Avenue	PA 252	North Valley Road	3.84	D
King Street	S Edge of Study Area	Lancaster Ave/US 30	4.06	D
West Central Avenue	Lancaster Ave/US 30	North Valley Road	4.07	D
Leopard Road/PA 252	Sugartown Road	Lancaster Ave/US 30	4.08	D
Swedesford Road	North Valley Road	US 202	4.09	D
Grubb Road	S Edge of Study Area	King Street	4.12	D
Swedesford Road	Morehall Road/ 29	North Valley Road	4.13	D
North Valley Road	Swedesford Road	Central Avenue	4.14	D
Darby Paoli Rd/ 252	S Edge of Study Area	Sugartown Road	4.15	D
Old Lancaster Road	E Edge of Study Area	Russell Road	4.17	D
North Valley Road	Yellow Springs Road	Swedesford Road	4.24	D
South Valley Road	S Edge of Study Area	Lancaster Ave/US 30	4.55	E
Sugartown Road	Evergreen Lane	PA 252	4.62	E
North Valley Road	Central Avenue	Lancaster Ave/US 30	4.69	E
Paoli Pike	Grubb Road	Lancaster Ave/US 30	4.70	E
Darby Road	PA 252	Lancaster Ave/US 30	4.98	E
Swedesford Road	US 202	PA 252	5.03	E
Chesterbrook Blvd	N Edge of Study Area	PA 252	5.11	E
Paoli Pike	S Edge of Study Area	Grubb Road	5.25	E
Matthews Road	Morehall Road/ 29	Cedar Hollow Road	5.41	E
Lancaster Ave/US 30	W Edge of Study Area	PA 252	5.79	F
Duportail Road	Chesterbrook Blvd	Swedesford Road	5.98	F
Lancaster Ave/US 30	Morehall Road/ 29	King Street	6.01	F
Bearhill Road/PA 252	East Central Avenue	Lancaster Avenue	6.10	F
Bearhill Road/ PA 252	Howellville Road	Chesterbrook Road	6.14	F
Lancaster Ave/US 30	King Street	North Valley Road	6.24	F
Bearhill Road/PA 252	Swedesford Road	East Central Avenue	6.55	F
Lancaster Ave/US 30	PA 252	Valley Road	6.58	F

Source: DVRPC 2009


Paoli Station Area
Bicycle Level of Service
Figure 19
Station
BLOS Grade:
B
C
D
E
F
2 MILES
TREDYFFRIN
SWEDESFORD RD
DUPORTAIL RD
202
252
N VALLEY RD
BEARHILL RD
MATTHEWS RD
CEDAR HOLLOW RD
EAST WHITELAND
29
30
LANCASTER AVE
CENTRAL AVE
SEPTA R5
RUSSELL RD
OLD LANCASTER RD
KING RD
DARBY RD
S VALLEY RD
Malvern
PAOLI PK
GRUBB RD
WILLISTOWN
DARBY-PAOLI RD
EASTTOWN
N
0
0.25
0.5
Miles
DVRPC Aerial Imagery: Spring, 2005
dvrpc
NOVEMBER 2009

Pedestrian Intersection Level of Service

Method and Data Assumptions

The Pedestrian Intersection LOS model was developed by transportation planning consultants and researchers Theodore Petritsch, Bruce Landis, Peyton McLeod, Herman Huang, and Srikalyan Challa. The model may be applied only to signalized intersections.

Inputs to the model include volume of turning vehicles that cross the study crosswalk, the number of lanes being crossed by the pedestrian, and the signal cycle length. For the intersection LOS, the two signalized intersections nearest the station were evaluated (Lancaster Avenue/US 30 at Valley Road and Lancaster Avenue/US 30 at Darby Road).

Results

The results of the Pedestrian Intersection LOS are shown in Figure 20. The intersection of Lancaster Avenue/US 30 at Valley Road scored a LOS of ‘B’ for the north and south crosswalks and a LOS of ‘C’ for the east and west crosswalks. The intersection of Lancaster Avenue/US 30 at Darby Road scored a LOS of ‘B’ for the south crosswalk and a LOS of ‘C’ for the west crosswalk. This intersection only includes a crosswalk at these two locations.

The lower scores for the east and west crosswalks reflect the high volumes of traffic traveling east-west on Lancaster Avenue/US 30. In field observations, DVRPC staff found that pedestrians tended to run across the east and west intersection of Lancaster Avenue/US 30 and Valley Road (shown in Figure 15, Location D). This suggests that pedestrians feel unsure that they will have sufficient time to make this crossing or otherwise feel threatened by traffic. Adjustments to signal timing or installation of additional signage or amenities for pedestrians may enhance the sense of safety at this intersection. Further recommendations for safety improvements at these locations are described in the Pedestrian Safety Audit section of this report.


Paoli Station Area
Pedestrian Intersection
Level of Service
Figure 20
Station
PLOS Grade:
B
C
Paoli
Station
N VALLEY RD
LANCASTER AVE
S VALLEY RD
DARBY RD
N
0 25 50
Feet
DVRPC Aerial Imagery: Spring, 2005
dvrpc
NOVEMBER 2009

Pedestrian Safety Audit

A Pedestrian Safety Audit was conducted on the primary pedestrian routes in the vicinity of Paoli Station. The goals of the audit were threefold: to provide a detailed account of pedestrian safety issues, to ascertain suitable recommendations to address these issues, and to identify possible causes for pedestrian/vehicle conflict. These include pedestrian trip generators that encourage jaywalking, conditions that might contribute to inattentiveness or unawareness in drivers and pedestrians, and roadway design features that are not conducive to a safe and functional pedestrian environment.

The audit was carried out by DVRPC staff members who walked the length of each corridor identifying and documenting pedestrian safety problems. This field view was conducted in March of 2009. The audit takes the form of a list of problem locations organized by direction for each corridor.

The intersection of Lancaster Avenue/US 30 and Valley Road was chosen as the focal point for the audit. This intersection is a central point for the primary access ways to both the existing and future stations at Paoli. The audit focuses on four major road segments and three secondary road segments near this intersection. The four major road segments were selected because they are major collector roads that provide access to the existing and future station and are integral to the area pedestrian network.

These segments are:

- Lancaster Avenue/US 30 from Valley Road to PA 252
- Lancaster Avenue/US 30 from Valley Road to Cedar Hollow Road
- North Valley Road from Lancaster Avenue/US 30 to Central Avenue
- South Valley Road from Lancaster Avenue/US 30 to Devon Road

These four major road segments are described in the audit as if one were heading out from and then back to the Lancaster Avenue/US 30 and Valley Road intersection, thus covering both sides of the street.

The three secondary segments were selected because they will provide significant access to the future Paoli Transportation Center centered on Greenwood Avenue, as described in the 2001 Paoli Community Master Plan. These segments are:

- Paoli Pike from Lancaster Avenue/US 30 to Cedar Hollow Road
- Greenwood Avenue from Lancaster Avenue/US 30 to terminus
- Paoli Plaza from Greenwood Avenue to Valley Road

The safe and efficient functioning of all these corridors is critical in order for area residents to feel comfortable accessing the station by modes other than automobile.

While these routes provide important pedestrian access to the current and future station, they form only a portion of the area's pedestrian network. It is significant to note that while existing pedestrian facilities are generally sufficient for pedestrian safety, there are multiple sections with relatively poor conditions, which effectively undermine the functionality of both the individual segments and the overall network. When sidewalks are discontinuous or not connected with other pedestrian facilities, the isolated sections of sidewalk are rendered ineffectual. Furthermore, a disjointed network limits overall pedestrian travel because it hinders a pedestrian's ability to make a complete journey. It is intended that the following list of audit findings be taken as a comprehensive account of problems that, when seen individually, might not appear significant, but when viewed in total, illustrates the larger issue of network integrity. In other words, the whole is greater than the sum of its parts.

Lancaster Avenue/US 30 – Eastbound from Valley Road to PA 252

The pedestrian environment is so well developed along this stretch of roadway that it serves to highlight the incongruity found when comparing it with the lack of pedestrian facilities along Valley Road and on Lancaster Avenue/US 30 west of here. See Figure 21.

1. In multiple places the pavement is crumbling around the decorative brickwork. While this does not yet constitute a hazard, it will eventually, and the sooner it is repaired, the less costly it will be. Regular sidewalk maintenance should be implemented.

2. Frequent jaywalking occurs here as pedestrians cross Lancaster Avenue/US 30 just west of Darby Road. This practice would be drastically reduced if pedestrians were provided with a safe and lawful means of crossing at or near this location. A crosswalk should be installed across the west leg of this intersection in order to achieve better pedestrian functionality.

3. As one approaches Chestnut Road, the sidewalk narrows to an uncomfortable width. It should be widened and all fixtures should be moved to the buffers.

4. Poor access management coming up to Chestnut Road is uncharacteristic of this section of roadway. The number of curb cuts should be reduced and the internal circulation should be improved for the three adjacent businesses here.

5. The absence of any markings across Chestnut Road is unsafe and inconsistent considering that pedestrian crossings are well marked across simple driveways at other locations along this segment. Sidewalk pavement should be laid or pathway should be striped.

6. There are no traffic signals or pedestrian crossings on Lancaster Avenue/US 30 at Chestnut Road, creating an excessive distance between the intersections at Darby Road and Paoli Shopping Center. This is doubly problematic as it encourages jaywalking while also allowing higher speeds by drivers along this stretch of Lancaster Avenue/US 30. Businesses on the north side of Lancaster Avenue/US 30 and pedestrians coming from the residential area down Chestnut Road would be well served by the increased pedestrian access and traffic calming effects that traffic signals and a pedestrian crossing would have at this junction.

7. The lack of pedestrian signals at PA 252 weakens the effectiveness of the crosswalks. Pedestrian signals should be installed.

Lancaster Avenue/US 30 – Westbound from PA 252 to Valley Road

See Figure 21.

8. A crosswalk and pedestrian signal should be installed on the north leg of PA 252 at Lancaster Avenue/US 30. The other three legs have crosswalks (but no signals) and the absence of one across Bearhill Road degrades the utility of the entire facility and is an inhibitor of pedestrian travel.

9. The existing crosswalks at Lancaster Avenue/US 30 and PA 252 need restriping.

10. There are excessive curb cuts along the entire corridor. The number of curb cuts should be reduced and the internal circulation should be improved for adjacent parking lots.

11. The curb cut in front of Paoli Rug Company no longer serves any driveway. The full curb should be reinstated.

12. The blind driveway between these two businesses creates a visibility hazard. Pedestrian and driver warning devices such as signage and striping should be installed.

13. In front of and between Paoli Tailor and the neighboring property to the west, the sidewalk is badly damaged in multiple places and should be repaired as soon as possible.

14. In front of Weichert Realty, there is no buffer between the parking lot and the sidewalk. Cars parked here overhang the sidewalk creating an obstacle—especially in conjunction with the poorly positioned lighting column. The parking blocks should be moved back from the sidewalk edge.

15. At the intersection, there is another blind driveway between two businesses. These blind driveways, coupled with the aforementioned excessive curb cuts, make the location a daunting environment for pedestrians and bicyclists to maneuver through. Pedestrian and driver warning devices such as signage and striping should be installed.

16. In front of Jiffy Lube, the decorative brick work is damaged. The longer it goes unrepaired, the worse the problem will become. This is one of the areas of focus from the 1996 Conceptual Design Study of the Paoli Pedestrian Environment. While many of the sidewalk's features here are sufficient, the unmaintained brickwork is degrading the quality of the whole facility. Sidewalk maintenance should be provided.

17. There is no crosswalk at Paoli Court and the curbline is unclear on the northwest corner. Pedestrian facilities should be installed.

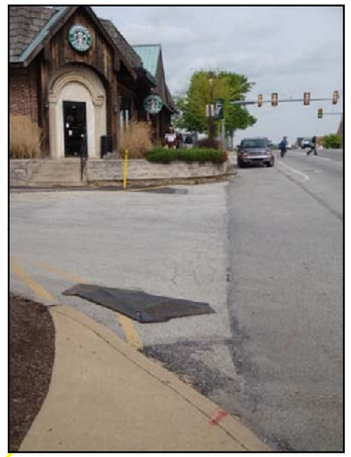
18. The sidewalk is effectively discontinued at the driveway for the train station parking lot, as it is elevated above street level and is only accessible by stairs. This is especially

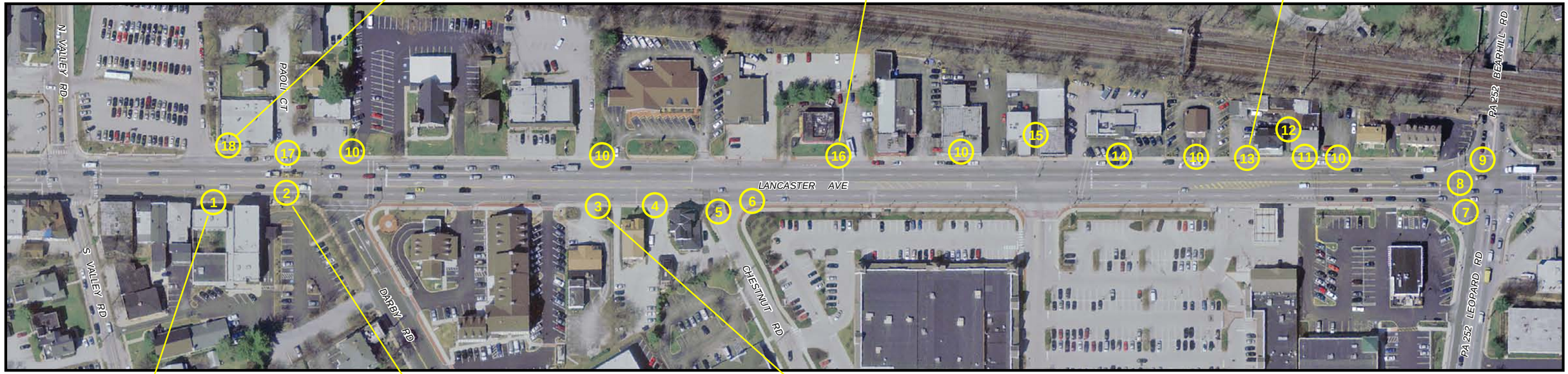
detrimental to any disabled pedestrians, the elderly, and parents with small children or strollers. Due to the regular street parking here, pedestrians are left with little choice but to travel a considerable distance in the traffic lane, risking their safety and causing a hazard to drivers. Pedestrians were also observed coming into conflict with drivers attempting to pull into traffic from the curbside parking here. There are two possible solutions to this problem: either a ramp should be installed to connect the sidewalk segment with the rest of the network or the shoulder should be replaced with a street-level sidewalk.

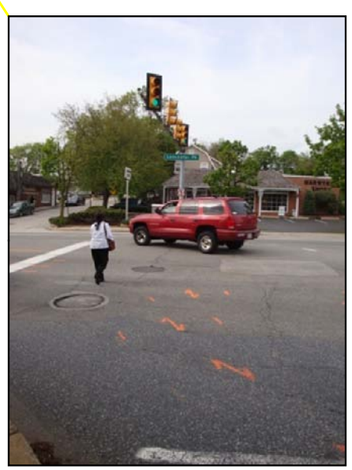
Paoli Station Area

Pedestrian Safety Audit: Lancaster Avenue/US 30 from Valley Road to PA 252

Figure 21







60 Problem Location

N

0 50 100
Feet

DVRPC Aerial Imagery: Spring, 2005

dvrpc

NOVEMBER 2009

Lancaster Avenue/US 30 – Westbound from Valley Road to Cedar Hollow Road

See Figure 22.

19. At the northwest corner, the sidewalk is sloped to such a degree as to be hazardous. It should be regraded.

20. The obsolete signal pole foundation is a trip hazard and should be removed.

21. The sloped driveway makes for a particularly uneven pedestrian crossing and should be regraded.

22. None of the driveways have sidewalks or crosswalks demarcating the pedestrian path or the edge of the cartway. Sidewalk pavement should be laid or the pathway should be striped.

23. Pedestrians are barred from crossing at Paoli Pike. This major intersection should have the facilities to enable pedestrians to cross Lancaster Avenue/US 30 safely in order to travel from and to Paoli Pike.

24. There is no pedestrian crossing at Greenwood Avenue. A crosswalk should be installed.

25. There is no pedestrian access to the property occupied by Burger King since the only entrance is the driveway which has no sidewalks and no pedestrian crossing. The business owner should be encouraged to install at least one sidewalk entrance.

26. At the northeast corner of Plank Avenue, the pedestrian signal pole is obstructing the sidewalk. All sidewalk fixtures should be moved to the buffer.

27. The view of the pedestrian signal on the northeast corner is blocked by a telephone pole. The signal should be moved to the back of the sidewalk.

28. There is no pedestrian crossing at the entrance to the TD Bank property. In fact, the island blocks pedestrians, forcing them into the cartway. The island should have pedestrian ramps or cuts installed and the crossing should be marked. (Location shown on map, but the actual image is not displayed due to age of aerial photography.)

29. The sidewalk is discontinued for the length of the next two properties where there is insufficient distinction between the parking lot, the driveway, and the edge of the roadway. Sidewalk pavement should be installed or the pathway and cartway edge should be marked.

30. Approaching the west junction with Plank Avenue, the sidewalk condition degrades; widening and maintenance is recommended.

31. There is no pedestrian crossing at the driveway just east of Plank Avenue, as well as no pedestrian ramp on the west side. Facilities should be installed.

32. The telephone/signal pole obstructs the already-narrow sidewalk. Fixtures should be moved to a buffer or the back of the sidewalk.

33. Both the crosswalks across Lancaster Avenue/US 30 lead to nowhere as there are no sidewalks or pedestrian ramps on the south side. Facilities should be installed and both crosswalks need to be repainted.

Lancaster Avenue/US 30 – Eastbound from Cedar Hollow Road to Valley Road

See Figure 22.

34. There is no pedestrian crossing on Cedar Hollow Road. A signalized crossing should be installed.

35. There is no sidewalk for a large portion of this side of the corridor. Sidewalks should be installed from Cedar Hollow Road to Paoli Pike.

36. At Plank Avenue where there are crosswalks and pedestrian signals, there is no sidewalk, so the crossings lead into a parking lot or driveway. Sidewalks should be installed.

37. The intersection of Lancaster Avenue/US 30 and Paoli Pike is hostile to pedestrians.

    - Though an existing sidewalk heads eastward from this intersection, there are no sidewalks on either leg to the west. There are also no crosswalks across either road.
    - Pedestrians traveling eastward on Lancaster Avenue/US 30 are left stranded on the southwest corner of the intersection with no sidewalk or crossing in any direction.
    - Pedestrians traveling westward on Lancaster Avenue/US 30 are left with no option but to turn south onto the south side of Paoli Pike.
    - Pedestrians have no means of crossing from south to north or continuing along Lancaster Avenue/US 30 past Paoli Pike in either direction.

    Pedestrian facilities must be installed as soon as possible. If the intersection is re-engineered, consideration should be given to pedestrians crossing West Circular Avenue if it becomes separate from Paoli Pike. The reengineered design should allow those traveling along Lancaster Avenue/US 30 to be able to cross onto the island that will be expanded east of Paoli Pike.

38. Moving east, the sidewalk is in favorable condition. This section was one of the focus areas in the 1996 Conceptual Design Study of the Paoli Pedestrian Environment. It should be noted that if one travels westward along this segment of sidewalk, there are no connections beyond West Circular Avenue, making it difficult to continue the journey.

39. There should be a crosswalk on Spring Street.

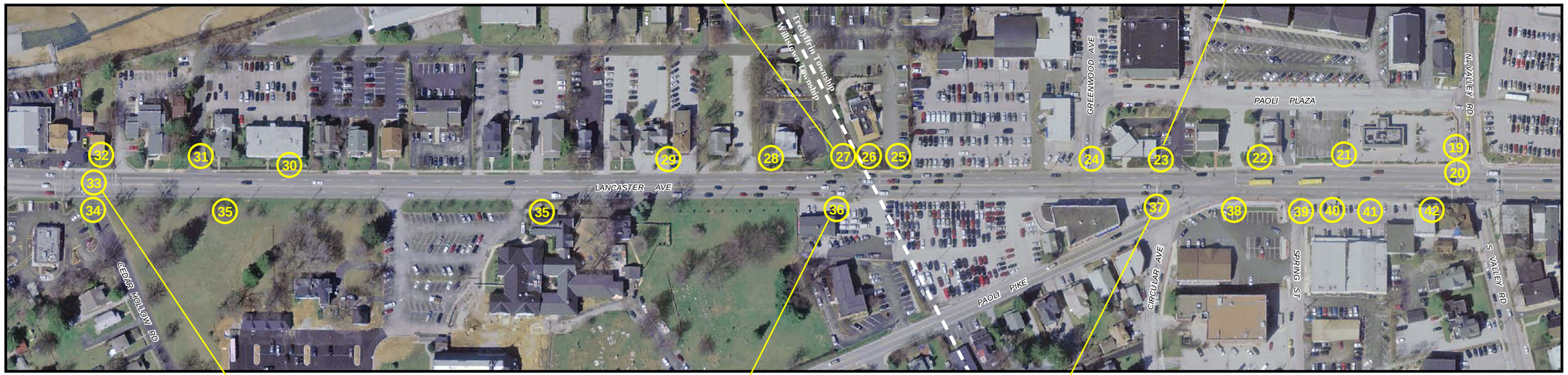
40. More consideration needs to be given to the relative placement of poles and signs to ensure they are not causing an obstruction.

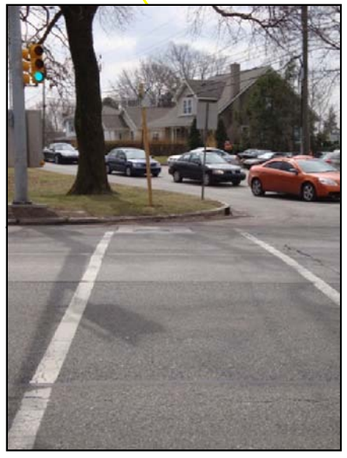
41. The driveway should have a sidewalk or crosswalk demarcating the pedestrian path or the edge of the cartway.

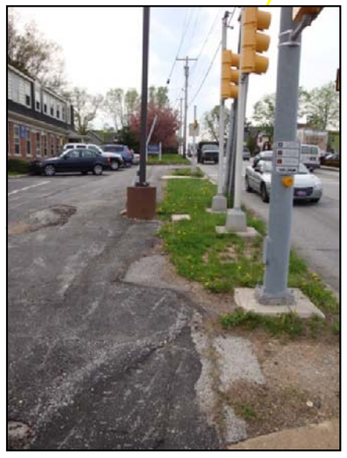
42. Approaching Valley Road, the sidewalk should be widened so that the curb line conforms to that found along the rest of this roadway segment. This will also provide for continuity of the outside lane width.

Paoli Station Area
Pedestrian Safety Audit:
Lancaster Avenue/US 30 from Valley Road to Cedar Hollow Road

Figure 22







60 Problem Location

N

0 50 100
Feet

DVRPC Aerial Imagery: Spring, 2005

dvrpc

NOVEMBER 2009

North Valley Road – Northbound from Lancaster Avenue/US 30 to East Central Avenue

The predominant state of the pedestrian environment along this segment is one of insufficient or non-existent facilities. These poor conditions leave pedestrians without protections or adequate guidance while forcing them to mix with vehicle traffic. This causes a myriad of problems such as lack of pedestrian safety, traffic congestion, and driver frustration, which are all contributing factors to vehicle crashes. See Figure 23.

43. The lack of pedestrian crossing into Paoli Plaza encourages frequent jaywalking. No viable solution to this problem could be ascertained at this time. The future station should be designed so that access ways accommodate pedestrians and do not encourage jaywalking.

44. There are no road markings across the driveway to delineate the road edge or the pedestrian crossing. The pathway and cartway edge should be appropriately striped.

45. The sidewalk ramp on the north side of the parking lot entrance is too steep and angled into the street, making it hazardous to pedestrians, especially wheelchair users. The sidewalk and ramp should be regraded.

46. Drivers have insufficient warning of pedestrian activity around the station. Flashing warning signals should be installed to alert drivers.

47. The slope of the bridge is a danger to pedestrians, especially during wet or icy conditions. Aside from bridge replacement or a large-scale regrading project, no viable solution could be ascertained at this time.

48. There is extremely limited visibility to the south for pedestrians trying to time their crossing at this location. Sufficient warning devices should be installed.

49. The crosswalk from the station into the parking lot has several substandard features:

    - The crosswalk angle forces pedestrians to be in the roadway for longer than necessary.
    - There are insufficient road markings or signage to alert drivers of the crossing.
    - It is in an ineffectual location; pedestrians cross into the lot along the shortest distance, which is south of the driveway. Since the crosswalk is on the north side, it is unused by the majority of people crossing at this location.

    The crosswalk should be moved and redesigned as a signalized, mid-block crossing.

50. The sidewalk is discontinued at this location and has no pedestrian ramp. This limits its functionality, especially for wheelchair users who will be forced to travel in the road. Sidewalks should be installed.

51. The walkway found further along this roadway segment is so lacking in quality that it should not be considered a viable pedestrian facility. In brief:

    - It is constructed of improper materials and is unmaintained.
    - It is uneven and too narrow.
    - It is disconnected from the sidewalk network.
    - Portions of it give way to an unguarded embankment.

    A sidewalk should be installed including necessary facilities (guardrails, ramps, etc.).

North Valley Road – Southbound from West Central Avenue to Lancaster Avenue/US 30

See Figure 23.

The existing section of sidewalk from West Central Avenue to the station parking lot is inadequate due to substandard features that undermine the quality of the whole facility.

52. The sidewalk is too narrow for pedestrians to safely pass each other or to provide a comfortable buffer between pedestrians and vehicles. It should be widened.

53. The curb and sidewalk are not level with each other because the sidewalk is sinking. The sidewalk should be repaired.

54. Utility poles are obstructing the sidewalk. The sidewalk should be widened to include a buffer.

55. An improvised walkway connecting to the sidewalk from the adjacent lot has caused mud and debris to wash over the sidewalk, creating a hazard and partial obstruction. A retaining wall should be installed.

56. The sidewalk inappropriately ends at a substandard crosswalk, leaving no southbound pedestrian route over the bridge. See problem 53.

57. At the entrance to Paoli Plaza, the sidewalks on each side of the driveway end without providing crossing facilities or southbound access to the crossing at the intersection of Valley Road and Lancaster Avenue/US 30. A crosswalk should be installed across the entrance and a sidewalk should be installed to the south leading to Lancaster Avenue/US 30.

South Valley Road –Both sides from Lancaster Avenue/US 30 to Devon Road

Due to a limited number of problems, a single list was made for this road segment rather than two directional lists. See Figure 23.

58. The curbs on the southeast and southwest corners of the intersection are so low as to be non-existent. This invites drivers to overrun the curb when making a turn, thereby endangering pedestrians and damaging the sidewalk pavement. Curbs should be reinstated.

59. On the east side, there are problems created by the sidewalk being elevated above street level. A guardrail or barrier should be installed along the edge of the sidewalk to protect pedestrians from the significant drop down to the street.

60. This section of sidewalk ends in a set of stairs, making it inaccessible to disabled pedestrians, the elderly, and parents with small children or strollers. The stairs should be replaced or augmented with a ramp in order to connect this segment with the rest of the network.

61. Further south, another set of stairs obstruct the sidewalk and should be removed.

Figure 23

Paoli Station Area

Pedestrian Safety Audit:
North Valley Rd. from Lancaster Ave./US 30 to East Central Ave. and South Valley Rd. from Lancaster Avenue/US 30

60 Problem Location

N

0 50 100
Feet

DVRPC Aerial Imagery: Spring, 2005

dvrpc

NOVEMBER 2009

Paoli Pike – Both sides from Lancaster Avenue/US 30 to Cedar Hollow Road

See Figure 24.

Pedestrians have no apparent options for traveling down Paoli Pike from the intersection at Lancaster Avenue/US 30.

62. There is no crosswalk across Paoli Pike at Lancaster Avenue/US 30. A signalized pedestrian crossing should be installed.

63. There is no sidewalk on the north side of Paoli Pike except for a limited section alongside the car dealership's main building. Sidewalks should be installed.

64. There is no sense of where pedestrians are supposed to go as they cross West Circular Avenue, because there are no road markings. A crosswalk should be installed leading to the facilities described in location number 65.

65. The distance to the southwest corner of Paoli Pike and West Circular Avenue is too far for pedestrians to travel safely. It is also unclear where the southwest corner is exactly, due to the lack of demarcation between the roadway edge and the parking area. Pedestrian access to the sidewalk surrounding the building here is blocked by parking spaces on the corner. Pedestrian facilities should be installed and a parking lot should be constructed around the business here in order to establish the curbline and boundary between public and private land.

66. The sidewalk is intermittent for the length of several properties up to the line between Willistown and Tredyffrin townships. Isolated sections of sidewalk are therefore underutilized. Sidewalks should be installed to fill the gaps.

67. Despite the fact that there is an adequate sidewalk running for the remainder of this corridor, it is practically inaccessible due to its lack of connection with any facility at this end.

Greenwood Avenue – Both sides from Lancaster Avenue/US 30

See Figure 24.

68. There is no crosswalk on Greenwoood Avenue and pavement markings at the corner suggest pedestrians are being guided into the cartway. This marking should be removed and the edge of cartway should be marked. A crosswalk should be installed across Greenwood Avenue.

69. There is no sidewalk on the entire west side of Greenwood Avenue. A sidewalk should be installed.

70. On the east side, there are no road markings across the driveway to delineate the road edge or the pedestrian crossing. The pathway should be delineated with striping.

71. The sidewalk ends with no pedestrian ramp, crosswalk, or connection to the sidewalk on Paoli Plaza. Facilities should be installed.

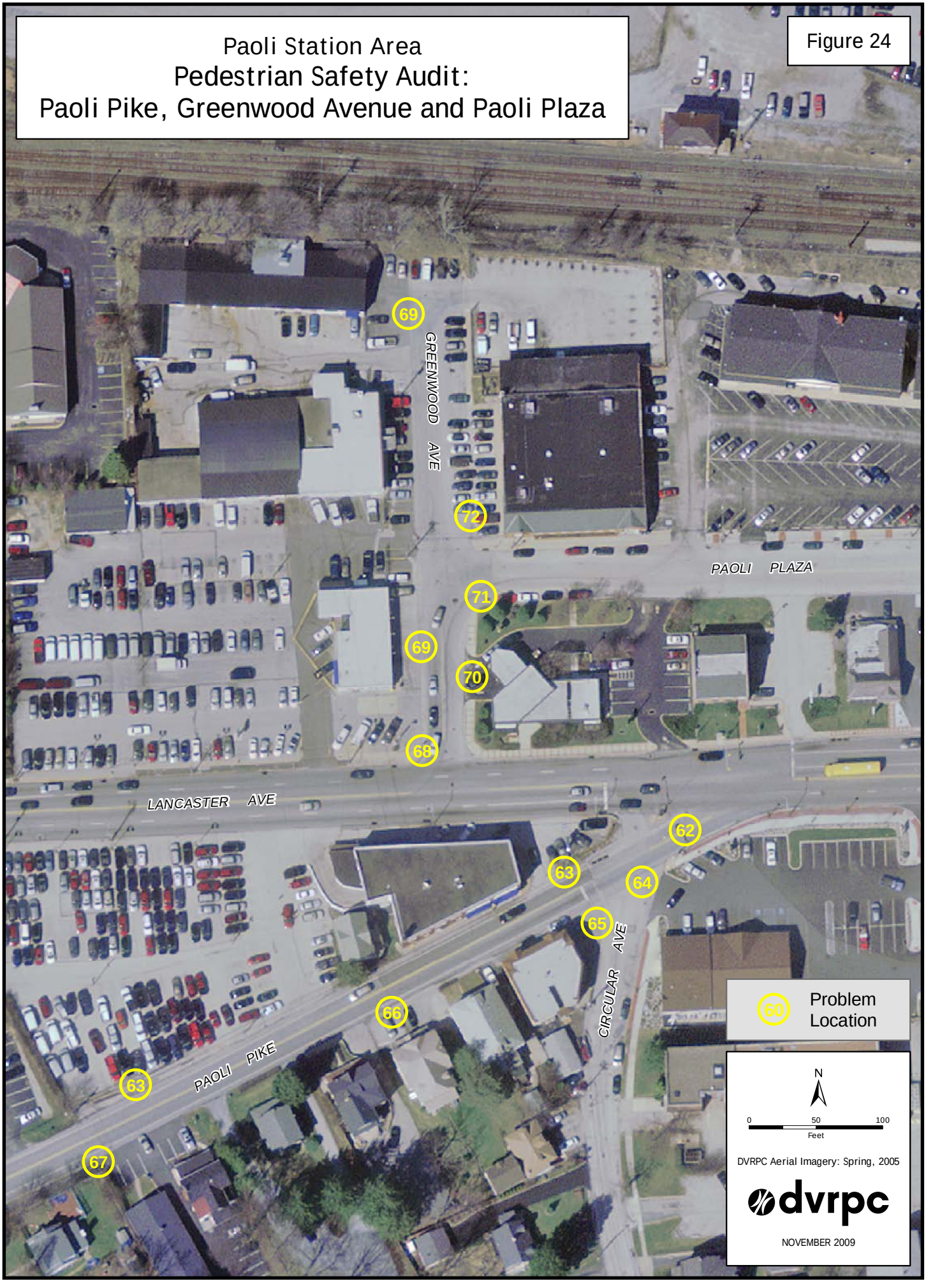
72. There is no sidewalk for the remainder of the east side of Greenwood Avenue. One should be installed.

Paoli Plaza – Both sides

73. There is no sidewalk on the entire south side of Paoli Plaza. This is especially problematic on this road because of the nature of pedestrian traffic generated by the surrounding land use. Parking lots occupy both sides of the road and there is no clear separation between parking areas and the cartway, leading to a perception that the road is part of one large parking facility. As pedestrians move freely between the two areas and across the road, they come into conflict with drivers behaving as though on a standard roadway. A sidewalk should be installed and parking should be redesigned to eliminate parking bays on the cartway of Paoli Plaza.

Figure 24

Paoli Station Area
Pedestrian Safety Audit:
Paoli Pike, Greenwood Avenue and Paoli Plaza



CHAPTER 3

Parking Management and Design

This chapter examines best practices in managing and accommodating commuter and visitor parking at a mixed-use transit station, including issues related to shared parking and the relationship of parking to transit terminal functions. This information can be used to guide the development of the master plan for the new Paoli Transportation Center.

The development of stations where a large number of users transfer between transportation modes is complicated, and particularly so when the station is also a major park-and-ride facility that must accommodate a high volume of automobile parking and movement. Parking and modal transfer facilities must be designed to minimize congestion on the area road network and promote circulation within the station site that minimizes conflict with pedestrians.

Start with a Vision

The Urban Land Institute identifies three basic goals of development around transit: successful development, growing transit ridership, and livable communities. At the Paoli Transportation Center, what will these outcomes look like? As the planning process for the site moves forward, it will be helpful to establish a vision for how to make the redeveloped station area a great place to live, work, commute, and visit. Creation of a vision should occur through a public process that incorporates the views of the many stakeholders affected by the project. An overall vision for the successful development of the site was established in the 2001 *Paoli Community Master Plan.* However, as the specific site and circulation plan for the project evolves, plan development should continue to involve the project's diverse stakeholders.

Station Access

Drive/Park

The dominant access mode to a station determines the station space requirements and design, and influences the viability of retail establishments at the station area. At the Paoli Transportation Center, the dominant access mode to the station is by car. Design and management of vehicle access—and storage of automobiles—will be a lynchpin of the project's success. For this reason,

it may be beneficial for the design process to focus first on identifying the most appropriate location and strategy for accommodating cars; from there, the design can incorporate strategies for efficient and comfortable access by the many other modes used at the station. While the parking function is fundamental to the overall design strategy, parking facilities should be oriented to the street and surrounding mix of uses, as well as scaled to pedestrians.

For stations with large park-and-ride facilities such as the Paoli Transportation Center, parking may be located either adjacent to the station or in a remote location. Remote locations can be accessed by walking or shuttle services. At the Paoli Transportation Center, any remote parking facilities should be linked to the station by dedicated pedestrian pathways that limit pedestrian conflict with automobile circulation. This will enhance the comfort of pedestrians while facilitating the efficient movement of automobiles entering and exiting the station. Remote parking facilities, however, are less convenient for transit riders.

Parking structures are recommended for use at park-and-ride stations to minimize the footprint of the station area and provide for parking in close proximity to the station terminal. Plans for the Paoli Transportation Center call for inclusion of one or more parking structures, and Tredyffrin and Willistown townships have amended their zoning to accommodate such facilities. Allowing for shared parking among different uses located in the station vicinity can further reduce the footprint of parking facilities.

Multimodal Access and Stacked Uses

Although the dominant access mode at the Paoli Transportation Center is by car, the station is truly a multimodal facility. The station's location within a pending mixed-use development project in the heart of Paoli's business district means that adequate facilities for pedestrian and bicycle users should be accommodated. In addition, bus, shuttle, kiss-and-ride, and taxi operations provide important access to the station, and may be an increasingly important mode of access for users going to and from growing employment and residential centers in the area including the Great Valley, Chesterbrook, and Phoenixville areas.

For multimodal stations, the vertical stacking of station land uses—such as parking facilities, bus staging, passenger drop-off and pick-up zones, and waiting areas can achieve a number of goals. Stacking the parking and terminal functions at park-and-ride stations allows for more convenient access to transit for users accessing the station by car. Stacked uses minimize the station's footprint and free up land for transit-oriented development. A station's proximity to a mix of uses is a key element in encouraging people to walk to transit.

The location and type of retail activities should be based on user travel behavior patterns. People arriving by car, by bike, and on foot are an important potential market for retail and services located at the station because they can control the time they enter and leave the station. Passengers making connections between transit modes are less able to take advantage of convenience retail. Since most transit riders will utilize the station during peak commuting hours, retail shops and services located near the train station should be designed to capture sales from users of surrounding land uses.

Buses and Shuttles

Buses and shuttles provide important access to the station. Buses require ample roadways to accommodate their large turning radii. At the current Paoli Station, buses have little room for staging, turning, and passenger loading and unloading. This leads to conflicts with pedestrians and cars, especially at peak commuting hours. Several designs for bus boarding areas are available for consideration at the future site including sawtooth, herringbone, and in-line patterns. Attention should be paid to the design of pedestrian linkages between bus boarding areas and the terminal. Pedestrians should be able to access the station via dedicated pathways that minimize conflict with cars, which can lead to congestion and safety issues.

Planning for adequate facilities for bus and shuttle service is important because these modes currently serve a large volume of passengers and may become an increasingly important mode for accessing the station. Although there are proposals for a "Green Line" to connect Phoenixville, the Great Valley Corporate Center, Worthington, and Vanguard to Paoli Station, this rail plan presents financial and technical challenges. Bus rapid transit may be easier to implement and could provide similar service levels if adequate bus and shuttle facilities are planned for at the Paoli Transportation Center.

Shared Parking

Shared parking is when two or more land uses share the same parking spaces. Shared parking evolves around different land uses having their respective peak demand for parking at different times of the day. Sharing parking spaces typically accommodates 20-40% more users compared with assigning each space to an individual motorist, since some potential users are usually away at any particular time.

Park-and-ride stations often present opportunities for shared parking. Typically, park-and-ride lots attract commuters during weekday business hours, leaving parking spaces available on weekends and evening hours. These parking spaces can be shared with uses that attract visitors at "off-peak" times, such as churches, movie theaters, or restaurants. Table 9 shows the typical peak parking demand periods for different types of land uses.

Table 9: Peak Parking Demand Periods for Different Land Uses

Weekday Peaks	Evening Peaks	Weekend Peaks
Banks	Hotels	Religious Institutions
Schools	Auditoriums	Parks
Distribution Facilities	Restaurants and Bars	Retail Shops
Factories	Theaters	Malls
Offices	Meeting Halls	Farmers Markets
Professional Services	Residences	Community Events

Source: DVRPC 2009

Having multiple businesses share parking encourages walking and reinforces the idea that centralized parking is a benefit to urban areas. Shared parking also requires fewer driveways and access points, resulting in more efficient traffic flow, reduced driver conflicts due to fewer turning vehicles, and reduced emissions from idling vehicles sitting in traffic.

The model form-based code, the SmartCode, includes shared parking calculations (see www.smartcodecentral.org). The *Pennsylvania Standards for Residential Development* includes recommendations on shared parking standards (see www.ndwrcdp.org/publications/index.htm).

There are several challenges to providing shared parking. Often, shared parking is precluded by local ordinances that require that a designated minimum number of spaces be made available around-the-clock for various uses. Municipalities should review their ordinances and develop ways to provide flexible parking standards that allow for shared parking. For example, parking minimums could be calculated based on shared demand over time for a mix of uses, or a process could be identified to permit owners of underutilized retail or commercial parking spaces to provide opportunities for commuter parking.

Property owners will be reluctant to permanently dedicate any portion of their parcel for shared parking. Rather, municipalities or transit agencies should consider entering into a lease—usually for one year terms—to offer shared commuter parking facilities. Leases should include an indemnification clause that protects the landowner from liability related to commuter use of the parking facilities. Businesses and property owners may be reluctant to share parking without such an agreement. A sample lease between a municipality and owner/business tenant for commuter parking is included in Appendix F.

SEPTA participates in a limited number of shared parking arrangements. Leveraging their reverse-peak parking needs, SEPTA contracts to use the parking lots of churches located within walking distance of some transit stations. Stations where parking is shared with churches include Marcus Hook, Strafford, and Chalfont. At Ardmore, SEPTA allows a restaurant to use some of its parking spaces on nights and weekends, when commuter parking needs taper off. Additionally, SEPTA does not enforce parking fees on daily use lots during the weekend. This means the public can park in these spaces at no cost to access local businesses.

Parking Management Implementation

Municipalities may choose to form their own parking management district, parking benefit district, or partner with their local transportation management association.

Parking Management Districts

Parking management districts are areas designated by local jurisdictions in which parking supply and rates are regulated to meet the parking needs of the area, while at the same time promoting

transit use, ridesharing, and other alternative modes of transportation. The parking management district's purpose is to promote economic development and encourage a balanced transportation system through the management techniques described in this chapter. By reducing the amount of land used for parking (supply), more land is available for tax-generating purposes. The management district's pricing policies are established to influence individual travel behavior and encourage alternative modes of transportation.

In a parking management district, each property is levied a fee based on the assessed value of the property. This, in turn, is used to support the functions of the district, such as parking-related maintenance, security, utilities, taxes, enforcement, etc. Fee collection can be as simple as including a separate line on the property tax bill.

There are many successful management techniques used by parking management districts, including these additional ideas:

- Build and operate a municipal centralized shared parking facility, alleviating the need for individual projects to provide on-site parking. This also gives municipalities greater control of overall parking supply while supporting the comprehensive development of the central business district.
- Charge for parking. When parking for a desirable destination is in short supply, paid parking can generate revenue for the management district. This also encourages other modes of travel and creates greater parking space turnover.
- Establish new development guidelines to coincide with changes in the parking regulations. Should a business owner want to expand, the implications on parking ought be overseen and coordinated by the parking management district.
- Manage on-street parking.

Initiating a parking management district is not without its share of challenges. The initial parking supply projections for a specific project may not be accurate. Additionally, economic conditions can change parking demand over time, even with consistent land use. Changes in tenants and ownership can also alter demand. Policies must be flexible and regularly updated to ensure that an adequate level of parking is supplied.

Parking Benefit Districts

While it does not assist in funding the construction of parking, municipalities have also looked at how to capture value from parking, by creating Parking Benefit Districts (PBDs), in which the revenue from parking lots, meters, and/or residential parking permits within a specified geographical area goes to support other neighborhood investments within that same area. In some cases, such as the PBD in Austin ,Texas, the revenue is spent specifically on "improvements in the neighborhood that promote walking, cycling and transit use, such as sidewalks, curb ramps, and bicycle lanes."

Transportation Management Associations (TMAs)

Transportation Management Associations (TMAs) are nonprofit agencies that can provide parking and mobility management programs to municipalities, usually with better cost efficiency. TMAs can help municipalities implement parking management programs to reduce total parking demand. TMAs can coordinate parking planning, perform parking utilization surveys, manage overflow programs, provide bicycle parking, coordinate enforcement services, monitor parking problems, maintain an inventory of facilities, distribute user information, and coordinate shared parking. There are two TMAs serving the Paoli area: Greater Valley Forge TMA serving the U.S. 422 Corridor in Montgomery and Chester counties, and the TMA of Chester County.

Factors Affecting Success of Parking Management

Generally speaking, the success of parking management policies over the long run depends on three primary factors, which are:

- The integral attractiveness and uniqueness of the place where parking is being managed. For example, shoppers may opt for the convenience of a shopping mall with abundant free parking for certain needs, but for special purchases, may well seek out stores that are not so easy to access.
- The availability of travel alternatives, or the extent to which accessibility is enhanced or impeded.
- The ease in which travelers and the business community affected by the parking management policy can evade it by moving or conducting the activity somewhere else. Much depends on what factors are being balanced in the particular decision and how important driving and parking is to that decision.

Intelligent Transportation Systems Applications in Parking

Intelligent transportation systems (ITS) refer to the application of advanced information and communications technologies to transportation systems, to improve safety, mobility, and productivity. ITS applications include electronically monitoring traffic volumes, automated incident response, and digital transit management. The application of ITS to parking is often called advanced parking management systems (APMS).

APMS applications include pre-trip parking information systems, such as a website with a map of where parking facilities are found relative to major access routes and attractions. Such websites also provide information on capacity, hours, and cost. The Philadelphia Parking Authority (PPA) website (www.philapark.org) has a map of all of their public parking facilities, as well as the PPA Parking Locator, a lookup tool that includes all public and private parking facilities near an address, along with distance to nearby destinations, capacity, and estimated cost.

APMS applications can also include lot-specific parking information systems, which notify drivers of parking availability. This technology monitors spaces available in a parking facility and updates variable message signs (VMS) or digital messaging (which can be viewed online, on a cell phone or PDA) in real time as spaces fill or empty in a particular facility. The message signs can have both permanent and variable components (such as the permanent name of the parking facility but a variable parking space capacity field). The Chicago Metro transit system uses such a system for its parking facilities. Such systems reduce the amount of time spent by drivers searching for available parking. Such systems are more common in Europe, though they have been utilized in the United States in cities such as St. Paul, Pittsburgh, and Baltimore.

More advanced APMS applications include floor-, aisle-, and space-specific parking information systems, where there are signs on every floor (number of spaces available on that floor), at the start of every aisle (number of spaces available in that aisle), and sometimes in front of every space that indicate availability (green or red light). Such systems can be found at Baltimore-Washington International (BWI) Airport, Portland International Airport (PDX), and soon Philadelphia International Airport (PHL).

Parking reservation systems allow the driver to reserve and pay for a parking space using the telephone, Internet, or wireless handheld devices. The California Department of Transportation (Caltrans) is testing such a system at the Rockbridge BART (Bay Area Rapid Transit) park-and-ride facility in Millbrae, California, working with the University of California at Berkeley, BART, ParkingCarma™, and Quixote Corporation. Electronic sensors in the east lot of the park-and-ride facility communicate space availability to commuters on the freeway using two temporary dynamic message signs. These 50 spaces can be reserved by telephone, Internet, or wireless handheld devices (such as a PDA), up to two weeks in advance, and cost $4.50 rather than the usual $1.00 for a space found upon arrival. Consumers seem to be willing to pay more for the peace of mind of a reserved space.

Private online parking reservation companies, such as MobileParking LLC and SpotScout™, allow drivers to check parking availability in select cities using their computer, cell phone, or personal digital assistant. MobileParking LLC covers 400 parking facilities in 50 U.S. cities, and allows drivers to call a toll-free number to check parking availability at a destination, whereby the operator will direct the driver to the closest available space. The first reservation is free, while users will pay $1.75 for each additional reservation. Some MobileParking garages also allow the driver to pay the actual parking fee over the phone. SpotScout™ allows drivers to reserve and pay for parking spots online or through web-enabled cell phones. SpotScout™ launched in 2004, and is thus far only in New York and Boston. SpotScout™ sends a text message confirming a parking reservation with a confirmation code and directions to the facility. It also allows users (called “SpotCasters”) to sell their personal parking spaces to others for short-term use. SpotCasters set the price and time parameters of the space they are selling themselves.

In addition, XM Satellite Radio in 2005 demonstrated a potential service called “Dynamic Parking Information,” providing XM radio users with the number of available parking spaces at specific lots. Parking sensors within the specific parking lots transmitted availability information to in-vehicle navigation systems. Demonstration cities included San Francisco, Los Angeles, and Detroit.

Another ITS application to parking is the automated parking facility. This is a robotic mechanism that transports vehicles to available parking spaces. Although these systems are extremely expensive, there are several major advantages over conventional parking facilities. The mechanism can, with precision, pack many more vehicles into the same space than would be safe for human drivers to attempt to do. It also reduces the time spent parking and retrieving a vehicle, and may lower the staff costs needed for some city garages with valet service. Such facilities have not been widely developed in the United States.

ITS can also be used for automated payment systems in parking facilities. Automated payment systems work like “EZ Pass” at a toll booth, whereby drivers have an electronic reader device on their vehicle and a sensor in the facility registers the vehicle passing and electronically charges a credit card or draws down from a pre-determined fund. There is no physical transfer of money, or time spent waiting in line to take tickets or pay upon departure. This type of system can significantly improve efficiency of parking facilities.

Other technologies exist to assist municipal officials and police, for example, in parking enforcement. ITS has been used with smart parking meters that electronically transmit data on how much time is left in a meter and whether or not a vehicle parked there has a special use permit (e.g., handicapped or official vehicle). This allows police and parking authorities to selectively dispatch staff, saving the time of constantly patrolling all available parking spaces.

ADA Accessibility

Another important element is to ensure that parking facilities are accessible as per the U.S. Department of Justice’s Americans with Disabilities Act (ADA) Standards for Accessible Design, as well as any additional state- or municipal-level regulations and guidelines to ensure accessibility. The ADA regulations, as they pertain to parking, include but are not limited to:

- A minimum number of accessible spaces (in relation to the total number)
- Parking spaces designated (with visible signage) for persons with disabilities
- Spaces to be serviced by a “van accessible” access aisle
- Accessible valet loading zones
- At least one accessible entrance to structured parking facilities
- Minimum width of 96 inches for accessible parking spaces
- Maximum access aisle slopes
- Minimum vertical clearance
- Suggested adoption of “universal parking space design” (every space is accessible)

Sustainability

Features and/or strategies to create more sustainable surface parking and structured parking include:

- Avoid siting facilities on sensitive environments; site in existing growth centers or brownfields
- Build the lowest number of possible spaces
- Create mixed-use buildings with parking
- Create shared parking
- Dedicate parking for bicycles, car sharing, and carpooling vehicles
- Include permeable surfaces and better stormwater management practices, as well as landscaping
- Reduce light pollution, heat islands, and energy usage
- Use recycled materials in the core and shell and/or recycled concrete and asphalt

The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system currently makes it difficult to attain a LEED certified parking structure. As LEED continues to develop and as USGBC creates new rating systems, it will be important to continue to focus on parking structures and parking treatments, and their ability to attain sustainable benchmark standards.

Parking, in general is addressed in several of the potential credit areas in the LEED rating system for New Construction (LEED-NC). These include:

- Sustainable Sites (SS) Credit 1: Site Selection places the same requirements on parking as on other types of construction, namely that it shall not be built on farmland, areas within the hundred-year floodplain, threatened habitats, and wetlands.
- SS Credit 4.3: Alternative Transportation: Low Emitting & Fuel Efficient Vehicles requires preferred parking for "low-emitting and fuel-efficient vehicles."
- SS Credit 4.4: Alternative Transportation: Parking Capacity requires parking not to exceed the existing zoning and to "provide preferred parking for carpools or vanpools."
- SS Credit 5.1: Site Development: Protect or Restore Habitat requires limiting site disturbance of parking lots.
- SS Credit 7.1: Heat Island Effect: Non-Roof requires treatments such as shade, open grid paving and materials with a Solar Reflective Index of at least 29 for "50% of the non-roof impervious site landscape (including roads, sidewalks, courtyards, parking lots, and driveways)," or "Place a minimum of 50% of parking spaces under cover."

Parking is also addressed in the pilot rating system for LEED- Neighborhood Development (LEED-ND). These include:

- Smart Location & Linkage (SLL) Credit 5: Bicycle Network requires bicycle parking and storage calculated in relation to the number of automobile parking spots.
- Neighborhood Pattern and Design (NPD) Credit 6: Reduced Parking Footprint requires the placement of “all off-street surface parking lots at the side or rear of buildings,” for multifamily and nonresidential development.
- NPD Credit 7: Walkable Streets requires that “On-street parking is provided on 70% of both sides of all new streets.”
- Green Construction and Technology (GCT) Credit 10: Heat Island Reduction requires treatments such as shade, open grid paving and materials with a Solar Reflective Index of at least 29 for “50% of the non-roof impervious site landscape (including roads, sidewalks, courtyards, parking lots, and driveways).”
- GCT Credit 17: Recycled Content in Infrastructure requires a percentage of recycled concrete and asphalt for “roadways, parking lots, sidewalks, and curbs.”

Parking Design

Design of Structured/Hybrid/Underground Parking

With higher density or higher land prices, structured parking may become feasible. Structured parking, though removing some of the negative elements of surface parking, can still have negative impacts if it is located on a main street. For this reason, it may also be desirable to locate structured facilities off of the main street to become less obtrusive.

In the case that structured parking is on a main street or primary destination area, it should be combined with other uses, especially at the ground floor. This “hybrid” parking is integrated into a mixed-use building, with ground-floor retail and parking (and possibly other uses) above. Mixed-use buildings with parking garages do pose design challenges due to fire code issues, particularly when combining parking with residential or hospital uses.

Structured parking can also be fronted with liner buildings. A liner building is a specialized building, parallel to the street, which is designed to conceal an area such as a parking lot or loading dock. While liner buildings may include commercial or residential uses, their limited depth (from front to back usually 40 feet or less) makes them more disposed to residential use. Liner buildings should be as tall as is required to serve their purpose of screening.

Another similar option is to locate the structured parking garage in the center of a building, with a building or group of buildings, often multi-family residential, wrapping around it. This is colloquially referred to as a “Texas doughnut.”

Another option for integrating parking garages into a main street setting is to design the building’s massing with a taller section set back, with a shorter, for example three-story, section on the streetfront. Large structures should also contain enough façade differentiation to “break down” the scale of the building.

Parking garages can also be clad or masked with decorative tiles, screens or plantings to add interest, whimsy, art, or ecological benefits to the exterior of the structure. Garages can also have green (vegetated) roofs.

In terms of general aesthetics of parking garage design, a good general goal is to make the design as unobtrusive as possible, with architecture that is either neutral or is sympathetic with the surrounding design palette of colors, materials, dimensions, and forms. Attention should be paid to the design of the upper stories, which will be seen from a distance. This is not to say that parking garages cannot be beautiful or architecturally detailed, but in general they are usually “background” buildings not “foreground.” Others may argue that given our car-obsessed culture, public parking garages are now “foreground,” or civic buildings that deserve more attention to

design as gateway buildings. Likewise, the design of stairs and elevator cores and signage/wayfinding may deserve more attention.

As mentioned previously, underground parking is generally the most desirable solution for accommodating a large number of vehicles with minimal negative impact on its context, while allowing more intense use of street-level or above-grade areas, or creating park space or a green roof above. Important design considerations with underground parking include enhancing security with good lighting, introducing daylight particularly near entrances/exits, and providing logical wayfinding and visual links to the outdoors. Underground parking is by far the most expensive solution, so it is usually found in urban areas and/or those with high density and land prices.

Design of Bicycle Parking

In urban and suburban contexts, it is important to provide adequate parking for bicyclists, in the form of bike racks, lockers, or even garages (though these are much more common in Europe). Especially in areas with schools or major employers along bicycle-friendly roadways, there may be demand for a significant volume of bicycle parking. Without appropriate planning, and regulations, bicyclists may be frustrated by a lack of options, and may end up locking bicycles to trees, lamp poles, or private property. In addition, the lack of adequate bicycle parking has been shown to discourage people from riding their bicycles to travel and commute.

Providing bicycle parking options is not as simple as just installing a bicycle rack. It is important first to consider whether more elaborate parking facilities – such as lockers – may be warranted – as well as selecting the necessary number and design of racks, as per the demand. It is also important to consider the location of bicycle racks, as related to probable destinations. Most bike racks are placed on sidewalks, however, another option is to place bike racks in designated on-street parking spaces. Portland, Oregon has permanently installed large bicycle racks in on-street parking lanes.

Certain kinds of bike racks are more effective and secure than others. Racks should be made of solid materials that cannot be cut with standard tools. They should generally be able to accommodate two bicycles, and should support the frame in at least two locations. Racks such as the “comb” or “toast” that support the bicycle from the wheel, rather than the frame should be avoided.

Bicycle lockers are container units, about 6.5-feet deep, which generally accommodate from one to 24 bicycles. These facilities are secure and operated with a key locking mechanism, similar to those used in other types of public lockers. These facilities are much more secure than a simple bicycle rack, and are more appropriate for all-day storage of bicycles. Schools, libraries, transit stations, and businesses may consider bicycle lockers as a safer and more durable alternative to bicycle racks. The downside to lockers, of course, is the increased cost for the facility. Businesses that have enclosed garages or lobby areas should be required to provide facilities for locking bicycles. Some employers also offer showers and changing rooms for bike commuters.

Some cities have installed bicycle garages, full facilities devoted to bicycle parking. Such facilities are appropriate at major recreational areas and commuting stations. The best example of such a facility in the United States is the Cycle Center at Chicago's Millennium Park. The Cycle Center contains parking for 300 bicycles, lockers and showers, bicycle rentals, a repair shop, and bicycle tours. Major bicycle garages also exist in Japan and the Netherlands. Such facilities show a major public investment in bicycling as a viable means of transportation.

Design of Motorcycle and Scooter Parking

Motorcycle and scooter parking needs are much closer to those of automobiles than of bicycles. Motorcycles and scooters should not be permitted on sidewalks, as they usually take up too much of the pedestrian right-of-way, and cannot be accommodated by individual racks. Motorcycles and scooters are generally permitted in on-street parking spots. Off-street facilities should take motorcycles and scooters into account, by creating designated parking areas with smaller spaces. This strategy maximizes the number of full spots for automobiles, and prevents the haphazard parking of motorcycles and scooters in inappropriate or unsafe locations. In order to ensure adequate parking for motorcycles and scooters, municipalities may consider converting on-street parking spots into a series of designated motorcycle/scooter spots. Typically one on-street automobile parking space can be converted into six motorcycle/scooter spaces.

Recommendations and Conclusion

Modal Inventory

In 2007, average weekday boards at Paoli Station totaled 1,468, composed of 1,282 boards for SEPTA R5 and 186 boards for Amtrak. This boarding data comes from a regional rail census conducted every two years. Based on boarding data from the prior 2005 census, SEPTA boards grew by 5.6% from 2005 and Amtrak boards grew by 51.2% If these trends continued to 2009, average weekday boards would total 1,635, as shown in Table 10.

Table 10: Paoli Station Average Weekday Boards

System	2005	2007	Percent Change 2005-2007	Projected 2009
SEPTA	1,214	1,282	5.6%	1,354
Amtrak	123	186	51.2%	281
TOTAL	1,337	1,468	9.8%	1,635

Source: DVRPC 2009

Based on the modal inventory conducted as part of this study, DVRPC estimated the modal share for drive/park, kiss-and-ride, shuttle, bus, pedestrian, and bicycle boards. Boards for the AM & PM commuter rush periods are estimated based on DVRPC counts described in this report. Off-peak boards are estimated at 25% of commuter rush boards, except for shuttles, which operate only during peak periods.

As shown in Table 11, drive/park is estimated to contribute to approximately 44% of station boards. Although Paoli is often considered a park-and-ride station due to the large number of parking spots available, this mode accounts for less than half of boards at the station. This is atypical for the westernmost stations on the R5 line. In DVRPC's *Needs and Opportunities Study for the R5 Extension West of Thorndale*, it was estimated that 71% of boards at Thorndale, 82% of boards at Downingtown, 80% of boards at Whitford, and 80% of boards at Exton are attributable to drive/park.

However, because parking at Paoli Station is at nearly 100% utilization, the share of users driving and parking at the station could increase significantly depending on the availability of expanded parking facilities at the Paoli Transportation Center.

Table 11: Paoli Station Modal Inventory

Mode	Boards (Number)			Boards (Percent)
	AM & PM Rush	Off-Peak	Total	Percent
Drive/Park	500	125	625	44%
Shuttle	300	0	300	21%
Bus	200	50	250	17%
Kiss-and-Ride	100	25	125	9%
Pedestrian	100	25	125	9%
Bicycle	5	1	6	0%
TOTAL	**1,205**	**226**	**1,431**	**100%**

Source: DVRPC 2009

Shuttle (21%), bus (17%), and kiss-and-ride (9%) also provide significant access to Paoli Station. Combined, these modes account for 47% of boards at Paoli Station. Pedestrians account for another 9% of boards. The many modes providing significant access at Paoli Station make it a truly multimodal facility. The following pages highlight recommendations for improvements to enhance multimodal access at Paoli Station.

Recommendations

This report provides an inventory of access modes to Paoli Station. Throughout the report, opportunities for improvements are highlighted. For example, the PLOS and BLOS analysis identify road segments that should be enhanced to improve pedestrian and bicycle access around the station, and the pedestrian safety audit identities specific safety problems on roadways providing direct pedestrian access to the station.

Overall, the findings in this report suggest three general principles to guide planning efforts related to intermodal access for both the current and future station. These are:

- Accommodate Kiss-and-Ride, Shuttles, Taxis, and Buses
- Design for Intermodal Transfers
- Improve Overall Transportation Network

Accommodate Kiss-and-Ride, Shuttles, Taxis, and Buses

As discussed throughout this report, the staging, loading, and access movements for kiss-and-ride, shuttles, taxis, and buses are not adequately accommodated at the current station.

Problem Identification

- All modes must use the same cartways and staging areas, creating congestion and conflict
- Staging areas for all modes are inadequate and unsafe
- Lack of space available to expand service over time
- Wider turning radii of buses and shuttles are not accommodated
- Lack of signalized entry to roadways from station creates congestion during peak commuting times

The wide turning radii of buses and shuttles should be accommodated within the station, as well as in the entry and exit points to and from the station. Shuttles picking up passengers on the northside/westbound station lot are challenged to turn around in the narrow lot, especially when several other vehicles are staged there for kiss-and-ride connections. Entry and exit points should also be signalized to direct traffic to appropriate routes and create more efficient traffic patterns. Currently, buses and shuttles leaving the southside/eastbound station lot prefer to cut through the Paoli Plaza area rather than negotiate a left turn onto Valley Road. These vehicles then turn right onto Lancaster Avenue/US 30 from Greenwood Avenue, as shown in Figures 25 and 26.

Planning for the Paoli Transportation Center should include provisions for sufficient staging areas, passenger loading and waiting zones, and turning movement capacity to allow these modes to easily enter and exit the station with minimal conflict with pedestrian, bicycle, and park/drive users. In general, commuter parking should be separated from these movements, as well as the movements of pedestrians and bicyclists, to reduce congestion and conflict. Given Paoli's critical role in an area experiencing growth, plans should allow for flexibility for expanded or specialized services, such as bus rapid transit, in the future.

Figure 25: Typical Bus Movement Exiting Station

Source: DVRPC 2009

Figure 26: Bus Turning Right onto Lancaster Avenue/US 30 from Greenwood Avenue

Source: DVRPC 2009

Station designs that provide for signalized entry and exit between the station and roadways will facilitate movement of all modes. Pedestrians can take advantage of crosswalks with signalized pedestrian crossing opportunities. Signalized traffic should reduce the severity of vehicle conflicts, facilitate the efficient movement of traffic, and enhance driver awareness of all modes utilizing the intersection.

Figure 27: Congestion Due to Unsignalized Exit at Paoli Station

Source:

DVRPC 2009

Source:

DVRPC 2009

Design for Intermodal Transfers

The existing Paoli Station is not designed to accomodate intermodal transfers safely and comfortably.

Problem Identification

- Passengers must wait for and access service connections in parking lots, in conflict with vehicles
- Passengers must cross major roads at unmarked intersections to make intermodal transfers
- Safe and sheltered waiting areas for modes other than train are not provided

Pedestrian movement as a result of transfers between rail, bus, shuttles, and kiss-and-ride modes should be provided for. Pedestrians should be able to access the station from all modes via dedicated pathways that minimize conflict with cars, which can lead to congestion and safety issues. Passengers transferring between modes should also have access to safe and sheltered waiting areas. Loading areas should be designed to separate passengers from moving vehicles.

Figure 28: Passengers Access Bus Service in Parking Lot

Source: DVRPC 2009

Figure 29: Kiss-and-Ride Connections Take Place in Parking Lot Cartway

Source: DVRPC 2009

Figure 30: Unsignalized Crosswalk Between Permit Parking and Station

Source: DVRPC 2009

Improve Overall Transportation Network

The safety, continuity, and comfort of the transportation network around Paoli Station are inadequate. In particular, the pedestrian environment is fragmented and hostile.

Problem Identification

- Poor LOS for pedestrians and bicyclists
- Sidewalks are inadequate or non-existent in many locations, limiting mobility
- High crash volumes in the station vicinity
- Lack of traffic calming devices to mitigate high traffic volumes in central business district
- Streetscaping and landscaping are absent in many places, undermining visual image of area

Access to Paoli Station for all modes can be improved through strategies designed to enhance the overall network. A complete traffic calming strategy built around context-sensitive solutions would be appropriate for Paoli. Traffic calming approaches can help to alleviate the high crash volumes on major roadways in the area while improving the compatibility of these roadways with non-motorized travel. Traffic calming strategies are often aesthetically-pleasing and can reinforce the central business district of the Paoli Station area.

Lancaster Avenue/US 30 and Valley Road should be priorities for improvements to the transportation network at Paoli Station. These roadways make up the key access ways to the current and future station. Lancaster Avenue/US 30 and Valley Road also exhibit high crash volumes and poor levels of service for pedestrians and bicyclists. Also, for the most part, these roadways are unlikely to be redeveloped as part of the Paoli Transportation Center project, meaning improvements need not be delayed until the new station project is underway.

Lancaster Avenue/US 30

Although parts of Lancaster Avenue/US 30 boast high-quality and well-maintained sidewalks and landscaping (especially in front of the Paoli Shopping Center), conditions overall are uneven and inadequate. Lancaster Avenue/US 30 is the gateway to the Paoli community and the most important access way to the station area. Overall, the sidewalk system and pedestrian amenities should be improved. An evaluation of crosswalk signal timing, lighting, and signage at the Valley Road intersection should be conducted to identify opportunities to reduce pedestrian perception of risk and enhance safety. The integrity of the transportation network here should be a high priority for Tredyffrin and Willistown Townships.

Problem Identification

- Excessive curb cuts
- Lack of curbing to separate road and sidewalk
- Inadequate crosswalks
- Pedestrian perception of risk, uncertainty, and inadequate time to cross at Valley Road intersection
- Lack of buffers from traffic
- Obstacles in pedestrian walkway
- Missing sidewalks west of Paoli Pike on the south side
- Inconsistencies in sidewalk width, paving materials, and quality
- Absence of trees or pedestrian amenities

Figure 31: Lack of Curbing to Separate Road and Sidewalk

Source: DVRPC 2009

Source: DVRPC 2009

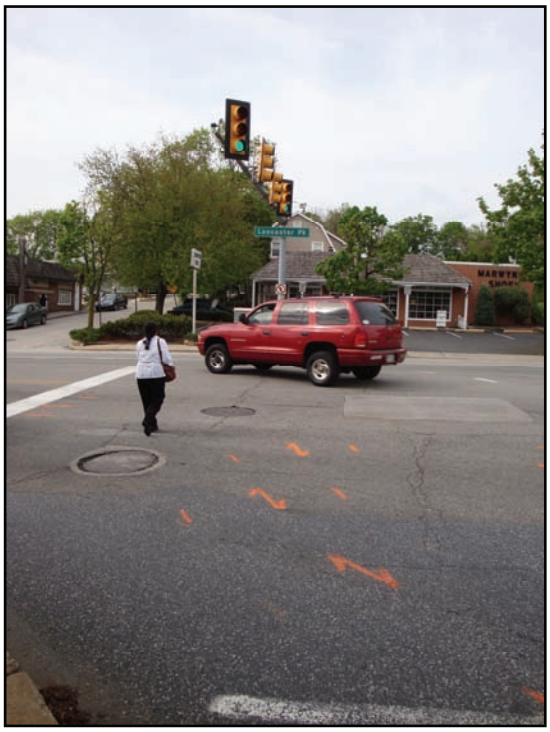
Figure 32: Excessive Curb Cuts Along Lancaster Avenue/US 30

Source: DVRPC 2009

Source: DVRPC 2009

Figure 33: Inadequate Crosswalks along Lancaster Avenue/US 30 (at 252 on left and Darby Road on right)

Source: DVRPC 2009



Source: DVRPC 2009

Figure 34: Pedestrian Perception of Risk at Lancaster Avenue/US 30 and Valley Road Intersection

Source: DVRPC 2009

Figure 35: Lack of Clarity About Areas for Pedestrians/Vehicles

Source: DVRPC 2009

Source: DVRPC 2009

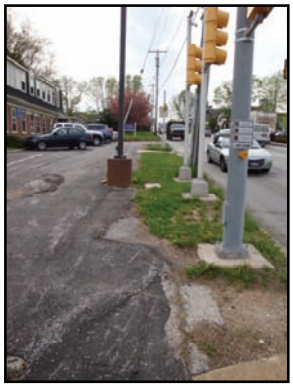
Figure 36: Lack of Buffers from Traffic

Source: DVRPC 2009

Source: DVRPC 2009

Figure 37: Obstacles in Walkway

Source: DVRPC 2009



Source: DVRPC 2009

Source: DVRPC 2009

Valley Road

Valley Road provides critical access to the existing Paoli Station, and may play an even more significant role in providing access to the Paoli Transportation Center. Currently, access along Valley Road is limited due to a lack of pedestrian facilities.

Problem Identification

- Inadequate and unsafe crosswalks at Northside/Westbound station
- Lack of sidewalks on North Valley Road
- Need for crosswalks at Central Avenue intersections
- Inconsistencies in sidewalk width, paving materials, and quality
- Absence of trees or pedestrian amenities

Figure 38: Inconsistencies in Sidewalk Width, Paving Materials, and Quality

Source: DVRPC 2009

Source: DVRPC 2009

Figure 39: Lack of Sidewalks on North Valley Road

Source: DVRPC 2009

Source: DVRPC 2009

Figure 40: Inadequate and Unsafe Crosswalks at Northside/Westbound Station

Source: DVRPC 2009

Source: DVRPC 2009

Source: DVRPC 2009

Figure 41: Need for Crosswalks at Central Avenue Intersections

Source: DVRPC 2009

Source: DVRPC 2009

Conclusion

The *Paoli Station Intermodal Access and Parking Study* finds that Paoli Station is truly a multimodal facility. The share of rail boards is distributed by mode as follows:

- Drive/Park – 44%
- Shuttle – 21%
- Bus – 17%
- Kiss-and-ride – 9%
- Pedestrian – 9%
- Bicycle – 0%

Although Paoli Station passengers access the station through a variety of modes, the transportation network surrounding the station provides only poor-to-adequate access for these modes. High traffic volumes, significant numbers of vehicle crashes, and poor pedestrian and bicycle levels of service indicate a need for improvements to the overall transportation network surrounding Paoli Station. The station is not designed to accommodate intermodal transfers or the staging and loading of modes including buses and kiss-and-ride. The findings in this report suggest three general principles to guide planning efforts related to intermodal access for both the current and future station.

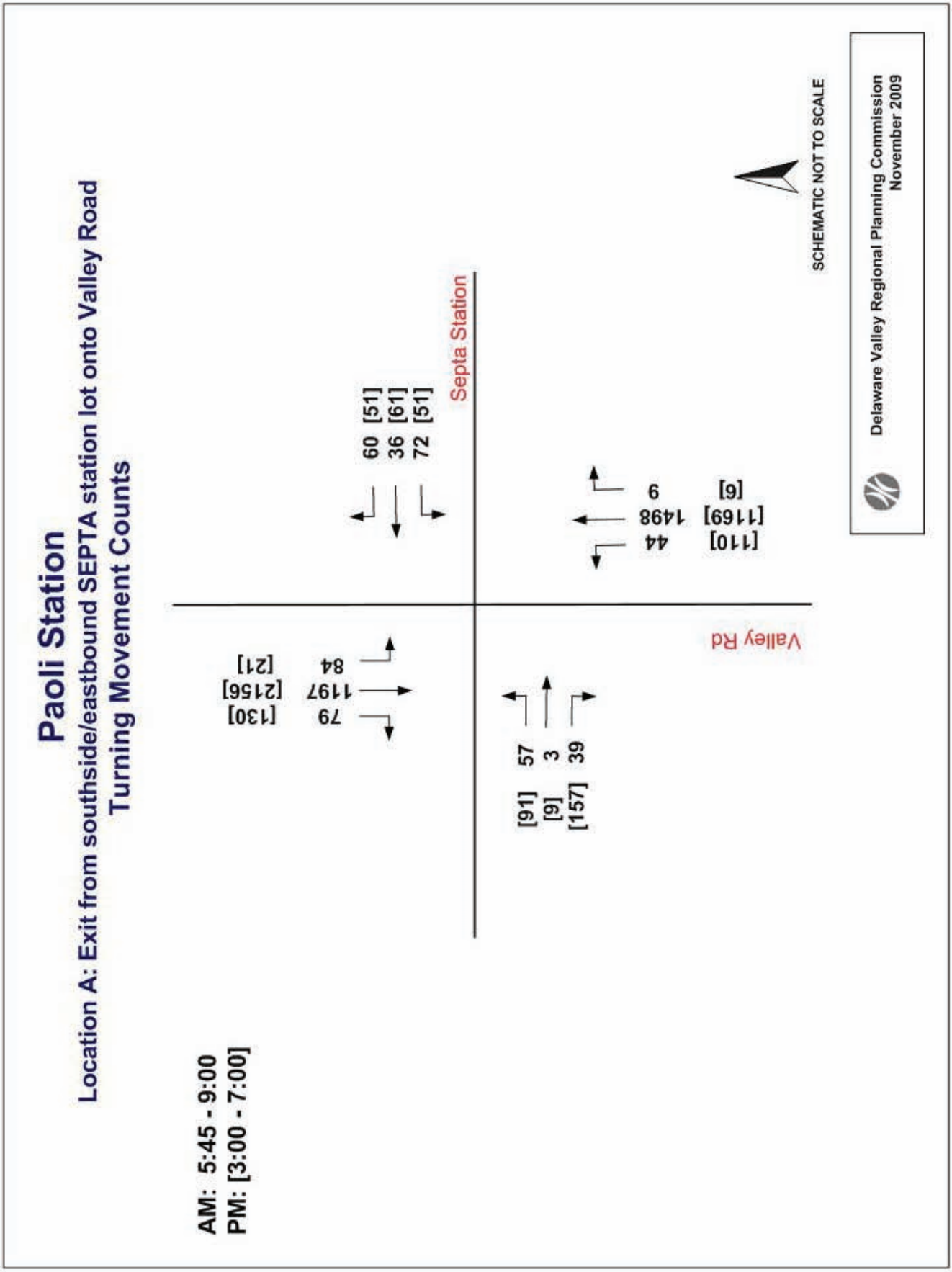
- Accommodate Kiss-and-Ride, Shuttles, Taxis, and Buses
- Design for Intermodal Transfers
- Improve the Overall Transportation Network

Plans for the future Paoli Transportation Center must take into account the mix of modes that provide significant access to rail service at Paoli. In addition, the future Paoli Transportation Center presents an opportunity to attract more commuters to the station, and planning efforts should support continued or expanded access for all modes. While the mix of uses planned at the station, as well as forecasted growth in residential and employment centers surrounding Paoli, are likely to contribute to an overall increase in utilization of Paoli Station, targeted improvements will influence the particular mix of modes utilized at the station. For example, improved pedestrian and bicycle facilities resulting from sidewalk, trail, and roadway improvements would support expanded use of non-motorized means of transportation to access the station.

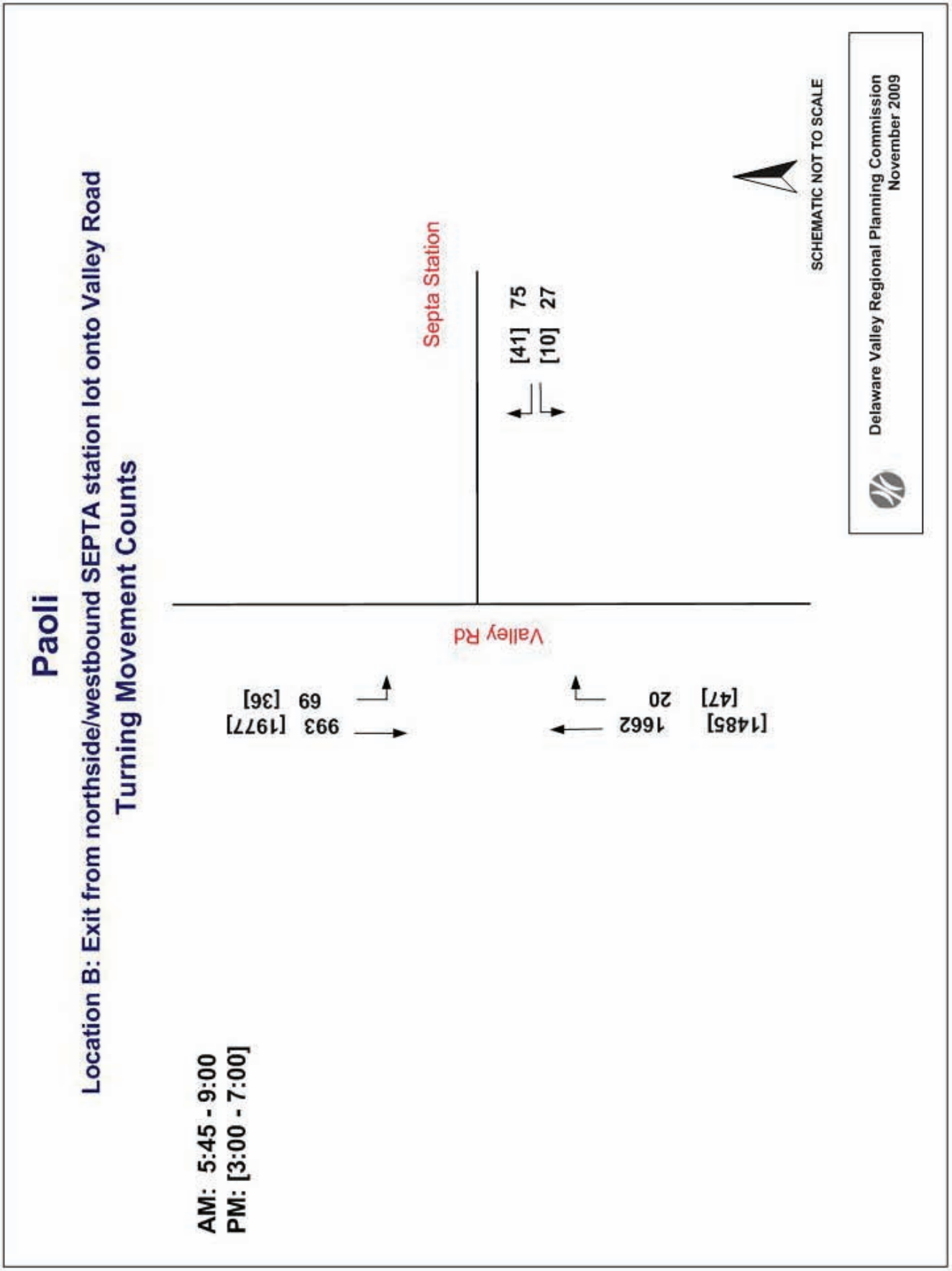
APPENDICES

Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics

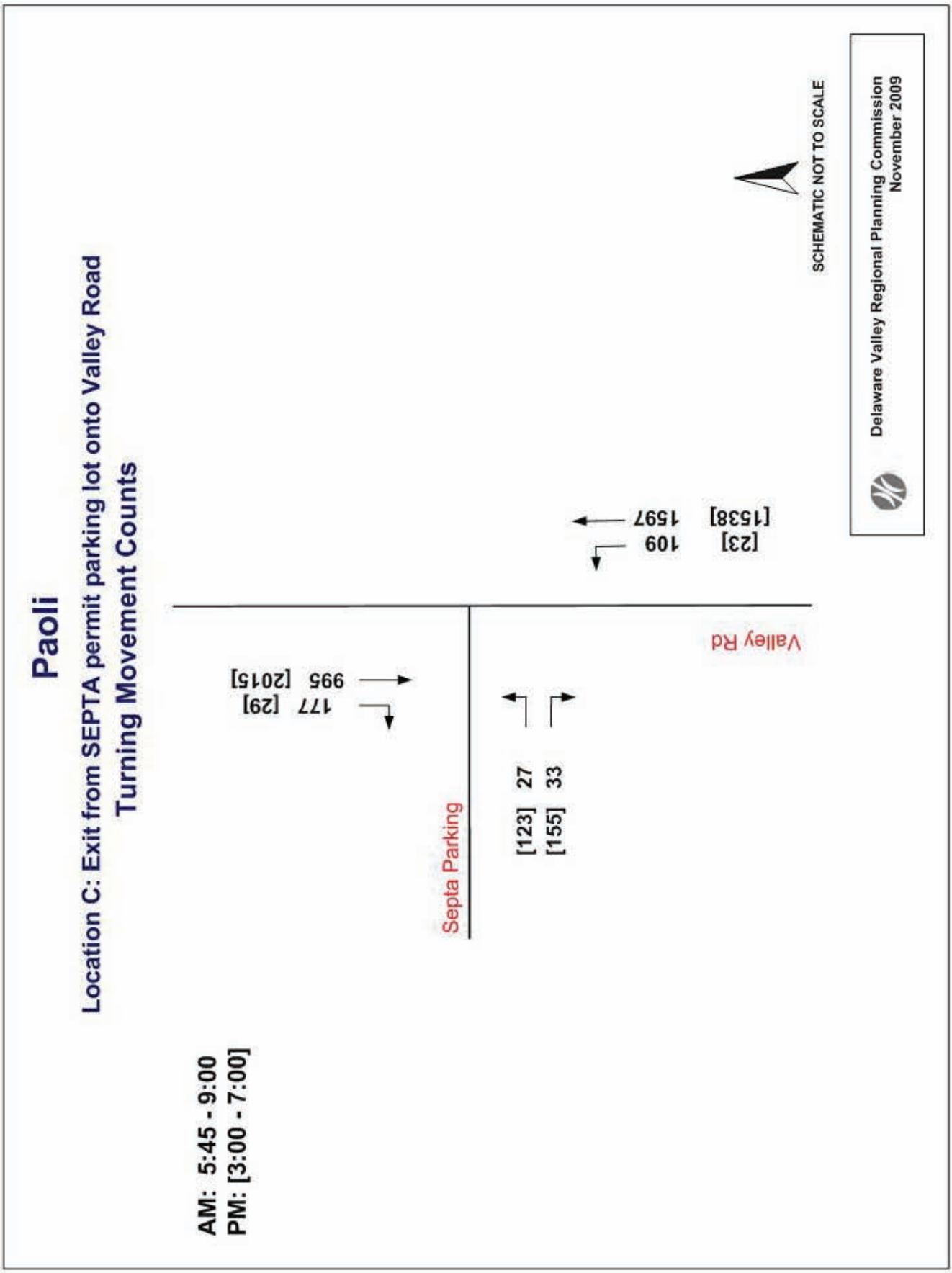
Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics



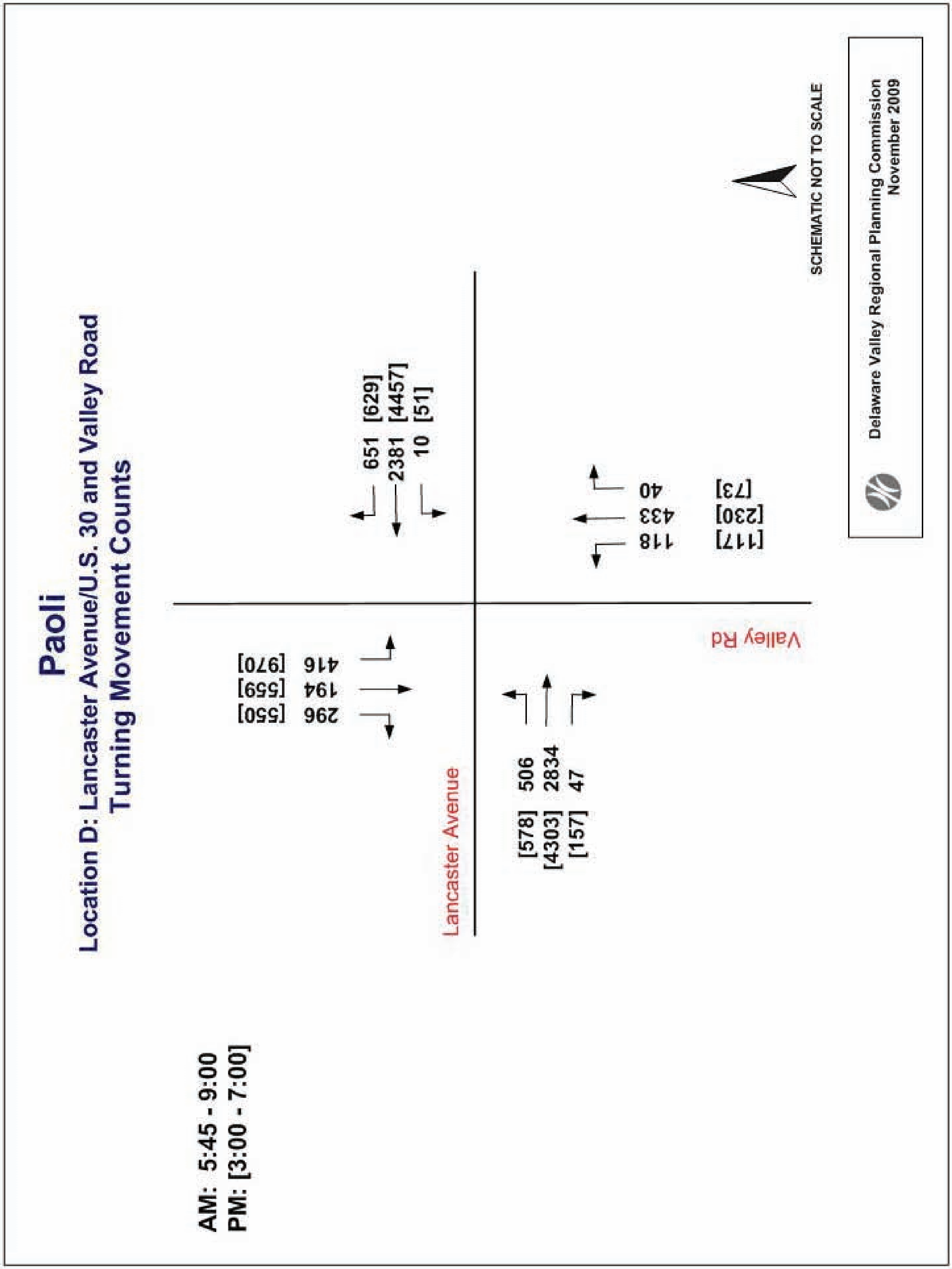
Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics

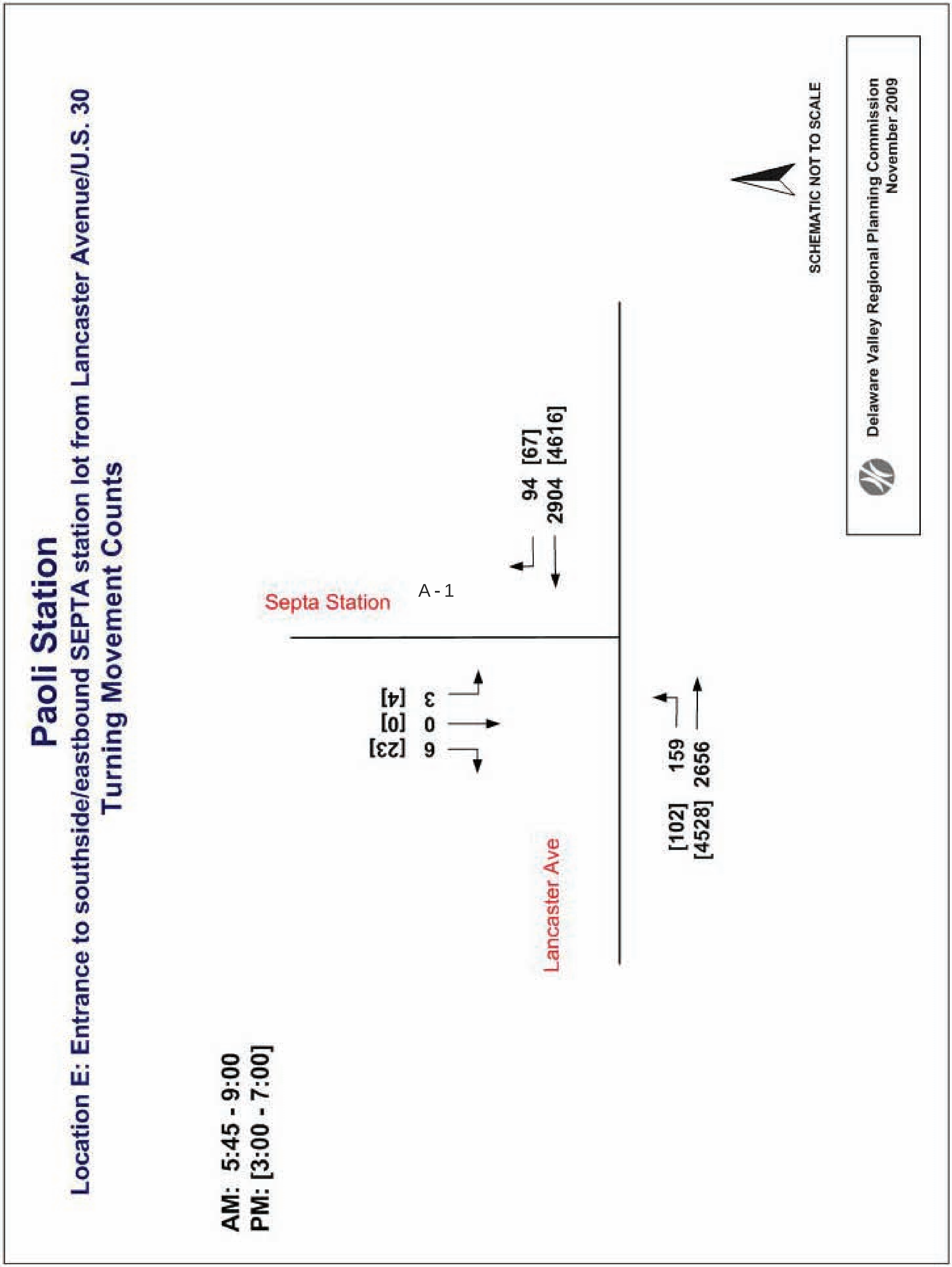


Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics



Appendix A: Paoli Station Area: Turning Movement Counts, Intersection Graphics




Paoli Station
Location E: Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/U.S. 30
Turning Movement Counts
AM: 5:45 - 9:00
PM: [3:00 - 7:00]
Septa Station
A - 1
Lancaster Ave
94 [67]
2904 [4616]
3 [4]
0 [0]
6 [23]
159 [102]
2656 [4528]
SCHEMATIC NOT TO SCALE
Delaware Valley Regional Planning Commission
November 2009

Appendix B: Paoli Station Turning Movement Counts, 15-Minute Intervals

DVRPC
OFFICE OF TRAVEL MAM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location A) Exit from southside/eastbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 1AM

AM INTERVAL COUNTS

STARTING TIME	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
5:45 6:00	0	10	2	12	1	11	2	14	0	0	0	0	0	1	2	3	26	3	29
6:00 6:15	0	32	0	32	4	27	3	34	1	0	1	2	8	2	2	12	66	14	80
6:15 6:30	3	28	0	31	6	41	2	49	1	0	0	1	2	4	6	12	80	13	93
6:30 6:45	2	75	0	77	4	39	7	50	0	1	6	7	4	1	3	8	127	15	142
6:45 7:00	4	74	1	79	6	50	4	60	4	0	4	8	2	5	5	12	139	20	159
7:00 7:15	2	164	2	168	6	120	5	131	1	0	3	4	5	1	5	11	299	15	314
7:15 7:30	3	158	1	162	12	137	4	153	2	0	1	3	2	1	3	6	315	9	324
7:30 7:45	2	181	0	183	2	204	12	218	4	0	3	7	5	3	6	14	401	21	422
7:45 8:00	9	214	0	223	30	149	7	186	11	0	2	13	8	2	8	18	409	31	440
8:00 8:15	3	238	1	242	3	146	11	160	15	0	7	22	10	7	7	24	402	46	448
8:15 8:30	4	81	1	86	2	46	3	51	6	0	4	10	3	7	3	13	137	23	160
8:30 8:45	7	119	1	127	8	86	6	100	7	2	4	13	16	1	4	21	227	34	261
8:45 9:00	5	124	0	129	0	141	13	154	5	0	4	9	7	1	6	14	283	23	306
TOTALS	44	1498	9	1551	84	1197	79	1360	57	3	39	99	72	36	60	168	2911	267	3178

DVRPC
OFFICE OF TRAVEL MAM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location A) Exit from southside/eastbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 1PM

PM INTERVAL COUNTS

STARTING	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
TIME	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
3:00 3:15	11	61	0	72	0	73	9	82	5	0	12	17	1	3	1	5	154	22	176
3:15 3:30	10	86	0	96	0	119	17	136	6	0	15	21	2	3	5	10	232	31	263
3:30 3:45	5	47	0	52	0	82	9	91	13	0	6	19	2	4	3	9	143	28	171
3:45 4:00	9	44	1	54	1	96	11	108	8	0	8	16	3	3	1	7	162	23	185
4:00 4:15	7	70	1	78	4	86	10	100	4	1	9	14	1	2	5	8	178	22	200
4:15 4:30	10	54	1	65	2	173	7	182	12	0	23	35	7	5	4	16	247	51	298
4:30 4:45	13	76	0	89	1	164	4	169	9	1	14	24	6	6	8	20	258	44	302
4:45 5:00	8	69	1	78	2	115	2	119	4	0	12	16	1	1	1	3	197	19	216
5:00 5:15	10	85	2	97	1	218	13	232	6	0	14	20	6	6	3	15	329	35	364
5:15 5:30	5	129	0	134	2	172	11	185	5	0	17	22	0	4	5	9	319	31	350
5:30 5:45	8	90	0	98	1	186	7	194	4	0	4	8	5	4	1	10	292	18	310
5:45 6:00	2	129	0	131	1	200	10	211	3	0	7	10	11	11	7	29	342	39	381
6:00 6:15	8	90	0	98	0	140	3	143	5	0	5	10	3	6	3	12	241	22	263
6:15 6:30	3	50	0	53	1	99	5	105	4	1	3	8	1	0	2	3	158	11	169
6:30 6:45	1	34	0	35	4	122	6	132	1	1	3	5	2	2	2	6	167	11	178
6:45 7:00	0	55	0	55	1	111	6	118	2	5	5	12	0	1	0	1	173	13	186
TOTALS	110	1169	6	1285	21	2156	130	2307	91	9	157	257	51	61	51	163	3592	420	4012

DVRPC
OFFICE OF TRAVEL M AM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location B) Exit from northside/westbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 2AM

AM INTERVAL COUNTS

STARTING	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
TIME	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
5:45 6:00	0	21	0	21	1	17	0	18	0	0	0	0	0	0	0	0	39	0	39
6:00 6:15	0	34	2	36	5	28	0	33	0	0	0	0	0	0	0	0	69	0	69
6:15 6:30	0	29	1	30	6	41	0	47	0	0	0	0	0	0	6	6	77	6	83
6:30 6:45	0	74	2	76	8	53	0	61	0	0	0	0	0	0	0	0	137	0	137
6:45 7:00	0	92	1	93	8	61	0	69	0	0	0	0	0	0	3	3	162	3	165
7:00 7:15	0	131	1	132	5	83	0	88	0	0	0	0	1	0	1	2	220	2	222
7:15 7:30	0	145	1	146	7	94	0	101	0	0	0	0	0	0	0	0	247	0	247
7:30 7:45	0	192	2	194	7	111	0	118	0	0	0	0	1	0	10	11	312	11	323
7:45 8:00	0	204	1	205	8	116	0	124	0	0	0	0	2	0	6	8	329	8	337
8:00 8:15	0	237	2	239	5	106	0	111	0	0	0	0	0	0	6	6	350	6	356
8:15 8:30	0	205	3	208	4	75	0	79	0	0	0	0	3	0	2	5	287	5	292
8:30 8:45	0	188	3	191	2	121	0	123	0	0	0	0	2	0	7	9	314	9	323
8:45 9:00	0	110	1	111	3	87	0	90	0	0	0	0	1	0	0	1	201	1	202
TOTALS	0	1662	20	1682	69	993	0	1062	0	0	0	0	10	0	41	51	2744	51	2795

DVRPC
OFFICE OF TRAVEL MAM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location B) Exit from northside/westbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 2PM

PM INTERVAL COUNTS

STARTING TIME	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
3:00 3:15	0	84	0	84	1	93	0	94	0	0	0	0	1	0	0	1	178	1	179
3:15 3:30	0	98	0	98	2	111	0	113	0	0	0	0	1	0	0	1	211	1	212
3:30 3:45	0	77	2	79	4	111	0	115	0	0	0	0	2	0	4	6	194	6	200
3:45 4:00	0	76	2	78	2	102	0	104	0	0	0	0	0	0	2	2	182	2	184
4:00 4:15	0	96	4	100	1	134	0	135	0	0	0	0	3	0	3	6	235	6	241
4:15 4:30	0	101	1	102	1	146	0	147	0	0	0	0	1	0	0	1	249	1	250
4:30 4:45	0	102	1	103	3	143	0	146	0	0	0	0	1	0	1	2	249	2	251
4:45 5:00	0	96	1	97	4	120	0	124	0	0	0	0	0	0	17	17	221	17	238
5:00 5:15	0	89	1	90	2	158	0	160	0	0	0	0	2	0	2	4	250	4	254
5:15 5:30	0	114	5	119	3	144	0	147	0	0	0	0	2	0	7	9	266	9	275
5:30 5:45	0	110	5	115	3	145	0	148	0	0	0	0	2	0	15	17	263	17	280
5:45 6:00	0	112	5	117	3	145	0	148	0	0	0	0	2	0	4	6	265	6	271
6:00 6:15	0	97	5	102	4	130	0	134	0	0	0	0	4	0	8	12	236	12	248
6:15 6:30	0	80	9	89	0	107	0	107	0	0	0	0	1	0	5	6	196	6	202
6:30 6:45	0	82	3	85	2	99	0	101	0	0	0	0	4	0	7	11	186	11	197
6:45 7:00	0	71	3	74	1	89	0	90	0	0	0	0	1	0	0	1	164	1	165
TOTALS	0	1485	47	1532	36	1977	0	2013	0	0	0	0	27	0	75	102	3545	102	3647

DVRPC
OFFICE OF TRAVEL M AM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location C) Exit from SEPTA permit parking lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 3AM

AM INTERVAL COUNTS

STARTING TIME	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
5:45 6:00	2	19	0	21	0	17	1	18	1	0	0	1	0	0	0	0	39	1	40
6:00 6:15	3	26	0	29	0	31	9	40	1	0	0	1	0	0	0	0	69	1	70
6:15 6:30	6	27	0	33	0	35	11	46	3	0	4	7	0	0	0	0	79	7	86
6:30 6:45	4	47	0	51	0	49	4	53	0	0	0	0	0	0	0	0	104	0	104
6:45 7:00	11	79	0	90	0	72	16	88	0	0	0	0	0	0	0	0	178	0	178
7:00 7:15	11	92	0	103	0	74	29	103	0	0	0	0	0	0	0	0	206	0	206
7:15 7:30	19	151	0	170	0	86	37	123	2	0	1	3	0	0	0	0	293	3	296
7:30 7:45	17	179	0	196	0	105	22	127	1	0	1	2	0	0	0	0	323	2	325
7:45 8:00	15	171	0	186	0	136	29	165	11	0	18	29	0	0	0	0	351	29	380
8:00 8:15	8	206	0	214	0	104	8	112	2	0	1	3	0	0	0	0	326	3	329
8:15 8:30	5	232	0	237	0	87	5	92	0	0	6	6	0	0	0	0	329	6	335
8:30 8:45	6	200	0	206	0	89	4	93	5	0	1	6	0	0	0	0	299	6	305
8:45 9:00	2	168	0	170	0	110	2	112	1	0	1	2	0	0	0	0	282	2	284
TOTALS	109	1597	0	1706	0	995	177	1172	27	0	33	60	0	0	0	0	2878	60	2938

DVRPC
OFFICE OF TRAVEL M AM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location C) Exit from SEPTA permit parking lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 3PM

PM INTERVAL COUNTS

STARTING	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
TIME	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
3:00 3:15	2	79	0	81	0	90	0	90	2	0	0	2	0	0	0	0	171	2	173
3:15 3:30	1	98	0	99	0	107	2	109	1	0	4	5	0	0	0	0	208	5	213
3:30 3:45	1	81	0	82	0	106	2	108	4	0	1	5	0	0	0	0	190	5	195
3:45 4:00	0	77	0	77	0	107	3	110	1	0	0	1	0	0	0	0	187	1	188
4:00 4:15	0	105	0	105	0	148	1	149	5	0	7	12	0	0	0	0	254	12	266
4:15 4:30	1	102	0	103	0	171	2	173	0	0	2	2	0	0	0	0	276	2	278
4:30 4:45	1	97	0	98	0	146	1	147	5	0	3	8	0	0	0	0	245	8	253
4:45 5:00	1	114	0	115	0	128	4	132	12	0	12	24	0	0	0	0	247	24	271
5:00 5:15	0	95	0	95	0	173	3	176	11	0	4	15	0	0	0	0	271	15	286
5:15 5:30	4	119	0	123	0	157	4	161	4	0	8	12	0	0	0	0	284	12	296
5:30 5:45	3	129	0	132	0	124	2	126	40	0	49	89	0	0	0	0	258	89	347
5:45 6:00	4	113	0	117	0	124	2	126	13	0	24	37	0	0	0	0	243	37	280
6:00 6:15	2	110	0	112	0	133	1	134	6	0	3	9	0	0	0	0	246	9	255
6:15 6:30	0	84	0	84	0	111	0	111	3	0	5	8	0	0	0	0	195	8	203
6:30 6:45	3	66	0	69	0	93	1	94	15	0	32	47	0	0	0	0	163	47	210
6:45 7:00	0	69	0	69	0	97	1	98	1	0	1	2	0	0	0	0	167	2	169
TOTALS	23	1538	0	1561	0	2015	29	2044	123	0	155	278	0	0	0	0	3605	278	3883

DVRPC
OFFICE OF TRAVEL M AM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location D) Lancaster Avenue/U.S. 30 and Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 4AM

AM INTERVAL COUNTS

STARTING TIME	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
5:45 6:00	1	2	0	3	10	4	1	15	8	63	2	73	0	66	11	77	18	150	168
6:00 6:15	2	10	2	14	11	4	12	27	7	79	2	88	0	79	16	95	41	183	224
6:15 6:30	3	2	1	6	23	6	10	39	10	113	3	126	0	113	11	124	45	250	295
6:30 6:45	8	5	1	14	25	9	14	48	16	150	2	168	0	190	28	218	62	386	448
6:45 7:00	5	12	7	24	27	8	25	60	40	202	4	246	1	198	41	240	84	486	570
7:00 7:15	8	22	4	34	30	7	26	63	37	212	3	252	1	154	37	192	97	444	541
7:15 7:30	7	40	3	50	32	15	27	74	45	244	4	293	2	210	71	283	124	576	700
7:30 7:45	12	46	4	62	46	22	27	95	54	274	2	330	3	217	82	302	157	632	789
7:45 8:00	13	55	5	73	47	31	41	119	54	303	3	360	0	240	84	324	192	684	876
8:00 8:15	11	56	2	69	44	34	40	118	55	294	2	351	0	188	61	249	187	600	787
8:15 8:30	13	70	3	86	37	25	26	88	56	297	3	356	2	244	79	325	174	681	855
8:30 8:45	21	61	4	86	44	15	25	84	64	305	10	379	0	252	84	336	170	715	885
8:45 9:00	14	52	4	70	40	14	22	76	60	298	7	365	1	230	46	277	146	642	788
TOTALS	118	433	40	591	416	194	296	906	506	2834	47	3387	10	2381	651	3042	1497	6429	7926

DVRPC
OFFICE OF TRAVEL MAM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location D) Lancaster Avenue/U.S. 30 and Valley Road

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 4PM

PM INTERVAL COUNTS

STARTING	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
TIME	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
3:00 3:15	6	9	8	23	64	11	21	96	33	227	2	262	7	256	45	308	119	570	689
3:15 3:30	12	22	6	40	54	14	21	89	33	238	5	276	4	280	46	330	129	606	735
3:30 3:45	7	9	6	22	66	27	29	122	24	280	12	316	2	237	51	290	144	606	750
3:45 4:00	10	12	6	28	59	27	27	113	26	239	4	269	2	247	37	286	141	555	696
4:00 4:15	6	18	3	27	67	33	30	130	35	261	3	299	3	277	40	320	157	619	776
4:15 4:30	11	20	3	34	81	49	26	156	29	247	10	286	3	295	36	334	190	620	810
4:30 4:45	7	9	8	24	74	47	26	147	37	244	14	295	6	327	44	377	171	672	843
4:45 5:00	5	23	3	31	59	44	47	150	38	293	19	350	2	293	25	320	181	670	851
5:00 5:15	10	13	3	26	64	45	41	150	37	307	15	359	4	339	33	376	176	735	911
5:15 5:30	7	16	4	27	66	49	42	157	40	312	17	369	5	308	39	352	184	721	905
5:30 5:45	6	18	5	29	57	43	45	145	42	302	10	354	3	294	39	336	174	690	864
5:45 6:00	4	18	5	27	62	41	50	153	43	287	12	342	3	318	49	370	180	712	892
6:00 6:15	10	9	6	25	55	28	35	118	45	275	9	329	1	305	37	343	143	672	815
6:15 6:30	1	12	4	17	50	34	41	125	40	270	8	318	3	235	36	274	142	592	734
6:30 6:45	9	8	2	19	47	35	37	119	37	267	8	312	1	249	30	280	138	592	730
6:45 7:00	6	14	1	21	45	32	32	109	39	254	9	302	2	197	42	241	130	543	673
TOTALS	117	230	73	420	970	559	550	2079	578	4303	157	5038	51	4457	629	5137	2499	10175	12674

DVRPC
OFFICE OF TRAVEL MAM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: EB SEPTA STATION LOT (LOCATION E) Location E) Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/U.S. 30

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 5AM

AM INTERVAL COUNTS

STARTING	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
TIME	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
5:45 6:00	0	0	0	0	1	0	0	1	16	62	0	78	0	72	8	80	1	158	159
6:00 6:15	0	0	0	0	0	0	0	0	20	58	0	78	0	85	10	95	0	173	173
6:15 6:30	0	0	0	0	0	0	1	1	9	94	0	103	0	124	8	132	1	235	236
6:30 6:45	0	0	0	0	0	0	0	0	13	123	0	136	0	201	13	214	0	350	350
6:45 7:00	0	0	0	0	0	0	0	0	17	177	0	194	0	247	8	255	0	449	449
7:00 7:15	0	0	0	0	0	0	1	1	16	201	0	217	0	205	5	210	1	427	428
7:15 7:30	0	0	0	0	0	0	1	1	11	221	0	232	0	223	5	228	1	460	461
7:30 7:45	0	0	0	0	0	0	0	0	13	274	0	287	0	267	5	272	0	559	559
7:45 8:00	0	0	0	0	0	0	0	0	10	291	0	301	0	263	7	270	0	571	571
8:00 8:15	0	0	0	0	0	0	0	0	6	301	0	307	0	284	6	290	0	597	597
8:15 8:30	0	0	0	0	0	0	1	1	9	283	0	292	0	303	3	306	1	598	599
8:30 8:45	0	0	0	0	1	0	0	1	10	306	0	316	0	357	11	368	1	684	685
8:45 9:00	0	0	0	0	1	0	2	3	9	265	0	274	0	273	5	278	3	552	555
TOTALS	0	0	0	0	3	0	6	9	159	2656	0	2815	0	2904	94	2998	9	5813	5822

DVRPC
OFFICE OF TRAVEL MAM INTERVAL COUNTS

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: EB SEPTA STATION LOT (LOCATION E) Location E) Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/U.S. 30

DATE: 3/17/09
DAY: TUESDAY
WEATHER: FAIR

FILE NUMBER: 5PM

PM INTERVAL COUNTS

STARTING	1-NORTHBOUND				2-SOUTHBOUND				3-EASTBOUND				4-WESTBOUND				N-S	E-W	
TIME	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	L	S	R	TOTAL	TOTAL	TOTAL	TOTAL
3:00 3:15	0	0	0	0	0	0	1	1	6	302	0	308	0	299	4	303	1	611	612
3:15 3:30	0	0	0	0	0	0	1	1	11	285	0	296	0	283	6	289	1	585	586
3:30 3:45	0	0	0	0	0	0	0	0	4	294	0	298	0	243	4	247	0	545	545
3:45 4:00	0	0	0	0	0	0	1	1	5	252	0	257	0	255	5	260	1	517	518
4:00 4:15	0	0	0	0	2	0	2	4	3	315	0	318	0	297	1	298	4	616	620
4:15 4:30	0	0	0	0	1	0	1	2	7	306	0	313	0	299	4	303	2	616	618
4:30 4:45	0	0	0	0	1	0	0	1	7	300	0	307	0	303	5	308	1	615	616
4:45 5:00	0	0	0	0	0	0	5	5	14	289	0	303	0	304	4	308	5	611	616
5:00 5:15	0	0	0	0	0	0	0	0	4	352	0	356	0	329	2	331	0	687	687
5:15 5:30	0	0	0	0	0	0	0	0	12	315	0	327	0	316	3	319	0	646	646
5:30 5:45	0	0	0	0	0	0	5	5	3	296	0	299	0	320	5	325	5	624	629
5:45 6:00	0	0	0	0	0	0	4	4	6	278	0	284	0	324	4	328	4	612	616
6:00 6:15	0	0	0	0	0	0	2	2	2	263	0	265	0	311	4	315	2	580	582
6:15 6:30	0	0	0	0	0	0	0	0	8	226	0	234	0	254	7	261	0	495	495
6:30 6:45	0	0	0	0	0	0	1	1	6	235	0	241	0	246	5	251	1	492	493
6:45 7:00	0	0	0	0	0	0	0	0	4	220	0	224	0	233	4	237	0	461	461
TOTALS	0	0	0	0	4	0	23	27	102	4528	0	4630	0	4616	67	4683	27	9313	9340

Appendix C: Paoli Station Parking Need Assessment

Appendix C: Paoli Station Parking Need Assessment

DVRPC Technical Memorandum: PAOLI STATION PARKING NEED ASSESSMENT

DVRPC staff contact: Joseph F. Hacker, Ph.D., AICP
Manager, Office of Transit, Bicycle, and Pedestrian Planning
Tel: 215-238-2935
Email: jhacker@dvrpc.org

1. Introduction, Outline and Summary

The Paoli Station Parking Need Assessment is a project requested by Chester County through the FY08 Unified Planning Work Program to determine whether year 2010 demand estimates of 1,000 mixed use and 700 railroad oriented parking spaces remain valid ten years since these estimates were originally made. The validity of this parking estimate is an input into correctly sizing any surface or built parking facilities in the development. The size, arrangement, and type of development have yet to be determined for the Paoli Transportation Center, and these unknowns would affect the forecast parking numbers.

This memorandum includes a new estimate for station parking demand generated in two ways: first by developing a straight line forecast for year 2010 and 2020 parking demand, factored for future growth and based on the municipal distribution of license plate surveys. The second is the conduct of intercept surveys at Malvern and Daylesford stations of rail customer preference for driving to Paoli if parking were increased there.

Forecast demand is figured for two target years, an opening day figure for year 2010 and a "mature" parking figure for year 2020. This straight line analysis forecasts a 717 space demand on opening day year 2010, which is marginally greater than the original Norman Day estimate of 700 railroad spaces for 2010. Forecast demand is estimated to be 780 spaces for year 2020. These figures are the outcome of a clear method for deriving future parking demand, and represent one means of establishing a benchmark for the discussion of parking at Paoli Station.

2. Review of Previous Work

The original estimate of parking need was from the *Paoli Rail Yards and Transit Center Study* completed in October 1996 by the consultant team of Norman Day and Associates. In the Norman Day study, the parking estimate for year 2010 was 700 spaces, which was revised upwards to 1,000 spaces to accommodate mixed-use parking. Only the 700 space railroad parking requirements are considered in this exercise, since other elements contributing to future parking demand remain undetermined.

In the Norman Day report, multiple surface lots were posited to serve the commercial, residential, and commuter demand in the proposed development. The proposed plan acknowledged that an adequate commuter parking facility is critical for the success of the new Transportation Center. SEPTA has expanded suburban station parking as a means to increase inbound ridership on its regional rail system, however, it is not a SEPTA policy to provide a parking space for every rider.

In November 2006 a license plate survey was conducted by the Chester County Planning Commission to inventory the origins of riders boarding the trains at Paoli. License plates of automobiles parked at the station were recorded and then sent to PennDOT to obtain address information. A station shed area was then defined when the resulting address information was matched in a GIS. The County found address matches with 423 out of about 500 recorded

plated returned from PennDOT with addresses being matched from as far away as Philadelphia. Of this number, only 361 addresses were identified within Chester County.

3. Straight line Forecast Method

Straight line forecasts use the distribution of matched addresses surrounding Paoli Station as a reliable geography of ridership. For purposes of consistency, Paoli's shed is defined using the data collected during the November 2006 survey of station parking. Distances were calculated from the station to each respective address (origin). As might be expected, the distribution of patron locations was not linear; parking lot patrons were heavily concentrated in the immediate station locality, and the furthest patrons were often great distances away (e.g.: Philadelphia). When distances were examined in quintiles or division by fifths, it was found that the closest 80% of origins (338 points) fall within about 8 miles from Paoli station with the remaining 20% of origins (85 points) dispersed up to a distance of about 31 miles. This method of defining a core 80% station shed was used to address outliers in the 2007 DVRPC report *Needs and opportunities Study for the R5 Extension West of Thorndale*.

Once the closest 80% of Paoli's patron distribution was defined, the shed boundary was outlined and smoothed in the GIS, and shown in Map 1. Municipalities intersected by the shed boundary are included as the population unit for the straight line forecasts. Table A in the back of the memorandum lists the 31 municipalities intersected by the Paoli station shed. The table includes townships and boroughs in Chester, Montgomery, and Delaware Counties.

The entire municipality was included for the forecast even if the shed intersects only a small portion of it. Year 2005 DVRPC municipal population estimates were used as the base year for comparison, since it is the closest corresponding year to the 2006 license plate survey. Next, the number of matched addresses in a municipality was divided by the DVRPC 2005 population estimates. This yields a parking per population factor which is then multiplied by the 2010 (opening date), 2015 (an intermediary date), and 2020 (mature) population forecasts of each respective municipality. This provides a consistent proportion of weighted parking demand. The individual municipal results were aggregated and are summarized in Table 1.

Table 1. Paoli Station Shed Straight line Summary

	2006 Plates/Base	**2010 Forecast**	**2015 Forecast**	**2020 Forecast**
Norman Day Estimate		700		
DVRPC estimate factored for 2006 parking occupancy	505	529	553	576
DVRPC estimate factored for survey preference demand	**684**	**717**	**749**	**780**

Source: DVRPC, *Analytical Data Report #14 Regional, County, and Municipal Population and Employment Forecasts, 2005-2035*, August 2007

Table 1 shows the year 2010 Norman Day forecast in the first row. The municipal portions are factored upward to account for full parking occupancy during the 2006 survey. This factoring calibrates the address matched parking demand upward to be in line with current parking occupancy. The resulting numbers, 529 in year 2010 and 576 in year 2020 are closer approximations to the observed parking demand, but short of the Norman Day estimate of 700.

What remains to be understood is the extent of unmet demand from those not able to access the filled Paoli parking facilities.

4. Preference Survey Work at Malvern and Daylesford

Intercept surveys were conducted on October 25, 2007 at Paoli's adjacent stations of Malvern and Daylesford to assess further demand for parking at Paoli. These were conducted between the peak inbound hours of about 5:16 am and 10:06 am at both stations. The surveys intercepted 262 of the total targeted sample of 573 boarding passengers for a 45% intercept rate. Riders were asked "If more parking were available at Paoli Station would you go there to take the train?" The results are shown in Table 2 below.

Table 2. Survey: Would Riders Drive To Paoli If More Parking Were Available?

Station	Yes	No	Other	Total Intercepts	Target Sample	Factored Demand
Malvern	38	110	14	162	428	98
Daylesford	56	38	6	100	146	81
Total	94	148	20	262	573	179

Source: DVRPC Station Surveys 25 October 2007

The table shows about a quarter of riders who board at Malvern (23%) are likely to switch to Paoli if more parking were provided. A slim majority of the sampled riders at Daylesford (56%) were also in favor of using Paoli if more parking were available. Taken at face value these "Yes" responses can be assumed to be representative of the latent demand on a 1:1 basis. However, in order to be consistent with previous sampling factors (e.g.: factoring up from matched plates to total parking occupancy), the proportion of "Yes" answers must be applied to the entire target sample, yielding 98 (Malvern) and 81 (Daylesford) in factored demand.

The target sample reflects the bulk of inbound passengers during the roughly five hour survey period, nearly all of whom had a park-and-ride access pattern. Therefore, in an unconstrained parking scenario at Paoli Station the intercept sample would add 179 automobiles in the base year. The new base total of 684 for year 2006 is then factored up by the 14% forecast rate of municipal change from 2005 to 2020 for the 80% shed municipalities. This yields a total forecast parking demand of 717 total spaces by 2010 and 780 total spaces by 2020. To accommodate this demand would require a 275 space expansion from the current parking supply of 505 spaces.

5. Summary and Recommendations

This straight line analysis forecasts a parking demand of 717 railroad oriented spaces for 2010 at Paoli Station, which is close to the original Norman Day estimate of 700 railroad spaces for 2010. The year 2020 forecast of 780 spaces is greater than the original Norman Day estimate of 700, accounting for growth over the more distant planning horizon.

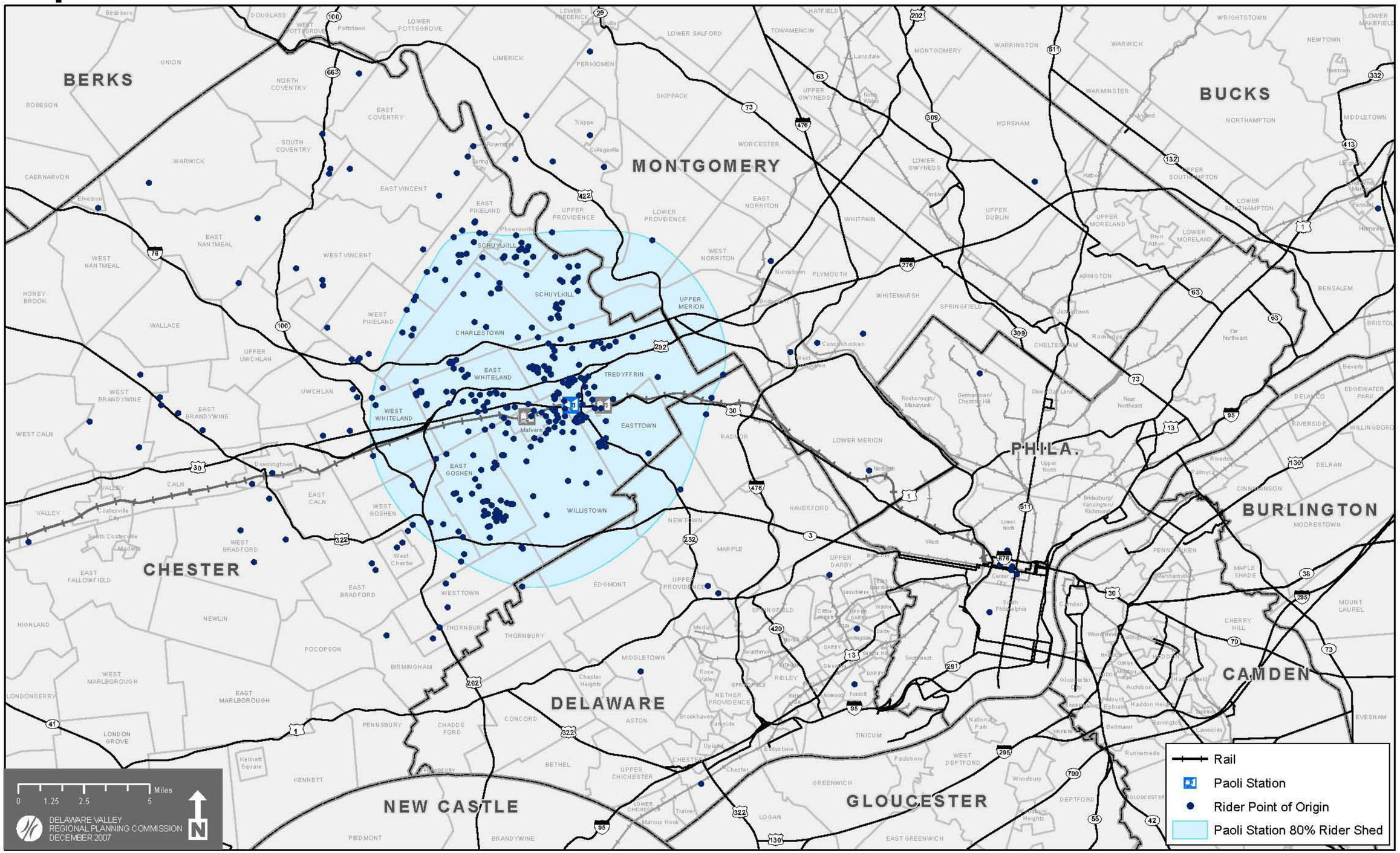
Norman Day's estimated requirement of 1,000 mixed use spaces appears high by any of the conservative methods employed in this forecast, although parking demand from other uses has not been considered in this memorandum. Alternatives for surface or structured parking, and shared parking facilities, require further examination once issues of zoning, tenant agreements, level of development, land use, and other issues have been resolved.

Table A: Straight line Population Forecast by Municipality, 2005 through 2020 (including factored results)

Jurisdiction / County	2006 Plate Survey	2005 Pop Estimate	Municipal Factor	2010 Pop Forecast	2010 Demand	2015 Pop Forecast	2015 Demand	2020 Pop Forecast	2020 Demand
Charlestown Township /	20	5,824	0.00343	6,327	22	6,929	24	7,505	26
Downingtown Borough	2	7,856	0.00025	8,143	2	8,531	2	8,902	2
East Bradford Township	2	10,172	0.00020	10,940	2	11,528	2	12,091	2
East Brandywine Township	4	6,449	0.00062	7,527	5	7,963	5	8,379	5
East Goshen Township	40	17,843	0.00224	18,749	42	19,605	44	20,415	46
East Nantmeal Township	2	1,864	0.00107	1,971	2	2,029	2	2,084	2
East Pikeland Township	13	6,816	0.00191	7,374	14	7,905	15	8,414	16
East Vincent Township	5	6,444	0.00078	6,920	5	7,496	6	8,047	6
East Whiteland Township	40	10,302	0.00388	10,757	42	11,313	44	11,844	46
Easttown Township	14	10,397	0.00135	10,630	14	11,078	15	11,506	15
Limerick Township	2	16,506	0.00012	17,944	2	19,304	2	20,590	2
Lower Providence Township	1	24,900	0.00004	25,975	1	26,991	1	27,952	1
Malvern Borough	3	3,099	0.00097	3,157	3	3,260	3	3,358	3
Newtown Township	1	11,842	0.00008	11,891	1	11,938	1	11,982	1
Phoenixville Borough	13	15,415	0.00084	15,879	13	16,323	14	16,748	14
Radnor Township	2	30,976	0.00006	31,012	2	31,046	2	31,079	2
Schuylkill Township	20	7,637	0.00262	8,208	21	8,748	23	9,258	24
South Coventry Township	3	2,384	0.00126	2,497	3	2,603	3	2,704	3
Thornbury Township	1	2,931	0.00034	3,230	1	3,405	1	3,572	1
Tredyffrin Township	61	29,073	0.00210	29,514	62	30,265	64	30,983	65
Upper Providence Township	1	11,142	0.00009	11,266	1	11,384	1	11,495	1
Uwchlan Township	1	18,311	0.00005	19,194	1	20,151	1	21,066	1
West Bradford Township	4	11,689	0.00034	12,521	4	13,202	5	13,853	5
West Brandywine Twsp.	3	7,636	0.00039	8,515	3	9,357	4	10,162	4
West Chester Borough	2	18,039	0.00011	18,502	2	18,826	2	19,136	2
West Goshen Township	8	21,169	0.00038	22,176	8	23,037	9	23,860	9
West Pikeland Township	6	3,988	0.00150	4,501	7	4,768	7	5,023	8
West Vincent Township	4	3,885	0.00103	4,203	4	4,396	5	4,581	5
West Whiteland Township	3	18,339	0.00016	19,296	3	20,109	3	20,886	3
Westtown Township	2	10,605	0.00019	10,861	2	11,224	2	11,572	2
Willistown Township	37	10,739	0.00345	11,114	38	11,352	39	11,580	40
Raw address matched total	320				335		351		365
Factored for 2005 parking occupancy	**505**				**529**		**553**		**576**
Factored survey preference demand	**684**				**717**		**749**		**780**

Source: 2006 Chester County and DVRPC GIS Survey data

Map 1: Paoli 80% Station Shed



Appendix D: Paoli Station Straightline Population Forecast by Municipality, 2005 through 2035

Appendix D: Paoli Station Straightline Population Forecast by Municipality, 2005 through 2035

Appendix D: Paoli Station Straightline Population Forecast by Municipality, 2005 through 2035

Jurisdiction / County	2006 Plate Survey	2005 Pop Estimate	Municipal Factor	2010 Pop Forecast	2010 Demand	2015 Pop Forecast	2015 Demand	2020 Pop Forecast	2020 Demand	2030 Pop Forecast	2030 Demand	2035 Pop Forecast	2035 Demand
Charlestown Township	20	5,824	0.00343	6,327	22	6,929	24	7,505	26	8578	29	8944	31
Downingtown Borough	2	7,856	0.00025	8,143	2	8,531	2	8,902	2	9594	2	9830	2
East Bradford Township	2	10,172	0.00020	10,940	2	11,528	2	12,091	2	13140	3	13498	3
East Brandywine Township	4	6,449	0.00062	7,527	5	7,963	5	8,379	5	9156	6	9421	6
East Goshen Township	40	17,843	0.00224	18,749	42	19,605	44	20,415	46	21899	49	22563	51
East Nantmeal Township	2	1,864	0.00107	1,971	2	2,029	2	2,084	2	2187	2	2222	2
East Pikeland Township	13	6,816	0.00191	7,374	14	7,905	15	8,414	16	9361	18	9684	18
East Vincent Township	5	6,444	0.00078	6,920	5	7,496	6	8,047	6	9074	7	9425	7
East Whiteland Township	40	10,302	0.00388	10,757	42	11,313	44	11,844	46	12835	50	13173	51
Easttown Township	14	10,397	0.00135	10,630	14	11,078	15	11,506	15	12304	17	12577	17
Limerick Township	2	16,506	0.00012	17,944	2	19,304	2	20,590	2	22946	3	24000	3
Lower Providence Township	1	24,900	0.00004	25,975	1	26,991	1	27,952	1	29712	1	30500	1
Malvern Borough	3	3,099	0.00097	3,157	3	3,260	3	3,358	3	3541	3	3603	3
Newtown Township	1	11,842	0.00008	11,891	1	11,938	1	11,982	1	12063	1	12099	1
Phoenixville Borough	13	15,415	0.00084	15,879	13	16,323	14	16,748	14	17540	15	17810	15
Radnor Township	2	30,976	0.00006	31,012	2	31,046	2	31,079	2	31138	2	31164	2
Schuylkill Township	20	7,637	0.00262	8,208	21	8,748	23	9,258	24	10193	27	10612	28
South Coventry Township	3	2,384	0.00126	2,497	3	2,603	3	2,704	3	2888	4	2971	4
Thornbury Township	1	2,931	0.00034	3,230	1	3,405	1	3,572	1	3884	1	3990	1
Tredyffrin Township	61	29,073	0.00210	29,514	62	30,265	64	30,983	65	32321	68	32778	69
Upper Providence Township	1	11,142	0.00009	11,266	1	11,384	1	11,495	1	11699	1	11791	1
Uwchlan Township	1	18,311	0.00005	19,194	1	20,151	1	21,066	1	22772	1	23354	1
West Bradford Township	4	11,689	0.00034	12,521	4	13,202	5	13,853	5	15067	5	15481	5
West Brandywine Township	3	7,636	0.00039	8,515	3	9,357	4	10,162	4	11662	5	12174	5
West Chester Borough	2	18,039	0.00011	18,502	2	18,826	2	19,136	2	19713	2	19910	2
West Goshen Township	8	21,169	0.00038	22,176	8	23,037	9	23,860	9	25394	10	25918	10
West Pikeland Township	6	3,988	0.00150	4,501	7	4,768	7	5,023	8	5499	8	5662	8
West Vincent Township	4	3,885	0.00103	4,203	4	4,396	5	4,581	5	4926	5	5044	5
West Whiteland Township	3	18,339	0.00016	19,296	3	20,109	3	20,886	3	22334	4	22829	4
Westtown Township	2	10,605	0.00019	10,861	2	11,224	2	11,572	2	12219	2	12440	2
Willistown Township	37	10,739	0.00345	11,114	38	11,352	39	11,580	40	12004	41	12149	42
Raw address matched total	320				335		351		365		392		402
Factored for 2005 parking occupancy	**505**				**529**		**553**		**576**		**619**		**634**
Factored survey preference demand	**684**				**717**		**749**		**780**		**834**		**854**

Source: 2006 Chester County and 2009 DVRPC

Appendix E: Paoli Station Pedestrian Counts, 15-Minute Intervals

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location A) Exit from southside/eastbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY

AM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
5:45 6:00	0	0	0	0	0	0	0
6:00 6:15	3	1	4	2	0	2	6
6:15 6:30	21	0	21	3	0	3	24
6:30 6:45	1	0	1	0	0	0	1
6:45 7:00	3	0	3	19	0	19	22
7:00 7:15	0	0	0	2	0	2	2
7:15 7:30	2	0	2	5	0	5	7
7:30 7:45	3	0	3	15	0	15	18
7:45 8:00	4	0	4	4	0	4	8
8:00 8:15	0	1	1	5	0	5	6
8:15 8:30	2	0	2	2	0	2	4
8:30 8:45	2	1	3	9	0	9	12
8:45 9:00	1	0	1	4	0	4	5
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	42	3	45	70	0	70	115

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location A) Exit from southside/eastbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY

PM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
3:00 3:15	1	1	2	1	0	1	3
3:15 3:30	3	1	4	1	0	1	5
3:30 3:45	2	0	2	11	0	11	13
3:45 4:00	1	2	3	5	0	5	8
4:00 4:15	2	0	2	5	2	7	9
4:15 4:30	5	2	7	4	1	5	12
4:30 4:45	8	3	11	3	1	4	15
4:45 5:00	3	0	3	12	0	12	15
5:00 5:15	3	1	4	6	0	6	10
5:15 5:30	7	0	7	0	0	0	7
5:30 5:45	4	0	4	8	5	13	17
5:45 6:00	2	1	3	6	0	6	9
6:00 6:15	3	0	3	6	0	6	9
6:15 6:30	2	0	2	2	0	2	4
6:30 6:45	1	0	1	13	0	13	14
6:45 7:00	2	0	2	0	0	0	2
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	49	11	57	70	9	79	136

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location B) Exit from northside/westbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY

AM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
5:45 6:00	0	0	0	0	0	0	0
6:00 6:15	0	0	0	16	0	16	16
6:15 6:30	0	0	0	17	0	17	17
6:30 6:45	0	0	0	4	0	4	4
6:45 7:00	0	0	0	27	0	27	27
7:00 7:15	1	0	1	60	0	60	61
7:15 7:30	0	0	0	36	0	36	36
7:30 7:45	0	0	0	30	0	30	30
7:45 8:00	0	0	0	31	0	31	31
8:00 8:15	0	0	0	16	0	16	16
8:15 8:30	0	0	0	12	0	12	12
8:30 8:45	1	0	1	6	0	6	7
8:45 9:00	0	0	0	8	0	8	8
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	2	0	2	263	0	263	265

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location B) Exit from northside/westbound SEPTA station lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY

PM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
3:00 3:15	0	0	0	6	0	6	6
3:15 3:30	0	0	0	6	0	6	6
3:30 3:45	0	0	0	12	0	12	12
3:45 4:00	1	0	1	3	0	3	4
4:00 4:15	0	0	0	8	0	8	8
4:15 4:30	0	0	0	9	0	9	9
4:30 4:45	2	0	2	5	0	5	7
4:45 5:00	0	0	0	6	0	6	6
5:00 5:15	0	0	0	16	0	16	16
5:15 5:30	0	0	0	16	0	16	16
5:30 5:45	0	0	0	6	0	6	6
5:45 6:00	1	0	1	10	0	10	11
6:00 6:15	0	0	0	1	0	1	1
6:15 6:30	0	0	0	4	0	4	4
6:30 6:45	0	0	0	2	0	2	2
6:45 7:00	0	0	0	2	0	2	2
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	4	0	4	108	0	108	112

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location C) Exit from SEPTA permit parking lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY

AM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
5:45 6:00	0	4	4	0	0	0	4
6:00 6:15	0	12	12	0	0	0	12
6:15 6:30	0	15	15	1	0	1	16
6:30 6:45	0	9	9	0	0	0	9
6:45 7:00	0	24	24	0	0	0	24
7:00 7:15	0	30	30	1	0	1	31
7:15 7:30	8	61	69	1	0	1	70
7:30 7:45	2	32	34	0	0	0	34
7:45 8:00	2	49	51	0	0	0	51
8:00 8:15	2	17	19	0	0	0	19
8:15 8:30	6	4	10	0	0	0	10
8:30 8:45	3	7	10	1	0	1	11
8:45 9:00	1	3	4	0	0	0	4
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	24	267	291	4	0	4	295

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location C) Exit from SEPTA permit parking lot onto Valley Road

DATE: 3/17/09
DAY: TUESDAY

PM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
3:00 3:15	2	2	4	0	2	2	6
3:15 3:30	2	1	3	0	1	1	4
3:30 3:45	2	4	6	0	3	3	9
3:45 4:00	0	0	0	0	0	0	0
4:00 4:15	1	5	6	0	3	3	9
4:15 4:30	0	3	3	0	3	3	6
4:30 4:45	3	4	7	0	3	3	10
4:45 5:00	2	4	6	0	1	1	7
5:00 5:15	0	4	4	0	4	4	8
5:15 5:30	2	5	7	0	8	8	15
5:30 5:45	1	1	2	0	1	1	3
5:45 6:00	1	9	10	0	7	7	17
6:00 6:15	2	0	2	0	0	0	2
6:15 6:30	0	3	3	0	3	3	6
6:30 6:45	0	2	2	0	2	2	4
6:45 7:00	0	1	1	0	1	1	2
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	18	45	63	0	42	39	102

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location D) Lancaster Avenue/U.S. 30 and Valley Road

DATE: 3/17/09
DAY: TUESDAY

AM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
5:45 6:00	1	0	1	0	0	0	1
6:00 6:15	1	1	2	1	1	2	4
6:15 6:30	1	0	1	1	0	1	2
6:30 6:45	0	1	1	2	0	2	3
6:45 7:00	1	3	4	2	1	3	7
7:00 7:15	2	1	3	2	1	3	6
7:15 7:30	2	2	4	6	1	7	11
7:30 7:45	0	3	3	5	1	6	9
7:45 8:00	2	3	5	5	1	6	11
8:00 8:15	5	2	7	2	1	3	10
8:15 8:30	3	3	6	3	1	4	10
8:30 8:45	1	2	3	3	5	8	11
8:45 9:00	1	1	2	2	1	3	5
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	20	22	42	34	14	48	90

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: VALLEY RD Location D) Lancaster Avenue/U.S. 30 and Valley Road

DATE: 3/17/09
DAY: TUESDAY

PM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
3:00 3:15	0	0	0	0	1	1	1
3:15 3:30	1	0	1	0	1	1	2
3:30 3:45	0	4	4	9	0	9	13
3:45 4:00	0	2	2	3	2	5	7
4:00 4:15	2	2	4	4	0	4	8
4:15 4:30	1	2	3	3	0	3	6
4:30 4:45	2	1	3	3	1	4	7
4:45 5:00	0	2	2	7	1	8	10
5:00 5:15	1	1	2	1	1	2	4
5:15 5:30	1	0	1	0	0	0	1
5:30 5:45	2	2	4	5	6	11	15
5:45 6:00	7	6	13	9	13	22	35
6:00 6:15	3	2	5	0	3	3	8
6:15 6:30	0	1	1	2	2	4	5
6:30 6:45	1	0	1	2	1	3	4
6:45 7:00	1	1	2	1	0	1	3
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	22	25	45	46	32	77	122

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: EB SEPTA STATION LOT (LOCATION E) Location E) Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/U.S. 30

DATE: 3/17/09
DAY: TUESDAY

AM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
5:45 6:00	0	0	0	0	0	0	0
6:00 6:15	0	0	0	0	0	0	0
6:15 6:30	2	0	2	0	0	0	2
6:30 6:45	0	0	0	0	0	0	0
6:45 7:00	0	0	0	0	0	0	0
7:00 7:15	1	0	1	0	0	0	1
7:15 7:30	0	0	0	0	1	1	1
7:30 7:45	0	0	0	0	0	0	0
7:45 8:00	0	0	0	0	0	0	0
8:00 8:15	0	0	0	0	0	0	0
8:15 8:30	2	0	2	0	0	0	2
8:30 8:45	1	0	1	0	0	0	1
8:45 9:00	1	0	1	0	0	0	1
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	7	0	7	0	1	1	8

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
OFFICE OF TRAVEL MONITORING

COUNTY: CHESTER
MUNICIPALITY: PAOLI

INTERSECTION: North-South Street & East-West Street
STREETS: EB SEPTA STATION LOT (LOCATION E) Location E) Entrance to southside/eastbound SEPTA station lot from Lancaster Avenue/U.S. 30

DATE: 3/17/09
DAY: TUESDAY

PM INTERVAL PEDESTRIAN COUNTS

TIME PERIOD	NORTH CROSSWALK	SOUTH CROSSWALK	N & S TOTAL	EAST CROSSWALK	WEST CROSSWALK	E & W TOTAL	TOTAL N, S, E, & W
3:00 3:15	0	0	0	1	0	1	1
3:15 3:30	0	0	0	0	0	0	0
3:30 3:45	0	0	0	0	0	0	0
3:45 4:00	0	0	0	0	1	1	1
4:00 4:15	0	0	0	0	0	0	0
4:15 4:30	0	0	0	0	0	0	0
4:30 4:45	0	0	0	0	0	0	0
4:45 5:00	0	0	0	0	0	0	0
5:00 5:15	0	0	0	0	0	0	0
5:15 5:30	0	0	0	0	0	0	0
5:30 5:45	0	0	0	0	1	1	1
5:45 6:00	0	0	0	0	0	0	0
6:00 6:15	0	0	0	0	0	0	0
6:15 6:30	0	0	0	0	0	0	0
6:30 6:45	0	0	0	0	0	0	0
6:45 7:00	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
TOTAL	0	0	0	1	2	3	3

Appendix F: Sample Commuter Parking Lease

Appendix F: Sample Commuter Parking Lease

SAMPLE LEASE AGREEMENT BETWEEN
(OWNER) AND THE (TOWNSHIP/BOROUGH/CITY) OF _____
FOR A PORTION OF (OWNER/BUSINESS TENANT) PARKING LOT FOR COMMUTER AREA

This Lease Agreement ("Lease") is made this ____ day of _____, 200__ between(Owner) with an office located at _____, _____, _____ (hereinafter "_____") and the Township/Borough/City of _____, a Municipal Corporation of the State of New Jersey, with an office located at _____, _____, New Jersey (hereinafter "(Municipality)").

(Owner) hereby leases (on a non-exclusive basis) to the (Municipality) of the Demised Premises in consideration of the rents to be paid and the covenants and other good and valuable consideration contained herein. (Owner) and the (Municipality) hereby agree as follows:

1. **DEMISED PREMISES:**
   The area of the existing (Owner/Business Tenant) parking lot (Block ____ Lot ____)located in the _____ corner, consisting of approximately ____ stalls more particularly as shown on Exhibit A attached hereto and made part hereof (hereinafter "Demised Premises").

2. **TERM:**
   The term of the Lease shall be for a period of one (1) year commencing on _____, 200___ and terminating on _____, 200__. This lease shall automatically continued and be renewed by successive terms of one (1) month (unless terminated by either party by providing thirty (30) days written notice).

3. **USE/OPERATING PERIOD:**
   (a)The Demised Premises may only be used for the parking of motor vehicles under the supervision and auspices of the (Municipality) for train station commuters. At the benefit of (Owner), the (Municipality) shall paint the lines of the parking stalls within the Demised Premises in yellow paint to differentiate them from the parking stalls not within the Demised Premises. The (Municipality) will install and maintain appropriate signs to direct traffic flow, parking and days of operation so as not to interfere with the operation of the (Owner/Business Tenant) business. The (Municipality) will obtain the approval of the owner in writing prior to the fabrication and installation of any signs or pavement markings, as to their type and location. [The (Municipality) shall also have the right to pick up and drop off occupants of said vehicles by use of a small shuttle bus or van] (Optional).

(b)The (Municipality's) use of the Demised Premises shall be limited to the period of time between the hours of 6:00 A.M. through 10:00 P.M. Monday through Friday. Notwithstanding anything to the contrary contained herein, the (Municipality) acknowledges that customers of (Owner/Business Tenant) may park in the parking stalls located within the Demised Premises.

4. RENT:

(a) Rental Schedule: $_____ per year; payable $_____ on _____, _____, _____, _____. ***(suggest quarterly)***

(b) Place of Payment: (Owner)

5. SURRENDER OF DEMISED PREMISES ON EXPIRATION DATE:

On the expiration date of this Lease or the last automatically renewed one month term, the (Municipality) shall quit and surrender the Demised Premises in the same condition as received. Upon or prior to surrender, the (Municipality) shall repair, at its sole cost, any damage to the Demised Premises except for the normal wear and tear and remove all signs and other markings put up by (Municipality).

6. INDEMNIFICATION:

The (Municipality) shall be responsible for maintenance and policing of the Demised Premises, including ice control, snow removal, customary mechanical sweeping or debris policing. The (Municipality) has inspected the Demised Premises and has found that it is in suitable condition for the intended use as a parking lot for commuters. The (Municipality) agrees to defend, save harmless and indemnify (Owner/Business Tenant) and its agents and employees from any action, claims, expenses and/or liability resulting from the use of the Demised Premises by the (Municipality) or patrons or vehicles of the commuter lot under this lease.

7. TERMINATION BY THE PARTIES:

Either party may terminate this lease upon thirty (30) days written notice at the end the term or thereafter.

8. NOTICE:

All notices required by this Lease shall be sent by certified letter, return receipt requested, to the parties at the address listed below, unless either party shall inform the other party in writing of any change in designated parties or addresses:

Appendix F: Sample Commuter Parking Lease

Owner:

Municipality:

9. ENTIRE AGREEMENT AND SEVERABILITY:
This Lease embodies the entire agreement between the parties. It may not be modified or terminated except as provided herein. If any provision is invalid, it shall be considered deleted herefrom and shall not invalidate the remaining provisions. This lease may be modified only by written agreement of the parties.

10. INSURANCE:
The (Municipality) shall provide the following insurance coverage through its self-insurance program during the term of this lease covering the Demised Premises:

(a) Workers' Compensation Insurance covering all costs, statutory benefits and liabilities under State Workers' Compensation and similar laws for employees of the (Municipality) with a waiver of subrogation in favor of (Owner), and Employer's Liability Insurance with limits of $_____ per accident or disease. In addition, the (Municipality) agrees to require and warrants that all contractors hired by the (Municipality) will maintain the same Workers' Compensation Insurance and Employer's Liability Insurance for such contractor's employees and will require all subcontractors to maintain such insurance and the (Municipality) agrees to indemnify, defend and hold (Owner) harmless from any loss, injury, damage or liability which the (Municipality) may suffer as a result of any such contractor or subcontractor failing to maintain such insurance.

(b) Commercial General Liability Insurance covering the (Municipality's) operations on the Demised presides with coverage premises/operations, products/completed operations, contractual liability and personal/advertising injury liability with combined single limits of $_____.00 per occurrence for bodily injury, and property damage, including Landlord as an additional insured.

(c) Motor Vehicle Liability Insurance with coverage for all owned, non-owned and hired vehicles with combined single limits of liability of $_____ per occurrence for bodily injury and property damage.

11. DEFAULT:

(a)If the rent herein provided for, or any part thereof, to be paid by the (Municipality) pursuant to this lease shall be unpaid on the date when due and remain so for a period of ten (10) days after Owner shall have given to the (Municipality) written notice of such default, then Owner shall have all rights and remedies available to Owner at law or in equity. Should the term of this lease at any time be terminated under the terms and conditions hereof, or in any other way, the (Municipality) hereby covenants and agrees to surrender and deliver up the Demised Premises peaceably to Owner immediately upon the termination of the term hereof.

(b)If the (Municipality) shall be in default in performing any of the terms or provisions of this lease other than the provision requiring the payment of rent and Landlord shall give to the (Municipality) notice of such default, and if the (Municipality) shall fail to cure such default within thirty (30) days after service of such notice, or if the default is of such character as reasonably to require more than thirty (30) days to cure, and the (Municipality) shall fail to commence to cure the same within such period or shall fail to use reasonable diligence in curing such default after service of such notice, then and in any such event (Owner) may cure such default for the account of and at the cost and expense of the (Municipality), and the full amount so expended (Owner) shall be immediately be owing by the (Municipality) to (Owner), together with interest at ten percent (10%).

12. ASSIGNMENT AND SUBLETTING:

The (Municipality) shall not assign this Lease or sublet the Demised Premises.

Appendix F: Sample Commuter Parking Lease

IN WITNESS WHEREOF, the parties hereto have caused this Lease to be duly executed and to be effective on the date first above written.

ATTEST: OWNER

BY: _____

DATED: _____

ATTEST: (TOWNSHIP/BOROUGH/CITY) OF _____ WITNESS:

BY: _____ _____

_____, _____

Mayor Municipal Clerk

DATED: _____

Publication Title:	Paoli Station Intermodal Access and Parking Study
Publication Number:	09078
Date Published:	2009
Geographic Area Covered:	Tredyffrin and Willistown Townships, Chester County, PA
Key Words:	Paoli Transportation Center, Paoli Station, R5, SEPTA, Amtrak, brownfield, transit-oriented development, redevelopment, intermodal access, parking, park-and-ride, kiss-and-ride, shuttle, bus, train, pedestrian, bicycle, safety

Abstract:

The *Paoli Station Intermodal Access and Parking Study* presents the findings obtained through research conducted as part of the Delaware Valley Regional Planning Commission's (DVRPC) Paoli Transportation Center Planning Assistance – Phase 2 initiative. The main contribution of the study is an inventory and assessment of access modes which currently arrive, park, idle, and/or leave Paoli Station, which provides access to SEPTA Regional Rail and Amtrak service. Evaluated modes include drive/park, kiss-and-ride, bus, shuttle, bicycle, and pedestrian. Also as part of this study, DVRPC evaluated issues of parking management and identified potential improvements to the current station and future station area.

Staff Contact:

Evangeline Linkous
Planning Analyst
☏ (215) 238-2865
elinkous@dvrpc.org

Delaware Valley Regional Planning Commission
190 N. Independence Mall West, 8th Floor
Philadelphia PA 19106
Phone: (215) 592-1800
Fax: (215) 592-9125
Internet: www.dvrpc.org


DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION