INCREASING INTERMODAL ACCESS TO TRANSIT

PHASE IV

Delaware Valley Regional Planning Commission

2007

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty, and intercity agency that provides continuing, comprehensive, and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.

The DVRPC logo is adapted from the official seal of the Commission 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 flowing through it. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey. The logo combines these elements to depict the areas served by DVRPC.

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 this report's findings and conclusions, which may not represent the official views of policies of the funding agencies.

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Note: Unless otherwise indicated, all photos in this report were taken between September 2006 and December 2006 by Gregory R. Krykewycz, PP, AICP.

EXECUTIVE SUMMARY

Phase IV of a DVRPC's *Increasing Intermodal Access to Transit* project examined five stations (four in Pennsylvania and one in New Jersey). Erie Station along the Broad Street Subway (Philadelphia) was selected because it would complement other planning activities undertaken by the City Planning Commission and DVRPC. Atco Station along New Jersey Transit's Atlantic City Line was selected due to local interest in exploring Transit Village concepts and a desire for enhanced connectivity in the area of the station. The three remaining stations (Bryn Mawr, Fox Chase, and Glenside in the SEPTA Regional Rail system) were selected based on their high passenger volumes and higher-than-usual level of non-park-and-ride access.

Each station was analyzed using Bicycle Level of Service (BLOS) and Pedestrian Level of Service (PLOS) models. These models score road segments based on their physical attributes, as well as on the intensities of their vehicular traffic. The use of these models resulted in a summary of the nonmotorized compatibility of individual road segments, which was supplemented by a qualitative examination of access conditions in the immediate vicinity of each station. A summary of recommended improvements/enhancements was prepared for each station, noting strategies that would address specific problem areas.

In general terms, Phase IV analysis found that:

- Pedestrian Level of Service (PLOS) scores were higher for the more urban, walkable locations studied (Erie, Fox Chase, and Glenside), reflecting the more widespread presence of sidewalks and other pedestrian amenities. Additionally, grid-based street networks surrounding these stations deconcentrated automobile traffic, resulting in lower traffic intensities for individual segments.

- Pedestrian Level of Service (PLOS) scores were higher overall than Bicycle Level of Service (BLOS) scores. This is largely because BLOS scores reflect conditions within the roadway that cannot be improved through the provision of sidewalks and where the provision of physical buffering (either through physical buffers or dedicated space) is much more problematic.

- In several cases (Atco, Fox Chase, and Glenside), rights-of-way were available or informal paths were apparent to accommodate dedicated bike/ped station access. Where such routes can be fully improved, they can have tremendous benefits in terms of nonmotorized connectivity (assuming connecting roadways are also accommodating to bicyclists and pedestrians). See Table 20 for a summary of recommendations by station area.

INTRODUCTION

This report is Phase IV in a continuing program to assess the accessibility of transit stations for pedestrians and bicyclists and to promote strategies and improvements that would improve this accessibility. Phase III, published last year (DVRPC Publication No. 06011), employed the statistically-calibrated Bicycle Level of Service (BLOS) and Pedestrian Level of Service (PLOS) models. These models were developed by Bruce W. Landis, in collaboration with the Tampa and Miami MPOs as well as the Florida DOT, as tools to assess and compare accessibility by non-motorized modes. Phase IV continues the application of these tools over additional transit station areas – four in Pennsylvania and one in New Jersey.

In employing these tools for analysis, data for a road segment that influence pedestrian and bicyclist comfort, such as the volume and speed of auto traffic and the presence and quality of sidewalks and buffers, are collected and used as inputs for the BLOS and PLOS 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 the project 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 are originating within a comfortable distance. Accordingly, pedestrian LOS is assessed within one-quarter-mile of each transit station studied (typically defined as the five-minute walk / 'pedestrian shed'), and bicycle LOS within one mile of each station. At the quarter-mile radius, every road segment is evaluated and assigned a PLOS score. Major roadways, typically collector and arterial routes, are evaluated for bicycle LOS at the one-mile radius.

The resulting LOS scores, in combination with a qualitative evaluation of existing pedestrian and bicycle-related amenities in the immediate vicinity of stations studied, informs recommendations for targeted improvements that would positively impact nonmotorized accessibility.

Method and data assumptions

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.

Specifically, the data collected to inform BLOS scoring 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 counter intuitively, 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'), which are recommended in various portions of this report. For details on sharrows, see Appendix A.

It should also 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 contrast, 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

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. An example where another value was input for one of these factors was in the case of a designated truck bypass route, where the proportion of heavy vehicle traffic was assumed to be roughly 20% as opposed to the 2% assumed for typical roadways.

Data for each of these factors were input, resulting in a numerical LOS score that corresponds with a range of letter grades. Table 1 (below) depicts the LOS score ranges associated with each LOS grade.

Table 1: PLOS and BLOS Scoring Standards

Numeric LOS Score	LOS Grade
< 1.5	A
> 1.5 and < 2.5	B
> 2.5 and < 3.5	C
> 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 input 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 quarter-mile radius and informed by GIS data at the one-mile radius for major roadways (verified and supplemented by aerial photography).

In the case of traffic volumes, where actual field-counted AADTs were not available for a given roadway segment, calibration runs of the DVRPC traffic simulation model were used to roughly estimate typical volumes. Volumes for roadways not included in the DVRPC model were estimated based on counts or modeled values for comparable roadways in the immediate vicinity.

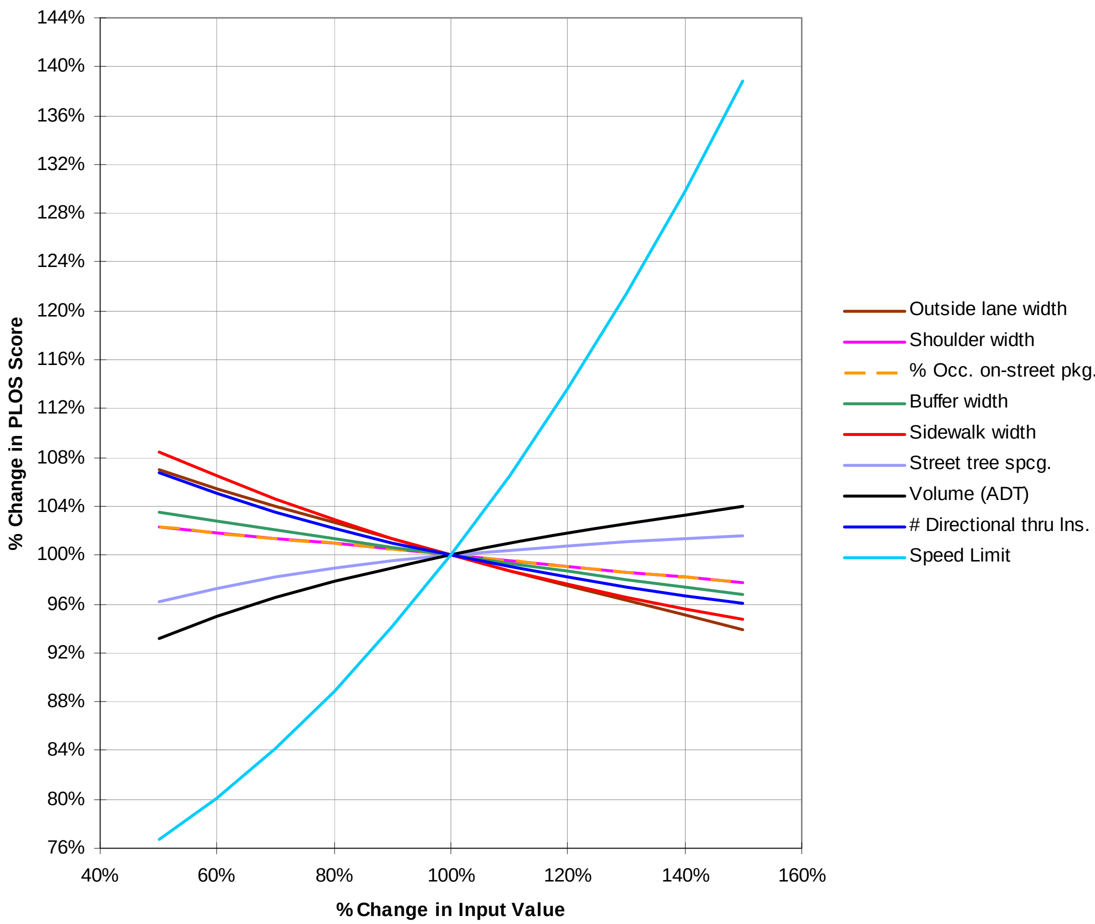
Sensitivity Analysis for PLOS and BLOS models

The relative impacts of each input characteristic on PLOS and BLOS scores was 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 Chart 1 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.

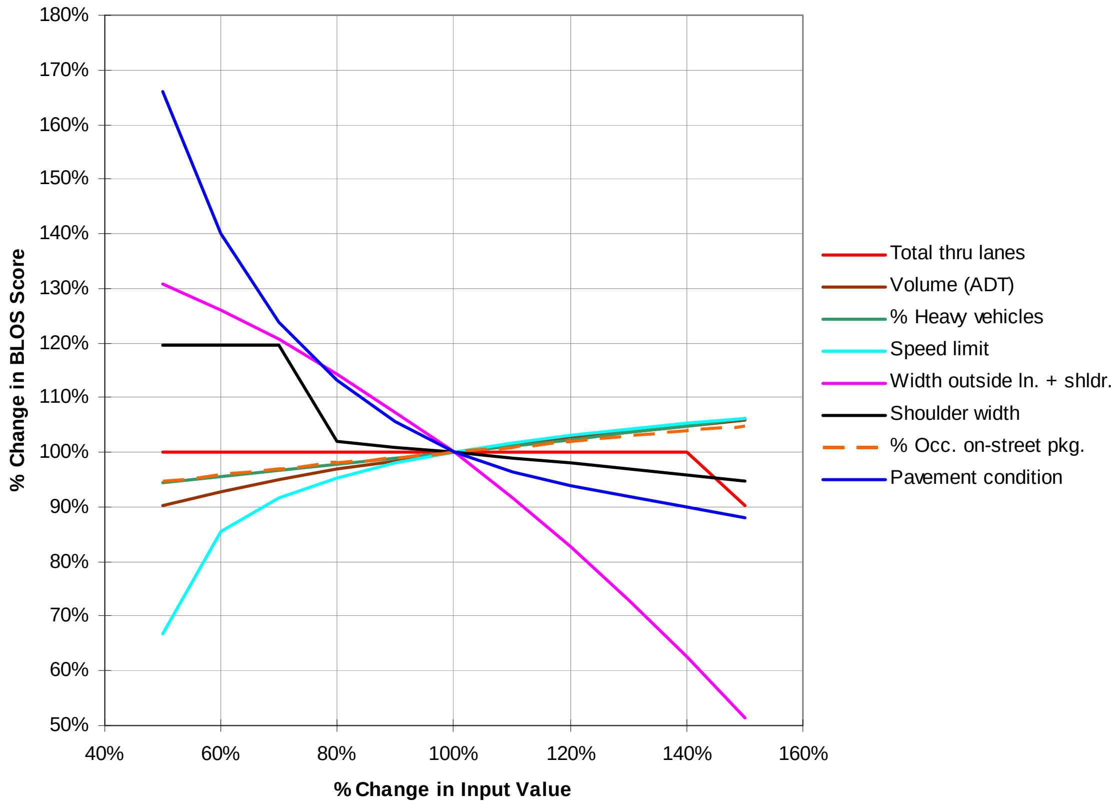
Chart 1: PLOS Sensitivity Analysis



Source: DVRPC, 2007

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 FHWA's 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 Chart 2 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.

Chart 2: BLOS Sensitivity Analysis



Source: DVRPC, 2007

Station selection method

As previously noted, this report evaluates pedestrian and bicycle accessibility for five rail stations in the region – four in Pennsylvania and one in New Jersey. Two stations (Atco and Erie Stations) were selected for study based on the ability for the analyses to contribute to other local planning projects. The three remaining stations were selected based on the notion that any eventual improvements intended to improve pedestrian/bicycle access should be targeted where surrounding land uses may be expected to generate the highest number of discretionary bikers/pedestrians.

Specifically, we aimed to identify stations that had high overall usage and a high non-park-and-ride component. To this end, the top-10 SEPTA Regional Rail stations in terms of weekday boards were examined based on the proportion of boards to occupied parking stalls: a station with a large number of boards but relatively few occupied stalls likely has a noteworthy bikeup/walkup ridership component. Table 2 (below) summarizes the results of this evaluation.

Table 2: Ratio of Average Weekday Boards to Occupied Parking Stalls, Top-10 SEPTA Stations for Weekday Ridership*

Station	2005 Weekday Boards	Total Daily Occupied Parking Stalls	Proportion of Weekday Boards to Occupied Stalls
1. Bryn Mawr	**956**	**155**	**6.17**
2. Glenside	**940**	**256**	**3.67**
3. Fox Chase	**1,150**	**340**	**3.38**
4. Torresdale	917	325	2.82
5. Jenkintown-Wyncote	1,489	533	2.79
6. Paoli	1,214	480	2.53
7. Lansdale	1,076	461	2.33
8. Ambler	996	551	1.81
9. Fern Rock TC	928	718	1.29
10. Cornwells Heights	1,152	980	1.18

Source: SEPTA 2005 Ridership Census, May/Sep. 2005 SEPTA Parking Operations Lot Utilization Survey. *After Center City stations, Temple University, University City, and Trenton.

The stations bolded were those selected for study in Phase IV (in addition to Atco and Erie Stations, which were selected based on relevance to other local and regional planning activities). Table 3 (below) summarizes the five stations selected for Phase IV study.

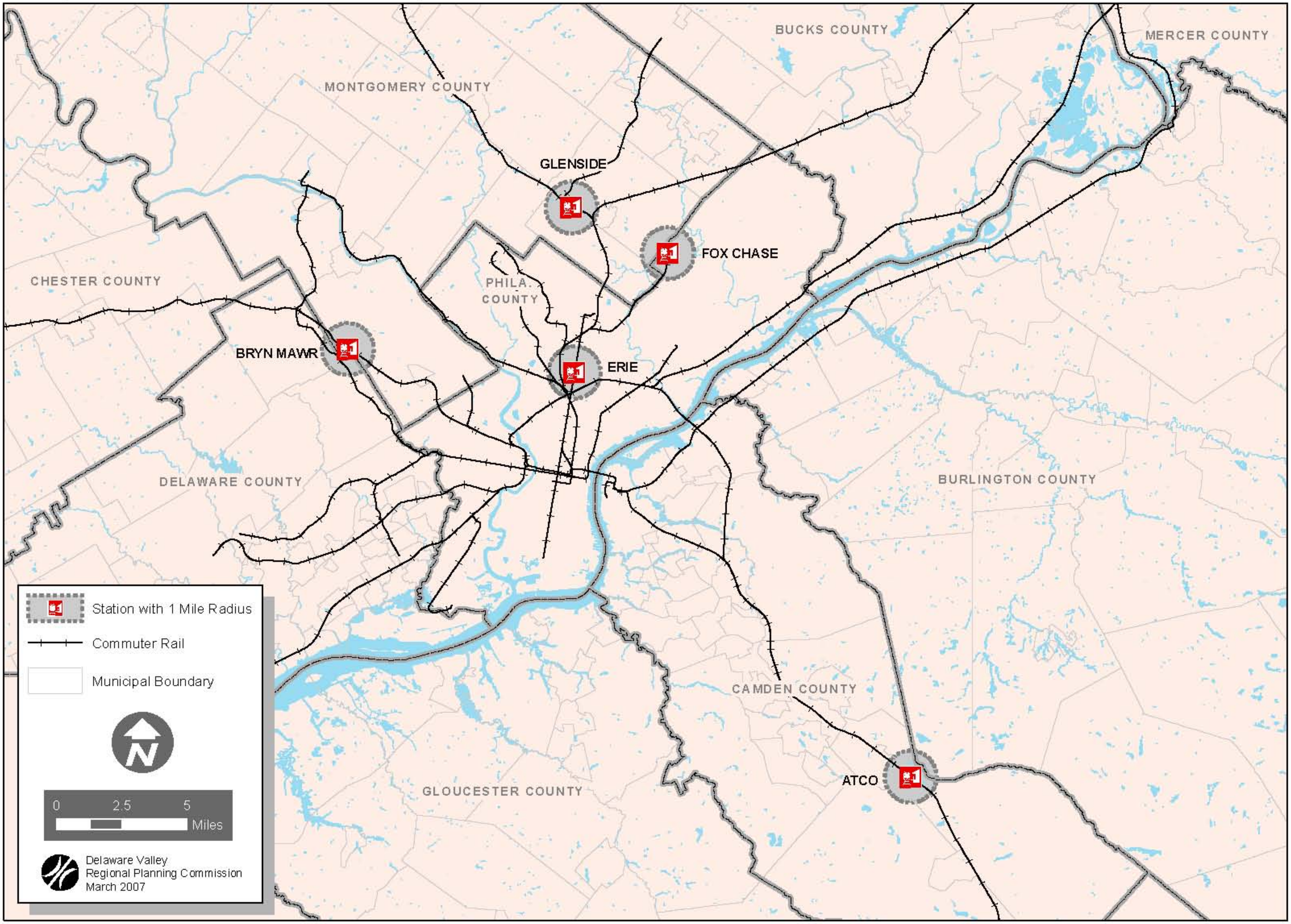
Table 3: Stations Selected for Phase IV Study

Station	Line	County
Atco	NJ Transit Atlantic City Line	Camden
Bryn Mawr	SEPTA R5	Montgomery
Erie	Broad Street Subway	Philadelphia
Fox Chase	SEPTA R8	Philadelphia
Glenside	SEPTA R1, R2, R5	Montgomery

Source: DVRPC, 2007.

Map 1 depicts the five station areas examined in Phase IV, as well as their relative locations in the region. The following sections contain the study results for each station area, presented in the same order as in Table 3.

Map 1: Phase IV Station Study Areas



ATCO STATION

Introduction/summary

Atco Station is located in the Atco section of Waterford Township, New Jersey. It provides access to New Jersey Transit's Atlantic City Line, which connects Atlantic City to Philadelphia. The study area is made up of primarily wooded land, but there is also a fair amount of single-family detached and commercial development, as well as some industrial land. The station is accessible by automobile from two major roads, Route 73 and U.S. Route 30, although access to and from Route 73 is limited to the northbound direction.

The PLOS study went beyond the quarter-mile radius of other stations studied to include roads that provided direct access to the station or would feed into a proposed bike/ped access path. The BLOS study focused not only on major roads in the study area, but also those that provided direct access to the station. Due to large cartway widths and an overall lack of sidewalks, streets throughout the study area generally scored poorly for pedestrian LOS, with only one road receiving a grade of 'B.' Conditions for bicyclists were quite uneven: two roads in the study area received grades of 'A,' but there were several grades below 'C' as well.

Transit service summary

Atco Station is served by New Jersey Transit's Atlantic City Line, which makes 14 daily runs each way between Atlantic City and Philadelphia's 30th Street station. According to New Jersey Transit's Quarterly Ridership Trends Report for the fourth quarter of 2006, the average number of weekday passenger boardings for Atco Station is 170.

Station area land use

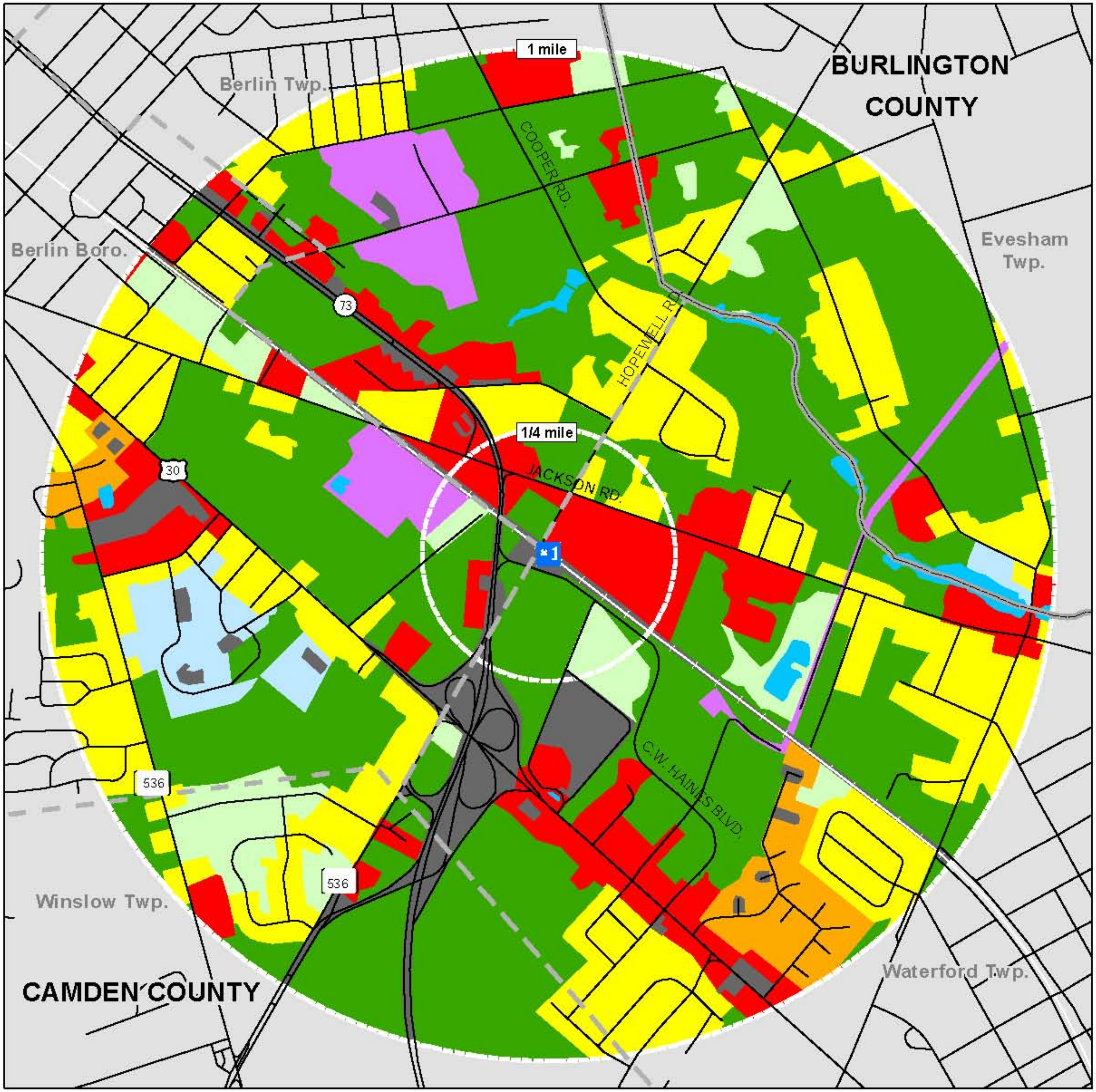
As illustrated in Table 4 and Map 2 below, undeveloped green or wooded land uses are the most frequently occurring in the study area, representing almost half of the total land coverage. Detached residential uses occur frequently outside the immediate station area, while commercial uses are present along Jackson Road and Route 30. Table 2 indicates the relative proportion of land uses occurring within one mile of the station, from the highest proportion to the lowest. Map 2 illustrates these land uses at the same radius.

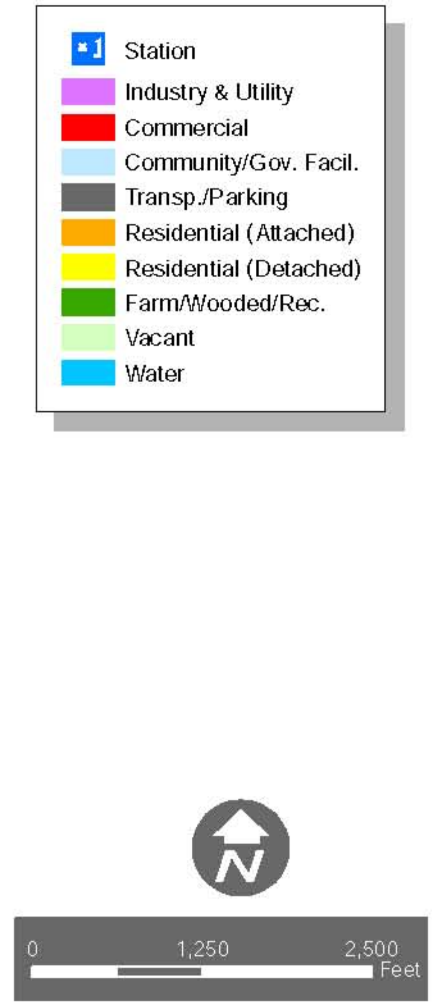
Table 4: Atco Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Farm/Wooded/Rec.	912.3	45.4%
Residential (Detached)	457.2	22.7%
Commercial	228.5	11.4%
Transportation & Parking	122.9	6.1%
Vacant	101.1	5.0%
Industry & Utility	74.1	3.7%
Residential (Attached)	51.5	2.6%
Community Services	43.9	2.2%
TOTAL	1,991.5	100.0%

Source: DVRPC land use, 2000.

Map 2: Atco Station Area Land Use (2000)





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Pedestrian LOS results and summary

Table 5 below contains the PLOS scores calculated for road segments within one mile of Atco Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 3. Two unnamed driveways have been assigned numbers for reference purposes (see Map 3).

Table 5: Atco Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Collings Ave.	West of Hopewell Rd.	3.13	C
Cooper Rd.	West of Hopewell Rd.	3.57	D
Driveway 1	Route 30 to C.W. Haines Blvd.	3.40	C
C.W. Haines Blvd.	Route 30 to Route 73	3.10	C
Driveway 2	Driveway 1 to Route 30	3.32	C
Hopewell Rd.	Jackson Rd. to 350 ft. N. of Jackson Rd.	4.32	D
Hopewell Rd.	350 ft. N. of Jackson to Collings Ave.	4.09	D
Hopewell Rd.	N. of Collings Ave.	4.58	D
Jackson Rd.	East of Hopewell Rd.	4.84	E
Joyce St.	East of Hopewell Rd.	2.08	B

Source: DVRPC field work and model output, 2006.

<u>Highest PLOS scoring:</u>
As depicted in Table 5, many study area road segments score similarly poorly for pedestrian LOS. This can largely be explained by a complete lack of sidewalks and on-street parking. Only Joyce Street scored above a ‘C’ (2.08; LOS ‘B’), being the only street in the study area that had sidewalks and on-street parking. However, in order to reach the station from Joyce Street, a pedestrian would need to walk along roadways with less favorable conditions (and eventually reach the north side of the station, which has no direct access).

<u>Lowest PLOS scoring:</u>
The lowest PLOS score in the study area occurred for Jackson Street east of Hopewell Road (4.84; LOS ‘E’). Like most of the other streets in the study area, this segment lacked sidewalks, and this, coupled with relatively high vehicular intensity and the highest posted speed limit in the study area, made for an unfriendly pedestrian environment.

Map 3: Atco Station Area PLOS Scores (1/2-Mile Radius)

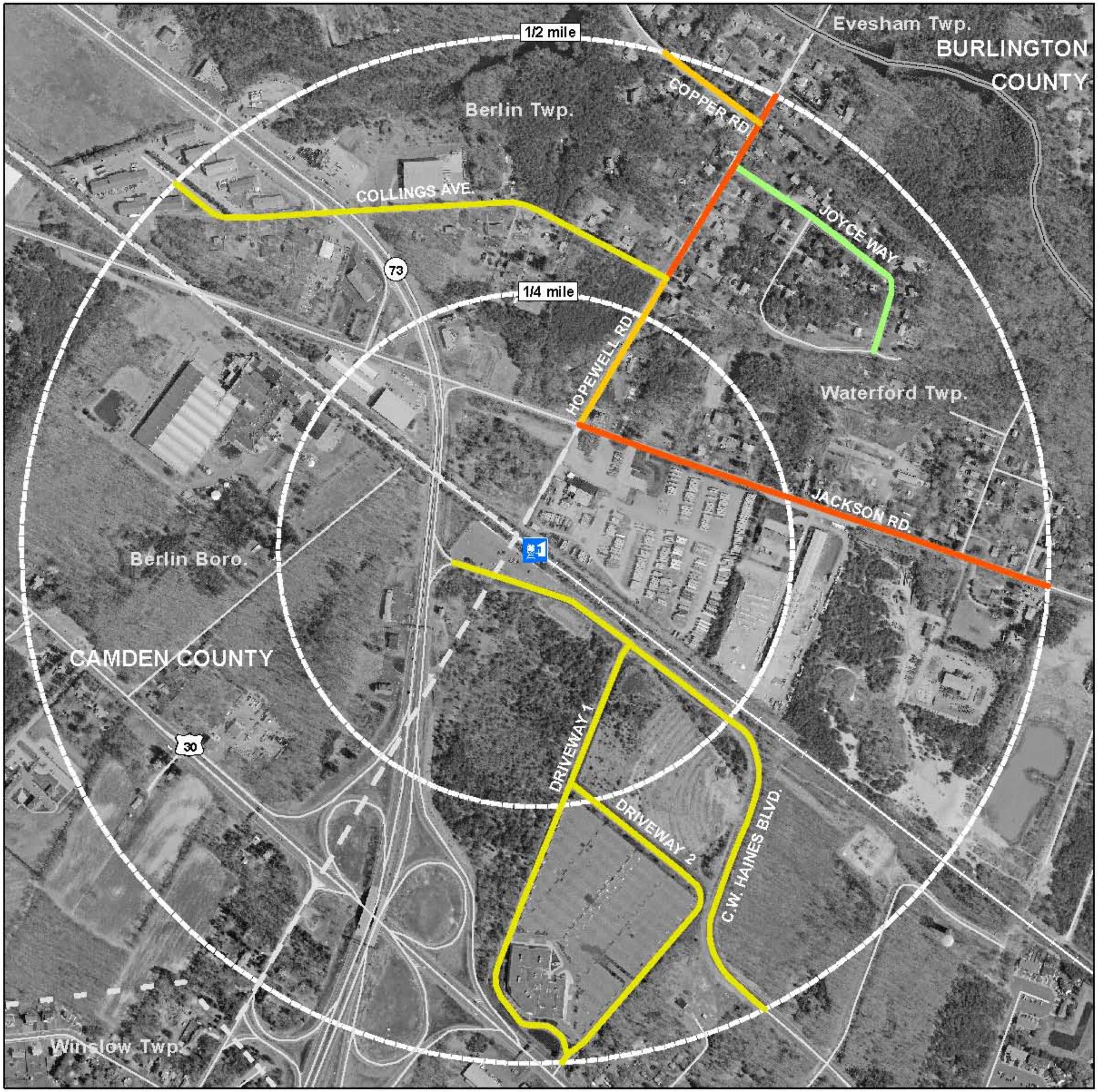

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Bicycle LOS results and summary

Table 6 below contains the BLOS scores calculated for road segments within one mile of Atco Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 4.

Table 6: Atco Station Area BLOS Summary

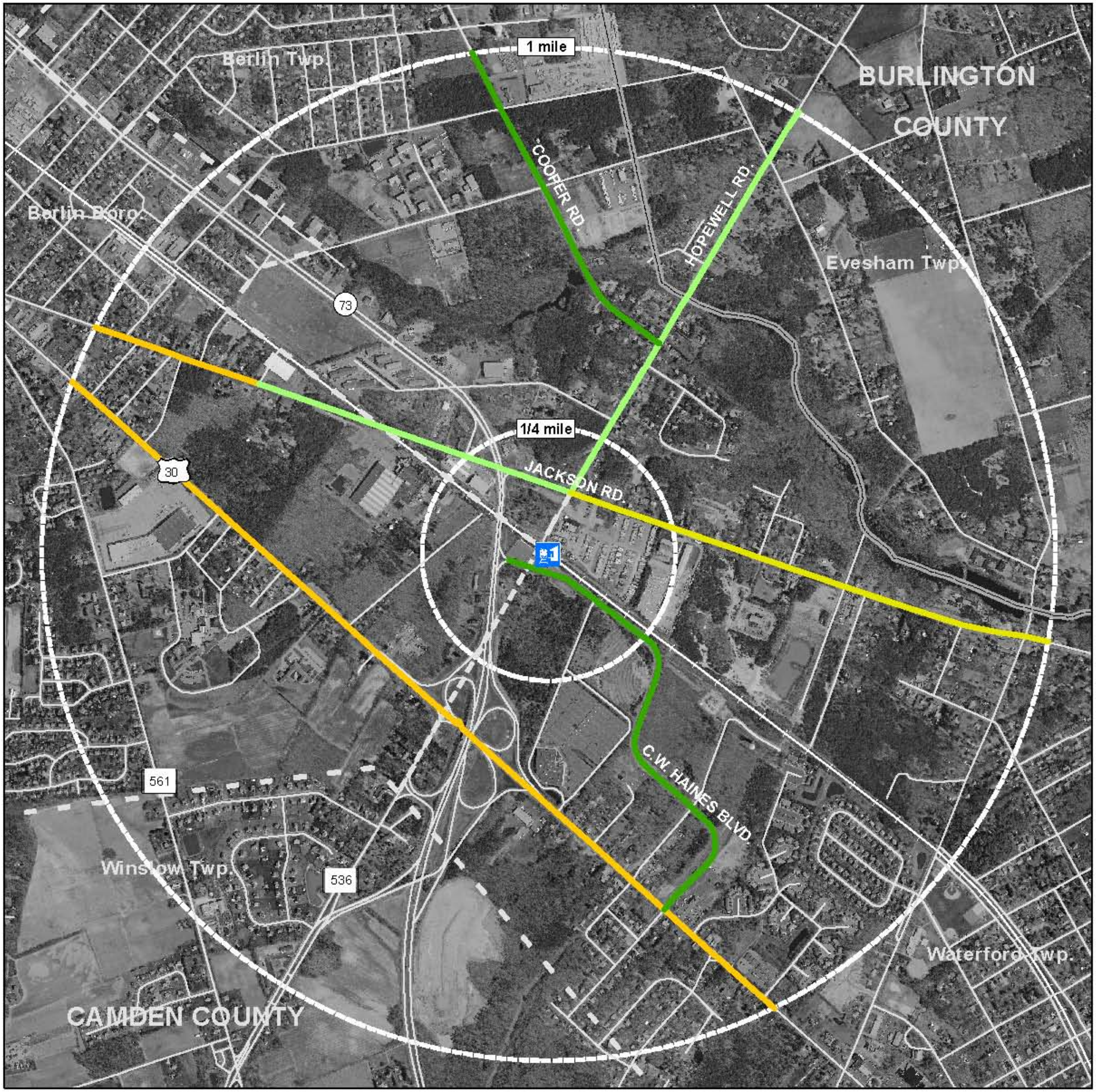
Road Segment	Location	BLOS Score	BLOS Grade
Cooper Rd.	West of Hopewell Rd.	1.43	A
C.W. Haines Blvd.	Route 73 to Route 30	0.00	A
Jackson Rd.	Route 73 to Johnny Boy Ln.	2.31	B
Jackson Rd.	Johnny Boy Ln. to Marshall Ave.	4.14	D
Jackson Rd.	Route 73 to Hopewell Rd.	2.31	B
Jackson Rd.	East of Hopewell Rd.	3.38	C
Route 30	West of Route 73	4.08	D
Route 30	East of Route 73	4.11	D

Source: DVRPC field work and model output, 2006.

Highest BLOS scoring:
As summarized in Table 6, BLOS scores are quite varied for this study area. There were two grades of 'A,' the highest score being for C.W. Haines Boulevard, which connects Routes 30 and 73 and directly accesses the station (0.00; LOS 'A'). The second grade of 'A' was for Cooper Road west of Hopewell Road (1.43; 'A'). These segments had much lower traffic intensity than the other roads in the study, along with passable shoulders.

Lowest BLOS scoring:
Three roads in the study area received BLOS scores of 'D.' These were Route 30 east and west of Route 73 and a western segment of Jackson Road that stretches from Johnny Boy Lane to Marshall Avenue. These roads are all poor in terms of bicycle compatibility because of high posted speed limits and vehicular intensities.

Map 4: Atco Station Area BLOS Scores (1-Mile Radius)



Bicycle Level of Service

- A
- B
- C
- D
- E
- F
- Station

0 1,250 2,500 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Conditions for pedestrians/bicyclists in the immediate station vicinity

One factor that bears noting is that the station area's residential uses are fairly dispersed, with very few located within the traditional quarter-mile pedestrian shed. Accordingly, even in the best of conditions and with no substantial barriers, the distance would represent a barrier in itself (at least for pedestrians). This factor makes any additional barriers, as are present in the case of Atco Station, all the more problematic. The first substantial barrier is that access from streets in the entire southwestern portion of the study area is impaired by the presence of Routes 30 and especially 73. The second barrier is that there is presently no way to reach the station platform from the north side of the station, causing any pedestrian or cyclist wishing to access the station from the north to loop around to the east/west, nearly a mile in each direction, or otherwise cross the tracks unsafely.

In addition to these specific access impediments, the PLOS and BLOS analyses found that the majority of access routes score poorly for both modes. For example, a major issue for pedestrians is that only one of the road segments in the study area has sidewalks. Even if a means of access from the north were provided, the lack of sidewalks along Hopewell Rd. would nonetheless make access extremely difficult.

C.W. Haines Boulevard connects Routes 30 and 73, and in so doing provides direct station access from a sizable (and growing) area of residential development to the southeast of the station. This roadway is presently very favorable for bicycle travel (having the highest possible BLOS score), but less favorable for pedestrians due to its lack of sidewalks, which forces pedestrians to walk in the street.

Atco station viewed from the parking lot south of the platform.

A pedestrian approaches Atco Station along C.W. Haines Boulevard. A lack of sidewalks throughout the study area hinders access by pedestrians.

Suggested improvements to enhance pedestrian/bicyclist accessibility

Atco Station's most pressing need in the context of this study is a safe way for cyclists and pedestrians to get from one side of the tracks to the other (in short, enabling station access for all modes from the north). As is evident from the worn path in the photograph below, pedestrians appear to be crossing the tracks in order to get from one side to another, creating a hazardous situation. As documented by Waterford Township, there is evidence of an abandoned Taunton Road underpass beneath the rail line just west of the station platform. Taunton Road presently exists as a dirt path to the north of the station, connecting the platform area to Jackson Road. Planners have proposed the improvement of this path as a new station access route from the north, connecting with Jackson Road, which would include bicycle and pedestrian access. Combined with this new multimodal access route, reopening the underpass would significantly enhance station access from the north.

The lack of an underpass forces pedestrians to find other, more dangerous ways of crossing over the tracks. This worn path on the southern side of the tracks is evidence.

Taunton Rd. right-of-way viewed from station platform (fence in foreground).

However, in order to accommodate safe bicycle and pedestrian access to the proposed access route and underpass, sidewalks and/or bicycle lanes would have to be added along streets that would feed into the walkway, most importantly to Jackson and Hopewell Roads. The photosimulation on page 16 depicts the current appearance of the former Taunton Road underpass and platform area viewed from the vicinity of Jackson Road, as well as a conceptual illustration of the new multimodal access route, including a proposed parking area.

Another notable deficiency is the lack of pedestrian access from developed residential sections to the southeast of the station. As previously noted, C.W. Haines Boulevard has no sidewalks; these should be added along one or both sides.

Atco Station is a proposed candidate for the “Transit Village” program, a New Jersey DOT and NJ Transit program that promotes transit-supportive growth around transit stations. Transit Villages are given priority consideration from the New Jersey Department of Transportation’s Local Aid for Centers program, Transportation Enhancements program, and New Jersey bicycle and pedestrian initiatives. Atco, being in a Pinelands Regional Growth Area, may be a good candidate for this program due to the availability of several vacant parcels of substantial size. A Transit Village designation could open additional planning and funding avenues to enhance bicycle and pedestrian travel in the station area and encourage development that would benefit from transit proximity.

Top: Current appearance of abandoned Taunton Road underpass; *Bottom:* Conceptual illustration of the proposed access road, multipurpose nonmotorized pathway, and underpass accessing the station platform.

Relevant aspects of regional and state bicycle and pedestrian plans

The New Jersey Statewide Bicycle and Pedestrian Plan (2004) identifies Routes 30 and 73, both of which bisect the station study area, as priority bicycle links. Route 30 is also identified as a medium priority pedestrian link. For a summary of this plan, see Appendix B.

BRYN MAWR STATION

Introduction/summary

Bryn Mawr Station is located near the boundary of Delaware and Montgomery Counties, roughly 20 miles outside Philadelphia, on Morris Avenue near Bryn Mawr Avenue. Bryn Mawr is an older suburb, with commercial development centered around the train station on Lancaster Avenue. Its street network is typically interconnected and has sidewalks, which translates into many of the street segments in the quarter-mile study area having favorable pedestrian LOS grades of 'B.'

The scores for bicycle LOS were not as favorable. Most of the road segments received grades of 'C' or lower, and more than half of the segments received grades of 'D' or 'E.' Scores for some of these roads were impaired by high vehicular intensities and speed limits in excess of 30 MPH, making it less safe for bicyclists in the area.

Transit service summary

Bryn Mawr Station is served by SEPTA's R5 Regional Rail line, which runs from Center City Philadelphia to Thorndale. According to SEPTA's 2005 Regional Rail Ridership Census, a weekday average of 800 riders board the train at Bryn Mawr every day, making it the second busiest station on the R5 line. Bryn Mawr is also served by the Route 100 high-speed line at a nearby facility, providing access to the Norristown Transportation Center and Center City by way of a transfer to the Market-Frankford Line at 69th Street Terminal.

Station area land use

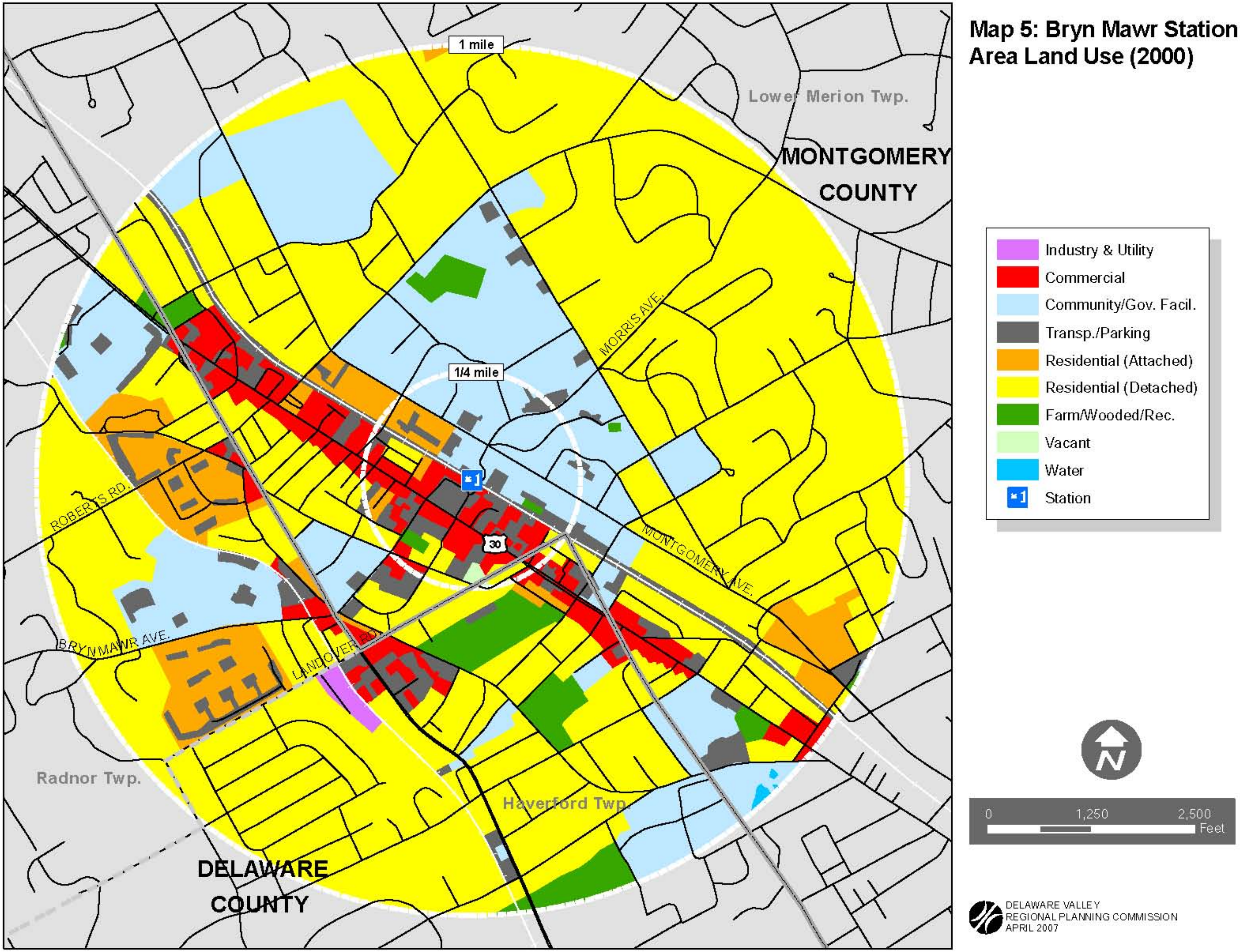
As illustrated in Table 7 and Map 5 below, single-family detached residences are the predominant form of land use in the study area. There is, however, little residential land use within the quarter-mile radius. Most of that area is comprised of commercial uses. The Bryn Mawr station area also includes a high concentration of community/government land uses, due to the presence of Bryn Mawr College and several other schools to the north of Montgomery Avenue (as well as other public uses, including a hospital and library, within the study area). The various schools in the station vicinity are particularly significant in terms of generating bicycle and pedestrian traffic.

Table 7: Bryn Mawr Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	1,221.4	60.6%
Community & Government Facilities	387.1	19.2%
Transp./Parking	123.9	6.2%
Residential (Attached)	113.4	5.6%
Commercial	100.3	5.0%
Recreation	59.8	3.0%
Total	2,005.9	100%

Source: DVRPC land use, 2000.

Map 5: Bryn Mawr Station Area Land Use (2000)



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Pedestrian LOS results and summary

Table 8 below contains the PLOS scores calculated for road segments within one-quarter mile of Bryn Mawr Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 6.

Table 8: Bryn Mawr Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Bryn Mawr Ave.	Abutting station	1.44	A
Bryn Mawr Ave.	North of Route 30	1.69	B
Bryn Mawr Ave.	South of Route 30	2.04	B
Central Ave.	South of Lancaster Ave.	1.97	B
County Line Rd.	South of Old Lancaster Rd.	3.78	D
Dayton Rd.	East of Old Lancaster Rd.	1.80	B
Elliot Ave.	Route 30 to Old Lancaster Rd.	2.42	B
Lancaster Ave.	Bryn Mawr Ave. to Morton Rd.	2.58	C
Lancaster Ave.	West of Morton Rd.	2.05	B
Lancaster Ave.	Bryn Mawr Ave. to Morris Rd.	2.69	C
Lancaster Ave.	East of Morris Ave.	2.54	C
Lee Ave.	North of Lancaster Ave.	1.87	B
Merion Rd.	South of Montgomery Ave.	1.65	B
Merion Rd.	Morton Rd. to Lancaster Ave.	2.03	B
Montgomery Ave.	Entire length	2.72	C
Morris Ave.	Station Underpass to Bryn Mawr Ave.	2.84	C
Morris Ave.	Station access from Montgomery Ave.	1.54	B
Morris Ave.	North of Montgomery Ave.	2.63	C
Morris Ave.	Lancaster to Ave. to Bryn Mawr Ave.	2.26	B
Morton Rd	North of Lancaster Ave.	1.89	B
Morton Rd.	East of Summit Grove Ave.	1.93	B
Morton Rd.	Summit Grove Ave. to Merion Rd.	1.74	B
Morton Terrace	Morton Rd. to Summit Rd.	3.15	C
Old Lancaster Rd.	Entire length	2.51	C
Pennsylvania Ave.	South of Old Lancaster Rd.	2.28	B
Radnor St.	North of Montgomery Ave.	2.69	C
San Marino Dr.	East of Lee St.	1.86	B
Summit Grove Ave.	West of Bryn Mawr Ave.	2.25	B
Summit Grove Ave.	South of Lancaster Ave.	2.22	B
Town Place	Entire length	2.12	B
Yarrow Rd.	West of Morris Ave.	1.32	A

Source: DVRPC fieldwork and model output, 2006.

<u>Highest PLOS scoring:</u>
As depicted in Table 8, many segments of the study area scored a favorable grade of 'B,' but there were two that received an 'A.' Yarrow Road west of Morris Avenue had the highest pedestrian LOS score (1.32; LOS 'A') due to its large sidewalk and buffer and low estimated vehicular intensities. Bryn Mawr Avenue abutting the station also received a good score (1.44; LOS 'A') due to wide shoulders and a high percentage of occupied on-street parking.

Map 6: Bryn Mawr Station Area PLOS Scores (1/4-Mile Radius)

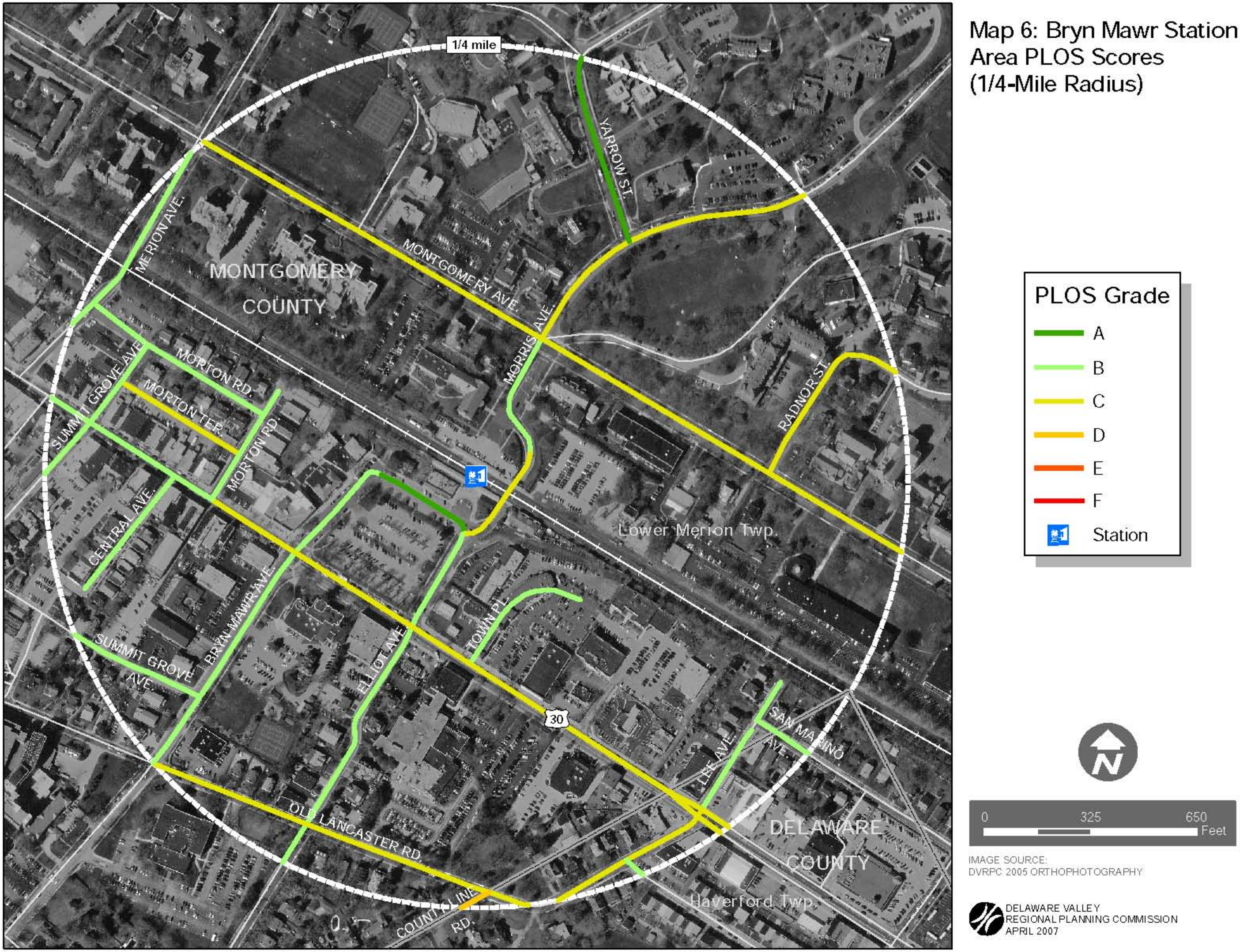

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Lowest PLOS scoring:
The lowest PLOS score in the study area occurred on County Line Road, south of Old Lancaster Road (3.78; LOS 'D'). This was the only segment to score below a 'C' in the entire pedestrian study area. Even though this segment had moderate vehicular intensities, its complete lack of sidewalks and narrow lane width contributed to its relatively poor score. It should be noted that this study area contained of two major roadways (Lancaster and Montgomery Avenues), which generally maintained 'C' levels of service despite very high traffic intensities.

Bicycle LOS results and summary

Table 9 below contains the BLOS scores calculated for road segments within one mile of Bryn Mawr Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 7.

Table 9: Bryn Mawr Station Area BLOS Summary

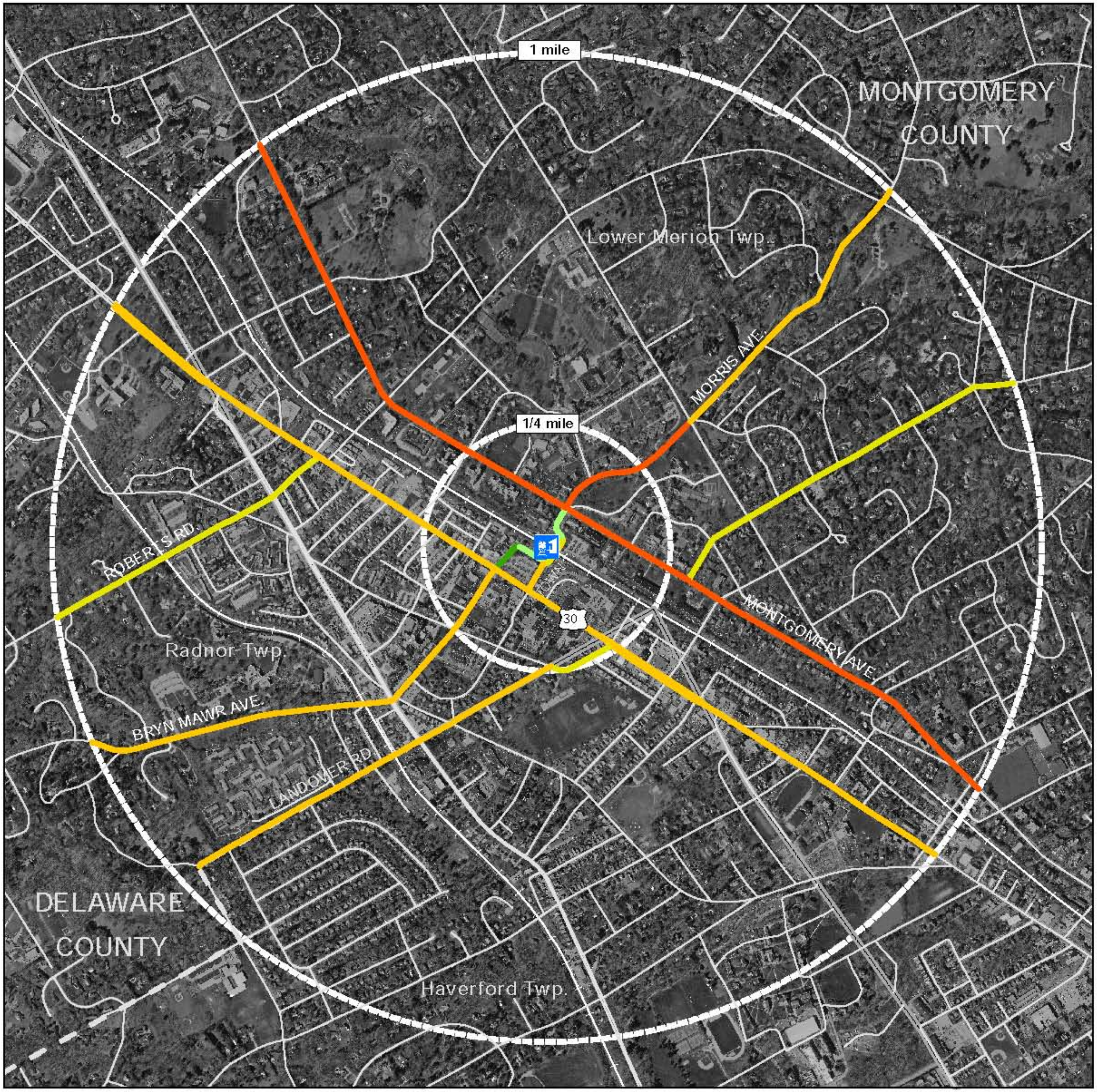
Road Segment	Location	BLOS Score	BLOS Grade
Bryn Mawr Ave.	Abutting station	2.27	B
Bryn Mawr Ave.	North of Lancaster Ave.	0.00	A
Bryn Mawr Ave.	Lancaster Ave. to County Line Rd.	4.06	D
Bryn Mawr Ave.	South of County Line Rd.	4.47	D
Fishers Rd/Hillbrook Rd.	North of Montgomery Ave.	2.82	C
Lancaster Ave.	Entire length	4.32	D
Landover / County Line Rd.	Old Lancaster Rd. to Coopertown Rd.	3.78	D
Montgomery Ave.	Entire length	5.10	E
Morris Ave.	North of New Gulph Rd.	3.84	D
Morris Ave.	Montgomery Ave. to New Gulph Rd.	4.55	E
Morris Ave.	Station access from Montgomery Ave.	1.91	B
Morris Ave.	Station underpass to Bryn Mawr Ave.	2.76	C
Morris Ave.	Bryn Mawr Ave. to Lancaster Ave.	3.96	D
Old Lancaster Ave.	Lancaster Ave. to Landover Ave.	3.06	C
Roberts Rd.	South of Lancaster Ave.	3.26	C

Source: DVRPC fieldwork and model output, 2006.

Highest BLOS scoring:
As summarized in Table 9, BLOS scores for the study area were generally poor. The only road segment that received a bicycle level of service grade of 'A' was Bryn Mawr Avenue north of Lancaster Avenue (0.00; LOS 'A'). This is significant in that this road segment directly accesses the station.

Lowest BLOS scoring:
The lowest study area BLOS score occurred for the entire length of Montgomery Avenue (5.10; LOS 'E'). This road had the highest speed limit in the study area, as well as a high traffic volume and relatively narrow lanes. It bears noting that the northern sidewalk of Montgomery Avenue is a designated bidirectional bicycle lane – bicycle travel in the roadway is discouraged in this case.

Map 7: Bryn Mawr Station Area BLOS Scores (1-Mile Radius)



BLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 1,250 2,500 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Conditions for pedestrians/bicyclists in the immediate station vicinity

While the typical LOS grade for pedestrians in the vicinity of Bryn Mawr station was a ‘B,’ the presence of two major streets that can be challenging to cross, Montgomery and Lancaster Avenues, hinders pedestrian access to the station. Pedestrians coming from the northern and southern edges of the quarter-mile study area have no choice but to cross one of these roads to access the station. Montgomery Avenue in particular is significant, as it separates the station from the largest concentration of educational institutions in the study area. While both Montgomery and Lancaster Avenues have well-defined pedestrian crosswalks at several key intersections (and in-street pedestrian yield signs and special pavement markings in the case of Lancaster Avenue near the station), the high traffic intensity and frequency of turns can nevertheless make crossings troublesome.

The streets immediately adjacent to the station provide favorable conditions for pedestrians, and the station itself has an underground passageway providing access between platforms. The Morris Avenue underpass, the one road segment adjacent to the station that scored below a ‘B’ in PLOS, can be avoided by pedestrians through the use of this below-grade passageway. However, during field views DVRPC staff witnessed many pedestrians crossing over the train tracks at grade rather than using the underground passageway, despite multiple hazard warning signs.

Given the low proportion of residential land use (but large nearby college population) in the quarter-mile study area, it is likely more realistic for many nearby residents and students to bike to the station than walk. This can be challenging, as the area is not very friendly to bicycles. The streets in the immediate station vicinity scored well, but to get to those streets, cyclists have to traverse many segments where conditions are much less favorable. Montgomery Avenue in particular acts as a barrier for cyclists because of its high traffic densities and 35 MPH speed limit. However, a sidewalk along the northern frontage of Montgomery Avenue is a designated bidirectional bicycle route, accommodating east-west travel. The station itself does have bicycle racks on both platforms.

An underground passageway allows transfer between both sides of the station.

A well-marked crosswalk over Lancaster Ave. south of the station with in-street pedestrian yield sign.

Suggested improvements to enhance pedestrian/bicyclist accessibility

Most of the residential uses in the study area occur to the south of Lancaster Avenue (on the south side of the station). Of all the segments of Lancaster Avenue examined, the segment just south of the train station, between Bryn Mawr and Morris Avenues, scored the lowest for pedestrian LOS (2.69; LOS ‘C’). An additional ‘full-featured’ crosswalk, such as the one present to the west of Bryn Mawr Avenue (see photo above), could be installed to the east in order to make Lancaster Avenue less of a barrier.

The intersection of Montgomery and Morris Avenues is the most significant crossing point for students walking/biking to or from Bryn Mawr Station. As a result, every effort should be made to enhance crossability at this intersection. This may be a particularly useful location for a traffic calming device such as a raised intersection or textured crosswalks. At a minimum, the existing crosswalks should be repainted and made more obvious. Additionally, as noted above, many R5 riders cross over the tracks in the platform area rather than using the dedicated underpass that has been provided. While this surface crossing may be more expedient or comfortable, it presents safety concerns. Train switching through the Bryn Mawr interlocking presently makes an intertrack fence impossible, but upcoming Keystone Corridor improvements will relocate this interlocking. At that time, an intertrack fence should be considered. Better lighting and signage would also make the underpass more visible and attractive.

Concerning bicycle station access, bicycle lanes should particularly be considered along both Montgomery and Lancaster Avenues, as well as on Bryn Mawr Avenue, Morris Avenue, and Landover Avenue. Of these, Lancaster and Bryn Mawr Avenues are also recommended for bicycle improvements in Delaware County's current draft bicycle plan, and are identified as part of the Montgomery County Planning Commission's secondary bicycle network. Bicycle lanes along any or all of these roadways would enhance bicycle station access from residential areas. As an alternative to full bicycle lanes, shared lane pavement markings (or 'sharrows') may be viable, particularly where on-street parking is present (see Appendix A).

The north sidewalk of Montgomery Avenue is a designated bicycle route, but dedicated bicycle lanes in the roadway would be a better and safer long term solution.

Bryn Mawr Station and Morris Avenue viewed from northwest corner of Morris and Lancaster Aves.

Relevant aspects of regional and state bicycle and pedestrian plans

Several roads in the study area were mentioned in the most recent Southeastern Pennsylvania Bicycle and Pedestrian Mobility Plan (1995) as proposed routes. These were Montgomery Avenue, Bryn Mawr Avenue, and Roberts Avenue (north and south of Lancaster Avenue), which is also identified as part of the Montgomery County Planning Commission's secondary bicycle network. Old Gulph Road and Haverford Road, which were not examined in this study but could nonetheless affect station accessibility, were proposed as a lower priority bicycle links (Old Gulph Road is proposed for a route within the right-of-way, and Haverford Road was proposed as a route of undefined configuration). Haverford Road is also recommended for bicycle improvements in Delaware County's current draft bicycle plan.

Relevant Transportation Improvement Program (TIP) projects

The interlocking at Bryn Mawr Station will be retired as part of the ongoing Keystone Corridor Improvement project (MPMS number 59917). This will provide an opportunity to install intertrack fencing at Bryn Mawr Station.

ERIE STATION

Introduction/summary

Erie Station, located in the midst of the complex intersection of Erie Avenue, Broad Street, and Germantown Avenue in North Philadelphia, provides access to the Broad Street Subway. The study area for both pedestrian and bicycle access is defined as the area within one-quarter mile of the station. The study area for Bicycle Levels of Service (BLOS) is smaller than for other stations examined due to the densities in the vicinity of this station, making each road segment a potentially significant bicycle-traffic generator, as well as the proximity of other stations on the Broad Street Line.

The station is located in a highly urban environment, surrounded by Philadelphia's dense, interconnected street grid. Most blocks in the study area are roughly 200-250 feet long in the east-west direction and 600 feet in the north-south direction. Study area land uses are dominated by single-family attached and multifamily residential uses, as well as commercial uses that are concentrated along Germantown Avenue. The southern portion of the study area includes part of the Temple University Hospital campus.

Due to the consistent presence of sidewalks, as well as a dense street network that helps to disperse traffic among local roads, streets throughout the study area typically score highly for pedestrian LOS, with many segments having a grade of 'B.' The study area length of Broad Street is a notable exception, having a relatively poor 'D' LOS in both peak and off-peak periods.

Conditions for bicyclists are much less favorable, as reflected by widespread BLOS scores of 'C' or lower. Many roadways are narrow, with high levels of occupied on-street parking, both of which present impediments to safe bicycle travel.

Transit service summary

Erie Station is served by all three variations of the north/south Broad Street Subway – local, express, and the Broad-Ridge Spur to/from 8th and Market Streets. Additionally, the intersection of Broad/Erie/Germantown has stops for the following SEPTA bus routes:

- Route 23 (north/south along Germantown Avenue – nearside stops northbound and southbound at the intersection with Erie Avenue)
- Routes 53 & 56 (east/west along Erie Avenue – nearside stops to the west of Broad Street (eastbound) and to the east of Germantown Avenue (westbound)
- Route C (north/south along Broad Street – nearside stops at the intersection with Erie Avenue)
- Routes H & XH (these routes provide service from areas to the northwest and terminate at Broad Street and Erie Avenue, stopping on southbound Broad Street to the north of Erie Avenue).

Each of these routes provides peak hour weekday headways of 12 minutes or less, with most having frequencies of 8 minutes or less along with near 24-hour service. Although SEPTA does not collect numerical data for transfers, the intensity of transit service in the vicinity of Erie Station anecdotally is associated with high volumes of bus-to-bus and bus-to-subway pedestrian transfers. Table 10 summarizes passenger volumes for each of the individual routes and stations/stops in the vicinity of the Broad/Erie intersection for which SEPTA has data available.

Table 10: Transit Passenger Volumes in the Vicinity of Broad St. and Erie Ave.

Station/Stop	Direction	Boards	Alights
Broad Street Subway (local/express/spur combined)			
Erie	North	1,388	6,281
Erie	South	5,900	1,653
Bus Route 53			
Broad St. and Erie Ave.	North/West	325	84
Broad St. and Erie Ave.	South/East	83	464
Erie Ave. and 15th St.	North/West	107	8
Erie Ave. and 15th St.	South/East	0	7
Bus Route 56			
Broad St. and Erie Ave.	East	862	237
Broad St. and Erie Ave.	West	85	992
Erie Ave. and 15th St.	East	8	1
Erie Ave. and 15th St.	West	84	56

Source: SEPTA, 2006.

Although SEPTA only has stop-level board/alight data for two of the six bus routes that make stops at the Broad/Erie/Germantown intersection, it is notable that for both of these routes the Broad/Erie stop is much more highly used than a nearby stop just to the west of Broad Street (Erie Avenue at 15th Street). This discrepancy in stop volumes reflects (to some degree) a high volume of transfers between these east/west routes, other bus routes, and the Erie Avenue subway station at Broad Street.

Station area land use

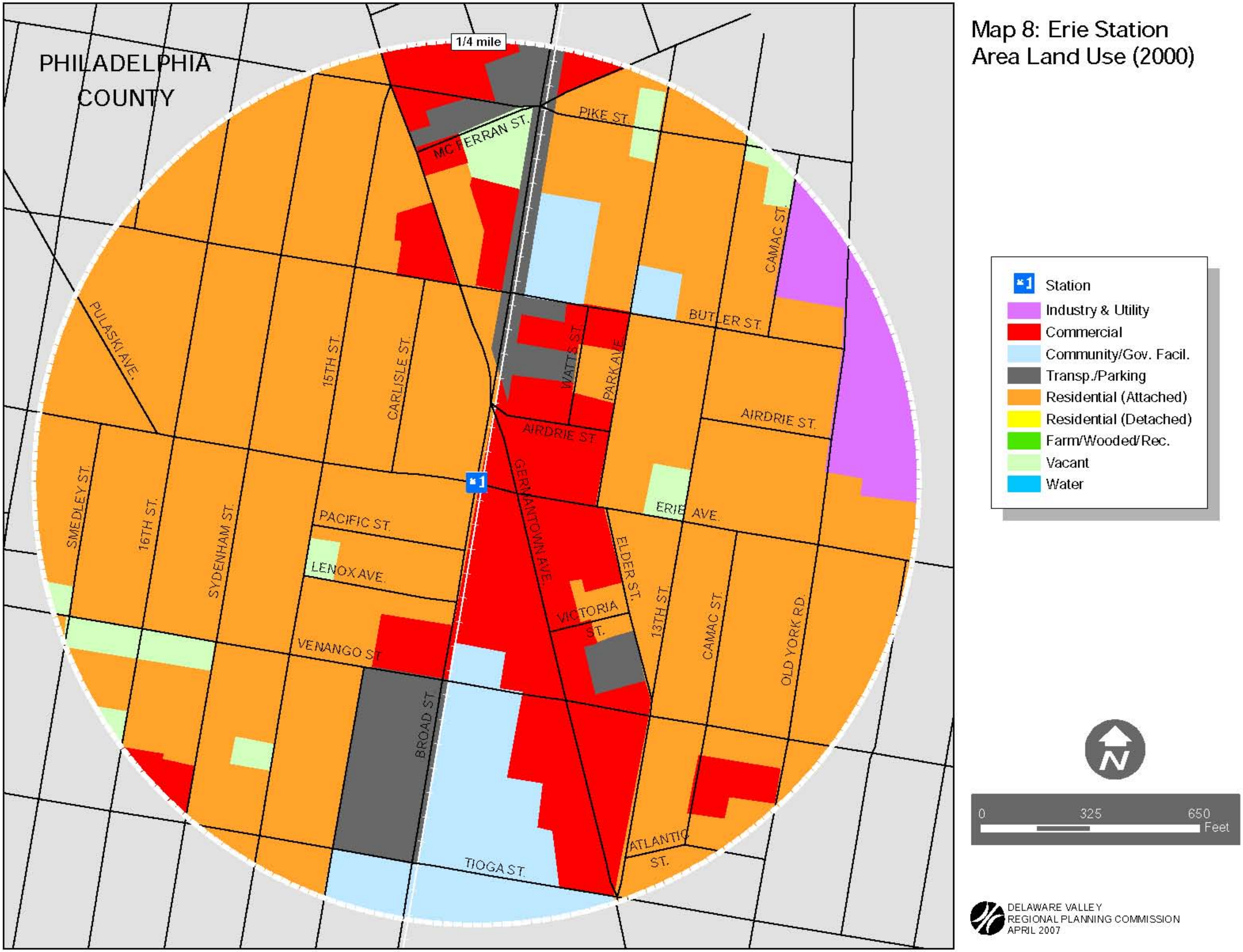
As illustrated in Table 11 and Map 8 below, attached residential land uses are the most frequently occurring in the quarter-mile station radius. Commercial uses are generally concentrated along Germantown Avenue and the eastern side of Broad Street, and the southern portion of the study area is dominated by the northern edge of the Temple University Hospital/medical campus. Table 1 indicates the relative proportion of land uses occurring within one-quarter mile of the station, from the highest proportion to the lowest. Map 8 illustrates these land uses at the same radius.

Table 11: Erie Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Attached)	84.4	67.1%
Commercial	17.9	14.3%
Community & Government Facilities	8.6	6.9%
Transportation & Parking	7.0	5.5%
Industry & Utility	4.3	3.4%
Vacant	3.5	2.8%
TOTAL	125.7	100.0%

Source: DVRPC land use, 2000.

Map 8: Erie Station Area Land Use (2000)



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Pedestrian LOS results and summary

Table 12 below contains the PLOS scores calculated for road segments within one-quarter mile of Erie Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 9.

Table 12: Erie Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
13th St.	Entire length	1.96	B
15th St.	Entire length	2.01	B
16th St.	North of Butler St.	2.17	B
16th St.	South of Butler St.	2.39	B
Airdrie St.	13th St. to Old York Rd.	1.69	B
Airdrie St.	Broad St. to Park Ave.	1.49	A
Atlantic St.	East of 13th St.	1.62	B
Broad St.	Entire length (off-peak)	3.58	D
Broad St.	Entire length (peak)	4.38	D
Butler St.	East of Broad St.	1.90	B
Butler St.	West of Broad St.	1.94	B
Camac St.	North of Butler St.	2.19	B
Camac St.	South of Erie Ave.	1.75	B
Carlisle St.	Erie Ave. to Butler St.	1.61	B
Carlisle St.	South of Venango St.	1.85	B
Elder St.	South of Erie Ave.	1.98	B
Erie Ave.	Broad St. to Germantown Ave.	2.28	B
Erie Ave.	East of Park Ave.	2.21	B
Erie Ave.	Germantown Ave. to Park Ave.	3.21	C
Erie Ave.	West of Broad St.	2.08	B
Germantown Ave.	Erie Ave. to Airdrie St.	2.22	B
Germantown Ave.	West of Broad St.	2.04	B
Germantown Ave.	South of Erie Ave.	1.97	B
Lenox St.	Broad St. to 15th St.	1.75	B
McFerran St.	East of Broad St.	1.68	B
McFerran St.	Germantown Ave. to Broad St.	1.98	B
Old York Rd.	Entire length	2.08	B
Pacific St.	Broad St. to 15th St.	1.67	B
Park Ave.	Entire length	1.87	B
Pike St.	Entire length	2.11	B
Pulaski Ave.	North of Erie Ave.	1.96	B
Smedley St.	Entire length	2.26	B
Sydenham St.	North of Erie Ave.	1.84	B
Sydenham St.	South of Erie Ave.	1.88	B
Tioga St.	East of Broad St.	2.49	B
Tioga St.	West of Broad St.	2.04	B
Venango St.	Entire length	2.47	B
Victoria St.	Germantown Ave. to Elder St.	1.51	B
Watts St.	Airdrie St. to Butler St.	1.83	B

Source: DVRPC field work and model output, 2006.

Highest PLOS scoring:

As depicted in Table 12, many study area road segments score similarly for pedestrian LOS, owing to similarities in traffic intensities and configurations. Airdrie Street between Broad Street and Park Avenue had the highest score at 1.49 (the only study area segment with an LOS of 'A'). This score reflects a high degree of occupied on-street parking along both sides of the cartway (80%), consistent 12-foot sidewalks, and low vehicular intensities in terms of speed and estimated volume.

Lowest PLOS scoring:

The lowest PLOS score in the study area occurred for Broad Street in the peak period (4.38; LOS ‘D’). Broad Street’s score in off-peak periods (3.58; LOS ‘D’) is enhanced by occupied on-street parking, but remains relatively poor. Despite consistent 20-foot sidewalks, scores along Broad Street are heavily impaired by its high traffic volumes (an estimated AADT for the study area of 45,000 vehicles). These volumes are indicated by the PLOS model to have a highly negative effect on pedestrian comfort despite the roadway’s relatively modest 30-mph speed limit in the study area.

Map 9: Erie Station Area PLOS Scores (1/4-Mile Radius)

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Bicycle LOS results and summary

Table 13 below contains the BLOS scores calculated for road segments within one-quarter mile of Erie Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 10.

Table 13: Erie Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
13th St.	Entire length	4.17	D
15th St.	Entire length	4.54	E
16th St.	North of Butler St.	4.57	E
16th St.	South of Butler St.	4.35	D
Airdrie St.	13th St. to Old York Rd.	2.63	C
Airdrie St.	Broad St. to Park Ave.	3.14	C
Atlantic St.	East of 13th St.	3.24	C
Broad St.	Entire length (off-peak)	4.59	E
Broad St.	Entire length (peak)	5.28	E
Butler St.	East of Broad St.	2.91	C
Butler St.	West of Broad St.	3.56	D
Camac St.	North of Butler St.	2.49	B
Camac St.	South of Erie Ave.	3.52	D
Carlisle St.	Erie Ave. to Butler St.	2.92	C
Carlisle St.	South of Venango St.	3.11	C
Elder St.	South of Erie Ave.	2.74	C
Erie Ave.	Broad St. to Germantown Ave.	2.61	C
Erie Ave.	East of Park Ave.	4.05	D
Erie Ave.	Germantown Ave. to Park Ave.	3.73	D
Erie Ave.	West of Broad St.	1.33	A
Germantown Ave.	Erie Ave. to Airdrie St.	4.04	D
Germantown Ave.	West of Broad St.	3.86	D
Germantown Ave.	South of Erie Ave.	4.06	D
Lenox St.	Broad St. to 15th St.	2.69	C
McFerran St.	East of Broad St.	2.70	C
McFerran St.	Germantown Ave. to Broad St.	2.56	C
Old York Rd.	Entire length	3.12	C
Pacific St.	Broad St. to 15th St.	2.94	C
Park Ave.	Entire length	2.44	B
Pike St.	Entire length	3.11	C
Pulaski Ave.	North of Erie Ave.	3.53	D
Smedley St.	Entire length	1.96	B
Sydenham St.	North of Erie Ave.	3.96	D
Sydenham St.	South of Erie Ave.	3.98	D
Tioga St.	East of Broad St.	1.47	A
Tioga St.	West of Broad St.	4.44	D
Venango St.	Entire length	4.18	D
Victoria St.	Germantown Ave. to Elder St.	3.26	C
Watts St.	Airdrie St. to Butler St.	2.03	B

Source: DVRPC field work and model output, 2006.

Highest BLOS scoring:

As summarized in Table 13, BLOS scores are generally fair to poor across the study area, with most road segments having grades of ‘C’ or ‘D.’ Erie Avenue to the west of Broad Street has the highest measured bicycle compatibility in the study area (1.33; LOS ‘A’), owing to the same low speed limit shared by many segments (25-mph) and the sole dedicated bicycle lane in the study area.

Map 10: Erie Station Area BLOS Scores (1/4-Mile Radius)

BLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 325 650 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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<u>Lowest BLOS scoring:</u>
The lowest study area BLOS score occurred for Broad Street in the peak period (5.28; LOS 'E'). The conditions that most significantly contributed to this score were relatively high traffic intensities, a lack of passable shoulders, and a relatively narrow outer lane (10-feet).

Conditions for pedestrians/bicyclists in the immediate station vicinity

Conditions for bicyclists and pedestrians are problematic in the immediate vicinity of the station, largely due to its being situated at the complex junction of three high-volume, bidirectional roadways (Broad Street, Erie Avenue, and Germantown Avenue). Station stairwells are located on the northwest, southwest, and southeast corners of the intersection of Broad Street and Erie Avenue, along with the northeast corner of the intersection of Germantown Avenue and Erie Avenue. While this number of stairwells means that people approaching the station from every direction do not need to cross any portion of the complex intersection in order to reach a stairwell, the number of surface bus routes interfacing with the subway station, in addition to general (non-transit related) pedestrian traffic, nonetheless yield (from observation) a high volume of surface street crossings in the immediate station vicinity.

Broad/Erie/Germantown intersection viewed from northeast corner of Germantown Ave. and Erie Ave. (Broad Street runs left to right in background). *Photo courtesy Orth-Rodgers & Associates.*

Broad/Erie/Germantown intersection viewed from the western frontage of Broad Street.

This volume of crossings, in combination with the complexity of the intersection, contributes to an unusually high number of pedestrian-involved crashes. Based on crash data from 1998-2003 (excluding 2002), PennDOT designated and mapped two classes of pedestrian crash clusters. All four road segments abutting the intersection of Broad Street and Erie Avenue were classified as crash clusters, and all but the segment of Broad Street north of Erie Avenue were further identified as 'priority' clusters. The concentration of three priority clusters among four road segments in an intersection only occurred for two other locations in the city. Although updated PennDOT crash cluster mapping has not been prepared, updated PennDOT crash data (for the years 2000-2005, excluding 2002) indicates that 32 pedestrian- and bicycle-involved auto crashes occurred within 200 feet of Erie Station over those years, and 92 total pedestrian- and bicycle-involved crashes within one-quarter mile of the station. This volume of crashes indicates that conditions for bicyclists and pedestrians in the immediate station vicinity are highly problematic.

Regarding bicycle accessibility specifically, bicycle station access is enhanced by the provision of bidirectional bicycle lanes along Erie Avenue west of Broad Street, but such lanes are not present to the east of Broad Street. In addition, no bicycle racks are located in the immediate station vicinity.

In terms of the broader study area within one-quarter mile of the station, bicycle and pedestrian compatibility is impaired by a general climate of deterioration among buildings and sidewalks in certain blocks, which generally increases with the distance from Broad Street. Specifically, the widespread presence of vacant structures, many of which appear to be structurally unsound, exerts a blighting influence, impairing comfort in ways which are not addressed by LOS measures. The unfortunate condition of many of these blocks is outside the scope of this report, but it is hoped that improvements to the cornerstone intersection of Broad Street, Erie Avenue, and Germantown Avenue might have an anchoring effect on the larger study area, which, combined with other supportive land use planning initiatives, would aid this community's recovery in the longer term.

Suggested improvements to enhance pedestrian/bicyclist accessibility

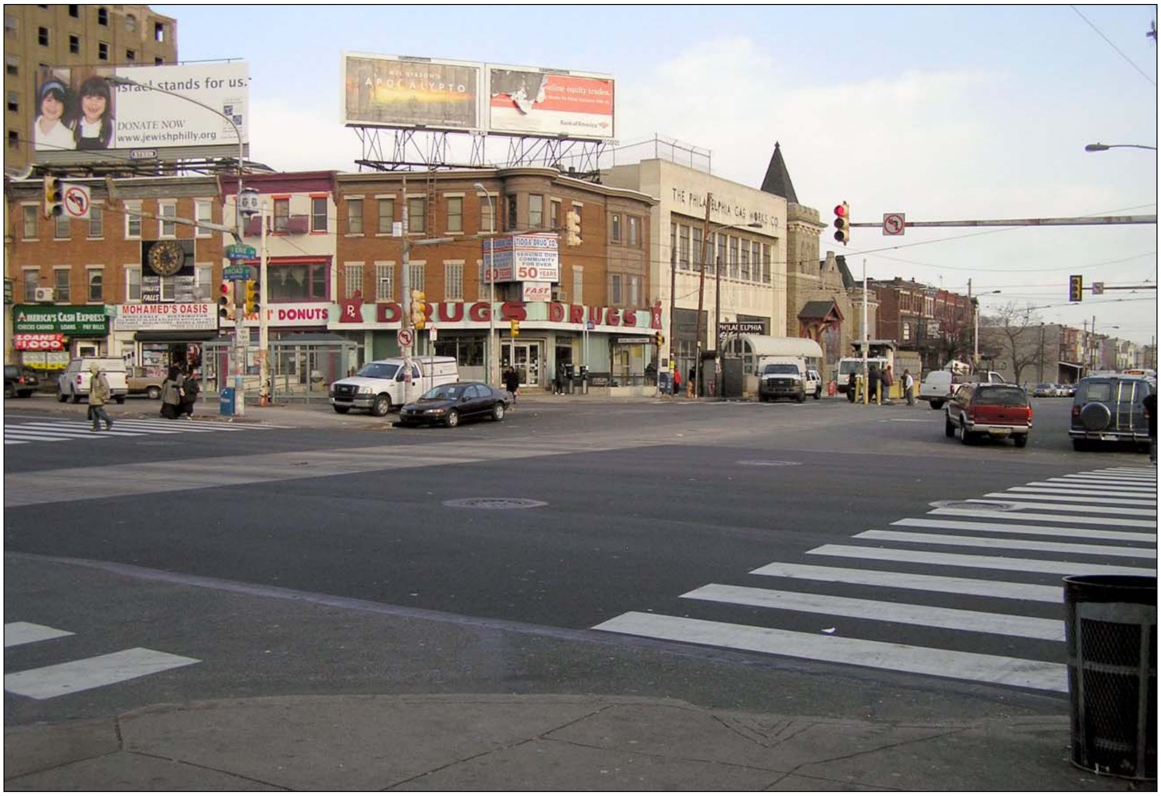
Given the station's location at their juncture, Broad Street, Erie Avenue, and Germantown Avenue are the most significant roadways in terms of enhancing station access. Of these three roadways, the LOS analyses indicate that Broad Street is the most problematic for both pedestrians (LOS 'D') and bicyclists (LOS 'E').

The Philadelphia City Planning Commission has conducted an extensive analysis of transportation issues along a large portion of North Broad Street – the North Broad Street Transportation and Access Study (June 2007). As part of that study, the study team evaluated a variety of alternatives for rethinking Broad Street's lane configuration to better accommodate bicyclists. Based on stakeholder preferences, a reconfiguration to provide in-road bicycle lanes was not recommended. Rather, the study recommended the promotion of parallel numbered streets, specifically 13th and 16th Streets, as north-south bicycle routes. An improvement strategy to this end should be pursued. Given those roadways' space constraints and frequently occupied on-street parking, some form of shared lane pavement marking (or 'sharrow' – see Appendix A) may be more appropriate than full bicycle lanes.

Erie Avenue would be critical in connecting these north-south bicycle routes to Erie Station. As noted above, bicycle lanes have been installed along Erie Avenue in both directions to the west of Broad Street. In order to facilitate better station access, these lanes should be continued to the east of Broad, and also provided in some form along Germantown Avenue. Again, given Germantown Avenue's space constraints, sharrows may be considered as an alternative to dedicated bicycle lanes. Bicycle racks should also be provided in proximity to station entrance stairwells in order to enhance the feasibility of bicycling to the station.

The North Broad Transportation and Access Study also recommends the installation of bus bulbs (curb extensions at bus stops) along Broad Street, particularly where subway stations are located at cross streets. This would be beneficial from the perspective of our study in several ways: it would enhance pedestrian crossability through an effective narrowing of Broad Street's crossing distance, benefit bus service by removing the necessity for buses to enter and exit traffic to meet the curb, and facilitate smoother and safer transfers between buses and the Broad Street Subway. More consistent and apparent transit-related signage, also recommended in the North Broad Transportation and Access Study, would also contribute to improved access conditions.

Given the complexity of the Broad/Erie/Germantown intersection, its high volumes of pedestrian crossings, and the high volumes of bicycle and pedestrian-involved crashes that result, consideration should be given to creative solutions that would enhance the safety of pedestrian crossings in all directions. One such solution could be the implementation of a 'pedestrian scramble' crossing mechanism over the entire intersection, from the western side of Broad Street to the eastern side of Germantown Avenue. Pedestrian scrambles involve the insertion of an intersection phase where no vehicle through movements are permitted, and during which pedestrians may cross in any direction, including diagonally.



Top: Current appearance of the Broad/Erie/Germantown intersection; *Bottom:* Conceptual illustration of a pedestrian scramble treatment at the intersection, along with other minor aesthetic improvements (including the removal of billboards)

Scrambles have been successfully implemented worldwide in a variety of urban contexts and are particularly appropriate where more than two high-volume roadways intersect, as in the Broad/Erie/Germantown intersection. A study by UC-Berkeley's Traffic Safety Center of the Oakland scramble pictured below indicated that pedestrian-vehicle collisions were reduced by 40% following the scramble implementation.

Example of two-street scramble in Oakland, California (*Source: Traffic Safety Center, University of California at Berkeley*).

Example pedestrian sign associated with scramble (*Source: USDOT, Federal Highway Administration - Publication number FHWA-RD-01-102, March 2002*).

It bears noting, though, that since pedestrians are forbidden to cross the intersection on the green phases of two or more roadways, pedestrian wait times prior to crossing can made worse by the implementation of a scramble. This could increase the number of instances of crossing against the signal by more impatient pedestrians.

Short of a more radical solution like a pedestrian scramble, there are also smaller-scale incremental improvements that could be made to enhance crossing safety. These could include the provision of refuge islands on Broad Street, the installation of countdown timers for pedestrian signals, and increasing walk signal phase lengths.

Relevant aspects of regional and state bicycle and pedestrian plans

The most recent regional Bicycle and Pedestrian Mobility Plan for Southeastern Pennsylvania (from the DVRPC *Direction 2020* Long Range Plan of 1995) identified a primary proposed bicycle corridor along Broad Street, a proposed bicycle route (with dedicated facilities along the right-of-way) along Erie Avenue to both the east and west of Broad Street, and a proposed bicycle route (with dedicated facilities along the right-of-way) along Germantown Avenue to the North of Broad Street. The recommendations in this report are consistent with that plan.

Relevant Transportation Improvement Program (TIP) projects

In order to better accommodate additional Broad Street traffic volumes resulting from the ongoing rehabilitation of Interstate 95, TIP project 17796 (MPMS#) involves the improvement of signals at 37 intersections along North Broad Street (from Vine Street to Olney Avenue), including the Erie Avenue intersection. According to Mr. Tom Boccuto, PennDOT project manager (conversation September 2006), final design has been completed, but the project has not advanced in roughly two years due to PECO and SEPTA engineering considerations. Upon the project's reevaluation in the near future, modifications stemming from recent plans (such as the North Broad Transportation and Access Study, as well as the current report) may be considered. The present plan calls for new pedestrian and auto signals at the intersection of Broad Street and Erie Avenue, along with new Broad Street medians, which would not affect the current crosswalk placements.

FOX CHASE STATION

Introduction/summary

Fox Chase Station is the northern terminus of SEPTA's R8 Fox Chase Line and is located near the busy intersection of Rhawn Street, Oxford Avenue (PA-232), and Pine Road in the Fox Chase neighborhood of northeast Philadelphia. The study area radius for pedestrian LOS is one-quarter mile and the study area for bicycle LOS is one mile. Fox Chase is a traditional Philadelphia neighborhood with a basic grid pattern of streets being broken up by larger roads. The study area is primarily residential, with single-family detached and multifamily attached housing constituting almost 60% of the study area land coverage.

The consistent presence of sidewalks makes the streets in the area score highly for PLOS, with many of the roads scoring a 'B' or higher. The only exception is the portion of PA-232 north of the busy intersection noted above. Conditions for bicyclists are not as favorable, with BLOS scores being negatively affected by high vehicle intensities. Many roads in the study area received BLOS scores of 'C' or lower.

Transit service summary

Fox Chase station serves approximately 20 inbound and outbound trips to/from Center City Philadelphia daily, with the trip lasting roughly half an hour. According to the 2005 SEPTA Regional Rail Ridership Census, an average weekday sees 1,150 passengers board at Fox Chase, 65% of whom board between the peak morning hours of 6:45 and 8:15. The number of passengers who board at peak hours is more than twice the number of total parking spaces at the station, which is indicative of a relatively high number of passengers arriving on foot, or by bicycle or bus. In addition to regional rail service, the station is also served by SEPTA bus routes 18, 24, and 28.

Station area land use

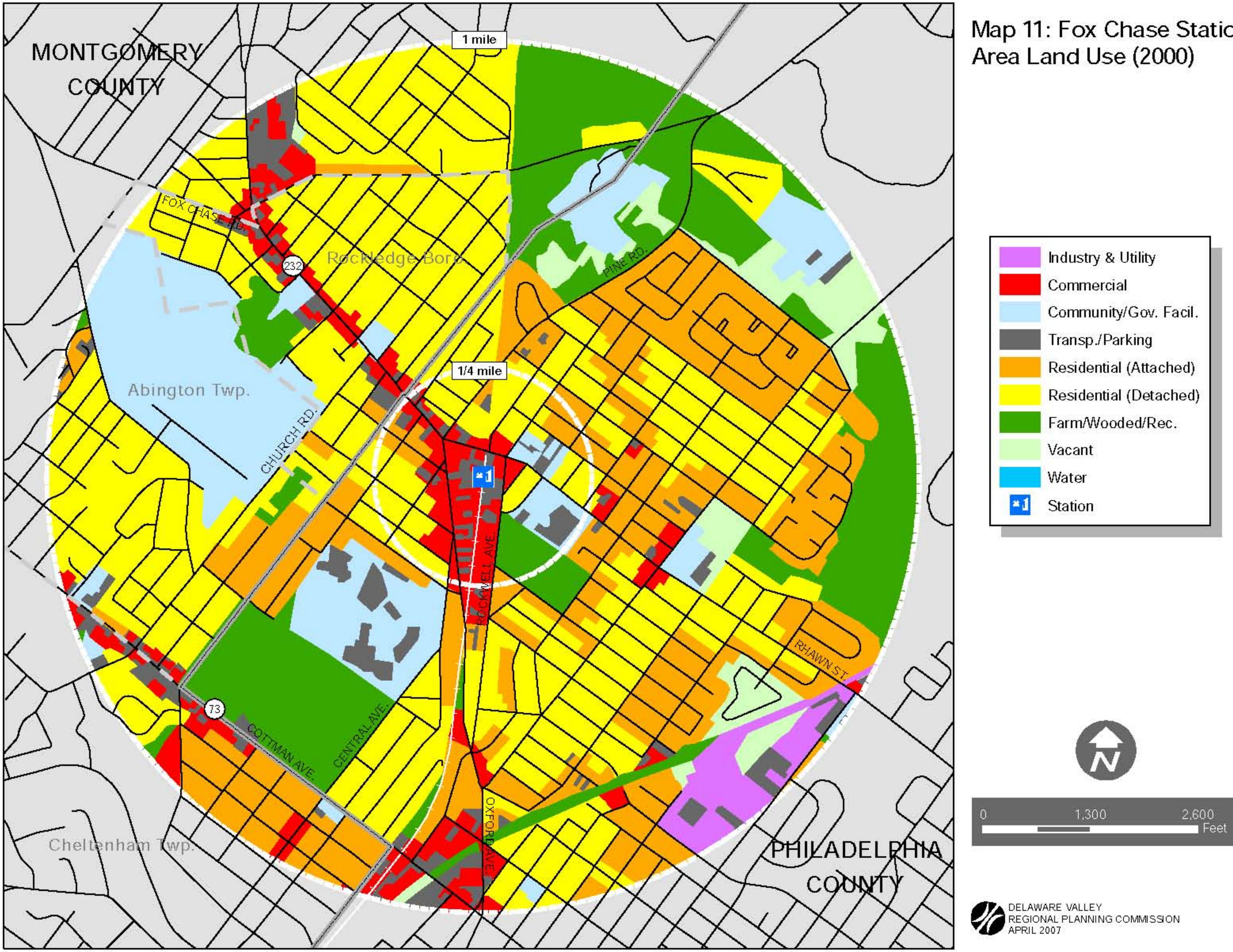
As illustrated in Table 14 and Map 11 below, detached residential land uses are the most frequently occurring at the one-mile station radius, followed by attached residential land uses. Community and government facilities also make up a large portion of the study area. Commercial uses are generally concentrated close to the station, in the central portion of the study area and northwest along Oxford Avenue.

Table 14: Fox Chase Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	753.5	37.5%
Residential (Attached)	419.2	20.8%
Farm/Wooded/Rec.	311.3	15.5%
Community/Government Facilities	233.2	11.6%
Commercial	110.9	5.5%
Parking	81.3	4.0%
Vacant	67.1	3.3%
Industry & Utility	34.1	1.7%
TOTAL	2,010.6	100.0%

Source: DVRPC land use, 2000.

Map 11: Fox Chase Station Area Land Use (2000)



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Pedestrian LOS results and summary

Table 15 below contains the PLOS scores calculated for road segments within one-quarter mile of Fox Chase Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 12.

Table 15: Fox Chase Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Arthur St.	Jeanes St. to Ridgeway St.	1.69	B
Barnes St.	Entire length	1.55	B
Borbeck Ave.	West of Oxford Ave.	1.66	B
Borbeck Ave.	Entire length	1.68	B
Bridle Rd.	Stanwood St. to Rhawn St.	1.59	B
Burholme Ave.	Entire length	1.63	B
Burholme Ave.	East of Route 232	1.71	B
Chandler St.	Entire length	1.76	B
Conrad St.	Entire length	1.94	B
Dalton St.	Burholme Ave. to Pine Rd.	1.87	B
Elberon Ave.	North of Rhawn St.	2.03	B
Fuller St.	Burholme Ave. to Pine Rd.	1.62	B
Hasbrook Ave.	South of Oxford Ave.	2.34	B
Jeanes St.	North of Rhawn St.	1.70	B
Loney St.	Entire length	1.54	B
Oxford Ave.	Rhawn St. to Borbeck Ave.	2.19	B
Oxford Ave.	South of Hasbrook Ave.	2.41	B
Pine Rd.	North of Rhawn St.	2.29	B
Rhawn St.	Jeanes St. to Pine Rd.	2.16	B
Rhawn St.	E. of Jeanes St.	2.23	B
Ridgeway St.	North of Stanwood St.	1.55	B
Ridgeway St.	Rhawn St. to Rockwell Ave.	1.35	A
Rockwell Ave.	South of Rhawn St.	1.69	B
Route 232	West of Pine Rd.	2.91	C
Stanwood St.	North of Pine Rd.	1.52	B
Stanwood St.	Elberon Ave. to Jeanes St.	1.31	A
Stanwood St.	East of Jeanes St.	1.21	A

Source: DVRPC field work and model output, 2006.

Highest PLOS scoring:

As depicted in Table 15, many study area road segments score similarly well for pedestrian LOS, owing to similarities in traffic intensities and configurations. Stanwood Street east of Jeanes Street had the highest grade (1.21; LOS 'A') due to its large cartway width, wide sidewalks, ample on-street parking, and low traffic volume. Two other segments in the study area that had similar features also received 'A' grades. However, even roads with higher vehicular volumes, such as Rhawn Street and Oxford Avenue (with AADTs over 10,000), typically had a pedestrian LOS of 'B.'

Lowest PLOS scoring:

The only road segment that had a pedestrian LOS below 'B' was Route 232 west of Pine Road. This road segment had the largest AADT and the highest posted speed limit of any of the roads in the study area. This segment does have wide sidewalks, but a disproportionately small buffer and no street trees.

Map 12: Fox Chase Station Area PLOS Scores (1/4-Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 325 650 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Bicycle LOS results and summary

Table 16 below contains the BLOS scores calculated for road segments within one mile of Fox Chase Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 13.

Table 16: Fox Chase Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
Central Ave.	Hasbrook Ave. to Route 73	1.19	A
Central Ave.	South of Route 73	4.10	D
Church Rd.	Route 232 to Chandler St.	3.19	C
Church Rd.	South of Chandler St.	3.86	D
Fox Chase Rd.	West of Route 232	4.62	E
Hasbrook Ave.	Oxford Ave. to Central Ave.	0.48	A
Oxford Ave.	Rhawn St. to Hasbrook Ave.	4.06	D
Oxford Ave.	Hasbrook Ave. to Verree Rd.	2.05	B
Oxford Ave.	South of Verree Rd.	4.75	E
Pine Rd.	North of Rhawn St.	1.50	A
Rhawn St.	Pine Rd. to Jeanes St.	2.84	C
Rhawn St.	East of Jeanes St.	3.08	C
Rockwell Ave.	Rhawn St. to Oxford Ave.	1.50	A
Route 232	Pine Rd. to Jarrett Ave.	3.31	C
Route 232	Jarrett Ave. to Penn Ave.	0.99	A
Route 232	West of Penn Ave.	4.38	E

Source: DVRPC field work and model output, 2006.

<u>Highest BLOS scoring:</u>
As summarized in Table 16, several road segments in the study area scored very high in bicycle LOS, even though only one segment (Rockwell Ave., 1.50; LOS ‘A’) benefited from having a bicycle lane. Hasbrook Avenue generated the highest area score (0.48; A) owing largely to wide passable shoulders (unoccupied on-street parking) and despite an AADT in excess of 10,000.

<u>Lowest BLOS scoring:</u>
There were three bicycle LOS scores of ‘E.’ The lowest of those was Route 232 west of Penn Avenue (4.98; LOS ‘E’). This road had high traffic volumes (with an estimated AADT of 23,000), as well as a high posted speed limit and relatively narrow lane width.

Map 13: Fox Chase Station Area BLOS Scores (1-Mile Radius)

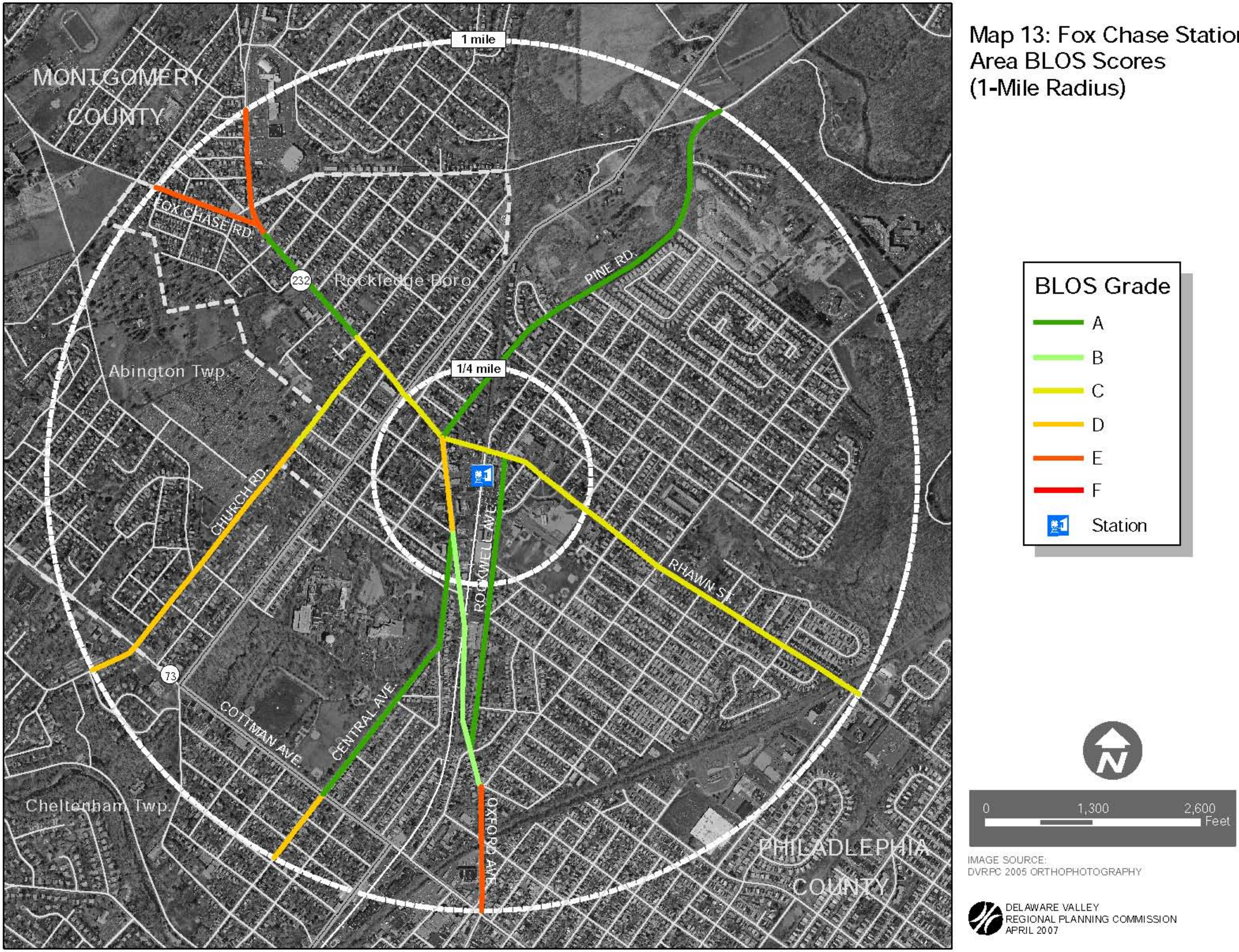

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Conditions for pedestrians/bicyclists in the immediate station vicinity

Conditions for pedestrians around Fox Chase station are quite good, due largely to the consistent presence of sidewalks, on-street parking, and low posted speed limits. Even larger roads, such as Oxford Avenue and Rhawn Street, which had AADTs in excess of 10,000, still came away from the study with a PLOS score of 'B.' Many of the smaller streets in the study area had both ample street parking and street trees as barriers between pedestrians and traffic.

The one major barrier of access facing pedestrians in the quarter-mile study area is the difficulty in accessing the station from the southwest. As it currently stands, a pedestrian coming from that region of the study area must walk north along Oxford Avenue to Rhawn Street or cut through a very busy parking lot to get to the inbound station platform. It bears noting that the site of an adjacent WaWa convenience store includes a concrete walkway that appears newly constructed, and would lead directly to the station platform if not for a fence that blocks access.

Conditions for cyclists in the one-mile study area were uneven in comparison to those for pedestrians. The junction of Rhawn Street, Oxford Avenue, and Route 232, with high traffic intensity and posted speed limits of 35 MPH and above, make bicycling to the station potentially dangerous. While some of the smaller side streets in the study area scored well in terms of bicycle LOS, to access Fox Chase station it is generally necessary to approach from one of the aforementioned main streets in the area. There were, however, several segments in the study area that received high marks for bicycle LOS, including Rockwell Street, which provides access to the station's parking area and has bike lanes.

Both platforms of the Fox Chase Station from the terminus at Rhawn Street.

An existing pathway extending from a WaWa parking lot to the platform area would greatly enhance access if completed.

Suggested improvements to enhance pedestrian/bicyclist accessibility

While pedestrian access to the station is generally good, improving access to the southwest portion of the study area would provide many pedestrians with a faster, safer way to get to the station platform. A readily available means of enhancing this access would involve completing the walkway linkage from the adjacent WaWa site. Short of new access routes, better wayfinding signage would help bicyclists and pedestrians to more intuitively find the platform area using the routes that are available.

A safer means of crossing from one platform to another would also be an improvement. Currently, the only safe way to cross over is to walk up to Rhawn Street and cross behind the bumpers at the terminus of the line, a distance of roughly 500 feet. A pedestrian overpass would allow for safer access from one side to another and help passengers to avoid walking out of their way to get to the platform they need (or otherwise crossing unsafely).

Fox Chase Station is outfitted with bike racks on both platforms; however, DVRPC staff observed that most of the racks sat unused with bicycles locked instead to fences and signs near the actual boarding locations. This indicates that better placement of the racks might serve the bicyclists in the study area well. It also indicates that Rhawn Street, which abuts the station to the North, could use bicycle lanes to better provide access to the existing racks. Additionally, bicycle lanes along Oxford Avenue would enhance access by commuters traveling from south and west of the station. Oxford Avenue is planned for restriping as part of a multiphase streetscape improvement project in the area, but bicycle lanes are not planned.

Bicycle parked at station platform, while racks along Rhawn St. are unused.


Bike lane along Rockwell Ave. accommodates safe bicycle station access from areas to the south and east.

Relevant aspects of regional and state bicycle and pedestrian plans

Several roads in the study area are mentioned in the most recent Southeastern Pennsylvania Bicycle and Pedestrian Mobility Plan (1995) as proposed routes. Oxford Avenue both north (when it becomes Route 232) and south of the Rhawn Street intersection, as well as Rhawn Street itself are the two prominent routes proposed for bicycle accommodations within the right-of-way (such as the bicycle lanes proposed in this report).

Relevant Transportation Improvement Program (TIP) projects

Fox Chase station is included in SEPTA's Station and Loop Renewal Program (MPMS number 77190). The programs that it is listed under are the High Level Platform Program, Station Platform Improvements Program, Station/Canopy Shelter Improvements Program, and the Intertrack Fencing Program. The Intertrack Fencing Program would be particularly important with regard to improving pedestrian safety.

Additionally, a multiphase streetscape improvement program (MPMS numbers 71211 and 73011) will improve pedestrian amenities along Oxford Avenue and Huntington Pike / Route 232. In addition to sidewalk reconstructions south to Hasbrook Avenue, the first phase will result in a widened sidewalk and new plaza at the intersection of Oxford Avenue with Barnes and Loney Streets, as well as enhanced signalization at the complex intersection of Oxford Avenue, Rhawn Street, Pine Road, and Route 232 that will make pedestrian crossings safer. Each of these improvements will enhance pedestrian station access. Where possible, such streetscape improvements should also include the installation of more consistent and apparent transit-related wayfinding and other signage.

GLENSIDE STATION

Introduction/summary

Glenside Station is located north of Philadelphia in Montgomery County. It serves as a station on the SEPTA R2 Warminster line, the northern terminus of the SEPTA R1 Airport line, and as a stop on the SEPTA R5 Lansdale/Doylestown line. The station is located in a largely residential area near Glenside's commercial core.

Most of the streets in the quarter-mile study area scored well for pedestrian LOS due to ample sidewalks and buffers. The high scores continued even to streets with high vehicular traffic intensity. Almost all of the road segments received scores of 'B,' with the notable exception of some segments of Easton Road, which has a higher speed limit than many of the other roads in the study area. Scores were typically poor for bicycle LOS, with three road segments having a bicycle LOS of 'E' and the majority of segments in the study area scoring below a 'C.'

Transit service summary

Glenside Station is served by the SEPTA R1 Airport Line, the R2 Warminster line, and the R5 Landsale/Doylestown line. According to the SEPTA 2005 Regional Rail Ridership Census, over 800 people board one of these inbound lines on an average weekday. Considering that the station has only 167 parking spots, this indicates that many people are walking, cycling, or using other means to reach Glenside Station.

Station area land use

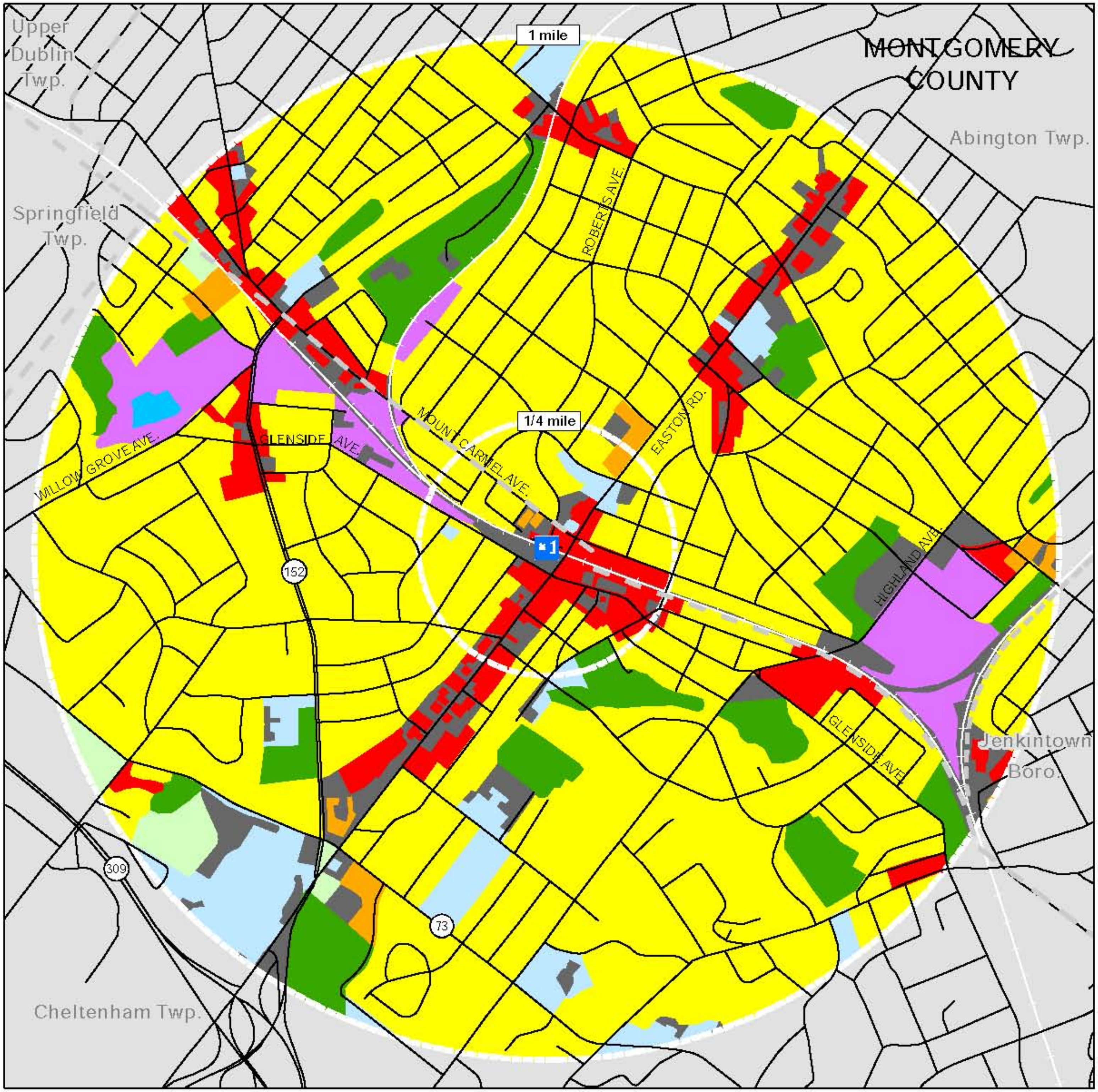
As illustrated in Table 17 and Map 14 below, Glenside consists primarily of detached single-family homes. Commercial land uses are concentrated in the general station area, primarily along Easton Road and Mount Carmel Avenue.

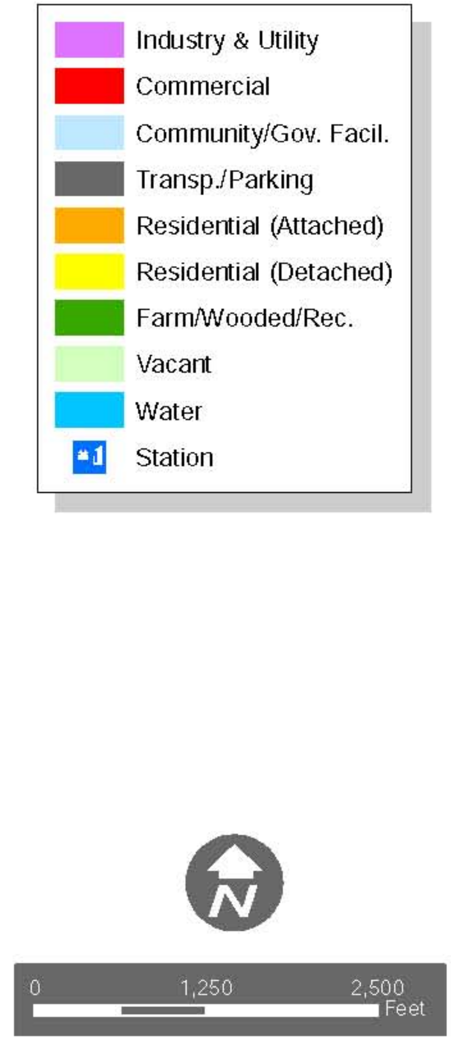
Table 17: Glenside Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Attached)	1,435.2	70.7%
Transp./Parking	144.8	7.1%
Farm/Wooded/Rec.	137.0	6.7%
Commercial	122.7	6.0%
Community Services	85.7	4.2%
Industry & Utility	82.7	4.1%
Vacant	19.9	1.0%
TOTAL	1,989.6	100.0%

Source: DVRPC land use, 2000.

Map 14: Glenside Station Area Land Use (2000)





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Pedestrian LOS results and summary

Table 18 below contains the PLOS scores calculated for road segments within one-quarter mile of Glenside Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 15.

Table 18: Glenside Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Bickley Ave.	Entire length	1.83	B
Easton Rd.	North of Fairhill Ave.	2.56	C
Easton Rd.	Fairhill Rd. to Glenside Ave.	2.61	C
Easton Rd.	South of Glenside Ave.	2.19	B
Fairhill Ave.	East of Roberts Ave.	1.95	B
Fairhill Ave.	East of Sylvania Ave.	1.94	B
Glenside Ave.	East of Harrison Ave.	1.98	B
Glenside Ave.	West of Harrison Ave.	2.49	B
Glenside Ave.	East of Easton Rd.	2.42	B
Harrison Ave.	South of Glenside Ave.	2.10	B
Huber Ave.	South of Mt. Carmel Ave.	1.79	B
Keswick Ave.	Glenside Ave. to Waverly Rd.	1.67	B
Lismore Ave.	South of Glenside Ave.	1.79	B
Lynwood Ave.	West of Roberts Ave.	2.24	B
Lynwood Ave.	South of Mt. Carmel	2.49	B
Lynwood Ave.	South of Glenside Ave.	1.98	B
Menlo Ave.	East of Easton Rd.	2.03	B
Mt. Carmel Ave.	East of Easton Rd.	1.92	B
Mt. Carmel Ave.	West of Easton Rd.	2.36	B
New St.	South of Glenside Ave.	2.04	B
Roberts Ave.	North of Mt. Carmel Ave.	2.02	B
Roberts Ave.	South of Mt. Carmel Ave.	1.68	B
Ruralside Ave.	South of Mt. Carmel Ave.	3.08	C
Sylvania Ave.	North of Fairhill Ave.	1.67	B
Tyson Ave.	West of Lynwood Ave.	3.43	C
Waverly Rd.	Easton Rd. to Harrison Ave.	2.47	B
Waverly Rd.	West of Harrison Ave.	2.02	B
Wesley Ave.	Plaza off Easton Rd.	1.49	A
Wesley Ave.	East of Plaza	2.01	B
Wesley Ave.	East of Bickley Ave.	2.21	B
Wilson Ave.	West of Ruralside Ave.	1.97	B
Woodlyn Rd.	North of Mt. Carmel Ave.	1.89	B

Source: DVRPC field work and model output, 2006.

<u>Highest PLOS scoring:</u>
As shown in Table 18, most of the roads in the Glenside study area had similarly favorable scores with a typical pedestrian LOS of ‘B.’ The one segment to receive a higher grade was not a true road, but a portion of Wesley Avenue that took the form of a plaza off Easton Road (1.49; LOS ‘A’). This segment had low vehicular traffic intensity, a wide outside lane, and ample sidewalks.

<u>Lowest PLOS scoring:</u>
Only a few study area segments had a pedestrian LOS of ‘C’ or lower. Two of those segments were on Easton Road, one of the larger roads in the study area with the highest vehicular traffic intensities and speed limits of the roads surveyed. The lowest overall score in the study area was Tyson Avenue west of Lynwood Avenue (3.43; LOS ‘C’), which was one of only two segments in the study area that did not have sidewalks. This, coupled with a relatively narrow outside lane width, hurt the road’s overall score despite its relatively low traffic intensity.

Map 15: Glenside Station Area PLOS Scores (1/4-Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 325 650 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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Bicycle LOS results and summary

Table 19 below summarizes the BLOS scores calculated for road segments within one mile of Glenside Station. Road segments are arranged alphabetically for ease of reference. These scores are also depicted on Map 16.

Table 19: Glenside Station Area BLOS Summary

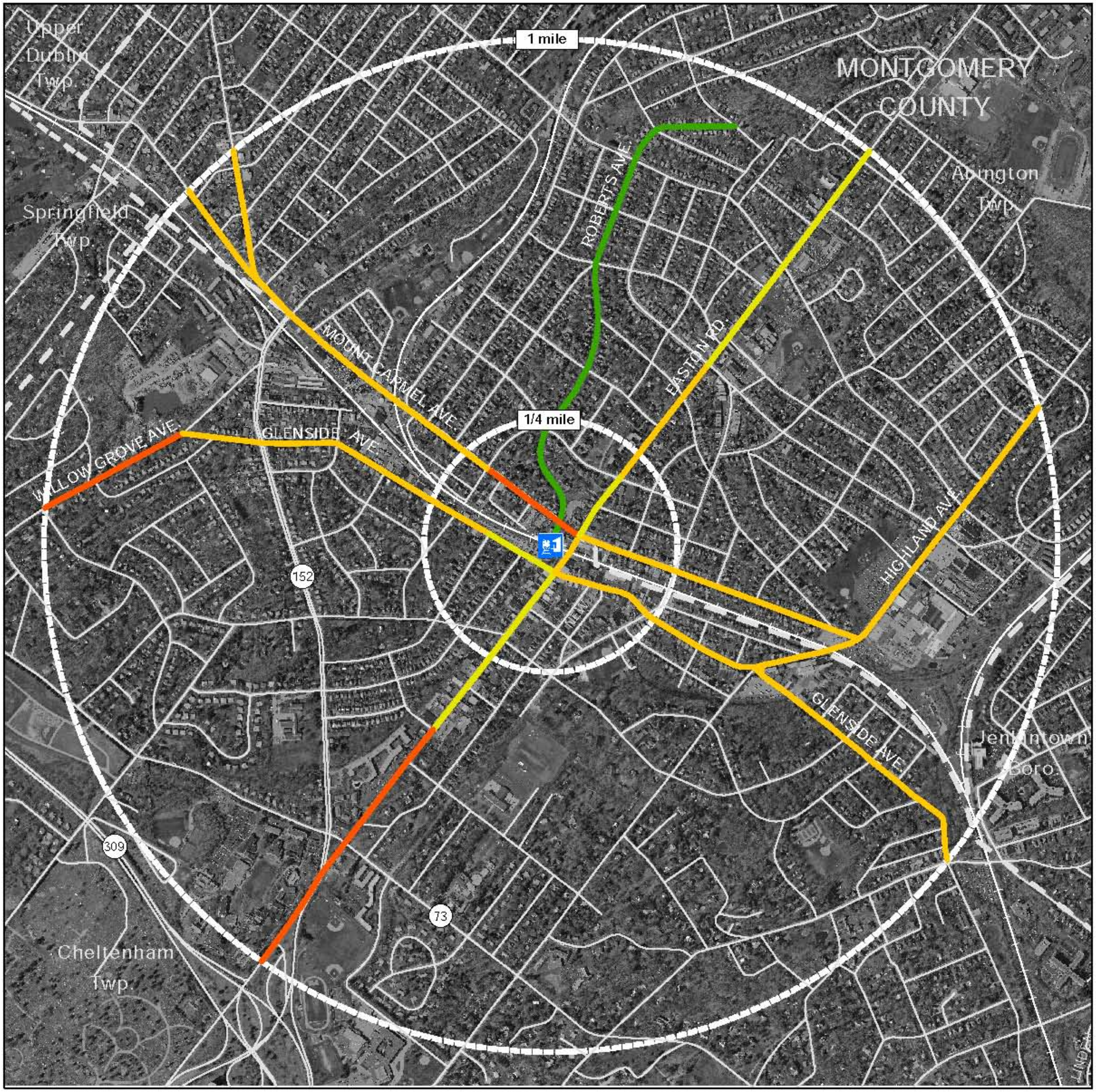
Road Segment	Location	BLOS Score	BLOS Grade
Easton Rd.	North of Keswick Ave.	3.03	C
Easton Rd.	Keswick Ave. to Fairhill Ave.	4.28	D
Easton Rd.	Fairhill Ave. to Mt. Carmel Ave.	2.81	C
Easton Rd.	Glenside Ave. to Springhouse Ln.	2.62	C
Easton Rd.	South of Springhouse Ln.	5.05	E
Glenside Ave.	Easton Rd. to Lismore Ave.	3.24	C
Glenside Ave.	Lismore Ave. to Willow Grove Ave.	4.08	D
Glenside Ave.	East of Keswick Ave.	4.22	D
Glenside Ave.	Easton Rd. to Keswick Ave.	4.11	D
Highland Ave.	North of Mt. Carmel Ave.	3.90	D
Limekiln Pk.	North of Mt. Carmel Ave.	3.76	D
Mt. Carmel Ave.	West of Tyson Ave.	4.13	D
Mt. Carmel Ave.	Tyson Ave. to Easton Rd.	4.74	E
Mt. Carmel Ave.	Easton Rd. to Keswick Ave.	3.57	D
Mt. Carmel Ave.	East of Keswick Ave.	3.81	D
Rice's Mill Rd.	Glenside Ave. to Mt. Carmel Ave.	4.38	D
Roberts Ave.	North of Jenkintown Rd.	1.01	A
Roberts Ave.	Jenkintown Rd. to Geneva Ave.	0.28	A
Roberts Ave.	Geneva Ave. to Mt. Carmel Ave.	0.00	A
Roberts Ave.	South of Mt. Carmel Ave.	2.05	B
Waverly Rd./Laverock Rd.	West of Easton Rd.	1.82	B
Willow Grove Ave.	South of Glenside Ave.	4.65	E

Source: DVRPC field work and model output, 2006.

<u>Highest BLOS scoring:</u>
As summarized in Table 19, bicycle LOS scores were generally poor in the study area, with most grades being a 'D' or lower. Only a few street segments received a score above a 'C,' the highest being Roberts Avenue between Geneva Avenue and Mt. Carmel Avenue (0.00; LOS 'A'). This segment scored highly because of wide lanes, a low posted speed limit, and relatively low traffic intensity. All segments of Roberts Avenue scored well relative to the other road segments in the study area.

<u>Lowest BLOS scoring:</u>
Most of the segments in the study area received a bicycle LOS score below a 'D.' The segment that had the lowest score was Easton Road South of Springhouse Lane (5.05; LOS 'E'). This segment had high vehicular traffic intensity, as well as a high posted speed limit and a relatively narrow pavement width. No segments of Easton Road, Glenside Avenue, or Mt. Carmel Avenue, the three major roads in the study area, scored higher than 'C.'

Map 16: Glenside Station Area BLOS Scores (1-Mile Radius)



BLOS Grade
A
B
C
D
E
F
Station

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

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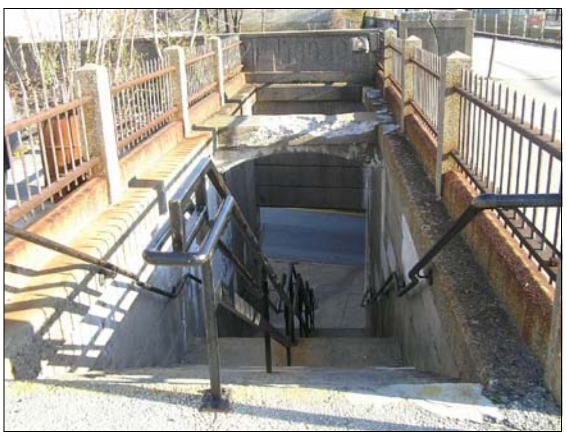
Conditions for pedestrians/bicyclists in the immediate station vicinity

The quarter-mile study demonstrated favorable conditions for pedestrians in the vicinity of Glenside station. Located at the edge of Glenside's commercial core, the station is accessible by pedestrians from all directions. A stairway on the south side of the station provides access to Easton Road and to the north station platform. For those unable to traverse the steep stairwell, a walkway extends from the Glenside Station parking lot to the northwest corner of Easton Road and Glenside Avenue.

One issue for pedestrians is that the only way to get from one station platform to the other is to walk along Easton Road, typically using the aforementioned stairwell. This segment of Easton Road had a PLOS grade 'C,' and the covered section is particularly risky for pedestrians because the raised sidewalks in the underpass have no railings to protect pedestrians from traffic.

Conditions for cyclists in the study area were generally unfavorable. With the exception of Roberts Avenue, the streets that surround the station all had average bicycle LOS grades of 'D.' With no other way of getting from one side of the station to the other, cyclists are forced to use the Easton Road underpass, which also had an LOS of 'D.'



A stairwell on the north side of Glenside station leading to Easton Road. The sidewalk below has no guardrail, however, to protect pedestrians from traffic.

Glenside Station viewed from southwest corner of Easton and Glenside.

Suggested improvements to enhance pedestrian/bicyclist accessibility

Creating a pedestrian bridge to facilitate safer passage from one side of the tracks to another would enable people to avoid the steep stairwell on the north side of the station and comparatively unsafe Easton Road underpass. At a minimum, a guardrail along the underpass section of Easton Road's sidewalk would provide an extra safety barrier for pedestrians who currently use it to get to and from the south side of the station. Additionally, an informal pathway running behind an apartment building and through several parking lots connects Mt. Carmel Avenue to the station site. Improving this route with wayfinding signage or the provision of a permanent walkway would enhance the safety of this informal route.

The roads surrounding Glenside Station are not bicycle friendly. Bicycle lanes on Mt. Carmel Avenue and Glenside Avenue, both of which parallel the rail right-of-way, would greatly enhance bicycle access from all directions. Bicycle lanes or shared-lane pavement markings on Easton Road would also allow cyclists coming from the northern and southern edges of the study area to have a safer commute to the station. Where roadways' space constraints due to cartway width or on-street parking prevent the provision of dedicated bicycle lanes, shared lane pavement markings (or 'sharrows' – see Appendix A) may be appropriate. Glenside station itself presently has no bicycle racks; installing these would also make cycling to the station a more attractive option.

The buildings surrounding Glenside Station provide unique opportunities for commercial development. The Roberts Block building, located on the north side of the station, which was severely damaged by fire in 2006, is a historically significant building that could anchor commercial development in Glenside. In 2004 it was proposed as such in the TCDI-funded Glenside Station Area Development Plan, which centered on a new mixed-use Glenside Station garage. This project has the capability to extend the pedestrian activity of Glenside's core northward, which can be expected to encourage pedestrian station access.

A short-cut through parking lots connects Mt. Carmel Avenue to the Glenside station platform.

The fire-damaged Roberts Block building just north of the station could serve as an anchor for commercial redevelopment.

Relevant aspects of regional and state bicycle and pedestrian plans

While none of the road segments that are most significant for station access were part of the most recent Southeastern Pennsylvania Bicycle and Pedestrian Mobility Plan (1995), Routes 73 and 152 were proposed as for bicycle accommodation within the right-of-way, as was Edge Hill Road. While none of these roads accommodates station access, their improvement would nonetheless enhance the general level of bicycle accommodation in the broader station vicinity.

Relevant Transportation Improvement Program (TIP) projects

Project 60540 (MPMS#) provides for the construction of a mixed-use parking garage at Glenside Station, implementing the 2004 development plan cited above.

SUMMARY AND RECOMMENDATIONS

The following sections contain photographs from the road segments among the five station areas that had the highest and lowest BLOS and PLOS scores. These photographs are not presented to suggest that segments with poor scores be redesigned to be more similar to those with high scores. In some cases, a more pedestrian- or bicycle-friendly parallel or alternate route is available, or another mitigating characteristic explains designs that are unfriendly to nonmotorized modes. Rather, a comparison between these images is intended to illustrate the types of physical conditions, incorporated in the BLOS and PLOS models, which make a road segment desirable or undesirable for pedestrians and bicyclists.

Highest Phase IV BLOS scoring

There are a number of study area road segments with the highest possible BLOS score (0.00; LOS 'A'). In most cases, these scores reflect a combination of particularly wide shoulders, dedicated bicycle lanes, or both. The photo below depicts one of these road segments: Roberts Avenue from Geneve Avenue to Mt. Carmel Avenue, just north of Glenside Station.

Roberts Avenue from Geneva Avenue to Mt. Carmel Avenue, north of Glenside station. Factors yielding the highest possible BLOS score include low traffic intensities (an estimated AADT of 1,250 and 25-mph speed limit) and a relatively wide cartway width (34 feet).

Lowest Phase IV BLOS scoring

The lowest Phase IV BLOS score occurred along Broad Street in the vicinity of Erie Station during peak travel hours (5.28; LOS ‘E’).

Broad Street in the vicinity of Erie Station. The unusually poor BLOS score is due to high traffic volumes (AADT of 45,000), narrow lanes (10-feet), a higher-than-usual estimated percentage of heavy truck traffic (7%), and the lack of a passable shoulder during the peak period.

Highest Phase IV PLOS scoring

The Phase IV road segment with the highest PLOS score was Stanwood Street (east of Jeanes Street) in the vicinity of Fox Chase Station, which had a score of 1.21 (LOS ‘A’).

Stanwood Street east of Jeanes Street. Factors yielding a desirable pedestrian environment include consistent sidewalks (roughly 5.2 feet avg. width), frequent street trees (spaced 40 feet on center), and a high proportion of occupied on-street parking (estimated at 80% for the length of the block), which provides an additional physical barrier from moving cars.

Lowest Phase IV PLOS scoring

The lowest PLOS score was associated with Jackson Road east of Hopewell Road in the vicinity of Atco station. (4.84; LOS ‘E’).

Jackson Street east of Hopewell Street. Factors influencing a negative score are a lack of any continuous sidewalk, narrow shoulder (6-inches), relatively narrow travel lane (11-feet), and high traffic intensities (AADT of 14,554 and speed limit of 45-mph).

Recommendation summary

Table 20 summarizes the recommendations presented in this report for each Phase IV station area.

Table 20: Summary of Improvement Recommendations by Station Area

Station	Bikeway along key route(s)	Crosswalk/ intersection improvement(s)	Pedestrian overpass/ Underpass/ or fencing	Station bike racks	Wayfinding signage	Off-road bike/ped path	Sidewalk improvement(s)
Atco	X		X			X	X
Bryn Mawr	X	X	X				
Erie	X	X		X	X		
Fox Chase	X		X	X	X	X	
Glenside	X		X	X	X	X	

Source: DVRPC, 2007.

For details concerning recommendations for each respective station area, see the appropriate section of this report.

APPENDIX A

Shared-lane pavement marking ('sharrow') detail

Several portions of this report reference the possibility of employing shared lane pavement markings (or shared lane arrows) as an alternative to dedicated bicycle lanes. The purpose of these 'sharrows' is to direct cyclists away from parked cars (and potential door openings) while promoting awareness among drivers of cyclists' right to use the road. Below are two examples of shared-lane pavement markings taken from a 2004 report of the San Francisco Department of Parking & Traffic.

Example of a 'sharrow' in San Francisco

Alternate shared-lane marking (Cambridge, Mass.)

Sharrows may be appropriate where continuity of bicycle routes is needed, but where there is insufficient room for a dedicated bicycle lane. A uniform design and implementation strategy for 'sharrows' has been proposed to be included as a new item in the Manual on Uniform Traffic Control Devices (MUTCD) by the Bicycle Technical Committee of the National Committee on Uniform Traffic Control Devices (NCUTCD). To date, such an adoption has not occurred. The summary report of the Bicycle Technical Committee can be downloaded from the following location: http://members.cox.net/ncutcdbtc/sls/slmtoncjan05.pdf.

The proposed guidance language, as submitted by the Bicycle Technical Committee (February 18, 2005), is as follows:

Section 9C.XX Shared Lane Marking

Support:

The Shared Lane Marking is intended to:

1. Help bicyclists position themselves in lanes where the traveled way is too narrow for a motorist and a bicyclist to travel side by side within the same traffic lane.
2. Encourage safe passing of bicyclists by motorists.
3. Reduce the chance of a bicyclist's impacting the open door of a parked vehicle in a shared lane with on-street parallel parking.
4. Alert road users of the lateral location bicyclists may occupy.
5. Reduce the incidence of wrong-way bicycling.

Option:

The Shared Lane Marking shown in Figure 9C-XX may be used to assist bicyclists with positioning in a shared lane and to alert road users to the location a bicyclist may occupy.

Standard:

If used in a shared lane with on-street parallel parking, Shared Lane Markings shall be placed so that the centers of the markings are a minimum of 3.4 m (11 ft) from the curb face, or from the edge of pavement where there is no curb.

Guidance:

If used, the Shared Lane Marking should be placed immediately after an intersection and spaced at intervals not greater than 75 m (250 ft) thereafter.

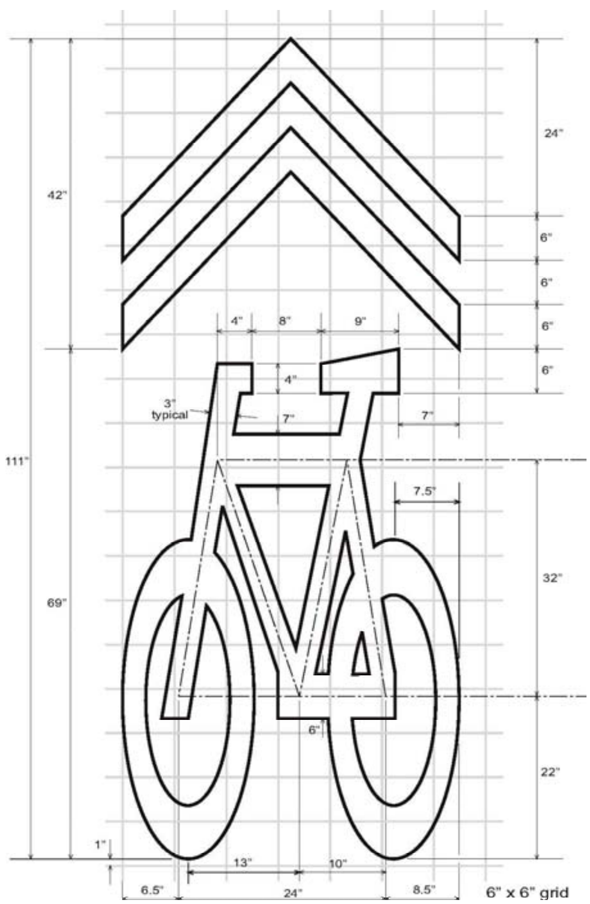
If used on a street without on-street parking with an outside travel lane less than 4.2 m (14 ft) wide, the centers of the Shared Lane Markings should be no closer than 1.2 m (4 ft) from the curb face, or from the edge of pavement where there is no curb.

The Shared Lane Marking is recommended primarily for use in urban areas.

Option:

Where used on a shared lane with on-street parking, the distance from the curb, or from the edge of pavement where there is no curb, may be increased beyond 3.4 m (11 ft).

Figure 9C-XX. Shared Lane Marking



APPENDIX B

Summary of New Jersey Statewide Bicycle and Pedestrian Master Plan

In 2004 NJDOT released Phase 2 of the Statewide Bicycle and Pedestrian Master Plan. The plan vision states: *New Jersey is a state where people choose to walk and bicycle; residents and visitors are able to conveniently walk and bicycle with confidence and a sense of security in every community; and both activities are a routine part of the transportation and recreation systems and support active, healthy life styles.*

While Phase 1 focused on policies, Phase 2 concentrates on facilities. This emphasis is the result of heightened interest in developing bicycle and pedestrian accommodations to the extent that funding requests for such projects far exceed available funds. Phase 2 is intended to provide clear guidance on prioritization of state investment in bicycle and pedestrian facilities.

Phase 2 accomplished this prioritization using analytical methods involving measures of demand and suitability applied to the CMS roadway network. Segments of the CMS network were identified as high priority where demand is high and facilities are least suitable.

Bicycle Demand is principally a function of demographics and mode split, where a younger population, college students, a high transit mode split and numbers of current bicycle commuters contribute to demand. Pedestrian Demand is derived from street network, population and employment densities and the balance of land uses.

Suitability is a level-of-service measure, a way of quantifying how comfortable a bicyclist or pedestrian would be traveling along or across a given facility. Bicycle Suitability is determined by roadway characteristics such as traffic speed and volume, presence of shoulders, or shoulder lane width. Pedestrian Suitability, defined as the ability of a person on foot to cross the roadway, factors in the speed and volume of traffic, the presence of a median refuge, and spacing of signalized crossings to determine overall delay from waiting for a safe gap in traffic in which to cross. Details on the analytical methodology used to classify priority segments may be found in the Phase 2 plan document.

Whereas study areas road segments in this report are not identified as priority segments in the State Plan, the State Plan's goals, objectives, and policies reference the importance of enhancing bicycle and pedestrian accessibility to transit stations generally.

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Geographic Area Covered: One-quarter mile and one-mile radii surrounding Atco, Bryn Mawr, Erie, Fox Chase, and Glenside rail stations.

Key Words: Atco Station, Bryn Mawr Station, Erie Station, Fox Chase Station, Glenside Station, New Jersey Transit Atlantic City Line, Pedestrian Level of Service (PLOS), Bicycle Level of Service (BLOS), Pedestrian Safety, Bicycle Safety, Pedestrian Compatibility, Bicycle Compatibility.

ABSTRACT: Phase IV of this continuing project assessed nonmotorized (pedestrian and bicycle) accessibility to five rail stations in the region. Three SEPTA Regional Rail stations (Bryn Mawr, Fox Chase, and Glenside), one SEPTA Broad Street Subway station (Erie), and one New Jersey Transit Atlantic City Line station (Atco) were analyzed using PLOS and BLOS model software. Field measurements and observations provided data for this analysis, which was supplemented by a qualitative examination of access conditions in the immediate vicinity of each station. A summary of recommended enhancements was prepared for each station, noting strategies that would address specific problem areas.

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