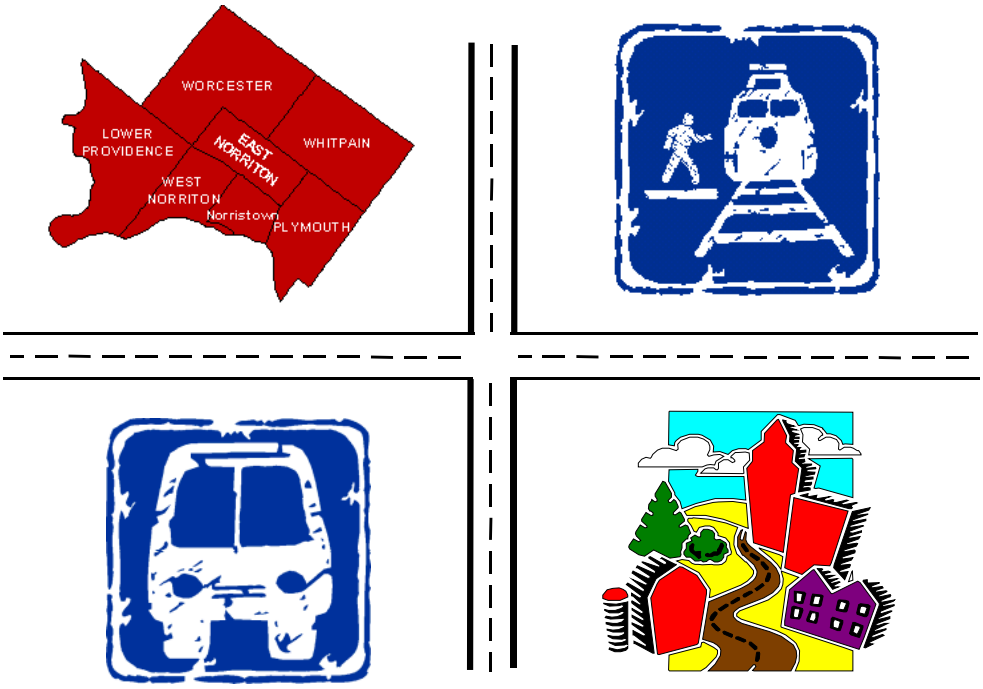
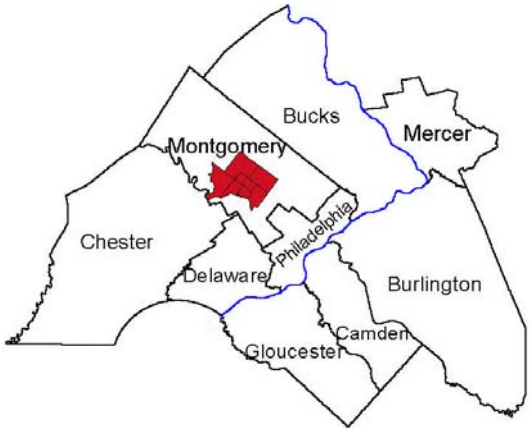


Central Montgomery County Transportation Study



YEAR 2020 PLANNING CORRIDORS REPORT 3

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

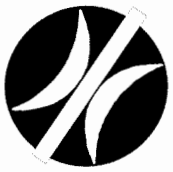
Central Montgomery County Transportation Study

YEAR 2020 PLANNING CORRIDORS

REPORT 3

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

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.



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

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

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 EXECUTIVE SUMMARY

This report presents the results of a comprehensive land use and transportation evaluation for seven municipalities located in Central Montgomery County, Pennsylvania.

The effort was undertaken as a by-product of the long range transportation plan for the region (*Direction 2020 Plan*), wherein it is recommended that high priority areas / corridors facing emerging problems — such as rapid suburbanization, inadequate public transportation and increasing traffic congestion — be subjected to more refined evaluations with the participation of local governments within the study area.

The Delaware Valley Regional Planning Commission's (DVRPC) Board of Commissioners directed staff to conduct an assessment of the area within and transportation systems serving Central Montgomery County. As part of the study development process the detailed study area was determined to include East Norriton, Lower Providence, Plymouth, West Norriton, Whitpain and Worcester townships, and the Borough of Norristown.

The study area is varied in character ranging from mature and dense urban settings within Norristown in the eastern portion of the study area, to seemingly rural conditions in Worcester on the west. The level of public transportation services within the study area varies directly with its state of urbanization. Despite the differences in setting, traffic congestion is prevalent throughout the study area and a ubiquitous concern of the seven municipalities. Developing a unified method to address that concern was the ultimate objective of the study, and required both technical and committee work.

In conducting this study, DVRPC augmented local independent planning initiatives by systematically examining the study area's existing transportation situation, estimating demographic changes associated with growth portrayed in municipal planning studies, and performing regional travel simulations for a 1995 Base Year condition and two future Year 2020 transportation improvement investment scenarios (Limited-Build and Full-Build) — to identify the infrastructure needed to support orderly growth throughout the study area.

A multi-jurisdictional Study Steering Committee was established to guide the work. Representation from each of the seven study area municipalities, the Montgomery County Planning Commission, PennDOT, the Pennsylvania Turnpike Commission, the Greater Valley Forge Transportation Management Association (GVFTMA) and the Southeastern Pennsylvania Transportation Authority (SEPTA) directed the

technical activities performed by DVRPC. Members serving on the Steering Committee are listed in Appendix B of this report.

In the study, considerable effort was directed to identifying proposed / potential land developments and quantifying the demographic change associated with the growth. From that work it was estimated that an additional 5,400 housing units, 2,500,000 square feet of retail space, and 3,700,000 square feet of office and light industrial use will be introduced to the study area by the year 2020. That growth equates with an additional 9,100 residents and 16,800 jobs within the study area (representing an eight percent increase in population and a 20 percent increase in employment over 1995 levels). Growth will be highest in Lower Providence and Plymouth, but also significant in East Norriton and Whitpain. The demographic surcharges were subsequently used as inputs to the Year 2020 travel simulation exercises performed for the modeling component of the study.

The initial future year travel simulation assumed that a selected set of committed transportation improvements are implemented in the vicinity of the study corridor (Year 2020 Limited-Build). Committed projects were defined as projects which are in, or are imminent for, construction — or are programmed for construction on the current regional TIP (covering federal fiscal years 1999 - 2002). Examples which have a significant bearing within the study area are:

- sections 500 and 600 of the US 202 Improvement Project;
- widening the PA Turnpike between Lansdale and Norristown, and;
- widening the PA Turnpike between Valley Forge and Norristown.

Performance statistics and traffic volumes emanating from the Year 2020 Limited-Build travel simulation indicated that, compared with the simulated 1995 Base Year condition, a 35 percent increase in total daily vehicle miles of travel (VMT) would occur throughout the study area. Along the local highway network only (i.e., all highway facilities except expressways and freeways), a 36 percent increase in VMT is projected, and a four percent increase in daily transit boardings is projected. Traffic congestion levels will heighten and be widespread throughout the study area, particularly for local highways in East Norriton, Norristown, Plymouth, West Norriton and Whitpain.

Assessments performed within the Limited-Build scenario indicated that multi-modal solutions be investigated, and that travel demand management strategies be pursued in Plymouth and Norristown. Additionally, a wider application of traditional highway improvements should be evaluated, including increasing local highway connections to the freeway network (via interchange completion and provision of "slip ramp" connections with the Turnpike).

The Year 2020 Full-Build travel simulation assumed the network and demographics associated with the Limited-Build scenario as well as recommendations emanating from Limited-Build alternative's assessment. As such, a wider set of improvements were added for the Full-Build modeled network, including but not limited to:

- operation of the Schuylkill Valley and Cross County metros;
- widening along PA 363 and Germantown Pike, from the US 422 interchange to the PA Turnpike's Norristown interchange, as an improvement to serve study area growth and circumvent congestion in Norristown;
- "completion" of the US 422 and PA 363 interchange — such that ramps to and from the west are provided, and;
- provision of electronic toll interchanges and corresponding "slip ramps" between the local highway network and the Pennsylvania Turnpike's northeastern extension (I-476) at three locations within the study area — in the vicinity of Township Line Road, in the vicinity of US 202, and near PA 363 at Schultz Road.

Performance statistics emanating from the Year 2020 Full-Build travel simulation, compared with the simulated 1995 Base Year condition, indicated that a 43 percent increase in total VMT would occur over the entire study area. On the other hand, travel along local access highways increased just 36 percent — an increase consistent with the Limited-Build scenario. Improved access between the study area's local highways and its freeways, modeled by the new ramps in the Full-Build alternative, allows for more optimal traffic distribution and reduces the reliance on local highways in the study area.

Daily transit boardings are estimated to rise about 48 percent over existing levels throughout the Central Montgomery County study area. The greatest gains will occur at the Norristown Transportation Center as a direct result of the mobility improvements introduced by the Schuylkill Valley and Cross County metros.

Local highway congestion throughout the study area, and particularly in East Norriton, Norristown, Plymouth, West Norriton and Whitpain, will be ameliorated in the Year 2020 as a consequence of providing traditional traffic improvements throughout the study area if compared to the Limited-Build scenario.

Assessments conducted within the Full-Build traffic scenario indicate that the study area is more completely addressed through a larger set, and wider distribution, of capital transportation improvements — both highway and transit. Travel demand management strategies and actions are viewed as necessary to augment traffic engineering improvements (in Norristown and Plymouth), and to extend the serviceability of the capital improvements provided in Whitpain — the study area's

other employment-rich municipality.

Ultimately, 44 individual capital projects are recommended within the study area as a result of the technical and committee work. For the most part, the recommendations adopt the set of improvements identified and evaluated in the Full-Build alternative as the most appropriate set for accommodating travel and growth needs. The projects are subdivided into highway improvements (34 projects), rideshare and transportation demand management improvements (1 project encompassing Norristown, Plymouth and Whitpain), intelligent transportation system improvements (7 projects), and two bikeway improvements.

The recommendations are arrayed into a capital improvement plan (CIP) for the study area which cites: project priorities based upon estimated availability of funding; order of magnitude project cost estimates; project funding (programming) status, and; project sponsors. Project priorities and funding elements are framed within four stages (short, near, medium and long terms) to coincide with the development of regional, state and federal planning and programming instruments.

A summary of the study area's recommended $710 million CIP is shown below.

SUMMARIZED AREA-WIDE CAPITAL IMPROVEMENT PLAN

STAGING / COST ESTIMATE (000'S)

IMPROVEMENT CATEGORY	Short Term (0-4 yrs)	Near Term (5-8 yrs)	Medium Term (9-12 yrs)	Long Term (13-20 yrs)	Totals
Highway	$ 230,425	$ 238,650	$ 109,500	$ 79,600	$ 658,175
Rideshare / TDM	$ 100	$ 100	$ 100	$ 200	$ 500
ITS	$ 2,050	$ 25,000	$ 20,000	—	$ 47,050
Bikeways	$ 1,738	$ 3,000	—	—	$ 4,738
Totals	$ 234,313	$ 266,750	$ 129,600	$ 79,800	$ 710,463

Short term improvements consist of projects which are in or are imminent for construction, are on the current regional TIP, or proposed for inclusion in DVRPC's 2001 - 2004 TIP update. Funding commitments have been identified for virtually

all of the short term program needs (0.5% percent unfunded).

The near term set of improvements include projects, or phases thereof, which coincide with the second four years of the PennDOT Twelve Year Program (STIP). Seventy-seven percent of the near term's projects are programmed (23% unfunded).

The medium term set of improvements coincides with the remaining program years of PennDOT's Twelve Year Program. About 23 percent of the implementation cost for the medium term improvement program are programmed (77% unfunded).

The long term program of improvements rounds-out the completion and update of DVRPC's long range transportation plan for the region (Year 2020 Transportation Plan). From a practical stand point, the long term portion of the CIP is completely unfunded (0.3% programmed).

More detail on project breakdowns and the financial aspects of the capital plan can be obtained by reviewing Table 19 - the CIP (on page 99) of the report.

The study area's improvement program (as summarized above) is supplemented by a set of important regional transportation improvements which will impact travel in Central Montgomery County. These projects are in varying stages of development, and fall under the sponsorship of other municipalities or agencies to implement. Notable among these are the Schuylkill Valley and Cross County metros, the PA 23 Relocation Project and a multi-purpose bike / pedestrian trail extending south of the study area.

Complementing the area-wide capital improvement plan, in the study's recommendations, are a broad set of management actions which emphasize transportation demand management and growth management as tools to extend mobility within and beyond the study area. Roles and responsibilities are identified for a full range of programmatic and institutional actions to be implemented regionally, locally, publicly and privately.

Together the capital improvements and the management measures represent a comprehensive and unified implementation strategy — designed to serve Central Montgomery County's growth and travel needs. □

2 INTRODUCTION

As part of DIRECTION 2020, the Delaware Valley Regional Planning Commission's (DVRPC) regional long-range plan, comprehensive land use and transportation planning initiatives for the year 2020 were undertaken throughout the region. A product of that effort indicated that high priority areas / corridors facing emerging problems — such as rapid suburbanization, inadequate public transportation and increasing traffic congestion — be subjected to more refined evaluations with the participation of local governments within the study area.

The Central Montgomery County Transportation Study's planning area, consisting of East Norriton, Lower Providence, Plymouth, West Norriton, Whitpain and Worcester townships, and the Borough of Norristown, has been selected as one such area. While the study area's setting is quite diverse (e.g., current build-out levels, rates of suburbanization and levels of transit service vary considerably), traffic congestion is a common concern. On the other hand, opinions and efforts to ameliorate the problem are as varied as the study area's setting.

This study provided the means to address the expected benefits of current transportation planning and improvement programming efforts in the Central Montgomery County sub-region. The work also furnished the ability to test additional actions which might be pursued to serve study area growth. Major planning issues which contributed to formulating the initial work program and defining the study area were:

1) To investigate and plan for the long term consequences of improving US 202 (Sections 500 and 600) on east-west arterial highways traversing the study area (particularly in East Norriton).
2) To investigate the possible effects of Turnpike slip ramps upon the local roadway network.
3) To document the affects of the Schuylkill Valley Metro on area-wide travel.
4) To incorporate independent transportation, traffic and land use planning initiatives that have been undertaken (in Plymouth and Whitpain).
5) To address neighboring municipalities where comprehensive transportation planning efforts have not recently been advanced (East Norriton, Lower Providence, Norristown, West Norriton and Worcester).

In conducting this study, DVRPC augmented local planning efforts by examining the Central Montgomery County sub-region in a comprehensive fashion. Additionally, DVRPC used regional planning initiatives and evaluation procedures in the effort. The study draws from the findings of the DIRECTION 2020 Plan, and in-house planning efforts such as the Pennsylvania Congestion Management Systems (PA CMS), and the Mobility Alternatives Program (MAP) so that land use-transportation

linkages and multi-modal perspectives are integrated into the evaluation. Lastly, the Central Montgomery County Transportation Study employed the regional travel demand forecasting model to perform travel simulations for two future year investment scenarios.

A variety of exercises were performed with the regional model's output, which yielded performance data, to assess the adequacy of the study area transportation network for each of the tested alternatives.

To guide the work, DVRPC established a collaborative steering committee composed of governmental jurisdictions, key operators and institutional entities located within the study area (membership on the Study Steering Committee is enumerated in Appendix B). Ultimately, the Central Montgomery County Transportation Study results in a comprehensive and unified implementation strategy — consisting of a capital improvement plan, management actions and additional studies — to serve sub-regional needs. Appropriate elements of the implementation strategy will serve as updates to the Long Range Plan and/or will be cited as candidate recommendations of the parent plans and programs (PA CMS, MAP, and the Transportation Improvement Program — TIP).

WORK PROGRAM

The following activities were undertaken in order to complete the Central Montgomery County Transportation Study.

1) Obtain instruction from the DVRPC Board of Commissioners regarding the appropriate study area for consideration.
2) Establish and provide administrative and technical support for a study area planning steering committee.
3) Use recommendations of the various management systems (as available), land use and transportation planning efforts and steering committee input to critique and supplement the recommendations of the regional plan.
4) Develop a focused transportation network to perform travel simulation / modeling within the detailed study area.
5) Prepare and evaluate alternate land use conditions (versus the population and employment forecasts of DIRECTION 2020) as the basis for modeling future travel conditions within the study area.
6) Test alternate future travel scenarios to determine the set of facilities needed to serve the study area.
7) Develop a final set of recommended land use conditions and transportation improvements for the study area.

8) Coordinate the area-wide plan with affected local governments, operating agencies and other groups as may be needed.

THE REPORT

This report summarizes the undertakings and findings of the work program through the preparation of recommendations for the Central Montgomery County sub-region.

- Chapter 3 describes the regional setting surrounding the study area.
- Chapter 4 presents existing conditions within the study area.
- Chapter 5 details the steps taken and results produced in simulating future Year 2020 travel demands.
- Chapter 6 summarizes the improvement plan recommended as a result of the technical and committee work.
- Chapter 7 addresses implementation practices to achieve the plan. □

3 REGIONAL SETTING

The study area is situated in the northwestern suburbs of the region (Figure 1), and is comprised of the Borough of Norristown, and East Norriton, Lower Providence, Plymouth, West Norriton, Whitpain and Worcester townships located in Central Montgomery County, Pennsylvania.

The character of the 69 square mile study area varies considerably. Rural-like conditions, on the west, give way to new and/or mature suburban settings as one travels eastward. The level of public transportation services also increases with eastward maturity of the study area. Ultimately, the aged and densely developed Borough of Norristown serves as the core of the study area and hub to the sub-region's transit services.

Regional development centers[1] that influence travel within and through the study area include: Norristown, Plymouth Meeting, King of Prussia, Conshohocken, and the City of Philadelphia. Access to and beyond these activity centers is afforded by a network of freeways, principal arterial highways, and passenger rail services.

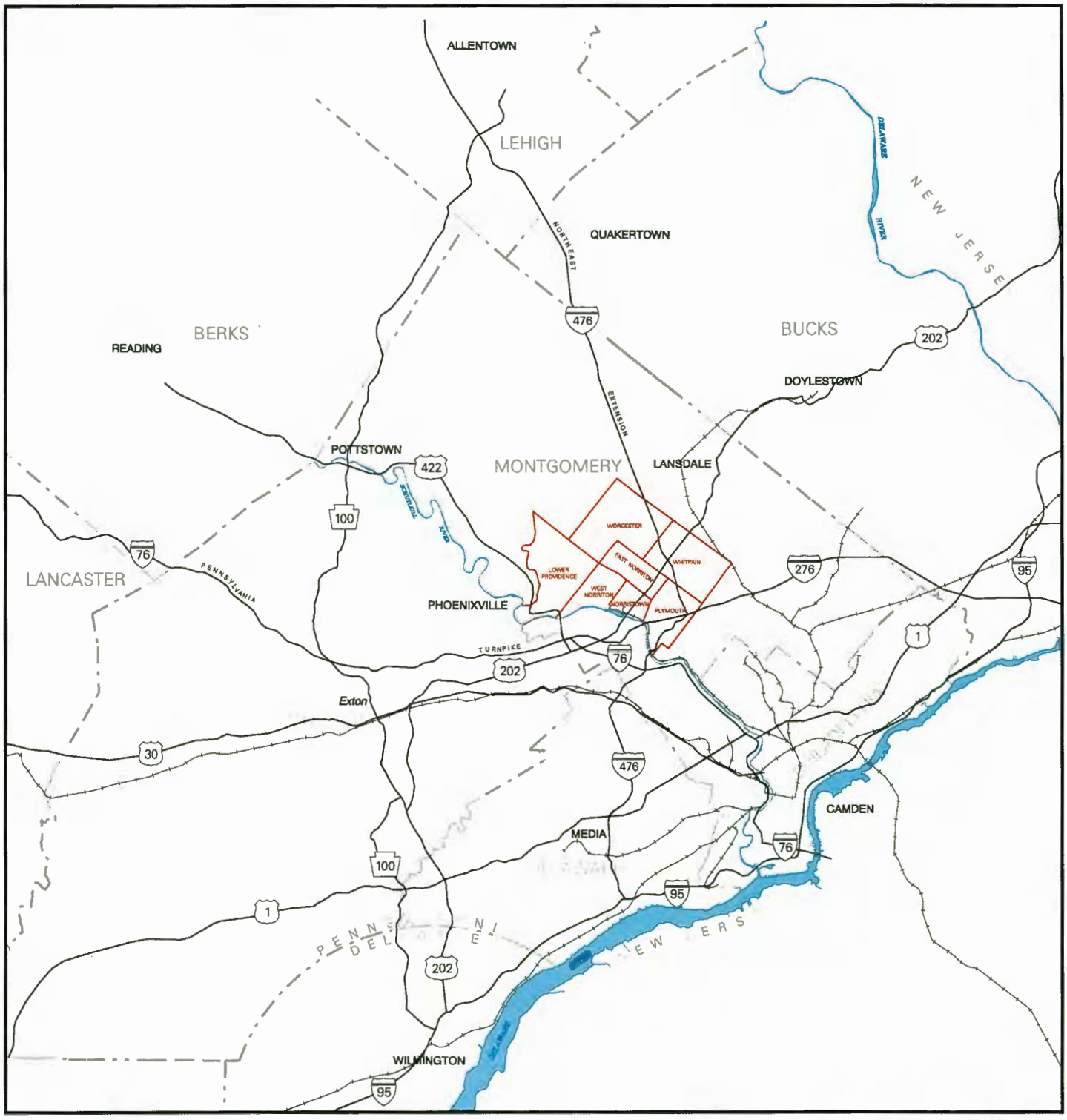
HIGHWAY FACILITIES

Freeways providing mobility in the vicinity of the study area include the east-west and northeastern extension of the Pennsylvania Turnpike (I-276 and I-476, respectively), the Mid-County Expressway (I-476) and the Pottstown Expressway (US 422). Principal arterial highways include: US 202, PA 363, PA 73, Germantown Pike and Ridge Pike.

The Turnpike is a toll highway, providing high levels of mobility for long distance trips to/from the east, west and north. The Turnpike's Norristown / I-476 Interchange (interchange #25) is situated at the eastern edge of the study area. The split interchange allows for direct freeway interconnection between I-276 and I-476, and local access at Germantown Pike and Plymouth Road (via the Norristown toll plaza). The nearest neighboring interchanges are located approximately 7 miles to the west (interchange #24, Valley Forge), 4.5 miles to the east (interchange #26, Fort Washington) and 11.5 miles to the north (interchange #31, Lansdale).

[1] Development centers are concentrations of and foci for dense development, typically, offering and mixing opportunities for shopping, employment, entertainment, etc..

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



0 5 15 20 MILES

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 1:
REGIONAL SETTING

STUDY AREA

East of Norristown, the Turnpike provides three lanes by direction. Widening to provide an additional (third) lane in each direction, between the Norristown and Valley Forge interchanges (e.g., west of Norristown) and between the Norristown and Lansdale interchanges (e.g., north of Norristown), are currently being evaluated by the Turnpike Commission.

The Mid-County Expressway (I-476) provides the study area's southerly oriented expressway axis. The Mid-County Expressway joins study area at the Turnpike's toll booth situated north of Germantown Pike. South from the study area, I-476 interconnects with the Schuylkill Expressway (I-76), traverses central Delaware County, and ultimately terminates at I-95. In the vicinity of the study area, I-476 provides three through lanes in both the northbound and southbound directions and has interchanges with Germantown Pike, Chemical Road and Ridge Pike.

The Pottstown Expressway (US 422) serves as the western extension of the Schuylkill Expressway (I-76), connecting US 202 in King of Prussia, on the east, with Pottstown on the west. The highway provides two travel lanes in both the eastbound and westbound directions, and skirts the southwestern side of the study area. PA 363 (Trooper Road) provides the study area's only direct link with this regional highway. However, the interchange between the facilities is configured to only serve traffic movements to and from the east on US 422.

US 202, is a principal arterial highway traversing, and bisecting the study area on a north-south axis. North from the study area, Montgomeryville and Doylestown are notable land marks. South of the study area, King of Prussia is the closest regional center. Through the Borough of Norristown, southbound US 202 traffic is signed along the Johnson Highway and Markley Street. Both streets are two-way highways. Along Markley Street, and north of Marshall Street, two moving lanes and on-street parking lanes are provided. South of Marshall Street, four moving traffic lanes plus on-street parking lanes are provided.

Northbound US 202 diverges from Southbound US 202 at DeKalb Street, just below the Borough of Bridgeport. Entering the study area from Bridgeport, DeKalb Street serves both northbound and southbound travel. Between Lafayette Street and the Johnson Highway, DeKalb Street becomes one-way northbound with two moving lanes and on-street parking.

Efforts are in progress between the Borough and PennDOT to upgrade US 202 along Johnson Highway and Markley Street, through Norristown. Pending a change in ownership to PennDOT's control, Markley Street will be reconstructed. The Markley Street Improvement Program (a.k.a.: US 202 Section 500), is imminent for design, and will result in a reconstructed cartway between Main Street and

Johnson Highway with significant intersection improvements undertaken at the end-point intersections. In the two lane section north of Marshall Street, on-street parking will be indented into sidewalk areas, and provisions for separate left turn lanes at cross streets will be made.

North of the Johnson Highway, both directions of US 202 share the same right-of-way, and the cross section varies from two to four travel lanes. Localized widening has been performed to add turning and/or through traffic lanes at intersections with major cross streets (e.g., at Germantown Pike, and at Skippack Pike). Comprehensive widening of US 202, north of Johnson Highway within the study area, is programmed to provide a minimum of four travel lanes (i.e., US 202 Section 600's Selective Widening Alternative).

PA 363 (variably aligned along Trooper Road, Park Avenue and Valley Forge Road as it crosses the study area) travels a north-south path from its origin at the US 422 interchange to the Borough of Lansdale, north of the project area. The highway supplies four lanes for through travel between US 422 and Egypt Road, and two elsewhere.

PA 73 (Skippack Pike) crosses the northern part of the study area connecting Schwenksville and Northeast Philadelphia. One eastbound and one westbound travel lane is typical of its cross section through the study area.

Germantown Pike is the center-most, east-west artery traversing the study area. Its alignment starts at its intersection with Ridge Pike, just east of the Borough of Collegeville. From there to its intersection with North Wales Road two travel lanes are provided for through traffic. For the remainder of the study area (i.e., North Wales Road to Chemical Road) four travel lanes, at a minimum, are provided. Localized widening has been performed through the Penn Square area for a center left turn lane, and between the Plymouth Meeting Mall and the PA Turnpike / I-476 interchange where seven travel lanes are offered. East of Chemical Road the roadway's cross section returns to two lanes.

Ridge Pike is an east-west arterial which traverses the southern portion of the study area. Two lanes are typical from the western boundary of the study area to Belvoir Road and four lanes are offered between Belvoir and Butler Pike. Localized widening is present: through the Germantown Pike intersection (four lanes); through the Park Avenue and Trooper Road intersections (a center left turn lane is provided though the PA 363 jog); between Egypt Road and Whitehall Road (four lanes), and; between Whitehall Road and Markley Street (2 lanes eastbound and 1 westbound). Through the Borough of Norristown metered on-street parking spaces occupy the cartway.

PASSENGER RAIL FACILITIES

The broad study area is served by regional and high speed train service oriented radially to Center City Philadelphia. The R6 (Norristown Line) is SEPTA's regional rail service within the study area. SEPTA's R5 (Lansdale / Doylestown Line) skirts the study area's northeastern corner. The Route 100 (SEPTA's Norristown High Speed Line) also serves the study area providing connection to Central Philadelphia via the Market-Frankford Line at the 69th Street Terminal in Upper Darby.

R6 Line station stops, directly serving the study area, include the Norristown Transportation Center, Main Street and Elm Street stations. The Norristown High Speed Line shares the Norristown Transportation Center facility with the R6 Line (and 6 SEPTA bus routes). Station stops along the R5 Line germane to the study area include the Ambler, Penllyn and Gwynedd Valley stations.

SEPTA is presently preparing financial, environmental and engineering analyses in support of providing new rail services west and south of Norristown:

- Schuylkill Valley Metro service - west to Reading along the US 422 corridor,
- Cross County Metro service - south to Glenloch (near Exton in Chester County) along the US 202 corridor.

With the support of Montgomery County, Bucks County is financing an investment study to ascertain the preferred mode and alignment for reactivating passenger rail service between Quakertown and Center City Philadelphia. A potential alignment for that service traverses the study area, utilizing the Stony Creek Branch railroad right-of-way between Lansdale and Norristown. □

4 EXISTING AREA-WIDE CONDITIONS

The subjects which are detailed in this chapter include:

- study area demographics according to the 1980 and 1990 Census;
- existing land use;
- existing highways and public transportation services;
- journey-to-work characteristics according to the 1990 Census;
- an assessment of existing transportation conditions within the study area, and;
- an overview of the projects contained within the current transportation improvement program encompassing the study area.

DEMOGRAPHICS

Montgomery County experienced a nominal increase in population (+5%), but a healthy increase in jobs (+27%) between 1980 and 1990 (see Table 1).

TABLE 1
STUDY AREA DEMOGRAPHIC CHARACTERISTICS: 1980 and 1990

		Population		Autos / Household		Employed Residents		Employment	
Municipality	Area (mi^2)	1980	1990	1980	1990	1980	1990	1980	1990
East Norriton	6.1	12,711	13,324	1.7	1.9	6,269	7,327	6,517	7,737
Lower Providence	15.5	18,945	19,351	1.7	1.9	9,335	10,264	6,014	10,366
Norristown	3.7	34,684	30,749	1.1	1.2	15,278	15,752	18,480	16,559
Plymouth	8.5	17,168	15,958	1.7	1.8	9,145	8,963	11,822	19,460
West Norriton	6.2	14,034	15,209	1.6	1.7	6,634	8,825	4,672	6,856
Whitpain	12.9	11,772	15,673	1.8	2.1	6,200	8,274	10,900	17,316
Worcester	16.2	4,661	4,686	1.9	2.0	2,406	2,352	1,479	2,649
Central Mont. Co. Study Area	**69.1**	**113,975**	**114,950**	**1.5**	**1.8**	**55,267**	**61,757**	**59,884**	**80,943**
Montgomery County	487.5	643,371	678,111	1.6	1.8	311,073	359,659	360,399	457,500

sources: statistics from 1980 and 1990 US Census

In contrast, over the same period, population within the study area grew just under one percent and employment jumped by 35 percent (+21,000 jobs). Population gains in Whitpain offset losses in Norristown and Plymouth. Large job gains were

experienced in Plymouth, Whitpain and Lower Providence. Auto availability for study area households increased 20 percent between 1980 and 1990.

LAND USE

Figure 2 illustrates 1995 land use conditions for the broad study area. The predominant land uses are single and multi-family residential use. A considerable amount of land north and west of Norristown is devoted to agricultural and wooded tracts (particularly in Worcester Township).

By stripping away the lower intensity uses from the existing land use map, concentrated nodes of commercial, industrial and higher density residential use become evident. Figure 3 executes this and reveals the development centers in the general surroundings of the study area.

King of Prussia, Conshohocken, Plymouth Meeting and Norristown are regionally significant development centers in the environs of the study area. Plymouth Meeting and Norristown are located in the detailed study area, at gateways to major transportation facilities (river, road and rail).

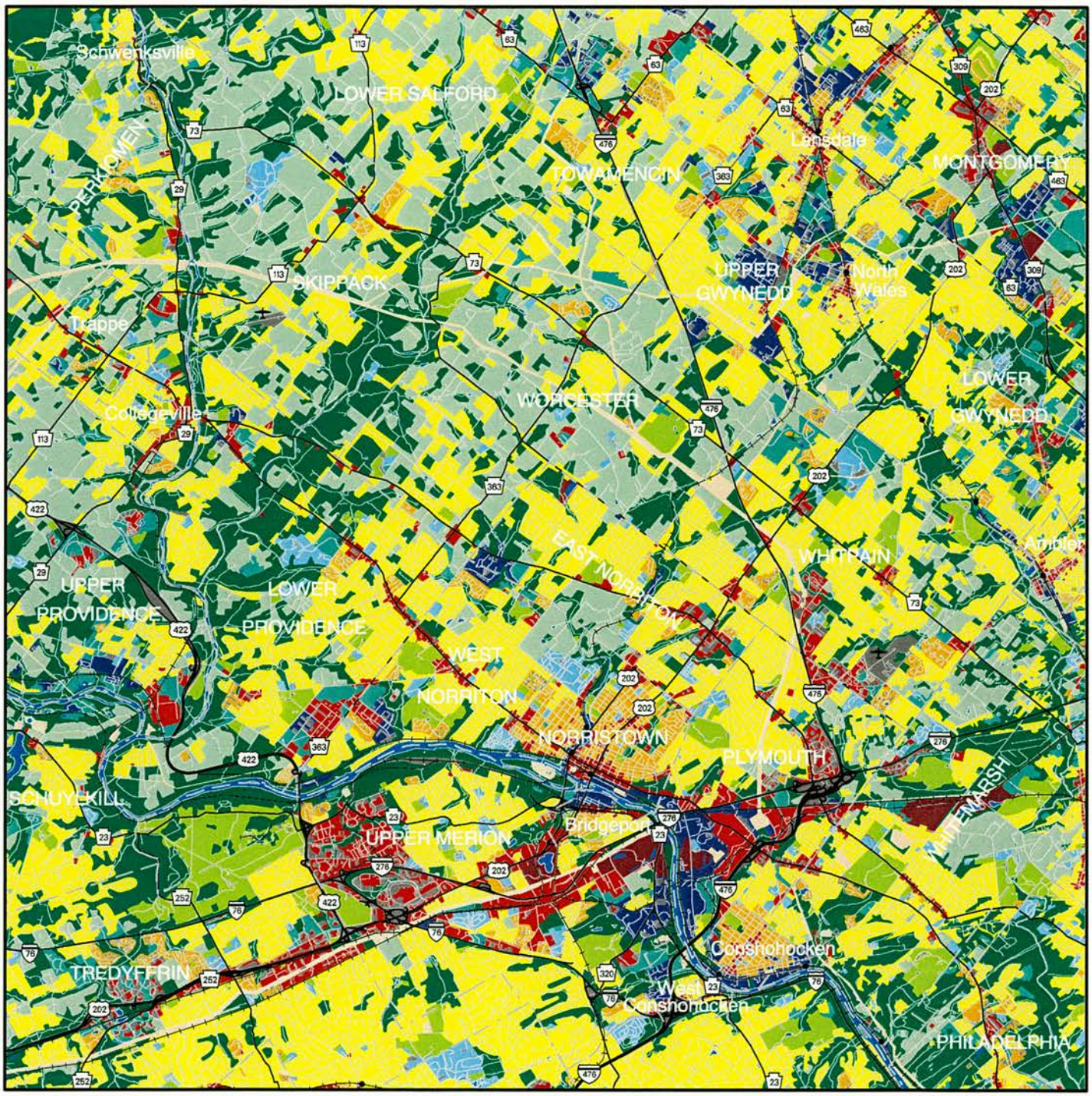
Plymouth's commercial and industrial center is generally defined by the triangle formed by the Schuylkill River, I-276 and I-476. That center includes the Plymouth Meeting Mall (a super-regional mall of 800,000 square feet), and a considerable number of proposals for new and/or expanded retail and office space (most notably Metroplex at Plymouth Meeting – a new 900,000 square feet retail / office / hotel development currently under construction along Chemical Road).

Norristown, the seat of government for Montgomery County, has its commercial center radiating out from the Main and DeKalb Streets intersection. North of the business district, high density residential use predominates. South and west of it, industrial use borders the Schuylkill River waterfront, and the R6 Line / Stony Creek Branch railroad right-of-way.

Three locally important commercial development centers are also located in the detailed study area:

1. in the Penn Square area of East Norriton Township surrounding the intersections of Germantown Pike with US 202 and Swede Street;
2. at the Valley Forge Corporate Center straddling Trooper Road (PA 363) just north of the US 422 interchange, in West Norriton and Lower Providence townships, and;
3. in Blue Bell, Whitpain Township, in the vicinity of the Pa Turnpike's northeast extension (I-476) crossing of Township Line Road.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2
MILES

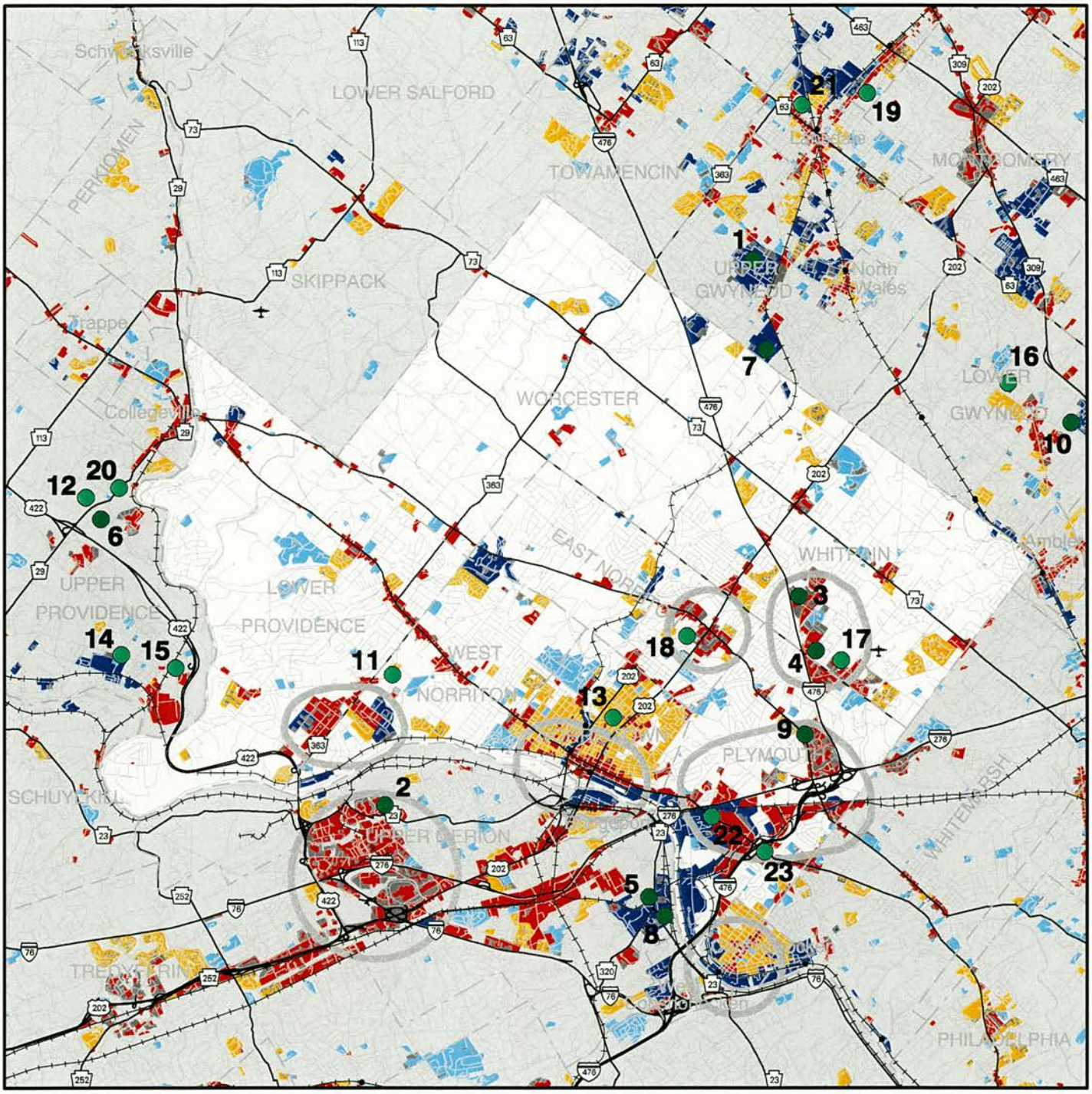
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 2 :

1995 LAND USE

- SINGLE FAMILY (DETACHED)
- MULTI FAMILY
- MANUFACTURING
- TRANSPORTATION
- UTILITY
- COMMERCIAL / SERVICES
- COMMUNITY SERVICE
- MILITARY
- RECREATION
- AGRICULTURE
- MINING
- VACANT
- WOODED
- WATER

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 3 :

DEVELOPMENT CENTERS - 1995

Development Center

EXISTING LAND USE (1995)
- Manufacturing / Industrial
- Community Service
- Commercial / Services
- Multi Family

- Employers With Over 1000 Employees
- Employers With 500-1000 Employees

Figure 3 also displays the location of major employers within the corridor. These are described in Table 2.

TABLE 2
MAJOR EMPLOYERS IN CENTRAL MONTGOMERY COUNTY

Fig. 3 ref. #	Company	Services	Local, Full Time Employees
1	Merck and Co., Inc.	human and animal health products	5,700
2	Lockheed Martin, Management & Data Systems	information systems and services	3,350
3	Aetna / U.S. Healthcare, Inc., Corp. HQ	managed health care services	3,000
4	Unisys Corporation, Corp. HQ	computers and network information systems	3,000
5	SmithKline Beecham Pharmaceuticals Research and Development	pharmaceutical research and development	3,000
6	Rhone-Poulenc Rorer, Inc.	human pharmaceuticals	2,400
7	Ford Electronics and Refrigeration	electronic devices - automobile industry	2,000
8	Philadelphia Newspapers, Inc.	publisher of Philadelphia Inquirer and Daily News newspapers	1,500
9	IMS America	health care industry	1,200
10	Rohm and Haas Company, Research Division	chemical manufacturing	1,144
11	SmithKline Beecham	pharmaceutical research and development	1,000
12	SmithKline Beecham Pharmaceuticals Research and Development	health care products, clinical research	1,000
13	Montgomery Hospital	hospital health care	915
14	Fleming Company	wholesale food distribution	871
15	SEI Investments	financial services	860
16	Moore Products	manufacturer of industrial controls and instruments	856
17	Merck and Company, Inc.	human and animal health products	800
18	Suburban General Hospital	hospital health care	800
19	North Penn Hospital	hospital health care	775
20	SmithKline Beecham Pharmaceuticals Clinical Laboratories, Corp. HQ	pharmaceutical research and development	650
21	Central Sprinkler	fire suppression equipment	600
22	Stroehmann Bakeries, Inc.	baked breads and rolls	600
23	PECO Energy Co. Company	public utility	550

Source: Montgomery County Community Profiles, 1996-1997 Edition, Montgomery County Department of Commerce and Economic Development

HIGHWAYS

Major highways consist of those facilities which completely traverse the study area — freeways and principal arterials. These facilities serve local and through travelers and are subject to the highest traffic loadings. The major highway network within the Central Montgomery County area is: I-276, I-476, US 422, PA 73, Germantown Pike, Ridge Pike, PA 363 and US 202. I-276, I-476 and US 422 are multi-lane freeways with entry / exit movement occurring only at interchanges.

With the exception of the freeways, and portions of US 202, Germantown Pike, Ridge Pike and Trooper Road (PA 363), the highways in the study area network are two lane highways (i.e., have one lane in each direction) with uncontrolled driveway access and at-grade intersections. Traffic signals, auxiliary turning lanes, and an occasional jughandle are present at major intersections. Posted speed limits are generally 45 miles per hour or less.

Table 3 summarizes some of the attributes of the key highways in the study area.

TABLE 3
CHARACTERISTICS OF MAJOR STUDY AREA HIGHWAYS

Highway	Limits	Ownership	Functional Classification	Lanes By Direction	Posted Speed (mph)
Morris Rd	Bustard Rd to Butler Pk	PennDOT (SR 2001)	Minor Arterial	1	30 - 45
Skippack Pk (PA 73)	Stump Hall Rd to Butler Pk	PennDOT (SR 0073)	Principal Arterial	1	35 - 50
Township Line Rd	Valley Forge Rd to Walton Rd	PennDOT (SR 3001)	Minor Arterial	1	35 - 40
Germantown Pk	Ridge Pk to N. Wales Rd	County	Principal Arterial	1	35
Germantown Pk	N. Wales Rd to Plymouth Mtg Mall	County	Principal Arterial	2	35 - 45
Germantown Pk	Plymouth Mtg Mall to I-476	County	Principal Arterial	3 / 4	35 - 45
Germantown Pk	I-476 to Chemical Rd	County	Principal Arterial	2	35 - 45
Germantown Pk	Chemical Rd to Butler Pk	County	Principal Arterial	1	35 - 45
Ridge Pk	Cross Keys Rd to Trooper Rd	PennDOT (SR 4031)	Principal Arterial	1 - 2	40 - 45
Main St	Trooper Rd to Airy St	PennDOT (SR 3009)	Principal Arterial	1	40
Main St / Ridge Pk	Airy St to Belvoir Rd	County	Principal Arterial	1	25
Ridge Pk	Belvoir Rd to Butler Pk	County	Principal Arterial	2	35
Egypt Rd	Perkiomen Creek to Main St	PennDOT (SR 4002)	Principal Arterial	1	35 - 45
US 422	Trooper Rd to PA 23	PennDOT (SR 0422)	Freeway / Expressway	2	55

TABLE 3
CHARACTERISTICS OF MAJOR STUDY AREA HIGHWAYS

Highway	Limits	Ownership	Functional Classification	Lanes By Direction	Posted Speed (mph)
PA Turnpike (I-276)	Norristown (#25) to Fort Washington (#26) Interchanges	PA Turnpike Commission	Freeway / Expressway	3	55
PA Turnpike (I-276)	Norristown (#25) to Valley Forge (#24) Interchanges	PA Turnpike Commission	Freeway / Expressway	2	55
Valley Forge Rd / Park Ave (PA 363)	Morris Rd to Germantown Pk / Germantown Pk to Ridge Pk	PennDOT (SR 0363)	Principal Arterial	1	45
Park Ave	Ridge Pk to Egypt Rd	PennDOT (SR 4004)	Minor Arterial	1	40
Trooper Rd	Germantown Pk to Ridge Pk / Main St	PennDOT (SR 3002)	Minor Arterial	1	35 - 45
Trooper Rd (PA 363)	Ridge Pk / Main St to US 422	PennDOT (SR 0363)	Principal Arterial	1 - 2	35 - 45
Whitehall Rd	Skippack Rd to Main St	PennDOT (SR 3006)	Minor Arterial	1	40
North Wales Rd	Morris Rd to Yost Rd	County	Minor Arterial	1	35
North Wales Rd	Township Line Rd to Germantown Pk	County	Minor Arterial	1	25
Swede St	DeKalb Pk to Johnson Hwy	PennDOT (SR 3008)	Principal Arterial	1	35
Markley St (US 202 sb)	Johnson Hwy to Main St	Borough	Principal Arterial	1	25
Markley St (US 202 sb)	Main St to DeKalb Pk	PennDOT (SR 3020)	Freeway / Expressway	2	55
DeKalb Pk (US 202 nb)	Morris Rd to Johnson Hwy	PennDOT (SR 0202)	Principal Arterial	1	40
DeKalb St (US 202 nb)	Washington St to Johnson Hwy	PennDOT (SR 0202)	Principal Arterial	2 one-way	40
DeKalb Pk (US 202 nb)	Washington St to I-276	PennDOT (SR 0202)	Principal Arterial	2	25 - 35
PA Turnpike - Northeastern Extension (I-476)	Lansdale (#31) to I-276 (#25) Interchange	PA Turnpike Commission	Freeway / Expressway	2	55
Mid-County Expy (I-476)	I-76 to I-276	PennDOT (SR 0476)	Freeway / Expressway	3	55
Butler Pk	Morris Rd to Germantown Pk	County	Principal Arterial	1	35
Airy St	Fairfield Rd to Arch St	PennDOT (SR 3009)	Minor Arterial	1	40
Airy St	Arch St to Main St	PennDOT (SR 3009)	Minor Arterial	2 one-way	25
Conshohocken Rd	Ridge Pk to Light St	PennDOT (SR 3013)	Minor Arterial	1	40
Lucetta St	Fairfield Rd to Ridge Pk	PennDOT (SR 3013)	Minor Arterial	1	40
Chemical Rd	Ridge Pk to Germantown Pk	PennDOT (SR 3015)	Minor Arterial	1	50

TABLE 3
CHARACTERISTICS OF MAJOR STUDY AREA HIGHWAYS

Highway	Limits	Ownership	Functional Classification	Lanes By Direction	Posted Speed (mph)
Johnson Hwy (US 202 sb)	Markley St / Swede Rd to DeKalb Pk	PennDOT (SR 3017)	Principal Arterial	1 - 2	35
Plymouth Rd	New Hope Rd to Butler Pk	PennDOT (SR 3017 & SR 3007)	Minor Arterial	1	30 - 35

NOTE: *Italicized* and **Bolded** cells denote highway segments which are National Highway System (NHS) roadways. NHS routes aim to enhance personal mobility, serve commerce, support economic growth and increase the Nations's competitiveness.

Traffic Volumes

Figure 4 illustrates daily traffic levels occurring throughout the study area between 1995 and 1997. Table A1 in Appendix A contains a listing for some of these locations in the study area.

Freeways carry the highest traffic volume. The PA Turnpike (I-276), east of the Norristown interchange, and the Mid-County Expressway (I-476), south of Ridge Pike, each carry in the neighborhood of 95,000 vehicles per day. Volume on each facility, on the opposite side of Norristown, is about half of these levels. US 422 serves approximately 85,000 vehicle east of PA 363, and about half that to the west of the interchange.

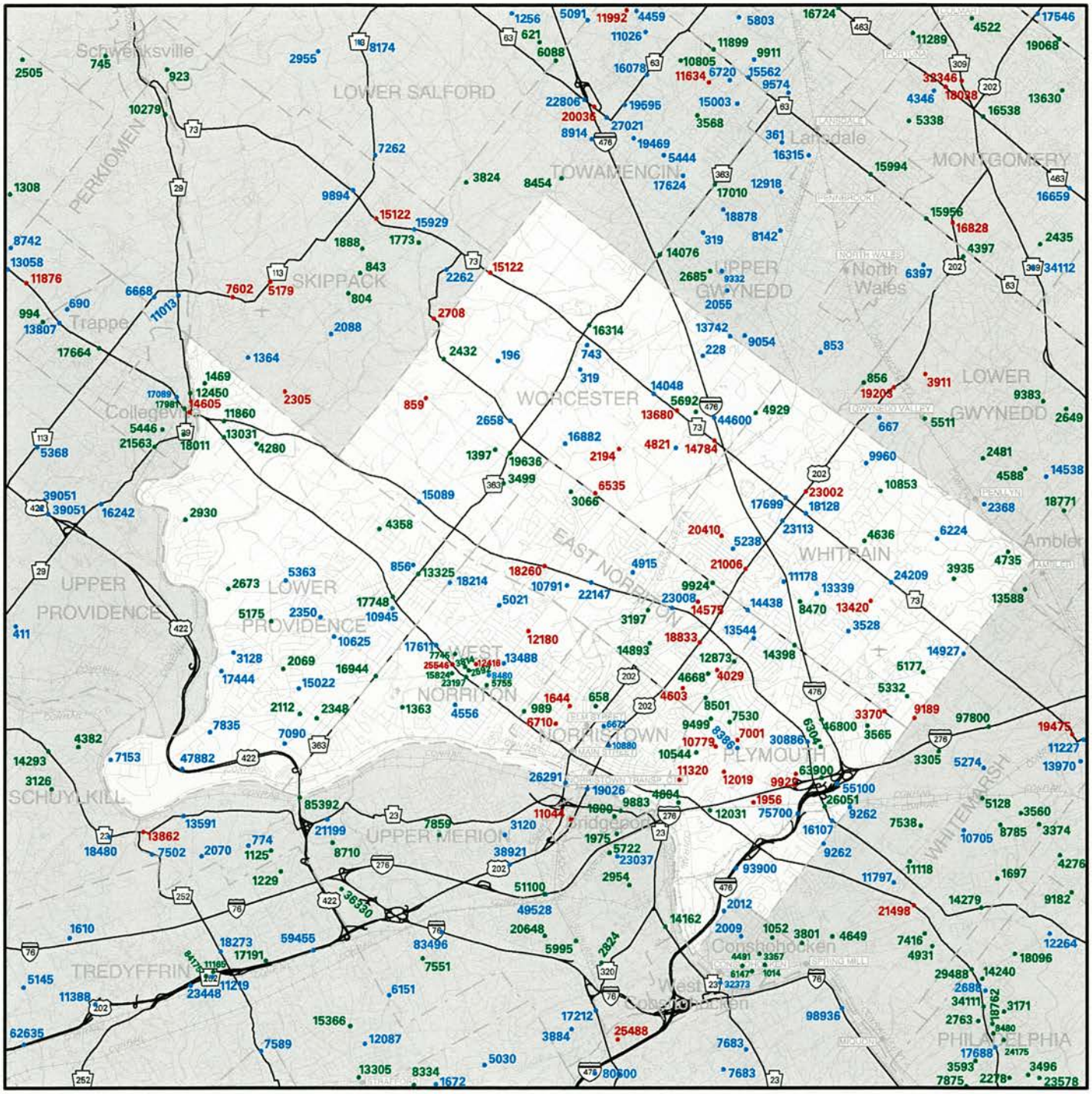
Along the "local" highway network, volume is considerably lower. Generally, and consistent with development conditions — the further east within the study area — the higher the traffic volume. Two of the busiest segments are: Germantown Pike near its junction with Walton Road (serving approximately 30,000 vehicles per day), and; DeKalb Pike north of Skippack Pike (serving about 23,000 vehicles per day).

PUBLIC TRANSPORTATION SERVICES

Figure 5 illustrates existing public transportation services provided within the study area. Table A2 in Appendix A summarizes daily boarding activity, by transit route, within the study area.

Service is provided by SEPTA and includes two regional rail lines, one rapid rail service, and eleven public bus routes. All of the study area municipalities, except Worcester Township, receive service. Each of the study area's development centers and major employers are also served.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



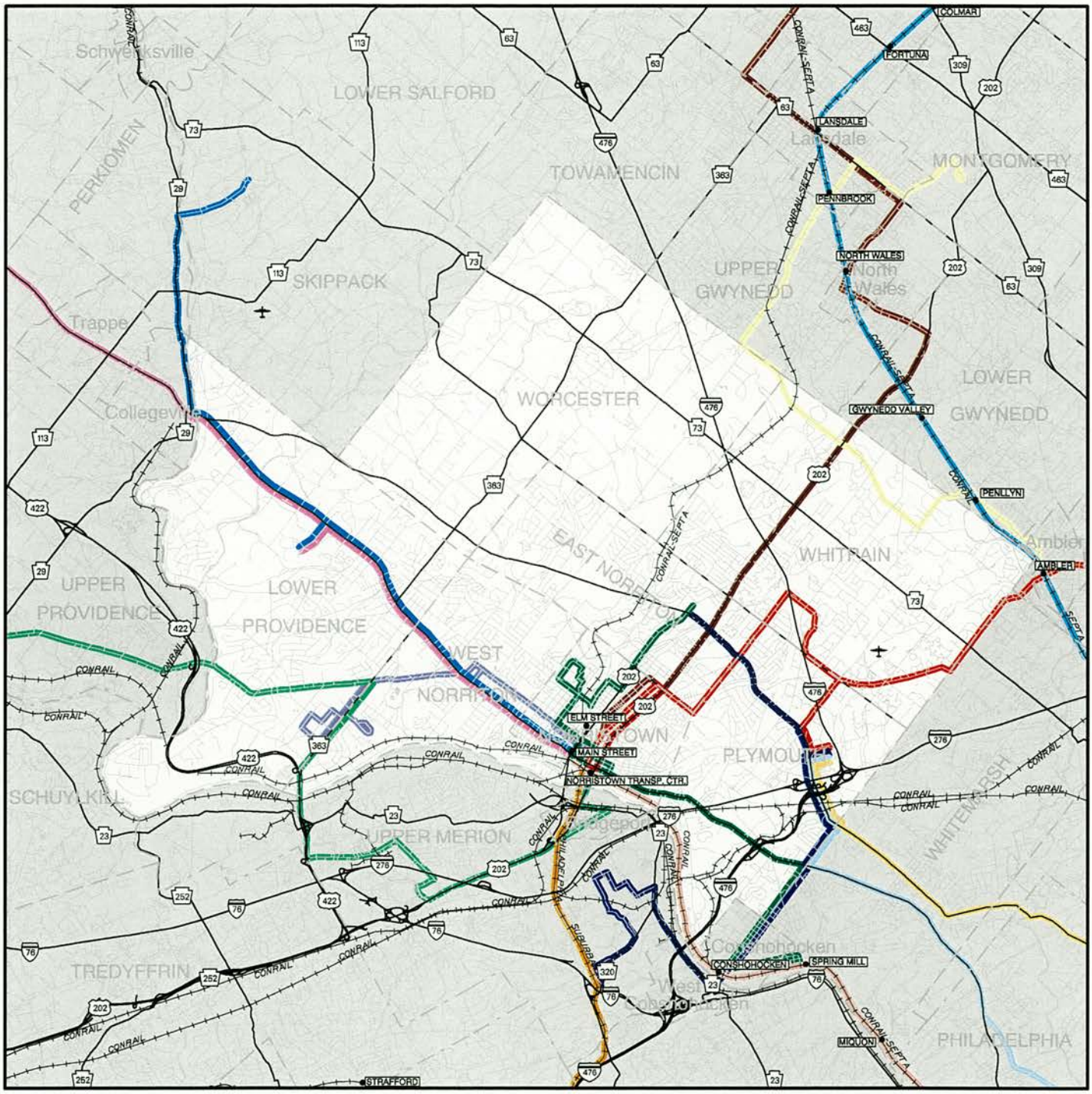
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 4 :

CURRENT TRAFFIC VOLUMES

- Traffic Count Location (approximate)
- 2823 1995 Traffic Count (AADT)
- 4917 1996 Traffic Count (AADT)
- 6321 1997 Traffic Count (AADT)

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2
MILES

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 5 :
EXISTING PUBLIC TRANSPORTATION SERVICES

- SEPTA Bus Route L (Plymouth Meeting Mall and Erdenheim to Olney Terminal)
- SEPTA Bus Route 27 (Plymouth Meeting Mall and Barren Hill)
- SEPTA Bus Route 91 (Saturday only - Norristown to Eagleville and Graterford)
- SEPTA Bus Route 93 (Norristown to Pottstown)
- SEPTA Bus Route 94 (Chesnut Hill to Montgomery Mall)
- SEPTA Bus Route 95 (Penn Square to Gulph Mills)
- SEPTA Bus Route 96 (Norristown to Telford)
- SEPTA Bus Route 97 (Penn Square to Spring Mill)
- SEPTA Bus Route 98 (Norristown to Plymouth Meeting Mall & Willow Grove)
- SEPTA Bus Route 99 (Norristown to Pottstown)
- SEPTA Bus Route 131 (Norristown to Valley Forge Corporate Center)
- SEPTA Suburban Rail Line 100 (69th St. Terminal to Norristown)
- SEPTA R5 Regional Rail Line (Doylestown to Center City)
- SEPTA R6 Regional Rail Line (Norristown to Center City)

Rail

There are three passenger rail lines which serve the broad study area: the R6 and the R5 regional rail lines, and the Norristown High Speed Line.

The R6 Regional Rail Line operates between Norristown / Cynwyd and Central Philadelphia. The line has three station stops in the study area, all within Norristown — the Norristown Transportation Center, Main Street and Elm Street. During peak commuter periods the R6 Line operates with 30 minute headways. In the off-peak and on weekends service is hourly. According to recent ridership statistics from SEPTA, there were a total of 962 daily boardings at these stations.

STATION	1997 BOARDINGS
Norristown T C	575
Main St	144
Elm St	243

The R5 Regional Rail Line operates between Lansdale / Doylestown and Central Philadelphia. The line skirts the study area's northeast corner, but has three stations proximate to Whitpain — Gwynedd Valley, Penllyn and Ambler. Weekday service to these stations is provided at 30 minute intervals. Saturday and Sunday service is hourly. Boardings total 1,079 persons per day at the three stations.

STATION	1997 BOARDINGS
Gwynedd Valley	198
Penllyn	117
Ambler	764

The Norristown High Speed Line (SEPTA Route 100) terminates its run from the 69th Street Terminal in Upper Darby at its lone station within the study area — the Norristown Transportation Center. Service is provided at six minute intervals during the weekday rush hours, and at ten minute intervals during the peak on Saturdays. Weekday and Saturday off-peak train frequencies are every 20 minutes. Sunday service is provided every 30 minutes. In 1997 there were a total of 710 daily boardings to the Norristown High Speed Line at the Norristown Transportation Center.

Bus

Ten regularly scheduled bus routes — typically radiating from the Norristown Transportation Center — serve the study area on weekdays. Another service focal point is the bus station at the Plymouth Meeting Mall. The majority of the routes

offer 30 minute frequencies during weekday peak periods and hourly service during the off-peak and on the weekends. Total boardings within the study area are shown below.

Bus Route	Boardings	Year
L	424	1995
27	203	1995
93	345	1995
94	28	1995
95	74	1995
96	650	1995
97	589	1995
98	971	1994
99	485	1991
131	NA	NA

Bikeways

The Schuylkill River Trail, a 22 mile long, on- and off-road bike / pedestrian trail traverses the study area's lower limits along the northern banks of the Schuylkill River. En route through the study area, the path connects the Valley Forge National Historical Park with the Philadelphia Museum of Art.

Montgomery and Chester counties are actively planning and implementing an extensive multi-purpose trail system to interconnect with the Schuylkill River Trail: on the north - the Cross County Trail; on the west - the Schuylkill Trail, and; on the south - the Chester Valley Trail. The Cross County and Schuylkill trails traverse the study area. Funds to further develop each trail are included on the current regional Transportation Improvement Program (TIP).

1990 Journey-to-Work Travel

A significant share of all trips made on an average weekday are those involving commuting to and from work (approximately 20 to 25 percent of total trips). Typically work trips are compressed into just two to three hours in the morning and two to three hours in the evening on any given workday. The inclination to use public transportation in completing work trips is higher than for any other trip purpose. As a result, travel to and from work creates a high temporal demand on highway and transit facilities and contributes significantly to the degree of congestion and delay encountered on those facilities.

In order to gain a better understanding of these conditions within the study area, detailed evaluations of Journey-to-Work data from the 1990 Census were conducted.

Table 4 summarizes some of the information pertinent to the Central Montgomery County study area. At the time the Census was conducted (April 1990) there were about 123,000 work trips made to, from and within the study area. A little less than one-half of the work trips were outbound to job sites (59,368), and a little more than one-half were inbound (63,560).

TABLE 4
JOURNEY-TO-WORK CHARACTERISTICS

	Workers Traveling From Municipality					Workers Traveling To Municipality				
		Means of Transportation					Means of Transportation			
Municipality	Total Workers	Drive Alone	Car/Van Pool	Public Transit	Other	Total Workers	Drive Alone	Car/Van Pool	Public Transit	Other
East Norriton	7,142	6,360	532	107	149	6,045	4,946	683	151	265
Lower Providence	9,906	8,770	724	213	199	8,764	7,548	760	257	199
Norristown	14,803	10,546	2,115	847	1,307	17,370	13,271	2,339	595	1,215
Plymouth	8,541	7,198	843	293	207	10,155	8,460	1,072	502	139
West Norriton	8,816	7,368	1,037	247	170	4,449	3,939	424	29	57
Whitpain	7,921	6,877	632	246	164	14,898	13,206	1,215	286	216
Worcester	2,239	1,982	136	30	91	1,879	1,512	255	46	75
Central Mont. Co. Study Area	**59,368**	**49,101**	**6,019**	**1,983**	**2,287**	**63,560**	**52,882**	**6,748**	**1,866**	**2,166**

source: 1990 US Census

The highest work trip generators were Norristown (32,173 worker trips in and out) and Whitpain (22,819 worker trips in and out). Worcester Township was the lowest (4,118 worker trips in and out). East Norriton, Lower Providence, West Norriton and Worcester are work trip exporters, while Norristown, Plymouth and Whitpain are importers of work trips.

Over the entire study area, 83 percent of all worker trips, both to and from the study area, were accomplished by driving alone in a private vehicle. Conditions in the Borough of Norristown are decidedly different than the rest of the study area (e.g., average drive alone trends for work trips to/from the Borough are nine percentage points lower than the overall study area's rate). Between 10 and 11

percent of all worker trips were accomplished through car or van pooling (13 to 14 percent for Norristown), and three percent of total worker trips were accomplished by using public transportation (four percent in Norristown). Between three and four percent of the study area worker trips were accomplished by other means, for example by walking or riding a bicycle (between seven and nine percent in Norristown).

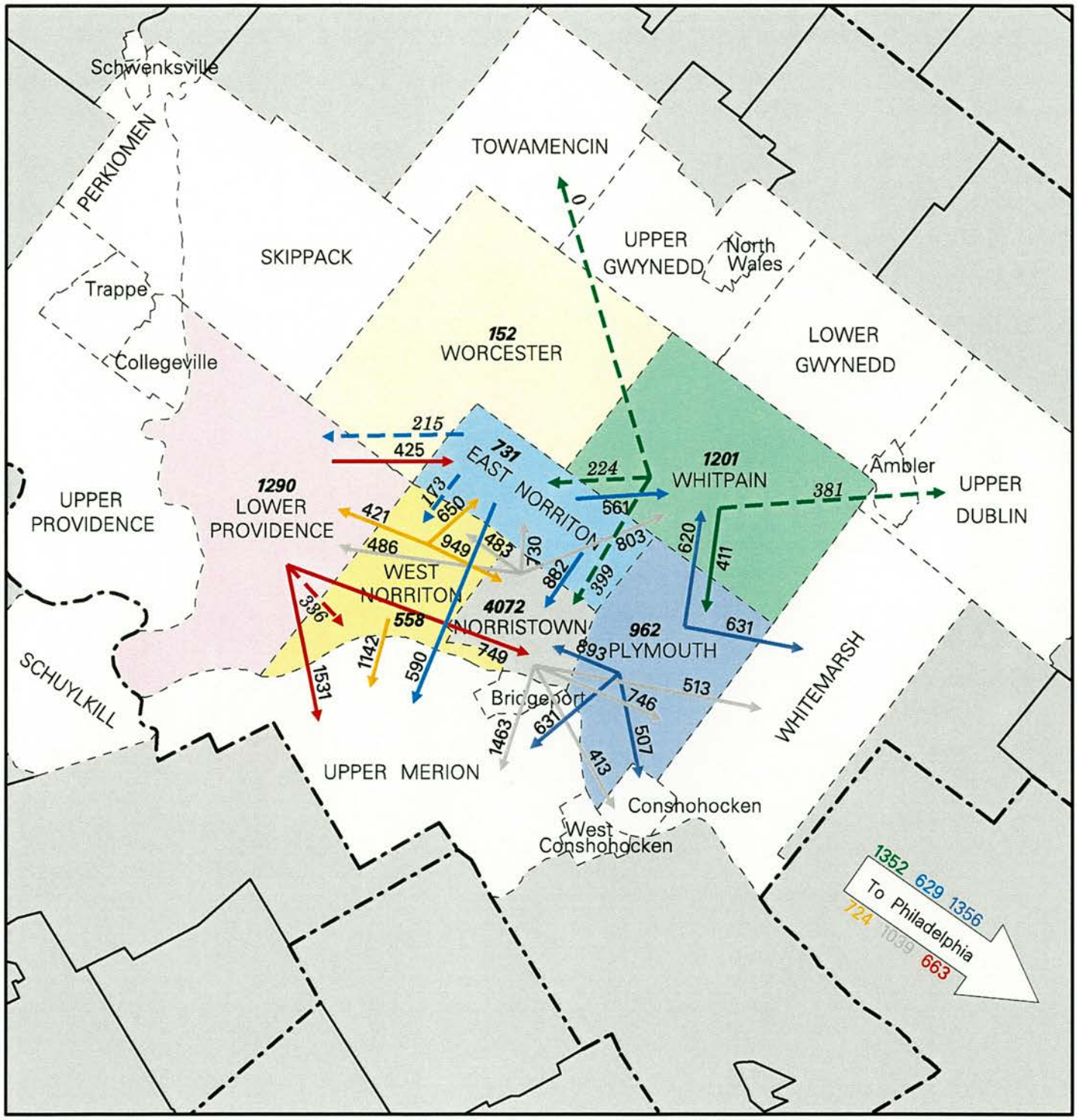
Major work trip origin-destination pairings (desire lines) to / from the Central Montgomery County study area municipalities were determined and are shown in Figures 6 and 7. For analytical purposes work trip pairings between municipalities were identified as "major" when a threshold of 400 or more one-way worker trips, between municipal pairs, was equaled or exceeded.

Figure 6 shows outbound work trips and Figure 7 illustrates inbound work trips. On each figure, the major work trip desire lines, those exceeding 400 work trips, are represented by arrows with solid lines while the complementary reverse trips, if less than 400 trips, are shown by arrows with dashed lines. The value in the center of the municipality, which is common to both figures, is the number of worker trips that begin and end in the same municipality. As a consequence of its small population and employment base, no work trips are displayed on either graphic for Worcester Township.

Observations about the desire lines shown on the figures, are:

1) Work trips do not exhibit a "corridor-like" directional pattern. They are highly confined within, and widely dispersed throughout the study area.
2) There is a gravitation to municipalities containing regional development centers (Center City Philadelphia, King of Prussia, Plymouth Meeting and Norristown).
3) Aside from the Philadelphia trip pairings, work trips are relatively short (less than ten airline miles), and frequently take place within municipalities (15% of all trips) or between adjacent municipalities.
4) There is a substantial amount of "reverse" commuting from the City of Philadelphia, particularly to the work trip importing municipalities of Whitpain, Plymouth and Norristown.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

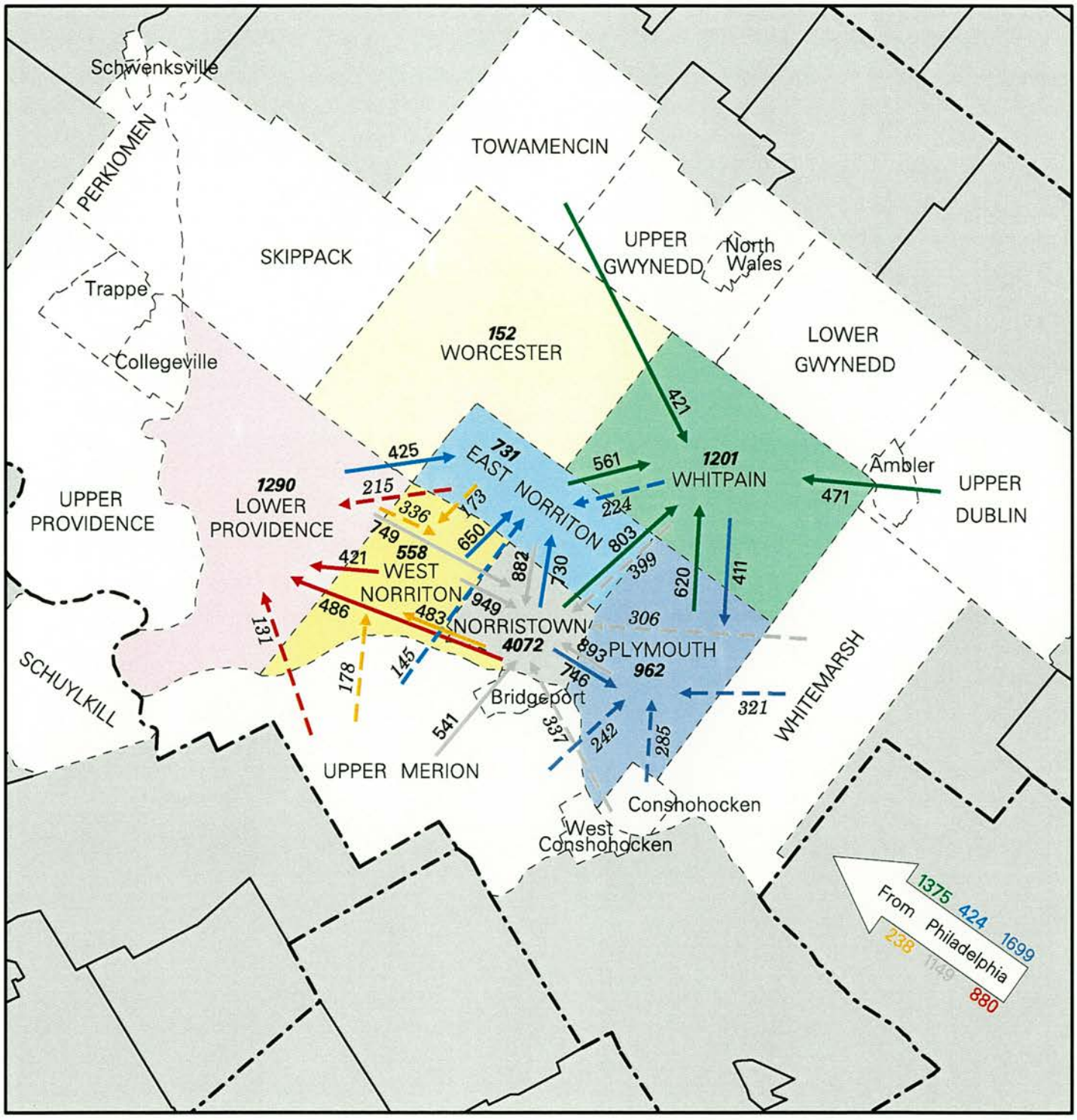
FIGURE 6 :

SELECTED MAJOR JOURNEY-TO-WORK TRAVEL PATTERNS

(FROM STUDY AREA MUNICIPALITIES)

←	Major work trip flows
- - →	Complementary reverse work trip flows
962	Total number of internal trips
513	Total number of trips
581	Total number of complementary reverse work trips

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 7 :

SELECTED MAJOR JOURNEY-TO-WORK TRAVEL PATTERNS

(TO STUDY AREA MUNICIPALITIES)

- Major work trip flows
- Complementary reverse work trip flows
- ***962*** Total number of internal trips
- 541 Total number of trips
- *337* Total number of complementary reverse work trips

Transit Trips

Key observations, regarding daily work trips completed by transit, which emanated from the analysis of Journey-to-Work data are:

1) Roughly three percent of study area commutation was accomplished using a transit mode (bus and rail).
2) There were a total of 1,983 transit work trips from the seven municipalities within the study area, recorded as part of the 1990 Census. Norristown was the highest transit work trip producer (847 trips). Of the total transit number, 1,097 transit trips (55%) were to Philadelphia (representing an 18% capture ratio of the work trip travel market to the city). Three quarters of the transit trips to Philadelphia were taken on regional rail (SEPTA's R6 and R5 lines). The remaining transit trips (45%) were widely dispersed, although Upper Merion attracts a noteworthy sum of 155 bus/trolley trips from Norristown.
3) There were 1,866 transit trips made to the study area. The highest transit work trip attractors within the study area were Norristown (595) and Plymouth (502). Of the total "inbound" transit worker trips, 1,095 trips (59%) were from Philadelphia. The vast majority (90%) of all transit worker trips into the study area — were accomplished by bus/trolley and subway/elevated modes (e.g., the Norristown High Speed Line).

Work at Home

An additional 1,088 workers work at home within the study area.

Municipality	Persons Working at Home
East Norriton	76
Lower Providence	157
Norristown	176
Plymouth	229
West Norriton	134
Whitpain	279
Worcester	37

Assessment of Existing Transportation Conditions

A current, but generalized, status report on the adequacy of the transportation infrastructure serving the Central Montgomery County study area has been drawn from a series of sources. These include: documented deficiencies cited within published municipal, county and/or regional traffic and transportation studies, and; input from the Study Steering Committee members.

Figure 8 shows where intersection and roadway congestion, transit service inadequacies and rail station parking constraints exist within the study area.

Traffic Operations

Congested intersection conditions correspond with locations where peak hour traffic operations were computed at Level of Service "E" or "F" according to traffic studies performed within the study area, those which were cited within *Centers and Corridors*[2], or those which were identified by the Study Steering Committee. Congested roadway locations are areas between closely spaced congested intersections which are operating in an uncoordinated manner, and/or have been cited from regional studies such as *Centers and Corridors*.

As can be seen in Figure 8, traffic congestion is widely dispersed throughout the study area affecting, but not limited to:

- areas: Norristown and Plymouth Meeting,
- principal arterial highways: US 202, PA 73 and Germantown Pike, and;
- secondary highways: Morris Road and Township Line Road east of US 202.

Transit Services

Transit service is generally inadequate in the US 422 corridor area due to limited choices and limited frequency. Parking lots at five of the six study area train stations are, for all practical purposes, full:

- Norristown Transportation Center - 100% utilized;
- Main Street - 100% utilized;
- Elm Street - 95% utilized;
- Gwynedd Valley - 100% utilized;
- Penllyn - 92% utilized.

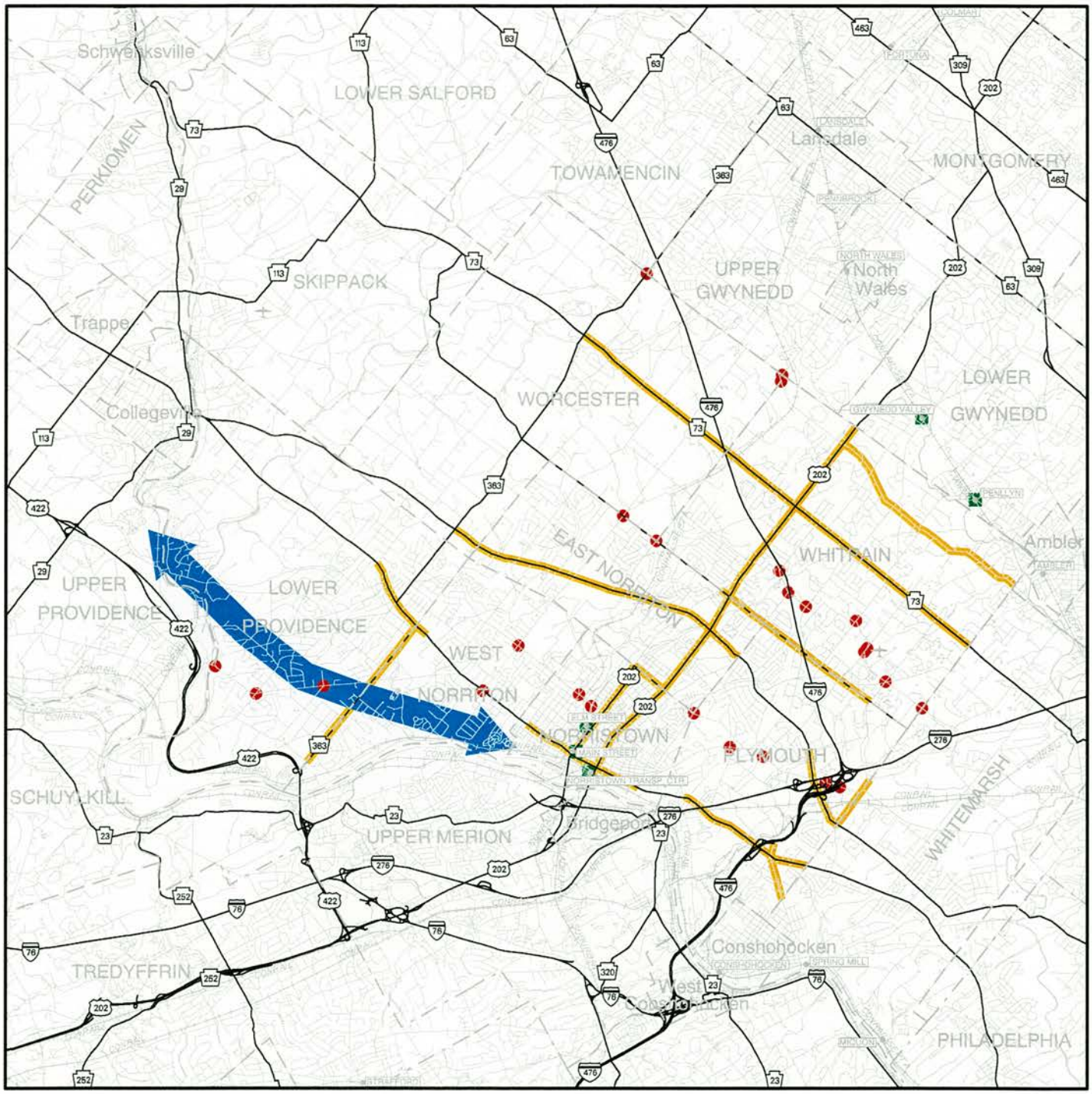
CURRENT IMPROVEMENT PROPOSALS

Independent initiatives have been advanced at the municipal and county level to rectify existing deficiencies and accommodate study area growth. The efforts have ranged from conducting planning studies — to designing and implementing physical and operational improvements. With the support of the Montgomery County Planning Commission and the assistance of PennDOT, the Pennsylvania Turnpike Commission and SEPTA, public funding streams are being used. Private contributions (funding or in-kind services) obtained through the land development application process are also being used.

---

[2] *Centers and Corridors - Direction 2020 Report 22*, DVRPC, October 1994. *Centers and Corridors* is DVRPC's land use and transportation inventory for the Year 2020 Plan.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2
MILES

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 8 :
DOCUMENTED EXISTING TRANSPORTATION DEFICIENCIES

- Intersection Congestion
- Roadway Congestion
- Inadequate Transit Service
- Rail Station Parking Constraint

Figure 9 illustrates mobility and circulation improvement projects which are currently in development / moving toward implementation using public funds — as part of the current regional TIP (covering Federal Fiscal Years 1999 - 2002), and Pennsylvania Turnpike Commission funding — and/or via private sector commitments. Project descriptions are given in Table 5.

There is a substantial inventory of additional transportation improvement proposals, which have been identified through traffic planning activities by the municipalities and/or are being considered by the county for addition to the TIP as part of its regular biennial update (FFY 2001 to 2004). Funding for some of these projects is not clearly defined, nor are the benefits they might be expected to deliver. Therefore, consideration of these, as they may address current conditions, is inappropriate. On the other hand, some warrant travel testing for future Year 2020 conditions. Where applicable, the latter are detailed in the following chapter.

CONCLUSIONS: ANALYSES OF EXISTING CONDITIONS

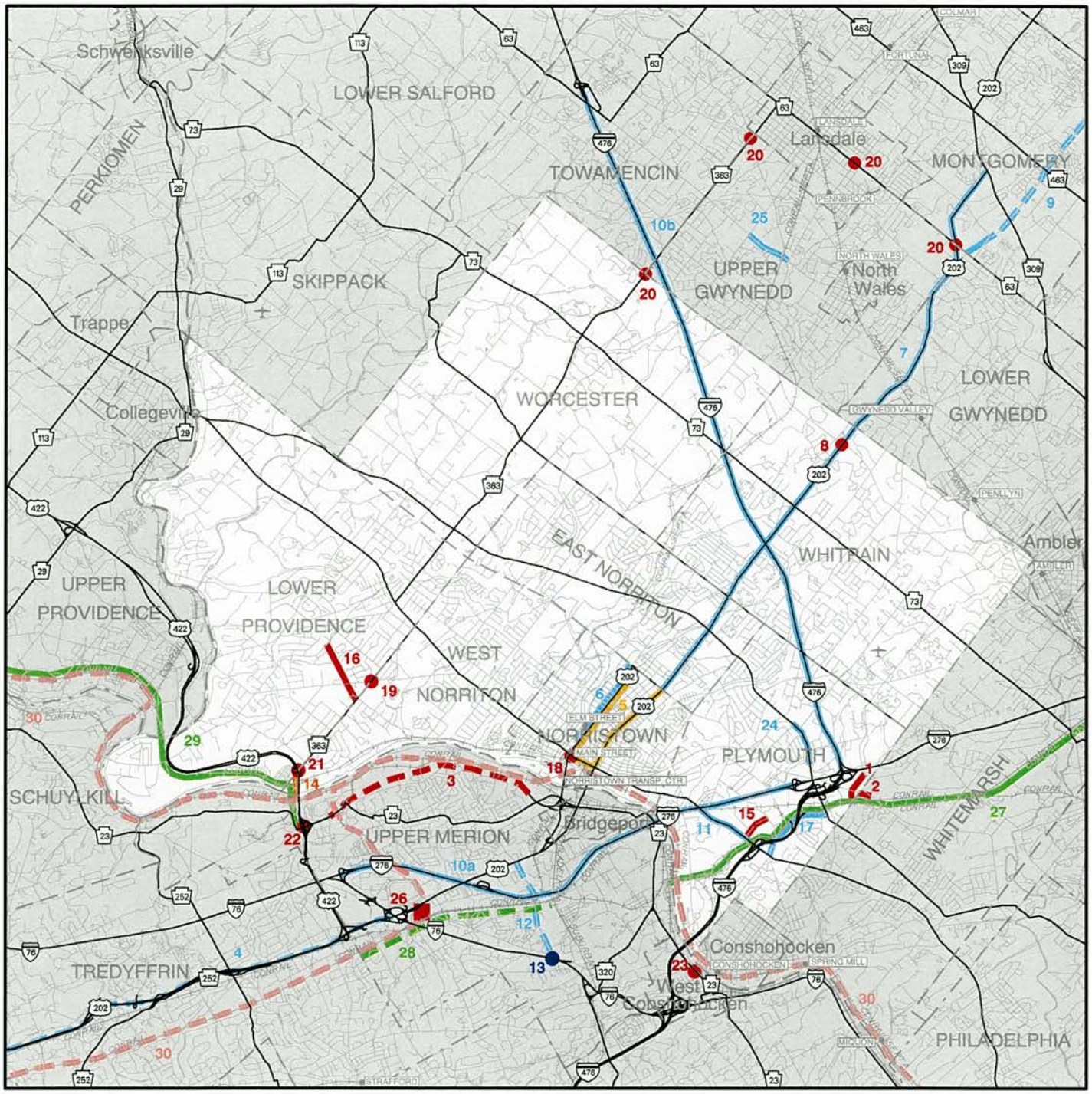
Observations reached in assessing the current transportation situation are:

1) There is a good overlap between the study area's development centers, major employers and existing public transportation services.
2) Both travel and congestion are widely dispersed throughout the study area. As such, a variety of transportation improvement strategies will be required to fully address study area needs.
3) The current TIP includes projects which address traffic congestion in Norristown and along US 202. However, the majority of transportation deficiencies documented throughout the study area are not adequately addressed by projects in the TIP. A more exhaustive set of transportation improvements including, but not limited to, proposals emanating from municipal initiatives and candidates considered for inclusion in the updated TIP would more comprehensively address existing deficiencies and accommodate the effects of future growth. As such, these improvements should be subject to evaluation in the futures testing. □

TABLE 5
CURRENT AREA-WIDE TRANSPORTATION IMPROVEMENT PROGRAM

Ref. # (see Fig. 9)	Description
1	Butler Pike By-Pass: construct two lanes plus turn lanes at key intersections
2	Flourtown Road relocated: construct two lanes plus turn lanes at Butler Pike
3	PA 23 relocation: construct a four-lane controlled access highway from US 422 to US 202
4	US 202 (Section 400), South Gulph Road to Swedesford / Howellville Rd interchange: Widening to a minimum of six lanes and interchange improvements (note: in construction)
5	Main, Markley and DeKalb Streets (Forest-Ford, Main-Johnson, Lafayette-Johnson) signal coordination and interconnection
6	US 202 Southbound (Section 500): reconstruct Markley Street to 48 feet and intersection improvements from Johnson Highway to Marshall Street
7	US 202 (Section 600), DeKalb Pike - widen to four through lanes per Selective Widening Alternative
8	US 202 and Morris Road intersection: widening for additional through and turning lanes on both roads (note: project was constructed in 1999)
9	US 202 Expressway (Section 700), US 202 Bypass to PA 63: construct four lane divided freeway
10	PA Turnpike widening to six lanes: I-276, between Valley Forge and Norristown interchanges, and I-476, between I-276 and Lansdale interchanges
11	Ridge Pike reconstruct and widen to five lanes from Belvoir Road to Alanwood Road
12	Henderson Road, from Shoemaker Road to PA Turnpike, widen to four lanes with intersection improvements
13	I-76 at Henderson Road: provide a new interchange on I-76 for westbound on and off movements and close the adjacent S. Gulph Road westbound on-ramp
14	Old Betzwood Bridge, over Schuylkill River, construct new bridge to serve two-way traffic and pedestrian and bike trail
15	Alanwood Road Extension: construct new road from Ridge Pike to Gallagher Road (note: project is presently being constructed)
16	Park Avenue / Egypt Road / Trooper Road connection: construct new road from Park Avenue to Egypt Road to Trooper Road
17	Chemical Road widening to five lanes and intersection improvements from a point south of Gallagher Road to Germantown Pike (note: project is presently in construction)
18	Main Street & Markley Street intersection: provide additional through lane in each direction along Main St, widen northbound Markley approach for addnl. (double) left turn lane
19	PA 363 & Egypt Road intersection add left turn lanes and modernize signals (note: project has been constructed)
20	North Penn Area Intersection Improvement Program (group 2), includes: Morris Rd. & PA 363; Allentown Rd. & PA 363; Main St. & Church Rd.; US 202 & PA 63
21	PA 363 at US 422 Off Ramp: signalization and ramp modification
22	PA 23 at Old Betzwood Bridge: intersection improvements
23	PA 23, River Road at Balligomingo Road: intersection improvement
24	Germantown Pike, Sandy Hill Rd. to Launfall Rd: signal improvement and left turn lanes
25	Sumneytown Pike, S. Broad St. to West Point Pk.: intersection improvement, widening
26	South Gulph Road Park-and-Ride Lot at US Route 202 (constructed)
27	Cross County Trail, Schuylkill River Trail in Conshohocken to Fort Washington: multi-purpose trail development
28	Chester Valley Trail Extension, County Line Road to Hughes Park Station: trail development and enhancements
29	Schuylkill Trail, Valley Forge Park to PA 29: develop multi-purpose trail
30	New SEPTA rail services: west (Schuylkill Valley Metro) and south (Cross County Metro) of the study area

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 9 :

CURRENT TRANSPORTATION IMPROVEMENT PLAN

- New Roadway Alignment
- Roadway Widening / Reconstruction
- New Ramps at Interchanges
- Intersection Improvement
- Traffic Signal Coordination
- Revise Traffic Circulation / Pattern
- New Rail Service
- Bike Path / Trail
- Park & Ride Lot

5 TRAVEL DEMAND ANALYSES

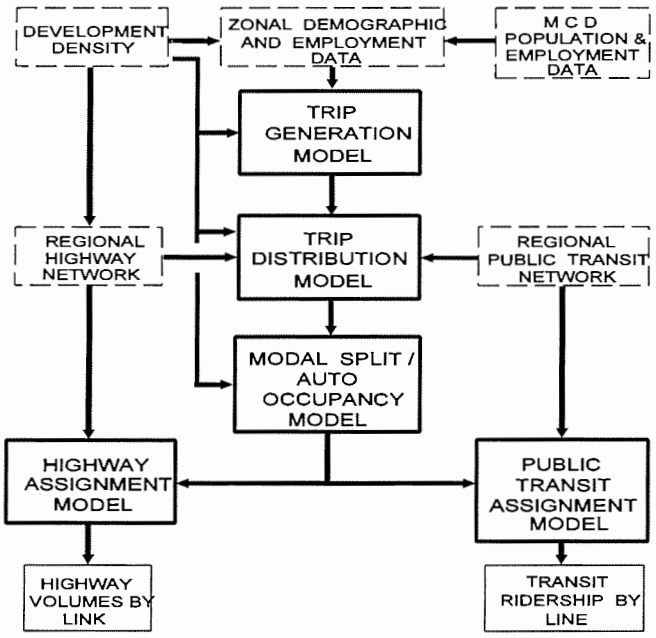
In this study three travel simulations were prepared using DVRPC's regional travel demand forecasting model. These included: the 1995 Base Year scenario — to establish the study area's baseline, and; two future year alternatives — Year 2020 Limited-Build and the Year 2020 Full-Build scenarios — to evaluate future conditions and test improvement recommendations assuming differing levels of capital investment.

FOCUSED SIMULATION PROCESS

DVRPC maintains a personal computer-based highway and public transportation travel simulation model that estimates travel behavior for a typical weekday and provides related travel data for different transportation network and demographic conditions[3]. A schematic portrayal of the four-step focused travel simulation process is shown on Figure 10.

FIGURE 10

DVRPC REGIONAL TRAVEL SIMULATION PROCESS



[3] DVRPC's travel simulation is performed on desktop micro-computers running the OS/2 version of TRANPLAN.

The regional travel model can be used to locate problem areas, identify future trends and travel conditions, and consider various alternative improvement strategies to address existing and emerging problems. By "focusing" DVRPC's regional travel forecasting model, enhancements are accomplished within a detailed study area while a regional level of detail is maintained elsewhere.

Application of the focused modeling process provided the opportunity to obtain performance data (listed below) and perform selected link analysis as part of the study.

- highway link daily traffic volumes (AADTs);
- daily transit ridership (boardings) by line, and;
- the following network performance statistics:
  - vehicle miles of travel (VMT),
  - vehicle hours of travel (VHT),
  - network highway speeds,
  - network volume / capacity ratios,
  - fuel consumption (using fleet average fuel consumption rates applied to VMT per highway functional class), and
  - mobile source emissions (using the model's VMT and speed estimates as inputs to Mobile5a_H emissions software).

1995 Base Year Conditions

The first step in preparing the Central Montgomery County Study simulation involved updating and focusing the regional model to reflect current demographic and transportation conditions within the study area. To most efficiently accomplish this task, DVRPC's network and supporting demographic database — serving as the baseline for a 1995 travel simulation prepared for the Pennsylvania Turnpike Commission[4] — was selected and updated.

Focusing to improve the level of detail within the study area involved the following activities:

- Revising DVRPC's transportation analysis zone (TAZ) structure for finer analytical "grain" and trip assignment within the focused study area. For example, the Central Montgomery County Transportation Study area contains 47 TAZs for study area analyses. (Six of the 33 TAZs covering the seven study area municipalities, per DVRPC's 1995 regional TAZ structure, were split to create 14 additional zones for analyzing study area travel data.)

[4] *Pennsylvania Turnpike Proposed Slip Ramp Traffic Study*, DVRPC 1998.

- Disaggregating DVRPC's 1995 zonal demographic data to "fit" the new TAZ structure for population and employment.
- Updating characteristics of the existing modeled highway network so that current highway geometry is accurately reflected in the simulation.
- Adding key highway facilities to the model, to more closely represent the study area's hierarchical and interconnected roadway system. (Note: local neighborhood and subdivisions streets / driveways are generally not included in the modeled network.)
- Updating the transit network in the study area to reflect the current route and operating configurations of SEPTA's services.

The final highway network and TAZ structure emanating from the focusing steps are shown on Figure 11.

Selected Link Analyses

The regional travel model was used to estimate the geographic distribution of highway trips within the study area. Knowing the distribution and magnitude of vehicle trips traveling to, through and within the study area can be a very useful indicator. For example, it can quantify the reliance on a facility by local traffic versus long distance travelers, and can be valuable in defining appropriate strategies to pursue within the corridor.

For this study a "selected link analysis" was performed for six links located throughout the study area. Table 6 describes the locations and findings for each of the sampling links, and provides potential applications based upon those results. The following tabulation shows the distribution of trip origins relative to the overall study area.

DIRECTION (FROM)	PERCENT
North	7%
East	19%
South	7%
West	16%
Internal	51%

The selected link analyses findings are consistent with the findings of the journey-to-work evaluation — vehicular trips are relatively short (overall average = 7.5 miles). The analyses also show that strategies useful in combating traffic congestion are as appropriate within the study area boundaries as beyond them (e.g., park and ride lot implementation).

TABLE 6
FINDINGS OF SELECTED LINK ANALYSES - 1995 BASE YEAR SCENARIO

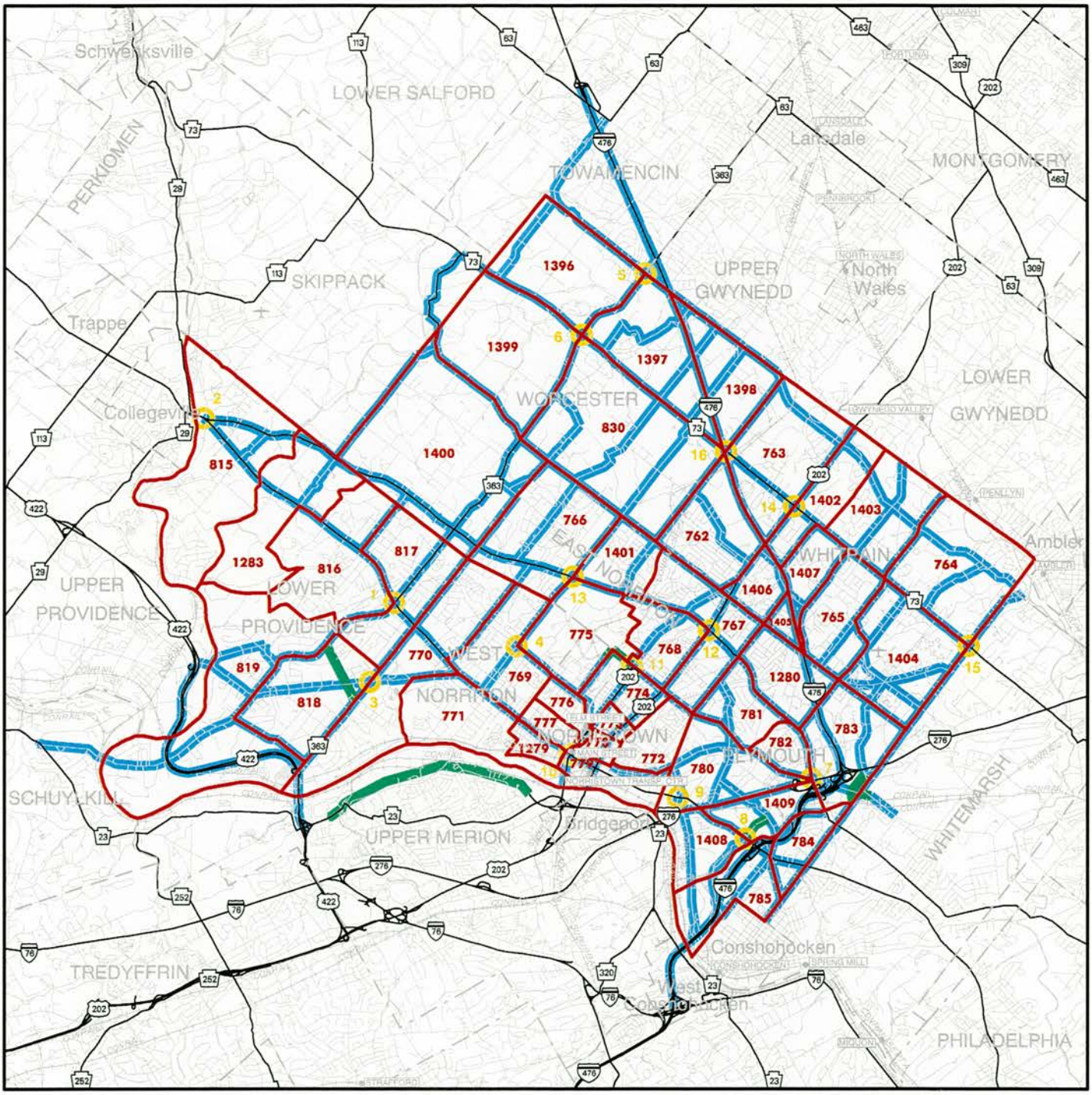
Link	AADT	Significant Trip Origin Sheds	Average Airline Distance to the Link	Potential Strategy(s)
Skippack Pike between Bustard Rd and Stump Hall Rd	15,122	**North** - Lansdale / Horsham area (19%) **East** - Abington / Upper Dublin area (9%) **West** - NW Mont. Co. (26%) and Pottstown / Trappe area (11%) **Internal** - Whitpain (9%)	10.5 miles	park & ride lots on US 202 and PA 363 slip ramps complemented by park & ride lots at new interchange slip ramps north of Lansdale complemented by park & ride lots at new interchange; park & ride lots on PA 73 and Ridge Pike / US 422; Schuylkill Valley Metro ridesharing / park & ride lots internal to the study area (Share-A-Lot)
Main Street between Trooper Rd and Egypt Rd	25,546	**South** - King of Prussia area (10%) **West** - NW Mont. Co. (26%) **Internal** - W. Norriton (32%), Norristown (17%), L. Providence (13%)	5.4 miles	Schuylkill Valley Metro & Cross County Metro park & ride lots on PA 29 / US 422; Schuylkill Valley Metro ridesharing / park & ride lots internal to the study area (Share-A-Lot)
Germantown Pike between Whitehall Rd and Burnside Av	18,260	**West** - Pottstown / Trappe area (11%) **Internal** - E. Norriton (17%), L. Providence (15%), W. Norriton (9%), Plymouth (9%)	7.7 miles	park & ride lots on Ridge Pike / US 422; Schuylkill Valley Metro ridesharing / park & ride lots internal to the study area (Share-A-Lot)
DeKalb Pike between Skippack Pk and Morris Rd	23,113	**North** - Lansdale / Horsham area (11%) **East** - Abington / U. Dublin area (12%) **West** - NW Mont. Co. (10%) **Internal** - Whitpain (26%)	7.2 miles	slip ramps at US 202 complemented by park & ride lots at new interchanges slip ramps complemented by park & ride lots at new interchange slip ramps north of Lansdale and at US 202 ridesharing / park & ride lots internal to the study area (Share-A-Lot)
Skippack Pike between Penllyn Blue-Bell Pk and Walton Rd	24,209	**East** - Abington / U. Dublin area (19%) **Internal** - Whitpain (38%)	7.2 miles	slip ramps in Blue Bell office area complemented by park & ride lots Share-A-Lot(s) in Blue Bell area
Germantown Pike between Walton Rd and Hickory Rd	30,886	**South** - Eastern Delaware Co. (8%) **Internal** - Plymouth (26%) and E. Norriton (12%)	8.0 miles	coordinate with the TMA of Delaware Co.; slip ramps in Blue Bell area at Union Meeting Road and Township Line Road / US 202 ridesharing / park & ride lots internal to the study area (Share-A-Lot)

1995 Base Year Performance Statistics

Performance statistics emanating from the simulated 1995 highway network were obtained by manipulating outputs of the Base Year travel simulation using geographic information system (GIS) software[5].

[5] DVRPC used ArcView and GIS + software for this work.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 11 :

FOCUSED NETWORK FOR TRAVEL SIMULATION

- Existing Highway
- New Roadway Alignment
- STUDY TAZ Boundary
- 763 STUDY TAZ Number
- Monitoring Intersection & ID #

Aggregated area-wide highway performance measures were computed on two levels:

1) to show the relative efficiency of the complete highway network (e.g., freeways and expressways, arterial and collector highways, and local streets); versus
2) the relative efficiency of the locally accessible highway network (i.e., just the arterials, collectors and local streets).

The rationale for the dual analyses is that congestion along the latter set of facilities is more often experienced and, as such, more readily understood by the study area population. Table 7 shows the performance statistics for the complete network.

TABLE 7
PERFORMANCE MEASURES - 1995 BASE YEAR MODELED HIGHWAY NETWORK (Complete System)

MCD	Vehicle Miles of Travel	Vehicle Hours of Travel	Avg. Daily Speed (mph)	V/C Ratio	Fuel Consumption (gallons/day)	Mobile Source Emissions (kilograms / day in July)		
						Carbon Monoxide	Non-methane Hydro-carbons	Oxides of Nitrogen
East Norriton	223,876	9,147	24.48	0.80	10,530	5,109	777	872
Lower Providence	457,835	14,546	31.47	0.68	21,583	2,718	430	691
Norristown	234,009	13,281	17.62	0.82	11,006	6,399	968	1,050
Plymouth	808,535	30,659	26.37	0.72	38,179	7,012	1,073	1,375
West Norriton	193,372	7,569	25.55	0.75	9,103	3,867	589	690
Whitpain	527,545	19,734	26.73	0.66	24,791	3,914	608	878
Worcester	436,419	12,898	33.84	0.59	20,551	2,287	362	551
Central Mont. Co. Study Area	**2,881,591**	**107,834**	**26.72**	**0.69**	**135,743**	**31,306**	**4,807**	**6,108**

Table 8 summarizes the same set of performance data for the locally accessible highway network (e.g., I-276, I-476, and US 422 are excluded from the calculations).[6] A quick comparison of the tables shows that 73 percent of the study area travel takes place on the "local" highway system, and that the local highway system is marginally more congested (see: "V/C Ratio" in Table 8) without the influence of the freeway statistics — particularly so for Plymouth Township.

[6] Note: the emissions data shown in Table 8 does incorporate expressways in its calculations, and therefore is the same information which is shown in Table 7.

TABLE 8
PERFORMANCE MEASURES - 1995 BASE YEAR MODELED HIGHWAY NETWORK ("Local" System)

MCD	Vehicle Miles of Travel	Vehicle Hours of Travel	Avg. Daily Speed (mph)	V/C Ratio	Fuel Consumption (gallons/day)	Mobile Source Emissions (kilograms / day in July)		
						Carbon Monoxide	Non-methane Hydro-carbons	Oxides of Nitrogen
East Norriton	223,876	9,147	24.48	0.80	10,530	5,109	777	872
Lower Providence	326,824	12,060	27.10	0.69	15,367	2,718	430	691
Norristown	211,547	12,230	17.30	0.79	9,940	6,399	968	1,050
Plymouth	418,584	18,545	22.57	0.89	19,677	7,012	1,073	1,375
West Norriton	156,880	6,715	23.36	0.70	7,372	3,867	589	690
Whitpain	409,493	17,540	23.35	0.78	19,190	3,914	608	878
Worcester	349,101	11,276	30.96	0.65	16,408	2,287	362	551
Central Mont. Co. Study Area	2,096,305	87,513	23.95	0.75	98,484	31,306	4,807	6,108

FUTURE LAND USE AND DEMOGRAPHICS

Special effort was devoted in the study to estimate additional population and employment associated with future land development scenarios portrayed in planning studies conducted by the study area municipalities. Once determined, the data served as demographic inputs to the regional model for Year 2020 futures testing.

The size, use(s) and location of future developments (proposed and potential) were tabulated, verified and updated with municipal representatives on the Steering Committee. "Typical densities" (i.e., residents per dwelling type; employees per 1,000 gross square feet or acre, for office, light industry, retail; etc.) were obtained from published references [7] [8] [9], Steering Committee members and professional judgement.

---

[7] *Trip Generation* (5th & 6th Editions), Institute of Transportation Engineers, Washington, D.C., 1991 and 1997.

[8] *The Fiscal Impact Handbook*, The Center for Urban Policy Research, New Brunswick, NJ, 1978.

[9] *The New Practitioner's Guide to Fiscal Impact Analysis*, The Center for Urban Policy Research, New Brunswick, NJ, 1985.

In turn, the appropriate densities were applied to the various uses to obtain estimates of population and/or employment for a given development. The population and employment increments associated with the future development scenarios were subsequently assessed for reasonableness, modified where appropriate, aggregated to the Central Montgomery County Transportation Study TAZ structure, summed with 1995 demographics, and — used as inputs for future Year 2020 modeling activities. Table 9 tabulates the significant development proposals within the study area which were identified through the work.

TABLE 9
TABULATION OF SIGNIFICANT FUTURE LAND USE (excludes institutional and lodging uses)

	Residential (units)	Commercial (square feet)			Industrial (square feet)	
Municipality	Single Family, Townhses. & Apts.	Retail	Office	Business Center	Warehouse	Light Industry
East Norriton	529	151,600	480,000	-	-	365,000
Lower Providence	3,803	389,660	835,575	-	-	-
Norristown	16	-	-	-	-	-
Plymouth	101	1,287,600	1,581,400	13,340	100,000	-
West Norriton	-	418,155	102,400	-	-	-
Whitpain	493	290,000	179,000	-	-	50,000
Worcester	438	-	-	-	-	-
Central Mont. Co. Study Area	5,380	2,537,015	3,178,375	13,340	100,000	415,000

Figure 12 illustrates the location of the significant land development proposals in conjunction with the higher density uses already present in the study corridor. Table 10 summarizes the projected changes to municipal population and employment as a consequence of this "land use assumptions" exercise.

By way of summary, the greatest absolute increases in population are projected for Lower Providence, Whitpain and East Norriton. Employment's greatest gains are projected to take place in Plymouth, Lower Providence and East Norriton. Total study area population will climb eight percent, and total study area employment will rise 20 percent between 1995 and 2020.

TABLE 10
DEMOGRAPHIC PROJECTIONS: 1995 and 2020

		Population				Employment			
				Change* vs. 1995 (Projected)				Change* vs. 1995 (Projected)	
Municipality	Area (mi^2)	1995	Year 2020	Abs.	%	1995	Year 2020	Abs.	%
East Norriton	6.1	13,135	14,727	1,592	12	7,255	9,771	2,516	35
Lower Providence	15.5	20,815	24,993	4,178	20	10,502	13,845	3,343	32
Norristown	3.7	30,008	30,044	36	-	15,922	16,012	90	1
Plymouth	8.5	16,028	16,257	229	1	22,399	30,497	8,098	36
West Norriton	6.2	14,963	14,963	0	-	6,925	8,256	1,331	19
Whitpain	12.9	17,640	19,481	1,841	10	19,162	20,535	1,373	7
Worcester	16.2	5,878	7,127	1,249	21	3,272	3,272	0	-
Central Mont. Co. Study Area	69.1	118,467	127,592	9,125	8	85,437	102,188	16,751	20

* Values include estimates of population and employment associated with institutional and lodging uses.

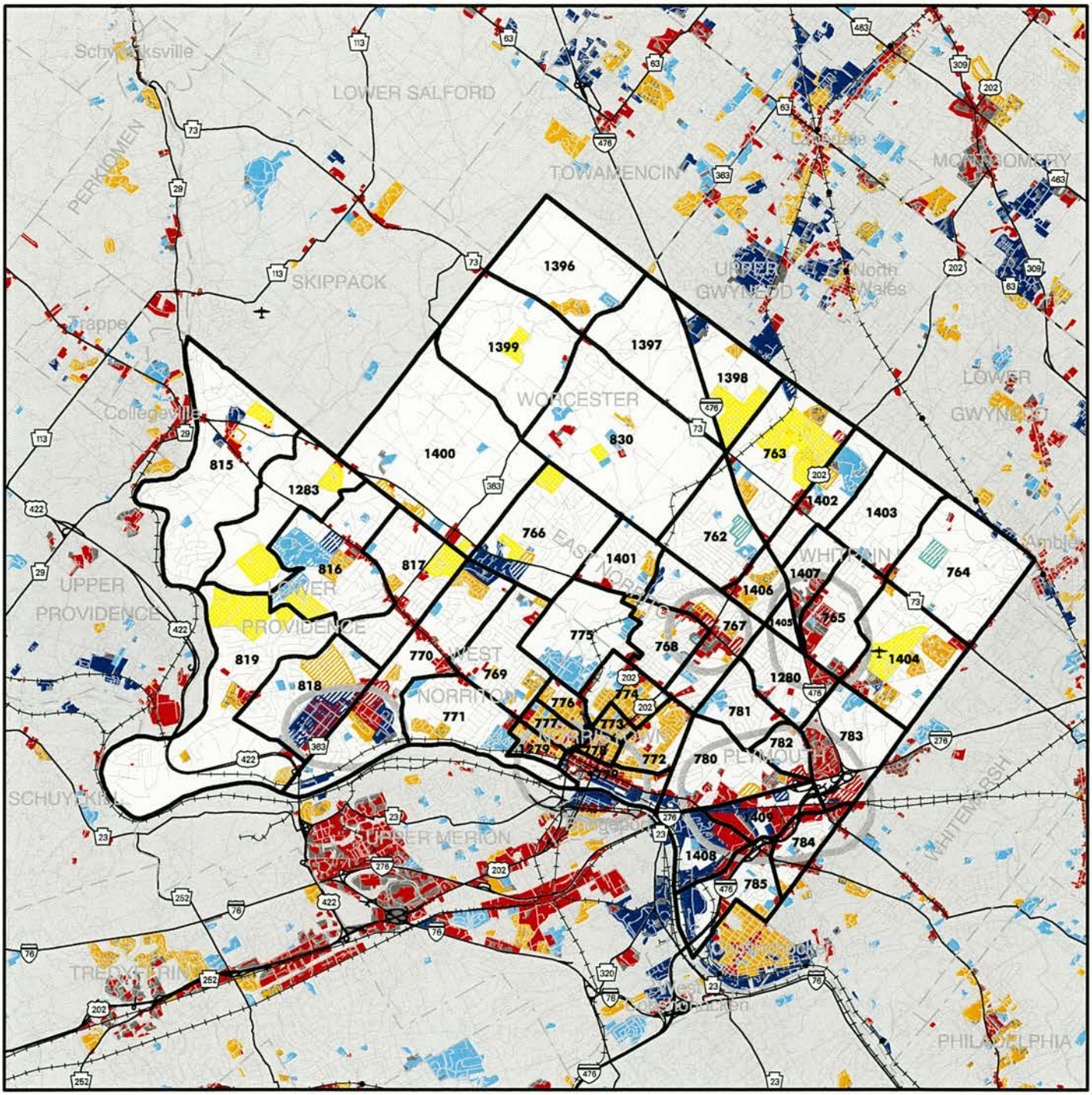
Figures 13 and 14 show the magnitude of the changes stratified by TAZs. In regard to population (see Figure 13):

- Population growth is projected to surround the core of the study area.
- Strong population growth is projected throughout Lower Providence, but strongest in the areas bordering the Perkiomen Creek (TAZs #815 and #819).
- Whitpain's population growth will surround its commercial center (Blue Bell), and is projected to be highest in the northernmost TAZ located east of the Turnpike's Northeast Extension (#763).
- East Norriton's residential growth will also ring its commercial center, Penn Square, and is projected to be greatest along its western boundary (TAZ #766), followed closely on the east in TAZ #767.

With respect to employment (see Figure 14):

- Employment growth is also projected to surround the core of the study area, but generally sidesteps Worcester.
- Plymouth's employment growth will be dispersed throughout the Township. The largest gains will take place in TAZs #1409 (Metroplex) and #783 (Plymouth Hill Associates office development proposal) — both very near the PA Turnpike's Norristown interchange.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 12 :

DEVELOPMENT CENTERS - 2020

Development Center

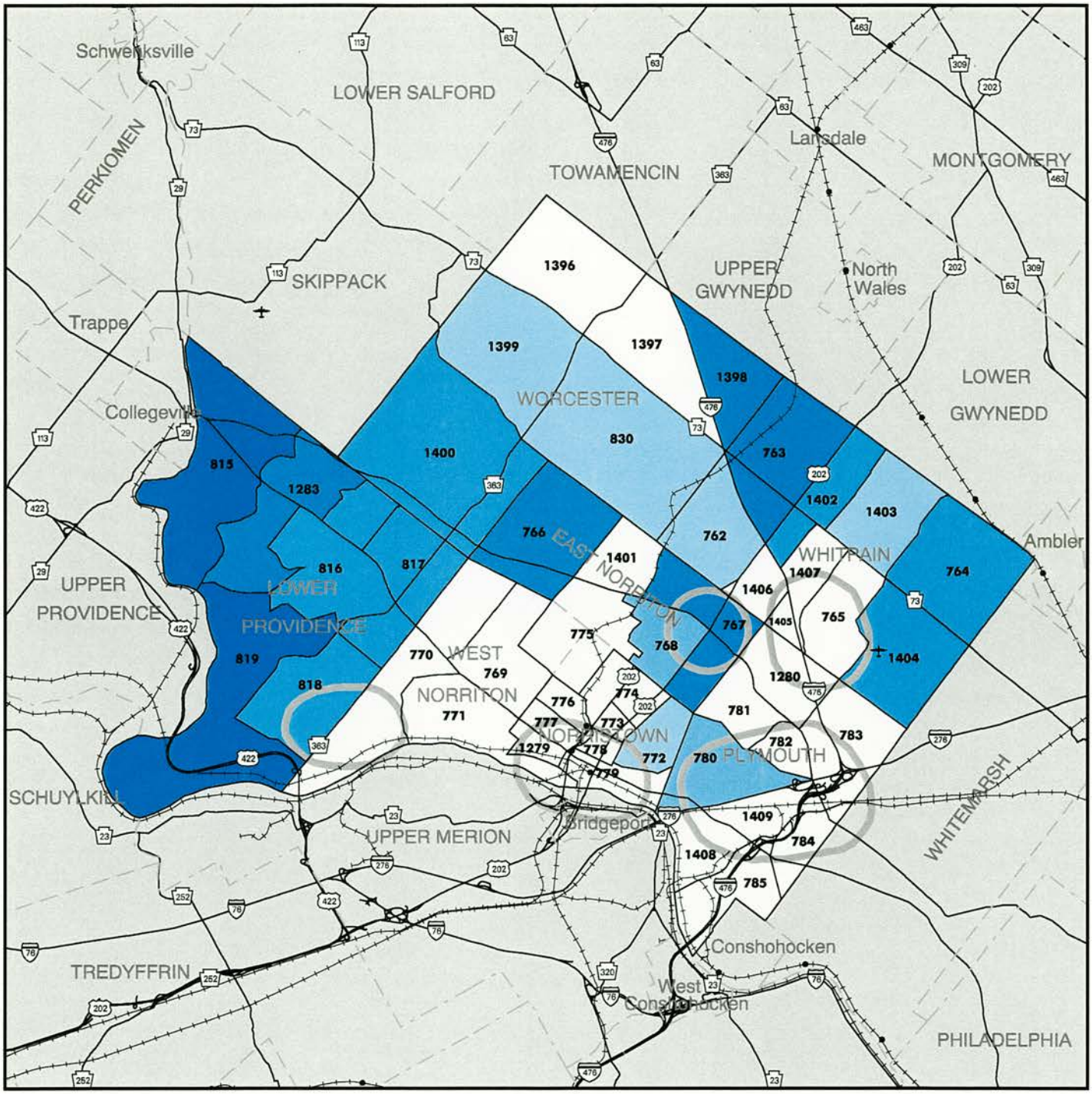
EXISTING LAND USE (1995)
- Manufacturing / Industrial
- Community Service
- Commercial / Services
- Multi Family

POTENTIAL DEVELOPMENT (SIGNIFICANT)
- Manufacturing / Industrial
- Community Service
- Commercial / Services
- Multi Family
- Single Family
- Parkland

Study TAZ Boundary

763 Study TAZ Number

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 13:

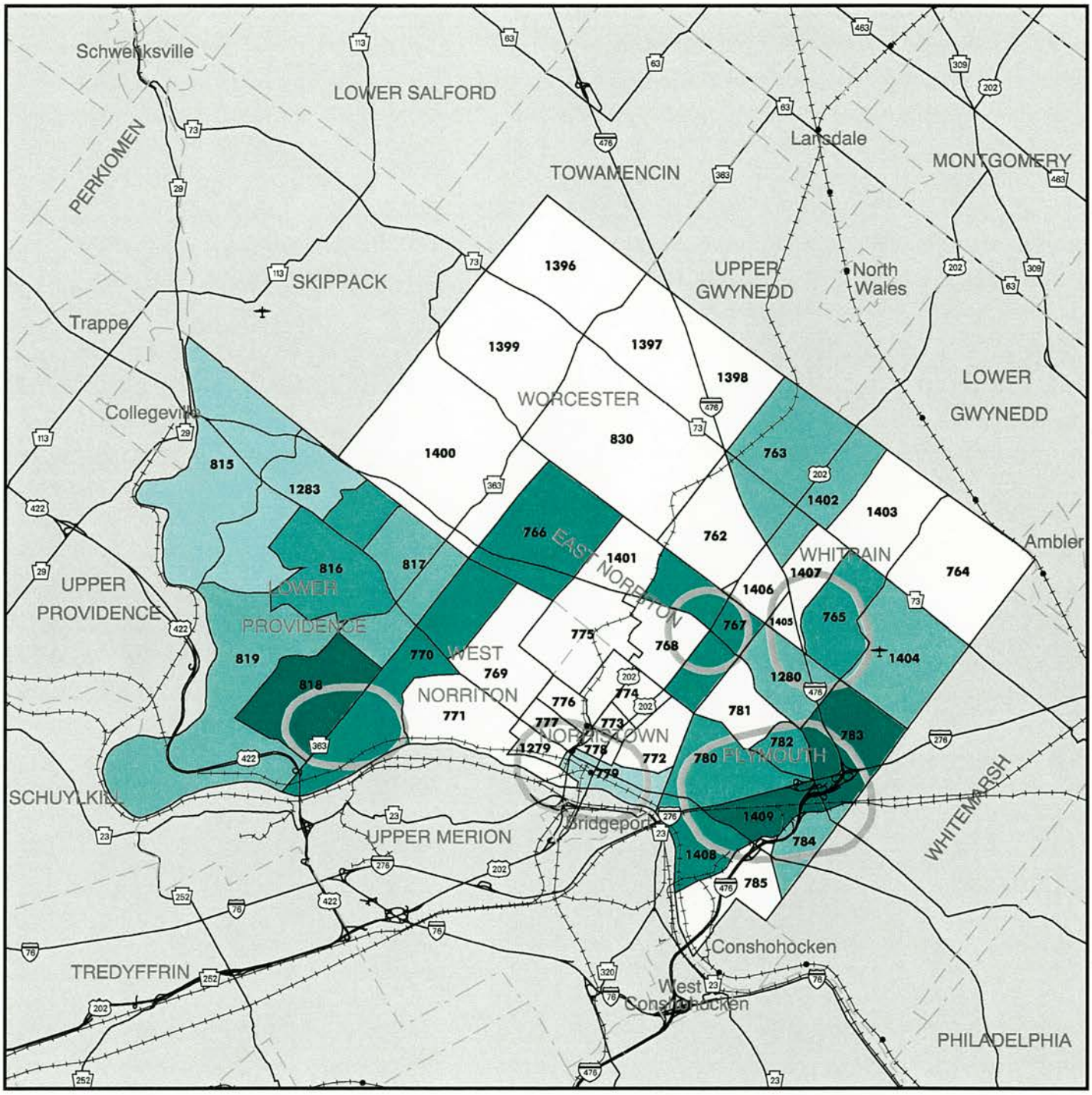
PROJECTED CHANGE IN STUDY AREA POPULATION 1995 - 2020

- 0 (no change)
- 1 - 99
- 100 - 299
- 300 - 599
- 600 - 899
- 900 - 1100

Development Center

623 Study Area TAZ Number

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 14:

PROJECTED CHANGE IN STUDY AREA EMPLOYMENT 1995 - 2020

- 0 (no change)
- 1 - 99
- 100 - 399
- 400 - 999
- 1,000 - 1,499
- 1,499 +

Development Center

623 Study Area TAZ Number

- Most of Lower Providence's job growth will take place along Trooper Road in TAZ #818, as a consequence of expansion in the Valley Forge Corporate Center — the township's existing commercial core.
- East Norriton's employment growth will be located in TAZ #766, as a consequence of a proposed industrial park near the Germantown and Trooper intersection, and in TAZ #767 in which the Bentwood Executive Campus is being constructed.

The future depicts an intensification of the employment centers located in Plymouth Meeting, Penn Square and at the Valley Forge Corporate Center; and population growth which is complementary with, but separate from, the Blue Bell development center in Whitpain. In summary, from a transportation perspective, projected land development trends largely consist of in-fill development without the formation of significant new concentrated and varied land forms — which might serve as generators for new public transit bus services within the study area.

2020 Limited-Build Conditions

Two initial activities were undertaken to prepare the Year 2020 Limited-Build scenario's travel simulation.

- Future study area demographics, developed through the land use assumptions exercise, described in the previous section, were input to the regional model for trip generation and trip distribution purposes.
- Second, the regional model's transportation network was updated to reflect a minimum set of "committed" transportation improvements for which funding (public or private) is reasonably assured and/or for which implementation is expected by the horizon year (i.e., the year 2020).

The land use assumptions exercise was fully described in the previous section of this chapter.

The set of committed transportation projects include: those projects in or entering construction; those proposed for construction in the current DVRPC TIP (covering FFYs 1999 to 2002); those anticipated as conditions in development approvals, and/or; those improvements otherwise identified through the Study Steering Committee. Table 11 lists the set of committed study area transportation improvements which were incorporated into the modeling of the Year 2020 Limited-Build scenario.

TABLE 11
STUDY AREA TRANSPORTATION IMPROVEMENTS -
YEAR 2020 LIMITED-BUILD TRAVEL SIMULATION

Ref. # (see Fig. 20)	Project Description
1	Butler Pike By-Pass: construct two lanes plus turn lanes at key intersections
2	Flourtown Road relocated: construct two lanes plus turn lanes at Butler Pike
3	PA 23 relocation: construct a four-lane controlled access highway from US 422 to US 202
4	US 202 (Section 400), South Gulph Road to Swedesford / Howellville Rd interchange: Widening to a minimum of six lanes and interchange improvements (Note: project is in construction)
5	Main, Markley and DeKalb Streets (Forest-Ford, Main-Johnson, Lafayette-Johnson) signal coordination and interconnection
6	US 202 Southbound (Section 500): reconstruct Markley Street to 48 feet and intersection improvements from Johnson Highway to Marshall Street
7	US 202 (Section 600), DeKalb Pike - widen to four through lanes per Selective Widening Alternative
8	US 202 and Morris Road intersection: widening for additional through and turning lanes on both roads (note: project was constructed in 1999)
9	US 202 Expressway (Section 700), US 202 Bypass to PA 63: construct four lane divided freeway
10	PA Turnpike widening to six lanes: I-276, between Valley Forge and Norristown interchanges, and I-476, between I-276 and Lansdale interchanges
11	Ridge Pike - reconstruct and widen to five lanes from Belvoir Road to Alanwood Road
12	Henderson Road, from Shoemaker Road to PA Turnpike, widen to four lanes with intersection improvements
13	I-76 at Henderson Road: provide a new interchange on I-76 for westbound on and off movements and close the adjacent S. Gulph Road westbound on-ramp
14	Old Betzwood Bridge, over Schuylkill River, construct new bridge to serve two-way traffic and pedestrian and bike trail
15	Alanwood Road Extension: construct new road from Ridge Pike to Gallagher Road (note: project is presently being constructed)
16	Park Avenue / Egypt Road / Trooper Road connection: construct new road from Park Avenue to Egypt Road to Trooper Road
17	Chemical Road widening to five lanes and intersection improvements from a point south of Gallagher Road to Germantown Pike (note: project is presently in construction)
31	Park Av and Egypt Rd intersection improvements

Figure 15 illustrates the simulated daily traffic volumes which emanated from the Year 2020 Limited-Build model run. Table A1 in Appendix A contains a listing of the simulated future traffic volumes within the study area. In the Year 2020 Limited-Build scenario, substantial traffic volume increases are projected throughout the study area.

Table A2 in Appendix A provides a listing of the scenario's simulated daily transit boardings. While no additional transit improvements have been modeled, the model's outputs indicate there will be a marginal increase in daily transit ridership for the Year 2020 Limited-Build conditions (+277 boardings, or +4% over current boardings) as a consequence of ongoing population and employment growth within the study area.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY

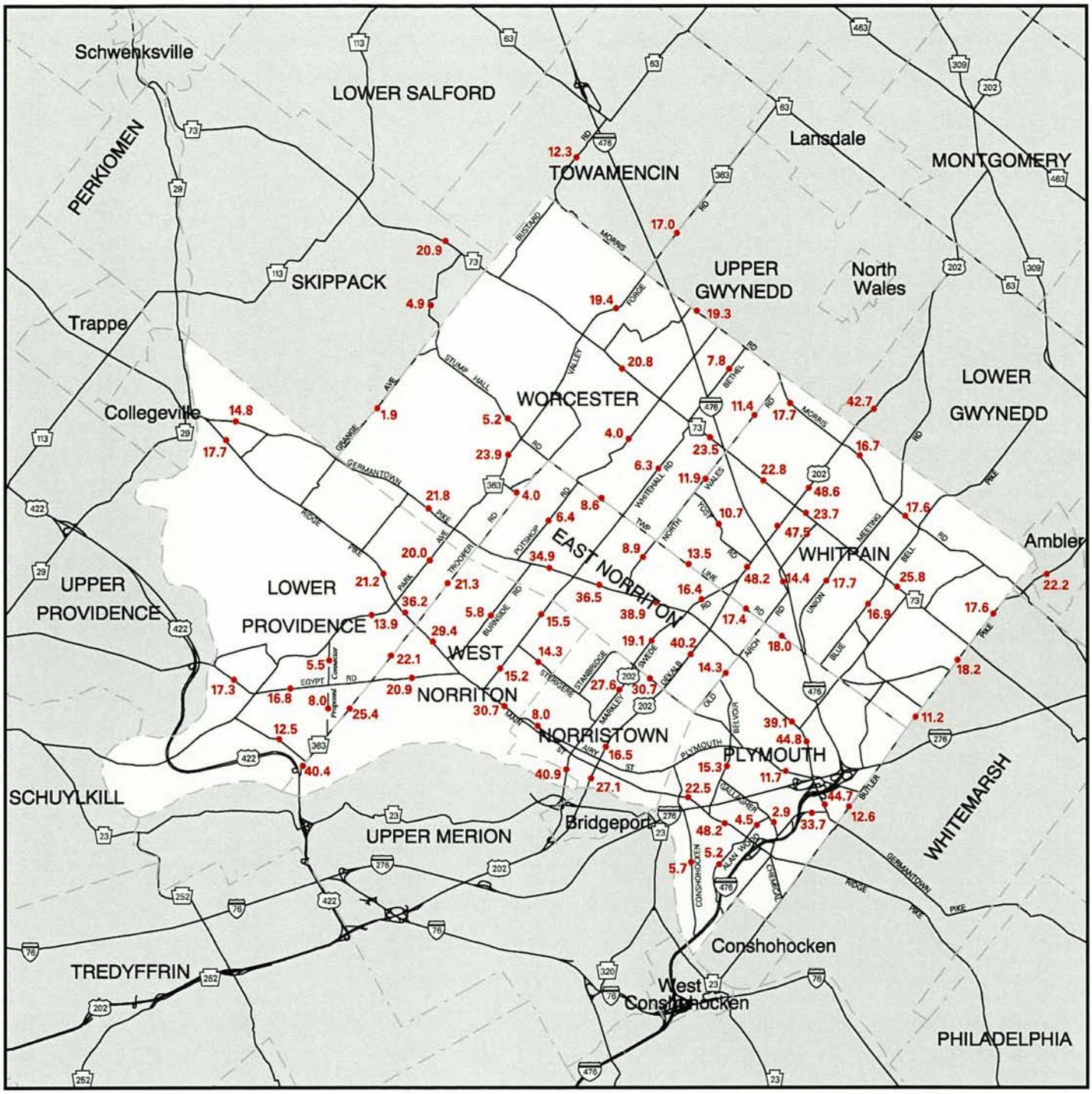


FIGURE 15:

YEAR 2020 LIMITED-BUILD SIMULATED TRAFFIC VOLUMES

- Traffic Volume Monitoring Location (AADT)
- 19.3 Total Daily Traffic Volume (in thousands)

Year 2020 Limited-Build Performance Statistics

Highway network performance statistics computed and aggregated from the Limited-Build simulation are shown in Table 12, for the complete network, and Table 13 for just the local highways.

TABLE 12
PERFORMANCE MEASURES - YEAR 2020 LIMITED-BUILD MODELED HIGHWAY NETWORK (Complete System)

MCD	Vehicle Miles of Travel	Vehicle Hours of Travel	Avg. Daily Speed (mph)	V/C Ratio	Fuel Consumption (gallons/day)	Mobile Source Emissions (kilograms / day in July)		
						Carbon Monoxide	Non-methane Hydro-carbons	Oxides of Nitrogen
East Norriton	339,023	13,880	24.43	0.93	15,957	4,737	526	686
Lower Providence	613,248	20,499	29.92	0.87	28,901	2,370	299	516
Norristown	291,680	17,229	16.93	0.97	13,717	5,965	654	823
Plymouth	1,075,981	40,949	26.28	0.78	50,800	6,108	704	1,023
West Norriton	261,205	11,034	23.67	0.97	12,287	3,643	409	547
Whitpain	754,751	28,099	26.86	0.71	35,480	3,458	422	696
Worcester	562,017	16,739	33.58	0.65	26,466	1,956	246	424
Central Mont. Co. Study Area	3,897,905	148,429	26.26	0.77	183,608	28,236	3,258	4,716

In summary, of the study area's complete modeled network (shown in Table 12), on a daily basis there will be about 3.9 million vehicle miles of travel (VMT) and 148,400 vehicle hours of travel (VHT) — representing a 35 percent increase in VMT, and a 38 percent increase in VHT over the 1995 Base Year scenario. Speeds throughout the network exhibit a small decline (-0.4 mph) to approximately 26.3 miles per hour, and the network is operating at 77 percent of its capacity (versus 69 percent in the 1995 Base Year scenario).

Assuming that current vehicle-type characteristics and fuel efficiencies are carried forward to the horizon year, approximately 184,000 gallons of fuel will be consumed on a daily basis throughout the modeled network — a change from 1995 Base Year conditions that is consistent with the increase in VMT. Future year 2020 emissions estimates assume that mandated improvements in vehicle design and re-formulated fuels will result in decreased emissions per vehicle mile traveled. As such, mobile source emissions for the Year 2020 Limited-Build scenario decrease an average of 22 percent versus the emission estimates for the 1995 Base Year alternative.

TABLE 13
PERFORMANCE MEASURES - YEAR 2020 LIMITED-BUILD MODELED HIGHWAY NETWORK ("Local" System)

MCD	Vehicle Miles of Travel	Vehicle Hours of Travel	Avg. Daily Speed (mph)	V/C Ratio	Fuel Consumption (gallons/day)	Mobile Source Emissions (kilograms / day in July)		
						Carbon Monoxide	Non-methane Hydro-carbons	Oxides of Nitrogen
East Norriton	339,023	13,880	24.43	0.93	15,957	4,737	526	686
Lower Providence	432,068	16,880	25.60	0.86	20,305	2,370	299	516
Norristown	265,382	15,907	16.68	0.94	12,469	5,965	654	823
Plymouth	556,145	25,648	21.68	1.05	26,134	6,108	704	1,023
West Norriton	219,599	9,902	22.18	0.92	10,313	3,643	409	547
Whitpain	592,702	25,097	23.62	0.94	27,791	3,458	422	696
Worcester	442,156	14,519	30.45	0.81	20,779	1,956	246	424
Central Mont. Co. Study Area	2,847,075	121,833	23.37	0.89	133,748	28,236	3,258	4,716

Two observations may be made about the data contained in Table 13, as compared with data presented earlier. First, the local highway system will carry about 73 percent of the study area VMT. A share which is consistent with the 1995 Base Year condition. Second, an appreciable increase in congestion will occur along the study area's local highway system. Without substantial improvement, and with the additional loading of future traffic demand, the Year 2020 Limited-Build local network will operate at 89 percent of capacity versus 75 percent in the base year. The most serious consequences will occur in Plymouth and Whitpain townships and the Borough of Norristown, and secondarily in East Norriton and West Norriton.

Assessment of Year 2020 Limited-Build Traffic Conditions

Sixteen (16) intersections, situated throughout the study, were selected as "monitoring" locations for a planning assessment of through-lane requirements along Central Montgomery County's main thoroughfares area (see Figure 11 for the locations of the monitoring intersections). To conduct the assessment, projected Year 2020 Limited-Build AADTs were converted to peak hour turning movement traffic volumes at each monitoring intersection. Furthermore, committed intersection geometry (or the existing geometry where no traffic improvements are proposed) was identified.

Figure 16 illustrates the initial set of intersection conditions (volume and geometry) assumed in the analyses. The analyses were conducted using the planning methodology for evaluating signalized intersections per the *Highway Capacity Manual*[10], and companion Highway Capacity Software[11]. In that methodology the computed sum of an intersection's critical lane volume is used as an overall indicator of the ability of the intersection's geometry to accommodate traffic demand. Output of the program are a critical v/c ratio at the intersection, and a corresponding qualitative rating of the intersection's expected performance (e.g., under, near, at, or over capacity).

The findings of the analyses for each monitoring location is described below and the results are tabulated in Table 14. At locations which were determined to be deficient (shaded cells in column #3), candidate improvements proposed as part of the Full-Build scenario's travel testing (see column #4 in the table) were subsequently applied in the analysis.

1. Ridge & Park (L. Providence) - Current geometry will be inadequate in accommodating future volume. Widening along Ridge for a 5 lane cross section at a minimum will be required.
2. Germantown & Ridge (L. Providence) - Existing geometry will accommodate future volumes.
3. Trooper & Egypt (L. Providence, W. Norriton) - Existing geometry will accommodate future volumes.
4. Sterigere & Whitehall (W. Norriton) - Existing geometry will accommodate future volumes.
5. Valley Forge & Morris (Worcester, Towamencin, U. Gwynedd) - Existing geometry will not adequately serve future volume.
6. Valley Forge & Skippack (Worcester) - Existing geometry will not be adequate to serve future volume.
7. Germantown & Plymouth (Plymouth) - Existing geometry will not be adequate to serve future volume. Substantial localized traffic engineering improvements (including providing additional through lanes on Germantown Pk northbound and Plymouth Rd eastbound) will improve, but won't rectify the condition. Travel demand management actions should be considered.
8. Ridge & Alanwood (Plymouth) - Existing geometry will accommodate future volumes.
9. Ridge & Conshohocken (Plymouth) - Existing intersection conditions do not accommodate future traffic projections. Widening for an additional through lane in each direction on Ridge, and selected turning lanes on Ridge and Lucetta will satisfy future demand.
10. Main & Markley (Norristown) - Existing geometry will not be adequate to serve future volume. Substantial localized traffic engineering improvements (including a double left turn lane on Markley Street northbound, and additional through lanes for both approaches of Main St) won't rectify the condition. Travel demand management actions should be considered, and "futures testing" conducted assuming the Schuylkill Valley Metro.
11. Markley / Swede & Johnson (Norristown) - Improvements associated with the Markley Street Improvement Project, will accommodate future volume.

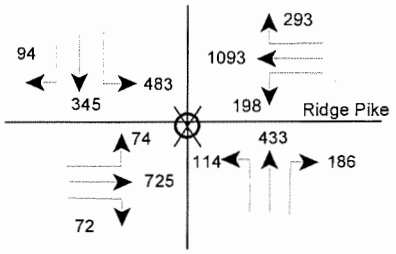
---

[10] *Highway Capacity Manual - Special Report #209*, third edition, Transportation Research Board, Washington, D.C., 1994.

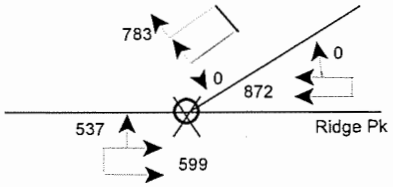
[11] Highway Capacity Software - Traffic Signals Module, release 2.4g, McTrans Center, Gainesville FL, Copyright 1995 - 1997.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY

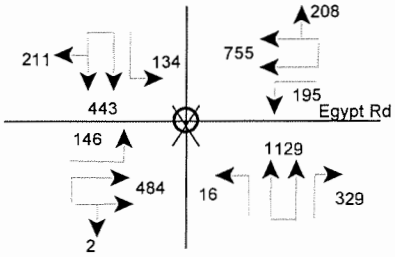
1. Ridge Pk and Park Ave (PM)



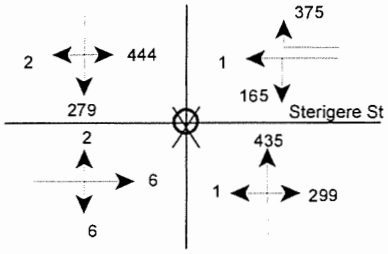
2. Germantown Pk and Ridge Pk (PM)



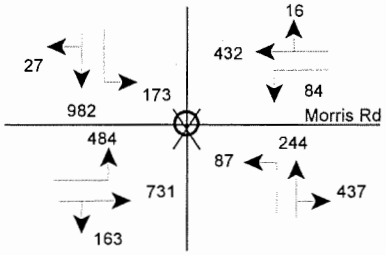
3. Trooper Rd and Egypt Rd (PM)



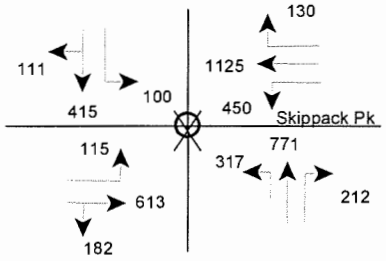
4. Sterigere St and Whitehall Rd (AM)



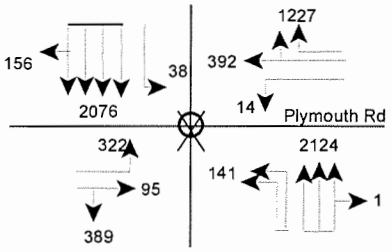
5. Valley Forge Rd and Morris Rd (AM)



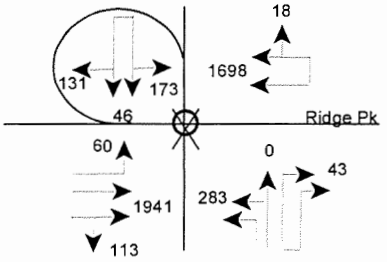
6. Valley Forge Rd and Skippack Pk (PM)



7. Germantown Ave and Plymouth Rd (AM)



8. Ridge Pk and Alanwood Rd (PM)



N

SCHEMATIC NOT TO SCALE

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 16:

TRAFFIC CONDITIONS AT SELECTED MONITORING LOCATIONS

Year 2020 Limited-Build Scenario

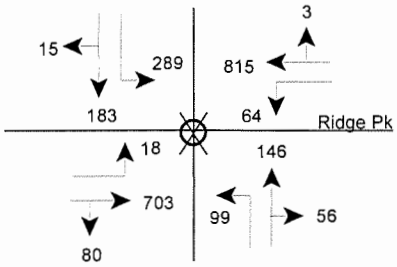
250 - Peak Hour Traffic Volume

- Traffic Signal

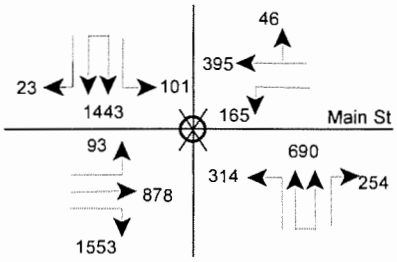
- Lane Group

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY

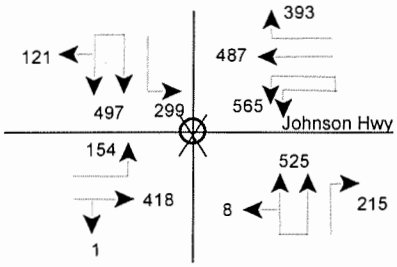
9. Ridge Pk and Conshohocken Rd (AM)



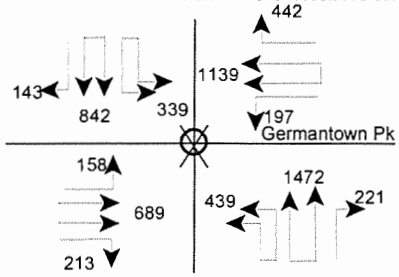
10. Main St and Markley St (AM)



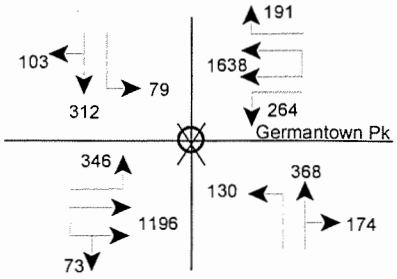
11. Markley St, Swede St, and Johnson Hwy (PM)



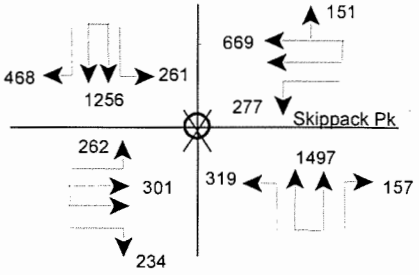
12. DeKalb Pk and Germantown Pk (PM)



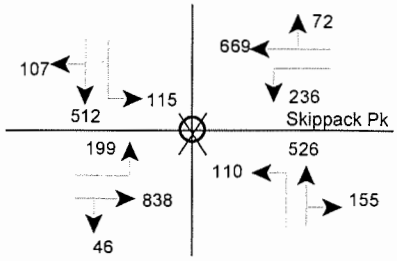
13. Germantown Pk and Whitehall (PM)



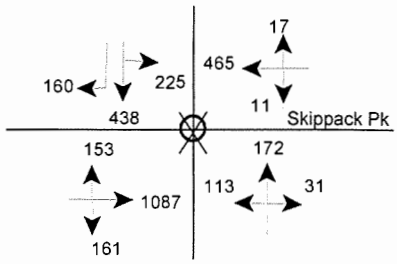
14. DeKalb Pk and Skippack Pk (PM)



15. Butler Pk Skippack Pk (PM)



16. N Wales Rd and Skippack Pk (AM)



N

SCHEMATIC NOT TO SCALE

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 16:
TRAFFIC CONDITIONS AT SELECTED MONITORING LOCATIONS
Year 2020 Limited-Build Scenario

250 - Peak Hour Traffic Volume ⊗ - Traffic Signal

- Lane Group

TABLE 14
PLANNING ASSESSMENT OF YEAR 2020 LIMITED-BUILD PEAK HOUR TRAFFIC CONDITIONS

Monitoring Location	Existing or Committed Geometry (see Fig. 16)		Proposed Full-Build Scenario Improvements Applied to Limited-Build Volumes		
	Critical Intersection V/C Ratio	Capacity Status	Description	Critical Intersection V/C Ratio	Capacity Status
1. Ridge Pk & Park Av	1.26	OVER	Provide five lane cross section on Ridge Pike.	1.03	AT / OVER
2. Germantown Pk & Ridge Pk	0.63	UNDER		0.63	UNDER
3. Trooper Rd & Egypt Rd	0.81	UNDER		0.81	UNDER
4. Sterigere St & Whitehall Rd	0.91	NEAR		0.91	NEAR
5. Valley Forge Rd & Morris Rd	1.30	OVER		1.30	OVER
6. Valley Forge Rd & Skippack Rd	1.31	OVER		1.31	OVER
7. Germantown Av & Plymouth Rd	1.17	OVER	Add EB THRU lane on Plymouth and NB THRU lane on Germantown.	1.11	OVER
8. Ridge Pk & Alanwood Rd	0.83	UNDER	Add SB LT lane on Alanwood.	0.82	UNDER
9. Ridge Pk & Conshohocken Rd	1.18	OVER	Add additional THRU lanes and separate RT lanes on both approaches of Ridge, and a SB LT lane on Lucetta.	0.41	UNDER
10. Main St & Markley St	1.85	OVER	Add second LT lane on Markley St NB, and additional THRU lanes on both approaches of Main.	1.75	OVER
11. Markley St, Swede St & Johnson Hwy,	0.77	UNDER		0.77	UNDER
12. DeKalb Pk & Germantown Pk	1.00	AT		1.00	AT
13. Germantown Pk & Whitehall Rd	1.50	OVER	Provide five lane cross section on Germantown Pike (provides 2 continuous THRU travel lanes in each direction of Germantown vs. existing condition).	1.01	AT / OVER
14. DeKalb Pk & Skippack Pk	0.98	AT		0.98	AT
15. Butler Pk & Skippack Pk	1.11	OVER	Provide separate RT lanes on both approaches of Butler, and an additional THRU lane for Skippack Pk EB.	0.89	NEAR
16. North Wales Rd & Skippack Pk	1.91	OVER	Provide separate LT lanes on all approaches.	1.14	OVER

12. DeKalb & Germantown (E. Norriton) - Improvements associated with the US 202 (Section 600) Improvement Project's Selective Widening Alternative will accommodate future volume.
13. Germantown & Whitehall (E. Norriton) - Existing intersection conditions will not accommodate future demand. Extending the widening of the westbound departure lane to allow a fully functioning five lane cross section along Germantown Pk, through the intersection, will satisfy future demand.
14. DeKalb & Skippack (Whitpain) - Improvements associated with the US 202 (Section 600) Improvement Project's Selective Widening Alternative will accommodate future volume.
15. Butler & Skippack (Whitpain, Whitemarsh) - The intersection's geometry will require separate right turn lanes on both approaches of Butler Pk and an additional eastbound through approach lane on Skippack Pk.
16. North Wales & Skippack (Whitpain, Worcester) - Committed intersection geometry (i.e., the provision of a southbound right turn lane) will not accommodate future demand. Complementing the intersection's design with separate left turn lanes will improve, but not rectify the condition.

Conclusions: Analyses of Year 2020 Limited-Build Scenario

Conclusions reached through the analyses of the 2020 Limited-Build scenario and completion of the study thus far, are:

1) Increased travel and associated congestion will be widespread throughout the study area by the Year 2020.
2) The current Transportation Improvement Plan, as evaluated through the Limited-Build scenario's testing, does not comprehensively address area-wide deficiencies. Local highway congestion is projected to be high in East Norriton, Norristown, Plymouth, West Norriton and Whitpain. Opportunities for improvement may be available by increasing connections to the freeway network, and introducing transit alternatives and travel demand management actions.
3) Evaluation of the monitoring intersections within the study area indicates congested spot and/or corridor conditions will exist in the Year 2020 even with the completion of the projects on the current TIP. As such, further capital improvement to the transportation infrastructure —- both highway and transit — warrants testing.

2020 Full-Build Conditions

The following activities were undertaken to prepare the Year 2020 Full-Build scenario travel simulation:

- First, a second tier of transportation improvements were added to the "committed" set modeled in the 2020 Limited-Build scenario. The funding outlook for this second set of improvements is less clear. Testing of the additional improvements seeks to provide an understanding of the improvements' effects / benefits.

- Second, future year 2020 employment and population demographics, which resulted from the land use assumptions exercise and were used in the Limited-Build scenario, were surcharged to account for potential induced area-wide development resulting from the full set of transportation improvements.

The modeled improvements emanated from various sources (including the assessment of the Limited-Build scenario, PennDOT's Twelve Year Program, comprehensive transportation plans prepared for the study area municipalities, DVRPC's 2020 Plan and suggestions by the Study Steering Committee). Table 15 lists the set of additional transportation improvements which were assumed as part of the Year 2020 Full-Build highway and transit travel simulation network.

TABLE 15
STUDY AREA TRANSPORTATION IMPROVEMENTS -
YEAR 2020 FULL-BUILD TRAVEL SIMULATION

Ref. # (see Fig. 20)	Project Description
18	Main Street & Markley Street intersection: provide additional through lane in each direction along Main St, widen northbound Markley approach for addnl. (double) left turn lane
30	SEPTA Schuylkill Valley Metro and Cross County Metro (operating between Norristown and Glenloch, in Chester County)
32	Ridge Pike - add (double) left turn on Belvoir Road southbound
33	Alanwood Road - add separate left turn lane on Alanwood southbound at Ridge
34	Stanbridge Street connection: construct new road from Johnson Highway, at Harding Boulevard, to Stanbridge Street
35	Plymouth Road - widen to four lanes from west of Germantown Pike to (proposed) Butler Pike Bypass
36	Germantown Pike - provide additional northbound through lane from I-476/I-276 interchange to Plymouth Meeting Mall entrance
37	Germantown Pike - widen to six lanes with separate left-turn slots at key intersections between Plymouth Meeting Mall and Walton Road
38	Germantown Pike, widen to five lanes from Walton Road to Arch Street
39	Germantown Pike, widen to five lanes from North Wales Road to PA 363
40	Ridge Pike, widen to three lanes from Park Avenue to Germantown Pike
41	Ridge Pike, widen to five lanes from Trooper Road to Park Avenue
42	Park Avenue, widen to three lanes from Ridge Pike to Germantown Pike
43	Trooper Road, widen to three lanes from Ridge Pike to Germantown Pike
44	Trooper Road, widen to three lanes from Ridge Pike to Egypt Road
45	Trooper Road, widen to five lanes south of Egypt Road thru Van Buren Avenue
46	Trooper Road, widen to five lanes from US 422 interchange thru Audubon Road
47	Township Line Rd - widen for center left-turn lane from DeKalb Pike to Union Meeting Road, provide additional (double) left turn lane on Union Meeting Road
48	Township Line Rd - widen to four lanes, with center left-turn lane, from Union Meeting to Walton Road, provide addnl. southbound approach lane on Norristown, and addnl. (double) left turn lane on Walton Road northbound

TABLE 15
STUDY AREA TRANSPORTATION IMPROVEMENTS -
YEAR 2020 FULL-BUILD TRAVEL SIMULATION

Ref. # (see Fig. 20)	Project Description
49	US 422, widen to six lanes from PA 363 to US 202
50	US 422, construct westbound-on and eastbound-off ramps at PA 363
51	PA Turnpike (I-476) vicinity of Township Line Road, construct slip ramps at: 1) the PECO right-of-way - southbound-on to Turnpike, and; 2) opposite Union Meeting Road - northbound-off from Turnpike
52	PA Turnpike (I-476) vicinity of Union Meeting Road, construct slip ramp for northbound-on to Turnpike at PECO right-of-way
53	PA Turnpike(I-476) at US 202, construct slip ramps - northbound-on to Turnpike and southbound- off from Turnpike
54	PA Turnpike, at Schultz Road, construct slip ramps - northbound-off from Turnpike and southbound-on to Turnpike (and close Shultz Road to thru traffic on the west side of the Turnpike)
55	Main Street / Ridge Pike, from Park Avenue to Belvoir Road, signal coordination and interconnection
56	Airy Street, from Arch Street to Main Street, convert traffic circulation from one-way to two-way
57	"Six Points" (Stenton Avenue, Narcissa Road, and Norristown Road), reconstruct into two intersections
58	Germantown Pike and Swede Road intersection: provide two thru and left turn lanes on Swede Road
59	Schuylkill Expressway (I-76), widen to six lanes from I-476 to US 202
60	Skippack Pike, widen to four lanes with center left-turn lane from DeKalb Pike to Wentz Road
61	Skippack Pk - between Wentz Road and Penllyn-Blue Bell Pike: widen for a center left turn lane; on the Union Meeting northbound approach: add (double) left turn lane, at School Road: provide addnl. westbound approach lane on Skippack Pike, at Penllyn-Blue Bell Pike: provide addnl. eastbound approach lane on Skippack and northbound approach lane on Penllyn-Blue Bell Pike
62	Skippack Pike and Butler Pike intersection: provide additional eastbound approach lane
63	Ridge Pike, Chemical Road, North Lane and Colwell Lane intersection: provide additional thru lanes in both directions of Ridge; double left turn on Colwell northbound approach; additional thru and additional (double) left turn on North Lane northbound; additional (double) left turn lane on Chemical Rd southbound
64	Conshohocken Road and Ridge Pike intersection: provide additional thru lanes in both directions of Ridge
65	Butler Pike and Ridge Pike intersection: provide additional thru lanes on both approaches of Ridge Pike

Figure 17 illustrates simulated AADTs which emanated from the Year 2020 Full-Build model run. Table A1 in Appendix A contains a listing of the simulated traffic volumes within the study area. Figure 18 portrays a generalization of the traffic volume changes which occur along the modeled local highway network, between the Limited-Build and Full-Build scenarios.

Traffic volume changes introduced as a consequence of the Full-Build Scenario are more localized and reflect influences of nearby major transportation improvements (versus the "global" changes which take place between current and Year 2020 Limited-Build traffic levels).

For example, traffic volume increases are projected along facilities where widening has been modeled. Trooper Road (PA 363), Ridge Pike, Park Avenue (PA 363) and

Germantown Pike, between US 422 and US 202 (north of Norristown), experience traffic volume increases. Similarly, traffic volume decreases take place within the area surrounded by that circumferential improvement. Traffic volume increases are projected along roadways leading to and from the Turnpike slip ramps. Decreases are projected along intervening parallel (and some perpendicular) highway segments.

Modeled transit improvements for the Year 2020 Build scenario (listed in Table 15) include the provision of the Schuylkill Valley and Cross County metros. Table A2 in Appendix A contains the simulated daily transit boardings associated with routes and services modeled in the Full-Build alternative. According to the modeled outputs, boardings at stations within the study area are projected to increase 3,124 over current levels (+48%). Large increases in boardings take place at the Norristown Transportation Center due to increased mobility provided by the Schuylkill Valley and Cross County metros.

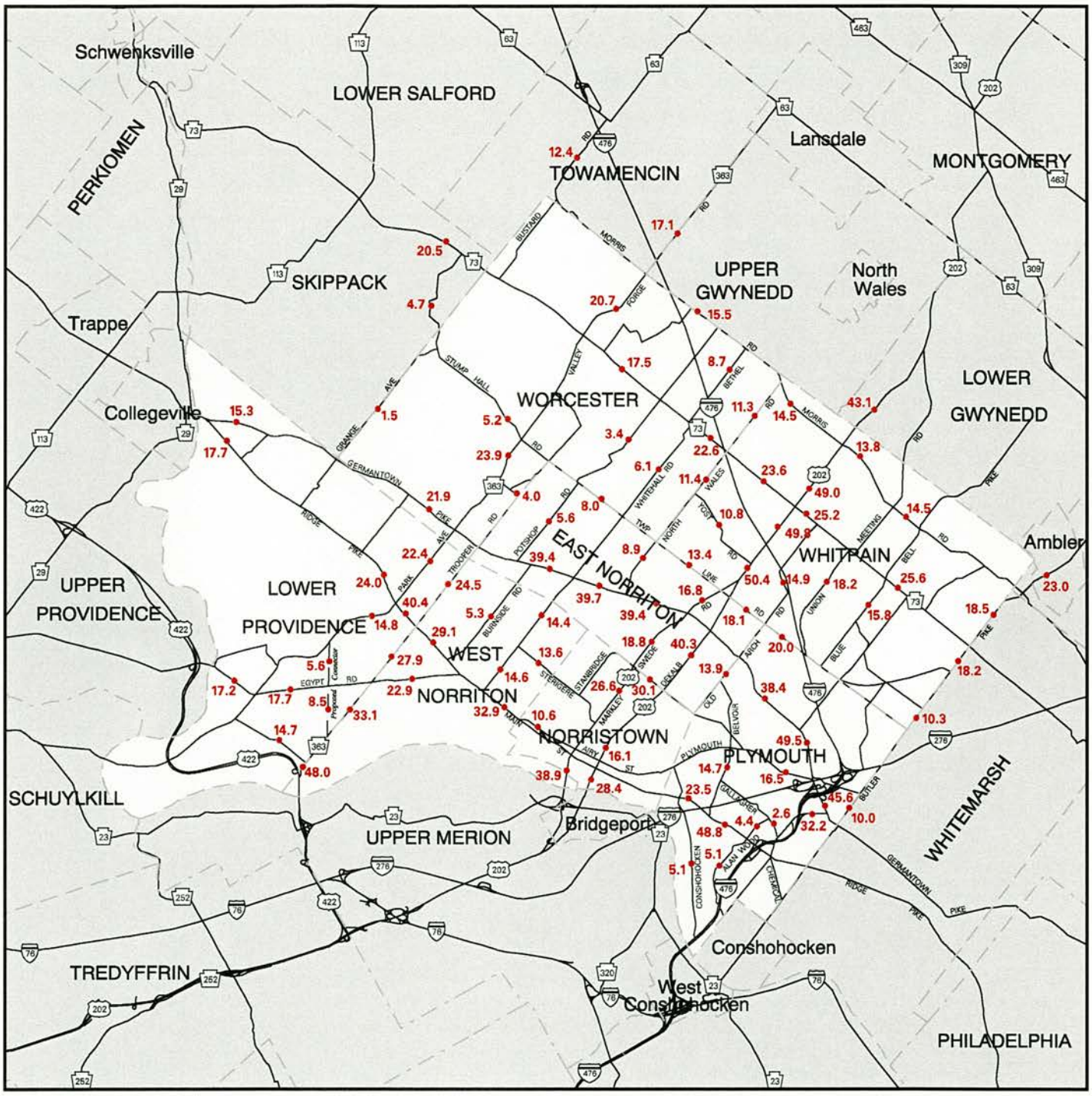
Year 2020 Full-Build Performance Statistics

Highway network performance statistics yielded by aggregating output from the 2020 Full-Build simulation are shown in Table 16 for the full network, and Table 17 for the local highway component.

TABLE 16
PERFORMANCE MEASURES - YEAR 2020 FULL-BUILD MODELED HIGHWAY NETWORK
(Complete System)

MCD	Vehicle Miles of Travel	Vehicle Hours of Travel	Avg. Daily Speed (mph)	V/C Ratio	Fuel Consumption (gallons/day)	Mobile Source Emissions (kilograms / day in July)		
						Carbon Monoxide	Non-methane Hydro-carbons	Oxides of Nitrogen
East Norriton	332,488	13,440	24.74	0.86	15,649	4,664	525	712
Lower Providence	652,733	21,896	29.81	0.87	30,772	2,468	312	540
Norristown	292,666	16,809	17.41	0.90	13,764	5,775	635	810
Plymouth	1,048,307	39,486	26.55	0.72	49,500	5,920	685	1,008
West Norriton	275,348	11,016	25.00	0.91	12,959	3,808	428	576
Whitpain	823,840	28,979	28.43	0.64	38,766	3,491	431	732
Worcester	683,628	18,864	36.24	0.60	32,240	2,135	277	513
Central Mont. Co. Study Area	4,109,010	150,490	27.30	0.73	193,650	28,261	3,293	4,889

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 17:

YEAR 2020 FULL-BUILD SIMULATED TRAFFIC VOLUMES

- ● Traffic Volume Monitoring Location (AADT)
- 19.3 Total Daily Traffic Volume (in thousands)

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY

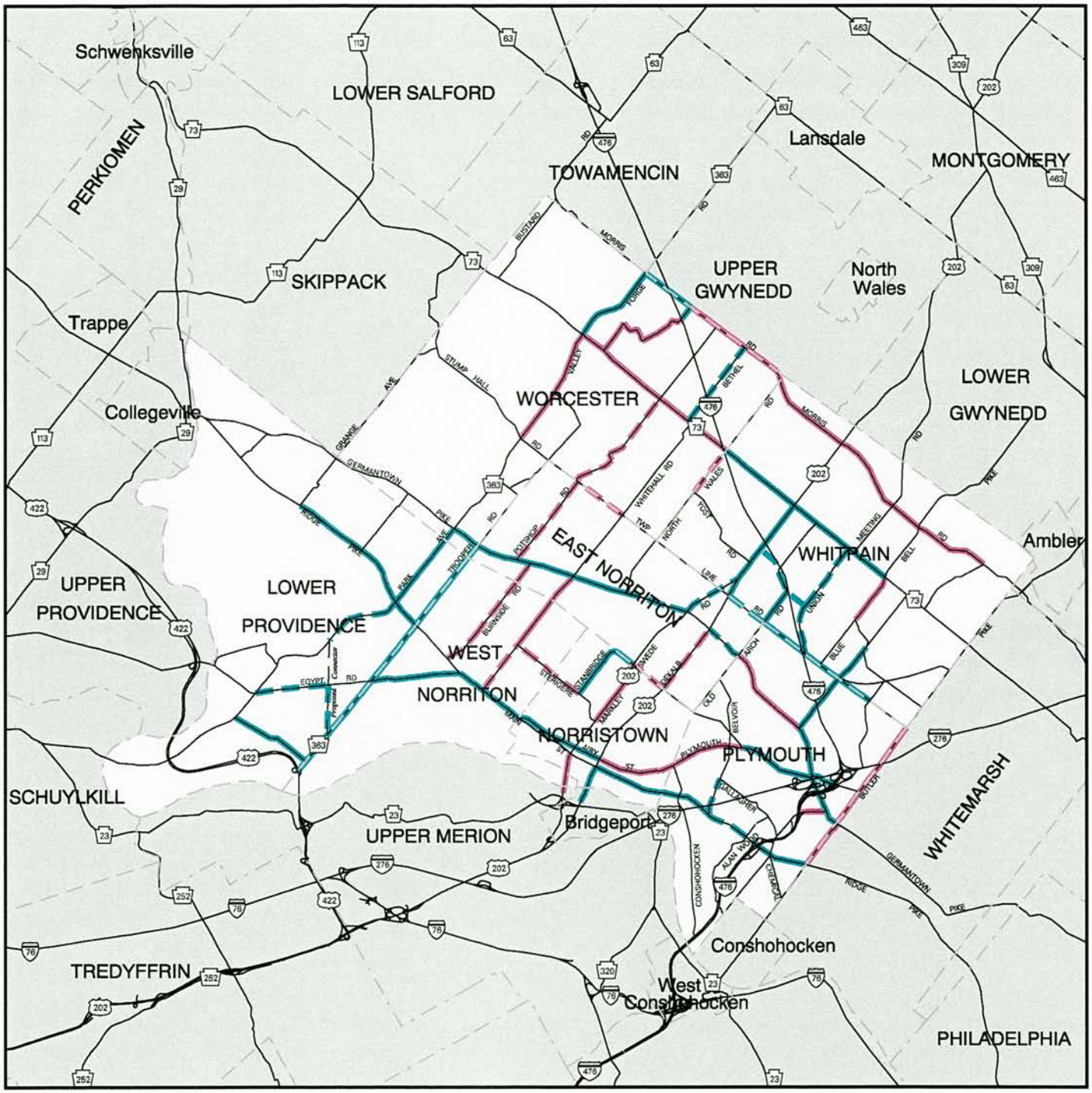


FIGURE 18 :

GENERALIZED TRAFFIC VOLUME (AADT) CHANGE

ALONG LOCAL ROADS BETWEEN THE MODELED LIMITED-BUILD AND FULL-BUILD SCENARIOS

- Decrease = 500 ≤ x < 1,000 vpd
- Decrease = x ≥ 1,000 vpd
- Increase = 500 ≤ x < 1,000 vpd
- Increase = x ≥ 1,000 vpd

1 0 1 2 MILES

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
AUGUST 2000

Compared to the Limited-Build alternative, for the full highway system, the Full-Build scenario exhibits: VMT increases of five percent; VHT increases of one percent; an overall speed increase of one mile per hour; a marginal decrease in the overall congestion index (v/c ratio decreases 5%), and; about 10,000 additional gallons of fuel consumed per day.

The Full-Build modeled results also indicate an increase in mobile source emissions ranging between 0.08 percent to 3.70 percent higher than the Limited-Build scenario (still a decrease from present conditions of about 20%).

Table 17 summarizes the same set of performance statistics for the local access component of the network.

TABLE 17
PERFORMANCE MEASURES - YEAR 2020 FULL-BUILD MODELED HIGHWAY NETWORK ("Local" System)

MCD	Vehicle Miles of Travel	Vehicle Hours of Travel	Avg. Daily Speed (mph)	V/C Ratio	Fuel Consumption (gallons/day)	Mobile Source Emissions (kilograms / day in July)		
						Carbon Monoxide	Non-methane Hydro-carbons	Oxides of Nitrogen
East Norriton	332,488	13,440	24.74	0.86	15,649	4,664	525	712
Lower Providence	453,800	17,799	25.50	0.83	21,333	2,468	312	540
Norristown	267,929	15,908	16.84	0.87	12,590	5,775	635	810
Plymouth	552,113	24,668	22.38	0.90	25,956	5,920	685	1,008
West Norriton	225,519	9,956	22.65	0.88	10,595	3,808	428	576
Whitpain	586,083	24,574	23.85	0.87	27,485	3,491	431	732
Worcester	432,883	14,215	30.45	0.82	20,343	2,135	277	513
Central Mont. Co. Study Area	2,850,815	120,560	23.65	0.86	133,951	28,261	3,293	4,889

Compared to the Limited-Build scenario's summation of local highway performance, the Full-Build's area-wide statistics show: VMT stays about the same (+0.1%), VHT decreases by one percent, average speeds increase nominally; the overall congestion index (v/c ratio) decreases marginally (-3%), and; about 200 additional gallons of fuel consumed per day.

As exhibited in the increased speeds and decreased v/c ratios — between the Limited-Build and Full-Build scenarios — improvement takes place along the local network of highways serving Plymouth (especially), East Norriton, Norristown,

West Norriton and Whitpain, as a result of the improvements modeled in the Full-Build scenario.

Furthermore, improved access to study area expressways — which is modeled in the Full-Build scenario (i.e., a complete interchange at PA 363 and US 422, and adding several slip ramps along the northeast extension of the Turnpike) — contributes to a reduced share of vehicle miles of travel (VMT) along the study area's local highway network. In the Limited-Build scenario 73 percent of the study area travel is non-freeway based, while in the Full-Build scenario 69 percent of the study area travel takes place along local highways. As a consequence, for the study area's local access component of highways, the volume increases projected under the Full-Build scenario are equal to the expected increases under the Limited-Build alternative. Local highway VMT reductions, versus the Limited-Build option, are indicated in East Norriton, Plymouth, Whitpain and Worcester.

Assessment of Year 2020 Full-Build Traffic Conditions

Planning assessments of the 16 monitoring intersections were again conducted to ascertain the relative adequacy of the study area's main thoroughfares assuming the Year 2020 Full-Build plan.

To begin the analysis projected Year 2020 Full-Build AADTs were converted to peak hour turning movement traffic volumes. Second, initial intersection geometry was established as the improvements reflected in Table 15 and those necessary to accommodate Limited-Build traffic demand (i.e., the improvements cited in column #4 in Table 14), plus others which were identified in independent municipal traffic planning efforts. Figure 19 illustrates the roadway and intersection conditions which were assumed as the baseline for the Full-Build scenario's planning level capacity analyses.

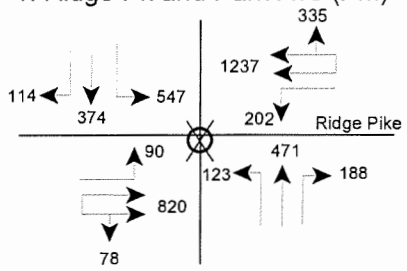
Table 18 outlines the results of the work. Additional improvements are identified in column #4 of the table for situations where the initial set of improvements may be supplemented in satisfying projected demand. Generally, the additional improvements provide auxiliary turning lanes which are complementary with the Full-Build Scenario's component set of improvements and appear "constructable" based upon field observation.

A discussion of the Full-Build's level of service analyses is provided below:

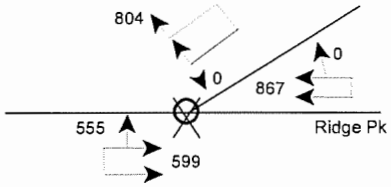
1. Ridge & Park (L. Providence) - The 5 lane cross section modeled along Ridge to accommodate PA 363's jogged alignment between Park Avenue and Trooper Road should be supplemented with a separate westbound right turn lane to accommodate Full-Build traffic demand.
2. Germantown & Ridge (L. Providence) - Existing geometry will accommodate future volume.
3. Trooper & Egypt (L. Providence, W. Norriton) - Existing geometry will accommodate future volume.
4. Sterigere & Whitehall (W. Norriton) - Existing geometry will accommodate future volume. Improved conditions versus the Limited-Build Scenario, are anticipated as a result of reduced traffic volume traversing the intersection due to the circumferential improvement to PA 363 and Germantown Pike, modeled in the Full-Build Scenario.
5. Valley Forge & Morris (Worcester, Towamencin, U. Gwynedd) - Existing geometry will not adequately serve Full-Build volume. Adding separate right turn lanes on all approaches will improve, but not rectify the situation.
6. Valley Forge & Skippack (Worcester) - Existing geometry will not be adequate to serve Full-Build volume. Adding a separate right turn lane on the eastbound approach does not measurably improve the situation.
7. Germantown & Plymouth (Plymouth) - Proposed widening of the Germantown Pike northbound and Plymouth Road eastbound approaches will not accommodate Full-Build volume. Travel demand management actions should also be implemented.
8. Ridge & Alanwood (Plymouth) - Adding a southbound left turn lane on Alanwood Road will accommodate future volume.
9. Ridge & Conshohocken (Plymouth) - Widening Ridge Pike for an additional through and separate right turn lane in each direction, and widening Lucetta Street for a separate southbound left turn lane will accommodate Full-Build traffic demand.
10. Main & Markley (Norristown) - Intersection improvements - associated with the Marley Street Improvement Project (e.g., including adding a second northbound left turn lane on Markley, and an additional through lane for both Main Street approaches); and traffic diversions - due to the Schuylkill Valley and Cross County metros and circumferential highway improvements — will improve, but not rectify poor traffic operations at the intersection. Additional area-wide travel demand management actions should be implemented.
11. Markley / Swede & Johnson (Norristown) - Improvements associated with the Markley Street Improvement Project, contained within the Limited-Build Scenario will also accommodate Full-Build traffic volume.
12. DeKalb & Germantown (E. Norriton) - Improvements associated with the US 202 (Section 600) Improvement Project's Selective Widening Alternative, contained within the Limited-Build Scenario will also accommodate Full-Build volume.
13. Germantown & Whitehall (E. Norriton) - Volume increases, expected at the intersection as a consequence of continuous widening along Germantown Pike in the Full-Build Scenario, will result in a marginal reduction in traffic service and undesirable conditions compared to the Limited-Build alternative. Supplemental improvements, including a separate southbound right turn lane plus a separate northbound right turn lane, are cited to satisfy Full-Build traffic.
14. DeKalb & Skippack (Whitpain) - Improvements associated with the US 202 (Section 600) Improvement Project's Selective Widening Alternative, contained within the Limited-Build Scenario will also accommodate Full-Build traffic demand.
15. Butler & Skippack (Whitpain, Whitemarsh) - Providing separate right turn lanes on Butler and an additional eastbound through lane on Skippack Pike, will deliver satisfactory traffic operations assuming the Full-Build traffic volume scenario.
16. North Wales & Skippack (Whitpain, Worcester) - Provisions for separate left turn lanes on all approaches and a separate southbound right turn lane on North Wales Road should be augmented with a separate eastbound right turn lane on Skippack Pike to accommodate Full-Build traffic demand.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY

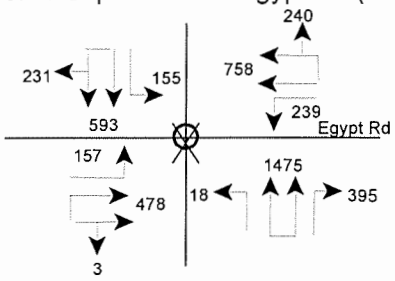
1. Ridge Pk and Park Ave (PM)



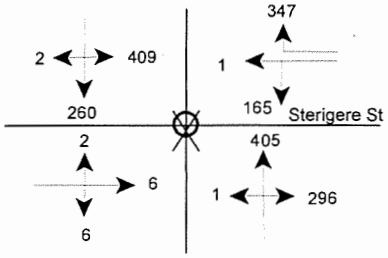
2. Germantown Pk and Ridge Pk (PM)



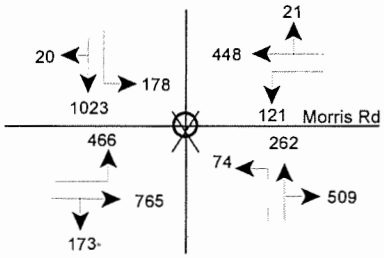
3. Trooper Rd and Egypt Rd (PM)



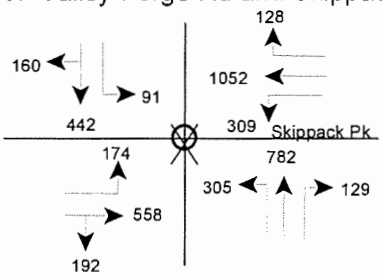
4. Sterigere St and Whitehall Rd (AM)



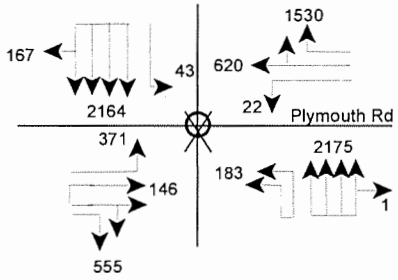
5. Valley Forge Rd and Morris Rd (AM)



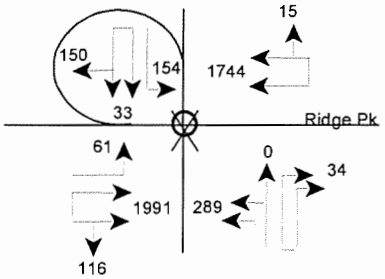
6. Valley Forge Rd and Skippack Pk (PM)



7. Germantown Ave and Plymouth Rd (AM)



8. Ridge Pk and Alanwood Rd (PM)



N

SCHEMATIC NOT TO SCALE

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

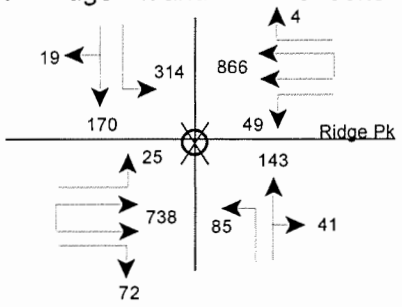
FIGURE 19:
TRAFFIC CONDITIONS AT SELECTED MONITORING LOCATIONS
Year 2020 Full-Build Scenario

250 - Peak Hour Traffic Volume ⊗ - Traffic Signal

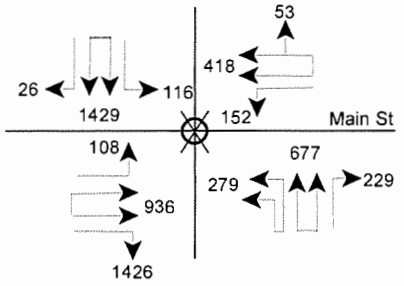
- Lane Group

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY

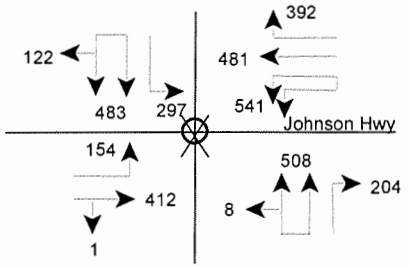
9. Ridge Pk and Conshohocken Rd (AM)



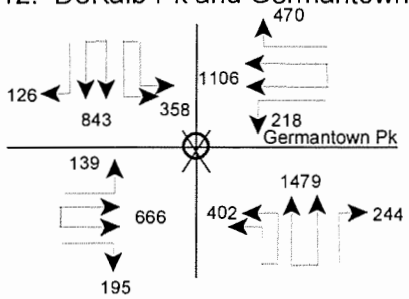
10. Main St and Markley St (AM)



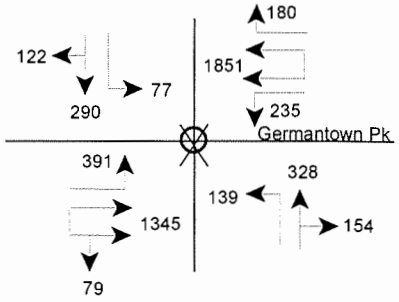
11. Markley St, Swede St, and Johnson Hwy (PM)



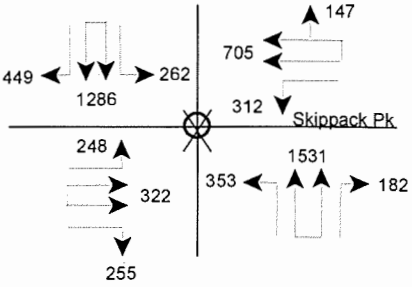
12. DeKalb Pk and Germantown Pk (PM)



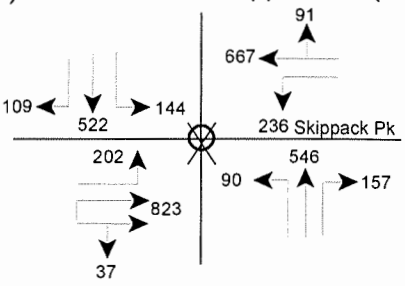
13. Germantown Pk and Whitehall (PM)



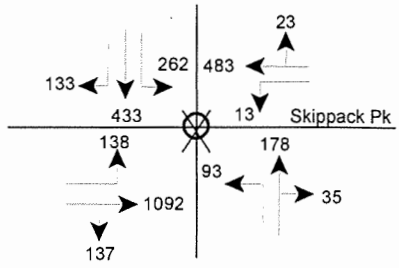
14. DeKalb Pk and Skippack Pk (PM)



15. Butler Pk Skippack Pk (PM)



16. N Wales Rd and Skippack Pk (AM)



N

SCHEMATIC NOT TO SCALE

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 19:
TRAFFIC CONDITIONS AT SELECTED MONITORING LOCATIONS
Year 2020 Full-Build Scenario

250 - Peak Hour Traffic Volume

- Traffic Signal

- Lane Group

TABLE 18
PLANNING ASSESSMENT OF YEAR 2020 FULL-BUILD PEAK HOUR TRAFFIC CONDITIONS

Monitoring Location	Proposed Full-Build Geometry (see Fig. 19)		Potential Additional Improvements to Serve Full-Build Volumes		
	Critical Intersection V/C Ratio	Capacity Status	Description	Critical Intersection V/C Ratio	Capacity Status
1. Ridge Pk & Park Av	1.17	OVER	Provide separate WB RT lane on Ridge Pk	1.04	AT / OVER
2. Germantown Pk & Ridge Pk	0.64	UNDER		0.64	UNDER
3. Trooper Rd & Egypt Rd	0.93	NEAR		0.93	NEAR
4. Sterigere St & Whitehall Rd	0.85	NEAR		0.85	NEAR
5. Valley Forge Rd & Morris Rd	1.37	OVER	Add separate RT lanes on all approaches	1.23	OVER
6. Valley Forge Rd & Skippack Rd	1.27	OVER	Add separate EB RT lane	1.27	OVER
7. Germantown Av & Plymouth Rd	1.29	OVER		1.29	OVER
8. Ridge Pk & Alanwood Rd	0.84	UNDER		0.84	UNDER
9. Ridge Pk & Conshohocken Rd	0.44	UNDER		0.44	UNDER
10. Main St & Markley St	1.64	OVER		1.64	OVER
11. Markley St, Swede St & Johnson Hwy,	0.75	UNDER		0.75	UNDER
12. DeKalb Pk & Germantown Pk	0.99	AT		0.99	AT
13. Germantown Pk & Whitehall Rd	1.07	OVER	Widen to provide separate NB and SB RT lanes	0.96	AT
14. DeKalb Pk & Skippack Pk	1.00	AT		1.00	AT
15. Butler Pk & Skippack Pk	0.92	NEAR		0.92	NEAR
16. North Wales Rd & Skippack Pk	1.11	OVER	Provide separate EB RT lane	1.01	AT / OVER

Conclusions: Analyses of Year 2020 Full-Build Scenario

The following conclusions have been reached regarding the requirements for through travel lanes along major thoroughfares serving the Central Montgomery County study area, assuming Year 2020 Full-Build scenario traffic conditions:

1) Existing or committed future intersection conditions at six monitoring intersections will be satisfactory to address Full-Build traffic demand (intersections: #2, #3, #4, #11, #12 and #14).
2) Improvements identified through the evaluation of the Full-Build Scenario are also required to accommodate projected volume associated with the Limited-Build Scenario (intersections: #8, #9, #13, #15 and #16).
3) Providing auxiliary turning lanes as a complement to the Full-Build Scenario's improvements will yield generally acceptable traffic operations (intersections: #13 and #16).
4) Traffic operations at four intersections are not adequately addressed by the physical and mobility improvements included in the Full-Build alternative (intersections: #5, #6, #7, and #10). As such, other measures including travel demand management and land development planning strategies will also be necessary.

FINDINGS OF THE TRAVEL DEMAND ANALYSES

The major findings of the "futures" analyses emanating from the study, are listed below.

1) Increased vehicular travel will be significant and widespread throughout the Central Montgomery County study area by the Year 2020 (+35% for the Limited-Build scenario to +43% for the Full-Build scenario).

2) Transportation improvements which already have funding commitments, from public and private sources (i.e., the "Limited-Build scenario"), include capacity improvements for US 202 (a north-south highway bisecting the study area) and the PA Turnpike (a toll highway with one local access interchange within the study area). Despite the size of these improvements, there are few other committed improvements distributed across the study area to accommodate the affects of anticipated growth.

   The findings of the analyses of the Limited-Build scenario traffic volumes suggests that the improvement program is not aggressive in combating projected increases in local highway congestion - as exhibited in municipal v/c ratios in East Norriton, Norristown, Plymouth, West Norriton and

Whitpain (evaluations conducted at "monitoring intersections" located throughout the study area confirm those findings).

Transit ridership will increase marginally (+4%) assuming the Year 2020 Limited-Build investment scenario. Gains are attributed solely to population and employment growth within the study area, since the alternative does not model improvement to public transportation modes or services.

3) The Full-Build scenario more completely addresses the study area through a larger set, and a wider distribution, of capital transportation improvements - both highway and transit. The additional highway improvements primarily address conditions along the locally accessible highway system.

   Notable within the modeled improvement set are completion of the US 422 and PA 363 interchange, and provision of slip ramps along the PA Turnpike's northeast extension (I-476). These provide opportunities for optimizing the distribution of traffic over the complete study area highway network. As a result, the effects of increased area-wide travel associated with the Full-Build scenario are offset from the local highway system.

   The set of physical improvements necessary to accommodate Full-Build traffic demand, at most of the monitoring locations are the same as would be necessary to serve the Limited-Build Scenario's traffic demand - indicating that the "scale" of the Full-Build alternative is appropriate to accommodate the study area's future. Minor additional widening for auxiliary turning lanes, performed in conjunction with arterial improvements, will yield satisfactory traffic conditions at most of the monitoring intersections.

   Substantial gains in transit ridership are projected in the Full-Build scenario (+48%) as a consequence of mobility improvements associated with extended rail services to/from the study area via the Schuylkill Valley Metro and the Cross County Metro.

4) Locations which are not improved by the Full-Build's complement of improvements are located within the heart of the study area's regional development or activity centers - Norristown, and Plymouth Meeting (e.g., Main and Markley, in the Borough of Norristown, and Germantown and Plymouth Road, in Plymouth Township) and within the PA 363 corridor, in Worcester Township.

5) Opportunities to provide more capacity in the central areas and high employment centers through additional traffic engineering improvements may not be practical. As such, local and regional area-wide travel demand management actions are recommended to supplement the improvement plan's capital physical and mobility improvements in Norristown, Plymouth, and Whitpain.

6) Improving future traffic conditions along PA 363 within Worcester Township is not adequately addressed in the plan. To compensate, traffic monitoring should be actively conducted along the route. Access management and land use strategies should be investigated in concert with land development planning — and implemented through the land development application, review and approval process. Organized travel demand management actions, applied on a regional basis, will also serve to extend the existing highway's serviceability.

Through the completion of the travel modeling and traffic assessment exercises it is concluded that the Full-Build Scenario's complement of capital improvements, augmented with traffic control measures (TCM) and travel demand management (TDM) actions, are the appropriate strategies to pursue to accommodate future growth and travel in Central Montgomery County. □

6 RECOMMENDATIONS

The technical analysis prepared in this study evaluated multi-modal capital improvement projects which emanated from municipal, county and regional transportation planning / programming efforts. The work was directed by a multi-jurisdictional Study Steering Committee comprised of representatives from each of the study area's seven municipalities, the Montgomery County Planning Commission, SEPTA, the Greater Valley Forge Transportation Management Association, the Pennsylvania Turnpike Commission and PennDOT (individuals serving on the Study Steering Committee are shown in Appendix B).

Through the work it was determined that long term success in accommodating growth and travel needs in Central Montgomery County is hinged upon implementing a variety of transportation strategies and actions. The improvement plan recommended as a result of the work addresses mobility and access issues through three broad improvement categories:

1) Capital Improvements - germane to directly solving current and/or future problems identified in the immediate study area;
2) Management Actions - programmatic and institutional actions implemented regionally, locally, publicly and/or privately which complement and extend the serviceability of the capital improvements, and;
3) Additional Studies - important matters in the study area that warrant more detailed evaluation.

IMPROVEMENT PLAN

Forty four (44) capital improvement projects are ultimately recommended for the study area. The recommendations generally mirror the Full-Build alternative's complement of improvements as the set most appropriate to serve mobility and growth in the study area. Steering Committee consideration of the Full-Build scenario's set of improvements, in light of the results of independent planning activities (made known after the completion of the technical work), suggested that amendments to the list be considered prior to endorsing it as the recommended plan of this study. As such, qualitative assessments of selected projects were undertaken.

Where appropriate projects were added to the list — complementing the study area's transportation recommendations. These included:

- providing a slip ramp at the PA Turnpike (I-276) and Conshohocken Road (project #68);

- constructing a diamond interchange between Markley Street / the Dannehower Bridge and Lafayette Avenue, extending Lafayette Avenue to Conshohocken Road, and relocating Conshohocken Road to intersect Ridge Pike opposite Fairfield Road (projects #66 and #64, respectively);
- extending the eastern limit of the Ridge Pike traffic signal interconnect project from Belvoir Road to Butler Pike (project #55);
- installing traffic signal interconnect hardware / coordination capability along Germantown Pike between Plymouth and Jolly roads (project #69), and;
- including implementation steps for Phase I of the Cross County Trail bikeway in Plymouth [and Whitemarsh] (project #27), and the Schuylkill Trail through West Norriton and Lower Providence [and Upper Providence] (project #29).

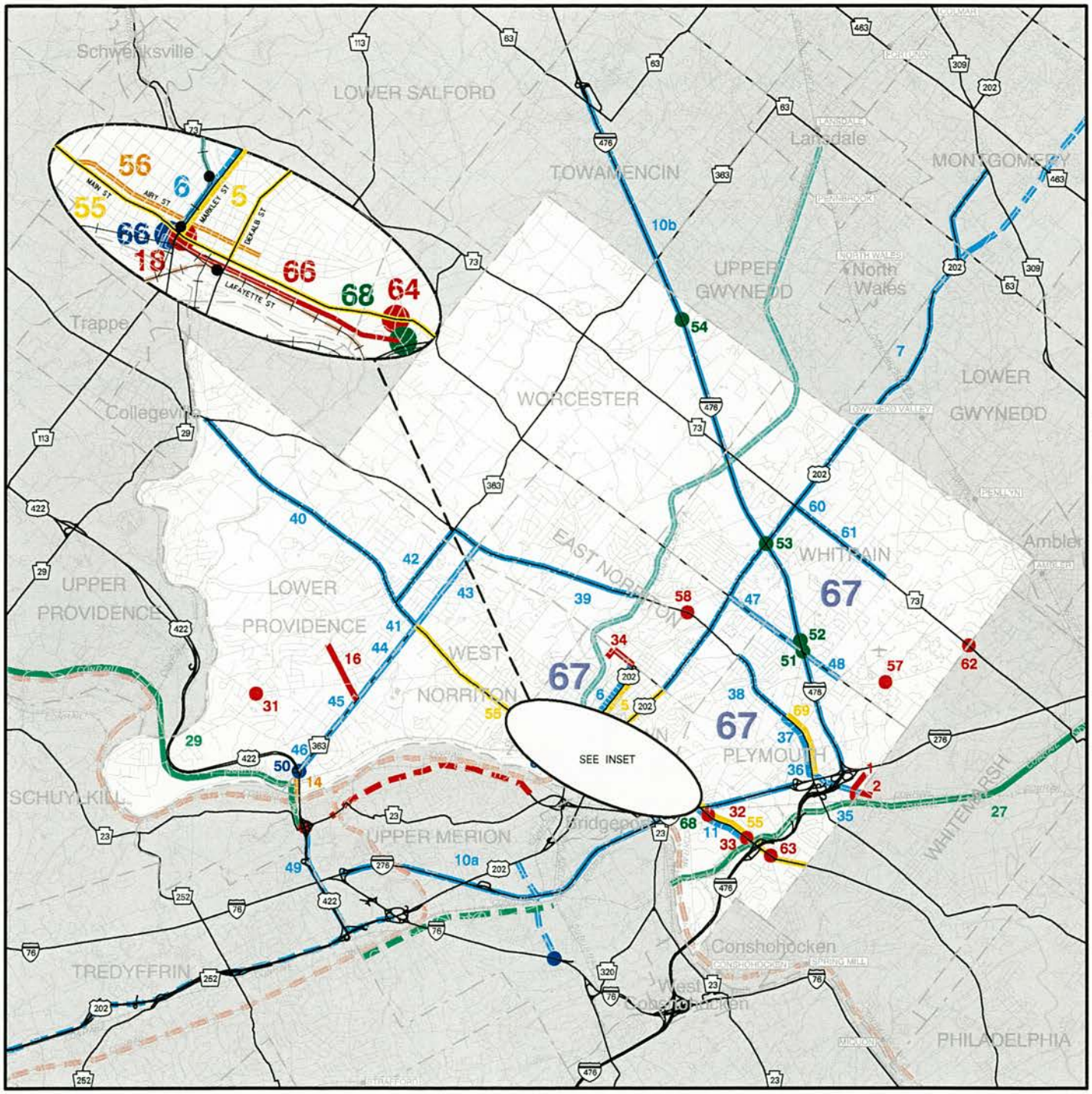
A few of the modeled projects, which were part of the Full-Build component of improvements, were identified as infeasible at the conclusion of the technical work and were either dropped from, or reduced in scope for the recommended plan. These included:

- dropping the roadway and intersection improvements at Ridge and Butler pikes (project #65);
- reducing the scope of the roadway and intersection improvements at the Ridge / Collwell / North Lane / Chemical Road junction to improving turning lanes only (project #63);
- replacing the roadway and intersection improvements at Ridge and Conshohocken / Lucetta (project #64) in favor of roadway and intersection improvements at Ridge and Fairfield / relocated Conshohocken (project #64, cited above).

The area-wide improvement plan is comprised of highway improvements (34 projects), ridesharing and transportation demand management improvements (1 project covering the three easternmost and employment-rich municipalities in the study area - Norristown, Plymouth and Whitpain), intelligent transportation system improvements (7 projects), and two bikeway / pedestrian trail segments in the study area, which are part of a larger, planned connection between Chester County and Bucks County.

Figure 20 illustrates the Central Montgomery County Transportation Study improvement plan recommendations in context with surrounding regional transportation improvement projects.

CENTRAL MONTGOMERY COUNTY TRANSPORTATION STUDY



1 0 1 2 MILES

DELAWARE VALLEY REGIONAL PLANNING COMMISSION
AUGUST 2000

FIGURE 20 :
IMPROVEMENT PLAN

- New Roadway Alignment
- Roadway Widening / Reconstruction
- New Ramps at Interchanges
- PA Turnpike Slip Ramps
- Intersection Improvement
- Traffic Signal Coordination
- Revise Traffic Circulation / Pattern
- New Rail Service
- Bike Path / Trail
- Transportation Study
- 67 Municipal - Wide Mobility Alternatives Program

Study Area Capital Improvement Plan

A capital improvements plan (CIP) was prepared to provide structure and direction in implementing the study area's set of capital and mobility-related recommendations (Table 19). The plan presents recommendations and costs in priority fashion for possible inclusion in the regional Transportation Improvement Program (TIP) and/or for use in seeking alternative sources of financing. The CIP takes project staging into account based upon the estimated availability of funding assuming current TIP project status, and draft TIP (FFY 2001 to 2004) and PennDOT's Twelve Year Program requests into account.

The project scheduling portion of Table 19 employs a time line to represent the beginning and duration of the engineering, right-of-way acquisition and construction phases. Order-of-magnitude project costs are shown, which were based upon project data in the TIP, the Twelve Year Program, municipal studies, and/or were estimated from projects of similar scope. Where appropriate, costs have been updated to 2000 dollars.

In addition to needs, staging and costs, the CIP also identifies funding (programming) status and sponsors. Project sponsors are those entities with primary responsibility for advocating advancement of a project, not necessarily funding it.

Within the CIP, project staging is defined in four time intervals. The short term (0 to 4 years) includes projects which are in or are imminent for construction and/or those phases proposed for inclusion in the draft regional TIP. The near term program of improvements (5 to 8 years) are projects for which staging can coincide with the development of a subsequent version of the TIP and/or the second four year portion of PennDOT's Twelve Year Program. Medium term improvements (9 to 12 years) coincide with the remaining years of PennDOT's Twelve Year Program. Finally, the long term set of improvements (13 to 20 years) round-out the completion and update of the long range plan for the region (DVRPC's Year 2020 Transportation Plan).

In summary, the plan totals approximately $710 million for capital improvements. The short term portion of the plan totals $234.3 million (or 33% of the program total), and virtually all the needs are "funded" (being programmed in the current TIP, or proposed for inclusion in the FFY 2001 to 2004 TIP update). In the 5 to 8 year portion, $266.8 million in improvement funds are needed (or 38% of the total program). Approximately three-quarters of the near term stage total is funded.

Just under one-third of the study area program's financial needs are included in the latter two stages of the plan. On the other hand, unfunded projects represent the majority of the stages' needs. For example, unfunded improvement needs represent 77 percent of the medium term total of $129.6 million. Virtually all of the plan's long term improvements (i.e., 13 to 20 years out), totaling $79.8 million, require programming and/or funding commitments.

Region-wide Improvements

Regional improvements, located beyond the study area boundaries, will also impact travel in Central Montgomery County. By and large, however, these fall under the sponsorship of other agencies or municipalities to initiate / implement, and are therefore not contained in the study area's improvement plan.

Noteworthy projects are described below.

- Schuylkill Valley and Cross County metros - Provisions for rail transit extensions from Norristown: westward to Reading along the US 422 corridor (Schuylkill Valley Metro), and southward along the US 202 corridor to Glenloch, near Exton (Cross County Metro). Service could begin in 2007, and would cost as much as $1.6 billion to initiate, beginning with environmental and engineering studies (unfunded).
- PA 23 Relocation - Construct 4 lane controlled access highway linking US 422, at PA 23 in Upper Merion Township, with US 202, just east of Bridgeport Borough (3.5 miles). Environmental studies are soon to be initiated. Total costs are estimated at $58.3 million (largely unfunded), and the projected facility opening is 2014.
- Chester Valley Trail - construction of a 18.5 mile long paved trail from the Montgomery County Line (near King of Prussia) to Downingtown in Chester County. The path is part of the larger effort to connect Chester and Bucks counties, and is manifested in the Central Montgomery County study area by the Cross County Trail Phase I project. Total project costs to complete the trail are slightly more than $7.7 million. Project implementation is ongoing, with portions of the path being financed as congestion management system commitments associated with the US 202 Section 400 Improvement Project.

TABLE 19
CAPITAL IMPROVEMENT PLAN

proj. ref. # **	Improvement Description	Const. Duration (years)	PROJECT SCHEDULING * '00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15 '16 '17 '18 '19 '20	PROJECT COST ESTIMATES (Order of magnitude project costs account for Eng. , R-O-W, & Constr.. 2000 Dollars in 000's.) 0-4 years funded	0-4 years unfunded	5-8 years funded	5-8 years unfunded	9-12 years funded	9-12 years unfunded	13-20 years funded	13-20 years unfunded	PROJECT SPONSOR(S) ***
STUDY AREA IMPROVEMENTS												
	HIGHWAY IMPROVEMENTS											
	PA Turnpike (I-276 and I-476)											
10 a	Widen I-276 to 6 lanes between Valley Forge and Norristown	4	E E E,R C C C C	$100,000								PTC, PD, P, UM, MC, TMA
10 b	Widen I-476 to 6 lanes between Lansdale and Norristown	5	E E E,R C C C C C			$200,000						PTC, PD, P, Wh, Wo, UG, T, MC, TMA
				$100,000	$0	$200,000	$0	$0	$0	$0	$0	
	Germantown Pike											
36	Widen for addn'l NB thru lane: I-476/I-276 interchange to Plymouth Mtg Mall entrance rd	2	E R C C						$3,900			PTC, PD, P, MC
37	Widen to 6 lanes plus center left turn lane from Plymouth Mtg Mall entrance rd to Walton Rd	2	E R R C C						$6,000			PD, P, MC
38	Widen Germantown Pk for a center left turn lane between Walton and Arch	1	E R C								$3,000	PD, P, MC
39	Widen to 5 lanes between North Wales Rd and Park Av (PA 363)	2	E E E R R C C				$5,000				$54,000	PD, EN, Wo, MC
58	Germantown Pk and Swede Rd intersect'n improvem't	1	E,R C				$1,500					PD, EN, MC
				$0	$0	$0	$6,500	$0	$9,900	$0	$57,000	
	US 202											
6 & 18	US 202 SB (Section 500), Markley St Recon and intersect'n improvem'ts - Main to Johnson	2	E R C C	$7,600								PD, N, EN, MC, TMA
7	US 202 (Section 600), between Johnson Hwy and PA 309, Selective Widening	3	E R C C C	$108,000								PD, MT, LG, Wh, EN, N, MC, TMA
				$115,600	$0	$0	$0	$0	$0	$0	$0	
	US 422											
49	Widen to 6 lanes from PA 363 to US 202	3	E E E E R R C C C	$1,000			$5,000		$80,000			PD, WN, UM, MC, TMA, S
50	Provide EB off and WB on Ramps at PA 363	2	E E E E R R C C						$6,000			PD, WN, MC, TMA
				$1,000	$0	$0	$5,000	$0	$86,000	$0	$0	
	Ridge Pike											
11, 32 & 33	Widen to 5 lanes between Belvoir and Alanwood, and intersect'n improvem'ts at each	2	E E E E R R C C	$900		$300		$9,100				PD, P, MC
40	Widen to 3 lanes between Park and Germantown	2	E R C C								$1,600	PD, LP, MC
41	Widen to 5 lanes between Park Av (PA 363) and Trooper Rd (PA 363)	1	E R C						$3,000			PD, LP, WN, MC
63	Ridge Pk, Chemical Rd, North La and Colwell La intersect'n: turning lane improvem'ts	2	E R C C								$1,500	PD, P, MC
64	Ridge Pk and Fairfield Rd / Conshohocken Rd (relocated) intersect'n improvem't	2	E R C C								$1,000	PD, P, MC
				$900	$0	$300	$0	$9,100	$3,000	$0	$4,100	
	Skippack Pike (PA 73)											
60	Widen for 5 lanes between DeKalb Pk and Wentz Rd	1	E,R C			$350						PD, Wh, MC
61	Widen to 3 lanes and intersect'n improvem'ts between Wentz and Penllyn-Blue Bell	1	E E R C			$1,150						PD, Wh, MC
62	Intersection improvement at Butler Pk, including addn'l EB thru lane	1	E,R C			$500						PD, Wh, W, MC
				$0	$0	$2,000	$0	$0	$0	$0	$0	
	Township Line Road											
47	Add center left turn lane and intersect'n imprvem'ts between US 202 and Union Mtg Rd	1	E E,R C								$2,000	PD, Wh, MC
48	Widen to 5 lanes and intersect'n improvem'ts between Union Meeting and Walton	1	E E,R C								$3,000	PD, Wh, P, MC
				$0	$0	$0	$0	$0	$0	$0	$5,000	
	Trooper Road											
43	Trooper Rd widen to 3 lanes between Ridge and Germantown	1	E E,R C								$4,000	PD, Wo, WN, EN, LP, MC
44	Trooper Rd (PA 363) widen to 3 lanes from Ridge Pk to Egypt Rd	1	E E,R C								$1,000	PD, WN, EN, MC
45 & 46	Provide continuous 5 lane cross section between Egypt and US 422 Interchange	1	E E R C				$5,000					PD, WN, EN, MC
				$0	$0	$0	$5,000	$0	$0	$0	$5,000	
	Park Avenue (PA 363)											
42	Park Av (PA 363) widen to 3 lanes between Ridge and Germantown	1	E R C								$3,000	PD, Wo, LP, MC
	Other Highway Improvements in the Study Area											
1 & 2	Butler Pk By-Pass (1) with Flourtown Rd Reloc (2)	2	E E,R C C			$300	$1,100					PD, P, W, D, MC
34	Stanbridge St Connection	2	E E,R C C								$5,500	N, MC
16	Lower Providence Connector, between Park, Egypt and Trooper	2	E,R C C	$1,000								LP, D
31	Park Av and Egypt Rd intersect'n improvem't	1	E,R C						$1,500			PD, LP, MC
35	Pymouth Rd Widening to 4 lanes from Germantown Pk to Butler Pk By-pass	1	E,R C		$500							PD, P, D, MC
56	Convert Airy St to 2-way flow from Arch to Main	1	E,R C	$500								PD, N, MC
57	"Six Points" Intersect'n, reconstruct into 2 intersect'ns	2	E E R C C			$1,550						PD, Wh, MC
14	Betzwood Bridge: Construct new bridge serving 2-way traffic, and ped / bike trail	2	R C C	$7,825								PD, WN, UM, MC
66	Lafayette Av: diamond interchng w/ Dannehower Br, and ext'n to Conshohocken Rd	2	E E E R R C C	$3,100			$16,900					PD, N, P, MC
				$12,425	$500	$1,850	$18,000	$0	$1,500	$0	$5,500	
				$229,925	**$500**	**$204,150**	**$34,500**	**$9,100**	**$100,400**	**$0**	**$79,600**	**TOTAL HIGHWAY**
	RIDESHARE / TDM IMPROVEMENTS											
67	Area-wide Mobility Alternatives Programs: Norristown, Plymouth and Whitpain****	ongoing	> >	$100		$100		$100		$200		PD, N, P, Wh, MC, TMA, S
				$100	**$0**	**$100**	**$0**	**$100**	**$0**	**$200**	**$0**	**TOTAL RIDESHARE**
	ITS IMPROVEMENTS											
51 & 52	PA Tpk (I-476) Slip Ramps at Township Line Rd: Build SB on, NB off & NB on ramps *****	2	E E,R C C					$9,000				PTC, PD, P, Wh, MC, TMA
53	PA Tpk (I-476) Slip Ramps at US 202: Build NB on and SB off ramps *****	1	E E,R C					$5,000				PTC, PD, Wh, MC, TMA
54	PA Tpk (I-476) Slip Ramps at Schultz Rd: Build SB on and NB off ramps *****	1	E E,R C					$6,000				PTC, PD, Wo, UG, MC, TMA
68	PA Tpk (I-276) Slip Ramps at Conshohocken Rd: Build EB on, WB on and WB off ramps	2	E E E R R C C				$25,000					PTC, PD, P, N, MC, TMA
55	Main St / Ridge Pk traffic signal interconnect and coord from Park Av (PA 363) to Butler Pk	1	E C		$550							PD, LP, WN, MC
69	Germantown Pk: traffic signal interconnect and coord from Plymouth to Jolly rds	1	E C		$100							PD, P, MC
5	Main, Markley and DeKalb sts: traffic signal interconnect and coord thru-out Norristown	1	E C	$1,400								PD, N, MC
				$1,400	**$650**	**$0**	**$25,000**	**$20,000**	**$0**	**$0**	**$0**	**TOTAL ITS**
	BIKEWAY IMPROVEMENTS											
27	Cross County Trail, Ph I: construct trail through Plymouth and Whitemarsh	1	E E R R C	$625			$3,000					PD, P, W, MC
29	Schuylliil Trail: construct multi-purpose trail from Valley Forge Nat'l Hist'l Park to PA 29	1	E E R C	$1,113								PD, WN, LP, UP, MC
				$1,738	**$0**	**$0**	**$3,000**	**$0**	**$0**	**$0**	**$0**	**TOTAL BIKEWAYS**

STUDY AREA SUMMARY :

$233,163	$1,150	$204,250	$62,500	$29,200	$100,400	$200	$79,600	TOTAL FUNDED / UNFUNDED
	$234,313		$266,750		$129,600		$79,800	TOTAL BY STAGE
							$710,463	TOTAL STUDY AREA PROGRAM

notes:

* Estimated time to complete known and identified project phases. Abbreviations: E - engineering & environmental studies; R - right-of-way acquisition & utility relocation.; C - construction

** See Figure 20 for map of Improvement Plan

*** Abbreviations: EN- E Norriton, LP- L Providence, N- Norristown, P- Plymouth, WN- W Norriton, Wh- Whitpain, Wo- Worcester, D- Developer, MC- Montgomery Co, PD- PennDOT, S- SEPTA, TMA- Greatr Valley Forge TMA, PTC- PA Turnpike Comm, UG- U Gwynedd, LG- L Gwynedd, MT- Montgomery Twp, T- Towamencin, UM- U Merion, W- Whitemarsh, UP- U Providence

**** Cost estimates are stage totals, assuming prorated current annual contract amounts carried forward to the year 2020

***** Probable that at most 2 intervening interchanges would be approved between Lansdale and I-276

MANAGEMENT MEASURES

Management strategies account for a broad set of actions available to enhance travel throughout the study area. They range from simple monitoring actions to improving existing institutional arrangements and programs. Alone or in combination they incrementally affect travel within and beyond the study area.

Certain strategies are integral with growth management and/or are capable of implementation through the land development application, review and approval process. These actions generally fall within the purview of government. Others seek to modify commuting behavior, these tend to center on employers. The effectiveness of travel demand management (TDM) measures increases at locations where supportive land use and urban design characteristics also exist. Therefore, cooperation — even partnering — between the public and private sectors will be necessary to garner full effect of the strategies for improving travel in Central Montgomery County.

Interface between the public and private sectors is provided through the transportation management association (TMA) administered DVRPC Mobility Alternatives Program (MAP). MAP's purpose is to assist employers (in the five-county southeastern Pennsylvania portion of the region) in decreasing the number of single occupant vehicles (SOVs) driven to their work site. In Central Montgomery County, the Greater Valley Forge TMA is the key operative in the improvement program.

It is estimated that diligent attention to and successful partnering in aggressively implementing packages of the TDM strategies can reduce work trips by as much as 15 percent. Reductions to peak period travel along key highway segments which serve commuters in the study area by about 10 percent. Corresponding savings in travel time and fuel consumption can also be expected as a result of the measures.

Identification of appropriate roles and responsibilities across the range of management strategies is presented below.

Pennsylvania Department of Transportation (PennDOT)

1) Participate in ongoing meetings and planning dialogue regarding the study area.

2) Prioritize the Central Montgomery County Transportation Study recommendations with respect to other statewide and region-wide programs and projects.

3) Target high priority recommendations for funding within the Twelve Year Program.

Southeastern Pennsylvania Transportation Authority (SEPTA)

1) Participate in ongoing meetings and planning dialogue regarding the study area.

2) Evaluate the Central Montgomery County Transportation Study's recommendations for transit improvement opportunities and management programs, and incorporate high priority projects into capital and operating programs and budgets.

3) Continue to implement its rail station parking expansion program particularly as it impacts the broad study area (included in SEPTA's current program are planned parking expansions at North Wales, Spring Mill, and Conshohocken stations and the Norristown Transportation Center).

4) Install modern bicycle parking facilities (e.g., lockers, modern design racks) at all rail stations and equip all buses with bike racks.

5) Continue to identify new markets and serve study area travel needs which support and/or result from operating the Schuylkill Valley and Cross County metros.

6) Conduct / support additional planning studies (cited in the next section of this chapter) through the annual planning work program.

Pennsylvania Turnpike Commission

1) Participate in ongoing meetings and planning dialogue regarding the study area.

2) Review the recommendations of this study, and where possible expedite those warranting immediate action (e.g., perform feasibility, environmental and engineering studies examining the widening of the Turnpike between the Norristown and Lansdale interchanges as were performed for the segment between the Norristown and Valley Forge interchanges).

3) Consider expanding its "smart highways" programs to the study area (including: slip ramp construction, electronic toll collection, highway advisory radio and variable message signs) as a means of reducing congestion at existing toll plazas, and optimizing traffic distribution throughout the study area.

4) Complement slip ramps with park-and-ride lots where possible.

Delaware Valley Regional Planning Commission (DVRPC)

1) Monitor travel conditions and assess the study area's efficiency as requested in comparison to the 16 intersection benchmarks contained within this study.

Montgomery County

1) Work with neighboring counties, PennDOT and the Pennsylvania Turnpike Commission to advocate and implement a region-wide park-and-ride lot program. Major thoroughfares cited in this report which should be concentrated on are: US 422, US 202, the PA Turnpike, and PA 363.

2) Work with SEPTA and PennDOT to implement planned intermodal parking expansions within the broad study area, including: North Wales, Spring Mill and Conshohocken stations, and the Norristown Transportation Center.

3) Conduct / support additional planning studies (cited in the next section of this report) through the annual planning work program.

4) Advocate for advancement of the improvement projects included on the Capital Improvement Plan in the region's Transportation Improvement Program (TIP), PennDOT's Twelve Year Improvement Program, and; long range transportation plan (DVRPC's Year 2020 Transportation Plan) and plan update (DVRPC's Year 2025 Transportation Plan).

5) Continue to work with the study area municipalities to implement the recommendations of this study.

6) Reconvene the Study Steering Committee, as appropriate, to review and revise the Capital Improvements Plan to reflect new conditions and priorities.

Greater Valley Forge TMA (GVFTMA)

1) Continue area-wide ridesharing activities and utilize Mobility Alternatives Program (MAP) resources to reach employers and commuters throughout its service area — to reduce journey-to-work travel within and beyond the study area.

   For example, Upper Merion Township, located just south of the study area, is a major draw of work trips from the study area's southern municipalities. The GVFTMA's service area envelops both sets of municipalities. As such its programs have the potential to exert influence at both ends of a work trip. The "Share-A-Lot" program (described later in this section, under Employer / Developer - Ridesharing actions) is well suited to address this opportunity.

2) Coordinate actions with neighboring TMAs. Towamencin's residents are a major component of the work trips destined to Whitpain. Towamencin Township is a member of the "Partnership TMA".

3) Implement comprehensive rideshare and TDM programs within the study area's eastern municipalities (e.g., Norristown, Plymouth and Whitpain) in the short term. Monitor long term need and opportunity for providing the same level of services in Lower Providence Township, if necessary.

Study Area Municipalities

1) Continue to meet and discuss issues of common concern, including those addressed in this effort. Coordinate and communicate with neighboring jurisdictions and Montgomery County Planning Commission staff to explore flexible approaches to funding and implementation.

2) Participate actively in the TMAs, ensuring that your needs are known.

3) Make growth management planning (i) and implementation (ii) activities a basic part of the study area's development.

i Growth management planning

a) Promote higher density, mixed-use, pedestrian-friendly development through zoning, and subdivision and land development regulations for large (re)development tracts. Such development patterns can reduce site generated trips by as much as 25 percent, and foster transit ridership where it already exists or may be planned to exist. Worcester Township provides the greatest opportunity for exercising this strategy within the study area, because of its largely undeveloped status.

b) Since work trips are widely scattered in the study area, extensive provision of park-and-ride facilities would be beneficial. Integrate park and ride lots into the development within the Plymouth Meeting, Norristown, Blue Bell, Penn Square and the Valley Forge Corporate Center to lend more support to transit services in the corridor, and provide more opportunities for the Share-A-Lot program.

Certain uses are amenable to shared use of parking facilities for commuting purposes. Churches, synagogues, parks and movie theaters are land uses which don't usually generate peak travel or parking demands during weekday business hours. Dedication for the outright use of these lots for park-and-ride purposes during the development application process should be considered.

Parking lots supporting other uses, even office and retail uses, can avail themselves to shared-use (an example is the bus station at the Plymouth Meeting Mall). However, the determination is best made on a case-by-case

basis after full occupancy of the buildings. Negotiating with developers prior to development approval is suggested.

c) Require pedestrian and bicycle design elements within land development and subdivision ordinances. Bikeways implementation by Montgomery and Chester counties (Cross County Trail, Chester Valley Trail Extension, and Schuylkill Trail) are examples of actions already in progress to foster non-motorized travel within and beyond the study area. These trails are interconnected, and complement the existing Schuylkill River Trail for long distance bike trips.

Where appropriate municipalities within the Central Montgomery County sub-region should advocate the completion of the trail network, and plan and implement local systems within and between their jurisdictions to integrate local generators (transportation hubs, development centers and major developments) with the broader network. Guidance in this effort is available from work conducted by the Montgomery County Planning Commission and is summarized in their report entitled: *Bicycling Road Map - A Bike Mobility Plan for Montgomery County, Pennsylvania* (MCPC, 1998).

The pedestrian / bike path proposed, by PennDOT, as part of the Betzwood Bridge replacement will facilitate non-motorized interconnections between the study area, Valley Forge National Historical Park, the existing Schuylkill River Trail and its proposed westward extension to PA 29.

d) Consider transit friendly design features within development review procedures where transit service exists or has the potential to. Items germane to vehicle access (lane width, turning radii, pull-out lanes) and transit user priority (bus stop signs, bus shelters, sidewalks) should be addressed.

ii Growth management implementation

a) Require auxiliary turning lanes as part of development access designs and at signalized intersections along major thoroughfares to maximize the capacity of the through travel lanes.

b) Implement trip reduction ordinances requiring that alternate modes and/or flexible work arrangements be employed to control the amount of trips generated by a development during the peak commuting hours.

c) Limit parking supply provided, by adopting maximum parking space requirements in municipal zoning ordinances, to discourage single occupant vehicle usage.

d) Adopt a Highway Corridor Zoning Overlay District (i.e., access management) — to reduce the number, or control the design and location of driveway access points and signalized intersections — and as such, prolong the serviceability of the highway facility. Improved access management practices yield savings in access related accidents and travel delay. Median barriers have been shown to reduce each by 30 percent.

   Access management strategies are most applicable along the study area's less developed two lane highways (i.e., PA 363 through Worcester), and should be considered in the design of facilities where widening is envisioned (e.g., Germantown Pike through East Norriton and Worcester).

e) Incorporate bicycle friendly design elements (e.g., shoulders or wide curb lanes) into the design of roads and highways where widening is proposed.

f) Install modern bicycle parking facilities in commercial districts and major destinations within development centers.

Employer / Developer

1) Participate actively in the TMA. TMA administered Mobility Alternatives Program (MAP) and new, improved Share-A-Ride services are effective measures in combating traffic congestion and increasing productivity.

   Carpooling at Merck & Co. facilities involves 1,000 of its 5,700 total work force in Montgomery County (18% participation). Ten percent of Boeing's Ridley Township facility (6,100 total employees) use alternative commute options. Similarly, the UPS facility at the Philadelphia International Airport sees eight percent of its work force commuting via alternate modes.

2) Decrease the number of single occupant vehicles (SOVs) / increase vehicle occupancies by advancing transit planning and support (i), promoting non-motorized commute options (ii), supporting ridesharing activities (iii), and encouraging alternative commute options (iv) where transit service is not provided.

i Transit planning

a) Orient building entrances toward the street with transit service, incorporate shallow setbacks, and place parking "behind" the building to facilitate transit usage.

b) Work with transit providers to establish new services, route deviations and/or optimized services. UPS has done this to facilitate commuting to its facility near the Philadelphia International Airport.

c) Purchase TransitCheks to promote transit use. SmithKline Beecham provides TransitCheks as a benefit to its employees using transit, in lieu of free / subsidized parking.

d) Provide transit shelters, street lighting, sidewalks and street furniture to encourage transit ridership.

ii Promoting alternate modes

a) Provide access treatments for pedestrian and bikes and install storage facilities for bicycles. Merck & Co. sponsors a "Bike to Work" day each Spring, and an in-house cycling club motivates a number of employees to bike to work on a daily basis.

b) Install bicycle storage facilities.

iii Ridesharing actions

a) Provide shuttles to transit stations. Vanguard provides an intercorporate shuttle service in the environs of its headquarters in Malvern.

b) Provide preferential parking for high occupancy vehicles (HOVs). Vanguard also provides preferred parking spaces to its ridesharing employees.

c) Establish in-house or third party vanpool programs. Wampler Foods, Inc. operates a subscription bus service between its site in Franconia and Center City Philadelphia.

d) Provide guaranteed ride home service. Merck & Co. practices this strategy so that in emergency situations employees are not stranded at the work place if they do not have a personal vehicle on site.

e) Participate in the "Share-A-Lot" program. Join with other regional employers to allow employees to stage carpooling activities and park at a remote partnering corporation's parking lot. By agreement, a participating company returns the favor to the employees of the outlying partnering corporation(s). Some participating Share-A-Lot corporations in the region are — Chester County - Vanguard in Malvern; Montgomery County - Aetna / U.S. Healthcare and the PMA Group in Blue Bell, Elf Atochem in King of Prussia, Merck and Co. in West Point; Delaware County - Boeing-Philadelphia in Ridley Township; Brinton Manor in Painters Crossing.

f) Become an "Adopt-A-Lot" sponsor. Support ridesharing by assuming maintenance responsibilities for public park-and-ride facilities. SmithKline Beecham Pharmaceuticals supports the park-and-ride concept and provides landscaping services at the Matsonford Road Park-and-Ride Lot in West Conshohocken Borough.

iv Alternate commute options

a) Implement telecommuting, alternate work hours and/or flexible work schedules to reduce peak period trip making. Bell Atlantic Corporation, Cigna Corporation, First Union Bank and Thomas Jefferson University support telecommute options for their Center City Philadelphia employees.

FURTHER STUDY REQUIREMENTS

Feasibility and investment studies should be continued as a means of determining the viability of reactivating passenger rail service between Quakertown and Center City Philadelphia. Technical matters which need to be addressed and communicated include ridership forecasts, and determinations of operating and capital costs for alternate modes and rail alignments.

The "Stony Creek Branch" railroad right-of-way, which traverses the study area, is a potential alignment that should be evaluated in that service plan (in addition to an alignment between Lansdale and Center City via the "Reading trunk line", and the No-Build alternative). □

7 IMPLEMENTATION

The recommendations of the study represent a unified implementation strategy to serve sub-regional needs. Plan elements consist of a Capital Improvement Plan (CIP), management actions and continuing an ongoing study. Implementation must take place on several fronts.

Technical studies may be undertaken through DVRPC's annual planning work program and/or the funds provided through the Transportation Improvement Program (TIP). Management actions encompass growth management and travel demand management strategies. Typically these are implemented through requirements specified in municipal zoning and subdivision ordinances, and through partnerships between the private and public sectors as exemplified in the Mobility Alternatives Program. Capital financing for implementing improvements can be secured through local tax revenues, bonding, special assessment districts and/or impact fees.

Very often local revenues are applied as a match to secure a larger share of project costs, taking advantage of state and federal-aid highway and transit funding programs in the TIP. Plymouth Township has been very successful in this regard, securing the required local share through its traffic impact fee ordinance. Whitpain has very recently enacted its own traffic impact fee ordinance, and Lower Providence and East Norriton are currently pursuing the requirements of Pennsylvania's Act 209 (i.e., the enabling legislation for impact fees).

Some implementation guidelines, offered by PennDOT's District Planning and Programming Engineer, are particularly relevant to implementing the recommended CIP (regardless of the funding process pursued) and warrant emphasis.

1) Cost efficiencies suggest that — where sensible and possible — individual smaller projects should be consolidated.
2) Individual phases of the project's development should be undertaken in entirety to expedite the project. (For example, environmental and engineering studies were expedited for US 202 Section 400, and more recently for US 202 Section 300, by being funded outside of the normal PennDOT / federal-aid funding process. Once cleared environmentally, the project advanced to construction in short order.) Being no different than any fiscally responsible owner, PennDOT would rather fund projects which are "ready to move", and not tie up its 12-Year Program where funding alternatives may be pursued.
3) Project advancement requires participation and "buy-in" of all parties (developers / employers included). Long term benefits and cost

efficiencies [i.e., the Plan] must be emphasized versus individual, short term wants / needs.

4) The Capital Improvement Plan must reflect the Steering Committee's priorities. The fact is, "realities" will change over the course of time it will take to implement the Plan. This suggests that the plan be flexible, and subject to review and revision on an ongoing and regular basis to ensure that implementation needs are reflected accurately.

FEDERAL-AID FUNDING GUIDELINES

Because of its complexity and importance, special discussion is made of the federal-aid funding / TIP process. Many of the implementation ingredients, as discussed above, are also found in the TIP process.

The TIP is the culmination of the regional transportation planning process. As a document it includes projects that are consistent with national, state, regional, county and municipal policies, plans and programs. The most relevant federal law which guides the current TIP is the Transportation Equity Act for the 21st Century (TEA-21) of 1998. It is the federal authorization bill for highways and transit.

The recommendations of the Central Montgomery County Transportation Study closely reflect the planning goals of TEA-21, DVRPC, Montgomery County and the seven study area municipalities. Furthermore, the study's recommendations (including its Capital Improvement Plan) contain five common ingredients with the objectives of the TIP, including:

1) supporting economic activity;
2) improving the mobility of people and goods;
3) supporting land use plans and goals;
4) preserving and modernizing key elements of the existing system, and;
5) mitigating congestion.

Of the set of highways identified in the CIP, most are functionally classified at levels which provide for the use of federal highway funds. For example, the Pennsylvania Turnpike[12], US 202, US 422, and Skippack Pike (PA 73) are National Highway System (NHS) roadways. NHS routes aim to enhance personal mobility, serve commerce, support economic growth, and increase the Nation's competitiveness. Projects on the NHS network are eligible for funding under a

[12] As a matter of practice the Pennsylvania Turnpike Commission does not typically apply for federal funding assistance to implement its improvements. Instead, it develops its projects with funds raised through revenue bonds.

special category within the federal-aid program — also called the NHS program. Other funding programs are also available to the region through the Federal Highway Administration and Federal Transit Administration for implementing the recommended (or other) improvements.

In the final analysis, the biennial development of the TIP is a highly competitive and complex process. Project inclusion is a necessary initial step toward implementation where federal-aid funding is sought, and will depend upon funding availability, priority setting by local governments and regional bodies, and selection by DVRPC. Ultimately, project construction will require multi-jurisdictional support from both the public and private sectors.

More information about the TIP can be obtained by visiting DVRPC's web site (www.dvrpc.org/transportation/tip.htm). Guidance in the matters of securing federal-aid funding may be obtained by the contacting the Assistant Executive Director for Transportation Planning at DVRPC, the Associate Director for Transportation Planning at the Montgomery County Planning Commission, and the PennDOT District 6-0 Planning and Programming Engineer.

CONCLUSIONS: IMPLEMENTATION

Attainment of the Plan is already being addressed through the independent initiatives of the study area municipalities. Public and private funding sources are being utilized to advance project engineering, right-of-way acquisition and construction. Continued vigilance will be necessary to procure the unfunded capital program amounts. Ongoing communication and collaboration between the Steering Committee members in implementing and updating the Plan will strengthen its momentum and enhance its meaningfulness to the funding agencies. □

APPENDICES

APPENDIX A

TABLE A1
CURRENT AND SIMULATED AVERAGE DAILY TRAFFIC VOLUMES
CURRENT vs. YEAR 2020 LIMITED-BUILD AND FULL-BUILD SCENARIO

				Simulated AADTs		Differences: Current vs. 2020 Limited-Build		Differences: Current vs. 2020 Full-Build	
Highway	Limits	Current AADTs	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
Bustard Rd	At bend, between PA 63 and Valley Forge Rd	8,454	1996	12,300	12,400	3,846	45	3,946	47
Morris Road	Shultz Rd to West Point Pk	13,742	1995	19,300	15,500	5,558	40	1,758	13
	West of North Wales	11,800	1992	17,700	14,500	5,900	50	2,700	23
	East of DeKalb Pk	9,960	1995	16,700	13,800	6,740	68	3,840	39
	East of Plymouth Rd	10,853	1996	17,600	14,500	6,747	62	3,647	34
Skippack Pk	West of Stump Hall Rd	15,929	1995	20,900	20,500	4,971	31	4,571	29
	East of Valley Forge Rd	12,500	1997	20,800	17,500	8,300	66	5,000	40
	West of North Wales	14,784	1997	23,500	22,600	8,716	59	7,816	53
	West of DeKalb Pk	17,699	1995	22,800	23,600	5,101	29	5,901	33
	East of DeKalb Pk	18,128	1995	23,700	25,200	5,572	31	7,072	39
	Village Circle to Penllyn Blue-Bell Pk	24,209	1995	25,800	25,600	1,591	7	1,391	6
Stump Hall Rd	Green Hill Rd to Cedar Rd	2,708	1997	4,900	4,700	2,192	81	1,992	74
	West of Valley Forge Rd	2,658	1995	5,200	5,200	2,542	96	2,542	96
Township Line Rd	West of Whitehall Rd	6,535	1997	8,600	8,000	2,065	32	1,465	22
	Between North Wales and Swede St	9,924	1996	13,500	13,400	3,576	36	3,476	35
	DeKalb Pk to Arch St	14,438	1995	17,400	18,100	2,962	21	3,662	25
	Arch St to Union Meeting / Jolly Rd	14,398	1996	18,000	20,000	3,602	25	5,602	39

TABLE A1
CURRENT AND SIMULATED AVERAGE DAILY TRAFFIC VOLUMES
CURRENT vs. YEAR 2020 LIMITED-BUILD AND FULL-BUILD SCENARIO

				Simulated AADTs		Differences: Current vs. 2020 Limited-Build		Differences: Current vs. 2020 Full-Build	
Highway	Limits	Current AADTs	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
Germantown Pk	East of Ridge Pk	11,860	1996	14,800	15,300	2,940	25	3,440	29
	West of Valley Forge Rd / Park Ave	15,089	1995	21,800	21,900	6,711	44	6,811	45
	West of Whitehall Rd	18,260	1997	34,900	39,400	16,640	91	21,140	116
	East of Whitehall Rd	22,147	1995	36,500	39,700	14,353	65	17,553	79
	Between North Wales and DeKalb Pk	23,008	1995	38,900	39,400	15,892	69	16,392	71
	East of Union Meeting / Jolly Rd	30,886	1995	39,100	38,400	8,214	27	7,514	24
	Walton Rd to Hickory Rd	36,476	1993	44,800	49,500	8,324	23	13,024	36
	I-476 to Chemical Rd	26,051	1996	44,700	45,600	18,649	72	19,549	75
Ridge Pk	Cross Keys Rd to Germantown Pk	13,031	1996	17,700	17,700	4,669	36	4,669	36
	Sunnyside Ave to Park Av	17,748	1996	21,200	24,000	3,452	19	6,252	35
	Park Ave to Trooper Rd	22,100	1999	36,200	40,400	14,100	64	18,300	83
	West of Egypt Rd	25,546	1997	29,400	29,100	3,854	15	3,554	14
	West of Airy St	26,600	1992	30,700	32,900	4,100	15	6,300	24
	West of Conshohocken St	20,597	1999	22,500	23,500	1,903	9	2,903	14
	Belvoir Dr to Alan Wood Rd	32,949	1992	48,200	48,800	15,251	46	15,851	48
US 422	Trooper Rd to PA 23	85,392	1997	103,000	121,400	17,608	21	36,008	42
I-276	Norristown to Valley Forge	51,100	1996	81,000	82,000	29,900	59	30,900	60
	I-476 to Fort Washington	97,800	1996	118,200	119,400	20,400	21	21,600	22

TABLE A1
CURRENT AND SIMULATED AVERAGE DAILY TRAFFIC VOLUMES
CURRENT vs. YEAR 2020 LIMITED-BUILD AND FULL-BUILD SCENARIO

				Simulated AADTs		Differences: Current vs. 2020 Limited-Build		Differences: Current vs. 2020 Full-Build	
Highway	Limits	Current AADTs	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
Egypt Rd	Perkiomen Creek to Park Ave	17,444	1995	17,300	17,200	(144)	(1)	(244)	(1)
	Crawford Rd to Buckwalter Rd	15,022	1995	16,800	17,700	1,778	12	2,678	18
	School Ln to Main St	15,824	1996	20,900	22,900	5,076	32	7,076	45
Grange Ave	Germantown Pk to Stump Hall Rd	1,432	1999	1,500	1,500	68	5	68	5
Park Ave	South of Ridge Pk / Main St	10,945	1995	13,900	14,800	2,955	27	3,855	35
	Between Ridge Pk and Germantown Pk	13,325	1996	20,000	22,400	6,675	50	9,075	68
Valley Forge Rd	South of Township Line Rd	19,636	1996	23,900	23,900	4,264	22	4,264	22
	North of Skippack Pk	16,314	1996	19,400	20,700	3,086	19	4,386	27
	North of Morris Rd	14,076	1996	17,000	17,100	2,924	21	3,024	21
Trooper Rd	422 to Audubon Rd	30,800	1990	40,400	48,000	9,600	31	17,200	56
	Between Connector and Egypt Rd	27,400	1990	25,400	33,100	(2,000)	(7)	5,700	21
	Between Egypt Rd and Main St	16,944	1996	22,100	27,900	5,156	30	10,956	65
	Between Main St and Germantown Pk	18,212	1995	21,300	24,500	3,088	17	6,288	35
Burnside Pk	South of Germantown Pk	5,021	1995	5,800	5,300	779	16	279	6
Potshop Rd	Between Germantown Pk and Township Line Rd	5,000	1998	6,400	5,600	1,400	28	600	12
Whitehall Rd	South of Sterigere St	13,488	1995	15,200	14,600	1,712	13	1,112	8
	North of Sterigere St	12,180	1997	15,500	14,400	3,320	27	2,220	18

TABLE A1
CURRENT AND SIMULATED AVERAGE DAILY TRAFFIC VOLUMES
CURRENT vs. YEAR 2020 LIMITED-BUILD AND FULL-BUILD SCENARIO

				Simulated AADTs		Differences: Current vs. 2020 Limited-Build		Differences: Current vs. 2020 Full-Build	
Highway	Limits	Current AADTs	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
Whitehall Rd	South of Skippack Pk	4,821	1997	6,300	6,100	1,479	31	1,279	27
Bethel Rd	North of Skippack Pk	5,692	1996	7,800	8,700	2,108	37	3,008	53
North Wales Rd	Between Germantown Pk and Township Line Rd	4,915	1995	8,900	8,900	3,985	81	3,985	81
	South of Skippack Pk	7,600	1992	11,900	11,400	4,300	57	3,800	50
	Skippack Pk to Morris Rd	4,929	1996	11,400	11,300	6,471	131	6,371	129
Markley St	Schuykill River to Main St.	26,291	1995	40,900	38,900	14,609	56	12,609	48
	Fornance St to Johnson Hwy	21,800	1992	27,600	26,600	5,800	27	4,800	22
Swede St	Johnson Hwy to Germantown Pk	14,893	1996	19,100	18,800	4,207	28	3,907	26
	Germantown Pk to Township Line Rd	14,575	1997	16,400	16,800	1,825	13	2,225	15
DeKalb St	Front St to Washington St	19,026	1995	27,100	28,400	8,074	42	9,374	49
	Airy St to Oak St	10,880	1995	16,500	16,100	5,620	52	5,220	48
DeKalb Pk	Colonial Dr to Germantown Pk	18,833	1997	40,200	40,300	21,367	113	21,467	114
	Swede St to Yost Rd	21,006	1997	48,200	50,400	27,194	129	29,394	140
	Cherry Rd to Skippack Pk	23,113	1995	47,500	49,800	24,387	106	26,687	115
	North of Skippack Pk	23,002	1997	48,600	49,000	25,598	111	25,998	113
	North of Morris Rd	19,203	1997	42,700	43,100	23,497	122	23,897	124
I-476	I-276 to Ridge Pk	93,900	1995	107,100	107,800	13,200	14	13,900	15

TABLE A1
CURRENT AND SIMULATED AVERAGE DAILY TRAFFIC VOLUMES
CURRENT vs. YEAR 2020 LIMITED-BUILD AND FULL-BUILD SCENARIO

				Simulated AADTs		Differences: Current vs. 2020 Limited-Build		Differences: Current vs. 2020 Full-Build	
Highway	Limits	Current AADTs	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
I-476	Chemical Rd to Germantown Pk	75,700	1995	89,900	90,600	14,200	19	14,900	20
	I-276 to Lansdale Int.	44,600	1995	98,600	varies	54,000	121		
	Schultz Rd to Lansdale Int	44,600	1995	98,600	92,800	54,000	121	48,200	108
Butler Pk	Germantown Pk to Plymouth Rd	9,262	1995	12,600	10,000	3,338	36	738	8
	Township Line Rd to Stenton Ave	9,189	1997	11,200	10,300	2,011	22	1,111	12
	Skippack Pk to Farm Dr	14,927	1995	18,200	18,200	3,273	22	3,273	22
	Whitpain Dr to Skippack Pk	12,564	1996	17,600	18,500	5,036	40	5,936	47
	Morris Rd to Maple Ave	13,588	1996	22,200	23,000	8,612	63	9,412	69
Airy St	Stanbridge St to Markley St	6,300	1992	8,000	10,600	1,700	27	4,300	68
Audubon Rd	Pawling Rd to Trooper Rd	7,090	1995	12,500	14,700	5,410	76	7,610	107
Belvoir Rd	Gallagher Rd to Johnson Rd	12,019	1997	15,300	14,700	3,281	27	2,681	22
Conshohocken Rd	Ridge Pk to Diamond Ave	4,604	1996	5,700	5,100	1,096	24	496	11
Gallagher Rd	Chemical Rd to Alan Wood Extension	1,956	1997	2,900	2,600	944	48	644	33
Johnson Hwy	East of Markley St	23,000	1992	30,700	30,100	7,700	33	7,100	31
Jolly Rd	Wentz Rd to Arch Rd	11,178	1995	14,400	14,900	3,222	29	3,722	33
Old Arch Rd	South of Germantown Pk	12,873	1996	14,300	13,900	1,427	11	1,027	8
Penllyn Blue-Bell Pk	Skippack Pk to Stenton Ave	13,420	1997	16,900	15,800	3,480	26	2,380	18

TABLE A1
CURRENT AND SIMULATED AVERAGE DAILY TRAFFIC VOLUMES
CURRENT vs. YEAR 2020 LIMITED-BUILD AND FULL-BUILD SCENARIO

				Simulated AADTs		Differences: Current vs. 2020 Limited-Build		Differences: Current vs. 2020 Full-Build	
Highway	Limits	Current AADTs	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
Plymouth Rd	West of Germantown Pk	9,922	1997	11,700	16,500	1,778	18	6,578	66
Sterigere St	Forrest Ave to Whitehall Rd	11,972	1998	14,300	13,600	2,328	19	1,628	14
Union Meeting Rd	North of Jolly Rd to Hoover Rd	13,339	1995	17,700	17,300	4,361	33	3,961	30
Woodlyn Ave	Valley Forge Rd to Trooper Rd	3,499	1997	4,000	4,000	501	14	501	14
Yost Rd	DeKalb Pk to North Wales Rd	5,238	1995	10,700	10,800	5,462	104	5,562	106
Proposed Lower Providence Connector	Park Ave to Egypt Rd			5,500	5,600				
	Egypt Rd to Trooper Rd			8,000	8,500				
Alan Wood Road	South of Ridge Pk	2,707	1998	5,200	5,100	2,493	92	2,393	88
Alan Wood Road Extension	Ridge Pk to Gallagher Rd	1,853	1995	4,500	4,400	2,647	143	2,547	137
Chemical Rd	I-476 to Germantown Pk	15,212	1998	33,700	32,200	18,488	122	16,988	112

TABLE A2
CURRENT AND SIMULATED AVERAGE DAILY TRANSIT BOARDINGS
CURRENT vs. YEAR 2020 LIMITED-BUILD and FULL-BUILD SCENARIOS

				SIMULATED BOARDINGS		Diff.: Current vs. Limited-Build		Diff.: Current vs. Full Build	
SEPTA Route	Limits	Current Boardings	Year	2020 Ltd-Build	2020 Full-Build	Abs.	%	Abs.	%
R-5 Line	Includes Ambler, Gwynedd Valley, and Penllyn Stations	1,079	1997	1,160	1,200	81	8	121	11
R-6 Line	Includes Elm Street, Main Street and Norristown Transportation Center	962	1997	930		(32)	(3)	(962)	
Schuykill Valley Metro	Norristown Transportation Center				2,469*			2,469	
Cross County Metro (Norristown and West)	Norristown Transportation Center				768*			768	
100 High Speed Line	Norristown Transportation Center	710	1997	700	1,060	(10)	(1)	350	49
"L" Bus	Plymouth	424	1995	500	540	76	18	116	27
"27" Bus	Plymouth	203	1995	240	230	37	18	27	13
"93" Bus	L. Providence, Norristown, W. Norriton	345	1995	350	210	5	1	(135)	(39)
"94" Bus	Whitpain	28	1995	30	50	2	7	22	79
"95" Bus	Plymouth	77	1995	100	100	23	30	23	30
"96" Bus	East Norriton, Norristown, and W. Norriton	650	1995	680	700	30	5	50	8
"97" Bus	East Norrtion, Norristown, Plymouth, and W. Norriton	589	1995	610	710	21	4	121	21
"98" Bus	Norristown, Plymouth, W. Norriton, nad Whitpain	971	1994	830	1,080	(141)	(15)	109	11
"99" Bus	Norristown	485	1991	490	350	5	1	(135)	(28)
"131" Bus	L. Providence, Norristown, and W. Norriton	NA	NA	180	180	180		180	
TOTAL		**6,523**		**6,800**	**9,647**	**277**	**4**	**3,124**	**48**

*Source: Year 2020 Boardings per SEPTA's MIS for the Schuykill Valley Metro and Feasibility Study of the Cross County Metro.

APPENDIX B

STUDY STEERING COMMITTEE MEMBERSHIP

Central Montgomery County Transportation Study
Steering Committee Members

HELMUTH BAERWALD, Manager, East Norriton Township

DONALD DELAMATER, Assistant Manager, East Norriton Township

BRUCE SHOUPE, Zoning Officer, East Norriton Township

PETER SITKOWSKI, Township Engineer, East Norriton Township

DAVID SHAFFER, Manager, Lower Providence Township

JAYNE MUSONYE, Director of Planning and Municipal Development, Norristown Borough

JOAN MOWER, Manager, Plymouth Township

TIMOTHY BOYD, Director of Public Works, Plymouth Township

JOSEPH HEIN, Manager, West Norriton Township

PHYLLIS LIEBERMAN, Manager, Whitpain Township

ROMAN PRONCZAK, Township Engineer, Whitpain Township

CHARLES SARDO, Manager, Worcester Township

ARTHUR LOEBEN, DVRPC Board Representative, Montgomery County

LEO D. BAGLEY, Associate Director, Montgomery County Planning Commission

GREG BROWN, District Planning & Programming Engineer, PennDOT District 6-0

JIM DELLIPRISCOLI, Operations Planner, Suburban Route and Service Planning, SEPTA

OWEN O'NEIL, Operations Planner, Suburban Route and Service Planning, SEPTA

WALT GREEN, Senior Civil Engineer, PA Turnpike Commission

PETER QUINN, Executive Director, Greater Valley Forge TMA □

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Publication Abstract

Title: Central Montgomery County Transportation Study	Date Published: August 2000
	Publication No. 00017

Geographic Area Covered: East Norriton, Lower Providence, Plymouth, West Norriton, Whitpain and Worcester townships, and the Borough of Norristown in Central Montgomery County, Pennsylvania

Key Words: development centers, journey-to-work, mobility alternatives, regional travel demand forecasting, capital improvement plan, transportation demand management, growth management, congestion management systems, transportation improvement program

ABSTRACT

This report documents a comprehensive land use and transportation evaluation for seven municipalities located in Central Montgomery County, Pennsylvania. The work augments planning activities conducted independently by the study area municipalities through adoption of a multi-modal area-wide perspective, application of regional planning initiatives (PA Congestion Management Systems, Mobility Alternatives Programs, etc.) and use of regional evaluation procedures (the regional travel demand forecasting model).

A total of 44 highway, travel demand management, intelligent transportation systems and bikeways improvements are enumerated to directly solve current and future mobility problems identified in the study area. These are enveloped into a recommended Capital Improvement Plan for the study area, totaling just over $710 million. The capital recommendations are complemented with a comprehensive list of growth management and travel demand management actions which are also recommended to maintain mobility in the study area.

For More Information Contact:

Delaware Valley Regional Planning Commission
Transportation Planning Division
The Bourse Building, 8th Floor
111 South Independence Mall East
Philadelphia, PA 19106-2515
Phone: 215.592.1800
Fax: 215.592.9125
website: http://www.dvrpc.org/

Staff contact: Jerry Coyne
Direct phone: 215.238.2850
E-mail: jcoyne@dvrpc.org