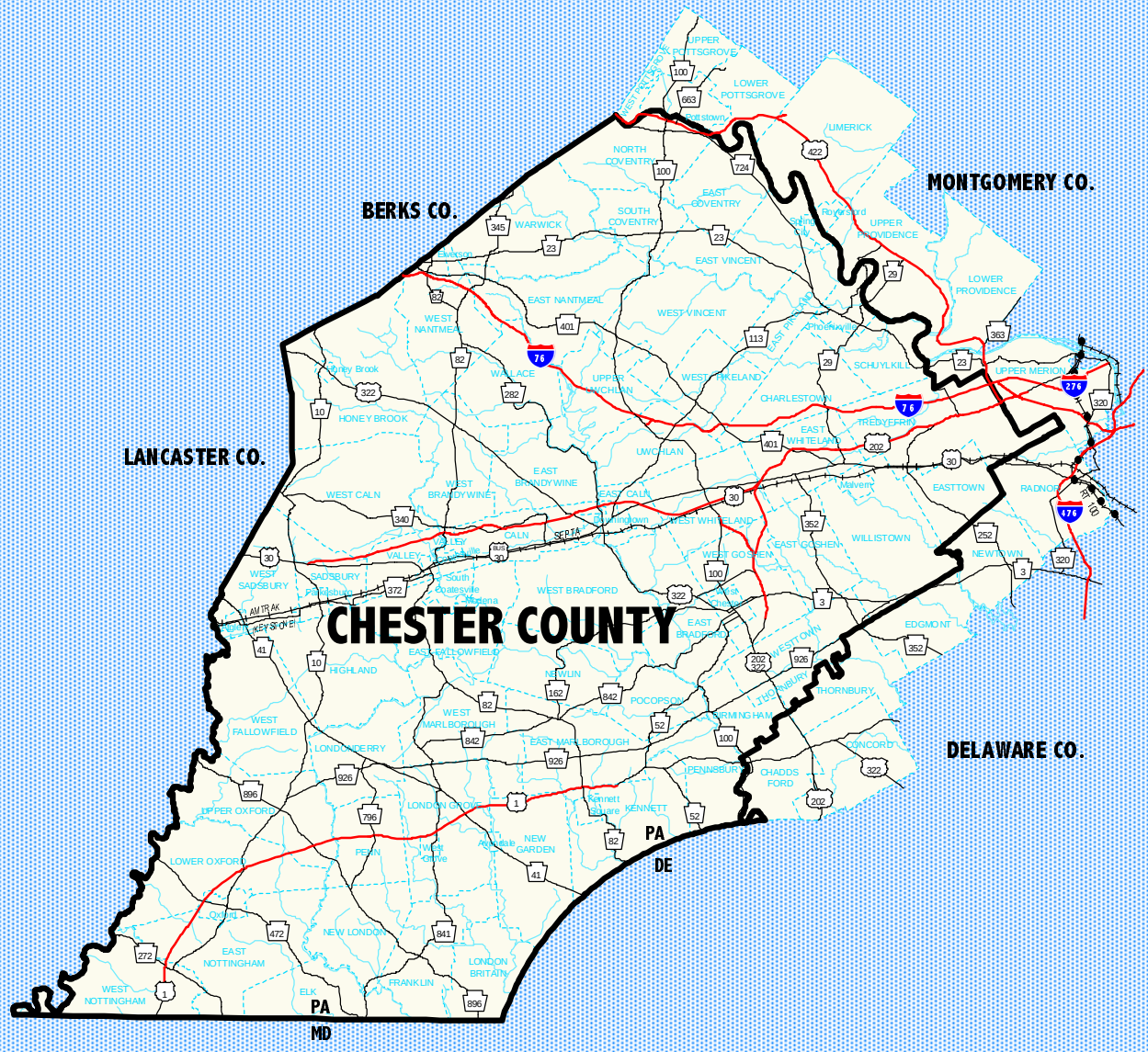
CHESTER COUNTY, PA
TRANSPORTATION STUDY



Prepared for
Chester County Planning Commission
By
Delaware Valley Regional Planning Commission

December 2001

CHESTER COUNTY, PA
TRANSPORTATION STUDY

Prepared for
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By

Delaware Valley Regional Planning Commission
The Bourse Building
111 South Independence Mall East
Philadelphia, PA 19106-2582

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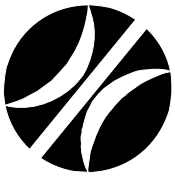
Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency which provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, 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 request 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. This report was primarily funded by Chester County Planning Commission. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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EXECUTIVE SUMMARY

In response to a request from Chester County, DVRPC staff prepared a special version of the DVRPC enhanced regional travel simulation model focused on the County. This county-wide focused model provides more transportation system detail and greater accuracy than the regional model, while maintaining a much larger study area than a traditional, project-specific focused model. This model was developed to assist Chester County in evaluating the impact of alternative transportation scenarios on highway levels of service given population and employment forecasts that concentrate new residential and commercial development in appropriate areas identified by the County's *Landscapes* development plan. This work supports the development of a county-wide transportation plan that promotes implementation of the goals, objectives, and policies included in the *Landscapes* Plan.

This report documents the 2020 model runs made with *Landscapes* development patterns and socioeconomic forecasts, testing three alternative levels of highway and public transit improvements - a No-Build, moderate improvement (Scenario 1) and extensive improvement (Scenario 2). The results of these travel simulations give insight into the levels of transportation investment that will be required to stabilize highway service levels at current conditions and reduce congestion levels in existing problem areas. The two build scenarios were constructed for evaluation purposes. Actual recommendations by the county will be made based on a technical and policy analysis of these scenarios.

For the county as a whole, Scenario 2 is adequate to preserve highway service levels at 1997 levels and in some locations reduce highway congestion below 1997 levels. Scenario 1 also for the most part preserves highway service levels at 1997 conditions, but reductions in existing operating speeds may occur in some areas, particularly during peak periods. These county-wide averages may not be indicative of prevailing highway conditions in certain corridors and on specific roadways. For this reason, separate more detailed analyses prepared for each of nine corridor/areas within Chester County are included in this report. These corridors/areas include: PA 100 Corridor, US 322 Corridor, US 1 Corridor, US 202 Corridor, Phoenixville Area, Downingtown Area, PA 41 Corridor, PA 113 Corridor, and the West Chester Area.

Chester County will experience very high rates of population and employment growth in the next 20 years. Although it may be possible to concentrate much of this growth in developed areas, traffic congestion will increase significantly unless new roadway capacity is created through investments in the transportation system. In some portions of the county, it is not possible to significantly reduce peak period congestion below current levels even with the Scenario 2 transportation improvements.

The projections, analyses, and conclusions presented in this report are intended for general overall planning purposes. They are valid given the socio-economic projections and the proposed highway and transit facilities included in the improvement scenarios 1 and 2. Forecast volumes included in this report should not be used for planning or design of specified facilities. These results are subject to refinement and adjustment in detailed traffic and public transit studies that must be conducted at the facility level of analyses prior to implementation.

I. INTRODUCTION

In response to a request from Chester County, DVRPC staff prepared a special version of the DVRPC enhanced regional travel simulation model focused on the County (see Map 1). This county-wide focused model provides more transportation system detail and greater accuracy than a regional model, while maintaining a much larger study area than a traditional, project-specific focused model. Although this model is not appropriate to forecast traffic volumes for the design of individual facilities, it does allow for the comprehensive evaluation of improvement scenarios and their impacts in all parts of the County. This model was developed to assist Chester County in evaluating alternative transportation scenarios given socio-economic forecasts consistent with its *Landscapes* development plan. This work supports the development of a county-wide transportation plan that promotes implementation of the goals, objectives, and policies included in *Landscapes*.

Landscapes is the official policy plan for Chester County. It identifies areas in which to focus future development and infrastructure improvements. Four distinct landscape types – natural, rural, suburban, and urban – as well as rural and suburban centers are identified. Strategies to guide the intensity and variety of development, including growth boundaries, are associated with each landscape type. Map 2, from the County's *Landscapes* plan, identifies these areas[1] (see Map 2).

Chester County staff assisted in this project by defining the magnitude and location of projected land use development within the county and by assisting in the identification of transportation improvements intended to alleviate existing and future congestion given the goals, strategies, and objectives of *Landscapes*. This project demonstrated a county level application of DVRPC's enhanced travel simulation model which could then be applied as needed in other counties to evaluate major land use or transportation proposals.

DVRPC staff worked very closely with county planners throughout the project. Phase 1 (FY 1999) of this project involved preparing the focused simulation model for Chester County and developing a baseline 2020 forecast utilizing the new DVRPC board adopted population and employment projections (adopted May 2000). Municipal population and employment growth was directed to areas consistent with *Landscapes*. In cooperation with county planners, DVRPC reviewed the facilities included in the regional highway and transit networks for accuracy and completeness. Where necessary, local roadways and minor transit routes not included in the regional model were added to the focused study area. The focused study area also included portions of Delaware and Montgomery counties to provide a "buffer" or transitional area to accurately simulate travel coming from outside of Chester County.

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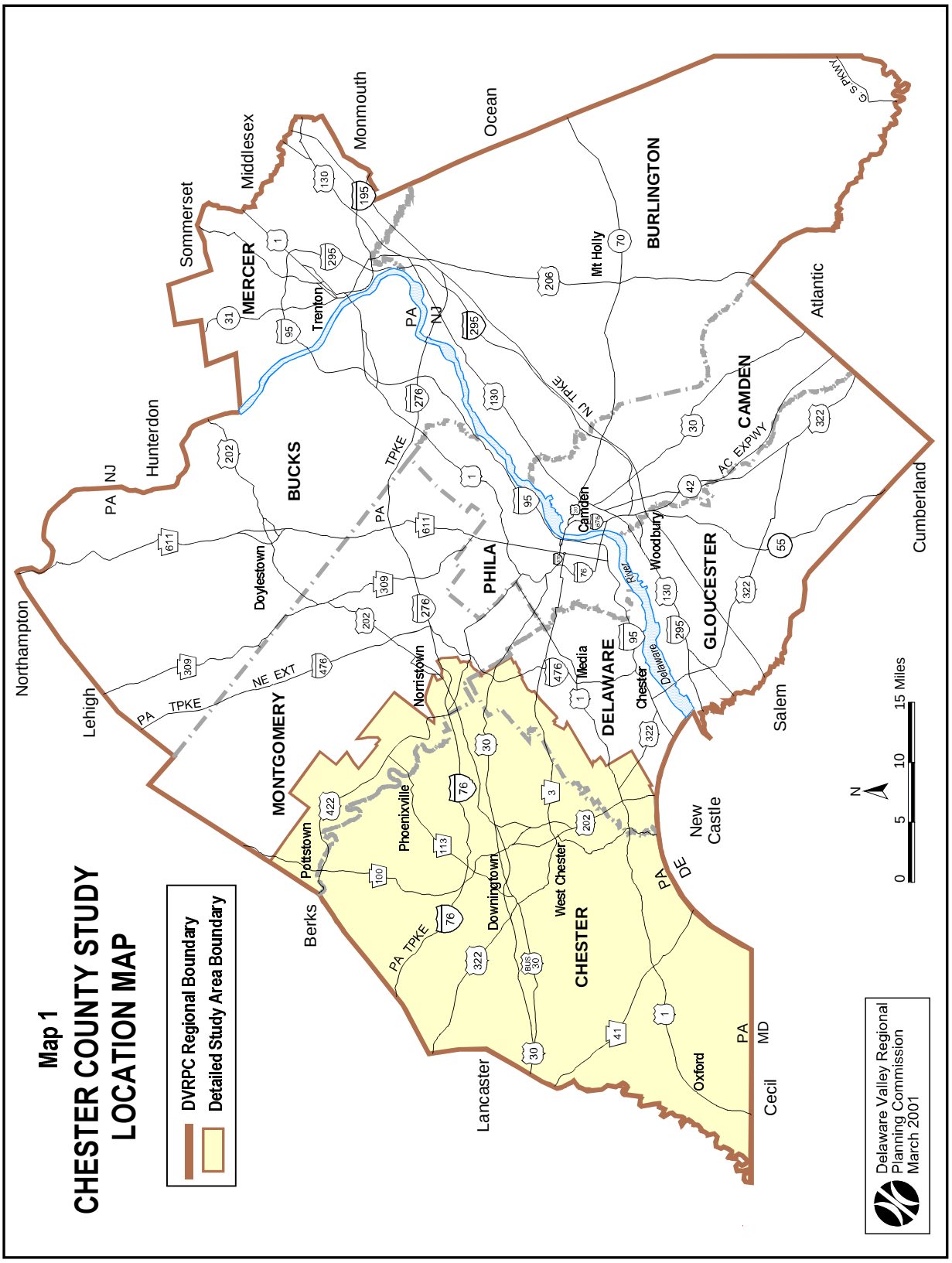
[1] *Landscapes: Managing Change in Chester County - 1996 to 2020* , Comprehensive Plan Policy Element, Chester County Planing Commission, 1996.


Map 1
CHESTER COUNTY STUDY
LOCATION MAP
DVRPC Regional Boundary
Detailed Study Area Boundary
Northampton
Lehigh
Berks
Lancaster
Chester
Cecil
Hunterdon
Somerset
Middlesex
Monmouth
Ocean
Atlantic
Cumberland
Salem
Gloucester
Camden
Burlington
Mercer
Bucks
Montgomery
Philadelphia
Delaware
New Castle
PA
NJ
DE
MD
Pottstown
Phoenixville
Downingtown
West Chester
Norristown
Doylestown
Trenton
Mt Holly
Camden
Woodbury
Media
Chester
Oxford
PA TPKE
NE EXT
NJ TPKE
AC EXPWY
G.S.PKWY
Delaware River
0 5 10 15 Miles
N
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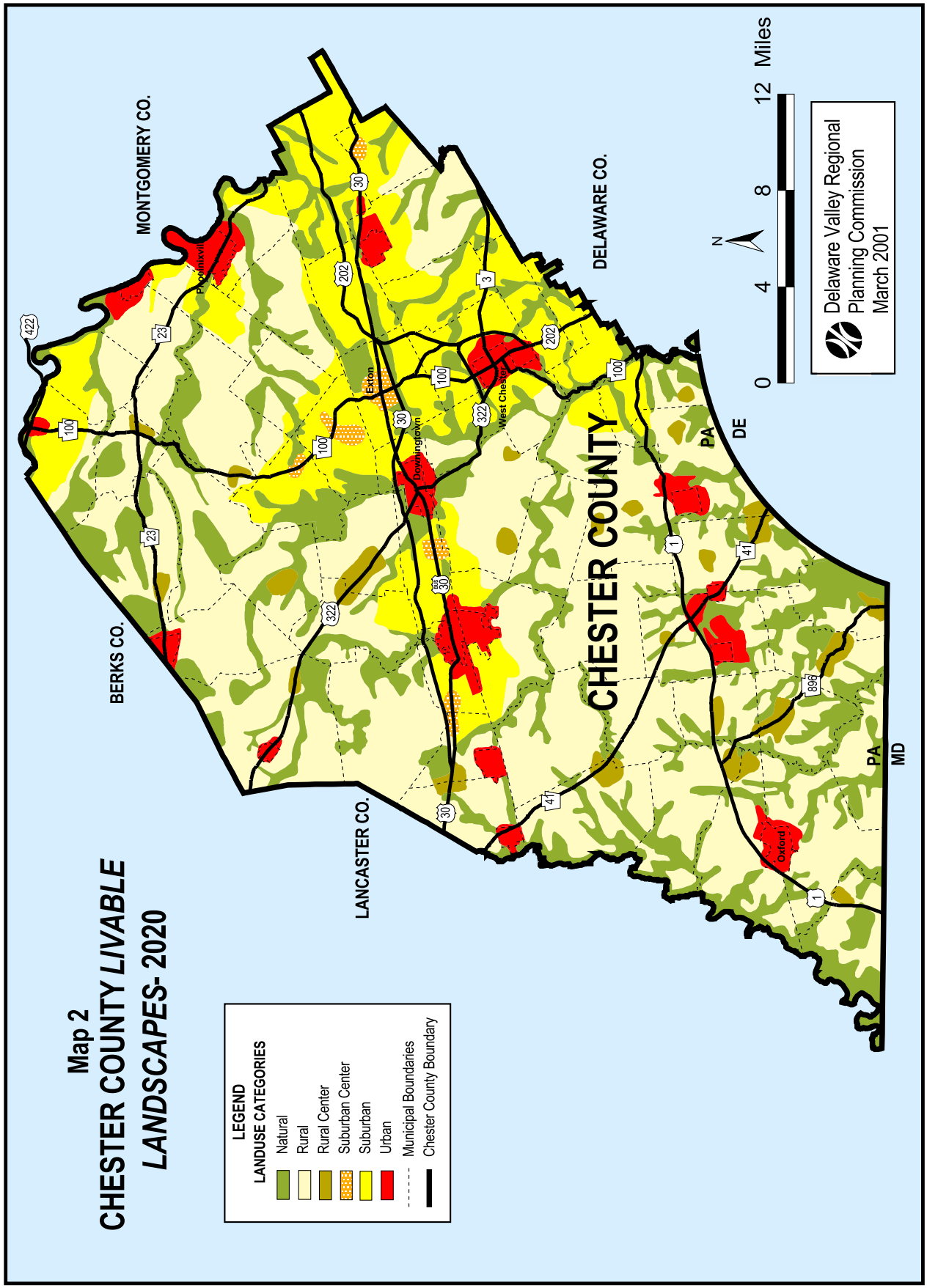
March 2001


Map 2
CHESTER COUNTY *LIVABLE LANDSCAPES*- 2020
LEGEND
LANDUSE CATEGORIES
Natural
Rural
Rural Center
Suburban Center
Suburban
Urban
Municipal Boundaries
Chester County Boundary
BERKS CO.
MONTGOMERY CO.
LANCASTER CO.
DELAWARE CO.
CHESTER COUNTY
PA
DE
MD
Phoenixville
Exton
Downingtown
West Chester
Oxford
0 4 8 12 Miles
N
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In Phase 2 (FY 2000) of this project, DVRPC applied the focused Chester County model prepared in Phase 1 to evaluate two alternative transportation scenarios. Phase 3 (FY 2001) of this project completed the analyses of the impact of transportation alternatives on projected congestion patterns in Chester County. It quantified the impact of highway and public transportation improvement projects given the *Landscapes* development schemes and identified existing and projected transportation problems in terms of travel impacts, air quality, congestion patterns, and transit ridership potential. This report highlights these comparisons; documents the alternative transportation scenarios; and describes the focused model, forecasts, and the results of the study.

Chapter II of this report discusses the interaction of transportation and land use, the focused model developed for Chester County, and the methods used to calculate and interpret the measures that are used to evaluate the impacts of land use changes and the proposed highway and transit improvement scenarios on Chester County travel patterns. Chapter III compares the results of the 1997 calibration and the 2020 simulation runs for the No-Build transportation scenario. A comparative analysis of the results for the improvement alternatives is presented in Chapter IV. Particular attention is paid to nine highly congested corridors and areas within the county. The conclusions for the study are presented in Chapter V.

II. TRAVEL SIMULATION MODEL METHODOLOGY

It is clear that land use developments, whether residential, commercial, industrial, or recreational, create the demand for travel. This relationship is well known and documented in the trip generation/distribution components of all travel simulation models as well as in the ITE Trip Generation manual, and innumerable traffic studies. People travel while going about the activities of their daily lives, either directly as in person travel (work, shopping, school, social/recreational, etc.) or indirectly through freight movements and the deliveries of goods and services to the home and work place.

The relationship between the supply of highway and transit facilities and land use is more nebulous, particularly in short time horizons. Clearly, the land around freeway interchanges is in demand for shopping centers and other commercial and industrial facilities that find the high accessibilities provided by the freeway attractive. Similarly, services and retail business tend to locate along major arterials which channel large numbers of potential customers within easy proximity. However at the metropolitan scale, development patterns tend to expand outward from the urban core. Most areas beyond the current developed area have freeway interchanges and high capacity arterials that would support development densities far beyond the current rural land uses which are predominately agricultural and open space. In these areas, especially in the fringe of the existing urbanized area, development decisions are made by the dynamics of the interaction between individual land owners, developers, and municipal and county planners, operating within the framework of the local zoning code and state regulations. This planning effort, if properly designed and implemented holds the promise to mitigate randomness, sprawl, congestion, and other undesirable aspects of the land use decisions being made at the present time. This is the promise of the *Landscapes* planning effort currently underway in Chester County. This study is directed towards analysis of the transportation needs of the *Landscapes* Plan, particularly, in determining the level of investment in highway and public transportation facilities needed to provide for adequate travel service levels in Chester County after the *Landscapes* Plan is implemented.

The Chester County study was one of the first production uses of the new enhanced DVRPC travel simulation model. This new model is built upon the classic DVRPC four step modeling process (Trip Generation, Trip Distribution, Modal Split, and Travel Assignment). Trip generation is the first step in the modeling process. Person, truck, and taxi travel is generated from traffic analysis zone (TAZ) level estimates of households and employment through the use of trip rates disaggregated by trip purpose (home based work, home based non-work, non-home based), auto ownership, and area type (CBD, fringe, urban, suburban, rural, and open rural). Estimates of external and through highway and transit travel are developed from population and employment forecasts in counties surrounding the Delaware Valley Region.

Travel from traffic zones within the region is distributed to regional destinations with a gravity model. This model assumes that the propensity to travel to a traffic analysis zone of destination increases with the attractiveness of the destination (as measured by employment) and decreases as the difficulty of traveling between zones increases. This travel effort (impedance) is measured by travel time and cost for both the highway and transit modes.

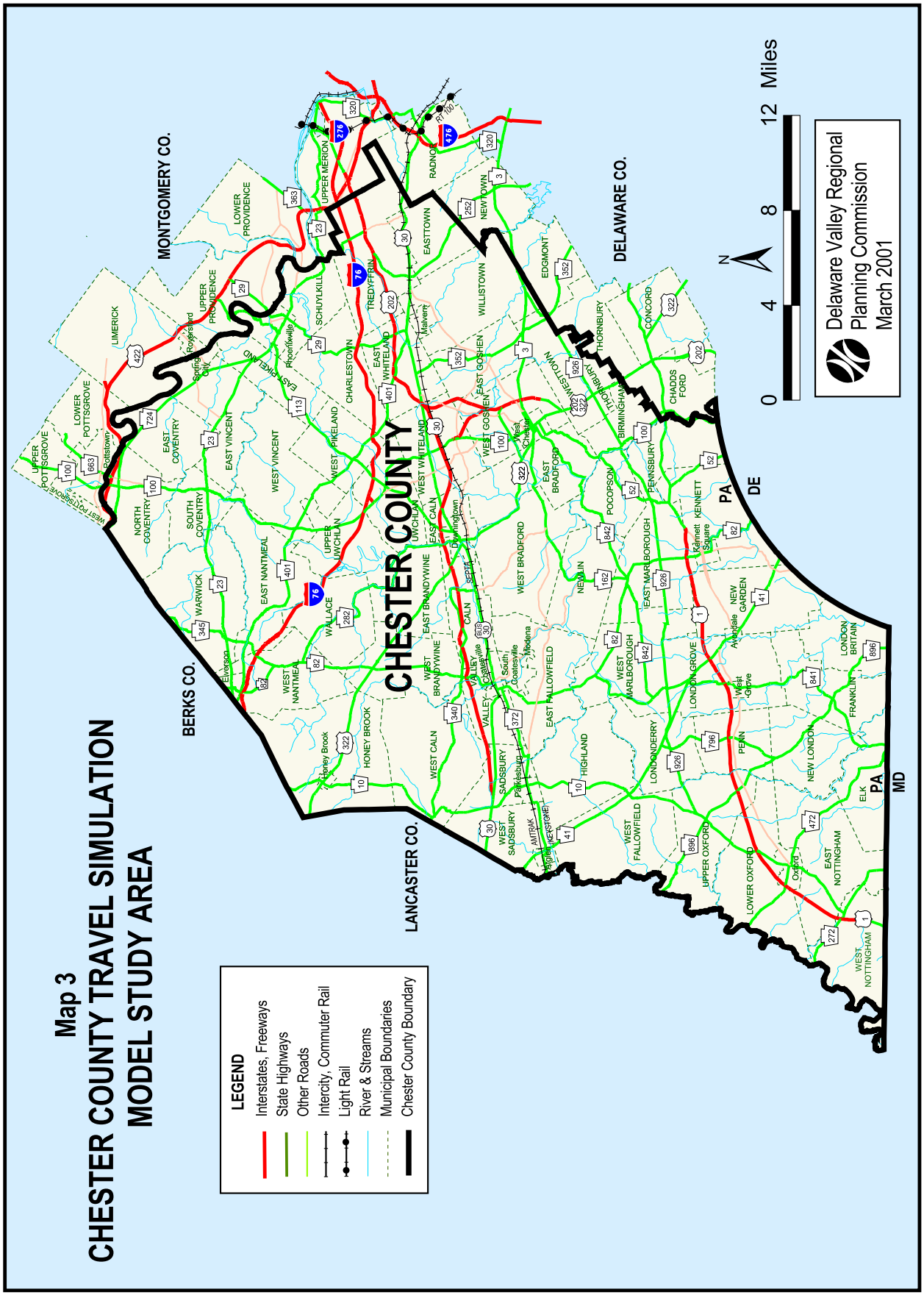
The modal split model divides the travel between zones within the region into transit and highway components. Generally, the propensity to use public transit increases with the relative transit-to-highway service levels. The relative service levels are estimated through highway and transit out-of-vehicle time and in-vehicle time, highway operating costs and parking charges, and transit fares. In addition, auto ownership, transit submode, household income, trip purpose, and the consumer price index further define the trip-maker's choice between highway and transit. The auto occupancy model determines the average number of persons per automobile. This value is used to convert auto person trips to auto vehicle trips. Auto occupancy is estimated by trip purpose and trip length. The final step in the process is to assign the estimated highway vehicle and transit person trips to specific facilities. This is accomplished by determining the best (minimum time and cost) route through the highway and public transit networks and allocating the transit travel to the transit facilities and highway travel to the highway facilities. The highway assignment is capacity restrained in that congestion levels are considered in determining the best route.

While the traditional four step DVRPC model has produced reasonable and accurate forecasts for many years, it does not meet the new federal regulations which require separate peak and off peak models that operate within an iterative structure with respect to highway travel time. The model should start with uncongested highway speeds and converge through iterations to a stable and accurate estimate of congested speeds. Furthermore, the old process did not model the effects of new and improved highway and transit facilities on trip length and destination as effectively. Highway and transit improvements tend to attract new travel into the improved corridor and make average trip lengths somewhat longer in response to higher operating speeds. The enhanced DVRPC model meets all federal modeling requirements.

Four runs of the Chester County model were performed: (1) a 1997 calibration run to test the model's ability to replicate observed highway and transit counts, (2) a run with projected 2020 socio-economic inputs to the model, but the current (No-Build) highway and transit networks. And two 2020 highway/transit improvement scenarios with moderate (3) and extensive (4) levels of transportation investment. All 2020 runs utilized socio-economic projections consistent with Chester Counties *Landscapes* development plan.

A. Focusing the Regional Model on Chester County

Basically, the focusing process involves enhancing the travel forecasting models within the study area, while maintaining the simulation at the regional level elsewhere. Map 3 shows the detailed study area and surrounding buffer area associated with the Chester County Model. This focusing process has three major components: 1) adding missing facilities within the study area that are considered important from a planning perspective, 2) splitting down the traffic zones to provide a finer grained and hence more accurate loading of the highway network, and 3) customizing the DVRPC enhanced model system to reflect the finer traffic zones, enhanced networks, and other special requirements for the Chester County Model.


Map 3
CHESTER COUNTY TRAVEL SIMULATION
MODEL STUDY AREA
LEGEND
Interstates, Freeways
State Highways
Other Roads
Intercity, Commuter Rail
Light Rail
River & Streams
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
BERKS CO.
MONTGOMERY CO.
DELAWARE CO.
LANCASTER CO.
PA
DE
MD
0 4 8 12 Miles
N
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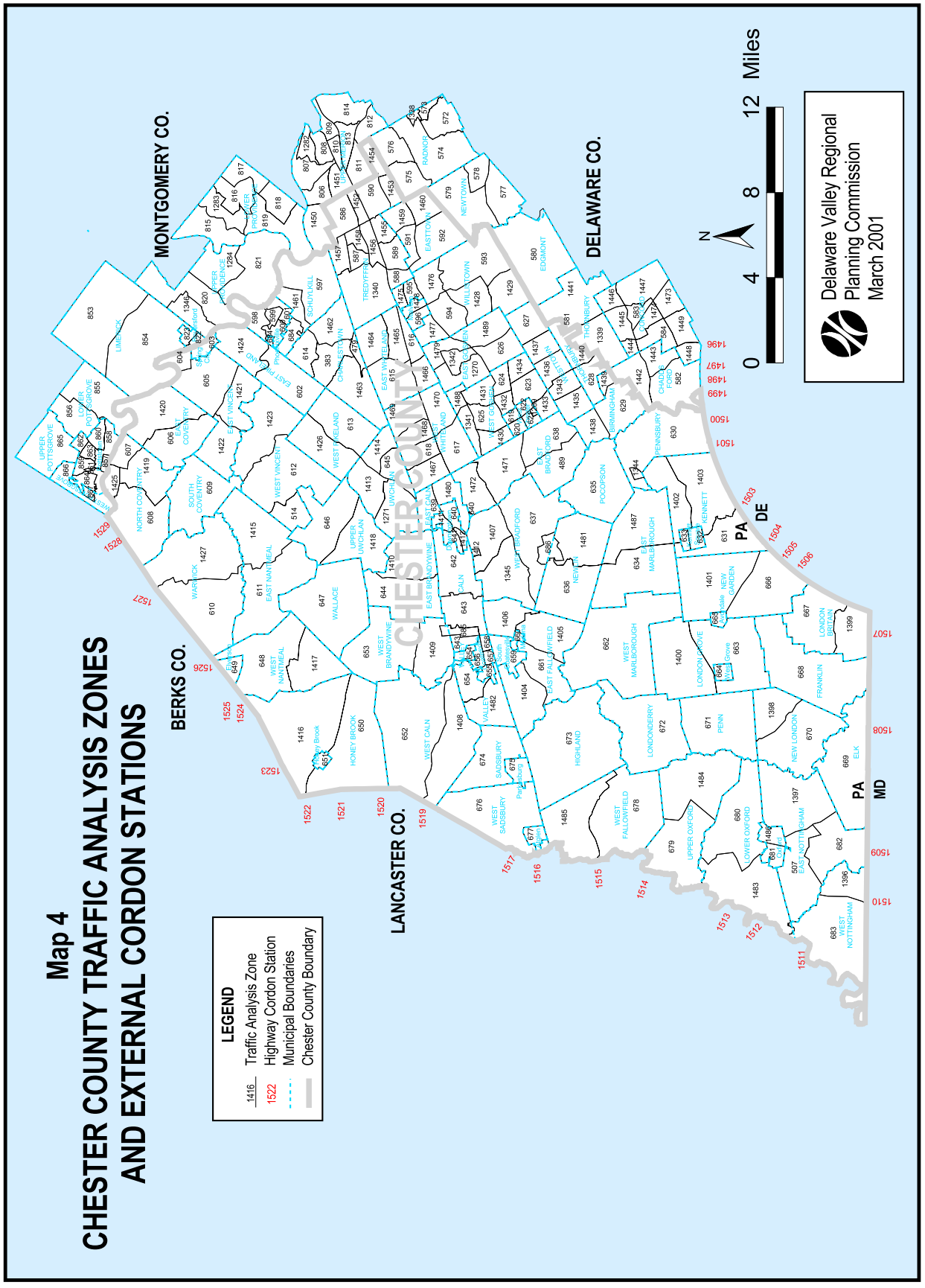
B. Chester County Focused Model Traffic Analysis Zones

The regional traffic analysis zone system currently in use at DVRPC is based on the Census Tract and Block Group system used to tabulate the 1990 Census. This system is termed the "1990 Traffic Zone" system and will remain the standard at DVRPC until the 2000 Census Journey to Work and other data is made available in about 2003. The 1990 Traffic Analysis Zones were divided into smaller areal units within Chester County and also within a buffer area east and north of the county. This buffer area is needed to smooth the transition between the relatively fine grained highway network within Chester County and the surrounding regional network. As a result, the number of traffic zones in the 3,816 square mile DVRPC region increased from 1395 to 1489. Within Chester County, the number of zones almost doubled from 110 to 209 traffic zones. Both Chester County and the buffer area are shown in Map 4. Traffic zones with numbers between 428 and 1345 represent either an unsplit 1990 traffic zone or the root portion of a split zone group. Without exception, traffic zones with numbers between 1396 and 1489 represent split segments of 1990 regional traffic zones. Split zones are usually numbered to form a cluster with the parent 1990 regional zone. Zone numbers 1490 though 1606 represent regional DVRPC cordon stations as described in the Enhanced Simulation Model paragraphs in Appendix A. Overall, 99 new traffic analysis zones and two cordon stations were added to the DVRPC regional system through the zone splitting process. This process resulted in 99 new traffic zone numbers within Chester County being created, five of which represented relocated unused traffic zones (water tracts) in the 1990 regional traffic zone system.

C. Focused Travel Simulation Networks

Three transportation networks were required for each run of the Chester County simulation model. They include a highway network and a two separate (peak and off-peak) transit networks. The highway network was initially coded with daily capacities and free flow speeds (See Appendix A Tables A-3 and A-4). Peak and off-peak factors in the highway assignment program were then used to proportion the daily roadway capacities into the peak and off-peak time periods. Transit service levels differ significantly by time period in terms of route structure (express runs, etc.) and frequency of service. These differences are so extensive, that no simple factoring procedure can compensate for the lack of separate peak and off-peak networks. For purposes of the Chester County simulation model, an AM peak transit network was taken as representative of the combined AM and PM peak time periods and a mid-day transit network was coded to represent off-peak transit service. The DVRPC simulation models use special "production-attraction" trip table formats. In this format, work and non-work to home trips are transposed and travel in the same direction as home based travel. This convention makes AM transit service patterns appropriate as service levels for both AM and PM peak period travel because the PM peak transit service is a mirror of the AM.


Map 4
CHESTER COUNTY TRAFFIC ANALYSIS ZONES
AND EXTERNAL CORDON STATIONS
LEGEND
1416 Traffic Analysis Zone
1522 Highway Cordon Station
Municipal Boundaries
Chester County Boundary
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
CHESTER COUNTY
PA
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0 4 8 12 Miles
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1. Preparation of the Highway Networks

The first step in the preparation of the focused highway network was to review the streets and intersections included in the DVRPC 1997 regional highway network for the Chester County study area to determine if any additional roads were required. The highway facilities included in the base 1997 DVRPC network were transmitted to Chester County staff in the form of a map for their review and comment. The county planners then identified highway facilities that should be added to the network. Additions to the network included minor arterials, collectors, and local roads that were considered important for ongoing Chester County planning activities and the implementation of the *Landscapes* plan. In total, approximately 114 miles of highway facilities were added to the network, most of these added facilities were collectors and local roadways. The resulting 1997 focused highway network for the Chester County Model is shown in Map 5. The facilities that were added to the regional network within Chester County are highlighted by using broken lines to denote the roadway. This focused network explicitly includes the impact of all highway facilities outside of the detailed study area on projected traffic volumes within the area. These facilities include all existing expressways, major arterials, and minor arterials within the region. This enhanced network results in a traffic assignment model capable of estimating accurate traffic volumes for most streets and intersections within Chester County.

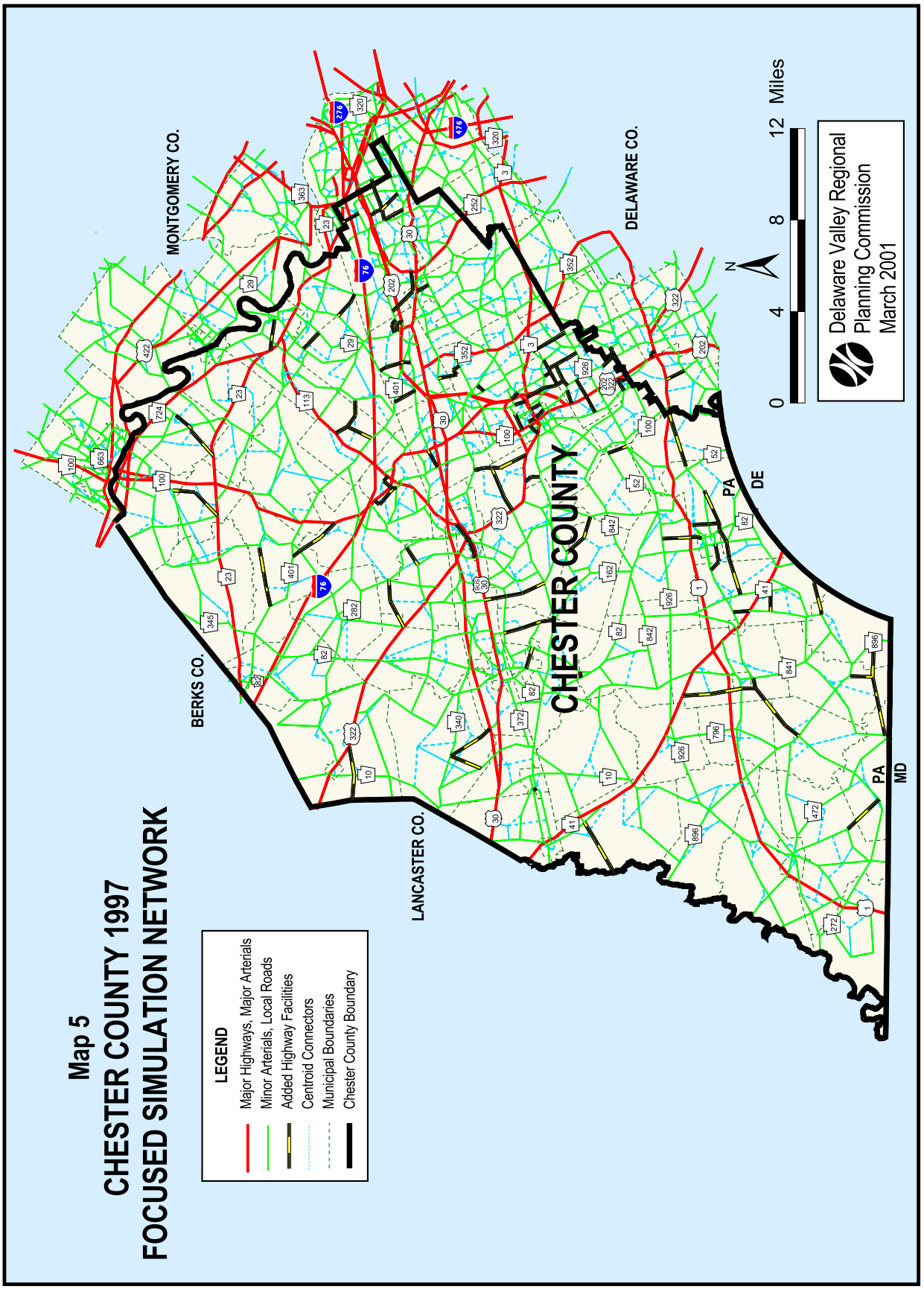
Detailed coding specifications for the Chester County highway network can be found in Chapter XI of the commission's 1997 simulation report[2]. The final step in the development of the highway networks was to recode the centroid connectors to be consistent with the focused Chester County zonal system.

2. Preparation of the Transit Networks

Separate peak and off-peak transit networks were required for the 1997 calibration and for each 2020 scenario tested as part of the Chester County Study. The 1997 regional peak and off-peak transit networks formed the basis for the Chester County Simulation Model networks. The centroid connectors were recoded to be consistent with the focused traffic zone system. Chester County staff also reviewed the facilities included in the base 1997 transit networks. Based on their recommendations, the following facilities were added:

- Krapf's Transit Bus A,
- Coatesville Link (operated by Krapf's coaches),
- Thorndale Station on SEPTA's R5 regional rail line,
- Exton Mall loop (off-peak only).
- Coventry Mall (PVT)

[2] *1997 Travel Simulation for the Delaware Valley Region* , Delaware Valley Regional Planning Commission, Publication Number 00001, January 2000.


Map 5
CHESTER COUNTY 1997
FOCUSED SIMULATION NETWORK
LEGEND
Major Highways, Major Arterials
Minor Arterials, Local Roads
Added Highway Facilities
Centroid Connectors
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
BERKS CO.
MONTGOMERY CO.
DELAWARE CO.
LANCASTER CO.
PA
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The Chester County portions of the 1997 peak and off-peak transit networks are shown in Map 6. The coverage of the transit system within Chester County is similar in the peak and off-peak, with only branches on routes 206 and 208 not being operated in the off-peak However, the frequency of service and amount of express service is greater in the peak, especially on the R3 and R5 regional rail lines. Network coding conventions and transit fare assumptions are documented in detail in Chapter VI of the Commission's *1997 Travel Simulation* report.

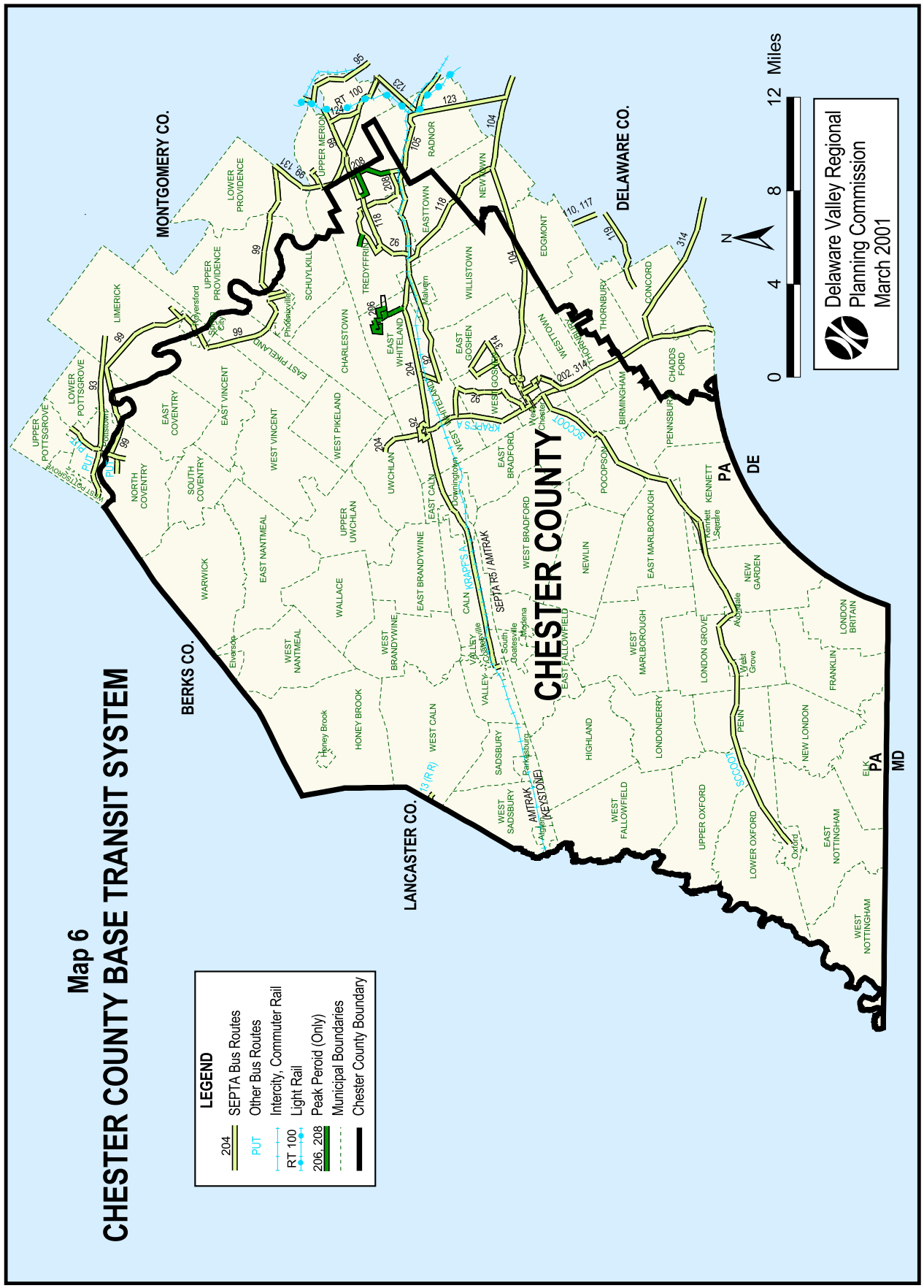
D. Demographic and Employment Inputs for Travel Simulation

Chester County is predominately rural. Although it constitutes almost 20 percent of the land area of the region, Chester County houses only about eight percent of the region's population and also contains about eight percent of the regional total jobs. The absolute number of persons and jobs is still impressive, however. In 1997 over 418,000 persons resided in Chester County and almost 225,000 persons were employed there. In 2020, some 527,100 persons and 277,500 jobs will be located in the county. In regional terms, this constitutes almost nine percent of the 2020 regional total of households and slightly over nine percent of the forecasted regional employment.

The travel simulation models require current and forecast year estimates of the following variables:

- Population;
- Households, stratified by vehicle ownership;
- Employed residents; and
- Employment stratified into eleven Standard Industrial Classification (SIC) groups.

Travel forecasting models require that estimates of demographic and employment data be made for small areas or zones. This requirement derives from the need to assign trip making associated with households and businesses to the streets and transit facilities serving them. For regional travel simulations, the traffic zone system is based on Census tracts within the nine-county region except in Center City Philadelphia and selected suburban locations where Census block groups are used. As noted above, the 1990 Census tract-based traffic analysis zones were used for this study. However, the 1990 zones within Chester County did not provide sufficient detail to accurately load the enhanced highway and transit networks of the focused model, so the traffic zones were split into smaller subzones throughout the county and for selected traffic zones in a buffer area east and north of the county. Within Chester County, the number almost doubled from 110 to 209 traffic zones. The 2000 Census traffic zones were not available when this study began. However, after the 1990 traffic zones were split, the level of detail provided was better than what would have been provided by the 2000 Census traffic zones, which would also increase the number of traffic zones in Chester County. For the most part, Chester County split zones and 2000 traffic zones are compatible. The traffic zone level demographic and employment data are required primarily for trip generation. Travel in this model is estimated from household and employee based trip rates that are cross classified by area type, vehicle ownership, and SIC employment classification as appropriate. Area type (i.e. CBD, fringe, urban, suburban, rural, and open rural) is calculated at


Map 6
CHESTER COUNTY BASE TRANSIT SYSTEM
LEGEND
SEPTA Bus Routes
Other Bus Routes
Intercity, Commuter Rail
Light Rail
Peak Peroid (Only)
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
PA
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the zonal level from a weighted average of population and employment density per acre. The DVRPC trip generation model was not changed significantly during the development of the Chester County model. For a more complete description of the DVRPC trip generation model see Appendix A and Chapter V of *1997 Travel Simulation*. The enhanced travel simulation model used for the Chester County travel simulation is described in detail in Appendix A.

E. 1997 Chester County Simulation Model Calibration Results

The completed Chester County simulation model was extensively tested based on its ability to replicate recent highway and public transit counts collected in the county. A total of 195 recent traffic counts taken throughout the county were utilized to validate the highway assignment portion of the model. The public transit assignment portion of the model was validated with SEPTA ridership count data for the R5 commuter rail line and buses operating within the County.

Table 1 summarizes the aggregate error in the assigned 1997 daily highway link volumes. In total, the aggregate assigned highway link volumes for freeway and expressway links within the county totals 871,565 daily trips. The total of the daily counted volumes for the same expressway links is 876,350 for a difference of -4,785 vehicle trips or -0.5 percent. This difference is negligible for all planning purposes. The percent differences for principal arterials and minor arterials/local streets are 6.4 and 12.9 percent, respectively. While these percentage differences are larger than the expressway error, they are acceptable because the absolute errors in traffic volumes for these facilities are relatively small.

Table 1. 1997 Calibration Error for Highway Facilities for Chester County.

Functional Classification	Assigned Volume	Counted Volume	Difference Absolute	Difference Percent
Freeways / Expressways	871,565	876,350	-4,785	-0.5%
Principal Arterials	1,779,044	1,672,627	106,417	6.4%
Minor Arterials / Collectors	516,687	457,776	58,911	12.9%
Total	**3,167,296**	**3,006,753**	**160,543**	**5.3%**

In general, for statistical reasons the simulation error decreases in percentage terms as the magnitude of the traffic volume being estimated increases. This is clearly shown in Table 2 which presents the root mean squared (RMS) and percent root mean squared errors by volume group. The percent RMS error is reduced from 58.0 percent (<3,000 daily vehicles) to 11.8 percent (>40,000 daily vehicles) as the traffic volumes being estimated increase. Although the percent RMS error for traffic volumes less than 10,000 averages about 40 percent, this error represents only about 1,600

daily vehicles, an acceptable error for most planning and facility improvement purposes. For traffic volumes greater than 10,000 daily vehicles, the simulation errors are smaller, ranging from 28.6 to 11.8 percent. The overall average for all volume groups is about 3,805 daily vehicles or 24.6 percent.

Table 2. Chester County Travel Simulation Model Highway Assignment Errors by Volume Group.

Counted Volume Group	Average Absolute Error	RMS Error	Percent RMS Error
< 3,000	902	1,252	58.0%
3,000-5,000	1,280	1,591	37.3%
5,000-10,000	2,161	2,684	41.4%
10,000-15,000	3,030	3,542	28.6%
15,000-20,000	2,788	3,832	23.9%
20,000-30,000	3,515	4,031	16.7%
30,000-40,000	4,239	4,939	14.7%
> 40,000	4,414	5,949	11.8%
Overall	**2,839**	**3,805**	**24.6%**

A comparison between total Chester County predicted and counted transit volumes by submode is given in Table 3. On the SEPTA R5 rail line between the Downingtown and Stratford stations, a total of 8,605 daily boardings were predicted by the model. The corresponding counted ridership was 8,499, for an error of 1.2 percent. Overall, RMS station error is about 275 daily boardings, which is less than 30 percent of the average station volume. Given the high levels of patronage detail associated with station boardings, these errors are acceptable for the evaluation of proposed stations and other planning purposes.

There are no available totals of bus route boardings within Chester County. Rather, only counts of total route passenger boardings are available. For this reason, only total bus route boardings are included in Table 3, even though many of these boardings occur in Delaware and Montgomery counties. For the bus routes that serve Chester County, a total of 8,831 route boardings were predicted for 1997 by the model. The total counted ridership on these routes was 10,115, for an underestimate of about 15 percent. Overall, the Chester County model underestimated transit riding by 7.5 percent.

Table 3. 1997 Calibration for Transit Facilities for Chester County.

Submode	Predicted	Actual	Difference Absolute	Difference Percent
Regional Rail	8,605	8,499	106	1.2%
Surface Bus*	8,631	10,115	-1,484	-14.7%
Total	**17,236**	**18,614**	**-1,378**	**-7.4%**

*Includes boardings that take place on bus routes outside of Chester County

III. 2020 *LANDSCAPES* TRAVEL FORECAST UNDER THE NO-BUILD SCENARIO

The simulation of 2020 Chester County travel patterns under the No-Build Scenario required development of network assumptions and 2020 projections of the socioeconomic inputs to the model. Once these data were available, they were input into the calibrated model in place of the 1997 data. The model was then executed for the set of network assumptions identified in the No-Build Scenario.

A. Demographic and Employment Forecasts

In close cooperation with Chester County planners, DVRPC prepared special updated forecasts of the socioeconomic inputs to the travel simulation process. These 2020 population and employment forecasts were closely coordinated with the land use policies included in the *Landscapes* Comprehensive Plan that was adopted by Chester County in July of 1996. These projections form the basis for the Chester County travel projections included in this report. In these forecasts, regional population is expected to grow by about 476,000 persons (8.9 percent) in the 23 years between 1997 and 2020. Chester County is expected to increase by 109,000 persons (26.1 percent), a growth rate far above average for the Delaware Valley Region. In fact, about 42 percent of the 1997 to 2020 population growth in DVRPC's five Pennsylvania counties will occur in Chester County. The 2020 Chester County population projection used in this study is 527,100 persons, which corresponds to the forecast adopted by the DVRPC Board in February 2000. The population projection included in the *Landscapes* plan adopted on July 12, 1996 (489,300) corresponded to the DVRPC 2020 forecasts adopted in June of 1993. There were no specific supplemental development surcharges used in the Chester County projections, although rapid development in all areas of the county brought on by the continued decentralization of the region's population and employment base and the strong economy of the 1990s resulted in an approximate 7.7 percent increase in Chester County's 2020 population forecast. However, in the Chester County Model, all updated socioeconomic projections were done in accordance with the *Landscapes* Plan and reviewed in detail by Chester County planning staff.

Tables 4 and 5 show the projected population and employment growth by Chester County planning Area, respectively. These planning areas are for the most part school districts. The tabulations shown in the planning areas table do not include the portions of Chester County planning areas that lie outside of the County (see Map 7). West Chester, Twin Valley and Unionville/Chadds Ford all serve significant areas outside of Chester County. Although the Borough of Spring City is included in the Royersford School District, it has been incorporated into the Owen J. Roberts Planning Area. The appendix contains a table showing the forecasted 2020 population and employment by municipality (MCD).

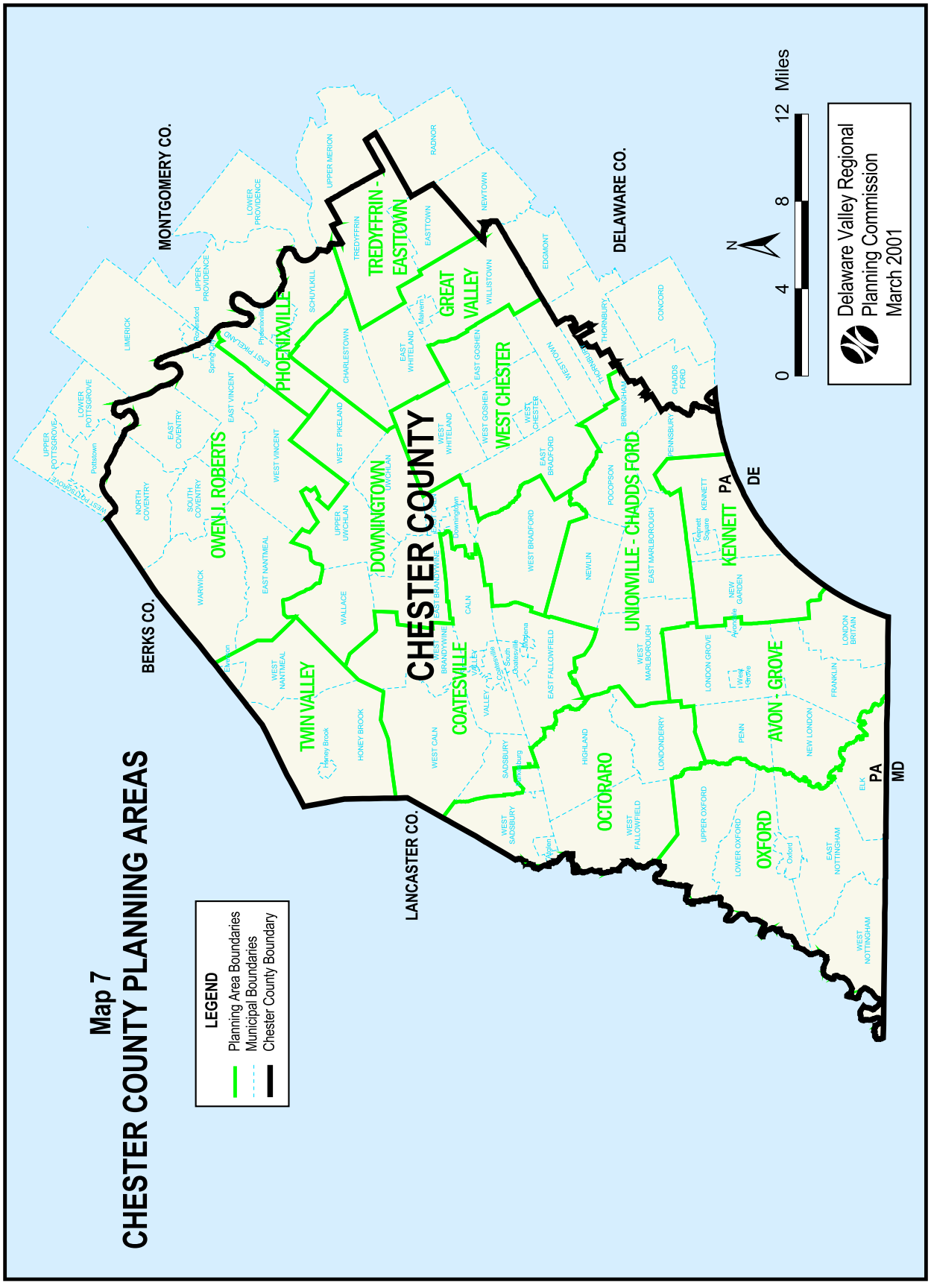
There are too many (209) traffic zones in Chester County to analyze population, employment, and other trends at the zonal level. For this reason, Chester County requested that planning areas be used instead. This makes this analysis consistent with the *Landscapes* plan reports.

Table 4. Population Growth in Chester County.

Planning	Area	Population 1997	Population 2020	1997- 2020 Growth	1997- 2020 Percent
19	Great Valley	25,134	28,900	3,766	15.0%
20	Phoenixville	28,427	33,850	5,423	19.1%
21	Owen J. Roberts	29,798	36,150	6,352	21.3%
22	Dowingtown	55,457	79,300	23,843	43.0%
23	West Chester	89,601	110,400	20,799	23.2%
24	Kennett	18,380	22,700	4,320	23.5%
25	Coatsville	52,520	67,250	14,730	28.0%
26	Twin Valley	10,389	13,150	2,761	26.6%
27	Avon-Grove	20,198	29,550	9,352	46.3%
28	Octorara	11,938	15,200	3,262	27.3%
29	Oxford	18,083	21,600	3,517	19.4%
73	Tredyffrin-Easttown	39,634	42,550	2,916	7.4%
74	Unionville-Chadds Ford	18,474	26,500	8,026	43.4%
Total	**Chester County**	**418,033**	**527,100**	**109,067**	**26.1%**

Table 5. Employment Growth in Chester County.

Planning	Area	Employment 1997	Employment 2020	1997-2020 Growth	1997-2020 Percent
19	Great Valley	35,645	44,700	9,055	25.4%
20	Phoenixville	9,626	10,200	574	6.0%
21	Owen J. Roberts	5,527	6,350	823	14.9%
22	Dowingtown	22,069	30,800	8,731	39.6%
23	West Chester	63,817	82,050	18,233	28.6%
24	Kennett	10,528	12,350	1,822	17.3%
25	Coatsville	19,958	23,100	3,142	15.7%
26	Twin Valley	3,425	4,200	775	22.6%
27	Avon-Grove	5,351	7,150	1,799	33.6%
28	Octorara	4,405	6,100	1,695	38.5%
29	Oxford	6,214	7,500	1,286	20.7%
73	Tredyffrin-Easttown	34,815	39,750	4,935	14.2%
74	Unionville-Chadds Ford	2,858	3,250	392	13.7%
Total	**Chester County**	**224,238**	**277,500**	**53,262**	**23.8%**


Map 7
CHESTER COUNTY PLANNING AREAS
LEGEND
Planning Area Boundaries
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
OWEN J. ROBERTS
PHOENIXVILLE
TREDYFFRIN - EASTTOWN
GREAT VALLEY
WEST CHESTER
DOWNINGTOWN
COATESVILLE
TWIN VALLEY
OCTORARO
UNIONVILLE - CHADDS FORD
KENNETT
AVON - GROVE
OXFORD
BERKS CO.
MONTGOMERY CO.
DELAWARE CO.
LANCASTER CO.
PA
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12 Miles
Delaware Valley Regional Planning Commission
March 2001

Within the County, population growth rates vary widely. Four planning areas, Tredyffrin-Easttown, Great Valley, Phoenixville, and Oxford are projected to grow relatively slowly; forecast growth from 1997 to 2020 is 7.4, 15.0, 19.1, and 19.4 percent, respectively. The remainder of the county is projected to grow rapidly, with 1997 to 2020 planning area growths ranging from 21.3 percent (Owen J Roberts) to 46.3 percent (Avon-Grove). Downingtown, Unionville-Chadds Ford, and Avon-Grove have projected growths in excess of 30 percent. Table 6 compares the updated population forecasts used in this study with the published *Landscapes* projections by planning area and for the county as a whole. In total, Chester County's 2020 population is now expected to increase over the *Landscapes* value by an additional 14.0 percent. However, by planning area the updated forecasts show a major shift from predominately rural areas (Avon-Grove, Owen J Roberts, and Oxford) to currently developed areas, especially Downingtown and West Chester in the US 30 corridor.

Employment across the region is expected to increase at a faster rate than population, reflecting a continuation of the current trend toward two-earner households. The regional increase from 1997 to 2020 is projected to be 14.3 percent. Because of the larger base in Pennsylvania, the absolute increase will be greater there. Pennsylvania county growth rates will range from 23.8 percent in Chester County, to 16.9 percent in Montgomery County, to 12.0 percent in Delaware County, down to 5.5 percent in the City of Philadelphia.

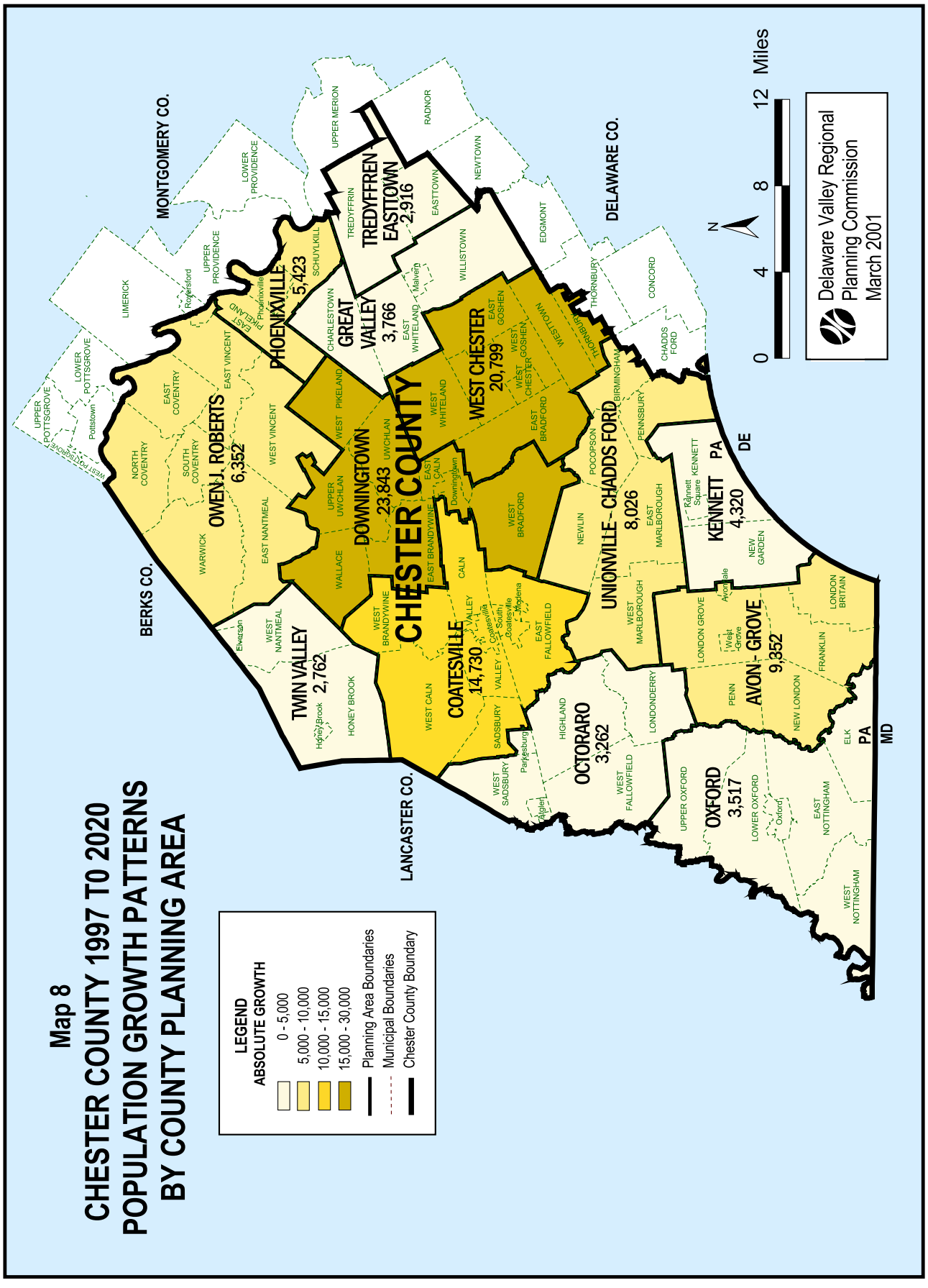
Within Chester County (see Table 5), the Downingtown Planning Area is projected to sustain the highest employment growth rate between 1997 and 2020 (39.6 percent) and Phoenixville the lowest (6.4 percent). Downingtown, Avon-Grove, and Octorara are all projected to grow by more than 30 percent, although Avon-Grove and Octorara are projected to grow by only 1,799 and 1,695 jobs respectively because of a relatively small employment base in 1997. In absolute terms, the largest employment growth is projected to occur in the West Chester Planning Area – 18,233 jobs. This represents over one-third of the total employment growth in Chester County.

The distribution of absolute population growth by planning area is shown in Map 8 and the corresponding distribution of absolute employment growth is displayed in Map 9. It is immediately apparent from both maps 8 and 9 that the majority of the population and especially the employment growth between 1997 and 2020 is projected to occur in the US 30/US 202 Expressway corridor - that is within the Tredyffrin-Easttown, Great Valley, West Chester, Downingtown and Coatesville Planning Areas. Within these five planning areas, over 60 percent of the additional population and 83 percent of the employment growth are concentrated. This growth clearly reflects the effect of the US 202 and Exton Bypass/US 30 expressways on Chester County land use patterns. However, population growth is more widely distributed than employment growth with significant amounts of population growth (more that 5,000 persons) also occurring in the Owen J. Roberts, Avon-Grove, and Unionville/Chadds Ford Planning Areas.

Table 6. Comparison of the Original and Revised *Landscapes* Population Forecasts.

Planning	Area	2020 Population		Difference	
		Original	Revised	Absolute	Percent
19	Great Valley	27,120	28,900	1,780	6.6%
20	Phoenixville	29,070	33,850	4,780	16.4%
21	Owen J. Roberts	38,460	36,150	-2,310	-6.0%
22	Dowingtown	67,100	79,300	12,200	18.2%
23	West Chester	98,170	110,400	12,230	12.5%
24	Kennett	20,410	22,700	2,290	11.2%
25	Coatsville	62,080	67,250	5,170	8.3%
26	Twin Valley	13,300	13,150	-150	-1.1%
27	Avon-Grove	34,390	29,550	-4,840	-14.1%
28	Octorara	14,860	15,200	340	2.3%
29	Oxford	22,610	21,600	-1,010	-4.5%
73	Tredyffrin-Easttown	39,710	42,550	2,840	7.2%
74	Unionville-Chadds Ford	22,020	26,500	4,480	20.3%
Total	**Chester County**	**462,180**	**527,100**	**64,920**	**14.0%**

Since household size has steadily declined over recent decades (a trend driven by diverse factors such as an increase in single-parent households and a longer-lived population who maintain independent households after their children leave home), the number of households increases faster than the population. Across the region, average household size (total population divided by occupied housing units) in 2020 is estimated to range from 2.57 in Philadelphia to 2.85 in Gloucester County. In 1980 the equivalent range was 2.72 to 3.06. Generally, urban areas and those with mature development have smaller households than high growth areas such as Chester County. In Chester County, the average household size has been declining slowly, from 3.02 to 2.78 between 1980 and 1997 and is projected to decline further to 2.74 by 2020.


Map 8
CHESTER COUNTY 1997 TO 2020
POPULATION GROWTH PATTERNS
BY COUNTY PLANNING AREA
LEGEND
ABSOLUTE GROWTH
0 - 5,000
5,000 - 10,000
10,000 - 15,000
15,000 - 30,000
Planning Area Boundaries
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
COATESVILLE 14,730
DOWNINGTOWN 23,843
KENNETT 4,320
OWEN J. ROBERTS 6,352
PHOENIXVILLE 5,423
TREDYFFRIN EASTTOWN 2,916
TWIN VALLEY 2,762
UNIONVILLE - CHADDS FORD 8,026
WEST CHESTER 20,799
AVON - GROVE 9,352
GREAT VALLEY 3,766
OCTORARO 3,262
OXFORD 3,517
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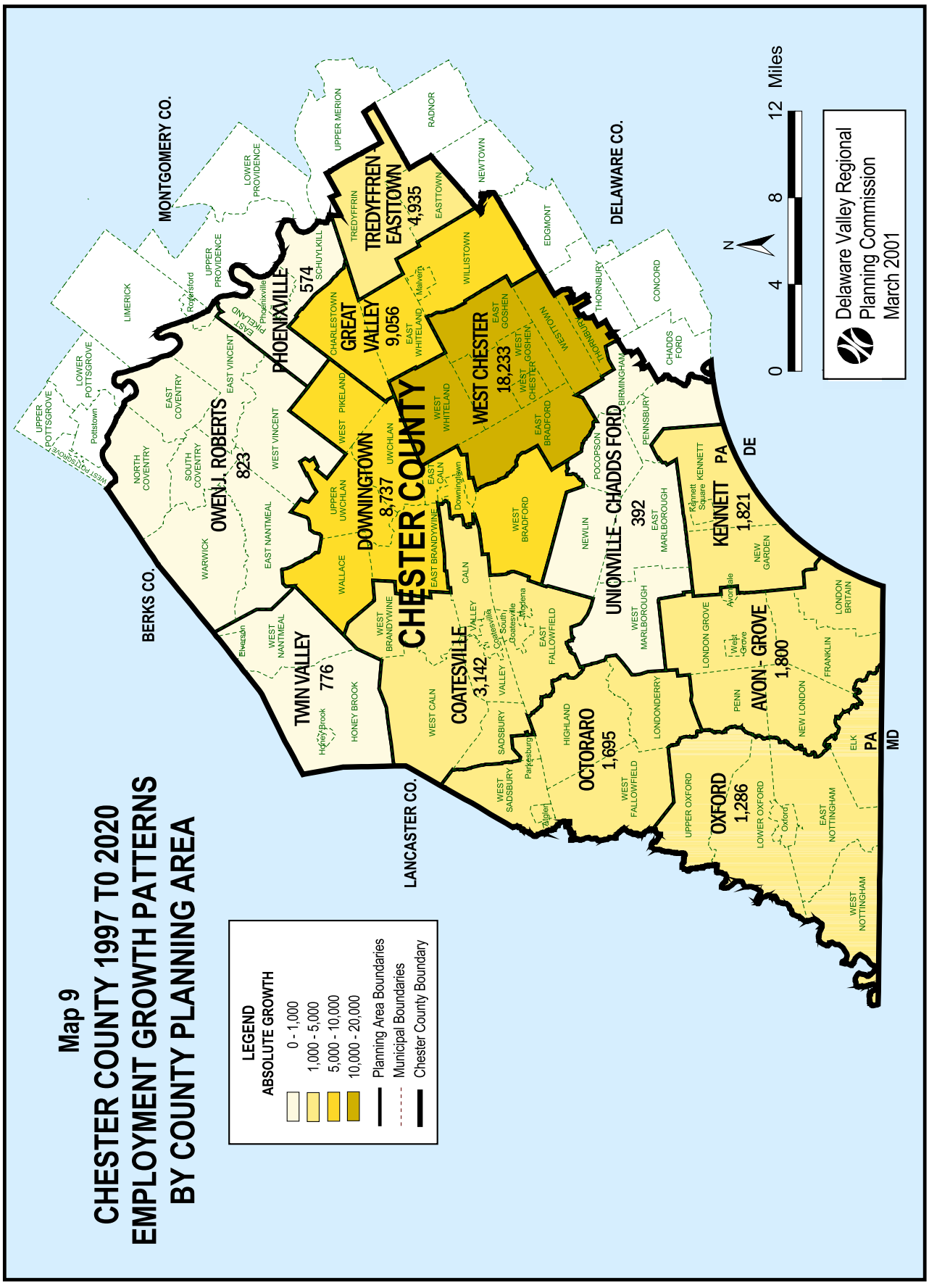
Delaware Valley Regional Planning Commission
March 2001


Map 9
CHESTER COUNTY 1997 T0 2020
EMPLOYMENT GROWTH PATTERNS
BY COUNTY PLANNING AREA
LEGEND
ABSOLUTE GROWTH
0 - 1,000
1,000 - 5,000
5,000 - 10,000
10,000 - 20,000
Planning Area Boundaries
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
WEST CHESTER 18,233
DOWNINGTOWN 8,737
GREAT VALLEY 9,056
TREDYFFRIN EASTTOWN 4,935
PHOENIXVILLE 574
OWEN J. ROBERTS 823
TWIN VALLEY 776
COATESVILLE 3,142
OCTORARO 1,695
AVON - GROVE 1,800
OXFORD 1,286
KENNETT 1,821
UNIONVILLE - CHADDS FORD 392
BERKS CO.
MONTGOMERY CO.
DELAWARE CO.
LANCASTER CO.
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Delaware Valley Regional
Planning Commission
March 2001

The number of vehicles used for personal transportation within the region is anticipated to grow by about 18 percent between 1997 and 2020, more than twice the rate of population growth. A vehicle for purposes of travel simulation modeling includes all motorized conveyance for personal transportation, autos as well as minivans and sport utility vehicles. In Chester County, the number of vehicles is projected to grow by 36 percent, a rate significantly higher than the population growth rate. In Chester County, the number of households without a automobile is projected to increase by 3 percent , and the 1-auto households by 6 percent. The number of two and three-plus auto households will increase significantly in absolute and percentage terms, reflecting the auto dependent status of Chester County's population. The number of Chester County 2-auto households is projected to increase by 23,575 or 32 percent over 1997. The three-plus auto household is projected to grow even faster in percentage terms (50 percent), although the absolute increase is smaller than the 2-auto group (15,946).

B. 2020 No-Build Transportation Networks

For 2020, a No-Build and two build alternative networks were prepared for the Chester County simulation study. The No-Build focused highway simulation network is similar to the 1997 base network, except that Chester County facilities programmed for construction in the 1999 DVRPC Transportation Improvement Program (TIP) were added. These facility improvements are listed in Table 7.

These improvements constitute intersection improvements and selective widenings. There are no new alignment facilities included in the 2020 No-Build highway network. The highway improvements included in the 2020 build scenarios tested in this study are much more extensive. The build scenarios are described in the next chapter of this report.

The 2020 No-Build transit networks were the same as the updated 1997 networks (see Map 6), because the 1999 TIP did not incorporate any new transit lines in Chester County. The 2020 build scenarios, however, did include major upgrades to the transit system in Chester County. These scenarios are described in detail in the following chapter. Network coding conventions and transit fare assumptions are documented in *1997 Travel Simulation*.

Table 7. Chester County Highway Improvements Included in the 2020 No-Build Highway Network.

TIP Number	Improvement Description
6530	Intersection improvement; PA 352 / Boot Road
6569	Intersection improvement; PA 352 / Chester Road
6594	Intersection improvement; US 30 / Waterloo Road
6624	Intersection improvement; PA 29 / Phoenixville Pike
6715	Intersection Improvement; US 30 / Downingtown Bypass
6732	Intersection Improvement; Business US 322 / Downingtown to West Chester Road
6779	Widen to 6 lanes; US 1 Baltimore Pike - Kennett Square Bypass to Bayard Road
6799	Widen to 6 lanes; US 202 Section 400
6805	Intersection improvement; PA 41 / PA 10
6807	Intersection improvement; PA 41 / Highland Road
6813	Intersection improvement; PA 41 / New Baltimore Pike
6909	Widen; PA 113 - Gordon Road to Davis Road
6915	Intersection Improvement; Paoli Pike/Five Points Road

C. Analysis of 2020 Travel Patterns Under the No-Build Scenario

For this study, the focused 2020 trip tables were prepared by running the Chester County model as calibrated with 1997 data, but using the 2020 socioeconomic projections and No-Build highway and transit networks described above. The resulting travel matrices include all travel patterns within Chester County and throughout the region. For instance, external-local trips from the US 202 and the PA Turnpike cordon stations to the PA 29 and King of Prussia areas are included, as is travel to and from all parts of Bucks, Chester, Delaware, and Montgomery counties; Philadelphia; and New Jersey via the Delaware River bridges.

1. 2020 Trip Generation Results

On an average day in 2020 about 502,000 two-way work trips (includes both home to work and work to home) will be produced by Chester County residents and 427,000 two-way work trips will be attracted to Chester County work places. This represents an increase over 1997 travel of 39.4 and 26.9 percent, respectively. In 2020, 1,230,000 daily two-way home based non-work trips (shopping, personal business, school, etc) will be produced by Chester County residents and 1,147,000 two-way trips of this type will be attracted to Chester County. Home based non-work productions and attractions are projected to increase by 31.3 and 24.2 percent, respectively. Chester County non-home based trip origins and destinations are each projected to total about 472,000 trips per day in 2020, a 25.9 percent increase over 1997.

In total, about 20.3 million person-trips are projected to be made within the Delaware Valley region on an average weekday in 2020. Of these, 4.9 million will be home based work trips. Total trip making is projected to increase by 2.8 million trips (16 percent) over the 23-year period between 1997 and 2020.

A growth factor was prepared for each external station, based on anticipated growth in travel across the cordon line. This factor was prepared by establishing growth trends for each station based on 1975, 1980, 1985, 1990, and 1995 traffic counts. The trends implicit in these counts were then extrapolated to 2020. The current (1997) and projected (2020) cordon station vehicular traffic totals for Chester County Cordon stations are presented in Table 8. A complete listing of the projections for of the nine county region's cordon stations is given in the appendix. See Appendix A Table A-6 for a correspondence between cordon centroid number and location. Chester County cordon traffic is expected to grow to 327,000 daily trips, which is 74 percent higher than that measured in 1997. Cordon traffic represents the fastest growing component in the simulation model because of rapid development in adjacent areas both inside and outside of the nine county regional cordon line. Regional light and heavy truck traffic is projected to grow by about 16 percent.

Table 8. Chester County Current and Forecast Trip Ends by Cordon Station.

Cordon Station	Trip Ends 1997	Trip Ends 2020	Growth Absolute	Growth Percent
1500	2,179	3,800	1,621	74.4%
1501	11,126	16,000	4,874	43.8%
1502	2,007	3,500	1,493	74.4%
1503	838	2,600	1,762	210.3%
1504	12,317	22,500	10,183	82.7%
1505	12,137	17,500	5,363	44.2%
1506	1,500	1,800	300	20.0%
1507	6,789	12,200	5,411	79.7%
1508	3,129	5,200	2,071	66.2%
1509	6,230	9,600	3,370	54.1%
1510	7,728	14,000	6,272	81.2%
1511	4,473	7,400	2,927	65.4%
1512	783	1,900	1,117	142.7%
1513	4,596	7,800	3,204	69.7%
1514	2,087	4,100	2,013	96.5%
1515	867	1,301	434	50.1%
1516	2,577	5,800	3,223	125.1%
1517	16,351	25,000	8,649	52.9%
1518	16,276	28,000	11,724	72.0%
1519	3,778	7,400	3,622	95.9%
1520	764	2,300	1,536	201.0%
1521	930	1,489	559	60.1%
1522	7,698	16,400	8,702	113.0%
1523	7,691	15,800	8,109	105.4%
1524	35,050	59,000	23,950	68.3%
1525	8,643	15,000	6,357	73.6%
1526	938	2,700	1,762	187.8%
1527	1,510	3,500	1,990	131.8%
1528	875	2,800	1,925	220.0%
1529	5,792	10,400	4,608	79.6%
Total	**187,659**	**326,790**	**139,131**	**74.1%**

2. 2020 Modal Split Results

Chester County transit ridership, under the No-Build Scenario, is projected to increase in both absolute and percentage terms. However, the No-Build transit system is projected to serve only a very small percentage of the travel needs of Chester County residents (productions) and/or persons who commute to or travel to the County for other purposes (attractions). Table 9 presents the number and percentage of transit trips associated with Chester County productions and attractions for work and total travel. Chester County transit work trip productions are projected to increase significantly from 6,800 daily trips in 1997 to 9,600 daily trips in 2020; however, the 2020 ridership still constitutes less than two percent of all commuting trips. The corresponding ridership for total trips is 8,900 daily trips in 1997 and 12,500 daily trips in 2020. This 2020 ridership constitutes only about 0.6 percent of total trip productions in the county.

Table 9. 1997 and 2020 Chester County Transit Trips.

Transit Trips	1997	2020 No-Build
Productions		
Home Based Work Transit Trips	6,800	9,600
Percent Transit	1.7%	1.9%
All Transit Trips	8,900	12,500
Percent Transit	0.5%	0.6%
Attractions		
Home Based Work Transit Trips	2,700	4,800
Percent Transit	0.9%	1.1%
All Transit Trips	3,800	6,800
Percent Transit	0.2%	0.3%

Table 9 also presents Chester County's existing and projected 2020 ridership for trip attractions. Transit ridership for trip attractions is only about one-half of the riding for trip productions. This smaller ridership reflects the difficulty in getting from the egress station to the final destination in low density areas dependent upon auto approach. Trip productions are based at the home end of the trip where the auto used for the approach is garaged. The attractions or non-home end of the trip do not have an auto available to complete the trip and are therefore dependent on walking or surface transit to complete the trip to the final destination. The low development densities characteristic of Chester County's predominately suburban and rural land use patterns make the trip attractions more difficult to serve by transit and therefore fewer in number. Currently, transit

attractions number about 2,700 daily trips. Under the 2020 No-Build Scenario, these trips are projected to increase to about 4,800 daily transit riders. Although this growth seems to be a significant increase over 1997 riding, it constitutes only about a 0.1 percent increase in transit's share of Chester County travel. In 2020, about 1.1 percent of work trip and 0.3 percent of total trip attractions are made by transit.

For the region as a whole, work trip transit riding is projected to increase slightly under the No-Build Scenario in absolute value (454,400 versus trips 444,900), but decline in percentage terms from 10.4 to 9.3 percent of work person trips because of continuing decentralization. For all purposes combined, however, transit's share of person travel will continue to decline in both absolute and percentage terms (746,900 to 737,600 trips and 4.3 to 3.6 percent). This trend occurs primarily as a result of projected growth in residential and commercial activity in suburban and rural areas unserved by transit. Most of the increase in person trip demand will be accommodated by private automobiles.

The average automobile moving on the Chester County's highways is projected to carry 1.39 persons. Residents are most likely to drive alone when traveling to or from work, averaging an occupancy of only 1.12, and least likely when traveling between home and non-work destinations, when the occupancy is 1.53. For this reason, auto occupancy is somewhat higher in the off-peak than during the peak periods of the day.

Total vehicle trips made for personal transportation internal to the region are expected to increase to approximately 14 million trips per weekday in the year 2020, a 17 percent increase over 1997. In 2020, some 1.5 million daily vehicle trips are projected to occur within Chester County a 32 percent increase over 1997. Currently, commutation accounts for 24.2 percent of weekday automobile trips. This fraction may increase slightly as the number of non-workers per household declines, which will push more non-work trips to weekends. All trip categories are expected to increase, but the larger increases will be found in the home based work and non-home based categories. Including all vehicle types and trip categories -- truck, taxi, external-local, and trips made through the region as well as internal automobile trips -- the 1997 highway loading matrix contained some 15,099,241 daily vehicle trips; 5,370,463 occurring during peak periods and 9,728,778 during off-peak time periods. In 2020, the total number of daily vehicle trips is projected to increase to 17,996,587, a 19.2 percent increase. Of these, some 2 million trips are projected to originate within Chester County. The proportions of 2020 peak and off-peak vehicle trips are projected to remain about constant from 1997 levels.

3. County-Wide Highway Assignment Results

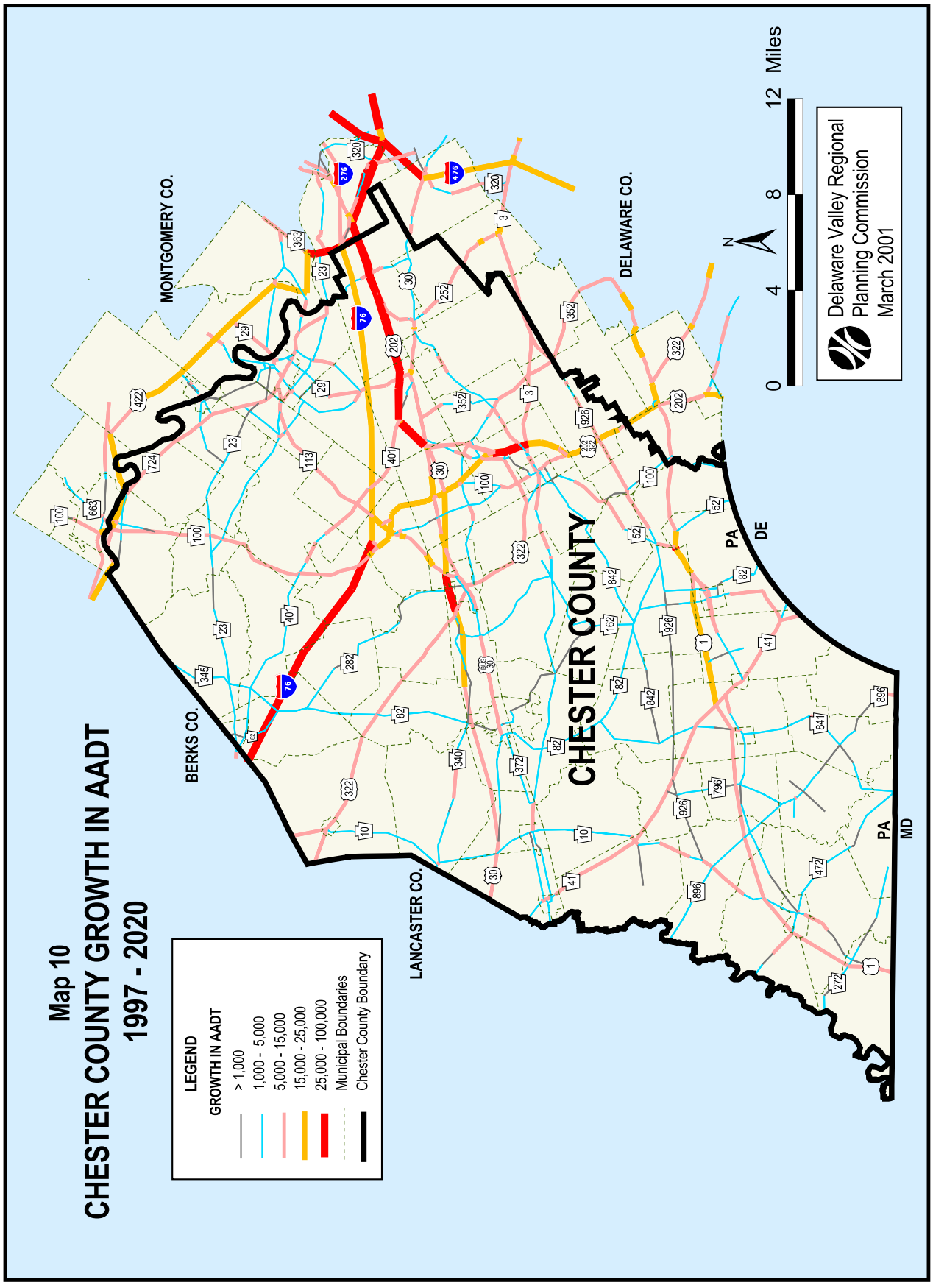
The absolute growth in highway traffic volumes for the principle highway facilities serving Chester County is shown in Map 10. The associated increase in the projected congestion levels is shown by a comparison of Maps 11 and 12. Map 11 shows congestion levels for the 1997 calibration year, while Map 12 shows the same information for the 2020 No-Build Scenario. The magnitude of traffic growth varies significantly from roadway to roadway, but in general the largest overall

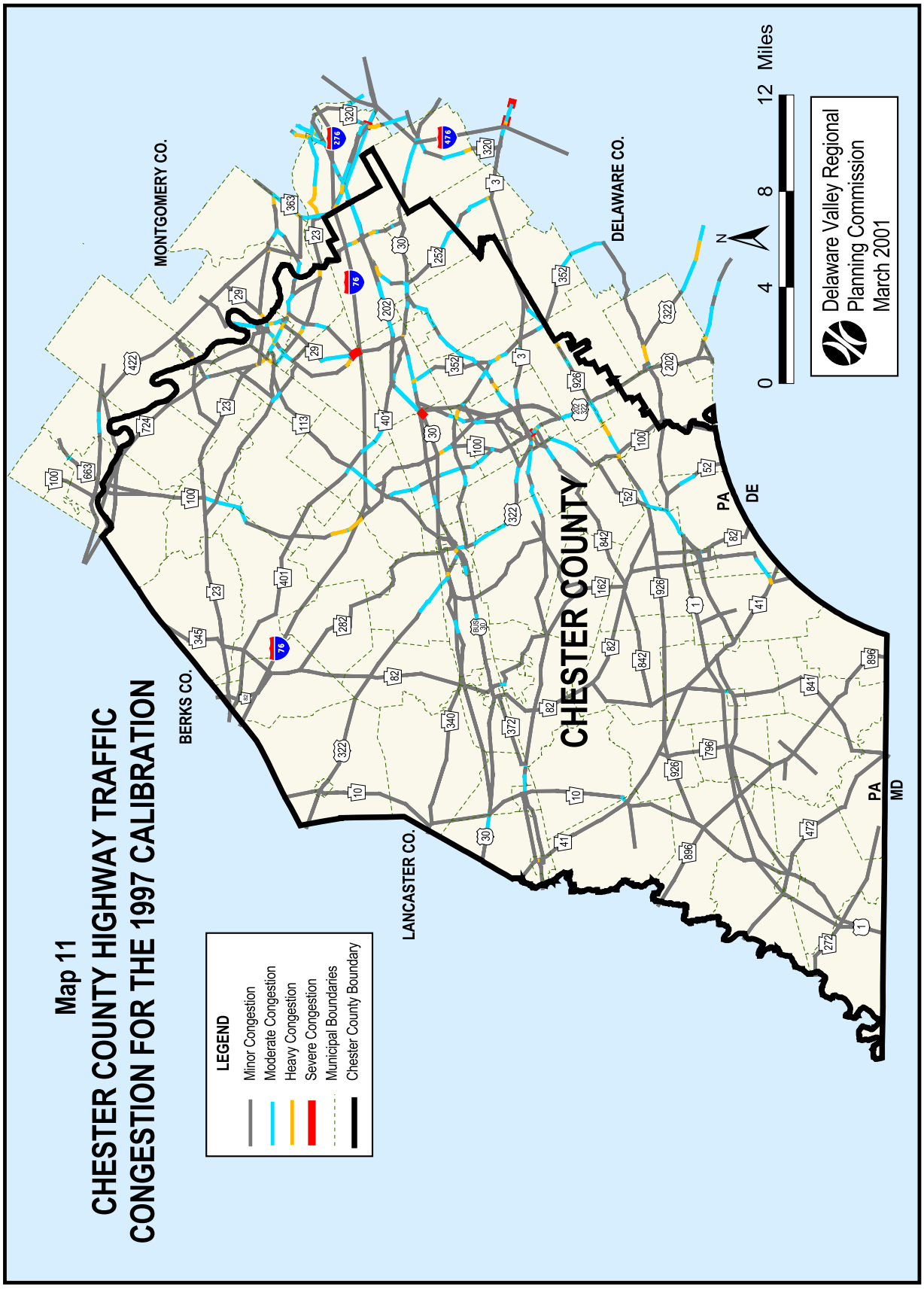
traffic growth is found on the Expressway system serving the County - Pennsylvania Turnpike (I-76), US 202, US 30, and US 1.

Table 10 compares the projected 2020 highway vehicular travel under the No-Build Scenario with the corresponding results from the 1997 calibration. Projected traffic growth is very substantial throughout Chester County. In general, the pattern of vehicular miles of travel (VMT) growth by planning areas follow the distribution of population and employment growth under the *Landscapes* plan. The highest growth in absolute terms is concentrated in the US 30 corridor - West Chester (additional 855,200 daily VMT), Downingtown (873,400 VMT), and Coatesville (492,600). High growth in absolute terms is also expected in the US 202 Corridor - Great Valley (550,300 daily VMT) and Tredyffrin/Easttown (439,000 daily VMT). In percentage terms, Twin Valley (74.5 percent), Oxford (59.0 percent), Octorara (58.1 percent) and Avon-Grove (56.8 percent) have the highest growth rates, although the absolute growth in VMT is less significant because of a small 1997 base VMT. Overall, Chester County's daily VMT total is projected to increase by more than 5.2 million vehicular miles, a more than 48 percent increase over 1997.

The increase in simulation model highway network capacity utilization (which functions as a composite traffic congestion index) between 1997 and 2020 under the No-Build Scenario is shown by planning areas in Table 11. In the most general sense, the increase in the fraction of capacity utilized does follow the increase in VMT, however, exceptions exist depending on the amount of base year roadway capacity. For instance, the highest increase in capacity utilization occurs in the Phoenixville Planning Area despite the fact that the lowest absolute increase in VMT occurs in this area. This apparent anomaly resulted from Phoenixville's relative small size and relatively small total of available capacity miles. In total, the Chester County highway capacity utilization is expected to increase from 0.43 to 0.62 under the 2020 no-build highway scenario.

This increase in capacity utilization results in a reduction in average PM peak hour highway operating speed, but not by as much as the capacity utilization increase (see Table 12). The average operating speed decline by planning area ranges from 0.1 mph (3 percent) in the Oxford Planning area to 3.5 mph in the West Chester Planning Area (11.4 percent). Overall, average Chester County speeds were reduced by 2.2 mph (7.1 percent) – about average for the Pennsylvania portion of the DVRPC region. It should be emphasized that these speed decreases represent averages (using link VMT as a weight) over all of the freeway, arterial, collector, and local highway facilities within Chester County. Speed decreases on some individual freeway segments and interchanges and at congested arterial intersections will be far more than what is indicated in the average PM peak hour speeds. The highway assignment procedure identifies the highway facilities that will experience high levels of traffic growth. The projected volume to capacity ratios for these facilities gives insight into probable congestion levels and the need for facility improvements. These congestion level increases on individual highway facilities are analyzed in Section D of this chapter.


Map 10
CHESTER COUNTY GROWTH IN AADT
1997 - 2020
LEGEND
GROWTH IN AADT
> 1,000
1,000 - 5,000
5,000 - 15,000
15,000 - 25,000
25,000 - 100,000
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
BERKS CO.
MONTGOMERY CO.
DELAWARE CO.
LANCASTER CO.
PA
DE
PA
MD
N
0 4 8 12 Miles
Delaware Valley Regional Planning Commission
March 2001


Map 11
CHESTER COUNTY HIGHWAY TRAFFIC
CONGESTION FOR THE 1997 CALIBRATION
LEGEND
Minor Congestion
Moderate Congestion
Heavy Congestion
Severe Congestion
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
PA
DE
PA
MD
0 4 8 12 Miles
N
Delaware Valley Regional
Planning Commission
March 2001

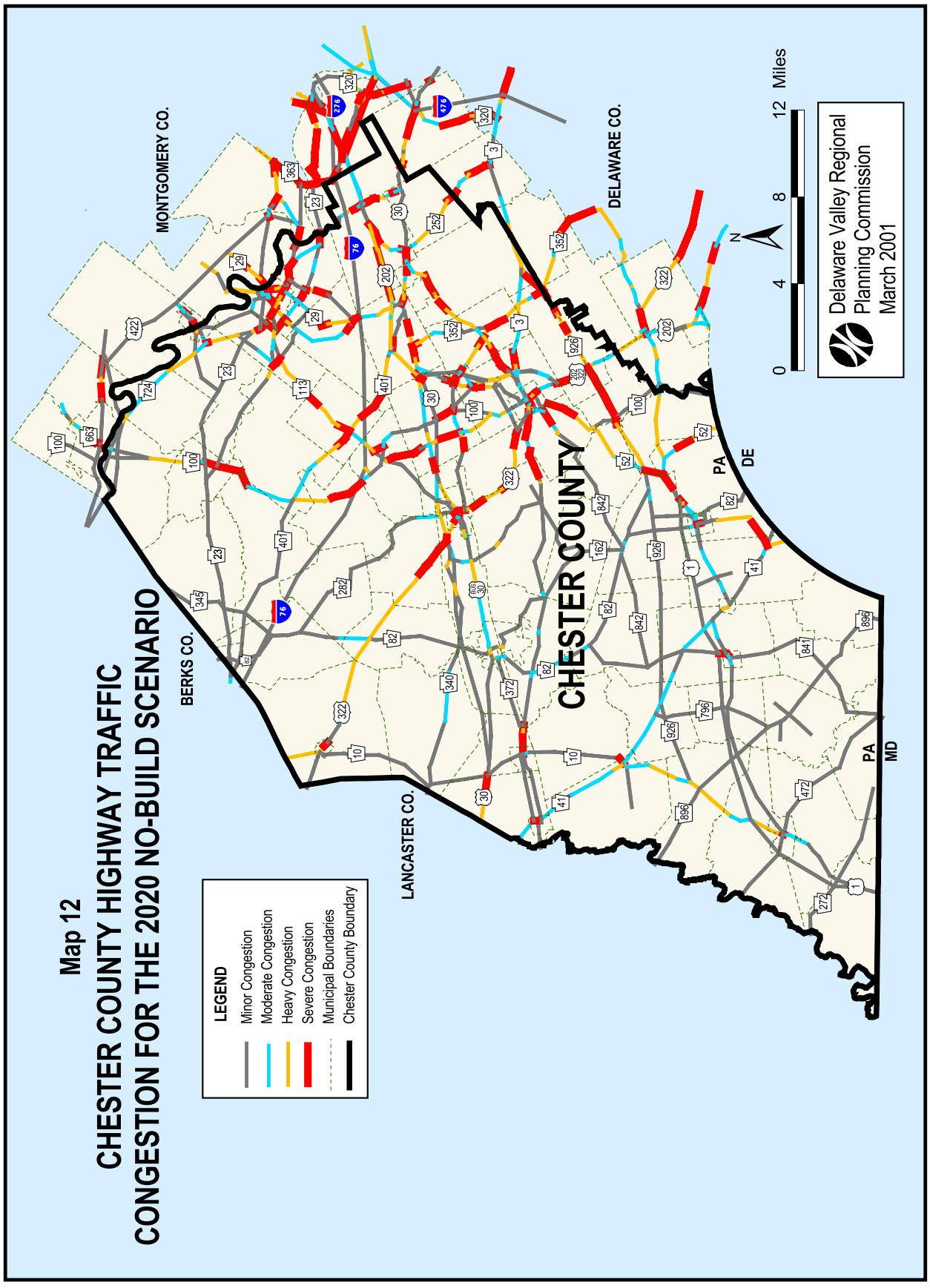

Map 12
CHESTER COUNTY HIGHWAY TRAFFIC
CONGESTION FOR THE 2020 NO-BUILD SCENARIO
LEGEND
Minor Congestion
Moderate Congestion
Heavy Congestion
Severe Congestion
Municipal Boundaries
Chester County Boundary
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
CHESTER COUNTY
PA
DE
PA
MD
N
0
4
8
12 Miles
Delaware Valley Regional
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Table 10. Traffic Volume (VMT) Growth Under the No-Build Scenario.

		VMT		1997 - 2020 Growth	
Planning	Area	1997 (000s)	2020 (000s)	(000s)	Percent
19	Great Valley	1,282	1,832	550	42.9%
20	Phoenixville	425	583	158	37.3%
21	Owen J. Roberts	758	1,148	391	51.6%
22	Dowingtown	1,615	2,489	873	54.1%
23	West Chester	1,979	2,834	855	43.2%
24	Kennett	466	695	228	49.0%
25	Coatsville	1,002	1,494	493	49.2%
26	Twin Valley	417	728	311	74.5%
27	Avon-Grove	455	714	259	56.8%
28	Octorara	360	569	209	58.1%
29	Oxford	309	492	182	59.0%
73	Tredyffrin-Easttown	1,181	1,620	439	37.2%
74	Unionville-Chadds Ford	608	876	268	44.1%
Total	**Chester County**	**10,856**	**16,074**	**5,217**	**48.1%**

Table 11. Capacity Utilization Projection Under the No-Build Scenario.

		Fraction Utilized		1997 - 2020	
Planning	Area	1997	2020	Increase	Percent
19	Great Valley	0.56	0.78	0.22	39.3%
20	Phoenixville	0.63	0.89	0.26	41.3%
21	Owen J. Roberts	0.33	0.49	0.16	48.5%
22	Dowingtown	0.48	0.71	0.23	47.9%
23	West Chester	0.53	0.75	0.22	41.5%
24	Kennett	0.39	0.58	0.19	48.7%
25	Coatsville	0.36	0.53	0.17	47.2%
26	Twin Valley	0.35	0.60	0.25	71.4%
27	Avon-Grove	0.25	0.40	0.15	60.0%
28	Octorara	0.34	0.53	0.19	55.9%
29	Oxford	0.18	0.27	0.09	50.0%
73	Tredyffrin-Easttown	0.62	0.79	0.17	27.4%
74	Unionville-Chadds Ford	0.46	0.65	0.22	47.8%
Total	**Chester County**	**0.43**	**0.62**	**0.22**	**51.2%**

Table 12. Average PM Peak Hour Highway Speed Under the No-Build Scenario.

Planning	Area	Speed (mph) 1997	2020	1997 - 2020 Difference	Percent
19	Great Valley	30.9	28.5	-2.4	-7.8%
20	Phoenixville	24.3	21.4	-2.9	-11.9%
21	Owen J. Roberts	31.6	30.7	-0.9	-2.8%
22	Dowingtown	33.9	31.0	-2.9	-8.6%
23	West Chester	30.7	27.2	-3.5	-11.4%
24	Kennett	30.5	28.8	-1.7	-5.6%
25	Coatsville	31.6	30.6	-1.0	-3.2%
26	Twin Valley	36.0	33.7	-2.3	-6.4%
27	Avon-Grove	33.2	32.3	-0.9	-2.7%
28	Octorara	30.7	28.8	-1.9	-6.2%
29	Oxford	31.1	31.0	-0.1	-0.3%
73	Tredyffrin-Easttown	29.5	27.2	-2.3	-7.8%
74	Unionville-Chadds Ford	29.1	26.4	-2.7	-9.3%
Total	**Chester County**	**31.0**	**28.8**	**-2.2**	**-7.1%**

Table 13 presents the 1997 to 2020 No-Build average daily speed declines by planning area. The average daily speed differences between current and 2020 No-Build are much less than for the PM Peak Hour. This is because traffic volumes occurring during off peak and especially evening/night hours are less intense and therefore hourly volumes are a smaller percentage of the roadway capacity. In general, highway links during off peak hours can absorb larger traffic increases without producing congestion, and conversely show less improvement from additional capacity. This increase in capacity utilization results in a reduction in average highway operating speed, but not by as much as the capacity utilization increase. The average operating speed decline by planning area ranges from 0.1 mph (3 percent) in the Owen J. Roberts Planning Area to 1.6 mph (5.1 percent) in the West Chester Planning Area. Overall, average Chester County speeds were reduced by 0.7 mph (2.2 percent), about average for the Pennsylvania counties in the DVRPC region.

Table 13. Average Daily Highway Speed Under the No-Build Scenario.

Planning	Area	Speed (mph) 1997	2020	1997 - 2020 Difference	Percent
19	Great Valley	31.7	31.0	-0.7	-2.2%
20	Phoenixville	25.1	24.2	-0.9	-3.6%
21	Owen J. Roberts	32.0	31.9	-0.1	-0.3%
22	Dowingtown	34.6	33.7	-0.9	-2.6%
23	West Chester	31.5	29.9	-1.6	-5.1%
24	Kennett	31.0	30.4	-0.6	-1.9%
25	Coatsville	32.1	31.8	-0.3	-0.9%
26	Twin Valley	36.4	35.0	-1.4	-3.8%
27	Avon-Grove	33.6	33.1	-0.5	-1.5%
28	Octorara	31.1	30.3	-0.8	-2.6%
29	Oxford	31.4	31.7	0.3	1.0%
73	Tredyffrin-Easttown	30.6	30.3	-0.3	-1.0%
74	Unionville-Chadds Ford	29.7	28.6	-1.1	-3.7%
Total	**Chester County**	**31.7**	**31.0**	**-0.7**	**-2.2%**

The projected Chester County VMT increases and speed reductions impact air quality through the mobile source emissions generated by vehicular travel. Table 14 presents estimates of carbon monoxide (CO), hydro carbons (HC), and nitrous oxides (NO_x) based on the 1997 calibration and the 2020 no-build travel simulation runs. By 2020, significant reductions in mobile source pollution are projected despite the VMT increases. These reductions result primarily from fleet turnover and continued improvements in motor vehicle design that are mandated in by the US EPA. The county-wide reductions range from 16.9 percent for CO to 28.7 percent for HC and 25.3 percent for NO_x. Chester County reductions are less than average for the Pennsylvania counties primarily because Chester County currently has relatively good operating speeds and therefore air quality is less elastic with regard to emissions than more congested areas within the DVRPC region.

Table 14. 2020 No-Build Scenario Mobile Source Emissions.

	Metric Tons per Day		Reduction	
Pollutant	1997	2020	Absolute	Percent
CO	90.4	75.1	15.3	16.9%
HC	14.3	10.2	4.1	28.7%
NO_x	22.1	16.5	5.6	25.3%

Although the average reduction in Chester County operating speeds is relatively small (up to 3.5 mph), congestion at existing bottlenecks and on specific highway facilities increases significantly under the No-Build Scenario as a result of the population and employment growths included in the *Landscapes* Plan. These impacts on congested corridors are discussed in Section D.

4. County-Wide Transit Ridership Growth Under the 2020 No-Build Scenario

No new bus routes or other service improvements were included in the No-Build transit scenarios. However, continued county-wide development under the *Landscapes* Plan increased ridership in 2020 on existing SEPTA bus lines by 14 percent. Rail ridership in 2020 on SEPTA's R5 line under the No-Build Scenario increased by 5,281 boardings (43 percent) over current counts. This increase in commuter rail riding tended to be located on the western portions of the existing R5 line in response to planned development activity. In total, Chester County transit boardings under the No-Build Scenario increased by 8,371 boardings over the 1997 calibration results.

D. Analysis and Description of Congested Corridors Under the No-Build Scenario

This section of this report describes the predicted traffic volumes and congestion levels for the No-Build Scenario at a finer level of detail by examining significant corridors and problem areas. The 2020 forecasts discussed in this report should be used for planning purposes only. DVRPC, in conjunction with Chester County, identified six corridors and three general study areas for more detailed examination of the No-Build simulation results. These areas and corridors are listed below and shown in Map 13.

1 - PA 100 Corridor Study, US 422 to PA 100 Connector
2 - US 322 Corridor Study, PA 10 to PA 100
3 - US 1 Corridor Study, PA 82 to US 202
4 - US 202 Corridor Study, Delaware State Line to US 422
5 - Phoenixville Area Transportation Study
6 - Downingtown Area Transportation Study
7 - PA 41 Corridor Study, Delaware State Line to Lancaster County Line
8 - PA 113 Corridor Study, US 30 to PA 23
9 - West Chester Area Transportation Study


Map 13
CHESTER COUNTY HIGHWAY CORRIDORS
AND DETAILED STUDY AREAS INDEX
CHESTER COUNTY
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
PA
DE
MD
PHOENIXVILLE AREA
DOWNINGTOWN AREA
WEST CHESTER AREA
PA 100 CORRIDOR
PA 113 CORRIDOR
US 322 CORRIDOR
US 202 CORRIDOR
US 1 CORRIDOR
PA 41 CORRIDOR
0 4 8 12 Miles
N
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All the corridors and areas indicated are projected to experience substantial traffic growth with heavy to severe congestion for several miles.

Travel volumes for the transportation alternatives were projected, with the *Landscapes* land use plan assumed for each scenario. First is a No-Build Scenario that assumes no additional transportation facilities beyond those currently existing plus committed construction projects. Results from this exercise are discussed as a baseline to measure the build scenarios, and as a means to measure likely conditions in the absence of new construction or other highway capacity increases.

Two build alternatives were developed and tested for both highway and transit: Scenario 1 with moderate improvements, and Scenario 2 with extensive improvements. Results from testing of both these scenarios are examined and analyzed in Chapter IV, with an emphasis on changes to highway congestion and travel patterns. The discussion that follows compares current traffic volumes with the results for the No-Build Scenario.

Within these corridors and areas, DVRPC focused on the volume to capacity ratio (V/C) as a measure of highway congestion. This ratio was calculated using simulated volumes and capacity based on functional class (freeway, primary arterial, etc.) and area type (urban, suburban, rural, etc.). This calculation in no way substitutes for a traditional operational analysis but does provide an excellent starting point for determining problem locations. Congestion levels were categorized by the V/C ratio. Categories included minor congestion (V/C < 0.8), moderate congestion (0.8-1.0), heavy congestion (1.0-1.2), and severe congestion (> 1.2). In addition, current traffic counts and predicted volumes are shown for selected locations. These volumes are adjusted from the future raw simulation value by either the absolute or percent deviation of the base year simulated volume from the actual count. Individual counts and predicted volumes, where discussed represent preliminary estimates. These projections assume implementation of the *Landscapes* plan and the No-Build Scenario. As such they may not be comparable with prior DVRPC projections or the results of traffic analyses conducted in the future. Additionally, the level of analysis yielding these forecasts is not at the level of detail commensurate with a design data traffic study. Therefore, 2020 forecasts discussed in this report are intended only for use in general planning applications and do not represent specific recommendations.

1. PA 100 Corridor Study - US 422 to PA 100 Connector

Pennsylvania Route 100 (PA 100) is the primary route between Pottstown and West Chester. The corridor as defined for this study begins at US 422 south of Pottstown and ends at the junction of PA 100 and PA 100 Connector, north of West Chester. Figure 1 shows No-Build congestion levels and selected current and No-Build traffic volumes for this corridor. Study area municipalities include North Coventry, South Coventry, West Vincent, East Nantmeal, Upper Uwchlan, Uwchlan, and West Whiteland townships. The northern approach to the study corridor is the PA 100 Bypass, a four lane freeway to the west of Pottstown. This road narrows to a two lane controlled access arterial south of US 422. Significant intersections include PA 724, Cedarville Road and Hanover

Street. South of Hanover Street to the intersection of PA 23, Route 100 is two lanes with shoulders and a continuous left turn lane. There is extensive roadside development in this area. The next major highway after PA 23 is PA 401. Between these roads, PA 100 is a two lane rural arterial with multiple steep grades, several climbing lanes, and a winding alignment. From PA 401 to the Pennsylvania Turnpike underpass, Route 100 continues as a two lane road with shoulders. The geometric alignment is favorable, following the rolling hills. In this segment, there is much new development, particularly south of the village of Eagle. The intersection of the Pennsylvania Turnpike and PA 100 is the only turnpike exit within Chester County. From the Pennsylvania Turnpike to the Exton Bypass (US 30), the roadway is a four to six lane divided highway with excellent geometric characteristics. Primary cross streets include PA 113, and US 30 Business. Whitford Road and Grove Road serve as a parallel route. This area is experiencing substantial growth and is emerging as a new suburban employment center, with employment substantially exceeding the population in West Whiteland and Uwchlan townships. South of the Exton Bypass, PA 100 splits into two routes. This junction is the southern limit for the study. PA 100 Connector branches to the east as a four lane freeway until merging with US 202 north of West Chester. PA 100 continues south as a two and three lane road with shoulders.

This corridor will grow in population and employment throughout, with the highest increases experienced in West Whiteland, Upper Uwchlan, and Uwchlan townships. Corridor, population under *Landscapes* is projected to rise by 57 percent from 1997 to 2020, reaching 80,000. Employment is projected to increase by 52 percent from 1997 to 2020, reaching 49,000.

Landscapes calls for suburban development throughout the southern and northern portions of the study corridor. Suburban centers, already developing, are designated for portions of Upper Uwchlan, Uwchlan, and West Whiteland townships. The middle portion of the corridor (West Vincent and East Nantmeal townships) is designated rural or natural, with the exception of two rural centers at Ludwig's Corner and Bucktown.

Beginning at US 422, volumes are projected to exceed capacity from the Pottstown Bypass south to the village of Eagle. Projected congestion levels will be most acute in North Coventry and South Coventry townships. Overall traffic will increase though these areas from approximately 19,000 vehicles per day (vpd) in 1997 to 27,800 vpd in 2020. Through West Vincent Township, Barlett Lane serves as an alternate route decreasing demand on PA 100. In West Vincent and Upper Uwchlan townships, current volumes range from 10,700 to 14,000 vpd, with simulated volumes rising an additional 4,000 to 5,000 vpd. From the village of Eagle to the Pennsylvania Turnpike, traffic volume will increase to a level indicating severe congestion. From the Pennsylvania Turnpike to Lincoln Highway (US 30 Business), volumes approach capacity, increasing from 36,300 to 55,900 vpd . South of Lincoln Highway, the current configuration is a four lane cross-section with heavy congestion. Projected volumes will approach 70,000 vpd south of Exton Bypass, a growth of 21,000 vpd over 1997 conditions. This volume is indicative of severe congestion, which will be most acute at the intersection of PA 100 and US 30 Bypass. Route 100 Connector, the southern terminus of the study area, will carry most traffic south of the Exton Bypass.

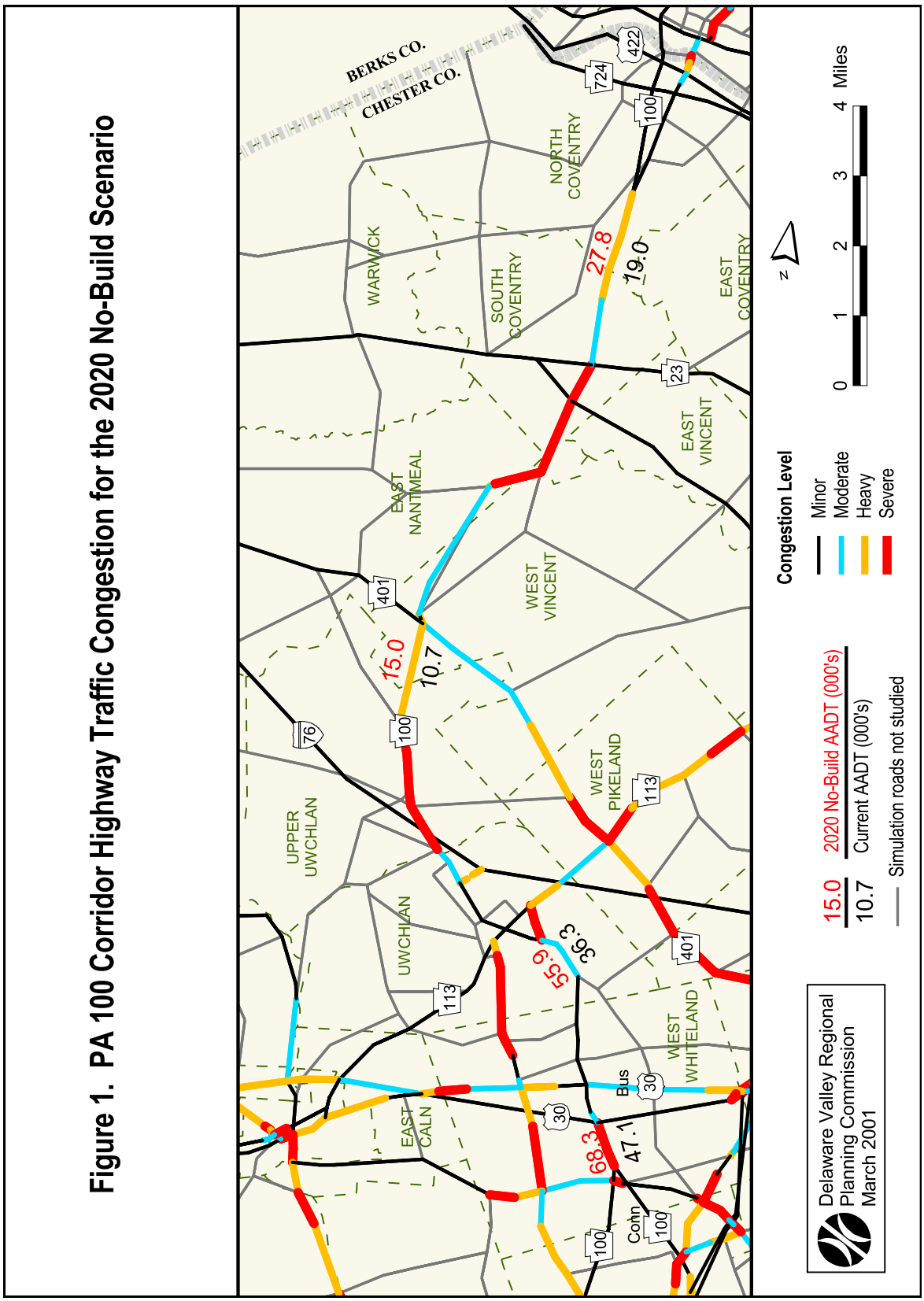
Figure 1. PA 100 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
BERKS CO.
CHESTER CO.
WARWICK
SOUTH COVENTRY
NORTH COVENTRY
EAST COVENTRY
EAST NANTMEAL
WEST VINCENT
EAST VINCENT
UPPER UWCHLAN
UWCHLAN
WEST PIKELAND
WEST WHITELAND
EAST CALN
Conn
Bus
15.0
10.7
27.8
19.0
55.9
36.3
68.3
47.1
76
100
401
113
30
23
724
422
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 3 4 Miles
N
15.0 2020 No-Build AADT (000's)
10.7 Current AADT (000's)
Simulation roads not studied
Delaware Valley Regional Planning Commission
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2. US 322 Corridor Study - PA 10 to PA 100

The US 322 corridor begins in the Borough of Honey Brook, and then proceeds southeast towards Downingtown and West Chester boroughs. This road is officially designated east-west. Figure 2 shows the entire study corridor. Study area municipalities include from west to east: the Borough and Township of Honey Brook; West Brandywine, East Brandywine, and Caln townships; Downingtown Borough; and East Caln, West Bradford and East Bradford townships.

East of Honey Brook Borough to Downingtown Borough, US 322 is a wide two lane road with occasional left turn lanes. The northern portion of this alignment is characterized by rolling hills with minimal development. Development pressures are highest in Caln and East Brandywine townships, because of their proximity to US 30 and employment centers. Major intersecting roads in this corridor include, from west to east: PA 10, Cambridge Road, PA 82, Bondsville Road, Edge's Mill Road, and US 30. The intersection of US 30, the Downingtown Bypass, and US 322 is a partial cloverleaf and represents the most significant traffic interchange in this corridor. A continuous left turn lane is provided for two miles west of this intersection. PA 282, a winding road following the Brandywine Creek, provides the only substantial alternate route in the corridor.

Within the Borough of Downingtown, US 322 is a narrow two lane urban arterial with some on street parking on either side, and no access controls. This configuration substantially limits capacity. In downtown Downingtown, US 322 briefly joins US 30 Business over the Brandywine Creek, forming a dogleg. Important intersections include Pennsylvania Avenue, US 30 Business, and Boot Road.

East of Downingtown, US 322 parallels the Brandywine Creek. In this section, there are generous shoulders, few driveways, and no signalized intersections. This allows maximum capacity for a two lane cross-section. Approaching West Goshen, 7 miles from Downingtown, US 322 splits into US 322 Bypass and US 322 Business. US 322 Bypass veers east to US 202 as a two lane road with substantial access control. US 322 Business continues as an urban arterial to downtown West Chester. Alternate routes include the combination of US 30 and PA 100 Connector, as well as Marshallton Road.

Population and employment are anticipated to rise throughout the US 322 corridor. Population is projected to increase from 63,000 to 89,000, and employment to increase by 12,000 jobs to 37,000. *Landscapes* designates the areas surrounding the boroughs of Downingtown and Honey Brook as urban. Additional areas to be urbanized include that portion of East Bradford closest to West Chester. Rural centers are projected for Rockville and Guthriesville. The remainder of the corridor is rural, with substantial portions designated as natural along the various branches of the Brandywine Creek.

Current volumes range from 9,600 vpd in Honey Brook rising to 14,900 vpd approaching US 30 from the west. Through Downingtown, volumes range from 11,000 to 14,000 vpd. Approaching US 322 Bypass in West Chester, current volumes are about 15,000 vpd.

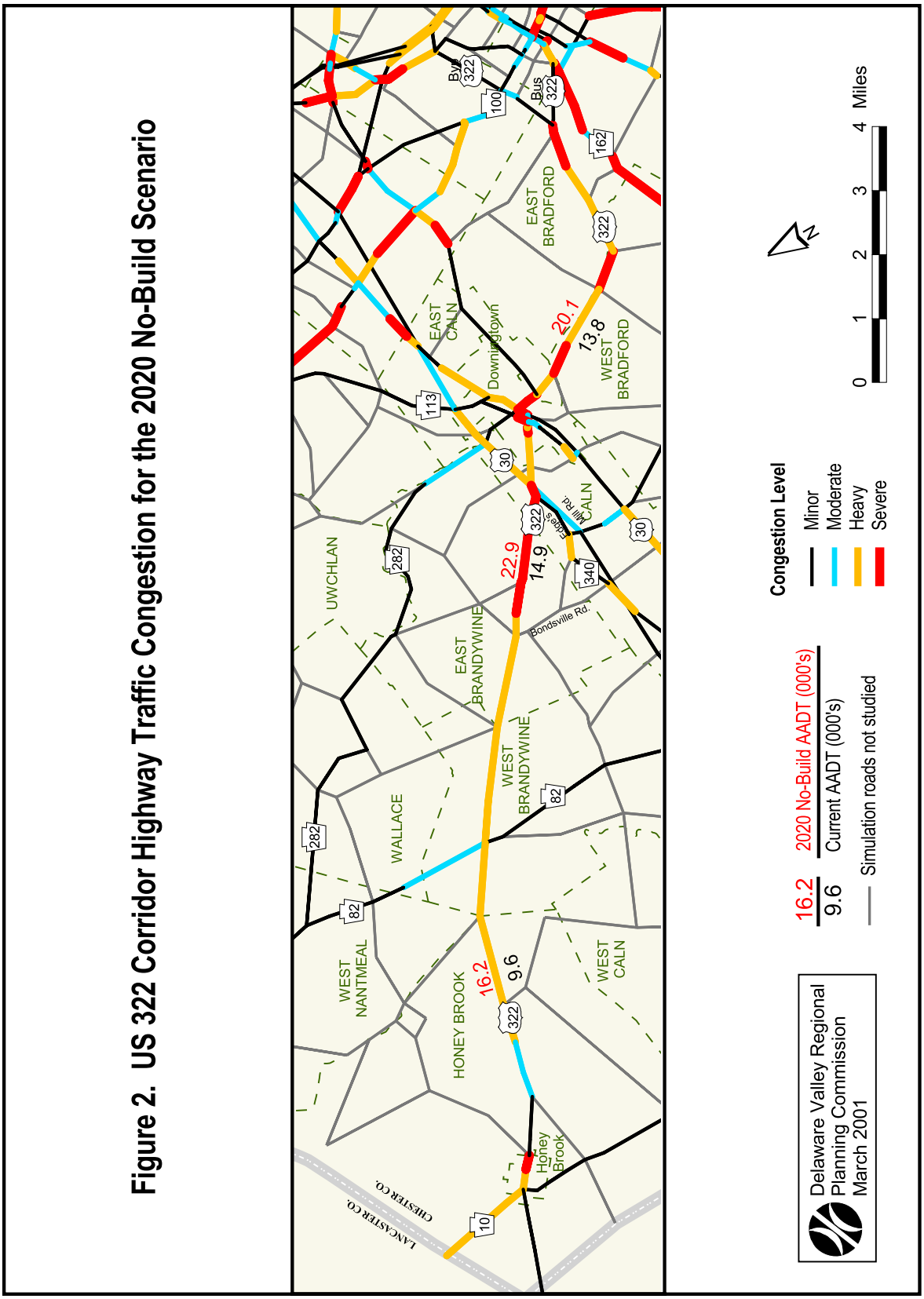
Figure 2. US 322 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
Delaware Valley Regional Planning Commission
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16.2
9.6
2020 No-Build AADT (000's)
Current AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 3 4 Miles
N
WEST NANTMEAL
WALLACE
HONEY BROOK
WEST CALN
EAST BRANDYWINE
WEST BRANDYWINE
UWCHLAN
EAST CALN
Downingtown
EAST BRADFORD
WEST BRADFORD
CALN
Honey Brook
Bondsville Rd.
Eagle Hill Rd.
LANCASTER CO.
CHESTER CO.
322
282
82
10
30
113
100
162
340
Bus 322
22.9
14.9
20.1
13.8

Volumes in the US 322 corridor are expected to increase over 1997 by at least 6,000 vpd throughout the US 322 corridor. However, in Caln and East Brandywine predicted volumes increase by 8,000 vpd over 1997 levels. The 2020 traffic volumes on US 322 are projected to rise from 14,900 to almost 22,900 vpd approaching US 30 from the west, peaking between Edge's Mill Road and US 30. Volumes through Downingtown on US 322 are projected to be above capacity. This is discussed more fully in the Downingtown study (section 6). Average daily traffic east of US 322 Bypass rises from 13,800 to 20,100 vpd, indicating heavy congestion. While this level of congestion might be considered tolerable for a short distance, it is continuous for the entire 7 mile distance from US 30 to US 322 Bypass.

3. US 1 Corridor Study - PA 82 to US 202

US 1 through Chester County consists of the Kennett Bypass, a four lane freeway on new alignment in the western portion, and a widened historic road, Baltimore Pike, in eastern Chester County. The study limits are PA 82 in the west and US 202 in Delaware County to the east. Major attractors include Longwood Gardens, the State Farm building at US 202, and several office parks. Study area Chester County municipalities include Kennett Square Borough; Kennett, East Marlborough, Pennsbury, and Birmingham townships; Chadds Ford Township in Delaware County is also included. Figure 3 shows 1997 and No-Build traffic conditions for the corridor.

US 1 enters the study area from the west as the Kennett Bypass, a freeway. East of the Kennett Bypass, US 1 merges with Baltimore Pike. This section has a four lane cross-section, a small median barrier, shoulders, frequent median openings, and mostly rural conditions. Immediately east of the Kennett Bypass, widening from two to three lanes per direction for 3/4 mile is scheduled in Fiscal Year 2002. Major intersecting routes between the study limits include Baltimore Pike, PA 52, and PA 100. Baltimore Pike joins US 1 slightly east of Kennett Square. PA 52 intersects US 1 in the vicinity of Longwood Gardens, forming a dogleg by joining US 1 for 3/4 mile. Design and right of way acquisition to improve this intersection is funded in the current TIP. However, construction is funded beyond Fiscal Year 2002 and therefore not included in the No-Build Scenario. East of PA 52, US 1 intersects PA 100 and US 202/US 322. The intersection of US 1 with US 322 / US 202, while in Delaware County, is a significant bottleneck for regional travel originating in Chester County.

Population is expected to rise on the order of 34 percent within the Chester County portion of the US 1 corridor, from 24,000 to 32,000. Employment in these townships is projected to grow from 9,000 to 10,500. Substantially higher growth will occur in the Delaware County townships of Chadds Ford and Concord, with employment growing from 11,000 to 15,000 and population increasing by 6,000 to 17,000.

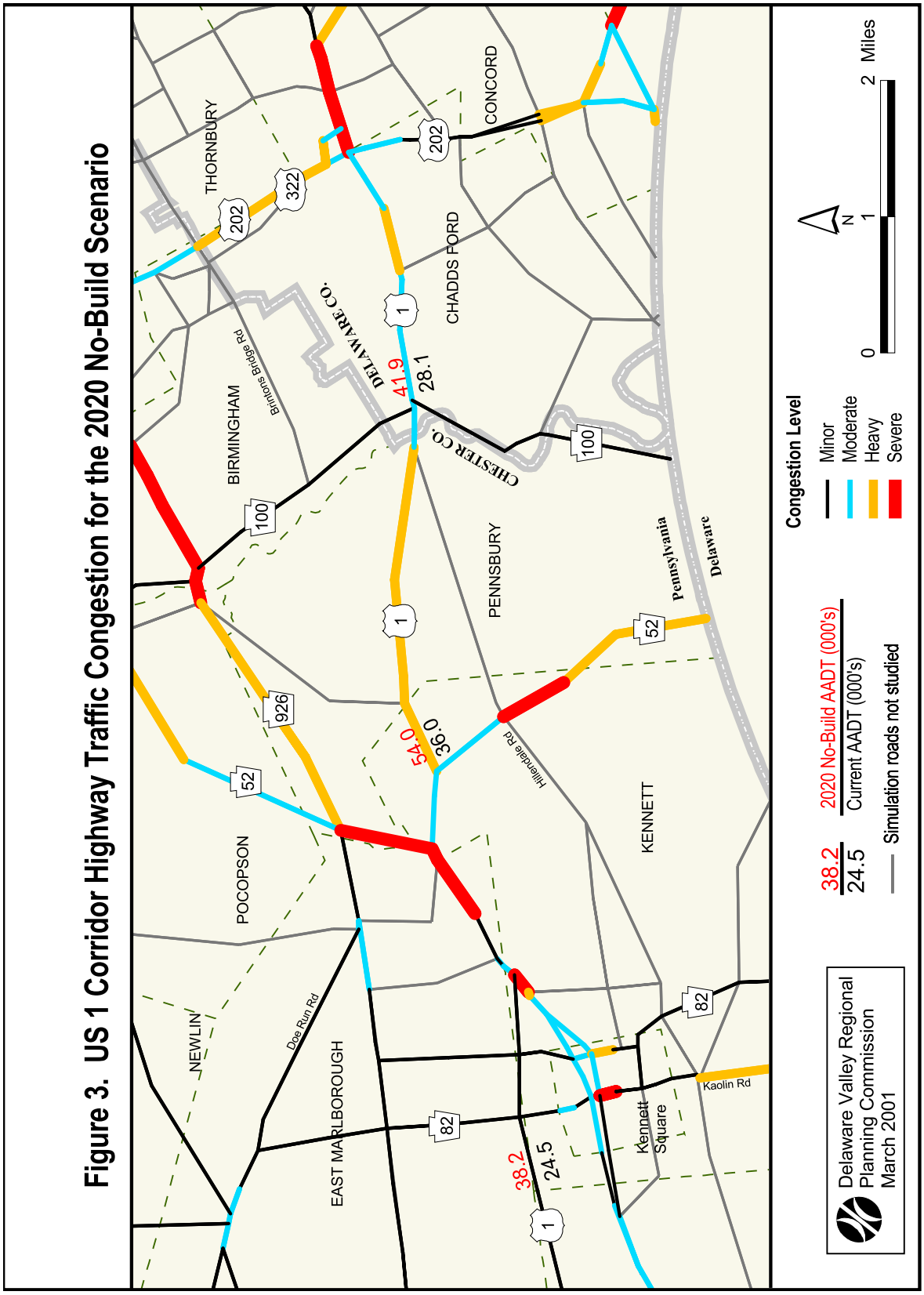


Figure 3. US 1 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
THORNBURY
CONCORD
CHADDS FORD
BIRMINGHAM
Birmingham Bridge Rd
DELAWARE CO.
CHESTER CO.
PENNSBURY
POCOPSON
NEWLIN
Doe Run Rd
EAST MARLBOROUGH
Hillendale Rd
KENNETT
Kennett Square
Kaolin Rd
Pennsylvania
Delaware
202
322
1
100
926
52
82
41.9
28.1
54.0
36.0
38.2
24.5
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1
2 Miles
38.2
2020 No-Build AADT (000's)
24.5
Current AADT (000's)
Simulation roads not studied
Delaware Valley Regional Planning Commission
March 2001

Landscapes designates all of Kennett Square and the surrounding portions of Kennett Township as urban locations. The western portion of Kennett and most of Birmingham townships are designated suburban. The area surrounding Longwood Gardens is designated natural, while the remainder of Kennett Township is planned as rural.

Traffic volumes on US 1 are projected to average on the order of 42,000 to 55,000 vehicles per day (vpd) throughout the study area under the No-Build Scenario. The highest volumes will be experienced in the vicinity of Longwood Gardens, increasing from 36,000 to 54,000 vpd. This congestion will be most severe immediately west of PA 52. Between PA 52 and US 202, traffic volumes are anticipated to increase by an additional 15,000 vehicles per day over the existing 28,100 vehicles per day, indicating heavy congestion. By comparison, these volumes are comparable to those currently experienced on US 202 south of West Chester.

4. US 202 Corridor Study - Delaware State Line to US 422

US 202 is a regional highway serving travel from the Delaware State line north through King of Prussia to Montgomery and Bucks counties. It is the business spine of Chester County, with numerous office parks, corporate campuses, and retail developments in close proximity. For illustrative purposes, the US 202 corridor south of the Exton Bypass (US 30) is shown Figure 4, with that portion north of the Exton Bypass shown Figure 5.

From the Delaware State line to West Chester, US 202 is a four lane divided highway designed for through movement with infrequent signalized intersections, and minimal median openings. In this section, major cross streets include Naamans Creek Road (PA 491), Smith Bridge Road, US 1, and Street Road (PA 926). US 322 joins US 202 from US 1 through West Chester. Parallel routes in this area include Concord Road and New Street, both local roads. Commercial development is most prominent in the vicinity of US 1 where State Farm has a substantial office building. New residential development is apparent throughout this corridor. Approaching West Chester, US 202 becomes the West Chester Bypass. Only one lane is currently available for through traffic on US 202 at this point, a significant bottleneck.

The West Chester Bypass is a four lane freeway passing east of West Chester, intersecting with PA 3 and Paoli Pike. North of these intersections Route 322 Bypass and Route 100 Connector, both controlled access roads, diverge from US 202. From the West Chester Bypass, US 202 turns towards the northeast, passing through West Goshen en route to US 30, intersecting Boot Road.

Chester County municipalities in this southern portion include, from south to north: Birmingham, Thornbury, Westtown, and West Goshen townships; West Chester Borough; and East Goshen Township. *Landscapes* designates West Chester and adjacent portions of West Goshen as urban. The remainder of the southern study area is designated as suburban with scattered natural areas along river basins. Total growth under *Landscapes* is projected as 12,000 additional residents for a total of 78,000 and an additional 8,000 jobs for a total of 50,000.

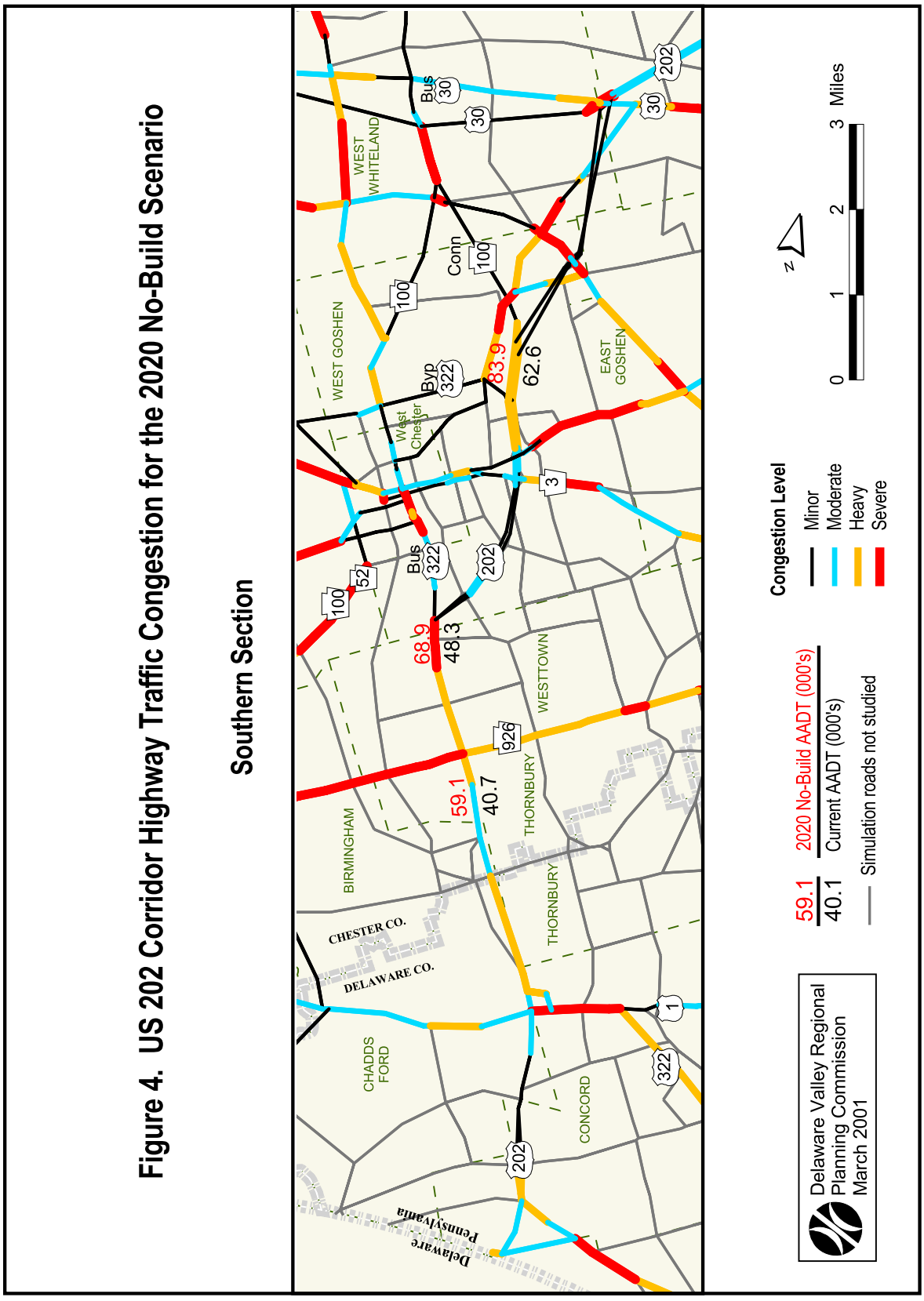


Figure 4. US 202 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
Southern Section
WEST GOSHEN
WEST WHITELAND
EAST GOSHEN
WESTTOWN
THORNBURY
BIRMINGHAM
CHADDS FORD
CONCORD
CHESTER CO.
DELAWARE CO.
Delaware Pennsylvania
West Chester
Byp
Bus
Conn
68.9
48.3
59.1
40.7
83.9
62.6
59.1
40.1
2020 No-Build AADT (000's)
Current AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1
2
3 Miles
Delaware Valley Regional Planning Commission
March 2001

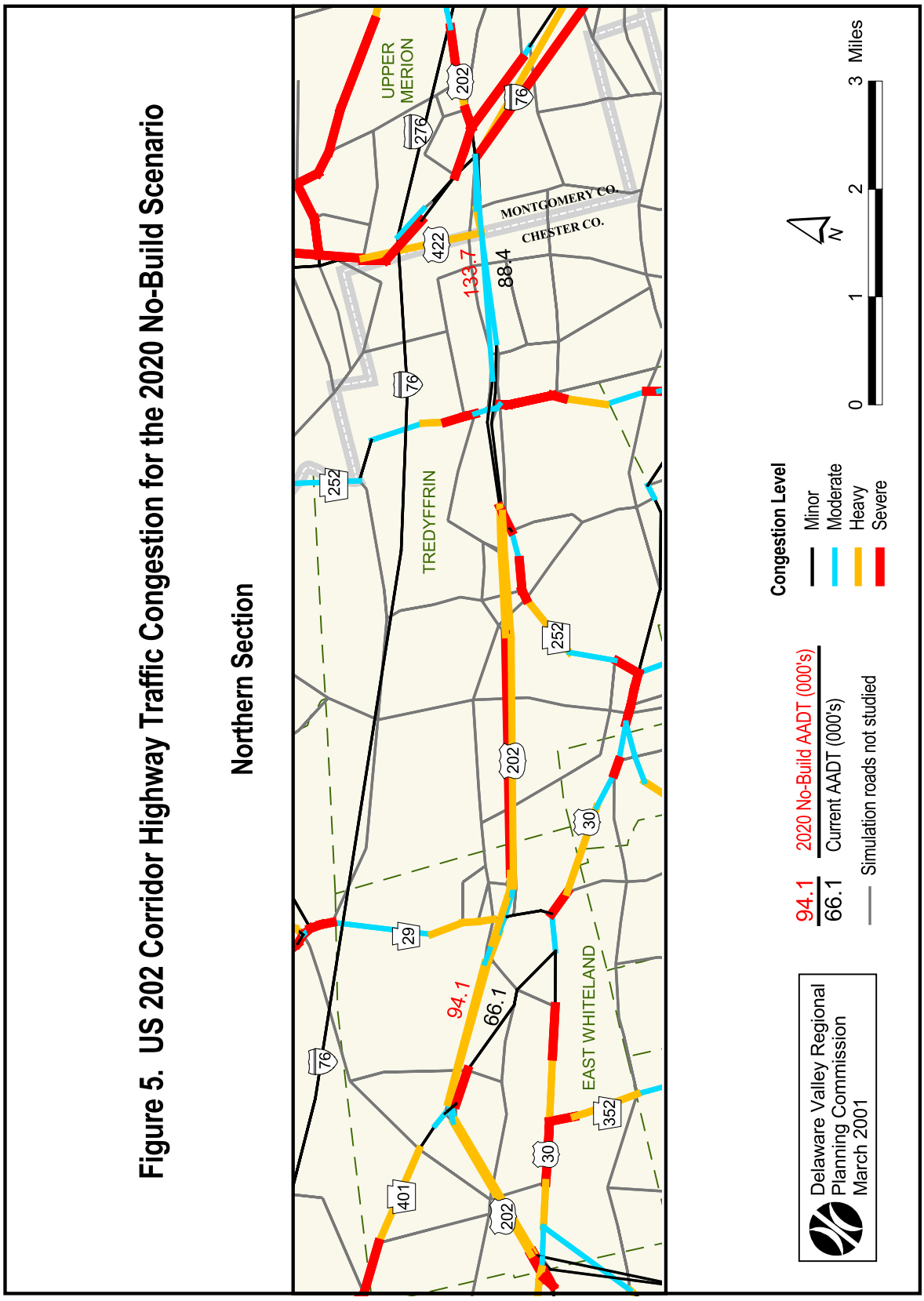


Figure 5. US 202 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
Northern Section
UPPER MERION
TREDYFFRIN
EAST WHITELAND
MONTGOMERY CO.
CHESTER CO.
94.1
66.1
133.7
88.4
202
76
276
422
252
29
30
352
401
Congestion Level
Minor
Moderate
Heavy
Severe
94.1 2020 No-Build AADT (000's)
66.1 Current AADT (000's)
Simulation roads not studied
N
0 1 2 3 Miles
Delaware Valley Regional Planning Commission
March 2001

Townships in the northern portion of the US 202 corridor include West Whiteland, East Whiteland, and Tredyffrin townships. The first significant intersection moving north on US 202 is the junction of the Exton Bypass (US 30), Lincoln Highway (US 30 Business), and Lancaster Pike (US 30). The Exton Bypass is a four lane freeway, while the other two roads are four lane arterials. Current congestion at this location along US 202 is severe during peak periods with two freeways (four lanes) merging into two lanes. Continuing north, other significant intersecting roads include: PA 401, PA 29, Swedesford Road, and PA 252. US 202 is four lanes in this segment, with expansion to six lanes currently underway from Swedesford Road (PA 252) to north of the Chester County line, and expansion planned from US 30 to Swedesford Road (PA 252) upon completion of the first section. The first improvement is included in the No-Build Scenario. US 202 in this area is the primary access route for many large commercial centers, including Great Valley, Chesterbrook, and the Valley Forge corporate centers. Lancaster Pike (US 30) and Swedesford Road provide alternate, parallel routes. Employment in this area, including East Whiteland, West Whiteland, and Tredyffrin townships is expected to approach 100,000 by 2020. At the Chester County / Montgomery County line, US 202 intersects US 422, and shortly thereafter, the Schuylkill Expressway (I-76), ceasing to be a freeway north of this location. This set of interchanges is one of the most congested in the Delaware Valley Region. It is currently being redesigned and expanded by PennDOT. North of I-76, US 202 serves King of Prussia, a regional employment center, and continues through Montgomery County towards Bucks County via Norristown.

Within Chester County, absolute growth along the US 202 corridor will be very high. This is most acute in the northern portion of the US 202 Corridor. Under *Landscapes*, employment is projected to rise by 30 percent from 69,000 to 90,000. Population will also increase from 53,500 to 63,500, a 17 percent gain. Within *Landscapes*, most of the corridor is designated suburban, with a suburban center around the Exton Mall in West Whiteland, and an urban designation for Paoli. Areas set aside as natural are also included within the corridor. The northern portion of US 202 is the only corridor or area identified where jobs outnumber residents. Based on the above numbers, the US 202 corridor will experience a massive net inbound commute in 2020 and the expressway will be required to accommodate much of this additional travel demand.

US 202 is projected to sustain large growth (34 to 51 percent over current counts) in traffic volume throughout the corridor. Under the No-Build Scenario moderate to severe congestion is projected to occur throughout the study corridor. Traffic volumes on US 202 are projected to range from 50,000 vpd at the Delaware State line, generally increasing to the north, peaking at roughly 134,000 approaching US 422. Starting at the southernmost terminus of US 202, volumes are projected to rise roughly 50 percent from the state of Delaware to US 1. Congestion in this area is moderate to heavy. North of US 1, volumes are anticipated to rise from the current levels, 40,700, to more than 59,000 vpd. North of PA 926, traffic is projected to increase from 48,300 to 68,900 (43 percent). Given that this roadway is already congested at peak periods, it is likely that peak period conditions will degrade substantially, with substantial peak spreading as commuters shift their travel time to avoid the peak of the peak. Much of this traffic will attempt to use the one lane ramps onto US 202 at High Street, causing a lengthy queue. Beyond this point the West Chester Bypass will approach capacity in 2020 with traffic loads of 83,900 just north of US 322 Bypass, a 34 percent increase over current volume. North of West Chester, roughly half of all

projected 2020 traffic uses PA 100 Connector, substantially dropping volume on US 202. At the junction of US 30, volume rises by roughly 50 percent over current counts. The current volume of 66,100 is anticipated to rise to roughly 94,000 in 2020. Plans call for a widening to six travel lanes in this section. In the absence of such action, heavy congestion will occur from US 30 to PA 252. The volume of traffic increases traveling north, reaching over 133,000 just west of the US 422 interchange. While this growth is substantial, the on-going widening should provide sufficient capacity.

5. Phoenixville Area Transportation Study

Phoenixville is a historic town adjacent to the Schuylkill River, with a population of just over 15,000 persons. Nearby municipalities in Chester County include Charlestown, Spring City, East Vincent, East Pikeland, and Schuylkill townships. Upper Providence Township is an adjacent municipality in Montgomery County.

The study area includes the junction of multiple state routes, including PA 113, PA 29, PA 23, and PA 724. In addition, the US 422 freeway passes roughly three miles north of Phoenixville. Other area roads include Pawlings Road, Egypt Road, Pot House Road, Charlestown Road, PA 252, and Bridge Street (Spring City). All of these roads, except US 422, are two lanes, with occasional left turn lanes. Capacities on PA 23, PA 29, and PA 113 through Phoenixville are low, as on-street parking is allowed, and often there is insufficient width to pass a left-turning vehicle. East-west travel is particularly constrained, with PA 23 being the primary facility. The combination of PA 29 and Egypt Road provides an alternate route to PA 23 traveling northeast from Phoenixville with Pot House Road providing a parallel route south of PA 23. Multiple routes converge on PA 23 as it approaches Phoenixville. To the west, traffic from Pottstown on PA 724 and from Uwchlan Township and Downingtown on PA 113 merges into traffic from Elverson and South Coventry Township on PA 23. To the east, traffic from Valley Forge on PA 252 and PA 23 is combined, with additional traffic entering Phoenixville via Pawlings Road. North-south travel is provided by PA 29 with access from Malvern and Great Valley to the south, and travel north to Trappe is accommodated by PA 113 and PA 29. The roadway capacity of these routes are all constrained by the necessity of using narrow city streets through Phoenixville. Figure 6 shows current and 2020 No-Build Scenario conditions for the study area.

Projected new development in the Phoenixville area is moderate, with 2020 population projections increasing 17 percent over 1997 estimates to 41,000 and employment growth 5 percent to 13,000 jobs. In Montgomery County, Upper Providence Township is anticipated to grow substantially. Under *Landscapes*, the Phoenixville area is planned to range from urban to rural and natural land uses. Spring City, Phoenixville and adjacent portions of Schuylkill Township are planned as urban. The southern portion of Charlestown Township, eastern and western parts of Schuylkill Township, and the center of East Pikeland Township are all identified as suburban. The remainder of the study area is planned to be rural, with natural areas following French Creek and Pickering Creek.

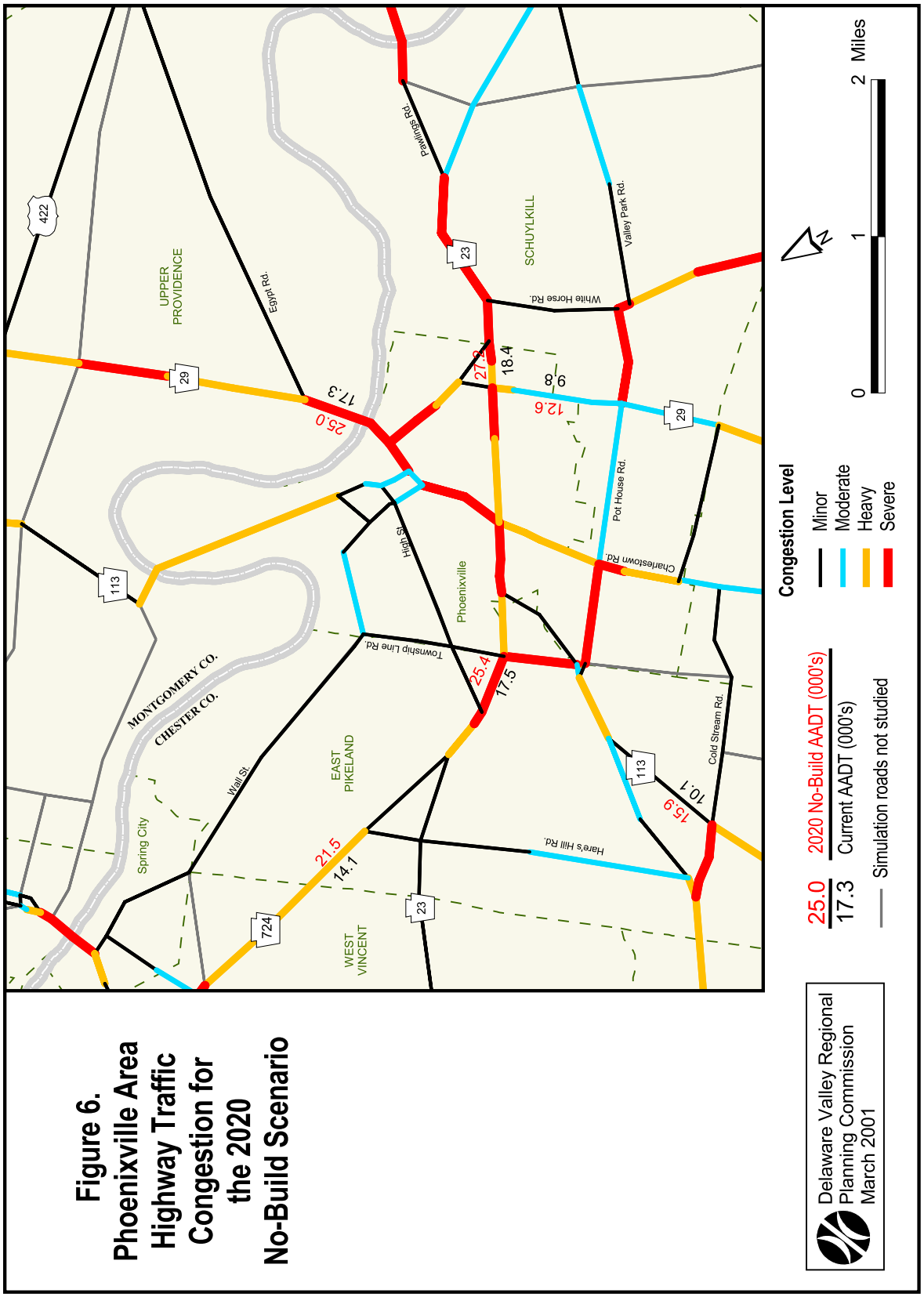


Figure 6.
Phoenixville Area
Highway Traffic
Congestion for
the 2020
No-Build Scenario
Delaware Valley Regional
Planning Commission
March 2001
25.0 2020 No-Build AADT (000's)
17.3 Current AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 Miles
N
MONTGOMERY CO.
CHESTER CO.
UPPER PROVIDENCE
SCHUYLKILL
EAST PIKELAND
WEST VINCENT
Phoenixville
Spring City
Egypt Rd.
Prawlingsville Rd.
Valley Park Rd.
White Horse Rd.
Pot House Rd.
Charlestown Rd.
Township Line Rd.
Wall St.
High St.
Hare's Hill Rd.
Cold Stream Rd.
422
29
113
23
724
17.3
25.0
27.0
18.4
9.8
12.6
25.4
17.5
21.5
14.1
10.1
15.9

The Schuylkill River represents a natural barrier, with bridges at Spring City, PA 113, PA 29, and Pawlings Road. Each of these bridges is one lane per direction, severely limiting capacity. Total 1997 simulated crossings are roughly 50,000, with 2020 No-Build volumes summing to 80,000 vpd. All of these bridges are projected to carry volumes greater than no-build capacity.

Projections for 2020 indicate severe congestion for portions of routes PA 724, PA 23, PA 113, and PA 29. The corridor with the worst projected conditions is PA 724 and PA 23 from Spring City to Valley Forge. Traffic volume in this corridor is anticipated to increase approximately 50 percent above current counts with future volumes ranging from 14,000 to 18,000 vpd. It should be noted that current volume already exceeds capacity on this route. The projected numbers indicate a bottleneck likely to cause extreme diversion away from the Phoenixville area, with associated increases in VMT and air quality impacts. North-south travel is similarly constrained. Two out of four bridges across the Schuylkill river are projected to experience severe congestion, with the remaining two at heavy and moderate congestion. PA 29 and PA 113 are both projected to experience severe congestion in Phoenixville. PA 29 will also be heavily congested approaching Phoenixville, with approximately 25,000 vpd on the two lane bridge crossing the Schuylkill River, versus current volume of 17,300.

6. Downingtown Area Transportation Study

Downingtown is an older, established town in central Chester County. It is surrounded by several rapidly growing townships in transition from rural to suburban status. Study area municipalities include Downingtown, Caln, East Brandywine, East Caln, West Bradford, and East Bradford. Major area roads include US 30, US 30 Business, US 322, PA 282, PA 340, PA 113, and Marshallton Road (see Figure 7). The primary east-west route through the study area is US 30, an older four lane freeway passing north of Downingtown. Other significant east-west routes include PA 340, PA 113, and US 30 Business. PA 340 is two lane rural arterial in Caln Township, paralleling US 30, then heading south to US 30 Business where it becomes Marshallton Road. PA 113 begins at US 30 Business east of Downingtown, with a partial interchange at US 30. The road serves northeasterly travel to Uwchlan Township and Phoenixville.

Projected growth is high within the Downingtown area. Population is expected to rise 32 percent from 47,000 to 62,000. Projected employment is 25,000, a 27 percent increase over 1997. The *Landscapes* plan calls for Downingtown and immediately surrounding areas to be developed as urban. The US 30 corridor, roughly the extent of the Great Valley, is designated as suburban, with a suburban center at PA 340 and US 30 Business. East Brandywine, East Bradford, and West Bradford townships are all planned as rural, with several rural centers. Significant natural areas are planned along the Brandywine Creek and its tributaries.

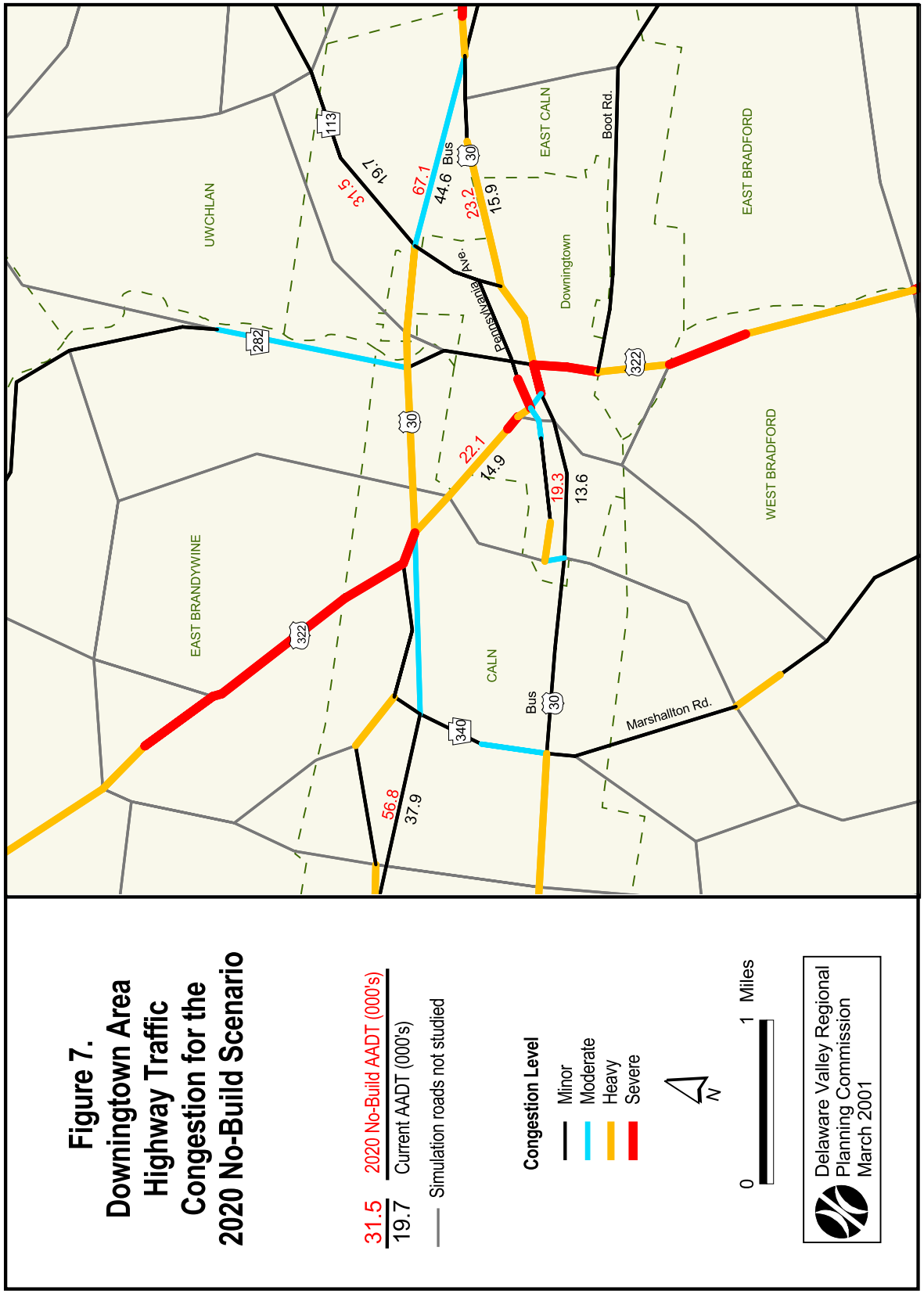


Figure 7.
Downingtown Area
Highway Traffic
Congestion for the
2020 No-Build Scenario
31.5 2020 No-Build AADT (000's)
19.7 Current AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1 Miles
Delaware Valley Regional
Planning Commission
March 2001
UWCHLAN
EAST BRANDYWINE
CALN
EAST CALN
Downingtown
EAST BRADFORD
WEST BRADFORD
Pennsylvania Ave.
Boot Rd.
Marshallton Rd.
Bus
113
282
30
322
340
19.7
31.5
67.1
44.6
23.2
15.9
22.1
14.9
19.3
13.6
56.8
37.9

US 30 Business is the commercial spine within the study area, serving most local East-West travel demand. It passes through downtown Downingtown as a two lane road with on street parking. One travel lane per direction, bicycle lanes, and some left turn pockets are provided. West of Downingtown, US 30 Business is a two lane road with a continuous left turn lane and much adjoining strip type commercial development. East of Downingtown, US 30 Business provides access to the Exton Bypass (US 30). It is two lanes by direction, with a continuous left turn lane.

US 322, officially east-west, passes through the study area from northwest to southeast. It serves travel to Honey Brook and West Chester. West of Downingtown, US 322 is a two lane rural arterial with shoulders. A two mile continuous left turn lane is provided west of US 30. PA 282, a winding road following the Brandywine Creek, provides an alternate route. US 322 provides access to Downingtown to and from the west via US 30. Through Downingtown, US 322 is a two lane urban arterial, with multiple access points restricting capacity. In Downingtown, US 322 joins the Lincoln Highway (US 30 Business), forming a dogleg. East of Downingtown, there is a T-intersection at Boot Road before US 322 heads toward West Chester. Alternate routes include the combination of US 30 and PA100 Connector, and Marshallton Road. East of Downingtown, US 322 parallels the Brandywine creek. In this section, there are generous shoulders, few driveways, and no signalized intersections. This allows maximum capacity for a two lane cross-section.

The following roads are all anticipated to experience some heavy congestion: US 322, US 30, US 30 Business, and PA 113. Figure 7 shows the study area as well as projected 2020 No-Build Scenario traffic conditions.

US 322 is projected to be the most congested route in the Downingtown area. Current traffic volumes range from 12,000 to 18,000 vpd, with 14,900 vpd just north of Pennsylvania Avenue. Volume in the corridor is expected to increase by around 7,000 vpd, with the exception of Caln and East Brandywine townships where volumes will increase slightly more. Through Downingtown, US 322 is projected to carry over 22,000 vpd, versus a current counts of about 15,000.

Traffic volumes in the US 30 corridor are projected to rise substantially by 2020. This growth will be highest in the western and central portions of the study area. AADT on US 30 from Coatesville to Downingtown is anticipated to rise 50 percent, to approximately 57,000 vehicles per day. US 30, a four lane freeway, will experience minor congestion in this area. The largest increase in volume occurs on US 30 from east of US 322 to PA 113. East of PA 113, traffic is projected to increase from a current volume of 44,600 to 68,100 vpd in 2020.

Traffic volumes on the Lincoln Highway (US 30 Business) are projected to grow by slightly less than 50 percent though Downingtown. Projected volumes are 19,300 west of US 322, and 23,200 approaching the Exton Bypass. Given this volume, it is likely that some key Downingtown intersections will fail.

7. PA 41 Corridor Study - Delaware State Line to Lancaster County Line

PA 41 provides for travel from northwest to southeast in the southwest portion of Chester County (see Figure 8). It is a major truck route connecting the Port of Wilmington to points west, with heavy trucks representing over 10 percent of the vehicle mix. PA 41 also accommodates commuter travel to Wilmington as well as recreational travel to New Castle County and the Delmarva Peninsula. Within the study area, from Lancaster County to the Delaware State line, truck and commuter traffic combine with substantial impacts on travel conditions. Municipalities in this corridor include from south to north: New Garden Township; Avondale Borough; and London Grove, Londonderry, Highland, West Fallowfield, Atglen, and West Sadsbury townships.

Projected population and employment growth in the PA 41 corridor is high in percentage terms at 39 percent and 34 percent, respectively. Population is expected to grow from 21,500 to almost 30,000, with employment rising from 8,500 to over 11,000. This corridor is primarily designated either rural or natural. Rural centers are planned at Kaolin, Chatham, and Cochranville. Urban areas are designated at Atglen and Avondale, with the Avondale growth area extending along PA 41 from the borough itself to north of US 1. Only a small portion of this corridor is designated suburban, highlighting the desire to limit development within this corridor.

Through most of the study area PA 41 is a two lane rural road with shoulders. Immediately north of the Delaware State line, PA 41 carries an AADT of 11,000. Just north of this point, there is a grade separated intersection with Limestone Road, a major route into Delaware. Current traffic volume north of this point rises to 15,000 vpd. The next major intersection is Newark Road which provides access to US 1 to the north. After Newark Road, Baltimore Pike joins PA 41 from the east, passing through Avondale, a small town with a population of 1,000. PA 41 at this location is a typical "Main Street," with on-street parking, abutting structures, and generally limited capacity. Current volume through Avondale is 17,500 vpd. North of Avondale, Baltimore Pike veers west and PA 41 diverges from this road. Traffic levels drop to 15,000 north of Baltimore Pike. The next major intersecting road is US 1, a four lane freeway. North of this point, the character of the corridor becomes rural. Several miles north of US 1, PA 841 and the village of Chatham are crossed. Current traffic volume is 15,300 in Chatham. The next major intersection moving north is PA 10. Next, PA 41 skirts the developed portions of Atglen, with constrained geometry. North of Atglen, PA 41 reaches Lancaster County, the northern limit of the corridor.

Projected traffic growth to 2020 for this corridor is high. Volume is anticipated to rise by 50 percent throughout the study area. This growth will range from 6,000 to 10,000 vpd. On most of the corridor, traffic volume is projected to be over 20,000 vehicles per day. North of Kaolin Road, projected No-Build volume is 25,800 vpd. Through Avondale volume is anticipated to be 27,900 vpd. North of Chatham 23,700 vpd is projected. All of these volumes indicate moderate congestion in rural areas, with heavy congestion passing through Cochranville, Atglen, and Avondale. At projected volumes, the capacities of isolated intersections will likely control flow.

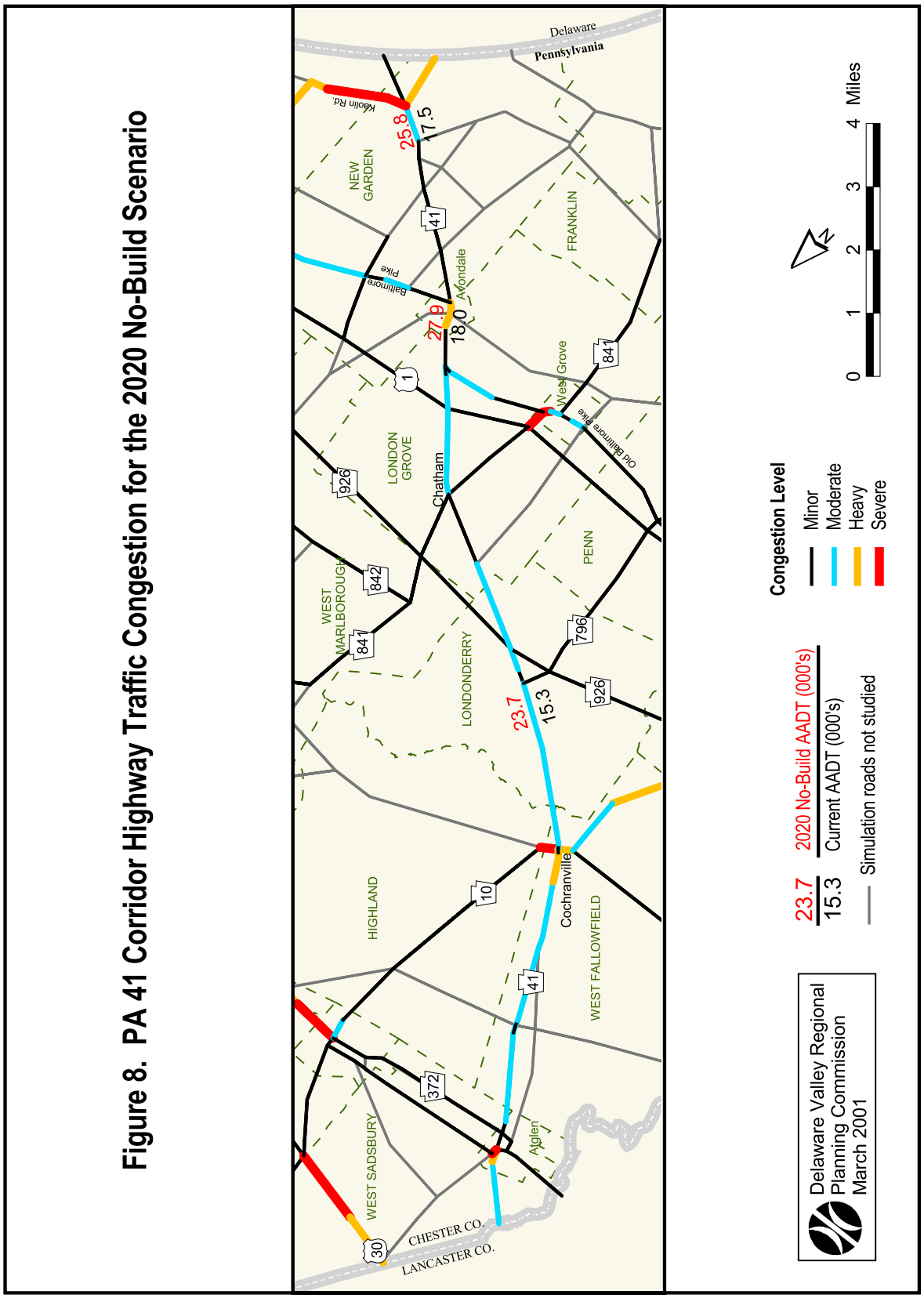


Figure 8. PA 41 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
Delaware
Pennsylvania
CHESTER CO.
LANCASTER CO.
NEW GARDEN
FRANKLIN
LONDON GROVE
WEST MARLBOROUGH
LONDONDERRY
PENN
HIGHLAND
WEST FALLOWFIELD
WEST SADSBURY
Chatham
West Grove
Avondale
Cochranville
Atglen
Baltimore Pike
Old Baltimore Pike
Kaolin Rd.
25.8
17.5
27.9
18.0
23.7
15.3
1
10
30
41
372
841
842
926
796
841
84
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 3 4 Miles
23.7 2020 No-Build AADT (000's)
15.3 Current AADT (000's)
Simulation roads not studied
Delaware Valley Regional Planning Commission
March 2001

8. PA 113 Corridor Study - US 30 to PA 23

PA 113, from US 30 to PA 23 provides the primary route from Downingtown to Phoenixville. From US 30, PA 113 is briefly a two lane road, it then widens to four lanes to a point northwest of Gordon Drive in Uwchlan Township. The southern portion of this alignment begins with a substantial grade out of the Chester Valley, which is followed by a generally straight alignment with mild vertical changes. The area from Downingtown to PA 100 is experiencing substantial development and is the sight of many recent subdivisions. In the vicinity of PA 100, a continuous left turn lane begins, and several office developments are present as part of the PA 100 commercial corridor. PA 113 continues north to Phoenixville as a two lane roadway through rural communities. Approaching Phoenixville, suburbanization is again apparent. However, few improvements have been made to PA 113 in this area, leaving a two lane road with poor geometry. Figure 9 shows the corridor under current and No-Build Scenario conditions.

Study municipalities include East Pikeland, West Pikeland, Uwchlan, and East Caln. Within these limits, 2020 population growth is anticipated at 41 percent, from 28,000 to 39,000. Growth in employment will be higher, at 46 percent, increasing by 4,500 to 14,500 by 2020. Within the *Landscapes* land use plan, this corridor is designated suburban for most of its length. In addition, a major suburban center is planned for the Lionville area at PA 100. The primary exception is West Pikeland, which is mostly designated rural or natural.

Major intersecting roads from west to east include US 30, Whitford Hills Road, Devon Drive, Eagleview Boulevard, PA 100, Gordon Drive, PA 401, Yellow Springs Road, Clover Mill Road, Hares Hill Road, Pot House Road, and PA 23. West of PA 100, parallel routes are Township Line Road, and Whitford Hills Road. East of PA 100, competing routes are Charlestown Road and St. Matthew's Road.

Current traffic volumes on PA 113 range from 11,000 to over 20,000. The highest volumes tend to occur between Gordon Drive and Downingtown. North of Downingtown, 30,100 vpd is projected with the No-Build Scenario, roughly10,000 higher than the 1997 values. This future volume can be handled with the current four lane configuration. From PA 100 to PA 401, predicted future year volumes rise to around 28,500 vehicles, roughly double the 1997 volume. From Cold Stream Road to PA 23, current volumes are 11,100, with projected volumes rising by 5,000 to 7,000 vpd, indicating congested conditions.

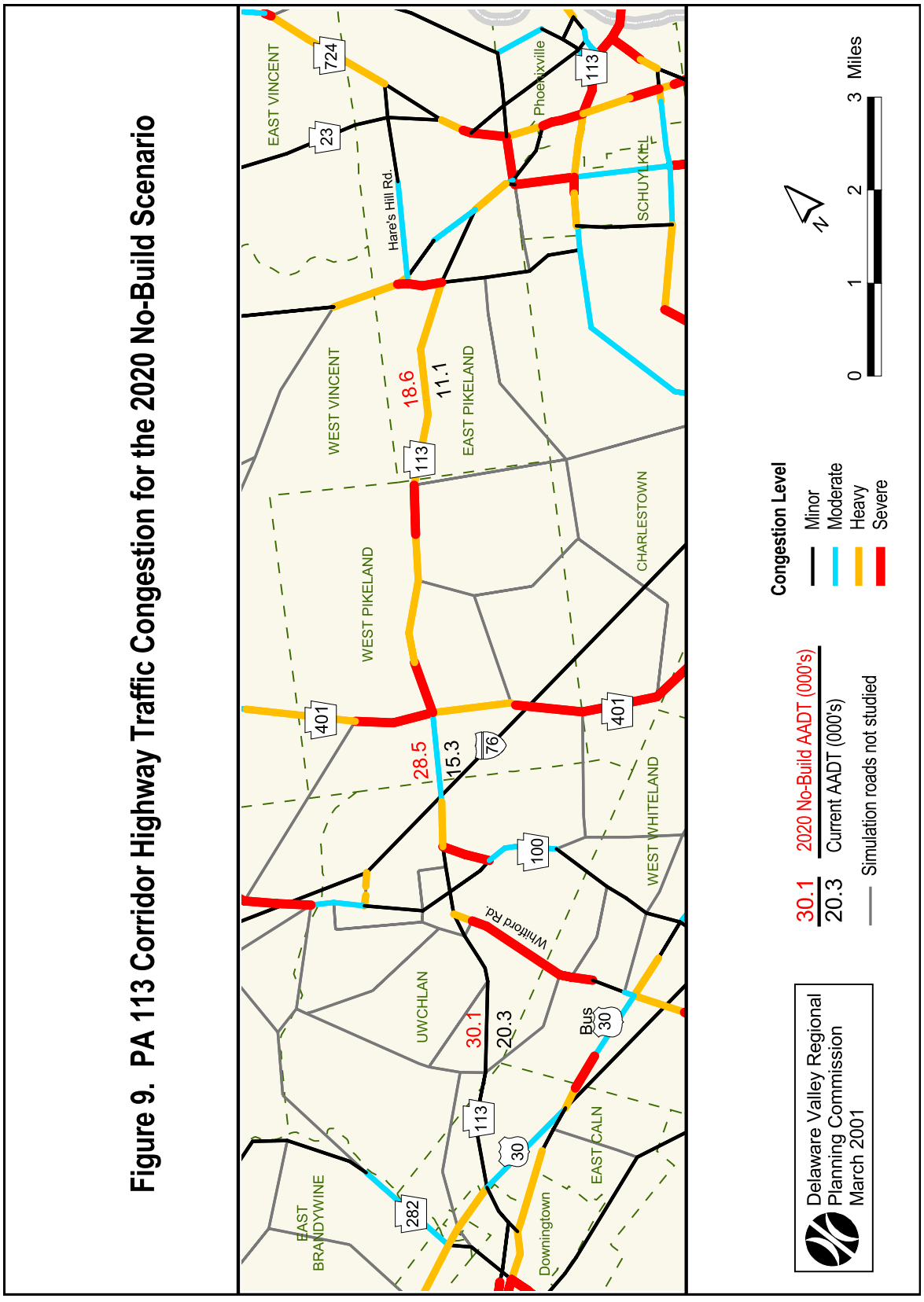


Figure 9. PA 113 Corridor Highway Traffic Congestion for the 2020 No-Build Scenario
EAST VINCENT
WEST VINCENT
WEST PIKELAND
EAST PIKELAND
CHARLESTOWN
WEST WHITELAND
UWCHLAN
EAST BRANDYWINE
EAST CALN
Downingtown
Phoenixville
SCHUYLKILL
Hare's Hill Rd.
Whitford Rd.
Bus
724
23
113
401
76
100
30
282
18.6
11.1
28.5
15.3
30.1
20.3
Congestion Level
Minor
Moderate
Heavy
Severe
30.1 2020 No-Build AADT (000's)
20.3 Current AADT (000's)
Simulation roads not studied
0 1 2 3 Miles
Delaware Valley Regional Planning Commission
March 2001

9. West Chester Area Transportation Study

The Borough of West Chester, a historic center, is a focal point of highways in Chester County. These routes converge on West Chester, focusing traffic into the borough. The approaches to West Chester are often narrow, historic roads, carrying high volumes relative to their design capacities. West Chester, with its traditional street grid pattern is generally able to absorb the travel demand associated with this confluence of highways. Therefore, this study will focus on the approaches to the Borough. Area municipalities include East Bradford, West Goshen, and West Chester. Figure 10 shows the study area and current and No-Build Scenario conditions.

From the north, West Chester is approached via PA 100, PA 100 Connector, Phoenixville Pike, and US 202. PA 3, Paoli Pike, and Westtown Road provide access to the east. Southern approaches include US 202, New Street, and Matlack Street. US 322, US 322 Business, PA 162, PA 842, PA 100, and PA 52 enter West Chester from the west. US 202 and PA 100 Connector are four lane freeways that merge to form a bypass around West Chester to the east. PA 3, and US 202 south of West Chester are four lane divided highways. US 322 approaches West Chester from the west and provides a four lane partially access controlled bypass north of West Chester. The remainder of the study area roads are two lane roads, passing through residential neighborhoods with minimal setbacks. Of these roads only US 322 Business, Phoenixville Pike, and PA 100 have shoulders.

Growth in employment and population will be moderate in the study area. Population is anticipated to rise 17 percent, from 46,000 to 54,000. Employment is anticipated to increase by 12 percent, from 34,000 to 38,000. Most of the population growth is projected to occur west of West Chester, in East Bradford Township while West Goshen, east of West Chester is likely to experience most of the employment growth. This will exacerbate the existing problems in the West Chester area, as workers and shoppers will likely travel through West Chester to reach their destinations.

The *Landscapes* land use plan designates West Chester and adjacent portions of East Bradford and West Goshen townships as an urban development area. The eastern portion of East Bradford and West Goshen townships are planned as a suburban locations. The remainder of East Bradford is designated either rural or natural.

Table 15 presents a summary of current and future simulated conditions on major approaches. Volumes are included for selected roadways. Table 15 demonstrates that many of the approaches to West Chester are likely to be over capacity by the year 2020. Those projected to be severely congested include PA 52, Paoli Pike, High Street, Lenape Road, and Strasburg Road. Heavily congested roads include US 322, PA 3, PA 100, and US 202. This level of congestion will restrict travel in the West Chester area, with resultant impact on quality of life and economic development.

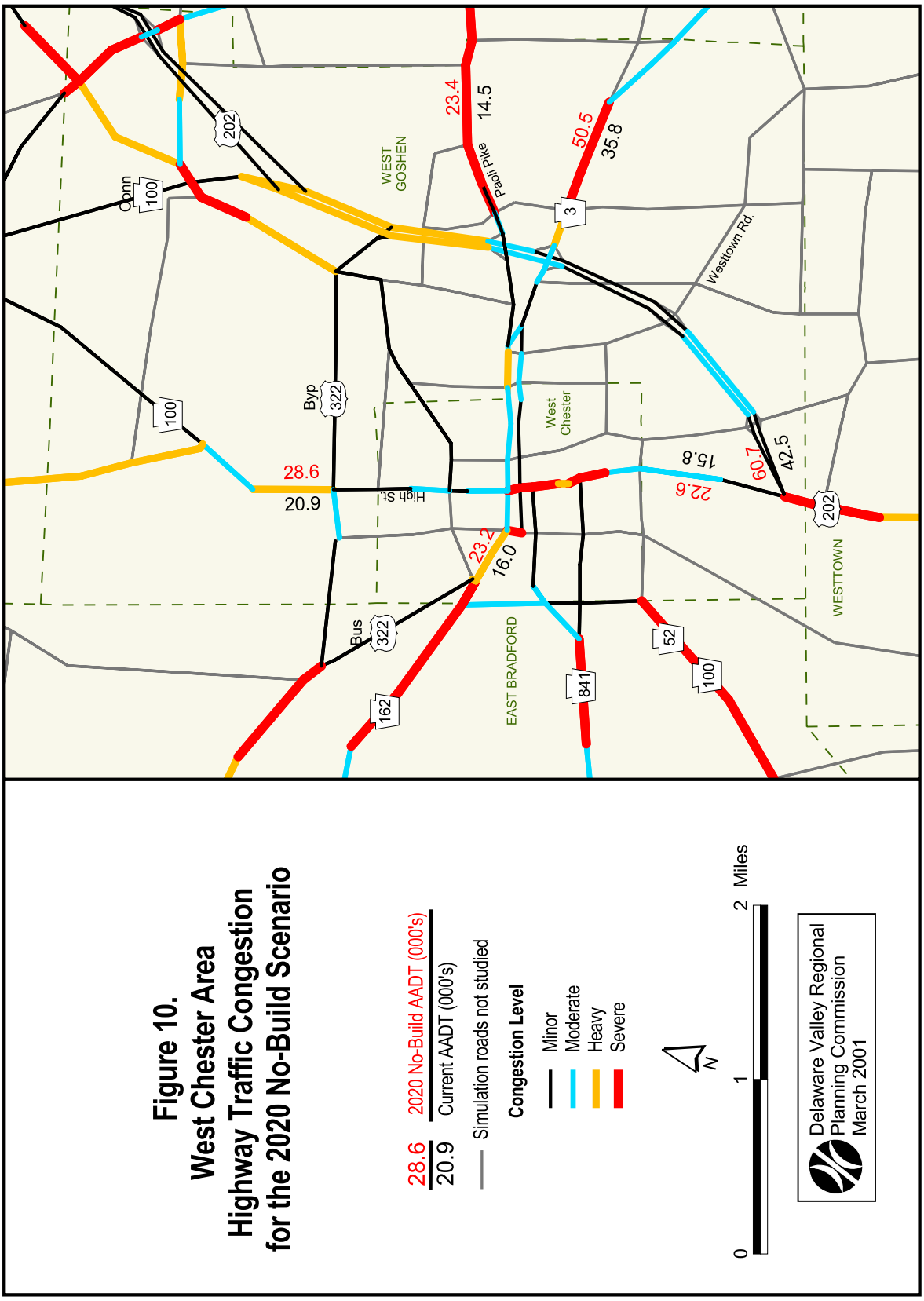


Figure 10.
West Chester Area
Highway Traffic Congestion
for the 2020 No-Build Scenario
28.6 2020 No-Build AADT (000's)
20.9 Current AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1
2 Miles
Delaware Valley Regional
Planning Commission
March 2001
WEST GOSHEN
EAST BRADFORD
West Chester
WESTTOWN
Westtown Rd.
Paoli Pike
High St.
Byp
Bus
Conn
202
100
322
162
841
52
3
23.4
14.5
50.5
35.8
28.6
20.9
23.2
16.0
22.6
15.8
60.7
42.5

Table 15. Current and Future Volumes on Major West Chester Approaches.

Road	Facility Type	Current Volume (000's)	2020 Volume (000's)	2020 Congestion Level
PA 100 (Grove Rd to US 322)	2 lane, with shoulders	20.9	28.6	Heavy
PA 100 Connector	4 lane freeway	NA	NA	None
US 202 (North of PA 100 Connector)	4 lane freeway	NA	NA	None
US 202 (PA 3 to PA 100 Connector)	4 lane freeway	62.6	83.9	Heavy
US 202 (PA 3 to High St)	4 lane expressway	42.5	60.7	Minor
Phoenixville Pike	2 lane with shoulders	NA	NA	Moderate
Paoli Pike	2 lane, no shoulders	14.5	23.4	Severe
PA 3	4 lane divided	35.8	50.5	Heavy
US 322 Business, High St	2 lane, turn pockets	15.8	22.6	Severe
PA 52 / PA 100, Price St	2 lane, no shoulders	NA	NA	Severe
Pa 841, Miner St	2 lane, no shoulders	NA	NA	Severe
PA 162, Strasburg Rd	2 lane, no shoulders	NA	NA	Severe
US 322 (North of US 322 Business)	2 lane with shoulders	NA	NA	Heavy
US 322 Business, Hannum Ave	2 lane, continuous left turns	16.0	23.2	Minor
US 322, West Chester Bypass	2 lane, part control	NA	NA	Minor

IV. 2020 *LANDSCAPES* TRAVEL FORECASTS UNDER THE IMPROVEMENT SCENARIOS

Three 2020 scenarios were tested with three separate runs of the Chester County model – a No-Build scenario and two improvement scenarios. Each scenario assumed the same county-wide population and employment distribution with growth concentrated in appropriate locations consistent with *Landscapes*.

Two improvement scenarios were specified for testing by Chester County planners. These alternatives are intended to test the effects of county-wide highway and transit improvement strategies on county-wide, planning area level congestion, and on specific facilities in the nine corridors or areas analyzed in greater detail under the No-Build conditions in Chapter III. The improvement scenarios tested as part of this study were very extensive in terms of the number of facilities improved. Scenario 1 is intended to test the effect of moderate levels of highway and public transit improvements on congestion levels throughout the county. Scenario 2 specifies more extensive levels of highway and transit improvements throughout the county. For the most part, Scenario 2 includes the facility improvements of Scenario 1 plus many significant upgrades and additional improvements.

Chester County staff identified numerous specific highway and transit improvements to be included in the improvement scenarios. In addition to these improvements, Chester County staff identified many other roadways where generalized safety and/or capacity improvements would be tested. These improvements include lane widenings, sight distance and other intersection improvements, additional interchange ramps, and so forth. In these cases, the improvements could only be specified in general terms, not in detail. For these improvements DVRPC and Chester County staff developed a series of four categories of improvement and the associated percentage capacity increase with each. Category 1 improvements tend to be minor safety and/or capacity improvements at existing intersections. These improvements include lane widenings, minor sight distance improvements, realignments, and provision of or improvements to individual traffic signals. Much the same type of improvements are included in category 2, although the specific improvements are more extensive. Included are major sight distance improvements, provision of left turn lanes, corridor-wide access management and signal systems, reconstruction of interchange ramps, and minor ring roads around villages or centers. Category 3 improvements include major facility upgrades such as addition of left and right turn lanes at all intersections, provision of additional lanes or a continuous center left turn lane, major improvements to existing interchanges, and provision of new slip ramps. Finally, the most extensive facility improvements are included in category 4. These improvements include new freeway interchanges, grade separations at congested arterial intersections, new arterial or collector roadways, major bypasses, and new limited access facilities.

These categorical improvements were modeled through a series of standardized capacity increases, subject to the requirements of the specific facility improvements also provided by the county. These standard capacity increases are shown in Table 16.

Table 16. Proposed Highway Improvement Categories for 2020 Travel Simulation .

Category	Types of Improvement	Capacity Increase
1	• Lane or shoulder widenings • Minor sight distance improvements • Realignments • Installation/upgrade of individual traffic signals	5 percent
2	• Major sight distance improvements • Provision of left-turn lanes • Access management • Signal system installation • Interchange reconstruction • Minor ring road construction	10 percent
3	• Addition of left and right turn lanes at all intersections • Provision of continuous center left-turn lane • Major interchange improvements • Provision of new slip ramps	15 percent
4	• New freeway interchanges • Grade separations at congested intersections • New arterial or collector roadways • Major bypasses • New limited access facilities	Project level specification

A. Transportation Improvement Scenario 1

A map displaying the categorical improvements included in future highway Scenario 1 was provided by Chester County staff. Most of the roadway improvements are defined as category 2. Category 3 improvements are concentrated in the US 202, US 30, and US 1 corridors. Category 4 improvements include the Avondale Bypass on PA 41, the Eagle Bypass around historic Eagle Village, and the French Creek Parkway connecting PA 23 and 29 in Phoenixville. The specific facility improvements that selectively further define these categorical improvements are given in Table17. These improvements include selective widenings on US 202, PA 29, US 1, PA 3, and PA 100, the new bypasses around Avondale and Eagle, and selected intersection and roadway improvements throughout the county. The resulting changes in capacity under Scenario 1 are plotted in Map 14.

The new transit facilities included in Improvement Scenario 1 are specified in Table 18. These include frequency improvements on the Amtrak Keystone Corridor and selected service improvements on the SEPTA R5, including new station stops at 52nd Street, Coatesville, and Parkesburg and other frequency and service pattern improvements; construction of the Cross County Metro as a light rail line from Glenloch to Center City via King of Prussia Mall; construction of the Schuylkill Valley Metro as a light rail line with Chester County Stations at Perkiomen Junction and Phoenixville ; construction of the R3 extension to Wawa and West Chester; and provision of SEPTA minimum suburban service standards on all suburban routes and other service improvements on most existing SEPTA, Krapf's, Pottstown Urban Transit, and RRTA routes. In addition, eight new bus routes are proposed to serve various portions of Chester County and circulators are provided for Coatesville, Phoenixville, West Whiteland, Downingtown - Lionville - East Caln, West Chester, Chesterbrook - King of Prussia - Port Kennedy, Kennett Square - Avondale, and Malvern - Paoli.

Table 17. Scenario 1 Simulated 2020 Highway Improvements for Chester County.

Highway	Municipality	Scenario 1 Highway Improvement
US 1	East Marlborough	Bayard Road to Bypass: widen to six lanes
US 1	East Marlborough	Bayard Road to PA 52 (Hammerton): widen to six lanes
PA 3	West Goshen	Intersection capacity at US 202, Five Points, and Strasburg roads
PA 3	West Goshen	Widen to 6 lanes by direction between US 202 and PA 352
PA 3	Willistown	Realignment and channelization at PA 926
PA 10	Upper Oxford	Channelization and install signal at PA 896
PA 10	West Fallowfield	Channelization at PA 41
PA 10	West Caln +	Reconstruction of roadway between PA 340 and Quarry Road
PA 23	South Coventry +	Channelization and safety at Bethel, Church, Bridge, and Hares Hill roads
PA 23	South Coventry	Ring road around the intersection of PA 100 (Bucktown)
PA 29	Charlestown	Channelization and signal timing at Charlestown Road/Phoenixville Pike
PA 29	East Whiteland +	Widen to four lanes between Great Valley Parkway and Charlestown Road
PA 29	East Whiteland +	Westbound exit/eastbound entry slip ramps at PA Turnpike
US 30 Bypass	Valley	Construct full interchange at Airport Road
US 30 Bypass	East Caln	Reconstruct PA 113 interchange
US 30 Bypass	Caln +	Reconstruct existing travel lanes and interchanges
US 30	Tredyffrin	Signalization and channelization at Devon State Road
US 30	Willistown +	Traffic improvements for Paoli Transportation Center
US 30	Tredyffrin	Channelization and safety at PA 252
US 30	West Sadsbury +	Traffic improvements associated with Wal-Mart
PA 41	Londonderry	Channelization and safety at PA 796
PA 41	West Sadsbury	Channelization and safety at Zook Road
PA 41	Atglen	Channelization and safety at PA 372
PA 41	Avondale +	Bypass around Avondale, remaining corridor four lanes from PA 926 to Delaware State Line
PA 41	Avondale +	New interchanges at US 1 and Limestone Road

Table 17. Scenario 1 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 1 Highway Improvement
PA 52	Kennett +	PA 926 to US 1: realignment - one lane in each direction
PA 52	Kennett +	Channelization, realignment and signal timing at PA 926; new intersection with US 1
PA 82	West Brandywine	Reconstruction of roadway between Cedar Knoll Road and PA 340
PA 82	West Brandywine	Channelization and install signal at PA 340
PA 100	Upper Uwchlan	Channelization and safety at Park, Little Conestoga, Font, Fellowship and Byers roads
PA 100	Upper Uwchlan	Eagle Bypass - five lane cross section
PA 100	North Coventry	New northbound ramp to PA 724
PA 100	West Whiteland +	US 30 Bypass to Welshpool Road: widen to six lanes and intersection capacity
PA 100	West Whiteland +	US 30 Bypass to Shoen Road: widen to 6 lanes
PA 100	West Whiteland +	Intersection capacity at Exton Bypass, US Business 30, and Swedesford Road
PA 100	South Coventry	Channelization and realignment at Pughtown Road
PA 113	West Pikeland	Channelization and signal timing at PA 401
PA 113	West Pikeland	Channelization at Yellow Springs, Pikeland, and Clover Mill roads
PA 113	Uwchlan	Gordon Drive to Davis Road: widen to four lanes
PA 113	Uwchlan	Westbound exit/eastbound entry slip ramps at PA Turnpike
PA 113	East Caln	Widen to two lanes by direction with center turn lane between Whitford Hills Road and US 30 Bypass
US 202	East Whiteland +	Section 300: widen to six lanes
US 202	Westtown +	Section 100: widen to six lanes; grade separation at US 1 and Matlack Street and ring roads at US 1 and PA 926
US 202	Tredyffrin	Full interchange at Chesterbrook interchange
US 202	West Goshen	Full interchange at US 322 (West Chester Bypass)

Table 17. Scenario 1 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 1 Highway Improvement
US 202	Westtown	Parallel roads connecting Skiles Boulevard and PA 926
PA 252	Tredyffrin	Widen to four lanes between Chesterbrook and US 202
US 322	East Bradford	Channelization and signal at West Chester Bypass
US 322	Honeybrook	Channelization and realignment at PA 10
US 322	East Brandywine	Channelization and signal timing at Hopewell and Springton Road
PA 352	East Goshen	Channelization and signal timing at Boot Road and Paoli Pike
PA 401	West Pikeland	Channelization at Byers, Upper Pine Creek and Messner roads
PA 401	Upper Uwchlan	Channelization and safety at Fellowship Road
PA 401	West Vincent	Channelization and realignment at Saint Matthews Road
US 422	Upper Merion	Westbound exit slip ramp merging with northbound traffic on US 422
PA 796	Penn	Channelization and safety at Baltimore Pike
PA 926	Pennsbury	Safety improvements at Parkersville Road and Denton Hollow and New streets
PA 926	Westtown	Channelization and safety at Concord, Shiloh, and Westtown roads
	Phoenixville	Traffic improvements for Phoenixville Transportation Center
	Phoenixville	Construct French Creek Parkway: one lane by direction with left turn lanes
PA Turnpike	Uwchlan	Electronic toll collection: interchanges 23 - 31
PA Turnpike	Uwchlan	One additional entrance and exit toll booth at the Downingtown interchange 23
Boot Road	West Goshen	Channelization and safety at Phoenixville Pike and Greenhill Road
Paoli Pike	West Goshen	Channelization and safety improvements at Five Points Rd
Paoli Pike	East Goshen +	Channelization and signal timing at Ellis Lane, Airport Road, Warren Avenue, and Root Road
BaltimorePike	Kennett	Channelization and safety improvements; install signal at McFarlan Road
Baltimore Pike	New Garden	Channelization and signal timing at Newark Road
US Business 30	West Whiteland	Two lanes by direction from US 30 Bypass to US 202
US Business 30	West Whiteland	Channelization and safety at Whitford Road and Ship Road
Newark Road	New Garden	Channelization and safety at Hillendale Road

Table 17. Scenario 1 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 1 Highway Improvement
Swedesford Rd	West Whiteland	Realignment and channelization at Ship Road
	Avondale	Park and ride lot at PA 41 and Baltimore Pike
	Phoenixville +	Park and ride lot at PA 113 and PA 23
	Caln +	Park and ride lots at interchanges along US 30 Bypass
	West Whiteland +	Chester Valley Trail phases 1 and 2
	West Whiteland +	Closed loop signal system: PA 100, PA 113, and US Business 30
	Downingtown	Closed loop signal system: US 322, PA 113, and US Business 30
	Phoenixville	Closed loop signal system: PA 23, PA 29, and PA 113
	West Chester	Closed loop signal system: PA 3 and PA 100
	Caln	Closed loop signal system: US Business 30 and PA 340
	East Goshen	Closed loop signal system: Paoli Pike
	Kennett Square	Closed loop signal system: PA 82 and Baltimore Pike
	Great Valley	Closed loop signal system: PA 29 and Swedesford Road

+ Highway improvements extend to adjacent municipality

note: intersection improvements can be assumed with closed loop signal systems

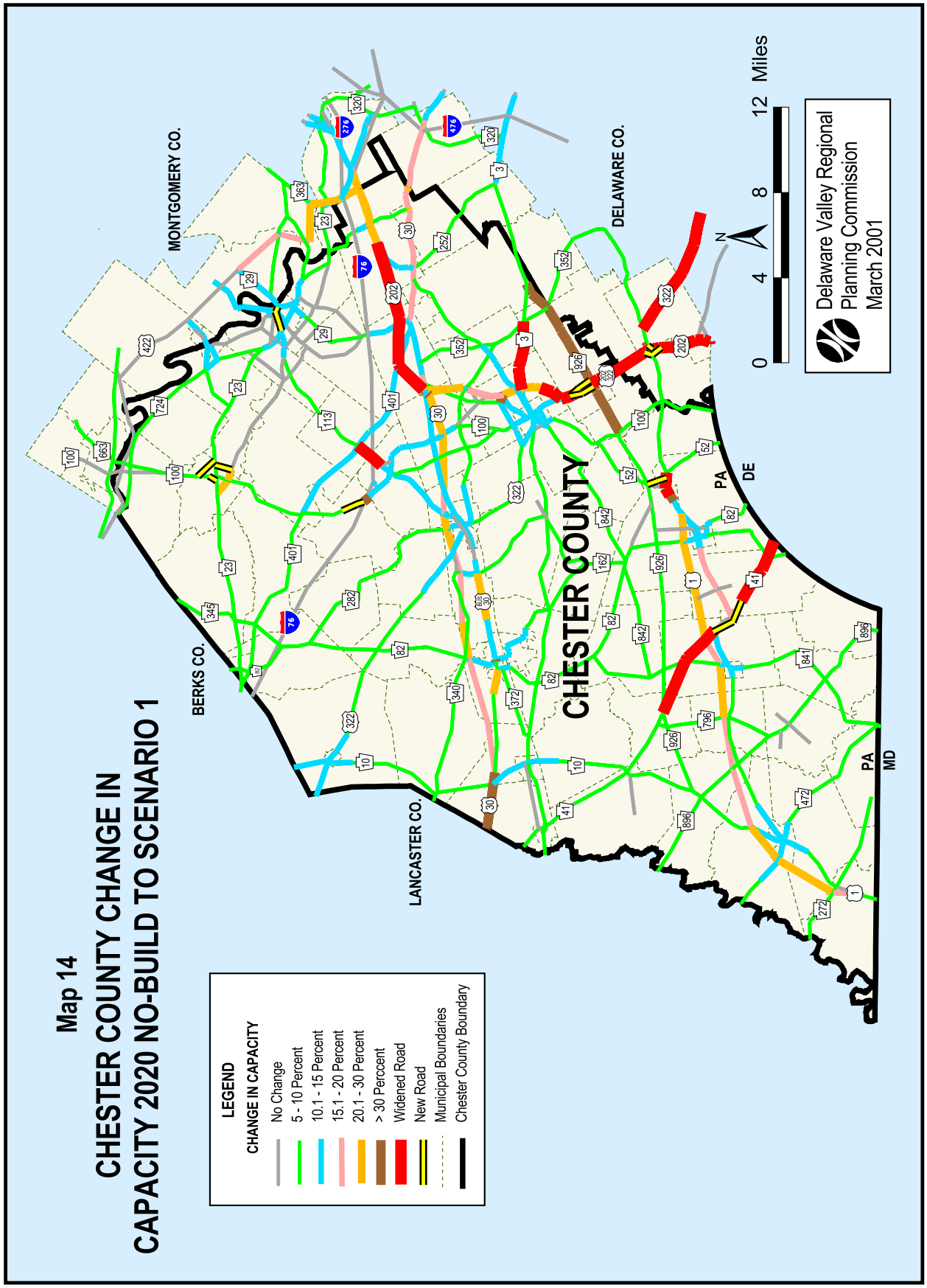

Map 14
CHESTER COUNTY CHANGE IN
CAPACITY 2020 NO-BUILD TO SCENARIO 1
LEGEND
CHANGE IN CAPACITY
No Change
5 - 10 Percent
10.1 - 15 Percent
15.1 - 20 Percent
20.1 - 30 Percent
> 30 Percent
Widened Road
New Road
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
BERKS CO.
MONTGOMERY CO.
DELAWARE CO.
LANCASTER CO.
PA
DE
PA
MD
N
0 4 8 12 Miles
Delaware Valley Regional
Planning Commission
March 2001

Table 18. Chester County Focused Travel Simulation: Transit Scenario 1 – Moderate.

Rail:

1. Amtrak Keystone Corridor
    - 90-minute weekday headways
    - Serving existing stations (Parkesburg, Coatesville, Downingtown, Exton, Paoli)
    - One a.m. and one p.m. peak express train to New York and Harrisburg, serving Paoli and Downingtown

2. R5:
    - Current Chester County station stops (at Strafford, Devon, Berwyn, Daylesford, Paoli, Malvern, Exton, Whitford, Downingtown, Thorndale)
    - Add station stop at 52nd Street (Philadelphia)
    - Add weekday peak station stops at Coatesville, Parkesburg
    - Additional cars on selected peak trains
    - One additional Great Valley Flyer in a.m. and p.m. peak
        - Inbound leaving Downingtown at 6:30 a.m., outbound leaving Suburban Station at 5:05 p.m.
    - Restore limited train making local stops from Paoli to Wayne, then non-stop to Philadelphia, leaving Paoli at 7:05 a.m.
    - Restore limited train operating non-stop from Philadelphia to Wayne, then local to Paoli, leaving Suburban Station at 5:35 p.m.

3. Schuylkill Valley Metro (SVM)
    - Stations at Port Kennedy, Perkiomen Junction, Oaks, and Phoenixville
    - Light rail service (MIS alternative 5E), 15-minute peak headways, 30-minute off-peak (coordinated with Cross County/SVM local service), 60-minute weekend headways
    - Street running from City Hall Philadelphia via City Branch, Girard Avenue Bridge
    - Dedicated track to Ivy Ridge, stops at Conshohocken, Norristown, Port Kennedy, Perkiomen Junction, Oaks, Phoenixville, Royersford, Limerick, Lower Pottsgrive, Pottstown

4. Cross County Metro/SVM local:
    - Light rail service, 15-minute peak headways, 30-minute off-peak (coordinated with SVM express service), 60-minute weekend headways
    - Station stops at Glenloch, Great Valley, Cassatt Road, South Gulph Road, King of Prussia Mall, First Avenue, Port Kennedy, Norristown, Conshohocken, Spring Mill, Miquon, Manayunk, Cynwyd, Bala, Wynnefield, 52nd Street
    - Street running to Zoo, Art Museum, Rodin Museum/Ben Franklin Parkway, Center City, and City Hall

Table 18. Chester County Focused Travel Simulation: Transit Scenario 1 - Moderate (Continued)

5. R3: Philadelphia - Elwyn - Wawa - West Chester
   - Extension of existing service to Glen Riddle and Wawa stations for all trains currently serving Elwyn
   - Extension of service on West Chester branch to Glen Mills, Cheyney, Westtown, West Chester University, and West Chester stations
   - 15-minute peak service from Wawa to Philadelphia, 30-minute peak headways from West Chester
   - 60-minute off-peak headways from West Chester and Wawa

Bus:

6. All Septa routes at least meet minimum Suburban Service Standards, except where exceptions noted. All routes that already exceed standards would remain at those higher frequencies and spans.

	Weekday	Saturday	Sunday
Frequency	60 minutes	60 minutes	60 minutes
Span	6:00 a.m. - 6:00 p.m.	8:00 a.m. - 6:00 p.m.	10:00 a.m. - 6:00 p.m.

1. SEPTA #92 (West Chester - King of Prussia)
   - Levels of service from November 21, 1999 schedule

2. SEPTA #99 (Norristown - Phoenixville - Spring City - Pottstown)
   - Service levels based on frequencies in November 21, 1999 schedule
   - Adjustments for pulse scheduling at Phoenixville SVM Station
   - Service to Valley Forge Christian College replaced by circulator

9. SEPTA #104 (West Chester - Upper Darby)
   - Levels of service from September 13, 1999 schedule

10. SEPTA #105 (Paoli - Ardmore - Upper Darby)
    - Levels of service from September 13, 1999 schedule
    - Minor adjustments for pulse scheduling at Devon Train Station

11. SEPTA #118 (Chester - Newtown Square - Paoli - King of Prussia)
    - Extend service span to 6:00 a.m. - 9:00 p.m., Monday - Saturday

Table 18. Chester County Focused Travel Simulation: Transit Scenario 1 - Moderate (Continued)

12. SEPTA #19 (Chester - Granite Run Mall - West Chester)
    - Chester County portion replaced by R3 extension to West Chester
    - Service extended west on US 1 to Painters Crossing

13. SEPTA #120 (Upper Darby - Cheyney University)
    - Replaced by R3 service to Cheyney Station and shuttle between station, Cheyney University, and SEPTA # 104 at Marketplace Shopping Center (PA 3 west of PA 351)

14. SEPTA #124
    - Replaced by Schuylkill Valley Metro and circulators in King of Prussia and Port Kennedy to Chesterbrook

15. SEPTA #202
    - Service restored between West Chester and Wilmington Amtrak Station via US 202
    - No southbound boardings between Brandywine Towne Center and Wilmington
    - No northbound departures between Wilmington and Brandywine Towne Center
    - 30-minute peak, 60-minutes off-peak service on weekdays
    - Limited service between West Chester and Concord Mall on Saturdays
    - One a.m. trip, two midday trips, one p.m. trip
    - Service span, weekdays: 6:00 a.m. - 9:00 p.m., Saturdays: 8:00 a.m. - 9:00 p.m.

16. SEPTA #204
    - 60-minute headways in midday hours between Paoli and Exton

17. SEPTA #206
    - Expand span of service to 6:00 - 10:00 a.m. and 3:00 - 7:00 p.m.
    - Add eastbound service to connect with 9:00 - 11:00 p.m. R5 inbound trips
    - Add peak service in conjunction with additional R5express service

18. SEPTA #208 (Chesterbrook - Strafford - Devon Park)
    - 90-minute headways during midday hours

19. SEPTA #314 (Upper Chichester - West Chester)
    - 30-minute peak, 60-minute off-peak frequencies
    - Service span, 6:00 a.m. - 9:00 p.m.

Table 18. Chester County Focused Travel Simulation: Transit Scenario 1 - Moderate (Continued)

20. Krapf's A bus
    - 30-minute weekday headways
    - 30-minute headways on Saturdays between 8:30 a.m. and 5 p.m.
    - 60-minute evening (Monday - Saturday) headways between 7:00 and 10:00 p.m.

21. PUT NC - Coventry Mall and Cedarville Road
    - 30-minute peak and 60-minute off-peak frequencies
    - Nighttime service on Fridays, 60-minute headways

22. SCCOOT: Oxford - East Goshen
    - Add a second peak round trip per day
    - Morning peak trip from Kennett Square to East Goshen
    - Afternoon peak trip from East Goshen to Kennett Square
    - 25' cutaway buses

23. RRTA #12
    - Extension of existing Lancaster - New Holland service to Honey Brook
    - 3 round trips per day

24. RRTA #13 from Compass to Lancaster
    - Existing levels of service

25. West Chester - Paoli via Paoli Pike
    - Pulse scheduling with R5 at Paoli Transportation Center
    - 30-minute peak, 60-minute off-peak headways, 6:00 a.m. - 7:00 p.m.
    - Limited Saturday service (60-minute headways, 8:00 a.m. - 6:00 p.m.)
    - 25' cutaway buses

26. Trappe - Phoenixville - Great Valley
    - 30-minute peak headways
    - 60-minute off-peak headways
    - Service span: Weekdays only, 6:00 a.m. - 7:00 p.m.

27. Kennett Square - Avondale - Wilmington
    - Peak service only
    - 60-minute headways

Table 18. Chester County Focused Travel Simulation: Transit Scenario 1 - Moderate (Continued)

28. Phoenixville - Lionville - Downingtown
    - 30-minute peak headways
    - 60-minute off-peak headways
    - Service span, 6:00 a.m. - 7:00 p.m.

29. Pottstown - Exton
    - 60-minute frequencies, weekdays and Saturdays only
    - 25' cutaway buses

30. Coatesville - Parkesburg - Christiana
    - 60-minute frequencies, weekdays and Saturdays only
    - Serving Airport Road industrial sites
    - Serving the proposed Wal-Mart site at PA 10 and US 30

31. Morgantown - Lionville Park and Ride - Valley Forge
    - Peak only express via Turnpike
    - 3 round trips per day

32. Lionville Park and Ride - Plymouth Meeting - Fort Washington
    - Peak only express via Turnpike
    - 3 round trips per day

Circulators:

33. Coatesville Link
    - 60-minute headways
    - Weekdays, 6:30 a.m. - 6:30 p.m.
    - Saturdays, 8:30 a.m. - 5:30 p.m.

34. Phoenixville
    - 30-minute peak headways
    - 60-minute off-peak weekdays headways
    - Weekday service, 6:00 a.m. - 7:00 p.m.

Table 18. Chester County Focused Travel Simulation: Transit Scenario 1 - Moderate (Continued)

35. West Whiteland
    - Connect with R5 trains in both directions
    - 30-minute headways, Monday - Saturday Weekday service, 6:00 a.m. - 9:00 p.m.
    - Saturday service, 9:00 a.m. - 6:00 p.m.

36. Downingtown - Lionville - East Caln
    - 60-minute headways, Monday - Friday
    - Weekday service, 6:30 a.m. - 8:00 p.m.

37. West Chester
    - 45-minute headways, Monday - Friday
    - Weekday service, 8:00 a.m. - 8:00 p.m.

38. Chesterbrook - King of Prussia - Port Kennedy
    - Connect with Schuylkill Valley Metro
    - 30-minute headways, Monday - Friday
    - 60-minute headways, Saturday

39. Kennett Square - Avondale
    - 60-minute headways, Monday - Friday
    - Weekday service, 8:00 a.m. - 6:00 p.m.

40. Malvern - Paoli
    - 30-minute peak headways
    - 60-minute off-peak headways
    - Weekday service, 5:30 a.m. - 9:00 p.m.

B. Transportation Improvement Scenario 2

A map displaying the categorical improvements included in future highway Scenario 2 was also provided by Chester County staff to accompany Scenario 1. Most of the roadway improvements defined in Scenario 1 are included and some upgraded to category 3. Category 4 improvements include the Chester-Montgomery Connector, French Creek Parkway, PA 29 Realignment, PA 100 Bucktown and Ludwig's Corner realignments, the Eagle Bypass and grade separations on PA 100 in Uwchlan and West Whiteland Townships. In addition, new alignment expressways are constructed for US 30 to Lancaster County and a new arterial extension from PA 10 / US 30 to Atglen. Finally, the Avondale and Chatham bypasses on PA 41 are included. Other category 4 improvements include widening Tigue Road from PA 52 to US 202 and a new arterial from the Kennett Bypass to PA 100 on a new alignment south of US 1. Category 3 improvements are most numerous in the eastern part of the county, being largely concentrated in the US 202, US 30, and US 1 corridors. The specific facility improvements that selectively further define these categorical improvements are given in Table 19. These improvements include selective widenings on US 202, PA 29, US 1, PA 3, and PA 100; the new bypasses around Avondale, Chatham, and Eagle; grade separation at the intersection of US 202 and PA 926; and selected intersection and roadway improvements throughout the county. The resulting changes in capacity under Scenario 2 are plotted in Map 15.

The transit facilities included in Improvement Scenario 2 are specified in Table 20. These include the same frequency improvements on the Amtrak Keystone Corridor and the station and service improvements on the SEPTA R5 included in Scenario 1. Construction of the Cross County Metro is upgraded from light rail to modified light rail service from Glenloch to Center City via King of Prussia Mall with a branch to Morrisville and Commuter Rail track running into Center City Philadelphia. Construction of the Schuylkill Valley Metro as a modified light rail line with stations at Port Kennedy, Perkiomen Junction, Oaks, Phoenixville, Royersford, Limerick, Lower Pottsgrove, and Pottstown is also included, as is construction of the R3 extension to Wawa and West Chester. More extensive service improvements are included on most existing SEPTA, Krapf's, Pottstown Urban Transit, SCCOOT, and RRTA routes than for Scenario 1. In addition, fourteen new bus routes are proposed to serve various portions of Chester County and circulators are provided for Coatesville, Phoenixville, Spring City - Royersford, West Whiteland, West Chester, Chesterbrook - King of Prussia - Port Kennedy, Malvern - Paoli, Berwyn - Devon, Kennett Square - Avondale, and North Coventry - Pottstown.

Table 19. Scenario 2 Simulated 2020 Highway Improvements for Chester County.

Highway	Municipality	Scenario 2 Highway Improvements
US 1	East Marlborough	Bayard Road to Bypass: widen to six lanes
US 1	East Marlborough	Bayard Road to PA 52 (Hammerton): widen to six lanes
US 1	East Marlborough +	Relocate one lane by direction with connector to Longwood
US 1	Kennett	Construct westbound off and eastbound on ramps to PECO property
US 1	Kennett	Ring road around the intersection of PA 52 (Hammerton)
PA 3	West Goshen	Intersection capacity at US 202, Five Points, and Strasburg roads
PA 3	West Goshen	Widen to 6 lanes by direction between US 202 and PA 352
PA 3	Willistown	Realignment and channelization at PA 926
PA 10	Upper Oxford	Channelization and install signal at PA 896
PA 10	West Fallowfield	Channelization at PA 41
PA 10	West Caln +	Reconstruction of roadway between PA 340 and Quarry Road
PA 10	West Caln	Realignment, channelization, and traffic signal at PA 340
PA 23	South Coventry +	Channelization and safety at Fulmer, Bethel, Church, Bridge, Hares Hill, and Buckwalter roads
PA 23	Schuylkill	Channelization and safety at Country Club and Valley Parks roads and PA 252
PA 29	Charlestown	Channelization and signal timing at Charlestown Road/Phoenixville Pike
PA 29	East Whiteland +	Widen to four lanes between Great Valley Parkway and Charlestown Road
PA 29	East Whiteland +	Westbound and eastbound slip ramps at PA Turnpike
PA 29	Charlestown	Relocate one lane by direction
US 30 Bypass	Valley	Construct full interchange at Airport Road
US 30 Bypass	East Caln	Reconstruct PA 113 interchange

Table 19. Scenario 2 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 2 Highway Improvements
US 30 Bypass	Caln +	Reconstruct existing travel lanes and interchanges
US 30 Bypass	Caln +	Widen to three lanes by direction from Exton Bypass to PA 340
US 30 Bypass	West Whiteland	Construct eastbound off ramp to US 202 southbound
PA 100	South Coventry	Bucktown relocation: one lane by direction
PA 100	Uwchlan +	Urban interchanges at PA 113, Swedesford Road, and US Business 30
PA 113	West Pikeland	Channelization and signal timing at PA 401
PA 113	West Pikeland	Channelization at Yellow Springs, Pikeland, and Clover Mill roads
PA 113	Uwchlan	Gordon Drive to Davis Road: widen to four lanes
PA 113	Uwchlan	Westbound exit/eastbound entry slip ramps at PA Turnpike
PA 113	East Pikeland	Channelization and safety at Cold Stream, Pothouse, and Township Line roads and PA 23
PA 113	East Caln	Widen to two lanes by direction with center turn lane between Whitford Hills Road and US 30 Bypass
PA 113	Phoenixville	Relocation: one lane by direction
PA 113	East Pikeland	Spring City Connector: one lane by direction connecting PA 113 and PA 724
PA 113	East Bradford	Ring road around the intersection of Northbrook/Wawaset roads (Marshallton)
US 202		East Whiteland +Section 300: widen to six lanes
US 202	Westtown +	Section 100: widen to six lanes; grade separation at US 1 and ring roads at US 1 and PA 926
US 202	Tredyffrin	Full interchange at Chesterbrook interchange
US 202	West Goshen	Full interchange at US 322 (West Chester Bypass)
US 202	West Goshen	Section 200: reconstruction of interchanges (auxiliary lanes)

Table 19. Scenario 2 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 2 Highway Improvements
US 202	West Goshen	Extend West Chester Bypass to PA 52 in East Bradford
US 202	Westtown	Parallel roads connecting Skiles Boulevard and PA 926
PA 252	Tredyffrin	Widen to four lanes between Chesterbrook and US 202
PA 252	Tredyffrin	Widen to four lanes between Central Avenue and Hilltop Road
US 322	East Bradford	Channelization and signal at West Chester Bypass US 322HoneybrookRing road around the intersection of PA 10
US 322	Honeybrook	Channelization and realignment at PA 10
US 322	East Brandywine	Channelization and signal timing at Hopewell and Springton Road
US 322	East Brandywine	Ring road around the intersection of Hopewell and Bondsville roads (Guthriesville)
PA 340	Caln	Channelization and safety at Reeceville Road
PA 352	East Goshen	Channelization and signal timing at Boot Road and Paoli Pike
PA 372	West Sadsbury +	US 30 Connector: one lane by direction connecting PA 372 with US 30 Bypass and US 30 Business
PA 401	West Pikeland	Channelization at Byers, Upper Pine Creek and Messner roads
PA 401	Upper Uwchlan	Channelization and safety at Fellowship Road
PA 401	West Vincent	Channelization and realignment at Saint Matthews Road
PA 401	East Whiteland	Channelization and safety at US 30 and Swedesford, Moores, and Malin roads
US 422	Upper Merion +	Widen to six lanes between PA 20 and US 202
US 422	Upper Merion	Westbound exit slip ramp merging with northbound traffic on US 422
PA 724	East Vincent	Channelization and safety at New Street

Table 19. Scenario 2 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 2 Highway Improvements
PA 724	East Pikeland +	Widen to four lanes between PA 23 and Bridge Street
PA 841	Franklin	Channelization and safety at PA 896 and Flint Hill and North Church roads
PA 896	New London	Ring road around the intersection of State Road (New London)
PA 896	Franklin	Ring road around the intersection of Kemblesville-Elkton Road
PA 896	Franklin +	Channelization and safety at Fellowship Road
PA 926	Pennsbury	Channelization and safety at PA 796 and Peacedale and Den roads
PA 926	Westtown	Channelization and safety at Concord, Shiloh, and Westtown roads
	Phoenixville	Traffic improvements for Phoenixville Transportation Center
	Phoenixville	Construct French Creek Parkway: one lane by direction with left turn lanes
PA Turnpike	Uwchlan	Electronic toll collection: interchanges 23 - 31
PA Turnpike	Uwchlan	Two additional entrance and exit toll booths at the Downingtown interchange 23
Boot Road	West Goshen	Channelization and safety at Phoenixville Pike and Greenhill Road
Boot Road	East Caln	Widen to four lanes between Chestnut Street and Quarry Road
Boot Road	East Goshen	Capacity improvements between Paoli Pike and Wilson Drive
Paoli Pike	West Goshen	Channelization and safety improvements at Five Points Rd
Paoli Pike	East Goshen +	Channelization and signal timing at Ellis Lane, Airport Road, Warren Avenue, and Root Road
Baltimore Pike	Kennett	Channelization and safety improvements; install signal at McFarlan Road
Baltimore Pike	New Garden	Channelization and signal timing at Newark Road
Baltimore Pike	New Garden	Ring road around intersection of Newark Road (Toughkenamon)
US Business 30	West Whiteland	Two lanes by direction from US 30 Bypass to US 202

Table 19. Scenario 2 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 2 Highway Improvements
US Business 30	West Whiteland	Channelization and safety at Whitford Road and Ship Road
Newark Road	New Garden	Channelization and safety at Hillendale and Starr roads
Strasburg Road	East Fallowfield	Channelization and safety at PA 82 and Buckrun Roads
Swedesford Rd	East Whiteland +	Channelization and safety at Liberty Boulevard, US 202 ramps, and Church, North Valley, and Phoenixville roads
Swedesford Rd	West Whiteland	Realignment and channelization at Ship Road
Main Street	Spring City	Channelization and safety at Bridge and New streets
	Avondale	Park and ride lot at PA 41 and Baltimore Pike
	Phoenixville +	Park and ride lot at PA 113 and PA 23
	Caln +	Park and ride lots at interchanges along US 30 Bypass
	West Whiteland +	Chester Valley Trail phases 1, 2 and 3
	West Whiteland +	Closed loop signal system: PA 100, PA 113, and US 30 Business
	Downingtown	Closed loop signal system: US 322, PA 113, and US 30 Business
	Phoenixville	Closed loop signal system: PA 23, PA 29, and PA 113
	West Chester	Closed loop signal system: PA 3 and PA 100
	Caln	Closed loop signal system: US 30 Business and PA 340
	East Goshen	Closed loop signal system: Paoli Pike
	Kennett Square	Closed loop signal system: PA 82 and Baltimore Pike
	Tredyffrin +	Closed loop signal system: US 30 from US 202 to I-476
	Coatesville	Closed loop signal system: US Business 30 and PA 82

Table 19. Scenario 2 Simulated 2020 Highway Improvements for Chester County. (Continued)

Highway	Municipality	Scenario 2 Highway Improvements
	Great Valley	Closed loop signal system: PA 29 and Swedesford Road
	Tredyffrin	Closed loop signal system: US 202 at Devon Interchange and Bay Colony ramps

+ Highway improvements extend to adjacent municipality

note: intersection improvements can be assumed with closed loop signal systems

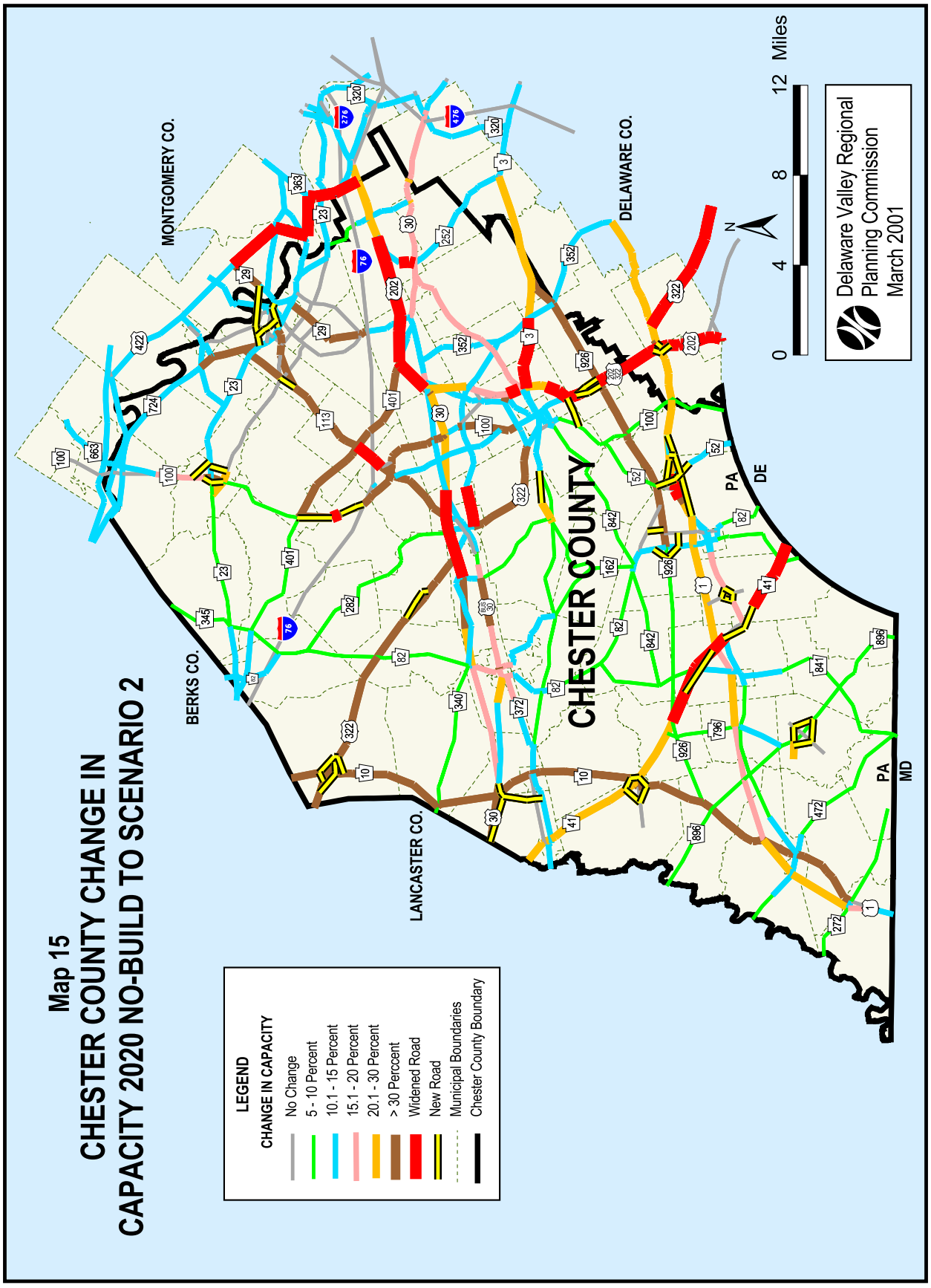

Map 15
CHESTER COUNTY CHANGE IN
CAPACITY 2020 NO-BUILD TO SCENARIO 2
LEGEND
CHANGE IN CAPACITY
No Change
5 - 10 Percent
10.1 - 15 Percent
15.1 - 20 Percent
20.1 - 30 Percent
> 30 Perccent
Widened Road
New Road
Municipal Boundaries
Chester County Boundary
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
CHESTER COUNTY
PA
DE
MD
N
0 4 8 12 Miles
Delaware Valley Regional
Planning Commission
March 2001

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 – Extensive.

Rail:

1. Amtrak Keystone Corridor
   - 60-minute weekday headways
   - Serving existing stations
   - 2 a.m. and 2 p.m. peak express trains to New York and Harrisburg serving Paoli and Downingtown
   - One additional train per day to Pittsburgh and Chicago

2. R5:
   - Same levels of service as in Scenario 1, plus:
   - Add station stop at 52nd Street (Philadelphia)
   - Extend Saturday service to Parkesburg, Sunday service to Thorndale
   - Two additional Great Valley Flyers, Earlier in a.m. and p.m. peak

3. Schuylkill Valley Metro
   - Modified light rail service (MIS alternative 6):
   - 15-minute peak headways, 30-minute off-peak (coordinated with Cross County/SVM local service), 60 minute weekend service
   - Operating on commuter rail track from Market East, stopping at Suburban Station, 30th Street, 52nd Street, Wynnefield, Bala, Cynwyd, Manayunk, Ivy Ridge, Conshohocken, Norristown, Port Kennedy, Perkiomen Junction, Oaks, Phoenixville, Royersford, Limerick, Lower Pottsgrove, Pottstown, Douglasville, Exeter, Reading BARTA ITF, Reading Outer Station, and Wyomissing
   - Weekend special service from Reading to King of Prussia Mall, making all local stops
   - Special tourist excursion trains from Philadelphia to Valley Forge Park on weekends and holidays

4. Cross County Metro / SVM local:
   - Modified light rail service:
   - 15-minute peak headways, 30-minute off-peak
   - Station stops at Glenloch, Great Valley, Cassatt Road, South Gulph Road, King of Prussia Mall, First Avenue, Port Kennedy, Norristown
   - Peak through service to Philadelphia, with stops at Conshohocken, Spring Mill, Miquon, Manayunk, Wissahickon, East Falls, Allegheny, North Broad, Temple, Market East, Suburban Station, and 30th Street (coordinated with SVM express service)
   - Off-peak service requires transfer to Schuylkill Valley Metro at Port Kennedy or Norristown to access Philadelphia
   - Extension via US 202 ROW from Glenloch to Hershey's Mill (Boot Road and US 202), West Goshen Center (Paoli Pike and US 202), connecting with West Chester Branch ROW to West Chester University, West Chester

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 - Extensive (Continued)

5. R3: Philadelphia - Wawa - West Chester
   - Extension of existing service to Glen Riddle and Wawa stations, based on service plan in draft feasibility study
   - Extension of service on West Chester branch to Glen Mills, Cheyney, Westtown, West Chester University, and West Chester stations
   - Passing sidings to accommodate 2 a.m. peak and 2 p.m. peak express trains
   - Branch from Wawa, serving stations at Chester Heights, Markham, Concordville, Painters Crossing, Chadds Ford, Mendenhall, and Kennett Square
   - Peak service from Avondale and West Grove
   - 30-minute peak headways on weekdays, 60-minutes off-peak

Bus:

6. SEPTA #92 (West Chester - King of Prussia)
   - Levels of service based on November 22, 1999 schedule

7. SEPTA #99
   - Replaced by Schuylkill Valley Metro and Phoenixville, Spring City circulators
   - Egypt Road shuttle to connect Phoenixville and Oaks
   - Peak period weekdays only to link with job sites
   - 30-40 minute headways
   - Segment east of Pawlings Road / Audubon replaced by reconfigured SEPTA #131

8. SEPTA #104 (West Chester - Upper Darby)
   - Levels of service based on September 13, 1999 schedule

9. SEPTA #105 (Paoli - Ardmore - Upper Darby)
   - Limited stops in areas served by circulators

10. SEPTA #118 (Chester - Newtown Square - Paoli - King of Prussia)
    - Expand span of service to 6:00 a.m. - 10:00 p.m., Monday - Saturday
    - Add Sunday service, 10 a.m. - 6:00 p.m.

11. SEPTA #119 (Chester - Granite Run Mall - West Chester)
    - Chester County portion replaced by R3 extension to West Chester
    - Service extended west on US 1 to Painters Crossing

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 - Extensive (Continued)

12. SEPTA #120 (Upper Darby - Cheyney University)
    - Replaced by R3 and shuttle

13. SEPTA #124
    - Replaced by Schuylkill Valley Metro and circulator

14. SEPTA #202
    - Same level of service as in scenario 1, plus 2 additional Saturday round-trips

15. SEPTA #204
    - 60-minute headways in midday hours between Paoli and Exton Target store

16. SEPTA #206
    - Add connection with Cross County Metro at Great Valley Station

17. SEPTA #208
    - Expand service to meet all R5 peak trains
    - 60-minute headway during midday hours

18. SEPTA #314 (Upper Chichester - West Chester)
    - 30-minute peak, 60-minute off-peak frequencies
    - Service span, 6:00 a.m. - 9:00 p.m.

19. Krapf's "A" bus
    - 30-minute frequencies from 7:00 a.m. to 7:00 p.m., Monday - Saturday

20. PUT NC - Coventry Mall
    - Replaced by North Coventry circulator

21. RRTA #13 from Compass to Lancaster
    - Existing levels of service

22. SCCOOT: Oxford - East Goshen
    - Same level of service as in Scenario 1

23. SCCOOT: Kenneth Square - Exton
    - 2 round trips per day

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 - Extensive (Continued)

- Morning northbound leaving Kennett Square at 7:45 and 8:45
- Afternoon southbound leaving Kennett Square at 5:00 and 6:00

24. West Chester - Paoli via Paoli Pike
    - 30-minute peak, 60-minute off-peak headways
    - 25' cutaway buses

25. Trappe - Phoenixville - Great Valley
    - Same level of service as in Scenario 1

26. Phoenixville - Lionville - Downingtown
    - Same level of service as in Scenario 1

27. West Grove - Avondale - Wilmington
    - Peak weekday service only, 45-minute headways

28. Kennett Square - Longwood - Wilmington
    - Extension of DART Route #10
    - 2 a.m., 2 p.m. peak weekday trips only

29. Oxford - Lincoln University - New London - Newark - Newark R2/Amtrak Station
    - 60-minute headways
    - Service span: weekdays 7:00 a.m. - 7:00 p.m.
    - 25' cutaway buses

30. Oxford - West Grove - Coatesville
    - 4 round trips per day, weekdays only
    - 1 a.m. peak, 1 p.m. peak
    - 2 mid-day trips to accommodate social service needs
    - Small vehicle route

31. Pottstown - Exton
    - Same level of service as in Scenario 1

32. Honey Brook - New Holland - Lancaster
    - Extend RRTA # 12
    - 60-minute frequencies, weekdays only

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 - Extensive (Continued)

33. Honey Brook - Downingtown Transportation Center
    - 30-minute peak, 60-minute off-peak headways
    - Candidate for small vehicle

34. Avondale - Churchman's Crossing (Delaware Park area via DE 7)
    - Extend DART # 19 during weekday peak only
    - 30 minute peak frequencies

35. Coatesville - Parkesburg - Christiana - Leaman Place (Lancaster County)
    - 60-minute frequencies, weekdays and Saturdays only
    - Connect with RRTA and Amtrak at proposed new rail station

36. Oxford - Baltimore
    - Limited stop service - peak only
    - One a.m. southbound and one p.m. northbound trip per day

37. Oxford - Quarryville - Lancaster
    - Peak only, 2 round trips per day

Circulators:

38. Coatesville Link
    - 30-minute headways weekdays, 60-minute Saturdays
    - Weekdays, 6:30 a.m. - 6:30 p.m.; Saturdays, 8:30 a.m. - 5:30 p.m.

39. Phoenixville
    - 15-minute peak, 30-minute off-peak weekday headways
    - Weekday service, 6:00 a.m. - 7:00 p.m.

40. Spring City - Royersford
    - 30-minute peak, 60-minute off-peak weekday headways
    - Weekday services, 6:00 a.m. - 7:00 p.m.

41. West Whiteland
    - 30-minute headways, Monday - Saturday
    - Weekday service, 6:00 a.m. - 9:00 a.m.
    - Saturday service, 9:00 a.m. - 6:00 p.m.
    - Limited Sunday Service, November - December

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 - Extensive (Continued)

42. West Chester
    - 30-minute headways, Monday - Friday
    - 60-minute headways, Saturdays
    - Weekday service, 8:00 a.m. - 8:00 p.m.
    - Saturday service, 9:00 a.m. - 6:00 p.m.

43. Chesterbrook - King of Prussia - Port Kennedy
    - 15-minute peak headways
    - 30-minute off-peak headways
    - 60-minute headways, Saturdays
    - Weekday service, 6:00 a.m. - 9:00 p.m.
    - Saturday service, 8:00 a.m. - 6:00 p.m.

44. Malvern - Paoli
    - 20-minute peak headways
    - 30-minute off peak and Saturday headways
    - Weekday service 5:30 a.m. - 9:00 p.m.
    - Saturday service, 8:00 a.m. - 6:00 p.m.

45. Berwyn - Devon
    - 20-minute peak headways
    - 30-minute off-peak and Saturday headways
    - Weekday service, 5:30 a.m. - 9:00 p.m.
    - Saturday service, 8:00 a.m. - 6:00 p.m.

46. Kennett Square - Avondale
    - 45-minute headways, Monday - Friday
    - Weekday service, 8:00 a.m. - 6:30 p.m.

47. North Coventry - Pottstown
    - Replaces PUT NC route
    - 30-minute headways, Monday - Saturday
    - Weekday service, 6:00 a.m. - 9:00 p.m.
    - Saturday service, 9:00 a.m. - 8:00 p.m.
    - Limited Sunday service, November - December

Table 20. Chester County Focused Travel Simulation: Transit Scenario 2 - Extensive (Continued)

Other investments:

48. Bus shelters on all routes

49. Paoli Transportation Center
    - 1200+ new long-term parking spaces
    - 20-30 short-term parking spaces

50. West Chester Transportation Center (location TBD)

51. Exton Transit Center (adjacent to Exton Square Mall)

52. Coatesville Transportation Center (location TBD)

53. Pottstown Transportation Center (at site of SVM station)

54. Phoenixville Transportation Center (at site of SVM station)

55. King of Prussia Transit Center (at site of SVM/Cross County station)

56. Downingtown Transportation Center (at site of R5 station)

57. Kennett Square Transportation Center

58. Transfer center at Lionville Park-and-Ride (PA 113, east of PA 100)

59. ITS improvements at rail stations and bus transfer points

C. County-Wide Impacts of the Build Scenarios

Table 21 compares the projected 2020 highway vehicular miles of travel (VMT) under the No-Build Scenario with the corresponding results for Scenarios 1 and 2. Projected aggregate traffic differences are fairly small throughout Chester County. Some planning areas experience small increases as a result of the improvement scenarios and others small declines.

Two opposing factors within the enhanced DVRPC model determine the effect of highway improvements on projected VMT:

1. More direct, faster trip routings utilizing formerly congested facilities and
2. Longer trip lengths resulting from higher speeds being input to the gravity model.

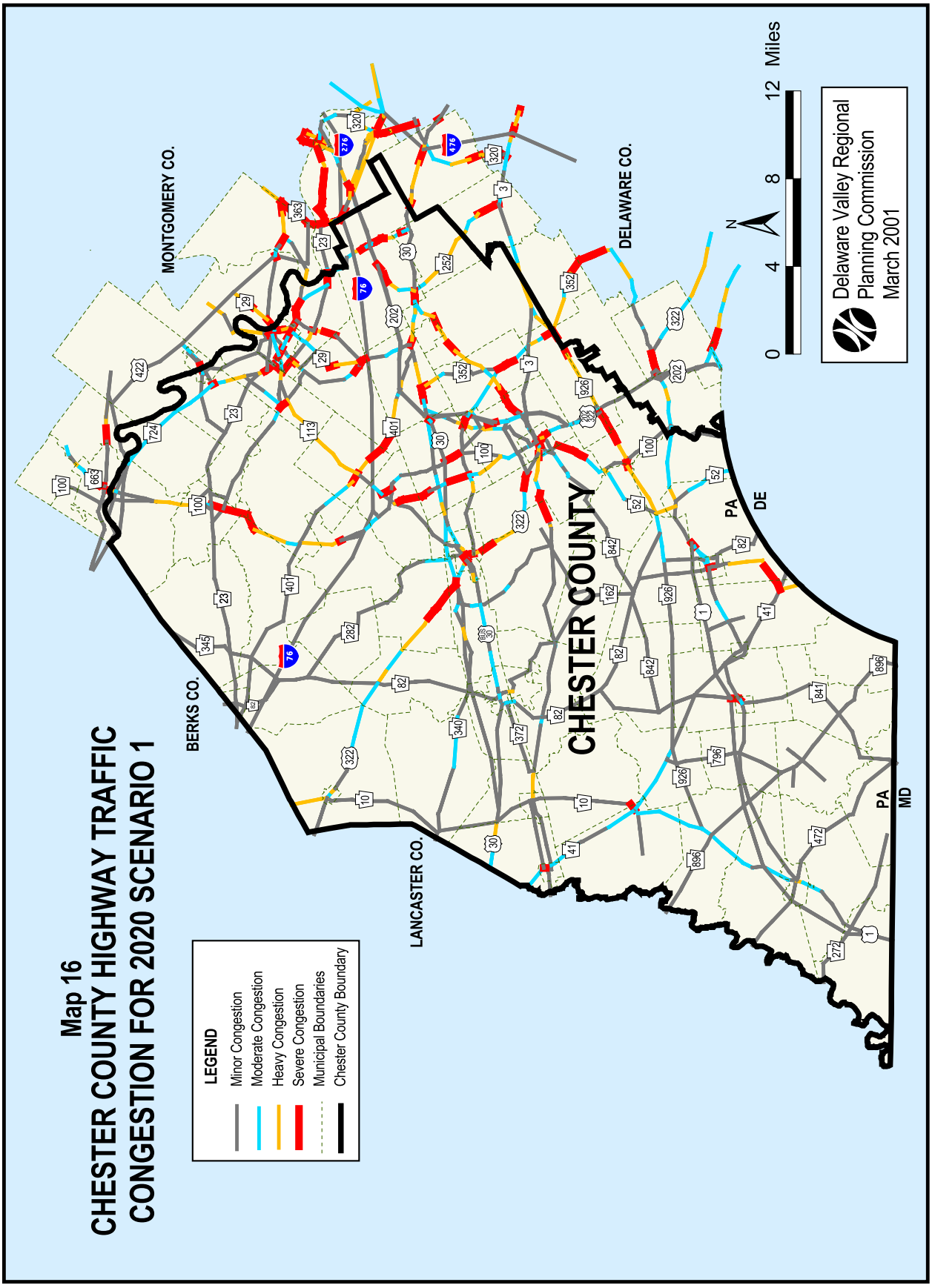
More direct routings tend to reduce VMT by eliminating circuitous driver paths that avoid congested roadway links and intersections. Under congested conditions, these paths are longer in terms of distance and hence VMT, but faster in terms of elapsed travel time and therefore attractive to drivers. However, the higher speeds and more direct routings provided by the congestion relief under the build scenarios tend to encourage longer trip lengths to destinations further away from the trip origin, thereby increasing VMT. In general, these factors counter balance each other and the overall change in VMT resulting from highway improvements is small.

The planning areas in the US 30 and PA 41 corridors receive slight congestion relief related reductions in VMT (up to 3.2 percent in Scenario 1 and 2.3 percent Scenario 2) relative to the No-Build Scenario. In this case the more direct routing from the facility improvements outweigh the trip length effect. The planning areas elsewhere in the county experience VMT increases of up to 5.0 percent in Scenario 1 and 9.4 percent in Scenario 2. Overall, Scenario 1 increases total Chester County VMT by 0.5 percent and Scenario 2 increases VMT by about 1.3 percent. These differences are small compared the more than 5 million VMT increase over 1997 (almost 50 percent). Maps 16 and 17 show the resulting 2020 congestion levels under Scenario 1 and Scenario 2, respectively. These maps show significant reductions in the capacity utilization, for some individual roadways, brought about by the capacity increases in the build scenarios.

The reduction in simulation model highway network capacity utilization between the no-build and the build scenarios is tabulated by planning areas in Table 22. In general, the reduction in capacity utilization closely follows the distribution of highway improvements included in the build scenarios. The build scenarios reduced the fraction of capacity utilized throughout the county with Scenario 1 reducing the fraction of capacity utilized by about 0.07 (11.3 percent from the No-Build) and Scenario 2 reduced capacity utilization by 0.10 (16.1 percent) versus the No-Build. This difference between the build scenarios clearly resulted from the more extensive list of highway improvements included in Scenario 2.

Table 21. 2020 Traffic Volume (VMT) Differences Between Scenario 1 and Scenario 2.

Planning	Area	No-Build (000s)	Scenario 1 (000s)	No-Build - Scenario 1 (000s)	No-Build - Scenario 1 Percent	Scenario 2 (000s)	No-Build - Scenario 2 (000s)	No-Build - Scenario 2 Percent
19	Great Valley	1,832.0	1,810.0	-22.0	-1.2%	1,807.7	-24.3	-1.3%
20	Phoenixville	583.0	612.3	29.3	5.0%	664.2	81.2	13.9%
21	Owen J. Roberts	1,148.3	1,154.3	6.0	0.5%	1,171.2	22.9	2.0%
22	Dowingtown	2,488.8	2,449.7	-39.1	-1.6%	2,471.6	-17.2	-0.7%
23	West Chester	2,834.4	2,907.6	73.2	2.6%	2,920.4	86.0	3.0%
24	Kennett	694.5	694.0	-0.5	-0.1%	692.8	-1.7	-0.2%
25	Coatsville	1,494.1	1,487.7	-6.4	-0.4%	1,460.4	-33.7	-2.3%
26	Twin Valley	727.6	728.7	1.1	0.2%	724.4	-3.2	-0.4%
27	Avon-Grove	714.1	691.2	-22.9	-3.2%	710.3	-3.8	-0.5%
28	Octorara	569.4	569.8	0.4	0.1%	585.5	16.1	2.8%
29	Oxford	491.5	495.0	3.5	0.7%	493.6	2.1	0.4%
73	Tredyffrin-Easttown	1,619.9	1,644.8	24.9	1.5%	1,615.7	-4.2	-0.3%
74	Unionville-Chadds Ford	875.9	908.9	33.0	3.8%	957.9	82.0	9.4%
Total	**Chester County**	**16,073.7**	**16,154.0**	**80.3**	**0.5%**	**16,275.7**	**202.0**	**1.3%**


Map 16
CHESTER COUNTY HIGHWAY TRAFFIC
CONGESTION FOR 2020 SCENARIO 1
LEGEND
Minor Congestion
Moderate Congestion
Heavy Congestion
Severe Congestion
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
PA
DE
PA
MD
0 4 8 12 Miles
N
Delaware Valley Regional
Planning Commission
March 2001

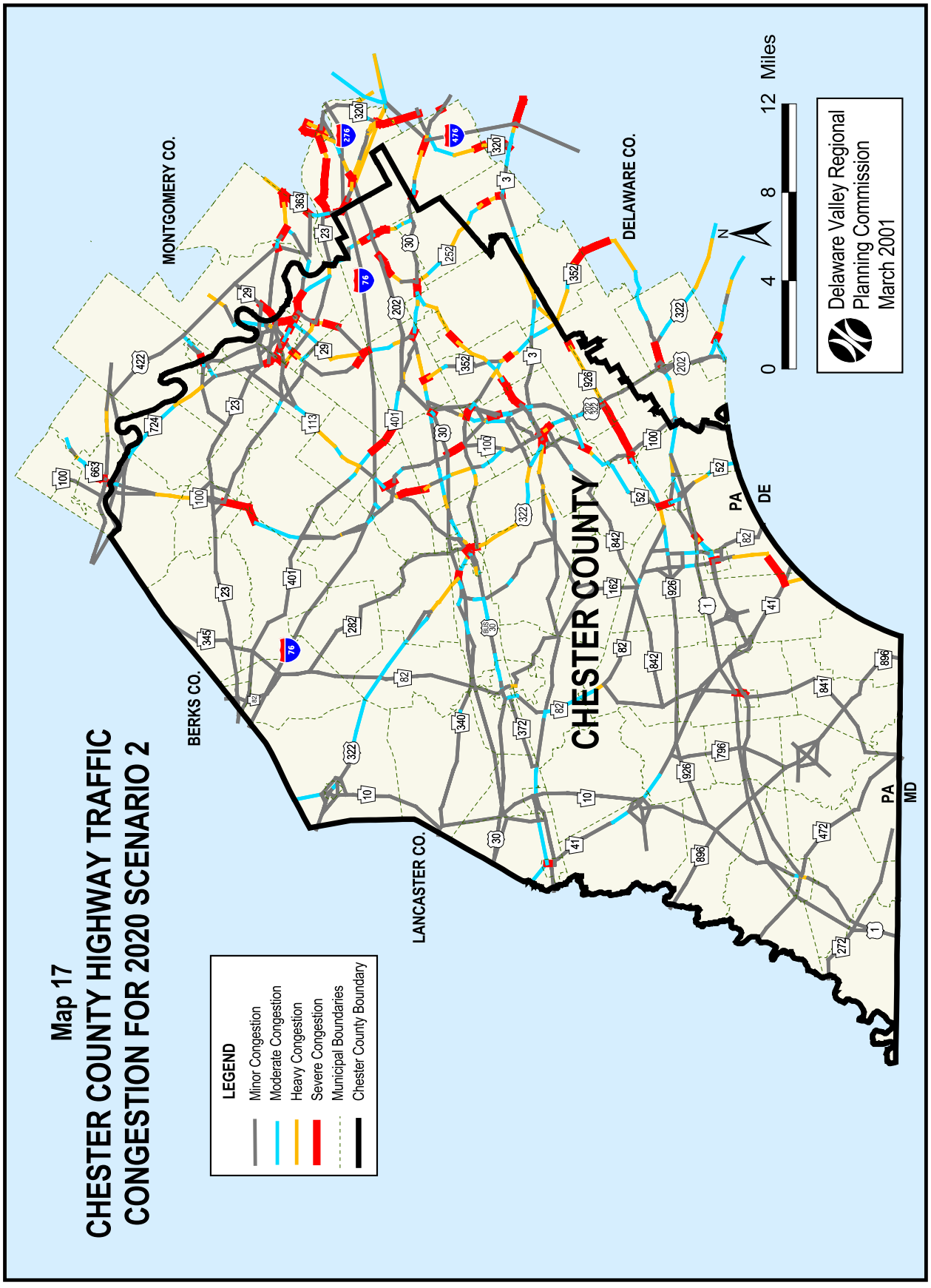

Map 17
CHESTER COUNTY HIGHWAY TRAFFIC
CONGESTION FOR 2020 SCENARIO 2
LEGEND
Minor Congestion
Moderate Congestion
Heavy Congestion
Severe Congestion
Municipal Boundaries
Chester County Boundary
CHESTER COUNTY
MONTGOMERY CO.
BERKS CO.
LANCASTER CO.
DELAWARE CO.
PA
DE
PA
MD
N
0 4 8 12 Miles
Delaware Valley Regional
Planning Commission
March 2001

Table 22. Projected Capacity Utilization Under Scenario 1 and Scenario 2.

Planning	Area	No-Build	Scenario 1	No-Build - Scenario 1		Scenario 2	No-Build - Scenario 2	
		----------Fraction Utilized----------			Percent	------Fraction Utilized--------		Percent
19	Great Valley	0.78	0.66	-0.12	-15.4%	0.65	-0.13	-16.7%
20	Phoenixville	0.89	0.82	-0.07	-7.9%	0.65	-0.24	-27.0%
21	Owen J. Roberts	0.49	0.47	-0.02	-4.1%	0.45	-0.04	-8.2%
22	Dowingtown	0.71	0.66	-0.05	-7.0%	0.60	-0.11	-15.5%
23	West Chester	0.75	0.64	-0.11	-14.7%	0.61	-0.14	-18.7%
24	Kennett	0.58	0.48	-0.10	-17.2%	0.43	-0.15	-25.9%
25	Coatsville	0.53	0.47	-0.06	-11.3%	0.43	-0.10	-18.9%
26	Twin Valley	0.60	0.58	-0.02	-3.3%	0.53	-0.07	-11.7%
27	Avon-Grove	0.40	0.33	-0.07	-17.5%	0.33	-0.07	-17.5%
28	Octorara	0.53	0.48	-0.05	-9.4%	0.37	-0.16	-30.2%
29	Oxford	0.27	0.24	-0.03	-11.1%	0.23	-0.04	-14.8%
73	Tredyffrin-Easttown	0.79	0.66	-0.13	-16.5%	0.65	-0.14	-17.7%
74	Unionville-Chadds Ford	0.65	0.61	-0.04	-6.2%	0.58	-0.07	-10.8%
Total	**Chester County**	**0.62**	**0.55**	**-0.07**	**-11.3%**	**0.52**	**-0.10**	**-16.1%**

This decrease in capacity utilization (which functions as a composite traffic congestion index) results in an increase in average highway operating speed, but not by as much as the capacity utilization decrease. Table 23 presents the 2020 No-Build, Scenario 1, and Scenario 2 average PM peak hour speeds by planning area. The county-wide average PM speed increases 0.9 mph (3.1 percent) in Scenario 1 and 2.2 mph (7.6 percent) in Scenario 2. By planning area, the speed increases under Scenario 1 range from 0.1 mph (0.3 percent) in the Oxford Planning Area to 1.3 mph (4.0 percent) in the Avon-Grove Planning Area. As one might expect, the additional facility improvements included in Scenario 2 generally increased the average PM peak speeds over Scenario 1. However, the degree of improvement depends on the geographical distribution of the additional facility improvements included in Scenario 2. These increases versus the No-Build range from 0.3 mph (1.0 percent) in Oxford Planning Area to 4.8 miles per hour in the Octorara and Chadds Ford Planning Areas (16.7 and 18.2 percent, respectively).

Overall, average PM Peak Chester County Scenario 1 speeds were slightly lower than the 1997 calibration shown in Table 12 (Chapter III) (29.7 versus 31.0 mph) with only the Avon-Grove Planning Area showing an increase over the 1997 calibration (33.6 versus 33.2 mph). However, under Scenario 2 the additional highway improvements increased the projected average PM peak speed to 31.0 mph, the same value recorded for the 1997 calibration. Under Scenario 2, 2020 average PM peak hour speeds were increased by small amounts over the 1997 calibration in Phoenixville, Owen J Roberts, Avon-Grove, Octorara, Oxford, and Unionville-Chadds Ford planning areas and dropped slightly from 1997 values in the Great Valley, Downingtown, West Chester, Kennett, Coatesville, Twin Valley, and Tredyffrin-Easttown planning areas.

Table 24 presents the 2020 No-Build, Scenario 1, and Scenario 2 average daily speeds by planning area. The average daily speed differences between scenarios are much less than for the PM peak hour. This is because traffic volumes occurring during the off-peak and especially evening / night hours are less intense and therefore hourly volumes are a smaller percentage of the roadway capacity. In general, highway links during off peak hours can absorb larger traffic increases without significantly affecting speed or producing congestion, and conversely show less improvement from additional capacity. In Scenario 1, the average daily operating speed increase over the No-Build scenario range from 0.0 mph in the Oxford Planning Area to 1.2 mph (3.6 percent) in the Avon-Grove Planning Area. In Scenario 2, average daily speed increases range from 0.1 mph in the Oxford and Twin Valley Planning Area to 4.0 mph (13.2 percent) in the Octorara planning Area. Overall, average Chester County Scenario 1 speeds were increased by 0.5 mph (1.6 percent) over the 2020 No-Build value, and 1.6 mph (5.2 percent) under Scenario 2. When compared to the 1997 calibrated speeds, average Chester County Scenario 1 speeds were decreased by 0.2 mph (0.6 percent) and increased by 0.9 mph (2.8 percent) under Scenario 2. It should be noted that the speeds presented in tables 29 and 30 are average speeds, weighted by link distance and VMT, for all travel that occurs on all of the roadways in a given planning area. Congestion and related backups may occur at certain intersections, but these delays do not have a large impact on the average speed. For this reason, relatively small changes in overall average speed can be very significant from a planning point of view.

Table 23. Projected Average PM Peak Operating Speeds Under Scenario 1 and Scenario 2.

Planning	Area	No-Build (mph)	Scenario 1 (mph)	No-Build - Scenario 1 (mph)	No-Build - Scenario 1 Percent	Scenario 2 (mph)	No-Build - Scenario 2 (mph)	No-Build - Scenario 2 Percent
19	Great Valley	28.5	29.4	0.9	3.2%	30.5	2.0	7.0%
20	Phoenixville	21.4	22.7	1.3	6.1%	25.2	3.8	17.8%
21	Owen J. Roberts	30.7	31.0	0.3	1.0%	31.9	1.2	3.9%
22	Dowingtown	31.0	32.2	1.2	3.9%	33.7	2.7	8.7%
23	West Chester	27.2	28.4	1.2	4.4%	30.0	2.8	10.3%
24	Kennett	28.8	29.8	1.0	3.5%	30.2	1.4	4.9%
25	Coatsville	30.6	30.9	0.3	1.0%	31.5	0.9	2.9%
26	Twin Valley	33.7	34.0	0.3	0.9%	34.1	0.4	1.2%
27	Avon-Grove	32.3	33.6	1.3	4.0%	34.0	1.7	5.3%
28	Octorara	28.8	29.9	1.1	3.8%	33.6	4.8	16.7%
29	Oxford	31.0	31.1	0.1	0.3%	31.3	0.3	1.0%
73	Tredyffrin-Easttown	27.2	28.4	1.2	4.4%	28.5	1.3	4.8%
74	Unionville-Chadds Ford	26.4	27.7	1.3	4.9%	31.2	4.8	18.2%
Total	**Chester County**	**28.8**	**29.7**	**0.9**	**3.1%**	**31.0**	**2.2**	**7.6%**

Table 24. Projected Average Daily Operating Speeds Under Scenario 1 and Scenario 2.

Planning	Area	No-Build (mph)	Scenario 1 (mph)	No-Build - Scenario 1 (mph)	No-Build - Scenario 1 Percent	Scenario 2 (mph)	No-Build - Scenario 2 (mph)	No-Build - Scenario 2 Percent
19	Great Valley	31.0	31.5	0.5	1.6%	32.4	1.4	4.5%
20	Phoenixville	24.2	25.0	0.8	3.3%	27.2	3.0	12.4%
21	Owen J. Roberts	31.9	32.4	0.5	1.6%	33.0	1.1	3.4%
22	Dowingtown	33.7	34.3	0.6	1.8%	35.4	1.7	5.0%
23	West Chester	29.9	30.5	0.6	2.0%	32.0	2.1	7.0%
24	Kennett	30.4	31.1	0.7	2.3%	31.6	1.2	3.9%
25	Coatsville	31.8	32.0	0.2	0.6%	32.5	0.7	2.2%
26	Twin Valley	35.0	35.1	0.1	0.3%	35.1	0.1	0.3%
27	Avon-Grove	33.1	34.3	1.2	3.6%	34.7	1.6	4.8%
28	Octorara	30.3	30.8	0.5	1.7%	34.3	4.0	13.2%
29	Oxford	31.7	31.6	-0.1	-0.3%	31.8	0.1	0.3%
73	Tredyffrin-Easttown	30.3	30.9	0.6	2.0%	30.9	0.6	2.0%
74	Unionville-Chads Ford	28.6	29.4	0.8	2.8%	32.3	3.7	12.9%
Total	**Chester County**	**31.0**	**31.5**	**0.5**	**1.6%**	**32.6**	**1.6**	**5.2%**

The projected VMT increases and speed reductions impact air quality through the Chester County mobile source emissions generated by vehicular travel. Table 25 presents estimates of carbon monoxide (CO), hydro carbons (HC), and nitrous oxides (NO_x) emissions based on the 2020 No-Build, Scenario 1, and Scenario 2 travel simulation runs. By the 2020, significant reductions in mobile source pollution are projected despite the VMT and speed differences in the 2020 scenarios. This reduction primarily results from fleet turnover and continued improvements in motor vehicle design. The improvement scenarios generally reduce the volume of mobile source CO and HC pollution, and increase NO_x emissions. These emission differences are greater for Scenario 2 than Scenario 1 as a result of the greater number and magnitude of the traffic improvements included in Scenario 2. However, these differences vis-a-vis the No-Build Scenario are small - on the order of one percent for Scenario 1 and two to four percent for Scenario 2.

Table 25. 2020 Mobile Source Emissions Under the Build Scenarios (Metric Tons per Summer Day).

Pollutant	No-Build	Scenario 1	Percent Difference	Scenario 2	Percent Difference
CO	75.1	74.3	-1.1%	72.2	-3.9%
HC	10.2	10.1	-1.0%	10.0	-2.0%
NO_x	16.5	16.7	1.2%	16.9	2.4%

Another measure of the success of a particular scenario in eliminating congestion is the percentage of VMT occurring in congested conditions. This statistic mirrors the experience of the average driver. Simply examining the extent of congestion within the roadway system does not indicate the extent to which the network accommodates desired flows. Table 26 shows congested VMT as a percentage of total VMT for each CPA within the study area. In the No-Build case, 35.6 percent of 2020 VMT in Chester County will be in congested conditions. The improvements in Scenario 1 reduce this value to around 23 percent, a substantial improvement. Scenario 2 further reduces this number to 18.6 percent of Chester County VMT. The relatively small incremental improvements under Scenario 2 resulted from the fact that most of the additional improvements were concentrated in areas that had less severe congestion problems. The most serious congestion problems tended to be addressed in Scenario 1.

By planning area under the No-Build Scenario, Tredyffrin-Easttown has the largest percentage of vehicular travel occurring under congested conditions (55.8 percent); followed by Unionville-Chadds Ford (55.3 percent), Phoenixville (54.3 percent), and Great Valley (51.1 percent). Relatively little of the vehicular travel occurring in the rural portions of the county occurs under

congested conditions. The Owen J. Roberts (24.1 percent), Avon-Grove (4.2 percent), Octorara (22.9 percent), Coatesville (22.2 percent), and Oxford (11.9 percent) planning areas all have less than 25 percent of daily travel occurring under congested conditions. Scenario 1 significantly improves congestion levels over the No-Build in Great Valley (51.1 to 32.4 percent), Tredyffrin-Easttown (58.8 to 30.1 percent), Unionville-Chadds Ford (55.3 to 39.5 percent), and West Chester (41.4 to 23.5 percent) with smaller reductions elsewhere. Comparing scenarios 1 and 2, Phoenixville has the largest improvement in congested VMT (13.6 percent) under Scenario 2.

Table 26. Percent of VMT on Congested Roadways by Planning Area and Scenario.

Planning	Area	No-Build	Scenario 1	Scenario 2
19	Great Valley	51.1%	32.4%	31.7%
20	Phoenixville	54.3%	45.6%	32.0%
21	Owen J. Roberts	24.1%	21.7%	19.7%
22	Dowingtown	29.1%	23.1%	17.1%
23	West Chester	41.4%	23.5%	18.6%
24	Kennett	26.6%	23.2%	22.4%
25	Coatsville	22.2%	8.3%	4.8%
26	Twin Valley	12.8%	4.6%	0.0%
27	Avon-Grove	4.2%	2.8%	2.8%
28	Octorara	22.9%	13.0%	0.3%
29	Oxford	11.9%	1.1%	1.1%
73	Tredyffrin-Easttown	55.8%	30.1%	27.0%
74	Unionville-Chadds Ford	55.3%	39.5%	31.9%
Total	**Chester County**	**35.6%**	**22.8%**	**18.6%**

D. Transit Ridership Under Scenarios 1 and 2

Table 27 displays the projected transit ridership by transit facility under the No-Build and improvement scenarios 1 and 2 . The new bus routes included in transit improvement scenarios reduced ridership on existing SEPTA bus lines - by 13 percent in Scenario 1 and 16 percent in Scenario 2 compared to the No-Build Scenario. Relatively large counter balancing increases are found on the Krapf's system (1,729 and 1,782 daily riders), on the new bus routes (1,944 and 2,395 daily riders), and on the new circulator services (1,864 and 4,231 daily riders). Overall, bus ridership increased by 4,242 in Scenario 1 and 6,463 riders in Scenario 2.

Table 27. Chester County Simulation Study Transit Ridership Summary.

Description	No-Build	Scenario 1	Percent Difference	Scenario 2	Percent Difference
Current Bus Routes					
SEPTA[1]	11,416	9,925	-13.1%	9,596	-15.9%
Other Operators	804	2,729	239.4%	2,461	206.1%
Sub-Total	**12,220**	**12,654**	**3.6%**	**12,057**	**-1.3%**
Proposed Bus Routes					
Regular Bus Service	0	1,944	n/a	2,395	n/a
Circulator Service	0	1,864	n/a	4,231	n/a
Sub-Total	**0**	**3,808**	**n/a**	**6,626**	**n/a**
Total Bus Ridership	**12,220**	**16,462**	**34.7%**	**18,683**	**52.9%**
Current Rail Service (R5)[2]	8,838	10,627	20.2%	10,583	19.7%
Proposed Rail Lines[2]	0	5,339	n/a	13,401	n/a
Total Rail Ridership	**8,838**	**15,966**	**80.7%**	**23,984**	**171.4%**
Total Transit Ridership	**21,058**	**32,428**	**54.0%**	**42,667**	**102.6%**

[1]Total for all SEPTA routes serving Chester County, including portions in other counties
[2]Includes Chester County study area stations only

Ridership at existing SEPTA R5 stations increased by 1,789 daily boardings over the no-build in Scenario 1 and 1,745 daily boardings under Scenario 2. The slight reduction in the boarding increase in Scenario 2 resulted from the additional competing transit services included in that alternative. The inclusion of the R3 extensions, and the Schuylkill Valley and Cross County Metros also significantly increased the rail ridership using Chester County stations. Overall, rail ridership increased by 7,128 daily boardings under Scenario 1 and 15,146 daily boardings under Scenario 2.

In total, Chester County transit boardings increased by 13,370 over the No-Build Scenario under Scenario 1 and 21,509 under Scenario 2. This corresponds to 15,556 daily boardings over the 1997 calibration under Scenario 1 and 25,794 daily boarding under Scenario 2. These are very significant increases in transit ridership in Chester County. However, this increase corresponds to less than 2 percent of projected 2020 Chester County person trips under the No-Build Scenario. The public transit improvements included in Scenarios 1 and 2 will have little effect on projected 2020 highway congestion levels, except perhaps in localized areas.

E. Corridor Analysis of the 2020 Highway Improvement Scenarios

Although the average increase in PM peak and average daily Chester County operating speeds is relatively small, peak period congestion at existing bottlenecks and on specific highway facilities is reduced significantly as a result of the highway facility improvements included in scenarios 1 and 2. This section presents the results of a detailed link level analysis of the model outputs under scenarios 1 and 2 at the corridor/study area level. Projected traffic volumes and congestion levels for major highway facilities were prepared for each corridor.

Each of these analyses begins with a table showing the highway improvements to key roads included in the improvement scenarios. In the presentation of the projected traffic volumes, the emphasis is on congestion level impacts caused by the improvements. Within the text, changes in travel patterns and roadway conditions are identified. Accompanying maps for each scenario show both volume over capacity ratio and selected projected traffic volumes for that scenario. In considering volumes and V/C, it should be noted that many of Chester County's suggested capacity increases are generalized and not related to specific roadway improvements.

As in the No-Build analyses of Chapter III, V/C was classified as indicating minor congestion (< 0.8), moderate congestion (0.8-1.0), heavy congestion (1.0-1.2), and severe congestion (> 1.2). In addition, current traffic counts and predicted volumes are shown for selected locations. Individual predicted volumes should be viewed as preliminary estimates. These projections assume implementation of the *Landscapes* plan and one of two transportation improvement scenarios. As such, they may not be comparable with prior DVRPC projections or the results of traffic analyses conducted in the future. Additionally, the level of detail yielding these forecasts was not commensurate with a design data traffic study. Therefore, the 2020 forecasts discussed in this report do not represent design data, but are intended for use in general planning applications.

1. PA 100 Corridor Study, US 422 to PA 100 Connector

The highway improvements included in Scenarios 1 and 2 for the PA 100 Corridor are listed in the Table 28 below. The improvements included in Scenario 1 include the Eagle Bypass and a new ring road at PA 23 as well as generalized capacity improvements along PA 100. Scenario 2 includes the Eagle Bypass as well as selective widenings of PA 100 to four lanes.

Table 28. PA 100 Corridor Study Highway Improvements for Scenarios 1 and 2

Locations	Scenario 1 Improvements	Scenario 2 Improvements
PA 23 to US 422	Increase capacity 15 percent	Increase capacity 20 percent
PA 23 Intersection	Build ring road at PA 23	Build one-way couplet, 2 lanes by direction
PA 23 to PA 401	Increase capacity 5 percent	Increase capacity 10 percent
PA 401 Intersection	No change	Build one-way couplet, 2 lanes by direction
PA 401 to Eagle Village	Increase capacity 10 percent	Four lane cross section
Eagle Village to I-76	Build 4 lane parkway bypass	Build 4 lane parkway bypass
I-76 to US 30 Bypass	Increase capacity 15 percent	Increase functional class to high parkway or low freeway
US 30 to PA 100 Connector	Increase capacity 15 percent	Increase capacity 15 percent

a. Description of Results

The projected traffic volumes and congestion levels under Scenarios 1 and 2 are given in figures 11 and 12, respectively. Examining simulation results within the PA 100 corridor it is apparent that increased capacity and speed substantially increased volumes throughout the corridor. Under Scenario1, these increases range from 2,300 to 7,200, while traffic volumes rise by 3,700 to 9,200 under Scenario 2. However, the increase in traffic along the corridor was not sufficient to eliminate the beneficial effects of the proposed improvements.

Localized bottlenecks are apparent throughout the corridor. First, from north of PA 23 to Hanover Street, a severe capacity constraint exists, with predicted volumes in both improvement scenarios exceeding 30,000 vpd (31,600 and 32,200). This volume is somewhat lower from PA 23 to PA 401

as the combination of Birch Run Road, Bartlett Lane, and Flowing Springs Road provide an alternate route. From Ludwig's Corner (PA 401) to Eagle, Scenario 2 adds a one-way couple with two travel lanes in each direction, yielding good travel conditions. However, in Scenario 1 congested conditions exist from PA 401 to the Eagle Bypass. The Eagle Bypass does provide appropriate relief to the village of Eagle in both scenarios. From the Pennsylvania Turnpike to US 30, both scenarios provide sufficient capacity to accommodate predicted volumes on PA 100. However, parallel routes remain congested in all scenarios. In Uwchlan and West Whiteland townships, traffic growth due to improvements relative to the No-Build Scenario is moderate at 3,600 vpd and 6,500 vpd. Total volume is on the order of 60,000 vpd. The next constraint occurs at the intersection with the Exton Bypass. The volumes shown, 75,500 vpd under Scenario 1, and 77,500 under Scenario 2 are unlikely to be achievable given the current configuration at this interchange. Further study is required to examine this problem and develop appropriate solutions.

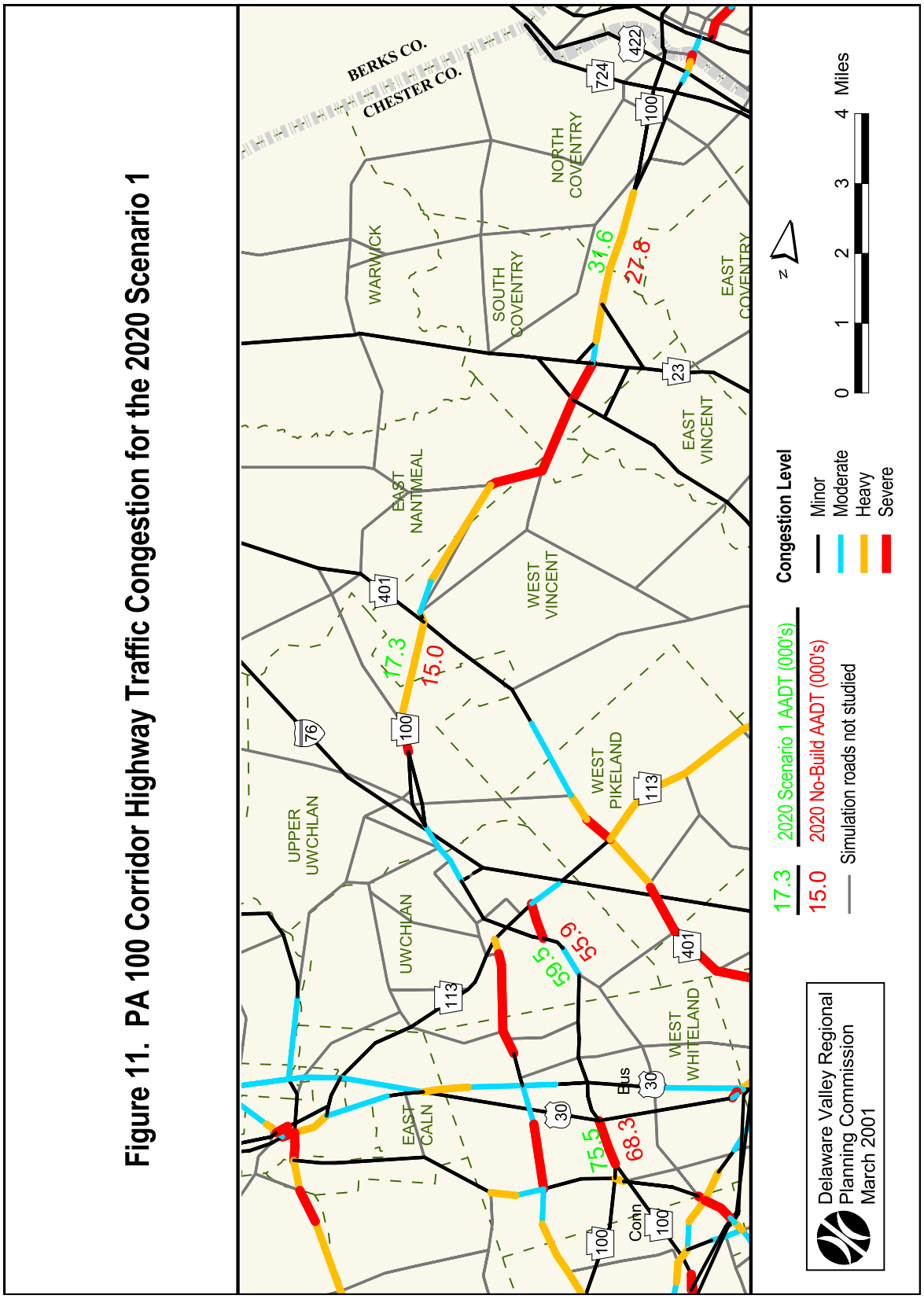


Figure 11. PA 100 Corridor Highway Traffic Congestion for the 2020 Scenario 1
BERKS CO.
CHESTER CO.
WARWICK
SOUTH COVENTRY
NORTH COVENTRY
EAST COVENTRY
EAST NANTMEAL
WEST VINCENT
EAST VINCENT
UPPER UWCHLAN
UWCHLAN
WEST PIKELAND
WEST WHITELAND
EAST CALN
17.3
15.0
31.6
27.8
55.9
59.5
75.5
68.3
Bus
Conn
76
100
401
113
30
23
724
422
Congestion Level
Minor
Moderate
Heavy
Severe
17.3 2020 Scenario 1 AADT (000's)
15.0 2020 No-Build AADT (000's)
Simulation roads not studied
N
0 1 2 3 4 Miles
Delaware Valley Regional Planning Commission
March 2001

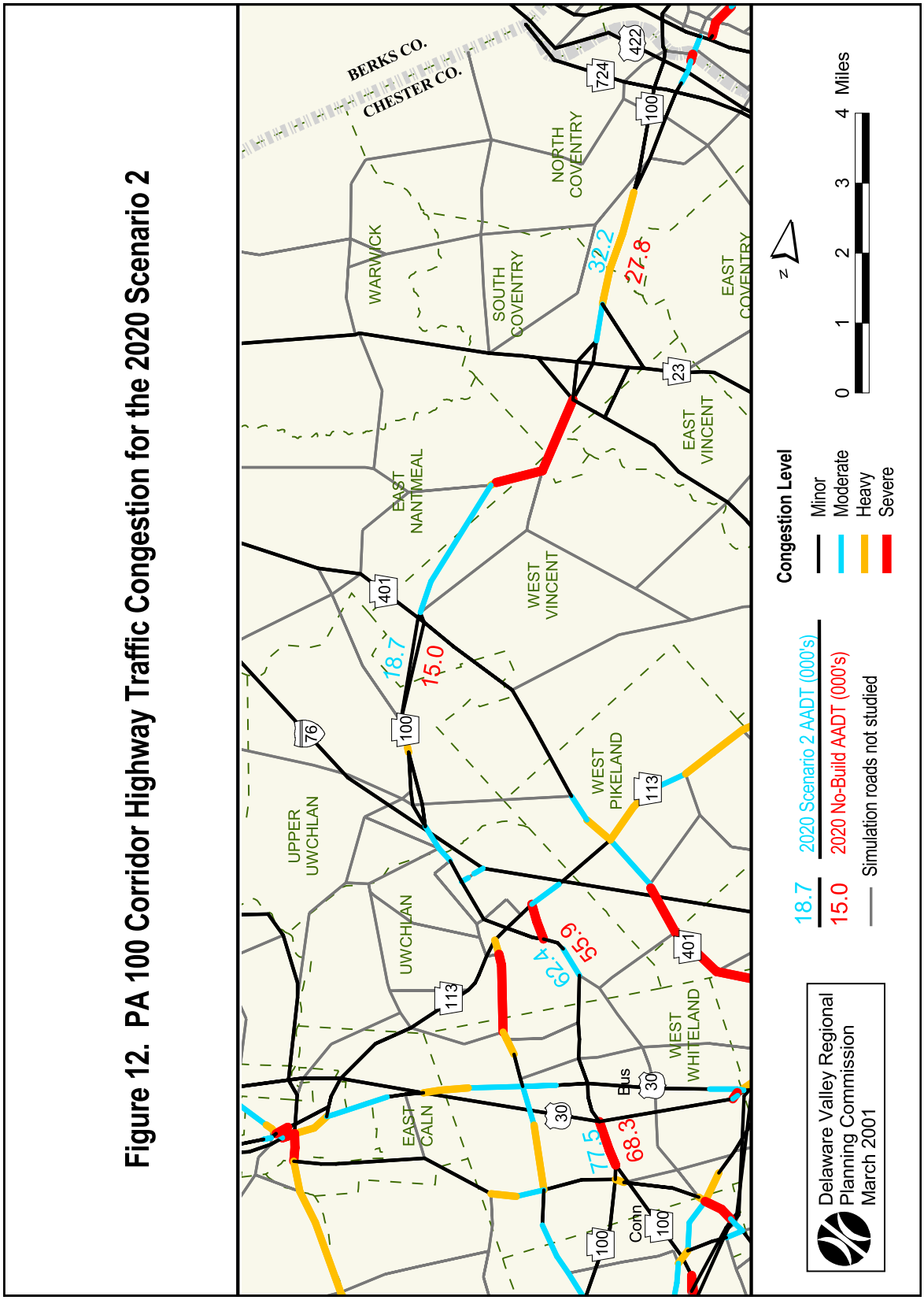


Figure 12. PA 100 Corridor Highway Traffic Congestion for the 2020 Scenario 2

2. US 322 Corridor Study, PA 10 to PA 100

As shown in Table 29, the improvements included in both scenarios 1 and 2 are limited to generalized capacity improvements, except for ring roads around Guthriesville included in Scenario 2.

Table 29. US 322 Corridor Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
PA 10 to PA 82	Increase capacity 10 percent	Increase functional class to high arterial
PA 82 to US 30 Bypass	Increase capacity 15 percent	Increase functional class to high arterial
Guthriesville		Build ring roads
US 30 Bypass to Boot Rd	Increase capacity 15 percent	Increase capacity 15 percent
Boot Rd to US 322 Bypass	Increase capacity 10 percent	Increase functional class to high arterial
US 322 Bypass to PA 100	Increase capacity 15 percent	Increase capacity 15 percent

a. Description of Results

The projected traffic volumes and congestion levels for the US 322 Corridor under Scenarios 1 and 2 are given in figures 13 and 14, respectively. Conditions on US 322 range from acceptable to poor in all scenarios, with congestion increasing from west to east. From east of Honey Brook to Guthriesville, the base case represents acceptable conditions with a volume of 16,200. Increasing capacity in scenarios 1 and 2 slightly increases this volume to around 17,100 and 17,200 respectively. It should be noted that much of this increase is a re-direction of traffic from PA 282, where traffic is reduced due to additional capacity on US 322.

South of Guthriesville to Edges Mill Road, volumes increase to 22,900 in the base case, with the scenarios representing an additional 2,600 to 4,600 vpd. Neither build scenario includes widening, and as such these are extremely high volumes for a two lane road. From Edges Mill Road to the US 30 Bypass volumes are substantially higher, indicating that the intersections of Edges Mill Road and US 30 Bypass with US 322 will be problematic if no improvements occur. The increase in traffic on US 322 south of Guthriesville is partially due to diversion off of Bondsville Road, where simulated volumes drop by to 2,000 to 3,000 vpd.

Through Downingtown, volumes remain above capacity, and it is quite likely that US 322 will fail in peak hours. Conditions in this area are analyzed in more detail in the Downingtown area study. US 322 remains congested south of Downingtown to West Chester. However, the section along the Brandywine Creek allows for a high degree of access control, making it more likely that the predicted volumes can be achieved on a two lane cross section. South of Boot Road, volumes are 20,100 vpd under the No-Build Scenario, 21,200 vpd under Scenario 1, and 24,000 vpd under Scenario 2.

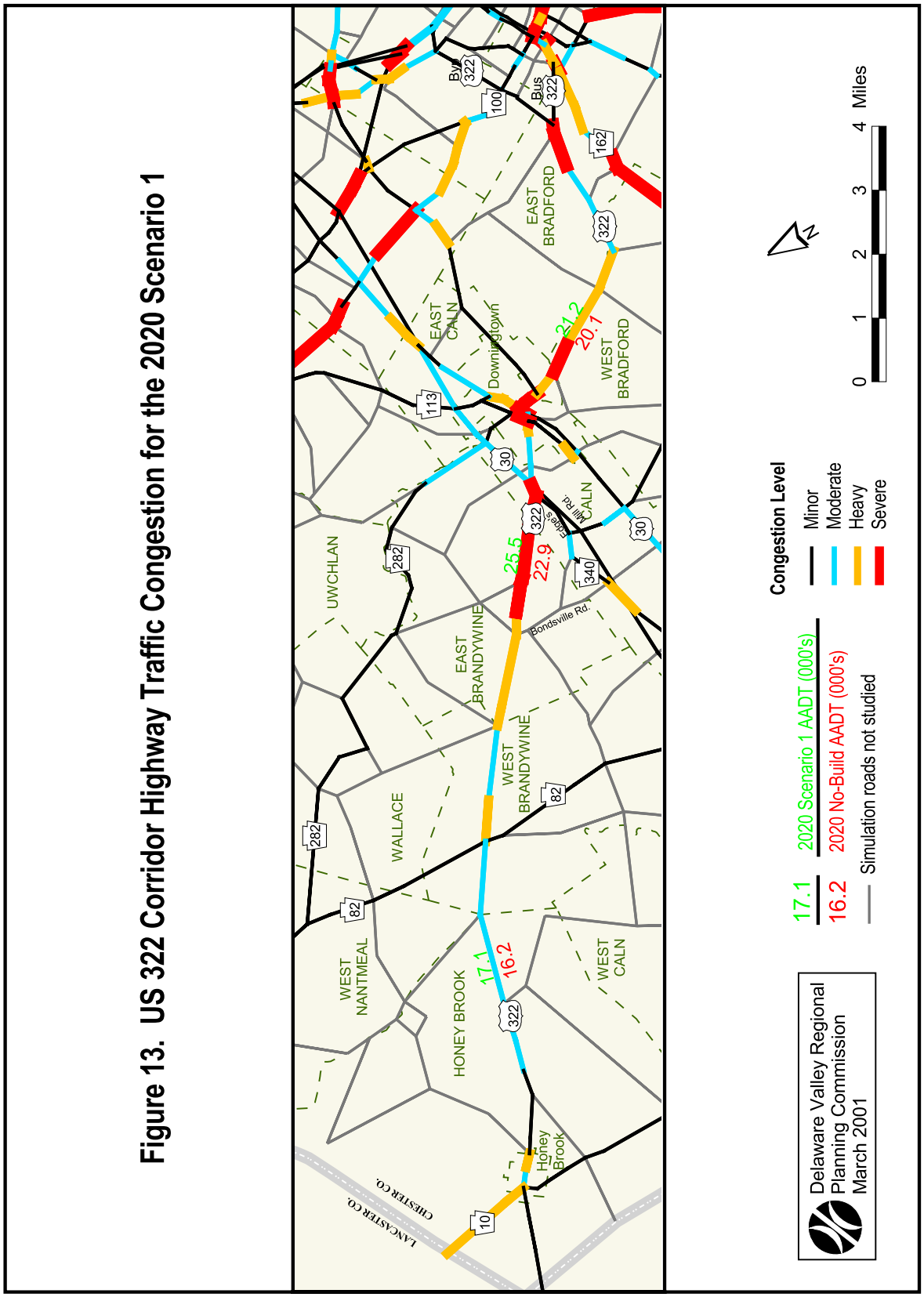


Figure 13. US 322 Corridor Highway Traffic Congestion for the 2020 Scenario 1
Delaware Valley Regional Planning Commission
March 2001
17.1 2020 Scenario 1 AADT (000's)
16.2 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 3 4 Miles
N
WEST NANTMEAL
HONEY BROOK
WALLACE
UWCHLAN
EAST BRANDYWINE
WEST BRANDYWINE
WEST CALN
EAST CALN
Downingtown
EAST BRADFORD
WEST BRADFORD
CALN
Honey Brook
Bondsville Rd.
Hughes Mill Rd.
LANCASTER CO.
CHESTER CO.
25.5
22.9
21.2
20.7
17.1
16.2
322
282
82
10
30
113
100
162
340

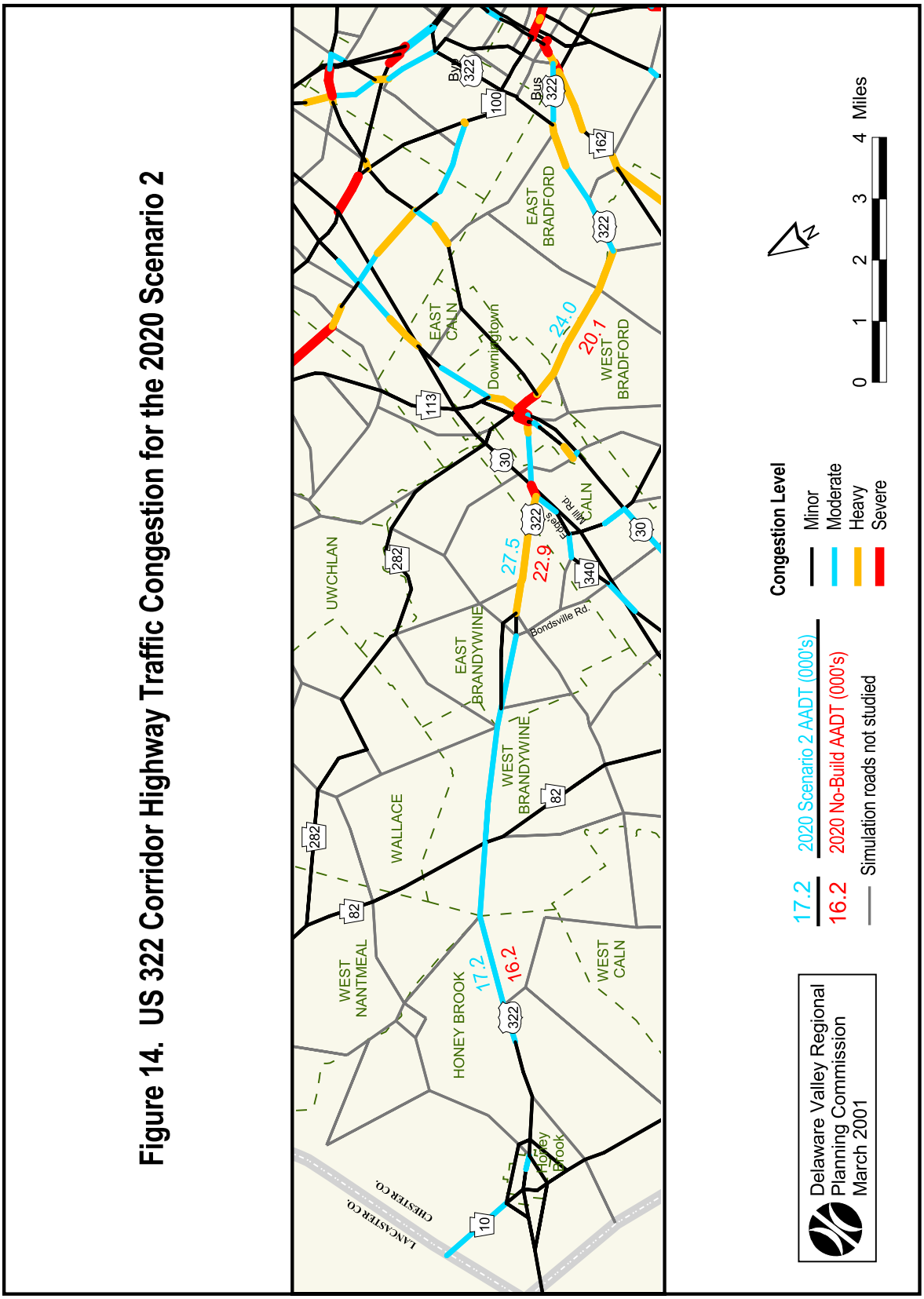


Figure 14. US 322 Corridor Highway Traffic Congestion for the 2020 Scenario 2
Delaware Valley Regional Planning Commission
March 2001
17.2 2020 Scenario 2 AADT (000's)
16.2 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 3 4 Miles
N
24.0
20.1
27.5
22.9
17.2
16.2
EAST BRADFORD
WEST BRADFORD
EAST CALN
Downingtown
CALN
UWCHLAN
EAST BRANDYWINE
WEST BRANDYWINE
WALLACE
WEST NANTMEAL
HONEY BROOK
WEST CALN
Honey Brook
Bondsville Rd.
Hughes Mill Rd.
LANCASTER CO.
CHESTER CO.
Byp 322
Bus 322
100
162
322
113
30
282
82
340
10

3. US 1 Corridor Study, PA 82 to US 202

The principal improvement to US 1 included in both Scenarios 1 and 2 is widening this roadway to six lanes from Baltimore Pike to PA 52. In addition, Scenario 2 includes construction of a new two lane arterial from the Kennett Bypass to east of PA 52. This new arterial is intended to relieve the parallel portion of US 1. Other improvements in the US 1 corridor are limited to generalized capacity increases and functional class changes that are not defined in terms of specific improvements. These improvements are listed in Table 30, below.

Table 30. US 1 Corridor Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
PA 82 to Baltimore Pike	Increase functional class to high freeway	Increase functional class to high freeway
Baltimore Pike to PA 52	Widen to 6 lanes	Widen to 6 lanes and increase functional class to parkway
PA 52 to US 202	Increase capacity 10 percent	Increase functional class to parkway
New Roads		
Parallel route from Kennett Bypass to east of PA 52	Not built	Build 2 lane arterial

a. Description of Results

The projected US 1 Corridor traffic volumes and congestion levels under scenarios 1 and 2 are given in figures 15 and 16, respectively. In the Western portion of US 1, the Kennett Bypass has more than sufficient capacity. Projected AADT ranges from 38,200 under the No-Build Scenario to 39,900 under Scenario 1 and 42,900 under Scenario 2. From east of the Kennett Bypass to PA 52, widening to three lanes achieves an acceptable level of service in both build scenarios. East of PA 52, volume on US 1 approaches capacity, at 60,300 under Scenario1 and 57,600 under Scenario 2. Both of these values represent increased travel on US 1 as the No-Build Scenario projection is 54,000. Scenario 2 includes a new bypass route and ring roads at PA 52 and US 1. The ring roads do provide relief to the intersection of PA 52 and US 1, with the connection from US 1 east to PA 52 projected to have the greatest traffic volumes. The proposed bypass route, a two-lane arterial included in Scenario 2, does not draw a large traffic volume. US 1, a parkway, is assumed to allow

a higher speed than the arterial bypass, and congestion is not sufficient to reduce travel speeds to the level of an arterial. From PA 100 to US 202, volumes range from 41,900 under the No-Build Scenario to 43,300 under Scenario 1 and 47,600 under Scenario 2.

Usage of PA 926 increased dramatically in the build scenarios versus the No-Build Scenario. This increase appears to be the result of shifted travel patterns where traffic previously using US 1 to reach the West Chester area instead are using PA 82 and PA 926. AADT on PA 926 rises from 14,400 in the No-Build to 17,100 in Scenario 1 to 19,600 in Scenario 2. Despite increased capacity, PA 926 remains congested in both build scenarios. Additional improvements on PA 926 might further alleviate congestion on US 1.

Finally, the addition of ring roads does divert traffic away from the US 1/US 202 intersection. However, it should be noted that volumes remain quite high at this location, and the grade separation in Scenarios 1 and 2 help to better accommodate the projected flows.

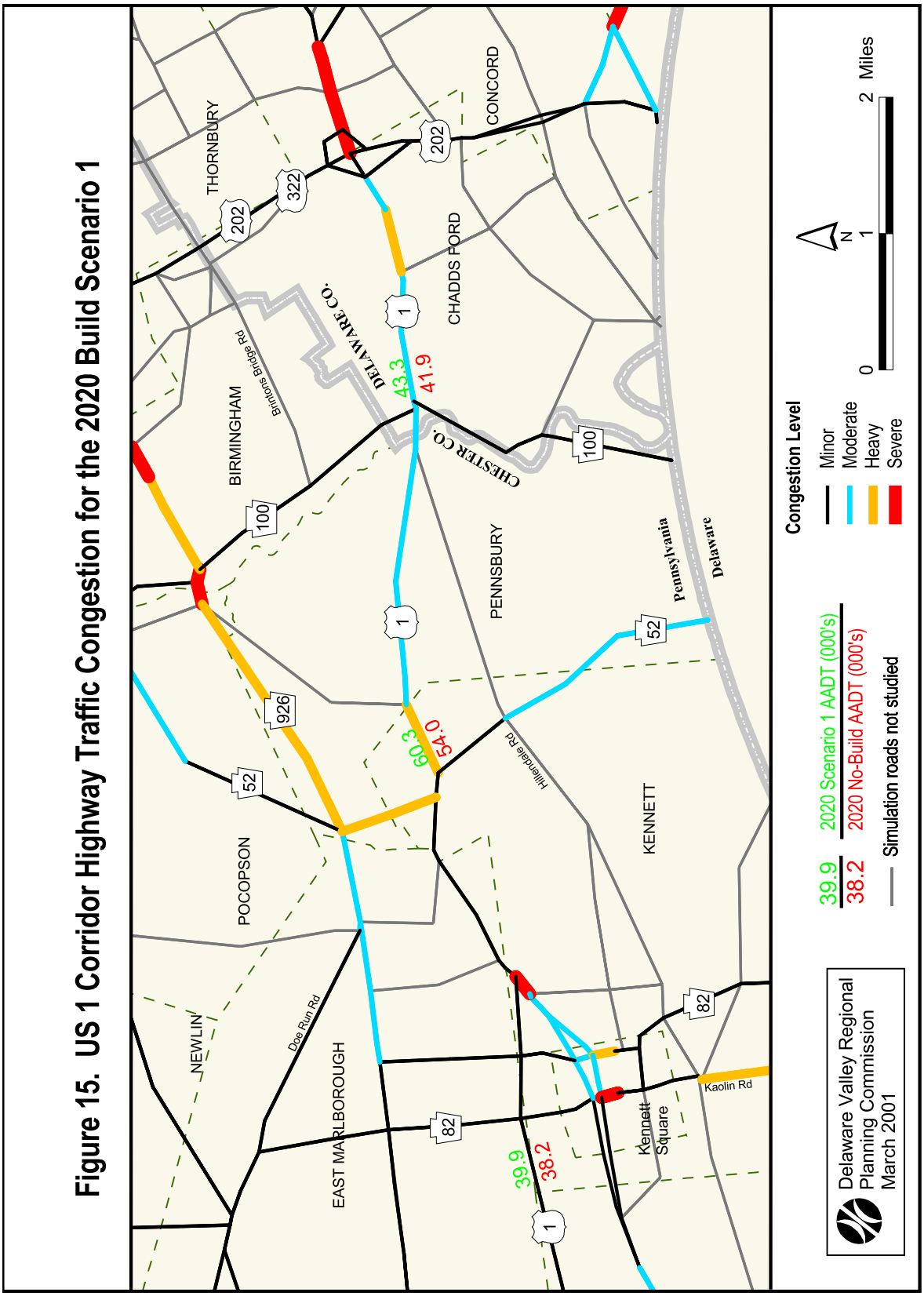


Figure 15. US 1 Corridor Highway Traffic Congestion for the 2020 Build Scenario 1
THORNBURY
CONCORD
CHADDS FORD
BIRMINGHAM
Brinton's Bridge Rd
DELAWARE CO.
CHESTER CO.
PENNSBURY
Pennsylvania
Delaware
POCOPSON
NEWLIN
Doe Run Rd
EAST MARLBOROUGH
Hillendale Rd
KENNETT
Kennett Square
Kaolin Rd
202
322
100
926
52
1
82
43.3
41.9
60.3
54.0
39.9
38.2
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1
2 Miles
39.9
38.2
2020 Scenario 1 AADT (000's)
2020 No-Build AADT (000's)
Simulation roads not studied
Delaware Valley Regional Planning Commission
March 2001

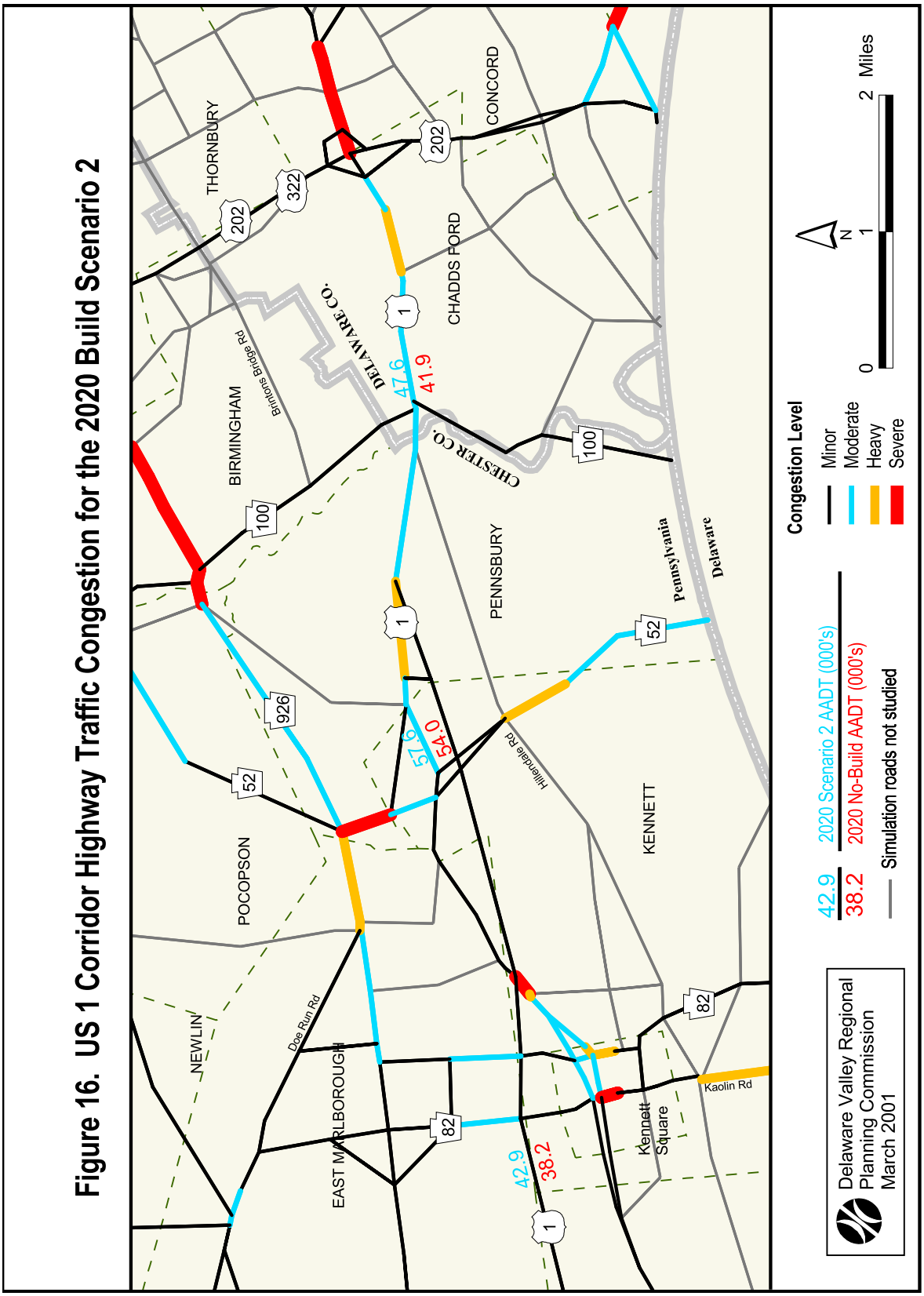


Figure 16. US 1 Corridor Highway Traffic Congestion for the 2020 Build Scenario 2
THORNBURY
CONCORD
CHADDS FORD
BIRMINGHAM
Birmingham Bridge Rd
DELAWARE CO.
CHESTER CO.
PENNSBURY
POCOPSON
NEWLIN
Doe Run Rd
EAST MARLBOROUGH
KENNETT
Hillendale Rd
Kaolin Rd
Kennett Square
Pennsylvania
Delaware
202
322
100
1
926
52
82
47.6
41.9
57.6
54.0
42.9
38.2
Congestion Level
Minor
Moderate
Heavy
Severe
0
1
2 Miles
N
42.9 2020 Scenario 2 AADT (000's)
38.2 2020 No-Build AADT (000's)
Simulation roads not studied
Delaware Valley Regional Planning Commission
March 2001

4. US 202 Corridor Study, Delaware State Line to US 422

The principal improvements in the US 202 Corridor are to widen this roadway to six lanes from PA 252 to US 30 and from High Street to the Delaware State Line. These improvements are included in both scenarios 1 and 2. Also included in Scenario 1 is the construction of ring roads at PA 926 and US 1, as well as grade separation at US 1 (Painter's Crossroads) only. Scenario 2 provides for grade separation at PA 926 as well. Table 31 list these improvements.

Table 31. US 202 Corridor Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
US 422 to PA 252	Increase functional class to high freeway (base scenario already 6 lanes)	Increase functional class to high freeway (base scenario already 6 lanes)
PA 252 to US 30	Widen to 6 lanes and increase functional class to high freeway	Widen to 6 lanes and increase functional class to high freeway
US 30 to High St	Increase functional class to high freeway	Increase functional class to high freeway
High St to Delaware State Line	Widen to 6 lanes and increase functional class to high parkway	Widen to 6 lanes and increase functional class to high parkway
PA 926 Intersection	Build ring roads	Build grade separation and ring roads
US 1 Intersection	Build Grade separation and ring roads	Build grade separation and ring roads

a. Description of Results

Figures 17 and 18 present the projected traffic volumes and congestion levels under scenarios 1 and 2 for the southern portion of the US 202 corridor and figures 19 and 20 for the northern portion of this corridor. Projected traffic growth on US 202 is high in all scenarios, ranging from a minimum of 18,000 to over 54,000 depending upon location and scenario. Suggested improvements for both Scenarios 1 and 2 provide sufficient capacity for US 202 in Chester County. Except for an additional grade separation at PA 926, both build scenarios provide the same improvements to US 202. One location that bears further examination is the section from PA 100 Connector to Paoli Pike, which currently has a four lane cross section from US 322 to PA 100. This section is projected to carry 83,900 vpd under the No-Build Scenario and about 91,500 vpd in both build scenarios. In particular, the lane configuration at the merge with PA 100 Connector should be carefully considered. In addition, improved ramp geometrics and/or ramp meters would ease congestion at this location.

Ring roads at both PA 926 and US 1 successfully reduce intersection loadings. This is particularly true in the case of PA 926 where substantial volumes occur to and from US 202 north and PA 926 west. In both scenarios, roughly 10,000 vehicles use the ring road for this movement. An additional successful improvement is the provision of a full interchange at US 322 Bypass. This change reduces travel on US 202 from Paoli Pike to US 322 Bypass, and also on Phoenixville Pike from US 322 Bypass to Boot Road.

From PA 100 Connector to US 30, volumes remain well under capacity in all scenarios. From the Exton Bypass (US 30) to US 422, projected volumes under Scenario 1 increase from 99,200 vpd north of PA 401 to 142,700 vpd just south of US 422. Scenario 2 volumes north of US 30 are similar but slightly lower. Possible explanations for this change relative to Scenario 1 include increased travel on US 30 within the US 202 corridor and a substantial increase in usage of PA 3.

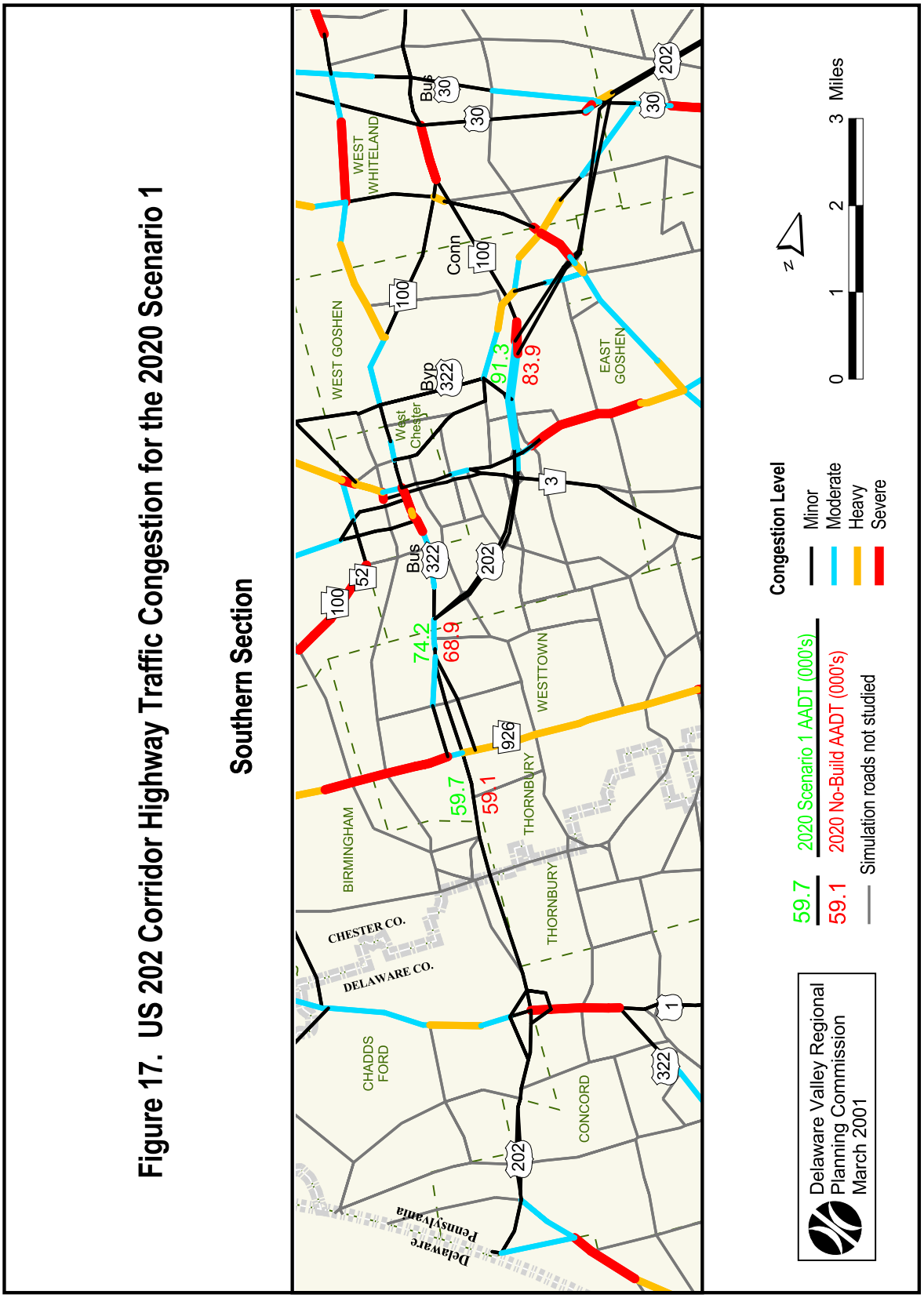


Figure 17. US 202 Corridor Highway Traffic Congestion for the 2020 Scenario 1
Southern Section
WEST GOSHEN
WEST WHITELAND
EAST GOSHEN
WESTTOWN
THORNBURY
BIRMINGHAM
CHADDS FORD
CONCORD
CHESTER CO.
DELAWARE CO.
Delaware
Pennsylvania
West Chester
Byp
Bus
Conn
74.2
68.9
59.7
59.1
91.3
83.9
Congestion Level
Minor
Moderate
Heavy
Severe
59.7 2020 Scenario 1 AADT (000's)
59.1 2020 No-Build AADT (000's)
Simulation roads not studied
0 1 2 3 Miles
N
Delaware Valley Regional Planning Commission
March 2001

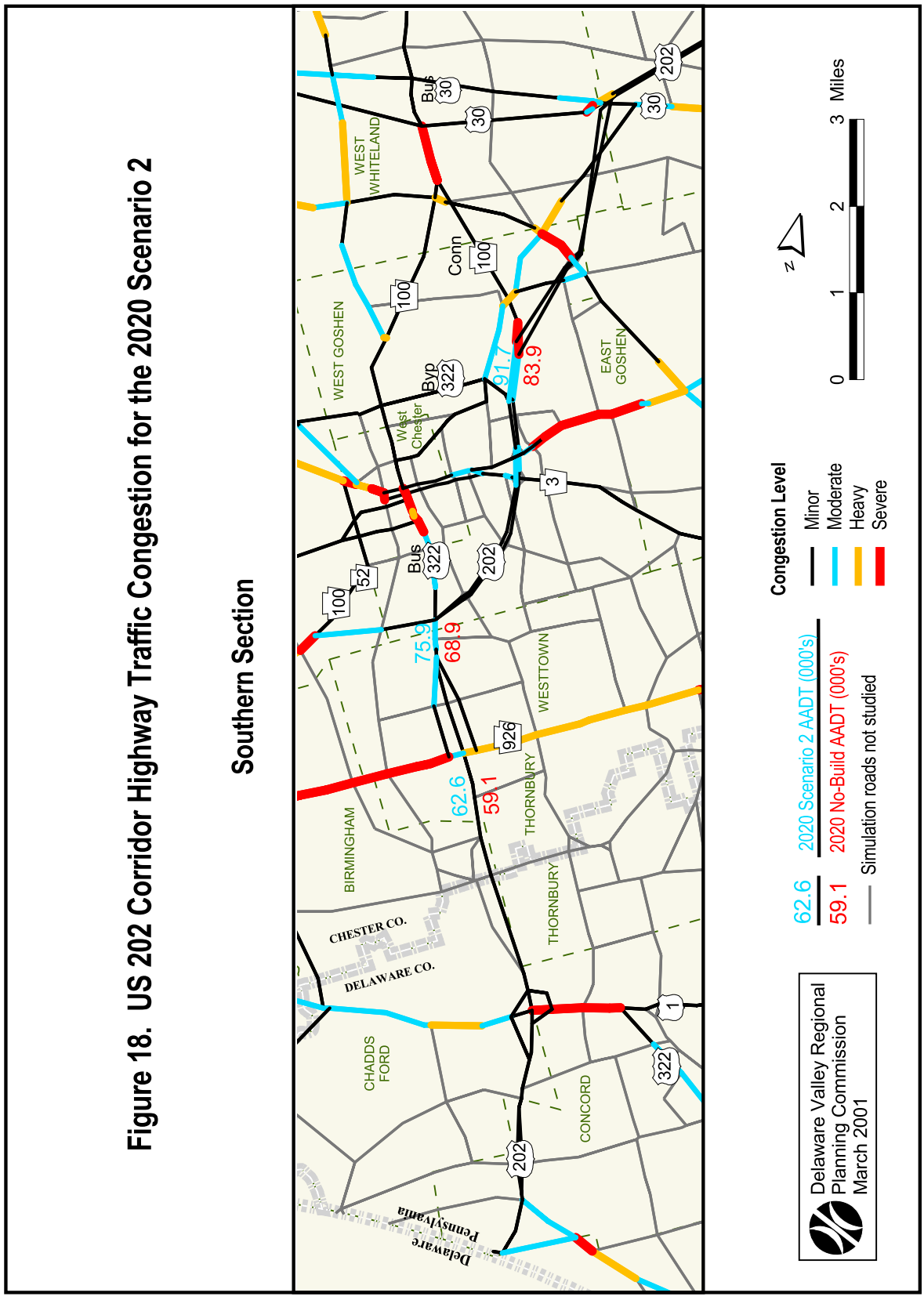


Figure 18. US 202 Corridor Highway Traffic Congestion for the 2020 Scenario 2
Southern Section
Delaware Valley Regional Planning Commission March 2001
62.6 2020 Scenario 2 AADT (000's)
59.1 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
0 1 2 3 Miles
N
WEST GOSHEN
WEST WHITELAND
EAST GOSHEN
WESTTOWN
THORNBURY
BIRMINGHAM
CHADDS FORD
CONCORD
CHESTER CO.
DELAWARE CO.
Delaware
Pennsylvania
West Chester
Byp
Bus
Conn
75.9
68.9
62.6
59.1
91.7
83.9
202
322
100
52
30
926
3
1

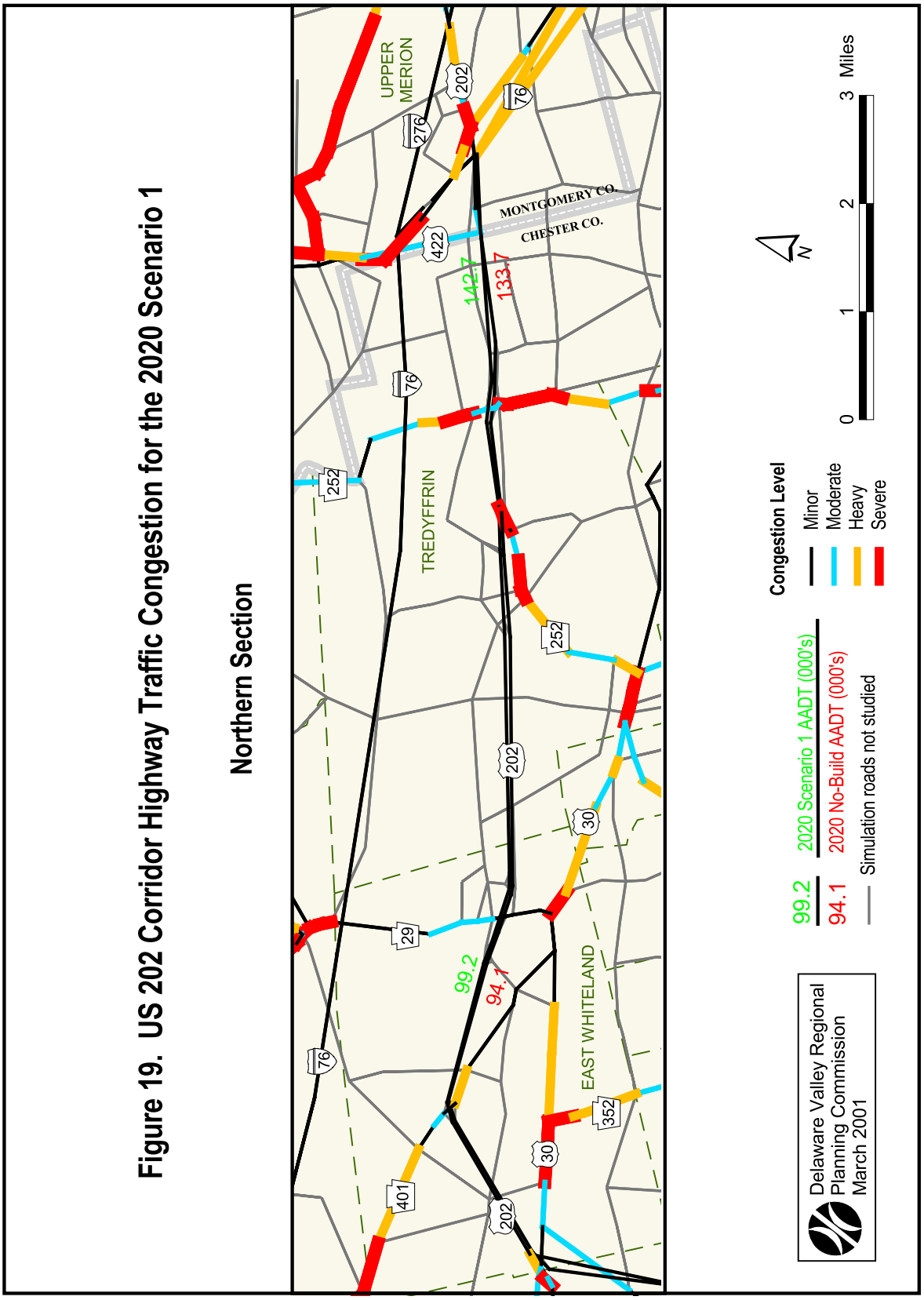


Figure 19. US 202 Corridor Highway Traffic Congestion for the 2020 Scenario 1
Northern Section
UPPER MERION
MONTGOMERY CO.
CHESTER CO.
TREDYFFRIN
EAST WHITELAND
142.7
133.7
99.2
94.1
Congestion Level
Minor
Moderate
Heavy
Severe
99.2 2020 Scenario 1 AADT (000's)
94.1 2020 No-Build AADT (000's)
Simulation roads not studied
N
0 1 2 3 Miles
Delaware Valley Regional Planning Commission
March 2001

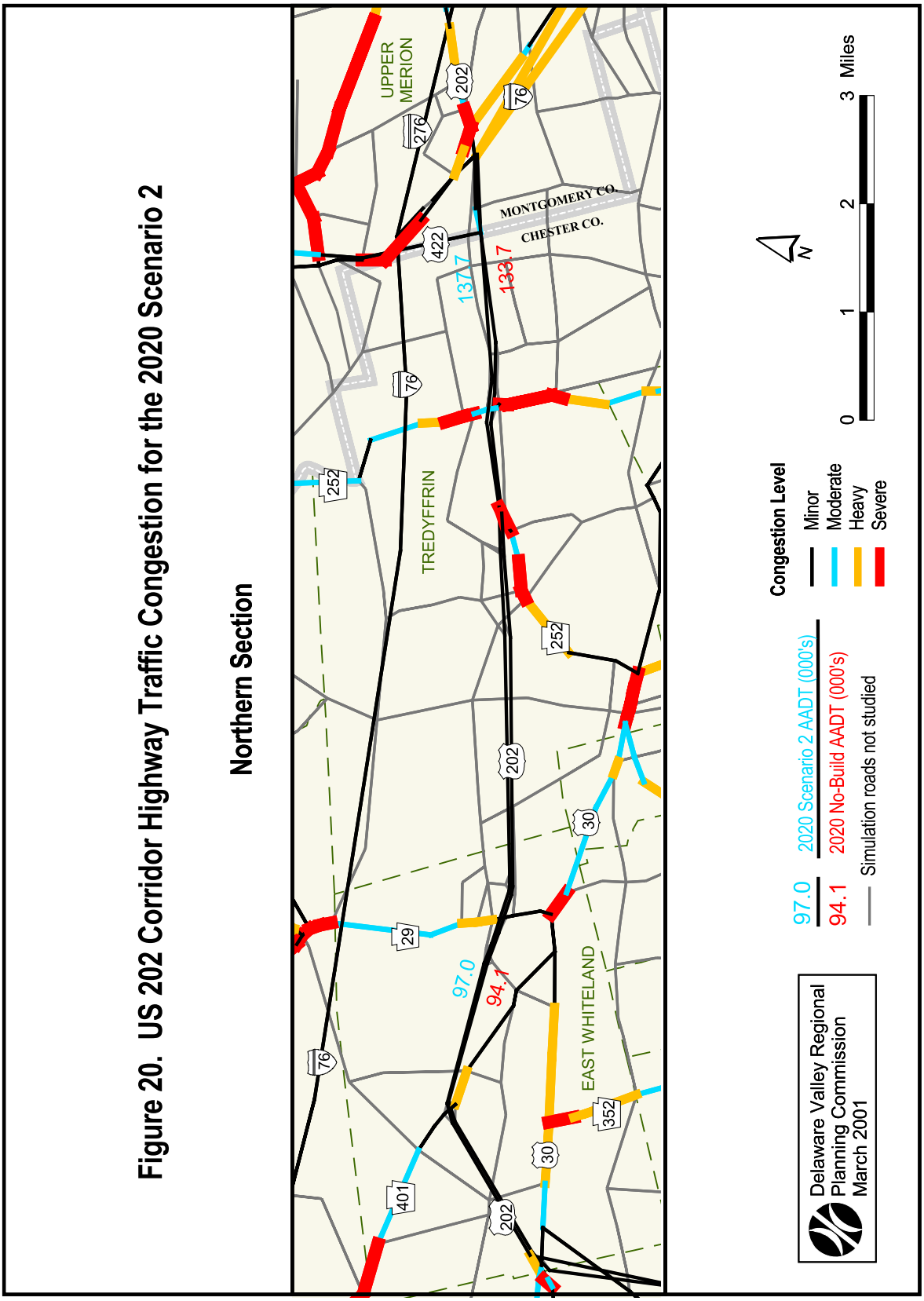


Figure 20. US 202 Corridor Highway Traffic Congestion for the 2020 Scenario 2
Northern Section
UPPER MERION
TREDYFFRIN
EAST WHITELAND
MONTGOMERY CO.
CHESTER CO.
97.0
94.1
137.7
133.7
Congestion Level
Minor
Moderate
Heavy
Severe
97.0 2020 Scenario 2 AADT (000's)
94.1 2020 No-Build AADT (000's)
Simulation roads not studied
N
0 1 2 3 Miles
Delaware Valley Regional Planning Commission
March 2001

5. Phoenixville Area Transportation Study

In addition to generalized improvements, Scenario 1 includes construction of the French Creek Parkway. In addition, Scenario 2 specifies construction of the Inter-County Connector (ICC) and widening PA 724 to four lanes between Bridge Street and PA 23. As shown in Table 32.

Table 32. Phoenixville Area Transportation Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
PA 23		
PA 100 to PA 724	Increase capacity 10 percent	Increase capacity 15 percent
PA 724 to Starr Rd	Increase capacity 15 percent	Increase capacity 15 percent
Starr Rd to PA 252	Increase capacity 10 percent	Increase capacity 15 percent
PA 724		
US 422 to Bridge St	Increase capacity 10 percent	Increase capacity 15 percent
Bridge St to PA 23	Increase capacity 10 percent	Widen to 4 lanes
PA 113		
PA 100 to PA 23	Increase capacity 15 percent	Increase functional class to high arterial
PA 23 to Montgomery Co.	Increase capacity 15 percent	Increase capacity 15 percent
PA 29		
Charlestown Rd to PA 23	Increase capacity 5 percent	Functional class to arterial
PA 23 to Inter-County Connector	Increase capacity 15 percent	Increase capacity 15 percent
Inter-County Connector to US 422	Increase capacity 15 percent	Widen to 4 lanes, and increase functional class to parkway
New Roads		
Inter-County Connector	Not Built	4 lane parkway
French Creek Parkway	2 lane arterial	2 lane arterial

a. Description of Results

Impacts to the Phoenixville area are broad, and simulated volumes change over a large area, see figures 21 and 22. Given the number of improvements and very congested conditions in this area it is difficult to determine the impact of any one improvement on travel patterns. For this reason, travel will be discussed within the context of predominant travel corridors rather than focusing on individual facilities.

First, the Schuylkill River crossings will be addressed. In the No-Build Scenario, bridges at Spring City, PA 113, and PA 29 are projected to experience severe congestion, while Pawlings Road is projected to be moderately congested. Total crossings in the base case are 81,000 vehicles, with Scenario 1 at 86,000 and Scenario 2 at 95,000 vpd. All of these bridges received capacity improvements; however, this did not solve all of the congestion problems on these bridges. Most bridge capacities were increased by 15 percent, providing marginal gains in Scenario 1. Traffic volumes increase six percent versus the No-Build Scenario, with little change to congestion levels. Scenario 2, with a new bridge modeled after the former Inter-County Connector (ICC) proposal, provided more substantive relief, especially to the PA 113 bridge. However, bridges at PA 29 and Spring City remain severely congested despite this additional route.

Examining travel in the northern and western quadrants of the Phoenixville study area, significant changes are forecast. Under Scenario 1, the largest change is that construction of the French Creek Parkway relieved Bridge Street in Phoenixville. Additionally, some traffic originating in central Phoenixville was diverted to French Creek Parkway instead of using Nutt Road (PA 23). With increased capacity along PA 724, and better connections in Phoenixville, traffic volume on PA 724 and PA 23 increased substantially west of Phoenixville. PA 724 volumes increase by 900 vpd, with PA 23 experiencing a greater increase in traffic, from 25,400 to 29,300 vpd. Much of these increases are diversions from local roads onto the major highways. A second effect of the French Creek Parkway and other Scenario 1 capacity improvements is an increase in travel from 15,900 to 18,500 vpd on PA 113 towards the southwest.

Within the northern and western quadrants, Scenario 2 causes the greatest shifts in travel. The Inter-County Connector (ICC) serves from 11,000 to 16,000 vehicles, with French Creek Parkway usage at 11,500 to 14,500 vpd. Approaches from the north of Phoenixville, Wall Street, and PA 113 both have substantially reduced volume in Scenario 2. The traffic reduction on PA 113 approaching Phoenixville from the north appears to be both diversion onto the alternate route provided by the Spring City Bridge, PA 724, and Hare's Hill Road, and diversion onto the ICC bridge. Given this level of relief to PA 113, it might prove useful to study the addition of a direct interchange between the ICC and PA 113. Further, a direct connection between PA 113 and US 422 at Trappe Road may be examined. These connections were not modeled but offer the possibility of better utilization of the PA 113 bridge.

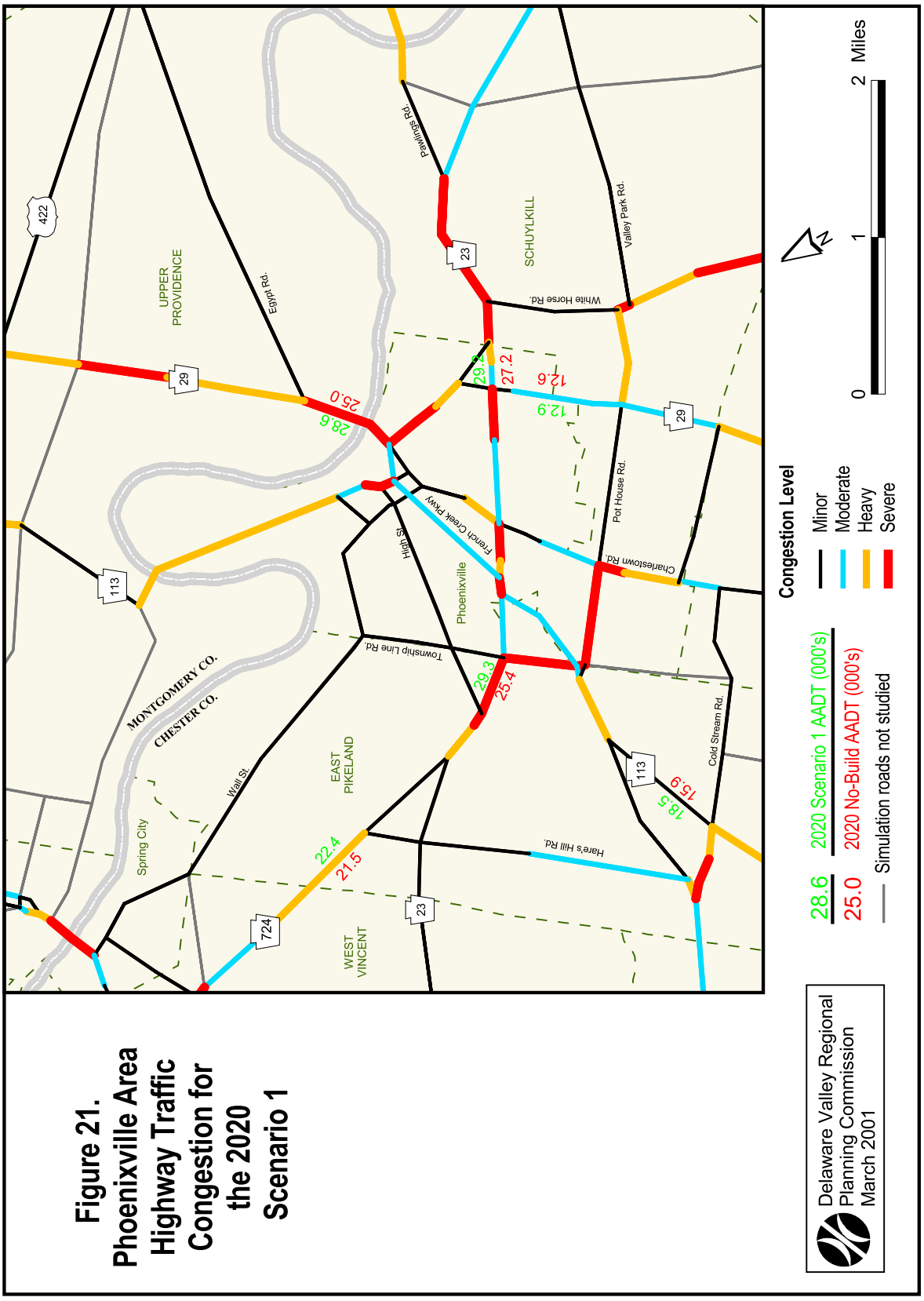


Figure 21.
Phoenixville Area
Highway Traffic
Congestion for
the 2020
Scenario 1
Delaware Valley Regional
Planning Commission
March 2001
28.6 2020 Scenario 1 AADT (000's)
25.0 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
0
1
2 Miles
MONTGOMERY CO.
CHESTER CO.
UPPER PROVIDENCE
SCHUYLKILL
EAST PIKELAND
WEST VINCENT
Spring City
Phoenixville
Egypt Rd.
Pawlings Rd.
White Horse Rd.
Valley Park Rd.
Pot House Rd.
Charlestown Rd.
Township Line Rd.
High St.
French Creek Pkwy
Wall St.
Hare's Hill Rd.
Cold Stream Rd.
422
29
23
113
724
28.6
25.0
29.3
27.2
12.6
12.9
29.3
25.4
22.4
21.5
15.9
18.5

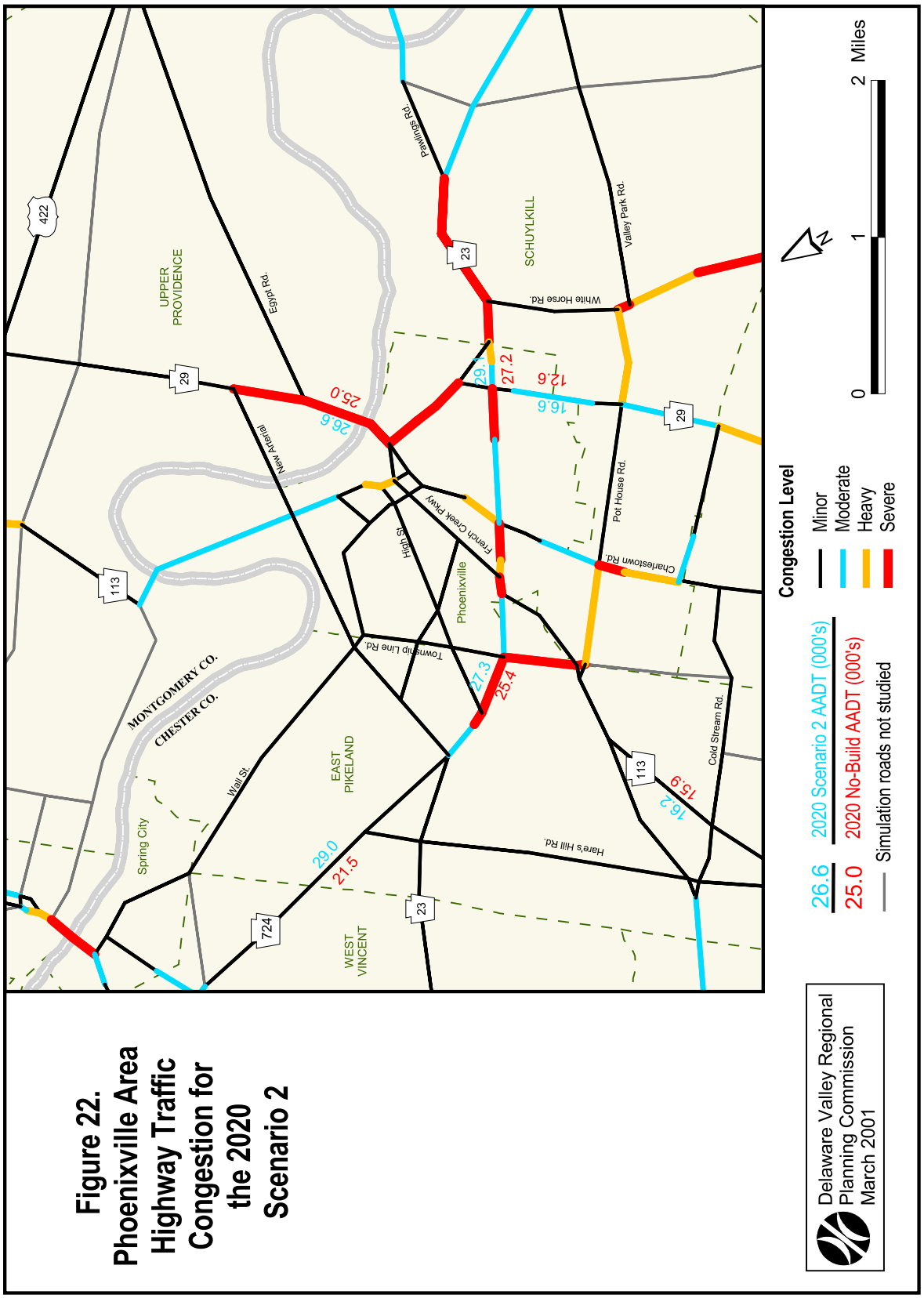


Figure 22.
Phoenixville Area
Highway Traffic
Congestion for
the 2020
Scenario 2
Delaware Valley Regional
Planning Commission
March 2001
Congestion Level
Minor
Moderate
Heavy
Severe
26.6 2020 Scenario 2 AADT (000's)
25.0 2020 No-Build AADT (000's)
Simulation roads not studied
0
1
2 Miles
N
MONTGOMERY CO.
CHESTER CO.
UPPER PROVIDENCE
SCHUYLKILL
EAST PIKELAND
WEST VINCENT
Spring City
Phoenixville
Egypt Rd.
New Arterial
Wall St.
High St.
French Creek Pkwy
Township Line Rd.
Pawlings Rd.
White Horse Rd.
Valley Park Rd.
Pot House Rd.
Charlestown Rd.
Hare's Hill Rd.
Cold Stream Rd.
422
29
113
23
724
25.0
26.6
29.1
27.2
12.6
16.6
27.3
25.4
29.0
21.5
16.2
15.9

Substantial increases in volume on PA 724 and PA 23 are predicted west of Phoenixville as a result of traffic using the ICC. One important result on a regional level is a drop in volume on US 422 east of Pottstown. This appears to result from vehicles utilizing additional capacity in Phoenixville to take a more direct route due east from north-central Chester County to King of Prussia, rather than first going north to US 422. Between Spring City and Hare's Hill Road, AADT on PA 724 increases from 21,500 to 29,000 as through traffic on PA 724 intersects traffic shifted from the PA 113 onto the Spring City Bridge via Hare's Hill Road. With the widening of PA 724, capacity is sufficient and the predicted volume is well below capacity.

From east of Phoenixville to Valley Forge, volumes on PA 23 increase in both scenarios. Scenario 1 volumes on PA 23 increase by around 2,000 vpd. However, most of this traffic is diverted from Pothouse Road / Valley Park Road. Similar results are noted in scenario 2, with PA 23 again at 2,000 vpd greater than the No-Build Scenario and Valley Park Road reduced by a comparable amount. It appears that travel originating in areas adjacent to Phoenixville is diverted so that it passes through the town to the Inter-County Connector rather than using back roads to avoid the heavy congestion in the No-Build Scenario.

South of Phoenixville, Charlestown Road, PA 29, and White Horse Road all provide alternate routes. Therefore, these roads are best considered as a group. Both scenarios increased capacity slightly, resulting in increased traffic volumes with marginal gains in V/C through much of this corridor. Increased capacity on PA 23, particularly in Scenario 2, reduces volumes on the parallel routes. Total corridor volume is slightly higher in Scenario 1 relative to the No-Build Scenario. Scenario 2 causes larger increases (by 4,000 vpd). Much of the increase in Scenario 2 is on PA 29.

Volumes inside Phoenixville Borough change moderately as a result of the build scenarios. Within Phoenixville Borough, a slight increase in volume exists on PA 23 in both Scenario 1 and Scenario 2. The largest shift is on Bridge Street where provision of a parallel facility, the French Creek Parkway, reduces volumes substantially. As a result of increased capacity, volumes on Starr Road increased slightly in both scenarios, with little or no change in V/C.

6. Downingtown Area Transportation Study

In Scenario 1, there are no specific highway improvements, although generalized improvements are specified for US 30 Business, US 30 Bypass, and US 322. In addition to the generalized improvements, Scenario 2 includes widening US 30 Bypass from four to six lanes between PA 340 and US 30 Business (see Table 33, below).

Table 33. Downingtown Area Transportation Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
US 30 Business		
PA 340 to US 322	Increase capacity 15 percent	Increase capacity 15 percent
US 322 to US 30 Bypass	Increase capacity 15 percent	Increase capacity 15 percent
US 30 Bypass to PA 100	Increase capacity 15 percent	Increase capacity 15 percent
US 30 Bypass		
PA 340 to US 30 Business	Increase functional class to high freeway	Widen to 6 lanes and increase functional class to high freeway
US 30 Business to PA 100	Increase functional class to high freeway	Increase functional class to high freeway
US 322		
PA 82 to US 30 Bypass	Increase capacity 15 percent	Increase functional class to high arterial
US 30 Bypass to Boot Rd	Increase capacity 15 percent	Increase capacity 15 percent
Boot Rd to US 322 Bypass	Increase capacity 10 percent	Increase high arterial

a. Description of Results

Traffic in the Downingtown area was shifted and congestion reduced in response to capacity improvements in both scenarios as shown in figures 23 and 24. First among these improvements is US 30 Bypass, particularly from PA 113 to US 322. These results apply to both Scenarios 1 and 2. In this section, the increase in capacity was sufficient to alleviate congestion on this roadway. The base condition was a V/C indicating heavy congestion. Scenarios 1 and 2 reduce congestion levels to moderate and light respectively, despite diverting some traffic from downtown Downingtown to US 30 Bypass.

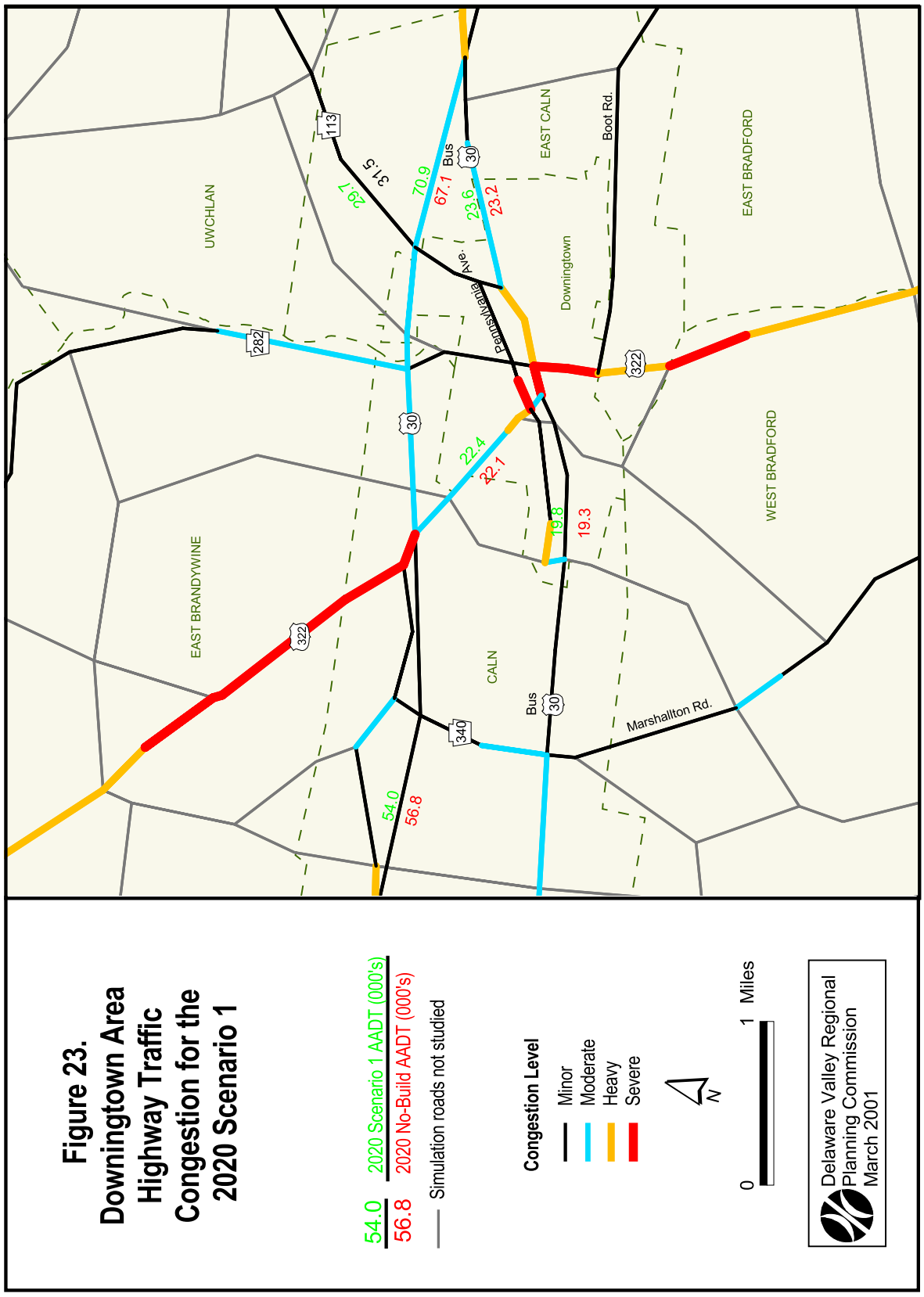
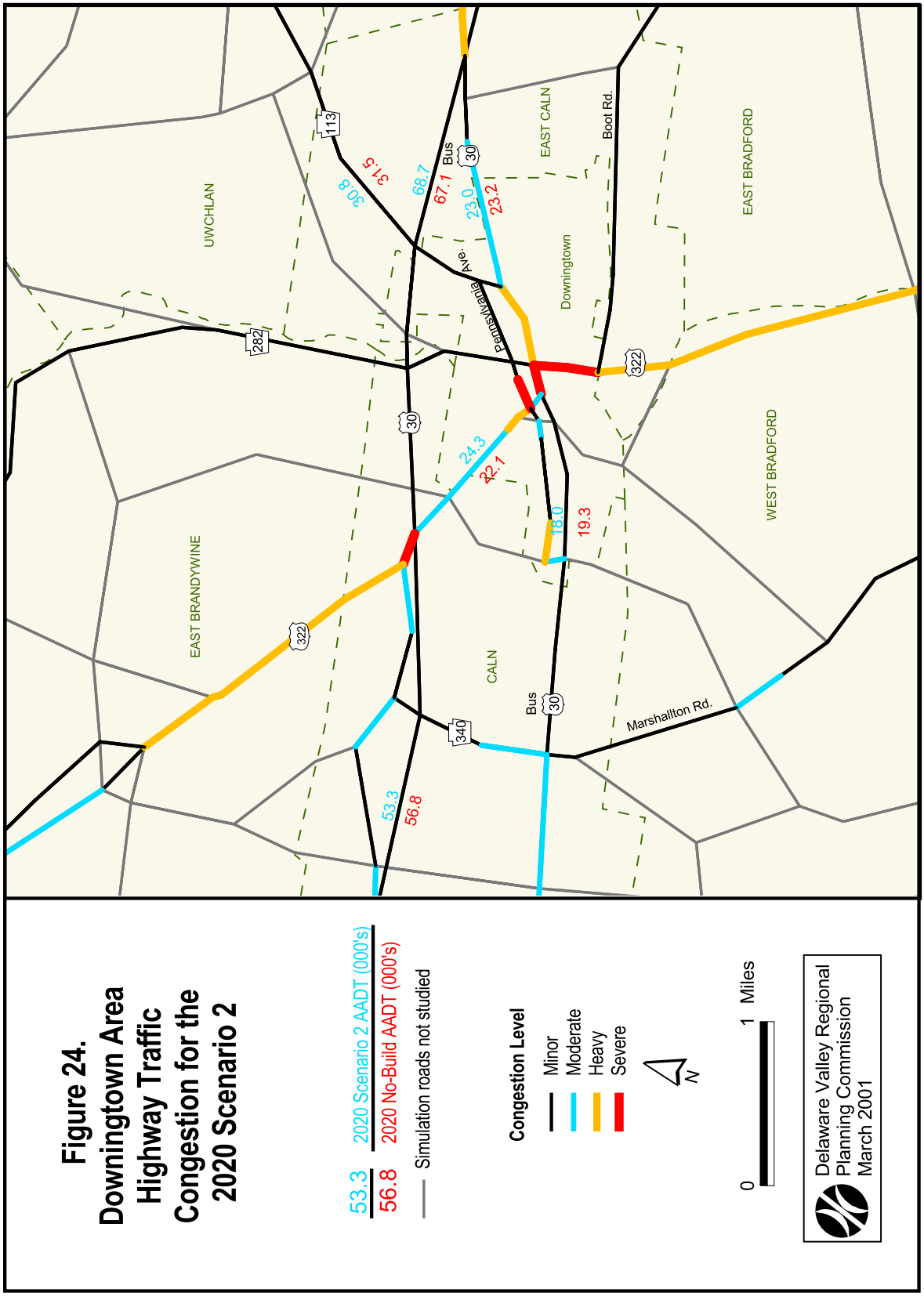


Figure 23.
Downingtown Area
Highway Traffic
Congestion for the
2020 Scenario 1
54.0 2020 Scenario 1 AADT (000's)
56.8 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1 Miles
Delaware Valley Regional
Planning Commission
March 2001
UWCHLAN
EAST BRANDYWINE
CALN
EAST CALN
Downingtown
EAST BRADFORD
WEST BRADFORD
Boot Rd.
Pennsylvania Ave.
Marshallton Rd.
Bus
113
282
30
322
340
54.0
56.8
51.5
70.9
67.1
23.6
23.2
22.4
22.1
19.8
19.3


UWCHLAN
EAST BRANDYWINE
CALN
EAST CALN
Downingtown
EAST BRADFORD
WEST BRADFORD
Boot Rd.
Pennsylvania Ave.
Marshallton Rd.
Bus
113
282
30
322
340
53.3
56.8
68.7
67.1
23.0
23.2
24.3
22.1
18.0
19.3
Figure 24.
Downingtown Area
Highway Traffic
Congestion for the
2020 Scenario 2
53.3 2020 Scenario 2 AADT (000's)
56.8 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1 Miles
Delaware Valley Regional
Planning Commission
March 2001

A second location of concern is US 322. Within Downingtown itself, volumes are stable under Scenario 1 and increase by 2,200 vpd under Scenario 2. Conditions remained congested in both scenarios despite the additional capacity. The volume on Boot Road drops significantly in Scenario 2, suggesting diversion onto US 322.

PA 113 in all scenarios has ample capacity. Base volumes are 31,500 with both build scenarios producing reductions from this level of traffic (29,700 and 30,800). This reduction extends onto Shoen Road, suggesting that improvements to US 30 Business might have reduced demand on these local roads and PA 113.

7. PA 41 Corridor Study, Delaware State Line to Lancaster County Line

South of US 1, both scenarios include widening of PA 41 to four lanes from the Delaware state line to Avondale and construction of a two-lane arterial bypass around Avondale to US 1. North of US 1, both scenarios include widening PA 41 to four lanes, but Scenario 2 also includes construction of the Chatham bypass as a two lane arterial. These improvements are listed in Table 34, below.

Table 34. PA 41 Corridor Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1	Scenario 2
US 30 to PA 926	Increase capacity 10 percent	Increase functional class to high parkway
PA 926 to US 1	Widen to 4 lanes, and increase functional class to high parkway	Widen to 4 lanes and build Chatham bypass
US 1 to Avondale	Build 2 lane bypass	Build 2 lane bypass
Avondale to Delaware State Line	Widen to 4 lanes and increase functional class to high parkway	Widen to 4 lanes and increase functional class to high parkway.

a. Description of Results

Figures 25 and 26 present the 2020 travel simulation results for the PA 41 Corridor under scenarios 1 and 2, respectively. Traffic volumes moving through this corridor were not significantly impacted by the addition of bypasses around Chatham and Avondale. The maximum impact was a 2,000 vehicle increase north of Chatham in scenario 2. As expected, the bypasses diverted traffic away from existing PA 41 in Avondale and Chatham. In Scenario 2 a reduced number of vehicles pass through Chatham, while the maximum load in Avondale is roughly 9,300 vpd.

In the northern portion of PA 41, differences between the scenarios are minimal, with Scenario 2 about 2,000 vpd higher than the no build. All three options yield AADTs above 20,000 throughout the corridor. Two further observations can be made regarding this portion of the roadway. First, the ring roads suggested in the Cochranville area do provide some relief to the intersection of PA 41 with PA 10. Of particular note is the road in the east quadrant of this intersection, which carries a volume around 5,000 vehicles per day. The ring road in the north quadrant also generates a substantial simulated volume. Second, traffic volumes in the Atglen area in all scenarios exceed 20,000 vpd. This suggests that attention should be given to solving traffic problems in this area.

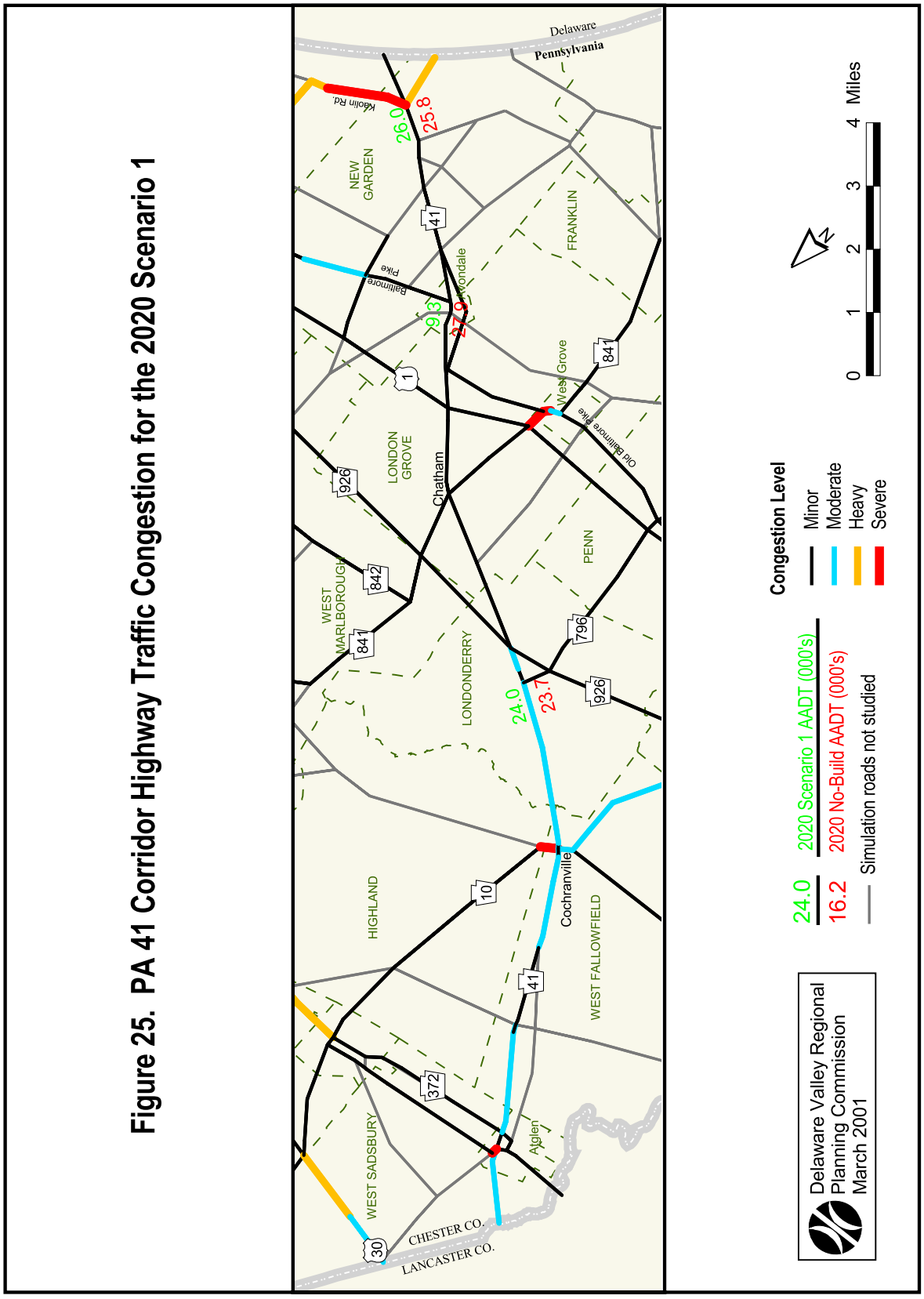


Figure 25. PA 41 Corridor Highway Traffic Congestion for the 2020 Scenario 1

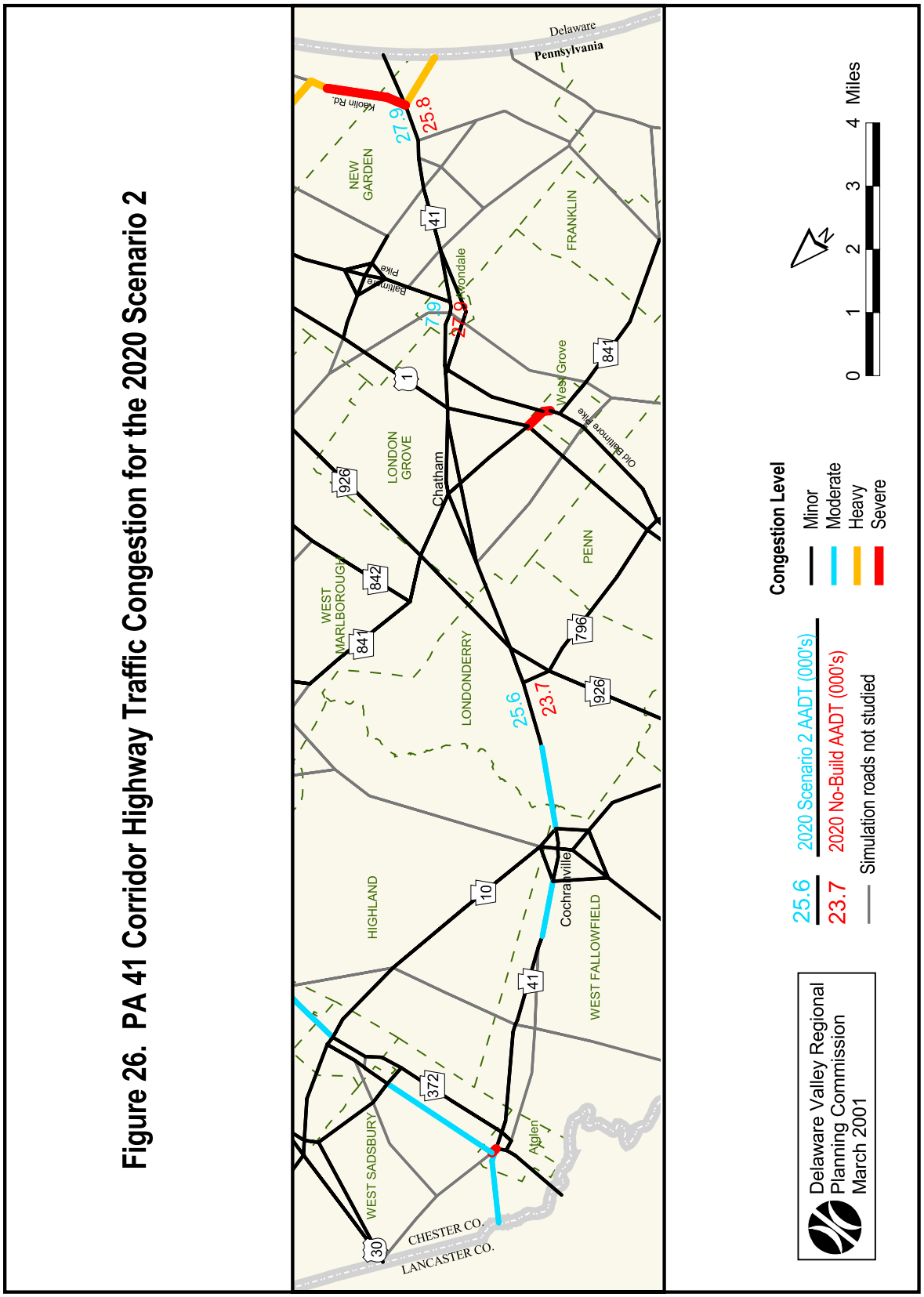


Figure 26. PA 41 Corridor Highway Traffic Congestion for the 2020 Scenario 2

8. PA 113 Corridor Study, US 30 Bypass to PA 23

As shown in Table 35, only generalized improvements are suggested for PA 113 in the improvement scenarios. In Scenario 2, a new principle arterial connector to PA 113 is constructed along the Hare's Hill Road alignment.

Table 35. PA 113 Corridor Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
US 30 Bypass to PA 401	Increase capacity 15 percent	Increase functional class to high arterial
PA 401 to PA 23	Increase capacity 10 percent	Increase functional class to high arterial
New Roads		
Hare's Hill Rd	No change	Build extension to PA 113, change functional class to major arterial

a. Description of Results

From north of US 30 Bypass to PA 100, PA 113 is well below capacity in both improvement scenarios (see figures 27 and 28). North of US 30 Bypass, projected volume is roughly 30,100 in the No-Build Scenario. Scenario 1 increases this prediction slightly to 31,900, with Scenario 2 projecting 2,300 vpd above the No-Build Scenario.

From PA 100 to PA 401, the build scenarios slightly increase travel on PA 401 relative to the No-Build conditions. Volumes rise to 29,100 and 31,500 from a base of 28,500. These projected volumes can be accommodated on the existing cross section, with the exception of the intersection of PA 113 with PA 401.

From PA 401 to the proposed new road in the Hare's Hill Road corridor, volumes rise from 18,600 in the base case to 20,100 and 23,900 in the future scenarios. These volumes represent V/C ratios above 1.00 in both future year scenarios. To achieve these volumes, intersections must be widened and signal systems improved. Much of PA 113 from PA 401 to Hare's Hill Road remains congested despite additional capacity, suggesting that it may be prudent to consider widening in this section.

Approaching Phoenixville, a substantial shift occurs in Scenario 2, with roughly half of the traffic on PA 113 using the improved Hare's Hill Road corridor. Despite traffic growth south of this location and additional capacity, PA 113 does not experience increased volume (300 vpd) in Scenario 2 relative to the No-Build Scenario as it approaches Phoenixville. Scenario 1, without the Hare's Hill Road improvement, however, indicates more significant numbers (2,600 vpd) of additional vehicles on PA 113 as a result of increased capacity on this roadway.

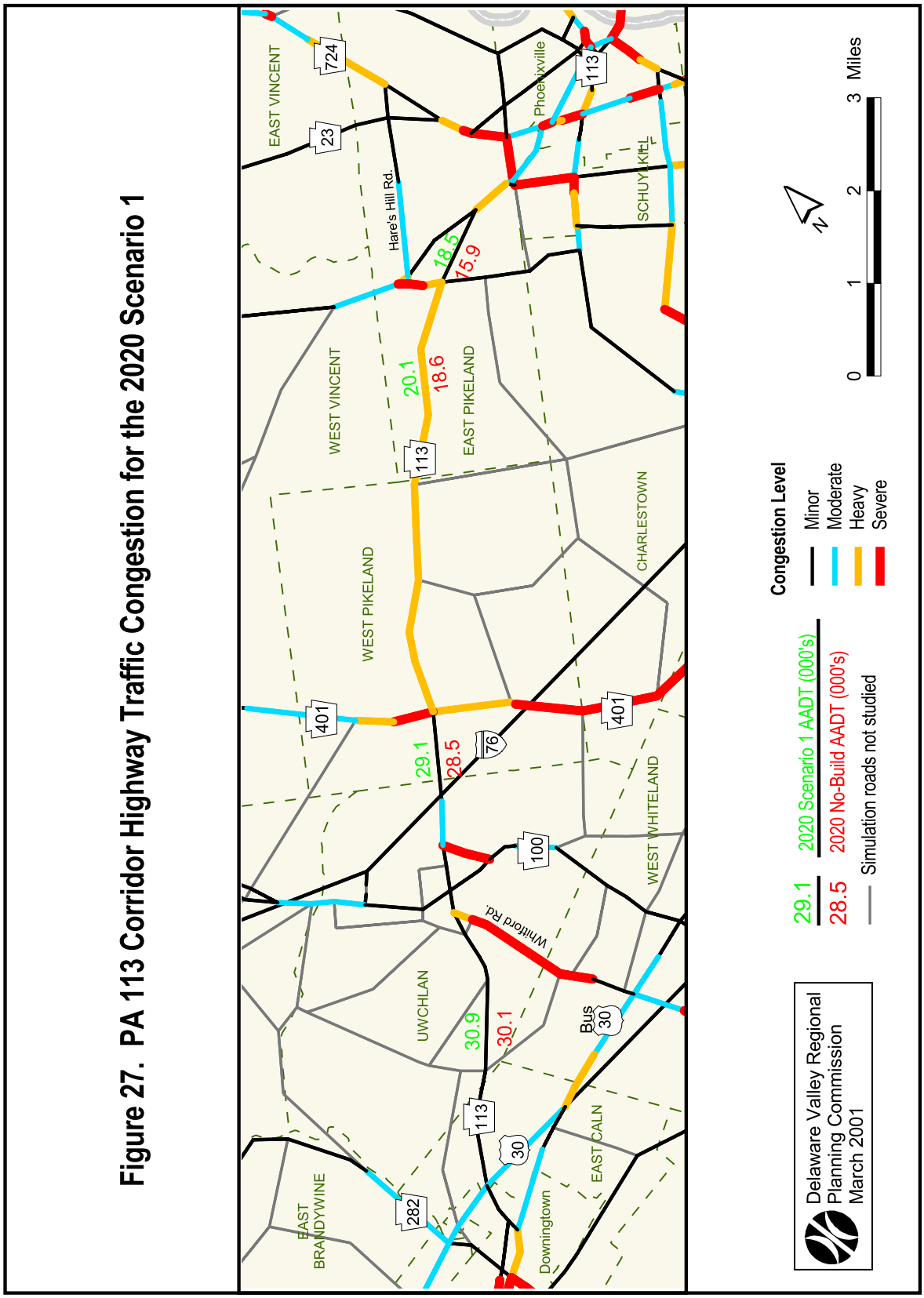


Figure 27. PA 113 Corridor Highway Traffic Congestion for the 2020 Scenario 1
EAST VINCENT
WEST VINCENT
WEST PIKELAND
EAST PIKELAND
CHARLESTOWN
WEST WHITELAND
UWCHLAN
EAST BRANDYWINE
EAST CALN
Downingtown
Phoenixville
SCHUYLKILL
Hare's Hill Rd.
Whitford Rd.
Bus
724
23
113
401
76
100
282
30
29.1
28.5
20.1
18.6
18.5
15.9
30.9
30.1
Congestion Level
Minor
Moderate
Heavy
Severe
29.1 2020 Scenario 1 AADT (000's)
28.5 2020 No-Build AADT (000's)
Simulation roads not studied
0 1 2 3 Miles
N
Delaware Valley Regional Planning Commission
March 2001

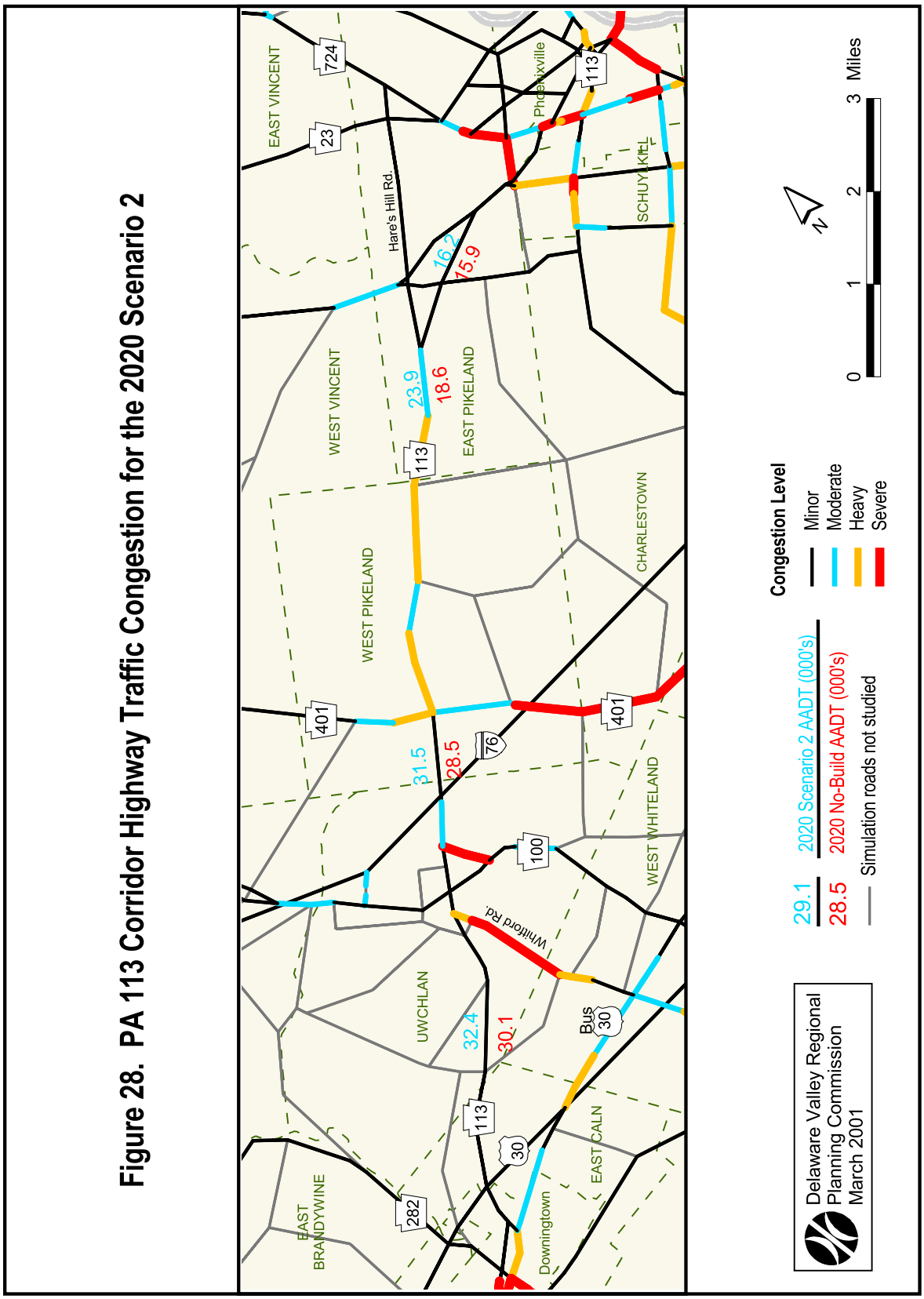


Figure 28. PA 113 Corridor Highway Traffic Congestion for the 2020 Scenario 2
EAST VINCENT
WEST VINCENT
WEST PIKELAND
EAST PIKELAND
CHARLESTOWN
WEST WHITELAND
UWCHLAN
EAST BRANDYWINE
EAST CALN
Downingtown
Phoenixville
SCHUYLKILL
Hare's Hill Rd.
Whitford Rd.
Bus
724
23
113
401
76
100
30
282
16.2
15.9
23.9
18.6
31.5
28.5
32.4
30.1
Congestion Level
Minor
Moderate
Heavy
Severe
29.1 2020 Scenario 2 AADT (000's)
28.5 2020 No-Build AADT (000's)
Simulation roads not studied
0 1 2 3 Miles
N
Delaware Valley Regional Planning Commission
March 2001

9. West Chester Area Transportation Study

Both build scenarios include many generalized capacity increases. In Scenario 1, the US 322 Bypass interchange with US 202 is completed to include the movements to and from the south on US 202. In addition, PA 3 is widened to six lanes from PA 352 to US 202. These improvements are also included in Scenario 2 as is widening PA 100 from the US 202 Connector to PA 3 to six lanes. Table 36 list these improvements.

Table 36. West Chester Area Transportation Study Highway Improvements for Scenarios 1 and 2

Location	Scenario 1 Improvements	Scenario 2 Improvements
US 202		
US 30 to PA 100 Connector	Increase functional class to high freeway	Increase functional class to high freeway
PA 100 Connector to PA 3	Increase functional class to high freeway	Increase functional class to high freeway, widen to 6 lanes
PA 3 to PA 926	Increase functional class to either high freeway or high parkway	Increase functional class to either high freeway or high parkway
PA 100		
US322 Bypass to PA 100 Connector	Increase capacity 10 percent	Increase functional class to high arterial
US 322 Bypass to US 202	Increase capacity 15 percent	Increase capacity 15 percent
PA 100 Connector	No change	No change
US 322		
Downingtown to US 322 Bypass	Increase capacity 15 percent	Increase capacity 15 percent
US 322 Bypass	Increase capacity 15 percent and build full US 202 interchange	Increase capacity 15 percent and build full US 202 interchange
US 322 Business	Increase capacity 15 percent	Increase capacity 15 percent
PA 162	Increase capacity 15 percent	Increase capacity 15 percent
PA 842	Increase capacity 10 percent	Increase capacity 10 percent
PA 100 / 52	Increase capacity 10 percent	Increase capacity 10 percent

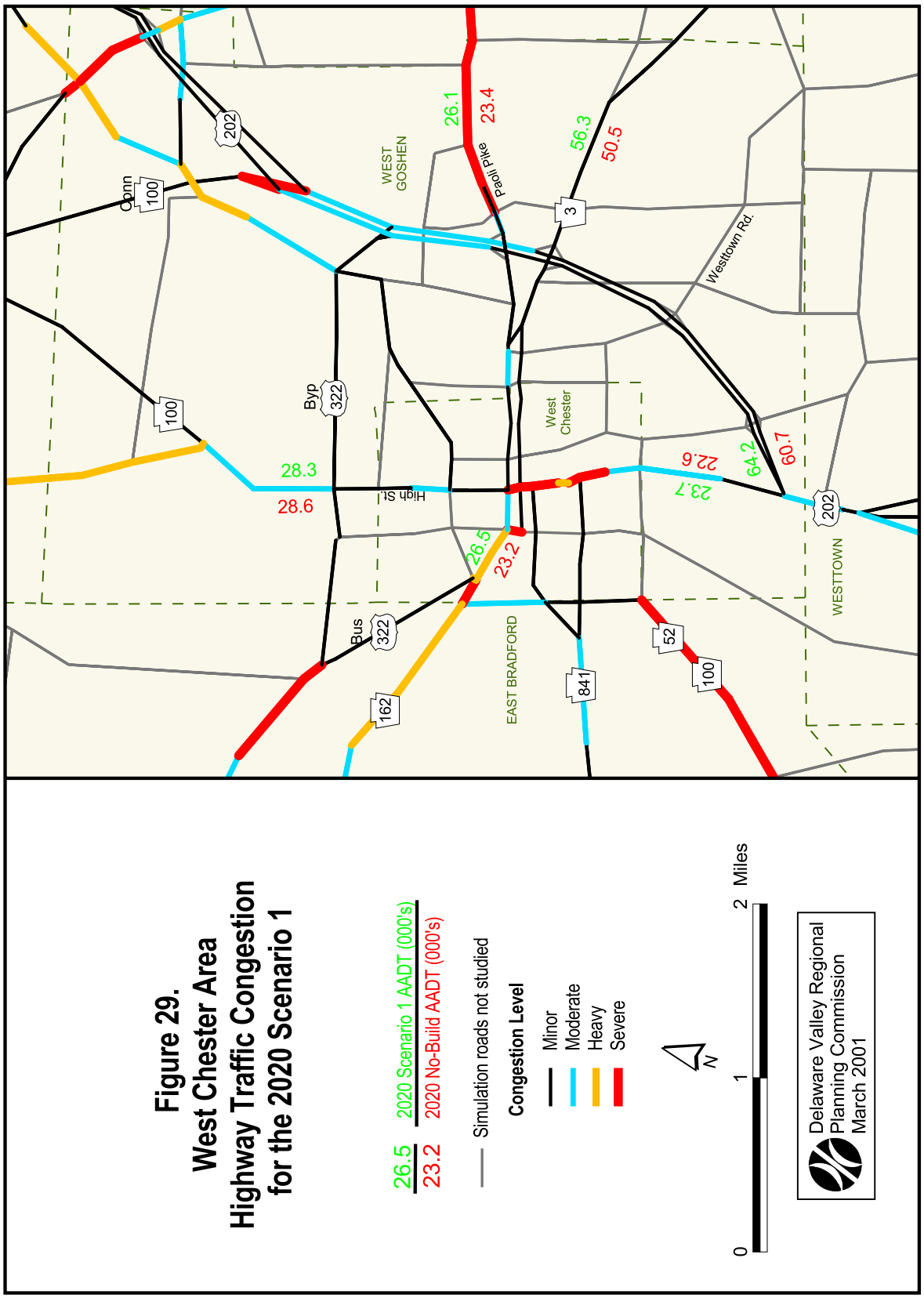
Tigue Rd	No change	Upgrade to major arterial
PA 3		
PA 352 to US 202	Widen to 6 lanes and increase functional class to high arterial	Widen to 6 lanes and increase functional class to high parkway
High St to US 202	Increase capacity 15 percent	Increase capacity 15 percent
Paoli Pike	Increase capacity 15 percent	Increase capacity 20 percent

a. Description of Results

As shown in figures 29 and 30, the West Chester area remains congested in all scenarios. Access to West Chester is best analyzed by compass directions. Approaching West Chester from the west; PA 842, PA 100, PA 162, and US 322 are all expected to experience severe congestion for at least one link. Clearly, demand far outstrips capacity in this corridor. Scenario 1 provides substantial relief to PA 842. However, traffic on PA 162 near West Chester increases, causing V/C to be unchanged despite additional capacity. Conditions on PA 100 from the southwest are essentially unchanged in Scenario 1.

Scenario 2 offers the greatest relief although Paoli Pike, High Street, and Strasburg Road remain as locations of severe congestion. Scenario 2 provides substantial relief for PA 100 and PA 842 as a new arterial in the Tigue Road corridor draws 17,500 vehicles from PA 100 and PA 842. However, under Scenario 2 congestion on US 322 Business actually increases while there is little impact on PA 162. Part of this additional volume is diverted from US 322 Bypass, which experiences a slight traffic reduction in both build scenarios. From the south, volumes on US 202 north of High Street rise from 60,700 to 64,200 and 78,500 vpd, respectively. Volumes on High Street near West Chester University also increase slightly from 22,600 in the No-Build Scenario to 23,700 in both build scenarios.

To the East, widening on PA 3 under Scenario 1, draws 56,300 vehicles to PA 3 east of US 202., versus 50,500 in the No-Build Scenario. There is a significant shift from Westtown Road to PA 3 in this scenario. Scenario 2, which both widens and improves speeds on PA 3 draws a much larger volume, 70,900 vpd. This suggests that increased travel speeds will attract significant travel onto PA 3. Traffic on local parallel routes drops, particularly Strasburg Road and Westtown Road.


WEST GOSHEN
WEST CHESTER
EAST BRADFORD
WESTTOWN
Byp 322
Bus 322
202
100
3
52
841
162
Paoli Pike
Westtown Rd.
High St
26.1
23.4
56.3
50.5
28.3
28.6
26.5
23.2
23.7
22.6
64.2
60.7
Figure 29.
West Chester Area
Highway Traffic Congestion
for the 2020 Scenario 1
26.5 2020 Scenario 1 AADT (000's)
23.2 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1
2 Miles
Delaware Valley Regional
Planning Commission
March 2001

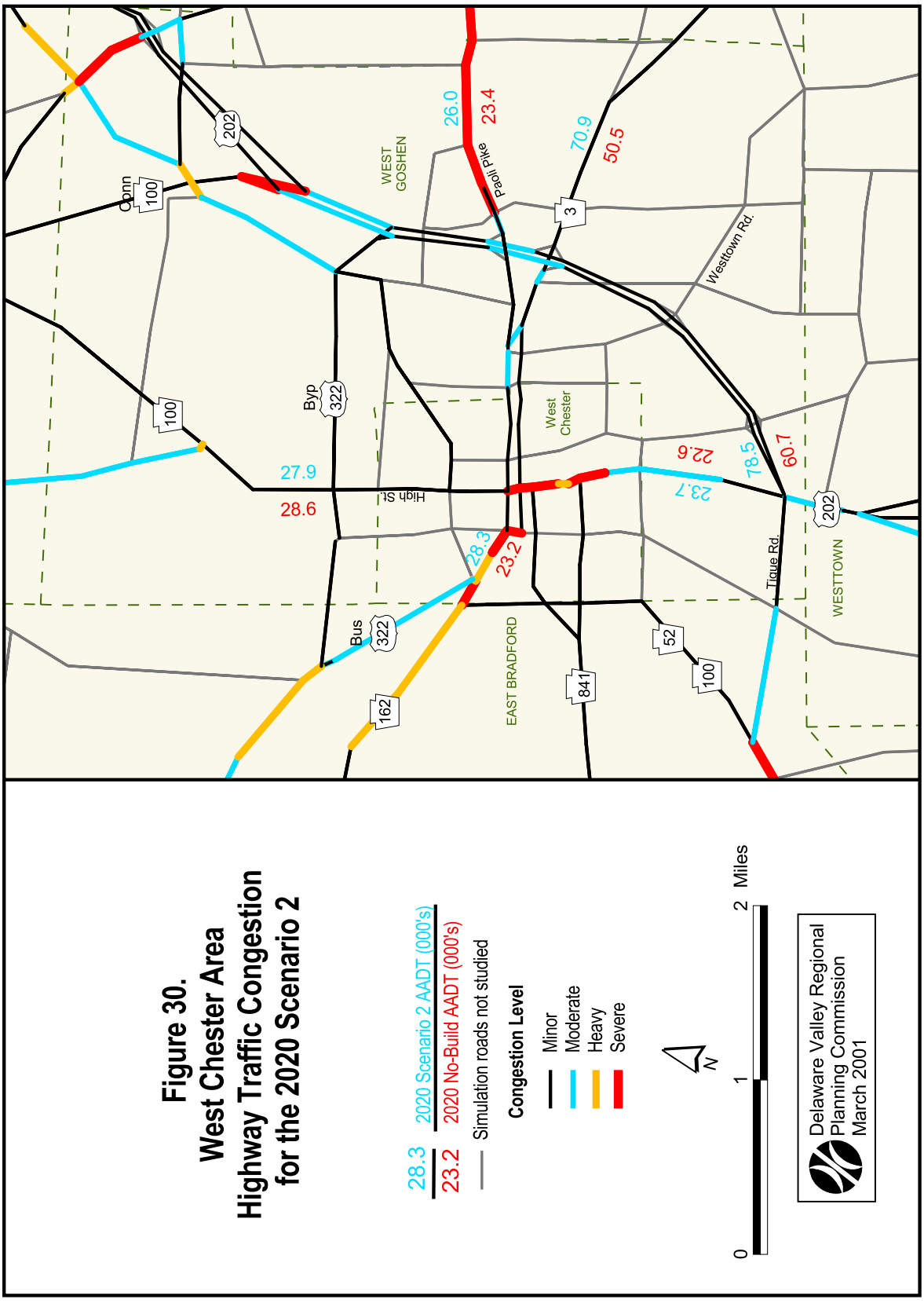


Figure 30.
West Chester Area
Highway Traffic Congestion
for the 2020 Scenario 2
28.3 2020 Scenario 2 AADT (000's)
23.2 2020 No-Build AADT (000's)
Simulation roads not studied
Congestion Level
Minor
Moderate
Heavy
Severe
N
0
1
2 Miles
Delaware Valley Regional
Planning Commission
March 2001
WEST GOSHEN
West Chester
EAST BRADFORD
WESTTOWN
Paoli Pike
Westtown Rd.
Tique Rd
High St.
Byp
Bus
Conn
202
100
322
162
3
52
841
26.0
23.4
70.9
50.5
27.9
28.6
28.3
23.2
22.6
23.7
78.5
60.7

In both scenarios, Paoli Pike remains severely congested. East of PA 3, volumes rise from 23,400 vpd in the No-Build Scenario to about 26,000 vpd in both build scenarios. Congestion drops only slightly in the build scenarios despite additional capacity because of increased traffic volumes.

The ramps completing the US 322 Bypass/US 202 interchange are well utilized, with significant traffic diverted from Phoenixville Pike and Paoli Pike onto US 322 Bypass. However, it should be noted that improvements to US 322 Business reduce volume on US 322 Bypass west of High Street.

V. CONCLUSIONS

DVRPC staff has successfully prepared a travel simulation model, focused on Chester County. This model is intended to be a general planning tool capable of testing transportation and land use scenarios and providing travel forecasts at the facility, corridor, and county levels of analysis. This model includes all relevant highway and public transit facilities within Chester County and uses the latest modeling methodology and computer technology. It complies with all TEA-21 and Transportation/Air Quality conformity requirements and has been calibrated and validated with extensive highway and public transit counts and other data. The model is a reliable tool to predict future transportation volumes, given the growth projections for the socio-economic inputs to the model and the highway and public transit networks that include transportation facility improvements.

This report documents the model runs made with Chester County's *Landscapes* development plan testing three alternative levels of highway and public transit improvements – No-Build, moderate improvement (Scenario 1) and extensive improvement (Scenario 2). The results of these travel simulations give insight into the levels of transportation investment that will be required to stabilize highway service levels at current conditions and reduce congestion levels in existing problem areas.

A. County-Wide Results Under the 2020 No-Build Scenario

The 2020 No-Build Scenario run was made to estimate the highway and transit network patronage levels and determine the deficiencies under the do nothing condition. These results were used to help determine the facility improvements that should be included in the build scenarios and to provide a benchmark to evaluate the ability of these proposed improvements to solve congestion problems.

The major findings of the No-Build Scenario projections are as follows:

- The socio-economic data corresponding to the *Landscapes* plan were updated to conform with the new DVRPC board adopted projections. In the new projections, overall 2020 Chester County population increased by 26.1 percent from 1997 to 527,100 persons, about seven percent higher than the projections included in Chester County's *Landscapes* report. Employment growth from 1997 is projected to be 23.8 percent from 1997 to a total of 277,500 jobs.

- 2020 work trips made by Chester County residents increased by 39.4 percent over 1997 levels to 502,000 trips per day. Over the same time interval, resident non-work trips increased by 31.3 percent to 1,230,000 trips per day and non-home based travel increased by 25.9 percent to 472,000 daily trips. In 2020, Chester County residents are projected to produce more than 2.2 million trips on an average weekday. In addition, another 2.0 million daily trips made by persons residing outside of the county will be attracted to Chester County. This travel load places significant demands on the highway and public transit facilities in the county.

- As a result of concentrating new development in existing developed areas, transit's share of Chester County work travel will increase from 1.7 percent in 1997 to 1.9 percent in 2020. The corresponding total percentage of trips made by transit will increase from 0.5 percent to 0.6 percent. Because of the increase in total trip making, bus riding on existing routes increase by 14 percent and rail boardings increase by 43 percent to over 17,000 daily boardings. Because of the low modal splits associated with this ridership, this increase in transit riding will not have a widespread effect on highway congestion levels.

- As a result of the socio-economic forecasts and the growth patterns included in the *Landscapes* Plan, Chester County daily vehicular travel is projected to increase by 48.1 percent over 1997 levels to 16,073,700 vehicle miles of travel (VMT). As a result of this increase, Chester County's roadway capacity utilization will increase from 43 to 62 percent of available daily roadway capacity. Because of the additional congestion associated with this VMT increase, county average PM peak hour speeds decrease by 7.1 percent from 1997 to 28.8 mph. Average daily Chester County speeds decrease by 2.2 percent to 31.0 mph. Despite these increases in VMT and congestion, vehicular emissions are projected to decrease by 16.9 percent for CO, 28.7 percent for HC and 25.3 percent for NO_x. These emissions decreases resulted principally from fleet turnover and the improved vehicle designs mandated in the federal air quality program.

B. County-Wide Results Under the Build Scenarios

Two improvement scenarios were tested as part of the Chester County study. The facility improvements included in both of these scenarios were provided by Chester County staff in consultation with DVRPC staff. Scenario 1 included a moderate level of improvement for most of the major roadways in Chester County, with major improvements for some highly congested facilities. Many of these highway and transit improvements, such as the widening of US 202 Expressway, have been studied in the past and are included in DVRPC's Transportation Improvement Plan (TIP).

Scenario 2 includes much more extensive levels of highway and transit improvement, many of which have not been studied previously. Both build Scenarios include many generalized improvements expressed in terms of a percentage increase over existing roadway capacity or a highway functional class upgrade. These improvements are not specified in terms of geometric, signal, or other improvements.

The major findings of the 2020 travel projections under the build scenarios are as follows:

- Because of the large increase in the number of Chester County transit facilities included in the build Scenarios, 2020 transit riding increased by 4,200 additional bus riders and 7,100 rail riders over the No-Build in Scenario 1. The corresponding increases under Scenario 2 were 6,500 bus riders and 15,100 rail riders. Despite the increases in transit ridership in the build Scenarios, the modal split for Chester County remained well below two percent. Although non-auto accessibility is greatly improved by the build Scenarios for transit dependent populations, the transit improvements do not significantly reduce congestion levels, except in localized areas.

- Both build scenarios result in small increases in 2020 VMT over the No-Build Scenario; 0.5 percent for Scenario 1 and 1.3 percent for Scenario 2.

- The increases in capacity in scenarios 1 and 2 did much to ameliorate the congestion increases brought about by the population and employment growths provided for in the *Landscapes* Plan. Highway capacity utilization in Scenario 1 was reduced to 55 percent from 62 percent in the No-Build and to 52 percent in Scenario 2. Even the improvements included in Scenario 2 did not reduce the capacity utilization back to the 1997 level of 43 percent.

- The county-wide average peak hour speed under Scenario 1 (29.7 mph) was better than the No-Build value (28.8 mph). The additional facility improvements included in Scenario 2 further improved Chester County's average highway speed to 31.0 mph. In terms of average daily speed, Scenario 2 was almost one mph higher than the Scenario 1 estimate (32.6 vs. 31.7 mph).

- In 2020 under the No-Build Scenario, about 41 percent of all highway travel in Chester County occurs under congested conditions. Scenario 1 reduces this percentage to about 34 percent and Scenario 2 to about 32.1 percent.

- Because of the increase in highway operating speed in the build scenarios, carbon monoxide (CO) and hydrocarbon (HC) vehicular emissions were reduced slightly vis-a-vis the No-Build - by up to 3.9 and 2.0 percent, respectively. Nitrous Oxide (NO_x) emissions were increased by up to 2.4 percent under the build scenarios. These changes in vehicular emissions resulted primarily from the relationship of emission factors to highway link operating speed.

For the county as a whole, Scenario 2 provided adequate highway service levels. Scenario 1 also for the most part provides adequate highway service, but reductions in existing operating speeds may occur in some areas, particularly during peak periods. These county-wide averages may not be indicative of prevailing highway conditions in certain corridors and on specific roadways. For this reason, separate conclusions for each of the nine corridor/area analyses included in this report are presented below.

- The PA 100 corridor generally improves over its entire length in the build scenarios. Traffic growth is very high, ranging from 40 percent to 54 percent versus 1997 in the No-Build to 65

percent to 75 percent in Scenario 2. Where capacity increases are highest, at bypasses and through Uwchlan Township, congestion is minimal. However, because of the additional travel that is attracted to the corridor, those areas that receive minimal upgrades (south of US 30 and north of PA 401) experience little or no improvement over current conditions.

- The US 322 corridor remains congested despite additional capacity. A moderate increase in capacity produced substantial gains in volume. This is most acute approaching Downingtown from the west where Scenario 2 added 4,600 vehicles over the No-Build. Overall, congestion did decrease within the corridor, with positive impacts to parallel roads, particularly Bondsville Road and PA 282. Also, provision of a ring road at Guthriesville reduced congestion at this location.

- Improvements to US 1 provide substantial relief throughout the corridor in both build scenarios, although accommodating roughly 50 percent traffic growth over 1997. First among these successes is widening US 1 to six lanes from the Kennett-Oxford Bypass to PA 52 which eliminates congestion in this segment. East of PA 52, heavy congestion predominates in the No-Build Scenario. However, upgrades to US 1 result in a projection of moderate congestion for both build scenarios in this area, with much traffic using an improved PA 926.

- Increased capacity drastically reduces congestion on US 202. Much of this corridor is projected to experience heavy congestion under the No-Build Scenario, with traffic growth of 30 to 50 percent over 1997 levels. Travel on US 202 in the build scenarios increases moderately, but the proposed improvements allow US 202 to accommodate projected demand. Also, problem intersections at PA 926 and US 1 are relieved with the addition of ring roads and grade separation.

- The Phoenixville area in the No-Build is the most congested portion of Chester County. Provision of additional roadways, widenings, and capacity improvements provide only moderate relief. With additional capacity, travel that previously avoided Phoenixville due to congestion now passes through the area in both build scenarios. While small improvements occur on most major roads, minor roadways experience more substantial drops in volume versus the No-Build Scenario.

- The Downingtown area experiences substantial congestion in the No-Build Scenario, with traffic growth on the order of 50 percent from 1997. Most of the Downingtown area received slight capacity increases in the build scenarios, with the exception of US 30 which receives substantial capacity increases as a result of widening to six lanes in Scenario 2. US 322 remains congested in all scenarios, while improvements to US 30 improve east-west travel by diverting traffic off of US 30 Business. In all scenarios, pockets of congestion persist in the downtown area.

- PA 41 under the No-Build Scenario is projected to be moderately congested through much of the corridor, with heavy congestion in Avondale, Cochranville, and Atglen. Both build scenarios alleviate this congestion, with combinations of bypasses, ring roads, and widening

improving conditions. Provision of this additional capacity has little impact on volumes, with traffic growth from 1997 to 2020 projected at slightly over 50 percent in all scenarios.

- In the four lane portion of PA 113 south of PA 100, congestion is projected to be minimal, while the northern portion, mostly two lanes, remains congested in all scenarios. This imbalance in capacity and resulting congestion impacts all scenarios. Additional capacity in the northern portion is partly offset by additional travel in the corridor, causing congestion to be only somewhat improved.

- The West Chester area is projected to experience severe congestion on many roadways in the No-Build Scenario. Most facilities receive moderate capacity increases in the build scenarios, with commensurate moderate improvements in congestion. However, additional traffic attracted into West Chester by the improvements is sufficient to make congestion worse in several locations. The completion of ramps at US 202 and US 322 Bypass, and opening of Tigue Road, cause the greatest reductions in congestion.

Based on the analysis of the above corridors and study areas within Chester County, the following three overall conclusions can be made: First, those corridors where large capacity increases are proposed experience the most relief from congested conditions. Second, the provision of additional capacity in congested corridors attracts additional traffic volume to the improved road both by diverting trips from parallel highway facilities and by attracting trips into the corridor which formally had destinations elsewhere. This is the principal component of latent demand in Chester County. Third, localized changes at problem locations can have significant positive impacts on corridor congestion levels.

Chester County will experience very high rates of population and employment growth in the next 20 years. Although it may be possible to concentrate much of this growth in developed areas, traffic congestion will increase significantly unless new roadway capacity is created through investments in the transportation system. In some portions of the county, it is not possible to reduce peak period congestion below current levels even with the Scenario 2 transportation improvements.

Finally, the projections, analyses, and conclusions presented in this report are intended for general overall planning purposes. They are valid given the socio-economic projections and the proposed highway and transit facilities included in the improvement scenarios 1 and 2. Forecast volumes included in this report should not be used for planning or design of specified facilities. These results are subject to refinement and adjustment in detailed traffic and public transit studies that must be conducted at the facility level of analyses prior to implementation.

APPENDIX A

ENHANCED ITERATIVE SIMULATION PROCESS

The enhanced DVRPC travel simulation process utilizes the Evans Algorithm to iterate the model. Evans re-executes the trip distribution and modal split models based on updated highway speeds after each iteration of highway assignment and assigns a weight (λ) to each iteration. This weight is then used to prepare a convex combination of the link volumes and trip tables for the current iteration and a running weighted average of the previous iterations. This algorithm converges rapidly to the equilibrium solution on highway travel speeds and congestion levels. About seven iterations are required for the process to converge to the equilibrium state for Chester County travel patterns. After equilibrium is achieved, the weighted average transit trip tables are assigned to the transit networks to produce link and route passenger volumes.

Urban Systems Inc. was retained by DVRPC to prepare a special extended version of TRANPLAN that supports the Evans Algorithm procedures. This required creation of special computerized feed back and weighting mechanisms between the trip distribution, modal split and highway assignment programs. These special features have been incorporated into TRANPLAN Version 9.1. The enhanced DVRPC iterative procedure is documented more detail in Chapter XI of *1997 Travel Simulation*.

1. Separate Peak and Off-Peak Models

The enhanced DVRPC travel simulation models are disaggregated into separate peak and off-peak time periods. This disaggregation begins in trip generation where factors are used to separate daily trips into peak and off peak travel. The enhanced process then utilizes completely separate model chains for peak and off-peak travel simulation runs. The separation of the models into two time periods proved to be relatively straight forward with few changes to the basic models or their parameters required. However, time of day sensitive inputs to the models such as highway capacities and transit service levels were disaggregated to be reflective of peak and off-peak conditions. Capacity factors were used to allocate daily highway capacity to the peak and off-peak time periods. Separate peak and off-peak transit networks were required to represent the difference in transit service.

The enhanced model is disaggregated into separate model chains for the peak (combined AM and PM) and off-peak (the remainder of the day) periods for the trip distribution, modal split, and travel assignment phases of the process. The peak period is defined as 7:00 AM to 9:00 AM and 3:00 PM to 6:00 PM. Peak period travel is based on a series of factors which determine the percentage of daily trips that occur during peak periods. Off-peak travel is then defined as the residual after peak travel is removed from daily travel. The peak period factors are documented in Table A-1. These represent the percent of daily trip generation that occurs during the combined AM/PM Peak Period.

External-local productions at the nine-county cordon stations were disaggregated into peak and off-peak components using peak percentages derived from the temporal distribution of traffic counts taken at each cordon station. Off-peak external-local travel was again derived as the residual when

peak travel was deducted from daily totals. The peak percentages used for Chester County cordon stations are given in Table A-2. The percentages for all cordon stations are included in Appendix B.

Table A-1. Peak Period Trip Generation Percentages.

Trip Purpose	Percent of Daily Travel During Peak Periods
Home Based Work	52.8%
Home Based Non-work	31.4%
Non-Home Based	26.7%
Light Truck	32.4%
Heavy Truck	32.4%
Taxi	32.4%

Table A-2. Fraction of Chester County Daily Cordon Station Travel in the Peak Period.

Cordon Centriod	Peak Fraction	Cordon Centroid	Peak Fraction
1500	0.524	1516	0.391
1501	0.435	1517	0.364
1502	0.385	1518	0.304
1503	0.421	1519	0.355
1504	0.343	1520	0.385
1505	0.398	1521	0.385
1506	0.398	1522	0.342
1507	0.384	1523	0.348
1508	0.392	1427	0.385
1509	0.360	1524	0.353
1510	0.340	1525	0.384
1511	0.349	1526	0.356
1512	0.385	1527	0.385
1513	0.358	1528	0.385
1514	0.374	1529	0.414
1515	0.374		

2. Free Flow Highway Speeds

Input highway operating speeds for the enhanced DVRPC model were estimated from a special highway travel time survey conducted as part of the Model Enhancement Study. The study, completed in 1997, surveyed about 2,000 miles of roadways within the DVRPC region using floating car techniques. Several additional changes were required to produce reasonably accurate estimates of highway traffic volumes and operating speeds directly from the highway assignment model. The number of functional classes in the highway link capacity lookup table was increased from 9 to 27 to better account for detailed design capacity variations within the general functional class designations (freeway, parkway, principal arterial, etc.). Table A-3, presents the expanded link hourly capacity table stratified by functional class and area type. The initial highway network speeds were modified to reflect free-flow speeds (speed limits or measured operating speeds, which ever is higher). The input highway network free flow speeds are listed in Table A-4. And finally, a formal toll plaza queuing model was implemented to better model the toll collection congestion and delay on the Turnpikes and Toll Bridges within the region. These changes improved the accuracy of the highway link volumes produced by the Evans process and brought the model into compliance with recent federal requirements. See Chapter XI of *1997 Travel Simulation* for a detailed description of the highway network coding procedures.

Table A-3. Per Lane Hourly Capacities Assuming "E" Service Level.

			Area Type				
			CBD	Fringe	Urban	Suburban	Rural
Functional Classification			(1)	(2)	(3)	(4)	(5)
		High	2,320	2,320	2,330	2,430	2,490
1	Freeway	Medium	1,950	1,950	1,950	2,000	2,100
		Low	1,450	1,450	1,450	1,590	1,730
		High	1,190	1,190	1,290	1,390	1,530
2	Parkway	Medium	1,060	1,060	1,150	1,240	1,370
		Low	960	960	960	960	1,120
		High	760	800	1,060	1,290	1,500
3	Principal Arterial	Medium	600	640	820	950	1,100
		Low	460	540	690	810	910
		High	520	620	760	920	1,150
4	Secondary Arterial	Medium	410	460	570	680	800
		Low	310	360	460	590	680
		High	560	630	700	840	980
6	Collector / Local	Medium	400	450	500	600	750
		Low	320	360	400	480	600
		High	590	610	700	810	910
8	Ramps	Medium	460	490	540	680	800
		Low	330	370	390	540	680

Table A-4. Free Flow Speeds.

	Free-Flow Speeds (mph)				
	CBD	Fringe	Urban	Suburban	Rural
	(1)	(2)	(3)	(4)	(5)
Freeway	50.0	55.0	55.0	55.0	60.0
Parkway	45.0	45.0	50.0	60.0	55.0
Principal Arterial	30.0	30.0	35.0	40.0	50.0
Secondary Arterial	25.0	25.0	30.0	35.0	45.0
Collector / Local	15.0	15.0	20.0	35.0	35.0
Ramp	20.0	35.0	40.0	45.0	45.0

3. The Enhanced DVRPC Model Process

The enhanced iterative DVRPC model is charted in Figure A-1. The first step in the process involves generating the number of trips that are produced by and destined for each traffic zone and cordon station throughout the nine-county region.

a. Trip Generation

Both internal trips (those made within the DVRPC region) and external trips (those which cross the boundary of the region) must be considered in the simulation of regional travel. For the simulation of 1997 and 2020 travel demand, internal trip generation is based on zonal forecasts of population and employment, whereas external trips are extrapolated from cordon line traffic counts. The latter also include trips which pass through the Delaware Valley region. Estimates of internal trip productions and attractions by zone are established on the basis of trip rates applied to the zonal estimates of demographic and employment data. This part of the DVRPC model is not iterated on highway travel speed. Rather, estimates of daily trip making by traffic zone are calculated and then disaggregated into peak and off-peak time periods. The trip rates used in the Chester County Model are given in Table A-5. For a complete description of the DVRPC trip generation model see chapters IV and V of *1997 Travel Simulation*. Home-based trip productions vary significantly by area type. This is because of the prevalence of walk trips in dense urban areas. The rates given in Table A-5 are for motorized travel only (highway and transit).

Figure A-1. Evans Iterative Travel Simulation Process

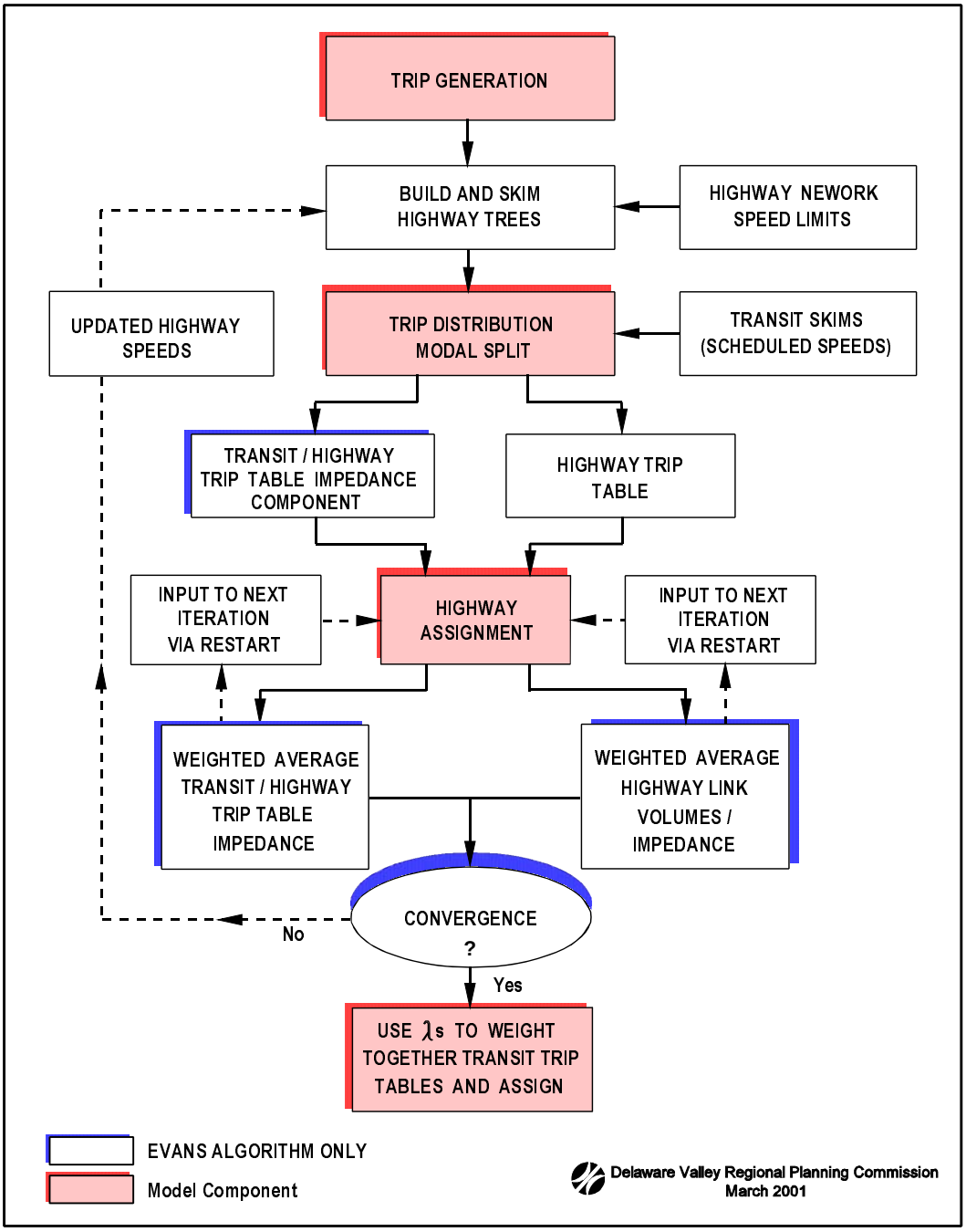


Table A- 5. Trip Generation Rates by Type of Trip and Area Type

Trip Category		Socio-Economic Variable	Rates by Area Type					
			CBD	Fringe	Urban	Suburban	Rural	Open Rural
1	Home Based Work Person Trip Productions	Employed Adult Residents	0.653	0.918	1.507	1.632	1.628	1.597
2	Home Based Work Person Trip Attractions	Total Employment	1.420	1.461	1.504	1.492	1.461	1.461
3	Home Based Non-work Person Trip Productions	Households Owning 0 Cars	0.540	0.570	1.000	1.280	1.280	1.280
		Households Owning 1 Cars	2.360	2.490	2.500	4.250	4.980	4.980
		Households Owning 2 Cars	3.740	3.940	4.050	6.640	7.780	7.780
		Households Owning 3+ Cars	4.240	4.460	4.570	7.530	8.920	8.920
4	Home Based Non-work Person Trip Attractions	Occupied Dwelling Units	0.611	0.713	0.814	1.425	1.425	1.527
		Basic Employment *	0.204	0.255	0.356	0.713	0.713	0.713
		Retail Employment	2.036	2.345	3.854	8.368	10.708	11.744
		Other Employment	0.611	0.814	1.018	3.461	3.461	4.581
5	Non-home Based Person Trip Origins or Destinations	Occupied Dwelling Units	0.216	0.271	0.324	0.541	0.541	0.541
		Basic Employment **	0.108	0.163	0.216	0.324	0.216	0.216
		Retail Employment	0.649	1.297	1.946	4.001	4.650	4.650
		Other Employment	0.324	0.432	0.649	1.081	1.297	1.297
6	Light Truck Vehicle Trip Origins or Destinations	Occupied Dwelling Units	0.053	0.105	0.157	0.263	0.315	0.367
		Retail Employment	0.157	0.263	0.630	0.735	0.839	0.945
		Other Employment	0.094	0.105	0.210	0.210	0.315	0.315
7	Heavy Truck Vehicle Trip Origins or Destinations	Occupied Dwelling Units	0.048	0.058	0.068	0.092	0.097	0.097
		Manufacturing and Wholesale Employment	0.068	0.087	0.116	0.135	0.116	0.097
		Retail Employment	0.097	0.194	0.290	0.387	0.484	0.484
		Other Employment	0.029	0.097	0.174	0.251	0.300	0.348
8	Taxi Vehicle Trip Origins or Destinations	Occupied Dwelling Units	0.099	0.030	0.020	0.010	0.010	0.010
		Transportation Employment	0.296	0.069	0.079	0.039	0.039	0.039
		Other Employment	0.099	0.069	0.049	0.039	0.030	0.020

* For the calculations of HBNW Trip Attractions, Basic Employment includes: Agricultural, Mining, Construction, Manufacturing, Transportation/Communications and Finance, Insurance and Real Estate (F.I.R.E.)

** For NHB Trips, Basic Employment is the same as above except that Mining is redesignated as "Other"

The additional highway facilities added to the focused Chester County network required the creation of two additional cordon stations. These new cordon stations load traffic onto Schoff Road and Cambridge Road. In addition, zone numbers associated with the regional system of cordon stations were renumbered (cordon stations numbers must be at end of the zone number series) to reflect the additional split zones created in Chester County and the buffer area and the two new cordon stations. The revised Chester county cordon stations are described in Table A-6. A complete listing of the Chester County model cordon stations is given in the Appendix C. Altogether, 116 cordon stations were identified as significant regional entry/exit points.

b. Evans Iterations

The iterative portion of the Evans forecasting process involves updating the highway network restrained link travel speeds, rebuilding the minimum time paths through the network, and skimming the interzonal travel time for the minimum paths. Then the trip distribution, modal split, and highway assignment models are applied in sequence for each pass through the model chain (see Figure A-1). After convergence is reached, the transit trip tables for each iteration are weighted together and the weighted average table assigned to the transit network. The highway trip tables are loaded onto the network during each Evans iteration, and a composite highway trip table is not normally produced. For each time period, seven iterations of the Evans process are performed to ensure that convergence on travel times is reached.

c. Trip Distribution

Trip distribution is the process whereby the zonal trip ends established in the trip generation analysis are linked together to form origin-destination patterns in the trip table format. Peak and off-peak trip ends are distributed separately. For each Evans iteration, a series of seven gravity-type distribution models were applied at the zonal level. These models follow the trip purpose and vehicle type stratifications established in trip generation. For a complete description of the DVRPC trip distribution model see chapters VII and XI of *1997 Travel Simulation*.

Table A-6. Correspondence Between Chester County Centroid Number and Cordon Station.

Station Number	Centroid Number	Description
11	1500	Chadds Ford Rd (PA 100 [Brookfield-Cossart Rd]) north of Delaware State Line, Pennsbury Township
12	1501	Kennett Pike (PA 52) between Rain Tree Rd and Delaware State Line, Pennsbury Township
13	1502	Old Kennett Rd between Ashland Dr and Delaware State Line, Kennett Township
14	1503	Creek Rd (PA 82) north of Delaware State Line, Kennett Township
15	1504	Newport-Lancaster Pike (PA 41) between Kaolin Rd and Delaware State Line, Kennett Township
16	1505	Limestone Rd between Southwood Rd and Delaware State Line, New Garden Township
17	1506	New London Rd (PA 896) between Morgan Hollow Way and Elbow Lane, London-Britain Township
18	1507	Lewisville-Chesterville Rd (PA 841 [Westgrove-Lewisville Rd]) between Oxford-Lewisville Rd and Maryland State Line, Elk Township
19	1508	Chrome-Calvert Rd (PA 272) between Greenhouse Rd and Maryland State Line, East Nottingham Township
20	1509	Baltimore Pike (US 1) between West Ridge Rd and Sylmar Rd, West Nottingham Township
21	1510	Christine Rd (PA 272) between Glenroy Rd and Chester Co Line, West Nottingham Township
22	1511	Forge Rd between Street Rd and Chester Co Line, Lower Oxford Township
23	1512	Lancaster Pike (PA 472) between Street Rd and Chester Co Line, Lower Oxford Township
24	1513	Newark Rd (PA 896) between Homeville Rd and Chester Co Line, Upper Oxford Township
25	1514	Valley Ave (PA 372) west of railroad overpass and Chester Co Line, West Sadsbury Township
New	1515	Schoff Road between Old Forge Rd and Lancaster Co. Line, West Followfield Township
26	1516	Newport-Lancaster Pike (PA 41)between Zook Rd and Lancaster Co Line, West Sadsbury Township
27	1517	Lincoln Hwy (US 30) between Newlin Lane and Lancaster Co Line, West Sadsbury Township
28	1518	Philadelphia Pike (PA 340) between Compass Rd (PA 10) and Lancaster Co Line, West Cain Township

Table A-6. Correspondence Between Chester County Centroid Number and Cordon Station (Continued)

Station Number	Centroid Number	Description
29	1519	Beaver Dam Rd between Cambridge Rd and Lancaster Co Line, Honey Brook Township
30	1520	White Horse Pike (US 322) between Mill Rd and Lancaster Co Line, Honey Brook Township
New	1521	Cambridge Rd between Lombard Street and Lancaster Co. Line, Honey Brook Township
31	1522	Conestoga Ave (PA 10) between Reservoir Rd and Lancaster Co Line, Honey Brook Township
32	1523	Morgantown Rd between Taborville Rd and Lancaster Co Line, Honey Brook Township
33	1524	Pennsylvania Turnpike (I-76) between Downingtown, Interchange 23 and Morgantown, Interchange 22
34	1525	Main St/Conestoga Rd (PA 23/PA 401) west of intersection in Berks Co
35	1526	Water St (PA 82) west of intersection between Laurel Rd with Park Ave in Berks Co Line, Warwick Township
36	1527	Pine Swamp Rd (PA 345) between Laurel Rd and Chester Co. Line, Warwick Township
37	1528	Unionville Rd between Temple Rd and Berks Co Line, North Coventry Township
38	1529	Schuykill Rd (PA 724) between Scholl Rd and Berks Co Line

d. Modal Split

The modal split model is also run separately for the peak and off-peak time periods. The modal split model calculates the fraction of each person-trip interchange in the trip table which should be allocated to transit, and then assigns the residual to the highway side. The choice between highway and transit usage is made on the basis of comparative cost, travel time, and frequency of service, with other aspects of modal choice being used to modify this basic relationship. In general, the better the transit service, the higher the fraction assigned to transit, although trip purpose and auto ownership also affect the allocation. The model subdivides highway trips into auto drivers and passengers. Auto driver trips are added to the truck, taxi, and external vehicle trips in preparation for assignment to the highway network. For a more complete description of the DVRPC modal split model see chapters VIII and XI of the *1997 Travel Simulation*.

e. Highway Assignment

The final step in the focused simulation process is the assignment of 1997 or 2020 vehicle trips to the highway network representative of the appropriate scenario. For peak and off-peak travel, this assignment model produces the future traffic volumes for individual highway links that are required for the evaluation of the alternatives. The regional nature of the highway network and trip table underlying the focused assignment process allow the diversion of travel into and through the study area to various points of entry and exit in response to the improvements made in Chester County.

For each Evans iteration, highway trips are assigned to the network representative of a given alternative by determining the best (minimum time) route through the highway network for each zonal interchange and then allocating the interzonal highway travel to the highway facilities along that route. This assignment model is “capacity restrained” in that congestion levels are considered when determining the best route. The Evans equilibrium assignment method is used to implement the capacity constraint. When the assignment reaches equilibrium, no path faster than the one actually assigned can be found through the network, given the capacity restrained travel times on each link.

f. Transit Assignment

After equilibrium is achieved, the weighted average transit trip tables (using the lambda's calculated from the overall Evans process as weights) are assigned to the transit network to produce link and route passenger volumes. The transit person trips produced by the modal split model are "linked" in that they do not include any transfers that occur either between transit trips or between auto approaches and transit lines. The transit assignment procedure accomplishes two major tasks. First, the transit trips are "unlinked" to include transfers, and second, the unlinked transit trips are associated with specific transit facilities to produce link, line, and station volumes. These tasks are accomplished simultaneously within TRANPLAN, which assigns the transit trip matrix to minimum impedance paths built through the transit network. There is no capacity restraining procedure in the transit assignment model.

APPENDIX B

Fraction of Daily Cordon Station Travel in the Peak Period for the Chester County Travel Simulation Study

Cordon Centriod	Peak Fraction	Cordon Centriod	Peak Fraction	Cordon Centriod	Peak Fraction
1490	0.416	1529	0.414	1568	0.353
1491	0.369	1530	0.356	1569	0.393
1492	0.393	1531	0.369	1570	0.385
1493	0.335	1532	0.385	1571	0.369
1494	0.373	1533	0.364	1572	0.39
1495	0.408	1534	0.31	1573	0.369
1496	0.366	1535	0.366	1574	0.385
1497	0.353	1536	0.385	1575	0.385
1498	0.402	1537	0.385	1576	0.364
1499	0.347	1538	0.385	1577	0.364
1500	0.524	1539	0.369	1578	0.364
1501	0.435	1540	0.353	1579	0.364
1502	0.385	1541	0.427	1580	0.366
1503	0.421	1542	0.385	1581	0.385
1504	0.343	1543	0.341	1582	0.364
1505	0.398	1544	0.341	1583	0.385
1506	0.398	1545	0.385	1584	0.385
1507	0.384	1546	0.377	1585	0.351
1508	0.392	1547	0.353	1586	0.364
1509	0.36	1548	0.385	1587	0.345
1510	0.34	1549	0.385	1588	0.385
1511	0.349	1550	0.364	1589	0.353
1512	0.385	1551	0.369	1590	0.369
1513	0.358	1552	0.353	1591	0.361
1514	0.374	1553	0.369	1592	0.346
1515	0.374	1554	0.353	1593	0.369
1516	0.391	1555	0.364	1594	0.365
1517	0.364	1556	0.364	1595	0.366
1518	0.304	1557	0.315	1596	0.343
1519	0.355	1558	0.385	1597	0.364
1520	0.385	1559	0.394	1598	0.385
1521	0.385	1560	0.385	1599	0.385
1522	0.342	1561	0.31	1600	0.364
1523	0.348	1562	0.332	1601	0.364
1524	0.353	1563	0.361	1602	0.353
1525	0.384	1564	0.385	1603	0.369
1526	0.356	1565	0.364	1604	0.33
1527	0.385	1566	0.394	1605	0.369
1528	0.385	1567	0.369		

APPENDIX C

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study . . . . . Pages C-1 -C-10

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study

Station Number	Centroid Number	Description
PENNSYLVANIA		
Delaware County		
1	1490	Post Rd (US 13) at Delaware State at Delaware State Line, Marcus Hook Borough
2	1491	Ridge Rd at Delaware State Line, Lower Chichester Township
3	1492	Naamans Creek Rd (PA 491) at Delaware Line, Lower Chichester Township
4	1493	Interstate 95 between PA 491 and Delaware State Line, Lower Chichester Township
5	1494	Meetinghouse Rd between Naamanwood Dr and Delaware State Line, Upper Chichester Township
6	1495	Foulk Rd (PA 261) between Zebley Rd and Delaware State Line, Bethel Township
7	1496	Wilmington-West Chester Pike (US 202) between Pyle Rd and Delaware State Line, Bethel Township
8	1497	Beaver Valley Rd north of Delaware State Line, Chadds Ford Township
9	1498	Smith Bridge Rd between Ridge Rd and Delaware State Line, Chadds Ford Township
10	1499	Ridge Rd between Rocky Hill Rd and Smith Bridge Rd, Chadds Ford Township
Chester County		
11	1500	Chadds Ford Rd (PA 100 [Brookfield-Cossart Rd]) north of Delaware State Line, Pennsbury Township
12	1501	Kennett Pike (PA 52) between Rain Tree Rd and Delaware State Line, Pennsbury Township
13	1502	Old Kennett Rd between Ashland Dr and Delaware State Line, Kennett Township
14	1503	Creek Rd (PA 82) north of Delaware State Line, Kennett Township
15	1504	Newport-Lancaster Pike (PA 41) between Kaolin Rd and Delaware State Line, Kennett Township
16	1505	Limestone Rd between Southwood Rd and Delaware State Line New Garden Township

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
Chester County (Continued)		
17	1506	New London Rd (PA 896) between Morgan Hollow Way and Elbow Lane, London-Britain Township
18	1507	Lewisville-Chesterville Rd (PA 841 [Westgrove-Lewisville Rd]) between Oxford-Lewisville Rd and Maryland State Line, Elk Township
19	1508	Chrome-Calvert Rd (PA 272) between Greenhouse Rd and Maryland State Line, East Nottingham Township
20	1509	Baltimore Pike (US 1) between West Ridge Rd and Sylmar Rd, West Nottingham Township
21	1510	Christine Rd (PA 272) between Glenroy Rd and Chester Co Line, West Nottingham Township
22	1511	Forge Rd between Street Rd and Chester Co Line, Lower Oxford Township
23	1512	Lancaster Pike (PA 472) between Street Rd and Chester Co Line, Lower Oxford Township
24	1513	Newark Rd (PA 896) between Homeville Rd and Chester Co Line, Upper Oxford Township
25	1514	Valley Ave (PA 372) west of railroad overpassand Chester Co Line, West Sadsbury Township
New	1515	Schoff Road between Old Forge Rd and Lancaster Co. Line, West Followfield Township
26	1516	Newport-Lancaster Pike (PA 41)between Zook Rd and Lancaster Co Line, West Sadsbury Township
27	1517	Lincoln Hwy (US 30) between Newlin Lane and Lancaster Co Line, West Sadsbury Township
28	1518	Philadelphia Pike (PA 340) between Compass Rd (PA 10)and Lancaster Co Line, West Cain Township
29	1519	Beaver Dam Rd between Cambridge Rd and Lancaster Co Line, Honey Brook Township
30	1520	White Horse Pike (US 322) between Mill Rd and Lancaster Co Line, Honey Brook Township
New	1521	Main Street(Cambridge Rd)between Lombard Street and Lancaster Co. Line, Honey Brook Township
31	1522	Conestoga Ave (PA 10) between Reservoir Rd and Lancaster Co Line, Honey Brook Township

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
Chester County (Continued)		
32	1523	Morgantown Rd between Taborville Rd and Lancaster Co Line, Honey Brook Township
33	1524	Pennsylvania Turnpike (I-76) between Downingtown, Interchange 23 and Morgantown, Interchange 22
34	1525	Main St/Conestoga Rd (PA 23/PA 401)west of intersection in Berks Co
35	1526	Water St (PA 82) west of intersection between Laurel Rd with Park Ave in Berks Co Line, Warwick Township
36	1527	Pine Swamp Rd (PA 345) between Laurel Rd and Chester Co. Line, Warwick Township
37	1528	Unionville Rd between Temple Rd and Berks Co Line, North Coventry Township
38	1529	Schuykill Rd (PA 724) between Scholl Rd and Berks Co Line, North Coventry Township
Berks County		
39	1530	Pottstown Bypass (US 422) east of Ben Franklin Hwy & Old Reading Pike, Douglass Township (Berks County)
40	1531	Benjamin Franklin Hwy between Montgomery Co.line and US 422, Douglass Township (Berks County)
41	1532	Pine Forge Rd between Douglass Grosstown Dr and Woodsbrook Dr, Douglass Township (Berks County)
42	1533	Reading Avenue (PA 562) between Fancy Sunrise Lane and Fancy Vale Dr, Douglass Township (Berks County)
43	1534	West Philadelphia Ave (PA 73) between Pond Rd and Grims Mil, Colebrookdale Township (Berks County)
44	1535	PA 100 between Pit Rd and Miller St, Colebrookdale Township (Berks County)
Montgomery County		
45	1536	Hoffmansville Rd between Miller between Miller Rd and Berks Co Line, Douglass Township
46	1537	Niantic Rd between Miller Rd and Berks Co Line, Douglass Township

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
Montgomery County (Continued)		
47	1538	Philadelphia and Kutztown Rd between Bethesda Church Rd and Berks Co. Line, Upper Hanover Township
48	1539	Gravel Pike (PA 29) between Stauffer Rd and Berks Co Line, Upper Hanover Township
Bucks County		
49	1540	PA Turnpike Northeast Ext (I-476) between Quakertown, Interchange 32 and Lehigh Valley, Interchange 33, just north of Bucks Co Line, Milford Township
50	1541	Allentown Rd between Grant Rd and Lehigh Co Line, Milford Township
51	1542	Old Bethlehem Pike between Blue Church Rd and Lehigh Co Line, Springfield Township
52	1543	Bethlehem Pike (PA 309) between Springfield St and Lehigh Co Line, Springfield Township
53	1544	State Rd between Tumblebrook Rd and Lehigh Co Line, Springfield Township
54	1545	Richlandtown Pike between between Highpoint Rd and Northampton Co Line, Springfield Township
55	1546	Hellertown Rd (PA 412) between Highpoint Rd and Northampton Co Line, Springfield Township
56	1547	Easton Rd (PA 611) between Spring Hill and Northampton Co Line, Riegelsville Borough
57	1548	Riegelsville Bridge across Delaware River, Riegelsville Borough
58	1549	Milford-Upper Black Eddy Bridge across DelawareRiver, Bridgeton Township
59	1550	Frenchtown-Uhlerstown Bridge across Delaware River, Tinicum Township
60	1551	Stockton-Centre Bridge across Delaware River, Solebury Township
61	1552	New Hope-Lambertville Toll Bridge (US-202) over Delaware River, Solebury Township
62	1553	Bridge St Bridge (PA 179) across Delaware River, New Hope Borough

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
NEW JERSEY		
Mercer County		
63	1554	River Rd (NJ 29) between Valley Rd and Hunterdon Co Line, Hopewell Township
64	1555	Lambertville-Hopewell Rd (CR 518) between Harbourton-Mt Airy (CR 601) and Hunterdon Co. Line Hopewell Township
65	1556	Harbourton-Rocktown Rd (CR 579)between Lambertville-Hopewell (CR 518)and Hunterdon Co Line, Hopewell Township
66	1557	NJ 31 just north of intersection with Lambertville-Hopewell Rd (CR 518), Hopewell Township
67	1558	Hopewell-Wertsville Rd (CR 607) between Minnietown Lane and Hunterdon Co. Line, Hopewell Township
68	1559	Hopewell-Rocky Hill Rd (CR 518)between Hopewell-Amwell Rd and Somerset Co Line, Hopewell Township
69	1560	Great Rd (CR 601) north of Cherry Valley Rd, Somerset Co. Line, Somerset County
70	1561	US 206, (CR 533) just north of Cherry Valley Rd, Somerset Co. Line, Somerset County
71	1562	Lincoln Hwy (NJ 27) between Dodds La and Middlesex Co Line, Princeton Township
72	1563	Brunswick Pike (US 1) between Harrison St (CR 629) and Mercer/Middlesex Co Line West Windsor Township
73	1564	Cranbury Rd (CR 615) between Rabbit Hill Rd and Middlesex Co Line, West Windsor Township
74	1565	Old Trenton Rd (CR 535 [Cranbury-Edinburg]) between One Mile Rd and Ansil Davison Rd at Mercer/Middlesex Co Line, East Windsor Township
75	1566	US 130, just north of Old Cranbury Rd, and Middlesex Co. Line, East Windsor Township
76	1567	North Main Street (CR 539), between Old Cranbury Rd and Middlesex Co. Line, East Windsor Township
77	1568	NJ Turnpike between Interchanges 8 and 8A, East Windsor Township
78	1569	Freehold Rd, (NJ 33) between Mercer/ Middlesex Co Line and Applegarth Rd, Middlesex Co

Correspondence between Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
Mercer County (Continued)		
79	1570	Etra Rd (CR 571) between Fieldsher Rd and Mercer/Monmouth Co Line, East Windsor Township
80	1571	Old York Rd (CR 539) between Windsor- Perrineville Rd and Mercer Co Line, East Windsor Township
81	1572	Interstate 195 west of Interchange 8, Washington Township Robbinsville-Allentown Rd (CR 526)between Circle Dr and Mercer Co Line, Washington Township
83	1574	Yardville-Allentown Rd (CR 524)between Doctors Creek Rd and Mercer/Monmouth Co. Line Hamilton Township
Burlington County		
84	1575	Chesterfield-Arneytown Rd (CR 664) between Jacobtown-Arneytown Rd and Burlington Co Line, North Hanover Township
85	1576	Monmouth Rd (CR 537) between Meany Rd and Burlington Co Line, North Hanover Township
86	1577	Jacobstown-New Egypt Rd (CR 528) between Meany Rd and Province Line at Burlington Co Line, North Hanover Township
87	1578	Cookstown-New Egypt Rd (CR 528 Spur) between Mary St and Burlington Co Line, North Hanover Township
88	1579	NJ 70 between Lakehurst Rd (CR 530)and Burlington Co Line, Pemberton Township
89	1580	Barnegat Rd (NJ 72) between Stephensons Rd and Burlington Co Line, Woodland Township
90	1581	Stage Rd between Munion Field Rd and Ocean Co. Line, Bass River Township
91	1582	Hammonton Rd (CR 542) north of Lovelands Lane, Bass River Township
92	1583	CR 563 between CR 542 and Burlington Co Line, Washington Township
93	1584	Batsto-Bridgeport Rd (CR 542) between Elmwood-Batsto Rd and Burlington Co Line, Washington Township
94	1585	US 206 north of Burlington Co Line, Shamong Township
95	1586	Chew Rd (CR 536) west of Camden Co Line, Waterford Township Line, Winslow Township

Correspondence between Chester County Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
Camden County		
96	1587	White Horse Pike (US 30) between Walker Rd and Camden Co
97	1588	Cedarbrook Rd (CR 561) between Laurel Ave andCamden Co Line, Winslow Township
98	1589	Atlantic City Expressway at Mile Post 42, Winslow Township
99	1590	Mays Landing Rd (CR 561 Spur) between Cains Mill Rd and Camden Co Line, Winslow Township
Gloucester County		
100	1591	Black Horse Pike (US 322) west of Gloucerster Co Line, Monroe Township
101	1592	Harding Hwy (US 40) just east of CR 557, Atlantic Co
102	1593	Main Rd (CR 555) between Garden Rd and Mainlake Rd, Franklin Township
103	1594	Old Delsea Dr (NJ 47) between Malaga Terr and Gloucester Co Line, Franklin Township
104	1595	NJ 55 Freeway south of Interchange with US 40, Franklin Township
105	1596	Harding Hwy (US 40) west of Porchtown Rd at Gloucester Co Line, Franklin Township
106	1597	Centerton-Glassboro Rd (CR 553) between Garrison Rd and Franklin Rd and Franklinville-Monroeville Rd, Franklin Township
107	1598	Franklinville-Monroeville (CR 604)between Row Rd and Pinard Rd, Elk Township
108	1599	Bridgeton Pike (NJ 77) between Oldmans Creek and Springtown-Pine Taverntown Rd, Elk Township
109	1600	Commissioners Rd (CR 581) between Springtown-Pine Tavern Rd and Gloucester Co Line, South Harrison Township
110	1601	Woodstown-Mullica Hill Rd (NJ 45)between Oldmans Creek and Marl Rd, South Harrison Township
111	1602	NJ Turnpike between Interchanges 2 and 1, WoolwichTownship
112	1603	Auburn Rd (CR 551) between Oldmans Creek and Moravian Church Rd, Woolwich Township

Correspondence between Chester County Centroid Number and Cordon Station for the Chester County Travel Simulation Study (Continued)

Station Number	Centroid Number	Description
Gloucester County (Continued)		
113	1604	Interstate 295 between Old Ferry Rd Interchange and Straughs Mill Rd Interchange, Logan Township
114	1605	US 130 between Oldmans Creek and Center Square Rd, Logan Township

APPENDIX D

Forecasted 2020 Population by Municipality (MCD)
for Chester County Travel Simulation Study

Municipality	1997 Estimate	2020 Forecast	Difference Absolute	Difference Percent
Atglen Borough	985	1,250	265	26.9%
Avondale Borough	981	1,200	219	22.3%
Birmingham Township	3,607	6,300	2,693	74.7%
Caln Township	13,011	15,050	2,039	15.7%
Charlestown Township	3,139	3,500	361	11.5%
Coatesville city	10,994	11,550	556	5.1%
Downingtown Borough	7,936	8,500	564	7.1%
East Bradford Township	7,999	12,000	4,001	50.0%
East Brandywine Township	5,960	7,900	1,940	32.6%
East Caln Township	2,813	3,450	637	22.6%
East Coventry Township	4,631	5,300	669	14.4%
East Fallowfield Township	4,971	6,000	1,029	20.7%
East Goshen Township	16,265	18,550	2,285	14.0%
East MarlBorough Township	5,632	7,600	1,968	34.9%
East Nantmeal Township	1,636	1,800	164	10.0%
East Nottingham Township	4,696	5,900	1,204	25.6%
East Pikeland Township	6,815	9,350	2,535	37.2%
Easttown Township	9,932	9,900	-32	-0.3%
East Vincent Township	4,801	5,900	1,099	22.9%
East Whiteland Township	8,795	9,800	1,005	11.4%
Elk Township	1,349	1,750	401	29.7%
Elverson Borough	774	1,350	576	74.4%
Franklin Township	3,282	4,550	1,268	38.6%
Highland Township	1,255	1,200	-55	-4.4%
Honey Brook Borough	1,263	1,500	237	18.8%
Honey Brook Township	6,171	7,250	1,079	17.5%
Kennett Township	5,751	7,250	1,499	26.1%
Kennett Square Borough	5,279	5,400	121	2.3%
London Britain Township	2,918	4,050	1,132	38.8%
Londonderry Township	1,433	2,000	567	39.6%
London Grove Township	4,341	6,600	2,259	52.0%
Lower Oxford Township	3,752	4,000	248	6.6%
Malvern Borough	3,129	3,450	321	10.3%
Modena Borough	563	600	37	6.6%
New Garden Township	7,350	10,050	2,700	36.7%
Newlin Township	1,200	1,200	0	0.0%
New London Township	3,666	5,950	2,284	62.3%
North Coventry Township	8,015	9,350	1,335	16.7%

Forecasted 2020 Population by Municipality (MCD) for Chester County Travel Simulation Study (Continued)

Municipality	1997 Estimate	2020 Forecast	Difference Absolute	Difference Percent
Oxford Borough	3,879	4,000	121	3.1%
Parkesburg Borough	3,168	3,300	132	4.2%
Penn Township	2,503	3,900	1,397	55.8%
Pennsbury Township	3,630	5,300	1,670	46.0%
Phoenixville Borough	15,457	17,100	1,643	10.6%
Pocopson Township	3,507	5,200	1,693	48.3%
Sadsbury Township	2,630	3,100	470	17.9%
Schuylkill Township	6,155	7,400	1,245	20.2%
South Coatesville Borough	1,026	1,050	24	2.3%
South Coventry Township	1,897	2,500	603	31.8%
Spring City Borough	3,442	3,650	208	6.0%
Thornbury Township	1,382	2,250	868	62.8%
Tredyffrin Township	29,702	32,650	2,948	9.9%
Upper Oxford Township	2,006	2,700	694	34.6%
Upper Uwchlan Township	6,235	12,500	6,265	100.5%
Uwchlan Township	15,407	22,400	6,993	45.4%
Valley Township	5,160	8,250	3,090	59.9%
Wallace Township	3,090	4,550	1,460	47.2%
Warwick Township	2,716	3,500	784	28.9%
West Bradford Township	11,163	15,900	4,737	42.4%
West Brandywine Township	6,863	11,550	4,687	68.3%
West Caln Township	7,302	10,100	2,798	38.3%
West Chester Borough	18,201	19,100	899	4.9%
West Fallowfield Township	2,640	3,650	1,010	38.3%
West Goshen Township	19,741	22,550	2,809	14.2%
West Grove Borough	2,507	3,300	793	31.6%
West MarlBorough Township	898	900	2	0.2%
West Nantmeal Township	2,181	3,050	869	39.8%
West Nottingham Township	2,401	3,250	849	35.4%
West Pikeland Township	2,852	4,100	1,248	43.8%
West Sadsbury Township	2,457	3,800	1,343	54.7%
Westtown Township	11,045	15,800	4,755	43.1%
West Vincent Township	2,660	4,150	1,490	56.0%
West Whiteland Township	14,970	20,150	5,180	34.6%
Willistown Township	10,072	12,150	2,078	20.6%
Total	**418,035**	**527,100**	**109,065**	**26.1%**

Forecasted 2020 Employment by Municipality (MCD) for Chester County Travel Simulation Study

Municipality	1997 Estimate	2020 Forecast	Difference Absolute	Difference Percent
Atglen Borough	526	600	74	14.1%
Avondale Borough	1,534	1,850	316	20.6%
Birmingham Township	218	300	82	37.6%
Caln Township	8,925	10,000	1,075	12.0%
Charlestown Township	1,343	1,450	107	8.0%
Coatesville city	4,634	4,900	266	5.7%
Downingtown Borough	6,942	7,000	58	0.8%
East Bradford Township	1,429	2,250	821	57.5%
East Brandywine Township	419	1,300	881	210.3%
East Caln Township	1,162	1,550	388	33.4%
East Coventry Township	419	450	31	7.4%
East Fallowfield Township	411	500	89	21.7%
East Goshen Township	5,839	9,850	4,011	68.7%
East MarlBorough Township	1,338	1,400	62	4.6%
East Nantmeal Township	244	350	106	43.4%
East Nottingham Township	2,041	2,850	809	39.6%
East Pikeland Township	986	950	-36	-3.7%
Easttown Township	6,190	5,750	-440	-7.1%
East Vincent Township	1,539	1,700	161	10.5%
East Whiteland Township	19,693	26,150	6,457	32.8%
Elk Township	81	150	69	85.2%
Elverson Borough	981	1,100	119	12.1%
Franklin Township	393	1,000	607	154.5%
Highland Township	961	1,150	189	19.7%
Honey Brook Borough	553	650	97	17.5%
Honey Brook Township	1,657	2,150	493	29.8%
Kennett Township	2,415	2,650	235	9.7%
Kennett Square Borough	5,161	5,900	739	14.3%
London Britain Township	143	350	207	144.8%
Londonderry Township	201	350	149	74.1%
London Grove Township	856	1,000	144	16.8%
Lower Oxford Township	679	800	121	17.8%
Malvern Borough	6,012	7,750	1,738	28.9%
Modena Borough	168	150	-18	-10.7%
New Garden Township	2,952	3,800	848	28.7%
Newlin Township	166	200	34	20.5%
New London Township	339	600	261	77.0%
North Coventry Township	1,303	1,550	247	19.0%

Forecasted 2020 Employment by Municipality (MCD) for Chester County Travel Simulation Study (Continued)

Municipality	1997 Estimate	2020 Forecast	Difference Absolute	Difference Percent
Oxford Borough	2,525	2,700	175	6.9%
Parkesburg Borough	1,247	1,400	153	12.3%
Penn Township	293	400	107	36.5%
Pennsbury Township	280	300	20	7.1%
Phoenixville Borough	5,746	6,450	704	12.3%
Pocopson Township	687	750	63	9.2%
Sadsbury Township	395	450	55	13.9%
Schuylkill Township	2,894	2,800	-94	-3.2%
South Coatesville Borough	1,106	1,600	494	44.7%
South Coventry Township	86	200	114	132.6%
Spring City Borough	1,421	1,400	-21	-1.5%
Thornbury Township	290	550	260	89.7%
Tredyffrin Township	28,625	34,000	5,375	18.8%
Upper Oxford Township	138	200	62	44.9%
Upper Uwchlan Township	2,708	4,700	1,992	73.6%
Uwchlan Township	6,683	10,500	3,817	57.1%
Valley Township	1,284	1,550	266	20.7%
Wallace Township	719	900	181	25.2%
Warwick Township	235	250	15	6.4%
West Bradford Township	2,467	3,550	1,083	43.9%
West Brandywine Township	2,273	2,850	577	25.4%
West Caln Township	762	1,100	338	44.4%
West Chester Borough	14,984	15,150	166	1.1%
West Fallowfield Township	592	650	58	9.8%
West Goshen Township	17,525	20,500	2,975	17.0%
West Grove Borough	1,792	1,950	158	8.8%
West MarlBorough Township	169	300	131	77.5%
West Nantmeal Township	234	300	66	28.2%
West Nottingham Township	750	800	50	6.7%
West Pikeland Township	969	1,300	331	34.2%
West Sadsbury Township	878	1,950	1,072	122.1%
Westtown Township	2,963	3,800	837	28.2%
West Vincent Township	280	450	170	60.7%
West Whiteland Township	20,787	29,950	9,163	44.1%
Willistown Township	8,538	9,350	812	9.5%
Total	**224,178**	**277,500**	**53,322**	**23.8%**

APPENDIX E

Current and Forecast Trip Ends by Cordon Station for the Chester County Travel Simulation Study . . . . . Pages E-1 - E-6

Current and Forecast Trip Ends by Cordon Station for the Chester County Travel Simulation Study

Cordon Station	Trip Ends 1997	Trip Ends 2020	Growth Absolute	Growth Percent
1490	6,596	8,400	1,804	27.3%
1491	6,047	7,600	1,553	25.7%
1492	3,748	6,600	2,852	76.1%
1493	104,569	138,000	33,431	32.0%
1494	5,578	8,200	2,622	47.0%
1495	8,549	14,500	5,951	69.6%
1496	33,782	52,000	18,218	53.9%
1497	812	2,800	1,988	244.8%
1498	1,029	2,600	1,571	152.7%
1499	645	2,200	1,555	241.1%
1500	2,179	3,800	1,621	74.4%
1501	11,126	16,000	4,874	43.8%
1502	2,007	3,500	1,493	74.4%
1503	838	2,600	1,762	210.3%
1504	12,317	22,500	10,183	82.7%
1505	12,137	17,500	5,363	44.2%
1506	1,500	1,800	300	20.0%
1507	6,789	12,200	5,411	79.7%
1508	3,129	5,200	2,071	66.2%
1509	6,230	9,600	3,370	54.1%
1510	7,728	14,000	6,272	81.2%
1511	4,473	7,400	2,927	65.4%
1512	783	1,900	1,117	142.7%
1513	4,596	7,800	3,204	69.7%
1514	2,087	4,100	2,013	96.5%
1515	867	1,301	434	50.1%
1516	2,577	5,800	3,223	125.1%
1517	16,351	25,000	8,649	52.9%
1518	16,276	28,000	11,724	72.0%
1519	3,778	7,400	3,622	95.9%
1520	764	2,300	1,536	201.0%
1521	930	1,489	559	60.1%
1522	7,698	16,400	8,702	113.0%
1523	7,691	15,800	8,109	105.4%
1524	35,050	59,000	23,950	68.3%
1525	8,643	15,000	6,357	73.6%
1526	938	2,700	1,762	187.8%

Current and Forecast Trip Ends by Cordon Station for the Chester County Travel Simulation Model (Continued)

Cordon Station	Trip Ends 1997	Trip Ends 2020	Growth Absolute	Growth Percent
1527	1,510	3,500	1,990	131.8%
1528	875	2,800	1,925	220.0%
1529	5,792	10,400	4,608	79.6%
1530	27,592	42,500	14,908	54.0%
1531	11,278	17,800	6,522	57.8%
1532	808	2,200	1,392	172.3%
1533	7,468	13,400	5,932	79.4%
1534	9,468	17,200	7,732	81.7%
1535	18,675	38,000	19,325	103.5%
1536	2,269	4,600	2,331	102.7%
1537	1,772	3,400	1,628	91.9%
1538	1,804	4,300	2,496	138.4%
1539	10,840	19,000	8,160	75.3%
1540	34,112	61,000	26,888	78.8%
1541	2,834	5,800	2,966	104.7%
1542	3,643	6,900	3,257	89.4%
1543	36,567	54,000	17,433	47.7%
1544	1,424	3,300	1,876	131.7%
1545	2,878	5,100	2,222	77.2%
1546	5,237	7,800	2,563	48.9%
1547	5,436	9,600	4,164	76.6%
1548	3,624	5,600	1,976	54.5%
1549	5,332	7,900	2,568	48.2%
1550	5,726	8,200	2,474	43.2%
1551	4,778	6,800	2,022	42.3%
1552	8,859	14,500	5,641	63.7%
1553	13,361	18,500	5,139	38.5%
1554	10,486	18,500	8,014	76.4%
1555	6,629	10,500	3,871	58.4%
1556	4,622	6,800	2,178	47.1%
1557	15,633	28,000	12,367	79.1%
1558	2,402	4,900	2,498	104.0%
1559	12,176	18,000	5,824	47.8%
1560	7,723	13,000	5,277	68.3%
1561	21,784	27,000	5,216	23.9%
1562	12,045	17,000	4,955	41.1%
1563	62,486	85,000	22,514	36.0%
1564	4,936	8,000	3,064	62.1%

Current and Forecast Trip Ends by Cordon Station for the Chester County Travel Simulation Study (Continued)

Cordon Station	Trip Ends 1997	Trip Ends 2020	Growth Absolute	Growth Percent
1565	10,570	17,100	6,530	61.8%
1566	27,952	42,000	14,048	50.3%
1567	8,299	12,500	4,201	50.6%
1568	107,944	138,000	30,056	27.8%
1569	20,852	29,000	8,148	39.1%
1570	3,048	5,900	2,852	93.6%
1571	7,798	13,900	6,102	78.3%
1572	24,522	39,000	14,478	59.0%
1573	8,618	14,900	6,282	72.9%
1574	3,837	6,500	2,663	69.4%
1575	1,087	2,800	1,713	157.6%
1576	4,643	7,400	2,757	59.4%
1577	3,962	5,900	1,938	48.9%
1578	5,096	7,500	2,404	47.2%
1579	7,146	13,000	5,854	81.9%
1580	6,392	12,700	6,308	98.7%
1581	1,545	2,900	1,355	87.7%
1582	2,026	3,900	1,874	92.5%
1583	645	2,400	1,7552	72.1%
1584	2,025	3,600	1,575	77.8%
1585	11,923	19,000	7,077	59.4%
1586	3,235	5,600	2,365	73.1%
1587	11,329	18,000	6,671	58.9%
1588	5,643	8,000	2,357	41.8%
1589	47,039	62,000	14,961	31.8%
1590	5,385	7,400	2,015	37.4%
1591	10,223	15,000	4,777	46.7%
1592	9,282	14,000	4,718	50.8%
1593	8,987	13,000	4,013	44.7%
1594	6,351	11,000	4,649	73.2%
1595	23,372	45,000	21,628	92.5%
1596	10,517	14,000	3,483	33.1%
1597	4,978	9,200	4,222	84.8%
1598	1,851	4,900	3,049	164.7%
1599	4,377	7,600	3,223	73.6%
1600	1,370	3,400	2,030	148.2%
1601	4,357	7,500	3,143	72.1%

Current and Forecast Trip Ends by Cordon Station for the Chester County Travel Simulation Study (Continued)

Cordon Station	Trip Ends 1997	Trip Ends 2020	Growth Absolute	Growth Percent
1602	37,449	49,000	11,551	30.8%
1603	2,090	4,500	2,410	115.3%
1604	34,836	51,000	16,164	46.4%
1605	5,125	7,500	2,375	46.3%
Total	**1,253,447**	**1,941,290**	**687,843**	**54.9**

Chester County, PA Transportation Study

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Geographic Area Covered: The study area includes Chester County Pennsylvania in its entirety, and the following municipalities in Montgomery and Delaware County: Chadds Ford, Concord, Thornbury, Edgmont, Newtown, and Radnor townships in Montgomery County, the following municipalities Upper Merion, Lower Providence, Upper Providence, Limerick, Lower Pottsgrove, West Pottsgrove, Upper Pottsgrove, and Pottstown Borough.

Key Words: Chester County, *Landscapes* development plan, Travel Simulation Model, socioeconomic forecasts, projected highway volumes, traffic congestion, travel speeds, transit ridership.

ABSTRACT

This report presents the 2020 simulation model runs with *Landscapes* development patterns and socioeconomic forecasts, testing three alternative levels of highway and public transit improvements - No-Build, moderate improvement, and extensive improvement. The results of these simulations give insight into the levels of transportation investments that will be required to stabilize highway service levels at the current conditions and reduce congestion levels in the existing problem areas.

Delaware Valley Regional Planning Commission
8th Floor - The Bourse Building
111 South Independence Mall East
Philadelphia, PA 19106-2582

Phone: 215-592-1800
Fax: 215-592-9125
Internet: www.dvrpc.org

Staff contact: W. Thomas Walker
Direct phone: 215-238-2886
E-mail: twalker@dvrpc.org