November 2003

ROUTE 57/46

CONNECTOR STUDY

A Component of the Warren County Strategic Growth Plan

Submitted by: Edwards AND Kelcey

Table of Contents

List of Figures

Appendix

I. Introduction

The Warren County Department of Planning retained Edwards and Kelcey to perform this study as a component of the Warren County Strategic Growth Plan.

The origin-destination survey was performed to assess the projected demand for a connection between N.J. Route 57 and U.S. Route 46, hereafter termed the Route 57/46 connector. (See Figures 1 and 2.)

The Route 57/46 Connector Study analyzed two scenarios in two years. A simulation of existing conditions was calibrated to year 2003 conditions. No-Build and Build simulations were run for the year 2012. The Build model includes the Route 57/46 connector. Both years and scenarios were run for AM, PM, and Weekend time periods.

An October 2000 study, The *Hackettstown Bypass Corridor Study*, was performed by Urbitran/Garmen. This study analyzed the same corridor in Hackettstown and Washington Township, Morris County. The purpose of the Route 57/46 Connector Study is to verify the results of this previous study and to update the analysis.

U.S. Route 46 runs east-west through central Warren County. In the study area, it is classified as an urban principal arterial from Mountain Avenue south to Water Street, and a rural principal arterial east of this point. It is also designated as Main Street in Hackettstown.

N.J. Route 57 runs southwest-northeast from Phillipsburg to Hackettstown. In the study area, it is classified as an urban principal arterial. Its currently ends at a traffic signal with Mountain Avenue.

East Avenue runs east-west linking Mountain Avenue and U.S. Route 46. It is classified as a rural major collector.

Mountain Avenue (N.J. Route 182) runs north-south from N.J. Route 57 to U.S. Route 46. It is also designated as County Route 517. It is classified as an urban principal arterial. South of N.J. Route 57 it becomes Schooley's Mountain Road or N.J. Route 24.

STUDY AREA MAP

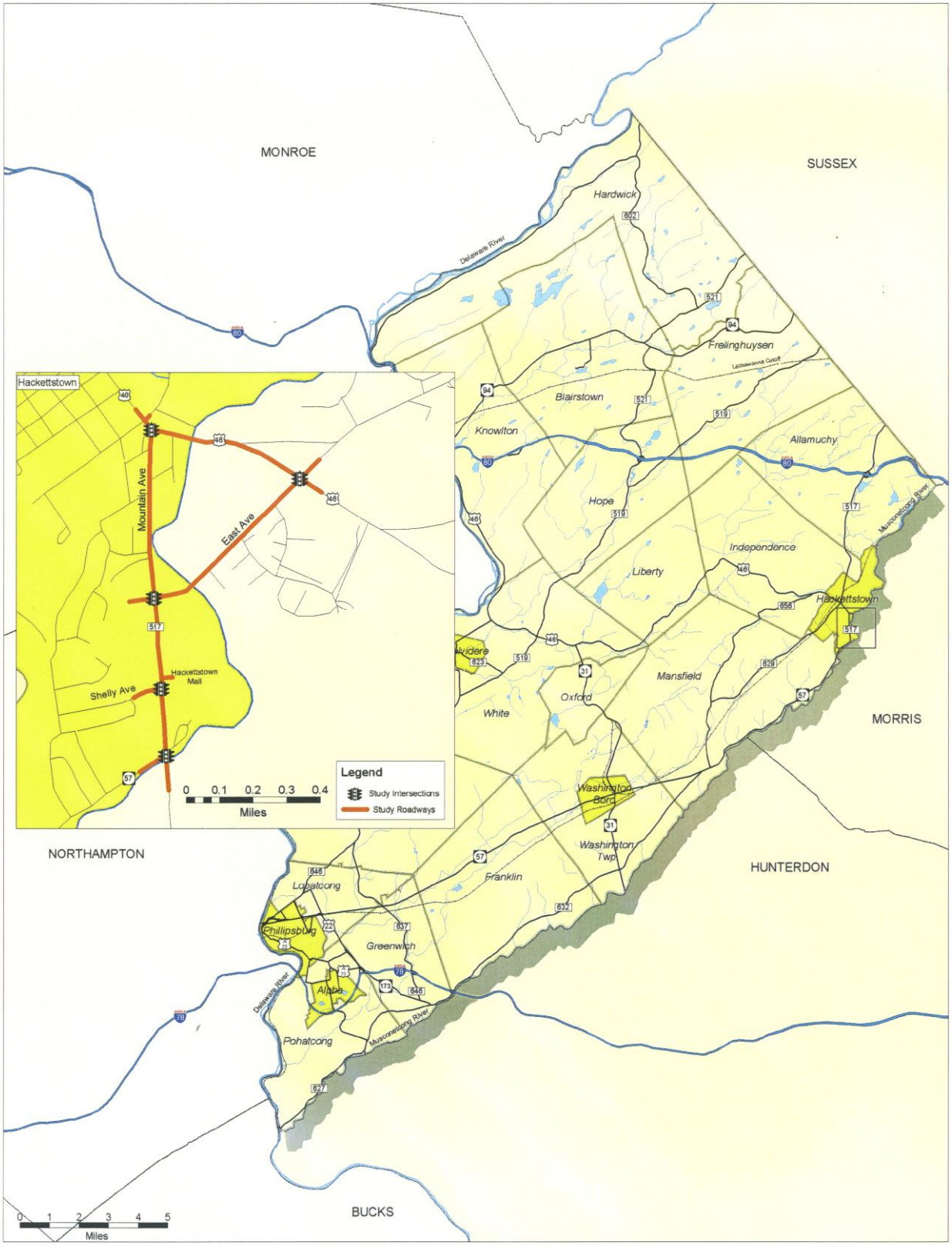

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Figure 1

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PROPOSED ROUTE 57/46 CONNECTOR

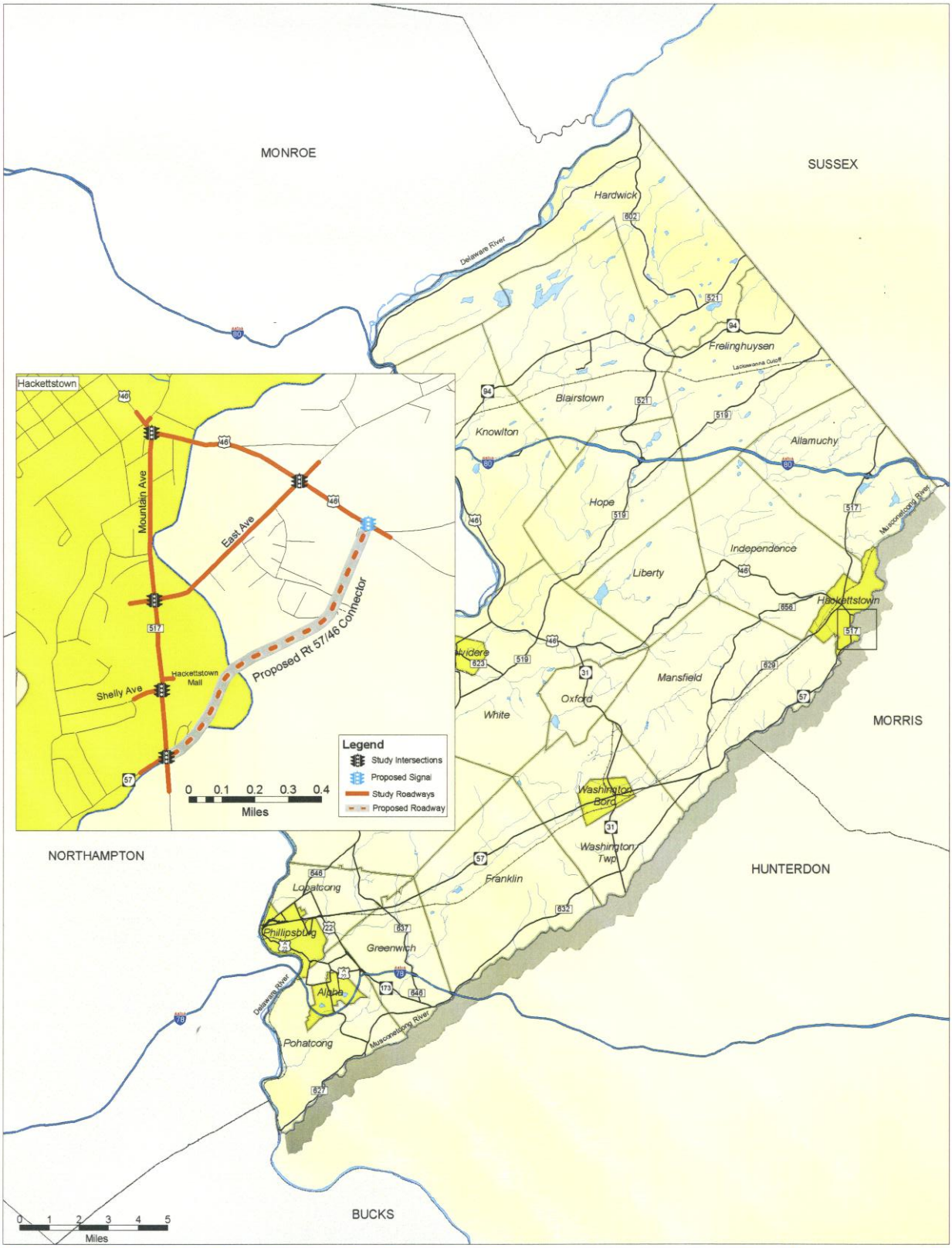

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Figure 2

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II. Methodology

A. Survey

The origin-destination survey was designed in accordance with equal probability of selection methods to facilitate analysis of the projected demand for the Route 57/46 connector (See Figure 3). Additionally, data regarding vehicle occupancy, vehicle classification, and trip purpose were gathered.

The survey was performed during the following time periods:

- Wednesday, June 11th, 2003 (7:00 AM – 9:00 AM)
- Wednesday, June 11th, 2003 (4:00 PM – 6:00 PM)
- Saturday, June 14th, 2003 (12:00 PM – 2:00 PM) (Weekend)

The Washington Township (Morris County) Police Department participated in the survey to ensure the safety of the surveyors and the safe and efficient flow of traffic during the survey.

Automatic traffic recorders (ATR's) were placed on East Avenue for a period of one week from Wednesday, June 11th to Tuesday, June 17th.

Traffic traveling in the eastbound direction on East Avenue was surveyed (See Figure 1). Advisory signage was placed in advance of the survey location to alert motorists and traffic cones were placed to cordon off the survey area. The police officer directed traffic approaching the survey to either enter the survey area or to proceed cautiously ahead when surveyors were occupied processing vehicles. All surveyors and support staff were outfitted with traffic safety vests.

When stopped, motorists were asked the questions to complete the information on the survey form. Upon completion of the form, the surveyor directed the motorists to cautiously re-enter the traffic stream and proceed to their destination.

B. Data Entry/Processing & Geocoding

The data from the origin-destination surveys was entered into a Microsoft Access database. Upon entry into the database, each response was assigned a unique identification number. In cases where street addresses were not directly provided, the location was determined manually. Responses that did not include a valid address that could be located for both the origin and destination were excluded from the sample.

The Microsoft Access database file was converted to GIS-compliant dBase IV files and geocoded in ArcGIS. The T.I.G.E.R. files from the 2000 Census were used as the base street layer.

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WARREN COUNTY / HACKETTSTOWN BYPASS
ORIGIN / DESTINATION SURVEY

VEHICLE TYPE: AUTO LT MT HT ☐ Record # _____

OCCUPANCY: 1 2 3 4 5 6+ ☐ **TRIP PURPOSE:** HB WORK HB SHOP HB OTHER NON HB

ORIGIN: ☐☐ **DESTINATION:**

ORIGIN		DESTINATION	
ADDRESS	_____	*ADDRESS*	_____
TOWN	_____	*TOWN*	_____
ZIP CODE	_____	*ZIP CODE*	_____
CROSS ROAD	_____	*CROSS ROAD*	_____

VEHICLE TYPE: AUTO LT MT HT ☐ Record # _____

OCCUPANCY: 1 2 3 4 5 6+ ☐ **TRIP PURPOSE:** HB WORK HB SHOP HB OTHER NON HB

ORIGIN: ☐☐ **DESTINATION:**

ORIGIN		DESTINATION	
ADDRESS	_____	*ADDRESS*	_____
TOWN	_____	*TOWN*	_____
ZIP CODE	_____	*ZIP CODE*	_____
CROSS ROAD	_____	*CROSS ROAD*	_____

VEHICLE TYPE: AUTO LT MT HT ☐ Record # _____

OCCUPANCY: 1 2 3 4 5 6+ ☐ **TRIP PURPOSE:** HB WORK HB SHOP HB OTHER NON HB

ORIGIN: ☐☐ **DESTINATION:**

ORIGIN		DESTINATION	
ADDRESS	_____	*ADDRESS*	_____
TOWN	_____	*TOWN*	_____
ZIP CODE	_____	*ZIP CODE*	_____
CROSS ROAD	_____	*CROSS ROAD*	_____

Figure 3

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C. Statistical Validation

The geocoding process resulted in 157, 172, and 158 valid origin-destination surveys for the AM, PM, and Saturday study time periods respectively. This level of responses resulted in a sampling distribution that was tested for statistical significance at the 95% confidence level (See Table 6 on page 15 where the validation is discussed in greater detail.)

D. TAZ Refinement/Consolidation

The transportation analysis zone (TAZ) structure of the Warren County Travel Demand Model (WCTDM) was used as the base for the development of the study zonal structure. TAZ's proximate to the survey location and proposed connection alignment were refined to smaller geography and peripheral areas such as southern and western Warren County were aggregated. The resulting TAZ structure comprised 44 zones, which were numbered from #201 – 244 (See Figure 4). For trips with origins and/or destinations external to the TAZ structure, they were assigned to the TAZ where they enter or leave the study area. Centroid connectors (which connect the TAZ's with the roadway network) of the WCTDM were maintained where appropriate. However in many cases centroid connectors were modified to reflect the new geography of TAZ's that were split or aggregated.

E. Demand Model Extraction/Enhancement

The roadway network structure of the WCTDM was used as the input for the development of the transportation network for this study. The WCTDM roadway network, previously in TRANPLAN, was imported into TransCAD for use on this study. TransCAD was selected as the platform for the travel demand model on this for its GIS capabilities and ease of use with the geocoded survey data.

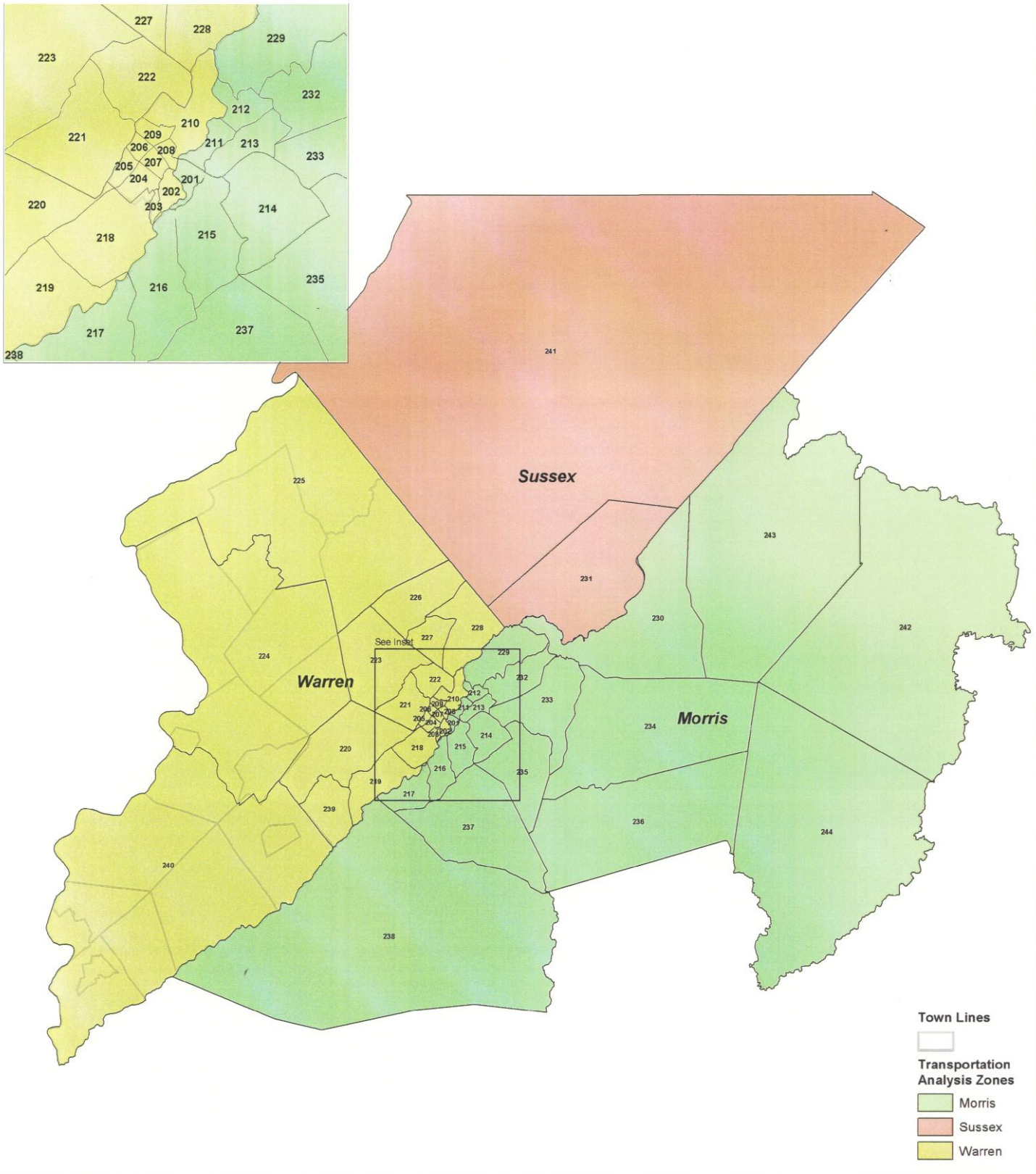
Within Warren County, the network structure was refined and links added where appropriate. In Sussex and Morris counties, where the WCTDM has external stations, the arterial roadway system was coded into the network as appropriate to the needs of this study. (See Figure 5.)

Three trip matrices (analogous to trip tables in TRANPLAN were developed for each time period of the survey. The geocoded responses to the survey indicated a particular trip interchange for each motorist (an origin TAZ and a destination TAZ). These were expanded to a full trip matrix using the inverse of the response rates. (See Table 1.) For example, in the AM period the survey sample size was 17.8 percent of the total traffic traveling east on East Avenue. Therefore, the trip matrix was expanded by the inverse of this percentage, or 5.63.

Table 1: Trip Matrix Growth Factors

	Response Rate	Growth Factor
AM	17.8%	5.63
PM	18.3%	5.47
Weekend	14.8%	6.76

TAZ Diagram



WARREN COUNTY SMART GROWTH PLAN

Figure 4

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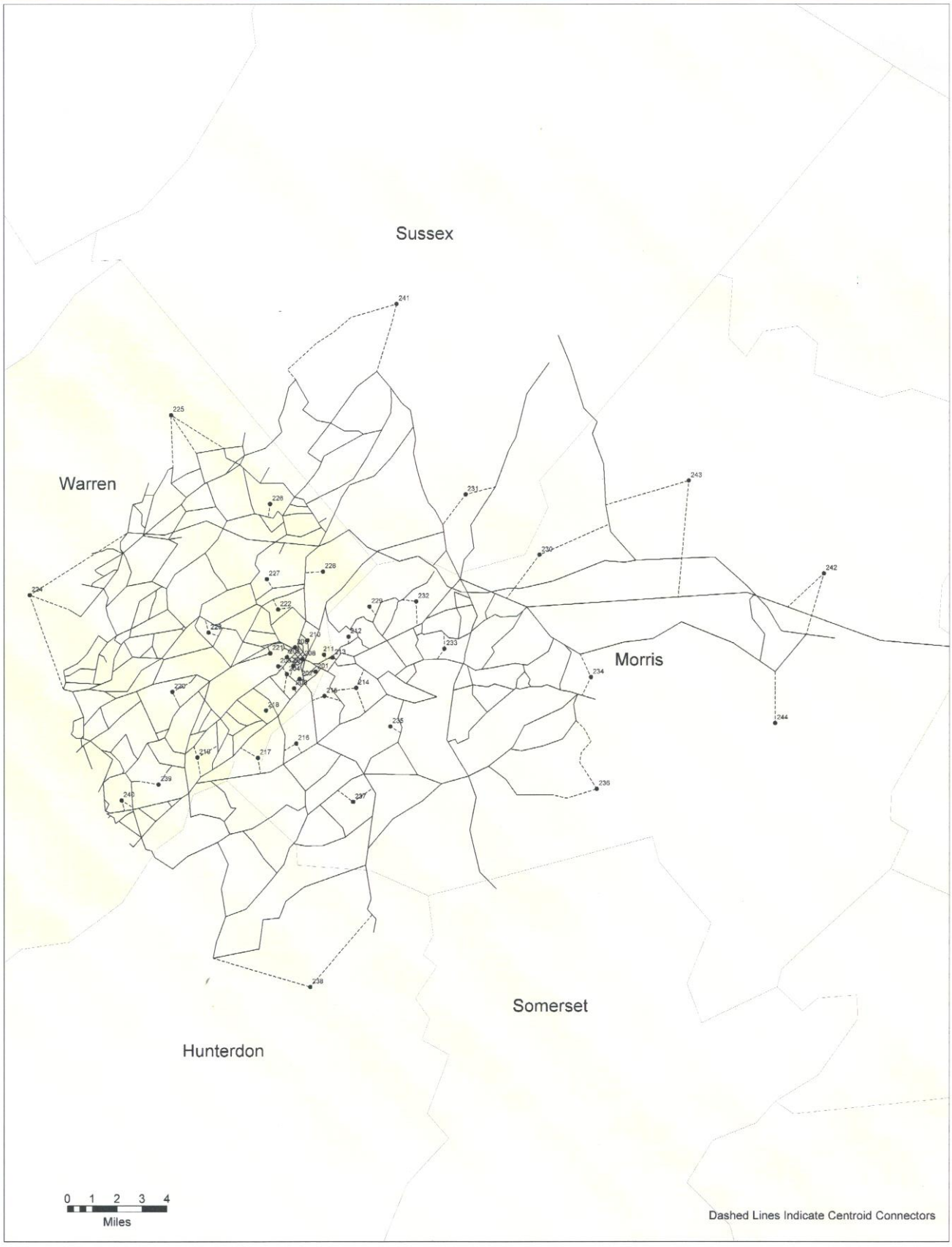
TRAVEL DEMAND MODEL NETWORK



ROUTE 57/46 CONNECTOR STUDY

Figure 5

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A stochastic assignment procedure was used to assign the trip matrices to the roadway network based on user travel time. A stochastic procedure loads trips onto paths that are the shortest route between the origin and destination zones as well as other paths that have marginally higher impedance (travel time). This procedure reflects the degree of randomness associated with motorists' routing decisions. The use of a capacity-restrained assignment procedure on this study was considered. However, it was deemed not feasible because the trip matrices represented only a fraction of the trips on the entire study area network, and the WCTDM does not encompass the large part of the study area outside of Warren County.

F. Synchro/SimTraffic Model Development

The study area was analyzed with the traffic simulation software ***SYNCHRO Plus SimTraffic Version 5.0***. Using an aerial photograph as a background, an operational model was created that represents the roadway network in the study area and was calibrated to match existing conditions.

The level of service (LOS) and delay values in ***SYNCHRO Plus SimTraffic Version 5.0*** are based on the procedures in the *2000 Highway Capacity Manual* for signalized and unsignalized intersections.

Signalized and unsignalized intersection LOS are defined in terms of average control delay per vehicle (in units of seconds per vehicle). LOS ranges from "A" to "F". LOS "A" represents unrestricted flow, while LOS "F" represents severe congestion, high delays per vehicle and poor traffic operations. Table 2 presents the average delay per vehicle associated with each LOS for signalized intersections and Table 3 presents the average delay per vehicle associated with each LOS for unsignalized intersections.

Table 2: Level of Service Definitions – Signalized Intersections

LOS	Delay per Vehicle (sec.)
A	$\leq$ 10.0
B	> 10.0 and $\leq$ 20.0
C	> 20.0 and $\leq$ 35.0
D	> 35.0 and $\leq$ 55.0
E	> 55.0 and $\leq$ 80.0
F	> 80.0

Table 3: Level of Service Definitions – Unsignalized Intersections

LOS	Delay per Vehicle (sec.)
A	$\leq$ 10.0
B	> 10.0 and $\leq$ 15.0
C	> 15.0 and $\leq$ 25.0
D	> 25.0 and $\leq$ 35.0
E	> 35.0 and $\leq$ 50.0
F	> 50.0

SimTraffic also reports emissions, vehicle-miles traveled (VMT), vehicle-hours traveled (VHT), and average speed indicators for the operations of the study area network as a system. Total signal delay in vehicle-hours was also summarized networkwide.

Mobile source emissions are a key measure of effectiveness for the network, which is within the North Jersey Transportation Planning Authority (NJTPA) planning area. Parts of the NJTPA planning area have been found to not meet federal standards for ground-level ozone, and have additionally been declared a maintenance area for carbon monoxide.[1]

Vehicles over four tons are restricted from travel on East Avenue. The proposed connector road would be a direct connection between N.J. Route 57 and U.S. Route 46, thereby reducing the amount of general traffic on East Avenue and truck traffic on Mountain Avenue and U.S. Route 46 between Mountain Avenue and the proposed connector road.

The peak hour traffic volumes for the existing conditions were determined through a field data collection program concurrent with the survey in June 2003. The program included the installation of ATR's and the collection of intersection turning movement counts. Existing intersection geometries, and traffic signal phasing and timing were also recorded.

Turning movement counts were conducted at the following locations:

- Mountain Avenue & N.J. Route 46
- Mountain Avenue & East Avenue
- Mountain Avenue & N.J. Route 57*
- Route 46 & East Avenue
- Mountain Avenue & Shelley Drive*
- Mountain Avenue & Mall Entrance*

All of the study area intersections are signalized. Counts were conducted at three of the intersections during the same periods that the survey was performed, the weekday AM and PM peak periods (7:00-9:00 AM, 4:00-6:00 PM) as well as Saturday midday peak period (12:00-2:00 PM). The other intersections (those highlighted with an asterisk) were counted at a later date during the same time periods. Traffic volumes were recorded for each movement in 15-minute intervals for automobiles, light trucks and heavy trucks.

The peak hours of the survey time periods were determined to be:

- AM (7:30 – 8:30)
- PM (4:45 – 5:45)
- Weekend (12:15 – 1:15)

The existing conditions SYNCHRO models were simulated in SimTraffic and calibrated to match the observed traffic conditions, including queuing and motorist behavior. Traffic volumes were expanded from 2003 volumes to 2013 levels using a growth rate of 1% per annum, which corresponds to that used in the October 2000 Urbitran/Garmen study.

[1] NJTPA; Access and Mobility: *2025 Regional Transportation Plan*; 2002

A total of nine SYNCHRO/SimTraffic models were run. These were:

- AM Existing (2003)
- PM Existing (2003)
- Weekend Existing (2003)
- AM No-Build (2013)
- PM No-Build (2013)
- Weekend No-Build (2013)
- AM Build (2013)
- PM Build (2013)
- Weekend Build (2013)

The Route 57/46 connector modeled in this study follows the conceptual alignment of "Connector A" in the October 2000 Urbitran/Garmen study. It was modeled with a 40 mph speed. Conceptual roadway geometrics were developed at the two intersections at either end of the connector in order to ensure operations at LOS "C" or better at all approaches during the analysis periods.

The intersection improvements recommended at U.S. Route 46 and Mountain Avenue in the October 2000 Urbitran/Garmen report are assumed to be in place by the analysis year of 2013. This improved geometry consists of:

- Route 46 eastbound: 1 left turn lane, 1 shared through-right turn lane
- Route 46 westbound: 1 shared through-left lane, 1 shared through-right lane
- Mountain Avenue northbound: 2 left turn lanes; 1 through lane, 1 right turn lane (channelized at intersection)
- Willow Grove Street southbound: 1 left turn lane, 1 through lane, 1 right turn lane (channelized at intersection)

The intersection of the connector with Route 46 was modeled with the following conceptual geometry (See Figure 6):

- Route 46 eastbound: 1 through lane; 1 shared through-right turn lane
- Route 46 westbound: 1 through lane (no turns at signal; all left turns at jughandle)
- Reverse jughandle from Route 46 Westbound: 1 through lane (onto Route 57/46 connector); 1 shared through-left lane (left turning vehicles are making u-turns from U.S. Route 46 WB to EB)
- Route 57/46 connector westbound: 1 left turn lane and two right turn lanes
- Right turns on red prohibited from connector onto Route 46 eastbound

The inclusion of the reverse jughandle geometry at this intersection is consistent with the preferred alternative identified in the October 2000 Urbitran/Garmen study. This minimizes the affected developed and buildable property with frontage on U.S. Route 46 along the north curbline. The 50-foot wide roadbed of Hearthstone Drive, which the connector would utilize, would not accommodate the full width of the approach to U.S. Route 46. It would need to be widened to fit 5

lanes of standard width (2 receiving lanes; 1 left turn lane; 2 right turn lanes). The mainline of the connector would be one travel lane in either direction, with shoulders of standard width.

The intersection of the connector with Mountain Avenue (N.J. Route 182) was modeled with the following conceptual geometry (See Figure 6):

- Route 57 eastbound: 1 left turn lane; 1 shared through-right turn lane
- Route 57/46 connector westbound: 1 left turn lane; 1 shared through-right turn lane
- Mountain Avenue southbound: 1 shared through-left turn lane; 1 through lane; 1 shared through-right turn lane
- Mountain Avenue northbound: 1 left turn lane; 1 shared through-right turn lane

The Build simulations included control changes at the intersections of East Avenue and Mountain Avenue and East Avenue and U.S. Route 46. Due to the diversion of traffic onto the bypass, traffic volumes on East Avenue no longer warranted the traffic signals, and both were replaced with stop sign control on the East Avenue approaches. (See Figure 6.)

The turning movements at the intersections at the end of the connector (with U.S. Route 46 and with Mountain Avenue) were determined from the turning percentages associated with the existing network and the origin-destination survey results (see the figure in the appendix).

CONCEPTUAL ROUTE 57/46 CONNECTOR GEOMETRY AND ALIGNMENT

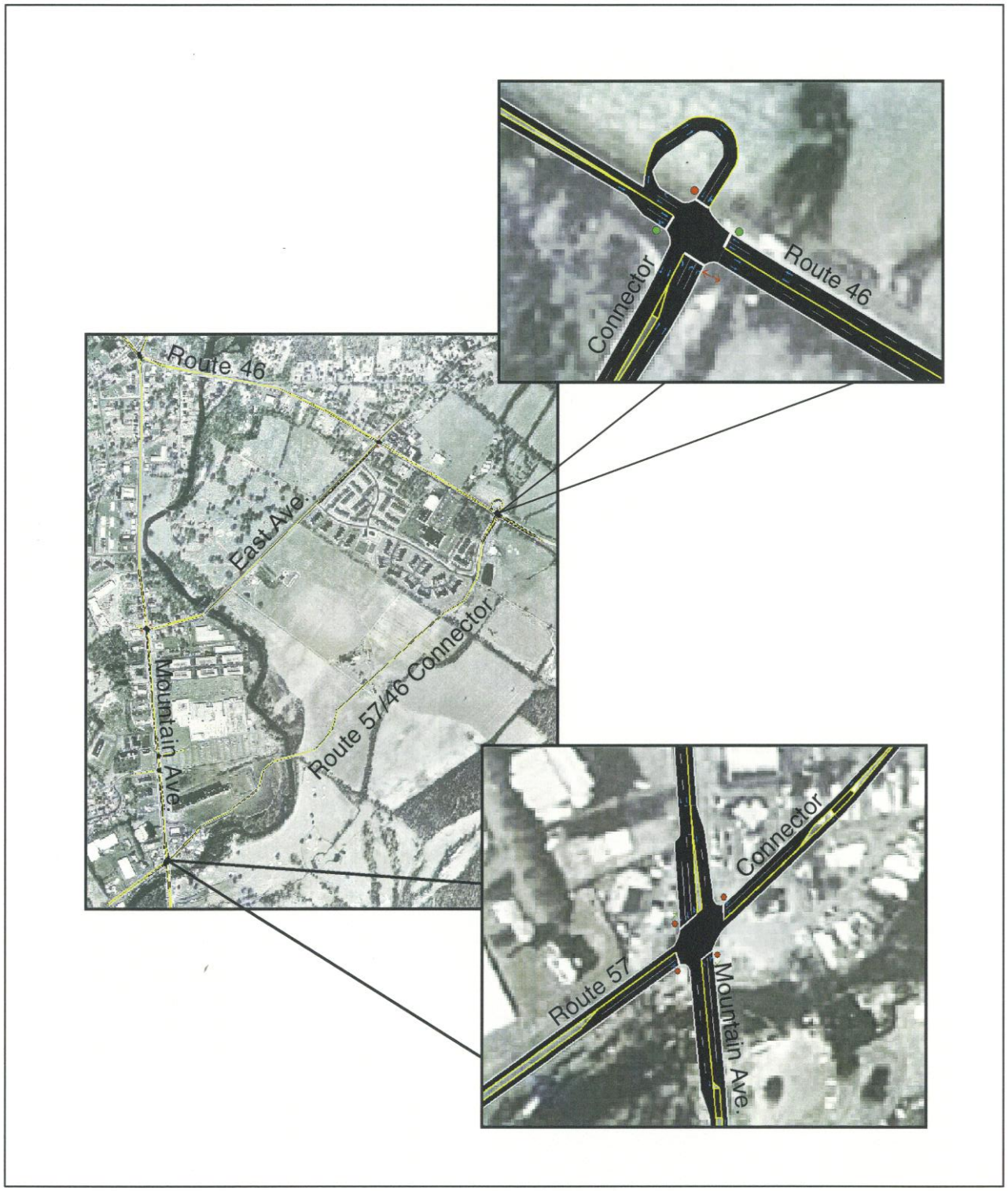

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Figure 6

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III. Results

A. Survey Response Rate

Table 4 shows the sample sizes of the survey that were determined from the number of completed surveys that were able to be geocoded and the ATR's.

Table 4: Survey Response Rates

	Conducted Surveys	Valid Surveys	Eastbound East Avenue Traffic Volume (2 hours)	Sample Size
AM	184	157	884	17.8%
PM	233	172	941	18.3%
Weekend	199	158	1068	14.8%

B. Geocoding results

Table 5 summarizes the final geocoded match rates for all origin and destination addresses for each study period. Figures 7 – 9 show the origin and destination patterns for the respective time periods.

Table 5: Geocoding Results

	AM Origins	AM Destinations	PM Origins	PM Destinations	Weekend Origins	Weekend Destinations
Number of Surveys Completed	184	184	232	232	199	199
% Of Surveys Matched With Score of 80-100	99%	86%	88%	86%	84%	94%
% Of Surveys Matched With Score of < 80	2%	0%	0%	1%	1%	0%
% Of Surveys Unmatched	0%	14%	29%	13%	15%	6%

The scores from the geocoding analysis indicate the closeness of fit of the address as reported in the survey and the matching address that the software searches for. For example, if there is a minor spelling error (i.e. if 35 Washington Street were instead entered as 35 Washigton Street), the score would be lower than 100 indicating that the match found was not perfect. At the level below a score of 80, addresses were reviewed manually to ensure that the software-generated match was correct.

Analysis of the geocoding results reveals that the predominant travel flows using eastbound East Avenue in all time periods are from the southwest to northeast. This reflects the connectivity of the roadway network, as N.J. Route 57 approaches the study area from the southwest. Many of the destinations are at locations accessed via U.S. Route 46. Although Hackettstown is a major destination and traffic attractor in the area, traffic destined for Hackettstown generally does not use East Avenue and did not show up in the origin-destination survey to a large degree.

C. Statistical Validation

A statistical analysis was performed in accordance with equal probability of selection methods[2], testing for the adequacy of the sample size of the surveyed drivers relative to the entire volume of traffic using East Main Street in the eastbound direction. Table 6 summarizes the results of the analysis of statistical significance of the origin-destination survey.

Table 6: Statistical Validation of Origin-Destination Survey

	Traffic Volume During 2-hour Survey Time Period	Number of Surveys Conducted	Number of Valid Surveys Geocoded	Maximum Expected Variance in Volume	Statistically Significant At 95% Level
AM	884	184	157	7.1%	Yes
PM	941	233	172	6.8%	Yes
Weekend	1068	199	158	7.2%	Yes

The statistical analysis indicates that the potential diversions determined from the survey are significant at a 95% confidence interval at the percentages listed above. For example, the AM results would be expected to be within 7.1% of the calculated value 19 times out of 20. This means that if the survey were performed 20 times, the calculated percentage diversion off of East Avenue would be between 90.1% (97.2% - 7.1%) and 100% (diversion cannot be greater than 100%), for 19 times out of the 20.

D. Demand Model Runs

Trips from the trip matrix were assigned to the travel demand network to quantify the extent of any diversion onto the proposed Route 57/46 connector. There were a total of six demand model runs:

- Existing network with AM trips
- Network with Route 57/46 Connector with AM trips
- Existing network with PM trips
- Network with Route 57/46 Connector with PM trips
- Existing network with Weekend trips
- Network with Route 57/46 Connector with Weekend trips

The results of the diversion from the travel demand model runs are shown in Table 7 on page 18.

[2] Healy, Joseph F.; *Statistics: A Tool for Social Research*; 6th Edition; Wadsworth/Thomson Learning; 2002

AM ORIGIN - DESTINATION PATTERNS

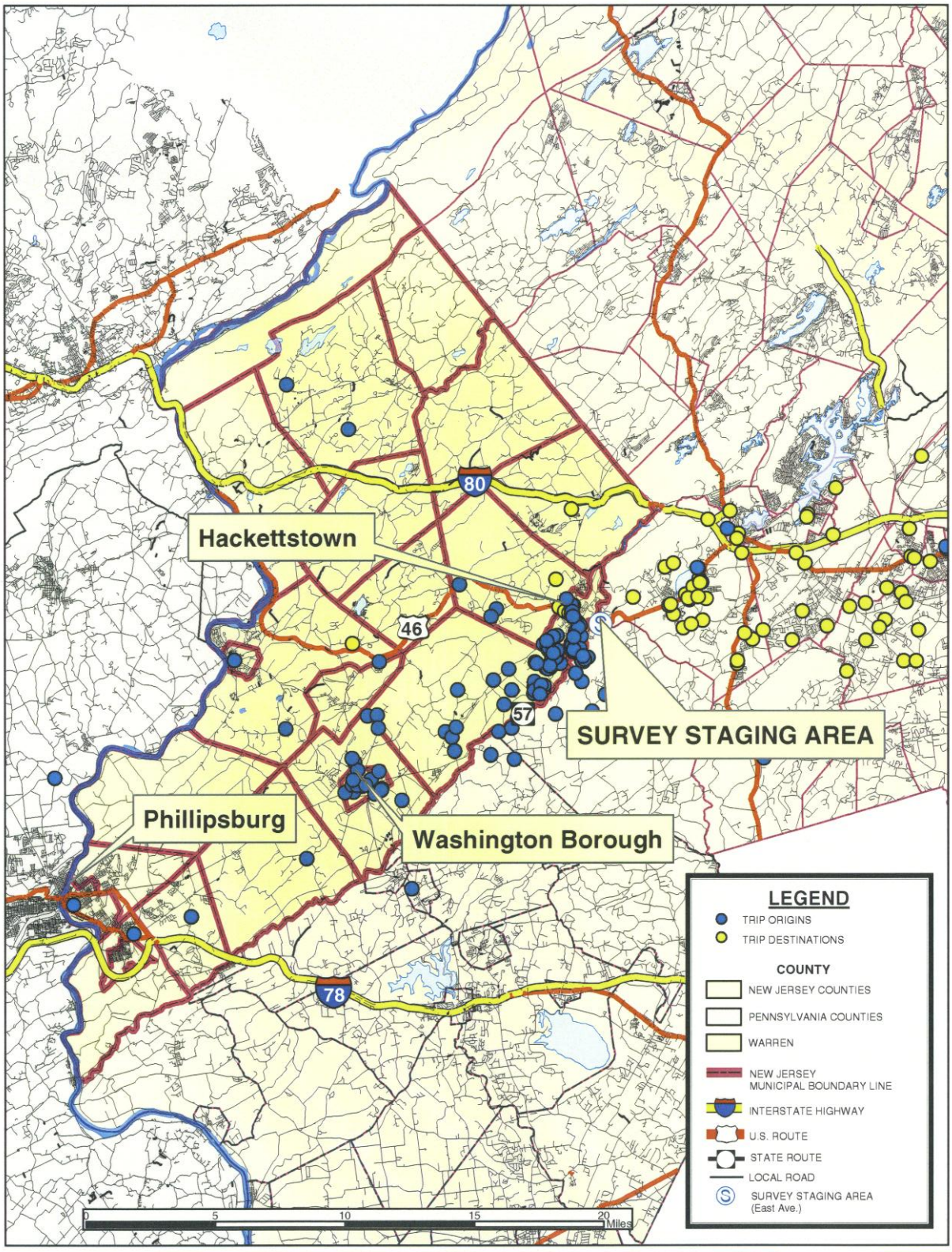

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Figure 7

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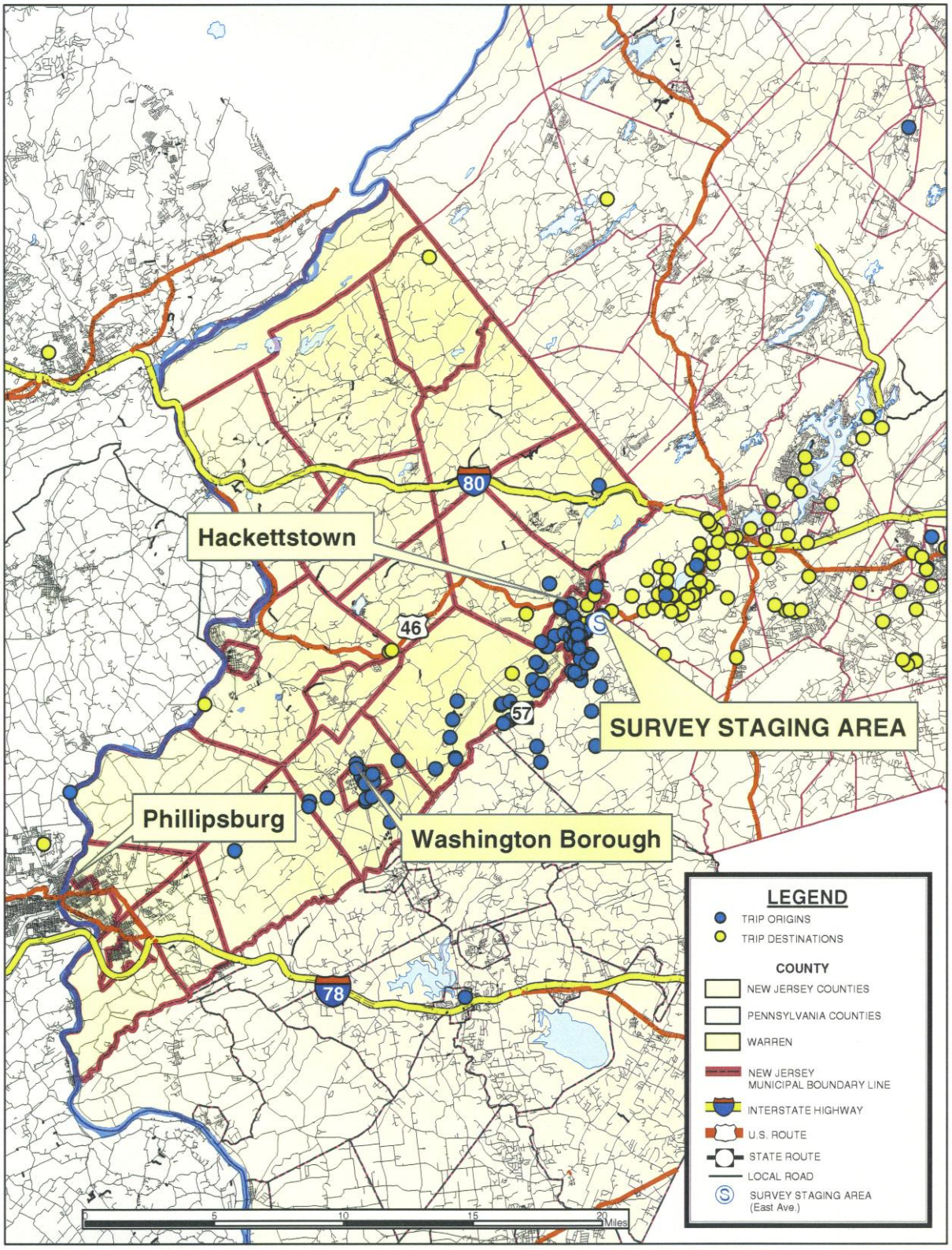
PM ORIGIN - DESTINATION PATTERNS



ROUTE 57/46 CONNECTOR STUDY

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Figure 8

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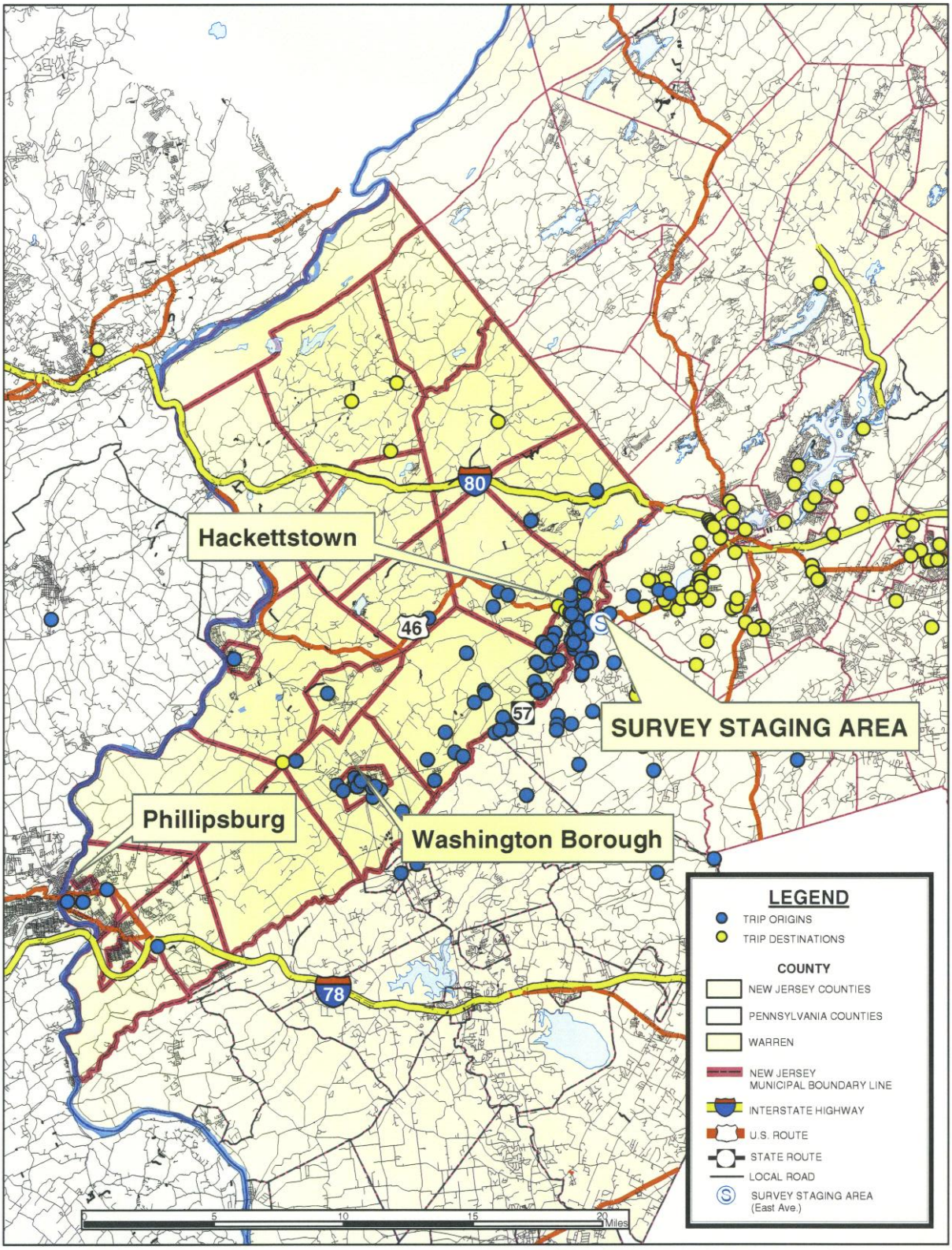
SATURDAY ORIGIN - DESTINATION PATTERNS



ROUTE 57/46 CONNECTOR STUDY

Figure 9

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Table 7: Volume Comparisons between No-Build (2013) and Build (2013) Networks (Two-Hour Volumes)

	Existing Conditions (2003)	No-Build (2013	Build (2013)		Diversion off of East Avenue (2013)	
	East Avenue*	East Avenue	East Avenue	Route 57/46 Connector	East Avenue	Percentage
AM	575	635	18	616	-617	-97.2%
PM	571	631	78	536	-551	-87.4%
Weekend	557	615	43	530	-572	-93.0%

* East Avenue refers to link of East Avenue between Mountain Avenue and the condominium entrance

Traffic that was diverted from East Avenue onto the Route 57/46 connector was reassigned to that link in the Build simulation model based on the percentage diversions from the demand model runs.

Note that the volume on East Avenue in the existing conditions demand model is lower than the volume from the traffic counts. In theory, all trips using East Avenue should be loaded onto this link in the existing conditions model. The fact that a smaller number of trips were loaded onto East Avenue is due to several possible reasons:

- The assignment of the trip matrix using a "demand" assignment (stochastic). For the reasons stated earlier (See Section II E , it was not feasible to use a capacity-restrained assignment
- Motorists using other paths in the demand model which are not the shortest time path for their stated origin-destination pair
- Motorists incorrectly stating their origin and/or destination thereby precluding the model from accurately simulating the trip because their origin or destination as given to the surveyor would not result in a travel path using East Ave.
- Trip has an origin & destination within same zone

E. Synchro/SimTraffic Measures of Effectiveness

Table 8 displays the results of the capacity analyses for all the study area intersections under the 2003 Existing Conditions. The individual intersection reports are in the appendix.

Table 8: Intersection Levels of Service – Existing Conditions (2003)

Intersection	AM Peak LOS	PM Peak LOS	Saturday LOS
Mountain Avenue & U.S Route 46	F	E	E
Mountain Avenue & East Avenue	B	C	C
Mountain Avenue & Mall Driveway	A	A	A
Mountain Avenue & Shelley Drive	A	A	A
Mountain Avenue & N.J. Route 57	C	B	C
U.S. Route 46 & East Avenue	B	D	B

Mountain Avenue and U.S. Route 46 operates at the lowest levels of service, ranging from "E" to "F" in the three analysis time periods. This intersection has poor lines of site and constrained geometry. Realignment and improvement at this location was recommended by the October 2000 Urbitran/Garmen study, and was included in the No-Build simulation in this study.

Table 9: Intersection Levels of Service – No-Build Conditions (2013)

Intersection	AM Peak LOS	PM Peak LOS	Saturday LOS
Mountain Avenue & U.S Route 46	D	B	B
Mountain Avenue & East Avenue	B	C	C
Mountain Avenue & Mall Driveway	A	A	A
Mountain Avenue & Shelley Drive	A	A	A
Mountain Avenue & N.J. Route 57	C	C	C
U.S. Route 46 & East Avenue	B	E	D

In the No-Build scenario, the intersection of U.S. Route 46 and East Avenue operates at LOS "E" in the PM peak period and a "D" in the Saturday midday period. The intersection of Mountain Avenue and U.S. Route 46 operates at higher levels of service than in the existing conditions analysis because of the improvements at this intersection. The intersection of Mountain Avenue and N.J. Route 57 operates at LOS "C" in all time periods, however the simulation results indicate extensive queuing on the eastbound and northbound approaches and isolated signal failure.

Table 10: Intersection Levels of Service – Build Conditions (2013)

Intersection	AM Peak LOS	PM Peak LOS	Saturday LOS
Mountain Avenue & U.S Route 46	D	C	C
Mountain Avenue & East Avenue	A	A	A
Mountain Avenue & Mall Driveway	A	A	A
Mountain Avenue & Shelley Drive	A	A	A
Mountain Avenue & N.J. Route 57	A	B	B
U.S. Route 46 & East Avenue	A	A	A
U.S. Route 46 and Route 57/46 Connector	B	B	B

In the Build conditions, all intersections except Mountain Avenue and U.S. Route 46 operate at LOS "B" or better, with all approaches to these intersections at LOS "C" or better. The intersection of Mountain Avenue and U.S. Route 46 continues to operate with significant queuing and throughput restrictions.

Table 11: Systemwide Measures of Effectiveness (AM)

Measure of Effectiveness	Existing Conditions (2003)	No-Build (2013)	Build (2013)	Percent Difference (No-Build v. Build)
VMT (veh.-mi.)	3,173.6	4,492.5	3,638.2	-19.0%
VHT (veh.-hr.)	384.2	515.9	245.5	-52.4%
Average Speed (mph)	18	14	20	42.9%
Total Delay (hr.)	290.1	371.5	139.2	-62.5%
Emissions (CO) (g)	31,197	41,350	30,384	-26.5%
Emissions (NO_x) (g)	2,531	3,432	2,337	-31.9%
Emissions (VOC) (g)	1,011	1,334	837	-37.3%

Table 12: Systemwide Measures of Effectiveness (PM)

Measure of Effectiveness	Existing Conditions (2003)	No-Build (2013)	Build (2013)	Percent Difference (No-Build v. Build)
VMT (veh.-mi.)	3,983.2	4,492.5	4,501.9	0.2%
VHT (veh.-hr.)	556.5	515.9	357.2	-30.8%
Average Speed (mph)	14	14	18	28.6%
Total Delay (hr.)	430	371.3	224.8	-39.5%
Emissions (CO) (g)	37,703	41,350	38,263	-7.5%
Emissions (NO_x) (g)	3,058	3,432	3,116	-9.2%
Emissions (VOC) (g)	1,292	1,334	1,126	-15.6%

Table 13: Systemwide Measures of Effectiveness (Weekend)

Measure of Effectiveness	Existing Conditions (2003)	No-Build (2013)	Build (2013)	Percent Difference (No-Build v. Build)
VMT (veh.-mi.)	4,220.5	4,869	4,712.7	-3.2%
VHT (veh.-hr.)	345.1	435	304.9	-29.9%
Average Speed (mph)	15	14	17	21.4%
Total Delay (hr.)	220.1	291.2	166.4	-42.9%
Emissions (CO) (g)	40,324	46,556	39,147	-15.9%
Emissions (NO_x) (g)	3141	3792	3291	-13.2%
Emissions (VOC) (g)	1,112	1,338	1,126	-15.8%

Comparison of the systemwide indicators of the Build and No-Build simulations yields information that is indicative of improved operations with the Route 57/46 connector in place. Most notably the build network operates with significantly decreased aggregate travel time and delay in each analysis period. Mobile source emissions decreased as well, indicating a net positive impact on air quality. Average speed increased between 21 and 42 percent, due primarily to the decreased intersection control delay. Vehicle-miles traveled decreased nearly 20 percent in the AM analysis period with little or no change in the other periods. The slight increase in VMT during the PM period (See Table 12) is likely due to the increased throughput of the transportation network allowing more vehicles to enter the system and therefore record VMT's.

IV. Recommendations

The proposed Route 57/46 connector would fill a significant missing link in the arterial system. N.J. Route 57 terminates at a traffic signal approximately 1 mile west of U.S. Route 46. The Route 57/46 connector would provide a direct through movement to traffic which currently must travel through two additional traffic lights and make three turning movements.

The Route 57/46 connector would support local economic development in the identified center of Hackettstown, which is a goal of the County Strategic Growth Plan. It would support the "smart growth" development of the Mountain Avenue section of Hackettstown by giving the town the opportunity to retrofit the strip commercial development pattern to one that is more pedestrian and bicycle compatible and is linked in form to Main Street. The current planning and zoning policies in place in Washington Township, Morris County, would be supported by the connector because the farmland that it would pass through is currently zoned for Office/Research. The OR zone could be built to complement the functional development pattern of the Hackettstown Center while providing a tax ratable to Washington Township and ensuring safe and efficient movement though the area.

Additional benefits would be felt on both sides of the county border including the facilitation of efficient travel flow by eliminating the circuitous route that must be taken by motorists to access U.S. Route 46 from County Route 517, Mountain Avenue, and N.J. Route 57. The connector would provide better access and improve response times for emergency and police vehicles to incidents in the northwestern section of Washington Township.

Three roadway segments would be most relieved by the proposed connector:

- Mountain Avenue between N.J. Route 57 and East Avenue
- East Avenue between Mountain Avenue and U.S. Route 46
- U.S. Route 46 between East Avenue and the Route 57/46 connector

Additionally, there would be a reduction of truck traffic on Mountain Avenue between N.J. Route 57 and U.S. Route 46 and U.S. Route 46 between Mountain Avenue and the Route 57/46 connector by eliminating the need for truck traffic to negotiate the Mountain Ave/U.S. Route 46/ Willow Grove St. intersection in Hackettstown.

From an overall systems approach, the connectivity between three state routes (N.J. Route 57, U.S. Route 46, N.J. 182) that the connector would provide is an improvement on the circuitous travel path that motorists must now use to access U.S. Route 46 from N.J. Route 57. The study recommends the following to implement the Route 57/46 connector:

- Construction of a Route 57/46 connector roadway between the current terminus of N.J. Route 57 and the roadbed of Hearthstone Drive which was built to accept the connector. The standard cross-section of the connector would be one travel lane in either direction and a standard shoulder width. Right-of-way acquired should be 75 feet wide in accordance with the NJDOT standard specifications for

a two-lane roadway[3]. (Right-of-way should be sufficient at the intersections with Mountain Avenue and U.S. Route 46 to allow for expansion of turn lanes at these intersections as further development takes place in the adjacent parcels.)

- Construction of a signalized intersection at U.S. Route 46 and the Route 57/46 connector with the following geometry

    - U.S. Route 46 eastbound: 1 through lane; 1 shared through-right turn lane
    - U.S. Route 46 westbound: 1 shared through-right lane
    - Reverse jughandle from Route 46 westbound: 1 through lane (onto Route 57/46 connector); 1 shared through-left lane (left turning vehicles are making u-turns from U.S. Route 46 WB to EB)
    - Route 57/46 connector eastbound: 1 left turn lane and two right turn lanes
    - Right turns on red prohibited from connector onto Route 46 eastbound
    - Construction of a reverse jughandle from U.S. Route 46 eastbound to connect with the connector at the new signalized intersection. Geometry would be 1 shared left-through lane and 1 through lane.

- Construction of a signalized intersection at N.J. Route 57 and the Route 57/46 connector with the following geometry

    - N.J. Route 57 eastbound: 1 left turn lane; 1 shared through-right turn lane
    - Route 57/46 connector westbound: 1 left turn lane; 1 shared through-right turn lane
    - Mountain Avenue southbound: 1 shared through-left turn lane; 1 through lane; 1 shared through-right turn lane
    - Mountain Avenue northbound: 1 left turn lane; 1 shared through-right turn lane

- Further study of control changes at the intersections of East Avenue and Mountain Avenue and East Avenue and U.S. Route 46 upon implementation of the Route 57/46 connector. This study would also balance the possibility of increases in traffic on East Avenue from the future development of parcels that would become more accessible due to the connector. This operational traffic study would analyze:

    - Elimination of both traffic signals (due to the reduction of traffic on East Avenue)
    - Stop sign control on East Avenue at both intersections

[3] NJDOT; *Design Manual – Roadway, Section 5-10*; Update 3/11/2003

- Preservation of existing roadway geometry at both intersections

- Access management to preserve the efficient flow of traffic on the connector and maintain it as a limited-access facility. This includes:

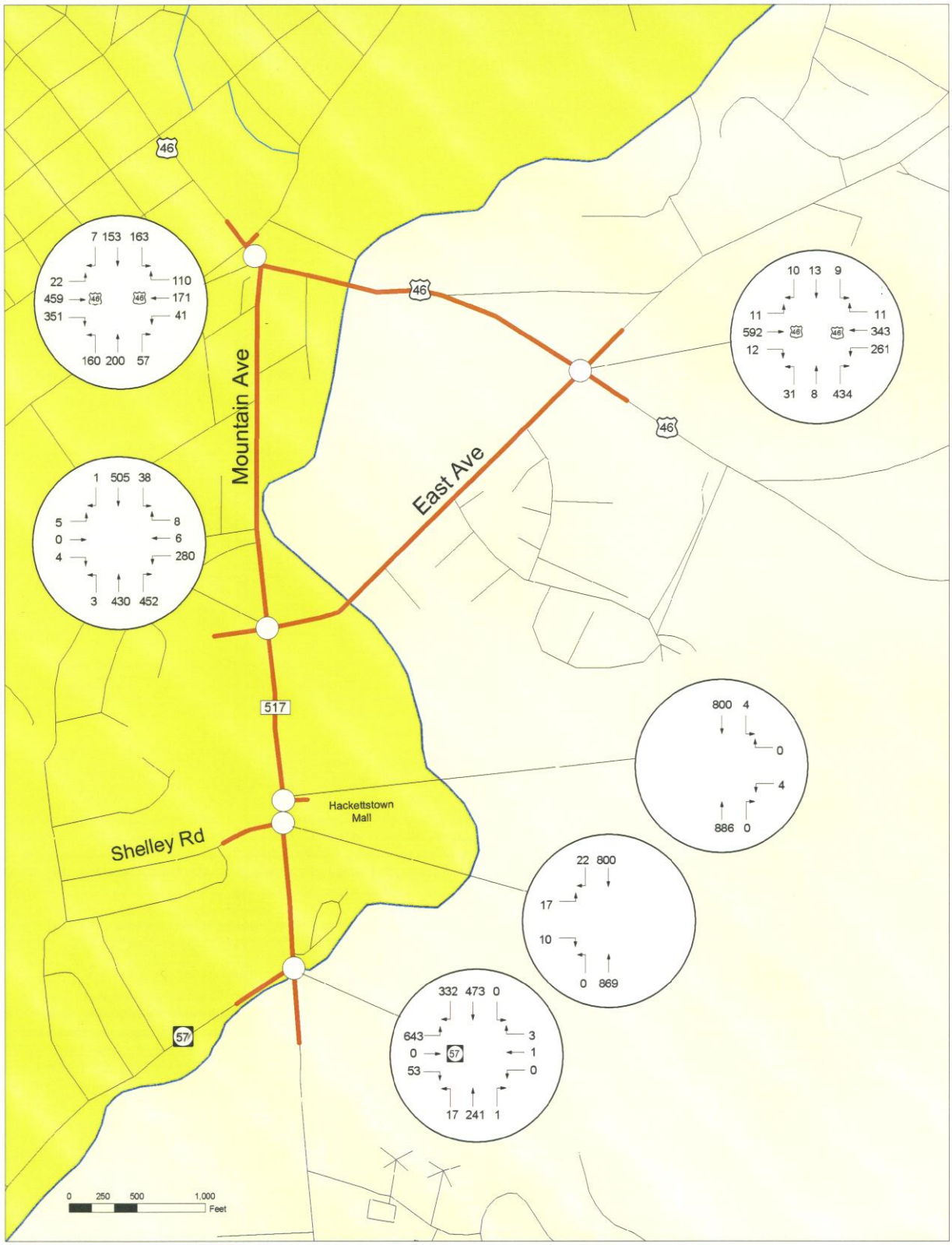
    - Satisfactory left turn treatment to adjacent land uses as a precondition for development of parcels (whether signalized/unsignalized, by jughandle or turn bays to be determined by detailed individual analyses)
    - Adequate setbacks of new development along the Route 57/46 connector to maintain sufficient lines of sight, provide for future sidewalk installation, and to provide for future roadway improvement if ever needed.
    - Internal circulation plans for adjacent parcels which allow vehicles ingressing/egressing the adjacent land uses to do so at limited access points without interrupting the safe and efficient flow of traffic
    - Shared access roadways and rear access between adjacent developments.

Edwards AND Kelcey

WE'LL TAKE YOU THERE

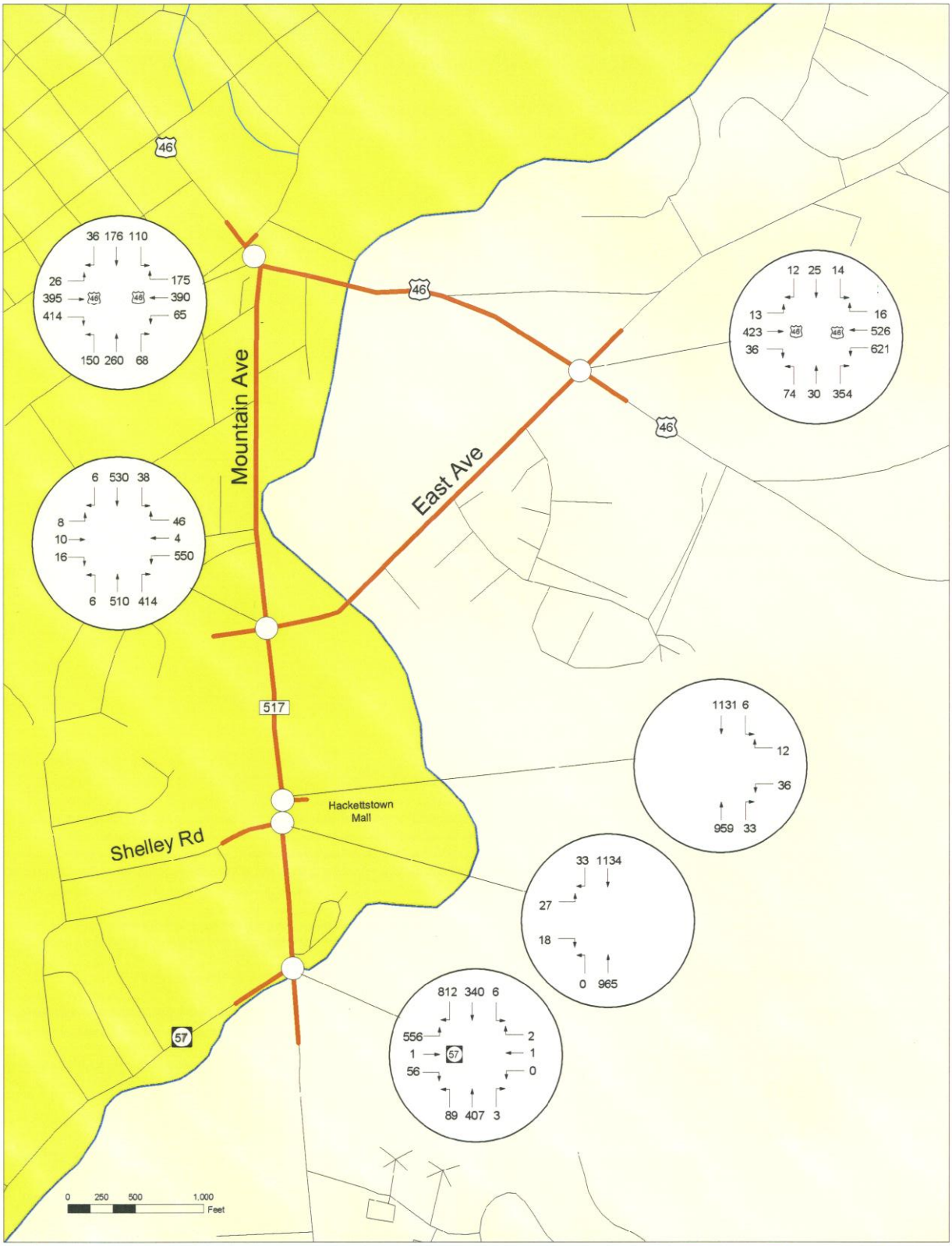
APPENDIX

AM PEAK HOUR INTERSECTION VOLUMES - EXISTING CONDITIONS (2003)



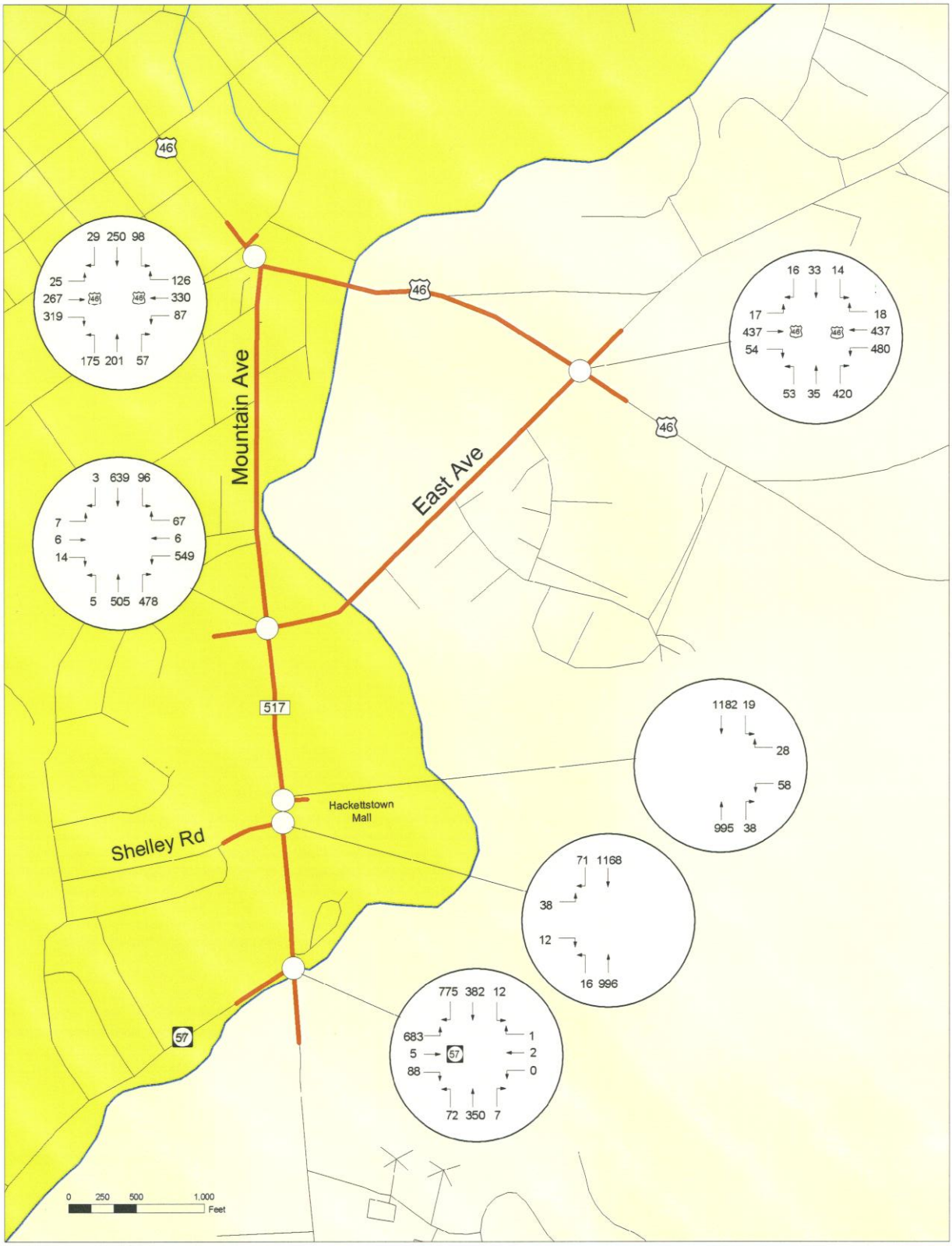
ROUTE 57/46 CONNECTOR STUDY

PM PEAK HOUR INTERSECTION VOLUMES - EXISTING CONDITIONS (2003)



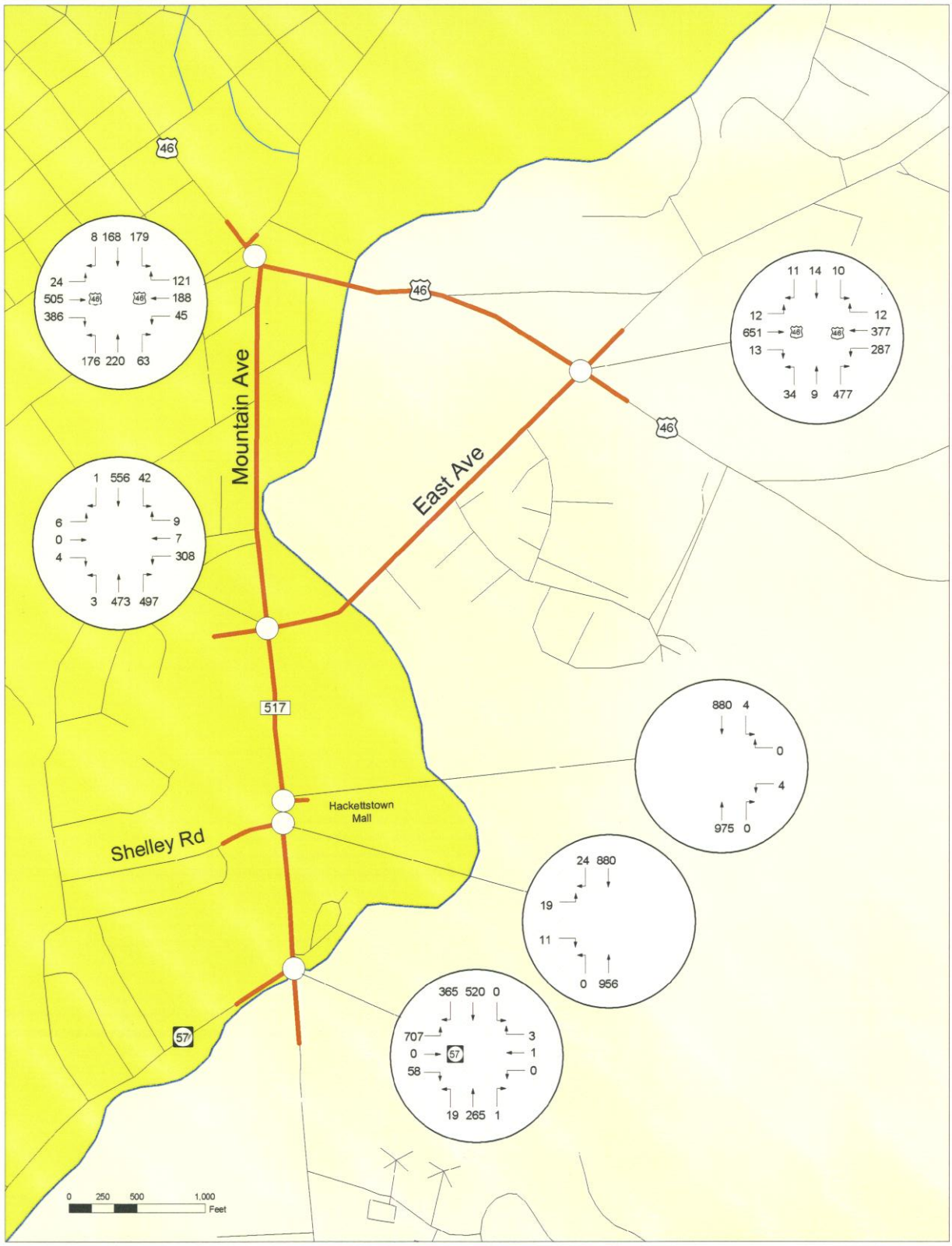
ROUTE 57/46 CONNECTOR STUDY

SATURDAY PEAK HOUR INTERSECTION VOLUMES - EXISTING CONDITIONS (2003)



ROUTE 57/46 CONNECTOR STUDY

AM PEAK HOUR INTERSECTION VOLUMES - NO BUILD CONDITIONS (2013)



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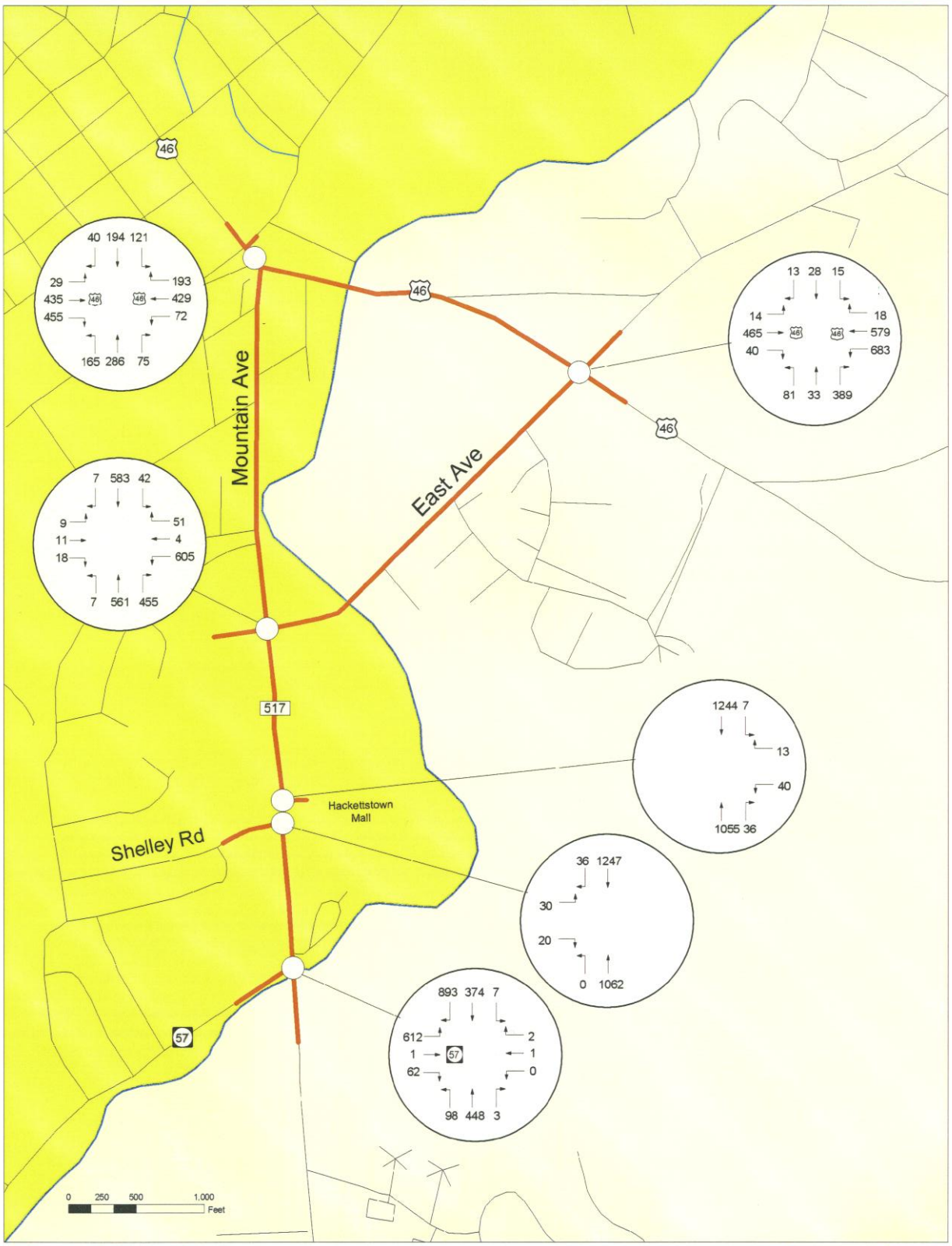

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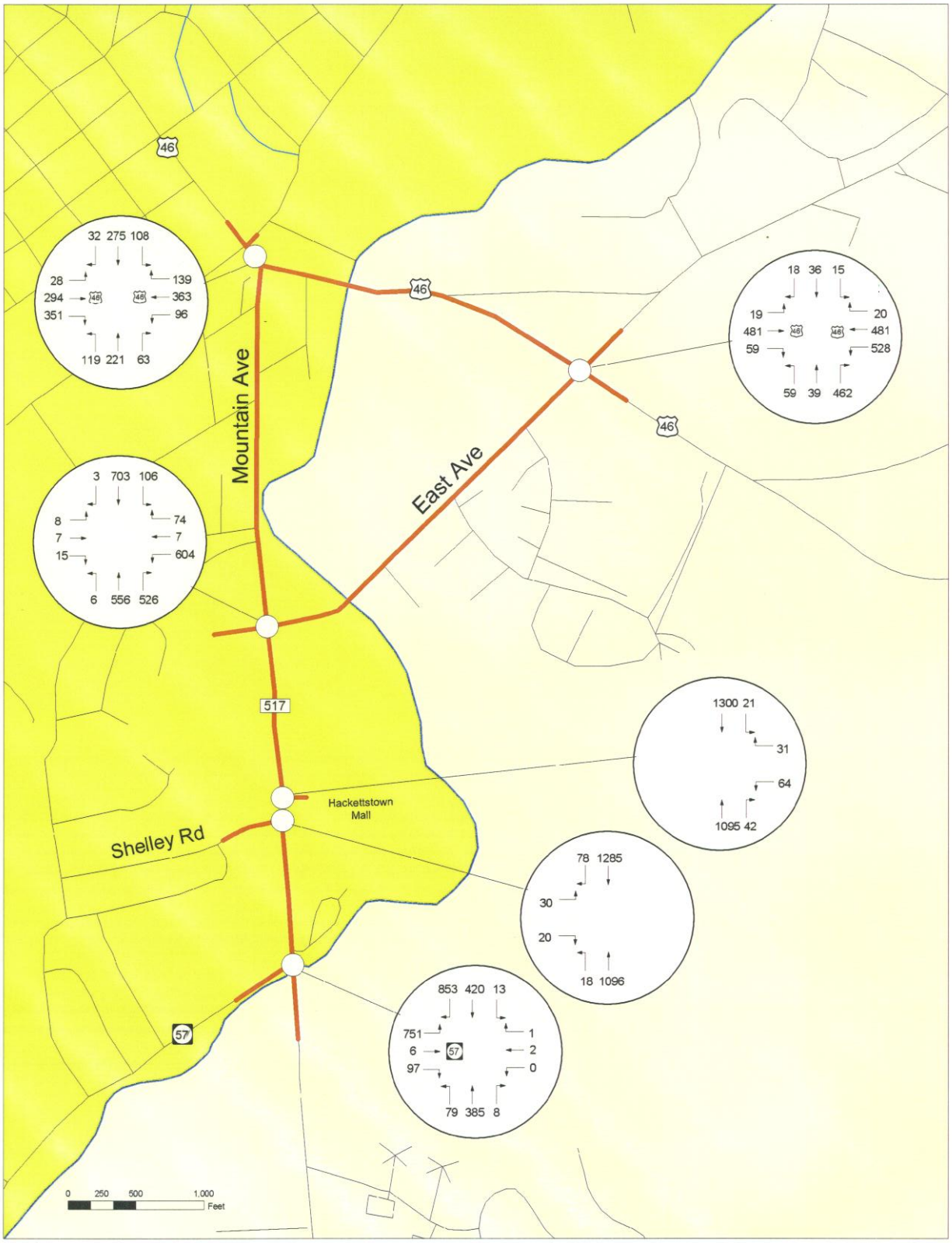
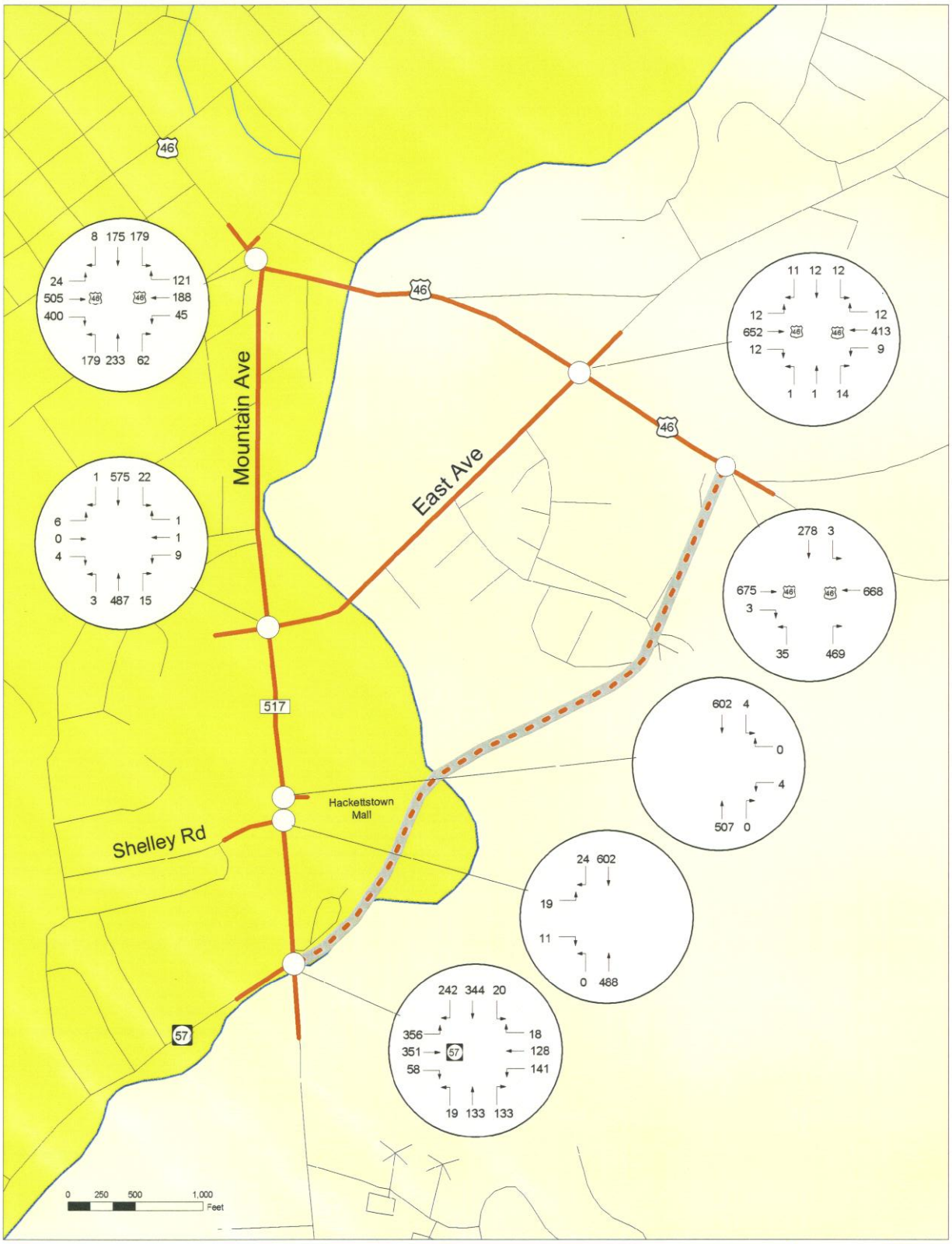


ROUTE 57/46 CONNECTOR STUDY

AM PEAK HOUR INTERSECTION VOLUMES - BUILD CONDITIONS (2013)



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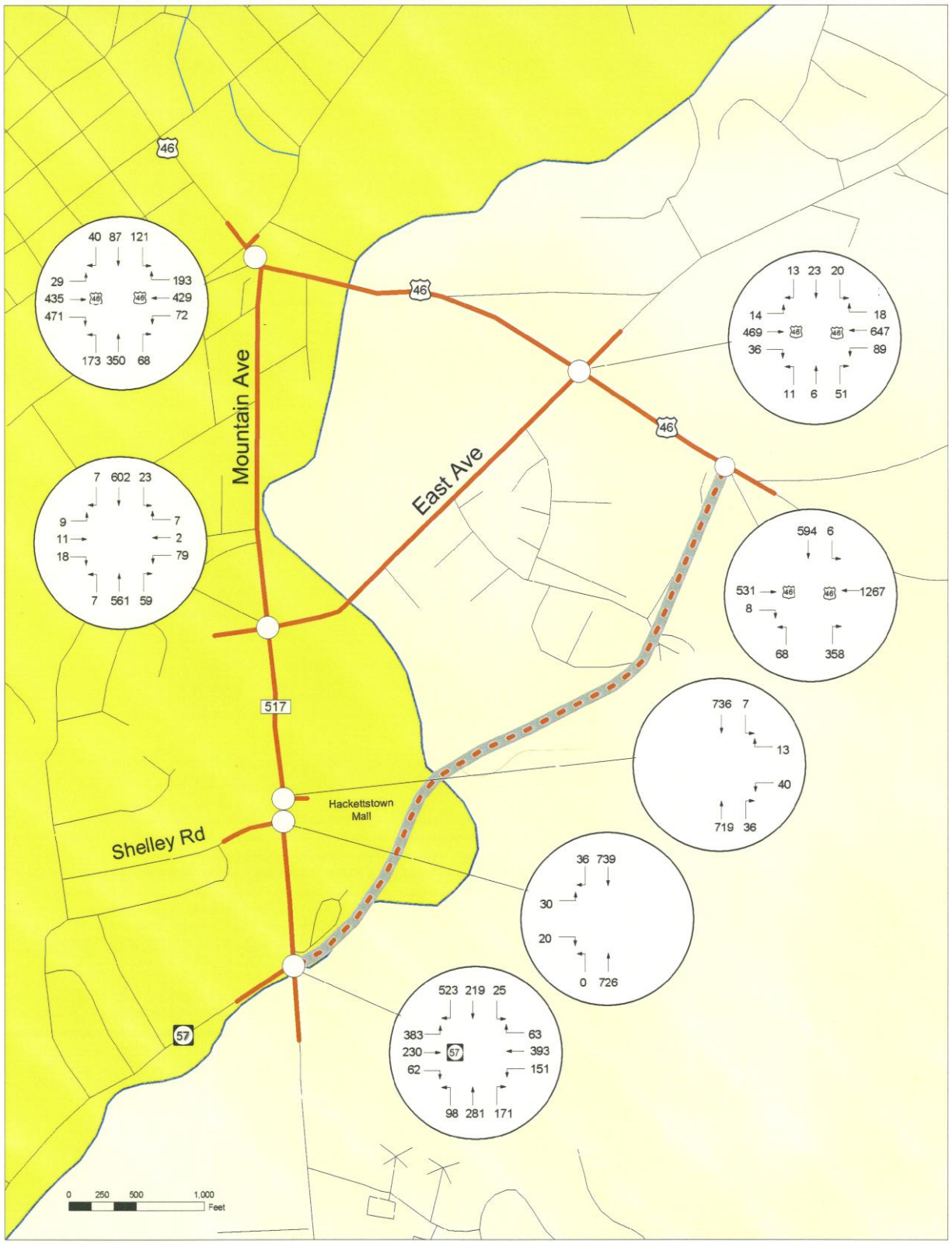

ROUTE 57/46 CONNECTOR STUDY

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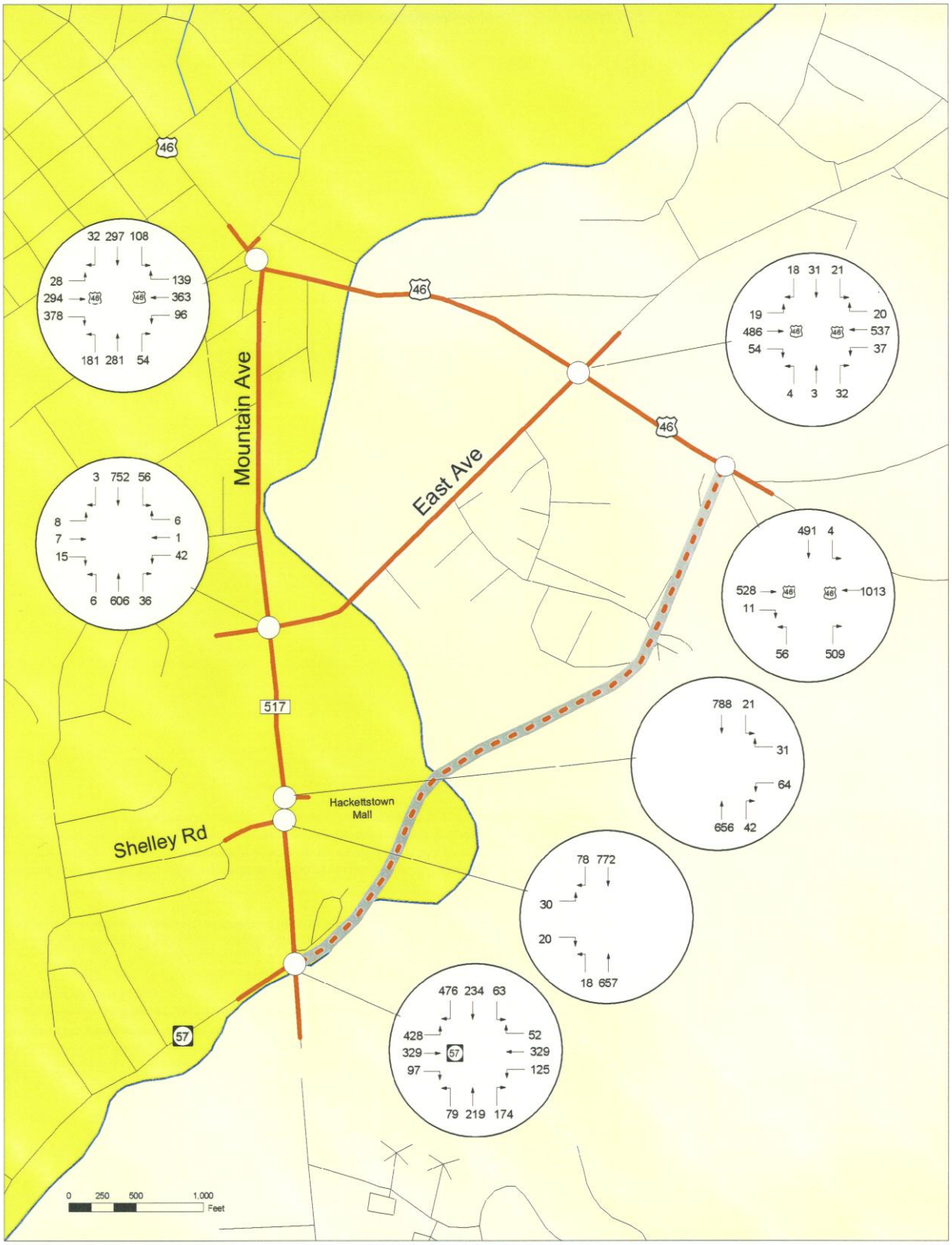

ROUTE 57/46 CONNECTOR STUDY

Route 57/46 Connector Study

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Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	70.00	0.00	0.00	0.00	0.00	0.00	894.00

Route 57/46 Connector Study

	215	216	217	218	219	220	221	222	223	224	225	226	227	228	Sum
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Sum	6.00	0.00	0.00	6.00	0.00	0.00	0.00	6.00	0.00	6.00	0.00	0.00	6.00	0.00	894.00

OD MATRIX (AM)

Route 57/46 Connector Study

	229	230	231	232	233	234	235	236	237	238	239	240	241	242	Sum
201	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
202	--	17.00	--	--	17.00	17.00	--	--	--	--	--	--	--	--	102.00
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215	--	--	--	11.00	11.00	6.00	--	--	--	--	--	--	--	11.00	62.00
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218	--	28.00	--	11.00	11.00	56.00	--	--	6.00	--	--	--	--	39.00	252.00
219	--	6.00	--	--	--	--	--	--	--	--	--	--	--	--	34.00
220	--	11.00	--	--	--	6.00	--	--	--	--	--	--	--	--	29.00
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240	--	11.00	6.00	6.00	11.00	17.00	--	--	--	--	--	--	--	45.00	159.00
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Sum	0.00	79.00	6.00	46.00	85.00	120.00	0.00	0.00	6.00	0.00	6.00	0.00	0.00	149.00	894.00

	243	244	Sum
201	--	--	0.00
202	17.00	17.00	102.00
203	--	6.00	12.00
204	6.00	6.00	24.00
205	--	--	6.00
206	--	--	0.00
207	--	--	0.00
208	--	11.00	23.00
209	--	--	12.00
210	--	6.00	18.00
211	--	--	0.00
212	--	--	0.00
213	--	--	0.00
214	--	--	0.00
215	11.00	6.00	62.00
216	--	--	24.00
217	--	--	18.00
218	62.00	39.00	252.00
219	11.00	6.00	34.00
220	6.00	--	29.00
221	--	--	0.00
222	--	--	0.00
223	--	--	18.00
224	6.00	--	12.00
225	--	--	12.00
226	--	--	0.00
227	--	--	0.00
228	--	--	0.00
229	--	--	0.00
230	--	--	0.00
231	--	--	0.00
232	--	--	6.00
233	--	--	0.00
234	--	--	0.00
235	--	--	0.00
236	--	--	6.00
237	--	--	6.00
238	--	--	17.00
239	--	6.00	12.00
240	51.00	--	159.00
241	--	--	6.00
242	--	6.00	12.00
243	--	--	6.00
Sum	170.00	109.00	894.00

Fri Oct 17 11:51:57 2003

Route 57/46 Connector Study

	201	202	203	204	205	206	207	208	209	210	211	212	213	214	Sum
201	5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
202	16.00	--	--	--	--	--	--	5.00	5.00	5.00	22.00	5.00	--	--	132.00
203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
204	--	--	--	--	--	--	--	--	--	--	5.00	--	--	--	15.00
205	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
207	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
208	--	--	--	--	--	--	--	5.00	5.00	--	16.00	--	--	--	51.00
209	--	--	--	--	--	--	--	16.00	--	--	--	--	--	--	21.00
210	--	--	--	--	--	--	--	--	--	--	5.00	--	--	--	10.00
211	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.00
212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
214	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
215	--	--	--	--	--	--	--	--	--	--	5.00	--	--	--	47.00
216	--	--	--	--	--	--	--	5.00	--	--	--	--	--	--	69.00
217	--	--	--	--	--	--	--	5.00	--	--	--	--	--	--	47.00
218	5.00	--	--	--	--	--	--	5.00	11.00	--	--	--	--	--	161.00
219	--	--	--	--	--	--	--	11.00	--	--	--	--	--	5.00	70.00
220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
222	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
223	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
225	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
226	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
227	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
228	5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
229	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
231	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
232	--	--	--	--	--	--	--	--	--	--	--	5.00	--	--	10.00
233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
235	--	--	--	--	--	--	--	--	5.00	--	--	--	--	--	5.00
236	--	--	--	--	--	--	--	--	--	--	5.00	--	--	--	5.00
237	--	--	--	--	--	--	--	--	--	--	5.00	--	--	5.00	30.00
238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
239	--	--	--	--	--	--	--	5.00	--	--	--	--	--	--	15.00
240	--	--	--	--	--	--	--	--	--	5.00	5.00	--	--	--	140.00
241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
243	--	--	--	--	--	--	--	5.00	--	--	--	--	--	--	21.00
Sum	31.00	0.00	0.00	0.00	0.00	0.00	0.00	62.00	26.00	10.00	68.00	10.00	0.00	10.00	889.00

OD MATRIX (PM)

Route 57/46 Connector Study

	215	216	217	218	219	220	221	222	223	224	225	226	227	228	Sum
201	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
202	--	--	--	--	--	--	--	--	--	5.00	--	--	--	--	132.00
203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
204	--	--	--	5.00	--	--	--	--	--	--	--	--	--	--	15.00
205	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
207	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
208	--	--	--	--	--	--	--	--	--	--	5.00	--	--	--	51.00
209	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.00
210	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.00
211	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	10.00
212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
214	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
215	--	--	--	--	--	--	--	--	--	--	--	--	--	--	47.00
216	--	--	--	--	--	--	--	--	--	5.00	5.00	--	--	--	69.00
217	--	--	--	--	--	--	--	--	--	--	--	--	--	--	47.00
218	--	--	--	--	--	--	--	--	--	--	--	--	--	--	161.00
219	--	--	--	--	--	--	--	--	--	--	--	--	--	--	70.00
220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
222	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
223	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
225	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
226	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
227	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
228	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
229	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
230	5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
231	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
232	--	--	--	--	5.00	--	--	--	--	--	--	--	--	--	10.00
233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
237	--	--	--	--	--	--	5.00	--	--	--	--	--	--	--	30.00
238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
239	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15.00
240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	140.00
241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
243	--	11.00	--	--	--	--	--	--	--	--	--	--	--	--	21.00
Sum	5.00	16.00	0.00	5.00	5.00	0.00	5.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	889.00

Route 57/46 Connector Study

	229	230	231	232	233	234	235	236	237	238	239	240	241	242	Sum
201	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
202	--	11.00	5.00	16.00	--	11.00	--	--	--	--	--	--	--	5.00	132.00
203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
204	--	--	--	5.00	--	--	--	--	--	--	--	--	--	--	15.00
205	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
207	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
208	--	5.00	5.00	5.00	--	--	5.00	--	--	--	--	--	--	--	51.00
209	--	--	--	5.00	--	--	--	--	--	--	--	--	--	--	21.00
210	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	10.00
211	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.00
212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
214	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
215	--	5.00	--	--	--	5.00	5.00	--	--	--	--	--	5.00	11.00	47.00
216	--	11.00	--	11.00	--	11.00	--	--	--	--	--	--	--	5.00	69.00
217	--	5.00	--	--	22.00	--	--	--	--	--	--	--	--	5.00	47.00
218	--	27.00	5.00	38.00	33.00	16.00	--	--	5.00	--	--	--	--	--	161.00
219	--	11.00	11.00	5.00	11.00	11.00	--	--	--	--	--	--	--	--	70.00
220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
222	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	5.00
223	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
225	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
226	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
227	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
228	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
229	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
231	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.00
233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00
237	--	--	--	--	--	5.00	--	--	--	--	--	5.00	--	--	30.00
238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
239	--	--	--	5.00	--	--	--	--	--	--	--	--	--	5.00	15.00
240	--	33.00	--	27.00	5.00	27.00	--	--	--	--	--	--	--	5.00	140.00
241	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	5.00
242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
243	--	--	--	--	--	--	--	--	--	--	--	5.00	--	--	21.00
Sum	0.00	123.00	26.00	117.00	71.00	86.00	10.00	0.00	5.00	0.00	0.00	10.00	5.00	36.00	889.00

	243	244	Sum
201	--	--	5.00
202	16.00	5.00	132.00
203	--	--	0.00
204	--	--	15.00
205	--	--	0.00
206	--	--	0.00
207	--	--	0.00
208	--	--	51.00
209	--	--	21.00
210	--	--	10.00
211	5.00	--	10.00
212	--	--	0.00
213	--	--	0.00
214	--	--	0.00
215	11.00	--	47.00
216	11.00	5.00	69.00
217	5.00	5.00	47.00
218	11.00	5.00	161.00
219	5.00	--	70.00
220	--	5.00	5.00
221	--	--	0.00
222	--	--	5.00
223	--	--	0.00
224	--	--	0.00
225	--	--	0.00
226	--	--	0.00
227	--	--	0.00
228	--	--	5.00
229	--	--	0.00
230	--	--	5.00
231	--	--	0.00
232	--	--	10.00
233	--	--	0.00
234	--	--	0.00
235	--	--	5.00
236	--	--	5.00
237	5.00	--	30.00
238	--	--	0.00
239	--	--	15.00
240	33.00	--	140.00
241	--	--	5.00
242	--	--	0.00
243	--	--	21.00
Sum	102.00	25.00	889.00

Fri Oct 17 11:52:30 2003

OD MATRIX (PM)

Route 57/46 Connector Study

	201	202	203	204	205	206	207	208	209	210	211	212	213	214	Sum
201	7.00	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
202	7.00	--	--	--	--	--	--	7.00	14.00	--	--	--	--	--	97.00
203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
204	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14.00
205	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
207	--	--	--	--	--	--	--	--	--	--	--	--	--	--	61.00
208	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.00
209	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.00
210	--	--	--	--	--	--	--	--	--	7.00	--	--	--	--	28.00
211	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.00
212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
214	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
215	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
216	--	--	--	--	--	--	--	--	14.00	--	--	--	--	--	42.00
217	7.00	--	--	--	--	--	--	--	--	--	--	--	--	--	35.00
218	--	--	--	--	--	--	--	7.00	14.00	14.00	7.00	--	--	--	275.00
219	--	--	--	--	--	--	--	7.00	--	--	--	--	--	--	42.00
220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
222	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
223	--	--	--	--	--	--	--	--	14.00	--	--	--	--	--	21.00
224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.00
225	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
226	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
227	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
228	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
229	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
231	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
232	--	--	--	--	--	--	--	--	--	--	7.00	--	--	--	14.00
233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
236	--	--	--	--	--	--	--	--	7.00	--	--	--	--	--	7.00
237	--	--	--	--	--	--	--	--	7.00	--	7.00	--	--	--	49.00
238	--	--	--	--	--	--	--	--	7.00	--	--	--	--	--	41.00
239	--	--	--	--	--	--	--	--	14.00	--	--	--	--	--	35.00
240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	164.00
241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.00
243	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
Sum	21.00	0.00	0.00	0.00	0.00	0.00	0.00	21.00	91.00	21.00	21.00	0.00	0.00	0.00	1100.00

Route 57/46 Connector Study

	215	216	217	218	219	220	221	222	223	224	225	226	227	228	Sum
201	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
202	--	--	--	--	--	--	--	--	--	--	--	--	--	--	97.00
203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
204	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14.00
205	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
207	--	--	--	--	--	--	--	--	--	--	--	--	--	--	61.00
208	--	--	--	--	7.00	--	--	--	--	--	--	--	--	--	21.00
209	--	--	--	--	7.00	--	--	--	--	--	--	--	--	--	35.00
210	--	--	--	--	--	--	--	--	--	--	--	--	--	--	28.00
211	--	--	--	--	7.00	--	--	--	--	--	--	--	--	--	21.00
212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
214	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
215	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
216	--	--	--	--	--	--	--	--	--	--	7.00	--	--	--	42.00
217	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.00
218	--	--	--	7.00	7.00	--	--	--	--	--	7.00	--	--	--	275.00
219	--	--	--	--	--	--	--	--	--	--	--	--	--	--	42.00
220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
222	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
223	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.00
224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.00
225	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
226	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
227	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
228	--	--	--	7.00	--	--	--	--	--	--	--	--	--	--	7.00
229	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
231	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14.00
233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
237	--	--	--	--	--	--	--	--	--	--	7.00	--	--	--	49.00
238	--	--	--	--	--	--	--	7.00	--	--	--	--	--	--	41.00
239	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.00
240	--	--	--	--	--	--	--	--	--	--	7.00	--	--	--	164.00
241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
242	--	--	--	--	--	--	--	--	--	--	7.00	--	--	--	21.00
243	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
Sum	0.00	0.00	0.00	14.00	28.00	0.00	0.00	7.00	0.00	0.00	35.00	0.00	0.00	0.00	1100.00

Route 57/46 Connector Study

	229	230	231	232	233	234	235	236	237	238	239	240	241	242	Sum
201	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
202	--	20.00	14.00	--	14.00	7.00	--	--	--	--	--	--	--	7.00	97.00
203	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
204	--	--	--	7.00	--	--	--	--	--	--	--	--	--	--	14.00
205	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
207	--	27.00	--	--	27.00	--	--	--	--	--	--	--	--	--	61.00
208	--	--	--	7.00	--	--	--	--	--	--	--	7.00	--	--	21.00
209	--	--	7.00	7.00	--	--	--	--	--	--	--	--	--	--	35.00
210	--	14.00	--	--	--	--	--	--	--	--	--	--	--	--	28.00
211	--	7.00	--	7.00	--	--	--	--	--	--	--	--	--	--	21.00
212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
214	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00	7.00
215	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
216	--	--	--	--	7.00	--	--	--	--	--	--	--	--	7.00	42.00
217	--	7.00	--	--	14.00	--	--	--	--	--	--	--	--	7.00	35.00
218	7.00	34.00	7.00	20.00	14.00	14.00	7.00	--	--	--	--	--	7.00	34.00	275.00
219	--	7.00	--	7.00	7.00	--	--	--	--	--	--	7.00	--	--	42.00
220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
222	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
223	--	--	--	7.00	--	--	--	--	--	--	--	--	--	--	21.00
224	--	--	7.00	7.00	7.00	--	--	--	--	--	--	--	--	--	35.00
225	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
226	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
227	--	--	--	--	7.00	--	--	--	--	--	--	--	--	--	7.00
228	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
229	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
231	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
232	--	--	--	--	--	7.00	--	--	--	--	--	--	--	--	14.00
233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00
237	--	--	--	7.00	7.00	--	7.00	--	--	--	--	--	--	7.00	49.00
238	--	20.00	--	--	--	--	--	--	--	--	--	--	--	--	41.00
239	--	7.00	--	--	--	7.00	--	--	--	--	--	--	--	--	35.00
240	--	7.00	--	14.00	27.00	27.00	7.00	--	--	--	--	--	--	14.00	164.00
241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
242	--	--	--	7.00	--	--	--	--	--	--	--	--	--	--	21.00
243	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00
Sum	7.00	150.00	35.00	97.00	131.00	62.00	21.00	0.00	0.00	0.00	0.00	14.00	7.00	83.00	1100.00

OD MATRIX (WEEKEND)

	243	244	Sum
201	--	--	7.00
202	--	7.00	97.00
203	--	--	0.00
204	--	7.00	14.00
205	7.00	--	7.00
206	--	--	0.00
207	--	7.00	61.00
208	--	--	21.00
209	14.00	--	35.00
210	--	7.00	28.00
211	--	--	21.00
212	--	--	0.00
213	--	--	0.00
214	--	--	7.00
215	--	--	0.00
216	7.00	--	42.00
217	--	--	35.00
218	54.00	14.00	275.00
219	7.00	--	42.00
220	--	--	0.00
221	--	--	0.00
222	--	--	0.00
223	--	--	21.00
224	14.00	--	35.00
225	7.00	--	7.00
226	--	--	0.00
227	--	--	7.00
228	--	--	7.00
229	--	--	0.00
230	--	--	0.00
231	--	--	0.00
232	--	--	14.00
233	--	--	0.00
234	--	--	0.00
235	--	--	0.00
236	--	--	7.00
237	--	--	49.00
238	7.00	--	41.00
239	7.00	--	35.00
240	34.00	27.00	164.00
241	--	--	0.00
242	--	7.00	21.00
243	--	--	0.00
Sum	158.00	76.00	1100.00

Fri Oct 17 11:52:56 2003