

Traffic
Technical Environmental Study

June 2006

US Department of Transportation
Federal Highway Administration
New Jersey Department of Transportation

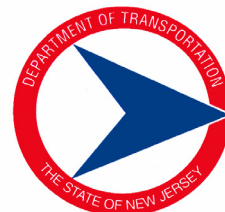


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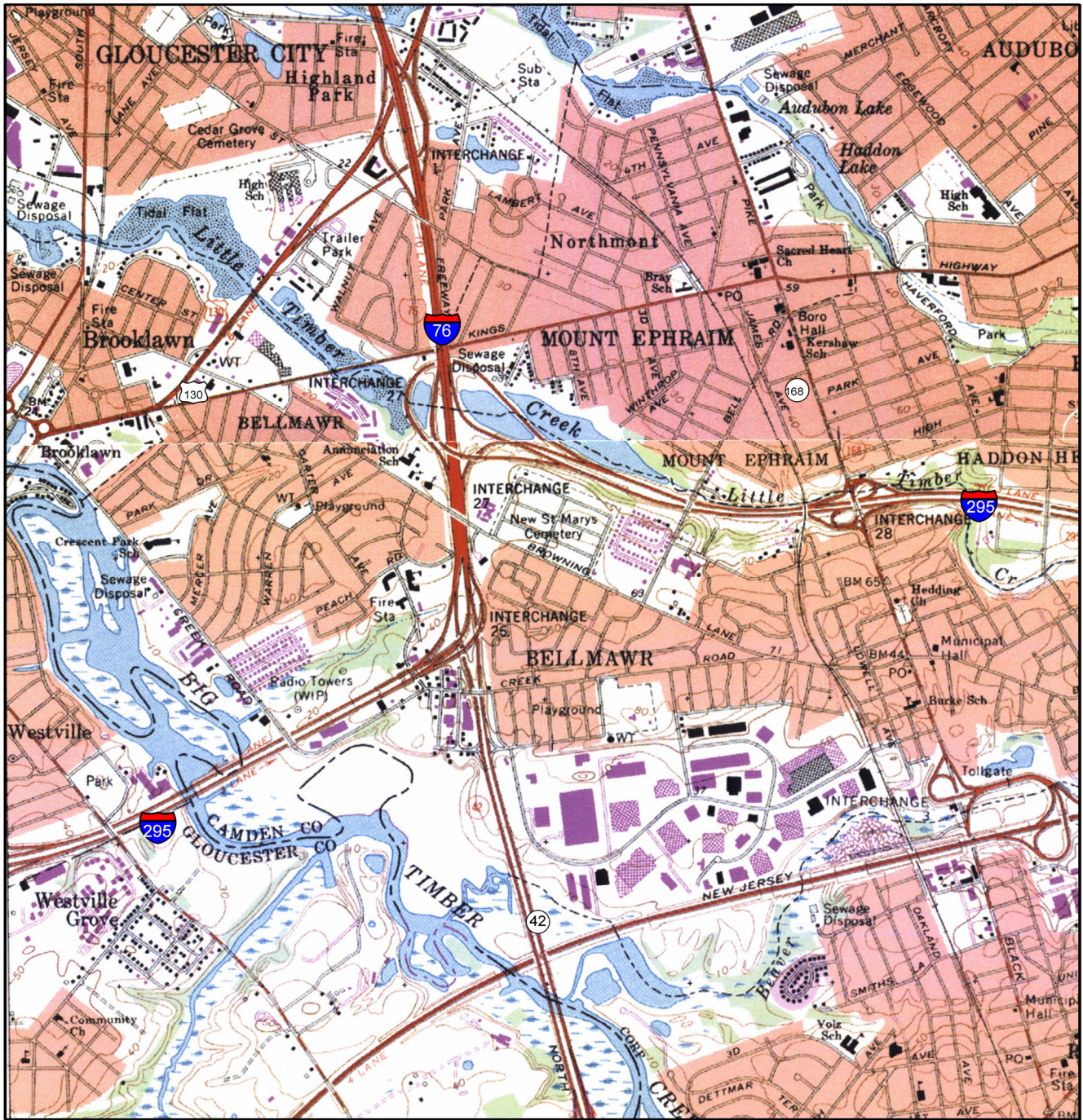
I. INTRODUCTION

Project Background

The I-295/I-76/Route 42 Direct Connection project involves the reconstruction of Interstate 295 (I-295), Interstate 76 (I-76), and New Jersey State Route 42 (Route 42) and affected roadway segments traversing the Boroughs of Bellmawr and Mount Ephraim, and Gloucester City, Camden County. The existing interchange, which was constructed between 1958 and 1961, is insufficient to accommodate current traffic volumes and travel speeds safely, resulting in an accident rate that is considerably more than the statewide average. Additionally, failing levels of service on the interchange ramps, combined with the congestion of local streets, adversely affects the quality of life in the surrounding communities.

Along the Route 42/I-76 corridor, the study area extends from the southerly limit of Route 42 at Leaf Avenue, Mile Post (M.P.) 13.82, north to where Route 42 ends at M.P. 14.28 and merges with I-295 at M.P. 26.79. The I-295 corridor includes a short section of I-295 from M.P. 26.79 to M.P. 26.96 before I-295 continues north following Ramp A. Additionally, the I-76 section of the project begins at M.P. 0.00 and continues to the northerly limit just south of Crescent Boulevard (Route 130) over I-76 at M.P. 1.15. Along I-295, the study area extends from the southerly limit of Creek Road (CR 753) over I-295 (M.P. 26.03), to the merge with Route 42 (M.P. 26.79), and continues north to M.P. 28.16, where Black Horse Pike (Route 168) crosses over I-295.

Figure 1 provides a location map of the project area.



SOURCE:

- Camden, NJ-PA
 USGS 7.5 Minute Quadrangle
 1967, Revised 1994
- Runnemede, NJ
 USGS 7.5 Minute Quadrangle
 1964, Revised 1994

0 1,000 2,000 4,000
 Feet



NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
 Direct Connection
 Camden County

Figure 1
 Project Location Map

Dewberry-Goodkind, Inc.

Purpose of the Traffic Report

This Traffic Report presents the methodologies used to develop Design Year (2030) traffic volume data for both the No Build and the Build scenarios and for the conditions where the I-295/Route 42 Missing Moves ramps are assumed to either be present or not present in the base network. It also describes the evaluation procedure used to compare the operational efficiencies among the five interchange design alternatives, as well as the results of those comparisons.

The basis for year 2030 traffic projections under the Draft Traffic Report, documented by Urbitran Associates in a Technical Memorandum dated July 8, 2003, was based on growth rates derived from a pre-existing 22-county regional highway model developed in 2002 for the Penns Neck EIS. That model was built using the latest North Jersey Transportation Planning Authority (NJTPA) and Delaware Valley Regional Planning Commission (DVRPC) highway networks and demographic data and projections that were available at the time. Urbitran made some corrections and adjustments to the 22-county model to configure a subarea travel demand model that had more accurate roadway and traffic features for the specific Project area.

For this release of the I-295/I-76/Route 42 Interchange Traffic Report, it was decided in consultation with NJDOT to obtain and use an updated version of the DVRPC model, which reflects the current DVRPC-adopted Year 2025 demographic projections. Within Burlington, Camden, and Gloucester Counties, the new DVRPC population and employment projections show higher growth within the I-295 corridor (both north and south of I-76/NJ-42), as compared with the projections used in the 22-county model. Areas within these counties for which the population and/or employment projections have decreased significantly mostly lie away from the I-295 corridor.

As a result of these changes, the new travel forecasts for I-295 through traffic are substantially higher than in the prior projections. In addition, the Draft Traffic Report did not address the construction of the I-295/Route 42 Missing Moves which has now advanced into the design phase. Based on this, forecasts for both "With Missing Moves" and "With No Missing Moves" were developed.

Considerable details were added to the DVRPC highway network in the Project area, in order to better reflect capacity limitations imposed by individual ramps and intersections in this area. A highway trip assignment algorithm was then applied to assign the DVRPC vehicle trip tables to the modified network. This methodology had been successfully used on a number of recent studies in New Jersey and Pennsylvania taking into account the capacity limitations on affected roadways and intersections.

The remainder of this document presents:

- A. The base year (2000) data used to calibrate the highway assignment model used for this Project.
- B. The projection of Year 2030 peak hour No-Build and Build traffic volumes With the I-295 / Route 42 Missing Moves Project
- C. The projection of Year 2030 peak hour No-Build and Build traffic volumes With No_I-295 / Route 42 Missing Moves Project
- D. A discussion of the traffic-related benefits and impacts of the Project as estimated by the highway assignment model
- E. The Interchange Design Alternatives developed as part of the environmental screening process, and,
- F. A comparison of the traffic performance among the various Interchange Design Alternatives.

II. TRAFFIC FORECASTING METHODOLOGY AND RESULTS

A. TRAFFIC DATA COLLECTION (BASE CONDITION)

Field-Collected Traffic Counts and Travel Time Studies

In October 2000, an extensive traffic data collection effort was undertaken by A-Tech Engineers, Inc. to record current traffic flow conditions in the Interchange area. These field studies included the deployment of automatic traffic recorders (ATRs) on various sections of I-295 and I-76/Route 42 as well as their respective on-ramps for week-long count durations, manual turning movement counts at local intersections during the 7:00-9:00 AM peak hour and the 4:00-6:00 PM peak hour and travel time and delay studies along the mainline sections of freeways within the project area. The compiled traffic data are summarized in the Traffic Report Appendix, a separate document.

In one case, an inconsistency in A-Tech's ATR counts was found that was larger than the normal measurement error that one expects. The AM peak hour ATR count on the ramp from the westbound I-76 local roadway to northbound I-295 was 4993 vph. The ATR counts upstream and downstream of this ramp, however, suggest that the correct volume on this ramp should be in the 3600-3900 vph range. The ATR count on this ramp was ignored, and the ramp volume was imputed based on the upstream and downstream counts.

A similar situation occurred with the PM peak hour count on this same ramp, although the size of the discrepancy was not as great as with the AM peak hour. Again the ATR count was ignored and the ramp volume was imputed based on the upstream and downstream counts.

In addition, the PM counts were adjusted further because the ATR counts implied that the peak hour volume on the slip ramp from Ramp C to southbound NJ-42 was 2570 vph, an unrealistic volume for a one-lane ramp. Based on a spot count taken at the site, this volume was reduced to 1820 vph, and the PM peak hour flows were re-balanced.

The resulting Year 2000 flows, which are rounded to the nearest 10 vehicles, are shown in **Figures 2** and **3** for the AM and PM peak hours respectively. Traffic in the study area flows primarily toward Philadelphia during the AM peak and away from Philadelphia during the PM peak.

FIGURE 2

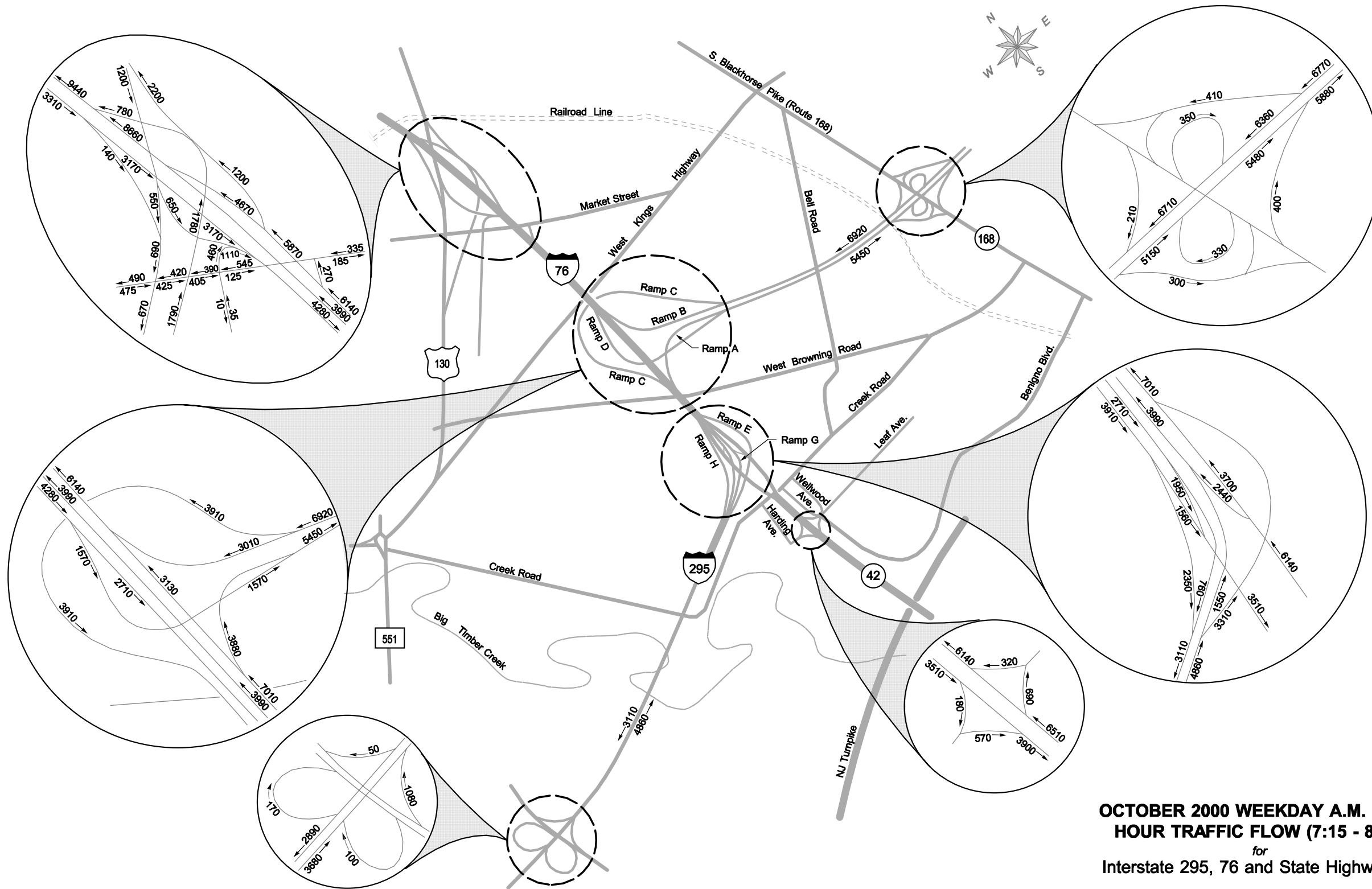
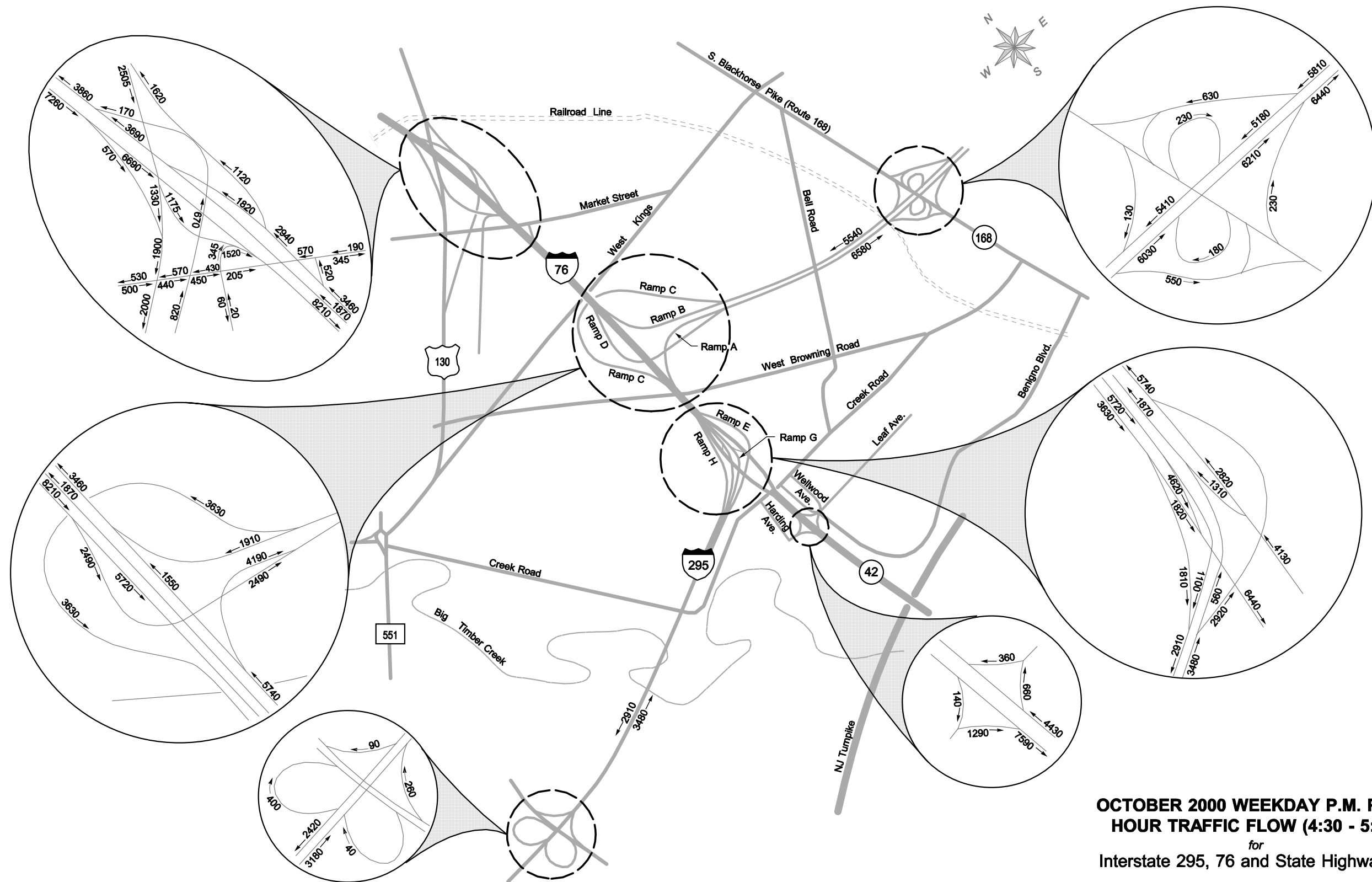


FIGURE 3



Aerial Survey

Also in October 2000, Skycomp conducted an aerial survey for the purpose of collecting data for specified traffic movements, volumes, and vehicle classification during morning and afternoon peak periods. The following procedures were used to obtain data on the main interchange:

- **Origin–Destination:** With the exception of two designated origins, vehicles entering the main interchange did not “mix” with vehicles from another origin. In these cases, vehicles were identified at the destination(s); therefore, O&D data were obtained without having to track vehicles through the interchange. Northbound vehicles from I-295 (local) and NJ 42 (local) shared northbound lanes in the interchange with destination options of northbound I-295 or northbound I-76. Tracking vehicles through the interchange was required to obtain O&D data for these two origins.
- **Flow Rates:** Flow Rates were obtained by identifying all vehicles for a given origin or destination in a specified time period.
- **Vehicle Classification:** Vehicles for a given origin or destination were classified as cars, trucks, tractor-trailers or buses. Classification percentages were calculated from these data.

SkyComp data can be found in the Traffic Report Appendix, a separate document. A summary of the aerial survey results is shown below.

Origin & Destination : I-295 NB (Local) and Route 42 NB (Local)

MORNING SUMMARY	
Origin I-295 NB (Local)	
Percentage of I-76 WB originating from I-295 NB (Local)	18%
Percentage of vehicles from I-295 NB (Local) to I-76 WB	17%
Percentage of vehicles from I-295 NB (Local) to I-295 NB	83%
Origin Route 42 NB (Local)	
Percentage of I-76 WB originating from Route 42 NB (Local)	82%
Percentage of vehicles from Route 42 NB to I-76 WB	56%
Percentage of vehicles from Route 42 NB to I-295 NB	44%

EVENING SUMMARY	
Origin I-295 NB (Local)	
Percentage of I-76 WB originating from I-295 NB (Local)	21%
Percentage of vehicles from I-295 NB (Local) to I-76 WB	15%
Percentage of vehicles from I-295 NB (Local) to I-295 NB	85%
Origin Route 42 NB (Local)	
Percentage of I-76 WB originating from Route 42 NB (Local)	79%
Percentage of vehicles from Route 42 NB to I-76 WB	50%
Percentage of vehicles from Route 42 NB to I-295 NB	50%

Video Counts

Manual classification counts using portable video cameras were performed on I-76 at the interchange with Market Street and on Route 42 at the interchange with the New Jersey Turnpike for the purpose of determining vehicle classifications. The classifications that were used were passenger cars/light trucks, medium trucks (6 wheels), heavy trucks (tractor trailers), buses, and motorcycles. Counts were performed as follows:

- I-76 Wednesday 5/10/00 from 7:00-8:00 A.M.
 Thursday 5/11/00 from 4:00-6:00 P.M., and
 Sunday 8/20/00 from 2:00-6:00 P.M.
- Route 42 Friday 5/12/00 from 6:45-8:45 A.M.
 Friday 5/12/00 from 4:00-6:00 P.M.
 Tuesday 5/9/00 from 7:00-8:00 A.M.
 Tuesday 5/9/00 from 4:30-6:30 P.M.
 Sunday 8/27/00 from 2:15-6:15 P.M., and
 Friday 8/25/00 from 3:00-7:00 P.M.

NJDOT Video Count Data can be examined in the Traffic Report Appendix, a separate document. A summary of the data compiled from the video study is presented below.

Vehicle Classification Data from Video Study

Location: I-76 at Market Street Vicinity	Passenger Cars & Light Trucks	Medium Trucks	Heavy Trucks	Buses	Motor cycles
Wednesday, 5/10/00, 7-8AM					
Northbound	96.5	1.2	1.7	0.6	0.0
Southbound	92.0	4.0	3.2	0.7	0.1
Thursday, 5/11/00, 4-6PM					
Northbound	94.6	2.3	2.0	0.9	0.2
Southbound	95.7	1.8	1.9	0.4	0.2
Sunday, 8/20/00, 2-6PM					
Northbound	98.6	0.4	0.3	0.2	0.5
Southbound	97.8	0.7	0.6	0.5	0.4

Location: Route 42 at NJ Turnpike Vic.	Passenger Cars & Light Trucks	Medium Trucks	Heavy Trucks	Buses	Motor cycles
Tuesday, 5/9/00, 7-8AM					
Northbound	96.2	2.0	1.1	0.6	0.1
Southbound	93.9	3.8	1.3	0.9	0.1
Tuesday, 5/9/00, 4:30-6:30PM					
Northbound	93.2	2.6	2.6	1.2	0.4
Southbound	98.4	0.5	0.7	0.3	0.1
Friday, 5/12/00, 6:45-8:45AM					
Northbound	96.8	1.3	1.5	0.4	0.0
Southbound	89.3	4.5	4.9	1.2	0.1
Friday, 5/12/00, 4-6PM					
Northbound	94.5	2.8	1.9	0.7	0.1
Southbound	97.7	1.0	0.9	0.3	0.1
Friday, 8/25/00, 3-7PM					
Northbound	93.1	4.0	1.8	0.9	0.2
Southbound	96.7	2.1	0.7	0.3	0.2
Sunday, 8/27/00, 2:15-6:15PM					
Northbound	98.2	0.6	0.2	0.4	0.6
Southbound	98.0	0.6	0.2	0.5	0.7

Bus Count Data

Bus volumes were collected for the Route 42/I-76 Freeway in order to analyze the need for dedicated bus lanes within the interchange. Data was collected from NJ Transit and NJDOT Videos.

The NJ Transit data included Westbound I-76 buses volumes bound for Walt Whitman and Ben Franklin Bridges. Volumes were available for March of 2002 and July of 2002. The highest fifteen hourly volumes were determined and compiled. Videotapes provided by NJDOT were analyzed and bus volumes were counted for both westbound and eastbound I-76 at milepost 0.0. The tapes contained footage from July 2002 and August 2002 for P.M. peak hours.

Data from both NJ Transit and NJDOT videos can be found in the Traffic Report Appendix, a separate document. While the AM weekday data showed a relatively low volume of buses (18-21) using the Walt Whitman and Ben Franklin Bridges and traveling on Route 42/I-76 freeways, the PM data showed a range of 36 buses during a typical weekday to 61 buses during a Saturday evening.

Origin and Destination (O-D) Survey

This section presents the results of an origin-destination survey for vehicles using the interchange between three expressways, I-295, I-76 and NJ-42, in Camden County, New Jersey. It was undertaken to gain a clearer understanding of people's travel patterns when they use this Interchange---i.e. on what roadway or ramp do they enter the Interchange area and on what roadway or ramp do they exit? This information is valuable in properly accounting for the volume of traffic whose routes may change (from existing) depending on proposed revised Interchange designs. The study area also included ramps to and from nearby local routes NJ-168, US-130, Market Street and Leaf Avenue. The purpose of this survey was to collect data to be used in the evaluation of alternative configurations for a new the interchange. In particular, weaving volumes at certain sections had to be quantified. The results are presented for the 7:15 to 8:15 AM weekday peak hour. An O-D matrix was subsequently generated.

The origin and destination surveys were conducted at the following roadway sections:

Origins:

- Southbound I-295
 - Mainline Before Entrance from Northbound NJ-168
 - On-Ramp from Northbound NJ-168
 - On-Ramp from Southbound NJ-168
- Northbound I-295
 - Mainline before Exit to Westbound I-76 Express Lanes
- Eastbound I-76
 - Mainline before Entrance from Southbound US-130/Market Street
 - On-Ramp from Southbound US-130/Market Street
- Northbound NJ-42
 - Mainline before Entrance from Westbound Leaf Avenue
 - On-Ramp from Westbound Leaf Avenue

Destinations:

- Northbound I-295
 - Mainline after Exit to NJ-168
 - Off-Ramp to NJ-168
- Southbound I-295
 - Mainline after Entrance from Eastbound I-76
- Westbound I-76
 - Express Lanes after Entrance from Northbound I-295
 - Local Lanes after Exit to Northbound US-130
 - Off-Ramp to Northbound US-130
 - Off-Ramp to Market Street
- Southbound NJ-42
 - Mainline after Exit to Westbound Leaf Avenue
 - On-Ramp to Westbound Leaf Avenue

Survey Procedure

The survey procedure involved the recording of license plates at specific locations and then matching them to determine origin-destination pairs. License plates were recorded either by audio tape recorder or video camera. Generally, audio tape recording was performed at low speed ramps, with two surveyors for each lane of traffic. Video recording was performed at high speed mainline sections, with one camera for each lane of traffic. At some locations, only manual vehicle counts were performed without recording license plates.

The survey was conducted on Thursday, May 27th, 2004 between 6:45 and 8:45 AM. The audio tape recorder, video camera and vehicle count locations are shown in **Figure 4**. Each location is listed below:

Audio Tape Recorder Locations:

- A1: Ramp from Northbound NJ-168 to Southbound I-295 (2 surveyors)
- A2: Ramp from Southbound NJ-168 to Southbound I-295 (2 surveyors)
- A9: Ramp from Northbound I-295 to NJ-168 (4 surveyors)
- A10: Ramp from Southbound US-130 and Market Street to Eastbound I-76 (4 surveyors)
- A13: Ramp from Southbound NJ-42 to Westbound Leaf Avenue
- A14: Ramp from Westbound Leaf Avenue to Northbound NJ-42
- A18: Ramp from Westbound I-76 Local Lanes to Market Street (2 surveyors)

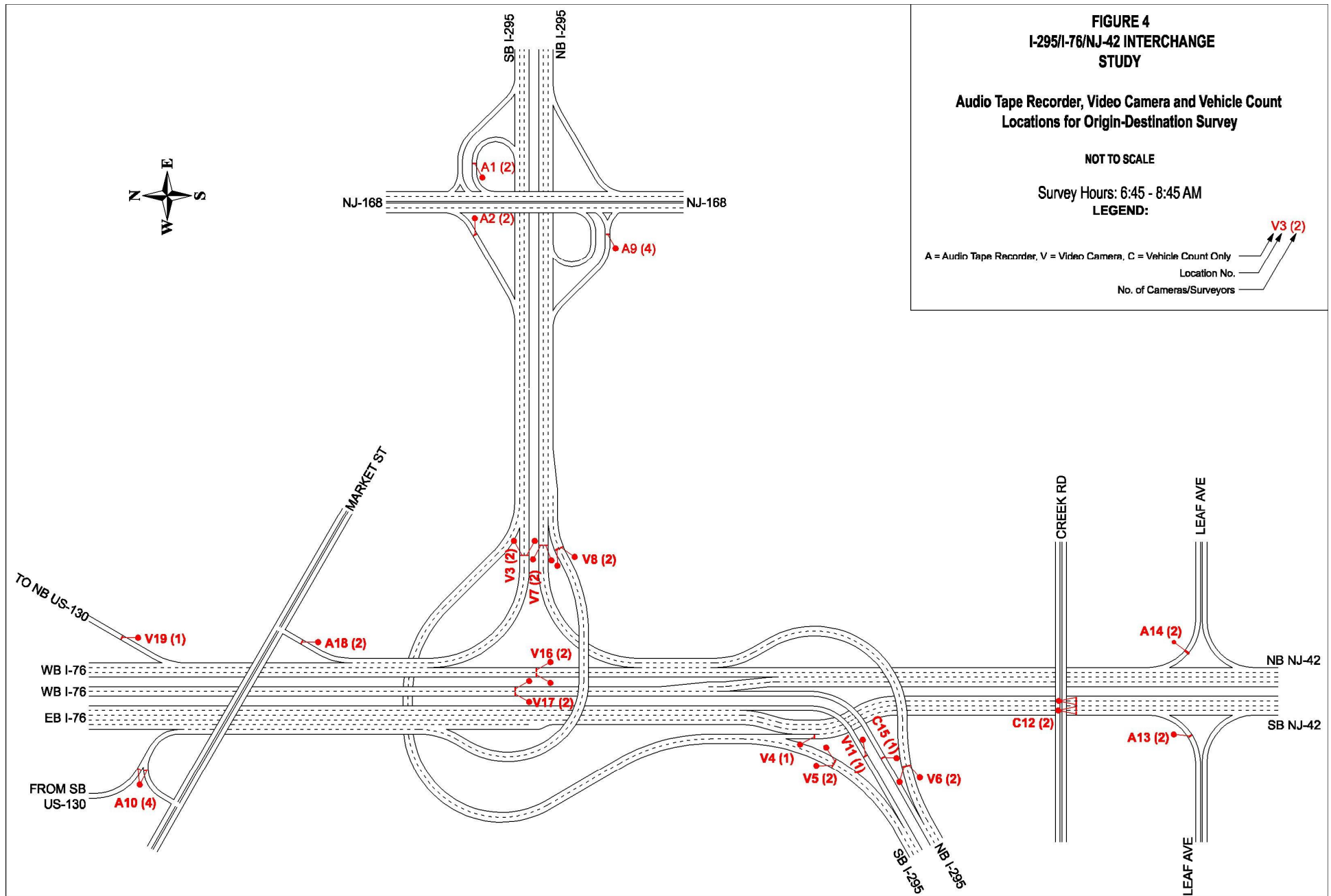
Video Camera Locations:

- V3: Ramp from Southbound I-295 to Westbound I-76 Local Lanes (2 cameras)
- V4: Ramp from Southbound I-295 to Southbound NJ-42 (1 camera)
- V5: Southbound I-295 Mainline between Exit to Southbound NJ-42 and Entrance from Eastbound I-76 (2 cameras)
- V6: I-295 Mainline after Exit to Westbound I-76 Express Lanes (2 cameras)
- V7: Northbound I-295 before Entrance from Eastbound I-76 (2 cameras)
- V8: Ramp from Eastbound I-76 to Northbound I-295 (2 cameras)
- V11: Ramp from Eastbound I-76 to Southbound I-295 (1 camera)
- V16: Westbound I-76 Local Lanes between Exit to Northbound I-295 and Entrance from Southbound I-295 (2 surveyors)
- V17: Westbound I-76 Express Lanes between Exit to Northbound I-295 and Entrance from Southbound I-295

Vehicle Count Locations (Supplement)

- C12: Southbound NJ-42 before Exit to Westbound Leaf Avenue from Creek Road Overpass (2 surveyors)
- C15: Ramp from Northbound I-295 to Westbound I-76 Express Lanes

The audio and video recordings of license plates were transcribed and matched for all possible study location pairs. Each origin-destination pair was then determined for the peak hour of 7:15 to 8:15 AM.



Traffic Observations

Based on the automatic traffic recorders (ATR) data collected in October 2000, the typical weekday peak hours for the interchange were found to be 7:15 – 8:15AM and 4:30 – 5:30PM.

Traffic volumes for the weekday AM peak are shown in **Figure 5**. This flow map presents “balanced” traffic volumes for the study area, but does not provide origin-destination information. **Table 1** presents the weekday AM peak hour trip matrix that shows the origin-destination pairs for every vehicle entering and leaving the study area. Highlights of the findings are summarized below:

1. A total of 21,275 vehicles passed through the study area.
2. The sections that carried the highest per lane volumes are:
 - Westbound I-76 local lanes between the exit to Market Street and the exit to Northbound US-130 carried 6224 vehicles per hour (vph) in three lanes.
 - The mainline connecting Northbound NJ-42 to the Westbound I-76 local lanes before the merge with Northbound I-295 carried 4072 vph in two lanes.
 - Southbound I-295 carried 5399 vph between the exit to NJ-168 and the entrance from Northbound NJ-168, 5790 vph between the entrance from Northbound NJ-168 and the entrance from Southbound NJ-168, and 6005 vph between the entrance from Southbound NJ-168 and the exit to Westbound I-76. All sections are three lanes.
 - Westbound I-76 local lanes between the exit to Northbound I-295 and the entrance from Southbound I-295 carried 3740 vph in two lanes.
 - The four lane roadway between the merge of Northbound NJ-42 and Northbound I-295 and the diverge of Westbound I-76 and Northbound I-295 carried 7129 vehicles.
3. Critical weaving sections include:
 - Of the 391 vph from Northbound NJ-168 that merged with the 5399 vph on the Southbound I-295 mainline, 194 were destined to the left-handed Westbound I-76 exit, a move that requires moving one lane to the left within 3500 feet after merging. The remaining 197 vph were destined to Southbound I-295 or Southbound NJ-42, a move requiring no lane changes.
 - Of the 215 vph from Southbound NJ-168 that merged with the 5790 vph on the Southbound I-295 mainline, 35 were destined to the left-handed Westbound I-76 exit, a move that requires moving one lane to the left within 2500 feet after merging. The remaining 180 were destined to Southbound I-295 or Southbound NJ-42, a move requiring no lane changes.
 - Of the 345 vph that exited to NJ-168 from the Northbound I-295 mainline, 180 originated from Northbound NJ-42 or Northbound I-295, a move that requires moving one lane to the right within 2500 feet before exiting. The remaining 165 originated from Eastbound I-76, a move requiring no lane changes, but a neckdown from two lanes to one.
 - There is an 850 foot four-lane section where two lanes from Northbound NJ-42 on the left join two lanes from Northbound I-295 on the right. They diverge to two lanes to Westbound I-76 on the left and two lanes to Northbound I-295 on the right. Of the 4072 vph that entered this section from the left, 1111 weaved to the right. Of the 1111 vph that weaved to the right, 55 originated from the 289 vph Leaf Avenue entrance. Of the 3057 vph that entered from the right, 779 weaved to the left. Of the 779 vph that weaved to the left, 286 exited at Market Street or US-130. The remaining 493 could have avoided the weave by using to the express lanes of Westbound I-76.

FIGURE 5
I-295/I-76/NJ-42 INTERCHANGE STUDY
Flow Map
WEEKDAY AM PEAK HOUR 7:15-8:15 TRAFFIC VOLUMES

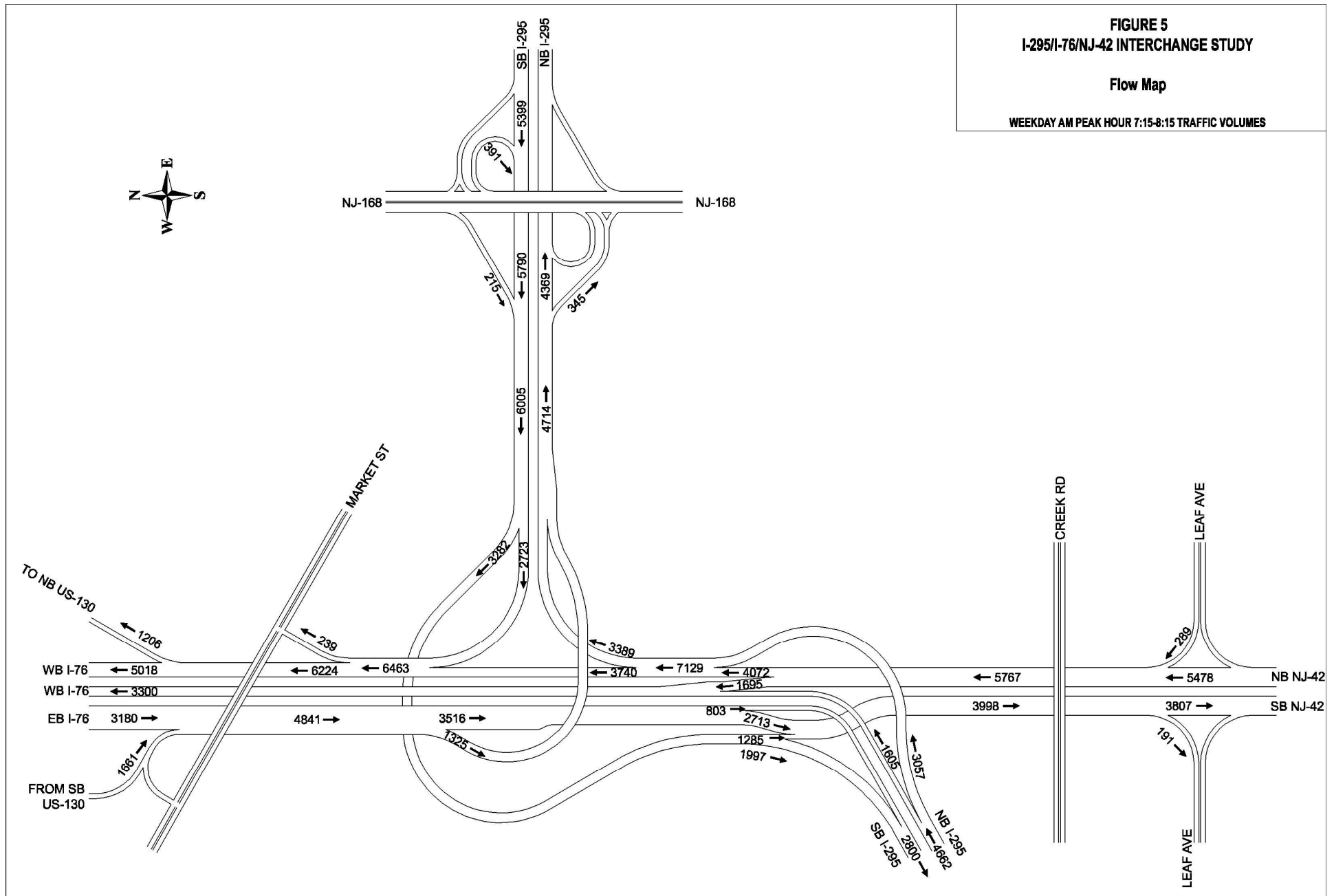


TABLE 1
I-295/I-76/NJ-42 INTERCHANGE STUDY
ORIGIN-DESTINATION RESULTS
WEEKDAY AM PEAK HOUR 7:15-8:15

Vehicles per Hour (% of Origins)
(% of Destinations)

Destinations Origins		NB I-295		SB I-295	WB I-76				SB NJ-42		ORIGIN TOTALS
		Mainline After Exit to NJ-168	Off-Ramp to NJ-168	Mainline After Entrance from Eastbound I-76	Express Lanes After Entrance from NB I- 295	Local Lanes After Exit to NB US-130	Off Ramp to NB US- 130	Off Ramp to Market Street	Mainline After Exit to Westbound Leaf Ave	Off-Ramp to Westbound Leaf Ave	
SB I-295	Mainline Before Entrance from NB NJ-168			32.6% 1,761		42.1% 2,272	2.0% 110	2.1% 112	20.0% 1,079	1.2% 65	100.0% 5,399
			62.9%		45.3%	9.1%	46.9%	28.3%	34%	25.4%	
	On Ramp from NB NJ-168			37.3% 146		45.0% 176	1.3% 5	3.3% 13	12.8% 50	0.3% 1	100.0% 391
			5.2%		3.5%	0.4%	5.4%	1.3%	0.5%	1.8%	
	On Ramp from SB NJ-168			41.9% 90		12.1% 26	2.8% 6	1.4% 3	41.9% 90	0.0% 0	100.0% 215
			3.2%		0.5%	0.5%	1.3%	2.4%	0.0%	1.0%	
NB I-295	Mainline before Exit to Westbound I- 76 Express Lanes	46.5% 2,166	2.4% 112		34.4% 1,605	10.6% 493	5.1% 240	1.0% 46			100.0% 4,662
		49.6%	32.5%		48.6%	9.8%	19.9%	19.2%			21.9%
EB I-76	Mainline Before Entrance from US-130/Market Street	26.8% 852	5.1% 163	19.4% 617					45.6% 1,450	3.1% 98	100.0% 3,180
		19.5%	47.2%	22.0%					38.1%	51.3%	14.9%
	On Ramp from SB US- 130/Market Street	18.5% 308	0.1% 2	11.2% 186					68.5% 1,138	1.6% 27	100.0% 1,661
		7.0%	0.6%	6.6%					29.9%	14.1%	7.8%
NB NJ-42	Mainline Before Entrance from Westbound Leaf Avenue	18.1% 989	1.2% 67		30.2% 1,656	34.6% 1,896	15.0% 819	0.9% 51			100.0% 5,478
		22.6%	19.4%		50.2%	37.8%	67.9%	21.3%			25.7%
	On-Ramp from Westbound Leaf Ave	18.7% 54	0.3% 1		13.5% 39	53.6% 155	9.0% 26	4.8% 14			100.0% 289
		1.2%	0.3%		1.2%	3.1%	2.2%	5.9%			1.4%
DESTINATION TOTALS		20.5% 4,369	1.6% 345	13.2% 2,800	15.5% 3,300	23.6% 5,018	5.7% 1,206	1.1% 239	17.9% 3,807	0.9% 191	100.0% 21,275
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

- Of the 191 vph that exited Southbound NJ-42 at Leaf Avenue, 125 originated from Eastbound I-76, a move that requires moving one lane to the right within 1900 feet before exiting. The remaining 66 originated from Southbound I-295, a move requiring no lane changes.
- Of the 239 vph that exited to Market Street from the Westbound I-76 local lanes, 111 vph originated from Northbound NJ-42 or Northbound I-295, a move that requires moving two lanes to the right within 1150 feet. The remaining 128 originated from Southbound I-295, a move requiring no lane changes.
- Of the 1206 vph that exited to Northbound US-130 from the Westbound I-76 local lanes, 1085 vph originated from Northbound NJ-42 or Northbound I-295, a move that requires moving one lane to the right within 2550 feet. The remaining 121 originated from Southbound I-295, a move requiring no lane changes.
- Of the 1661 vph from Southbound US-130/Market Street that merged with the 3180 vph on the Eastbound I-76 mainline, 1351 were destined to Southbound NJ-42 or Southbound I-295, a move that requires moving one lane to the left within 2300 feet, then moving another lane to the left within another 1000 feet as the right lane drops. The remaining 310 were destined to Northbound I-295, a move requiring no lane changes.

B. TRAVEL FORECASTS WITH THE MISSING MOVES PROJECT

The highway assignment model was calibrated to the traffic volumes compiled for year 2000 by employing a TP+-based “adaptable assignment” process to assign the DVRPC vehicle trip tables (2-hour AM peak period and 3-hour PM peak period). This process develops “correction matrices” for the AM and PM peak periods. These matrices (also known as “delta tables”) yield trip tables which, when assigned to the base year highway network, result in assigned peak period traffic volumes that closely match the peak hour counts. The modeled AM peak hour volumes were assumed to be 55 percent of the 2-hour AM peak period volumes, while the modeled PM peak hour volumes were assumed to be 35 percent of the 3-hour PM peak period volumes. The delta tables are then carried forward to the future-year traffic assignments.

Year 2030 Interchange Volumes

Year 2030 AM and PM peak hour volumes for the No-Build and Build scenarios were developed in 2 steps:

1. “Unconstrained” volumes were developed assuming no constraints to the capacities of the mainline highway sections leading to and from the Interchange.
2. The unconstrained volumes were then constrained to the existing capacities of the I-295 and I-76 mainline sections leading to and from the interchange. (Note: No constraint was used for Route 42 south of the Interchange.)

Unconstrained Forecast

Year 2000 and Year 2025 peak period trip tables were obtained from DVRPC. Twenty percent of the difference between the 2000 and 2025 tables was added to the 2025 tables to develop approximate peak period vehicle trip tables for the Year 2030.

The highway assignment algorithm within the project travel demand model was used to assign these trips (plus the “correction matrices” developed in the Year 2000 calibration) to future No-Build and Build highway networks. The results of these assignments were used to develop Year 2000-to-Year 2030 changes in peak hour flows through the Interchange, which were then applied to the Year 2000 observed volumes to develop estimated Year 2030 peak hour volumes.

Constrained Forecast

The traffic volume projections were then constrained as needed to ensure that the projected peak hour volumes on the highway sections leading to and from the Interchange do not exceed the maximum hourly capacities of these highway sections. These capacities were established as follows (refer to **Figure 6** for numbers of lanes):

- The highest per-lane hourly volume from the October 2000 count on these highway sections was found to occur during the AM peak on southbound I-295 between NJ-168 (Black Horse Pike) and the interchange. The observed volume on this 3-lane section was 6,920 vehicles per hour (VPH), or 2,307 vehicles per lane per hour (or 2,310 VPLPH, rounded). The 2,310 VPH value was assumed to be the maximum per-lane capacity for a freeway lane for one hour in this area. Thus capacities for sections of I-295 north and south of the interchange were set to 6,930 VPH in each direction. For sections of Route 42 south of the interchange, capacities were set to 9,240 VPH for 4 lanes in each direction. For I-76 north of US-130, capacities were set to 11,550 VPH for the 5 southbound 5 lanes and 13,860 VPH for the 6 northbound 6 lanes.
- The unconstrained AM and PM peak hour volumes were then reduced as needed to ensure that these roadway capacities were not exceeded. Wherever a constraint was applied, the reduction in volume was also applied to the upstream and downstream sections. At upstream entrances and downstream exits, volumes were reduced in proportion to the unconstrained volumes on the entrance/exit ramps and the mainline.

The results are shown in **Figures 7 and 8** for the No Build scenario, and in **Figures 9 and 10** for the Build scenario.

We note that, in developing the constrained volumes, no constraints were applied to exit ramp capacities that might exist due to conditions at local road intersections. Consequently, the constrained volumes may be somewhat conservative because the actual maximum volumes that can pass through the interchange could potentially be lower.

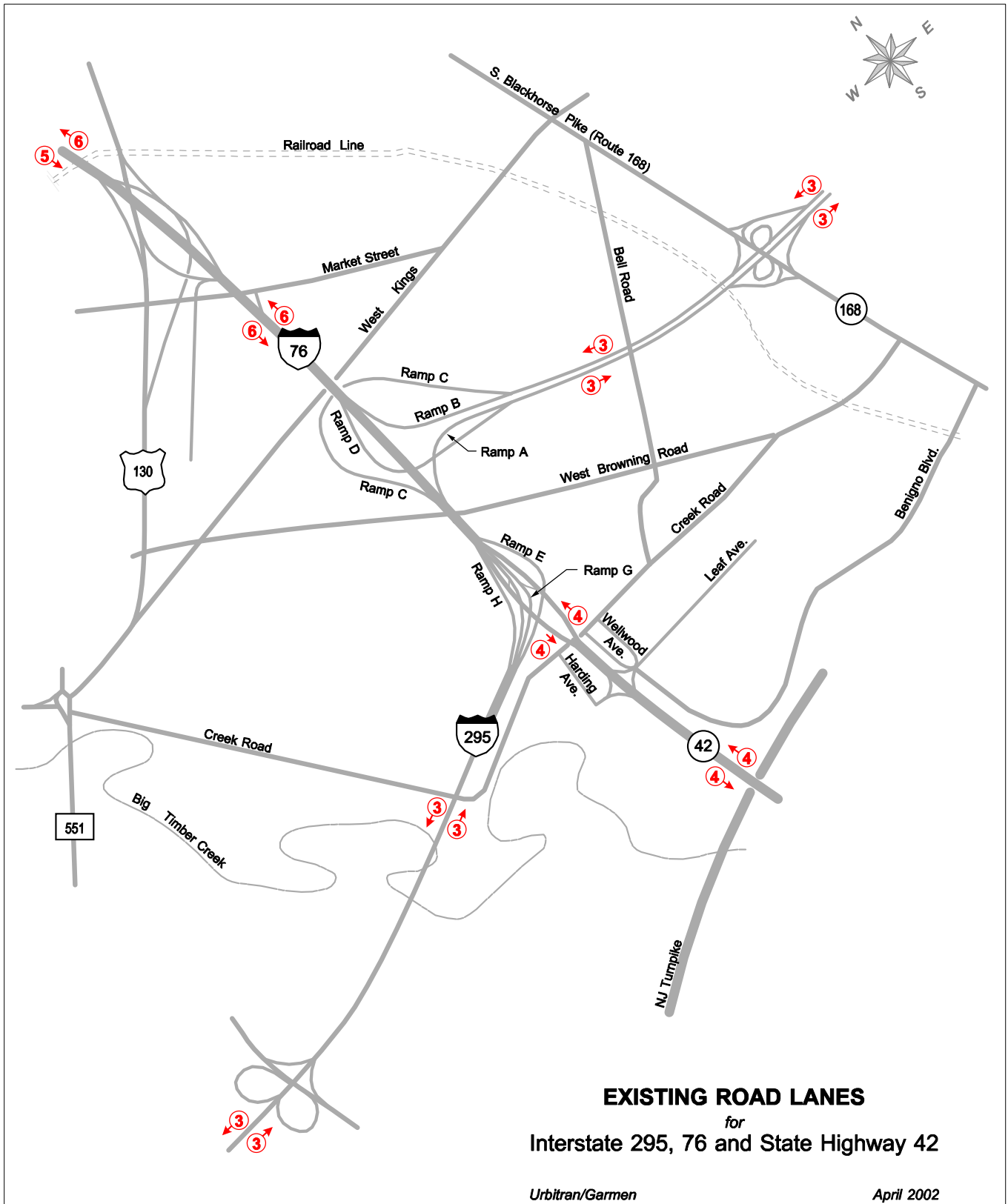
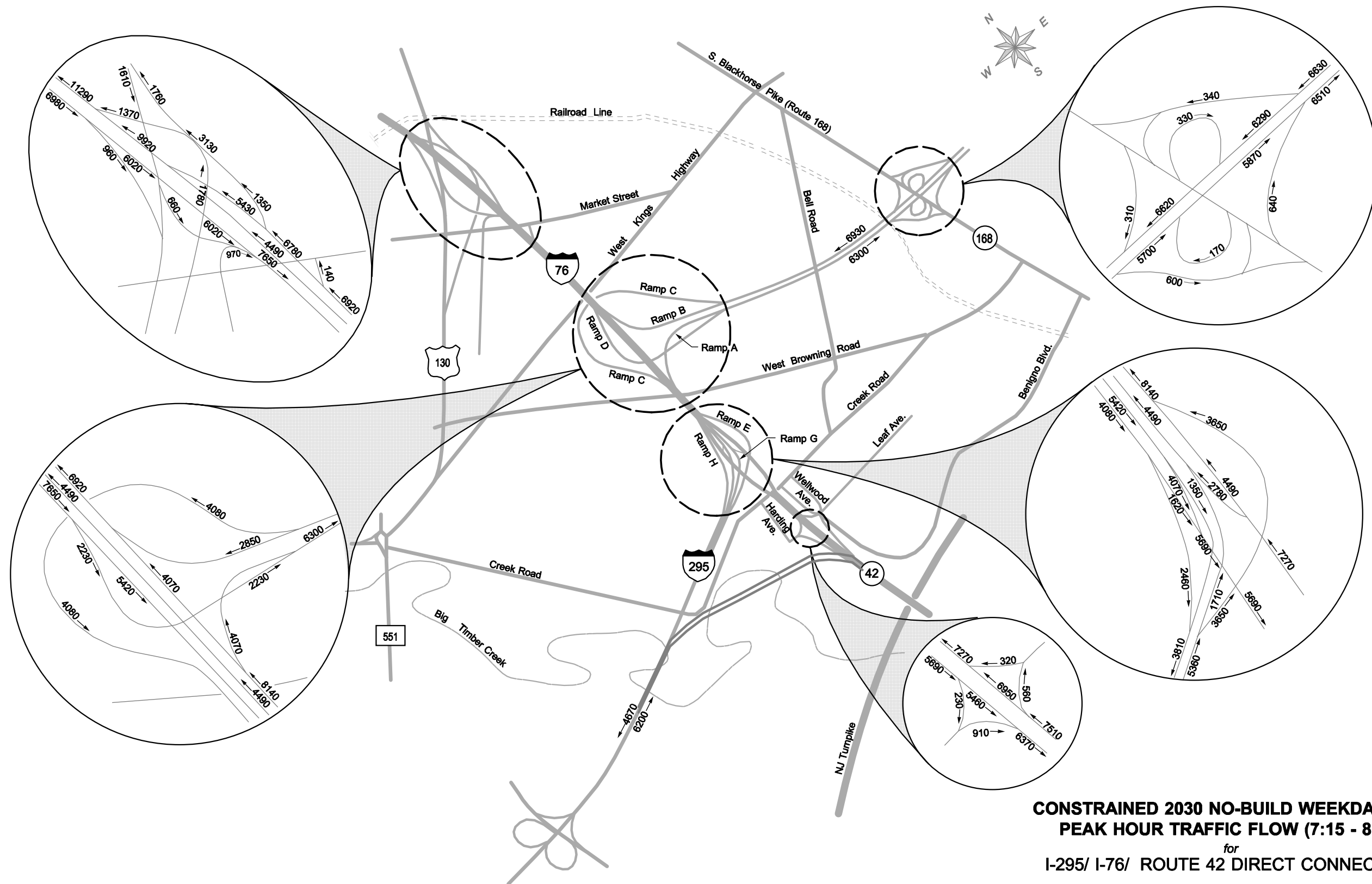


FIGURE 6

FIGURE 7



**CONSTRAINED 2030 NO-BUILD WEEKDAY A.M.
 PEAK HOUR TRAFFIC FLOW (7:15 - 8:15)**
 for
I-295/ I-76/ ROUTE 42 DIRECT CONNECTION

FIGURE 8

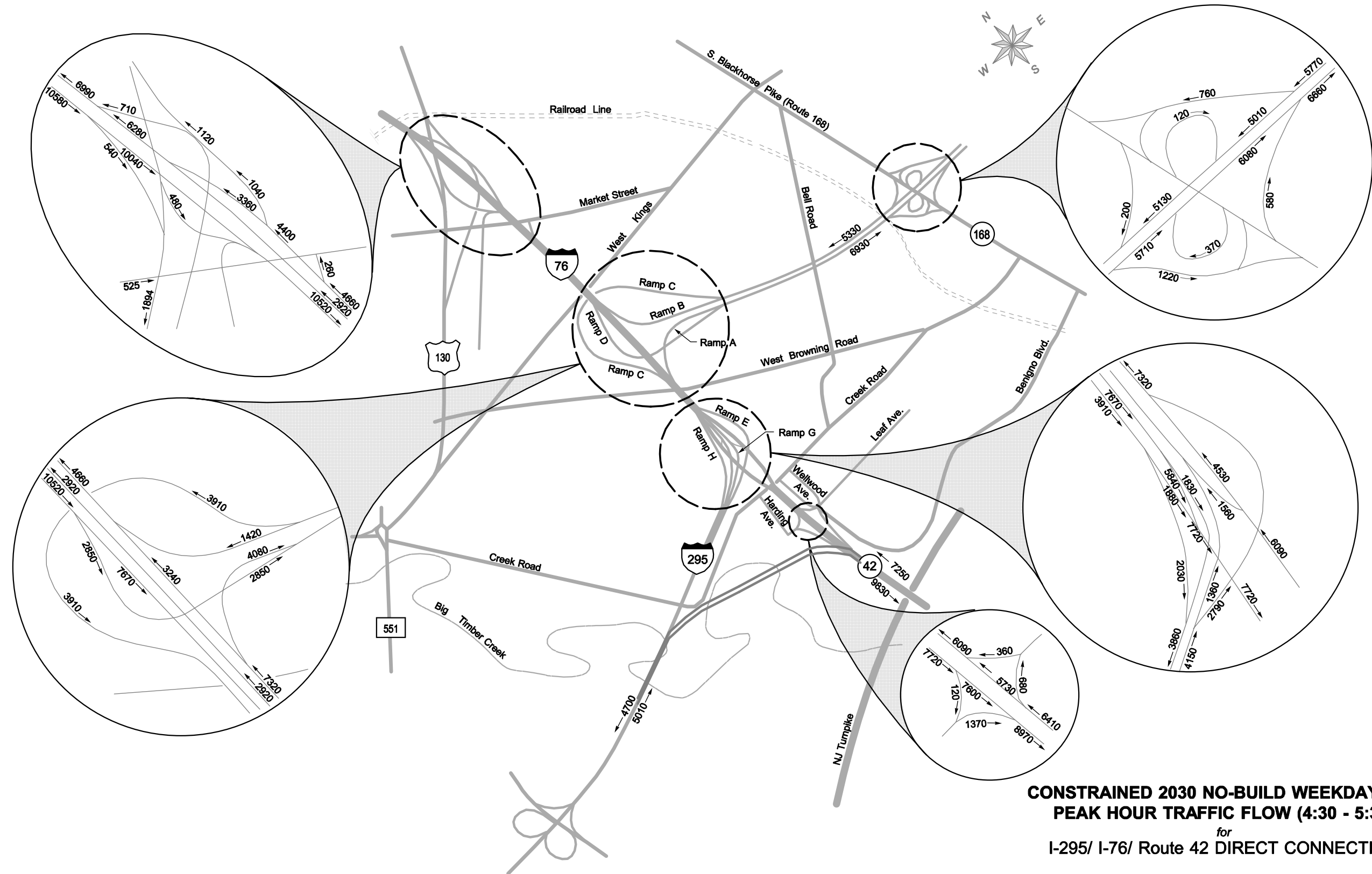


FIGURE 9

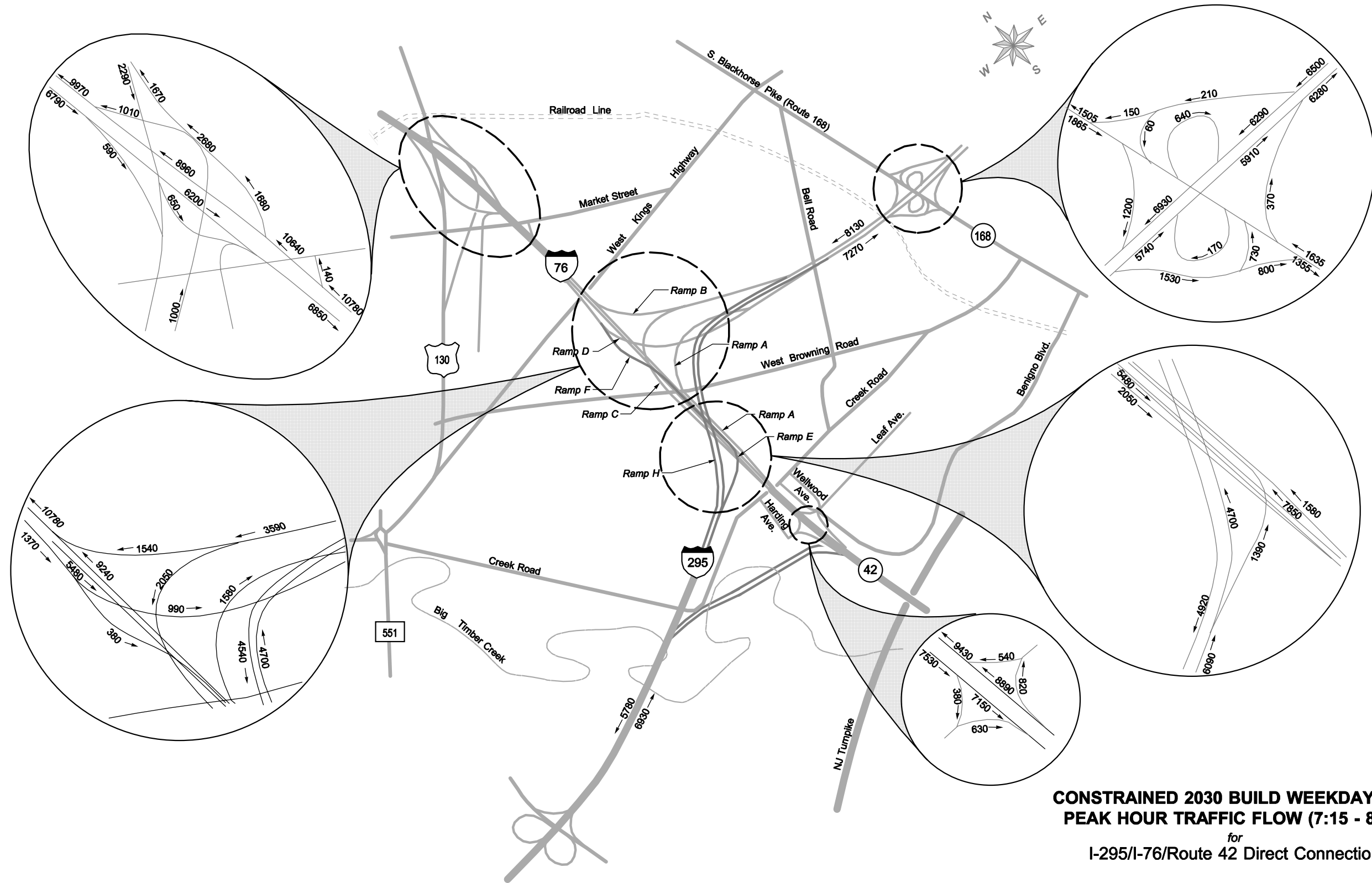
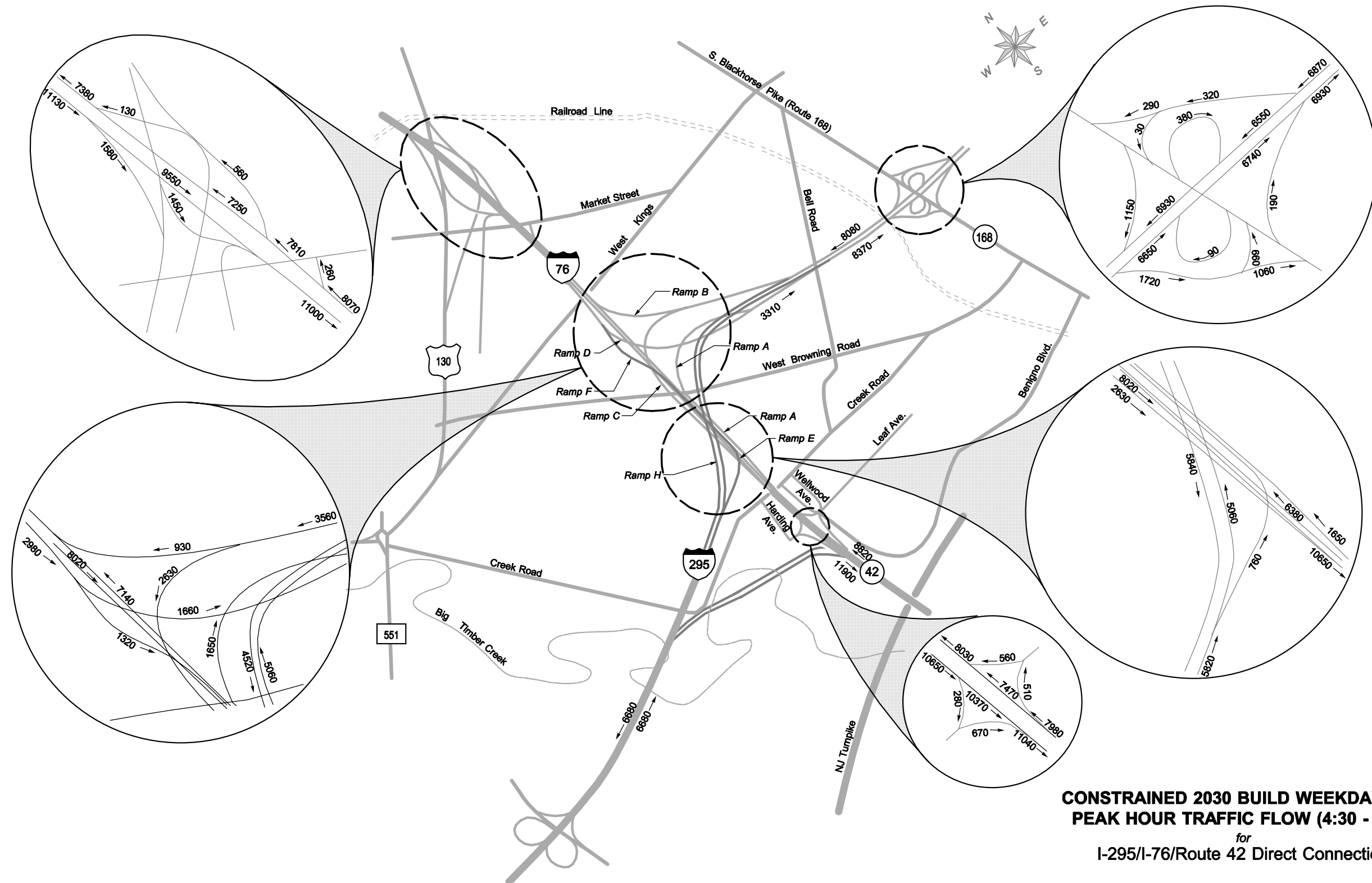


FIGURE 10



**CONSTRAINED 2030 BUILD WEEKDAY P.M.
 PEAK HOUR TRAFFIC FLOW (4:30 - 5:30)**
 for
 I-295/I-76/Route 42 Direct Connection

Urbitran Associates

November 2005

Traffic-Related Benefits and Impacts

Travel Time Savings

By comparing the total Vehicle-Hours Traveled that the highway assignment model estimates for the respective AM and PM peak periods of the Build and No-Build scenarios, the following area-wide reductions in delay can be realized as a result of building the project:

- Approximately 4,570 vehicle-hours during the 2-hour AM peak period, and
- Approximately 7,120 vehicle-hours during the 3-hour PM peak period.

The model does not provide estimates for other time periods, but it is safe to assume that the vast majority of travel time savings occur during regular, weekday, peak commuting periods. Most of these savings will be realized on roads within the towns of Mt. Ephraim and Bellmawr, along with the adjacent towns such as Brooklawn and Runnemede.

Congestion Relief on Local Arterials

Consistent with the travel time savings cited above, considerable reductions in traffic volumes on the local arterial system within the project area can also be anticipated. The magnitudes of these reductions are presented in **Figures 11 and 12**.

Construction Impacts

Construction of the Direct Connection project is not expected to significantly affect traffic conditions in the project area, since the same numbers of traveled lanes as existing will be maintained at all times. And any diversions to the local arterial system will be sufficiently dispersed to avoid overwhelming any specific location.

The only exception is a temporary weaving condition on I-76 eastbound (aka Route 42 southbound) that will exist after the closure of existing Ramp G and prior to the closure of existing Ramp C. This condition will be present under Alternatives D, D1, G2, and H1. Southbound through traffic on I-295 and traffic from southbound I-295 to southbound NJ-42 will share a 3-lane, 900-foot section of roadway with traffic from southbound I-76 to southbound I-295. The travel demand model estimates some diversion of southbound mainline traffic to southbound US-130. An example (for Alternative D) is shown in **Figure 13** for the Year 2010. The diverting traffic will be larger during the AM peak because I-295 southbound through traffic is projected to be high. This should not be problematic, as southbound US-130 is not congested in the morning and should be able to absorb the additional traffic.

Estimated diversions during the PM peak period due to the temporary southbound weaving section are much more dispersed, and are not expected to cause significant negative impacts in any specific location.

FIGURE 11

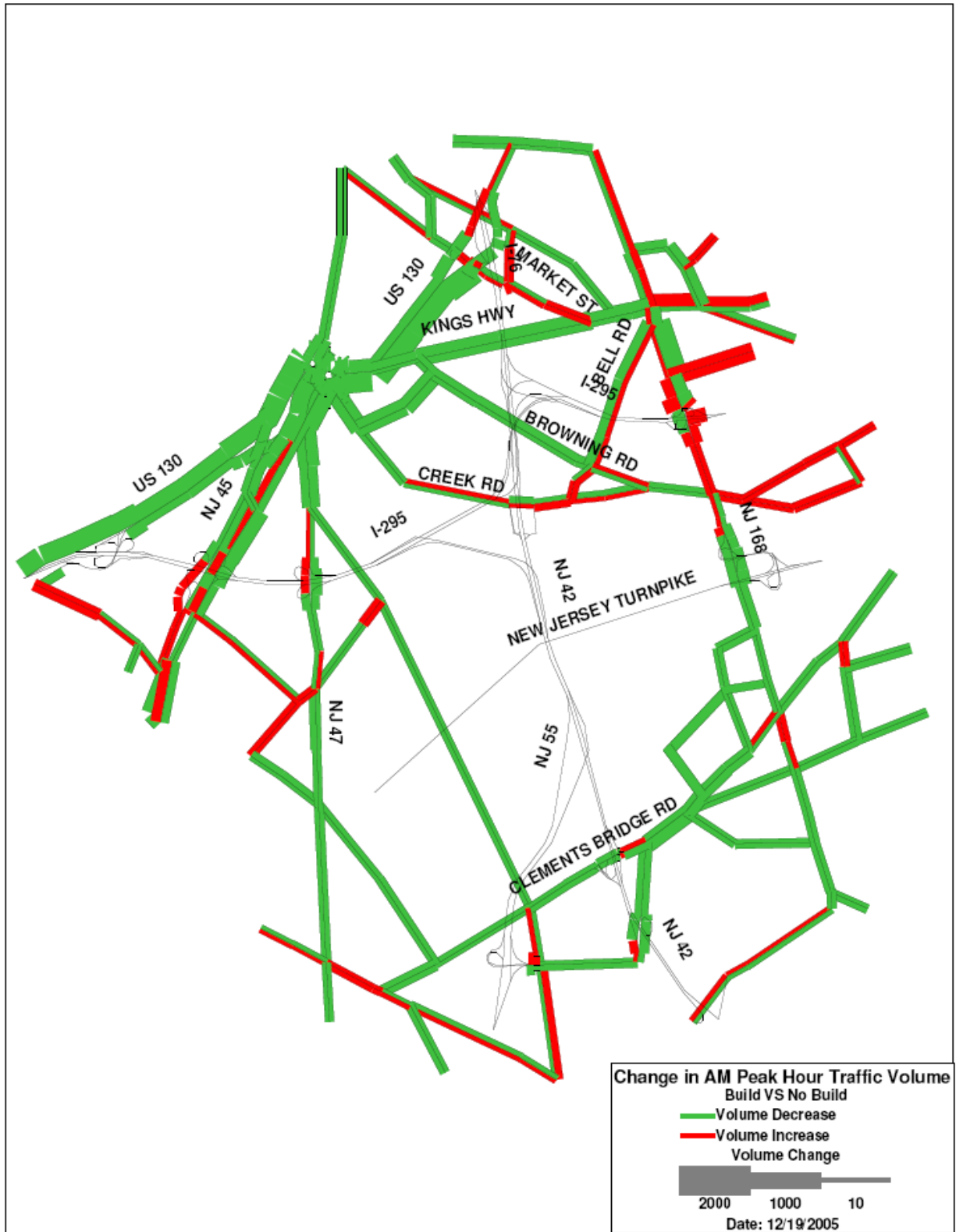
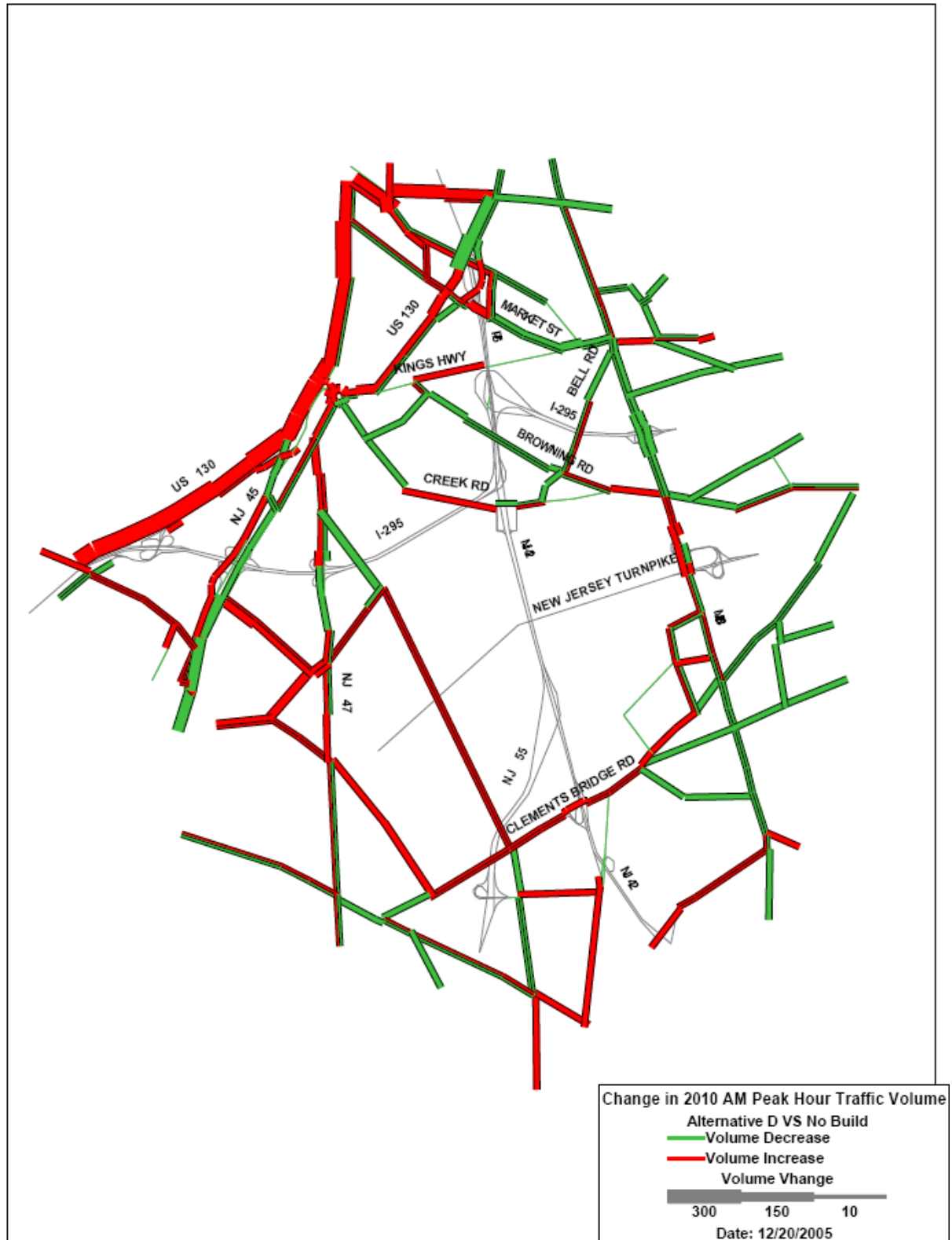


FIGURE 12



FIGURE 13



C. TRAVEL FORECASTS WITH NO MISSING MOVES PROJECT

The traffic projections and related analyses described in the previous sections all assume that the “Missing Moves” project (providing a direct ramp connection for the movement from Northbound I-295 to Southbound Route 42, and for the reverse movement from Northbound Route 42 to Southbound I-295) will be constructed and open to traffic by the year 2030.

Subsequent to these analyses, NJDOT asked the project team to investigate what changes (if any) in the projected peak hour traffic volumes and related information would result if we assume that the Missing Moves project will not be constructed.

The following sections described the results of these investigations.

Year 2030 Interchange Volumes

Year 2030 AM. and PM peak hour traffic volumes for the Interchange were developed for “No-Build” (i.e., no I-295 Direct Connection) and “Build” (i.e., with I-295 Direct Connection) conditions using the same procedures that were used for the projections done above under *With the Missing Moves*. The same Year 2030 trip tables were assigned to No-Build and Build networks from which the Missing Moves were removed. First, unconstrained volumes were developed, and these volumes were then constrained to ensure that the projected peak hour volumes on the highway sections leading to and from the Interchange do not exceed the maximum hourly capacities of these highway sections.

The resulting projections show that, without the Missing Moves in place, the projected volumes in the Interchange would not be appreciably different than they would be with the Missing Moves in place. Rather, the model indicates that the Missing Moves traffic is drawn primarily from roads to the south along NJ-42 and to the west along I-295, rather than from the Interchange. One notable change the With No Missing Moves scenario is the higher northbound volumes on I-295. It appears that removing the Missing Moves users on I-295 under the With No Missing Moves scenario is sufficient to invite more (and other) people to travel northbound on I-295. The results are shown in **Figures 14 and 15** for the No Build scenario, and in **Figures 16 and 17** for the Build scenario.

Travel Time Savings

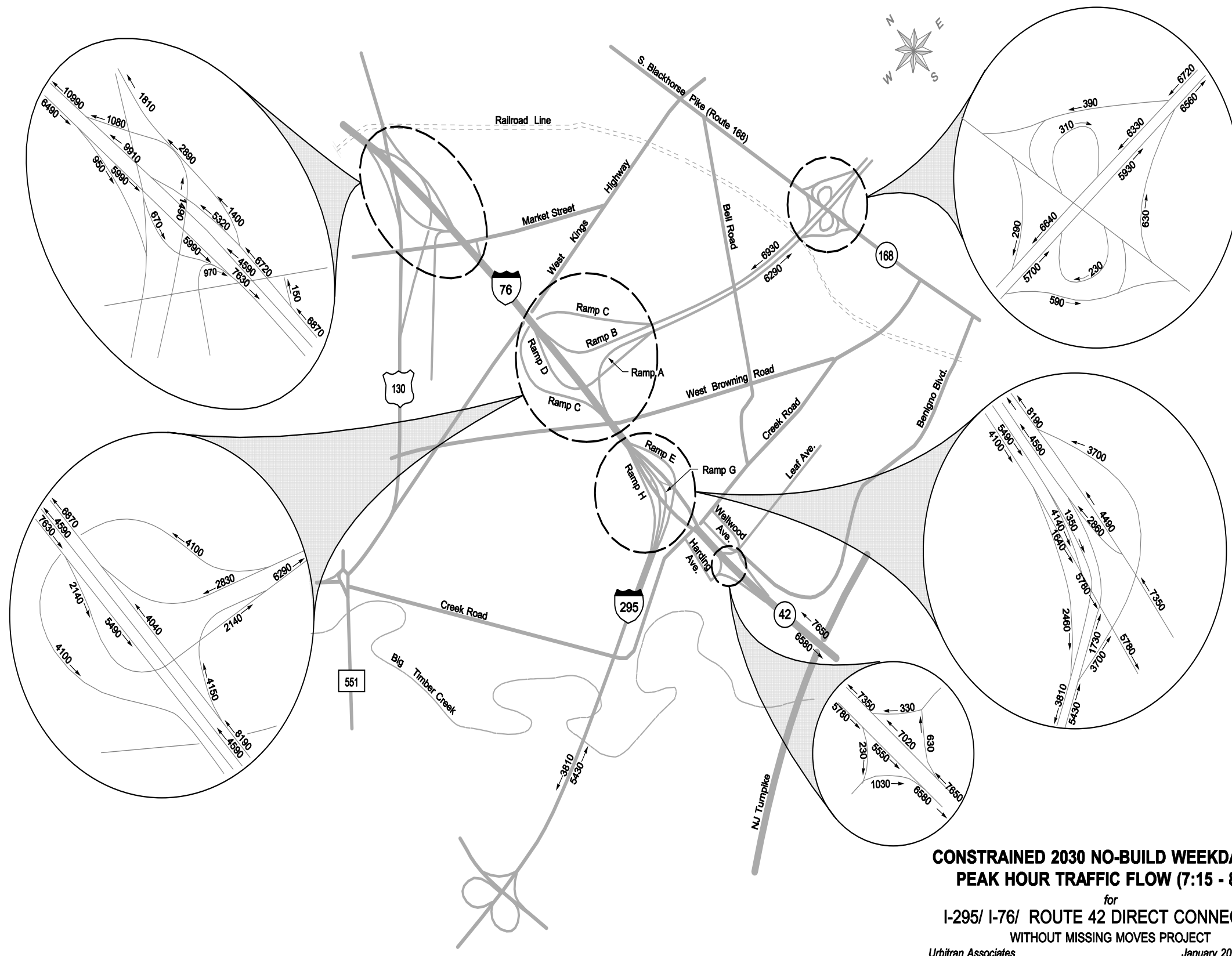
The network model projects that if the Missing Moves project is not built, the travel time savings afforded by the 295 Direct Connection project during the PM peak period would increase by approximately 1400 vehicle-hours (a savings of about 8,530 hours versus 7,120 if the Missing Moves project is built). No appreciable change in travel time savings was projected for the AM peak period.

This can be explained by the fact that not building the Missing Moves would “free up” some capacity on I-295 south of the Interchange in the PM peak, allowing the Direct Connection to provide additional relief to the local roadway system in Mt. Ephraim, Bellmawr, and adjacent towns.

Congestion Relief on Local Arterials

The projected reductions in traffic volumes on the local arterial system due to the I-295 Direct Connection project are essentially the same whether or not the Missing Moves project is built.

FIGURE 14



**CONSTRAINED 2030 NO-BUILD WEEKDAY A.M.
 PEAK HOUR TRAFFIC FLOW (7:15 - 8:15)**
 for
I-295/ I-76/ ROUTE 42 DIRECT CONNECTION
 WITHOUT MISSING MOVES PROJECT
 Urbitran Associates January 2006

FIGURE 15

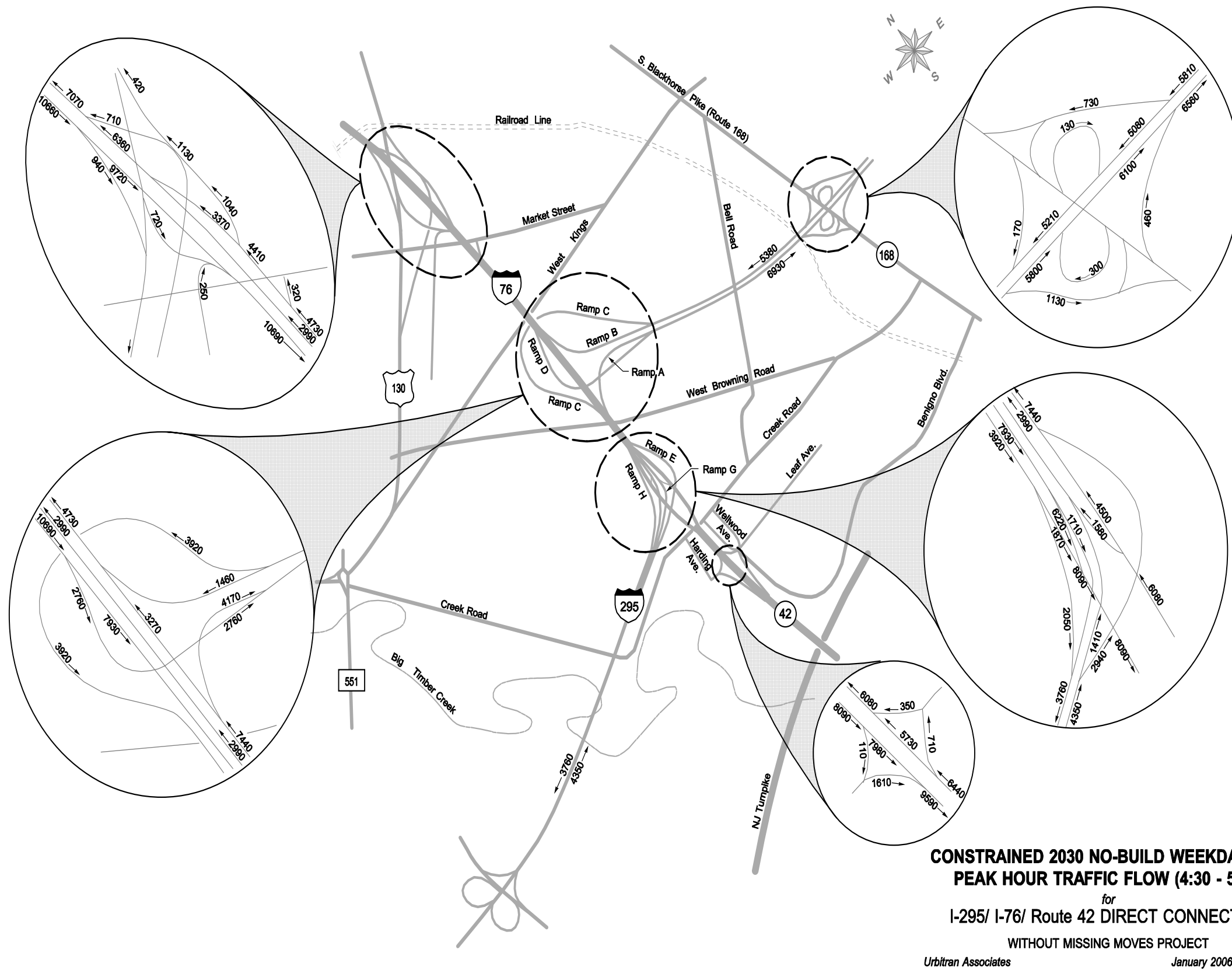


FIGURE 16

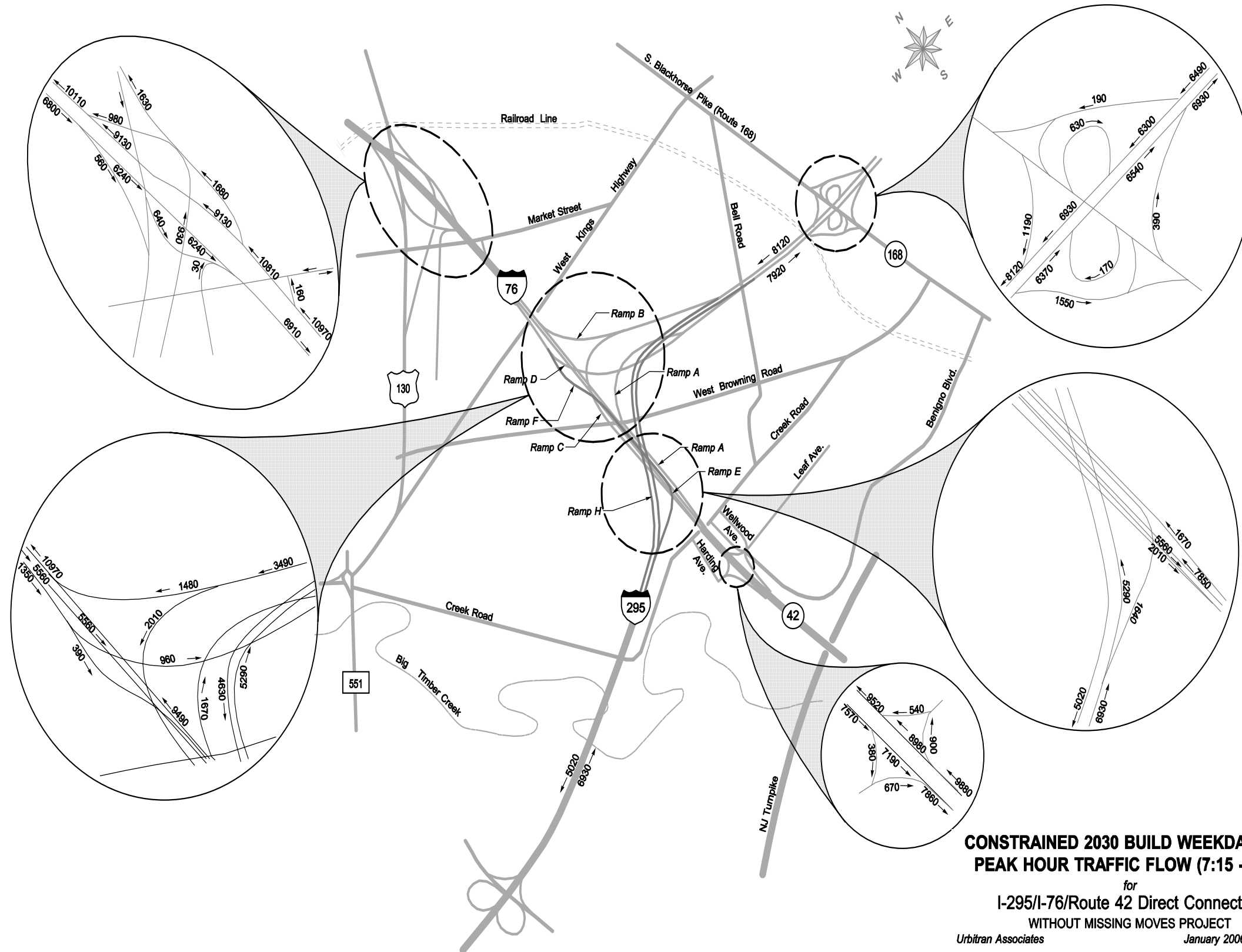
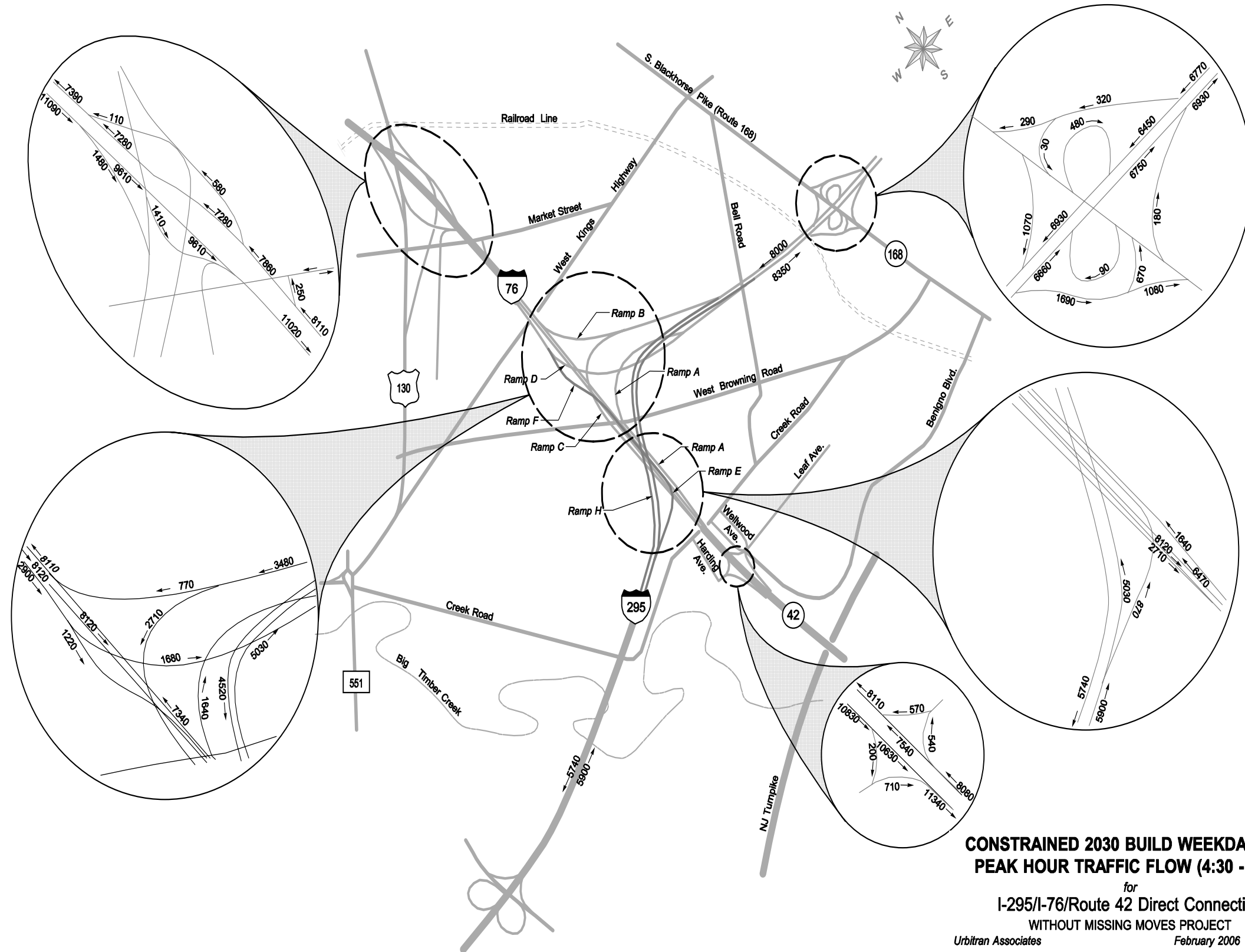


FIGURE 17



Construction Impacts

The projected traffic impacts due to construction of the I-295 Direct Connection project are essentially the same whether or not the Missing Moves project is built. That is, no significant negative impacts are expected.

III. DESIGN ALTERNATIVES FOR YEAR 2030

This section provides a description of the alternatives selected for further study. The alternatives were developed through a collaborative effort between stakeholder groups and were based on the objectives set forth in the project Purpose and Need statement. Graphics illustrating each alternative are provided in **Figures 18-22**.

Alternative D

Alternative D begins in the vicinity of the Grenloch Secondary Railroad Bridge over I-295. Mainline I-295 shifts slightly south and elevates to a third level viaduct over Browning Road and Route 42 and a second level viaduct over Ramp C. The roadway meets existing I-295 pavement north of the Creek Road overpass. The I-295 Alternative D alignment crosses I-76/Route 42 at a skew through an unused area of New St. Mary's Cemetery.

Vehicles on northbound Route 42, whose destination is I-295 northbound, exit on Ramp A. This ramp configuration, in conjunction with the new I-295 mainline alignment, eliminates the current substandard weaving condition with Ramp E at this location. Ramp A crosses under Ramp E and then crosses over Route 42 northbound before joining the elevated I-295 northbound alignment just north of Browning Road.

Ramp B provides the movement from southbound I-295 to northbound I-76. Ramp C provides the movement from southbound I-295 to southbound I-76/Route 42. Ramp B and Ramp C exit I-295 from the right. Ramp B follows a similar alignment to its existing one to meet I-76 northbound. Ramp C splits from Ramp B and crosses under Ramp D, I-76, Browning Road, and I-295 to connect with Route 42 north of the Creek Road Bridge.

Ramp D is the move from I-76 southbound to I-295 northbound. Ramp D exits I-76 in much the same way that it does now. The Ramp D alignment crosses over I-76, over Ramp C, and under I-295 before merging with I-295 northbound south of Bell Road.

Northbound I-295 traffic heading north to I-76 utilizes Ramp E which follows essentially the same alignment as it does now.

Southbound I-76 traffic heading to I-295 southbound utilizes Ramp F. Ramp F diverts from I-76 from the right (existing exit is from the left), and then passes under Browning Road. Ramp F first runs parallel to Ramp C and then runs adjacent to I-295 southbound. Ramp F rises from a depressed section at Browning Road to an elevated section as it ties into I-295 southbound prior to Essex Avenue.

A summary of design features of this alternative are:

- Northbound and Southbound I-295 are side-by-side
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- Ramp D on viaduct over I-76/Route 42, Ramp C and under I-295
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)

- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

Alternative D1

Alternative D1 is identical to Alternative D, except for the configuration of Ramps B and C. Ramp C exits I-295 southbound from the tangent section of I-295 southbound. Ramp B exits from the right approximately 1,000' later. Ramp B is on a new alignment south of its present location, but ties into I-76 at a similar location. Ramp C generally follows (within 150'±) the existing Ramp C alignment (Al Jo's curve) and passes under I-76 and Ramp F before merging with Route 42 southbound. The substandard radius on the existing Ramp C is replaced with a larger radius. Ramp D follows the same alignment as in Alternative D.

A summary of design features of this alternative are:

- Northbound and Southbound I-295 are side-by-side
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- Ramp D on viaduct over I-76/Route 42 and under I-295
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

Alternative G2

Alternative G2 also begins in the vicinity of the Grenloch Secondary Railroad Bridge over I-295. The southbound and northbound lanes of I-295 align over top of each other as an over-and-under viaduct and shift south. The I-295 viaduct alignment is elevated to cross over all of the ramps as well as I-76 and Browning Road. I-295 crosses over I-76 on a skewed alignment and then diverges and lowers in elevation to meet the existing I-295 pavement following the same alignment as in Alternative D to a point just north of the Creek Road Bridge. I-295 southbound is a fourth level viaduct and northbound is a third level viaduct at the Route 42 and Browning Road crossings. I-295 southbound passes over Bell Road, whereas, I-295 northbound passes under Bell Road.

Vehicles on Route 42 whose destination is I-295 northbound, exit on Ramp A. Ramp A crosses under Ramp E and then crosses over Route 42 northbound before joining the elevated I-295 northbound alignment just north of Browning Road, similar to Alternative D.

Ramp B provides the movement from southbound I-295 to northbound I-76. Ramp C provides the movement from southbound I-295 to southbound Route 42. Ramps B and C exit I-295 from the right. Ramp B follows a similar alignment to its existing alignment to meet I-76 northbound. Ramp C crosses under Ramp D, I-76, Browning Road, and I-295 to connect with Route 42 north of the Creek Road Bridge.

Ramp D is the move from I-76 southbound to I-295 northbound. Ramp D exits I-76 in much the same way that it does now. The Ramp D alignment crosses over I-76, over Ramp C, and under I-295 before merging with I-295 northbound south of Bell Road.

Northbound I-295 traffic heading north on I-76 utilizes Ramp E which follows essentially the same alignment as it does now.

Southbound I-76 traffic heading to I-295 southbound utilizes Ramp F. Ramp F diverts from I-76 from the right (existing exit is from the left), and then passes under Browning Road. Ramp F first runs parallel to Ramp C and then runs adjacent to I-295 southbound. Ramp F rises from a depressed section at Browning Road to an elevated structure as it ties into I-295 southbound prior to Essex Avenue.

A summary of design features of this alternative are:

- Southbound I-295 placed above Northbound I-295 using a double-decker configuration
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- I-295 on viaduct over Ramp D
- Ramp D on viaduct over I-76/Route 42 and Ramp C
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

Alternative H1

Alternative H1 is almost identical to Alternative G2. The primary difference is the configuration of Ramps B and C. Ramps B and C exit from I-295 from the right. Ramp C generally follows (within 150'±) the existing Ramp C alignment (Al Jo's curve) and passes under I-76 and Ramp F before merging with Route 42 southbound. The substandard radius on the existing Ramp C is replaced with a larger radius. Ramp B splits from Ramp C to meet I-76 northbound.

A summary of design features of this alternative are:

- Southbound I-295 placed above Northbound I-295 using a double-decker configuration
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- I-295 on viaduct over Ramp D
- Ramp D on viaduct over I-76/Route 42
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

Alternative K

Alternative K makes I-295 a continuous direct-through alignment in the form of a tunnel beneath I-76/Route 42. Alternative K begins in the vicinity of the Grenloch Secondary Railroad Bridge over I-295. Mainline I-295 shifts slightly south and begins to descend at a 3.5%± grade close to New St. Mary's Cemetery. The road reaches a depth of 60' in the northwestern corner of New St. Mary's Cemetery, and a depth of 35' below the I-76/Route 42 pavement. The roadway begins to ascend at a 4% grade beside the baseball fields and is at grade to meet the I-295 pavement north of the Creek Road overpass.

Vehicles on northbound Route 42 whose destination is I-295 northbound, take the Ramp A exit and itself is separated from, but parallel to, Route 42. This ramp configuration, in

conjunction with the new I-295 mainline alignment, eliminates the current substandard weaving condition with Ramp E at this location. Ramp A then crosses under Ramp E before joining the depressed I-295 alignment north of Browning Road.

Ramp B provides the movement from southbound I-295 to northbound I-76. Ramp C provides the movement from southbound I-295 to southbound Route 42. Ramp C exits I-295 from the right and Ramp B exits from the right approximately 1,000' further. Ramp B follows a similar path but to the south of its existing location to meet I-76 northbound. Ramp C crosses over Ramps B and D, and I-76. Then Ramp C passes over Browning Road and I-295 to connect with Route 42 north of the Creek Road Bridge.

Ramp D is the move from I-76 southbound to I-295 northbound. Ramp D exits I-76 in much the same way that it does now. The Ramp D alignment crosses over I-76, under Ramp C, and over I-295 before merging with I-295 northbound south of Bell Road.

Northbound I-295 traffic heading north on I-76 utilizes Ramp E which follows essentially the same alignment as it does now.

Southbound I-76 traffic heading to I-295 southbound utilizes Ramp F. Ramp F diverts from I-76 from the right (existing exit is from the left) and then passes under Browning Road. Ramp F first runs parallel to Ramp C and then runs adjacent to I-295 southbound. Ramp F rises from a depressed section at Browning Road to tie into I-295 southbound prior to Essex Avenue.

The primary design features for this alternative include the following:

- Northbound and Southbound I-295 are side-by-side
- Mainline I-295 is a tunnel under I-76/Route 42 on a skew
- Ramp C on viaduct over Ramps B and D and I-76/Route 42
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph, (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph, (Design Speed: 45 mph)

Three local bridges are impacted by each of the alternatives. The Bell Road, Browning Road, and Creek Road bridges will be raised to provide proper vertical clearance and lengthened to accommodate the wider typical section of I-295 or I-76/Route 42. In addition, Kings Highway will be lowered by approximately one foot under each alternative and Alternative K may require Essex Avenue to be lowered by approximately two feet.

No Build Alternative

This alternative proposes no changes to the existing interchange. Impacts to the project area will be evaluated in the same way as the other proposed alternatives, with the assessment of current conditions projected to the design year serving as the impact assessment for the no-build alternative. The no-build alternative serves as the benchmark to measure the costs and benefits of each build alternative evaluated.



- Ramp Designation
- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed



0 750 1,500 3,000 Feet

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
 Direct Connection
 Camden County
 Figure 18
 Alternative D



- Ramp Designation
- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed








0 750 1,500 3,000 Feet

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
 Direct Connection
 Camden County
 Figure 19
 Alternative D1



-  - Ramp Designation
-  - Roadway
-  - Bridge
-  - Ramps for Missing Moves
-  - Roadway to be Removed



0 750 1,500 3,000 Feet

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
 Direct Connection
 Camden County
 Figure 20
 Alternative G2



- Ramp Designation
- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed



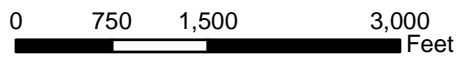
0 750 1,500 3,000 Feet

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
 Direct Connection
 Camden County
 Figure 21
 Alternative H1



- Ramp Designation
- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed



NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
 Direct Connection
 Camden County
 Figure 22
 Alternative K

IV. TRAFFIC PERFORMANCE COMPARISONS OF DESIGN ALTERNATIVES

Approach to Evaluating Traffic Performance

The AM and PM peak hour traffic volumes that were forecasted for the year 2030 were assigned to the study area network under the With Missing Moves and With No Missing Moves scenarios for their respective No Build and Build Alternatives.

To be able to compare traffic flow conditions for each of the five Build Alternatives and the No Build Alternative against one another, the Synchro/SimTraffic suite of traffic analyses programs were employed. The Synchro/SimTraffic program is particularly useful in capturing and reporting the traffic flow dynamics of and interaction between adjacent roadway sections---i.e. to the extent that traffic conditions at a downstream roadway section affect the section upstream of it, and vice-versa). As a micro-simulation model, SimTraffic is able to simulate network-wide traffic flows on a vehicle-by-vehicle basis (randomly generated for each simulation) by updating position, speed, acceleration, lane position, and other state variables on a second-by-second basis, and as vehicles interact with other vehicles, traffic control devices and roadway geometrics.

A scaled network model of the entire study area---consisting of relevant sections of I-295, I-76 and Route 42 together with their on- and off-ramps---was constructed within the Synchro/SimTraffic program. In addition to traffic volumes, geometric and traffic control parameters for each of the Alternatives were also used as input for every link in the network and for all ramp junctions and local intersections. After data entry was completed, the simulation component of the program (SimTraffic) was applied.

While the output of the SimTraffic simulation includes a range of traffic operations and fuel consumption measures, only travel speeds and delay at ramp junctions were chosen for reporting traffic performance under each of the project Alternatives. Travel speed, in miles per hour (MPH), and delay, in seconds per vehicle, are two performance criteria that easily capture and describe traffic flow conditions at the key locations of freeway performance, namely at ramp junctions. And because they are derived as output of traffic simulations, they represent the interaction, if any exists, between upstream and downstream traffic conditions. Prevailing traffic conditions invariably result from the interplay between traffic volumes and specific roadway designs and/or operational characteristics. Therefore the use of speeds and delays as primary measures of effectiveness in this context provides a quick and easy way to compare the degree to which an Alternative helps address deficiencies, or the degree to which that it does not. Other typical traffic measures like queue lengths, while potentially useful for some traffic investigations, are not as easily informative as speeds and delays. In fact and because simulation is available using SimTraffic, the observation of queue lengths and their implications is much more informative when viewed as part of the simulation runs themselves.

The speeds and delays on freeway sections and on intersecting ramps for the study network are presented for each of the Alternatives under With Missing Moves scenario in **Table 2** for 2030 AM Peak conditions and **Table 3** for the 2030 PM Peak conditions. The comparative values for the With No Missing Moves scenario are provided in the **Table 4** for 2030 AM Peak conditions and **Table 5** for the 2030 PM Peak conditions.

Observations on Expected Traffic Performance

The traffic analyses results for either the With No Missing Moves or the With Missing Moves scenario indicate that overall traffic flow conditions under any of the five Build Alternatives will be relatively similar to one another. And against the No Build condition, every Build Alternative will deliver better overall traffic operations because any of them will separate through traffic on I-295

from those on I-76/Route 42. Average speeds will be higher and average delay per vehicle will be lower on I-295 mainline and I-76/Route 42 mainline for all Build Alternatives compared to the No Build.

On a section-by-section basis however, conditions for the Build Alternatives are not altogether better compared to those for the No Build Alternative. There are instances where sections of freeways in the No Build Alternative would operate at relatively better levels of service because they are located downstream of sections that are congested (bottleneck). That means, the bottleneck section is regulating or metering the volume that gets through it and arrives at the downstream section. If these bottlenecks were in fact addressed by the Build Alternatives, it is possible that the section(s) of freeway downstream of the previously bottlenecked section would operate at a lower level of service under the Build Alternative compared to the No Build.

One such section is I-76 westbound (or Route 42 northbound) where it intersects with Ramp B (I-295 southbound to I-76 westbound). During the AM peak hour, the section of I-76 westbound can be expected to operate at an average speed of 47 MPH under the No Build Alternative. But the section of I-76 westbound upstream of this junction with Ramp B is the section where I-295 northbound and I-76 westbound (i.e. on the I-76 Local Roadway only, not the I-76 Expressway) come together and their respective heavy traffic volumes have to weave against one another to get to their destinations. In short, this will be (and is today!) a major bottleneck where the expected average speeds of I-76 westbound vehicles will be about 10 MPH. By comparison under the Build Alternatives, the section of I-76 westbound where Ramp B joins with it is expected to operate at an average speed of about 20 MPH. This low speed results from the need to accommodate 9,240 VPH on a 4-lane I-76 westbound mainline at a point where Ramp B, with its 1,540 VPH, is coming onto I-76 westbound. We note that the 9,240 VPH on I-76 will arrive at the Ramp B junction without encountering any bottleneck at an upstream section. One of the sections upstream of Ramp B is where Ramp E comes onto I-76 westbound. At that location, I-76 mainline is expected to operate at an average speed of 42 MPH. (As mentioned above, this same section will operate with an average speed of 10 MPH under the No Build Alternative.)

At the I-295/Route 168 interchange, traffic operations on I-295 will be similar between the No Build and any of the Build Alternatives. This common future is expected because traffic volumes in year 2030 under either No Build or Build will have exceeded the capacity of I-295 in both directions. Further, no capacity improvement to I-295 is assumed under this project.

The one situation where traffic flow conditions are distinctly different between the With Missing Moves scenario and the With No Missing Moves scenario involves Route 42 northbound during the AM peak hour. It was mentioned in the section on *Traffic Forecasting Methodology and Results* that the peak direction during the AM commute is primarily headed towards Philadelphia and, to a relatively lesser degree, to other points north along I-295. The consequence of not having the Missing Moves ramps is for a moderate number of vehicles to circulate through the Interchange area to get to their destinations. (Note: The majority of Missing Moves users will actually divert onto local roads that are located south of this project, that is south of Route 55.) For Route 42, that means accommodating slightly more traffic volumes (8,980 VPH under With No Missing Moves vs. 8,890 VPH under With Missing Moves) on a facility that, in year 2030, will already be at capacity even with the Missing Moves ramps in place. In either scenario, Route 42 northbound will have four travel lanes. Therefore traffic on Route 42 during the AM peak hour will be more congested (14-16 MPH average speed) without the Missing Moves ramps compared to having the Missing Moves ramps (22-26 MPH).

Table 2: Traffic Performance Comparisons With Missing Moves---2030 AM Peak Hour

Node #	Node Name	No Build	Alternative D & G2	Alternative D1	Alternative H1	Alternative K		
I-295 SOUTHBOUND								
73	@ Off-Ramp to Rt 168					Same as Alternative D		
16 in	Volume	6290	340	6290	210		6290	210
No Build	Movement	Freeway	Ramp	Freeway	Ramp		Freeway	Ramp
	Avg Speed (mph)	14	28	14	35		14	35
	Delay / Veh (s)	43	14	23	1		24	1
5	@ On-Ramp from Rt 168 NB							
	Volume	6290	330	6290	640		6290	640
	Movement	Freeway	Ramp	Freeway	Ramp		Freeway	Ramp
	Avg Speed (mph)	12	32	12	24		12	24
	Delay / Veh (s)	31	1	26	1		26	1
4	@ Rt 168 SB On-Ramp							
6 in	Volume	6620	310	6930	1200		6930	1200
No Build	Movement	Freeway	Ramp	Freeway	Ramp		Freeway	Ramp
	Avg Speed (mph)	13	31	16	28		15	28
	Delay / Veh (s)	13	1	8	3		6	3
32	@ Ramp C (off-ramp)							
	Volume	2460	1620				6080	2050
	Movement	To I-295 SB	To Rt 42 SB	na	na		Freeway	Ramp
	Avg Speed (mph)	25	28	na	na		36	36
	Delay / Veh (s)	6	4	na	na		4	4
1	@ Ramp B (off-ramp)							
	Volume					4540	1540	
	Movement	na	na	na	na	Freeway	Ramp	
	Avg Speed (mph)	na	na	na	na	48	48	
	Delay / Veh (s)	na	na	na	na	3	3	
32	@ Ramp B/C (off-ramp)							
3 in	Volume	4080	2850	4540	3590	na	na	
No Build	Movement	To I-295 SB	To I-76 WB	To I-295 SB	To Ramps B & C	na	na	
	Avg Speed (mph)	21	21	41	41	na	na	
	Delay / Veh (s)	45	45	5	5	na	na	
57	@ Ramp B & Ramp C Split							
17 in H1	Volume	na	na	2050	1540	na	na	
	Movement	na	na	To Ramp C	To Ramp B	na	na	
	Avg Speed (mph)	na	na	41	41	na	na	
	Delay / Veh (s)	na	na	2	2	na	na	
12	@ Ramp F (on-ramp)							
	Volume	2460	1350	4540	380	4540	380	
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	39	33	48	42	49	40	
	Delay / Veh (s)	2	4	4	2	4	3	
89/102	@ Missing Moves Ramp A							
108 in	Volume	3810	860	4920	860	4920	860	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	45	33	46	37	45	32	
	Delay / Veh (s)	11	4	6	2	6	4	

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
I-295 NORTHBOUND								
111	@ Missing Moves Ramp B							
116 in	Volume	5360	840	6090	840	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	26	40	41	41			
	Delay / Veh (s)	14	5	4	4			
42	@ Ramp E (off-ramp)							
33 in	Volume	1710	3650	4700	1390			
No Build	Movement	To I-76 X	To I-76 Local	Freeway	Ramp			
	Avg Speed (mph)	45	43	41	41			
	Delay / Veh (s)	11	12	5	5			
34	@ Rt 42 NB Junction 1	I-295 & I-76 Coincident						
	Volume	4490	3650					
	Movement	Rt 42	I-295	na	na			
	Avg Speed (mph)	11	26	na	na			
	Delay / Veh (s)	33	3	na	na			
23	@ Rt 42 NB Junction 2	I-295 & I-76 Coincident						
	Volume	4070	4070					
	Movement	Rt 42	I-295	na	na			
	Avg Speed (mph)	22	23	na	na			
	Delay / Veh (s)	20	17	na	na			
36	@ Ramp D (on-ramp)							
40 in	Volume	4070	2230	6280	990			
No Build	Movement	I-295 NB	Ramp D	Freeway	Ramp			
	Avg Speed (mph)	33	26	42	38			
	Delay / Veh (s)	8	13	3	2			
46	@ Ramp A (on-ramp)							
43 after	Volume			4700	1580			
Relocatn	Movement	na	na	Freeway	Ramp			
	Avg Speed (mph)	na	na	48	38			
	Delay / Veh (s)	na	na	6	4			
47	@ Off Ramp to Rt 168							
35 in	Volume	5700	600	5740	1530			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	44	40	25			
	Delay / Veh (s)	1	0.4	5	1			
49	@ On-Ramp from Rt 168 SB							
18 in	Volume	5700	170	5740	170			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	48	32	46	22			
	Delay / Veh (s)	2	0.4	2	1			
16	@ On-Ramp from Rt 168 NB							
72 in	Volume	5870	640	5910	370			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	42	31	44	32			
	Delay / Veh (s)	2	3	1	1			

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Node #	Node Name	No Build	Alternative D & G2	Alternative D1	Alternative H1	Alternative K
Rt 42 NORTHBOUND & I-76 WESTBOUND						
62	@ Benigno Blvd Off-Ramp					
31 in	Volume	6950	1420	8890	1680	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
57 in K	Avg Speed (mph)	29	43	26	26	
82 in H1	Delay / Veh (s)	164	153	10	10	
56	@ Benigno Blvd On-Ramp					Same as Alternative D
114 in	Volume	6950	320	8890	540	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	21	33	22	32	
	Delay / Veh (s)	27	0.3	28	0.3	
	@ I-76 WB Split					Same as Alternative D
39 in	Volume	2780	4490			
No Build	Movement	Express	Local	na	na	
	Avg Speed (mph)	24	10	na	na	
	Delay / Veh (s)	13	43	na	na	
9	@ Ramp A (off-ramp)					Same as Alternative D
23 in	Volume	4070	4070	7850	1580	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	22	23	34	34	
	Delay / Veh (s)	20	17	16	16	
23	@ Ramp E (on-ramp)	I-295 & I-76 Coincident				Same as Alternative D
34 in	Volume	4490	3650	7850	1390	
No Build	Movement	Rt 42	Ramp	Freeway	Ramp	
	Avg Speed (mph)	11	26	42	40	
	Delay / Veh (s)	33	3	7	3	
2	@ Ramp B					Same as Alternative D
	Volume	4070	2850	9240	1540	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	26	26	20	41	
	Delay / Veh (s)	31	41	7	1	
21	@ Market St Off-Ramp					Same as Alternative D
	Volume	6780	140	10640	140	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	17	17	30	30	
	Delay / Veh (s)	29	29	19	19	
20	@ Rt 130 Off-Ramp					Same as Alternative D
	Volume	5430	1350	8960	1680	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	43	46	48	48	
	Delay / Veh (s)	2	1	1	1	
118	@ Rt 130 On-Ramp					Same as Alternative D
64 in	Volume	6280	710	8960	1010	
No-Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	47	41	48	43	
	Delay / Veh (s)	4	0.2	5	0	

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
Rt 42 SOUTHBOUND & I-76 EASTBOUND								
89	@ Rt 130 Off Ramp							
	Volume	6020	960	6200	590	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	48	45	49	49			
	Delay / Veh (s)	1	1	1	1			
41	@ Rt 130 On Ramp							
	Volume	6020	1630	6200	650			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	46	26	49	35			
	Delay / Veh (s)	5	1	4	0.1			
40	@ Ramp D (off-ramp)							
	Volume	5420	2230	5860	990			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	40	34	47	47			
	Delay / Veh (s)	12	19	6	6			
30	@ Ramp F (off-ramp)	Left Off-Ramp to I-295						
	Volume	4070	1350	5480	380			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	51	42	48	48			
	Delay / Veh (s)	1	2	3	3			
13	@ Ramp C (on-ramp)							
	Volume	4070	1620	5480	2050			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	50	42	47	34			
	Delay / Veh (s)	1	1	6	2			
24	@ Leaf Ave Off-Ramp							
	Volume	5460	230	7150	380			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	47	46	46			
	Delay / Veh (s)	2	2	2	1			
25	@ Leaf Ave On-Ramp							
	Volume	5460	910	7150	630			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	47	32	46	32			
	Delay / Veh (s)	1	1	1	1			
26/114	@ Missing Moves Ramp B							
	Volume	6370	840	7780	840			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	46	36	48	37			
	Delay / Veh (s)	4	4	3	3			

Table 3: Traffic Performance Comparisons With Missing Moves---2030 PM Peak Hour

Node #	Node Name	No Build	Alternative D & G2	Alternative D1	Alternative H1	Alternative K
I-295 SOUTHBOUND						
73	@ Off-Ramp to Rt 168					
16 in	Volume	5010	760	6550	320	6550 320
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway Ramp
	Avg Speed (mph)	18	32	16	27	16 27
	Delay / Veh (s)	19	5	19	7	19 7
5	@ On-Ramp from Rt 168 NB					
	Volume	5010	120	6550	380	6550 380
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway Ramp
	Avg Speed (mph)	19	21	13	24	13 24
	Delay / Veh (s)	14	2	23	1	23 1
4	@ Rt 168 SB On-Ramp					
6 in	Volume	5130	200	6930	1150	6930 1150
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway Ramp
	Avg Speed (mph)	12	30	15	30	15 30
	Delay / Veh (s)	14	2	7	3	7 3
32	@ Ramp C (off-ramp)					
	Volume	2030	1880	na	na	5450 2630
	Movement	To I-295 SB	To Rt 42 SB	na	na	Freeway Ramp
	Avg Speed (mph)	35	32	na	na	47 40
	Delay / Veh (s)	1	1	na	na	1 2
		2030	1880	na	na	5450 2630
1	@ Ramp B (off-ramp)					
	Volume	na	na	na	na	4520 930
	Movement	na	na	na	na	Freeway Ramp
	Avg Speed (mph)	na	na	na	na	50 50
	Delay / Veh (s)	na	na	na	na	3 3
32	@ Ramp B/C (off-ramp)					
3 in	Volume	3910	1420	4520	3560	4520 3560
No Build	Movement	To I-295 SB	To I-76 WB	To I-295 SB	To Ramps B & C	To I-295 SB To Ramps B & C
	Avg Speed (mph)	16	17	44	40	44 40
	Delay / Veh (s)	67	62	4	5	4 5
57	@ Ramp B & Ramp C Split					
17 in H1	Volume			2630	930	2630 930
	Movement			To Ramp C	To Ramp B	To Ramp C To Ramp B
	Avg Speed (mph)			40	38	40 38
	Delay / Veh (s)			1	3	1 3
12	@ Ramp F (on-ramp)					
	Volume	2030	1830	4520	1320	4520 1320
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway Ramp
	Avg Speed (mph)	34	39	47	37	47 37
	Delay / Veh (s)	4	3	5	6	5 6
89/102	@ Missing Moves Ramp A					
108 in	Volume	3860	840	5840	840	5840 840
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway Ramp
	Avg Speed (mph)	49	37	43	31	43 31
	Delay / Veh (s)	7	3	8	5	8 5

Same as Alternative D

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
I-295 NORTHBOUND								
111	@ Missing Moves Ramp B							
116 in	Volume	4150	860	5820	860	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	46	49	44	48			
	Delay / Veh (s)	1	2	3	2			
42	@ Ramp E (off-ramp)							
33 in	Volume	1360	2790	5060	760	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	To I-76 X	To I-76 Local	Freeway	Ramp			
	Avg Speed (mph)	42	45	45	45			
	Delay / Veh (s)	13	11	4	4			
34	@ Rt 42 NB Junction 1	I-295 & I-76 Coincident						
	Volume	2790	4530			Same as Alternative D	Same as Alternative D	Same as Alternative D
	Movement	I-295	Rt 42	na	na			
	Avg Speed (mph)	23	10	na	na			
	Delay / Veh (s)	4	37	na	na			
23	@ Rt 42 NB Junction 2	I-295 & I-76 Coincident						
	Volume	4080	3240			Same as Alternative D	Same as Alternative D	Same as Alternative D
	Movement	I-295	Rt 42	na	na			
	Avg Speed (mph)	15	21	na	na			
	Delay / Veh (s)	32	20	na	na			
36	@ Ramp D (on-ramp)							
40 in	Volume	4080	2850	6710	1660	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	I-295 NB	Ramp D	Freeway	Ramp			
	Avg Speed (mph)	27	27	30	34			
	Delay / Veh (s)	19	12	9	4			
46	@ Ramp A (on-ramp)							
43 after	Volume			5060	1650	Same as Alternative D	Same as Alternative D	Same as Alternative D
Relocatn	Movement	na	na	Freeway	Ramp			
	Avg Speed (mph)	na	na	46	35			
	Delay / Veh (s)	na	na	8	5			
47	@ Off Ramp to Rt 168							
35 in	Volume	5710	1220	6650	1720	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	42	33	27			
	Delay / Veh (s)	1	1	10	13			
49	@ On-Ramp from Rt 168 SB							
18 in	Volume	5710	370	6650	90	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	24	47	23			
	Delay / Veh (s)	1	1	2	1			
16	@ On-Ramp from Rt 168 NB							
72 in	Volume	6080	580	6740	190	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	46	31	46	33			
	Delay / Veh (s)	1	2	1	1			

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Node #	Node Name	No Build	Alternative D & G2	Alternative D1	Alternative H1	Alternative K
Rt 42 NORTHBOUND & I-76 WESTBOUND						
62	@ Benigno Blvd Off-Ramp					
31 in	Volume	5730	1520	7470	1350	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
57 in K	Avg Speed (mph)	19	31	35	38	
82 in H1	Delay / Veh (s)	47	23	5	3	
56	@ Benigno Blvd On-Ramp					Same as Alternative D
114 in	Volume	5730	360	7470	560	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	10	25	30	31	
	Delay / Veh (s)	77	2	15	0.4	
	@ I-76 WB Split					Same as Alternative D
39 in	Volume	1560	4530			
No Build	Movement	Express	Local	na	na	
	Avg Speed (mph)	30	8	na	na	
	Delay / Veh (s)	9	56	na	na	
9	@ Ramp A (off-ramp)	I-295 & I-76 Coincident				Same as Alternative D
23 in	Volume	3240	4080	6380	1650	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	21	15	35	27	
	Delay / Veh (s)	20	32	16	27	
23	@ Ramp E (on-ramp)	I-295 & I-76 Coincident				Same as Alternative D
34 in	Volume	4530	2790	6380	760	
No Build	Movement	Rt 42	I-295	Freeway	Ramp	
	Avg Speed (mph)	10	23	47	44	
	Delay / Veh (s)	37	4	4	2	
2	@ Ramp B					Same as Alternative D
	Volume	3240	1420	7140	930	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	49	51	45	41	
	Delay / Veh (s)	5	4	2	1	
21	@ Market St Off-Ramp					Same as Alternative D
	Volume	4400	260	7810	260	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	40	37	47	47	
	Delay / Veh (s)	6	6	4	4	
20	@ Rt 130 Off-Ramp					Same as Alternative D
	Volume	3360	1040	7250	560	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	52	46	48	47	
	Delay / Veh (s)	1	1	2	1	
118	@ Rt 130 On-Ramp					Same as Alternative D
64 in	Volume	6280	710	7250	130	
No-Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	46	41	48	41	
	Delay / Veh (s)	4	0.3	5	0	

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
Rt 42 SOUTHBOUND & I-76 EASTBOUND								
89	@ Rt 130 Off Ramp							
92 in	Volume	10040	540	9550	1580	Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	39	43	40	28			
	Delay / Veh (s)	1	1	4	10			
41	@ Rt 130 On Ramp							
43 in	Volume	10040	480	9550	1450			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	44	37	46	28			
	Delay / Veh (s)	7	0.2	6	0.4			
40	@ Ramp D (off-ramp)							
41 in	Volume	7670	2850	9340	1660			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	40	39	40	35			
	Delay / Veh (s)	12	13	12	17			
30	@ Ramp F (off-ramp)	Left Off-Ramp to I-295						
63 in	Volume	5840	1830	8020	1320			
No Build	Movement	To Rt 42 S	To I295 S	Freeway	Ramp			
	Avg Speed (mph)	48	42	47	45			
	Delay / Veh (s)	2	3	3	4			
13	@ Ramp C (on-ramp)							
	Volume	5840	1880	8020	2630			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	47	33	43	30			
	Delay / Veh (s)	2	4	9	3			
24	@ Leaf Ave Off-Ramp							
	Volume	7600	120	10370	280			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	43	42	42			
	Delay / Veh (s)	1	0.1	2	0.1			
25	@ Leaf Ave On-Ramp							
	Volume	7600	370	10370	670			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	30	46	32			
	Delay / Veh (s)	1	1	1	1			
26/114	@ Missing Moves Ramp B							
	Volume	7970	860	11040	860			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	47	38	47	36			
	Delay / Veh (s)	4	3	4	4			

Table 4: Traffic Performance Comparisons With No Missing Moves---2030 AM Peak Hour

Node #	Node Name	No Build		Alternative D & G2		Alternative D1		Alternative H1		Alternative K
I-295 SOUTHBOUND										
73	@ Off-Ramp to Rt 168									Same as Alternative D
16 in	Volume	6290	340	6290	210	6290	210	6290	210	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	14	28	14	35	13	35	14	35	
	Delay / Veh (s)	43	14	23	1	26	1	24	1	
5	@ On-Ramp from Rt 168 NB									
	Volume	6290	330	6290	640	6290	640	6290	640	
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	12	32	12	24	13	24	12	24	
	Delay / Veh (s)	31	1	26	1	23	1	26	1	
4	@ Rt 168 SB On-Ramp									
6 in	Volume	6620	310	6930	1200	6930	1200	6930	1200	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	13	31	16	28	14	29	15	28	
	Delay / Veh (s)	13	1	8	3	6	3	6	3	
32	@ Ramp C (off-ramp)									
	Volume					6080	2050			
	Movement	na	na	na	na	Freeway	Ramp	na	na	
	Avg Speed (mph)	na	na	na	na	36	36	na	na	
	Delay / Veh (s)	na	na	na	na	4	4	na	na	
1	@ Ramp B (off-ramp)									
	Volume					4540	1480			
	Movement	na	na	na	na	Freeway	Ramp	na	na	
	Avg Speed (mph)	na	na	na	na	48	48	na	na	
	Delay / Veh (s)	na	na	na	na	3	3	na	na	
32	@ Ramp B/C (off-ramp)									
3 in	Volume	4080	2850	4540	3530	na	na	4540	3530	
No Build	Movement	To I-295 SB	To I-76 WB	To I-295 SB	To Ramp B & C	na	na	To I-295 SB	To Ramp B & C	
	Avg Speed (mph)	21	21	41	41	na	na	41	41	
	Delay / Veh (s)	45	45	5	5	na	na	5	5	
57	@ Ramp B & Ramp C Split									
17 in H1	Volume	na	na	2050	1480	na	na	2050	1480	
	Movement	na	na	To Ramp C	To Ramp B	na	na	To Ramp C	To Ramp B	
	Avg Speed (mph)	na	na	41	41	na	na	36	36	
	Delay / Veh (s)	na	na	2	2	na	na	2	2	
12	@ Ramp F (on-ramp)									
	Volume	2460	1350	4540	380	4540	380	4540	380	
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	39	33	48	42	49	40	48	40	
	Delay / Veh (s)	2	4	4	2	4	3	4	3	
89/102	@ Missing Moves Ramp A									
108 in	Volume									
No Build	Movement									
	Avg Speed (mph)									
	Delay / Veh (s)									

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
I-295 NORTHBOUND								
111	@ Missing Moves Ramp B							
116 in	Volume					Same as Alternative D	Same as Alternative D	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)							
	Delay / Veh (s)							
42	@ Ramp E (off-ramp)							
33 in	Volume	1730	3700	5280	1640			
No Build	Movement	To I-76 X	To I-76 Local	Freeway	Ramp			
	Avg Speed (mph)	41	38	36	35			
	Delay / Veh (s)	15	19	8	9			
34	@ Rt 42 NB Junction 1	I-295 & I-76 Coincident						
	Volume	4490	3700					
	Movement	Rt 42	I-295	na	na			
	Avg Speed (mph)	10	20	na	na			
	Delay / Veh (s)	36	4	na	na			
23	@ Rt 42 NB Junction 2	I-295 & I-76 Coincident						
	Volume	4040	4150					
	Movement	Rt 42	I-295	na	na			
	Avg Speed (mph)	20	21	na	na			
	Delay / Veh (s)	22	19	na	na			
36	@ Ramp D (on-ramp)							
40 in	Volume	4150	2140	6950	990			
No Build	Movement	I-295 NB	Ramp D	Freeway	Ramp			
	Avg Speed (mph)	36	28	43	37			
	Delay / Veh (s)	8	10	3	3			
46	@ Ramp A (on-ramp)							
43 after	Volume			5280	1670			
Relocatn	Movement	na	na	Freeway	Ramp			
	Avg Speed (mph)	na	na	49	38			
	Delay / Veh (s)	na	na	6	3			
47	@ Off Ramp to Rt 168							
35 in	Volume	5700	590	6370	1530			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	44	41	33			
	Delay / Veh (s)	1	0.4	6	8			
49	@ On-Ramp from Rt 168 SB							
18 in	Volume	5700	230	6370	170			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	47	33	47	25			
	Delay / Veh (s)	2	0.2	2	0.1			
16	@ On-Ramp from Rt 168 NB							
72 in	Volume	5930	630	6540	370			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	40	31	44	32			
	Delay / Veh (s)	3	2	1	1			

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Node #	Node Name	No Build	Alternative D & G2	Alternative D1	Alternative H1	Alternative K
Rt 42 NORTHBOUND & I-76 WESTBOUND						
62	@ Benigno Blvd Off-Ramp					
31 in	Volume	7020	630	8980	900	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
57 in K	Avg Speed (mph)	10	35	16	34	
82 in H1	Delay / Veh (s)	39	5	20	4	
56	@ Benigno Blvd On-Ramp					Same as Alternative D
114 in	Volume	7020	330	8980	540	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	9	20	14	29	
	Delay / Veh (s)	17	2	13	0.4	
	@ I-76 WB Split					Same as Alternative D
39 in	Volume	2860	4490			
No Build	Movement	Express	Local	na	na	
	Avg Speed (mph)	13	10	na	na	
	Delay / Veh (s)	34	44	na	na	
9	@ Ramp A (off-ramp)					Same as Alternative D
23 in	Volume	4040	4150	7850	1670	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	20	21	32	26	
	Delay / Veh (s)	22	19	10	16	
23	@ Ramp E (on-ramp)	I-295 & I-76 Coincident				Same as Alternative D
34 in	Volume	4490	3700	7850	1640	
No Build	Movement	Rt 42	Ramp	Freeway	Ramp	
	Avg Speed (mph)	10	20	44	38	
	Delay / Veh (s)	36	4	6	5	
2	@ Ramp B					Same as Alternative D
	Volume	4040	2830	9490	1480	
	Movement	-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	20	22	13	39	
	Delay / Veh (s)	49	44	12	2	
21	@ Market St Off-Ramp					Same as Alternative D
	Volume	6720	150	10640	140	
	Movement	I-76 Local Onl	Ramp	Freeway	Ramp	
	Avg Speed (mph)	17	16	26	22	
	Delay / Veh (s)	30	32	26	33	
20	@ Rt 130 Off-Ramp					Same as Alternative D
	Volume	5320	1400	8960	1680	
	Movement	I-76 Local Onl	Ramp	Freeway	Ramp	
	Avg Speed (mph)	52	44	49	44	
	Delay / Veh (s)	1	1	1	2	
118	@ Rt 130 On-Ramp					Same as Alternative D
64 in	Volume	9910	1080	8960	1010	
No-Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	48	40	48	35	
	Delay / Veh (s)	3	0.3	5	0.2	

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
Rt 42 SOUTHBOUND & I-76 EASTBOUND								
89	@ Rt 130 Off Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
92 in	Volume	5990	950	6200	590			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	47	26	49	49			
	Delay / Veh (s)	1	3	1	1			
41	@ Rt 130 On Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
43 in	Volume	5990	1640	6200	650			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	48	25	49	35			
	Delay / Veh (s)	5	1	4	0.1			
40	@ Ramp D (off-ramp)					Same as Alternative D	Same as Alternative D	Same as Alternative D
41 in	Volume	5490	2140	5860	990			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	41	41	47	47			
	Delay / Veh (s)	12	12	6	6			
30	@ Ramp F (off-ramp)	Left Off-Ramp to I-295				Same as Alternative D	Same as Alternative D	Same as Alternative D
63 in	Volume	4140	1350	5480	380			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	48	48	48	48			
	Delay / Veh (s)	1	1	3	3			
13	@ Ramp C (on-ramp)					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume	4140	1640	5480	2050			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	50	40	47	34			
	Delay / Veh (s)	1	1	6	2			
24	@ Leaf Ave Off-Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume	5550	230	7150	380			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	48	48	46	46			
	Delay / Veh (s)	2	2	2	1			
25	@ Leaf Ave On-Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume	5550	1030	7150	630			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	45	30	46	32			
	Delay / Veh (s)	1	1	1	1			
26/114	@ Missing Moves Ramp B					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume							
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)							
	Delay / Veh (s)							

Table 5: Traffic Performance Comparisons With No Missing Moves---2030 PM Peak Hour

Node #	Node Name	No Build		Alternative D & G2		Alternative D1		Alternative H1		Alternative K
I-295 SOUTHBOUND										
73	@ Off-Ramp to Rt 168									Same as Alternative D1
16 in	Volume	5080	730	6550	320	6550	320	6550	320	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	19	34	16	29	16	29	16	29	
	Delay / Veh (s)	18	4	19	5	19	5	19	5	
5	@ On-Ramp from Rt 168 NB									
	Volume	5080	130	6550	480	6550	480	6550	480	
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	15	23	13	24	13	24	13	24	
	Delay / Veh (s)	20	1	23	1	23	1	23	1	
4	@ Rt 168 SB On-Ramp									
6 in	Volume	5210	170	6930	1070	6930	1070	6930	1070	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	11	31	15	29	15	29	15	29	
	Delay / Veh (s)	18	1	7	3	7	3	7	3	
32	@ Ramp C (off-ramp)									
	Volume	2050	1870	na	na	5290	2710	na	na	
	Movement	To I-295 SB	To I-76 EB	na	na	Freeway	Ramp	na	na	
	Avg Speed (mph)	17	34	na	na	42	33	na	na	
	Delay / Veh (s)	8	1	na	na	2	4	na	na	
1	@ Ramp B (off-ramp)									
	Volume	na	na	na	na	4520	770	na	na	
	Movement	na	na	na	na	Freeway	Ramp	na	na	
	Avg Speed (mph)	na	na	na	na	50	51	na	na	
	Delay / Veh (s)	na	na	na	na	3	2	na	na	
32	@ Ramp B/C (off-ramp)									
3 in	Volume	3920	1460	4520	3480	na	na	4520	3480	
No Build	Movement	To I-295 SB	To I-76 WB	To I-295 SB	To Ramps B & C	na	na	To I-295 SB	To Ramps B & C	
	Avg Speed (mph)	17	16	43	41	na	na	43	41	
	Delay / Veh (s)	61	66	4	4	na	na	4	4	
57	@ Ramp B & Ramp C Split									
17 in H1	Volume			2710	770	na	na	2710	770	
	Movement			To Ramp C	To Ramp B	na	na	To Ramp C	To Ramp B	
	Avg Speed (mph)			39	41	na	na	39	41	
	Delay / Veh (s)			3	2	na	na	3	2	
12	@ Ramp F (on-ramp)									
	Volume	2050	1710	4520	1240	4520	1240	4520	1240	
	Movement	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	34	38	47	37	47	37	47	37	
	Delay / Veh (s)	4	3	5	5	5	5	5	5	
89/102	@ Missing Moves Ramp A									
108 in	Volume									
No Build	Movement									
	Avg Speed (mph)									
	Delay / Veh (s)									

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
I-295 NORTHBOUND								
111	@ Missing Moves Ramp B							
116 in	Volume							
No Build	Movement	Freeway	Ramp	Freeway	Ramp	Same as Alternative D	Same as Alternative D	Same as Alternative D
	Avg Speed (mph)							
	Delay / Veh (s)							
42	@ Ramp E (off-ramp)							
33 in	Volume	1410	2940	5060	870			
No Build	Movement	To I-76 X	To I-76 Local	Freeway	Ramp			
	Avg Speed (mph)	41	44	44	45			
	Delay / Veh (s)	14	12	4	4			
34	@ Rt 42 NB Junction 1	I-295 & I-76 Coincident						
	Volume	2940	4500					
	Movement	I-295	Rt 42	na	na			
	Avg Speed (mph)	21	10	na	na			
	Delay / Veh (s)	5	37	na	na			
23	@ Rt 42 NB Junction 2	I-295 & I-76 Coincident						
	Volume	4170	3270					
	Movement	I-295	Rt 42	na	na			
	Avg Speed (mph)	22	22	na	na			
	Delay / Veh (s)	19	18	na	na			
36	@ Ramp D (on-ramp)							
40 in	Volume	4170	2760	6710	1660			
No Build	Movement	I-295 NB	Ramp D	Freeway	Ramp			
	Avg Speed (mph)	23	25	30	34			
	Delay / Veh (s)	29	18	9	4			
46	@ Ramp A (on-ramp)							
43 after	Volume			5060	1650			
Relocatn	Movement	na	na	Freeway	Ramp			
	Avg Speed (mph)	na	na	46	35			
	Delay / Veh (s)	na	na	8	5			
47	@ Off Ramp to Rt 168							
35 in	Volume	5800	1130	6650	1720			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	28	33	27			
	Delay / Veh (s)	1	5	10	13			
49	@ On-Ramp from Rt 168 SB							
18 in	Volume	5710	300	6650	90			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	49	22	47	23			
	Delay / Veh (s)	1	2	2	1			
16	@ On-Ramp from Rt 168 NB							
72 in	Volume	6100	460	6740	190			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	44	31	46	33			
	Delay / Veh (s)	2	3	1	1			

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Node #	Node Name	No Build	Alternative D & G2	Alternative D1	Alternative H1	Alternative K
Rt 42 NORTHBOUND & I-76 WESTBOUND						
62	@ Benigno Blvd Off-Ramp					
31 in	Volume	5730	710	7540	540	Same as Alternative D
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
57 in K	Avg Speed (mph)	8	18	40	49	
82 in H1	Delay / Veh (s)	51	17	3	1	
56	@ Benigno Blvd On-Ramp					Same as Alternative D
114 in	Volume	5730	350	7540	560	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	7	30	35	32	
	Delay / Veh (s)	33	0.4	9	0.4	
	@ I-76 WB Split					Same as Alternative D
39 in	Volume	1580	4500			
No Build	Movement	Express	Local	na	na	
	Avg Speed (mph)	33	8	na	na	
	Delay / Veh (s)	7	59	na	na	
9	@ Ramp A (off-ramp)	I-295 & I-76 Coincident				Same as Alternative D
23 in	Volume	3270	4170	6470	1650	
No Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	22	22	35	33	
	Delay / Veh (s)	19	18	11	18	
23	@ Ramp E (on-ramp)	I-295 & I-76 Coincident				Same as Alternative D
34 in	Volume	4500	2940	6470	870	
No Build	Movement	Rt 42	I-295	Freeway	Ramp	
	Avg Speed (mph)	10	21	46	42	
	Delay / Veh (s)	37	5	3	2	
2	@ Ramp B					Same as Alternative D
	Volume	3270	1460	7340	770	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	47	50	42	42	
	Delay / Veh (s)	6	5	2	1	
21	@ Market St Off-Ramp					Same as Alternative D
	Volume	4410	320	7400	260	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	36	33	48	48	
	Delay / Veh (s)	7	9	4	4	
20	@ Rt 130 Off-Ramp					Same as Alternative D
	Volume	3370	1040	6840	560	
	Movement	I-76 Local Only	Ramp	Freeway	Ramp	
	Avg Speed (mph)	53	45	49	46	
	Delay / Veh (s)	1	1	1	1	
118	@ Rt 130 On-Ramp					Same as Alternative D
64 in	Volume	6360	710	6840	130	
No-Build	Movement	Freeway	Ramp	Freeway	Ramp	
	Avg Speed (mph)	46	41	49	42	
	Delay / Veh (s)	4	0.2	4	0	

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Node #	Node Name	No Build		Alternative D & G2		Alternative D1	Alternative H1	Alternative K
Rt 42 SOUTHBOUND & I-76 EASTBOUND								
89	@ Rt 130 Off Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
92 in	Volume	9720	940	9610	1480			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	36	40	37	28			
	Delay / Veh (s)	1	1	5	11			
41	@ Rt 130 On Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
43 in	Volume	9720	970	9610	1450			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	23	26	45	28			
	Delay / Veh (s)	39	1	7	0.4			
40	@ Ramp D (off-ramp)					Same as Alternative D	Same as Alternative D	Same as Alternative D
41 in	Volume	7930	2760	9360	1660			
No Build	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	23	25	39	33			
	Delay / Veh (s)	41	36	13	20			
30	@ Ramp F (off-ramp)	Left Off-Ramp to I-295				Same as Alternative D	Same as Alternative D	Same as Alternative D
63 in	Volume	6220	1710	8120	1240			
No Build	Movement	To Rt 42 S	To I295 S	Freeway	Ramp			
	Avg Speed (mph)	40	41	47	46			
	Delay / Veh (s)	3	3	4	3			
13	@ Ramp C (on-ramp)					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume	6220	1870	8120	2710			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	34	38	42	33			
	Delay / Veh (s)	5	2	9	2			
24	@ Leaf Ave Off-Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume	7980	110	10630	200			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	17	41	38	33			
	Delay / Veh (s)	21	2	5	2			
25	@ Leaf Ave On-Ramp					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume	7980	1610	10630	670			
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)	16	9	42	32			
	Delay / Veh (s)	7	78	2	0.4			
26/114	@ Missing Moves Ramp B					Same as Alternative D	Same as Alternative D	Same as Alternative D
	Volume							
	Movement	Freeway	Ramp	Freeway	Ramp			
	Avg Speed (mph)							
	Delay / Veh (s)							

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