

Route 37 Access Management Study

Final Report



Prepared for the Winchester - Frederick
County Metropolitan Planning Organization
November 19, 2007

HNTB

TABLE OF CONTENTS

Disclaimer.....	1
A. Introduction	2
B. Existing Conditions.....	2
1. Existing Network Configuration	2
2. Existing Traffic Operations	3
C. Future Conditions	6
1. Developments.....	6
2. Roadway Network Improvements.....	7
3. Forecast Methodology.....	8
D. Alternatives.....	12
1. No Build Alternative.....	12
2. Preliminary Alternatives.....	14
3. Build Alternative 1	14
4. Build Alternative 2.....	18
5. Build Alternative 3.....	21
E. Evaluation of Alternatives	24
1. Measures of Effectiveness	24
2. Quantitative Measures	25
3. Qualitative Assessment	29
F. Recommended Alternative.....	31
1. Summary of Features and Issues.....	31
2. Justification of Selection.....	35
3. Additional Modification.....	35
4. Check of Year 2015 Operations.....	39
G. Appendices	47
1. Summary of CORSIM Outputs.....	48
2. Synchro Intersection Reports.....	49
3. Cost Estimates	50
4. Existing Conditions Report.....	51

LIST OF TABLES

Table 1: Existing Intersection Level of Service.....	5
Table 2: Existing Travel Times.....	5
Table 3: Existing Operating Speeds	6
Table 4: Planned Improvements for “No Build” Network – Year 2035.....	10
Table 5: Overall ranking of alternatives	25
Table 6: Average travel times.....	26
Table 7: Average density.....	27
Table 8: Densities and levels of service in weaving segments	27
Table 9: Approach and Intersection delay with LOS and 95th percentile queue length.....	28
Table 10: Conceptual-level construction cost estimates.....	29
Table 11: Estimated right-of-way needs.....	30
Table 12: Average travel times including Alternative 2 Modified.....	35
Table 13: Average density including Alternative 2 Modified	37
Table 14: Densities and levels of service in weaving segments including Alternative 2 Modified.....	37
Table 15: 2015 Average travel time and densities.....	40
Table 16: 2015 Densities and levels of service in weaving segments.....	40
Table 17: Approach and Intersection delay with LOS and 95th percentile queue length	41
Table 18: Planned Improvements for “No Build” Network – Year 2015.....	42

LIST OF FIGURES

Figure 1: Study Area.....	3
Figure 2: Existing Volumes AM	4
Figure 3: Existing Volumes PM.....	4
Figure 4: Proposed Development Locations	7
Figure 5: Planned Interchange Improvements at I-81/Route 37 – Ultimate Configuration.....	9
Figure 6: No Build Alternative Forecast Volumes – Year 2035 AM Peak Hour.....	13
Figure 7: No Build Alternative Forecast Volumes – Year 2035 PM Peak Hour	13
Figure 8: Alternative 1 Configuration.....	16
Figure 9: Alternative 1 Forecast Volumes – Year 2035 AM Peak Hour.....	17
Figure 10: Alternative 1 Forecast Volumes – Year 2035 PM Peak Hour.....	17
Figure 11: Alternative 2 Configuration.....	19
Figure 12: Alternative 2 Forecast Volumes – Year 2035 AM Peak Hour.....	20
Figure 13: Alternative 2 Forecast Volumes – Year 2035 PM Peak Hour.....	20
Figure 14: Alternative 3 Configuration.....	22
Figure 15: Alternative 3 Forecast Volumes – Year 2035 AM Peak Hour.....	23
Figure 16: Alternative 3 Forecast Volumes – Year 2035 PM Peak Hour.....	23
Figure 17: Alternative 2 Detailed Layout Sheet 1.....	32
Figure 18: Alternative 2 Detailed Layout Sheet 2.....	33
Figure 19: Alternative 2 Detailed Layout Sheet 3.....	34
Figure 20: Alternative 2 Modified Detailed Layout.....	36
Figure 21: Alternative 2 Modified – Year 2035 AM Peak Hour.....	38
Figure 22: Alternative 2 Modified – Year 2035 PM Peak Hour.....	38
Figure 23: Planned Interchange Improvements at I-81/Route 37 – Phase I – 2015 No Build Alternatives	43

Figure 24: No Build Alternative Forecast Volumes – Year 2015 AM Peak Hour.....	44
Figure 25: No Build Alternative Forecast Volumes – Year 2015 PM Peak Hour	44
Figure 26: Alternative 2 Forecast Volumes – Year 2015 AM Peak Hour.....	45
Figure 27: Alternative 2 Forecast Volumes – Year 2015 PM Peak Hour.....	45
Figure 28: Alternative 2 Modified Forecast Volumes – Year 2015 AM Peak Hour	46
Figure 29: Alternative 2 Modified Forecast Volumes – Year 2015 PM Peak Hour.....	46

ROUTE 37 ACCESS MANAGEMENT STUDY

COUNTY OF FREDERICK

FINAL REPORT

Disclaimer

The contents of this report reflect the views of the author(s) who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration (FHWA) and the Commonwealth Transportation Board. This report does not constitute a standard, specification, or regulation. FHWA acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement / approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.

This report has been prepared for the Winchester – Frederick County Metropolitan Planning Organization with funding provided by the Virginia Department of Transportation.

ROUTE 37 ACCESS MANAGEMENT STUDY

COUNTY OF FREDERICK

FINAL REPORT

A. Introduction

The purpose of this study is to assess the impact of proposed modifications and improvements to the Route 37 / Interstate 81 interchange and of increased traffic associated with approved and planned developments in the area, and to develop recommendations to improve traffic operations in the vicinity of the Route 37/Route 11 interchange.

This report provides an overview of the existing conditions in the study area and presents planned improvements and developments. This document also details the analysis of future conditions. This includes a no-build scenario and the evaluation of three alternative treatments to Route 37 to address the impact of expected development in the area, changes in infrastructure, and to, if possible, maintain access to US 11 while providing a connection to Shady Elm Road.

Figure 1 shows the study area for this Route 37 Access Management Study and the Route 11 study being conducted in parallel by VDOT. These two studies have been coordinated in recognition of the relationship between the two corridors and to ensure that impacts of proposed alternatives beyond the confines of Route 37 are understood and addressed.

B. Existing Conditions

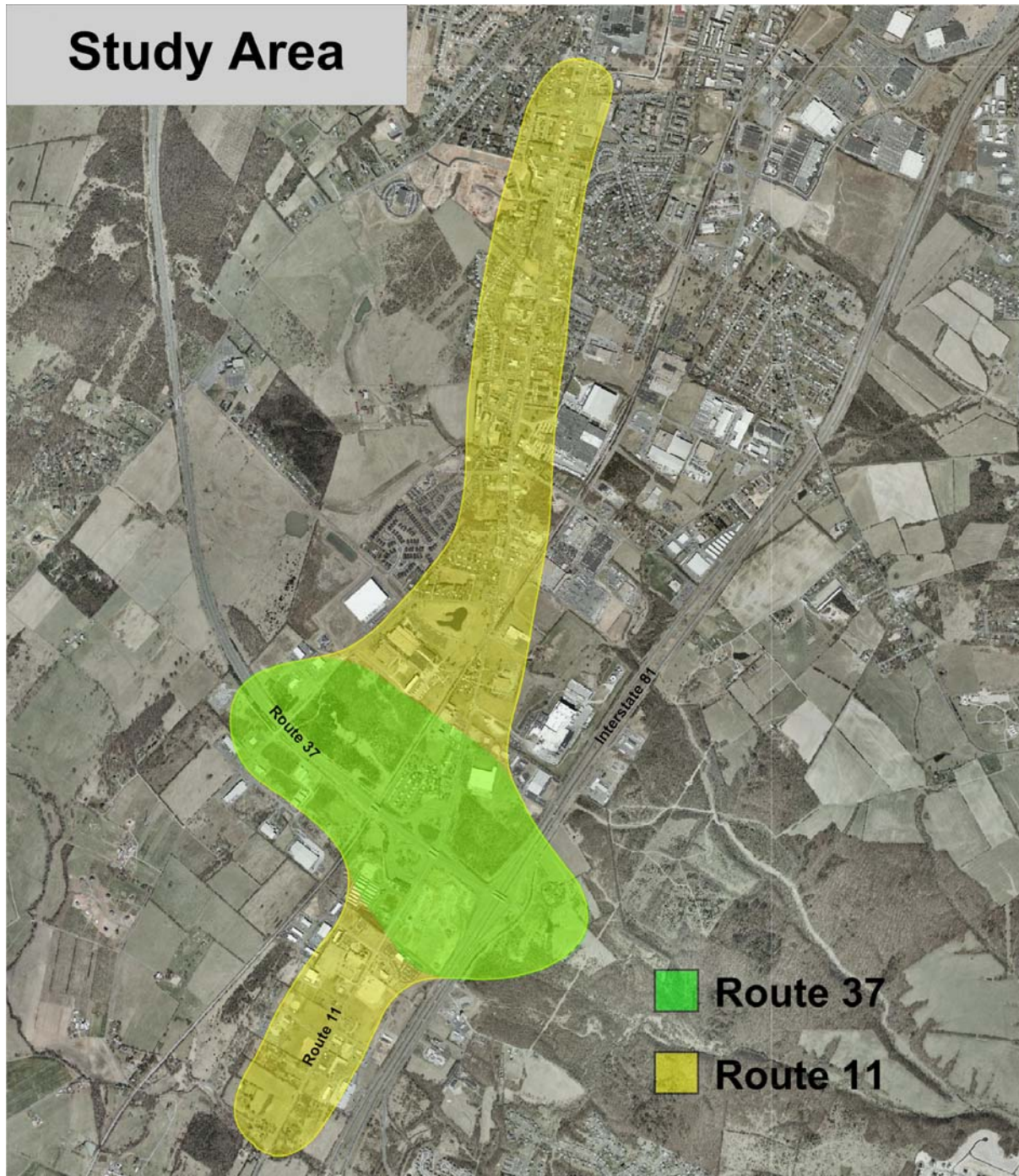
Below is a summary of existing conditions. For more information, see the Existing Conditions Report Appendix.

1. Existing Network Configuration

The Route 37 / Interstate 81 interchange is less than one quarter of a mile from the Route 37 / US 11 interchange. The study area, shown in Figure 1, is along Route 37 between Tasker Road / Hillandale Lane in the east and Shady Elm Road in the west, and along US 11 between Prosperity Drive in the south and Shawnee Drive in the north.

Route 37 is a rural four-lane divided highway within the study area. It is classified as a limited access principal arterial west of US 11 and a principal arterial east of US 11. Interstate 81 is a rural four-lane divided highway classified as a limited access principal arterial. US 11 is primarily two to three lanes within the study area and classified as a major collector.

Figure 1: Study Area



2. Existing Traffic Operations

Current year traffic volumes were developed to analyze existing intersection levels of service in the morning and afternoon peak periods. Volumes from different sources were balanced to create a consistent set of turning movements. Existing volumes are shown in Figure 2 and Figure 3.

Figure 2: Existing Volumes AM

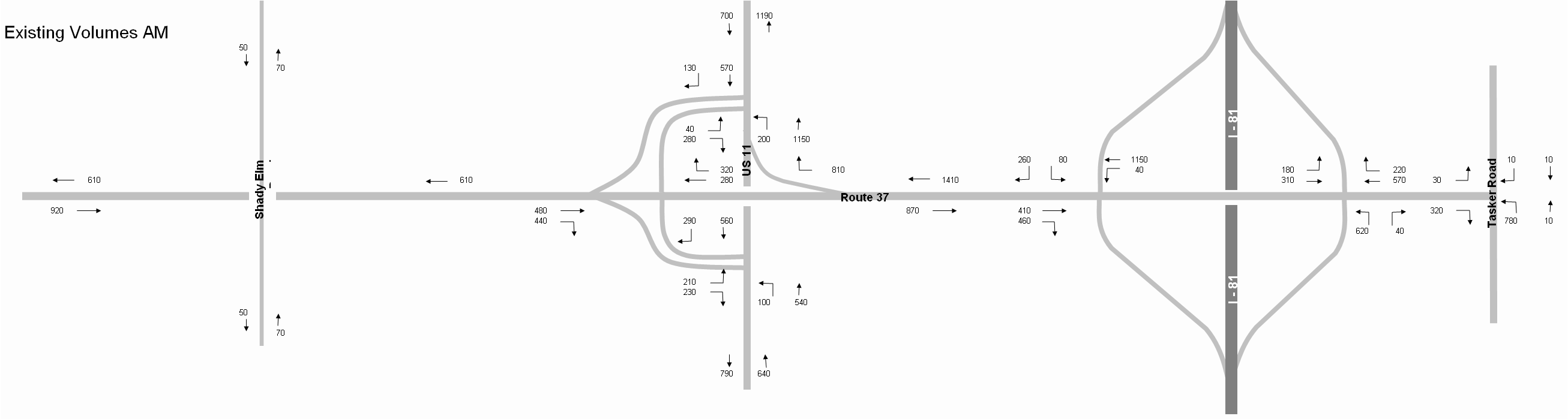
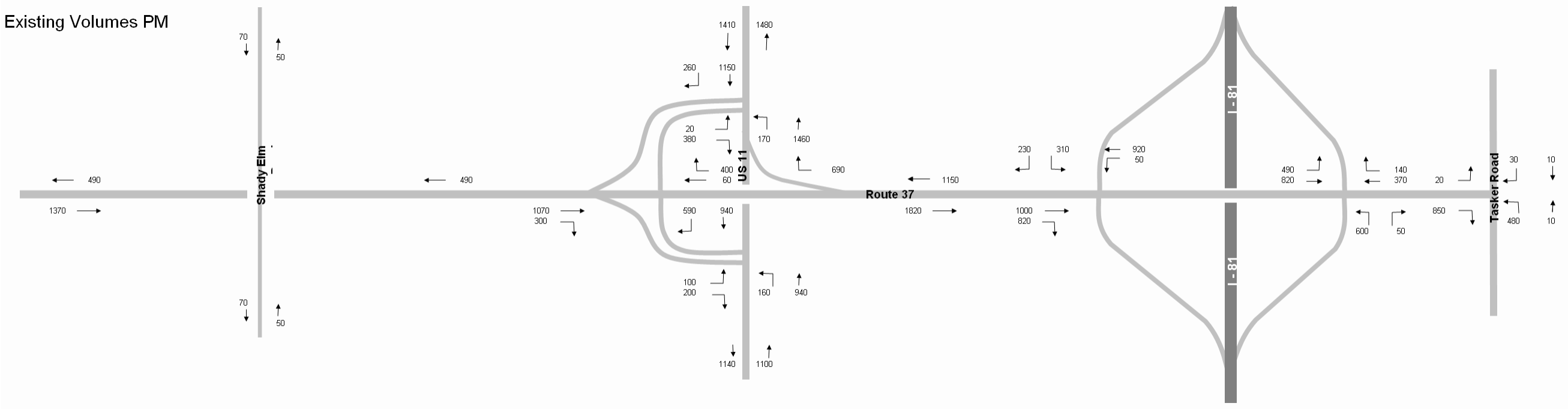


Figure 3: Existing Volumes PM



At locations where turning movement counts were not available, volumes were synthesized taking into consideration balancing volumes from nearby counted intersections as well as land uses accessed at the uncounted intersection. Signal timing plans were provided by VDOT.

Levels of service (LOS) were calculated using Synchro 7 traffic analysis software. The results for the intersections in the study area are shown in Table 1.

The study team conducted travel times on Route 37 and US 11. These were driven five times in each direction during the morning and afternoon peak periods and two times in each direction during the midday on Tuesday, April 3, 2007. The results are shown in Table 2. Travel times were fairly consistent between runs, more so in the morning than in the afternoon. Route 37 had greater variations in travel time than US 11, which could be attributed to the shorter length.

Existing operating speeds generally appear reasonable on all segments. As Table 3 indicates, Route 37 operates particularly slowly westbound at midday. However, only two travel time runs were made at that time, and the variation in travel time between those two runs was high. Therefore, typical operation may not have been observed.

Table 1: Existing Intersection Level of Service

Intersection	AM		PM	
	Average Delay (seconds/vehicle)	LOS	Average Delay (seconds/vehicle)	LOS
<i>Signalized</i>				
Route 37 at Tasker/Hillandale	11.5	B	14.5	B
Route 37 at NB I-81 Ramps	40.7	D	42.5	D
Route 37 at SB I-81 Ramps	18.4	B	25.2	C
<i>Unsignalized</i>				
US 11 at EB Route 37 Ramps	6.7	A	4.2	A
US 11 at WB Route 37 Ramps	3.0	A	5.6	C
US 11 at WB Route 37 Off-Ramp	53.4	C	67.9	D

Table 2: Existing Travel Times

Average Travel Times (min:sec)	AM Peak Hour	Midday	PM Peak Hour
US 11 southbound <i>from Tevis Street to Mill Lane</i>	5:41	6:17	7:51
US 11 northbound <i>from Mill Lane to Tevis Street</i>	5:34	7:53	8:29
Route 37 eastbound <i>from Shady Elm Road to Tasker Road</i>	2:01	2:14	2:16
Route 37 westbound <i>from Tasker Road to Shady Elm Road</i>	1:30	2:57	1:53

Table 3: Existing Operating Speeds

Average Speed (mph)	AM Peak Hour	Midday	PM Peak Hour
US 11 southbound <i>from Tevis Street to Mill Lane</i>	34	31	25
US 11 northbound <i>from Mill Lane to Tevis Street</i>	35	25	23
Route 37 eastbound <i>from Shady Elm Road to Tasker Road</i>	28	26	25
Route 37 westbound <i>from Tasker Road to Shady Elm Road</i>	38	19	30

C. Future Conditions

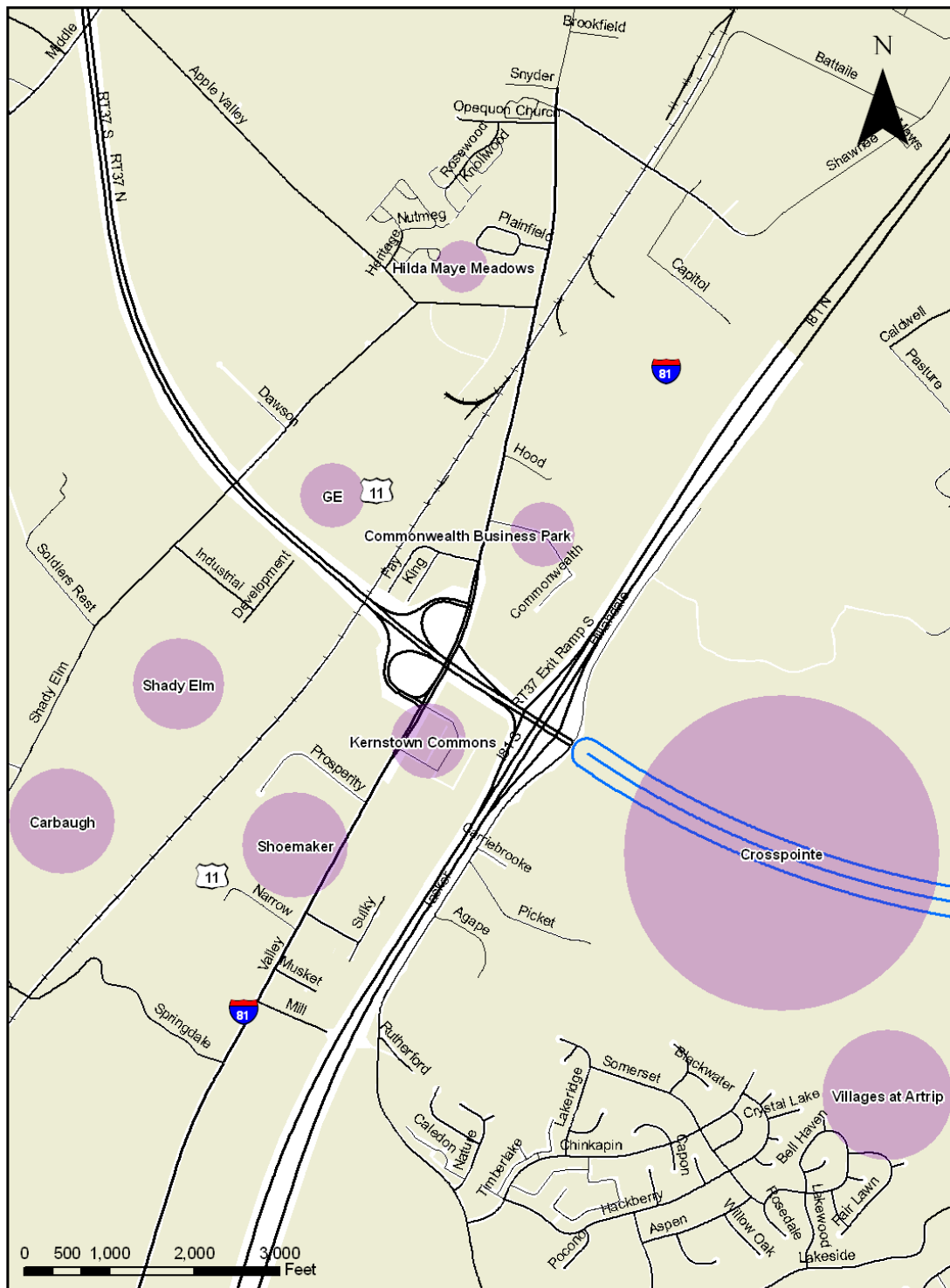
1. Developments

Several new developments are planned for the vicinity of the Interstate 81 / Route 37 interchange. The following developments are anticipated to be in place by year 2035.

- Crosspointe Center, located east of Interstate 81, served by an extended Route 37, consisting of a mix of residential, office, and retail.
- Villages at Artrip, located southeast of the Route 37 / Interstate 81 interchange, consisting of a mix of residential, office, retail, and recreational space.
- Kernstown Commons, located southwest of the Route 37 / Interstate 81 interchange, consisting of a mix of retail and hotel uses.
- Commonwealth Business Park, Ventures 1, located north of the Route 37 / US 11 interchange, potentially consisting of a mix of retail and light industrial uses.
- Hilda Maye Meadows, located on the north side of Apple Valley Road, consisting of residential units and a community center.
- Shady Elm development, located south of Route 37 and east of Shady Elm Road, consisting of a mix of office and industrial development.
- The Carbaugh site, located directly south of the Shady Elm parcel, assumed to be a similar office and industrial development.
- The Shoemaker development, located west of US 11, consisting of a mix of office and retail.
- The GE parcel, located north of Route 37 and east of Shady Elm Road, consisting of light industrial and office development.

The location of these developments is shown in Figure 4.

Figure 4: Proposed Development Locations



2. Roadway Network Improvements

Route 37 is planned to be extended to the east to form a bypass around the east side of Winchester. Part of this extension would be constructed through developer proffer. The

proposed typical section is a rural four-lane divided highway with grade separations at major crossing roadways. This new highway is part of the Win-Fred MPO's Constrained Long Range Plan (CLRP).

The Interstate 81 / Route 37 interchange is to be rebuilt. This improvement is also listed in the CLRP. The reconfiguration will be phased, starting with reconstructing the ramp termini farther apart while retaining a diamond interchange. This first phase is anticipated to be in place by 2015. The ultimate full cloverleaf, as shown in Figure 5, is expected to be in place by 2035.

A list of planned improvements being considered as part of the "no build" network for this study is shown in Table 4 for year 2035. Maps depicting these improvements are given in Appendix 4: Existing Conditions Report.

3. Forecast Methodology

Following is the procedure used to arrive at future forecast traffic volumes.

1. Existing counts were taken within the study area. The counts were balanced and smoothed based on engineering judgment and input from VDOT and local stakeholders.
2. Regional travel demand models were run for the base year and the future years in the no-build configuration and for each of the build alternatives. These incorporated the planned improvements listed in Table 4.
3. Volume growth factors on a link basis were computed from the regional travel demand model outputs.
4. Existing volumes were factored up using the growth factors.
5. The grown volumes were then balanced and smoothed.
6. Forecast traffic volumes from traffic impact studies were added to the balanced grown volumes when the new developments were not fully accounted for in the regional model.
7. Further adjustments were made to ensure consistency between alternatives and that development traffic was adequately reflected. These adjustments were made in consultation with VDOT.

Figure 5: Planned Interchange Improvements at I-81/Route 37 - Ultimate Configuration



Source: VDOT, Interchange Modification Report for Interstate 81 And Route 37 Interchange, Frederick County, Virginia, Milepost 310, February 16, 2007.

Table 4: Planned Improvements for “No Build” Network – Year 2035

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
1-19	City of Winchester				
1	2030	Weems Lane	Roosevelt Blvd to US Rte 11	0.4	Widen 2 to 5 Lanes (New Center Turn Lane)
2	2030	Hope Drive Ext	Wilson Blvd to Papermill Rd	0.2	Widen 2 to 3 Lanes (New Center Turn Lane)
3	2030	Papermill Road Relocation	Hope Drive to Pleasant Valley Rd	0.2	Widen 4 to 5 Lanes (New Center Turn Lane)
4	2008	Papermill Road	Taft Ave to S Weems Lane	0.2	Widen 2 to 5 Lanes (New Center Turn Lane)
20-49	Frederick County				
20	2008	Rte 277	I-81 to US Rte 522	4.0	Widen 2 to 5 Lanes (New Center Turn Lane)
21	2030	Rte 37	I-81 (MP 310) to Rte 7	7.6	New 4-lane Limited Access Divided Highway
22	2030	Rte 37	Rte 7 to I-81 (MP 318)	5.0	New 4-lane Controlled Access Divided Highway
23	2030	Rte 37	I-81 (MP 310) to Rte 7	2.4	New 4-lane Limited Access Divided Highway
24	2030	Rte 37	Eastern Quadrant of Proposed Rte 37 Circumferential Rd	NA	New Interchanges at Warrior Drive, US Rte 522, US Rte 17/50, Senseny Rd, Rte 7, and existing Rte 37
25	2008	Greenwood Rd	Sulphur Springs Rd to US Rte 17/50	1.1	Realign and improve 2-lane Stretch: Upgrade FC
26	2008	Sulphur Springs Rd	US Rte 17/50 to Greenwood Rd	0.7	Widen to improve 2-lane Stretch: Upgrade FC
27	2030	Stephenson Village Blvd	US Rte 11 to Old Charles Town Road	2.5	New 4-lane Collector Roadway
28	2030	Old Charles Town Road	US Rte 11 to Proposed Stephenson Village Blvd	0.9	Widen 2 to 3 Lanes (New Center Turn Lane)
29	2030	Old Charles Town Road	Proposed Stephenson Village Blvd to Jordan Springs Rd	0.3	Realign and improve 2-lane Stretch: Upgrade FC
30	2030	Warrior Drive	Rte 277 to Opequon Creek	2.5	Widen 2 to 4 lanes
31	2008	Aylor Road	N/A	0.9	Major widening
32	2008	Aylor Road	N/A	0.9	Major widening
50-59	Regional				
50	2030	I-81	South MPO Boundary to MP 310	13.2	Widen from 4 to 6 lanes
51	2030	I-81	MP 310 to MP 313	3.0	Widen from 4 to 8 lanes with 6 lanes mainline and 2 parallel collector/distributor lanes
52	2030	I-81	MP 313 to North MPO Boundary	11.0	Widen from 4 to 6 lanes
53	2030	I-81	MP 318 (North side of Winchester)	NA	New interchange with new Rte 37
54	2030	I-81	MP 311 (Battale Drive)	NA	New interchange with Battale Drive
60+	Winchester Model Technical Report (projects that cannot be found elsewhere)				(No detailed description in the report)
61	2030	Channing Drive	West: Route 37 to Route 50. East: I-81 to Route 37		New road
62	2030	Inverlee Way			New road
64	2030	Crosspointe Blvd			See Route 37 (Item 21)
65	2030	Warrior Drive			Widening See (Item 19)
67	2030	Route 50			Rural 6 lane divided highway
69	2030	Valley Avenue	Tevis Street to Middle Road		Widen 2 to 5, yearopen=0
70	2030	Papermill Road	Tevis Street to Featherbed Lane		Widen 2 to 5, yearopen=0

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
A B C	Additional				(No detailed description in the report)
	2030	Pleasant Valley Road Rte 37 Intersection	To Battaile Drive		Extension urban four lane roadway
	2030	Improvements and associated roadways	See plan		Various see plan
	2030	Stephen City Bypass	Fairfax Pike to Powder Horn lane		Urban 4 lane divided highway

D. Alternatives

1. No Build Alternative

The No Build alternative in 2035 includes a diamond interchange at Warrior Drive, traffic signals at the Route 37 / US 11 ramp termini, a new connector road between Shady Elm Road and US 11 approximately 3,000 feet south of Route 37, and a full cloverleaf interchange at Route 37 and Interstate 81.

a. Network Features and Issues

The No Build alternative maintains the existing connectivity with US 11. It also maintains the short weaving section between US 11 and Interstate 81 along Route 37. The main purpose of this study, which is to develop solutions to this problematic weaving area, would remain unaddressed in the No Build case. Because the existing westbound to northbound ramp at US 11 is removed, traffic volumes increase on the remaining westbound exit ramp. This, in turn, increases left turns at the terminus of this ramp at US 11.

b. Forecast Volumes

Forecast volumes for the No Build alternative in 2035 are given in Figure 6 and Figure 7.

Figure 6: No Build Alternative Forecast Volumes - Year 2035 AM Peak Hour

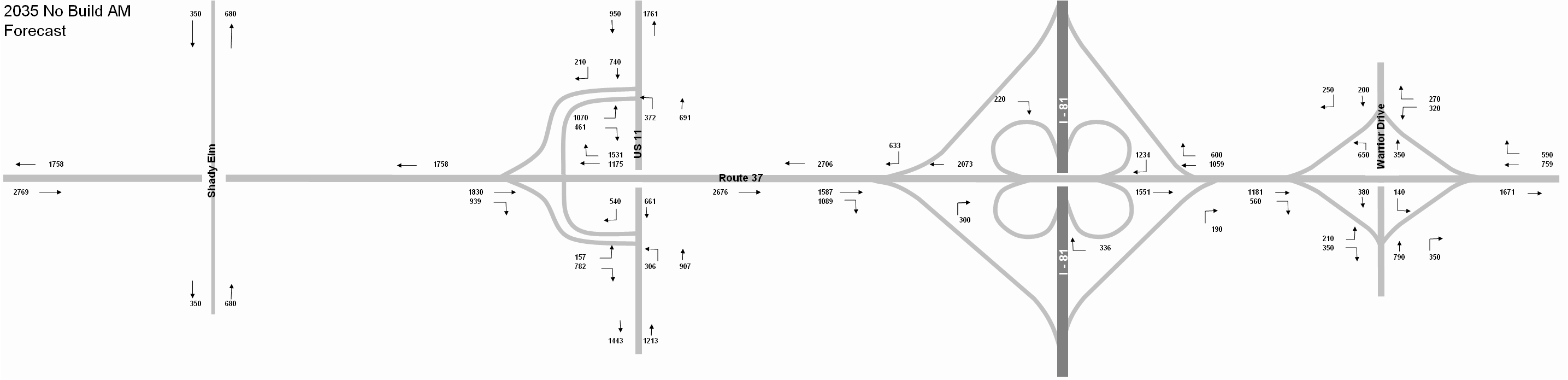
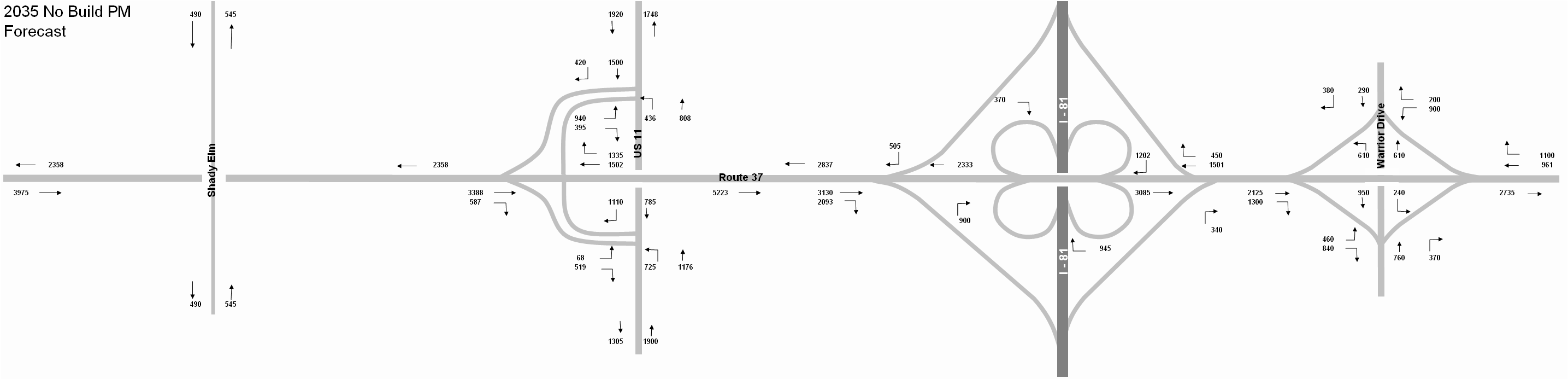


Figure 7: No Build Alternative Forecast Volumes - Year 2035 PM Peak Hour



2. Preliminary Alternatives

A series of preliminary alternatives was developed and presented at a workshop with VDOT and jurisdictional stakeholders. These alternatives were:

- A: Urban diamond at Interstate 81 and half cloverleaf at US 11
- B: Cloverleaf at Interstate 81 with diamond interchange at Shady Elm Road; US 11 accessed off Shady Elm Road
- C: Realigned US 11
- D: Cloverleaf at Interstate 81 with signalized intersection at Shady Elm Road; US 11 accessed off Shady Elm Road
- E: Continuous flow intersection at Interstate 81 and half cloverleaf at US 11
- F: Cloverleaf at Interstate 81 and half cloverleaf at US 11, with collector-distributor roads on Route 37
- G: Three level interchange proposed by the Crosspointe project

After discussions, the study team agreed to move forward with three refined build alternatives. These alternatives are presented as, and have been analyzed as, conceptual layouts. As such they represent methods for addressing issues of connectivity given the objectives and constraints outlined in this report; they do not demonstrate a level of design beyond the concept level, and, although there is no recommendation that is outside what is believed to be feasible in engineering terms, it is acknowledged that gaining approval from FHWA and practicalities of construction and budget may require alterations to the plans presented and recommend below.

3. Build Alternative 1

a. Network Description

The configuration of Alternative 1 is shown in Figure 8. In addition to the No Build improvements, Alternative 1 consists of:

- Eliminating the existing interchange of Route 37 with US 11
- Constructing a new diamond interchange at Route 37 and Shady Elm Road
- Constructing a new connector road between Shady Elm Road and US 11 approximately 1,000 feet north of Route 37.

b. Forecast Volumes

Volume forecasts for Alternative 1 are shown in Figure 9 and Figure 10.

c. Network Features and Issues

Alternative 1 removes the existing connectivity of Route 37 with US 11 and replaces it with an interchange at Shady Elm Road. To provide access to US 11 a new connector road would be built, requiring additional right-of-way. Alternative 1 addresses the problematic weaving area on Route 37 by substantially increasing the weaving distance. Alternative 1 would bring much

higher traffic volumes to Shady Elm Road than experienced currently, and improvements to this road, including additional right-of-way, would be required.

Route 37 Access Management Study

Alternative 1

Conceptual Layout

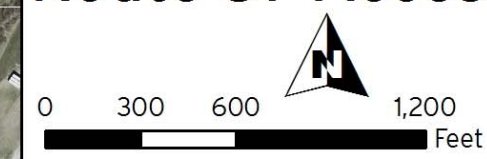


Figure 8: Alternative 1 Configuration

Legend

- Proposed Right-of-Way
- Existing Property Lines
- Route 37 Centerline
- Alternative 1 Roadway Improvements
- I-81 Interchange Roadway Improvements
- Route 37 Extension

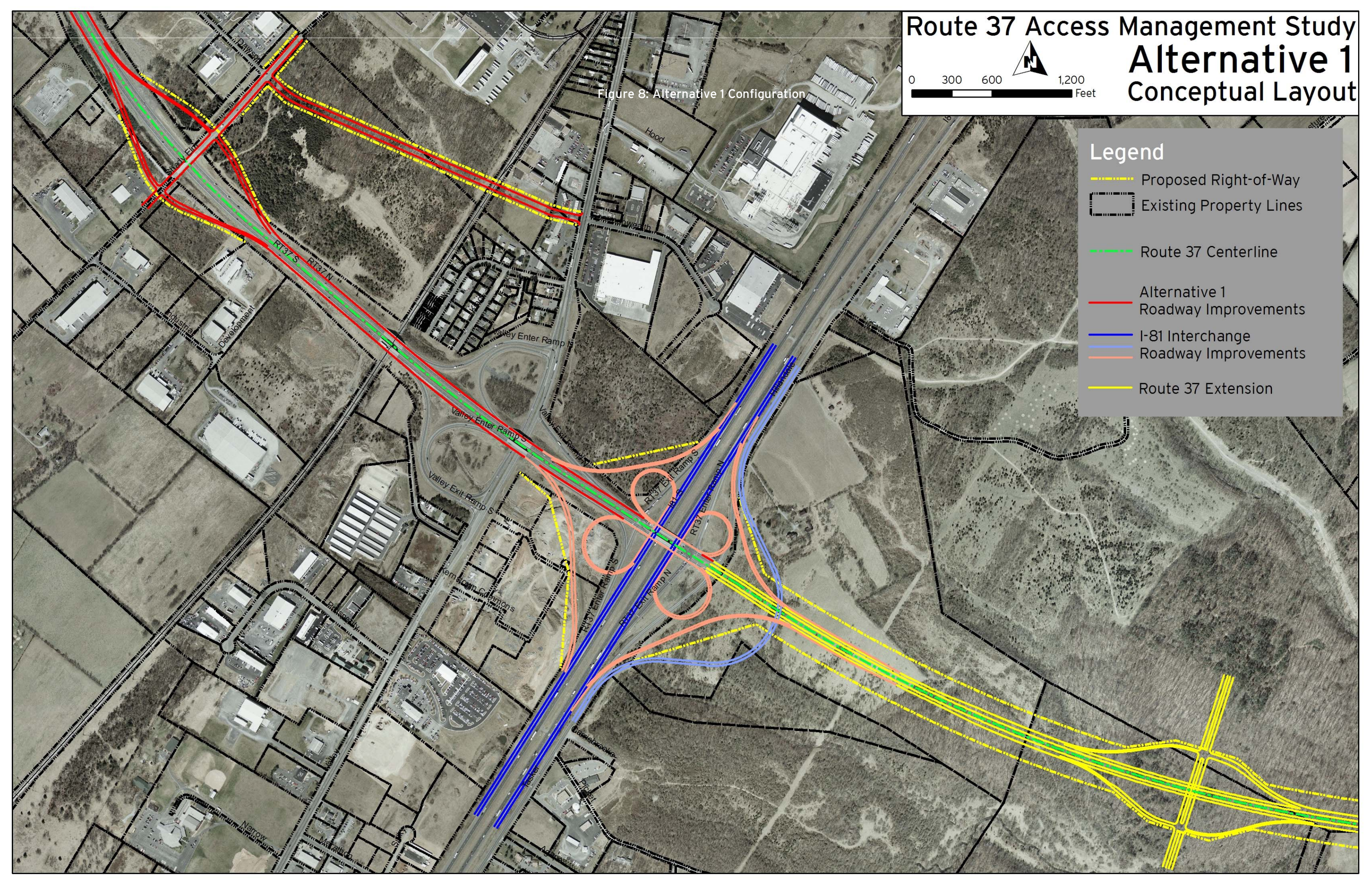


Figure 9: Alternative 1 Forecast Volumes - Year 2035 AM Peak Hour

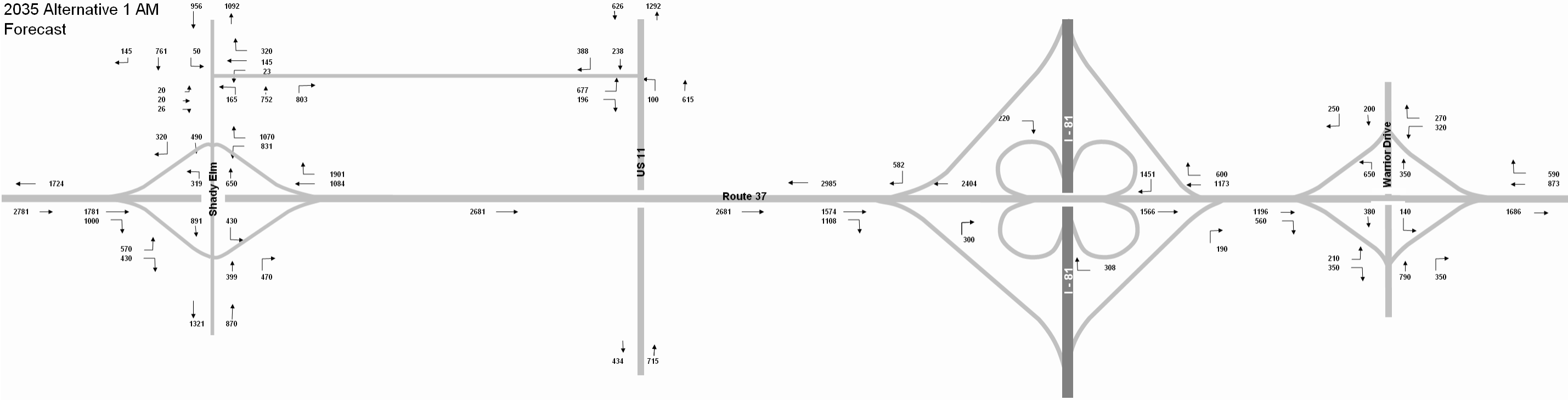
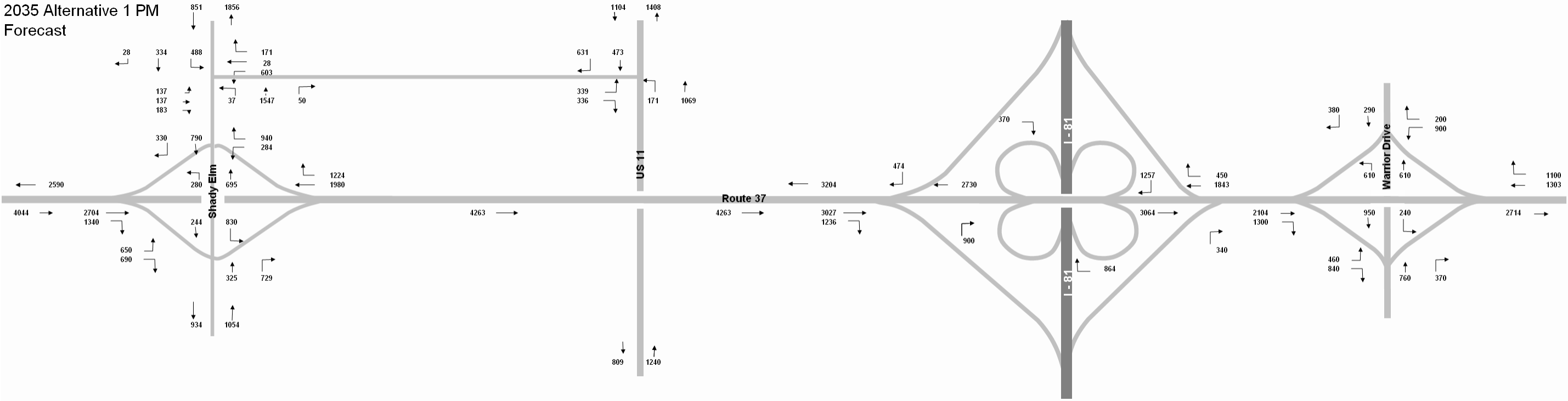


Figure 10: Alternative 1 Forecast Volumes - Year 2035 PM Peak Hour



4. Build Alternative 2

a. Network Description

The configuration of Alternative 2 is shown in Figure 11. It consists of:

- Constructing eastbound and westbound collector-distributor roads along Route 37 from Warrior Drive to Shady Elm Road.
- Connecting ramps at Warrior Drive, Interstate 81, US 11, to the Route 37 collector-distributor roads.
- Constructing a new diamond interchange on the Route 37 collector-distributor roads at Shady Elm Road

b. Forecast Volumes

Volume forecasts for Alternative 2 are shown in Figure 12 and Figure 13.

c. Network Features and Issues

Alternative 2 maintains the existing connectivity of Route 37 with US 11 and also adds an interchange at Shady Elm Road. Alternative 2 addresses the problematic weaving area on Route 37 by moving local access to a collector-distributor road and leaving through traffic on the existing mainline. The collector-distributor road would require additional right-of-way and new grade separations, which bring higher costs and potential constructability issues. Because of the increased connectivity, Alternative 2 would bring higher traffic volumes to Route 37.

Route 37 Access Management Study

Alternative 2

Conceptual Layout

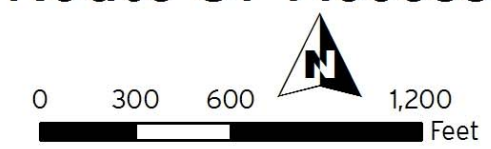


Figure 11: Alternative 2 Configuration

Legend

- Proposed Right-of-Way
- Existing Property Lines
- Route 37 Centerline
- Alternative Roadway Improvements
- I-81 Interchange Roadway Improvements
- Route 37 Extension

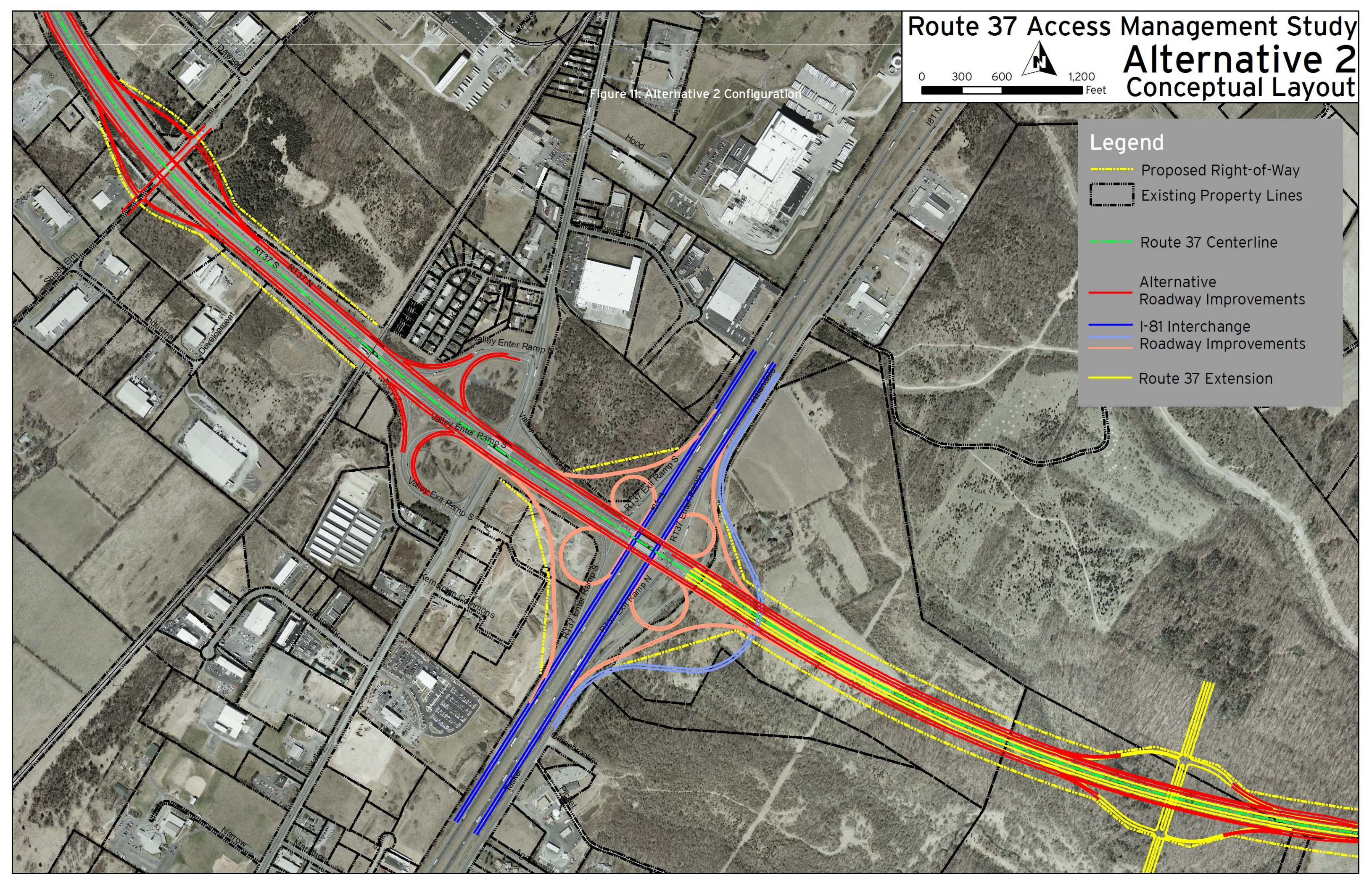


Figure 12: Alternative 2 Forecast Volumes - Year 2035 AM Peak Hour

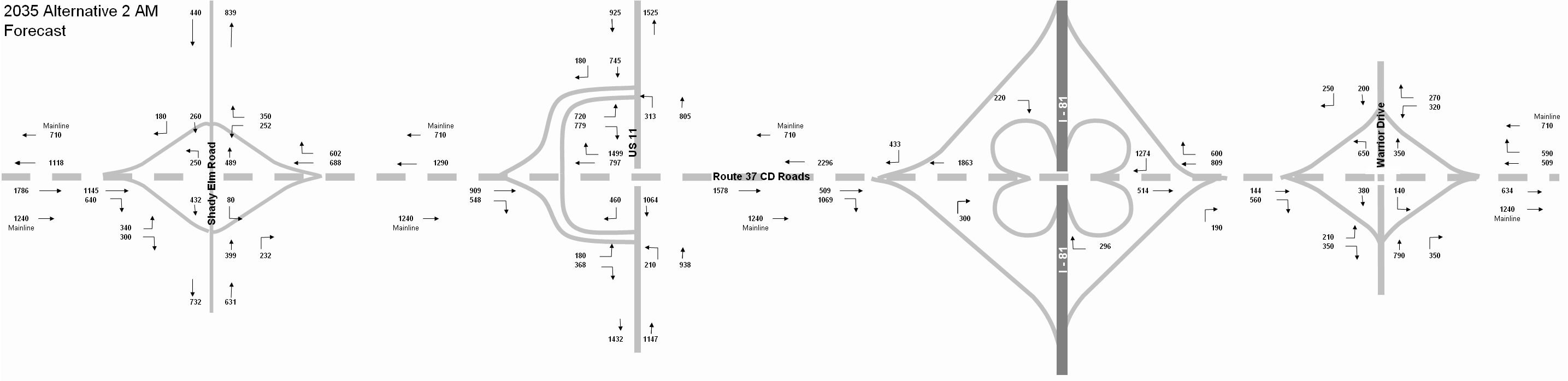
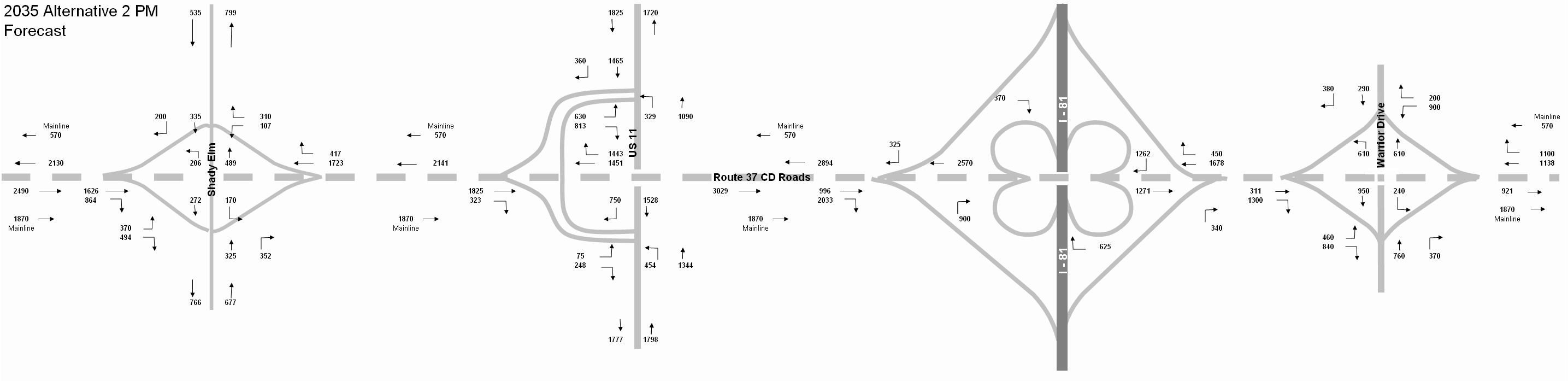


Figure 13: Alternative 2 Forecast Volumes - Year 2035 PM Peak Hour



5. Build Alternative 3

a. Network Description

The configuration of Alternative 3 is shown in Figure 14. It consists of:

- Constructing a westbound frontage road along Route 37 from Interstate 81 to Shady Elm Road
- Constructing an eastbound frontage road along Route 37 from Shady Elm Road to US 11.
- Modifying the Route 37 westbound ramps at US 11 to connect to the new westbound frontage road.
- Modifying the Route 37 eastbound exit ramp to US 11 to connect to the new eastbound frontage road
- Constructing a new slip ramp from the Route 37 westbound frontage road to the Route 37 westbound mainline and a new slip ramp from the Route 37 eastbound frontage road to the Route 37 eastbound mainline between US 11 and Shady Elm Road.
- Constructing an eastbound exit ramp to Shady Elm Road and a westbound entrance ramp from Shady Elm Road.

b. Forecast Volumes

Volume forecasts for Alternative 3 are shown in Figure 15 and Figure 16.

c. Network Features and Issues

Alternative 3 maintains the existing connectivity of Route 37 with US 11 and also adds an interchange at Shady Elm Road. Alternative 3 partially addresses the problematic weaving area on Route 37 by moving local access to a frontage road and leaving through traffic on the existing mainline on the westbound side. The short distance for the eastbound weave between US 11 and Interstate 81 would remain unaddressed. The frontage road would require additional right-of-way and new grade separations, which bring higher costs and potential constructability issues. Because of the increased connectivity, Alternative 3 would bring higher traffic volumes to Route 37.

d. Additional Analysis

The slip ramp from Interstate 81 southbound to US 11 northbound was analyzed for two different merge points on US 11. The analysis below assumes the ramp terminating upstream of the intersection of US 11 and the Route 37 westbound ramps. The ramp was also analyzed terminating downstream of this intersection. This change made no change to the intersection level of service and a nominal change in intersection delay.

Route 37 Access Management Study

Alternative 3

Conceptual Layout

Figure 14: Alternative 3 Configuration

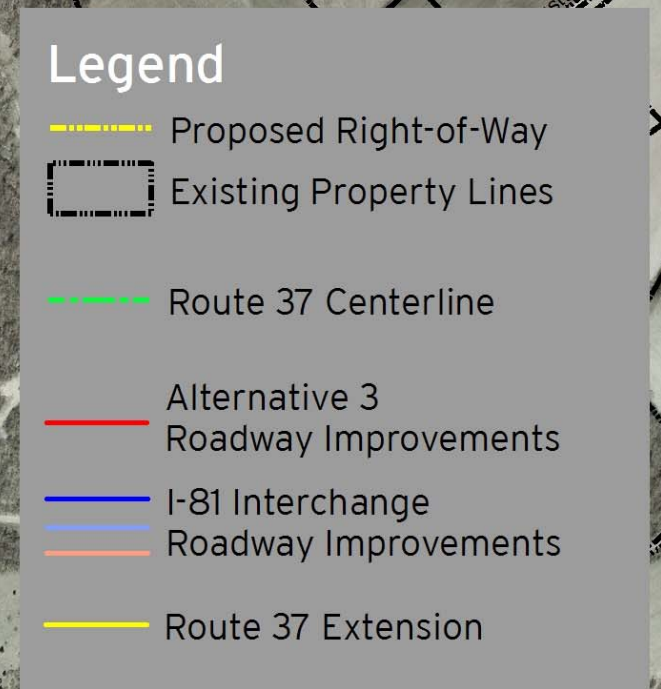


Figure 15: Alternative 3 Forecast Volumes - Year 2035 AM Peak Hour

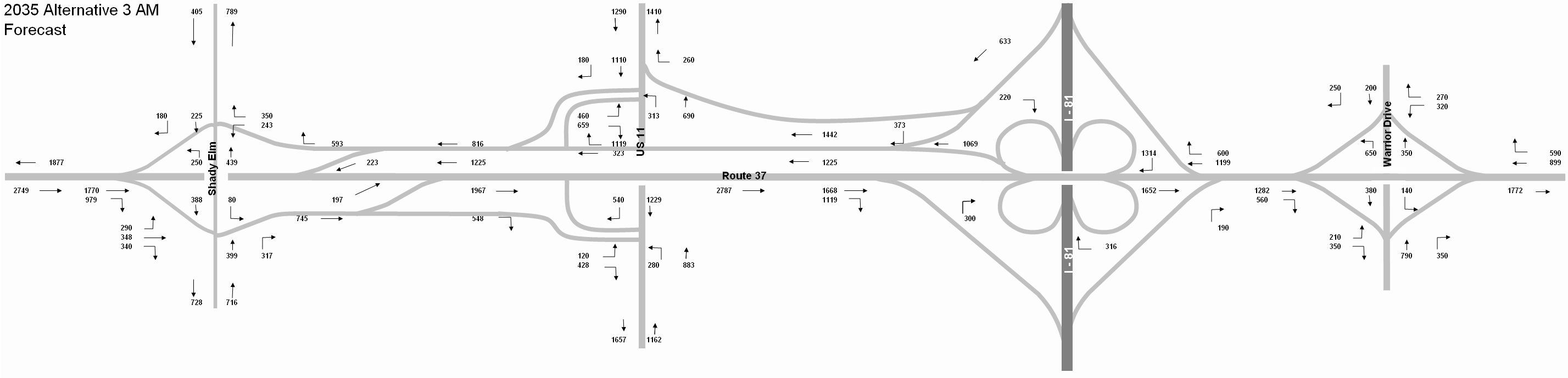
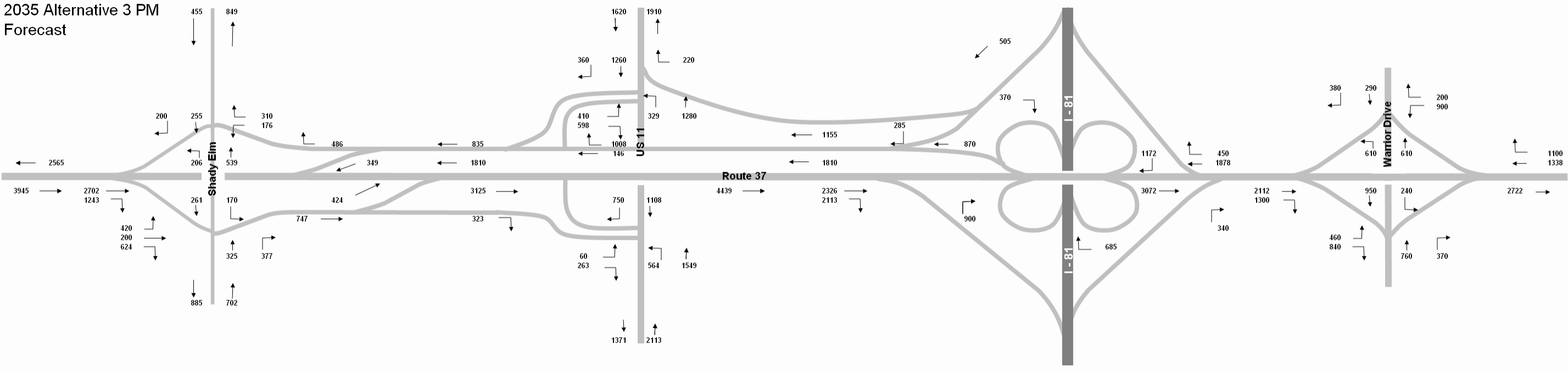


Figure 16: Alternative 3 Forecast Volumes - Year 2035 PM Peak Hour



E. Evaluation of Alternatives

1. Measures of Effectiveness

HNTB used the CORSIM¹ microsimulation model and Synchro² to analyze the alternatives. In evaluating the alternatives, HNTB examined a number of measures of effectiveness, some numerical and some qualitative. Each alternative was then ranked for each measure of effectiveness. Giving equal weight to all measures of effectiveness, the highest ranked alternative overall was advanced as the recommended alternative.

Five quantitative measures of effectiveness were considered.

- Travel Time: Travel times (in minutes and seconds) were computed from CORSIM outputs along the following paths:
 1. Route 37 westbound from east of Warrior Drive to west of Shady Elm Road
 2. Route 37 eastbound from west of Shady Elm Road to east of Warrior Drive
 3. Interstate 81 northbound to US 11 at Fox Street
 4. Interstate 81 southbound to US 11 at Fox Street
 5. US 11 at Fox Street to Interstate 81 northbound
 6. US 11 at Fox Street to Interstate 81 southbound
 7. Route 37 eastbound from west of Shady Elm Road to US 11 at Fox Street
 8. US 11 at Fox Street to Route 37 westbound west of Shady Elm Road
- Roadway Level of Service: Average density (in vehicles per mile per lane) was computed for Route 37 eastbound, Route 37 westbound, and along paths connecting to US 11. In addition, principal weaving sections were also evaluated. Density was computed as an output from CORSIM microsimulations.
- Delay: Average intersection delay and approach delay (in seconds per vehicle) were computed for the intersections of US 11 and the two Route 37 ramps and for the intersections of Shady Elm Road and the two Route 37 ramps. Delay was computed using Synchro.
- Queues: 95th percentile queue lengths (in feet) were computed for ramp approaches from Route 37 to US 11 and from Route 37 to Shady Elm Road. Queues were computed using Synchro.
- Cost: Conceptual-level construction cost estimates, considering the amount of new roadway and new bridges.

In addition, four qualitative measures were evaluated.

- Safety: a qualitative review of sight distances, decision distances, and potential sideswipe accident locations
- Right-of-Way: a qualitative review of potential land acquisition requirements

¹ CORSIM was selected as VDOT's preferred traffic simulation package for this study. This application was developed by the Federal Highway Administration as a microsimulation of traffic behavior on surface roads and freeways.

² Synchro is a traffic signal modeling software application developed by Trafficware Corporation.

- **Connectivity:** a qualitative review of the degree of connectivity maintained in the revised roadway network
- **Constructability:** a qualitative review of difficulty of construction, considering phasing and maintenance of traffic

Table 5 gives the overall ranking of the alternatives for each measure of effectiveness. In this table, a ranking of 1 is the best, and a ranking of 4 is the worst among the alternatives for any particular measure. The alternative with the lowest sum of rankings for all measures of effectiveness is ranked highest overall.

Table 5: Overall ranking of alternatives

	No Build	Alternative 1	Alternative 2	Alternative 3
Travel Time	3	4	1	2
Roadway Level of Service	4	3	1	2
Intersection Delay	3	4	1	2
Intersection Queues	3	4	1	2
Cost	1	2	4	3
Safety	4	1	2	3
Right of Way	1	4	2	3
Connectivity	3	4	1 (tie)	1 (tie)
Constructability	1	2	4	3
Sum of Rankings	23	28	17	21

Both Alternatives 2 and 3 perform better overall than the No Build case, with Alternative 2 performing the best overall. Alternative 2, however, is also anticipated to have the highest cost and greatest constructability issues among the alternatives.

2. Quantitative Measures

The following tables describe each of the quantitative measures of effectiveness.

a. Travel Time

Table 6 reports the average travel times in minutes and seconds along the eight paths described in the discussion above. Alternative 2 produces the lowest travel times along Route 37 on account of segregating through volumes onto a mainline freeway and local access volumes onto collector-distributor roads, thereby reducing friction. It should be noted, however, that travel times between Alternative 2 and 3 are very similar.³ Alternative 1 and the No Build are generally worse than Alternatives 2 and 3, with Alternative 1 being worst in the morning and the No Build being worst in the afternoon. Alternative 2 generally outperforms Alternative 3 on the travel time measure.

Further details for information in Table 6 are provided in Appendix 1: Summary of CORSIM Outputs.

³ In several instances the differences in travel times between Alternative 2 and Alternative 3 are not statistically significantly different at the 95% confidence level.

Table 6: Average travel times

Travel Time (m:ss)	No Build AM	Alternative 1 AM	Alternative 2 AM	Alternative 3 AM
Route 37 WB	2:52	3:02	2:38	2:45
Route 37 EB	2:49	2:55	2:41	2:49
I-81 NB to US 11 ⁽¹⁾	2:55	5:22	2:60	2:58
I-81 SB to US 11	2:15	4:41	2:11	1:40
US 11 to I-81 NB	4:04	5:37	3:25	3:32
US 11 to I-81 SB	3:33	4:58	2:43	2:52
Route 37 EB to US 11 ⁽¹⁾	3:11	3:38	3:08	3:23
US 11 to Route 37 WB	2:06	3:03	2:02	2:35
Travel Time (m:ss)	No Build PM	Alternative 1 PM	Alternative 2 PM	Alternative 3 PM
Route 37 WB	2:49	5:41	2:38	2:52
Route 37 EB ⁽¹⁾	10:41	3:38	2:50	5:02
I-81 NB to US 11 ⁽¹⁾	2:59	11:16	5:59	2:53
I-81 SB to US 11 ⁽¹⁾	2:18	10:19	5:02	1:43
US 11 to I-81 NB	5:20	5:53	3:36	4:27
US 11 to I-81 SB	5:30	4:58	2:52	3:42
Route 37 EB to US 11	10:14	4:22	3:15	3:45
US 11 to Route 37 WB ⁽¹⁾	2:09	2:54	2:37	2:58

Note: Shaded cells are the best for the particular route.

(1) Alternatives 2 and 3 were not found to be statistically significantly different.

b. Roadway Level of Service

Table 7 gives the average density in vehicles per mile per lane over eight paths described above. Density is a measure of level of service for highways. Alternative 2 has the lowest densities for Route 37 on account of segregating out through volumes. Alternative 3 has the lowest densities between US 11 and the western study limit because of the frontage road through that area. Alternative 2 and 3 both generally perform better than the No Build and Alternative 1 in terms of density.

In addition to average density along paths, density in principal weaving segments was also computed, as shown in Table 8. Alternative 2 generally performs the best in terms of weaves, with Alternative 3 also performing well. A notable issue with Alternative 3 is the short weaving distance eastbound between US 11 and Interstate 81, which performs poorly in the afternoon. This is due to its configuration very similar to the No Build. Alternative 2 performs better on account of having a collector-distributor road through this segment.

Overall Alternative 2 performs the best under the roadway level of service measure.

Further details for information in Table 7 and Table 8 are provided in Appendix 1: Summary of CORSIM Outputs.

Table 7: Average density

Average Density (veh/mi/ln)	No Build AM	Alternative 1 AM	Alternative 2 AM	Alternative 3 AM
Route 37 WB	18.1	15.9	7.3	12.4
Route 37 EB	18.8	16.2	12.7	16.4
I-81 NB to US 11	37.5	35.5	32.1	29.2
I-81 SB to US 11	27.5	32.7	24.4	19.1
US 11 to I-81 NB	24.5	19.3	16.6	23.4
US 11 to I-81 SB	39.2	21.4	20.3	28.2
Route 37 EB to US 11	30.1	32.0	21.6	17.4
US 11 to Route 37 WB	25.3	20.8	17.1	17.8
Average Density (veh/mi/ln)	No Build PM	Alternative 1 PM	Alternative 2 PM	Alternative 3 PM
Route 37 WB	16.2	25.9	6.9	18.2
Route 37 EB	102.2	35.4	20.2	40.0
I-81 NB to US 11	33.3	49.0	49.5	27.5
I-81 SB to US 11	27.4	50.4	47.3	25.8
US 11 to I-81 NB	49.1	31.5	25.8	39.1
US 11 to I-81 SB	87.8	29.9	34.2	50.5
Route 37 EB to US 11	129.6	42.3	29.0	23.4
US 11 to Route 37 WB	31.5	24.5	41.7	24.4

Note: Shaded cells are the best for the particular path

Table 8: Densities and levels of service in weaving segments

Weaving segment	No-Build AM	Alt 1 AM	Alt 2 AM	Alt 3 AM
EB Rt 37 between Shady Elm and US 11	no weave	22.5 (C)	15.5 (B)	no weave
EB Rt 37 between US 11 and I-81	22.5 (C)		10.9 (A)	29.8 (D)
EB Rt 37 within I-81 cloverleaf	11.6 (B)	13.3 (B)	9.6 (A)	15.5 (B)
WB Rt 37 within I-81 cloverleaf	24.6 (C)	23.2 (C)	18.9 (B)	23.6 (C)
WB Rt 37 between I-81 and US 11	38.7 (E)	22.5 (C)	25.1 (C)	17.6 (B)
WB Rt 37 between US 11 and Shady Elm	no weave		15.6 (B)	9.8 (A)
NB I-81 C-D within cloverleaf	31.9 (C)	24.4 (C)	20.3 (B)	22.2 (B)
Weaving segment	No-Build PM	Alt 1 PM	Alt 2 PM	Alt 3 PM
EB Rt 37 between Shady Elm and US 11	no weave	22.5 (C)	25 (C)	no weave
EB Rt 37 between US 11 and I-81	152.6 (F)		22.1 (B)	141.7 (F)
EB Rt 37 within I-81 cloverleaf	30.5 (D)	57.7 (F)	27 (C)	36.8 (E)
WB Rt 37 within I-81 cloverleaf	20.1 (C)	30.5 (D)	31.4 (C)	30.6 (D)
WB Rt 37 between I-81 and US 11	25.5 (C)	22.5 (C)	64 (F)	12.7 (B)
WB Rt 37 between US 11 and Shady Elm	no weave		32 (C)	10.1 (A)
NB I-81 C-D within cloverleaf	29.8 (C)	27.1 (C)	21.7 (B)	22.3 (B)

Note: Shaded cells are the best for the particular weaving segment

c. Delay and Queues

Table 9 summarizes three intersection-related measures. The signalized intersections were modeled and optimized using Synchro. First is the approach delay in seconds per vehicle for the ramp approach to the intersection. Alternatives 2 and 3 perform better than the No Build and Alternative 1, with Alternative 2 on average better than Alternative 3. Second is the average intersection delay in seconds per vehicle for all approaches to the listed intersection. Alternatives 2 and 3 perform better than the No Build and Alternative 1, with Alternative 2 on average better than Alternative 3. Third is the 95th percentile queue length in feet. These queues are on the Route 37 ramps to US 11 and to Shady Elm Road and are reported for the lane with the longest queue. Alternatives 2 and 3 perform better than the No Build and Alternative 1, with Alternative 2 on average slightly better than Alternative 3. Further details for information in Table 9 are provided in Appendix 2: Synchro Intersection Reports.

Table 9: Approach and Intersection delay with LOS and 95th percentile queue length

	No-Build		Alternative 1		Alternative 2		Alternative 3	
	AM	PM	AM	PM	AM	PM	AM	PM
Approach Delay (sec/veh) and Level of Service								
Route 37 WB Ramp approach to US 11	37.9 (D)	106.2 (F)	N/A	N/A	26.0 (C)	61.9 (E)	39.9 (D)	53.1 (D)
Route 37 EB Ramps approach to US 11	37.6 (D)	35.7 (D)	N/A	N/A	28.6 (C)	28.0 (C)	29.0 (C)	33.9 (C)
Route 37 WB Ramps approach to Shady Elm Rd	N/A	N/A	42.9 (D)	44.2 (D)	21.4 (C)	18.3 (B)	29.0 (C)	13.0 (B)
Route 37 EB Ramps approach to Shady Elm Rd	N/A	N/A	40.7 (D)	37.5 (D)	26.3 (C)	17.1 (B)	32.6 (C)	31.6 (C)
Average Intersection Delay (sec/veh) and Level of Service								
US 11/Route 37 WB Ramps	23.5 (C)	119.5 (F)	N/A	N/A	20.5 (C)	39.9 (D)	28.7 (C)	38.4 (D)
US 11/Route 37 EB Ramps	32.6 (C)	84.0 (F)	N/A	N/A	10.7 (B)	22.5 (C)	11.8 (B)	14.9 (B)
Shady Elm Road/Route 37 WB Ramps	N/A	N/A	46.1 (D)	20.2 (C)	11.7 (B)	8.6 (A)	15.5 (B)	19.0 (B)
Shady Elm Road/Route 37 EB Ramps	N/A	N/A	25.1 (C)	38.7 (D)	16.8 (B)	12.4 (B)	21.7 (C)	27.8 (C)
Queue Length (ft)								
Route 37 WB Ramp approach to US 11	*388	*398	N/A	N/A	*326	*354	*441	*423
Route 37 EB Ramp approach to US 11	*461	*223	N/A	N/A	130	66	*144	39
Route 37 WB Ramp approach to Shady Elm Rd	N/A	N/A	*781	*359	145	58	*176	119
Route 37 EB Ramp approach to Shady Elm Rd	N/A	N/A	*531	*624	*248	*182	*306	*379

Note: Shaded cells are the best for the particular weaving segment

* means the 95th percentile volume exceeds capacity and the queue could be longer.

d. Construction Cost

Conceptual-level construction costs have been estimated for the alternatives, as given in Table 10. The No Build has the lowest construction cost of the alternatives, while Alternative 1 has the lowest construction cost of the build alternatives. Alternative 1 requires the construction of an at-grade roadway, which is likely to cost less than the access controlled frontage roads or collector-distributor roads of Alternatives 2 and 3. Alternative 2 is likely to have the highest construction cost, because the lane-mileage of new roadway is the greatest and involves new grade separations at Interstate 81, US 11, and the CSX Railroad. Alternative 3 is also likely to have a high construction cost with grade separations at US 11 and the CSX Railroad. The length of new roadway is less than with Alternative 2, and there are fewer grade separations.

Details of the construction cost estimates are provided in Appendix 3: Cost Estimates

Table 10: Conceptual-level construction cost estimates

	No Build	Alternative 1 with grade separation at railroad	Alternative 1 with at-grade crossing at railroad	Alternative 2	Alternative 3
Estimated Construction Cost	\$0	\$44 million	\$28 million	\$127 million	\$52 million

3. Qualitative Assessment

The following sections describe each of the qualitative considerations that were evaluated.

a. Safety

- The No Build alternative has a safety concern associated with short weaving distances between US 11 and Interstate 81, with a potentially higher risk of sideswipe or rear-end accidents.
- Alternative 1, by replacing the US 11 interchange with one at Shady Elm Road, lengthens the weaving distance, thereby alleviating some of the safety concerns with the No Build.
- Alternative 2 incorporates collector-distributor roads, which isolate the weaves from the higher speed through traffic. Weaves would occur in a lower speed environment, which would potentially reduce accident severity.
- Alternative 3 also isolates some of the weaves from higher speed through traffic. However, the start of the westbound frontage road at the Interstate 81 interchange involves a sequence of short decision distances, which may confuse some drivers and potentially lead to a higher likelihood of accidents.
- Alternative 1 has been assessed as the best alternative from a safety perspective, followed by Alternative 2, Alternative 3, and the No Build.

b. Right-of-Way

The amount of additional right-of-way required for the alternatives has been estimated, as shown

in Table 11⁴. The No Build alternative requires no additional right-of-way beyond what is anticipated for the Interstate 81 interchange with Route 37 and the eastward extension of Route 37. Alternative 1 has the highest right-of-way impacts in that it requires the construction of a new parallel roadway connecting Shady Elm Road and US 11. This roadway would likely traverse readily developable land and so may have higher land acquisition cost and greater disruption to development. Two buildings may need to be acquired. Alternative 2 would require some right-of-way acquisition along both sides of Route 37 between Interstate 81 and Shady Elm Road in order to construct the collector-distributor road. It has been assumed that the right-of-way acquired for constructing the eastward extension of Route 37 will be wide enough to accommodate the collector-distributor road east of Interstate 81. Alternative 3 is likely to require additional right-of-way west of Interstate 81 to build the frontage roads and the new connection to US 11. The right-of-way needs would be greater than for Alternative 2 in this area because the frontage roads would require greater separation from the mainline than collector-distributor roads would need. All the build alternatives would require driveway relocations for the Potomac Edison Company and C & P Telephone Company sites near Shady Elm Road.

Details of the right-of-way estimates are provided in Appendix 3: Cost Estimates.

Table 11: Estimated right-of-way needs

	No Build	Alternative 1	Alternative 2	Alternative 3
Estimated Right of Way Acquisition	0 acres	12.8 acres	8.9 acres	10.2 acres

Note: Right-of-way estimates only include land needed for roadways and not for storm water management facilities.

c. Connectivity

- The No Build alternative maintains the existing connectivity, particularly between Interstate 81 and US 11.
- Alternative 1 replaces the interchange at US 11 with one at Shady Elm Road. This would improve connectivity to new development on Shady Elm Road while at the same time increasing travel time and travel distance for accessing existing development along US 11.
- Alternative 2 and 3 both maintain connectivity with US 11 while adding connectivity with Shady Elm Road.
- Alternatives 2 and 3 have been assessed as the best for connectivity for increasing overall connectivity, followed by the No Build for maintaining current connectivity, followed by Alternative 1 which decreases connectivity to existing developments.

d. Constructability

- The No Build alternative involves no additional construction.

⁴ Right-of-way estimates are based on GIS data supplied by Frederick County as well as a review of aerial photography. Detailed surveys have not been conducted.

- Alternative 1 entails constructing a new interchange at Shady Elm Road and removing the interchange at US 11. Both these activities would likely require short duration lane closures on Route 37. Impacts to the Interstate 81 interchange would be minimal. A new connector road would be constructed between Shady Elm Road and US 11, which would likely require short duration closures to construct pavement and install traffic signals.
- Alternative 2 with its collector-distributor roads would require the construction of new bridges over Interstate 81, which would require closures of the interstate. It may also require complete reconstruction of Route 37 within the study area, depending on right-of-way availability.
- Alternative 3 has construction challenges west of Interstate 81, including modifying the US 11 interchange and constructing new slip ramps between the frontage roads and Route 37. Alternative 3 also has short decision distances as described above that may require design exceptions that FHWA may not approve, or may require extending the westbound frontage road to the east introducing additional construction impacts to Interstate 81.
- The No Build has been rated as the most easily constructable, followed by Alternative 1, Alternative 3, and Alternative 2.

F. Recommended Alternative

It is the recommendation of this study to advance Alternative 2 as the preferred alternative. A detailed drawing of this recommendation is shown in Figure 17, Figure 18 and Figure 19.

1. Summary of Features and Issues

Alternative 2 incorporates collector-distributor roads in both directions along Route 37 within the study area to separate local traffic from through traffic. This feature allows maintaining connectivity to Interstate 81, US 11, and Shady Elm Road while having weaving movements take place in a safer, lower-speed environment. Alternative 2 offers improved traffic operations over the No Build and performs acceptably in 2035 in terms of travel time, intersection delay, and density.

Alternative 2 requires acquisition of right-of-way on both sides of Route 37 west of Interstate 81. In addition, the right-of-way acquired for the eastward extension of Route 37 must also accommodate the collector-distributor roads. Alternative 2 requires new grade separations at Shady Elm Road, the CSX Railroad, US 11, Interstate 81, and Warrior Drive. Alternative 2 also has the greatest amount of additional pavement among the alternatives. As such, Alternative 2 is anticipated to cost the most and have the greatest constructability issues among the alternatives.

Figure 17: Alternative 2 Detailed Layout Sheet 1



VA Route 37

Shady Elm Rd.



Route 37 Access
Management Study
Alternative 2

0 150 300 600 Feet

0 25 50 Feet

0 25 50 Feet

Figure 18: Alternative 2 Detailed Layout Sheet 2



Interstate 81

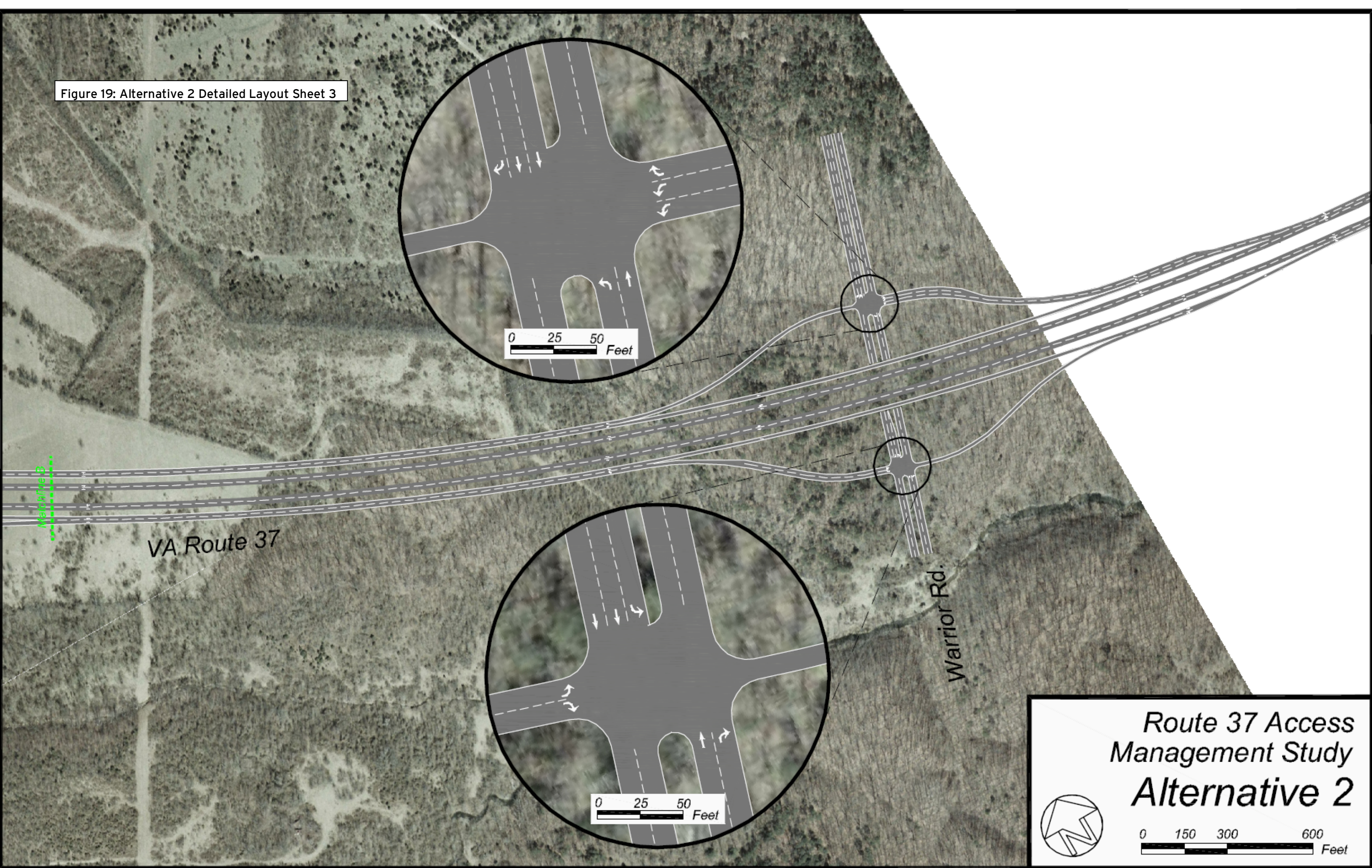
VA Route 37

US Route 11

Route 37 Access
Management Study
Alternative 2

0 150 300 600 Feet

Figure 19: Alternative 2 Detailed Layout Sheet 3



2. Justification of Selection

Alternative 2 performs the best among the build alternatives for all measures of effectiveness, except for cost and constructability. It is superior to the other alternatives in terms of travel time, density, delay, and queuing based on the traffic analysis conducted. Its configuration offers safety benefits over the other alternatives and expands connectivity over the other alternatives except for Alternative 3.

The most closely related alternative in terms of traffic performance is Alternative 3. Alternative 3 has similar right-of-way requirements and substantially less estimated construction cost. However, Alternative 3 maintains a poor weaving section on eastbound Route 37 between US 11 and Interstate 81. Alternative 3 also has closely spaced decision points on the westbound frontage road that may not meet design standards. Addressing these shortcomings to Alternative 3 would result in a configuration similar to and with the higher cost of Alternative 2.

3. Additional Modification

As a result of additional comments provided by the study steering committee, a slightly modified version of Alternative 2 was analyzed. The modification consists of providing a ramp to take traffic from I-81 southbound to the Route 37 westbound off-ramp to US 11 northbound, as in Alternative 3 as shown in Figure 20. This ramp was provided to reduce traffic in the weave between I-81 and US 11.

The findings of the assessment of a modified Alternative 2 are summarized below. Revised forecasts are shown in Figure 21 and Figure 22.

Table 12: Average travel times including Alternative 2 Modified

Travel Time (m:ss)	No Build AM	Alternative 1 AM	Alternative 2 AM	Alternative 2 Modified AM	Alternative 3 AM
I-81 NB to US 11 ⁽¹⁾	2:55	5:22	2:60	2:47	2:58
I-81 SB to US 11	2:15	4:41	2:11	1:46	1:40
US 11 to Route 37 WB	2:06	3:03	2:02	2:11	2:35
Travel Time (m:ss)	No Build PM	Alternative 1 PM	Alternative 2 PM	Alternative 2 Modified PM	Alternative 3 PM
I-81 NB to US 11 ⁽¹⁾	2:59	11:16	5:59	3:38	2:53
I-81 SB to US 11 ⁽¹⁾	2:18	10:19	5:02	2:28	1:43
US 11 to Route 37 WB ⁽¹⁾	2:09	2:54	2:37	3:49	2:58

Note: Shaded cells are the best for the particular path

Figure 20: Alternative 2 Modified Detailed Layout



Table 13: Average density including Alternative 2 Modified

Average Density (veh/mi/ln)	No Build AM	Alternative 1 AM	Alternative 2 AM	Alternative 2 Modified AM	Alternative 3 AM
I-81 NB to US 11	37.5	35.5	32.1	30.1	29.2
I-81 SB to US 11	27.5	32.7	24.4	26.3	19.1
US 11 to Route 37 WB	25.3	20.8	17.1	20.6	17.8
Average Density (veh/mi/ln)	No Build PM	Alternative 1 PM	Alternative 2 PM	Alternative 2 Modified PM	Alternative 3 PM
I-81 NB to US 11	33.3	49.0	49.5	41.5	27.5
I-81 SB to US 11	27.4	50.4	47.3	44.7	25.8
US 11 to Route 37 WB	31.5	24.5	41.7	61.7	24.4

Note: Shaded cells are the best for the particular path

Table 14: Densities and levels of service in weaving segments including Alternative 2 Modified

Weaving segment	No-Build AM	Alt 1 AM	Alt 2 AM	Alt 2 Mod AM	Alt 3 AM
WB Rt 37 within I-81 cloverleaf	24.6 (C)	23.2 (C)	18.9 (B)	18.7 (B)	23.6 (C)
WB Rt 37 between I-81 and US 11	38.7 (E)		25.1 (C)	24.8 (C)	17.6 (B)
WB Rt 37 between US 11 and Shady Elm	no weave	22.5 (C)	15.6 (B)	18.4 (B)	9.8 (A)
Weaving segment	No-Build PM	Alt 1 PM	Alt 2 PM	Alt 2 Mod PM	Alt 3 PM
WB Rt 37 within I-81 cloverleaf	20.1 (C)	30.5 (D)	31.4 (C)	30.0 (C)	30.6 (D)
WB Rt 37 between I-81 and US 11	25.5 (C)		64 (F)	45.5 (F)	12.7 (B)
WB Rt 37 between US 11 and Shady Elm	no weave	22.5 (C)	32 (C)	61.3 (F)	10.1 (A)

Note: Shaded cells are the best for the particular weaving segment

As can be seen, the introduction of the ramp has a positive impact on travel times and densities between I-81 and US 11, particularly in the PM. This positive result is mitigated by the impact downstream. In the AM this effect is minimal, but in the PM improving the weave between I-81 and US 11 allows a greater flow of vehicles towards Shady Elm Road and consequently travel times and densities increase significantly.

Overall, the ramp is a benefit to the operation of the network and particularly to the flow between the two major facilities I-81 and US 11 and its inclusion is desirable and recommended. The additional construction cost of the ramp is estimated to be \$2 million bringing the estimated cost for Alternative 2 Modified to \$129 million.

Figure 21: Alternative 2 Modified - Year 2035 AM Peak Hour

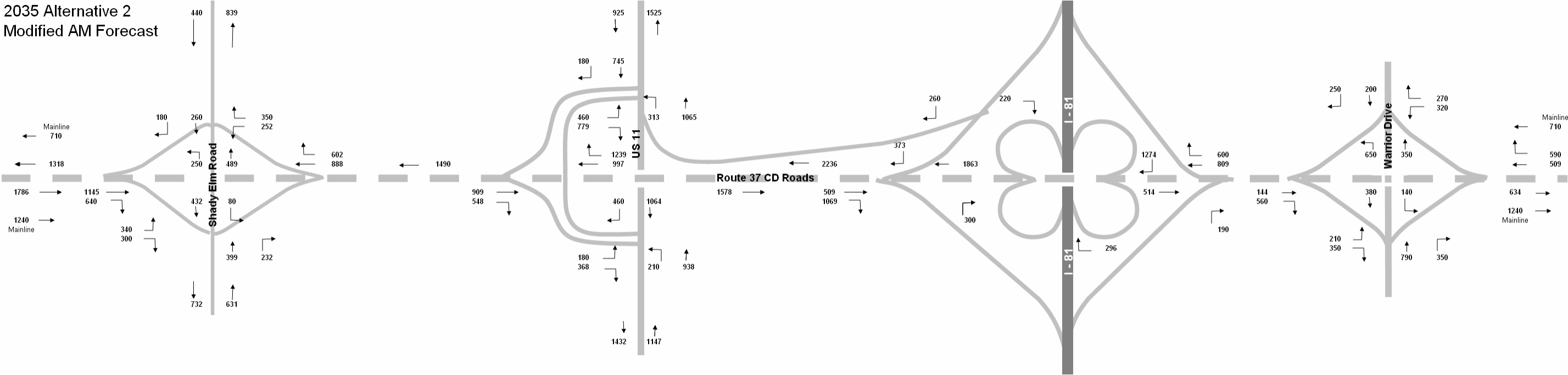
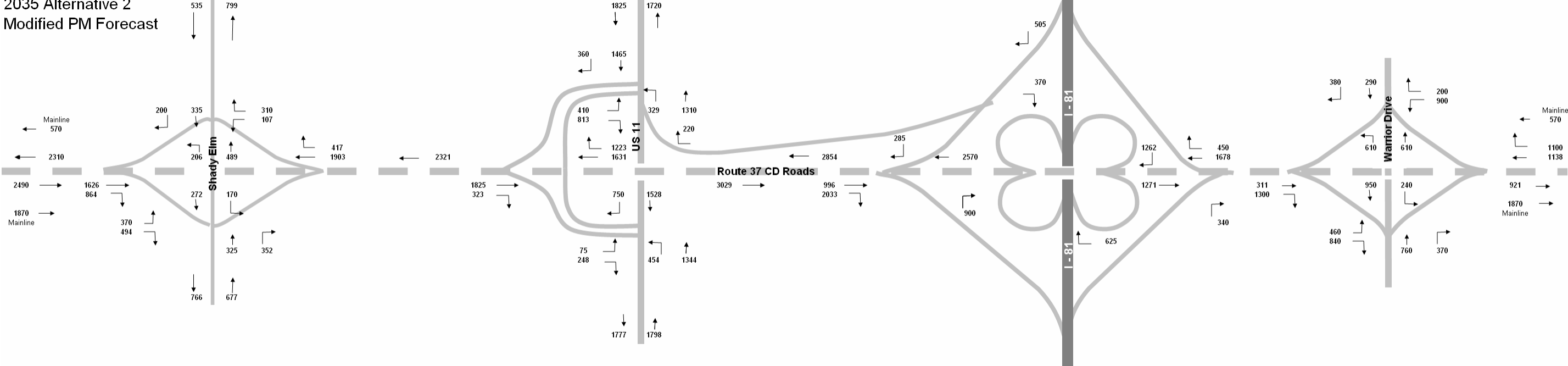


Figure 22: Alternative 2 Modified - Year 2035 PM Peak Hour



4. Check of Year 2015 Operations

Traffic operations of the recommended alternative are reviewed for year 2015 as an estimate of opening year conditions.

a. Network Improvements

A list of planned improvements being considered as part of the “no build” network for this study is shown in Table 18 for year 2015. Maps depicting these improvements are given in Appendix 4: Existing Conditions Report.

Within the study area, the No Build alternative in 2015 includes a diamond interchange at Warrior Drive, traffic signals at the Route 37/US 11 ramp termini, an expanded diamond interchange at Route 37/Interstate 81 as shown in Figure 23, a new connector road between Shady Elm Road and US 11 approximately 3,000 feet south of Route 37, and elimination of the existing westbound to northbound ramp from Route 37 to US 11.

The recommended alternatives (preliminarily Alternative 2 and Alternative 2 Modified) are assumed to have the same configuration in 2015 as in 2035 described above:

- Eastbound and westbound collector-distributor roads along Route 37 from Warrior Drive to Shady Elm Road.
- Revised ramp connections at Warrior Drive, Interstate 81, US 11, to the Route 37 collector-distributor roads.
- A new diamond interchange on the Route 37 collector-distributor roads at Shady Elm Road
- A full cloverleaf interchange at Route 37 and Interstate 81

b. Forecast Volumes

Forecast volumes for year 2015 are given in Figure 24, Figure 25, Figure 26, and Figure 27

c. Year 2015 Analysis Results

Table 15, Table 16 and Table 17 summarize the 2015 analysis. As can be seen Alternative 2 and Alternative 2 Modified out perform the no-build scenario. Except for the westbound weaving areas between I-81 and Route US 11 the Alternatives perform similarly well; within them Alternative 2 Modified is significantly superior.

Table 15: 2015 Average travel time and densities

	No Build AM	Alternative 2 AM	Alternative 2 Modified AM	No Build PM	Alternative 2 PM	Alternative 2 Modified PM
Travel Time (m:ss)						
Route 37 WB	4:40	2:36	2:36	4:57	2:36	2:37
Route 37 EB	4:38	2:37	2:37	4:57	2:39	2:39
I-81 NB to US 11	3:34	2:46	2:42	4:10	8:57	3:10
I-81 SB to US 11	3:27	2:00	1:28	3:55	8:00	1:30
US 11 to I-81 NB	3:41	3:09	3:09	5:25	3:14	3:14
US 11 to I-81 SB	2:42	2:28	2:29	4:21	2:33	2:33
Route 37 EB to US 11	3:28	2:53	2:51	3:13	2:58	2:55
US 11 to Route 37 WB	2:10	1:52	1:52	3:31	1:56	1:55
Density (veh/hr/ln)						
Route 37 WB	14.9	3.8	5.5	16.8	3.8	3.8
Route 37 EB	10.3	5.5	3.8	23.1	8.4	8.4
I-81 NB to US 11	34.8	20.2	7.7	41.7	49.4	22.6
I-81 SB to US 11	23.2	16.8	10.8	30.0	60.8	16.9
US 11 to I-81 NB	19.8	10.2	10.3	52.7	17.1	18.4
US 11 to I-81 SB	22.3	13.4	10.6	57.7	24.0	26.0
Route 37 EB to US 11	18.0	12.6	10.4	20.7	15.3	15.7
US 11 to Route 37 WB	11.3	6.0	8.5	25.4	15.4	16.2

Table 16: 2015 Densities and levels of service in weaving segments

Weaving Section	No-Build AM	Alt 2 AM	Alt 2 Mod AM	No-Build PM	Alt 2 PM	Alt 2 Mod AM
EB Rt 37 between Shady Elm and US 11	N/A	7.6 (A)	5.3 (A)	N/A	10.9 (A)	10.9 (A)
EB Rt 37 between US 11 and I-81	15.8 (B)	5.4 (A)	3.2 (A)	49.6 (F)	11.7 (A)	13.1 (B)
EB Rt 37 within I-81 cloverleaf	17.8 (B)	3.9 (A)	2.9 (A)	52.9 (F)	12.2 (B)	12.9 (B)
EB Rt 37 between I-81 and Warrior Rd	6.4 (A)	not recorded	not recorded	18.3 (B)	not recorded	not recorded
WB Rt 37 between Warrior Rd and I-81	21.7 (C)	not recorded	not recorded	23.2 (C)	not recorded	not recorded
WB Rt 37 within I-81 cloverleaf	37.7 (E)	9.4 (A)	5.2 (A)	45.6 (F)	12.7 (B)	12.5 (B)
WB Rt 37 between I-81 and US 11	22.2 (C)	11.4 (A)	2.3 (A)	21.8 (C)	61.5 (F)	13.3 (B)
WB Rt 37 between US 11 and Shady Elm	N/A	4.2 (A)	9.8 (A)	N/A	10.9 (A)	11.8 (A)

Table 17: Approach and Intersection delay with LOS and 95th percentile queue length

	No-Build		Alternative 2		Alternative 2 Modified	
	AM	PM	AM	PM	AM	PM
Approach Delay (sec/veh) and Level of Service						
Route 37 WB Ramp approach to US 11	24.7 (C)	74.7 (E)	16.6 (B)	31.6 (C)	11.5 (B)	22.4 (C)
Route 37 EB Ramps approach to US 11	17.2 (B)	18.2 (B)	13.6 (B)	15.7 (B)	13.6 (B)	15.7 (B)
Route 37 WB Ramps approach to Shady Elm Rd	N/A	N/A	9.2 (A)	9.0 (A)	9.2 (A)	9.0 (A)
Route 37 EB Ramps approach to Shady Elm Rd	N/A	N/A	14.9 (B)	13.5 (B)	14.9 (B)	13.5 (B)
Average Intersection Delay (sec/veh) and Level of Service						
US 11/Route 37 WB Ramps	24.4 (C)	74.8 (E)	13.3 (B)	19.7 (B)	10.5 (B)	15.0 (B)
US 11/Route 37 EB Ramps	10.7 (B)	10.1 (B)	6.4 (A)	9.6 (A)	6.5 (A)	9.6 (A)
Shady Elm Road/Route 37 WB Ramps	N/A	N/A	7.2 (A)	6.6 (A)	7.2 (A)	6.6 (A)
Shady Elm Road/Route 37 EB Ramps	N/A	N/A	7.1 (A)	7.5 (A)	7.1 (A)	7.5 (A)
Queue Length (ft)						
Route 37 WB Ramp approach to US 11	*241	*334	*168	*267	108	*172
Route 37 EB Ramp approach to US 11	229	168	66	53	66	53
Route 37 WB Ramp approach to Shady Elm Rd	N/A	N/A	47	46	47	46
Route 37 EB Ramp approach to Shady Elm Rd	N/A	N/A	37	40	37	40

Table 18: Planned Improvements for “No Build” Network - Year 2015

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
1-19	City of Winchester				
2	2030	Hope Drive Ext	Wilson Blvd to Papermill Rd	0.2	Widen 2 to 3 Lanes (New Center Turn Lane)
3	2030	Papermill Road Relocation	Hope Drive to Pleasant Valley Rd	0.2	Widen 4 to 5 Lanes (New Center Turn Lane)
4	2008	Papermill Road	Taft Ave to S Weems Lane	0.2	Widen 2 to 5 Lanes (New Center Turn Lane)
20-49	Frederick County				
20	2008	Rte 277	I-81 to US Rte 522	1.3	Widen 2 to 5 Lanes (New Center Turn Lane)
25	2008	Greenwood Rd	Sulphur Springs Rd to US Rte 17/50	1.1	Realign and improve 2-lane Stretch: Upgrade FC
26	2008	Sulphur Springs Rd	US Rte 17/50 to Greenwood Rd	0.7	Widen to improve 2-lane Stretch: Upgrade FC
27	2030	Stephenson Village Blvd	US Rte 11 to Old Charles Town Road	2.5	New 4-lane Collector Roadway
28	2030	Old Charles Town Road	US Rte 11 to Proposed Stephenson Village Blvd	0.9	Widen 2 to 3 Lanes (New Center Turn Lane)
50-59	Regional				
60+	Winchester Model Technical Report (projects that cannot be found elsewhere)				(No detailed description in the report)
64	2030	Crosspointe Blvd			Widening
65	2030	Warrior Drive			Widen 4 to 6
67	2030	Route 50			Widen 2 to 5
69	2030	Valley Avenue	Tevis Street to Middle Road		Widen 2 to 5
70	2030	Papermill Road	Tevis Street to Featherbed Lane		Widen 2 to 5

Figure 23: Planned Interchange Improvements at I-81/Route 37 - Phase I - 2015 No Build Alternatives



Source: VDOT, *Interchange Modification Report for Interstate 81 And Route 37 Interchange, Frederick County, Virginia, Milepost 310*, February 16, 2007.

Figure 24: No Build Alternative Forecast Volumes - Year 2015 AM Peak Hour

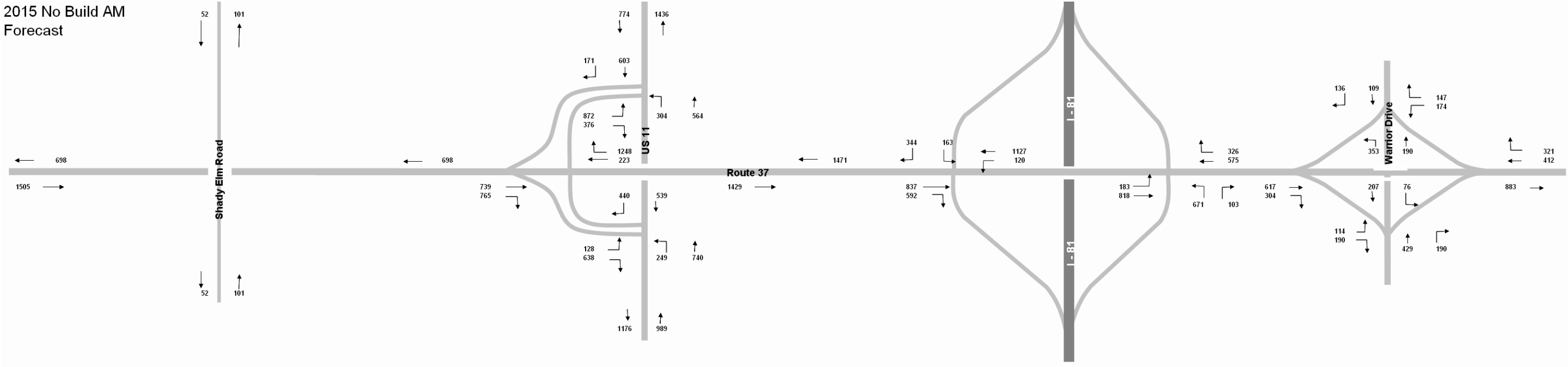


Figure 25: No Build Alternative Forecast Volumes - Year 2015 PM Peak Hour

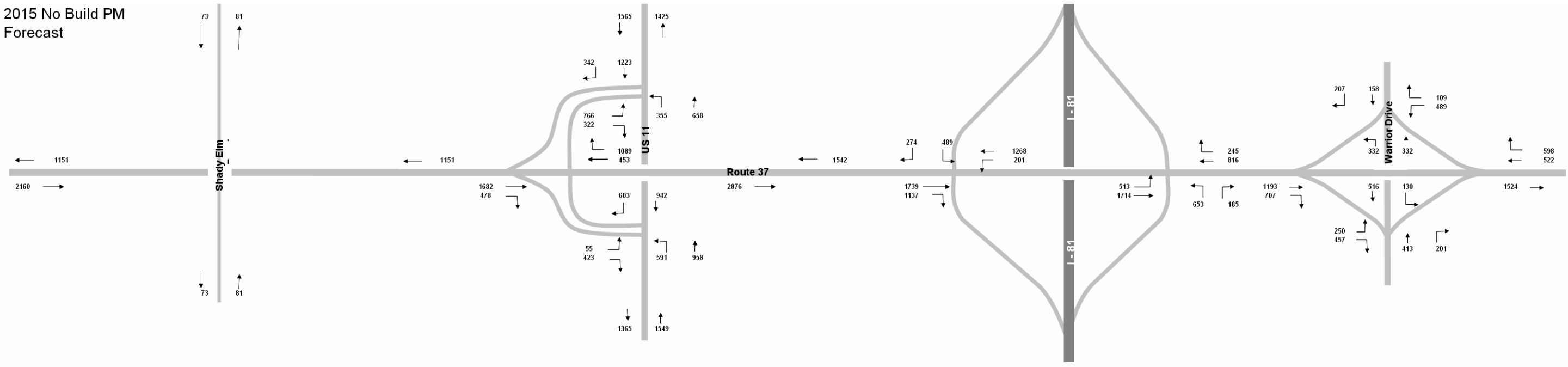


Figure 26: Alternative 2 Forecast Volumes - Year 2015 AM Peak Hour

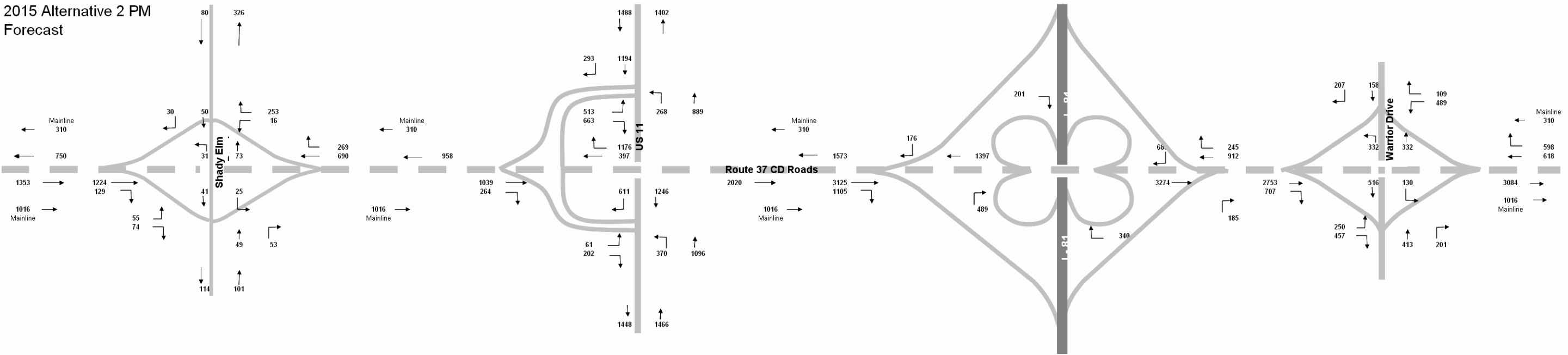


Figure 27: Alternative 2 Forecast Volumes - Year 2015 PM Peak Hour

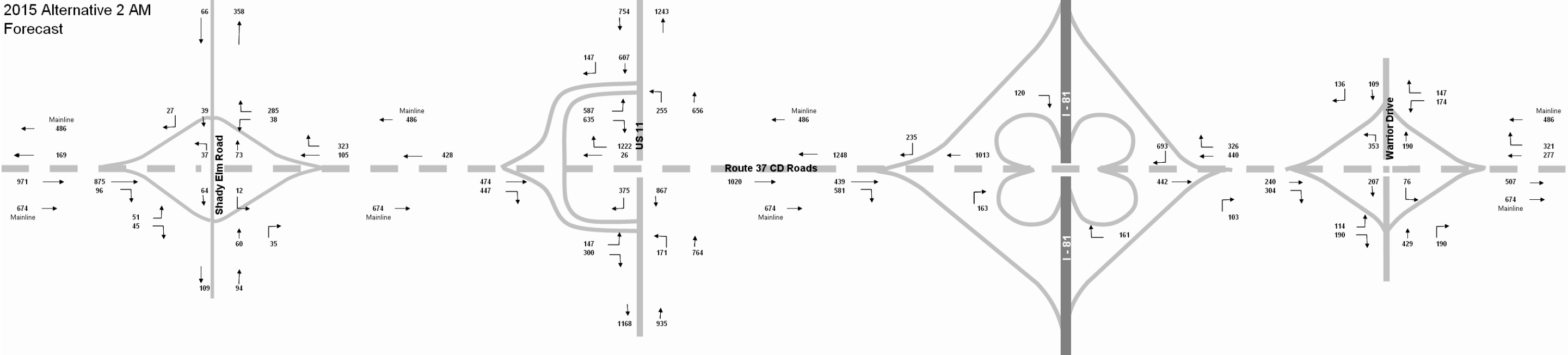


Figure 28: Alternative 2 Modified Forecast Volumes - Year 2015 AM Peak Hour

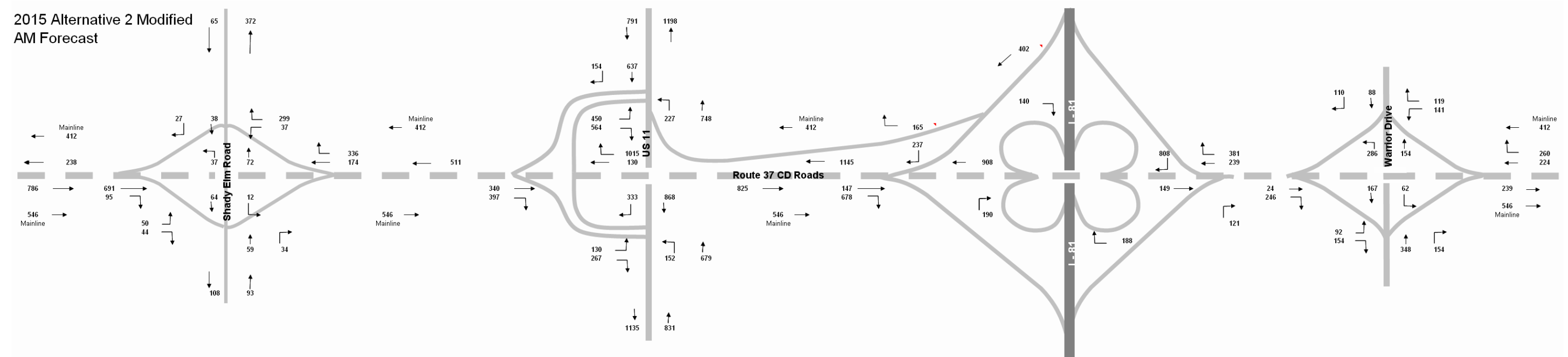
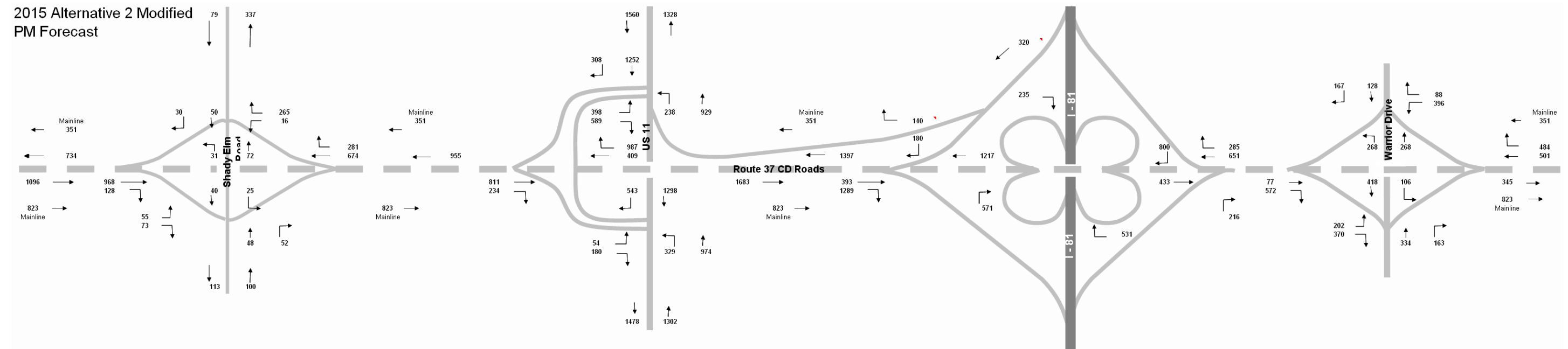


Figure 29: Alternative 2 Modified Forecast Volumes - Year 2015 PM Peak Hour



G. Appendices

1. Summary of CORSIM Outputs

Route 37 Access Management Study

CORSIM Processing

2035 No Build AM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	9 (84,9)	825	2	947	53.8	8.8 A	10
9	66 (9,66)	266	3	947	52.9	6.0 A	3
66	69 (66,69)	1178	2	374	53.6	3.5 A	15
69	86 (69,86)	240	3	1303	35.4	12.3 B	5
86	85 (86,85)	814	2	1302	48.7	13.4 B	11
85	14 (85,14)	536	3	1303	43.2	10.1 A	8
14	12 (14,12)	1008	2	916	49.7	9.2 A	14
12	8 (12,8)	591	3	2644	35.8	24.6 C	11
8	17 (8,17)	909	2	2570	44.2	29.1 D	14
17	20 (17,20)	244	3	3199	27.6	38.7 E	6
20	23 (20,23)	1067	2	1908	48.5	19.7 C	15
23	57 (23,57)	349	3	2428	42.1	19.2 C	6
57	63 (57,63)	1270	2	2430	49.2	24.7 C	18
63	83 (63,83)	1368	2	2434	49.5	24.6 C	19
83	71 (83,71)	340	2	2431	48.2	25.2 C	5
71	24 (71,24)	874	2	2429	49.5	24.5 C	12
Entire Path		11879			47.8	18.1 C	172 2:52
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	71 (24,71)	874	2	2766	51.9	26.6 D	11
71	83 (71,83)	340	2	2766	49.4	28.0 D	5
83	63 (83,63)	1368	2	2765	48.1	28.7 D	19
63	57 (63,57)	1270	2	2768	46.8	29.6 D	18
57	23 (57,23)	349	3	2767	30.5	30.3 D	8
23	20 (23,20)	1067	2	1964	45.5	21.6 C	16
20	17 (20,17)	244	3	2457	36.4	22.5 C	5
17	8 (17,8)	909	2	1345	49.6	13.5 B	12
8	12 (8,12)	591	3	1591	45.7	11.6 B	9
12	14 (12,14)	1008	2	1301	51.4	12.7 B	13
14	85 (14,85)	536	3	1472	49.6	9.9 A	7
85	86 (85,86)	814	2	1470	51.3	14.3 B	11
86	69 (86,69)	240	3	1469	49.2	9.9 A	3
69	66 (69,66)	1178	2	935	53.0	8.8 A	15
66	9 (66,9)	266	3	1332	44.1	10.1 A	4
9	84 (9,84)	825	2	1332	51.1	13.0 B	11
Entire Path		11879			48.5	18.8 C	169 2:49

2035 No Build AM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1905	39.4	24.2 C	17
10	11 (10,11)	945	1	1738	36.1	48.2 F	18
11	13 (11,13)	664	2	2027	31.8	31.9 D	14 Weave LOS C
13	12 (13,12)	1019	1	1728	23.9	72.2 F	29
12	8 (12,8)	591	3	2644	35.8	24.6 C	11 Weave LOS C
8	17 (8,17)	909	2	2570	44.2	29.1 D	14
17	20 (17,20)	244	3	3199	27.6	38.7 E	6 Weave LOS E
20	82 (20,82)	746	2	1292	27.7	23.3 C	18
82	19 (82,19)	448	3	1296	9.5	45.4 F	32
19	25 (19,25)	540	2	1182	23.5	25.2 C	16
Entire Path		7076			31.6	37.5 E	175 2:55

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	1	876	34.4	25.5 C	18
61	3 (61,3)	413	1	631	25.0	25.2 C	11
3	76 (3,76)	668	1	630	26.2	24.1 C	17
76	17 (76,17)	580	1	630	25.2	25.0 C	16
17	20 (17,20)	244	3	3199	27.6	38.7 E	6 Weave LOS E
20	82 (20,82)	746	2	1292	27.7	23.3 C	18
82	19 (82,19)	448	3	1296	9.5	45.4 F	32
19	25 (19,25)	540	2	1182	23.5	25.2 C	16
Entire Path		4557			26.0	27.5 D	135 2:15

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	950	10.5	45.1 F	35
19	22 (19,22)	1299	2	1621	12.3	65.9 F	72
22	78 (22,78)	389	1	492	24.5	20.1 C	10
78	79 (78,79)	379	1	491	26.0	18.9 C	10
79	20 (79,20)	581	1	491	26.1	18.8 C	15
20	17 (20,17)	244	3	2457	36.4	22.5 C	5 Weave LOS C
17	8 (17,8)	909	2	1345	49.6	13.5 B	12
8	12 (8,12)	591	3	1591	45.7	11.6 B	9 Weave LOS B
12	11 (12,11)	1289	1	290	31.0	9.4 A	28
11	13 (11,13)	664	2	2027	31.8	31.9 D	14 Weave LOS C
13	58 (13,58)	940	1	300	40.3	7.4 A	16
58	4 (58,4)	346	2	692	34.7	10.0 A	7
4	72 (4,72)	611	1	692	38.8	17.8 B	11
Entire Path		8782			30.9	24.5 C	244 4:04

2035 No Build AM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	950	10.5	45.1 F	35
19	22 (19,22)	1299	2	1621	12.3	65.9 F	72
22	78 (22,78)	389	1	492	24.5	20.1 C	10
78	79 (78,79)	379	1	491	26.0	18.9 C	10
79	20 (79,20)	581	1	491	26.1	18.8 C	15
20	17 (20,17)	244	3	2457	36.4	22.5 C	5 Weave LOS C
17	75 (17,75)	656	1	1113	26.9	41.4 E	17
75	51 (75,51)	543	1	1115	24.6	45.2 F	15
51	62 (51,62)	398	1	1115	24.9	44.9 E	11
62	6 (62,6)	418	2	1189	33.0	18.0 C	9
6	52 (6,52)	796	1	1190	36.2	32.9 D	15
Entire Path		6243			23.8	39.2 E	213 3:33

<i>Route 37 WB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	71 (24,71)	874	2	2766	51.9	26.6 D	11
71	83 (71,83)	340	2	2766	49.4	28.0 D	5
83	63 (83,63)	1368	2	2765	48.1	28.7 D	19
63	57 (63,57)	1270	2	2768	46.8	29.6 D	18
57	23 (57,23)	349	3	2767	30.5	30.3 D	8
23	81 (23,81)	599	1	802	28.6	28.1 D	14
81	80 (81,80)	193	1	803	26.0	30.9 D	5
80	78 (80,78)	300	1	802	25.5	31.4 D	8
78	22 (78,22)	389	2	801	7.1	56.6 F	38
22	19 (22,19)	1299	2	1073	18.1	29.6 D	49
19	25 (19,25)	540	2	1182	23.5	25.2 C	16
Entire Path		7521			35.5	30.1 D	191 3:11

<i>US 11 to Route 37 EB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	950	10.5	45.1 F	35
19	82 (19,82)	448	1	524	25.0	21.0 C	12
82	23 (82,23)	778	1	521	25.9	20.1 C	20
23	57 (23,57)	349	3	2428	42.1	19.2 C	6
57	63 (57,63)	1270	2	2430	49.2	24.7 C	18
63	83 (63,83)	1368	2	2434	49.5	24.6 C	19
83	71 (83,71)	340	2	2431	48.2	25.2 C	5
71	24 (71,24)	874	2	2429	49.5	24.5 C	12
Entire Path		5967			40.5	25.3 C	126 2:06

Route 37 Access Management Study

CORSIM Processing

2035 No Build PM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	9 (84,9)	825	2	1760	52.3	16.8 B	4
9	66 (9,66)	266	3	1760	50.9	11.5 B	10
66	69 (66,69)	1178	2	195	53.9	1.8 A	15
69	86 (69,86)	240	3	1066	34.7	10.3 A	5
86	85 (86,85)	814	2	1065	49.0	10.9 A	11
85	14 (85,14)	536	3	1067	45.5	7.8 A	8
14	12 (14,12)	1008	2	729	50.9	7.2 A	13
12	8 (12,8)	591	3	2228	37.0	20.1 C	11
8	17 (8,17)	909	2	2124	46.3	22.9 C	13
17	20 (17,20)	244	3	2625	34.4	25.5 C	5
20	23 (20,23)	1067	2	1470	50.4	14.6 B	14
23	57 (23,57)	349	3	2322	39.7	19.5 C	6
57	63 (57,63)	1270	2	2322	49.6	23.4 C	17
63	83 (63,83)	1368	2	2320	50.4	23.0 C	19
83	71 (83,71)	340	2	2318	49.0	23.6 C	5
71	24 (71,24)	874	2	2315	50.2	23.0 C	12
Entire Path		11879			48.5	16.2 B	169 2:49
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	71 (24,71)	874	2	2929	7.2	204.6 F	85
71	83 (71,83)	340	2	2929	7.3	201.2 F	33
83	63 (83,63)	1368	2	2926	7.3	199.2 F	129
63	57 (63,57)	1270	2	2915	7.5	194.3 F	118
57	23 (57,23)	349	3	2912	7.4	132.0 F	33
23	20 (23,20)	1067	2	2481	6.0	207.6 F	123
20	17 (20,17)	244	3	3685	8.0	152.6 F	21
17	8 (17,8)	909	2	1859	42.4	21.9 C	15
8	12 (8,12)	591	3	2689	29.4	30.5 D	14
12	14 (12,14)	1008	2	2207	45.6	24.2 C	15
14	85 (14,85)	536	3	2555	44.3	19.2 C	8
85	86 (85,86)	814	2	2560	46.3	27.7 D	12
86	69 (86,69)	240	3	2560	43.8	19.5 C	4
69	66 (69,66)	1178	2	1772	49.5	17.9 B	16
66	9 (66,9)	266	3	2140	47.0	15.2 B	11
9	84 (9,84)	825	2	2139	49.3	21.7 C	4
Entire Path		11879			27.3	102.2 F	641 10:41

2035 No Build PM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1859	37.9	24.6 C	17
10	11 (10,11)	945	1	1506	36.9	40.8 E	17
11	13 (11,13)	664	2	1982	33.2	29.8 D	14 Weave LOS C
13	12 (13,12)	1019	1	1501	24.3	61.8 F	29
12	8 (12,8)	591	3	2228	37.0	20.1 C	11 Weave LOS C
8	17 (8,17)	909	2	2124	46.3	22.9 C	13
17	20 (17,20)	244	3	2625	34.4	25.5 C	5 Weave LOS C
20	82 (20,82)	746	2	1152	28.1	20.5 C	18
82	19 (82,19)	448	3	1157	7.9	48.8 F	39
19	25 (19,25)	540	2	1261	23.4	26.9 D	16
Entire Path		7076			32.2	33.3 D	179 2:59
<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	1	1331	34.1	39.1 E	18
61	3 (61,3)	413	1	499	26.1	19.1 C	11
3	76 (3,76)	668	1	500	27.3	18.3 C	17
76	17 (76,17)	580	1	501	26.4	19.0 C	15
17	20 (17,20)	244	3	2625	34.4	25.5 C	5 Weave LOS C
20	82 (20,82)	746	2	1152	28.1	20.5 C	18
82	19 (82,19)	448	3	1157	7.9	48.8 F	39
19	25 (19,25)	540	2	1261	23.4	26.9 D	16
Entire Path		4557			26.6	27.4 D	138 2:18
<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1798	9.6	93.6 F	38
19	22 (19,22)	1299	2	2201	13.4	81.9 F	67
22	78 (22,78)	389	1	1211	18.8	64.3 F	17
78	79 (78,79)	379	1	1209	16.5	73.2 F	22
79	20 (79,20)	581	1	1205	9.3	129.3 F	47
20	17 (20,17)	244	3	3685	8.0	152.6 F	21 Weave LOS F
17	8 (17,8)	909	2	1859	42.4	21.9 C	15
8	12 (8,12)	591	3	2689	29.4	30.5 D	14 Weave LOS D
12	11 (12,11)	1289	1	474	27.2	17.4 B	32
11	13 (11,13)	664	2	1982	33.2	29.8 D	14 Weave LOS C
13	58 (13,58)	940	1	482	38.4	12.6 B	17
58	4 (58,4)	346	2	820	33.6	12.2 B	7
4	72 (4,72)	611	1	818	37.6	21.8 C	11
Entire Path		8782			25.9	49.1 F	320 5:20

2035 No Build PM

Paths							
US 11 to I-81 SB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1798	9.6	93.6 F	38
19	22 (19,22)	1299	2	2201	13.4	81.9 F	67
22	78 (22,78)	389	1	1211	18.8	64.3 F	17
78	79 (78,79)	379	1	1209	16.5	73.2 F	22
79	20 (79,20)	581	1	1205	9.3	129.3 F	47
20	17 (20,17)	244	3	3685	8.0	152.6 F	21 Weave LOS F
17	75 (17,75)	656	1	1825	18.3	99.7 F	28
75	51 (75,51)	543	1	1823	17.9	102.0 F	24
51	62 (51,62)	398	1	1822	18.5	98.5 F	18
62	6 (62,6)	418	2	1925	19.2	50.1 F	33
6	52 (6,52)	796	1	1924	34.0	56.6 F	16
Entire Path		6243			17.3	87.8 F	330 5:30

Route 37 WB to US 11							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	71 (24,71)	874	2	2929	7.2	204.6 F	85
71	83 (71,83)	340	2	2929	7.3	201.2 F	33
83	63 (83,63)	1368	2	2926	7.3	199.2 F	129
63	57 (63,57)	1270	2	2915	7.5	194.3 F	118
57	23 (57,23)	349	3	2912	7.4	132.0 F	33
23	81 (23,81)	599	1	434	29.7	14.6 B	14
81	80 (81,80)	193	1	434	27.4	15.8 B	5
80	78 (80,78)	300	1	434	27.7	15.7 B	7
78	22 (78,22)	389	2	435	7.9	27.6 D	34
22	19 (22,19)	1299	2	1362	7.3	92.6 F	141
19	25 (19,25)	540	2	1261	23.4	26.9 D	16
Entire Path		7521			11.6	129.6 F	614 10:14

US 11 to Route 37 EB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1798	9.6	93.6 F	38
19	82 (19,82)	448	1	851	25.0	34.0 D	12
82	23 (82,23)	778	1	852	25.8	33.1 D	21
23	57 (23,57)	349	3	2322	39.7	19.5 C	6
57	63 (57,63)	1270	2	2322	49.6	23.4 C	17
63	83 (63,83)	1368	2	2320	50.4	23.0 C	19
83	71 (83,71)	340	2	2318	49.0	23.6 C	5
71	24 (71,24)	874	2	2315	50.2	23.0 C	12
Entire Path		5967			40.7	31.5 D	129 2:09

2035 Alternative 1 AM

Route 37 Westbound

Route 37 Eastbound

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
24	80 (24,80)	949	2	2780	51.3	27.1	D	13	
80	71 (80,71)	448	3	2778	39.3	23.6	C	8	
71	2 (71,2)	1656	2	1798	48.9	18.4	C	23	
2	83 (2,83)	614	3	2427	47.6	17.0	B	9	Weave LOS B
83	57 (83,57)	338	3	2426	49.3	16.4	B	5	
57	23 (57,23)	511	3	2426	50.0	16.2	B	7	
23	20 (23,20)	528	3	2428	49.5	16.4	B	7	
20	17 (20,17)	783	3	2425	41.3	19.6	C	13	
17	8 (17,8)	909	2	1439	48.5	14.8	B	13	
8	12 (8,12)	591	3	1741	43.5	13.3	B	9	Weave LOS B
12	14 (12,14)	928	2	1524	50.0	15.3	B	13	
14	79 (14,79)	684	3	1719	50.1	11.4	B	9	Weave LOS B
79	82 (79,82)	411	3	1719	50.7	11.3	B	6	
82	69 (82,69)	580	3	1721	44.4	12.9	B	9	
69	66 (69,66)	1160	2	1185	50.6	11.7	B	16	
66	81 (66,81)	727	3	1583	47.8	11.0	B	10	
81	9 (81,9)	458	2	1584	50.6	15.6	B	6	
Entire Path		12275			48.1	16.2	B	175	2:55

2035 Alternative 1 AM

Paths								
<i>I-81 NB to US 11</i>								
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1639	40.8	20.1	C	16
10	11 (10,11)	945	1	1447	36.7	39.4	E	18
11	13 (11,13)	664	2	1663	34.0	24.4	C	13
13	12 (13,12)	1019	1	1442	24.2	59.6	F	29
12	8 (12,8)	591	3	2536	36.4	23.2	C	11
8	17 (8,17)	909	2	2460	47.4	25.9	C	13
17	20 (17,20)	783	3	3037	47.5	21.3	C	11
20	23 (20,23)	528	3	3039	48.8	20.8	C	7
23	57 (23,57)	511	3	3041	49.1	20.6	C	7
57	83 (57,83)	338	3	3038	45.5	22.3	C	5
83	2 (83,2)	614	3	3025	28.7	35.1	E	17
2	63 (2,63)	722	2	1935	8.7	111.3	F	61
63	36 (63,36)	620	2	1919	13.6	70.4	F	31
36	29 (36,29)	2610	2	941	21.3	22.1	C	82
Entire Path		11824			31.9	35.5	E	322
<i>I-81 SB to US 11</i>								
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)
72	84 (72,84)	685	1	881	35.4	24.9	C	13
84	61 (84,61)	235	2	881	40.7	10.8	A	4
61	3 (61,3)	413	1	577	29.8	19.3	C	9
3	76 (3,76)	668	1	577	26.6	21.6	C	17
76	17 (76,17)	580	1	578	26.0	22.3	C	15
17	20 (17,20)	783	3	3037	47.5	21.3	C	11
20	23 (20,23)	528	3	3039	48.8	20.8	C	7
23	57 (23,57)	511	3	3041	49.1	20.6	C	7
57	83 (57,83)	338	3	3038	45.5	22.3	C	5
83	2 (83,2)	614	3	3025	28.7	35.1	E	17
2	63 (2,63)	722	2	1935	8.7	111.3	F	61
63	36 (63,36)	620	2	1919	13.6	70.4	F	31
36	29 (36,29)	2610	2	941	21.3	22.1	C	82
Entire Path		9307			29.1	32.7	D	281

Weave LOS C

Weave LOS C

Weave LOS C

5:22

Weave LOS C

4:41

2035 Alternative 1 AM

		Paths						
US 11 to I-81 NB		Length	Lanes	Avg Volume	Avg Speed	Density	Avg Travel	
Link		(ft)	(#)	(veh/hr)	(mph)	(veh/mi/ln) LOS	Time (sec)	
29	36 (29,36)	2610	2	711	18.1	19.6 C	98	
36	63 (36,63)	620	2	828	9.7	42.9 E	44	
63	70 (63,70)	591	2	1332	10.7	62.1 F	38	
70	85 (70,85)	340	2	630	23.1	13.7 B	9	
85	2 (85,2)	397	1	630	27.6	22.8 C	10	
2	83 (2,83)	614	3	2427	47.6	17.0 B	9	Weave LOS B
83	57 (83,57)	338	3	2426	49.3	16.4 B	5	
57	23 (57,23)	511	3	2426	50.0	16.2 B	7	
23	20 (23,20)	528	3	2428	49.5	16.4 B	7	
20	17 (20,17)	783	3	2425	41.3	19.6 C	13	
17	8 (17,8)	909	2	1439	48.5	14.8 B	13	
8	12 (8,12)	591	3	1741	43.5	13.3 B	9	Weave LOS B
12	11 (12,11)	1289	1	217	30.5	7.1 A	29	
11	13 (11,13)	664	2	1663	34.0	24.4 C	13	Weave LOS C
13	58 (13,58)	940	1	218	40.6	5.4 A	16	
58	4 (58,4)	346	2	769	33.6	11.4 B	7	
4	72 (4,72)	615	1	769	38.2	20.1 C	11	
Entire Path		12686			32.6	19.3 C	337	5:37

US 11 to I-81 SB		Length	Lanes	Avg Volume	Avg Speed	Density	Avg Travel	
Link		(ft)	(#)	(veh/hr)	(mph)	(veh/mi/ln)	LOS	Time (sec)
29	36 (29,36)	2610	2	711	18.1	19.6	C	98
36	63 (36,63)	620	2	828	9.7	42.9	E	44
63	70 (63,70)	591	2	1332	10.7	62.1	F	38
70	85 (70,85)	340	2	630	23.1	13.7	B	9
85	2 (85,2)	397	1	630	27.6	22.8	C	10
2	83 (2,83)	614	3	2427	47.6	17.0	B	9
83	57 (83,57)	338	3	2426	49.3	16.4	B	5
57	23 (57,23)	511	3	2426	50.0	16.2	B	7
23	20 (23,20)	528	3	2428	49.5	16.4	B	7
20	17 (20,17)	783	3	2425	41.3	19.6	C	13
17	75 (17,75)	653	2	986	30.8	16.0	B	14
75	51 (75,51)	543	2	985	28.1	17.5	B	13
51	62 (51,62)	399	2	985	28.3	17.4	B	10
62	6 (62,6)	418	3	1059	35.0	10.1	A	8
6	52 (6,52)	796	2	1058	42.5	12.5	B	13
Entire Path		10141			29.9	21.4	C	298
								4:58

2035 Alternative 1 AM

Paths									
Route 37 WB to US 11									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
24 80 (24,80)		949	2	2780	51.3	27.1	D	13	
80 71 (80,71)		448	3	2778	39.3	23.6	C	8	
71 70 (71,70)		945	2	967	11.8	41.0	E	55	
70 63 (70,63)		591	2	954	13.3	35.9	E	30	
63 36 (63,36)		620	2	1919	13.6	70.4	F	31	
36 29 (36,29)		2610	2	941	21.3	22.1	C	82	
Entire Path		6163			24.2	32.0	D	218	3:38
US 11 to Route 37 EB									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
29 36 (29,36)		2610	2	711	18.1	19.6	C	98	
36 63 (36,63)		620	2	828	9.7	42.9	E	44	
63 71 (63,71)		849	1	482	25.8	18.7	C	22	
71 80 (71,80)		448	3	1579	44.2	11.9	B	7	
80 24 (80,24)		949	2	1578	50.1	15.8	B	13	
Entire Path		5476			26.0	20.8	C	183	3:03

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 1 PM

Paths								
Route 37 Westbound								
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)
9	81 (9,81)	458	2	2403	52.6	22.9	C	6
81	66 (81,66)	727	3	2403	50.4	15.9	B	10
66	69 (66,69)	1160	2	1296	51.2	12.6	B	15
69	82 (69,82)	580	3	1833	47.7	12.8	B	8
82	79 (82,79)	411	3	1831	50.5	12.1	B	6
79	14 (79,14)	684	3	1833	47.0	13.0	B	10
14	12 (14,12)	928	2	1484	47.9	15.5	B	13
12	8 (12,8)	591	3	2736	30.0	30.5	D	16
8	17 (8,17)	909	2	2556	38.9	32.8	D	24
17	20 (17,20)	783	3	3016	36.9	27.2	D	28
20	23 (20,23)	528	3	3001	26.9	37.2	E	28
23	57 (23,57)	511	3	2996	23.3	42.9	E	39
57	83 (57,83)	338	3	2991	19.9	50.1	F	33
83	2 (83,2)	614	3	2980	11.3	87.6	F	62
2	71 (2,71)	1656	2	1869	45.9	20.4	C	25
71	80 (71,80)	448	3	2268	43.5	17.4	B	7
80	24 (80,24)	949	2	2263	47.8	23.7	C	11
Entire Path		12275			41.4	25.9	C	341
Route 37 Eastbound								
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)
24	80 (24,80)	949	2	4042	44.2	45.8	F	12
80	71 (80,71)	448	3	4045	27.6	48.8	F	11
71	2 (71,2)	1656	2	2731	45.1	30.3	D	25
2	83 (2,83)	614	3	4053	44.9	30.1	D	9
83	57 (83,57)	338	3	4053	47.3	28.6	D	5
57	23 (57,23)	511	3	4050	47.5	28.4	D	7
23	20 (23,20)	528	3	4046	45.2	29.9	D	8
20	17 (20,17)	783	3	4040	22.4	60.2	F	24
17	8 (17,8)	909	2	2875	39.8	36.1	E	16
8	12 (8,12)	591	3	3772	21.8	57.7	F	18
12	14 (12,14)	928	2	3174	42.3	37.5	E	15
14	79 (14,79)	684	3	3506	47.0	24.9	C	10
79	82 (79,82)	411	3	3502	46.1	25.3	C	6
82	69 (82,69)	580	3	3511	24.5	47.8	F	16
69	66 (69,66)	1160	2	2240	44.4	25.2	C	18
66	81 (66,81)	727	3	2658	45.0	19.7	C	11
81	9 (81,9)	458	2	2661	47.7	27.9	D	6
Entire Path		12275			40.6	35.4	E	218

5:41

3:38

2035 Alternative 1 PM

Paths									
<i>I-81 NB to US 11</i>									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
52	10 (52,10)	970	2	1597	41.8	19.1	C	16	
10	11 (10,11)	945	1	1260	37.2	33.9	D	17	
11	13 (11,13)	664	2	1854	34.3	27.1	D	13	Weave LOS C
13	12 (13,12)	1019	1	1256	24.1	52.1	F	29	
12	8 (12,8)	591	3	2736	30.0	30.5	D	16	Weave LOS D
8	17 (8,17)	909	2	2556	38.9	32.8	D	24	
17	20 (17,20)	783	3	3016	36.9	27.2	D	28	
20	23 (20,23)	528	3	3001	26.9	37.2	E	28	
23	57 (23,57)	511	3	2996	23.3	42.9	E	39	Weave LOS F
57	83 (57,83)	338	3	2991	19.9	50.1	F	33	
83	2 (83,2)	614	3	2980	11.3	87.6	F	62	
2	63 (2,63)	722	2	1101	2.9	187.6	F	195	
63	36 (63,36)	620	2	1713	5.3	162.0	F	79	
36	29 (36,29)	2610	2	565	18.4	15.3	B	96	
Entire Path		11824			25.2	49.0	F	676	11:16
<i>I-81 SB to US 11</i>									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
72	84 (72,84)	685	1	1372	34.9	39.3	E	13	
84	61 (84,61)	235	2	1372	40.2	17.1	B	4	
61	3 (61,3)	413	1	475	30.8	15.5	B	9	
3	76 (3,76)	668	1	476	27.4	17.4	B	17	
76	17 (76,17)	580	1	476	26.2	18.2	C	15	
17	20 (17,20)	783	3	3016	36.9	27.2	D	28	
20	23 (20,23)	528	3	3001	26.9	37.2	E	28	
23	57 (23,57)	511	3	2996	23.3	42.9	E	39	Weave LOS F
57	83 (57,83)	338	3	2991	19.9	50.1	F	33	
83	2 (83,2)	614	3	2980	11.3	87.6	F	62	
2	63 (2,63)	722	2	1101	2.9	187.6	F	195	
63	36 (63,36)	620	2	1713	5.3	162.0	F	79	
36	29 (36,29)	2610	2	565	18.4	15.3	B	96	
Entire Path		9307			21.7	50.4	F	619	10:19

2035 Alternative 1 PM

Paths								
<i>US 11 to I-81 NB</i>								
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)
29	36 (29,36)	2610	2	871	16.6	26.2	D	107
36	63 (36,63)	620	2	1093	15.1	36.2	E	28
63	70 (63,70)	591	2	1050	15.8	33.2	D	26
70	85 (70,85)	340	2	1324	15.3	43.3	E	14
85	2 (85,2)	397	1	1324	24.6	53.8	F	11
2	83 (2,83)	614	3	4053	44.9	30.1	D	9
83	57 (83,57)	338	3	4053	47.3	28.6	D	5
57	23 (57,23)	511	3	4050	47.5	28.4	D	7
23	20 (23,20)	528	3	4046	45.2	29.9	D	8
20	17 (20,17)	783	3	4040	22.4	60.2	F	24
17	8 (17,8)	909	2	2875	39.8	36.1	E	16
8	12 (8,12)	591	3	3772	21.8	57.7	F	18
12	11 (12,11)	1289	1	592	27.5	21.5	C	32
11	13 (11,13)	664	2	1854	34.3	27.1	D	13
13	58 (13,58)	940	1	595	38.2	15.6	B	17
58	4 (58,4)	346	2	946	32.5	14.5	B	7
4	72 (4,72)	615	1	947	37.3	25.4	C	11
Entire Path		12686			28.7	31.5	D	353
<i>US 11 to I-81 SB</i>								
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)
29	36 (29,36)	2610	2	871	16.6	26.2	D	107
36	63 (36,63)	620	2	1093	15.1	36.2	E	28
63	70 (63,70)	591	2	1050	15.8	33.2	D	26
70	85 (70,85)	340	2	1324	15.3	43.3	E	14
85	2 (85,2)	397	1	1324	24.6	53.8	F	11
2	83 (2,83)	614	3	4053	44.9	30.1	D	9
83	57 (83,57)	338	3	4053	47.3	28.6	D	5
57	23 (57,23)	511	3	4050	47.5	28.4	D	7
23	20 (23,20)	528	3	4046	45.2	29.9	D	8
20	17 (20,17)	783	3	4040	22.4	60.2	F	24
17	75 (17,75)	653	2	1165	28.5	20.4	C	16
75	51 (75,51)	543	2	1164	27.9	20.9	C	13
51	62 (51,62)	399	2	1164	28.0	20.8	C	10
62	6 (62,6)	418	3	1330	34.8	12.7	B	8
6	52 (6,52)	796	2	1331	41.9	15.9	B	13
Entire Path		10141			27.5	29.9	D	298

5:53

Weave LOS E

Weave LOS F

Weave LOS C

Weave LOS E

4:58

2035 Alternative 1 PM

Paths									
Route 37 WB to US 11									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
24	80 (24,80)	949	2	4042	44.2	45.8	F	12	
80	71 (80,71)	448	3	4045	27.6	48.8	F	11	
71	70 (71,70)	945	2	1318	15.6	42.3	E	41	
70	63 (70,63)	591	2	968	18.7	25.8	C	22	
63	36 (63,36)	620	2	1713	5.3	162.0	F	79	
36	29 (36,29)	2610	2	565	18.4	15.3	B	96	
Entire Path		6163			21.3	42.3	E	262	4:22
US 11 to Route 37 EB									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
29	36 (29,36)	2610	2	871	16.6	26.2	D	107	
36	63 (36,63)	620	2	1093	15.1	36.2	E	28	
63	71 (63,71)	849	1	401	26.2	15.3	B	21	
71	80 (71,80)	448	3	2268	43.5	17.4	B	7	
80	24 (80,24)	949	2	2263	47.8	23.7	C	11	
Entire Path		5476			25.5	24.5	C	174	2:54

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 2 AM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	1808	42.6	14.1 B	2
63	90 (63,90)	302	3	1808	54.1	11.1 B	4
90	9 (90,9)	509	2	713	52.9	6.7 A	7
9	66 (9,66)	315	2	713	52.5	6.8 A	4
66	69 (66,69)	1178	2	712	52.7	6.8 A	15
69	86 (69,86)	240	2	712	51.9	6.9 A	3
86	85 (86,85)	814	2	711	53.4	6.7 A	10
85	14 (85,14)	536	2	712	52.9	6.7 A	7
14	12 (14,12)	1008	2	711	52.9	6.7 A	13
12	8 (12,8)	591	2	711	52.6	6.8 A	8
8	17 (8,17)	909	2	711	52.9	6.7 A	12
17	20 (17,20)	244	2	711	52.5	6.8 A	3
20	23 (20,23)	1067	2	712	53.1	6.7 A	14
23	57 (23,57)	302	2	712	52.0	6.8 A	4
57	2 (57,2)	1161	2	713	53.1	6.7 A	15
2	71 (2,71)	1697	2	713	52.7	6.8 A	22
71	93 (71,93)	975	3	1698	50.2	11.3 B	13
93	24 (93,24)	192	3	1699	52.5	10.8 A	2
Entire Path		12165			52.6	7.3 A	158 2:38
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	3025	55.9	18.1 C	2
93	71 (93,71)	975	3	3026	50.7	19.9 C	13
71	2 (71,2)	1697	2	1242	52.4	11.8 B	22
2	57 (2,57)	1161	2	1242	52.5	11.8 B	15
57	23 (57,23)	302	2	1242	51.0	12.2 B	4
23	20 (23,20)	1067	2	1243	52.1	11.9 B	14
20	17 (20,17)	244	2	1243	51.4	12.1 B	3
17	8 (17,8)	909	2	1244	51.6	12.0 B	12
8	12 (8,12)	591	2	1243	51.2	12.1 B	8
12	14 (12,14)	1008	2	1242	51.4	12.1 B	13
14	85 (14,85)	536	2	1242	51.5	12.1 B	7
85	86 (85,86)	814	2	1242	52.1	11.9 B	11
86	69 (86,69)	240	2	1241	50.7	12.2 B	3
69	66 (69,66)	1178	2	1239	51.2	12.1 B	16
66	9 (66,9)	315	2	1240	51.5	12.0 B	4
9	90 (9,90)	509	2	1238	51.2	12.1 B	7
90	63 (90,63)	302	3	1815	48.8	12.4 B	4
63	84 (63,84)	125	3	1815	47.2	12.8 B	2
Entire Path		12165			51.6	12.7 B	161 2:41

2035 Alternative 2 AM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1463	42.3	17.3 B	16
10	11 (10,11)	945	1	1273	37.7	33.8 D	17
11	13 (11,13)	697	2	1429	35.2	20.3 C	13 Weave LOS B
13	115 (13,115)	1062	1	1272	24.6	51.6 F	29
115	114 (115,114)	481	3	1981	35.0	18.9 C	9 Weave LOS B
114	118 (114,118)	629	2	1907	39.4	24.2 C	11
118	112 (118,112)	292	3	2324	37.4	20.7 C	5
112	110 (112,110)	375	3	2324	27.2	28.5 D	9 Weave LOS C
110	87 (110,87)	170	2	1520	29.7	25.6 C	4
87	82 (87,82)	295	2	1519	27.9	27.2 D	7
82	19 (82,19)	449	3	1506	8.5	59.2 F	36
19	25 (19,25)	540	2	1548	17.4	44.6 E	22
Entire Path		6905			31.4	32.1 D	180 2:60

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	2	732	45.8	8.0 A	14
61	3 (61,3)	415	1	417	30.7	13.6 B	9
3	118 (3,118)	942	1	417	26.9	15.5 B	24
118	112 (118,112)	292	3	2324	37.4	20.7 C	5
112	110 (112,110)	375	3	2324	27.2	28.5 D	9 Weave LOS C
110	87 (110,87)	170	2	1520	29.7	25.6 C	4
87	82 (87,82)	295	2	1519	27.9	27.2 D	7
82	19 (82,19)	449	3	1506	8.5	59.2 F	36
19	25 (19,25)	540	2	1548	17.4	44.6 E	22
Entire Path		4396			29.0	24.4 C	131 2:11

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	943	15.5	30.5 D	24
19	22 (19,22)	1299	2	1529	19.8	38.7 E	44
22	78 (22,78)	389	1	420	24.5	17.1 B	10
78	79 (78,79)	414	1	421	26.6	15.9 B	11
79	98 (79,98)	409	1	423	26.8	15.8 B	10
98	96 (98,96)	660	3	1310	40.0	10.9 A	11 Weave LOS A
96	91 (96,91)	630	1	419	40.8	10.3 A	11
91	94 (91,94)	533	2	732	38.3	9.6 A	9 Weave LOS A
94	11 (94,11)	1223	1	154	29.7	5.2 A	28
11	13 (11,13)	697	2	1429	35.2	20.3 C	13 Weave LOS B
13	58 (13,58)	907	1	158	41.3	3.8 A	15
58	4 (58,4)	346	2	699	34.4	10.2 A	7
4	72 (4,72)	611	1	699	38.5	18.2 C	11
Entire Path		8658			31.4	16.6 B	205 3:25

2035 Alternative 2 AM

Paths							
US 11 to I-81 SB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	943	15.5	30.5 D	24
19	22 (19,22)	1299	2	1529	19.8	38.7 E	44
22	78 (22,78)	389	1	420	24.5	17.1 B	10
78	79 (78,79)	414	1	421	26.6	15.9 B	11
79	98 (79,98)	409	1	423	26.8	15.8 B	10
98	96 (98,96)	660	3	1310	40.0	10.9 A	11
96	75 (96,75)	379	2	892	31.1	14.3 B	8
75	51 (75,51)	543	2	892	28.0	15.9 B	13
51	62 (51,62)	397	2	891	28.1	15.8 B	10
62	6 (62,6)	418	3	968	35.3	9.2 A	8
6	52 (6,52)	796	2	970	42.3	11.5 B	13
Entire Path		6244			28.6	20.3 C	163 2:43
Route 37 WB to US 11							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	3025	55.9	18.1 C	2
93	71 (93,71)	975	3	3026	50.7	19.9 C	13
71	95 (71,95)	335	2	1782	42.5	20.9 C	5
95	107 (95,107)	257	2	1782	32.1	27.8 D	5
107	104 (107,104)	1179	2	1146	41.6	13.8 B	19
104	16 (104,16)	539	3	1408	41.4	11.3 B	9
16	99 (16,99)	1218	2	1411	40.6	17.4 B	20
99	81 (99,81)	273	1	526	31.4	16.7 B	6
81	80 (81,80)	152	1	526	26.7	19.7 C	4
80	78 (80,78)	300	1	526	27.0	19.5 C	8
78	22 (78,22)	389	2	526	8.8	29.9 D	30
22	19 (22,19)	1299	2	1116	20.2	27.6 D	44
19	25 (19,25)	540	2	1548	17.4	44.6 E	22
Entire Path		7648			34.4	21.6 C	188 3:08
US 11 to Route 37 EB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	943	15.5	30.5 D	24
19	82 (19,82)	449	1	443	24.4	18.1 C	12
82	111 (82,111)	460	1	442	26.6	16.6 B	12
111	101 (111,101)	828	2	1244	40.1	15.5 B	14
101	105 (101,105)	829	2	1246	39.8	15.6 B	14
105	108 (105,108)	1131	1	658	39.7	16.6 B	19
108	70 (108,70)	260	2	985	32.9	15.0 B	5
70	71 (70,71)	321	1	985	37.4	26.3 D	6
71	93 (71,93)	975	3	1698	50.2	11.3 B	13
93	24 (93,24)	192	3	1699	52.5	10.8 A	2
Entire Path		5985			37.1	17.1 B	122 2:02

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 2 PM

Paths							
<i>Route 37 Westbound</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	2807	42.6	22.0 C	2
63	90 (63,90)	302	3	2807	52.5	17.8 B	4
90	9 (90,9)	509	2	562	52.3	5.4 A	7
9	66 (9,66)	315	2	562	52.3	5.4 A	4
66	69 (66,69)	1178	2	560	52.7	5.3 A	15
69	86 (69,86)	240	2	560	51.7	5.4 A	3
86	85 (86,85)	814	2	560	53.4	5.2 A	10
85	14 (85,14)	536	2	561	52.8	5.3 A	7
14	12 (14,12)	1008	2	561	53.0	5.3 A	13
12	8 (12,8)	591	2	560	52.6	5.3 A	8
8	17 (8,17)	909	2	560	52.8	5.3 A	12
17	20 (17,20)	244	2	560	52.4	5.3 A	3
20	23 (20,23)	1067	2	560	53.2	5.3 A	14
23	57 (23,57)	302	2	561	52.0	5.4 A	4
57	2 (57,2)	1161	2	560	53.2	5.3 A	15
2	71 (2,71)	1697	2	561	52.8	5.3 A	22
71	93 (71,93)	978	3	2565	48.6	17.6 B	14
93	24 (93,24)	183	3	2565	52.5	16.3 B	2
Entire Path		12159			52.4	6.9 A	158 2:38

<i>Route 37 Eastbound</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	183	3	4360	58.4	24.9 C	2
93	71 (93,71)	978	3	4358	48.7	29.8 D	14
71	2 (71,2)	1697	2	1878	49.8	18.9 C	23
2	57 (2,57)	1161	2	1877	49.6	18.9 C	16
57	23 (57,23)	302	2	1878	48.2	19.5 C	4
23	20 (23,20)	1067	2	1879	49.0	19.2 C	15
20	17 (20,17)	244	2	1878	48.6	19.3 C	3
17	8 (17,8)	909	2	1876	48.6	19.3 C	13
8	12 (8,12)	591	2	1880	48.2	19.5 C	8
12	14 (12,14)	1008	2	1879	48.3	19.4 C	14
14	85 (14,85)	536	2	1881	48.3	19.5 C	8
85	86 (85,86)	814	2	1878	48.7	19.3 C	11
86	69 (86,69)	240	2	1877	47.3	19.8 C	3
69	66 (69,66)	1178	2	1875	48.1	19.5 C	17
66	9 (66,9)	315	2	1875	48.2	19.4 C	4
9	90 (9,90)	509	2	1875	47.9	19.6 C	7
90	63 (90,63)	302	3	2668	46.9	19.0 C	4
63	84 (63,84)	125	3	2669	45.6	19.5 C	2
Entire Path		12159			48.8	20.2 C	170 2:50

2035 Alternative 2 PM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1600	42.2	19.0 C	16
10	11 (10,11)	945	1	1260	37.6	33.5 D	17
11	13 (11,13)	697	2	1526	35.2	21.7 C	13
13	115 (13,115)	1062	1	1262	24.6	51.3 F	29
115	114 (115,114)	481	3	2720	28.9	31.4 D	11
114	118 (114,118)	629	2	2520	28.4	44.3 E	17
118	112 (118,112)	297	3	2845	21.0	45.1 F	14
112	110 (112,110)	370	3	2837	11.9	79.2 F	28
110	87 (110,87)	170	2	1410	13.5	52.3 F	20
87	82 (87,82)	295	2	1399	10.1	69.2 F	43
82	19 (82,19)	449	3	1391	2.5	186.0 F	131
19	25 (19,25)	540	2	1804	20.8	43.5 E	18
Entire Path		6905			27.1	49.5 F	359 5:59

I-81 SB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	2	1224	43.0	14.2 B	15
61	3 (61,3)	413	1	325	31.2	10.4 A	9
3	118 (3,118)	942	1	326	27.1	12.0 B	24
118	112 (118,112)	297	3	2845	21.0	45.1 F	14
112	110 (112,110)	370	3	2837	11.9	79.2 F	28
110	87 (110,87)	170	2	1410	13.5	52.3 F	20
87	82 (87,82)	295	2	1399	10.1	69.2 F	43
82	19 (82,19)	449	3	1391	2.5	186.0 F	131
19	25 (19,25)	540	2	1804	20.8	43.5 E	18
Entire Path		4394			24.2	47.3 F	302 5:02

US 11 to I-81 NB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1589	12.1	65.5 F	30
19	22 (19,22)	1299	2	2065	20.4	50.7 F	43
22	78 (22,78)	389	1	697	24.4	28.5 D	10
78	79 (78,79)	414	1	698	26.1	26.7 D	11
79	98 (79,98)	409	1	697	26.4	26.5 D	11
98	96 (98,96)	660	3	2418	36.4	22.1 C	12
96	91 (96,91)	630	1	797	38.5	20.7 C	11
91	94 (91,94)	533	2	1696	31.4	27.0 D	12
94	11 (94,11)	1223	1	265	28.6	9.3 A	29
11	13 (11,13)	697	2	1526	35.2	21.7 C	13
13	58 (13,58)	907	1	267	40.3	6.6 A	15
58	4 (58,4)	346	2	684	34.0	10.1 A	7
4	72 (4,72)	611	1	687	38.5	17.8 B	11
Entire Path		8658			30.1	25.8 C	216 3:36

2035 Alternative 2 PM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1589	12.1	65.5 F	30
19	22 (19,22)	1299	2	2065	20.4	50.7 F	43
22	78 (22,78)	389	1	697	24.4	28.5 D	10
78	79 (78,79)	414	1	698	26.1	26.7 D	11
79	98 (79,98)	409	1	697	26.4	26.5 D	11
98	96 (98,96)	660	3	2418	36.4	22.1 C	12
96	75 (96,75)	379	2	1623	29.2	27.8 D	9
75	51 (75,51)	543	2	1621	27.0	30.0 D	14
51	62 (51,62)	397	2	1619	26.9	30.1 D	10
62	6 (62,6)	418	3	1809	32.0	18.8 C	9
6	52 (6,52)	794	2	1813	40.5	22.4 C	13
Entire Path		6242			27.2	34.2 D	172 2:52

<i>Route 37 WB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	183	3	4360	58.4	24.9 C	2
93	71 (93,71)	978	3	4358	48.7	29.8 D	14
71	95 (71,95)	330	2	2480	35.1	35.4 E	6
95	107 (95,107)	246	2	2484	17.1	72.7 F	10
107	104 (107,104)	1190	2	1587	40.2	19.7 C	20
104	16 (104,16)	543	3	2045	39.5	17.3 B	9
16	99 (16,99)	1213	2	2044	35.9	28.4 D	23
99	81 (99,81)	273	1	324	31.5	10.3 A	6
81	80 (81,80)	152	1	323	27.6	11.7 B	4
80	78 (80,78)	300	1	322	28.0	11.5 B	7
78	22 (78,22)	389	2	321	9.0	17.9 B	30
22	19 (22,19)	1299	2	1573	19.5	40.4 E	45
19	25 (19,25)	540	2	1804	20.8	43.5 E	18
Entire Path		7636			32.5	29.0 D	195 3:15

<i>US 11 to Route 37 EB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1589	12.1	65.5 F	30
19	82 (19,82)	449	1	661	24.7	26.8 D	12
82	111 (82,111)	460	1	658	26.2	25.1 C	12
111	101 (111,101)	858	2	2072	38.6	26.8 D	15
101	105 (101,105)	818	2	2085	27.9	37.4 E	20
105	108 (105,108)	1109	1	1697	24.7	68.6 F	32
108	70 (108,70)	265	2	2005	14.6	68.8 F	13
70	71 (70,71)	321	1	2005	28.9	69.5 F	8
71	93 (71,93)	978	3	2565	48.6	17.6 B	14
93	24 (93,24)	183	3	2565	52.5	16.3 B	2
Entire Path		5981			30.7	41.7 E	157 2:37

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 3 AM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	9 (84,9)	411	3	1488	53.3	9.3 A	5
9	66 (9,66)	670	3	1488	52.5	9.4 A	9
66	69 (66,69)	1178	2	881	52.7	8.4 A	15
69	86 (69,86)	718	3	1633	47.3	11.5 B	10
86	85 (86,85)	151	3	1632	48.8	11.1 B	2 Weave LOS B
85	14 (85,14)	720	3	1631	46.2	11.8 B	11
14	12 (14,12)	1008	2	1105	50.9	10.9 A	14
12	8 (12,8)	591	3	2414	34.0	23.6 C	12 Weave LOS C
8	17 (8,17)	909	2	1233	48.7	12.7 B	13
17	20 (17,20)	371	2	1233	51.3	12.0 B	5
20	2 (20,2)	2261	2	1230	52.1	11.8 B	30
2	23 (2,23)	194	3	1438	48.3	9.9 A	3
23	71 (23,71)	1451	2	1438	51.0	14.1 B	19
71	94 (71,94)	672	3	1773	48.2	12.3 B	10
94	24 (94,24)	617	2	1773	51.2	17.3 B	8
Entire Path		11922			49.8	12.4 B	165 2:45
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	94 (24,94)	617	3	2747	51.0	18.0 B	8
94	71 (94,71)	672	3	2748	49.7	18.4 C	9
71	2 (71,2)	1600	2	1746	51.0	17.1 B	21
2	95 (2,95)	201	3	1843	49.4	12.4 B	3
95	20 (95,20)	2060	2	1841	50.1	18.4 C	28
20	17 (20,17)	371	3	2657	29.8	29.8 D	9 Weave LOS D
17	8 (17,8)	909	2	1659	46.4	17.9 B	13
8	12 (8,12)	591	3	1960	42.2	15.5 B	10 Weave LOS B
12	14 (12,14)	1008	2	1709	49.2	17.4 B	14
14	85 (14,85)	720	3	1902	49.3	12.8 B	10
85	86 (85,86)	151	3	1901	48.6	13.0 B	2 Weave LOS B
86	69 (86,69)	718	3	1900	44.7	14.2 B	11
69	66 (69,66)	1178	2	1329	50.2	13.2 B	16
66	9 (66,9)	670	3	1741	48.7	11.9 B	9
9	84 (9,84)	411	3	1743	51.3	11.3 B	5
Entire Path		11877			48.4	16.4 B	169 2:49

2035 Alternative 3 AM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1502	42.1	17.9 B	16
10	11 (10,11)	945	1	1310	37.5	34.9 D	17
11	13 (11,13)	664	2	1552	35.0	22.2 C	13 Weave LOS B
13	12 (13,12)	1019	1	1307	24.6	53.1 F	28
12	8 (12,8)	591	3	2414	34.0	23.6 C	12 Weave LOS C
8	88 (8,88)	283	1	1178	29.5	40.0 E	7
88	89 (88,89)	262	1	972	34.8	28.0 D	5
89	81 (89,81)	929	2	1335	38.0	17.6 B	17 Weave LOS B
81	82 (81,82)	426	2	1039	29.0	17.9 B	10
82	19 (82,19)	424	3	1037	8.5	40.8 E	34
19	25 (19,25)	540	3	1379	19.4	23.6 C	19
Entire Path		7053			31.7	29.2 D	178 2:58
<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	1	932	42.4	22.0 C	15
61	3 (61,3)	413	1	629	29.4	21.4 C	10
3	92 (3,92)	528	2	630	27.7	11.4 B	13
92	93 (92,93)	890	1	267	27.4	9.8 A	22
93	19 (93,19)	350	3	1282	11.4	37.4 E	21
19	25 (19,25)	540	3	1379	19.4	23.6 C	19
Entire Path		3639			28.7	19.1 C	100 1:40
<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1304	12.1	53.9 F	30
19	93 (19,93)	350	2	1764	23.8	37.0 E	10
93	22 (93,22)	945	2	1747	20.8	42.1 E	31
22	78 (22,78)	389	1	813	24.3	33.5 D	10
78	79 (78,79)	414	1	811	26.3	30.9 D	11
79	20 (79,20)	474	1	811	26.0	31.2 D	12
20	17 (20,17)	371	3	2657	29.8	29.8 D	9 Weave LOS D
17	8 (17,8)	909	2	1659	46.4	17.9 B	13
8	12 (8,12)	591	3	1960	42.2	15.5 B	10 Weave LOS B
12	11 (12,11)	1289	1	245	30.3	8.1 A	29
11	13 (11,13)	664	2	1552	35.0	22.2 C	13 Weave LOS A
13	58 (13,58)	940	1	247	40.3	6.1 A	16
58	4 (58,4)	316	2	776	33.2	11.7 B	6
4	72 (4,72)	639	1	777	37.7	20.6 C	12
Entire Path		8831			31.7	23.4 C	212 3:32

2035 Alternative 3 AM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1304	12.1	53.9 F	30
19	93 (19,93)	350	2	1764	23.8	37.0 E	10
93	22 (93,22)	945	2	1747	20.8	42.1 E	31
22	78 (22,78)	389	1	813	24.3	33.5 D	10
78	79 (78,79)	414	1	811	26.3	30.9 D	11
79	20 (79,20)	474	1	811	26.0	31.2 D	12
20	17 (20,17)	371	3	2657	29.8	29.8 D	9 Weave LOS D
17	75 (17,75)	656	2	1003	29.9	16.7 B	15
75	51 (75,51)	543	2	1003	27.9	17.9 B	13
51	62 (51,62)	399	2	1002	28.1	17.8 B	10
62	6 (62,6)	418	3	1206	35.4	11.4 B	8
6	52 (6,52)	796	2	1207	41.8	14.4 B	13
Entire Path		6295			27.4	28.2 D	172 2:52

Route 37 EB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	94 (24,94)	617	3	2747	51.0	18.0 B	8
94	71 (94,71)	672	3	2748	49.7	18.4 C	9
71	70 (71,70)	858	2	1002	16.4	30.6 D	36
70	18 (70,18)	593	2	686	26.5	12.9 B	15
18	83 (18,83)	1230	2	588	41.7	7.1 A	20
83	80 (83,80)	1045	2	587	43.6	6.7 A	16
80	78 (80,78)	300	2	587	33.1	8.9 A	6
78	22 (78,22)	389	2	587	9.4	31.4 D	28
22	93 (22,93)	945	2	1010	27.0	18.7 C	24
93	19 (93,19)	350	3	1282	11.4	37.4 E	21
19	25 (19,25)	540	3	1379	19.4	23.6 C	19
Entire Path		7539			32.5	17.4 B	203 3:23

US 11 to Route 37 WB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1304	12.1	53.9 F	30
19	82 (19,82)	424	1	491	25.4	19.4 C	11
82	87 (82,87)	530	1	489	26.8	18.2 C	13
87	91 (87,91)	1238	2	788	40.0	9.8 A	21 Weave LOS A
91	63 (91,63)	1121	2	578	19.0	15.2 B	40
63	71 (63,71)	799	1	335	25.8	13.0 B	21
71	94 (71,94)	672	3	1773	48.2	12.3 B	10
94	24 (94,24)	617	2	1773	51.2	17.3 B	8
Entire Path		5941			31.5	17.8 B	155 2:35

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 3 PM

Paths									
Route 37 Westbound									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
84	9 (84,9)	411	3	2436	51.7	15.7	B	5	
9	66 (9,66)	670	3	2437	49.8	16.3	B	9	
66	69 (66,69)	1178	2	1334	51.9	12.8	B	15	
69	86 (69,86)	718	3	2082	47.9	14.5	B	10	
86	85 (86,85)	151	3	2081	48.5	14.3	B	2	Weave LOS B
85	14 (85,14)	720	3	2080	42.3	16.4	B	12	
14	12 (14,12)	1008	2	1691	48.9	17.3	B	14	
12	8 (12,8)	591	3	2865	31.2	30.6	D	13	Weave LOS D
8	17 (8,17)	909	2	1764	46.6	18.9	C	13	
17	20 (17,20)	371	2	1762	50.1	17.6	B	5	
20	2 (20,2)	2261	2	1760	50.4	17.4	B	31	
2	23 (2,23)	194	3	2110	42.8	16.4	B	3	
23	71 (23,71)	1451	2	2113	48.7	21.7	C	20	
71	94 (71,94)	672	3	2417	47.2	17.1	B	10	
94	24 (94,24)	617	2	2423	49.7	24.4	C	8	
Entire Path		11922			48.0	18.2	C	172	2:52
Route 37 Eastbound									
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
24	94 (24,94)	617	3	3944	48.3	27.2	D	9	
94	71 (94,71)	672	3	3942	44.0	29.8	D	10	
71	2 (71,2)	1600	2	2667	39.6	33.6	D	35	
2	95 (2,95)	201	3	2936	29.4	33.3	D	8	
95	20 (95,20)	2060	2	2916	19.9	73.1	F	107	
20	17 (20,17)	371	3	4140	9.7	141.7	F	26	Weave LOS F
17	8 (17,8)	909	2	2388	36.9	32.4	D	17	
8	12 (8,12)	591	3	3293	29.8	36.8	E	14	Weave LOS E
12	14 (12,14)	1008	2	2901	44.7	32.4	D	15	
14	85 (14,85)	720	3	3226	47.0	22.9	C	10	
85	86 (85,86)	151	3	3228	47.1	22.8	C	2	Weave LOS D
86	69 (86,69)	718	3	3228	30.9	34.9	D	16	
69	66 (69,66)	1178	2	2072	45.7	22.7	C	18	
66	9 (66,9)	670	3	2522	48.1	17.5	B	10	
9	84 (9,84)	411	3	2525	50.5	16.7	B	6	
Entire Path		11877			37.0	40.0	E	302	5:02

2035 Alternative 3 PM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1511	42.6	17.8 B	16
10	11 (10,11)	945	1	1184	37.8	31.3 D	17
11	13 (11,13)	664	2	1573	35.3	22.3 C	13
13	12 (13,12)	1019	1	1181	24.8	47.6 F	28
12	8 (12,8)	591	3	2865	31.2	30.6 D	13
8	88 (8,88)	283	1	1103	29.5	37.4 E	7
88	89 (88,89)	262	1	769	35.0	22.0 C	5
89	81 (89,81)	929	2	990	38.9	12.7 B	16
81	82 (81,82)	426	2	835	29.3	14.2 B	10
82	19 (82,19)	424	3	836	10.2	27.3 D	28
19	25 (19,25)	540	3	1980	18.2	36.3 E	20
Entire Path		7053			31.8	27.5 D	173 2:53

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	1	1403	40.4	34.8 D	16
61	3 (61,3)	413	1	505	30.1	16.8 B	9
3	92 (3,92)	528	2	505	28.1	9.0 A	13
92	93 (92,93)	890	1	283	27.5	10.3 A	22
93	19 (93,19)	350	3	1934	10.5	61.7 F	23
19	25 (19,25)	540	3	1980	18.2	36.3 E	20
Entire Path		3639			28.1	25.8 C	103 1:43

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1589	7.3	109.1 F	51
19	93 (19,93)	350	2	1716	24.1	35.6 E	10
93	22 (93,22)	945	2	1716	18.2	47.2 F	35
22	78 (22,78)	389	1	1217	23.6	51.6 F	10
78	79 (78,79)	414	1	1218	24.7	49.4 F	11
79	20 (79,20)	474	1	1217	21.3	57.1 F	15
20	17 (20,17)	371	3	4140	9.7	141.7 F	26
17	8 (17,8)	909	2	2388	36.9	32.4 D	17
8	12 (8,12)	591	3	3293	29.8	36.8 E	14
12	11 (12,11)	1289	1	389	28.9	13.5 B	30
11	13 (11,13)	664	2	1573	35.3	22.3 C	13
13	58 (13,58)	940	1	391	39.6	9.9 A	16
58	4 (58,4)	316	2	779	33.8	11.5 B	6
4	72 (4,72)	639	1	781	38.1	20.5 C	11
Entire Path		8831			27.9	39.1 E	267 4:27

2035 Alternative 3 PM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1589	7.3	109.1 F	51
19	93 (19,93)	350	2	1716	24.1	35.6 E	10
93	22 (93,22)	945	2	1716	18.2	47.2 F	35
22	78 (22,78)	389	1	1217	23.6	51.6 F	10
78	79 (78,79)	414	1	1218	24.7	49.4 F	11
79	20 (79,20)	474	1	1217	21.3	57.1 F	15
20	17 (20,17)	371	3	4140	9.7	141.7 F	26
17	75 (17,75)	656	2	1749	27.2	32.1 D	16
75	51 (75,51)	543	2	1748	26.9	32.5 D	14
51	62 (51,62)	399	2	1750	26.9	32.5 D	10
62	6 (62,6)	418	3	2084	31.9	21.8 C	9
6	52 (6,52)	796	2	2082	39.9	26.1 D	14
Entire Path		6295			24.0	50.5 F	222 3:42

Weave LOS F

<i>Route 37 EB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	94 (24,94)	617	3	3944	48.3	27.2 D	9
94	71 (94,71)	672	3	3942	44.0	29.8 D	10
71	70 (71,70)	946	2	1261	14.8	42.5 E	44
70	18 (70,18)	593	2	672	26.1	12.9 B	15
18	83 (18,83)	1230	2	400	41.7	4.8 A	20
83	80 (83,80)	1045	2	401	30.5	6.6 A	23
80	78 (80,78)	300	2	401	29.4	6.8 A	7
78	22 (78,22)	389	2	401	9.0	22.3 C	30
22	93 (22,93)	945	2	1644	26.7	30.8 D	24
93	19 (93,19)	350	3	1934	10.5	61.7 F	23
19	25 (19,25)	540	3	1980	18.2	36.3 E	20
Entire Path		7627			29.2	23.4 C	225 3:45

<i>US 11 to Route 37 WB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1589	7.3	109.1 F	51
19	82 (19,82)	424	1	663	25.4	26.1 D	11
82	87 (82,87)	530	1	662	26.7	24.8 C	14
87	91 (87,91)	1238	2	815	40.2	10.1 A	21
91	63 (91,63)	1121	2	463	18.4	12.5 B	41
63	71 (63,71)	861	1	305	26.1	11.7 B	22
71	94 (71,94)	672	3	2417	47.2	17.1 B	10
94	24 (94,24)	617	2	2423	49.7	24.4 C	8
Entire Path		6003			30.7	24.4 C	178 2:58

Weave LOS B

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 2 Refined AM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	1808	42.6	14.1 B	2
63	90 (63,90)	302	3	1808	54.1	11.1 B	4
90	9 (90,9)	509	2	713	52.9	6.7 A	7
9	66 (9,66)	315	2	713	52.5	6.8 A	4
66	69 (66,69)	1178	2	712	52.7	6.8 A	15
69	86 (69,86)	240	2	712	51.8	6.9 A	3
86	85 (86,85)	814	2	711	53.4	6.7 A	10
85	14 (85,14)	536	2	712	52.9	6.7 A	7
14	12 (14,12)	1008	2	711	52.9	6.7 A	13
12	8 (12,8)	591	2	711	52.7	6.7 A	8
8	17 (8,17)	909	2	711	52.9	6.7 A	12
17	20 (17,20)	244	2	711	52.5	6.8 A	3
20	23 (20,23)	1067	2	711	53.2	6.7 A	14
23	57 (23,57)	302	2	712	52.0	6.8 A	4
57	2 (57,2)	1161	2	713	53.1	6.7 A	15
2	71 (2,71)	1697	2	713	52.8	6.8 A	22
71	93 (71,93)	975	3	1911	49.8	12.8 B	13
93	24 (93,24)	192	3	1912	52.3	12.2 B	3
Entire Path		12165			52.5	7.5 A	158 2:38
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	3025	55.8	18.1 C	2
93	71 (93,71)	975	3	3026	50.9	19.8 C	13
71	2 (71,2)	1697	2	1242	52.4	11.9 B	22
2	57 (2,57)	1161	2	1243	52.4	11.8 B	15
57	23 (57,23)	302	2	1243	51.0	12.2 B	4
23	20 (23,20)	1067	2	1243	52.1	11.9 B	14
20	17 (20,17)	244	2	1243	51.5	12.1 B	3
17	8 (17,8)	909	2	1244	51.6	12.0 B	12
8	12 (8,12)	591	2	1244	51.2	12.2 B	8
12	14 (12,14)	1008	2	1242	51.4	12.1 B	13
14	85 (14,85)	536	2	1242	51.5	12.1 B	7
85	86 (85,86)	814	2	1241	52.1	11.9 B	11
86	69 (86,69)	240	2	1241	50.7	12.2 B	3
69	66 (69,66)	1178	2	1239	51.2	12.1 B	16
66	9 (66,9)	315	2	1240	51.4	12.0 B	4
9	90 (9,90)	509	2	1240	51.2	12.1 B	7
90	63 (90,63)	302	3	1823	48.8	12.5 B	4
63	84 (63,84)	125	3	1823	47.2	12.9 B	2
Entire Path		12165			51.6	12.7 B	161 2:41

2035 Alternative 2 Refined AM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1463	42.3	17.3 B	16
10	11 (10,11)	945	1	1273	37.7	33.8 D	17
11	13 (11,13)	697	2	1459	35.3	20.7 C	13 Weave LOS B
13	115 (13,115)	1062	1	1272	24.6	51.7 F	29
115	114 (115,114)	481	3	1979	35.3	18.7 C	9 Weave LOS B
114	118 (114,118)	629	2	1906	39.3	24.3 C	11
118	112 (118,112)	292	3	2267	37.5	20.2 C	5
112	110 (112,110)	375	3	2262	26.5	28.4 D	10 Weave LOS C
110	87 (110,87)	170	2	1249	30.1	20.7 C	4
87	82 (87,82)	295	2	1250	28.4	22.0 C	7
82	19 (82,19)	449	3	1249	13.5	30.9 D	23
19	25 (19,25)	540	2	1583	16.8	47.0 F	22
Entire Path		6905			31.7	30.1 D	167 2:47

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	2	931	44.5	10.5 A	14
61	3 (61,3)	415	1	629	29.3	21.5 C	10
3	15 (3,15)	474	1	631	26.4	23.9 C	12
15	21 (15,21)	824	1	267	27.0	9.9 A	21
21	19 (21,19)	262	2	1379	6.8	102.1 F	27 Weave LOS C
19	25 (19,25)	540	2	1583	16.8	47.0 F	22
Entire Path		3433			28.7	26.3 D	106 1:46

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	953	12.1	39.4 E	30
19	21 (19,21)	264	2	1524	23.1	33.0 D	7
21	22 (21,22)	1035	2	1513	20.7	36.5 E	34
22	78 (22,78)	389	1	660	23.4	28.2 D	10
78	79 (78,79)	414	1	662	26.8	24.7 C	11
79	98 (79,98)	409	1	663	26.8	24.7 C	10
98	96 (98,96)	660	3	1546	39.1	13.2 B	12 Weave LOS B
96	91 (96,91)	630	1	497	40.3	12.3 B	11
91	94 (91,94)	533	2	799	38.1	10.5 A	10 Weave LOS A
94	11 (94,11)	1223	1	186	29.4	6.3 A	28
11	13 (11,13)	697	2	1459	35.3	20.7 C	13 Weave LOS B
13	58 (13,58)	907	1	188	41.0	4.6 A	15
58	4 (58,4)	346	2	730	34.0	10.7 A	7
4	72 (4,72)	611	1	730	38.4	19.0 C	11
Entire Path		8658			31.1	18.8 C	210 3:30

2035 Alternative 2 Refined AM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	953	12.1	39.4 E	30
19	21 (19,21)	264	2	1524	23.1	33.0 D	7
21	22 (21,22)	1035	2	1513	20.7	36.5 E	34
22	78 (22,78)	389	1	660	23.4	28.2 D	10
78	79 (78,79)	414	1	662	26.8	24.7 C	11
79	98 (79,98)	409	1	663	26.8	24.7 C	10
98	96 (98,96)	660	3	1546	39.1	13.2 B	12 Weave LOS B
96	75 (96,75)	379	2	1051	30.7	17.1 B	8
75	51 (75,51)	543	2	1053	27.8	18.9 C	13
51	62 (51,62)	397	2	1053	27.9	18.9 C	10
62	6 (62,6)	418	3	1132	34.7	10.9 A	8
6	52 (6,52)	796	2	1131	42.2	13.4 B	13
Entire Path		6244			28.3	23.6 C	167 2:47

<i>Route 37 WB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	3025	55.8	18.1 C	2
93	71 (93,71)	975	3	3026	50.9	19.8 C	13
71	95 (71,95)	335	2	1782	42.8	20.8 C	5
95	107 (95,107)	257	2	1782	32.9	27.1 D	5
107	104 (107,104)	1179	2	1147	41.7	13.8 B	19
104	16 (104,16)	539	3	1409	41.3	11.4 B	9 Weave LOS B
16	99 (16,99)	1218	2	1411	40.6	17.4 B	20
99	81 (99,81)	273	1	525	31.5	16.7 B	6
81	80 (81,80)	152	1	526	26.7	19.7 C	4
80	78 (80,78)	300	1	526	27.1	19.4 C	8
78	22 (78,22)	389	2	528	9.3	28.4 D	29
22	21 (22,21)	1035	2	1116	26.7	20.9 C	26
21	19 (21,19)	262	2	1379	6.8	102.1 F	27
19	25 (19,25)	540	2	1583	16.8	47.0 F	22
Entire Path		7646			34.9	23.3 C	196 3:16

<i>US 11 to Route 37 EB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	953	12.1	39.4 E	30
19	82 (19,82)	449	1	432	24.5	17.6 B	12
82	111 (82,111)	460	1	432	26.8	16.1 B	12
111	101 (111,101)	828	2	1444	39.9	18.1 C	14 Weave LOS B
101	105 (101,105)	829	2	1444	38.7	18.7 C	15
105	108 (105,108)	1131	1	870	38.5	22.6 C	20
108	70 (108,70)	260	2	1197	30.4	19.7 C	6
70	71 (70,71)	321	1	1199	35.7	33.6 D	6
71	93 (71,93)	975	3	1911	49.8	12.8 B	13
93	24 (93,24)	192	3	1912	52.3	12.2 B	3
Entire Path		5985			36.2	20.6 C	131 2:11

Route 37 Access Management Study

CORSIM Processing

2035 Alternative 2 Refined PM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	2807	42.6	22.0 C	2
63	90 (63,90)	302	3	2807	52.6	17.8 B	4
90	9 (90,9)	509	2	562	52.3	5.4 A	7
9	66 (9,66)	315	2	562	52.4	5.4 A	4
66	69 (66,69)	1178	2	560	52.7	5.3 A	15
69	86 (69,86)	240	2	560	51.7	5.4 A	3
86	85 (86,85)	814	2	560	53.4	5.2 A	10
85	14 (85,14)	536	2	561	52.9	5.3 A	7
14	12 (14,12)	1008	2	561	53.0	5.3 A	13
12	8 (12,8)	591	2	560	52.6	5.3 A	8
8	17 (8,17)	909	2	560	52.8	5.3 A	12
17	20 (17,20)	244	2	560	52.4	5.3 A	3
20	23 (20,23)	1067	2	560	53.2	5.3 A	14
23	57 (23,57)	302	2	561	52.0	5.4 A	4
57	2 (57,2)	1161	2	560	53.1	5.3 A	15
2	71 (2,71)	1697	2	561	52.8	5.3 A	22
71	93 (71,93)	975	3	2692	48.6	18.5 C	14
93	24 (93,24)	192	3	2693	52.5	17.1 B	2
Entire Path		12165			52.4	7.0 A	158 2:38
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	4360	58.4	24.9 C	2
93	71 (93,71)	975	3	4361	48.5	30.0 D	14
71	2 (71,2)	1697	2	1879	49.8	18.9 C	23
2	57 (2,57)	1161	2	1878	49.6	19.0 C	16
57	23 (57,23)	302	2	1877	48.2	19.5 C	4
23	20 (23,20)	1067	2	1876	48.9	19.2 C	15
20	17 (20,17)	244	2	1878	48.5	19.4 C	3
17	8 (17,8)	909	2	1876	48.7	19.3 C	13
8	12 (8,12)	591	2	1878	48.3	19.5 C	8
12	14 (12,14)	1008	2	1877	48.4	19.4 C	14
14	85 (14,85)	536	2	1878	48.4	19.4 C	8
85	86 (85,86)	814	2	1876	48.8	19.2 C	11
86	69 (86,69)	240	2	1876	47.3	19.8 C	3
69	66 (69,66)	1178	2	1875	48.1	19.5 C	17
66	9 (66,9)	315	2	1874	48.3	19.4 C	4
9	90 (9,90)	509	2	1875	48.0	19.5 C	7
90	63 (90,63)	302	3	2692	47.0	19.1 C	4
63	84 (63,84)	125	3	2694	45.7	19.6 C	2
Entire Path		12165			48.8	20.2 C	170 2:50

2035 Alternative 2 Refined PM

Paths

I-81 NB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
52	10 (52,10)	970	2	1600	42.3	18.9	C	16	
10	11 (10,11)	945	1	1260	37.6	33.5	D	17	
11	13 (11,13)	697	2	1561	35.0	22.3	C	14	Weave LOS B
13	115 (13,115)	1062	1	1261	24.6	51.2	F	29	
115	114 (115,114)	481	3	2721	30.3	30.0	D	11	Weave LOS C
114	118 (114,118)	629	2	2526	35.9	35.2	E	12	
118	112 (118,112)	292	3	2804	31.7	29.4	D	7	Weave LOS F
112	110 (112,110)	375	3	2802	16.1	58.0	F	16	
110	87 (110,87)	170	2	1212	28.2	21.5	C	4	
87	82 (87,82)	295	2	1211	28.3	21.4	C	7	
82	19 (82,19)	449	3	1213	9.5	42.6	E	32	
19	25 (19,25)	540	2	1890	7.2	130.7	F	52	
Entire Path		6905			29.1	41.5	E	218	3:38

I-81 SB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
72	61 (72,61)	918	2	1404	42.9	16.4	B	15	
61	3 (61,3)	415	1	505	29.9	16.9	B	9	
3	15 (3,15)	474	1	505	26.7	18.9	C	12	
15	21 (15,21)	824	1	219	22.7	9.7	A	27	Weave LOS F
21	19 (21,19)	262	2	1793	5.4	167.4	F	34	
19	25 (19,25)	540	2	1890	7.2	130.7	F	52	
Entire Path		3433			25.8	44.7	E	148	2:28

US 11 to I-81 NB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
25	19 (25,19)	540	2	1687	12.6	66.9	F	29	
19	21 (19,21)	264	2	2127	23.5	45.2	F	7	
21	22 (21,22)	1035	2	2135	20.9	51.1	F	34	
22	78 (22,78)	389	1	973	24.1	40.3	E	10	
78	79 (78,79)	414	1	972	26.0	37.5	E	11	
79	98 (79,98)	409	1	970	26.0	37.3	E	11	
98	96 (98,96)	660	3	2684	35.6	25.1	C	13	Weave LOS C
96	91 (96,91)	630	1	900	37.9	23.7	C	11	
91	94 (91,94)	533	2	1802	30.1	29.9	D	12	Weave LOS C
94	11 (94,11)	1223	1	300	28.2	10.6	A	30	
11	13 (11,13)	697	2	1561	35.0	22.3	C	14	Weave LOS B
13	58 (13,58)	907	1	303	39.7	7.6	A	16	
58	4 (58,4)	346	2	719	32.8	11.0	A	7	
4	72 (4,72)	611	1	720	38.1	18.9	C	11	
Entire Path		8658			29.8	28.4	D	215	3:35

2035 Alternative 2 Refined PM

Paths

US 11 to I-81 SB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
25	19 (25,19)	540	2	1687	12.6	66.9	F	29	
19	21 (19,21)	264	2	2127	23.5	45.2	F	7	
21	22 (21,22)	1035	2	2135	20.9	51.1	F	34	
22	78 (22,78)	389	1	973	24.1	40.3	E	10	
78	79 (78,79)	414	1	972	26.0	37.5	E	11	
79	98 (79,98)	409	1	970	26.0	37.3	E	11	
98	96 (98,96)	660	3	2684	35.6	25.1	C	13	Weave LOS C
96	75 (96,75)	379	2	1786	28.9	30.9	D	9	
75	51 (75,51)	543	2	1783	26.8	33.3	D	14	
51	62 (51,62)	397	2	1787	26.8	33.4	D	10	
62	6 (62,6)	418	3	1976	31.7	20.8	C	9	
6	52 (6,52)	796	2	1975	40.3	24.5	C	13	
Entire Path		6244			27.3	37.7 E		170 2:50	

Route 37 WB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
24	93 (24,93)	192	3	4360	58.4	24.9	C	2	
93	71 (93,71)	975	3	4361	48.5	30.0	D	14	
71	95 (71,95)	335	2	2482	33.8	36.7	E	7	
95	107 (95,107)	257	2	2480	16.9	73.5	F	10	
107	104 (107,104)	1179	2	1586	40.3	19.7	C	20	
104	16 (104,16)	539	3	2048	39.5	17.3	B	9	Weave LOS C
16	99 (16,99)	1218	2	2046	35.4	28.9	D	23	
99	81 (99,81)	273	1	333	31.0	10.7	A	6	
81	80 (81,80)	152	1	333	27.6	12.1	B	4	
80	78 (80,78)	300	1	333	28.1	11.9	B	7	
78	22 (78,22)	389	2	331	9.2	18.0	B	29	
22	21 (22,21)	1035	2	1578	21.9	36.1	E	34	
21	19 (21,19)	262	2	1793	5.4	167.4	F	34	
19	25 (19,25)	540	2	1890	7.2	130.7	F	52	
Entire Path		7646			31.2	39.2 E		251 4:11	

US 11 to Route 37 EB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
25	19 (25,19)	540	2	1687	12.6	66.9	F	29	
19	82 (19,82)	449	1	646	24.8	26.1	D	12	
82	111 (82,111)	460	1	642	26.1	24.6	C	12	
111	101 (111,101)	828	2	2217	30.0	37.0	E	28	Weave LOS F
101	105 (101,105)	829	2	2213	12.9	85.6	F	56	
105	108 (105,108)	1131	1	1819	14.9	122.3	F	52	
108	70 (108,70)	260	2	2130	11.5	92.5	F	16	
70	71 (70,71)	321	1	2132	27.7	77.1	F	8	
71	93 (71,93)	975	3	2692	48.6	18.5	C	14	
93	24 (93,24)	192	3	2693	52.5	17.1	B	2	
Entire Path		5985			25.3	61.7 F		229 3:49	

Route 37 Access Management Study

CORSIM Processing

2015 No Build AM

Paths							
<i>Route 37 Westbound</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
14	31 (14,31)	879	2	914	29.6	15.4 B	20
31	10 (31,10)	317	3	914	28.6	10.7 A	8
10	5 (10,5)	1173	2	656	28.8	11.4 B	28
5	28 (5,28)	240	3	1052	27.1	13.0 B	6
28	9 (28,9)	1934	2	1051	23.0	22.8 C	57
9	17 (9,17)	1364	2	1304	17.3	37.7 E	54
17	68 (17,68)	321	2	1556	29.0	26.8 D	7
68	20 (68,20)	483	3	1553	27.0	19.2 C	12
20	23 (20,23)	1026	2	432	46.7	4.6 A	15
23	57 (23,57)	511	3	883	44.2	6.7 A	8
57	2 (57,2)	952	2	881	51.5	8.6 A	13
2	51 (2,51)	359	2	881	51.5	8.5 A	5
51	52 (51,52)	1408	2	884	52.2	8.5 A	18
52	53 (52,53)	2214	2	884	52.3	8.5 A	29
Entire Path		13181			37.4	14.9 B	280 4:40

<i>Route 37 Eastbound</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
53	52 (53,52)	2214	2	1216	53.1	11.4 B	28
52	51 (52,51)	1408	2	1217	51.8	11.8 B	19
51	2 (51,2)	359	2	1217	50.9	12.0 B	5
2	57 (2,57)	952	2	1218	50.6	12.0 B	13
57	23 (57,23)	511	3	1216	32.0	12.7 B	11
23	20 (23,20)	1026	2	525	46.0	5.7 A	15
20	68 (20,68)	483	3	1104	39.7	9.3 A	8
68	17 (68,17)	321	3	1105	14.4	25.5 C	15
17	9 (17,9)	1364	2	612	17.2	17.8 B	54
9	28 (9,28)	1934	3	530	27.6	6.4 A	48
28	5 (28,5)	240	3	530	27.7	6.4 A	6
5	10 (5,10)	1173	2	290	29.0	5.0 A	28
10	31 (10,31)	317	3	508	28.2	6.0 A	8
31	14 (31,14)	879	2	510	28.8	8.8 A	21
Entire Path		13181			37.6	10.3 A	278 4:38

2015 No Build AM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
55	3 (55,3)	448	3	762	59.7	4.3 A	5
3	9 (3,9)	1795	1	754	20.7	36.4 E	59
9	17 (9,17)	1364	2	1304	17.3	37.7 E	54 Weave LOS E
17	68 (17,68)	321	2	1556	29.0	26.8 D	7
68	20 (68,20)	483	3	1553	27.0	19.2 C	12 Weave LOS B
20	50 (20,50)	462	1	1119	26.6	42.0 E	12
50	35 (50,35)	318	1	1118	16.9	66.1 F	13 Weave LOS F
35	19 (35,19)	429	3	1118	8.7	43.0 E	34
19	25 (19,25)	520	2	1349	19.4	34.8 D	18
Entire Path		6140			23.0	34.8 D	214 3:34
<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
1	56 (1,56)	3011	2	591	26.1	11.3 B	79
56	8 (56,8)	511	1	579	25.4	22.8 C	13
8	17 (8,17)	870	4	580	15.9	9.1 A	37
17	68 (17,68)	321	2	1556	29.0	26.8 D	7
68	20 (68,20)	483	3	1553	27.0	19.2 C	12 Weave LOS B
20	50 (20,50)	462	1	1119	26.6	42.0 E	12
50	35 (50,35)	318	1	1118	16.9	66.1 F	13
35	19 (35,19)	429	3	1118	8.7	43.0 E	34
19	25 (19,25)	520	2	1349	19.4	34.8 D	18
Entire Path		6405			23.3	23.2 C	207 3:27
<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	520	2	811	14.2	28.6 D	25
19	18 (19,18)	493	2	930	25.2	18.5 C	13
18	22 (18,22)	822	2	929	19.4	24.0 C	29
22	24 (22,24)	353	1	579	17.7	32.8 D	12
24	20 (24,20)	1005	1	579	26.5	21.9 C	26
20	68 (20,68)	483	3	1104	39.7	9.3 A	8 Weave LOS A
68	17 (68,17)	321	3	1105	14.4	25.5 C	15
17	9 (17,9)	1364	2	612	17.2	17.8 B	54 Weave LOS B
9	63 (9,63)	1073	2	585	25.7	11.4 B	27
63	58 (63,58)	414	1	586	25.9	22.6 C	11 Weave LOS B
Entire Path		6848			22.5	19.8 C	221 3:41

2015 No Build AM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	520	2	811	14.2	28.6 D	25
19	18 (19,18)	493	2	930	25.2	18.5 C	13
18	22 (18,22)	822	2	929	19.4	24.0 C	29
22	24 (22,24)	353	1	579	17.7	32.8 D	12
24	20 (24,20)	1005	1	579	26.5	21.9 C	26
20	68 (20,68)	483	3	1104	39.7	9.3 A	8
68	17 (68,17)	321	3	1105	14.4	25.5 C	15
17	12 (17,12)	812	2	818	25.2	16.2 B	21
12	61 (12,61)	481	1	818	26.0	31.4 D	13
Entire Path		5290			23.7	22.3 C	162 2:42

Route 37 WB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
53	52 (53,52)	2214	2	1216	53.1	11.4 B	28
52	51 (52,51)	1408	2	1217	51.8	11.8 B	19
51	2 (51,2)	359	2	1217	50.9	12.0 B	5
2	57 (2,57)	952	2	1218	50.6	12.0 B	13
57	23 (57,23)	511	3	1216	32.0	12.7 B	11
23	24 (23,24)	1119	1	690	26.6	25.9 C	29
24	22 (24,22)	353	2	690	10.8	31.9 D	22
22	18 (22,18)	822	2	806	27.2	14.8 B	21
18	19 (18,19)	493	2	806	8.6	46.7 F	43
19	25 (19,25)	520	2	1349	19.4	34.8 D	18
Entire Path		8751			39.3	18.0 C	208 3:28

US 11 to Route 37 EB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	520	2	811	14.2	28.6 D	25
19	35 (19,35)	429	1	451	25.0	18.0 C	11
35	23 (35,23)	821	1	451	26.8	16.9 B	21
23	57 (23,57)	511	3	883	44.2	6.7 A	8
57	2 (57,2)	952	2	881	51.5	8.6 A	13
2	51 (2,51)	359	2	881	51.5	8.5 A	5
51	52 (51,52)	1408	2	884	52.2	8.5 A	18
52	53 (52,53)	2214	2	884	52.3	8.5 A	29
Entire Path		7214			44.3	11.3 B	130 2:10

Route 37 Access Management Study

CORSIM Processing

2015 No Build PM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
14	31 (14,31)	879	2	1078	29.4	18.3 C	20
31	10 (31,10)	317	3	1077	28.0	12.8 B	8
10	5 (10,5)	1173	2	593	28.8	10.3 A	28
5	28 (5,28)	240	3	1028	26.9	12.7 B	6
28	9 (28,9)	1934	2	1023	20.9	24.4 C	63 Weave LOS C
9	17 (9,17)	1364	2	1363	14.9	45.6 F	62
17	68 (17,68)	321	2	1457	30.2	24.1 C	7
68	20 (68,20)	483	3	1459	24.0	20.2 C	14 Weave LOS F
20	23 (20,23)	1026	2	447	45.9	4.9 A	15
23	57 (23,57)	511	3	1053	42.8	8.2 A	8 Weave LOS C
57	2 (57,2)	952	2	1050	50.9	10.3 A	13
2	51 (2,51)	359	2	1049	51.0	10.3 A	5
51	52 (51,52)	1408	2	1046	51.6	10.1 A	19
52	53 (52,53)	2214	2	1051	51.7	10.2 A	29
Entire Path		13181			36.4	16.8 B	297 4:57
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
53	52 (53,52)	2214	2	1748	52.2	16.7 B	29
52	51 (52,51)	1408	2	1747	50.1	17.4 B	19
51	2 (51,2)	359	2	1745	49.4	17.7 B	5
2	57 (2,57)	952	2	1748	48.4	18.1 C	13
57	23 (57,23)	511	3	1746	29.8	19.6 C	12
23	20 (23,20)	1026	2	1308	44.3	14.7 B	16
20	68 (20,68)	483	3	2453	32.8	24.9 C	10 Weave LOS F
68	17 (68,17)	321	3	2456	9.5	86.6 F	23
17	9 (17,9)	1364	2	1809	17.1	52.9 F	54 Weave LOS F
9	28 (9,28)	1934	3	1446	26.7	18.1 C	49
28	5 (28,5)	240	3	1446	24.2	19.9 C	7
5	10 (5,10)	1173	2	888	27.7	16.1 B	29 Weave LOS B
10	31 (10,31)	317	3	1160	26.8	14.4 B	8
31	14 (31,14)	879	2	1162	27.6	21.0 C	22
Entire Path		13181			36.1	23.1 C	297 4:57

2015 No Build PM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
55	3 (55,3)	448	3	839	59.3	4.7 A	5
3	9 (3,9)	1795	1	841	17.0	49.6 F	72
9	17 (9,17)	1364	2	1363	14.9	45.6 F	62 Weave LOS F
17	68 (17,68)	321	2	1457	30.2	24.1 C	7
68	20 (68,20)	483	3	1459	24.0	20.2 C	14 Weave LOS C
20	50 (20,50)	462	1	1012	26.4	38.3 E	12
50	35 (50,35)	318	1	1012	16.6	61.0 F	13 Weave LOS F
35	19 (35,19)	429	3	1014	7.7	43.7 E	38
19	25 (19,25)	520	2	1508	13.4	56.1 F	27
Entire Path		6140			20.6	41.7 E	250 4:10
<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
1	56 (1,56)	3011	2	890	24.9	17.9 B	83
56	8 (56,8)	511	1	889	25.3	35.2 E	13
8	17 (8,17)	870	4	888	10.7	20.7 C	55
17	68 (17,68)	321	2	1457	30.2	24.1 C	7
68	20 (68,20)	483	3	1459	24.0	20.2 C	14 Weave LOS C
20	50 (20,50)	462	1	1012	26.4	38.3 E	12
50	35 (50,35)	318	1	1012	16.6	61.0 F	13
35	19 (35,19)	429	3	1014	7.7	43.7 E	38
19	25 (19,25)	520	2	1508	13.4	56.1 F	27
Entire Path		6405			21.7	30.0 D	235 3:55
<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	520	2	1288	3.4	191.1 F	105
19	18 (19,18)	493	2	1250	24.9	25.1 C	13
18	22 (18,22)	822	2	1264	16.7	37.9 E	34
22	24 (22,24)	353	1	1153	15.8	72.8 F	14
24	20 (24,20)	1005	1	1144	25.5	44.9 E	27
20	68 (20,68)	483	3	2453	32.8	24.9 C	10 Weave LOS C
68	17 (68,17)	321	3	2456	9.5	86.6 F	23
17	9 (17,9)	1364	2	1809	17.1	52.9 F	54 Weave LOS F
9	63 (9,63)	1073	2	859	22.2	19.4 C	32
63	58 (63,58)	414	1	859	24.2	35.5 E	12 Weave LOS D
Entire Path		6848			19.7	52.7 F	325 5:25

2015 No Build PM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	520	2	1288	3.4	191.1 F	105
19	18 (19,18)	493	2	1250	24.9	25.1 C	13
18	22 (18,22)	822	2	1264	16.7	37.9 E	34
22	24 (22,24)	353	1	1153	15.8	72.8 F	14
24	20 (24,20)	1005	1	1144	25.5	44.9 E	27
20	68 (20,68)	483	3	2453	32.8	24.9 C	10
68	17 (68,17)	321	3	2456	9.5	86.6 F	23
17	12 (17,12)	812	2	1437	24.3	29.5 D	21
12	61 (12,61)	481	1	1435	24.9	57.6 F	13
Entire Path		5290			20.7	57.7 F	261 4:21

Weave LOS C

<i>Route 37 WB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
53	52 (53,52)	2214	2	1748	52.2	16.7 B	29
52	51 (52,51)	1408	2	1747	50.1	17.4 B	19
51	2 (51,2)	359	2	1745	49.4	17.7 B	5
2	57 (2,57)	952	2	1748	48.4	18.1 C	13
57	23 (57,23)	511	3	1746	29.8	19.6 C	12
23	24 (23,24)	1119	1	439	28.7	15.3 B	27
24	22 (24,22)	353	2	439	12.2	18.0 C	20
22	18 (22,18)	822	2	1086	27.1	20.0 C	21
18	19 (18,19)	493	2	1081	15.8	34.1 D	21
19	25 (19,25)	520	2	1508	13.4	56.1 F	27
Entire Path		8751			38.7	20.7 C	193 3:13

<i>US 11 to Route 37 EB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	520	2	1288	3.4	191.1 F	105
19	35 (19,35)	429	1	599	25.1	23.9 C	11
35	23 (35,23)	821	1	605	26.1	23.1 C	21
23	57 (23,57)	511	3	1053	42.8	8.2 A	8
57	2 (57,2)	952	2	1050	50.9	10.3 A	13
2	51 (2,51)	359	2	1049	51.0	10.3 A	5
51	52 (51,52)	1408	2	1046	51.6	10.1 A	19
52	53 (52,53)	2214	2	1051	51.7	10.2 A	29
Entire Path		7214			42.9	25.4 C	211 3:31

Route 37 Access Management Study

CORSIM Processing

2015 Alternative 2 AM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	895	42.6	7.0 A	2
63	90 (63,90)	302	3	895	56.3	5.3 A	4
90	9 (90,9)	509	2	400	54.1	3.7 A	6
9	66 (9,66)	315	2	400	53.3	3.8 A	4
66	69 (66,69)	1178	2	401	53.4	3.8 A	15
69	86 (69,86)	240	2	401	52.2	3.8 A	3
86	85 (86,85)	814	2	402	53.7	3.7 A	10
85	14 (85,14)	536	2	402	53.3	3.8 A	7
14	12 (14,12)	1008	2	402	53.3	3.8 A	13
12	8 (12,8)	591	2	403	53.2	3.8 A	8
8	17 (8,17)	909	2	402	53.4	3.8 A	12
17	20 (17,20)	244	2	402	53.2	3.8 A	3
20	23 (20,23)	1067	2	402	53.6	3.7 A	14
23	57 (23,57)	302	2	402	52.4	3.8 A	4
57	2 (57,2)	1161	2	401	53.6	3.7 A	15
2	71 (2,71)	1697	2	401	53.3	3.8 A	22
71	93 (71,93)	975	3	494	53.0	3.1 A	13
93	24 (93,24)	192	3	494	53.9	3.1 A	2
Entire Path		12165			53.3	3.8 A	156 2:36

Route 37 Eastbound

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	1330	64.1	6.9 A	2
93	71 (93,71)	975	3	1330	53.5	8.3 A	12
71	2 (71,2)	1697	2	548	52.9	5.2 A	22
2	57 (2,57)	1161	2	549	53.2	5.2 A	15
57	23 (57,23)	302	2	548	51.8	5.3 A	4
23	20 (23,20)	1067	2	548	53.1	5.2 A	14
20	17 (20,17)	244	2	548	52.5	5.2 A	3
17	8 (17,8)	909	2	549	52.5	5.2 A	12
8	12 (8,12)	591	2	549	52.1	5.3 A	8
12	14 (12,14)	1008	2	548	52.6	5.2 A	13
14	85 (14,85)	536	2	549	52.6	5.2 A	7
85	86 (85,86)	814	2	548	53.3	5.1 A	10
86	69 (86,69)	240	2	548	51.6	5.3 A	3
69	66 (69,66)	1178	2	547	52.6	5.2 A	15
66	9 (66,9)	315	2	547	52.5	5.2 A	4
9	90 (9,90)	509	2	546	52.3	5.2 A	7
90	63 (90,63)	302	3	769	50.2	5.1 A	4
63	84 (63,84)	125	3	769	49.8	5.1 A	2
Entire Path		12165			52.9	5.5 A	157 2:37

2015 Alternative 2 AM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	930	44.1	10.6 A	15
10	11 (10,11)	945	1	805	39.5	20.4 C	16
11	13 (11,13)	697	2	874	37.7	11.6 B	13 Weave LOS A
13	115 (13,115)	1062	1	807	25.7	31.4 D	28
115	114 (115,114)	481	3	1035	36.8	9.4 A	9 Weave LOS A
114	118 (114,118)	629	2	1005	41.0	12.3 B	10
118	112 (118,112)	292	3	1286	38.7	11.1 B	5
112	110 (112,110)	375	3	1285	36.9	11.6 B	7 Weave LOS A
110	87 (110,87)	170	2	1286	32.2	20.0 C	4
87	82 (87,82)	295	2	1286	28.3	22.7 C	7
82	19 (82,19)	449	3	1282	9.0	47.3 F	34
19	25 (19,25)	540	2	1290	20.4	31.7 D	18
Entire Path		6905			33.5	20.2 C	166 2:46

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	2	465	47.4	4.9 A	13
61	3 (61,3)	415	1	279	32.1	8.7 A	9
3	118 (3,118)	942	1	280	27.7	10.1 A	23
118	112 (118,112)	292	3	1286	38.7	11.1 B	5
112	110 (112,110)	375	3	1285	36.9	11.6 B	7 Weave LOS A
110	87 (110,87)	170	2	1286	32.2	20.0 C	4
87	82 (87,82)	295	2	1286	28.3	22.7 C	7
82	19 (82,19)	449	3	1282	9.0	47.3 F	34
19	25 (19,25)	540	2	1290	20.4	31.7 D	18
Entire Path		4396			31.1	16.8 B	120 2:00

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	814	19.7	20.6 C	19
19	22 (19,22)	1299	2	1245	23.6	26.4 D	37
22	78 (22,78)	389	1	329	24.3	13.6 B	10
78	79 (78,79)	414	1	329	27.4	12.0 B	10
79	98 (79,98)	409	1	329	27.7	11.9 B	10
98	96 (98,96)	660	3	662	40.7	5.4 A	11 Weave LOS A
96	91 (96,91)	630	1	122	42.1	2.9 A	10
91	94 (91,94)	533	2	308	39.3	3.9 A	9 Weave LOS A
94	11 (94,11)	1223	1	68	30.1	2.3 A	28
11	13 (11,13)	697	2	874	37.7	11.6 B	13 Weave LOS A
13	58 (13,58)	907	1	68	42.3	1.6 A	15
58	4 (58,4)	346	2	412	35.2	5.9 A	7
4	72 (4,72)	611	1	412	39.6	10.4 A	11
Entire Path		8658			33.0	10.2 A	189 3:09

2015 Alternative 2 AM

Paths							
US 11 to I-81 SB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	814	19.7	20.6 C	19
19	22 (19,22)	1299	2	1245	23.6	26.4 D	37
22	78 (22,78)	389	1	329	24.3	13.6 B	10
78	79 (78,79)	414	1	329	27.4	12.0 B	10
79	98 (79,98)	409	1	329	27.7	11.9 B	10
98	96 (98,96)	660	3	662	40.7	5.4 A	11 Weave LOS A
96	75 (96,75)	379	2	539	32.5	8.3 A	8
75	51 (75,51)	543	2	540	28.4	9.5 A	13
51	62 (51,62)	397	2	539	28.6	9.4 A	9
62	6 (62,6)	418	3	569	36.6	5.2 A	8
6	52 (6,52)	796	2	568	43.1	6.6 A	13
Entire Path		6244			30.3	13.4 B	148 2:28
Route 37 WB to US 11							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	1330	64.1	6.9 A	2
93	71 (93,71)	975	3	1330	53.5	8.3 A	12
71	95 (71,95)	335	2	782	46.6	8.4 A	5
95	107 (95,107)	257	2	782	41.7	9.4 A	4
107	104 (107,104)	1179	2	682	42.6	8.0 A	19
104	16 (104,16)	539	3	722	42.8	5.6 A	9
16	99 (16,99)	1218	2	720	42.3	8.5 A	20 Weave LOS A
99	81 (99,81)	273	1	386	32.8	11.7 B	6
81	80 (81,80)	152	1	386	27.4	14.1 B	4
80	78 (80,78)	300	1	387	27.6	14.0 B	7
78	22 (78,22)	389	2	386	10.6	18.1 C	25
22	19 (22,19)	1299	2	818	20.9	19.6 C	42
19	25 (19,25)	540	2	1290	20.4	31.7 D	18
Entire Path		7648			36.5	12.6 B	173 2:53
US 11 to Route 37 EB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	814	19.7	20.6 C	19
19	82 (19,82)	449	1	342	24.4	14.0 B	12
82	111 (82,111)	460	1	340	27.2	12.5 B	12
111	101 (111,101)	828	2	339	40.0	4.2 A	14
101	105 (101,105)	829	2	339	41.7	4.1 A	14 Weave LOS A
105	108 (105,108)	1131	1	42	43.2	1.0 A	18
108	70 (108,70)	260	2	93	37.6	1.2 A	5
70	71 (70,71)	321	1	93	43.2	2.2 A	5
71	93 (71,93)	975	3	494	53.0	3.1 A	13
93	24 (93,24)	192	3	494	53.9	3.1 A	2
Entire Path		5985			39.5	6.0 A	112 1:52

Route 37 Access Management Study

CORSIM Processing

2015 Alternative 2 PM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	1336	42.6	10.5 A	2
63	90 (63,90)	302	3	1336	54.6	8.2 A	4
90	9 (90,9)	509	2	344	53.7	3.2 A	6
9	66 (9,66)	315	2	344	53.0	3.2 A	4
66	69 (66,69)	1178	2	345	53.3	3.2 A	15
69	86 (69,86)	240	2	344	52.1	3.3 A	3
86	85 (86,85)	814	2	345	53.9	3.2 A	10
85	14 (85,14)	536	2	345	53.2	3.2 A	7
14	12 (14,12)	1008	2	346	53.2	3.3 A	13
12	8 (12,8)	591	2	346	53.1	3.3 A	8
8	17 (8,17)	909	2	346	53.3	3.2 A	12
17	20 (17,20)	244	2	346	52.9	3.3 A	3
20	23 (20,23)	1067	2	346	53.7	3.2 A	14
23	57 (23,57)	302	2	347	52.3	3.3 A	4
57	2 (57,2)	1161	2	347	53.6	3.2 A	15
2	71 (2,71)	1697	2	347	53.2	3.3 A	22
71	93 (71,93)	975	3	996	50.5	6.6 A	13
93	24 (93,24)	192	3	996	53.7	6.2 A	2
Entire Path		12165			53.0	3.8 A	156 2:36

Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	1917	62.4	10.2 A	2
93	71 (93,71)	975	3	1918	53.6	11.9 B	12
71	2 (71,2)	1697	2	833	52.6	7.9 A	22
2	57 (2,57)	1161	2	832	52.6	7.9 A	15
57	23 (57,23)	302	2	832	51.1	8.1 A	4
23	20 (23,20)	1067	2	832	52.2	8.0 A	14
20	17 (20,17)	244	2	832	51.7	8.0 A	3
17	8 (17,8)	909	2	833	51.7	8.1 A	12
8	12 (8,12)	591	2	832	51.2	8.1 A	8
12	14 (12,14)	1008	2	832	51.6	8.1 A	13
14	85 (14,85)	536	2	832	51.5	8.1 A	7
85	86 (85,86)	814	2	833	52.1	8.0 A	11
86	69 (86,69)	240	2	832	50.7	8.2 A	3
69	66 (69,66)	1178	2	832	51.4	8.1 A	16
66	9 (66,9)	315	2	832	51.5	8.1 A	4
9	90 (9,90)	509	2	833	51.3	8.1 A	7
90	63 (90,63)	302	3	1123	49.4	7.6 A	4
63	84 (63,84)	125	3	1123	48.6	7.7 A	2
Entire Path		12165			52.1	8.4 A	159 2:39

2015 Alternative 2 PM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1015	44.2	11.5 B	15
10	11 (10,11)	945	1	802	39.5	20.3 C	16
11	13 (11,13)	697	2	971	37.6	12.9 B	13 Weave LOS B
13	115 (13,115)	1062	1	804	25.7	31.2 D	28
115	114 (115,114)	481	3	1398	36.6	12.7 B	9 Weave LOS B
114	118 (114,118)	629	2	1285	31.9	20.1 C	22
118	112 (118,112)	292	3	1467	14.3	34.3 D	26
112	110 (112,110)	375	3	1434	5.8	82.7 F	68 Weave LOS F
110	87 (110,87)	170	2	1081	3.2	168.8 F	40
87	82 (87,82)	295	2	1064	2.7	196.8 F	78
82	19 (82,19)	449	3	1055	1.5	229.9 F	202
19	25 (19,25)	540	2	1320	18.9	34.9 D	20
Entire Path		6905			27.5	49.4 F	537 8:57

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	2	776	45.0	8.6 A	14
61	3 (61,3)	415	1	203	32.4	6.3 A	9
3	118 (3,118)	942	1	203	27.8	7.3 A	23
118	112 (118,112)	292	3	1467	14.3	34.3 D	26
112	110 (112,110)	375	3	1434	5.8	82.7 F	68 Weave LOS F
110	87 (110,87)	170	2	1081	3.2	168.8 F	40
87	82 (87,82)	295	2	1064	2.7	196.8 F	78
82	19 (82,19)	449	3	1055	1.5	229.9 F	202
19	25 (19,25)	540	2	1320	18.9	34.9 D	20
Entire Path		4396			22.6	60.8 F	480 8:00

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1564	18.7	41.7 E	20
19	22 (19,22)	1299	2	1807	23.5	38.5 E	38
22	78 (22,78)	389	1	598	24.1	24.9 C	10
78	79 (78,79)	414	1	598	26.3	22.8 C	11
79	98 (79,98)	409	1	600	26.6	22.6 C	10
98	96 (98,96)	660	3	1390	39.5	11.7 B	11 Weave LOS A
96	91 (96,91)	630	1	308	40.8	7.6 A	11
91	94 (91,94)	533	2	879	36.1	12.2 B	10 Weave LOS A
94	11 (94,11)	1223	1	168	29.1	5.8 A	29
11	13 (11,13)	697	2	971	37.6	12.9 B	13 Weave LOS B
13	58 (13,58)	907	1	169	40.7	4.1 A	15
58	4 (58,4)	346	2	424	35.6	5.9 A	7
4	72 (4,72)	611	1	423	39.7	10.7 A	10
Entire Path		8658			32.1	17.1 B	194 3:14

2015 Alternative 2 PM

Paths							
US 11 to I-81 SB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1564	18.7	41.7 E	20
19	22 (19,22)	1299	2	1807	23.5	38.5 E	38
22	78 (22,78)	389	1	598	24.1	24.9 C	10
78	79 (78,79)	414	1	598	26.3	22.8 C	11
79	98 (79,98)	409	1	600	26.6	22.6 C	10
98	96 (98,96)	660	3	1390	39.5	11.7 B	11 Weave LOS A
96	75 (96,75)	379	2	1082	30.5	17.7 B	8
75	51 (75,51)	543	2	1080	27.5	19.7 C	13
51	62 (51,62)	397	2	1081	27.6	19.6 C	10
62	6 (62,6)	418	3	1174	34.4	11.4 B	8
6	52 (6,52)	796	2	1174	41.7	14.1 B	13
Entire Path		6244			29.3	24.0 C	153 2:33
Route 37 WB to US 11							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	1917	62.4	10.2 A	2
93	71 (93,71)	975	3	1918	53.6	11.9 B	12
71	95 (71,95)	335	2	1085	46.0	11.8 B	5
95	107 (95,107)	257	2	1084	39.2	13.8 B	4
107	104 (107,104)	1179	2	935	42.2	11.1 B	19
104	16 (104,16)	539	3	1007	42.2	7.9 A	9
16	99 (16,99)	1218	2	1006	41.0	12.3 B	20 Weave LOS A
99	81 (99,81)	273	1	216	34.8	6.2 A	5
81	80 (81,80)	152	1	217	28.3	7.7 A	4
80	78 (80,78)	300	1	217	28.4	7.6 A	7
78	22 (78,22)	389	2	217	10.1	10.8 A	26
22	19 (22,19)	1299	2	1099	20.1	27.4 D	44
19	25 (19,25)	540	2	1320	18.9	34.9 D	20
Entire Path		7648			35.9	15.3 B	178 2:58
US 11 to Route 37 EB							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1564	18.7	41.7 E	20
19	82 (19,82)	449	1	550	24.7	22.3 C	12
82	111 (82,111)	460	1	549	26.8	20.5 C	12
111	101 (111,101)	828	2	886	40.5	10.9 A	14
101	105 (101,105)	829	2	887	40.8	10.9 A	14 Weave LOS A
105	108 (105,108)	1131	1	607	40.0	15.2 B	19
108	70 (108,70)	260	2	653	38.9	8.4 A	5
70	71 (70,71)	321	1	652	39.8	16.4 B	5
71	93 (71,93)	975	3	996	50.5	6.6 A	13
93	24 (93,24)	192	3	996	53.7	6.2 A	2
Entire Path		5985			38.2	15.4 B	116 1:56

Route 37 Access Management Study

CORSIM Processing

2015 Alternative 2 Refined AM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	403	42.6	3.1 A	2.0
63	90 (63,90)	302	3	197	56.3	1.2 A	3.7
90	9 (90,9)	509	2	775	54.1	7.2 A	6.4
9	66 (9,66)	315	2	546	53.3	5.1 A	4.0
66	69 (66,69)	1178	2	366	53.4	3.4 A	15.0
69	86 (69,86)	240	2	223	52.2	2.1 A	3.1
86	85 (86,85)	814	2	1102	53.8	10.2 A	10.3
85	14 (85,14)	536	2	548	53.3	5.1 A	6.9
14	12 (14,12)	1008	2	549	53.4	5.1 A	12.9
12	8 (12,8)	591	2	548	53.2	5.2 A	7.6
8	17 (8,17)	909	2	400	53.4	3.8 A	11.6
17	20 (17,20)	244	2	376	53.1	3.5 A	3.1
20	23 (20,23)	1067	2	985	53.6	9.2 A	13.6
23	57 (23,57)	302	2	1330	52.5	12.7 B	3.9
57	2 (57,2)	1161	2	548	53.6	5.1 A	14.8
2	71 (2,71)	1697	2	403	53.3	3.8 A	21.7
71	93 (71,93)	975	3	782	52.3	5.0 A	12.7
93	24 (93,24)	192	3	1330	53.9	8.2 A	2.4
Entire Path		12165			53.3	5.5 A	156 2:36
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	814	64.1	4.2 A	2.0
93	71 (93,71)	975	3	89	53.4	0.6 A	12.4
71	2 (71,2)	1697	2	624	52.9	5.9 A	21.9
2	57 (2,57)	1161	2	401	53.2	3.8 A	14.9
57	23 (57,23)	302	2	432	51.8	4.2 A	4.0
23	20 (23,20)	1067	2	402	53.2	3.8 A	13.7
20	17 (20,17)	244	2	402	52.5	3.8 A	3.2
17	8 (17,8)	909	2	402	52.6	3.8 A	11.8
8	12 (8,12)	591	2	402	52.2	3.9 A	7.7
12	14 (12,14)	1008	2	89	52.6	0.8 A	13.1
14	85 (14,85)	536	2	166	52.6	1.6 A	6.9
85	86 (85,86)	814	2	548	53.3	5.1 A	10.4
86	69 (86,69)	240	2	402	51.6	3.9 A	3.2
69	66 (69,66)	1178	2	401	52.6	3.8 A	15.3
66	9 (66,9)	315	2	401	52.4	3.8 A	4.1
9	90 (9,90)	509	2	804	52.3	7.7 A	6.6
90	63 (90,63)	302	3	495	50.2	3.3 A	4.1
63	84 (63,84)	125	3	895	49.9	6.0 A	1.7
Entire Path		12165			52.9	3.8 A	157 2:37

2015 Alternative 2 Refined AM

Paths

I-81 NB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
52	10 (52,10)	970	2	705	44.1	8.0	A	15.0	
10	11 (10,11)	945	1	124	39.5	3.1	A	16.3	
11	13 (11,13)	697	2	403	37.7	5.3	A	12.6	Weave LOS A
13	115 (13,115)	1062	1	402	25.7	15.6	B	28.2	
115	114 (115,114)	481	3	571	36.8	5.2	A	8.9	Weave LOS A
114	118 (114,118)	629	2	1035	41.0	12.6	B	10.5	
118	112 (118,112)	292	3	569	39.0	4.9	A	5.1	Weave LOS A
112	110 (112,110)	375	3	31	37.0	0.3	A	6.9	
110	87 (110,87)	170	2	140	32.8	2.1	A	3.5	
87	82 (87,82)	295	2	37	28.6	0.6	A	7.0	
82	19 (82,19)	449	3	345	10.3	11.1	B	29.7	
19	25 (19,25)	540	2	347	20.2	8.6	A	18.4	
Entire Path		6905			33.6	7.7	A	162	2:42

I-81 SB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
72	61 (72,61)	918	2	124	46.5	1.3	A	13.5	
61	3 (61,3)	415	1	187	31.0	6.0	A	9.1	
3	15 (3,15)	474	1	433	27.4	15.8	B	10.9	
15	21 (15,21)	824	1	238	27.7	8.6	A	20.9	Weave LOS B
21	19 (21,19)	262	2	1251	11.6	53.7	F	15.1	
19	25 (19,25)	540	2	347	20.2	8.6	A	18.4	

Entire Path **3433** **30.7** **10.8 A** **88 1:28**

US 11 to I-81 NB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
25	19 (25,19)	540	2	173	19.9	4.4	A	18.5	
19	21 (19,21)	264	2	1267	23.8	26.6	D	7.0	
21	22 (21,22)	1035	2	814	23.6	17.2	B	30.1	
22	78 (22,78)	389	1	548	24.3	22.5	C	10.0	
78	79 (78,79)	414	1	498	27.3	18.3	C	10.4	
79	98 (79,98)	409	1	387	27.3	14.2	B	10.2	
98	96 (98,96)	660	3	386	40.2	3.2	A	11.2	Weave LOS A
96	91 (96,91)	630	1	0	41.6	0.0	A	10.3	
91	94 (91,94)	533	2	229	39.3	2.9	A	9.2	Weave LOS A
94	11 (94,11)	1223	1	254	29.8	8.5	A	28.0	
11	13 (11,13)	697	2	403	37.7	5.3	A	12.6	Weave LOS A
13	58 (13,58)	907	1	807	41.9	19.2	C	14.8	
58	4 (58,4)	346	2	829	35.5	11.7	B	6.6	
4	72 (4,72)	611	1	30	39.7	0.8	A	10.5	
Entire Path		8658			32.9	10.3	A	189	3:09

2015 Alternative 2 Refined AM

Paths

US 11 to I-81 SB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
25	19 (25,19)	540	2	173	19.9	4.4	A	18.5	
19	21 (19,21)	264	2	1267	23.8	26.6	D	7.0	
21	22 (21,22)	1035	2	814	23.6	17.2	B	30.1	
22	78 (22,78)	389	1	548	24.3	22.5	C	10.0	
78	79 (78,79)	414	1	498	27.3	18.3	C	10.4	
79	98 (79,98)	409	1	387	27.3	14.2	B	10.2	
98	96 (98,96)	660	3	386	40.2	3.2	A	11.2	Weave LOS A
96	75 (96,75)	379	2	156	32.1	2.4	A	8.1	
75	51 (75,51)	543	2	273	28.3	4.8	A	13.1	
51	62 (51,62)	397	2	930	28.4	16.4	B	9.5	
62	6 (62,6)	418	3	775	36.2	7.1	A	7.9	
6	52 (6,52)	796	2	218	42.9	2.5	A	12.6	
Entire Path		6244			30.1	10.6	A	149	2:29

Route 37 WB to US 11

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
24	93 (24,93)	192	3	814	64.1	4.2	A	2.0	
93	71 (93,71)	975	3	89	53.4	0.6	A	12.4	
71	95 (71,95)	335	2	432	46.6	4.6	A	4.9	
95	107 (95,107)	257	2	676	41.6	8.1	A	4.2	
107	104 (107,104)	1179	2	223	42.5	2.6	A	18.9	
104	16 (104,16)	539	3	314	42.8	2.4	A	8.6	Weave LOS A
16	99 (16,99)	1218	2	549	42.3	6.5	A	19.6	
99	81 (99,81)	273	1	334	32.8	10.2	A	5.7	
81	80 (81,80)	152	1	1101	27.4	40.1	E	3.8	
80	78 (80,78)	300	1	387	27.6	14.0	B	7.4	
78	22 (78,22)	389	2	497	11.2	22.2	C	23.7	
22	21 (22,21)	1035	2	1159	27.3	21.2	C	26.0	
21	19 (21,19)	262	2	1251	11.6	53.7	F	15.1	
19	25 (19,25)	540	2	347	20.2	8.6	A	18.4	
Entire Path		7646			37.1	10.4	A	171	2:51

US 11 to Route 37 EB

Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln)	LOS	Avg Travel Time (sec)	
25	19 (25,19)	540	2	173	19.9	4.4	A	18.5	
19	82 (19,82)	449	1	548	24.6	22.3	C	11.8	
82	111 (82,111)	460	1	341	27.3	12.5	B	11.5	
111	101 (111,101)	828	2	1242	41.0	15.2	B	13.8	Weave LOS A
101	105 (101,105)	829	2	369	42.3	4.4	A	13.4	
105	108 (105,108)	1131	1	100	42.2	2.4	A	18.3	
108	70 (108,70)	260	2	1103	39.9	13.8	B	4.4	
70	71 (70,71)	321	1	548	42.5	12.9	B	5.1	
71	93 (71,93)	975	3	782	52.3	5.0	A	12.7	
93	24 (93,24)	192	3	1330	53.9	8.2	A	2.4	
Entire Path		5985			39.5	8.5	A	112	1:52

Route 37 Access Management Study

CORSIM Processing

2015 Alternative 2 Refined PM

Paths							
Route 37 Westbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
84	63 (84,63)	125	3	1336	42.6	10.5 A	2.0
63	90 (63,90)	302	3	1336	54.6	8.2 A	3.8
90	9 (90,9)	509	2	344	53.7	3.2 A	6.5
9	66 (9,66)	315	2	344	53.0	3.2 A	4.1
66	69 (66,69)	1178	2	345	53.3	3.2 A	15.1
69	86 (69,86)	240	2	344	52.1	3.3 A	3.1
86	85 (86,85)	814	2	345	53.9	3.2 A	10.3
85	14 (85,14)	536	2	345	53.3	3.2 A	6.9
14	12 (14,12)	1008	2	346	53.2	3.3 A	12.9
12	8 (12,8)	591	2	346	53.1	3.3 A	7.6
8	17 (8,17)	909	2	346	53.3	3.2 A	11.6
17	20 (17,20)	244	2	346	52.9	3.3 A	3.1
20	23 (20,23)	1067	2	347	53.7	3.2 A	13.6
23	57 (23,57)	302	2	347	52.3	3.3 A	3.9
57	2 (57,2)	1161	2	347	53.5	3.2 A	14.8
2	71 (2,71)	1697	2	347	53.2	3.3 A	21.7
71	93 (71,93)	975	3	1086	50.3	7.2 A	13.3
93	24 (93,24)	192	3	1086	53.6	6.7 A	2.3
Entire Path		12165			53.0	3.8 A	157 2:37
Route 37 Eastbound							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	1917	62.4	10.2 A	2.0
93	71 (93,71)	975	3	1918	53.6	11.9 B	12.4
71	2 (71,2)	1697	2	833	52.6	7.9 A	22.0
2	57 (2,57)	1161	2	832	52.5	7.9 A	15.1
57	23 (57,23)	302	2	832	51.0	8.2 A	4.0
23	20 (23,20)	1067	2	832	52.2	8.0 A	14.0
20	17 (20,17)	244	2	831	51.6	8.1 A	3.2
17	8 (17,8)	909	2	833	51.6	8.1 A	12.0
8	12 (8,12)	591	2	832	51.2	8.1 A	7.9
12	14 (12,14)	1008	2	832	51.6	8.1 A	13.3
14	85 (14,85)	536	2	832	51.6	8.1 A	7.1
85	86 (85,86)	814	2	832	52.1	8.0 A	10.6
86	69 (86,69)	240	2	832	50.7	8.2 A	3.2
69	66 (69,66)	1178	2	833	51.5	8.1 A	15.6
66	9 (66,9)	315	2	833	51.6	8.1 A	4.2
9	90 (9,90)	509	2	832	51.3	8.1 A	6.8
90	63 (90,63)	302	3	1130	49.5	7.6 A	4.2
63	84 (63,84)	125	3	1130	48.7	7.7 A	1.8
Entire Path		12165			52.1	8.4 A	159 2:39

2015 Alternative 2 Refined PM

Paths							
<i>I-81 NB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
52	10 (52,10)	970	2	1015	44.2	11.5 B	15.0
10	11 (10,11)	945	1	802	39.4	20.3 C	16.3
11	13 (11,13)	697	2	989	37.6	13.2 B	12.7 Weave LOS B
13	115 (13,115)	1062	1	804	25.7	31.2 D	28.1
115	114 (115,114)	481	3	1399	37.3	12.5 B	8.8 Weave LOS B
114	118 (114,118)	629	2	1303	40.4	16.1 B	10.6
118	112 (118,112)	292	3	1471	38.7	12.7 B	5.2
112	110 (112,110)	375	3	1471	35.7	13.7 B	7.1 Weave LOS B
110	87 (110,87)	170	2	1043	32.7	16.0 B	3.6
87	82 (87,82)	295	2	1044	28.8	18.1 C	7.0
82	19 (82,19)	449	3	1044	5.6	62.7 F	55.2
19	25 (19,25)	540	2	1455	17.9	40.6 E	20.7
Entire Path		6905			33.0	22.6 C	190 3:10

<i>I-81 SB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
72	61 (72,61)	918	2	890	44.8	9.9 A	14.0
61	3 (61,3)	415	1	306	31.6	9.7 A	8.9
3	15 (3,15)	474	1	306	27.6	11.1 B	11.4
15	21 (15,21)	824	1	137	27.8	4.9 A	20.6
21	19 (21,19)	262	2	1277	12.2	52.3 F	14.2 Weave LOS B
19	25 (19,25)	540	2	1455	17.9	40.6 E	20.7
Entire Path		3433			30.0	16.9 B	90 1:30

<i>US 11 to I-81 NB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1565	19.2	40.7 E	19.1
19	21 (19,21)	264	2	1857	24.6	37.7 E	6.8
21	22 (21,22)	1035	2	1855	23.2	39.9 E	30.6
22	78 (22,78)	389	1	746	24.3	30.7 D	10.0
78	79 (78,79)	414	1	748	26.4	28.3 D	10.7
79	98 (79,98)	409	1	750	26.5	28.3 D	10.5
98	96 (98,96)	660	3	1537	39.2	13.1 B	11.5 Weave LOS B
96	91 (96,91)	630	1	341	40.6	8.4 A	10.6
91	94 (91,94)	533	2	924	35.9	12.9 B	10.1 Weave LOS B
94	11 (94,11)	1223	1	186	29.1	6.4 A	28.7
11	13 (11,13)	697	2	989	37.6	13.2 B	12.7 Weave LOS B
13	58 (13,58)	907	1	186	40.8	4.6 A	15.2
58	4 (58,4)	346	2	440	35.8	6.2 A	6.6
4	72 (4,72)	611	1	441	39.8	11.1 B	10.5
Entire Path		8658			32.1	18.4 C	194 3:14

2015 Alternative 2 Refined PM

Paths							
<i>US 11 to I-81 SB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1565	19.2	40.7 E	19.1
19	21 (19,21)	264	2	1857	24.6	37.7 E	6.8
21	22 (21,22)	1035	2	1855	23.2	39.9 E	30.6
22	78 (22,78)	389	1	746	24.3	30.7 D	10.0
78	79 (78,79)	414	1	748	26.4	28.3 D	10.7
79	98 (79,98)	409	1	750	26.5	28.3 D	10.5
98	96 (98,96)	660	3	1537	39.2	13.1 B	11.5 Weave LOS B
96	75 (96,75)	379	2	1197	30.3	19.8 C	8.5
75	51 (75,51)	543	2	1195	27.4	21.8 C	13.5
51	62 (51,62)	397	2	1193	27.5	21.7 C	9.9
62	6 (62,6)	418	3	1288	33.9	12.6 B	8.4
6	52 (6,52)	796	2	1288	41.6	15.5 B	13.0
Entire Path		6244			29.3	26.0 D	153 2:33

<i>Route 37 WB to US 11</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
24	93 (24,93)	192	3	1917	62.4	10.2 A	2.0
93	71 (93,71)	975	3	1918	53.6	11.9 B	12.4
71	95 (71,95)	335	2	1085	46.0	11.8 B	4.9
95	107 (95,107)	257	2	1084	39.4	13.8 B	4.3
107	104 (107,104)	1179	2	935	42.2	11.1 B	19.2
104	16 (104,16)	539	3	1007	42.2	7.9 A	8.8
16	99 (16,99)	1218	2	1006	41.1	12.2 B	20.1 Weave LOS A
99	81 (99,81)	273	1	216	34.9	6.2 A	5.3
81	80 (81,80)	152	1	216	28.2	7.7 A	3.7
80	78 (80,78)	300	1	217	28.4	7.6 A	7.2
78	22 (78,22)	389	2	217	10.1	10.8 A	26.4
22	21 (22,21)	1035	2	1138	27.3	20.9 C	26.1
21	19 (21,19)	262	2	1277	12.2	52.3 F	14.2
19	25 (19,25)	540	2	1455	17.9	40.6 E	20.7
Entire Path		7646			36.6	15.7 B	175 2:55

<i>US 11 to Route 37 EB</i>							
Link		Length (ft)	Lanes (#)	Avg Volume (veh/hr)	Avg Speed (mph)	Density (veh/mi/ln) LOS	Avg Travel Time (sec)
25	19 (25,19)	540	2	1565	19.2	40.7 E	19.1
19	82 (19,82)	449	1	528	24.9	21.2 C	11.5
82	111 (82,111)	460	1	528	27.0	19.5 C	11.6
111	101 (111,101)	828	2	958	40.7	11.8 B	14.4
101	105 (101,105)	829	2	960	40.6	11.8 B	13.7 Weave LOS A
105	108 (105,108)	1131	1	696	39.7	17.5 B	19.0
108	70 (108,70)	260	2	742	38.3	9.7 A	4.7
70	71 (70,71)	321	1	740	39.2	18.9 C	5.6
71	93 (71,93)	975	3	1086	50.3	7.2 A	13.3
93	24 (93,24)	192	3	1086	53.6	6.7 A	2.3
Entire Path		5985			38.1	16.2 B	115 1:55

2. Synchro Intersection Reports

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US Route 11

Synchro 7 - Report
2035 No Build AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	157	782	306	907	661	540
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Flt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.23	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	423	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	171	850	333	986	718	587
RTOR Reduction (vph)	0	240	0	0	0	423
Lane Group Flow (vph)	171	610	333	986	718	164
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	28.5	28.5	33.5	33.5	19.5	19.5
Effective Green, g (s)	28.5	28.5	33.5	33.5	19.5	19.5
Actuated g/C Ratio	0.41	0.41	0.48	0.48	0.28	0.28
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	721	645	395	1694	986	441
v/s Ratio Prot	0.10		c0.12	0.28	0.20	
v/s Ratio Perm		c0.39	c0.28			0.10
v/c Ratio	0.24	0.95	0.84	0.58	0.73	0.37
Uniform Delay, d1	13.6	20.0	21.3	13.2	22.9	20.3
Progression Factor	1.00	1.00	1.00	1.00	0.51	0.78
Incremental Delay, d2	0.2	22.7	15.0	1.5	2.7	1.3
Delay (s)	13.8	42.7	36.3	14.7	14.2	17.3
Level of Service	B	D	D	B	B	B
Approach Delay (s)	37.9			20.1	15.6	
Approach LOS	D			C	B	

Intersection Summary

HCM Average Control Delay	23.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US Route 11

Synchro 7 - Report
2035 No Build PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	68	519	725	1176	785	1110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Flt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.18	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	333	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	74	564	788	1278	853	1207
RTOR Reduction (vph)	0	348	0	0	0	355
Lane Group Flow (vph)	74	216	788	1278	853	852
Turn Type		Prot	pm+pt			Perm
Protected Phases	4	4	5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	12.8	12.8	49.2	49.2	27.0	27.0
Effective Green, g (s)	12.8	12.8	49.2	49.2	27.0	27.0
Actuated g/C Ratio	0.18	0.18	0.70	0.70	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	324	289	608	2487	1365	611
v/s Ratio Prot	0.04	c0.14	c0.34	0.36	0.24	
v/s Ratio Perm			c0.57			0.54
v/c Ratio	0.23	0.75	1.30	0.51	0.62	1.39
Uniform Delay, d1	24.4	27.1	16.6	4.8	17.4	21.5
Progression Factor	1.00	1.00	1.00	1.00	0.42	0.81
Incremental Delay, d2	0.4	10.1	145.1	0.8	0.2	178.4
Delay (s)	24.8	37.1	161.8	5.6	7.5	195.8
Level of Service	C	D	F	A	A	F
Approach Delay (s)	35.7			65.2	117.8	
Approach LOS	D			E	F	

Intersection Summary

HCM Average Control Delay	84.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	115.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US Route 11

Synchro 7 - Report

2035 No Build AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	1070	461	372	691	740	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	
Flt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3433	1583	1770	3539	3422	
Flt Permitted	0.95	1.00	0.15	1.00	1.00	
Satd. Flow (perm)	3433	1583	287	3539	3422	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1163	501	404	751	804	228
RTOR Reduction (vph)	0	267	0	0	37	0
Lane Group Flow (vph)	1163	234	404	751	995	0
Turn Type		Perm	pm+pt			
Protected Phases	4		5	2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	24.0	24.0	38.0	38.0	22.0	
Effective Green, g (s)	24.0	24.0	38.0	38.0	22.0	
Actuated g/C Ratio	0.34	0.34	0.54	0.54	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1177	543	410	1921	1075	
v/s Ratio Prot	c0.34		c0.17	0.21	0.29	
v/s Ratio Perm		0.15	c0.37			
v/c Ratio	0.99	0.43	0.99	0.39	0.93	
Uniform Delay, d1	22.9	17.7	23.6	9.3	23.2	
Progression Factor	1.00	1.00	0.82	0.40	1.00	
Incremental Delay, d2	23.1	0.5	37.1	0.5	12.7	
Delay (s)	46.0	18.3	56.4	4.3	35.9	
Level of Service	D	B	E	A	D	
Approach Delay (s)	37.6			22.5	35.9	
Approach LOS	D			C	D	

Intersection Summary

HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US Route 11

Synchro 7 - Report
2035 No Build PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→	←	→→	→→	←
Volume (vph)	940	395	436	808	1500	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	
Flt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3433	1583	1770	3539	3423	
Flt Permitted	0.95	1.00	0.11	1.00	1.00	
Satd. Flow (perm)	3433	1583	201	3539	3423	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1022	429	474	878	1630	457
RTOR Reduction (vph)	0	167	0	0	36	0
Lane Group Flow (vph)	1022	262	474	878	2051	0
Turn Type		Prot	pm+pt			
Protected Phases	4	4	5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	17.0	17.0	45.0	45.0	33.0	
Effective Green, g (s)	17.0	17.0	45.0	45.0	33.0	
Actuated g/C Ratio	0.24	0.24	0.64	0.64	0.47	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	834	384	309	2275	1614	
v/s Ratio Prot	c0.30	0.17	c0.18	0.25	0.60	
v/s Ratio Perm			c0.81			
v/c Ratio	1.23	0.68	1.53	0.39	1.27	
Uniform Delay, d1	26.5	24.1	33.3	5.9	18.5	
Progression Factor	1.00	1.00	0.66	1.03	1.00	
Incremental Delay, d2	112.1	5.0	254.2	0.4	122.2	
Delay (s)	138.6	29.0	276.2	6.5	140.7	
Level of Service	F	C	F	A	F	
Approach Delay (s)	106.2			101.1	140.7	
Approach LOS	F			F	F	

Intersection Summary

HCM Average Control Delay	119.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.42		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	115.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

70: Route 37 EB Ramp & Shady Elm Road

2035 Alternative 1 AM

													
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR	
Lane Configurations										 			
Volume (vph)	570	0	430	0	0	0	0	399	470	430	891	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0		4.0					4.0	4.0	4.0	4.0		
Lane Util. Factor	1.00		1.00					1.00	1.00	0.97	1.00		
Frt	1.00		0.85					1.00	0.85	1.00	1.00		
Flt Protected	0.95		1.00					1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1770		1583					1863	1583	3433	1863		
Flt Permitted	0.95		1.00					1.00	1.00	0.29	1.00		
Satd. Flow (perm)	1770		1583					1863	1583	1063	1863		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	620	0	467	0	0	0	0	434	511	467	968	0	
RTOR Reduction (vph)	0	0	64	0	0	0	0	0	307	0	0	0	
Lane Group Flow (vph)	620	0	403	0	0	0	0	434	204	467	968	0	
Turn Type	custom		custom							Perm	pm+pt		
Protected Phases							2			1		6	
Permitted Phases	4		4							2		6	
Actuated Green, G (s)	29.0		29.0							32.0	32.0	43.0	43.0
Effective Green, q (s)	29.0		29.0							32.0	32.0	43.0	43.0
Actuated g/C Ratio	0.36		0.36							0.40	0.40	0.54	0.54
Clearance Time (s)	4.0		4.0							4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0							3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	642		574							745	633	779	1001
v/s Ratio Prot										0.23	0.05		c0.52
v/s Ratio Perm	c0.35		0.25							0.13	0.27		
v/c Ratio	0.97		0.70							0.58	0.32	0.60	0.97
Uniform Delay, d1	25.0		21.8							18.8	16.5	11.8	17.8
Progression Factor	1.00		1.00							1.00	1.00	0.94	0.87
Incremental Delay, d2	26.9		3.9							3.3	1.4	0.1	3.8
Delay (s)	51.9		25.7							22.1	17.9	11.2	19.4
Level of Service	D		C							C	B	B	B
Approach Delay (s)	40.7						0.0			19.8			16.7
Approach LOS	D						A			B			B
Intersection Summary													
HCM Average Control Delay			25.1		HCM Level of Service				C				
HCM Volume to Capacity ratio			0.97										
Actuated Cycle Length (s)			80.0		Sum of lost time (s)				8.0				
Intersection Capacity Utilization			124.5%		ICU Level of Service				H				
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

70: Route 37 EB Ramp & Shady Elm Road

Synchro 7 - Report
2035 Alternative 1 PM

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	650	0	690	0	0	0	0	325	729	830	244	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00					1.00	1.00	0.91	0.91	
Flt	1.00		0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95		1.00					1.00	1.00	0.95	0.97	
Satd. Flow (prot)	1770		1583					1863	1583	1610	3287	
Flt Permitted	0.95		1.00					1.00	1.00	0.22	0.58	
Satd. Flow (perm)	1770		1583					1863	1583	368	1969	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	707	0	750	0	0	0	0	353	792	902	265	0
RTOR Reduction (vph)	0	0	326	0	0	0	0	0	552	0	0	0
Lane Group Flow (vph)	707	0	424	0	0	0	0	353	240	451	716	0
Turn Type	Prot		custom						Perm	pm+pt		
Protected Phases	4		4					2		1	6	
Permitted Phases									2	6		
Actuated Green, G (s)	37.0		37.0					23.0	23.0	45.0	45.0	
Effective Green, g (s)	37.0		37.0					23.0	23.0	45.0	45.0	
Actuated g/C Ratio	0.41		0.41					0.26	0.26	0.50	0.50	
Clearance Time (s)	4.0		4.0					4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	728		651					476	405	432	1248	
v/s Ratio Prot	c0.40		0.27					0.19		c0.21	0.11	
v/s Ratio Perm									0.15	c0.31	0.17	
v/c Ratio	0.97		0.65					0.74	0.59	1.04	1.00dl	
Uniform Delay, d1	26.0		21.3					30.8	29.4	20.8	15.8	
Progression Factor	1.00		1.00					1.00	1.00	1.35	1.26	
Incremental Delay, d2	26.2		2.3					10.0	6.3	46.9	0.4	
Delay (s)	52.2		23.6					40.8	35.7	75.1	20.4	
Level of Service	D		C					D	D	E	C	
Approach Delay (s)		37.5			0.0			37.2			41.5	
Approach LOS		D			A			D			D	

Intersection Summary

HCM Average Control Delay	38.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

63: Route 37 WB Ramp & Shady Elm Road

Synchro 7 - Report
2035 Alternative 1 AM



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	831	0	1070	319	650	0	0	490	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				1.00		0.88	0.91	0.91			1.00	1.00
Flt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770		2787	1610	3374			1863	1583
Flt Permitted				0.95		1.00	0.15	0.59			1.00	1.00
Satd. Flow (perm)				1770		2787	261	1991			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	903	0	1163	347	707	0	0	533	348
RTOR Reduction (vph)	0	0	0	0	0	123	0	0	0	0	0	252
Lane Group Flow (vph)	0	0	0	903	0	1040	274	780	0	0	533	96
Turn Type				custom		custom	pm+pt					Perm
Protected Phases							5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)				38.0		38.0	34.0	34.0			22.0	22.0
Effective Green, g (s)				38.0		38.0	34.0	34.0			22.0	22.0
Actuated g/C Ratio				0.48		0.48	0.42	0.42			0.28	0.28
Clearance Time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				841		1324	246	984			512	435
v/s Ratio Prot							c0.11	0.08			0.29	
v/s Ratio Perm				c0.51		0.37	c0.36	0.26				0.06
v/c Ratio				1.07		0.79	1.11	0.79			1.04	0.22
Uniform Delay, d1				21.0		17.6	20.1	19.9			29.0	22.4
Progression Factor				1.00		1.00	1.26	0.57			0.85	1.89
Incremental Delay, d2				52.8		3.1	77.7	2.5			49.7	1.1
Delay (s)				73.8		20.7	103.0	13.9			74.4	43.3
Level of Service				E		C	F	B			E	D
Approach Delay (s)		0.0			43.9			37.1			62.1	
Approach LOS		A			D			D			E	

Intersection Summary

HCM Average Control Delay	46.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	124.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

63: Route 37 WB Ramp & Shady Elm Road

Synchro 7 - Report
2035 Alternative 1 PM



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	284	0	940	280	695	0	0	790	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	4.0	4.0			4.0	
Lane Util. Factor				1.00		0.88	0.91	0.91			0.95	
Flt				1.00		0.85	1.00	1.00			0.96	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1770		2787	1610	3377			3383	
Flt Permitted				0.95		1.00	0.10	0.71			1.00	
Satd. Flow (perm)				1770		2787	176	2420			3383	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	309	0	1022	304	755	0	0	859	359
RTOR Reduction (vph)	0	0	0	0	0	287	0	0	0	0	51	0
Lane Group Flow (vph)	0	0	0	309	0	735	240	819	0	0	1168	0
Turn Type				Prot		custom	pm+pt					
Protected Phases				8		8	5	2			6	
Permitted Phases							2					
Actuated Green, G (s)				25.5		25.5	56.5	56.5			39.5	
Effective Green, g (s)				25.5		25.5	56.5	56.5			39.5	
Actuated g/C Ratio				0.28		0.28	0.63	0.63			0.44	
Clearance Time (s)				4.0		4.0	4.0	4.0			4.0	
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)				502		790	318	1657			1485	
v/s Ratio Prot				0.17		c0.26	c0.11	0.07			c0.35	
v/s Ratio Perm							0.37	0.24				
v/c Ratio				0.62		0.93	0.75	0.49			0.79	
Uniform Delay, d1				28.0		31.4	26.7	9.0			21.6	
Progression Factor				1.00		1.00	0.50	0.14			0.27	
Incremental Delay, d2				2.2		17.1	4.3	0.1			1.3	
Delay (s)				30.2		48.5	17.8	1.4			7.2	
Level of Service				C		D	B	A			A	
Approach Delay (s)		0.0			44.2			5.1			7.2	
Approach LOS		A			D			A			A	

Intersection Summary

HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

103: Shady Elm Road & Route 37 EB Ramp

2035 Alternative 2 AM

c Critical Lane Group

103: Shady Elm Road & Route 37 EB Ramp

2035 Alternative 2 PM

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

102: Route 37 WB Ramp & Shady Elm Road

Synchro 7 - Report
2035 Alternative 2 AM



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations				↰		↱	↰	↱			↱	↰
Volume (vph)	0	0	0	252	0	350	250	489	0	0	260	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				1.00		1.00	1.00	1.00			1.00	1.00
Flt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770		1583	1770	1863			1863	1583
Flt Permitted				0.95		1.00	0.45	1.00			1.00	1.00
Satd. Flow (perm)				1770		1583	841	1863			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	274	0	380	272	532	0	0	283	196
RTOR Reduction (vph)	0	0	0	0	0	246	0	0	0	0	0	115
Lane Group Flow (vph)	0	0	0	274	0	134	272	532	0	0	283	81
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				14.3		14.3	37.7	37.7			24.7	24.7
Effective Green, g (s)				14.3		14.3	37.7	37.7			24.7	24.7
Actuated g/C Ratio				0.24		0.24	0.63	0.63			0.41	0.41
Clearance Time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				422		377	668	1171			767	652
v/s Ratio Prot				c0.15		0.08	0.06	c0.29			0.15	
v/s Ratio Perm							0.19					0.05
v/c Ratio				0.65		0.36	0.41	0.45			0.37	0.12
Uniform Delay, d1				20.6		19.0	5.4	5.8			12.2	10.9
Progression Factor				1.00		1.00	0.42	0.45			1.00	1.00
Incremental Delay, d2				3.4		0.6	0.3	0.8			1.4	0.4
Delay (s)				24.0		19.6	2.5	3.4			13.6	11.3
Level of Service				C		B	A	A			B	B
Approach Delay (s)		0.0			21.4			3.1			12.7	
Approach LOS		A			C			A			B	

Intersection Summary

HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

102: Route 37 WB Ramp & Shady Elm Road

Synchro 7 - Report
2035 Alternative 2 PM



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations				↰		↱	↰	↱			↱	↰
Volume (vph)	0	0	0	107	0	310	206	489	0	0	335	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				1.00		1.00	1.00	1.00			1.00	1.00
Flt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770		1583	1770	1863			1863	1583
Flt Permitted				0.95		1.00	0.49	1.00			1.00	1.00
Satd. Flow (perm)				1770		1583	915	1863			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	116	0	337	224	532	0	0	364	217
RTOR Reduction (vph)	0	0	0	0	0	235	0	0	0	0	0	115
Lane Group Flow (vph)	0	0	0	116	0	102	224	532	0	0	364	102
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				9.4		9.4	32.6	32.6			23.6	23.6
Effective Green, g (s)				9.4		9.4	32.6	32.6			23.6	23.6
Actuated g/C Ratio				0.19		0.19	0.65	0.65			0.47	0.47
Clearance Time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				333		298	682	1215			879	747
v/s Ratio Prot				c0.07		0.06	0.03	c0.29			0.20	
v/s Ratio Perm							0.18					0.06
v/c Ratio				0.35		0.34	0.33	0.44			0.41	0.14
Uniform Delay, d1				17.6		17.6	5.2	4.2			8.7	7.5
Progression Factor				1.00		1.00	0.33	0.32			1.00	1.00
Incremental Delay, d2				0.6		0.7	0.2	0.9			1.4	0.4
Delay (s)				18.3		18.3	1.9	2.3			10.1	7.8
Level of Service				B		B	A	A			B	A
Approach Delay (s)		0.0			18.3			2.2			9.3	
Approach LOS		A			B			A			A	

Intersection Summary

HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	180	368	210	938	1064	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Flt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.14	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	263	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	400	228	1020	1157	500
RTOR Reduction (vph)	0	237	0	0	0	239
Lane Group Flow (vph)	196	163	228	1020	1157	261
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	12.9	12.9	49.1	49.1	36.5	36.5
Effective Green, g (s)	12.9	12.9	49.1	49.1	36.5	36.5
Actuated g/C Ratio	0.18	0.18	0.70	0.70	0.52	0.52
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	326	292	370	2482	1845	825
v/s Ratio Prot	c0.11		c0.08	0.29	0.33	
v/s Ratio Perm		0.10	c0.36			0.16
v/c Ratio	0.60	0.56	0.62	0.41	0.63	0.32
Uniform Delay, d1	26.2	26.0	7.8	4.4	11.9	9.6
Progression Factor	1.00	1.00	1.00	1.00	0.65	0.53
Incremental Delay, d2	3.1	2.3	3.0	0.5	1.0	0.6
Delay (s)	29.3	28.3	10.8	4.9	8.7	5.7
Level of Service	C	C	B	A	A	A
Approach Delay (s)	28.6			6.0	7.8	
Approach LOS	C			A	A	

Intersection Summary

HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	75	248	454	1344	1528	750
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Flt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.10	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	181	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	270	493	1461	1661	815
RTOR Reduction (vph)	0	236	0	0	0	304
Lane Group Flow (vph)	82	34	493	1461	1661	511
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.9	8.9	53.1	53.1	37.1	37.1
Effective Green, g (s)	8.9	8.9	53.1	53.1	37.1	37.1
Actuated g/C Ratio	0.13	0.13	0.76	0.76	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	225	201	410	2685	1876	839
v/s Ratio Prot	c0.05		c0.21	0.41	0.47	
v/s Ratio Perm		0.02	c0.71			0.32
v/c Ratio	0.36	0.17	1.20	0.54	0.89	0.61
Uniform Delay, d1	28.0	27.3	21.7	3.5	14.6	11.4
Progression Factor	1.00	1.00	1.00	1.00	0.74	0.47
Incremental Delay, d2	1.0	0.4	112.3	0.8	1.7	0.8
Delay (s)	29.0	27.7	134.0	4.3	12.4	6.1
Level of Service	C	C	F	A	B	A
Approach Delay (s)	28.0			37.0	10.4	
Approach LOS	C			D	B	

Intersection Summary

HCM Average Control Delay	22.5	HCM Level of Service	C
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←←	←	←	↑↑	↑↑	←
Volume (vph)	720	779	313	805	745	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Flt	0.96	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.97	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3336	1441	1770	3539	3539	1583
Flt Permitted	0.97	1.00	0.16	1.00	1.00	1.00
Satd. Flow (perm)	3336	1441	297	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	783	847	340	875	810	196
RTOR Reduction (vph)	70	287	0	0	0	137
Lane Group Flow (vph)	1043	230	340	875	810	59
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	24.7	24.7	37.3	37.3	21.1	21.1
Effective Green, g (s)	24.7	24.7	37.3	37.3	21.1	21.1
Actuated g/C Ratio	0.35	0.35	0.53	0.53	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1177	508	415	1886	1067	477
v/s Ratio Prot	c0.31		c0.14	0.25	0.23	
v/s Ratio Perm		0.16	c0.29			0.04
v/c Ratio	0.89	0.45	0.82	0.46	0.76	0.12
Uniform Delay, d1	21.3	17.4	14.3	10.1	22.1	17.7
Progression Factor	1.00	1.00	0.69	0.84	0.87	0.65
Incremental Delay, d2	8.3	0.6	11.1	0.8	4.2	0.4
Delay (s)	29.6	18.1	21.0	9.3	23.5	12.0
Level of Service	C	B	C	A	C	B
Approach Delay (s)	26.0			12.5	21.2	
Approach LOS	C			B	C	

Intersection Summary

HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←←	→	←	→→	→→	→
Volume (vph)	630	813	329	1090	1465	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Flt	0.95	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.97	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3312	1441	1770	3539	3539	1583
Flt Permitted	0.97	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	3312	1441	213	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	685	884	358	1185	1592	391
RTOR Reduction (vph)	121	168	0	0	0	218
Lane Group Flow (vph)	953	327	358	1185	1592	173
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	19.0	19.0	43.0	43.0	31.0	31.0
Effective Green, g (s)	19.0	19.0	43.0	43.0	31.0	31.0
Actuated g/C Ratio	0.27	0.27	0.61	0.61	0.44	0.44
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	899	391	309	2174	1567	701
v/s Ratio Prot	c0.29		c0.13	0.33	0.45	
v/s Ratio Perm		0.23	c0.58			0.11
v/c Ratio	1.06	0.84	1.16	0.55	1.02	0.25
Uniform Delay, d1	25.5	24.0	20.1	7.8	19.5	12.2
Progression Factor	1.00	1.00	1.14	0.62	0.98	1.55
Incremental Delay, d2	47.3	14.4	98.0	0.9	11.3	0.1
Delay (s)	72.8	38.5	121.0	5.7	30.4	19.0
Level of Service	E	D	F	A	C	B
Approach Delay (s)	61.9			32.5	28.2	
Approach LOS	E			C	C	

Intersection Summary

HCM Average Control Delay	39.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	95.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

70: Route 37 EB Ramp & Shady Elm Road

2035 Alternative 3 AM

c Critical Lane Group

70: Route 37 EB Ramp & Shady Elm Road

2035 Alternative 3 PM

[illegible]

Synchro 7 - Report
2035 Alternative 3 AM

												
Movement	NBL2	NBL	NBR	SEL	SER	NEL	NET	NER	SWL	SWT	SWR	
Lane Configurations												
Volume (vph)	243	0	350	0	0	250	439	0	0	225	180	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00		1.00			1.00	1.00			1.00	1.00	
Frt	1.00		0.85			1.00	1.00			1.00	0.85	
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00	
Satd. Flow (prot)	1770		1583			1770	1863			1863	1583	
Flt Permitted	0.95		1.00			0.56	1.00			1.00	1.00	
Satd. Flow (perm)	1770		1583			1035	1863			1863	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	264	0	380	0	0	272	477	0	0	245	196	
RTOR Reduction (vph)	0	0	276	0	0	0	0	0	0	0	112	
Lane Group Flow (vph)	264	0	104	0	0	272	477	0	0	245	84	
Turn Type	Prot	custom		pm+pt				Perm				
Protected Phases	8	8		5				2				
Permitted Phases			2				6					
Actuated Green, G (s)	17.8	17.8		54.2				54.2				
Effective Green, q (s)	17.8	17.8		54.2				54.2				
Actuated g/C Ratio	0.22	0.22		0.68				0.68				
Clearance Time (s)	4.0	4.0		4.0				4.0				
Vehicle Extension (s)	3.0	3.0		3.0				3.0				
Lane Grp Cap (vph)	394	352		848				1262				
v/s Ratio Prot	c0.15	0.07		0.06				c0.26				
v/s Ratio Perm			0.15				0.05					
v/c Ratio	0.67	0.30		0.32				0.38				
Uniform Delay, d1	28.4	25.9		6.9				5.6				
Progression Factor	1.00	1.00		0.61				0.61				
Incremental Delay, d2	4.4	0.5		0.1				0.6				
Delay (s)	32.8	26.4		4.4				4.0				
Level of Service	C	C		A				A				
Approach Delay (s)	29.0		0.0				4.1					
Approach LOS	C		A				A					
Intersection Summary												
HCM Average Control Delay	15.5			HCM Level of Service					B			
HCM Volume to Capacity ratio	0.45											
Actuated Cycle Length (s)	80.0			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	94.6%			ICU Level of Service					F			
Analysis Period (min)	15											
c Critical Lane Group												

Synchro 7 - Report
2035 Alternative 3 PM

											
Movement	NBL2	NBL	NBR	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Volume (vph)	176	0	310	0	0	206	539	0	0	255	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0			4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00			1.00	1.00			1.00	1.00
Frt	1.00		0.85			1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00			0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583			1770	1863			1863	1583
Flt Permitted	0.95		1.00			0.28	1.00			1.00	1.00
Satd. Flow (perm)	1770		1583			514	1863			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	191	0	337	0	0	224	586	0	0	277	217
RTOR Reduction (vph)	0	0	146	0	0	0	0	0	0	0	170
Lane Group Flow (vph)	191	0	191	0	0	224	586	0	0	277	47
Turn Type	custom		custom		pm+pt		Perm				
Protected Phases					7		4		8		
Permitted Phases	2		2		4				8		
Actuated Green, G (s)	38.3		38.3		33.7		33.7		17.4		
Effective Green, q (s)	38.3		38.3		33.7		33.7		17.4		
Actuated g/C Ratio	0.48		0.48		0.42		0.42		0.22		
Clearance Time (s)	4.0		4.0		4.0		4.0		4.0		
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.0		
Lane Grp Cap (vph)	847		758		410		785		405		
v/s Ratio Prot					0.08		c0.31		0.15		
v/s Ratio Perm	0.11		c0.12		0.15				0.03		
v/c Ratio	0.23		0.25		0.55		0.75		0.68		
Uniform Delay, d1	12.2		12.4		16.4		19.5		28.8		
Progression Factor	1.00		1.00		0.83		0.77		1.00		
Incremental Delay, d2	0.6		0.8		0.7		1.9		4.7		
Delay (s)	12.8		13.2		14.3		17.0		33.5		
Level of Service	B		B		B		B		C		
Approach Delay (s)	13.0		0.0		16.2		30.0				
Approach LOS	B		A		B		C				
Intersection Summary											
HCM Average Control Delay	19.0		HCM Level of Service		B						
HCM Volume to Capacity ratio	0.48										
Actuated Cycle Length (s)	80.0		Sum of lost time (s)		8.0						
Intersection Capacity Utilization	111.1%		ICU Level of Service		H						
Analysis Period (min)	15										
c Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US Route 11

Synchro 7 - Report
2035 Alternative 3 AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	120	428	280	883	1229	540
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Flt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	206	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	465	304	960	1336	587
RTOR Reduction (vph)	0	229	0	0	0	284
Lane Group Flow (vph)	130	236	304	960	1336	303
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	14.7	14.7	57.3	57.3	41.3	41.3
Effective Green, g (s)	14.7	14.7	57.3	57.3	41.3	41.3
Actuated g/C Ratio	0.18	0.18	0.72	0.72	0.52	0.52
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	325	291	382	2535	1827	817
v/s Ratio Prot	0.07		c0.12	0.27	0.38	
v/s Ratio Perm		c0.15	c0.45			0.19
v/c Ratio	0.40	0.81	0.80	0.38	0.73	0.37
Uniform Delay, d1	28.8	31.3	20.4	4.4	15.0	11.6
Progression Factor	0.76	0.63	1.00	1.00	0.49	0.19
Incremental Delay, d2	0.6	11.3	10.9	0.4	1.4	0.7
Delay (s)	22.3	30.9	31.4	4.9	8.7	2.8
Level of Service	C	C	C	A	A	A
Approach Delay (s)	29.0			11.2	6.9	
Approach LOS	C			B	A	

Intersection Summary

HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US Route 11

Synchro 7 - Report
2035 Alternative 3 PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	60	263	564	1549	1108	750
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Flt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.12	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	220	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	286	613	1684	1204	815
RTOR Reduction (vph)	0	254	0	0	0	278
Lane Group Flow (vph)	65	32	613	1684	1204	537
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.9	8.9	63.1	63.1	36.1	36.1
Effective Green, g (s)	8.9	8.9	63.1	63.1	36.1	36.1
Actuated g/C Ratio	0.11	0.11	0.79	0.79	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	197	176	619	2791	1597	714
v/s Ratio Prot	c0.04		c0.28	0.48	0.34	
v/s Ratio Perm		0.02	c0.50			0.34
v/c Ratio	0.33	0.18	0.99	0.60	0.75	0.75
Uniform Delay, d1	32.8	32.2	19.2	3.4	18.3	18.2
Progression Factor	0.92	1.06	1.00	1.00	0.51	0.21
Incremental Delay, d2	0.7	0.3	33.6	1.0	1.3	2.7
Delay (s)	30.9	34.5	52.8	4.4	10.5	6.6
Level of Service	C	C	D	A	B	A
Approach Delay (s)	33.9			17.3	8.9	
Approach LOS	C			B	A	

Intersection Summary

HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2035 Alternative 3 AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	460	659	313	950	1110	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.88	1.00	0.91	0.95	
Flt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	2787	1770	5085	3465	
Flt Permitted	0.95	1.00	0.11	1.00	1.00	
Satd. Flow (perm)	1770	2787	201	5085	3465	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	500	716	340	1033	1207	196
RTOR Reduction (vph)	0	383	0	0	16	0
Lane Group Flow (vph)	500	333	340	1033	1387	0
Turn Type		Perm	pm+pt			
Protected Phases	4		5	2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	23.0	23.0	49.0	49.0	33.0	
Effective Green, g (s)	23.0	23.0	49.0	49.0	33.0	
Actuated g/C Ratio	0.29	0.29	0.61	0.61	0.41	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	509	801	358	3115	1429	
v/s Ratio Prot	c0.28		c0.14	0.20	0.40	
v/s Ratio Perm		0.12	c0.44			
v/c Ratio	0.98	0.42	0.95	0.33	0.97	
Uniform Delay, d1	28.3	23.1	23.0	7.5	23.0	
Progression Factor	1.00	1.00	0.76	0.76	0.80	
Incremental Delay, d2	35.1	0.4	33.6	0.3	11.8	
Delay (s)	63.4	23.4	50.9	6.0	30.2	
Level of Service	E	C	D	A	C	
Approach Delay (s)	39.9			17.1	30.2	
Approach LOS	D			B	C	

Intersection Summary

HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2035 Alternative 3 PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	410	598	329	1500	1260	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.88	1.00	0.91	0.95	
Flt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	2787	1770	5085	3421	
Flt Permitted	0.95	1.00	0.10	1.00	1.00	
Satd. Flow (perm)	1770	2787	177	5085	3421	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	446	650	358	1630	1370	391
RTOR Reduction (vph)	0	351	0	0	33	0
Lane Group Flow (vph)	446	299	358	1630	1728	0
Turn Type	Perm		pm+pt			
Protected Phases	4		5	2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	19.0	19.0	53.0	53.0	38.0	
Effective Green, g (s)	19.0	19.0	53.0	53.0	38.0	
Actuated g/C Ratio	0.24	0.24	0.66	0.66	0.48	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	420	662	336	3369	1625	
v/s Ratio Prot	c0.25		c0.15	0.32	0.51	
v/s Ratio Perm		0.11	c0.56			
v/c Ratio	1.06	0.45	1.07	0.48	1.06	
Uniform Delay, d1	30.5	26.1	36.7	6.7	21.0	
Progression Factor	1.00	1.00	0.98	0.62	0.86	
Incremental Delay, d2	61.3	0.5	64.2	0.4	30.1	
Delay (s)	91.8	26.5	100.3	4.6	48.1	
Level of Service	F	C	F	A	D	
Approach Delay (s)	53.1			21.8	48.1	
Approach LOS	D			C	D	

Intersection Summary

HCM Average Control Delay	38.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

103: Shady Elm Road & Route 37 EB Ramp

2035 Alternative 2 Modified AM

[illegible]

103: Shady Elm Road & Route 37 EB Ramp

2035 Alternative 2 Modified PM

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	325	352	170	272	0	370	0	494	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0		4.0			
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00		1.00			
Frt		1.00	0.85	1.00	1.00		1.00		0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			
Satd. Flow (prot)		1863	1583	1770	1863		1770		1583			
Flt Permitted		1.00	1.00	0.47	1.00		0.95		1.00			
Satd. Flow (perm)		1863	1583	874	1863		1770		1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	353	383	185	296	0	402	0	537	0	0	0
RTOR Reduction (vph)	0	0	234	0	0	0	0	0	354	0	0	0
Lane Group Flow (vph)	0	353	149	185	296	0	402	0	183	0	0	0
Turn Type			Perm	pm+pt			Prot		custom			
Protected Phases		2		1	6		4		4			
Permitted Phases			2	6								
Actuated Green, G (s)		19.5	19.5	26.7	26.7		15.3		15.3			
Effective Green, g (s)		19.5	19.5	26.7	26.7		15.3		15.3			
Actuated g/C Ratio		0.39	0.39	0.53	0.53		0.31		0.31			
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0		4.0			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0			
Lane Grp Cap (vph)		727	617	524	995		542		484			
v/s Ratio Prot		c0.19		0.02	c0.16		c0.23		0.12			
v/s Ratio Perm			0.09	0.17								
v/c Ratio		0.49	0.24	0.35	0.30		0.74		0.38			
Uniform Delay, d1		11.5	10.3	8.7	6.5		15.6		13.6			
Progression Factor		1.00	1.00	0.33	0.33		1.00		1.00			
Incremental Delay, d2		2.3	0.9	0.4	0.7		5.4		0.5			
Delay (s)		13.8	11.2	3.3	2.8		21.0		14.1			
Level of Service		B	B	A	A		C		B			
Approach Delay (s)		12.4			3.0			17.1			0.0	
Approach LOS		B			A			B			A	
Intersection Summary												
HCM Average Control Delay			12.4			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			50.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			86.2%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

Synchro 7 - Report

2035 Alternative 2 Modified AM

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	252	0	350	250	489	0	0	260	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				1.00		1.00	1.00	1.00			1.00	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770		1583	1770	1863			1863	1583
Flt Permitted				0.95		1.00	0.45	1.00			1.00	1.00
Satd. Flow (perm)				1770		1583	841	1863			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	274	0	380	272	532	0	0	283	196
RTOR Reduction (vph)	0	0	0	0	0	246	0	0	0	0	0	115
Lane Group Flow (vph)	0	0	0	274	0	134	272	532	0	0	283	81
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				14.3		14.3	37.7	37.7			24.7	24.7
Effective Green, g (s)				14.3		14.3	37.7	37.7			24.7	24.7
Actuated g/C Ratio				0.24		0.24	0.63	0.63			0.41	0.41
Clearance Time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				422		377	668	1171			767	652
v/s Ratio Prot				c0.15		0.08	0.06	c0.29			0.15	
v/s Ratio Perm							0.19					0.05
v/c Ratio				0.65		0.36	0.41	0.45			0.37	0.12
Uniform Delay, d1				20.6		19.0	5.4	5.8			12.2	10.9
Progression Factor				1.00		1.00	0.42	0.45			1.00	1.00
Incremental Delay, d2				3.4		0.6	0.3	0.8			1.4	0.4
Delay (s)				24.0		19.6	2.5	3.4			13.6	11.3
Level of Service				C		B	A	A			B	B
Approach Delay (s)		0.0			21.4			3.1			12.7	
Approach LOS		A			C			A			B	
Intersection Summary												
HCM Average Control Delay			11.7		HCM Level of Service					B		
HCM Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			60.0		Sum of lost time (s)					8.0		
Intersection Capacity Utilization			86.3%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

Synchro 7 - Report

2035 Alternative 2 Modified PM

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	107	0	310	206	489	0	0	335	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				1.00		1.00	1.00	1.00			1.00	1.00
Frt				1.00		0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95		1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770		1583	1770	1863			1863	1583
Flt Permitted				0.95		1.00	0.49	1.00			1.00	1.00
Satd. Flow (perm)				1770		1583	915	1863			1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	116	0	337	224	532	0	0	364	217
RTOR Reduction (vph)	0	0	0	0	0	235	0	0	0	0	0	115
Lane Group Flow (vph)	0	0	0	116	0	102	224	532	0	0	364	102
Turn Type				Prot		custom	pm+pt					Perm
Protected Phases				8		8	5	2			6	
Permitted Phases							2					6
Actuated Green, G (s)				9.4		9.4	32.6	32.6			23.6	23.6
Effective Green, g (s)				9.4		9.4	32.6	32.6			23.6	23.6
Actuated g/C Ratio				0.19		0.19	0.65	0.65			0.47	0.47
Clearance Time (s)				4.0		4.0	4.0	4.0			4.0	4.0
Vehicle Extension (s)				3.0		3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)				333		298	682	1215			879	747
v/s Ratio Prot				c0.07		0.06	0.03	c0.29			0.20	
v/s Ratio Perm							0.18					0.06
v/c Ratio				0.35		0.34	0.33	0.44			0.41	0.14
Uniform Delay, d1				17.6		17.6	5.2	4.2			8.7	7.5
Progression Factor				1.00		1.00	0.33	0.32			1.00	1.00
Incremental Delay, d2				0.6		0.7	0.2	0.9			1.4	0.4
Delay (s)				18.3		18.3	1.9	2.3			10.1	7.8
Level of Service				B		B	A	A			B	A
Approach Delay (s)		0.0			18.3			2.2			9.3	
Approach LOS		A			B			A			A	
Intersection Summary												
HCM Average Control Delay			8.6		HCM Level of Service					A		
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			50.0		Sum of lost time (s)					8.0		
Intersection Capacity Utilization			86.2%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 Modified AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	180	368	210	938	1064	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.16	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	290	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	400	228	1020	1157	500
RTOR Reduction (vph)	0	206	0	0	0	260
Lane Group Flow (vph)	196	194	228	1020	1157	240
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	12.2	12.2	39.8	39.8	28.8	28.8
Effective Green, g (s)	12.2	12.2	39.8	39.8	28.8	28.8
Actuated g/C Ratio	0.20	0.20	0.66	0.66	0.48	0.48
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	360	322	365	2348	1699	760
v/s Ratio Prot	0.11		c0.07	0.29	c0.33	
v/s Ratio Perm		c0.12	0.34			0.15
v/c Ratio	0.54	0.60	0.62	0.43	0.68	0.32
Uniform Delay, d1	21.4	21.7	14.5	4.8	12.1	9.6
Progression Factor	1.00	1.00	1.00	1.00	0.69	0.67
Incremental Delay, d2	1.7	3.2	3.3	0.6	1.6	0.8
Delay (s)	23.1	24.9	17.8	5.4	10.0	7.2
Level of Service	C	C	B	A	A	A
Approach Delay (s)	24.3			7.6	9.2	
Approach LOS	C			A	A	

Intersection Summary

HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 Modified PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	75	248	454	1344	1528	750
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.10	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	181	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	270	493	1461	1661	815
RTOR Reduction (vph)	0	236	0	0	0	304
Lane Group Flow (vph)	82	34	493	1461	1661	511
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.9	8.9	53.1	53.1	37.1	37.1
Effective Green, g (s)	8.9	8.9	53.1	53.1	37.1	37.1
Actuated g/C Ratio	0.13	0.13	0.76	0.76	0.53	0.53
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	225	201	410	2685	1876	839
v/s Ratio Prot	c0.05		c0.21	0.41	0.47	
v/s Ratio Perm		0.02	c0.71			0.32
v/c Ratio	0.36	0.17	1.20	0.54	0.89	0.61
Uniform Delay, d1	28.0	27.3	21.7	3.5	14.6	11.4
Progression Factor	1.00	1.00	1.00	1.00	0.68	1.17
Incremental Delay, d2	1.0	0.4	112.3	0.8	2.5	1.2
Delay (s)	29.0	27.7	134.0	4.3	12.4	14.5
Level of Service	C	C	F	A	B	B
Approach Delay (s)	28.0			37.0	13.1	
Approach LOS	C			D	B	

Intersection Summary

HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 Modified AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	460	779	313	1065	745	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.93	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.97	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3278	1441	1770	3539	3539	1583
Flt Permitted	0.97	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	3278	1441	350	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	500	847	340	1158	810	196
RTOR Reduction (vph)	253	321	0	0	0	124
Lane Group Flow (vph)	662	111	340	1158	810	72
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	15.4	15.4	36.6	36.6	21.9	21.9
Effective Green, g (s)	15.4	15.4	36.6	36.6	21.9	21.9
Actuated g/C Ratio	0.26	0.26	0.61	0.61	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	841	370	467	2159	1292	578
v/s Ratio Prot	c0.20		c0.13	0.33	0.23	
v/s Ratio Perm		0.08	c0.31			0.05
v/c Ratio	0.79	0.30	0.73	0.54	0.63	0.12
Uniform Delay, d1	20.8	18.0	8.1	6.8	15.7	12.7
Progression Factor	1.00	1.00	1.28	0.69	0.86	0.73
Incremental Delay, d2	4.9	0.5	5.4	0.9	1.9	0.4
Delay (s)	25.7	18.4	15.8	5.6	15.4	9.6
Level of Service	C	B	B	A	B	A
Approach Delay (s)	23.4			7.9	14.3	
Approach LOS	C			A	B	

Intersection Summary

HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2035 Alternative 2 Modified PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	410	813	329	1310	1465	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.93	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.98	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3262	1441	1770	3539	3539	1583
Flt Permitted	0.98	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	3262	1441	201	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	446	884	358	1424	1592	391
RTOR Reduction (vph)	187	187	0	0	0	207
Lane Group Flow (vph)	701	255	358	1424	1592	184
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	16.0	16.0	46.0	46.0	33.0	33.0
Effective Green, g (s)	16.0	16.0	46.0	46.0	33.0	33.0
Actuated g/C Ratio	0.23	0.23	0.66	0.66	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	746	329	334	2326	1668	746
v/s Ratio Prot	c0.21		c0.14	0.40	0.45	
v/s Ratio Perm		0.18	c0.57			0.12
v/c Ratio	0.94	0.78	1.07	0.61	0.95	0.25
Uniform Delay, d1	26.5	25.3	20.7	6.9	17.8	11.1
Progression Factor	1.00	1.00	1.58	0.77	0.92	1.14
Incremental Delay, d2	19.8	10.9	67.3	1.1	1.9	0.1
Delay (s)	46.3	36.2	99.9	6.4	18.2	12.6
Level of Service	D	D	F	A	B	B
Approach Delay (s)	42.9			25.2	17.1	
Approach LOS	D			C	B	

Intersection Summary

HCM Average Control Delay	26.7	HCM Level of Service	C
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2015 No Build AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	134	566	221	657	575	391
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.35	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	647	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	615	240	714	625	425
RTOR Reduction (vph)	0	40	0	0	0	264
Lane Group Flow (vph)	146	575	240	714	625	161
Turn Type	pt+ov		pm+pt		Perm	
Protected Phases	4	4 5	5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	15.5	29.3	36.5	36.5	22.7	22.7
Effective Green, g (s)	15.5	29.3	36.5	36.5	22.7	22.7
Actuated g/C Ratio	0.26	0.49	0.61	0.61	0.38	0.38
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	457	773	577	2153	1339	599
v/s Ratio Prot	0.08	c0.36	0.07	0.20	c0.18	
v/s Ratio Perm			0.19			0.10
v/c Ratio	0.32	0.74	0.42	0.33	0.47	0.27
Uniform Delay, d1	18.0	12.3	9.4	5.8	14.1	12.9
Progression Factor	1.00	1.00	1.00	1.00	0.64	0.49
Incremental Delay, d2	0.4	3.9	0.5	0.4	0.9	0.8
Delay (s)	18.4	16.2	9.9	6.2	9.9	7.1
Level of Service	B	B	A	A	A	A
Approach Delay (s)	16.6			7.1	8.8	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2015 No Build PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	58	376	525	1005	765	804
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.26	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	485	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	409	571	1092	832	874
RTOR Reduction (vph)	0	31	0	0	0	331
Lane Group Flow (vph)	63	378	571	1092	832	543
Turn Type		pt+ov	pm+pt			Perm
Protected Phases	4	4 5	5	2	6	
Permitted Phases			2			6
Actuated Green, G (s)	8.8	30.2	53.2	53.2	31.8	31.8
Effective Green, g (s)	8.8	30.2	53.2	53.2	31.8	31.8
Actuated g/C Ratio	0.13	0.43	0.76	0.76	0.45	0.45
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	223	683	688	2690	1608	719
v/s Ratio Prot	0.04	c0.24	c0.21	0.31	0.24	
v/s Ratio Perm			c0.42			0.34
v/c Ratio	0.28	0.55	0.83	0.41	0.52	0.75
Uniform Delay, d1	27.7	14.9	11.3	2.9	13.6	15.9
Progression Factor	1.00	1.00	1.00	1.00	0.47	0.55
Incremental Delay, d2	0.7	1.0	8.2	0.5	0.1	0.7
Delay (s)	28.4	15.8	19.5	3.4	6.6	9.4
Level of Service	C	B	B	A	A	A
Approach Delay (s)	17.5			8.9	8.0	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2015 No Build AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	915	334	270	521	633	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3433	1583	1770	3539	3422	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3433	1583	1770	3539	3422	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	995	363	293	566	688	196
RTOR Reduction (vph)	0	21	0	0	44	0
Lane Group Flow (vph)	995	342	293	566	840	0
Turn Type	pt+ov		Prot			
Protected Phases	4	4 5	5	2	6	
Permitted Phases						
Actuated Green, G (s)	19.2	34.4	11.2	32.8	17.6	
Effective Green, g (s)	19.2	34.4	11.2	32.8	17.6	
Actuated g/C Ratio	0.32	0.57	0.19	0.55	0.29	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1099	908	330	1935	1004	
v/s Ratio Prot	c0.29	0.22	c0.17	0.16	c0.25	
v/s Ratio Perm						
v/c Ratio	0.91	0.38	0.89	0.29	0.84	
Uniform Delay, d1	19.5	7.0	23.8	7.3	19.9	
Progression Factor	1.06	1.51	0.88	0.65	1.00	
Incremental Delay, d2	6.1	0.1	23.1	0.4	7.5	
Delay (s)	26.8	10.6	44.0	5.1	27.3	
Level of Service	C	B	D	A	C	
Approach Delay (s)	22.5			18.4	27.3	
Approach LOS	C			B	C	

Intersection Summary

HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2015 No Build PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	803	286	315	747	1282	359
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3433	1583	1770	3539	3423	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	3433	1583	1770	3539	3423	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	873	311	342	812	1393	390
RTOR Reduction (vph)	0	8	0	0	37	0
Lane Group Flow (vph)	873	303	342	812	1746	0
Turn Type	pt+ov		Prot			
Protected Phases	4	4 5	5	2	6	
Permitted Phases						
Actuated Green, G (s)	16.0	31.0	11.0	46.0	31.0	
Effective Green, g (s)	16.0	31.0	11.0	46.0	31.0	
Actuated g/C Ratio	0.23	0.44	0.16	0.66	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	785	701	278	2326	1516	
v/s Ratio Prot	c0.25	0.19	c0.19	0.23	c0.51	
v/s Ratio Perm						
v/c Ratio	1.11	0.43	1.23	0.35	1.15	
Uniform Delay, d1	27.0	13.4	29.5	5.3	19.5	
Progression Factor	1.00	1.00	1.01	0.62	1.00	
Incremental Delay, d2	67.5	0.4	129.5	0.4	71.0	
Delay (s)	94.5	13.9	159.4	3.7	90.5	
Level of Service	F	B	F	A	F	
Approach Delay (s)	73.3			49.8	90.5	
Approach LOS	E			D	F	

Intersection Summary

HCM Average Control Delay	74.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

103: Shady Elm Road & Route 37 EB Ramp

Synchro 7 - Report

2015 Alternative 2 AM

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	59	34	12	64	0	50	0	44	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0		4.0		4.0			
Lane Util. Factor		1.00		1.00	1.00		1.00		1.00			
Frt		0.95		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		1771		1770	1863		1770		1583			
Flt Permitted		1.00		0.69	1.00		0.95		1.00			
Satd. Flow (perm)		1771		1288	1863		1770		1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	64	37	13	70	0	54	0	48	0	0	0
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	43	0	0	0
Lane Group Flow (vph)	0	88	0	13	70	0	54	0	5	0	0	0
Turn Type			pm+pt			custom		custom				
Protected Phases		2		1	6							
Permitted Phases				6			4		4			
Actuated Green, G (s)		32.4		37.2	37.2		4.8		4.8			
Effective Green, g (s)		32.4		37.2	37.2		4.8		4.8			
Actuated g/C Ratio		0.65		0.74	0.74		0.10		0.10			
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0			
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0			
Lane Grp Cap (vph)		1148		966	1386		170		152			
v/s Ratio Prot		c0.05		0.00	c0.04							
v/s Ratio Perm				0.01			c0.03		0.00			
v/c Ratio		0.08		0.01	0.05		0.32		0.03			
Uniform Delay, d1		3.3		1.7	1.7		21.1		20.5			
Progression Factor		1.00		0.74	0.77		1.00		1.00			
Incremental Delay, d2		0.1		0.0	0.1		1.1		0.1			
Delay (s)		3.4		1.2	1.4		22.2		20.6			
Level of Service		A		A	A		C		C			
Approach Delay (s)		3.4			1.4			21.4			0.0	
Approach LOS		A			A			C			A	
Intersection Summary												
HCM Average Control Delay			9.2		HCM Level of Service				A			
HCM Volume to Capacity ratio			0.10									
Actuated Cycle Length (s)			50.0		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			29.0%		ICU Level of Service				A			
Analysis Period (min)			15									
c Critical Lane Group												

103: Shady Elm Road & Route 37 EB Ramp

2015 Alternative 2 PM

[illegible]

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	130	267	152	679	868	333
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	459	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	290	165	738	943	362
RTOR Reduction (vph)	0	181	0	0	0	180
Lane Group Flow (vph)	141	109	165	738	943	182
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	9.7	9.7	32.3	32.3	25.1	25.1
Effective Green, g (s)	9.7	9.7	32.3	32.3	25.1	25.1
Actuated g/C Ratio	0.19	0.19	0.65	0.65	0.50	0.50
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	343	307	380	2286	1777	795
v/s Ratio Prot	c0.08		0.03	c0.21	c0.27	
v/s Ratio Perm		0.07	0.25			0.11
v/c Ratio	0.41	0.36	0.43	0.32	0.53	0.23
Uniform Delay, d1	17.6	17.4	7.6	4.0	8.5	7.0
Progression Factor	1.00	1.00	1.00	1.00	0.46	0.43
Incremental Delay, d2	0.8	0.7	0.8	0.4	0.9	0.5
Delay (s)	18.5	18.2	8.4	4.3	4.8	3.5
Level of Service	B	B	A	A	A	A
Approach Delay (s)	18.3			5.1	4.4	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	54	180	329	974	1298	543
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	204	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	196	358	1059	1411	590
RTOR Reduction (vph)	0	173	0	0	0	265
Lane Group Flow (vph)	59	23	358	1059	1411	325
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.1	8.1	53.9	53.9	38.6	38.6
Effective Green, g (s)	8.1	8.1	53.9	53.9	38.6	38.6
Actuated g/C Ratio	0.12	0.12	0.77	0.77	0.55	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	205	183	410	2725	1952	873
v/s Ratio Prot	c0.03		c0.14	0.30	0.40	
v/s Ratio Perm		0.01	c0.53			0.21
v/c Ratio	0.29	0.12	0.87	0.39	0.72	0.37
Uniform Delay, d1	28.3	27.8	16.6	2.6	11.7	8.9
Progression Factor	1.00	1.00	1.00	1.00	0.52	0.33
Incremental Delay, d2	0.8	0.3	18.2	0.4	1.3	0.7
Delay (s)	29.1	28.1	34.8	3.1	7.3	3.5
Level of Service	C	C	C	A	A	A
Approach Delay (s)	28.3			11.1	6.2	
Approach LOS	C			B	A	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	615	564	227	583	637	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.96	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.96	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3357	1441	1770	3539	3539	1583
Flt Permitted	0.96	1.00	0.30	1.00	1.00	1.00
Satd. Flow (perm)	3357	1441	565	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	668	613	247	634	692	167
RTOR Reduction (vph)	62	236	0	0	0	112
Lane Group Flow (vph)	814	169	247	634	692	55
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	15.5	15.5	26.5	26.5	16.5	16.5
Effective Green, g (s)	15.5	15.5	26.5	26.5	16.5	16.5
Actuated g/C Ratio	0.31	0.31	0.53	0.53	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1041	447	444	1876	1168	522
v/s Ratio Prot	c0.24		c0.07	0.18	0.20	
v/s Ratio Perm		0.12	c0.23			0.03
v/c Ratio	0.78	0.38	0.56	0.34	0.59	0.11
Uniform Delay, d1	15.7	13.5	11.9	6.7	13.9	11.6
Progression Factor	1.00	1.00	0.79	0.68	1.00	1.00
Incremental Delay, d2	3.9	0.5	1.5	0.5	2.0	0.4
Delay (s)	19.6	14.0	10.8	5.0	15.9	12.0
Level of Service	B	B	B	A	B	B
Approach Delay (s)	17.8			6.7	15.2	
Approach LOS	B			A	B	

Intersection Summary

HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	←	←	↑↑	↑↑	←
Volume (vph)	538	589	238	789	1252	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.95	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.97	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3333	1441	1770	3539	3539	1583
Flt Permitted	0.97	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	3333	1441	207	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	585	640	259	858	1361	335
RTOR Reduction (vph)	74	173	0	0	0	182
Lane Group Flow (vph)	767	211	259	858	1361	153
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	17.9	17.9	44.1	44.1	32.0	32.0
Effective Green, g (s)	17.9	17.9	44.1	44.1	32.0	32.0
Actuated g/C Ratio	0.26	0.26	0.63	0.63	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	852	368	311	2230	1618	724
v/s Ratio Prot	c0.23		c0.10	0.24	0.38	
v/s Ratio Perm		0.15	c0.43			0.10
v/c Ratio	0.90	0.57	0.83	0.38	0.84	0.21
Uniform Delay, d1	25.2	22.7	15.8	6.3	16.8	11.4
Progression Factor	1.00	1.00	0.74	0.69	1.00	1.00
Incremental Delay, d2	12.3	2.1	16.3	0.5	2.3	0.3
Delay (s)	37.5	24.9	28.0	4.9	19.0	11.7
Level of Service	D	C	C	A	B	B
Approach Delay (s)	33.5			10.2	17.6	
Approach LOS	C			B	B	

Intersection Summary

HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

103: Shady Elm Road & Route 37 EB Ramp

2015 Alternative 2 Modified AM

[illegible]

103: Shady Elm Road & Route 37 EB Ramp

2015 Alternative 2 Modified PM

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	48	52	25	40	0	55	0	73	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0		4.0			
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00		1.00			
Frt		1.00	0.85	1.00	1.00		1.00		0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00			
Satd. Flow (prot)		1863	1583	1770	1863		1770		1583			
Flt Permitted		1.00	1.00	0.72	1.00		0.95		1.00			
Satd. Flow (perm)		1863	1583	1347	1863		1770		1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	52	57	27	43	0	60	0	79	0	0	0
RTOR Reduction (vph)	0	0	22	0	0	0	0	0	69	0	0	0
Lane Group Flow (vph)	0	52	35	27	43	0	60	0	10	0	0	0
Turn Type			Perm	pm+pt			Prot		custom			
Protected Phases		2		1	6		4		4			
Permitted Phases			2	6								
Actuated Green, G (s)		31.1	31.1	35.9	35.9		6.1		6.1			
Effective Green, g (s)		31.1	31.1	35.9	35.9		6.1		6.1			
Actuated g/C Ratio		0.62	0.62	0.72	0.72		0.12		0.12			
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0		4.0			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0		3.0			
Lane Grp Cap (vph)		1159	985	974	1338		216		193			
v/s Ratio Prot		c0.03		0.00	c0.02		c0.03		0.01			
v/s Ratio Perm			0.02	0.02								
v/c Ratio		0.04	0.04	0.03	0.03		0.28		0.05			
Uniform Delay, d1		3.7	3.7	2.0	2.0		19.9		19.4			
Progression Factor		1.00	1.00	0.67	0.67		1.00		1.00			
Incremental Delay, d2		0.1	0.1	0.0	0.0		0.7		0.1			
Delay (s)		3.7	3.7	1.4	1.4		20.7		19.5			
Level of Service		A	A	A	A		C		B			
Approach Delay (s)		3.7			1.4			20.0			0.0	
Approach LOS		A			A			B			A	
Intersection Summary												
HCM Average Control Delay			10.3			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.08									
Actuated Cycle Length (s)			50.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			26.9%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Synchro 7 - Report

2015 Alternative 2 Modified AM

[illegible]

Synchro 7 - Report

2015 Alternative 2 Modified PM

[illegible]

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 Modified AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	130	267	152	679	868	333
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	459	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	290	165	738	943	362
RTOR Reduction (vph)	0	181	0	0	0	180
Lane Group Flow (vph)	141	109	165	738	943	182
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	9.7	9.7	32.3	32.3	25.1	25.1
Effective Green, g (s)	9.7	9.7	32.3	32.3	25.1	25.1
Actuated g/C Ratio	0.19	0.19	0.65	0.65	0.50	0.50
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	343	307	380	2286	1777	795
v/s Ratio Prot	c0.08		0.03	c0.21	c0.27	
v/s Ratio Perm		0.07	0.25			0.11
v/c Ratio	0.41	0.36	0.43	0.32	0.53	0.23
Uniform Delay, d1	17.6	17.4	7.6	4.0	8.5	7.0
Progression Factor	1.00	1.00	1.00	1.00	0.48	0.43
Incremental Delay, d2	0.8	0.7	0.8	0.4	1.0	0.6
Delay (s)	18.5	18.2	8.4	4.3	5.0	3.6
Level of Service	B	B	A	A	A	A
Approach Delay (s)	18.3			5.1	4.6	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: Route 37 EB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 Modified PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	54	180	329	974	1298	543
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	204	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	196	358	1059	1411	590
RTOR Reduction (vph)	0	173	0	0	0	265
Lane Group Flow (vph)	59	23	358	1059	1411	325
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.1	8.1	53.9	53.9	38.6	38.6
Effective Green, g (s)	8.1	8.1	53.9	53.9	38.6	38.6
Actuated g/C Ratio	0.12	0.12	0.77	0.77	0.55	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	205	183	410	2725	1952	873
v/s Ratio Prot	c0.03		c0.14	0.30	0.40	
v/s Ratio Perm		0.01	c0.53			0.21
v/c Ratio	0.29	0.12	0.87	0.39	0.72	0.37
Uniform Delay, d1	28.3	27.8	16.6	2.6	11.7	8.9
Progression Factor	1.00	1.00	1.00	1.00	0.49	0.32
Incremental Delay, d2	0.8	0.3	18.2	0.4	1.5	0.8
Delay (s)	29.1	28.1	34.8	3.1	7.3	3.6
Level of Service	C	C	C	A	A	A
Approach Delay (s)	28.3			11.1	6.2	
Approach LOS	C			B	A	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 Modified AM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	450	564	227	748	637	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.95	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.97	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3316	1441	1770	3539	3539	1583
Flt Permitted	0.97	1.00	0.32	1.00	1.00	1.00
Satd. Flow (perm)	3316	1441	587	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	489	613	247	813	692	167
RTOR Reduction (vph)	162	246	0	0	0	107
Lane Group Flow (vph)	591	103	247	813	692	60
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	14.1	14.1	27.9	27.9	17.9	17.9
Effective Green, g (s)	14.1	14.1	27.9	27.9	17.9	17.9
Actuated g/C Ratio	0.28	0.28	0.56	0.56	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	935	406	470	1975	1267	567
v/s Ratio Prot	c0.18		c0.06	0.23	0.20	
v/s Ratio Perm		0.07	c0.23			0.04
v/c Ratio	0.63	0.25	0.53	0.41	0.55	0.11
Uniform Delay, d1	15.7	13.9	10.5	6.3	12.8	10.7
Progression Factor	1.00	1.00	0.81	0.72	1.00	1.00
Incremental Delay, d2	1.4	0.3	1.0	0.6	1.5	0.3
Delay (s)	17.1	14.2	9.5	5.2	14.3	11.0
Level of Service	B	B	A	A	B	B
Approach Delay (s)	16.2			6.2	13.7	
Approach LOS	B			A	B	

Intersection Summary

HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

19: Route 37 WB Ramps & US 11

Synchro 7 - Report
2015 Alternative 2 Modified PM



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	398	589	238	929	1252	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.94	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.97	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3294	1441	1770	3539	3539	1583
Flt Permitted	0.97	1.00	0.10	1.00	1.00	1.00
Satd. Flow (perm)	3294	1441	196	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	433	640	259	1010	1361	335
RTOR Reduction (vph)	182	196	0	0	0	172
Lane Group Flow (vph)	552	143	259	1010	1361	163
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	15.2	15.2	46.8	46.8	34.1	34.1
Effective Green, g (s)	15.2	15.2	46.8	46.8	34.1	34.1
Actuated g/C Ratio	0.22	0.22	0.67	0.67	0.49	0.49
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	715	313	327	2366	1724	771
v/s Ratio Prot	c0.17		c0.10	0.29	0.38	
v/s Ratio Perm		0.10	c0.43			0.10
v/c Ratio	0.77	0.46	0.79	0.43	0.79	0.21
Uniform Delay, d1	25.8	23.8	15.6	5.4	15.0	10.3
Progression Factor	1.00	1.00	0.80	0.69	1.00	1.00
Incremental Delay, d2	5.2	1.1	11.9	0.5	1.5	0.2
Delay (s)	30.9	24.9	24.4	4.3	16.5	10.5
Level of Service	C	C	C	A	B	B
Approach Delay (s)	29.0			8.4	15.3	
Approach LOS	C			A	B	

Intersection Summary

HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

3. Cost Estimates

Route 37 Access Management Study

Alternative 1 with at-grade crossing at railroad

Description	Type	LF	Cross Section (FT)	Quantity	Unit	Unit Cost	Amount	Notes
Shady Elm WB accel lane and shoulder	Roadway	990	22	21,780	SF	\$12.00	\$261,000	
Shady Elm WB entrance ramp		1040	24	24,960	SF	\$12.00	\$300,000	
Shady Elm EB decel lane and shoulder		1110	22	24,420	SF	\$12.00	\$293,000	
Shady Elm EB exit ramp		1000	36	36,000	SF	\$12.00	\$432,000	
Shady Elm WB decel lane and shoulder		740	22	16,280	SF	\$12.00	\$195,000	
Shady Elm WB exit ramp		820	24	19,680	SF	\$12.00	\$236,000	
Shady Elm EB accel lane and shoulder		950	22	20,900	SF	\$12.00	\$251,000	
Shady Elm EB entrance ramp		870	24	20,880	SF	\$12.00	\$251,000	
Shady Elm ramps earthwork	Earthwork (assuming 3 ft cut/fill)			25,558	CY	\$10.00	\$256,000	
	Total						\$2,475,000	
Shady Elm widening plus connector road	Roadway	4180	48	200,640	SF	\$12.00	\$2,408,000	
	Bridge	200	72	14,400	SF	\$200.00	\$2,880,000	Assume existing bridge is replaced
	Sidewalk	8360	4	3,716	SY	\$48.00	\$178,000	
	Earthwork (assuming 3 ft cut/fill)			25,080	CY	\$10.00	\$251,000	
	Total						\$5,717,000	
US 11 interchange	Demolition			106,900	SF	\$1.25	\$134,000	
Auxiliary lane and shoulder	Roadway	1900	22	41,800	SF	\$12.00	\$502,000	
	Earthwork (assuming 3 ft cut/fill)			5,911	CY	\$10.00	\$59,000	
	Total						\$695,000	

Roadway Improvements Subtotal \$8,887,000

Additional Items Based on Percentage of Roadway Subtotal

Description	Percentage	Amount
Drainage and Stormwater Management Items	30%	\$2,666,000
Roadside Development and Incidental Items	20%	\$1,777,000
Signing and Pavement Marking Items	20%	\$1,777,000
Maintenance of Traffic Items	15%	\$1,333,000
Lighting	10%	\$889,000

Traffic Signals

Description	Type	Quantity	Unit Cost	Amount
Shady Elm ramp termini	Signal	2.00	\$200,000	\$400,000
New connector road	Signal	2.00	\$200,000	\$400,000
New connector road	RR Crossing	1.00	\$500,000	\$500,000

Project Subtotal \$18,629,000

Items Based on Project Subtotal

Construction Surveying (1% of Project Subtotal)	\$186,000
Mobilization [\$80,000 + 5% x (Project Subtotal - \$1,000,000)]	\$961,000
Engineering (15% of Project Subtotal)	\$2,794,000
Contingency (30% of Project Subtotal)	\$5,589,000

PROJECT CONSTRUCTION TOTAL \$28,159,000

Say \$28,000,000

Right of Way			Quantity	Unit	Unit Cost	Amount	
Land							
Shady Elm interchange			6.50	acre	\$35,000	\$228,000	Assume I-81 cloverleaf ROW acquired under another project
Shady Elm widening and connector road			6.30	acre	\$35,000	\$221,000	
Displacements							
EMMART, W H & SON, INC	Building				\$382,300	\$382,300	Value based on tax record
ADAMS, T G & ROSALIE F	Building				\$912,600	\$912,600	Value based on tax record
POTOMAC EDISON COMPANY	New Driveway	1,160.00	20.00	23,200 SF	\$5.00	\$116,000	
C & P TELEPHONE COMPANY	New Driveway	380.00	20.00	7,600 SF	\$5.00	\$38,000	
ROW TOTAL						\$1,897,900	
Say						\$1,900,000	

Route 37 Access Management Study

Alternative 1 with grade separation at railroad

Description	Type	LF	Cross Section (FT)	Quantity	Unit	Unit Cost	Amount	Notes
Shady Elm WB accel lane and shoulder	Roadway	990	22	21,780	SF	\$12.00	\$261,000	
Shady Elm WB entrance ramp		1040	24	24,960	SF	\$12.00	\$300,000	
Shady Elm EB decel lane and shoulder		1110	22	24,420	SF	\$12.00	\$293,000	
Shady Elm EB exit ramp		1000	36	36,000	SF	\$12.00	\$432,000	
Shady Elm WB decel lane and shoulder		740	22	16,280	SF	\$12.00	\$195,000	
Shady Elm WB exit ramp		820	24	19,680	SF	\$12.00	\$236,000	
Shady Elm EB accel lane and shoulder		950	22	20,900	SF	\$12.00	\$251,000	
Shady Elm EB entrance ramp		870	24	20,880	SF	\$12.00	\$251,000	
Shady Elm ramps earthwork	Earthwork (assuming 3 ft cut/fill)			25,558	CY	\$10.00	\$256,000	
	Total						\$2,475,000	
Shady Elm widening plus connector road	Roadway	3980	52	206,960	SF	\$12.00	\$2,484,000	
	Bridge	400	72	28,800	SF	\$200.00	\$5,760,000	Assume existing bridge is replaced
	Sidewalk	7960	4	3,538	SY	\$48.00	\$170,000	
	Retaining Wall			20,000	SF	\$100.00	\$2,000,000	
	Earthwork (assuming 10 ft cut/fill)			106,133	CY	\$10.00	\$1,061,000	
	Total						\$11,475,000	
US 11 interchange	Demolition			106,900	SF	\$1.25	\$134,000	
Auxiliary lane and shoulder	Roadway	1900	22	41,800	SF	\$12.00	\$502,000	
	Earthwork (assuming 3 ft cut/fill)			5,911	CY	\$10.00	\$59,000	
	Total						\$695,000	

Roadway Improvements Subtotal \$14,645,000

Additional Items Based on Percentage of Roadway Subtotal

Description	Percentage	Amount
Drainage and Stormwater Management Items	30%	\$4,394,000
Roadside Development and Incidental Items	20%	\$2,929,000
Signing and Pavement Marking Items	20%	\$2,929,000
Maintenance of Traffic Items	15%	\$2,197,000
Lighting	10%	\$1,465,000

Traffic Signals

Description	Type	Quantity	Unit Cost	Amount
Shady Elm ramp termini	Signal	2.00	\$200,000	\$400,000
New connector road	Signal	2.00	\$200,000	\$400,000

Project Subtotal \$29,359,000

Items Based on Project Subtotal

Construction Surveying (1% of Project Subtotal)	\$294,000
Mobilization [\$80,000 + 5% x (Project Subtotal - \$1,000,000)]	\$1,498,000
Engineering (15% of Project Subtotal)	\$4,404,000
Contingency (30% of Project Subtotal)	\$8,808,000

PROJECT CONSTRUCTION TOTAL \$44,363,000

Say \$44,000,000

Right of Way			Quantity	Unit	Unit Cost	Amount	
Land							
Shady Elm interchange			6.50	acre	\$35,000	\$228,000	Assume I-81 cloverleaf ROW acquired under another project
Shady Elm widening and connector road			6.30	acre	\$35,000	\$221,000	
Displacements							
EMMART, W H & SON, INC	Building				\$382,300	\$382,300	Value based on tax record
ADAMS, T G & ROSALIE F	Building				\$912,600	\$912,600	Value based on tax record
POTOMAC EDISON COMPANY	New Driveway	1,160.00	20.00	23,200 SF	\$5.00	\$116,000	
C & P TELEPHONE COMPANY	New Driveway	380.00	20.00	7,600 SF	\$5.00	\$38,000	
ROW TOTAL						\$1,897,900	
Say						\$1,900,000	

Route 37 Access Management Study

Alternative 2

Description	Type	LF	Cross Section (FT)	Quantity	Unit	Unit Cost	Amount	Notes
Shady Elm WB entrance ramp		915	24	21,960	SF	\$12.00	\$264,000	
Shady Elm EB exit ramp		760	30	22,800	SF	\$12.00	\$274,000	partially 1 lane, partially 2 lanes
Shady Elm WB exit ramp		850	30	25,500	SF	\$12.00	\$306,000	partially 1 lane, partially 2 lanes
Shady Elm EB entrance ramp		670	24	16,080	SF	\$12.00	\$193,000	
Shady Elm ramps earthwork	Earthwork (assuming 3 ft cut/fill)			11,723	CY	\$10.00	\$117,000	
	Total						\$1,154,000	
Shady Elm widening	Roadway	800	48	38,400	SF	\$12.00	\$461,000	
	Bridge	200	72	14,400	SF	\$200.00	\$2,880,000	Assume existing bridge is replaced
	Sidewalk	1600	4	711	SY	\$48.00	\$34,000	
	Earthwork (assuming 10 ft cut/fill)			20,148	CY	\$10.00	\$201,000	
	Total						\$3,576,000	
Eastbound CD Road 2 lane	Roadway	11700	44	514,800	SF	\$12.00	\$6,178,000	
Eastbound CD Road 1 lane	Roadway	1700	32	54,400	SF	\$12.00	\$653,000	
Eastbound CD Road	Bridge	900	48	43,200	SF	\$200.00	\$8,640,000	
Westbound CD Road 2 lane	Roadway	9900	44	435,600	SF	\$12.00	\$5,227,000	
Westbound CD Road 1 lane	Roadway	3500	32	112,000	SF	\$12.00	\$1,344,000	
Westbound CD Road	Bridge	900	48	43,200	SF	\$200.00	\$8,640,000	
CD Road Earthwork	Earthwork (assuming 10 ft cut/fill)			612,148	CY	\$10.00	\$6,121,000	
	Total						\$36,803,000	
US 11 interchange ramp tie-ins	Roadway	2460	32	78,720	SF	\$12.00	\$945,000	
Warrior Road interchange ramp tie-ins	Roadway	1600	24	38,400	SF	\$12.00	\$461,000	Assume Warrior Road interchange is build in No Build
	Total						\$1,406,000	

Roadway Improvements Subtotal \$42,939,000

Additional Items Based on Percentage of Roadway Subtotal

Description	Percentage	Amount
Drainage and Stormwater Management Items	30%	\$12,882,000
Roadside Development and Incidental Items	20%	\$8,588,000
Signing and Pavement Marking Items	20%	\$8,588,000
Maintenance of Traffic Items	15%	\$6,441,000
Lighting	10%	\$4,294,000

Traffic Signals

Description	Type	Quantity	Unit Cost	Amount	
Shady Elm ramp termini	Signal	2.00	\$200,000	\$400,000	Assume US 11 ramp termini are signalized in the No Build

Project Subtotal \$84,132,000

Items Based on Project Subtotal

Construction Surveying (1% of Project Subtotal)	\$841,000
Mobilization [\$80,000 + 5% x (Project Subtotal - \$1,000,000)]	\$4,237,000
Engineering (15% of Project Subtotal)	\$12,620,000
Contingency (30% of Project Subtotal)	\$25,240,000

PROJECT CONSTRUCTION TOTAL \$127,070,000

Say \$127,000,000

Right of Way	Quantity	Unit	Unit Cost	Amount	
Land					
Shady Elm interchange and CD road	8.85	acre	\$35,000	\$310,000	Assume I-81 cloverleaf ROW acquired under another project
Displacements					
POTOMAC EDISON COMPANY	1,160.00	20.00 SF	\$5.00	\$116,000	
C & P TELEPHONE COMPANY	380.00	20.00 SF	\$5.00	\$38,000	
			ROW TOTAL	\$464,000	
			Say	\$500,000	

Route 37 Access Management Study

Alternative 3

Description	Type	LF	Cross Section (FT)	Quantity	Unit	Unit Cost	Amount	Notes
Shady Elm widening	Roadway	800	48	38,400	SF	\$12.00	\$461,000	
	Bridge	200	72	14,400	SF	\$200.00	\$2,880,000	Assume existing bridge is replaced
	Sidewalk	1600	4	711	SY	\$48.00	\$34,000	
	Earthwork (assuming 10 ft cut/fill)			20,148	CY	\$10.00	\$201,000	
	Total						\$3,576,000	
Eastbound frontage road 2 lane	Roadway	6090	28	170,520	SF	\$12.00	\$2,046,000	
	Bridge	200	48	9,600	SF	\$200.00	\$1,920,000	
Westbound frontage road 2 lane	Roadway	4530	28	126,840	SF	\$12.00	\$1,522,000	
Westbound frontage road 1 lane	Roadway	2100	20	42,000	SF	\$12.00	\$504,000	
	Bridge	400	48	19,200	SF	\$200.00	\$3,840,000	
Frontage road Earthwork	Earthwork (assuming 10 ft cut/fill)			219,911	CY	\$10.00	\$2,199,000	
	Total						\$12,031,000	
Eastbound slip ramp and accel lane	Roadway	1550	24	37,200.00	SF	\$12.00	\$446,000	
Westbound slip ramp and accel lane	Roadway	1580	24	37,920.00	SF	\$12.00	\$455,000	
	Earthwork (assuming 3 ft cut/fill)			10,433	CY	\$10.00	\$104,000	
	Total						\$1,005,000	
Connector from I-81 to US 11	Roadway	1570	24	37,680.00	SF	\$12.00	\$452,000	
	Earthwork (assuming 3 ft cut/fill)			5,233	CY	\$10.00	\$52,000	
	Total						\$504,000	
US 11 interchange ramp tie-ins	Roadway	1210	32	38,720.00	SF	\$12.00	\$465,000	
	Total						\$465,000	

Roadway Improvements Subtotal \$17,581,000

Additional Items Based on Percentage of Roadway Subtotal

Description	Percentage	Amount
Drainage and Stormwater Management Items	30%	\$5,274,000
Roadside Development and Incidental Items	20%	\$3,516,000
Signing and Pavement Marking Items	20%	\$3,516,000
Maintenance of Traffic Items	15%	\$2,637,000
Lighting	10%	\$1,758,000

Traffic Signals

Description	Type	Quantity	Unit Cost	Amount	
Shady Elm ramp termini	Signal	2.00	\$200,000	\$400,000	Assume US 11 ramp termini are signalized in the No Build

Project Subtotal \$34,682,000

Items Based on Project Subtotal

Construction Surveying (1% of Project Subtotal)	\$347,000
Mobilization [\$80,000 + 5% x (Project Subtotal - \$1,000,000)]	\$1,764,000
Engineering (15% of Project Subtotal)	\$5,202,000
Contingency (30% of Project Subtotal)	\$10,405,000

PROJECT CONSTRUCTION TOTAL \$52,400,000

Say \$52,000,000

Right of Way				Quantity	Unit	Unit Cost	Amount
Land							
Shady Elm interchange and CD road				8.85	acre	\$35,000	\$310,000
Displacements							
POTOMAC EDISON COMPANY	New Driveway	1,160.00	20.00	23,200	SF	\$5.00	\$116,000
C & P TELEPHONE COMPANY	New Driveway	380.00	20.00	7,600	SF	\$5.00	\$38,000
						ROW TOTAL	\$464,000
						Say	\$500,000

Route 37 Access Management Study

Alternative 2 Modified

Description	Type	LF	Cross Section (FT)	Quantity	Unit	Unit Cost	Amount	Notes
Shady Elm WB entrance ramp		915	24	21,960	SF	\$12.00	\$264,000	
Shady Elm EB exit ramp		760	30	22,800	SF	\$12.00	\$274,000	partially 1 lane, partially 2 lanes
Shady Elm WB exit ramp		850	30	25,500	SF	\$12.00	\$306,000	partially 1 lane, partially 2 lanes
Shady Elm EB entrance ramp		670	24	16,080	SF	\$12.00	\$193,000	
Shady Elm ramps earthwork	Earthwork (assuming 3 ft cut/fill)			11,723	CY	\$10.00	\$117,000	
Total							\$1,154,000	
Shady Elm widening	Roadway	800	48	38,400	SF	\$12.00	\$461,000	
	Bridge	200	72	14,400	SF	\$200.00	\$2,880,000	Assume existing bridge is replaced
	Sidewalk	1600	4	711	SY	\$48.00	\$34,000	
	Earthwork (assuming 10 ft cut/fill)			20,148	CY	\$10.00	\$201,000	
Total							\$3,576,000	
Eastbound CD Road 2 lane	Roadway	11700	44	514,800	SF	\$12.00	\$6,178,000	
Eastbound CD Road 1 lane	Roadway	1700	32	54,400	SF	\$12.00	\$653,000	
Eastbound CD Road	Bridge	900	48	43,200	SF	\$200.00	\$8,640,000	
Westbound CD Road 2 lane	Roadway	9900	44	435,600	SF	\$12.00	\$5,227,000	
Westbound CD Road 1 lane	Roadway	3500	32	112,000	SF	\$12.00	\$1,344,000	
Westbound CD Road	Bridge	900	48	43,200	SF	\$200.00	\$8,640,000	
CD Road Earthwork	Earthwork (assuming 10 ft cut/fill)			612,148	CY	\$10.00	\$6,121,000	
Total							\$36,803,000	
Connector from I-81 to US 11	Roadway	1570	24	37,680	SF	\$12.00	\$452,000	
	Earthwork (assuming 3 ft cut/fill)			5,233	CY	\$10.00	\$52,000	
Total							\$504,000	
US 11 interchange ramp tie-ins	Roadway	2460	32	78,720	SF	\$12.00	\$945,000	
Warrior Road interchange ramp tie-ins	Roadway	1600	24	38,400	SF	\$12.00	\$461,000	Assume Warrior Road interchange is build in No Build
Total							\$1,406,000	

Roadway Improvements Subtotal \$43,443,000

Additional Items Based on Percentage of Roadway Subtotal

Description	Percentage	Amount
Drainage and Stormwater Management Items	30%	\$13,033,000
Roadside Development and Incidental Items	20%	\$8,689,000
Signing and Pavement Marking Items	20%	\$8,689,000
Maintenance of Traffic Items	15%	\$6,516,000
Lighting	10%	\$4,344,000

Traffic Signals

Description	Type	Quantity	Unit Cost	Amount	
Shady Elm ramp termini	Signal	2.00	\$200,000	\$400,000	Assume US 11 ramp termini are signalized in the No Build

Project Subtotal \$85,114,000

Items Based on Project Subtotal

Construction Surveying (1% of Project Subtotal)	\$851,000
Mobilization [\$80,000 + 5% x (Project Subtotal - \$1,000,000)]	\$4,286,000
Engineering (15% of Project Subtotal)	\$12,767,000
Contingency (30% of Project Subtotal)	\$25,534,000

PROJECT CONSTRUCTION TOTAL \$128,552,000

Say \$129,000,000

Right of Way	Quantity	Unit	Unit Cost	Amount
Land				
Shady Elm interchange and CD road	8.85	acre	\$35,000	\$310,000
Displacements				Assume I-81 cloverleaf ROW acquired under another project
POTOMAC EDISON COMPANY	1,160.00	20.00 SF	\$5.00	\$116,000
C & P TELEPHONE COMPANY	380.00	20.00 SF	\$5.00	\$38,000
			ROW TOTAL	\$464,000
			Say	\$500,000

4. Existing Conditions Report

Route 37 Access Management Study

Technical Memorandum #1
FINAL Existing Conditions Report



Prepared for the Virginia Department of
Transportation
August 15, 2007

County of Frederick



TABLE OF CONTENTS

A. Introduction	1
B. Existing Traffic Operations.....	3
C. Crash Data.....	6
D. Planned Changes.....	7
1. Land Development.....	7
2. Roadway Improvements	9
E. Next Steps.....	16
F. Appendices.....	17

LIST OF FIGURES

Figure 1: Study Area.....	2
Figure 2: Proposed Development Locations	8
Figure 3: Planned Interchange Improvements at I-81/Route 37 – Ultimate Configuration.....	11
Figure 4: Planned Interchange Improvements at I-81/Route 37 – Phase I.....	12

LIST OF TABLES

Table 1: Existing Intersection Level of Service.....	4
Table 2: Existing Travel Times.....	4
Table 3: Existing Operating Speeds.....	5
Table 4: Estimated Crash Rates	7
Table 5: Planned Improvements for “No Build” Network – Year 2015.....	13
Table 6: Planned Improvements for “No Build” Network – Year 2035.....	14

ROUTE 37 ACCESS MANAGEMENT STUDY

COUNTY OF FREDERICK

EXISTING CONDITIONS REPORT

A. Introduction

The purpose of this study is to assess the impact of proposed modifications and improvements to the Route 37 / Interstate 81 interchange and of increased traffic associated with approved and planned developments in the area.

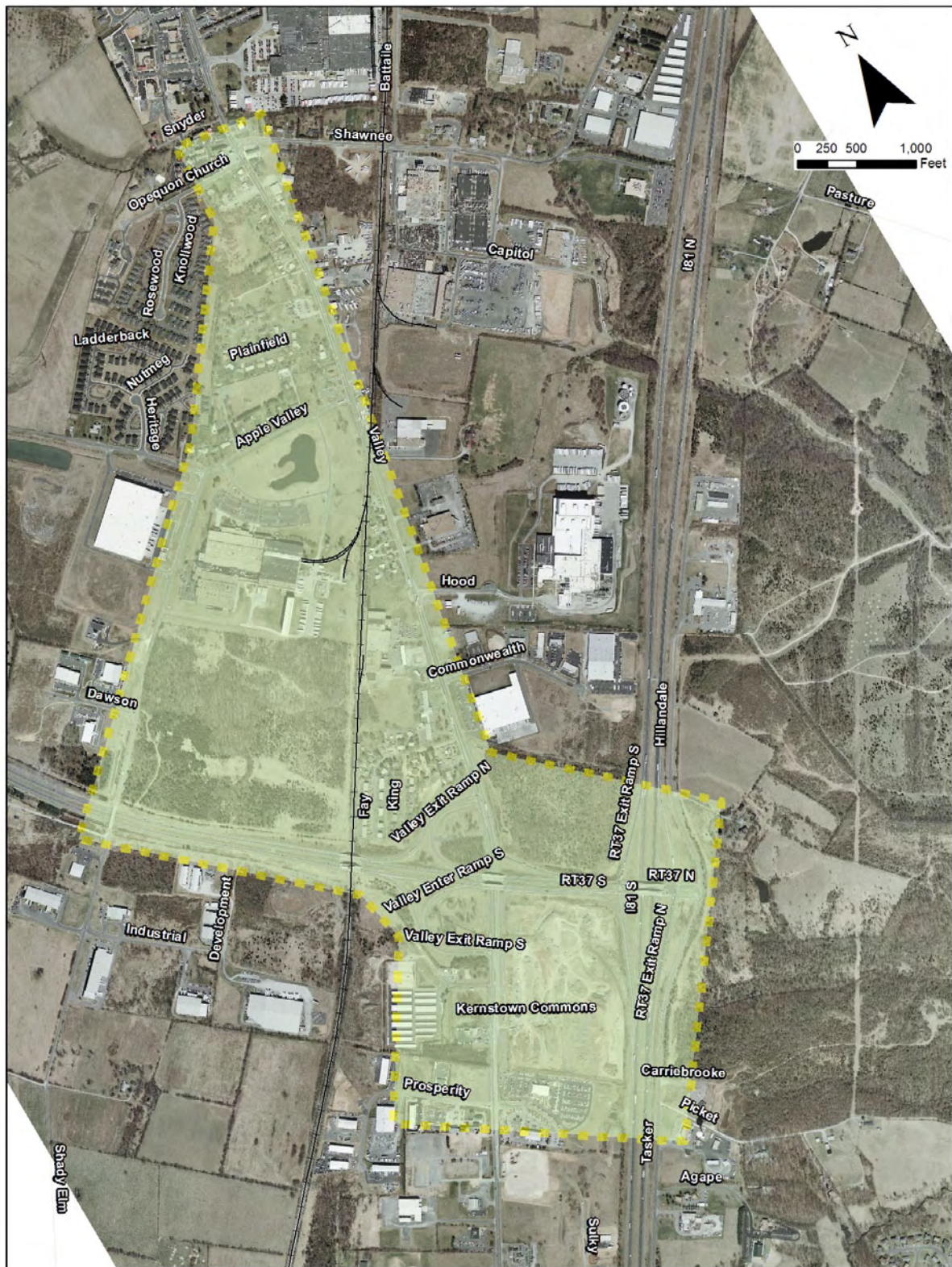
The Route 37 / Interstate 81 interchange is less than one quarter of a mile from the Route 37 / US 11 interchange. The study area, shown in Figure 1, is along Route 37 between Tasker Rd. / Hillandale Ln. in the east and Shady Elm Rd in the west, and along US 11 between Prosperity Dr .in the south and Shawnee Dr. in the north.

Route 37 is a rural four-lane divided highway within the study area. It is classified as a limited access principal arterial west of US 11 and a principal arterial east of US 11. Interstate 81 is a rural four-lane divided highway classified as a limited access principal arterial. US 11 is primarily two to three lanes within the study area and classified as a major collector.

In 2005 a bus route was operated along US 11 between Winchester and Stephens City passing through the study area as part of a one-year demonstration project. This route operated on three-hour headways weekdays and Saturdays.

This report provides an overview of existing traffic conditions within the study area. It covers existing traffic volumes, intersection level of service, travel times, crash analysis, and planned improvements.

Figure 1: Study Area



B. Existing Traffic Operations

Current year traffic volumes were used to analyze existing intersection levels of service. This analysis was done for morning and afternoon peak commuting periods.

Traffic volumes or turning proportions came from the following sources:

1. April-May 2004 turning movement and tube counts, conducted as part of the I-81 NEPA Study, at the I-81/Route 37 Interchange.
2. August 2006 turning movement and tube counts conducted by The Traffic Group for VDOT for a previous study.
3. January 2007 turning movement and tube counts conducted for this study
4. *A Global Traffic Study regarding Kernstown Commons – Limited Access Line Adjustment*, February 23, 2006. By PHRA.
5. *Route 37 / I-81 Interchange Analysis, June 1, 2006*. By PHRA.
6. Trip generation for the partial development on Kernstown Common site (consisting of a fast food restaurant, a sit-down restaurant and 120-room hotel) derived from Volumes 2 and 3 of the Institute of Transportation Engineers *Trip Generation 7th Edition*.

Volumes from different sources were balanced to create a consistent set of turning movements from which intersection levels of service could be calculated. At locations where turning movement counts were not available, volumes were synthesized taking into consideration balancing volumes from nearby counted intersections as well as land uses accessed at the uncounted intersection. Traffic assignments are shown in the Appendix. Signal timing plans were provided by VDOT.

Levels of service (LOS) were calculated using Synchro 7 traffic analysis software. The results, in terms of intersection LOS and delay, are shown in Table 1. There are 16 intersections in the study area that have been included in the analysis. Of these seven are operating at an acceptable level of service (LOS C or better in the AM and PM peak hours), four are marginal (LOS D in either the AM peak, PM peak or both peak hours), and five are failing (LOS E or worse in one or both of the peak hours). It should be noted that although the overall intersection LOS is adequate the LOS by movement is variable. Particularly the Route 37 Ramps, both east- and west bound, have approaches that are failing in one or more of the peak hours. Approach levels of service are recorded in the Appendices.

As part of the existing traffic operations analysis, travel time runs were conducted. Two roadway segments were driven five times in each direction during the morning and afternoon peak periods and two times in each direction during the midday on Tuesday, April 3, 2007. The time to traverse each segment was recorded and averaged. These travel time measurements are intended to reflect typical commuting conditions in the absence of traffic accidents or inclement weather. The results are shown in Table 2.

Existing operating speeds generally appear reasonable on all segments. As Table 3 indicates, Route 37 operates particularly slowly westbound at midday. However, only two travel time runs were made at that time, and the variation in travel time between those two runs was high. Therefore, typical operation may not have been observed.

On the day of observations travel times were fairly consistent between runs and more consistent in the morning than in the afternoon. Route 37 experiences greater variations in travel time than US 11, which could be attributed to the shorter length.

Table 1: Existing Inter section Level of Service

Intersection	AM		PM	
	Average Delay (seconds/vehicle)	LOS	Average Delay (seconds/vehicle)	LOS
<i>Signalized</i>				
Route 37 at Tasker/Hillandale	11.5	B	14.5	B
Route 37 at NB I-81 Ramps	40.7	D	42.5	D
Route 37 at SB I-81 Ramps	18.4	B	25.2	C
US 11 at Commonwealth Ct	61.5	E	247.3	F
US 11 at Hood Way	18.6	B	44.0	D
US 11 at Apple Valley Rd	14.1	B	137.9	F
US 11 at Shawnee Dr	9.8	A	63.2	E
<i>Unsignalized</i>				
US 11 at Prosperity Dr	1.2	A	32.5	D
US 11 at Kernstown Commons	3.5	C	10.9	F
US 11 at driveway	0.3	A	0.3	A
US 11 at EB Route 37 Ramps	6.7	A	4.2	A
US 11 at WB Route 37 Ramps	3.0	A	5.6	C
US 11 at WB Route 37 Off-Ramp	53.4	C	67.9	D
US 11 at Fox Street	3.1	D	172.2	F
US 11 at Opequon Church Ln	0.2	A	0.6	C
Apple Valley Rd at Shady Elm Rd	8.1	A	8.2	A

Table 2: Existing Travel Times

Average Travel Times (min:sec)	AM Peak Hour	Midday	PM Peak Hour
US 11 southbound <i>from Tevis St to Mill Ln</i>	5:41	6:17	7:51
US 11 northbound <i>from Mill Ln to Tevis St</i>	5:34	7:53	8:29
Route 37 eastbound <i>from Shady Elm Rd to Tasker Rd</i>	2:01	2:14	2:16
Route 37 westbound <i>from Tasker Rd to Shady Elm Rd</i>	1:30	2:57	1:53

Table 3: Existing Operating Speeds

Average Speed (mph)	AM Peak Hour	Midday	PM Peak Hour
US 11 southbound <i>from Tevis St to Mill Ln</i>	34	31	25
US 11 northbound <i>from Mill Ln to Tevis St</i>	35	25	23
Route 37 eastbound <i>from Shady Elm Rd to Tasker Rd</i>	28	26	25
Route 37 westbound <i>from Tasker Rd to Shady Elm Rd</i>	38	19	30

C. Crash Data

Crash data was collected from VDOT for Route 37 and US 11 in the study area. The data collection period was January 2004 through June 2006.

Route 11

- There were 39 crashes in the period. There were no fatalities and 18 crashes with injuries resulting in 32 injuries.
- Crashes were concentrated around Apple Valley Rd and the railroad crossing (23 of the crashes). A few crashes occurred at Route 37 ramp termini (4 of 39), at Prosperity Dr (4 of 39), and at Shawnee Dr (5 of 39).
- A slight increase in the number of crashes occurred in January 2005 and then again in the first quarter of 2006. Weather was not cited as a factor in general. Crashes tended to take place in the middle of the afternoon. Sunlight does not appear to be a factor.
- The vast majority of crashes were linked to driver inattention (32 of 39). Drugs/alcohol (3 of 39) and weather (2 of 39) made up a small portion.
- Rear end crashes were the most prevalent type (22 of 39), followed by angle crashes (10 of 39). Rear end crashes appear concentrated around the railroad crossing. Angle crashes appear concentrated around the unsignalized intersections north of the Route 37 westbound ramp terminus.

Route 37

- There were 29 crashes in the period. There were one fatality and nine crashes with injuries resulting in 11 injuries.
- Crashes were concentrated around the I-81 ramp termini.
- There was no apparent concentration of crashes by time of year. Crashes tend to take place in the morning and evening commute times, likely tied to volume (exposure). The angle of sunlight could be a factor on an east-west road, but the direction of travel was not reported.
- The vast majority of crashes were linked to driver inattention (21 of 29). Drugs/alcohol (3 of 29) and weather (4 of 29) made up a small portion.
- Rear end crashes (11 of 29) and angle crashes (11 of 29) were the most prevalent. The one fatality occurred at a rear end crash. Both these crash types occurred at the I-81 ramp termini.

The following table shows the estimated crash rates per million vehicle-miles traveled for roadways in the study area.

Table 4: Estimated Crash Rates

	Segment length	AADT (1)	Number of days	Estimated VMT (2)	Number of crashes	Crashes per Million VMT
Route 11 south of Rt 37	0.46	9900	912.5	4,155,525	7	1.68
Route 11 north of Rt 37	1.16	17000	912.5	17,994,500	32	1.78
Route 37	0.3	21000	912.5	5,748,750	29	5.04

(1) Source: VDOT, *Average Daily Traffic Volumes with Vehicle Classification Data on Interstate, Arterial, and Primary Routes* (2005)

(2) Vehicle-miles traveled

D. Planned Changes

1. Land Development

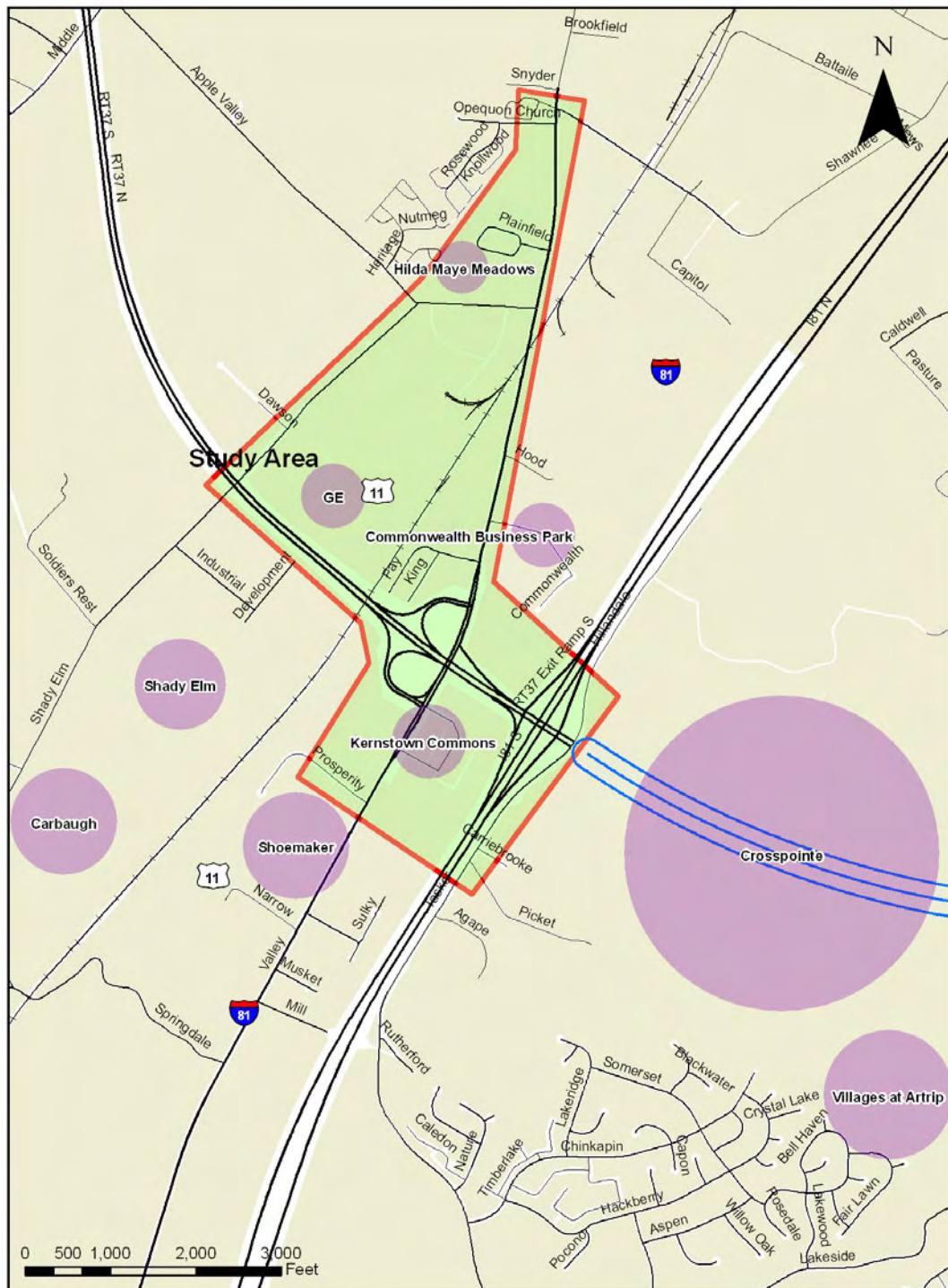
Several new developments are planned for the vicinity of the Interstate 81 / Route 37 interchange.

- Crosspointe Center will be located east of Interstate 81. Route 37 will be extended east to serve this new development. Crosspointe Center will consist of 1,110 single family detached houses, 280 townhouses, 200 elderly housing units, 190,000 SF of office, and 750,000 SF of retail.
- Villages at Artrip will be located on Tasker Rd southeast of interchange. This development will consist of 190 single family detached houses, 438 townhouses, 192 apartments, 60,000 SF of office, 149,400 SF of retail, 12,000 SF of restaurants, and 3 athletic fields.
- Kernstown Commons will be located on US 11 southwest of interchange. This development will consist of, 85,500 SF of retail, 8,500 SF of restaurants, a 4,250 SF gas station, and a 3,500 SF bank. A 120-room hotel and 17,000 SF of restaurants have already been constructed.
- Commonwealth Business Park, Ventures 1 is located on Commonwealth Court off Route 11 and north of the Route 37 and Route 11 interchange. The development has been rezoned to General Business (B2) from Industrial Transitional Business (B3) and covers twelve acres (approximately 523,000 SF). The future development use is unknown, but an impact analysis was conducted assuming specialty retail and 25% of lot area would reflect gross square footage, or about 131,000 SF.
- Hilda May Meadows will be located on the north side of Apple Valley Road about a quarter mile west of Route 11. The development will be small consisting of 20 age-restricted single family lots of a minimum of 3,750 SF each and a community center on a 4.67 acre (203,000 SF) site.
- Shady Elm development will be on a plot south of Route 37 and east of Shady Elm Road. The development will be a mix of office and industrial development.
- The Carbaugh site is directly south of the Shady Elm parcel. It is assumed to be a similar office and industrial development.
- The Shoemaker development west of US 11 will be mixed use containing both office and retail.
- The GE parcel is assumed to be a light industrial and office development and is situated

north of Route 37 and east of Shady Elm Road.

The location of these developments is shown in Figure 2

Figure 2: Proposed Development Locations



2. Roadway Improvements

Route 37 is planned to be extended to the east from its current terminus at Tasker Road to form a semi-circular bypass around the east side of Winchester. Part of this extension would be constructed through developer proffer. The proposed typical section is a rural four-lane divided highway with grade separations at major crossing roadways. This new highway is part of the Win-Fred MPO's Constrained Long Range Plan (CLRP).

The Interstate 81 / Route 37 interchange is proposed to be rebuilt. This improvement is also listed in the CLRP. Two alternative interchanges are detailed in the *Interchange Modification Report for Interstate 81 and Route 37 Interchange Frederick County, Virginia Milepost 310*, November 16, 2006 (IMR). Two alternatives were discussed in the IMR:

- Alternative A, shown in Figure 3: A four leg, full clover leaf initially with collector distributor roads on I-81 and Route 37. Following discussions between VDOT and FHWA the collector distributor roads on Route 37 were dropped.
- Alternative B: A three level semi-directional interchange. This provides a better level of service but requires more land and has a higher construction cost.

Planning concentrated on Alternative A and it has now been approved. The interchange reconfiguration is to be achieved by a three phase process as follows:

Phase I. Phase I is shown in Figure 4. It relocates the ramp termini away from the Interstate 81 overpass, relocates the westbound to northbound ramp from Route 37 to US 11, and realigns Tasker Road. The phase also adds width to the I-81 off-ramps allowing for additional turning lanes and greater queuing areas. Similar improvements are proposed for Route 37.

Phase II. The precise nature of Phase II is to be determined. The IMR outlines three options. Two of these options would introduce temporary roadway elements that would be replaced in Phase III and create a partial clover leaf. The third option replaces the Route 37 structure above I-81 with a six lane section that provides storage for left turn movements. These improvements would be retained in Phase III.

Phase III. Phase III will complete the full clover leaf interchange in line with the conclusions of the 1998 Interstate 81 improvement study (See Figure 3). Tasker Road would be relocated approximately 1300 feet to the east and the intersection with Route 37 would be grade separated. Widening of Route 37 will also continue.

In addition, the CLRP calls for widening Interstate 81 to eight lanes (four general purpose lanes and four collector-distributor lanes) within the study area.

In the Win-Fred MPO's Vision Plan, Shady Elm Road is proposed to become an urban four-lane divided roadway including an interchange with Route 37. Shady Elm Road runs parallel to

Interstate 81, nearly a mile to the west of the interstate.

The local Vision Plan also calls for improvements to the Route 37 / US 11 interchange and for a new urban four-lane divided roadway called Warrior Drive parallel to and east of Interstate 81.

A list of planned improvements being considered as part of the “no build” network for this study is shown in Table 5 for year 2015 and in Table 6 for year 2035. Maps depicting these improvements are given in the Appendix.

Figure 3: Planned Interchange Improvements at I-81/Route 37 - Ultimate Configuration



Source: VDOT, Interchange Modification Report for Interstate 81 And Route 37 Interchange, Frederick County, Virginia, Milepost 310, February 16, 2007.

Figure 4: Planned Interchange Improvements at I-81/Route 37 - Phase I



Source: VDOT, *Interchange Modification Report for Interstate 81 And Route 37 Interchange, Frederick County, Virginia, Milepost 310*, February 16, 2007.

Table 5: Planned Improvements for “No Build” Network - Year 2015

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
1-19	City of Winchester				
2	2030	Hope Drive Ext	Wilson Blvd to Papermill Rd	0.2	Widen 2 to 3 Lanes (New Center Turn Lane)
3	2030	Papermill Road Relocation	Hope Drive to Pleasant Valley Rd	0.2	Widen 4 to 5 Lanes (New Center Turn Lane)
4	2008	Papermill Road	Taft Ave to S Weems Lane	0.2	Widen 2 to 5 Lanes (New Center Turn Lane)
20-49	Frederick County				
20	2008	Rte 277	I-81 to US Rte 522	1.3	Widen 2 to 5 Lanes (New Center Turn Lane)
25	2008	Greenwood Rd	Sulphur Springs Rd to US Rte 17/50	1.1	Realign and improve 2-lane Stretch: Upgrade FC
26	2008	Sulphur Springs Rd	US Rte 17/50 to Greenwood Rd	0.7	Widen to improve 2-lane Stretch: Upgrade FC
27	2030	Stephenson Village Blvd	US Rte 11 to Old Charles Town Road	2.5	New 4-lane Collector Roadway
28	2030	Old Charles Town Road	US Rte 11 to Proposed Stephenson Village Blvd	0.9	Widen 2 to 3 Lanes (New Center Turn Lane)
50-59	Regional				
60+	Winchester Model Technical Report (projects that cannot be found elsewhere)				(No detailed description in the report)
64	2030	Crosspointe Blvd			Widening
65	2030	Warrior Drive			Widen 4 to 6
67	2030	Route 50			Widen 2 to 5
69	2030	Valley Avenue	Tevis Street to Middle Road		Widen 2 to 5
70	2030	Papermill Road	Tevis Street to Featherbed Lane		Widen 2 to 5

Table 6: Planned Improvements for “No Build” Network - Year 2035

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
1-19	City of Winchester				
1	2030	Weems Lane	Roosevelt Blvd to US Rte 11	0.4	Widen 2 to 5 Lanes (New Center Turn Lane)
2	2030	Hope Drive Ext	Wilson Blvd to Papermill Rd	0.2	Widen 2 to 3 Lanes (New Center Turn Lane)
3	2030	Papermill Road Relocation	Hope Drive to Pleasant Valley Rd	0.2	Widen 4 to 5 Lanes (New Center Turn Lane)
4	2008	Papermill Road	Taft Ave to S Weems Lane	0.2	Widen 2 to 5 Lanes (New Center Turn Lane)
20-49	Frederick County				
20	2008	Rte 277	I-81 to US Rte 522	4.0	Widen 2 to 5 Lanes (New Center Turn Lane)
21	2030	Rte 37	I-81 (MP 310) to Rte 7	7.6	New 4-lane Limited Access Divided Highway
22	2030	Rte 37	Rte 7 to I-81 (MP 318)	5.0	New 4-lane Controlled Access Divided Highway
23	2030	Rte 37	I-81 (MP 310) to Rte 7	2.4	New 4-lane Limited Access Divided Highway
24	2030	Rte 37	Eastern Quadrant of Proposed Rte 37 Circumferential Rd	NA	New Interchanges at Warrior Drive, US Rte 522, US Rte 17/50, Senseny Rd, Rte 7, and existing Rte 37
25	2008	Greenwood Rd	Sulphur Springs Rd to US Rte 17/50	1.1	Realign and improve 2-lane Stretch: Upgrade FC
26	2008	Sulphur Springs Rd	US Rte 17/50 to Greenwood Rd	0.7	Widen to improve 2-lane Stretch: Upgrade FC
27	2030	Stephenson Village Blvd	US Rte 11 to Old Charles Town Road	2.5	New 4-lane Collector Roadway
28	2030	Old Charles Town Road	US Rte 11 to Proposed Stephenson Village Blvd	0.9	Widen 2 to 3 Lanes (New Center Turn Lane)
29	2030	Old Charles Town Road	Proposed Stephenson Village Blvd to Jordan Springs Rd	0.3	Realign and improve 2-lane Stretch: Upgrade FC
30	2030	Warrior Drive	Rte 277 to Opequon Creek	2.5	Widen 2 to 4 lanes
31	2008	Aylor Road	N/A	0.9	Major widening
32	2008	Aylor Road	N/A	0.9	Major widening
50-59	Regional				
50	2030	I-81	South MPO Boundary to MP 310	13.2	Widen from 4 to 6 lanes
51	2030	I-81	MP 310 to MP 313	3.0	Widen from 4 to 8 lanes with 6 lanes mainline and 2 parallel collector/distributor lanes
52	2030	I-81	MP 313 to North MPO Boundary	11.0	Widen from 4 to 6 lanes
53	2030	I-81	MP 318 (North side of Winchester)	NA	New interchange with new Rte 37
54	2030	I-81	MP 311 (Battale Drive)	NA	New interchange with Battale Drive
60+	Winchester Model Technical Report (projects that cannot be found elsewhere)				
61	2030	Channing Drive			New road
62	2030	Inverlee Way			New road
64	2030	Crosspointe Blvd			See Route 37 (Item 21)
65	2030	Warrior Drive			Widening See (Item 19)
67	2030	Route 50	West: Route 37 to Route 50. East: I-81 to Route 37		Rural 6 lane divided highway
69	2030	Valley Avenue	Tevis Street to Middle Road		Widen 2 to 5, yearopen=0
70	2030	Papermill Road	Tevis Street to Featherbed Lane		Widen 2 to 5, yearopen=0

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
A B C	Additional	(No detailed description in the report)			
	2030	Pleasant Valley Road Rte 37 Intersection	To Battaille Drive		Extension urban four lane roadway
	2030	Improvements and associated roadways	See plan		Various see plan
	2030	Stephen City Bypass	Fairfax Pike to Powder Horn lane		Urban 4 lane divided highway

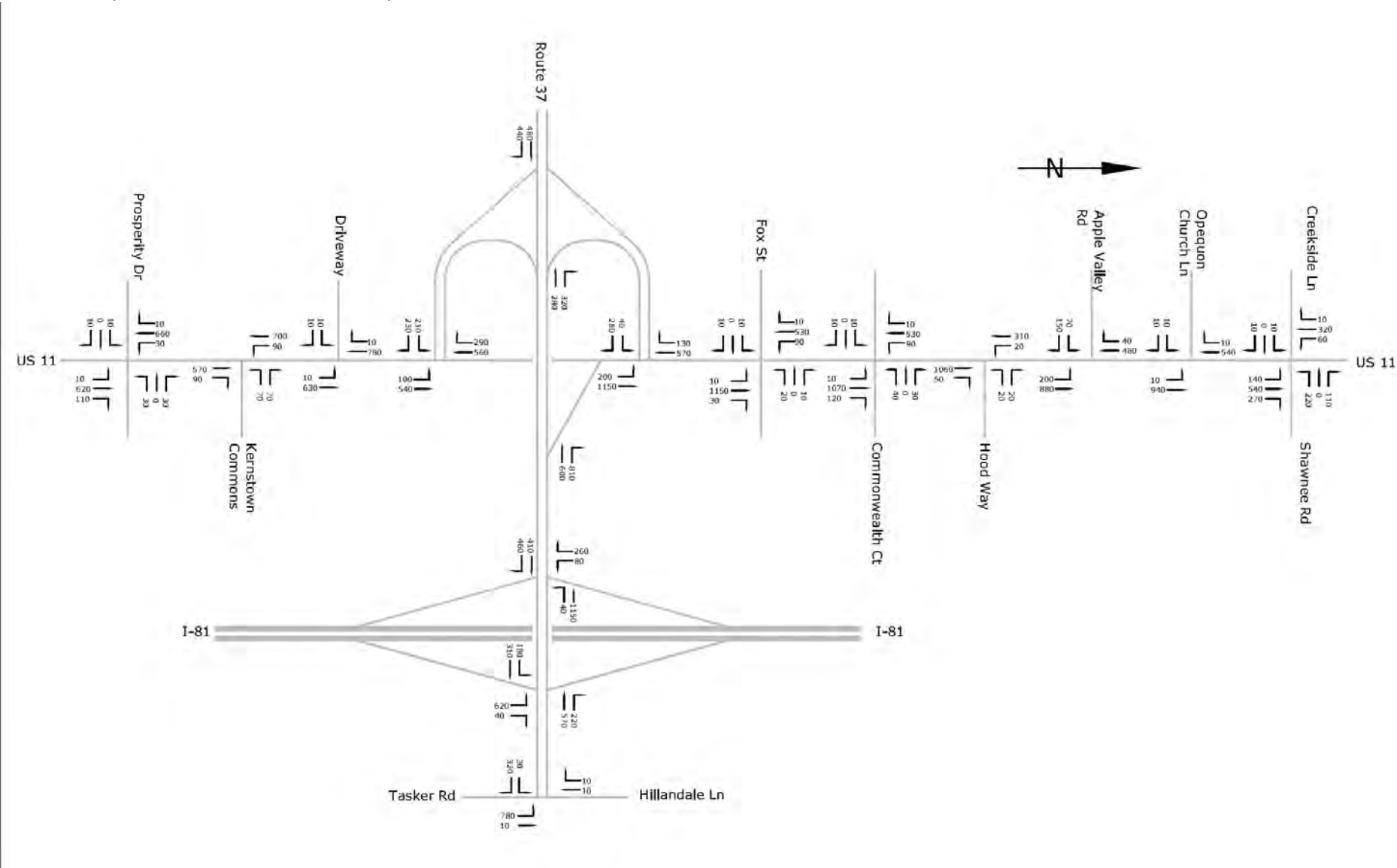
E. Next Steps

The next steps in this study are the following:

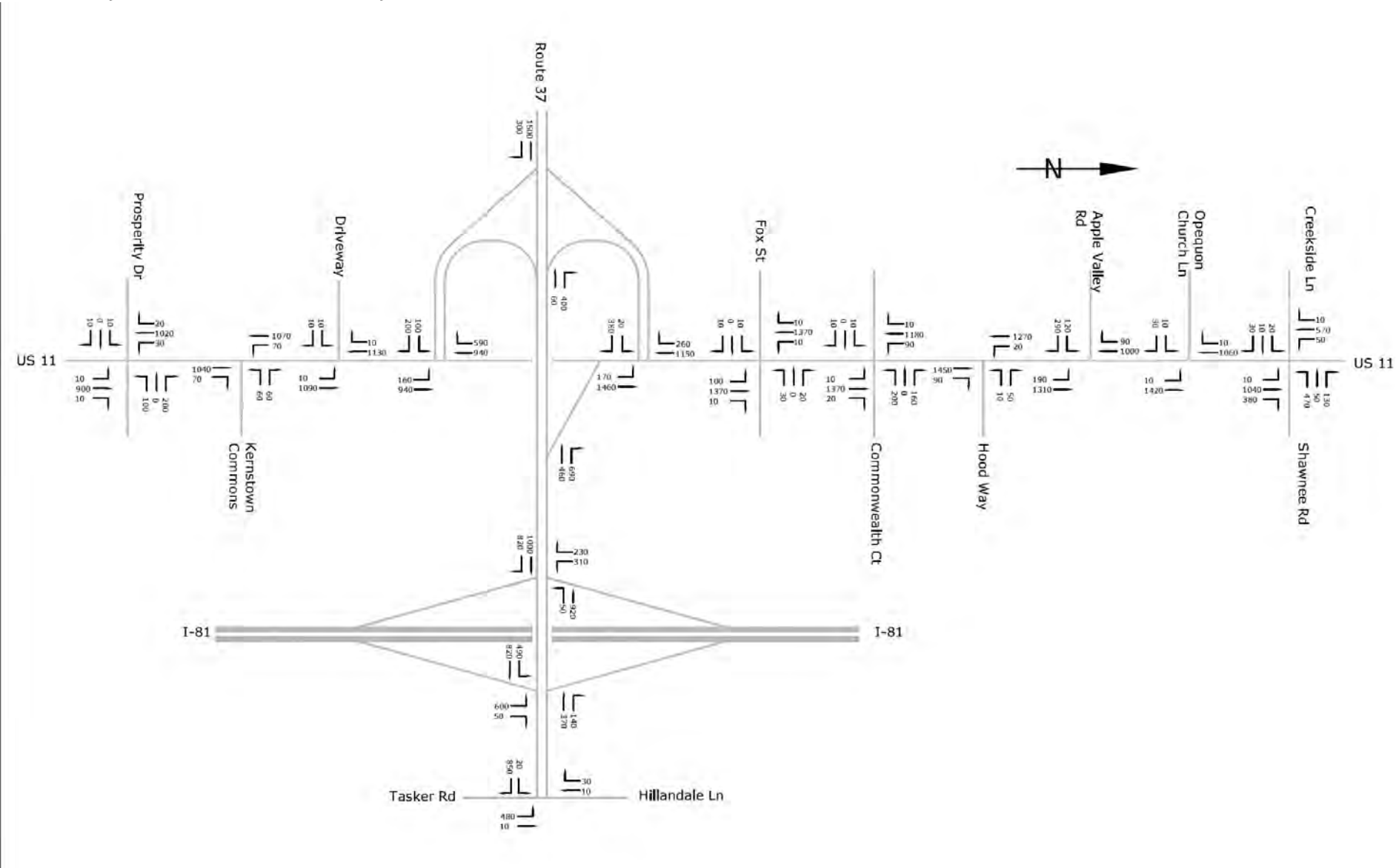
- Validate VDOT's travel demand forecast and refine the AM and PM peak hour forecast volumes for years 2015 and 2035.
- Assess the no-build scenario for 2015 and 2035 and develop up to three alternatives to improve traffic operations in the vicinity of the Route 37 / US 11 interchange and the Route 37 / Interstate 81 interchange.
- Evaluate the alternatives and develop recommendations.

F. Appendices

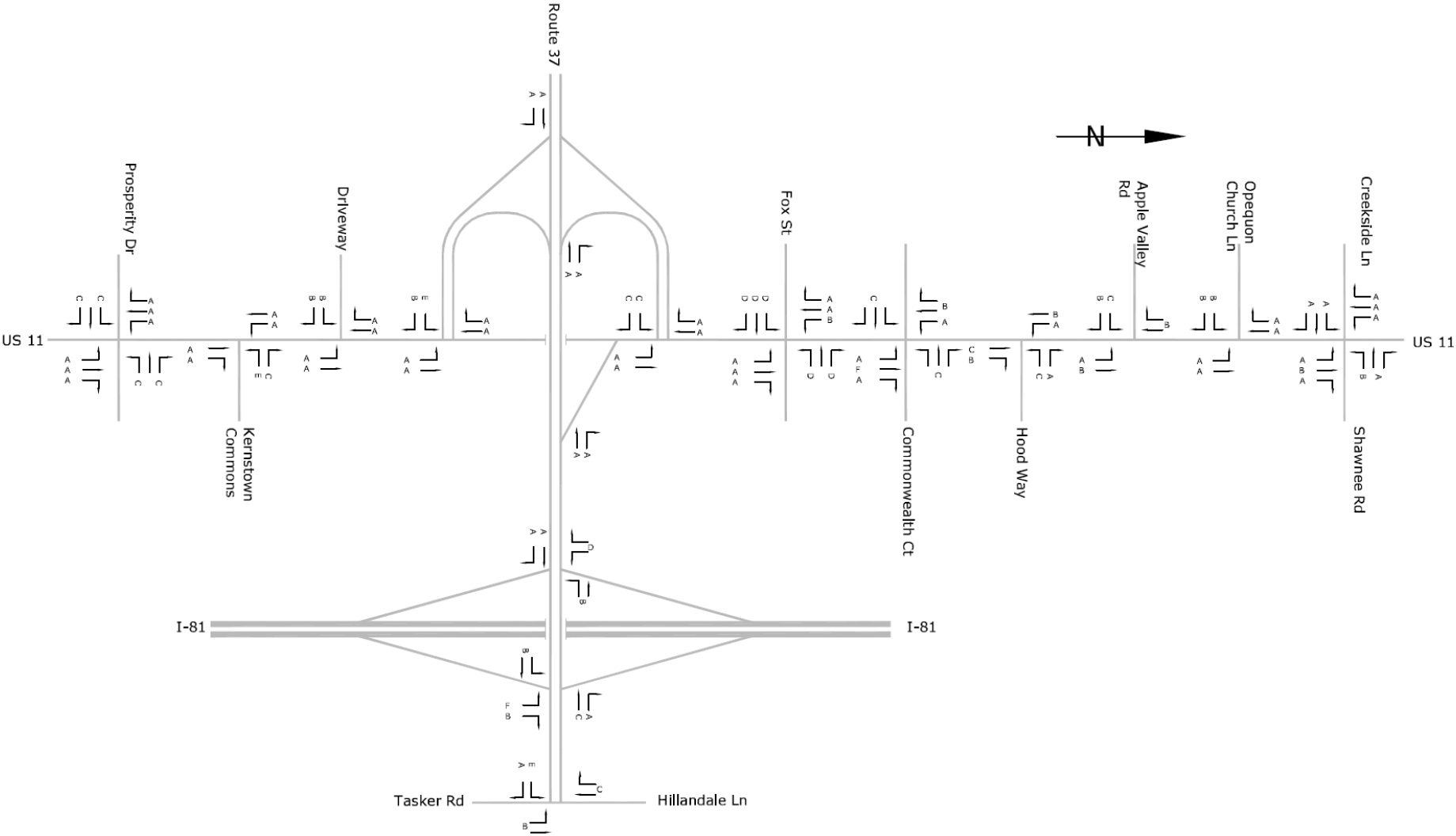
AM Existing (2007) Peak Hour Turning Movement Volumes



PM Existing (2007) Peak Hour Turning Movement Volumes



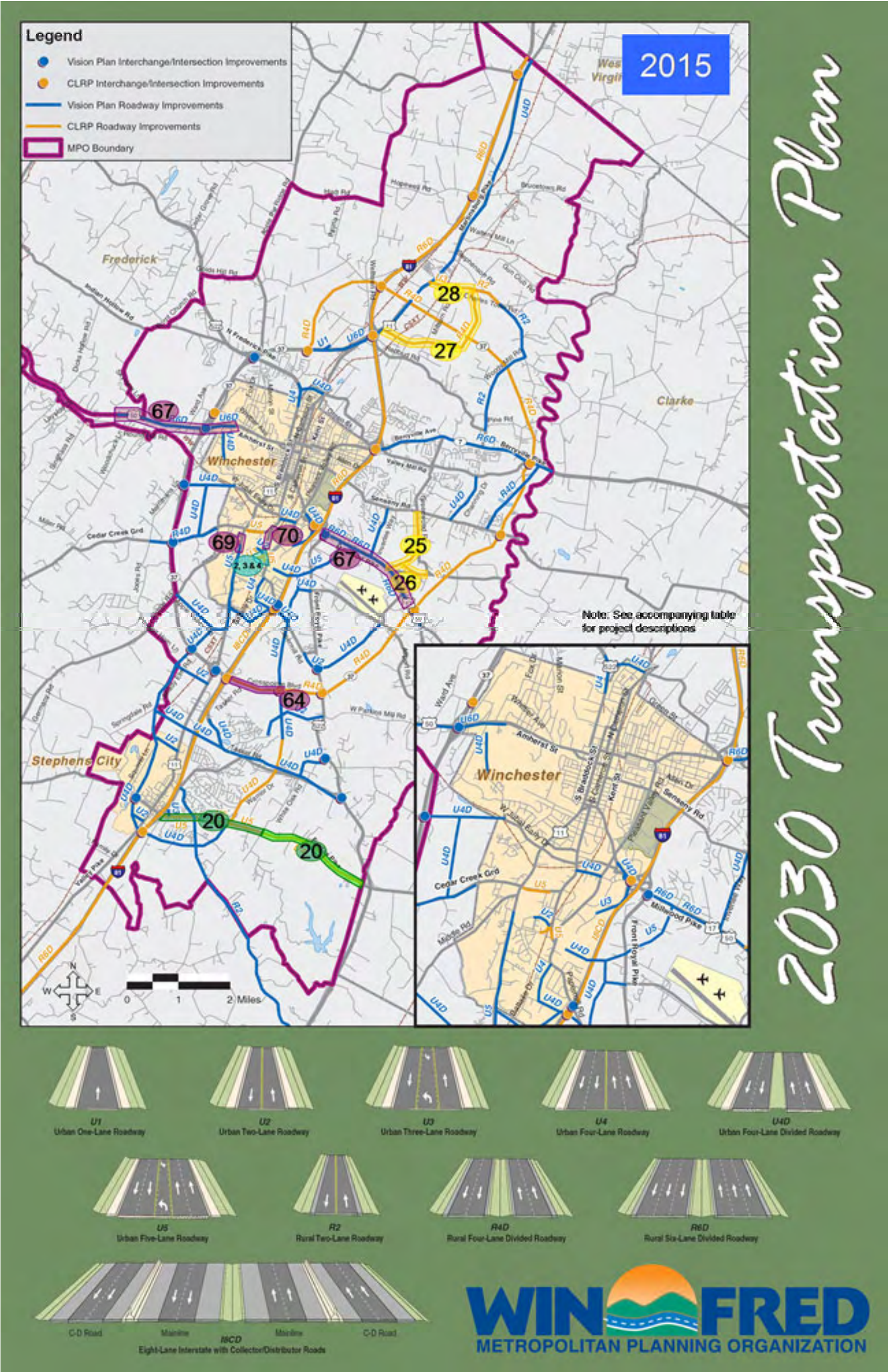
AM Existing (2007) Peak Hour Level of Service



Overall Intersection LOS is shown in Table 1

Overall Intersection LOS is shown in Table 1

Planned Improvements for “No Build” Network - Year 2015

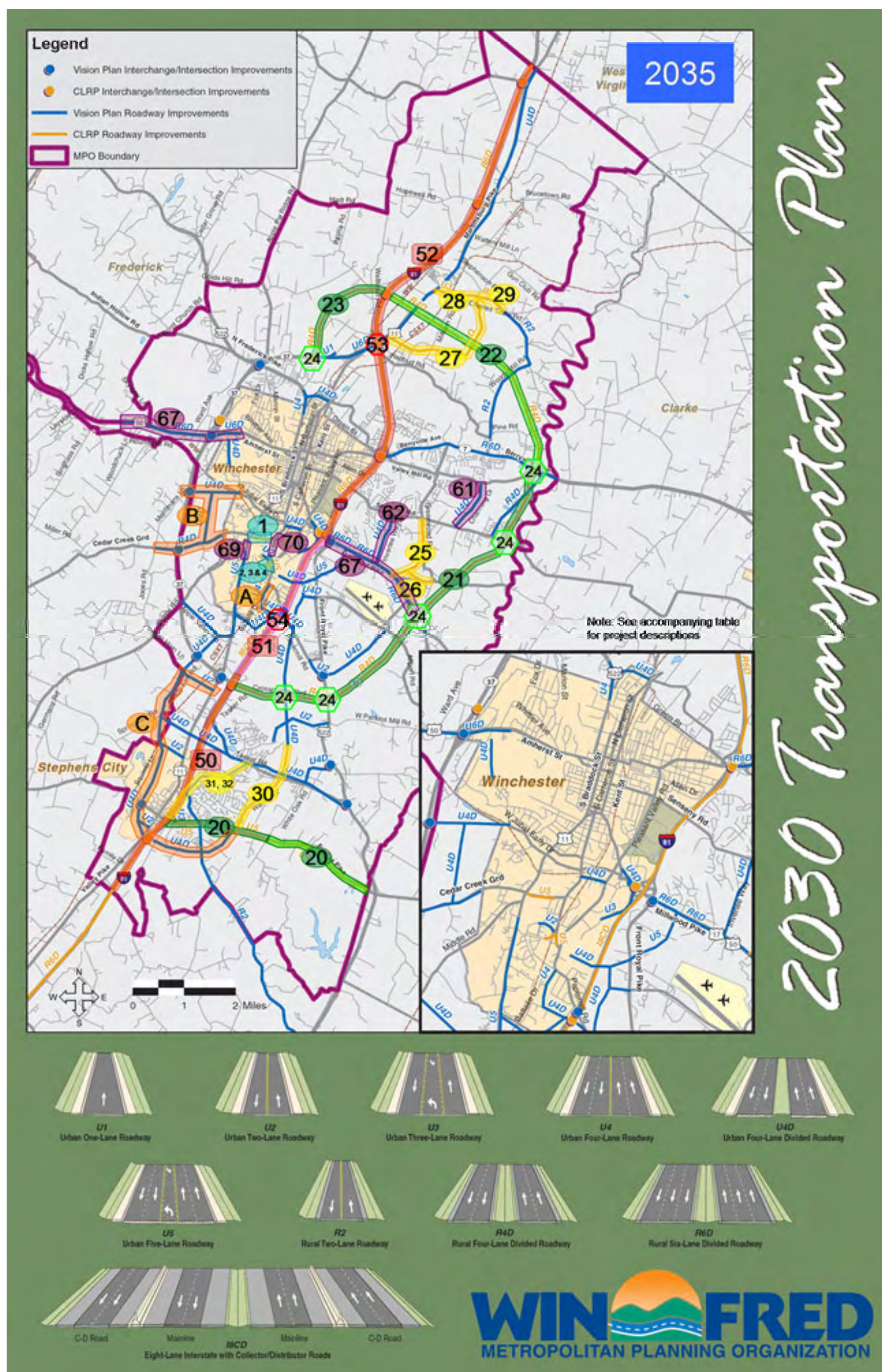


The numbers on the above graphic refer to Project IDs. These are described in the table below.

COPY of Table 5: Planned Improvements for “No Build” Network - Year 2015 (Page 11)

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
1-19	City of Winchester				
2	2030	Hope Drive Ext	Wilson Blvd to Papermill Rd	0.2	Widen 2 to 3 Lanes (New Center Turn Lane)
3	2030	Papermill Road Relocation	Hope Drive to Pleasant Valley Rd	0.2	Widen 4 to 5 Lanes (New Center Turn Lane)
4	2008	Papermill Road	Taft Ave to S Weems Lane	0.2	Widen 2 to 5 Lanes (New Center Turn Lane)
20-49	Frederick County				
20	2008	Rte 277	I-81 to US Rte 522	1.3	Widen 2 to 5 Lanes (New Center Turn Lane)
25	2008	Greenwood Rd	Sulphur Springs Rd to US Rte 17/50	1.1	Realign and improve 2-lane Stretch: Upgrade FC
26	2008	Sulphur Springs Rd	US Rte 17/50 to Greenwood Rd	0.7	Widen to improve 2-lane Stretch: Upgrade FC
27	2030	Stephenson Village Blvd	US Rte 11 to Old Charles Town Road	2.5	New 4-lane Collector Roadway
28	2030	Old Charles Town Road	US Rte 11 to Proposed Stephenson Village Blvd	0.9	Widen 2 to 3 Lanes (New Center Turn Lane)
50-59	Regional				
60+	Winchester Model Technical Report (projects that cannot be found elsewhere)				(No detailed description in the report)
64	2030	Crosspointe Blvd			Widening
65	2030	Warrior Drive			Widen 4 to 6
67	2030	Route 50			Widen 2 to 5
69	2030	Valley Avenue	Tevis Street to Middle Road		Widen 2 to 5
70	2030	Papermill Road	Tevis Street to Featherbed Lane		Widen 2 to 5

Planned Improvements for “No Build” Network - Year 2035



The numbers on the above graphic refer to Project IDs. These are described in the table below

COPY of Table 6: Planned Improvements for “No Build” Network - Year 2035 (Page 12 & 13)

Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
1-19	City of Winchester				
1	2030	Weems Lane	Roosevelt Blvd to US Rte 11	0.4	Widen 2 to 5 Lanes (New Center Turn Lane)
2	2030	Hope Drive Ext	Wilson Blvd to Papermill Rd	0.2	Widen 2 to 3 Lanes (New Center Turn Lane)
3	2030	Papermill Road Relocation	Hope Drive to Pleasant Valley Rd	0.2	Widen 4 to 5 Lanes (New Center Turn Lane)
4	2008	Papermill Road	Taft Ave to S Weems Lane	0.2	Widen 2 to 5 Lanes (New Center Turn Lane)
20-49	Frederick County				
20	2008	Rte 277	I-81 to US Rte 522	4.0	Widen 2 to 5 Lanes (New Center Turn Lane)
21	2030	Rte 37	I-81 (MP 310) to Rte 7	7.6	New 4-lane Limited Access Divided Highway
22	2030	Rte 37	Rte 7 to I-81 (MP 318)	5.0	New 4-lane Controlled Access Divided Highway
23	2030	Rte 37	I-81 (MP 310) to Rte 7	2.4	New 4-lane Limited Access Divided Highway
24	2030	Rte 37	Eastern Quadrant of Proposed Rte 37 Circumferential Rd	NA	New Interchanges at Warrior Drive, US Rte 522, US Rte 17/50, Senseny Rd, Rte 7, and existing Rte 37
25	2008	Greenwood Rd	Sulphur Springs Rd to US Rte 17/50	1.1	Realign and improve 2-lane Stretch: Upgrade FC
26	2008	Sulphur Springs Rd	US Rte 17/50 to Greenwood Rd	0.7	Widen to improve 2-lane Stretch: Upgrade FC
27	2030	Stephenson Village Blvd	US Rte 11 to Old Charles Town Road	2.5	New 4-lane Collector Roadway
28	2030	Old Charles Town Road	US Rte 11 to Proposed Stephenson Village Blvd	0.9	Widen 2 to 3 Lanes (New Center Turn Lane)
29	2030	Old Charles Town Road	Proposed Stephenson Village Blvd to Jordan Springs Rd	0.3	Realign and improve 2-lane Stretch: Upgrade FC
30	2030	Warrior Drive	Rte 277 to Opequon Creek	2.5	Widen 2 to 4 lanes
31	2008	Aylor Road	N/A	0.9	Major widening
32	2008	Aylor Road	N/A	0.9	Major widening
50-59	Regional				
50	2030	I-81	South MPO Boundary to MP 310	13.2	Widen from 4 to 6 lanes
51	2030	I-81	MP 310 to MP 313	3.0	Widen from 4 to 8 lanes with 6 lanes mainline and 2 parallel collector/distributor lanes
52	2030	I-81	MP 313 to North MPO Boundary	11.0	Widen from 4 to 6 lanes
53	2030	I-81	MP 318 (North side of Winchester)	NA	New interchange with new Rte 37
54	2030	I-81	MP 311 (Battale Drive)	NA	New interchange with Battale Drive
60+	Winchester Model Technical Report (projects that cannot be found elsewhere)				
61	2030	Channing Drive			New road
62	2030	Inverlee Way			New road
64	2030	Crosspointe Blvd			See Route 37 (Item 21)
65	2030	Warrior Drive			Widening See (Item 19)
67	2030	Route 50	West: Route 37 to Route 50. East: I-81 to Route 37		Rural 6 lane divided highway
69	2030	Valley Avenue	Tevis Street to Middle Road		Widen 2 to 5, yearopen=0
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Project ID	YEAR OF OPERATION	FACILITY	LIMITS	Length	DESCRIPTION
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	2030	Pleasant Valley Road Rte 37 Intersection	To Battaille Drive		Extension urban four lane roadway
	2030	Improvements and associated roadways	See plan		Various see plan
	2030	Stephen City Bypass	Fairfax Pike to Powder Horn lane		Urban 4 lane divided highway