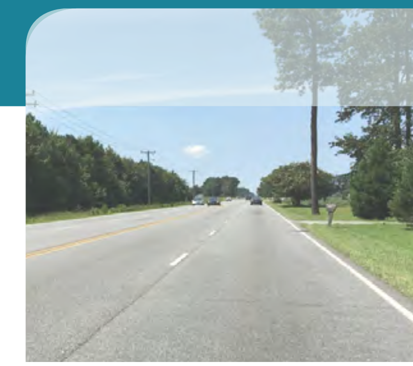
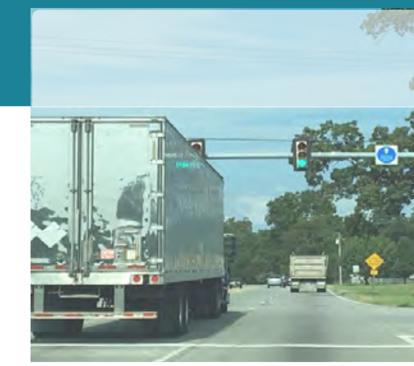
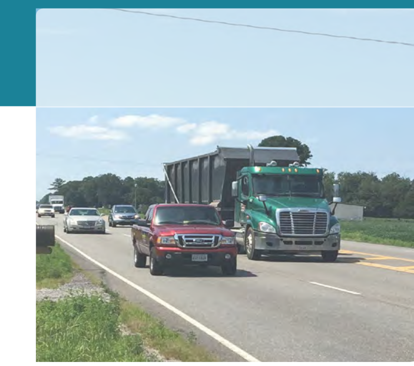
Route 460







Safety and Operations Study

July 2018

VDOT
Virginia Department of Transportation

vhb

Acknowledgments

This plan was produced by

VHB

for

Virginia Department of Transportation (VDOT)

Table of Contents

List of Figures

List of Tables

Definition of Terms

Crossover - a break in the landscaped or concrete median.

*KAB Crashe*s - Fatal and severe crashes as noted by the KABCO scale: K = fatal crash; A = incapacitating injury; B = non-incapacitating injury; C = possible injury; and O = no injury.

MUTCD – Manual on Uniform Traffic Control Devices for Streets and Highways. Published by the Federal Highway Administration (FHWA) to provide standardization of traffic control devices throughout the United States. Compliance with the MUTCD helps promote safe, orderly and efficient movement of traffic.

PSI – Potential for Safety Improvement. A statistical measurement providing an indication of where crashes may be reduced with intersection/corridor improvements or upgrades. It is the difference between expected crashes and actual crashes.

Roadway Departure - a crash where the vehicle ran off the road either to the right or to the left.

Safety Edge – a sloped pavement edge to the ground to aid vehicle recovery from a roadway departure.

Vehicle Miles Traveled (VMT) - The number of miles collectively traveled by all vehicles on a specific stretch of roadway for one year.

Sources

American Association of State Highway and Transportation Officials. Highway Safety Manual. U.S. Department of Transportation, Federal Highway Administration.

Federal Highway Administration. Crash Modification Clearinghouse. http://www.cmfclearinghouse.org/. Federal Highway Administration.

Federal Highway Administration Office of Safety. Integrating the HSM into the Highway Project Development Process. U.S. Department of Transportation, Federal Highway Administration.

Federal Highway Administration Office of Safety. Systemic Safety Project Selection Tool. U.S. Department of Transportation, Federal Highway Administration.

Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition with Revision Numbers 1 and 2 incorporated, dated May 2012. U.S. Department of Transportation.

Virginia Department of Transportation. Corridors of Statewide Significance Corridor Safety Assessment Process Guidelines. Commonwealth of Virginia.

Virginia Department of Transportation. Road Design Manual. Commonwealth of Virginia.

Virginia Department of Transportation. Traffic Operations and Safety Analysis Manual. Commonwealth of Virginia.

GIS Data:

Speed limit data was based on information on the VDOT website: http://virginiaroads.org/Mapping/#SpeedZones and field review of speed limit signs.

GIS lighting, signs and traffic signals received from VDOT.

Crash records provided by VDOT (2012-2016).

Base map data and graphics throughout this report were created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license.

Operational Analysis:

Existing signal timings received from City of Suffolk and VDOT.

Turning movement counts were conducted by VHB on Tuesday, May 16 and Thursday, May 18, 2017.

Trafficware, LLC. (2017). Synchro Studio 9 User Guide. Sugar Land, TX.

This page intentionally left blank.

Executive Summary

This page intentionally left blank.

The Virginia Department of Transportation (VDOT) identified the need to evaluate the Route 460 corridor for improved transportation safety and operations within the City of Suffolk and Isle of Wight County. The project corridor spans from 1,500 feet west of the Route 58 and Route 460 interchange to the eastern Town of Windsor limits. This report documents the findings of the safety and operational analyses and presents the final recommendations and plan of action for the corridor. The goal of the study was to identify and develop a plan of low-cost improvements that VDOT can implement to make Route 460 a safer transportation facility.

E.1 Operational Analysis and Recommendation

As part of the study, an operational analysis of signalized and key unsignalized intersections along the project corridor was conducted. The evaluation examined existing conditions, 2040 No Build and 2040 Build conditions. Additionally, a signal warrant screening was conducted at the Old Suffolk Road and Route 460 intersection in order to determine if a signal may be warranted at that intersection. The results of the operational analysis, combined with the safety analysis guided site-specific operational recommendations. The operational recommendations included changes to signal timings and phasing, the implementation of flashing yellow arrow signals for protected/permissive movements, and lane use changes that result in changes to signal phasing.

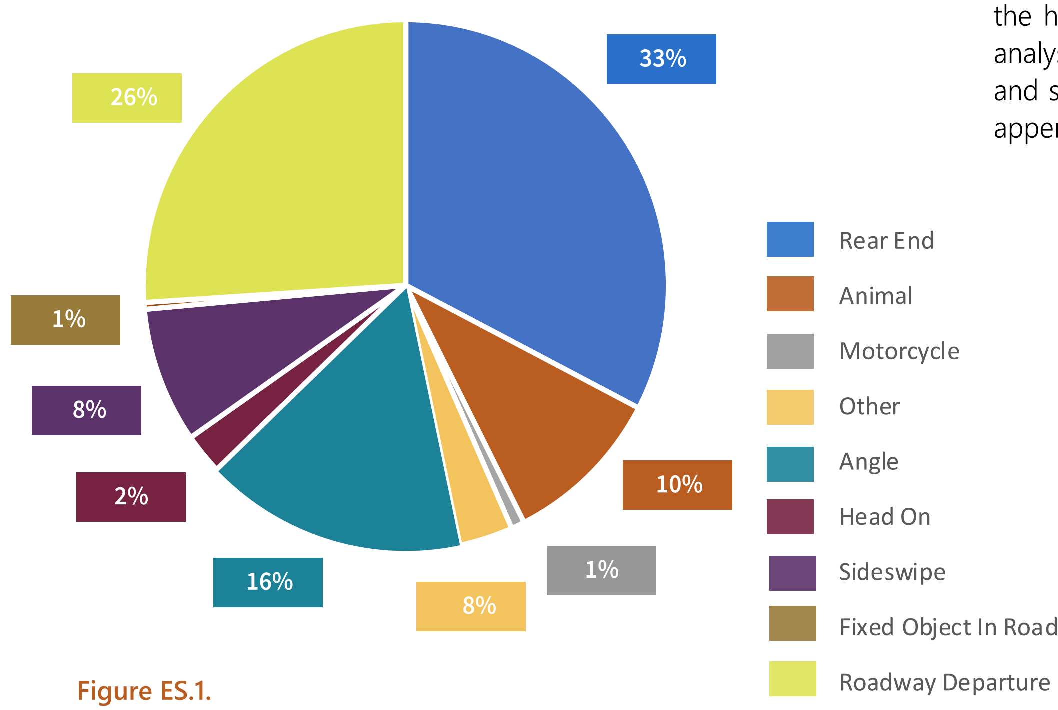


Figure ES.1.
Crash Type Distribution.

E.2 Recommendations and Action Plan

The study utilized five years of crash data (2012 – 2016) to assess the current safety of the Route 460 corridor in accordance with the Corridor Safety Assessment (CSA) Process Guideline prepared for Corridors of Statewide Significance (CoSS). The data set included 242 crash records categorized as roadway departure, crash with an animal, angle, rear end, sideswipe or other. The distribution by crash type is shown in Figure ES.1.

The data was processed from multiple perspectives to provide the most comprehensive evaluation of the roadway conditions. The results were used to prepare a set of countermeasures which can predictively produce facilities with reduced crash rates after implementation when referencing the Federal Highway Administration's (FHWA) Crash Modification Factors Clearinghouse (http://www.cmfclearinghouse.org).

The safety techniques can be organized into three categories. The three categories, and example measures, are described below:

- Positive guidance and recovery measures – widening shoulders, installing safety edge, and enhancing roadway delineation and lighting where needed.
- Unsignalized intersection measures – construction of turn lanes at select intersections, installing intersection warning signs, and speed enforcement.
- Signalized intersection measures – installing high visibility signal backplates, installing intersection warning signs and lane control markings, installing overhead lane use signs, and speed enforcement.

The countermeasures were assigned throughout the Route 460 corridor through the hybrid approach of addressing crash history and potential crash risk. The analysis led to a series of recommendations which emerged from both systemic and site specific evaluations. All details can be found in the full document and appendices.

This page intentionally left blank.

chapter

1

Introduction

Figure 1.1
Study Area.

VDOT has been working to improve Route 460 within Hampton Roads for decades. There was a proposed widening project along this segment that would have provided a divided four-lane highway. While this project was not funded, VDOT saw there was a need to address safety concerns along Route 460 with low-cost easily implementable solutions.

Based on known safety concerns and changes in traffic on Route 460, VDOT requested that VHB assess the current safety and operational conditions of the corridor. At the conclusion of the assessment, VHB was to determine modifications that would improve safety and operations for personal and commercial traffic. This report documents the findings of the study and presents the following: operational analysis, systemic analysis of intersections and corridor segments, intersection assessment, site specific location evaluation, arterial preservation, evacuation assessment, and recommendations.

1.1 Study Area

The study area is along the Route 460 corridor. The study area begins approximately 1,500 feet west of Route 460 and U.S. Route 58 interchange and extends to the eastern limits of the Town of Windsor, a distance of approximately 6.6 miles. Regionally, Route 460 is a principal east – west corridor linking Norfolk to Petersburg. Within the study area, Route 460 traverses Suffolk and Isle of Wight County.

It should be noted that the original study limits included the Town of Windsor. However, improvements within the Town limits would require substantial right of way impacts and costs for major reconstruction. Based on the initial analysis of traffic data, the crashes that have occurred in the higher speed sections of the corridor resulted in a greater number of persons being injured. As such, the limits of the study were revised to the eastern Town of Windsor limits.

Route 460 has a dual purpose, serving as a "main street" for local residents and also a popular alternative commercial trucking route, in lieu of Interstate 64. Route 460 is a four-lane, undivided highway with uncontrolled access. Speed limits vary from 35 miles per hour (MPH) to 55 MPH.

1.2 Study Team and Coordination

The Study Team includes local and regional staff from VDOT and VHB. A team of Project Stakeholders augments the Study Team to guide the consultant through the duration of the study, review all technical documents, and provide direct input on recommendations. The Stakeholders include representatives from VDOT's Hampton Roads District, in addition to representatives from City of Suffolk, Isle of Wight, Town of Windsor and Hampton Roads Transportation Planning Organization (HRTPO). The Project Stakeholders met at critical decision points throughout project development.

1.3 Study Goals and Coordination

Specific goals and objectives were developed at the outset based on field reviews of the corridor, information received during the initial scoping process, and input from the initial stakeholder meeting. The goal of the study was to set forth a set of tiered recommendations of signs, pavement markings, geometric changes, traffic control techniques and other improvements to enhance safety and operations of the Route 460 corridor. The recommendations were developed through an evaluation of traffic operations and crash history by proactively applying templates of proven safety techniques in combination with site specific measures that have proven safety results.

The objectives in comprehensively assessing the safety of the corridors are as follows:

- Conduct a field review, inventory, and evaluation of existing conditions.
- Identify corridor users, roadway characteristics, and key issues affecting travel along the corridor.
- Synthesize background, traffic operations, and crash data.
- Develop recommendations that address safety concerns and operational issues.
- Provide planning level cost estimates for associated study recommendations.

This report provides the documentation of the study, results, and recommendations. It is generally organized by existing conditions, operational analysis, systemic evaluation, site specific location evaluation, arterial preservation and evacuation assessment, and recommendations.

This page intentionally left blank.

chapter

2

Methodology

This page intentionally left blank.

2.1 Study Methodology

The study follows VDOT's Corridor Safety Assessment (CSA) Process Guideline prepared for Corridors of Statewide Significance (CoSS). The CSA process is a systemic approach to proactively reduce potential crashes using a series of templates with tiered application for various geometric conditions. The methodology for this study is based on the layered nine step CSA process, see Figure 2.1. The final recommendations are a product of the systemic analysis, field review and observations, and the site specific location evaluation.

Five-year (2012-2016) crash data was used to measure current crash trends and develop site specific improvements to achieve a reduction in the number of crashes or the severity of crashes. The existing field conditions were documented through a field assessment and the database inventory of existing roadway attributes. Signals, pavement condition, pavement markings, and stormwater collection and drainage were the most thoroughly documented attributes, as the scope of this study did not include an asset inventory.

Figure 2.1.
Study Process.

VHB took a hybrid approach to evaluating the corridor using a process that was created by VHB for VDOT's CSA (see Figure 2.2), whereby systemic and site specific approaches were combined to comprehensively review the Route 460 corridor. With this approach, VHB utilized systemic countermeasure packages developed for the improvements as needed. The VDOT approved CoSS templates were modified to be specific to Route 460 and were used to identify up to three tiers of countermeasure treatments to enhance safety. The templates are provided in Appendix A. The findings of the systemic analysis are documented in Chapter 4.

As part of this study, a portion of the recommendations were analyzed using the VDOT Extended Highway Safety Manual (HSM) Part C Spreadsheets to predict the crashes on the corridor. Results are provided in Chapter 4.

GIS mapping tools and crash data analysis for a five-year period were used to identify specific areas of concern or locations that have a potential for safety improvement. A more in-depth review was conducted at 11 site specific locations which are described in detail in Chapter 5.

Through the public involvement process, the citizens in the City of Suffolk and Isle of Wight County expressed concern on two major elements of the corridors: turning lanes and the lack of shoulders. The results and recommendations are discussed in Chapter 6.

2.2 Systemic Analysis Process

The following items are detailed in the study report:

- Recommended upgrades of traffic control devices;
- Recommended systemic countermeasure packages to address identified intersections and corridor segments; and,
- Recommended site specific improvements for 11 locations along the corridor.

2.3 Public Involvement

This study relied heavily on the crash data to guide analysts to the site specific locations, to perform the systemic evaluation, and to apply the appropriate templates; nonetheless, there is always value in hearing citizens' perspectives and concerns. Crash history is a documentation of events, but does not capture the daily experience of the local community. The key components of the public involvement for this study were:

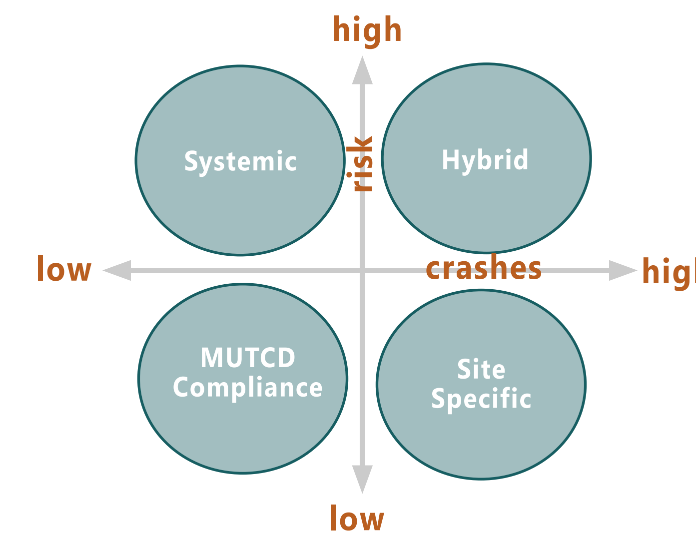


Figure 2.2.
Systemic Analysis Process.

- Initial Scoping Meetings;
- Coordination with Elected Officials and Key Stakeholders; and
- Citizen Information Meetings.

Scoping meetings relied on the collaboration between VDOT Hampton Roads District, City of Suffolk, Isle of Wight, and Hampton Roads Transportation Planning Organization (HRTPO) to define and refine the scope of the study. This process allowed the team to identify other areas or items for consideration and evaluation.

Additionally, four Citizen Information Meetings (CIM) were held; two during the initial investigation phase and two at the final stage. During each phase, one meeting was held in the City of Suffolk and one meeting in the Town of Windsor. Citizen comments were solicited during the CIM#1, held on October 18, 2017 at the Kings Folk Middle School, and CIM#2, held on October 19, 2017 at the Windsor High School. Two follow up meetings, CIM#3 and CIM#4, were held on February 20, 2018 and February 22, 2018, respectively at the same locations to report on analysis results and potential countermeasures which would be in the recommendations.

CIM#1 and CIM#2 included boards displayed for viewing, a continuous loop video of the corridor, and study team representatives engaged in conversation with citizens on their experiences along the corridors. A handout was provided for capturing comments which could be mailed in and was made available electronically after the meeting. The comment period was open until October 30, 2017.

Ten citizens provided comments (see Appendix B). Of the 14 locations that citizens could comment on, Locations #3, 8, and 11 received the majority of comments. Six comments referenced widening the existing roadway or installing turning lanes. Traffic volume, lack of proper shoulders, and lack of medians made up 3 comments. One citizen commented on how Location #3 needed an advanced warning signal to try and combat observed red-light running.

The comments received were reviewed during the analysis of the corridors and then again after the recommendations were developed. The review was performed to ensure the concerns were taken into consideration during the study.

Two follow-up meetings, CIM#3 which was held on February 20, 2018 at Windsor High School, and CIM#4 which was held on February 22, 2018 at the Kings Fork Middle School, as an update on the progress of the study. The study presentation provided an overview of the study process, some of the countermeasures which were in the recommendations, and the schedule. Additional comments were received and reviewed to ensure concerns were taken into consideration in the report.

2.4 Crash Modification Factors

A crash modification factor (CMF) is a factor, based on documented safety research studies, used to compute the expected number of crashes after implementing a given countermeasure at a specific site. CMFs provide some indication of the potential benefit, or lack thereof, associated with specific countermeasures. The Federal Highway Administration (FHWA) compiles CMF data from published safety studies and posts them in the CMF Clearinghouse (http://www.cmfclearinghouse.org/index.cfm) to help practitioners select the most effective safety treatments. While CMF data is not available for all potential countermeasures, the CMF Clearinghouse provides a useful and consolidated source of data to help engineers, planners, and project owners make informed decisions.

There are many countermeasure techniques recommended in this study and only some of them have CMFs associated with them. Table 2.1, below, is a sample of the techniques and the corresponding CMFs used in the study.

How do CMF's work?

CMFs are a multiplicative factor that can be used to estimate the number of crashes with implementation of the selected countermeasure. The following equation can be used to calculate the estimated crashes with the treatment:

$$\left(\begin{array}{c}\text{Estimated Crashes}\\\text{WITH Treatment}\end{array}\right) = \left(\text{CMF}\right) \times \left(\begin{array}{c}\text{Estimated Crashes}\\\text{WITHOUT Treatment}\end{array}\right)$$

Example:

A location had 10 crashes per year during the study period. The countermeasure has a CMF of 0.8, meaning according to research, this countermeasure may provide a 20% reduction in crashes. Therefore, the expected crashes after implementation of the countermeasure is 8 crashes per year.

$$\left(\text{Expected crashes}\right) = \left(0.8\right) \times \left(\begin{array}{c}\text{10 crashes}\\\text{per year}\end{array}\right) = \left(\begin{array}{c}\text{8 crashes per year}\\\text{after implementation}\end{array}\right)$$

Table 2.1.
Crash Modification Factors.

Countermeasure	CMF	Notes	Source
Install shoulder rumble strips	0.82 (18% reduction)	Roadway Departures - all severities	CMF Clearinghouse
Install center line rumble strips	0.82 (18% reduction)	All Crashes - fatal, serious injury	CMF Clearinghouse
Widen shoulder (paved) (from 2 to 4 ft)	0.89 (11% reduction)	All Crashes - all severities	CMF Clearinghouse
Installation of safety edge treatment	0.85 - 1.00 (0 - 15% reduction)	All Crashes - all severities	CMF Clearinghouse
Add dynamic intersection warning signs	0.814-0.918 (8.2%-18.6% reduction)	All Crashes - all severities	CMF Clearinghouse
Intersection lighting	0.881 - 0.92 (8 - 11.9% reduction)	Nighttime crashes - all severities	CMF Clearinghouse
Directional medians to allow left-turns and u-turns	0.77 (23% reduction)	All Crashes - all severities	CMF Clearinghouse
Replace a direct left turn with a right-turn/u-turn[1] (RCUT Intersection)	0.8 (20% reduction)	All Crashes - all severities	CMF Clearinghouse
Provide a right-turn lane on one major road approach	0.86 - 0.92 (8 - 14% reduction)	All Crashes - all severities	CMF Clearinghouse
Corridor Access Management	0.77 - 0.95 (5 - 23% reduction)		FHWA Proven Countermeasures

[1]RCUT: Restricted Crossing U-Turn (RCUT) Intersection.

chapter

3

Operational Analysis

This page intentionally left blank.

Figure 3.1
Existing Lane Configuration.

As part of the Route 460 Study, VDOT requested an analysis of the operational conditions along the corridor to determine areas for improved operations. This evaluation examined the existing, 2040 No Build and 2040 Build conditions. Additionally, the analysis included a high-level signal warrant screening at the intersection of Old Suffolk Road and Route 460.

As part of this analysis, existing turning movement counts were conducted at identified signalized and unsignalized intersections. Those volumes along with existing signal timings and lane geometry were utilized to analyze the existing conditions. Growth rates that were developed from VDOT's regional traffic model were utilized to project the volumes for the 2040 No Build and Build analyses. Intersections with poor level of service, or information gathered from community meetings and safety analysis helped guide the improvements that were tested in the 2040 Build analysis. The following section details the operational analysis and results.

3.1 Existing Conditions

The preparation of operational analysis required a thorough understanding of the existing roadway conditions at the subject intersections. Elements incorporated into the baseline analysis include roadway lane geometry, shown in Figure 3.1, and hourly traffic volumes.

Traffic around the site includes trucks, passenger vehicles, buses and service vehicles as well as emergency response vehicles. Based on the 2016 Annual Daily Traffic (AADT) data available on the Virginia Department of Transportation (VDOT) web site, 20,000-27,000 vehicles per day travel through the study corridor.

3.1.1 2017 Existing Traffic Counts

VHB collected peak hour traffic counts at all study intersections on Tuesday May 16th and on Thursday, May 18, 2017. In addition, 14-hour turning movements counts were taken on Thursday, May 18th, 2017 at the intersection of Route 460/Windsor Boulevard & Old Suffolk Road. These 14-hour counts were required for a signal warrant screening. As a part of the turning movement counts, pedestrian volumes were also recorded at the subject intersections. Pedestrian traffic was light and most intersections did not have any pedestrian volumes. Detailed count data is provided in Appendix C.

The turning movement traffic counts indicate that there are distinct hours during the weekday when traffic experiences its highest levels at the subject intersections. Based on the traffic count data the peak hours for the observed signalized intersections were identified as shown in Table 3.1.

Despite the variation in peak hours shown in Table 3.1, the AM and PM peak hours were assumed to be consistent along the corridor for the analysis. Therefore the peak hour volume for each intersection was used in the analysis in order to be conservative.

Table 3.1.
Summary of Intersection Peak Hours.

ID	Intersection	AM Peak	PM Peak
1	Route 460 & Northfield Drive	7:15-8:15	4:30-5:30
2	Route 460 & Rob's Drive	7:30-8:30	4:45-5:45
3	Route 460 & Kings Fork Road	7:15-8:15	4:45-5:45
4	Route 460 & Providence Road/Lake Prince Drive	7:00-8:00	4:45-5:45
5	Route 460 Woodlawn Drive	6:45-7:45	4:45-5:45
6	Route 460 & Old Suffolk Road	6:15-7:15	4:45-5:45
7	Route 460 & Dominion Way	6:30-7:30	4:30-5:30

A summary AM and PM peak hour turning movement volumes at each of the intersections in the study network is presented on Figure 3.4.

The posted speed limit on Route 460 along the study corridor ranges between 45 and 55 MPH. There is a school zone speed limit at both westbound and eastbound approaches to Rob's Drive, where the school zone speed limit is 35 MPH during morning and evening drop off hours. The speed limit of 35 MPH at these approaches was used in this analysis since the drop off times fall into actual AM and PM peak hours.

3.1.2 Methodology

Capacity analyses were performed to determine the existing level-of-service (LOS) for the AM and PM peak hours for the study intersections.

Capacity analysis results are expressed in terms of LOS. LOS is a qualitative measurement of traffic operations. It is translated from a measure of delay to drivers in units of time, seconds per vehicle. The Transportation Research Board's (TRB's) Highway Capacity Manual (HCM) defines six levels of service for intersections with LOS "A" representing operating conditions with minimal constraints on traffic movements and LOS "F" representing extremely congested operating conditions. Exhibit 18-4 of the HCM gives the criteria for signal controlled intersections, while HCM Exhibit 19-1 gives the criteria for unsignalized intersections.

As mentioned earlier, levels of service results range from LOS A being the best to LOS F being the worst. LOS D is typically used as the acceptable LOS threshold for many states and cities, including the Commonwealth of Virginia and the City of Suffolk. Sometimes LOS E and F are accepted in certain highly urbanized and constrained areas.

Signalized Level of Service	Signal Delay per Vehicle (sec/veh)
A	≤ 10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	> 80.0

Figure 3.2
HCM Exhibit 18-4: Level of Service Criteria

Unsignalized Level of Service	Stopped Delay per Vehicle (sec/veh)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

Figure 3.3
HCM Exhibit 19-1: Level of Service Criteria

The analysis was performed in accordance with the VDOT requirements and guidelines provided in the Traffic Operations and Safety Analysis Manual (TOSAM). The TOSAM provides consistent and uniform direction and guidance for scoping, conducting, and reporting traffic and safety analyses in the state of Virginia. Synchro 9.1 was the software tool used for analysis determining the delay, capacity and corresponding LOS of the study intersections. The existing LOS capacity analyses were based on: (1) the existing lane use and traffic controls shown on Figure 3.1; (2) the existing AM and PM traffic volumes presented in Figure 3.4; and (3) the HCM methodologies (using Synchro 9.1 software).

LOS results summary for existing conditions are presented in Table 3.2 below. Based on the existing conditions analysis, all intersections in the study area operate acceptably at a LOS A, B, and C.

Table 3.2.
2017 Existing Conditions Level of Service Results Summary.

ID	Intersection Name	Control	Existing	
			AM	PM
1	Route 460/Pruden Boulevard & Northfield Drive	Signalized	A (SB-C)	B (SB-D)
2	Route 460/Pruden Boulevard & Rob's Drive	Signalized	B (SB-D)	B (SB-D)
3	Route 460/Pruden Boulevard & Kings Fork Road	Signalized	C (SB-F)	C (SB-E)
4	Route 460/Pruden Boulevard&Providence Road/Lake Prince Drive	Signalized	B (SB-C)	B (NB-C)
5	Route 460/Pruden Boulevard/Woodlawn Drive	Unsignalized	(NB-C)	(NB-B)
6	Route 460/Windsor Boulevard & Old Suffolk Rd	Unsignalized	(SB-C)	(NB-C)
7	Route 460/Windsor Boulevard & Dominion Way	Signalized	A (NB-C)	A (NB-C)

Legend: X - Overall Level of Service, (XX-X) - Worst Approach-Worst Approach Level of Service

Details on the expected delays at each approach in the study corridor are shown in Table D.2 in Appendix D. The Synchro reports for the 2017 Existing conditions scenario are also included in Appendix D.

The analysis showed that all intersections operate at acceptable LOS C or better in both the AM and PM peak hours. However, even though the intersection of Route 460 and Kings Fork Road is currently operating under LOS C during both AM and PM peak hours, the southbound approach is operating at LOS F with 116 seconds of delay per vehicle (sec/veh) during AM peak hour and at LOS E with 64 sec/veh of delay during PM peak hour.

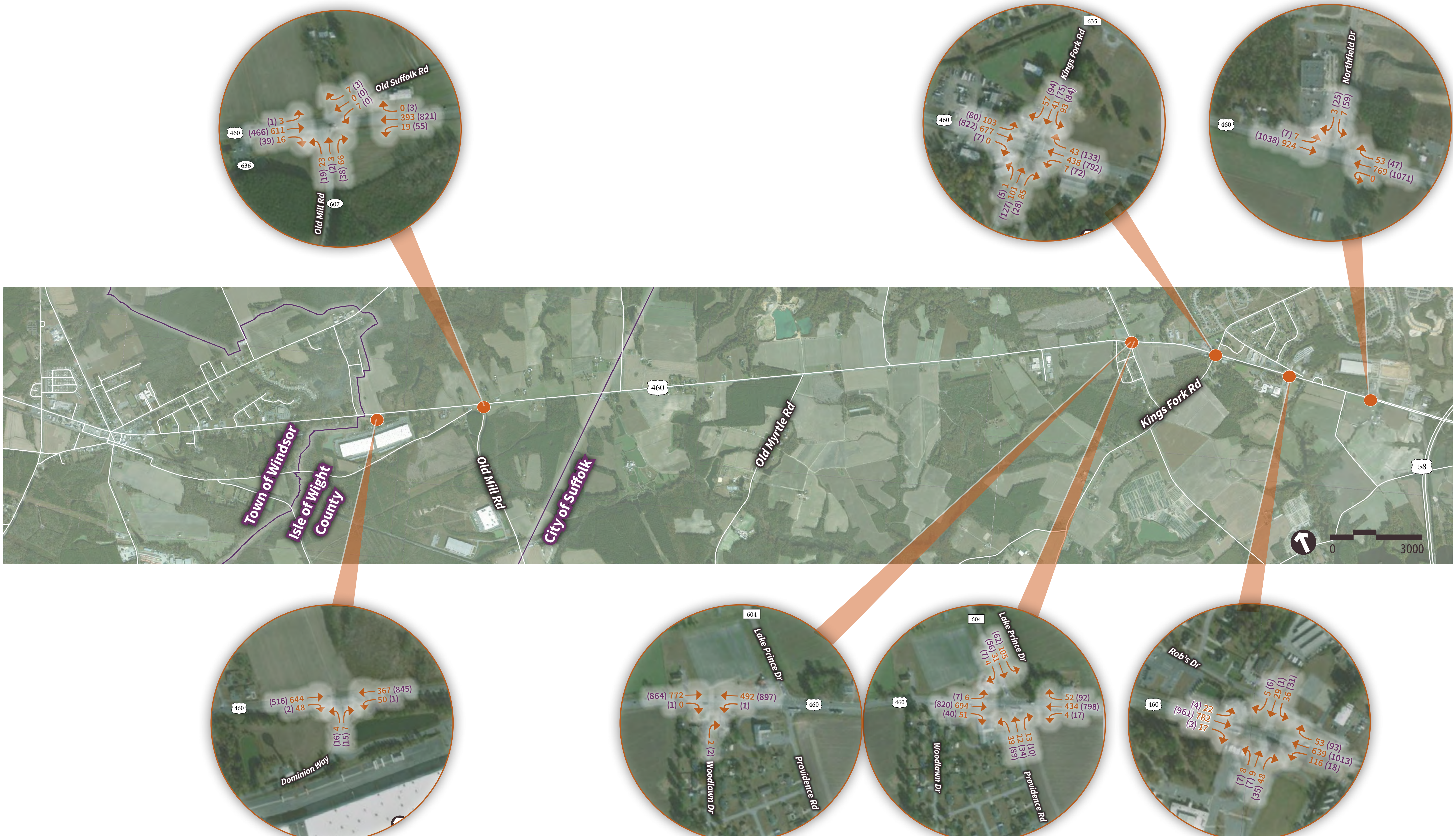


Figure 3.4
2017 Existing Peak Hour Turning Movement Volumes.

LEGEND

AM (PM) Volumes

3.1.3 Signal Warrant Screening

Evaluation of the need for a traffic signal at an intersection requires the examination of various factors such as traffic volumes, traffic flow and progression, and overall safety of the intersection to determine if a traffic signal would be warranted. Each of these elements should be considered in the signal warrant analysis. As a part of this study, a high-level traffic signal warrant screening was performed for the intersection of Route 460/Windsor Boulevard and Old Suffolk Road, to determine whether a signal would be warranted under the existing conditions. This signal warrant screening process only included screening the peak hour and four-hour volume warrants for the existing conditions and was performed following the procedures outlined in the 2009 edition of the Manual of Uniform Traffic Control Devices (MUTCD).

More detailed documented results are presented in Appendix E. The results of the signal warrant screening showed that under the existing conditions the subject intersection does not meet the two traffic signal warrants outlined by the MUTCD, and therefore traffic signal installation is not recommended at the subject intersection under the existing conditions. However, further evaluation should be performed to determine whether signal installation would be warranted in the future if growth occurs.

3.2 2040 No Build Conditions

The preparation of the 2040 No Build operational analysis required an understanding of future growth and how that growth would affect the traffic volumes along the Route 460 corridor. The elements incorporated into the future 2040 No Build analysis include: existing roadway lane geometry, 2040 forecasted peak hour traffic volumes and existing signal timing plans.

3.2.1 Future Traffic Growth

The 2040 No Build traffic volumes were calculated in accordance with the HRTPO 2040 Long Range Plan model. The annual average daily traffic (AADT) information from the existing model for year 2009 and projected year 2040, provided by VDOT, shown in Appendix F, was used to calculate average growth rates to be used for 2040 peak hour volume projections. A summary of the calculated growth rates is presented in the Table 3.3.

Table 3.3.
Annual Average Daily Traffic Growth Rates.

Area	2009	2009	2040	2040	Growth Rate	Growth Rate
	WB	EB	WB	EB		
Route 58 to Rob's Drive	10,859	11,087	18,755	19,161	1.78%	1.78%
Rob's Drive to Kings Fork Road	10,738	10,972	17,223	17,573	1.54%	1.53%
Kings Fork Road to Lake Prince Drive	9,472	9,630	13,350	13,469	1.11%	1.09%
Lake Prince Drive to Lovers Lane	9,311	9,397	12,530	12,592	0.96%	0.95%

After the discussion with VDOT on the summary of the growth rates presented in Table 3.3, the decision was made to use the following growth rates:

- 1.78% conservative growth rate to be used on the eastern project segment (Route 58 to Woodlawn Drive) along the Route 460 corridor;
- 1% growth rate to be used on the western project segment (Old Suffolk Road to Dominion Way) along the Route 460 corridor;
- 0.5% growth rate on the side streets.

Based on the above growth rates, peak hour turning volumes were calculated for the 2040 No Build scenario. Projected volumes are presented Figure 3.5.

3.2.2 Methodology

Capacity analyses were performed to determine the 2040 No Build scenario LOS for the AM and PM peak hours for the study intersections.

Similar to the existing conditions analysis, the 2040 No Build analysis was performed in accordance to the VDOT requirements and guidelines provided in the TOSAM. Synchro 9.1 was the software tool used for analysis determining the delay, capacity and corresponding LOS of the study intersections. The 2040 No Build LOS capacity analyses were based on: (1) the existing lane use and traffic controls shown in Figure 3.1; (2) the 2040 projected AM and PM traffic volumes presented on Figure 3.5; and (3) the HCM methodologies (using Synchro 9.1 software).

LOS results summary for 2040 No Build conditions are presented in Table 3.4.

Table 3.4.
2040 No Build Conditions Level of Service Results Summary.

ID	Intersection Name	Control	2040 No Build	
			AM	PM
1	Route 460/Pruden Boulevard & Northfield Drive	Signalized	A (SB-D)	B (SB-D)
2	Route 460/Pruden Boulevard & Rob's Drive	Signalized	C (SB-D)	B (SB-D)
3	Route 460/Pruden Boulevard & Kings Fork Road	Signalized	D (SB-F)	E (SB-F)
4	Route 460/Pruden Boulevard&Providence Road/Lake Prince Drive	Signalized	B (SB-C)	C (NB-E)
5	Route 460/Pruden Boulevard/Woodlawn Drive	Unsignalized	(NB-D)	(NB-B)
6	Route 460/Windsor Boulevard & Old Suffolk Road	Unsignalized	(NB-D)	(NB-F)
7	Route 460/Windsor Boulevard & Dominion Way	Signalized	A (NB-D)	A (NB-D)

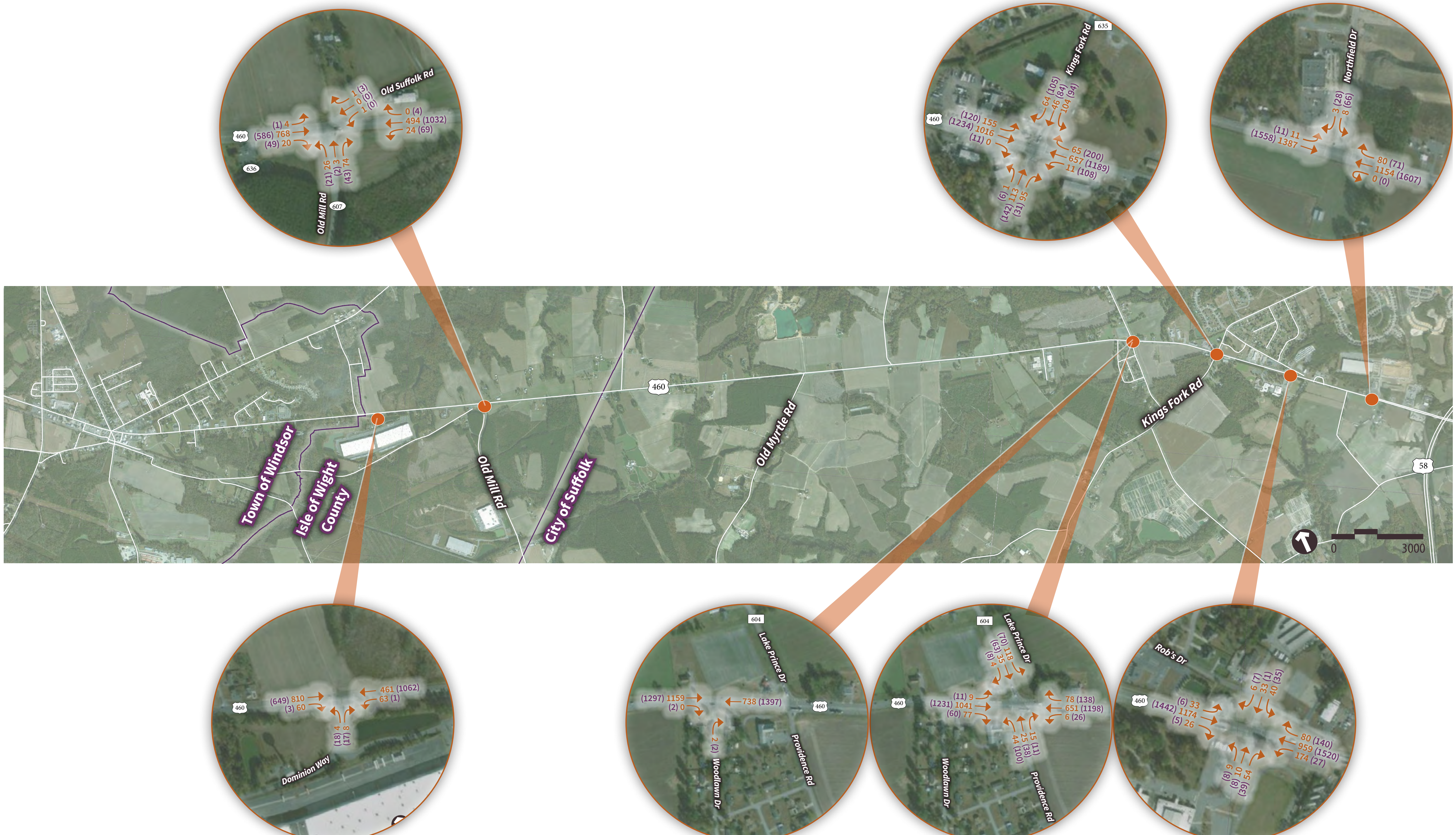
Legend: X - Overall Level of Service, (XX-X) - Worst Approach-Worst Approach Level of Service

Details on the expected delays at each approach in the study corridor are shown in Table D.2 in Appendix D. Appendix D also includes the Synchro reports for the 2040 No Build conditions scenario.

The analyses showed that most intersections in the study area will continue to operate at acceptable LOS D or better under 2040 No Build conditions in both the AM and PM peak hours. At the signalized intersection of Route 460/Pruden Boulevard & Kings Fork Road operations during evening peak hour are expected to fall to the unacceptable LOS E. The southbound approach at this intersection is expected to suffer longer delay operating at LOS F during both AM and PM peak hours in 2040 without additional improvements. In addition, the northbound approach at the signalized intersection of Route 460/Pruden Boulevard & Providence Road/Lake Prince Drive is expected to fall to LOS E during evening peak hour, while the overall intersection LOS is expected to be C under 2040 No Build conditions. Also, the northbound approach at unsignalized intersection of Route 460/Windsor Boulevard and Old Suffolk Road is expected to fall to LOS F during evening peak hour under 2040 No Build conditions.

3.2.3 Recommended Improvements

Operations at signalized intersections may be improved with full corridor coordination and future splits, offsets and cycle lengths optimization. At the intersection of Route 460 and Rob's Drive, an increase in green time should improve operations on side streets. In addition, as mentioned previously, at the intersection of Route 460 and Kings Fork Road, consideration should be given to changing the existing lane configuration on the southbound approach from shared left-turn and through lane and dedicated right-turn lane to exclusive left-turn lane and shared right-turn and through lane. This modification will require signal phasing changes and consideration should be given to alternative phasing with a flashing yellow arrow (FYA) which could reduce delay at this approach. The FYA allows flexibility in left-turn phasing operation and studies have documented that they are better understood by drivers than the standard five-section signal head. The FYA also eliminates the 'yellow trap' decreasing overall delay and increasing driver safety. Therefore, installation of FYA should also be considered on the mainline at the intersection of Route 460 and Providence Road/Lake Prince Drive.



LEGEND

AM (PM) Volumes

Figure 3.5
2040 No Build Peak Hour Turning Movement Volumes.

3.3 2040 Build Conditions

Through the operational analysis of existing conditions and 2040 No Build conditions, potential shortfalls were identified along the corridor and a set of recommendations was developed to mitigate these shortfalls. The 2040 Build scenario includes all the proposed recommendations and the following elements were incorporated into the future 2040 Build analysis: improved roadway lane configuration, forecasted peak hour traffic volumes and optimized splits, offsets and cycle lengths.

3.3.1 Proposed Improvements

After a detailed review of the analysis and recommendations of existing and 2040 No Build conditions, the following changes were incorporated into the 2040 Build scenario:

- At the signalized intersection of Route 460 and Rob's Drive, green time was increased for side streets.
- At the signalized intersection of Route 460 and Kings Fork Road, on southbound approach lane configuration was changed to exclusive left-turn lane and shared through and right-turn lane with FYA implementation on the mainline and required signal phasing changes were incorporated.
- At the signalized intersection of Route 460 and Providence Road/Lake Prince Drive, FYA implementation on the mainline and required phasing changes were incorporated.

3.3.2 Methodology

Capacity analyses were performed to determine the 2040 Build scenario LOS for the AM and PM peak hours for the study intersections.

As with the previous scenarios, the 2040 Build analysis was performed in accordance to the VDOT requirements and guidelines provided in the TOSAM. Synchro 9.1 was the software tool used for analysis determining the delay, capacity and corresponding LOS of the study intersections. The 2040 Build LOS capacity analyses were based on: (1) the proposed lane use and existing traffic controls shown on Figure 3.6; (2) the 2040 projected AM and PM traffic volumes presented on Figure 3.5; and (3) the HCM methodologies (using Synchro 9.1 software).

LOS results summary for 2040 Build conditions are presented in Table 3.5.

Table 3.5.
2040 Build Conditions Level of Service Results Summary.

ID	Intersection Name	Control	2040 Build	
			AM	PM
1	Route 460/Pruden Boulevard & Northfield Drive	Signalized	A (SB-D)	B (SB-D)
2	Route 460/Pruden Boulevard & Rob's Drive	Signalized	C (SB-D)	A (SB-D)
3	Route 460/Pruden Boulevard & Kings Fork Road	Signalized	D (NB-F)	E (NB-F)
4	Route 460/Pruden Boulevard&Providence Road/Lake Prince Drive	Signalized	B (SB-C)	C (NB-D)
5	Route 460/Pruden Boulevard/Woodlawn Drive	Unsignalized	(NB-D)	(NB-B)
6	Route 460/Windsor Boulevard & Old Suffolk Rd	Unsignalized	(NB-D)	(NB-F)
7	Route 460/Windsor Boulevard & Dominion Way	Signalized	A (NB-D)	A (NB-D)

Legend: X - Overall Level of Service, (XX-X) - Worst Approach-Worst Approach Level of Service

Details on the expected delays at each approach in the study corridor are shown in Table D.2 in Appendix D. Appendix D also includes the Synchro reports for the 2040 Build conditions scenario.

The analyses showed that most intersections are expected to continue to operate at acceptable LOS D or better with the proposed improvements in both the AM and PM peak hours with the exception of the intersection of Route 460 Boulevard and Kings Fork Road, where intersection operations are still expected to fall to the unacceptable LOS E during the evening peak hour. The analysis showed, that with the proposed improvements, the LOS at southbound approach will be improved, but LOS on the northbound approach is expected to suffer longer delay operating at LOS F during both AM and PM peak hours. In addition, LOS on the westbound approach is expected to fall to LOS E.

The northbound approach at the signalized intersection of Route 460 and Providence Road/Lake Prince Drive is expected to improve to acceptable LOS D during evening peak hour with recommended improvements under 2040 Build conditions.

The northbound approach at unsignalized intersection of Route 460 and Old Suffolk Road is still expected to fall to LOS F during evening peak hour.

3.3.3 Signal Warrant Screening

As mentioned previously, an evaluation of the need for a traffic signal at an intersection requires the examination of various factors. As a part of this study, a high-level traffic signal warrant screening was performed for the intersection of Route 460/Windsor Boulevard and Old Suffolk Road, to determine whether a signal would be warranted under the 2040 Build conditions. This signal warrant screening process only included screening of the peak hour and four-hour warrants for the 2040 Build volumes and was performed following the procedures outlined in the 2009 edition of the Manual of Uniform Traffic Control Devices (MUTCD).

More detailed documented results are presented in Appendix E (Signal Warrant Screening). The results of the signal warrant screening showed that under the 2040 Build conditions the subject intersection does not meet the two traffic signal warrants outlined by the MUTCD, and therefore traffic signal installation is not recommended at the subject intersection under the 2040 Build conditions. However, further evaluation should be performed to determine whether signal installation is warranted if there are major changes in future growth patterns from what is expected.

3.3.4 Conclusions

The operational analysis of Existing, 2040 No Build and 2040 Build conditions showed that all intersections in the study area are expected to continue to operate at acceptable LOS D or better, with the exception of the signalized intersection of Route 460 and Kings Fork Road. During evening peak hour, the LOS at this intersection is expected to fall to LOS E with 57 sec/veh in delay under 2040 No Build conditions, and will slightly improve to 56 sec/veh in delay with the proposed improvements under the 2040 Build conditions. Analyses of existing conditions showed that even though the overall LOS at this intersection is D, the southbound approach operates at LOS F with 125 sec/veh in delay during morning peak hour and LOS E with 70 sec/veh in delay during evening peak hour. Implementation of the proposed lane configuration changes along with FYA, is expected to improve operations in 2040 on southbound approach to LOS C with 31 sec/veh in delay during morning peak hour and to LOS D with 43 sec/veh in delay during evening peak hour. However, the northbound approach is expected to suffer longer delay under the 2040 Build conditions, operating at LOS F with over 93 sec/veh in delay during both morning and evening peak hours and westbound approach is projected to operate at LOS E with 57 sec/veh in delay during evening peak hour. The proposed improvements should help shift excessive delay on the southbound approach to other approaches, however, the overall LOS at this intersection is still expected to be a LOS E.

The proposed changes at the signalized intersection of Route 460/Pruden Boulevard and Providence Road/Lake Prince Drive are expected to improve the overall intersection delay and should improve the northbound approach operations from LOS E with 56 sec/veh in delay under 2040 No Build conditions to LOS D with 49 sec/veh in delay under 2040 Build conditions.

The City of Suffolk and VDOT should continue to monitor traffic volumes in the study corridor to determine if the growth in this area occurs as predicted and whether other roadway improvements should be considered to improve operations.

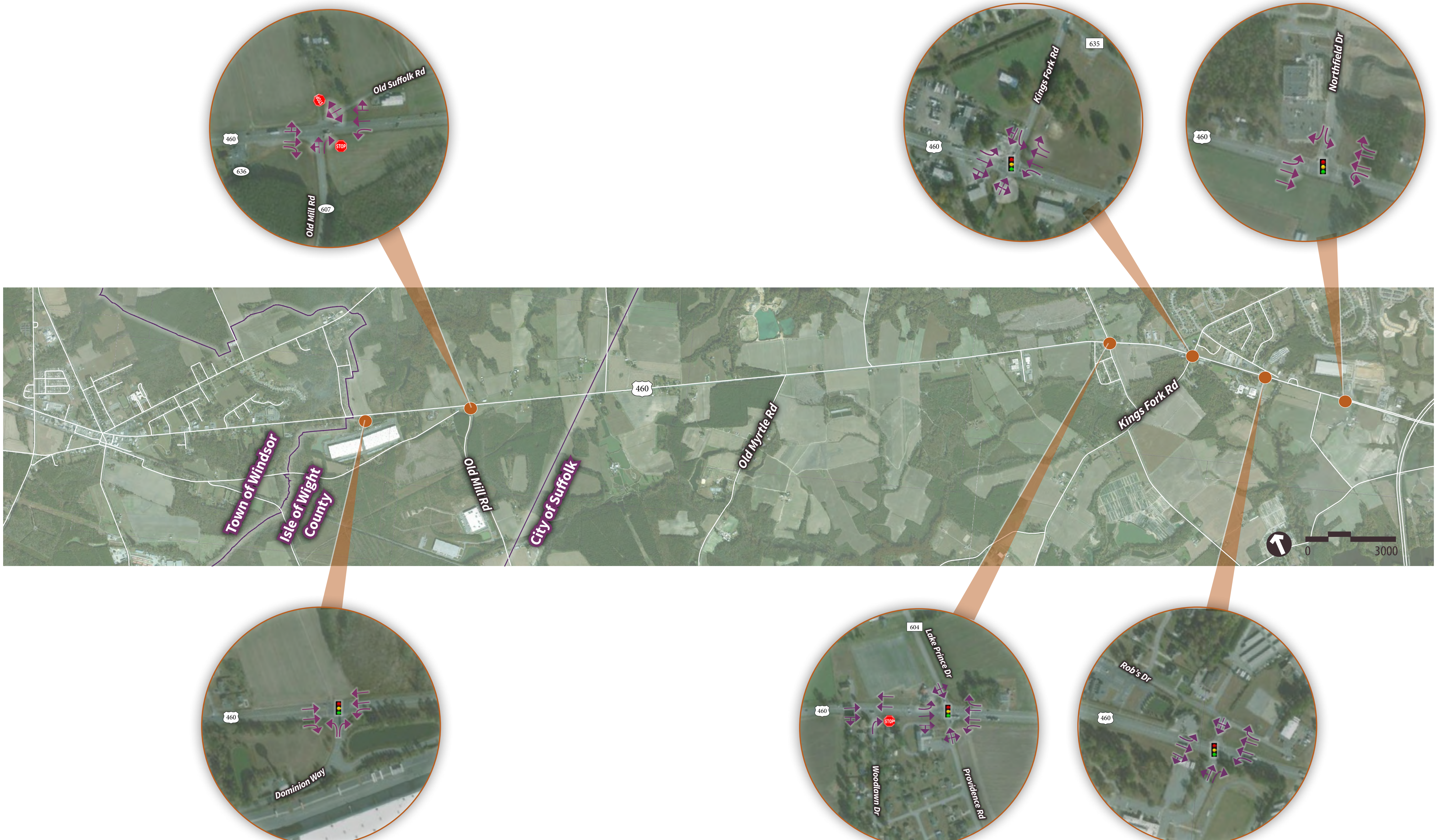


Figure 3.6
2040 Build Lane Configuration.

This page intentionally left blank.

chapter

4

Systemic Analysis

This page intentionally left blank.

4.1 Introduction and Methodology

There are two primary approaches to addressing safety: using a site specific approach to address locations with a history of high or severe crashes, and using a systemic approach to proactively address safety by identifying and targeting specific risk factors. This chapter describes how the systemic analysis was applied to the study area.

The project team used the methodology created for the VDOT CSA for CoSS whereby a set of risk reducing templates are provided for intersections and for corridors throughout the study area. Templates applicable to this project are provided in Appendix A. The countermeasures in the templates are grouped into tiers and are applied to the intersections and corridors based upon the presence of systemic risk factors, crash risk, and their Potential for Safety Improvement (PSI). Each of these three factors and how they impact tier selection are described in this chapter. The AASHTO Highway Safety Manual and FHWA systemic methodology guided the analysis and identification of systemic risk factors present throughout the study area. [1 2]

- The call-out boxes in this chapter highlight elements related to the focus area risk factor determination.

4.2 Systemic Risk Factor Analysis

The following analysis involves the identification of focus areas and the associated risk factors. The data set used in the analysis includes 242 crashes for the five-year period 2012-2016 over 6.6 miles, an average of 7 crashes per year/mile.

4.2.1 Primary Focus Areas

There are two possible types of focus areas in systemic data analysis: focus crash types and focus facility types. With the available robust crash dataset, the analysis was guided by the focus crash types. The following describes which focus areas were selected and what factors were used in that determination.

The highest proportion of crashes are rear end followed by roadway departure and angle crash types as shown in Table 4.1. Together these three crash types comprised 75 percent of the total crashes and 84 percent of the severe crashes within the study area. (Note: KAB Crashes are fatal and severe crashes as noted by the KABCO scale: K = fatal crash, A = incapacitating injury, B = non-incapacitating injury, C = possible injury, and O = no injury.)

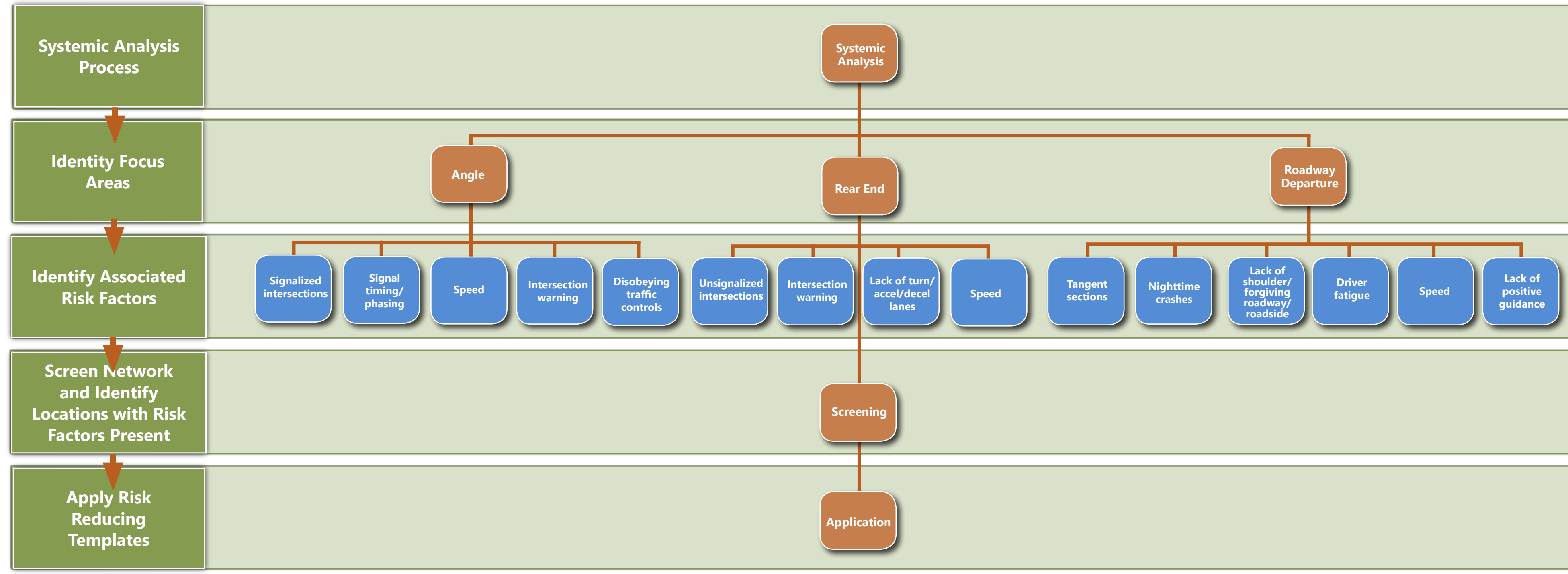


Figure 4.1.
Systemic Process.

Table 4.1.
Focus Crash Types.

Crash Types	All Crashes	% of Total (n=242	KAB crashes	% of Total (n=49
Rear End	79	33%	13	27%
Animal	24	10%	0	0%
Motorcyclist	2	1%	1	2%
Angle	39	16%	11	22%
Head On	6	2%	2	4%
Sideswipe	20	8%	1	2%
Fixed Object in Road	1	1%	0	0%
Roadway Departure	63	26%	17	35%
Other	8	3%	4	8%
Total	242	100%	49	100%

4.3 Risk Factor Determination

The following is a description and overview of the risk factor determination for the focus crash types: rear end, angle, and roadway departure crashes. Included with the analysis are callout boxes highlighting elements related to the focus area risk factors.

4.3.1 Rear End Crashes

Rear end crashes were the most prevalent crash type with 33 percent of the total crashes and 27 percent of the severe crashes. There were 79 total rear end crashes of which 13 were severe. Table 4.2 presents rear end, angle, and total crashes with respect to the intersection type (signalized, unsignalized, or non-intersection).

Almost half (44 percent) of the total rear end crashes and the majority of severe crashes (69 percent) occurred at unsignalized intersection locations. This is almost double the proportion of total crash and severe crashes for all crash types within the study area.

- Rear end crashes are most prevalent at unsignalized intersection locations.

1 American Association of State Highway and Transportation Officials. Highway Safety Manual. U.S. Department of Transportation, Federal Highway Administration

2 Federal Highway Administration Office of Safety. Systemic Safety Project Selection Tool. U.S. Department of Transportation, Federal Highway Administration.

Table 4.2.
Crashes By Intersection Type.

All Crash Types	Total Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Rear End Crashes	% of Total (n=79)	Rear End KAB Crashes	% of Total (n=13)	Angle Total Crashes	% of Total (n=39)	Angle KAB Crashes	% of Total (n-11)
Unsignalized Intersection-Related	68	28%	16	33%	35	44%	9	69%	10	26%	4	36%
Signalized Intersection-Related	61	25%	8	16%	24	30%	1	8%	19	49%	3	27%
Not Intersection-Related	113	47%	25	51%	20	25%	3	23%	10	26%	4	36%
Total	242	100%	49	100%	79	100%	13	100%	39	100%	11	100%

Crashes along the corridor typically occurred during the morning and evening commuting times of 6 to 9 AM (16 percent of total crashes and 20 percent of severe crashes) and 3 to 6 PM (25 percent of total crashes and 22 percent of severe crashes), as shown in Table 4.3. Each of the focus crash types differ in the primary time of day for that crash. Rear end crashes and severe crashes most often occurred during the evening commuting hours of 3 to 6 PM (38 percent of total crashes and 31 percent of severe rear end crashes).

This pattern could be due to local traffic patterns and behaviors, such as higher traffic volumes, speeds, vehicle type, distracted driving, or following too closely. Table 4-4 shows rear end crashes by speed limit, indicating that the highest total number and severe crashes along the corridor occur in the 55 MPH speed limit zone (58 percent of total crashes and 67 percent of severe crashes. There are also considerably more severe rear end crashes on sections of roadway with the higher speed limit of 55 MPH (85 percent). In only 11 percent of the total rear end crashes did the reporting officer determine that the driver was speeding (see Figure 4.2). However, the project team reviewed the extents of the speed limit zone in relation to crashes and believe there may be discrepancy in the posted speed and the speed limit indicated on the crash report form.

Table 4.3.
Crashes by Time of Day.

Time of Day	All Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Rear End Crashes	% of Total (n=79)	Rear End KAB Crashes	% of Total (n=13)	Angle Total Crashes	% of Total (n=39)	Angle KAB Crashes	% of Total (n-11)	Roadway Departure Crashes	% of Total (n-63)	Roadway Departure KAB Crashes	% of Total (n-17)
0 AM TO 3 AM	12	5%	4	8%	0	0%	0	0%	1	3%	1	9%	9	14%	3	18%
3 AM TO 6 AM	19	8%	3	6%	2	3%	2	15%	1	3%	0	0%	3	5%	2	12%
6 AM TO 9 AM	38	16%	10	20%	9	11%	2	15%	13	33%	6	55%	10	16%	1	6%
9 AM TO 12 PM	31	13%	3	6%	15	19%	2	15%	5	13%	0	0%	10	16%	1	6%
12 PM TO 3 PM	33	14%	7	14%	15	19%	1	8%	5	13%	2	18%	9	14%	2	12%
3 PM TO 6 PM	61	25%	11	22%	30	38%	4	31%	8	21%	1	9%	6	10%	3	18%
6 PM TO 9 PM	30	12%	6	12%	8	10%	2	15%	6	15%	1	9%	6	10%	1	6%
9 PM TO 12 AM	18	7%	5	10%	0	0%	0	0%		0%	0	0%	10	16%	4	24%
TOTAL	242	100%	49	100%	79	100%	13	100%	39	100%	11	100%	63	100%	17	100%

Table 4.4.
Rear End Crashes by Speed Limit.

Speed Limit	All Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Rear End Crashes	% of Total (n=79)	Rear End KAB Crashes	% of Total (n=13)
45	81	33%	11	22%	28	35%	2	15%
55	141	58%	33	67%	46	58%	11	85%
Unknown	20	8%	5	10%	5	6%	0	0%
Total	242	100%	49	100%	79	100%	13	100%

Heavier vehicles require longer stopping distances and given the high percentage of heavy vehicles along the corridor, the vehicle type may contribute to the high number of rear end crashes. However, the crash analysis shown in Table 4.5 does not support that theory as only five percent of rear end crashes was caused by heavy vehicles.

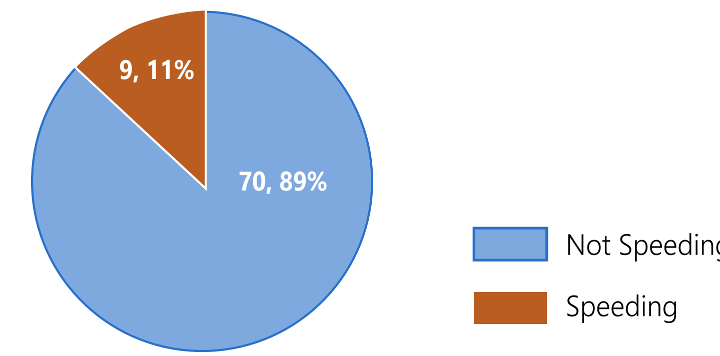


Figure 4.2.
Speeding Determination for Rear End Crashes.

Table 4.5.
Rear End Crashes by Vehicle Type.

Vehicle Type	Rear End Crashes	% of Total (n=79)
Passenger Car	50	63%
Motorcycle	2	3%
Truck - Passenger Pick-up/SUV	18	23%
Van	5	6%
Truck (2 Axles)	1	1%
Truck (3 Axles or More)	3	4%
Total	79	100%

Table 4.6.
Rear End Crashes by Vehicle Driver Actions.

Vehicle Type	Rear End Crashes	% of Total (n=79)
No Improper Action	5	6%
Following Too Close	40	51%
Driver Distraction	4	5%
Improper Parking	2	3%
Exceeded Safe Speed (But Not Speed Limit)	3	4%
Avoiding Other Vehicle	1	1%
Other	8	10%
Fail to Maintain Proper Control	16	20%
Total	79	100%

- The influence of speeding on rear end crashes is unclear.
- Rear end crashes typically involve passenger vehicles and non-commercial trucks.
- The action of following too closely led to just over half of rear end crashes.

This rear end crash pattern could also reflect geometric conditions, such as inadequate sight distance or warning of intersections, lack of space for acceleration and deceleration, or inadequate friction. Table 4.7 and Table 4.8 help to assess some of these risks. Consistent with corridor trends, most of the rear end crashes occurred during dry conditions. Half of the intersections in the study area have turn lanes on both the Route 460 eastbound and westbound approaches but just under half (40 percent) do not have any turn lanes on Route 460. For all 13 intersections, there are a total of 11 left turns and 8 right turn lanes. A signage inventory, sight distance evaluation, and friction assessment were not part of this study.

It is possible that the lack of roadway friction is a factor in dry, rear end crashes. Also, providing turn lanes or acceleration and deceleration lanes would provide separation from vehicles with a large speed differential. The need for additional lanes will be addressed on a site-specific basis (see Chapter 5).

Unsignalized intersection enhancements, such as intersection warning signs and beacons, or larger signs at the intersection, can help to improve driver awareness of the intersection.

- Most rear end crashes occurred during dry conditions.
- Almost half of the intersections do not have turn lanes on Route 460.

4.3.2 Angle Crashes

Angle crashes were the third most prevalent crash type in the study area, but were the second highest crash type at intersections. There were 39 total angle crashes, of which 11 were severe angle crashes. Relative to all other crash types, angle crashes comprised 16 percent of all the total crashes and 22 percent of the severe crashes. As shown in Table 4.2, approximately half of the total angle crashes (49%) occurred at signalized intersection locations, which is considerable higher than for all crash types (25%).

- Angle crashes were the most prevalent at signalized intersection locations.

Total and severe angle crashes most often occurred during the morning commuting hours of 6 AM to 9 AM (33 percent of total crashes and 55 percent of severe angle crashes).

This pattern could be due to local traffic patterns and behaviors, such as higher traffic volumes, speeds, or drivers in a rush, all of which could result in misjudging adequate gaps in traffic.

Most of the angle crashes (41 percent of all crashes and 45 percent of severe crashes) occurred in the portion of the corridor with the lower 45 MPH speed limit. For only 13 percent of angle crashes did the law enforcement officer indicate that the driver was speeding. The project team reviewed the extents of the speed limit zone in relation to crashes and believe there may be discrepancy in the posted speed and the speed limit indicated on the crash report form.

Table 4.7.
Rear End Crashes by Roadway Conditions.

Speed Limit	All Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Rear End Crashes	% of Total (n=79)	Rear End KAB Crashes	% of Total (n=13)
Dry	185	76%	36	73%	61	77%	11	85%
Wet	48	20%	11	22%	17	22%	2	15%
Snowy	3	1%	1	2%	1	1%	0	0%
Icy	5	2%		0%	0	0%	0	0%
Water (Standing, Moving)	1	0%	1	2%	0	0%	0	0%
Total	242	100%	49	100%	79	100%	13	100%

Table 4.8.
Route 460 Turn Lane Summary.

Intersection Turn Lane Presence on Route 460 Approaches	Number of Intersections	% of Total (n=13)	Number of Turn Lanes on Route 460		% of Total (n=19)
Both WB/EB Approaches	6	50%	Right	8	40%
One Approach (WB or EB)	2	20%	Left	11	60%
No Turn Lanes (WB or EB)	5	40%	Total	19	
Total	13	100%			

Table 4.9.
Angle Crashes by Speed Limit.

Speed Limit	All Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Rear End Crashes	% of Total (n=79)	Rear End KAB Crashes	% of Total (n=13)
45	81	33%	11	22%	16	41%	5	45%
55	141	58%	33	67%	13	33%	3	27%
Unknown	20	8%	5	10%	10	26%	3	27%
Total	242	100%	49	100%	39	100%	11	100%

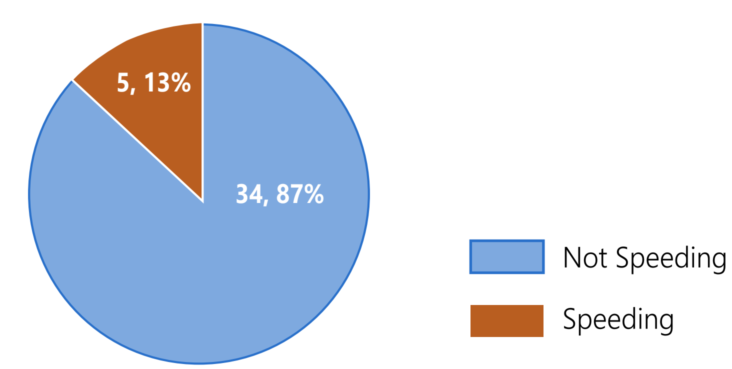


Figure 4.3.
Speeding Determination for Angle Crashes.

Heavier vehicles may have a difficult time finding an acceptable gap in traffic due to their difficulty accelerating. However, as shown in Table 4.10, only five percent of angle crashes were caused by heavy vehicles.

Table 4.11 contains a summary of the drivers actions for angle crashes. Drivers who did not have right-of-way, conducted improper turns, or disregarded the traffic signal were involved in 66 percent of the crashes. As shown in Table 4.12, while the east and westbound directions of travel (on Route 460) have much higher traffic volumes, crashes involving vehicles traveling north and south occurred in 43 percent of the angle crashes and 36 percent of the severe angle crashes.

Table 4.10.
Angle Crashes by Vehicle Type.

Vehicle Type	Angle Crashes	% of Total (n=39)
Passenger Car	18	46%
Motorcycle	0	0%
Truck - Passenger Pick-up/SUV	19	49%
Van	0	0%
Truck (2 Axles)	0	0%
Truck (3 Axles or More)	2	5%
Total	39	100%

Table 4.11.
Angle Crashes by Vehicle Driver Actions.

Vehicle Type	Angle Crashes	% of Total (n=39)
No Improper Action	4	10%
Following Too Close	15	38%
Driver Distraction	1	3%
Improper Parking	7	18%
Exceeded Safe Speed (But Not Speed Limit)	1	3%
Avoiding Other Vehicle	4	10%
Other	4	10%
Fail to Maintain Proper Control	3	8%
Total	39	100%

Table 4.12.
Angle Crashes by Direction of Travel.

Direction	Angle Crashes	% of Total (n=39)	Angle KAB Crashes	% of Total (n=11)
East	7	18%	2	18%
West	14	36%	4	36%
North	6	15%	2	18%
South	11	28%	2	18%
Unknown	1	3%	1	9%
Total	39	100%	11	100%

For those crashes where drivers did not have right-of-way, there are several elements that may have contributed to misjudging gaps such as speed, heavy traffic volumes, large vehicles obscuring the view of other on-coming vehicles, and possibly a lack of sufficient protected turn phasing. Improper turns or disregarding the traffic signal could be indicative of other factors such as speed, heavy traffic volumes, lack of intersection awareness and preparation, or signal phasing issues. In addition to the countermeasures identified through the template application shown in Figure 4.5, education and enforcement of the posted speed limit throughout the study area could also help to address speed related crashes.

- Angle crashes are most prevalent during morning commute time of 6 to 9 AM.
- Drivers who did not have right-of-way, conducted improper turns, or disregarded the traffic signal were involved in 66 percent of the crashes.
- North and southbound vehicles accounted for 43 percent of the crashes.

Table 4.13.
Roadway Departure Crashes by Corridor Type.

Corridor Type	Length (Mile - Eastbound)	% of Total (n=6.64)	Roadway Departure Crashes	% of Total (n=63)	Crashes/ Mile	Roadway Departure KAB Crashes	% of Total (n=17)	KAB Crashes/ Mile
Curve	0.34	5%	3	5%	9	0	0%	0
Tangent	6.30	95%	60	95%	10	17	100%	3
Total	6.64	100%	63	100%	9	17	100%	3

Table 4.14.
Roadway Departure Crashes by Direction of Travel.

Direction of Travel	All Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Roadway Departure Crashes	% of Total (n=63)	Roadway Departure KAB Crashes	% of Total (n=17)
East	88	36%	19	39%	30	48%	8	47%
West	106	44%	22	45%	26	41%	8	47%
North	16	7%	3	6%	3	5%	1	6%
South	25	10%	3	6%	3	5%	0	0%
Unknown	7	3%	2	4%	1	2%	0	0%
Total	242	100%	49	100%	63	100%	17	100%

4.3.3 Roadway Departure Crashes

Roadway departure crashes were the most prevalent severe crash type with 26 percent of the total crashes and 35 percent of the severe crashes. There were 63 total roadway departure crashes of which 17 were severe. Table 4.13 presents roadway departure crashes and total crashes with respect to the corridor type (tangent or curve). The majority of the crashes (95 percent of all crashes and 100 percent of the severe crashes) occurred on tangent sections.

The trend of higher percentages of crashes within tangent sections persisted for rear end and angle crash types. However, roadway departure crashes were relatively evenly dispersed throughout the time periods and severe roadway departure crashes primarily occurred at night with 54 percent occurring between the hours of 9 PM to 6 AM.

As shown in Table 4.14, there were more roadway departure crashes in the eastbound direction (36 percent for total crashes to 48 percent for roadway departure), compared to eastbound crashes for all crash types on the corridor. However, the directional split for roadway departure crashes was relatively even (48 percent eastbound and 41 percent westbound).

- The majority of roadway departure crashes occurred during the nighttime hours of 9 PM to 6 AM.
- The roadway departure crash directional split was relatively even for eastbound and westbound travel.

With respect to road conditions, most of the corridor and roadway departure-specific crashes occurred during dry conditions (76 and 70 percent respectively). A comparison of roadway departure crashes to all crash types is shown in Table 4.15. A slightly higher proportion of roadway departure crashes (70 percent for total crashes and 76 percent for severe crashes for roadway departure crash types), compared to all crash types (20 percent for total crashes and 22 percent for severe crashes for all crash types), occurred when the roads were wet.

Table 4.16 provides crashes by vehicle type. Most of the vehicles involved in roadway departure crashes are passenger cars (63 percent). However, roughly double the amount of large commercial trucks are involved in roadway departure crashes compared to all crash types on the corridor (13 percent of roadway departure crashes compared to 7 percent for all crash types).

As shown in Figure 4.3, in only 13 percent of the crashes did the officer find that the driver was speeding prior to the crash. Table 4.17 and Table 4.18 provide information on driver's actions at the time of the crash. In most of the roadway departure crashes (60 percent), it was noted that the driver "failed to maintain control". Looking specifically at driver distraction, 68 percent of the total crashes involved driver distraction, but only 8 percent for roadway departure crashes. Driver fatigue was noted in 19 percent of the roadway departure crashes, which comprise almost all driver fatigue crashes along the corridor (92 percent).

Table 4.15.
Road Conditions for Roadway Departure Crashes.

Road Conditions	Total Crashes	% of Total (n=242)	KAB Crashes	% of Total (n=49)	Roadway Departure Crashes	% of Total (n=63)	Roadway Departure KAB Crashes	% of Total (n=17)
Dry	185	76%	36	73%	44	70%	11	65%
Wet	48	20%	11	22%	16	25%	4	24%
Snowy	3	1%	1	2%	1	2%	0	0%
Icy	5	2%	0	0%	1	2%	1	6%
Water (Standing, Moving)	1	0%	1	2%	1	2%	1	6%
Total	242	100%	49	100%	63	100%	17	100%

Table 4.16.
Roadway Crashes by Vehicle Type.

Vehicle Type	Total Crashes	% of Total (n=242)	Roadway Departure Crashes	% of Total (n=63)
Passenger Car	141	58%	40	63%
Motorcycle	5	2%	0	0%
Truck - Passenger Pick-up/ SUV	64	26%	11	17%
Van	8	3%	2	3%
Truck Tractor (Bobtail - No Trailer)	3	1%	2	3%
Truck (2 Axles)	2	1%	0	0%
Truck (3 Axles or More)	18	7%	8	13%
RV	1	0%	0	0%
Total	242	100%	63	100%

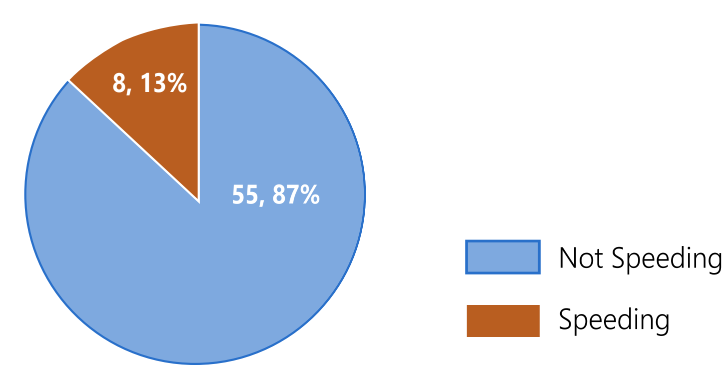


Figure 4.4.
Speeding Determination for Roadway Departure Crashes.

Table 4.17.
Roadway Departure Crashes by Vehicle Driver Actions.

Vehicle Type	Roadway Departure Crashes	% of Total (n=63)
No Improper Action	4	6%
Improper Turn	2	3%
Improper Lane Change	1	2%
Exceeded Safe Limit	2	3%
Driver Distraction	1	2%
Avoiding Other Vehicle	2	3%
Avoiding Animal	4	6%
Avoiding Object In Road	1	2%
Hit and Run	1	2%
Fail to Maintain Proper Control	38	60%
Over Correction	3	5%
Other	4	6%
Total	63	100%

Table 4.18.
Roadway Departure Crashes by Driver Condition.

Driver Distraction	Total Crashes	% of Total (n=242)	Roadway Departure Crashes	% of Roadway Departure Total (n=63)	% of Distraction Type (n=varies)
Distracted	43	68%	5	8%	12%
Not Distracted	186	295%	46	73%	25%
Driver Fatigue	13	21%	12	19%	92%
Total	242	384%	63	100%	26%

- Most of the vehicles involved in roadway departure crashes are passenger cars; however, twice as many large commercial trucks are involved as compared to all crash types on the corridor.
- Almost all driver fatigue crashes were roadway departure crash types. Fatigue was noted in just under 20 percent of the roadway departure crashes.

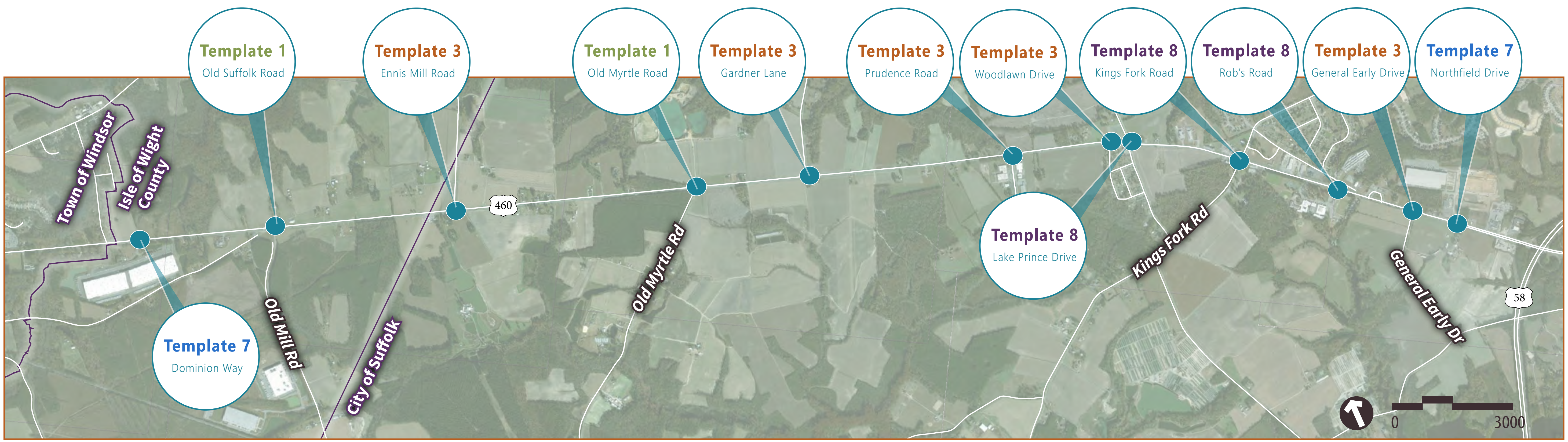


Figure 4.5.
Corridor and Intersection Template Locations.

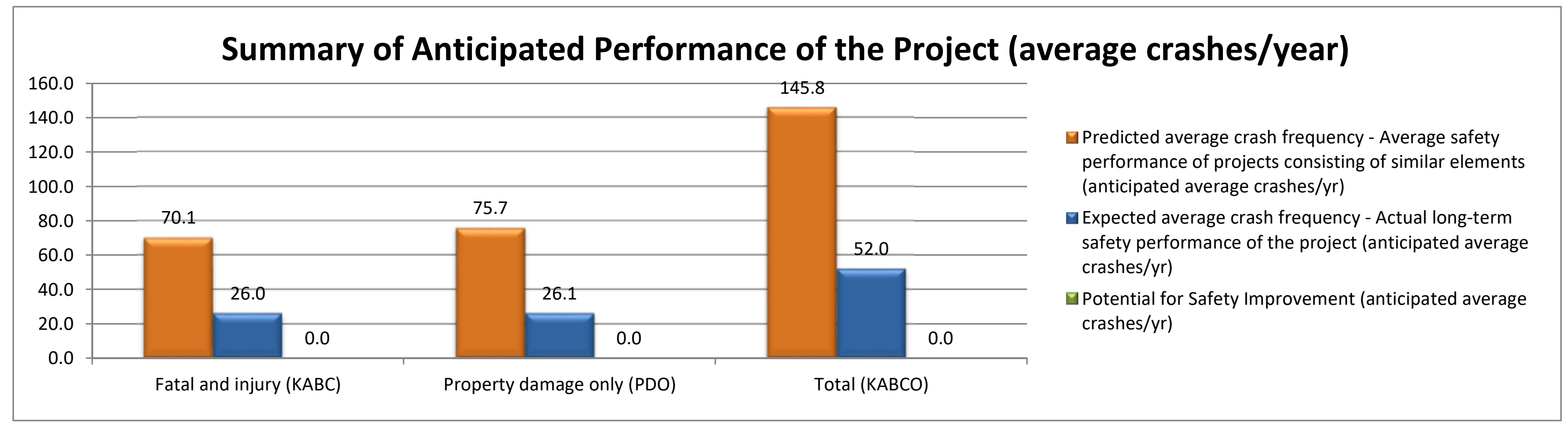
4.4 Systemic Conclusion

Through the systemic analysis specific countermeasures were identified in the risk reducing templates. All Tier 1 countermeasures are to be applied systemically. Specific Tier 2 and Tier 3 countermeasures were chosen based on the crash data and analysis. The application of templates across the corridor is shown in Figure 4.5.

4.5 HSM Spreadsheets

A portion of the safety recommendations were analyzed using the VDOT Extended Highway Safety Manual (HSM) Part C Spreadsheets to predict the changes to crashes on the corridor. This tool only takes into account a portion of the safety countermeasures recommended for the corridor. This method for estimating the benefit of recommended countermeasures is included in the VDOT TOSAM[3] . Additional details about these spreadsheets can be found within the TOSAM and also in the FHWA Integrating the HSM into the Highway Project Development Process[4]. It is anticipated that this project will, on average, experience 52 crashes per year, while a similar project, on average would experience 145.8 crashes per year. A summary of findings from the HSM spreadsheets is included in Figure 7.1 and the full report is provided in Appendix G.

The spreadsheets used to create these summary tables have been provided as a supplement to this study report. The spreadsheets are tools that can be used in planning the implementation of the countermeasures. Considerations for implementation include the most influential techniques in reducing the most severe crash types, the time frame in which countermeasures can be installed, and the funding source identified. This study and the spreadsheets provide a basis for an action plan that VDOT can use to improve safety and operations on Route 460.



HSM Spreadsheet.
Figure 4.6.

3 Virginia Department of Transportation. Traffic Operations and Safety Manual. Available: http://www.virginiadot.org/business/resources/TOSAM.pdf.

4 Federal Highway Administration. Integrating the HSM into the Highway Project Development Process. Available: https://safety.fhwa.dot.gov/hsm/hsm_integration/sec2.cfm.

This page intentionally left blank.

chapter

5

Site Specific Analysis

Figure 5.1.
Site Study Locations.

5.1 Introduction

The third approach to addressing safety in the corridor is site specific analysis. In the CSA process, the pre-field review data analysis guided the approach to the field review and assessment. The analysis of a five-year period (2012-2016) of crash data led to the identification of 11 site specific locations due to their crash history and severity, see Figure 5.1. The site specific locations were chosen based on their potential to show reduced average crash frequency or severity. Once the locations were identified, field reviews were conducted in accordance with standard Road Safety Audit (RSA) practices of evaluation and documentation. In addition, a directional video recording of the corridors through the driver's perspective was generated. The 11 locations are listed in Table 5.1.

Table 5.1.
Route 460 Specific Locations.

1.	Northfield Drive
2.	Rob's Drive
3.	Kings Fork Road
4.	Lake Prince Drive
5.	Prudence Road
6.	1,200 Feet East of Gardner Lane
7.	Gardner Lane
8.	Old Myrtle Road
9.	2,200 Feet West of Old Myrtle Road
10.	1,750 Feet East of Ennis Mill Road
11.	1,000 Feet East of Old Suffolk Road

The 11 site specific locations are discussed in full detail on the following pages. For each site, the following information is included:

- Location of site along corridor;
- Aerial photo of location with crash locations shown;
- Description of existing conditions;
- Crash data;
- Key safety concerns;
- Recommended countermeasures and implementation plan for short-term, mid-term and long-term conditions;
- Summarized cost estimate using the templates as shown in Appendix A and other recommended countermeasures listed; and
- Crash mitigation summary for recommended improvements.

Additional details for the cost estimate can be found in Table 5.2 and in Appendix H.

The recommendations are a result of the application of the Templates with the addition of site specific countermeasures. The recommendations are presented in three levels of implementation based on anticipated funding and potential completion. Generally, Tier 1 and Short-Term include countermeasures that are anticipated to be implemented quickly, possibly during maintenance using VDOT crews; Tier 2 and Mid-Term include countermeasures that would require more time to be implemented due to design or funding; and Tier 3 and Long-Term include countermeasures that would require longer lead time due to funding, property acquisition, public hearing, and/or longer construction time.

Site Specific Location #1

5.2 Site Specific Location #1 Northfield Drive

5.2.1 Existing Conditions

This location is at the signalized, three-legged intersection of Route 460 and Northfield Drive. Surrounding areas are a combination of commercial and residential development to the north and agricultural fields to the south.

All legs of the intersection are paved. On the eastern leg of the intersection, there is a 195-foot right turn lane with a 150-foot taper and a 105-foot left turn lane with a 195-foot taper with signage denoting the lane for Police Vehicles Only . On the western leg of the intersection there is a 300-foot left turn lane with a 190-foot taper. 300-feet west of the intersection, there is a lateral shift in pavement denoted by black and white reflective pavement edge markers. East and westbound directions of Route 460 have raised, plowable pavement markers installed along lane boundaries.

There is sidewalk located on the north side of Route 460 that is approximately 5-feet wide. The sidewalk is well maintained and clear of debris. One crosswalk is installed crossing Northfield Drive. The crosswalk is clearly marked and abuts up to ADA accessible ramps with truncated dome warning surfaces.

Narrow, raised, concrete medians that are roughly two to three feet wide, are present on both eastern and western legs of Route 460. Northfield Drive has an approximately 15-foot, vegetated median separating north and southbound lanes. The north side of Route 460 has curb and gutter while the southern facing edge of Route 460 has a deteriorated or non-existent shoulder, no curb and gutter, and pavement drop off. Grass along the intersection is well maintained and sight distance for all legs are clear. However, along the southern side of the intersection there is a parallel drainage ditch that is obscured by vegetation.

The intersection has large, clearly visible street signs. There is low illumination throughout intersection, as there is only one mounted street lamp installed on the northeast corner of Route 460 and Northfield Drive. All intersection signals have black backplates but reflectivity borders are not present. Pavement quality is average throughout the intersection, but pavement markings are worn or deteriorating.

Curb and gutter is present on the north side of the intersection and an edgeline is present on the south side. Nighttime drivers have positive guidance through the edgeline on the southern side of the intersection.

5.2.2 Crash Summary

Between 2012 and 2016, nine (9) crashes occurred at Route 460 and Northfield Drive. Sixty-seven percent (6 crashes) resulted in a non-visible injury (crash type C) and 33 percent (3 crashes) resulted in a property damage only crash (crash type O). There were five rear-end crashes, two in the southbound direction, two in the eastbound direction, and one in the westbound direction, with 56 percent (5 crashes) occurring between 3 PM and 6 PM. The remaining crash was deer related. One crash was the result of driving under the influence (DUI). None of the crashes at this location involved commercial vehicles.

5.2.3 Suggested Countermeasures

- Pavement resurfacing – the pavement crack sealing is much more apparent than the pavement markings and as such, draws the driver's attention. Resurfacing the road would remove the lines formed by the crack seal. Additionally, given the number of rear end crashes, friction may be reduced and could be improved through repaving.
- Enhanced pavement markings – new pavement markings could help to improve visibility of the roadway edge and intersection.
- Reflective border on signal backplates – this will help to enhance conspicuity of the intersection signals.
- Shoulder improvement – shoulders should be widened on the southern side of the intersection to provide a more forgiving roadway and assist with roadway stabilization.
- Safety edge – the edge of the roadway should have a safety edge to help drivers re-enter the roadway, in the event a driver leaves the travel way, and also to help preserve the pavement.
- Additional intersection lighting – the intersection is currently served by one street light illuminating the northwest corner of the intersection. Additional street lights will enhance intersection conspicuity during dark conditions.
- Curb and gutter maintenance – vegetation is encroaching on the curb and gutter, reducing the effectiveness and causing pavement deterioration.
- Positive guidance on northern side of intersection – There is positive guidance, in the form of edgeline, for drivers on the southern side of the intersection but not on the northern side. Additional positive guidance, such as edgeline or reflective post mounted delineators would enhance nighttime visibility of the roadside, particularly leading the lateral shift just west of the intersection.

Figure 5.2.

Site Specific Location #2

5.3 Site Specific Location #2 Rob's Drive

5.3.1 Existing Conditions

This location is at the signalized, four-legged intersection of Route 460 and Rob's Drive. There is a grade school to the south and a combination of commercial and residential to the north.

All legs of the intersection are paved and undivided. Both the eastern and western legs of the intersection have a two-way center left turn lane that converts to a single left turn lane. On the western leg of Route 460, there is a 100-foot transition to from two-way center turn lane to a 150-foot left turn lane. The eastern leg of Route 460 has a 70-foot transition from two-way center turn lane to a 205-foot single left turn lane.

There are depressions in the roadway, near the curb, at the corners of Route 460 and the southern leg of Rob's Drive which serves as the entrance to Nansemond Suffolk Academy. Standing water was observed in the depressions during the field review. The curb and gutter section is limited to these two corners of the intersection - no other curb or curb and gutter is present at this intersection. Grassy shoulders line the remainder of pavement edges. All intersection signals have black backplates but reflective borders are not present. The intersection has two street lights located on the northwest and southeast corners of Route 460 and Rob's Drive.

Pavement within the legs of the intersection show high wear and moderate deterioration. High amounts of deterioration were identified along turning radiuses between Route 460 and northbound Rob's Drive. Large amounts of crack seal, and the varying difference in pavement and crack seal coloring, is a visual distraction. Pavement markings and edgelines are visible. Edgelines are largely worn due to turning vehicles.

During VHB's field review, one driver commented that changes, made within the last year, to the timing of the intersection, heavily hinders drivers traversing Route 460 from the northern leg of Rob's Drive to the southern leg.

5.3.2 Crash Summary

Between 2012 and 2016, ten (10) crashes occurred at Route 460 and Rob's Drive. Ten percent (1 crash) resulted in ambulatory injury (crash type A), 10 percent (1 crash) resulted in visible injury (crash type B), and 60 percent (6 crashes) resulted in non-visible injury (crash type C). Twenty percent (2 crashes) resulted in property damage only (crash type O). There were five rear-end crashes, four in the eastbound direction, and one in the southbound direction. Three angle crashes occurred at this location, as well as one side-swipe crash and one fixed object off road crash. Two of the angle crashes involved drivers on the southern approach, leaving the school property, and one resulted in a serious injury. Sixty percent (6 crashes) occurred between 6 AM and 12 PM. One crash was the result of DUI.

5.3.3 Suggested Countermeasures

- Right turn on red prohibition from minor streets – on the southern approach drivers are misjudging the acceptable gaps in traffic. This could be due to speed, vehicle size, or heavy traffic volumes. Prohibiting right turns on red would require drivers to enter traffic during a protected phase.
- Education – working with the school to educate students, parents, and faculty on local driving risks and safe driving skills could help drivers arrive and leave safety.
- Pavement resurfacing – the pavement crack sealing is much more apparent than the pavement markings and as such, draws the driver's attention. Resurfacing the road would remove the lines formed by the crack seal. Additionally, given the number of rear end crashes, friction may be reduced and could be improved through repaving.
- Enhanced pavement markings – new pavement markings could help to improve visibility of the roadway edge and intersection.
- Reflective border on signal backplates – this will help to enhance conspicuity of the intersection signals.
- Drainage (curb, gutter, and pavement) improvements on the southern leg- the curb and gutter is inconsistent and depressions in the pavement reduce the effectiveness of stormwater facilities potentially resulting in on-street ponding and reduced friction for drivers.

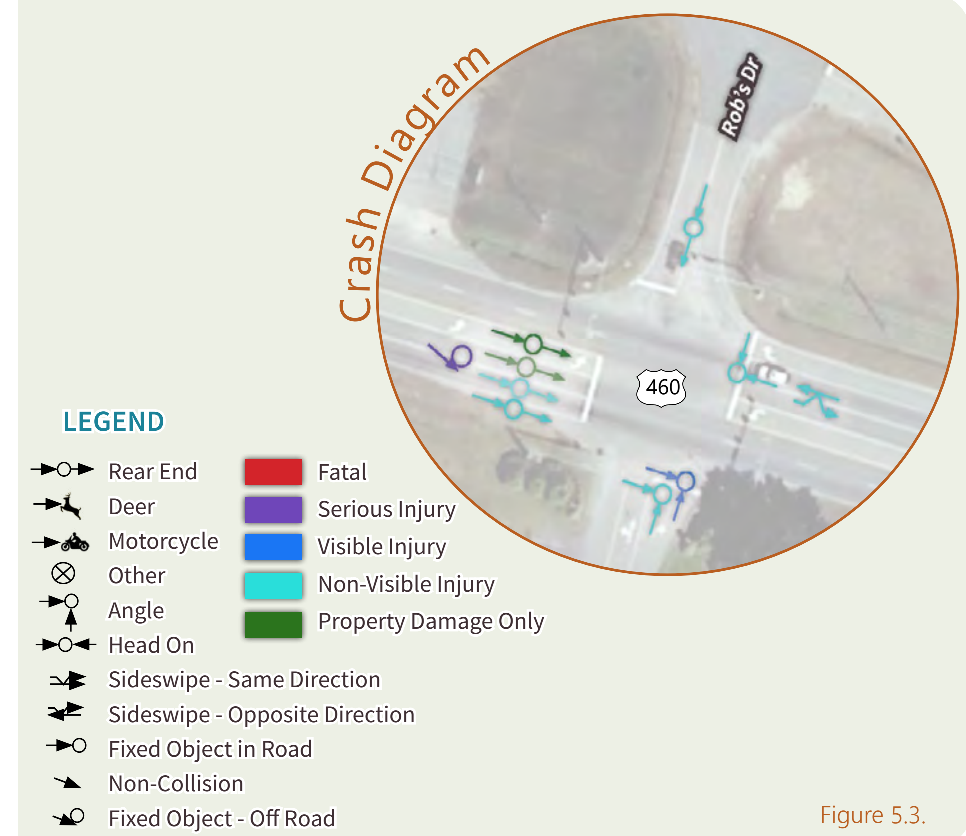


Figure 5.3.

Site Specific Location #3

5.4 Site Specific Location #3 Kings Fork Road

5.4.1 Existing Conditions

This location is at the signalized, paved, four-legged intersection of Route 460 and Kings Fork Road. Surrounding areas are commercial, with a recreational area in the northeast corner.

All legs of this intersection are paved and undivided. The western leg of Route 460 has a 175-foot left turn lane present with 75-foot taper. The eastern leg is equipped with a two-way left turn lane that ends with a 70-foot transition and a 205-foot single left turn lane. Additionally, there is a 160-foot right turn lane with a 145-foot taper on the eastern leg. There are no permissive left turn signal phases on any of the intersection approaches. In the northern leg of Kings Fork Road, a 30-foot designated right turn lane is present. The southern leg has a single lane for right, left, and traversing traffic.

Curb and gutter is present in the northwest and southwest corners of the intersection. The northwest corner has mountable curb installed and southwest corner has non-mountable curb. A heavy amount of debris can be seen in all curb and gutter sections. Northeast and southeast shoulders show signs of vehicular traffic. Vehicular traffic has caused significant deterioration in the southeast corner. No pedestrian facilities are install at this location.

Large street signs are installed, facilitating wayfinding. All intersection signals have black backplates but are lacking reflective borders. This intersection is illuminated by two mounted street lights. Pavement quality is moderate throughout Route 460 and southern leg of Kings Fork Road. The northern leg of Kings Fork Road has new pavement ending at Route 460. Pavement to gutter transition is not smooth, with the pavement bulging and overlapping the gutter. The edgeline pavement markings on the curb and gutter portions provide positive guidance to drivers, particularly in dark conditions.

Drainage ditches are located along the roadway in the northeast corner of the intersection, along Kings Fork Road, and along the roadway on the southeast corner of the intersection, along Route 460. Extremely high vegetation can be found in the southwest corner between the intersection and the entrance to ARC3 Gases. Maintained height of vegetation from the gutter ranged upward of 12 to 18 inches. Vegetation is also encroaching on the gutter.

Several sets of tire tracks can be found along the eastbound direction of Route 460. Through observation, it was found that the traffic queue built up quickly in this direction. Horizontal alignment of the road has Route 460 curving up from the south to the intersection with Kings Fork Road. Observation found that sight distance approaching the intersection was limited, especially with the high commercial traffic. Further investigation found that no signal ahead warning sign was present on the approach.

5.4.2 Crash Summary

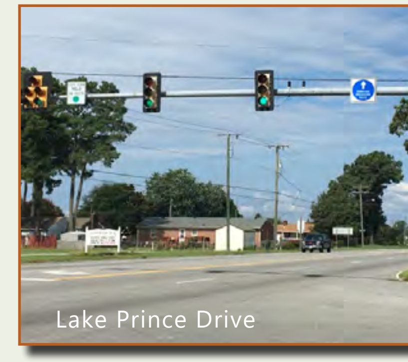
Between 2012 and 2016, twenty-five (25) crashes occurred at the intersection of Route 460 and Kings Fork Road. Sixteen percent (4 crashes) resulted in visible injury (crash type B), 32 percent (8 crashes) resulted in non visible injury (crash type C), 52 percent (13 crashes) resulted in property damage only (crash type O). Eleven rear ends occurred at this location: four eastbound, four westbound, two southbound and one in the northbound direction. Additionally, eight angle crashes occurred at this location. The remaining crashes were head on, side swipe, and other. Forty-four percent (11 crashes) occurring between 3 PM and 6 PM. None of crashes at this location were the result of DUI.

5.4.3 Suggested Countermeasures

- Curb and gutter improvements:
  - ◊ Remove debris and vegetation from curb and gutter – the debris and vegetation found in the gutter pan reduce the effectiveness of stormwater remove and can lead to pavement deterioration.
  - ◊ Remove/smooth pavement transition on the northern leg of the intersection.
- Red light running enforcement – Some drivers have noted concerns regarding red light running. Also, given the protected only left turn phasing at the intersection, and the amount of angle crashes, drivers are most likely disregarding the signal.
- Education – Messaging directed at drivers regarding speed and red light running.
- Pavement resurfacing – the pavement crack sealing is much more apparent than the pavement markings and as such, draws the driver's attention. Resurfacing the road would remove the lines formed by the crack seal. Additionally, given the number of rear end crashes, friction may be reduced and could be improved through repaving.
- Reflective border on signal backplates – this will help to enhance conspicuity of the intersection signals.
- Advance dynamic signal warning sign on both east and west bound approaches to intersection – this will provide vehicles, particularly heavy vehicles, with advance notice of the red signal at the intersection.

Figure 5.4.

Site Specific Location #4



5.5 Site Specific Location #4 Lake Prince Drive

5.5.1 Existing Conditions

This location is a signalized, paved, four-legged intersection located at Route 460, Lake Prince Drive and Providence Road. The surrounding area is comprised of agricultural land with a church property in the southwest corner. There is a lot on the northwestern corner of the intersection that appears to be used seasonally as a farmers market.

The eastern leg of Route 460 has a 190-foot left turn lane with 150-foot taper and a 110-foot right turn lane with a 170-foot taper. Along the western leg, there is a 220-foot left turn lane with a 165-foot taper. Right turn on red is permitted for both eastern and western legs. Protected left turn signal phasing is present in both the east and westbound directions. Both Lake Prince Drive and Providence Road, the northern and southern legs, respectively, have a single travel lane for all directions. Raised plowable pavement markers are installed along the eastern and western approaches. There are two horizontal curves, located east and west of the intersection. Sight distance along Route 460, from Lake Prince Drive or Providence Road, is clear to those points.

There are no medians within the limits of the intersection. Curb and gutter is present in the northeast and southwest corners of the intersection. Debris and vegetation within the gutter pan was visible. Grassy shoulders are present on the northwest and southeast corners of the intersection.

Wayfinding signage is present throughout intersection. It was observed that the 55 MPH sign just west of this location is noticeably smaller than other signs installed in the vicinity of the intersection and the other speed limit signs throughout the rest of the corridor. There are two pole mounted street lamps for illumination. Pavement quality is in average condition; pavement cracking and deterioration, without the application of crack seal, was noticed throughout. Pavement markings are visible, but are worn and deteriorating. Edgelines show signs of heavy wearing from vehicular traffic. All intersection signals have black backplates but are lacking reflective borders.

A fixed object, a concrete bollard, was identified in the northeast quadrant.

5.5.2 Crash Summary

Between 2012 and 2016, twelve crashes occurred at the intersection of Route 460 and Lake Prince Drive. Eight percent (1 crash) resulted in visible injury (crash type B), 25 percent (3 crashes) resulted in non-visible injury (crash type C), and 67 percent (8 crashes) resulted in property damage only (crash type O). Fifty percent (6 crashes) were angle crashes and 25 percent (3 crashes) were rear ends. All rear end crashes occurred in the westbound direction. Three of the six angle crashes involved left turning vehicles; two of those left-turning angle crashes were from left turning vehicles from the southern leg of the intersection. The remaining crashes were side swipe and fixed object off road. Fifty percent (6 crashes) occurred between the hours of 12 PM and 6 PM. One crash was the result of a DUI.

5.5.3 Suggested Countermeasures

- Remove concrete bollard – the concrete bollard on the northeast quadrant of the intersection should be removed if possible. If removal is not possible then an object marker should be installed.
- Remove debris and vegetation from curb and gutter – the debris and vegetation found in the gutter pan reduce the effectiveness of stormwater remove and can lead to pavement deterioration.
- Pavement resurfacing – the pavement crack sealing is much more apparent than the pavement markings and as such, draws the driver's attention. Resurfacing the road would remove the lines formed by the crack seal. Additionally, given the number of rear end crashes, friction may be reduced and could be improved through repaving.
- Reflective border on signal backplates – this will help to enhance conspicuity of the intersection signals.
- Intersection warning signage – add intersection warning sign on the westbound approach to warn drivers of the upcoming intersection. An existing signal warning sign with beacons is present on the eastbound approach. If rear end crashes persist, future enhancement could include warning beacons or a dynamic red light warning sign.
- Speed enforcement – conduct speed enforcement on Route 460 intersection approaches.
- Larger speed limit sign – replace smaller sized 55 MPH speed limit sign, to the west of the intersection, with a larger sign consistent with other speed limit signs within the study area.

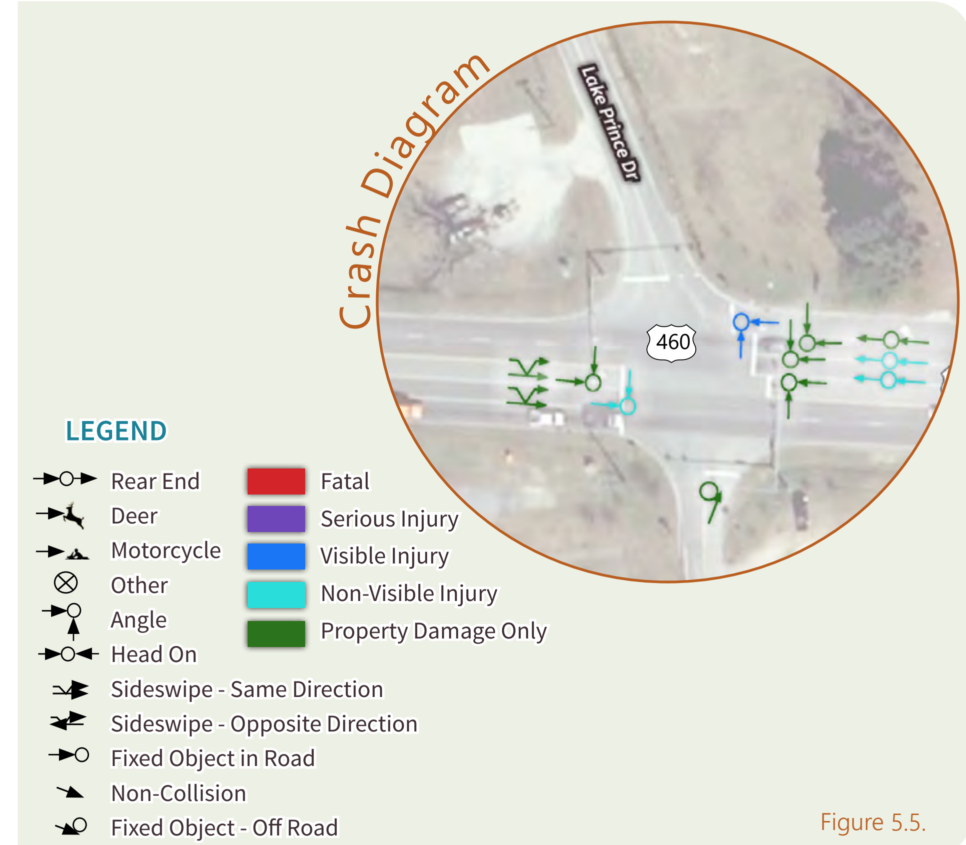
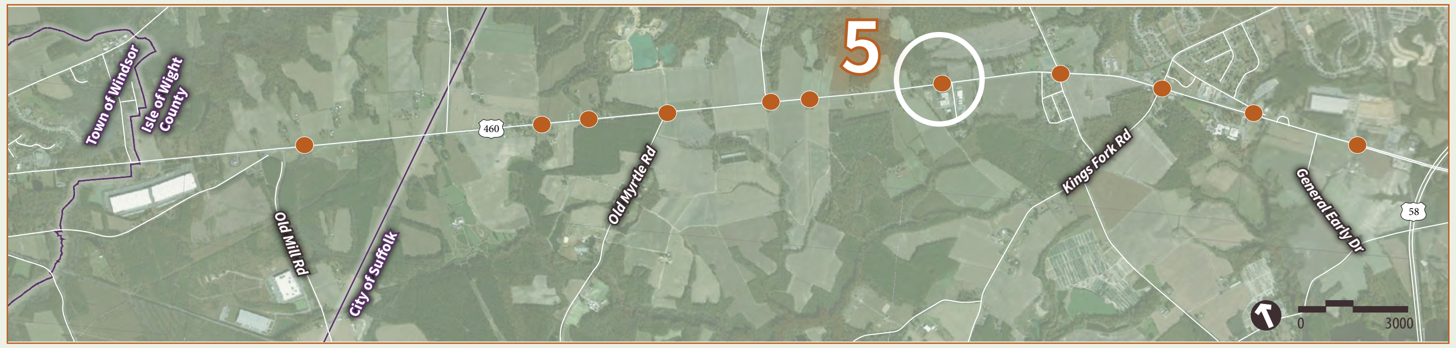


Figure 5.5.

Site Specific Location #5



5.6 Site Specific Location #5 Prudence Road

5.6.1 Existing Conditions

This location is the three-legged, unsignalized intersection of Route 460 and Prudence Road. The surrounding area on the northern side of Route 460 is heavily forested. The southern side is commercial, institutional, and church property.

All legs of this intersection are paved. The western leg of Route 460 has a single 115-foot right turn lane, with a 130-foot taper, on to Prudence Road. This intersection is void of any other turn lanes. Sight distance is clear throughout this location. A centerline rumble strip and raised plowable pavement markers are present along this stretch of Route 460. The outer travel lanes at this location are directly adjacent to narrow grassed shoulders. Little to no recovery area is provided between pavement edge and stormwater ditches.

Minimal signage can be seen at this location. Object markers are damaged or missing at all junctions of the drainage ditches and piping. One pole mounted street light is set far off from intersection, on the other side of the drainage ditch. Pavement of Route 460 and the apron of Prudence Road appear to be in good condition. However, heavy deterioration can be identified throughout the Prudence Road approach to the start of the paved apron. During the field review, ponding water was noted along the edge of Prudence Road. Pavement markings at this location are worn, cracking and in some portions, deteriorated. Outside the limits of the intersection, all four "SCHOOL" lane lettering is heavily worn.

All stormwater facilities show erosion and debris build up. There was significant deterioration of the stormwater facilities on the southwestern and southeastern corners of the intersection. Draining water appears to have washed away the dirt around the headwall at the drainage culvert on the southwestern quadrant, causing a hole to form between the headwall and the edge of the roadway.

5.6.2 Crash Summary

Between 2012 and 2016, twenty-two (22) crashes occurred at the intersection of Route 460 and Prudence Road. Nine percent (2 crashes) resulted in visible injury (crash type B), 55 percent (12 crashes) resulted in non visible injury (crash type C) and 36 percent (8 crashes) resulted in property damage only (crash type O). Fifty-five percent (12 crashes) were rear end crashes, six crashes in the eastbound direction, five in the westbound direction, and one in the northbound direction. Of the remaining 45 percent (10 crashes) four were angle crashes, two were side swipe crashes and three were fixed object off road crashes. Twenty-three percent (5 crashes) occurred during rainy weather conditions, while the other 77 percent occurred with no adverse weather conditions. Thirty-two percent of crashes occurred between 9 AM and 12 PM.

5.6.3 Suggested Countermeasures

- Pavement resurfacing on Prudence Road – the Prudence Road approach is significantly deteriorated and provides and unstable surface for drivers. Resurfacing could also help to improve drainage on Prudence Road.
- Enhanced pavement markings – new pavement markings, including the "SCHOOL" warning markings could help to improve visibility of the roadway edge and intersection.
- Drainage ditch improvements – the drainage ditch, and facilities on both the southeastern and southwestern corners of the intersection, are significantly deteriorating and should be repaired, regraded, and reseeded to ensure proper function, roadway stability, and remove the steep roadside drop-off that poses a risk to drivers who may leave the roadway.
- Protection/warning of steep roadside ditch – guardrail should be considered in the vicinity of the intersection, to protect drivers from the steep drainage ditch on the southern side of the roadway. If guardrail is not installed, or until it can be installed, object marker signs should be installed along the ditch to warn drivers.
- Intersection warning signage – add intersection warning sign on the westbound, and possibly eastbound, approach to warn drivers of the upcoming intersection. An existing sign warning drivers to watch for turning vehicles, with a 45 MPH placard, is present on the westbound approach, prior to the "SCHOOL" pavement markings. An additional sign, closer to the intersection, warning of the intersection could supplement the existing warning sign. If rear end crashes persist, future enhancement could include warning beacons or a dynamic beacons warning of side-street traffic in combination with the warning sign.
- Turn lane/acceleration lane – Adding a left turn on the westbound approach, along with a complimentary acceleration lane for vehicles turning left from the school onto westbound Route 460, would remove slower moving traffic from the through traffic.

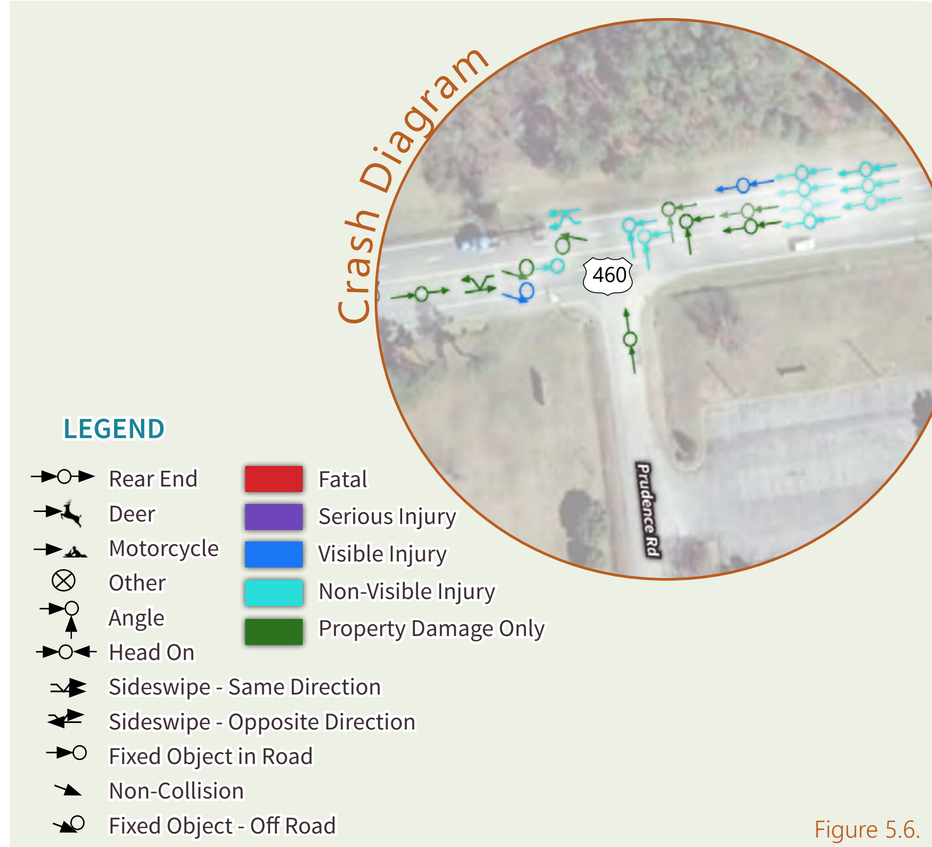


Figure 5.6.

Site Specific Location #6

5.7 Site Specific Location #6 1,200 Feet East of Gardner Lane

5.7.1 Existing Conditions

This location is the segment of Route 460 located approximately 1200 feet east of Gardner Lane. The surrounding area is a mixture of agriculture and residential land. Sight distance throughout the segment is clear.

Both the eastern and western legs of Route 460 are paved. On the southern side of Route 460, one residential property, with two dirt apron entrances, is present adjacent to the intersection. Alternatively, a paved apron is located on the northside of Route 460, leading to two private residences. The remainder of the surrounding area is agricultural land. No turn or deceleration lanes are present at this location.

Route 460 is undivided with a rumble strip and raised plowable pavement markers A narrow gravel shoulder is present on the southern edge of the intersection with a drop off from the pavement to the gravel and another into ditch. The northern edge has little to no shoulders.

There are no direction or wayfinding signs at this location. Pavement and pavement markings along Route 460 are in good condition but the shoulder. is deteriorating. There is no lighting identified at this location.

5.7.2 Crash Summary

Between 2012 and 2016, eight (8) crashes occurred at the segment of Route 460 located approximately 1200 feet east of Gardner Lane. Thirteen percent (1 crash) resulted in fatality (crash type K), 25 percent (2 crashes) resulted in visible injury (crash type B), 25 percent (2 crashes) resulted in non-injury (crash type C), and the remaining 37 percent (3 crashes) were property damage only (crash type O). At this location, two rear end crashes occurred in the westbound direction, one motorcyclist crash occurred in the southbound direction, one angle crash, one non-collision, one deer collision, and two fixed object off road crashes. Thirty-seven percent of crashes occurred during the hours of 6 AM and 9AM. Sixty-two percent of crashes occurred in the months of April, May, and June.

5.7.3 Suggested Countermeasures

- Pave driveway aprons – paving driveway aprons will help to keep debris off the roadway and maintain pavement quality.
- Shoulder widening – providing a more forgiving roadway would allow space for to recover from unexpected roadway conditions or leaving the travel lane.

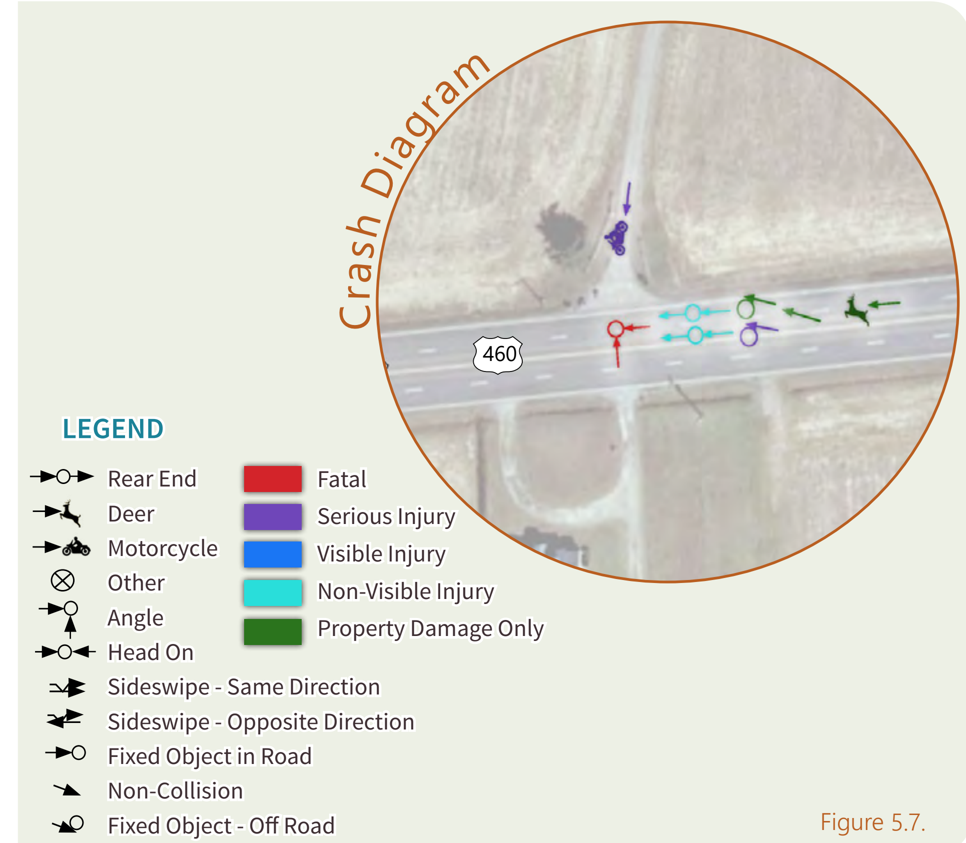
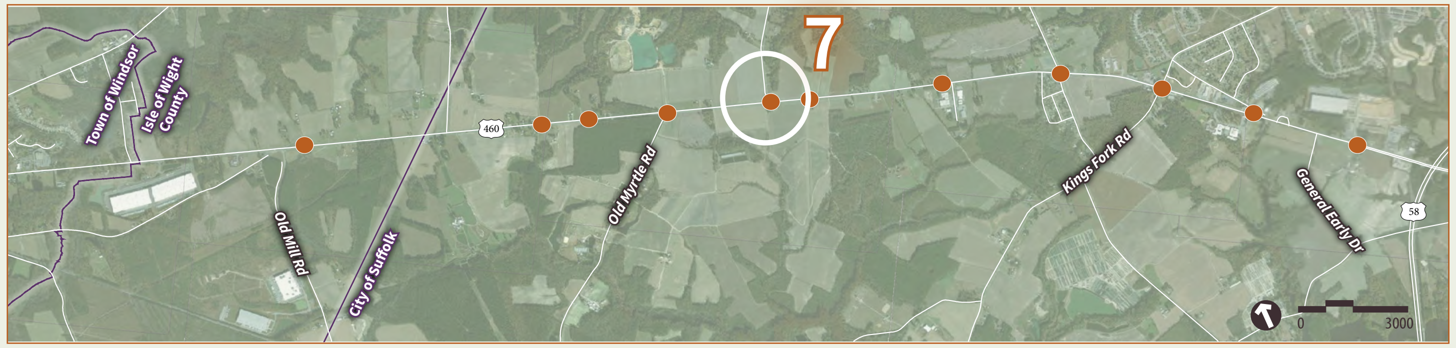


Figure 5.7.

Site Specific Location #7



5.8 Site Specific Location #7 Gardner Lane

5.8.1 Existing Conditions

This location is the three-legged, unsignalized intersection of Route 460 and Gardner Lane. The surrounding area is comprised of agriculture and residential land.

All intersection approaches are paved; however, on the southside of Route 460, two dirt aprons are present to access the residential property located adjacent to the intersection. No turn or deceleration lanes are present at this location. Sight distance around the intersection is clear.

Route 460 is undivided with a rumble strip and raised plowable pavement markers. A small, approximately 3-foot by 8-foot, concrete median is located in the center of Gardner Lane and is the placeholder of a single stop sign. There were raised pavement markers on the stop sign island; however, three of five raised pavement markers are missing and the remaining markers are broken. A gravel shoulder is present on the southern edge of the intersection with immediate drop off into a drainage ditch. Other sections of this location have little to no shoulders. The southern stormwater ditch is in good condition.

Within the intersection, one stop sign is installed on the Gardner Lane approach and one pole mounted street light is installed on the southern edge. No other direction or wayfinding signs were observed. Pavement and pavement markings along Route 460 are in good condition. Roadway and shoulder deterioration was observed, as well as a lack of pavement markings, including stop bar, on Gardner Lane. Edgelines were not present at the corner radii in either the northeast or northwest corners of the intersection.

5.8.2 Crash Summary

Between 2012 and 2016, twelve (12) crashes occurred at the intersection of Route 460 and Gardner Lane. Twenty-five percent (2 crashes) resulted in visible injury (crash type B), 33 percent (4 crashes) resulted in non-visible injury (crash type C), and 42 percent (5 crashes) resulted in property damage only (crash type O). Forty-two percent of crashes were rear end, two eastbound and three in the westbound direction. Additionally, twenty-five percent of crashes were angle crashes. The angle crashes all involved left-turning vehicles, two turning left from Gardner Lane onto eastbound Route 460 and two turning left from eastbound Route 460 onto Gardner Lane. The remain thirty-three percent of crashes were side swipe, fixed object and deer related crashes. Fifty percent of crashes occurred during the hours of 6 AM and 9AM.

5.8.3 Suggested Countermeasures

- Realign intersection – Gardner Lane intersects Route 460 at a skewed angle, restricting sight distance of oncoming traffic and allowing for high speed turns onto Gardner Lane.
- Improve or remove island with stop sign on Gardner Lane.
- Provide turning lanes and acceleration lanes for traffic onto and off of Garner Lane.
- Speed enforcement in vicinity of intersection.

Figure 5.8.

Site Specific Location #8

5.9 Site Specific Location #8 Old Myrtle Road

5.9.1 Existing Conditions

This location is the unsignalized, four-legged intersection of Route 460 and Old Myrtle Road. The surrounding area is a combination of agricultural and heavily forested land.

Route 460, in both the eastern and western legs, and the southern leg of Old Myrtle Road are paved. The northern leg of the intersection is gravel, with a dirt pull off just west of the intersection. The Southern leg of Old Myrtle Road creates a skewed intersection. There is a 135-foot right turn lane with a 155-foot taper located along the eastern leg of Route 460. Line of sight is hindered by vegetation, signs, and other fixed objects along Route 460.

Curb and gutter is not present at this location. Gravel and grass shoulders are present, albeit narrow, resulting in little to no recovery area. Deep stormwater ditches runs parallel to both sides of Route 460.

Good wayfinding signs are present throughout intersection. One pole mounted street light was identified at this location. Heavy dump truck traffic was observed on southbound Old Myrtle Road to and from commercial business. Despite some pitting in the right turn lane, overall the pavement on Route 460 is in good condition. All pavement edges are showing signs of deterioration and cracking. Between pavement edge and dirt pull off, pavement drop off was noticeable. Pavement markings are visible, but show signs on wearing and deterioration. A centerline rumble strip is present, as well as raised plowable pavement markers.

5.9.2 Crash Summary

Between 2012 and 2016, twenty-eight (28) crashes occurred at the intersection of Route 460 and Old Myrtle Road. Four percent (1 crash) resulted in fatality (crash type K), 11 percent (3 crashes) resulted in ambulatory injury (crash type A), 21 percent (6 crashes) resulted in visible injury (crash type B), 29 percent (8 crashes) resulted in non-injury (crash type C), and the remaining 36 percent (10 crashes) were property damage only (crash type O). Thirteen rear end crashes accounted for forty-six percent of crashes at this location, six in the eastbound directions and seven in the westbound direction. Fourteen percent of crashes were fixed object off road. Eleven percent accounted for deer related crashes and an additional eleven percent were categorized as other crashes. Seven percent were angle crashes, and the remaining twelve percent were a motorcycle crash, a head on crash and a non-collision. Thirty-nine percent of crashes occurred during the hours of 3 PM and 6 PM. One crash was the result of a DUI.

5.9.3 Suggested Countermeasures

- Pave driveway aprons – paving driveway aprons will help to keep debris off the roadway and maintain pavement quality.
- Intersection warning signs in both east/westbound directions – may want to consider installing dynamic warning signs for both Old Myrtle Road and the private driveway given the high number of crashes.
- Add turn/acceleration lanes:
  - Add left turn lane and left/right turn receiving lanes (from Old Myrtle Road and private driveway in westbound direction).
  - Add left and right turn and acceleration lanes in eastbound direction.

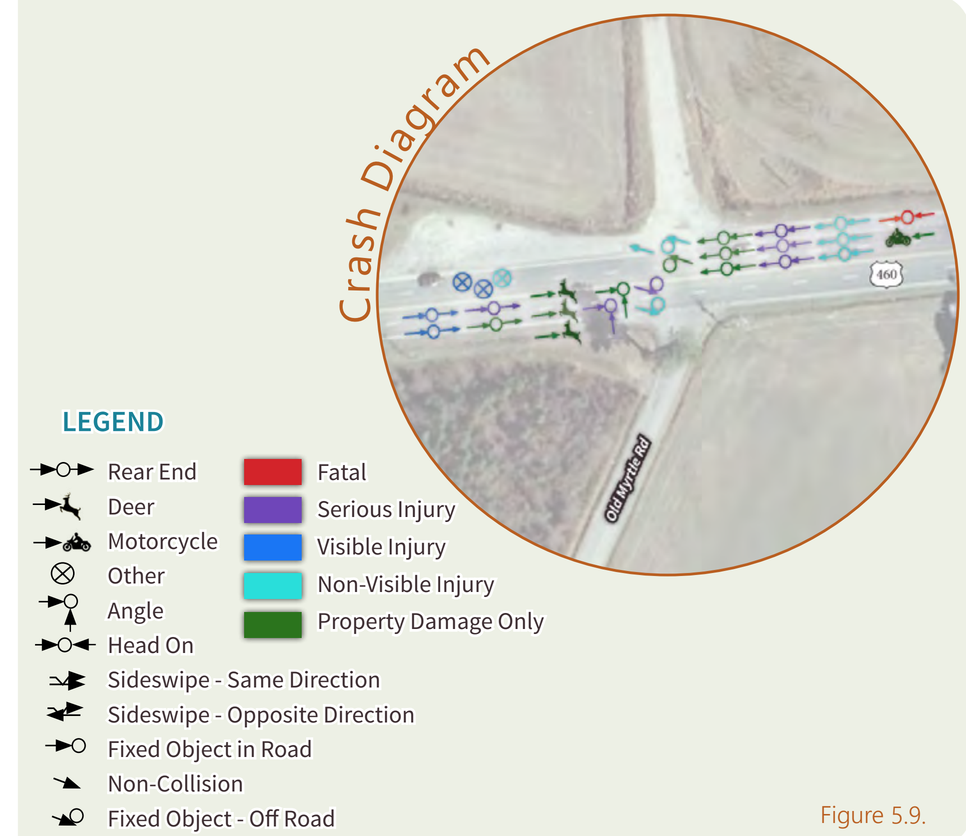


Figure 5.9.

Site Specific Location #9

5.10 Site Specific Location #9 2,200 Feet West of Old Myrtle Road

5.10.1 Existing Conditions

This location is a segment of Route 460, located 2,200 feet west of Old Myrtle Road. Surrounding area is a combination of residential and forested land. Heavy vegetation is found along the northern side of Route 460.

The four-lane, undivided highway is paved, with dirt aprons leading to residential land. There are no turn lanes present.

A centerline rumble strip is installed along this segment. Steep sloped embankments line both sides of Route 460 and little to no recovery area is available between pavement edge and stormwater ditch.

Pavement along Route 460 is in good condition. Pavement markings, including edgelines, are visible but are deteriorating and cracking. Raised plowable pavement markers are installed along centerline and lane markings. No street lights were observed along this corridor section.

Mailboxes, trees and other fixed objects are present on both sides of Route 460.

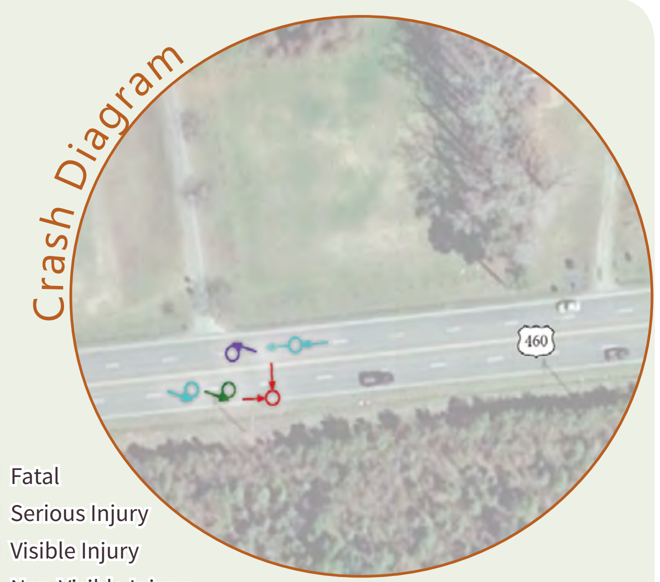
5.10.2 Crash Summary

Between 2012 and 2016, five (5) crashes occurred at the segment of Route 460 and 2200ft West of Old Myrtle Road. Twenty percent (1 crash) resulted in a fatality (crash type K), 20 percent (1 crash) resulted in a visible injury (crash type B), 40 percent (2 crashes) resulted in non-visible injury (crash type C), and the remaining 20 percent (1 crash) resulted in property damage only (crash type O). At this location, one crash was a rear end in the westbound direction, one crash was an angle crash, and three crashes were fixed object off road, one in the westbound direction and two in the eastbound direction. Sixty percent of crashes at this location was due to failure to maintain proper control.

5.10.3 Suggested Countermeasures

- Pave driveway aprons – paving driveway aprons will help to keep debris off the roadway and maintain pavement quality.
- Shoulder widening – providing a more forgiving roadway would allow space for to recover from unexpected roadway conditions or leaving the travel lane.

Crash Diagram



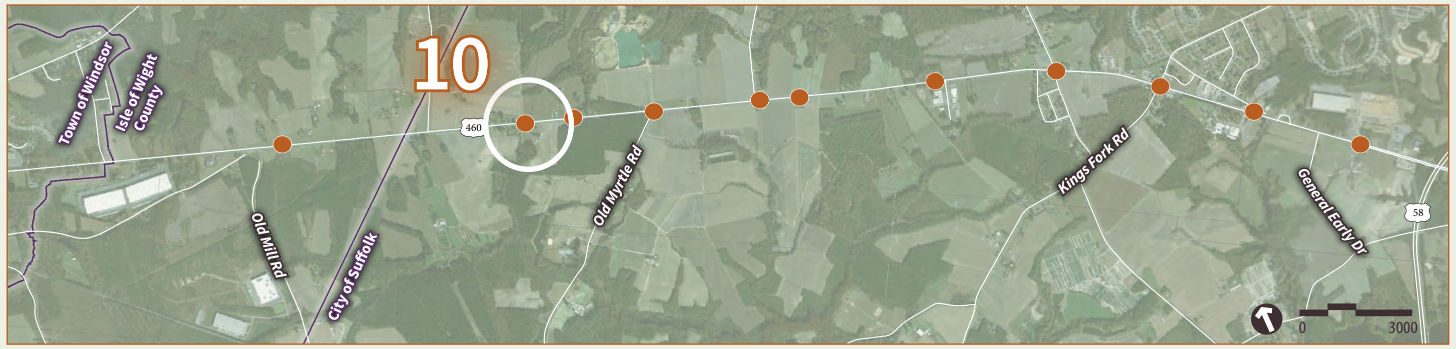
LEGEND

- Rear End
- Deer
- Motorcycle
- Other
- Angle
- Head On
- Sideswipe - Same Direction
- Sideswipe - Opposite Direction
- Fixed Object in Road
- Non-Collision
- Fixed Object - Off Road

- Fatal
- Serious Injury
- Visible Injury
- Non-Visible Injury
- Property Damage Only

Figure 5.10.

Site Specific Location #10



5.11 Site Specific Location #10 1,750 Feet East of Ennis Mill Road

5.11.1 Existing Conditions

This location is a segment of Route 460 located 1,750 feet east of Ennis Mill Road. It is an undivided 4-lane segment with turn lanes. Both the eastern and western legs of Route 460 are paved while the adjoining pull-off is a gravel access to a vacant commercial building. The area surrounding this location is a mixture of residential and agricultural land. Segment sight distance is fine in both directions. Poles and mailboxes both line Route 460.

There are no medians or curb and gutters along this portion of the corridor. A centerline rumble strip is installed along the centerline, separating east and westbound traffic. This segment is lined with little to no shoulders. Existing shoulders have drop-offs to gravel and stormwater ditches. The transition from pavement edge to drainage ditches are steep and eroded.

Wayfinding signs are not installed along this segment and the existing 55 MPH sign was observed to be smaller than other signs. The pavement is in average condition and pavement marking cracking and wear is evident. Raised paved pavement markers are installed along this stretch of Route 460. One street lamp is installed, but it is for business use.

5.11.2 Crash Summary

Between 2012 and 2016, seven (7) crashes occurred at the segment of Route 460 located 1750ft East of Ennis Mill Road. Fourteen percent (1 crash) resulted in a fatality (crash type K), 14 percent (1 crash) resulted in visible injury (crash type B), 29 percent (2 crashes) resulted in non-visible injury (crash type C), and remaining 43 percent (3 crashes) resulted in property damage only (crash type O). Of the seven crashes at this location, two were rear end crashes, one in each the eastbound and westbound directions, two crashes were side swipe crashes, one in each the eastbound and westbound directions. The remaining three crashes that occurred at this location were a deer-related crash, a fixed object off road, and a crash categorized as other. The remain 58 percent (four crashes) were due to failure to maintain proper control. Seventy-two percent (5 crashes) occurred during no adverse weather conditions, while 14 percent (1 crash) occurred during the rain, and fourteen percent (1 crash) occurred in misty weather. Fifty-eight percent (4 crashes) occurred during the hours 3 PM and 6 PM. Seventy-two percent of crashes occurred with in the months of October, November and December.

5.11.3 Suggested Countermeasures

- Treatments to allow residents to enter/exit road:
  - ◊ Access road to combine driveway access points onto Route 460.
  - ◊ Acceleration/deceleration lanes or a two way left turn lane.
  - ◊ Speed enforcement to ensure that drivers have adequate time to see and react to entering vehicles and to also provide sufficient gaps for drivers pulling out of the driveways.

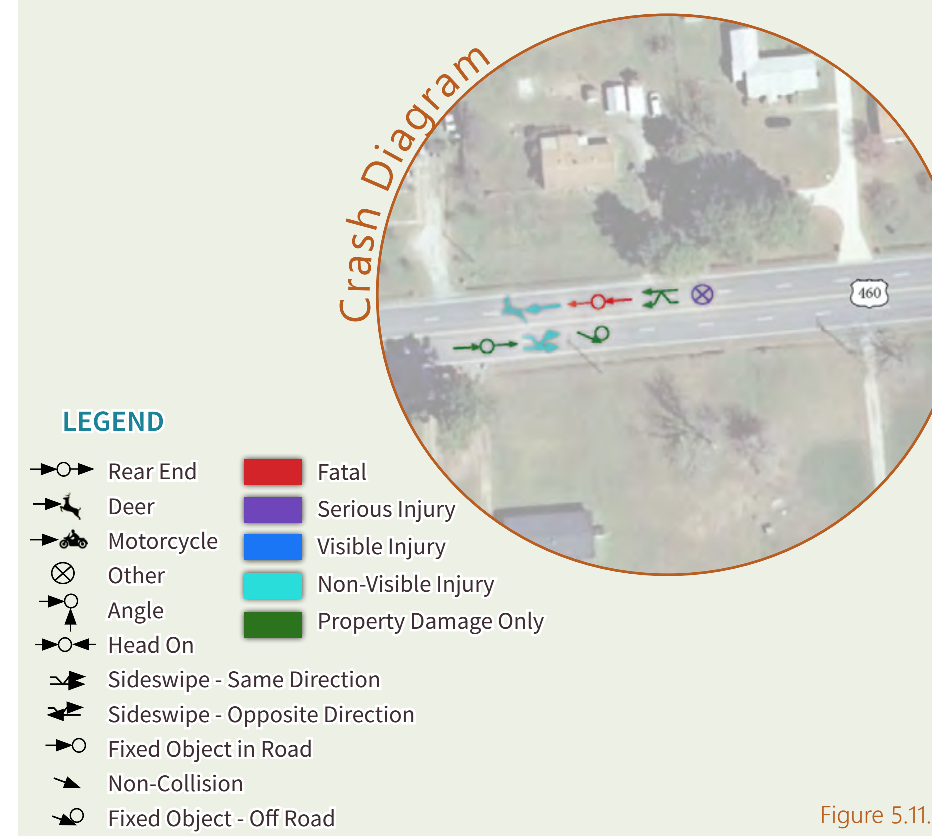


Figure 5.11.

Site Specific Location #11

5.12 Site Specific Location #11 1,000 Feet East of Old Suffolk Road

5.12.1 Existing Conditions

This location is an undivided segment of Route 460 located 1,000 feet east of Old Suffolk Road. The area surrounding this location is predominately agricultural crop land divided by two gravel driveways. Sight distance along this segment is clear, with the exception of mailboxes and utility poles.

This location is paved along the eastern and western legs, with three dirt aprons, two on the southern side and one on the northern side. The dirt aprons are not located across from each other. No turn lanes are located along this segment.

This segment contains a pavement marking transition from a double yellow line, with a centerline rumble strip, to a traversable median. A centerline rumble strip is also installed. Raised plowable pavement markers installed throughout the segment.

Little to no shoulders or recovery area are present at this location. There is a steep transition from edge of pavement into stormwater collection ditches. Overgrown vegetation, debris, and build-up can be seen along entire length of ditch and the reinforced concrete piping is blocked or clogged. Two of the entry points to Route 460 are obscured by overgrown vegetation and may lead to unexpected entries into the roadway.

No advanced warning or wayfinding signs are installed within this segment. Additionally, no street lighting was visible in this segment. Pavement markings are in acceptable condition and visible; however, wear and heavy cracking can be observed on edgelines. Pavement appears to be in good condition.

Standing water was observed during and after all rainfall events. Both sides of the roadway ditches were full of sediment and vegetation. Stormwater drainage pipes were 75 percent obstructed during VHB's field review, potentially limiting effective water flow and drainage.

5.12.2 Crash Summary

Between 2012 and 2016, five (5) crashes occurred at the segment of Route 460 and 1,000 feet east of Old Suffolk Road (City Route 636). Forty percent (2 crashes) resulted in an ambulatory injury (crash type A), 40 percent (2 crashes) resulted in visible injury (crash type B), and the remaining 20 percent (1 crash) resulted in property damage only (crash type O). The five crashes that occurred at this location were a westbound rear end, a westbound sideswipe, a non-collision, a fixed object off road, and a crash categorized as other. Forty percent of crashes were caused by failure to maintain proper control. One crash occurred during rain, while the remaining crashes occurred during no adverse weather conditions. Sixty percent of crashes occurred during the months of April, May, and June.

5.12.3 Suggested Countermeasures

- Treatments to allow residents to enter/exit road:
  - Acceleration/deceleration lanes or a two-way left turn lane.
  - Speed enforcement to ensure that drivers have adequate time to see and react to entering vehicles and to also provide sufficient gaps for drivers pulling out of the driveways.
  - Trim vegetation to increase visibility of oncoming vehicles.
- Clear vegetation from drainage ditches to promote proper drainage and maintain roadway stability.

Figure 5.12.

Table 5.2.
Site Specific Cost Estimate.

		Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8	Location 9	Location 10	Location 11
Tier 1	Signage		$803		$503							
	Pavement Markings	$11,909	$14,006	$13,522	$19,612	$7,541						
	Signal	$792	$792	$792	$792							
	Other	$166	$166	$166	$166	$166	$166	$166	$166	$332	$166	$166
	Total	**$12,867**	**$15,767**	**$14,480**	**$21,073**	**$7,707**	**$166**	**$166**	**$166**	**$332**	**$166**	**$166**
Tier 2	Signage	$500	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
	Pavement Markings	$1,016	$964	$871	$554	$7,541						
	Signal			$2,600	$2,600							
	Other											
	Total	**$1,516**	**$1,624**	**$4,131**	**$3,814**	**$8,201**	**$660**	**$660**	**$660**	**$660**	**$660**	**$660**
Tier 3	Signage			$7,920	$7,920	$7,920			$7,920			
	Pavement Markings					$832						
	Signal											
	Other			$15,000	$600			$5,280				
	Mill and Overlay*	$562,800	$609,000	$504,000	$634,200	$168,000						
	Install Turn Lane(s)					$179,000		$236,000	$358,000			
	Install Acceleration Lane(s)					$203,000		$203,000	$507,500		$812,000	$406,000
	Pave Driveway Apron						$6,000		$23,000	$12,000		
	Roadway Lighting	$20,000				$20,000						
	Widen Shoulder & Add Guardrail					$52,026						
	Widen Shoulder	$52,034					$104,068			$104,068		
	Realign Intersection							$154,532				
	Total	**$634,834**	**$609,000**	**$526,920**	**$642,720**	**$630,778**	**$110,068**	**$598,812**	**$896,420**	**$116,068**	**$812,000**	**$406,000**

Note: 1) Systemic improvements from the templates are not included separately in this estimate. They are accounted for in the systemic cost estimate.
2) Right of way and utility relocations are not included in these estimates.
3) Full depth pavement replacement may be necessary, but is not included in the cost.

*Does not include new pavement markings - those are accounted for above in Tier 1 and Tier 2.

This page intentionally left blank.

chapter 6

Arterial Preservation and Emergency Evacuation

This page intentionally left blank.

6.1 Introduction

The vision for Route 460 is to provide safe and reliable mobility along the corridor. VDOT's new program, the Arterial Preservation Program, ties directly to that vision. While the need for this project was identified prior to the release of VDOT's program, this section intends to touch on the overarching principals of the program and how they can be tied to Route 460.

Additionally, mobility during emergency situations is key to mobility and safety of the public, especially in coastal areas that are prone to hurricanes and flooding. As part of this study, a qualitative evaluation of Route 460 as a possible evacuation route was conducted. The details and summary are presented later in this section.

6.2 Arterial Preservation

VDOT developed an Arterial Preservation Program to preserve and enhance the mobility and safety along critical transportation corridors within the Commonwealth. The main objective of this program is to establish alternative, innovative transportation solutions and strategies to corridor treatments to increase capacity as a substitute for traditional widening projects. The Route 460 corridor has been identified as a Mobility Preservation Segment (MPS) by VDOT and is pending adoption into VTrans2040 by the Commonwealth Transportation Board (CTB).

A MPS has been defined, by VDOT, as "a segment of arterial roadway outside of an urban area, with a population of 50,000 or more, that serves as a long-distance mobility need where no parallel freeway route exists." The major goal for Route 460, as an MPS, is to minimize traffic delays, especially at access points.

6.3 Route 460 Corridor Preservation

A systemic field review and a traditional site-specific field review were conducted on the Route 460 corridor as part of this study. This review process was used to identify and collect roadway features, right-of-way/clear zone restrictions, roadside observations, traffic control information and intersection design. In addition, existing studies, plans, policies and guidelines were reviewed to provide a greater understanding of the corridor, while assessing safety and operational needs.

Operational analysis was conducted as part of this study. The primary goal is to increase capacity and reduce delay along the mainline, Route 460. Through proposed signal timing and phasing improvements such as adding the flashing yellow arrow signals at select intersection, flow along Route 460 may be increased while delay decreases.

In line with that, a detailed evaluation of the intersection of Prudence Road and Route 460 intersection was evaluated for an innovative intersection design utilizing VDOT's Junction Screening Tool (VJuST). The results of this analysis will be included in the final study.

6.4 Access Management

Access management supports corridor preservations and is key to improvement of mobility and safety along the Route 460 corridor. While access management was not specifically evaluated along the entire Route 460 corridor as part of this study, any new access points should be closely evaluated for the impact to the mainline as future development occurs. VDOT provides guidance on the spacing, design, and control of new access points that should be utilized when making decisions on future access points or evaluating existing access point consolidation.

6.5 Evacuation Route Qualitative Evaluation

Evacuation routes are planned and analyzed for viability during natural or man-made disasters. Routes should be considered based on the roadway's ease of restoration, functional service, and strategic location. Potential problems such as bottlenecks, barriers and scheduled work zones should be identified and analyzed in advance to ensure sufficient egress is provided within the affected areas.

On June 1, 2017, Virginia launched new tiered evacuation zones for the coastal areas throughout Hampton Roads, the Northern Neck, Middle Peninsula and Eastern Shore. These zones are designated letters A through D and provide residents with a better understanding of whether they should evacuate in an emergency based on the nature of the event. This new system has the potential to reduce traffic congestion, promote increased highway safety, and lessen overcrowding at storm shelters throughout Virginia's coastal region.

The study area along the Route 460 corridor resides in Isle of Wight County and the City of Suffolk. Currently, Route 460 westbound operates as a two-lane evacuation route for residents on the southside of Interstate 264. Interstate 64 is the only route with a contra-flow lane reversal plan as stated in the Virginia Hurricane Preparedness Guide. Due to the number of uncontrolled access points and driveways along Route 460, a one-way contra-flow reversal evacuation route is not recommended along this route.

One of the constraints to Route 460 serving as an evacuation route is that it has minimal shoulders and a lack of pull-off areas along the corridor. The lack of space prohibits vehicles from pulling off the roadway and does not allow emergency vehicles access if the roadway becomes congested. Providing a wide shoulder on the westbound direction would provide greater emergency vehicle accessibility. Additionally, providing intermittent pull-off areas would get broken down vehicles out of the road and provide more capacity. Those pull-off areas could also be used during non-emergency times for speed enforcement pull-offs.

Drainage issues have been identified along the Route 460 corridor. Drainage ditches are located directly adjacent to the roadway, potentially creating a flooding hazard during emergency evacuations. Geometric/drainage alternations should be made to reduce pooling and water spread to promote safer travel through the corridor. Drainage improvements, such as vegetation trimming, are proposed as part of the site-specific recommendations.

This page intentionally left blank.

chapter

7

Long Term Improvements

This page intentionally left blank.

The objective of this study is to identify small-achievable spot projects for improvements to the Route 460 corridor, from the western limits of the Town of Windsor to approximately 1,500 feet west of the Route 460 and Route 58 interchange. The spot projects will address safety and operational deficiencies while preserving the corridor as a primary arterial and emergency evacuation route. Based on the results of the corridor evaluation and the public comments received, it was clear that long-term substantial changes were needed to truly address safety and traffic flow along the corridor. Three alternative typical sections were evaluated to address the geometric deficiencies along the current roadway alignment. The alternatives are anticipated to reduce the number, and severity, of crashes while increasing mobility along the corridor. Each alternative builds on the previous one, providing additional safety and operational benefits while requiring additional investment for construction. For each alternative, a description of the anticipated improvements, the benefits it will provide, and a conceptual cost, are provided in this section and are shown in Figure 7.1. Details on the planning level costs are provided in Appendix I.

7.1 Alternative 1

This alternative includes the addition of wide shoulders throughout the entire study corridor. Providing shoulders is the lowest cost alternative we evaluated, providing many important safety and operational functions while minimizing right-of-way needs.

- Shoulders provide space for errant vehicles that have left the travel lane, increasing the chance for recovery for run off the road crashes.
- Shoulders provide space for temporary storage of disabled vehicles, reducing accident related lane closures, which contribute to severe congestion, and associated safety problems on high volume roadways.
- Shoulders increase driver comfort, which can improve capacity
- Shoulders accommodate bicyclists, providing them with separation from vehicle traffic and reduce risky passing maneuvers from motor vehicles traveling at higher speeds.
- Shoulders may be used by pedestrians.
- Shoulders help preserve the integrity of the roadway edge.
- Shoulders provide space for enforcement activities.

This alternative provides 8-foot-wide shoulders, along the outside edge of the roadway, consisting of 6-inches of asphalt paving over 10-inches of aggregate base. This alternative does not include any change to the existing lane width, nor does it include milling of the adjacent lane. Therefore, it will have the least amount of impact to the traveling public during construction of all the alternatives. Alternative 1 also has the least improvement to safety and operational efficiencies.

Alternative 1 - Conceptual Cost Estimate

The conceptual cost estimate is adjusted for inflation to construction year 2024, and includes estimated private utility relocation fees, and preliminary engineering and construction engineering services. This estimate does not include right-of-way costs.

- Isle of Wight County segment: encompasses an 8,040 foot stretch of Route 460 from Lovers Lane to the City of Suffolk line and is estimated to cost $6,060,000.
- City of Suffolk segment: encompasses a 25,580 foot stretch of Route 460 from the Suffolk City line to Northfield Drive and is estimated to cost $25,620,000.

7.2 Alternative 2

This alternative includes the addition of 8-foot-wide shoulders through the corridor, as described in Alternative 1, with the addition of a median barrier and narrow inner shoulder along the edge of the travel lanes. A median barrier provides additional safety and operational benefits over those discussed in Alternative 1.

- Median barriers physically separate opposing traffic, reducing highly destructive and often fatal, head on collisions.
- Median barriers control access at intersections by limiting turning options, improving traffic flow and reducing collisions by allowing certain turning movements only at locations where sight distance is improved, or crossing treatments have been provided.

This alternative provides 8-foot-wide shoulders, along the outside edge of the roadway, consisting of 6-inches of asphalt paving over 10-inches of aggregate base. Ten feet of separation will be provided between each direction of travel, with a 2-foot-wide concrete median barrier in the center. To incorporate this separation and median barrier, the roadway would need to be widened approximately 5 feet in both directions. The affected travel lane area will be constructed with 9-inches of asphalt over 12-inches of aggregate base.

This alternative does not include any change to the existing lane width, nor does it include milling of the adjacent lane.

Alternative 2 - Conceptual Cost Estimate

The conceptual cost estimate is adjusted for inflation to construction year 2024, and includes estimated private utility relocation fees, and preliminary engineering and construction engineering services. This estimate does not include right-of-way costs.

- Isle of Wight County segment: encompasses an 8,040 foot stretch of Route 460 from Lovers Lane to the City of Suffolk line and is estimated to cost $11,570,000.
- City of Suffolk segment: encompasses a 25,580 foot stretch of Route 460 from the Suffolk City line to Northfield Drive and is estimated to cost $41,490,000.

7.3 Alternative 3

This alternative provides complete reconstruction of the roadway, wider travel lanes, a 40-foot depressed median and an 8-foot-wide outside shoulder. In addition to the safety and access management improvements provided in Alternative 2, this option provides some increased operational, safety, aesthetic, and environmental benefits.

- Depressed median provides a recovery area for errant vehicles leaving the roadway along the inside edge of the traveled way.
- Depressed median provides a refuge space for turning vehicles allowing for a two-stage left turn by allowing the driver to focus on one direction of opposing vehicles at a time.
- Trees, or other landscaping features, may be provided in the median space.
- The wide median space retains and filters stormwater, reducing water on the roadway and reducing the impact to nearby water ways.
- 12-foot lanes provide additional comfort for drivers, especially truck traffic.
- Reconstructed lanes will provide a smooth driving surface.
- Wide median widths provide space for future roadway widening, addition of turn lanes, additional lighting, and other treatments requiring additional roadway right-of-way.

This alternative is the most expensive alternative, but it provides the most flexibility to mitigate issues in the future as the corridor grows, and volumes increase

Alternative 3 - Conceptual Cost Estimate

The conceptual cost estimate is adjusted for inflation for construction year 2024, and includes estimated private utility relocation fees and preliminary engineering and construction engineering services. This estimate does not include right-of-way costs.

- Isle of Wight County segment: encompasses an 8,040 foot stretch of Route 460 from Lovers Lane to the City of Suffolk line and is estimated to cost $21,310,000.
- City of Suffolk segment: encompasses a 25,580 foot stretch of Route 460 from the Suffolk City line to Northfield Drive and is estimated to cost $62,840,000.

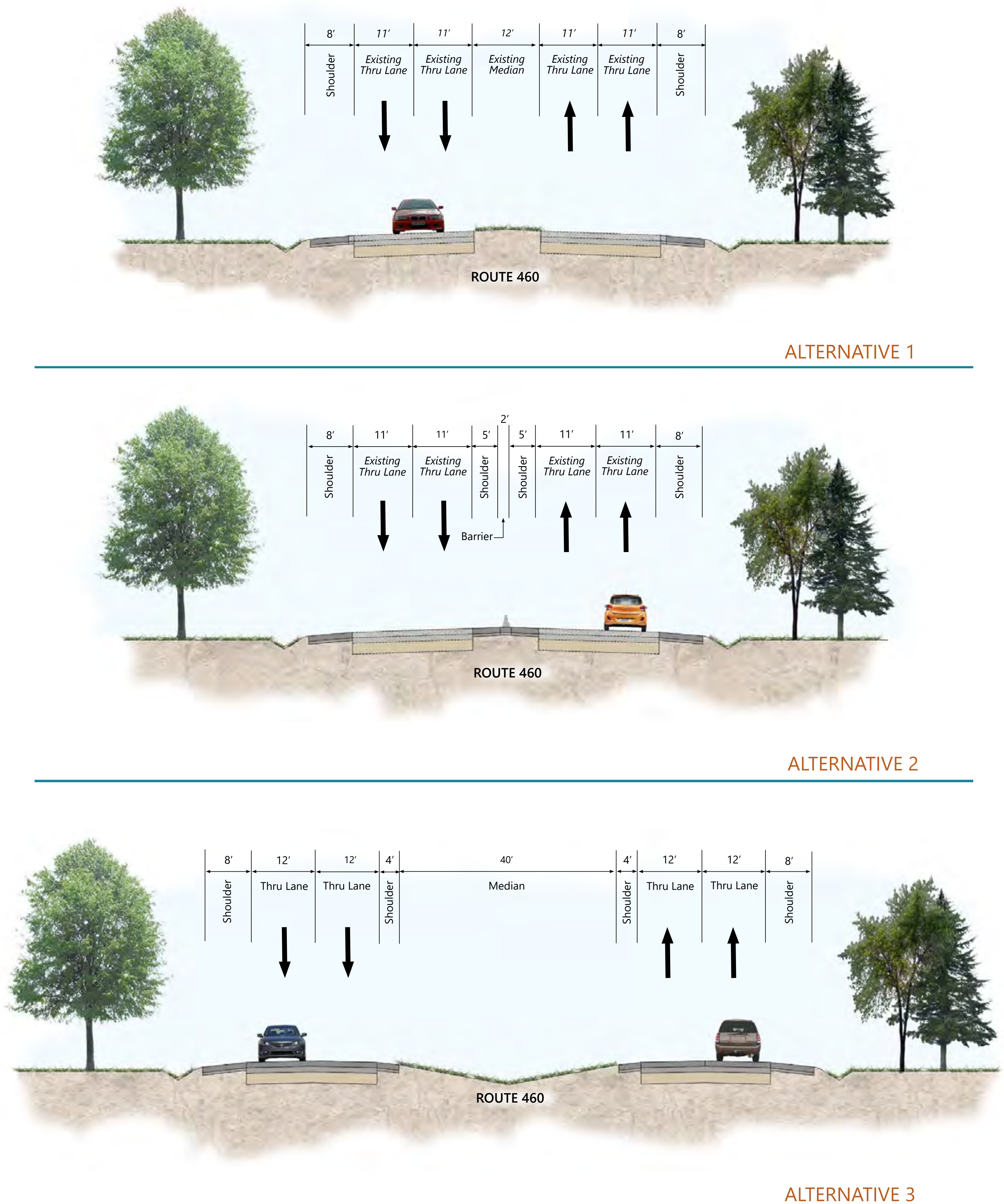


Figure 7.1.
Typical Sections.

chapter

8

Recommendations

This page intentionally left blank.

8.1 Introduction and Methodology

The goal of the study was to provide a set of recommendations for operational, safety, and arterial preservation and evacuation improvement. In order to achieve that goal, the Route 460 Safety and Operations Study provided a comprehensive evaluation the Route 460 corridor with the purpose of understanding operational and safety conditions, within the context of arterial preservation and evacuation. The outcome of these evaluations is a series of recommended treatments which have proven operational and safety benefits and address existing, short-term, and long-term corridor needs.

8.1.1 Operational Recommendations

The operational analysis included identification and study of specific intersections throughout the study area; including an analysis of existing 2040 No Build and Build conditions. This analysis was comprised of several elements, including the collection of traffic volumes and subsequent operational analysis of both signalized and unsignalized intersections. One signal warrant screening was also conducted. A summary of the recommendation, based on this analysis, are as follows:

- At the intersection of Route 460 and Rob's Drive, reduce delay on the side streets by increase green time for these approaches.
- At the intersection of Route 460 and Kings Fork Road, the southbound approach lane configuration should be changed to provide an exclusive left turn lane and combined through/right turn lane. This provides a dedicated lane to the movement with heavier volumes and signal phasing optimization. Also suggested are the provision of flashing yellow arrows on the Route 460 approaches to provide a safety benefit and phasing optimization for left turning vehicles.
- At the intersection of Route 460 and Providence Road/Lake Prince Drive, implement flashing yellow arrows on the Route 460 approaches to provide a safety benefit and phasing optimization for left turning vehicles.

8.1.2 Safety Recommendations

The safety portion of this study incorporated systemic template application, intersection evaluation, and site specific assessment toward the development of the recommendations. The safety improvements are comprised of a set of tiered recommendations of signs, pavement markings, geometric changes, traffic control techniques and other improvements to enhance safety and operations of the Route 460 corridor. The recommendations were determined through an evaluation of crash history and proactively applying templates of proven safety techniques in combination with site specific modifications with proven safety results.

During the five-year period of 2012-2016, there were 242 crashes. Through the approach presented in this report, the most prevalent and most severe crash types have been comprehensively considered and addressed.

- Two of the most common crash types were intersection-type crashes with rear end crashes accounting for 33 percent or 79 reported crashes and angle crashes accounting for 16 percent of all crashes or 39 reported crashes. Improved intersection signage, enhanced roadway delineation, and along with improvements in select locations, such as lighting and dynamic intersection warning improve intersection visibility and expectancy. Signal timing improvements would provide improved vehicular flow and turn lanes would remove slower moving vehicles from the flow of traffic.
- Roadway departure crashes were the second most prevalent crash type within the study area representing 26 percent or 63 of the total crashes. Countermeasures such as improved pavement markings, and rumble strips, along with site specific measures, such as lighting and shoulder widening, provide enhanced roadway delineation and warning for drivers.

8.1.3 Arterial Preservation and Evacuation Recommendations

For the purposes of this report, the existing conditions and potential considerations for arterial preservation and evacuation were reviewed at a high level. These findings have been summarized but no direct recommendations are included in this report. However, VDOT should consider these elements when planning for proposed changes to the corridor.

A high level summary of recommendations costs are presented in Table 8.1. See Appendix H and Appendix J for additional details.

Table 8.1.
Recommended Improvements.

Treatmemt	Cost
Systemic Treatments	
Tier 1	$1,293,492
Tier 2	$518,817
Tier 3	$608,284
Total	$2,420,593
Site Specific Treatments	
Tier 1	$73,056
Tier 2	$23,246
Tier 3	$5,983,620
Total	$6,079,922

8.2 Conclusion

Safety and operations play an important role in improving mobility along Route 460. This study has identified varying tiers of low-cost improvements that can be implemented along the corridor to provide a safer travel experience to road users.

The City of Suffolk is applying for funding for the implementation of Alternative 2 for the longer term improvements. The implementation of this alternative would further address the safety and operational challenges along the Route 460 corridor.

This page intentionally left blank.

Appendix A

CONTENTS

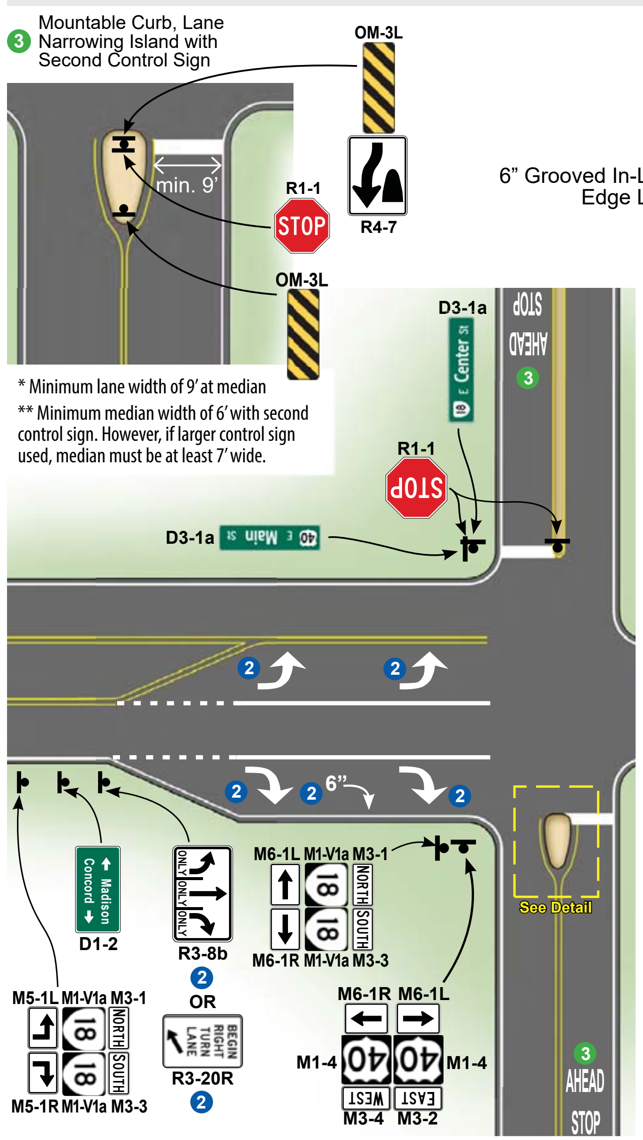
This page intentionally left blank.

Criteria for Placement of Edge Line Markings (Source: Virginia Supplement Chapter 3B)

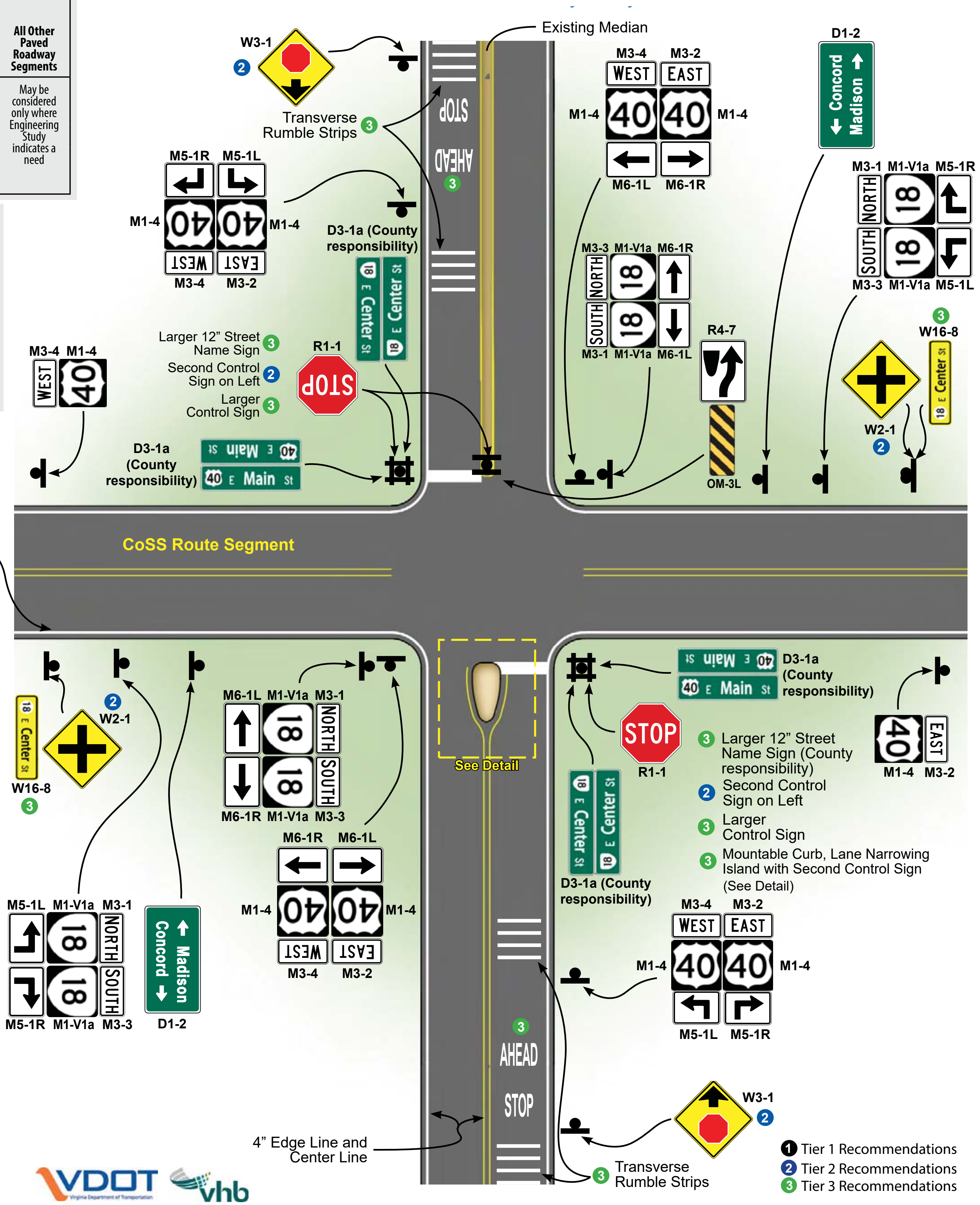
Pavement Width	Traffic Volume	Roadway Type: Undivided Limited Access	Bi-directional multi-lane	Two-lane Paved Roads with Center Line & without Curb and Gutter	Other Rural Arterials and Collectors	Local Residential	All Other Paved Roadway Segments
≥ 20 feet	≥ 3,000 vpd	Required	Required	Required	Recommended	Not Recommended unless primarily serving through traffic	May be considered only where Engineering Study indicates a need
	< 3,000 vpd	Required	Required	Required	May be considered only where Engineering Study indicates a need		
< 20 feet	≥ 3,000 vpd	Required	Required	May be considered only where Engineering Study indicates a need			
	< 3,000 vpd	Required	Required				

Criteria for Placement of Center Line Markings (Source: Virginia Supplement Chapter 3B))

Pavement Width	Traffic Volume	Roadway Type: Undivided Limited Access	Bi-directional multi-lane	Other Non-Local Residential	Other Local Residential	Local Residential
≥ 18 feet	≥ 500 vpd	Required	Required	Required	Recommended	Recommended
	< 500 vpd	Required	Required	Optional (if warranted)	Optional	Recommended
< 18 feet	≥ 500 vpd	Required	Required	May be considered only where Engineering Study indicates a need		Recommended
	< 500 vpd	Required	Required			Recommended



Template 1 - Unsignalized Intersection - 4-leg (2-way stop controlled), Undivided (3 Tiers)



NOTES:

Signage

- (1) Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- (1) Fluorescent yellow sheeting on change of Direction Warning signs
- (1) Street Name sign (D3-1a or D3-1 for local roads) (County responsibility)
- (3) Larger 12" Street Name sign (D3-1a) (County responsibility)
- (1) Control sign (R1 Series)
- (2) Second Control sign (R1 Series) on left if median is present and is greater than 6' in width, with a "Keep Right" sign (R4-7) and an Object Marker (OM3-L) facing opposite direction
- (3) Larger Control sign (R1 Series)
- (3) Mountable curb, lane narrowing island with second control sign (see detail)
- (1) OM3-L object marker and R4-7 "Keep Right" sign at end of mountable curb island
- (1) Intersecting Route and Directional sign (M1, M3, & M6 Series). Include signs for through movements on primary routes only where through movement is a different route number
- (1) Advance Intersecting Route and Directional sign (M1, M3, & M5 Series) on primary routes and secondary routes with AADT ≥ 2000 vpd
- (1) Confirmation Route signs (M1 and M3 series) on primary routes
- (1) Destination/guide sign (D1 series) on primary routes
- (2) Advance Intersection Lane Control signs (R3-8 Series) on approaches with turn lanes, or "Begin Right Turn Lane" sign (R3-20R) where only a right-turn lane is present
- (2) Intersection Warning sign (W2 series) on approaches that are not stop-controlled
- (3) Street Name (W16-8 series) signs on CoSS approaches
- (2) Stop Ahead sign (W3-1) on stop-controlled approaches

Pavement Markings

- (1) Stop bar/yield line (MUTCD Section 3B.16)
- (1) 6" grooved/in-laid edge line on primary routes
- (1) 4" edge line on secondary routes (see table for application guidance)
- (1) 4" center line pavement markings on secondary routes (see table for application guidance)
- (1) Solid lane and center line approaching intersection
- (1) Mini-skip marks delineating turn lanes through the intersection when dual turn lanes are present
- (1) Mini-skip marks at turn lane when taper length is greater than 100'
- (2) Lane use pavement markings (MUTCD Section 3B.20)
- (3) "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.20)
- (3) Use rumble stripe for 6" markings

Other

- (1) If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar) and crosswalk warning sign
- (3) Reflectorized sign posts (MUTCD Section 2A.15)
- (3) Add transverse rumble strips on stop-controlled approach to CoSS
- (1) Trim vegetation to provide adequate sight distance
- (2) Mark obstructions within clear zone (OM1, 2, or 3 series)
- (3) Remove or provide a barrier for obstructions within clear zone

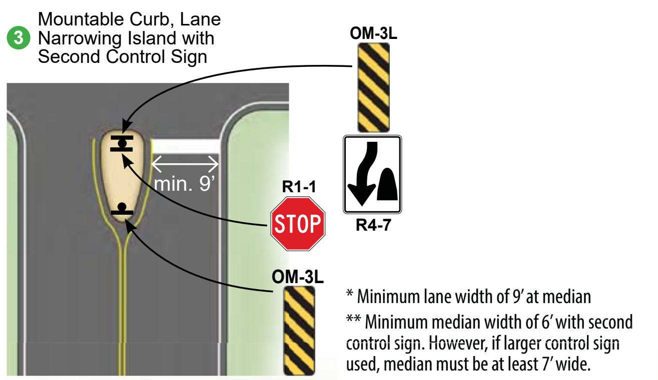
NOTE: Signage and pavement marking placement is not to scale. Depending upon site conditions, signs should share the same post to the extent possible in order to reduce sign clutter. Actual placement will be determined on a site by site basis based on MUTCD and/or VA Supplement design standards and guidance. Signs should not be placed in the median unless the median is ≥ 4' wide and the sign is smaller than the median.

Criteria for Placement of Edge Line Markings (Source: Virginia Supplement Chapter 3B)

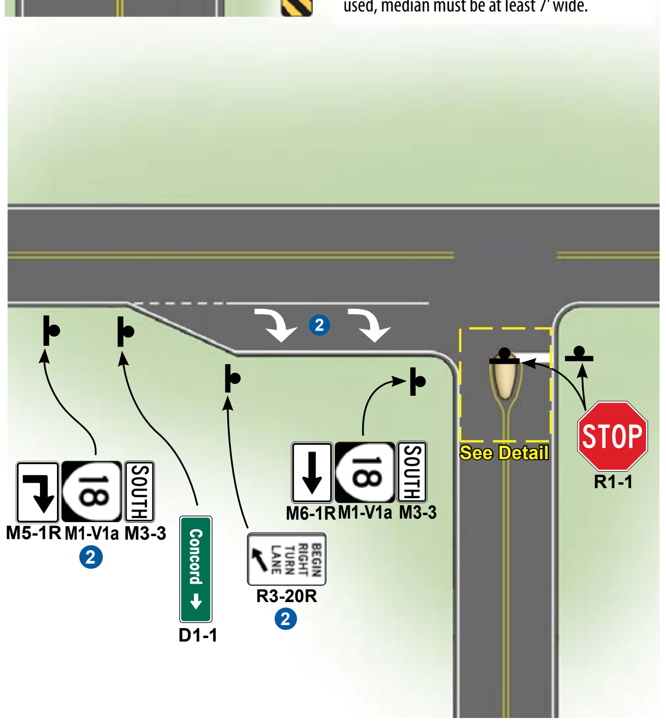
Pave-ment Width	Traffic Volume	Roadway Type: Undi-vided Limited Access	Bi-directional multi-lane	Two-lane Paved Roads with Center Line & without Curb and Gutter	Other Rural Arterials and Collectors	Local Residential	All Other Paved Roadway Segments
≥ 20 feet	≥ 3,000 vpd	Required	Required	Required	Recommended	Not Recommended unless primarily serving through traffic	May be considered only where Engineering Study indicates a need
	< 3,000 vpd	Required	Required	Required	May be considered only where Engineering Study indicates a need		
< 20 feet	≥ 3,000 vpd	Required	Required	May be consid-ered only where Engineering Study indicates a need			
	< 3,000 vpd	Required	Required				

Criteria for Placement of Center Line Markings (Source: Virginia Supplement Chapter

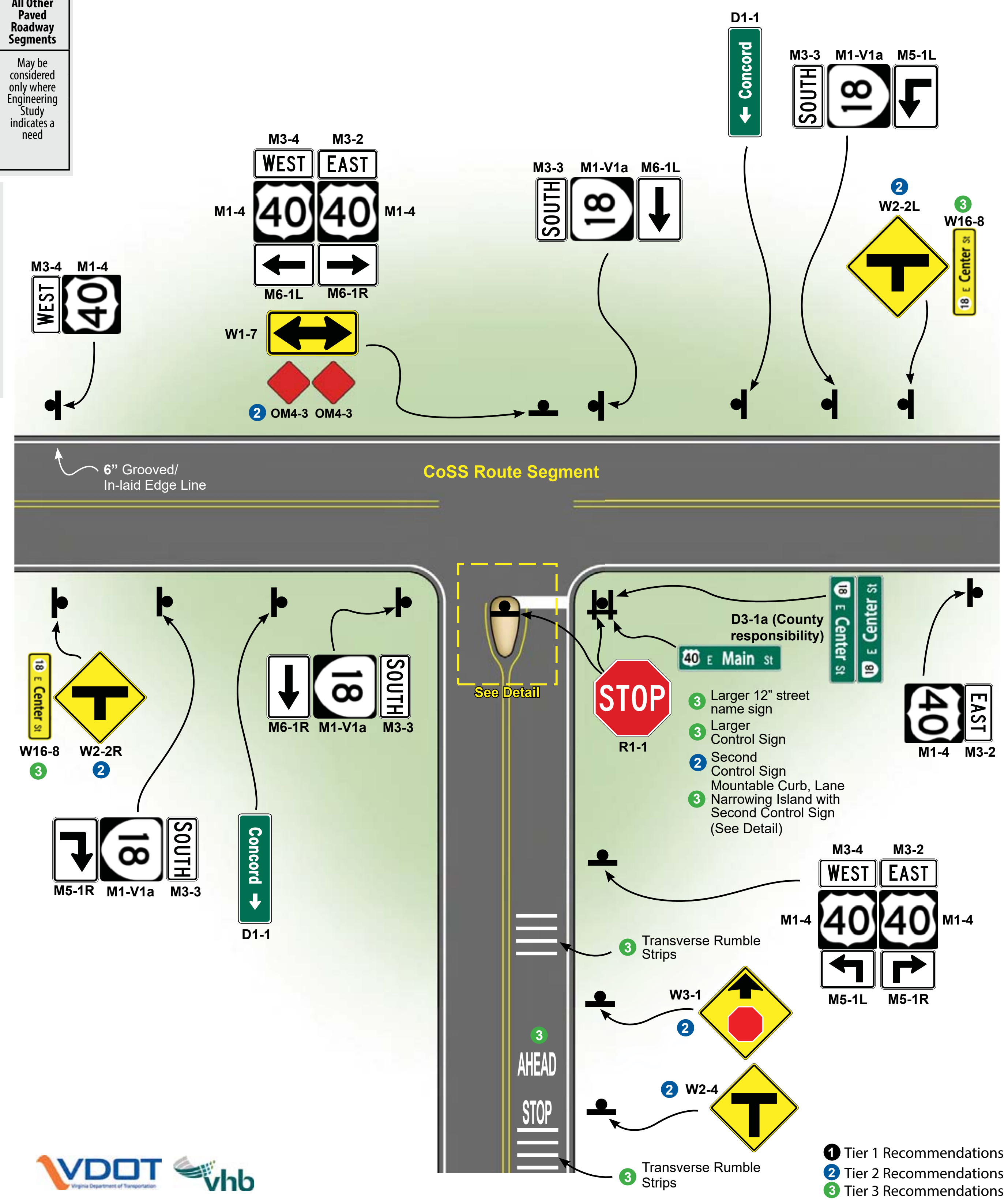
Pave-ment Width	Traffic Volume	Roadway Type: Undivided Limited Access	Bi-directional multi-lane	Other Non-Local Residential	Other Local Residential	Local Residential
≥ 18 feet	≥ 500 vpd	Required	Required	Required	Recommended	Recommended
	< 500 vpd	Required	Required	Optional (if warranted)	Optional	Recommended
< 18 feet	≥ 500 vpd	Required	Required	May be considered only where Engineering Study indicates a need		Recommended
	< 500 vpd	Required	Required			Recommended



* Minimum lane width of 9' at median
** Minimum median width of 6' with second control sign. However, if larger control sign used, median must be at least 7' wide.



Template 3 - Unsignalized Intersection - 3-leg (1-way stop controlled) Undivided (3 Tiers)



NOTES:

Signage

- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- 1 Fluorescent yellow sheeting on changes of Direction Warning signs
- 1 Control sign (R1 Series)
- 2 Second Control sign (R1 Series) on left, if median is present and is greater than 6' in width, with a "Keep Right" sign (R4-7) and Object Marker (OM3-L) facing opposite direction
- 3 Larger Control sign (R1 Series)
- 1 Street Name sign (D3-1a or D3-1 for local roads) (County responsibility)
- 3 Larger 12" Street Name sign (D3-1, 1a) (County responsibility)
- 3 Mountable curb, lane narrowing island with second control sign (see detail)
- 1 OM3-L Object Marker and R4-7 "Keep Right" sign at end of mountable curb island
- 1 Intersecting Route and Directional sign (M1, M3, & M6 Series). Include signs for through movements on primary routes only where through movement is a different route number.
- 1 Advance Intersecting Route and Directional sign on primary routes (M1, M3, & M5 Series)
- 1 Confirmation Route signs (M1 and M3 Series) on primary routes
- 1 Destination/guide sign (D1 Series) on CoSS
- 2 "Begin Right Turn Lane" sign (R3-20R)
- 2 Intersection Warning sign (W2 series)
- 3 Street Name (W16-8)) signs on CoSS approaches
- 2 Stop Ahead sign (W3-1) on stop controlled approach
- 1 Two-Direction Large Arrow sign at T-intersection (W1-7)
- 2 Add two OM4-3 Object Markers below the Two Direction Large Arrow (W1-7) sign

Pavement Markings

- 1 Stop bar/yield line (MUTCD Section 3B.16)
- 1 6" grooved/in-laid edge line on primary routes
- 2 4" edge line on secondary routes (see table for application guidance)
- 1 4" center line pavement markings on secondary routes (see table for application guidance)
- 1 Solid lane and center line approaching intersection
- 1 Mini-skip marks delineating turn lanes through the intersection when dual turn lanes are present
- 1 Mini-skip marks at turn lane taper when taper length is greater than 100'
- 2 Lane use pavement markings (MUTCD Section 3B.20)
- 3 "Stop Ahead" or "Yield Ahead" pavement markings (MUTCD Section 3B.20)
- 3 Use rumble stripe for 6" markings

Other

- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar) and crosswalk warning sign
- 3 Reflectorized sign posts (MUTCD Section 2A.15)
- 1 Trim vegetation to provide adequate sight distance
- 2 Mark obstructions within clear zone (OM1, 2, or 3 series)
- 3 Remove or provide a barrier for obstructions within clear zone
- 3 Add transverse rumble strips on stop controlled approach to CoSS

NOTE: Signage and pavement marking placement is not to scale. Depending upon site conditions, signs should share the same post to the extent possible in order to reduce sign clutter. Actual placement will be determined on a site by site basis based on MUTCD and/or VA Supplement design standards and guidance. Signs should not be placed in the median unless the median is ≥ 4' wide and the sign is smaller than the median.

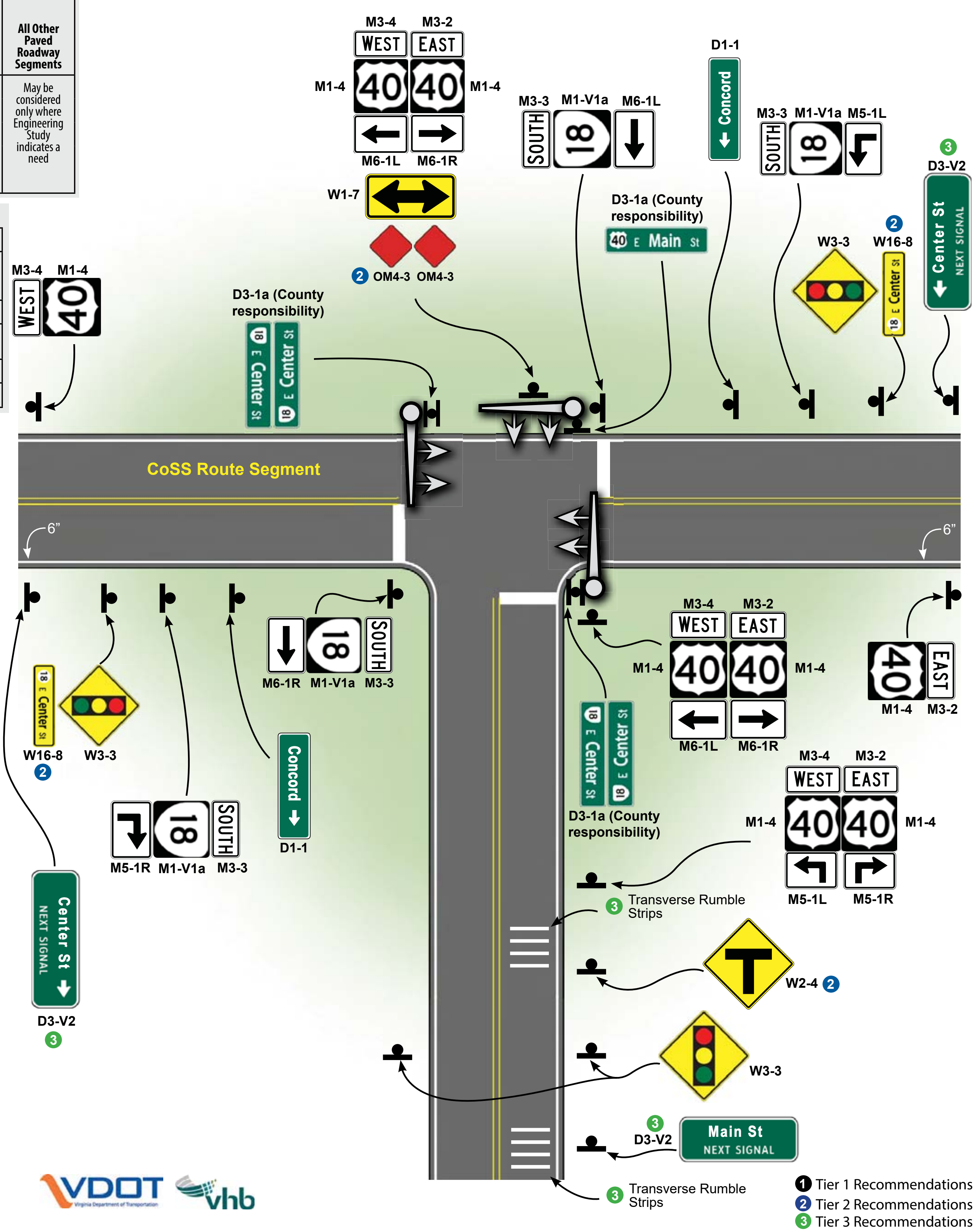
Criteria for Placement of Edge Line Markings (Source: Virginia Supplement Chapter

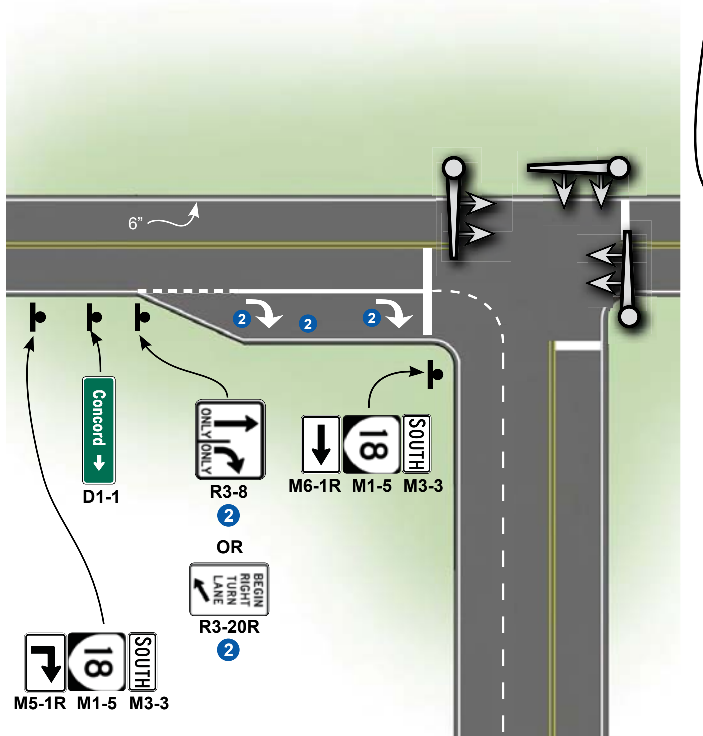
Pavement Width	Traffic Volume	Roadway Type: Undivided Limited Access	Roadway Type: Bi-directional multi-lane	Roadway Type: Two-lane Paved Roads with Center Line & without Curb and Gutter	Roadway Type: Other Rural Arterials and Collectors	Roadway Type: Local Residential	Roadway Type: All Other Paved Roadway Segments
≥ 20 feet	≥ 3,000 vpd	Required	Required	Required	Recommended	Not Recommended unless primarily serving through traffic	May be considered only where Engineering Study indicates a need
	< 3,000 vpd	Required	Required	Required	May be considered only where Engineering Study indicates a need		
< 20 feet	≥ 3,000 vpd	Required	Required	May be considered only where Engineering Study indicates a need			
	< 3,000 vpd	Required	Required				

Criteria for Placement of Center Line Markings (Source: Virginia Supplement Chapter 3B))

Pavement Width	Traffic Volume	Roadway Type: Undivided Limited Access	Roadway Type: Bi-directional multi-lane	Roadway Type: Other Non-Local Residential	Roadway Type: Other Local Residential	Roadway Type: Local Residential
≥ 18 feet	≥ 500 vpd	Required	Required	Required	Recommended	Recommended
	< 500 vpd	Required	Required	Optional (if warranted)	Optional	Recommended
< 18 feet	≥ 500 vpd	Required	Required	May be considered only where Engineering Study indicates a need		Recommended
	< 500 vpd	Required	Required			Recommended

Template 7 - Signalized Intersection - 3-leg (3 Tiers)





VDOT vhb

NOTES:

Signage

1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
1 Fluorescent yellow sheeting on change of Direction Warning signs

Post-Mounted

1 Street Name sign (D3-1a or D3-1 for local roads) (County responsibility)
1 Two-Direction Large Arrow Warning sign at T-intersection (W1-7)
1 Intersecting Route and Directional sign (M1, M3, & M6 Series). Include signs for through movements on primary routes only where through movement is a different route number.
1 Advance Intersecting Route and Directional sign (M1, M3, & M5 Series) on primary routes
1 Confirmation Route signs (M1& M3 Series) on primary routes
1 Destination/guide sign (D1 Series) on CoSS
2 Advance Intersection Lane Control signs (R3-8 Series) on approaches with turn lanes, or "Begin Right Turn Lane" sign (R3-20R) where only a right-turn lane is present
3 Advances Street Name signs (D3-2 & D3-V2)
2 Add two OM4-3 Object Markers below the Two Direction Large Arrow (W1-7) sign
1 Signal Ahead warning sign (W3-3) on CoSS
1 Signal Ahead warning sign (W3-3) on non-CoSS roads
2 Street Name (W16-8) signs on CoSS approaches
2 Intersection Warning sign (W2-4) on approach that does not continue through intersection

Overhead

3 Overhead Lane Use signs and Left Turn Regulatory signs
1 Mast arm mounted 12" Street Name sign (D3-1a or D3-V1 for local roads)

Pavement Markings

1 Stop bar/yield line (MUTCD Section 3B.16)
1 6" grooved/in-laid edge line on primary routes
1 4" edge line on secondary routes (see table for application guidance)
1 4" center line pavement markings on secondary routes (see table for application guidance)
1 Mini-skip marks delineating turn lanes through the intersection when dual turn lanes are present
1 Mini-skip marks at turn lane taper when taper length is greater than 100'
2 Lane use pavement markings (MUTCD Section 3B.20)
3 Use rumble stripe for 6" markings

Signal

1 Check signal sight distance
1 12" LED signal lenses
1 Red and yellow arrow lenses for protected movements
1 Signal backplates with retroreflective border
1 Check for proper red clearance and yellow change intervals (VDOT TE 306.1)
1 One signal head per approach (where structural loading permits)
2 Provide near side signal heads if minimum signal sight distance is not provided
3 Provide actuated signals

Other

1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6' and placed 4' in advance of the stop bar), Pedestrian Warning sign, and Right Turn Yield to Pedestrian signs.
1 If pedestrian phase is present, provide pedestrian countdown signals with pushbutton activation and appropriate pedestrian crossing clearance interval.
1 Restrict parking near intersection
3 Reflectorized sign posts (MUTCD Section 2A.15)
3 Transverse rumble strips on approach to CoSS
1 Trim vegetation to provide adequate sight distance
2 Mark obstructions within clear zone (OM1, 2, or 3 Series)
3 Remove or provide a barrier for obstructions.

NOTE: Signage and pavement marking placement is not to scale. Depending upon site conditions, signs should share the same post to the extent possible in order to reduce sign clutter. Actual placement will be determined on a site by site basis based on MUTCD and/or VA Supplement design standards and guidance. Signs should not be placed in the median unless the median is ≥ 4' wide and the sign is smaller than the median.

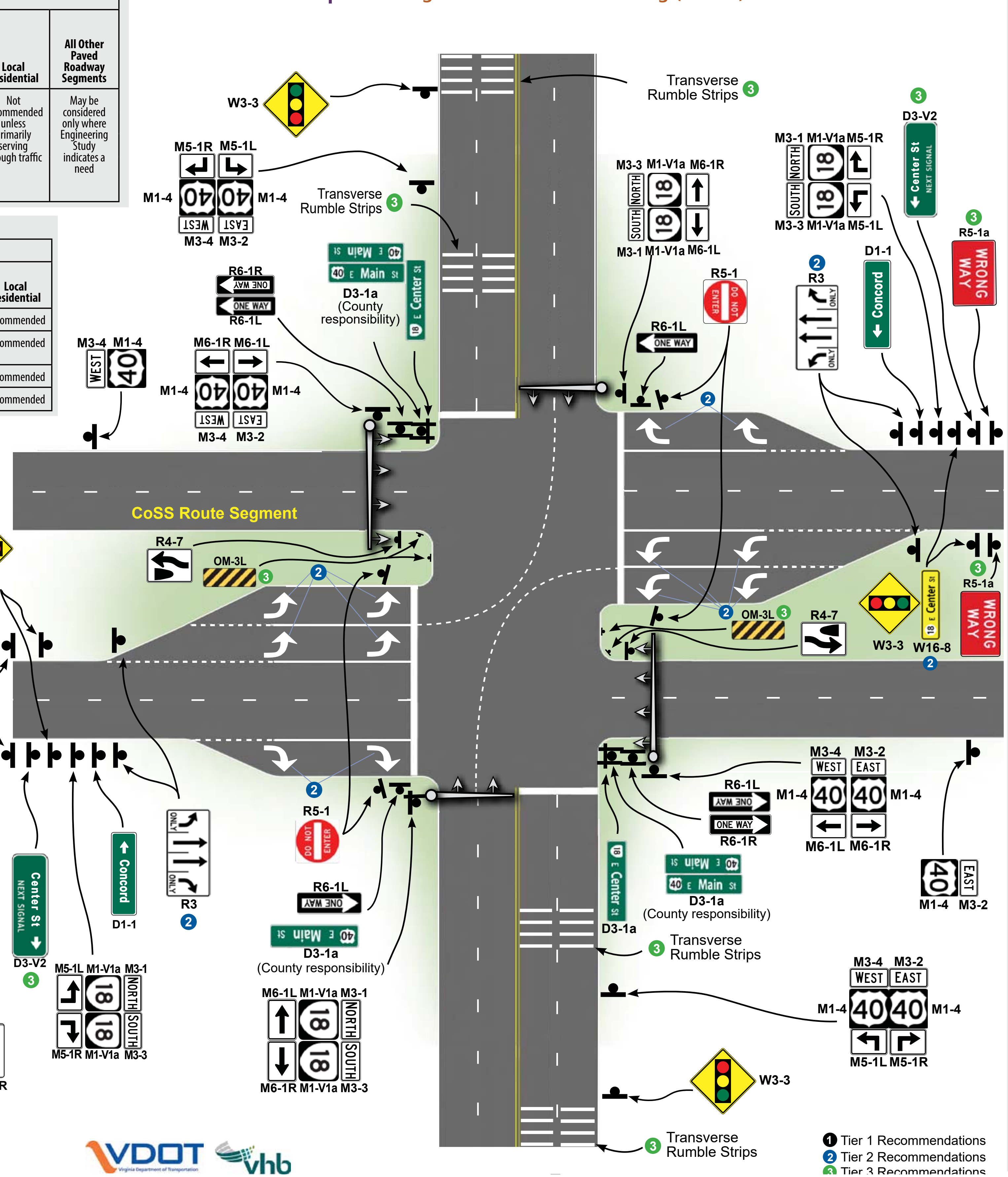
Criteria for Placement of Edge Line Markings (Source: Virginia Supplement Chapter 3B)

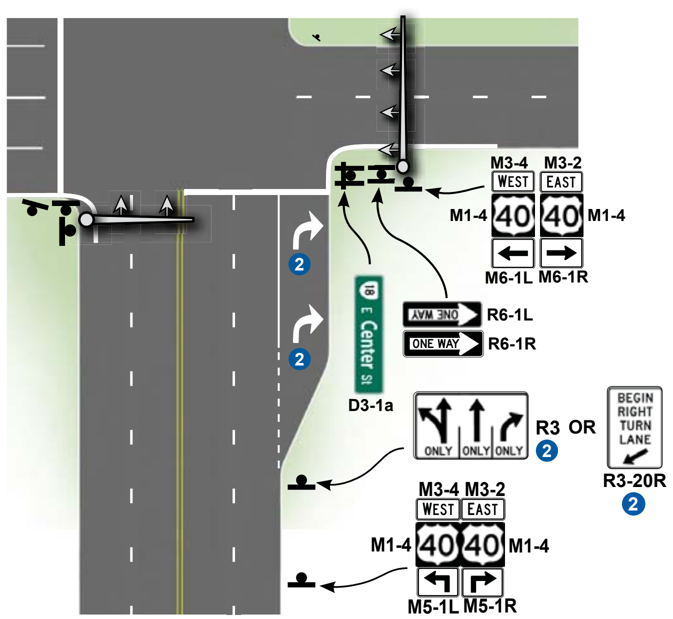
Pave-ment Width	Traffic Volume	Roadway Type					
		Undi-vided Limited Access	Bi-directional multi-lane	Two-lane Paved Roads with Center Line & without Curb and Gutter	Other Rural Arterials and Collectors	Local Residential	All Other Paved Roadway Segments
≥ 20 feet	≥ 3,000 vpd	Required	Required	Required	Recommended	Not Recommended unless primarily serving through traffic	May be considered only where Engineering Study indicates a need
	< 3,000 vpd	Required	Required	Required	May be considered only where Engineering Study indicates a need		
< 20 feet	≥ 3,000 vpd	Required	Required	May be consid-ered only where Engineering Study indicates a need			
	< 3,000 vpd	Required	Required				

Criteria for Placement of Center Line Markings (Source: Virginia Supplement Chapter 3B))

Pave-ment Width	Traffic Volume	Roadway Type				
		Undivided Limited Access	Bi-directional multi-lane	Other Non-Local Residential	Other Local Residential	Local Residential
≥ 18 feet	≥ 500 vpd	Required	Required	Required	Recommended	Recommended
	< 500 vpd	Required	Required	Optional (if warranted)	Optional	Recommended
< 18 feet	≥ 500 vpd	Required	Required	May be considered only where Engineering Study indicates a need		Recommended
	< 500 vpd	Required	Required			Recommended

Template 8 - Signalized Intersection - 4-leg (3 Tiers)





NOTES:

Signage

- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- 1 ~~Fluorescent yellow sheeting on change of Direction Warning signs~~

Post-Mounted

- 1 Street Name sign (D3-1a or D3-1 for local roads) - County responsibility
- 1 Intersecting Route and Directional sign (M1, M3, & M6 Series) on primary routes
- 1 ~~"Keep Right" sign for median separated roads (R4-7 or R4-8 Series) on raised medians where it is not readily apparent that traffic is required to keep to the right (MUTCD Figure 2B-10)~~
- 3 ~~Add Object Marker on same post as R4-7 or on separate post closer to road (OM3-L)~~
- 1 Advance Intersecting Route and Directional sign (M1, M3, & M5 Series) on primary routes and secondary routes with AADT ≥ 2000 vpd
- 1 Confirmation Route signs (M1-M3 Series) on primary routes
- 1 Destination/guide sign (D1-1) on primary routes
- 2 Advance Intersection Lane Control signs (R3-8 Series) on approaches with turn lanes, or "Begin Right Turn Lane" sign (R3-20R) where only a right-turn lane is present
- 3 Advance Street Name signs on CoSS (D3-2 & D3-V2)
- 1 Signal Ahead Warning sign (left and right)(W3-3)
- 2 Street Name (W16-8 series) signs on CoSS approaches
- 1 "One Way" and "Do Not Enter" signs per VA Supplement
- 3 "Wrong Way" (R5-1a) signs on divided highway

Overhead

- 2 Overhead Lane Use signs and Left Turn Regulatory signs
- 1 Mast arm mounted 12" Street Name sign (D3-1a or D3-V1 for local roads) per TE-379 memorandum

Pavement Markings

- 1 Stop bar/yield line (MUTCD Section 3B.16)
- 1 6" grooved/in-laid edge line on primary routes
- 1 4" edge line on secondary routes (see table for application guidance)
- 1 4" center line pavement markings on secondary routes (see table for application guidance)
- 1 Solid lane and center line approaching intersection
- 1 Mini-Skip marks delineating turn lanes through the intersection when dual turn lanes are present
- 1 Mini-Skip marks at turn lane taper when taper length is greater than 100′
- 2 Lane use pavement markings (MUTCD Section 3B.20)
- 3 Use rumble stripe for 6" markings

Signal

- 1 Check signal sight distance
- 1 12" LED signal lenses
- 1 Red and yellow arrow lenses for protected movements
- 1 Signal backplates with retroreflective border
- 1 Check for proper red clearance and yellow change intervals (VDOT TE 306.1)
- 1 One signal head per approach (where structural loading permits)
- 2 Provide near side signal heads if minimum signal sight distance is not provided
- 3 Provide actuated signals

Other

- 1 If pedestrian accommodations are present, ensure minimum requirements for crossing (6" solid lines offset minimum 6′ and placed 4′ in advance of the stop bar), Pedestrian Warning sign, and Right Turn Yield to Pedestrian signs.
- 1 If pedestrian phase is present, provide pedestrian countdown signals with pushbutton activation and appropriate pedestrian crossing clearance interval.
- 1 Restrict parking near intersection
- 3 Reflectorized sign posts
- 3 Transverse rumble strips on approach to CoSS
- 1 Trim vegetation to provide adequate sight distance within clear zone
- 2 Mark obstructions within clear zone (OM1, 2, or 3 Series)
- 3 Remove, mark, or provide a barrier for obstructions within clear zone

NOTE: Signage and pavement marking placement is not to scale. Depending upon site conditions, signs should share the same post to the extent possible in order to reduce sign clutter. Actual placement will be determined on a site by site basis based on MUTCD and/or VA Supplement design standards and guidance. Signs should not be placed in the median unless the median is ≥ 4′ wide and the sign is smaller than the median.

Criteria for Placement of Edge Line Markings (Source: Virginia Supplement Chapter 3B)

Pave-ment Width	Traffic Volume	Roadway Type: Undi-vided Limited Access	Bi-directional multi-lane	Two-lane Paved Roads with Center Line & without Curb and Gutter	Other Rural Arterials and Collectors	Local Residential	All Other Paved Roadway Segments
≥ 20 feet	≥ 3,000 vpd	Required	Required	Required	Recommended	Not Recommended unless primarily serving through traffic	May be considered only where Engineering Study indicates a need
	< 3,000 vpd	Required	Required	Required	May be considered only where Engineering Study indicates a need		
< 20 feet	≥ 3,000 vpd	Required	Required	May be consid-ered only where Engineering Study indicates a need			
	< 3,000 vpd	Required	Required				

Criteria for Placement of Center Line Markings (Source: Virginia Supplement Chapter

Pave-ment Width	Traffic Volume	Roadway Type: Undivided Limited Access	Bi-directional multi-lane	Other Non-Local Residential	Other Local Residential	Local Residential
≥ 18 feet	≥ 500 vpd	Required	Required	Required	Recommended	Recommended
	< 500 vpd	Required	Required	Optional (if warranted)	Optional	Recommended
< 18 feet	≥ 500 vpd	Required	Required	May be considered only where Engineering Study indicates a need		Recommended
	< 500 vpd	Required	Required			Recommended

Raised Pavement Marker Application (Source: MUTCD VA Supplement Section 3B.11)

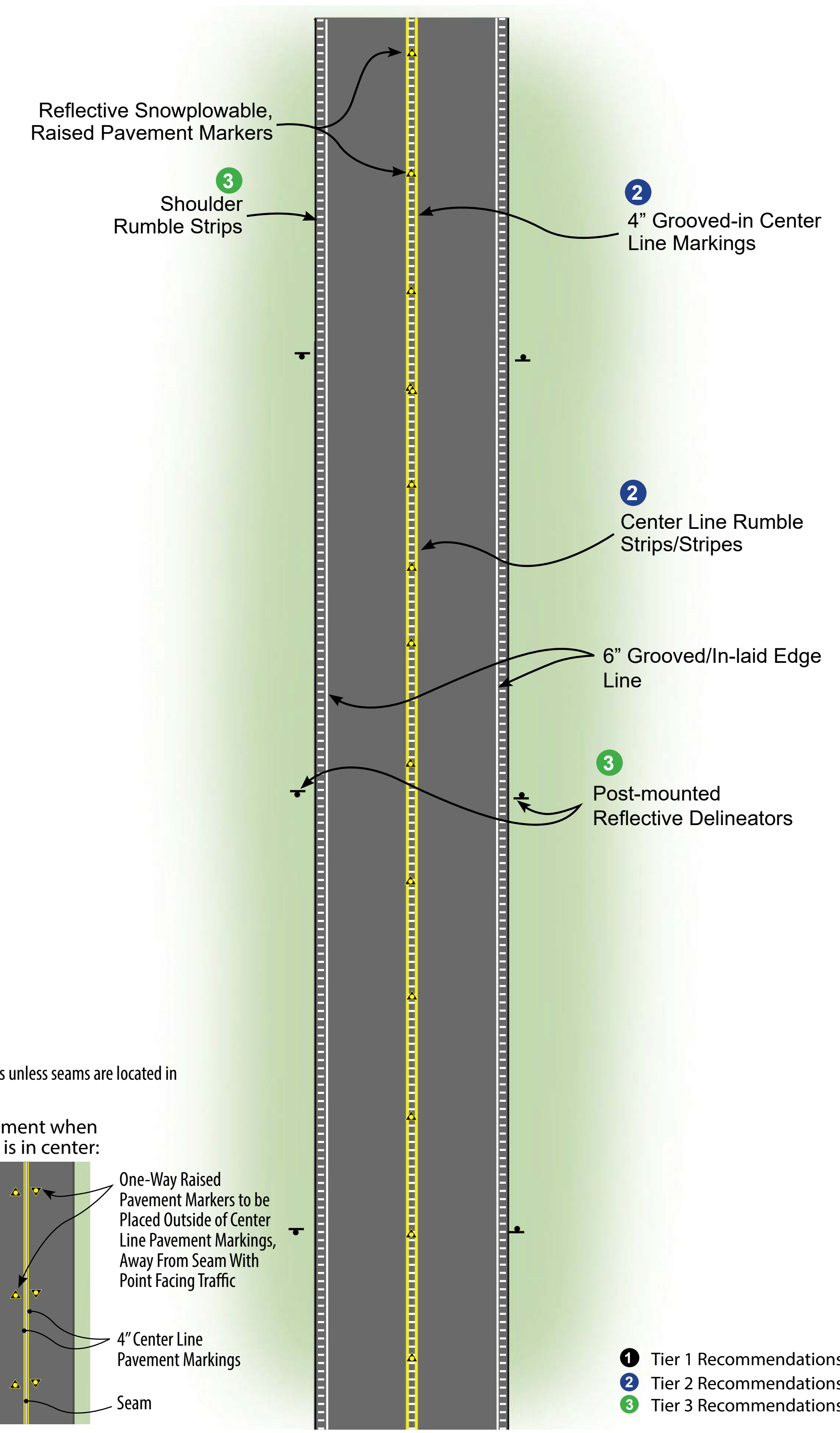
Tier	CoSS Facility Type	AADT	Posted Speed Limit	Lighting	Application
1	All Roadway Facilities	-	≥ 60 MPH	-	SRPMs shall be installed continuously.
1	Two-Lane, Two-Way Roadways	≥ 15,000	-	No roadway lighting	SRPMs shall be installed continuously.
1	Multilane Roadways	≥ 25,000	≥ 45 MPH	No roadway lighting	SRPMs shall be installed continuously.
2	Multilane Roadways	15,000 ≤ AADT < 25,000	45-55 mph	-	SRPMs shall be installed continuously.
3	Two-Lane, Two-Way Roadways (Only if the sections DO NOT have multiple horizontal curves with Posted Speed Limit < 55 MPH)	5,000 ≤ AADT < 15,000			SRPMs shall be installed continuously.
3	Two-Lane, Two-Way Roadways	≥ 15,000		Roadway lighting present	SRPMs shall be installed continuously.
3	Multilane Roadways	≥ 25,000	45-55 mph	Roadway lighting present	SRPMs shall be installed continuously.

Delineator Placement and Spacing (Source Section 3F.04 MUTCD VA Supplement)

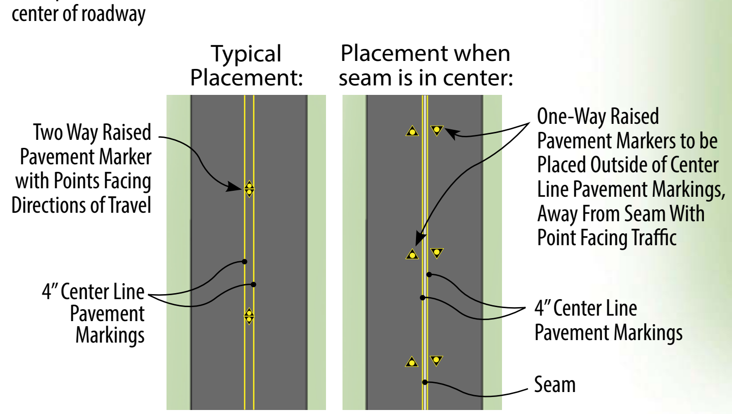
Type	Placement	Spacing
D-1	On the right of through roadways	300 feet*
D-1	Interchange ramps	100 feet (except on horizontal curve sections)
D-2	On acceleration and deceleration lanes	100 feet
Delineators on barrier or guardrail		80 feet (may vary on interchange ramp horizontal curve sections although maximum spacing = 80 feet)

*Spacing may take into consideration other sources of reflection (such as signs)(modification to MUTCD guidance)

Template 9 - Corridor - Undivided Roadway (3 Tiers)



Raised Pavement Markers:
Place pavement markers between double solid lines unless seams are located in center of roadway



NOTES:

Signage

- 1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
- 1 Fluorescent yellow sheeting on change of Direction Warning signs

Pavement Markings

- 1 6" center line pavement markings on primary routes
- 2 6" grooved-in center line markings on primary routes
- 1 6" grooved/in-laid edge line (MUTCD Section 3B.01 and 3B.o6) on primary routes
- 1 Reflective, snowplowable, raised pavement markers (Section 3B.11 MUTCD VA Supplement)(see table for application guidance and template tier)

Other

- 1 Trim vegetation provide adequate sight distance within clear zone
- 2 Mark obstructions within clear zone (OM1, 2, or 3 Series)
- 3 Remove or provide a barrier for obstructions within clear zone
- 3 Post-mounted reflective delineators (Chapter 3F MUTCD VA Supplement)(see table for application guidance)
- 1 Reflective delineation of barriers (Chapter 3F MUTCD VA Supplement)
- 2 If bike route is present install signs and pavement markings (shared lane markings) (Chapter 9 MUTCD VA Supplement)
- 3 Shoulder rumble strips/stripes (MUTCD Chapter 3J.01) on corridors with a high number of roadway departure crashes per IIM #212.5. (see notes for application details)
- 2 Center line rumble strips/stripes (Section 3J.01 MUTCD) on corridors with a high number of head-on crashes or crashes involving vehicles crossing the centerline (see notes for application details)
- 3 Reflectorized sign posts (MUTCD Section 2A.15)

NOTE: Signage and pavement marking placement is not to scale. Actual placement will be determined on a site by site basis based on MUTCD and/or VA Supplement design standards and guidance. Signs should not be placed in the median unless the median is ≥ 4' wide and the sign is smaller than the median.

Rumble Strips and Stripes:

If it is determined that rumble strips/stripes should be applied to a corridor, utilize the following application guidance:

- Shoulder rumble strips shall be placed continuously on outside paved shoulders of CoSS where the shoulder has a minimum width of four (4) feet where bicycles are prohibited and eight (8) feet where bicycles are permitted. Rumble strips shall not be placed within limits of bridge drainage aprons or special design shoulder slot inlets.
- Shoulder rumble stripes shall be placed with an intermittent pattern on outside paved shoulders of CoSS where shoulders are at least two (2) feet wide. Rumble stripes shall not be placed in the following locations: within 50' of any intersection, turn lane, acceleration/deceleration lane, or gore area; bridge drainage aprons; or, special design shoulder slot inlets.
- Center line rumble strips shall not be placed in the following locations: within limits of bridges; on narrow, unmarked road sections without pavement markings; within the limits of center two-way turn lanes; or, in passing zones.

Additional rumble strip/stripe application guidance can be found in the VDOT Road and Bridge Standards. Pavement markings shall be placed in accordance with current MUTCD or VA Supplement standards.

Template 11 - Curve - Undivided Roadway (3 Tiers)

No Passing Zones:

(Source: MUTCD Section 3B.02)

On two-way, two- or three-lane roadways at vertical and horizontal curves and other locations where an engineering study indicates that passing must be prohibited because of inadequate sight distances or other special conditions.

At horizontal or vertical curves where:

A. The passing sight distance is less than the minimum shown in the following table for the 85th-percentile speed or the posted or statutory speed limit.

B. The passing sight distance on a vertical curve is the distance at which an object 3.5 feet above the pavement surface can be seen from a point 3.5 feet above the pavement.

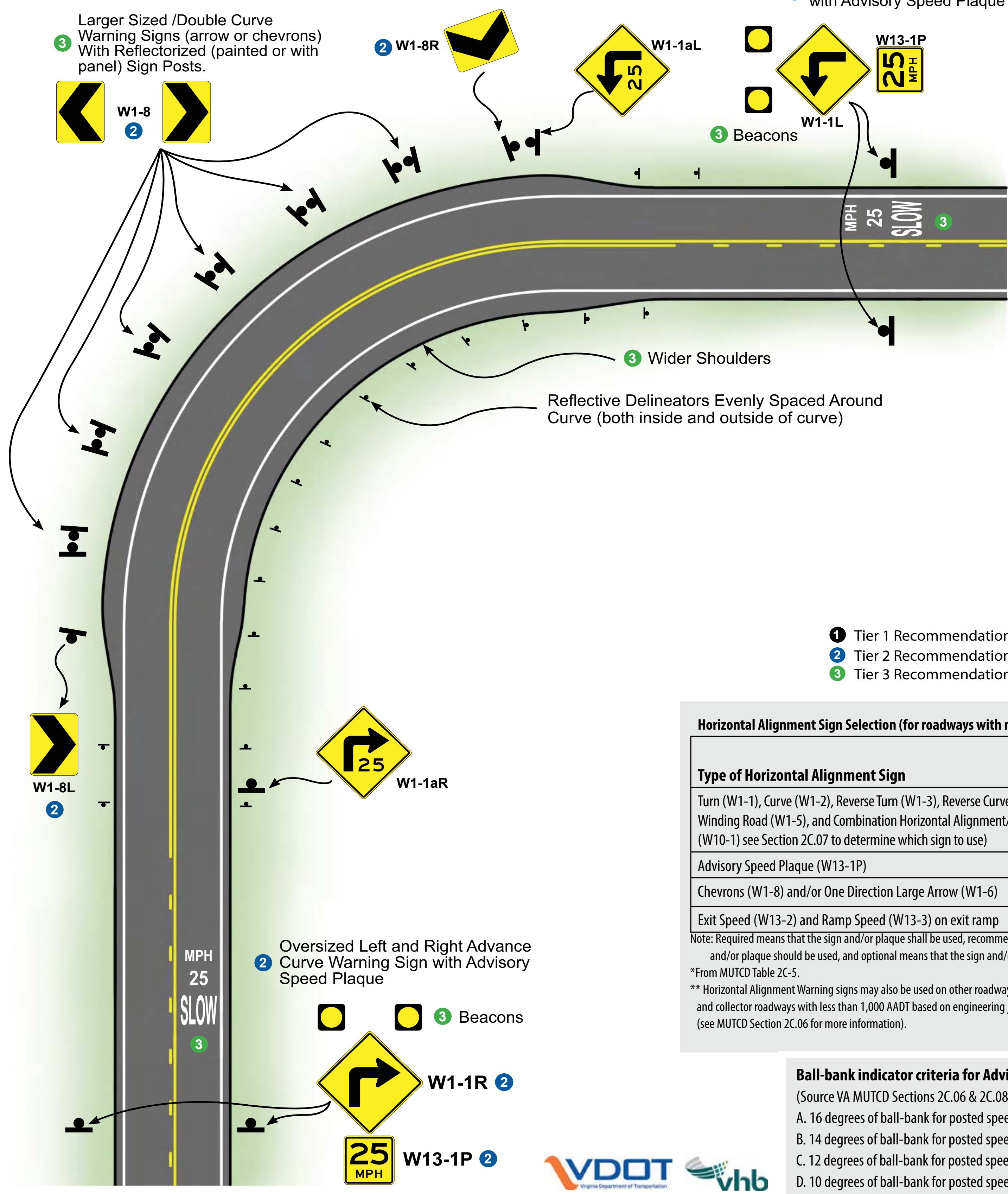
C. the passing sight distance on a horizontal curve is the distance measured along the center line (or right-hand lane line of a three-lane roadway) between two points 3.5 feet above the pavement on a line tangent to the embankment or other obstruction that cuts off the view on the inside of the curve

A short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when center line striping is provided on a two-lane or three-lane road

85th Percentile or Posted or Statutory Speed Limit	Minimum Passing Sight Distance
25 mph	450 feet
30 mph	500 feet
35 mph	550 feet
40 mph	600 feet
45 mph	700 feet
50 mph	800 feet
55 mph	900 feet
60 mph	1,000 feet
65 mph	1,100 feet
70 mph	1,200 feet

Approximate Spacing for Delineators on Horizontal Curves (Including Interchange Ramps)
(Source Section 3F.04 MUTCD VA Supplement)

Placement	Spacing
Radius of curve = 50 feet	20 feet
Radius of curve = 115 feet	25 feet
Radius of curve = 180 feet	35 feet
Radius of curve = 250 feet	40 feet
Radius of curve = 300 feet	50 feet
Radius of curve = 400 feet	55 feet
Radius of curve = 500 feet	65 feet
Radius of curve = 600 feet	70 feet
Radius of curve = 700 feet	75 feet
Radius of curve = 800 feet	80 feet
Radius of curve = 900 feet	85 feet
Radius of curve = 1,000 feet	90 feet



1 Tier 1 Recommendations
2 Tier 2 Recommendations
3 Tier 3 Recommendations

NOTES:

The following templates should only be applied at curves based on differential of speed limit and advisory speed and ball-bank testing as specified by MUTCD requirements. See MUTCD Tables 2C-5 and 2C-6 along with Section 2C.08. Other measures identified in corridor or segment templates may be applied as well.

Signage

1 Upgraded signs with current MUTCD standards (font, size, retroreflectivity, placement, message, etc.)
1 Minimize driver distraction in curve by relocating wayfinding/informational signs so they are not placed on the curve.
1 Horizontal alignment signs (W1 Series)
3 Larger sized /double Curve Warning signs (arrow or chevrons – W1-8, W1-6) with reflectorized (painted or with panel sign posts (MUTCD Section 2A.15)
1 Left and Right Advance Curve Warning sign with Advisory Speed Plague (W1 Series with W13-1P)
2 Oversized Left and Right Advance Curve Warning Sign with Advisory Speed plaque (W1 Series with W13-1P)
1 Fluorescent yellow sheeting on change in Direction Warning signs

Pavement Markings

3 "SLOW" and "XX mph" pavement markings (MUTCD Section 3B.20)

Other

1 Post-mounted delineators except in locations with chevrons (e.g. if chevrons are present on outside of curve, place delineators on inside of curve only) (MUTCD Section 3B.20)
3 Shoulder widening (engineering study required to determine exact widths)
3 Reflectorized sign posts (MUTCD Section 2A.15)
3 Flashing beacons on top of curve warning signs

NOTE: Signage and pavement marking placement is not to scale. Depending upon site conditions, signs should share the same post to the extent possible in order to reduce sign clutter. Actual placement will be determined on a site by site basis based on MUTCD and/or VA Supplement design standards and guidance. Signs should not be placed in the median unless the median is ≥ 4' wide and the sign is smaller than the median.

Horizontal Alignment Sign Selection (for roadways with more than 1,000 AADT)

Type of Horizontal Alignment Sign	Difference Between Speed Limit and Advisory Speed				
	5 mph	10 mph	15 mph	20 mph	25 mph or more
Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/Intersection (W10-1) see Section 2C.07 to determine which sign to use)	Recommended	Required	Required	Required	Required
Advisory Speed Plaque (W13-1P)	Recommended	Required	Required	Required	Required
Chevrons (W1-8) and/or One Direction Large Arrow (W1-6)	Optional	Recommended	Required	Required	Required
Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp	Optional	Optional	Recommended	Required	Required

Note: Required means that the sign and/or plaque shall be used, recommended means that the sign and/or plaque should be used, and optional means that the sign and/or plaque may be used.
*From MUTCD Table 2C-5.
** Horizontal Alignment Warning signs may also be used on other roadways or on arterial and collector roadways with less than 1,000 AADT based on engineering judgment (see MUTCD Section 2C.06 for more information).

Ball-bank indicator criteria for Advisory Speed Plaques:
(Source VA MUTCD Sections 2C.06 & 2C.08)
A. 16 degrees of ball-bank for posted speeds of 20 mph or less
B. 14 degrees of ball-bank for posted speeds of 25 or 30 mph
C. 12 degrees of ball-bank for posted speeds of 35 mph to 45 mph
D. 10 degrees of ball-bank for posted speeds of 50 mph or greater

Typical Spacing of Chevron Alignment Signs on Horizontal Curves: (Source: MUTCD Table 2C-6)

Advisory Speed	Curve Radius	Sign Spacing
15 mph or less	Less than 200 feet	40 feet
20 to 30 mph	200 to 400 feet	80 feet
35 to 45 mph	401 to 700 feet	120 feet
50 to 60 mph	701 to 1,250 feet	160 feet
more than 60 mph	More than 1,250 feet	200 feet

Note: The relationship between the curve radius and the advisory speed shown in the table should not be used to determine advisory speed*

Appendix B

CONTENTS

This page intentionally left blank.

VDOT, with support from VHB, hosted two public meetings, welcoming questions, comments and thoughts from residents and businesses regarding the Route 460 Safety and Operations Study. The first public meeting took place on Wednesday, October 18, 2017 at Kings Fork Middle School, and the second took place on Thursday, October 19, 2017 at Windsor High School. Both of the meetings were open houses where locals could walk around, look at poster boards with information on the study, and talk to representative areas of concern.

The first public meeting at Kings Fork Middle School had approximately eleven attendees. These attendees were mostly from the surrounding areas of Suffolk and Windsor. The second public meeting at Windsor High School had approximately 17 attendees. These attendees were mostly citizens (from Zuni, Suffolk, Windsor, and Ivor), members of local government, and media personnel.

Local Comments

The overarching opinion of the local community is that Route 460 should be widened. This was mentioned a few times in the comments. The specific locations that were mentioned were #3 (Kings Fork Road), #5 (Prudence Road), #8 (Old Myrtle Road), #11 (1,000' East of Old Suffolk Road), #12 (Lovers Lane) and #13 (Bank Street).

#3 (Kings Fork Road) – Resident mentioned the need for an advance warning sign for Kings Fork Road signal, as there are many vehicles speeding on the approach to the intersection.

#5 (Prudence Road) – Residents have suggested that this intersection is challenging due to the vehicular traffic from the Pruden Center.

#8 (Old Myrtle Road) – Residents have complained that this intersection has numerous pot holes and that the intersection is dangerous.

#11 (1,000' East of Old Suffolk Road) – Residents have suggested that there are pot holes, rough road, and a bad shoulder at this location along Route 460.

#12 (Lovers Lane) – This intersection, along with Windsor Boulevard, was the most referenced intersection in the local comments. Residents have cited that turning onto and off Lovers Lane is dangerous around commute time, as oncoming traffic is heavy and numerous vehicles are speeding.

#13 (Bank Street) – Due to the complex geometry of the intersection, residents have suggested that this intersection have pedestrian signals, for safe crossing of peds and bikes.

Citizen Information Meeting #1 Comments:
With the overall damanges of this road (460), its hard to know where to begin. With no median and no shoulder, it's a "death trap." Given the volume of the traffic and the future getting more traffic, it's just hard to not put every effert into this major artery. The need is so great and the money is short or not there its hard to see how the state can accomplish the goal of making a safe and so much needed road.
Locations 8, 11, 13: Pot Holes
Locations 3, 11, 12, 13: Bad Shoulder, Rough Road, Needs to be widened
Locations 8, 11, 13: No Comment
Location 12: Live near Lovers Lane. 460 needs to be wide
460 needs to be upgraded all of the way from Windsor to the 58 interchange. Upgrades needed are wider lanes, median until at least Lake Prince Drive and turn lanes on <u>all</u> roads between Windsor and 59. Narrow lanes and no turn lanes make for an extremely dangerous road give the amount of traffic and especially truck traffic
Location 3: Add an avance warning to the light at Kings Fork Road. Too many people are driving too fast and running the red light. I tend to wait a few seconds and really look before proceding into the intersection.

Citizen Information Meeting #2 Comments:
Location 12: Turning left is difficult coming out of Windsor as traffic gaining speed and oncoming traffic can be heavy and fast as the 45 limit is not observed in time. Turning lane both directions would help. Location 13: Too many streets entering. Really needs pedestrian lights for safe crossing of persons and the numerous bicycles attempting to cross. Of course, the time to wait for pedestrians backs up traffic as few cars make it through the lights
Would like to see a turn line or 5th lane for turning vehicles Would like to see a turn lane into Windsor
Location 5: A challenging intersection due to Pruden center traffic Location 8: I drive this often. This is a dangerous intersection. Location 12: I live on Lovers Lane and always concerned with being rear ended. Also getting onto Lovers Lane at commute time is trying.

This page intentionally left blank.

Appendix C

CONTENTS

This page intentionally left blank.

VHB

Two Columbus Center
4500 Main Street, Suite 400
Virginia Beach, VA 23462
p: 757.490.0132

File Name : US460@Northfield
Site Code :
Start Date : 5/18/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	Northfield Drive Southbound				US 460 (Pruden Boulevard) Westbound				No Approach Northbound				US 460 (Pruden Boulevard) Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
06:30 AM	1	0	2	0	0	113	10	0	0	0	0	0	3	201	0	0	0	330	330
06:45 AM	4	0	0	0	0	138	19	0	0	0	0	0	4	194	0	0	0	359	359
Total	5	0	2	0	0	251	29	0	0	0	0	0	7	395	0	0	0	689	689
07:00 AM	2	0	1	0	0	138	7	0	0	0	0	0	2	225	0	0	0	375	375
07:15 AM	1	0	1	0	0	138	21	0	0	0	0	0	3	247	0	0	0	411	411
07:30 AM	3	0	0	0	0	180	11	0	0	0	0	0	1	211	0	0	0	406	406
07:45 AM	1	0	0	0	0	234	11	0	0	0	0	0	1	228	0	0	0	475	475
Total	7	0	2	0	0	690	50	0	0	0	0	0	7	911	0	0	0	1667	1667
08:00 AM	2	0	2	0	0	217	10	0	0	0	0	0	2	238	0	0	0	471	471
08:15 AM	4	0	4	0	0	173	6	0	0	0	0	0	2	220	0	0	0	409	409
*** BREAK ***																			
Total	6	0	6	0	0	390	16	0	0	0	0	0	4	458	0	0	0	880	880
*** BREAK ***																			
04:00 PM	35	0	15	0	0	242	16	0	0	0	0	0	2	237	0	0	0	547	547
04:15 PM	16	0	6	0	0	254	15	0	0	0	0	0	1	272	0	0	0	564	564
04:30 PM	11	0	9	0	0	249	16	0	0	0	0	0	0	266	0	0	0	551	551
04:45 PM	8	0	10	0	0	252	10	0	0	0	0	0	4	237	0	0	0	521	521
Total	70	0	40	0	0	997	57	0	0	0	0	0	7	1012	0	0	0	2183	2183
05:00 PM	25	0	1	0	0	297	12	0	0	0	0	0	2	262	0	0	0	599	599
05:15 PM	15	0	5	0	0	273	9	0	0	0	0	0	1	273	0	0	0	576	576
05:30 PM	9	0	4	0	0	271	4	0	0	0	0	0	1	251	0	0	0	540	540
05:45 PM	0	0	1	0	0	260	10	0	0	0	0	0	2	201	0	0	0	474	474
Total	49	0	11	0	0	1101	35	0	0	0	0	0	6	987	0	0	0	2189	2189
Grand Total	137	0	61	0	0	3429	187	0	0	0	0	0	31	3763	0	0	0	7608	7608
Apprch %	69.2	0	30.8		0	94.8	5.2		0	0	0		0.8	99.2	0				
Total %	1.8	0	0.8		0	45.1	2.5		0	0	0		0.4	49.5	0		0	100	
Motorcycles	0	0	1		0	18	0		0	0	0		0	24	0		0	0	43
% Motorcycles	0	0	1.6	0	0	0.5	0	0	0	0	0	0	0	0.6	0	0	0	0	0.6
Cars	77	0	33		0	2322	117		0	0	0		18	2781	0		0	0	5348
% Cars	56.2	0	54.1	0	0	67.7	62.6	0	0	0	0	0	58.1	73.9	0	0	0	0	70.3
Light Goods Vehicles	43	0	23		0	731	56		0	0	0		10	621	0		0	0	1484
% Light Goods Vehicles	31.4	0	37.7	0	0	21.3	29.9	0	0	0	0	0	32.3	16.5	0	0	0	0	19.5
Buses	0	0	0		0	27	1		0	0	0		0	18	0		0	0	46
% Buses	0	0	0	0	0	0.8	0.5	0	0	0	0	0	0	0.5	0	0	0	0	0.6
Single-Unit Trucks	9	0	4		0	92	8		0	0	0		2	90	0		0	0	205
% Single-Unit Trucks	6.6	0	6.6	0	0	2.7	4.3	0	0	0	0	0	6.5	2.4	0	0	0	0	2.7
Articulated Trucks	8	0	0		0	233	5		0	0	0		1	229	0		0	0	476
% Articulated Trucks	5.8	0	0	0	0	6.8	2.7	0	0	0	0	0	3.2	6.1	0	0	0	0	6.3
Bicycles on Road	0	0	0		0	6	0		0	0	0		0	0	0		0	0	6
% Bicycles on Road	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

VHB

Two Columbus Center
4500 Main Street, Suite 400
Virginia Beach, VA 23462
p: 757.490.0132

File Name : US460@Robs
Site Code :
Start Date : 5/18/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	Rob's Drive Southbound				US 460 (Pruden Boulevard) Westbound				Nansemond Suffolk Academy Northbound				US 460 (Pruden Boulevard) Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
06:30 AM	8	0	0	0	3	105	4	0	0	0	3	0	1	185	0	0	0	309	309
06:45 AM	11	0	0	0	1	131	8	0	0	0	0	0	0	197	0	0	0	348	348
Total	19	0	0	0	4	236	12	0	0	0	3	0	1	382	0	0	0	657	657
07:00 AM	7	0	2	0	1	123	10	0	0	0	0	0	0	218	0	0	0	361	361
07:15 AM	11	0	0	0	9	140	7	0	0	1	5	0	0	222	0	0	0	395	395
07:30 AM	9	3	1	0	15	149	11	0	0	3	1	0	3	194	1	0	0	390	390
07:45 AM	14	16	2	0	49	167	10	0	3	3	14	0	5	189	6	0	0	478	478
Total	41	19	5	0	74	579	38	0	3	7	20	0	8	823	7	0	0	1624	1624
08:00 AM	4	9	2	0	43	164	22	0	5	3	27	0	12	201	7	0	0	499	499
08:15 AM	9	1	0	0	9	159	10	0	0	0	6	0	2	198	3	0	0	397	397
*** BREAK ***																			
Total	13	10	2	0	52	323	32	0	5	3	33	0	14	399	10	0	0	896	896
*** BREAK ***																			
04:00 PM	3	0	1	0	3	242	22	0	0	1	5	0	1	209	1	0	0	488	488
04:15 PM	5	0	0	0	2	244	16	0	1	0	7	0	0	271	0	0	0	546	546
04:30 PM	7	2	2	0	5	217	19	0	1	2	7	0	1	225	0	0	0	488	488
04:45 PM	7	0	1	0	5	247	20	0	1	2	5	0	1	231	0	0	0	520	520
Total	22	2	4	0	15	950	77	0	3	5	24	0	3	936	1	0	0	2042	2042
05:00 PM	12	0	2	0	4	282	18	0	2	3	13	0	1	240	1	0	0	578	578
05:15 PM	3	0	2	0	5	250	29	0	2	0	12	0	1	246	1	0	0	551	551
05:30 PM	9	1	1	0	4	234	26	0	2	2	5	0	1	244	1	0	0	530	530
05:45 PM	4	3	1	0	24	223	19	0	0	0	9	0	0	178	4	0	0	465	465
Total	28	4	6	0	37	989	92	0	6	5	39	0	3	908	7	0	0	2124	2124
Grand Total	123	35	17	0	182	3077	251	0	17	20	119	0	29	3448	25	0	0	7343	7343
Apprch %	70.3	20	9.7		5.2	87.7	7.2		10.9	12.8	76.3		0.8	98.5	0.7				
Total %	1.7	0.5	0.2		2.5	41.9	3.4		0.2	0.3	1.6		0.4	47	0.3		0	100	
Motorcycles	0	0	0		0	23	1		0	0	0		0	25	0		0	0	49
% Motorcycles	0	0	0	0	0	0.7	0.4	0	0	0	0	0	0	0.7	0	0	0	0	0.7
Cars	88	32	14		164	2104	195		13	17	101		27	2435	17		0	0	5207
% Cars	71.5	91.4	82.4	0	90.1	68.4	77.7	0	76.5	85	84.9	0	93.1	70.6	68	0	0	0	70.9
Light Goods Vehicles	30	2	1		13	611	41		4	3	8		2	665	8		0	0	1388
% Light Goods Vehicles	24.4	5.7	5.9	0	7.1	19.9	16.3	0	23.5	15	6.7	0	6.9	19.3	32	0	0	0	18.9
Buses	2	1	0		4	24	6		0	0	9		0	12	0		0	0	58
% Buses	1.6	2.9	0	0	2.2	0.8	2.4	0	0	0	7.6	0	0	0.3	0	0	0	0	0.8
Single-Unit Trucks	3	0	2		1	83	8		0	0	1		0	92	0		0	0	190
% Single-Unit Trucks	2.4	0	11.8	0	0.5	2.7	3.2	0	0	0	0.8	0	0	2.7	0	0	0	0	2.6
Articulated Trucks	0	0	0		0	230	0		0	0	0		0	219	0		0	0	449
% Articulated Trucks	0	0	0	0	0	7.5	0	0	0	0	0	0	0	6.4	0	0	0	0	6.1
Bicycles on Road	0	0	0		0	2	0		0	0	0		0	0	0		0	0	2
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

VHB

Two Columbus Center
4500 Main Street, Suite 400
Virginia Beach, VA 23462
p: 757.490.0132

File Name : US460@KingsFork
Site Code :
Start Date : 5/18/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	Kings Fork Road Southbound				US 460 (Pruden Boulevard) Westbound				Kings Fork Road Northbound				US 460 (Pruden Boulevard) Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
06:30 AM	11	1	12	0	1	88	7	0	0	13	8	0	18	164	1	0	0	324	324
06:45 AM	15	4	6	0	1	101	14	0	0	19	10	0	19	167	0	0	0	356	356
Total	26	5	18	0	2	189	21	0	0	32	18	0	37	331	1	0	0	680	680
07:00 AM	21	14	14	0	4	99	9	0	1	11	19	0	18	181	0	0	0	391	391
07:15 AM	21	10	11	0	0	117	12	0	0	16	15	0	20	188	0	0	0	410	410
07:30 AM	23	7	10	0	0	113	10	0	1	22	14	0	26	177	0	0	0	403	403
07:45 AM	18	7	13	0	2	97	12	0	0	25	33	0	31	156	0	0	0	394	394
Total	83	38	48	0	6	426	43	0	2	74	81	0	95	702	0	0	0	1598	1598
08:00 AM	31	17	23	0	5	111	9	0	0	38	23	0	26	156	0	0	0	439	439
08:15 AM	20	20	14	0	5	129	16	0	0	20	16	0	21	148	1	0	0	410	410
*** BREAK ***																			
Total	51	37	37	0	10	240	25	0	0	58	39	0	47	304	1	0	0	849	849
*** BREAK ***																			
04:00 PM	20	20	30	0	23	185	26	0	1	6	8	0	16	176	0	0	0	511	511
04:15 PM	11	15	22	0	11	197	22	0	1	20	10	0	19	232	0	0	0	560	560
04:30 PM	25	22	30	0	19	190	24	0	1	20	7	0	23	199	0	0	0	560	560
04:45 PM	21	15	21	0	11	199	32	0	3	24	4	0	15	197	1	0	0	543	543
Total	77	72	103	0	64	771	104	0	6	70	29	0	73	804	1	0	0	2174	2174
05:00 PM	23	24	33	0	25	209	36	0	0	25	11	0	22	193	3	0	0	604	604
05:15 PM	24	19	24	0	22	200	29	0	0	40	7	0	19	221	3	0	0	608	608
05:30 PM	16	17	16	0	14	184	36	0	2	38	6	0	24	211	0	0	0	564	564
05:45 PM	17	13	19	0	12	178	30	0	0	36	13	0	20	173	1	0	0	512	512
Total	80	73	92	0	73	771	131	0	2	139	37	0	85	798	7	0	0	2288	2288
Grand Total	317	225	298	0	155	2397	324	0	10	373	204	0	337	2939	10	0	0	7589	7589
Apprch %	37.7	26.8	35.5		5.4	83.3	11.3		1.7	63.5	34.8		10.3	89.4	0.3				
Total %	4.2	3	3.9		2	31.6	4.3		0.1	4.9	2.7		4.4	38.7	0.1		0	100	
Motorcycles	2	1	3		4	18	1		0	2	0		4	20	0		0	0	55
% Motorcycles	0.6	0.4	1	0	2.6	0.8	0.3	0	0	0.5	0	0	1.2	0.7	0	0	0	0	0.7
Cars	265	164	232		107	1567	243		8	272	170		265	2151	9		0	0	5453
% Cars	83.6	72.9	77.9	0	69	65.4	75	0	80	72.9	83.3	0	78.6	73.2	90	0	0	0	71.9
Light Goods Vehicles	44	39	43		41	497	73		2	74	32		50	448	1		0	0	1344
% Light Goods Vehicles	13.9	17.3	14.4	0	26.5	20.7	22.5	0	20	19.8	15.7	0	14.8	15.2	10	0	0	0	17.7
Buses	1	19	11		1	9	2		0	22	1		12	9	0		0	0	87
% Buses	0.3	8.4	3.7	0	0.6	0.4	0.6	0	0	5.9	0.5	0	3.6	0.3	0	0	0	0	1.1
Single-Unit Trucks	4	2	8		2	82	3		0	3	1		6	80	0		0	0	191
% Single-Unit Trucks	1.3	0.9	2.7	0	1.3	3.4	0.9	0	0	0.8	0.5	0	1.8	2.7	0	0	0	0	2.5
Articulated Trucks	1	0	1		0	222	2		0	0	0		0	231	0		0	0	457
% Articulated Trucks	0.3	0	0.3	0	0	9.3	0.6	0	0	0	0	0	0	7.9	0	0	0	0	6
Bicycles on Road	0	0	0		0	2	0		0	0	0		0	0	0		0	0	2
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

VHB Engineering NC, P.C.

Venture I
940 Main Campus Drive, Suite 500
Raleigh, NC 28606
p: 919.829.0328 f: 919.833.0034

File Name : US460@Prince
Site Code :
Start Date : 5/16/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	US 258 (Prince Boulevard) Southbound				US 460 (Windsor Boulevard) Westbound				US 258 (Prince Boulevard) Northbound				US 460 (Windsor Boulevard) Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
06:30 AM	31	9	3	0	5	67	7	0	9	39	40	0	2	63	3	0	0	278	278
06:45 AM	22	12	3	0	3	68	10	0	9	31	25	0	5	67	1	0	0	256	256
Total	53	21	6	0	8	135	17	0	18	70	65	0	7	130	4	0	0	534	534
07:00 AM	25	19	1	0	7	64	9	0	10	33	26	0	10	91	6	0	0	301	301
07:15 AM	34	24	6	0	4	63	26	0	13	47	20	0	10	72	3	0	0	322	322
07:30 AM	20	29	4	0	10	62	14	0	12	29	20	0	5	80	2	0	0	287	287
07:45 AM	23	13	0	0	8	72	26	0	8	16	18	0	0	89	8	0	0	281	281
Total	102	85	11	0	29	261	75	0	43	125	84	0	25	332	19	0	0	1191	1191
08:00 AM	17	16	3	0	10	71	33	0	2	28	27	0	0	83	4	0	0	294	294
08:15 AM	25	17	3	0	9	64	23	0	11	29	18	0	5	76	5	0	0	285	285
*** BREAK ***																			
Total	42	33	6	0	19	135	56	0	13	57	45	0	5	159	9	0	0	579	579
*** BREAK ***																			
04:00 PM	32	35	4	0	23	116	25	0	9	16	14	0	3	73	6	0	0	356	356
04:15 PM	25	51	3	0	38	110	26	0	11	17	15	0	6	101	6	0	0	409	409
04:30 PM	19	45	6	0	27	146	34	0	6	18	15	0	5	99	17	0	0	437	437
04:45 PM	30	38	2	0	31	111	28	0	13	14	16	0	5	83	7	0	0	378	378
Total	106	169	15	0	119	483	113	0	39	65	60	0	19	356	36	0	0	1580	1580
05:00 PM	34	38	2	0	37	121	26	0	5	28	16	0	4	83	11	0	0	405	405
05:15 PM	29	35	4	0	26	110	39	0	8	28	10	0	6	107	5	0	0	407	407
05:30 PM	18	21	6	0	33	116	32	0	8	25	15	0	5	70	8	0	0	357	357
05:45 PM	30	23	7	0	21	109	36	0	6	18	22	0	9	89	5	0	0	375	375
Total	111	117	19	0	117	456	133	0	27	99	63	0	24	349	29	0	0	1544	1544
Grand Total	414	425	57	0	292	1470	394	0	140	416	317	0	80	1326	97	0	0	5428	5428
Apprch %	46.2	47.4	6.4		13.5	68.2	18.3		16	47.7	36.3		5.3	88.2	6.5				
Total %	7.6	7.8	1.1		5.4	27.1	7.3		2.6	7.7	5.8		1.5	24.4	1.8		0	100	
Motorcycles	3	4	2		1	9	0		0	4	3		1	9	1		0	0	37
% Motorcycles	0.7	0.9	3.5	0	0.3	0.6	0	0	0	1	0.9	0	1.2	0.7	1	0	0	0	0.7
Cars	340	323	43		225	935	345		79	322	249		52	861	53		0	0	3827
% Cars	82.1	76	75.4	0	77.1	63.6	87.6	0	56.4	77.4	78.5	0	65	64.9	54.6	0	0	0	70.5
Light Goods Vehicles	58	65	8		52	274	34		37	58	52		17	252	21		0	0	928
% Light Goods Vehicles	14	15.3	14	0	17.8	18.6	8.6	0	26.4	13.9	16.4	0	21.2	19	21.6	0	0	0	17.1
Buses	4	6	2		2	4	5		0	7	3		2	3	1		0	0	39
% Buses	1	1.4	3.5	0	0.7	0.3	1.3	0	0	1.7	0.9	0	2.5	0.2	1	0	0	0	0.7
Single-Unit Trucks	8	8	1		9	40	5		5	8	6		1	38	4		0	0	133
% Single-Unit Trucks	1.9	1.9	1.8	0	3.1	2.7	1.3	0	3.6	1.9	1.9	0	1.2	2.9	4.1	0	0	0	2.5
Articulated Trucks	1	19	1		3	208	5		19	17	4		7	163	17		0	0	464
% Articulated Trucks	0.2	4.5	1.8	0	1	14.1	1.3	0	13.6	4.1	1.3	0	8.8	12.3	17.5	0	0	0	8.5
Bicycles on Road	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

VHB

Two Columbus Center
4500 Main Street, Suite 400
Virginia Beach, VA 23462
p: 757.490.0132

File Name : US460@Woodlawn
Site Code :
Start Date : 5/18/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	No Approach Southbound				US 460 (Pruden Boulevard) Westbound				Woodlawn Drive Northbound				US 460 (Pruden Boulevard) Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
06:30 AM	0	0	0	0	0	110	0	0	0	0	2	0	0	162	1	0	0	275	275
06:45 AM	0	0	0	0	0	114	0	0	0	0	0	0	0	186	0	0	0	300	300
Total	0	0	0	0	0	224	0	0	0	0	2	0	0	348	1	0	0	575	575
07:00 AM	0	0	0	0	0	123	0	0	0	0	0	0	0	186	0	0	0	309	309
07:15 AM	0	0	0	0	0	129	0	0	0	0	1	0	0	199	0	0	0	329	329
07:30 AM	0	0	0	0	0	126	0	0	1	0	0	0	0	201	0	0	0	328	328
07:45 AM	0	0	0	0	0	99	0	0	1	0	0	0	0	180	0	0	0	280	280
Total	0	0	0	0	0	477	0	0	2	0	1	0	0	766	0	0	0	1246	1246
08:00 AM	0	0	0	0	1	121	0	0	0	0	1	0	0	146	0	0	0	269	269
08:15 AM	0	0	0	0	0	119	0	0	0	0	0	0	0	171	0	0	0	290	290
*** BREAK ***																			
Total	0	0	0	0	1	240	0	0	0	0	1	0	0	317	0	0	0	559	559
*** BREAK ***																			
04:00 PM	0	0	0	0	0	206	0	0	0	0	0	0	0	204	1	0	0	411	411
04:15 PM	0	0	0	0	0	199	0	0	0	0	0	0	0	232	0	0	0	431	431
04:30 PM	0	0	0	0	2	204	0	0	0	0	0	0	0	206	0	0	0	412	412
04:45 PM	0	0	0	0	0	216	0	0	0	0	1	0	0	203	0	0	0	420	420
Total	0	0	0	0	2	825	0	0	0	0	1	0	0	845	1	0	0	1674	1674
05:00 PM	0	0	0	0	0	248	0	0	0	0	0	0	0	219	0	0	0	467	467
05:15 PM	0	0	0	0	0	226	0	0	0	0	1	0	0	235	1	0	0	463	463
05:30 PM	0	0	0	0	1	206	0	0	0	0	0	0	0	207	0	0	0	414	414
05:45 PM	0	0	0	0	0	178	0	0	0	0	0	0	0	174	0	0	0	352	352
Total	0	0	0	0	1	858	0	0	0	0	1	0	0	835	1	0	0	1696	1696
Grand Total	0	0	0	0	4	2624	0	0	2	0	6	0	0	3111	3	0	0	5750	5750
Apprch %	0	0	0		0.2	99.8	0		25	0	75		0	99.9	0.1				
Total %	0	0	0		0.1	45.6	0		0	0	0.1		0	54.1	0.1		0	100	
Motorcycles	0	0	0		0	18	0		0	0	0		0	26	0		0	0	44
% Motorcycles	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0.8	0	0	0	0	0.8
Cars	0	0	0		4	1810	0		1	0	6		0	2180	2		0	0	4003
% Cars	0	0	0	0	100	69	0	0	50	0	100	0	0	70.1	66.7	0	0	0	69.6
Light Goods Vehicles	0	0	0		0	473	0		1	0	0		0	570	0		0	0	1044
% Light Goods Vehicles	0	0	0	0	0	18	0	0	50	0	0	0	0	18.3	0	0	0	0	18.2
Buses	0	0	0		0	18	0		0	0	0		0	20	1		0	0	39
% Buses	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0.6	33.3	0	0	0	0.7
Single-Unit Trucks	0	0	0		0	73	0		0	0	0		0	96	0		0	0	169
% Single-Unit Trucks	0	0	0	0	0	2.8	0	0	0	0	0	0	0	3.1	0	0	0	0	2.9
Articulated Trucks	0	0	0		0	232	0		0	0	0		0	219	0		0	0	451
% Articulated Trucks	0	0	0	0	0	8.8	0	0	0	0	0	0	0	7	0	0	0	0	7.8
Bicycles on Road	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

VHB Engineering NC, P.C.

Venture I
940 Main Campus Drive, Suite 500
Raleigh, NC 28606
p: 919.829.0328 f: 919.833.0034

File Name : US460@OldSuffolk
Site Code :
Start Date : 5/16/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	Old Suffolk Road Southbound				US 460 (Windsor Boulevard) Westbound				Old Mill Road Northbound				US 460 (Windsor Boulevard) Eastbound						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
05:00 AM	0	1	0	0	2	32	0	0	1	0	1	0	0	52	2	0	0	91	91
05:15 AM	0	0	0	0	12	41	0	0	2	0	3	0	0	82	4	0	0	144	144
05:30 AM	0	0	0	0	25	44	0	0	0	0	6	0	0	97	6	0	0	178	178
05:45 AM	0	0	0	0	27	47	0	0	0	0	4	0	0	94	10	0	0	182	182
Total	0	1	0	0	66	164	0	0	3	0	14	0	0	325	22	0	0	595	595
06:00 AM	0	2	0	0	2	62	0	0	2	1	14	0	1	129	6	0	0	219	219
06:15 AM	0	0	0	0	7	82	0	0	14	3	48	0	0	144	3	0	0	301	301
06:30 AM	0	0	0	0	2	109	0	0	3	0	7	0	0	171	5	0	0	297	297
06:45 AM	1	0	0	0	5	99	0	0	2	0	5	0	2	132	3	0	0	249	249
Total	1	2	0	0	16	352	0	0	21	4	74	0	3	576	17	0	0	1066	1066
07:00 AM	0	0	1	0	5	103	0	0	4	0	6	0	1	164	5	0	0	289	289
07:15 AM	0	0	0	0	12	91	1	0	3	0	7	0	1	154	6	0	0	275	275
07:30 AM	0	0	1	0	7	86	0	0	3	0	8	0	1	160	5	0	0	271	271
07:45 AM	0	1	1	0	19	112	1	0	1	1	7	0	1	151	4	0	0	299	299
Total	0	1	3	0	43	392	2	0	11	1	28	0	4	629	20	0	0	1134	1134
08:00 AM	0	0	1	0	17	96	0	0	5	0	5	0	0	134	7	0	0	265	265
08:15 AM	0	0	0	0	5	78	0	0	3	2	5	0	0	121	3	0	0	217	217
08:30 AM	0	0	2	0	4	99	0	0	1	0	3	0	0	118	4	0	0	231	231
08:45 AM	0	0	0	0	2	92	0	0	3	1	2	0	1	135	3	0	0	239	239
Total	0	0	3	0	28	365	0	0	12	3	15	0	1	508	17	0	0	952	952
09:00 AM	0	1	0	0	1	86	0	0	1	0	1	0	2	157	2	0	0	251	251
09:15 AM	0	0	0	0	6	102	0	0	2	0	6	0	1	121	1	0	0	239	239
09:30 AM	0	0	0	0	1	94	0	0	3	0	2	1	0	99	1	0	1	200	201
09:45 AM	0	1	3	0	2	91	0	0	5	0	4	0	1	119	5	0	0	231	231
Total	0	2	3	0	10	373	0	0	11	0	13	1	4	496	9	0	1	921	922
10:00 AM	0	0	1	0	1	78	0	0	1	0	5	0	1	113	4	0	0	204	204
10:15 AM	0	0	0	0	2	111	0	0	2	0	1	0	3	116	4	0	0	239	239
10:30 AM	0	0	0	0	4	86	0	0	3	0	2	0	0	103	1	0	0	199	199
10:45 AM	0	0	0	0	2	94	0	0	5	1	3	0	0	119	1	0	0	225	225
Total	0	0	1	0	9	369	0	0	11	1	11	0	4	451	10	0	0	867	867
11:00 AM	0	0	0	0	2	92	0	0	2	0	3	0	0	114	2	0	0	215	215
11:15 AM	0	1	0	0	5	101	0	0	2	0	4	0	1	100	3	0	0	217	217
11:30 AM	0	0	3	0	4	88	0	0	4	0	6	0	0	112	6	0	0	223	223
11:45 AM	0	0	0	0	3	112	0	0	7	0	3	0	0	120	4	0	0	249	249
Total	0	1	3	0	14	393	0	0	15	0	16	0	1	446	15	0	0	904	904
12:00 PM	0	0	1	0	2	98	0	0	8	0	13	0	2	104	6	0	0	234	234
12:15 PM	1	0	0	0	9	100	0	0	2	1	2	0	1	97	1	0	0	214	214
12:30 PM	0	0	1	0	9	92	2	0	7	0	2	0	0	104	3	0	0	220	220
12:45 PM	0	0	0	0	4	111	1	0	4	4	6	0	1	98	5	0	0	234	234
Total	1	0	2	0	24	401	3	0	21	5	23	0	4	403	15	0	0	902	902
01:00 PM	0	0	1	0	2	93	0	0	3	0	1	0	1	97	2	0	0	200	200
01:15 PM	0	0	0	0	5	144	0	0	3	0	2	0	0	142	2	0	0	298	298
01:30 PM	0	0	0	0	2	117	0	0	2	0	1	0	0	113	3	0	0	238	238
01:45 PM	0	0	0	0	4	109	0	0	4	0	2	0	0	89	4	0	0	212	212
Total	0	0	1	0	13	463	0	0	12	0	6	0	1	441	11	0	0	948	948
02:00 PM	0	0	3	0	1	108	1	0	7	1	7	0	0	107	2	0	0	237	237
02:15 PM	0	0	2	0	6	124	1	0	3	0	5	0	1	113	3	0	0	258	258
02:30 PM	0	0	0	0	4	130	0	0	2	0	0	0	2	130	0	0	0	268	268
02:45 PM	0	0	3	0	12	114	0	0	1	0	3	0	4	132	5	0	0	274	274
Total	0	0	8	0	23	476	2	0	13	1	15	0	7	482	10	0	0	1037	1037
03:00 PM	0	0	1	0	6	156	0	0	2	2	7	0	4	119	3	0	0	300	300
03:15 PM	0	0	0	0	6	175	0	0	2	0	3	0	0	114	3	0	0	303	303
03:30 PM	0	0	1	0	6	201	0	0	5	0	4	0	0	132	2	0	0	351	351
03:45 PM	0	0	1	0	10	169	2	0	3	0	0	0	1	107	3	0	0	296	296
Total	0	0	3	0	28	701	2	0	12	2	14	0	5	472	11	0	0	1250	1250

VHB Engineering NC, P.C.

Venture I
940 Main Campus Drive, Suite 500
Raleigh, NC 28606
p: 919.829.0328 f: 919.833.0034

File Name : US460@Dominion
Site Code :
Start Date : 5/16/2017
Page No : 1

Groups Printed- Motorcycles - Cars - Light Goods Vehicles - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	No Approach Southbound				**US 460 (Windsor Boulevard) Westbound**				**Dominion Way Northbound**				**US 460 (Windsor Boulevard) Eastbound**						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
06:30 AM	0	0	0	0	23	83	0	0	0	0	2	0	0	178	22	0	0	308	308
06:45 AM	0	0	0	0	20	86	0	0	2	0	4	0	0	132	22	0	0	266	266
Total	0	0	0	0	43	169	0	0	2	0	6	0	0	310	44	0	0	574	574
07:00 AM	0	0	0	0	4	104	0	0	1	0	1	0	0	171	2	0	0	283	283
07:15 AM	0	0	0	0	3	94	0	0	1	0	0	0	0	163	2	0	0	263	263
07:30 AM	0	0	0	0	3	88	0	0	1	0	0	0	0	169	1	0	0	262	262
07:45 AM	0	0	0	0	1	119	0	0	0	0	0	0	0	162	2	0	0	284	284
Total	0	0	0	0	11	405	0	0	3	0	1	0	0	665	7	0	0	1092	1092
08:00 AM	0	0	0	0	1	98	0	0	1	0	1	0	0	134	2	0	0	237	237
08:15 AM	0	0	0	0	1	80	0	0	0	0	0	0	0	129	0	0	0	210	210
*** BREAK ***																			
Total	0	0	0	0	2	178	0	0	1	0	1	0	0	263	2	0	0	447	447
*** BREAK ***																			
04:00 PM	0	0	0	0	0	197	0	0	7	0	7	0	0	122	1	0	0	334	334
04:15 PM	0	0	0	0	0	194	0	0	2	0	3	0	0	123	0	0	0	322	322
04:30 PM	0	0	0	0	1	206	0	0	13	0	6	0	0	138	1	0	0	365	365
04:45 PM	0	0	0	0	0	187	0	0	1	0	4	0	0	114	0	0	0	306	306
Total	0	0	0	0	1	784	0	0	23	0	20	0	0	497	2	0	0	1327	1327
05:00 PM	0	0	0	0	0	236	0	0	0	0	4	0	0	122	0	0	0	362	362
05:15 PM	0	0	0	0	0	216	0	0	2	0	1	0	0	142	1	0	0	362	362
05:30 PM	0	0	0	0	0	215	0	0	1	0	0	0	0	117	1	0	0	334	334
05:45 PM	0	0	0	0	0	143	0	0	0	0	3	0	0	135	0	0	0	281	281
Total	0	0	0	0	0	810	0	0	3	0	8	0	0	516	2	0	0	1339	1339
Grand Total	0	0	0	0	57	2346	0	0	32	0	36	0	0	2251	57	0	0	4779	4779
Apprch %	0	0	0		2.4	97.6	0		47.1	0	52.9		0	97.5	2.5				
Total %	0	0	0		1.2	49.1	0		0.7	0	0.8		0	47.1	1.2		0	100	
Motorcycles	0	0	0		0	12	0		0	0	0		0	21	0		0	0	33
% Motorcycles	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.9	0	0	0	0	0.7
Cars	0	0	0		48	1591	0		22	0	33		0	1511	49		0	0	3254
% Cars	0	0	0	0	84.2	67.8	0	0	68.8	0	91.7	0	0	67.1	86	0	0	0	68.1
Light Goods Vehicles	0	0	0		5	470	0		5	0	1		0	472	5		0	0	958
% Light Goods Vehicles	0	0	0	0	8.8	20	0	0	15.6	0	2.8	0	0	21	8.8	0	0	0	20
Buses	0	0	0		0	12	0		0	0	0		0	8	0		0	0	20
% Buses	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.4	0	0	0	0	0.4
Single-Unit Trucks	0	0	0		2	49	0		0	0	2		0	63	0		0	0	116
% Single-Unit Trucks	0	0	0	0	3.5	2.1	0	0	0	0	5.6	0	0	2.8	0	0	0	0	2.4
Articulated Trucks	0	0	0		2	212	0		5	0	0		0	176	3		0	0	398
% Articulated Trucks	0	0	0	0	3.5	9	0	0	15.6	0	0	0	0	7.8	5.3	0	0	0	8.3
Bicycles on Road	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0		0	0	0		0	0	0		0	0	0		0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix D

CONTENTS

Table D.1.
Level of Service Results Summary.

ID	Intersection Name	Control	Existing		2040 No-Build		2040 Build	
			AM	PM	AM	PM	AM	PM
1	U.S. 460/Pruden Boulevard & Northfield Drive	Signalized	A (SB-C)	B (SB-D)	A (SB-C)	B (SB-D)	A (SB-C)	B (SB-D)
2	U.S. 460/Pruden Boulevard & Rob's Drive	Signalized	B (SB-D)	B (SB-D)	C (SB-D)	B (SB-D)	C (SB-D)	A (SB-D)
3	U.S. 460/Pruden Boulevard & Kings Fork Road	Signalized	C (SB-F)	C (SB-E)	D (SB-F)	E (SB-F)	D (NB-F)	E (NB-F)
4	U.S.4 60/Pruden Boulevard & Providence Road/Lake Prince Drive	Signalized	B (SB-C)	B (NB-C)	B (SB-D)	C (NB-E)	B (SB-C)	C (NB-D)
5	U.S. 460/Pruden Boulevard/Woodlawn Drive	Unsignalized	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)	(NB-B)
6	U.S. 460/Windsor Boulevard & Old Suffolk Rd	Unsignalized	(SB-C)	(NB-C)	(NB-D)	(NB-F)	(NB-D)	(NB-F)
7	U.S. 460/Windsor Boulevard & Dominion Way	Signalized	A (NB-C)	A (NB-C)	A (NB-C)	A (NB-C)	A (NB-C)	A (NB-C)

Legend: X - Overall Level of Service, (XX-X) - Worst Approach-Worst Approach Level of Service

Table D.2.
Detailed Level of Service Results Summary.

ID	Intersection and Approach	Control	Existing		2040 No-Build		2040 Build	
			AM	PM	AM	PM	AM	PM
1	**U.S. 460/Pruden Boulevard & Northfield Drive**	Signalized	**A (2.2 sec/veh)**	**B (10.4 sec/veh)**	**A (3.2 sec/veh)**	**B (15.3 sec/veh)**	**A (3.2 sec/veh)**	**B (12.2 sec/veh)**
	Eastbound		A-0.7	A-8.8	A-0.9	B-11.4	A-1.1	A-4.1
	Westbound		A-3	A-8.1	A-4.9	B-16.2	A-4.9	B-16.2
	Southbound		C-33.2	D-40.5	C-33.8	D-40.8	C-33.8	D-40.8
2	**U.S. 460/Pruden Boulevard & Rob's Drive**	Signalized	**B (16.9 sec/veh)**	**B (10 sec/veh)**	**C (22.1 sec/veh)**	**B (13.4 sec/veh)**	**C (25.2 sec/veh)**	**A (8.9 sec/veh)**
	Eastbound		B-13.5	B-13.8	B-18.7	C-20.4	C-26.1	B-12.6
	Westbound		B-16.5	A-4	C-23.3	A-5.8	C-23.4	A-3.4
	Northbound		B-14.4	C-20	B-15.2	C-21.5	B-14.7	C-21.3
	Southbound		D-46.3	D-52.6	D-47.6	D-53.2	D-45.6	D-53.4
3	**U.S. 460/Pruden Boulevard & Kings Fork Road**	Signalized	**C (33.8 sec/veh)**	**C (34.5 sec/veh)**	**D (44.5 sec/veh)**	**E (55.6 sec/veh)**	**D (39 sec/veh)**	**E (55.6 sec/veh)**
	Eastbound		B-16.7	C-27.3	C-21.9	D-37.6	D-35.2	D-53.6
	Westbound		B-13.7	C-28.9	B-13.2	E-59.8	C-27.9	D-54.3
	Northbound		D-41.9	D-44.5	D-49.5	D-53.9	F-95.7	F-94.2
	Southbound		F-116.1	E-64.1	F-212	F-102.9	C-25.9	D-42.9
4	**U.S. 460/Pruden Boulevard&Providence Road/Lake Prince Drive**	Signalized	**B (14.2 sec/veh)**	**B (18.6 sec/veh)**	**B (18.6 sec/veh)**	**C (24.2 sec/veh)**	**B (17.8 sec/veh)**	**C (22.2 sec/veh)**
	Eastbound		B-14.1	C-20.1	B-19.4	C-24.3	B-18.5	C-23
	Westbound		B-10.6	B-13.1	B-12.7	B-16.7	B-11.8	B-14.3
	Northbound		B-16.8	C-31.2	C-24.8	E-58.1	C-24.4	D-54.9
	Southbound		C-24.5	C-29.7	D-35.1	D-47.7	C-34.5	D-45.9
5	**U.S. 460/Pruden Boulevard/Woodlawn Drive**	Unsignalized	-	-	-	-	**A (0.1 sec/veh)**	**A (0 sec/veh)**
	Northbound		B-11.1	B-11.6	B-13.3	B-14.3	B-13.3	B-14.3
6	**U.S. 460/Windsor Boulevard & Old Suffolk Rd**	Unsignalized	-	-	-	-	**A (5.2 sec/veh)**	**A (5 sec/veh)**
	Northbound		C-18.1	C-23.7	D-29.5	F-51.7	D-29.5	F-51.7
	Southbound		C-18.8	B-11.7	D-27.8	B-13	D-27.8	B-13
7	**U.S. 460/Windsor Boulevard & Dominion Way**	Signalized	**A (4.4 sec/veh)**	**A (4.6 sec/veh)**	**A (5.3 sec/veh)**	**A (4.9 sec/veh)**	**A (5.3 sec/veh)**	**A (4.9 sec/veh)**
	Eastbound		A-5.5	A-4.2	A-6.9	A-4.6	A-6.9	A-4.6
	Westbound		A-1.6	A-3	A-1.7	A-3.5	A-1.7	A-3.5
	Northbound		C-28.5	C-30.5	C-27.5	C-30.2	C-27.5	C-30.2

ID	Intersection Name	Control	Existing		2040 No-Build		2040 Build	
			AM	PM	AM	PM	AM	PM
1	U.S. 460/Pruden Boulevard & Northfield Drive	Signalized	2.2	10.4	3.2	15.3	3.2	12.2
2	U.S. 460/Pruden Boulevard & Rob's Drive	Signalized	16.9	10	22.1	13.4	25.2	8.9
3	U.S. 460/Pruden Boulevard & Kings Fork Road	Signalized	33.8	34.5	44.5	55.6	39	55.6
4	U.S. 460/Pruden Boulevard&Providence Road/Lake Prince Drive	Signalized	14.2	18.6	18.6	24.2	17.8	22.2
5	U.S. 460/Pruden Boulevard/Woodlawn Drive	Unsignalized	0.1	0.1	0.1	0	0.1	0
6	U.S. 460/Windsor Boulevard & Old Suffolk Rd	Unsignalized	3.6	2.7	5.2	5	5.2	5
7	U.S. 460/Windsor Boulevard & Dominion Way	Signalized	4.4	4.6	5.3	4.9	5.3	4.9

Existing AM

1: US 460/Pruden Boulevard & Northfield Drive

Baseline

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	7	924	0	769	53	7	3
Future Volume (vph)	7	924	0	769	53	7	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	305		125		195	0	155
Storage Lanes	1		1		1	1	1
Taper Length (ft)	190		200			0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Frt					0.850		0.850
Flt Protected	0.950					0.950	
Satd. Flow (prot)	1770	3539	1863	3539	1583	1770	1583
Flt Permitted	0.261					0.950	
Satd. Flow (perm)	486	3539	1863	3539	1583	1770	1583
Right Turn on Red					Yes		Yes
Satd. Flow (RTOR)					84		8
Link Speed (mph)		55		55		25	
Link Distance (ft)		537		2299		1306	
Travel Time (s)		6.7		28.5		35.6	
Peak Hour Factor	0.58	0.94	0.92	0.82	0.63	0.58	0.38
Adj. Flow (vph)	12	983	0	938	84	12	8
Shared Lane Traffic (%)							
Lane Group Flow (vph)	12	983	0	938	84	12	8
Turn Type	pm+pt	NA	pm+pt	NA	Prot	Prot	Prot
Protected Phases	1	6	5	2	2	7	4
Permitted Phases	6		2				
Detector Phase	1	6	5	2	2	7	4
Switch Phase							
Minimum Initial (s)	5.0	15.0	5.0	15.0	15.0	7.0	7.0
Minimum Split (s)	13.3	23.3	9.5	34.9	34.9	14.4	14.4
Total Split (s)	20.0	48.0	20.0	48.0	48.0	22.0	22.0
Total Split (%)	22.2%	53.3%	22.2%	53.3%	53.3%	24.4%	24.4%
Maximum Green (s)	11.7	39.7	15.5	40.1	40.1	14.6	14.6
Yellow Time (s)	4.8	4.8	3.5	4.8	4.8	4.0	4.0
All-Red Time (s)	3.5	3.5	1.0	3.1	3.1	3.4	3.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.3	8.3	4.5	7.9	7.9	7.4	7.4
Lead/Lag	Lead	Lag	Lead	Lag	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None
Walk Time (s)				7.0	7.0		
Flash Dont Walk (s)				20.0	20.0		
Pedestrian Calls (#/hr)				0	0		
Act Effct Green (s)	78.7	85.4		82.6	82.6	7.1	7.1
Actuated g/C Ratio	0.87	0.95		0.92	0.92	0.08	0.08
v/c Ratio	0.02	0.29		0.29	0.06	0.09	0.06
Control Delay	1.1	0.7		3.1	1.5	40.0	23.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	1.1	0.7		3.1	1.5	40.0	23.0

Synchro 9 Report
Existing AM.syn

1: US 460/Pruden Boulevard & Northfield Drive

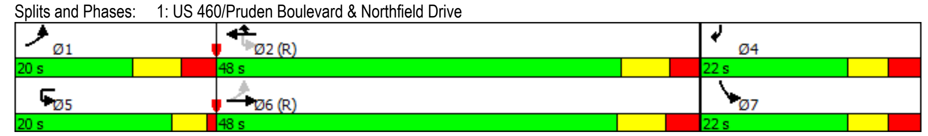
Baseline

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
LOS	A	A		A	A	D	C
Approach Delay		0.7		3.0		33.2	
Approach LOS		A		A		C	
Queue Length 50th (ft)	0	0		0	0	6	0
Queue Length 95th (ft)	m2	52		165	6	15	3
Internal Link Dist (ft)		457		2219		1226	
Turn Bay Length (ft)	305				195		155
Base Capacity (vph)	592	3357		3248	1460	287	263
Starvation Cap Reductn	0	0		0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0
Reduced v/c Ratio	0.02	0.29		0.29	0.06	0.04	0.03

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 68 (76%), Referenced to phase 2:WBTU and 6:EBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.29
Intersection Signal Delay: 2.2 Intersection LOS: A
Intersection Capacity Utilization 44.5% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: US 460/Pruden Boulevard & Northfield Drive



Synchro 9 Report
Existing AM.syn

1: US 460/Pruden Boulevard & Northfield Drive

Baseline

HCM 2010 cannot analyze U-Turning movements.

Synchro 9 Report
Existing AM.syn

Existing AM (Cont)

2: US460/Pruden Boulevard & Rob's Drive
Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	782	17	116	639	53	8	9	48	36	29	5
Future Volume (vph)	22	782	17	116	639	53	8	9	48	36	29	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	400		175	0		50	0		0
Storage Lanes	1		0	1		1	0		1	0		0
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995				0.850			0.850		0.992	
Flt Protected	0.950			0.950				0.970			0.979	
Satd. Flow (prot)	1770	3522	0	1770	3539	1583	0	1807	1583	0	1809	0
Flt Permitted	0.950			0.950				0.775			0.844	
Satd. Flow (perm)	1770	3522	0	1770	3539	1583	0	1444	1583	0	1560	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				112			120		3	
Link Speed (mph)		35			35			25			30	
Link Distance (ft)		2499			463			411			171	
Travel Time (s)		48.7			9.0			11.2			3.9	
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Adj. Flow (vph)	48	806	28	197	666	88	20	12	109	56	64	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	834	0	197	666	88	0	32	109	0	128	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8		8	4		
Detector Phase	1	6		5	2	2	8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	5.0	5.0	5.0	7.0	7.0	
Minimum Split (s)	11.1	21.8		11.1	21.8	21.8	11.1	11.1	11.1	13.1	13.1	
Total Split (s)	24.0	45.0		22.0	43.0	43.0	23.0	23.0	23.0	23.0	23.0	
Total Split (%)	26.7%	50.0%		24.4%	47.8%	47.8%	25.6%	25.6%	25.6%	25.6%	25.6%	
Maximum Green (s)	17.9	38.2		15.9	36.2	36.2	16.9	16.9	16.9	16.9	16.9	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.1	4.1	4.1	4.1	4.1	
All-Red Time (s)	2.1	2.0		2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Lost Time (s)	6.1	6.8		6.1	6.8	6.8		6.1	6.1		6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	
Act Effct Green (s)	7.9	44.8		13.9	55.6	55.6		12.3	12.3		12.3	
Actuated g/C Ratio	0.09	0.50		0.15	0.62	0.62		0.14	0.14		0.14	
v/c Ratio	0.31	0.48		0.72	0.30	0.09		0.16	0.34		0.59	
Control Delay	43.1	11.8		53.0	7.8	1.0		34.4	8.5		46.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	43.1	11.8		53.0	7.8	1.0		34.4	8.5		46.3	
LOS	D	B		D	A	A		C	A		D	
Approach Delay		13.5			16.5			14.4			46.3	
Approach LOS		B			B			B			D	

Synchro 9 Report
Existing AM.syn

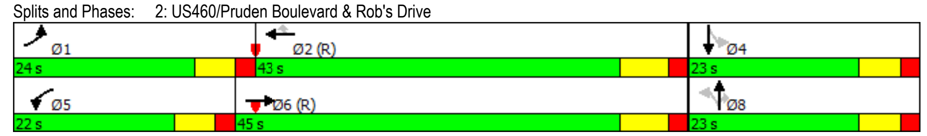
2: US460/Pruden Boulevard & Rob's Drive
Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	25	193		106	100	0		16	0		68	
Queue Length 95th (ft)	m27	m118		85	149	8		33	0		54	
Internal Link Dist (ft)		2419			383			331			91	
Turn Bay Length (ft)	250			400		175			50			
Base Capacity (vph)	352	1755		312	2187	1021		271	394		295	
Starvation Cap Reductn	0	0		0	0	0		0	0		0	
Spillback Cap Reductn	0	0		0	0	0		0	0		0	
Storage Cap Reductn	0	0		0	0	0		0	0		0	
Reduced v/c Ratio	0.14	0.48		0.63	0.30	0.09		0.12	0.28		0.43	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 25 (28%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 16.9 Intersection LOS: B
Intersection Capacity Utilization 54.9% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: US460/Pruden Boulevard & Rob's Drive



Synchro 9 Report
Existing AM.syn

2: US460/Pruden Boulevard & Rob's Drive
Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	782	17	116	639	53	8	9	48	36	29	5
Future Volume (veh/h)	22	782	17	116	639	53	8	9	48	36	29	5
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	48	806	28	197	666	88	20	12	109	56	64	8
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	69	1912	66	234	2269	1015	154	78	173	120	98	11
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.08	1.00	1.00	0.13	0.64	0.64	0.11	0.11	0.11	0.11	0.11	0.11
Ln Grp Delay, s/veh	52.3	1.3	1.2	52.4	7.5	6.3	36.6	0.0	42.1	40.9	0.0	0.0
Ln Grp LOS	D	A	A	D	A	A	D		D	D		
Approach Vol, veh/h		882			951			141			128	
Approach Delay, s/veh		4.0			16.7			40.9			40.9	
Approach LOS		A			B			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		7.0
Phs Duration (G+Y+Rc), s	9.6	64.5		15.9	18.0	56.1		15.9
Change Period (Y+Rc), s	6.1	6.8		6.1	6.1	6.8		6.1
Max Green (Gmax), s	17.9	36.2		16.9	15.9	38.2		16.9
Max Allow Headway (MAH), s	3.8	5.1		4.9	3.8	5.1		4.9
Max Q Clear (g_c+l1), s	4.4	9.5		9.1	11.8	2.0		7.9
Green Ext Time (g_e), s	0.1	11.7		0.7	0.2	13.1		0.8
Prob of Phs Call (p_c)	0.70	1.00		1.00	0.99	1.00		1.00
Prob of Max Out (p_x)	0.00	0.28		0.25	0.74	0.16		0.15
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			570	1774			819
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		896		3490		717
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		98		121		1583
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T

Synchro 9 Report
Existing AM.syn

Existing AM (Cont)

2: US460/Pruden Boulevard & Rob's Drive

Baseline

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	48	0	0	128	197	0	0	32
Grp Sat Flow (s), veh/h/ln	1774	0	0	1564	1774	0	0	1536
Q Serve Time (g_s), s	2.4	0.0	0.0	5.6	9.8	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	2.4	0.0	0.0	7.1	9.8	0.0	0.0	1.5
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1291	0	0	0	1349
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	1495
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	9.8	0.0	0.0	0.0	9.8
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	8.4	0.0	0.0	0.0	2.7
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	1.4	0.0	0.0	0.0	1.2
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	1.4	0.0	0.0	0.0	1.2
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.44	1.00	0.00	0.00	0.62
Lane Grp Cap (c), veh/h	69	0	0	228	234	0	0	233
V/C Ratio (X)	0.70	0.00	0.00	0.56	0.84	0.00	0.00	0.14
Avail Cap (c_a), veh/h	353	0	0	349	313	0	0	349
Upstream Filter (I)	0.94	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	41.0	0.0	0.0	38.8	38.2	0.0	0.0	36.3
Incr Delay (d2), s/veh	11.3	0.0	0.0	2.2	14.3	0.0	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	52.3	0.0	0.0	40.9	52.4	0.0	0.0	36.6
1st-Term Q (Q1), veh/ln	1.1	0.0	0.0	3.1	4.8	0.0	0.0	0.7
2nd-Term Q (Q2), veh/ln	0.2	0.0	0.0	0.1	0.9	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	1.4	0.0	0.0	3.2	5.7	0.0	0.0	0.7
%ile Storage Ratio (RQ%)	0.14	0.00	0.00	0.75	0.36	0.00	0.00	0.05
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	666	0	0	0	409	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0
Lane Grp Cap (c), veh/h	0	2269	0	0	0	970	0	0
V/C Ratio (X)	0.00	0.29	0.00	0.00	0.00	0.42	0.00	0.00
Avail Cap (c_a), veh/h	0	2269	0	0	0	970	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.94	0.00	0.00
Uniform Delay (d1), s/veh	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	1.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.5	0.0	0.0	0.0	1.3	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0

Synchro 9 Report
Existing AM.syn

2: US460/Pruden Boulevard & Rob's Drive

Baseline

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	3.7	0.0	0.0	0.0	0.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		R
Lanes in Grp	0	1	0	0	0	1	0	1
Grp Vol (v), veh/h	0	88	0	0	0	425	0	109
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1841	0	1583
Q Serve Time (g_s), s	0.0	1.9	0.0	0.0	0.0	0.0	0.0	5.9
Cycle Q Clear Time (g_c), s	0.0	1.9	0.0	0.0	0.0	0.0	0.0	5.9
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.06	0.00	0.07	0.00	1.00
Lane Grp Cap (c), veh/h	0	1015	0	0	0	1009	0	173
V/C Ratio (X)	0.00	0.09	0.00	0.00	0.00	0.42	0.00	0.63
Avail Cap (c_a), veh/h	0	1015	0	0	0	1009	0	297
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.94	0.00	1.00
Uniform Delay (d1), s/veh	0.0	6.1	0.0	0.0	0.0	0.0	0.0	38.4
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	1.2	0.0	3.8
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	6.3	0.0	0.0	0.0	1.2	0.0	42.1
1st-Term Q (Q1), veh/ln	0.0	0.8	0.0	0.0	0.0	0.0	0.0	2.6
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.9	0.0	0.0	0.0	0.3	0.0	2.8
%ile Storage Ratio (RQ%)	0.00	0.13	0.00	0.00	0.00	0.00	0.00	1.41
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		14.5						
HCM 2010 LOS		B						

Synchro 9 Report
Existing AM.syn

3: US460/Pruden Boulevard & Kings Fork Rd

Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	677	0	7	438	43	1	101	85	93	41	57
Future Volume (vph)	103	677	0	7	438	43	1	101	85	93	41	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	250		145	0		0	0		50
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	80			0			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850		0.938				0.850
Flt Protected	0.950			0.950				0.999			0.969	
Satd. Flow (prot)	1770	3539	0	1770	3539	1583	0	1746	0	0	1805	1583
Flt Permitted	0.950			0.950				0.995			0.427	
Satd. Flow (perm)	1770	3539	0	1770	3539	1583	0	1739	0	0	795	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						125		42				125
Link Speed (mph)		55			35			45			45	
Link Distance (ft)		2858			2499			2180			1010	
Travel Time (s)		35.4			48.7			33.0			15.3	
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Adj. Flow (vph)	124	752	0	20	466	48	4	151	131	124	68	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	752	0	20	466	48	0	286	0	0	192	92
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		4
Detector Phase	1	6		5	2	2	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	11.0	21.8		11.5	21.8	21.8	13.8	13.8		13.8	13.8	13.8
Total Split (s)	20.0	45.0		20.0	45.0	45.0	25.0	25.0		25.0	25.0	25.0
Total Split (%)	22.2%	50.0%		22.2%	50.0%	50.0%	27.8%	27.8%		27.8%	27.8%	27.8%
Maximum Green (s)	14.0	38.2		13.5	38.2	38.2	18.2	18.2		18.2	18.2	18.2
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.8	4.8		4.8	4.8	4.8
All-Red Time (s)	2.0	2.0		2.5	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	6.0	6.8		6.5	6.8	6.8		6.8			6.8	6.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Act Effct Green (s)	11.2	52.5		6.6	41.0	41.0		18.2			18.2	18.2
Actuated g/C Ratio	0.12	0.58		0.07	0.46	0.46		0.20			0.20	0.20
v/c Ratio	0.57	0.36		0.16	0.29	0.06		0.74			1.20	0.22
Control Delay	46.9	11.7		56.9	12.9	3.2		41.9			169.8	4.1
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	46.9	11.7		56.9	12.9	3.2		41.9			169.8	4.1
LOS	D	B		E	B	A		D			F	A
Approach Delay		16.7			13.7			41.9			116.1	
Approach LOS		B			B			D			F	

Synchro 9 Report
Existing AM.syn

Existing AM (Cont)

3: US460/Pruden Boulevard & Kings Fork Rd

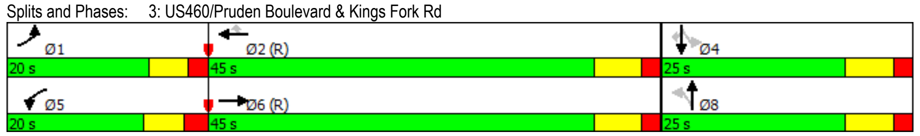
Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	67	90		8	100	3		131			~133	0
Queue Length 95th (ft)	109	187		14	151	17		147			#145	0
Internal Link Dist (ft)		2778			2419			2100			930	
Turn Bay Length (ft)	165			250		145						50
Base Capacity (vph)	275	2065		265	1613	789		385			160	419
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.45	0.36		0.08	0.29	0.06		0.74			1.20	0.22

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86 (96%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 33.8 Intersection LOS: C
Intersection Capacity Utilization 63.2% ICU Level of Service B
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: US460/Pruden Boulevard & Kings Fork Rd



3: US460/Pruden Boulevard & Kings Fork Rd

Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	677	0	7	438	43	1	101	85	93	41	57
Future Volume (veh/h)	103	677	0	7	438	43	1	101	85	93	41	57
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	124	752	0	20	466	48	4	151	131	124	68	92
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	1
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	156	1956	0	39	1741	779	41	134	113	135	48	320
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.09	0.55	0.00	0.02	0.49	0.49	0.20	0.20	0.20	0.20	0.20	0.20
Ln Grp Delay, s/veh	47.3	11.9	0.0	53.4	13.7	12.1	87.0	0.0	0.0	119.8	0.0	30.9
Ln Grp LOS	D	B		D	B	B	F			F		C
Approach Vol, veh/h		876			534			286			284	
Approach Delay, s/veh		16.9			15.1			87.0			91.0	
Approach LOS		B			B			F			F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		7.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	13.9	51.1		25.0	8.5	56.5		25.0
Change Period (Y+Rc), s	6.0	6.8		6.8	6.5	6.8		6.8
Max Green (Gmax), s	14.0	38.2		18.2	13.5	38.2		18.2
Max Allow Headway (MAH), s	3.6	4.8		5.0	3.8	4.8		5.0
Max Q Clear (g_c+I1), s	8.2	8.9		20.2	3.0	12.9		20.2
Green Ext Time (g_e), s	0.1	8.9		0.0	0.0	8.5		0.0
Prob of Phs Call (p_c)	0.95	1.00		1.00	0.39	1.00		1.00
Prob of Max Out (p_x)	0.11	0.08		1.00	0.00	0.12		1.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			340	1774			0
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		238		3632		660
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		1583		0		558
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T	(Prot)			L+T+R

3: US460/Pruden Boulevard & Kings Fork Rd

Baseline

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	124	0	0	192	20	0	0	286
Grp Sat Flow (s), veh/h/ln	1774	0	0	577	1774	0	0	1219
Q Serve Time (g_s), s	6.2	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	6.2	0.0	0.0	18.2	1.0	0.0	0.0	18.2
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1115	0	0	0	1246
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	541	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	18.2	0.0	0.0	0.0	18.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	12.9
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	12.9
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.65	1.00	0.00	0.00	0.01
Lane Grp Cap (c), veh/h	156	0	0	183	39	0	0	287
V/C Ratio (X)	0.79	0.00	0.00	1.05	0.52	0.00	0.00	1.00
Avail Cap (c_a), veh/h	276	0	0	183	266	0	0	287
Upstream Filter (I)	0.79	0.00	0.00	1.00	0.96	0.00	0.00	1.00
Uniform Delay (d1), s/veh	40.2	0.0	0.0	38.8	43.5	0.0	0.0	34.9
Incr Delay (d2), s/veh	7.1	0.0	0.0	80.9	9.8	0.0	0.0	52.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	47.3	0.0	0.0	119.8	53.4	0.0	0.0	87.0
1st-Term Q (Q1), veh/ln	3.0	0.0	0.0	4.5	0.5	0.0	0.0	7.1
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.0	4.1	0.1	0.0	0.0	4.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	3.3	0.0	0.0	8.6	0.6	0.0	0.0	11.2
%ile Storage Ratio (RQ%)	0.51	0.00	0.00	0.23	0.06	0.00	0.00	0.13
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	466	0	0	0	752	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	6.9	0.0	0.0	0.0	10.9	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	6.9	0.0	0.0	0.0	10.9	0.0	0.0
Lane Grp Cap (c), veh/h	0	1741	0	0	0	1956	0	0
V/C Ratio (X)	0.00	0.27	0.00	0.00	0.00	0.38	0.00	0.00
Avail Cap (c_a), veh/h	0	1741	0	0	0	1956	0	0
Upstream Filter (I)	0.00	0.96	0.00	0.00	0.00	0.79	0.00	0.00
Uniform Delay (d1), s/veh	0.0	13.4	0.0	0.0	0.0	11.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.0	0.5	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	13.7	0.0	0.0	0.0	11.9	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.4	0.0	0.0	0.0	5.2	0.0	0.0

Existing AM (Cont)

3: US460/Pruden Boulevard & Kings Fork Rd

Baseline

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	3.5	0.0	0.0	0.0	5.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.04	0.00	0.00	0.00	0.05	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	48	0	92	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	1.4	0.0	4.4	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	1.4	0.0	4.4	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.46
Lane Grp Cap (c), veh/h	0	779	0	320	0	0	0	0
V/C Ratio (X)	0.00	0.06	0.00	0.29	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	779	0	320	0	0	0	0
Upstream Filter (I)	0.00	0.96	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	12.0	0.0	30.4	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	12.1	0.0	30.9	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.6	0.0	1.9	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.7	0.0	2.0	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.12	0.00	1.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		37.2						
HCM 2010 LOS		D						

Synchro 9 Report
Existing AM.syn

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	694	51	4	434	52	39	22	13	105	31	4
Future Volume (vph)	6	694	51	4	434	52	39	22	13	105	31	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220		0	200		110	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	160			150			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986				0.850		0.966			0.992	
Flt Protected	0.950			0.950				0.977			0.968	
Satd. Flow (prot)	1770	3490	0	1770	3539	1583	0	1758	0	0	1789	0
Flt Permitted	0.950			0.950				0.796			0.732	
Satd. Flow (perm)	1770	3490	0	1770	3539	1583	0	1432	0	0	1353	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				128		17			3	
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		471			2858			1931			2337	
Travel Time (s)		5.8			35.4			29.3			35.4	
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Adj. Flow (vph)	12	754	76	12	488	88	52	32	28	128	52	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	830	0	12	488	88	0	112	0	0	192	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		
Detector Phase	1	6		5	2	2	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.8	21.8		11.8	21.8	21.8	13.3	13.3		13.8	13.8	
Total Split (s)	18.0	46.0		18.0	46.0	46.0	26.0	26.0		26.0	26.0	
Total Split (%)	20.0%	51.1%		20.0%	51.1%	51.1%	28.9%	28.9%		28.9%	28.9%	
Maximum Green (s)	11.2	39.2		11.2	39.2	39.2	19.7	19.7		19.2	19.2	
Yellow Time (s)	4.8	4.8		4.8	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.5	1.5		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.8	6.8		6.8	6.8	6.8		6.3			6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	3.5		0.2	3.5	3.5	0.2	0.2		0.2	0.2	
Time Before Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Act Effct Green (s)	6.3	19.8		6.3	19.8	19.8		13.0			12.4	
Actuated g/C Ratio	0.13	0.41		0.13	0.41	0.41		0.27			0.26	
v/c Ratio	0.05	0.58		0.05	0.34	0.12		0.28			0.55	
Control Delay	25.8	14.0		25.8	11.8	1.8		16.8			24.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	25.8	14.0		25.8	11.8	1.8		16.8			24.5	

Synchro 9 Report
Existing AM.syn

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

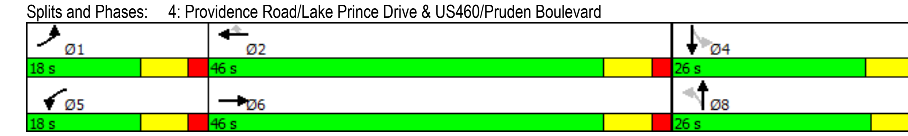
Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	B		C	B	A		B			C	
Approach Delay		14.1			10.6			16.8			24.5	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	3	75		3	40	0		18			38	
Queue Length 95th (ft)	12	216		8	120	0		57			88	
Internal Link Dist (ft)		391			2778			1851			2257	
Turn Bay Length (ft)	220			200		110						
Base Capacity (vph)	439	2960		439	2999	1361		634			577	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.03	0.28		0.03	0.16	0.06		0.18			0.33	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 48.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 14.2 Intersection LOS: B
Intersection Capacity Utilization 43.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard



Synchro 9 Report
Existing AM.syn

Existing AM (Cont)

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Baseline

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱		✥			✥	
Traffic Volume (veh/h)	6	694	51	4	434	52	39	22	13	105	31	4
Future Volume (veh/h)	6	694	51	4	434	52	39	22	13	105	31	4
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	12	754	76	12	488	88	52	32	28	128	52	12
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	0
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	27	1295	130	27	1412	631	207	120	73	290	86	17
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.40	0.40	0.02	0.40	0.40	0.17	0.17	0.17	0.17	0.17	0.17
Ln Grp Delay, s/veh	34.8	12.4	12.4	34.8	10.5	9.5	18.4	0.0	0.0	20.0	0.0	0.0
Ln Grp LOS	C	B	B	C	B	A	B			B		
Approach Vol, veh/h		842			588			112			192	
Approach Delay, s/veh		12.7			10.8			18.4			20.0	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	7.6	26.5		15.3	7.6	26.5		15.3
Change Period (Y+Rc), s	6.8	6.8		6.8	6.8	6.8		* 6.8
Max Green (Gmax), s	11.2	39.2		19.2	11.2	39.2		* 20
Max Allow Headway (MAH), s	3.6	4.7		5.0	3.6	4.7		5.0
Max Q Clear (g_c+I1), s	2.3	6.7		7.4	2.3	11.0		4.7
Green Ext Time (g_e), s	0.0	9.0		1.2	0.0	8.7		1.3
Prob of Phs Call (p_c)	0.15	1.00		0.98	0.15	1.00		0.98
Prob of Max Out (p_x)	0.00	0.08		0.06	0.00	0.12		0.02
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			978	1774			581
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		498		3247		695
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		98		327		425
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T+R

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Baseline

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	12	0	0	192	12	0	0	112
Grp Sat Flow (s), veh/h/ln	1774	0	0	1574	1774	0	0	1701
Q Serve Time (g_s), s	0.3	0.0	0.0	2.7	0.3	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.3	0.0	0.0	5.4	0.3	0.0	0.0	2.7
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1364	0	0	0	1359
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	1803	0	0	0	1820
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	8.5	0.0	0.0	0.0	8.5
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	5.8	0.0	0.0	0.0	3.1
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	2.1
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	2.1
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.67	1.00	0.00	0.00	0.46
Lane Grp Cap (c), veh/h	27	0	0	393	27	0	0	400
V/C Ratio (X)	0.44	0.00	0.00	0.49	0.44	0.00	0.00	0.28
Avail Cap (c_a), veh/h	403	0	0	711	403	0	0	744
Upstream Filter (I)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	24.1	0.0	0.0	19.0	24.1	0.0	0.0	18.0
Incr Delay (d2), s/veh	10.8	0.0	0.0	0.9	10.8	0.0	0.0	0.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	34.8	0.0	0.0	20.0	34.8	0.0	0.0	18.4
1st-Term Q (Q1), veh/ln	0.2	0.0	0.0	2.5	0.2	0.0	0.0	1.3
2nd-Term Q (Q2), veh/ln	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.2	0.0	0.0	2.6	0.2	0.0	0.0	1.4
%ile Storage Ratio (RQ%)	0.03	0.00	0.00	0.03	0.03	0.00	0.00	0.02
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	488	0	0	0	411	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	4.7	0.0	0.0	0.0	9.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	4.7	0.0	0.0	0.0	9.0	0.0	0.0
Lane Grp Cap (c), veh/h	0	1412	0	0	0	706	0	0
V/C Ratio (X)	0.00	0.35	0.00	0.00	0.00	0.58	0.00	0.00
Avail Cap (c_a), veh/h	0	2814	0	0	0	1407	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	10.3	0.0	0.0	0.0	11.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.8	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.5	0.0	0.0	0.0	12.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	2.3	0.0	0.0	0.0	4.3	0.0	0.0

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Baseline

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.3	0.0	0.0	0.0	4.5	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.02	0.00	0.00	0.00	0.30	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		
Lanes in Grp	0	1	0	0	0	1	0	0
Grp Vol (v), veh/h	0	88	0	0	0	419	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1805	0	0
Q Serve Time (g_s), s	0.0	1.7	0.0	0.0	0.0	9.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	1.7	0.0	0.0	0.0	9.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.06	0.00	0.18	0.00	0.25
Lane Grp Cap (c), veh/h	0	631	0	0	0	720	0	0
V/C Ratio (X)	0.00	0.14	0.00	0.00	0.00	0.58	0.00	0.00
Avail Cap (c_a), veh/h	0	1259	0	0	0	1435	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	9.4	0.0	0.0	0.0	11.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.8	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.5	0.0	0.0	0.0	12.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.8	0.0	0.0	0.0	4.4	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.8	0.0	0.0	0.0	4.6	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.18	0.00	0.00	0.00	0.30	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		13.2						
HCM 2010 LOS		B						

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Existing AM (Cont)

5: Woodlawn Dr & US460/Pruden Boulevard

Baseline

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	772	0	0	492	0	2
Future Volume (vph)	772	0	0	492	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1611
Link Speed (mph)	55			55	25	
Link Distance (ft)	1965			471	1166	
Travel Time (s)	24.4			5.8	31.8	
Peak Hour Factor	0.96	0.92	0.92	0.95	0.25	0.25
Adj. Flow (vph)	804	0	0	518	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	804	0	0	518	0	8
Sign Control	Free			Free	Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 31.3%	ICU Level of Service A
Analysis Period (min) 15	

5: Woodlawn Dr & US460/Pruden Boulevard

Baseline

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	772	0	0	492	0	2
Future Vol, veh/h	772	0	0	492	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	92	92	95	25	25
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	804	0	0	518	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	402
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	598
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	598
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	598	-	-	-
HCM Lane V/C Ratio	0.013	-	-	-
HCM Control Delay (s)	11.1	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

6: Old Suffolk Rd & US 460/Windsor Boulevard

Baseline

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	611	16	19	393	0	23	3	66	1	0	1
Future Volume (vph)	3	611	16	19	393	0	23	3	66	1	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		340	400		0	0		300	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			125			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850						0.850		0.932	
Flt Protected		0.999		0.950				0.960			0.976	
Satd. Flow (prot)	0	3536	1583	1770	3539	0	0	1788	1583	0	1694	0
Flt Permitted		0.999		0.950				0.960			0.976	
Satd. Flow (perm)	0	3536	1583	1770	3539	0	0	1788	1583	0	1694	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		3402			5235			2230			2290	
Travel Time (s)		42.2			64.9			33.8			34.7	
Peak Hour Factor	0.38	0.89	0.80	0.68	0.90	0.92	0.41	0.25	0.34	0.25	0.92	0.25
Adj. Flow (vph)	8	687	20	28	437	0	56	12	194	4	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	695	20	28	437	0	0	68	194	0	8	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 34.4%	ICU Level of Service A
Analysis Period (min) 15	

Existing AM (Cont)

6: Old Suffolk Rd & US 460/Windsor Boulevard

Baseline

Intersection												
Int Delay, s/veh	3.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	611	16	19	393	0	23	3	66	1	0	1
Future Vol, veh/h	3	611	16	19	393	0	23	3	66	1	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	340	400	-	-	-	-	300	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	89	80	68	90	92	41	25	34	25	92	25
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	687	20	28	437	0	56	12	194	4	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	437	0	0	687	0	0	976	1195	343	858	1195	218
Stage 1	-	-	-	-	-	-	702	702	-	493	493	-
Stage 2	-	-	-	-	-	-	274	493	-	365	702	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1119	-	-	903	-	-	206	185	653	251	185	786
Stage 1	-	-	-	-	-	-	395	439	-	526	545	-
Stage 2	-	-	-	-	-	-	709	545	-	627	439	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1119	-	-	903	-	-	198	177	653	162	177	786
Mov Cap-2 Maneuver	-	-	-	-	-	-	198	177	-	162	177	-
Stage 1	-	-	-	-	-	-	390	434	-	520	528	-
Stage 2	-	-	-	-	-	-	684	528	-	423	434	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.5	18.1	18.8
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	194	653	1119	-	-	903	-	-	269
HCM Lane V/C Ratio	0.351	0.297	0.007	-	-	0.031	-	-	0.03
HCM Control Delay (s)	33.3	12.8	8.2	-	-	9.1	-	-	18.8
HCM Lane LOS	D	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1.5	1.2	0	-	-	0.1	-	-	0.1

Synchro 9 Report
Existing AM.syn

7: Dominion Way & US 460/Windsor Boulevard

Baseline

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	644	48	50	367	4	7
Future Volume (vph)	644	48	50	367	4	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		180	325		0	0
Storage Lanes		1	1		1	1
Taper Length (ft)			225		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted			0.371		0.950	
Satd. Flow (perm)	3539	1583	691	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		87				16
Link Speed (mph)	55			55	25	
Link Distance (ft)	709			3402	1205	
Travel Time (s)	8.8			42.2	32.9	
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Adj. Flow (vph)	716	87	93	417	8	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	716	87	93	417	8	16
Turn Type	NA	Perm	D.P+P	NA	Prot	Prot
Protected Phases	2		1	6	4	4
Permitted Phases		2	2			
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	5.0	5.0
Minimum Split (s)	21.5	21.5	16.0	21.5	11.0	11.0
Total Split (s)	47.0	47.0	21.0	68.0	26.0	26.0
Total Split (%)	50.0%	50.0%	22.3%	72.3%	27.7%	27.7%
Maximum Green (s)	40.5	40.5	12.0	61.5	20.0	20.0
Yellow Time (s)	5.5	5.5	5.0	5.5	3.0	3.0
All-Red Time (s)	1.0	1.0	4.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	9.0	6.5	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Min	C-Min	None	C-Min	None	None
Act Effct Green (s)	70.7	70.7	72.7	86.3	6.1	6.1
Actuated g/C Ratio	0.75	0.75	0.77	0.92	0.06	0.06
v/c Ratio	0.27	0.07	0.15	0.13	0.07	0.14
Control Delay	5.9	1.9	2.9	1.3	42.2	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	1.9	2.9	1.3	42.2	21.6
LOS	A	A	A	A	D	C
Approach Delay	5.5			1.6	28.5	
Approach LOS	A			A	C	

Synchro 9 Report
Existing AM.syn

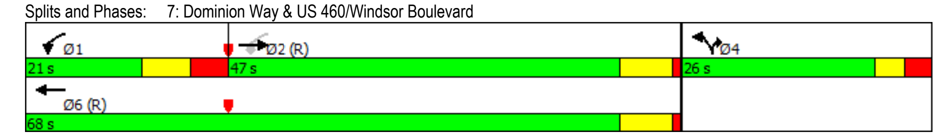
7: Dominion Way & US 460/Windsor Boulevard

Baseline

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (ft)	54	0	2	0	5	0
Queue Length 95th (ft)	133	3	12	32	11	5
Internal Link Dist (ft)	629			3322	1125	
Turn Bay Length (ft)		180	325			
Base Capacity (vph)	2660	1211	700	3248	376	349
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.07	0.13	0.13	0.02	0.05

Intersection Summary	
Area Type: Other	
Cycle Length: 94	
Actuated Cycle Length: 94	
Offset: 73 (78%), Referenced to phase 2:EBWB and 6:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.27	
Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 45.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 7: Dominion Way & US 460/Windsor Boulevard



Synchro 9 Report
Existing AM.syn

Existing AM (Cont)

7: Dominion Way & US 460/Windsor Boulevard

Baseline

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	644	48	50	367	4	7
Future Volume (veh/h)	644	48	50	367	4	7
Number	2	12	1	6	7	14
Initial Q, veh	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)		1.00	1.00		1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	716	87	93	417	8	16
Adj No. of Lanes	2	1	1	2	1	1
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Percent Heavy Veh, %	2	2	2	2	2	2
Opposing Right Turn Influence			Yes		Yes	
Cap, veh/h	2402	1074	600	2981	44	39
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.68	0.68	0.07	0.84	0.02	0.02
Ln Grp Delay, s/veh	6.4	5.3	3.4	1.4	46.9	51.8
Ln Grp LOS	A	A	A	A	D	D
Approach Vol, veh/h	803			510	24	
Approach Delay, s/veh	6.3			1.8	50.2	
Approach LOS	A			A	D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.2	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	15.4	70.3		8.3		85.7		
Change Period (Y+Rc), s	9.0	6.5		6.0		6.5		
Max Green (Gmax), s	12.0	40.5		20.0		61.5		
Max Allow Headway (MAH), s	3.6	4.7		4.0		4.7		
Max Q Clear (g_c+I1), s	3.2	9.7		2.9		4.0		
Green Ext Time (g_e), s	0.1	7.9		0.0		8.6		
Prob of Phs Call (p_c)	0.91	1.00		0.47		1.00		
Prob of Max Out (p_x)	0.00	0.04		0.00		0.00		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

7: Dominion Way & US 460/Windsor Boulevard

Baseline

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	93	0	0	8	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	1.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	1.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	675	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	65.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	56.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	63.8	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	600	0	0	44	0	0	0	0
V/C Ratio (X)	0.15	0.00	0.00	0.18	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	706	0	0	377	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	3.3	0.0	0.0	44.9	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	3.4	0.0	0.0	46.9	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	716	0	0	0	417	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	7.7	0.0	0.0	0.0	2.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	7.7	0.0	0.0	0.0	2.0	0.0	0.0
Lane Grp Cap (c), veh/h	0	2402	0	0	0	2981	0	0
V/C Ratio (X)	0.00	0.30	0.00	0.00	0.00	0.14	0.00	0.00
Avail Cap (c_a), veh/h	0	2402	0	0	0	2981	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	6.1	0.0	0.0	0.0	1.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	6.4	0.0	0.0	0.0	1.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.7	0.0	0.0	0.0	0.9	0.0	0.0

7: Dominion Way & US 460/Windsor Boulevard

Baseline

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	3.8	0.0	0.0	0.0	1.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.15	0.00	0.00	0.00	0.01	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	87	0	16	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	1.8	0.0	0.9	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	1.8	0.0	0.9	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1074	0	39	0	0	0	0
V/C Ratio (X)	0.00	0.08	0.00	0.41	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1074	0	337	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	5.1	0.0	45.2	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	6.7	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.3	0.0	51.8	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.8	0.0	0.4	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.8	0.0	0.5	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.12	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		5.4						
HCM 2010 LOS		A						

Existing PM

US 460 Corridor Safety Study — Existing PM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	7	1038	0	1071	47	59	25
Future Volume (vph)	7	1038	0	1071	47	59	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	305		125		195	0	155
Storage Lanes	1		1		1	1	1
Taper Length (ft)	190		200			0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Frt					0.850		0.850
Flt Protected	0.950					0.950	
Satd. Flow (prot)	1770	3539	1863	3539	1583	1770	1583
Flt Permitted	0.152					0.950	
Satd. Flow (perm)	283	3539	1863	3539	1583	1770	1583
Right Turn on Red					Yes		Yes
Satd. Flow (RTOR)					71		66
Link Speed (mph)		55		55		25	
Link Distance (ft)		537		2299		1306	
Travel Time (s)		6.7		28.5		35.6	
Peak Hour Factor	0.58	0.94	0.92	0.82	0.63	0.58	0.38
Adj. Flow (vph)	12	1104	0	1306	75	102	66
Shared Lane Traffic (%)							
Lane Group Flow (vph)	12	1104	0	1306	75	102	66
Turn Type	pm+pt	NA	pm+pt	NA	Prot	Prot	Prot
Protected Phases	1	6	5	2	2	7	4
Permitted Phases	6		2				
Detector Phase	1	6	5	2	2	7	4
Switch Phase							
Minimum Initial (s)	5.0	15.0	5.0	15.0	15.0	7.0	7.0
Minimum Split (s)	13.3	23.3	9.5	34.9	34.9	14.4	14.4
Total Split (s)	18.0	69.0	18.0	69.0	69.0	23.0	23.0
Total Split (%)	16.4%	62.7%	16.4%	62.7%	62.7%	20.9%	20.9%
Maximum Green (s)	9.7	60.7	13.5	61.1	61.1	15.6	15.6
Yellow Time (s)	4.8	4.8	3.5	4.8	4.8	4.0	4.0
All-Red Time (s)	3.5	3.5	1.0	3.1	3.1	3.4	3.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.3	8.3	4.5	7.9	7.9	7.4	7.4
Lead/Lag	Lead	Lag	Lead	Lag	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None
Walk Time (s)				7.0	7.0		
Flash Dont Walk (s)				20.0	20.0		
Pedestrian Calls (#/hr)				0	0		
Act Effct Green (s)	82.8	82.8		80.3	80.3	11.5	11.5
Actuated g/C Ratio	0.75	0.75		0.73	0.73	0.10	0.10
v/c Ratio	0.04	0.41		0.51	0.06	0.55	0.29
Control Delay	4.3	8.9		8.4	2.2	57.5	14.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	4.3	8.9		8.4	2.2	57.5	14.1

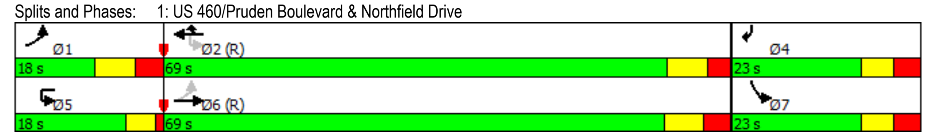
US 460 Corridor Safety Study — Existing PM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
LOS	A	A		A	A	E	B
Approach Delay		8.8		8.1		40.5	
Approach LOS		A		A		D	
Queue Length 50th (ft)	2	253		158	1	70	0
Queue Length 95th (ft)	7	269		313	8	75	0
Internal Link Dist (ft)		457		2219		1226	
Turn Bay Length (ft)	305				195		155
Base Capacity (vph)	344	2663		2584	1175	251	281
Starvation Cap Reductn	0	0		0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0
Reduced v/c Ratio	0.03	0.41		0.51	0.06	0.41	0.23

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 61 (55%), Referenced to phase 2:WBTU and 6:EBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 10.4 — Intersection LOS: B
Intersection Capacity Utilization 48.2% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: US 460/Pruden Boulevard & Northfield Drive



US 460 Corridor Safety Study — Existing PM
1: US 460/Pruden Boulevard & Northfield Drive

HCM 2010 cannot analyze U-Turning movements.

Existing PM (Cont)

US 460 Corridor Safety Study | Existing PM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	961	3	18	1013	93	7	7	35	31	1	6
Future Volume (vph)	4	961	3	18	1013	93	7	7	35	31	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	400		175	0		50	0		0
Storage Lanes	1		0	1		1	0		1	0		0
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850		0.977	
Flt Protected	0.950			0.950				0.968			0.962	
Satd. Flow (prot)	1770	3536	0	1770	3539	1583	0	1803	1583	0	1751	0
Flt Permitted	0.950			0.950				0.821			0.751	
Satd. Flow (perm)	1770	3536	0	1770	3539	1583	0	1529	1583	0	1367	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				147			98		8	
Link Speed (mph)		35			35			25			30	
Link Distance (ft)		2499			463			411			171	
Travel Time (s)		48.7			9.0			11.2			3.9	
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Adj. Flow (vph)	9	991	5	31	1055	155	18	9	80	48	2	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	996	0	31	1055	155	0	27	80	0	60	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8		8	4		
Detector Phase	1	6		5	2	2	8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	5.0	5.0	5.0	7.0	7.0	
Minimum Split (s)	11.1	21.8		11.1	21.8	21.8	11.1	11.1	11.1	13.1	13.1	
Total Split (s)	21.0	62.0		21.0	62.0	62.0	27.0	27.0	27.0	27.0	27.0	
Total Split (%)	19.1%	56.4%		19.1%	56.4%	56.4%	24.5%	24.5%	24.5%	24.5%	24.5%	
Maximum Green (s)	14.9	55.2		14.9	55.2	55.2	20.9	20.9	20.9	20.9	20.9	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.1	4.1	4.1	4.1	4.1	
All-Red Time (s)	2.1	2.0		2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Lost Time (s)	6.1	6.8		6.1	6.8	6.8		6.1	6.1		6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	
Act Effct Green (s)	6.2	82.4		7.5	88.5	88.5		9.6	9.6		9.9	
Actuated g/C Ratio	0.06	0.75		0.07	0.80	0.80		0.09	0.09		0.09	
v/c Ratio	0.09	0.38		0.26	0.37	0.12		0.20	0.35		0.46	
Control Delay	36.5	13.6		62.3	2.8	0.5		48.5	10.4		52.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	36.5	13.6		62.3	2.8	0.5		48.5	10.4		52.6	
LOS	D	B		E	A	A		D	B		D	
Approach Delay		13.8			4.0			20.0			52.6	
Approach LOS		B			A			C			D	

VHB | Synchro 9 Report
Existing PM.syn

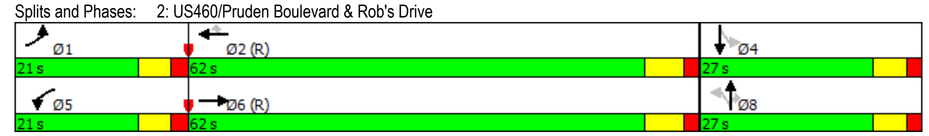
US 460 Corridor Safety Study | Existing PM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	6	203		23	32	0		18	0		35	
Queue Length 95th (ft)	m11	m244		36	90	1		37	0		34	
Internal Link Dist (ft)		2419			383			331			91	
Turn Bay Length (ft)	250			400		175			50			
Base Capacity (vph)	239	2649		239	2847	1302		290	380		266	
Starvation Cap Reductn	0	0		0	0	0		0	0		0	
Spillback Cap Reductn	0	0		0	0	0		0	0		0	
Storage Cap Reductn	0	0		0	0	0		0	0		0	
Reduced v/c Ratio	0.04	0.38		0.13	0.37	0.12		0.09	0.21		0.23	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 10.0 | Intersection LOS: B
Intersection Capacity Utilization 52.5% | ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: US460/Pruden Boulevard & Rob's Drive



VHB | Synchro 9 Report
Existing PM.syn

US 460 Corridor Safety Study | Existing PM
2: US460/Pruden Boulevard & Rob's Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	961	3	18	1013	93	7	7	35	31	1	6
Future Volume (veh/h)	4	961	3	18	1013	93	7	7	35	31	1	6
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	9	991	5	31	1055	155	18	9	80	48	2	10
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	19	2620	13	49	2628	1176	127	53	117	124	10	15
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	1.00	1.00	0.03	0.74	0.74	0.07	0.07	0.07	0.07	0.07	0.07
Ln Grp Delay, s/veh	66.5	0.7	0.6	65.3	5.7	4.3	48.3	0.0	56.6	51.8	0.0	0.0
Ln Grp LOS	E	A	A	E	A	A	D		E	D		
Approach Vol, veh/h		1005			1241			107			60	
Approach Delay, s/veh		1.2			7.0			54.5			51.8	
Approach LOS		A			A			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		7.0
Phs Duration (G+Y+Rc), s	7.3	88.5		14.2	9.2	86.6		14.2
Change Period (Y+Rc), s	6.1	6.8		6.1	6.1	6.8		6.1
Max Green (Gmax), s	14.9	55.2		20.9	14.9	55.2		20.9
Max Allow Headway (MAH), s	3.8	5.0		4.8	3.8	5.0		4.8
Max Q Clear (g_c+I1), s	2.6	14.0		7.6	3.9	2.0		7.4
Green Ext Time (g_e), s	0.0	22.2		0.5	0.0	25.0		0.5
Prob of Phs Call (p_c)	0.24	1.00		0.99	0.61	1.00		0.99
Prob of Max Out (p_x)	0.00	0.39		0.00	0.00	0.28		0.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			880	1774			980
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		129		3611		717
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		202		18		1583
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T

VHB | Synchro 9 Report
Existing PM.syn

Existing PM (Cont)

US 460 Corridor Safety Study — Existing PM
2: US460/Pruden Boulevard & Rob's Drive

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	9	0	0	60	31	0	0	27
Grp Sat Flow (s), veh/h/ln	1774	0	0	1212	1774	0	0	1697
Q Serve Time (g_s), s	0.6	0.0	0.0	4.1	1.9	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.6	0.0	0.0	5.6	1.9	0.0	0.0	1.5
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1329	0	0	0	1424
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	1755
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	8.1	0.0	0.0	0.0	8.1
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	6.6	0.0	0.0	0.0	2.5
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.80	1.00	0.00	0.00	0.67
Lane Grp Cap (c), veh/h	19	0	0	148	49	0	0	180
V/C Ratio (X)	0.46	0.00	0.00	0.40	0.63	0.00	0.00	0.15
Avail Cap (c_a), veh/h	240	0	0	306	240	0	0	357
Upstream Filter (I)	0.79	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	53.5	0.0	0.0	50.1	52.9	0.0	0.0	47.9
Incr Delay (d2), s/veh	13.1	0.0	0.0	1.8	12.4	0.0	0.0	0.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	66.5	0.0	0.0	51.8	65.3	0.0	0.0	48.3
1st-Term Q (Q1), veh/ln	0.3	0.0	0.0	1.8	0.9	0.0	0.0	0.8
2nd-Term Q (Q2), veh/ln	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.3	0.0	0.0	1.9	1.1	0.0	0.0	0.8
%ile Storage Ratio (RQ%)	0.03	0.00	0.00	0.43	0.07	0.00	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1055	0	0	0	486	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Grp Cap (c), veh/h	0	2628	0	0	0	1284	0	0
V/C Ratio (X)	0.00	0.40	0.00	0.00	0.00	0.38	0.00	0.00
Avail Cap (c_a), veh/h	0	2628	0	0	0	1284	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.79	0.00	0.00
Uniform Delay (d1), s/veh	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.5	0.0	0.0	0.0	0.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.7	0.0	0.0	0.0	0.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
2: US460/Pruden Boulevard & Rob's Drive

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	6.0	0.0	0.0	0.0	0.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		R
Lanes in Grp	0	1	0	0	0	1	0	1
Grp Vol (v), veh/h	0	155	0	0	0	510	0	80
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1860	0	1583
Q Serve Time (g_s), s	0.0	3.1	0.0	0.0	0.0	0.0	0.0	5.4
Cycle Q Clear Time (g_c), s	0.0	3.1	0.0	0.0	0.0	0.0	0.0	5.4
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.17	0.00	0.01	0.00	1.00
Lane Grp Cap (c), veh/h	0	1176	0	0	0	1349	0	117
V/C Ratio (X)	0.00	0.13	0.00	0.00	0.00	0.38	0.00	0.68
Avail Cap (c_a), veh/h	0	1176	0	0	0	1349	0	301
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.79	0.00	1.00
Uniform Delay (d1), s/veh	0.0	4.0	0.0	0.0	0.0	0.0	0.0	49.7
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.6	0.0	6.9
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	4.3	0.0	0.0	0.0	0.6	0.0	56.6
1st-Term Q (Q1), veh/ln	0.0	1.3	0.0	0.0	0.0	0.0	0.0	2.4
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.4	0.0	0.0	0.0	0.2	0.0	2.6
%ile Storage Ratio (RQ%)	0.00	0.20	0.00	0.00	0.00	0.00	0.00	1.32
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		7.8						
HCM 2010 LOS		A						

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	822	7	72	792	133	5	127	28	84	75	94
Future Volume (vph)	80	822	7	72	792	133	5	127	28	84	75	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	250		145	0		0	0		50
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	80			0			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850		0.977				0.850
Flt Protected	0.950			0.950				0.996			0.977	
Satd. Flow (prot)	1770	3536	0	1770	3539	1583	0	1813	0	0	1820	1583
Flt Permitted	0.950			0.950				0.958			0.571	
Satd. Flow (perm)	1770	3536	0	1770	3539	1583	0	1743	0	0	1064	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				134		9				102
Link Speed (mph)		55			35			45			45	
Link Distance (ft)		2858			2499			2180			1010	
Travel Time (s)		35.4			48.7			33.0			15.3	
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Adj. Flow (vph)	96	913	8	206	843	148	20	190	43	112	125	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	921	0	206	843	148	0	253	0	0	237	152
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		4
Detector Phase	1	6		5	2	2	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	11.0	21.8		11.5	21.8	21.8	13.8	13.8		13.8	13.8	13.8
Total Split (s)	22.0	56.0		22.0	56.0	56.0	32.0	32.0		32.0	32.0	32.0
Total Split (%)	20.0%	50.9%		20.0%	50.9%	50.9%	29.1%	29.1%		29.1%	29.1%	29.1%
Maximum Green (s)	16.0	49.2		15.5	49.2	49.2	25.2	25.2		25.2	25.2	25.2
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.8	4.8		4.8	4.8	4.8
All-Red Time (s)	2.0	2.0		2.5	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	6.0	6.8		6.5	6.8	6.8		6.8			6.8	6.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Act Effct Green (s)	11.3	49.7		15.0	56.5	56.5		25.2			25.2	25.2
Actuated g/C Ratio	0.10	0.45		0.14	0.51	0.51		0.23			0.23	0.23
v/c Ratio	0.53	0.58		0.85	0.46	0.17		0.62			0.98	0.34
Control Delay	56.8	24.2		69.0	22.8	7.7		44.5			95.2	15.5
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	56.8	24.2		69.0	22.8	7.7		44.5			95.2	15.5
LOS	E	C		E	C	A		D			F	B
Approach Delay		27.3			28.9			44.5			64.1	
Approach LOS		C			C			D			E	

VHB — Synchro 9 Report, Existing PM.syn

Existing PM (Cont)

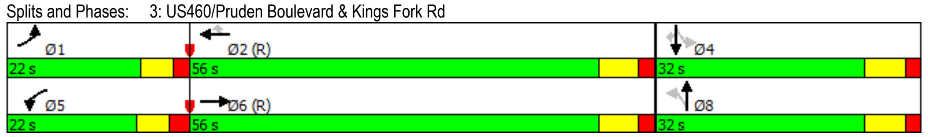
US 460 Corridor Safety Study — Existing PM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	65	248		143	187	5		156			167	28
Queue Length 95th (ft)	105	314		64	361	95		169			160	37
Internal Link Dist (ft)		2778			2419			2100			930	
Turn Bay Length (ft)	165			250		145						50
Base Capacity (vph)	257	1599		249	1818	878		406			243	441
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.37	0.58		0.83	0.46	0.17		0.62			0.98	0.34

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 93 (85%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 34.5 — Intersection LOS: C
Intersection Capacity Utilization 66.8% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: US460/Pruden Boulevard & Kings Fork Rd



VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
3: US460/Pruden Boulevard & Kings Fork Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (veh/h)	80	822	7	72	792	133	5	127	28	84	75	94
Future Volume (veh/h)	80	822	7	72	792	133	5	127	28	84	75	94
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	96	913	8	206	843	148	20	190	43	112	125	152
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	1
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	122	1639	14	235	1855	830	35	156	32	111	87	363
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.07	0.46	0.46	0.13	0.52	0.52	0.23	0.23	0.23	0.23	0.23	0.23
Ln Grp Delay, s/veh	58.1	23.8	23.7	72.2	17.1	14.2	140.0	0.0	0.0	170.6	0.0	36.9
Ln Grp LOS	E	C	C	E	B	B	F			F		D
Approach Vol, veh/h		1017			1197			253			389	
Approach Delay, s/veh		27.0			26.2			140.0			118.4	
Approach LOS		C			C			F			F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		7.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	13.5	64.5		32.0	21.1	56.9		32.0
Change Period (Y+Rc), s	6.0	6.8		6.8	6.5	6.8		6.8
Max Green (Gmax), s	16.0	49.2		25.2	15.5	49.2		25.2
Max Allow Headway (MAH), s	3.6	4.8		4.8	3.8	4.8		4.8
Max Q Clear (g_c+I1), s	7.9	18.4		27.2	14.5	22.4		27.2
Green Ext Time (g_e), s	0.1	14.6		0.0	0.1	13.6		0.0
Prob of Phs Call (p_c)	0.95	1.00		1.00	1.00	1.00		1.00
Prob of Max Out (p_x)	0.01	0.32		1.00	1.00	0.38		1.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			276	1774			0
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		381		3595		680
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		1583		32		139
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T	(Prot)			L+T+R

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
3: US460/Pruden Boulevard & Kings Fork Rd

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	96	0	0	237	206	0	0	253
Grp Sat Flow (s), veh/h/ln	1774	0	0	656	1774	0	0	819
Q Serve Time (g_s), s	5.9	0.0	0.0	0.0	12.5	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	5.9	0.0	0.0	25.2	12.5	0.0	0.0	25.2
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1166	0	0	0	1120
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	607	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	25.2	0.0	0.0	0.0	25.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	1.0	0.0	0.0	0.0	11.4
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	1.0	0.0	0.0	0.0	11.4
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.47	1.00	0.00	0.00	0.08
Lane Grp Cap (c), veh/h	122	0	0	199	235	0	0	223
V/C Ratio (X)	0.79	0.00	0.00	1.19	0.88	0.00	0.00	1.14
Avail Cap (c_a), veh/h	258	0	0	199	250	0	0	223
Upstream Filter (I)	0.69	0.00	0.00	1.00	0.94	0.00	0.00	1.00
Uniform Delay (d1), s/veh	50.4	0.0	0.0	44.8	46.8	0.0	0.0	38.6
Incr Delay (d2), s/veh	7.7	0.0	0.0	125.8	25.4	0.0	0.0	101.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	58.1	0.0	0.0	170.6	72.2	0.0	0.0	140.0
1st-Term Q (Q1), veh/ln	2.9	0.0	0.0	6.0	6.1	0.0	0.0	6.7
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.0	6.9	1.7	0.0	0.0	6.3
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	3.1	0.0	0.0	13.0	7.8	0.0	0.0	13.0
%ile Storage Ratio (RQ%)	0.48	0.00	0.00	0.35	0.79	0.00	0.00	0.16
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	9.6	0.0	0.0	0.0	7.5
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	843	0	0	0	449	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	16.4	0.0	0.0	0.0	20.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	16.4	0.0	0.0	0.0	20.4	0.0	0.0
Lane Grp Cap (c), veh/h	0	1855	0	0	0	807	0	0
V/C Ratio (X)	0.00	0.45	0.00	0.00	0.00	0.56	0.00	0.00
Avail Cap (c_a), veh/h	0	1855	0	0	0	807	0	0
Upstream Filter (I)	0.00	0.94	0.00	0.00	0.00	0.69	0.00	0.00
Uniform Delay (d1), s/veh	0.0	16.3	0.0	0.0	0.0	21.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.0	0.0	1.9	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.1	0.0	0.0	0.0	23.8	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	8.0	0.0	0.0	0.0	9.9	0.0	0.0

VHB — Synchro 9 Report, Existing PM.syn

Existing PM (Cont)

US 460 Corridor Safety Study — Existing PM

3: US460/Pruden Boulevard & Kings Fork Rd

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	8.2	0.0	0.0	0.0	10.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.09	0.00	0.00	0.00	0.09	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		T+R		
Lanes in Grp	0	1	0	1	0	1	0	0
Grp Vol (v), veh/h	0	148	0	152	0	472	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	1857	0	0
Q Serve Time (g_s), s	0.0	5.4	0.0	9.0	0.0	20.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	5.4	0.0	9.0	0.0	20.4	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.02	0.00	0.17
Lane Grp Cap (c), veh/h	0	830	0	363	0	846	0	0
V/C Ratio (X)	0.00	0.18	0.00	0.42	0.00	0.56	0.00	0.00
Avail Cap (c_a), veh/h	0	830	0	363	0	846	0	0
Upstream Filter (I)	0.00	0.94	0.00	1.00	0.00	0.69	0.00	0.00
Uniform Delay (d1), s/veh	0.0	13.7	0.0	36.2	0.0	21.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.8	0.0	1.8	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	14.2	0.0	36.9	0.0	23.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	2.3	0.0	3.9	0.0	10.3	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.1	0.0	0.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.4	0.0	4.0	0.0	10.8	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.43	0.00	2.03	0.00	0.10	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	49.1
HCM 2010 LOS	D

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	820	40	17	798	92	89	34	10	62	56	7
Future Volume (vph)	7	820	40	17	798	92	89	34	10	62	56	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220		0	200		110	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	160			150			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991				0.850		0.984			0.985	
Flt Protected	0.950			0.950				0.970			0.980	
Satd. Flow (prot)	1770	3507	0	1770	3539	1583	0	1778	0	0	1798	0
Flt Permitted	0.950			0.950				0.718			0.807	
Satd. Flow (perm)	1770	3507	0	1770	3539	1583	0	1316	0	0	1481	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				129		5			5	
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		471			2858			1931			2337	
Travel Time (s)		5.8			35.4			29.3			35.4	
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Adj. Flow (vph)	14	891	60	52	897	156	119	49	22	76	93	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	14	951	0	52	897	156	0	190	0	0	190	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		
Detector Phase	1	6		5	2	2	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.8	21.8		11.8	21.8	21.8	13.3	13.3		13.8	13.8	
Total Split (s)	16.0	67.0		16.0	67.0	67.0	27.0	27.0		27.0	27.0	
Total Split (%)	14.5%	60.9%		14.5%	60.9%	60.9%	24.5%	24.5%		24.5%	24.5%	
Maximum Green (s)	9.2	60.2		9.2	60.2	60.2	20.7	20.7		20.2	20.2	
Yellow Time (s)	4.8	4.8		4.8	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.5	1.5		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.8	6.8		6.8	6.8	6.8		6.3			6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	3.5		0.2	3.5	3.5	0.2	0.2		0.2	0.2	
Time Before Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Act Effct Green (s)	6.6	26.9		7.8	32.3	32.3		17.5			16.9	
Actuated g/C Ratio	0.10	0.41		0.12	0.49	0.49		0.26			0.25	
v/c Ratio	0.08	0.67		0.25	0.52	0.19		0.54			0.50	
Control Delay	36.1	19.9		36.2	13.3	4.1		31.2			29.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	36.1	19.9		36.2	13.3	4.1		31.2			29.7	

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM

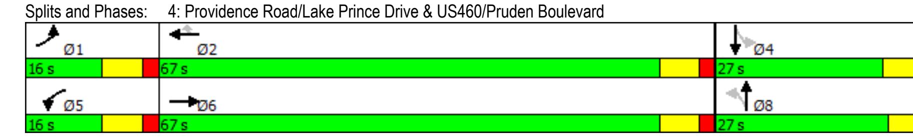
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		D	B	A		C			C	
Approach Delay		20.1			13.1			31.2			29.7	
Approach LOS		C			B			C			C	
Queue Length 50th (ft)	6	190		23	114	5		73			73	
Queue Length 95th (ft)	14	271		22	239	13		114			95	
Internal Link Dist (ft)		391			2778			1851			2257	
Turn Bay Length (ft)	220			200		110						
Base Capacity (vph)	269	2987		269	3013	1367		454			498	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.05	0.32		0.19	0.30	0.11		0.42			0.38	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 66.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 18.6 — Intersection LOS: B
Intersection Capacity Utilization 45.3% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard



VHB — Synchro 9 Report, Existing PM.syn

Existing PM (Cont)

US 460 Corridor Safety Study | Existing PM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	820	40	17	798	92	89	34	10	62	56	7
Future Volume (veh/h)	7	820	40	17	798	92	89	34	10	62	56	7
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	14	891	60	52	897	156	119	49	22	76	93	21
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	0
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	30	1591	107	82	1776	795	234	80	30	170	163	32
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.47	0.47	0.05	0.50	0.50	0.17	0.17	0.17	0.17	0.17	0.17
Ln Grp Delay, s/veh	42.7	13.1	13.1	38.7	11.2	9.2	27.3	0.0	0.0	26.6	0.0	0.0
Ln Grp LOS	D	B	B	D	B	A	C			C		
Approach Vol, veh/h		965			1105			190			190	
Approach Delay, s/veh		13.5			12.2			27.3			26.6	
Approach LOS		B			B			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	7.9	40.1		18.3	9.9	38.1		18.3
Change Period (Y+Rc), s	6.8	6.8		6.8	6.8	6.8		* 6.8
Max Green (Gmax), s	9.2	60.2		20.2	9.2	60.2		* 21
Max Allow Headway (MAH), s	3.6	4.7		5.1	3.6	4.7		5.1
Max Q Clear (g_c+I1), s	2.5	13.2		8.8	3.9	14.6		10.0
Green Ext Time (g_e), s	0.0	16.9		1.5	0.0	16.7		1.5
Prob of Phs Call (p_c)	0.23	1.00		1.00	0.62	1.00		1.00
Prob of Max Out (p_x)	0.00	0.15		0.11	0.10	0.16		0.14
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			542	1774			841
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		942		3366		460
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		184		227		170
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T+R

VHB | Synchro 9 Report Existing PM.syn

US 460 Corridor Safety Study | Existing PM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	14	0	0	190	52	0	0	190
Grp Sat Flow (s), veh/h/ln	1774	0	0	1668	1774	0	0	1472
Q Serve Time (g_s), s	0.5	0.0	0.0	0.0	1.9	0.0	0.0	1.2
Cycle Q Clear Time (g_c), s	0.5	0.0	0.0	6.8	1.9	0.0	0.0	8.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1350	0	0	0	1299
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	1670	0	0	0	1463
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	11.5	0.0	0.0	0.0	11.5
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	3.5	0.0	0.0	0.0	4.6
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Time to First Blk (g_f), s	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.8
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.8
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.40	1.00	0.00	0.00	0.63
Lane Grp Cap (c), veh/h	30	0	0	365	82	0	0	343
V/C Ratio (X)	0.46	0.00	0.00	0.52	0.63	0.00	0.00	0.55
Avail Cap (c_a), veh/h	246	0	0	572	246	0	0	541
Upstream Filter (I)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	32.3	0.0	0.0	25.4	31.0	0.0	0.0	25.9
Incr Delay (d2), s/veh	10.5	0.0	0.0	1.2	7.7	0.0	0.0	1.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	42.7	0.0	0.0	26.6	38.7	0.0	0.0	27.3
1st-Term Q (Q1), veh/ln	0.3	0.0	0.0	3.2	0.9	0.0	0.0	3.3
2nd-Term Q (Q2), veh/ln	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.1
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.3	0.0	0.0	3.3	1.1	0.0	0.0	3.4
%ile Storage Ratio (RQ%)	0.04	0.00	0.00	0.04	0.14	0.00	0.00	0.05
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	897	0	0	0	468	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	11.2	0.0	0.0	0.0	12.6	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	11.2	0.0	0.0	0.0	12.6	0.0	0.0
Lane Grp Cap (c), veh/h	0	1776	0	0	0	836	0	0
V/C Ratio (X)	0.00	0.50	0.00	0.00	0.00	0.56	0.00	0.00
Avail Cap (c_a), veh/h	0	3215	0	0	0	1607	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	11.0	0.0	0.0	0.0	12.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.6	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	11.2	0.0	0.0	0.0	13.1	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	5.4	0.0	0.0	0.0	6.1	0.0	0.0

VHB | Synchro 9 Report Existing PM.syn

US 460 Corridor Safety Study | Existing PM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	5.4	0.0	0.0	0.0	6.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.05	0.00	0.00	0.00	0.41	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		
Lanes in Grp	0	1	0	0	0	1	0	0
Grp Vol (v), veh/h	0	156	0	0	0	483	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1823	0	0
Q Serve Time (g_s), s	0.0	3.6	0.0	0.0	0.0	12.6	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	3.6	0.0	0.0	0.0	12.6	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.11	0.00	0.12	0.00	0.12
Lane Grp Cap (c), veh/h	0	795	0	0	0	861	0	0
V/C Ratio (X)	0.00	0.20	0.00	0.00	0.00	0.56	0.00	0.00
Avail Cap (c_a), veh/h	0	1438	0	0	0	1656	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	9.1	0.0	0.0	0.0	12.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.6	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.2	0.0	0.0	0.0	13.1	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.6	0.0	0.0	0.0	6.3	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.6	0.0	0.0	0.0	6.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.37	0.00	0.00	0.00	0.42	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		15.0						
HCM 2010 LOS		B						

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

VHB | Synchro 9 Report Existing PM.syn

Existing PM (Cont)

US 460 Corridor Safety Study — Existing PM
5: Woodlawn Dr & US460/Pruden Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	864	1	0	897	0	2
Future Volume (vph)	864	1	0	897	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1611
Link Speed (mph)	55			55	25	
Link Distance (ft)	1965			471	1166	
Travel Time (s)	24.4			5.8	31.8	
Peak Hour Factor	0.96	0.92	0.92	0.95	0.25	0.25
Adj. Flow (vph)	900	1	0	944	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	901	0	0	944	0	8
Sign Control	Free			Free	Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 33.9%	ICU Level of Service A
Analysis Period (min) 15	

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
5: Woodlawn Dr & US460/Pruden Boulevard

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	864	1	0	897	0	2
Future Vol, veh/h	864	1	0	897	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	92	92	95	25	25
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	900	1	0	944	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	451
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	556
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	556
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	556	-	-	-
HCM Lane V/C Ratio	0.014	-	-	-
HCM Control Delay (s)	11.6	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0	-	-	-

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
6: Old Suffolk Rd & US 460/Windsor Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	466	39	55	821	3	19	2	38	0	0	3
Future Volume (vph)	1	466	39	55	821	3	19	2	38	0	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		340	400		0	0		300	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			125			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850						0.850		0.865	
Flt Protected				0.950				0.959				
Satd. Flow (prot)	0	3539	1583	1770	3539	0	0	1786	1583	0	1611	0
Flt Permitted				0.950				0.959				
Satd. Flow (perm)	0	3539	1583	1770	3539	0	0	1786	1583	0	1611	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		3402			5235			2230			2290	
Travel Time (s)		42.2			64.9			33.8			34.7	
Peak Hour Factor	0.38	0.89	0.80	0.68	0.90	0.92	0.41	0.25	0.34	0.25	0.92	0.25
Adj. Flow (vph)	3	524	49	81	912	3	46	8	112	0	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	527	49	81	915	0	0	54	112	0	12	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 53.5%	ICU Level of Service A
Analysis Period (min) 15	

VHB — Synchro 9 Report, Existing PM.syn

Existing PM (Cont)

US 460 Corridor Safety Study — Existing PM
6: Old Suffolk Rd & US 460/Windsor Boulevard

Intersection												
Int Delay, s/veh	2.7											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	466	39	55	821	3	19	2	38	0	0	3
Future Vol, veh/h	1	466	39	55	821	3	19	2	38	0	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	340	400	-	-	-	-	300	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	89	80	68	90	92	41	25	34	25	92	25
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	524	49	81	912	3	46	8	112	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	915	0	0	524	0	0	1147	1606	262	1347	1605	458
Stage 1	-	-	-	-	-	-	529	529	-	1076	1076	-
Stage 2	-	-	-	-	-	-	618	1077	-	271	529	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	741	-	-	1039	-	-	154	104	737	110	104	550
Stage 1	-	-	-	-	-	-	501	525	-	234	294	-
Stage 2	-	-	-	-	-	-	443	293	-	712	525	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	741	-	-	1039	-	-	141	95	737	82	95	550
Mov Cap-2 Maneuver	-	-	-	-	-	-	141	95	-	82	95	-
Stage 1	-	-	-	-	-	-	498	522	-	233	271	-
Stage 2	-	-	-	-	-	-	400	270	-	591	522	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	23.7	11.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	132	737	741	-	-	1039	-	-	550
HCM Lane V/C Ratio	0.412	0.152	0.004	-	-	0.078	-	-	0.022
HCM Control Delay (s)	50.2	10.8	9.9	-	-	8.8	-	-	11.7
HCM Lane LOS	F	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	1.8	0.5	0	-	-	0.3	-	-	0.1

VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	516	2	1	845	16	15
Future Volume (vph)	516	2	1	845	16	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		200	330		0	0
Storage Lanes		1	1		1	1
Taper Length (ft)			200		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted			0.436		0.950	
Satd. Flow (perm)	3539	1583	812	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		4				34
Link Speed (mph)	55			55	25	
Link Distance (ft)	709			3402	1205	
Travel Time (s)	8.8			42.2	32.9	
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Adj. Flow (vph)	573	4	2	960	32	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	573	4	2	960	32	34
Turn Type	NA	Perm	D.P+P	NA	Prot	Prot
Protected Phases	2		1	6	4	4
Permitted Phases		2	2			
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	5.0	5.0
Minimum Split (s)	21.5	21.5	16.0	21.5	11.5	11.5
Total Split (s)	47.0	47.0	21.0	68.0	26.0	26.0
Total Split (%)	50.0%	50.0%	22.3%	72.3%	27.7%	27.7%
Maximum Green (s)	40.5	40.5	12.0	61.5	20.0	20.0
Yellow Time (s)	5.5	5.5	5.0	5.5	3.0	3.0
All-Red Time (s)	1.0	1.0	4.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	9.0	6.5	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.5	3.5	0.2	3.5	0.2	0.2
Time Before Reduce (s)	25.0	25.0	0.0	25.0	0.0	0.0
Time To Reduce (s)	15.0	15.0	0.0	15.0	0.0	0.0
Recall Mode	C-Min	C-Min	None	C-Min	None	None
Act Effct Green (s)	74.7	74.7	72.3	77.9	7.2	7.2
Actuated g/C Ratio	0.79	0.79	0.77	0.83	0.08	0.08
v/c Ratio	0.20	0.00	0.00	0.33	0.24	0.22
Control Delay	4.2	4.0	3.0	3.0	44.4	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.2	4.0	3.0	3.0	44.4	17.4

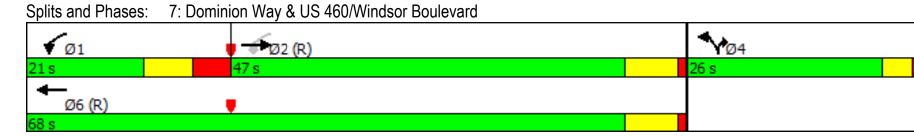
VHB — Synchro 9 Report, Existing PM.syn

US 460 Corridor Safety Study — Existing PM
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A	A	A	A	D	B
Approach Delay	4.2			3.0	30.5	
Approach LOS	A			A	C	
Queue Length 50th (ft)	34	0	0	65	18	0
Queue Length 95th (ft)	108	2	1	95	25	4
Internal Link Dist (ft)	629			3322	1125	
Turn Bay Length (ft)		200	330			
Base Capacity (vph)	2811	1258	755	2931	376	363
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.00	0.00	0.33	0.09	0.09

Intersection Summary
Area Type: Other
Cycle Length: 94
Actuated Cycle Length: 94
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.33
Intersection Signal Delay: 4.6 — Intersection LOS: A
Intersection Capacity Utilization 37.9% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Dominion Way & US 460/Windsor Boulevard



VHB — Synchro 9 Report, Existing PM.syn

Existing PM (Cont)

US 460 Corridor Safety Study — Existing PM
7: Dominion Way & US 460/Windsor Boulevard

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Volume (veh/h)	516	2	1	845	16	15
Future Volume (veh/h)	516	2	1	845	16	15
Number	2	12	1	6	7	14
Initial Q, veh	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)		1.00	1.00		1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	573	4	2	960	32	34
Adj No. of Lanes	2	1	1	2	1	1
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Percent Heavy Veh, %	2	2	2	2	2	2
Opposing Right Turn Influence			Yes		Yes	
Cap, veh/h	2562	1146	642	2914	78	69
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.72	0.72	0.00	0.82	0.04	0.04
Ln Grp Delay, s/veh	4.5	3.6	3.2	2.3	47.3	49.2
Ln Grp LOS	A	A	A	A	D	D
Approach Vol, veh/h	577			962	66	
Approach Delay, s/veh	4.5			2.3	48.3	
Approach LOS	A			A	D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.2	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	9.4	74.5		10.1		83.9		
Change Period (Y+Rc), s	9.0	6.5		6.0		6.5		
Max Green (Gmax), s	12.0	40.5		20.0		61.5		
Max Allow Headway (MAH), s	3.6	4.7		4.0		4.7		
Max Q Clear (g_c+I1), s	2.0	7.0		4.0		8.2		
Green Ext Time (g_e), s	0.0	11.7		0.1		12.9		
Prob of Phs Call (p_c)	0.05	1.00		0.82		1.00		
Prob of Max Out (p_x)	0.00	0.11		0.00		0.02		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

US 460 Corridor Safety Study — Existing PM
7: Dominion Way & US 460/Windsor Boulevard

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	2	0	0	32	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	833	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	68.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	642	0	0	78	0	0	0	0
V/C Ratio (X)	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	862	0	0	377	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	3.2	0.0	0.0	43.8	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	3.2	0.0	0.0	47.3	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	573	0	0	0	960	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	5.0	0.0	0.0	0.0	6.2	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	5.0	0.0	0.0	0.0	6.2	0.0	0.0
Lane Grp Cap (c), veh/h	0	2562	0	0	0	2914	0	0
V/C Ratio (X)	0.00	0.22	0.00	0.00	0.00	0.33	0.00	0.00
Avail Cap (c_a), veh/h	0	2562	0	0	0	2914	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	4.3	0.0	0.0	0.0	2.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	4.5	0.0	0.0	0.0	2.3	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	2.4	0.0	0.0	0.0	2.9	0.0	0.0

US 460 Corridor Safety Study — Existing PM
7: Dominion Way & US 460/Windsor Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	2.5	0.0	0.0	0.0	3.1	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.10	0.00	0.00	0.00	0.02	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	4	0	34	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	0.1	0.0	2.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.1	0.0	2.0	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1146	0	69	0	0	0	0
V/C Ratio (X)	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1146	0	337	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	3.6	0.0	43.9	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	3.6	0.0	49.2	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		5.0						
HCM 2010 LOS		A						

2040 No Build AM

US 460 Corridor Safety Study — 2040 No Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	11	1387	0	1154	80	8	3
Future Volume (vph)	11	1387	0	1154	80	8	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	305		125		195	0	155
Storage Lanes	1		1		1	1	1
Taper Length (ft)	190		200			0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Frt					0.850		0.850
Flt Protected	0.950					0.950	
Satd. Flow (prot)	1770	3539	1863	3539	1583	1770	1583
Flt Permitted	0.137					0.950	
Satd. Flow (perm)	255	3539	1863	3539	1583	1770	1583
Right Turn on Red					Yes		Yes
Satd. Flow (RTOR)					109		8
Link Speed (mph)		55		55		25	
Link Distance (ft)		537		2299		1306	
Travel Time (s)		6.7		28.5		35.6	
Peak Hour Factor	0.58	0.94	0.92	0.82	0.63	0.58	0.38
Adj. Flow (vph)	19	1476	0	1407	127	14	8
Shared Lane Traffic (%)							
Lane Group Flow (vph)	19	1476	0	1407	127	14	8
Turn Type	pm+pt	NA	pm+pt	NA	Prot	Prot	Prot
Protected Phases	1	6	5	2	2	7	4
Permitted Phases	6		2				
Detector Phase	1	6	5	2	2	7	4
Switch Phase							
Minimum Initial (s)	5.0	15.0	5.0	15.0	15.0	7.0	7.0
Minimum Split (s)	13.3	23.3	9.5	34.9	34.9	14.4	14.4
Total Split (s)	20.0	48.0	20.0	48.0	48.0	22.0	22.0
Total Split (%)	22.2%	53.3%	22.2%	53.3%	53.3%	24.4%	24.4%
Maximum Green (s)	11.7	39.7	15.5	40.1	40.1	14.6	14.6
Yellow Time (s)	4.8	4.8	3.5	4.8	4.8	4.0	4.0
All-Red Time (s)	3.5	3.5	1.0	3.1	3.1	3.4	3.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.3	8.3	4.5	7.9	7.9	7.4	7.4
Lead/Lag	Lead	Lag	Lead	Lag	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None
Walk Time (s)				7.0	7.0		
Flash Dont Walk (s)				20.0	20.0		
Pedestrian Calls (#/hr)				0	0		
Act Effct Green (s)	78.7	85.3		78.2	78.2	7.1	7.1
Actuated g/C Ratio	0.87	0.95		0.87	0.87	0.08	0.08
v/c Ratio	0.06	0.44		0.46	0.09	0.10	0.06
Control Delay	1.2	0.9		5.2	1.8	40.1	22.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	1.2	0.9		5.2	1.8	40.1	22.7

VHB — Synchro 9 Report
2040 No Build AM.syn

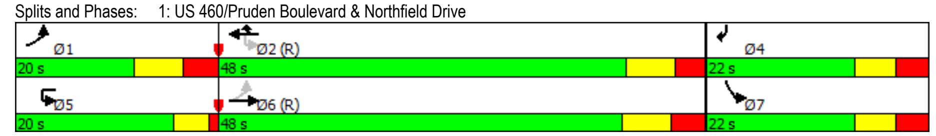
US 460 Corridor Safety Study — 2040 No Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
LOS	A	A		A	A	D	C
Approach Delay		0.9		4.9		33.8	
Approach LOS		A		A		C	
Queue Length 50th (ft)	1	3		0	0	8	0
Queue Length 95th (ft)	m1	57		290	10	17	3
Internal Link Dist (ft)		457		2219		1226	
Turn Bay Length (ft)	305				195		155
Base Capacity (vph)	419	3356		3073	1389	287	263
Starvation Cap Reductn	0	0		0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0
Reduced v/c Ratio	0.05	0.44		0.46	0.09	0.05	0.03

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 68 (76%), Referenced to phase 2:WBTU and 6:EBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 3.2 — Intersection LOS: A
Intersection Capacity Utilization 57.3% — ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: US 460/Pruden Boulevard & Northfield Drive



VHB — Synchro 9 Report
2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (veh/h)	11	1387	0	1154	80	8	3
Future Volume (veh/h)	11	1387	0	1154	80	8	3
Number	1	6		2	12	7	14
Initial Q, veh	0	0		0	0	0	0
Ped-Bike Adj (A_pbT)	1.00				1.00	1.00	1.00
Parking Bus Adj	1.00	1.00		1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863		1863	1863	1863	1863
Adj Flow Rate, veh/h	19	1476		1407	127	14	8
Adj No. of Lanes	1	2		2	1	1	1
Peak Hour Factor	0.58	0.94		0.82	0.63	0.58	0.38
Percent Heavy Veh, %	2	2		2	2	2	2
Opposing Right Turn Influence	Yes					Yes	
Cap, veh/h	132	2805		2405	1076	58	52
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.79		0.68	0.68	0.03	0.03
Ln Grp Delay, s/veh	28.9	4.0		8.7	5.3	44.5	43.7
Ln Grp LOS	C	A		A	A	D	D
Approach Vol, veh/h		1495		1534		22	
Approach Delay, s/veh		4.3		8.4		44.2	
Approach LOS		A		A		D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.1	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	10.2	69.4		10.4		79.6		
Change Period (Y+Rc), s	8.3	* 8.3		7.4		8.3		
Max Green (Gmax), s	11.7	* 40		14.6		39.7		
Max Allow Headway (MAH), s	3.6	4.7		3.9		4.7		
Max Q Clear (g_c+I1), s	2.2	21.0		2.7		15.4		
Green Ext Time (g_e), s	0.0	16.4		0.0		20.3		
Prob of Phs Call (p_c)	0.38	1.00		0.42		1.00		
Prob of Max Out (p_x)	0.00	0.84		0.00		0.79		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

VHB — Synchro 9 Report
2040 No Build AM.syn

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	19	0	0	14	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	0.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	337	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	71.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	61.1	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	132	0	0	58	0	0	0	0
V/C Ratio (X)	0.14	0.00	0.00	0.24	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	325	0	0	288	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	28.4	0.0	0.0	42.4	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.0	2.1	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	28.9	0.0	0.0	44.5	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	1407	0	0	0	1476	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	19.0	0.0	0.0	0.0	13.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	19.0	0.0	0.0	0.0	13.4	0.0	0.0
Lane Grp Cap (c), veh/h	0	2405	0	0	0	2805	0	0
V/C Ratio (X)	0.00	0.59	0.00	0.00	0.00	0.53	0.00	0.00
Avail Cap (c_a), veh/h	0	2405	0	0	0	2805	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	7.7	0.0	0.0	0.0	3.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	8.7	0.0	0.0	0.0	4.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	9.2	0.0	0.0	0.0	6.4	0.0	0.0

VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
1: US 460/Pruden Boulevard & Northfield Drive

2nd-Term Q (Q2), veh/ln	0.0	0.4	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	9.5	0.0	0.0	0.0	6.6	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.11	0.00	0.00	0.00	0.35	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	127	0	8	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	2.5	0.0	0.4	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.5	0.0	0.4	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1076	0	52	0	0	0	0
V/C Ratio (X)	0.00	0.12	0.00	0.15	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1076	0	257	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	5.0	0.0	42.3	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	1.3	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.3	0.0	43.7	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.1	0.0	0.4	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	1.2	0.0	0.4	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.15	0.00	0.07	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary

HCM 2010 Ctrl Delay	6.7
HCM 2010 LOS	A

Notes

User approved ignoring U-Turning movement.
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	1174	26	174	959	80	9	10	54	40	33	6
Future Volume (vph)	33	1174	26	174	959	80	9	10	54	40	33	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	400		175	0		50	0		0
Storage Lanes	1		0	1		1	0		1	0		0
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995				0.850			0.850		0.991	
Flt Protected	0.950			0.950				0.969			0.979	
Satd. Flow (prot)	1770	3522	0	1770	3539	1583	0	1805	1583	0	1807	0
Flt Permitted	0.950			0.950				0.743			0.844	
Satd. Flow (perm)	1770	3522	0	1770	3539	1583	0	1384	1583	0	1558	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				133			123		4	
Link Speed (mph)		35			35			25			30	
Link Distance (ft)		2499			463			411			171	
Travel Time (s)		48.7			9.0			11.2			3.9	
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Adj. Flow (vph)	72	1210	43	295	999	133	23	13	123	63	73	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	1253	0	295	999	133	0	36	123	0	146	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8		8	4		
Detector Phase	1	6		5	2	2	8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	5.0	5.0	5.0	7.0	7.0	
Minimum Split (s)	11.1	21.8		11.1	21.8	21.8	11.1	11.1	11.1	13.1	13.1	
Total Split (s)	24.0	45.0		22.0	43.0	43.0	23.0	23.0	23.0	23.0	23.0	
Total Split (%)	26.7%	50.0%		24.4%	47.8%	47.8%	25.6%	25.6%	25.6%	25.6%	25.6%	
Maximum Green (s)	17.9	38.2		15.9	36.2	36.2	16.9	16.9	16.9	16.9	16.9	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.1	4.1	4.1	4.1	4.1	
All-Red Time (s)	2.1	2.0		2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Lost Time (s)	6.1	6.8		6.1	6.8	6.8		6.1	6.1		6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	
Act Effct Green (s)	9.0	42.1		15.9	51.3	51.3		13.0	13.0		13.0	
Actuated g/C Ratio	0.10	0.47		0.18	0.57	0.57		0.14	0.14		0.14	
v/c Ratio	0.41	0.76		0.95	0.50	0.14		0.18	0.37		0.64	
Control Delay	41.4	17.4		77.9	10.1	1.9		34.3	9.6		47.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	41.4	17.4		77.9	10.1	1.9		34.3	9.6		47.6	
LOS	D	B		E	B	A		C	A		D	
Approach Delay		18.7			23.3			15.2			47.6	
Approach LOS		B			C			B			D	

VHB — Synchro 9 Report, 2040 No Build AM.syn

2040 No Build AM (Cont)

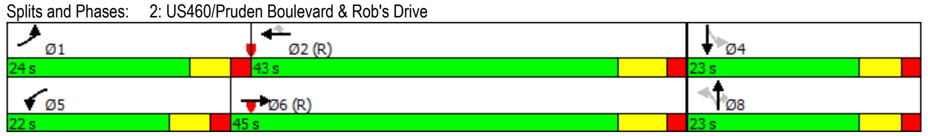
US 460 Corridor Safety Study — 2040 No Build AM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	41	109		168	180	0		18	0		77	
Queue Length 95th (ft)	m39	m243		155	102	2		36	0		60	
Internal Link Dist (ft)		2419			383			331			91	
Turn Bay Length (ft)	250			400		175			50			
Base Capacity (vph)	352	1649		312	2018	959		259	397		295	
Starvation Cap Reductn	0	0		0	0	0		0	0		0	
Spillback Cap Reductn	0	0		0	0	0		0	0		0	
Storage Cap Reductn	0	0		0	0	0		0	0		0	
Reduced v/c Ratio	0.20	0.76		0.95	0.50	0.14		0.14	0.31		0.49	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 25 (28%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 22.1 — Intersection LOS: C
Intersection Capacity Utilization 69.7% — ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: US460/Pruden Boulevard & Rob's Drive



VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
2: US460/Pruden Boulevard & Rob's Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	1174	26	174	959	80	9	10	54	40	33	6
Future Volume (veh/h)	33	1174	26	174	959	80	9	10	54	40	33	6
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	72	1210	43	295	999	133	22	13	123	62	73	10
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	93	1712	61	313	2178	974	161	81	192	124	108	13
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.10	0.98	0.98	0.18	0.62	0.62	0.12	0.12	0.12	0.12	0.12	0.12
Ln Grp Delay, s/veh	50.0	4.2	4.1	72.2	10.0	7.6	35.7	0.0	41.2	40.5	0.0	0.0
Ln Grp LOS	D	A	A	E	A	A	D		D	D		
Approach Vol, veh/h		1325			1427			158			145	
Approach Delay, s/veh		6.7			22.6			40.0			40.5	
Approach LOS		A			C			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		7.0
Phs Duration (G+Y+Rc), s	10.8	62.2		17.0	22.0	51.0		17.0
Change Period (Y+Rc), s	6.1	6.8		6.1	6.1	6.8		6.1
Max Green (Gmax), s	17.9	36.2		16.9	15.9	38.2		16.9
Max Allow Headway (MAH), s	3.8	5.1		4.9	3.8	5.1		4.9
Max Q Clear (g_c+I1), s	5.6	15.6		10.1	16.8	3.8		8.7
Green Ext Time (g_e), s	0.1	15.5		0.8	0.0	22.4		0.9
Prob of Phs Call (p_c)	0.83	1.00		1.00	1.00	1.00		1.00
Prob of Max Out (p_x)	0.00	0.74		0.44	1.00	0.57		0.23
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			554	1774			793
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		889		3487		670
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		107		124		1583
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T

VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
2: US460/Pruden Boulevard & Rob's Drive

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	72	0	0	145	295	0	0	35
Grp Sat Flow (s), veh/h/ln	1774	0	0	1550	1774	0	0	1462
Q Serve Time (g_s), s	3.6	0.0	0.0	6.5	14.8	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	3.6	0.0	0.0	8.1	14.8	0.0	0.0	1.6
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1273	0	0	0	1336
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	1391
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	10.9	0.0	0.0	0.0	10.9
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	9.3	0.0	0.0	0.0	2.8
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	6.5	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.2
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.2
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.43	1.00	0.00	0.00	0.63
Lane Grp Cap (c), veh/h	93	0	0	245	313	0	0	242
V/C Ratio (X)	0.77	0.00	0.00	0.59	0.94	0.00	0.00	0.14
Avail Cap (c_a), veh/h	353	0	0	346	313	0	0	340
Upstream Filter (I)	0.79	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	39.8	0.0	0.0	38.2	36.6	0.0	0.0	35.4
Incr Delay (d2), s/veh	10.2	0.0	0.0	2.3	35.6	0.0	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	50.0	0.0	0.0	40.5	72.2	0.0	0.0	35.7
1st-Term Q (Q1), veh/ln	1.7	0.0	0.0	3.5	7.2	0.0	0.0	0.8
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.0	0.2	3.1	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	2.0	0.0	0.0	3.7	10.3	0.0	0.0	0.8
%ile Storage Ratio (RQ%)	0.20	0.00	0.00	0.85	0.65	0.00	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	999	0	0	0	614	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	13.6	0.0	0.0	0.0	1.8	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	13.6	0.0	0.0	0.0	1.8	0.0	0.0
Lane Grp Cap (c), veh/h	0	2178	0	0	0	869	0	0
V/C Ratio (X)	0.00	0.46	0.00	0.00	0.00	0.71	0.00	0.00
Avail Cap (c_a), veh/h	0	2178	0	0	0	869	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.79	0.00	0.00
Uniform Delay (d1), s/veh	0.0	9.3	0.0	0.0	0.0	0.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	3.8	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.0	0.0	0.0	0.0	4.2	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	6.5	0.0	0.0	0.0	0.3	0.0	0.0

VHB — Synchro 9 Report, 2040 No Build AM.syn

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM
2: US460/Pruden Boulevard & Rob's Drive

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.9	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	6.7	0.0	0.0	0.0	1.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.43	0.00	0.00	0.00	0.01	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		R
Lanes in Grp	0	1	0	0	0	1	0	1
Grp Vol (v), veh/h	0	133	0	0	0	639	0	123
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1841	0	1583
Q Serve Time (g_s), s	0.0	3.2	0.0	0.0	0.0	1.8	0.0	6.7
Cycle Q Clear Time (g_c), s	0.0	3.2	0.0	0.0	0.0	1.8	0.0	6.7
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.07	0.00	0.07	0.00	1.00
Lane Grp Cap (c), veh/h	0	974	0	0	0	904	0	192
V/C Ratio (X)	0.00	0.14	0.00	0.00	0.00	0.71	0.00	0.64
Avail Cap (c_a), veh/h	0	974	0	0	0	904	0	297
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.79	0.00	1.00
Uniform Delay (d1), s/veh	0.0	7.3	0.0	0.0	0.0	0.4	0.0	37.7
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	3.7	0.0	3.6
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.6	0.0	0.0	0.0	4.1	0.0	41.2
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	0.0	0.0	0.4	0.0	2.9
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.9	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.4	0.0	0.0	0.0	1.3	0.0	3.1
%ile Storage Ratio (RQ%)	0.00	0.21	0.00	0.00	0.00	0.01	0.00	1.57
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	17.4
HCM 2010 LOS	B

VHB — Synchro 9 Report
2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	1016	0	11	657	65	1	113	95	104	46	64
Future Volume (vph)	155	1016	0	11	657	65	1	113	95	104	46	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	250		145	0		0	0		50
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	80			0			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850		0.938				0.850
Flt Protected	0.950			0.950				0.999			0.969	
Satd. Flow (prot)	1770	3539	0	1770	3539	1583	0	1746	0	0	1805	1583
Flt Permitted	0.950			0.950				0.995			0.371	
Satd. Flow (perm)	1770	3539	0	1770	3539	1583	0	1739	0	0	691	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						125		42				125
Link Speed (mph)		55			35			45			45	
Link Distance (ft)		2858			2499			2180			1010	
Travel Time (s)		35.4			48.7			33.0			15.3	
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Adj. Flow (vph)	187	1129	0	31	699	72	4	169	146	139	77	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	1129	0	31	699	72	0	319	0	0	216	103
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		4
Detector Phase	1	6		5	2	2	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	11.0	21.8		11.5	21.8	21.8	13.8	13.8		13.8	13.8	13.8
Total Split (s)	20.0	45.0		20.0	45.0	45.0	25.0	25.0		25.0	25.0	25.0
Total Split (%)	22.2%	50.0%		22.2%	50.0%	50.0%	27.8%	27.8%		27.8%	27.8%	27.8%
Maximum Green (s)	14.0	38.2		13.5	38.2	38.2	18.2	18.2		18.2	18.2	18.2
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.8	4.8		4.8	4.8	4.8
All-Red Time (s)	2.0	2.0		2.5	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	6.0	6.8		6.5	6.8	6.8		6.8			6.8	6.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Act Effct Green (s)	12.8	49.5		7.1	39.4	39.4		18.2			18.2	18.2
Actuated g/C Ratio	0.14	0.55		0.08	0.44	0.44		0.20			0.20	0.20
v/c Ratio	0.74	0.58		0.22	0.45	0.09		0.83			1.55	0.25
Control Delay	55.3	16.3		59.5	12.2	3.3		49.5			310.5	5.5
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	55.3	16.3		59.5	12.2	3.3		49.5			310.5	5.5
LOS	E	B		E	B	A		D			F	A
Approach Delay		21.9			13.2			49.5			212.0	
Approach LOS		C			B			D			F	

VHB — Synchro 9 Report
2040 No Build AM.syn

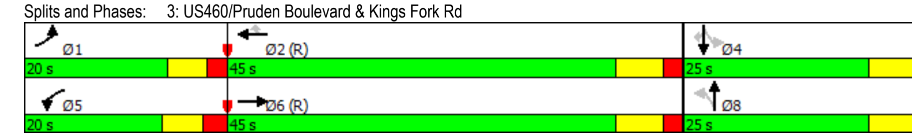
US 460 Corridor Safety Study — 2040 No Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	102	238		19	150	5		153			~175	0
Queue Length 95th (ft)	157	323		15	250	27		166			#181	2
Internal Link Dist (ft)		2778			2419			2100			930	
Turn Bay Length (ft)	165			250		145						50
Base Capacity (vph)	275	1945		265	1548	762		385			139	419
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.68	0.58		0.12	0.45	0.09		0.83			1.55	0.25

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86 (96%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.55
Intersection Signal Delay: 44.5 — Intersection LOS: D
Intersection Capacity Utilization 74.7% — ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: US460/Pruden Boulevard & Kings Fork Rd



VHB — Synchro 9 Report
2040 No Build AM.syn

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	1016	0	11	657	65	1	113	95	104	46	64
Future Volume (veh/h)	155	1016	0	11	657	65	1	113	95	104	46	64
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	187	1129	0	31	699	72	4	169	146	139	77	103
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	1
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	223	1927	0	53	1609	720	41	134	113	134	40	320
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.13	0.54	0.00	0.03	0.45	0.45	0.20	0.20	0.20	0.20	0.20	0.20
Ln Grp Delay, s/veh	48.7	14.4	0.0	51.5	17.4	14.3	121.4	0.0	0.0	184.9	0.0	31.2
Ln Grp LOS	D	B		D	B	B	F			F		C
Approach Vol, veh/h		1316			802			319			319	
Approach Delay, s/veh		19.3			18.5			121.4			135.3	
Approach LOS		B			B			F			F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		7.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	17.3	47.7		25.0	9.2	55.8		25.0
Change Period (Y+Rc), s	6.0	6.8		6.8	6.5	6.8		6.8
Max Green (Gmax), s	14.0	38.2		18.2	13.5	38.2		18.2
Max Allow Headway (MAH), s	3.6	4.8		5.0	3.8	4.8		5.0
Max Q Clear (g_c+I1), s	11.3	14.1		20.2	3.6	21.2		20.2
Green Ext Time (g_e), s	0.1	13.6		0.0	0.0	10.9		0.0
Prob of Phs Call (p_c)	0.99	1.00		1.00	0.54	1.00		1.00
Prob of Max Out (p_x)	1.00	0.41		1.00	0.00	0.57		1.00

Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			339	1774			0
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		199		3632		661
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		1583		0		558
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T	(Prot)			L+T+R

US 460 Corridor Safety Study — 2040 No Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	187	0	0	216	31	0	0	319
Grp Sat Flow (s), veh/h/ln	1774	0	0	539	1774	0	0	1219
Q Serve Time (g_s), s	9.3	0.0	0.0	0.0	1.6	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	9.3	0.0	0.0	18.2	1.6	0.0	0.0	18.2
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1081	0	0	0	1223
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	531	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	18.2	0.0	0.0	0.0	18.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.1	0.0	0.0	0.0	12.9
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.1	0.0	0.0	0.0	12.9
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.64	1.00	0.00	0.00	0.01
Lane Grp Cap (c), veh/h	223	0	0	175	53	0	0	287
V/C Ratio (X)	0.84	0.00	0.00	1.24	0.58	0.00	0.00	1.11
Avail Cap (c_a), veh/h	276	0	0	175	266	0	0	287
Upstream Filter (I)	0.56	0.00	0.00	1.00	0.86	0.00	0.00	1.00
Uniform Delay (d1), s/veh	38.5	0.0	0.0	39.2	43.1	0.0	0.0	34.9
Incr Delay (d2), s/veh	10.3	0.0	0.0	145.7	8.4	0.0	0.0	86.5
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	48.7	0.0	0.0	184.9	51.5	0.0	0.0	121.4
1st-Term Q (Q1), veh/ln	4.5	0.0	0.0	4.3	0.8	0.0	0.0	7.1
2nd-Term Q (Q2), veh/ln	0.6	0.0	0.0	7.1	0.1	0.0	0.0	6.9
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	5.2	0.0	0.0	11.4	0.9	0.0	0.0	14.0
%ile Storage Ratio (RQ%)	0.79	0.00	0.00	0.30	0.09	0.00	0.00	0.17
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	10.3	0.0	0.0	0.0	8.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	699	0	0	0	1129	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	12.1	0.0	0.0	0.0	19.2	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	12.1	0.0	0.0	0.0	19.2	0.0	0.0
Lane Grp Cap (c), veh/h	0	1609	0	0	0	1927	0	0
V/C Ratio (X)	0.00	0.43	0.00	0.00	0.00	0.59	0.00	0.00
Avail Cap (c_a), veh/h	0	1609	0	0	0	1927	0	0
Upstream Filter (I)	0.00	0.86	0.00	0.00	0.00	0.56	0.00	0.00
Uniform Delay (d1), s/veh	0.0	16.7	0.0	0.0	0.0	13.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.4	0.0	0.0	0.0	14.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	5.8	0.0	0.0	0.0	9.3	0.0	0.0

US 460 Corridor Safety Study — 2040 No Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	6.0	0.0	0.0	0.0	9.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.06	0.00	0.00	0.00	0.09	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	72	0	103	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	2.3	0.0	5.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.3	0.0	5.0	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.46
Lane Grp Cap (c), veh/h	0	720	0	320	0	0	0	0
V/C Ratio (X)	0.00	0.10	0.00	0.32	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	720	0	320	0	0	0	0
Upstream Filter (I)	0.00	0.86	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	14.0	0.0	30.6	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	14.3	0.0	31.2	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.0	0.0	2.2	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.1	0.0	2.2	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.19	0.00	1.13	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	44.3
HCM 2010 LOS	D

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	1041	77	6	651	78	44	25	15	118	35	4
Future Volume (vph)	9	1041	77	6	651	78	44	25	15	118	35	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220		0	200		110	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	160			150			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986				0.850		0.965			0.992	
Flt Protected	0.950			0.950				0.977			0.967	
Satd. Flow (prot)	1770	3490	0	1770	3539	1583	0	1756	0	0	1787	0
Flt Permitted	0.950			0.950				0.781			0.764	
Satd. Flow (perm)	1770	3490	0	1770	3539	1583	0	1404	0	0	1412	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				131		18			3	
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		471			2858			1931			2337	
Travel Time (s)		5.8			35.4			29.3			35.4	
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Adj. Flow (vph)	18	1132	115	18	731	132	59	36	33	144	58	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	1247	0	18	731	132	0	128	0	0	214	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		
Detector Phase	1	6		5	2	2	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.8	21.8		11.8	21.8	21.8	13.3	13.3		13.8	13.8	
Total Split (s)	18.0	46.0		18.0	46.0	46.0	26.0	26.0		26.0	26.0	
Total Split (%)	20.0%	51.1%		20.0%	51.1%	51.1%	28.9%	28.9%		28.9%	28.9%	
Maximum Green (s)	11.2	39.2		11.2	39.2	39.2	19.7	19.7		19.2	19.2	
Yellow Time (s)	4.8	4.8		4.8	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.5	1.5		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.8	6.8		6.8	6.8	6.8		6.3			6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	3.5		0.2	3.5	3.5	0.2	0.2		0.2	0.2	
Time Before Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Act Effct Green (s)	6.7	30.2		6.7	30.2	30.2		16.2			15.6	
Actuated g/C Ratio	0.10	0.47		0.10	0.47	0.47		0.25			0.24	
v/c Ratio	0.10	0.77		0.10	0.44	0.16		0.35			0.63	
Control Delay	35.9	19.2		35.8	13.8	3.5		24.8			35.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	35.9	19.2		35.8	13.8	3.5		24.8			35.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		D	B	A		C			D	
Approach Delay		19.4			12.7			24.8			35.1	
Approach LOS		B			B			C			D	
Queue Length 50th (ft)	6	167		6	81	0		32			66	
Queue Length 95th (ft)	16	376		11	184	6		73			110	
Internal Link Dist (ft)		391			2778			1851			2257	
Turn Bay Length (ft)	220			200		110						
Base Capacity (vph)	332	2302		332	2329	1087		476			457	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.05	0.54		0.05	0.31	0.12		0.27			0.47	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 64.9

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

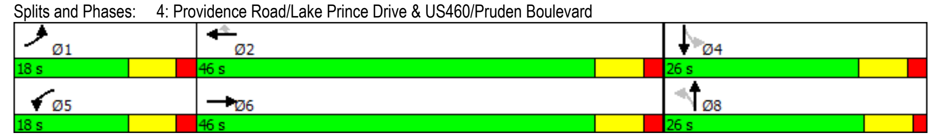
Maximum v/c Ratio: 0.77

Intersection Signal Delay: 18.6 — Intersection LOS: B

Intersection Capacity Utilization 55.1% — ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	1041	77	6	651	78	44	25	15	118	35	4
Future Volume (veh/h)	9	1041	77	6	651	78	44	25	15	118	35	4
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	18	1132	115	18	731	132	59	36	33	144	58	12
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	0
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	38	1592	162	38	1736	777	184	109	74	271	81	15
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.49	0.49	0.02	0.49	0.49	0.17	0.17	0.17	0.17	0.17	0.17
Ln Grp Delay, s/veh	40.4	14.6	14.6	40.4	10.8	9.3	24.5	0.0	0.0	26.8	0.0	0.0
Ln Grp LOS	D	B	B	D	B	A	C			C		
Approach Vol, veh/h		1265			881			128			214	
Approach Delay, s/veh		15.0			11.2			24.5			26.8	
Approach LOS		B			B			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	8.2	38.6		18.1	8.2	38.6		18.1
Change Period (Y+Rc), s	6.8	6.8		6.8	6.8	6.8		* 6.8
Max Green (Gmax), s	11.2	39.2		19.2	11.2	39.2		* 20
Max Allow Headway (MAH), s	3.6	4.7		5.0	3.6	4.7		5.0
Max Q Clear (g_c+I1), s	2.7	10.6		10.1	2.7	19.7		6.3
Green Ext Time (g_e), s	0.0	15.2		1.2	0.0	12.1		1.5
Prob of Phs Call (p_c)	0.28	1.00		1.00	0.28	1.00		1.00
Prob of Max Out (p_x)	0.00	0.42		0.22	0.00	0.58		0.04
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			1025	1774			596
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		467		3245		629
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		89		329		426
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T+R

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	18	0	0	214	18	0	0	128
Grp Sat Flow (s), veh/h/ln	1774	0	0	1581	1774	0	0	1651
Q Serve Time (g_s), s	0.7	0.0	0.0	3.8	0.7	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.7	0.0	0.0	8.1	0.7	0.0	0.0	4.3
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1353	0	0	0	1352
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	1786	0	0	0	1675
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	11.3	0.0	0.0	0.0	11.3
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	7.0	0.0	0.0	0.0	3.2
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.4	0.0	0.0	0.0	2.3
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.4	0.0	0.0	0.0	2.3
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.67	1.00	0.00	0.00	0.46
Lane Grp Cap (c), veh/h	38	0	0	367	38	0	0	368
V/C Ratio (X)	0.48	0.00	0.00	0.58	0.48	0.00	0.00	0.35
Avail Cap (c_a), veh/h	306	0	0	545	306	0	0	564
Upstream Filter (I)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	31.4	0.0	0.0	25.3	31.4	0.0	0.0	23.9
Incr Delay (d2), s/veh	9.0	0.0	0.0	1.5	9.0	0.0	0.0	0.6
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	40.4	0.0	0.0	26.8	40.4	0.0	0.0	24.5
1st-Term Q (Q1), veh/ln	0.3	0.0	0.0	3.6	0.3	0.0	0.0	2.0
2nd-Term Q (Q2), veh/ln	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.4	0.0	0.0	3.8	0.4	0.0	0.0	2.1
%ile Storage Ratio (RQ%)	0.05	0.00	0.00	0.04	0.05	0.00	0.00	0.03
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	731	0	0	0	617	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	8.6	0.0	0.0	0.0	17.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	8.6	0.0	0.0	0.0	17.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	1736	0	0	0	868	0	0
V/C Ratio (X)	0.00	0.42	0.00	0.00	0.00	0.71	0.00	0.00
Avail Cap (c_a), veh/h	0	2138	0	0	0	1069	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	10.6	0.0	0.0	0.0	12.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	1.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.8	0.0	0.0	0.0	14.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	4.2	0.0	0.0	0.0	8.6	0.0	0.0

VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	4.2	0.0	0.0	0.0	9.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.04	0.00	0.00	0.00	0.59	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		
Lanes in Grp	0	1	0	0	0	1	0	0
Grp Vol (v), veh/h	0	132	0	0	0	630	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1805	0	0
Q Serve Time (g_s), s	0.0	3.0	0.0	0.0	0.0	17.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	3.0	0.0	0.0	0.0	17.7	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.06	0.00	0.18	0.00	0.26
Lane Grp Cap (c), veh/h	0	777	0	0	0	885	0	0
V/C Ratio (X)	0.00	0.17	0.00	0.00	0.00	0.71	0.00	0.00
Avail Cap (c_a), veh/h	0	957	0	0	0	1090	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	9.2	0.0	0.0	0.0	12.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	1.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.3	0.0	0.0	0.0	14.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.3	0.0	0.0	0.0	8.8	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.3	0.0	0.0	0.0	9.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.31	0.00	0.00	0.00	0.60	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		15.1						
HCM 2010 LOS		B						

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
5: Woodlawn Dr & US460/Pruden Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1159	0	0	738	0	2
Future Volume (vph)	1159	0	0	738	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1611
Link Speed (mph)	55			55	25	
Link Distance (ft)	1965			471	1166	
Travel Time (s)	24.4			5.8	31.8	
Peak Hour Factor	0.96	0.92	0.92	0.95	0.25	0.25
Adj. Flow (vph)	1207	0	0	777	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1207	0	0	777	0	8
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 42.0% — ICU Level of Service A
Analysis Period (min) 15

VHB — Synchro 9 Report, 2040 No Build AM.syn

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM

5: Woodlawn Dr & US460/Pruden Boulevard

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1159	0	0	738	0	2
Future Vol, veh/h	1159	0	0	738	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	92	92	95	25	25
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1207	0	0	777	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	604
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	441
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	441
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	441	-	-	-
HCM Lane V/C Ratio	0.018	-	-	-
HCM Control Delay (s)	13.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

US 460 Corridor Safety Study — 2040 No Build AM

6: Old Suffolk Rd & US 460/Windsor Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	768	20	24	494	0	26	3	74	1	0	1
Future Volume (vph)	4	768	20	24	494	0	26	3	74	1	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		340	400		0	0		300	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			125			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850						0.850		0.932	
Flt Protected		0.999		0.950				0.960			0.976	
Satd. Flow (prot)	0	3536	1583	1770	3539	0	0	1788	1583	0	1694	0
Flt Permitted		0.999		0.950				0.960			0.976	
Satd. Flow (perm)	0	3536	1583	1770	3539	0	0	1788	1583	0	1694	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		3402			5235			2230			2290	
Travel Time (s)		42.2			64.9			33.8			34.7	
Peak Hour Factor	0.38	0.89	0.80	0.68	0.90	0.92	0.41	0.25	0.34	0.25	0.92	0.25
Adj. Flow (vph)	11	863	25	35	549	0	63	12	218	4	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	874	25	35	549	0	0	75	218	0	8	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 39.3%	ICU Level of Service A
Analysis Period (min) 15	

US 460 Corridor Safety Study — 2040 No Build AM

6: Old Suffolk Rd & US 460/Windsor Boulevard

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	768	20	24	494	0	26	3	74	1	0	1
Future Vol, veh/h	4	768	20	24	494	0	26	3	74	1	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	340	400	-	-	-	-	300	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	89	80	68	90	92	41	25	34	25	92	25
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	863	25	35	549	0	63	12	218	4	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	549	0	0	863	0	0	1229	1503	431	1078	1503	274
Stage 1	-	-	-	-	-	-	884	884	-	619	619	-
Stage 2	-	-	-	-	-	-	345	619	-	459	884	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1017	-	-	775	-	-	134	120	573	173	120	724
Stage 1	-	-	-	-	-	-	307	362	-	443	478	-
Stage 2	-	-	-	-	-	-	644	478	-	551	362	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1017	-	-	775	-	-	127	112	573	94	112	724
Mov Cap-2 Maneuver	-	-	-	-	-	-	127	112	-	94	112	-
Stage 1	-	-	-	-	-	-	301	354	-	434	456	-
Stage 2	-	-	-	-	-	-	612	456	-	323	354	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.6	29.5	27.8
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	124	573	1017	-	-	775	-	-	166
HCM Lane V/C Ratio	0.608	0.38	0.01	-	-	0.046	-	-	0.048
HCM Control Delay (s)	71.2	15.1	8.6	-	-	9.9	-	-	27.8
HCM Lane LOS	F	C	A	-	-	A	-	-	D
HCM 95th %tile Q(veh)	3.1	1.8	0	-	-	0.1	-	-	0.2

2040 No Build AM (Cont)

US 460 Corridor Safety Study — 2040 No Build AM
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	810	60	63	461	4	8
Future Volume (vph)	810	60	63	461	4	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		180	325		0	0
Storage Lanes		1	1		1	1
Taper Length (ft)			225		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted			0.290		0.950	
Satd. Flow (perm)	3539	1583	540	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		109				18
Link Speed (mph)	55			55	25	
Link Distance (ft)	709			3402	1205	
Travel Time (s)	8.8			42.2	32.9	
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Adj. Flow (vph)	900	109	117	524	8	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	900	109	117	524	8	18
Turn Type	NA	Perm	D.P+P	NA	Prot	Prot
Protected Phases	2		1	6	4	4
Permitted Phases		2	2			
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	5.0	5.0
Minimum Split (s)	21.5	21.5	16.0	21.5	11.0	11.0
Total Split (s)	47.0	47.0	21.0	68.0	26.0	26.0
Total Split (%)	50.0%	50.0%	22.3%	72.3%	27.7%	27.7%
Maximum Green (s)	40.5	40.5	12.0	61.5	20.0	20.0
Yellow Time (s)	5.5	5.5	5.0	5.5	3.0	3.0
All-Red Time (s)	1.0	1.0	4.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	9.0	6.5	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Min	C-Min	None	C-Min	None	None
Act Effct Green (s)	65.2	65.2	70.9	86.3	6.1	6.1
Actuated g/C Ratio	0.69	0.69	0.75	0.92	0.06	0.06
v/c Ratio	0.37	0.10	0.23	0.16	0.07	0.15
Control Delay	7.5	1.9	3.5	1.3	42.0	21.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.5	1.9	3.5	1.3	42.0	21.1
LOS	A	A	A	A	D	C
Approach Delay	6.9			1.7	27.5	
Approach LOS	A			A	C	

VHB — Synchro 9 Report, 2040 No Build AM.syn

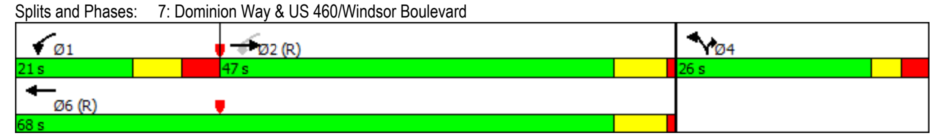
US 460 Corridor Safety Study — 2040 No Build AM
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (ft)	77	0	3	0	5	0
Queue Length 95th (ft)	188	2	15	41	11	5
Internal Link Dist (ft)	629			3322	1125	
Turn Bay Length (ft)		180	325			
Base Capacity (vph)	2452	1130	585	3247	376	350
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.10	0.20	0.16	0.02	0.05

Intersection Summary

Area Type: Other
Cycle Length: 94
Actuated Cycle Length: 94
Offset: 73 (78%), Referenced to phase 2:EBWB and 6:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.37
Intersection Signal Delay: 5.3 — Intersection LOS: A
Intersection Capacity Utilization 50.3% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Dominion Way & US 460/Windsor Boulevard



VHB — Synchro 9 Report, 2040 No Build AM.syn

US 460 Corridor Safety Study — 2040 No Build AM
7: Dominion Way & US 460/Windsor Boulevard

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	810	60	63	461	4	8
Future Volume (veh/h)	810	60	63	461	4	8
Number	2	12	1	6	7	14
Initial Q, veh	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)		1.00	1.00		1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	900	109	117	524	8	18
Adj No. of Lanes	2	1	1	2	1	1
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Percent Heavy Veh, %	2	2	2	2	2	2
Opposing Right Turn Influence			Yes		Yes	
Cap, veh/h	2386	1067	516	2976	47	42
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.67	0.67	0.07	0.84	0.03	0.03
Ln Grp Delay, s/veh	7.2	5.6	4.0	1.5	46.5	52.1
Ln Grp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1009			641	26	
Approach Delay, s/veh	7.0			2.0	50.4	
Approach LOS	A			A	D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.2	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	15.7	69.9		8.5		85.5		
Change Period (Y+Rc), s	9.0	6.5		6.0		6.5		
Max Green (Gmax), s	12.0	40.5		20.0		61.5		
Max Allow Headway (MAH), s	3.6	4.7		4.0		4.7		
Max Q Clear (g_c+I1), s	3.6	12.4		3.1		4.6		
Green Ext Time (g_e), s	0.1	10.4		0.0		12.2		
Prob of Phs Call (p_c)	0.95	1.00		0.49		1.00		
Prob of Max Out (p_x)	0.01	0.15		0.00		0.01		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

VHB — Synchro 9 Report, 2040 No Build AM.syn

2040 No Build AM (Cont)

US 460 Corridor Safety Study 2040 No Build AM
7: Dominion Way & US 460/Windsor Boulevard

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	117	0	0	8	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	1.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	1.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	556	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	65.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	52.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	63.4	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	516	0	0	47	0	0	0	0
V/C Ratio (X)	0.23	0.00	0.00	0.17	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	616	0	0	377	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	3.8	0.0	0.0	44.8	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	1.7	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	4.0	0.0	0.0	46.5	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.7	0.0	0.0	0.2	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.7	0.0	0.0	0.2	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	900	0	0	0	524	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	10.4	0.0	0.0	0.0	2.6	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	10.4	0.0	0.0	0.0	2.6	0.0	0.0
Lane Grp Cap (c), veh/h	0	2386	0	0	0	2976	0	0
V/C Ratio (X)	0.00	0.38	0.00	0.00	0.00	0.18	0.00	0.00
Avail Cap (c_a), veh/h	0	2386	0	0	0	2976	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	6.7	0.0	0.0	0.0	1.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.5	0.0	0.0	0.0	0.1	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.2	0.0	0.0	0.0	1.5	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	5.0	0.0	0.0	0.0	1.2	0.0	0.0

Synchro 9 Report
VHB 2040 No Build AM.syn

US 460 Corridor Safety Study 2040 No Build AM
7: Dominion Way & US 460/Windsor Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	5.2	0.0	0.0	0.0	1.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.20	0.00	0.00	0.00	0.01	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	109	0	18	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	2.3	0.0	1.1	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.3	0.0	1.1	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1067	0	42	0	0	0	0
V/C Ratio (X)	0.00	0.10	0.00	0.43	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1067	0	337	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	5.4	0.0	45.1	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	7.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.6	0.0	52.1	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.14	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		5.7						
HCM 2010 LOS		A						

Synchro 9 Report
VHB 2040 No Build AM.syn

2040 No Build PM

1: US 460/Pruden Boulevard & Northfield Drive
2040 No Build

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑	U	↑↑	↱	↰	↱
Traffic Volume (vph)	11	1558	0	1607	71	66	28
Future Volume (vph)	11	1558	0	1607	71	66	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	305		125		195	0	155
Storage Lanes	1		1		1	1	1
Taper Length (ft)	190		200			0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Frt					0.850		0.850
Flt Protected	0.950					0.950	
Satd. Flow (prot)	1770	3539	1863	3539	1583	1770	1583
Flt Permitted	0.050					0.950	
Satd. Flow (perm)	93	3539	1863	3539	1583	1770	1583
Right Turn on Red					Yes		Yes
Satd. Flow (RTOR)					71		74
Link Speed (mph)		55		55		25	
Link Distance (ft)		537		2299		1306	
Travel Time (s)		6.7		28.5		35.6	
Peak Hour Factor	0.58	0.94	0.92	0.82	0.63	0.58	0.38
Adj. Flow (vph)	19	1657	0	1960	113	114	74
Shared Lane Traffic (%)							
Lane Group Flow (vph)	19	1657	0	1960	113	114	74
Turn Type	pm+pt	NA	pm+pt	NA	Prot	Prot	Prot
Protected Phases	1	6	5	2	2	7	4
Permitted Phases	6		2				
Detector Phase	1	6	5	2	2	7	4
Switch Phase							
Minimum Initial (s)	5.0	15.0	5.0	15.0	15.0	7.0	7.0
Minimum Split (s)	13.3	23.3	9.5	34.9	34.9	14.4	14.4
Total Split (s)	18.0	69.0	18.0	69.0	69.0	23.0	23.0
Total Split (%)	16.4%	62.7%	16.4%	62.7%	62.7%	20.9%	20.9%
Maximum Green (s)	9.7	60.7	13.5	61.1	61.1	15.6	15.6
Yellow Time (s)	4.8	4.8	3.5	4.8	4.8	4.0	4.0
All-Red Time (s)	3.5	3.5	1.0	3.1	3.1	3.4	3.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.3	8.3	4.5	7.9	7.9	7.4	7.4
Lead/Lag	Lead	Lag	Lead	Lag	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None
Walk Time (s)				7.0	7.0		
Flash Dont Walk (s)				20.0	20.0		
Pedestrian Calls (#/hr)				0	0		
Act Effct Green (s)	82.2	82.2		76.8	76.8	12.1	12.1
Actuated g/C Ratio	0.75	0.75		0.70	0.70	0.11	0.11
v/c Ratio	0.12	0.63		0.79	0.10	0.59	0.31
Control Delay	4.3	11.5		16.9	3.9	58.5	13.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	4.3	11.5		16.9	3.9	58.5	13.5

Synchro 9 Report
VHB 2040 No Build PM.syn

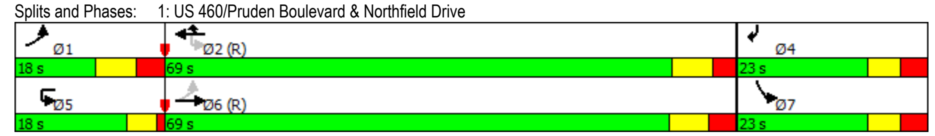
1: US 460/Pruden Boulevard & Northfield Drive
2040 No Build

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
LOS	A	B		B	A	E	B
Approach Delay		11.4		16.2		40.8	
Approach LOS		B		B		D	
Queue Length 50th (ft)	6	466		349	7	78	0
Queue Length 95th (ft)	m2	399		627	18	82	0
Internal Link Dist (ft)		457		2219		1226	
Turn Bay Length (ft)	305				195		155
Base Capacity (vph)	217	2645		2472	1127	251	288
Starvation Cap Reductn	0	0		0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0
Reduced v/c Ratio	0.09	0.63		0.79	0.10	0.45	0.26

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 61 (55%), Referenced to phase 2:WBTU and 6:EBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 15.3 Intersection LOS: B
Intersection Capacity Utilization 63.0% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: US 460/Pruden Boulevard & Northfield Drive



Synchro 9 Report
VHB 2040 No Build PM.syn

1: US 460/Pruden Boulevard & Northfield Drive
2040 No Build

HCM 2010 cannot analyze U-Turning movements.

Synchro 9 Report
VHB 2040 No Build PM.syn

2040 No Build PM (Cont)

2: US460/Pruden Boulevard & Rob's Drive

2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	1442	5	27	1520	140	8	8	39	35	1	7
Future Volume (vph)	6	1442	5	27	1520	140	8	8	39	35	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	400		175	0		50	0		0
Storage Lanes	1		0	1		1	0		1	0		0
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850		0.978	
Flt Protected	0.950			0.950				0.969			0.961	
Satd. Flow (prot)	1770	3536	0	1770	3539	1583	0	1805	1583	0	1751	0
Flt Permitted	0.950			0.950				0.816			0.746	
Satd. Flow (perm)	1770	3536	0	1770	3539	1583	0	1520	1583	0	1359	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				147			98		8	
Link Speed (mph)		35			35			25			30	
Link Distance (ft)		2499			463			411			171	
Travel Time (s)		48.7			9.0			11.2			3.9	
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Adj. Flow (vph)	13	1487	8	46	1583	233	20	11	89	55	2	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1495	0	46	1583	233	0	31	89	0	68	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8		8	4		
Detector Phase	1	6		5	2	2	8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	5.0	5.0	5.0	7.0	7.0	
Minimum Split (s)	11.1	21.8		11.1	21.8	21.8	11.1	11.1	11.1	13.1	13.1	
Total Split (s)	21.0	62.0		21.0	62.0	62.0	27.0	27.0	27.0	27.0	27.0	
Total Split (%)	19.1%	56.4%		19.1%	56.4%	56.4%	24.5%	24.5%	24.5%	24.5%	24.5%	
Maximum Green (s)	14.9	55.2		14.9	55.2	55.2	20.9	20.9	20.9	20.9	20.9	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.1	4.1	4.1	4.1	4.1	
All-Red Time (s)	2.1	2.0		2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Lost Time (s)	6.1	6.8		6.1	6.8	6.8		6.1	6.1		6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	
Act Effct Green (s)	6.4	78.5		8.3	85.2	85.2		10.2	10.2		10.5	
Actuated g/C Ratio	0.06	0.71		0.08	0.77	0.77		0.09	0.09		0.10	
v/c Ratio	0.13	0.59		0.35	0.58	0.19		0.22	0.38		0.50	
Control Delay	33.3	20.3		53.9	5.0	1.9		48.1	12.2		53.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	33.3	20.3		53.9	5.0	1.9		48.1	12.2		53.2	
LOS	C	C		D	A	A		D	B		D	
Approach Delay		20.4			5.8			21.5			53.2	
Approach LOS		C			A			C			D	

Synchro 9 Report
VHB 2040 No Build PM.syn

2: US460/Pruden Boulevard & Rob's Drive

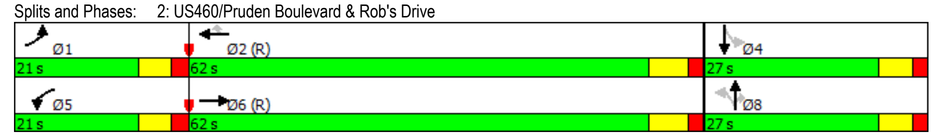
2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	8	437		35	124	10		21	0		41	
Queue Length 95th (ft)	m11	m379		m44	127	8		40	0		37	
Internal Link Dist (ft)		2419			383			331			91	
Turn Bay Length (ft)	250			400		175			50			
Base Capacity (vph)	239	2523		239	2740	1259		288	380		264	
Starvation Cap Reductn	0	0		0	0	0		0	0		0	
Spillback Cap Reductn	0	0		0	0	0		0	0		0	
Storage Cap Reductn	0	0		0	0	0		0	0		0	
Reduced v/c Ratio	0.05	0.59		0.19	0.58	0.19		0.11	0.23		0.26	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 13.4 Intersection LOS: B
Intersection Capacity Utilization 65.9% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: US460/Pruden Boulevard & Rob's Drive



Synchro 9 Report
VHB 2040 No Build PM.syn

2: US460/Pruden Boulevard & Rob's Drive

2040 No Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	1442	5	27	1520	140	8	8	39	35	1	7
Future Volume (veh/h)	6	1442	5	27	1520	140	8	8	39	35	1	7
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	13	1487	8	46	1583	233	20	11	89	55	2	11
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	26	2562	14	61	2581	1155	132	61	132	132	9	16
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.03	1.00	1.00	0.03	0.73	0.73	0.08	0.08	0.08	0.08	0.08	0.08
Ln Grp Delay, s/veh	58.0	0.7	0.7	69.8	8.4	5.1	47.4	0.0	54.9	51.5	0.0	0.0
Ln Grp LOS	E	A	A	E	A	A	D		D	D		
Approach Vol, veh/h		1508			1862			120			68	
Approach Delay, s/veh		1.2			9.5			53.0			51.5	
Approach LOS		A			A			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		7.0
Phs Duration (G+Y+Rc), s	7.7	87.0		15.3	9.9	84.9		15.3
Change Period (Y+Rc), s	6.1	6.8		6.1	6.1	6.8		6.1
Max Green (Gmax), s	14.9	55.2		20.9	14.9	55.2		20.9
Max Allow Headway (MAH), s	3.8	5.0		4.8	3.8	5.0		4.8
Max Q Clear (g_c+I1), s	2.8	26.1		8.6	4.8	2.0		8.0
Green Ext Time (g_e), s	0.0	25.9		0.6	0.0	43.7		0.6
Prob of Phs Call (p_c)	0.33	1.00		1.00	0.75	1.00		1.00
Prob of Max Out (p_x)	0.00	0.88		0.01	0.00	0.78		0.01
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			876	1774			940
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		110		3610		739
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		190		19		1583
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T

Synchro 9 Report
VHB 2040 No Build PM.syn

2040 No Build PM (Cont)

2: US460/Pruden Boulevard & Rob's Drive

2040 No Build

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	13	0	0	68	46	0	0	31
Grp Sat Flow (s), veh/h/ln	1774	0	0	1177	1774	0	0	1679
Q Serve Time (g_s), s	0.8	0.0	0.0	4.8	2.8	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.8	0.0	0.0	6.6	2.8	0.0	0.0	1.8
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1315	0	0	0	1423
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	1712
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	9.2	0.0	0.0	0.0	9.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	7.4	0.0	0.0	0.0	2.6
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.1
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.1
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.81	1.00	0.00	0.00	0.65
Lane Grp Cap (c), veh/h	26	0	0	157	61	0	0	194
V/C Ratio (X)	0.49	0.00	0.00	0.43	0.76	0.00	0.00	0.16
Avail Cap (c_a), veh/h	240	0	0	300	240	0	0	357
Upstream Filter (I)	0.37	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	53.0	0.0	0.0	49.7	52.7	0.0	0.0	47.0
Incr Delay (d2), s/veh	5.1	0.0	0.0	1.9	17.1	0.0	0.0	0.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	58.0	0.0	0.0	51.5	69.8	0.0	0.0	47.4
1st-Term Q (Q1), veh/ln	0.4	0.0	0.0	2.0	1.4	0.0	0.0	0.9
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.4	0.0	0.0	2.1	1.7	0.0	0.0	0.9
%ile Storage Ratio (RQ%)	0.04	0.00	0.00	0.49	0.11	0.00	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1583	0	0	0	729	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	24.1	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	24.1	0.0	0.0	0.0	0.0	0.0	0.0
Lane Grp Cap (c), veh/h	0	2581	0	0	0	1256	0	0
V/C Ratio (X)	0.00	0.61	0.00	0.00	0.00	0.58	0.00	0.00
Avail Cap (c_a), veh/h	0	2581	0	0	0	1256	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.37	0.00	0.00
Uniform Delay (d1), s/veh	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.0	0.0	0.0	0.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	8.4	0.0	0.0	0.0	0.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	11.7	0.0	0.0	0.0	0.0	0.0	0.0

VHB

Synchro 9 Report
2040 No Build PM.syn

2: US460/Pruden Boulevard & Rob's Drive

2040 No Build

2nd-Term Q (Q2), veh/ln	0.0	0.4	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	12.0	0.0	0.0	0.0	0.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		R
Lanes in Grp	0	1	0	0	0	1	0	1
Grp Vol (v), veh/h	0	233	0	0	0	766	0	89
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1859	0	1583
Q Serve Time (g_s), s	0.0	5.1	0.0	0.0	0.0	0.0	0.0	6.0
Cycle Q Clear Time (g_c), s	0.0	5.1	0.0	0.0	0.0	0.0	0.0	6.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.16	0.00	0.01	0.00	1.00
Lane Grp Cap (c), veh/h	0	1155	0	0	0	1320	0	132
V/C Ratio (X)	0.00	0.20	0.00	0.00	0.00	0.58	0.00	0.68
Avail Cap (c_a), veh/h	0	1155	0	0	0	1320	0	301
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.37	0.00	1.00
Uniform Delay (d1), s/veh	0.0	4.7	0.0	0.0	0.0	0.0	0.0	49.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.0	0.7	0.0	5.9
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.1	0.0	0.0	0.0	0.7	0.0	54.9
1st-Term Q (Q1), veh/ln	0.0	2.2	0.0	0.0	0.0	0.0	0.0	2.6
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.3	0.0	0.0	0.0	0.3	0.0	2.8
%ile Storage Ratio (RQ%)	0.00	0.34	0.00	0.00	0.00	0.00	0.00	1.44
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		8.3						
HCM 2010 LOS		A						

VHB

Synchro 9 Report
2040 No Build PM.syn

3: US460/Pruden Boulevard & Kings Fork Rd

2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1234	11	108	1189	200	6	142	31	94	84	105
Future Volume (vph)	120	1234	11	108	1189	200	6	142	31	94	84	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	250		145	0		0	0		50
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	80			0			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850		0.977				0.850
Flt Protected	0.950			0.950				0.996			0.977	
Satd. Flow (prot)	1770	3536	0	1770	3539	1583	0	1813	0	0	1820	1583
Flt Permitted	0.950			0.950				0.867			0.527	
Satd. Flow (perm)	1770	3536	0	1770	3539	1583	0	1578	0	0	982	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				134		9				102
Link Speed (mph)		55			35			45			45	
Link Distance (ft)		2858			2499			2180			1010	
Travel Time (s)		35.4			48.7			33.0			15.3	
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Adj. Flow (vph)	145	1371	12	309	1265	222	24	212	48	125	140	169
Shared Lane Traffic (%)												
Lane Group Flow (vph)	145	1383	0	309	1265	222	0	284	0	0	265	169
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		4
Detector Phase	1	6		5	2	2	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	11.0	21.8		11.5	21.8	21.8	13.8	13.8		13.8	13.8	13.8
Total Split (s)	22.0	56.0		22.0	56.0	56.0	32.0	32.0		32.0	32.0	32.0
Total Split (%)	20.0%	50.9%		20.0%	50.9%	50.9%	29.1%	29.1%		29.1%	29.1%	29.1%
Maximum Green (s)	16.0	49.2		15.5	49.2	49.2	25.2	25.2		25.2	25.2	25.2
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.8	4.8		4.8	4.8	4.8
All-Red Time (s)	2.0	2.0		2.5	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	6.0	6.8		6.5	6.8	6.8		6.8			6.8	6.8
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Act Effct Green (s)	13.4	49.2		15.5	51.8	51.8		25.2			25.2	25.2
Actuated g/C Ratio	0.12	0.45		0.14	0.47	0.47		0.23			0.23	0.23
v/c Ratio	0.67	0.87		1.24	0.76	0.27		0.77			1.18	0.38
Control Delay	61.3	35.2		170.2	40.4	17.1		53.9			157.1	17.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	61.3	35.2		170.2	40.4	17.1		53.9			157.1	17.8
LOS	E	D		F	D	B		D			F	B
Approach Delay		37.6			59.8			53.9			102.9	
Approach LOS		D			E			D			F	

VHB

Synchro 9 Report
2040 No Build PM.syn

2040 No Build PM (Cont)

3: US460/Pruden Boulevard & Kings Fork Rd

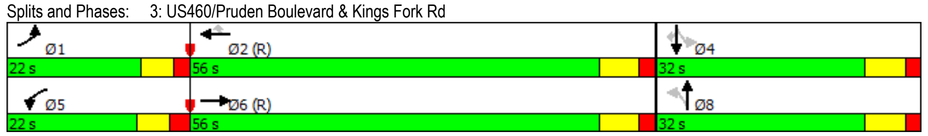
2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	99	454		~273	417	72		183			~225	38
Queue Length 95th (ft)	149	558		103	573	181		194			#204	45
Internal Link Dist (ft)		2778			2419			2100			930	
Turn Bay Length (ft)	165			250		145						50
Base Capacity (vph)	257	1582		249	1665	815		368			224	441
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.56	0.87		1.24	0.76	0.27		0.77			1.18	0.38

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 93 (85%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.24
Intersection Signal Delay: 55.6 Intersection LOS: E
Intersection Capacity Utilization 82.2% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: US460/Pruden Boulevard & Kings Fork Rd



VHB
Synchro 9 Report
2040 No Build PM.syn

3: US460/Pruden Boulevard & Kings Fork Rd

2040 No Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	1234	11	108	1189	200	6	142	31	94	84	105
Future Volume (veh/h)	120	1234	11	108	1189	200	6	142	31	94	84	105
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	145	1371	12	309	1265	222	24	212	48	125	140	169
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	1
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	175	1608	14	250	1749	783	35	142	29	113	81	363
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.10	0.45	0.45	0.14	0.49	0.49	0.23	0.23	0.23	0.23	0.23	0.23
Ln Grp Delay, s/veh	55.6	32.9	32.7	177.8	24.0	17.1	233.9	0.0	0.0	241.3	0.0	37.5
Ln Grp LOS	E	C	C	F	C	B	F			F		D
Approach Vol, veh/h		1528			1796			284			434	
Approach Delay, s/veh		35.0			49.6			233.9			162.0	
Approach LOS		C			D			F			F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		7.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	16.8	61.2		32.0	22.0	56.0		32.0
Change Period (Y+Rc), s	6.0	6.8		6.8	6.5	6.8		6.8
Max Green (Gmax), s	16.0	49.2		25.2	15.5	49.2		25.2
Max Allow Headway (MAH), s	3.6	4.8		4.8	3.8	4.8		4.8
Max Q Clear (g_c+I1), s	10.8	32.9		27.2	17.5	39.5		27.2
Green Ext Time (g_e), s	0.1	13.9		0.0	0.0	8.7		0.0
Prob of Phs Call (p_c)	0.99	1.00		1.00	1.00	1.00		1.00
Prob of Max Out (p_x)	0.23	0.87		1.00	1.00	0.94		1.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			281	1774			0
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		353		3595		621
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		1583		31		126
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T	(Prot)			L+T+R

VHB
Synchro 9 Report
2040 No Build PM.syn

3: US460/Pruden Boulevard & Kings Fork Rd

2040 No Build

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	145	0	0	265	309	0	0	284
Grp Sat Flow (s), veh/h/ln	1774	0	0	634	1774	0	0	748
Q Serve Time (g_s), s	8.8	0.0	0.0	0.0	15.5	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	8.8	0.0	0.0	25.2	15.5	0.0	0.0	25.2
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1137	0	0	0	1087
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	608	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	25.2	0.0	0.0	0.0	25.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	10.4
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	10.4
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.47	1.00	0.00	0.00	0.08
Lane Grp Cap (c), veh/h	175	0	0	193	250	0	0	207
V/C Ratio (X)	0.83	0.00	0.00	1.37	1.24	0.00	0.00	1.37
Avail Cap (c_a), veh/h	258	0	0	193	250	0	0	207
Upstream Filter (I)	0.48	0.00	0.00	1.00	0.79	0.00	0.00	1.00
Uniform Delay (d1), s/veh	48.7	0.0	0.0	45.2	47.3	0.0	0.0	38.4
Incr Delay (d2), s/veh	6.9	0.0	0.0	196.2	130.5	0.0	0.0	195.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	55.6	0.0	0.0	241.3	177.8	0.0	0.0	233.9
1st-Term Q (Q1), veh/ln	4.3	0.0	0.0	5.9	7.6	0.0	0.0	6.3
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.0	10.5	9.1	0.0	0.0	11.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	4.6	0.0	0.0	16.4	16.6	0.0	0.0	17.5
%ile Storage Ratio (RQ%)	0.71	0.00	0.00	0.44	1.69	0.00	0.00	0.21
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	17.9	14.8	0.0	0.0	19.3
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.3
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1265	0	0	0	675	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	30.9	0.0	0.0	0.0	37.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	30.9	0.0	0.0	0.0	37.5	0.0	0.0
Lane Grp Cap (c), veh/h	0	1749	0	0	0	791	0	0
V/C Ratio (X)	0.00	0.72	0.00	0.00	0.00	0.85	0.00	0.00
Avail Cap (c_a), veh/h	0	1749	0	0	0	791	0	0
Upstream Filter (I)	0.00	0.79	0.00	0.00	0.00	0.48	0.00	0.00
Uniform Delay (d1), s/veh	0.0	21.9	0.0	0.0	0.0	27.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	2.1	0.0	0.0	0.0	5.8	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	24.0	0.0	0.0	0.0	32.9	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	15.1	0.0	0.0	0.0	18.2	0.0	0.0

VHB
Synchro 9 Report
2040 No Build PM.syn

2040 No Build PM (Cont)

3: US460/Pruden Boulevard & Kings Fork Rd

2040 No Build

2nd-Term Q (Q2), veh/ln	0.0	0.5	0.0	0.0	0.0	1.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	15.6	0.0	0.0	0.0	19.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.16	0.00	0.00	0.00	0.18	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		T+R		
Lanes in Grp	0	1	0	1	0	1	0	0
Grp Vol (v), veh/h	0	222	0	169	0	708	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	1857	0	0
Q Serve Time (g_s), s	0.0	9.1	0.0	10.1	0.0	37.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	9.1	0.0	10.1	0.0	37.5	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.02	0.00	0.17
Lane Grp Cap (c), veh/h	0	783	0	363	0	831	0	0
V/C Ratio (X)	0.00	0.28	0.00	0.47	0.00	0.85	0.00	0.00
Avail Cap (c_a), veh/h	0	783	0	363	0	831	0	0
Upstream Filter (I)	0.00	0.79	0.00	1.00	0.00	0.48	0.00	0.00
Uniform Delay (d1), s/veh	0.0	16.4	0.0	36.6	0.0	27.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.9	0.0	5.5	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.1	0.0	37.5	0.0	32.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.9	0.0	4.4	0.0	19.1	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.1	0.0	1.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	4.1	0.0	4.5	0.0	20.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.72	0.00	2.29	0.00	0.19	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		69.1						
HCM 2010 LOS		E						

VHB

Synchro 9 Report
2040 No Build PM.syn

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	1231	60	26	1198	138	100	38	11	70	63	8
Future Volume (vph)	11	1231	60	26	1198	138	100	38	11	70	63	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220		0	200		110	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	160			150			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991				0.850		0.985			0.985	
Flt Protected	0.950			0.950				0.970			0.981	
Satd. Flow (prot)	1770	3507	0	1770	3539	1583	0	1780	0	0	1800	0
Flt Permitted	0.950			0.950				0.648			0.793	
Satd. Flow (perm)	1770	3507	0	1770	3539	1583	0	1189	0	0	1455	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				129		5			5	
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		471			2858			1931			2337	
Travel Time (s)		5.8			35.4			29.3			35.4	
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Adj. Flow (vph)	22	1338	90	79	1346	234	133	55	24	85	105	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	1428	0	79	1346	234	0	212	0	0	214	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8			4		
Detector Phase	1	6		5	2	2	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.8	21.8		11.8	21.8	21.8	13.3	13.3		13.8	13.8	
Total Split (s)	16.0	67.0		16.0	67.0	67.0	27.0	27.0		27.0	27.0	
Total Split (%)	14.5%	60.9%		14.5%	60.9%	60.9%	24.5%	24.5%		24.5%	24.5%	
Maximum Green (s)	9.2	60.2		9.2	60.2	60.2	20.7	20.7		20.2	20.2	
Yellow Time (s)	4.8	4.8		4.8	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.5	1.5		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.8	6.8		6.8	6.8	6.8		6.3			6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	3.5		0.2	3.5	3.5	0.2	0.2		0.2	0.2	
Time Before Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Act Effct Green (s)	7.0	46.5		8.4	52.9	52.9		21.2			20.7	
Actuated g/C Ratio	0.08	0.50		0.09	0.57	0.57		0.23			0.22	
v/c Ratio	0.17	0.81		0.49	0.67	0.25		0.77			0.65	
Control Delay	49.0	24.0		56.7	16.3	5.7		58.1			47.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	49.0	24.0		56.7	16.3	5.7		58.1			47.7	

VHB

Synchro 9 Report
2040 No Build PM.syn

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

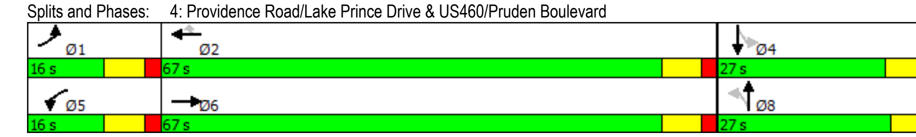
2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C		E	B	A		E			D	
Approach Delay		24.3			16.7			58.1			47.7	
Approach LOS		C			B			E			D	
Queue Length 50th (ft)	13	382		48	221	22		126			124	
Queue Length 95th (ft)	22	471		37	415	30		#184			140	
Internal Link Dist (ft)		391			2778			1851			2257	
Turn Bay Length (ft)	220			200		110						
Base Capacity (vph)	183	2381		183	2437	1130		280			334	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.12	0.60		0.43	0.55	0.21		0.76			0.64	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 93
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 24.2 Intersection LOS: C
Intersection Capacity Utilization 58.5% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard



VHB

Synchro 9 Report
2040 No Build PM.syn

2040 No Build PM (Cont)

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2040 No Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	1231	60	26	1198	138	100	38	11	70	63	8
Future Volume (veh/h)	11	1231	60	26	1198	138	100	38	11	70	63	8
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	22	1338	90	79	1346	234	133	55	24	85	105	24
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	0
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	41	1833	123	101	2048	916	202	71	27	153	166	34
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.54	0.54	0.06	0.58	0.58	0.19	0.19	0.19	0.19	0.19	0.19
Ln Grp Delay, s/veh	58.8	19.3	19.4	58.3	14.9	10.5	45.6	0.0	0.0	39.9	0.0	0.0
Ln Grp LOS	E	B	B	E	B	B	D			D		
Approach Vol, veh/h		1450			1659			212			214	
Approach Delay, s/veh		20.0			16.4			45.6			39.9	
Approach LOS		B			B			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		8.0
Phs Duration (G+Y+Rc), s	9.1	64.3		26.0	12.5	60.9		26.0
Change Period (Y+Rc), s	6.8	6.8		6.8	6.8	6.8		* 6.8
Max Green (Gmax), s	9.2	60.2		20.2	9.2	60.2		* 21
Max Allow Headway (MAH), s	3.6	4.7		5.1	3.6	4.7		5.1
Max Q Clear (g_c+I1), s	3.2	27.7		14.6	6.4	32.0		18.7
Green Ext Time (g_e), s	0.0	24.7		1.1	0.0	22.1		0.5
Prob of Phs Call (p_c)	0.46	1.00		1.00	0.89	1.00		1.00
Prob of Max Out (p_x)	0.02	0.72		0.84	1.00	0.76		1.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			531	1774			741
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		860		3367		368
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		176		226		142
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T+R

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2040 No Build

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	22	0	0	214	79	0	0	212
Grp Sat Flow (s), veh/h/ln	1774	0	0	1567	1774	0	0	1251
Q Serve Time (g_s), s	1.2	0.0	0.0	0.0	4.4	0.0	0.0	4.2
Cycle Q Clear Time (g_c), s	1.2	0.0	0.0	12.6	4.4	0.0	0.0	16.7
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1341	0	0	0	1281
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	1523	0	0	0	1127
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	19.2	0.0	0.0	0.0	19.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	2.5	0.0	0.0	0.0	6.6
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2
Time to First Blk (g_f), s	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.7
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.7
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.40	1.00	0.00	0.00	0.63
Lane Grp Cap (c), veh/h	41	0	0	353	101	0	0	301
V/C Ratio (X)	0.54	0.00	0.00	0.61	0.78	0.00	0.00	0.71
Avail Cap (c_a), veh/h	164	0	0	369	164	0	0	322
Upstream Filter (I)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	48.0	0.0	0.0	37.2	46.2	0.0	0.0	39.3
Incr Delay (d2), s/veh	10.7	0.0	0.0	2.6	12.1	0.0	0.0	6.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	58.8	0.0	0.0	39.9	58.3	0.0	0.0	45.6
1st-Term Q (Q1), veh/ln	0.6	0.0	0.0	5.5	2.2	0.0	0.0	5.7
2nd-Term Q (Q2), veh/ln	0.1	0.0	0.0	0.3	0.3	0.0	0.0	0.5
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.7	0.0	0.0	5.7	2.5	0.0	0.0	6.2
%ile Storage Ratio (RQ%)	0.08	0.00	0.00	0.06	0.32	0.00	0.00	0.08
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1346	0	0	0	702	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	25.7	0.0	0.0	0.0	29.8	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	25.7	0.0	0.0	0.0	29.8	0.0	0.0
Lane Grp Cap (c), veh/h	0	2048	0	0	0	963	0	0
V/C Ratio (X)	0.00	0.66	0.00	0.00	0.00	0.73	0.00	0.00
Avail Cap (c_a), veh/h	0	2144	0	0	0	1072	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	14.2	0.0	0.0	0.0	17.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	2.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	14.9	0.0	0.0	0.0	19.3	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	12.5	0.0	0.0	0.0	14.4	0.0	0.0

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2040 No Build

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.6	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	12.7	0.0	0.0	0.0	15.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.12	0.00	0.00	0.00	0.99	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		
Lanes in Grp	0	1	0	0	0	1	0	0
Grp Vol (v), veh/h	0	234	0	0	0	726	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1823	0	0
Q Serve Time (g_s), s	0.0	7.3	0.0	0.0	0.0	30.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	7.3	0.0	0.0	0.0	30.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.11	0.00	0.12	0.00	0.11
Lane Grp Cap (c), veh/h	0	916	0	0	0	992	0	0
V/C Ratio (X)	0.00	0.26	0.00	0.00	0.00	0.73	0.00	0.00
Avail Cap (c_a), veh/h	0	959	0	0	0	1104	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	10.4	0.0	0.0	0.0	17.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	2.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.5	0.0	0.0	0.0	19.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.1	0.0	0.0	0.0	14.9	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	3.2	0.0	0.0	0.0	15.5	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.73	0.00	0.00	0.00	1.03	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	21.0
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

2040 No Build PM (Cont)

5: Woodlawn Dr & US460/Pruden Boulevard

2040 No Build

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1297	2	0	1347	0	2
Future Volume (vph)	1297	2	0	1347	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1611
Link Speed (mph)	55			55	25	
Link Distance (ft)	1965			471	1166	
Travel Time (s)	24.4			5.8	31.8	
Peak Hour Factor	0.96	0.92	0.92	0.95	0.25	0.25
Adj. Flow (vph)	1351	2	0	1418	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1353	0	0	1418	0	8
Sign Control	Free			Free	Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 45.9%	ICU Level of Service A
Analysis Period (min) 15	

5: Woodlawn Dr & US460/Pruden Boulevard

2040 No Build

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1297	2	0	1347	0	2
Future Vol, veh/h	1297	2	0	1347	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	92	92	95	25	25
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1351	2	0	1418	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	677
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	395
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	395
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	395	-	-	-
HCM Lane V/C Ratio	0.02	-	-	-
HCM Control Delay (s)	14.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

6: Old Suffolk Rd & US 460/Windsor Boulevard

2040 No Build

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	586	49	69	1032	4	21	2	43	0	0	3
Future Volume (vph)	1	586	49	69	1032	4	21	2	43	0	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		340	400		0	0		300	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			125			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.999				0.850		0.865	
Flt Protected				0.950				0.959				
Satd. Flow (prot)	0	3539	1583	1770	3536	0	0	1786	1583	0	1611	0
Flt Permitted				0.950				0.959				
Satd. Flow (perm)	0	3539	1583	1770	3536	0	0	1786	1583	0	1611	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		3402			5235			2230			2290	
Travel Time (s)		42.2			64.9			33.8			34.7	
Peak Hour Factor	0.38	0.89	0.80	0.68	0.90	0.92	0.41	0.25	0.34	0.25	0.92	0.25
Adj. Flow (vph)	3	658	61	101	1147	4	51	8	126	0	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	661	61	101	1151	0	0	59	126	0	12	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 62.8%	ICU Level of Service B
Analysis Period (min) 15	

2040 No Build PM (Cont)

6: Old Suffolk Rd & US 460/Windsor Boulevard

2040 No Build

Intersection												
Int Delay, s/veh	5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	586	49	69	1032	4	21	2	43	0	0	3
Future Vol, veh/h	1	586	49	69	1032	4	21	2	43	0	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	340	400	-	-	-	-	300	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	89	80	68	90	92	41	25	34	25	92	25
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	658	61	101	1147	4	51	8	126	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1151	0	0	658	0	0	1440	2018	329	1690	2016	576
Stage 1	-	-	-	-	-	-	664	664	-	1352	1352	-
Stage 2	-	-	-	-	-	-	776	1354	-	338	664	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	603	-	-	926	-	-	93	58	667	61	58	460
Stage 1	-	-	-	-	-	-	416	456	-	158	217	-
Stage 2	-	-	-	-	-	-	356	216	-	650	456	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	603	-	-	926	-	-	83	51	667	40	51	460
Mov Cap-2 Maneuver	-	-	-	-	-	-	83	51	-	40	51	-
Stage 1	-	-	-	-	-	-	413	452	-	157	193	-
Stage 2	-	-	-	-	-	-	309	192	-	513	452	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.8	51.7	13
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	77	667	603	-	-	926	-	-	460
HCM Lane V/C Ratio	0.769	0.19	0.004	-	-	0.11	-	-	0.026
HCM Control Delay (s)	137.2	11.7	11	-	-	9.4	-	-	13
HCM Lane LOS	F	B	B	-	-	A	-	-	B
HCM 95th %tile Q(veh)	3.7	0.7	0	-	-	0.4	-	-	0.1

Synchro 9 Report
VHB
2040 No Build PM.syn

7: Dominion Way & US 460/Windsor Boulevard

2040 No Build

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	649	3	1	1062	18	17
Future Volume (vph)	649	3	1	1062	18	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		200	330		0	0
Storage Lanes		1	1		1	1
Taper Length (ft)			200		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted			0.370		0.950	
Satd. Flow (perm)	3539	1583	689	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		5				39
Link Speed (mph)	55			55	25	
Link Distance (ft)	709			3402	1205	
Travel Time (s)	8.8			42.2	32.9	
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Adj. Flow (vph)	721	5	2	1207	36	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	721	5	2	1207	36	39
Turn Type	NA	Perm	D.P+P	NA	Prot	Prot
Protected Phases	2		1	6	4	4
Permitted Phases		2	2			
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	5.0	5.0
Minimum Split (s)	21.5	21.5	16.0	21.5	11.5	11.5
Total Split (s)	47.0	47.0	21.0	68.0	26.0	26.0
Total Split (%)	50.0%	50.0%	22.3%	72.3%	27.7%	27.7%
Maximum Green (s)	40.5	40.5	12.0	61.5	20.0	20.0
Yellow Time (s)	5.5	5.5	5.0	5.5	3.0	3.0
All-Red Time (s)	1.0	1.0	4.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	9.0	6.5	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.5	3.5	0.2	3.5	0.2	0.2
Time Before Reduce (s)	25.0	25.0	0.0	25.0	0.0	0.0
Time To Reduce (s)	15.0	15.0	0.0	15.0	0.0	0.0
Recall Mode	C-Min	C-Min	None	C-Min	None	None
Act Effct Green (s)	74.5	74.5	72.1	77.7	7.4	7.4
Actuated g/C Ratio	0.79	0.79	0.77	0.83	0.08	0.08
v/c Ratio	0.26	0.00	0.00	0.41	0.26	0.24
Control Delay	4.6	4.0	3.0	3.5	44.6	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	4.0	3.0	3.5	44.6	16.9

Synchro 9 Report
VHB
2040 No Build PM.syn

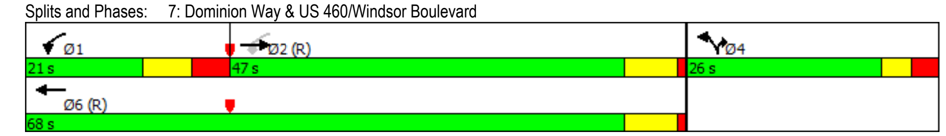
7: Dominion Way & US 460/Windsor Boulevard

2040 No Build

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A	A	A	A	D	B
Approach Delay	4.6			3.5	30.2	
Approach LOS	A			A	C	
Queue Length 50th (ft)	45	0	0	92	21	0
Queue Length 95th (ft)	141	2	1	134	27	3
Internal Link Dist (ft)	629			3322	1125	
Turn Bay Length (ft)		200	330			
Base Capacity (vph)	2803	1255	673	2923	376	367
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.00	0.00	0.41	0.10	0.11

Intersection Summary	
Area Type: Other	
Cycle Length: 94	
Actuated Cycle Length: 94	
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:WBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.41	
Intersection Signal Delay: 4.9	Intersection LOS: A
Intersection Capacity Utilization 43.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 7: Dominion Way & US 460/Windsor Boulevard



Synchro 9 Report
VHB
2040 No Build PM.syn

2040 No Build PM (Cont)

7: Dominion Way & US 460/Windsor Boulevard

2040 No Build

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	649	3	1	1062	18	17
Future Volume (veh/h)	649	3	1	1062	18	17
Number	2	12	1	6	7	14
Initial Q, veh	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)		1.00	1.00		1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	721	5	2	1207	36	39
Adj No. of Lanes	2	1	1	2	1	1
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Percent Heavy Veh, %	2	2	2	2	2	2
Opposing Right Turn Influence			Yes		Yes	
Cap, veh/h	2555	1143	555	2907	81	72
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.72	0.72	0.00	0.82	0.05	0.05
Ln Grp Delay, s/veh	4.8	3.7	3.4	2.7	47.5	50.0
Ln Grp LOS	A	A	A	A	D	D
Approach Vol, veh/h	726			1209	75	
Approach Delay, s/veh	4.8			2.7	48.8	
Approach LOS	A			A	D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.2	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	9.4	74.3		10.3		83.7		
Change Period (Y+Rc), s	9.0	6.5		6.0		6.5		
Max Green (Gmax), s	12.0	40.5		20.0		61.5		
Max Allow Headway (MAH), s	3.6	4.7		4.0		4.7		
Max Q Clear (g_c+I1), s	2.0	8.7		4.3		10.7		
Green Ext Time (g_e), s	0.0	15.7		0.1		18.9		
Prob of Phs Call (p_c)	0.05	1.00		0.86		1.00		
Prob of Max Out (p_x)	0.00	0.28		0.00		0.11		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

7: Dominion Way & US 460/Windsor Boulevard

2040 No Build

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	2	0	0	36	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	725	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	69.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	61.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	67.8	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	555	0	0	81	0	0	0	0
V/C Ratio (X)	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	775	0	0	377	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	3.4	0.0	0.0	43.7	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	3.4	0.0	0.0	47.5	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	721	0	0	0	1207	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	6.7	0.0	0.0	0.0	8.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	6.7	0.0	0.0	0.0	8.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	2555	0	0	0	2907	0	0
V/C Ratio (X)	0.00	0.28	0.00	0.00	0.00	0.42	0.00	0.00
Avail Cap (c_a), veh/h	0	2555	0	0	0	2907	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	4.6	0.0	0.0	0.0	2.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	0.4	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	4.8	0.0	0.0	0.0	2.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.2	0.0	0.0	0.0	4.0	0.0	0.0

7: Dominion Way & US 460/Windsor Boulevard

2040 No Build

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	3.3	0.0	0.0	0.0	4.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.13	0.00	0.00	0.00	0.03	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	5	0	39	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	0.1	0.0	2.3	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.1	0.0	2.3	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1143	0	72	0	0	0	0
V/C Ratio (X)	0.00	0.00	0.00	0.54	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1143	0	337	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	3.6	0.0	43.9	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	3.7	0.0	50.0	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		5.2						
HCM 2010 LOS		A						

2040 Build AM

US 460 Corridor Safety Study 2040 Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	11	1387	0	1154	80	8	3
Future Volume (vph)	11	1387	0	1154	80	8	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	305		125		195	0	155
Storage Lanes	1		1		1	1	1
Taper Length (ft)	190		200			0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Frt					0.850		0.850
Flt Protected	0.950					0.950	
Satd. Flow (prot)	1770	3539	1863	3539	1583	1770	1583
Flt Permitted	0.137					0.950	
Satd. Flow (perm)	255	3539	1863	3539	1583	1770	1583
Right Turn on Red					Yes		Yes
Satd. Flow (RTOR)					109		8
Link Speed (mph)		55		55		25	
Link Distance (ft)		537		2299		1306	
Travel Time (s)		6.7		28.5		35.6	
Peak Hour Factor	0.58	0.94	0.92	0.82	0.63	0.58	0.38
Adj. Flow (vph)	19	1476	0	1407	127	14	8
Shared Lane Traffic (%)							
Lane Group Flow (vph)	19	1476	0	1407	127	14	8
Turn Type	pm+pt	NA	pm+pt	NA	Prot	Prot	Prot
Protected Phases	1	6	5	2	2	7	4
Permitted Phases	6		2				
Detector Phase	1	6	5	2	2	7	4
Switch Phase							
Minimum Initial (s)	5.0	15.0	5.0	15.0	15.0	7.0	7.0
Minimum Split (s)	13.3	23.3	9.5	34.9	34.9	14.4	14.4
Total Split (s)	20.0	48.0	20.0	48.0	48.0	22.0	22.0
Total Split (%)	22.2%	53.3%	22.2%	53.3%	53.3%	24.4%	24.4%
Maximum Green (s)	11.7	39.7	15.5	40.1	40.1	14.6	14.6
Yellow Time (s)	4.8	4.8	3.5	4.8	4.8	4.0	4.0
All-Red Time (s)	3.5	3.5	1.0	3.1	3.1	3.4	3.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.3	8.3	4.5	7.9	7.9	7.4	7.4
Lead/Lag	Lead	Lag	Lead	Lag	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None
Walk Time (s)				7.0	7.0		
Flash Dont Walk (s)				20.0	20.0		
Pedestrian Calls (#/hr)				0	0		
Act Effct Green (s)	78.7	85.3		78.2	78.2	7.1	7.1
Actuated g/C Ratio	0.87	0.95		0.87	0.87	0.08	0.08
v/c Ratio	0.06	0.44		0.46	0.09	0.10	0.06
Control Delay	1.1	1.1		5.2	1.8	40.1	22.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	1.1	1.1		5.2	1.8	40.1	22.7

VHB Synchro 9 Report
2040 Build AM.syn

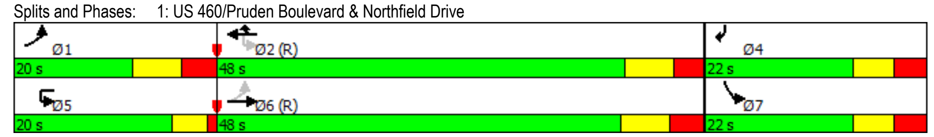
US 460 Corridor Safety Study 2040 Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
LOS	A	A		A	A	D	C
Approach Delay		1.1		4.9		33.8	
Approach LOS		A		A		C	
Queue Length 50th (ft)	1	3		0	0	8	0
Queue Length 95th (ft)	m2	57		290	10	17	3
Internal Link Dist (ft)		457		2219		1226	
Turn Bay Length (ft)	305				195		155
Base Capacity (vph)	419	3356		3073	1389	287	263
Starvation Cap Reductn	0	0		0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0
Reduced v/c Ratio	0.05	0.44		0.46	0.09	0.05	0.03

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 80 (89%), Referenced to phase 2:WBTU and 6:EBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 3.2 Intersection LOS: A
Intersection Capacity Utilization 57.3% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: US 460/Pruden Boulevard & Northfield Drive



VHB Synchro 9 Report
2040 Build AM.syn

US 460 Corridor Safety Study 2040 Build AM
1: US 460/Pruden Boulevard & Northfield Drive

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (veh/h)	11	1387	0	1154	80	8	3
Future Volume (veh/h)	11	1387	0	1154	80	8	3
Number	1	6		2	12	7	14
Initial Q, veh	0	0		0	0	0	0
Ped-Bike Adj (A_pbT)	1.00				1.00	1.00	1.00
Parking Bus Adj	1.00	1.00		1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863		1863	1863	1863	1863
Adj Flow Rate, veh/h	19	1476		1407	127	14	8
Adj No. of Lanes	1	2		2	1	1	1
Peak Hour Factor	0.58	0.94		0.82	0.63	0.58	0.38
Percent Heavy Veh, %	2	2		2	2	2	2
Opposing Right Turn Influence	Yes					Yes	
Cap, veh/h	132	2805		2405	1076	58	52
HCM Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.79		0.68	0.68	0.03	0.03
Ln Grp Delay, s/veh	28.9	4.0		8.7	5.3	44.5	43.7
Ln Grp LOS	C	A		A	A	D	D
Approach Vol, veh/h		1495		1534		22	
Approach Delay, s/veh		4.3		8.4		44.2	
Approach LOS		A		A		D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.1	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	10.2	69.4		10.4		79.6		
Change Period (Y+Rc), s	8.3	* 8.3		7.4		8.3		
Max Green (Gmax), s	11.7	* 40		14.6		39.7		
Max Allow Headway (MAH), s	3.6	4.7		3.9		4.7		
Max Q Clear (g_c+I1), s	2.2	21.0		2.7		15.4		
Green Ext Time (g_e), s	0.0	16.4		0.0		20.3		
Prob of Phs Call (p_c)	0.38	1.00		0.42		1.00		
Prob of Max Out (p_x)	0.00	0.84		0.00		0.79		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

VHB Synchro 9 Report
2040 Build AM.syn

2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM

1: US 460/Pruden Boulevard & Northfield Drive

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	19	0	0	14	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	0.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	337	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	71.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	61.1	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	132	0	0	58	0	0	0	0
V/C Ratio (X)	0.14	0.00	0.00	0.24	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	325	0	0	288	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	28.4	0.0	0.0	42.4	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.0	2.1	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	28.9	0.0	0.0	44.5	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	1407	0	0	0	1476	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	19.0	0.0	0.0	0.0	13.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	19.0	0.0	0.0	0.0	13.4	0.0	0.0
Lane Grp Cap (c), veh/h	0	2405	0	0	0	2805	0	0
V/C Ratio (X)	0.00	0.59	0.00	0.00	0.00	0.53	0.00	0.00
Avail Cap (c_a), veh/h	0	2405	0	0	0	2805	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	7.7	0.0	0.0	0.0	3.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.0	0.0	0.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	8.7	0.0	0.0	0.0	4.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	9.2	0.0	0.0	0.0	6.4	0.0	0.0

VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM

1: US 460/Pruden Boulevard & Northfield Drive

2nd-Term Q (Q2), veh/ln	0.0	0.4	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	9.5	0.0	0.0	0.0	6.6	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.11	0.00	0.00	0.00	0.35	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	127	0	8	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	2.5	0.0	0.4	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.5	0.0	0.4	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1076	0	52	0	0	0	0
V/C Ratio (X)	0.00	0.12	0.00	0.15	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1076	0	257	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	5.0	0.0	42.3	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	1.3	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.3	0.0	43.7	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.1	0.0	0.2	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	1.2	0.0	0.2	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.15	0.00	0.03	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	6.7
HCM 2010 LOS	A

Notes

User approved ignoring U-Turning movement.

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM

2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	1174	26	174	959	80	9	10	54	40	33	6
Future Volume (vph)	33	1174	26	174	959	80	9	10	54	40	33	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	400		175	0		50	0		0
Storage Lanes	1		0	1		1	0		1	0		0
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995				0.850			0.850		0.991	
Flt Protected	0.950			0.950				0.969			0.979	
Satd. Flow (prot)	1770	3522	0	1770	3539	1583	0	1805	1583	0	1807	0
Flt Permitted	0.950			0.950				0.752			0.844	
Satd. Flow (perm)	1770	3522	0	1770	3539	1583	0	1401	1583	0	1558	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				131			123		4	
Link Speed (mph)		35			35			25			30	
Link Distance (ft)		2499			463			411			171	
Travel Time (s)		48.7			9.0			11.2			3.9	
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Adj. Flow (vph)	72	1210	43	295	999	133	23	13	123	63	73	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	1253	0	295	999	133	0	36	123	0	146	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8		8	4		
Detector Phase	1	6		5	2	2	8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.1	21.8		11.1	21.8	21.8	13.1	13.1	13.1	13.1	13.1	
Total Split (s)	24.0	43.0		22.0	41.0	41.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	26.7%	47.8%		24.4%	45.6%	45.6%	27.8%	27.8%	27.8%	27.8%	27.8%	
Maximum Green (s)	17.9	36.2		15.9	34.2	34.2	18.9	18.9	18.9	18.9	18.9	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.1	4.1	4.1	4.1	4.1	
All-Red Time (s)	2.1	2.0		2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Lost Time (s)	6.1	6.8		6.1	6.8	6.8		6.1	6.1		6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	
Act Effct Green (s)	9.0	41.7		15.9	50.9	50.9		13.4	13.4		13.4	
Actuated g/C Ratio	0.10	0.46		0.18	0.57	0.57		0.15	0.15		0.15	
v/c Ratio	0.41	0.77		0.95	0.50	0.14		0.17	0.36		0.62	
Control Delay	44.1	25.1		78.1	10.2	1.7		33.3	9.2		45.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	44.1	25.1		78.1	10.2	1.7		33.3	9.2		45.6	
LOS	D	C		E	B	A		C	A		D	
Approach Delay		26.1			23.4			14.7			45.6	
Approach LOS		C			C			B			D	

VHB — Synchro 9 Report, 2040 Build AM.syn

2040 Build AM (Cont)

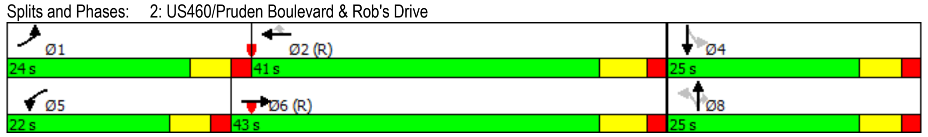
US 460 Corridor Safety Study — 2040 Build AM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	39	300		168	181	1		18	0		77	
Queue Length 95th (ft)	38	#471		159	115	1		35	0		58	
Internal Link Dist (ft)		2419			383			331			91	
Turn Bay Length (ft)	250			400		175			50			
Base Capacity (vph)	352	1632		312	2001	952		294	429		330	
Starvation Cap Reductn	0	0		0	0	0		0	0		0	
Spillback Cap Reductn	0	0		0	0	0		0	0		0	
Storage Cap Reductn	0	0		0	0	0		0	0		0	
Reduced v/c Ratio	0.20	0.77		0.95	0.50	0.14		0.12	0.29		0.44	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 36 (40%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 25.2 — Intersection LOS: C
Intersection Capacity Utilization 69.7% — ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: US460/Pruden Boulevard & Rob's Drive



VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM
2: US460/Pruden Boulevard & Rob's Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	1174	26	174	959	80	9	10	54	40	33	6
Future Volume (veh/h)	33	1174	26	174	959	80	9	10	54	40	33	6
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	72	1210	43	295	999	133	22	13	123	62	73	10
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	94	1709	61	313	2172	972	162	82	193	125	109	13
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.05	0.49	0.49	0.18	0.61	0.61	0.12	0.12	0.12	0.12	0.12	0.12
Ln Grp Delay, s/veh	50.7	21.3	21.2	72.2	10.1	7.6	35.6	0.0	41.0	40.3	0.0	0.0
Ln Grp LOS	D	C	C	E	B	A	D		D	D		
Approach Vol, veh/h		1325			1427			158			145	
Approach Delay, s/veh		22.8			22.7			39.8			40.3	
Approach LOS		C			C			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		7.0
Phs Duration (G+Y+Rc), s	10.9	62.0		17.1	22.0	50.9		17.1
Change Period (Y+Rc), s	6.1	6.8		6.1	6.1	6.8		6.1
Max Green (Gmax), s	17.9	34.2		18.9	15.9	36.2		18.9
Max Allow Headway (MAH), s	3.8	5.1		4.9	3.8	5.1		4.9
Max Q Clear (g_c+I1), s	5.6	15.7		10.1	16.8	26.4		8.7
Green Ext Time (g_e), s	0.1	14.3		0.9	0.0	8.3		1.0
Prob of Phs Call (p_c)	0.83	1.00		1.00	1.00	1.00		1.00
Prob of Max Out (p_x)	0.00	0.77		0.18	1.00	0.91		0.10
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			555	1774			796
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		894		3487		670
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		107		124		1583
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T

VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM
2: US460/Pruden Boulevard & Rob's Drive

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	72	0	0	145	295	0	0	35
Grp Sat Flow (s), veh/h/ln	1774	0	0	1556	1774	0	0	1466
Q Serve Time (g_s), s	3.6	0.0	0.0	6.4	14.8	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	3.6	0.0	0.0	8.1	14.8	0.0	0.0	1.6
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1273	0	0	0	1336
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	1395
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	11.0	0.0	0.0	0.0	11.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	9.4	0.0	0.0	0.0	2.9
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.2
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	1.5	0.0	0.0	0.0	1.2
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.43	1.00	0.00	0.00	0.63
Lane Grp Cap (c), veh/h	94	0	0	247	313	0	0	244
V/C Ratio (X)	0.77	0.00	0.00	0.59	0.94	0.00	0.00	0.14
Avail Cap (c_a), veh/h	353	0	0	381	313	0	0	374
Upstream Filter (I)	0.69	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	42.1	0.0	0.0	38.1	36.6	0.0	0.0	35.4
Incr Delay (d2), s/veh	8.7	0.0	0.0	2.2	35.6	0.0	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	50.7	0.0	0.0	40.3	72.2	0.0	0.0	35.6
1st-Term Q (Q1), veh/ln	1.8	0.0	0.0	3.5	7.2	0.0	0.0	0.8
2nd-Term Q (Q2), veh/ln	0.2	0.0	0.0	0.2	3.1	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	2.0	0.0	0.0	3.7	10.3	0.0	0.0	0.8
%ile Storage Ratio (RQ%)	0.20	0.00	0.00	0.85	0.65	0.00	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	999	0	0	0	614	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	13.7	0.0	0.0	0.0	24.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	13.7	0.0	0.0	0.0	24.4	0.0	0.0
Lane Grp Cap (c), veh/h	0	2172	0	0	0	867	0	0
V/C Ratio (X)	0.00	0.46	0.00	0.00	0.00	0.71	0.00	0.00
Avail Cap (c_a), veh/h	0	2172	0	0	0	867	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.69	0.00	0.00
Uniform Delay (d1), s/veh	0.0	9.4	0.0	0.0	0.0	17.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	3.4	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.1	0.0	0.0	0.0	21.3	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	6.7	0.0	0.0	0.0	11.8	0.0	0.0

VHB — Synchro 9 Report, 2040 Build AM.syn

2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM
2: US460/Pruden Boulevard & Rob's Drive

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.8	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	6.9	0.0	0.0	0.0	12.6	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.44	0.00	0.00	0.00	0.13	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		R
Lanes in Grp	0	1	0	0	0	1	0	1
Grp Vol (v), veh/h	0	133	0	0	0	639	0	123
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1841	0	1583
Q Serve Time (g_s), s	0.0	3.2	0.0	0.0	0.0	24.4	0.0	6.7
Cycle Q Clear Time (g_c), s	0.0	3.2	0.0	0.0	0.0	24.4	0.0	6.7
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.07	0.00	0.07	0.00	1.00
Lane Grp Cap (c), veh/h	0	972	0	0	0	902	0	193
V/C Ratio (X)	0.00	0.14	0.00	0.00	0.00	0.71	0.00	0.64
Avail Cap (c_a), veh/h	0	972	0	0	0	902	0	332
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.69	0.00	1.00
Uniform Delay (d1), s/veh	0.0	7.3	0.0	0.0	0.0	17.9	0.0	37.6
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	3.3	0.0	3.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.6	0.0	0.0	0.0	21.2	0.0	41.0
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	0.0	0.0	12.3	0.0	2.9
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.8	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.4	0.0	0.0	0.0	13.1	0.0	3.1
%ile Storage Ratio (RQ%)	0.00	0.21	0.00	0.00	0.00	0.14	0.00	1.57
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		24.5						
HCM 2010 LOS		C						

US 460 Corridor Safety Study — 2040 Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	1016	0	11	657	65	1	113	95	104	46	64
Future Volume (vph)	155	1016	0	11	657	65	1	113	95	104	46	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	250		145	0		0	0		50
Storage Lanes	1		0	1		1	0		0	1		0
Taper Length (ft)	80			0			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850		0.938			0.914	
Flt Protected	0.950			0.950				0.999		0.950		
Satd. Flow (prot)	1770	3539	0	1770	3539	1583	0	1746	0	1770	1703	0
Flt Permitted	0.950			0.950				0.995		0.220		
Satd. Flow (perm)	1770	3539	0	1770	3539	1583	0	1739	0	410	1703	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						170		33			67	
Link Speed (mph)		55			35			45			45	
Link Distance (ft)		2858			2499			2180			1010	
Travel Time (s)		35.4			48.7			33.0			15.3	
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Adj. Flow (vph)	187	1129	0	31	699	72	4	169	146	139	77	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	187	1129	0	31	699	72	0	319	0	139	180	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases	1	6		5	2			8		7	4	
Permitted Phases						2	8			8		
Detector Phase	1	6		5	2	2	8	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.0	21.8		11.5	21.8	21.8	13.8	13.8		13.8	13.8	
Total Split (s)	20.0	45.0		20.0	45.0	45.0	25.0	25.0		20.0	45.0	
Total Split (%)	18.2%	40.9%		18.2%	40.9%	40.9%	22.7%	22.7%		18.2%	40.9%	
Maximum Green (s)	14.0	38.2		13.5	38.2	38.2	18.2	18.2		13.2	38.2	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.5	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.8		6.5	6.8	6.8		6.8		6.8	6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	
Act Effct Green (s)	13.6	51.3		7.5	40.7	40.7		18.2		29.3	36.1	
Actuated g/C Ratio	0.12	0.47		0.07	0.37	0.37		0.17		0.27	0.33	
v/c Ratio	0.85	0.68		0.26	0.53	0.10		1.01		0.57	0.30	
Control Delay	80.4	27.7		53.3	29.6	0.3		95.7		36.2	17.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	80.4	27.7		53.3	29.6	0.3		95.7		36.2	17.9	
LOS	F	C		D	C	A		F		D	B	
Approach Delay		35.2			27.9			95.7			25.9	
Approach LOS		D			C			F			C	

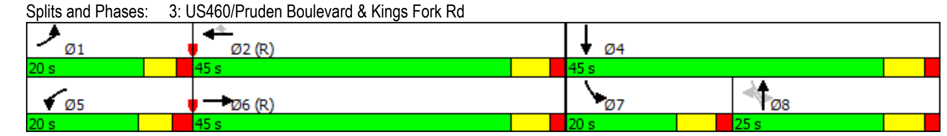
US 460 Corridor Safety Study — 2040 Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	131	352		21	204	0		~211		71	57	
Queue Length 95th (ft)	#220	467		19	270	0		#227		96	57	
Internal Link Dist (ft)		2778			2419			2100			930	
Turn Bay Length (ft)	165			250		145						
Base Capacity (vph)	225	1651		217	1309	692		315		280	635	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.83	0.68		0.14	0.53	0.10		1.01		0.50	0.28	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 39.0 — Intersection LOS: D
Intersection Capacity Utilization 72.8% — ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: US460/Pruden Boulevard & Kings Fork Rd



2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	1016	0	11	657	65	1	113	95	104	46	64
Future Volume (veh/h)	155	1016	0	11	657	65	1	113	95	104	46	64
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	187	1129	0	31	699	72	4	169	146	139	77	103
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	1	1	0
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	216	1704	0	49	1389	621	34	153	130	271	223	298
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.12	0.48	0.00	0.03	0.39	0.39	0.17	0.17	0.17	0.08	0.31	0.31
Ln Grp Delay, s/veh	64.8	22.9	0.0	63.6	26.4	21.6	98.3	0.0	0.0	33.8	0.0	29.9
Ln Grp LOS	E	C		E	C	C	F			C		C
Approach Vol, veh/h		1316			802			319			319	
Approach Delay, s/veh		28.8			27.4			98.3			31.6	
Approach LOS		C			C			F			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6	7	8
Case No	2.0	3.0		4.0	2.0	4.0	1.2	8.0
Phs Duration (G+Y+Rc), s	19.4	50.0		40.7	9.6	59.8	15.7	25.0
Change Period (Y+Rc), s	6.0	6.8		6.8	6.5	6.8	6.8	6.8
Max Green (Gmax), s	14.0	38.2		38.2	13.5	38.2	13.2	18.2
Max Allow Headway (MAH), s	3.6	4.8		5.1	3.8	4.8	3.7	5.1
Max Q Clear (g_c+l1), s	13.4	18.4		11.1	3.9	28.7	8.9	20.2
Green Ext Time (g_e), s	0.0	12.1		2.9	0.0	7.0	0.1	0.0
Prob of Phs Call (p_c)	1.00	1.00		1.00	0.61	1.00	0.99	1.00
Prob of Max Out (p_x)	1.00	0.50		0.00	0.00	0.81	0.55	1.00
Left-Turn Movement Data								
Assigned Mvmt	1				5		7	3
Mvmt Sat Flow, veh/h	1774				1774		1774	7
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		724		3632		926
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		968		0		787
Left Lane Group Data								
Assigned Mvmt	1	0	0	0	5	0	7	3
Lane Assignment	(Prot)				(Prot)		(Pr/Pm)	L+T+R

VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

Lanes in Grp	1	0	0	0	1	0	1	1
Grp Vol (v), veh/h	187	0	0	0	31	0	139	319
Grp Sat Flow (s), veh/h/ln	1774	0	0	0	1774	0	1774	1720
Q Serve Time (g_s), s	11.4	0.0	0.0	0.0	1.9	0.0	6.9	5.7
Cycle Q Clear Time (g_c), s	11.4	0.0	0.0	0.0	1.9	0.0	6.9	18.2
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	1060	1223
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	342	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	20.2	18.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.00	1.00	0.00	1.00	0.01
Lane Grp Cap (c), veh/h	216	0	0	0	49	0	271	318
V/C Ratio (X)	0.87	0.00	0.00	0.00	0.63	0.00	0.51	1.00
Avail Cap (c_a), veh/h	226	0	0	0	218	0	341	318
Upstream Filter (I)	0.56	0.00	0.00	0.00	0.86	0.00	1.00	1.00
Uniform Delay (d1), s/veh	47.4	0.0	0.0	0.0	52.9	0.0	32.3	46.8
Incr Delay (d2), s/veh	17.3	0.0	0.0	0.0	10.7	0.0	1.5	51.5
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	64.8	0.0	0.0	0.0	63.6	0.0	33.8	98.3
1st-Term Q (Q1), veh/ln	5.6	0.0	0.0	0.0	0.9	0.0	3.3	9.6
2nd-Term Q (Q2), veh/ln	1.0	0.0	0.0	0.0	0.1	0.0	0.1	4.5
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	0.00	1.00	0.00	1.00	1.00
%ile Back of Q (50%), veh/ln	6.6	0.0	0.0	0.0	1.1	0.0	3.4	14.2
%ile Storage Ratio (RQ%)	1.02	0.00	0.00	0.00	0.11	0.00	0.09	0.17
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	699	0	0	0	1129	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	16.4	0.0	0.0	0.0	26.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	16.4	0.0	0.0	0.0	26.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	1389	0	0	0	1704	0	0
V/C Ratio (X)	0.00	0.50	0.00	0.00	0.00	0.66	0.00	0.00
Avail Cap (c_a), veh/h	0	1389	0	0	0	1704	0	0
Upstream Filter (I)	0.00	0.86	0.00	0.00	0.00	0.56	0.00	0.00
Uniform Delay (d1), s/veh	0.0	25.3	0.0	0.0	0.0	21.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.0	0.0	0.0	1.2	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	26.4	0.0	0.0	0.0	22.9	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	8.1	0.0	0.0	0.0	13.0	0.0	0.0

VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM
3: US460/Pruden Boulevard & Kings Fork Rd

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	8.3	0.0	0.0	0.0	13.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.09	0.00	0.00	0.00	0.12	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	72	0	180	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1692	0	0	0	0
Q Serve Time (g_s), s	0.0	3.2	0.0	9.1	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	3.2	0.0	9.1	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.57	0.00	0.00	0.00	0.46
Lane Grp Cap (c), veh/h	0	621	0	521	0	0	0	0
V/C Ratio (X)	0.00	0.12	0.00	0.35	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	621	0	588	0	0	0	0
Upstream Filter (I)	0.00	0.86	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	21.3	0.0	29.5	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.4	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	21.6	0.0	29.9	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	4.3	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.5	0.0	4.3	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.26	0.00	0.12	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		36.8						
HCM 2010 LOS		D						

VHB — Synchro 9 Report, 2040 Build AM.syn

2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	1041	77	6	651	78	44	25	15	118	35	4
Future Volume (vph)	9	1041	77	6	651	78	44	25	15	118	35	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220		0	200		110	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	160			150			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986				0.850		0.965			0.992	
Flt Protected	0.950			0.950				0.977			0.967	
Satd. Flow (prot)	1770	3490	0	1770	3539	1583	0	1756	0	0	1787	0
Flt Permitted	0.330			0.133				0.782			0.764	
Satd. Flow (perm)	615	3490	0	248	3539	1583	0	1406	0	0	1412	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				131		18			3	
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		471			2858			1931			2337	
Travel Time (s)		5.8			35.4			29.3			35.4	
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Adj. Flow (vph)	18	1132	115	18	731	132	59	36	33	144	58	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	1247	0	18	731	132	0	128	0	0	214	0
Turn Type	D.P+P	NA		D.P+P	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases	2			6		2	8			4		
Detector Phase	1	6		5	2	2	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.8	21.8		11.8	21.8	21.8	13.3	13.3		13.8	13.8	
Total Split (s)	18.0	46.0		18.0	46.0	46.0	26.0	26.0		26.0	26.0	
Total Split (%)	20.0%	51.1%		20.0%	51.1%	51.1%	28.9%	28.9%		28.9%	28.9%	
Maximum Green (s)	11.2	39.2		11.2	39.2	39.2	19.7	19.7		19.2	19.2	
Yellow Time (s)	4.8	4.8		4.8	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.5	1.5		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.8	6.8		6.8	6.8	6.8		6.3			6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	3.5		0.2	3.5	3.5	0.2	0.2		0.2	0.2	
Time Before Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Act Effct Green (s)	32.0	30.1		32.0	30.1	30.1		16.1			15.6	
Actuated g/C Ratio	0.50	0.47		0.50	0.47	0.47		0.25			0.24	
v/c Ratio	0.04	0.76		0.07	0.44	0.16		0.35			0.62	
Control Delay	7.1	18.7		7.3	13.5	3.4		24.4			34.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	7.1	18.7		7.3	13.5	3.4		24.4			34.5	

VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM

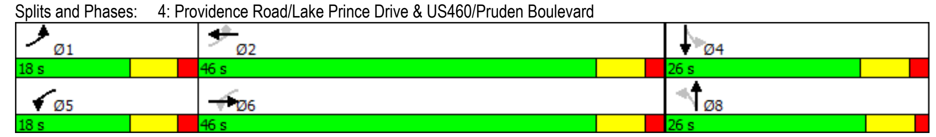
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	B		A	B	A		C			C	
Approach Delay		18.5			11.8			24.4			34.5	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	3	167		3	81	0		32			66	
Queue Length 95th (ft)	6	364		4	178	5		72			108	
Internal Link Dist (ft)		391			2778			1851			2257	
Turn Bay Length (ft)	220			200		110						
Base Capacity (vph)	537	2311		416	2338	1090		478			459	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.03	0.54		0.04	0.31	0.12		0.27			0.47	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 64.4
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 17.8 — Intersection LOS: B
Intersection Capacity Utilization 55.1% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard



VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	1041	77	6	651	78	44	25	15	118	35	4
Future Volume (veh/h)	9	1041	77	6	651	78	44	25	15	118	35	4
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	18	1132	115	18	731	132	59	36	33	144	58	12
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	0
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	377	1592	162	245	1736	777	184	109	74	271	81	15
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.49	0.49	0.02	0.49	0.49	0.17	0.17	0.17	0.17	0.17	0.17
Ln Grp Delay, s/veh	8.4	14.6	14.6	10.5	10.8	9.3	24.5	0.0	0.0	26.8	0.0	0.0
Ln Grp LOS	A	B	B	B	B	A	C			C		
Approach Vol, veh/h		1265			881			128			214	
Approach Delay, s/veh		14.5			10.5			24.5			26.8	
Approach LOS		B			B			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	1.1	3.0		8.0	1.1	4.0		8.0
Phs Duration (G+Y+Rc), s	8.2	38.6		18.1	8.2	38.6		18.1
Change Period (Y+Rc), s	6.8	6.8		6.8	6.8	6.8		* 6.8
Max Green (Gmax), s	11.2	39.2		19.2	11.2	39.2		* 20
Max Allow Headway (MAH), s	3.6	4.7		5.0	3.6	4.7		5.0
Max Q Clear (g_c+I1), s	2.3	10.6		10.1	2.3	19.7		6.3
Green Ext Time (g_e), s	0.0	15.2		1.2	0.0	12.1		1.5
Prob of Phs Call (p_c)	0.28	1.00		1.00	0.28	1.00		1.00
Prob of Max Out (p_x)	0.00	0.42		0.22	0.00	0.58		0.04
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			1025	1774			596
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		467		3245		629
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		89		329		426
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Pr/Pm)			L+T+R	(Pr/Pm)			L+T+R

VHB — Synchro 9 Report, 2040 Build AM.syn

2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	18	0	0	214	18	0	0	128
Grp Sat Flow (s), veh/h/ln	1774	0	0	1581	1774	0	0	1651
Q Serve Time (g_s), s	0.3	0.0	0.0	3.8	0.3	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.3	0.0	0.0	8.1	0.3	0.0	0.0	4.3
Perm LT Sat Flow (s_l), veh/h/ln	638	0	0	1353	444	0	0	1352
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	1786	0	0	0	1675
Perm LT Eff Green (g_p), s	31.8	0.0	0.0	11.3	31.8	0.0	0.0	11.3
Perm LT Serve Time (g_u), s	23.2	0.0	0.0	7.0	14.1	0.0	0.0	3.2
Perm LT Q Serve Time (g_ps), s	0.2	0.0	0.0	3.8	0.7	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.4	0.0	0.0	0.0	2.3
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.4	0.0	0.0	0.0	2.3
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.67	1.00	0.00	0.00	0.46
Lane Grp Cap (c), veh/h	377	0	0	367	245	0	0	368
V/C Ratio (X)	0.05	0.00	0.00	0.58	0.07	0.00	0.00	0.35
Avail Cap (c_a), veh/h	646	0	0	545	514	0	0	564
Upstream Filter (I)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	8.4	0.0	0.0	25.3	10.3	0.0	0.0	23.9
Incr Delay (d2), s/veh	0.1	0.0	0.0	1.5	0.1	0.0	0.0	0.6
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	8.4	0.0	0.0	26.8	10.5	0.0	0.0	24.5
1st-Term Q (Q1), veh/ln	0.2	0.0	0.0	3.6	0.2	0.0	0.0	2.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.2	0.0	0.0	3.8	0.2	0.0	0.0	2.1
%ile Storage Ratio (RQ%)	0.02	0.00	0.00	0.04	0.02	0.00	0.00	0.03
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	731	0	0	0	617	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	8.6	0.0	0.0	0.0	17.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	8.6	0.0	0.0	0.0	17.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	1736	0	0	0	868	0	0
V/C Ratio (X)	0.00	0.42	0.00	0.00	0.00	0.71	0.00	0.00
Avail Cap (c_a), veh/h	0	2138	0	0	0	1069	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	10.6	0.0	0.0	0.0	12.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	1.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.8	0.0	0.0	0.0	14.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	4.2	0.0	0.0	0.0	8.6	0.0	0.0

US 460 Corridor Safety Study — 2040 Build AM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	4.2	0.0	0.0	0.0	9.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.04	0.00	0.00	0.00	0.59	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		
Lanes in Grp	0	1	0	0	0	1	0	0
Grp Vol (v), veh/h	0	132	0	0	0	630	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1805	0	0
Q Serve Time (g_s), s	0.0	3.0	0.0	0.0	0.0	17.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	3.0	0.0	0.0	0.0	17.7	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.06	0.00	0.18	0.00	0.26
Lane Grp Cap (c), veh/h	0	777	0	0	0	885	0	0
V/C Ratio (X)	0.00	0.17	0.00	0.00	0.00	0.71	0.00	0.00
Avail Cap (c_a), veh/h	0	957	0	0	0	1090	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	9.2	0.0	0.0	0.0	12.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	1.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.3	0.0	0.0	0.0	14.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.3	0.0	0.0	0.0	8.8	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.3	0.0	0.0	0.0	9.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.31	0.00	0.00	0.00	0.60	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary

HCM 2010 Ctrl Delay	14.7
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

US 460 Corridor Safety Study — 2040 Build AM
5: Woodlawn Dr & US460/Pruden Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1159	0	0	738	0	2
Future Volume (vph)	1159	0	0	738	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1611
Link Speed (mph)	55			55	25	
Link Distance (ft)	1965			471	1166	
Travel Time (s)	24.4			5.8	31.8	
Peak Hour Factor	0.96	0.92	0.92	0.95	0.25	0.25
Adj. Flow (vph)	1207	0	0	777	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1207	0	0	777	0	8
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 42.0% ICU Level of Service A
Analysis Period (min) 15

2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM
5: Woodlawn Dr & US460/Pruden Boulevard

Intersection						
Int Delay, s/veh	0.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1159	0	0	738	0	2
Future Vol, veh/h	1159	0	0	738	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	92	92	95	25	25
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1207	0	0	777	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	604
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	441
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	441
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0		13.3	
HCM LOS					B	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	441	-	-	-
HCM Lane V/C Ratio	0.018	-	-	-
HCM Control Delay (s)	13.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

US 460 Corridor Safety Study — 2040 Build AM
6: Old Suffolk Rd & US 460/Windsor Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	768	20	24	494	0	26	3	74	1	0	1
Future Volume (vph)	4	768	20	24	494	0	26	3	74	1	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		340	400		0	0		300	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			125			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850						0.850		0.932	
Flt Protected		0.999		0.950				0.960			0.976	
Satd. Flow (prot)	0	3536	1583	1770	3539	0	0	1788	1583	0	1694	0
Flt Permitted		0.999		0.950				0.960			0.976	
Satd. Flow (perm)	0	3536	1583	1770	3539	0	0	1788	1583	0	1694	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		3402			5235			2230			2290	
Travel Time (s)		42.2			64.9			33.8			34.7	
Peak Hour Factor	0.38	0.89	0.80	0.68	0.90	0.92	0.41	0.25	0.34	0.25	0.92	0.25
Adj. Flow (vph)	11	863	25	35	549	0	63	12	218	4	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	874	25	35	549	0	0	75	218	0	8	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 39.3%	ICU Level of Service A
Analysis Period (min) 15	

US 460 Corridor Safety Study — 2040 Build AM
6: Old Suffolk Rd & US 460/Windsor Boulevard

Intersection												
Int Delay, s/veh	5.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	768	20	24	494	0	26	3	74	1	0	1
Future Vol, veh/h	4	768	20	24	494	0	26	3	74	1	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	340	400	-	-	-	-	300	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	89	80	68	90	92	41	25	34	25	92	25
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	863	25	35	549	0	63	12	218	4	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	549	0	0	863	0	0	1229	1503	431	1078	1503	274
Stage 1	-	-	-	-	-	-	884	884	-	619	619	-
Stage 2	-	-	-	-	-	-	345	619	-	459	884	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1017	-	-	775	-	-	134	120	573	173	120	724
Stage 1	-	-	-	-	-	-	307	362	-	443	478	-
Stage 2	-	-	-	-	-	-	644	478	-	551	362	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1017	-	-	775	-	-	127	112	573	94	112	724
Mov Cap-2 Maneuver	-	-	-	-	-	-	127	112	-	94	112	-
Stage 1	-	-	-	-	-	-	301	354	-	434	456	-
Stage 2	-	-	-	-	-	-	612	456	-	323	354	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.6			29.5			27.8		
HCM LOS							D			D		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	124	573	1017	-	-	775	-	-	166
HCM Lane V/C Ratio	0.608	0.38	0.01	-	-	0.046	-	-	0.048
HCM Control Delay (s)	71.2	15.1	8.6	-	-	9.9	-	-	27.8
HCM Lane LOS	F	C	A	-	-	A	-	-	D
HCM 95th %tile Q(veh)	3.1	1.8	0	-	-	0.1	-	-	0.2

2040 Build AM (Cont)

US 460 Corridor Safety Study — 2040 Build AM
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	810	60	63	461	4	8
Future Volume (vph)	810	60	63	461	4	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		180	325		0	0
Storage Lanes		1	1		1	1
Taper Length (ft)			225		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted			0.290		0.950	
Satd. Flow (perm)	3539	1583	540	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		109				18
Link Speed (mph)	55			55	25	
Link Distance (ft)	709			3402	1205	
Travel Time (s)	8.8			42.2	32.9	
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Adj. Flow (vph)	900	109	117	524	8	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	900	109	117	524	8	18
Turn Type	NA	Perm	D.P+P	NA	Prot	Prot
Protected Phases	2		1	6	4	4
Permitted Phases		2	2			
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	5.0	5.0
Minimum Split (s)	21.5	21.5	16.0	21.5	11.0	11.0
Total Split (s)	47.0	47.0	21.0	68.0	26.0	26.0
Total Split (%)	50.0%	50.0%	22.3%	72.3%	27.7%	27.7%
Maximum Green (s)	40.5	40.5	12.0	61.5	20.0	20.0
Yellow Time (s)	5.5	5.5	5.0	5.5	3.0	3.0
All-Red Time (s)	1.0	1.0	4.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	9.0	6.5	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Min	C-Min	None	C-Min	None	None
Act Effct Green (s)	65.2	65.2	70.9	86.3	6.1	6.1
Actuated g/C Ratio	0.69	0.69	0.75	0.92	0.06	0.06
v/c Ratio	0.37	0.10	0.23	0.16	0.07	0.15
Control Delay	7.5	1.9	3.5	1.3	42.0	21.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.5	1.9	3.5	1.3	42.0	21.1
LOS	A	A	A	A	D	C
Approach Delay	6.9			1.7	27.5	
Approach LOS	A			A	C	

VHB — Synchro 9 Report, 2040 Build AM.syn

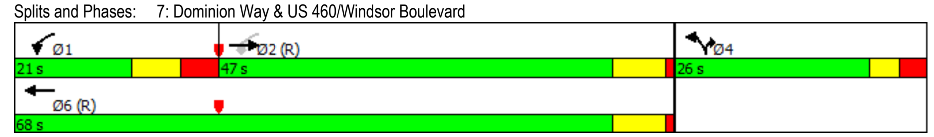
US 460 Corridor Safety Study — 2040 Build AM
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Length 50th (ft)	77	0	3	0	5	0
Queue Length 95th (ft)	188	2	15	41	11	5
Internal Link Dist (ft)	629			3322	1125	
Turn Bay Length (ft)		180	325			
Base Capacity (vph)	2452	1130	585	3247	376	350
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.10	0.20	0.16	0.02	0.05

Intersection Summary

Area Type: Other
Cycle Length: 94
Actuated Cycle Length: 94
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.37
Intersection Signal Delay: 5.3 — Intersection LOS: A
Intersection Capacity Utilization 50.3% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Dominion Way & US 460/Windsor Boulevard



VHB — Synchro 9 Report, 2040 Build AM.syn

US 460 Corridor Safety Study — 2040 Build AM
7: Dominion Way & US 460/Windsor Boulevard

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	810	60	63	461	4	8
Future Volume (veh/h)	810	60	63	461	4	8
Number	2	12	1	6	7	14
Initial Q, veh	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)		1.00	1.00		1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	900	109	117	524	8	18
Adj No. of Lanes	2	1	1	2	1	1
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Percent Heavy Veh, %	2	2	2	2	2	2
Opposing Right Turn Influence			Yes		Yes	
Cap, veh/h	2386	1067	516	2976	47	42
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.67	0.67	0.07	0.84	0.03	0.03
Ln Grp Delay, s/veh	7.2	5.6	4.0	1.5	46.5	52.1
Ln Grp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1009			641	26	
Approach Delay, s/veh	7.0			2.0	50.4	
Approach LOS	A			A	D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.2	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	15.7	69.9		8.5		85.5		
Change Period (Y+Rc), s	9.0	6.5		6.0		6.5		
Max Green (Gmax), s	12.0	40.5		20.0		61.5		
Max Allow Headway (MAH), s	3.6	4.7		4.0		4.7		
Max Q Clear (g_c+I1), s	3.6	12.4		3.1		4.6		
Green Ext Time (g_e), s	0.1	10.4		0.0		12.2		
Prob of Phs Call (p_c)	0.95	1.00		0.49		1.00		
Prob of Max Out (p_x)	0.01	0.15		0.00		0.01		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

VHB — Synchro 9 Report, 2040 Build AM.syn

2040 Build AM (Cont)

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	117	0	0	8	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	1.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	1.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	556	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	65.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	52.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	63.4	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	516	0	0	47	0	0	0	0
V/C Ratio (X)	0.23	0.00	0.00	0.17	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	616	0	0	377	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	3.8	0.0	0.0	44.8	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	1.7	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	4.0	0.0	0.0	46.5	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.7	0.0	0.0	0.2	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.7	0.0	0.0	0.2	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	900	0	0	0	524	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	10.4	0.0	0.0	0.0	2.6	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	10.4	0.0	0.0	0.0	2.6	0.0	0.0
Lane Grp Cap (c), veh/h	0	2386	0	0	0	2976	0	0
V/C Ratio (X)	0.00	0.38	0.00	0.00	0.00	0.18	0.00	0.00
Avail Cap (c_a), veh/h	0	2386	0	0	0	2976	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	6.7	0.0	0.0	0.0	1.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.5	0.0	0.0	0.0	0.1	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.2	0.0	0.0	0.0	1.5	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	5.0	0.0	0.0	0.0	1.2	0.0	0.0

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	5.2	0.0	0.0	0.0	1.3	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.20	0.00	0.00	0.00	0.01	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	109	0	18	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	2.3	0.0	1.1	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.3	0.0	1.1	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1067	0	42	0	0	0	0
V/C Ratio (X)	0.00	0.10	0.00	0.43	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1067	0	337	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	5.4	0.0	45.1	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	7.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.6	0.0	52.1	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.14	0.00	0.01	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		5.7						
HCM 2010 LOS		A						

2040 Build PM

US 460 Corridor Safety Study — 2040 Build PM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	11	1558	0	1607	71	66	28
Future Volume (vph)	11	1558	0	1607	71	66	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	305		125		195	0	155
Storage Lanes	1		1		1	1	1
Taper Length (ft)	190		200			0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Frt					0.850		0.850
Flt Protected	0.950					0.950	
Satd. Flow (prot)	1770	3539	1863	3539	1583	1770	1583
Flt Permitted	0.050					0.950	
Satd. Flow (perm)	93	3539	1863	3539	1583	1770	1583
Right Turn on Red					Yes		Yes
Satd. Flow (RTOR)					71		74
Link Speed (mph)		55		55		25	
Link Distance (ft)		537		2299		1306	
Travel Time (s)		6.7		28.5		35.6	
Peak Hour Factor	0.58	0.94	0.92	0.82	0.63	0.58	0.38
Adj. Flow (vph)	19	1657	0	1960	113	114	74
Shared Lane Traffic (%)							
Lane Group Flow (vph)	19	1657	0	1960	113	114	74
Turn Type	pm+pt	NA	pm+pt	NA	Prot	Prot	Prot
Protected Phases	1	6	5	2	2	7	4
Permitted Phases	6		2				
Detector Phase	1	6	5	2	2	7	4
Switch Phase							
Minimum Initial (s)	5.0	15.0	5.0	15.0	15.0	7.0	7.0
Minimum Split (s)	13.3	23.3	9.5	34.9	34.9	14.4	14.4
Total Split (s)	18.0	69.0	18.0	69.0	69.0	23.0	23.0
Total Split (%)	16.4%	62.7%	16.4%	62.7%	62.7%	20.9%	20.9%
Maximum Green (s)	9.7	60.7	13.5	61.1	61.1	15.6	15.6
Yellow Time (s)	4.8	4.8	3.5	4.8	4.8	4.0	4.0
All-Red Time (s)	3.5	3.5	1.0	3.1	3.1	3.4	3.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	8.3	8.3	4.5	7.9	7.9	7.4	7.4
Lead/Lag	Lead	Lag	Lead	Lag	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None
Walk Time (s)				7.0	7.0		
Flash Dont Walk (s)				20.0	20.0		
Pedestrian Calls (#/hr)				0	0		
Act Effct Green (s)	82.2	82.2		76.8	76.8	12.1	12.1
Actuated g/C Ratio	0.75	0.75		0.70	0.70	0.11	0.11
v/c Ratio	0.12	0.63		0.79	0.10	0.59	0.31
Control Delay	2.5	4.1		16.9	3.9	58.5	13.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	2.5	4.1		16.9	3.9	58.5	13.5

VHB — Synchro 9 Report, 2040 Build PM.syn

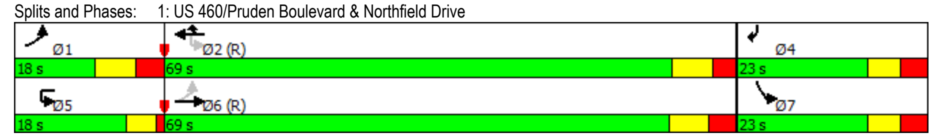
US 460 Corridor Safety Study — 2040 Build PM
1: US 460/Pruden Boulevard & Northfield Drive

Lane Group	EBL	EBT	WBU	WBT	WBR	SBL	SBR
LOS	A	A		B	A	E	B
Approach Delay		4.1		16.2		40.8	
Approach LOS		A		B		D	
Queue Length 50th (ft)	1	12		349	7	78	0
Queue Length 95th (ft)	m2	50		627	18	82	0
Internal Link Dist (ft)		457		2219		1226	
Turn Bay Length (ft)	305				195		155
Base Capacity (vph)	217	2645		2472	1127	251	288
Starvation Cap Reductn	0	0		0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0
Reduced v/c Ratio	0.09	0.63		0.79	0.10	0.45	0.26

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 86 (78%), Referenced to phase 2:WBTU and 6:EBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 12.2 — Intersection LOS: B
Intersection Capacity Utilization 63.0% — ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: US 460/Pruden Boulevard & Northfield Drive



VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
1: US 460/Pruden Boulevard & Northfield Drive

HCM 2010 cannot analyze U-Turning movements.

VHB — Synchro 9 Report, 2040 Build PM.syn

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	1442	5	27	1520	140	8	8	39	35	1	7
Future Volume (vph)	6	1442	5	27	1520	140	8	8	39	35	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	400		175	0		50	0		0
Storage Lanes	1		0	1		1	0		1	0		0
Taper Length (ft)	0			0			0			0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850		0.978	
Flt Protected	0.950			0.950				0.969			0.961	
Satd. Flow (prot)	1770	3536	0	1770	3539	1583	0	1805	1583	0	1751	0
Flt Permitted	0.950			0.950				0.816			0.746	
Satd. Flow (perm)	1770	3536	0	1770	3539	1583	0	1520	1583	0	1359	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				142			98		8	
Link Speed (mph)		35			35			25			30	
Link Distance (ft)		2499			463			411			171	
Travel Time (s)		48.7			9.0			11.2			3.9	
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Adj. Flow (vph)	13	1487	8	46	1583	233	20	11	89	55	2	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	1495	0	46	1583	233	0	31	89	0	68	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases						2	8		8	4		
Detector Phase	1	6		5	2	2	8	8	8	4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	11.1	21.8		11.1	21.8	21.8	13.1	13.1	13.1	13.1	13.1	
Total Split (s)	20.0	60.0		20.0	60.0	60.0	30.0	30.0	30.0	30.0	30.0	
Total Split (%)	18.2%	54.5%		18.2%	54.5%	54.5%	27.3%	27.3%	27.3%	27.3%	27.3%	
Maximum Green (s)	13.9	53.2		13.9	53.2	53.2	23.9	23.9	23.9	23.9	23.9	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.1	4.1	4.1	4.1	4.1	
All-Red Time (s)	2.1	2.0		2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Lost Time (s)	6.1	6.8		6.1	6.8	6.8		6.1	6.1		6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	
Act Effct Green (s)	6.4	78.5		8.3	85.2	85.2		10.5	10.5		10.5	
Actuated g/C Ratio	0.06	0.71		0.08	0.77	0.77		0.10	0.10		0.10	
v/c Ratio	0.13	0.59		0.35	0.58	0.19		0.22	0.37		0.50	
Control Delay	51.3	12.2		70.4	2.0	0.3		48.0	12.1		53.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	
Total Delay	51.3	12.2		70.4	2.0	0.3		48.0	12.1		53.4	
LOS	D	B		E	A	A		D	B		D	
Approach Delay		12.6			3.4			21.3			53.4	
Approach LOS		B			A			C			D	

VHB — Synchro 9 Report, 2040 Build PM.syn

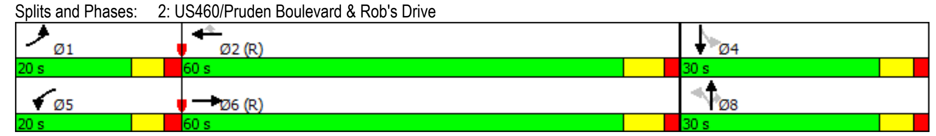
US 460 Corridor Safety Study — 2040 Build PM
2: US460/Pruden Boulevard & Rob's Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	9	297		32	3	0		21	0		41	
Queue Length 95th (ft)	15	455		m42	103	1		40	0		38	
Internal Link Dist (ft)		2419			383			331			91	
Turn Bay Length (ft)	250			400		175			50			
Base Capacity (vph)	223	2525		223	2741	1258		330	420		301	
Starvation Cap Reductn	0	0		0	0	0		0	0		0	
Spillback Cap Reductn	0	0		0	0	0		0	0		0	
Storage Cap Reductn	0	0		0	0	0		0	0		0	
Reduced v/c Ratio	0.06	0.59		0.21	0.58	0.19		0.09	0.21		0.23	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 48 (44%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 8.9 — Intersection LOS: A
Intersection Capacity Utilization 67.5% — ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: US460/Pruden Boulevard & Rob's Drive



VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
2: US460/Pruden Boulevard & Rob's Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	1442	5	27	1520	140	8	8	39	35	1	7
Future Volume (veh/h)	6	1442	5	27	1520	140	8	8	39	35	1	7
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	13	1487	8	46	1583	233	20	11	89	55	2	11
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	0.46	0.97	0.61	0.59	0.96	0.60	0.40	0.75	0.44	0.64	0.45	0.63
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	26	2560	14	61	2579	1154	133	62	133	133	9	16
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.01	0.71	0.71	0.03	0.73	0.73	0.08	0.08	0.08	0.08	0.08	0.08
Ln Grp Delay, s/veh	57.1	8.4	8.4	69.8	8.4	5.1	47.3	0.0	54.7	51.4	0.0	0.0
Ln Grp LOS	E	A	A	E	A	A	D		D	D		
Approach Vol, veh/h		1508			1862			120			68	
Approach Delay, s/veh		8.8			9.5			52.8			51.4	
Approach LOS		A			A			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	2.0	3.0		8.0	2.0	4.0		7.0
Phs Duration (G+Y+Rc), s	7.7	86.9		15.3	9.9	84.8		15.3
Change Period (Y+Rc), s	6.1	6.8		6.1	6.1	6.8		6.1
Max Green (Gmax), s	13.9	53.2		23.9	13.9	53.2		23.9
Max Allow Headway (MAH), s	3.8	5.0		4.8	3.8	5.0		4.8
Max Q Clear (g_c+I1), s	2.8	26.2		8.6	4.8	24.4		8.0
Green Ext Time (g_e), s	0.0	24.3		0.7	0.0	25.7		0.7
Prob of Phs Call (p_c)	0.33	1.00		1.00	0.75	1.00		1.00
Prob of Max Out (p_x)	0.00	0.89		0.00	0.00	0.89		0.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			878	1774			940
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		110		3610		738
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		191		19		1583
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Prot)			L+T+R	(Prot)			L+T

VHB — Synchro 9 Report, 2040 Build PM.syn

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM
2: US460/Pruden Boulevard & Rob's Drive

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	13	0	0	68	46	0	0	31
Grp Sat Flow (s), veh/h/ln	1774	0	0	1179	1774	0	0	1678
Q Serve Time (g_s), s	0.8	0.0	0.0	4.8	2.8	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.8	0.0	0.0	6.6	2.8	0.0	0.0	1.8
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	1315	0	0	0	1423
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	1712
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	9.2	0.0	0.0	0.0	9.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	7.5	0.0	0.0	0.0	2.7
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.1
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.1
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.81	1.00	0.00	0.00	0.65
Lane Grp Cap (c), veh/h	26	0	0	158	61	0	0	194
V/C Ratio (X)	0.49	0.00	0.00	0.43	0.76	0.00	0.00	0.16
Avail Cap (c_a), veh/h	224	0	0	337	224	0	0	399
Upstream Filter (I)	0.24	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	53.8	0.0	0.0	49.6	52.7	0.0	0.0	47.0
Incr Delay (d2), s/veh	3.4	0.0	0.0	1.8	17.1	0.0	0.0	0.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	57.1	0.0	0.0	51.4	69.8	0.0	0.0	47.3
1st-Term Q (Q1), veh/ln	0.4	0.0	0.0	2.0	1.4	0.0	0.0	0.9
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.4	0.0	0.0	2.1	1.7	0.0	0.0	0.9
%ile Storage Ratio (RQ%)	0.04	0.00	0.00	0.49	0.11	0.00	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1583	0	0	0	729	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	24.2	0.0	0.0	0.0	22.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	24.2	0.0	0.0	0.0	22.4	0.0	0.0
Lane Grp Cap (c), veh/h	0	2579	0	0	0	1255	0	0
V/C Ratio (X)	0.00	0.61	0.00	0.00	0.00	0.58	0.00	0.00
Avail Cap (c_a), veh/h	0	2579	0	0	0	1255	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.24	0.00	0.00
Uniform Delay (d1), s/veh	0.0	7.3	0.0	0.0	0.0	7.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.0	0.0	0.0	0.5	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	8.4	0.0	0.0	0.0	8.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	11.7	0.0	0.0	0.0	10.7	0.0	0.0

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
2: US460/Pruden Boulevard & Rob's Drive

2nd-Term Q (Q2), veh/ln	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	12.0	0.0	0.0	0.0	10.9	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.77	0.00	0.00	0.00	0.11	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		R
Lanes in Grp	0	1	0	0	0	1	0	1
Grp Vol (v), veh/h	0	233	0	0	0	766	0	89
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1859	0	1583
Q Serve Time (g_s), s	0.0	5.2	0.0	0.0	0.0	22.4	0.0	6.0
Cycle Q Clear Time (g_c), s	0.0	5.2	0.0	0.0	0.0	22.4	0.0	6.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.16	0.00	0.01	0.00	1.00
Lane Grp Cap (c), veh/h	0	1154	0	0	0	1319	0	133
V/C Ratio (X)	0.00	0.20	0.00	0.00	0.00	0.58	0.00	0.67
Avail Cap (c_a), veh/h	0	1154	0	0	0	1319	0	344
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.24	0.00	1.00
Uniform Delay (d1), s/veh	0.0	4.8	0.0	0.0	0.0	7.9	0.0	48.9
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.0	0.5	0.0	5.7
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	5.1	0.0	0.0	0.0	8.4	0.0	54.7
1st-Term Q (Q1), veh/ln	0.0	2.2	0.0	0.0	0.0	11.3	0.0	2.6
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.3	0.0	0.0	0.0	11.4	0.0	2.8
%ile Storage Ratio (RQ%)	0.00	0.34	0.00	0.00	0.00	0.12	0.00	1.44
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		11.5						
HCM 2010 LOS		B						

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1234	11	108	1189	200	6	142	31	94	84	105
Future Volume (vph)	120	1234	11	108	1189	200	6	142	31	94	84	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	250		145	0		0	0		50
Storage Lanes	1		0	1		1	0		0	1		0
Taper Length (ft)	80			0			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850		0.977			0.918	
Flt Protected	0.950			0.950				0.996		0.950		
Satd. Flow (prot)	1770	3536	0	1770	3539	1583	0	1813	0	1770	1710	0
Flt Permitted	0.950			0.950				0.940		0.259		
Satd. Flow (perm)	1770	3536	0	1770	3539	1583	0	1711	0	482	1710	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				149		7			48	
Link Speed (mph)		55			35			45			45	
Link Distance (ft)		2858			2499			2180			1010	
Travel Time (s)		35.4			48.7			33.0			15.3	
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Adj. Flow (vph)	145	1371	12	309	1265	222	24	212	48	125	140	169
Shared Lane Traffic (%)												
Lane Group Flow (vph)	145	1383	0	309	1265	222	0	284	0	125	309	0
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases	1	6		5	2			8		7	4	
Permitted Phases						2	8			8		
Detector Phase	1	6		5	2	2	8	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.0	21.8		11.5	21.8	21.8	13.8	13.8		13.8	13.8	
Total Split (s)	25.0	58.0		25.0	58.0	58.0	28.0	28.0		14.0	42.0	
Total Split (%)	20.0%	46.4%		20.0%	46.4%	46.4%	22.4%	22.4%		11.2%	33.6%	
Maximum Green (s)	19.0	51.2		18.5	51.2	51.2	21.2	21.2		7.2	35.2	
Yellow Time (s)	4.0	4.8		4.0	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.5	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.8		6.5	6.8	6.8		6.8		6.8	6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	
Act Effct Green (s)	15.0	51.0		18.5	55.0	55.0		21.2		28.6	35.4	
Actuated g/C Ratio	0.12	0.41		0.15	0.44	0.44		0.17		0.23	0.28	
v/c Ratio	0.68	0.96		1.18	0.81	0.28		0.96		0.67	0.60	
Control Delay	68.5	52.0		160.6	36.3	9.1		94.2		55.2	37.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	68.5	52.0		160.6	36.3	9.1		94.2		55.2	37.9	
LOS	E	D		F	D	A		F		E	D	
Approach Delay		53.6			54.3			94.2			42.9	
Approach LOS		D			D			F			D	

VHB — Synchro 9 Report, 2040 Build PM.syn

2040 Build PM (Cont)

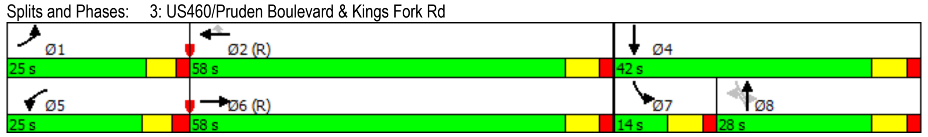
US 460 Corridor Safety Study — 2040 Build PM
3: US460/Pruden Boulevard & Kings Fork Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	114	562		~299	463	34		225		78	183	
Queue Length 95th (ft)	164	#722		124	588	93		231		108	158	
Internal Link Dist (ft)		2778			2419			2100			930	
Turn Bay Length (ft)	165			250		145						
Base Capacity (vph)	269	1448		261	1555	779		295		186	519	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.54	0.96		1.18	0.81	0.28		0.96		0.67	0.60	

Intersection Summary

Area Type: Other
Cycle Length: 125
Actuated Cycle Length: 125
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 55.6 — Intersection LOS: E
Intersection Capacity Utilization 83.4% — ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: US460/Pruden Boulevard & Kings Fork Rd



US 460 Corridor Safety Study — 2040 Build PM
3: US460/Pruden Boulevard & Kings Fork Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	1234	11	108	1189	200	6	142	31	94	84	105
Future Volume (veh/h)	120	1234	11	108	1189	200	6	142	31	94	84	105
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	145	1371	12	309	1265	222	24	212	48	125	140	169
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	1	1	0
Peak Hour Factor	0.83	0.90	0.92	0.35	0.94	0.90	0.25	0.67	0.65	0.75	0.60	0.62
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	172	1473	13	263	1644	735	47	230	50	235	217	262
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.10	0.41	0.41	0.15	0.46	0.46	0.17	0.17	0.17	0.06	0.28	0.28
Ln Grp Delay, s/veh	62.2	46.9	46.6	159.8	30.7	21.7	72.6	0.0	0.0	40.8	0.0	42.4
Ln Grp LOS	E	D	D	F	C	C	E			D		D
Approach Vol, veh/h		1528			1796			284			434	
Approach Delay, s/veh		48.2			51.8			72.6			41.9	
Approach LOS		D			D			E			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6	7	8
Case No	2.0	3.0		4.0	2.0	4.0	1.2	8.0
Phs Duration (G+Y+Rc), s	18.1	64.9		42.0	25.0	58.0	14.0	28.0
Change Period (Y+Rc), s	6.0	6.8		6.8	6.5	6.8	6.8	6.8
Max Green (Gmax), s	19.0	51.2		35.2	18.5	51.2	7.2	21.2
Max Allow Headway (MAH), s	3.6	4.8		5.1	3.8	4.8	3.7	5.1
Max Q Clear (g_c+I1), s	12.0	39.2		22.0	20.5	47.5	9.2	22.2
Green Ext Time (g_e), s	0.2	10.6		2.8	0.0	3.5	0.0	0.0
Prob of Phs Call (p_c)	0.99	1.00		1.00	1.00	1.00	0.99	1.00
Prob of Max Out (p_x)	0.04	0.92		0.15	1.00	1.00	1.00	1.00
Left-Turn Movement Data								
Assigned Mvmt	1				5		7	3
Mvmt Sat Flow, veh/h	1774				1774		1774	91
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		770		3595		1358
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		929		31		295
Left Lane Group Data								
Assigned Mvmt	1	0	0	0	5	0	7	3
Lane Assignment	(Prot)				(Prot)		(Pr/Pm)	L+T+R

US 460 Corridor Safety Study — 2040 Build PM
3: US460/Pruden Boulevard & Kings Fork Rd

Lanes in Grp	1	0	0	0	1	0	1	1
Grp Vol (v), veh/h	145	0	0	0	309	0	125	284
Grp Sat Flow (s), veh/h/ln	1774	0	0	0	1774	0	1774	1743
Q Serve Time (g_s), s	10.0	0.0	0.0	0.0	18.5	0.0	7.2	12.3
Cycle Q Clear Time (g_c), s	10.0	0.0	0.0	0.0	18.5	0.0	7.2	20.2
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	1115	1087
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	375	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	23.2	21.2
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	1.0	15.2
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.3
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.00	1.00	0.00	1.00	0.08
Lane Grp Cap (c), veh/h	172	0	0	0	263	0	235	327
V/C Ratio (X)	0.84	0.00	0.00	0.00	1.18	0.00	0.53	0.87
Avail Cap (c_a), veh/h	270	0	0	0	263	0	235	327
Upstream Filter (I)	0.48	0.00	0.00	0.00	0.79	0.00	1.00	1.00
Uniform Delay (d1), s/veh	55.5	0.0	0.0	0.0	53.3	0.0	38.5	51.3
Incr Delay (d2), s/veh	6.7	0.0	0.0	0.0	106.6	0.0	2.3	21.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	62.2	0.0	0.0	0.0	159.8	0.0	40.8	72.6
1st-Term Q (Q1), veh/ln	4.9	0.0	0.0	0.0	9.0	0.0	3.5	9.7
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.0	0.0	7.8	0.0	0.1	1.9
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	0.00	1.00	0.00	1.00	1.00
%ile Back of Q (50%), veh/ln	5.2	0.0	0.0	0.0	16.8	0.0	3.6	11.6
%ile Storage Ratio (RQ%)	0.81	0.00	0.00	0.00	1.71	0.00	0.10	0.14
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	11.6	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1265	0	0	0	675	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	37.2	0.0	0.0	0.0	45.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	37.2	0.0	0.0	0.0	45.5	0.0	0.0
Lane Grp Cap (c), veh/h	0	1644	0	0	0	725	0	0
V/C Ratio (X)	0.00	0.77	0.00	0.00	0.00	0.93	0.00	0.00
Avail Cap (c_a), veh/h	0	1644	0	0	0	725	0	0
Upstream Filter (I)	0.00	0.79	0.00	0.00	0.00	0.48	0.00	0.00
Uniform Delay (d1), s/veh	0.0	27.9	0.0	0.0	0.0	35.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	2.8	0.0	0.0	0.0	11.7	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	30.7	0.0	0.0	0.0	46.9	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	18.1	0.0	0.0	0.0	22.1	0.0	0.0

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM

3: US460/Pruden Boulevard & Kings Fork Rd

2nd-Term Q (Q2), veh/ln	0.0	0.6	0.0	0.0	0.0	2.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	18.7	0.0	0.0	0.0	24.5	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.20	0.00	0.00	0.00	0.23	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		
Lanes in Grp	0	1	0	1	0	1	0	0
Grp Vol (v), veh/h	0	222	0	309	0	708	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1699	0	1857	0	0
Q Serve Time (g_s), s	0.0	10.9	0.0	20.0	0.0	45.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	10.9	0.0	20.0	0.0	45.5	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.55	0.00	0.02	0.00	0.17
Lane Grp Cap (c), veh/h	0	735	0	478	0	761	0	0
V/C Ratio (X)	0.00	0.30	0.00	0.65	0.00	0.93	0.00	0.00
Avail Cap (c_a), veh/h	0	735	0	478	0	761	0	0
Upstream Filter (I)	0.00	0.79	0.00	1.00	0.00	0.48	0.00	0.00
Uniform Delay (d1), s/veh	0.0	20.8	0.0	39.4	0.0	35.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.8	0.0	3.0	0.0	11.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	21.7	0.0	42.4	0.0	46.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	4.7	0.0	9.4	0.0	23.2	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.4	0.0	2.4	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	4.9	0.0	9.8	0.0	25.6	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.86	0.00	0.26	0.00	0.24	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	50.9
HCM 2010 LOS	D

VHB — Synchro 9 Report 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	1231	60	26	1198	138	100	38	11	70	63	8
Future Volume (vph)	11	1231	60	26	1198	138	100	38	11	70	63	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220		0	200		110	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (ft)	160			150			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991				0.850		0.985			0.985	
Flt Protected	0.950			0.950				0.970			0.981	
Satd. Flow (prot)	1770	3507	0	1770	3539	1583	0	1780	0	0	1800	0
Flt Permitted	0.119			0.084				0.652			0.793	
Satd. Flow (perm)	222	3507	0	156	3539	1583	0	1196	0	0	1455	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				129		5			5	
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		471			2858			1931			2337	
Travel Time (s)		5.8			35.4			29.3			35.4	
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Adj. Flow (vph)	22	1338	90	79	1346	234	133	55	24	85	105	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	1428	0	79	1346	234	0	212	0	0	214	0
Turn Type	D.P+P	NA		D.P+P	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases	2			6		2	8			4		
Detector Phase	1	6		5	2	2	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	11.8	21.8		11.8	21.8	21.8	13.3	13.3		13.8	13.8	
Total Split (s)	16.0	67.0		16.0	67.0	67.0	27.0	27.0		27.0	27.0	
Total Split (%)	14.5%	60.9%		14.5%	60.9%	60.9%	24.5%	24.5%		24.5%	24.5%	
Maximum Green (s)	9.2	60.2		9.2	60.2	60.2	20.7	20.7		20.2	20.2	
Yellow Time (s)	4.8	4.8		4.8	4.8	4.8	4.8	4.8		4.8	4.8	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	1.5	1.5		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.8	6.8		6.8	6.8	6.8		6.3			6.8	
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?				Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	0.2	3.5		3.0	3.5	3.5	0.2	0.2		0.2	0.2	
Time Before Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	20.0		0.0	20.0	20.0	0.0	0.0		0.0	0.0	
Recall Mode	None	Min		None	Min	Min	None	None		None	None	
Act Effct Green (s)	53.8	45.7		51.1	51.6	51.6		21.2			20.6	
Actuated g/C Ratio	0.59	0.50		0.56	0.57	0.57		0.23			0.23	
v/c Ratio	0.09	0.81		0.37	0.67	0.25		0.75			0.64	
Control Delay	6.6	23.2		12.4	16.0	5.5		54.9			45.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	6.6	23.2		12.4	16.0	5.5		54.9			45.9	

VHB — Synchro 9 Report 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM

4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	C		B	B	A		D			D	
Approach Delay		23.0			14.3			54.9			45.9	
Approach LOS		C			B			D			D	
Queue Length 50th (ft)	4	363		16	221	22		119			117	
Queue Length 95th (ft)	7	463		11	395	29		#182			139	
Internal Link Dist (ft)		391			2778			1851			2257	
Turn Bay Length (ft)	220			200		110						
Base Capacity (vph)	297	2426		260	2466	1142		287			341	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.07	0.59		0.30	0.55	0.20		0.74			0.63	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 91

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

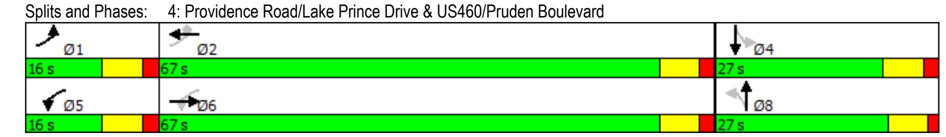
Intersection Signal Delay: 22.2 — Intersection LOS: C

Intersection Capacity Utilization 58.5% — ICU Level of Service B

Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard



VHB — Synchro 9 Report 2040 Build PM.syn

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	1231	60	26	1198	138	100	38	11	70	63	8
Future Volume (veh/h)	11	1231	60	26	1198	138	100	38	11	70	63	8
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	22	1338	90	79	1346	234	133	55	24	85	105	24
Adj No. of Lanes	1	2	0	1	2	1	0	1	0	0	1	0
Peak Hour Factor	0.50	0.92	0.67	0.33	0.89	0.59	0.75	0.69	0.46	0.82	0.60	0.33
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	216	1857	125	249	2031	909	204	72	28	154	167	34
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.02	0.55	0.55	0.05	0.57	0.57	0.19	0.19	0.19	0.19	0.19	0.19
Ln Grp Delay, s/veh	11.8	18.2	18.3	14.4	14.9	10.5	44.1	0.0	0.0	38.9	0.0	0.0
Ln Grp LOS	B	B	B	B	B	B	D			D		
Approach Vol, veh/h		1450			1659			212			214	
Approach Delay, s/veh		18.2			14.3			44.1			38.9	
Approach LOS		B			B			D			D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Case No	1.1	3.0		8.0	1.1	4.0		8.0
Phs Duration (G+Y+Rc), s	9.0	62.7		25.6	11.2	60.5		25.6
Change Period (Y+Rc), s	6.8	6.8		6.8	6.8	6.8		* 6.8
Max Green (Gmax), s	9.2	60.2		20.2	9.2	60.2		* 21
Max Allow Headway (MAH), s	3.6	4.7		5.1	3.6	4.7		5.1
Max Q Clear (g_c+l1), s	2.5	27.5		14.3	3.8	30.9		18.3
Green Ext Time (g_e), s	0.0	24.8		1.2	0.1	22.8		0.6
Prob of Phs Call (p_c)	0.45	1.00		1.00	0.88	1.00		1.00
Prob of Max Out (p_x)	0.00	0.72		0.76	0.12	0.75		1.00
Left-Turn Movement Data								
Assigned Mvmt	1			7	5			3
Mvmt Sat Flow, veh/h	1774			531	1774			744
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		863		3367		372
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		176		226		143
Left Lane Group Data								
Assigned Mvmt	1	0	0	7	5	0	0	3
Lane Assignment	(Pr/Pm)			L+T+R	(Pr/Pm)			L+T+R

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

Lanes in Grp	1	0	0	1	1	0	0	1
Grp Vol (v), veh/h	22	0	0	214	79	0	0	212
Grp Sat Flow (s), veh/h/ln	1774	0	0	1570	1774	0	0	1259
Q Serve Time (g_s), s	0.5	0.0	0.0	0.0	1.8	0.0	0.0	4.0
Cycle Q Clear Time (g_c), s	0.5	0.0	0.0	12.3	1.8	0.0	0.0	16.3
Perm LT Sat Flow (s_l), veh/h/ln	323	0	0	1341	373	0	0	1281
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	1525	0	0	0	1136
Perm LT Eff Green (g_p), s	55.9	0.0	0.0	18.8	53.7	0.0	0.0	18.8
Perm LT Serve Time (g_u), s	30.4	0.0	0.0	2.6	24.8	0.0	0.0	6.6
Perm LT Q Serve Time (g_ps), s	1.9	0.0	0.0	0.0	7.8	0.0	0.0	4.0
Time to First Blk (g_f), s	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.8
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.8
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	0.40	1.00	0.00	0.00	0.63
Lane Grp Cap (c), veh/h	216	0	0	355	249	0	0	304
V/C Ratio (X)	0.10	0.00	0.00	0.60	0.32	0.00	0.00	0.70
Avail Cap (c_a), veh/h	342	0	0	377	337	0	0	331
Upstream Filter (I)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	11.6	0.0	0.0	36.4	13.7	0.0	0.0	38.3
Incr Delay (d2), s/veh	0.2	0.0	0.0	2.4	0.7	0.0	0.0	5.7
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	11.8	0.0	0.0	38.9	14.4	0.0	0.0	44.1
1st-Term Q (Q1), veh/ln	0.2	0.0	0.0	5.3	0.9	0.0	0.0	5.5
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.5
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.3	0.0	0.0	5.6	0.9	0.0	0.0	6.0
%ile Storage Ratio (RQ%)	0.03	0.00	0.00	0.06	0.12	0.00	0.00	0.08
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	1346	0	0	0	702	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	25.5	0.0	0.0	0.0	28.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	25.5	0.0	0.0	0.0	28.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	2031	0	0	0	976	0	0
V/C Ratio (X)	0.00	0.66	0.00	0.00	0.00	0.72	0.00	0.00
Avail Cap (c_a), veh/h	0	2189	0	0	0	1094	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	14.3	0.0	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	2.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	14.9	0.0	0.0	0.0	18.2	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	12.3	0.0	0.0	0.0	13.8	0.0	0.0

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
4: Providence Road/Lake Prince Drive & US460/Pruden Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.6	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	12.5	0.0	0.0	0.0	14.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.12	0.00	0.00	0.00	0.95	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R				T+R		
Lanes in Grp	0	1	0	0	0	1	0	0
Grp Vol (v), veh/h	0	234	0	0	0	726	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	0	0	1823	0	0
Q Serve Time (g_s), s	0.0	7.2	0.0	0.0	0.0	28.9	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	7.2	0.0	0.0	0.0	28.9	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.11	0.00	0.12	0.00	0.11
Lane Grp Cap (c), veh/h	0	909	0	0	0	1006	0	0
V/C Ratio (X)	0.00	0.26	0.00	0.00	0.00	0.72	0.00	0.00
Avail Cap (c_a), veh/h	0	979	0	0	0	1127	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	10.4	0.0	0.0	0.0	16.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	2.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.5	0.0	0.0	0.0	18.3	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.1	0.0	0.0	0.0	14.3	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	3.2	0.0	0.0	0.0	14.9	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.73	0.00	0.00	0.00	0.98	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		19.2						
HCM 2010 LOS		B						

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

VHB — Synchro 9 Report, 2040 Build PM.syn

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM
5: Woodlawn Dr & US460/Pruden Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1297	2	0	1347	0	2
Future Volume (vph)	1297	2	0	1347	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.865
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1611
Link Speed (mph)	55			55	25	
Link Distance (ft)	1965			471	1166	
Travel Time (s)	24.4			5.8	31.8	
Peak Hour Factor	0.96	0.92	0.92	0.95	0.25	0.25
Adj. Flow (vph)	1351	2	0	1418	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1353	0	0	1418	0	8
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 45.9% ICU Level of Service A
Analysis Period (min) 15

US 460 Corridor Safety Study — 2040 Build PM
5: Woodlawn Dr & US460/Pruden Boulevard

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1297	2	0	1347	0	2
Future Vol, veh/h	1297	2	0	1347	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	92	92	95	25	25
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1351	2	0	1418	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	677
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	395
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	395
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	395	-	-	-
HCM Lane V/C Ratio	0.02	-	-	-
HCM Control Delay (s)	14.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

US 460 Corridor Safety Study — 2040 Build PM
6: Old Suffolk Rd & US 460/Windsor Boulevard

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	586	49	69	1032	4	21	2	43	0	0	3
Future Volume (vph)	1	586	49	69	1032	4	21	2	43	0	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		340	400		0	0		300	0		0
Storage Lanes	0		1	1		0	0		1	0		0
Taper Length (ft)	25			125			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.999				0.850		0.865	
Flt Protected				0.950				0.959				
Satd. Flow (prot)	0	3539	1583	1770	3536	0	0	1786	1583	0	1611	0
Flt Permitted				0.950				0.959				
Satd. Flow (perm)	0	3539	1583	1770	3536	0	0	1786	1583	0	1611	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		3402			5235			2230			2290	
Travel Time (s)		42.2			64.9			33.8			34.7	
Peak Hour Factor	0.38	0.89	0.80	0.68	0.90	0.92	0.41	0.25	0.34	0.25	0.92	0.25
Adj. Flow (vph)	3	658	61	101	1147	4	51	8	126	0	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	661	61	101	1151	0	0	59	126	0	12	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 62.8% ICU Level of Service B
Analysis Period (min) 15

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM

6: Old Suffolk Rd & US 460/Windsor Boulevard

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	586	49	69	1032	4	21	2	43	0	0	3
Future Vol, veh/h	1	586	49	69	1032	4	21	2	43	0	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	340	400	-	-	-	-	300	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	89	80	68	90	92	41	25	34	25	92	25
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	658	61	101	1147	4	51	8	126	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1151	0	0	658	0	0	1440	2018	329	1690	2016	576
Stage 1	-	-	-	-	-	-	664	664	-	1352	1352	-
Stage 2	-	-	-	-	-	-	776	1354	-	338	664	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	603	-	-	926	-	-	93	58	667	61	58	460
Stage 1	-	-	-	-	-	-	416	456	-	158	217	-
Stage 2	-	-	-	-	-	-	356	216	-	650	456	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	603	-	-	926	-	-	83	51	667	40	51	460
Mov Cap-2 Maneuver	-	-	-	-	-	-	83	51	-	40	51	-
Stage 1	-	-	-	-	-	-	413	452	-	157	193	-
Stage 2	-	-	-	-	-	-	309	192	-	513	452	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.8	51.7	13
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	77	667	603	-	-	926	-	-	460
HCM Lane V/C Ratio	0.769	0.19	0.004	-	-	0.11	-	-	0.026
HCM Control Delay (s)	137.2	11.7	11	-	-	9.4	-	-	13
HCM Lane LOS	F	B	B	-	-	A	-	-	B
HCM 95th %tile Q(veh)	3.7	0.7	0	-	-	0.4	-	-	0.1

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM

7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	649	3	1	1062	18	17
Future Volume (vph)	649	3	1	1062	18	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		200	330		0	0
Storage Lanes		1	1		1	1
Taper Length (ft)			200		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted			0.370		0.950	
Satd. Flow (perm)	3539	1583	689	3539	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		5				39
Link Speed (mph)	55			55	25	
Link Distance (ft)	709			3402	1205	
Travel Time (s)	8.8			42.2	32.9	
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Adj. Flow (vph)	721	5	2	1207	36	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	721	5	2	1207	36	39
Turn Type	NA	Perm	D.P+P	NA	Prot	Prot
Protected Phases	2		1	6	4	4
Permitted Phases		2	2			
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	15.0	15.0	7.0	15.0	5.0	5.0
Minimum Split (s)	21.5	21.5	16.0	21.5	11.5	11.5
Total Split (s)	47.0	47.0	21.0	68.0	26.0	26.0
Total Split (%)	50.0%	50.0%	22.3%	72.3%	27.7%	27.7%
Maximum Green (s)	40.5	40.5	12.0	61.5	20.0	20.0
Yellow Time (s)	5.5	5.5	5.0	5.5	3.0	3.0
All-Red Time (s)	1.0	1.0	4.0	1.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	9.0	6.5	6.0	6.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.5	3.5	0.2	3.5	0.2	0.2
Time Before Reduce (s)	25.0	25.0	0.0	25.0	0.0	0.0
Time To Reduce (s)	15.0	15.0	0.0	15.0	0.0	0.0
Recall Mode	C-Min	C-Min	None	C-Min	None	None
Act Effct Green (s)	74.5	74.5	72.1	77.7	7.4	7.4
Actuated g/C Ratio	0.79	0.79	0.77	0.83	0.08	0.08
v/c Ratio	0.26	0.00	0.00	0.41	0.26	0.24
Control Delay	4.6	4.0	3.0	3.5	44.6	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	4.0	3.0	3.5	44.6	16.9

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM

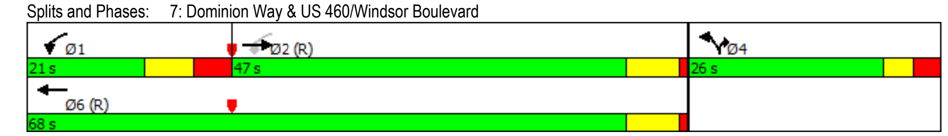
7: Dominion Way & US 460/Windsor Boulevard

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A	A	A	A	D	B
Approach Delay	4.6			3.5	30.2	
Approach LOS	A			A	C	
Queue Length 50th (ft)	45	0	0	92	21	0
Queue Length 95th (ft)	141	2	1	134	27	3
Internal Link Dist (ft)	629			3322	1125	
Turn Bay Length (ft)		200	330			
Base Capacity (vph)	2803	1255	673	2923	376	367
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.00	0.00	0.41	0.10	0.11

Intersection Summary

Area Type: Other
Cycle Length: 94
Actuated Cycle Length: 94
Offset: 0 (0%), Referenced to phase 2:EBWB and 6:WBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.41
Intersection Signal Delay: 4.9 — Intersection LOS: A
Intersection Capacity Utilization 43.9% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Dominion Way & US 460/Windsor Boulevard



VHB — Synchro 9 Report, 2040 Build PM.syn

2040 Build PM (Cont)

US 460 Corridor Safety Study — 2040 Build PM
7: Dominion Way & US 460/Windsor Boulevard

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	649	3	1	1062	18	17
Future Volume (veh/h)	649	3	1	1062	18	17
Number	2	12	1	6	7	14
Initial Q, veh	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)		1.00	1.00		1.00	1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	721	5	2	1207	36	39
Adj No. of Lanes	2	1	1	2	1	1
Peak Hour Factor	0.90	0.55	0.54	0.88	0.50	0.44
Percent Heavy Veh, %	2	2	2	2	2	2
Opposing Right Turn Influence			Yes		Yes	
Cap, veh/h	2555	1143	555	2907	81	72
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.72	0.72	0.00	0.82	0.05	0.05
Ln Grp Delay, s/veh	4.8	3.7	3.4	2.7	47.5	50.0
Ln Grp LOS	A	A	A	A	D	D
Approach Vol, veh/h	726			1209	75	
Approach Delay, s/veh	4.8			2.7	48.8	
Approach LOS	A			A	D	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Case No	1.2	7.0		9.0		4.0		
Phs Duration (G+Y+Rc), s	9.4	74.3		10.3		83.7		
Change Period (Y+Rc), s	9.0	6.5		6.0		6.5		
Max Green (Gmax), s	12.0	40.5		20.0		61.5		
Max Allow Headway (MAH), s	3.6	4.7		4.0		4.7		
Max Q Clear (g_c+I1), s	2.0	8.7		4.3		10.7		
Green Ext Time (g_e), s	0.0	15.7		0.1		18.9		
Prob of Phs Call (p_c)	0.05	1.00		0.86		1.00		
Prob of Max Out (p_x)	0.00	0.28		0.00		0.11		
Left-Turn Movement Data								
Assigned Mvmt	1	5		7				
Mvmt Sat Flow, veh/h	1774	0		1774				
Through Movement Data								
Assigned Mvmt		2		4		6		
Mvmt Sat Flow, veh/h		3632		0		3632		
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		
Mvmt Sat Flow, veh/h		1583		1583		0		
Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	0
Lane Assignment	(Pr/Pm)							

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
7: Dominion Way & US 460/Windsor Boulevard

Lanes in Grp	1	0	0	1	0	0	0	0
Grp Vol (v), veh/h	2	0	0	36	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	0	1774	0	0	0	0
Q Serve Time (g_s), s	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	725	0	0	1774	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	69.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	61.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	67.8	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	555	0	0	81	0	0	0	0
V/C Ratio (X)	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	775	0	0	377	0	0	0	0
Upstream Filter (I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	3.4	0.0	0.0	43.7	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	3.4	0.0	0.0	47.5	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	0
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	2	0	0
Grp Vol (v), veh/h	0	721	0	0	0	1207	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	6.7	0.0	0.0	0.0	8.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	6.7	0.0	0.0	0.0	8.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	2555	0	0	0	2907	0	0
V/C Ratio (X)	0.00	0.28	0.00	0.00	0.00	0.42	0.00	0.00
Avail Cap (c_a), veh/h	0	2555	0	0	0	2907	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	4.6	0.0	0.0	0.0	2.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	0.4	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	4.8	0.0	0.0	0.0	2.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	3.2	0.0	0.0	0.0	4.0	0.0	0.0

VHB — Synchro 9 Report, 2040 Build PM.syn

US 460 Corridor Safety Study — 2040 Build PM
7: Dominion Way & US 460/Windsor Boulevard

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	3.3	0.0	0.0	0.0	4.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.13	0.00	0.00	0.00	0.03	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	0
Lane Assignment		R		R				
Lanes in Grp	0	1	0	1	0	0	0	0
Grp Vol (v), veh/h	0	5	0	39	0	0	0	0
Grp Sat Flow (s), veh/h/ln	0	1583	0	1583	0	0	0	0
Q Serve Time (g_s), s	0.0	0.1	0.0	2.3	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	0.1	0.0	2.3	0.0	0.0	0.0	0.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Lane Grp Cap (c), veh/h	0	1143	0	72	0	0	0	0
V/C Ratio (X)	0.00	0.00	0.00	0.54	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	0	1143	0	337	0	0	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	3.6	0.0	43.9	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	3.7	0.0	50.0	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
%ile Back of Q (50%), veh/ln	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		5.2						
HCM 2010 LOS		A						

VHB — Synchro 9 Report, 2040 Build PM.syn

Appendix E

CONTENTS

This page intentionally left blank.

E.1 Existing Traffic Signal Warrant Screening

This report details the findings of a high level traffic signal warrant screening on the Route 460/Windsor Boulevard and Old Suffolk Road intersection, to determine whether a signal would be warranted for the existing conditions.

Evaluation of the need for a traffic signal at an intersection requires the examination of various factors such as traffic volumes, traffic flow and progression, and overall safety of the intersection to determine if a traffic signal would be warranted. Screening of the peak hour and four-hour volume checks for the existing conditions were included in this evaluation.

This traffic signal warrant screening includes high level signal warrant analysis.

E.1.1 Methodology

Signal warrant screening was performed following the procedures outlined in the 2009 edition of the Manual of Uniform Traffic Control Devices (MUTCD). Existing fourteen-hour turning movement counts were collected at the study intersection on Tuesday, May 16th, 2017 and were used for this high level signal warrant screening.

E.1.2 Warrant Analysis Results

E.1.2.1 Warrant 2 – Four Hour Vehicular Volume

Warrant 2, Four-Hour Vehicular Volume, is intended for use at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal. A traffic signal is warranted based on Warrant 2 if "the plotted points representing the vehicles per hour on the major street and the minor street fall above the applicable curve."

Considering 55 MPH posted speed limit on Route 460/Windsor Boulevard, Figure E-1 was used to screen warrant 2. The highest four-hour volumes were selected based on the minor street highest volumes recorded in fourteen-hour counts, then the major street both approaches volumes were calculated. The following table 2 represents the highest four-hour volumes that were used to screen this warrant.

Table E.1.
Existing Conditions - Four Hour Vehicular Volumes.

Time Period	Major Street Volumes (both approaches)	Minor Street Volume (Higher Volume Approach)
6:00-7:00 AM	964	99
4:00-5:00 PM	1291	59
5:00-6:00 PM	1370	65
6:00-7:00 PM	868	99

The plotted points represent vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only). The four highest hour volumes at the study intersection plotted on the following figure showed that only two points exceed the threshold of 80 vehicles per hour (VPH) for two or more lanes on major street and two and more lanes on minor street.

Warrant 2 is not satisfied.

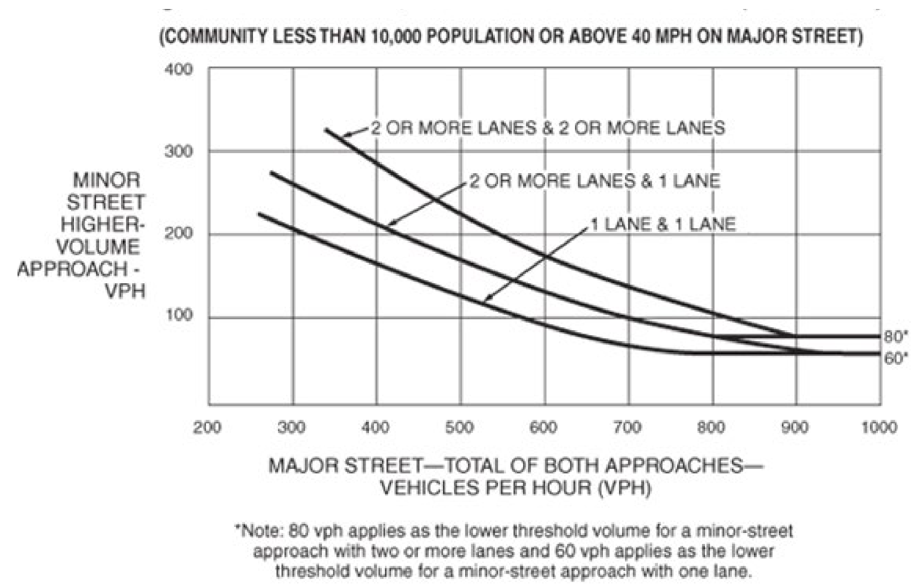


Figure E.1.
Existing Conditions - Warrant 2 Summary.

E.1.1.2 Warrant 3 – Peak Hour

Warrant 3, Peak Hour, "is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street." The Peak Hour warrant is met when "the plotted point representing the vehicles per hour on the major street and the minor street for one hour fall above the applicable curve" or based on the following conditions:

- The total stopped time delay experienced by the traffic on one minor-street approach controlled by a stop sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and
- The volume on the same minor-street approach equals or exceeds 75 vehicles per hour for one lane or 100 vehicles per hour for two lanes, and
- The total entering volume during the hour meets or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

Considering 55 MPH posted speed limit on Route 460/Windsor Boulevard, Figure E-2 was used to screen warrant 3. The following Table E.2 represents peak hour volumes that were used to screen this warrant.

The plotted points represent vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only). Both morning and evening peak hour volumes fall below the curve for the geometric combination as shown in Figure E-2. Therefore, this warrant is not satisfied.

Warrant 3 is not satisfied.

Table E.2.
Existing Conditions - Peak Hour Volumes.

Time Period	Major Street Volumes (both approaches)	Minor Street Volume (Higher Volume Approach)
6:15-7:15	1042	92
4:45-5:45	1385	59

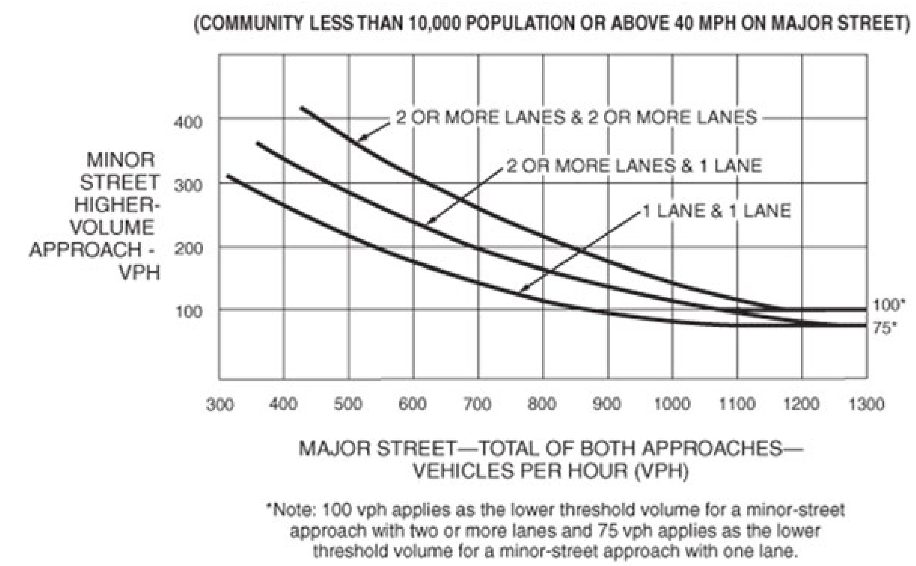


Figure E.2.
Existing Conditions - Warrant 3 Summary.

E.1.3 Conclusions

The performed high level signal warrant screening for the existing conditions at the intersection of Route 460/Windsor Boulevard and Old Suffolk Road showed that under existing conditions, the subject intersection does not meet two signal traffic warrants outlined by the MUTCD and used in this signal warrant screening:

- Warrant 2 - Four-Hour Vehicular Volume - is not satisfied;
- Warrant 3 - Peak Hour - is not satisfied.

Therefore, traffic signal installation is not recommended at the subject intersection based on the findings of the performed signal warrant screening.

E.2 2040 Build Traffic Signal Warrant Screening

This report details the findings of a high level traffic signal warrant screening on the Route 460/Windsor Boulevard & Old Suffolk Road intersection, to determine whether a signal would be warranted in the future under 2040 Build conditions.

Evaluation of the need for a traffic signal at an intersection requires the examination of various factors such as traffic volumes, traffic flow and progression, and overall safety of the intersection to determine if a traffic signal would be warranted. Screening of the peak hour and four-hour volume checks for the 2040 Build conditions were included in this evaluation.

This traffic signal warrant screening includes high level signal warrant analysis.

E.2.1 Methodology

Signal warrant screening was performed following the procedures outlined in the 2009 edition of the Manual of Uniform Traffic Control Devices (MUTCD). Existing fourteen-hour turning movement counts were collected at the study intersection on Tuesday, May 16th, 2017.One percent (1%) growth rate was used for the major road (Route 460/Windsor Boulevard) and half of a percent (0.5%) growth rate was used for the minor street (Old Suffolk Road) to calculate future volumes to be used for this high level signal warrant screening.

E.2.2 Warrant Analysis Results

E.2.2.1 Warrant 2 – Four Hour Vehicular Volume

Warrant 2, Four-Hour Vehicular Volume, is intended for use at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal. A traffic signal is warranted based on Warrant 2 if "the plotted points representing the vehicles per hour on the major street and the minor street fall above the applicable curve."

Considering 55 MPH posted speed limit on Route 460/Windsor Boulevard, Figure 4C-2 was used to screen warrant 2. The highest four-hour volumes were selected based on the minor street highest volumes recorded during fourteen-hour counts, then the major street both approaches volumes were calculated. One percent growth rate was used on a major street and half percent growth rate was used on a minor street to calculate volumes for 2040 Build conditions for this signal warrant screening. The following table E.3. represents the highest four-hour volumes that were used to screen this warrant.

The plotted points represent vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only). The four highest hour volumes at the study intersection plotted on the following figure showed that only two points exceed the threshold of 80 vehicles per hour (VPH) for two or more lanes on major street and two and more lanes on minor street. Therefore, this warrant is not satisfied.

Warrant 2 is not satisfied.

Table E.3.
Existing Conditions - Four Hour Vehicular Volumes.

Time Period	Major Street Volumes (both approaches)	Minor Street Volume (Higher Volume Approach)
6:00-7:00 AM	1212	111
4:00-5:00 PM	1623	66
5:00-6:00 PM	1722	73
6:00-7:00 PM	1091	124

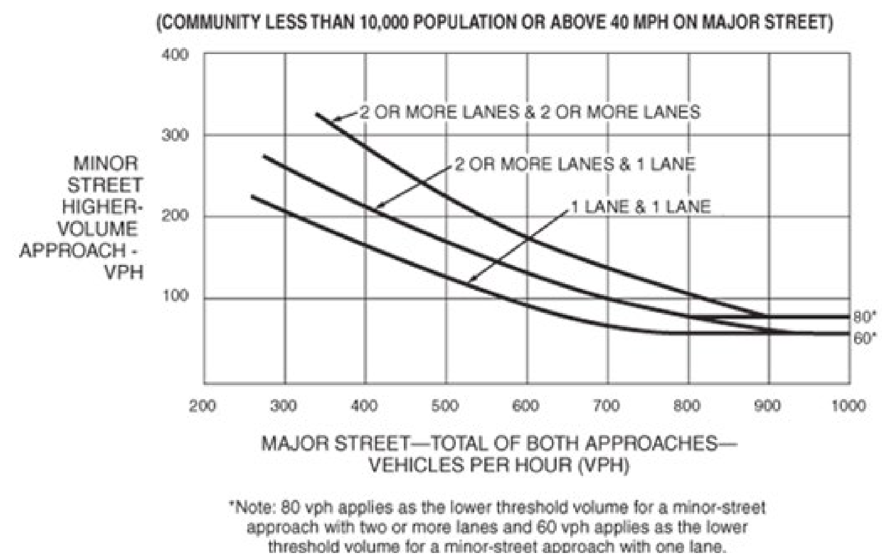


Figure E.3.
Existing Conditions - Warrant 2 Summary.

E.2.2.2 Warrant 3 – Peak Hour

Warrant 3, Peak Hour, "is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street." The Peak Hour warrant is met when "the plotted point representing the vehicles per hour on the major street and the minor street for one hour fall above the applicable curve" or based on the following conditions:

- ◊ The total stopped time delay experienced by the traffic on one minor-street approach controlled by a stop sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach, and
- ◊ The volume on the same minor-street approach equals or exceeds 75 vehicles per hour for one lane or 100 vehicles per hour for two lanes, and
- ◊ The total entering volume during the hour meets or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

Considering 55 MPH posted speed limit on US 460/Windsor Boulevard, Figure E.3. was used to screen warrant 3. Existing peak hour volumes were used to calculated projected 2040 Build scenario volumes with added one percent (1%) growth rate on the major street (Route 460/Burden Boulevard) and half percent (0.5%) growth rate on the minor street (Old Suffolk Road). The following table E.4. represents peak hour volumes that were used to screen this warrant.

The plotted points represent vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only). Morning peak hour volume falls above the curve, while evening peak hour volume falls below the curve for the geometric combination as shown in Figure E.4. Therefore, this warrant is not satisfied.

Warrant 3 is not satisfied.

Table E.4.
Existing Conditions - Peak Hour Vehicular Volumes.

Time Period	Major Street Volumes (both approaches)	Minor Street Volume (Higher Volume Approach)
6:15-7:15	1310	103
4:45-5:45	1741	66

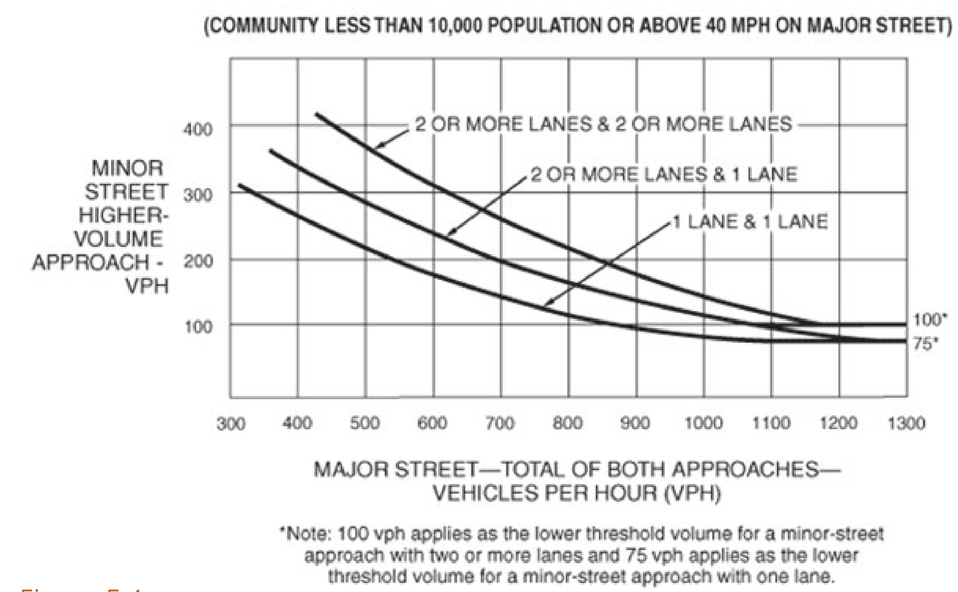


Figure E.4.
Existing Conditions - Warrant 3 Summary.

E.2.3 Conclusions

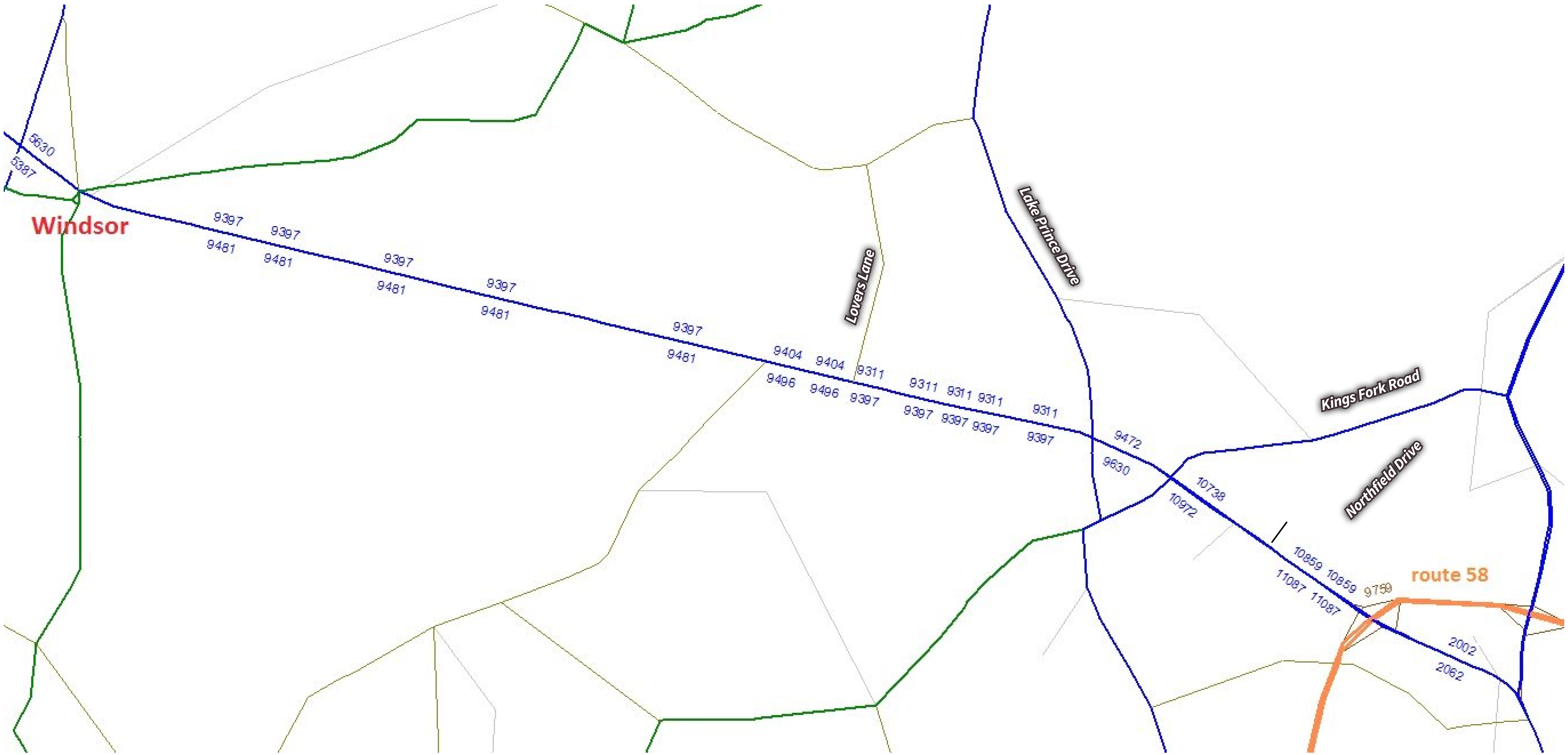
The performed high level signal warrant screening for the 2040 Build conditions at the intersection of US 460/Windsor Boulevard and Old Suffolk Road showed that if traffic growth happens as projected, the subject intersection does not meet two signal traffic warrants outlined by the MUTCD and used in this signal warrant screening:

- ◊ Warrant 2 - Four-Hour Vehicular Volume - is not satisfied;
- ◊ Warrant 3 - Peak Hour - is not satisfied.

Therefore, traffic signal installation is not recommended at the subject intersection based on the findings of the performed signal warrant screening.

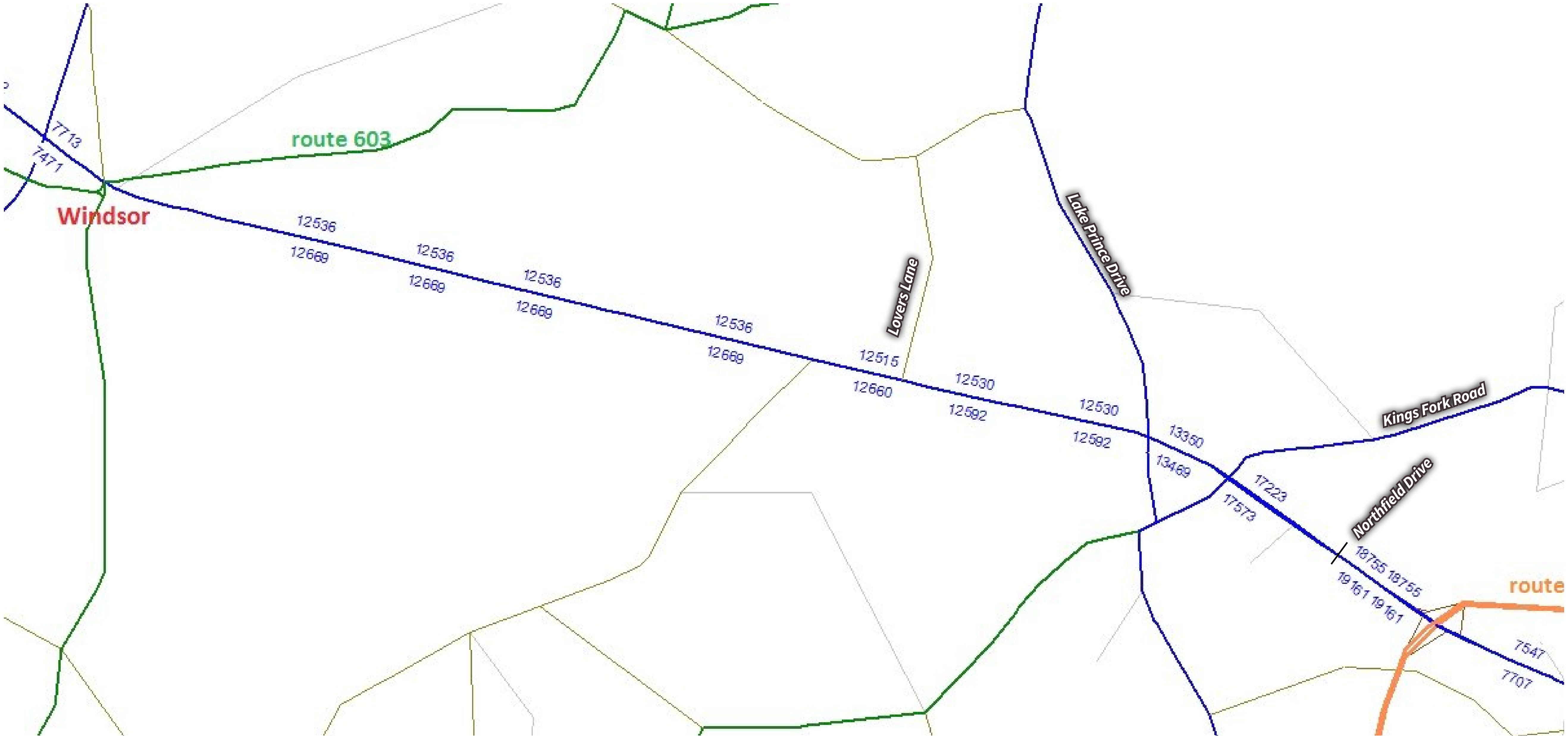
Appendix F

CONTENTS



Windsor
5630
5387
9397
9481
9404
9496
9311
9472
9630
10738
10972
10859
11087
9759
2002
2062
Lovers Lane
Lake Prince Drive
Kings Fork Road
Northfield Drive
route 58

YEAR 2009


route 603
Windsor
7713
7471
12536
12669
12536
12669
12536
12669
12536
12669
Lovers Lane
12515
12660
Lake Prince Drive
12530
12592
12530
12592
13350
13469
Kings Fork Road
17223
17573
Northfield Drive
18755 18755
19161 19161
route
7547
7707

YEAR 2040

This page intentionally left blank.

Appendix G

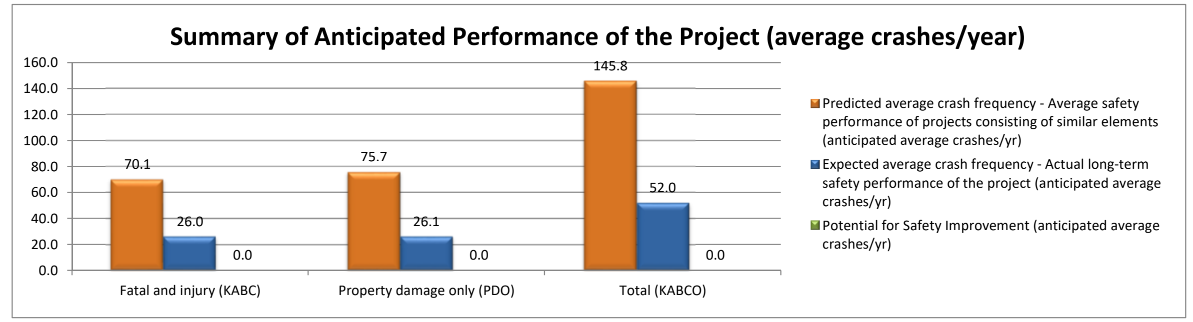
CONTENTS

This page intentionally left blank.

PROJECT SAFETY PERFORMANCE SUMMARY REPORT

General Information		
Project Name	U.S. Route 460 Safety Study	
Project Description	Corridor Safety Analysis	
Reference Number	39955.29	
Analyst	Christine Braden	
Agency/Company	VHB, Inc.	
Contact Email	cbraden@vhb.com	
Contact Phone	757-233-3227	
Date Completed	01/24/18	Years of crash data incorporated into the analysis: 0

PROJECT SUMMARY



Project Element	Total Crashes/yr (KABCO)			Fatal and Injury Crashes/yr (KABC)			Property Damage Only Crashes/yr (PDO)		
	Predicted average crash frequency $N_{predicted\ (KABCO)}$	Expected average crash frequency $N_{expected\ (KABCO)}$	Potential for Improvement	Predicted average crash frequency $N_{predicted\ (KABC)}$	Expected average crash frequency $N_{expected\ (KABC)}$	Potential for Improvement	Predicted average crash frequency $N_{predicted\ (O)}$	Expected average crash frequency $N_{expected\ (O)}$	Potential for Improvement
INDIVIDUAL SEGMENTS									
Segment 1	2.0	0.5	0.0	1.1	0.3	0.0	0.9	0.2	0.0
Segment 2	7.6	1.5	0.0	4.2	0.8	0.0	3.4	0.7	0.0
Segment 3	5.3	0.5	0.0	2.9	0.3	0.0	2.4	0.2	0.0
Segment 4	5.3	2.3	0.0	3.0	1.3	0.0	2.3	1.0	0.0
Segment 5	5.0	1.6	0.0	2.9	0.9	0.0	2.2	0.7	0.0
Segment 6	8.2	5.0	0.0	4.7	2.9	0.0	3.5	2.1	0.0
Segment 7	4.7	3.0	0.0	2.7	1.7	0.0	2.0	1.3	0.0
Segment 8	17.3	10.5	0.0	9.9	6.0	0.0	7.4	4.5	0.0
Segment 9	5.6	3.5	0.0	3.2	2.0	0.0	2.4	1.5	0.0
INDIVIDUAL INTERSECTIONS									
Intersection 1	13.8	1.8	0.0	6.0	0.8	0.0	7.8	1.0	0.0
Intersection 2	15.3	2.6	0.0	6.5	1.1	0.0	8.8	1.5	0.0
Intersection 3	20.9	5.3	0.0	8.0	2.0	0.0	12.9	3.3	0.0
Intersection 4	16.3	2.6	0.0	6.8	1.1	0.0	9.6	1.5	0.0
Intersection 5	1.8	3.4	1.6	0.7	1.3	0.6	1.1	2.1	1.0
Intersection 6	2.2	1.5	0.0	1.0	0.7	0.0	1.2	0.8	0.0
Intersection 7	3.3	4.1	0.8	1.5	1.8	0.4	1.8	2.3	0.5
Intersection 8	2.9	1.2	0.0	1.1	0.5	0.0	1.8	0.8	0.0
Intersection 9	8.2	1.0	0.0	3.9	0.5	0.0	4.3	0.5	0.0
COMBINED (sum of column)	145.8	52.0	0.0	70.1	26.0	0.0	75.7	26.1	0.0

PROJECT SUMMARY -- Site-Specific EB Method Summary Results for Rural Multilane Roads

Crash severity level	$N_{predicted(PROJECT)}$ Predicted average crash frequency - Average safety performance of projects consisting of similar elements (anticipated average crashes/yr)	$N_{expected\ (PROJECT)}$ Expected average crash frequency - Actual long-term safety performance of the project (anticipated average crashes/yr)	$N_{potential\ for\ improvement\ (PROJECT)}$ Potential for Safety Improvement (anticipated average crashes/yr)
Fatal and injury (KABC)	70.1	26.0	N/A
Property damage only (PDO)	75.7	26.1	N/A
Total (KABCO)	145.8	52.0	N/A

HSM1 Extended Spreadsheet for Part C Chapter 11 v.9.1

Discussion of Results

Given the potential effects of project characteristics on safety performance, results indicate that:

1. It is anticipated that the project will, on average, experience 52 crashes per year (26 fatal and injury crashes per year; and 26.1 property damage only crashes per year).

2. A similar project is anticipated, on average, to experience 145.8 crashes per year (70.1 fatal and injury crashes per year; and 75.7 property damage only crashes per year).

Federal law 23 USC § 409 prohibits the discovery or admission into evidence of "reports, surveys, schedules, lists, or data" compiled or collected for the purpose of highway safety improvement projects that might qualify for federal safety improvement funding.

NOTE: Northfield Drive intersection and Dominion Way intersections are 3-leg signalized intersections and are currently modeled as a 4-leg signalized intersection, HSM does not have an SPF for 3-leg signalized.

This page intentionally left blank.

Appendix H

CONTENTS

This page intentionally left blank.

Site Specific Cost Estimate.

		Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8	Location 9	Location 10	Location 11
Tier 1	Signage		$803		$503							
	Pavement Markings	$11,909	$14,006	$13,522	$19,612	$7,541						
	Signal	$792	$792	$792	$792							
	Other	$166	$166	$166	$166	$166	$166	$166	$166	$332	$166	$166
	Total	**$12,867**	**$15,767**	**$14,480**	**$21,073**	**$7,707**	**$166**	**$166**	**$166**	**$332**	**$166**	**$166**
Tier 2	Signage	$500	$660	$660	$660	$660	$660	$660	$660	$660	$660	$660
	Pavement Markings	$1,016	$964	$871	$554	$7,541						
	Signal			$2,600	$2,600							
	Other											
	Total	**$1,516**	**$1,624**	**$4,131**	**$3,814**	**$8,201**	**$660**	**$660**	**$660**	**$660**	**$660**	**$660**
Tier 3	Signage			$7,920	$7,920	$7,920			$7,920			
	Pavement Markings					$832						
	Signal											
	Other			$15,000	$600			$5,280				
	Mill and Overlay*	$562,800	$609,000	$504,000	$634,200	$168,000						
	Install Turn Lane(s)					$179,000		$236,000	$358,000			
	Install Acceleration Lane(s)					$203,000		$203,000	$507,500		$812,000	$406,000
	Pave Driveway Apron						$6,000		$23,000	$12,000		
	Roadway Lighting	$20,000				$20,000						
	Widen Shoulder & Add Guardrail					$52,026						
	Widen Shoulder	$52,034					$104,068			$104,068		
	Realign Intersection							$154,532				
	Total	**$634,834**	**$609,000**	**$526,920**	**$642,720**	**$630,778**	**$110,068**	**$598,812**	**$896,420**	**$116,068**	**$812,000**	**$406,000**

Note: 1) Systemic improvements from the templates are not included separately in this estimate. They are accounted for in the systemic cost estimate.
2) Right of way and utility relocations are not included in these estimates.
3) Full depth pavement replacement may be necessary, but is not included in the cost.

*Does not include new pavement markings - those are accounted for above in Tier 1 and Tier 2.

This page intentionally left blank.

Appendix I

CONTENTS

Computations

Project:	US 460 Safety Study	Project #	39955.29
Location:	Isle of White, VA	Sheet:	1 of 6
Calculated by:	BEM	Date:	4/30/2018
Checked by:		Date:	
Title:	Planning Level Cost Estimates		

Alternative 1

Widening of both east and westbound shoulders to 8'

Assumptions:

8,040' of widening paved shoulder 8' , from Lovers Ln to Suffolk City line.
6" asphalt pavement depth, 10" aggregate base
Rural principal arterial functional classification
Ditched roadway section
No milling of adjacent lane
Utility relocation cost have been captured in this estimate

ROW cost have **not** been captured in this estimate

Pay Items	Unit	Length (ft)	Width (ft)	Depth (ft)	Factor	% Occurring	Quantity	Unit Cost	TOTAL
ASPHALT PAVEMENT - 6" (Widen EB and WB Shoulder to 8')	TONS	16,080	9.0	0.50	0.07407		5,360	$ 90.00	$ 482,400
AGGREGATE BASE - 10" (Widen EB and WB Shoulder to 8')	TONS	16,080	9.0	0.83	0.07407		8,933	$ 42.00	$ 375,200
EXCAVATION (For Roadway Construction	CY	16,080	9.0	1.17	0.03704		6,253	$ 30.00	$ 187,600
SELECT MATERIAL (Roadside fill and ditch	CY	16,080	5.0	1.00	0.03704		2,978	$ 70.00	$ 208,444
SAW CUT	LF	16,080	-	-	-		16,080	$ 3.00	$ 48,240
DEMOLITION OF PAVEMENT	SY	16,080	1.0	-	0.11111		1,787	$ 6.00	$ 10,720
4" YELLOW PAVEMENT MARKING LINE (Solid)	LF	16,080	-	-	1		16,080	$ 1.50	$ 24,120
4" WHITE PAVEMENT MARKING LINE (Solid)	LF	16,080	-	-	1		16,080	$ 1.50	$ 24,120
4" WHITE PAVEMENT MARKING LINE (Dashed)	LF	16,080	-	-	1	25%	4,020	$ 1.50	$ 6,030
2" TOPSOIL (Sideslope)	ACRE	16,080	10	-	0.00002		3.69	$ 32,000.00	$ 118,127
CLEARING	ACRE	1,350	8	-	0.00002		0.25	$ 40,000.00	$ 9,917
STORMWATER MANAGEMENT (Approx. 3 acres of additional impervious	LS	-	-	-	-		1	$ 400,000.00	$ 400,000
					SUBTOTAL A				$ 1,894,919
ROW									
	SF	-	-	-	-		-	$ -	
PRIVATE UTILITY RELOCATION (From PCES)	LS	-	-	-	-		1	$ 656,937.00	$ 656,937
					SUBTOTAL B				$ 656,937

EROSION AND SEDIMENT CONTROL 5% SUBTOTAL A	$ 94,745.93
MAINTENANCE OF TRAFFIC 5% SUBTOTAL A	$ 94,745.93
MISCELLANEOUS ITEMS 25% SUBTOTAL A	$ 473,729.63
SUBTOTAL C (Excludes Subtotal B)	$ 2,558,140
MOBILIZATION 10% SUBTOTAL C	$ 255,814.00
SUBTOTAL D (Excludes Subtotal B)	$ 2,813,954
CONST. ENG. 16.5% & CONTIG. 10% SUBTOTAL D	$ 745,697.81
SUBTOTAL E (Excludes Subtotal B)	$ 3,559,652
PRELIMINARY ENGINEERING 24% SUBTOTAL D	$ 854,316.44
GRAND TOTAL COST (Includes Subtotal B)	$ 5,071,000

TOTAL COST

$ 5,080,000

Computations

Project:	US 460 Safety Study	Project #	39955.29
Location:	Isle of White, VA	Sheet:	2 of 6
Calculated by:	BEM	Date:	4/30/2018
Checked by:		Date:	
Title:	Planning Level Cost Estimates		

Alternative 2

Widening of both east and westbound lanes to 11' minimum, shoulders to 8', and Instalation of Median Barrier

Assumptions:

8,040' of widening paved shoulder to 8' in EB and WB directions, from Lovers Ln to Suffolk City line.
6" asphalt pavement depth, 10" aggregate base (Shoulders)
8,040' of widening roadway by 5' in EB and WB direction to accommodate concrete median barrier, from Lovers Ln to Suffolk City line.
9" asphalt pavement depth, 12" aggregate base (travel lane)
Rural principal arterial functional classification
Ditched roadway section
Existing lane widths are 11' (no widening of lanes)
No milling of adjacent lane
Utility relocation cost have been captured in this estimate
ROW cost have **not** been captured in this estimate

Pay Items	Unit	Length (ft)	Width (ft)	Depth (ft)	Factor	% Occurring	Quantity	Unit Cost	TOTAL
ASPHALT PAVEMENT - 6" (Widen EB and WB Shoulder to 8')	TONS	16,080	8.0	0.50	0.07407		4,764	$ 90.00	$ 428,800
ASPHALT PAVEMENT - 9" (Widen EB and WB lanes 5' to accommodate median barrier)	TONS	16,080	6.0	0.75	0.07407		5,360	$ 90.00	$ 482,400
AGGREGATE BASE - 10" (Widen EB and WB Shoulder to 8')	TONS	16,080	8.0	0.83	0.07407		7,941	$ 42.00	$ 333,511
AGGREGATE BASE - 12"(Widen EB and WB lanes 5' to accommodate median barrier)	TONS	16,080	6.0	1.00	0.07407		7,147	$ 42.00	$ 300,160
MEDIAN BARRIER (MB-7D)	LF	8,040	-	-	-		8,040	$ 75.00	$ 603,000
IMPACT ATTENUATOR (TL-3)	EA	-	-	-	-		11	$ 12,000.00	$ 132,000
EXCAVATION (For roadway construction)	CY	16,080	14.0	1.17	0.03704		9,727	$ 30.00	$ 291,822
SELECT MATERIAL (Roadside fill and ditch)	CY	16,080	5.0	1.00	0.03704		2,978	$ 70.00	$ 208,444
SAW CUT	LF	16,080	-	-	-		16,080	$ 3.00	$ 48,240
DEMOLITION OF PAVEMENT	SY	16,080	1.0	-	0.11111		1,787	$ 6.00	$ 10,720
4" YELLOW PAVEMENT MARKING LINE (Solid)	LF	16,080	-	-	1		16,080	$ 1.50	$ 24,120
4" WHITE PAVEMENT MARKING LINE (Solid)	LF	16,080	-	-	1		16,080	$ 1.50	$ 24,120
4" WHITE PAVEMENT MARKING LINE (Dashed)	LF	16,080	-	-	1	25%	4,020	$ 1.50	$ 6,030
ERADICATION OF PAVEMENT MARKINGS	LF	16,080	-	-	3		48,240	$ 0.75	$ 36,180
2" TOPSOIL (Sideslope)	ACRE	16,080	10	-	0.00002		3.69	$ 32,000.00	$ 118,127
CLEARING	ACRE	1,350	8	-	0.00002		0.25	$ 40,000.00	$ 9,917
SIGNAL SYSTEM (Shirley Holland Commerce Park)	EA	-	-	-	-	-	1.00	$ 600,000.00	$ 600,000
STORMWATER MANAGEMENT (Approx. 5 acres of additional impervious)	LS	-	-	-	-		1	$ 700,000.00	$ 700,000
					SUBTOTAL A				$ 4,357,592
ROW									
	SF	-	-	-	-		-	$ -	
PRIVATE UTILITY RELOCATION (From PCES)	LS	-	-	-	-		1	$ 656,937.00	$ 656,937
					SUBTOTAL B				$ 656,937

EROSION AND SEDIMENT CONTROL 5% SUBTOTAL A	$ 217,879.59
MAINTENANCE OF TRAFFIC 5% SUBTOTAL A	$ 217,879.59
MISCELLANEOUS ITEMS 25% SUBTOTAL A	$ 1,089,397.96
SUBTOTAL C (Excludes Subtotal B)	$ 5,882,749
MOBILIZATION 10% SUBTOTAL C	$ 588,274.90
SUBTOTAL D (Excludes Subtotal B)	$ 6,471,024
CONST. ENG. 14.5% & CONTIG. 10% SUBTOTAL D	$ 1,585,400.86
SUBTOTAL E (Excludes Subtotal B)	$ 8,056,425
PRELIMINARY ENGINEERING 15% SUBTOTAL D	$ 970,653.59
GRAND TOTAL COST (Includes Subtotal B)	$ 9,684,015

TOTAL COST

$ 9,690,000

Computations

Project: US 460 Safety Study
Location: Isle of White, VA
Calculated by: BEM
Checked by:
Title: Planning Level Cost Estimates

Project # 39955.29
Sheet: 3 of 6
Date: 4/30/2018
Date:

Alternative 3

Construct VDOT GS-1 Typical Section

Assumptions:

8,040' of new roadway construction, 4 lane divided w/ 40' depressed median, 12' lanes, 4' left shoulder, and 8' right shoulder from Lovers Ln to Suffolk City line.
6" asphalt pavement depth, 10" aggregate base (right shoulders)
9" asphalt pavement depth, 12" aggregate base (travel lane, left shoulder)
Remove entire existing roadway
Rural principal arterial functional classification
Ditched roadway section
Utility relocation cost have been captured in this estimate
ROW cost have **not** been captured in this estimate

Pay Items	Unit	Length (ft)	Width (ft)	Depth (ft)	Factor	% Occurring	Quantity	Unit Cost	TOTAL
ASPHALT PAVEMENT - 6" (8' right shoulders)	TONS	16,080	8.0	0.50	0.07407		4,764	$ 90.00	$ 428,800
ASPHALT PAVEMENT - 9" (28' travels lanes and left shoulders)	TONS	16,080	28.0	0.75	0.07407		25,013	$ 90.00	$ 2,251,200
AGGREGATE BASE - 10" (8' right shoulders)	TONS	16,080	8.0	0.83	0.07407		7,941	$ 42.00	$ 333,511
AGGREGATE BASE - 12" (28' travels lanes and left shoulders)	TONS	16,080	28.0	1.00	0.07407		33,351	$ 42.00	$ 1,400,747
MEDIAN CROSSOVER	EA	-	-	-	-		4	$ 18,000.00	$ 72,000
RIGHT TURN LANE	EA	-	-	-	-		3	$ 45,000.00	$ 135,000
LEFT TURN LANE (Single)	EA	-	-	-	-		3	$ 50,000.00	$ 150,000
LEFT TURN LANE (Double)	EA	-	-	-	-		1	$ 100,000.00	$ 100,000
EXCAVATION (For roadway construction)	CY	16,080	28.0	1.50	0.03704		25,013	$ 30.00	$ 750,400
EXCAVATION (Median)	CY	8,040	40.0	3.50	0.03704		20,844	$ 31.00	$ 646,178
SELECT MATERIAL (Roadside fill and ditch)	CY	16,080	5.0	1.00	0.03704		2,978	$ 70.00	$ 208,444
DEMOLITION OF PAVEMENT (5 lane section)	SY	5,320	60.0	-	0.11111		35,467	$ 6.00	$ 212,800
DEMOLITION OF PAVEMENT (4 lane section)	SY	2,720	48.0	-	0.11111		14,507	$ 7.00	$ 101,547
OBSCURING ROADWAY (5 lane section)	UNIT	5,320	60.0	-	0.00100		319	$ 300.00	$ 95,760
OBSCURING ROADWAY (4 lane section)	UNIT	2,720	48.0	-	0.00100		131	$ 300.00	$ 39,168
4" YELLOW PAVEMENT MARKING LINE (Solid)	LF	16,080	-	-	1		16,080	$ 1.50	$ 24,120
4" WHITE PAVEMENT MARKING LINE (Solid)	LF	16,080	-	-	1		16,080	$ 1.50	$ 24,120
4" WHITE PAVEMENT MARKING LINE (Dashed)	LF	16,080	-	-	1	25%	4,020	$ 1.50	$ 6,030
2" TOPSOIL (Sideslope)	ACRE	16,080	10	-	0.00002		3.69	$ 32,000.00	$ 118,127
2" TOPSOIL (Median)	ACRE	8,040	40	-	0.00002		7.38	$ 32,000.00	$ 236,253
CLEARING	ACRE	1,350	20	-	0.00002		0.62	$ 40,000.00	$ 24,793
SIGNAL SYSTEM (Shirley Holland Commerce Park)	EA	-	-	-	-	-	1.00	$ 600,000.00	$ 600,000
DRAINAGE (Structures and pipes)	LS	-	-	-	-		1	$ 88,000.00	$ 88,000
STORMWATER MANAGEMENT (Approx. 3 acres of additional impervious)	LS	-	-	-	-		1	$ 400,000.00	$ 400,000
					SUBTOTAL A				$ 8,446,998
ROW									
	SF	-	-	-	-		-	$ -	$ -
PRIVATE UTILITY RELOCATION (From PCES)	LS	-	-	-	-		1	$ 656,937.00	$ 656,937
					SUBTOTAL B				$ 656,937

EROSION AND SEDIMENT CONTROL 5% SUBTOTAL A	$ 422,349.91
MAINTENANCE OF TRAFFIC 5% SUBTOTAL A	$ 422,349.91
MISCELLANEOUS ITEMS 25% SUBTOTAL A	$ 2,111,749.56
SUBTOTAL C (Excludes Subtotal B)	$ 11,403,448
MOBILIZATION 10% SUBTOTAL C	$ 1,140,344.76
SUBTOTAL D (Excludes Subtotal B)	$ 12,543,792
CONST. ENG. 13.25% & CONTIG. 10% SUBTOTAL D	$ 2,947,791.20
SUBTOTAL E (Excludes Subtotal B)	$ 15,491,584
PRELIMINARY ENGINEERING 13.5% SUBTOTAL D	$ 1,693,411.97
GRAND TOTAL COST (Includes Subtotal B)	$ 17,841,933

TOTAL COST

$ 17,850,000

Computations

Project: US 460 Safety Study
Location: Suffolk, VA
Calculated by: BEM
Checked by:
Title: Planning Level Cost Estimates

Project # 39955.29
Sheet: 4 of 6
Date: 4/30/2018
Date:

Alternative 1

Widening of both east and westbound shoulders to 8'

Assumptions:

25,580' of widening paved shoulder 8' , from Suffolk City line to Northfield Dr.
6" asphalt pavement depth, 10" aggregate base
Rural principal arterial functional classification
Ditched roadway section
No milling of adjacent lane
Utility relocation cost have been captured in this estimate
ROW cost have **not** been captured in this estimate

Construction	Unit	Length (ft)	Width (ft)	Depth (ft)	Factor	% Occurring	Quantity	Unit Cost	TOTAL
ASPHALT PAVEMENT - 6" (Widen EB and WB Shoulder to 8')	TONS	51,160	9.0	0.50	0.07407		17,053	$ 90.00	$ 1,534,800
AGGREGATE BASE - 10" (Widen EB and WB Shoulder to 8')	TONS	51,160	9.0	0.83	0.07407		28,422	$ 42.00	$ 1,193,733
EXCAVATION (For Roadway Construction)	CY	51,160	9.0	1.17	0.03704		19,896	$ 30.00	$ 596,867
SELECT MATERIAL (Roadside fill and ditch)	CY	51,160	5.0	1.00	0.03704		9,474	$ 70.00	$ 663,185
SAW CUT	LF	51,160	-	-	-		51,160	$ 3.00	$ 153,480
DEMOLITION OF PAVEMENT	SY	51,160	1.0	-	0.11111		5,684	$ 6.00	$ 34,107
4" YELLOW PAVEMENT MARKING LINE (Solid)	LF	51,160	-	-	1		51,160	$ 1.50	$ 76,740
4" WHITE PAVEMENT MARKING LINE (Solid)	LF	51,160	-	-	1		51,160	$ 1.50	$ 76,740
4" WHITE PAVEMENT MARKING LINE (Dashed)	LF	51,160	-	-	1	25%	12,790	$ 1.50	$ 19,185
2" TOPSOIL (Sideslope)	ACRE	51,160	10	-	0.00002		11.74	$ 32,000.00	$ 375,831
CLEARING	ACRE	1,250	8	-	0.00002		0.23	$ 40,000.00	$ 9,183
STORMWATER MANAGEMENT (Approx. 9.5 acres of additional impervious)	LS	-	-	-	-		1	$ 1,500,000.00	$ 1,500,000
PUBLIC UTILITY RELOCATION (From PCES)	LS	-	-	-	-	-	1	$ 2,819,231.00	$ 2,819,231
					SUBTOTAL A				$ 9,053,082
ROW & Utilities									
	SF	-	-	-	-	-	-	$ -	
PRIVATE UTILITY RELOCATION (From PCES)	LS	-	-	-	-	-	1	$ 3,010,961.00	$ 3,010,961
					SUBTOTAL B				$ 3,010,961

EROSION AND SEDIMENT CONTROL 5% SUBTOTAL A	$ 452,654.08
MAINTENANCE OF TRAFFIC 5% SUBTOTAL A	$ 452,654.08
MISCELLANEOUS ITEMS 25% SUBTOTAL A	$ 2,263,270.41
SUBTOTAL C (Excludes Subtotal B)	$ 12,221,660
MOBILIZATION 10% SUBTOTAL C	$ 1,222,166.02
SUBTOTAL D (Excludes Subtotal B)	$ 13,443,826
CONST. ENG. 12.5% & CONTIG. 10% SUBTOTAL D	$ 3,024,860.90
SUBTOTAL E (Excludes Subtotal B)	$ 16,468,687
PRELIMINARY ENGINEERING 12% SUBTOTAL D	$ 1,976,242.45
GRAND TOTAL COST (Includes Subtotal B)	$ 21,456,000

TOTAL COST

$ 21,460,000

Computations

Project:	US 460 Safety Study	Project #	39955.29
Location:	Suffolk, VA	Sheet:	5 of 6
Calculated by:	BEM	Date:	7/15/2018
Checked by:		Date:	
Title:	Planning Level Cost Estimates		

Alternative 2

Widening of both east and westbound lanes to 11', shoulders to 8', and Installation of Median Barrier

Assumptions:

25,580' of widening paved shoulder to 8' in EB and WB directions, from Suffolk City line to Northfield Dr.
6" asphalt pavement depth, 10" aggregate base (Shoulders)

25,580' of widening roadway by 5' in EB and WB direction to accommodate concrete median barrier, from Suffolk City line to Northfield Dr.
9" asphalt pavement depth, 12" aggregate base (travel lane)

Rural principal arterial functional classification
Ditched roadway section
Existing lane widths are 11' (no widening of lanes)
No milling of adjacent lane
Utility relocation cost have been captured in this estimate

ROW cost have **not** been captured in this estimate

Construction	Unit	Length (ft)	Width (ft)	Depth (ft)	Factor	% Occurring	Quantity	Unit Cost	TOTAL
ASPHALT PAVEMENT - 6" (Widen EB and WB Shoulder to 8')	TONS	51,160	8.0	0.50	0.07407		15,159	$ 90.00	$ 1,364,267
ASPHALT PAVEMENT - 9" (Widen EB and WB lanes 5' to accommodate median barrier	TONS	51,160	6.0	0.75	0.07407		17,053	$ 90.00	$ 1,534,800
AGGREGATE BASE - 10" (Widen EB and WB Shoulder to 8')	TONS	51,160	8.0	0.83	0.07407		25,264	$ 42.00	$ 1,061,096
AGGREGATE BASE - 12"(Widen EB and WB lanes 5' to accommodate median barrier	TONS	51,160	6.0	1.00	0.07407		22,738	$ 42.00	$ 954,987
MEDIAN BARRIER (MB-7D)	LF	25,580	-	-	-		25,580	$ 75.00	$ 1,918,500
IMPACT ATTENUATOR (TL-3)	EA	-	-	-	-		50	$ 12,000.00	$ 600,000
EXCAVATION (For roadway construction	CY	51,160	9.0	1.17	0.03704		19,896	$ 30.00	$ 596,867
SELECT MATERIAL (Roadside fill and ditch	CY	51,160	5.0	1.00	0.03704		9,474	$ 70.00	$ 663,185
SAW CUT	LF	51,160	-	-	-		51,160	$ 3.00	$ 153,480
DEMOLITION OF PAVEMENT	SY	51,160	1.0	-	0.11111		5,684	$ 6.00	$ 34,107
4" YELLOW PAVEMENT MARKING LINE (Solid)	LF	51,160	-	-	1		51,160	$ 1.50	$ 76,740
4" WHITE PAVEMENT MARKING LINE (Solid)	LF	51,160	-	-	1		51,160	$ 1.50	$ 76,740
4" WHITE PAVEMENT MARKING LINE (Dashed)	LF	51,160	-	-	1	25%	12,790	$ 1.50	$ 19,185
ERADICATION OF PAVEMENT MARKINGS	LF	51,160	-	-	3		153,480	$ 0.75	$ 115,110
2" TOPSOIL (Side slope)	ACRE	51,160	10	-	0.00002		11.74	$ 32,000.00	$ 375,831
CLEARING	ACRE	1,250	8	-	0.00002		0.23	$ 40,000.00	$ 9,183
SIGNAL SYSTEM (Rob's Dr, Lake Prince Dr)	EA	-	-	-	-	-	2.00	$ 600,000.00	$ 1,200,000
STORMWATER MANAGEMENT (Approx. 15 acres of additional impervious)	LS	-	-	-	-		1	$ 2,000,000.00	$ 2,000,000
PUBLIC UTILITY RELOCATION (From PCES)	LS	-	-	-	-	-	1	$ 2,819,231.00	$ 2,819,231
					SUBTOTAL A				$ 15,573,308
ROW & Utilities									
RIGHT OF WAY	LS	-	-	-	-	-	1	-	$ -
PRIVATE UTILITY RELOCATION (From PCES)	LS	-	-	-	-	-	1	$ 3,010,961.00	$ 3,010,961
					SUBTOTAL B				$ 3,010,961

EROSION AND SEDIMENT CONTROL 5% SUBTOTAL A	$ 778,665.40
MAINTENANCE OF TRAFFIC 5% SUBTOTAL A	$ 778,665.40
MISCELLANEOUS ITEMS 25% SUBTOTAL A	$ 3,893,326.98
SUBTOTAL C (Excludes Subtotal B)	**$ 21,023,966**
MOBILIZATION 10% SUBTOTAL C	$ 2,102,396.57
SUBTOTAL D (Excludes Subtotal B)	**$ 23,126,362**
CONST. ENG. 125% & CONTIG. 10% SUBTOTAL D	$ 5,203,431.51
SUBTOTAL E (Excludes Subtotal B)	**$ 28,329,794**
PRELIMINARY ENGINEERING 12% SUBTOTAL D	$ 3,399,575.25
GRAND TOTAL COST (Includes Subtotal B)	**$ 34,741,000**

TOTAL COST

$ 34,750,000

Computations

Project:	US 460 Safety Study	Project #	39955.29
Location:	Suffolk, VA	Sheet:	6 of 6
Calculated by:	BEM	Date:	4/30/2018
Checked by:		Date:	
Title:	Planning Level Cost Estimates		

Alternative 3

Construct VDOT GS-1 Typical Section

Assumptions:

25,580' of new roadway construction, 4 lane divided w/ 40' depressed median, 12' lanes, 4' left shoulder, and 8' shoulder from Suffolk City line to Northfield Dr.
6" asphalt pavement depth, 10" aggregate base (right shoulders)
9" asphalt pavement depth, 12" aggregate base (travel lane, left shoulder)
Remove entire existing roadway
Rural principal arterial functional classification
Ditched roadway section
Utility relocation cost have been captured in this estimate
ROW cost have **not** been captured in this estimate

Construction	Unit	Length (ft)	Width (ft)	Depth (ft)	Factor	% Occurring	Quantity	Unit Cost	TOTAL
ASPHALT PAVEMENT - 6" (8' right shoulders)	TONS	51,160	8.0	0.50	0.07407		15,159	$ 90.00	$ 1,364,267
ASPHALT PAVEMENT - 9" (28' travels lanes and left shoulders	TONS	25,580	28.0	0.75	0.07407		39,791	$ 90.00	$ 3,581,200
AGGREGATE BASE - 10" (Widen EB and WB Shoulder to 8')	TONS	51,160	8.0	0.83	0.07407		25,264	$ 42.00	$ 1,061,096
AGGREGATE BASE - 12"(Construct new travel lanes)	TONS	25,580	28.0	1.00	0.07407		53,055	$ 42.00	$ 2,228,302
MEDIAN CROSSOVER	EA	-	-	-	-		15	$ 18,000.00	$ 270,000
RIGHT TURN LANE	EA	-	-	-	-		4	$ 45,000.00	$ 180,000
LEFT TURN LANE (Single)	EA	-	-	-	-		8	$ 50,000.00	$ 400,000
LEFT TURN LANE (Double)	EA	-	-	-	-		7	$ 100,000.00	$ 700,000
EXCAVATION (For roadway construction)	CY	51,160	28.0	1.50	0.03704		79,582	$ 30.00	$ 2,387,467
EXCAVATION (Median)	CY	25,580	40.0	3.50	0.03704		66,319	$ 31.00	$ 2,055,874
DEMOLITION OF PAVEMENT (5 lane section)	SY	5,870	60.0	-	0.11111		39,133	$ 6.00	$ 234,800
DEMOLITION OF PAVEMENT (4 lane section)	SY	19,710	48.0	-	0.11111		105,120	$ 7.00	$ 735,840
OBSCURING ROADWAY (5 lane section)	UNIT	5,870	60.0	-	0.00100		352	$ 300.00	$ 105,660
OBSCURING ROADWAY (4 lane section)	UNIT	19,710	48.0	-	0.00100		946	$ 300.00	$ 283,824
4" YELLOW PAVEMENT MARKING LINE (Solid)	LF	51,160	-	-	1		51,160	$ 1.50	$ 76,740
4" WHITE PAVEMENT MARKING LINE (Solid)	LF	51,160	-	-	1		51,160	$ 1.50	$ 76,740
4" WHITE PAVEMENT MARKING LINE (Dashed)	LF	51,160	-	-	1	25%	12,790	$ 1.50	$ 19,185
2" TOPSOIL (Sideslope)	ACRE	51,160	10	-	0.00002		11.74	$ 32,000.00	$ 375,831
2" TOPSOIL (Median)	ACRE	25,580	40	-	0.00002		23.49	$ 32,000.00	$ 751,662
CLEARING	ACRE	3,670	20	-	0.00002		1.69	$ 40,000.00	$ 67,401
SIGNAL SYSTEM (Rob's Dr, Kingsfork Rd, Lake Prince Rd)	EA	-	-	-	-	-	3.00	$ 600,000.00	$ 1,800,000
DRAINAGE (Structures and pipes)	LS	-	-	-	-		1	$ 275,000.00	$ 275,000
STORMWATER MANAGEMENT (Approx. 21 acres of additional impervious	LS	-	-	-	-		1	$ 2,500,000.00	$ 2,500,000
PUBLIC UTILITY RELOCATION (From PCES)	LS	-	-	-	-	-	1	$ 2,819,231.00	$ 2,819,231
					SUBTOTAL A				$ 24,350,120
ROW									
	SF	-	-	-	-	-	-	$ -	$ -
PRIVATE UTILITY RELOCATION (From PCES)	LS	-	-	-	-	-	1	$ 3,010,961.00	$ 3,010,961
					SUBTOTAL B				$ 3,010,961

EROSION AND SEDIMENT CONTROL 5% SUBTOTAL A	$ 1,217,506.02
MAINTENANCE OF TRAFFIC 5% SUBTOTAL A	$ 1,217,506.02
MISCELLANEOUS ITEMS 25% SUBTOTAL A	$ 6,087,530.08
SUBTOTAL C (Excludes Subtotal B)	**$ 32,872,662**
MOBILIZATION 10% SUBTOTAL C	$ 3,287,266.24
SUBTOTAL D (Excludes Subtotal B)	**$ 36,159,929**
CONST. ENG. 12.5% & CONTIG. 10% SUBTOTAL D	$ 8,135,983.95
SUBTOTAL E (Excludes Subtotal B)	**$ 44,295,913**
PRELIMINARY ENGINEERING 12% SUBTOTAL D	$ 5,315,509.52
GRAND TOTAL COST (Includes Subtotal B)	**$ 52,623,000**

TOTAL COST

$ 52,630,000

Appendix J

CONTENTS

Systemic Cost Estimate Summary	Total Cost
"Template 1 - 4-LEG (2-Way Stop Controlled), Unseparated (for 2 Intersections)"	
Tier 1	$132,215.81
Tier 2	$17,315.79
Tier 3	$21,141.44
"Template 3 - 3-LEG (1-Way Stop Controlled), Unseparated (for 5 Intersections)"	
Tier 1	$145,446.03
Tier 2	$34,520.36
Tier 3	$38,279.60
"Template 7 - Signalized - No Median (for 2 Intersections)"	
Tier 1	$139,256.33
Tier 2	$14,971.33
Tier 3	$30,198.49
"Template 8 - Signalized - Median (for 3 Intersections)"	
Tier 1	$345,257.76
Tier 2	$73,544.18
Tier 3	$32,536.94
"Template 9 - Corridor - No Median (1 mile segment) (for 6.3 miles)"	
Tier 1	$496,178.63
Tier 2	$378,465.19
Tier 3	$276,400.15
"Template 11 - Curve - No Median (for 2 curves)"	
Tier 1	$35,137.35
Tier 2	$-
Tier 3	$209,727.76

Virginia Department of Transportation