Corridor Study

Russ Avenue
Town of Waynesville, North Carolina

Prepared For:
Town of Waynesville
16 South Main Street
Waynesville, North Carolina 28786

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES

Submitted: February 28, 2010
WSA # 102706

CORRIDOR STUDY

For

Russ Avenue

Waynesville, North Carolina

Prepared For:

Town of Waynesville. North Carolina

Prepared By:

421 Fayetteville Street, Suite 1303
Raleigh, North Carolina 27601
919.755.0583

WSA License No.: F-0378

February 28, 2010

(WSA Project No. 102706)

Table of Contents

Table of Contents

LIST OF TABLES

LIST OF FIGURES

I. EXECUTIVE SUMMARY

The Town of Waynesville, North Carolina has identified the need to improve the Russ Avenue Corridor from the Great Smoky Mountains Expressway (US 23-74) interchange to Walnut Street. The purpose of this study is develop a feasible corridor plan which includes plans for future travel demand; intersection improvements; access configuration and management; median and edge landscaping; and pedestrian, bicycle, and public transportation facilities along the Russ Avenue corridor. Planning level project cost estimates will also be developed for use by the Town of Waynesville in its transportation planning process. This study is the initial step in the planning process for this project and is not the product of detailed environmental or design analysis.

Russ Avenue is a part of the major north-south transportation corridor through Waynesville and forms the major eastern gateway into the town from the Great Smoky Mountains Expressway (US 23-74). As such, the efficiency and attractiveness of the road shape many visitors' first impression of the town and the quality of many residents' daily lives.

Russ Avenue currently functions with a dual purpose: 1) to provide through access from the Great Smoky Mountains Expressway into the heart of Waynesville, and 2) to provide access to a variety of retail stores and restaurants that line the roadway. This dual purpose with heavy through volumes, combined with heavy turning movements can cause congestion and driver confusion, particularly in the peak hours. The developments along the corridor are supportive of primarily automobile use, with few sidewalk connections and bicycle and pedestrian amenities.

As Waynesville's most heavily travelled thoroughfare, Russ Avenue experiences extended periods of congestion, specifically during the morning and afternoon peak hours. Due to numerous driveways along Russ Avenue, there is a significant amount of left-turning movements throughout the corridor, which creates additional congestion and driver confusion, decreasing safety

The development of concepts for the area that meet the goals established for this project was an extremely iterative process that included a significant amount of stakeholder and public input. A wide variety of transportation options were considered, including:

- Roundabouts
- 6-lane section
- 2-lane section
- 4-lane section
- Parallel facilities

As part of the development of concepts for the area, several meetings were held during the process of this study in order to obtain input from the Town of Waynesville staff and public officials, as well as the citizens of Waynesville.

A detailed traffic analysis was performed of the existing conditions, expected future conditions without any roadway improvements, and future conditions with the recommended alternative.

Existing levels of service were calculated for the study area intersections using the existing lane configurations and signal timings. With the exception of Barber Boulevard in the PM peak hour, there were no major capacity problems identified in the study area. The poor level-of-service at Barber Road was expected, as a high number of accidents were reported at this intersection in 2006 and 2007. The 2008 AM and PM existing conditions capacity analyses results for the Russ Avenue corridor is included in Table 2.

Not included in the capacity analysis is the effect of the multiple driveways along Russ Avenue. These driveways serve to increase congestion, lowering level of service and decreasing safety. The five-lane undivided cross section with continuous two-way left turn lane coupled with the multiple driveways has a dramatic effect on traffic operations due to the absence of any access control.

Most major intersections in the project area are expected to continue operating at acceptable LOS during the 2030 AM & PM No-Build Scenario. However the LOS did worsen the unacceptable LOS at the Russ Avenue intersections with Barber Boulevard, Dellwood Road / Howell Mill Road (in the PM peak), and US 23/74 Northbound ramp (in the PM peak, in the westbound approach). The 2030 No-Build Scenario Condition analyses results for the AM & PM peak hours for the Russ Avenue corridor is included in Table 2.

As with the existing conditions, the five-lane undivided cross section with continuous two-way left turn lane coupled with the multiple driveways will continue to cause increased traffic congestion and decreased safety as through and turning movement volumes grow in the study area.

The 2030 Buildout Conditions assumes the redistribution of some of the through volumes on Russ Avenue to connectors between Waynesville Plaza and Howell Mill Road and between Barber Boulevard and Frazier Street, in order to alleviate some of the congestion at these intersections along the Russ Avenue corridor. The 2030 Buildout Condition capacity analyses results for the AM and PM peak hours for the study area intersections including the recommendations developed through the public involvement process are included in Table 2.

This analysis indicates that all study area intersections should operate with a reasonable level of service and delay in 2030 with the recommended improvements. Additionally, the addition of a median along Russ Avenue should greatly increase safety and congestion at the driveways between the major study area intersections. Appropriate pedestrian and bicycle accommodations should also encourage multi-modal travel in the area, encouraging people to leave their vehicle at one location and walk to their destinations, and to walk from some of the adjacent residential neighborhoods to destinations within the study area.

To accommodate for the projected design year 2030 traffic volumes along Russ Avenue, the following improvements are recommended:

NEW CONNECTOR ROADS

- Construct a connector road that extends from Frazier Street to the intersection of Russ Avenue and Barber Boulevard to form a 4-leg intersection.
- Construct a connector road from Frazier Street (behind the Shell Gas Station) to Russ Avenue where the existing abandoned Long John Silver restaurant sits. This new connector road would be located behind McDonalds and CVS.
- Construct a connector road / back access road to connect the Waffle House, Arby's, and Pizza Hut to Barber Boulevard.
- Construct a connector road / back access road to connect the Sears Shopping Center to Howell Mill Road.
- Construct a bridge over Richland Creek to connect the Sears Shopping Center to Marshall Street. This bridge should be of sufficient length to allow for a greenway underneath the structure.

BRIDGES

- Construct a new 5-lane bridge over Richland Creek to allow for northbound and southbound left turn lanes. This bridge should be of sufficient length to allow for a greenway underneath the structure.
- Construct a new 5-lane bridge over the rail line to allow for northbound and southbound left turn lanes.

RUSS AVENUE

- Construct a 4-lane landscaped median divided, curb and gutter roadway with turn lanes at key intersections.
- Construct sidewalks along both sides of the roadway.
- Construct bicycle lanes along both sides of the roadway.

❖ ***Frazier Street Intersection***

- Construct a southbound left turn lane on Russ Avenue with 100 feet of storage.
- Construct an eastbound shared left turn / through lane and a right turn lane with 100 feet of storage on Frazier Street.
- Construct a westbound shared left/through/right turn lane on the new Frazier Street connector.
- Construct a traffic signal.

❖ ***Barber Boulevard Intersection***

- Construct an eastbound left turn lane with 150 feet of storage a through lane and a right turn lane with 100 feet of storage on Barber Boulevard.
- Construct a westbound left turn lane with 150 feet of storage and shared through/right turn lane on Barber Boulevard.
- Construct a northbound left turn lane with 200 feet of storage and a right turn lane with 100 feet of storage on Russ Avenue.

Probable costs for the recommended roadway improvements were developed using cost estimates provided by the Capital Area Metropolitan Planning Organization and quantities developed from the conceptual design plans. A summary of the planning level cost estimates for the proposed improvements are included in the table below.

Opinion of Probable Cost Russ Avenue Corridor Study	
Russ Avenue Improvements	
Preliminary Engineering	$1,300,000
Construction	$8,610,000
Right-of-Way	$5,670,000
Side Streets / Connectors	
Preliminary Engineering	$413,000
Construction	$2,880,000
Right-of-Way	$2,800,000
Total Cost	**$21,673,000**

The Russ Avenue Corridor Study is the initial step in the planning and design process for the development of a project. The public, Town of Waynesville and the French Broad River Metropolitan Planning Organization all contributed greatly in the development of a future plan for the Russ Avenue corridor that can safely and efficiently accommodate all modes of travel and will enhance the aesthetics of the corridor.

II. INTRODUCTION

The Town of Waynesville, North Carolina has identified the need to improve the Russ Avenue Corridor from the Great Smoky Mountains Expressway (US 23-74) interchange to Walnut Street. The purpose of this study is develop a feasible corridor plan which includes plans for future travel demand; intersection improvements; access configuration and management; median and edge landscaping; and pedestrian, bicycle, and public transportation facilities along the Russ Avenue corridor. Planning level project cost estimates will also be developed for use by the Town of Waynesville in its transportation planning process. This study is the initial step in the planning process for this project and is not the product of detailed environmental or design analysis. The general location and project study area are shown in Figure 1.

Russ Avenue is a part of the major north-south transportation corridor through Waynesville and forms the major eastern gateway into the town from the Great Smoky Mountains Expressway (US 23-74). As such, the efficiency and attractiveness of the road shape many visitors' first impression of the town and the quality of many residents' daily lives.

The goals for this project, as developed by the Town of Waynesville and the French Broad River Metropolitan Planning Organization are as follows:

1. Analyze roadway capacity and future travel demand
2. Analyze and design intersection improvements
3. Analyze and design access from abutting properties
4. Analyze and design pedestrian and bicycle facilities
5. Analyze and design opportunities for landscaped median and street tree planting strips
6. Address aesthetics, gateway features, and context-sensitive roadway design
7. Obtain community input as to current problems and desired solutions
8. Develop recommendations for improvements designed to meet community goals
9. Develop a priority listing of implementation strategies
10. Develop perspective illustrations of streetscape improvements and plan view renderings of roadway improvements
11. Produce a document that can be used as a blueprint for public and private sector decisions concerning road improvements and development of adjacent properties

This report includes improvements to Russ Avenue from the Great Smoky Mountains Expressway from the north to Walnut Street in the south. The study also includes considerations of improvements to major intersections and adjacent and parallel surface streets within the study area to improve traffic flow along the corridor. While the study primarily focuses on improvements to Russ Avenue, it also includes pedestrian and bicycle facilities and side street connections which may be implemented to provide a safer and more efficient roadway network.

Russ Avenue congestion

III. BACKGROUND INFORMATION

Study Area Description
Russ Avenue (US 276) is a major north-south thoroughfare that connects US 19 to the north and Walnut Street to the south. The segment between the Great Smoky Mountains Expressway (US 23/74) and Walnut Street (approximately 0.8 miles) serves as a gateway into Waynesville. As such, the efficiency and attractiveness of the road shape a great deal of visitors' first impression of the town and the quality of many residents' everyday lives.

Russ Avenue currently functions with a dual purpose: 1) to provide through access from the Great Smoky Mountains Expressway into the heart of Waynesville, and 2) to provide access to a variety of retail stores and restaurants that line the roadway. This dual purpose with heavy through volumes, combined with heavy turning movements can cause congestion and driver confusion, particularly in the peak hours. The developments along the corridor are supportive of primarily automobile use, with few sidewalk connections and bicycle and pedestrian amenities.

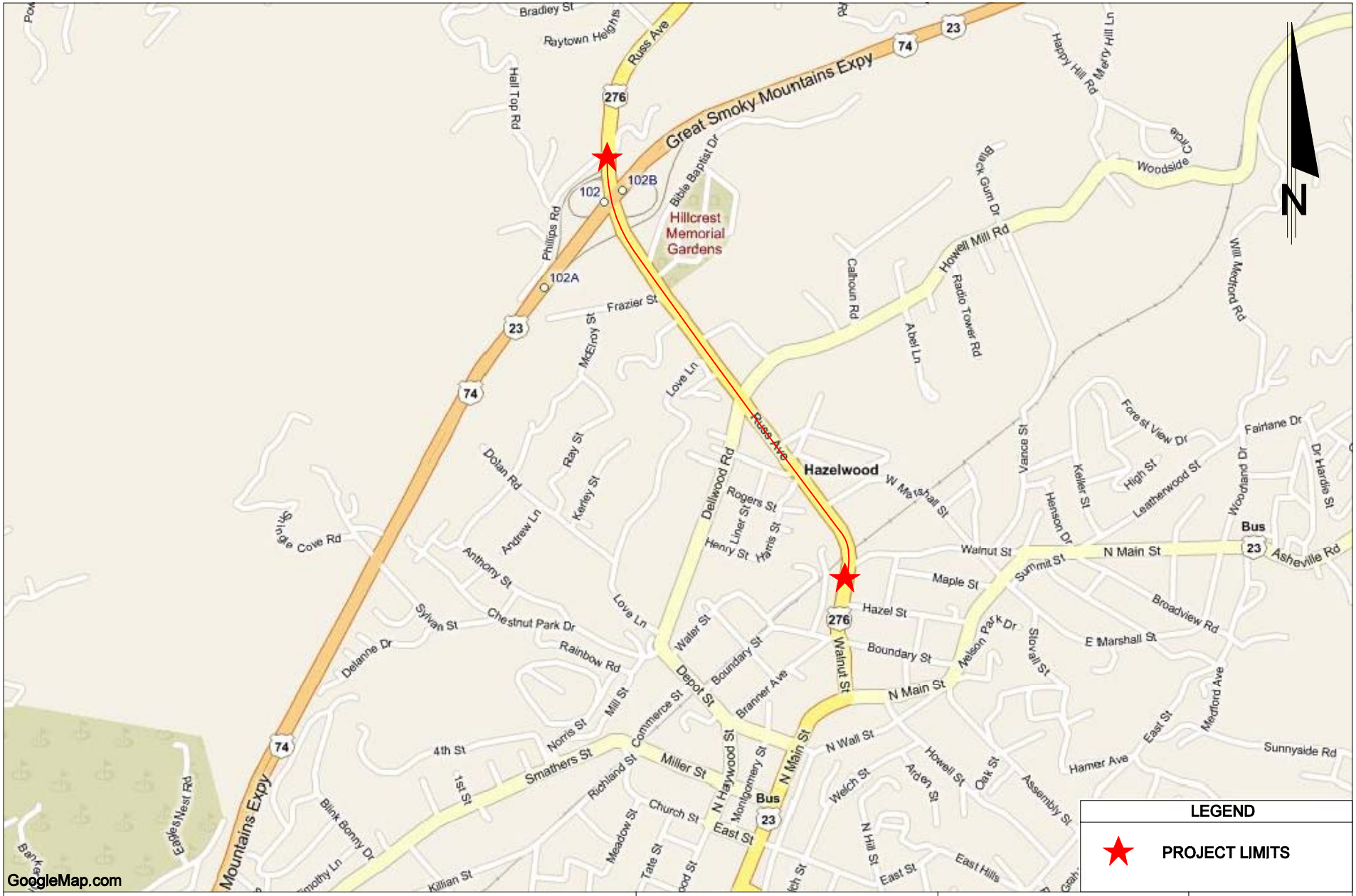
The study area consists of the US 23-74 / Russ Avenue partial cloverleaf interchange and nearby roadways intersecting Russ Avenue. The minor roadways evaluated in the study area include Frazier Street, Betsy Acres Lane, Barber Boulevard, Dellwood Road/Howell Mill Road, Border Street (Shopping Center Access), Waynesville Plaza driveway (Shopping Center Access), Lee Street, West Marshall Street, and Walnut Street. The intersections along Russ Avenue at Phillips Road, Barber Boulevard, Dellwood Road/Howell Mill Road, West Marshall Street, and Walnut Street are currently signalized. All other intersections are stop-controlled on the minor side-street approaches. Figure 1 shows the project study area.

Existing Conditions
As Waynesville's most heavily travelled thoroughfare, Russ Avenue experiences extended periods of congestion, specifically during the morning and afternoon peak hours. Due to numerous driveways along Russ Avenue, there is a significant amount of left-turning movements throughout the corridor, which creates additional congestion and driver confusion, decreasing safety.

The following is a description of the study area roadways, crash statistics, projected roadway improvements, and land uses.

A. Study Area Roadways

Figure 1 shows the project study area along Russ Avenue. The existing geometrics and intersection traffic control for existing roadways and intersections within the study area are shown schematically in Figure 2. The following is a brief description of existing roadways and intersections within the study area:



WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS

421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

STUDY LOCATION MAP

FIGURE: 1

SCALE: NONE

Russ Avenue (US 276) is a major northbound-southbound thoroughfare located in the Town of Waynesville. Within the study area, Russ Avenue is a five-lane roadway section, with a continuous two-way center left-turn lane and multiple driveway cuts from the beginning limits of the project (US 23 / 74) to its end in the southern direction at Walnut Street. Not only does Russ Avenue provide direct access to Waynesville, it also serves as the primary access to Lake Junaluska.

Russ Avenue looking northbound

The Town of Waynesville has identified Russ Avenue as a roadway that needs to be physically enhanced, both functionally and aesthetically. The 2008 Annual Average Daily Traffic (AADT) volume on Russ Avenue was approximately 17,000 Vehicles Per Day (VPD) just north of the US 23 / 73 Interchange, and 23,000 VPD south of Frazier Street and north of Betsy Acres Lane, as published on the ***North Carolina Department of Transportation (NCDOT) Traffic Volume (AADT) Maps***[1]. The posted speed limit along the study corridor is 35 miles per hour (MPH).

US 23 / 74 (Great Smoky Mountains Expressway) is a US Highway which runs north-south along the northern limits of the project study area. US 23 / 74 is a four lane divided highway with a concrete jersey barrier separating the north/south travel lanes. US 23 / 74 connects Waynesville to Asheville (approximately 30 miles northeast) and to Bryson City (approximately 35 miles southwest). US 23/74 splits in Sylva with US 23 extending into Georgia while US 74 extends to Bryson City. The 2008 AADT volume on US 23 / 74 as published by NCDOT is approximately 30,000 VPD north and south of the Russ Avenue interchange. The posted speed limit on US 23 / 74 along the study corridor is 60 MPH.

Looking eastbound @ US23/74 westbound on ramp.

Betsy Acres Lane is a private driveway which provides access to private residence west of Russ Avenue. In addition, Betsy Acres Lane provides access for McDonald's and CVS Pharmacy. Betsy Acres Lane is an unmarked two-lane drive. No AADT data is available on Barber Boulevard, nor is a speed limit posted.

Barber Boulevard is a shopping center driveway, providing access for Ingles, Belk, and other businesses to Russ Avenue and Howell Mill Road. Barber Boulevard is an unmarked two-lane drive. No AADT data is available on Barber Boulevard, nor is a speed limit posted.

Barber Street/Russ Ave intersection looking westbound.

Dellwood Drive (SR 1247) / Howell Mill Road (SR 1184) are major connector roads within the project study area. Dellwood Drive primarily serves as a connector street linking Russ Avenue to the Frog Level area and provides a secondary access to downtown Waynesville via Depot Street. Primary development along Dellwood Drive is a mostly commercial with some minor residential developments. There is no published AADT data available on Dellwood Drive. The posted speed limit on Dellwood Drive is 30 MPH.

Howell Mill Road serves as a major connector from Russ Avenue to Asheville Road (Business US 23). Primary development along Howell Mill Road is a mixture of residential, retail, and commercial. The 2008 AADT volume on Howell Mill Road as published by NCDOT is approximately 4,700 VPD just east of its intersection with Russ Avenue. The posted speed limit on Howell Mill Road is 35 MPH east of Russ Avenue.

West Marshall Street is a connector road within the project study area. This connector's western leg begins on the southern end of Russ Avenue and continues to North Main Street (US 23 Business) on its eastern leg. No AADT data is available on West Marshall Street and no speed limit is posted. Since it is a local town street, the speed limit is assumed to be 35 MPH.

Walnut Street is a connector road on the southern end of the project study area. Walnut Street begins where Russ Avenue ends just south of its bridge over the Norfolk Southern Railroad, and continues southward into the downtown Waynesville area. The 2008 AADT volume on Walnut Street, as published by NCDOT, is approximately 5,900 VPD just north of its intersection with North Main Street and at its southern end. The posted speed limit on Walnut Street is 20 MPH.

Walnut Street looking westbound @ Russ Avenue.

Pedestrian facilities at Ingles driveway.

Pedestrian and Bicycle Facilities

There are no designated bicycle facilities along the Russ Avenue corridor. Sidewalks exist along the majority of Russ Avenue and are typically located immediately adjacent to the curb. There are few crosswalks along the corridor and no crosswalks are provided for individuals wishing to cross Russ Avenue. Traffic signals do not contain pedestrian signal heads or actuation.

Bridges

Bridge No. 870184 is located over the Norfolk Southern Railroad line. This steel structure was constructed in 1968. According to NCDOT, the bridge is currently functionally obsolete with a sufficiency rating of 73.3%. It qualifies for replacement due to substandard load carrying capacity or substandard bridge roadway geometry.

Bridge No. 870186 is located over Richland Creek. This pre-stressed concrete structure was constructed in 1967. According to NCDOT, the bridge is functionally obsolete with a sufficiency rating of 75.6%. It qualifies for replacement due to substandard load carrying capacity or substandard bridge roadway geometry.

Existing Lane Configurations and Traffic Control are illustrated on Figure 2.

Russ Avenue looking southbound with Richland Creek Bridge and Railroad Bridge in background.

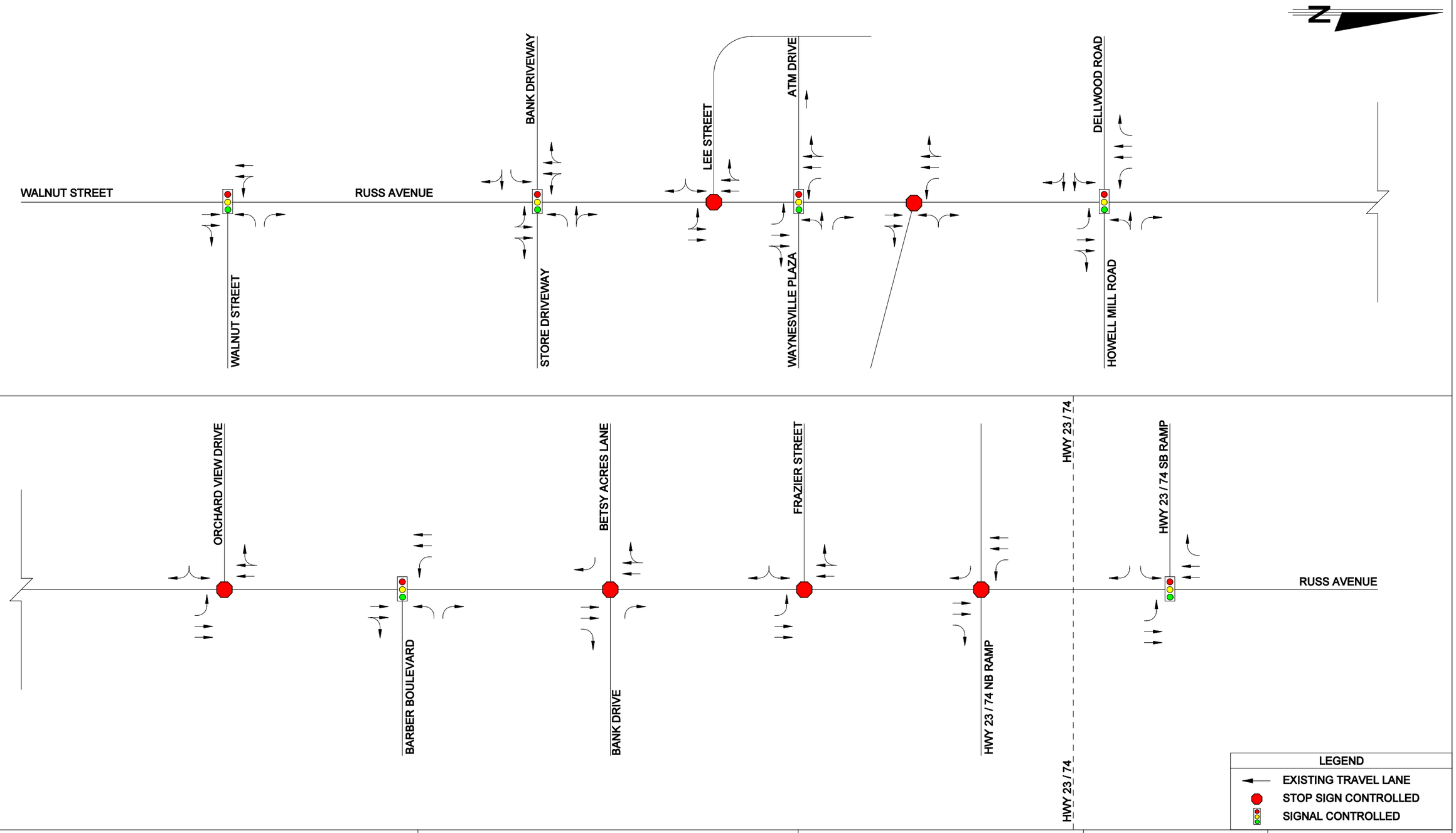
B. Crash Data

According to the Town of Waynesville Police Department accident report archives, multiple accidents have occurred on Russ Avenue in recent years. One-hundred five (105) accidents were reported in 2006 and ninety-four (94) in 2007. Of those accidents, those with reported injuries included fifteen (15) in 2006 and twenty-one (21) in 2007. Estimated damages were $160,600 in 2006 and $179,219 in 2007. In 2006, the majority of the accidents reported occurred at the McDonalds driveway, Barber Boulevard, Dellwood Road, and Howell Mill Road. In 2007, the majority of the accidents reported occurred at Barber Boulevard, Howell Mill Road, and the Kmart driveway, coinciding with some of the areas of densest development within the study area. See Appendix A for a detailed breakdown of the reported accidents.

C. Projected Roadway Improvements

Based on the ***2009-2015 State Transportation Improvement Program (TIP)***[2], there is one project in the vicinity of the Russ Avenue study area. A brief description of the project is included below:

TIP Project No. U-4412: Waynesville, Haywood County. SR 1184 (Howell Mill Road), US 276 to US 23 Business. Upgrade two lanes and construct railroad grade separation. At the time of this study, the right-of-way is scheduled for December 2009 with construction in January 2012.



ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

EXISTING LANE CONFIGURATIONS
AND TRAFFIC CONTROL

FIGURE: 2

SCALE: NONE

D. Land Uses

Land uses along the corridor are primarily retail and restaurant oriented. Immediately adjacent to the US 23/74/Russ Avenue interchange are several motels including the Lodge and Days Inn located along the west side of Russ Avenue with the Hillcrest Memorial Gardens located southeast of the interchange.

Sit-down restaurants such as Sagebrush Steakhouse, Pizza Hut, and Zaxby's as well as numerous fast food establishments such as McDonalds, Wendy's, KFC, Arby's, and Hardee's are all located along the Russ Avenue corridor with most having individual driveway accesses to Russ Avenue. There is one Shell gas station in the southwest quadrant of Russ Avenue and Frazier Street. Several pharmacies such as CVS and Rite Aid are located along the corridor
Three shopping centers, anchored by Ingle's and Belk, with specialty restaurants and other retail shops are located along the east side of Russ Avenue. Other land uses located along the corridor include banks, ATM machines, AutoBell Car Wash, Sear's, Enterprise Rental Car, and Taylor Motors Company.

Most businesses along Russ Avenue have an individual driveway access and in some cases, have multiple driveway curb cuts. This is one of the main causes of the high frequency of crashes along Russ Avenue.

IV. ALTERNATIVES DEVELOPMENT AND PUBLIC INVOLVEMENT

The development of concepts for the area that meet the goals established for this project was an extremely iterative process that included a significant amount of stakeholder and public input. A wide variety of transportation options were considered, including;

Roundabouts – a system of single land and 2-lane roundabouts were considered along Russ Avenue. Traffic analysis of these roundabouts is included later in the report. Roundabouts would likely provide an attractive alternative by providing options for aesthetic improvements within the center of the roundabouts and would improve pedestrian connectivity along and across Russ Avenue.

6-lane section – a 6-lane cross section with a narrow center median was also considered to increase through capacity along Russ Avenue. This alternative was rejected due to the additional right-of-way need for the additional through lanes as well as the need for left turn lanes at strategic locations along the corridor. This alternative would also not be aesthetically pleasing with the narrow concrete center median.

2-lane section – a 2-lane section was also considered, which would allow for a striped bike lane, a wide center median, and expanded sidewalks. This option was eliminated from consideration due to the capacity needed for through volumes along Russ Avenue

Parallel facilities – attempts were made to develop a system of parallel facilities that would work to relieve much of the local access traffic from Russ Avenue. The variety of stream crossings and challenging grades in the area made the development of a true parallel road system difficult, but the final alternative includes several connections that utilize existing roadways and shopping centers to provide alternative routes for local access traffic.

As part of the development of concepts for the area, several meetings were held during the process of this study in order to obtain input from the Town of Waynesville staff and public officials, as well as the citizens of Waynesville. Minutes from each of the meetings are attached in Appendix C. A Kick-off Meeting and two (2) Public Workshops were held in addition to the several project team meetings.

A. 1st Public Workshop

The ***1st Public Workshop*** was held on August 21, 2008 at the Waynesville Recreation Center, from 5:00 pm to 7:00 pm. Twenty-four (24) citizens signed the attendance sheet. The purpose of this workshop was to get the citizens assistance in identifying issues and concerns, and in gathering suggestions on how to improve upon them. Sixteen (16) written comments were received from Town of Waynesville residents concerning the issues the perceived along Russ Avenue. The following is a summary of some of the general suggestions, comments, and concerns regarding the corridor.

- Address the median and center turn lane along Russ Avenue in front of McDonalds and CVS
- Correct the intersection alignment of Russ Avenue/Barber Boulevard/Long John Silver
- Need crosswalks and pedestrian signal heads
- Consider a parallel street to Russ Avenue to allow for one-way traffic northbound and southbound
- Improve aesthetics and bury utilities underground
- Do not need bicycle or pedestrian facilities
- Construct a bridge over the creek to connect the Bi-Lo and the Staples/Sears shopping centers

B. 2nd Public Workshop

The ***2nd Public Workshop*** was held on October 8, 2009 at the Waynesville Recreation Center, from 5:00 pm to 7:00 pm. Invitations to the public meeting were mailed to the residents in the project vicinity. A news article was also posted in the local newspaper to notify the public of the time and date of the meeting. A total of twenty-six (26) citizens signed the attendance form at the door for the 2nd public session. The purpose of this informational workshop was to present the some alternatives to the citizens based on their comments from the previous public workshop and gather input on which should be the preferred alternative.

The Project Team discussed project details with each citizen who attended, explaining the planning process and soliciting comments. Project maps illustrating the all potential alternatives were provided to help the public visualize the changes. Comment sheets were available for input from the meeting.

A total of twelve (12) comments were received as a result of the public workshop and of those, seven (7) noted that overall they like the Russ Avenue Corridor Plan.

A summary of the Public Workshops and written comments received from both of the Public Workshops are included in Appendix C.

V. TRAFFIC VOLUMES

A. Existing Traffic Volumes

To aid in determining the level of service of current traffic operations, morning (7-9 am) and afternoon (4-6pm) peak hour traffic counts were provided by WSA at the following locations:

- Russ Avenue / US 23/74 Southbound Ramps
- Russ Avenue / US 23/74 Northbound Ramps
- Russ Avenue / North Frazier Street
- Russ Avenue / Betsy Acres Lane
- Russ Avenue / Barber Boulevard
- Russ Avenue / Dellwood Road/Howell Mill Road
- Russ Avenue / Border Street (Shopping Center Access)
- Russ Avenue / Waynesville Plaza (Shopping Center Access)
- Russ Avenue / Lee Street
- Russ Avenue / West Marshall Street
- Russ Avenue / Walnut Street

Existing morning and afternoon peak hour traffic counts are shown on Figure 3. Raw count data is included in Appendix A.

B. 2030 No-Build Traffic Volumes

No-build traffic volumes are the volumes expected along the corridor if no roadway improvements are developed. Long-range traffic volumes forecasts are typically developed by utilizing a regional travel demand model. Since the updated 2030 traffic forecast model prepared by the French Broad River MPO was not completed during the time of this study, an annual growth rate was applied to the base 2008 traffic volumes to forecast future 2030 traffic volumes. Based on historic traffic trends, a 2.0% per year growth rate was applied to the base 2008 traffic volumes within the study area to estimate the projected 2030 traffic volumes to be used in the analysis of this study.

2030 No-Build morning and afternoon peak hour traffic counts are shown on Figure 4.

C. 2030 Buildout Traffic Volumes

The 2030 Buildout Traffic Volumes were determined utilizing the alternatives roadway alignments developed as part of this study. Specifically, these volumes were developed by rerouting the 2030 No-Build traffic volumes along Russ Avenue to new connectors between Waynesville Plaza and Howell Mill Road, and between Barber Boulevard and Frazier Street. The distribution percentages were determined from current traffic volumes accessing these roadways from either the north or southbound direction on Russ Avenue. Twenty percent of the through traffic along Russ Avenue between Waynesville Plaza and Howell Mill Road was redistributed to the Waynesville Plaza / Howell Mill Road connector. Forty percent of the through traffic along Russ Avenue in the northbound direction between Barber Boulevard and Frazier Street was redistributed to the Barber Street / Frazier Street connector.

The re-distribution percentages are illustrated on Figure 5. The final 2030 Buildout morning and afternoon peak hour traffic volumes are illustrated on Figures 6 and 7.

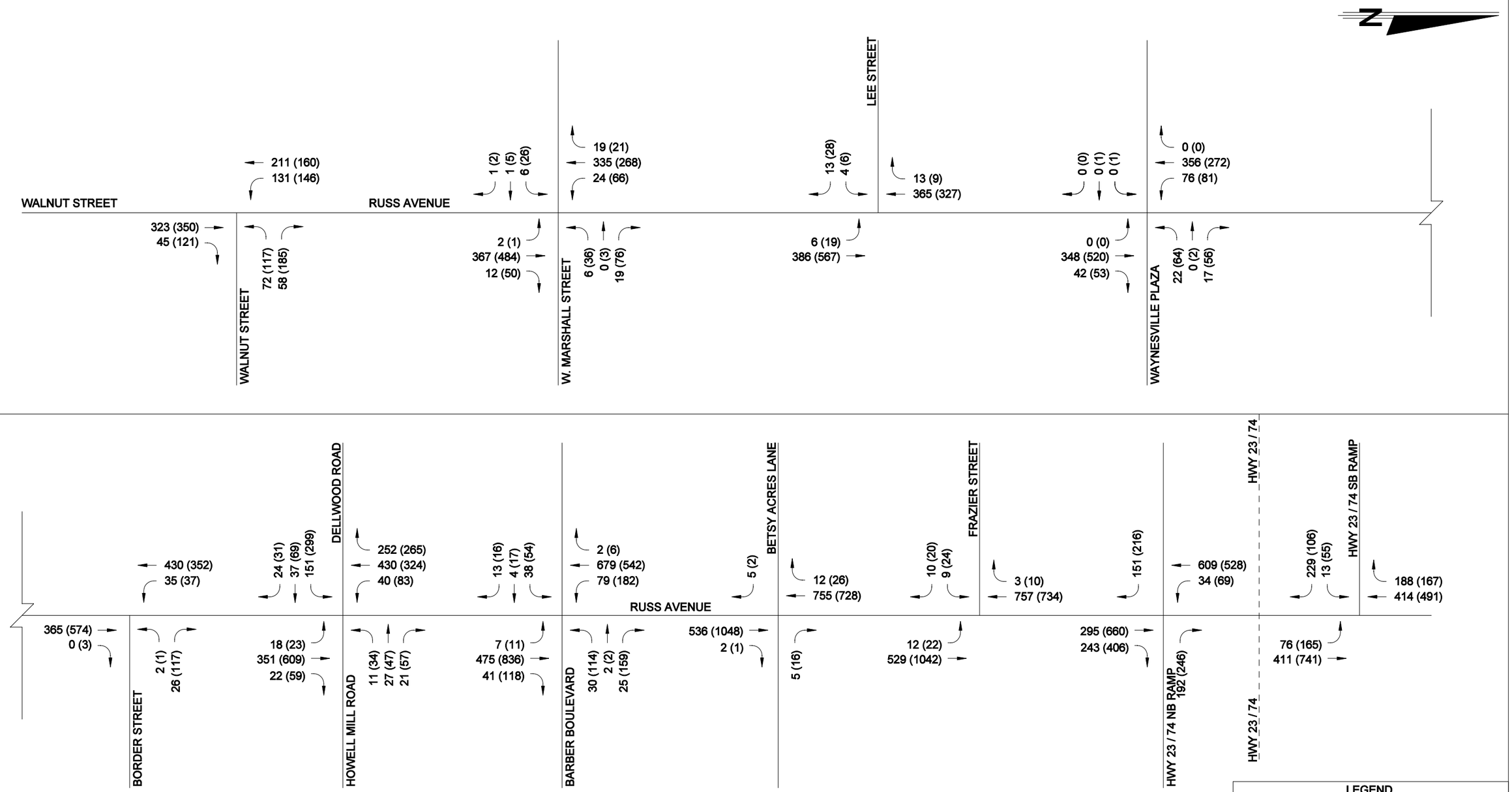
VI. CAPACITY ANALYSES

A. Level of Service Calculations

The study area intersections were analyzed using the methods outlined in the ***Highway Capacity Manual***[3] and Synchro Version 7.0 Software. The Highway Capacity Manual defines capacity as "the maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform section of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions, usually expressed as vehicles per hour or persons per hour".

Level of service (LOS) is a term used to represent different traffic conditions, and is defined as a "qualitative measure describing operational conditions within a traffic stream, and their perception by motorist/or passengers". Level of Service varies from Level A, representing free flow, to Level F where traffic breakdown conditions are evident. Level B represents good progression with minimal congestion. At Level C, the number of vehicles stopping is significant, although many still pass through the intersection without stopping. Level D represents more congestion, but the overall operations are acceptable. At Level E, freedom to maneuver within the traffic stream is extremely difficult with driver frustration being generally high.

For signalized intersections, service levels pertain to each approach as well as an overall value. The unsignalized intersection analysis method in the Highway Capacity Manual assigns LOS values for each movement that yields the right-of-way, but not to the overall intersection. This movement is generally a secondary movement from a minor street. At an unsignalized intersection, the primary traffic on the main roadway is virtually uninterrupted. Therefore, the overall level of service is usually much greater than what is represented by the results of the minor street movements. Synchro Version 7.0 will calculate an amount of delay for the overall intersection, but will not assign a LOS value.



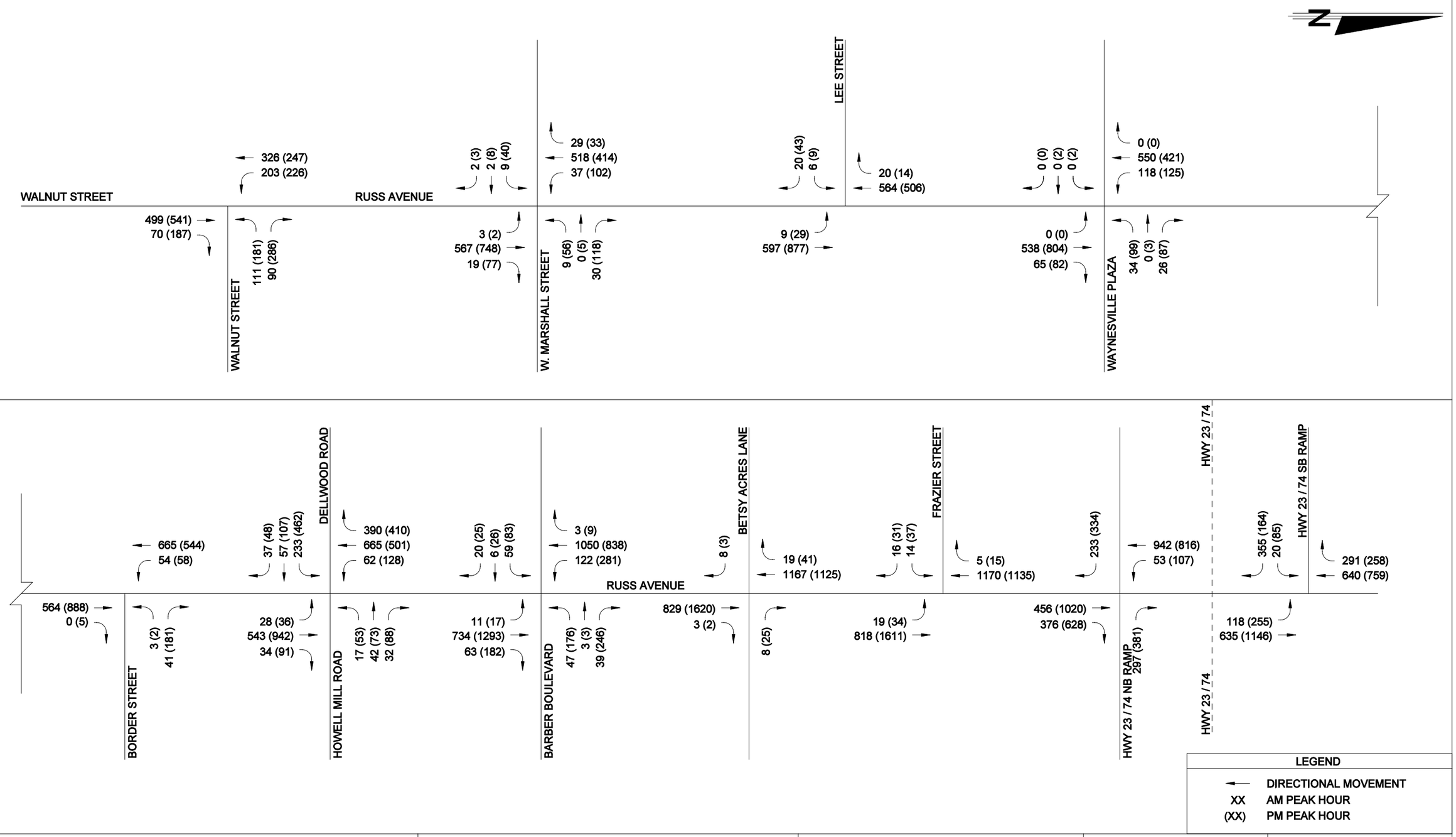
ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

2008 AM AND PM BALANCED
PEAK HOUR TRAFFIC VOLUMES

FIGURE: 3

SCALE: NONE



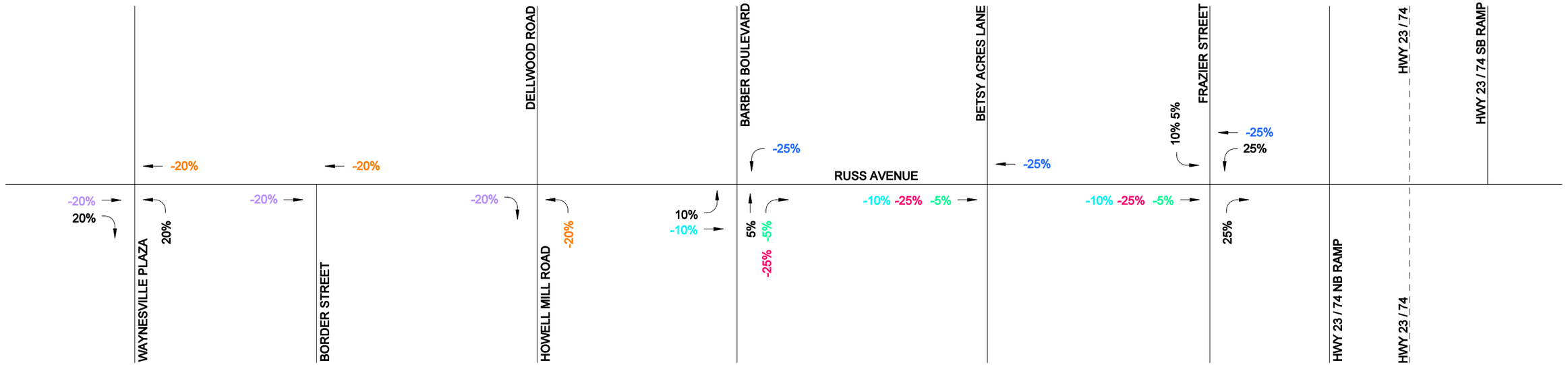
ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

2030 AM AND PM NO BUILD
PEAK HOUR TRAFFIC VOLUMES

FIGURE: 4

SCALE: NONE



LEGEND	
←	DIRECTIONAL MOVEMENT
XX	TRAFFIC DISTRIBUTION

ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES

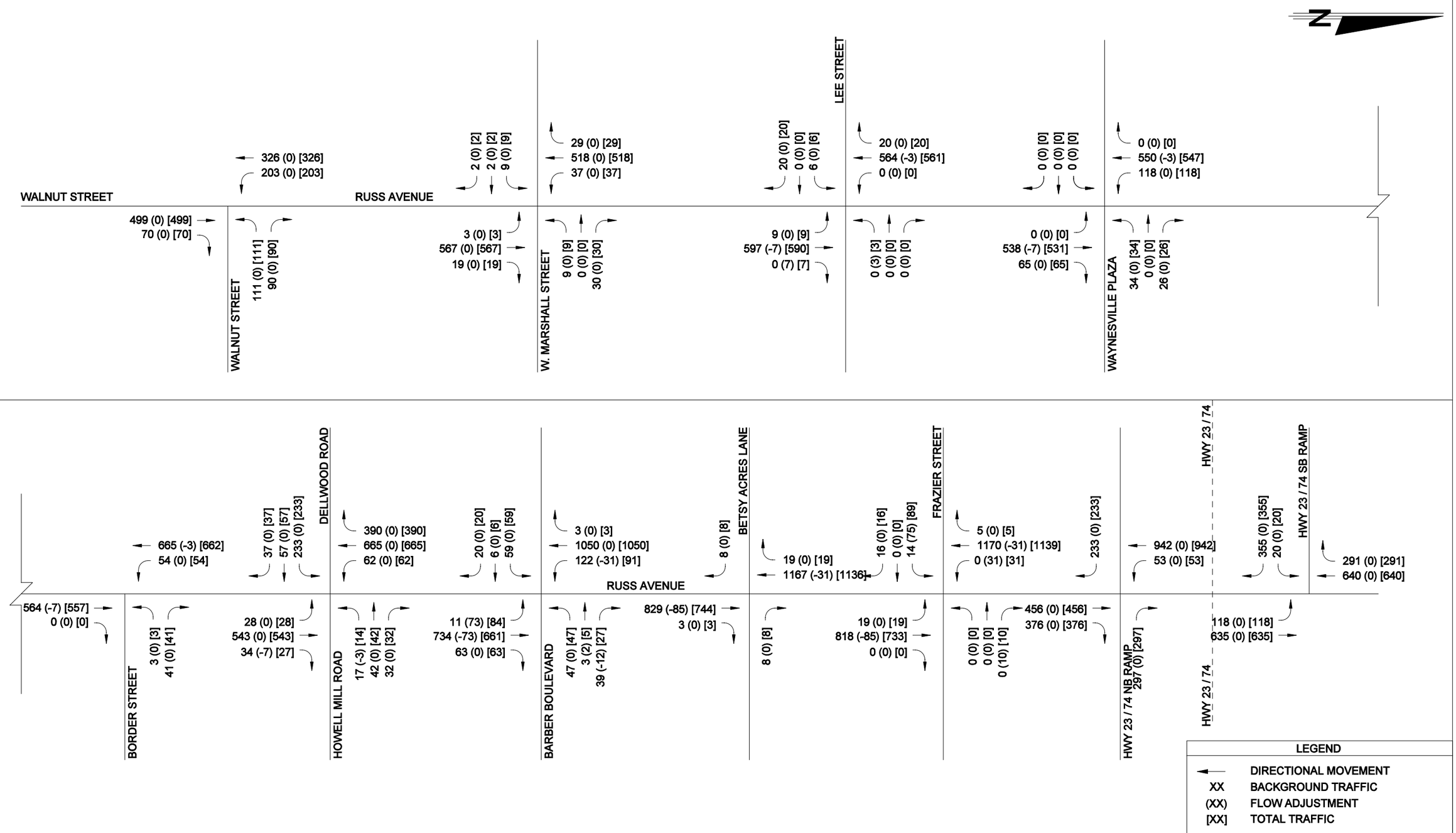
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

TRAFFIC RE-DISTRIBUTION

FIGURE: 5

SCALE: NONE



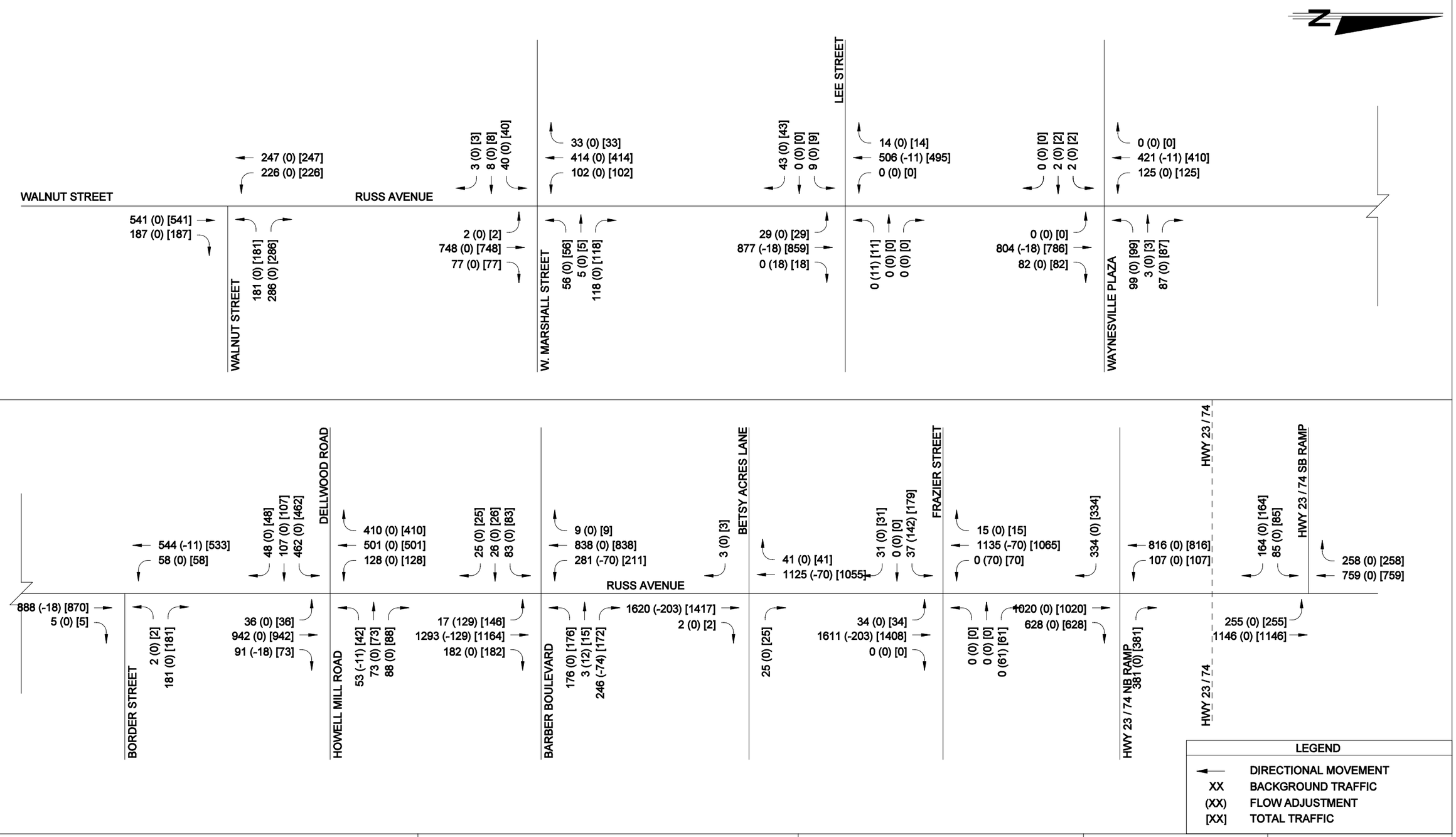
ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

2030 AM BUILDOUT
PEAK HOUR TRAFFIC VOLUMES

FIGURE: 6

SCALE: NONE



ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

2030 PM BUILDOUT
PEAK HOUR TRAFFIC VOLUMES

FIGURE: 7

SCALE: NONE

Generally, Level of Service D is considered acceptable for signalized intersections in suburban areas during peak periods. With the current method of reporting levels of service for unsignalized intersections, it is not uncommon for some of the minor street movements to be operating at a LOS F during the peak hours.

Table 1 presents criteria of each level of service as indicated in the ***Highway Capacity Manual***[3].

TABLE 1: LEVEL OF SERVICE CRITERIA

SIGNALIZED INTERSECTIONS

Level of Service	Stopped Delay Per Vehicle (sec)
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

UNSIGNALIZED INTERSECTIONS

Level of Service	Average Total Delay (sec/veh)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Source: ***Highway Capacity Manual***[3] Special Report 209, Transportation Research Board, National Research Council, Washington, D.C., 1998

Synchro Version 7.0 calculates the level of service and delay for each intersection using methods outlined in the ***Highway Capacity Manual***[3]. Table 2 summarizes the capacity analyses.

B. Existing Conditions

Existing levels of service were calculated for the study area intersections using the existing lane configurations and signal timings. With the exception of Barber Boulevard in the PM peak hour, there were no major capacity problems identified in the study area. The poor level-of-service at Barber Road was expected, as a high number of accidents were reported at this intersection in 2006 and 2007. The 2008 AM and PM existing conditions capacity analyses results for the Russ Avenue corridor is included in Table 2.

Not included in the capacity analysis is the effect of the multiple driveways along Russ Avenue. These driveways serve to increase congestion, lowering level of service and decreasing safety. The five-lane undivided cross section with continuous two-way left turn lane coupled with the multiple driveways has a dramatic effect on traffic operations due to the absence of any access control.

C. 2030 No-Build Conditions

Most major intersections in the project area are expected to continue operating at acceptable LOS during the 2030 AM & PM No-Build Scenario. However the LOS did worsen the unacceptable LOS at the Russ Avenue intersections with Barber Boulevard, Dellwood Road / Howell Mill Road (in the PM peak), and US 23/74 Northbound ramp (in the PM peak, in the westbound approach). The 2030 No-Build Scenario Condition analyses results for the AM & PM peak hours for the Russ Avenue corridor is included in Table 2.

As with the existing conditions, the five-lane undivided cross section with continuous two-way left turn lane coupled with the multiple driveways will continue to cause increased traffic congestion and decreased safety as through and turning movement volumes grow in the study area.

D. 2030 Buildout Conditions

The 2030 Buildout Conditions assumes the redistribution of some of the through volumes on Russ Avenue to connectors between Waynesville Plaza and Howell Mill Road and between Barber Boulevard and Frazier Street, in order to alleviate some of the congestion at these intersections along the Russ Avenue corridor. The 2030 Buildout Condition capacity analyses results for the AM and PM peak hours for the study area intersections including the recommendations developed through the public involvement process are included in Table 2.

This analysis indicates that all study area intersections should operate with a reasonable level of service and delay in 2030 with the recommended improvements. Additionally, the addition of a median along Russ Avenue should greatly increase safety and congestion at the driveways between the major study area intersections. Appropriate pedestrian and bicycle accommodations should also encourage multi-modal travel in the area, encouraging people to leave their vehicle at one location and walk to their destinations, and to walk from some of the adjacent residential neighborhoods to destinations within the study area.

TABLE 2: LEVEL OF SERVICE SUMMARY
Russ Avenue Corridor Study

	2008 Existing		2030 No-Build		2030 Build Out	
Intersection	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Russ Avenue & Highway 23/74 Southbound Ramp	A (9.9) 35.6%*	A (8.3) 41.0%*	B (12.7) 49.7%*	B (12.2) 54.8%*	B (13.5) 49.7%*	B (12.4) 54.8%*
Russ Avenue & Highway 23/74 Northbound Ramp	# (2.7) B (11.9) EB B (10.6) WB 32.9%*	# (3.2) B (11.7) EB B (14.7) WB 40.1%*	# (3.2) B (12.9) EB B (13.3) WB 47.1%*	# (6.8) B (11.5) EB E (45.2) WB 58.5%*	# (3.2) B (12.9) EB B (13.3) WB 47.1%*	# (4.7) B (11.5) EB D (26.8) WB 58.5%*
Russ Avenue & Frazier Street	# (0.3) B (13.2) EB 31.0%*	# (0.4) B (13.9) EB 38.8%*	# (0.4) C (18.9) EB 42.5%*	# (0.7) C (23.0) EB 55.1%*	B (10.7) 75.6%*	B (15.3) 74.4%*
Russ Avenue & Betsy Acres Lane	# (0.1) B (11.2) EB A (9.0) WB 31.3%*	# (0.1) B (11.1) EB A (9.6) WB 39.0%*	# (0.1) B (13.9) EB A (9.0) WB 42.9%*	# (0.1) B (13.6) EB B (11.1) WB 54.8%*	# (0.1) A (9.4) EB A (9.1) WB 42.0%*	# (0.1) A (9.2) EB B (10.5) WB 49.2%*
Russ Avenue & Barber Boulevard	B (17.4) 50.8%*	C (33.7) 65.2%*	C (21.9) 62.8%*	F (211.8) 88.2%*	D (45.6) 61.2%*	C (32.8) 82.8%*
Russ Avenue & Dellwood Road / Howell Mill Road	C (20.0) 45.2%*	C (29.4) 53.7%*	C (24.0) 52.0%*	D (39.5) 73.1%*	C (23.7) 51.8%*	D (39.2) 73.4%*
Russ Avenue & Border Street	# (0.6) A (9.3) WB 26.8%*	# (1.4) B (10.1) WB 36.6%*	# (0.7) A (9.6) WB 32.3%*	# (1.5) B (10.3) WB 49.4%*	# (0.7) A (9.3) WB 32.1%*	# (1.5) B (10.6) WB 48.9%*
Russ Avenue & Waynesville Plaza	A (4.5) 32.1%*	A (7.7) 36.9%*	A (5.5) 40.4%*	B (11.1) 55.1%*	B (11.3) 42.1%*	B (13.9) 59.5%*
Russ Avenue & Lee Street	# (0.3) A (9.8) EB 24.9%*	# (0.5) A (9.8) EB 38.9%*	# (0.3) B (10.6) EB 32.9%*	# (0.6) B (10.4) EB 52.9%*	N/A	N/A
Russ Avenue & West Marshall Street	A (2.9) 40.6%*	A (7.1) 47.2%*	A (3.3) 53.5%*	A (7.6) 69.7%*	A (3.3) 53.4%*	A (7.6) 69.7%*
Russ Avenue & Walnut Street	A (9.3) 41.3%*	B (13.6) 44.1%*	B (10.2) 52.5%*	B (15.6) 59.8%*	B (10.2) 52.5%*	B (15.6) 59.8%*

Note:
- No letter value assigned by Synchro, only overall intersection delay
* - Intersection Capacity Utilization (ICU) Calculations

Capacity analyses for all studied intersections are included in Appendix B.

E. Roundabout

During the public involvement process, questions were raised regarding the feasibility of removing the traffic signals along Russ Avenue and replacing them with roundabouts. To address the questions, a roundabout analysis was completed for all the major signalized intersections along Russ Avenue for the 2030 Buildout conditions. This included: Hwy 23/74 NB ramp; Frazier Street; Barber Boulevard; Dellwood Road/Howell Mill Road; Waynesville Plaza/Lee Street; West Marshall Street; and Walnut Street. The following table summarizes the level-of-service and volume to capacity (v/c) ratio if a 2-lane roundabout is constructed at each of the intersections.

TABLE 3: LEVEL OF SERVICE SUMMARY – ROUNDABOUT
Russ Avenue Corridor Study

Intersection	2030 Buildout	
	AM	PM
Russ Avenue & Highway 23/74 Northbound Ramp	A (4.7) 0.362*	B (10.5) 0.892*
Russ Avenue & Frazier Street	A (5.1) 0.375*	B (10.6) 0.693*
Russ Avenue & Barber Boulevard	A (6.2) 0.444*	B (19.6) 0.910*
Russ Avenue & Dellwood Road / Howell Mill Road	A (6.9) 0.400*	C (26.9) 1.200*
Russ Avenue & Waynesville Plaza / Lee Street	A (5.2) 0.233*	A (6.6) 0.364*
Russ Avenue & West Marshall Street	A (4.3) 0.204*	A (5.9) 0.333*
Russ Avenue & Walnut Street	A (6.7) 0.262*	A (8.8) 0.640*

Note: * Volume to Capacity (v/c) ratio

The table shows that all intersections will operate at acceptable levels-of-service. However, the v/c ratio for the Russ Avenue / Dellwood Road / Howell Mill Road intersection is projected to be 1.200 during the PM peak. A v/c ratio over 1.0 indicates that traffic flow is unstable and excessive delay and queuing is expected. Therefore, the Russ Avenue / Dellwood Road / Howell Mill Road intersection should not be considered for installation of a roundabout due to capacity. A v/c ratio less than 0.85 generally indicate that adequate capacity is available and vehicles are not expected to experience significant queues and delays.

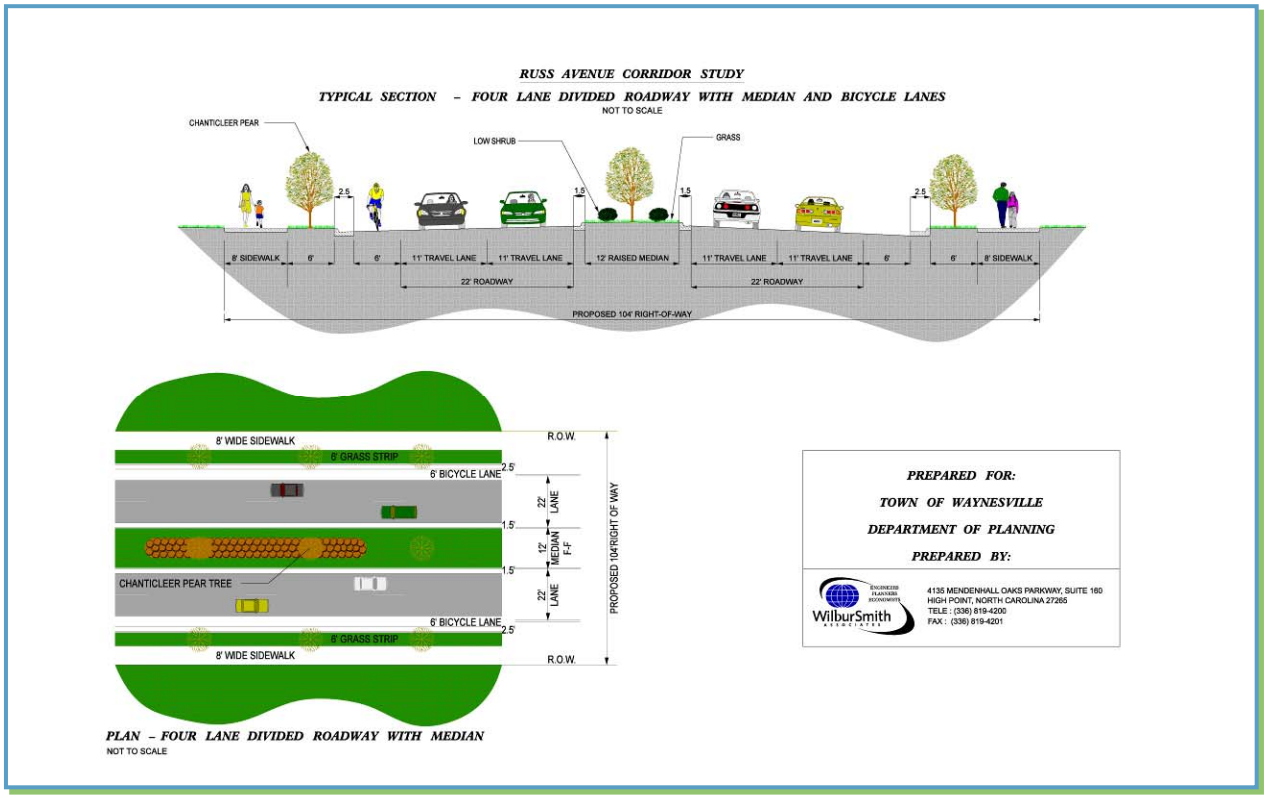
Additionally, the Russ Avenue / Walnut Street intersection may not be a candidate for installation of a roundabout due to the proximity to the railroad bridge on Russ Avenue. All other intersections could be considered for installation of a 2-lane roundabout; however it could result in major impacts to properties and businesses due to the size of a 2-lane roundabout.

VII. RECOMMENDATIONS

As discussed previously, the recommendations for the Russ Avenue corridor were developed through an iterative process involving Town, MPO, and NCDOT staff, and the public. Multiple options were considered for not only Russ Avenue, but for other roadways and connections throughout the study area that would alleviate some of the turning movement traffic on Russ Avenue, and would allow vehicles to travel through the area without utilizing Russ Avenue. At the end of the process, a variety of improvements are recommended to provide safe and efficient travel through the area.

The typical section for the Russ Avenue corridor was determined based on the Town of Waynesville ***Land Development Articles and Summaries – Article VII General Development, Site and Performance Standards***[4] using the street design standards for a Boulevard. The following lists the features of the 4-lane median divided roadway:

- 104 ft right-of-way
- 8 ft wide sidewalk on both sides
- 6 ft grass/planting strip on both sides
- 6 ft bicycle lane on both sides
- 11 ft travel lanes
- 12 ft median



The Recommended Lane Configurations & Traffic Control is shown on Figure 8.

To accommodate for the projected design year 2030 traffic volumes along Russ Avenue, the following improvements are recommended:

NEW CONNECTOR ROADS

- Construct a connector road that extends from Frazier Street to the intersection of Russ Avenue and Barber Boulevard to form a 4-leg intersection.
- Construct a connector road from Frazier Street (behind the Shell Gas Station) to Russ Avenue where the existing abandoned Long John Silver restaurant sits. This new connector road would be located behind McDonalds and CVS.
- Construct a connector road / back access road to connect the Waffle House, Arby's, and Pizza Hut to Barber Boulevard.
- Construct a connector road / back access road to connect the Sears Shopping Center to Howell Mill Road.
- Construct a bridge over Richland Creek to connect the Sears Shopping Center to Marshall Street. This bridge should be of sufficient length to allow for a greenway underneath the structure.

BRIDGES

- Construct a new 5-lane bridge over Richland Creek to allow for northbound and southbound left turn lanes. This bridge should be of sufficient length to allow for a greenway underneath the structure.
- Construct a new 5-lane bridge over the rail line to allow for northbound and southbound left turn lanes.

RUSS AVENUE

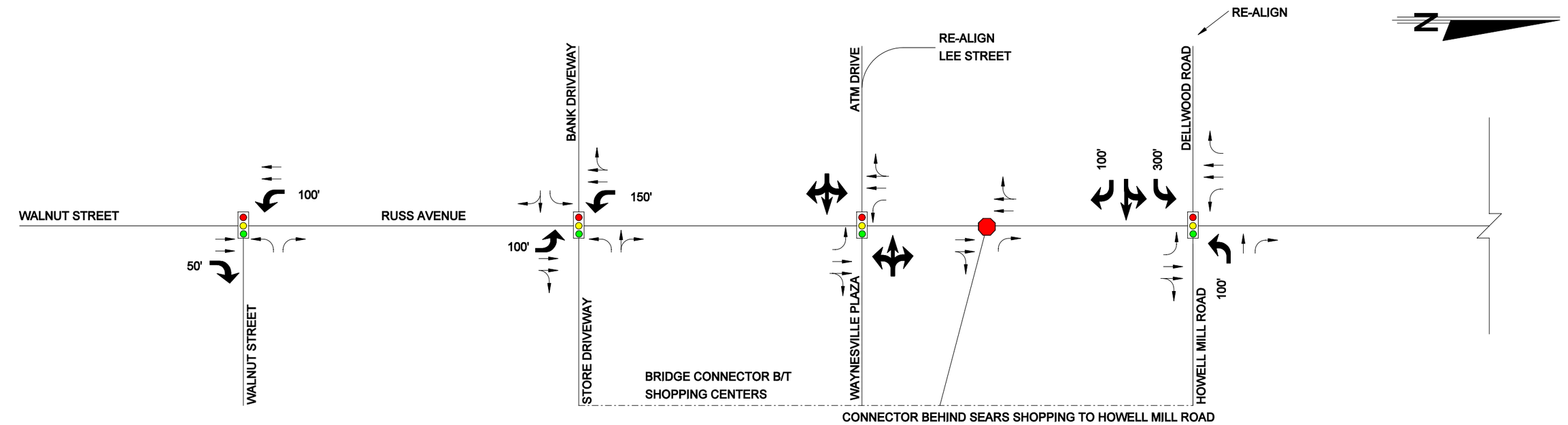
- Construct a 4-lane landscaped median divided, curb and gutter roadway with turn lanes at key intersections.
- Construct sidewalks along both sides of the roadway.
- Construct bicycle lanes along both sides of the roadway.

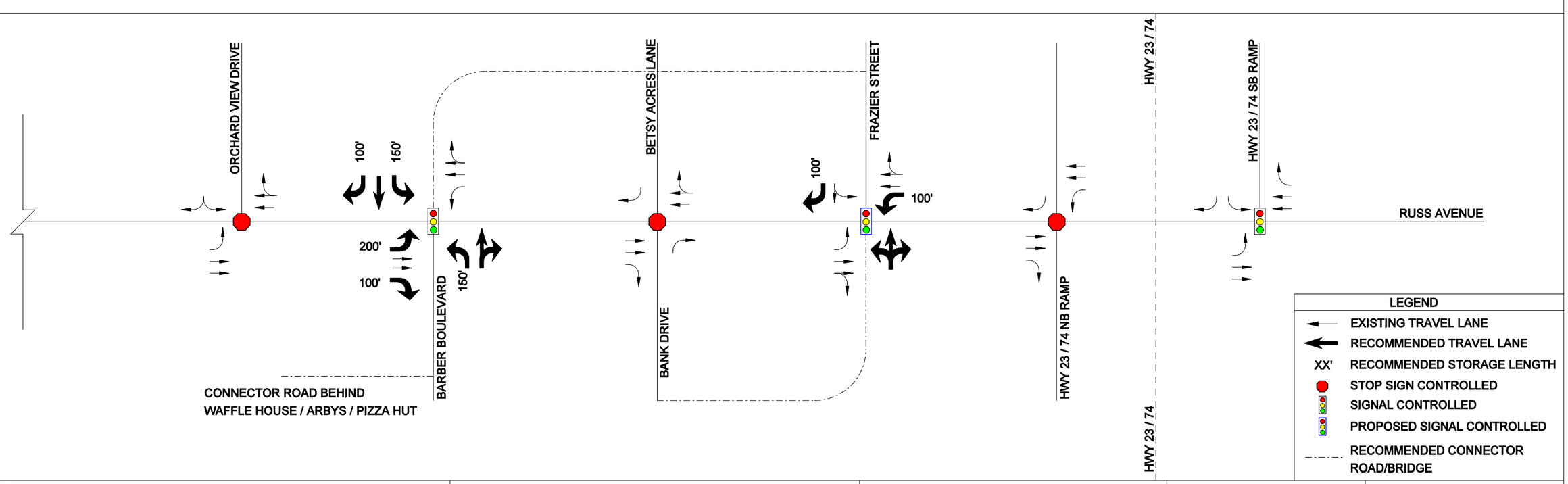
❖ ***Frazier Street Intersection***

- Construct a southbound left turn lane on Russ Avenue with 100 feet of storage.
- Construct an eastbound shared left turn / through lane and a right turn lane with 100 feet of storage on Frazier Street.
- Construct a westbound shared left/through/right turn lane on the new Frazier Street connector.
- Construct a traffic signal.

❖ ***Barber Boulevard Intersection***

- Construct an eastbound left turn lane with 150 feet of storage a through lane and a right turn lane with 100 feet of storage on Barber Boulevard.
- Construct a westbound left turn lane with 150 feet of storage and shared through/right turn lane on Barber Boulevard.
- Construct a northbound left turn lane with 200 feet of storage and a right turn lane with 100 feet of storage on Russ Avenue.





ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES
421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

RECOMMENDED LANE CONFIGURATIONS AND TRAFFIC CONTROL

FIGURE: 8

SCALE: NONE

- ***Dellwood Road / Howell Mill Road Intersection***
  - Construct an eastbound left turn lane with 300 feet of storage, a shared left/through turn lane, and right turn lane with 100 feet of storage on Dellwood Road.
  - Construct a westbound left turn lane with 100 feet of storage on Howell Mill Road.

- ***Lee Street / Waynesville Plaza Intersection***
  - Construct an eastbound shared left/through/right turn lane on the newly realigned Lee Street.
  - Construct a westbound shared left/through/right turn lane on the entrance to the Waynesville Plaza.

- ***Bi-Lo / Wachovia Bank Intersection***
  - Construct a northbound left turn lane with 100 feet of storage on Russ Avenue.
  - Construct a southbound left turn lane with 150 feet of storage on Russ Avenue.

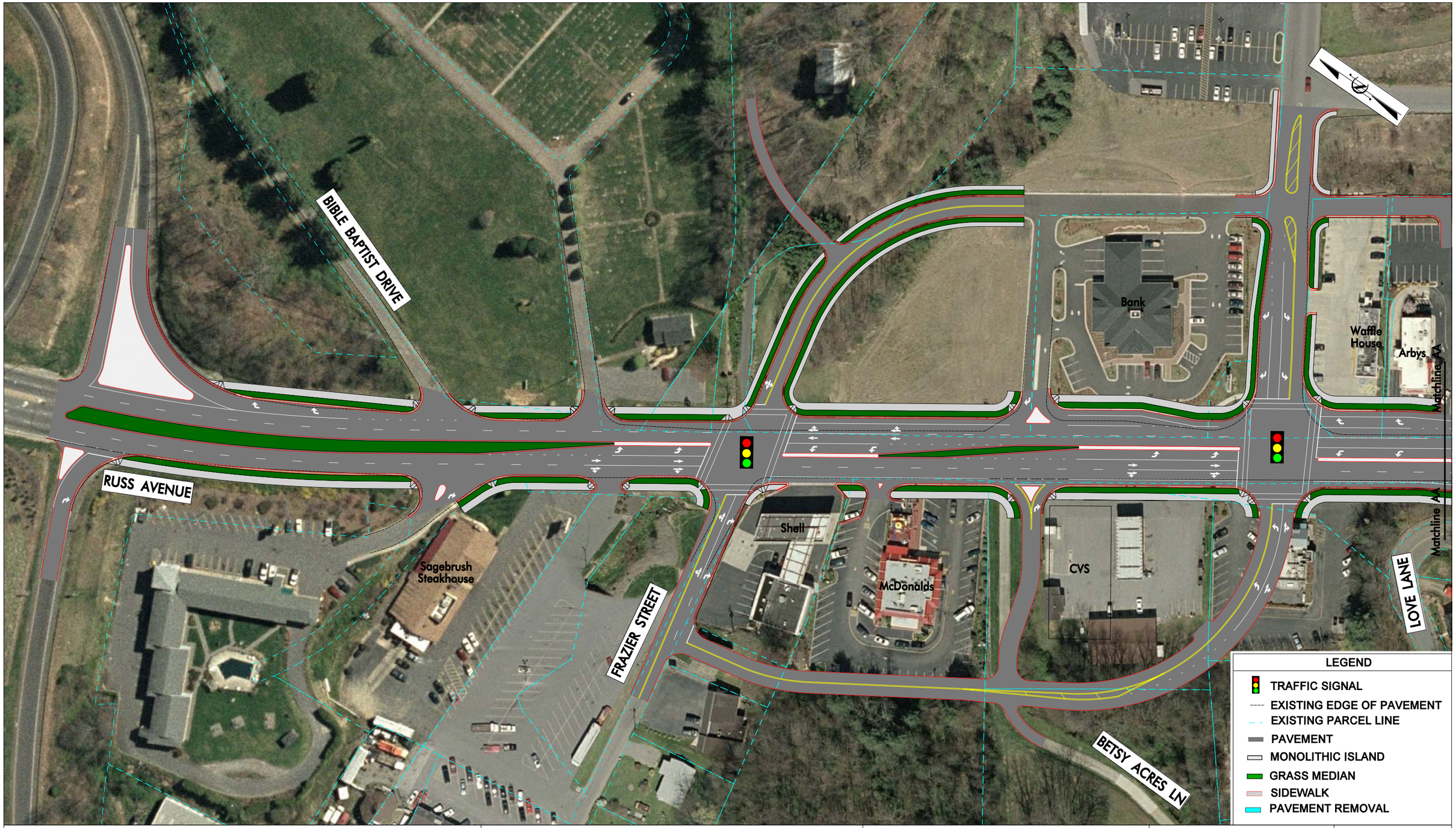
- ***Walnut Street Intersection***
  - Construct a northbound right turn lane with 50 feet of storage on Russ Avenue.
  - Construct a southbound left turn lane with 100 feet of storage on Russ Avenue.

Some design features to enhance vehicular and pedestrian safety and aesthetics include:

Example landscaped median

- 4-lane divided roadway
- Landscaped median
- Sidewalks along both sides
- Crosswalks and pedestrian signal heads
- Bicycle lanes
- Connector roads

A half scale conceptual design of the proposed improvements is illustrated on Figures 9A – 9E.



ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES

421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

RECOMMENDED LANE CONFIGURATIONS AND TRAFFIC CONTROL

0' 25' 50' 100'

FIGURE: 9A

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES

421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

RECOMMENDED LANE CONFIGURATIONS
AND TRAFFIC CONTROL

0' 25' 50' 100'

FIGURE: 9B

KFC

Matchline BB

Matchline BB

Burger King

Wendy's

Auto Bell

Matchline BB

Matchline BB

Hardees

LEE STREET

DELLWOOD RD

Wendy's

Burger King

DELLWOOD ROAD
ALTERNATE ALIGNMENT

LEGEND

- TRAFFIC SIGNAL
- EXISTING EDGE OF PAVEMENT
- EXISTING PARCEL LINE
- PAVEMENT
- MONOLITHIC ISLAND
- GRASS MEDIAN
- SIDEWALK
- PAVEMENT REMOVAL

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS

421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

RECOMMENDED LANE CONFIGURATIONS
AND TRAFFIC CONTROL

0' 25' 50' 100'

FIGURE: 9C

ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES

421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

RECOMMENDED LANE CONFIGURATIONS AND TRAFFIC CONTROL

0' 25' 50' 100'

FIGURE: 9D

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith ASSOCIATES

421 FAYETTEVILLE STREET, SUITE 1303
RALEIGH, NORTH CAROLINA 27601
TELEPHONE: 919.755.0583
FAX: 919.832.8798

FEASIBILITY STUDY
RUSS AVENUE CORRIDOR
WAYNESVILLE, NORTH CAROLINA

RECOMMENDED LANE CONFIGURATIONS
AND TRAFFIC CONTROL

0' 25' 50' 100'

FIGURE: 9E

OPINION OF PROBABLE COST

Probable costs for the recommended roadway improvements were developed using cost estimates provided by the Capital Area Metropolitan Planning Organization and quantities developed from the conceptual design plans. A summary of the planning level cost estimates for the proposed improvements are included in the Table 4. Detailed cost estimating spreadsheets are included in Appendix D.

Table 4: Opinion of Probable Cost
Russ Avenue Corridor Study

Russ Avenue Improvements	
Preliminary Engineering	$1,300,000
Construction	$8,610,000
Right-of-Way	$5,670,000
Side Streets / Connectors	
Preliminary Engineering	$413,000
Construction	$2,880,000
Right-of-Way	$2,800,000
Total Cost	**$21,673,000**

IX. IMPLEMENTATION STRATEGIES

The largest improvements in traffic flow, safety, and aesthetics along the Russ Avenue corridor will result from the construction of a center median throughout the study area. The installation of this median and associated turn lanes should be the primarily focus for the town within the corridor. The next steps in the process are to perform an environmental analysis, detailed roadway design, and permitting. Funding for this analysis, design, and permitting should be requested from NCDOT and the French Broad River MPO. Funding should also be requested for construction, although funding for this project may likely be several years away.

The Town should also begin to pursue the construction of the various connections within the study area that could alleviate congestion along Russ Avenue. These connections can be designed, permitted, and constructed in a much shorter timeframe than Russ Avenue, and will provide immediate, but localized benefits.

Pedestrian accommodations should also be considered as opportunities arise, particularly as a result of new construction or redevelopment of existing parcels. Any future developments should be required to install pedestrian facilities in conformance with the conceptual designs included in this plan that connect with adjacent parcels.

A summary of funding and financing options and programs for transportation that have been used by municipalities in North Carolina is included in Appendix E. This summary was prepared as part of a collaborative effort with the Regional Transportation alliance and includes options for public-private partnerships, and existing and potential state and federal programs and grants.

X. CONCLUSIONS

The Russ Avenue Corridor Study is the initial step in the planning and design process for the development of a project. The public, Town of Waynesville and the French Broad River Metropolitan Planning Organization all contributed greatly in the development of a future plan for the Russ Avenue corridor that can safely and efficiently accommodate all modes of travel and will enhance the aesthetics of the corridor.

XI. REFERENCES

[1]***2008 Annual Average Daily Traffic Volumes***, North Carolina Department of Transportation, 2008.

[2]***2009-2015 State Transportation Improvement Program***, North Carolina Department of Transportation, 2009.

[3]***Highway Capacity Manual*** Special Report 209, Transportation Research Board, National Research Council, Washington, D.C., 1998.

[4]***Land Development Articles and Summaries – Article VII General Development, Site and Performance Standards,*** Town of Waynesville, North Carolina, http://www.townofwaynesville.org/?option=com_content&task=view&id=104&Itemid=98, 2009.

Appendix A

Background / Traffic Data

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name: Russ Avenue
Counted By: L.B. Ray
Weather: Clear
Day: Monday June 16, 2008

File Name : Walnut
Site Code : 87654322
Start Date : 6/16/2008

Groups Printed- Unshifted

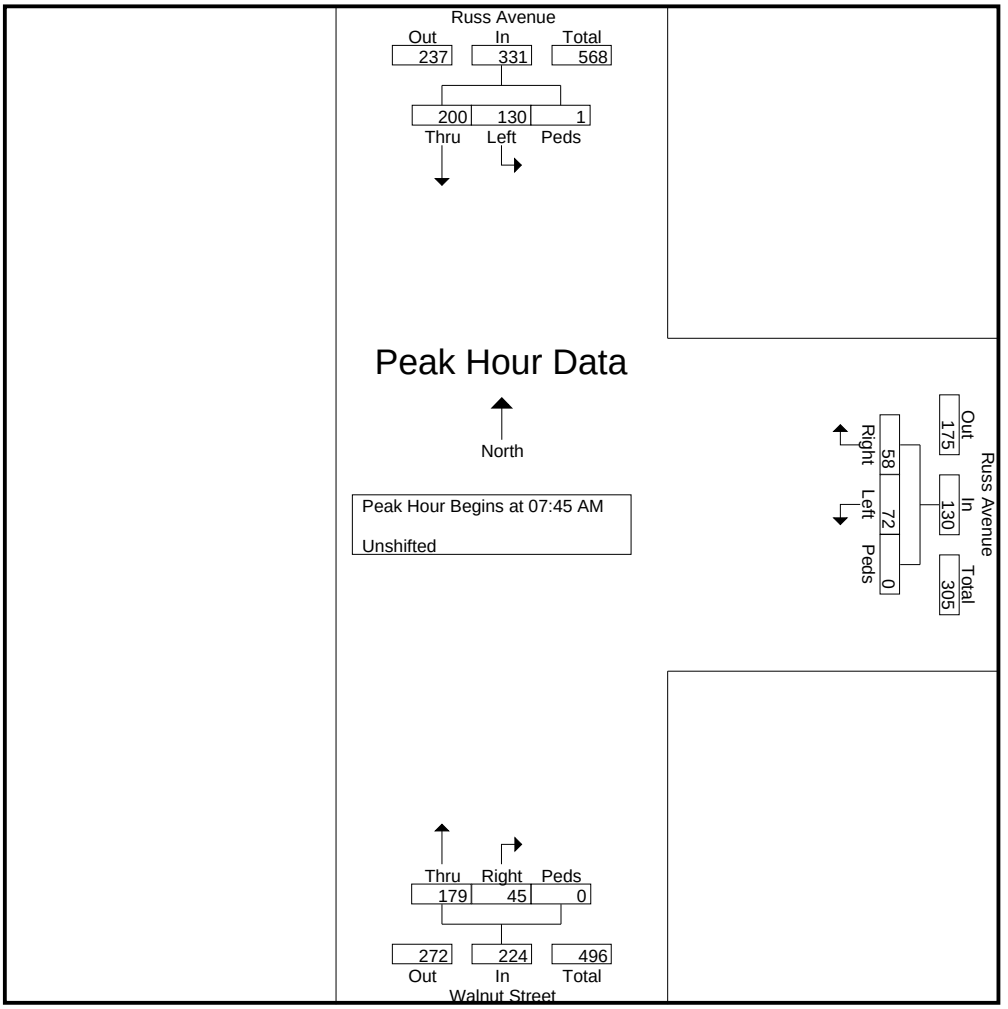
	Russ Avenue southbound			Russ Avenue westbound			Walnut Street northbound			
Start Time	Left	Thru	Peds	Left	Right	Peds	Thru	Right	Peds	Int. Total
07:00 AM	9	11	1	5	10	0	15	6	0	57
07:15 AM	12	20	0	9	12	0	21	6	0	80
07:30 AM	24	28	0	8	14	0	36	9	0	119
07:45 AM	43	47	0	21	22	0	57	17	0	207
Total	88	106	1	43	58	0	129	38	0	463
08:00 AM	36	51	0	20	12	0	51	6	0	176
08:15 AM	26	64	1	16	12	0	33	16	0	168
08:30 AM	25	38	0	15	12	0	38	6	0	134
08:45 AM	26	64	0	20	17	0	35	22	0	184
Total	113	217	1	71	53	0	157	50	0	662
BREAK										
04:00 PM	42	88	0	33	40	0	102	32	1	338
04:15 PM	36	69	0	28	44	0	57	28	0	262
04:30 PM	32	86	0	27	33	0	106	24	2	310
04:45 PM	32	86	0	29	43	0	92	26	0	308
Total	142	329	0	117	160	0	357	110	3	1218
05:00 PM	30	71	0	30	54	0	96	34	0	315
05:15 PM	46	66	6	31	55	0	97	35	0	336
05:30 PM	37	69	1	17	26	0	81	24	1	256
05:45 PM	31	72	0	17	25	1	90	16	0	252
Total	144	278	7	95	160	1	364	109	1	1159
Grand Total	487	930	9	326	431	1	1007	307	4	3502
Apprch %	34.2	65.2	0.6	43	56.9	0.1	76.4	23.3	0.3	
Total %	13.9	26.6	0.3	9.3	12.3	0	28.8	8.8	0.1	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Walnut
Site Code : 87654322
Start Date : 6/16/2008
Page No : 2

	Russ Avenue southbound				Russ Avenue westbound				Walnut Street northbound				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45 AM													
07:45 AM	**43**	47	0	90	**21**	**22**	0	**43**	**57**	**17**	0	**74**	**207**
08:00 AM	36	51	0	87	20	12	0	32	51	6	0	57	176
08:15 AM	26	**64**	**1**	**91**	16	12	0	28	33	16	0	49	168
08:30 AM	25	38	0	63	15	12	0	27	38	6	0	44	134
Total Volume	130	200	1	331	72	58	0	130	179	45	0	224	685
% App. Total	39.3	60.4	0.3		55.4	44.6	0		79.9	20.1	0		
PHF	.756	.781	.250	.909	.857	.659	.000	.756	.785	.662	.000	.757	.827

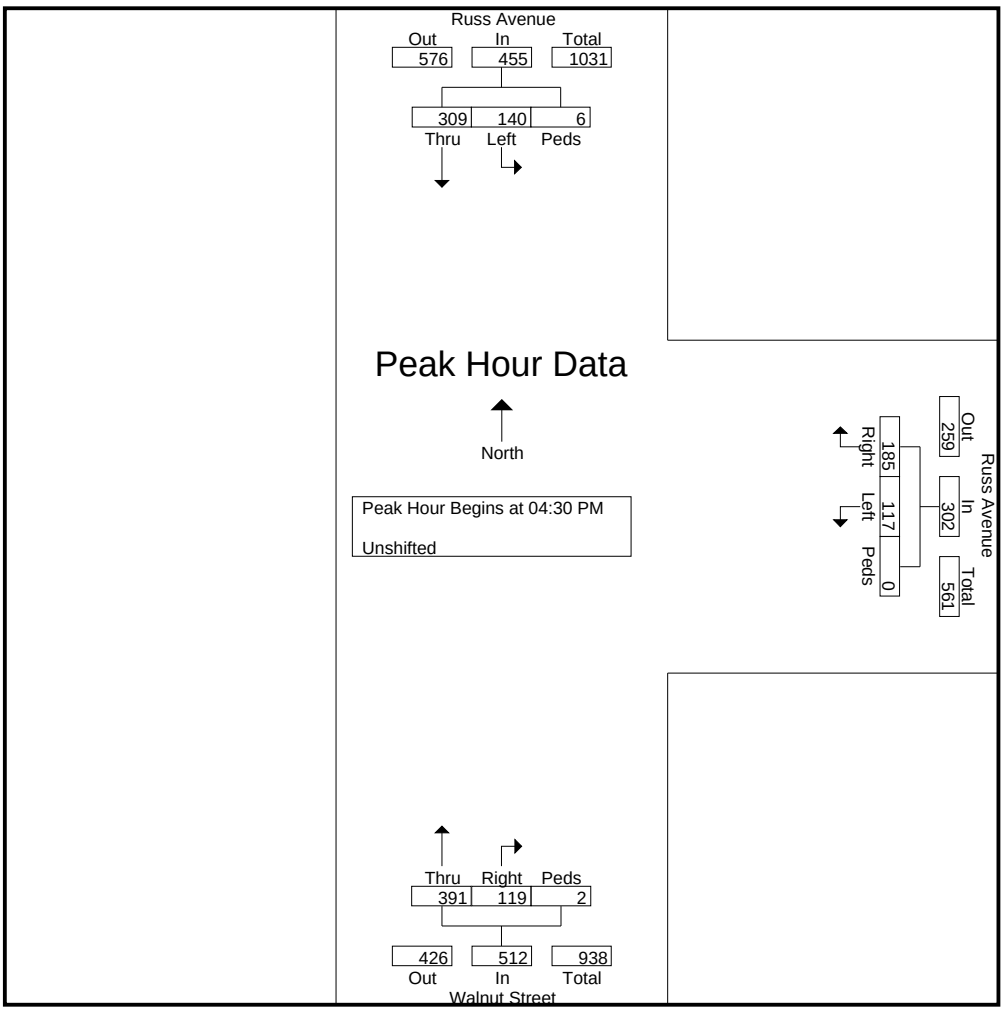


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Walnut
Site Code : 87654322
Start Date : 6/16/2008
Page No : 3

	Russ Avenue southbound				Russ Avenue westbound				Walnut Street northbound				
Start Time	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	32	**86**	0	**118**	27	33	0	60	**106**	24	**2**	**132**	310
04:45 PM	32	86	0	118	29	43	0	72	92	26	0	118	308
05:00 PM	30	71	0	101	30	54	0	84	96	34	0	130	315
05:15 PM	**46**	66	**6**	118	**31**	**55**	0	**86**	97	**35**	0	132	**336**
Total Volume	140	309	6	455	117	185	0	302	391	119	2	512	1269
% App. Total	30.8	67.9	1.3		38.7	61.3	0		76.4	23.2	0.4		
PHF	.761	.898	.250	.964	.944	.841	.000	.878	.922	.850	.250	.970	.944



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name:Russ Avenue
Counted By: Deanna Berlin
Weather: Clear
Day: Wednesday June 25, 2008

File Name : Russ-Shopping Center
Site Code : 00000444
Start Date : 6/25/2008
Page No : 1

Groups Printed- Unshifted

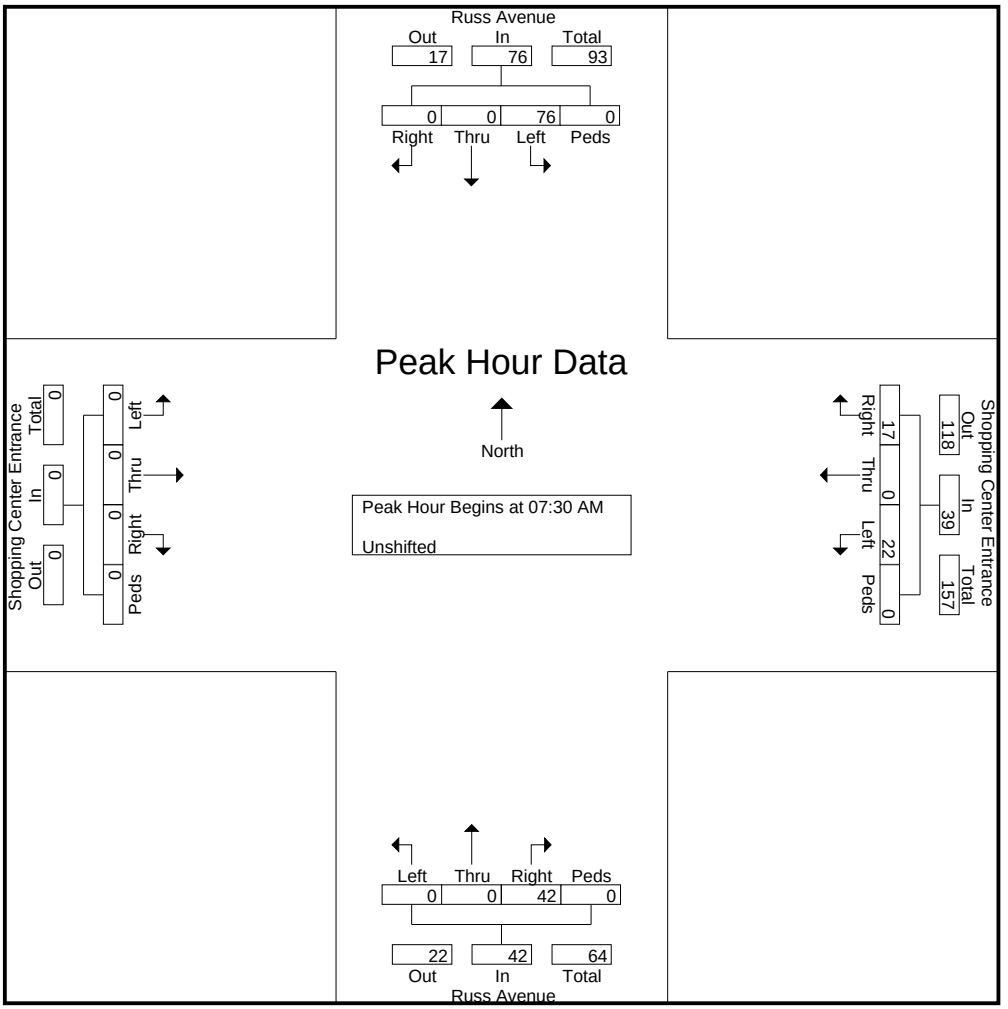
	Russ Avenue southbound				Shopping Center Entrance westbound				Russ Avenue northbound				Shopping Center Entrance eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:30 AM	14	0	0	0	4	0	7	0	0	0	11	0	0	0	0	0	36
07:45 AM	28	0	0	0	5	0	0	0	0	0	15	0	0	0	0	0	48
Total	42	0	0	0	9	0	7	0	0	0	26	0	0	0	0	0	84
08:00 AM	12	0	0	0	4	0	2	0	0	0	7	0	0	0	0	0	25
08:15 AM	22	0	0	0	9	0	8	0	0	0	9	0	0	0	0	0	48
BREAK																	
Total	34	0	0	0	13	0	10	0	0	0	16	0	0	0	0	0	73
BREAK																	
04:45 PM	11	0	0	0	15	1	14	1	0	0	16	0	0	0	0	0	58
Total	11	0	0	0	15	1	14	1	0	0	16	0	0	0	0	0	58
05:00 PM	18	0	0	0	21	1	16	0	0	0	11	0	0	1	0	0	68
05:15 PM	32	0	0	0	9	0	13	0	0	0	18	0	1	0	0	0	73
05:30 PM	20	0	0	0	18	0	13	0	0	0	8	0	0	0	0	0	59
Grand Total	157	0	0	0	85	2	73	1	0	0	95	0	1	1	0	0	415
Apprch %	100	0	0	0	52.8	1.2	45.3	0.6	0	0	100	0	50	50	0	0	
Total %	37.8	0	0	0	20.5	0.5	17.6	0.2	0	0	22.9	0	0.2	0.2	0	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ-Shopping Center
Site Code : 00000444
Start Date : 6/25/2008
Page No : 2

	Russ Avenue southbound					Shopping Center Entrance westbound					Russ Avenue northbound					Shopping Center Entrance eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	14	0	0	0	14	4	0	7	0	11	0	0	11	0	11	0	0	0	0	0	36
07:45 AM	**28**	0	0	0	**28**	5	0	0	0	5	0	0	**15**	0	**15**	0	0	0	0	0	**48**
08:00 AM	12	0	0	0	12	4	0	2	0	6	0	0	7	0	7	0	0	0	0	0	25
08:15 AM	22	0	0	0	22	**9**	0	**8**	0	**17**	0	0	9	0	9	0	0	0	0	0	48
Total Volume	76	0	0	0	76	22	0	17	0	39	0	0	42	0	42	0	0	0	0	0	157
% App. Total	100	0	0	0		56.4	0	43.6	0		0	0	100	0		0	0	0	0		
PHF	.679	.000	.000	.000	.679	.611	.000	.531	.000	.574	.000	.000	.700	.000	.700	.000	.000	.000	.000	.000	.818

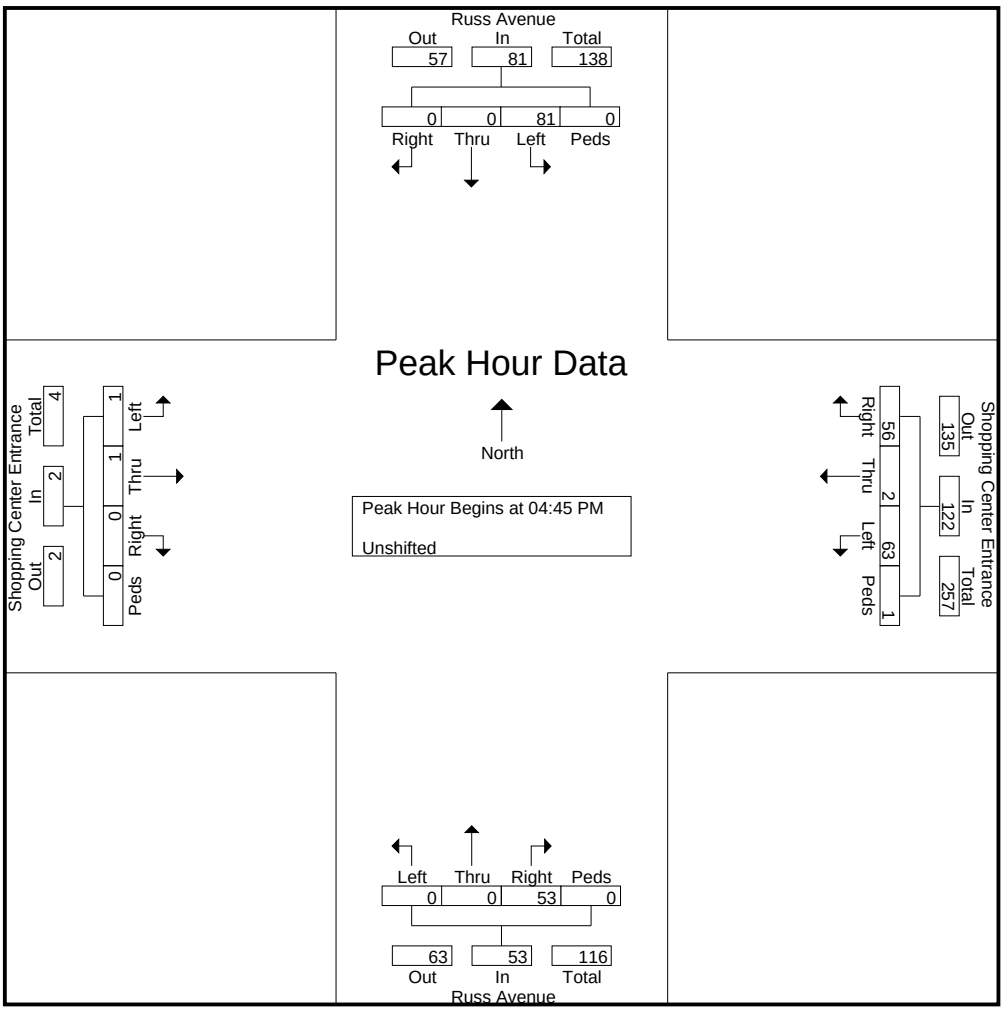


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ-Shopping Center
Site Code : 00000444
Start Date : 6/25/2008

	Russ Avenue southbound					Shopping Center Entrance westbound					Russ Avenue northbound					Shopping Center Entrance eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	11	0	0	0	11	15	**1**	14	**1**	31	0	0	16	0	16	0	0	0	0	0	58
05:00 PM	18	0	0	0	18	**21**	1	**16**	0	**38**	0	0	11	0	11	0	**1**	0	0	**1**	68
05:15 PM	**32**	0	0	0	**32**	9	0	13	0	22	0	0	**18**	0	**18**	**1**	0	0	0	1	**73**
05:30 PM	20	0	0	0	20	18	0	13	0	31	0	0	8	0	8	0	0	0	0	0	59
Total Volume	81	0	0	0	81	63	2	56	1	122	0	0	53	0	53	1	1	0	0	2	258
% App. Total	100	0	0	0		51.6	1.6	45.9	0.8		0	0	100	0		50	50	0	0		
PHF	.633	.000	.000	.000	.633	.750	.500	.875	.250	.803	.000	.000	.736	.000	.736	.250	.250	.000	.000	.500	.884



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name:Russ Avenue
Counted By:Deniece Swinton
Weather: Clear
Day: Wednesday June 25, 2008

File Name : Russ-Border
Site Code : 00000555
Start Date : 6/25/2008
Page No : 1

Groups Printed- Unshifted

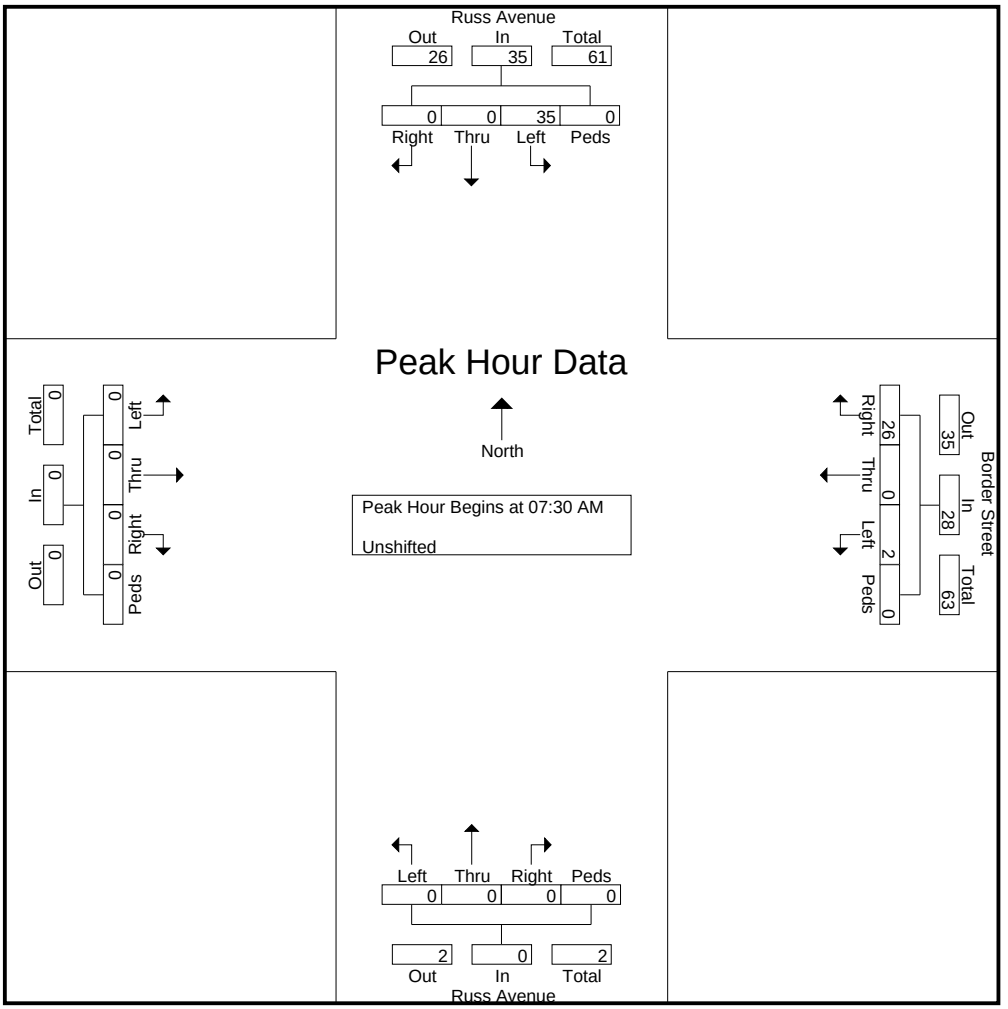
	Russ Avenue southbound				Border Street westbound				Russ Avenue northbound				eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:30 AM	5	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	9
07:45 AM	10	0	0	0	1	0	10	0	0	0	0	0	0	0	0	0	21
Total	15	0	0	0	2	0	13	0	0	0	0	0	0	0	0	0	30
08:00 AM	8	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	12
08:15 AM	12	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	21
BREAK																	
Total	20	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	33
BREAK																	
04:45 PM	11	0	0	0	0	0	44	0	0	0	1	0	0	0	0	0	56
Total	11	0	0	0	0	0	44	0	0	0	1	0	0	0	0	0	56
05:00 PM	12	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	32
05:15 PM	4	0	0	0	0	0	29	0	0	0	1	0	0	0	0	0	34
05:30 PM	10	0	0	0	1	0	24	0	0	0	1	0	0	0	0	0	36
Grand Total	72	0	0	0	3	0	143	0	0	0	3	0	0	0	0	0	221
Apprch %	100	0	0	0	2.1	0	97.9	0	0	0	100	0	0	0	0	0	
Total %	32.6	0	0	0	1.4	0	64.7	0	0	0	1.4	0	0	0	0	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ-Border
Site Code : 00000555
Start Date : 6/25/2008
Page No : 2

	Russ Avenue southbound					Border Street westbound					Russ Avenue northbound					eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	5	0	0	0	5	**1**	0	3	0	4	0	0	0	0	0	0	0	0	0	0	9
07:45 AM	10	0	0	0	10	1	0	**10**	0	**11**	0	0	0	0	0	0	0	0	0	0	**21**
08:00 AM	8	0	0	0	8	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	12
08:15 AM	**12**	0	0	0	**12**	0	0	9	0	9	0	0	0	0	0	0	0	0	0	0	21
Total Volume	35	0	0	0	35	2	0	26	0	28	0	0	0	0	0	0	0	0	0	0	63
% App. Total	100	0	0	0		7.1	0	92.9	0		0	0	0	0		0	0	0	0		
PHF	.729	.000	.000	.000	.729	.500	.000	.650	.000	.636	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.750

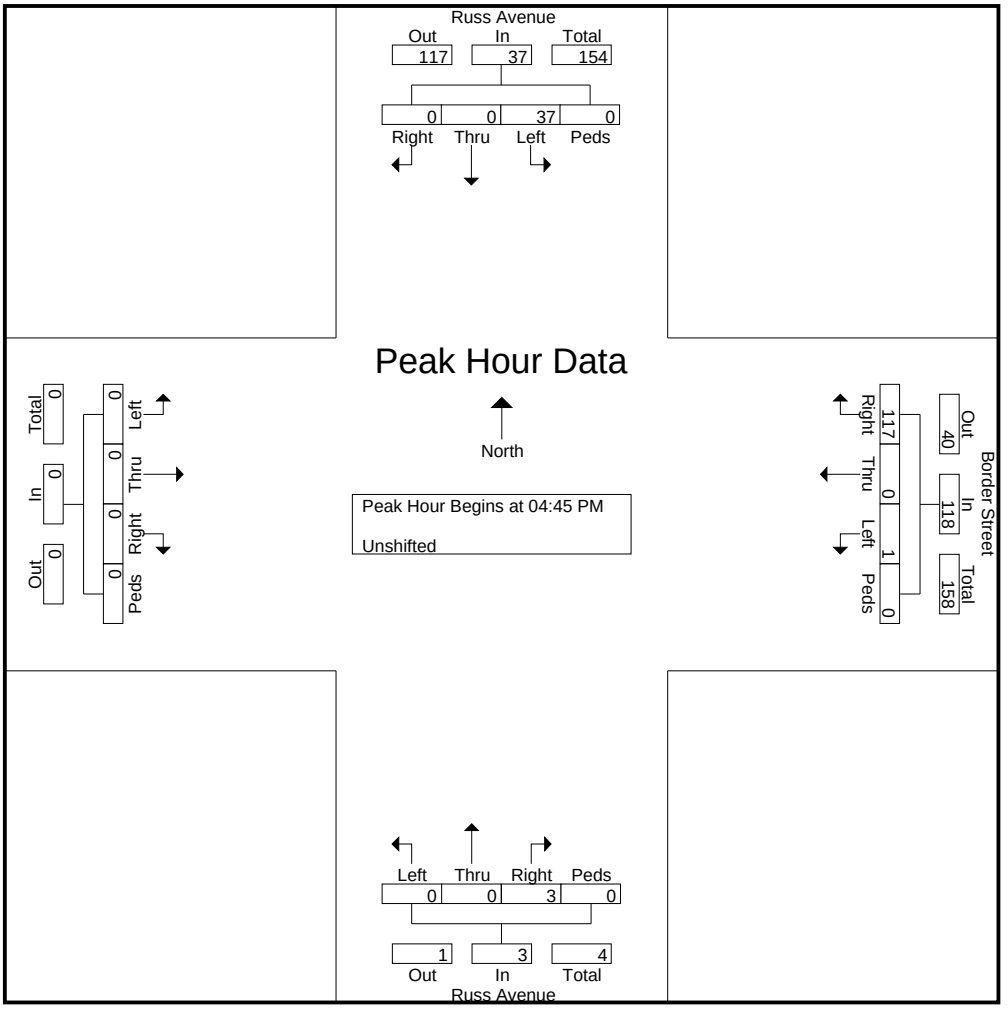


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ-Border
Site Code : 00000555
Start Date : 6/25/2008
Page No : 3

	Russ Avenue southbound					Border Street westbound					Russ Avenue northbound					eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	11	0	0	0	11	0	0	**44**	0	**44**	0	0	**1**	0	**1**	0	0	0	0	0	**56**
05:00 PM	**12**	0	0	0	**12**	0	0	20	0	20	0	0	0	0	0	0	0	0	0	0	32
05:15 PM	4	0	0	0	4	0	0	29	0	29	0	0	1	0	1	0	0	0	0	0	34
05:30 PM	10	0	0	0	10	**1**	0	24	0	25	0	0	1	0	1	0	0	0	0	0	36
Total Volume	37	0	0	0	37	1	0	117	0	118	0	0	3	0	3	0	0	0	0	0	158
% App. Total	100	0	0	0		0.8	0	99.2	0		0	0	100	0		0	0	0	0		
PHF	.771	.000	.000	.000	.771	.250	.000	.665	.000	.670	.000	.000	.750	.000	.750	.000	.000	.000	.000	.000	.705



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name:Russ Avenue
Counted By:L.B. Ray
Weather: Clear
Day: Tuesday June 10, 2008

File Name : Russ_23_19_SB
Site Code : 87654321
Start Date : 6/10/2008
Page No : 1

Groups Printed- Unshifted

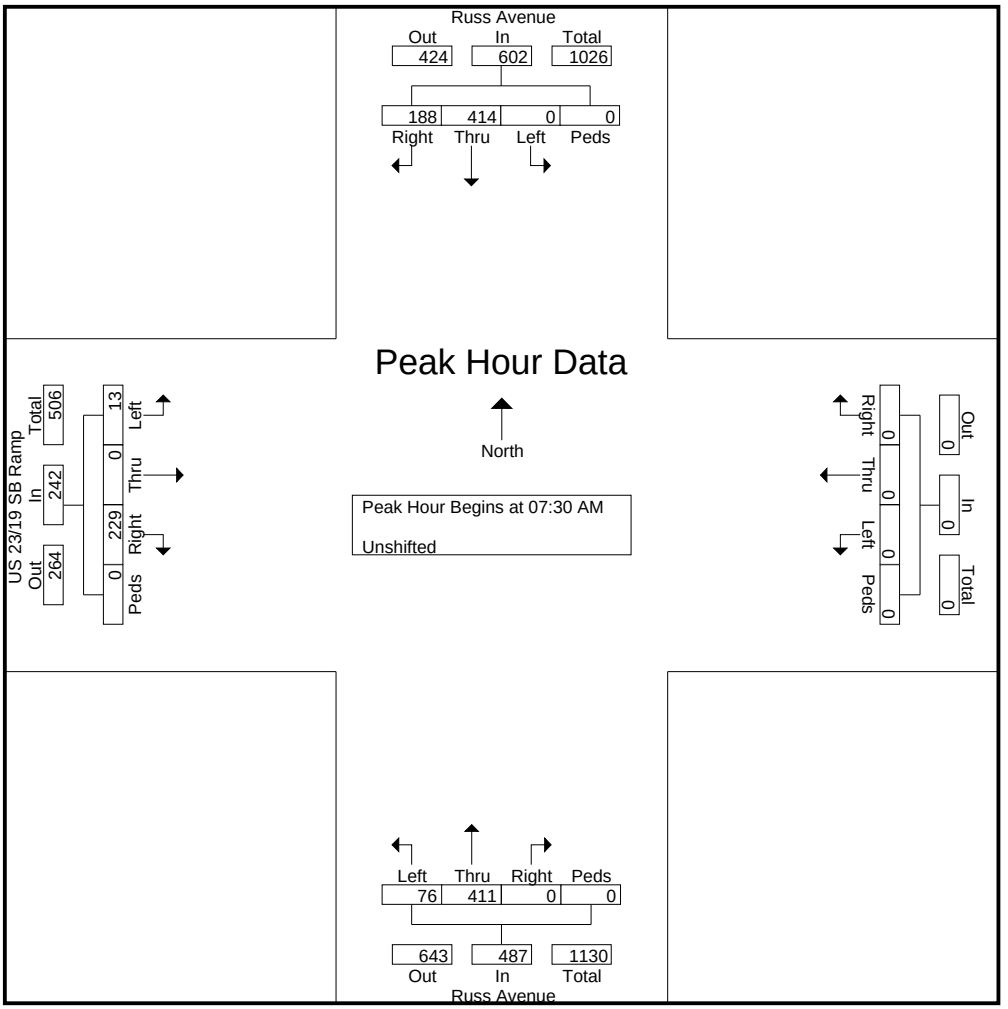
	Russ Avenue southbound				westbound				Russ Avenue northbound				US 23/19 SB Ramp eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	54	42	0	0	0	0	0	16	67	0	0	2	0	34	0	215
07:15 AM	0	64	34	0	0	0	0	0	9	74	0	0	3	0	42	0	226
07:30 AM	0	89	34	0	0	0	0	0	18	96	0	0	3	0	48	0	288
07:45 AM	0	116	64	0	0	0	0	0	21	114	0	0	3	0	79	0	397
Total	0	323	174	0	0	0	0	0	64	351	0	0	11	0	203	0	1126
08:00 AM	0	127	49	0	0	0	0	0	21	114	0	0	5	0	56	0	372
08:15 AM	0	82	41	0	0	0	0	0	16	87	0	0	2	0	46	0	274
08:30 AM	0	105	27	0	0	0	0	0	18	90	0	0	6	0	38	0	284
08:45 AM	0	115	33	0	0	0	0	0	13	146	0	0	7	0	60	0	374
Total	0	429	150	0	0	0	0	0	68	437	0	0	20	0	200	0	1304
BREAK																	
04:00 PM	0	94	32	0	0	0	0	0	25	160	0	0	6	0	57	0	374
04:15 PM	0	108	50	0	0	0	0	0	30	206	0	0	5	0	40	0	439
04:30 PM	0	110	29	0	0	0	0	0	22	171	0	0	14	0	34	0	380
04:45 PM	0	83	22	0	0	0	0	1	31	164	0	0	6	1	15	1	324
Total	0	395	133	0	0	0	0	1	108	701	0	0	31	1	146	1	1517
05:00 PM	0	131	48	0	0	0	0	0	24	188	0	0	11	0	12	0	414
05:15 PM	0	82	37	0	0	0	0	0	34	180	0	0	16	0	16	0	365
05:30 PM	0	113	42	0	0	0	0	0	60	181	0	0	15	0	41	0	452
05:45 PM	0	165	40	0	0	0	0	0	47	192	0	0	13	1	36	0	494
Total	0	491	167	0	0	0	0	0	165	741	0	0	55	1	105	0	1725
Grand Total	0	1638	624	0	0	0	0	1	405	2230	0	0	117	2	654	1	5672
Apprch %	0	72.4	27.6	0	0	0	0	100	15.4	84.6	0	0	15.1	0.3	84.5	0.1	
Total %	0	28.9	11	0	0	0	0	0	7.1	39.3	0	0	2.1	0	11.5	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ_23_19_SB
Site Code : 87654321
Start Date : 6/10/2008
Page No : 2

	Russ Avenue southbound					westbound					Russ Avenue northbound					US 23/19 SB Ramp eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	89	34	0	123	0	0	0	0	0	18	96	0	0	114	3	0	48	0	51	288
07:45 AM	0	116	**64**	0	**180**	0	0	0	0	0	**21**	**114**	0	0	**135**	3	0	**79**	0	**82**	**397**
08:00 AM	0	**127**	49	0	176	0	0	0	0	0	21	114	0	0	135	**5**	0	56	0	61	372
08:15 AM	0	82	41	0	123	0	0	0	0	0	16	87	0	0	103	2	0	46	0	48	274
Total Volume	0	414	188	0	602	0	0	0	0	0	76	411	0	0	487	13	0	229	0	242	1331
% App. Total	0	68.8	31.2	0		0	0	0	0		15.6	84.4	0	0		5.4	0	94.6	0		
PHF	.000	.815	.734	.000	.836	.000	.000	.000	.000	.000	.905	.901	.000	.000	.902	.650	.000	.725	.000	.738	.838

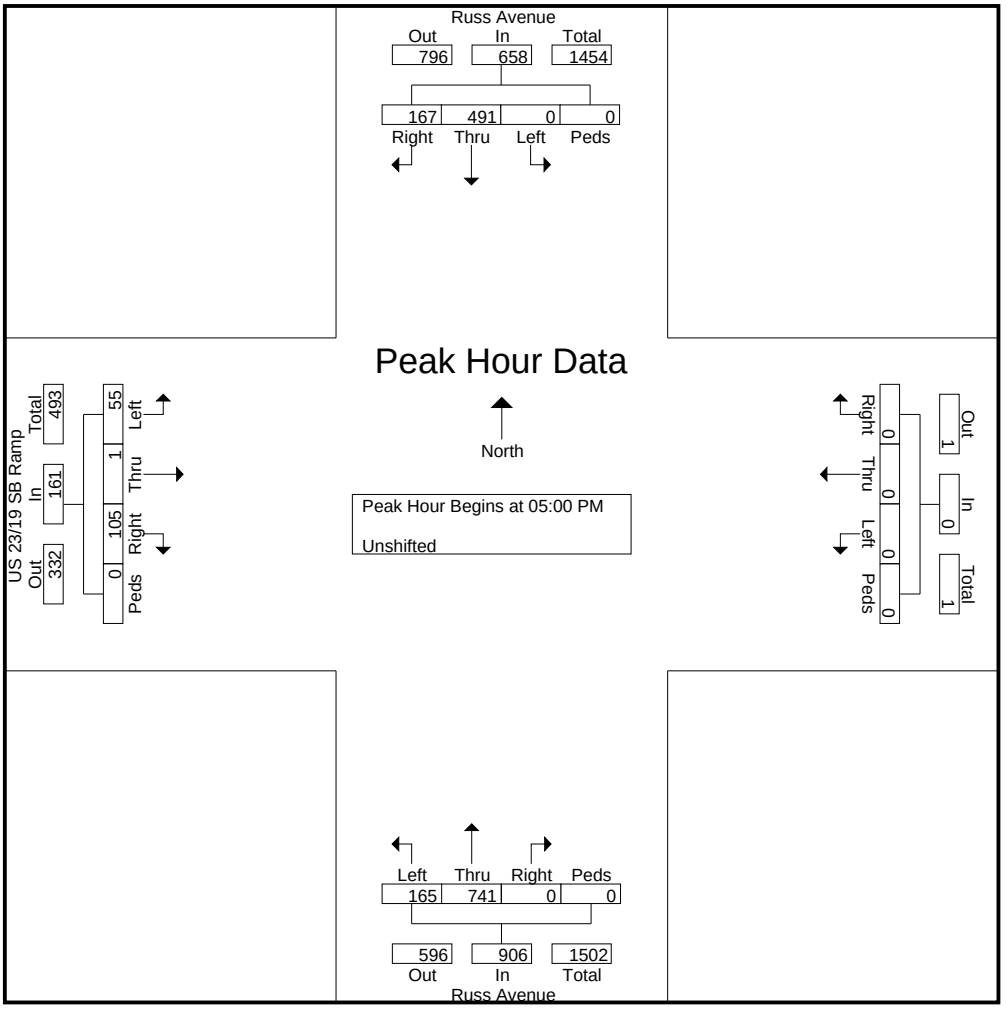


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ_23_19_SB
Site Code : 87654321
Start Date : 6/10/2008
Page No : 3

	Russ Avenue southbound					westbound					Russ Avenue northbound					US 23/19 SB Ramp eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	131	**48**	0	179	0	0	0	0	0	24	188	0	0	212	11	0	12	0	23	414
05:15 PM	0	82	37	0	119	0	0	0	0	0	34	180	0	0	214	**16**	0	16	0	32	365
05:30 PM	0	113	42	0	155	0	0	0	0	0	**60**	181	0	0	**241**	15	0	**41**	0	**56**	452
05:45 PM	0	**165**	40	0	**205**	0	0	0	0	0	47	**192**	0	0	239	13	**1**	36	0	50	**494**
Total Volume	0	491	167	0	658	0	0	0	0	0	165	741	0	0	906	55	1	105	0	161	1725
% App. Total	0	74.6	25.4	0		0	0	0	0		18.2	81.8	0	0		34.2	0.6	65.2	0		
PHF	.000	.744	.870	.000	.802	.000	.000	.000	.000	.000	.688	.965	.000	.000	.940	.859	.250	.640	.000	.719	.873



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name: Russ Avenue
Counted By: W. Vaughan
Weather: Clear
Day: Tuesday June 10, 2008

File Name : Russ_23_19_NB
Site Code : 00000243
Start Date : 6/10/2008

Groups Printed- Unshifted

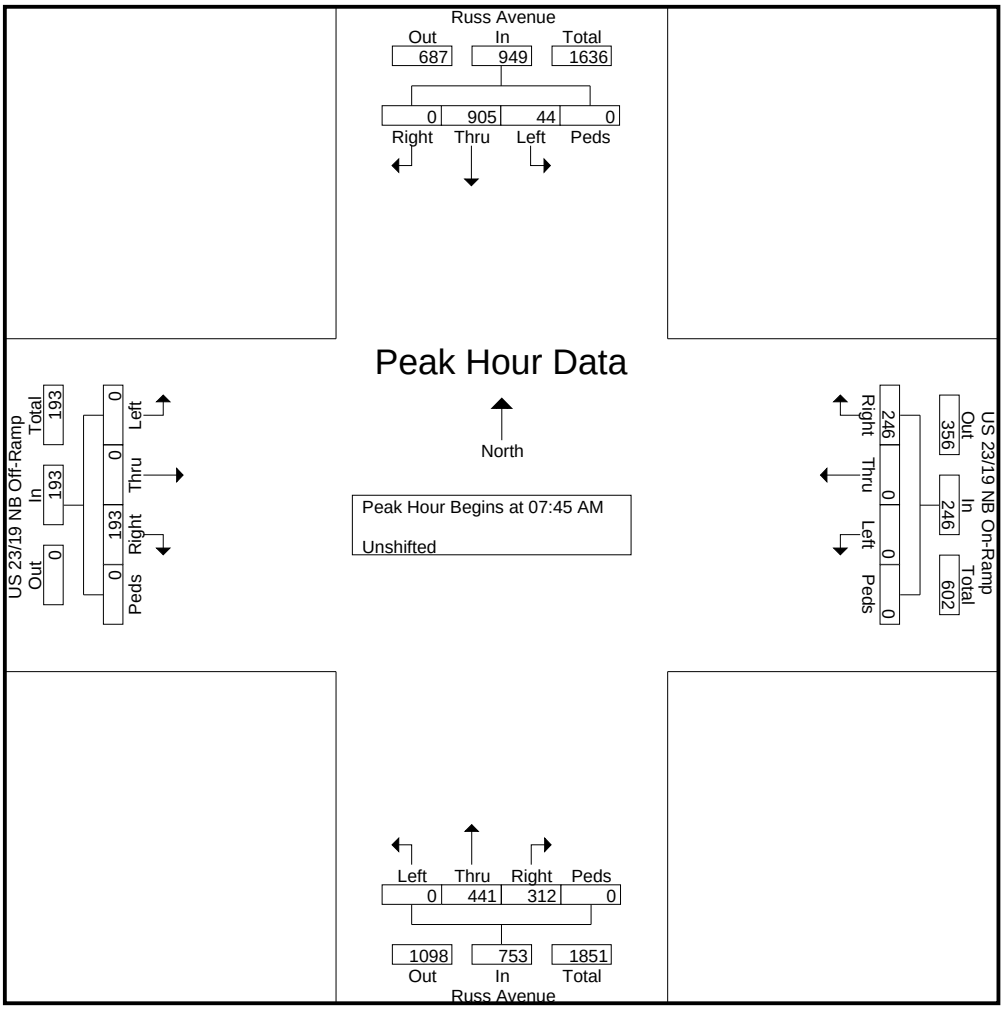
	Russ Avenue southbound				US 23/19 NB On-Ramp westbound				Russ Avenue northbound				US 23/19 NB Off-Ramp eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	4	59	0	0	0	0	21	0	0	50	28	0	0	0	20	0	182
Total	4	59	0	0	0	0	21	0	0	50	28	0	0	0	20	0	182
07:00 AM	3	138	0	0	0	0	41	0	0	52	36	1	0	0	22	0	293
07:15 AM	5	172	0	0	0	0	61	0	0	82	39	0	0	0	36	0	395
07:30 AM	3	258	0	0	0	0	73	0	0	86	47	0	0	0	54	0	521
07:45 AM	7	219	0	0	0	0	64	0	0	107	94	0	0	0	71	0	562
Total	18	787	0	0	0	0	239	0	0	327	216	1	0	0	183	0	1771
08:00 AM	13	201	0	0	0	0	51	0	0	102	90	0	0	0	39	0	496
08:15 AM	11	236	0	0	0	0	55	0	0	108	54	0	0	0	40	0	504
08:30 AM	13	249	0	0	0	0	76	0	0	124	74	0	0	0	43	0	579
BREAK																	
Total	37	686	0	0	0	0	182	0	0	334	218	0	0	0	122	0	1579
BREAK																	
03:45 PM	24	283	0	0	0	0	69	0	0	222	134	0	0	0	65	0	797
Total	24	283	0	0	0	0	69	0	0	222	134	0	0	0	65	0	797
04:00 PM	15	258	0	0	0	0	103	0	0	237	174	0	0	0	66	0	853
04:15 PM	13	257	3	0	0	0	100	0	0	200	135	0	0	0	60	0	768
04:30 PM	19	284	0	0	0	0	73	0	0	219	139	0	0	0	53	0	787
04:45 PM	15	268	0	0	0	0	77	0	0	208	132	0	0	0	63	0	763
Total	62	1067	3	0	0	0	353	0	0	864	580	0	0	0	242	0	3171
05:00 PM	19	257	0	0	0	0	74	0	0	250	134	0	0	0	55	0	789
05:15 PM	31	267	0	0	0	0	96	0	0	272	129	0	0	1	89	0	885
05:30 PM	24	308	0	0	0	0	68	0	1	217	125	0	0	0	69	0	812
Grand Total	219	3714	3	0	0	0	1102	0	1	2536	1564	1	0	1	845	0	9986
Apprch %	5.6	94.4	0.1	0	0	0	100	0	0	61.8	38.1	0	0	0.1	99.9	0	
Total %	2.2	37.2	0	0	0	0	11	0	0	25.4	15.7	0	0	0	8.5	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ_23_19_NB
Site Code : 00000243
Start Date : 6/10/2008

	Russ Avenue southbound					US 23/19 NB On-Ramp westbound					Russ Avenue northbound					US 23/19 NB Off-Ramp eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	7	219	0	0	226	0	0	64	0	64	0	107	**94**	0	**201**	0	0	**71**	0	**71**	562
08:00 AM	**13**	201	0	0	214	0	0	51	0	51	0	102	90	0	192	0	0	39	0	39	496
08:15 AM	11	236	0	0	247	0	0	55	0	55	0	108	54	0	162	0	0	40	0	40	504
08:30 AM	13	**249**	0	0	**262**	0	0	**76**	0	**76**	0	**124**	74	0	198	0	0	43	0	43	**579**
Total Volume	44	905	0	0	949	0	0	246	0	246	0	441	312	0	753	0	0	193	0	193	2141
% App. Total	4.6	95.4	0	0		0	0	100	0		0	58.6	41.4	0		0	0	100	0		
PHF	.846	.909	.000	.000	.906	.000	.000	.809	.000	.809	.000	.889	.830	.000	.937	.000	.000	.680	.000	.680	.924

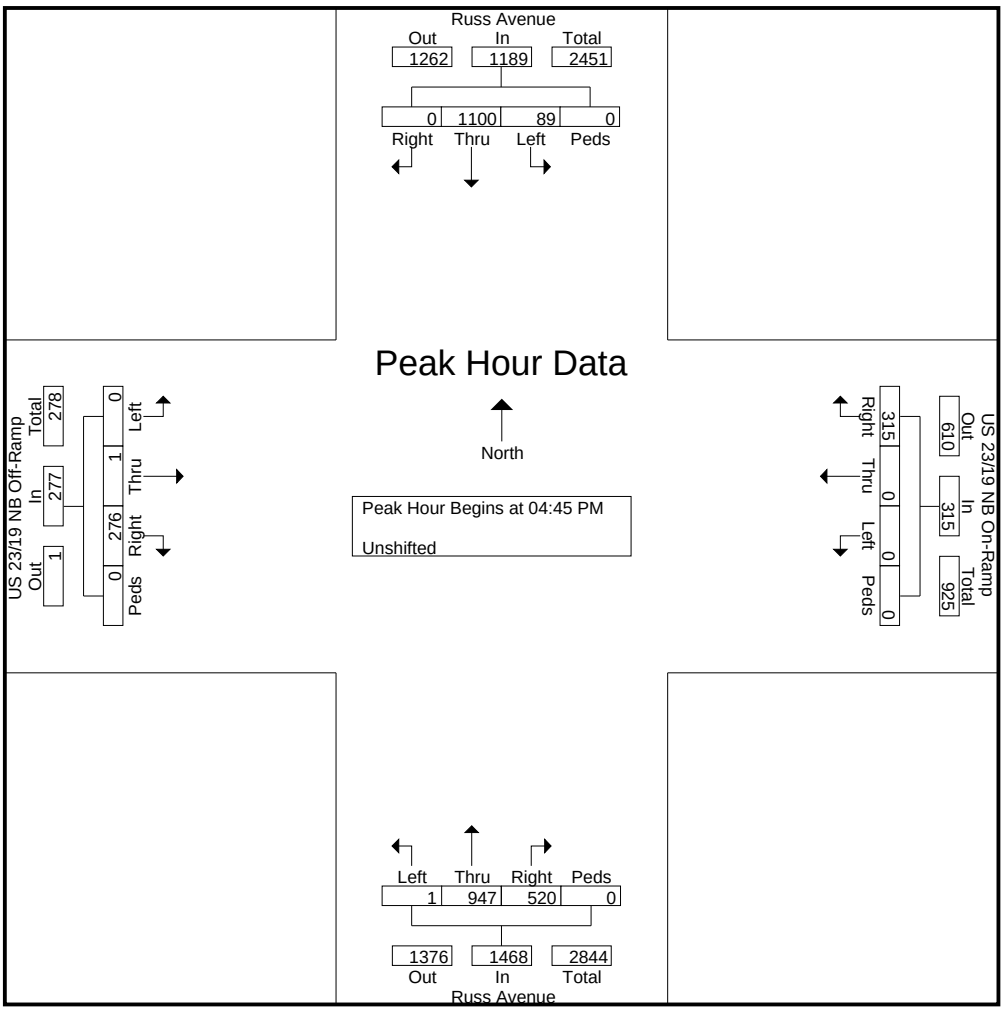


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Russ_23_19_NB
Site Code : 00000243
Start Date : 6/10/2008
Page No : 3

	Russ Avenue southbound					US 23/19 NB On-Ramp westbound					Russ Avenue northbound					US 23/19 NB Off-Ramp eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	15	268	0	0	283	0	0	77	0	77	0	208	132	0	340	0	0	63	0	63	763
05:00 PM	19	257	0	0	276	0	0	74	0	74	0	250	**134**	0	384	0	0	55	0	55	789
05:15 PM	**31**	267	0	0	298	0	0	**96**	0	**96**	0	**272**	129	0	**401**	0	**1**	**89**	0	**90**	**885**
05:30 PM	24	**308**	0	0	**332**	0	0	68	0	68	**1**	217	125	0	343	0	0	69	0	69	812
Total Volume	89	1100	0	0	1189	0	0	315	0	315	1	947	520	0	1468	0	1	276	0	277	3249
% App. Total	7.5	92.5	0	0		0	0	100	0		0.1	64.5	35.4	0		0	0.4	99.6	0		
PHF	.718	.893	.000	.000	.895	.000	.000	.820	.000	.820	.250	.870	.970	.000	.915	.000	.250	.775	.000	.769	.918



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name:Russ Avenue
Counted By: W. Vaughan
Weather: Clear
Day:Monday June 16, 2008

File Name : Marshall
Site Code : 00000577
Start Date : 6/16/2008

Groups Printed- Unshifted

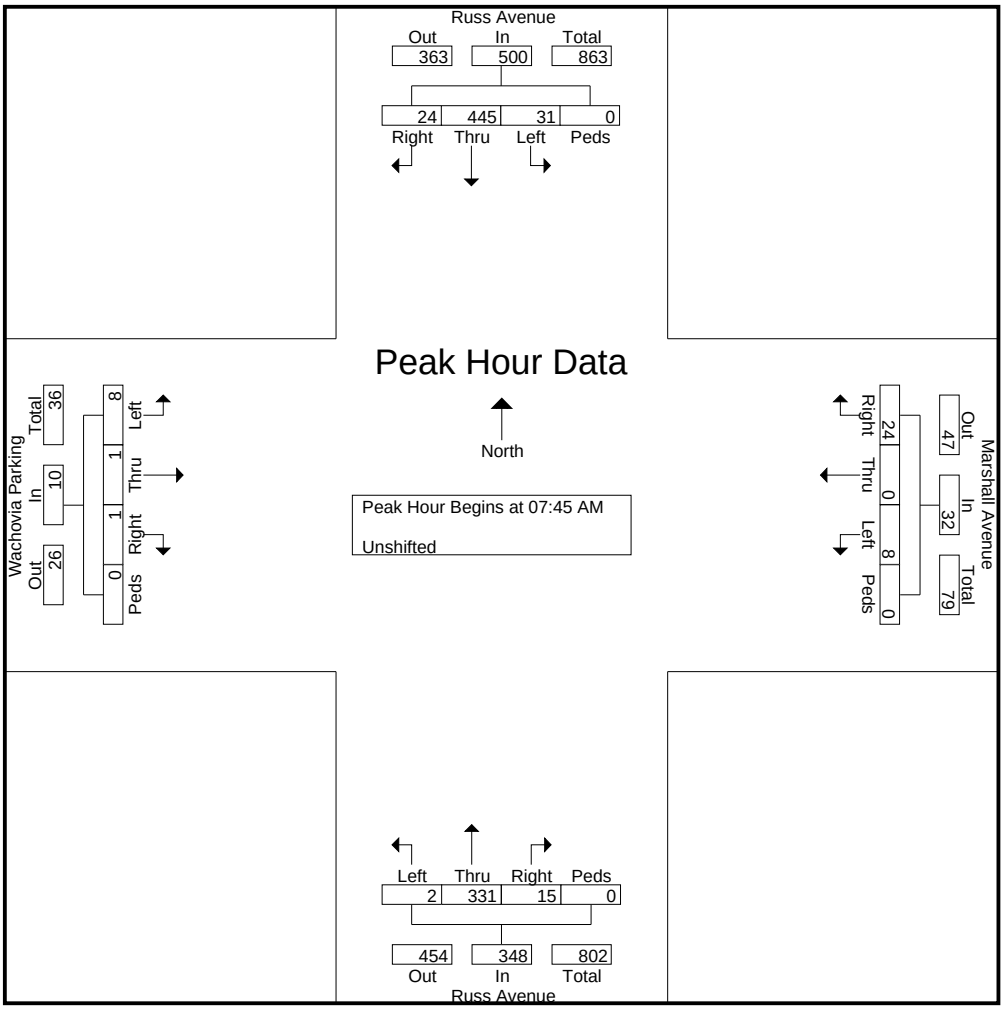
	Russ Avenue southbound				Marshall Avenue westbound				Russ Avenue northbound				Wachovia Parking eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	6	26	2	0	0	0	0	0	0	39	0	0	0	0	0	0	73
Total	6	26	2	0	0	0	0	0	0	39	0	0	0	0	0	0	73
07:00 AM	5	44	0	0	1	0	5	0	0	40	1	0	1	0	0	0	97
07:15 AM	3	70	2	0	1	0	7	0	0	59	1	0	0	0	0	0	143
07:30 AM	8	112	0	0	2	1	10	0	0	91	3	0	0	0	0	0	227
07:45 AM	7	100	4	0	3	0	7	0	0	89	6	0	3	0	0	0	219
Total	23	326	6	0	7	1	29	0	0	279	11	0	4	0	0	0	686
08:00 AM	6	105	3	0	1	0	2	0	0	61	4	0	1	1	0	0	184
08:15 AM	6	98	10	0	1	0	5	0	0	91	2	0	2	0	1	0	216
08:30 AM	12	142	7	0	3	0	10	0	2	90	3	0	2	0	0	0	271
BREAK																	
Total	24	345	20	0	5	0	17	0	2	242	9	0	5	1	1	0	671
BREAK																	
03:45 PM	13	120	12	0	8	0	22	0	2	150	11	0	10	2	1	0	351
Total	13	120	12	0	8	0	22	0	2	150	11	0	10	2	1	0	351
04:00 PM	19	127	13	0	10	2	24	0	2	123	18	0	8	2	2	0	350
04:15 PM	26	122	12	0	4	0	21	0	4	146	13	0	15	1	1	0	365
04:30 PM	24	133	10	0	12	0	24	0	0	152	8	0	8	2	1	0	374
04:45 PM	15	149	11	0	15	2	24	0	1	184	15	0	12	3	1	0	432
Total	84	531	46	0	41	4	93	0	7	605	54	0	43	8	5	0	1521
05:00 PM	20	116	3	0	9	1	27	0	0	154	13	0	4	1	0	0	348
05:15 PM	26	128	3	0	10	1	22	0	0	153	28	0	9	1	0	0	381
05:30 PM	18	127	3	0	14	0	41	0	0	138	19	0	4	0	0	0	364
Grand Total	214	1719	95	0	94	7	251	0	11	1760	145	0	79	13	7	0	4395
Apprch %	10.6	84.8	4.7	0	26.7	2	71.3	0	0.6	91.9	7.6	0	79.8	13.1	7.1	0	
Total %	4.9	39.1	2.2	0	2.1	0.2	5.7	0	0.3	40	3.3	0	1.8	0.3	0.2	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Marshall
Site Code : 00000577
Start Date : 6/16/2008
Page No : 2

	Russ Avenue southbound					Marshall Avenue westbound					Russ Avenue northbound					Wachovia Parking eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	7	100	4	0	111	**3**	0	7	0	10	0	89	**6**	0	**95**	**3**	0	0	0	**3**	219
08:00 AM	6	105	3	0	114	1	0	2	0	3	0	61	4	0	65	1	**1**	0	0	2	184
08:15 AM	6	98	**10**	0	114	1	0	5	0	6	0	**91**	2	0	93	2	0	**1**	0	3	216
08:30 AM	**12**	**142**	7	0	**161**	3	0	**10**	0	**13**	**2**	90	3	0	95	2	0	0	0	2	**271**
Total Volume	31	445	24	0	500	8	0	24	0	32	2	331	15	0	348	8	1	1	0	10	890
% App. Total	6.2	89	4.8	0		25	0	75	0		0.6	95.1	4.3	0		80	10	10	0		
PHF	.646	.783	.600	.000	.776	.667	.000	.600	.000	.615	.250	.909	.625	.000	.916	.667	.250	.250	.000	.833	.821

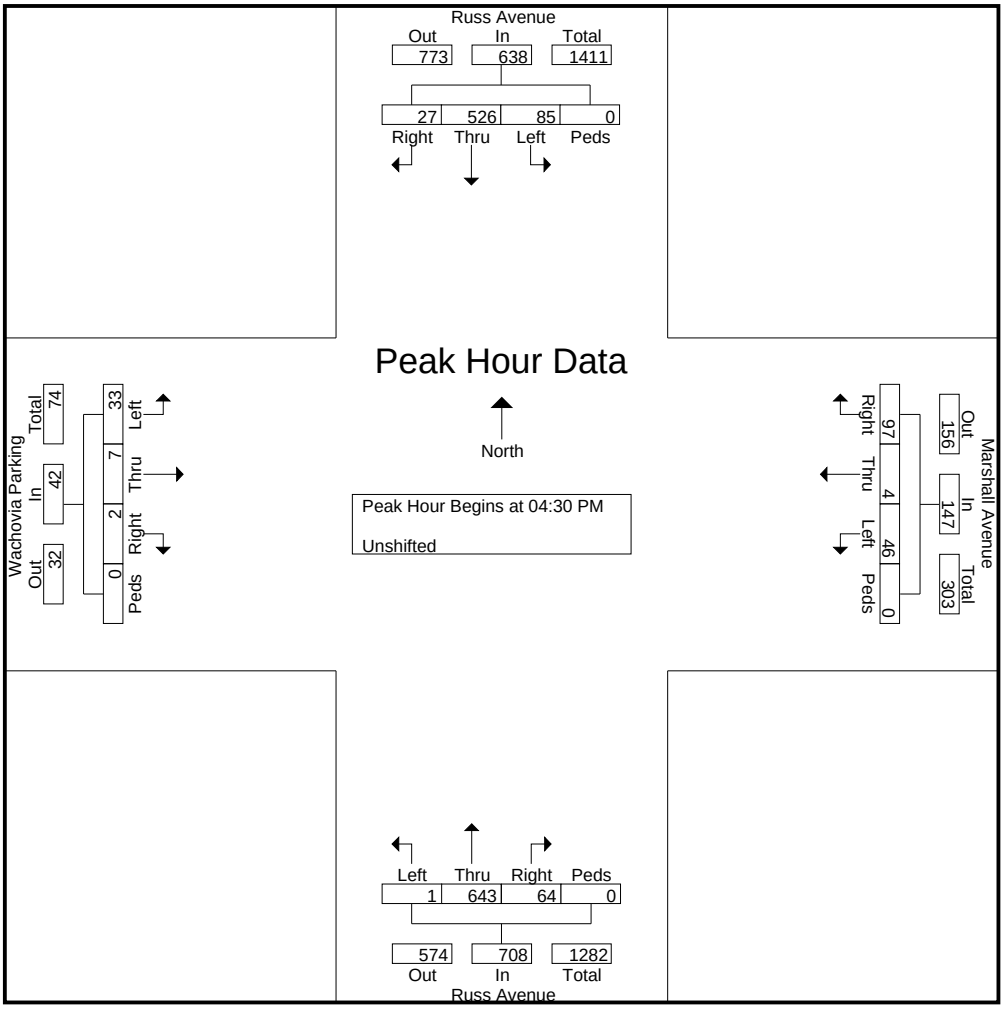


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Marshall
Site Code : 00000577
Start Date : 6/16/2008
Page No : 3

	Russ Avenue southbound					Marshall Avenue westbound					Russ Avenue northbound					Wachovia Parking eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	24	133	10	0	167	12	0	24	0	36	0	152	8	0	160	8	2	**1**	0	11	374
04:45 PM	15	**149**	**11**	0	**175**	**15**	**2**	24	0	**41**	**1**	**184**	15	0	**200**	**12**	**3**	1	0	**16**	**432**
05:00 PM	20	116	3	0	139	9	1	**27**	0	37	0	154	13	0	167	4	1	0	0	5	348
05:15 PM	**26**	128	3	0	157	10	1	22	0	33	0	153	**28**	0	181	9	1	0	0	10	381
Total Volume	85	526	27	0	638	46	4	97	0	147	1	643	64	0	708	33	7	2	0	42	1535
% App. Total	13.3	82.4	4.2	0		31.3	2.7	66	0		0.1	90.8	9	0		78.6	16.7	4.8	0		
PHF	.817	.883	.614	.000	.911	.767	.500	.898	.000	.896	.250	.874	.571	.000	.885	.688	.583	.500	.000	.656	.888



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name: Russ Avenue
Counted By: L.B. Ray
Weather: Clear
Day: Thursday June 12, 2008

File Name : Lee
Site Code : 87654321
Start Date : 6/12/2008
Page No : 1

Groups Printed- Unshifted

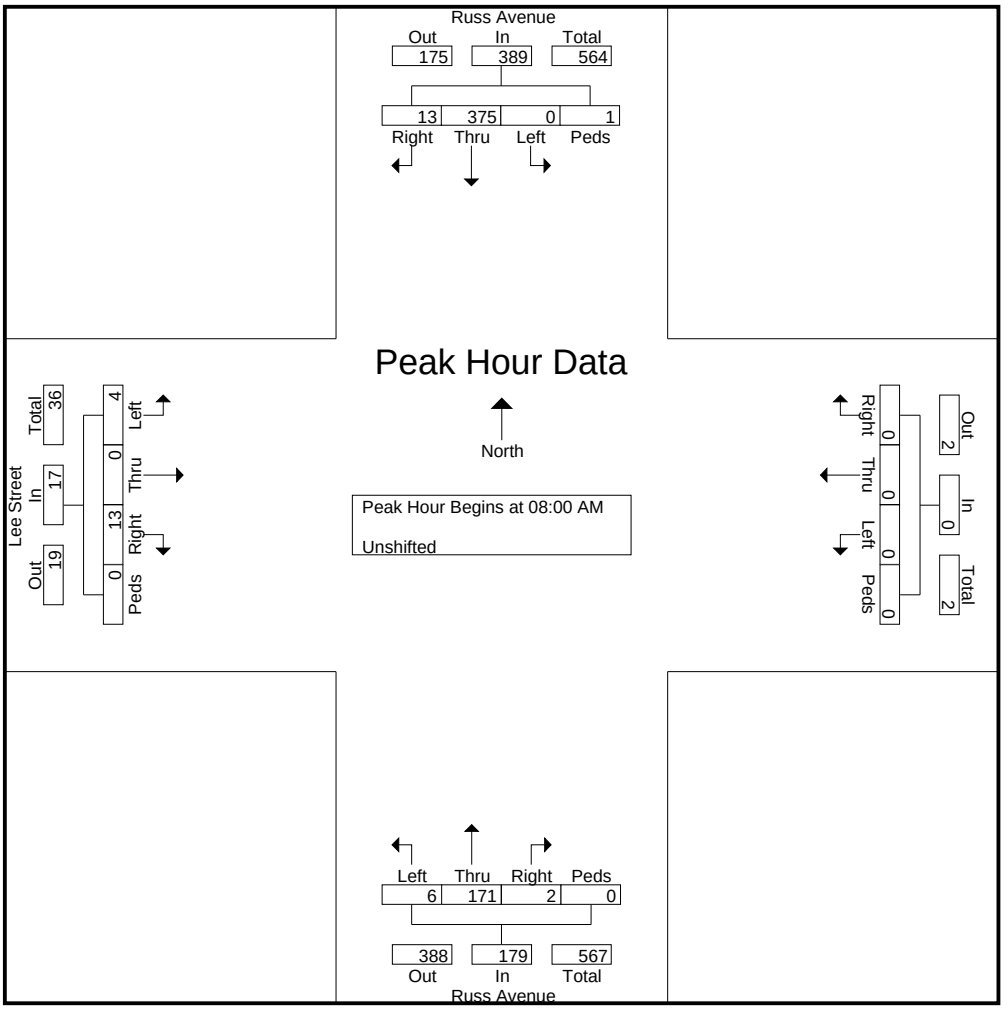
	Russ Avenue southbound				westbound				Russ Avenue northbound				Lee Street eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	0	36	1	0	0	0	0	0	4	33	1	0	0	0	2	0	77
07:15 AM	0	42	4	0	0	0	0	0	3	40	0	0	1	0	0	0	90
07:30 AM	0	73	3	0	0	0	0	0	2	54	0	0	2	0	2	0	136
07:45 AM	0	94	4	0	1	0	0	0	2	48	0	0	2	0	3	0	154
Total	0	245	12	0	1	0	0	0	11	175	1	0	5	0	7	0	457
08:00 AM	0	92	1	0	0	0	0	0	0	39	0	0	0	0	1	0	133
08:15 AM	0	73	4	0	0	0	0	0	0	34	0	0	1	0	2	0	114
08:30 AM	0	99	3	0	0	0	0	0	1	37	0	0	2	0	3	0	145
08:45 AM	0	111	5	1	0	0	0	0	5	61	2	0	1	0	7	0	193
Total	0	375	13	1	0	0	0	0	6	171	2	0	4	0	13	0	585
BREAK																	
04:00 PM	0	143	1	0	1	0	0	0	11	99	0	0	3	0	8	0	266
04:15 PM	0	123	3	0	0	0	0	0	2	128	0	0	0	0	9	0	265
04:30 PM	0	123	4	0	1	0	0	0	3	119	0	0	1	0	8	1	260
04:45 PM	0	122	1	0	0	0	0	0	3	99	0	0	2	0	2	0	229
Total	0	511	9	0	2	0	0	0	19	445	0	0	6	0	27	1	1020
05:00 PM	0	93	0	0	0	0	0	0	1	106	0	0	2	0	1	0	203
05:15 PM	0	90	3	0	0	0	0	0	4	77	0	0	0	0	3	0	177
05:30 PM	0	93	2	0	0	0	0	0	2	80	0	0	3	0	2	0	182
05:45 PM	0	134	4	0	0	0	0	2	6	139	0	0	2	0	3	0	290
Total	0	410	9	0	0	0	0	2	13	402	0	0	7	0	9	0	852
Grand Total	0	1541	43	1	3	0	0	2	49	1193	3	0	22	0	56	1	2914
Apprch %	0	97.2	2.7	0.1	60	0	0	40	3.9	95.8	0.2	0	27.8	0	70.9	1.3	
Total %	0	52.9	1.5	0	0.1	0	0	0.1	1.7	40.9	0.1	0	0.8	0	1.9	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Lee
Site Code : 87654321
Start Date : 6/12/2008
Page No : 2

	Russ Avenue southbound					westbound					Russ Avenue northbound					Lee Street eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	92	1	0	93	0	0	0	0	0	0	39	0	0	39	0	0	1	0	1	133
08:15 AM	0	73	4	0	77	0	0	0	0	0	0	34	0	0	34	1	0	2	0	3	114
08:30 AM	0	99	3	0	102	0	0	0	0	0	1	37	0	0	38	**2**	0	3	0	5	145
08:45 AM	0	**111**	**5**	**1**	**117**	0	0	0	0	0	**5**	**61**	**2**	0	**68**	1	0	**7**	0	**8**	**193**
Total Volume	0	375	13	1	389	0	0	0	0	0	6	171	2	0	179	4	0	13	0	17	585
% App. Total	0	96.4	3.3	0.3		0	0	0	0		3.4	95.5	1.1	0		23.5	0	76.5	0		
PHF	.000	.845	.650	.250	.831	.000	.000	.000	.000	.000	.300	.701	.250	.000	.658	.500	.000	.464	.000	.531	.758

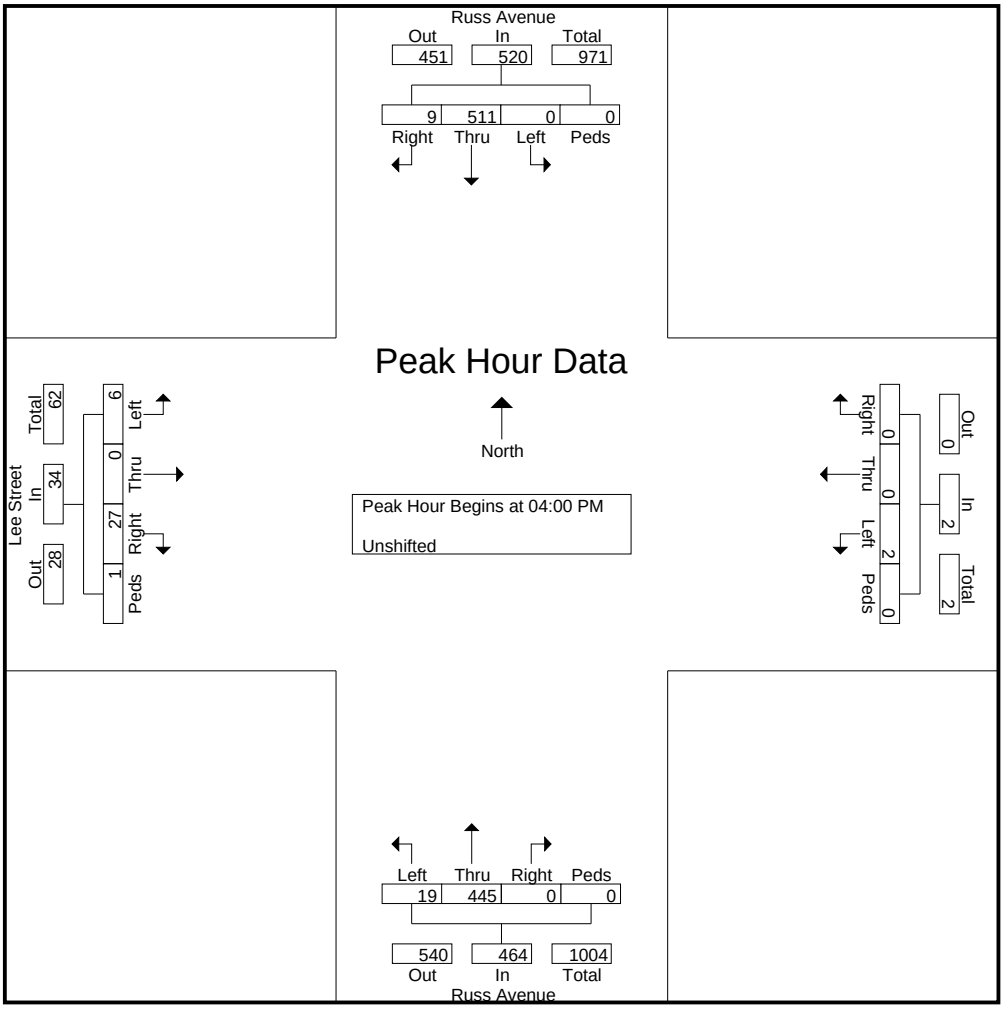


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Lee
Site Code : 87654321
Start Date : 6/12/2008
Page No : 3

	Russ Avenue southbound					westbound					Russ Avenue northbound					Lee Street eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	**143**	1	0	**144**	**1**	0	0	0	**1**	**11**	99	0	0	110	**3**	0	8	0	**11**	**266**
04:15 PM	0	123	3	0	126	0	0	0	0	0	2	**128**	0	0	**130**	0	0	**9**	0	9	265
04:30 PM	0	123	**4**	0	127	1	0	0	0	1	3	119	0	0	122	1	0	8	**1**	10	260
04:45 PM	0	122	1	0	123	0	0	0	0	0	3	99	0	0	102	2	0	2	0	4	229
Total Volume	0	511	9	0	520	2	0	0	0	2	19	445	0	0	464	6	0	27	1	34	1020
% App. Total	0	98.3	1.7	0		100	0	0	0		4.1	95.9	0	0		17.6	0	79.4	2.9		
PHF	.000	.893	.563	.000	.903	.500	.000	.000	.000	.500	.432	.869	.000	.000	.892	.500	.000	.750	.250	.773	.959



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name: Russ Avenue
Counted By: W. Vaughan
Weather: Clear
Day: Thursday June 12, 2008

File Name : Howell Mill_Dellwood
Site Code : 00000456
Start Date : 6/12/2008
Page No : 1

Groups Printed- Unshifted

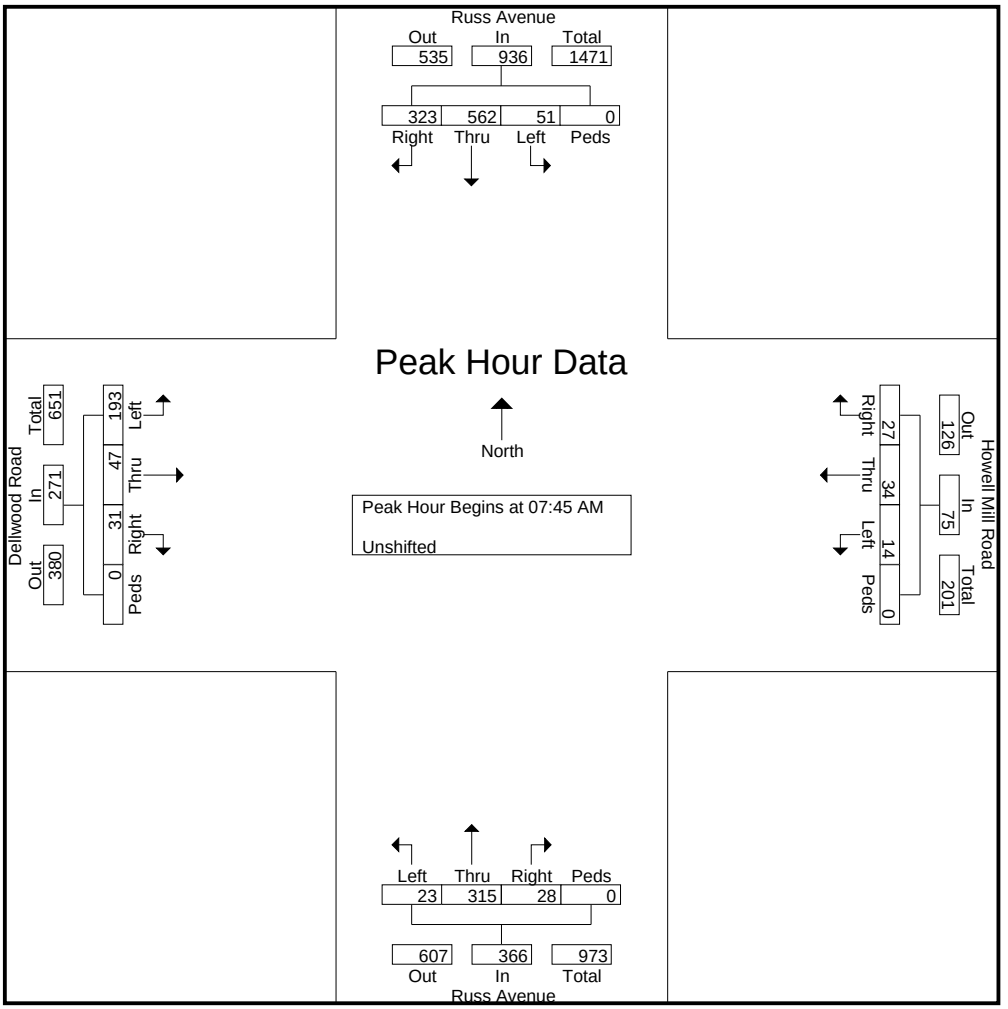
	Russ Avenue southbound				Howell Mill Road westbound				Russ Avenue northbound				Dellwood Road eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	7	44	41	0	5	2	6	0	2	40	4	0	30	3	0	0	184
Total	7	44	41	0	5	2	6	0	2	40	4	0	30	3	0	0	184
07:00 AM	6	55	38	0	4	5	4	0	2	43	4	0	37	7	5	0	210
07:15 AM	5	89	58	0	2	4	4	0	2	72	5	0	38	5	2	0	286
07:30 AM	14	153	57	0	3	12	8	0	3	67	6	0	57	8	6	0	394
07:45 AM	8	138	77	0	4	13	9	0	5	70	10	0	42	11	6	0	393
Total	33	435	230	0	13	34	25	0	12	252	25	0	174	31	19	0	1283
08:00 AM	13	124	78	0	3	4	4	0	4	61	4	0	52	8	6	0	361
08:15 AM	6	139	79	0	2	9	11	0	7	74	7	0	46	11	11	0	402
08:30 AM	24	161	89	0	5	8	3	0	7	110	7	0	53	17	8	0	492
BREAK																	
Total	43	424	246	0	10	21	18	0	18	245	18	0	151	36	25	0	1255
BREAK																	
03:45 PM	16	156	63	1	16	10	22	0	4	127	14	0	99	12	15	0	555
Total	16	156	63	1	16	10	22	0	4	127	14	0	99	12	15	0	555
04:00 PM	16	129	88	0	6	6	10	0	10	200	16	0	95	15	8	0	599
04:15 PM	12	136	94	0	16	15	16	0	13	149	14	0	74	19	9	0	567
04:30 PM	10	145	78	0	12	15	20	0	4	158	15	0	76	14	4	0	551
04:45 PM	24	128	74	0	12	14	16	0	7	152	15	0	102	28	15	0	587
Total	62	538	334	0	46	50	62	0	34	659	60	0	347	76	36	0	2304
05:00 PM	26	114	66	0	9	11	18	0	5	146	17	0	105	26	5	0	548
05:15 PM	27	127	99	0	8	20	16	0	5	189	27	0	84	22	14	0	638
05:30 PM	30	146	101	0	14	15	23	0	12	144	16	0	92	13	6	0	612
Grand Total	244	1984	1180	1	121	163	190	0	92	1802	181	0	1082	219	120	0	7379
Apprch %	7.2	58.2	34.6	0	25.5	34.4	40.1	0	4.4	86.8	8.7	0	76.1	15.4	8.4	0	
Total %	3.3	26.9	16	0	1.6	2.2	2.6	0	1.2	24.4	2.5	0	14.7	3	1.6	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Howell Mill_Dellwood
Site Code : 00000456
Start Date : 6/12/2008
Page No : 2

	Russ Avenue southbound					Howell Mill Road westbound					Russ Avenue northbound					Dellwood Road eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	8	138	77	0	223	4	**13**	9	0	**26**	5	70	**10**	0	85	42	11	6	0	59	393
08:00 AM	13	124	78	0	215	3	4	4	0	11	4	61	4	0	69	52	8	6	0	66	361
08:15 AM	6	139	79	0	224	2	9	**11**	0	22	**7**	74	7	0	88	46	11	**11**	0	68	402
08:30 AM	**24**	**161**	**89**	0	**274**	**5**	8	3	0	16	7	**110**	7	0	**124**	**53**	**17**	8	0	**78**	**492**
Total Volume	51	562	323	0	936	14	34	27	0	75	23	315	28	0	366	193	47	31	0	271	1648
% App. Total	5.4	60	34.5	0		18.7	45.3	36	0		6.3	86.1	7.7	0		71.2	17.3	11.4	0		
PHF	.531	.873	.907	.000	.854	.700	.654	.614	.000	.721	.821	.716	.700	.000	.738	.910	.691	.705	.000	.869	.837

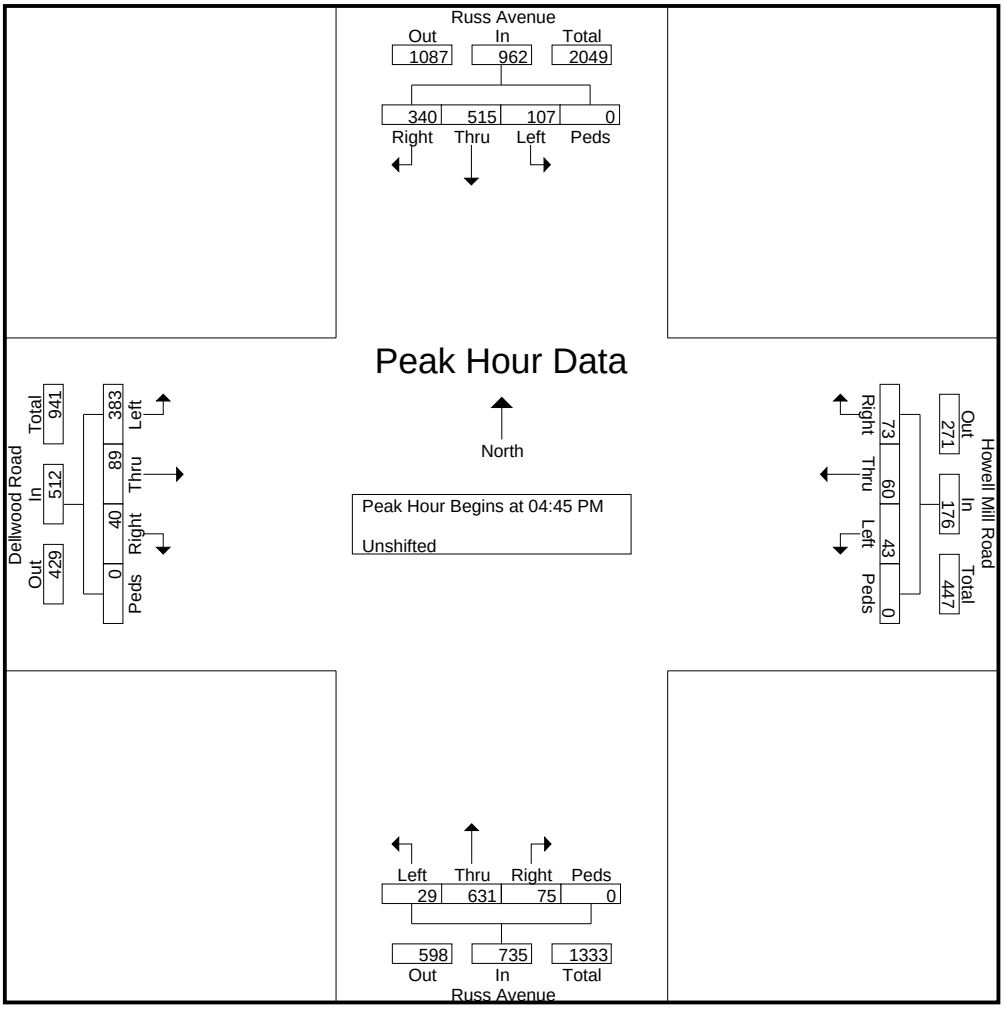


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Howell Mill_Dellwood
Site Code : 00000456
Start Date : 6/12/2008
Page No : 3

	Russ Avenue southbound					Howell Mill Road westbound					Russ Avenue northbound					Dellwood Road eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	24	128	74	0	226	12	14	16	0	42	7	152	15	0	174	102	**28**	**15**	0	**145**	587
05:00 PM	26	114	66	0	206	9	11	18	0	38	5	146	17	0	168	**105**	26	5	0	136	548
05:15 PM	27	127	99	0	253	8	**20**	16	0	44	5	**189**	**27**	0	**221**	84	22	14	0	120	**638**
05:30 PM	**30**	**146**	**101**	0	**277**	**14**	15	**23**	0	**52**	**12**	144	16	0	172	92	13	6	0	111	612
Total Volume	107	515	340	0	962	43	60	73	0	176	29	631	75	0	735	383	89	40	0	512	2385
% App. Total	11.1	53.5	35.3	0		24.4	34.1	41.5	0		3.9	85.9	10.2	0		74.8	17.4	7.8	0		
PHF	.892	.882	.842	.000	.868	.768	.750	.793	.000	.846	.604	.835	.694	.000	.831	.912	.795	.667	.000	.883	.935



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name: Russ Avenue
Counted By: L.B. Ray
Weather: Clear
Day: Monday June 9, 2008

File Name : Frazier
Site Code : 12345678
Start Date : 6/9/2008

Groups Printed- Unshifted

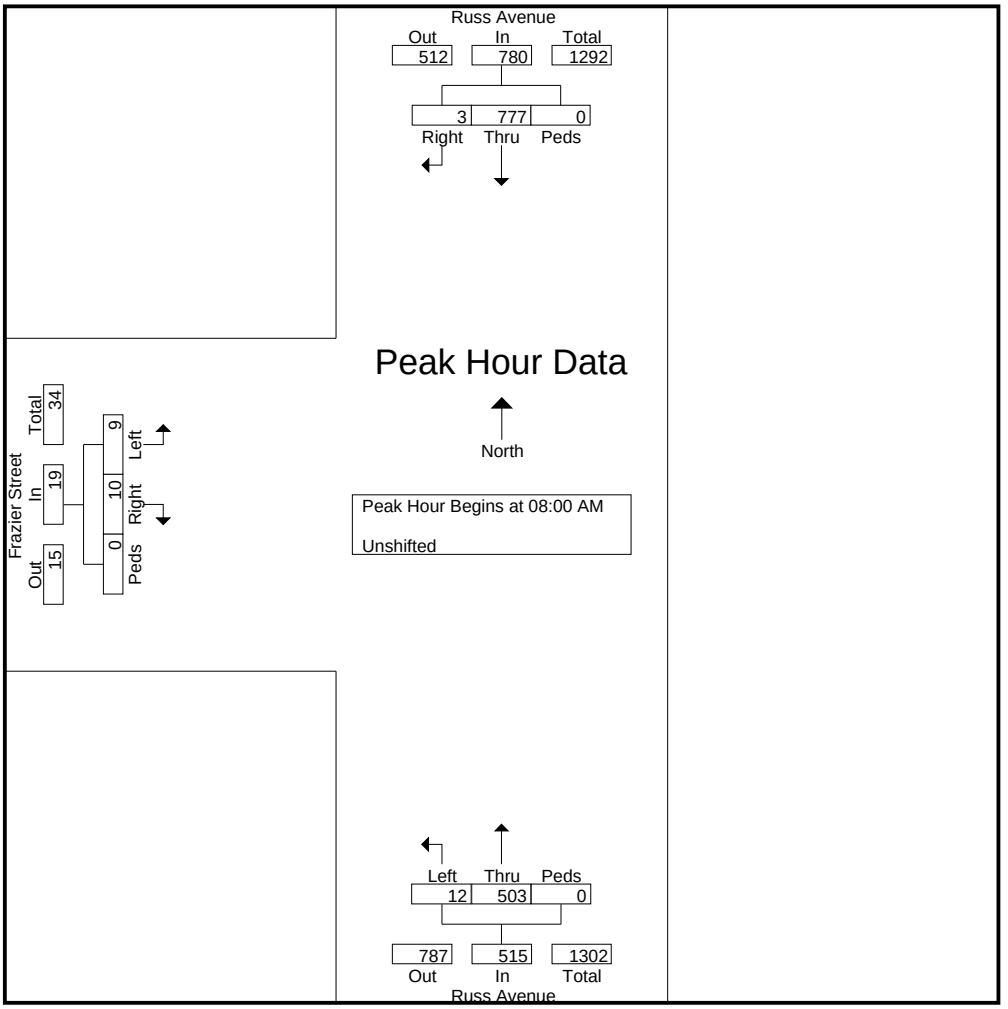
	Russ Avenue southbound			Russ Avenue northbound			Frazier Street eastbound			
Start Time	Thru	Right	Peds	Left	Thru	Peds	Left	Right	Peds	Int. Total
07:00 AM	106	0	0	3	79	0	4	1	0	193
07:15 AM	126	1	0	3	96	0	1	0	0	227
07:30 AM	104	1	0	3	50	0	3	1	0	162
07:45 AM	182	1	0	3	133	0	5	0	0	324
Total	518	3	0	12	358	0	13	2	0	906
08:00 AM	224	2	0	5	147	0	0	2	0	380
08:15 AM	195	0	0	2	102	0	3	3	0	305
08:30 AM	155	1	0	4	97	0	4	1	0	262
08:45 AM	203	0	0	1	157	0	2	4	0	367
Total	777	3	0	12	503	0	9	10	0	1314
BREAK										
04:00 PM	234	3	0	6	246	0	2	10	0	501
04:15 PM	192	3	0	7	238	0	3	5	0	448
04:30 PM	182	4	0	4	216	0	3	1	0	410
04:45 PM	217	2	0	4	287	0	4	3	0	517
Total	825	12	0	21	987	0	12	19	0	1876
05:00 PM	183	1	0	9	305	0	3	3	0	504
05:15 PM	218	2	0	5	293	0	6	3	0	527
05:30 PM	242	3	0	2	318	0	8	5	0	578
05:45 PM	226	4	0	6	288	0	7	9	0	540
Total	869	10	0	22	1204	0	24	20	0	2149
Grand Total	2989	28	0	67	3052	0	58	51	0	6245
Apprch %	99.1	0.9	0	2.1	97.9	0	53.2	46.8	0	
Total %	47.9	0.4	0	1.1	48.9	0	0.9	0.8	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Frazier
Site Code : 12345678
Start Date : 6/9/2008
Page No : 2

	Russ Avenue southbound				Russ Avenue northbound				Frazier Street eastbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	**224**	**2**	0	**226**	**5**	147	0	152	0	2	0	2	**380**
08:15 AM	195	0	0	195	2	102	0	104	3	3	0	**6**	305
08:30 AM	155	1	0	156	4	97	0	101	**4**	1	0	5	262
08:45 AM	203	0	0	203	1	**157**	0	**158**	2	**4**	0	6	367
Total Volume	777	3	0	780	12	503	0	515	9	10	0	19	1314
% App. Total	99.6	0.4	0		2.3	97.7	0		47.4	52.6	0		
PHF	.867	.375	.000	.863	.600	.801	.000	.815	.563	.625	.000	.792	.864

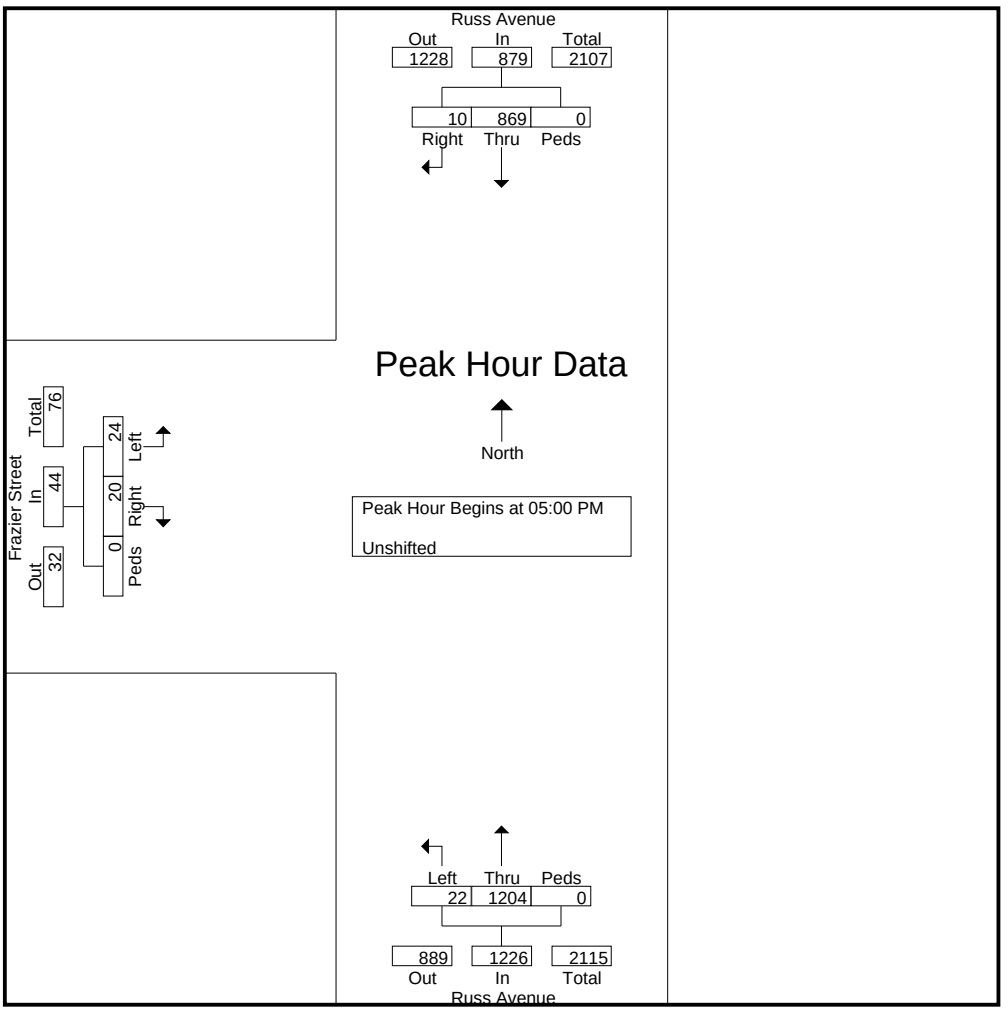


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Frazier
Site Code : 12345678
Start Date : 6/9/2008
Page No : 3

	Russ Avenue southbound				Russ Avenue northbound				Frazier Street eastbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	183	1	0	184	**9**	305	0	314	3	3	0	6	504
05:15 PM	218	2	0	220	5	293	0	298	6	3	0	9	527
05:30 PM	**242**	3	0	**245**	2	**318**	0	**320**	**8**	5	0	13	**578**
05:45 PM	226	**4**	0	230	6	288	0	294	7	**9**	0	**16**	540
Total Volume	869	10	0	879	22	1204	0	1226	24	20	0	44	2149
% App. Total	98.9	1.1	0		1.8	98.2	0		54.5	45.5	0		
PHF	.898	.625	.000	.897	.611	.947	.000	.958	.750	.556	.000	.688	.929



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name: Russ Avenue
Counted By:W. Vaughan
Weather: Clear
Day: Wednesday June 11, 2008

File Name : Betsy Acres
Site Code : 00000343
Start Date : 6/11/2008
Page No : 1

Groups Printed- Unshifted

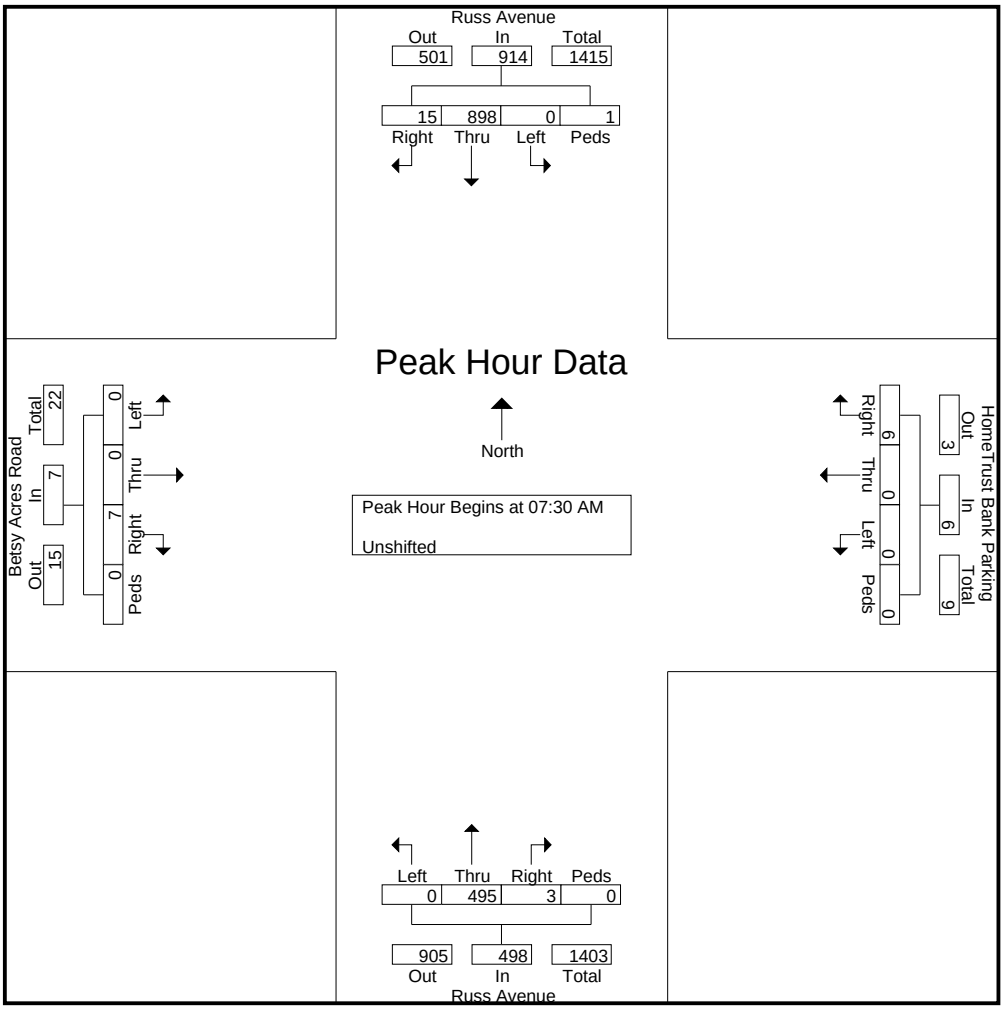
	Russ Avenue southbound				HomeTrust Bank Parking westbound				Russ Avenue northbound				Betsy Acres Road eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	0	92	0	0	0	0	2	0	0	71	0	0	0	0	3	0	168
Total	0	92	0	0	0	0	2	0	0	71	0	0	0	0	3	0	168
07:00 AM	0	135	0	1	0	0	2	0	0	79	0	0	0	0	3	0	220
07:15 AM	0	179	0	0	0	0	3	0	0	120	0	1	0	0	1	0	304
07:30 AM	0	292	3	1	0	0	2	0	0	115	2	0	0	0	2	0	417
07:45 AM	0	213	6	0	0	0	1	0	0	118	1	0	0	0	3	0	342
Total	0	819	9	2	0	0	8	0	0	432	3	1	0	0	9	0	1283
08:00 AM	0	152	2	0	0	0	1	0	0	101	0	0	0	0	2	0	258
08:15 AM	0	241	4	0	0	0	2	0	0	161	0	0	0	0	0	0	408
08:30 AM	0	252	4	0	0	0	2	0	0	141	0	0	0	0	2	0	401
BREAK																	
Total	0	645	10	0	0	0	5	0	0	403	0	0	0	0	4	0	1067
BREAK																	
03:45 PM	0	248	9	0	0	0	5	0	0	283	2	1	0	0	1	0	549
Total	0	248	9	0	0	0	5	0	0	283	2	1	0	0	1	0	549
04:00 PM	0	231	11	1	0	0	4	0	0	267	1	0	0	0	0	0	515
04:15 PM	0	243	10	0	0	0	9	0	0	298	3	0	0	0	1	0	564
04:30 PM	0	250	8	0	0	0	2	0	0	302	0	0	0	0	0	0	562
04:45 PM	0	262	5	0	0	0	9	0	0	341	1	0	0	0	0	0	618
Total	0	986	34	1	0	0	24	0	0	1208	5	0	0	0	1	0	2259
05:00 PM	0	288	9	0	0	0	5	0	0	331	0	0	0	0	1	0	634
05:15 PM	0	220	11	0	0	0	4	0	0	335	0	0	0	0	1	0	571
05:30 PM	0	205	17	0	0	0	4	0	0	266	1	0	0	0	1	0	494
Grand Total	0	3503	99	3	0	0	57	0	0	3329	11	2	0	0	21	0	7025
Apprch %	0	97.2	2.7	0.1	0	0	100	0	0	99.6	0.3	0.1	0	0	100	0	
Total %	0	49.9	1.4	0	0	0	0.8	0	0	47.4	0.2	0	0	0	0.3	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Betsy Acres
Site Code : 00000343
Start Date : 6/11/2008
Page No : 2

	Russ Avenue southbound					HomeTrust Bank Parking westbound					Russ Avenue northbound					Betsy Acres Road eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	**292**	3	**1**	**296**	0	0	**2**	0	**2**	0	115	**2**	0	117	0	0	2	0	2	**417**
07:45 AM	0	213	**6**	0	219	0	0	1	0	1	0	118	1	0	119	0	0	**3**	0	**3**	342
08:00 AM	0	152	2	0	154	0	0	1	0	1	0	101	0	0	101	0	0	2	0	2	258
08:15 AM	0	241	4	0	245	0	0	2	0	2	0	**161**	0	0	**161**	0	0	0	0	0	408
Total Volume	0	898	15	1	914	0	0	6	0	6	0	495	3	0	498	0	0	7	0	7	1425
% App. Total	0	98.2	1.6	0.1		0	0	100	0		0	99.4	0.6	0		0	0	100	0		
PHF	.000	.769	.625	.250	.772	.000	.000	.750	.000	.750	.000	.769	.375	.000	.773	.000	.000	.583	.000	.583	.854

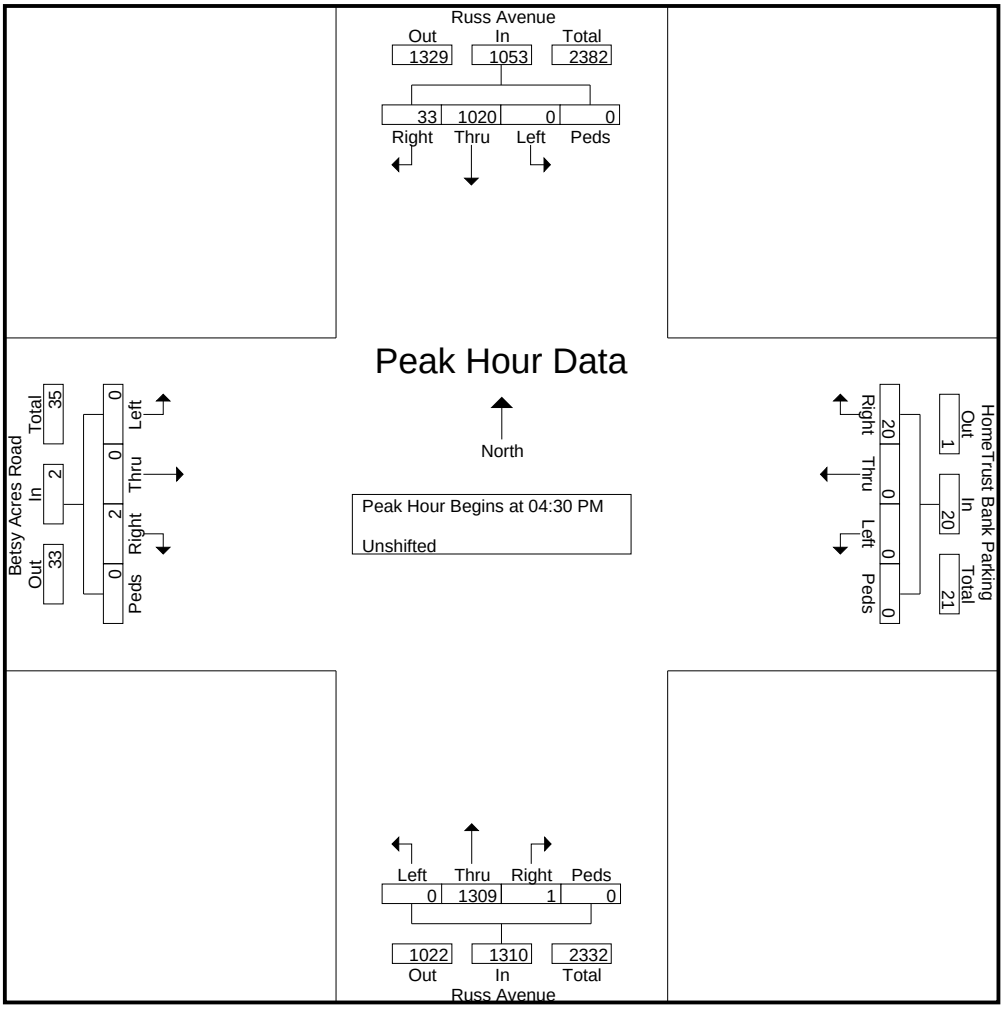


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Betsy Acres
Site Code : 00000343
Start Date : 6/11/2008
Page No : 3

	Russ Avenue southbound					HomeTrust Bank Parking westbound					Russ Avenue northbound					Betsy Acres Road eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	250	8	0	258	0	0	2	0	2	0	302	0	0	302	0	0	0	0	0	562
04:45 PM	0	262	5	0	267	0	0	**9**	0	**9**	0	**341**	**1**	0	**342**	0	0	0	0	0	618
05:00 PM	0	**288**	9	0	**297**	0	0	5	0	5	0	331	0	0	331	0	0	**1**	0	**1**	**634**
05:15 PM	0	220	**11**	0	231	0	0	4	0	4	0	335	0	0	335	0	0	1	0	1	571
Total Volume	0	1020	33	0	1053	0	0	20	0	20	0	1309	1	0	1310	0	0	2	0	2	2385
% App. Total	0	96.9	3.1	0		0	0	100	0		0	99.9	0.1	0		0	0	100	0		
PHF	.000	.885	.750	.000	.886	.000	.000	.556	.000	.556	.000	.960	.250	.000	.958	.000	.000	.500	.000	.500	.940



Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

Project Name:Russ Avenue
Counted By: L.B. Ray
Weather: Clear
Day:Wednesday June 11, 2008

File Name : Barber
Site Code : 12345678
Start Date : 6/11/2008

Groups Printed- Unshifted

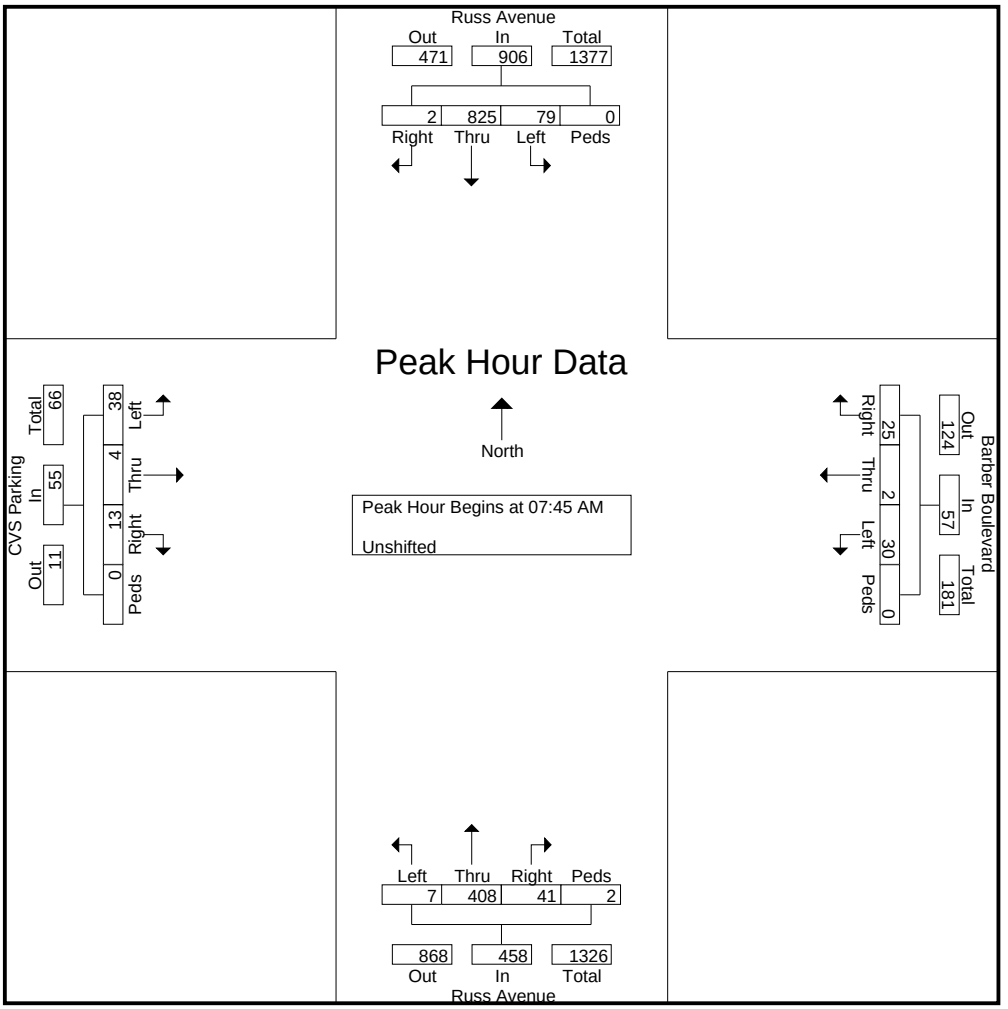
	Russ Avenue southbound				Barber Boulevard westbound				Russ Avenue northbound				CVS Parking eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
07:00 AM	13	85	0	0	5	0	5	0	0	64	6	0	5	0	1	0	184
07:15 AM	17	99	0	0	5	0	5	0	0	58	2	0	4	0	1	0	191
07:30 AM	18	140	1	0	4	0	5	0	1	90	8	0	6	0	2	0	275
07:45 AM	20	247	0	0	4	0	2	0	1	92	10	0	13	0	3	0	392
Total	68	571	1	0	18	0	17	0	2	304	26	0	28	0	7	0	1042
08:00 AM	14	211	1	0	6	0	8	0	1	99	13	0	8	1	2	0	364
08:15 AM	21	190	1	0	9	2	9	0	3	104	9	2	8	2	4	0	364
08:30 AM	24	177	0	0	11	0	6	0	2	113	9	0	9	1	4	0	356
08:45 AM	27	188	2	0	5	0	7	0	2	103	19	0	7	1	1	0	362
Total	86	766	4	0	31	2	30	0	8	419	50	2	32	5	11	0	1446
BREAK																	
04:00 PM	38	159	0	0	26	0	54	0	3	191	39	0	11	4	3	0	528
04:15 PM	42	167	0	0	37	3	31	1	3	200	22	0	12	0	10	0	528
04:30 PM	34	164	0	0	31	0	24	0	3	234	34	0	17	7	4	0	552
04:45 PM	50	159	3	0	23	0	35	0	2	230	35	0	13	5	5	0	560
Total	164	649	3	0	117	3	144	1	11	855	130	0	53	16	22	0	2168
05:00 PM	38	150	1	0	28	1	54	0	2	214	22	0	16	3	1	0	530
05:15 PM	60	180	2	0	32	1	46	0	4	239	27	0	8	2	6	0	607
05:30 PM	48	134	0	0	31	0	47	0	4	182	50	1	14	5	4	0	520
05:45 PM	45	142	0	0	35	1	42	0	7	229	32	0	14	2	2	0	551
Total	191	606	3	0	126	3	189	0	17	864	131	1	52	12	13	0	2208
Grand Total	509	2592	11	0	292	8	380	1	38	2442	337	3	165	33	53	0	6864
Apprch %	16.4	83.3	0.4	0	42.9	1.2	55.8	0.1	1.3	86.6	12	0.1	65.7	13.1	21.1	0	
Total %	7.4	37.8	0.2	0	4.3	0.1	5.5	0	0.6	35.6	4.9	0	2.4	0.5	0.8	0	

Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Barber
Site Code : 12345678
Start Date : 6/11/2008
Page No : 2

	Russ Avenue southbound					Barber Boulevard westbound					Russ Avenue northbound					CVS Parking eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	20	**247**	0	0	**267**	4	0	2	0	6	1	92	10	0	103	**13**	0	3	0	**16**	**392**
08:00 AM	14	211	**1**	0	226	6	0	8	0	14	1	99	**13**	0	113	8	1	2	0	11	364
08:15 AM	21	190	1	0	212	9	**2**	**9**	0	**20**	**3**	104	9	**2**	118	8	**2**	**4**	0	14	364
08:30 AM	**24**	177	0	0	201	**11**	0	6	0	17	2	**113**	9	0	**124**	9	1	4	0	14	356
Total Volume	79	825	2	0	906	30	2	25	0	57	7	408	41	2	458	38	4	13	0	55	1476
% App. Total	8.7	91.1	0.2	0		52.6	3.5	43.9	0		1.5	89.1	9	0.4		69.1	7.3	23.6	0		
PHF	.823	.835	.500	.000	.848	.682	.250	.694	.000	.713	.583	.903	.788	.250	.923	.731	.500	.813	.000	.859	.941

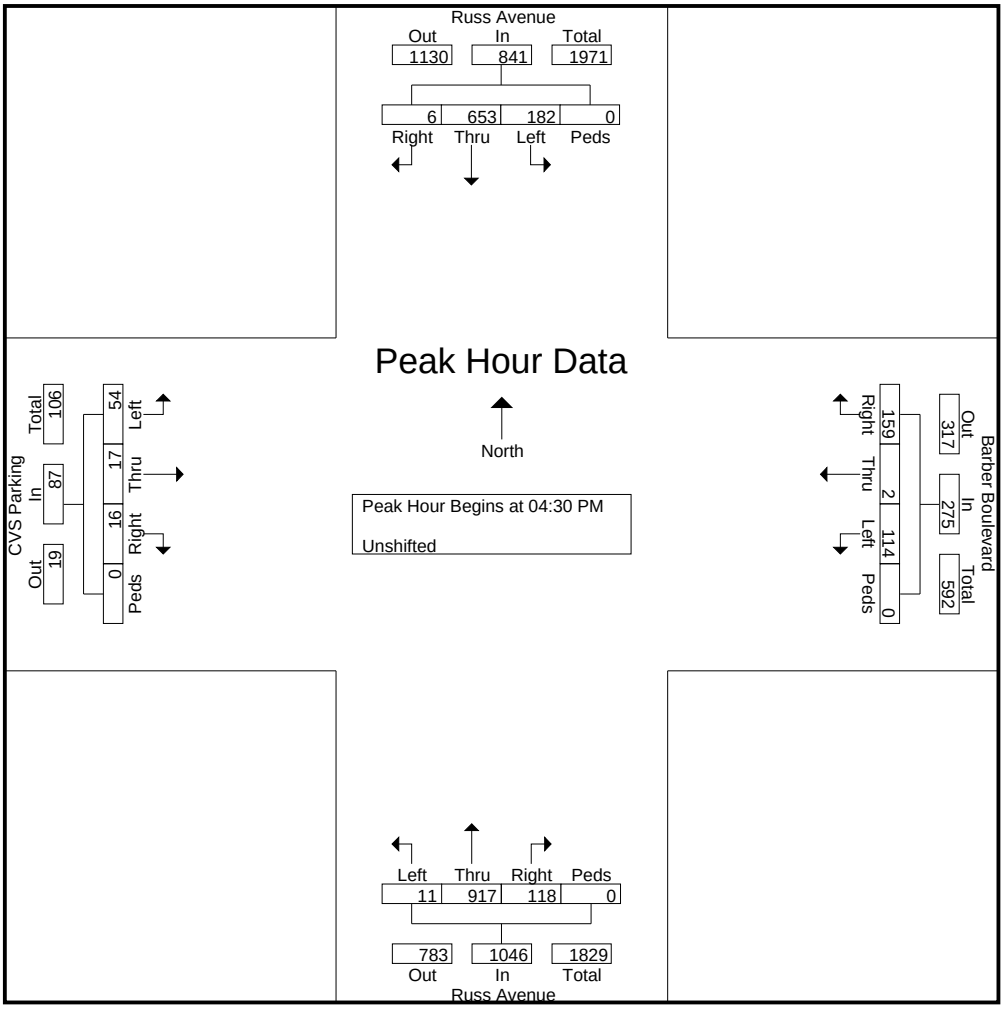


Wilbur Smith Associates

7015 - H Albert Pick Road
Greensboro, North Carolina 27409
Phone: (336) 668-4227

File Name : Barber
Site Code : 12345678
Start Date : 6/11/2008
Page No : 3

	Russ Avenue southbound					Barber Boulevard westbound					Russ Avenue northbound					CVS Parking eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	34	164	0	0	198	31	0	24	0	55	3	234	34	0	**271**	**17**	**7**	4	0	**28**	552
04:45 PM	50	159	**3**	0	212	23	0	35	0	58	2	230	**35**	0	267	13	5	5	0	23	560
05:00 PM	38	150	1	0	189	28	**1**	**54**	0	**83**	2	214	22	0	238	16	3	1	0	20	530
05:15 PM	**60**	**180**	2	0	**242**	**32**	1	46	0	79	**4**	**239**	27	0	270	8	2	**6**	0	16	**607**
Total Volume	182	653	6	0	841	114	2	159	0	275	11	917	118	0	1046	54	17	16	0	87	2249
% App. Total	21.6	77.6	0.7	0		41.5	0.7	57.8	0		1.1	87.7	11.3	0		62.1	19.5	18.4	0		
PHF	.758	.907	.500	.000	.869	.891	.500	.736	.000	.828	.688	.959	.843	.000	.965	.794	.607	.667	.000	.777	.926



Appendix B

Capacity Software Output

Appendix B

2008 Existing AM & PM Conditions

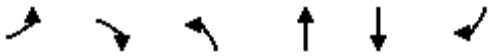
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	295	243	34	609	0	0	0	151	0	0	192
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	321	264	37	662	0	0	0	164	0	0	209
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					541							
pX, platoon unblocked	0.99						0.99	0.99	0.99	0.99	0.99	
vC, conflicting volume	662			321			896	1057	331	890	1057	160
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	638			321			874	1036	303	868	1036	160
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	76	100	100	76
cM capacity (veh/h)	932			1236			178	221	686	181	221	856

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	NE 1	SW 1
Volume Total	160	160	264	37	331	331	164	209
Volume Left	0	0	0	37	0	0	0	0
Volume Right	0	0	264	0	0	0	164	209
cSH	1700	1700	1700	1236	1700	1700	686	856
Volume to Capacity	0.09	0.09	0.16	0.03	0.19	0.19	0.24	0.24
Queue Length 95th (ft)	0	0	0	2	0	0	23	24
Control Delay (s)	0.0	0.0	0.0	8.0	0.0	0.0	11.9	10.6
Lane LOS				A			B	B
Approach Delay (s)	0.0			0.4			11.9	10.6
Approach LOS							B	B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	32.9%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	348	42	76	356	0	0	0	0	22	0	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5		5.0	5.5						5.8	5.0
Lane Util. Factor		0.95		1.00	0.95						1.00	1.00
Frt		0.98		1.00	1.00						1.00	0.85
Flt Protected		1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)		3482		1770	3539						1770	1583
Flt Permitted		1.00		0.46	1.00						1.00	1.00
Satd. Flow (perm)		3482		862	3539						1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	378	46	83	387	0	0	0	0	24	0	18
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	16
Lane Group Flow (vph)	0	418	0	83	387	0	0	0	0	0	24	2
Turn Type	Perm			pm+pt			Perm			Perm		pm+ov
Protected Phases		2		1	6			4			8	1
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)		55.2		65.3	65.3						3.4	8.5
Effective Green, g (s)		55.2		65.3	65.3						3.4	8.5
Actuated g/C Ratio		0.69		0.82	0.82						0.04	0.11
Clearance Time (s)		5.5		5.0	5.5						5.8	5.0
Vehicle Extension (s)		3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		2403		761	2889						79	168
v/s Ratio Prot		c0.12		0.01	c0.11							0.00
v/s Ratio Perm				0.08							c0.01	0.00
v/c Ratio		0.17		0.11	0.13						0.30	0.01
Uniform Delay, d1		4.4		1.6	1.5						37.2	32.0
Progression Factor		1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2		0.2		0.1	0.1						2.2	0.0
Delay (s)		4.5		1.7	1.6						39.3	32.0
Level of Service		A		A	A						D	C
Approach Delay (s)		4.5			1.6			0.0			36.2	
Approach LOS		A			A			A			D	

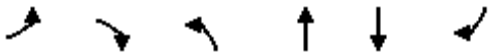
Intersection Summary			
HCM Average Control Delay	4.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.8
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	13	6	386	365	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	14	7	420	397	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				479	111	
pX, platoon unblocked	0.98	0.98	0.98			
vC, conflicting volume	627	205	411			
vC1, stage 1 conf vol	404					
vC2, stage 2 conf vol	223					
vCu, unblocked vol	585	156	365			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	99			
cM capacity (veh/h)	603	846	1169			

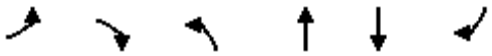
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	146	280	264	146
Volume Left	4	7	0	0	0
Volume Right	14	0	0	0	14
cSH	773	1169	1700	1700	1700
Volume to Capacity	0.02	0.01	0.16	0.16	0.09
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	9.8	0.4	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.8	0.1		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	13	229	76	411	414	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.41	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	760	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	249	83	447	450	204
RTOR Reduction (vph)	0	218	0	0	0	105
Lane Group Flow (vph)	14	31	83	447	450	99
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	7.5	7.5	40.5	40.5	29.1	29.1
Effective Green, g (s)	7.5	7.5	40.5	40.5	29.1	29.1
Actuated g/C Ratio	0.12	0.12	0.68	0.68	0.49	0.49
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	221	198	604	2389	1716	768
v/s Ratio Prot	0.01		0.01	c0.13	c0.13	
v/s Ratio Perm		c0.02	0.08			0.06
v/c Ratio	0.06	0.16	0.14	0.19	0.26	0.13
Uniform Delay, d1	23.2	23.4	3.7	3.6	9.1	8.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4	0.1	0.2	0.4	0.3
Delay (s)	23.3	23.8	3.8	3.8	9.5	8.8
Level of Service	C	C	A	A	A	A
Approach Delay (s)	23.8			3.8	9.3	
Approach LOS	C			A	A	

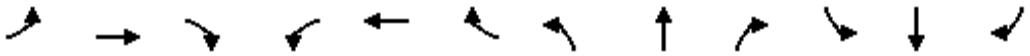
Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	10	12	529	757	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	11	13	575	823	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				573		
pX, platoon unblocked	0.93					
vC, conflicting volume	1138	413	826			
vC1, stage 1 conf vol	824					
vC2, stage 2 conf vol	314					
vCu, unblocked vol	1003	413	826			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	98	98			
cM capacity (veh/h)	372	588	800			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	21	13	288	288	549	278
Volume Left	10	13	0	0	0	0
Volume Right	11	0	0	0	0	3
cSH	461	800	1700	1700	1700	1700
Volume to Capacity	0.04	0.02	0.17	0.17	0.32	0.16
Queue Length 95th (ft)	4	1	0	0	0	0
Control Delay (s)	13.2	9.6	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	13.2	0.2			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	5	0	0	5	0	536	2	0	755	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	0	0	5	0	583	2	0	821	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								292				
pX, platoon unblocked	0.92	0.92		0.92	0.92	0.92				0.92		
vC, conflicting volume	1118	1412	417	993	1416	291	834			585		
vC1, stage 1 conf vol	827	827		583	583							
vC2, stage 2 conf vol	291	585		410	834							
vCu, unblocked vol	957	1275	417	820	1280	58	834			377		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	99	100			100		
cM capacity (veh/h)	319	337	585	454	335	916	795			1085		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	5	5	291	291	2	547	287
Volume Left	0	0	0	0	0	0	0
Volume Right	5	5	0	0	2	0	13
cSH	585	916	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.17	0.17	0.00	0.32	0.17
Queue Length 95th (ft)	1	0	0	0	0	0	0
Control Delay (s)	11.2	9.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	11.2	9.0	0.0			0.0	
Approach LOS	B	A					

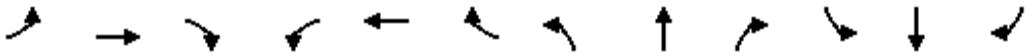
Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	31.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	151	37	24	11	27	21	40	430	252	18	351	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	0.97	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1717	1583		1836	1583	1770	3539	1583	1770	3508	
Flt Permitted	0.95	0.97	1.00		0.99	1.00	0.49	1.00	1.00	0.48	1.00	
Satd. Flow (perm)	1681	1717	1583		1836	1583	912	3539	1583	901	3508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	40	26	12	29	23	43	467	274	20	382	24
RTOR Reduction (vph)	0	0	23	0	0	22	0	0	30	0	3	0
Lane Group Flow (vph)	102	102	3	0	41	1	43	467	244	20	403	0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases			4			3	6		6	2		
Actuated Green, G (s)	12.6	12.6	12.6		7.0	7.0	78.0	72.2	72.2	72.0	69.2	
Effective Green, g (s)	12.6	12.6	12.6		7.0	7.0	78.0	72.2	72.2	72.0	69.2	
Actuated g/C Ratio	0.10	0.10	0.10		0.06	0.06	0.65	0.60	0.60	0.60	0.58	
Clearance Time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	177	180	166		107	92	634	2129	952	561	2023	
v/s Ratio Prot	c0.06	0.06			c0.02		c0.00	0.13		0.00	0.12	
v/s Ratio Perm			0.00			0.00	0.04		c0.15	0.02		
v/c Ratio	0.58	0.57	0.02		0.38	0.01	0.07	0.22	0.26	0.04	0.20	
Uniform Delay, d1	51.2	51.1	48.1		54.4	53.2	7.6	11.0	11.3	9.7	12.2	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.5	4.0	0.0		2.3	0.1	0.0	0.2	0.7	0.0	0.2	
Delay (s)	55.6	55.2	48.2		56.7	53.3	7.6	11.2	11.9	9.7	12.4	
Level of Service	E	E	D		E	D	A	B	B	A	B	
Approach Delay (s)		54.6			55.5			11.3			12.2	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.4
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	72	58	323	45	131	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	5.6	6.2			6.2
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1770	1583	3474			3473
Flt Permitted	0.95	1.00	1.00			0.67
Satd. Flow (perm)	1770	1583	3474			2374
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	63	351	49	142	229
RTOR Reduction (vph)	0	53	7	0	0	0
Lane Group Flow (vph)	78	10	393	0	0	371
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4			6	
Actuated Green, G (s)	8.0	13.6	53.5			64.7
Effective Green, g (s)	8.0	13.6	53.5			64.7
Actuated g/C Ratio	0.09	0.16	0.63			0.76
Clearance Time (s)	6.1	5.6	6.2			6.2
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	167	253	2187			1879
v/s Ratio Prot	c0.04	0.00	0.11			c0.01
v/s Ratio Perm		0.00				c0.14
v/c Ratio	0.47	0.04	0.18			0.20
Uniform Delay, d1	36.5	30.2	6.6			2.9
Progression Factor	1.00	1.00	1.00			0.79
Incremental Delay, d2	2.1	0.1	0.2			0.1
Delay (s)	38.5	30.2	6.8			2.3
Level of Service	D	C	A			A
Approach Delay (s)	34.8		6.8			2.3
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	12.3
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	4	13	30	2	25	7	475	41	79	679	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5			6.5	6.5	7.2	7.0		6.6	5.9	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1743			1779	1583	1770	3497		1770	3538	
Flt Permitted		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1743			1779	1583	1770	3497		1770	3538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	4	14	33	2	27	8	516	45	86	738	2
RTOR Reduction (vph)	0	11	0	0	0	21	0	4	0	0	0	0
Lane Group Flow (vph)	0	48	0	0	35	6	8	557	0	86	740	0
Turn Type	Split			Split		pt+ov	Prot			Prot		
Protected Phases	3	3		4	4	4 1	5	2		1	6	
Permitted Phases												
Actuated Green, G (s)		7.4			6.7	22.6	1.4	59.9		9.4	68.4	
Effective Green, g (s)		7.4			6.7	22.6	1.4	59.9		9.4	68.4	
Actuated g/C Ratio		0.07			0.06	0.21	0.01	0.54		0.09	0.62	
Clearance Time (s)		6.5			6.5		7.2	7.0		6.6	5.9	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		117			108	325	23	1904		151	2200	
v/s Ratio Prot		c0.03			c0.02	0.00	0.00	0.16		c0.05	c0.21	
v/s Ratio Perm												
v/c Ratio		0.41			0.32	0.02	0.35	0.29		0.57	0.34	
Uniform Delay, d1		49.2			49.5	34.8	53.8	13.6		48.4	9.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.3			1.7	0.0	8.9	0.4		4.9	0.4	
Delay (s)		51.5			51.2	34.9	62.8	14.0		53.2	10.4	
Level of Service		D			D	C	E	B		D	B	
Approach Delay (s)		51.5			44.1			14.6			14.8	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.6
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	2	367	12	24	335	19	6	1	1	6	0	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		1.00			0.99		1.00	0.92		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3522			3501		1770	1723		1770	1583	
Flt Permitted		0.95			0.92		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		3361			3217		1863	1723		1863	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	399	13	26	364	21	7	1	1	7	0	21
RTOR Reduction (vph)	0	1	0	0	2	0	0	1	0	0	20	0
Lane Group Flow (vph)	0	413	0	0	409	0	7	1	0	7	1	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		71.6			71.6		2.8	2.8		2.8	2.8	
Effective Green, g (s)		71.6			71.6		2.8	2.8		2.8	2.8	
Actuated g/C Ratio		0.84			0.84		0.03	0.03		0.03	0.03	
Clearance Time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2831			2710		61	57		61	52	
v/s Ratio Prot								0.00			0.00	
v/s Ratio Perm		0.12			c0.13		c0.00			0.00		
v/c Ratio		0.15			0.15		0.11	0.02		0.11	0.01	
Uniform Delay, d1		1.2			1.2		39.9	39.8		39.9	39.8	
Progression Factor		0.89			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.0		0.8	0.1		0.8	0.1	
Delay (s)		1.2			1.2		40.7	39.9		40.7	39.9	
Level of Service		A			A		D	D		D	D	
Approach Delay (s)		1.2			1.2			40.6			40.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	2.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	26	365	0	35	430
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	28	397	0	38	467
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)			172			586
pX, platoon unblocked	0.97	0.97			0.97	
vC, conflicting volume	707	198			397	
vC1, stage 1 conf vol	397					
vC2, stage 2 conf vol	310					
vCu, unblocked vol	497	107			312	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			97	
cM capacity (veh/h)	624	897			1206	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	30	264	132	38	234	234
Volume Left	2	0	0	38	0	0
Volume Right	28	0	0	0	0	0
cSH	870	1700	1700	1206	1700	1700
Volume to Capacity	0.03	0.16	0.08	0.03	0.14	0.14
Queue Length 95th (ft)	3	0	0	2	0	0
Control Delay (s)	9.3	0.0	0.0	8.1	0.0	0.0
Lane LOS	A			A		
Approach Delay (s)	9.3	0.0		0.6		
Approach LOS	A					

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

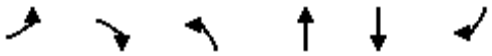
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	660	406	69	528	0	0	0	216	0	0	246
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	717	441	75	574	0	0	0	235	0	0	267
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					541							
pX, platoon unblocked	0.97						0.97	0.97	0.97	0.97	0.97	
vC, conflicting volume	574			717			1083	1441	287	1389	1441	359
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504			717			1028	1397	209	1343	1397	359
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	100	70	100	100	58
cM capacity (veh/h)	1027			879			99	124	775	70	124	638

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	NE 1	SW 1
Volume Total	359	359	441	75	287	287	235	267
Volume Left	0	0	0	75	0	0	0	0
Volume Right	0	0	441	0	0	0	235	267
cSH	1700	1700	1700	879	1700	1700	775	638
Volume to Capacity	0.21	0.21	0.26	0.09	0.17	0.17	0.30	0.42
Queue Length 95th (ft)	0	0	0	7	0	0	32	52
Control Delay (s)	0.0	0.0	0.0	9.5	0.0	0.0	11.7	14.7
Lane LOS				A			B	B
Approach Delay (s)	0.0			1.1			11.7	14.7
Approach LOS							B	B

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	40.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	520	53	81	272	0	1	1	0	64	2	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	4.0
Lane Util. Factor		0.95		1.00	0.95			1.00			1.00	1.00
Frt		0.99		1.00	1.00			1.00			1.00	0.85
Flt Protected		1.00		0.95	1.00			0.98			0.95	1.00
Satd. Flow (prot)		3490		1770	3539			1817			1776	1583
Flt Permitted		1.00		0.37	1.00			0.89			0.73	1.00
Satd. Flow (perm)		3490		698	3539			1660			1362	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	565	58	88	296	0	1	1	0	70	2	61
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	0	0	0	55
Lane Group Flow (vph)	0	617	0	88	296	0	0	2	0	0	72	6
Turn Type	Perm			pm+pt			Perm			Perm		Perm
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)		54.3		63.7	63.7			8.3			8.3	8.3
Effective Green, g (s)		54.3		63.7	63.7			8.3			8.3	8.3
Actuated g/C Ratio		0.68		0.80	0.80			0.10			0.10	0.10
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		2369		628	2818			172			141	164
v/s Ratio Prot		c0.18		c0.01	0.08							
v/s Ratio Perm				0.10				0.00			c0.05	0.00
v/c Ratio		0.26		0.14	0.11			0.01			0.51	0.04
Uniform Delay, d1		5.0		2.0	1.8			32.2			33.9	32.3
Progression Factor		1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2		0.3		0.1	0.1			0.0			3.1	0.1
Delay (s)		5.3		2.1	1.9			32.2			37.0	32.4
Level of Service		A		A	A			C			D	C
Approach Delay (s)		5.3			1.9			32.2			34.9	
Approach LOS		A			A			C			C	

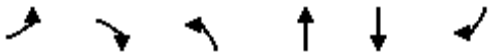
Intersection Summary			
HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	28	19	567	327	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	30	21	616	355	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				479	111	
pX, platoon unblocked	0.99	0.99	0.99			
vC, conflicting volume	710	183	365			
vC1, stage 1 conf vol	360					
vC2, stage 2 conf vol	349					
vCu, unblocked vol	670	149	334			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	96	98			
cM capacity (veh/h)	570	860	1208			

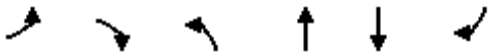
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	37	226	411	237	128
Volume Left	7	21	0	0	0
Volume Right	30	0	0	0	10
cSH	789	1208	1700	1700	1700
Volume to Capacity	0.05	0.02	0.24	0.14	0.08
Queue Length 95th (ft)	4	1	0	0	0
Control Delay (s)	9.8	0.9	0.0	0.0	0.0
Lane LOS	A	A			
Approach Delay (s)	9.8	0.3		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	55	106	165	741	491	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.37	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	695	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	115	179	805	534	182
RTOR Reduction (vph)	0	103	0	0	0	97
Lane Group Flow (vph)	60	12	179	805	534	85
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	6.4	6.4	41.6	41.6	27.9	27.9
Effective Green, g (s)	6.4	6.4	41.6	41.6	27.9	27.9
Actuated g/C Ratio	0.11	0.11	0.69	0.69	0.46	0.46
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	189	169	620	2454	1646	736
v/s Ratio Prot	c0.03		0.04	c0.23	0.15	
v/s Ratio Perm		0.01	0.16			0.05
v/c Ratio	0.32	0.07	0.29	0.33	0.32	0.11
Uniform Delay, d1	24.8	24.1	3.5	3.7	10.1	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.2	0.3	0.4	0.5	0.3
Delay (s)	25.8	24.3	3.8	4.0	10.6	9.4
Level of Service	C	C	A	A	B	A
Approach Delay (s)	24.8			4.0	10.3	
Approach LOS	C			A	B	

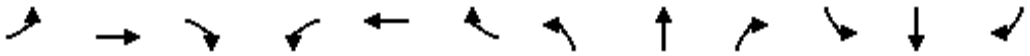
Intersection Summary			
HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	24	20	22	1042	734	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	22	24	1133	798	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				573		
pX, platoon unblocked	0.74					
vC, conflicting volume	1417	404	809			
vC1, stage 1 conf vol	803					
vC2, stage 2 conf vol	614					
vCu, unblocked vol	861	404	809			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	97			
cM capacity (veh/h)	375	596	813			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	48	24	566	566	532	277
Volume Left	26	24	0	0	0	0
Volume Right	22	0	0	0	0	11
cSH	451	813	1700	1700	1700	1700
Volume to Capacity	0.11	0.03	0.33	0.33	0.31	0.16
Queue Length 95th (ft)	9	2	0	0	0	0
Control Delay (s)	13.9	9.6	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	13.9	0.2			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		



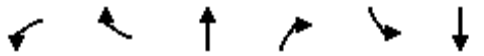
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	2	0	0	16	0	1048	1	0	728	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	2	0	0	17	0	1139	1	0	791	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								292				
pX, platoon unblocked	0.73	0.73		0.73	0.73	0.73				0.73		
vC, conflicting volume	1375	1946	410	1535	1959	570	820			1140		
vC1, stage 1 conf vol	805	805		1139	1139							
vC2, stage 2 conf vol	570	1140		396	820							
vCu, unblocked vol	776	1557	410	995	1575	0	820			455		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	98	100			100		
cM capacity (veh/h)	327	289	591	352	286	792	805			805		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	2	17	570	570	1	528	292
Volume Left	0	0	0	0	0	0	0
Volume Right	2	17	0	0	1	0	28
cSH	591	792	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.02	0.34	0.34	0.00	0.31	0.17
Queue Length 95th (ft)	0	2	0	0	0	0	0
Control Delay (s)	11.1	9.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	11.1	9.6	0.0			0.0	
Approach LOS	B	A					

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	39.0%	ICU Level of Service	A	
Analysis Period (min)	15			

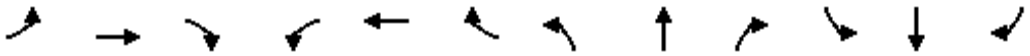
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	299	69	31	34	47	57	83	324	265	23	609	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	6.5	4.0	
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	0.97	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1716	1583		1824	1583	1770	3539	1583	1770	3492	
Flt Permitted	0.95	0.97	1.00		0.98	1.00	0.28	1.00	1.00	0.54	1.00	
Satd. Flow (perm)	1681	1716	1583		1824	1583	514	3539	1583	1008	3492	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	325	75	34	37	51	62	90	352	288	25	662	64
RTOR Reduction (vph)	0	0	28	0	0	56	0	0	51	0	5	0
Lane Group Flow (vph)	198	202	6	0	88	6	90	352	237	25	721	0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases			4			3	6		6	2		
Actuated Green, G (s)	19.5	19.5	19.5		11.1	11.1	66.8	58.4	58.4	62.2	58.1	
Effective Green, g (s)	19.5	19.5	19.5		11.1	11.1	66.8	58.4	58.4	62.2	58.1	
Actuated g/C Ratio	0.16	0.16	0.16		0.09	0.09	0.56	0.49	0.49	0.52	0.48	
Clearance Time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	6.5	4.0	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	273	279	257		169	146	374	1722	770	549	1691	
v/s Ratio Prot	c0.12	0.12			c0.05		c0.02	0.10		0.00	c0.21	
v/s Ratio Perm			0.00			0.00	0.12		0.15	0.02		
v/c Ratio	0.73	0.72	0.02		0.52	0.04	0.24	0.20	0.31	0.05	0.43	
Uniform Delay, d1	47.7	47.7	42.3		51.9	49.6	13.6	17.6	18.6	14.1	20.1	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.2	9.0	0.0		2.9	0.1	0.3	0.3	1.0	0.0	0.8	
Delay (s)	56.9	56.7	42.3		54.8	49.7	13.9	17.8	19.6	14.2	20.9	
Level of Service	E	E	D		D	D	B	B	B	B	C	
Approach Delay (s)		55.6			52.7			18.1			20.7	
Approach LOS		E			D			B			C	

Intersection Summary			
HCM Average Control Delay	29.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	117	185	350	121	146	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	5.6	6.2			6.2
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.96			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1770	1583	3402			3457
Flt Permitted	0.95	1.00	1.00			0.60
Satd. Flow (perm)	1770	1583	3402			2119
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	201	380	132	159	174
RTOR Reduction (vph)	0	157	27	0	0	0
Lane Group Flow (vph)	127	44	485	0	0	333
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4			6	
Actuated Green, G (s)	11.4	18.4	48.7			61.3
Effective Green, g (s)	11.4	18.4	48.7			61.3
Actuated g/C Ratio	0.13	0.22	0.57			0.72
Clearance Time (s)	6.1	5.6	6.2			6.2
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	237	343	1949			1638
v/s Ratio Prot	c0.07	0.01	c0.14			c0.02
v/s Ratio Perm		0.02				0.13
v/c Ratio	0.54	0.13	0.25			0.20
Uniform Delay, d1	34.3	26.8	9.0			3.9
Progression Factor	1.00	1.00	1.00			0.79
Incremental Delay, d2	2.3	0.2	0.3			0.1
Delay (s)	36.7	27.0	9.3			3.1
Level of Service	D	C	A			A
Approach Delay (s)	30.7		9.3			3.1
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	17	16	114	2	159	11	836	118	182	542	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5			6.5	6.6	7.2	7.0		6.6	5.9	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.98			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1762			1775	1583	1770	3474		1770	3533	
Flt Permitted		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1762			1775	1583	1770	3474		1770	3533	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	18	17	124	2	173	12	909	128	198	589	7
RTOR Reduction (vph)	0	9	0	0	0	117	0	9	0	0	0	0
Lane Group Flow (vph)	0	85	0	0	126	56	12	1028	0	198	596	0
Turn Type	Split			Split		pm+ov	Prot			Prot		
Protected Phases	3	3		4	4	1	5	2		1	6	
Permitted Phases						4						
Actuated Green, G (s)		9.4			13.1	35.6	1.5	38.4		22.5	59.9	
Effective Green, g (s)		9.4			13.1	35.6	1.5	38.4		22.5	59.9	
Actuated g/C Ratio		0.09			0.12	0.32	0.01	0.35		0.20	0.54	
Clearance Time (s)		6.5			6.5	6.6	7.2	7.0		6.6	5.9	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		151			211	512	24	1213		362	1924	
v/s Ratio Prot		c0.05			c0.07	0.02	0.01	c0.30		c0.11	0.17	
v/s Ratio Perm						0.01						
v/c Ratio		0.56			0.60	0.11	0.50	0.85		0.55	0.31	
Uniform Delay, d1		48.3			45.9	26.1	53.9	33.1		39.2	13.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.7			4.5	0.1	15.4	7.4		1.7	0.4	
Delay (s)		53.0			50.4	26.2	69.3	40.5		40.9	14.1	
Level of Service		D			D	C	E	D		D	B	
Approach Delay (s)		53.0			36.4			40.9			20.8	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	33.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	1	484	50	66	268	21	26	5	2	36	3	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.96		1.00	0.86	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3490			3475		1770	1783		1770	1593	
Flt Permitted		0.95			0.77		0.70	1.00		0.75	1.00	
Satd. Flow (perm)		3332			2717		1306	1783		1403	1593	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	526	54	72	291	23	28	5	2	39	3	83
RTOR Reduction (vph)	0	4	0	0	3	0	0	2	0	0	76	0
Lane Group Flow (vph)	0	577	0	0	383	0	28	5	0	39	10	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		67.5			67.5		6.9	6.9		6.9	6.9	
Effective Green, g (s)		67.5			67.5		6.9	6.9		6.9	6.9	
Actuated g/C Ratio		0.79			0.79		0.08	0.08		0.08	0.08	
Clearance Time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2646			2158		106	145		114	129	
v/s Ratio Prot								0.00			0.01	
v/s Ratio Perm		c0.17			0.14		0.02			c0.03		
v/c Ratio		0.22			0.18		0.26	0.04		0.34	0.08	
Uniform Delay, d1		2.2			2.1		36.7	36.0		36.9	36.1	
Progression Factor		0.86			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.0		1.3	0.1		1.8	0.3	
Delay (s)		2.1			2.1		38.0	36.1		38.7	36.4	
Level of Service		A			A		D	D		D	D	
Approach Delay (s)		2.1			2.1			37.6			37.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	117	574	3	37	352
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	127	624	3	40	383
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)			172			586
pX, platoon unblocked	0.96	0.94			0.94	
vC, conflicting volume	897	314			627	
vC1, stage 1 conf vol	626					
vC2, stage 2 conf vol	272					
vCu, unblocked vol	634	136			470	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	85			96	
cM capacity (veh/h)	524	833			1020	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	128	416	211	40	191	191
Volume Left	1	0	0	40	0	0
Volume Right	127	0	3	0	0	0
cSH	828	1700	1700	1020	1700	1700
Volume to Capacity	0.15	0.24	0.12	0.04	0.11	0.11
Queue Length 95th (ft)	14	0	0	3	0	0
Control Delay (s)	10.1	0.0	0.0	8.7	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	10.1	0.0		0.8		
Approach LOS	B					

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix B

2030 No-Build Conditions

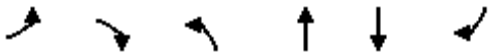
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	456	376	53	942	0	0	0	233	0	0	297
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	496	409	58	1024	0	0	0	253	0	0	323
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					541							
pX, platoon unblocked	0.89						0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	1024			496			1387	1635	512	1376	1635	248
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	788			496			1194	1472	215	1182	1472	248
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	64	100	100	57
cM capacity (veh/h)	739			1064			69	106	706	80	106	752

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	NE 1	SW 1
Volume Total	248	248	409	58	512	512	253	323
Volume Left	0	0	0	58	0	0	0	0
Volume Right	0	0	409	0	0	0	253	323
cSH	1700	1700	1700	1064	1700	1700	706	752
Volume to Capacity	0.15	0.15	0.24	0.05	0.30	0.30	0.36	0.43
Queue Length 95th (ft)	0	0	0	4	0	0	41	54
Control Delay (s)	0.0	0.0	0.0	8.6	0.0	0.0	12.9	13.3
Lane LOS				A			B	B
Approach Delay (s)	0.0			0.5			12.9	13.3
Approach LOS							B	B

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	47.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	538	65	118	550	0	0	0	0	34	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5		5.0	5.8						5.8	5.0
Lane Util. Factor		0.95		1.00	0.95						1.00	1.00
Frt		0.98		1.00	1.00						1.00	0.85
Flt Protected		1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)		3482		1770	3539						1770	1583
Flt Permitted		1.00		0.36	1.00						0.76	1.00
Satd. Flow (perm)		3482		672	3539						1410	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	585	71	128	598	0	0	0	0	37	0	28
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	0	0	0	24
Lane Group Flow (vph)	0	649	0	128	598	0	0	0	0	0	37	4
Turn Type	Perm			pm+pt			Perm			Perm		pm+ov
Protected Phases		2		1	6			4			8	1
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)		52.7		63.1	63.1						5.3	11.0
Effective Green, g (s)		52.7		63.1	63.1						5.3	11.0
Actuated g/C Ratio		0.66		0.79	0.79						0.07	0.14
Clearance Time (s)		5.5		5.0	5.8						5.8	5.0
Vehicle Extension (s)		3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)		2294		608	2791						93	218
v/s Ratio Prot		c0.19		0.01	c0.17							0.00
v/s Ratio Perm				0.15							c0.03	0.00
v/c Ratio		0.28		0.21	0.21						0.40	0.02
Uniform Delay, d1		5.7		2.2	2.1						35.8	29.8
Progression Factor		1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2		0.3		0.2	0.2						2.8	0.0
Delay (s)		6.0		2.4	2.3						38.6	29.9
Level of Service		A		A	A						D	C
Approach Delay (s)		6.0			2.3			0.0			34.8	
Approach LOS		A			A			A			C	

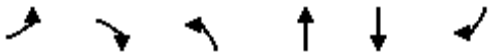
Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.1
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	20	9	597	564	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	22	10	649	613	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				479	111	
pX, platoon unblocked	0.96	0.96	0.96			
vC, conflicting volume	968	317	635			
vC1, stage 1 conf vol	624					
vC2, stage 2 conf vol	344					
vCu, unblocked vol	852	203	534			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	97	99			
cM capacity (veh/h)	477	771	988			

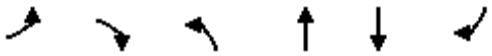
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	28	226	433	409	226
Volume Left	7	10	0	0	0
Volume Right	22	0	0	0	22
cSH	675	988	1700	1700	1700
Volume to Capacity	0.04	0.01	0.25	0.24	0.13
Queue Length 95th (ft)	3	1	0	0	0
Control Delay (s)	10.6	0.5	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.6	0.2		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	355	118	635	640	291
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.28	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	522	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	386	128	690	696	316
RTOR Reduction (vph)	0	193	0	0	0	181
Lane Group Flow (vph)	22	193	128	690	696	135
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	11.6	11.6	36.4	36.4	25.7	25.7
Effective Green, g (s)	11.6	11.6	36.4	36.4	25.7	25.7
Actuated g/C Ratio	0.19	0.19	0.61	0.61	0.43	0.43
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	306	414	2147	1516	678
v/s Ratio Prot	0.01		0.02	c0.19	c0.20	
v/s Ratio Perm		c0.12	0.16			0.09
v/c Ratio	0.06	0.63	0.31	0.32	0.46	0.20
Uniform Delay, d1	19.8	22.2	5.8	5.8	12.2	10.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	4.2	0.4	0.4	1.0	0.7
Delay (s)	19.8	26.4	6.2	6.2	13.2	11.4
Level of Service	B	C	A	A	B	B
Approach Delay (s)	26.1			6.2	12.6	
Approach LOS	C			A	B	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	14	16	19	818	1170	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	17	21	889	1272	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				573		
pX, platoon unblocked	0.84					
vC, conflicting volume	1760	639	1277			
vC1, stage 1 conf vol	1274					
vC2, stage 2 conf vol	486					
vCu, unblocked vol	1522	639	1277			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	96	96			
cM capacity (veh/h)	217	419	539			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	33	21	445	445	848	429
Volume Left	15	21	0	0	0	0
Volume Right	17	0	0	0	0	5
cSH	292	539	1700	1700	1700	1700
Volume to Capacity	0.11	0.04	0.26	0.26	0.50	0.25
Queue Length 95th (ft)	9	3	0	0	0	0
Control Delay (s)	18.9	11.9	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	18.9	0.3			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	8	0	0	8	0	829	3	0	1167	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	9	0	0	9	0	901	3	0	1268	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								292				
pX, platoon unblocked	0.83	0.83		0.83	0.83	0.83				0.83		
vC, conflicting volume	1729	2183	645	1535	2190	451	1289			904		
vC1, stage 1 conf vol	1279	1279		901	901							
vC2, stage 2 conf vol	451	904		634	1289							
vCu, unblocked vol	1472	2018	645	1239	2026	0	1289			480		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	98	100	100	99	100			100		
cM capacity (veh/h)	170	207	415	318	205	902	534			897		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	9	9	451	451	3	846	443
Volume Left	0	0	0	0	0	0	0
Volume Right	9	9	0	0	3	0	21
cSH	415	902	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.01	0.27	0.27	0.00	0.50	0.26
Queue Length 95th (ft)	2	1	0	0	0	0	0
Control Delay (s)	13.9	9.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	13.9	9.0	0.0			0.0	
Approach LOS	B	A					

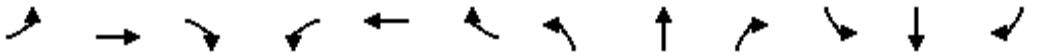
Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	42.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	233	57	37	17	42	32	62	665	390	28	543	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	0.97	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1717	1583		1837	1583	1770	3539	1583	1770	3508	
Flt Permitted	0.95	0.97	1.00		0.99	1.00	0.36	1.00	1.00	0.34	1.00	
Satd. Flow (perm)	1681	1717	1583		1837	1583	676	3539	1583	636	3508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	253	62	40	18	46	35	67	723	424	30	590	37
RTOR Reduction (vph)	0	0	35	0	0	33	0	0	37	0	3	0
Lane Group Flow (vph)	157	158	5	0	64	2	67	723	387	30	624	0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases			4			3	6		6	2		
Actuated Green, G (s)	16.4	16.4	16.4		8.3	8.3	71.9	65.8	65.8	67.9	63.8	
Effective Green, g (s)	16.4	16.4	16.4		8.3	8.3	71.9	65.8	65.8	67.9	63.8	
Actuated g/C Ratio	0.14	0.14	0.14		0.07	0.07	0.60	0.55	0.55	0.57	0.53	
Clearance Time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	230	235	216		127	109	461	1941	868	399	1865	
v/s Ratio Prot	c0.09	0.09			c0.03		c0.01	0.20		0.00	0.18	
v/s Ratio Perm			0.00			0.00	0.08		c0.24	0.04		
v/c Ratio	0.68	0.67	0.03		0.50	0.02	0.15	0.37	0.45	0.08	0.33	
Uniform Delay, d1	49.3	49.2	44.9		53.9	52.1	10.3	15.4	16.2	11.7	16.0	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.1	7.4	0.0		3.1	0.1	0.1	0.5	1.7	0.1	0.5	
Delay (s)	57.4	56.6	44.9		57.0	52.1	10.5	15.9	17.9	11.7	16.5	
Level of Service	E	E	D		E	D	B	B	B	B	B	
Approach Delay (s)		55.6			55.3			16.3			16.3	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	111	90	499	70	203	326
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	5.6	6.2			6.2
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1770	1583	3474			3472
Flt Permitted	0.95	1.00	1.00			0.59
Satd. Flow (perm)	1770	1583	3474			2095
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	121	98	542	76	221	354
RTOR Reduction (vph)	0	80	9	0	0	0
Lane Group Flow (vph)	121	18	609	0	0	575
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4			6	
Actuated Green, G (s)	9.8	15.4	51.7			62.9
Effective Green, g (s)	9.8	15.4	51.7			62.9
Actuated g/C Ratio	0.12	0.18	0.61			0.74
Clearance Time (s)	6.1	5.6	6.2			6.2
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	204	287	2113			1641
v/s Ratio Prot	c0.07	0.00	0.18			c0.02
v/s Ratio Perm		0.01				c0.24
v/c Ratio	0.59	0.06	0.29			0.35
Uniform Delay, d1	35.7	28.8	7.9			3.9
Progression Factor	1.00	1.00	1.00			0.65
Incremental Delay, d2	4.6	0.1	0.3			0.1
Delay (s)	40.3	28.9	8.3			2.7
Level of Service	D	C	A			A
Approach Delay (s)	35.2		8.3			2.7
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	12.3
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	6	20	47	3	39	11	734	63	122	1050	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5			6.5	6.6	7.2	7.0		6.6	5.9	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1743			1779	1583	1770	3498		1770	3538	
Flt Permitted		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1743			1779	1583	1770	3498		1770	3538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	64	7	22	51	3	42	12	798	68	133	1141	3
RTOR Reduction (vph)	0	13	0	0	0	33	0	4	0	0	0	0
Lane Group Flow (vph)	0	80	0	0	54	9	12	862	0	133	1144	0
Turn Type	Split			Split		pm+ov	Prot			Prot		
Protected Phases	3	3		4	4	1	5	2		1	6	
Permitted Phases						4						
Actuated Green, G (s)		9.2			7.6	22.3	1.5	51.9		14.7	65.6	
Effective Green, g (s)		9.2			7.6	22.3	1.5	51.9		14.7	65.6	
Actuated g/C Ratio		0.08			0.07	0.20	0.01	0.47		0.13	0.60	
Clearance Time (s)		6.5			6.5	6.6	7.2	7.0		6.6	5.9	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		146			123	321	24	1650		237	2110	
v/s Ratio Prot		c0.05			c0.03	0.00	0.01	0.25		c0.08	c0.32	
v/s Ratio Perm						0.00						
v/c Ratio		0.55			0.44	0.03	0.50	0.52		0.56	0.54	
Uniform Delay, d1		48.4			49.2	35.1	53.9	20.4		44.6	13.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.2			2.5	0.0	15.4	1.2		3.0	1.0	
Delay (s)		52.6			51.6	35.2	69.3	21.5		47.7	14.2	
Level of Service		D			D	D	E	C		D	B	
Approach Delay (s)		52.6			44.4			22.2			17.7	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	25.5
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	3	567	19	37	518	29	9	2	2	9	0	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7			4.9	4.9	4.9	4.9	
Lane Util. Factor		0.95			0.95			1.00	1.00	1.00	1.00	
Frt		1.00			0.99			1.00	0.85	1.00	0.85	
Flt Protected		1.00			1.00			0.96	1.00	0.95	1.00	
Satd. Flow (prot)		3521			3501			1788	1583	1770	1583	
Flt Permitted		0.95			0.88			0.85	1.00	0.93	1.00	
Satd. Flow (perm)		3357			3106			1588	1583	1733	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	616	21	40	563	32	10	2	2	10	0	33
RTOR Reduction (vph)	0	1	0	0	2	0	0	0	2	0	31	0
Lane Group Flow (vph)	0	639	0	0	633	0	0	12	0	10	2	0
Turn Type	Perm			pm+pt			Perm		Perm	Perm		
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		70.1			70.1			4.3	4.3	4.3	4.3	
Effective Green, g (s)		70.1			70.1			4.3	4.3	4.3	4.3	
Actuated g/C Ratio		0.82			0.82			0.05	0.05	0.05	0.05	
Clearance Time (s)		5.7			5.7			4.9	4.9	4.9	4.9	
Vehicle Extension (s)		3.0			3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		2769			2562			80	80	88	80	
v/s Ratio Prot											0.00	
v/s Ratio Perm		0.19			c0.20			c0.01	0.00	0.01		
v/c Ratio		0.23			0.25			0.15	0.00	0.11	0.02	
Uniform Delay, d1		1.6			1.6			38.6	38.3	38.5	38.3	
Progression Factor		0.94			1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.2			0.1			0.9	0.0	0.6	0.1	
Delay (s)		1.7			1.7			39.5	38.3	39.1	38.5	
Level of Service		A			A			D	D	D	D	
Approach Delay (s)		1.7			1.7			39.3			38.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	41	564	0	54	665
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	45	613	0	59	723
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)			172			586
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1092	307			613	
vC1, stage 1 conf vol	613					
vC2, stage 2 conf vol	479					
vCu, unblocked vol	605	102			432	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	95			94	
cM capacity (veh/h)	527	868			1045	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	48	409	204	59	361	361
Volume Left	3	0	0	59	0	0
Volume Right	45	0	0	0	0	0
cSH	831	1700	1700	1045	1700	1700
Volume to Capacity	0.06	0.24	0.12	0.06	0.21	0.21
Queue Length 95th (ft)	5	0	0	4	0	0
Control Delay (s)	9.6	0.0	0.0	8.7	0.0	0.0
Lane LOS	A			A		
Approach Delay (s)	9.6	0.0		0.6		
Approach LOS	A					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

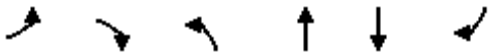
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	1020	628	107	816	0	0	0	334	0	0	381
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1109	683	116	887	0	0	0	363	0	0	414
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					541							
pX, platoon unblocked	0.84						0.84	0.84	0.84	0.84	0.84	
vC, conflicting volume	887			1109			1674	2228	443	2148	2228	554
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	493			1109			1427	2084	0	1989	2084	554
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			81			100	100	60	100	100	13
cM capacity (veh/h)	899			626			9	36	914	16	36	476

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	NE 1	SW 1
Volume Total	554	554	683	116	443	443	363	414
Volume Left	0	0	0	116	0	0	0	0
Volume Right	0	0	683	0	0	0	363	414
cSH	1700	1700	1700	626	1700	1700	914	476
Volume to Capacity	0.33	0.33	0.40	0.19	0.26	0.26	0.40	0.87
Queue Length 95th (ft)	0	0	0	17	0	0	48	230
Control Delay (s)	0.0	0.0	0.0	12.1	0.0	0.0	11.5	45.2
Lane LOS				B			B	E
Approach Delay (s)	0.0			1.4			11.5	45.2
Approach LOS							B	E

Intersection Summary				
Average Delay	6.8			
Intersection Capacity Utilization	58.5%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	804	82	125	421	0	2	2	0	99	3	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5		5.0	5.5			5.5			5.8	5.0
Lane Util. Factor		0.95		1.00	0.95			1.00			1.00	1.00
Frt		0.99		1.00	1.00			1.00			1.00	0.85
Flt Protected		1.00		0.95	1.00			0.98			0.95	1.00
Satd. Flow (prot)		3490		1770	3539			1817			1776	1583
Flt Permitted		1.00		0.22	1.00			0.86			0.73	1.00
Satd. Flow (perm)		3490		414	3539			1609			1359	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	874	89	136	458	0	2	2	0	108	3	95
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	0	72
Lane Group Flow (vph)	0	955	0	136	458	0	0	4	0	0	111	23
Turn Type	Perm			pm+pt			Perm			Perm		pm+ov
Protected Phases		2		1	6			4			8	1
Permitted Phases	2			6			4			8		8
Actuated Green, G (s)		45.9		58.4	58.4			10.6			10.3	17.8
Effective Green, g (s)		45.9		58.4	58.4			10.6			10.3	17.8
Actuated g/C Ratio		0.57		0.73	0.73			0.13			0.13	0.22
Clearance Time (s)		5.5		5.0	5.5			5.5			5.8	5.0
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		2002		429	2583			213			175	352
v/s Ratio Prot		c0.27		c0.03	0.13							0.01
v/s Ratio Perm				0.20				0.00			c0.08	0.01
v/c Ratio		0.48		0.32	0.18			0.02			0.63	0.07
Uniform Delay, d1		10.0		4.5	3.3			30.2			33.1	24.5
Progression Factor		1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2		0.8		0.4	0.2			0.0			7.3	0.1
Delay (s)		10.8		5.0	3.5			30.2			40.4	24.6
Level of Service		B		A	A			C			D	C
Approach Delay (s)		10.8			3.8			30.2			33.1	
Approach LOS		B			A			C			C	

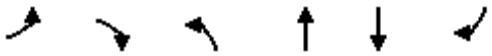
Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	16.3
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	9	43	29	877	506	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	47	32	953	550	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				479	111	
pX, platoon unblocked	0.96	0.96	0.96			
vC, conflicting volume	1097	283	565			
vC1, stage 1 conf vol	558					
vC2, stage 2 conf vol	540					
vCu, unblocked vol	835	177	471			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	94	97			
cM capacity (veh/h)	476	804	1047			

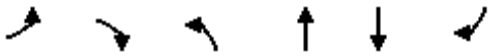
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	57	349	636	367	199
Volume Left	10	32	0	0	0
Volume Right	47	0	0	0	15
cSH	719	1047	1700	1700	1700
Volume to Capacity	0.08	0.03	0.37	0.22	0.12
Queue Length 95th (ft)	6	2	0	0	0
Control Delay (s)	10.4	1.1	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	10.4	0.4		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	85	164	255	1146	759	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	354	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	178	277	1246	825	280
RTOR Reduction (vph)	0	153	0	0	0	179
Lane Group Flow (vph)	92	25	277	1246	825	101
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.5	8.5	39.5	39.5	21.6	21.6
Effective Green, g (s)	8.5	8.5	39.5	39.5	21.6	21.6
Actuated g/C Ratio	0.14	0.14	0.66	0.66	0.36	0.36
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	251	224	514	2330	1274	570
v/s Ratio Prot	c0.05		0.11	c0.35	c0.23	
v/s Ratio Perm		0.02	0.25			0.06
v/c Ratio	0.37	0.11	0.54	0.53	0.65	0.18
Uniform Delay, d1	23.3	22.5	6.4	5.4	16.0	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.2	1.1	0.9	2.6	0.7
Delay (s)	24.2	22.7	7.4	6.3	18.6	13.8
Level of Service	C	C	A	A	B	B
Approach Delay (s)	23.2			6.5	17.4	
Approach LOS	C			A	B	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	31	34	1611	1135	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	34	37	1751	1234	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (ft)				573		
pX, platoon unblocked	0.76					
vC, conflicting volume	2191	625	1250			
vC1, stage 1 conf vol	1242					
vC2, stage 2 conf vol	949					
vCu, unblocked vol	1936	625	1250			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	92	93			
cM capacity (veh/h)	210	428	553			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	74	37	876	876	822	428
Volume Left	40	37	0	0	0	0
Volume Right	34	0	0	0	0	16
cSH	273	553	1700	1700	1700	1700
Volume to Capacity	0.27	0.07	0.52	0.52	0.48	0.25
Queue Length 95th (ft)	27	5	0	0	0	0
Control Delay (s)	23.0	12.0	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	23.0	0.2			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	3	0	0	25	0	1620	2	0	1125	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	3	0	0	27	0	1761	2	0	1223	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								292				
pX, platoon unblocked	0.76	0.76		0.76	0.76	0.76				0.76		
vC, conflicting volume	2126	3008	634	2372	3028	880	1267			1763		
vC1, stage 1 conf vol	1245	1245		1761	1761							
vC2, stage 2 conf vol	880	1763		611	1267							
vCu, unblocked vol	1842	3011	634	2169	3037	193	1267			1362		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	96	100			100		
cM capacity (veh/h)	171	128	422	111	127	616	544			378		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	3	27	880	880	2	815	452
Volume Left	0	0	0	0	0	0	0
Volume Right	3	27	0	0	2	0	45
cSH	422	616	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.04	0.52	0.52	0.00	0.48	0.27
Queue Length 95th (ft)	1	3	0	0	0	0	0
Control Delay (s)	13.6	11.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	13.6	11.1	0.0			0.0	
Approach LOS	B	B					

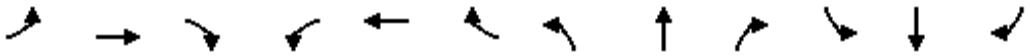
Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	54.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	462	107	48	53	73	88	128	501	410	36	942	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	5.5	
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	0.97	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1716	1583		1824	1583	1770	3539	1583	1770	3492	
Flt Permitted	0.95	0.97	1.00		0.98	1.00	0.08	1.00	1.00	0.45	1.00	
Satd. Flow (perm)	1681	1716	1583		1824	1583	153	3539	1583	836	3492	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	502	116	52	58	79	96	139	545	446	39	1024	99
RTOR Reduction (vph)	0	0	26	0	0	83	0	0	60	0	5	0
Lane Group Flow (vph)	306	312	26	0	137	13	139	545	386	39	1118	0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases			4			3	6		6	2		
Actuated Green, G (s)	25.4	25.4	25.4		13.6	13.6	60.6	52.9	52.9	50.3	47.6	
Effective Green, g (s)	25.4	25.4	25.4		13.6	13.6	60.6	52.9	52.9	50.3	47.6	
Actuated g/C Ratio	0.21	0.21	0.21		0.11	0.11	0.50	0.44	0.44	0.42	0.40	
Clearance Time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	5.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	356	363	335		207	179	199	1560	698	371	1385	
v/s Ratio Prot	c0.18	0.18			c0.08		c0.05	0.15		0.00	c0.32	
v/s Ratio Perm			0.02			0.01	0.30		0.24	0.04		
v/c Ratio	0.86	0.86	0.08		0.66	0.07	0.70	0.35	0.55	0.11	0.81	
Uniform Delay, d1	45.6	45.6	37.9		51.0	47.6	23.1	22.2	24.8	20.7	32.1	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.2	18.0	0.1		7.7	0.2	10.2	0.6	3.1	0.1	5.1	
Delay (s)	63.8	63.5	38.0		58.7	47.7	33.4	22.8	28.0	20.8	37.3	
Level of Service	E	E	D		E	D	C	C	C	C	D	
Approach Delay (s)		61.7			54.2			26.1			36.7	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM Average Control Delay	39.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.4
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	181	286	541	187	226	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	5.6	6.2			6.2
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.96			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1770	1583	3403			3457
Flt Permitted	0.95	1.00	1.00			0.53
Satd. Flow (perm)	1770	1583	3403			1874
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	311	588	203	246	268
RTOR Reduction (vph)	0	110	31	0	0	0
Lane Group Flow (vph)	197	201	760	0	0	514
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4			6	
Actuated Green, G (s)	14.6	21.6	45.5			58.1
Effective Green, g (s)	14.6	21.6	45.5			58.1
Actuated g/C Ratio	0.17	0.25	0.54			0.68
Clearance Time (s)	6.1	5.6	6.2			6.2
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	304	402	1822			1411
v/s Ratio Prot	c0.11	c0.04	c0.22			0.03
v/s Ratio Perm		0.09				0.22
v/c Ratio	0.65	0.50	0.42			0.36
Uniform Delay, d1	32.8	27.1	11.8			5.7
Progression Factor	1.00	1.00	1.00			0.74
Incremental Delay, d2	4.7	1.0	0.7			0.2
Delay (s)	37.5	28.1	12.5			4.4
Level of Service	D	C	B			A
Approach Delay (s)	31.7		12.5			4.4
Approach LOS	C		B			A

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	26	25	176	3	246	17	1293	182	281	838	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5			6.5	6.6	7.2	7.0		6.6	5.9	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	
Frt		0.97			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1761			1775	1583	1770	3474		1770	3533	
Flt Permitted		0.97			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1761			1775	1583	1770	3474		1770	3533	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	28	27	191	3	267	18	1405	198	305	911	10
RTOR Reduction (vph)	0	9	0	0	0	165	0	10	0	0	1	0
Lane Group Flow (vph)	0	136	0	0	194	102	18	1593	0	305	920	0
Turn Type	Split			Split		pm+ov	Prot			Prot		
Protected Phases	3	3		4	4	1	5	2		1	6	
Permitted Phases						4						
Actuated Green, G (s)		13.8			17.5	42.0	3.1	27.6		24.5	49.5	
Effective Green, g (s)		13.8			17.5	42.0	3.1	27.6		24.5	49.5	
Actuated g/C Ratio		0.13			0.16	0.38	0.03	0.25		0.22	0.45	
Clearance Time (s)		6.5			6.5	6.6	7.2	7.0		6.6	5.9	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		221			282	604	50	872		394	1590	
v/s Ratio Prot		c0.08			c0.11	0.04	0.01	c0.46		c0.17	0.26	
v/s Ratio Perm						0.03						
v/c Ratio		0.62			0.69	0.17	0.36	1.83		0.77	0.58	
Uniform Delay, d1		45.6			43.7	22.5	52.5	41.2		40.2	22.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.0			6.8	0.1	4.4	376.7		9.2	1.5	
Delay (s)		50.6			50.5	22.6	56.9	417.9		49.3	24.0	
Level of Service		D			D	C	E	F		D	C	
Approach Delay (s)		50.6			34.3			413.9			30.3	
Approach LOS		D			C			F			C	

Intersection Summary			
HCM Average Control Delay	211.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	2	748	77	102	414	33	40	8	3	56	5	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.96		1.00	0.86	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3489			3475		1770	1793		1770	1594	
Flt Permitted		0.95			0.67		0.59	1.00		0.75	1.00	
Satd. Flow (perm)		3330			2353		1101	1793		1397	1594	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	813	84	111	450	36	43	9	3	61	5	128
RTOR Reduction (vph)	0	5	0	0	4	0	0	3	0	0	114	0
Lane Group Flow (vph)	0	894	0	0	593	0	43	9	0	61	19	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		65.0			65.0		9.4	9.4		9.4	9.4	
Effective Green, g (s)		65.0			65.0		9.4	9.4		9.4	9.4	
Actuated g/C Ratio		0.76			0.76		0.11	0.11		0.11	0.11	
Clearance Time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2546			1799		122	198		154	176	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		c0.27			0.25		0.04			c0.04		
v/c Ratio		0.35			0.33		0.35	0.05		0.40	0.11	
Uniform Delay, d1		3.2			3.1		35.0	33.8		35.2	34.0	
Progression Factor		0.75			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.1		1.8	0.1		1.7	0.3	
Delay (s)		2.8			3.3		36.7	33.9		36.8	34.3	
Level of Service		A			A		D	C		D	C	
Approach Delay (s)		2.8			3.3			36.1			35.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	181	888	5	58	544
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	197	965	5	63	591
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)			172			586
pX, platoon unblocked	0.89	0.84			0.84	
vC, conflicting volume	1390	485			971	
vC1, stage 1 conf vol	968					
vC2, stage 2 conf vol	422					
vCu, unblocked vol	742	16			592	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	78			92	
cM capacity (veh/h)	413	892			826	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	199	643	327	63	296	296
Volume Left	2	0	0	63	0	0
Volume Right	197	0	5	0	0	0
cSH	881	1700	1700	826	1700	1700
Volume to Capacity	0.23	0.38	0.19	0.08	0.17	0.17
Queue Length 95th (ft)	22	0	0	6	0	0
Control Delay (s)	10.3	0.0	0.0	9.7	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	10.3	0.0		0.9		
Approach LOS	B					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix B

2030 Build Out Conditions

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	456	376	53	942	0	0	0	233	0	0	297
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	496	409	58	1024	0	0	0	253	0	0	323
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		791			541							
pX, platoon unblocked	0.89						0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	1024			496			1387	1635	512	1376	1635	248
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	788			496			1194	1472	215	1182	1472	248
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	64	100	100	57
cM capacity (veh/h)	739			1064			69	106	706	80	106	752

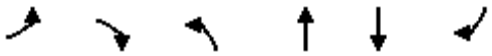
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	NE 1	SW 1
Volume Total	248	248	409	58	512	512	253	323
Volume Left	0	0	0	58	0	0	0	0
Volume Right	0	0	409	0	0	0	253	323
cSH	1700	1700	1700	1064	1700	1700	706	752
Volume to Capacity	0.15	0.15	0.24	0.05	0.30	0.30	0.36	0.43
Queue Length 95th (ft)	0	0	0	4	0	0	41	54
Control Delay (s)	0.0	0.0	0.0	8.6	0.0	0.0	12.9	13.3
Lane LOS				A			B	B
Approach Delay (s)	0.0			0.5			12.9	13.3
Approach LOS							B	B

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	47.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	9	525	72	118	527	20	6	0	20	37	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	0.98		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	3475		1770	3520			1770	1583		1770	1583
Flt Permitted	0.43	1.00		0.25	1.00			0.73	1.00		0.75	1.00
Satd. Flow (perm)	796	3475		472	3520			1362	1583		1403	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	571	78	128	573	22	7	0	22	40	0	28
RTOR Reduction (vph)	0	22	0	0	6	0	0	0	15	0	0	19
Lane Group Flow (vph)	10	627	0	128	590	0	0	7	7	0	40	9
Turn Type	Perm			pm+pt			Perm		Perm	Perm		Perm
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	16.0	16.0		24.0	24.0			16.0	16.0		16.0	16.0
Effective Green, g (s)	16.0	16.0		24.0	24.0			16.0	16.0		16.0	16.0
Actuated g/C Ratio	0.33	0.33		0.50	0.50			0.33	0.33		0.33	0.33
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	265	1158		344	1760			454	528		468	528
v/s Ratio Prot		c0.18		0.03	c0.17							
v/s Ratio Perm	0.01			0.15				0.01	0.00		c0.03	0.01
v/c Ratio	0.04	0.54		0.37	0.33			0.02	0.01		0.09	0.02
Uniform Delay, d1	10.8	13.0		7.2	7.2			10.7	10.7		11.0	10.7
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.3	1.8		3.1	0.5			0.1	0.0		0.4	0.1
Delay (s)	11.1	14.8		10.2	7.7			10.8	10.8		11.3	10.8
Level of Service	B	B		B	A			B	B		B	B
Approach Delay (s)		14.8			8.2			10.8			11.1	
Approach LOS		B			A			B			B	

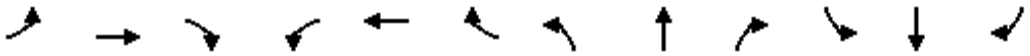
Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



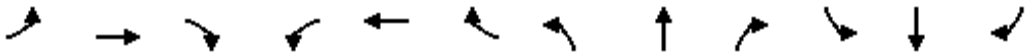
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	355	118	635	640	291
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.28	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	522	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	386	128	690	696	316
RTOR Reduction (vph)	0	193	0	0	0	181
Lane Group Flow (vph)	22	193	128	690	696	135
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	11.6	11.6	36.4	36.4	25.7	25.7
Effective Green, g (s)	11.6	11.6	36.4	36.4	25.7	25.7
Actuated g/C Ratio	0.19	0.19	0.61	0.61	0.43	0.43
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	306	414	2147	1516	678
v/s Ratio Prot	0.01		0.02	c0.19	c0.20	
v/s Ratio Perm		c0.12	0.16			0.09
v/c Ratio	0.06	0.63	0.31	0.32	0.46	0.20
Uniform Delay, d1	19.8	22.2	5.8	5.8	12.2	10.7
Progression Factor	1.00	1.00	1.41	1.38	1.00	1.00
Incremental Delay, d2	0.1	4.2	0.4	0.4	1.0	0.7
Delay (s)	19.8	26.4	8.6	8.4	13.2	11.4
Level of Service	B	C	A	A	B	B
Approach Delay (s)	26.1			8.4	12.6	
Approach LOS	C			A	B	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	0	16	0	0	10	19	733	0	31	1139	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95			0.95	
Frt		1.00	0.85		0.86		1.00	1.00			1.00	
Flt Protected		0.95	1.00		1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1770	1583		1611		1770	3539			3532	
Flt Permitted		0.75	1.00		1.00		0.18	1.00			0.92	
Satd. Flow (perm)		1398	1583		1611		342	3539			3247	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	0	17	0	0	11	21	797	0	34	1238	5
RTOR Reduction (vph)	0	0	15	0	9	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	97	2	0	2	0	21	797	0	0	1277	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		8.4	8.4		8.4		39.6	39.6			39.6	
Effective Green, g (s)		8.4	8.4		8.4		39.6	39.6			39.6	
Actuated g/C Ratio		0.14	0.14		0.14		0.66	0.66			0.66	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		196	222		226		226	2336			2143	
v/s Ratio Prot					0.00			0.23				
v/s Ratio Perm		c0.07	0.00				0.06				c0.39	
v/c Ratio		0.49	0.01		0.01		0.09	0.34			0.60	
Uniform Delay, d1		23.8	22.2		22.2		3.7	4.5			5.7	
Progression Factor		1.00	1.00		1.00		1.00	1.00			2.09	
Incremental Delay, d2		2.0	0.0		0.0		0.8	0.4			1.1	
Delay (s)		25.8	22.2		22.2		4.5	4.9			13.1	
Level of Service		C	C		C		A	A			B	
Approach Delay (s)		25.3			22.2			4.9			13.1	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	8	0	0	8	0	744	3	0	1136	19
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	9	0	0	9	0	809	3	0	1235	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								292			281	
pX, platoon unblocked	0.89	0.89	0.80	0.89	0.89	0.82	0.80			0.82		
vC, conflicting volume	1649	2057	628	1426	2064	404	1255			812		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	559	1015	37	309	1023	0	821			318		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	99	100			100		
cM capacity (veh/h)	364	211	822	548	209	885	644			1011		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	9	9	404	404	3	823	432
Volume Left	0	0	0	0	0	0	0
Volume Right	9	9	0	0	3	0	21
cSH	822	885	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.01	0.24	0.24	0.00	0.48	0.25
Queue Length 95th (ft)	1	1	0	0	0	0	0
Control Delay (s)	9.4	9.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	A					
Approach Delay (s)	9.4	9.1	0.0			0.0	
Approach LOS	A	A					

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	42.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	233	57	37	14	42	32	62	665	390	28	543	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	0.97	1.00		0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1717	1583		1840	1583	1770	3539	1583	1770	3514	
Flt Permitted	0.95	0.97	1.00		0.99	1.00	0.37	1.00	1.00	0.34	1.00	
Satd. Flow (perm)	1681	1717	1583		1840	1583	690	3539	1583	634	3514	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	253	62	40	15	46	35	67	723	424	30	590	29
RTOR Reduction (vph)	0	0	35	0	0	33	0	0	37	0	2	0
Lane Group Flow (vph)	157	158	5	0	61	2	67	723	387	30	617	0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases			4			3	6		6	2		
Actuated Green, G (s)	16.4	16.4	16.4		8.2	8.2	72.0	66.2	66.2	68.6	64.5	
Effective Green, g (s)	16.4	16.4	16.4		8.2	8.2	72.0	66.2	66.2	68.6	64.5	
Actuated g/C Ratio	0.14	0.14	0.14		0.07	0.07	0.60	0.55	0.55	0.57	0.54	
Clearance Time (s)	7.0	7.0	7.0		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	230	235	216		126	108	466	1952	873	401	1889	
v/s Ratio Prot	c0.09	0.09			c0.03		c0.01	0.20		0.00	0.18	
v/s Ratio Perm			0.00			0.00	0.08		c0.24	0.04		
v/c Ratio	0.68	0.67	0.03		0.48	0.02	0.14	0.37	0.44	0.07	0.33	
Uniform Delay, d1	49.3	49.2	44.9		53.9	52.2	10.2	15.2	16.0	11.4	15.6	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.1	7.4	0.0		2.9	0.1	0.1	0.5	1.6	0.1	0.5	
Delay (s)	57.4	56.6	44.9		56.8	52.2	10.4	15.7	17.6	11.4	16.0	
Level of Service	E	E	D		E	D	B	B	B	B	B	
Approach Delay (s)		55.6			55.1			16.1			15.8	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	111	90	499	70	203	326
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	5.6	6.2			6.2
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.98			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1770	1583	3474			3472
Flt Permitted	0.95	1.00	1.00			0.59
Satd. Flow (perm)	1770	1583	3474			2095
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	121	98	542	76	221	354
RTOR Reduction (vph)	0	80	9	0	0	0
Lane Group Flow (vph)	121	18	609	0	0	575
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4			6	
Actuated Green, G (s)	9.8	15.4	51.7			62.9
Effective Green, g (s)	9.8	15.4	51.7			62.9
Actuated g/C Ratio	0.12	0.18	0.61			0.74
Clearance Time (s)	6.1	5.6	6.2			6.2
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	204	287	2113			1641
v/s Ratio Prot	c0.07	0.00	0.18			c0.02
v/s Ratio Perm		0.01				c0.24
v/c Ratio	0.59	0.06	0.29			0.35
Uniform Delay, d1	35.7	28.8	7.9			3.9
Progression Factor	1.00	1.00	1.00			0.65
Incremental Delay, d2	4.6	0.1	0.3			0.1
Delay (s)	40.3	28.9	8.3			2.7
Level of Service	D	C	A			A
Approach Delay (s)	35.2		8.3			2.7
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	12.3
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	6	20	47	5	27	84	661	63	91	1050	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5	6.5	7.2	7.0		6.6	5.9	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1651		1770	1863	1583	1770	3493		1770	3538	
Flt Permitted	0.15	1.00		0.74	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	276	1651		1375	1863	1583	1770	3493		1770	3538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	64	7	22	51	5	29	91	718	68	99	1141	3
RTOR Reduction (vph)	0	17	0	0	0	22	0	6	0	0	0	0
Lane Group Flow (vph)	64	12	0	51	5	7	91	780	0	99	1144	0
Turn Type	Perm			Perm		pt+ov	Prot			Prot		
Protected Phases		3			4	4 1	5	2		1	6	
Permitted Phases	3			4								
Actuated Green, G (s)	27.0	27.0		8.4	8.4	25.8	10.3	37.1		10.9	38.2	
Effective Green, g (s)	27.0	27.0		8.4	8.4	25.8	10.3	37.1		10.9	38.2	
Actuated g/C Ratio	0.25	0.25		0.08	0.08	0.23	0.09	0.34		0.10	0.35	
Clearance Time (s)	6.5	6.5		6.5	6.5		7.2	7.0		6.6	5.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	68	405		105	142	371	166	1178		175	1229	
v/s Ratio Prot		0.01			0.00	0.00	0.05	0.22		c0.06	c0.32	
v/s Ratio Perm	c0.23			c0.04								
v/c Ratio	0.94	0.03		0.49	0.04	0.02	0.55	0.66		0.57	0.93	
Uniform Delay, d1	40.7	31.6		48.7	47.0	32.4	47.6	31.1		47.3	34.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	88.3	0.0		3.5	0.1	0.0	3.7	2.9		4.1	13.7	
Delay (s)	129.0	31.6		52.2	47.1	32.4	51.3	34.0		51.4	48.3	
Level of Service	F	C		D	D	C	D	C		D	D	
Approach Delay (s)		98.6			45.2			35.8			48.6	
Approach LOS		F			D			D			D	

Intersection Summary			
HCM Average Control Delay	45.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	25.5
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	3	567	19	37	518	29	9	2	2	9	0	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		1.00			0.99		1.00	0.92		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3521			3501		1770	1723		1770	1583	
Flt Permitted		0.95			0.88		0.93	1.00		0.93	1.00	
Satd. Flow (perm)		3357			3106		1733	1723		1733	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	616	21	40	563	32	10	2	2	10	0	33
RTOR Reduction (vph)	0	1	0	0	2	0	0	2	0	0	31	0
Lane Group Flow (vph)	0	639	0	0	633	0	10	2	0	10	2	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		70.1			70.1		4.3	4.3		4.3	4.3	
Effective Green, g (s)		70.1			70.1		4.3	4.3		4.3	4.3	
Actuated g/C Ratio		0.82			0.82		0.05	0.05		0.05	0.05	
Clearance Time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2769			2562		88	87		88	80	
v/s Ratio Prot								0.00			0.00	
v/s Ratio Perm		0.19			c0.20		c0.01			0.01		
v/c Ratio		0.23			0.25		0.11	0.02		0.11	0.02	
Uniform Delay, d1		1.6			1.6		38.5	38.4		38.5	38.3	
Progression Factor		0.94			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.1		0.6	0.1		0.6	0.1	
Delay (s)		1.7			1.7		39.1	38.5		39.1	38.5	
Level of Service		A			A		D	D		D	D	
Approach Delay (s)		1.7			1.7			38.9			38.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	41	557	0	54	662
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	45	605	0	59	720
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			172			586
pX, platoon unblocked	0.92	0.87			0.87	
vC, conflicting volume	1083	303			605	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	414	0			236	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	95			95	
cM capacity (veh/h)	492	939			1151	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	48	404	202	59	360	360
Volume Left	3	0	0	59	0	0
Volume Right	45	0	0	0	0	0
cSH	885	1700	1700	1151	1700	1700
Volume to Capacity	0.05	0.24	0.12	0.05	0.21	0.21
Queue Length 95th (ft)	4	0	0	4	0	0
Control Delay (s)	9.3	0.0	0.0	8.3	0.0	0.0
Lane LOS	A			A		
Approach Delay (s)	9.3	0.0		0.6		
Approach LOS	A					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

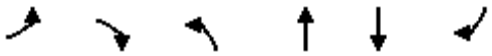
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	1020	628	107	816	0	0	0	334	0	0	381
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1109	683	116	887	0	0	0	363	0	0	414
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		791			541							
pX, platoon unblocked	0.84			0.94			0.87	0.87	0.84	0.87	0.87	0.94
vC, conflicting volume	887			1109			1674	2228	443	2148	2228	554
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	493			987			1170	1805	0	1713	1805	397
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			82			100	100	60	100	100	27
cM capacity (veh/h)	899			654			30	56	914	27	56	566

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	NE 1	SW 1
Volume Total	554	554	683	116	443	443	363	414
Volume Left	0	0	0	116	0	0	0	0
Volume Right	0	0	683	0	0	0	363	414
cSH	1700	1700	1700	654	1700	1700	914	566
Volume to Capacity	0.33	0.33	0.40	0.18	0.26	0.26	0.40	0.73
Queue Length 95th (ft)	0	0	0	16	0	0	48	154
Control Delay (s)	0.0	0.0	0.0	11.7	0.0	0.0	11.5	26.8
Lane LOS				B			B	D
Approach Delay (s)	0.0			1.4			11.5	26.8
Approach LOS							B	D

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	58.5%	ICU Level of Service	B	
Analysis Period (min)	15			

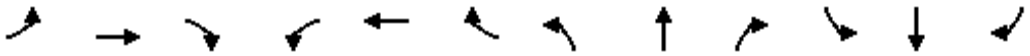
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	29	777	100	125	396	14	11	2	43	110	3	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	0.98		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.95	1.00
Satd. Flow (prot)	1770	3479		1770	3521			1786	1583		1776	1583
Flt Permitted	0.49	1.00		0.23	1.00			0.75	1.00		0.72	1.00
Satd. Flow (perm)	921	3479		427	3521			1394	1583		1344	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	845	109	136	430	15	12	2	47	120	3	95
RTOR Reduction (vph)	0	8	0	0	2	0	0	0	40	0	0	81
Lane Group Flow (vph)	32	946	0	136	443	0	0	14	7	0	123	14
Turn Type	Perm			pm+pt			Perm		Perm	Perm		Perm
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	59.9	59.9		73.7	73.7			14.3	14.3		14.3	14.3
Effective Green, g (s)	59.9	59.9		73.7	73.7			14.3	14.3		14.3	14.3
Actuated g/C Ratio	0.60	0.60		0.74	0.74			0.14	0.14		0.14	0.14
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	552	2084		419	2595			199	226		192	226
v/s Ratio Prot		c0.27		c0.03	0.13							
v/s Ratio Perm	0.03			0.21				0.01	0.00		c0.09	0.01
v/c Ratio	0.06	0.45		0.32	0.17			0.07	0.03		0.64	0.06
Uniform Delay, d1	8.3	11.0		5.3	4.0			37.1	36.9		40.4	37.0
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.7		0.5	0.1			0.2	0.1		7.1	0.1
Delay (s)	8.5	11.8		5.8	4.1			37.2	36.9		47.5	37.2
Level of Service	A	B		A	A			D	D		D	D
Approach Delay (s)		11.7			4.5			37.0			43.0	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



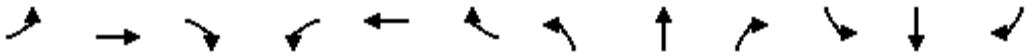
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	85	164	255	1146	759	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	354	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	178	277	1246	825	280
RTOR Reduction (vph)	0	153	0	0	0	179
Lane Group Flow (vph)	92	25	277	1246	825	101
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	8.5	8.5	39.5	39.5	21.6	21.6
Effective Green, g (s)	8.5	8.5	39.5	39.5	21.6	21.6
Actuated g/C Ratio	0.14	0.14	0.66	0.66	0.36	0.36
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	251	224	514	2330	1274	570
v/s Ratio Prot	c0.05		0.11	c0.35	c0.23	
v/s Ratio Perm		0.02	0.25			0.06
v/c Ratio	0.37	0.11	0.54	0.53	0.65	0.18
Uniform Delay, d1	23.3	22.5	6.4	5.4	16.0	13.1
Progression Factor	1.00	1.00	0.83	1.17	1.00	1.00
Incremental Delay, d2	0.9	0.2	1.0	0.8	2.6	0.7
Delay (s)	24.2	22.7	6.2	7.1	18.6	13.8
Level of Service	C	C	A	A	B	B
Approach Delay (s)	23.2			6.9	17.4	
Approach LOS	C			A	B	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	179	0	31	0	0	61	34	1408	0	70	1065	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.86		1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1770	1583		1611		1770	3539		1770	3532	
Flt Permitted		0.71	1.00		1.00		0.19	1.00		0.11	1.00	
Satd. Flow (perm)		1330	1583		1611		358	3539		213	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	195	0	34	0	0	66	37	1530	0	76	1158	16
RTOR Reduction (vph)	0	0	27	0	17	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	195	7	0	49	0	37	1530	0	76	1173	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		13.0	13.0		13.0		35.0	35.0		35.0	35.0	
Effective Green, g (s)		13.0	13.0		13.0		35.0	35.0		35.0	35.0	
Actuated g/C Ratio		0.22	0.22		0.22		0.58	0.58		0.58	0.58	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		288	343		349		209	2064		124	2060	
v/s Ratio Prot					0.03			c0.43			0.33	
v/s Ratio Perm		c0.15	0.00				0.10			0.36		
v/c Ratio		0.68	0.02		0.14		0.18	0.74		0.61	0.57	
Uniform Delay, d1		21.6	18.5		19.0		5.8	9.2		8.1	7.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.86	2.00	
Incremental Delay, d2		6.2	0.0		0.2		1.8	2.4		19.2	1.1	
Delay (s)		27.8	18.5		19.2		7.7	11.6		34.3	16.7	
Level of Service		C	B		B		A	B		C	B	
Approach Delay (s)		26.4			19.2			11.5			17.7	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	3	0	0	25	0	1417	2	0	1055	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	3	0	0	27	0	1540	2	0	1147	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								292			281	
pX, platoon unblocked	0.74	0.74	0.79	0.74	0.74	0.63	0.79			0.63		
vC, conflicting volume	1939	2711	596	2114	2732	770	1191			1542		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	264	1308	0	499	1335	0	699			696		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	96	100			100		
cM capacity (veh/h)	474	117	852	335	113	686	702			567		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	3	27	770	770	2	764	427
Volume Left	0	0	0	0	0	0	0
Volume Right	3	27	0	0	2	0	45
cSH	852	686	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.04	0.45	0.45	0.00	0.45	0.25
Queue Length 95th (ft)	0	3	0	0	0	0	0
Control Delay (s)	9.2	10.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	B					
Approach Delay (s)	9.2	10.5	0.0			0.0	
Approach LOS	A	B					

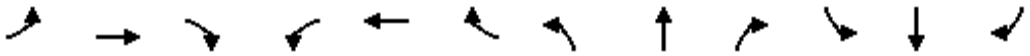
Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	49.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	462	107	48	42	73	88	128	501	410	36	942	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	0.97	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1681	1716	1583		1829	1583	1770	3539	1583	1770	3501	
Flt Permitted	0.95	0.97	1.00		0.98	1.00	0.09	1.00	1.00	0.44	1.00	
Satd. Flow (perm)	1681	1716	1583		1829	1583	174	3539	1583	826	3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	502	116	52	46	79	96	139	545	446	39	1024	79
RTOR Reduction (vph)	0	0	26	0	0	86	0	0	59	0	4	0
Lane Group Flow (vph)	306	312	26	0	125	10	139	545	387	39	1099	0
Turn Type	Split		Perm	Split		Perm	pm+pt		Perm	pm+pt		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases			4			3	6		6	2		
Actuated Green, G (s)	25.5	25.5	25.5		13.0	13.0	61.1	52.7	52.7	50.4	47.0	
Effective Green, g (s)	25.5	25.5	25.5		13.0	13.0	61.1	52.7	52.7	50.4	47.0	
Actuated g/C Ratio	0.21	0.21	0.21		0.11	0.11	0.51	0.44	0.44	0.42	0.39	
Clearance Time (s)	7.3	7.3	7.3		6.6	6.6	5.0	6.5	6.5	5.0	6.5	
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	357	365	336		198	171	210	1554	695	374	1371	
v/s Ratio Prot	c0.18	0.18			c0.07		c0.05	0.15		0.00	c0.31	
v/s Ratio Perm			0.02			0.01	0.29		0.24	0.04		
v/c Ratio	0.86	0.85	0.08		0.63	0.06	0.66	0.35	0.56	0.10	0.80	
Uniform Delay, d1	45.5	45.5	37.8		51.2	48.0	22.2	22.3	25.0	20.6	32.4	
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	18.0	17.4	0.1		6.4	0.1	7.6	0.6	3.2	0.1	5.0	
Delay (s)	63.5	62.9	37.9		57.6	48.2	29.8	22.9	28.2	20.8	37.4	
Level of Service	E	E	D		E	D	C	C	C	C	D	
Approach Delay (s)		61.2			53.5			25.8			36.8	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM Average Control Delay	39.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.4
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	181	286	541	187	226	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	5.6	6.2			6.2
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.96			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	1770	1583	3403			3457
Flt Permitted	0.95	1.00	1.00			0.53
Satd. Flow (perm)	1770	1583	3403			1874
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	311	588	203	246	268
RTOR Reduction (vph)	0	110	31	0	0	0
Lane Group Flow (vph)	197	201	760	0	0	514
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4			6	
Actuated Green, G (s)	14.6	21.6	45.5			58.1
Effective Green, g (s)	14.6	21.6	45.5			58.1
Actuated g/C Ratio	0.17	0.25	0.54			0.68
Clearance Time (s)	6.1	5.6	6.2			6.2
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	304	402	1822			1411
v/s Ratio Prot	c0.11	c0.04	c0.22			0.03
v/s Ratio Perm		0.09				0.22
v/c Ratio	0.65	0.50	0.42			0.36
Uniform Delay, d1	32.8	27.1	11.8			5.7
Progression Factor	1.00	1.00	1.00			0.74
Incremental Delay, d2	4.7	1.0	0.7			0.2
Delay (s)	37.5	28.1	12.5			4.4
Level of Service	D	C	B			A
Approach Delay (s)	31.7		12.5			4.4
Approach LOS	C		B			A

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	26	25	176	15	172	146	1164	182	211	838	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5	6.6	7.2	7.0		6.6	5.9	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1726		1770	1863	1583	1770	3467		1770	3533	
Flt Permitted	0.75	1.00		0.72	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1392	1726		1343	1863	1583	1770	3467		1770	3533	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	28	27	191	16	187	159	1265	198	229	911	10
RTOR Reduction (vph)	0	22	0	0	0	17	0	11	0	0	0	0
Lane Group Flow (vph)	90	33	0	191	16	170	159	1452	0	229	921	0
Turn Type	Perm			Perm		pm+ov	Prot			Prot		
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	18.8	18.8		18.8	18.8	36.2	14.6	53.7		17.4	57.0	
Effective Green, g (s)	18.8	18.8		18.8	18.8	36.2	14.6	53.7		17.4	57.0	
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.33	0.13	0.49		0.16	0.52	
Clearance Time (s)	6.5	6.5		6.5	6.5	6.6	7.2	7.0		6.6	5.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	238	295		230	318	521	235	1693		280	1831	
v/s Ratio Prot		0.02			0.01	0.05	0.09	c0.42		c0.13	0.26	
v/s Ratio Perm	0.06			c0.14		0.06						
v/c Ratio	0.38	0.11		0.83	0.05	0.33	0.68	0.86		0.82	0.50	
Uniform Delay, d1	40.4	38.5		44.1	38.1	27.7	45.5	24.8		44.8	17.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.2		21.7	0.1	0.4	7.5	5.9		16.7	1.0	
Delay (s)	41.4	38.7		65.8	38.2	28.1	52.9	30.7		61.5	18.3	
Level of Service	D	D		E	D	C	D	C		E	B	
Approach Delay (s)		40.4			46.8			32.8			26.9	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.1
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	2	748	77	102	414	33	40	8	3	56	5	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.96		1.00	0.86	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3489			3475		1770	1793		1770	1594	
Flt Permitted		0.95			0.67		0.59	1.00		0.75	1.00	
Satd. Flow (perm)		3330			2353		1101	1793		1397	1594	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	813	84	111	450	36	43	9	3	61	5	128
RTOR Reduction (vph)	0	5	0	0	4	0	0	3	0	0	114	0
Lane Group Flow (vph)	0	894	0	0	593	0	43	9	0	61	19	0
Turn Type	Perm			pm+pt			Perm			Perm		
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		65.0			65.0		9.4	9.4		9.4	9.4	
Effective Green, g (s)		65.0			65.0		9.4	9.4		9.4	9.4	
Actuated g/C Ratio		0.76			0.76		0.11	0.11		0.11	0.11	
Clearance Time (s)		5.7			5.7		4.9	4.9		4.9	4.9	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2546			1799		122	198		154	176	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		c0.27			0.25		0.04			c0.04		
v/c Ratio		0.35			0.33		0.35	0.05		0.40	0.11	
Uniform Delay, d1		3.2			3.1		35.0	33.8		35.2	34.0	
Progression Factor		0.75			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.1		1.8	0.1		1.7	0.3	
Delay (s)		2.8			3.3		36.7	33.9		36.8	34.3	
Level of Service		A			A		D	C		D	C	
Approach Delay (s)		2.8			3.3			36.1			35.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	181	870	5	58	533
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	197	946	5	63	579
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			172			586
pX, platoon unblocked	0.90	0.86			0.86	
vC, conflicting volume	1364	476			951	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	766	49			605	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	77			92	
cM capacity (veh/h)	280	864			829	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	199	630	321	63	290	290
Volume Left	2	0	0	63	0	0
Volume Right	197	0	5	0	0	0
cSH	844	1700	1700	829	1700	1700
Volume to Capacity	0.24	0.37	0.19	0.08	0.17	0.17
Queue Length 95th (ft)	23	0	0	6	0	0
Control Delay (s)	10.6	0.0	0.0	9.7	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	10.6	0.0		1.0		
Approach LOS	B					

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	48.9%	ICU Level of Service		A
Analysis Period (min)	15			

Appendix C

Public Involvement Information

Russ Avenue Corridor
Kick Off Meeting

MEETING SUMMARY JUNE 26, 2008 9:30 AM

WAYNESVILLE, NORTH CAROLINA

Wilbur Smith Associates Project No. 102706

MEETING CALLED BY	Deniece Swinton, PE
TYPE OF MEETING	Kick Off Meeting
FACILITATOR	Deniece Swinton, PE
NOTE TAKER	Deanna Berlin

Pursuant to the Professional Services Agreement, dated May 6, 2008, WSA representatives Deanna Berlin, Terry Snow, PE and Deniece Swinton, PE, prepared for and attended a Kick Off meeting on June 26, 2008 at 9:30 am at the Town of Waynesville Mayor's office in Waynesville, North Carolina. The subject meeting started at approximately 9:30 am and ended at approximately 10:30 am. The purpose of the meeting was to discuss the study plans and schedules and get feed back from the Town staff. A copy of this agenda is attached. The listing of representatives from the Town, and WSA who attended the meeting is noted below.

ATTENDEE LIST

NAME	AGENCY	PHONE	EMAIL
Bill Hollingsed	Waynesville Police Department	828.456.5363	wpdchief@chartner.net
Paul Benson	Planning Department	828.456.2004	planning@townofwaynesville.org
Alison Melnikova	Waynesville Administration	828.456.2491	townmanagerassistant@townofwaynesville.org
Fred Baker	Director of Public Works	828.456.4410	publicworksdirector@townofwaynesville.org
Terry snow	Wilbur Smith Associates	336.819.4200	TSnow@WilburSmith.com
Deniece Swinton	Wilbur Smith Associates	336.819.4200	DSwinton@WilburSmith.com
Deanna Berlin	Wilbur Smith Associates	336.819.4200	DBerlin@WilburSmith.com

DISCUSSION

The following is a recap of the high points discussed at the meeting:

- The hope for this corridor is to provide an inviting streetscape and welcoming environment while residents & tourists are traveling into the business district of Waynesville, NC
- Crosswalks are desired for safe passage across the corridor
- A median was installed in 2007 in front of McDonalds/Barber Blvd due to many accidents in years prior. This has lowered the crash numbers but has moved the accident zone up the Dellwood/Howell Mill intersection.

- Possible improvements to consider:
  - Widen curbline 3-4 feet
  - 5 lanes across bridge over stream
  - Consider roundabouts at ramps
  - Bulb outs for u-turns
- No speeding problem along the study corridor due to congestion
- Bicyclists use Dellwood and Howell Mill
- Dellwood needs to be addressed due to back ups, etc. – part of a TIP project
- Russ/Dellwood/Howell Mill intersection needs to be examined due to the skewed approaches
- There are plans to improve Howell Mill
- Town has had discussions with NCDOT regarding a possible traffic signal at Frazier
- Land Development Ordinance outlines driveway spacing and rear entrance access to adjacent properties
- Public Workshop to be held August 21, 2008 5:00 pm to 7:00 pm possibly at the Waynesville Recreation Center
- 7 Pedestrian accidents have taken place in this corridor. No specific area is targeted. Many of the pedestrian accidents are from people stopping to give directions and being struck by oncoming cars.

This concludes my understanding of the discussions held during the subject meeting. If there are discrepancies, errors, or omissions, please contact Terry Snow, PE at TSnow@WilburSmith.com by 5:00 Thursday July 3, 2008. If no changes are received by the said time, then this meeting summary will be considered accurate. If changes are required, then a revised meeting summary will be submitted on Friday July 11, 2008.

Attachment: Meeting Agenda
Meeting Attendee List

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
Contact Haywood County to obtain mapping data	Deniece Swinton, PE	July 11, 2008
Obtain current Hydrology report from State Data Center and State Comprehensive Transportation Plan off NCDOT website	Deniece Swinton, PE	July 11, 2008
Develop a mailing list of property owners using a 500 ft buffer from the centerline of Russ Avenue and send to Paul for review	Deanna Berlin	July 11, 2008
Obtain Signal Timings from NCDOT	Deniece Swinton, PE	July 11, 2008
Send Press Release to Allison Melnivoa for distribution to media for public workshop	Deanna Berlin	July 11, 2008

Russ Avenue Corridor Study

Waynesville, North Carolina
Kick-Off Meeting
June 26, 2008

Agenda

INTRODUCTIONS

PURPOSE OF MEETING

- Review Study Process and Schedule
- Get project input from Town Staff

STUDY PROCESS AND SCHEDULE

1. Kickoff Meeting (June 26, 2008)
2. Data Collections and Existing Conditions Assessment (in progress)
3. Development of Base Mapping (in progress)
4. Field Review and Data Verification (in progress)
5. Traffic Data Collection (in progress)
6. Initial Public Involvement Meeting (August 2008)
   - Open-house style
   - Mailing list (potential stakeholders)
   - Location
   - Time
   - 30 day comment period
7. Identification of Practical Alternatives (September 2008)
8. Presentation of Alternatives (late September 2008)
9. Selection of Preferred Alternative (October 2008)
10. Conceptual Design Plans and Cost Estimate (November 2008)
11. Second Public Information Meeting (December 2008)
12. Draft Report (January 2009)
13. Final Deliverables (February 2009)
14. Project Management/Client Communications (monthly)

ISSUES/CONCERNS

ACTION ITEMS

ADJOURN

RUSS AVENUE CORRIDOR STUDY
Kick-Off Meeting
June 26, 2008

Sign In Sheet

Name	Agency	Phone	Email
Bill Hollingsed	Waynesville PD	828-456-5363	wpdchief@charter.net
Paul Benson	Planning Dept	828-456-2004	planning@townofwaynesville.org
Alison Melnikova	Waynesville Administration	828/456-2491	townmanagerassistant@townofwaynesville.org
Fred Baker	Dir Pub Wks	456 4410	publicworksdirector@townofwaynesville.org
Terry Snow	Wilbur Smith Assoc.	336.819.4200	tsnowe@wilbursmith.com
Lee Galloway	Town Manager	828-452-2491	townmanager@townofwaynesville.org
Denise Winton	Wilbur Smith Associates	336.819.4200	DSwinton@wilbursmith.com
Deanna Berlin	Wilbur Smith Associates	336.819.4200	DBerlin@wilbursmith.com

RUSS AVENUE CORRIDOR STUDY
Public Workshop #1 Summary

A Public Workshop to discuss the Russ Avenue Corridor Study was held on August 21, 2008 in Waynesville, North Carolina. The Public Workshop was held at the Waynesville Recreation Center located at 550 Vance Street from 5:00 pm-7:00pm. Staff members from the Town of Waynesville and Wilbur Smith Associates were on hand to speak with the residents and encourage discussion of the corridor study.

The table below lists the individuals who attended the workshop and signed in.

PUBLIC WORKSHOP ATTENDEES

NAME	
Marl Claslsy	**Jamie Wilson**
Curtis & Lynda Doucette	**Lee Galloway, Town Manager**
Rich Boyd	**LeRoy Roberson**
Henry Foy	**Linda Ferguson**
Al & Carol Mankowsi	**Sybil Mann**
Philan Medford	**Steve Roper**
Hugh Phillips	**Kevin Williams**
Jeff Henderson	**Rev. Lib Srichter**
Joel Taylor	**Ron Leatherwood**
Roscoe Wells	**Gavin Brown**
Kathy Keogh	**Dian Oslund**

A total of 16 written comments were received.

Some of the major comments/concerns include:

- Address median and center turn lane along Russ Avenue in front of McDonalds and CVS
- Correct the intersection alignment of Russ Avenue/Barber Boulevard/Long John Silver
- Need crosswalks and pedestrian signal heads
- Consider a parallel street to Russ Avenue to allow for one-way traffic northbound and one-way traffic southbound
- Improve aesthetics and bury utilities underground
- Do not need bicycle or pedestrian facilities
- Install roundabouts at each intersection
- Construct a bridge over the creek to connect the Bi-Lo and the Staples/Sears shopping centers

Address: 524 Russ Avenue
Widen Russ Avenue in front of McDonalds and CVS to allow space for removal of the present island, installation of 3 to 4 high traffic paddles approximately 6 to 8" wide. These will stop vehicles from crossing southbound lane to turn left out of the McDonalds and allow enough width to increase left turn lane storage.
Align intersection from CVS across from Barber Boulevard.

I believe Russ Avenue is a destination shopping area and all of the pedestrian improvements in the world will not cause very many people to walk in this area. It is truly a highway district.

Address: 99 Pisgah Drive
Intersections- Put in Round-a-bouts for traffic calming, increase carrying capacity, increase safety, eliminate suicide lane, relieve congestion.
Public Transit- Plan for 5 stops. Now it is only on demand. Within 20 years, we need an efficient system.
Landscaping-Improves the journey

Address: 228-B Muse Business Park
In reference to your request for "sound off" concerning traffic problems on Russ Avenue in Waynesville, I hope you will address the fiasco in front of McDonalds and CVS. That concrete median was a mistake from the gitgo. The turning lane is too short for traffic trying to make a left turn into the shopping center at Ingle's, Goody's and Belk's. This is causing a backup on the inside lane of Russ Avenue. I am surprised there have not been more accidents there.

I have read in the newspaper in the past of City commissioners suggesting planting trees or concreting the median the length of Russ Avenue. I personally don't see that anything can be done in the median to solve the growing traffic problem. I am not an engineer but hopefully you have solutions to the problem.

Address: Emailed
I was not able to attend the public meeting and was not able to see if this item was brought up. If so, sorry, if not here goes. Has anyone ever thought of having the 18-wheelers that go to the paper company on Howell Mill Road only being able to access the paper plant from exit 104 by the Lowes store? There have been many times I have seen these big rigs turn into Ingles and take the side road that cuts through to Howell Mill Rd. to miss the light at Eckerd's Drugs. Now I know the big trucks have to come to the businesses on Russ Avenue, but it is already congested enough without the trucks going to the paper plant. I have seen the big trucks almost hit cars trying to make the turn onto Howell Mill Rd. between Maggie's Galley and Eckerd's. So maybe we could re-route some of these trucks to only exit by Lowes at exit 104. Don't know if this helps, but it is a suggestion.

Address: Emailed
I tend to agree with the gentleman from Taylor Ford, this is a major roadway. But we could have a biking and walkway that parallels the road on one side or the other going through the side street next to Auto Zone or going into the plazas on the other side instead of putting it right next to the road. Also it would be very nice if we could build a walking bridge across the creek from the park behind BiLo to the parking lot of where Antipasto's used to be or Scooby's now and run the walkway up through that way up near the Laundromat. This way you could walk all the way from the Rec Center up to Russ Avenue without going near the main road at Russ Avenue.

Address: Emailed
My husband and I recently had an errand to run at CVS on Russ Avenue, and were then going to go to Waffle House (across Russ Ave.) for breakfast, so we decided to park at CVS and walk across the street. Much to our surprise, there is no crosswalk at that intersection, even though there is a light there. Needless to say, crosswalks should exist wherever there is a traffic signal, and one is needed at this location. We literally had to run across the street (even when the light was red) for fear of being hit by a car.

Address: Emailed
Make Russ Avenue one way going south, into town. To go north, make the alleys behind stores one way. That means connecting them and beautifying them, too. Sure, it will cost money, but it will be worth it. The alleyway can be made to look quaint, with every store fixing up a quaint back entrance or, if that is not possible, at least fixing up to LOOK like a quaint back entrance. Murals can be painted on the buildings, as many towns have done, including Canton. Charleston and New Orleans have these kinds of "alley" streets (like Wall Street hopes to look?) and they are very attractive. In this way, traffic will be hugely eased and Russ Avenue and Russ Alley can be an attractive draw to tourists, not to mention a blessing to residents.

In the future, if any store or restaurant actually on Russ Avenue wants to build or change in any way, it is imperative our ordinances be observed WITH NO EXCEPTIONS. The McDonalds in Biltmore is a shining example of what a town can accomplish if it sticks to its guns and doesn't let big companies scare it by threats of not building there. (Like who cares if they don't?) Biltmore forced McDonalds to build in keeping with the look of the area and big, tough McDonalds buckled in when Biltmore stood its ground. Why can't Waynesville do that?

Address: Emailed -P.O. Box 1189 – Back to Basics
Instead of a turn-on-arrow-only light, allow those drivers who didn't make arrow time to pull into intersection and turn when there is a break in oncoming traffic.

Encourage those who do not fit into left turn pocket to continue to the next traffic light, turn left, and enter Ingles from Howell Mill Road.
The median across from McDonald's is imperative.

Address: Emailed
The first time I visited Palm Springs, CA I arrived after dusk. The main entry Avenue was flanked with illuminated palm trees of same height. It looked spectacular. That was thirty years ago and I haven't forgotten what I felt. Also, the street had underground wiring. Russ Ave. cannot support sidewalks. Bicycles & pedestrians would possibly be cause for more accidents. Other towns have laws for fast food chain exposures. Asheville's, Biltmore location of McDonalds is a fine example. Lots of flowers on display are always appreciated. Garden Clubs could maintain at no cost to city other than supplying containers. Restrict future business types, i.e. auto lots, R.V. parks, etc.

Address: Emailed
I present a couple of items that are intended to be used as considerations, not as final solutions.

If feasible, determine the counts of through traffic on Russ Avenue, and Howell Mill/Dellwood Roads. Based on that, consider possibility of inside lanes both directions as through-only lanes.

Consider alternative primary entry/egress on Howell Mill for the Ingles Center - or perhaps only northbound entry/exit from Russ/US276 for Ingles.

Whatever is done, do both projects at the same time (Russ and Howell Mill).

Study aerial/topo maps/photos to see if there is any 'otherwise unusable' property that might serve as a feeder or bypass to this corridor - perhaps involving a new ramp onto 23/74 eastbound (east of exit 102b).

Address: Emailed
The problem of congestion could be solved if Russ Avenue is made one way, going south, coming into town from 19/23. The opposite direction of going north, out of town, could also be solved by forming connections between the backs of the stores and buildings on Russ Avenue and building an attractive "alley" throughway. Other cities have built quaint, attractive alley streets, i.e. Charleston. Right now, the backs of buildings on Russ Avenue feature garbage collection, debris and general ugliness. Let's connect all these buildings, make the alley street one way and fix it up to be charming, instead of alarming!

Address: Emailed
Here is my suggestion: bury the cables, remove the power poles! Where I used to live in California the neighborhoods which had buried services looked SOOOOO much better than poles and power lines hanging all over the place.

Address: Emailed
I enjoyed talking about Waynesville yesterday. I have listed below several items that I feel are issues with Russ Ave. I am a retired engineer and will attempt to be objective with practical solutions where possible.

Top priority should be to return Russ Ave in front of CVS, McDonald's, and the Ingles Traffic light to the original configuration. The current condition is an abomination. Remove the concrete filled left-turn lane returning this to an active left-turn lane. THE CONCRETE FILLED LEFT-TURN LANE IS WASTED SPACE IN AN AREA THAT NEEDS ALL THE ROADWAY AVAILABLE. Allow outbound Russ Ave traffic to make left-turns into the entrance driveways of McDonald's and CVS. Outbound cars on Russ Ave will make a U-Turn creating a traffic hazard and unnecessary additional in-bound traffic congestion with the present abomination.

Modify the existing traffic light and intersection at the entrance into the Ingles parking areas. Buy or seize the old John Silver restaurant and fix this intersection now. A new business at this location will only make a bad situation worse. The property is needed to correct the intersection in front of this property.

Consider creating streets parallel to Russ Ave on both sides of Russ Ave behind the current businesses. Provide a walking and traffic bridge across the creek connecting the Bi-Lo and Staples/Sears shopping areas.

Eliminate at least one traffic light on Russ Ave. Several intersections could handle a traffic circle.

Russ Ave should consider moving traffic the major issue. Foot traffic is at a minimum and will always be small. Why? Lack of nearby high population areas and Americans do not walk to shopping or restaurants.

Address: Emailed
My comments concerning Russ Avenue in Waynesville are to build two roads either side of Russ Avenue, behind all the businesses, parallel to Russ Avenue. I don't mean connecting the back parking lots, I mean an actual road so that people who want to stop at the businesses can turn into them and Russ Avenue can become a thru street with right turns ONLY. This would divert a lot of traffic off Russ Avenue and still allow access to the businesses as needed. In fact, the roads in back of the businesses "might" be one way north and the other one way South to keep the traffic moving and lessen the chance for accidents. If you wanted to go the opposite direction of the one way roads, you could go turn out onto Russ Avenue.

Address: 434 Russ Avenue
Address traffic flow. Bad back ups on Friday. Safety issue for pedestrians crossing Russ Avenue. Trees planted by City along Russ Avenue are now blocking visibility of businesses facing Russ Avenue.

Address: Emailed
I am a part time resident of Waynesville and I have been reading about the current planning process related to pedestrian walkways, especially on Russ Ave. I would like to make a few comments about this subject. I have been coming here every summer since 1997 or so and have a lot of experience here during the May to late-October time period and I suspect this is the most likely time that people will be walking around this town.

I love the idea of making specific areas readily and safely accessible to pedestrians but I disagree with trying to do this on Russ Avenue. I have enough trouble trying to negotiate this area safely in my truck when I go over there to Ingles, Bi-Lo, the Ford dealer and the Town tennis courts. I would never imagine trying to park my pickup and then walk from one place to another. Basically I go over to shop for groceries, vehicle maintenance and tennis and I need my vehicle for all this activity. Russ Ave. is a heavy duty shopping and drive-to / drive-through eating district but it is not intended for "window" shopping. I would never expect to see people walking around, looking in one shop and then another or sitting at a sidewalk table enjoying a lunch, etc. This is a major 5-6 lane artery with tons of access points where drivers panic as they try to shoot out into the flow. You cannot add pedestrians to this mix with 1 and 2-ton vehicles. I am totally opposed to the concept of or spending any funds on a pedestrian walkway in Russ Ave. area.

Public Workshop Notice

WHO: **Town of Waynesville, North Carolina**

WHAT: **Russ Avenue Corridor Feasibility Study**

The Town of Waynesville cordially invites you to an informational workshop for the Russ Avenue Corridor Feasibility Study which extends from US 23/74 to Walnut Street. The purpose of this project is to develop an improvement plan for Russ Avenue which will enhance vehicular, pedestrian mobility, and safety while providing an aesthetically pleasing gateway into the Town of Waynesville.

The purpose of this informational workshop is for citizens to assist the project by gathering suggestions for improvements along Russ Avenue. The workshop will be formatted as a discussion to obtain citizen feedback to develop a vision for the Russ Avenue Corridor plan.

Members of the project team will be available to discuss the project one-on-one with you. Maps illustrating the area will be provided to assist the public in expressing their concerns. Overlay paper will also be available for the citizens to use to further visualize possible improvements.

WHEN: Thursday August 21, 2008
5:00 pm-7:00 pm

WHERE: Recreation Center
550 Vance Street
Waynesville, North Carolina
828.456.2030

We look forward to your participation!

If you are unable to attend the Workshop, you may provide input to the study by contacting:

Deniece Swinton, PE
Wilbur Smith Associates
4135 Mendenhall Oaks Parkway Suite 160
High Point, NC 27265
P 336.819.4200
F 336.819.4201
dswinton@wilbursmith.com

Deadline for Submissions is September 22, 2008

Press Release
August 8, 2008

Contacts: **Paul Benson**
Town of Waynesville, Planning Department
456-2004

Russ Avenue Corridor Study Public Workshop

Background:
The Town of Waynesville and the French Broad River Metropolitan Planning Organization have initiated a study of the Russ Avenue / US 276 corridor in Waynesville extending from the Smoky Mountain Expressway (US 23-74) southward to its intersection with Walnut Avenue, a distance of approximately 0.8 mile.

Russ Avenue serves as the major eastern gateway into Waynesville from the Smoky Mountains Expressway (US 23-74). As such, the efficiency and attractiveness of the road shape a great deal of visitors' first impression of the town and the quality of many residents' everyday lives.

The purpose of the corridor study is to plan future travel demand, intersection improvements, access configuration and management, median and edge landscaping and pedestrian, bicycle and public transportation facilities. The project will result in an improvement plan for Russ Avenue which will enhance vehicular, pedestrian mobility and safety while providing and aesthetically pleasing gateway into town.

Workshop:
Citizen involvement is an important part of this plan, so a workshop will be held on Thursday, August 21, 2008 from 5-7 pm at the Town of Waynesville Recreation Center located at 550 Vance Street.

The purpose of the workshop will be to obtain citizen involvement in the planning process by providing information to interested citizens and by gathering citizens' suggestions and comments for improving Russ Avenue.

Citizens not able to attend the workshop but interesting in getting more information about the plan or in submitting comments may contact either:

Deniece Swinton, PE
Wilbur Smith Associates
4135 Mendenhall Oaks Parkway, Suite 160
High Point, NC 27265
(336) 819-4200, phone
(336) 819-4201, fax
dswinton@wilbursmith.com

Paul Benson, AICP
Town of Waynesville
280 Georgia Avenue
Waynesville, NC 28786
(828) 456-2004, phone
(828) 452-1492
planning@townofwaynesville.org

RUSS AVENUE CORRIDOR STUDY
Public Workshop #2 Summary

A Public Workshop to discuss the Russ Avenue Corridor Study was held on October 8, 2009 in Waynesville, North Carolina. The Public Workshop was held at the Waynesville Recreation Center located at 550 Vance Street from 5:00 pm - 7:00 pm. Staff members from the Town of Waynesville and Wilbur Smith Associates were on hand to speak with the residents and encourage discussion of the corridor study.

The table below lists the individuals who attended the workshop. Approximately twenty-seven (27) citizens signed in.

PUBLIC WORKSHOP ATTENDEES	
Norman Medford	**John Truitt**
Ron Reid	**Melissa Noppen**
Verona Martin	**Mike Milner**
Lynn Truitt	**Valerie Holloway**
Randy Cunningham	**Reuben Moore**
Kristen Hammett	**Donald Hummel**
Mr. & Mrs. Medford	**Todd Carrier**
Kathryn Kirkpatrick	**Linda Ferguson**
Becky Johnson	**Lee Gallaway**
Mark Shumpert	**Eleanor & Lyle Coffey**
Joe Taylor	**Joel Taylor**
John Burgin	**Tom Anspach**
Gavin Brown	

A total of twelve (12) comments were received and of those, seven (7) noted that overall they like the Russ Avenue Corridor Plan.

Some of the 'Likes' include:
- Parallel roads to Russ Avenue and rear access roads
- Bridge over Richland Creek to connect the Bi-Lo and Sears Shopping Centers
- Redesign of some intersections
- Landscaped medians
- Sidewalks and bike lanes on both sides of Russ Avenue

Some of the 'Dislikes' include:
- No round-a-bouts are being proposed
- Need pedestrian refuge islands in crosswalks
- No room for u-turns at intersections

ACTUAL COMMENTS RECEIVED

Address: 92 Daisy Avenue, Waynesville, NC

✓ Likes the Russ Avenue Corridor Plan.

Likes - The parallel roads to Russ Avenue that would run behind the Home Trust Bank on one side and then behind the Shell Gas Station and McDonalds etc. Very Good!

Dislikes - Not a dislike…a possible oversight. The ability of the residents from Love Lane to be able to make a left turn onto Russ. There are a number of residents up in that area. Would there be the possibility to connect another access road to the newly created road that would run behind the Shell Gas and McDonalds?

Address: 109 Conley Street, Waynesville, NC

✓ Likes the Russ Avenue Corridor Plan.

Likes - Bridge over creek between Bi-Lo and Sears. Rear access for Pizza Hut and Arby's.

Address: 253 Webster Road, Sylva, NC

✓ Likes the Russ Avenue Corridor Plan.

Likes - Should be safer due to access management. Multi-modal (Bike & Ped).

Dislikes - 6 signals proposed. All but Howell Mill/Dellwood and Walnut Street (due to RR bridge) could be roundabouts. (2-lane major, 1-lane minor, like Winston-Salem's South Main Street round-a-bout in Old Salem)

Address: 91 Depot Street / Animal Hospital of Waynesville, NC

✓ Likes the Russ Avenue Corridor Plan.

Likes

- Sidewalks and bike lanes on both sides
- Sidewalks separated from pavement by grass
- Landscaped medians
- Underground utilities
- Corrected and widen Dellwood Intersection
- Rear Connectors
- Greenway Connectivity

Dislikes

- Greenway should connect to Greenway along Howell Mill to Waynesville Recreation Center
- Bridge over Richland should be wide enough for walkers and bicycles.
- Need pedestrian refuge at pedestrian crosswalks
- Doesn't address traffic backup on Dellwood Road. Most of that road us is only 2 lanes in places still.

Address: None given
Likes some things.

Likes - trees

Dislikes - displacement of some existing businesses

Address: 275 Wildcat Mountain Road, Waynesville, NC
Likes - rear access roads.

Dislikes - drive thru loss at Arby's. No need for bike lanes on 4 lane roads. No need for right hand turn lane in front of Arby's.

Address: 524 Russ Avenue, Waynesville, NC
✓ Likes the Russ Avenue Corridor Plan.

Likes
- Getting roads lined up with the traffic signals
- Adding rear access roads
- Widening Russ Avenue with additional traffic lanes
- Median strip as long as U-Turns are available at the traffic signals

Dislikes - need a way to get larger trucks from Bible Baptist Drive to Southbound 276

This project would greatly enhance one of the main entrances to Waynesville. It is needed.

Address: 99 Pisgah Drive, Waynesville, NC
✓ Likes the Russ Avenue Corridor Plan.

Likes
- Landscape medians
- Sidewalks/Nature strips on both sides
- New bridge between Staples and Bi-Lo
- New connections parallel to Russ Avenue

Dislikes
- Dellwood/Howell Mill Road needs a round-a-bout
- There will be an increase of traffic on Howell Mill Road – A cut through to Old Asheville Highway
- Every cross walk should have a pedestrian refuge island
- A round-a-bout at Lee Street

Emailed

Likes

- Sidewalks w/ nature strip both sides
- Landscaped median
- New bridge to connect Waynesville Plaza w/ Miller St. near Bilo's
- new rear-access streets

Dislikes

- Absence of Pedestrian refuge islands at all crosswalks- this is egregious with my town's commitment to build and support a walkable community. Also, the census predicts that population growth will be in group over 50 yrs., the very group that needs a safe place to walk. Also, there are already folks using motorized wheelchairs to get around-folks need a safe place to pause and plan their next move at every crosswalk! please be sensitive to folks with mobility challenges
- Absence of roundabouts-we should at least have 2 to provide safe u-turn mov'ts. for larger vehicles, I was impressed that Reuben Moore, Division Operations Engineer from div 14 NCDOT made a good case for roundabouts. Reuben has participated in past workshops about Russ Ave. and he lobbied for roundabouts. Reuben is very familiar w other roundabouts in NC, and has the data about design, capacity, etc. What happened to the 2 roundabouts on first draft? Bottom line, roundabouts reduce town and county cost to law enforcement, and other emergency services
- In medians too much concrete, please allow for more landscaping-plans provide a better visual aid to keep vehicles off the raised median.

Emailed

Looks like some good changes may be coming down the pipe for Russ Ave. Shame it could take up to ten years before any of it takes place as these things are needed now.

Some folks seem to be concerned if a median is put in place and traffic has to go to an intersection to double back that they will lose business. Not so. I moved from Raleigh and in some areas that is what the traffic flow is and you just do it. No big deal. They'll get over it and I don't believe their business will suffer from it.

It was mentioned in the article possibly being able to make a U-Turn at the intersection so as to double back. If the turn lane will be in the exact same place it is now to make that turn I'm not sure vehicles can turn in that radius unless some of the sidewalk is taken out on the opposite side. Just a thought.

Address: None given

"Leave the existing house and put new street between Shell Station and this house." The house he is referring to is owned by his family and is located at 43 Frazier Street.

Address: 630 Welsh Partridge Circle, Biltmore Lake, NC

- ✓ Likes the Russ Avenue Corridor Plan.

Likes - How the plan allows pedestrian traffic and provides for the integration of green buffer areas. I also like the implementation of the center median to eliminate the "suicide turns" that we had in all ingress locations to Russ Avenue. I also like the way the intersections have been re-designed to be on axis and how all the traffic is unloaded on Russ Avenue in a "controlled" and organized manner. Great Job!! Now if the State only had the money to move now!!

Dislikes - I am not saying I dislike anything, it will be interesting to see how this plan actually works with existing topos, especially behind the CVS and McDonalds connection to Frazier Street. That could get expensive because that is like a 20% grade on the back side going to Frazier Street.

TOWN OF WAYNESVILLE

PUBLIC NOTICE

RUSS AVENUE CORRIDOR STUDY
PUBLIC WORKSHOP

The Town of Waynesville cordially invites you to the final workshop for the Russ Avenue Corridor Study. The purpose of this workshop is for representatives of the consulting firm, Wilbur Smith Associates, to present future travel demand projections and the recommended corridor improvement alternative to the public. There will be a facilitated open-house style meeting where the public may review plans and offer comments. A brief presentation of the plan will be made at 6:00 pm.

Date: Thursday, October 8, 2009
Time: 5:00 pm to 7:00 pm
Location: Waynesville Rec. Center, 550 Vance Street

We look forward to your participation!

If you are unable to attend the workshop, public comments will be accepted up to 30 days following the meeting. You may view the draft plan in the Town of Waynesville Development Office at 9 South Main Street. For more information please contact:

Paul Benson
Town of Waynesville
Planning Director
PO Box 100
Waynesville, NC 28786
(828) 456-2004
planning@townofwaynesville.org

Russ Avenue Corridor Progress Meeting

MEETING SUMMARY 1/14/09 1:00 PM WAYNESVILLE, NORTH CAROLINA

Wilbur Smith Associates Project No. 102706

MEETING CALLED BY	Deniece Swinton, PE
TYPE OF MEETING	Progress Meeting
FACILITATOR	Deniece Swinton, PE
ATTENDEE LIST	

NAME	AGENCY	PHONE	EMAIL
Scott Cook	NCDOT	828.631.1150	scook@ncdot.gov
Fred Baker	Town of Waynesville	828.456.4410	publicworksdirector@townofwaynesville.org
Jonathon Woodward	NCDOT	828.488.2131	jwoodward@dot.state.nc.us
Reuben Moore	NCDOT	828.586.2141	reubenmoore@ncdot.gov
Lee Galloway	Town of Waynesville	828.452.2491	Townmanager@townofwaynesville.org
Alison Melnikova	Town of Waynesville	828.452.2491	townmanagerassistant@townofwaynesville.org
Terry snow	Wilbur Smith Associates	336.819.4200	tsnow@wilbursmith.com
Deniece Swinton	Wilbur Smith Associates	336.819.4200	dswinton@wilbursmith.com

DISCUSSION

The following is a recap of the high points discussed at the meeting:

- Bridge over Richland Creek at Clayton for possible connection between shopping centers
- Widen Dellwood to accommodate left turn lane
- Consider making this a TIP project
- Develop a Memorandum of Agreement (MOA) for project improvements
- Bridge on Russ Avenue over creek needs to be widen to allow for left turn lane
- Provide access from Hardees to realigned Lee Street
- Shackford Street will be closed and have no back access to the Wachovia Bank
- Winston-Salem has a dual roundabout
- If roundabout doesn't work at the Dellwood/Howell Mill intersection, consider the Lee Street/Shopping Street intersection
- Need MPO Endorsement
- Look at widening Dellwood Road to accommodate an additional left turn lane
- Burger King sidewalks can be moved as ROW is along the back of the parking lot

- NCDOT is currently planning for crosswalks and ped heads crossing Walnut Street - $15-$20 total for crosswalks and ped heads
- Bridge at Clayton over Richland Creek

Meeting adjourned at 3:00

This concludes my understanding of the discussions held during the subject meeting. If there are discrepancies, errors, or omissions, please contact Deniece Swinton, PE DSwinton@wilbursmith.com by Wednesday January 28 at 5:00pm. If no changes are received by the said time, then this meeting summary will be considered accurate. If changes are required, then a revised meeting summary will be submitted on Friday January 30, 2009.

Attachment: Meeting Agenda
Meeting Attendee List

Comments Received

1-26-09 Fred Baker, Public Works Director, Town of Waynesville:
I thought that Mr. Moore's suggestion to consider a flyover bridge possibly at either the Barber Blvd. left turn or at the Howell Mill intersection was excellent in the event that a multilane roundabout design ran into issues. I am concerned that there needs to be alternatives to the Howell Mill roundabout due to site constraints and capacity requirements.

ACTION ITEMS	PERSON RESPONSIBLE	DEADLINE
Send official request to NCDOT for Long Johns Silver restaurant acquisition	Town of Waynesville	
Send official request to NCDOT for consideration to add Dellwood Road intersection improvements into Howell Mill Road TIP	Town of Waynesville	
Provide a pdf of Dellwood/Howell Mill intersection to Town of Waynesville to include in letter request	Deniece Swinton	1-30-09

Appendix D

Cost Estimating Spreadsheets

Russ Avenue Opinion of Probable Cost - Preferred Alternative

TOTAL PROJECT COST ESTIMATE

Preliminary Engineering	**Cost**
Preliminary Engineering (18%Construction Cost.):	$1,234,909.83
Total Preliminary Engineering Cost:	**$ 1,234,909.83**

Roadway	**Cost**
Roadway New-Location Sub-Total (page 3):	$ -
Roadway Widening Sub-Total (page 4):	$ 2,084,392.42
Roadway Special (page 6):	$ 988,000.00
Total Roadway Cost:	**$ 3,072,392.42**

Structures	**Cost**
Total Structure Cost (page 5):	$ 2,205,000.00
Total Structure Cost:	**$ 2,205,000.00**

Construction (Roadway & Structures)	**Cost**
Total Roadway Cost:	$ 3,072,392.42
Total Structure Cost:	$ 2,205,000.00
Roadway + Structure Cost:	**$ 5,277,392.42**
Contingency (30%):	**$ 1,583,217.73**
Construction Cost + Contingency	**$ 6,860,610.15**
Terrain Adjustment Factor (Piedmont*1.15%)	**$ 791,608.86**
Inflation (to 2008) 14%	**$ 960,485.42**
Total Construction Cost:	**$ 8,612,704.44**
(terrain - precontingency)	

Right-of-Way	**Cost**
Right-of-Way Sub-Total (page 7):	$ 3,669,189.55
Administration / Acquisition (30%):	$ 1,100,756.86
Relocation (10%):	$ 366,918.95
Adjusted Right-of-Way:	$ 5,136,865.36
Utility Relocation (page 7):	$ 527,745.45
Total Right-of-Way Cost:	**$ 5,664,610.82**

TOTAL PROJECT COST (Const. & R/W):	**$ 15,512,225.08**

rev. 12/13/06

Russ Avenue Opinion of Probable Cost - Preferred Alternative
0

ESTIMATED FUTURE YEAR COST INCREASES

	Year	Incr. / Yr (%)	Infl.Years	Design	Right-of-Way	Const.	Total Cost
PHASE I	FY 06-07	3%	1	$ 1,235,000	$ 5,665,000	$ 8,613,000	$ 15,513,000
							$ -
	FY 07-08	3%	2	$ 1,311,000	$ 6,010,000	$ 9,138,000	$ 16,459,000
							$ -
	FY 08-09	3%	3	$ 1,350,000	$ 6,191,000	$ 9,412,000	$ 16,953,000
							$ -
	FY 09-10	3%	4	$ 1,391,000	$ 6,377,000	$ 9,695,000	$ 17,463,000
							$ -
	FY 10-11	3%	5	$ 1,432,000	$ 6,568,000	$ 9,985,000	$ 17,985,000
							$ -
PHASE II	FY 11-12	3%	6	$ 1,475,000	$ 6,765,000	$ 10,285,000	$ 18,525,000
							$ -
	FY 12-13	3%	7	$ 1,519,000	$ 6,968,000	$ 10,593,000	$ 19,080,000
							$ -
	FY 13-14	3%	8	$ 1,565,000	$ 7,177,000	$ 10,911,000	$ 19,653,000
							$ -
	FY 14-15	3%	9	$ 1,612,000	$ 7,392,000	$ 11,239,000	$ 20,243,000
							$ -
	FY 15-16	3%	10	$ 1,660,000	$ 7,614,000	$ 11,576,000	$ 20,850,000
	FY 16-17	3%	11	$ 1,710,000	$ 7,842,000	$ 11,923,000	$ 21,475,000
	FY 17-18	3%	12	$ 1,761,000	$ 8,077,000	$ 12,281,000	$ 22,119,000
	FY 18-19	3%	13	$ 1,814,000	$ 8,320,000	$ 12,649,000	$ 22,783,000
	FY 19-20	3%	14	$ 1,869,000	$ 8,569,000	$ 13,028,000	$ 23,466,000
	FY 20-21	3%	15	$ 1,925,000	$ 8,826,000	$ 13,419,000	$ 24,170,000
	FY 21-22	3%	16	$ 1,982,000	$ 9,091,000	$ 13,822,000	$ 24,895,000
	FY 22-23	3%	17	$ 2,042,000	$ 9,364,000	$ 14,236,000	$ 25,642,000
	FY 23-24	3%	18	$ 2,103,000	$ 9,645,000	$ 14,664,000	$ 26,412,000
	FY 24-25	3%	19	$ 2,166,000	$ 9,934,000	$ 15,103,000	$ 27,203,000
	FY 25-26	3%	20	$ 2,231,000	$ 10,232,000	$ 15,557,000	$ 28,020,000
	FY 26-27	3%	21	$ 2,298,000	$ 10,539,000	$ 16,023,000	$ 28,860,000
	FY 27-28	3%	22	$ 2,367,000	$ 10,855,000	$ 16,504,000	$ 29,726,000
	FY 28-29	3%	23	$ 2,438,000	$ 11,181,000	$ 16,999,000	$ 30,618,000
	FY 29-30	3%	24	$ 2,511,000	$ 11,516,000	$ 17,509,000	$ 31,536,000

Russ Avenue Opinion of Probable Cost - Preferred Alternative

NEW-LOCATION ROADWAY

Description	Lin.Ft.	Miles	$ / Mile	Cost
2-lane c & g parking 2-sides		0.00	$ 2,400,000.00	$ -
2-lane c & g		0.00	$ 2,200,000.00	$ -
2-lane shoulder w/ 2' pvd shldrs		0.00	$ 2,200,000.00	$ -
2-lane shldr sect. W/ bike lanes		0.00	$ 2,200,000.00	$ -
2-lane divided c & g		0.00	$ 2,000,000.00	$ -
2-lane divided c & g w/ bike lanes		0.00	$ 2,700,000.00	$ -
3-lane c & g (41'b-b) or shldr.		0.00	$ 2,900,000.00	$ -
4-lane c & g (53' b-b)		0.00	$ 3,200,000.00	$ -
4-lane divided w/ med.- freeway		0.00	$4,400,000.00	$ -
4-lane divided c & g		0.00	$ 3,800,000.00	$ -
4-lane boulevard (grass med)		0.00	$ 3,800,000.00	$ -
4-lane divided c & g w/ bike lanes		0.00	$ 3,800,000.00	$ -
5-lane c & g w/ bike lanes		0.00	$ 3,800,000.00	$ -
5-lane c & g (65' b-b)		0.00	$ 3,700,000.00	$ -
6-lane divided c & g		0.00	$ 4,000,000.00	$ -
6-lane divided shldr (grass med)		0.00	$ 6,100,000.00	$ -
7-lane c & g (89' b-b)		0.00	$ 4,400,000.00	$ -
			Sub-Total:	$ -

rev. per NCDOT

{ } File name: m:\cip\costest\Opinion of Probable Cost_RussAve Sheet: New-Location
Version: (insert date time manually and update only when estimate is revised)

Russ Avenue Opinion of Probable Cost - Preferred Alternative

WIDENINGS

Description	Lin. Ft.	Miles	$/Mile	Cost
Existing 2-lane shoulder section to:				
3-lane shoulder or c&g section		0.00	$ 1,800,000.00	$ -
3-lane c&g section w/ median	3800.00	0.72	$ 2,200,000.00	$ 1,583,333.33
4-lane curb & gutter		0.00	$ 2,600,000.00	$ -
4-lane c&g w/ raised median		0.00	$ 3,200,000.00	$ -
4-lane shoulder w/median (non-freeway)		0.00	$ 3,000,000.00	$ -
4-lane shoulder w/median (freeway)		0.00	$ 3,500,000.00	$ -
5-lane curb & gutter		0.00	$ 2,900,000.00	$ -
5-lane shoulder section		0.00	$ 2,900,000.00	$ -
Existing 2-lane curb & gutter section to:				
3-lane curb & gutter		0.00	$ 1,800,000.00	$ -
4-lane curb & gutter		0.00	$ 2,600,000.00	$ -
5-lane curb & gutter		0.00	$ 2,900,000.00	$ -
Existing 5-lane w/ median to:				
6-lane w/median, inside widening		0.00	$ 4,700,000.00	$ -
6-lane w/median, outside widening		0.00	$ 9,700,000.00	$ -
8-lane w/median, outside widening		0.00	$ 9,600,000.00	$ -
24-foot shoulder section		0.00	$ 1,000,000.00	$ -
Widen for bicycle lanes				
Existing shoulder section				
add 2 ft. paved shoulders each side		0.00	$ 235,000.00	$ -
add 4 ft. paved shoulders each side		0.00	$ 470,000.00	$ -
add 6 ft. paved shoulders each side	2600.00	0.49	$ 705,000.00	$ 347,159.09
Existing shoulder section				
add curb and gutter 2 sides		0.00	$ 400,000.00	$ -

Description	Lin. Ft.	$/Lin. Ft.	Cost
Construction of turn-lane			
existing 4-lane divided	570.00	$ 270.00	$ 153,900.00
		Sub-Total:	$ 2,084,392.42

rev. 9/27/01

{ } File name: m:\cip\costest\Opinion of Probable Cost_RussAve Sheet: Widening
Version: (insert date time manually and update only when estimate is revised)

Russ Avenue Opinion of Probable Cost - Preferred Alternative
0

STRUCTURES

Bridges:	**Surface Area (ft^2)**		**$/ sq.ft.**		**Cost**
construct new bridge					
tangent section	13,500.00	$	90.00	$	1,215,000.00
curved section	11,000.00	$	90.00	$	990,000.00
widen existing bridge					
tangent section	-	$	110.00	$	-
curved section	-	$	110.00	$	-

Interchanges:	**Number**		**$/each**		**Cost**
grade separation	0.00	$	1,450,000.00	$	-
simple diamond	0.00	$	5,700,000.00	$	-
half clover	0.00	$	7,700,000.00	$	-
full clover	0.00	$	14,100,000.00	$	-
w/ 1 collect-dist	0.00	$	16,600,000.00	$	-
w/ 2 collect-dist	0.00	$	19,200,000.00	$	-
w/ 3 collect-dist	0.00	$	21,800,000.00	$	-
w/ 4 collect-dist	0.00	$	24,300,000.00	$	-
simple flyover	0.00	$	5,700,000.00	$	-
3-level flyover*	0.00	$	14,000,000.00	$	-
urban diamond	0.00	$	16,600,000.00	$	-
single point diamond**	0.00	$	17,000,000.00	$	-

*variable-$14 to $26M/each-depending on difficulty

**variable-$17 to $20,900.000/each-depending on difficulty

Culverts	**Length (ft)**	**$/linear foot**		**Cost**
Box Culvert	0.00	$2,000.00	$	-
Pipe Culvert	0.00	$220.00	$	-

Sub-Total:	$	2,205,000.00

rev. 9/27/01

Russ Avenue Opinion of Probable Cost - Preferred Alternative
0

SPECIAL ITEMS

Sidewalks	Lin. Ft.	$/Lin. Ft.	Cost
8 ft., 1-side	0	$ 40.00	$ -
8 ft., 2-sides	4600	$ 80.00	$ 368,000.00

Landscaping	Lin. Ft.	$/Lin. Ft.	Cost
enter length of project	4600.00	$ 50.00	$ 230,000.00

Railroad Xings (At Grade)	Each	$/Each	Cost
signals without gates	0.00	$110,000.00	$ -
signals with gates	0.00	$150,000.00	$ -
	0.00		

Railroad Xings (At Grade)	Lin.Ft.	$/Lin.Ft.	Cost
concrete railroad crossings-1 track	0.00	$800.00	$ -
concrete railroad crossings-2 tracks	0.00	$1,200.00	$ -

Traffic Signal	Units	$/Unit	Cost
Wood Pole Installation			
Revise traffic signal -1 approach	0.00	$ 15,000.00	$ -
Revise traffic signal -2 approach	0.00	$ 30,000.00	$ -
Revise traffic signal - 3 approach	0.00	$ 45,000.00	$ -
Revise traffic signal - 4 approach	5.00	$ 60,000.00	$ 300,000.00
New traffic signal- minor-minor	0.00	$ 50,000.00	$ -
New traffic signal- major-minor	1.00	$ 90,000.00	$ 90,000.00
New traffic signal- major-major	0.00	$ 120,000.00	$ -
Metal Pole Installation			
Revise traffic signal -1 approach	0.00	$ 18,000.00	$ -
Revise traffic signal -2 approach	0.00	$ 36,000.00	$ -
Revise traffic signal - 3 approach	0.00	$ 54,000.00	$ -
Revise traffic signal - 4 approach	0.00	$ 72,000.00	$ -
New traffic signal- minor-minor	0.00	$ 60,000.00	$ -
New traffic signal- major-minor	0.00	$ 100,000.00	$ -
New traffic signal- major-major	0.00	$ 135,000.00	$ -
Metal Pole, Mast Arm Installation			
Revise traffic signal -1 approach	0.00	$ 20,000.00	$ -
Revise traffic signal -2 approach	0.00	$ 39,000.00	$ -
Revise traffic signal - 3 approach	0.00	$ 60,000.00	$ -
Revise traffic signal - 4 approach	0.00	$ 78,000.00	$ -
New traffic signal- minor-minor	0.00	$ 65,000.00	$ -
New traffic signal- major-minor	0.00	$ 115,000.00	$ -
New traffic signal- major-major	0.00	$ 160,000.00	$ -
Single Lane Roundabout	0.00	$ 200,000.00	$ -

Sub-Total: $ 988,000.00

Russ Avenue Opinion of Probable Cost - Preferred Alternative

RIGHT-OF-WAY

Vacant Land	**Sq. Feet**	**Acres**	**$/Acre**	**Cost**
farmland / wooded	0	0.00	$ 65,000.00	$ -
commercial	50950	1.17	$ 655,000.00	$ 766,121.44
residential	1300	0.03	$ 155,000.00	$ 4,625.80
office and industrial	0	0.00	$ 265,000.00	$ -

Structures (total takes)*	**Property Cost**	**Cost**
(cost of lots + structures)		
residential	$0.00	$ -
commercial	$876,460.00	$ 876,460.00
industrial	$0.00	$ -
office	$0.00	$ -

*Determine settlement value from property tax structure information and add 50-75% to get structure damage

Proximity Damages	**Property Cost**	**% Damage**	**Cost**
Dist. from structure(s) to new right-of-way line			
41 ft (12 m) to 50 ft (15 m)	$1,742,790.00	7%	$ 121,995.30
31 ft (9 m) to 40 ft (12 m)	$0.00	15%	$ -
21 ft (6 m) to 30 ft (9 m)	$904,550.00	30%	$ 271,365.00
11 ft (3 m) to 20 ft (6 m)	$1,701,990.00	40%	$ 680,796.00
less than 10 ft (3 m)	$1,579,710.00	60%	$ 947,826.00

Wetland Mitigation	**Acres**	**$/Acre**	**Cost**
enter acreage displaced		$ 70,000.00	$ -

Right-of-way Sub-Total: $ 3,669,189.55

Streetlight Installation / Relocation	**Lin. Ft.**	**$/Lin. Ft.**	**Cost**
enter length of project, $ is for both sides	4600	$ 17.00	$78,200.00

Water / Sewer Utility Relocations	**Lin. Ft.**	**$/Lin. Ft.**	**Cost**
new location or if not located under existing pavement**:			
water line, length of widening	4600	$ 35.00	$ 161,000.00
sewer line, length of widening	4600	$ 40.00	$ 184,000.00
** for 8"-10", higher cost for larger lines			

Utility Relocation - Widening	**Lin.Ft.**	**Miles**	**$/mile**	**Cost**
For widening projects, enter length of widening:	4600.00	0.87	$ 120,000	$ 104,545.45

Utility Relocation - New Location	**# intersections**	**$/int.**	**Cost**
For new-location projects, enter # of major roads intersected:		$ 15,000	$ -

Utility Reloc. Sub-Total: $527,745.45

rev. 1/2004

{ } File name: m:\cip\costest\Opinion of Probable Cost_RussAve Sheet: Right of Way
Version: (insert date time manually and update only when estimate is revised)

Opinion of Probable Cost - Sidestreet connectors

TOTAL PROJECT COST ESTIMATE

Preliminary Engineering	**Cost**
Preliminary Engineering (18%Construction Cost.):	$413,470.91
Total Preliminary Engineering Cost:	**$ 413,470.91**

Roadway	**Cost**
Roadway New-Location Sub-Total (page 3):	$ 875,000.00
Roadway Widening Sub-Total (page 4):	$ 645,969.70
Roadway Special (page 6):	$ 146,000.00
Total Roadway Cost:	**$ 1,666,969.70**

Structures	**Cost**
Total Structure Cost (page 5):	$ 100,000.00
Total Structure Cost:	**$ 100,000.00**

Construction (Roadway & Structures)	**Cost**
Total Roadway Cost:	$ 1,666,969.70
Total Structure Cost:	$ 100,000.00
Roadway + Structure Cost:	**$ 1,766,969.70**
Contingency (30%):	**$ 530,090.91**
Construction Cost + Contingency	**$ 2,297,060.61**
Terrain Adjustment Factor (Piedmont*1.15%)	**$ 265,045.45**
Inflation (to 2008) 14%	**$ 321,588.48**
Total Construction Cost:	**$ 2,883,694.55**
(terrain - precontingency)	

Right-of-Way	**Cost**
Right-of-Way Sub-Total (page 7):	$ 1,720,868.35
Administration / Acquisition (30%):	$ 516,260.50
Relocation (10%):	$ 172,086.83
Adjusted Right-of-Way:	$ 2,409,215.69
Utility Relocation (page 7):	$ 394,600.00
Total Right-of-Way Cost:	**$ 2,803,815.69**

TOTAL PROJECT COST (Const. & R/W):	**$ 6,100,981.14**

rev. 12/13/06

{ } File name: m:\cip\costest\Opinion of Probable Cost_sidestreets Sheet: Current Total Cost
Version: (insert date time manually and update only when estimate is revised)

Opinion of Probable Cost - Sidestreet connectors
0

ESTIMATED FUTURE YEAR COST INCREASES

	Year	Incr. / Yr (%)	Infl.Years	Design	Right-of-Way	Const.	Total Cost
PHASE I	FY 06-07	3%	1	$ 414,000	$ 2,804,000	$ 2,884,000	$ 6,102,000
							$ -
	FY 07-08	3%	2	$ 440,000	$ 2,975,000	$ 3,060,000	$ 6,475,000
							$ -
	FY 08-09	3%	3	$ 453,000	$ 3,065,000	$ 3,152,000	$ 6,670,000
							$ -
	FY 09-10	3%	4	$ 466,000	$ 3,156,000	$ 3,246,000	$ 6,868,000
							$ -
	FY 10-11	3%	5	$ 480,000	$ 3,251,000	$ 3,344,000	$ 7,075,000
							$ -
PHASE II	FY 11-12	3%	6	$ 495,000	$ 3,349,000	$ 3,444,000	$ 7,288,000
							$ -
	FY 12-13	3%	7	$ 510,000	$ 3,449,000	$ 3,547,000	$ 7,506,000
							$ -
	FY 13-14	3%	8	$ 525,000	$ 3,553,000	$ 3,654,000	$ 7,732,000
							$ -
	FY 14-15	3%	9	$ 541,000	$ 3,659,000	$ 3,763,000	$ 7,963,000
							$ -
	FY 15-16	3%	10	$ 557,000	$ 3,769,000	$ 3,876,000	$ 8,202,000
	FY 16-17	3%	11	$ 574,000	$ 3,882,000	$ 3,993,000	$ 8,449,000
	FY 17-18	3%	12	$ 591,000	$ 3,998,000	$ 4,112,000	$ 8,701,000
	FY 18-19	3%	13	$ 608,000	$ 4,118,000	$ 4,236,000	$ 8,962,000
	FY 19-20	3%	14	$ 627,000	$ 4,242,000	$ 4,363,000	$ 9,232,000
	FY 20-21	3%	15	$ 645,000	$ 4,369,000	$ 4,494,000	$ 9,508,000
	FY 21-22	3%	16	$ 665,000	$ 4,500,000	$ 4,628,000	$ 9,793,000
	FY 22-23	3%	17	$ 685,000	$ 4,635,000	$ 4,767,000	$ 10,087,000
	FY 23-24	3%	18	$ 705,000	$ 4,774,000	$ 4,910,000	$ 10,389,000
	FY 24-25	3%	19	$ 726,000	$ 4,917,000	$ 5,058,000	$ 10,701,000
	FY 25-26	3%	20	$ 748,000	$ 5,065,000	$ 5,209,000	$ 11,022,000
	FY 26-27	3%	21	$ 771,000	$ 5,217,000	$ 5,366,000	$ 11,354,000
	FY 27-28	3%	22	$ 794,000	$ 5,373,000	$ 5,527,000	$ 11,694,000
	FY 28-29	3%	23	$ 818,000	$ 5,534,000	$ 5,692,000	$ 12,044,000
	FY 29-30	3%	24	$ 842,000	$ 5,700,000	$ 5,863,000	$ 12,405,000

Opinion of Probable Cost - Sidestreet connectors

NEW-LOCATION ROADWAY

Description	Lin.Ft.	Miles	$ / Mile	Cost
2-lane c & g parking 2-sides		0.00	$ 2,400,000.00	$ -
2-lane c & g	2100	0.40	$ 2,200,000.00	$ 875,000.00
2-lane shoulder w/ 2' pvd shldrs		0.00	$ 2,200,000.00	$ -
2-lane shldr sect. W/ bike lanes		0.00	$ 2,200,000.00	$ -
2-lane divided c & g		0.00	$ 2,300,000.00	$ -
2-lane divided c & g w/ bike lanes		0.00	$ 2,700,000.00	$ -
3-lane c & g (41'b-b) or shldr.		0.00	$ 2,900,000.00	$ -
4-lane c & g (53' b-b)		0.00	$ 3,200,000.00	$ -
4-lane divided w/ med.- freeway		0.00	$4,400,000.00	$ -
4-lane divided c & g		0.00	$ 3,800,000.00	$ -
4-lane boulevard (grass med)		0.00	$ 3,800,000.00	$ -
4-lane divided c & g w/ bike lanes		0.00	$ 3,800,000.00	$ -
5-lane c & g w/ bike lanes		0.00	$ 3,800,000.00	$ -
5-lane c & g (65' b-b)		0.00	$ 3,700,000.00	$ -
6-lane divided c & g		0.00	$ 4,000,000.00	$ -
6-lane divided shldr (grass med)		0.00	$ 6,100,000.00	$ -
7-lane c & g (89' b-b)		0.00	$ 4,400,000.00	$ -
			Sub-Total:	$ 875,000.00

rev. per NCDOT

Opinion of Probable Cost - Sidestreet connectors

WIDENINGS

Description	Lin. Ft.	Miles	$/Mile	Cost
Existing 2-lane shoulder section to:				
3-lane shoulder or c&g section		0.00	$ 1,800,000.00	$ -
3-lane c&g section w/ median		0.00	$ 2,200,000.00	$ -
4-lane curb & gutter		0.00	$ 2,600,000.00	$ -
4-lane c&g w/ raised median		0.00	$ 3,200,000.00	$ -
4-lane shoulder w/median (non-freeway)		0.00	$ 3,000,000.00	$ -
4-lane shoulder w/median (freeway)		0.00	$ 3,500,000.00	$ -
5-lane curb & gutter		0.00	$ 2,900,000.00	$ -
5-lane shoulder section		0.00	$ 2,900,000.00	$ -
Existing 2-lane curb & gutter section to:				
3-lane curb & gutter		0.00	$ 1,800,000.00	$ -
4-lane curb & gutter		0.00	$ 2,600,000.00	$ -
5-lane curb & gutter		0.00	$ 2,900,000.00	$ -
Existing 5-lane w/ median to:				
6-lane w/median, inside widening		0.00	$ 4,700,000.00	$ -
6-lane w/median, outside widening		0.00	$ 9,700,000.00	$ -
8-lane w/median, outside widening		0.00	$ 9,600,000.00	$ -
24-foot shoulder section	1700.00	0.32	$ 1,000,000.00	$ 321,969.70
Widen for bicycle lanes				
Existing shoulder section				
add 2 ft. paved shoulders each side		0.00	$ 235,000.00	$ -
add 4 ft. paved shoulders each side		0.00	$ 470,000.00	$ -
add 6 ft. paved shoulders each side		0.00	$ 705,000.00	$ -
Existing shoulder section				
add curb and gutter 2 sides		0.00	$ 400,000.00	$ -

Description	Lin. Ft.	$/Lin. Ft.	Cost
Construction of turn-lane			
existing 4-lane divided	1200.00	$ 270.00	$ 324,000.00
		Sub-Total:	$ 645,969.70

rev. 9/27/01

Opinion of Probable Cost - Sidestreet connectors
0

STRUCTURES

Bridges:	**Surface Area (ft^2)**	**$/ sq.ft.**	**Cost**
construct new bridge			
tangent section	-	$ 90.00	$ -
curved section	-	$ 90.00	$ -
widen existing bridge			
tangent section	-	$ 110.00	$ -
curved section	-	$ 110.00	$ -

Interchanges:	**Number**	**$/each**	**Cost**
grade separation	0.00	$ 1,450,000.00	$ -
simple diamond	0.00	$ 5,700,000.00	$ -
half clover	0.00	$ 7,700,000.00	$ -
full clover	0.00	$ 14,100,000.00	$ -
w/ 1 collect-dist	0.00	$ 16,600,000.00	$ -
w/ 2 collect-dist	0.00	$ 19,200,000.00	$ -
w/ 3 collect-dist	0.00	$ 21,800,000.00	$ -
w/ 4 collect-dist	0.00	$ 24,300,000.00	$ -
simple flyover	0.00	$ 5,700,000.00	$ -
3-level flyover*	0.00	$ 14,000,000.00	$ -
urban diamond	0.00	$ 16,600,000.00	$ -
single point diamond**	0.00	$ 17,000,000.00	$ -

*variable-$14 to $26M/each-depending on difficulty

**variable-$17 to $20,900.000/each-depending on difficulty

Culverts	**Length (ft)**	**$/linear foot**	**Cost**
Box Culvert	50.00	$2,000.00	$ 100,000.00
Pipe Culvert		$220.00	$ -
		Sub-Total:	$ 100,000.00

rev. 9/27/01

{ } File name: m:\cip\costest\Opinion of Probable Cost_sidestreets Sheet: Structures
Version: (insert date time manually and update only when estimate is revised)

Opinion of Probable Cost - Sidestreet connectors
0

SPECIAL ITEMS

Sidewalks	Lin. Ft.	$/Lin. Ft.	Cost
8 ft., 1-side	750	$ 40.00	$ 30,000.00
8 ft., 2-sides	1450	$ 80.00	$ 116,000.00
Landscaping	**Lin. Ft.**	**$/Lin. Ft.**	**Cost**
enter length of project	0.00	$ 50.00	$ -
Railroad Xings (At Grade)	**Each**	**$/Each**	**Cost**
signals without gates	0.00	$110,000.00	$ -
signals with gates	0.00	$150,000.00	$ -
	0.00		
Railroad Xings (At Grade)	**Lin.Ft.**	**$/Lin.Ft.**	**Cost**
concrete railroad crossings-1 track	0.00	$800.00	$ -
concrete railroad crossings-2 tracks	0.00	$1,200.00	$ -
Traffic Signal	**Units**	**$/Unit**	**Cost**
Wood Pole Installation			
Revise traffic signal -1 approach	0.00	$ 15,000.00	$ -
Revise traffic signal -2 approach	0.00	$ 30,000.00	$ -
Revise traffic signal - 3 approach	0.00	$ 45,000.00	$ -
Revise traffic signal - 4 approach	0.00	$ 60,000.00	$ -
New traffic signal- minor-minor	0.00	$ 50,000.00	$ -
New traffic signal- major-minor	0.00	$ 90,000.00	$ -
New traffic signal- major-major	0.00	$ 120,000.00	$ -
Metal Pole Installation			
Revise traffic signal -1 approach	0.00	$ 18,000.00	$ -
Revise traffic signal -2 approach	0.00	$ 36,000.00	$ -
Revise traffic signal - 3 approach	0.00	$ 54,000.00	$ -
Revise traffic signal - 4 approach	0.00	$ 72,000.00	$ -
New traffic signal- minor-minor	0.00	$ 60,000.00	$ -
New traffic signal- major-minor	0.00	$ 100,000.00	$ -
New traffic signal- major-major	0.00	$ 135,000.00	$ -
Metal Pole, Mast Arm Installation			
Revise traffic signal -1 approach	0.00	$ 20,000.00	$ -
Revise traffic signal -2 approach	0.00	$ 39,000.00	$ -
Revise traffic signal - 3 approach	0.00	$ 60,000.00	$ -
Revise traffic signal - 4 approach	0.00	$ 78,000.00	$ -
New traffic signal- minor-minor	0.00	$ 65,000.00	$ -
New traffic signal- major-minor	0.00	$ 115,000.00	$ -
New traffic signal- major-major	0.00	$ 160,000.00	$ -
Single Lane Roundabout	0.00	$ 200,000.00	$ -
		Sub-Total:	$ 146,000.00

{ } File name: m:\cip\costest\Opinion of Probable Cost_sidestreets Sheet: Special
Version: (insert date time manually and update only when estimate is revised)

Opinion of Probable Cost - Sidestreet connectors

RIGHT-OF-WAY

Vacant Land	Sq. Feet	Acres	$/Acre	Cost
farmland / wooded	0	0.00	$ 65,000.00	$ -
commercial	73000	1.68	$ 655,000.00	$ 1,097,681.36
residential	7700	0.18	$ 155,000.00	$ 27,398.99
office and industrial	0	0.00	$ 265,000.00	$ -

Structures (total takes)*	Property Cost		Cost
(cost of lots + structures)			
residential	$44,370.00		$ 44,370.00
commercial	$229,770.00		$ 229,770.00
industrial	$0.00		$ -
office	$0.00		$ -

*Determine settlement value from property tax structure information and add 50-75% to get structure damage

Proximity Damages	Property Cost	% Damage	Cost
Dist. from structure(s) to new right-of-way line			
41 ft (12 m) to 50 ft (15 m)	$0.00	7%	$ -
31 ft (9 m) to 40 ft (12 m)	$0.00	15%	$ -
21 ft (6 m) to 30 ft (9 m)	$0.00	30%	$ -
11 ft (3 m) to 20 ft (6 m)	$103,140.00	40%	$ 41,256.00
less than 10 ft (3 m)	$467,320.00	60%	$ 280,392.00

Wetland Mitigation	Acres	$/Acre	Cost
enter acreage displaced		$ 70,000.00	$ -

Right-of-way Sub-Total:	$ 1,720,868.35

Streetlight Installation / Relocation	Lin. Ft.	$/Lin. Ft.	Cost
enter length of project, $ is for both sides	3800	$ 17.00	$64,600.00

Water / Sewer Utility Relocations	Lin. Ft.	$/Lin. Ft.	Cost
new location or if not located under existing pavement**:			
water line, length of widening	3800	$ 35.00	$ 133,000.00
sewer line, length of widening	3800	$ 40.00	$ 152,000.00
** for 8"-10", higher cost for larger lines			

Utility Relocation - Widening	Lin.Ft.	Miles	$/mile	Cost
For widening projects, enter length of widening:		0.00	$ 120,000	$ -

Utility Relocation - New Location	# intersections	$/int.	Cost
For new-location projects, enter # of major roads intersected:	3.00	$ 15,000	$ 45,000.00

Utility Reloc. Sub-Total:	$394,600.00

rev. 1/2004

{ } File name: m:\cip\costest\Opinion of Probable Cost_sidestreets Sheet: Right of Way
Version: (insert date time manually and update only when estimate is revised)

Appendix D

Funding Opportunities

Funding and financing options and programs for transportation in use by municipalities in North Carolina and elsewhere

Regional Transportation Alliance
Focused, Accelerated, Simple, and Timely *(FAST)* Research Team report

December 11, 2009

Summary
This research report summarizes various existing and emerging funding options in use by municipalities in North Carolina and elsewhere. Not all options are currently available for implementation in North Carolina.

Contents

RTA volunteers for this report

- AECOM (Sunny Nandagiri)
- K&L Gates (Mack Paul, Eric Braun)
- MACTEC (Bob Miller, Miguel Frisco)
- Wetherill Engineering (Frank Price)
- Wilbur Smith Associates (Will Letchworth, Roberto Miquel)
- WSP Sells (Ross Massey, Mike Surasksy)

I. Existing and potential traditional local revenue options

I.1 - Transit local options bill of 2009: H 148 (SL 2009-527) Congestion Relief / Intermodal Transport Fund

Summary:

Transit local options legislation, signed by North Carolina Governor Bev Perdue on August 27, 2009, greatly expanded the breadth of local options for counties, regional transit authorities, and Research Triangle Park to accelerate transit investments. The legislation also established a state funding framework termed the "Congestion Relief and Intermodal Transportation 21st Century Fund," although the 2009 passage did not include any actual state-level funding.

Benefits:

Legislation signed in summer 2009 greatly increased existing local empowerment options to fund their multimodal transportation future.

Implementation process:

All local funding sources require affirmative votes by boards of commissioners, boards of trustees, etc. Furthermore, sales taxes require additional approvals before placing on the ballot as well as passage of a voter referendum.

Current usage in North Carolina (partial list):

- Mecklenburg County (Charlotte) has implemented a 1/2-cent sales tax to fund their existing bus and light rail system
- Triangle Transit has implemented an existing $5 fee to fund their existing regional bus and vanpool system
- Both of these examples were permitted by legislation that was enacted prior to the passage of the 2009 Transit Local Options bill.

Current usage in other states (partial list):

Counties in California, Colorado, and several other states have implemented sales taxes to fund transit.

Additional information:

Summary of transit local options permitted in North Carolina under H148:

- 1/2 cent county local option sales tax (Durham, Orange, Wake, Guilford, Forsyth counties only)
  - Requires county commissioner and MPO approval of financial plan developed by regional transit agency
  - Requires county commissioners to request referendum
  - Requires passage of voter referendum
  - Funding to be distributed to county and municipalities by population
- $7 county local option vehicle registration fee (all counties)
  - Requires county commissioner approval, but not referendum
  - Funding provided to counties and municipalities by population, or to regional transit authority by interlocal agreement with county
- $3 regional local option vehicle registration fee inflation adjustment for Triangle Transit ($2 until July 1, 2010)

- Requires approval of regional transit agency and all county commissions, but not referenda
- Funding provided to regional transit agency

- $0.10 Production and services district property tax increment for Research Triangle Park
  - Requires request from RTP Owners and Tenants advisory committee and approval by both counties
  - Each county levies tax; resources must serve or benefit RTP

I.2 - County authority referenda, primarily focused on schools: In 2007 appropriations act (H1473, SL 2007-323)

Summary:

Local option land transfer tax and local option sales tax revenue options were included in the 2007 appropriations act. A county may implement a land transfer tax of up to 0.4% (increments of 0.1%), or a sales tax of 0.25%, but not both. They may be used for any lawful purpose, with the most common focus being education.

Benefits:

This authority provides a potential additional local source of revenue for infrastructure; however, most conversations in the Triangle have focused on using this possible future resource for education.

Implementation process:

Requires affirmative vote of county commissioners subsequent to passage of a voter referendum. Voters can approve both referenda, but a county can only implement one source.

Current usage in North Carolina:

- More than 50 of the state's 100 counties have considered county authority referenda since 2007.
- There have been a total of 8 successful sales tax referenda since 2007 out of approximately 50 attempts (some counties have had a sales tax referendum more than once). In 2007, voters in Catawba, Martin, Pitt, Sampson, and Surry counties passed the sales tax referendum. In 2008, voters in Alexander, Cumberland, and Haywood counties passed the sales tax referendum.
- In the Triangle region, Harnett, Johnson, Person, Nash, and Moore counties have all unsuccessfully attempted a sales tax referendum. In 2009, voters in Harnett and Lee counties will consider a sales tax referendum.
- There have been zero successful land transfer tax referenda since 2007 out of more than 20 attempts (some counties have had a land transfer tax referendum more than once).
- In the Triangle region, Orange, Johnston, Chatham, Harnett, and Moore counties have all unsuccessfully attempted a land transfer tax referendum.

Additional information:

- NC Association of County Commissioners information on County Authority Referenda
- FAQs: http://www.ncacc.org/revenueauthority-q&a.html
- Referendum history: http://www.ncacc.org/2008revenueoptions.html

I.3 - Highway local option (not yet available in NC; e.g., S 222 Wilmington local option sales tax for congestion relief)

Overview:

Highway local options for use by municipalities

Benefits:

If S222 or a similar bill were implemented, it would provide an additional local source of revenue for congestion relief.

Implementation process:

If S222 were implemented in current form, it would require affirmative vote of city council subsequent to passage of a voter referendum to implement a ½-cent sales tax, and would require cost analysis for each project prior to referendum. Current form includes provision for seven year sunset.

Current usage in North Carolina:

N/A -- S222 is eligible for consideration in the 2010 short session of the NC General Assembly but has not passed either chamber in its present form.

Current usage in other states (partial list):

Several counties in South Carolina, most notably the York County (adjacent to Charlotte) "Pennies for Progress" program.

Additional information:

- Pennies for Progress [http://www.penniesforprogress.net/]

II. Public-Private Partnership funding and financing methods

II.1 - Overview of public-private partnerships

Introduction:

Public-private partnerships comprise strategies to foster economic development and infrastructure acceleration through the use of tax-exempt and other public finance programs and vehicles (bonds, tax credits, PDF, SAD, revolving loan funds). Methods under the umbrella heading of "public-private partnerships" are private investment predicated on public investment and vice versa.

Traditionally, public-private partnership arrangements (PPP or P3) were primarily focused on major infrastructure projects. These are contractual agreements formed between a public agency and a private sector entity that allow for greater private sector participation in the delivery and financing of transportation projects. Expanding the private sector role allows the public agencies to tap private sector technical, management and financial resources in new ways to achieve certain public agency objectives such as greater cost and schedule certainty, supplementing in-house staff, innovative technology applications, specialized expertise or access to private capital.

The private partner can expand its business opportunities in return for assuming the new or expanded responsibilities and risks.

Benefits:

PPPs provide benefits by allocating the responsibilities to the party – either public or private – that is best positioned to control the activity that will produce the desired result. With PPPs, this is accomplished by specifying the roles, risks and rewards contractually, so as to provide incentives for maximum performance and the flexibility necessary to achieve the desired results.

The primary benefits of using PPPs to deliver transportation projects include:

- Expedited completion compared to conventional project delivery methods;
- Project cost savings;
- Improved quality and system performance from the use of innovative materials and management techniques;
- Substitution of private resources and personnel for constrained public resources; and
- Access to new sources of private capital.

Implementation process:

Public agencies generally determine the scope of a PPP based on their specific transportation needs and policy objectives. The first step in the process then involves identification of the activities to be included in the procurement. Traditionally, public transportation owners acquire services through a competitive procurement process for each separate activity, either on a qualifications basis (for professional services) or low bid basis (for construction and technology). However, the traditional procurement process is often not conducive to the use of PPP.

II.2 - Project Development Financing (PDF) a/k/a tax increment financing (in other states)

Overview:

Allows financing of public improvements using an increment of future tax revenue generated from development within a defined district.

Benefits:

Ties financing of public infrastructure to future tax revenue generated by properties benefited from the public improvement. Encourages economic development that would not otherwise happen. Does not impact local government's bond rating.

Implementation process:

Creation of PDF District can be initiated by private owner or local government. Requires local government to approve district, establish financing plan, and obtain approval of Local Government Commission. Local government then issues bonds to pay for improvements.

Current usage in North Carolina:

While authorized by constitional amendment in 2004, only three projects to date have used PDF (Roanoke Rapids, Woodfin, Buncombe County, and Kannapolis Technology Campus)

External example:

City of Chicago Tax Increment Financing (TIF) Program -- used to promote private investment in blighted areas of the City, with funds generated by growth in the Equalized Assessed Valuation (EAV) of properties within a designated district over a period of 23 years.

II.3 - Synthetic Project Development financing a/k/a synthetic tax increment financing (in other states)

Overview:

Allows financing of public improvements using an increment of future tax revenue generated from development within a defined district.

Benefits:

Ties financing of public infrastructure to future tax revenue generated by properties benefited from the public improvement. Encourages economic development that would not otherwise happen. Does not impact local government's bond rating. Unlike a standard project development financing (PDF) arrangement, a synthetic TIF arrangement does not require the local government to issue bonds, and does not require Local Government Commission approval. Developer does not get use of future tax revenue to pay for public improvements unless project produces additional revenue.

Apart from the more flexible approval process and lack of public debt issuance, synthetic TIF is similar in theory to PDF. By putting all risk on the developer, synthetic TIF may make more sense in areas where development is more likely to occur.

Implementation process:

Handled through agreement between developer and local or county government. Private developer borrows money against future revenue generated by project. Local or county government refunds developer through annual grants, assuming anticipated tax revenue is generated by project.

Current usage in North Carolina:

Multiple examples in North Carolina, mostly in the City of Charlotte and Mecklenburg County. North Mecklenburg commuter rail line is to be funded in part with synthetic TIF. Wake County PDF policy expresses preference for synthetic TIF over PDF.

II.4 - Special assessment districts (SADs)

Overview:

A Special Assessment District (SAD) is a geographic area in which the market value of real estate is enhanced due to the influence of a public improvement and in which a tax is apportioned to recover the costs of the public improvement. Individual special assessment levies may be made only in a Special Assessment District. The SAD is one of two kinds of geographic areas commonly associated with a special assessment levy.

Benefits:

In 2008, the General Assembly adopted Session Law 2008-165, which authorizes local governments to impose special assessments to finance the capital costs of many public infrastructure projects. In August of 2009, the General Assembly amended the SAD enabling legislation to allow SADs to be used for the same types of projects that PDF can be used for. Additionally, the amendment allowed for the use of SADs to finance renewable energy projects (see SL 2009-525). One of the more attractive features of SADs is the ability to include finance professional services costs, rights-of-way purchasing, and up to two years of interest in the amount financed through the SAD.

Although local governments have had the authority to impose special assessments, the recent legislation makes this tool much more feasible for large projects. The most advantageous provision of the legislation concerns the time period over which the assessments may be paid. Prior to Session Law 2008-165, property owners within a district were required to repay the special assessment within ten years. SADs may now be paid in annual installments over a maximum of thirty years. By providing for an extended amortization period, and thereby making the individual assessments more affordable, the public infrastructure improvements are now more feasible. Also, under SL 2009-575, the General Assembly allowed for additional flexibility so that the public bidding requirements need only be complied with if more than 25% of the cost of a project will be funded using general obligation debt or general revenues.

Implementation process:

Local governments may impose special assessments under this new authority only after first receiving a petition from owners of property benefited by the project. The petition must be signed by a majority of property owners in an area to be assessed (representing at least 66 percent of the assessed value of real property to be assessed). Also, the petition must include a description of the proposed project, an estimate of the project's cost, and an estimate of the portion of the cost to be assessed against owners of benefited property.

Current usage in North Carolina:

None as of yet

Additional information:

Example: Bloomfield, Michigan
http://www.bloomfieldtwp.org/Services/EES/Engineering/SpecialAssessmentDistricts.htm

II.5 - Business Improvement Districts (BIDs) or Municipal Services District (MSD)

Overview:

A Municipal Service District (MSD) or a Business Improvement District (collectively called a BID) is a self-taxing district that uses additional property tax dollars to improve its district such as accelerating transportation and infrastructure improvement projects. Typically, BIDs are not used to finance major infrastructure improvements based on the amount of assessment. BIDs are generally used for enhanced public safety, street cleaning, and marketing the district.

Benefits:

BIDs are funded by a self-imposed and self-regulated ad valorem tax on real and personal properties within the district.

Implementation process:

BIDs are created by a local governing body through a simple majority vote, after development of a map showing the proposed district, a report showing the proposed district meets the statutory criteria, public notice and a hearing to consider the merits of creating the BID.

Current usage in North Carolina:

Downtown Raleigh BID, managed by the Downtown Raleigh Alliance

Hillsborough Street BID, administered by the Hillsborough Street Community Service (HSCS) corporation

II.6 - Joint Development Agreements

Overview:

A joint development agreement is generally defined as a real estate development project that involves coordination among multiple parties to develop sites near transit, usually on publicly-owned land. A joint development agreement typically involves the financing and development of a project that incorporates both transit facilities and private development. Such an agreement could include a cost-sharing agreement to pay for transit infrastructure, a revenue-sharing agreement to divide profits from increased real estate values, or a combination of the two. Cost-sharing agreements usually involve cooperation to pay for infrastructure that helps to integrate transit with surrounding development. Revenue-sharing agreements distribute the revenues that result from development among joint development partners. Examples of revenue-sharing agreements include ground lease revenues, air rights payments, or in some cases direct participation in rents or other revenues from development.

Benefits:

Similar to TIFs, SADs and CIDs, joint development agreements provide another value capture mechanism to fund transit without requiring a direct outlay of government funding. However, joint development agreements are more flexible than the other tools and can be tailored to a particular situation.

Implementation process:

There is no single process for implementing joint development agreements. Typically, they require a public hearing by the government authority entering the agreement and formal approval by that body. In practice, the transit authority or local government will issue a Request for Qualifications or Request for Proposal to create interest and competition for the development rights in a transit area. The RFQ or RFP may be for a single development project or a system wide proposal.

Current usage in North Carolina:

Cherokee Investment Partners master development agreement with Triangle Transit Authority

Example:

As noted above, Triangle Transit Authority entered into a master development agreement with Cherokee Investment Partners, which has been viewed as a model around the country. This agreement gives Cherokee the ability to coordinate transit oriented development at future rail stations, including land owned by Triangle Transit and additional land purchased by Cherokee. Station development plans would be reviewed by local and state agencies to ensure that they meet community needs and promote transit use. One of the potential advantages of this approach is that it means the transit agency or city only needs to issue one RFP. It also provides for a system-wide approach wherein the development can phase TOD projects to respond to the market. The larger scale of the development opportunity can also be a way to attract more experienced developer partners.

II.7 - Large-scale public-private partnerships for transportation

Current usage in North Carolina - highways:
North Carolina Turnpike Authority signed a "private development agreement" in April 2009 with the Currituck Development Group, LLC to perform financial analyses as to the feasibility of a 7-mile long toll bridge over Currituck Sound.

Current usage in other states:

The 28 Freeway project in Fairfax and Loudoun counties in Virginia is being built under Virginia's Public-Private Transportation Act, which allows private entities to propose innovative solutions for designing, building, financing and operating transportation improvements. Virginia DOT will contribute state highway funds, and revenue bonds backed by proceeds from the Route 28 Tax District will be utilized to finance the balance of the project. Landowners along Route 28 agreed to pay for improvements to the corridor in 1988 through a special tax district.

Additional information:

- NC Turnpike Private Development Agreement for mid-Currituck Bridge
  http://www.ncturnpike.org/pdf/Release%20for%20Mid-Currituck%20Bridge%20PDA%20Signing.pdf
- Route 28 in Northern Virginia
  http://www.28freeway.com/
- Federal Highway Administration Web page for Public-Private Partnership Projects
  http://www.fhwa.dot.gov/ppp/defined_default.htm:
  http://www.fhwa.dot.gov/ppp/case_studies.htm#oip: PPP case studies

III. Existing and potential state and federal programs and grants

III.1 - NC EECBG Block Grants through North Carolina Department of Energy

Overview:

State guidelines should be released in early October. Grants will likely be available for transportation activities that reduce energy usage and greenhouse gas emissions

Additional information: http://www.energync.net/sdocs/block%20grant%20FACT%20SHEET.pdf

III.2 - State Infrastructure Banks (SIBs)

Overview:

Shared financing mechanism created by the state legislature to advance infrastructure projects.

Current usage in North Carolina:

North Carolina has an existing state infrastructure bank. It has not been used as extensively as in some neighboring states such as South Carolina.

Current usage in other states:

South Carolina

For more information:

American Association of State Highway and Transportation Officials info
http://www.transportation-finance.org/funding_financing/financing/credit_assistance/state_infrastructure_banks.aspx

III.3 - Build America Bonds

Overview:

A new type of taxable municipal bonds authorized under the ARRA. There are two types of Build America Bonds, "Direct Payment" bonds and "Tax Credit" bonds. Direct payment bonds are bonds on which the US Treasury Department pays state or local government issuers a payment equal to 35 percent of the interest payment which is intended to lower the issuer's cost of funds. Tax credit bonds are bonds on which the bond holders receive a tax credit equal to the 35 percent of interest on such bonds. These bonds can not be used for private activity bonds.

Additional information:

US Treasury: http://www.ustreas.gov/press/releases/tg81.htm

III.4 - Status of Federal Surface Transportation Reauthorization Funding and of Federal Highway Trust Fund

Summary:

SAFETEA-LU-expired at end of September 2009. A $450 billion six year bill is being crafted as an eventual successor to SAFETEA-LU but likely will not pass in 2009. This bill, called the Surface Transportation Authorization Act of 2009, is stuck in committee until a sustainable funding mechanism can be devised. In the interim, SAFETEA-LU has been extended until mid-December 2009. The program may well be extended for a year or more at 2009 funding levels ($41 billion in 2010 and $20.5 billion in 2011) in an additional continuing resolution which will keep the federal transportation program operating but not provide additional resources.

If passed, the Surface Transportation Authorization Act of 2009 will provide significant new authority to local metropolitan planning organizations, (MPOs) under a new Metropolitan Mobility and Access program. This program would offer funding and financing directly to MPOs with populations over 500,000 with the goal of lowering congestion in metropolitan areas. MPOs would have to develop a metropolitan mobility plan for approval by the USDOT and carry out congestion management programs. The bill as currently drafted expands the percentage of surface transportation funding that is allocated directly to MPOs based on population from 62.5% of the program to 80%.

As a source of funds, federal motor fuel tax will continue to be collected through September 2011 but receipts will not cover needs. The federal government is looking at an alternative revenue stream related to vehicle miles traveled (VMT) instead of relying on a tax on fuel. This is neither technically practical nor politically palatable at the present time. There are test programs being performed in various parts of the country (including Raleigh) to test the concept of VMT instead of gasoline receipts as source of revenue. Early results indicate that the program can work and is favorably received by the public. However, technological limitations and political considerations are such that this paradigm shift in how transit projects are paid for will likely not be ready for at least six years. Instead, it is likely that an increase in the federal motor fuel tax will be proposed and passed.

An additional $13 billion is anticipated to be needed to keep the Federal Highway Trust Fund solvent through March 2011.

III.5 - Congestion Mitigation and Air Quality (CMAQ) Improvement Program

Additional information:

US DOT links on CMAQ:

- http://www.fhwa.dot.gov/environment/cmaqpgs/
- http://www.fhwa.dot.gov/environment/cmaq/

US DOT links on Reauthorization:

- http://www.fhwa.dot.gov/reauthorization/links.htm

III.6 - High Priority Projects (HPPs) in a future federal transportation reauthorization

Additional information:

US DOT links on Reauthorization:

- http://www.fhwa.dot.gov/reauthorization/links.htm

III.7 - Climate change benefit inventory

Overview:

In anticipation of future federal climate change legislation (e.g., carbon tax, cap-and-trade, etc.) a jurisdiction could begin compiling estimates of the potential energy and greenhouse gas emission reductions on proposed transportation projects.

Benefits:

Calculating and compiling carbon footprint reductions now -- or at least developing a system or process for doing so - will simplify potential grant application activity in the future.

####

421 Fayetteville Street • Suite 1303 • Raleigh • NC • 27601 • (919) 755-0583
www.WilburSmith.com