FINAL
Corridor Study

Dow Road
Carolina Beach, North Carolina

Prepared For:
Wilmington Metropolitan Planning Organization
305 Chestnut Street, Floor 4
Wilmington, NC 28401

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES

Submitted: October 5, 2009
WSA # 102488

FINAL

Corridor Study

For

Dow Road

Carolina Beach, North Carolina

Prepared For:

Wilmington Metropolitan Planning Organization
305 Chestnut Street, Floor 4
Wilmington, NC 28401

Prepared By:

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601
(919) 755-0583

NORTH CAROLINA
PROFESSIONAL
SEAL
033718
ENGINEER
WILLIAM E. LETCHWORTH

10/5/09

October 5, 2009
(WSA Project No. 102488)

Table of Contents

APPENDICES

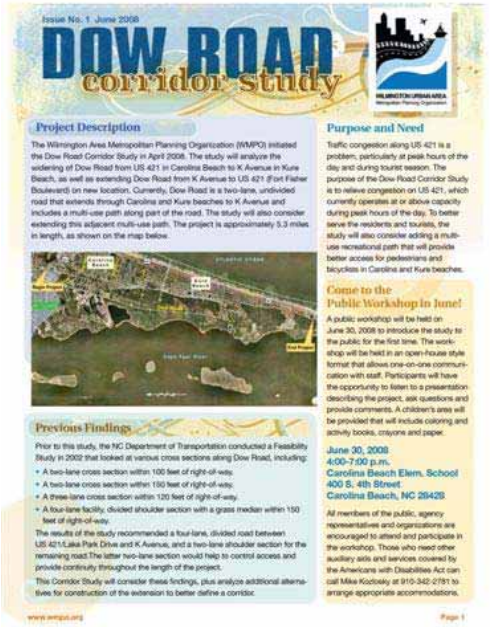
Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF EXHIBITS

I. Introduction


Issue No. 1 June 2008

DOW ROAD corridor study

Project Description

The Wilmington Area Metropolitan Planning Organization (WMPO) initiated the Dow Road Corridor Study in April 2008. The study will analyze the widening of Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, as well as extending Dow Road from K Avenue to US 421 (Fort Fisher Boulevard) on new location. Currently, Dow Road is a two-lane, undivided road that extends through Carolina and Kure beaches to K Avenue and includes a multi-use path along part of the road. The study will also consider extending this adjacent multi-use path. The project is approximately 5.3 miles in length, as shown on the map below.

Purpose and Need

Traffic congestion along US 421 is a problem, particularly at peak hours of the day and during tourist season. The purpose of the Dow Road Corridor Study is to relieve congestion on US 421, which currently operates at or above capacity during peak hours of the day. To better serve the residents and tourists, the study will also consider adding a multi-use recreational path that will provide better access for pedestrians and bicyclists in Carolina and Kure beaches.

Come to the Public Workshop in June!

A public workshop will be held on June 30, 2008 to introduce the study to the public for the first time. The workshop will be held in an open-house style format that allows one-on-one communication with staff. Participants will have the opportunity to listen to a presentation describing the project, ask questions and provide comments. A children's area will be provided that will include coloring and activity books, crayons and paper.

June 30, 2008
4:00-7:00 p.m.
Carolina Beach Elem. School
400 S. 4th Street
Carolina Beach, NC 28428

All members of the public, agency representatives and organizations are encouraged to attend and participate in the workshop. Those who need other auxiliary aids and services covered by the Americans with Disabilities Act can call Mike Kozlosky at 910-342-2781 to arrange appropriate accommodations.

Previous Findings

Prior to this study, the NC Department of Transportation conducted a Feasibility Study in 2002 that looked at various cross sections along Dow Road, including:

- A two-lane cross section within 100 feet of right-of-way.
- A two-lane cross section within 150 feet of right-of-way.
- A three-lane cross section within 120 feet of right-of-way.
- A four-lane facility, divided shoulder section with a grass median within 150 feet of right-of-way.

The results of the study recommended a four-lane, divided road between US 421/Lake Park Drive and K Avenue, and a two-lane shoulder section for the remaining road. The latter two-lane section would help to control access and provide continuity throughout the length of the project.

This Corridor Study will consider these findings, plus analyze additional alternatives for construction of the extension to better define a corridor.

www.wmpo.org

Page 1

North Carolina Department of Transportation (NCDOT) project R-4708 calls for the widening of Dow Road from US 421 (Lake Park Boulevard) in Carolina Beach to US 421 (Fort Fisher Boulevard) in Kure Beach. The purpose of this project is to provide improved north-south access in both Carolina Beach and Kure Beach by widening Dow Road from US 421 to K Avenue and extend Dow Road from K Avenue to US 421 in Kure Beach, a total of 5.3 miles. The widening and extension are expected to reduce traffic congestion on US 421 and to provide improved pedestrian and bicycle facilities in and around Carolina and Kure Beaches

In 2002 NCDOT completed a feasibility study that analyzed several different cross-sections for the existing Dow Road and proposed extension. This study recommended a four-lane divided facility for the section between US 421 and K Avenue and for a two-lane shoulder section for the proposed extension between K Avenue and US 421.

In April 2008, Wilbur Smith Associates (WSA) was tasked by the Wilmington Metropolitan Planning Organization (WMPO) to perform a corridor study for Dow Road from its northern terminus at US 421 (Lake Park Boulevard) to K Avenue in Kure Beach and to determine the feasibility and impacts of extending Dow Road from K Avenue south to Fort Fisher. The study, as originally planned, involved close coordination with local municipalities and stakeholders, extensive public involvement, a preliminary environmental screening of the study area, traffic forecasts to determine future traffic volumes, and capacity analysis to determine future roadway design characteristics.

WSA began the process by performing a preliminary environmental screening, and developing several concepts for the extension of Dow Road. WSA met with representatives from Marine Ocean Terminal Sunny Point (MOTSU), the United States Air Force, and the North Carolina State Parks, the Towns of Carolina Beach and Kure Beach, and the North Carolina Department of Transportation, and members of the public.

Through this analysis and meetings it became readily apparent that the proposed extension of Dow Road faced many issues with gaining access to right-of-way from Sunny Point and the US Air Force, and would be unlikely to receive the necessary permits due to significant environmental impacts to both wetlands and endangered species and some impacts to archeological sites. In addition, the Kure Beach's Town Council felt that the Dow Road Extension would divert traffic around their community and could potentially lead to a decline in visitor traffic. Comment letters from the US Air Force, Kure Beach Town Council, NC Division of Water Quality, NC Department of Environmental and Natural Resources, NC Department of Cultural Resources, and the NC Wildlife Resources Commission, as well as comments from the public at June 2008 public meeting can be found in Appendix A.

Due to the Dow Road extension falling within an environmentally sensitive area and the lack of support from multiple stakeholders, the WMPO passed a resolution on August 27, 2008 eliminating the extension of Dow Road from K Avenue to US 421 from further study. Based on this resolution, the scope of this project was amended to focus solely on the forecasts of future volumes along Dow Road from US 421 to K Avenue, and along K Avenue from Dow Road to US 421 and the multi-modal transportation facilities needed to support these projected future volumes and to improve safety along the corridor.

The purpose of this report is to present the environmental analysis performed for the extension of Dow Road from K Avenue to US 421, to briefly discuss the public involvement portions of this project, to examine 2008 existing conditions, 2030 "No Build" conditions without the Dow Road traffic diversion, and 2030 "Build" conditions with the Dow Road traffic diversion, and to recommend multi-modal transportation facilities needed to support these projected future volumes and to improve safety along the corridor.

II. Study Area and Existing Conditions

A. Study Area

The study area for this report focused on Dow Road and Lake Park Boulevard from Dow Road to K Avenue in Carolina Beach, North Carolina as shown in Figure 1. The specific intersections included in the analysis are as follows:

- Lake Park Boulevard (US 421) / Dow Road (signalized)
- Lake Park Boulevard (US 421) / Federal Point Shopping Center (signalized)
- Lake Park Boulevard (US 421) / Carl Winner Avenue (signalized)
- Lake Park Boulevard (US 421) / Harper Avenue (signalized)
- Lake Park Boulevard (US 421) / Cape Fear Boulevard (signalized)
- Lake Park Boulevard (US 421) / Atlanta Avenue (unsignalized)
- Lake Park Boulevard (US 421) / Ocean Boulevard (unsignalized)
- Lake Park Boulevard (US 421) / K Avenue (signalized)
- Dow Road / Harper Avenue (unsignalized)
- Dow Road / Atlanta Avenue (unsignalized)
- Dow Road / Ocean Boulevard (unsignalized)

In addition, the study area for the proposed Dow Road Extension and the study area for this corridor study are shown on Figure 1.

B. Existing Conditions

The following section briefly describes the roadways in the study area.

Dow Road (SR 1573) is a two-lane, 24 foot wide shoulder section roadway. Dow Road serves as an alternative route around downtown Carolina Beach with a connection from Snow's Cut Bridge south to K Avenue and has a speed limit of 55 and 45 mph. The 2007 Annual Average Daily Traffic (AADT) as counted by NCDOT was 8,400 Vehicles per Day (vpd) just west of the Lake Park Boulevard intersection and 2,700 vpd south of Ocean Boulevard. The 2008 Average Daily Traffic (ADT) as counted by the WMPO was 8,473 vpd just west of the Lake Park Boulevard intersection and 2,733 vpd south of Ocean Boulevard. Dow Road is currently primarily used as a connector street for residential subdivisions to the east as well as an alternative route to get to Kure Beach from north Carolina Beach. In addition, a 10 foot multi-use path currently exists along Old Dow Road from Harper Avenue to the northernmost end of Bridge Barrier Road and crosses Dow Road just south of Harper Avenue.

Dow Road looking south

Lake Park Boulevard (US 421) is a four-lane roadway from Snow's Cut bridge to Carl Winner Avenue in Carolina Beach where it changes to a two-lane roadway and continues south to Fort Fisher. Lake Park Boulevard is a curb and gutter section roadway within Carolina Beach and Kure Beach and provides a direct north – south connection between the Town of Fort Fisher and Wilmington. US 421 travels from Bristol, Tennessee and terminates at the Atlantic Ocean / Cape Fear River and has a varying speed limit of 25, 35, and 45 mph. The 2007 AADT as counted by NCDOT was 18,000 vpd and 12,000 vpd north and south of the US 421 / Carl Winner Avenue intersection, respectively. By comparison, the 2008 AADT as counted by the WMPO was 17,403 vpd and 15,281 vpd north and south of the US 421 / Carl Winner Avenue intersection, respectively. Lake Park Boulevard attracts on-street parking, pedestrians and bicycles and currently serves as a multimodal corridor through the Town of Carolina Beach's Central Business District and Kure Beach.

Lake Park Boulevard looking north

LEGEND

STUDY AREA CORRIDORS

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

STUDY AREA

FIGURE: 1

SCALE: NONE

Carl Winner Avenue is a three-lane, 30 foot wide curb and gutter section roadway located west of the proposed development. Carl Winner Avenue runs east to west from Canal Drive to Lake Park Boulevard. Carl Winner Drive was recently realigned by the Town of Carolina Beach to provide a larger pedestrian area on the north side to accommodate the large numbers of persons that may be waiting to board cruise boats. In addition, Carl Winner Drive serves several surface parking lots and is the first access that serves the northern peninsula. The posted speed limit is 25 mph.

Carl Winner Ave looking west

Harper Avenue is a two-lane, 25 foot wide roadway east of Lake Park Boulevard and a two-lane median divided roadway west of US 421. Harper Avenue provides an east to west connection between Lake Park Boulevard and Canal Drive and Carolina Beach Avenue to the east and Dow Road to the west. The posted speed limit is 25 mph.

Harper Avenue looking east

Cape Fear Boulevard is a two-lane, 77 foot wide roadway with on-street angled parking. Cape Fear Boulevard provides an east to west connection between Dow Road and Canal Drive. Cape Fear Boulevard has posted speed limit of 25 mph.

Cape Fear Boulevard looking west

Atlanta Avenue is a two-lane, 20 foot wide shoulder section roadway that serves primarily residential uses. Atlanta Avenue runs east to west from Carolina Beach Avenue South to Dow Road. The posted speed limit is 25 mph.

Ocean Boulevard (SR 1539) is a two-lane, 20 foot wide shoulder section roadway that serves primarily residential uses. Ocean Boulevard runs east to west from Dow Road to Lake Park Boulevard. The 2008 AADT as counted by the WMPO was 1,900 vpd east of Dow Road and 1,120 vpd west of US 421. The posted speed limit is 25 mph through the residential areas and 35 mph through the buffer zone.

K Avenue is a two-lane, 24 foot wide shoulder section roadway that serves primarily commercial and residential uses. K Avenue runs east to west from Dow Road to Lake Park Boulevard in Kure Beach. The 2008 AADT as counted by the WMPO on K Avenue was 3,160 vpd west of US 421. The posted speed limit is 35 mph.

K Avenue looking west

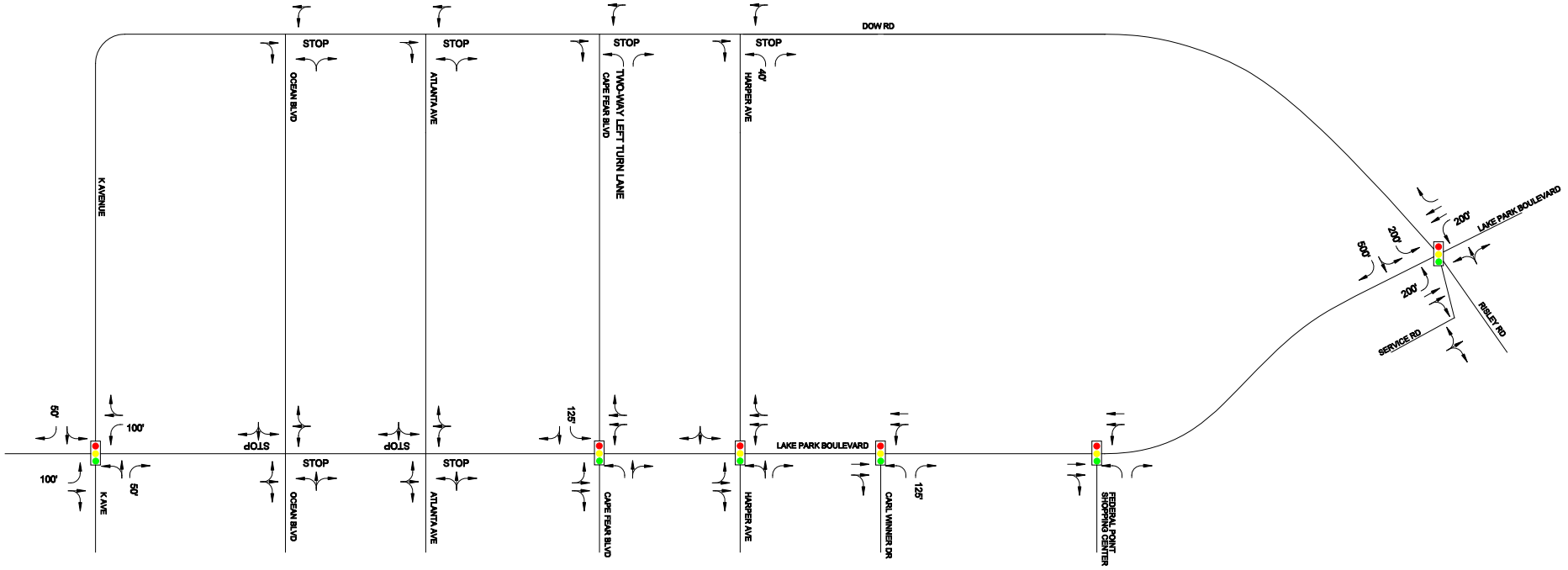
Existing Lane Configurations and Traffic Control are illustrated on Figure 2.

C. Projected Roadway Improvements

Currently, there are no known significant NCDOT transportation improvement projects in the vicinity of the proposed development which are programmed to be constructed before the 2030 design year.

The Town of Carolina Beach is proposing roadway improvements along Lake Park Boulevard as a part of their Streetscape Plan. Lake Park Boulevard is proposed to be reduced to a two-lane roadway (commonly referred to as a "Road Diet") from Carl Winner Avenue to Atlanta Avenue. This project will also include provisions for on-street vehicle parking with a center median or possibly a center two-way, left turn lane. The streetscape project has no schedule for completion at this time, but for the purposes of this study, this project is planned to be completed by the 2030 design year.

In addition, the Town of Carolina Beach will be improving the east leg of the intersection of Lake Park Boulevard and Carl Winner Avenue to include a shared left/right lane and an exclusive right turn lane. These improvements are assumed to be completed by the 2030 design year.



LEGEND	
	EXISTING TRAVEL LANE
	SIGNAL CONTROLLED
STOP	STOP CONTROLLED
XX'	STORAGE LENGTH

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

EXISTING LANE CONFIGURATIONS
AND TRAFFIC CONTROL

FIGURE:
2

III. Public Involvement

On June 30, 2008, WSA held a public meeting at the Carolina Beach Elementary School to discuss the scope of the corridor study for Dow Road and gather public input. At the time, the study was scoped to include the analysis of widening and extending Dow Road from K Avenue to Fort Fisher. For display purposes, display boards of environmental features (wetlands, etc), property owners (Sunny Point, US Air Force, etc.), and a draft representation of several possible alignments for the extension of Dow Road were used when discussing the corridor study.

Public Meeting #1

In general, the Town of Kure Beach and their residents were against the extension of Dow Road due to the impacts to the environment and changing the corridor from a lightly used minor thoroughfare to a heavily traveled, major thoroughfare highway. In contrast, some residents of Carolina Beach were in support of the proposed extension of Dow Road. There was however support from most attendees for improvements along Dow Road such as pedestrian and bicycle provisions and straightening out the Dow Road / K Avenue curve. A comment summary report from the public meeting is contained in Appendix A.

On September 28, 2009, WSA held a final public meeting at the Carolina Beach Town Hall to discuss the findings of the revised Dow Road Corridor Study. In general, the public showed much greater support for the revised study and its recommendations. Residents showed interest and gave positive feedback on the pedestrian and bicycle improvements along Dow Road as well as the proposed improvements to the Dow Road / K Avenue curve. A comment summary report from the public meeting is contained in Appendix A.

Public Meeting #2

IV. Environmental Analysis

When this study began, WSA started work on the environmental analysis for the Dow Road Extension but due to the number of impacts, both environmental and community, the WMPO directed WSA to stop work on the corridor study for the extension of Dow Road and look at only what improvements can be accomplished within the existing alignment. The following environmental analysis details only the areas which WSA studied for the Dow Road extension.

In an effort to identify potential environmental constraints to the proposed action of extending and widening Dow Road from K Avenue south to Fort Fisher, WSA performed a preliminary environmental screening. The purpose of the screening is to identify known and documented environmental concerns within the Dow Road corridor that could be "project stopping." Existing Geographic Information System (GIS) data from various local, state and federal sources, augmented with limited field reconnaissance, was used to perform this preliminary analysis. The pertinent environmental features, discussed below, are shown on Figure 3.

Wetlands & Surface Waters

The presence of wetlands in the Dow Road corridor was determined through a review of the National Wetlands Inventory (NWI) mapping of the area coupled with direct field observation by staff trained and experienced with the methods outlined in the United States Army Corps of Engineers 1987 Wetland Delineation Manual. These wetlands areas, relatively permanent waters (RPW) and the Coastal Area Management Act (CAMA) buffers associated with them should be considered when evaluating alternatives and the selection of the preferred alternative. A key factor in the selection of a preferred alternative for the extension would have been the avoidance and minimization of potential impacts to wetlands.

The NWI mapping indicates the presence of wetlands in the Dow Road corridor which is to be expected in coastal area. Any temporary or permanent impacts, whether they are clear cutting, filling, or draining, to either of the aforementioned wetland features would need to go through the Section 404 and 401 permitting process. In the case of this project impacts would most likely be permitted under a Nationwide 14 permit with the USACE in addition to requiring a 401 Water Quality Certification from the DWQ. Mitigation for these impacts would likely be required.

The inventory of surface water features indicates that a creek traverses the potential alternatives corridor. Any temporary or permanent impacts or crossing of the creek would have require a Section 404/401 permit(s).

Contaminated Properties

A database report was obtained from Environmental Data Resources, Inc. which details all past and present reported hazardous substance storage, release, generation, or transport in that has occurred or is occurring in the Dow Road corridor. Based on the EDR report, field reconnaissance, and Hazard Substance Disposal Site mapping developed by The North Carolina Department of Environment, Health, and Natural Resources, Division of Waste Management, Superfund Section and obtained from NC OneMap (http://www.nconemap.com) "areas of concern" were identified as having reported past contamination or of having hazardous substance disposed on the site in the past.

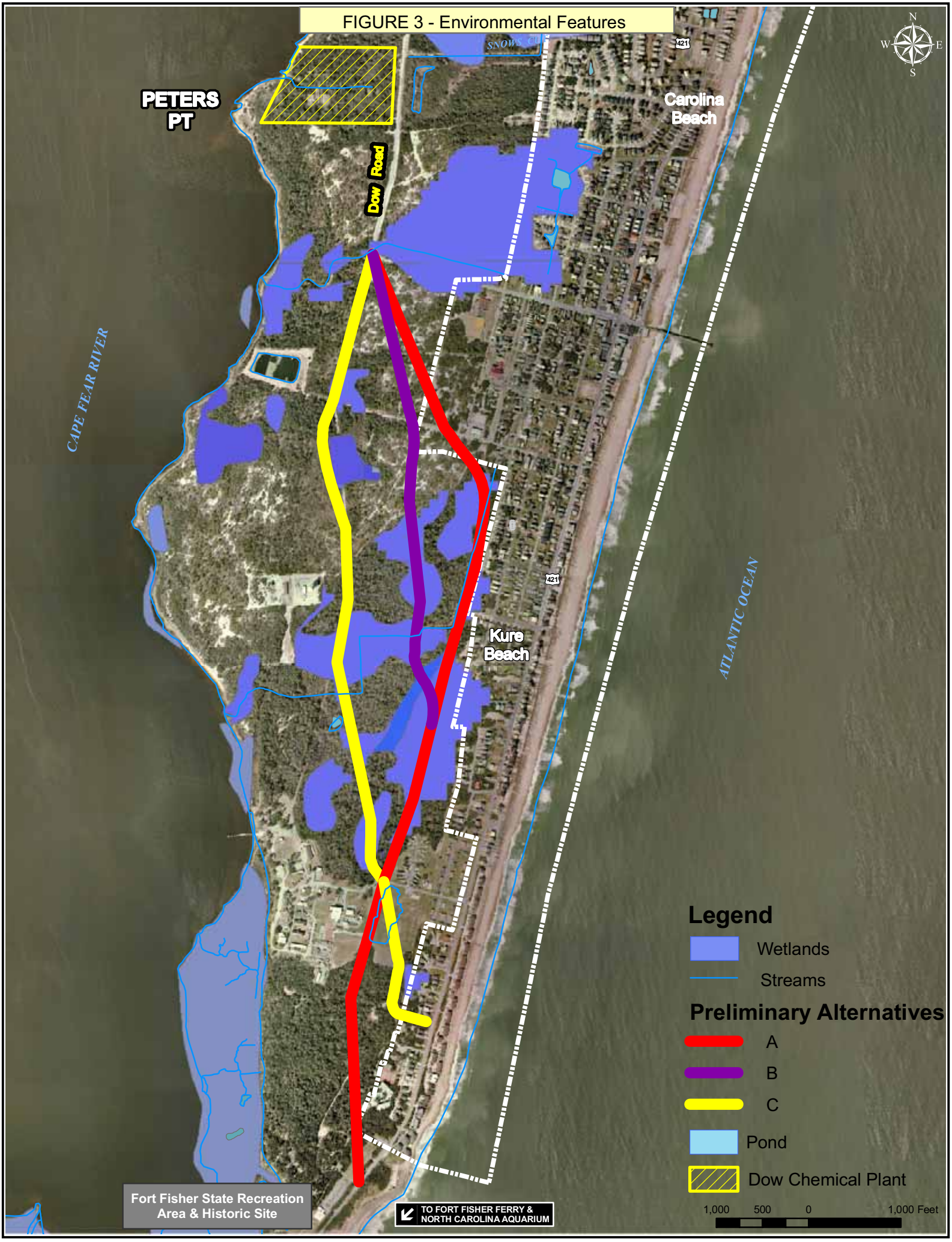


FIGURE 3 - Environmental Features
PETERS PT
Dow Road
Carolina Beach
Kure Beach
CAPE FEAR RIVER
ATLANTIC OCEAN
421
Fort Fisher State Recreation Area & Historic Site
TO FORT FISHER FERRY & NORTH CAROLINA AQUARIUM
Legend
Wetlands
Streams
Preliminary Alternatives
A
B
C
Pond
Dow Chemical Plant
1,000 500 0 1,000 Feet

A 1949 aerial photograph depicting the Dow Chemical Plant. Some buildings and other structures are still standing today.

The widening and extending of Dow Road has a strong potential to encounter hazardous materials, considering the past land uses that have taken place, mainly in the southern portion of the project area, and some of the present land use occurring along existing Dow Road. Special consideration of the widening of Dow Road in the areas of the water treatment plant and landfill, as well as the Dow Bromine Chemical plant, which is on the Environmental Protection Agency's Superfund list, will need to be taken. Additionally, the extension and the majority of the widening of Dow Road will go through the Military Ocean Terminal Sunny Point (MOTSU) buffer. The location of Underground Storage Tanks (UST) containing diesel or gasoline products would have to be further investigated if this extension was pursued further, see Appendix A for the executive summary to the EDR report which details the known UST locations. UST removal will add to project costs and the risk of remediation for a UST that has leaked exists. Further searches of all pertinent local, state, and federal databases in order to identify any potential hazardous materials in the study area will be needed. In addition, WSA staff performed limited field reconnaissance in an attempt to verify database information and to identify any hazardous materials not uncovered during the database search. The areas of concern indentified do pose a constraint to this project and should be taken into consideration during alternative development.

Threatened or Endangered Species

According to information obtained from the United States Fish and Wildlife Service, which organizes the information by county, New Hanover County is currently home to at least one federally protected species, the loggerhead sea turtle. Federally Listed Threatened and Endangered Species and their habitat are protected under federal law.

Natural Heritage Sites

The North Carolina Natural Heritage Program indicates that there are records of known rare species, high quality natural communities, and significant natural areas occurring in the project area. These include the phaeon crescent butterfly, coastal fringe evergreen forest, interdune pond, coastal fringe sandhill, pond pine woodland, wet pine flats, and pine savanna. When further evaluating project alternatives, coordination with the North Carolina Natural Heritage program, the project steering committee, and the public are required to ensure that these resources are considered and practical steps are taken to preserve these areas.

Soils

Digital soils mapping from the United States Department of Agriculture (USDA) was obtained and reviewed for the presence of hydric soils which are a good indicator for the presence of likelihood of wetlands. Wetland features were identified in the corridor as hydric soils.

Cultural and Historic Resources

Potential impacts to Fort Fisher, which is a national historic landmark have to be taken into consideration in any evaluation of alternatives for the extension of Dow Road portion of the

project. Additionally, due to the rich military history of the area potential significant archaeological remains may be present in the areas considered for right-of-way acquisition.

Land Use

Land use considerations included the effects that the widening and extending of Dow Road will have on the existing land use in the project area as well as how it may influence future land use and development patterns. Since the majority of the project actions will occur in the MOTSU buffer which is considered federal conservation lands and where future development is not likely, the indirect effect of the project on land use should be closely evaluated.

Other

Other concerns that will need to be considered in the evaluation of alternatives are Department of Defense owned properties and the Carolina Beach and Fort Fisher State Parks. DOD properties in the project area include MOTSU buffer zone and the Air Force's Fort Fisher Recreation Area. There are foreseeable difficulties in eventually obtaining the needed right-of-way from the DOD which will be considered. State park and recreation lands carry special federal protection and converting portions of these lands to roadway will require special consideration and evaluations. Additionally, obtaining right-of-way from the DOD may be difficult. The Military Ocean Terminal Sunny Point will have safety and security concerns that need to be addressed as well as environmental concerns. The DOD is required to consider all natural and human environment issues when evaluating land transfers and agreements. The Fort Fisher Air Force Recreation Area is a resort vacation spot which is only open to DOD personnel, both military and civilian. The evaluation of alternatives for the extension to Dow Road paid special attention to this area and unique design considerations that are sensitive to the context of this site were looked at. Any extension to Dow Road will bisect this property with anywhere from a 125'-150' right-of-way, which is not compatible with its existing land use. The extension or widening of Dow Road requires close coordination with the Air Force, MOTSU, and the North Carolina Division of Parks and Recreation.

Depiction of some of the important land owners in the project area.

Conclusion

Because of the wide range of environmental issues, along with the public objections from Kure Beach residents and public officials to the project, involved with the extension of Dow Road, WSA recommends that the corridor remain on its existing alignment and that the Dow Road Extension should not be constructed. The rest of the report will detail the findings of the traffic analysis for the existing alignment and the possible need for the widening of Dow Road from Lake Park Boulevard to K Avenue. Impacts from any of the proposed improvements to the existing alignment of Dow Road may require further study to reduce disturbance to the local ecosystem, however any impacts should be minimal as any improvements are extremely likely to be contained within the existing right-of-way.

V. Projected Traffic Volumes

A. Existing Traffic

Morning (7-9 am) and afternoon (4-6 pm) peak hour traffic counts were taken by WSA at the following locations:

- Lake Park Boulevard (US 421) / Federal Point Shopping Center (7/22/2008)

Morning (7-9 am) and afternoon (4-6 pm) peak hour traffic counts were taken by the WMPO at the following locations:

- Lake Park Boulevard (US 421) / Dow Road (4/29/2008)
- Lake Park Boulevard (US 421) / Carl Winner Avenue (4/29/2008)
- Lake Park Boulevard (US 421) / Harper Avenue (4/30/2008)
- Lake Park Boulevard (US 421) / Cape Fear Boulevard (4/30/2008)
- Lake Park Boulevard (US 421) / Atlanta Avenue (4/30/2008)
- Lake Park Boulevard (US 421) / Ocean Boulevard (5/6/2008)
- Lake Park Boulevard (US 421) / K Avenue (5/6/2008)
- Dow Road / Harper Avenue (5/1/2008)
- Dow Road / Atlanta Avenue (5/1/2008)
- Dow Road / Ocean Boulevard (5/6/2008)

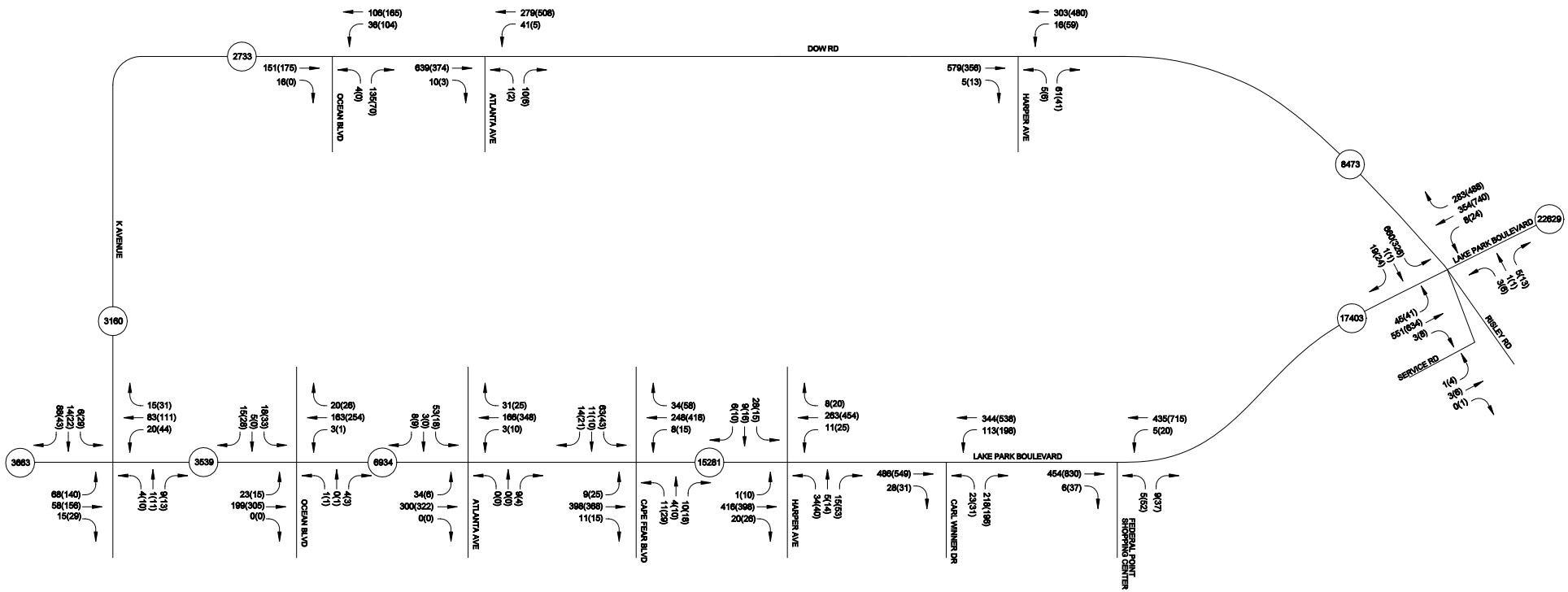
These traffic volumes are shown on Figure 1A in Appendix B.

Recognizing that traffic volumes collected during April and May 2008 will be lower than the volumes typically seen during peak summer conditions; WSA multiplied the counts taken in 2008 by an adjustment factor. This factor was determined using 2004 and 2005 traffic data supplied by NCDOT from an automatic traffic recorder (ATR) site located near Carolina Beach just south of Wilmington.

Based on the ATR data, the WMPO traffic counts collected in April and May were multiplied by 1.25 to more accurately predict typical peak hour traffic experienced between June and August. These seasonally adjusted traffic volumes are shown on Figure 4 with the 2008 WMPO ADT traffic counts. Raw count data for these locations are included in Appendix B.

B. Future Background Traffic Volumes

Based on historical AADT provided by NCDOT, ADT provided by WMPO, and projected residential and retail development in Carolina Beach and Kure Beach, a 1.5% growth rate percentage was applied to determine the projected 2030 "No Build" traffic volumes without the Dow Road traffic diversion. Because of the nature of the surrounding land uses and the Sunny Point Blast Zone along Dow Road, a 1.5% growth rate was determined to be a conservative growth factor based on the lack of potential for any large future developments. Any future growth in traffic will likely be due to pockets of redevelopment expected to occur within downtown Carolina Beach or the gradual increase in visitor traffic going to the beach or Fort Fisher. Projected 2030 No Build peak hour and ADT traffic volumes along Lake Park Boulevard and Dow Road are illustrated on Figure 5.



LEGEND	
←	DIRECTIONAL MOVEMENT
XX	AM PEAK HOUR TRAFFIC
(XX)	PM PEAK HOUR TRAFFIC
(XXXX)	AVERAGE DAILY TRAFFIC

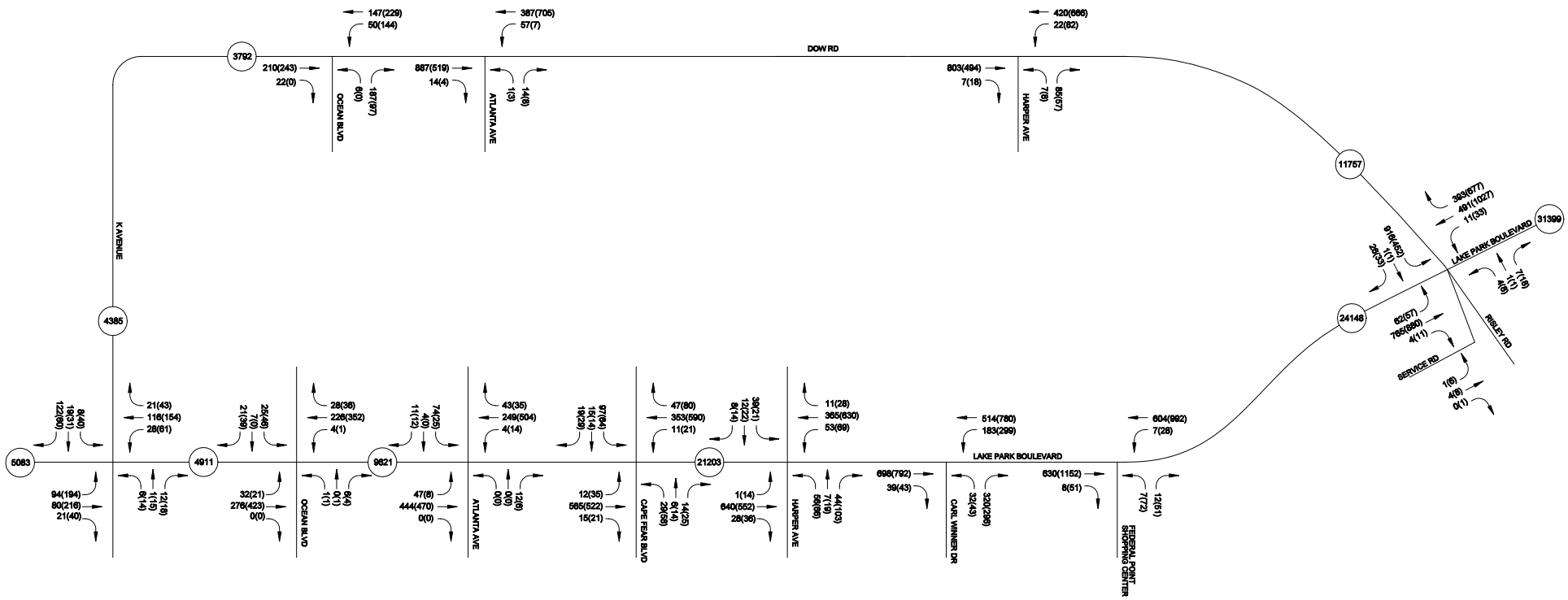
*ADT COURTESY OF WMPO

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

2008 SEASONALLY ADJUSTED
EXISTING PEAK HOUR
TRAFFIC VOLUMES

FIGURE:
4



LEGEND	
←	DIRECTIONAL MOVEMENT
XX	AM PEAK HOUR TRAFFIC
(XX)	PM PEAK HOUR TRAFFIC
(XXXX)	AVERAGE DAILY TRAFFIC

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

2030 FUTURE
PEAK HOUR
TRAFFIC VOLUMES

FIGURE:
5

C. Future Traffic Volumes with Dow Road Diversion

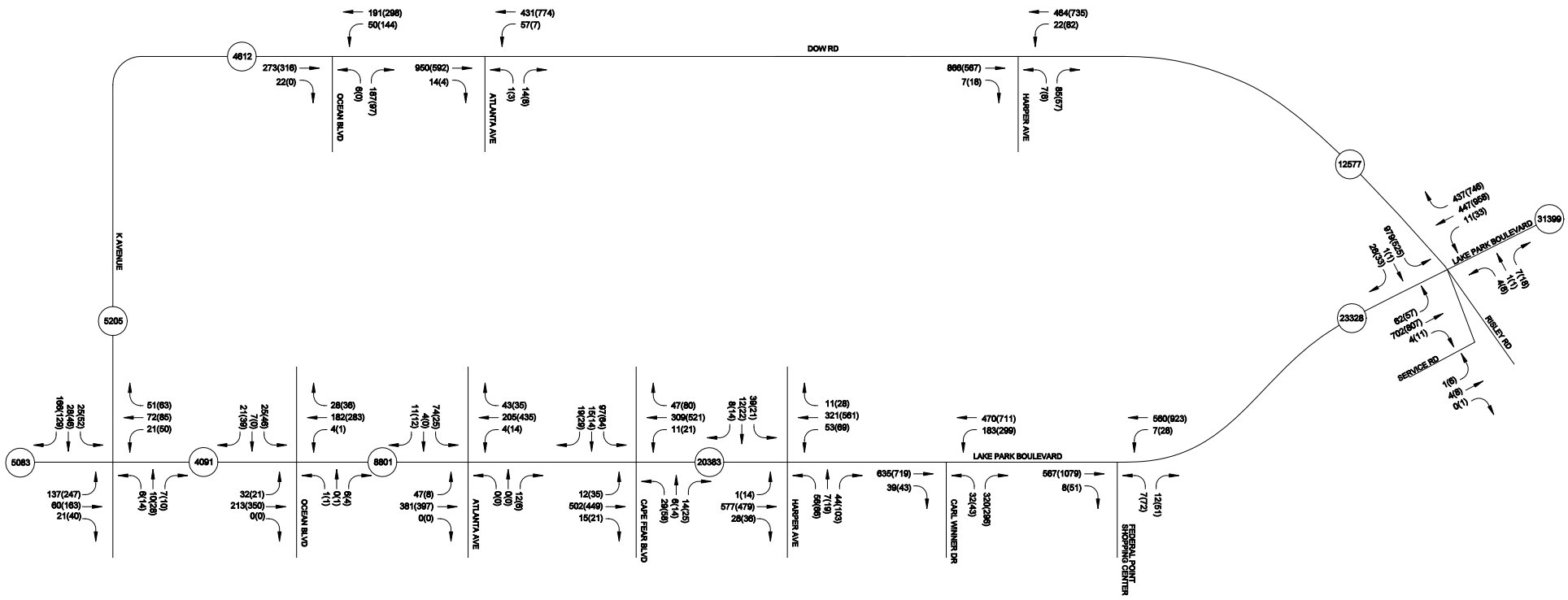
In order to develop the 2030 Build alternative traffic volumes, a percentage of vehicles assumed to divert from Lake Park Boulevard onto Dow Road was chosen. First, the amount of traffic that uses Dow Road as an alternative route around Lake Park Boulevard had to be determined. This was accomplished by examining the through traffic along Dow Road at the intersection of Dow Road and Ocean Boulevard. This through traffic represents the individuals that are traveling along Dow Road purely to bypass Carolina Beach and northern Kure Beach. In 2008 there were 257 and 340 vehicles during the AM and PM peak hours, respectively, that were assumed to be using Dow Road to get from K Avenue to Lake Park Boulevard. At the intersection of Dow Road and Lake Park Boulevard, there were 1,009 and 881 vehicles during the AM and PM peak hours, respectively, on Dow Road. This shows that of the traffic that turns onto Dow Road from Lake Park Boulevard, only approximately 30% of the traffic will continue south to Kure Beach.

An increase of 30% in the amount of diversion traffic was chosen to develop the 2030 Build alternative peak hour traffic volumes. This percentage increase was selected based on the current traffic patterns, the fact that only signage will be used to direct travelers along Dow Road, the continued designation of Lake Park Boulevard as US 421, and the significant attractions along Lake Park Boulevard between the intersection of Dow Road and K Avenue. Therefore, the traffic that was estimated to use Dow Road as a "bypass" was increased by 30% to assume the future "Build" traffic. The 30% was then subtracted from Lake Park Boulevard to account for the shift of traffic onto Dow Road. Thus based on the 2008 WMPO ADT of 2,733 vpd on Dow Road just south of Ocean Boulevard; approximately 820 additional vehicles are expected to be diverted to Dow Road on a given weekday with installation of wayfinding signage for bypassing traffic around Carolina Beach. This amounts to roughly 108 additional vehicles on Dow Road in the AM peak hour and 144 additional vehicles in the PM peak hour.

The 2030 Build alternative peak hour and ADT traffic volumes with the Dow Road traffic diversion are shown on Figure 6.

VI. Traffic Analysis

The study area intersections were analyzed using the methods outlined in the ***Highway Capacity Manual***[1], and Synchro Version 7.0. The ***Highway Capacity Manual***[1] 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.



LEGEND	
←	DIRECTIONAL MOVEMENT
XX	AM PEAK HOUR TRAFFIC
(XX)	PM PEAK HOUR TRAFFIC
(XXXX)	AVERAGE DAILY TRAFFIC

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

2030 FUTURE WITH DIVERSION
PEAK HOUR
TRAFFIC VOLUMES

FIGURE:
6

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 operate at LOS F during the peak hours.

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

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***[1] 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***[1].

Table 2 summarizes the capacity analyses for the study area intersections, which is discussed below. All capacity analyses are included in Appendix C.

Table 2
Level-of-Service Summary

Intersection	2008 Existing		2030 No Build Alternative without Diversion		2030 Build Alternative with Diversion and Improvements to Dow Road	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Dow Road / Lake Park Blvd.	D (36.8)	C (28.0)	D (45.5)	C (34.7)	D (45.4)	D (36.6)
Lake Park Blvd. / Federal Point Shopping Center	A (4.7)	A (9.0)	A (2.2)	B (11.8)	A (2.3)	B (10.3)
Lake Park Blvd. / Carl Winner Ave.	B (18.7)	B (19.6)	C (23.9)	C (27.4)	C (23.9)	C (28.1)
Lake Park Blvd. / Harper Ave.	B (11.0)	B (12.8)	B (19.8)	B (17.5)	B (17.8)	B (17.5)
Lake Park Blvd. / Cape Fear Blvd.	A (9.6)	A (9.2)	B (17.0)	B (15.8)	B (16.5)	B (15.2)
Lake Park Blvd. / Atlanta Ave.	# (2.4) C (15.3) EB B (10.1) WB	# (0.9) C (15.5) EB B (10.2) WB	# (3.4) D (25.8) EB B (11.3) WB	# (1.2) C (24.6) EB B (11.5) WB	# (3.3) C (21.0) EB B (10.8) WB	# (1.2) C (20.1) EB B (10.8) WB
Lake Park Blvd. / Ocean Blvd.	# (1.6) B (11.5) EB B (10.1) WB	# (1.6) B (13.7) EB B (12.2) WB	# (1.9) B (13.7) EB B (10.7) WB	# (2.2) C (19.2) EB B (14.2) WB	# (2.0) B (12.4) EB B (10.1) WB	# (2.1) C (15.9) EB B (12.7) WB
Lake Park Blvd. / K Ave.	B (11.7)	B (11.3)	B (12.5)	B (11.8)	B (12.6)	B (12.3)
Dow Road / Harper Ave.	# (1.2) B (14.1) WB	# (1.4) B (12.1) WB	# (1.6) C (19.9) WB	# (2.0) C (15.2) WB	# (1.5) C (21.9) WB	# (1.4) D (25.4) WB
Dow Road / Atlanta Ave.	# (0.7) B (14.2) WB	# (0.2) B (12.6) WB	# (1.0) C (18.8) WB	# (0.3) C (16.4) WB	# (1.1) C (20.4) WB	# (0.3) C (18.5) WB
Dow Road / Ocean Blvd.	# (3.8) B (10.1) WB	# (3.1) A (9.6) WB	# (4.2) B (11.3) WB	# (3.4) B (10.4) WB	# (3.8) B (12.1) WB	# (2.7) B (11.1) WB

- No letter value assigned by Synchro, only overall intersection delay

Dow Road / Lake Park Boulevard

Capacity analysis shows that the signalized intersection of Dow Road and Lake Park Boulevard currently operates at LOS D during the AM peak hour and LOS C during the PM peak hour. In 2030 No Build, the overall delay is expected to remain a LOS D during the AM peak hour and LOS C during the PM peak hour with an increase of 8.7 and 6.7 seconds / vehicle during the 2030 morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection is expected to continue to operate at LOS D during the AM peak hour and LOS C during the PM peak hour with a reduction in delay of 0.1 seconds / vehicle during the AM peak hour and an increase of 1.9 seconds / vehicle during the PM peak hour.

Lake Park Boulevard / Federal Point Shopping Center

Capacity analysis shows that the signalized "T" intersection of Lake Park Boulevard and the Federal Point Shopping Center access currently operates at LOS A during the AM and PM peak hours. In 2030 No Build, the overall delay is expected to remain LOS A during the AM peak hour and increase to LOS B during the PM peak hour. With the Build alternative during 2030, the intersection is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour with an increase of 0.1 seconds / vehicle during the AM peak hour and a reduction of 1.5 seconds / vehicle during the PM peak hour.

Lake Park Boulevard / Carl Winner Avenue

Capacity analysis shows that the signalized "T" intersection of Lake Park Boulevard and Carl Winner Avenue currently operates at LOS B during the AM and PM peak hours. In 2030 No Build, the overall delay is expected to increase to LOS C during the AM and PM peak hours with an increase of 5.2 and 7.8 seconds / vehicle during the 2030 morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection is expected to operate at LOS C during the AM and PM peak hours an with no change for the overall intersection delay during the AM peak hour and a increase of 0.7 seconds / vehicle during the PM peak hour.

Lake Park Boulevard / Harper Avenue

Capacity analysis shows that the signalized intersection of Lake Park Boulevard and Carl Harper Avenue currently operates at LOS B during the AM and PM peak hours. In 2030 No Build, the overall delay is expected to remain a LOS B with an increase of 8.8 and 4.7 seconds / vehicle during the 2030 morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection is expected to operate at LOS B during the AM and PM peak hours with a reduction of 2.0 seconds / vehicle during the AM peak hour and no change in the overall intersection delay during the PM peak hour.

Lake Park Boulevard / Cape Fear Boulevard

Capacity analysis shows that the signalized intersection of Lake Park Boulevard and Cape Fear Boulevard currently operates at LOS A during the AM and PM peak hours. In 2030 No Build, the overall delay is expected to operate at LOS B with an increase of 7.4 and 6.6 seconds / vehicle during the 2030 morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection is expected to operate at LOS B during the AM and PM peak hours with a reduction of 0.5 and 0.6 seconds / vehicle during the AM and PM peak hours, respectively.

Lake Park Boulevard / Atlanta Avenue

Capacity analysis shows that the unsignalized Lake Park Boulevard / Atlanta Avenue intersection currently operates with overall intersection delays of 2.4 and 0.9 seconds / vehicle during the AM and PM peak hours. The minor eastbound movement currently experiences 15.3 and 15.5 seconds of delay per vehicle during the AM and PM peak hours, respectively. While the minor westbound movement currently experiences 10.1 and 10.2 seconds of delay per vehicle during the AM and PM peak hours, respectively. In 2030 No Build, the minor movement delays are expected to have minimal increases of delay over the existing conditions during the morning and afternoon peak hours, respectively. With the Build alternative during

2030, the intersection delay is expected to change very little over the 2030 No Build alternative with reduced delays expected for the minor eastbound and westbound movements.

Lake Park Boulevard / Ocean Boulevard

Capacity analysis shows that the unsignalized Lake Park Boulevard / Ocean Boulevard intersection currently operates with overall intersection delays of 1.6 / vehicle during the AM and PM peak hours. The minor eastbound movement currently experiences 11.5 and 13.7 seconds of delay per vehicle during the AM and PM peak hours, respectively. While the minor westbound movement currently experiences 10.1 and 12.2 seconds of delay per vehicle during the AM and PM peak hours, respectively. In 2030 No Build, the minor movement delays are expected to have minimal increases of delay over the existing conditions during the morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection delay is expected to change very little over the 2030 No Build alternative with reduced delays expected for the minor eastbound and westbound movements.

Lake Park Boulevard / K Avenue

Capacity analysis shows that the signalized intersection of Lake Park Boulevard and K Avenue currently operates at LOS B during the AM and PM peak hours. In 2030 No Build, the overall delay is expected to remain a LOS B with an increase of 0.8 and 0.5 seconds / vehicle during the 2030 morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection is expected to operate at LOS B during the AM and PM peak hours with an increase of 0.1 seconds / vehicle during the AM peak hour and 0.5 seconds / vehicle during the PM peak hour.

Dow Road / Harper Avenue

Capacity analysis shows that the unsignalized Dow Road / Harper Avenue intersection currently operates with overall intersection delays of 1.2 and 1.4 seconds / vehicle during the AM and PM peak hours. The minor westbound movement currently experiences 14.1 and 12.1 seconds of delay per vehicle during the AM and PM peak hours, respectively. In 2030 No Build, the minor movement delays are expected to have minimal increases of delay over the existing conditions during the morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection delay is expected to change very little over the 2030 No Build alternative with reduced delays expected for the minor westbound movements. Based on the volume of left turning vehicles from Dow Road onto Harper Avenue a southbound left turn lane on Dow Road with 100 feet of full width storage is recommended at Harper Avenue to provide safer vehicular travel along Dow Road.

Dow Road / Atlanta Avenue

Capacity analysis shows that the unsignalized Dow Road / Atlanta Avenue intersection currently operates with overall intersection delays of 0.7 and 0.2 seconds / vehicle during the AM and PM peak hours. The minor westbound movement currently experiences 14.2 and 12.6 seconds of delay per vehicle during the AM and PM peak hours, respectively. In 2030 No Build, the minor movement delays are expected to have minimal increases of delay over the existing conditions during the morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection delay is expected to change very little over the 2030 No Build alternative with reduced delays expected for the minor westbound movements.

Dow Road / Ocean Boulevard

Capacity analysis shows that the unsignalized Dow Road / Ocean Boulevard intersection currently operates with overall intersection delays of 3.8 and 3.1 seconds / vehicle during the AM and PM peak hours. The minor westbound movement currently experiences 10.1 and 9.6 seconds of delay per vehicle during the AM and PM peak hours, respectively. In 2030 No Build, the minor movement delays are expected to have minimal increases of delay over the existing conditions during the morning and afternoon peak hours, respectively. With the Build alternative during 2030, the intersection delay is expected to change very little over the 2030 No Build alternative with reduced delays expected for the minor westbound movements. Based on the volume of left turning vehicles from Dow Road onto Ocean Boulevard a southbound left turn lane on Dow Road with 100 feet of full width storage is recommended at Ocean Boulevard to provide safer vehicular travel along Dow Road.

Overall, the proposed Dow Road traffic diversion plan can accommodate the projected future traffic growth subject to the recommendations for turn lanes and other considerations described in Section VI.

VII. Recommendations

The results of this study indicate that there are no major existing traffic capacity concerns to date at the analyzed intersections. This study shows that minor improvements should be constructed to provide safe and efficient ingress and egress as well as to enhance vehicular, bicycle, pedestrian and parking operations and public safety in the vicinity of the proposed development. Because the projected 2030 ADT along Dow Road is expected to reach only 4,800 vpd just south of Ocean Boulevard and 12,600 vpd just south of Lake Park Boulevard, Dow Road is recommended to remain a two-lane facility, the following improvements are recommended to be implemented with the traffic diversion plan for Dow Road:

Dow Road / Harper Avenue

- Construct a southbound left turn lane on Dow Road with 100 feet of full width storage.

Dow Road /Cape Fear Boulevard

- Construct a southbound left turn lane on Dow Road with 100 feet of full width storage.

Dow Road / Ocean Boulevard

- Construct a southbound left turn lane on Dow Road with 100 feet of full width storage.

Lake Park Boulevard / Dow Road

- Provide wayfinding signs to direct southbound Kure Beach and Fort Fisher traffic from Lake Park Boulevard to Dow Road.

Lake Park Boulevard / K Avenue

- Provide wayfinding signs to direct northbound Wilmington traffic from Lake Park Boulevard to Dow Road.

Other Recommendations

Dow Road / K Avenue Curve

As currently designed, the Dow Road onto K Avenue curve is approximately a 90 foot radius curve with very little superelevation. While the crash data from the past three (3) years shows that there have been no reported vehicular crashes in this vicinity, a closer site inspection suggests that there may be a significant number of unreported crashes due to the damaged roadway signs and visible tire skid marks along Dow Road and K Avenue.

As a part of the Dow Road traffic diversion plan, WSA recommends that the Dow Road / K Avenue curve be lengthened and super-elevated to allow for safer vehicular and bicycle travel. At a minimum, WSA recommends that the curve radii be increased from 90 feet to 250 feet. Based on *AASHTO A Policy on Geometric Design of Highway and Streets*[2], this would allow the signed 15 mph turning speed be increased to 25 mph. In addition, the design should incorporate the addition of bike lanes as well as multi-use path. The relocation of one (1) utility pole will likely be required with this improvement. Coordination with Sunny Point Marine Ocean Terminal and NCDOT will be required to plan for and construct this realignment. This proposed improvement is shown on Figure 8.

Bicycle Facilities

Bicycle lanes are proposed along both Dow Road and K Avenue as a part of this plan. Bicycles are an important element of multimodal, livable streets. The proposed bike lanes provide important linkages within Carolina Beach and Kure Beach destinations, improved bicycling environment and also acts as a buffer to pedestrians. In addition, bike lanes allow space for vehicles to temporarily store while emergency vehicles pass, they add to turning radii, and they improve sight distances.

Based on the *AASHTO Guide for the Development of Bicycle Facilities*[3] and the *Manual on Uniform Traffic Control Devices (MUTCD*[4]*)*, WSA recommends the following be constructed and incorporated into Carolina Beach's future pedestrian and bicycle plan:

- Add an additional 5 feet of pavement for wide outside shoulders on both sides of Dow Road;
- Bike lane pavement markings should be provided.

Bike lanes should be striped, signed, and marked in accordance with the MUTCD. The MUTCD and the Institute of Transportation Engineer's *Traffic Control Handbook* recommend intersections with bike lanes located the striped bike lanes to the left side of right-turn only lanes. **Exhibit 1** shows this detail for bike lane approaches to intersections.

Bicyclist traveling along Dow Road

Pedestrian Facilities

In an effort to reflect the recommendations from Carolina Beach's Master Development Plan, WSA recommends that a 10 foot wide multi-use path be constructed along the west side of Dow Road from the Carolina Beach State Park to approximately 1.0 mile south of Ocean Boulevard then transition to the east side of Dow Road to K Avenue. The proposed bicycle lanes and 5 foot grass buffer provide sufficient buffer distance for pedestrians utilizing the proposed path. Bike lanes and multi-use paths will strengthen linkages and connect destinations within Carolina Beach and Kure Beach.

Based on the *AASHTO Guide for the Development of Pedestrian Facilities*[5] and the *MUTCD*, WSA recommends the following considerations for bicycle facilities:

- Construct a 10 foot wide multi-use path along the east side of Dow Road and K Avenue and connect with the existing multi-use path near the Carolina Beach State Park;
- Provide crosswalks for the multi-use path at all the side street intersections along Dow Road;
- Provide adequate pedestrian crosswalk signs to warn approaching vehicles;
- Provide adequate pedestrian facilities to meet the requirements of the Americans with Disabilities Act (ADA);
- Provide audible pedestrian crosswalk signals to accommodate visually impaired pedestrians;
- Design and maintenance of landscaping to provide good visibility between pedestrians and approaching vehicles;

Recommended Lane Configurations and Traffic Control for the Dow Road and Lake Park Boulevard corridors are illustrated on Figure 7. The conceptual design for the Dow Road / K Avenue curve is shown on Figure 8 and the conceptual designs for the Dow Road / Harper Avenue, Dow Road / Cape Fear Boulevard, and Dow Road / Ocean Boulevard left turn bays are shown on Figures 9, 10, and 11. The recommended typical section for Dow Road is shown on Figure 12.

Exhibit 1 – Bike Lane treatments at intersections

Figure 2a – Conflicts with Bike Lane to the Right of a Right Turn Lane

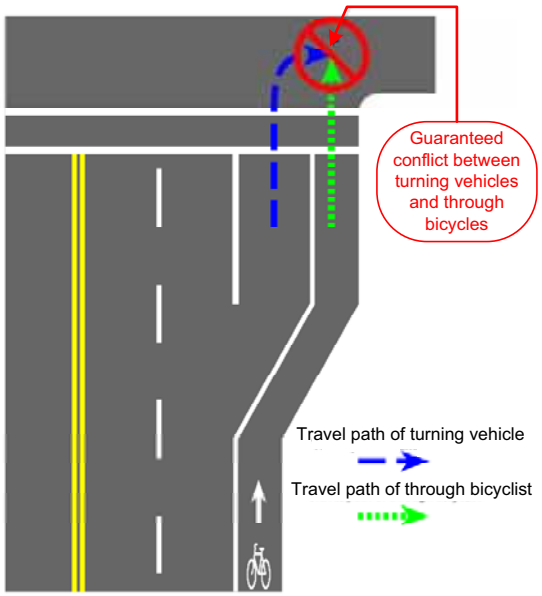


Figure 2b – Proper Location of Bike Lane to the Left of Right Turn Lane

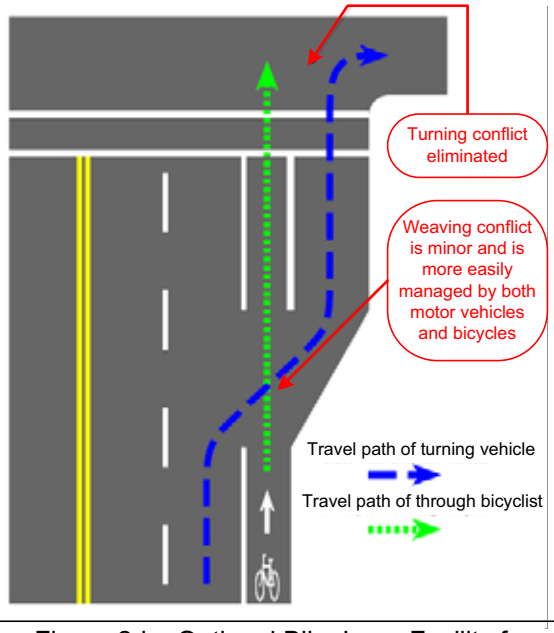


Figure 2c – Optional Bike Lane Treatment where Right Lane Becomes Right Turn Only Lane

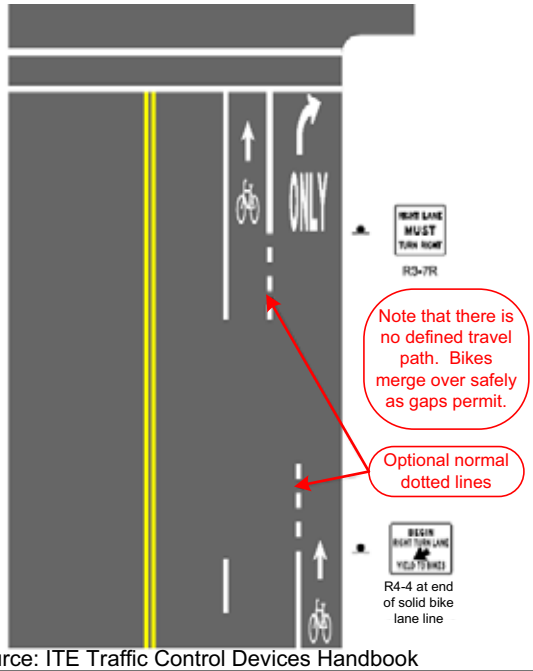
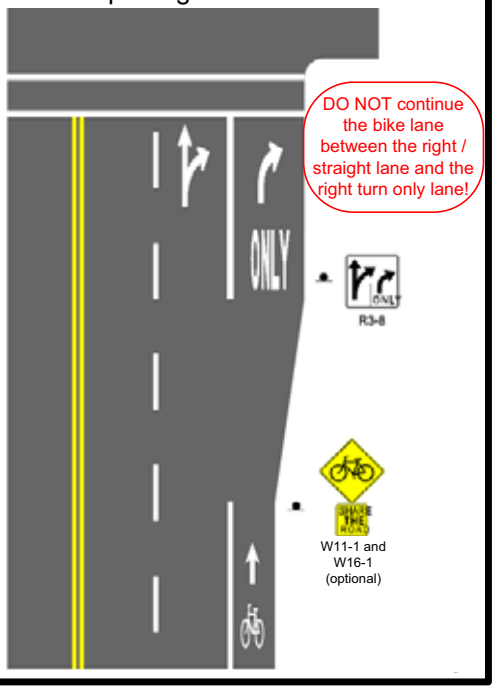
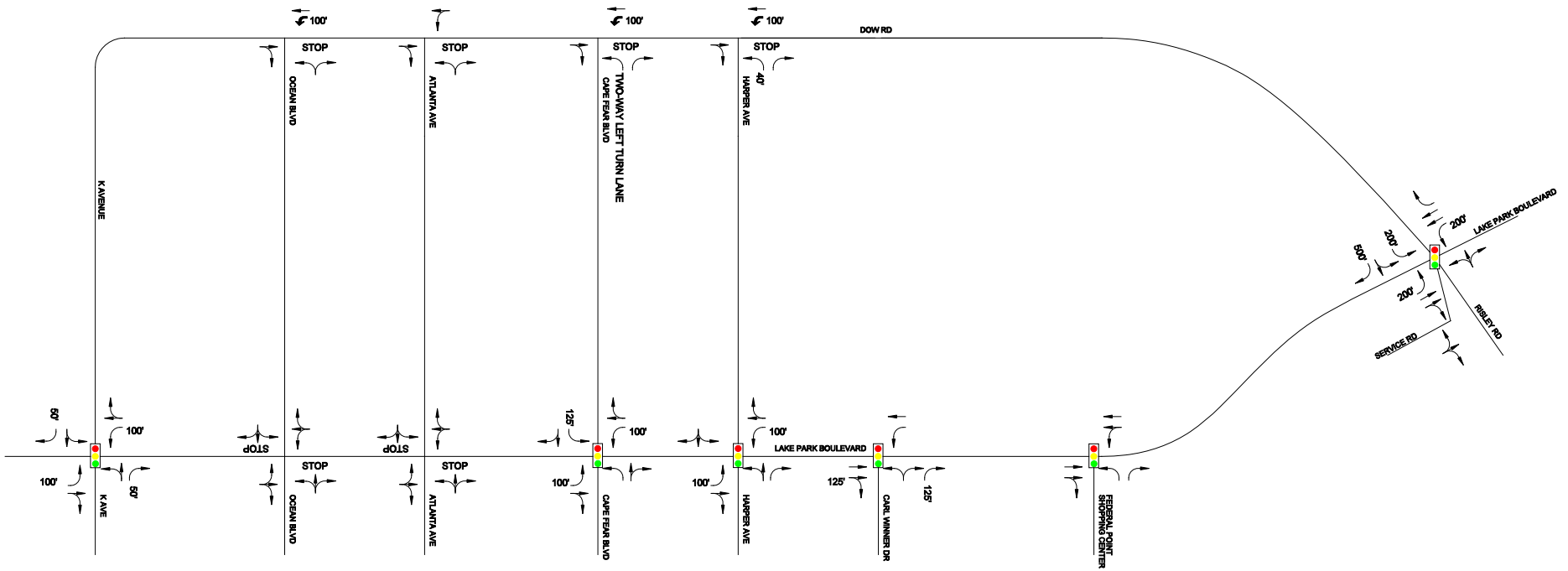


Figure 2d – Optional Bike Lane Facility for Multiple Right Turn Lanes



Source: ITE Traffic Control Devices Handbook



LEGEND	
	EXISTING TRAVEL LANE
	RECOMMENDED TRAVEL LANE
	SIGNAL CONTROLLED
STOP	STOP CONTROLLED
XX'	STORAGE LENGTH

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

RECOMMENDED 2030 FUTURE LANE CONFIGURATIONS AND TRAFFIC CONTROL

FIGURE: 7

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

DOW ROAD / K AVENUE
CONCEPTUAL DESIGN

FIGURE: 8

SCALE:
1"=100'

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

DOW ROAD / HARPER AVENUE
CONCEPTUAL DESIGN

FIGURE: 9

SCALE:
NONE

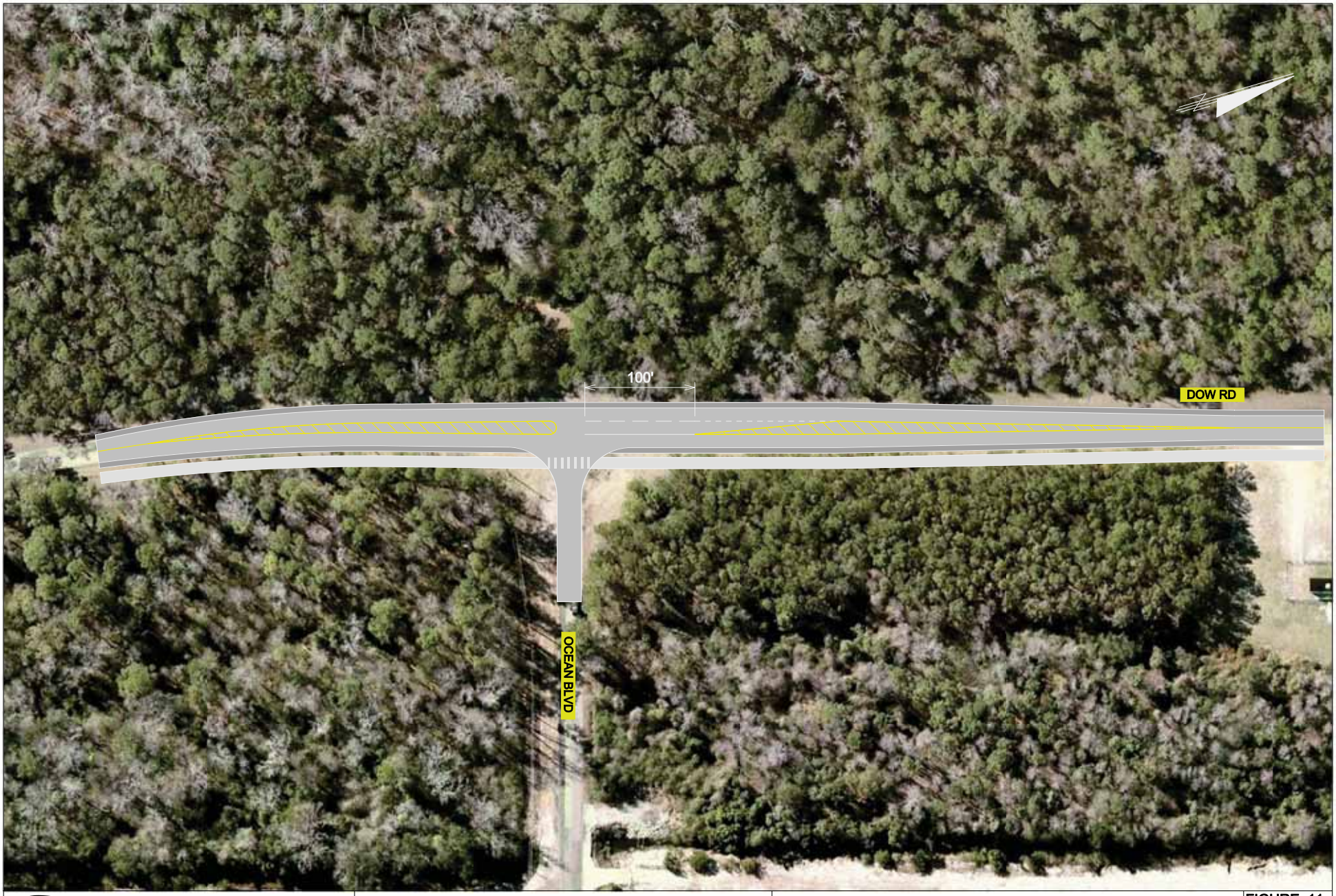
ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

DOW ROAD / CAPE FEAR BOULEVARD
CONCEPTUAL DESIGN

FIGURE: 10

SCALE:
NONE



ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

DOW ROAD / OCEAN BOULEVARD
CONCEPTUAL DESIGN

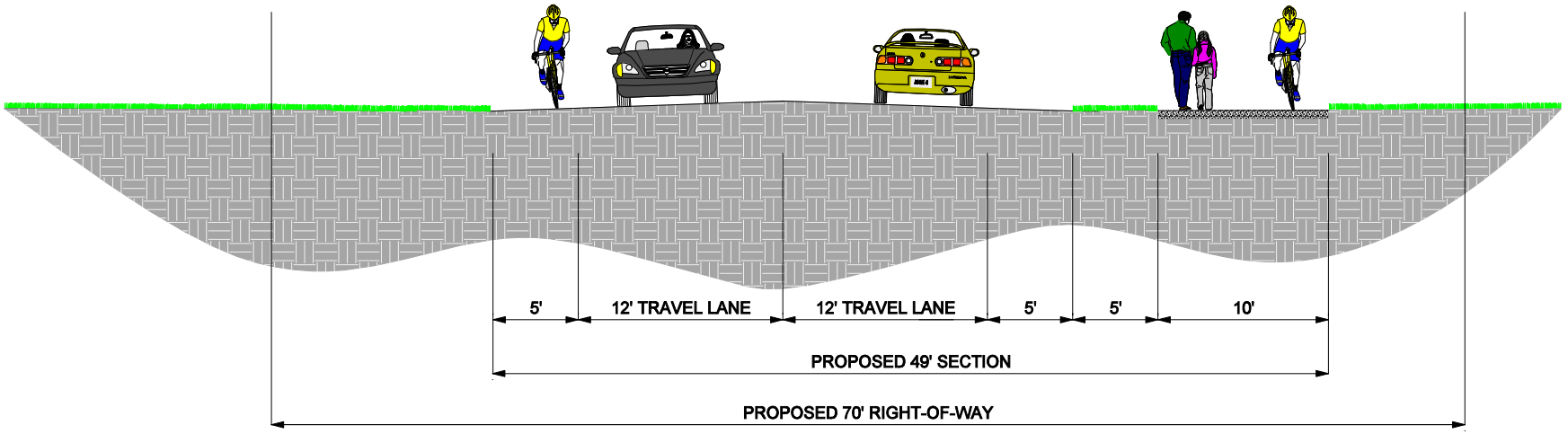
FIGURE: 11

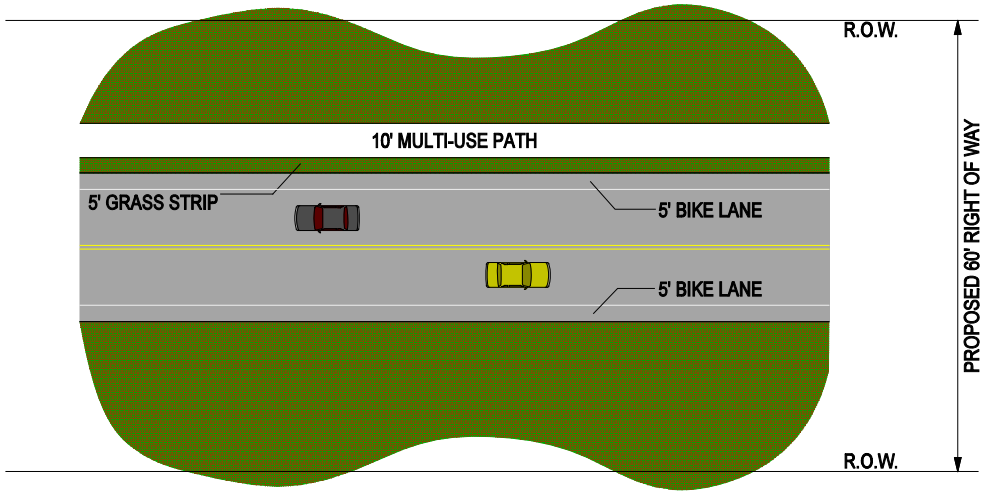
SCALE:
NONE

DOW ROAD

TYPICAL SECTION – TWO–LANE ROADWAY WITH BIKE LANES AND MULTI–USE PATH

NOT TO SCALE





PREPARED FOR:

WILMINGTON METROPOLITAN PLANNING ORGANIZATION

PREPARED BY:

ENGINEERS PLANNERS ECONOMISTS
WilburSmith ASSOCIATES

421 Fayetteville Street, Suite 1303
Raleigh, North Carolina 27601
Tele:919.755.0583
Fax: 919.832.8798

PLAN – TWO–LANE ROADWAY

NOT TO SCALE

FIGURE 12

VIII. Conclusions

Based on the potential for significant environmental impacts and the lack of public support for a new facility, WSA recommends that Dow Road not be extended from K Avenue to US 421. Due to the lack of significant growth projected on the island, the traffic analysis indicates that the Dow Road will function with a reasonable level of service as a two lane facility in 2030. Improvements should be made to better accommodate cyclists and a multi-use path should be added to better facilitate cyclists and pedestrians along this corridor. Finally the Dow Road / K Avenue curve should be constructed to allow for safer travel through this intersection.

IX. References

[1] ***Highway Capacity Manual***, Transportation Research Board, National Research Council, Washington, D.C., 2000.

[2]***A Policy on Geometric Design of Highways and Streets***, AASHTO, Washington, DC, 2004

[3]***Guide for the Development of Bicycle Facilities***, AASHTO, Washington, DC, 1999

[4]***Manual of Uniform Traffic Control Devices,*** Federal Highway Administration, Washington, D.C. 2003

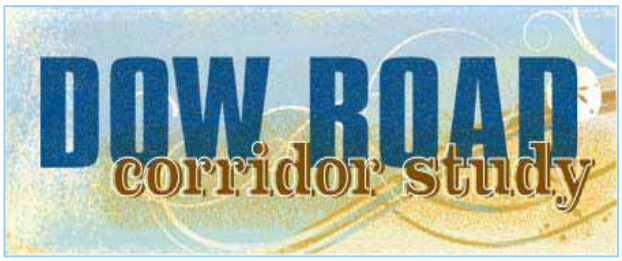
[5]***Guide for the Planning, Design and Operation of Pedestrian Facilities***, AASHTO, Washington, DC, 2004

Appendix A

Agency and Town Council

Comment Letters, EDR Report

Executive Summary



DOW ROAD CORRIDOR STUDY

Summary of Public Comments
June 30, 2008

Table of Contents

Introduction

The Wilmington Metropolitan Planning Organization (WMPO) held a Public Workshop for the Dow Road Corridor Study on the following date:

Monday, June 30, 2008 – Carolina Beach Elementary School, Carolina Beach

The local public was notified of the workshop in advance in the following ways:

- Mailing of Newsletter via USPS standard mail (mailed to property owners and stakeholders) on June 12, 2008
- Newspaper advertisement in Island Gazette and Wilmington Morning Star on June 25 and 29, 2008.
- Media press release submitted on June 26, 2008
- Email Notification to public officials and agencies.

The corridor study will analyze the widening of Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, as well as extending Dow Road from K Avenue to US 421 (Fort Fisher Boulevard) on new location. Currently, Dow Road is a two-lane, undivided road that extends through Carolina and Kure beaches to K Avenue and includes a multi-use path along part of the road. The study will also consider extending this adjacent multi-use path. The improved Dow Road will improve north-south access in both Carolina and Kure Beaches and reduce congestion along US 421 (US 421 is designated a Hurricane Evacuation Route). The area being studied is approximately 5.3 miles in length, bordered within the Military Ocean Terminal, Sunny Point (MOTSU) Blast Buffer.

The purpose of the workshop was to review and discuss the widening and extension of Dow Road, and to provide participants an opportunity to speak to WMPO and Consultant team staff and make verbal and written comments.

As participants arrived, they were asked to sign in and provided a handout packet. Citizens were provided a newsletter, project fact sheet and comment sheet regarding the Dow Road Corridor Study. The Comment Sheet included three special topics of interest to write comments, which included:

- Dow Road Route
- Neighborhood/Community Impacts
- Environmental or Other Issues

The format of the workshop provided citizens' an opportunity to learn about the project, understand the social, environmental and economic character of the area, ask questions and offer input to MPO staff and consultant team members. Maps, displays and other project information were available for viewing to provide participants a good understanding of the project.

Mr. Mike Kozlosky, WMPO Project Manager, Mr. Sun Temple Helgren, Consultant Team Project Manager, other WMPO staff and consultant team members were available at the workshop to answer questions.

A total of 97 people signed in at the workshop. Additionally, a total of 69 comment sheets were completed at the meeting and/or received by mail or via email. A summary of all written comments is presented below.

Summary of Comments

JUNE 30, 2008 – CAROLINA BEACH ELEMENTARY SCHOOL, CAROLINA BEACH

Dow Road Route

FAVOR

- Support expansion – include shoulders for bicycles and dedicated turn lanes.
- Support widening of Dow Road in the least invasive way; keep it two lanes but add bike lane and wider shoulders.
- Extension should utilize as much of Kure Beach town-owned property as possible; does not need to extend to Ft. Fisher.
- Growth brings tax revenue and community project money (such as beach replenishment); new routes for access are needed. ADVANCED planning is necessary. (3 comments received)
    - Homeowners along S. Ft. Fisher Blvd. would appreciate a bypass via Dow extender. Extender would decrease 'thru traffic' in front yards.
    - Downtown, if cleaned up/spruced up, will be visited even with bypass in place.
- Strongly support the extension of Dow Road so that we can reclaim the peaceful pace of a pedestrian, bike-friendly town and community. Seize the moment and secure our tranquil future values. (7 comments received)
    - Lower speed limit along Fort Fisher to 25MPH while lowering traffic volume.
    - If Davis Road folks are against it, consider extending to President Davis Road, as there are no houses directly on the road.
- Support improvement through K Avenue – beyond that is a waste of money (few people live beyond this point). (5 comments received)
- Three-lane road, bike path, and walking trail – YES. EXTENSION – NO.
    - Support improvements (shoulders, etc.) to existing Dow Road to K Avenue.
    - Support bike path (multi-use) along existing footprint of Dow Road/right of way.
- Widen Dow Road to at least three lanes; straighten sharp curve just before Kure Beach; add bike route along Dow Road; extend Dow Road to Ft. Fisher Blvd. near the Fort.

OPPOSED

- Road is dangerous and locals feel they will lose business with the change. (3 comments received)
- Currently an accident waiting to happen due to deer and fox population and speeding; making it four lanes, any longer would be a death trap! (3 comments received)
- Heavy traffic is a negative impact for the economic health of this community. (4 comments received)
    - Currently, a fairly pristine wooded area with no construction on Kure Beach section and not much in the Carolina Beach section. A four-lane road will end the Pleasure Island as we know it!
- Proposed four lanes will take up our parking in front of our business.
- Traffic flow to Snows Cut Bridge will back up on weekends, holidays and emergency evacuations. There is only one bridge off the island to handle traffic.
- Not needed – would go through wetlands.

- Currently no congestion – leave it as is! (21 comments received)
    - Waste of money in these poor economic times.
    - Preserve our buffer zones.
- No more asphalt on this island!
- Oppose extending Dow Road beyond K Avenue through the Sunny Point Buffer Zone. (2 comments received)
    - Improve Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, especially the shoulders and road condition.
    - Creating new right of way through Sunny Point Military Operations Terminal 'buffer zone' poses additional security risks – outside of Town's jurisdiction creating patrolling and monitoring traffic issues.
    - Proposed route interferes with and infringes on the US Air Force Recreation Center at Fort Fisher. This facility contributes immensely to town's local economy and vital morale support issue for the Forces and families.
    - Proposed route diverts tourists away from Kure Beach business district and causes a negative economic impact.
    - Proposed route creates profound impacts on the environmental makeup of the surrounding Kure Beach area – it would degrade the environment and increase pollution and storm water issues.
- Opposed to bike path (multi-use) in existing MOTSU Buffer fire lane area.
- Opposed to dirt road or fire break in government-owned land between Dow Road and the residential community as an alternative.
    - Fire hazard concerns; concealment which draws possibility of robbery, rape and worse; reduction to habitat for wildlife; create foothold for future development of natural sanctuary; hidden from casual observation by drivers and police; accidents involving personal injury to solitary riders would go unnoticed until next biker happened along; cost is higher.
- Have yet to hear a good argument on why this study is needed – waste of money.

IDEA GENERATION or SUGGESTION

- Add a bike path/pedestrian path the continuation of the one there now (all the way to K Street in Kure Beach). (34 comments received)
- Currently sight distance is a problem making a right turn from Ocean Blvd. to Dow Road.
- Add a light at Ocean Blvd.
- Maintain two primary lanes – turn lanes might help.
- Make improvements to Dow Road, K Avenue and through existing stop light, then north and south on US 421. Discourage through traffic on 7th, 6th, 5th, 4th, and 3rd streets in Kure Beach.
- Make Dow Road a three-lane road using two lanes for exit in an emergency and keep the middle lane as a turning lane during normal use. (2 comments received)
- Bike path should not be next to road or shoulder – 20 feet away is better. (4 comments received)
- Unnecessary expense – improve it by widening but not extending it.
    - Create a wide shoulder as an alternative.
- Maintain Dow Road as a 'through road' and widen so slow moving traffic is less of an inhibitor.
- Improve the "blind corner" at Ocean Blvd/Dow Road.
- Modify sharp turn at K Avenue.
- Rebuild Dow road only to the capacity of Snow's Cut Bridge.
- Design to accommodate residents, south end should be smaller – two lanes and grow as traffic load requires (south to north).

- Pleasure Island needs expansion and access to the south for both cars and bicycles.
- Any taking of land from Carolina Beach State Park would require an act of the state legislature.
    - Land owned by Carolina Beach State Park has routine prescribed burns on both sides of Dow Road (may cause occasional inconveniences for drivers using Dow as bypass).

Neighborhood/Community Impacts

FAVOR

- Big plus, makes the street (Ft Fisher Blvd) much safer.
- Would improve traffic flow off the island.
- Bypassing K Blvd should help the local neighborhood. (4 comments received)
    - Improve quality of life; easy traffic congestion; will provide avenues for future economic resources.

OPPOSED

- It would bypass the town's 'business districts' (bad for businesses) – Carolina Beach and Kure Beach. (17 comments received)
    - Could change dynamics of business district to local dining destination and a pure destination for lodging.
- It would mean more police patrol – who would this be? Who pays for it?
- It would destroy wetlands for a road to be used three months out of the year. (3 comments received)
    - Where would this road end – in Ft. Fisher, in the Ferry Terminal, near people's homes?
- Business loss for locals. Will not decrease overcrowding of island traffic. (2 comments received)
- This is a quiet beach community – would increase traffic speed and noise. (4 comments received)
- Negative for residential (particularly children at play). (2 comments received)
- Honor MOTSU commitment to keep buffer zone intact.

IDEA GENERATION or SUGGESTION

- Try selling it by adding a bike trail. (5 comments received)
- Not feasible since it is a hurricane evacuation route and two-lane bridge (Snow's Cut) would create bottleneck.

Environmental or Other Issues

FAVOR

- None

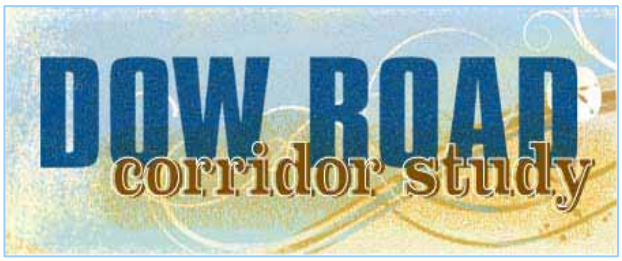
OPPOSED

- Do not ruin the little wetland and natural area on this island; do not abuse historic sites. (4 comments received)
- Creates negative impact on storm water runoff with more asphalt, loss of trees and impacts wetlands. (3 comments received)
- Just negative, negative, negative.
- Storm water runoff and natural drainage will cause significant issues. (3 comments received)

- Will impact wildlife – deer, birds, etc. (7 comments received)
    - Deer overpopulated on Federal property causing accidents with cars (and you propose more cars?). Get the government to rid the deer and folks may think differently about it.
- According to geologists, all efforts must be made to reduce the erosion of our island by less development and less destruction of natural habitat.
    - Valuable wetlands that protect island from flooding, major east coast refuge for many migratory birds, carnivorous plants.
- Dow Road extension beyond K Avenue would negatively affect recreational area – would require more safety (Fire & Police).

IDEA GENERATION or SUGGESTION

- Bike lanes should be in the form of a very wide shoulder, not the narrow ones as on River Road. (2 comments received)
- Need more representatives from Carolina and Kure Beach on your committee. (2 comments received)
- Spend our tax dollars elsewhere!
- Visibility issues - cut back trees or vegetation for all turning lanes within five mile study area. (2 comments received)
    - Reduce speed limit.
- Wildlife impact needs serious review (deer, etc.) (2 comments received)
- Do a fly-over through the Air Force Recreation Center.
- A large crosswalk from K Avenue to the pier area at the stoplight should be painted on the Big Daddy's side so that pedestrians can cross at the light without getting in the way of cars and trucks that turn right to go toward Fort Fisher.
- If you want to use our taxpayer's money wisely, widen River Road and put a light at River and Carolina Beach Roads.
- Concerned about getting off the island for a Category 3 or 4 Hurricane – US 421 is totally submerged following one of these storms. Create high routes to avoid flooding and possibly make a toll road like Hilton Head. This would defray the cost of construction.
- Project should consider landscaping, choice of pavement, etc.; keeping it two lanes rather than four lanes would be far preferable.



DOW ROAD CORRIDOR STUDY

Summary of Public Comments
September 28, 2009

Table of Contents

Introduction

The Wilmington Metropolitan Planning Organization (WMPO) held a Public Workshop for the Dow Road Corridor Study on the following date:

Monday, September 28, 2009 – Carolina Beach Town Hall, Carolina Beach

The local public was notified of the workshop in advance in the following ways:

- Newspaper advertisement in Island Gazette and Wilmington Morning Star
- Flyer posted on Carolina Beach / Kure Beach area businesses
- Email Notification to public officials and agencies.

The corridor study was to initially analyze the widening of Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, as well as extending Dow Road from K Avenue to US 421 (Fort Fisher Boulevard) on new location. Due to lack of support from some residents, the Town of Kure Beach, and some public agencies, the study was re-scoped to study only the existing alignment of Dow Road and what improvements may be needed to handle future projected traffic volumes and to accommodate pedestrians and cyclists. Currently, Dow Road is a two-lane, undivided road that includes bike lanes and extends through Carolina and Kure Beaches. The study recommends adding a multi-use recreational path for bicycles, pedestrians, skaters and other users and additional turn lanes and signage to provide for safe and efficient vehicular movements. The area being studied is approximately 5.3 miles in length, bordered within the Military Ocean Terminal, Sunny Point (MOTSU) Blast Buffer.

The purpose of the workshop was to review and discuss the findings of the Dow Road Corridor Study, and to provide participants an opportunity to speak to WMPO and Consultant team staff and make verbal and written comments.

As participants arrived, they were asked to sign in and provided a newsletter and comment sheet regarding the Dow Road Corridor Study. The Comment Sheet included three special topics of interest to write comments, which included:

- Dow Road Improvements
- Neighborhood/Community Impacts
- Environmental or Other Issues

The format of the workshop provided citizens' an opportunity to learn about the project, understand the social, environmental and economic character of the area, ask questions and offer input to MPO staff and consultant team members. Maps, displays and other project information were available for viewing to provide participants a good understanding of the project.

Mr. Mike Kozlosky, WMPO Project Manager, Mr. Matt Pickens, Consultant Team Project Manager, Mr. Tim Owens of Carolina Beach, and consultant team members were available at the workshop to answer questions.

A total of 10 people signed in at the workshop. Additionally, a total of 4 comment sheets were completed at the meeting and/or received by mail or via email. A summary of all written comments is presented below.

Summary of Comments

September 28, 2009 – CAROLINA BEACH TOWN HALL, CAROLINA BEACH

Dow Road Improvements

FAVOR

- Support Dow Road / K Avenue curve improvements
- Pleased with bikes paths and Dow Road ending at K Avenue
- Supports extending Dow Road south to bypass Kure Beach
- Supports the idea of connecting bicycle / foot paths whenever possible, possibly eliminating this kind of traffic in congested areas and creating safe zones

OPPOSED

- NONE

IDEA GENERATION or SUGGESTION

- Keep the possibility of extending Dow Road, traffic is so much worse now on US 421 (2 comments)
- Bring the bike path closer into residential and commercial areas (1 comment)

Neighborhood/Community Impacts

FAVOR

- NONE

OPPOSED

- NONE

Environmental or Other Issues

FAVOR

- NONE

OPPOSED

- NONE

TOWN COUNCIL
TOWN OF KURE BEACH, NC

RESOLUTION BYTHE TOWN COUNCIL OF THE TOWN OF KURE BEACH

OPPOSING EXTENSION OF DOW ROAD BEYOND K AVENUE THROUGH THE SUNNY POINT BUFFER ZONE

WHEREAS: The Wilmington Urban Area Metropolitan Planning Organization Transportation Advisory Committee is conducting the Dow Road Corridor Study to analyze the widening of Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, as well as extending Dow Road from K Avenue to US 421 (Fort Fisher Boulevard), and

WHEREAS: The Kure Beach Town Council is in favor of a bike path from the Town to the Fort Fisher Ferry, and

WHEREAS: the Kure Beach Town Council is in favor of improving Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, especially the shoulders and road condition; and

NOW, THEREFORE BE IT RESOLVED, that the Kure Beach Town Council does hereby publicly state opposition to the extension of Dow Road beyond K Avenue through the Sunny Point buffer zone for the following reasons:

1. Creating a new right of way through the Sunny Point Military Operations Terminal 'buffer zone' poses additional security risks in that it is outside the Town's jurisdiction and thus patrolling and monitoring traffic brings additional problems.

2. The proposed route interferes with and infringes on the US Air Force Recreation Center at Fort Fisher. This facility contributes immensely to the Town's local economy and is a vital morale support issue for US Armed Forces and their families.

3. The Town of Kure Beach is one of Pleasure Island's top tourist attractions with visitors from all over the United States. The proposed route will divert traffic away from the Kure Beach business district which will have a significant negative economic impact. This comes at a time when the Town is exploring new economic development opportunities for the Town, not creating bypasses around the businesses.

4. This project will have significant and profound impacts on the environmental makeup of the area surrounding the Kure Beach community by degrading the environment and increasing pollution and storm water issues that neither the Town nor Sunny Point are prepared to deal with.

Approved this 17th day of June, 2008.

By: _____
Mac Montgomery, Mayor

TOWN OF KURE BEACH INCORPORATED 1947 STATE OF NORTH CAROLINA

ATTEST: _____
Nancy Avery, Town Clerk

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Coleen Sullins, Director
Division of Water Quality

June 16, 2008

MEMORANDUM

To: Mr. SunTemple Helgren
Wilbur Smith Associates
421 Fayetteville Street
Suite 1303
Raleigh, NC 27601

From: David Wainwright, NC Division of Water Quality

Subject: Scoping comments on proposed widening and extension of Dow Road (SR 1573) in New Hanover County.

Reference your correspondence dated May 26, 2008 in which you requested comments for the referenced project. Preliminary analysis of the project reveals the potential for multiple impacts to perennial streams and jurisdictional wetlands in the project area. More specifically, impacts to:

Stream Name	River Basin	Stream Classification(s)	Stream Index Number
UT to Cape Fear River	Cape Fear	SC	18-(71)
UT to Cape Fear River	Cape Fear	SC	18-(71)
UT to Cape Fear River	Cape Fear	SC	18-(71)

Due to the nature of the area in and around the project, this project has the potential to have significant impacts to wetlands. Wilbur Smith Associates and the Wilmington Area Metropolitan Planning Organization (WMPO) are strongly urged to consider measures which will keep impacts to natural resources to a minimum. Wilbur Smith Associates and the WMPO are respectfully reminded that in order to obtain a 401 Water Quality Certification applicants must show avoidance and minimization to the greatest extent practicable.

Further investigations at a higher resolution should be undertaken to verify the presence of other streams and/or jurisdictional wetlands in the area. In the event that any jurisdictional areas are identified, the Division of Water Quality requests that Wilbur Smith Associates and the WMPO consider the following environmental issues for the proposed project:

1. Environmental documentations should provide a detailed and itemized presentation of the proposed impacts to wetlands and streams with corresponding mapping. If mitigation is necessary as required by 15A NCAC 2H.0506(h), it is preferable to present a conceptual (if not finalized) mitigation plan with the environmental documentation. Appropriate mitigation plans will be required prior to issuance of a 401 Water Quality Certification.

Transportation Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
2321 Crabtree Boulevard, Suite 250, Raleigh, North Carolina 27604
Phone: 919-733-1786 / FAX 919-733-6893 / Internet: http://h2o.enr.state.nc.us/ncwetlands

2. Environmental assessment alternatives should consider design criteria that reduce the impacts to streams and wetlands from storm water runoff. These alternatives should include road designs that allow for treatment of the storm water runoff through best management practices as detailed in the most recent version of NC DWQ *Stormwater Best Management Practices*, such as grassed swales, buffer areas, preformed scour holes, retention basins, etc.

3. After the selection of the preferred alternative and prior to an issuance of the 401 Water Quality Certification, the NCDOT is respectfully reminded that they will need to demonstrate the avoidance and minimization of impacts to wetlands (and streams) to the maximum extent practical. In accordance with the Environmental Management Commission's Rules (15A NCAC 2H.0506[h]), mitigation will be required for impacts of greater than 1 acre to wetlands. In the event that mitigation is required, the mitigation plan should be designed to replace appropriate lost functions and values. The NC Ecosystem Enhancement Program may be available for use as wetland mitigation.

4. In accordance with the Environmental Management Commission's Rules (15A NCAC 2H.0506[h]), mitigation will be required for impacts of greater than 150 linear feet to any single perennial stream. In the event that mitigation is required, the mitigation plan should be designed to replace appropriate lost functions and values. The NC Ecosystem Enhancement Program may be available for use as stream mitigation.

5. DWQ is very concerned with sediment and erosion impacts that could result from this project. NC DOT should address these concerns by describing the potential impacts that may occur to the aquatic environments and any mitigating factors that would reduce the impacts.

6. If a bridge is being replaced with a hydraulic conveyance other than another bridge, DWQ believes the use of a Nationwide Permit may be required. Please contact the US Army Corp of Engineers to determine the required permit(s).

7. If the old bridge is removed, no discharge of bridge material into surface waters is allowed unless otherwise authorized by the US ACOE. Strict adherence to the Corps of Engineers guidelines for bridge demolition will be a condition of the 401 Water Quality Certification.

8. Bridge supports (bents) should not be placed in the stream when possible.

9. Whenever possible, the DWQ prefers spanning structures. Spanning structures usually do not require work within the stream or grubbing of the streambanks and do not require stream channel realignment. The horizontal and vertical clearances provided by bridges allow for human and wildlife passage beneath the structure, do not block fish passage and do not block navigation by canoeists and boaters.

10. Bridge deck drains should not discharge directly into the stream. Stormwater should be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of the DWQ's *Stormwater Best Management Practices.*

11. If concrete is used during construction, a dry work area should be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete should not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

12. If temporary access roads or detours are constructed, the site should be graded to its preconstruction contours and elevations. Disturbed areas should be seeded or mulched to stabilize the soil and appropriate native woody species should be planted. When using temporary structures the area should be cleared but not grubbed. Clearing the area with chain saws, mowers, bush-hogs, or other mechanized equipment and leaving the stumps and root mat intact allows the area to re-vegetate naturally and minimizes soil disturbance.

13. Placement of culverts and other structures in waters, streams, and wetlands should be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures should not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by the DWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact the NC DWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.

14. If multiple pipes or barrels are required, they should be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.

15. If foundation test borings are necessary; it should be noted in the document. Geotechnical work is approved under General 401 Certification Number 3494/Nationwide Permit No. 6 for Survey Activities.

16. Sediment and erosion control measures sufficient to protect water resources must be implemented and maintained in accordance with the most recent version of North Carolina Sediment and Erosion Control Planning and Design Manual and the most recent version of NCS000250.

17. All work in or adjacent to stream waters should be conducted in a dry work area unless otherwise approved by NC DWQ. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures should be used to prevent excavation in flowing water.

18. Sediment and erosion control measures should not be placed in wetlands and streams.

19. Borrow/waste areas should avoid wetlands to the maximum extent practical. Impacts to wetlands in borrow/waste areas could precipitate compensatory mitigation.

20. While the use of National Wetland Inventory (NWI) maps, NC Coastal Region Evaluation of Wetland Significance (NC-CREWS) maps and soil survey maps are useful tools, their inherent inaccuracies require that qualified personnel perform onsite wetland delineations prior to permit approval.

21. Heavy equipment should be operated from the bank rather than in stream channels in order to minimize sedimentation and reduce the likelihood of introducing other pollutants into streams. This equipment should be inspected daily and maintained to prevent contamination of surface waters from leaking fuels, lubricants, hydraulic fluids, or other toxic materials.

22. In most cases, the DWQ prefers the replacement of the existing structure at the same location with road closure. If road closure is not feasible, a temporary detour should be designed and located to avoid wetland impacts, minimize the need for clearing and to avoid destabilizing stream banks. If the structure will be on a new alignment, the old structure should be removed and the approach fills removed from the 100-year floodplain. Approach fills should be removed and restored to the natural ground elevation. The area should be stabilized with grass and planted with native tree species. Tall fescue should not be used in riparian areas.

23. Riprap should not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.

Thank you for requesting our input at this time. The DOT is reminded that issuance of a 401 Water Quality Certification requires that appropriate measures be instituted to ensure that water quality standards are met and designated uses are not degraded or lost. If you have any questions or require additional information, please contact David Wainwright at (919) 773-3415.

cc: Brad Shaver, US Army Corps of Engineers, Wilmington Field Office
Travis Wilson, NC Wildlife Resources Commission
Steve Sollod, Division of Coastal Management
Chris Militscher, Environmental Protection Agency
Ken Averitte, DWQ Fayetteville Regional Office
File Copy

North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

July 16, 2008

Ms. SunTemple Helgren
Wilbur Smith Associates
421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

Subject: Planning Study --Widening of Dow Road from US 421 in Carolina Beach to K Avenue in Kure Beach, and then Extending Dow Road from K Avenue to US 421 in Kure Beach; New Hanover County

Dear Ms. Helgren:

The Natural Heritage Program has a number of records of rare species, significant natural heritage areas (SNHA), and managed/conservation areas in the vicinity of the project area. These rare species and sites are associated with the Carolina Beach State Park SNHA and the MOTSU Buffer Zone SNHA, both of which are State significant. I am enclosing descriptions of the two SNHAs, from the Natural Area Inventory of New Hanover County, North Carolina (2003), by Richard LeBlond (Natural Heritage Program). The reports name the many rare species and natural communities present in these two sites.

Some of the most urgent protection of natural resources in the state involves maritime forests and other maritime habitats, such as coastal sandhills Most of such habitat types have already been lost to development, especially in Brunswick and New Hanover counties. Some of the best remaining habitats along the southern coast are those at the MOTSU Buffer Zone and at Carolina Beach State Park. The northern 2/3rds of the proposed project would impact several acres along one or both sides of Dow Road by the presumed clearing of some maritime forest. The southern third of the project, extending Dow Road south from K Road as a completely new road, would not only remove additional acres of maritime habitat but would fragment forest on both sides.

The Natural Heritage Program does not support this project. In particular, the extension of Dow Road south of K Road would do irreparable damage to maritime forest communities, and to the plants and animals that inhabit them. Because the project involves the taking of land from the State (Carolina Beach State Park, administered by the N.C. Division of Parks and Recreation) and the Federal government (Sunny Point Military Ocean Terminal, owned by the U.S. Department of Defense), these agencies will need to be contacted for their comments on the project.

You may wish to check the Natural Heritage Program database website at www.ncnhp.org for a listing of rare plants and animals and significant natural communities in the county and on the quad map. Our Program also has a new website that allows users to obtain information on element occurrences and significant natural heritage areas within two miles of a given location:

<http://nhpweb.enr.state.nc.us/nhis/public/gmap75_main.phtml>. The user name is "public" and the password is "heritage". You may want to click "Help" for more information.

NC OneMap now provides digital Natural Heritage data online for free. This service provides site specific information on GIS layers with Natural Heritage Program rare species occurrences and Significant Natural Heritage Areas. The NC OneMap website provides Element Occurrence (EO) ID numbers (instead of species name), and the data user is then encouraged to contact the Natural Heritage Program for detailed information. This service allows the user to quickly and efficiently get site specific NHP data without visiting the NHP workroom or waiting for the Information Request to be answered by NHP staff. For more information about data formats and access, visit <www.nconemap.com>, then click on "FTP Data Download", and then "nheo.zip" [to the right of "Natural Heritage Element Occurrences"]. You may also e-mail NC OneMap at <dataq@ncmail.net> for more information.

Please do not hesitate to contact me at 919-715-8697 if you have questions or need further information.

Sincerely,

Harry E. LeGrand, Jr.

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program

Enclosures

cc: Brian Strong, N.C. Division of Parks and Recreation

NEW HANOVER COUNTY INVENTORY

Carolina Beach State Park
Significant Natural Heritage Area
Carolina Beach quad

Scale - 1:24,000

prepared by N.C. Natural Heritage Program - 4/03

CAROLINA BEACH STATE PARK
Significant Natural Heritage Area

Site significance: state **Size:** 600 acres
Quadrangle: Carolina Beach
Ownership: N.C. Division of Parks and Recreation, U.S. Department of Defense, private

SIGNIFICANT FEATURES: Carolina Beach State Park natural area possesses a high diversity of plants, animals, and natural communities. It has more rare species than any other natural area in New Hanover County, with 17 rare plants and nine rare animals documented from the site. Among the rare animals, Federally and State Threatened American alligator (*Alligator mississippiensis*) can be found in the marshes here bordering Cape Fear River. Three Federal Species of Concern also occur here: eastern painted bunting (*Passerina ciris ciris*), gopher frog (*Rana capito*), and Croatan crayfish (*Procambarus plumimanus*). The site contains the only known current population in North Carolina for the State Endangered eastern coral snake (*Micrurus fulvius*). Among the rare plants are Venus flytrap (*Dionaea muscipula*) and coastal beaksedge (*Rhynchospora pleiantha*), both Federal Species of Concern. Another indication of biological diversity at this site is the occurrence of 11 natural community types, the most of any natural area in the county. Among these are the uncommon to rare Pine Savanna Wet Spodosol Variant, Coastal Fringe Sandhill, and Xeric Sandhill Scrub Coastal Fringe Variant. Two wetland communities, Small Depression Pond and Vernal Pool, contain the great majority of rare plants in the park, and are excellent examples of their community types. The site also contains a newly identified community association currently known only along the saltwater tidal shores of Cape Fear River, and called Tidal Saltwater Levee Forest.

LANDSCAPE RELATIONSHIPS: This natural area is located in southern New Hanover County along the east shore of Cape Fear River, just northwest of the town of Carolina Beach. It includes a large portion of Carolina Beach State Park, plus a smaller area of adjacent undeveloped private land. MOTSU Buffer Zone Natural Area lies one-half mile southward, but the two natural areas are separated by a county waste treatment facility. Doctor Point Hammocks natural area lies one mile to the north, beyond Snows Cut. Land to the east is mostly residentially and commercially developed. The site forms the northern end of the Carolina Beach Macrosite within the Cape Fear Megasite.

SITE DESCRIPTION: Carolina Beach State Park natural area occurs on a diverse landscape of sand ridges, dunes, swales, and embayments. The geology and biology reflect its unusual topographic position between the ocean and a large river. In this area, New Hanover County in essence is a mainland peninsula with features similar to those of a barrier island. In the natural area, the sand ridges and interior dunes support longleaf pine communities wherever fire has been a natural component of the landscape. There are two longleaf pine communities associated with drier ridges at this site: Coastal Fringe Sandhill and Xeric Sandhill Scrub Coastal Fringe Variant. Two other longleaf pine communities are found on low flats adjacent to the ridges and dunes: Pine Savanna Wet Spodosol Variant and Wet Pine Flatwoods Wet Spodosol Variant. In areas where the

sand ridges and dunes have naturally been protected from fire, the Coastal Fringe Evergreen Forest can be found. The Small Depression Pocosin, Small Depression Pond, and Vernal Pool communities occur in wet depressions between the sand ridges and dunes, and Streamhead Pocosin is found along low slopes associated with small stream headwaters. Two other communities are associated with embayments along the Cape Fear River: Brackish Marsh in the embayments, and the newly identified Tidal Saltwater Levee Forest on natural levees between marsh habitat and the river.

Coastal Fringe Sandhill is found primarily on dry sands of relict beach dunes and slopes of sand ridges. The canopy of longleaf pine (*Pinus palustris*) is sparse, while the oak understory is open to dense. The dominant oak is sand live oak (*Quercus geminata*), sometimes co-dominating with turkey oak (*Q. laevis*). Shrubs and herbs are patchy to moderate where the understory is open, and sparse where little light reaches the ground. Prominent shrubs include southern blueberry (*Vaccinium tenellum*) and deerberry (*V. stamineum*). Reindeer lichen (*Cladonia* sp.) and oaktoes lichen (*Cladina evansii*) are the most frequent ground layer dominants, with Carolina wiregrass (*Aristida stricta*) and sandhill beaksedge (*Rhynchospora megalocarpa*) prominent. This community is virtually restricted to within five miles of the coast, and is only known from Brunswick County north to Carteret County.

Xeric Sandhill Scrub Coastal Fringe Variant occurs on the driest sands of ridges and dunes. It has an open canopy of longleaf pine, which is stunted in some areas, apparently due to extreme dryness. The open to dense oak understory is dominated by turkey oak, with dwarf huckleberry (*Gaylussacia dumosa*) and southern blueberry dominating the patchy shrub layer. Wiregrass and reindeer and oaktoes lichens are patch dominants in the ground layer. This community is distinguished from other xeric sandhill communities by the presence of species primarily found along the coast, such as sandhill beaksedge and oaktoes lichen. It also occurs in association with the Coastal Fringe Sandhill community.

Pine Savanna Wet Spodosol Variant is found on flats and gentle slopes where the sand is wet year-round. The sparse canopy of longleaf pine and pond pine (*Pinus serotina*) allows plenty of light to reach the forest floor, enhancing herb diversity. Carolina wiregrass is the dominant ground layer plant, although in the past such shrubs as dwarf huckleberry had become prominent due to lack of fire. More recently, prescribed burns have reduced shrub dominance and are allowing the grasses and wildflowers to resume natural prominence.

Sands that are wet in spring but dry out later in the growing season support the Wet Pine Flatwoods Wet Spodosol Variant community. It has an open, mature canopy of uneven-aged longleaf pine over a fairly dense ground layer of Carolina wiregrass and creeping blueberry (*Vaccinium crassifolium*). Staggerbush (*Lyonia mariana*) forms patches. In some areas, shrub dominance and litter buildup have resulted from an extended period without fire.

The Coastal Fringe Evergreen Forest community occurs on relict sand dunes and low upland terraces near the river. It is more exposed to wind and salt spray than the interior areas, and naturally burns less frequently than the longleaf pine communities. As a result, its vegetation more closely

resembles that of the maritime forests found on barrier islands. Sand laurel oak (*Quercus hemisphaerica*), live oak (*Q. virginicus*), and loblolly pine (*Pinus taeda*) form a moderately dense canopy over an understory of American holly (*Ilex opaca*) and wild olive (*Osmanthus americanus*). The shrub layer is dominated by yaupon (*I. vomitoria*), swamp red bay (*Persea palustris*), and dwarf palmetto (*Sabal minor*). Herbs are sparse.

The Small Depression Pocosin, Small Depression Pond, and Vernal Pool communities occur in small isolated depressions called limesinks. These depressions intersect the water table, and are formed by the dissolution of underground limestone, resulting in the collapse of the overlying sand. The Small Depression Pocosin is characterized by a canopy of pond pine and loblolly pine over a dense shrub layer of swamp red bay, inkberry (*Ilex glabra*), blue huckleberry (*Gaylussacia frondosa*), and blaspheme-vine (*Smilax laurifolia*).

Small Depression Ponds are permanently or semipermanently flooded limesink depressions. They may be without standing water for brief periods during droughts, but at least the centers remain mucky and support aquatic vegetation. Most years, these ponds experience high water levels during winter and spring. As the water table drops during the growing season, the pond shores become exposed and support a high diversity of quick-growing grasses, sedges, and wilfdlowers, including several rare species. Taller grasses and sedges emerge though the shallow pond waters. Dominance patterns are variable, not only within the various pond zones, but from year to year. Pond-cypress (*Taxodium ascendens*) forms a canopy at one pond, and water lily (*Nymphaea odorata*) is dominant at another. Other dominant plants include maidencane (*Panicum hemitomon*) and Tracy's beaksedge (*Rhynchospora tracyi*), a rare species. Dahoon (*Ilex cassine*) is a prominent shrub and small tree around several ponds; in North Carolina, it is known only from New Hanover and Brunswick counties.

The Vernal Pool community is similar to the Small Depression Pond, but typically dries out during most growing seasons and lacks a central aquatic zone. These conditions–flooded in spring, exposed in summer–are ideal breeding habitat for amphibians, as the Vernal Pool cannot support egg- and tadpole-eating fish populations. Because these depressions dry out in the summer, the vegetation includes some species more commonly associated with longleaf pine flatwoods and savannas. Dominant plants include little bluestem (*Schizachyrium scoparium*), switchcane (*Panicum virgatum*), and common broomsedge (*Andropogon virginicus*). The Vernal Pool and Small Depression Pond communities contain the majority of rare plant species found in the site.

Streamhead Pocosin is found along small drains known as streamheads. The drains form the headwaters of small streams, and the soils are saturated to shallowly inundated. These conditions are favorable for pocosin vegetation, which is characterized by dense wetland shrubs on acidic organic soils. The canopy is composed of pond pine, loblolly pine, loblolly bay (*Gordonia lasianthus*), and swamp red bay. The dense shrub layer is dominated by fetterbush (*Lyonia lucida*), inkberry, wax-myrtle (*Morella cerifera*), titi (*Cyrilla racemiflora*), and blaspheme-vine.

Brackish Marsh is found in small embayments along the Cape Fear River. Portions of these marshes are flooded daily, while areas farther from tidal creeks are flooded only during lunar and storm tides.

Due to the upstream location, river salinity is reduced. Black needlerush (*Juncus roemerianus*) is the most frequent dominant, with giant cordgrass (*Spartina cynosuroides*) prominent along tidal creeks, and sawgrass (*Cladium jamaicense*) forming patches away from the creeks.

The newly identified Tidal Saltwater Levee Forest is found on narrow levees between the Brackish Marsh embayments and Cape Fear River. The narrow sandy levee is a patchwork of dense oak forest intermixed with open areas sparsely vegetated by grasses. This community brings together species found on coastal sand dunes with species normally found in sandhill habitat well inland from the ocean. The canopy is dominated by live oak, sand live oak, and sand laurel oak. The shrub layer is dominated by yaupon, with October-flower (*Polygonella polygama* var. *polygama*) and Adam's needle (*Yucca filamentosa*) prominent. Open patches are sparsely dominated by the unusual combination of big three-awn (*Aristida condensata*), an inland sandhills grass, and bitter seabeach grass (*Panicum amarum* var. *amarum*), a plant of coastal dunes. This community likely has been impacted by river dredging, and spoil may have been placed on portions of it historically at this site. First identified in 2002, this community association is currently known only from New Hanover County.

The majority of habitat at Carolina Beach State Park is dry sandhill with an open canopy, moderate understory, and sparse to patchy shrub and ground layers. There are also forested areas with denser hardwood canopies. Several isolated depressions contain ponded to vegetated wetlands. These variable conditions provide home and foraging habitat for many animal species, including rare birds, reptiles, and amphibians. The park contains a remarkable number of rare snake species, though populations are likely small because of surrounding development and habitat fragmentation. The sandhill understory oaks provide mast for game animals, and the isolated depressions provide critical amphibian breeding sites.

MANAGEMENT AND PROTECTION: The southwestern portion of the natural area (and state park) is located within the Military Ocean Terminal Sunny Point Buffer Zone, owned by the U.S. Department of Defense. This portion of the Buffer Zone is leased to the N.C. Division of Parks and Recreation, which manages this land together with state-owned land as Carolina Beach State Park. The state park is managed to protect the natural ecosystem while allowing for public recreational use. Public use areas are monitored to insure that the type and volume of use does not exceed an area's carrying capacity. Wherever and whenever possible, fire is used to maintain and enhance the communities of the longleaf pine ecosystem. However, increased adjacent residential and commercial development could limit the use of fire as a management tool in the future. There is also concern that increased ground water withdrawal in the area could impact the limesink communities.

NATURAL COMMUNITIES: Brackish Marsh, Coastal Fringe Evergreen Forest, Coastal Fringe Sandhill, Pine Savanna Wet Spodosol Variant, Small Depression Pocosin, Small Depression Pond, Streamhead Pocosin, Tidal Saltwater Levee Forest (newly identified), Vernal Pool, Wet Pine Flatwoods Wet Spodosol Variant, Xeric Sandhill Scrub Coastal Fringe Variant.

RARE PLANTS: branched gerardia (*Agalinis virgata*), savanna milkwort (*Asclepias pedicellata*), Venus flytrap (*Dionaea muscipula*), coralbean (*Erythrina herbacea*), limesink dog-fennel

(*Eupatorium leptophyllum*), dissected sneezeweed (*Helenium pinnatifidum*), flaxleaf seedbox (*Ludwigia linifolia*), shrubby seedbox (*Ludwigia suffruticosa*), southeastern panic grass (*Panicum tenerum*), West Indies meadow-beauty (*Rhexia cubensis*), coastal beaksedge (*Rhynchospora pleiantha*), long-beak baldsedge (*Rhynchospora scirpoides*), Tracy's beaksedge (*Rhynchospora tracyi*), quillwort arrowhead (*Sagittaria isoetiformis*), Georgia nutrush (*Scleria georgiana*), netted nutrush (*Scleria reticularis*), dwarf bladderwort (*Utricularia olivacea*).

RARE ANIMALS: Vertebrates - American alligator (*Alligator mississippiensis*), timber rattlesnake (*Crotalus horridus*), chicken turtle (*Deirochelys reticularia*), coachwhip (*Masticophis flagellum*), eastern coral snake (*Micrurus fulvius*), eastern painted bunting (*Passerina ciris ciris*), gopher frog (*Rana capito*), pigmy rattlesnake (*Sistrurus miliarius*). Invertebrates - Croatan crayfish (*Procambarus plumimanus*).

REFERENCES:

LeBlond, R.J. 2002. Carolina Beach State Park plant species list - small depression ponds. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

North Carolina Vegetation Survey. 1992. Vegetation sample data: Carolina Beach State Park. University of North Carolina, Chapel Hill, N.C.

Schafale, M.P. 1990. Supplemental notes for January 17, 1988 visit. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

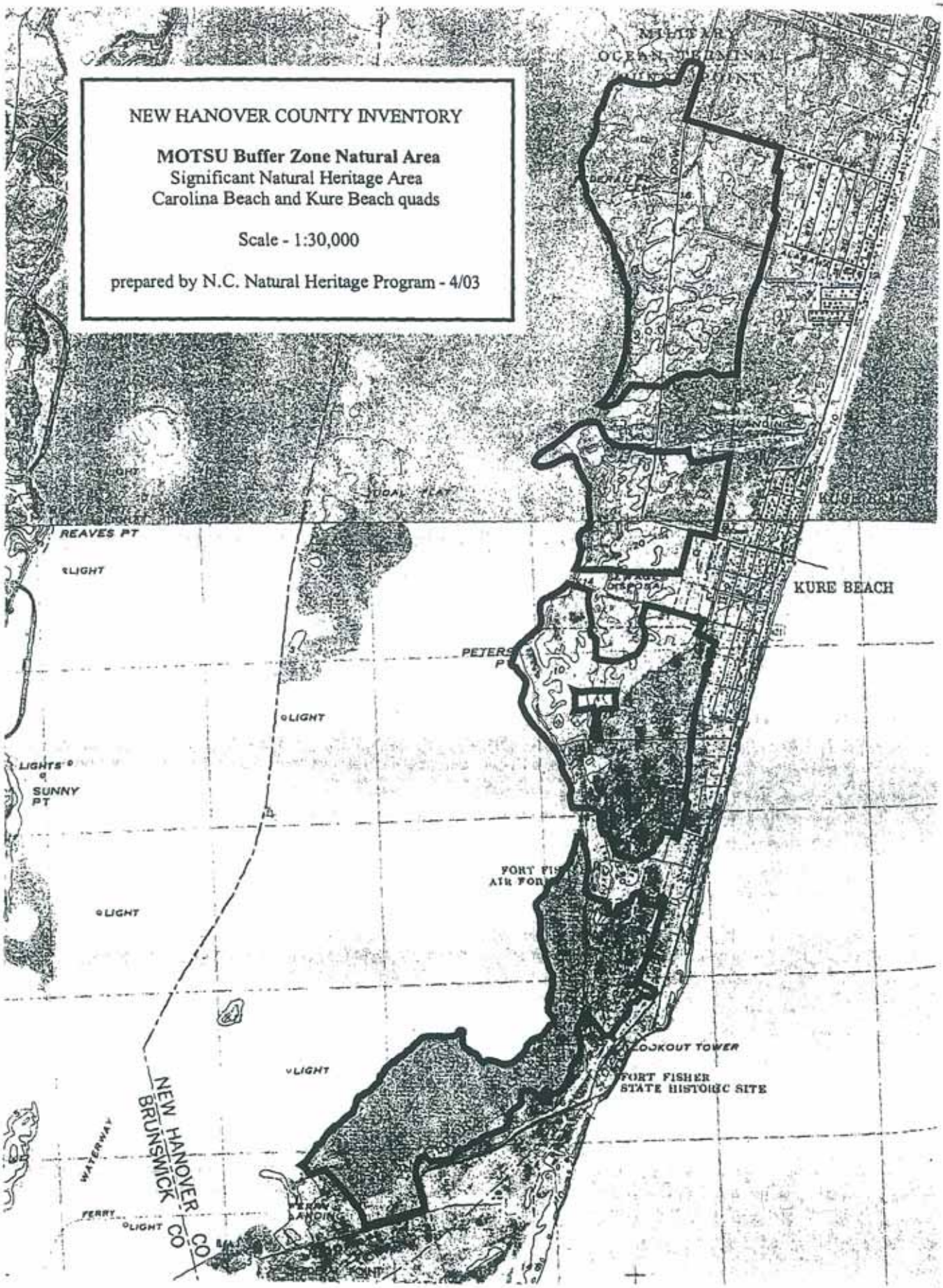
_____. 1990. Site survey report: Carolina Beach State Park. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

Schafale, M.P., C. Tingley, R. Marty, and L. Dillard. 1989. Site survey report: Carolina Beach State Park. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

Sieren, D.J. 1991. Flora of Carolina Beach State Park - interim report no. 2. University of North Carolina at Wilmington, Wilmington, N.C.

Sieren, D.J., and K.R. Warr. 1990. Flora of Carolina Beach State Park - interim report no. 1. University of North Carolina at Wilmington, Wilmington, N.C.

Taggart, J.B., and T.J. Dickerson. 1980. Carolina Beach State Park Natural Area. Report to Division of Parks and Recreation, DENR, Raleigh, N.C.


NEW HANOVER COUNTY INVENTORY
MOTSU Buffer Zone Natural Area
Significant Natural Heritage Area
Carolina Beach and Kure Beach quads
Scale - 1:30,000
prepared by N.C. Natural Heritage Program - 4/03
REAVES PT
LIGHT
KURE BEACH
LIGHT
LIGHTS
SUNNY PT
LIGHT
LOOKOUT TOWER
FORT FISHER STATE HISTORIC SITE
LIGHT
NEW HANOVER CO
BRUNSWICK CO
WATERWAY
FERRY
LIGHT

New Hanover County Natural Area Inventory

MOTSU BUFFER ZONE NATURAL AREA
Significant Natural Heritage Area
(MOTSU = Military Ocean Terminal Sunny Point)

Site significance: state
Quadrangles: Carolina Beach, Kure Beach
Size: 1190 acres
Ownership: U.S. Department of Defense

SIGNIFICANT FEATURES: MOTSU Buffer Zone Natural Area contains extensive, good quality habitat for longleaf pine and coastal fringe ecosystems, supporting eight natural community types, including the uncommon to rare Coastal Fringe Evergreen Forest, Coastal Fringe Sandhill, Small Depression Pond, and Pine Savanna Wet Spodosol Variant. The site also contains a newly identified community association currently known only along the saltwater tidal shores of Cape Fear River, and called Tidal Saltwater Levee Forest. The natural area supports populations for four rare animal species, including Federal Species of Concern eastern painted bunting (*Passerina ciris ciris*). Populations for three rare plant species are also present, including the only population in North Carolina for Confederate huckleberry (*Gaylussacia nana*), and one of only two populations in the state for Florida scrub frostweed (*Helianthemum nashii*).

LANDSCAPE RELATIONSHIPS: This site is located in southern New Hanover County along the Cape Fear River, between Carolina Beach State Park and Fort Fisher ferry landing. Carolina Beach State Park lies one-half mile to the north, but the two natural areas are separated by a county waste treatment facility. Near the southern end of the site, Fort Fisher Coquina Outcrop natural area lies about 1000 feet to the east, and Fort Fisher State Recreation Area lies only 500 feet to the southeast, across highway US 421 near the ferry landing. The site forms the southern end of the Carolina Beach Macrosite within the Cape Fear Megasite.

SITE DESCRIPTION: MOTSU Buffer Zone Natural Area is a diverse landscape of open sandhills, flatwoods, and savannas, dense coastal fringe forests, and tidal marshes. The geology and biology reflect its unusual topographic position between the ocean and a large river. In this area, New Hanover County in essence is a mainland peninsula with features similar to those of a barrier island. In the natural area, the sand ridges and interior dunes support longleaf pine communities wherever fire has been a natural component of the landscape. Drier sands support the Coastal Fringe Sandhill community while wetter sands produce Pine Savanna Wet Spodosol Variant and Wet Pine Flatwoods Wet Spodosol Variant. Pond Pine Woodland is found on saturated soils in a mosaic with the savanna and flatwoods communities. The Coastal Fringe Evergreen Forest can be found in areas where the sand ridges and dunes have naturally been protected from fire. A Small Depression Pond occurs in a swale between forested low sand ridges. Two other communities are associated with embayments along the Cape Fear River: Brackish Marsh in the embayments, and the newly identified Tidal Saltwater Levee Forest on natural levees between marsh habitat and the river.

Coastal Fringe Sandhill occurs on dry sands of gently rolling, low sandhills. Scattered longleaf pine (*Pinus palustris*) form the canopy over an open to moderate subcanopy of sand live oak (*Quercus*

geminata), turkey oak (*Q. laevis*), and sand laurel oak (*Q. hemisphaerica*). Dwarf wax-myrtle (*Morella pumila*), common October-flower (*Polygonella polygama* var. *polygama*), and southern blueberry (*Vaccinium tenellum*) are characteristic of the open shrub layer. Carolina wiregrass (*Aristida stricta*) and sandhill beaksedge (*Rhynchospora megalocarpa*) are frequent in the sparse ground layer, with reindeer lichen (*Cladonia* sp.) and oaktoes lichen (*Cladina evansii*) forming patches. Although in need of fire, the occurrence here is one of the best examples of this rare community type in North Carolina.

Pine Savanna Wet Spodosol Variant is found in a small area where the sand is wet year-round. The sparse canopy of longleaf pine and pond pine (*Pinus serotina*) allows plenty of light to reach the forest floor, enhancing herb diversity. Carolina wiregrass is the dominant ground layer plant. Sands that are wet in spring but dry out later in the growing season support the Wet Pine Flatwoods Wet Spodosol Variant community. It has an open, mature canopy of longleaf pine over an open shrub layer where staggerbush (*Lyonia mariana*) is prominent, and a moderately dense ground layer of Carolina wiregrass and creeping blueberry (*Vaccinium crassifolium*). In some areas, shrub dominance and litter buildup have resulted from an extended period without fire. Pond Pine Woodland occupies saturated soils within and adjacent to the longleaf pine communities where a mucky organic layer has developed. It is characterized by an open canopy of pond pine over a dense shrub layer of inkberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), and swamp red bay (*Persea palustris).*

The Coastal Fringe Evergreen Forest community occurs on dry sand ridges and low upland terraces where fire is naturally uncommon or rare. It is found near the river and towards the southern tip of the site (and county), where it is more exposed to wind and salt spray than the interior areas. As a result, its vegetation more closely resembles that of the maritime forests found on barrier islands. Sand laurel oak (*Quercus hemisphaerica*), live oak (*Q. virginicus*), coastal pignut hickory (*Carya glabra* var. *megacarpa*), and loblolly pine (*Pinus taeda*) form a dense canopy over an understory of yaupon (*Ilex vomitoria*) and wild olive (*Osmanthus americanus*). The canopy is mature over much of the area, with many trunks reaching 2 feet in diameter. Herbs are sparse. Near the southern end of the site, this community begins to grade into Maritime Evergreen Forest.

The Small Depression Pond community occurs in a shallow but semi-permanently flooded depression on a flat sandy upland terrace near the river. The pond is bordered by woody vegetation such as Carolina willow (*Salix caroliniana*) and buttonbush (*Cephalanthus occidentalis*). The open pond areas are dominated by taller herbs that emerge through the shallow water, including waterpepper (*Persicaria hydropiperoides* var. *hydropiperoides*), American cupscale (*Sacciolepis striata*), and Atlantic bishopweed (*Ptilimnium capillaceum*).

Brackish Marsh is found in small embayments along the Cape Fear River, and in a larger tidal flat near the ferry landing. Portions of these marshes are flooded daily, while areas farther from tidal creeks are flooded only during lunar and storm tides. Black needlerush (*Juncus roemerianus*) is the most frequent dominant, with giant cordgrass (*Spartina cynosuroides*) prominent along tidal creeks and near the upland margin.

The newly identified Tidal Saltwater Levee Forest is found on narrow levees between the small Brackish Marsh embayments and Cape Fear River. The narrow sandy levee is a patchwork of dense oak forest intermixed with open areas sparsely vegetated by grasses. This community brings together species found on coastal sand dunes with species normally found in sandhill habitat well inland from the ocean. The canopy is dominated by mature live oak, sand live oak, and sand laurel oak, with larger trunks reaching 2.5 feet in diameter. The shrub layer is dominated by yaupon, with wax-myrtle (*Morella cerifera*) prominent. Spanish moss (*Tillandsia usneoides*) is an abundant epiphyte on canopy trees. Open patches are sparsely dominated by the unusual combination of big three-awn (*Aristida condensata*), an inland sandhills grass, and bitter seabeach grass (*Panicum amarum* var. *amarum*), a plant of coastal dunes. This community likely has been impacted by river dredging, and spoil may have been placed on portions of it historically at this site. First identified in 2002, this community association is currently known only from New Hanover County.

The majority of MOTSU Buffer Zone Natural Area is moderately open dry pine sandhill habitat and denser mesic to dry hardwood forests. Wetland depressions are few and scattered. These variable conditions provide home and foraging habitat for several animal species, including rare mammals, birds, reptiles, and butterflies. The abundant oaks provide mast for game animals, and the isolated depressions provide critcal amphibian breeding sites.

MANAGEMENT AND PROTECTION: This site is managed by the U.S. Department of Defense as a buffer zone for its munitions storage facility at Military Ocean Terminal Sunny Point (MOTSU) near Southport. Residential development is prohibited and other uses are restricted. Longleaf pine communities are in need of prescribed fire to prevent additional litter buildup and increased shrub layer and oak subcanopy growth, which shades out the ground layer. The site has no protection status.

NATURAL COMMUNITIES: Brackish Marsh, Coastal Fringe Evergreen Forest, Coastal Fringe Sandhill, Small Depression Pond, Pine Savanna Wet Spodosol Variant, Pond Pine Woodland, Tidal Saltwater Levee Forest (newly identified), Wet Pine Flatwoods Wet Spodosol Variant.

RARE PLANTS: coralbean (*Erythrina herbacea*), Confederate huckleberry (*Gaylussacia nana*), Florida scrub frostweed (*Helianthemum nashii*).

RARE ANIMALS: Vertebrates - coachwhip (*Masticophis flagellum*), eastern woodrat - Coastal Plain population (*Neotoma floridana pop 1*), eastern painted bunting (*Passerina ciris ciris*). Invertebrates - northern oak hairstreak (*Fixsenia favonius ontario*).

REFERENCES:

LeBlond, R.J. 1998. Natural Area Inventory: Military Ocean Terminal Sunny Point, Brunswick and New Hanover Counties, North Carolina. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

North Carolina Vegetation Survey. 1992. Vegetation sample data: MOTSU Buffer Zone Natural Area. University of North Carolina, Chapel Hill, N.C.

Schafale, M.P. 1989. Note to files: Recommendations for MOTSU Buffer Zone lands near Carolina Beach. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

Schafale, M.P., and C. Tingley. 1989. Site survey report: MOTSU Buffer Zone Natural Area. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

Schafale, M.P., A.S. Weakley, H.E. LeGrand, and S. Hall. 1993. Site survey report: MOTSU Buffer Zone Natural Area. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

TNC and NC NHP. 1994. Report: Fort Fisher Air Force Recreation Area. The Nature Conservancy North Carolina Chapter, Durham, N.C., and N.C. Natural Heritage Program, OCCA, DENR, Raleigh, N.C.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

MEMO TO: SunTemple Helgren
Wilbur Smith Associates

FROM: John A. Vine-Hodge JVH
Division of Bicycle and Pedestrian Transportation

DATE: July 9, 2008

SUBJECT: Project Comments – Carolina Beach and Kure Beach – **Dow Road Corridor Study**

In response to your request for information on the planning study for widening Dow Road (SR 1573) from US 421 (Lake Park Blvd.) in Carolina Beach to K Avenue in Kure Beach, and extension of Dow Road from K Avenue to US 421 (Fort Fisher Blvd.), the Division of Bicycle and Pedestrian Transportation has the following comments.

US 421 and Dow Road serve as the main north-south transportation corridors in Carolina Beach and Kure Beach. The section of US 421 in Carolina Beach and Kure Beach is located on two state bike routes, Cape Fear Run and Ports of Call. Both US 421 and Dow Road are frequented by bicyclists. Also indicating the level of bike use and interest was a 2007 survey conducted by the Town of Kure Beach that revealed that biking as the number one interest.

An existing path of approximately one mile in length is located at the northern terminus of Old Dow Road to the intersection of Harper Avenue and Dow Road. The Division of Bicycle and Pedestrian Transportation supports the extension of the multi-use path and/or other bike accommodations. The provision of a multi-use path and/or bike lanes or paved shoulders for the length of Dow Road is recommended in order to provide an alternative for bicyclists who may not be comfortable biking on the more highly congested US 421 and to provide connections from the existing path at Old Dow Road and areas north to Fort Fisher. The design of a multi-use path should adhere to the AASHTO *Guide for the Development of Bicycle Facilities*, particularly the guideline stating the need to limit the number of intersection and driveway crossings (which will be the case if located on the western side of Dow Road).

Also, accommodation of a bicycle facility along this corridor is consistent with FHWA guidelines (FHWA Guidance – Bicycle an Pedestrian Provision of Federal Transportation Legislation) for bicycle provisions that call for "all highways and transportation facilities be planned, designed, and constructed" with the realization that "bicyclists and pedestrians will be present on all highways and transportation facilities where they are

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
DIVISION OF BICYCLE & PEDESTRIAN TRANSPORTATION
1552 MAIL SERVICE CENTER
RALEIGH NC 27699-1552

TELEPHONE: 919-807-0772
FAX: 919-807-0768

WEBSITE: WWW.NCDOT.ORG/TRANSIT/BICYCLE/
EMAIL: JAVINEHODGE@DOT.STATE.NC.US

LOCATION:
401 OBERLIN ROAD
SUITE 250
RALEIGH NC 27601

permitted." The FHWA guidelines further state that (if this project utilizes federal funds) project design must follow FHWA policy, including the FHWA Policy for mainstreaming nonmotorized transportation, which states that "in the planning, design, and operation of transportation facilities, bicyclists and pedestrians should be included as a matter of routine, and the decision to not accommodate them should be the exception rather than the rule."

The Division of Bicycle and Pedestrian Transportation appreciates the opportunity to comment. Please contact us if there is a need for additional information or if the names and contact information for local officials is needed.

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

June 24, 2008

SunTemple Helgren
Wilbur Smith Associates
421 Fayetteville St., Suite 1303
Raleigh, North Carolina 27601

RE: Dow Road Corridor Study, Carolina Beach and Kure Beach, New Hanover County, ER 08-1295

Dear Mr. Helgren:

We have received the letter requesting comment concerning the Wilmington Area Metropolitan Planning Organization's (WMPO) planning study for improvements to Dow Road.

From an archaeological resource standpoint there are possibly 60 archaeological sites within the area of potential impact from both the widening of the existing road and the proposed extension through Kure Beach. These include prehistoric and historic habitation sites as well as several associated with military activity.

Within the existing Dow Road corridor there are at least two archaeological sites potentially eligible for inclusion on the National Register of Historic Places (NRHP) that could be impacted. These are fairly extensive and cover most of the area between the Newton/Federal Point cemetery and the old Dow Chemical Plant intake canal.

On the Department of Defense property between K Avenue and Cape Fear Boulevard there are eight archaeological sites potentially eligible for inclusion on the NRHP that could be impacted, depending on the corridor placement of the Dow Road extension.

As the proposed project becomes better defined we recommend that an experienced archaeologist assess the potential impact of the project on these significant archaeological resources. If these resources cannot be avoided they should be further assessed according to NRHP criterion to determine their eligibility. Archaeological sites eligible for NRHP listing that cannot be avoided will need additional data recovery to mitigate for their loss.

We have conducted a search of our maps and files and have located the following structures of historical or architectural importance within the general area of the project:

- NH 628, The Joy Lee Apartments is listed on the National Register of Historic Places.
- NH 629, Carolina Beach Town Hall has been determined eligible for the National Register of Historic Places.
- NH 631, the former Ocean Plaza Café is on the State Study List.

This area was surveyed in 1985 and there are several properties that were noted in the survey that need to be evaluated for eligibility for the National Register of Historic Places. We are therefore requesting an architectural survey of the project area.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

Peter Sandbeck

North Carolina Wildlife Resources Commission

MEMORANDUM

TO: SunTemple Helgren
Wilbur Smith Associates

FROM: Travis Wilson, Highway Project Coordinator
Habitat Conservation Program

DATE: August 1, 2008

SUBJECT: Response to the start of study notification regarding fish and wildlife concerns for the proposed widening and extension of Dow Road (SR 1573) from US 421 in Carolina Beach to US 421 in Kure Beach, New Hanover County, North Carolina.

This memorandum responds to a request for our concerns regarding impacts on fish and wildlife resources resulting from the subject project. Biologists on the staff of the N. C. Wildlife Resources Commission (NCWRC) have reviewed the proposed improvements. Our comments are provided in accordance with certain provisions of the National Environmental Policy Act (42 U.S.C. 4332(2)(c)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d).

The NCWRC has review the proposed project; there are a multitude of natural resources within the project study area. More specifically the majority of the project would traverse two identified Significant Natural Heritage Areas: Carolina Beach State Park and Military Ocean Terminal Sunny Point Buffer Zone Natural Area. Although there are varying degrees of natural resource management and protection between the two sites they are both currently in public ownership. These two areas represent an important component of the natural systems remaining in New Hanover County, supporting numerous rare plants and animals. It will be imperative during the planning and construction of this project to avoid and minimize impacts to these resources. Our standard recommendations are below:

1. Description of fishery and wildlife resources within the project area, including a listing of federally or state designated threatened, endangered, or special concern species. Potential borrow areas to be used for project construction should be included in the inventories. A listing of designated plant species can be developed through consultation with:

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

NC Natural Heritage Program
Dept. of Environment & Natural Resources
1601 Mail Service Center
Raleigh, NC 27699-1601.
WWW.ncnhp.org

and,

NCDA Plant Conservation Program
P. O. Box 27647
Raleigh, N. C. 27611
(919) 733-3610

2. Description of any streams or wetlands affected by the project. The need for channelizing or relocating portions of streams crossed and the extent of such activities.

3. Cover type maps showing wetland acreages impacted by the project. Wetland acreages should include all project-related areas that may undergo hydrologic change as a result of ditching, other drainage, or filling for project construction. Wetland identification may be accomplished through coordination with the U. S. Army Corps of Engineers (COE). If the COE is not consulted, the person delineating wetlands should be identified and criteria listed.

4. Cover type maps showing acreages of upland wildlife habitat impacted by the proposed project. Potential borrow sites should be included.

5. The extent to which the project will result in loss, degradation, or fragmentation of wildlife habitat (wetlands or uplands).

6. Mitigation for avoiding, minimizing or compensating for direct and indirect degradation in habitat quality as well as quantitative losses.

7. A cumulative impact assessment section which analyzes the environmental effects of highway construction and quantifies the contribution of this individual project to environmental degradation.

8. A discussion of the probable impacts on natural resources which will result from secondary development facilitated by the improved road access.

9. If construction of this facility is to be coordinated with other state, municipal, or private development projects, a description of these projects should be included in the environmental document, and all project sponsors should be identified.

Thank you for the opportunity to provide input in the early planning stages for this project. If we can further assist your office, please contact me at (919) 528-9886.

WILBUR SMITH ASSOCIATES
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NC 27601
Phone (919) 755-0583
Fax (919) 832-8798
E-Mail – wsa_raleigh@wilbursmith.com

DATE 05/30/08 JOB NO. 102488

BY: SunTemple Helgren

SUBJECT: response to scoping letter information request

TALKED WITH: Stever Everhart – District Manager

OF: DENR- DCM

PHONE NO. 910-796-7266

[X] INCOMING [ ] OUTGOING

TELEPHONE LOG

NOTES:

Steve Everhart called in response to the scoping letter information request he received via mail. I explained to Steve that at this point the project is mainly a feasibility study. There is no federal funding in the project at present and the effort is being led by the Wilmington MPO. Eventually there may be federal dollars and/or NCDOT may have more involvement but we are not to that point yet. First we need to figure out if the project is even feasible and that is the purpose of this study.

Mr. Everhart explained that the only information/comment his agency has at this point in the project is that section of project on existing US 421 may be within an area of environmental concern for ocean hazards and if so, a CAMA permit may be needed.

Mr. Everhart informed me that he will forward the scoping letter to Stephen Lane (NCDOT Representative for DCM) because he may be able to offer more information or comments. His address is 400 Commerce Lane, Morehead City, NC 28557.

ACTION REQUIRED:

None

COPIES TO:

Project File

WILBUR SMITH ASSOCIATES
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NC 27601
Phone (919) 755-0583
Fax (919) 832-8798
E-Mail – wsa_raleigh@wilbursmith.com

DATE 06/02/08 JOB NO. 102488

BY: SunTemple Helgren

SUBJECT: response to scoping letter information request

TALKED WITH: Gary Jordan

OF: U.S. Fish & Wildlife Service

PHONE NO. 919-856-4520 ext. 32

[X] INCOMING [ ] OUTGOING

TELEPHONE LOG

NOTES:

Gary Jordan called in response to the scoping/request for information letter he received for this project. He asked where the funding for the project was coming from and if NCDOT was overseeing the project. I explained where we were at this point in the project and that is was unclear where the funding would come from eventually or if the project would even get constructed. There is not TIP# for the project at present.

After hearing this Gary explained that the USFWS may not comment on the project mainly due to their present workload and back log. If this were a NCDOT administered project or had a TIP number than USFWS would be more involved.

ACTION REQUIRED:

None

COPIES TO:

Project File

DEPARTMENT OF THE AIR FORCE

4TH FIGHTER WING (ACC)
SEYMOUR JOHNSON AFB, NC 27531

31 July 2008

Lieutenant Colonel William P. Mazzeno
Commander, 4th Civil Engineer Squadron
1095 Peterson Avenue
Seymour Johnson AFB NC 27531

Wilbur Smith Associates
421 Fayetteville Street, Suite 1303
Raleigh, North Carolina 27601

Dear Ms. Helgren,

Reference your May 28, 2008 letter requesting comments and any known environmental impact information associated with the Dow Road Extension through Fort Fisher Recreation Site (FFRS). My planning staff completed a preliminary evaluation of this proposal and offered the following comments:

1. The proposed road extension requires a 150-foot corridor that would sever the main portion of the installation from the existing recreational cottage area adjacent to Fort Fisher Blvd. In addition, it will disrupt half of the existing recreational vehicle (RV) park area. Access by cottage occupants to the main installation would have to be reestablished by an unimpeded overhead walkway or underpass and visual buffers and physical barriers from the road to the cottages would have to be established. Finally, provisions to reconstruct the RV and trailer park and provide visual buffers and physical barriers for the main installation would be required. FFRS provides a major source of non-appropriated income to the Seymour Johnson AFB morale, welfare, and recreation fund, which supports recreational activities for military, DoD civilian, and retired personnel. In addition, FFRA supports a NC National Guard training site. The proposed road extension is not desirable for maintaining a cohesive Air Force recreation and Guard training site and detracts from providing an overall quality experience. Appropriate actions will be required to mitigate these concerns.

2. The Air Force is currently in the process of conducting an enhanced use lease study for privatizing the cottage area. Any resultant lease Request for Proposal/Agreement will have to be coordinated with the corridor proposal. Affects on the viability and equitability of the resultant lease would have to be evaluated.

3. There are water wells in the proposed 150 foot corridor that will have to be properly closed in accordance with Federal and State policies and procedures.

4. There are no known endangered species on FFRS proper.

5. There are known and potential cultural resources in areas on the south and west side of FFRS, outside the proposed corridor. There is the potential for discovery of additional cultural resources within the corridor and within the vicinity of FFRS.

Thank you for contacting us with this matter and requesting our comments. If additional information or clarification is required, please contact Mr. Matthew Makdad, P.E., 4 CES/CECP, (919) 722-5531.

//SIGNED - wpm/31 Jul 08//
WILLIAM P. MAZZENO, Lt Col, USAF
Commander, 4th Civil Engineer Squadron
Base Civil Engineer

DEPARTMENT OF THE AIR FORCE

4TH FIGHTER WING (ACC)
SEYMOUR JOHNSON AFB, NC 27531

31 July 2008

Debra A. Lovette, Major, USAF
Commander, Force Support Squadron
1540 Goodson Street
Seymour Johnson AFB NC 27531

Wilbur Smith Associates
421 Fayetteville Street, Suite 1303
Raleigh, North Carolina 27601

Dear Ms. Helgren,

Reference the May 28, 2008 letter requesting comments associated with the Dow Road Extension through Fort Fisher Recreation Site (FFRS). My staff has completed a preliminary evaluation of this proposal. There are a number of issues of operational concern as follows:

A. FFRS is used as a resort for the military to relax with their families. A four lane road bisecting the site will effectively destroy that ambience, impacting their leisure. Even with audio/visual buffers the atmosphere of a calm, quiet place to recreate will cease to exist.

B. The road will create safety hazards for pedestrians, vehicles and bicyclists from the cottages attempting to cross to reach the river, pool, restaurant, shop and equipment rental, or for the personnel residing in the mobile homes, campers and tents to access the beach.

C. Extending Dow Road through FFRS will adversely impact the ability of the facility to host community/base recreational events. The road will bisect the field used for parking for events such as the Seafood/Jazz festival, the Car Shows, etc, rendering it unusable. Inability to host these events directly impacts the financial base of Seymour Johnson AFB.

If additional information or clarification is required, please contact Ms. Linda Edsall-Huard., 4 FSS/DD, (919) 722-5331.

//signed, DAL, 31 Jul 08//
DEBRA A. LOVETTE, MAJOR, USAF

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

DOW RD S/OCEAN BLVD
CAROLINA BEACH, NC 28428

COORDINATES

Latitude (North):	34.000200 - 34˚ 0' 0.7''
Longitude (West):	77.915600 - 77˚ 54' 56.2''
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	230701.3
UTM Y (Meters):	3765817.2
Elevation:	19 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	34077-A8 CAROLINA BEACH, NC
Most Recent Revision:	1999
South Map:	33077-H8 KURE BEACH, NC
Most Recent Revision:	1999

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

FEDERAL RECORDS

NPL National Priority List
Proposed NPL Proposed National Priority List Sites
Delisted NPL National Priority List Deletions
NPL LIENS Federal Superfund Liens
CERCLIS Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP CERCLIS No Further Remedial Action Planned
CORRACTS Corrective Action Report

EXECUTIVE SUMMARY

RCRA-TSDF Resource Conservation and Recovery Act Information
RCRA-LQG Resource Conservation and Recovery Act Information
ERNS Emergency Response Notification System
HMIRS Hazardous Materials Information Reporting System
US ENG CONTROLS Engineering Controls Sites List
US INST CONTROL Sites with Institutional Controls
US BROWNFIELDS A Listing of Brownfields Sites
CONSENT Superfund (CERCLA) Consent Decrees
ROD Records Of Decision
UMTRA Uranium Mill Tailings Sites
ODI Open Dump Inventory
TRIS Toxic Chemical Release Inventory System
TSCA Toxic Substances Control Act
FTTS FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
SSTS Section 7 Tracking Systems
LUCIS Land Use Control Information System
DOT OPS Incident and Accident Data
ICIS Integrated Compliance Information System
HIST FTTS FIFRA/TSCA Tracking System Administrative Case Listing
US CDL Clandestine Drug Labs
RADINFO Radiation Information Database
LIENS 2 CERCLA Lien Information
PADS PCB Activity Database System
MLTS Material Licensing Tracking System
MINES Mines Master Index File
RAATS RCRA Administrative Action Tracking System

STATE AND LOCAL RECORDS

SHWS Inactive Hazardous Sites Inventory
SWF/LF List of Solid Waste Facilities
OLI Old Landfill Inventory
HIST LF Solid Waste Facility Listing
AST AST Database
INST CONTROL No Further Action Sites With Land Use Restrictions Monitoring
VCP Responsible Party Voluntary Action Sites
DRYCLEANERS Drycleaning Sites
BROWNFIELDS Brownfields Projects Inventory
NPDES NPDES Facility Location Listing

TRIBAL RECORDS

INDIAN RESERV Indian Reservations
INDIAN LUST Leaking Underground Storage Tanks on Indian Land
INDIAN UST Underground Storage Tanks on Indian Land

EDR PROPRIETARY RECORDS

Manufactured Gas Plants EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

EXECUTIVE SUMMARY

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

FEDERAL RECORDS

RCRAInfo: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System(RCRIS). The database includes selective information on sites which generate, transport, store , treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month Large quantity generators generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

A review of the RCRA-SQG list, as provided by EDR, and dated 06/13/2006 has revealed that there is 1 RCRA-SQG site within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
CLENE-N-TIDEY	***702 S LAKE PARK BLVD***	***1 - 2 NNE***	***14***	***35***

DOD: Consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

A review of the DOD list, as provided by EDR, and dated 12/31/2005 has revealed that there is 1 DOD site within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir	Map ID	Page
MILITARY OCEAN TERMINAL SUNNY		0 - 1/8	0	6

FUDS: The Listing includes locations of Formerly Used Defense Sites Properties where the US Army Corps Of Engineers is actively working or will take necessary cleanup actions.

A review of the FUDS list, as provided by EDR, and dated 12/31/2005 has revealed that there is 1 FUDS site within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
FORT FISHER		1 - 2 S	C10	29

EXECUTIVE SUMMARY

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 04/12/2007 has revealed that there are 2 FINDS sites within approximately 1 mile of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
TOWN OF KURE BEACH	118 NORTH 3RD AVENUE, P	1/4 - 1/2 ESE	A2	10
BODENHAMER S GROCERY	308 SOUTH SECOND ST. HI	1/2 - 1 SE	B4	14

STATE AND LOCAL RECORDS

IMD: Incident Management Database.

A review of the IMD list, as provided by EDR, and dated 07/21/2006 has revealed that there are 5 IMD sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
TOWN OF KURE BEACH	***118 NORTH 3RD AVENUE, P***	***1/4 - 1/2 ESE***	***A1***	***6***
FORT FISHER AIR FORCE HEATING	***U.S. HIGHWAY 421-KURE B***	***1 - 2 S***	***C6***	***16***
AIR FORCE (FORT FISHER) BLG. 1	***118 RIVERFRONT ROAD***	***1 - 2 S***	***C7***	***18***
FORT FISHER AIR FORCE	***US HIGHWAY 421-KURE BEA***	***1 - 2 S***	***C8***	***20***
PARADISE INN	***310 CAROLINA BCH RD***	***1 - 2 NE***	***13***	***33***

HSDS: The Hazardous Substance Disposal Sites list contains locations of uncontrolled and unregulated hazardous waste sites. The file contains sites on the national priority list as well as the state priority list. The data source is the North Carolina Center for Geographic Information and Analysis.

A review of the NC HSDS list, as provided by EDR, and dated 04/06/2006 has revealed that there are 2 NC HSDS sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir	Map ID	Page
DOW CHEMICAL PLANT CAPE FEAR		1/4 - 1/2 N	0	6
US DOD MILITARY OCEAN TER/SUNN		0 - 1/8	0	6

LUST: The Leaking Underground Storage Tank Incidents Management Database contains an inventory of reported leaking underground storage tank incidents. The data come from the Department of Environment, & Natural Resources' Incidents by Address.

A review of the LUST list, as provided by EDR, and dated 06/01/2007 has revealed that there are 5 LUST sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
TOWN OF KURE BEACH	***118 NORTH 3RD AVENUE, P***	***1/4 - 1/2 ESE***	***A1***	***6***
FORT FISHER AIR FORCE HEATING	***U.S. HIGHWAY 421-KURE B***	***1 - 2 S***	***C6***	***16***

EXECUTIVE SUMMARY

Lower Elevation	Address	Dist / Dir	Map ID	Page
AIR FORCE (FORT FISHER) BLG. 1	***118 RIVERFRONT ROAD***	***1 - 2 S***	***C7***	***18***
FORT FISHER AIR FORCE	***US HIGHWAY 421-KURE BEA***	***1 - 2 S***	***C8***	***20***
PARADISE INN	***310 CAROLINA BCH RD***	***1 - 2 NE***	***13***	***33***

LUST TRUST: This database contains information about claims against the State Trust Funds for reimbursements for expenses incurred while remediating Leaking USTs.

A review of the LUST TRUST list, as provided by EDR, and dated 08/03/2007 has revealed that there is 1 LUST TRUST site within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
PARADISE INN	***310 CAROLINA BCH RD***	***1 - 2 NE***	***13***	***33***

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Environment & Natural Resources' Petroleum Underground Storage Tank Database.

A review of the UST list, as provided by EDR, and dated 05/25/2007 has revealed that there are 6 UST sites within approximately 2 miles of the target property.

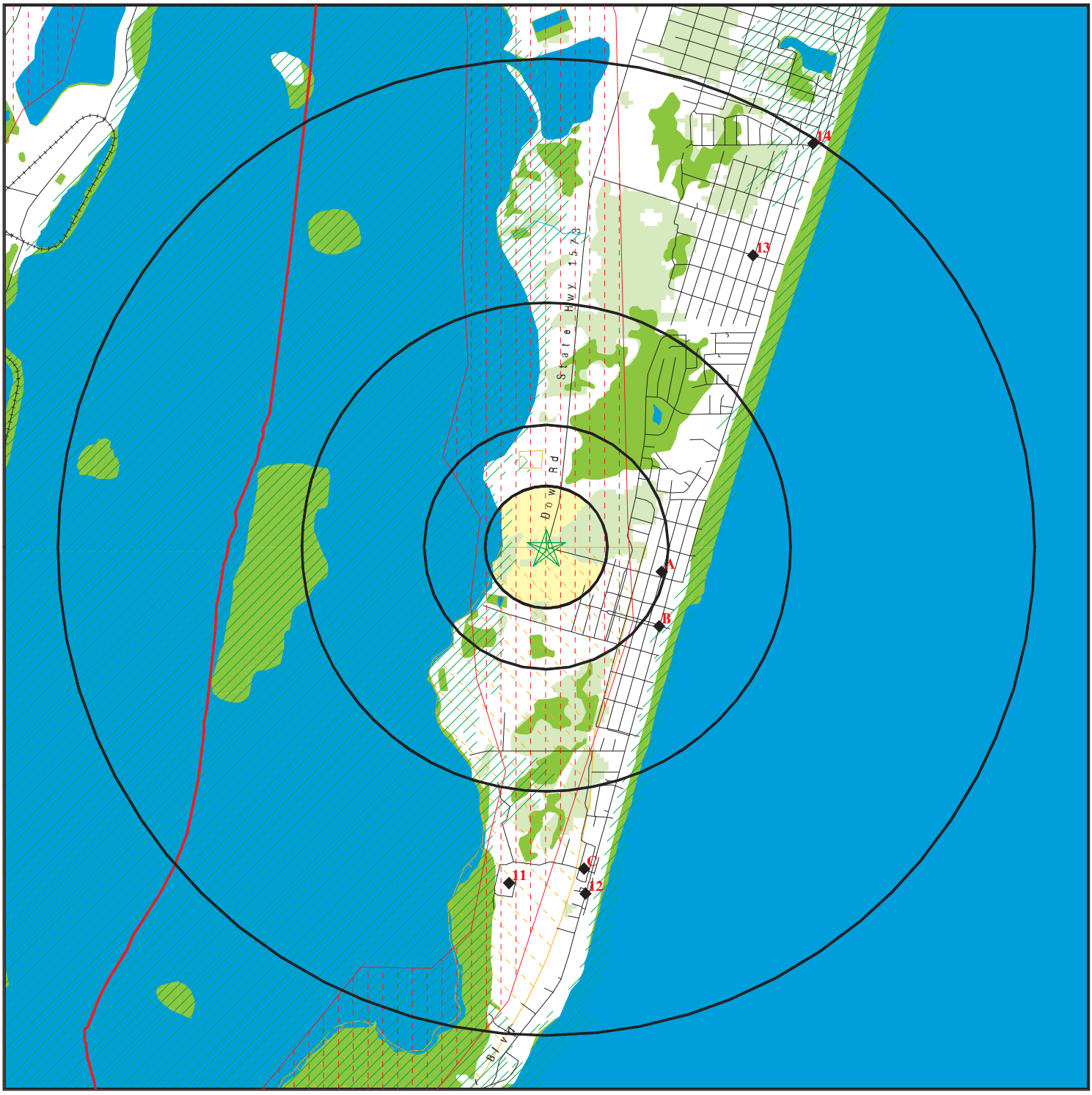
Lower Elevation	Address	Dist / Dir	Map ID	Page
TOWN OF KURE BEACH	***118 NORTH 3RD AVENUE, P***	***1/4 - 1/2 ESE***	***A1***	***6***
BIGLEY-TINSLEY CORPORATION	102 SOUTH SECOND STREET	1/2 - 1 ESE	A3	11
BODENHAMER'S GROCERY	308 SOUTH SECOND ST. HW	1/2 - 1 SE	B5	14
FORT FISHER AIR FORCE STATION	KURE BEACH	1 - 2 S	C9	22
FORT FISHER STATE HISTORIC ST	HWY 421 SOUTH OF KURE B	1 - 2 S	11	30
TOWN OF KURE BEACH	701 FORT FISHER BLVD N(	1 - 2 S	12	32

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
NEW HANOVER CY & CAROLINA LDFL	SHWS
MONTY'S NORTH	LUST, IMD
HINES, CLINTON PROPERTY	LUST, IMD
SCOTCHMAN 22	LUST, UST, LUST TRUST, IMD
OLDE BRUNSWICK GENERAL STORE	UST
BOILING SPRING LAKES MINI MAR	UST
CAPE FEAR BROADCASTING COMPAN	UST
PLEASURE ISLAND VOL RESCUE SQ	UST
CAROLINA BEACH TRAVELERS	UST
TOWN GARAGE	UST
SOUTHERN BELL - KRBHNCKA	UST
SOUTHERN BELL-GLC 21826	UST
HARRELSON'S MARKET	UST
FISH PROCESSING PLANT	UST
SOUTHPORT FERRY OPERATION	UST
CAROLINA BEACH AMOCO	UST
CAROLINA POWER & LIGHT CO. (BRUNSW	AST
US MILITARY OCEAN TERM	RCRA-SQG, FINDS
CAROLINA BEACH POST OFFICE	IMD
NEW HANOVER CO & CAROLINA BEACH	OLI
CAROLINA BEACH REFUSE DISPOSAL	OLI
NEW HANOVER CO. LANDFILL	OLI
CAROLINA BEACH WWTP	NPDES

OVERVIEW MAP - 2022443.1s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

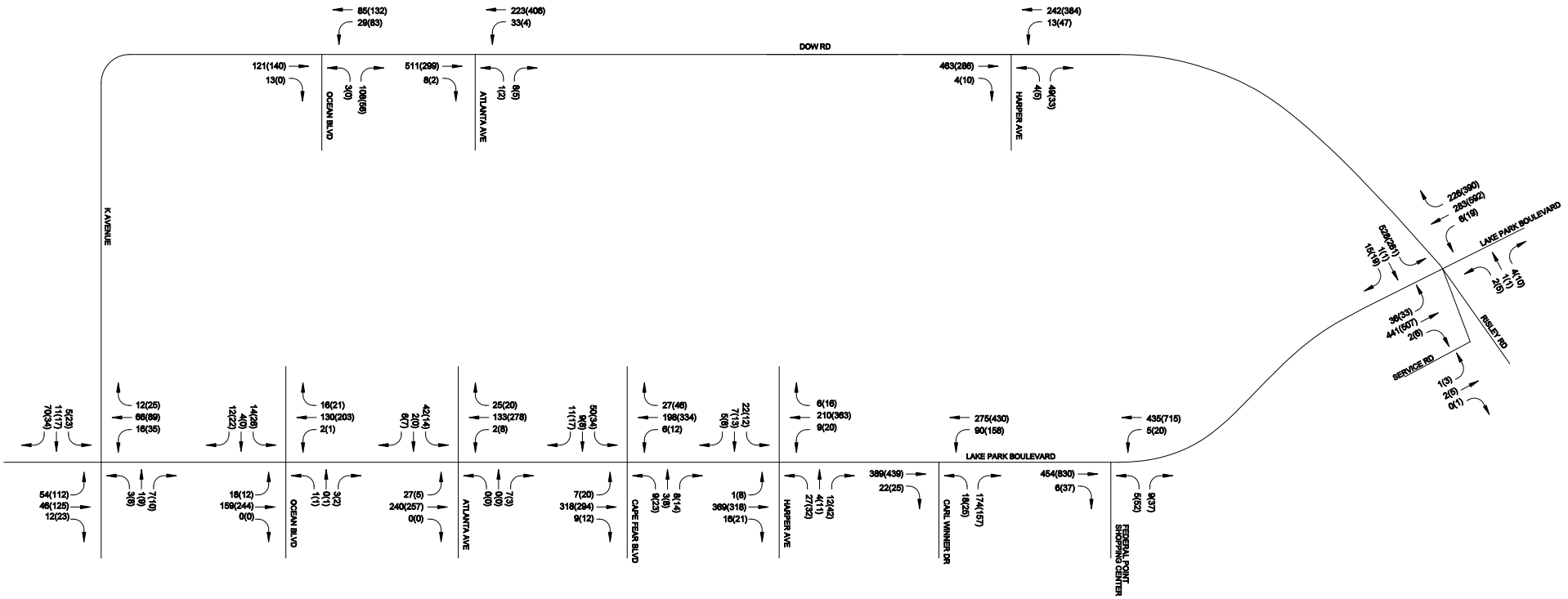
0 1/2 1 2 Miles

N

SITE NAME:	Dow Rd	CLIENT:	Wilbur Smith Associates
ADDRESS:	Dow Rd S/Ocean Blvd Carolina Beach NC 28428	CONTACT:	Rajit Ramkumar
LAT/LONG:	34.0002 / 77.9156	INQUIRY #:	2022443.1s
		DATE:	September 06, 2007 12:43 pm

Appendix B

Traffic Data



LEGEND	
←	DIRECTIONAL MOVEMENT
XX	AM PEAK HOUR TRAFFIC
(XX)	PM PEAK HOUR TRAFFIC

WilburSmith ASSOCIATES
ENGINEERS PLANNERS ECONOMISTS
421 FAYETTEVILLE STREET
SUITE 1303
RALEIGH, NORTH CAROLINA 27601
p: (919) 755-0583
f: (919) 832-8798

DOW ROAD
CORRIDOR STUDY
CAROLINA BEACH, NORTH CAROLINA

2008 EXISTING PEAK HOUR
TRAFFIC COUNTS

FIGURE:
1A

Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : A Dow & US421
Site Code : 00000001
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	28	58	1	0	87	5	0	0	0	5	0	86	3	0	89	4	0	79	0	83	264
07:15 AM	59	55	0	0	114	2	1	0	0	3	1	87	11	0	99	2	0	104	0	106	322
07:30 AM	53	65	4	0	122	1	0	1	0	2	0	129	10	0	139	1	1	142	0	144	407
07:45 AM	77	83	2	0	162	0	0	0	0	0	0	108	8	0	116	5	0	152	0	157	435
Total	217	261	7	0	485	8	1	1	0	10	1	410	32	0	443	12	1	477	0	490	1428
08:00 AM	37	80	0	0	117	1	0	0	0	1	1	117	7	0	125	7	0	130	0	137	380
08:15 AM	50	92	0	1	143	2	0	0	0	2	0	92	7	0	99	3	0	74	0	77	321
08:30 AM	36	109	1	0	146	4	0	0	0	4	0	121	5	0	126	4	1	79	0	84	360
08:45 AM	51	89	3	0	143	0	0	0	0	0	0	58	7	0	65	4	0	62	0	66	274
Total	174	370	4	1	549	7	0	0	0	7	1	388	26	0	415	18	1	345	0	364	1335
*** BREAK ***																					
04:00 PM	95	118	5	2	220	2	2	0	0	4	2	132	16	1	151	6	0	79	0	85	460
04:15 PM	96	137	3	0	236	2	1	1	0	4	1	108	14	0	123	12	1	70	0	83	446
04:30 PM	81	135	3	0	219	0	1	2	0	3	1	130	12	0	143	8	1	69	0	78	443
04:45 PM	79	146	6	0	231	2	0	1	0	3	3	136	10	0	149	9	0	52	0	61	444
Total	351	536	17	2	906	6	4	4	0	14	7	506	52	1	566	35	2	270	0	307	1793
05:00 PM	81	144	3	0	228	2	0	1	0	3	0	153	6	0	159	3	0	75	0	78	468
05:15 PM	111	157	4	0	272	4	1	1	0	6	2	99	10	0	111	5	0	76	0	81	470
05:30 PM	119	145	6	0	270	2	0	1	0	3	1	119	7	0	127	2	1	58	0	61	461
05:45 PM	86	138	6	0	230	0	1	1	0	2	1	116	4	0	121	3	0	50	0	53	406
Total	397	584	19	0	1000	8	2	4	0	14	4	487	27	0	518	13	1	259	0	273	1805
Grand Total	1139	1751	47	3	2940	29	7	9	0	45	13	1791	137	1	1942	78	5	1351	0	1434	6361
Apprch %	38.7	59.6	1.6	0.1		64.4	15.6	20	0		0.7	92.2	7.1	0.1		5.4	0.3	94.2	0		
Total %	17.9	27.5	0.7	0	46.2	0.5	0.1	0.1	0	0.7	0.2	28.2	2.2	0	30.5	1.2	0.1	21.2	0	22.5	

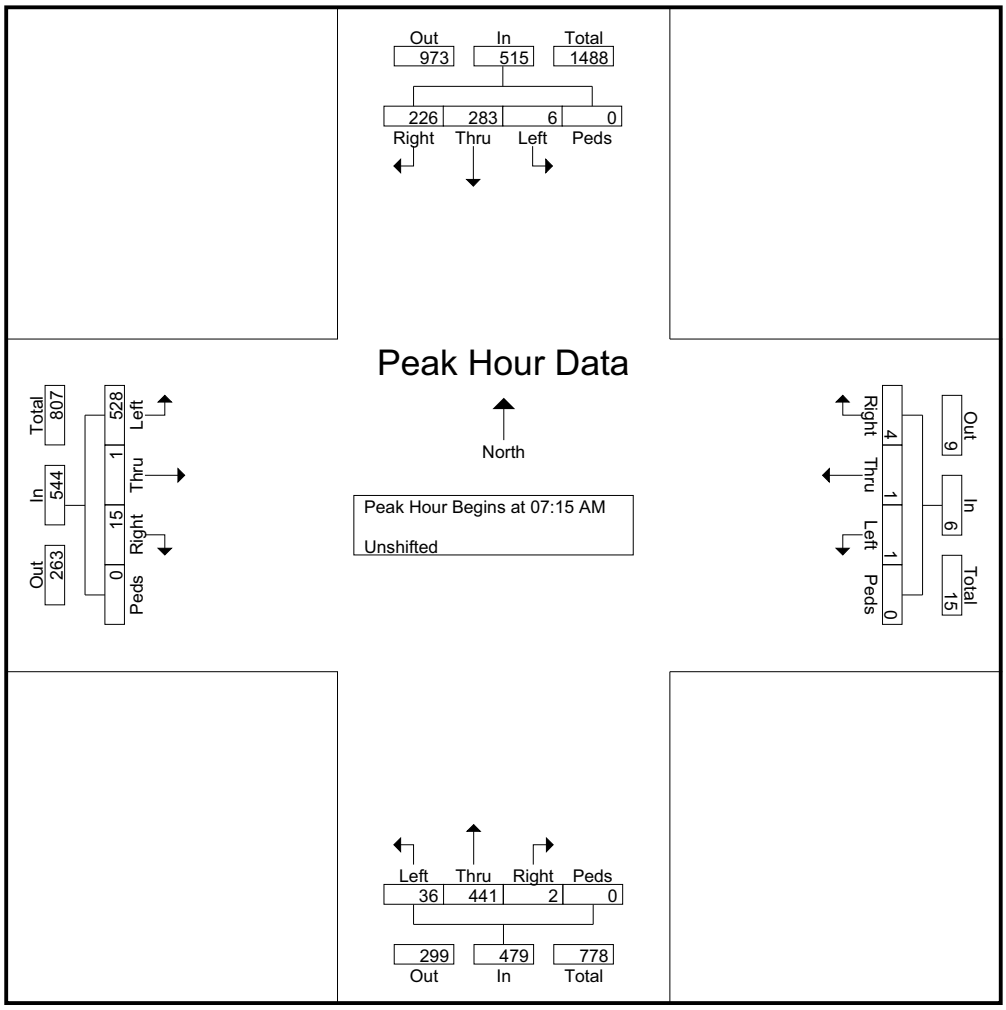
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : A Dow & US421
Site Code : 00000001
Start Date : 4/29/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	59	55	0	0	114	**2**	**1**	0	0	**3**	**1**	87	**11**	0	99	2	0	104	0	106	322
07:30 AM	53	65	**4**	0	122	1	0	**1**	0	2	0	**129**	10	0	**139**	1	**1**	142	0	144	407
07:45 AM	**77**	**83**	2	0	**162**	0	0	0	0	0	0	108	8	0	116	5	0	**152**	0	**157**	**435**
08:00 AM	37	80	0	0	117	1	0	0	0	1	1	117	7	0	125	**7**	0	130	0	137	380
Total Volume	226	283	6	0	515	4	1	1	0	6	2	441	36	0	479	15	1	528	0	544	1544
% App. Total	43.9	55	1.2	0		66.7	16.7	16.7	0		0.4	92.1	7.5	0		2.8	0.2	97.1	0		
PHF	.734	.852	.375	.000	.795	.500	.250	.250	.000	.500	.500	.855	.818	.000	.862	.536	.250	.868	.000	.866	.887



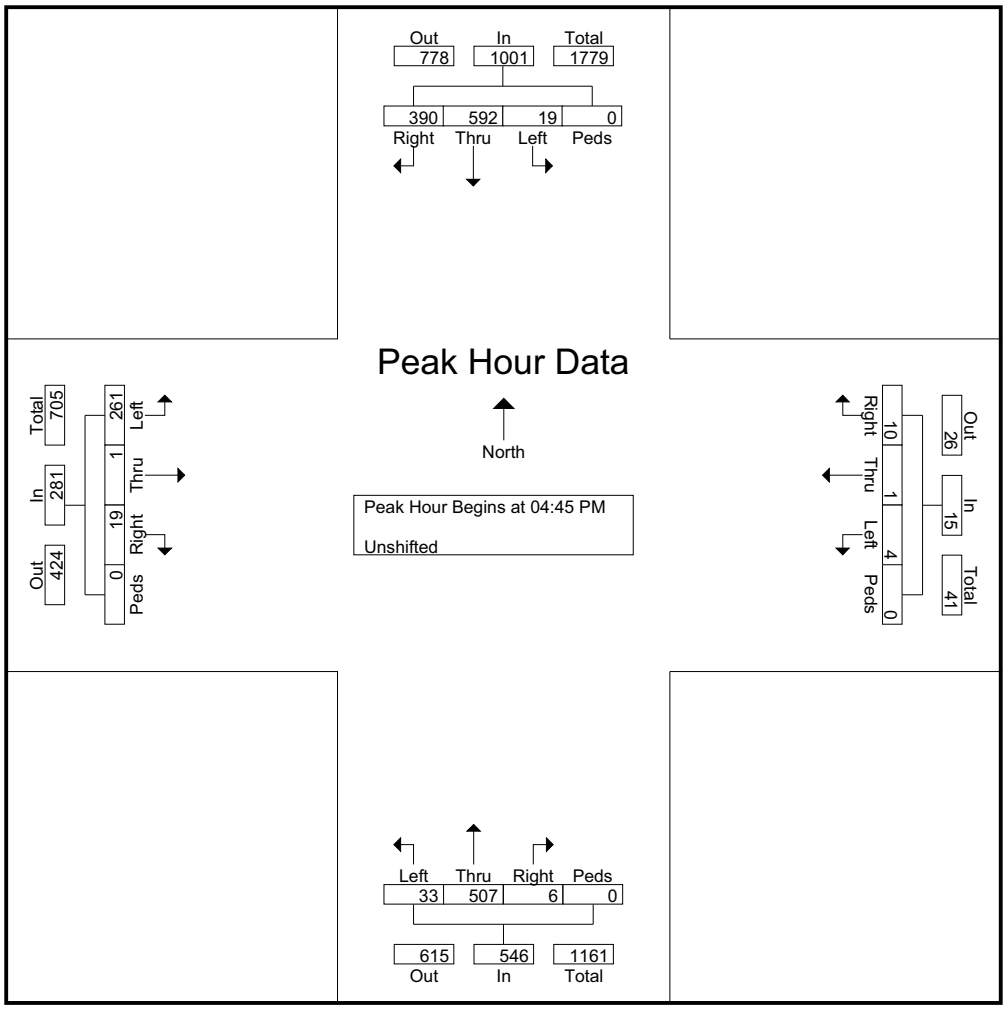
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : A Dow & US421
Site Code : 00000001
Start Date : 4/29/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	79	146	**6**	0	231	2	0	**1**	0	3	**3**	136	**10**	0	149	**9**	0	52	0	61	444
05:00 PM	81	144	3	0	228	2	0	1	0	3	0	**153**	6	0	**159**	3	0	75	0	78	468
05:15 PM	111	**157**	4	0	**272**	**4**	**1**	1	0	**6**	2	99	10	0	111	5	0	**76**	0	**81**	**470**
05:30 PM	**119**	145	6	0	270	2	0	1	0	3	1	119	7	0	127	2	**1**	58	0	61	461
Total Volume	390	592	19	0	1001	10	1	4	0	15	6	507	33	0	546	19	1	261	0	281	1843
% App. Total	39	59.1	1.9	0		66.7	6.7	26.7	0		1.1	92.9	6	0		6.8	0.4	92.9	0		
PHF	.819	.943	.792	.000	.920	.625	.250	1.000	.000	.625	.500	.828	.825	.000	.858	.528	.250	.859	.000	.867	.980



Wilbur Smith Associates
421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

File Name : US421_~3
Site Code : 07220801
Start Date : 7/22/2008
Page No : 1

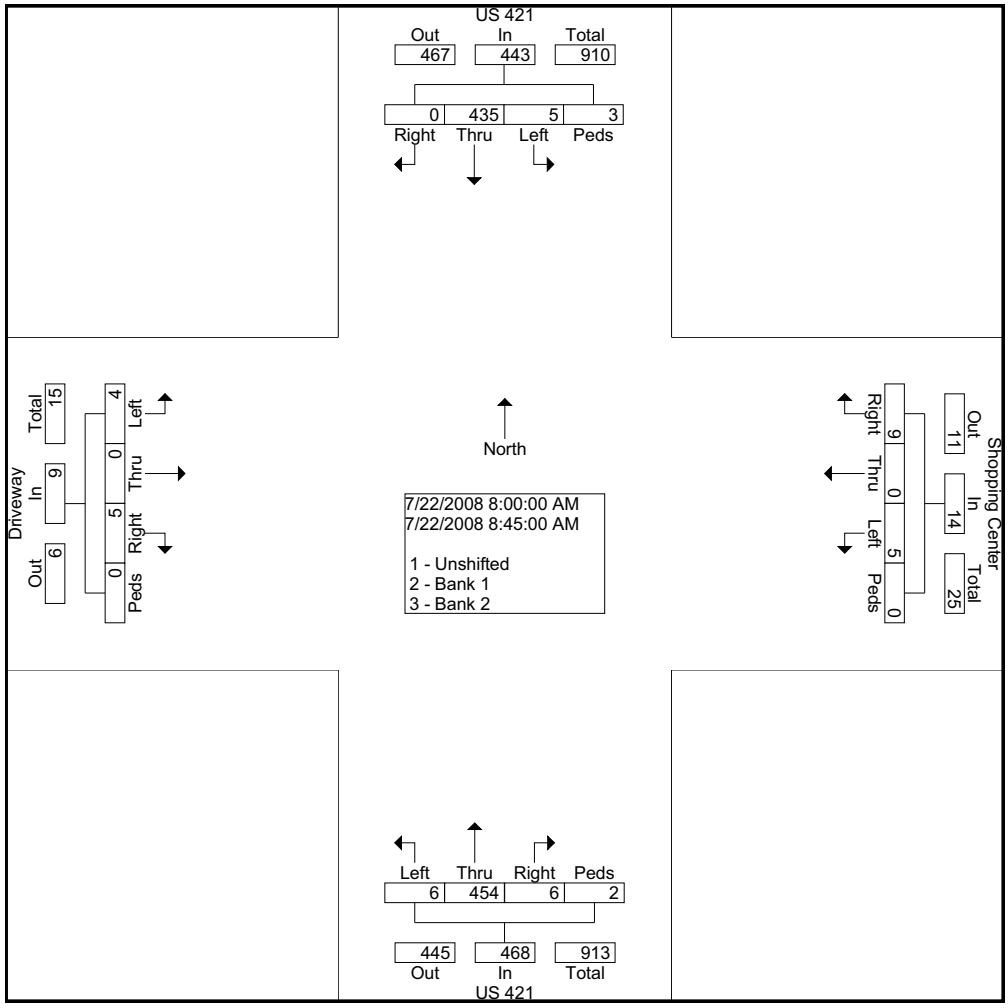
Groups Printed- 1 - Unshifted - 2 - Bank 1 - 3 - Bank 2

	US 421 From North					Shopping Center From East					US 421 From South					Driveway From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	1	50	2	1	54	1	0	0	0	1	0	76	1	1	78	0	0	0	0	0	133
07:15 AM	2	68	1	0	71	2	0	0	0	2	3	113	0	0	116	0	0	0	0	0	189
07:30 AM	1	67	1	0	69	1	0	0	0	1	1	119	1	0	121	1	0	2	0	3	194
07:45 AM	0	101	3	1	105	3	0	1	0	4	1	124	0	1	126	0	0	0	0	0	235
Total	4	286	7	2	299	7	0	1	0	8	5	432	2	2	441	1	0	2	0	3	751
08:00 AM	0	81	1	0	82	2	0	0	0	2	1	121	2	0	124	1	0	0	0	1	209
08:15 AM	0	110	1	0	111	1	0	2	0	3	1	108	2	2	113	1	0	1	0	2	229
08:30 AM	0	122	0	2	124	2	0	1	0	3	4	112	0	0	116	2	0	1	0	3	246
08:45 AM	0	122	3	1	126	4	0	2	0	6	0	113	2	0	115	1	0	2	0	3	250
Total	0	435	5	3	443	9	0	5	0	14	6	454	6	2	468	5	0	4	0	9	934
04:00 PM	4	173	9	0	186	11	0	6	0	17	8	238	2	0	248	3	0	1	0	4	455
04:15 PM	2	165	2	0	169	11	0	8	0	19	6	185	0	1	192	1	0	2	0	3	383
04:30 PM	1	149	8	0	158	12	0	12	0	24	9	194	1	0	204	4	0	0	0	4	390
04:45 PM	0	183	6	0	189	10	0	9	0	19	5	198	3	0	206	1	2	1	0	4	418
Total	7	670	25	0	702	44	0	35	0	79	28	815	6	1	850	9	2	4	0	15	1646
05:00 PM	1	192	3	0	196	7	0	18	0	25	14	228	0	0	242	0	0	2	0	2	465
05:15 PM	0	178	7	1	186	12	0	11	0	23	8	213	0	1	222	0	0	0	0	0	431
05:30 PM	0	162	4	0	166	8	0	14	0	22	10	191	1	0	202	3	0	0	0	3	393
05:45 PM	0	195	3	1	199	5	0	12	0	17	7	182	1	0	190	1	1	2	0	4	410
Total	1	727	17	2	747	32	0	55	0	87	39	814	2	1	856	4	1	4	0	9	1699
Grand Total	12	2118	54	7	2191	92	0	96	0	188	78	2515	16	6	2615	19	3	14	0	36	5030
Apprch %	0.5	96.7	2.5	0.3		48.9	0.0	51.1	0.0		3.0	96.2	0.6	0.2		52.8	8.3	38.9	0.0		
Total %	0.2	42.1	1.1	0.1	43.6	1.8	0.0	1.9	0.0	3.7	1.6	50.0	0.3	0.1	52.0	0.4	0.1	0.3	0.0	0.7	

Wilbur Smith Associates
421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

File Name : US421_~3
Site Code : 07220801
Start Date : 7/22/2008

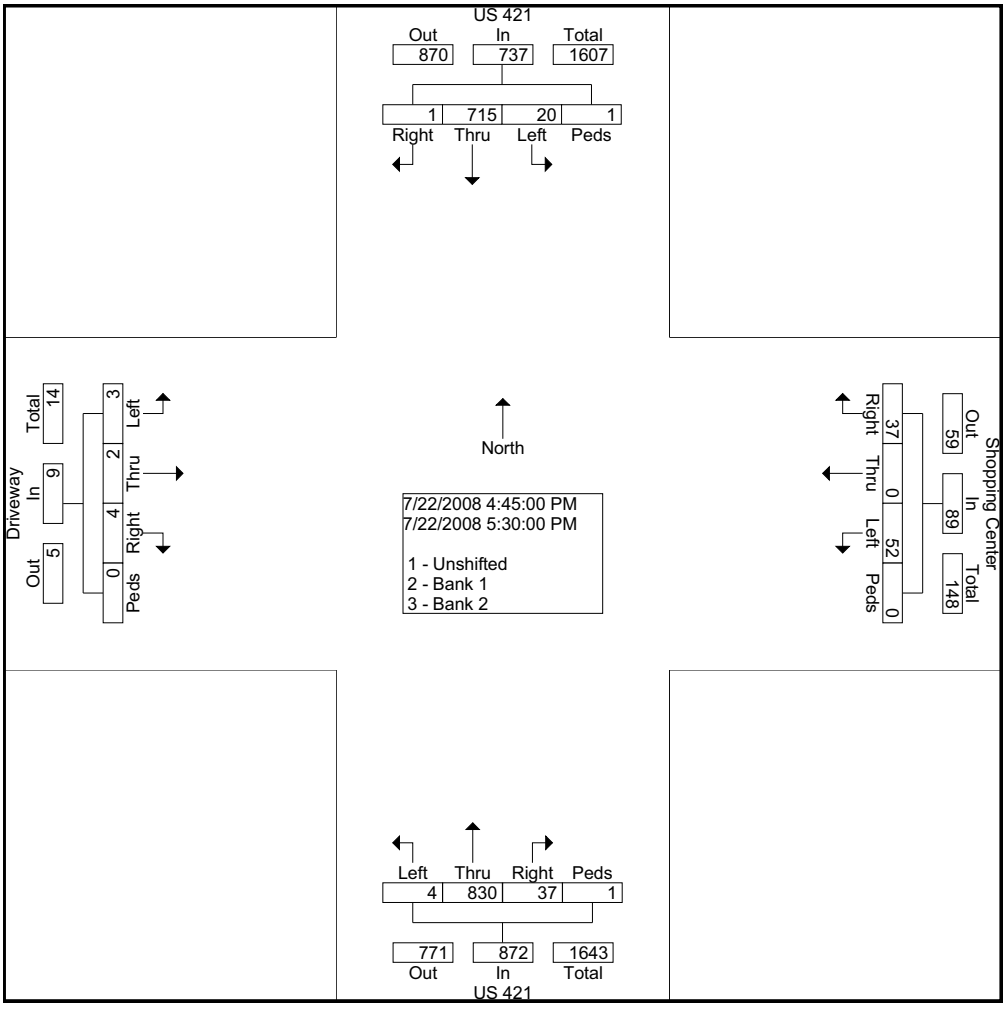
	US 421 From North					Shopping Center From East					US 421 From South					Driveway From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Intersection	08:00 AM																				
Volume	0	435	5	3	443	9	0	5	0	14	6	454	6	2	468	5	0	4	0	9	934
Percent	0.0	98.2	1.1	0.7		64.3	0.0	35.7	0.0		1.3	97.0	1.3	0.4		55.6	0.0	44.4	0.0		
08:45 Volume	0	122	3	1	126	4	0	2	0	6	0	113	2	0	115	1	0	2	0	3	250
Peak Factor																					0.934
High Int.	08:45 AM					08:45 AM					08:00 AM					08:30 AM					
Volume	0	122	3	1	126	4	0	2	0	6	1	121	2	0	124	2	0	1	0	3	
Peak Factor					0.879					0.583					0.944					0.750	



Wilbur Smith Associates
421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

File Name : US421_~3
Site Code : 07220801
Start Date : 7/22/2008

	US 421 From North					Shopping Center From East					US 421 From South					Driveway From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	1	715	20	1	737	37	0	52	0	89	37	830	4	1	872	4	2	3	0	9	1707
Percent	0.1	97.0	2.7	0.1		41.6	0.0	58.4	0.0		4.2	95.2	0.5	0.1		44.4	22.2	33.3	0.0		
05:00 Volume	1	192	3	0	196	7	0	18	0	25	14	228	0	0	242	0	0	2	0	2	465
Peak Factor																					0.918
High Int.	05:00 PM					05:00 PM					05:00 PM					04:45 PM					
Volume	1	192	3	0	196	7	0	18	0	25	14	228	0	0	242	1	2	1	0	4	
Peak Factor					0.94					0.89					0.90					0.56	
					0					0					1					3	



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : E US421& Carl Winner
Site Code : 00030055
Start Date : 4/29/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	37	16	2	55	36	0	2	1	39	4	53	0	0	57	0	0	0	0	0	151
07:15 AM	0	38	16	0	54	37	0	3	2	42	3	76	0	0	79	0	0	0	0	0	175
07:30 AM	0	58	15	0	73	51	0	2	0	53	8	96	0	0	104	0	0	0	0	0	230
07:45 AM	0	71	17	0	88	51	0	6	0	57	7	106	0	0	113	0	0	0	0	0	258
Total	0	204	64	2	270	175	0	13	3	191	22	331	0	0	353	0	0	0	0	0	814
08:00 AM	0	51	33	0	84	37	0	6	0	43	7	100	0	0	107	0	0	0	0	0	234
08:15 AM	0	69	22	0	91	44	0	2	0	46	3	90	0	0	93	0	0	0	0	0	230
08:30 AM	0	84	18	1	103	42	0	4	0	46	5	93	0	0	98	0	0	0	0	0	247
08:45 AM	0	73	22	0	95	32	0	5	3	40	2	54	0	0	56	0	0	0	0	0	191
Total	0	277	95	1	373	155	0	17	3	175	17	337	0	0	354	0	0	0	0	0	902
*** BREAK ***																					
04:00 PM	0	105	32	0	137	36	0	7	0	43	6	126	0	0	132	0	0	0	0	0	312
04:15 PM	0	102	42	3	147	47	0	7	0	54	6	101	0	2	109	0	0	0	0	0	310
04:30 PM	0	104	41	3	148	36	0	3	0	39	5	106	0	2	113	0	0	0	1	1	301
04:45 PM	0	119	43	3	165	38	0	8	0	46	8	106	0	0	114	0	0	0	0	0	325
Total	0	430	158	9	597	157	0	25	0	182	25	439	0	4	468	0	0	0	1	1	1248
05:00 PM	0	104	46	0	150	30	0	6	0	36	9	98	1	0	108	0	0	0	0	0	294
05:15 PM	0	101	52	1	154	37	0	6	0	43	5	96	0	0	101	0	0	0	2	2	300
05:30 PM	0	106	57	0	163	38	0	3	0	41	5	96	0	1	102	0	0	0	3	3	309
05:45 PM	0	86	45	3	134	35	0	4	1	40	8	64	0	2	74	0	0	0	3	3	251
Total	0	397	200	4	601	140	0	19	1	160	27	354	1	3	385	0	0	0	8	8	1154
Grand Total	0	1308	517	16	1841	627	0	74	7	708	91	1461	1	7	1560	0	0	0	9	9	4118
Apprch %	0	71	28.1	0.9		88.6	0	10.5	1		5.8	93.7	0.1	0.4		0	0	0	100		
Total %	0	31.8	12.6	0.4	44.7	15.2	0	1.8	0.2	17.2	2.2	35.5	0	0.2	37.9	0	0	0	0.2	0.2	

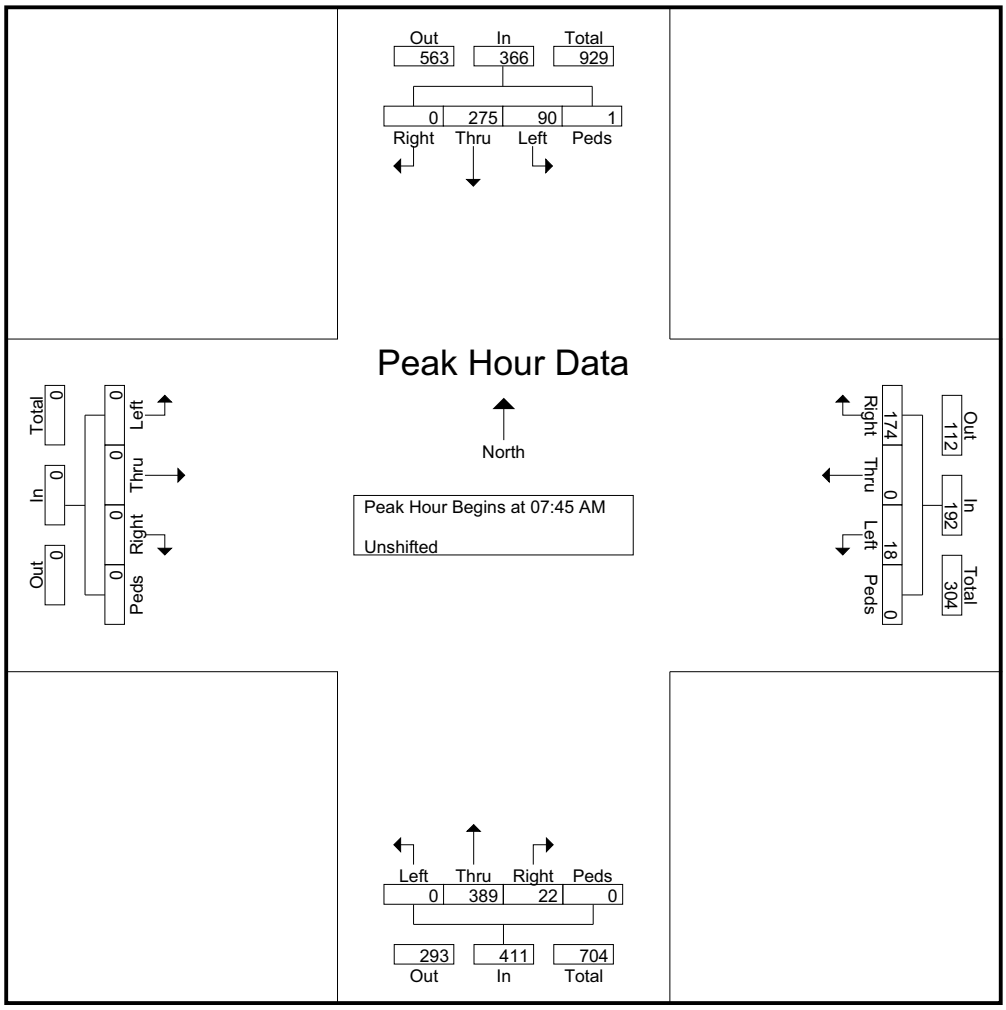
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : E US421& Carl Winner
Site Code : 00030055
Start Date : 4/29/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	71	17	0	88	**51**	0	**6**	0	**57**	**7**	**106**	0	0	**113**	0	0	0	0	0	**258**
08:00 AM	0	51	**33**	0	84	37	0	6	0	43	7	100	0	0	107	0	0	0	0	0	234
08:15 AM	0	69	22	0	91	44	0	2	0	46	3	90	0	0	93	0	0	0	0	0	230
08:30 AM	0	**84**	18	**1**	**103**	42	0	4	0	46	5	93	0	0	98	0	0	0	0	0	247
Total Volume	0	275	90	1	366	174	0	18	0	192	22	389	0	0	411	0	0	0	0	0	969
% App. Total	0	75.1	24.6	0.3		90.6	0	9.4	0		5.4	94.6	0	0		0	0	0	0		
PHF	.000	.818	.682	.250	.888	.853	.000	.750	.000	.842	.786	.917	.000	.000	.909	.000	.000	.000	.000	.000	.939



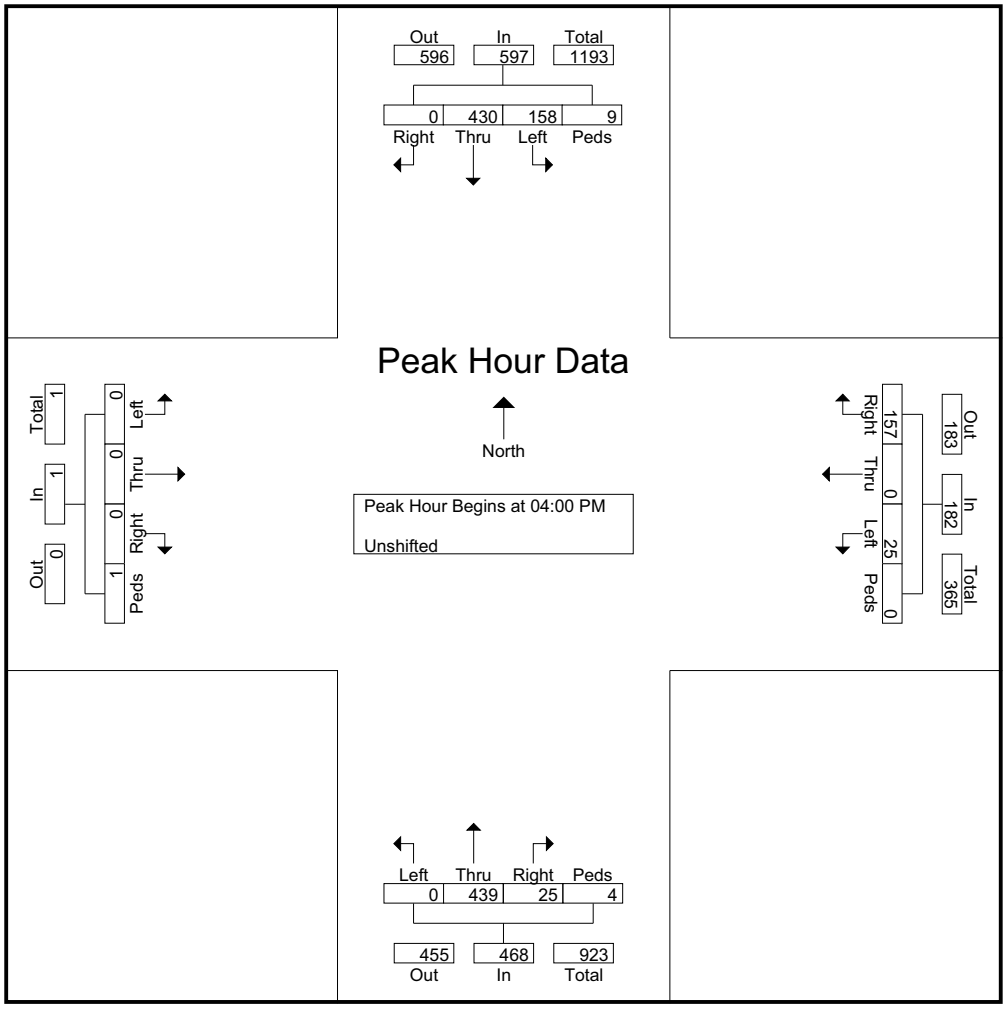
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : E US421& Carl Winner
Site Code : 00030055
Start Date : 4/29/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	105	32	0	137	36	0	7	0	43	6	**126**	0	0	**132**	0	0	0	0	0	312
04:15 PM	0	102	42	**3**	147	**47**	0	7	0	**54**	6	101	0	**2**	109	0	0	0	0	0	310
04:30 PM	0	104	41	3	148	36	0	3	0	39	5	106	0	2	113	0	0	0	**1**	**1**	301
04:45 PM	0	**119**	**43**	3	**165**	38	0	**8**	0	46	**8**	106	0	0	114	0	0	0	0	0	**325**
Total Volume	0	430	158	9	597	157	0	25	0	182	25	439	0	4	468	0	0	0	1	1	1248
% App. Total	0	72	26.5	1.5		86.3	0	13.7	0		5.3	93.8	0	0.9		0	0	0	100		
PHF	.000	.903	.919	.750	.905	.835	.000	.781	.000	.843	.781	.871	.000	.500	.886	.000	.000	.000	.250	.250	.960



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : F US 421 & Harper
Site Code : 00003077
Start Date : 4/30/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	21	2	0	23	5	0	4	0	9	4	66	2	0	72	0	0	8	0	8	112
07:15 AM	1	39	2	1	43	1	0	8	0	9	4	83	0	1	88	0	2	4	0	6	146
07:30 AM	1	49	2	0	52	3	2	8	0	13	3	97	0	0	100	3	3	7	0	13	178
07:45 AM	1	69	1	2	73	4	2	6	0	12	2	102	0	0	104	0	0	5	3	8	197
Total	3	178	7	3	191	13	4	26	0	43	13	348	2	1	364	3	5	24	3	35	633
08:00 AM	3	53	4	0	60	4	0	5	0	9	7	87	1	2	97	2	2	6	1	11	177
08:15 AM	1	51	7	0	59	6	1	4	1	12	4	60	0	3	67	1	1	3	0	5	143
08:30 AM	1	63	0	0	64	6	3	1	2	12	5	82	1	3	91	0	1	6	0	7	174
08:45 AM	1	68	6	2	77	9	1	7	0	17	1	63	0	6	70	0	3	5	0	8	172
Total	6	235	17	2	260	25	5	17	3	50	17	292	2	14	325	3	7	20	1	31	666
*** BREAK ***																					
04:00 PM	5	97	6	1	109	13	2	5	2	22	8	84	1	0	93	2	1	5	6	14	238
04:15 PM	5	89	2	4	100	9	0	5	6	20	4	93	0	3	100	0	3	4	2	9	229
04:30 PM	4	83	4	1	92	12	0	2	0	14	3	84	2	1	90	3	3	4	1	11	207
04:45 PM	2	82	3	8	95	7	0	12	0	19	4	75	3	0	82	1	1	1	3	6	202
Total	16	351	15	14	396	41	2	24	8	75	19	336	6	4	365	6	8	14	12	40	876
05:00 PM	7	82	4	2	95	13	2	6	2	23	2	80	4	0	86	1	4	2	1	8	212
05:15 PM	5	95	2	1	103	10	3	7	0	20	6	82	3	0	91	5	3	5	1	14	228
05:30 PM	1	97	7	4	109	12	4	9	2	27	8	75	0	1	84	1	2	2	3	8	228
05:45 PM	3	89	7	3	102	7	2	10	1	20	5	81	1	2	89	1	4	3	2	10	221
Total	16	363	20	10	409	42	11	32	5	90	21	318	8	3	350	8	13	12	7	40	889
Grand Total	41	1127	59	29	1256	121	22	99	16	258	70	1294	18	22	1404	20	33	70	23	146	3064
Apprch %	3.3	89.7	4.7	2.3		46.9	8.5	38.4	6.2		5	92.2	1.3	1.6		13.7	22.6	47.9	15.8		
Total %	1.3	36.8	1.9	0.9	41	3.9	0.7	3.2	0.5	8.4	2.3	42.2	0.6	0.7	45.8	0.7	1.1	2.3	0.8	4.8	

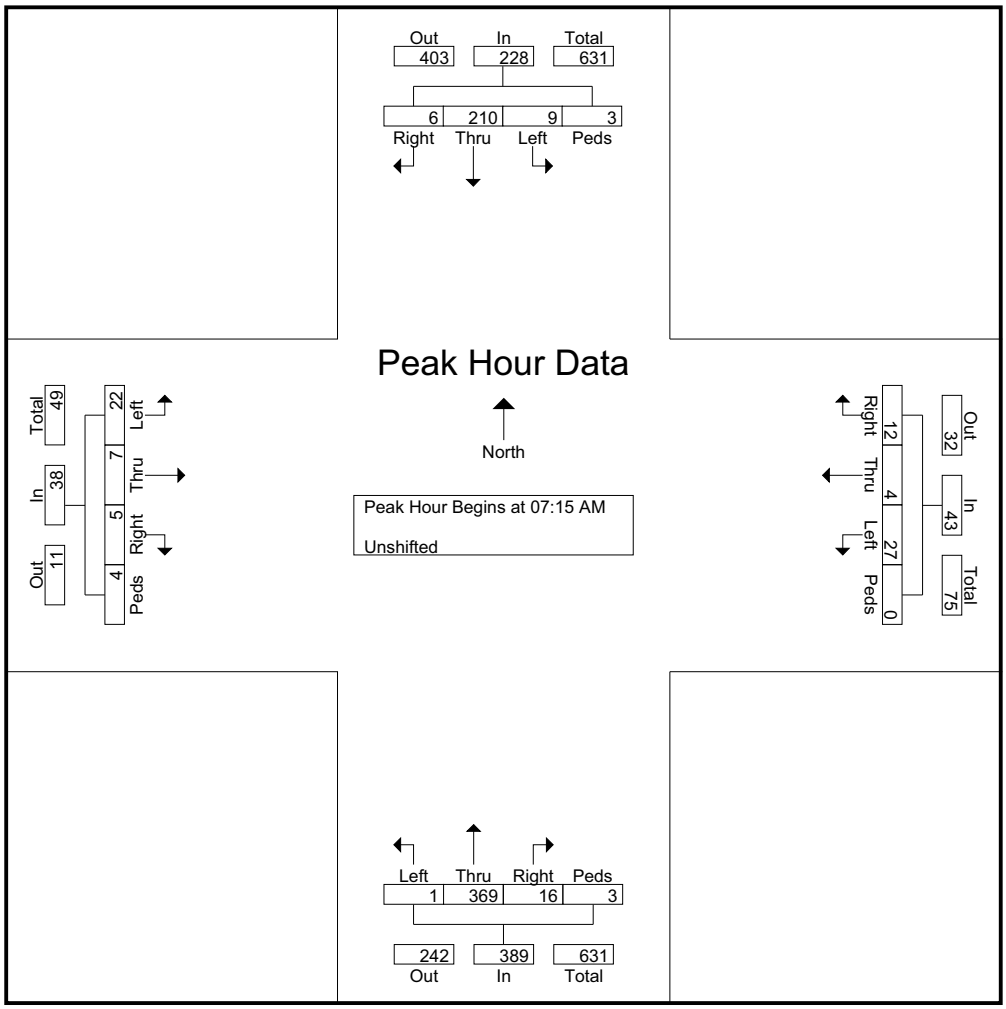
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : F US 421 & Harper
Site Code : 00003077
Start Date : 4/30/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	1	39	2	1	43	1	0	**8**	0	9	4	83	0	1	88	0	2	4	0	6	146
07:30 AM	1	49	2	0	52	3	**2**	8	0	**13**	3	97	0	0	100	**3**	**3**	**7**	0	**13**	178
07:45 AM	1	**69**	1	**2**	**73**	**4**	2	6	0	12	2	**102**	0	0	**104**	0	0	5	**3**	8	**197**
08:00 AM	**3**	53	**4**	0	60	4	0	5	0	9	**7**	87	**1**	**2**	97	2	2	6	1	11	177
Total Volume	6	210	9	3	228	12	4	27	0	43	16	369	1	3	389	5	7	22	4	38	698
% App. Total	2.6	92.1	3.9	1.3		27.9	9.3	62.8	0		4.1	94.9	0.3	0.8		13.2	18.4	57.9	10.5		
PHF	.500	.761	.563	.375	.781	.750	.500	.844	.000	.827	.571	.904	.250	.375	.935	.417	.583	.786	.333	.731	.886



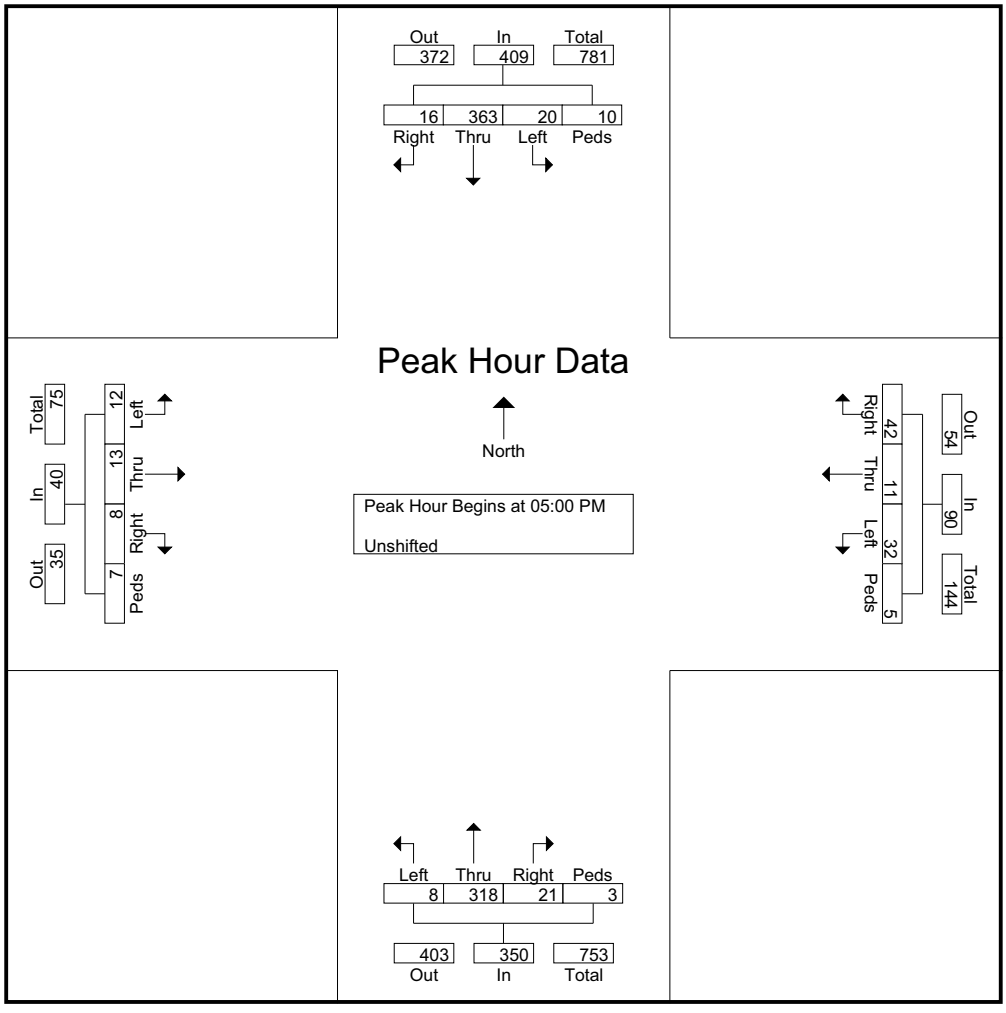
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : F US 421 & Harper
Site Code : 00003077
Start Date : 4/30/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	**7**	82	4	2	95	**13**	2	6	**2**	23	2	80	**4**	0	86	1	**4**	2	1	8	212
05:15 PM	5	95	2	1	103	10	3	7	0	20	6	**82**	3	0	**91**	**5**	3	**5**	1	**14**	**228**
05:30 PM	1	**97**	**7**	**4**	**109**	12	**4**	9	2	**27**	**8**	75	0	1	84	1	2	2	**3**	8	228
05:45 PM	3	89	7	3	102	7	2	**10**	1	20	5	81	1	**2**	89	1	4	3	2	10	221
Total Volume	16	363	20	10	409	42	11	32	5	90	21	318	8	3	350	8	13	12	7	40	889
% App. Total	3.9	88.8	4.9	2.4		46.7	12.2	35.6	5.6		6	90.9	2.3	0.9		20	32.5	30	17.5		
PHF	.571	.936	.714	.625	.938	.808	.688	.800	.625	.833	.656	.970	.500	.375	.962	.400	.813	.600	.583	.714	.975



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : G US 421 & Cape Fear Blvd
Site Code : 00000010
Start Date : 4/30/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	3	17	3	0	23	0	1	3	0	4	0	67	0	0	67	1	2	5	0	8	102
07:15 AM	7	38	2	2	49	3	0	1	0	4	3	77	1	2	83	0	2	4	1	7	143
07:30 AM	7	47	0	0	54	0	0	3	0	3	1	83	1	0	85	2	2	11	0	15	157
07:45 AM	4	59	4	0	67	1	1	4	1	7	3	87	2	2	94	4	1	16	0	21	189
Total	21	161	9	2	193	4	2	11	1	18	7	314	4	4	329	7	7	36	1	51	591
08:00 AM	9	54	0	0	63	4	2	1	0	7	2	71	3	0	76	5	4	19	2	30	176
08:15 AM	6	45	1	1	53	1	2	4	1	8	2	50	0	1	53	2	3	7	0	12	126
08:30 AM	10	50	0	1	61	3	0	2	0	5	0	74	1	3	78	4	2	5	0	11	155
08:45 AM	4	67	1	4	76	1	2	3	0	6	2	51	0	2	55	2	2	10	2	16	153
Total	29	216	2	6	253	9	6	10	1	26	6	246	4	6	262	13	11	41	4	69	610
*** BREAK ***																					
04:00 PM	13	79	4	5	101	3	2	5	2	12	1	71	4	1	77	9	5	13	2	29	219
04:15 PM	9	67	6	2	84	2	1	2	2	7	3	75	4	1	83	3	2	14	6	25	199
04:30 PM	15	80	1	2	98	5	2	5	0	12	3	77	2	0	82	7	0	10	0	17	209
04:45 PM	6	66	4	3	79	2	2	5	5	14	11	66	1	3	81	2	2	11	3	18	192
Total	43	292	15	12	362	12	7	17	9	45	18	289	11	5	323	21	9	48	11	89	819
05:00 PM	9	80	5	1	95	4	3	3	0	10	2	74	6	2	84	5	1	8	2	16	205
05:15 PM	15	78	3	2	98	2	2	7	2	13	2	71	3	3	79	4	2	8	1	15	205
05:30 PM	13	81	1	2	97	3	2	8	2	15	3	72	5	6	86	3	3	10	5	21	219
05:45 PM	9	95	3	1	108	5	1	5	2	13	5	77	6	1	89	5	2	8	5	20	230
Total	46	334	12	6	398	14	8	23	6	51	12	294	20	12	338	17	8	34	13	72	859
Grand Total	139	1003	38	26	1206	39	23	61	17	140	43	1143	39	27	1252	58	35	159	29	281	2879
Apprch %	11.5	83.2	3.2	2.2		27.9	16.4	43.6	12.1		3.4	91.3	3.1	2.2		20.6	12.5	56.6	10.3		
Total %	4.8	34.8	1.3	0.9	41.9	1.4	0.8	2.1	0.6	4.9	1.5	39.7	1.4	0.9	43.5	2	1.2	5.5	1	9.8	

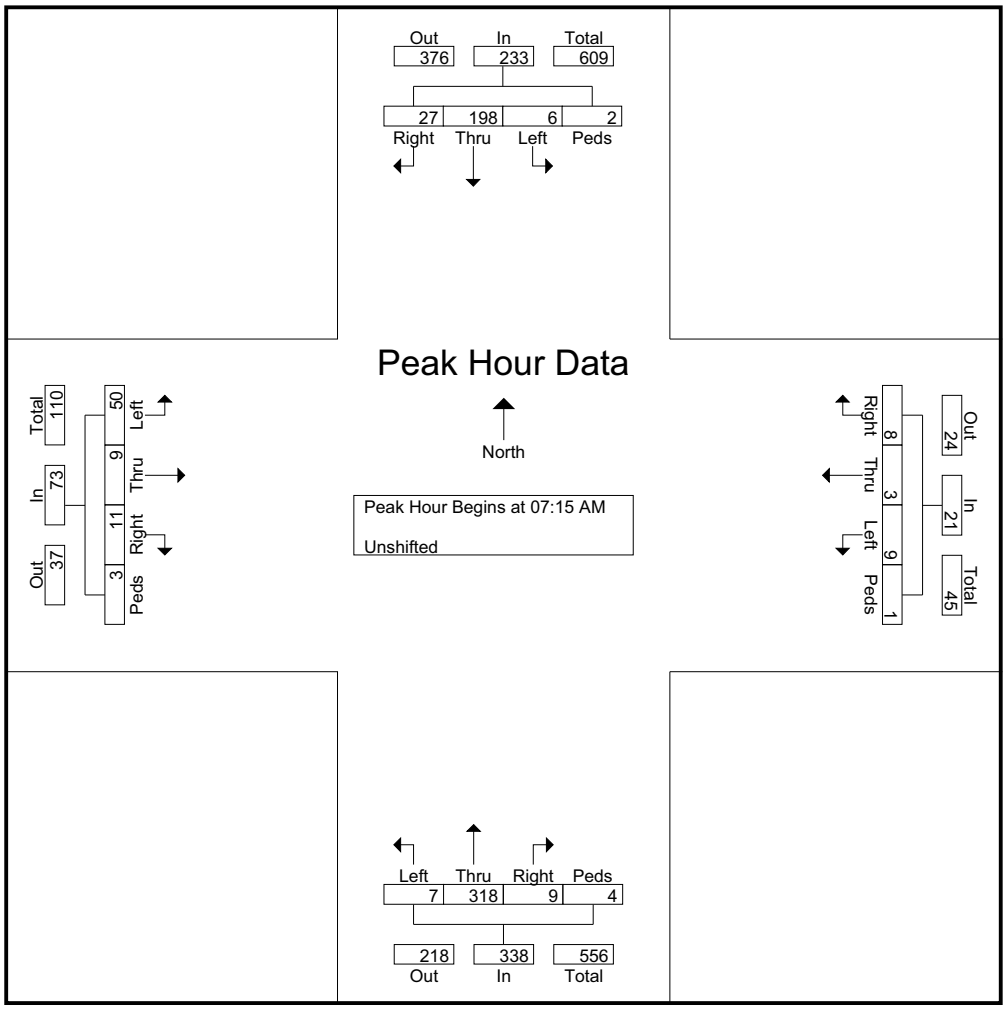
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : G US 421 & Cape Fear Blvd
Site Code : 00000010
Start Date : 4/30/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	7	38	2	**2**	49	3	0	1	0	4	**3**	77	1	**2**	83	0	2	4	1	7	143
07:30 AM	7	47	0	0	54	0	0	3	0	3	1	83	1	0	85	2	2	11	0	15	157
07:45 AM	4	**59**	**4**	0	**67**	1	1	**4**	**1**	**7**	3	**87**	2	2	**94**	4	1	16	0	21	**189**
08:00 AM	**9**	54	0	0	63	**4**	**2**	1	0	7	2	71	**3**	0	76	**5**	**4**	**19**	**2**	**30**	176
Total Volume	27	198	6	2	233	8	3	9	1	21	9	318	7	4	338	11	9	50	3	73	665
% App. Total	11.6	85	2.6	0.9		38.1	14.3	42.9	4.8		2.7	94.1	2.1	1.2		15.1	12.3	68.5	4.1		
PHF	.750	.839	.375	.250	.869	.500	.375	.563	.250	.750	.750	.914	.583	.500	.899	.550	.563	.658	.375	.608	.880



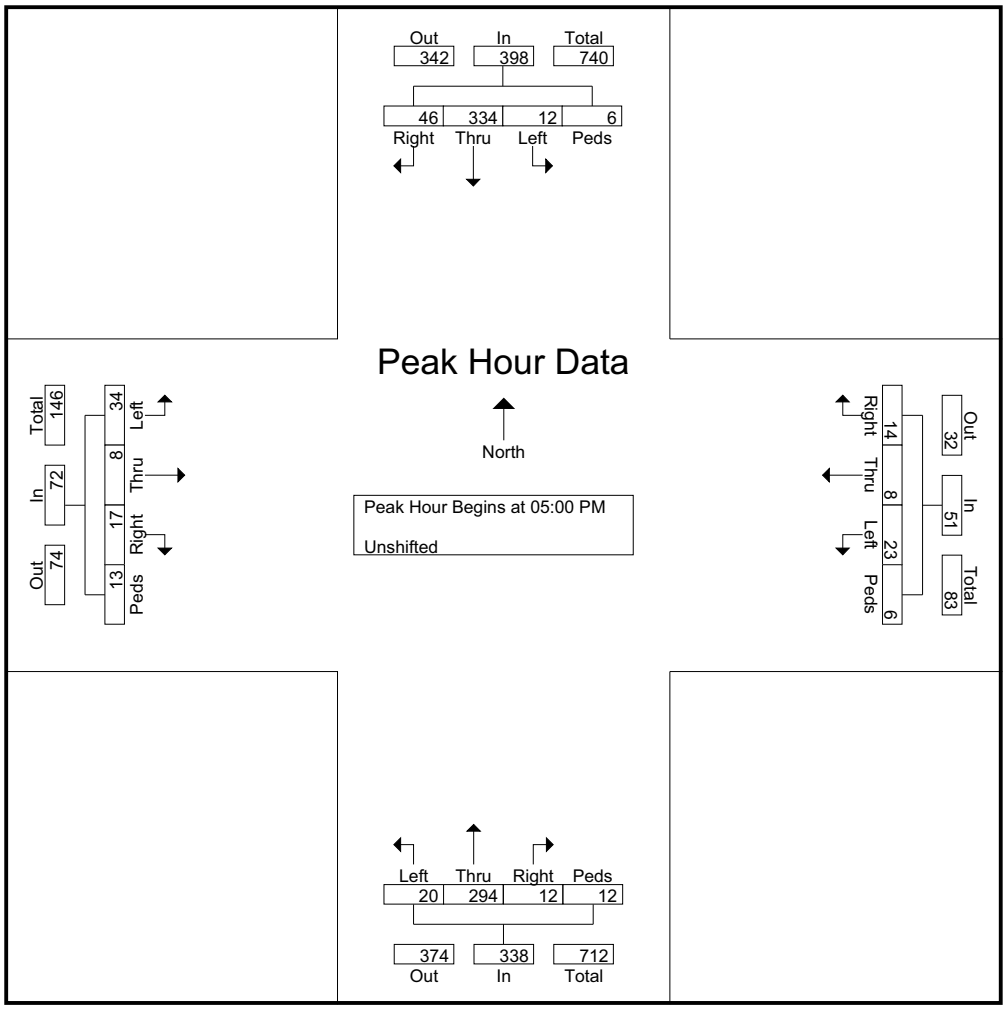
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : G US 421 & Cape Fear Blvd
Site Code : 00000010
Start Date : 4/30/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	9	80	**5**	1	95	4	**3**	3	0	10	2	74	**6**	2	84	**5**	1	8	2	16	205
05:15 PM	**15**	78	3	**2**	98	2	2	7	**2**	13	2	71	3	3	79	4	2	8	1	15	205
05:30 PM	13	81	1	2	97	3	2	**8**	2	**15**	3	72	5	**6**	86	3	**3**	**10**	**5**	**21**	219
05:45 PM	9	**95**	3	1	**108**	**5**	1	5	2	13	**5**	**77**	6	1	**89**	5	2	8	5	20	**230**
Total Volume	46	334	12	6	398	14	8	23	6	51	12	294	20	12	338	17	8	34	13	72	859
% App. Total	11.6	83.9	3	1.5		27.5	15.7	45.1	11.8		3.6	87	5.9	3.6		23.6	11.1	47.2	18.1		
PHF	.767	.879	.600	.750	.921	.700	.667	.719	.750	.850	.600	.955	.833	.500	.949	.850	.667	.850	.650	.857	.934



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : H US421 & Atlanta
Site Code : 00000005
Start Date : 4/30/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	1	13	0	0	14	0	2	0	0	2	0	50	1	0	51	1	1	3	0	5	72
07:15 AM	3	24	0	0	27	2	0	0	0	2	0	57	1	0	58	0	0	6	0	6	93
07:30 AM	5	31	1	0	37	4	0	0	0	4	0	71	5	0	76	1	0	6	0	7	124
07:45 AM	15	40	0	0	55	1	0	0	0	1	0	62	15	0	77	2	2	18	0	22	155
Total	24	108	1	0	133	7	2	0	0	9	0	240	22	0	262	4	3	33	0	40	444
08:00 AM	2	38	1	0	41	0	0	0	0	0	0	50	6	0	56	3	0	12	0	15	112
08:15 AM	1	37	2	2	42	1	0	0	0	1	0	46	1	0	47	0	0	1	2	3	93
08:30 AM	4	39	1	0	44	0	0	0	0	0	0	52	3	0	55	3	1	2	0	6	105
08:45 AM	3	54	2	0	59	0	0	0	0	0	0	42	0	0	42	0	0	1	0	1	102
Total	10	168	6	2	186	1	0	0	0	1	0	190	10	0	200	6	1	16	2	25	412
*** BREAK ***																					
03:45 PM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
04:00 PM	2	71	2	0	75	1	0	0	0	1	1	71	1	0	73	3	0	1	0	4	153
04:15 PM	2	59	3	0	64	0	3	0	0	3	2	60	3	0	65	6	0	3	2	11	143
04:30 PM	1	47	2	0	50	0	0	0	0	0	0	56	4	0	60	3	0	1	0	4	114
04:45 PM	3	66	0	1	70	0	0	0	0	0	0	61	1	1	63	3	0	5	0	8	141
Total	8	243	7	1	259	1	3	0	0	4	3	248	9	1	261	15	0	10	2	27	551
05:00 PM	5	68	1	1	75	0	0	0	0	0	0	65	2	0	67	0	0	4	0	4	146
05:15 PM	3	63	3	0	69	1	0	0	0	1	0	57	0	0	57	2	0	2	0	4	131
05:30 PM	4	69	3	0	76	0	0	0	0	0	0	68	1	0	69	4	0	3	0	7	152
05:45 PM	8	78	1	0	87	2	0	0	0	2	0	67	2	0	69	1	0	5	0	6	164
Total	20	278	8	1	307	3	0	0	0	3	0	257	5	0	262	7	0	14	0	21	593
Grand Total	65	797	22	4	888	12	5	0	0	17	3	935	46	1	985	32	4	73	4	113	2003
Apprch %	7.3	89.8	2.5	0.5		70.6	29.4	0	0		0.3	94.9	4.7	0.1		28.3	3.5	64.6	3.5		
Total %	3.2	39.8	1.1	0.2	44.3	0.6	0.2	0	0	0.8	0.1	46.7	2.3	0	49.2	1.6	0.2	3.6	0.2	5.6	

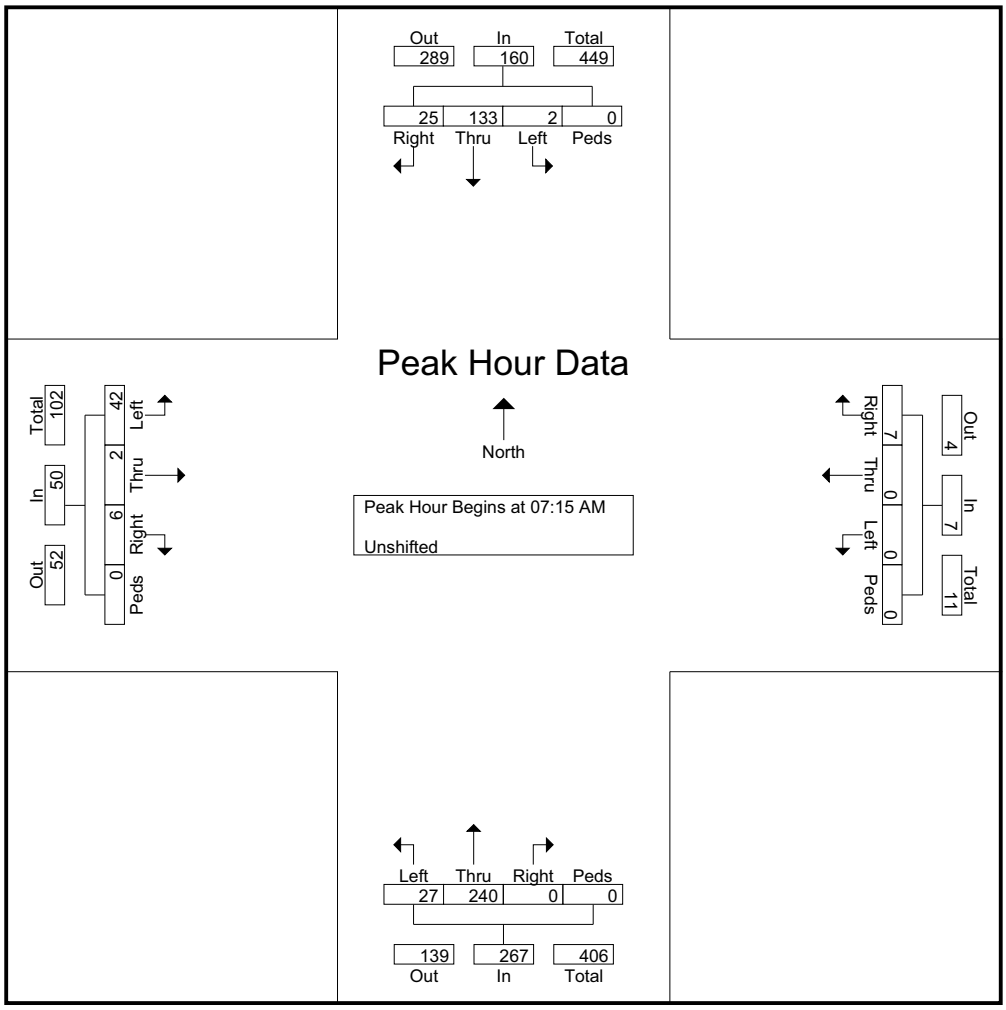
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : H US421 & Atlanta
Site Code : 00000005
Start Date : 4/30/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	3	24	0	0	27	2	0	0	0	2	0	57	1	0	58	0	0	6	0	6	93
07:30 AM	5	31	**1**	0	37	**4**	0	0	0	**4**	0	**71**	5	0	76	1	0	6	0	7	124
07:45 AM	**15**	**40**	0	0	**55**	1	0	0	0	1	0	62	**15**	0	**77**	2	**2**	**18**	0	**22**	**155**
08:00 AM	2	38	1	0	41	0	0	0	0	0	0	50	6	0	56	**3**	0	12	0	15	112
Total Volume	25	133	2	0	160	7	0	0	0	7	0	240	27	0	267	6	2	42	0	50	484
% App. Total	15.6	83.1	1.2	0		100	0	0	0		0	89.9	10.1	0		12	4	84	0		
PHF	.417	.831	.500	.000	.727	.438	.000	.000	.000	.438	.000	.845	.450	.000	.867	.500	.250	.583	.000	.568	.781



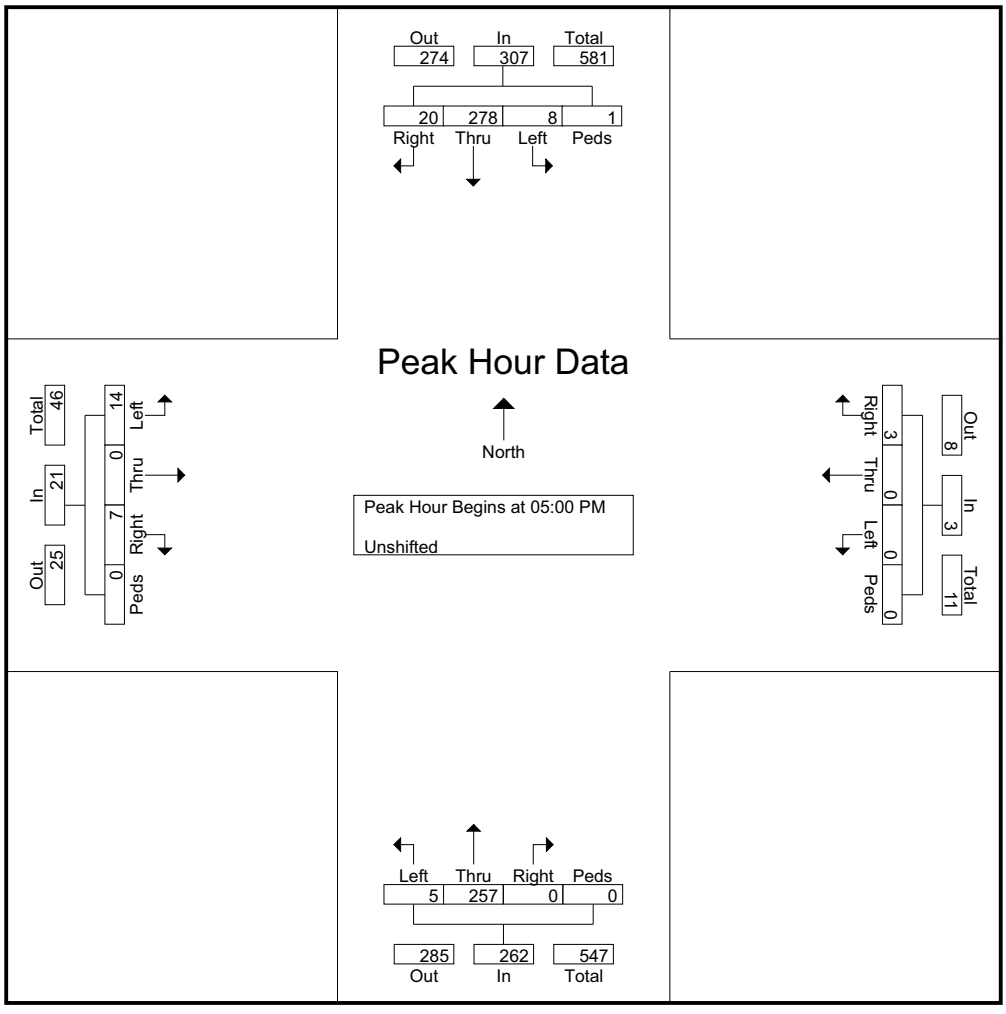
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

10th and Wooster St.
Turning Movement Count

File Name : H US421 & Atlanta
Site Code : 00000005
Start Date : 4/30/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	5	68	1	**1**	75	0	0	0	0	0	0	65	**2**	0	67	0	0	4	0	4	146
05:15 PM	3	63	**3**	0	69	1	0	0	0	1	0	57	0	0	57	2	0	2	0	4	131
05:30 PM	4	69	3	0	76	0	0	0	0	0	0	**68**	1	0	**69**	**4**	0	3	0	**7**	152
05:45 PM	**8**	**78**	1	0	**87**	**2**	0	0	0	**2**	0	67	2	0	69	1	0	**5**	0	6	**164**
Total Volume	20	278	8	1	307	3	0	0	0	3	0	257	5	0	262	7	0	14	0	21	593
% App. Total	6.5	90.6	2.6	0.3		100	0	0	0		0	98.1	1.9	0		33.3	0	66.7	0		
PHF	.625	.891	.667	.250	.882	.375	.000	.000	.000	.375	.000	.945	.625	.000	.949	.438	.000	.700	.000	.750	.904



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : I US 421 & Ocean
Site Code : 00001234
Start Date : 5/6/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	4	11	0	0	15	0	0	0	0	0	0	25	3	0	28	2	2	5	0	9	52
07:15 AM	3	17	0	1	21	0	1	0	0	1	0	31	2	4	37	1	0	7	0	8	67
07:30 AM	3	25	3	0	31	2	2	0	0	4	0	34	4	0	38	3	0	4	0	7	80
07:45 AM	1	33	1	1	36	2	0	0	0	2	0	49	4	1	54	3	0	4	0	7	99
Total	11	86	4	2	103	4	3	0	0	7	0	139	13	5	157	9	2	20	0	31	298
08:00 AM	5	30	0	1	36	0	0	0	0	0	0	31	5	1	37	1	0	4	0	5	78
08:15 AM	7	29	0	0	36	0	0	1	0	1	0	39	2	1	42	2	1	4	0	7	86
08:30 AM	3	38	1	0	42	1	0	0	0	1	0	40	7	2	49	6	3	2	0	11	103
08:45 AM	1	39	1	2	43	2	0	1	0	3	0	34	1	1	36	4	0	7	0	11	93
Total	16	136	2	3	157	3	0	2	0	5	0	144	15	5	164	13	4	17	0	34	360
*** BREAK ***																					
04:00 PM	5	50	0	5	60	2	0	0	2	4	0	65	0	0	65	7	0	9	0	16	145
04:15 PM	6	46	0	1	53	0	1	0	0	1	0	51	2	2	55	7	0	5	2	14	123
04:30 PM	7	63	0	1	71	0	0	0	6	6	0	63	5	0	68	7	0	3	0	10	155
04:45 PM	3	44	1	0	48	0	0	1	1	2	0	65	5	4	74	1	0	9	2	12	136
Total	21	203	1	7	232	2	1	1	9	13	0	244	12	6	262	22	0	26	4	52	559
05:00 PM	6	53	0	0	59	1	1	0	1	3	0	54	2	1	57	4	0	4	3	11	130
05:15 PM	7	44	1	0	52	0	1	2	0	3	1	64	2	0	67	4	1	4	2	11	133
05:30 PM	7	64	0	1	72	2	0	0	5	7	0	46	3	0	49	8	0	3	0	11	139
05:45 PM	4	55	1	0	60	1	0	1	0	2	0	52	5	1	58	5	0	7	0	12	132
Total	24	216	2	1	243	4	2	3	6	15	1	216	12	2	231	21	1	18	5	45	534
Grand Total	72	641	9	13	735	13	6	6	15	40	1	743	52	18	814	65	7	81	9	162	1751
Apprch %	9.8	87.2	1.2	1.8		32.5	15	15	37.5		0.1	91.3	6.4	2.2		40.1	4.3	50	5.6		
Total %	4.1	36.6	0.5	0.7	42	0.7	0.3	0.3	0.9	2.3	0.1	42.4	3	1	46.5	3.7	0.4	4.6	0.5	9.3	

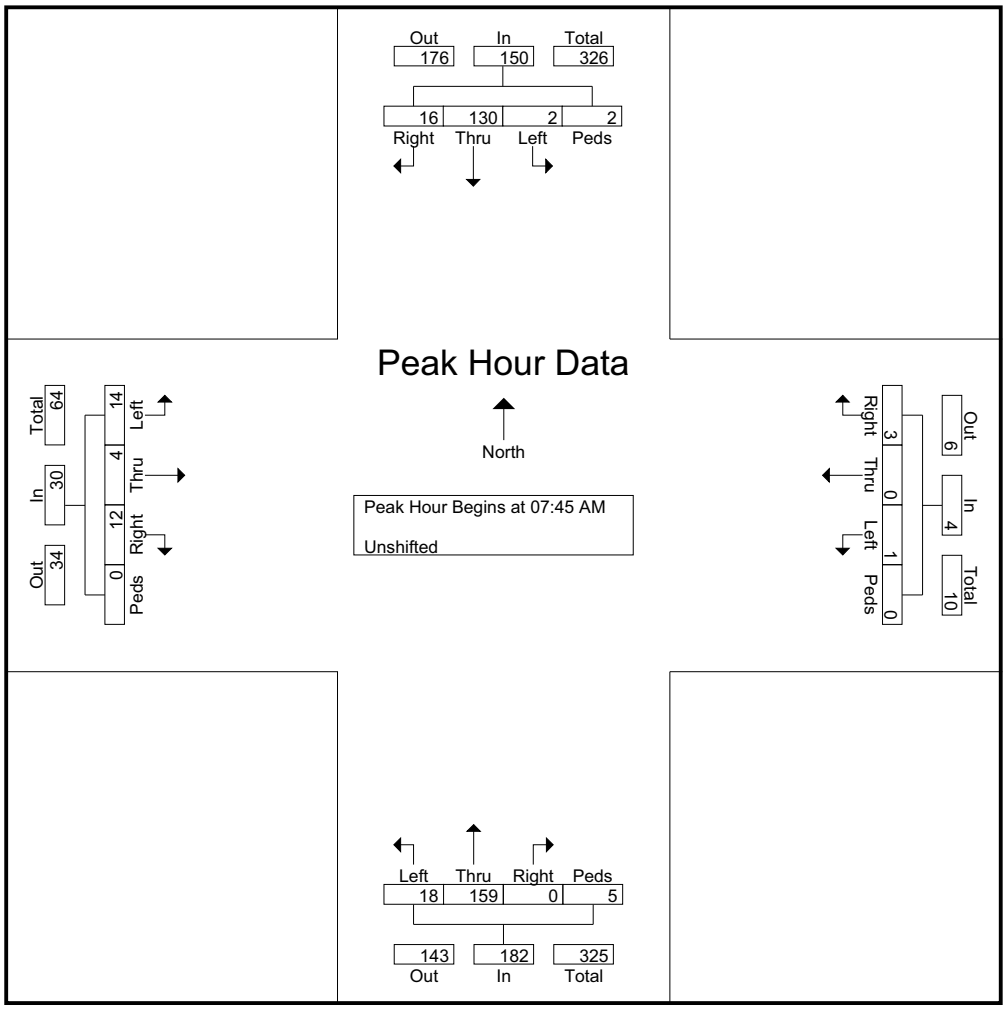
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : I US 421 & Ocean
Site Code : 00001234
Start Date : 5/6/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	1	33	**1**	**1**	36	**2**	0	0	0	**2**	0	**49**	4	1	**54**	3	0	**4**	0	7	99
08:00 AM	5	30	0	1	36	0	0	0	0	0	0	31	5	1	37	1	0	4	0	5	78
08:15 AM	**7**	29	0	0	36	0	0	**1**	0	1	0	39	2	1	42	2	1	4	0	7	86
08:30 AM	3	**38**	1	0	**42**	1	0	0	0	1	0	40	**7**	**2**	49	**6**	**3**	2	0	**11**	**103**
Total Volume	16	130	2	2	150	3	0	1	0	4	0	159	18	5	182	12	4	14	0	30	366
% App. Total	10.7	86.7	1.3	1.3		75	0	25	0		0	87.4	9.9	2.7		40	13.3	46.7	0		
PHF	.571	.855	.500	.500	.893	.375	.000	.250	.000	.500	.000	.811	.643	.625	.843	.500	.333	.875	.000	.682	.888



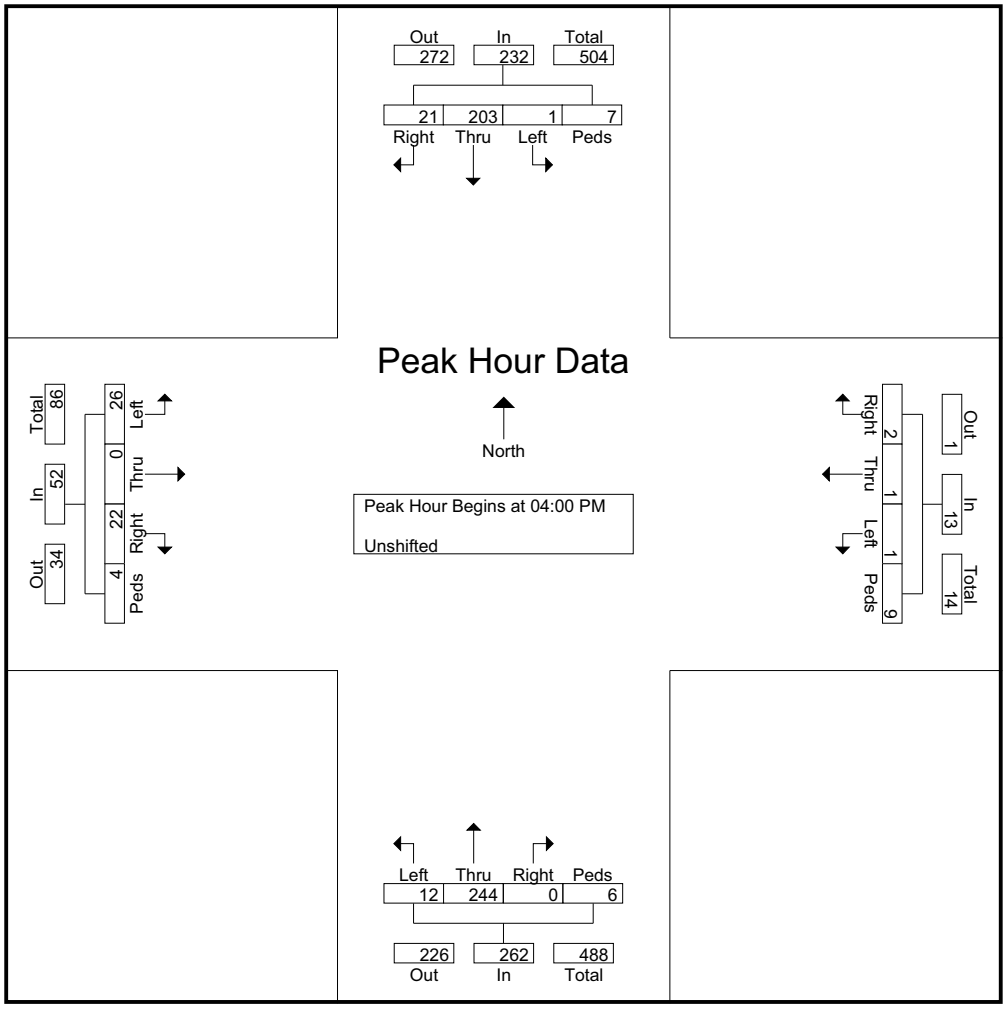
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : I US 421 & Ocean
Site Code : 00001234
Start Date : 5/6/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	5	50	0	**5**	60	**2**	0	0	2	4	0	**65**	0	0	65	**7**	0	**9**	0	**16**	145
04:15 PM	6	46	0	1	53	0	**1**	0	0	1	0	51	2	2	55	7	0	5	**2**	14	123
04:30 PM	**7**	**63**	0	1	**71**	0	0	0	**6**	**6**	0	63	**5**	0	68	7	0	3	0	10	**155**
04:45 PM	3	44	**1**	0	48	0	0	**1**	1	2	0	65	5	**4**	**74**	1	0	9	2	12	136
Total Volume	21	203	1	7	232	2	1	1	9	13	0	244	12	6	262	22	0	26	4	52	559
% App. Total	9.1	87.5	0.4	3		15.4	7.7	7.7	69.2		0	93.1	4.6	2.3		42.3	0	50	7.7		
PHF	.750	.806	.250	.350	.817	.250	.250	.250	.375	.542	.000	.938	.600	.375	.885	.786	.000	.722	.500	.813	.902



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : J US 421 & K Ave
Site Code : 00000000
Start Date : 5/7/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	5	2	4	0	11	3	1	0	0	4	3	5	6	0	14	6	2	2	1	11	40
07:15 AM	1	7	3	0	11	3	1	1	0	5	1	8	7	0	16	18	1	0	0	19	51
07:30 AM	1	17	4	1	23	2	0	0	2	4	2	11	24	1	38	14	3	2	0	19	84
07:45 AM	3	14	1	1	19	3	0	0	1	4	6	6	15	3	30	21	4	1	5	31	84
Total	10	40	12	2	64	11	2	1	3	17	12	30	52	4	98	59	10	5	6	80	259
08:00 AM	4	15	4	0	23	1	1	2	0	4	1	20	8	0	29	17	2	2	0	21	77
08:15 AM	4	20	7	0	31	1	0	1	0	2	3	9	7	0	19	18	2	0	0	20	72
08:30 AM	5	11	7	3	26	0	1	2	1	4	1	9	11	6	27	4	0	1	0	5	62
08:45 AM	9	16	11	1	37	1	0	3	0	4	4	13	14	0	31	10	3	3	1	17	89
Total	22	62	29	4	117	3	2	8	1	14	9	51	40	6	106	49	7	6	1	63	300
*** BREAK ***																					
04:00 PM	4	30	5	2	41	0	1	1	1	3	7	48	19	1	75	7	6	7	2	22	141
04:15 PM	6	28	8	0	42	6	0	1	2	9	7	21	11	1	40	8	4	7	0	19	110
04:30 PM	5	27	11	0	43	5	3	1	0	9	6	27	22	2	57	9	5	3	0	17	126
04:45 PM	8	19	5	0	32	1	2	0	1	4	4	48	33	0	85	9	4	9	1	23	144
Total	23	104	29	2	158	12	6	3	4	25	24	144	85	4	257	33	19	26	3	81	521
05:00 PM	9	26	9	0	44	1	1	5	10	17	6	23	17	7	53	10	5	8	11	34	148
05:15 PM	3	17	10	4	34	3	3	2	3	11	7	27	40	0	74	6	3	3	9	21	140
05:30 PM	11	12	10	3	36	3	2	1	2	8	5	29	12	0	46	11	5	9	0	25	115
05:45 PM	7	20	15	1	43	7	7	2	0	16	7	20	8	0	35	8	7	3	0	18	112
Total	30	75	44	8	157	14	13	10	15	52	25	99	77	7	208	35	20	23	20	98	515
Grand Total	85	281	114	16	496	40	23	22	23	108	70	324	254	21	669	176	56	60	30	322	1595
Apprch %	17.1	56.7	23	3.2		37	21.3	20.4	21.3		10.5	48.4	38	3.1		54.7	17.4	18.6	9.3		
Total %	5.3	17.6	7.1	1	31.1	2.5	1.4	1.4	1.4	6.8	4.4	20.3	15.9	1.3	41.9	11	3.5	3.8	1.9	20.2	

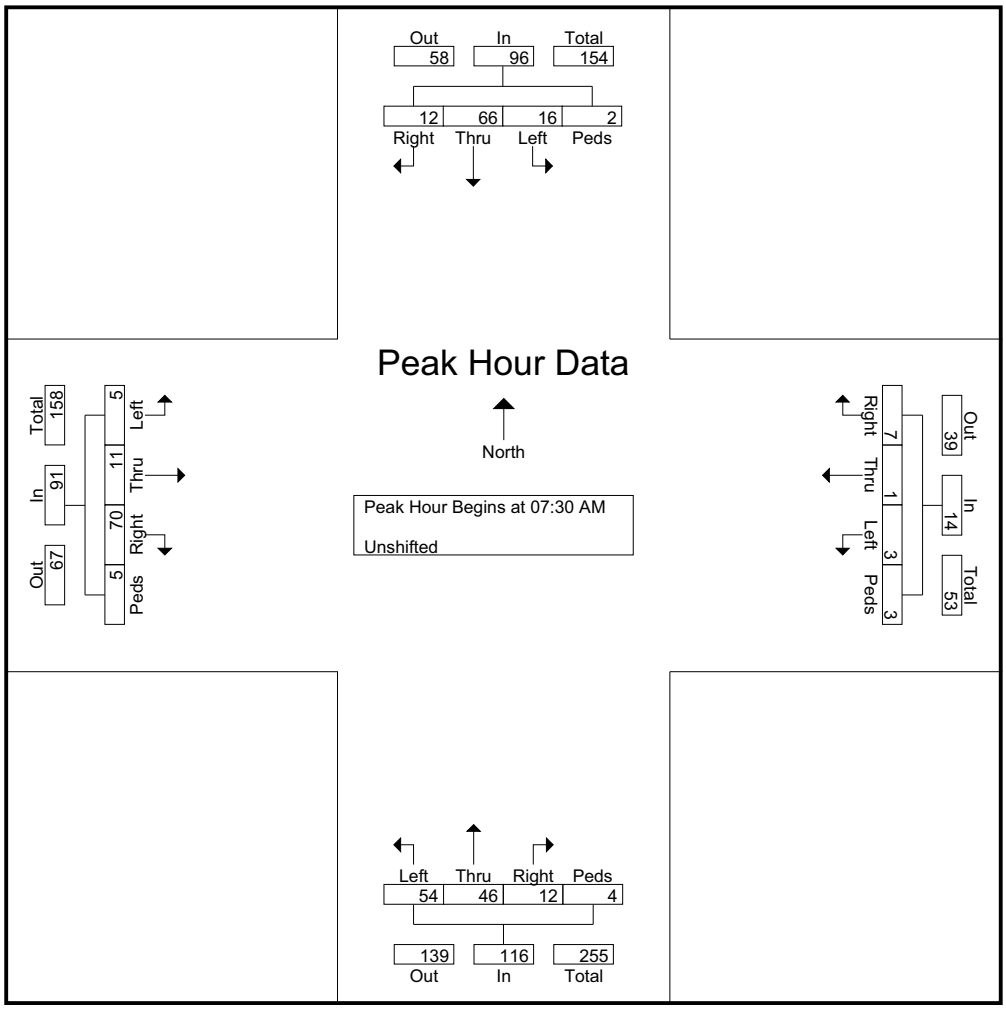
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : J US 421 & K Ave
Site Code : 00000000
Start Date : 5/7/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	1	17	4	**1**	23	2	0	0	**2**	**4**	2	11	**24**	1	**38**	14	3	**2**	0	19	**84**
07:45 AM	3	14	1	1	19	**3**	0	0	1	4	**6**	6	15	**3**	30	**21**	**4**	1	**5**	**31**	84
08:00 AM	**4**	15	4	0	23	1	**1**	**2**	0	4	1	**20**	8	0	29	17	2	2	0	21	77
08:15 AM	4	**20**	**7**	0	**31**	1	0	1	0	2	3	9	7	0	19	18	2	0	0	20	72
Total Volume	12	66	16	2	96	7	1	3	3	14	12	46	54	4	116	70	11	5	5	91	317
% App. Total	12.5	68.8	16.7	2.1		50	7.1	21.4	21.4		10.3	39.7	46.6	3.4		76.9	12.1	5.5	5.5		
PHF	.750	.825	.571	.500	.774	.583	.250	.375	.375	.875	.500	.575	.563	.333	.763	.833	.688	.625	.250	.734	.943



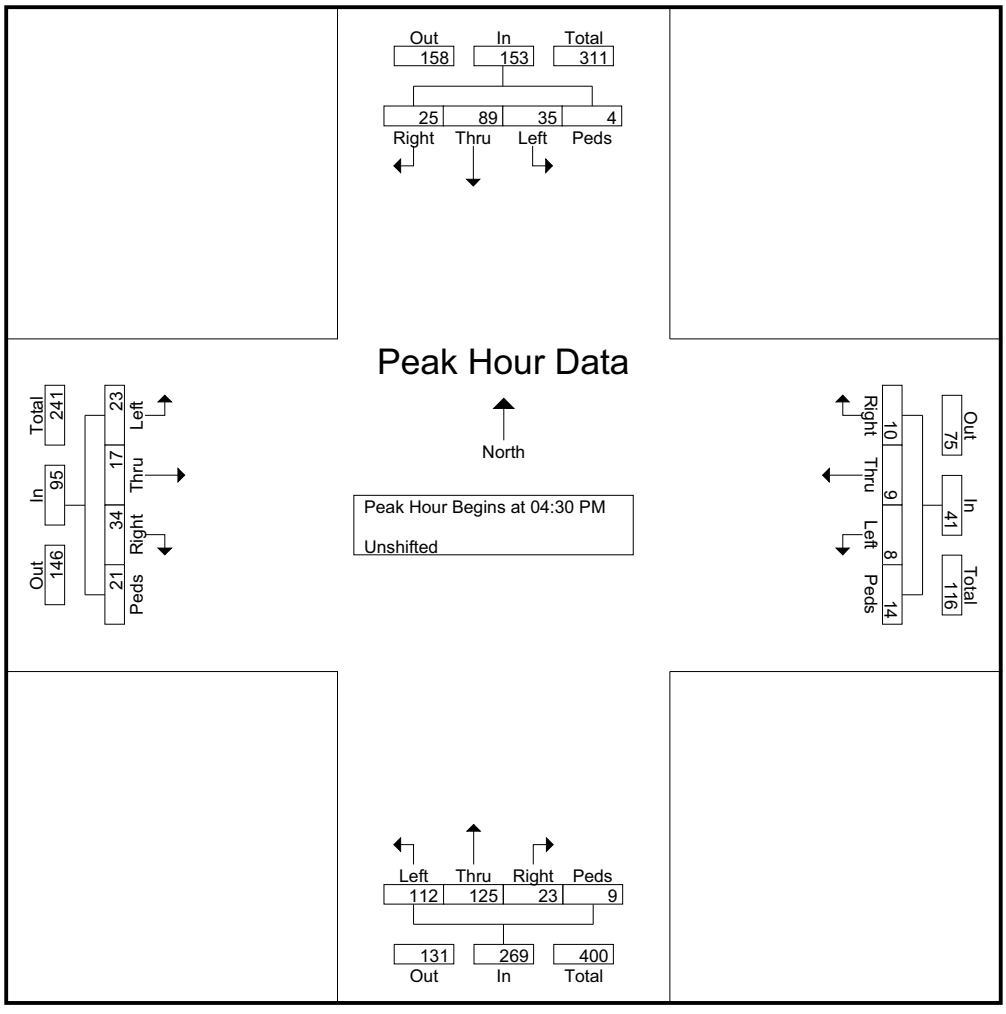
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : J US 421 & K Ave
Site Code : 00000000
Start Date : 5/7/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	5	**27**	**11**	0	43	**5**	**3**	1	0	9	6	27	22	2	57	9	**5**	3	0	17	126
04:45 PM	8	19	5	0	32	1	2	0	1	4	4	**48**	33	0	**85**	9	4	**9**	1	23	144
05:00 PM	**9**	26	9	0	**44**	1	1	**5**	**10**	**17**	6	23	17	**7**	53	**10**	5	8	**11**	**34**	**148**
05:15 PM	3	17	10	**4**	34	3	3	2	3	11	**7**	27	**40**	0	74	6	3	3	9	21	140
Total Volume	25	89	35	4	153	10	9	8	14	41	23	125	112	9	269	34	17	23	21	95	558
% App. Total	16.3	58.2	22.9	2.6		24.4	22	19.5	34.1		8.6	46.5	41.6	3.3		35.8	17.9	24.2	22.1		
PHF	.694	.824	.795	.250	.869	.500	.750	.400	.350	.603	.821	.651	.700	.321	.791	.850	.850	.639	.477	.699	.943



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

Dow Rd and Harper
Turning Movement Count
1/4 of ped are cyclists

File Name : B Dow & Harper
Site Code : 00000002
Start Date : 5/1/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	30	6	0	36	13	0	0	0	13	1	80	0	0	81	0	0	0	0	0	130
07:15 AM	0	53	5	0	58	15	0	2	0	17	0	108	0	0	108	0	0	0	0	0	183
07:30 AM	0	62	2	1	65	10	0	0	0	10	2	117	0	0	119	0	0	0	0	0	194
07:45 AM	0	81	3	0	84	14	0	2	1	17	1	122	0	0	123	0	0	0	1	1	225
Total	0	226	16	1	243	52	0	4	1	57	4	427	0	0	431	0	0	0	1	1	732
08:00 AM	0	46	3	0	49	10	0	0	0	10	1	116	0	0	117	0	0	0	0	0	176
08:15 AM	0	40	4	0	44	7	0	0	2	9	0	63	0	0	63	0	0	0	0	0	116
08:30 AM	0	46	11	1	58	6	0	0	0	6	0	85	0	0	85	0	0	0	1	1	150
08:45 AM	0	48	5	0	53	10	0	1	0	11	0	59	0	0	59	0	0	0	0	0	123
Total	0	180	23	1	204	33	0	1	2	36	1	323	0	0	324	0	0	0	1	1	565
*** BREAK ***																					
04:00 PM	0	65	12	0	77	9	0	0	0	9	0	86	0	0	86	0	0	0	0	0	172
04:15 PM	0	87	14	0	101	9	0	1	2	12	2	76	0	0	78	0	0	0	0	0	191
04:30 PM	0	95	11	0	106	9	0	1	1	11	3	68	0	0	71	0	0	0	1	1	189
04:45 PM	0	91	14	0	105	9	0	2	1	12	4	70	0	0	74	0	0	0	0	0	191
Total	0	338	51	0	389	36	0	4	4	44	9	300	0	0	309	0	0	0	1	1	743
05:00 PM	0	96	9	0	105	5	0	2	0	7	2	70	0	0	72	0	0	0	0	0	184
05:15 PM	0	102	13	1	116	10	0	0	2	12	1	78	0	0	79	0	0	0	2	2	209
05:30 PM	0	92	13	1	106	7	0	2	2	11	1	60	0	0	61	0	0	0	0	0	178
05:45 PM	0	88	15	0	103	6	0	0	0	6	0	72	0	0	72	0	0	0	2	2	183
Total	0	378	50	2	430	28	0	4	4	36	4	280	0	0	284	0	0	0	4	4	754
Grand Total	0	1122	140	4	1266	149	0	13	11	173	18	1330	0	0	1348	0	0	0	7	7	2794
Apprch %	0	88.6	11.1	0.3		86.1	0	7.5	6.4		1.3	98.7	0	0		0	0	0	100		
Total %	0	40.2	5	0.1	45.3	5.3	0	0.5	0.4	6.2	0.6	47.6	0	0	48.2	0	0	0	0.3	0.3	

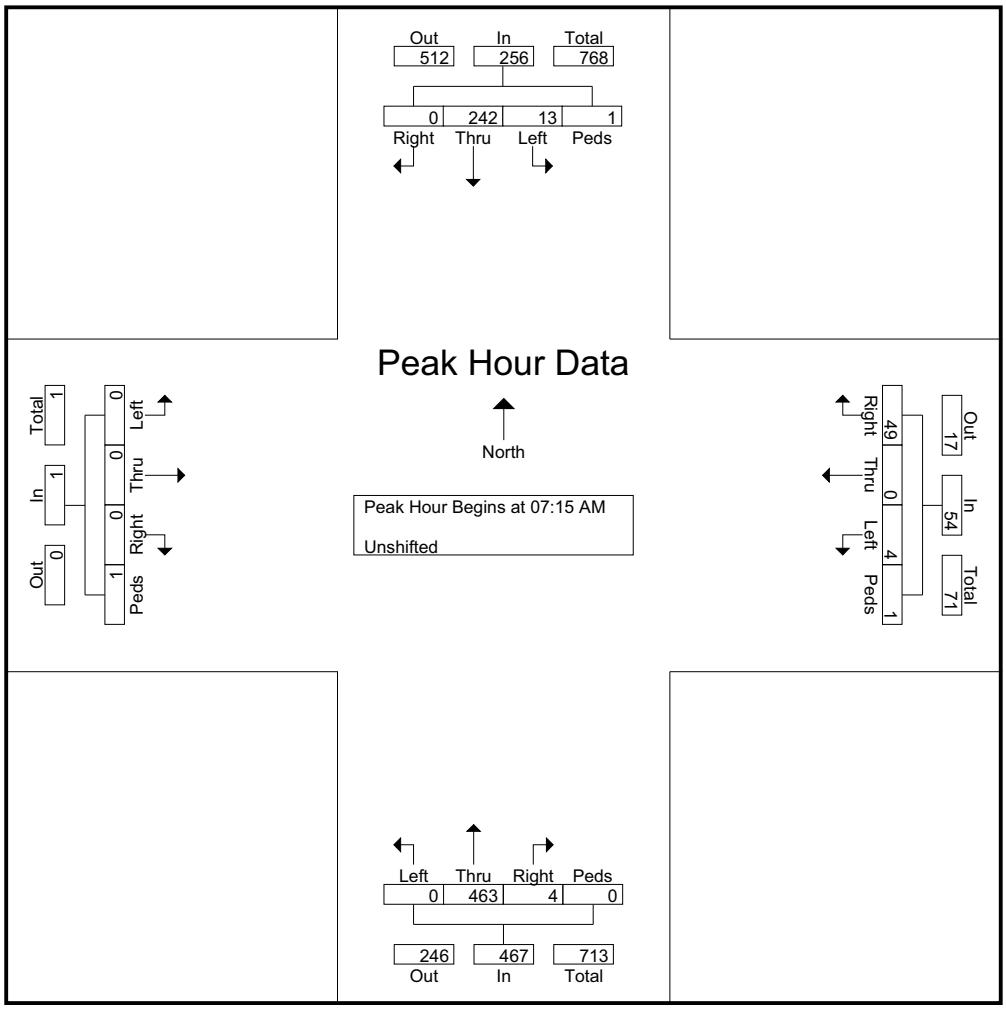
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

Dow Rd and Harper
Turning Movement Count
1/4 of ped are cyclists

File Name : B Dow & Harper
Site Code : 00000002
Start Date : 5/1/2008

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	53	**5**	0	58	**15**	0	**2**	0	**17**	0	108	0	0	108	0	0	0	0	0	183
07:30 AM	0	62	2	**1**	65	10	0	0	0	10	**2**	117	0	0	119	0	0	0	0	0	194
07:45 AM	0	**81**	3	0	**84**	14	0	2	**1**	17	1	**122**	0	0	**123**	0	0	0	**1**	**1**	**225**
08:00 AM	0	46	3	0	49	10	0	0	0	10	1	116	0	0	117	0	0	0	0	0	176
Total Volume	0	242	13	1	256	49	0	4	1	54	4	463	0	0	467	0	0	0	1	1	778
% App. Total	0	94.5	5.1	0.4		90.7	0	7.4	1.9		0.9	99.1	0	0		0	0	0	100		
PHF	.000	.747	.650	.250	.762	.817	.000	.500	.250	.794	.500	.949	.000	.000	.949	.000	.000	.000	.250	.250	.864



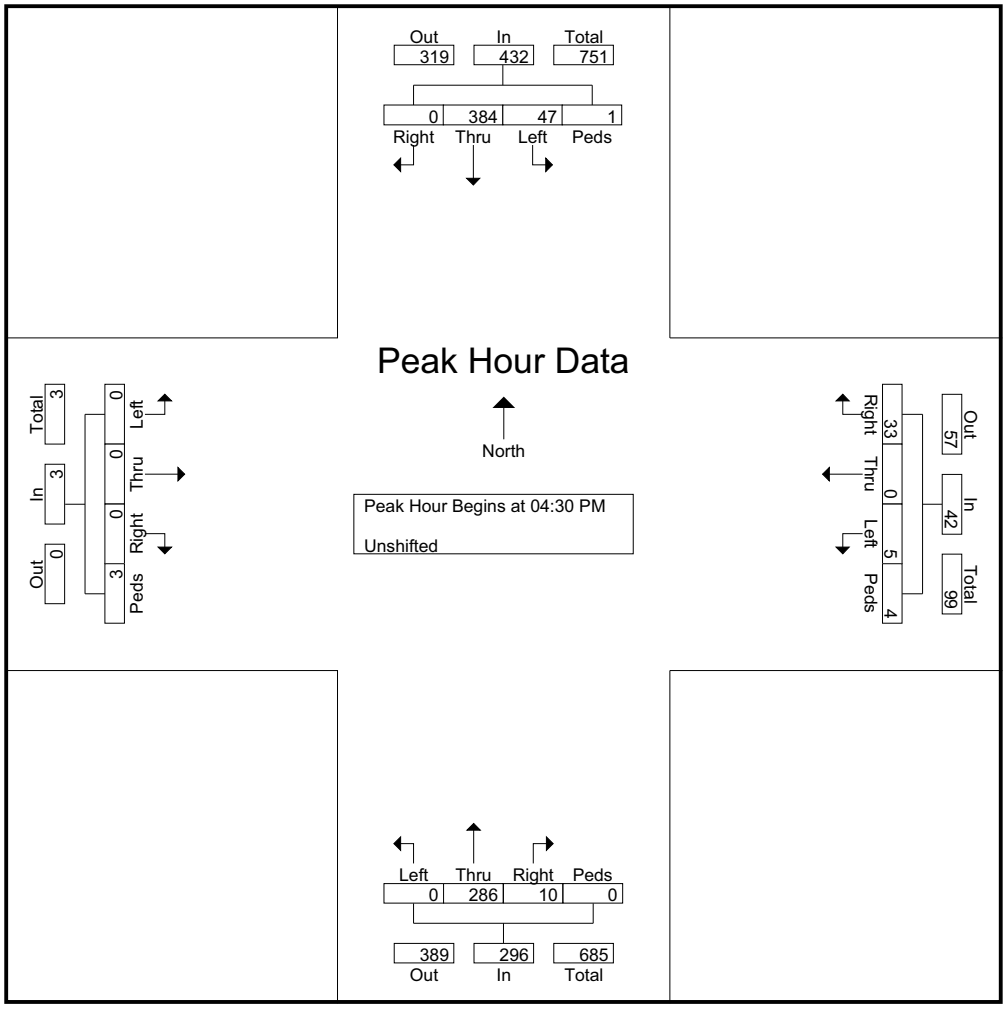
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

Dow Rd and Harper
Turning Movement Count
1/4 of ped are cyclists

File Name : B Dow & Harper
Site Code : 00000002
Start Date : 5/1/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	95	11	0	106	9	0	1	1	11	3	68	0	0	71	0	0	0	1	1	189
04:45 PM	0	91	**14**	0	105	9	0	**2**	1	**12**	**4**	70	0	0	74	0	0	0	0	0	191
05:00 PM	0	96	9	0	105	5	0	2	0	7	2	70	0	0	72	0	0	0	0	0	184
05:15 PM	0	**102**	13	**1**	**116**	**10**	0	0	**2**	12	1	**78**	0	0	**79**	0	0	0	**2**	**2**	**209**
Total Volume	0	384	47	1	432	33	0	5	4	42	10	286	0	0	296	0	0	0	3	3	773
% App. Total	0	88.9	10.9	0.2		78.6	0	11.9	9.5		3.4	96.6	0	0		0	0	0	100		
PHF	.000	.941	.839	.250	.931	.825	.000	.625	.500	.875	.625	.917	.000	.000	.937	.000	.000	.000	.375	.375	.925



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : C Dow & Atlanta
Site Code : 00000003
Start Date : 5/1/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	35	1	0	36	2	0	0	0	2	0	67	0	0	67	0	0	0	0	0	105
07:15 AM	0	49	0	0	49	4	0	1	0	5	0	105	0	0	105	0	0	0	0	0	159
07:30 AM	0	58	9	0	67	2	0	0	0	2	2	135	0	0	137	0	0	0	0	0	206
07:45 AM	0	75	23	0	98	0	0	0	0	0	5	149	0	0	154	0	0	0	0	0	252
Total	0	217	33	0	250	8	0	1	0	9	7	456	0	0	463	0	0	0	0	0	722
08:00 AM	0	41	1	0	42	2	0	0	0	2	1	122	0	0	123	0	0	0	0	0	167
08:15 AM	0	50	2	0	52	2	0	1	1	4	0	66	0	0	66	0	0	0	0	0	122
08:30 AM	0	44	0	0	44	0	0	0	0	0	0	84	0	0	84	0	0	0	0	0	128
08:45 AM	0	47	5	0	52	2	0	2	0	4	0	67	0	0	67	0	0	0	0	0	123
Total	0	182	8	0	190	6	0	3	1	10	1	339	0	0	340	0	0	0	0	0	540
*** BREAK ***																					
04:00 PM	0	71	1	0	72	1	0	2	0	3	0	78	0	0	78	0	0	0	0	0	153
04:15 PM	0	71	0	0	71	2	0	0	0	2	1	56	0	0	57	0	0	0	0	0	130
04:30 PM	0	97	1	0	98	0	0	0	0	0	0	77	0	0	77	0	0	0	0	0	175
04:45 PM	0	105	2	0	107	1	0	0	1	2	0	68	0	0	68	0	0	0	0	0	177
Total	0	344	4	0	348	4	0	2	1	7	1	279	0	0	280	0	0	0	0	0	635
05:00 PM	0	96	0	0	96	1	0	2	0	3	0	73	0	0	73	0	0	0	0	0	172
05:15 PM	0	108	1	0	109	3	0	0	0	3	2	81	0	0	83	0	0	0	0	0	195
05:30 PM	0	106	4	0	110	3	0	1	0	4	2	56	0	0	58	0	0	0	0	0	172
05:45 PM	0	94	5	0	99	1	0	0	0	1	0	52	0	0	52	0	1	0	0	1	153
Total	0	404	10	0	414	8	0	3	0	11	4	262	0	0	266	0	1	0	0	1	692
Grand Total	0	1147	55	0	1202	26	0	9	2	37	13	1336	0	0	1349	0	1	0	0	1	2589
Apprch %	0	95.4	4.6	0		70.3	0	24.3	5.4		1	99	0	0		0	100	0	0		
Total %	0	44.3	2.1	0	46.4	1	0	0.3	0.1	1.4	0.5	51.6	0	0	52.1	0	0	0	0	0	

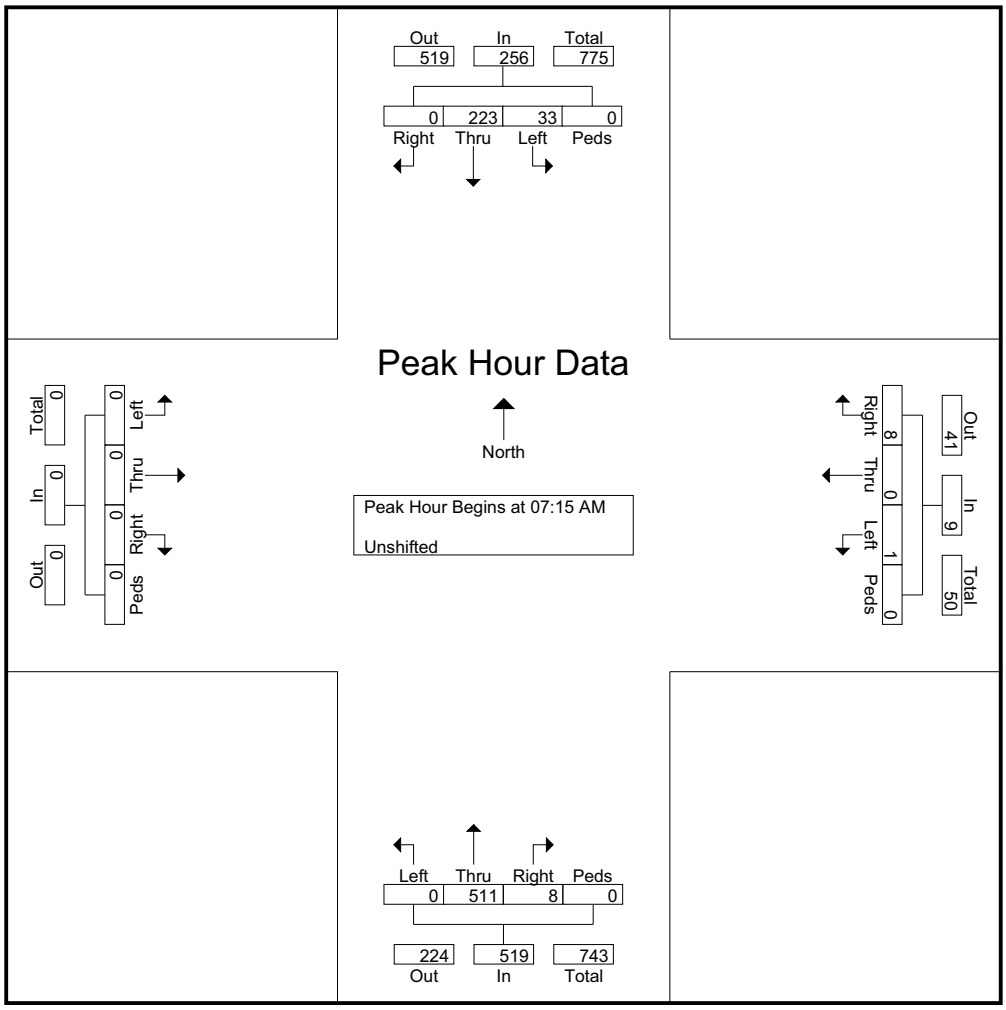
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : C Dow & Atlanta
Site Code : 00000003
Start Date : 5/1/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	49	0	0	49	**4**	0	**1**	0	**5**	0	105	0	0	105	0	0	0	0	0	159
07:30 AM	0	58	9	0	67	2	0	0	0	2	2	135	0	0	137	0	0	0	0	0	206
07:45 AM	0	**75**	**23**	0	**98**	0	0	0	0	0	**5**	**149**	0	0	**154**	0	0	0	0	0	**252**
08:00 AM	0	41	1	0	42	2	0	0	0	2	1	122	0	0	123	0	0	0	0	0	167
Total Volume	0	223	33	0	256	8	0	1	0	9	8	511	0	0	519	0	0	0	0	0	784
% App. Total	0	87.1	12.9	0		88.9	0	11.1	0		1.5	98.5	0	0		0	0	0	0		
PHF	.000	.743	.359	.000	.653	.500	.000	.250	.000	.450	.400	.857	.000	.000	.843	.000	.000	.000	.000	.000	.778



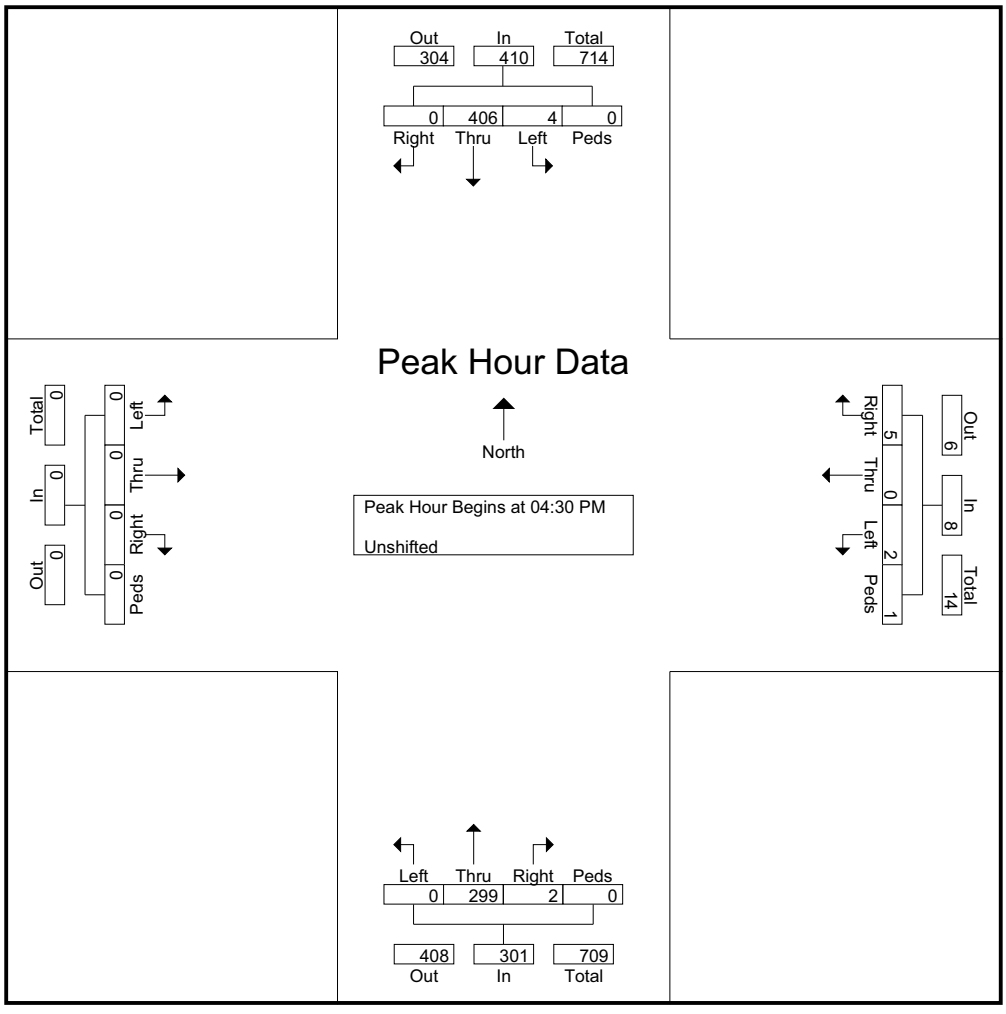
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : C Dow & Atlanta
Site Code : 00000003
Start Date : 5/1/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	97	1	0	98	0	0	0	0	0	0	77	0	0	77	0	0	0	0	0	175
04:45 PM	0	105	**2**	0	107	1	0	0	**1**	2	0	68	0	0	68	0	0	0	0	0	177
05:00 PM	0	96	0	0	96	1	0	**2**	0	**3**	0	73	0	0	73	0	0	0	0	0	172
05:15 PM	0	**108**	1	0	**109**	**3**	0	0	0	3	**2**	**81**	0	0	**83**	0	0	0	0	0	**195**
Total Volume	0	406	4	0	410	5	0	2	1	8	2	299	0	0	301	0	0	0	0	0	719
% App. Total	0	99	1	0		62.5	0	25	12.5		0.7	99.3	0	0		0	0	0	0		
PHF	.000	.940	.500	.000	.940	.417	.000	.250	.250	.667	.250	.923	.000	.000	.907	.000	.000	.000	.000	.000	.922



Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : D Dow & Ocean
Site Code : 00000004
Start Date : 5/6/2008
Page No : 1

Groups Printed- Unshifted

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	12	4	0	16	29	0	2	0	31	0	31	0	0	31	0	0	0	0	0	78
07:15 AM	0	24	10	0	34	33	0	0	0	33	0	34	0	0	34	0	0	0	0	0	101
07:30 AM	0	21	4	0	25	31	0	0	0	31	1	44	0	0	45	0	0	0	0	0	101
07:45 AM	0	22	10	0	32	26	0	0	0	26	0	27	0	0	27	0	0	0	0	0	85
Total	0	79	28	0	107	119	0	2	0	121	1	136	0	0	137	0	0	0	0	0	365
08:00 AM	0	18	5	0	23	18	8	3	0	29	12	16	0	0	28	0	0	0	0	0	80
08:15 AM	0	18	5	0	23	21	0	0	0	21	0	21	0	0	21	0	0	0	0	0	65
08:30 AM	0	24	9	0	33	22	0	0	0	22	0	22	0	0	22	0	0	0	0	0	77
08:45 AM	0	14	7	0	21	7	0	0	0	7	0	22	0	4	26	0	0	0	0	0	54
Total	0	74	26	0	100	68	8	3	0	79	12	81	0	4	97	0	0	0	0	0	276
*** BREAK ***																					
04:00 PM	0	26	21	0	47	14	0	0	0	14	0	26	0	0	26	0	0	0	0	0	87
04:15 PM	0	34	19	0	53	8	0	0	0	8	0	29	0	0	29	0	0	0	0	0	90
04:30 PM	0	32	13	0	45	11	0	0	0	11	1	34	0	0	35	0	0	0	0	0	91
04:45 PM	0	27	22	0	49	13	0	0	0	13	0	32	0	0	32	0	0	0	0	0	94
Total	0	119	75	0	194	46	0	0	0	46	1	121	0	0	122	0	0	0	0	0	362
05:00 PM	0	37	17	0	54	12	0	0	0	12	0	40	0	0	40	0	0	0	0	0	106
05:15 PM	0	39	20	0	59	15	0	0	0	15	0	42	0	0	42	0	0	0	0	0	116
05:30 PM	0	29	24	0	53	16	0	0	0	16	0	26	0	0	26	0	0	0	0	0	95
05:45 PM	0	22	20	0	42	26	0	0	1	27	0	16	0	0	16	0	0	0	0	0	85
Total	0	127	81	0	208	69	0	0	1	70	0	124	0	0	124	0	0	0	0	0	402
Grand Total	0	399	210	0	609	302	8	5	1	316	14	462	0	4	480	0	0	0	0	0	1405
Apprch %	0	65.5	34.5	0		95.6	2.5	1.6	0.3		2.9	96.2	0	0.8		0	0	0	0		
Total %	0	28.4	14.9	0	43.3	21.5	0.6	0.4	0.1	22.5	1	32.9	0	0.3	34.2	0	0	0	0	0	

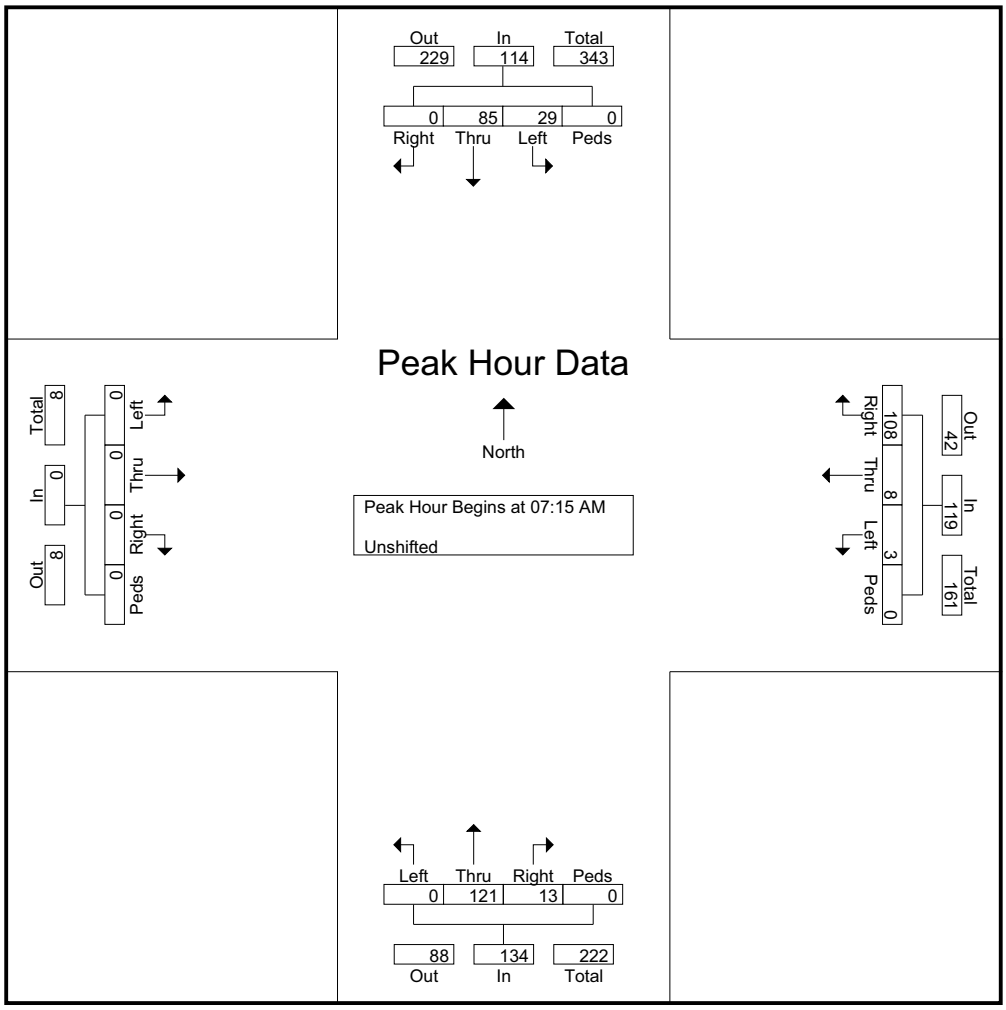
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : D Dow & Ocean
Site Code : 00000004
Start Date : 5/6/2008
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	**24**	**10**	0	**34**	**33**	0	0	0	**33**	0	34	0	0	34	0	0	0	0	0	**101**
07:30 AM	0	21	4	0	25	31	0	0	0	31	1	**44**	0	0	**45**	0	0	0	0	0	101
07:45 AM	0	22	10	0	32	26	0	0	0	26	0	27	0	0	27	0	0	0	0	0	85
08:00 AM	0	18	5	0	23	18	**8**	**3**	0	29	**12**	16	0	0	28	0	0	0	0	0	80
Total Volume	0	85	29	0	114	108	8	3	0	119	13	121	0	0	134	0	0	0	0	0	367
% App. Total	0	74.6	25.4	0		90.8	6.7	2.5	0		9.7	90.3	0	0		0	0	0	0		
PHF	.000	.885	.725	.000	.838	.818	.250	.250	.000	.902	.271	.688	.000	.000	.744	.000	.000	.000	.000	.000	.908



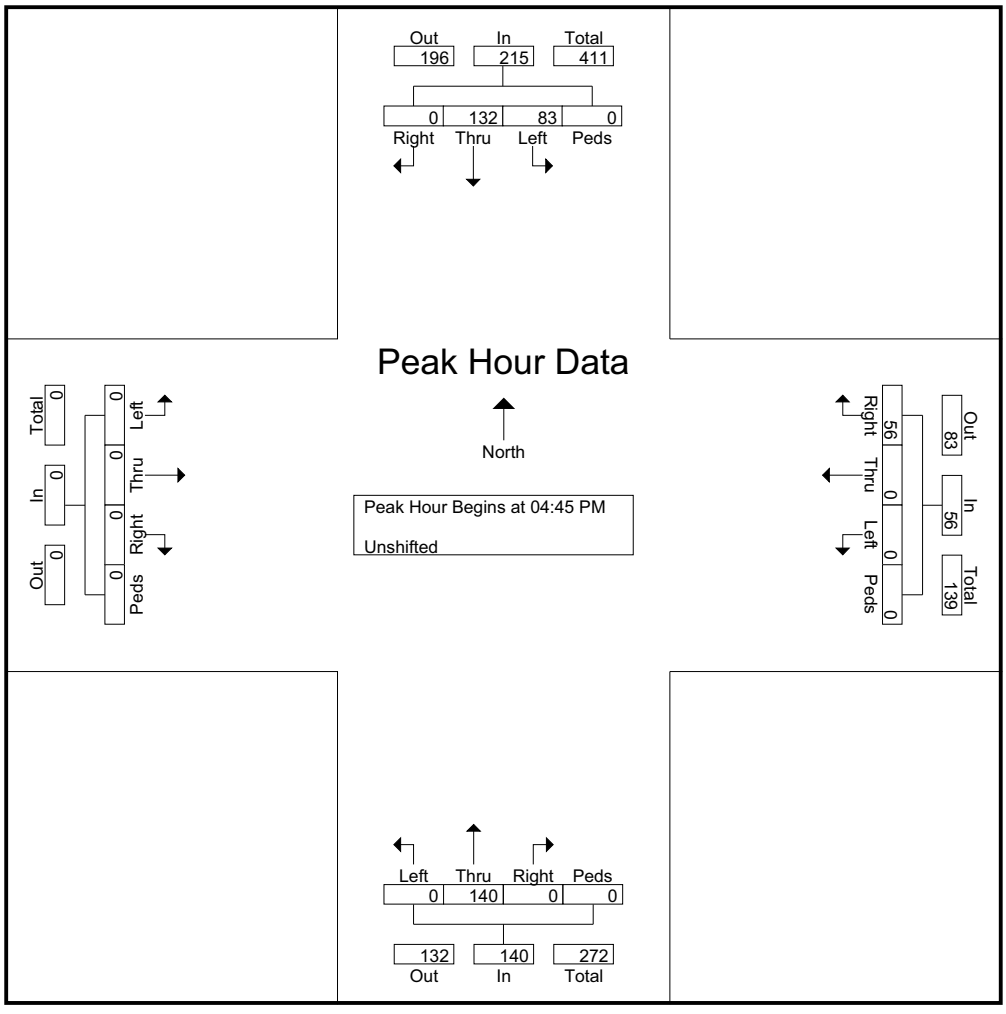
Wilbur Smith Associates

421 Fayetteville Street, Suite 1303
Raleigh, NC 27601

US 421 & Atlanta Ave
Turning Movement Count

File Name : D Dow & Ocean
Site Code : 00000004
Start Date : 5/6/2008
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	27	22	0	49	13	0	0	0	13	0	32	0	0	32	0	0	0	0	0	94
05:00 PM	0	37	17	0	54	12	0	0	0	12	0	40	0	0	40	0	0	0	0	0	106
05:15 PM	0	**39**	20	0	**59**	15	0	0	0	15	0	**42**	0	0	**42**	0	0	0	0	0	**116**
05:30 PM	0	29	**24**	0	53	**16**	0	0	0	**16**	0	26	0	0	26	0	0	0	0	0	95
Total Volume	0	132	83	0	215	56	0	0	0	56	0	140	0	0	140	0	0	0	0	0	411
% App. Total	0	61.4	38.6	0		100	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.846	.865	.000	.911	.875	.000	.000	.000	.875	.000	.833	.000	.000	.833	.000	.000	.000	.000	.000	.886



Appendix C

Capacity Software Output

Appendix C

2008 Existing AM & PM Conditions

Movement	EBL	EBT	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBL
Lane Configurations												
Volume (vph)	660	1	19	1	1	1	5	45	551	3	7	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0		5.0	5.0			5.0
Lane Util. Factor	0.95	0.95	1.00			1.00		1.00	0.95			1.00
Frt	1.00	1.00	0.85			0.92		1.00	1.00			1.00
Flt Protected	0.95	0.95	1.00			0.99		0.95	1.00			0.95
Satd. Flow (prot)	1681	1686	1583			1685		1770	3537			1770
Flt Permitted	0.95	0.95	1.00			0.99		0.95	1.00			0.42
Satd. Flow (perm)	1681	1686	1583			1685		1770	3537			790
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)	717	1	21	1	1	1	5	49	599	3	8	1
RTOR Reduction (vph)	0	0	12	0	0	5	0	0	0	0	0	0
Lane Group Flow (vph)	358	360	9	0	0	3	0	49	602	0	0	9
Turn Type	Split		Perm	Perm	Split			Prot			Prot	Perm
Protected Phases	3	3			4	4		5	2		1	
Permitted Phases			3	4								6
Actuated Green, G (s)	51.5	51.5	51.5			7.1		8.6	66.4			50.8
Effective Green, g (s)	53.5	53.5	53.5			9.1		10.6	68.4			52.8
Actuated g/C Ratio	0.33	0.33	0.33			0.06		0.07	0.43			0.33
Clearance Time (s)	7.0	7.0	7.0			7.0		7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	562	564	529			96		117	1512			261
v/s Ratio Prot	0.21	c0.21				c0.00		0.03	c0.17			
v/s Ratio Perm			0.01									0.01
v/c Ratio	0.64	0.64	0.02			0.03		0.42	0.40			0.03
Uniform Delay, d1	45.0	45.1	35.6			71.3		71.7	31.6			36.3
Progression Factor	1.00	1.00	1.00			1.00		0.95	0.97			1.00
Incremental Delay, d2	2.4	2.4	0.0			0.1		2.4	0.8			0.2
Delay (s)	47.4	47.4	35.7			71.4		70.5	31.5			36.6
Level of Service	D	D	D			E		E	C			D
Approach Delay (s)		47.1				71.4			34.5			
Approach LOS		D				E			C			

Intersection Summary				
HCM Average Control Delay	36.8	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	20.0	
Intersection Capacity Utilization	68.6%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	SBT	SBR	NWL	NWR
Lane Configurations				
Volume (vph)	354	283	1	3
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	
Lane Util. Factor	0.95	1.00	1.00	
Frt	1.00	0.85	0.90	
Flt Protected	1.00	1.00	0.99	
Satd. Flow (prot)	3539	1583	1653	
Flt Permitted	1.00	1.00	0.99	
Satd. Flow (perm)	3539	1583	1653	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92
Adj. Flow (vph)	385	308	1	3
RTOR Reduction (vph)	0	103	0	0
Lane Group Flow (vph)	385	205	4	0
Turn Type		pm+ov		
Protected Phases	6	3	7	
Permitted Phases		6		
Actuated Green, G (s)	50.8	102.3	7.0	
Effective Green, g (s)	52.8	106.3	9.0	
Actuated g/C Ratio	0.33	0.66	0.06	
Clearance Time (s)	7.0	7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	
Lane Grp Cap (vph)	1168	1101	93	
v/s Ratio Prot	0.11	0.06	c0.00	
v/s Ratio Perm		0.07		
v/c Ratio	0.33	0.19	0.04	
Uniform Delay, d1	40.3	10.3	71.4	
Progression Factor	1.00	1.00	1.00	
Incremental Delay, d2	0.8	0.1	0.2	
Delay (s)	41.1	10.4	71.6	
Level of Service	D	B	E	
Approach Delay (s)	27.5		71.6	
Approach LOS	C		E	

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	5	9	454	6	5	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	3532			3537
Flt Permitted	0.95	1.00	1.00			0.95
Satd. Flow (perm)	1770	1583	3532			3364
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	10	493	7	5	473
RTOR Reduction (vph)	0	9	0	0	0	0
Lane Group Flow (vph)	5	1	500	0	0	478
Turn Type		Perm			Perm	
Protected Phases	4		2			6
Permitted Phases		4			6	
Actuated Green, G (s)	7.1	7.1	138.9			138.9
Effective Green, g (s)	9.1	9.1	140.9			140.9
Actuated g/C Ratio	0.06	0.06	0.88			0.88
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	101	90	3110			2962
v/s Ratio Prot	c0.00		0.14			
v/s Ratio Perm		0.00				c0.14
v/c Ratio	0.05	0.01	0.16			0.16
Uniform Delay, d1	71.4	71.2	1.3			1.3
Progression Factor	1.00	1.00	1.00			4.51
Incremental Delay, d2	0.2	0.0	0.1			0.1
Delay (s)	71.6	71.2	1.4			6.1
Level of Service	E	E	A			A
Approach Delay (s)	71.3		1.4			6.1
Approach LOS	E		A			A

Intersection Summary				
HCM Average Control Delay	4.7	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.15			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	29.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	23	218	486	28	113	344
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	11	11	11	11
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.99	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	0.99			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1486	1314	2784			3041
Flt Permitted	0.95	1.00	1.00			0.68
Satd. Flow (perm)	1486	1314	2784			2079
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	237	528	30	123	374
RTOR Reduction (vph)	0	212	1	0	0	0
Lane Group Flow (vph)	25	25	557	0	0	497
Confl. Peds. (#/hr)	5	5		5	5	
Parking (#/hr)			15	15		
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4	2		6	
Actuated Green, G (s)	5.8	12.8	126.2			140.2
Effective Green, g (s)	7.8	16.8	128.2			142.2
Actuated g/C Ratio	0.05	0.11	0.80			0.89
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	72	179	2231			1902
v/s Ratio Prot	c0.02	0.01	0.20			c0.01
v/s Ratio Perm		0.01				c0.22
v/c Ratio	0.35	0.14	0.25			0.26
Uniform Delay, d1	73.6	65.0	4.0			1.3
Progression Factor	1.00	1.00	0.62			8.80
Incremental Delay, d2	2.9	0.4	0.3			0.1
Delay (s)	76.5	65.4	2.7			11.4
Level of Service	E	E	A			B
Approach Delay (s)	66.5		2.7			11.4
Approach LOS	E		A			B

Intersection Summary				
HCM Average Control Delay	18.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.26			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	49.6%	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)	28	9	6	34	5	15	1	416	20	11	263	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0			5.0	5.0		5.0			5.0	
Lane Util. Factor		1.00			1.00	1.00		0.95			0.95	
Frpb, ped/bikes		1.00			1.00	0.98		1.00			1.00	
Flpb, ped/bikes		0.98			0.99	1.00		1.00			1.00	
Frt		0.98			1.00	0.85		0.99			1.00	
Flt Protected		0.97			0.96	1.00		1.00			1.00	
Satd. Flow (prot)		1614			1593	1393		2786			2790	
Flt Permitted		0.78			0.75	1.00		0.95			0.93	
Satd. Flow (perm)		1301			1241	1393		2660			2600	
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)	30	10	7	37	5	16	1	452	22	12	286	9
RTOR Reduction (vph)	0	5	0	0	0	14	0	1	0	0	1	0
Lane Group Flow (vph)	0	42	0	0	42	2	0	474	0	0	306	0
Confl. Peds. (#/hr)	7		3	3		7	1		18	18		1
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm		custom	Perm			Perm		
Protected Phases		4			8	1		2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		10.9			10.9	13.7		125.3			135.1	
Effective Green, g (s)		12.9			12.9	17.7		127.3			137.1	
Actuated g/C Ratio		0.08			0.08	0.11		0.80			0.86	
Clearance Time (s)		7.0			7.0	7.0		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)		105			100	198		2116			2228	
v/s Ratio Prot						0.00						
v/s Ratio Perm		0.03			c0.03	0.00		c0.18			c0.12	
v/c Ratio		0.40			0.42	0.01		0.22			0.14	
Uniform Delay, d1		69.9			70.0	63.3		4.1			1.9	
Progression Factor		1.00			1.00	1.00		1.00			0.39	
Incremental Delay, d2		2.5			2.8	0.0		0.2			0.1	
Delay (s)		72.4			72.8	63.4		4.3			0.8	
Level of Service		E			E	E		A			A	
Approach Delay (s)		72.4			70.2			4.3			0.8	
Approach LOS		E			E			A			A	

Intersection Summary				
HCM Average Control Delay	11.0	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.24			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	40.0%	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)	63	11	14	11	4	10	9	398	11	8	248	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.97			1.00			1.00	
Flpb, ped/bikes	0.97	1.00		0.91	1.00			1.00			1.00	
Frt	1.00	0.92		1.00	0.89			1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1549	1449		1451	1449			2792			2748	
Flt Permitted	0.75	1.00		0.74	1.00			0.95			0.94	
Satd. Flow (perm)	1219	1449		1129	1449			2645			2590	
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)	68	12	15	12	4	11	10	433	12	9	270	37
RTOR Reduction (vph)	0	13	0	0	10	0	0	1	0	0	5	0
Lane Group Flow (vph)	68	14	0	12	5	0	0	454	0	0	311	0
Confl. Peds. (#/hr)	11		36	36		11	4		41	41		4
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm			Perm				pm+pt	
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.0	12.0		12.0	12.0			94.0			94.0	
Effective Green, g (s)	14.0	14.0		14.0	14.0			96.0			96.0	
Actuated g/C Ratio	0.12	0.12		0.12	0.12			0.80			0.80	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	142	169		132	169			2116			2072	
v/s Ratio Prot		0.01			0.00							
v/s Ratio Perm	c0.06			0.01				c0.17			0.12	
v/c Ratio	0.48	0.08		0.09	0.03			0.21			0.15	
Uniform Delay, d1	49.6	47.3		47.3	47.0			2.9			2.7	
Progression Factor	1.00	1.00		1.00	1.00			1.11			1.00	
Incremental Delay, d2	2.5	0.2		0.3	0.1			0.2			0.0	
Delay (s)	52.1	47.5		47.6	47.1			3.5			2.8	
Level of Service	D	D		D	D			A			A	
Approach Delay (s)		50.8			47.3			3.5			2.8	
Approach LOS		D			D			A			A	

Intersection Summary				
HCM Average Control Delay	9.6	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.25			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	40.7%	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 (veh/h)	53	3	8	0	0	9	34	300	0	3	166	31
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)	58	3	9	0	0	10	37	326	0	3	180	34
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1286	
pX, platoon unblocked												
vC, conflicting volume	614	604	197	614	621	326	214			326		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	614	604	197	614	621	326	214			326		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	85	99	99	100	100	99	97			100		
cM capacity (veh/h)	390	400	844	388	392	715	1356			1234		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	70	10	363	217
Volume Left	58	0	37	3
Volume Right	9	10	0	34
cSH	418	715	1356	1234
Volume to Capacity	0.17	0.01	0.03	0.00
Queue Length 95th (ft)	15	1	2	0
Control Delay (s)	15.3	10.1	1.0	0.1
Lane LOS	C	B	A	A
Approach Delay (s)	15.3	10.1	1.0	0.1
Approach LOS	C	B		

Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	48.7%	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)	18	5	15	1	0	4	23	199	0	3	163	20
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)	20	5	16	1	0	4	25	216	0	3	177	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	465	461	188	480	472	216	199			216		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	465	461	188	480	472	216	199			216		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	96	99	98	100	100	99	98			100		
cM capacity (veh/h)	497	487	854	475	480	824	1373			1353		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	41	5	241	202
Volume Left	20	1	25	3
Volume Right	16	4	0	22
cSH	593	718	1373	1353
Volume to Capacity	0.07	0.01	0.02	0.00
Queue Length 95th (ft)	6	1	1	0
Control Delay (s)	11.5	10.1	0.9	0.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.5	10.1	0.9	0.1
Approach LOS	B	B		

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	35.0%	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 (vph)	6	14	88	4	1	9	68	58	15	20	83	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	3.0	3.0	4.0		3.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1834	1583		1791	1583	1770	1806		1770	1821	
Flt Permitted		0.95	1.00		0.89	1.00	0.69	1.00		0.71	1.00	
Satd. Flow (perm)		1760	1583		1652	1583	1283	1806		1314	1821	
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)	7	15	96	4	1	10	74	63	16	22	90	16
RTOR Reduction (vph)	0	0	72	0	0	8	0	9	0	0	9	0
Lane Group Flow (vph)	0	22	24	0	5	3	74	70	0	22	97	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.0	13.0		13.0	13.0	31.0	24.0		31.0	24.0	
Effective Green, g (s)		15.0	15.0		15.0	15.0	35.0	26.0		35.0	26.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.58	0.43		0.58	0.43	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	6.0		5.0	6.0	
Lane Grp Cap (vph)		440	396		413	396	821	783		835	789	
v/s Ratio Prot							c0.01	0.04		0.00	c0.05	
v/s Ratio Perm		0.01	c0.02		0.00	0.00	0.04			0.01		
v/c Ratio		0.05	0.06		0.01	0.01	0.09	0.09		0.03	0.12	
Uniform Delay, d1		17.1	17.1		16.9	16.9	5.4	10.0		5.3	10.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.90	1.07	
Incremental Delay, d2		0.2	0.3		0.1	0.0	0.2	0.2		0.1	0.3	
Delay (s)		17.3	17.4		17.0	16.9	5.7	10.2		4.8	11.2	
Level of Service		B	B		B	B	A	B		A	B	
Approach Delay (s)		17.4			16.9			8.0			10.1	
Approach LOS		B			B			A			B	

Intersection Summary				
HCM Average Control Delay	11.7	HCM Level of Service		B
HCM Volume to Capacity ratio	0.10			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization	27.5%	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)	5	61	579	5	16	303
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)	5	66	629	5	17	329
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	996	632			629	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	996	632			629	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	86			98	
cM capacity (veh/h)	266	480			953	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	5	66	635	347
Volume Left	5	0	0	17
Volume Right	0	66	5	0
cSH	266	480	1700	953
Volume to Capacity	0.02	0.14	0.37	0.02
Queue Length 95th (ft)	2	12	0	1
Control Delay (s)	18.8	13.7	0.0	0.6
Lane LOS	C	B		A
Approach Delay (s)	14.1		0.0	0.6
Approach LOS	B			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	10	639	10	41	279
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	11	695	11	45	303
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1092	700			705	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1092	700			705	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	98			95	
cM capacity (veh/h)	225	439			893	

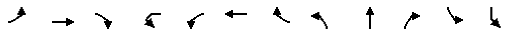
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	705	348
Volume Left	1	0	45
Volume Right	11	11	0
cSH	404	1700	893
Volume to Capacity	0.03	0.41	0.05
Queue Length 95th (ft)	2	0	4
Control Delay (s)	14.2	0.0	1.7
Lane LOS	B		A
Approach Delay (s)	14.2	0.0	1.7
Approach LOS	B		

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	59.3%	ICU Level of Service		B
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	135	151	16	36	106
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	147	164	17	39	115
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	366	173			182	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	366	173			182	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	83			97	
cM capacity (veh/h)	616	871			1394	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	151	182	154
Volume Left	4	0	39
Volume Right	147	17	0
cSH	860	1700	1394
Volume to Capacity	0.18	0.11	0.03
Queue Length 95th (ft)	16	0	2
Control Delay (s)	10.1	0.0	2.1
Lane LOS	B		A
Approach Delay (s)	10.1	0.0	2.1
Approach LOS	B		

Intersection Summary				
Average Delay	3.8			
Intersection Capacity Utilization	35.1%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBL
Lane Configurations												
Volume (vph)	326	1	24	1	5	1	13	41	634	8	4	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0		5.0	5.0			5.0
Lane Util. Factor	0.95	0.95	1.00			1.00		1.00	0.95			1.00
Frt	1.00	1.00	0.85			0.91		1.00	1.00			1.00
Flt Protected	0.95	0.95	1.00			0.99		0.95	1.00			0.95
Satd. Flow (prot)	1681	1686	1583			1671		1770	3532			1770
Flt Permitted	0.95	0.95	1.00			0.99		0.95	1.00			0.39
Satd. Flow (perm)	1681	1686	1583			1671		1770	3532			719
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)	354	1	26	1	5	1	14	45	689	9	4	22
RTOR Reduction (vph)	0	0	22	0	0	13	0	0	0	0	0	0
Lane Group Flow (vph)	177	178	4	0	0	8	0	45	698	0	0	26
Turn Type	Split		Perm	Perm	Split			Prot			Prot	Perm
Protected Phases	3	3			4	4		5	2		1	
Permitted Phases			3	4								6
Actuated Green, G (s)	24.3	24.3	24.3			7.4		8.3	93.0			77.7
Effective Green, g (s)	26.3	26.3	26.3			9.4		10.3	95.0			79.7
Actuated g/C Ratio	0.16	0.16	0.16			0.06		0.06	0.59			0.50
Clearance Time (s)	7.0	7.0	7.0			7.0		7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	276	277	260			98		114	2097			358
v/s Ratio Prot	0.11	c0.11				c0.00		0.03	c0.20			
v/s Ratio Perm			0.00									0.04
v/c Ratio	0.64	0.64	0.02			0.08		0.39	0.33			0.07
Uniform Delay, d1	62.4	62.5	56.0			71.2		71.9	16.5			20.9
Progression Factor	1.00	1.00	1.00			1.00		0.92	0.95			1.00
Incremental Delay, d2	5.0	5.0	0.0			0.4		2.2	0.4			0.4
Delay (s)	67.5	67.5	56.0			71.6		68.0	16.0			21.3
Level of Service	E	E	E			E		E	B			C
Approach Delay (s)		66.7				71.6			19.1			
Approach LOS		E				E			B			

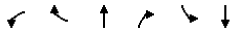
Intersection Summary				
HCM Average Control Delay	28.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	25.0	
Intersection Capacity Utilization	64.5%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	SBT	SBR	NWL2	NWL	NWR	NWR2
Lane Configurations						
Volume (vph)	740	488	1	2	6	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0		
Lane Util. Factor	0.95	1.00		1.00		
Frt	1.00	0.85		0.90		
Flt Protected	1.00	1.00		0.99		
Satd. Flow (prot)	3539	1583		1657		
Flt Permitted	1.00	1.00		0.99		
Satd. Flow (perm)	3539	1583		1657		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	804	530	1	2	7	1
RTOR Reduction (vph)	0	179	0	1	0	0
Lane Group Flow (vph)	804	351	0	10	0	0
Turn Type		pm+ov	Perm			
Protected Phases	6	3		7		
Permitted Phases		6	7			
Actuated Green, G (s)	77.7	102.0		7.3		
Effective Green, g (s)	79.7	106.0		9.3		
Actuated g/C Ratio	0.50	0.66		0.06		
Clearance Time (s)	7.0	7.0		7.0		
Vehicle Extension (s)	3.0	3.0		3.0		
Lane Grp Cap (vph)	1763	1098		96		
v/s Ratio Prot	c0.23	0.05				
v/s Ratio Perm		0.17		0.01		
v/c Ratio	0.46	0.32		0.10		
Uniform Delay, d1	26.1	11.6		71.4		
Progression Factor	1.00	1.00		1.00		
Incremental Delay, d2	0.9	0.2		0.5		
Delay (s)	26.9	11.7		71.9		
Level of Service	C	B		E		
Approach Delay (s)	20.9			71.9		
Approach LOS	C			E		

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	52	37	830	37	20	715
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.99			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	3517			3534
Flt Permitted	0.95	1.00	1.00			0.90
Satd. Flow (perm)	1770	1583	3517			3194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	40	902	40	22	777
RTOR Reduction (vph)	0	37	1	0	0	0
Lane Group Flow (vph)	57	3	941	0	0	799
Turn Type		Perm			Perm	
Protected Phases	4		2			6
Permitted Phases		4			6	
Actuated Green, G (s)	10.6	10.6	135.4			135.4
Effective Green, g (s)	12.6	12.6	137.4			137.4
Actuated g/C Ratio	0.08	0.08	0.86			0.86
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	139	125	3020			2743
v/s Ratio Prot	c0.03		c0.27			
v/s Ratio Perm		0.00				0.25
v/c Ratio	0.41	0.03	0.31			0.29
Uniform Delay, d1	70.2	68.0	2.2			2.1
Progression Factor	1.00	1.00	0.93			4.31
Incremental Delay, d2	2.0	0.1	0.3			0.2
Delay (s)	72.1	68.1	2.3			9.4
Level of Service	E	E	A			A
Approach Delay (s)	70.5		2.3			9.4
Approach LOS	E		A			A

Intersection Summary				
HCM Average Control Delay	9.0	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.32			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	48.3%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	31	196	549	31	198	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	11	11	11	11
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.99	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	0.99			1.00
Flt Protected	0.95	1.00	1.00			0.99
Satd. Flow (prot)	1486	1313	2784			3038
Flt Permitted	0.95	1.00	1.00			0.63
Satd. Flow (perm)	1486	1313	2784			1946
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	213	597	34	215	585
RTOR Reduction (vph)	0	188	1	0	0	0
Lane Group Flow (vph)	34	25	630	0	0	800
Confl. Peds. (#/hr)	5	5		5	5	
Parking (#/hr)			15	15		
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4	2		6	
Actuated Green, G (s)	8.0	15.0	124.0			138.0
Effective Green, g (s)	10.0	19.0	126.0			140.0
Actuated g/C Ratio	0.06	0.12	0.79			0.88
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	93	197	2192			1764
v/s Ratio Prot	c0.02	0.01	0.23			c0.03
v/s Ratio Perm		0.01				c0.37
v/c Ratio	0.37	0.13	0.29			0.45
Uniform Delay, d1	72.0	63.1	4.7			2.1
Progression Factor	1.00	1.00	0.56			9.00
Incremental Delay, d2	2.4	0.3	0.3			0.2
Delay (s)	74.4	63.4	2.9			18.8
Level of Service	E	E	A			B
Approach Delay (s)	64.9		2.9			18.8
Approach LOS	E		A			B

Intersection Summary				
HCM Average Control Delay	19.6	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	60.4%	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)	15	16	10	40	14	53	10	398	26	25	454	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0			5.0	5.0		5.0			5.0	
Lane Util. Factor		1.00			1.00	1.00		0.95			0.95	
Frpb, ped/bikes		0.99			1.00	0.98		1.00			1.00	
Flpb, ped/bikes		0.99			0.99	1.00		1.00			1.00	
Frt		0.97			1.00	0.85		0.99			0.99	
Flt Protected		0.98			0.96	1.00		1.00			1.00	
Satd. Flow (prot)		1622			1606	1400		2776			2783	
Flt Permitted		0.87			0.78	1.00		0.94			0.91	
Satd. Flow (perm)		1434			1293	1400		2608			2532	
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)	16	17	11	43	15	58	11	433	28	27	493	22
RTOR Reduction (vph)	0	8	0	0	0	50	0	2	0	0	1	0
Lane Group Flow (vph)	0	36	0	0	58	8	0	470	0	0	541	0
Confl. Peds. (#/hr)	7		3	3		7	1		18	18		1
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm		custom	Perm			Perm		
Protected Phases		4			8	1		2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		12.5			12.5	18.1		120.9			133.5	
Effective Green, g (s)		14.5			14.5	22.1		122.9			135.5	
Actuated g/C Ratio		0.09			0.09	0.14		0.77			0.85	
Clearance Time (s)		7.0			7.0	7.0		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)		130			117	237		2003			2144	
v/s Ratio Prot						0.00						
v/s Ratio Perm		0.02			c0.04	0.00		0.18			c0.21	
v/c Ratio		0.28			0.50	0.03		0.23			0.25	
Uniform Delay, d1		67.9			69.3	59.7		5.2			2.4	
Progression Factor		1.00			1.00	1.00		1.00			1.23	
Incremental Delay, d2		1.2			3.3	0.1		0.3			0.3	
Delay (s)		69.0			72.5	59.8		5.5			3.2	
Level of Service		E			E	E		A			A	
Approach Delay (s)		69.0			66.2			5.5			3.2	
Approach LOS		E			E			A			A	

Intersection Summary				
HCM Average Control Delay	12.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.28			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	51.2%	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)	43	10	21	29	10	18	25	368	15	15	418	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.92		1.00	0.97			1.00			1.00	
Flpb, ped/bikes	0.97	1.00		0.90	1.00			1.00			1.00	
Frt	1.00	0.90		1.00	0.90			0.99			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1544	1389		1433	1472			2781			2747	
Flt Permitted	0.74	1.00		0.73	1.00			0.90			0.94	
Satd. Flow (perm)	1197	1389		1108	1472			2510			2575	
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)	47	11	23	32	11	20	27	400	16	16	454	63
RTOR Reduction (vph)	0	21	0	0	18	0	0	1	0	0	5	0
Lane Group Flow (vph)	47	13	0	32	13	0	0	442	0	0	528	0
Confl. Peds. (#/hr)	11		36	36		11	4		41	41		4
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.3	10.3		10.3	10.3			95.7			95.7	
Effective Green, g (s)	12.3	12.3		12.3	12.3			97.7			97.7	
Actuated g/C Ratio	0.10	0.10		0.10	0.10			0.81			0.81	
Clearance Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	123	142		114	151			2044			2096	
v/s Ratio Prot		0.01			0.01							
v/s Ratio Perm	c0.04			0.03				0.18			c0.21	
v/c Ratio	0.38	0.09		0.28	0.09			0.22			0.25	
Uniform Delay, d1	50.3	48.8		49.8	48.8			2.5			2.6	
Progression Factor	1.00	1.00		1.00	1.00			1.36			1.00	
Incremental Delay, d2	2.0	0.3		1.3	0.2			0.2			0.1	
Delay (s)	52.3	49.1		51.1	49.0			3.7			2.7	
Level of Service	D	D		D	D			A			A	
Approach Delay (s)		50.9			50.1			3.7			2.7	
Approach LOS		D			D			A			A	

Intersection Summary				
HCM Average Control Delay	9.2	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.27			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	53.4%	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 (veh/h)	18	0	9	0	0	4	6	322	0	10	348	25
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)	20	0	10	0	0	4	7	350	0	11	378	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1286	
pX, platoon unblocked												
vC, conflicting volume	781	777	392	786	790	350	405			350		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	781	777	392	786	790	350	405			350		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	94	100	99	100	100	99	99			99		
cM capacity (veh/h)	307	323	657	302	318	693	1153			1209		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	29	4	357	416
Volume Left	20	0	7	11
Volume Right	10	4	0	27
cSH	373	693	1153	1209
Volume to Capacity	0.08	0.01	0.01	0.01
Queue Length 95th (ft)	6	0	0	1
Control Delay (s)	15.5	10.2	0.2	0.3
Lane LOS	C	B	A	A
Approach Delay (s)	15.5	10.2	0.2	0.3
Approach LOS	C	B		

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	40.0%	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)	33	0	28	1	1	3	15	305	0	1	254	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)	36	0	30	1	1	3	16	332	0	1	276	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	660	657	290	687	671	332	304			332		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	660	657	290	687	671	332	304			332		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	90	100	96	100	100	100	99			100		
cM capacity (veh/h)	370	380	749	343	373	710	1256			1228		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	66	5	348	305
Volume Left	36	1	16	1
Volume Right	30	3	0	28
cSH	482	509	1256	1228
Volume to Capacity	0.14	0.01	0.01	0.00
Queue Length 95th (ft)	12	1	1	0
Control Delay (s)	13.7	12.2	0.5	0.0
Lane LOS	B	B	A	A
Approach Delay (s)	13.7	12.2	0.5	0.0
Approach LOS	B	B		

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	41.9%	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 (vph)	29	22	43	10	11	13	140	156	29	44	111	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	3.0	3.0	4.0		3.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1811	1583		1819	1583	1770	1818		1770	1801	
Flt Permitted		0.86	1.00		0.90	1.00	0.66	1.00		0.62	1.00	
Satd. Flow (perm)		1610	1583		1676	1583	1227	1818		1162	1801	
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	24	47	11	12	14	152	170	32	48	121	34
RTOR Reduction (vph)	0	0	35	0	0	11	0	11	0	0	17	0
Lane Group Flow (vph)	0	56	12	0	23	4	152	191	0	48	138	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.0	13.0		13.0	13.0	31.0	24.0		31.0	24.0	
Effective Green, g (s)		15.0	15.0		15.0	15.0	35.0	26.0		35.0	26.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.58	0.43		0.58	0.43	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	6.0		5.0	6.0	
Lane Grp Cap (vph)		403	396		419	396	797	788		769	780	
v/s Ratio Prot							c0.03	c0.10		0.01	0.08	
v/s Ratio Perm		c0.03	0.01		0.01	0.00	0.08			0.03		
v/c Ratio		0.14	0.03		0.05	0.01	0.19	0.24		0.06	0.18	
Uniform Delay, d1		17.5	17.0		17.1	16.9	5.7	10.8		5.4	10.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.98	1.12	
Incremental Delay, d2		0.7	0.1		0.2	0.0	0.5	0.7		0.2	0.5	
Delay (s)		18.2	17.1		17.4	17.0	6.2	11.5		5.4	12.2	
Level of Service		B	B		B	B	A	B		A	B	
Approach Delay (s)		17.7			17.2			9.2			10.6	
Approach LOS		B			B			A			B	

Intersection Summary				
HCM Average Control Delay	11.3	HCM Level of Service		B
HCM Volume to Capacity ratio	0.20			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization	35.2%	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)	6	41	356	13	59	480
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	45	387	14	64	522
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1044	394			387	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1044	394			387	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	93			95	
cM capacity (veh/h)	240	655			1172	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	7	45	401	586
Volume Left	7	0	0	64
Volume Right	0	45	14	0
cSH	240	655	1700	1172
Volume to Capacity	0.03	0.07	0.24	0.05
Queue Length 95th (ft)	2	5	0	4
Control Delay (s)	20.4	10.9	0.0	1.5
Lane LOS	C	B		A
Approach Delay (s)	12.1		0.0	1.5
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	2	6	374	3	5	508
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	7	407	3	5	552
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	971	408			410	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	971	408			410	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	279	643			1149	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	410	558
Volume Left	2	0	5
Volume Right	7	3	0
cSH	485	1700	1149
Volume to Capacity	0.02	0.24	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	12.6	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	12.6	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

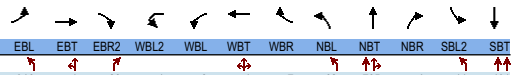
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	70	175	0	104	165
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	76	190	0	113	179
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	596	190			190	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	596	190			190	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	91			92	
cM capacity (veh/h)	428	852			1384	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	76	190	292
Volume Left	0	0	113
Volume Right	76	0	0
cSH	852	1700	1384
Volume to Capacity	0.09	0.11	0.08
Queue Length 95th (ft)	7	0	7
Control Delay (s)	9.6	0.0	3.5
Lane LOS	A		A
Approach Delay (s)	9.6	0.0	3.5
Approach LOS	A		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

2030 No Build AM & PM Conditions



Movement	EBL	EBT	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBT
Lane Configurations												
Volume (vph)	916	1	26	1	3	1	7	62	765	4	11	491
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	0.95	0.95	1.00			1.00		1.00	0.95		1.00	0.95
Frt	1.00	1.00	0.85			0.92		1.00	1.00		1.00	1.00
Flt Protected	0.95	0.95	1.00			0.98		0.95	1.00		0.95	1.00
Satd. Flow (prot)	1681	1686	1583			1682		1770	3537		1770	3539
Flt Permitted	0.95	0.95	1.00			0.98		0.95	1.00		0.95	1.00
Satd. Flow (perm)	1681	1686	1583			1682		1770	3537		1770	3539
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)	996	1	28	1	3	1	8	67	832	4	12	534
RTOR Reduction (vph)	0	0	11	0	0	8	0	0	0	0	0	0
Lane Group Flow (vph)	498	499	17	0	0	5	0	67	836	0	12	534
Turn Type	Split		Perm	Perm	Split			Prot			Prot	
Protected Phases	3	3			4	4		5	2		1	6
Permitted Phases			3	4								
Actuated Green, G (s)	56.5	56.5	56.5			7.2		11.4	51.1		3.1	42.8
Effective Green, g (s)	58.5	58.5	58.5			9.2		13.4	53.1		5.1	44.8
Actuated g/C Ratio	0.37	0.37	0.37			0.06		0.08	0.33		0.03	0.28
Clearance Time (s)	7.0	7.0	7.0			7.0		7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	615	616	579			97		148	1174		56	991
v/s Ratio Prot	c0.30	0.30				c0.00		c0.04	c0.24		0.01	0.15
v/s Ratio Perm			0.01									
v/c Ratio	0.81	0.81	0.03			0.06		0.45	0.71		0.21	0.54
Uniform Delay, d1	45.7	45.7	32.5			71.3		69.8	46.8		75.5	48.8
Progression Factor	1.00	1.00	1.00			1.00		1.01	0.92		1.00	1.00
Incremental Delay, d2	7.8	7.9	0.0			0.2		2.2	3.7		1.9	2.1
Delay (s)	53.5	53.7	32.6			71.5		72.5	46.6		77.4	50.9
Level of Service	D	D	C			E		E	D		E	D
Approach Delay (s)		53.0				71.5			48.6			34.3
Approach LOS		D				E			D			C

Intersection Summary			
HCM Average Control Delay	45.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR	NWL2	NWL	NWR	NWR2
Lane Configurations					
Volume (vph)	393	3	1	2	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0		
Lane Util. Factor	1.00		1.00		
Frt	0.85		0.93		
Flt Protected	1.00		0.98		
Satd. Flow (prot)	1583		1695		
Flt Permitted	1.00		0.98		
Satd. Flow (perm)	1583		1695		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	427	3	1	2	2
RTOR Reduction (vph)	151	0	2	0	0
Lane Group Flow (vph)	276	0	6	0	0
Turn Type	pm+ov	Perm			
Protected Phases	3		7		
Permitted Phases	6	7			
Actuated Green, G (s)	99.3		7.1		
Effective Green, g (s)	103.3		9.1		
Actuated g/C Ratio	0.65		0.06		
Clearance Time (s)	7.0		7.0		
Vehicle Extension (s)	3.0		3.0		
Lane Grp Cap (vph)	1071		96		
v/s Ratio Prot	0.09				
v/s Ratio Perm	0.08		0.00		
v/c Ratio	0.26		0.06		
Uniform Delay, d1	12.0		71.4		
Progression Factor	1.00		1.00		
Incremental Delay, d2	0.1		0.3		
Delay (s)	12.2		71.7		
Level of Service	B		E		
Approach Delay (s)			71.7		
Approach LOS			E		

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	7	12	630	8	7	604
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	3532			3537
Flt Permitted	0.95	1.00	1.00			0.95
Satd. Flow (perm)	1770	1583	3532			3346
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	13	685	9	8	657
RTOR Reduction (vph)	0	12	0	0	0	0
Lane Group Flow (vph)	8	1	694	0	0	665
Turn Type		Perm			Perm	
Protected Phases	4		2			6
Permitted Phases		4			6	
Actuated Green, G (s)	7.1	7.1	138.9			138.9
Effective Green, g (s)	9.1	9.1	140.9			140.9
Actuated g/C Ratio	0.06	0.06	0.88			0.88
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	101	90	3110			2947
v/s Ratio Prot	c0.00		0.20			
v/s Ratio Perm		0.00				c0.20
v/c Ratio	0.08	0.01	0.22			0.23
Uniform Delay, d1	71.5	71.2	1.4			1.4
Progression Factor	1.00	1.00	0.76			0.64
Incremental Delay, d2	0.3	0.0	0.2			0.2
Delay (s)	71.8	71.2	1.2			1.1
Level of Service	E	E	A			A
Approach Delay (s)	71.5		1.2			1.1
Approach LOS	E		A			A

Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	32	320	698	39	183	514
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	11	11	11	11
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	0.98	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	0.88	0.85	0.99		1.00	1.00
Flt Protected	0.99	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1331	1249	2784		1539	1621
Flt Permitted	0.99	1.00	1.00		0.31	1.00
Satd. Flow (perm)	1331	1249	2784		503	1621
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	348	759	42	199	559
RTOR Reduction (vph)	118	134	1	0	0	0
Lane Group Flow (vph)	77	54	800	0	199	559
Confl. Peds. (#/hr)	5	5		5	5	
Parking (#/hr)			15	15		
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4	2		6	
Actuated Green, G (s)	14.6	24.9	114.1		131.4	131.4
Effective Green, g (s)	16.6	28.9	116.1		133.4	133.4
Actuated g/C Ratio	0.10	0.18	0.73		0.83	0.83
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	138	265	2020		499	1352
v/s Ratio Prot	c0.06	0.02	0.29		0.03	c0.34
v/s Ratio Perm		0.03			0.30	
v/c Ratio	0.56	0.21	0.40		0.40	0.41
Uniform Delay, d1	68.2	55.8	8.4		3.4	3.4
Progression Factor	1.00	1.00	1.02		5.58	5.45
Incremental Delay, d2	4.8	0.4	0.4		0.5	0.2
Delay (s)	73.0	56.2	9.1		19.5	18.6
Level of Service	E	E	A		B	B
Approach Delay (s)	64.7		9.1			18.8
Approach LOS	E		A			B

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.9%	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)	39	12	8	56	7	44	1	640	28	53	365	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.98			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.98			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1605			1589	1383	1270	1327		1266	1330	
Flt Permitted		0.73			0.71	1.00	0.52	1.00		0.29	1.00	
Satd. Flow (perm)		1205			1186	1383	698	1327		387	1330	
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)	42	13	9	61	8	48	1	696	30	58	397	12
RTOR Reduction (vph)	0	4	0	0	0	41	0	0	0	0	0	0
Lane Group Flow (vph)	0	60	0	0	69	7	1	726	0	58	409	0
Confl. Peds. (#/hr)	7		3	3		7	1		18	18		1
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm		custom	Perm			Perm		
Protected Phases		4			8	1		2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		14.5			14.5	20.1	118.9	118.9		131.5	131.5	
Effective Green, g (s)		16.5			16.5	24.1	120.9	120.9		133.5	133.5	
Actuated g/C Ratio		0.10			0.10	0.15	0.76	0.76		0.83	0.83	
Clearance Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		124			122	252	527	1003		323	1110	
v/s Ratio Prot						0.00		c0.55			c0.31	
v/s Ratio Perm		0.05			c0.06	0.00	0.00			0.15		
v/c Ratio		0.48			0.57	0.03	0.00	0.72		0.18	0.37	
Uniform Delay, d1		67.7			68.3	58.0	4.8	10.5		2.6	3.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.53	2.50	
Incremental Delay, d2		2.9			5.9	0.0	0.0	4.5		1.1	0.9	
Delay (s)		70.6			74.2	58.0	4.8	15.1		5.1	8.8	
Level of Service		E			E	E	A	B		A	A	
Approach Delay (s)		70.6			67.6			15.0			8.3	
Approach LOS		E			E			B			A	

Intersection Summary					
HCM Average Control Delay	19.8	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.69				
Actuated Cycle Length (s)	160.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	67.9%	ICU Level of Service		C	
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)	97	15	19	29	6	14	12	565	15	11	353	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.92		1.00	0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.96	1.00		0.88	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.90		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1535	1412		1407	1447		1268	1330		1266	1310	
Flt Permitted	0.74	1.00		0.73	1.00		0.51	1.00		0.33	1.00	
Satd. Flow (perm)	1200	1412		1086	1447		681	1330		437	1310	
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)	105	16	21	32	7	15	13	614	16	12	384	51
RTOR Reduction (vph)	0	18	0	0	13	0	0	0	0	0	3	0
Lane Group Flow (vph)	105	19	0	32	9	0	13	630	0	12	432	0
Confl. Peds. (#/hr)	11		36	36		11	4		41	41		4
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm			Perm				pm+pt	
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.6	15.6		15.6	15.6		80.6	80.6		90.4	90.4	
Effective Green, g (s)	17.6	17.6		17.6	17.6		82.6	82.6		92.4	92.4	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.69	0.69		0.77	0.77	
Clearance Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	176	207		159	212		469	915		370	1009	
v/s Ratio Prot		0.01			0.01			c0.47		0.00	c0.33	
v/s Ratio Perm	c0.09			0.03			0.02			0.02		
v/c Ratio	0.60	0.09		0.20	0.04		0.03	0.69		0.03	0.43	
Uniform Delay, d1	47.9	44.3		45.0	44.0		5.9	11.1		4.9	4.7	
Progression Factor	1.00	1.00		1.00	1.00		0.96	0.97		1.00	1.00	
Incremental Delay, d2	5.3	0.2		0.6	0.1		0.1	4.2		0.0	1.3	
Delay (s)	53.2	44.5		45.6	44.1		5.8	14.9		5.0	6.1	
Level of Service	D	D		D	D		A	B		A	A	
Approach Delay (s)		50.9			45.0			14.7			6.0	
Approach LOS		D			D			B			A	

Intersection Summary					
HCM Average Control Delay	17.0	HCM Level of Service		B	
HCM Volume to Capacity ratio	0.67				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	55.6%	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 (veh/h)	74	4	11	0	0	12	47	444	0	4	249	43
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)	80	4	12	0	0	13	51	483	0	4	271	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1286	
pX, platoon unblocked												
vC, conflicting volume	901	888	294	902	911	483	317			483		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	901	888	294	902	911	483	317			483		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	67	98	98	100	100	98	96			100		
cM capacity (veh/h)	245	270	745	243	262	584	1243			1080		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	97	13	534	322
Volume Left	80	0	51	4
Volume Right	12	13	0	47
cSH	268	584	1243	1080
Volume to Capacity	0.36	0.02	0.04	0.00
Queue Length 95th (ft)	39	2	3	0
Control Delay (s)	25.8	11.3	1.2	0.2
Lane LOS	D	B	A	A
Approach Delay (s)	25.8	11.3	1.2	0.2
Approach LOS	D	B		

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	63.5%	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)	25	7	21	1	0	6	32	276	0	4	226	28
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)	27	8	23	1	0	7	35	300	0	4	246	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	646	639	261	666	654	300	276			300		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	646	639	261	666	654	300	276			300		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	93	98	97	100	100	99	97			100		
cM capacity (veh/h)	373	382	778	348	374	740	1287			1261		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	58	8	335	280
Volume Left	27	1	35	4
Volume Right	23	7	0	30
cSH	471	637	1287	1261
Volume to Capacity	0.12	0.01	0.03	0.00
Queue Length 95th (ft)	10	1	2	0
Control Delay (s)	13.7	10.7	1.0	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	13.7	10.7	1.0	0.2
Approach LOS	B	B		

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	47.7%	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 (vph)	8	19	122	6	1	12	94	80	21	28	116	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	3.0	3.0	4.0		3.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected		0.99	1.00		0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1835	1583		1785	1583	1770	1804		1770	1820	
Flt Permitted		0.94	1.00		0.86	1.00	0.66	1.00		0.69	1.00	
Satd. Flow (perm)		1760	1583		1609	1583	1234	1804		1278	1820	
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)	9	21	133	7	1	13	102	87	23	30	126	23
RTOR Reduction (vph)	0	0	100	0	0	10	0	13	0	0	11	0
Lane Group Flow (vph)	0	30	33	0	8	3	102	97	0	30	138	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.0	13.0		13.0	13.0	31.0	24.0		31.0	24.0	
Effective Green, g (s)		15.0	15.0		15.0	15.0	35.0	26.0		35.0	26.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.58	0.43		0.58	0.43	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	6.0		5.0	6.0	
Lane Grp Cap (vph)		440	396		402	396	800	782		819	789	
v/s Ratio Prot							c0.02	0.05		0.01	c0.08	
v/s Ratio Perm		0.02	c0.02		0.00	0.00	0.06			0.02		
v/c Ratio		0.07	0.08		0.02	0.01	0.13	0.12		0.04	0.18	
Uniform Delay, d1		17.2	17.2		17.0	16.9	5.5	10.2		5.3	10.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.34	1.25	
Incremental Delay, d2		0.3	0.4		0.1	0.0	0.3	0.3		0.1	0.5	
Delay (s)		17.5	17.7		17.1	16.9	5.9	10.5		7.2	13.5	
Level of Service		B	B		B	B	A	B		A	B	
Approach Delay (s)		17.6			17.0			8.3			12.4	
Approach LOS		B			B			A			B	

Intersection Summary				
HCM Average Control Delay	12.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.14			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	31.3%	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)	7	85	803	7	22	420
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)	8	92	873	8	24	457
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1381	877			873	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1381	877			873	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	73			97	
cM capacity (veh/h)	154	348			773	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	8	92	880	480
Volume Left	8	0	0	24
Volume Right	0	92	8	0
cSH	154	348	1700	773
Volume to Capacity	0.05	0.27	0.52	0.03
Queue Length 95th (ft)	4	26	0	2
Control Delay (s)	29.6	19.1	0.0	0.9
Lane LOS	D	C		A
Approach Delay (s)	19.9		0.0	0.9
Approach LOS	C			

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	14	887	14	57	387
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	15	964	15	62	421
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1516	972			979	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1516	972			979	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	95			91	
cM capacity (veh/h)	120	306			705	

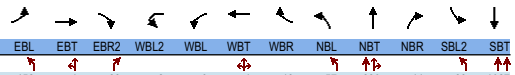
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	979	483
Volume Left	1	0	62
Volume Right	15	15	0
cSH	278	1700	705
Volume to Capacity	0.06	0.58	0.09
Queue Length 95th (ft)	5	0	7
Control Delay (s)	18.8	0.0	2.4
Lane LOS	C		A
Approach Delay (s)	18.8	0.0	2.4
Approach LOS	C		

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	78.5%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	187	210	22	50	147
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	203	228	24	54	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	509	240			252	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	509	240			252	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	75			96	
cM capacity (veh/h)	503	799			1313	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	210	252	214
Volume Left	7	0	54
Volume Right	203	24	0
cSH	784	1700	1313
Volume to Capacity	0.27	0.15	0.04
Queue Length 95th (ft)	27	0	3
Control Delay (s)	11.3	0.0	2.3
Lane LOS	B		A
Approach Delay (s)	11.3	0.0	2.3
Approach LOS	B		

Intersection Summary				
Average Delay	4.2			
Intersection Capacity Utilization	44.8%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBT
Lane Configurations												
Volume (vph)	452	1	33	2	6	1	18	57	880	11	33	1027
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	0.95	0.95	1.00			1.00		1.00	0.95		1.00	0.95
Frt	1.00	1.00	0.85			0.91		1.00	1.00		1.00	1.00
Flt Protected	0.95	0.95	1.00			0.99		0.95	1.00		0.95	1.00
Satd. Flow (prot)	1681	1686	1583			1670		1770	3533		1770	3539
Flt Permitted	0.95	0.95	1.00			0.99		0.95	1.00		0.95	1.00
Satd. Flow (perm)	1681	1686	1583			1670		1770	3533		1770	3539
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)	491	1	36	2	7	1	20	62	957	12	36	1116
RTOR Reduction (vph)	0	0	29	0	0	19	0	0	0	0	0	0
Lane Group Flow (vph)	245	247	7	0	0	11	0	62	969	0	36	1116
Turn Type	Split		Perm	Perm	Split			Prot			Prot	
Protected Phases	3	3			4	4		5	2		1	6
Permitted Phases			3	4								
Actuated Green, G (s)	28.6	28.6	28.6			7.3		9.6	74.8		6.7	71.9
Effective Green, g (s)	30.6	30.6	30.6			9.3		11.6	76.8		8.7	73.9
Actuated g/C Ratio	0.19	0.19	0.19			0.06		0.07	0.48		0.05	0.46
Clearance Time (s)	7.0	7.0	7.0			7.0		7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	321	322	303			97		128	1696		96	1635
v/s Ratio Prot	0.15	c0.15				c0.01		c0.04	c0.27		0.02	c0.32
v/s Ratio Perm			0.00									
v/c Ratio	0.76	0.77	0.02			0.12		0.48	0.57		0.38	0.68
Uniform Delay, d1	61.3	61.3	52.6			71.4		71.3	29.8		73.0	33.8
Progression Factor	1.00	1.00	1.00			1.00		1.02	0.74		1.00	1.00
Incremental Delay, d2	10.3	10.4	0.0			0.5		2.6	1.3		2.5	2.3
Delay (s)	71.6	71.8	52.6			72.0		75.7	23.4		75.5	36.2
Level of Service	E	E	D			E		E	C		E	D
Approach Delay (s)		70.4				72.0			26.6			28.2
Approach LOS		E				E			C			C

Intersection Summary				
HCM Average Control Delay	34.7	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	30.0	
Intersection Capacity Utilization	75.9%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	SBR	NWL2	NWL	NWR	NWR2
Lane Configurations					
Volume (vph)	677	4	2	8	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0		
Lane Util. Factor	1.00		1.00		
Frt	0.85		0.92		
Flt Protected	1.00		0.98		
Satd. Flow (prot)	1583		1674		
Flt Permitted	1.00		0.98		
Satd. Flow (perm)	1583		1674		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	736	4	2	9	1
RTOR Reduction (vph)	255	0	1	0	0
Lane Group Flow (vph)	481	0	15	0	0
Turn Type	pm+ov	Perm			
Protected Phases	3		7		
Permitted Phases	6	7			
Actuated Green, G (s)	100.5		7.6		
Effective Green, g (s)	104.5		9.6		
Actuated g/C Ratio	0.65		0.06		
Clearance Time (s)	7.0		7.0		
Vehicle Extension (s)	3.0		3.0		
Lane Grp Cap (vph)	1083		100		
v/s Ratio Prot	0.08				
v/s Ratio Perm	0.22		0.01		
v/c Ratio	0.44		0.15		
Uniform Delay, d1	13.6		71.3		
Progression Factor	1.00		1.00		
Incremental Delay, d2	0.3		0.7		
Delay (s)	13.8		72.0		
Level of Service	B		E		
Approach Delay (s)			72.0		
Approach LOS			E		

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	72	51	1152	51	28	992
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.99			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	3517			3534
Flt Permitted	0.95	1.00	1.00			0.86
Satd. Flow (perm)	1770	1583	3517			3042
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	55	1252	55	30	1078
RTOR Reduction (vph)	0	50	1	0	0	0
Lane Group Flow (vph)	78	5	1306	0	0	1108
Turn Type		Perm			Perm	
Protected Phases	4		2			6
Permitted Phases		4			6	
Actuated Green, G (s)	12.4	12.4	133.6			133.6
Effective Green, g (s)	14.4	14.4	135.6			135.6
Actuated g/C Ratio	0.09	0.09	0.85			0.85
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	159	142	2981			2578
v/s Ratio Prot	c0.04		c0.37			
v/s Ratio Perm		0.00				0.36
v/c Ratio	0.49	0.03	0.44			0.43
Uniform Delay, d1	69.3	66.5	3.0			2.9
Progression Factor	1.00	1.00	0.54			5.45
Incremental Delay, d2	2.4	0.1	0.4			0.4
Delay (s)	71.7	66.6	2.0			16.4
Level of Service	E	E	A			B
Approach Delay (s)	69.6		2.0			16.4
Approach LOS	E		A			B

Intersection Summary				
HCM Average Control Delay	11.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	61.8%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	43	296	792	43	299	780
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	11	11	11	11
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	0.98	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	0.89	0.85	0.99		1.00	1.00
Flt Protected	0.99	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1347	1254	2784		1539	1621
Flt Permitted	0.99	1.00	1.00		0.24	1.00
Satd. Flow (perm)	1347	1254	2784		396	1621
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	322	861	47	325	848
RTOR Reduction (vph)	76	88	2	0	0	0
Lane Group Flow (vph)	113	92	906	0	325	848
Confl. Peds. (#/hr)	5	5		5	5	
Parking (#/hr)			15	15		
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4	2		6	
Actuated Green, G (s)	18.2	43.6	95.4		127.8	127.8
Effective Green, g (s)	20.2	47.6	97.4		129.8	129.8
Actuated g/C Ratio	0.13	0.30	0.61		0.81	0.81
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	170	412	1695		517	1315
v/s Ratio Prot	c0.08	0.04	0.33		0.11	c0.52
v/s Ratio Perm		0.04			0.40	
v/c Ratio	0.66	0.22	0.53		0.63	0.64
Uniform Delay, d1	66.7	42.3	18.2		8.0	6.0
Progression Factor	1.00	1.00	0.68		3.53	4.35
Incremental Delay, d2	9.4	0.3	1.1		2.2	1.0
Delay (s)	76.1	42.6	13.4		30.6	27.0
Level of Service	E	D	B		C	C
Approach Delay (s)	59.7		13.4			28.0
Approach LOS	E		B			C

Intersection Summary				
HCM Average Control Delay	27.4	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	67.1%	ICU Level of Service	C	
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)	21	22	14	66	19	103	14	552	36	69	630	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1618			1601	1387	1270	1322		1265	1327	
Flt Permitted		0.84			0.71	1.00	0.39	1.00		0.32	1.00	
Satd. Flow (perm)		1390			1188	1387	524	1322		420	1327	
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)	23	24	15	72	21	112	15	600	39	75	685	30
RTOR Reduction (vph)	0	8	0	0	0	92	0	1	0	0	1	0
Lane Group Flow (vph)	0	54	0	0	93	20	15	638	0	75	714	0
Confl. Peds. (#/hr)	7		3	3		7	1		18	18		1
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm		custom	Perm			Perm		
Protected Phases		4			8	1		2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		17.5			17.5	24.5	114.5	114.5		128.5	128.5	
Effective Green, g (s)		19.5			19.5	28.5	116.5	116.5		130.5	130.5	
Actuated g/C Ratio		0.12			0.12	0.18	0.73	0.73		0.82	0.82	
Clearance Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		169			145	290	382	963		343	1082	
v/s Ratio Prot						0.00		0.48			c0.54	
v/s Ratio Perm		0.04			c0.08	0.01	0.03			0.18		
v/c Ratio		0.32			0.64	0.07	0.04	0.66		0.22	0.66	
Uniform Delay, d1		64.2			66.9	54.7	6.1	11.4		3.3	5.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		0.35	0.24	
Incremental Delay, d2		1.1			9.3	0.1	0.2	3.6		1.1	2.4	
Delay (s)		65.3			76.2	54.8	6.3	15.0		2.3	3.9	
Level of Service		E			E	D	A	B		A	A	
Approach Delay (s)		65.3			64.5			14.8			3.7	
Approach LOS		E			E			B			A	

Intersection Summary				
HCM Average Control Delay	17.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.66			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
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)	64	14	29	58	14	25	35	522	21	21	590	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.89		1.00	0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.96	1.00		0.86	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90		1.00	0.90		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1524	1335		1370	1452		1269	1327		1266	1309	
Flt Permitted	0.73	1.00		0.73	1.00		0.39	1.00		0.36	1.00	
Satd. Flow (perm)	1171	1335		1048	1452		516	1327		474	1309	
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)	70	15	32	63	15	27	38	567	23	23	641	87
RTOR Reduction (vph)	0	28	0	0	24	0	0	1	0	0	2	0
Lane Group Flow (vph)	70	19	0	63	18	0	38	589	0	23	726	0
Confl. Peds. (#/hr)	11		36	36		11	4		41	41		4
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm			Perm				pm+pt	
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.5	12.5		12.5	12.5		82.3	82.3		93.5	93.5	
Effective Green, g (s)	14.5	14.5		14.5	14.5		84.3	84.3		95.5	95.5	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.70	0.70		0.80	0.80	
Clearance Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	161		127	175		362	932		418	1042	
v/s Ratio Prot		0.01			0.01			0.44		0.00	c0.55	
v/s Ratio Perm	0.06			c0.06			0.07			0.04		
v/c Ratio	0.50	0.12		0.50	0.10		0.10	0.63		0.06	0.70	
Uniform Delay, d1	49.3	47.0		49.3	47.0		5.7	9.6		3.9	5.6	
Progression Factor	1.00	1.00		1.00	1.00		0.86	0.89		1.00	1.00	
Incremental Delay, d2	2.7	0.3		3.0	0.3		0.6	3.2		0.1	3.9	
Delay (s)	52.1	47.4		52.4	47.2		5.5	11.7		3.9	9.5	
Level of Service	D	D		D	D		A	B		A	A	
Approach Delay (s)		50.2			50.3			11.3			9.3	
Approach LOS		D			D			B			A	

Intersection Summary				
HCM Average Control Delay	15.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	60.8%	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 (veh/h)	25	0	12	0	0	6	8	470	0	14	504	35
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)	27	0	13	0	0	7	9	511	0	15	548	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1286	
pX, platoon unblocked												
vC, conflicting volume	1132	1126	567	1139	1145	511	586			511		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1132	1126	567	1139	1145	511	586			511		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	84	100	98	100	100	99	99			99		
cM capacity (veh/h)	175	200	523	171	195	563	989			1054		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	40	7	520	601
Volume Left	27	0	9	15
Volume Right	13	7	0	38
cSH	223	563	989	1054
Volume to Capacity	0.18	0.01	0.01	0.01
Queue Length 95th (ft)	16	1	1	1
Control Delay (s)	24.6	11.5	0.3	0.4
Lane LOS	C	B	A	A
Approach Delay (s)	24.6	11.5	0.3	0.4
Approach LOS	C	B		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	51.7%	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)	46	0	39	1	1	4	21	423	0	1	352	36
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)	50	0	42	1	1	4	23	460	0	1	383	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	915	910	402	952	929	460	422			460		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	915	910	402	952	929	460	422			460		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	80	100	93	100	100	99	98			100		
cM capacity (veh/h)	247	269	648	220	262	601	1137			1101		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	92	7	483	423
Volume Left	50	1	23	1
Volume Right	42	4	0	39
cSH	345	400	1137	1101
Volume to Capacity	0.27	0.02	0.02	0.00
Queue Length 95th (ft)	27	1	2	0
Control Delay (s)	19.2	14.2	0.6	0.0
Lane LOS	C	B	A	A
Approach Delay (s)	19.2	14.2	0.6	0.0
Approach LOS	C	B		

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	56.5%	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 (vph)	40	31	60	14	15	18	194	216	40	61	154	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	3.0	3.0	4.0		3.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1812	1583		1819	1583	1770	1820		1770	1801	
Flt Permitted		0.85	1.00		0.89	1.00	0.61	1.00		0.54	1.00	
Satd. Flow (perm)		1590	1583		1649	1583	1136	1820		1003	1801	
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)	43	34	65	15	16	20	211	235	43	66	167	47
RTOR Reduction (vph)	0	0	49	0	0	15	0	11	0	0	17	0
Lane Group Flow (vph)	0	77	16	0	31	5	211	267	0	66	197	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.0	13.0		13.0	13.0	31.0	24.0		31.0	24.0	
Effective Green, g (s)		15.0	15.0		15.0	15.0	35.0	26.0		35.0	26.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.58	0.43		0.58	0.43	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	6.0		5.0	6.0	
Lane Grp Cap (vph)		398	396		412	396	758	789		700	780	
v/s Ratio Prot							c0.04	c0.15		0.01	0.11	
v/s Ratio Perm		c0.05	0.01		0.02	0.00	0.12			0.04		
v/c Ratio		0.19	0.04		0.08	0.01	0.28	0.34		0.09	0.25	
Uniform Delay, d1		17.7	17.0		17.2	16.9	5.9	11.3		5.5	10.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.09	1.06	
Incremental Delay, d2		1.1	0.2		0.4	0.1	0.9	1.2		0.2	0.7	
Delay (s)		18.8	17.2		17.6	17.0	6.8	12.5		6.2	12.1	
Level of Service		B	B		B	B	A	B		A	B	
Approach Delay (s)		18.1			17.3			10.0			10.7	
Approach LOS		B			B			B			B	

Intersection Summary				
HCM Average Control Delay	11.8	HCM Level of Service		B
HCM Volume to Capacity ratio	0.28			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		10.0
Intersection Capacity Utilization	42.0%	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)	8	57	494	18	82	666
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)	9	62	537	20	89	724
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1449	547			537	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1449	547			537	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	88			91	
cM capacity (veh/h)	132	537			1031	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	9	62	557	813
Volume Left	9	0	0	89
Volume Right	0	62	20	0
cSH	132	537	1700	1031
Volume to Capacity	0.07	0.12	0.33	0.09
Queue Length 95th (ft)	5	10	0	7
Control Delay (s)	34.2	12.6	0.0	2.1
Lane LOS	D	B		A
Approach Delay (s)	15.2		0.0	2.1
Approach LOS	C			

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	8	519	4	7	705
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	9	564	4	8	766
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1348	566			568	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1348	566			568	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			99	
cM capacity (veh/h)	165	523			1004	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	568	774
Volume Left	3	0	8
Volume Right	9	4	0
cSH	329	1700	1004
Volume to Capacity	0.04	0.33	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	16.4	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.4	0.0	0.2
Approach LOS	C		

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	52.7%	ICU Level of Service		A
Analysis Period (min)	15			

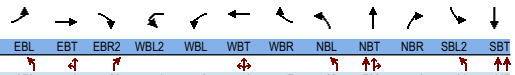
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	97	243	0	144	229
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	105	264	0	157	249
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	826	264			264	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	826	264			264	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	86			88	
cM capacity (veh/h)	301	775			1300	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	105	264	405
Volume Left	0	0	157
Volume Right	105	0	0
cSH	775	1700	1300
Volume to Capacity	0.14	0.16	0.12
Queue Length 95th (ft)	12	0	10
Control Delay (s)	10.4	0.0	3.9
Lane LOS	B		A
Approach Delay (s)	10.4	0.0	3.9
Approach LOS	B		

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	48.8%	ICU Level of Service		A
Analysis Period (min)	15			

Appendix C

2030 Build AM & PM Conditions



Movement	EBL	EBT	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBT
Lane Configurations												
Volume (vph)	979	1	26	1	3	1	7	62	702	4	11	447
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	0.95	0.95	1.00			1.00		1.00	0.95		1.00	0.95
Frt	1.00	1.00	0.85			0.92		1.00	1.00		1.00	1.00
Flt Protected	0.95	0.95	1.00			0.98		0.95	1.00		0.95	1.00
Satd. Flow (prot)	1681	1685	1583			1682		1770	3536		1770	3539
Flt Permitted	0.95	0.95	1.00			0.98		0.95	1.00		0.95	1.00
Satd. Flow (perm)	1681	1685	1583			1682		1770	3536		1770	3539
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)	1064	1	28	1	3	1	8	67	763	4	12	486
RTOR Reduction (vph)	0	0	10	0	0	8	0	0	0	0	0	0
Lane Group Flow (vph)	532	533	18	0	0	5	0	67	767	0	12	486
Turn Type	Split		Perm	Perm	Split			Prot			Prot	
Protected Phases	3	3			4	4		5	2		1	6
Permitted Phases			3	4								
Actuated Green, G (s)	59.7	59.7	59.7			7.2		11.4	47.9		3.1	39.6
Effective Green, g (s)	61.7	61.7	61.7			9.2		13.4	49.9		5.1	41.6
Actuated g/C Ratio	0.39	0.39	0.39			0.06		0.08	0.31		0.03	0.26
Clearance Time (s)	7.0	7.0	7.0			7.0		7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	648	650	610			97		148	1103		56	920
v/s Ratio Prot	c0.32	0.32				c0.00		c0.04	c0.22		0.01	0.14
v/s Ratio Perm			0.01									
v/c Ratio	0.82	0.82	0.03			0.06		0.45	0.70		0.21	0.53
Uniform Delay, d1	44.2	44.2	30.5			71.3		69.8	48.4		75.5	50.8
Progression Factor	1.00	1.00	1.00			1.00		0.97	0.93		1.00	1.00
Incremental Delay, d2	8.2	8.2	0.0			0.2		2.2	3.6		1.9	2.2
Delay (s)	52.4	52.3	30.6			71.5		69.6	48.5		77.4	53.0
Level of Service	D	D	C			E		E	D		E	D
Approach Delay (s)		51.8				71.5			50.2			33.5
Approach LOS		D				E			D			C

Intersection Summary				
HCM Average Control Delay	45.4	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	25.0	
Intersection Capacity Utilization	81.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	SBR	NWL2	NWL	NWR	NWR2
Lane Configurations					
Volume (vph)	437	3	1	2	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0		
Lane Util. Factor	1.00		1.00		
Frt	0.85		0.93		
Flt Protected	1.00		0.98		
Satd. Flow (prot)	1583		1695		
Flt Permitted	1.00		0.98		
Satd. Flow (perm)	1583		1695		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	475	3	1	2	2
RTOR Reduction (vph)	168	0	2	0	0
Lane Group Flow (vph)	307	0	6	0	0
Turn Type	pm+ov	Perm			
Protected Phases	3		7		
Permitted Phases	6	7			
Actuated Green, G (s)	99.3		7.1		
Effective Green, g (s)	103.3		9.1		
Actuated g/C Ratio	0.65		0.06		
Clearance Time (s)	7.0		7.0		
Vehicle Extension (s)	3.0		3.0		
Lane Grp Cap (vph)	1071		96		
v/s Ratio Prot	0.11				
v/s Ratio Perm	0.08		0.00		
v/c Ratio	0.29		0.06		
Uniform Delay, d1	12.3		71.4		
Progression Factor	1.00		1.00		
Incremental Delay, d2	0.1		0.3		
Delay (s)	12.5		71.7		
Level of Service	B		E		
Approach Delay (s)			71.7		
Approach LOS			E		

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	7	12	567	8	7	560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	3532			3537
Flt Permitted	0.95	1.00	1.00			0.95
Satd. Flow (perm)	1770	1583	3532			3348
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	13	616	9	8	609
RTOR Reduction (vph)	0	12	0	0	0	0
Lane Group Flow (vph)	8	1	625	0	0	617
Turn Type		Perm			Perm	
Protected Phases	4		2			6
Permitted Phases		4			6	
Actuated Green, G (s)	7.1	7.1	138.9			138.9
Effective Green, g (s)	9.1	9.1	140.9			140.9
Actuated g/C Ratio	0.06	0.06	0.88			0.88
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	101	90	3110			2948
v/s Ratio Prot	c0.00		0.18			
v/s Ratio Perm		0.00				c0.18
v/c Ratio	0.08	0.01	0.20			0.21
Uniform Delay, d1	71.5	71.2	1.4			1.4
Progression Factor	1.00	1.00	0.74			0.61
Incremental Delay, d2	0.3	0.0	0.1			0.2
Delay (s)	71.8	71.2	1.2			1.0
Level of Service	E	E	A			A
Approach Delay (s)	71.5		1.2			1.0
Approach LOS	E		A			A

Intersection Summary				
HCM Average Control Delay	2.3	HCM Level of Service	A	
HCM Volume to Capacity ratio	0.20			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	34.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	32	320	635	39	183	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	11	11	11	11
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	0.98	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	0.88	0.85	0.99		1.00	1.00
Flt Protected	0.99	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1331	1249	2782		1539	1621
Flt Permitted	0.99	1.00	1.00		0.34	1.00
Satd. Flow (perm)	1331	1249	2782		546	1621
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	348	690	42	199	511
RTOR Reduction (vph)	118	154	2	0	0	0
Lane Group Flow (vph)	77	34	730	0	199	511
Confl. Peds. (#/hr)	5	5		5	5	
Parking (#/hr)			15	15		
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4	2		6	
Actuated Green, G (s)	14.6	24.7	114.3		131.4	131.4
Effective Green, g (s)	16.6	28.7	116.3		133.4	133.4
Actuated g/C Ratio	0.10	0.18	0.73		0.83	0.83
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	138	263	2022		530	1352
v/s Ratio Prot	c0.06	0.01	0.26		0.03	c0.32
v/s Ratio Perm		0.02			0.28	
v/c Ratio	0.56	0.13	0.36		0.38	0.38
Uniform Delay, d1	68.2	55.1	8.1		3.2	3.2
Progression Factor	1.00	1.00	0.94		5.56	5.72
Incremental Delay, d2	4.8	0.2	0.4		0.4	0.2
Delay (s)	73.0	55.4	8.0		18.2	18.6
Level of Service	E	E	A		B	B
Approach Delay (s)	64.3		8.0			18.5
Approach LOS	E		A			B

Intersection Summary				
HCM Average Control Delay	23.9	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.40			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	54.9%	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)	39	12	8	56	7	44	1	577	28	53	321	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.98			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.98			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1605			1589	1383	1270	1326		1265	1329	
Flt Permitted		0.73			0.71	1.00	0.55	1.00		0.32	1.00	
Satd. Flow (perm)		1205			1186	1383	729	1326		428	1329	
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)	42	13	9	61	8	48	1	627	30	58	349	12
RTOR Reduction (vph)	0	4	0	0	0	41	0	0	0	0	0	0
Lane Group Flow (vph)	0	60	0	0	69	7	1	657	0	58	361	0
Confl. Peds. (#/hr)	7		3	3		7	1		18	18		1
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm		custom	Perm			Perm		
Protected Phases		4			8	1		2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		14.5			14.5	20.1	118.9	118.9		131.5	131.5	
Effective Green, g (s)		16.5			16.5	24.1	120.9	120.9		133.5	133.5	
Actuated g/C Ratio		0.10			0.10	0.15	0.76	0.76		0.83	0.83	
Clearance Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		124			122	252	551	1002		357	1109	
v/s Ratio Prot						0.00		c0.50			c0.27	
v/s Ratio Perm		0.05			c0.06	0.00	0.00			0.14		
v/c Ratio		0.48			0.57	0.03	0.00	0.66		0.16	0.33	
Uniform Delay, d1		67.7			68.3	58.0	4.8	9.5		2.5	3.0	
Progression Factor		1.00			1.00	1.00	1.00	1.00		0.76	1.06	
Incremental Delay, d2		2.9			5.9	0.0	0.0	3.3		0.9	0.7	
Delay (s)		70.6			74.2	58.0	4.8	12.8		2.8	3.9	
Level of Service		E			E	E	A	B		A	A	
Approach Delay (s)		70.6			67.6			12.8			3.8	
Approach LOS		E			E			B			A	

Intersection Summary				
HCM Average Control Delay	17.8	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	64.7%	ICU Level of Service	C	
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)	97	15	19	29	6	14	12	502	15	11	309	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.92		1.00	0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.96	1.00		0.88	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.90		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1535	1412		1407	1447		1268	1329		1265	1307	
Flt Permitted	0.74	1.00		0.73	1.00		0.53	1.00		0.37	1.00	
Satd. Flow (perm)	1200	1412		1086	1447		711	1329		487	1307	
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)	105	16	21	32	7	15	13	546	16	12	336	51
RTOR Reduction (vph)	0	18	0	0	13	0	0	1	0	0	3	0
Lane Group Flow (vph)	105	19	0	32	9	0	13	561	0	12	384	0
Confl. Peds. (#/hr)	11		36	36		11	4		41	41		4
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm			Perm				pm+pt	
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.6	15.6		15.6	15.6		80.6	80.6		90.4	90.4	
Effective Green, g (s)	17.6	17.6		17.6	17.6		82.6	82.6		92.4	92.4	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.69	0.69		0.77	0.77	
Clearance Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	176	207		159	212		489	915		406	1006	
v/s Ratio Prot		0.01			0.01			c0.42		0.00	c0.29	
v/s Ratio Perm	c0.09			0.03			0.02			0.02		
v/c Ratio	0.60	0.09		0.20	0.04		0.03	0.61		0.03	0.38	
Uniform Delay, d1	47.9	44.3		45.0	44.0		5.9	10.1		4.4	4.5	
Progression Factor	1.00	1.00		1.00	1.00		0.97	0.98		1.00	1.00	
Incremental Delay, d2	5.3	0.2		0.6	0.1		0.1	3.1		0.0	1.1	
Delay (s)	53.2	44.5		45.6	44.1		5.9	13.0		4.5	5.6	
Level of Service	D	D		D	D		A	B		A	A	
Approach Delay (s)		50.9			45.0			12.8			5.6	
Approach LOS		D			D			B			A	

Intersection Summary				
HCM Average Control Delay	16.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	51.9%	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 (veh/h)	74	4	11	0	0	12	47	381	0	4	205	43
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)	80	4	12	0	0	13	51	414	0	4	223	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1286	
pX, platoon unblocked												
vC, conflicting volume	784	771	246	785	795	414	270			414		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	784	771	246	785	795	414	270			414		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	73	99	98	100	100	98	96			100		
cM capacity (veh/h)	294	316	793	292	307	638	1294			1145		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	97	13	465	274
Volume Left	80	0	51	4
Volume Right	12	13	0	47
cSH	320	638	1294	1145
Volume to Capacity	0.30	0.02	0.04	0.00
Queue Length 95th (ft)	31	2	3	0
Control Delay (s)	21.0	10.8	1.2	0.2
Lane LOS	C	B	A	A
Approach Delay (s)	21.0	10.8	1.2	0.2
Approach LOS	C	B		

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	57.9%	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)	25	7	21	1	0	6	32	213	0	4	182	28
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)	27	8	23	1	0	7	35	232	0	4	198	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	529	523	213	549	538	232	228			232		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	529	523	213	549	538	232	228			232		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	94	98	97	100	100	99	97			100		
cM capacity (veh/h)	446	445	827	419	437	808	1340			1336		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	58	8	266	233
Volume Left	27	1	35	4
Volume Right	23	7	0	30
cSH	546	713	1340	1336
Volume to Capacity	0.11	0.01	0.03	0.00
Queue Length 95th (ft)	9	1	2	0
Control Delay (s)	12.4	10.1	1.2	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	12.4	10.1	1.2	0.2
Approach LOS	B	B		

Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	42.1%	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 (vph)	25	28	166	6	10	7	137	60	21	21	72	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	3.0	3.0	4.0		3.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.96		1.00	0.94	
Flt Protected		0.98	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1820	1583		1827	1583	1770	1790		1770	1747	
Flt Permitted		0.89	1.00		0.92	1.00	0.67	1.00		0.70	1.00	
Satd. Flow (perm)		1659	1583		1719	1583	1252	1790		1304	1747	
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)	27	30	180	7	11	8	149	65	23	23	78	55
RTOR Reduction (vph)	0	0	135	0	0	6	0	13	0	0	31	0
Lane Group Flow (vph)	0	57	45	0	18	2	149	75	0	23	102	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.0	13.0		13.0	13.0	31.0	24.0		31.0	24.0	
Effective Green, g (s)		15.0	15.0		15.0	15.0	35.0	26.0		35.0	26.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.58	0.43		0.58	0.43	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	6.0		5.0	6.0	
Lane Grp Cap (vph)		415	396		430	396	808	776		831	757	
v/s Ratio Prot							c0.03	0.04		0.00	0.06	
v/s Ratio Perm		c0.03	0.03		0.01	0.00	c0.08			0.01		
v/c Ratio		0.14	0.11		0.04	0.01	0.18	0.10		0.03	0.13	
Uniform Delay, d1		17.5	17.4		17.1	16.9	5.7	10.1		5.3	10.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.14	1.13	
Incremental Delay, d2		0.7	0.6		0.2	0.0	0.5	0.2		0.1	0.4	
Delay (s)		18.2	18.0		17.2	16.9	6.2	10.3		6.1	11.9	
Level of Service		B	B		B	B	A	B		A	B	
Approach Delay (s)		18.0			17.1			7.7			11.0	
Approach LOS		B			B			A			B	

Intersection Summary				
HCM Average Control Delay	12.6	HCM Level of Service		B
HCM Volume to Capacity ratio	0.17			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		9.0
Intersection Capacity Utilization	34.0%	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)	7	85	866	7	22	464
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)	8	92	941	8	24	504
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1497	945			941	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1497	945			941	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	71			97	
cM capacity (veh/h)	130	318			728	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	8	92	949	24	504
Volume Left	8	0	0	24	0
Volume Right	0	92	8	0	0
cSH	130	318	1700	728	1700
Volume to Capacity	0.06	0.29	0.56	0.03	0.30
Queue Length 95th (ft)	5	30	0	3	0
Control Delay (s)	34.3	20.9	0.0	10.1	0.0
Lane LOS	D	C		B	
Approach Delay (s)	21.9		0.0	0.5	
Approach LOS	C				

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	14	950	14	57	431
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	15	1033	15	62	468
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1633	1040			1048	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1633	1040			1048	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	95			91	
cM capacity (veh/h)	101	280			664	

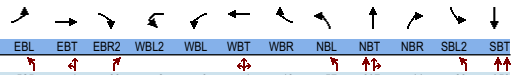
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	1048	530
Volume Left	1	0	62
Volume Right	15	15	0
cSH	250	1700	664
Volume to Capacity	0.07	0.62	0.09
Queue Length 95th (ft)	5	0	8
Control Delay (s)	20.4	0.0	2.5
Lane LOS	C		A
Approach Delay (s)	20.4	0.0	2.5
Approach LOS	C		

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	80.6%	ICU Level of Service		D
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	187	273	22	50	191
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	203	297	24	54	208
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	625	309			321	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	625	309			321	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	72			96	
cM capacity (veh/h)	429	731			1239	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	210	321	54	208
Volume Left	7	0	54	0
Volume Right	203	24	0	0
cSH	716	1700	1239	1700
Volume to Capacity	0.29	0.19	0.04	0.12
Queue Length 95th (ft)	31	0	3	0
Control Delay (s)	12.1	0.0	8.0	0.0
Lane LOS	B		A	
Approach Delay (s)	12.1	0.0	1.7	
Approach LOS	B			

Intersection Summary				
Average Delay	3.8			
Intersection Capacity Utilization	40.9%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL2	SBT
Lane Configurations												
Volume (vph)	525	1	33	2	6	1	18	57	807	11	33	958
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	0.95	0.95	1.00			1.00		1.00	0.95		1.00	0.95
Frt	1.00	1.00	0.85			0.91		1.00	1.00		1.00	1.00
Flt Protected	0.95	0.95	1.00			0.99		0.95	1.00		0.95	1.00
Satd. Flow (prot)	1681	1686	1583			1670		1770	3532		1770	3539
Flt Permitted	0.95	0.95	1.00			0.99		0.95	1.00		0.95	1.00
Satd. Flow (perm)	1681	1686	1583			1670		1770	3532		1770	3539
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)	571	1	36	2	7	1	20	62	877	12	36	1041
RTOR Reduction (vph)	0	0	28	0	0	19	0	0	0	0	0	0
Lane Group Flow (vph)	285	287	8	0	0	11	0	62	889	0	36	1041
Turn Type	Split		Perm	Perm	Split			Prot			Prot	
Protected Phases	3	3			4	4		5	2		1	6
Permitted Phases			3	4								
Actuated Green, G (s)	33.3	33.3	33.3			7.3		9.6	70.1		6.7	67.2
Effective Green, g (s)	35.3	35.3	35.3			9.3		11.6	72.1		8.7	69.2
Actuated g/C Ratio	0.22	0.22	0.22			0.06		0.07	0.45		0.05	0.43
Clearance Time (s)	7.0	7.0	7.0			7.0		7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	371	372	349			97		128	1592		96	1531
v/s Ratio Prot	0.17	c0.17				c0.01		c0.04	c0.25		0.02	c0.29
v/s Ratio Perm			0.01									
v/c Ratio	0.77	0.77	0.02			0.12		0.48	0.56		0.38	0.68
Uniform Delay, d1	58.5	58.6	48.8			71.4		71.3	32.3		73.0	36.5
Progression Factor	1.00	1.00	1.00			1.00		0.96	0.81		1.00	1.00
Incremental Delay, d2	9.2	9.5	0.0			0.5		2.7	1.3		2.5	2.5
Delay (s)	67.7	68.1	48.9			72.0		71.5	27.6		75.5	39.0
Level of Service	E	E	D			E		E	C		E	D
Approach Delay (s)		66.8				72.0			30.4			29.1
Approach LOS		E				E			C			C

Intersection Summary				
HCM Average Control Delay	36.6	HCM Level of Service	D	
HCM Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	30.0	
Intersection Capacity Utilization	76.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	SBR	NWL2	NWL	NWR	NWR2
Lane Configurations					
Volume (vph)	746	4	2	8	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0		
Lane Util. Factor	1.00		1.00		
Frt	0.85		0.92		
Flt Protected	1.00		0.98		
Satd. Flow (prot)	1583		1674		
Flt Permitted	1.00		0.98		
Satd. Flow (perm)	1583		1674		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	811	4	2	9	1
RTOR Reduction (vph)	281	0	1	0	0
Lane Group Flow (vph)	530	0	15	0	0
Turn Type	pm+ov	Perm			
Protected Phases	3		7		
Permitted Phases	6	7			
Actuated Green, G (s)	100.5		7.6		
Effective Green, g (s)	104.5		9.6		
Actuated g/C Ratio	0.65		0.06		
Clearance Time (s)	7.0		7.0		
Vehicle Extension (s)	3.0		3.0		
Lane Grp Cap (vph)	1083		100		
v/s Ratio Prot	0.11				
v/s Ratio Perm	0.23		0.01		
v/c Ratio	0.49		0.15		
Uniform Delay, d1	14.1		71.3		
Progression Factor	1.00		1.00		
Incremental Delay, d2	0.3		0.7		
Delay (s)	14.5		72.0		
Level of Service	B		E		
Approach Delay (s)			72.0		
Approach LOS			E		

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	72	51	1079	51	28	923
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	1.00	1.00	0.95			0.95
Frt	1.00	0.85	0.99			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1770	1583	3515			3534
Flt Permitted	0.95	1.00	1.00			0.86
Satd. Flow (perm)	1770	1583	3515			3053
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	55	1173	55	30	1003
RTOR Reduction (vph)	0	50	2	0	0	0
Lane Group Flow (vph)	78	5	1226	0	0	1033
Turn Type		Perm			Perm	
Protected Phases	4		2			6
Permitted Phases		4			6	
Actuated Green, G (s)	12.4	12.4	133.6			133.6
Effective Green, g (s)	14.4	14.4	135.6			135.6
Actuated g/C Ratio	0.09	0.09	0.85			0.85
Clearance Time (s)	7.0	7.0	7.0			7.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	159	142	2979			2587
v/s Ratio Prot	c0.04		c0.35			
v/s Ratio Perm		0.00				0.34
v/c Ratio	0.49	0.03	0.41			0.40
Uniform Delay, d1	69.3	66.5	2.9			2.8
Progression Factor	1.00	1.00	0.54			4.38
Incremental Delay, d2	2.4	0.1	0.4			0.4
Delay (s)	71.7	66.6	1.9			12.7
Level of Service	E	E	A			B
Approach Delay (s)	69.6		1.9			12.7
Approach LOS	E		A			B

Intersection Summary				
HCM Average Control Delay	10.3	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.42			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	59.9%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	43	296	719	43	299	711
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	10	10	11	11	11	11
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	0.98	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	0.89	0.85	0.99		1.00	1.00
Flt Protected	0.99	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1347	1255	2782		1539	1621
Flt Permitted	0.99	1.00	1.00		0.27	1.00
Satd. Flow (perm)	1347	1255	2782		441	1621
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	322	782	47	325	773
RTOR Reduction (vph)	76	107	2	0	0	0
Lane Group Flow (vph)	113	73	827	0	325	773
Confl. Peds. (#/hr)	5	5		5	5	
Parking (#/hr)			15	15		
Turn Type		pm+ov			pm+pt	
Protected Phases	4	1	2		1	6
Permitted Phases		4	2		6	
Actuated Green, G (s)	18.2	44.0	95.0		127.8	127.8
Effective Green, g (s)	20.2	48.0	97.0		129.8	129.8
Actuated g/C Ratio	0.13	0.30	0.61		0.81	0.81
Clearance Time (s)	7.0	7.0	7.0		7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	170	416	1687		549	1315
v/s Ratio Prot	c0.08	0.03	0.30		0.10	c0.48
v/s Ratio Perm		0.03			c0.38	
v/c Ratio	0.66	0.18	0.49		0.59	0.59
Uniform Delay, d1	66.7	41.4	17.6		6.7	5.4
Progression Factor	1.00	1.00	0.73		4.52	4.81
Incremental Delay, d2	9.4	0.2	1.0		1.6	0.6
Delay (s)	76.1	41.6	13.8		31.9	26.9
Level of Service	E	D	B		C	C
Approach Delay (s)	59.2		13.8			28.4
Approach LOS	E		B			C

Intersection Summary				
HCM Average Control Delay	28.1	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	64.9%	ICU Level of Service	C	
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)	21	22	14	66	19	103	14	479	36	69	561	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	13	13	12	12	12	11	11	11	11	11	11
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99			0.99	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1618			1601	1387	1270	1320		1264	1326	
Flt Permitted		0.84			0.71	1.00	0.42	1.00		0.35	1.00	
Satd. Flow (perm)		1390			1188	1387	564	1320		472	1326	
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)	23	24	15	72	21	112	15	521	39	75	610	30
RTOR Reduction (vph)	0	8	0	0	0	92	0	1	0	0	1	0
Lane Group Flow (vph)	0	54	0	0	93	20	15	559	0	75	639	0
Confl. Peds. (#/hr)	7		3	3		7	1		18	18		1
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm		custom	Perm			Perm		
Protected Phases		4			8	1		2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		17.5			17.5	24.5	114.5	114.5		128.5	128.5	
Effective Green, g (s)		19.5			19.5	28.5	116.5	116.5		130.5	130.5	
Actuated g/C Ratio		0.12			0.12	0.18	0.73	0.73		0.82	0.82	
Clearance Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		169			145	290	411	961		385	1082	
v/s Ratio Prot						0.00		0.42			c0.48	
v/s Ratio Perm		0.04			c0.08	0.01	0.03			0.16		
v/c Ratio		0.32			0.64	0.07	0.04	0.58		0.19	0.59	
Uniform Delay, d1		64.2			66.9	54.7	6.1	10.3		3.2	5.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		0.43	0.38	
Incremental Delay, d2		1.1			9.3	0.1	0.2	2.6		0.9	1.9	
Delay (s)		65.3			76.2	54.8	6.2	12.8		2.3	3.9	
Level of Service		E			E	D	A	B		A	A	
Approach Delay (s)		65.3			64.5			12.7			3.7	
Approach LOS		E			E			B			A	

Intersection Summary				
HCM Average Control Delay	17.5	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	160.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	63.7%	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)	64	14	29	58	14	25	35	449	21	21	521	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	11	11	11	11	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.89		1.00	0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.96	1.00		0.86	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90		1.00	0.90		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1524	1335		1370	1452		1269	1325		1265	1306	
Flt Permitted	0.73	1.00		0.73	1.00		0.42	1.00		0.40	1.00	
Satd. Flow (perm)	1171	1335		1048	1452		557	1325		532	1306	
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)	70	15	32	63	15	27	38	488	23	23	566	87
RTOR Reduction (vph)	0	28	0	0	24	0	0	1	0	0	3	0
Lane Group Flow (vph)	70	19	0	63	18	0	38	510	0	23	650	0
Confl. Peds. (#/hr)	11		36	36		11	4		41	41		4
Parking (#/hr)							15	15	15	15	15	15
Turn Type	Perm			Perm			Perm				pm+pt	
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.5	12.5		12.5	12.5		82.3	82.3		93.5	93.5	
Effective Green, g (s)	14.5	14.5		14.5	14.5		84.3	84.3		95.5	95.5	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.70	0.70		0.80	0.80	
Clearance Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	161		127	175		391	931		461	1039	
v/s Ratio Prot		0.01			0.01			0.38		0.00	c0.50	
v/s Ratio Perm	0.06			c0.06			0.07			0.04		
v/c Ratio	0.50	0.12		0.50	0.10		0.10	0.55		0.05	0.63	
Uniform Delay, d1	49.3	47.0		49.3	47.0		5.7	8.6		3.4	5.0	
Progression Factor	1.00	1.00		1.00	1.00		0.95	0.98		1.00	1.00	
Incremental Delay, d2	2.7	0.3		3.0	0.3		0.5	2.3		0.0	2.8	
Delay (s)	52.1	47.4		52.4	47.2		5.9	10.7		3.5	7.8	
Level of Service	D	D		D	D		A	B		A	A	
Approach Delay (s)		50.2			50.3			10.4			7.7	
Approach LOS		D			D			B			A	

Intersection Summary				
HCM Average Control Delay	15.2	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0	
Intersection Capacity Utilization	56.8%	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 (veh/h)	25	0	12	0	0	6	8	397	0	14	435	35
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)	27	0	13	0	0	7	9	432	0	15	473	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1286	
pX, platoon unblocked												
vC, conflicting volume	978	971	492	984	990	432	511			432		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	978	971	492	984	990	432	511			432		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	88	100	98	100	100	99	99			99		
cM capacity (veh/h)	224	247	577	219	241	624	1054			1128		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	40	7	440	526
Volume Left	27	0	9	15
Volume Right	13	7	0	38
cSH	279	624	1054	1128
Volume to Capacity	0.14	0.01	0.01	0.01
Queue Length 95th (ft)	12	1	1	1
Control Delay (s)	20.1	10.8	0.3	0.4
Lane LOS	C	B	A	A
Approach Delay (s)	20.1	10.8	0.3	0.4
Approach LOS	C	B		

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	47.7%	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)	46	0	39	1	1	4	21	350	0	1	283	36
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)	50	0	42	1	1	4	23	380	0	1	308	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	760	755	327	798	775	380	347			380		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	760	755	327	798	775	380	347			380		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	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 %	84	100	94	100	100	99	98			100		
cM capacity (veh/h)	315	331	714	282	322	667	1212			1178		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	92	7	403	348
Volume Left	50	1	23	1
Volume Right	42	4	0	39
cSH	423	474	1212	1178
Volume to Capacity	0.22	0.01	0.02	0.00
Queue Length 95th (ft)	21	1	1	0
Control Delay (s)	15.9	12.7	0.6	0.0
Lane LOS	C	B	A	A
Approach Delay (s)	15.9	12.7	0.6	0.0
Approach LOS	C	B		

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	52.5%	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 (vph)	52	46	129	14	28	10	247	163	40	50	85	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.0	3.0		3.0	3.0	3.0	4.0		3.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.97		1.00	0.94	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1814	1583		1832	1583	1770	1808		1770	1744	
Flt Permitted		0.84	1.00		0.91	1.00	0.66	1.00		0.60	1.00	
Satd. Flow (perm)		1570	1583		1693	1583	1221	1808		1124	1744	
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)	57	50	140	15	30	11	268	177	43	54	92	68
RTOR Reduction (vph)	0	0	105	0	0	8	0	15	0	0	39	0
Lane Group Flow (vph)	0	107	35	0	45	3	268	205	0	54	121	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		13.0	13.0		13.0	13.0	31.0	24.0		31.0	24.0	
Effective Green, g (s)		15.0	15.0		15.0	15.0	35.0	26.0		35.0	26.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.58	0.43		0.58	0.43	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	6.0		5.0	6.0	
Lane Grp Cap (vph)		393	396		423	396	795	783		753	756	
v/s Ratio Prot							c0.05	0.11		0.01	0.07	
v/s Ratio Perm		c0.07	0.02		0.03	0.00	c0.15			0.03		
v/c Ratio		0.27	0.09		0.11	0.01	0.34	0.26		0.07	0.16	
Uniform Delay, d1		18.1	17.3		17.3	16.9	6.1	10.9		5.4	10.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.05	1.10	
Incremental Delay, d2		1.7	0.4		0.5	0.0	1.1	0.8		0.2	0.4	
Delay (s)		19.8	17.7		17.8	16.9	7.3	11.7		5.8	11.8	
Level of Service		B	B		B	B	A	B		A	B	
Approach Delay (s)		18.6			17.7			9.3			10.3	
Approach LOS		B			B			A			B	

Intersection Summary				
HCM Average Control Delay	12.3	HCM Level of Service		B
HCM Volume to Capacity ratio	0.31			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		9.0
Intersection Capacity Utilization	44.0%	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)	8	57	866	18	82	735
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)	9	62	941	20	89	799
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1928	951			941	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1928	951			941	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	80			88	
cM capacity (veh/h)	64	315			728	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	9	62	961	89	799
Volume Left	9	0	0	89	0
Volume Right	0	62	20	0	0
cSH	64	315	1700	728	1700
Volume to Capacity	0.14	0.20	0.57	0.12	0.47
Queue Length 95th (ft)	11	18	0	10	0
Control Delay (s)	69.8	19.2	0.0	10.6	0.0
Lane LOS	F	C		B	
Approach Delay (s)	25.4		0.0	1.1	
Approach LOS	D				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	8	592	4	7	774
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	9	643	4	8	841
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1502	646			648	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1502	646			648	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			99	
cM capacity (veh/h)	133	472			938	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	12	648	849
Volume Left	3	0	8
Volume Right	9	4	0
cSH	278	1700	938
Volume to Capacity	0.04	0.38	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	18.5	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	18.5	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	97	316	0	144	298
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)	0	105	343	0	157	324
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	980	343			343	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	980	343			343	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	85			87	
cM capacity (veh/h)	241	699			1216	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	105	343	157	324
Volume Left	0	0	157	0
Volume Right	105	0	0	0
cSH	699	1700	1216	1700
Volume to Capacity	0.15	0.20	0.13	0.19
Queue Length 95th (ft)	13	0	11	0
Control Delay (s)	11.1	0.0	8.4	0.0
Lane LOS	B		A	
Approach Delay (s)	11.1	0.0	2.7	
Approach LOS	B			

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		

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