# 2011Village of Pinehurst Thoroughfare Plan

**Adopted 10/11/11**

# 2011 Village of Pinehurst Thoroughfare Plan

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## Introduction

The existing thoroughfare plan was completed twenty years ago by the North Carolina Department of Transportation for Aberdeen, Pinehurst and Southern Pines. Much of the functional classification system found in this plan is based on the original thoroughfare map.

The purpose of this thoroughfare planning document is to ensure that Pinehurst's road network will be both dynamic and strategic in its development and will be sufficient to serve both future travel and future land use demands for the Village of Pinehurst and surrounding communities of Moore County. Ultimately, the goal is for traffic to function in the most efficient manner possible. The basic principles applied in the development of Pinehurst's local thoroughfare plan establish a foundation upon which to seek and support a local consensus of the vision for Pinehurst's future transportation system. This endeavor is based upon collected data and identification of emerging needs due to growth and development.

By endorsing a local developed thoroughfare plan, the Village of Pinehurst will facilitate the implementation of roadway improvements and manage projected growth permitting travel in Pinehurst to occur safely and unrestricted by congestion.

Due to physical roadway conditions, deteriorating level of service, and increasing traffic volumes; congestion has become prevalent along specific corridors in Moore County. In addition, development partnered with land-use patterns have progressed inconsistently with the existing roadway network. To identify possible improvements, the existing roadway network should be delineated with respect to travel use, contiguous land use, and local vision.

## Classification System

The role of each road is to provide mobility of travel and access to property. However, the streets in our transportation system are designed to carry traffic in different ways, and it is important to delineate by category these roadways in consideration of future service and improvements. Facility classifications germane to the Village of Pinehurst are as follows:

> **Major Thoroughfares** function as the primary traffic arterial and provide for traffic movements within, through, and around the area. Major arterials are the "highest order" of surface streets and typically carry high volumes of traffic. Examples of major thoroughfares in Pinehurst are mostly state routes such as Highway 211, Juniper Lake Road, Highway 15-501, Midland Road, Morganton Road, Highway 5/Beulah Hill Road and Linden Road
>
> **Minor Thoroughfares** are designed to collect traffic from the local streets to the major thoroughfares. Minor thoroughfares serve a similar function as major thoroughfares;

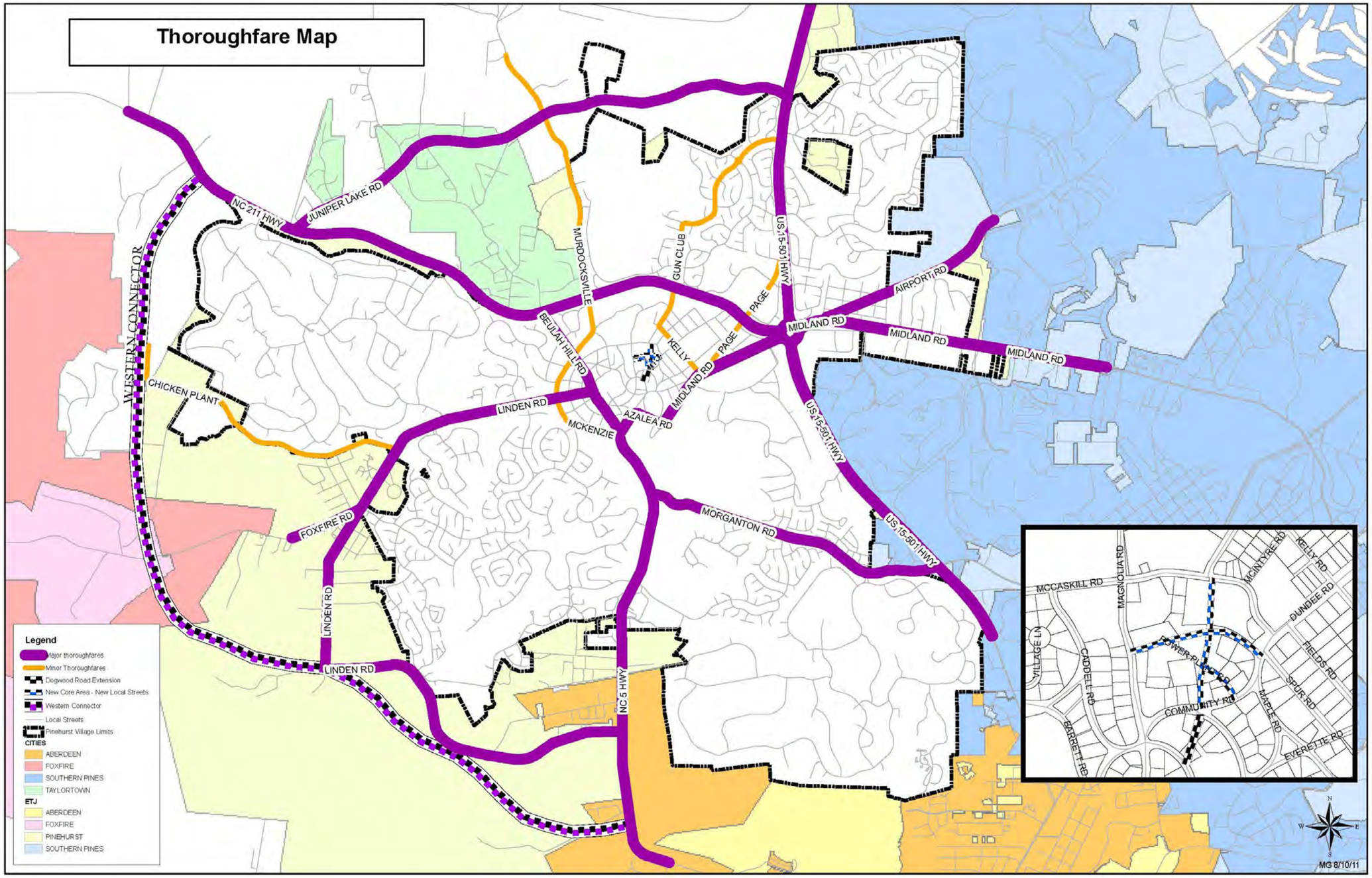
however, these roads carry less traffic over shorter distances than major thoroughfares. Examples of minor thoroughfares in Pinehurst include; McKenzie Road, Murdocksville Road, Rattlesnake Trail, Gunclub Road, Spring Lake Drive, Kelly Road and Chicken Plant Road.

**Collector Streets** provide access to abutting properties. Local streets may be further classified as residential or commercial. Through traffic is generally discouraged on residential access streets, however, there are a few roads where these streets connect to thoroughfares. Examples would be Monticello Drive and Fields Road. There are local access streets in Pinehurst South which function as commercial access roads such as Blake Boulevard and Parker Lane.

## Thoroughfare Map

The Thoroughfare Map, included in this report on the next page, indicates how Pinehurst's roadways are classified for future road function, based on the categories of roads discussed above.

# Thoroughfare Map



## Transportation Planning

The Village of Pinehurst participates in the rural policy organization known as the Triangle Area Rural Policy Organization (TARPO). In the last decade the Village has worked dividing transportation planning efforts into long range and short range transportation planning.

## Short Range Transportation Studies and Plans

### Community Indicator Reports

In 2004 as a result of concerns over the quality of home development and efforts from the 2003 Village Long Range Plan, the annual Community Indicator Reports were undertaken by the planning staff. These reports focused on key /critical community indicators which included transportation. Utilizing Carl Simmons, traffic engineer and consultant, several key local improvements were made as a result of this excellent planning effort.

In the May 2006 Community Indicator report four intersections were selected for study which resulted in the intersection improvement at NC 5 and NC 2. The roundabout at Carolina Vista and NC 2 was included in this report and the 2003 Comprehensive Plan.

### NC 5 Bi-Annual Traffic Update

In 2005 the Village of Pinehurst completed a traffic review of the major intersections along NC 5, NC 2, and NC 211. The study provided a base condition of the existing traffic at these locations. In 2005, peak hour counts were obtained and the Level of Service at the intersections calculated. This information is important because it will be used to make future comparison, so that transportation projects can be developed for the Village. The Village has set up a two-year cycle for updating the traffic information along these transportation corridors. Studies were completed in 2005, 2007, 2009 and most recently the 2011 report.

Along NC 5, the seven intersections studied are:

- NC 5@ McDonald
- NC 5@ McKenzie
- NC 5 @ Barrett/McCaskill
- NC 5 @ NC2/McKenzie
- NC 5 @ Morganton
- NC 5 @ Monticello
- NC 5 @ Blake

Please refer to Appendix A for a summary of the approach volumes for the different intersection legs along the NC 5 corridor for the study years referenced above. Carl Simmons, PE prepared all of the referenced reports for the Village of Pinehurst in November 2005, May 2009 and May 2011. The Highway Capacity Manual standards were utilized in establishing the level of service (LOS). Several of the intersections are showing level of service changes since they were last studied in 2009. The westbound AM traffic at the intersection of NC 5 and McDonald Road is slightly improved from a level of service D changing to a level of service C.

The intersection of NC 5 at McKenzie Road is also showing an improved level of service for AM westbound traffic and PM eastbound traffic. This increase was caused by a 30% decrease in traffic on McKenzie Road. Consequently, this improved the AM westbound LOS on McKenzie Road from a LOS D to LOS C, and the eastbound PM level of service on McKenzie Road from LOS E to LOS D.

Levels of service improvements are also occurring on the Barrett/McCaskill six way intersection. The software and motion cameras used for the study could not analyze a six way intersection, so the traffic on Barrett Road and McCaskill Road was statistically combined to a four way intersection for better analysis. The AM eastbound level of service improved from LOS E to LOS C, while the AM westbound Level of Service improved from LOS F to LOS D. The PM analysis showed an improvement in the Level of Service for the eastbound traffic from LOS D to LOS C while the westbound Level of Service remained the same.

With stop signs controlling intersections, the poor levels of service can be found on the side streets along NC 5. The first signalized intersection in the study was NC 5 and NC 2 (Cherokee Road). The Simmons 2011 study found that traffic along NC 5 had increased by approximately 15% for the AM peak hour since the 2009 study. This increase has caused a decrease in the Level of Service during that peak hour from LOS B to LOS C. A slight increase in the PM peak hour did not change the level of service.

Please note at signalized intersections the Synchro software calculates the complete intersection.

At NC 5 and Morganton Road, north and southbound, AM traffic increased by 6%. This increase has caused both the northbound and southbound traffic at the intersection to decrease from LOS B to LOS C. The PM traffic at this intersection had an increase of 10% on the northbound, southbound and eastbound lanes which impacted the level of service, which decreased from LOS B to LOS D. The analysis stated this should not be cause for concern because the delay time only exceeds the level of C threshold by .7 seconds.

There were no changes to report in the level of service at the two remaining signalized intersections; NC 5 at Monticello Drive (East) and Lake Hills (West) and NC 5 at Blake Boulevard (East) and Trotter Road (West), which remained at the same level of service since the 2009 report period.

Please refer to NC 5 2011 Traffic Update in its entirety in Appendix A of this Thoroughfare Plan.

## Long Range Transportation Planning

### 2003 Comprehensive Long Range Plan

It is not the intent of this Comprehensive Plan to accommodate traffic growth in Pinehurst to the exclusion of other factors. Community character is an essential element of what makes Pinehurst special and the community intends to fit transportation improvement that may be necessary into the fabric of the community rather than to the detriment of community character. This balancing act will be one of the challenges to the Plan.

To protect community character, roadway modifications will:

- Be limited to major thoroughfares to the extent possible,
- Discourage through traffic in residential neighborhoods,
- Maintain or enhance the roadway character (especially on historic and scenic roads such as Midland Road (the oldest median-divided highway in North Carolina) and Linden Road,
- Exhibit roadway designs that support and reinforce the "character" of Pinehurst.

Much of Pinehurst and the surrounding area has been developed with only a limited number of either continuous north-south or east-west roadways through the area. This has concentrated travel on a limited number of major roadways and is one of the reasons why traffic congestion is increasing in Pinehurst. The 2003 plan recommends improvement of regional connectivity through the establishment of alternative routes and roadway connections. Additional roadway connections will help distribute traffic over more routes and help reduce congestion.

As was stated in the 2003 Plan, the Pinehurst area has been developed with only a limited number of major roadways. This has concentrated travel on a few corridors which lead to and through the village. As traffic increases in the region, it ultimately increases in Pinehurst because four major highways pass through our historic village. These highways include:

- US 15-501
- NC 5
- NC 2
- NC 211

The 2003 plan strongly recommends the construction of the western bypass (also known as the western connector in later plans) to reduce traffic flow through the Village.

## 2010 Comprehensive Long Range Plan

The Village of Pinehurst has had a roadway system for over a century, and there have been no significant changes for over forty years. The population has increased significantly over the last twenty years. Traffic congestion is of major importance, and its impact will become even more pronounced as the area continues to grow. Unfortunately, Pinehurst is incapable of solving these issues by itself because some traffic issues are the result of developments approved by adjacent communities. Meanwhile, the land area needed for such improvements falls under the jurisdiction of the North Carolina Department of Transportation (NCDOT), Moore County, or other incorporated places. Pinehurst encourages others to consider a long-term strategy in order for regional traffic needs to be met and to ensure that the overall character of Pinehurst is maintained and protected.

We need to manage the transportation system to ensure that it operates safely and with a reasonable level of service, supports community structure, and enhances community character. Pinehurst's character is an essential element of what makes it special, and transportation improvements should be designed to blend into the character of the community. It is the Village of Pinehurst's policy that traffic improvements should not have an adverse impact on ambience and character of the community. The Pinehurst area has been developed with only a limited number of major roadways, which has concentrated travel on these few corridors and is a main cause of increasing traffic congestion in Pinehurst and the surrounding areas. Since 2003 this problem has gotten worse. Additional housing has been constructed, and new developments have been approved, all without approving or constructing any new roadways. Directly, traffic volumes and congestion are increasing and are expected to increase significantly on all major roads in the area.

Pinehurst has sought to improve regional connectivity by establishing one or more alternative routes/roadway connections. Proposed projects significant to Pinehurst and the region are:

- Western Connector North - connecting Hwy 211 near Pinewild to Foxfire Road
- Western Connector South - connecting Foxfire Road to Linden Road near Lake Pinehurst and to NC Hwy5.
- Southern Connector - connecting NC Hwy 5 near Linden Road to the US 15-501 commercial area.
- Juniper Lake Road - widening and other improvements to provide relief to NC Hwy 211 and an alternate route to Carthage and points north of Pinehurst.

In addition to establishing alternative routes, Pinehurst must strive to ensure that necessary improvements be made to existing major roadways while preserving the community's character during this process. Some proposals for roadway improvements in the area include:

- **NC Hwy 211** – is presently being reconstructed as a four-lane highway by NCDOT. The village should make sure that improvements occur in a manner that is as compatible as possible with the character of Pinehurst with decorative traffic signals, tree lined center medians, pedestrian crossings and sidewalks where appropriate.
- **US 15-501** – needs a raised median, pedestrian/bicycle crossings, and realignment of Spring Lake Road at its intersections with Highway 15-501. We should advocate for these future improvements to be context sensitive and keep the tree canopy where ever possible.
- **Traffic Circle**- should be retained and preserved as it is a significant element in community character and an important entrance into the Village of Pinehurst.
- **NC Hwy 2** - should be further improved with a roundabout or other intersection improvement feature at Fields/Cherokee. It is important that traffic be guided to the village center at this location. Also additional improvements are needed at the Page Road intersection with NC 2.
- **NC Hwy 2** - (East of Traffic Circle)-should be preserved and maintained as North Carolina's oldest median-divided highway in a manner that promotes it beauty and historic character.
- **NC Hwy 5** – needs continued intersection improvements, with traffic volumes projected to increase beyond the road's capacity, establishing an alternate route is paramount in preserving the community historic character and quality of life. Make intersection improvements with preference for roundabouts especially at the Barrett/McCaskill intersection.
- **Morganton Rd. /Linden Rd** –we should encouraging alternative routes so as to minimize traffic growth in these areas.

In addition, Pinehurst needs to advocate and participate in local road improvements which:

- Advocate for context sensitive design in all transportation planning and design efforts
- Continue to prefer roundabouts over signalized intersection and other traffic control devices when considering intersection improvements.
- Assure appropriate landscaping as a high priority on road projects in our jurisdiction
- Preserve the tree canopy on local and regional projects to maintain our community character
- Preserve and enhance landscaping at gateway intersections
- Maintain and enhance landscape along road corridors
- Maintain strong design controls in the transportation planning review process
- Continue to investigate methods to minimize the overall costs of future pavement maintenance
- Continue to monitor traffic speeds

- Continue efforts to minimize the number of curb cuts and other possible disruptions to traffic flow, capacity, and safety on major roads.
- Continue to plan for additional sidewalks and trails to be integrated with local streets and NCDOT projects

**Expansion of the Village Center Road Network**

Pedestrian and traffic patterns have been the subject of many studies in our Village Center and the New Core area. It is important to have a continuous level of pedestrian interest along our core Village streets. This type of expansion will maintain an active streetscape, which should lead to a strong market and an enhanced level of interest in the village center and adjacent areas.

The pedestrian connection needs to be resolved during the design of the Dogwood Road extension project. The planned roadway shown in the Thoroughfare Map for Dogwood Road extension should begin development in the near future to connect the Village Center with the proposed development in the New Core area. It is important to the success of future development and redevelopment projects; such as Magnolia Place and the Performing Arts Center.

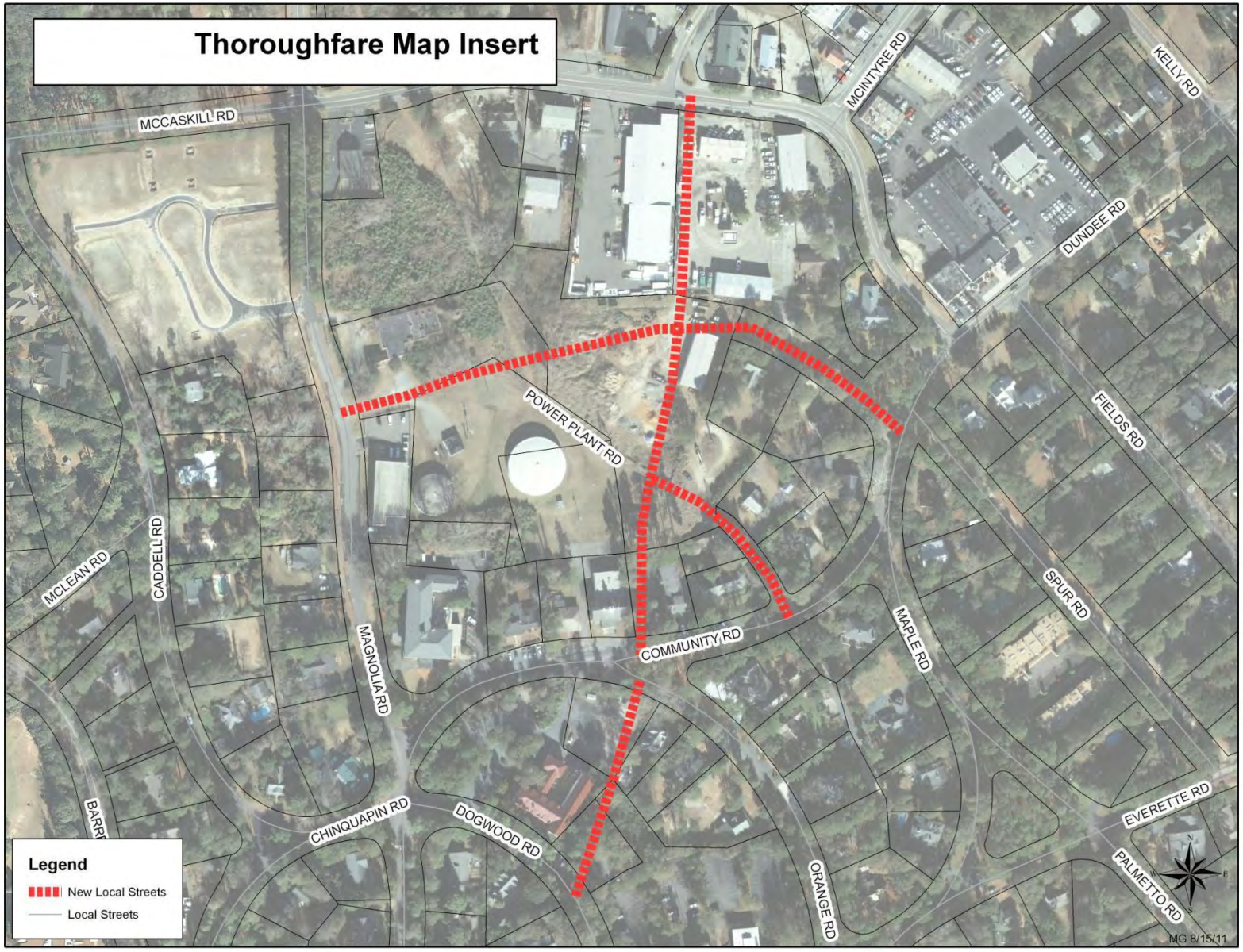
Another key issue outlined in the 2010 Comprehensive Plan is the incremental expansion of development. The continued success of existing mixed use development in the Village center is dependent on methodical incrementalism in expansion of our core village. This incremental approach to development will be controlled by zoning. Retail uses will occur in the VC zoning district which should be cautiously extended as the situation warrants.

This zoning process will clearly delineate the area where a retail streetscape is to occur. The first step is capital improvement planning for the Dogwood Road expansion project.

The adopted Implementation Element of the 2010 Comprehensive plan further supports the extension of Dogwood Road as the best method of expanding our village center business district to connect with the New Core redevelopment area.

The New Core Plan incorporates a concept in which new local access streets will be designed and constructed in order to break up the large block of land surrounded by McCaskill Road, Magnolia Road, Dundee Road and Community Road into a series of smaller development blocks consistent with the existing commercial development within the village center. The intent is to create a walkable, lively, human scale development area that will be an attraction to residents and visitors alike.

See the Dogwood Road Extension as well as the connecting blocks of roads associated with redevelopment in New Core location map on the following page.


Thoroughfare Map Insert
MCCASKILL RD
MCINTYRE RD
KELLY RD
DUNDEE RD
POWER PLANT RD
FIELDS RD
MCLEAN RD
CADDELL RD
MAGNOLIA RD
COMMUNITY RD
MAPLE RD
SPUR RD
CHINQUAPIN RD
DOGWOOD RD
EVERETTE RD
ORANGE RD
PALMETTO RD
Legend
New Local Streets
Local Streets
MG 8/15/11

## Bike/Pedestrian

A major strategy of the Strategic Element of the 2010 Comprehensive Plan is to prepare a pedestrian/Bicycle Master Plan. Due to the growing interest in walking and bicycling, this plan's goals see to standardize the overall approach to bicycle and pedestrian circulation in Pinehurst and to find ways to provide more and better facilities throughout the community.

The 2010 Comprehensive Plan Implementation Strategy calls for development of a Bicycle/Pedestrian Master Plan slated for completion in 2013. An ongoing goal is to provide for bicycles in the Village Center area. Pinehurst presently has brick sidewalks in the busiest parts and sand-clay walkways in other areas. In addition, a greenway trail system has been established which connects some of the surrounding areas to the Village Center. Since the brick sidewalks enhance the overall Village Center experience, the Plan recommends that brick sidewalks of generous width continue to be maintained in the business areas of the Village Center and expanded along major roadways to connect to major uses as opportunities present themselves. The historic sand/clay paths in the Village Center area should be retained in historic district residential areas but these are not considered appropriate for high foot-traffic and business areas since they can be messy and are often not well-maintained.

In outlying areas, the long-term goal is to provide for pedestrian circulation through establishment of sidewalks in business areas and establishment of a greenway trail system in residential neighborhoods. It may be desirable to consider the establishment of sidewalks along some of the major streets in the residential neighborhoods or seek more ways to help people get to the greenway trail system. In the 2010 Comprehensive Plan telephone survey 64 percent of respondents felt that Pinehurst needed more sidewalks on main roads in residential neighborhoods. In addition, 56 percent of those surveyed indicated they would walk more if there was an improved trail system in Pinehurst.

The Sandhills area is known regionally as an area for bicyclists, and bicycle use within Pinehurst is increasing for recreational and other reasons. In public meetings held as part of preparing the 2010 Comprehensive Long Range Plan, residents indicated they would ride a bicycle more often if there were an improved trail system in Pinehurst. If the trail system connected to adjacent communities, the appeal of bicycle riding would greatly increase.

Within the Village Center, bicycle use is easily accommodated due to the low travel speeds and a variety of routes. The Resort provides bicycles for guests to explore the Village Center and other areas. Outside of the Center, the greenway network could provide for bicycle circulation in a way that supports and enhances community character. This might include improved road shoulders, striped bike lanes, additional signage, and bicycle racks. Overall, Pinehurst should seek ways to provide for and encourage bicycle circulation and for bike lanes to be considered in future road projects.

## Conclusion

The Village of Pinehurst should continue to work closely with the Moore County Multi-modal Transportation Plan being prepared by the planning branch at NCDOT. Without this plan in place, we will not be eligible for future NCDOT road improvement projects.

The continued bi-yearly traffic update is essential to managing local and state partnered projects such as the intersection improvement at NC 5 and NC 2 as well as the roundabout at Carolina Vista and NC 2.

In the last decade the Village has worked diligently both in excellent capital improvement planning and exceptional comprehensive planning to assure that the Village of Pinehurst's quality is preserved and maintained for future generations.

Appendix A

# NC 5

## 2011 TRAFFIC UPDATE

PREPARED FOR *THE VILLAGE OF PINEHURST*

Prepared By

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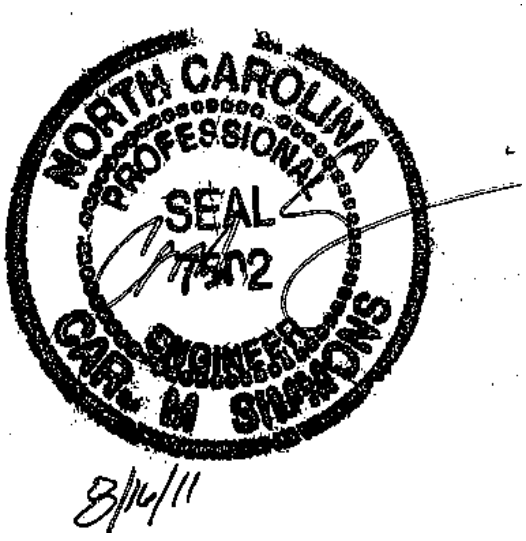
May 23, 2011



***BACKGROUND***

In 2005 the Village of Pinehurst did a traffic review of the major intersections along NC 5, NC 2, and NC 211. The study provided a base condition of the existing traffic at these locations. In 2005, peak hour traffic counts were obtained and the Level of Service at the study intersections was calculated. That information is the base on which to make future comparisons so that transportation plans and projects can be developed for the Village. The Village has set up a 2 year cycle for updating the traffic information along these transportation corridors. The first update was done in 2007, the second update was performed in 2009 and the current update has recently been completed for the intersections along NC 5.

***2011 UPDATE***

Along NC 5, seven intersections were studied and those intersections are listed below.

NC 5 @ McDonald – April 26, 2011

NC 5 @ McKenzie – April 21, 2011

NC 5 @ Barrett/McCaskill – April 20, 2011

NC 5 @ NC 2/McKenzie – April 19, 2011

NC 5 @ Morganton – April 14, 2011

NC 5 @ Monticello – April 13, 2011

NC 5 @ Blake – April 12, 2011

New AM and PM peak hour turning movement counts were taken at the above intersections during April. At the NC 5/McDonald, NC 5/Morganton and NC5/Blake/Trotter intersections, AM, Noon and PM turning movement counts were taken. The counts were performed utilizing Miovision Technologies Classic Video Collections Unit. The counts coincided with the schools being open. Figure 1 shows the peak hour volumes for the northern section of NC 5 and Figure 2 shows the peak hour volumes for the southern section of NC 5.

Table 1 is a summary of the approach volumes for the different intersection legs along the NC 5 corridor for the study years of 2005, 2007, 2009 and 2011. Approach volumes are the sum of the actual turning movement counts for that leg of the intersection. By comparing approach volumes over the different years, one can see the amount traffic change that has taken place along this roadway.

# Pinehurst 2005-2011 AM & PM Peak Hour Approach Volumes

*North Section of NC 5 between McDonald and Barrett*

**McDonald & NC 5**

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 387 | 366 | 522 | 561 | 39 | | 434 | 447 | 507 | 553 | 46 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 8 | 7 | 8 | 6 | -2 | | 13 | 5 | 7 | 5 | -2 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 302 | 303 | 352 | 456 | 104 | | 346 | 464 | 431 | 458 | 27 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 16 | 14 | 41 | 53 | 12 | | 19 | 11 | 11 | 10 | -1 |

**NC5 & McKenzie**

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 390 | 354 | 521 | 562 | 41 | | 411 | 432 | 504 | 589 | 85 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 57 | 37 | 34 | 24 | -10 | | 59 | 62 | 48 | 33 | -15 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 295 | 283 | 336 | 363 | 27 | | 354 | 482 | 416 | 487 | 71 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 111 | 83 | 93 | 144 | 51 | | 53 | 53 | 43 | 26 | -17 |

## NC5 & Barrett & McCaskill

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009 - 2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 389 | 499 | 497 | 492 | -5 | | 391 | 433 | 353 | 429 | 76 |
| **Southwestbound** | | | | | | | | | | | |
| Approach Volumes | 83 | 79 | 61 | 54 | -7 | | 105 | 87 | 142 | 82 | -60 |
| **Northwestbound** | | | | | | | | | | | |
| Approach Volumes | 20 | 4 | 3 | 8 | 5 | | 41 | 19 | 22 | 15 | -7 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 338 | 409 | 385 | 392 | 7 | | 356 | 445 | 484 | 480 | -4 |
| **Northeastbound** | | | | | | | | | | | |
| Approach Volumes | 9 | 11 | 4 | N/A | N/A | | 3 | 11 | 2 | N/A | N/A |
| **Southeastbound** | | | | | | | | | | | |
| Approach Volumes | 35 | 56 | 59 | 52 | -7 | | 31 | 17 | 100 | 22 | -78 |

**TABLE 1**

# Pinehurst 2005-2011 AM & PM Peak Hour Approach Volumes

*NC 5 between Cherokee Road (NC @) and Blake Boulevard*

## NC 5 & Cherokee Road (NC 2)

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 494 | 519 | 463 | 549 | 86 | | 495 | 526 | 456 | 474 | 18 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 287 | 261 | 201 | 203 | 2 | | 509 | 543 | 437 | 459 | 22 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 776 | 800 | 683 | 765 | 82 | | 693 | 855 | 730 | 796 | 66 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 443 | 185 | 355 | 384 | 29 | | 136 | 185 | 143 | 154 | 11 |

## NC 5 & Morganton Road

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 680 | 556 | 691 | 717 | 26 | | 917 | 821 | 767 | 862 | 95 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 231 | 173 | 235 | 237 | 2 | | 401 | 375 | 430 | 483 | 53 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 695 | 601 | 584 | 638 | 54 | | 601 | 553 | 500 | 523 | 23 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 5 | 3 | 5 | 3 | -2 | | 10 | 4 | 3 | 3 | 0 |

**NC5 & Monticello/Lake Hills**

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 504 | 403 | 441 | 414 | -27 | | 650 | 638 | 586 | 604 | 18 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 51 | 54 | 57 | 42 | -15 | | 132 | 126 | 93 | 136 | 43 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 610 | 543 | 537 | 526 | -11 | | 510 | 572 | 484 | 500 | 16 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 186 | 153 | 200 | 222 | 22 | | 131 | 120 | 128 | 145 | 17 |

**TABLE 1**

## Pinehurst 2005-2011 AM & PM Peak Hour Approach Volumes

*NC 5 between Cherokee Road (NC @) and Blake Boulevard - continued*

**NC5 & Blake/Trotter**

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 450 | 377 | 432 | 456 | 24 | | 693 | 474 | 576 | 600 | 24 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 67 | 55 | 79 | 64 | -15 | | 287 | 150 | 214 | 191 | -23 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 632 | 516 | 508 | 607 | 99 | | 553 | 428 | 552 | 504 | -48 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 47 | 34 | 33 | 37 | 4 | | 39 | 25 | 38 | 33 | -5 |

**TABLE 1**

The intersections were grouped into two sections along NC 5. The first section is from McDonald to Barrett/McCaskill and is called the North Section. The second section is from NC 2 to Blake and is referred to as the South Section. The North Section is composed of all stop sign controlled intersections and the South Section has the signalized intersections.

All of the intersections were analyzed with Synchro 6 software to determine the present Levels of Service. The Table 2 below compares the changes in Level of Service from 2005 to 2011 at the different study intersections.

**2011 PINEHURST NC 5 TRAFFIC UPDATE**

**LEVEL OF SERVICE COMPARISON**

| | **AM PERIOD** | | | | | **PM PERIOD** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **INTERSECTION** | **2005** | **2007** | **2009** | **2011** | | **2005** | **2007** | **2009** | **2011** |
| NC 5 @ MCDONALD | C-C | C-B | D-D | D-C | | C-C | C-C | C-B | C-C |
| NC 5 @ MCKENZIE | D-D | D-D | E-D | E-C | | C-C | D-D | E-D | D-D |
| NC 5 @ BARRETT | C-C | D-E | E-F | C-D | | C-D | C-C | D-D | C-D |
| NC 5 @ NC 2 | C | B | B | C | | C | D | B | B |
| NC 5 @ MORGANTON | C | B | B | C | | B | B | B | D |
| NC 5 @ MONTICELLO | B | B | B | B | | C | B | B | B |
| NC 5 @ BLAKE | A | A | A | A | | B | A | A | A |

**TABLE 2**

The Highway Capacity Manual defines capacity as “the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions”. Level of Service (LOS) is a term used to describe different driving conditions and is a qualitative measure describing the traffic conditions. LOS will go from “A” to “F” and these levels are broken out based on average control delay per vehicle. The table below shows the different levels of service and the related delays.

**HCM Level of Service and Delay Table**

| Stop Sign Controlled | | Signalized Intersections | |
|---|---|---|---|
| **LEVEL OF SERVICE** | **AVERAGE CONTROL DELAY PER VEHICLE (seconds)** | **LEVEL OF SERVICE** | **AVERAGE CONTROL DELAY PER VEHICLE (seconds)** |
| A | 0 to 10 | A | 0 to 10 |
| B | 10 to 15 | B | 10 to 20 |
| C | 15 to 25 | C | 20 to 35 |
| D | 25 to 35 | D | 35 to 55 |
| E | 35 to 50 | E | 55 to 80 |
| F | >50 | F | >80 |

Based on the intersection capacity information, several of the intersections are showing a change in Level of Service when compared to the 2009 study.

The Level of Service for westbound AM traffic at the intersection of NC 5 and McDonald Road is showing a slight improvement from LOS D to LOS C. This is due to the slight decrease in AM traffic in the westbound direction. The westbound traffic experienced a slight decrease in LOS in the afternoon, due to the increase in traffic on NC 5. The PM LOS for the westbound traffic at this intersection decreased from LOS B to LOS C.

The intersection of NC 5 at McKenzie Road is showing an improved Level of Service for AM westbound traffic and PM eastbound traffic. Both the westbound AM traffic and the eastbound PM traffic on McKenzie Road decreased by approximately 30%. The westbound AM Level of Service improved from LOS D to LOS C, while the eastbound PM Level of Service improved from LOS E to LOS D.

At the six way intersection of NC 5 at Barrett Road and McCaskill Road, the Miovision Camera could not discern the turning movements from McCaskill Road W. These movements were combined with the southeast bound traffic on Barrett Road W. Synchro 6 software could not analyze this intersection as a six way intersection, so the traffic on Barrett and McCaskill was combined for a four way

analysis. This analysis showed an improvement in the Level of Service for both east and westbound AM traffic. The AM eastbound Level of Service improved from LOS E to LOS C, while the AM westbound Level of Service improved from LOS F to LOS D. The PM analysis showed an improvement in the Level of Service for the eastbound traffic, from LOS D to LOS C while the westbound Level of Service remained the same. These improvements are all due to the decrease in traffic along Barrett Road and McCaskill Road. However, due to the conflicting traffic movements at this intersection, it is our recommendation that Barrett Road E be closed with a cul-de-sac or a hammerhead turn around. This road has a minimal amount of traffic approaching NC 5. Two sketches of the intersection changes are in the Appendix.

With these stop sign controlled intersections, the poor Level of Service is for the side street delay. In general terms, the approach delay per vehicle is in the 30 second range. The actual calculated delay is shown on the Synchro printouts.

The first signalized intersection in our study is the intersection of NC 5 at NC 2 (Cherokee Road). Our study indicated that the traffic along NC 5 has increased by approximately 15% during the AM peak hour period. This has caused the AM Level of Service for the intersection to decrease from LOS B to LOS C. The slight increase in traffic during the PM peak hour period did not affect the Level of Service for this intersection.

At NC 5 and Morganton Road, the AM traffic, north and southbound, increased by approximately 6%. This increase has caused the AM Level of Service at the intersection to decrease from LOS B to LOS C. The PM traffic at this intersection experienced a greater increase of approximately 10% in northbound, southbound and westbound directions. The increase in traffic has caused the PM Level of Service at the intersection to decrease from LOS B to LOS D. However, the threshold for Level of Service D is 35 seconds, and the delay time for the intersection exceeds this threshold by only 0.7 seconds. Therefore, this decrease in Level of Service should not cause concern.

The remaining signalized intersections, NC 5 at Monticello Drive (E) and Lake Hills Road (W) and NC 5 at Blake Road (E) and Trotter Road (W), maintained the same Level of Service as 2009.

***Summary***

The slight improvement in Level of Service northern section of NC 5 is due to a decrease in the east and westbound traffic on the side streets at the NC5/McDonald and NC 5/McKenzie intersections.

The southern section of NC 5 is showing a volume increase at both NC 2 and Morganton Roads, resulting in a decreased Level of Service at these intersections. However, the Level of Service at these signalized intersections remains very good.

The intersection of NC 5 at Barrett/McCaskill is operating at a level of service D for side street delay. Some alternative intersection layouts are provided for that intersection and the changes should improve its overall operation.

The turning movement counts and capacity analyses are included in the Appendix and they provide the details for this report.

## Pinehurst 2005-2011 AM & PM Peak Hour Approach Volumes

*NC 5 between Cherokee Road (NC @) and Blake Boulevard - continued*

**NC5 & Blake/Trotter**

| | 2005 AM | 2007 AM | 2009 AM | 2011 AM | 2009-2011 Difference | | 2005 PM | 2007 PM | 2009 PM | 2011 PM | 2009-2011 Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Southbound** | | | | | | | | | | | |
| Approach Volumes | 450 | 377 | 432 | 456 | 24 | | 693 | 474 | 576 | 600 | 24 |
| **Westbound** | | | | | | | | | | | |
| Approach Volumes | 67 | 55 | 79 | 64 | -15 | | 287 | 150 | 214 | 191 | -23 |
| **Northbound** | | | | | | | | | | | |
| Approach Volumes | 632 | 516 | 508 | 607 | 99 | | 553 | 428 | 552 | 504 | -48 |
| **Eastbound** | | | | | | | | | | | |
| Approach Volumes | 47 | 34 | 33 | 37 | 4 | | 39 | 25 | 38 | 33 | -5 |

**TABLE 1**

The intersections were grouped into two sections along NC 5. The first section is from McDonald to Barrett/McCaskill and is called the North Section. The second section is from NC 2 to Blake and is referred to as the South Section. The North Section is composed of all stop sign controlled intersections and the South Section has the signalized intersections.

All of the intersections were analyzed with Synchro 6 software to determine the present Levels of Service. The Table 2 below compares the changes in Level of Service from 2005 to 2011 at the different study intersections.

**2011 PINEHURST NC 5 TRAFFIC UPDATE**

**LEVEL OF SERVICE COMPARISON**

| | AM PERIOD | | | | | PM PERIOD | | | |
|---|---|---|---|---|---|---|---|---|---|
| **INTERSECTION** | **2005** | **2007** | **2009** | **2011** | | **2005** | **2007** | **2009** | **2011** |
| NC 5 @ MCDONALD | C-C | C-B | D-D | D-C | | C-C | C-C | C-B | C-C |
| NC 5 @ MCKENZIE | D-D | D-D | E-D | E-C | | C-C | D-D | E-D | D-D |
| NC 5 @ BARRETT | C-C | D-E | E-F | C-D | | C-D | C-C | D-D | C-D |
| NC 5 @ NC 2 | C | B | B | C | | C | D | B | B |
| NC 5 @ MORGANTON | C | B | B | C | | B | B | B | D |
| NC 5 @ MONTICELLO | B | B | B | B | | C | B | B | B |
| NC 5 @ BLAKE | A | A | A | A | | B | A | A | A |

**TABLE 2**

The Highway Capacity Manual defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions". Level of Service (LOS) is a term used to describe different driving conditions and is a qualitative measure describing the traffic conditions. LOS will go from "A" to "F" and these levels are broken out based on average control delay per vehicle. The table below shows the different levels of service and the related delays.

**HCM Level of Service and Delay Table**

| **Stop Sign Controlled** | | **Signalized Intersections** | |
|---|---|---|---|
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Based on the intersection capacity information, several of the intersections are showing a change in Level of Service when compared to the 2009 study.

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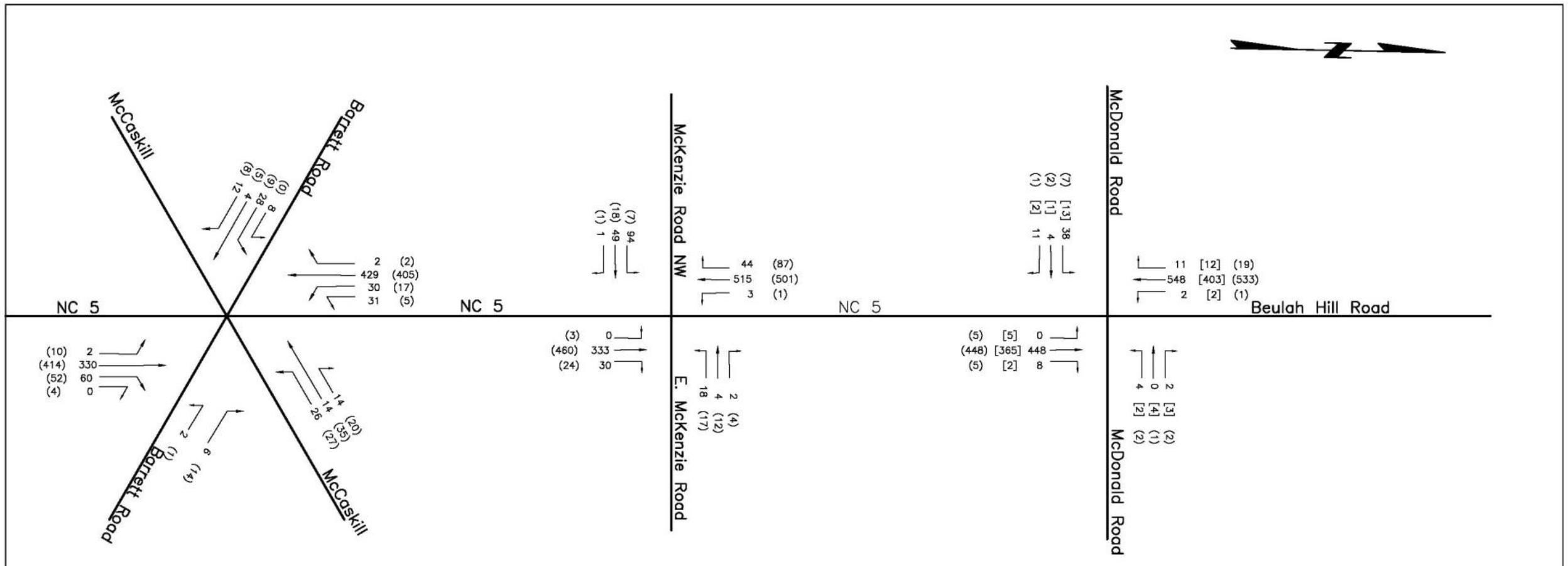
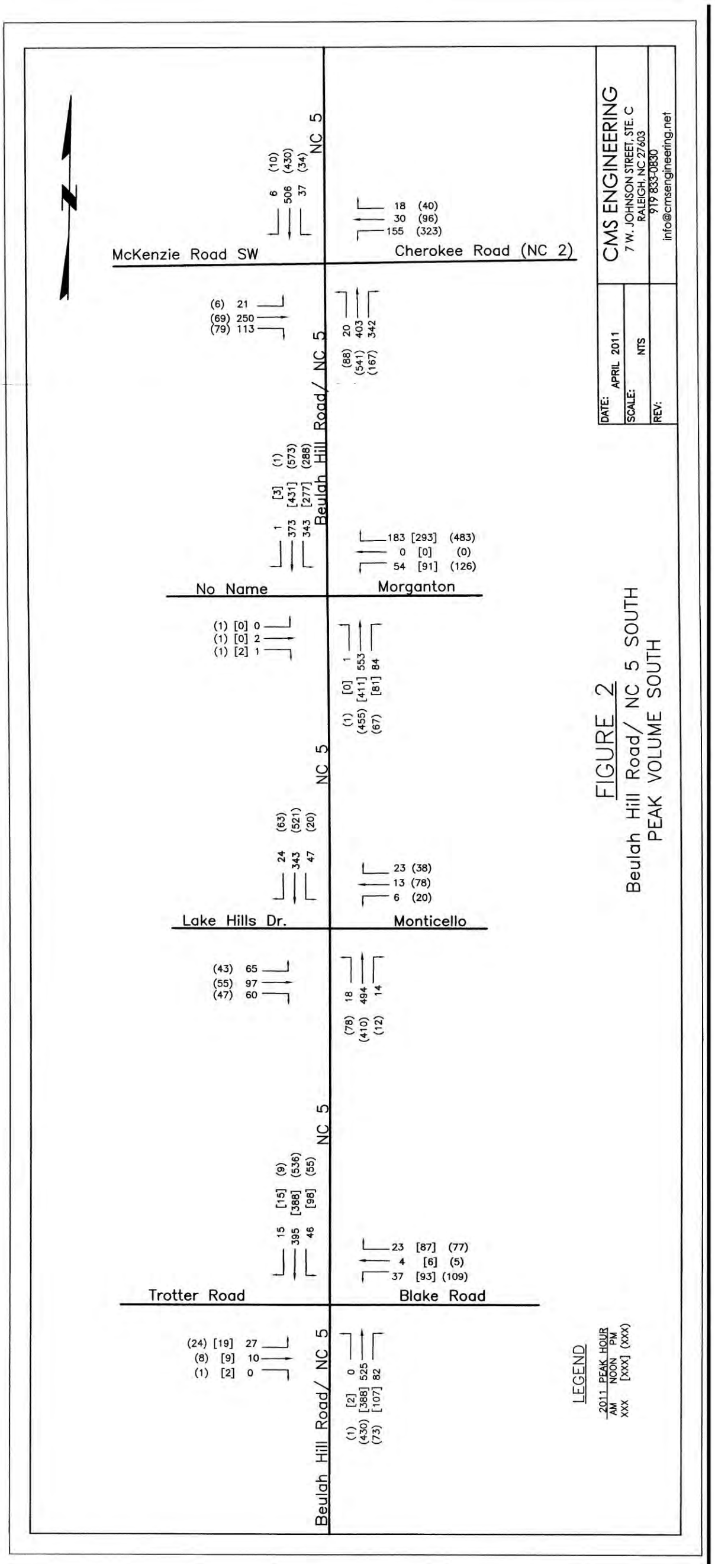
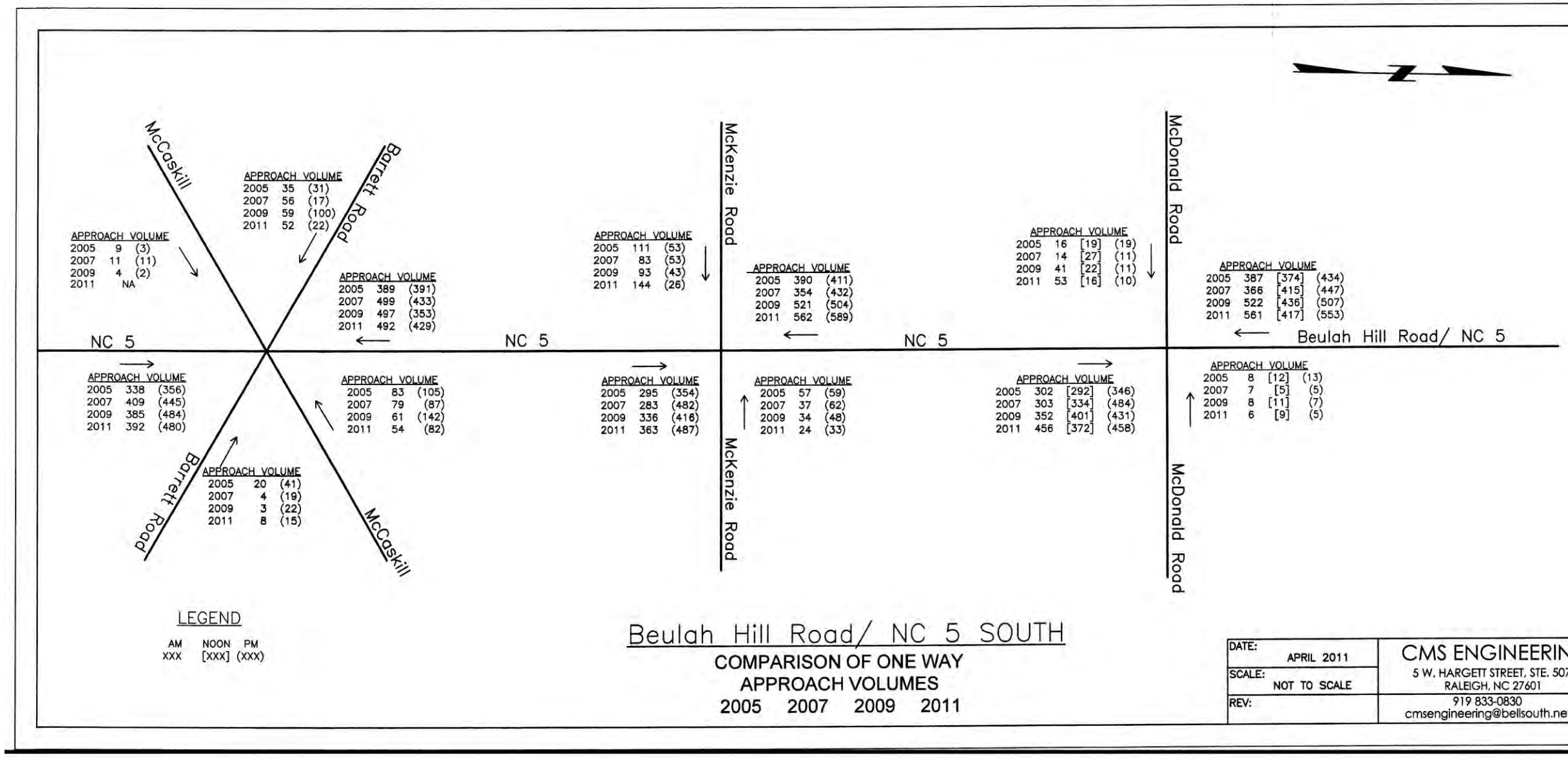



FIGURE 1

Beulah Hill Road/ NC 5 SOUTH
PEAK VOLUME NORTH

| | |
|---|---|
| DATE: APRIL 2011 | CMS ENGINEERING |
| SCALE: NTS | 7 W. JOHNSON STREET, STE. C<br>RALEIGH, NC 27603 |
| REV: | 919 833-0830<br>info@cmsengineering.net |

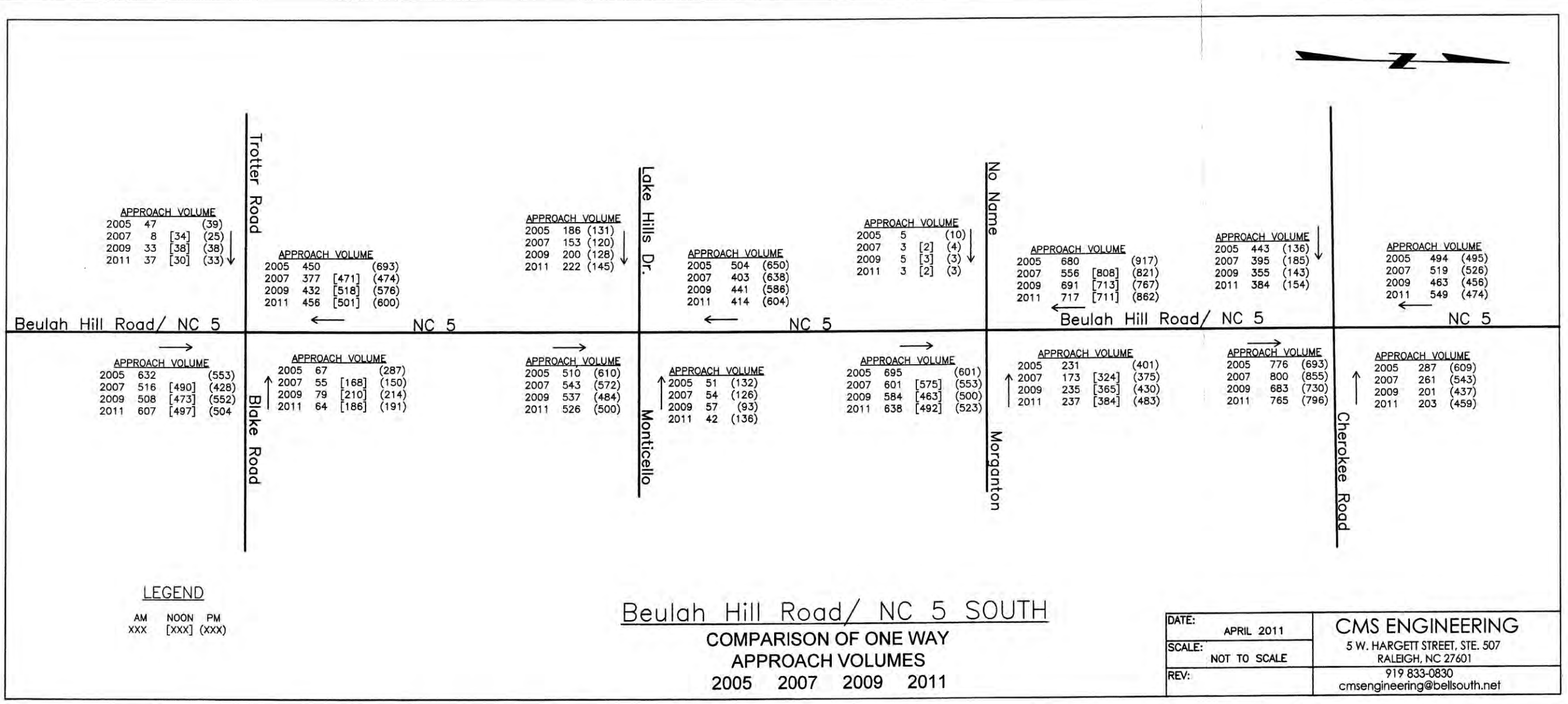

McKenzie Road SW
Cherokee Road (NC 2)
Beulah Hill Road/ NC 5
No Name
Morganton
Lake Hills Dr.
Monticello
Trotter Road
Blake Road
NC 5
6 (10)
506 (430)
37 (34)
18 (40)
30 (96)
155 (323)
(6) 21
(69) 250
(79) 113
(88) 20
(541) 403
(167) 342
1 [3] (1)
373 [431] (573)
343 [277] (288)
183 [293] (483)
0 [0] (0)
54 [91] (126)
(1) [0] 0
(1) [0] 2
(1) [2] 1
(1) [0] 1
(455) [411] 553
(67) [81] 84
24 (63)
343 (521)
47 (20)
23 (38)
13 (78)
6 (20)
(43) 65
(55) 97
(47) 60
(78) 18
(410) 494
(12) 14
15 [15] (9)
395 [388] (536)
46 [98] (55)
23 [87] (77)
4 [6] (5)
37 [93] (109)
(24) [19] 27
(8) [9] 10
(1) [2] 0
(1) [2] 0
(430) [388] 525
(73) [107] 82
CMS ENGINEERING
7 W. JOHNSON STREET, STE. C
RALEIGH, NC 27603
919 833-0830
info@cmsengineering.net
DATE: APRIL 2011
SCALE: NTS
REV:
FIGURE 2
Beulah Hill Road/ NC 5 SOUTH
PEAK VOLUME SOUTH
LEGEND
2011 PEAK HOUR
AM NOON PM
XXX [XXX] (XXX)




# Beulah Hill Road/ NC 5 SOUTH

COMPARISON OF ONE WAY
APPROACH VOLUMES
2005 2007 2009 2011

| | |
|---|---|
| DATE: APRIL 2011 | CMS ENGINEERING |
| SCALE: NOT TO SCALE | 5 W. HARGETT STREET, STE. 507<br>RALEIGH, NC 27601 |
| REV: | 919 833-0830<br>cmsengineering@bellsouth.net |




LEGEND

| AM | NOON | PM |
|---|---|---|
| XXX | [XXX] | (XXX) |

## Beulah Hill Road/ NC 5 SOUTH

COMPARISON OF ONE WAY
APPROACH VOLUMES
2005 2007 2009 2011

| | |
|---|---|
| DATE: APRIL 2011 | CMS ENGINEERING |
| SCALE: NOT TO SCALE | 5 W. HARGETT STREET, STE. 507<br>RALEIGH, NC 27601 |
| REV: | 919 833-0830<br>cmsengineering@bellsouth.net |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ↔ | | | ↔ | | ↰ | ↑ | | ↰ | ↑ | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 4.0 | | | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | | 0.96 | | | 0.96 | | 1.00 | 1.00 | | 1.00 | 0.98 | |
| Flt Protected | | 0.99 | | | 0.99 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 1755 | | | 1780 | | 1770 | 1855 | | 1770 | 1833 | |
| Flt Permitted | | 0.73 | | | 0.90 | | 0.32 | 1.00 | | 0.47 | 1.00 | |
| Satd. Flow (perm) | | 1299 | | | 1620 | | 603 | 1855 | | 883 | 1833 | |
| Volume (vph) | 43 | 55 | 47 | 20 | 78 | 38 | 78 | 410 | 12 | 20 | 521 | 63 |
| 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 | 60 | 51 | 22 | 85 | 41 | 85 | 446 | 13 | 22 | 566 | 68 |
| RTOR Reduction (vph) | 0 | 20 | 0 | 0 | 16 | 0 | 0 | 1 | 0 | 0 | 2 | 0 |
| Lane Group Flow (vph) | 0 | 138 | 0 | 0 | 132 | 0 | 85 | 458 | 0 | 22 | 632 | 0 |
| Turn Type | Perm | | | Perm | | | pm+pt | | | pm+pt | | |
| Protected Phases | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | | 13.9 | | | 13.9 | | 79.2 | 73.3 | | 73.0 | 70.2 | |
| Effective Green, g (s) | | 15.4 | | | 15.4 | | 81.7 | 74.8 | | 75.5 | 71.7 | |
| Actuated g/C Ratio | | 0.15 | | | 0.15 | | 0.77 | 0.71 | | 0.71 | 0.68 | |
| Clearance Time (s) | | 5.5 | | | 5.5 | | 5.0 | 5.5 | | 5.0 | 5.5 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 189 | | | 235 | | 541 | 1309 | | 661 | 1240 | |
| v/s Ratio Prot | | | | | | | c0.01 | 0.25 | | 0.00 | c0.34 | |
| v/s Ratio Perm | | c0.11 | | | 0.08 | | 0.11 | | | 0.02 | | |
| v/c Ratio | | 0.73 | | | 0.56 | | 0.16 | 0.35 | | 0.03 | 0.51 | |
| Uniform Delay, d1 | | 43.3 | | | 42.2 | | 4.6 | 6.1 | | 4.5 | 8.5 | |
| Progression Factor | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 13.6 | | | 3.0 | | 0.1 | 0.7 | | 0.0 | 1.5 | |
| Delay (s) | | 56.9 | | | 45.2 | | 4.7 | 6.8 | | 4.5 | 10.0 | |
| Level of Service | | E | | | D | | A | A | | A | A | |
| Approach Delay (s) | | 56.9 | | | 45.2 | | | 6.5 | | | 9.8 | |
| Approach LOS | | E | | | D | | | A | | | A | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 17.0 | HCM Level of Service | B |
| HCM Volume to Capacity ratio | 0.54 | | |
| Actuated Cycle Length (s) | 106.0 | Sum of lost time (s) | 16.0 |
| Intersection Capacity Utilization | 61.8% | 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 | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 38 | 4 | 11 | 4 | 0 | 2 | 0 | 448 | 8 | 2 | 548 | 11 |
| 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) | 41 | 4 | 12 | 4 | 0 | 2 | 0 | 487 | 9 | 2 | 596 | 12 |
| 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 | 1099 | 1102 | 602 | 1111 | 1103 | 491 | 608 | | | 496 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 1099 | 1102 | 602 | 1111 | 1103 | 491 | 608 | | | 496 | | |
| 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 % | 78 | 98 | 98 | 98 | 100 | 100 | 100 | | | 100 | | |
| cM capacity (veh/h) | 189 | 211 | 500 | 179 | 211 | 577 | 971 | | | 1068 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 58 | 7 | 496 | 610 |
| Volume Left | 41 | 4 | 0 | 2 |
| Volume Right | 12 | 2 | 9 | 12 |
| cSH | 219 | 232 | 971 | 1068 |
| Volume to Capacity | 0.26 | 0.03 | 0.00 | 0.00 |
| Queue Length 95th (ft) | 26 | 2 | 0 | 0 |
| Control Delay (s) | 27.2 | 21.0 | 0.0 | 0.1 |
| Lane LOS | D | C | | A |
| Approach Delay (s) | 27.2 | 21.0 | 0.0 | 0.1 |
| Approach LOS | D | C | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 1.5 | | |
| Intersection Capacity Utilization | 41.3% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 94 | 49 | 1 | 18 | 4 | 2 | 0 | 333 | 30 | 3 | 515 | 44 |
| 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) | 102 | 53 | 1 | 20 | 4 | 2 | 0 | 362 | 33 | 3 | 560 | 48 |
| 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 | 973 | 985 | 584 | 996 | 992 | 378 | 608 | | | 395 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 973 | 985 | 584 | 996 | 992 | 378 | 608 | | | 395 | | |
| 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 % | 55 | 78 | 100 | 89 | 98 | 100 | 100 | | | 100 | | |
| cM capacity (veh/h) | 227 | 247 | 512 | 185 | 245 | 668 | 971 | | | 1164 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 157 | 26 | 395 | 611 |
| Volume Left | 102 | 20 | 0 | 3 |
| Volume Right | 1 | 2 | 33 | 48 |
| cSH | 235 | 206 | 971 | 1164 |
| Volume to Capacity | 0.67 | 0.13 | 0.00 | 0.00 |
| Queue Length 95th (ft) | 105 | 11 | 0 | 0 |
| Control Delay (s) | 46.5 | 25.0 | 0.0 | 0.1 |
| Lane LOS | E | C | | A |
| Approach Delay (s) | 46.5 | 25.0 | 0.0 | 0.1 |
| Approach LOS | E | C | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 6.7 | | |
| Intersection Capacity Utilization | 47.3% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 8 | 32 | 12 | 28 | 14 | 20 | 2 | 330 | 60 | 61 | 429 | 2 |
| 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) | 9 | 35 | 13 | 30 | 15 | 22 | 2 | 359 | 65 | 66 | 466 | 2 |
| 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 | 1025 | 1028 | 467 | 1026 | 997 | 391 | 468 | | | 424 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 1025 | 1028 | 467 | 1026 | 997 | 391 | 468 | | | 424 | | |
| 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 % | 95 | 84 | 98 | 83 | 93 | 97 | 100 | | | 94 | | |
| cM capacity (veh/h) | 187 | 220 | 596 | 175 | 229 | 657 | 1093 | | | 1135 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 57 | 67 | 426 | 535 |
| Volume Left | 9 | 30 | 2 | 66 |
| Volume Right | 13 | 22 | 65 | 2 |
| cSH | 249 | 246 | 1093 | 1135 |
| Volume to Capacity | 0.23 | 0.27 | 0.00 | 0.06 |
| Queue Length 95th (ft) | 21 | 27 | 0 | 5 |
| Control Delay (s) | 23.6 | 25.0 | 0.1 | 1.6 |
| Lane LOS | C | D | A | A |
| Approach Delay (s) | 23.6 | 25.0 | 0.1 | 1.6 |
| Approach LOS | C | D | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 3.6 | | |
| Intersection Capacity Utilization | 65.4% | ICU Level of Service | C |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| Lane Util. Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frt | 1.00 | 0.95 | | 1.00 | 0.94 | | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1770 | 1776 | | 1770 | 1757 | | 1770 | 1863 | 1583 | 1770 | 1859 | |
| Flt Permitted | 0.72 | 1.00 | | 0.45 | 1.00 | | 0.16 | 1.00 | 1.00 | 0.29 | 1.00 | |
| Satd. Flow (perm) | 1346 | 1776 | | 843 | 1757 | | 292 | 1863 | 1583 | 540 | 1859 | |
| Volume (vph) | 21 | 250 | 113 | 155 | 30 | 18 | 20 | 403 | 342 | 37 | 506 | 6 |
| 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 | 272 | 123 | 168 | 33 | 20 | 22 | 438 | 372 | 40 | 550 | 7 |
| RTOR Reduction (vph) | 0 | 14 | 0 | 0 | 9 | 0 | 0 | 0 | 203 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 23 | 381 | 0 | 168 | 44 | 0 | 22 | 438 | 169 | 40 | 556 | 0 |
| Turn Type | Perm | | | Perm | | | Perm | | Perm | Perm | | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | 2 | 6 | | |
| Actuated Green, G (s) | 39.2 | 39.2 | | 39.2 | 39.2 | | 25.8 | 25.8 | 25.8 | 25.8 | 25.8 | |
| Effective Green, g (s) | 40.9 | 40.9 | | 40.9 | 40.9 | | 27.3 | 27.3 | 27.3 | 27.3 | 27.3 | |
| Actuated g/C Ratio | 0.54 | 0.54 | | 0.54 | 0.54 | | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 | |
| Clearance Time (s) | 5.7 | 5.7 | | 5.7 | 5.7 | | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | |
| Vehicle Extension (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | 722 | 953 | | 452 | 943 | | 105 | 667 | 567 | 193 | 666 | |
| v/s Ratio Prot | | c0.21 | | | 0.02 | | | 0.24 | | | c0.30 | |
| v/s Ratio Perm | 0.02 | | | 0.20 | | | 0.08 | | 0.11 | 0.07 | | |
| v/c Ratio | 0.03 | 0.40 | | 0.37 | 0.05 | | 0.21 | 0.66 | 0.30 | 0.21 | 0.83 | |
| Uniform Delay, d1 | 8.3 | 10.4 | | 10.2 | 8.4 | | 17.0 | 20.5 | 17.6 | 16.9 | 22.4 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.0 | 0.3 | | 0.5 | 0.0 | | 4.5 | 5.0 | 1.3 | 2.4 | 11.8 | |
| Delay (s) | 8.3 | 10.7 | | 10.7 | 8.4 | | 21.5 | 25.5 | 18.9 | 19.4 | 34.1 | |
| Level of Service | A | B | | B | A | | C | C | B | B | C | |
| Approach Delay (s) | | 10.6 | | | 10.2 | | | 22.5 | | | 33.2 | |
| Approach LOS | | B | | | B | | | C | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 21.8 | HCM Level of Service | C |
| HCM Volume to Capacity ratio | 0.57 | | |
| Actuated Cycle Length (s) | 76.2 | Sum of lost time (s) | 8.0 |
| Intersection Capacity Utilization | 69.4% | 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 | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 4.0 | | | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | | 0.95 | | | 1.00 | 0.85 | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flt Protected | | 1.00 | | | 0.95 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 1779 | | | 1770 | 1583 | 1770 | 1826 | | 1770 | 1862 | |
| Flt Permitted | | 1.00 | | | 0.76 | 1.00 | 0.26 | 1.00 | | 0.15 | 1.00 | |
| Satd. Flow (perm) | | 1779 | | | 1408 | 1583 | 479 | 1826 | | 284 | 1862 | |
| Volume (vph) | 0 | 2 | 1 | 54 | 0 | 183 | 1 | 553 | 84 | 343 | 373 | 1 |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 0 | 2 | 1 | 59 | 0 | 199 | 1 | 601 | 91 | 373 | 405 | 1 |
| RTOR Reduction (vph) | 0 | 1 | 0 | 0 | 0 | 109 | 0 | 5 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 2 | 0 | 0 | 59 | 90 | 1 | 687 | 0 | 373 | 406 | 0 |
| Turn Type | Perm | | | Perm | | pm+ov | pm+pt | | | pm+pt | | |
| Protected Phases | | 4 | | | 8 | 1 | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | 8 | 2 | | | 6 | | |
| Actuated Green, G (s) | | 8.9 | | | 8.9 | 48.0 | 94.7 | 49.3 | | 76.7 | 37.6 | |
| Effective Green, g (s) | | 11.2 | | | 11.2 | 52.6 | 96.8 | 51.4 | | 81.1 | 39.7 | |
| Actuated g/C Ratio | | 0.10 | | | 0.10 | 0.45 | 0.83 | 0.44 | | 0.70 | 0.34 | |
| Clearance Time (s) | | 6.3 | | | 6.3 | 6.3 | 5.3 | 6.1 | | 6.3 | 6.1 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 172 | | | 136 | 772 | 991 | 809 | | 729 | 637 | |
| v/s Ratio Prot | | 0.00 | | | | 0.04 | 0.00 | c0.38 | | c0.18 | 0.22 | |
| v/s Ratio Perm | | | | | c0.04 | 0.02 | 0.00 | | | 0.18 | | |
| v/c Ratio | | 0.01 | | | 0.43 | 0.12 | 0.00 | 0.85 | | 0.51 | 0.64 | |
| Uniform Delay, d1 | | 47.4 | | | 49.4 | 18.3 | 3.7 | 28.8 | | 15.2 | 32.1 | |
| Progression Factor | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.0 | | | 2.2 | 0.1 | 0.0 | 10.8 | | 0.6 | 4.8 | |
| Delay (s) | | 47.4 | | | 51.6 | 18.4 | 3.7 | 39.6 | | 15.8 | 36.9 | |
| Level of Service | | D | | | D | B | A | D | | B | D | |
| Approach Delay (s) | | 47.4 | | | 26.0 | | | 39.6 | | | 26.8 | |
| Approach LOS | | D | | | C | | | D | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 31.8 | HCM Level of Service | C |
| HCM Volume to Capacity ratio | 0.67 | | |
| Actuated Cycle Length (s) | 116.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 72.9% | 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 | | ↔ | | | ↔ | | | ↑ | | | ↑ | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 4.0 | | | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | | 0.96 | | | 0.93 | | 1.00 | 1.00 | | 1.00 | 0.99 | |
| Flt Protected | | 0.99 | | | 0.99 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 1769 | | | 1713 | | 1770 | 1855 | | 1770 | 1845 | |
| Flt Permitted | | 0.89 | | | 0.95 | | 0.50 | 1.00 | | 0.35 | 1.00 | |
| Satd. Flow (perm) | | 1598 | | | 1640 | | 930 | 1855 | | 652 | 1845 | |
| Volume (vph) | 65 | 97 | 60 | 6 | 13 | 23 | 18 | 494 | 14 | 47 | 343 | 24 |
| 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) | 71 | 105 | 65 | 7 | 14 | 25 | 20 | 537 | 15 | 51 | 373 | 26 |
| RTOR Reduction (vph) | 0 | 14 | 0 | 0 | 20 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 0 | 227 | 0 | 0 | 26 | 0 | 20 | 551 | 0 | 51 | 398 | 0 |
| Turn Type | Perm | | | Perm | | | pm+pt | | | pm+pt | | |
| Protected Phases | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | | 19.2 | | | 19.2 | | 67.9 | 65.1 | | 73.7 | 68.0 | |
| Effective Green, g (s) | | 20.7 | | | 20.7 | | 70.4 | 66.6 | | 76.2 | 69.5 | |
| Actuated g/C Ratio | | 0.20 | | | 0.20 | | 0.66 | 0.63 | | 0.72 | 0.66 | |
| Clearance Time (s) | | 5.5 | | | 5.5 | | 5.0 | 5.5 | | 5.0 | 5.5 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 312 | | | 320 | | 648 | 1166 | | 539 | 1210 | |
| v/s Ratio Prot | | | | | | | 0.00 | c0.30 | | c0.01 | 0.22 | |
| v/s Ratio Perm | | c0.14 | | | 0.02 | | 0.02 | | | 0.06 | | |
| v/c Ratio | | 0.73 | | | 0.08 | | 0.03 | 0.47 | | 0.09 | 0.33 | |
| Uniform Delay, d1 | | 40.0 | | | 34.9 | | 6.1 | 10.4 | | 5.7 | 8.0 | |
| Progression Factor | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 8.1 | | | 0.1 | | 0.0 | 1.4 | | 0.1 | 0.7 | |
| Delay (s) | | 48.1 | | | 35.0 | | 6.1 | 11.8 | | 5.7 | 8.7 | |
| Level of Service | | D | | | C | | A | B | | A | A | |
| Approach Delay (s) | | 48.1 | | | 35.0 | | | 11.6 | | | 8.4 | |
| Approach LOS | | D | | | C | | | B | | | A | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 18.0 | HCM Level of Service | B |
| HCM Volume to Capacity ratio | 0.52 | | |
| Actuated Cycle Length (s) | 106.0 | Sum of lost time (s) | 16.0 |
| Intersection Capacity Utilization | 61.7% | 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 | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 1.00 | | 1.00 | 0.87 | | | 0.98 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1770 | 1863 | | 1770 | 1622 | | | 1825 | | 1770 | 1853 | |
| Flt Permitted | 0.74 | 1.00 | | 0.75 | 1.00 | | | 1.00 | | 0.39 | 1.00 | |
| Satd. Flow (perm) | 1375 | 1863 | | 1398 | 1622 | | | 1825 | | 719 | 1853 | |
| Volume (vph) | 27 | 10 | 0 | 37 | 4 | 23 | 0 | 525 | 82 | 46 | 395 | 15 |
| 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) | 29 | 11 | 0 | 40 | 4 | 25 | 0 | 571 | 89 | 50 | 429 | 16 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 23 | 0 | 0 | 3 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 29 | 11 | 0 | 40 | 6 | 0 | 0 | 657 | 0 | 50 | 444 | 0 |
| Turn Type | Perm | | | Perm | | | Perm | | | Perm | | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | 4.8 | 4.8 | | 4.8 | 4.8 | | | 65.2 | | 65.2 | 65.2 | |
| Effective Green, g (s) | 6.8 | 6.8 | | 6.8 | 6.8 | | | 67.9 | | 67.9 | 67.9 | |
| Actuated g/C Ratio | 0.08 | 0.08 | | 0.08 | 0.08 | | | 0.82 | | 0.82 | 0.82 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.7 | | 6.7 | 6.7 | |
| Vehicle Extension (s) | 1.0 | 1.0 | | 2.0 | 2.0 | | | 2.0 | | 2.0 | 2.0 | |
| Lane Grp Cap (vph) | 113 | 153 | | 115 | 133 | | | 1498 | | 590 | 1521 | |
| v/s Ratio Prot | | 0.01 | | | 0.00 | | | c0.36 | | | 0.24 | |
| v/s Ratio Perm | 0.02 | | | c0.03 | | | | | | 0.07 | | |
| v/c Ratio | 0.26 | 0.07 | | 0.35 | 0.05 | | | 0.44 | | 0.08 | 0.29 | |
| Uniform Delay, d1 | 35.6 | 35.0 | | 35.9 | 35.0 | | | 2.1 | | 1.4 | 1.7 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.4 | 0.1 | | 0.7 | 0.1 | | | 0.9 | | 0.3 | 0.5 | |
| Delay (s) | 36.0 | 35.1 | | 36.5 | 35.0 | | | 3.0 | | 1.7 | 2.2 | |
| Level of Service | D | D | | D | D | | | A | | A | A | |
| Approach Delay (s) | | 35.8 | | | 35.9 | | | 3.0 | | | 2.2 | |
| Approach LOS | | D | | | D | | | A | | | A | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 5.5 | HCM Level of Service | A |
| HCM Volume to Capacity ratio | 0.43 | | |
| Actuated Cycle Length (s) | 82.7 | Sum of lost time (s) | 8.0 |
| Intersection Capacity Utilization | 53.6% | 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 | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 13 | 1 | 2 | 2 | 4 | 3 | 5 | 365 | 2 | 2 | 403 | 12 |
| 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) | 14 | 1 | 2 | 2 | 4 | 3 | 5 | 397 | 2 | 2 | 438 | 13 |
| 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 | 863 | 859 | 445 | 860 | 864 | 398 | 451 | | | 399 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 863 | 859 | 445 | 860 | 864 | 398 | 451 | | | 399 | | |
| 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 % | 95 | 100 | 100 | 99 | 99 | 99 | 100 | | | 100 | | |
| cM capacity (veh/h) | 269 | 292 | 613 | 273 | 290 | 652 | 1109 | | | 1160 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 17 | 10 | 404 | 453 |
| Volume Left | 14 | 2 | 5 | 2 |
| Volume Right | 2 | 3 | 2 | 13 |
| cSH | 291 | 350 | 1109 | 1160 |
| Volume to Capacity | 0.06 | 0.03 | 0.00 | 0.00 |
| Queue Length 95th (ft) | 5 | 2 | 0 | 0 |
| Control Delay (s) | 18.2 | 15.6 | 0.2 | 0.1 |
| Lane LOS | C | C | A | A |
| Approach Delay (s) | 18.2 | 15.6 | 0.2 | 0.1 |
| Approach LOS | C | C | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 0.6 | | |
| Intersection Capacity Utilization | 33.1% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 4.0 | | | 4.0 | 4.0 | | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | | 1.00 | | | 1.00 | 1.00 | | 1.00 | | 1.00 | 1.00 | |
| Frt | | 0.86 | | | 1.00 | 0.85 | | 0.98 | | 1.00 | 1.00 | |
| Flt Protected | | 1.00 | | | 0.95 | 1.00 | | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 1611 | | | 1770 | 1583 | | 1817 | | 1770 | 1861 | |
| Flt Permitted | | 1.00 | | | 0.76 | 1.00 | | 1.00 | | 0.46 | 1.00 | |
| Satd. Flow (perm) | | 1611 | | | 1409 | 1583 | | 1817 | | 866 | 1861 | |
| Volume (vph) | 0 | 0 | 2 | 91 | 0 | 293 | 0 | 411 | 81 | 277 | 431 | 3 |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 0 | 0 | 2 | 99 | 0 | 318 | 0 | 447 | 88 | 301 | 468 | 3 |
| RTOR Reduction (vph) | 0 | 2 | 0 | 0 | 0 | 230 | 0 | 4 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 0 | 0 | 0 | 99 | 88 | 0 | 531 | 0 | 301 | 471 | 0 |
| Turn Type | Perm | | | Perm | | pm+ov | pm+pt | | | pm+pt | | |
| Protected Phases | | 4 | | | 8 | 1 | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | 8 | 2 | | | 6 | | |
| Actuated Green, G (s) | | 13.2 | | | 13.2 | 27.6 | | 69.7 | | 53.3 | 38.9 | |
| Effective Green, g (s) | | 15.5 | | | 15.5 | 32.2 | | 71.8 | | 57.7 | 41.0 | |
| Actuated g/C Ratio | | 0.13 | | | 0.13 | 0.28 | | 0.62 | | 0.50 | 0.35 | |
| Clearance Time (s) | | 6.3 | | | 6.3 | 6.3 | | 6.1 | | 6.3 | 6.1 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | 3.0 | | 3.0 | | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 215 | | | 188 | 494 | | 1125 | | 561 | 658 | |
| v/s Ratio Prot | | 0.00 | | | | 0.03 | | c0.29 | | c0.08 | c0.25 | |
| v/s Ratio Perm | | | | | c0.07 | 0.03 | | | | 0.19 | | |
| v/c Ratio | | 0.00 | | | 0.53 | 0.18 | | 0.47 | | 0.54 | 0.72 | |
| Uniform Delay, d1 | | 43.5 | | | 46.8 | 31.8 | | 11.9 | | 22.5 | 32.5 | |
| Progression Factor | | 1.00 | | | 1.00 | 1.00 | | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.0 | | | 2.7 | 0.2 | | 1.4 | | 1.0 | 6.6 | |
| Delay (s) | | 43.5 | | | 49.5 | 32.0 | | 13.3 | | 23.4 | 39.0 | |
| Level of Service | | D | | | D | C | | B | | C | D | |
| Approach Delay (s) | | 43.5 | | | 36.2 | | | 13.3 | | | 32.9 | |
| Approach LOS | | D | | | D | | | B | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 27.7 | HCM Level of Service | C |
| HCM Volume to Capacity ratio | 0.60 | | |
| Actuated Cycle Length (s) | 116.0 | Sum of lost time (s) | 16.0 |
| Intersection Capacity Utilization | 63.6% | 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 | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.97 | | 1.00 | 0.86 | | 1.00 | 0.97 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1770 | 1816 | | 1770 | 1603 | | 1770 | 1803 | | 1770 | 1853 | |
| Flt Permitted | 0.67 | 1.00 | | 0.75 | 1.00 | | 0.49 | 1.00 | | 0.43 | 1.00 | |
| Satd. Flow (perm) | 1249 | 1816 | | 1397 | 1603 | | 917 | 1803 | | 809 | 1853 | |
| Volume (vph) | 19 | 9 | 2 | 93 | 6 | 87 | 2 | 388 | 107 | 98 | 388 | 15 |
| 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) | 21 | 10 | 2 | 101 | 7 | 95 | 2 | 422 | 116 | 107 | 422 | 16 |
| RTOR Reduction (vph) | 0 | 2 | 0 | 0 | 83 | 0 | 0 | 6 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 21 | 10 | 0 | 101 | 19 | 0 | 2 | 532 | 0 | 107 | 437 | 0 |
| Turn Type | Perm | | | Perm | | | Perm | | | Perm | | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | 8.8 | 8.8 | | 8.8 | 8.8 | | 61.2 | 61.2 | | 61.2 | 61.2 | |
| Effective Green, g (s) | 10.8 | 10.8 | | 10.8 | 10.8 | | 63.9 | 63.9 | | 63.9 | 63.9 | |
| Actuated g/C Ratio | 0.13 | 0.13 | | 0.13 | 0.13 | | 0.77 | 0.77 | | 0.77 | 0.77 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.7 | 6.7 | | 6.7 | 6.7 | |
| Vehicle Extension (s) | 1.0 | 1.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lane Grp Cap (vph) | 163 | 237 | | 182 | 209 | | 709 | 1393 | | 625 | 1432 | |
| v/s Ratio Prot | | 0.01 | | | 0.01 | | | c0.29 | | | 0.24 | |
| v/s Ratio Perm | 0.02 | | | c0.07 | | | 0.00 | | | 0.13 | | |
| v/c Ratio | 0.13 | 0.04 | | 0.55 | 0.09 | | 0.00 | 0.38 | | 0.17 | 0.31 | |
| Uniform Delay, d1 | 31.8 | 31.4 | | 33.7 | 31.6 | | 2.1 | 3.0 | | 2.5 | 2.8 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.1 | 0.0 | | 2.1 | 0.1 | | 0.0 | 0.8 | | 0.6 | 0.6 | |
| Delay (s) | 31.9 | 31.5 | | 35.8 | 31.7 | | 2.1 | 3.8 | | 3.1 | 3.3 | |
| Level of Service | C | C | | D | C | | A | A | | A | A | |
| Approach Delay (s) | | 31.8 | | | 33.7 | | | 3.8 | | | 3.3 | |
| Approach LOS | | C | | | C | | | A | | | A | |

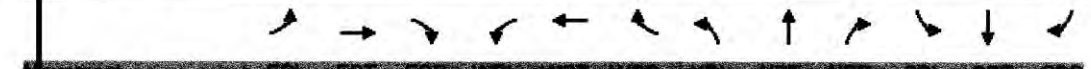
| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 8.9 | HCM Level of Service | A |
| HCM Volume to Capacity ratio | 0.41 | | |
| Actuated Cycle Length (s) | 82.7 | Sum of lost time (s) | 8.0 |
| Intersection Capacity Utilization | 58.7% | ICU Level of Service | B |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 7 | 2 | 1 | 2 | 1 | 2 | 5 | 448 | 5 | 1 | 533 | 19 |
| 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) | 8 | 2 | 1 | 2 | 1 | 2 | 5 | 487 | 5 | 1 | 579 | 21 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 1095 | 1095 | 590 | 1095 | 1103 | 490 | 600 | | | 492 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 1095 | 1095 | 590 | 1095 | 1103 | 490 | 600 | | | 492 | | |
| 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 | 100 | 99 | 99 | 100 | 99 | | | 100 | | |
| cM capacity (veh/h) | 189 | 212 | 508 | 188 | 210 | 579 | 977 | | | 1071 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 11 | 5 | 498 | 601 |
| Volume Left | 8 | 2 | 5 | 1 |
| Volume Right | 1 | 2 | 5 | 21 |
| cSH | 206 | 265 | 977 | 1071 |
| Volume to Capacity | 0.05 | 0.02 | 0.01 | 0.00 |
| Queue Length 95th (ft) | 4 | 2 | 0 | 0 |
| Control Delay (s) | 23.4 | 18.8 | 0.2 | 0.0 |
| Lane LOS | C | C | A | A |
| Approach Delay (s) | 23.4 | 18.8 | 0.2 | 0.0 |
| Approach LOS | C | C | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 0.4 | | |
| Intersection Capacity Utilization | 39.8% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 7 | 18 | 1 | 17 | 12 | 4 | 3 | 460 | 24 | 1 | 501 | 87 |
| 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) | 8 | 20 | 1 | 18 | 13 | 4 | 3 | 500 | 26 | 1 | 545 | 95 |
| 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 | 1124 | 1127 | 592 | 1124 | 1161 | 513 | 639 | | | 526 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 1124 | 1127 | 592 | 1124 | 1161 | 513 | 639 | | | 526 | | |
| 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 | 90 | 100 | 89 | 93 | 99 | 100 | | | 100 | | |
| cM capacity (veh/h) | 171 | 204 | 506 | 168 | 194 | 561 | 945 | | | 1041 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 28 | 36 | 529 | 640 |
| Volume Left | 8 | 18 | 3 | 1 |
| Volume Right | 1 | 4 | 26 | 95 |
| cSH | 198 | 194 | 945 | 1041 |
| Volume to Capacity | 0.14 | 0.18 | 0.00 | 0.00 |
| Queue Length 95th (ft) | 12 | 16 | 0 | 0 |
| Control Delay (s) | 26.2 | 27.7 | 0.1 | 0.0 |
| Lane LOS | D | D | A | A |
| Approach Delay (s) | 26.2 | 27.7 | 0.1 | 0.0 |
| Approach LOS | D | D | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 1.5 | | |
| Intersection Capacity Utilization | 42.3% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Volume (veh/h) | 0 | 14 | 8 | 28 | 35 | 34 | 10 | 414 | 56 | 22 | 405 | 2 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 15 | 9 | 30 | 38 | 37 | 11 | 450 | 61 | 24 | 440 | 2 |
| 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 | 1047 | 1022 | 441 | 1008 | 992 | 480 | 442 | | | 511 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 1047 | 1022 | 441 | 1008 | 992 | 480 | 442 | | | 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 % | 100 | 93 | 99 | 85 | 84 | 94 | 99 | | | 98 | | |
| cM capacity (veh/h) | 165 | 228 | 616 | 200 | 238 | 586 | 1118 | | | 1054 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 24 | 105 | 522 | 466 |
| Volume Left | 0 | 30 | 11 | 24 |
| Volume Right | 9 | 37 | 61 | 2 |
| cSH | 296 | 281 | 1118 | 1054 |
| Volume to Capacity | 0.08 | 0.38 | 0.01 | 0.02 |
| Queue Length 95th (ft) | 7 | 42 | 1 | 2 |
| Control Delay (s) | 18.2 | 25.3 | 0.3 | 0.7 |
| Lane LOS | C | D | A | A |
| Approach Delay (s) | 18.2 | 25.3 | 0.3 | 0.7 |
| Approach LOS | C | D | | |

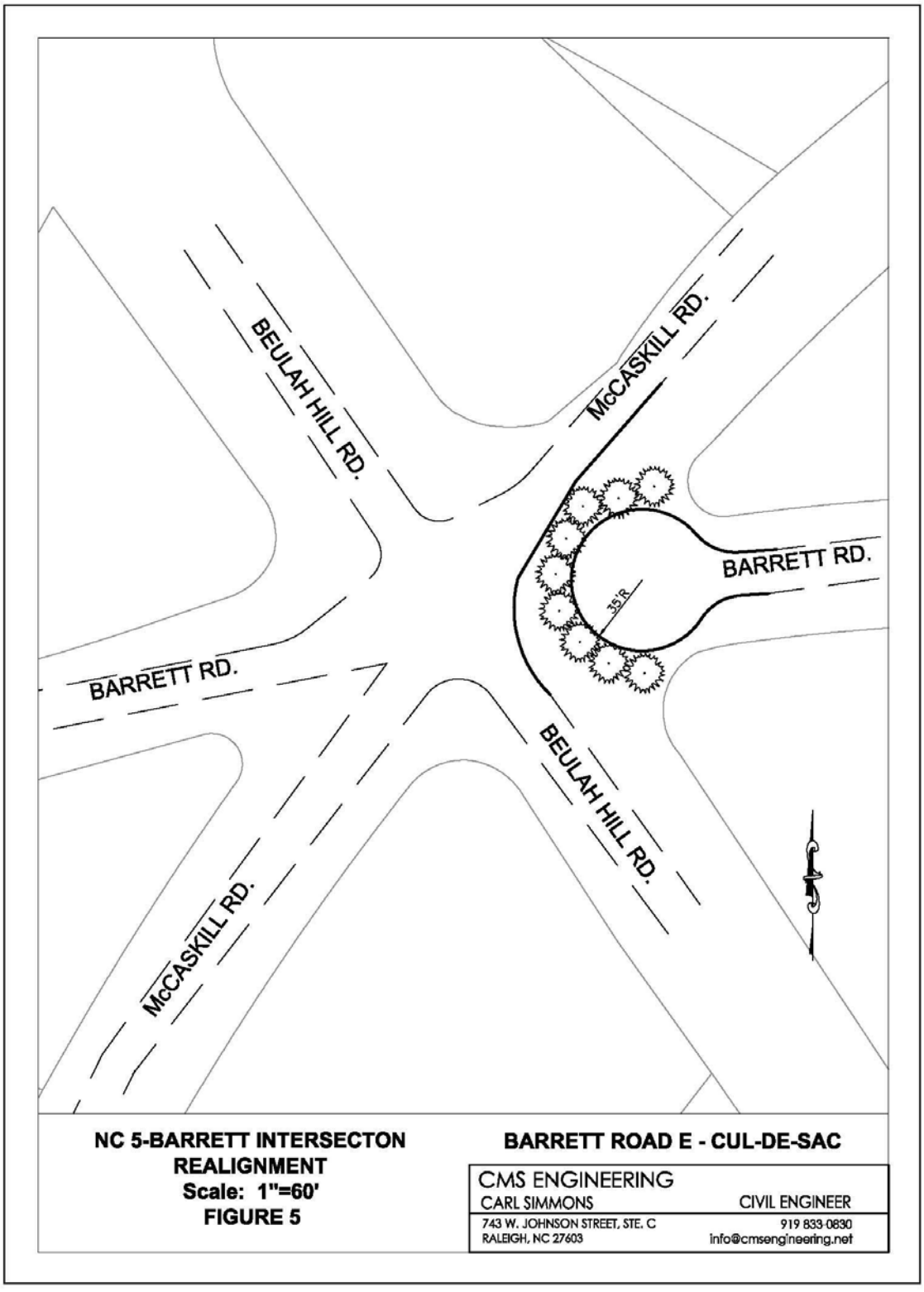
| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 3.2 | | |
| Intersection Capacity Utilization | 51.5% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| Lane Util. Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Frt | 1.00 | 0.92 | | 1.00 | 0.96 | | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1770 | 1713 | | 1770 | 1781 | | 1770 | 1863 | 1583 | 1770 | 1856 | |
| Flt Permitted | 0.66 | 1.00 | | 0.66 | 1.00 | | 0.31 | 1.00 | 1.00 | 0.20 | 1.00 | |
| Satd. Flow (perm) | 1236 | 1713 | | 1220 | 1781 | | 573 | 1863 | 1583 | 378 | 1856 | |
| Volume (vph) | 6 | 69 | 79 | 323 | 96 | 40 | 88 | 541 | 167 | 34 | 430 | 10 |
| 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 | 75 | 86 | 351 | 104 | 43 | 96 | 588 | 182 | 37 | 467 | 11 |
| RTOR Reduction (vph) | 0 | 40 | 0 | 0 | 14 | 0 | 0 | 0 | 105 | 0 | 2 | 0 |
| Lane Group Flow (vph) | 7 | 121 | 0 | 351 | 133 | 0 | 96 | 588 | 77 | 37 | 476 | 0 |
| Turn Type | Perm | | | Perm | | | Perm | | Perm | Perm | | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | 2 | 6 | | |
| Actuated Green, G (s) | 34.4 | 34.4 | | 34.4 | 34.4 | | 30.6 | 30.6 | 30.6 | 30.6 | 30.6 | |
| Effective Green, g (s) | 36.1 | 36.1 | | 36.1 | 36.1 | | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | |
| Actuated g/C Ratio | 0.47 | 0.47 | | 0.47 | 0.47 | | 0.42 | 0.42 | 0.42 | 0.42 | 0.42 | |
| Clearance Time (s) | 5.7 | 5.7 | | 5.7 | 5.7 | | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | |
| Vehicle Extension (s) | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | 586 | 812 | | 578 | 844 | | 241 | 785 | 667 | 159 | 782 | |
| v/s Ratio Prot | | 0.07 | | | 0.07 | | | c0.32 | | | 0.26 | |
| v/s Ratio Perm | 0.01 | | | c0.29 | | | 0.17 | | 0.05 | 0.10 | | |
| v/c Ratio | 0.01 | 0.15 | | 0.61 | 0.16 | | 0.40 | 0.75 | 0.11 | 0.23 | 0.61 | |
| Uniform Delay, d1 | 10.6 | 11.4 | | 14.8 | 11.4 | | 15.3 | 18.6 | 13.4 | 14.1 | 17.2 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.0 | 0.1 | | 1.8 | 0.1 | | 4.9 | 6.5 | 0.4 | 3.4 | 3.5 | |
| Delay (s) | 10.6 | 11.4 | | 16.6 | 11.5 | | 20.2 | 25.1 | 13.8 | 17.5 | 20.7 | |
| Level of Service | B | B | | B | B | | C | C | B | B | C | |
| Approach Delay (s) | | 11.4 | | | 15.1 | | | 22.2 | | | 20.5 | |
| Approach LOS | | B | | | B | | | C | | | C | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 19.1 | HCM Level of Service | B |
| HCM Volume to Capacity ratio | 0.67 | | |
| Actuated Cycle Length (s) | 76.2 | Sum of lost time (s) | 8.0 |
| Intersection Capacity Utilization | 76.5% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 4.0 | | | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Lane Util. Factor | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | | 0.95 | | | 1.00 | 0.85 | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flt Protected | | 0.98 | | | 0.95 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | | 1750 | | | 1770 | 1583 | 1770 | 1827 | | 1770 | 1862 | |
| Flt Permitted | | 0.93 | | | 0.76 | 1.00 | 0.09 | 1.00 | | 0.45 | 1.00 | |
| Satd. Flow (perm) | | 1650 | | | 1408 | 1583 | 166 | 1827 | | 840 | 1862 | |
| Volume (vph) | 1 | 1 | 1 | 126 | 0 | 483 | 1 | 455 | 67 | 288 | 573 | 1 |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 1 | 1 | 1 | 137 | 0 | 525 | 1 | 495 | 73 | 313 | 623 | 1 |
| RTOR Reduction (vph) | 0 | 1 | 0 | 0 | 0 | 329 | 0 | 3 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 2 | 0 | 0 | 137 | 196 | 1 | 565 | 0 | 313 | 624 | 0 |
| Turn Type | Perm | | | Perm | | pm+ov | pm+pt | | | pm+pt | | |
| Protected Phases | | 4 | | | 8 | 1 | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | 8 | 2 | | | 6 | | |
| Actuated Green, G (s) | | 15.3 | | | 15.3 | 34.1 | 88.3 | 63.2 | | 57.7 | 38.9 | |
| Effective Green, g (s) | | 17.6 | | | 17.6 | 38.7 | 90.4 | 65.3 | | 62.1 | 41.0 | |
| Actuated g/C Ratio | | 0.15 | | | 0.15 | 0.33 | 0.78 | 0.56 | | 0.54 | 0.35 | |
| Clearance Time (s) | | 6.3 | | | 6.3 | 6.3 | 5.3 | 6.1 | | 6.3 | 6.1 | |
| Vehicle Extension (s) | | 3.0 | | | 3.0 | 3.0 | 3.0 | 3.0 | | 3.0 | 3.0 | |
| Lane Grp Cap (vph) | | 250 | | | 214 | 583 | 757 | 1028 | | 619 | 658 | |
| v/s Ratio Prot | | | | | | 0.06 | 0.00 | c0.31 | | c0.09 | c0.34 | |
| v/s Ratio Perm | | 0.00 | | | c0.10 | 0.06 | 0.00 | | | 0.18 | | |
| v/c Ratio | | 0.01 | | | 0.64 | 0.34 | 0.00 | 0.55 | | 0.51 | 0.95 | |
| Uniform Delay, d1 | | 41.8 | | | 46.2 | 29.0 | 9.7 | 16.0 | | 20.0 | 36.5 | |
| Progression Factor | | 1.00 | | | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | | 0.0 | | | 6.4 | 0.3 | 0.0 | 2.1 | | 0.7 | 24.5 | |
| Delay (s) | | 41.8 | | | 52.6 | 29.3 | 9.7 | 18.1 | | 20.6 | 60.9 | |
| Level of Service | | D | | | D | C | A | B | | C | E | |
| Approach Delay (s) | | 41.8 | | | 34.2 | | | 18.1 | | | 47.5 | |
| Approach LOS | | D | | | C | | | B | | | D | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM Average Control Delay | 35.7 | HCM Level of Service | D |
| HCM Volume to Capacity ratio | 0.73 | | |
| Actuated Cycle Length (s) | 116.0 | Sum of lost time (s) | 16.0 |
| Intersection Capacity Utilization | 73.8% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |


BEULAH HILL RD.
McCASKILL RD.
BARRETT RD.
35'R
BARRETT RD.
BEULAH HILL RD.
McCASKILL RD.
NC 5-BARRETT INTERSECTON
REALIGNMENT
Scale: 1"=60'
FIGURE 5
BARRETT ROAD E - CUL-DE-SAC
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CIVIL ENGINEER
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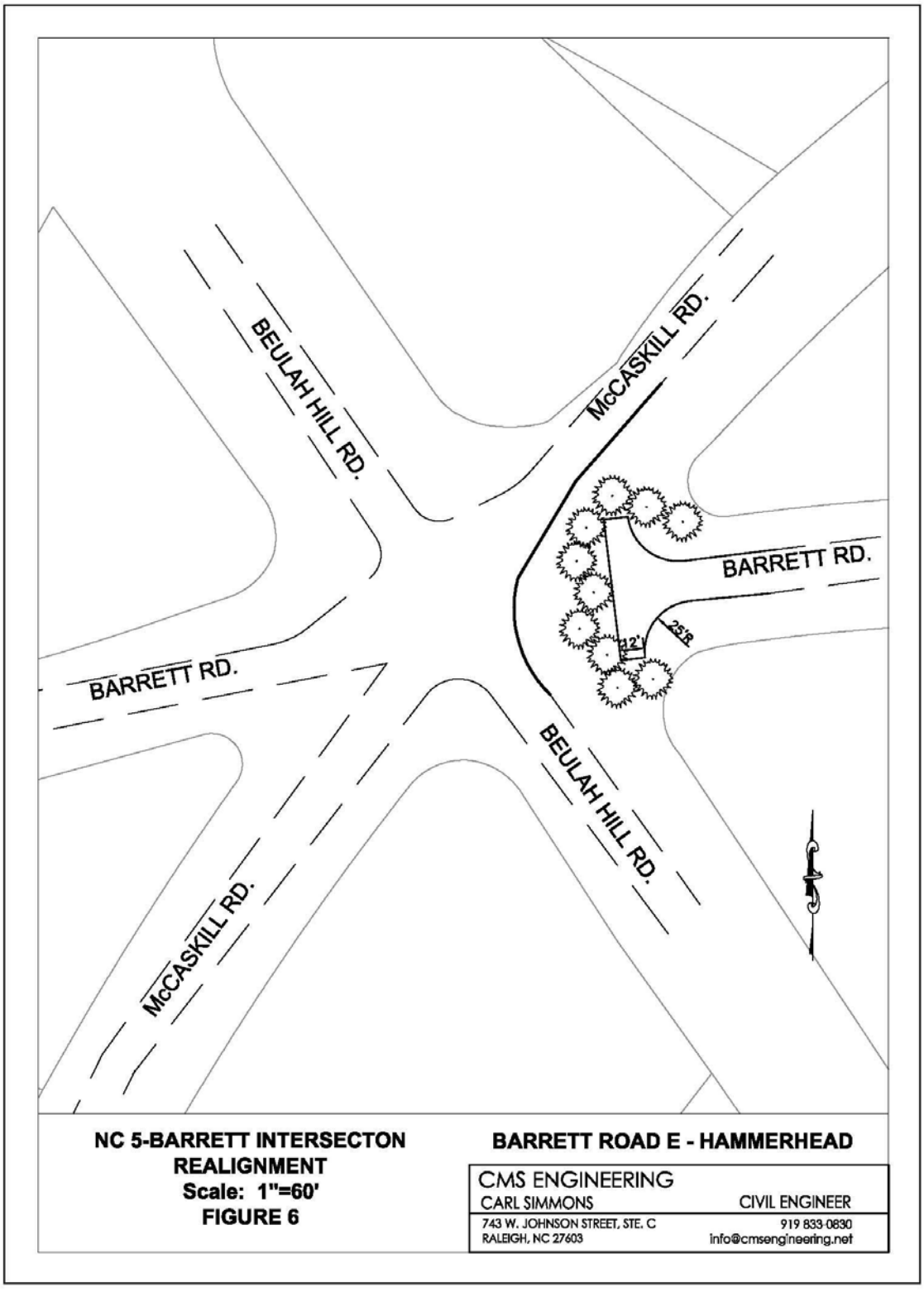
RALEIGH, NC 27603
919 833-0830
info@cmsengineering.net


BEULAH HILL RD.
McCASKILL RD.
BARRETT RD.
BARRETT RD.
BEULAH HILL RD.
McCASKILL RD.
25'R
12'
NC 5-BARRETT INTERSECTON
REALIGNMENT
Scale: 1"=60'
FIGURE 6
BARRETT ROAD E - HAMMERHEAD
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