



# **Cottonwood Village**

## **Traffic Impact Analysis Report**

Prepared for:

Lincoln County, NC

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July 19, 2010



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## EXECUTIVE SUMMARY

Cottonwood Village is to be located on the north side of S. Little Egypt Road (SR 1386) between NC Hwy 16 and NC 16 Hwy Business. The mixed use development will consist of apartment homes, office space, and retail space, and will be constructed in two phases. Phase 1 will include the construction of 222 apartment units. Phase 2 will include the construction of 32 apartment units, 47,600 square feet (sf) of office space, and 33,200 sf of retail space. The land use immediately adjacent to the site is mostly vacant with some commercial.

The Cottonwood Village site is proposed to have three full-access points; one each on NC Hwy 73, S. Little Egypt Road (SR 1386), and Advance Avenue (SR 2069).

The full occupancy of Cottonwood Village is expected in two phases. Phase 1 is anticipated to be fully occupied in 2012. Phase 2 is expected to be complete and occupied in 2014. The following existing roadways and intersections are included as the area of influence for the development:

1. NC Hwy 73 @ S. Little Egypt Road	<i>signalized four-legged-intersection</i>
2. NC Hwy 73 @ NC Hwy 16 SB ramps	<i>signalized four-legged intersection</i>
3. NC Hwy 73 @ NC Hwy 16 NB ramp	<i>signalized four-legged intersection</i>
4. NC Hwy 73 @ NC Hwy 16 Business	<i>signalized four-legged intersection</i>
5. NC Hwy 73 @ Pilot Knob Road	<i>signalized four-legged intersection</i>
6. NC Hwy 16 Business @ S. Pilot Knob Road	<i>unsignalized three-legged intersection</i>
7. NC Hwy 16 Business @ S. Little Egypt Road	<i>unsignalized three-legged intersection</i>
8. NC Hwy 16 Business @ Advance Avenue	<i>unsignalized three-legged intersection</i>
9. NC Hwy 16 Business @ Waterside Crossing Blvd	<i>unsignalized three-legged intersection</i>
10. S. Pilot Knob Rd @ Waterside Crossing Blvd	<i>unsignalized four-legged intersection</i>

Below is a detailed description of the existing study area roadway network. All Average Annual Daily Traffic (AADT) information provided in this description was obtained from the North Carolina Department of Transportation (NCDOT) via the [www.ncdot.org](http://www.ncdot.org) website.

NC Hwy 73 is an east-west four-lane roadway providing access to Denver, NC and Huntersville, NC. The land use along NC Hwy 73 is mainly industrial and commercial with some residential. The 2008 AADT on NC Hwy 73 was 13,000 vehicles per day (vpd) in the study area. The posted speed limit on this road is 45 miles per hour (mph) in the vicinity of the site.

*S. Little Egypt Road (SR 1386)* is a north-south two-lane roadway that curves to form an east-west roadway in the study area. This roadway no longer connects from NC Hwy 73 to NC Hwy 16 Business. It has been bisected by NC Hwy 16 and now is a dead end road at both ends, from NC Hwy 73 and from NC Hwy 16 Business. The land use along S. Little Egypt Road in the study area is a mixture of residential, industrial, and commercial. There was no AADT available for S. Little Egypt Road. The speed limit along this road is 45 mph near NC Hwy 73. There is no posted speed limit near NC Hwy 16 Business.

*NC Hwy 16 southbound (SB) ramps* are entrance and exit ramps to and from the southbound lanes of NC Hwy 16 providing access to and from NC Hwy 73 in Lincoln County, NC. There is no land use along the NC Hwy 16 SB ramps as this portion is controlled access.

*NC Hwy 16 northbound (NB) ramps* are entrance and exit ramps to and from the northbound lanes of NC Hwy 16 providing access to and from NC Hwy 73 in Lincoln County, NC. There is no land use along the NC Hwy 16 SB ramps as this portion is controlled access.

*NC Hwy 16 Business* is a north-south, two-lane roadway providing access to nearby Hickory, NC and Charlotte, NC. The land use along this roadway is a mixture of residential, industrial, and commercial. The 2008 AADT on NC Hwy 16 Business was 11,000 vpd south of NC Hwy 73 and 17,000 vpd north of NC Hwy 73. The speed limit along this road is 45 mph.

*S. Pilot Knob Road (SR 1394)* is a north-south two-lane roadway connecting NC Hwy 16 Business to NC Hwy 73. The land use along this roadway is residential with some commercial. The 2008 AADT on Pilot Knob Road was 4,600 vpd south of NC Hwy 73. The posted speed limit on this roadway is 45 mph.

*Advance Avenue (SR 2069)* is an east-west two-lane roadway providing access to some commercial properties and other undeveloped sites. The land use along this roadway is mainly commercial. The 2008 AADT on this road was not available. There was no posted speed limit along this road.

*Waterside Crossing Blvd (SR 2039)* is an east-west two-lane roadway providing access to shopping and housing between NC Hwy 16 Business and S. Pilot Knob Road. The land use along this roadway is a mix of commercial and residential. There was no AADT available for this road. The posted speed limit along this road is 25 mph.

This study documents the intersection level of service (LOS) analyses for the proposed Cottonwood Village. The LOS, as defined by the Transportation Research Board's Highway Capacity Manual (HCM), is a measurement of average delay incurred at an intersection for a particular movement. Intersections are graded with levels of service "A" through "F" with "A" being the best. According to industry standards, any signalized intersection or any approach of an unsignalized intersection is considered acceptable if average delay is LOS D or better. Any signalized intersection or approach

with a LOS of E or worse is considered substandard and may need solutions to improve the operational performance.

There are a total of seven (7) scenarios evaluated for the intersections affected by the proposed Cottonwood Village:

1. The “Base Conditions” analysis uses the latest traffic counts available to evaluate the current intersection capacity utilization and operational performance,
2. The “Future No-Build Phase 1” analysis examines the future traffic performance where the proposed Cottonwood Village Phase 1 is not constructed. This analysis takes into account background traffic growth (3% per year), other approved developments in the area, and any associated transportation improvements,
3. The “Future Build Phase 1” analysis comprises the build-out of proposed Cottonwood Village Phase 1 with the outlying future traffic, and evaluates the intersection operational performance using trips generated from the ITE Trip Generation rates,
4. The “Future Build with Improvements Phase 1” analysis highlights the mitigation needed if the “Future Build Phase 1” analyses show deficiencies on the roadway network in the study area. This analysis will report the improvements and their effect on the studied intersections,
5. The “Future No-Build Phase 2” analysis examines the future traffic performance where the proposed Cottonwood Village Phase 1 or Phase 2 is not constructed. This analysis takes into account background traffic growth (3% per year), other approved developments in the area, and any associated transportation improvements,
6. The “Future Build Phase 2” analysis comprises the build-out of proposed Cottonwood Village Phase 1 and Phase 2 with the outlying future traffic, and evaluates the intersection operational performance using trips generated from the ITE Trip Generation rates, and
7. The “Future Build with Improvements” highlights the mitigation needed if the “Future Build” analyses show deficiencies on the roadway network in the study area. This analysis will report improvements and their effect on the studied intersections.

All seven of the scenarios are performed for both AM and PM peak hours.

## **Phase 1 Site Trip Generation and Distribution**

Phase 1 of the Cottonwood Village development will consist of 222 apartment units and has a build-out year of 2012. According to the ITE Trip Generation, Phase 1 of Cottonwood Village will generate approximately 1,469 trips daily. Of these daily trips, 113 will be in the AM peak hour and 140 in the PM peak hour.

The distribution of trips created by Phase 1 of Cottonwood Village was determined based upon current traffic patterns and the proposed site layout. Of the traffic entering the site, 60% will use the site access on NC Hwy 73; 30% will be traveling westbound on NC

Hwy 73 (4% of this from northbound NC Hwy 16 Business) and 30% will be traveling eastbound on NC Hwy 73. 20% of the entering site traffic will be from northbound NC Hwy 16 Business, 5% of which will use Advance Avenue to access the site and 15% will use the site entrance on S. Little Egypt Road. 20% of the entering site traffic will be from southbound NC Hwy 16 Business. Of this, 15% will use the site access on S. Little Egypt Road and 5% will access the site using Advance Avenue.

Of the exiting traffic, 32% will be traveling westbound on NC Hwy 73 using the Lowes driveway (no left-turns will be permitted from the site access to NC Hwy 73) and 28% will be traveling eastbound on NC Hwy 73 using the site access on NC Hwy 73. 20% of the exiting site traffic will travel northbound on NC Hwy 16 Business, 5% of which will be using Advance Avenue and 15% using the site entrance on S. Little Egypt Road. The remaining 20% of the exiting site traffic will travel southbound on NC Hwy 16 Business. Of this, 15% will use the site access on S. Little Egypt Road and 5% will use Advance Avenue.

## **Phase 2 Site Trip Generation and Distribution**

Phase 2 has a build-out year of 2014 and will include 32 apartments, 47,600 square feet (sf) of office space, and 33,200 sf of retail space. This phase will generate approximately 3,602 trips daily. Of these daily trips, 184 will be in the AM peak hour and 289 in the PM peak hour.

The distribution of non-pass-by trips created by Phase 2 of Cottonwood Village was determined based upon current traffic patterns and the proposed site layout. Of the traffic entering the site, 65% will use the site access on NC Hwy 73; 32% from the east and 33% from the west. 25% of the entering non-pass-by site traffic will use Advance Avenue to access the site; 13% from the south on NC Hwy 16 Business and 12% from the north. 5% of the non-pass-by site traffic will use the site entrance on S. Little Egypt Road; 3% from the south and 2% from the north on NC Hwy 16 Business. The remaining 5% of non-pass-by site trips will travel from Links Landing/Wal-Mart using the Wal-Mart/Lowe's access which will provide alternate site access since no through movement across NC Hwy 73 will be permitted at the site entrance.

Of the exiting non-pass-by traffic, 36% will use the site access on NC Hwy 73; 36% will travel east, 5% of which will travel north into the Links Landing/Walgreen's site via NC Hwy 16 Business since no through movement across NC Hwy 73 will be permitted at the site entrance. 25% of the non-pass-by exiting site traffic will use Advance Avenue; 12% travelling north and 13% travelling south on NC Hwy 16 Business. 5% of the exiting non-pass-by traffic will use the access on S. Little Egypt Road; 2% will travel north and 3% will travel south on NC Hwy 16 Business. The remaining 34% of exiting non-pass-by traffic will use the alternate access via the Lowe's/Wal-Mart access to NC Hwy 73 and travel west on NC Hwy 73.

The distribution of pass-by trips created by Phase 2 of Cottonwood Village was determined based upon current traffic patterns and the site layout. 43% of the pass-by

traffic will travel from west to east on NC Hwy 73. 47% of the pass-by traffic will travel from east to west on NC Hwy 73. 5% of the pass-by traffic will travel from north to south along NC Hwy 16 Business and 5% will travel from south to north along NC Hwy 16 Business, utilizing Advance Avenue to enter and exit the site.

### **Base Conditions (2009)**

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS E in the AM peak hour. In the PM peak hour, the intersection operates at LOS B.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS A in the AM and PM peak hours.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS A in the AM peak hour. In the PM peak hour, the intersection operates at LOS B.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS C in the AM peak hour. In the PM peak hour, the intersection operates at LOS D.

The signalized intersection of NC Hwy 73 at S. Pilot Knob Road operates at LOS C in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM and PM peak hours.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the eastbound approach operates at LOS C.

The unsignalized intersection of NC Hwy 16 Business at Advance Avenue operates at LOS A in the AM and PM peak hours on the northbound and southbound approaches. The eastbound approach operates at LOS B in the AM peak hour and LOS C in the PM peak hour.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS E.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours. The southbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the southbound approach operates at LOS C. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

## 2012 No-Build Phase 1 Conditions

The proposed Cottonwood Village Phase 1 is expected to be fully built and occupied by 2012. An annual growth rate of 3% was applied to the base year (2009) traffic to forecast the future (2012) background traffic volumes. In addition, the background traffic will include trips generated from another development that has been approved:

- Walgreen's
  - 14,280 sf Pharmacy/Drug-Store with Drive-thru window

As part of the roadway improvements for the Walgreen's site and the future Links Landing site, a traffic signal was to be installed at their shared site access on NC Hwy 73. However, since the development of the NC Hwy 73 corridor, NCDOT and municipalities have agreed on an access management vision. Therefore, the site access for Links Landing/Walgreen's will be studied as having a "leftover" with 150 feet of storage as required by NCDOT for left-turning vehicles. This leftover is assumed to be installed prior the completion of Phase 1.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS D in the AM peak hour. In the PM peak hour, the intersection operates at LOS B.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS C.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM and PM peak hours.

The signalized intersection of NC Hwy 73 at S. Pilot Knob Road operates at LOS C in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS D.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at Advance Avenue operates at LOS A in the AM and PM peak hours on the northbound and southbound approaches.

The eastbound approach operates at LOS B in the AM peak hour and LOS C in the PM peak hour.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS F.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours. The southbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the southbound approach operates at LOS C. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Walgreen's site access operates at LOS B in the southbound approach in the AM and PM peak hours. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

## 2012 Build Phase 1 Conditions

The total future traffic volumes for the 2012 Build Phase 1 scenario is comprised of traffic volumes from the 2012 No-Build Phase 1 Analysis plus the Phase 1 site traffic generated.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS D in the AM peak hour. In the PM peak hour, the intersection operates at LOS B.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS C.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM and PM peak hours.

The signalized intersection of NC Hwy 73 at S. Pilot Knob Road operates at LOS C in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS D.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours.

The eastbound approach operates at LOS B in the AM peak hour and LOS C in the PM peak hour.

The unsignalized intersection of NC Hwy 16 Business at Advance Avenue operates at LOS A in the AM and PM peak hours on the northbound and southbound approaches. The eastbound approach operates at LOS B in the AM peak hour and LOS C in the PM peak hour.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS F.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours. The southbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the southbound approach operates at LOS C. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Site Access 1/Walgreen's site access operates at LOS B in the northbound and southbound approaches in the AM and PM peak hours. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of S. Little Egypt Road at Site Access 2 operates at LOS A on the southbound, eastbound, and westbound approaches in the AM and PM peak hours.

## **2012 Build with Improvements Phase 1 Conditions**

NCDOT requires that mitigation to the roadway network shall be identified if, using the HCM method:

1. The total average delay at an intersection increases by 25% or greater, while maintaining the same Level of Service, or:
2. The Level of Service degrades by at least one level, or:
3. The Level of Service is "F," or:
4. The turning and opposing traffic volumes fall within the "Warrant for Left and Right-Turn Lanes" in accordance to the *Policy of Street and Driveway Access to North Carolina Highways, July 2003*.

Lincoln County requires that mitigation to the roadway network shall be identified if:

1. The Level of Service at any intersection leg degrades to less than a "C, or:
2. Any intersection that has an existing Level of Service below "C" must be maintained at existing Level of Service, and:

3. All improvements must be approved by NCDOT.

The site traffic will satisfy at least one of these conditions on two of the existing intersections in Phase 1 and must therefore, be mitigated.

### **Improvements by Developer – Phase 1:**

1. NC Hwy 73 @ Site Access 1/Links Landing and Walgreen's access:
  - o Provide for a separate right-turn lane on the northbound approach for traffic exiting the site,
  - o Provide for a westbound left-turn lane (leftover) with 175 ft of storage and appropriate taper and striping,
2. NC Hwy 16 Business @ S. Little Egypt Road:
  - o Install a northbound left-turn lane with 50 ft of storage and appropriate taper and striping on NC Hwy 16 Business

These improvements are to be installed prior to the completion of construction of Phase 1 in accordance with NCDOT regulations.

Based upon the recommended mitigation:

1. The unsignalized intersection of NC Hwy 73 at Site Access 1/Links Landing and Walgreen's access operates at LOS B in the northbound and southbound approaches in the AM and PM peak hours. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.
2. The unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road operates at LOS A on the northbound and southbound approaches for the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour and LOS C in the PM peak hour.

### **2014 No-Build Phase 2 Conditions**

Phase 2 of the proposed Cottonwood Village is expected to be completed and fully occupied by 2014. An annual growth rate of 3% was applied to the existing traffic to forecast the future (2014) background traffic volumes. In addition, the background traffic will include trips generated from other developments that have been approved:

- Links Landing
  - o Mixed use project to consist of
    - 86,991 sf Shopping Center
    - 7,000 sf High-Turnover Restaurant
    - 7,000 sf High-Turnover Restaurant
    - 3,500 sf Fast-Food Restaurant with Drive-thru
    - 1,500 sf Fast-Food Restaurant with Drive-thru

- Walgreen's
  - 14,280 sf Pharmacy/Drug-Store with Drive-thru window

As part of the roadway improvements for the Walgreen's site and the future Links Landing site, a traffic signal was to be installed at their shared site access on NC Hwy 73. However, since the development of the NC Hwy 73 corridor, NCDOT and municipalities have agreed on an access management vision. Therefore, the site access for Links Landing/Walgreen's will be studied as having a "leftover" with 150 feet of storage as required by NCDOT for left-turning vehicles. This leftover is assumed to be installed prior the completion of Phase 1.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS D in the AM peak hour. In the PM peak hour, the intersection operates at LOS C.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS C.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM peak hour. In the PM peak hour, the intersection operates at LOS E.

The signalized intersection of NC Hwy 73 at S. Pilot Knob Road operates at LOS C in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS D.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS C in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at Advance Avenue operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the eastbound approach operates at LOS C.

At the unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS F.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours. The southbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the southbound approach operates at LOS C. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Links Landing/Walgreen's site access operates at LOS B in the southbound approach in AM and PM peak hours. In the eastbound and westbound approaches, the LOS is A during the AM and PM peak hours.

## 2014 Build Phase 2 Conditions

The total future traffic volumes for the 2014 Build Phase 2 scenario is comprised of traffic volumes from the 2014 No-Build Phase 2 traffic plus the Phase 1 and Phase 2 site generated traffic.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS E in the AM peak. In the PM peak hour, the intersection operates at LOS C.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour. In the PM peak hour, the intersection operates at LOS C.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM peak hour. In the PM peak hour, the intersection operates at LOS E.

The signalized intersection of NC Hwy 73 at S. Pilot Knob Road operates at LOS C in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS D in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS E.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the eastbound approach operates at LOS C.

At the unsignalized intersection of NC Hwy 16 Business at Advance Avenue, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the eastbound approach operates at LOS C.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS F.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours. The southbound approach operates at LOS B in the AM peak hour. In the PM peak hour, the southbound approach operates at LOS C. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Site Access 1/Walgreen's and Links Landing site access operates at LOS C in the northbound approach in the AM and PM peak hours. The southbound approach operates at LOS C in the AM and PM peak hours. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of S. Little Egypt Road at Site Access 2 operates at LOS A on the southbound, eastbound, and westbound approaches in the AM and PM peak hours.

## **2014 Build with Improvements Phase 2 Conditions**

NCDOT requires that mitigation to the roadway network shall be identified if, using the HCM method:

1. The total average delay at an intersection increases by 25% or greater, while maintaining the same Level of Service, or:
2. The Level of Service degrades by at least one level, or:
3. The Level of Service is "F," or:
4. The turning and opposing traffic volumes fall within the "Warrant for Left and Right-Turn Lanes" in accordance to the *Policy of Street and Driveway Access to North Carolina Highways, July 2003*.

Lincoln County requires that mitigation to the roadway network shall be identified if:

1. The Level of Service at any intersection leg degrades to less than a "C, or:
2. Any intersection that has an existing Level of Service below "C" must be maintained at existing Level of Service, and:
3. All improvements must be approved by NCDOT.

The site traffic will satisfy at least one of these conditions on two of the existing intersections in Phase 2 and must therefore, be mitigated.

**Improvements by Developer – Phase 2:**

In addition to improvements completed in Phase 1, the following improvements to the roadway network are recommended:

1. **NC Hwy 16 Business @ S. Pilot Knob Road:**
  - Install a northbound right-turn lane with 125 ft of storage and appropriate taper and striping on NC Hwy 16 Business
2. **NC Hwy 16 Business @ Waterside Crossing Blvd:**
  - Stripe the westbound approach to have a left-turn lane and right-turn lane  
Note: the existing shared lane is 24 feet wide therefore no additional pavement is necessary.

These improvements are to be installed prior to the completion of Phase 2 construction in accordance with NCDOT regulations.

With the proposed improvements:

1. The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A on the northbound and southbound approaches for the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour and LOS D in the PM peak hour.
2. The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A on the northbound and southbound approaches for the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour. In the PM peak hour, the westbound approach operates at LOS F, within 11.58% of the 2009 existing condition delay.

Note: although the LOS decreases from D to E from the No-Build Phase 2 to the Build Phase 2 scenarios at the intersection of NC Hwy 73 at Little Egypt Rd, the increase in delay is less than 10% therefore no improvements are recommended at this intersection.

After full build-out, NCDOT may consider a traffic signal at Site access 1 on NC Hwy 73 if warranted.

## Conclusions/Recommendations

Phase 1 of Cottonwood Village will generate approximately 1,469 trips daily. Of these daily trips, 113 will be in the AM peak hour and 140 in the PM peak hour. Phase 2 of Cottonwood Village will generate approximately 3,602 trips daily. Of these daily trips, 184 will be in the AM peak hour and 289 in the PM peak hour.

From the operational analysis, recommendations are as follows:

### Improvements by Developer:

#### Phase 1:

1. NC Hwy 73 @ Site Access 1/Links Landing and Walgreen's access:
  - o Provide for a separate right-turn lane on the northbound approach for traffic exiting the site,
  - o Provide for a westbound left-turn lane (leftover) with 175 ft of storage and appropriate taper and striping,
2. NC Hwy 16 Business @ S. Little Egypt Road:
  - o Install a northbound left-turn lane with 50 ft of storage and appropriate taper and striping on NC Hwy 16 Business

#### Phase 2:

1. NC Hwy 16 Business @ S. Pilot Knob Road:
  - o Install a northbound right-turn lane with 125 ft of storage and appropriate taper and striping on NC Hwy 16 Business
2. NC Hwy 16 Business @ Waterside Crossing Blvd:
  - o Stripe the westbound approach to have a left-turn lane and right-turn lane  
Note: the existing shared lane is 24 feet wide therefore no additional pavement is necessary.

Note: although the LOS decreases from D to E from the No-Build Phase 2 to the Build Phase 2 scenarios at the intersection of NC Hwy 73 at Little Egypt Rd, the increase in delay is less than 10% therefore no improvements are recommended at this intersection.

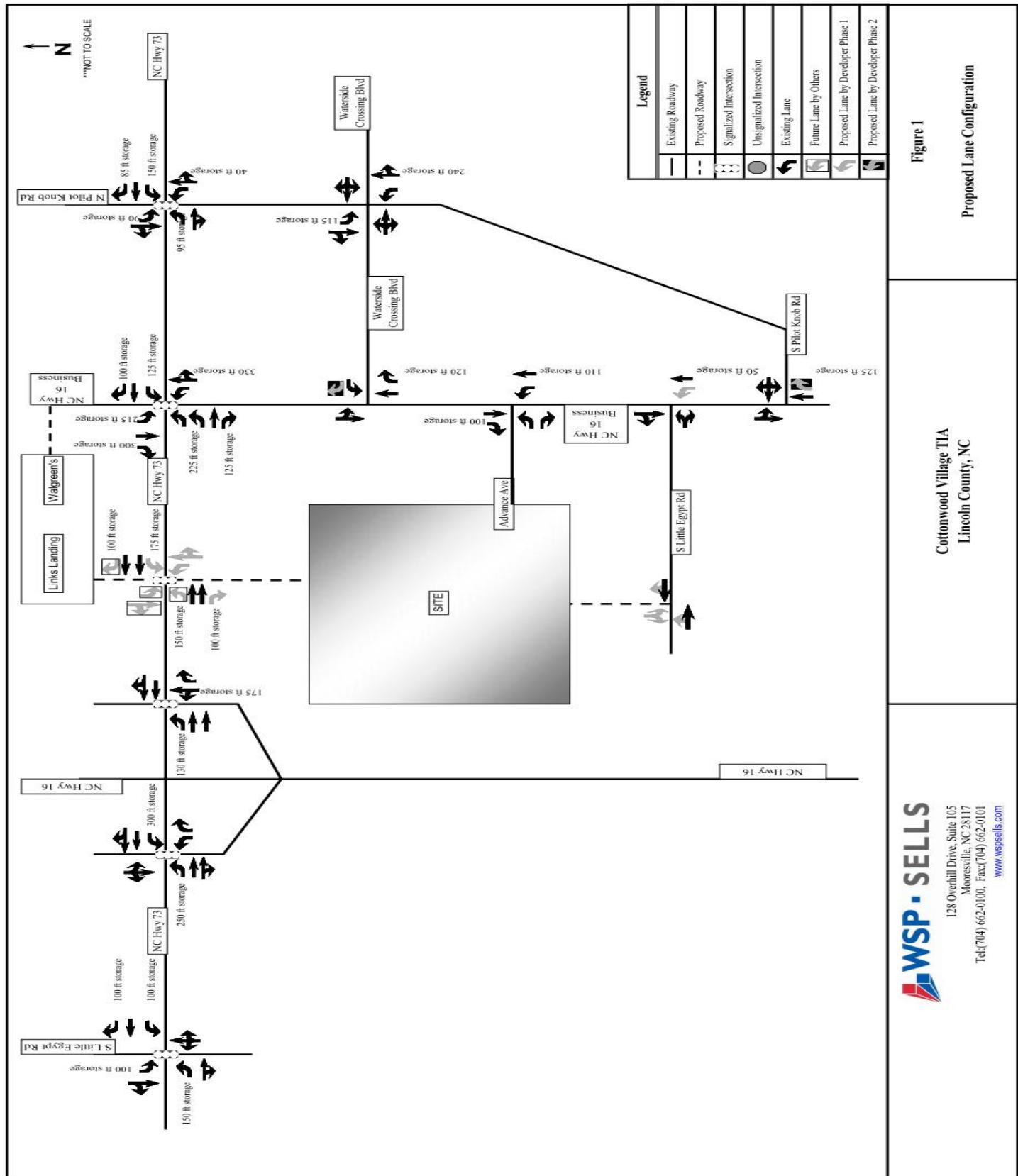
These improvements are to be installed prior to the completion of construction in the respective phase as noted in accordance with NCDOT regulations.

After full build-out, NCDOT may consider a traffic signal at Site access 1 on NC Hwy 73 if warranted.

**Table 1: Level of Service Analysis Summary**

Intersection	Approach	Existing (2009)		No-Build Phase 1 (2012)		Build Phase 1 (2012)		Build Phase 1 (2012) with Improvements		No-Build Phase 2 (2014)		Build Phase 2 (2014)		Build Phase 2 (2014) with Improvements			
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM		
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS		
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	NB - S. Little Egypt Rd	38.0	E	136	B	38.5	D	17.9	B	39.6	D	18.5	B	39.6	D	18.5	B
	SB - N. Little Egypt Rd		EB - NC Hwy 73														
NC Hwy 73 @ NC Hwy 16 SB ramps	NB - NC Hwy 16 SB ramps	9.2	A	2.8	A	12.9	B	4.3	A	13.0	B	4.4	A	13.0	B	4.4	A
	WB - NC Hwy 73		EB - NC Hwy 73														
NC Hwy 73 @ NC Hwy 16 NB ramp	NB - NC Hwy 16 NB ramp	9.1	A	13.7	B	11.8	B	24.6	C	12.0	B	25.1	C	12.0	B	25.1	C
	WB - NC Hwy 73		EB - NC Hwy 73														
NC Hwy 73 @ NC Hwy 16 Business	NB - NC Hwy 16 Business	31.9	C	39.1	D	36.6	D	49.1	D	37.5	D	51.8	D	37.5	D	47.4	D
	SB - NC Hwy 16 Business		EB - NC Hwy 73														
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	NB - S. Pilot Knob Rd	28.2	C	280	C	22.4	C	23.0	C	23.1	C	23.7	C	23.1	C	22.5	C
	WB - S. Pilot Knob Rd		EB - NC Hwy 73														
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	NB - NC Hwy 16 Business	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
	SB - NC Hwy 16 Business	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	NB - NC Hwy 16 Business	22.1	C	222	C	20.3	C	27.0	D	21.3	C	29.3	D	22.5	C	31.8	D
	SB - NC Hwy 16 Business	0.3	A	0.6	A	0.3	A	0.6	A	0.4	A	0.9	A	0.3	A	0.5	A
NC Hwy 16 Business @ Advance Ave (SR 2069)	NB - NC Hwy 16 Business	14.1	B	150	C	14.6	B	14.9	B	13.3	B	16.4	C	13.3	B	16.4	C
	SB - NC Hwy 16 Business	0.0	A	0.4	A	0.0	A	0.4	A	0.0	A	0.4	A	0.0	A	0.4	A
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	NB - NC Hwy 16 Business	12.9	B	160	C	13.3	B	18.1	C	13.5	B	19.0	C	13.5	B	19.0	C
	SB - NC Hwy 16 Business	2.0	A	3.0	A	2.1	A	3.2	A	2.1	A	3.2	A	2.1	A	3.2	A
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	NB - Site Access 1	12.5	B	122	B	12.6	B	12.6	B	12.2	B	12.6	B	12.5	B	13.0	B
	SB - Waterside Crossing Blvd		EB - S. Pilot Knob Rd														
NC Hwy 73 @ Site Access 1	NB - Site Access 1	12.4	B	13.1	B	12.4	B	12.6	B	12.2	B	12.6	B	12.5	B	13.1	B
	SB - Links Landing/Walgreen's		EB - NC Hwy 73														
S. Little Egypt Rd (SR 1386) @ Site Access 2	NB - Site Access 2	0.1	A	0.5	A	0.1	A	0.9	A	1.1	A	0.9	A	1.1	A	0.9	A
	SB - Site Access 2		EB - S. Little Egypt Rd														
unacceptable LOS and delay																	

Figure 1: Proposed Lane Configuration



## INTRODUCTION

Cottonwood Village is to be located south of NC Hwy 73 and north of S. Little Egypt Road (SR 1386) between NC Hwy 16 and NC Hwy 16 Business in Lincoln County, NC. The mixed use development will consist of apartment homes, office space, and retail space, and will be constructed in two phases. Phase 1 has a build-out year of 2012, and will include the construction of 222 apartment units. Phase 2 has a build-out year of 2014, and will include the construction of 32 apartment units, 47,600 square feet (sf) of office space, and 33,200 sf of retail space.

The Cottonwood Village site is proposed to have three access points; a left-over with a right-in/right-out access on NC Hwy 73, full access on S. Little Egypt Road (SR 1386), and full access on Advance Avenue. The site layout is displayed in Figure 2.

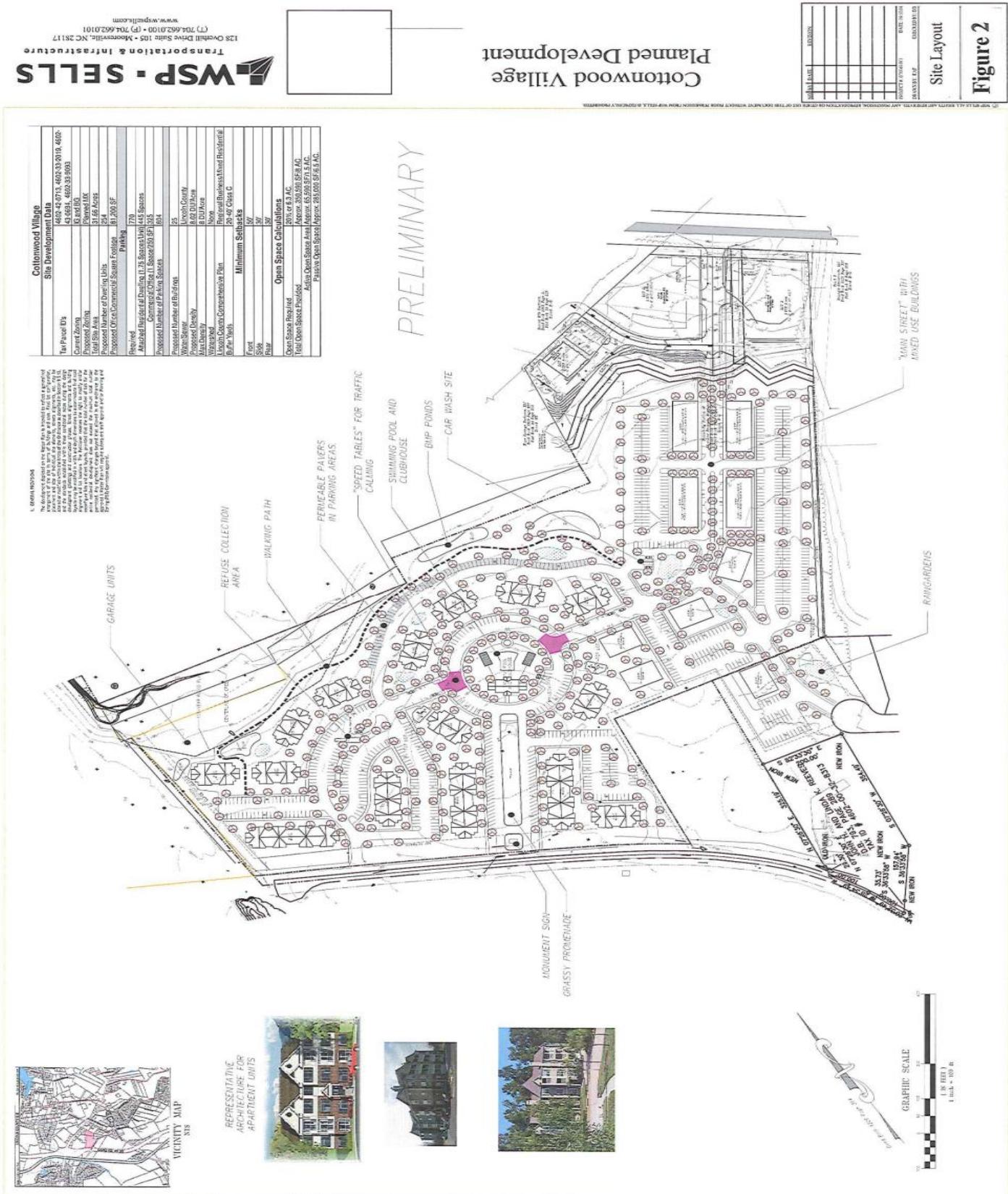
In addition to the Cottonwood Village site, traffic will also be generated from other approved developments. Specifically:

- Walgreen's
  - 14,280 sf Pharmacy/Drug-Store with Drive-thru window
- Links Landing
  - Mixed use project to consist of
    - 86,991 sf Shopping Center
    - 7,000 sf High-Turnover Restaurant
    - 7,000 sf High-Turnover Restaurant
    - 3,500 sf Fast-Food Restaurant with Drive-thru
    - 1,500 sf Fast-Food Restaurant with Drive-thru

The Walgreen's is currently under site plan review with Lincoln County. The drug-store is expected to generate 1,307 daily site trips, 39 in the AM peak hour and 78 in the PM peak hour. This site is expected to be open before 2012, when Phase 1 of Cottonwood Village is anticipated to open.

Links Landing is proposed to open before 2014, when Phase 2 of Cottonwood Village is projected to be finished with construction and open to the public. Links Landing is anticipated to generate 7,995 daily site trips, 386 in the AM peak hour and 389 in the PM peak hour.

**Figure 2: Site Layout**



## STUDY AREA

As shown in Figure 3, the following existing roadways and intersections are included as the area of influence for the development.

1. NC Hwy 73 @ S. Little Egypt Road	<i>signalized four-legged intersection</i>
2. NC Hwy 73 @ NC Hwy 16 SB ramps	<i>signalized four-legged intersection</i>
3. NC Hwy 73 @ NC Hwy 16 NB ramp	<i>signalized four-legged intersection</i>
4. NC Hwy 73 @ NC Hwy 16 Business	<i>signalized four-legged intersection</i>
5. NC Hwy 73 @ Pilot Knob Road	<i>signalized four-legged intersection</i>
6. NC Hwy 16 Business @ S. Pilot Knob Road	<i>unsignalized three-legged intersection</i>
7. NC Hwy 16 Business @ S. Little Egypt Road	<i>unsignalized three-legged intersection</i>
8. NC Hwy 16 Business @ Advance Avenue	<i>unsignalized three-legged intersection</i>
9. NC Hwy 16 Business @ Waterside Crossing Blvd	<i>unsignalized three-legged intersection</i>
10. S. Pilot Knob Rd @ Waterside Crossing Blvd	<i>unsignalized four-legged intersection</i>

Below is a detailed description of the existing study area roadway network. All Average Annual Daily Traffic (AADT) information provided in this description was obtained from the North Carolina Department of Transportation (NCDOT) via the [www.ncdot.org](http://www.ncdot.org) website.

*NC Hwy 73* is an east-west four-lane roadway providing access to Denver, NC and Huntersville, NC. The land use along NC Hwy 73 is mainly industrial and commercial with some residential. The 2008 AADT on NC Hwy 73 was 13,000 vehicles per day (vpd) in the study area. The posted speed limit on this road is 45 miles per hour (mph) in the vicinity of the site.

*S. Little Egypt Road (SR 1386)* is a north-south two-lane roadway that curves to form an east-west roadway in the study area. This roadway no longer connects from NC Hwy 73 to NC Hwy 16 Business. It has been bisected by NC Hwy 16 and now is a dead end road at both ends, from NC Hwy 73 and from NC Hwy 16 Business. The land use along S. Little Egypt Road in the study area is a mixture of residential, industrial, and commercial. There was no AADT available for S. Little Egypt Road. The speed limit along this road is 45 mph near NC Hwy 73. There is no posted speed limit near NC Hwy 16 Business.

*NC Hwy 16 southbound (SB) ramps* are entrance and exit ramps to and from the southbound lanes of NC Hwy 16 providing access to and from NC Hwy 73 in Lincoln County, NC. There is no land use along the NC Hwy 16 SB ramps as this portion is controlled access.

*NC Hwy 16 northbound (NB) ramps* are entrance and exit ramps to and from the northbound lanes of NC Hwy 16 providing access to and from NC Hwy 73 in Lincoln County, NC. There is no land use along the NC Hwy 16 SB ramps as this portion is controlled access.

*NC Hwy 16 Business* is a north-south, two-lane roadway providing access to Hickory, NC and Charlotte, NC. The land use along this roadway is a mixture of residential, industrial, and commercial. The 2008 AADT on NC Hwy 16 Business was 11,000 vpd south of NC Hwy 73 and 17,000 vpd north of NC Hwy 73. The speed limit along this road is 45 mph.

*S. Pilot Knob Road (SR 1394)* is a north-south two-lane roadway connecting NC Hwy 16 Business to NC Hwy 73. The land use along this roadway is residential with some commercial. The 2008 AADT on Pilot Knob Road was 4,600 vpd south of NC Hwy 73. The posted speed limit on this roadway is 45 mph.

*Advance Avenue (SR 2069)* is an east-west two-lane roadway providing access to some commercial properties and other undeveloped sites. The land use along this roadway is mainly commercial. The 2008 AADT on this road was not available. There was no posted speed limit along this road.

*Waterside Crossing Blvd (SR 2039)* is an east-west two-lane roadway providing access to shopping and housing between NC Hwy 16 Business and S. Pilot Knob Road. The land use along this roadway is a mix of commercial and residential. There was no AADT available for this road. The posted speed limit along this road is 25 mph.

The intersection of NC Hwy 73 at S. Little Egypt Road is a signalized four-legged intersection. The northbound approach on S. Little Egypt has a shared left-turn/through/right-turn lane with right-turn channelization. The southbound approach on S. Little Egypt has a left-turn lane with 100 ft of storage and a shared through/right-turn lane with right-turn channelization. The eastbound approach on NC Hwy 73 has a left-turn lane with 150 ft of storage and a shared through/right-turn lane. The westbound approach has both a left-turn lane and a right turn lane, each with 100 ft of storage, a through lane. The speed limit on all approaches is 45 mph, with a school zone restricted speed limit of 35 mph on the southbound approach.

The intersection NC Hwy 73 and the NC Hwy 16 Southbound ramps/Access Road is a signalized four-legged intersection. The northbound approach on the ramp has a left-turn lane and a shared through/right-turn lane. The southbound approach on the Access Road has a shared left-turn/through/right-turn lane. The eastbound approach on NC Hwy 73 has a left-turn lane with 250 ft of storage, a through lane, and a shared through/right-turn lane. The westbound approach on NC Hwy 73 has a left-turn lane with 300 ft of storage, a through lane, and a shared through/right-turn lane. The speed limit on NC Hwy 73 is 45 mph.

The intersection NC Hwy 73 and the NC Hwy 16 Northbound ramps is a signalized four-legged intersection. The northbound exit ramp has a shared left-turn/through lane with 175 ft of storage and a right-turn lane. The eastbound approach on NC Hwy 73 has a left-turn lane with 130 ft of storage and two through lanes. The westbound approach on NC Hwy 73 has a through lane and a shared through/right-turn lane. The speed limit on NC Hwy 73 is 45 mph.

The intersection of NC Hwy 73 at NC Hwy 16 Business is a signalized four-legged intersection. The northbound approach on NC Hwy 16 Business has a left-turn lane with 330 ft of storage and a shared through/right-turn lane. The southbound approach on NC Hwy 16 Business has a left-turn lane with 215 ft of storage, a through lane, and a channelized right-turn lane with 300 ft of storage. The eastbound approach on NC Hwy 73 has dual left turn lanes with 225 ft of storage each, a through lane, and a right-turn lane with 125 ft of storage. The westbound approach on NC Hwy 73 has a left-turn lane with 125 ft of storage, a through lane, and a right-turn lane with 100 ft of storage. The speed limit on NC Hwy 73 is 45 mph and on NC Hwy 16 the speed limit is 45 mph.

The intersection of NC Hwy 73 at Pilot Knob Road is a signalized four-legged intersection. The northbound and southbound approaches on Pilot Knob Road have left-turn lanes with 40 ft and 90 ft of storage, respectively, and a shared through/right-turn lane. The eastbound approach on NC Hwy 73 has a left-turn lane with 95 ft of storage and a shared through/right-turn lane. The westbound approach on NC Hwy 73 has a left-turn lane with 150 ft of storage, a though lane, and a right-turn lane with 85 ft of storage. The speed limit on all approaches is 45 mph.

The intersection of NC Hwy 16 Business at S. Pilot Knob Road is an unsignalized three-legged intersection. The northbound approach has a shared through/right-turn lane. The southbound approach on NC Hwy 16 Business has a shared left-turn/through lane. The eastbound approach on Pilot Knob Road has a shared left-turn/right-turn lane. The speed limit on NC Hwy 16 Business is 50 mph and on S. Pilot Knob Road the speed limit is 45 mph.

The intersection of NC Hwy 16 Business at S. Little Egypt Road is an unsignalized three-legged intersection. The northbound approach on NC Hwy 16 Business has a shared left-turn/through lane. The southbound approach has a shared through/right-turn lane. The eastbound approach on S. Little Egypt Road has a shared left-turn/right-turn lane. The speed limit on NC Hwy 16 Business is 45 mph. There was no posted speed limit on S. Little Egypt Road.

The intersection of NC Hwy 16 Business at Advance Avenue is an unsignalized three-legged intersection. The northbound approach on NC Hwy 16 Business has a left-turn lane with 110 ft of storage and a through lane. The southbound approach on NC Hwy 16 Business has a right-turn lane with 100 ft of storage and a through lane. The eastbound approach on Advance Avenue has a left-turn and a right-turn lane. The speed limit on NC Hwy 16 Business is 45 mph. There was no posted speed limit on Advance Avenue.

The intersection of NC Hwy 16 Business at Waterside Crossing Blvd is an unsignalized three-legged intersection. The northbound approach on NC Hwy 16 Business has a through lane and a right-turn lane with 120 ft of storage. The southbound approach on NC Hwy 16 Business has a shared left-turn/through lane. The westbound approach on Waterside Crossing Blvd has a shared left-turn/right-turn lane. The speed limit on NC Hwy 16 Business is 45 mph. There was no posted speed limit on Waterside Crossing Blvd.

The intersection of S. Pilot Knob Road at Waterside Crossing Blvd is an unsignalized four-legged intersection. The northbound approach on S. Pilot Knob Road has a left-turn lane with 240 ft of storage and a shared through/right-turn lane. The southbound approach on S. Pilot Knob Road has a left-turn lane with 115 ft of storage and a shared through/right-turn lane. The eastbound and westbound approaches on Waterside Crossing Blvd have shared left-turn/through/right-turn lanes. The speed limit on S. Pilot Knob Road is 45 mph and on Waterside Crossing Blvd the speed limit is 25 mph.

The existing intersection lane configuration is shown in Figure 4.

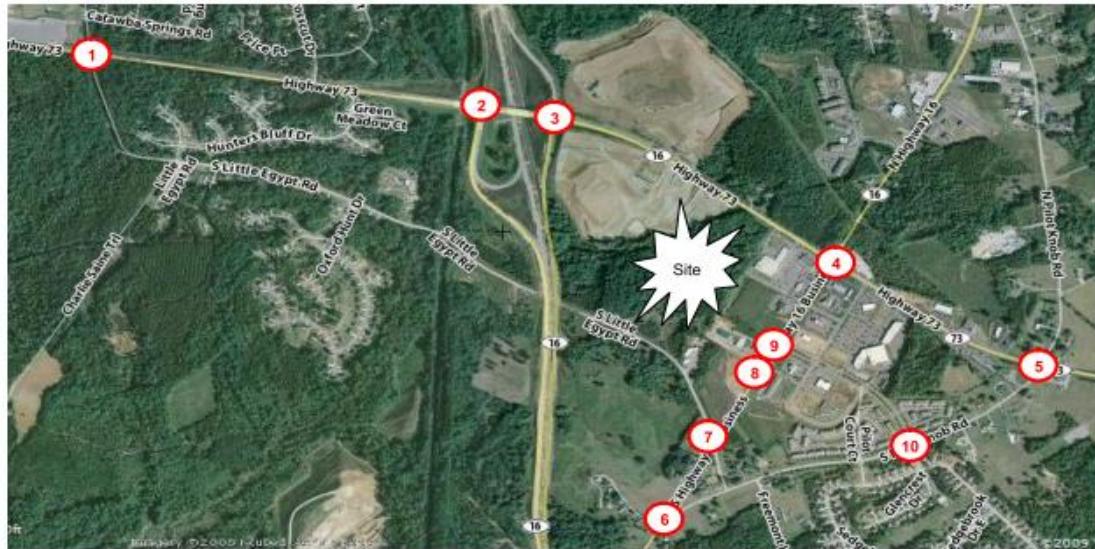
There are a total of seven (7) scenarios evaluated for the intersections affected by the proposed Cottonwood Village:

1. The “Base Conditions” analysis uses the latest traffic counts available to evaluate the current intersection capacity utilization and operational performance,
2. The “Future No-Build Phase 1” analysis examines the future traffic performance where the proposed Cottonwood Village Phase 1 is not constructed. This analysis takes into account background traffic growth (3% per year), other approved developments in the area, and any associated transportation improvements,
3. The “Future Build Phase 1” analysis comprises the build-out of proposed Cottonwood Village Phase 1 with the outlying future traffic, and evaluates the intersection operational performance using trips generated from the ITE Trip Generation rates,
4. The “Future Build with Improvements Phase 1” analysis highlights the mitigation needed if the “Future Build Phase 1” analyses show deficiencies on the roadway network in the study area. This analysis will report the improvements and their effect on the studied intersections,
5. The “Future No-Build Phase 2” analysis examines the future traffic performance where the proposed Cottonwood Village Phase 1 or Phase 2 is not constructed. This analysis takes into account background traffic growth (3% per year), other approved developments in the area, and any associated transportation improvements,
6. The “Future Build Phase 2” analysis comprises the build-out of proposed Cottonwood Village Phase 1 and Phase 2 with the outlying future traffic, and evaluates the intersection operational performance using trips generated from the ITE Trip Generation rates, and
7. The “Future Build with Improvements” highlights the mitigation needed if the “Future Build” analyses show deficiencies on the roadway network in the study

area. This analysis will report improvements and their effect on the studied intersections.

All seven of the scenarios are performed for both AM and PM peak hours.

Figure 3: Vicinity Map



## Study area intersections

- 1 NC Hwy 73 @ S Little Egypt Road
- 2 NC Hwy 73 @ NC Hwy 16 SB ramps
- 3 NC Hwy 73 @ NC Hwy 16 NB ramps
- 4 NC Hwy 73 @ NC Hwy 16 Business
- 5 NC Hwy 73 @ Pilot Knob Road
- 6 NC Hwy 16 Business @ S Pilot Knob Road
- 7 NC Hwy 16 Business @ S Little Egypt Road
- 8 NC Hwy 16 Business @ Advance Avenue
- 9 NC Hwy 16 Business @ Waterside Crossing Blvd
- 10 S Pilot Knob Road @ Waterside Crossing Blvd

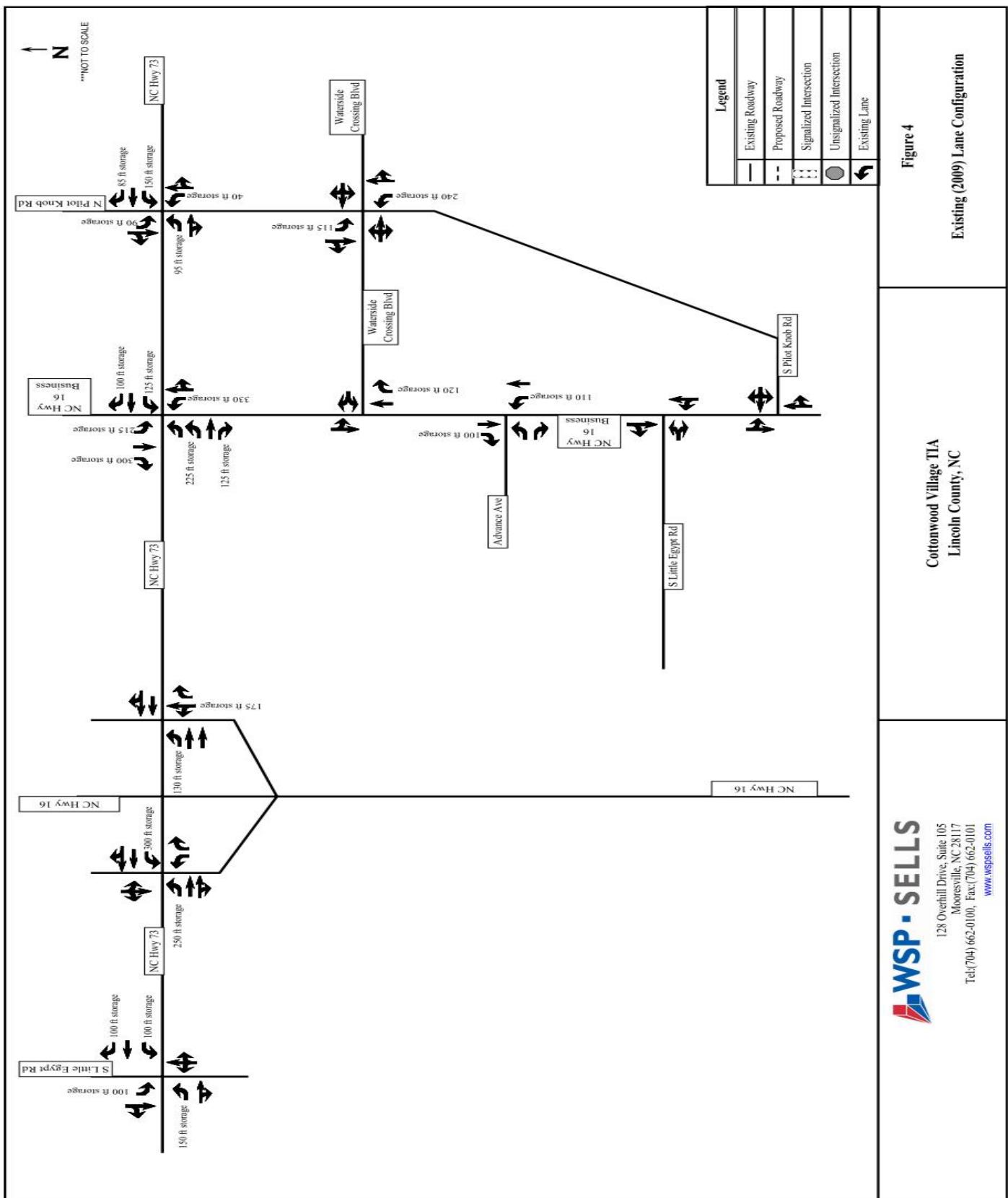


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Cottonwood Village TIA  
Lincoln County, NC

Figure 3  
Vicinity Map

**Figure 4: Existing (2009) Lane Configuration**



## 2009 EXISTING CONDITIONS

Traffic counts were performed at the following intersections on the dates listed:

1. NC Hwy 73 @ S. Little Egypt Road – Dec. 9, 2009
2. NC Hwy 73 @ NC Hwy 16 SB ramps – Dec. 1, 2009
3. NC Hwy 73 @ NC Hwy 16 NB ramps – Dec. 2, 2009
4. NC Hwy 73 @ NC Hwy 16 Business – Dec. 2, 2009
5. NC Hwy 73 @ Pilot Knob Road – Dec. 3, 2009
6. NC Hwy 16 Business @ S. Pilot Knob Road – Dec. 2, 2009
7. NC Hwy 16 Business @ S. Little Egypt Road – Dec. 3, 2009
8. NC Hwy 16 Business @ Advance Avenue – Dec. 8, 2009
9. NC Hwy 16 Business @ Waterside Crossing Blvd – Dec. 8, 2009
10. Pilot Knob Road @ Waterside Crossing Blvd – Dec. 3, 2009

These counts were performed during the peak hours of 6:30 - 9:00 am and 4:00 - 6:30 pm. The traffic counts are in Appendix A and depicted in Figure 5.

Existing volumes, traffic flow characteristics, and intersection geometry collected during field visits were used to determine the level of service.

The North Carolina Department of Transportation (NCDOT) requires that analysis of intersections be performed using the HCM method for traffic impact analyses. The level of service (LOS), as defined by the Transportation Research Board's Highway Capacity Manual (HCM), is a measurement of average delay incurred at an intersection for a particular movement. The following tables give the HCM criteria for both signalized (HCM Exhibit 16-2) and unsignalized intersections (HCM Exhibit 17-2).

HCM Exhibit 16-2	
Signalized Level of Service	Average delay per Vehicle (sec)
A	<10
B	> 10 and < 20
C	> 20 and < 35
D	> 35 and < 55
E	> 55 and < 80
F	> 80

HCM Exhibit 17-2	
Unsignalized Level of Service	Average delay per Vehicle (sec)
A	<10
B	> 10 and < 15
C	> 15 and < 25
D	> 25 and < 35
E	> 35 and < 50
F	> 50

The LOS analysis was completed through the use of Synchro, version 7. The software package categorizes the LOS based HCM methodology and criteria. According to industry standards, any signalized intersection or any approach of an unsignalized intersection is considered acceptable if average delay is LOS D or better. Any intersection or approach with a LOS of E or worse is considered substandard and may need solutions to improve the operational performance.

Figure 5: 2009 Existing Traffic Volumes

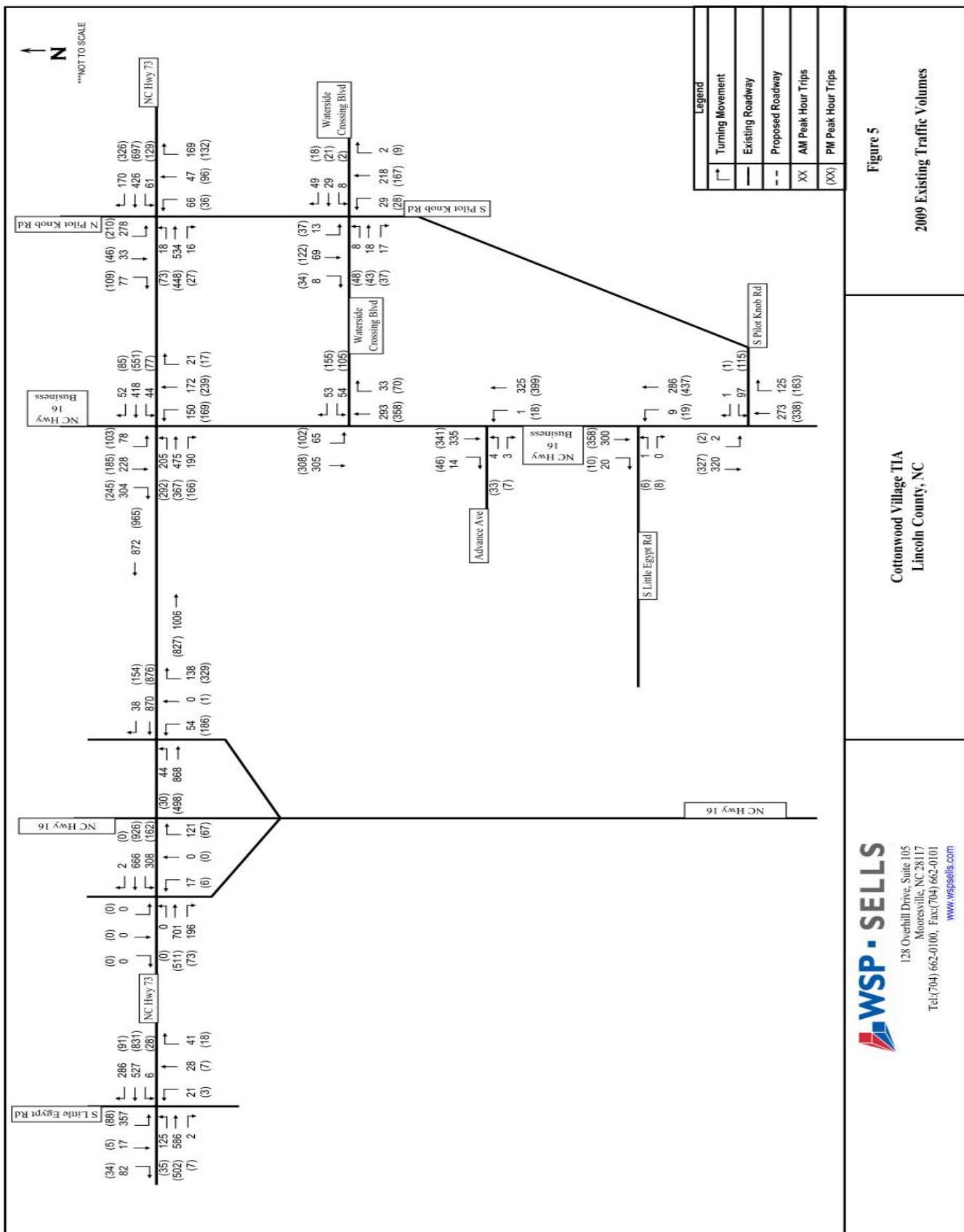


Table 2 lists the LOS results from the existing conditions analysis.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS E in the AM peak hour with an average delay of 58.0 seconds. In the PM peak hour, the intersection operates at LOS B with an average delay of 13.6 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS A in the AM and PM peak hours.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS A in the AM peak hour. In the PM peak hour, the intersection operates at LOS B with an average delay of 13.7 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS C in the AM peak hour with an average delay of 31.9 seconds. In the PM peak hour, the intersection operates at LOS D with an average delay of 39.1 seconds.

The signalized intersection of NC Hwy 73 at Pilot Knob Road operates at LOS C in the AM and PM peak hours with average delays of 28.2 and 28.0 seconds, respectively.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM and PM peak hours with average delays of 22.1 and 22.2 seconds, respectively.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 14.1 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 15.0 seconds.

At the unsignalized intersection of NC Hwy 16 Business at Advance Avenue, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 12.9 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 16.0 seconds.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 16.4 seconds. In the PM peak hour, the westbound approach operates at LOS E with an average delay of 45.2 seconds.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours with average delays of 12.5 seconds and 12.2 seconds, respectively. The southbound approach

operates at LOS B in the AM peak hour with an Average delay of 12.6 seconds. In the PM peak hour, the southbound approach operates at LOS C with an average delay of 15.2 seconds. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

Table 2: Level of Service Analysis – 2009 Existing

Intersection	Approach	Existing (2009)			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	58.0	E	B
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	9.2	A	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	9.1	A	B
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	31.9	C	D
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	28.2	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	0.1	A	A
		WB - S. Pilot Knob Rd	22.1	C	C
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.3	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - S. Little Egypt Rd	14.1	B	C
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - Advance Ave	12.9	B	C
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	2.0	A	A
		WB - Waterside Crossing Blvd	16.4	C	E
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.5	B	B
		SB - Waterside Crossing Blvd	12.6	B	C
		EB - S. Pilot Knob Rd	0.9	A	A
		WB - S. Pilot Knob Rd	1.1	A	A
unacceptable LOS and delay					

## 2012 NO-BUILD PHASE 1 ANALYSIS

Phase 1 of the proposed Cottonwood Village is expected to be completed and fully occupied by 2012. An annual growth rate of 3% was applied to the existing traffic to forecast the future (2012) background traffic volumes. In addition, the background traffic will include trips generated from another development that has been approved:

- Walgreen's
  - 14,280 sf Pharmacy/Drug-Store with Drive-thru window

As part of the roadway improvements for the Walgreen's site and the future Links Landing site, a traffic signal was to be installed at their shared site access on NC Hwy 73. However, since the development of the NC Hwy 73 corridor, NCDOT and municipalities have agreed on an access management vision. Therefore, the site access for Links Landing/Walgreen's will be studied as having a "leftover" with 150 feet of storage as required by NCDOT for left-turning vehicles. This leftover is assumed to be installed prior the completion of Phase 1.

Figure 6 displays the traffic volumes for the 2012 No-Build Phase 1 conditions including:

1. Existing (2009) traffic volumes plus,
2. 3% growth rate, compounded annually into year 2012 plus,
3. Site trips generates by the approved Walgreen's project.

The 2012 No-Build Phase 1 analyses were performed using the same methods as described in the Existing Conditions analyses. The results of the 2012 No-Build Phase 1 analyses are displayed in Table 3.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS D in the AM peak hour with an Average delay of 38.5 seconds. In the PM peak hour, the intersection operates at LOS B with an average delay of 17.9 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour with an average delay of 12.9 seconds. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour with an average delay of 11.8 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 24.6 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM and PM peak hours with average delays of 36.6 seconds and 49.1 seconds, respectively.

The signalized intersection of NC Hwy 73 at Pilot Knob Road operates at LOS C in the AM and PM peak hours with average delays of 22.4 and 23.0 seconds, respectively.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 20.3 seconds. In the PM peak hour, the westbound approach operates at LOS D with an average delay of 27.0 seconds.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 14.6 seconds. In the PM peak hour, the eastbound approach operates at LOS B with an average delay of 14.9 seconds.

At the unsignalized intersection of NC Hwy 16 Business at Advance Avenue, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 13.3 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 18.1 seconds.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 18.0 seconds. In the PM peak hour, the westbound approach operates at LOS F with an average delay of 63.7 seconds.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours with average delays of 12.2 seconds and 12.6 seconds, respectively. The southbound approach operates at LOS B in the AM peak hour with an average delay of 12.0 seconds. In the PM peak hour, the southbound approach operates at LOS C with an average delay of 16.2 seconds. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

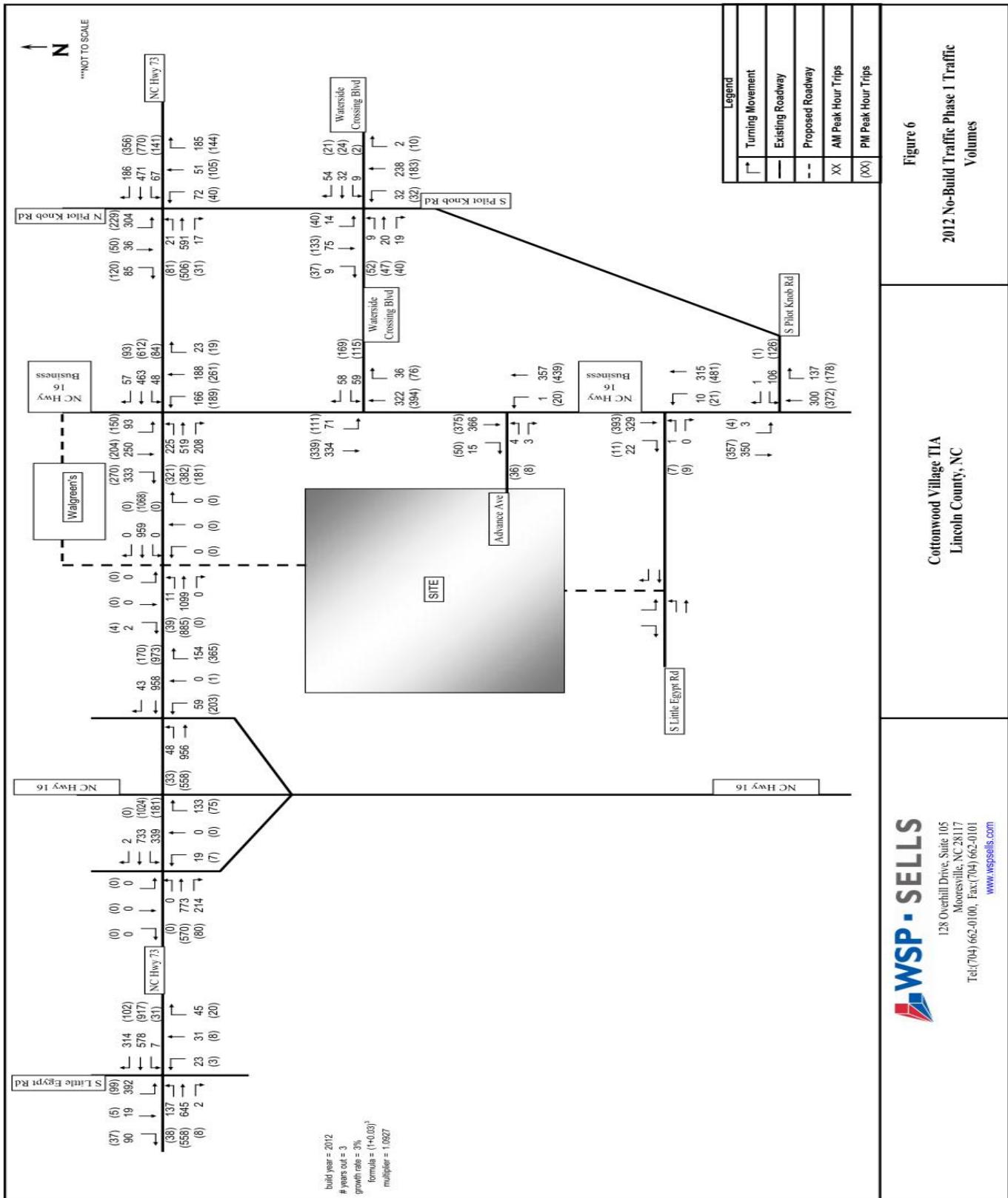
The unsignalized intersection of NC Hwy 73 at Walgreen's site access operates at LOS B in the southbound approach in the AM and PM peak hours with average delays of 12.4 seconds and 13.1 seconds, respectively. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

**Table 3: Level of Service Analysis – 2012 No-Build Phase 1**

Intersection	Approach	No-Build Phase 1 (2012)			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	38.5	D	B
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	12.9	B	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	11.8	B	C
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	36.6	D	D
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	22.4	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.0
		SB - NC Hwy 16 Business	0.1	A	0.1
		WB - S. Pilot Knob Rd	20.3	C	27.0
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.3	A	0.6
		SB - NC Hwy 16 Business	0.0	A	0.0
		EB - S. Little Egypt Rd	14.6	B	14.9
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.4
		SB - NC Hwy 16 Business	0.0	A	0.0
		EB - Advance Ave	13.3	B	18.1
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.0
		SB - NC Hwy 16 Business	2.1	A	3.2
		WB - Waterside Crossing Blvd	18.0	C	63.5
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.2	B	B
		SB - Waterside Crossing Blvd	12.0	B	C
		EB - S. Pilot Knob Rd	0.9	A	A
		WB - S. Pilot Knob Rd	1.1	A	A
NC Hwy 73 @ Site Access 1	unsignalized	NB - Site Access 1	--	--	--
		SB - Links Landing/Walgreen's	12.4	B	B
		EB - NC Hwy 73	0.1	A	0.5
		WB - NC Hwy 73	0.0	A	A

unacceptable LOS and delay

Figure 6: 2012 No-Build Phase 1 Traffic Volumes



## PHASE 1 SITE TRIP GENERATION AND DISTRIBUTION

According to the ITE Trip Generation, Phase 1 of Cottonwood Village will generate approximately 1,469 trips daily. Of these daily trips, 113 will be in the AM peak hour and 140 in the PM peak hour. Table 4 displays the ITE Trip Generation for Phase 1 of this site.

**Table 4: Cottonwood Village Phase 1 Trip Generation**

			Average Daily Trips (24 Hours)			AM Peak Hour (7AM to 8AM, 8AM to 9AM)			PM Peak Hour (4PM to 5PM, 5PM to 6PM)		
ITE CODE	LAND USE	SIZE	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	Apartments	222 DU	735	735	1,469	23	90	113	91	49	140
		<b>TOTAL NON PASS-BY, EXTERNAL TRIPS</b>	<b>735</b>	<b>735</b>	<b>1,469</b>	<b>23</b>	<b>90</b>	<b>113</b>	<b>91</b>	<b>49</b>	<b>140</b>

The distribution of trips created by Phase 1 of Cottonwood Village was determined based upon current traffic patterns and the proposed site layout. Of the traffic entering the site, 60% will use the site access on NC Hwy 73; 30% will be traveling westbound on NC Hwy 73 (4% of this from northbound NC Hwy 16 Business) and 30% will be traveling eastbound on NC Hwy 73. 20% of the entering site traffic will be from northbound NC Hwy 16 Business, 5% of which will use Advance Avenue to access the site and 15% will use the site entrance on S. Little Egypt Road. 20% of the entering site traffic will be from southbound NC Hwy 16 Business. Of this, 15% will use the site access on S. Little Egypt Road and 5% will access the site using Advance Avenue.

Of the exiting traffic, 32% will be traveling westbound on NC Hwy 73 using the Lowes driveway (no left-turns will be permitted from the site access to NC Hwy 73) and 28% will be traveling eastbound on NC Hwy 73 using the site access on NC Hwy 73. 20% of the exiting site traffic will travel northbound on NC Hwy 16 Business, 5% of which will be using Advance Avenue and 15% using the site entrance on S. Little Egypt Road. The remaining 20% of the exiting site traffic will travel southbound on NC Hwy 16 Business. Of this, 15% will use the site access on S. Little Egypt Road and 5% will use Advance Avenue.

Figure 7 displays the site trip distribution for Phase 1. Figure 8 shows the Phase 1 site trips.

Figure 7: Phase 1 Site Trip Distribution

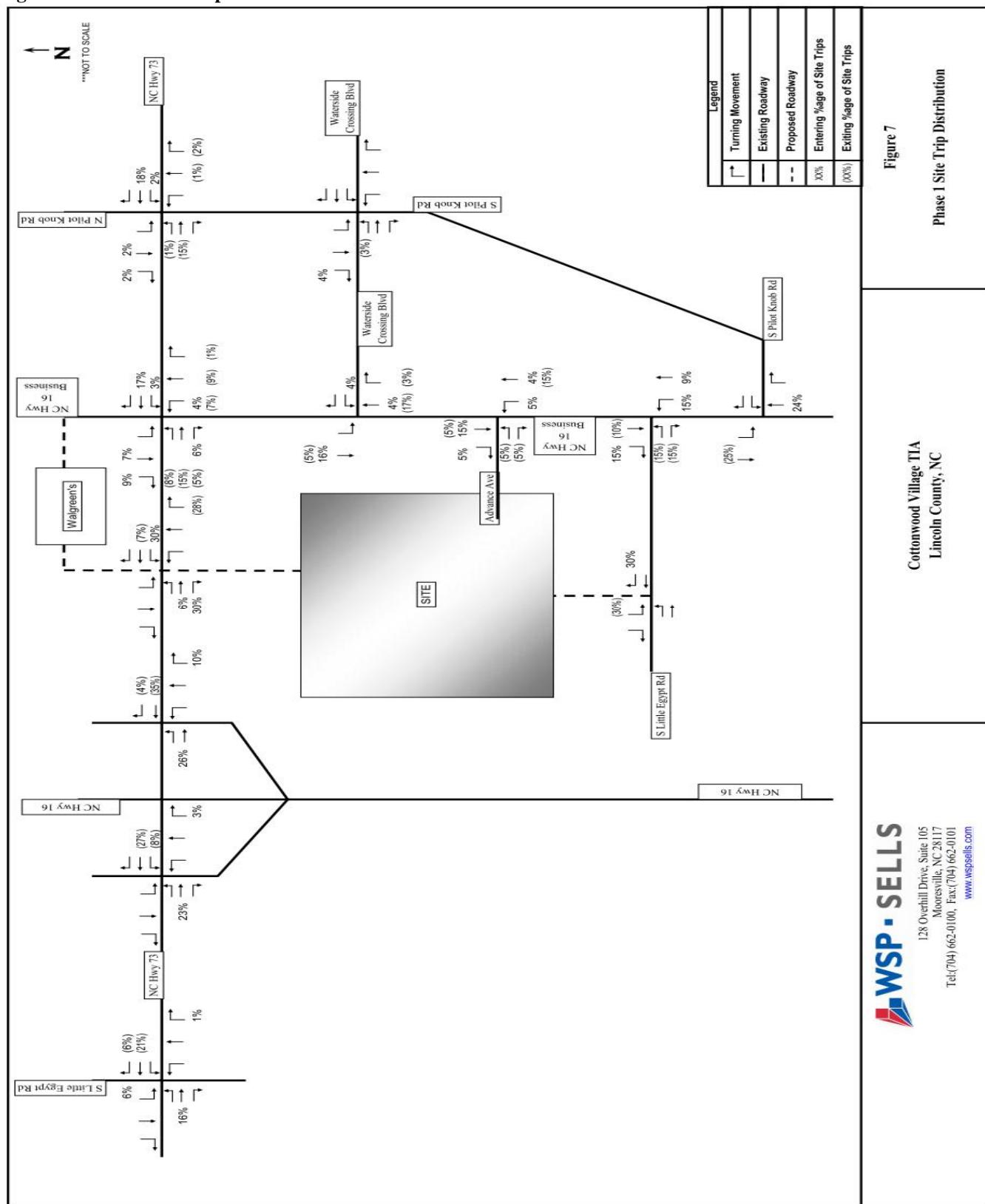
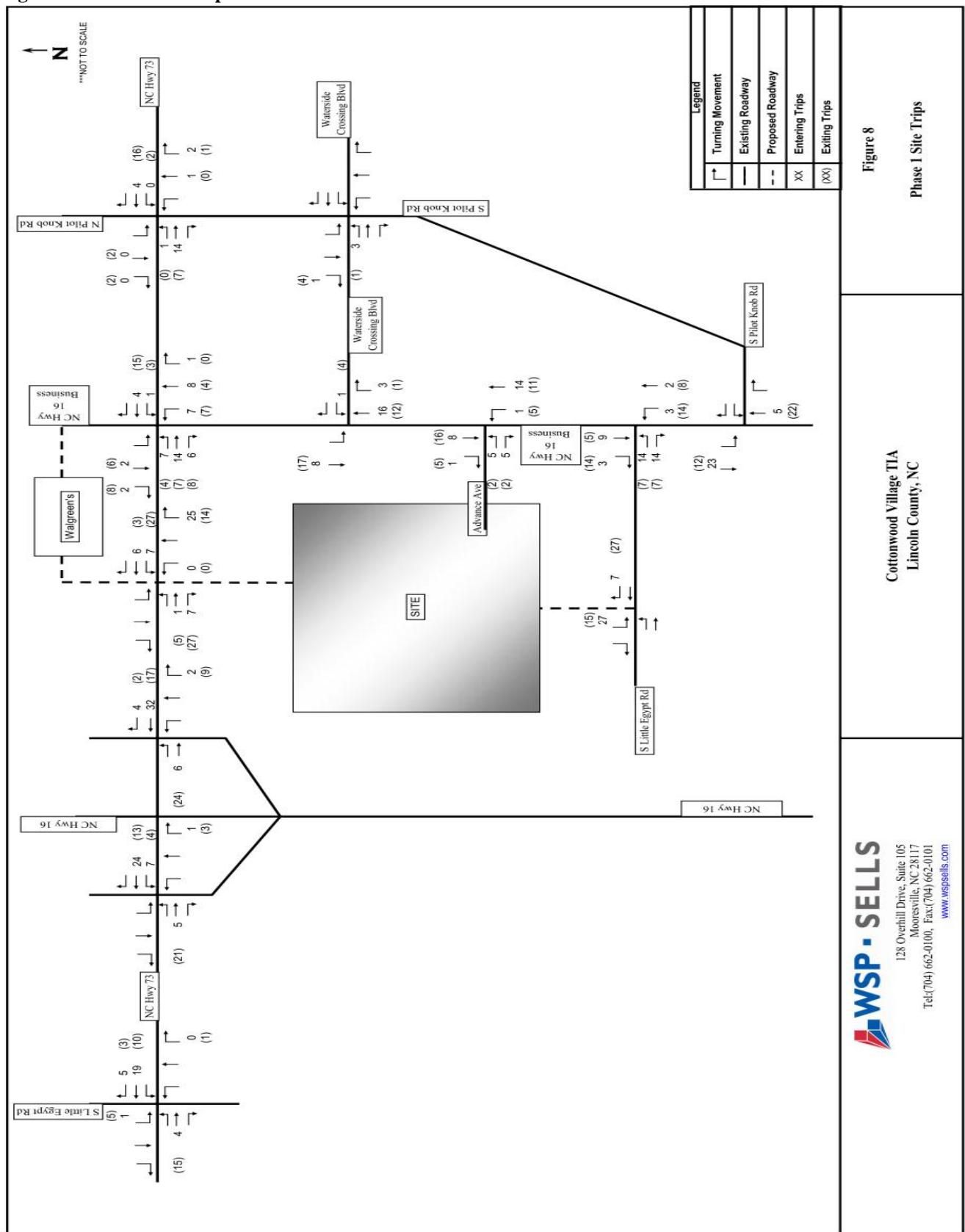


Figure 8: Phase 1 Site Trips



## 2012 BUILD PHASE 1 ANALYSIS

The total 2012 Build Phase 1 traffic volumes, as shown in Figure 9, include traffic volumes from the 2012 No-Build Phase 1 Analysis as well as the Phase 1 site traffic generated.

The 2012 Build Phase 1 analyses were performed using the same methods as described in the Existing Conditions analyses.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS D in the AM peak hour with an average delay of 39.6 seconds. In the PM peak hour, the intersection operates at LOS B with an average delay of 18.5 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour with an average delay of 13.0 seconds. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour with an average delay of 12.0 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 25.1 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM and PM peak hours with average delays of 37.5 seconds and 51.8 seconds, respectively.

The signalized intersection of NC Hwy 73 at Pilot Knob Road operates at LOS C in the AM and PM peak hours with average delays of 23.1 and 23.7 seconds, respectively.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 21.3 seconds. In the PM peak hour, the westbound approach operates at LOS D with an average delay of 29.3 seconds.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 13.3 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 16.4 seconds.

At the unsignalized intersection of NC Hwy 16 Business at Advance Avenue, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 13.5 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 19.0 seconds.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 18.8 seconds. In the PM peak hour, the westbound approach operates at LOS F with an average delay of 77.3 seconds.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours with average delays of 12.2 seconds and 12.6 seconds, respectively. The southbound approach operates at LOS B in the AM peak hour with an average delay of 12.2 seconds. In the PM peak hour, the southbound approach operates at LOS C with an average delay of 16.4 seconds. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Site Access 1/Walgreen's site access operates at LOS A in the eastbound and westbound approaches in the AM and PM peak hours. The northbound approach operates at LOS B in the AM and PM peak hours with average delays of 13.9 seconds and 12.3 seconds, respectively. The southbound approach operates at LOS B in the AM and PM peak hours with average delays of 12.4 seconds and 13.1 seconds, respectively.

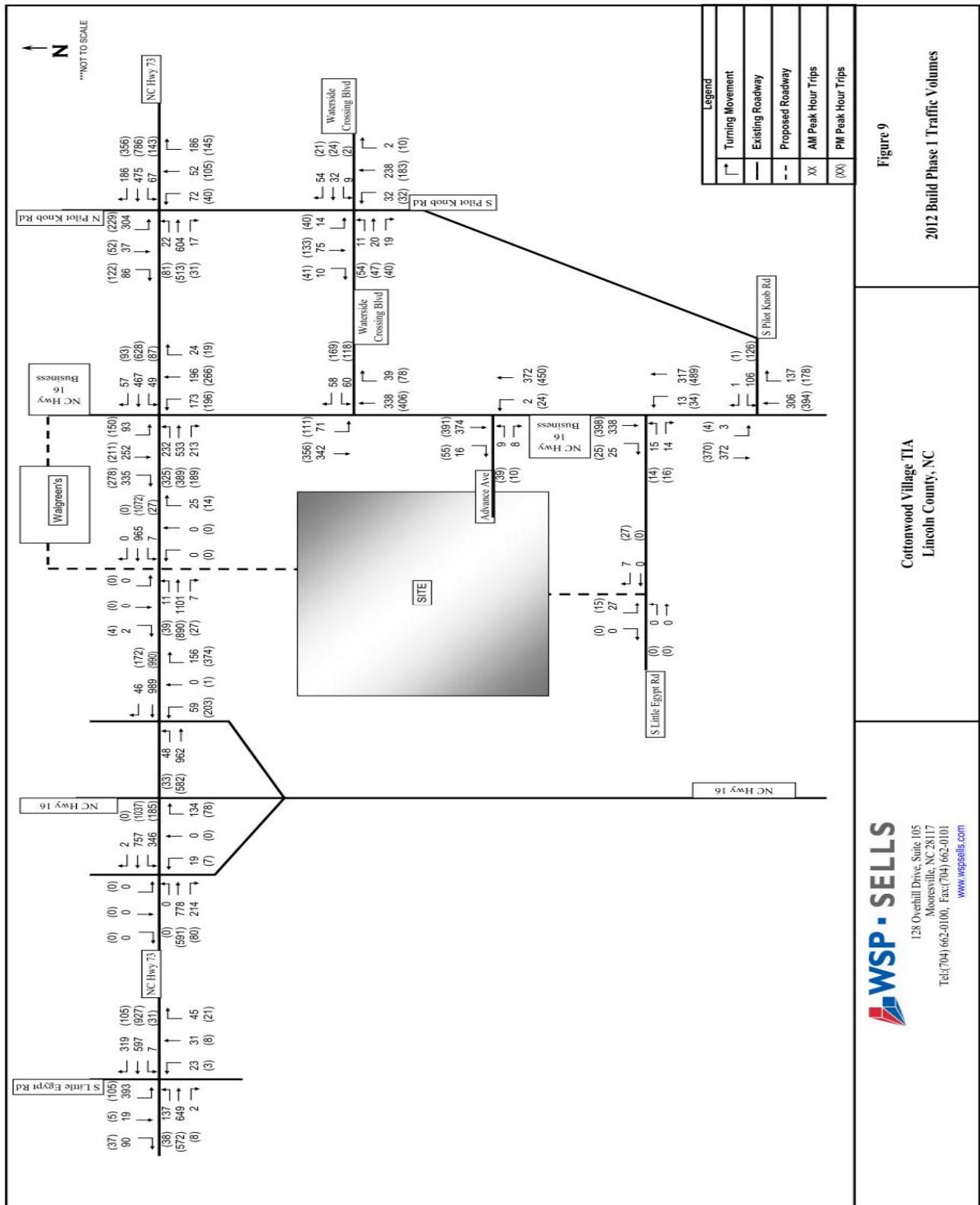
The unsignalized intersection of S. Little Egypt Road at Site Access 2 operates at LOS A on the southbound, eastbound, and westbound approaches in the AM and PM peak hours.

Table 5 shows the LOS results for the intersections in the Build Phase 1 scenarios.

**Table 5: Level of Service Analysis – 2012 Build Phase 1**

Intersection	Approach	Build Phase 1 (2012)			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	39.6	D	B
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	13.0	B	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	12.0	B	C
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	37.5	D	D
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	23.1	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.0
		SB - NC Hwy 16 Business	0.1	A	0.1
		WB - S. Pilot Knob Rd	21.3	C	29.3
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.4	A	0.9
		SB - NC Hwy 16 Business	0.0	A	0.0
		EB - S. Little Egypt Rd	13.3	B	16.4
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.4
		SB - NC Hwy 16 Business	0.0	A	0.0
		EB - Advance Ave	13.5	B	19.0
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.0
		SB - NC Hwy 16 Business	2.1	A	3.2
		WB - Waterside Crossing Blvd	18.8	C	77.3
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.2	B	12.6
		SB - Waterside Crossing Blvd	12.2	B	16.4
		EB - S. Pilot Knob Rd	0.9	A	1.1
		WB - S. Pilot Knob Rd	1.1	A	1.4
NC Hwy 73 @ Site Access 1	unsignalized	NB - Site Access 1	13.9	B	12.3
		SB - Links Landing/Walgreen's	12.4	B	13.1
		EB - NC Hwy 73	0.1	A	0.5
		WB - NC Hwy 73	0.1	A	0.3
S. Little Egypt Rd (SR 1386) @ Site Access 2	unsignalized	SB - Site Access 2	8.6	A	8.6
		EB - S. Little Egypt Rd	0.0	A	0.0
		WB - S. Little Egypt Rd	0.0	A	0.0
unacceptable LOS and delay					

Figure 9: 2012 Build Phase 1 Traffic Volumes



## 2012 BUILD WITH IMPROVEMENTS PHASE 1 ANALYSIS

NCDOT requires that mitigation improvements to the roadway network shall be identified if at least one of the following conditions exists when comparing Future No-Build conditions to Future Build conditions:

1. The total average delay at an intersection increases by 25% or greater, while maintaining the same Level of Service, or:
2. The Level of Service degrades by at least one level, or:
3. The Level of Service is “F,” or:
4. The turning and opposing traffic volumes fall within the “Warrant for Left and Right-Turn Lanes” in accordance to the *Policy of Street and Driveway Access to North Carolina Highways, July 2003*.

Lincoln County requires that mitigation to the roadway network shall be identified if:

1. The Level of Service at any intersection leg degrades to less than a “C, or:
2. Any intersection that has an existing Level of Service below “C” must be maintained at existing Level of Service, and:
3. All improvements must be approved by NCDOT.

The site traffic will satisfy at least one of these conditions on two of the existing intersections in Phase 1 and must therefore, be mitigated.

### Improvements by Developer – Phase 1:

1. NC Hwy 73 @ Site Access 1/Links Landing and Walgreen’s access:
  - o Provide for a separate right-turn lane on the northbound approach for traffic exiting the site,
  - o Provide for a westbound left-turn lane (leftover) with 175 ft of storage and appropriate taper and striping,
2. NC Hwy 16 Business @ S. Little Egypt Road:
  - o Install a northbound left-turn lane with 50 ft of storage and appropriate taper and striping on NC Hwy 16 Business

These improvements are to be installed prior to the completion of construction of Phase 1 in accordance with NCDOT regulations.

Based upon the recommended mitigation:

1. The unsignalized intersection of NC Hwy 73 at Site Access 1/Links Landing and Walgreen’s access operates at LOS B in the northbound and southbound approaches in the AM and PM peak hours. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

2. The unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road operates at LOS A on the northbound and southbound approaches for the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour and LOS C in the PM peak hour.

Table 6 displays the LOS analysis results for all study intersections in the 2012 Build with Improvements Phase 1 scenario.

**Table 6: Level of Service Analysis – 2012 Build Phase 1 with Improvements**

Intersection	Approach	Build Phase 1 (2012) with Improvements			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	39.6	D	B
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	13.0	B	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	12.0	B	C
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	37.5	D	D
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	23.1	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.0 A
		SB - NC Hwy 16 Business	0.1	A	0.1 A
		WB - S. Pilot Knob Rd	21.3	C	29.3 D
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.3	A	0.5 A
		SB - NC Hwy 16 Business	0.0	A	0.0 A
		EB - S. Little Egypt Rd	13.3	B	16.4 C
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.4 A
		SB - NC Hwy 16 Business	0.0	A	0.0 A
		EB - Advance Ave	13.5	B	19.0 C
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	0.0 A
		SB - NC Hwy 16 Business	2.1	A	3.2 A
		WB - Waterside Crossing Blvd	18.8	C	77.6 F
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.2	B	12.6 B
		SB - Waterside Crossing Blvd	12.2	B	16.4 C
		EB - S. Pilot Knob Rd	0.9	A	1.1 A
		WB - S. Pilot Knob Rd	1.1	A	1.4 A
NC Hwy 73 @ Site Access 1	unsignalized	NB - Site Access 1	13.9	B	12.3 B
		SB - Links Landing/Walgreen's	12.4	B	13.1 B
		EB - NC Hwy 73	0.1	A	0.5 A
		WB - NC Hwy 73	0.1	A	0.3 A
S. Little Egypt Rd (SR 1386) @ Site Access 2	unsignalized	SB - Site Access 2	8.6	A	8.6 A
		EB - S. Little Egypt Rd	0.0	A	0.0 A
		WB - S. Little Egypt Rd	0.0	A	0.0 A
unacceptable LOS and delay					

## 2014 NO-BUILD PHASE 2 ANALYSIS

Phase 2 of the proposed Cottonwood Village is expected to be completed and fully occupied by 2014. An annual growth rate of 3% was applied to the existing traffic to forecast the future (2014) background traffic volumes. In addition, the background traffic will include trips generated from other developments that have been approved and expected to be completed by construction of Phase 2:

- Links Landing
  - Mixed use project to consist of
    - 86,991 sf Shopping Center
    - 7,000 sf High-Turnover Restaurant
    - 7,000 sf High-Turnover Restaurant
    - 3,500 sf Fast-Food Restaurant with Drive-thru
    - 1,500 sf Fast-Food Restaurant with Drive-thru
- Walgreen's
  - 14,280 sf Pharmacy/Drug-Store with Drive-thru window

Figure 10 displays the traffic volumes for the 2014 No-Build Phase 2 conditions including:

1. Existing traffic volumes plus,
2. 3% growth rate, compounded annually into year 2014 plus,
3. Site trips generates by the approved Links Landing and Walgreen's projects.

The 2014 No-Build Phase 2 analyses were performed using the same methods as described in the Existing Conditions analyses. The results of the 2014 No-Build Phase 2 analyses are displayed in Table 7.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS D in the AM peak hour with an average delay of 51.8 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 23.9 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour with an average delay of 15.4 seconds. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour with an average delay of 15.1 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 29.4 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM peak hour with an average delay of 41.4 seconds. In the PM peak hour, the intersection operates at LOS E with an average delay of 58.6 seconds.

The signalized intersection of NC Hwy 73 at S. Pilot Knob Road operates at LOS C in the AM peak hour with an average delay of 26.1 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 27.9 seconds.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 22.5 seconds. In the PM peak hour, the westbound approach operates at LOS D with an average delay of 31.8 seconds.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 15.2 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 15.7 seconds.

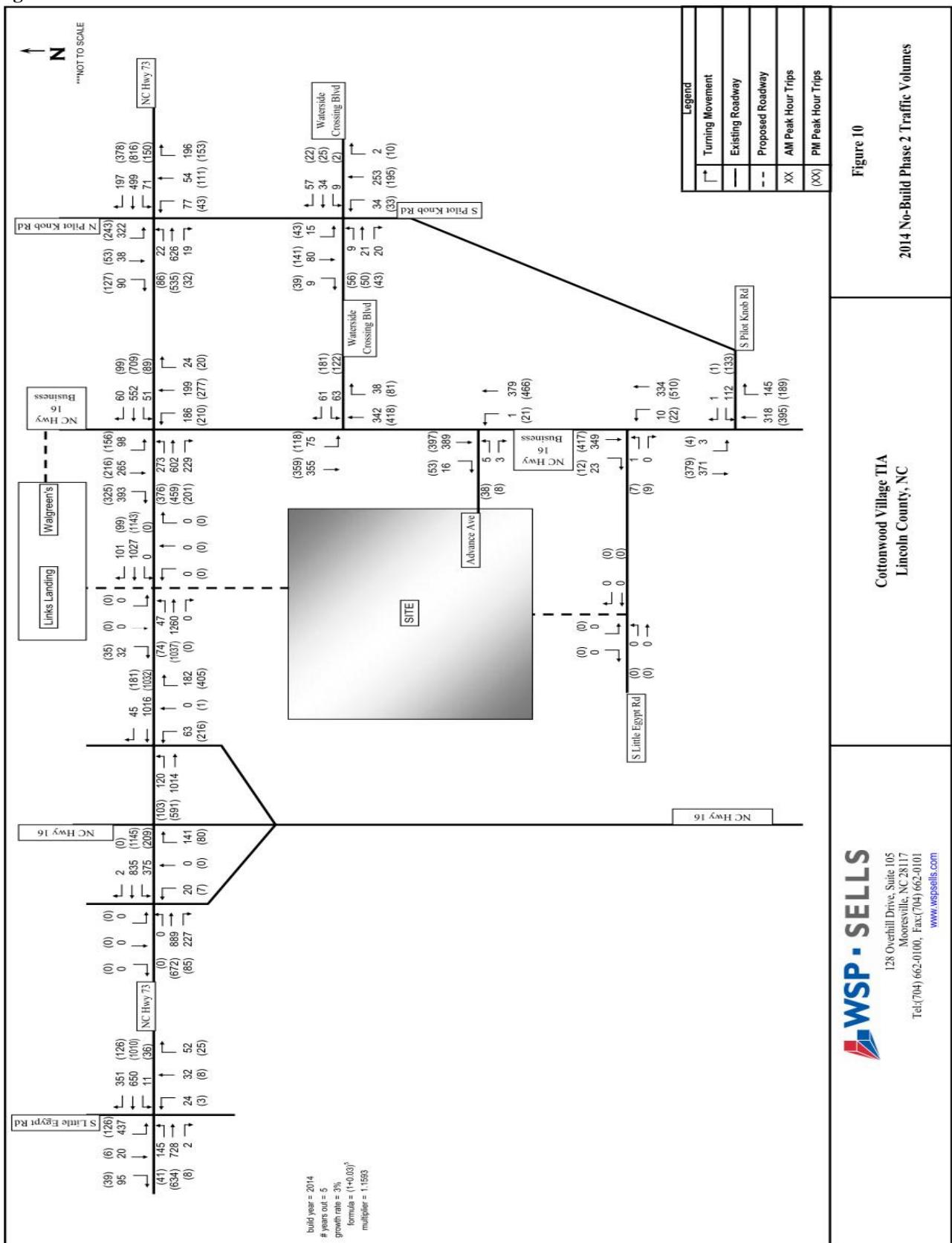
The unsignalized intersection of NC Hwy 16 Business at Advance Avenue operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 14.2 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 19.6 seconds.

At the unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 20.0 seconds. In the PM peak hour, the westbound approach operates at LOS F with an average delay of 104.4 seconds.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours with average delays of 12.5 seconds and 13.0 seconds, respectively. The southbound approach operates at LOS B in the AM peak hour with an average delay of 12.3 seconds. In the PM peak hour, the southbound approach operates at LOS C with an average delay of 17.5 seconds. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Links Landing/Walgreen's site access operates at LOS B in the AM and PM peak hours in the southbound approach with average delays of 13.4 seconds and 14.4 seconds, respectively.

Figure 10: 2014 No-Build Phase 2 Traffic Volumes



**Table 7: Level of Service Analysis – 2014 No-Build Phase 2**

Intersection	Approach	No-Build Phase 2 (2014)			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	51.8	D	C
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	15.4	B	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	15.1	B	C
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	41.4	D	E
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	26.1	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	0.1	A	A
		WB - S. Pilot Knob Rd	22.5	C	D
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.3	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - S. Little Egypt Rd	15.2	C	C
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - Advance Ave	14.2	B	C
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	2.1	A	A
		WB - Waterside Crossing Blvd	20.0	C	F
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.5	B	B
		SB - Waterside Crossing Blvd	12.3	B	C
		EB - S. Pilot Knob Rd	0.9	A	A
		WB - S. Pilot Knob Rd	1.1	A	A
NC Hwy 73 @ Site Access 1	unsignalized	NB - Site Access 1	--	--	--
		SB - Links Landing/Walgreen's	13.4	B	B
		EB - NC Hwy 73	0.4	A	A
		WB - NC Hwy 73	0.0	A	A

unacceptable LOS and delay

## PHASE 2 SITE TRIP GENERATION AND DISTRIBUTION

According to the ITE Trip Generation, Phase 1 of Cottonwood Village will generate approximately 1,469 trips daily. Of these daily trips, 113 will be in the AM peak hour and 140 in the PM peak hour. Table 8 displays the ITE Trip Generation for Phase 1 of this site.

**Table 8: Trip Generation for Cottonwood Village Phase 1**

			Average Daily Trips (24 Hours)			AM Peak Hour (7AM to 8AM, 8AM to 9AM)			PM Peak Hour (4PM to 5PM, 5PM to 6PM)		
ITE CODE	LAND USE	SIZE	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	Apartments	222 DU	735	735	1,469	23	90	113	91	49	140
	<b>TOTAL NON PASS-BY, EXTERNAL TRIPS</b>		<b>735</b>	<b>735</b>	<b>1,469</b>	<b>23</b>	<b>90</b>	<b>113</b>	<b>91</b>	<b>49</b>	<b>140</b>

According to the ITE Trip Generation, Phase 2 of Cottonwood Village will generate approximately 3,602 trips daily. Of these daily trips, 184 will be in the AM peak hour and 289 in the PM peak hour. Table 9 displays the ITE Trip Generation for Phase 2 of this site.

**Table 9: Trip Generation for Cottonwood Village Phase 2**

			Average Daily Trips (24 Hours)			AM Peak Hour (7AM to 8AM, 8AM to 9AM)			PM Peak Hour (4PM to 5PM, 5PM to 6PM)		
ITE CODE	LAND USE	SIZE	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
220	Apartments	32 DU	159	159	317	4	15	19	23	12	35
710	General Office	47,600 SF	377	377	753	92	12	104	22	110	132
820	Shopping Center	33,200 SF	1,658	1,658	3,316	49	31	80	149	155	304
	<b>SUBTOTAL</b>		<b>2,035</b>	<b>2,035</b>	<b>4,069</b>	<b>140</b>	<b>44</b>	<b>184</b>	<b>171</b>	<b>265</b>	<b>436</b>
	<b>* INTERNAL CAPTURE REDUCTION</b>		<b>-233</b>	<b>-233</b>	<b>-467</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>-22</b>	<b>-22</b>	<b>-43</b>
	<b>SUBTOTAL</b>		<b>1,801</b>	<b>1,801</b>	<b>3,602</b>	<b>140</b>	<b>44</b>	<b>184</b>	<b>150</b>	<b>243</b>	<b>393</b>
	<b>** RETAIL PASS-BY REDUCTION</b>		<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>-51</b>	<b>-53</b>	<b>-103</b>
	<b>TOTAL NON PASS-BY, EXTERNAL TRIPS</b>		<b>1,801</b>	<b>1,801</b>	<b>3,602</b>	<b>140</b>	<b>44</b>	<b>184</b>	<b>99</b>	<b>190</b>	<b>289</b>

\*ITE Trip Generation Handbook, 2nd Edition, Pg. 94.

\*\*ITE Trip Generation Handbook, 2nd Edition and NCDOT guidance

\*\*Shopping Center = 34% (pm)

The distribution of trips created by Phase 1 of Cottonwood Village was determined based upon current traffic patterns and the site layout as previously discussed. Figure 7 displays the site trip distribution for Phase 1. Figure 8 shows the Phase 1 site trips.

The distribution of non-pass-by trips created by Phase 2 of Cottonwood Village was determined based upon current traffic patterns and the proposed site layout. Of the traffic entering the site, 65% will use the site access on NC Hwy 73; 32% from the east and 33% from the west. 25% of the entering non-pass-by site traffic will use Advance Avenue to access the site; 13% from the south on NC Hwy 16 Business and 12% from the north. 5% of the non-pass-by site traffic will use the site entrance on S. Little Egypt Road; 3% from the south and 2% from the north on NC Hwy 16 Business. The remaining 5% of non-pass-by site trips will travel from Links Landing/Wal-Mart using the Wal-Mart/Lowe's access which will provide alternate site access since no through movement across NC Hwy 73 will be permitted at the site entrance. .

Of the exiting non-pass-by traffic, 36% will use the site access on NC Hwy 73; 36% will travel east, 5% of which will travel north into the Links Landing/Walgreen's site via NC Hwy 16 Business since no through movement across NC Hwy 73 will be permitted at the site entrance. 25% of the non-pass-by exiting site traffic will use Advance Avenue; 12% travelling north and 13% travelling south on NC Hwy 16 Business. 5% of the exiting non-pass-by traffic will use the access on S. Little Egypt Road; 2% will travel north and 3% will travel south on NC Hwy 16 Business. The remaining 34% of exiting non-pass-by traffic will use the alternate access via the Lowe's/Wal-Mart access to NC Hwy 73 and travel west on NC Hwy 73.

Figure 11 displays the non-pass-by site trip distribution for Phase 2. Figure 12 shows the Phase 2 non-pass-by site trips.

The distribution of pass-by trips created by Phase 2 of Cottonwood Village was determined based upon current traffic patterns and the site layout. 43% of the pass-by traffic will travel from west to east on NC Hwy 73. 47% of the pass-by traffic will travel from east to west on NC Hwy 73. 5% of the pass-by traffic will travel from north to south along NC Hwy 16 Business and 5% will travel from south to north along NC Hwy 16 Business, utilizing Advance Avenue to enter and exit the site.

Figure 13 displays the pass-by site trip distribution for Phase 2. Figure 14 shows the Phase 2 pass-by site trips.

Figure 11: Phase 2 Non-Pass-By Trip Distribution

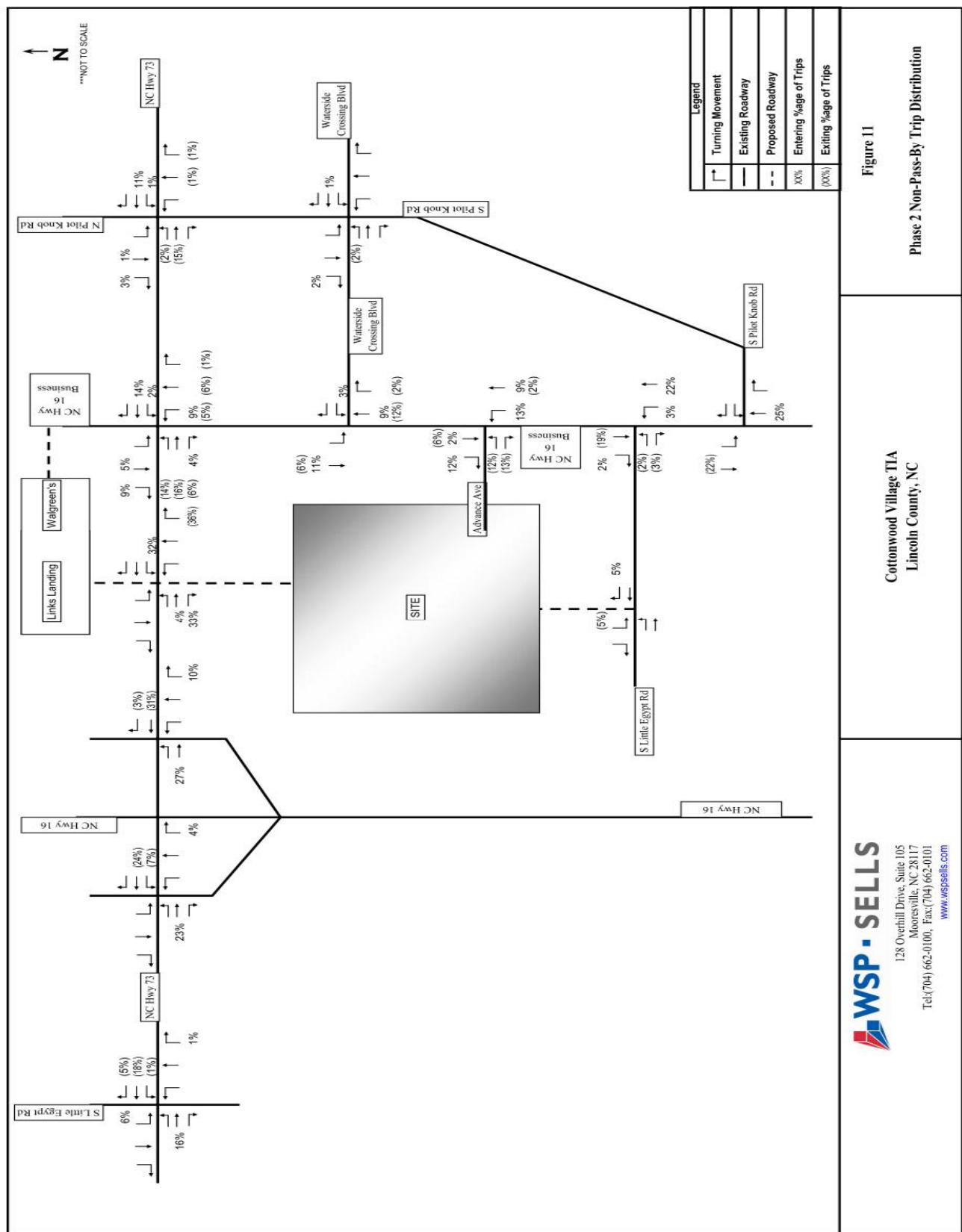


Figure 12: Phase 2 Non-Pass-By Site Trips

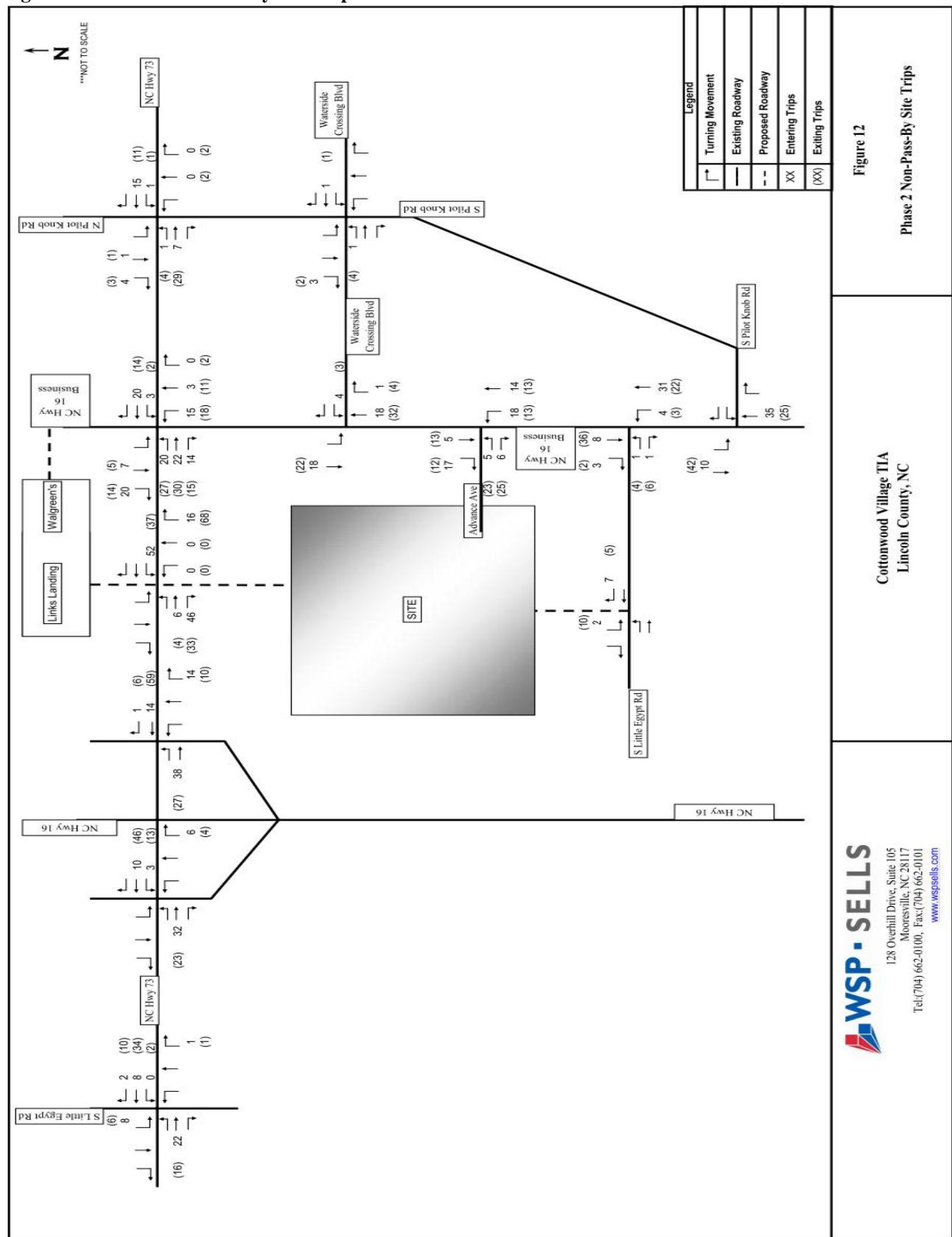


Figure 13: Phase 2 Pass-By Trip Distribution

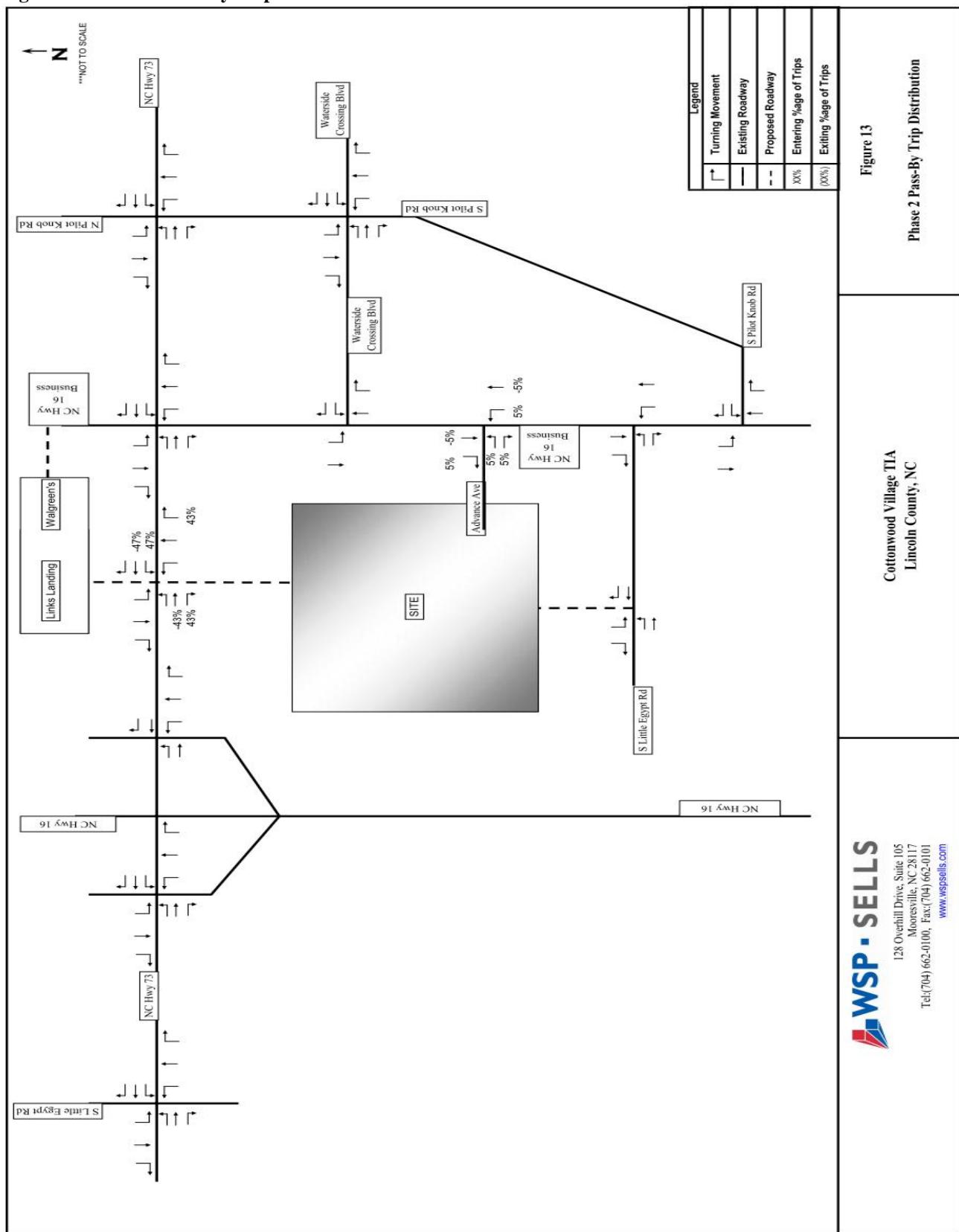
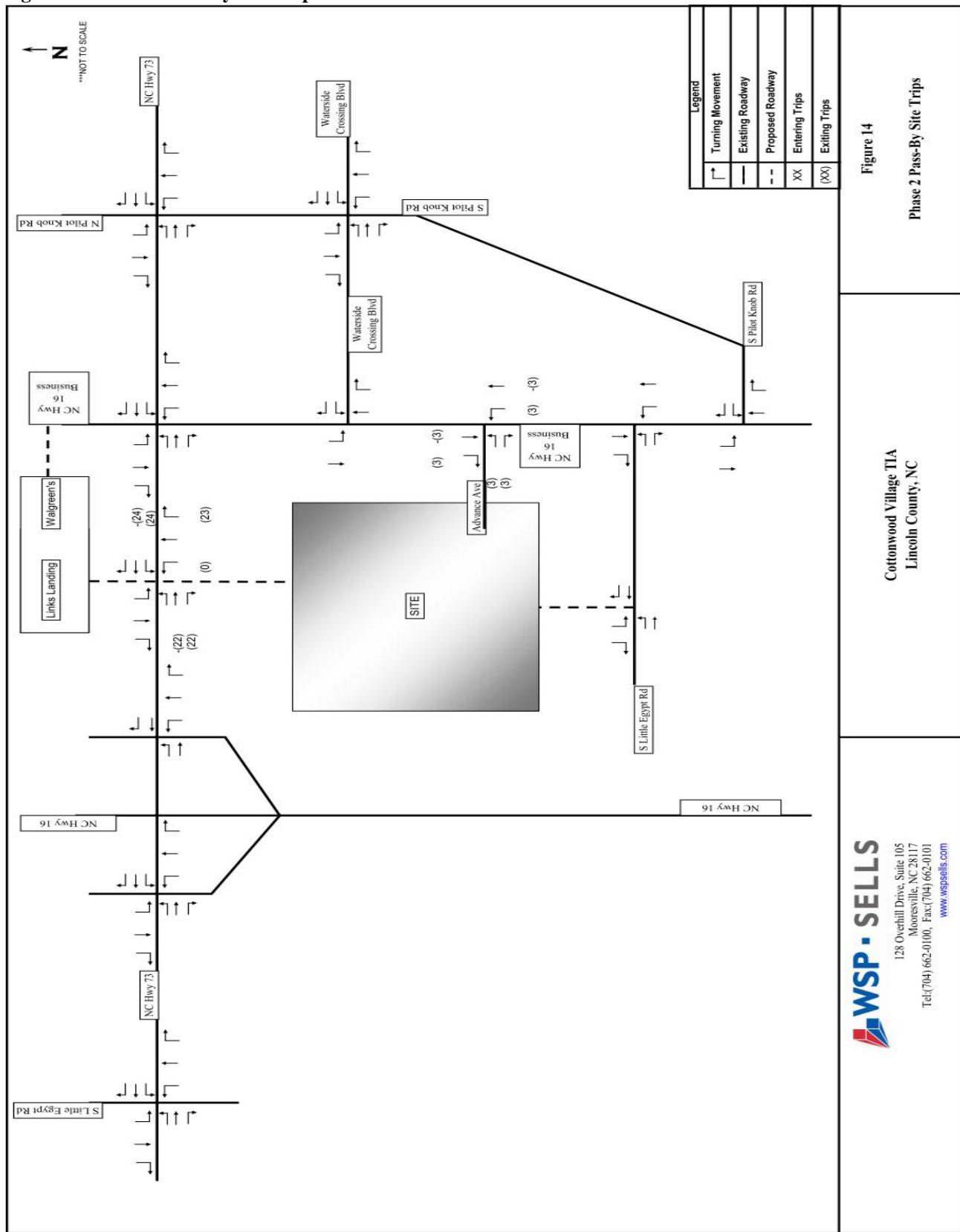


Figure 14: Phase 2 Pass-By Site Trips



## 2014 BUILD PHASE 2 ANALYSIS

The total future 2014 Build Phase 2 traffic volumes, as shown in Figure 15, include traffic volumes from the 2014 No-Build Phase 2 Analysis as well as the Phase 1 and Phase 2 site traffic generated.

The 2014 Build Phase 2 analyses were performed using the same methods as described in the Existing Conditions analyses.

The signalized intersection of NC Hwy 73 at S. Little Egypt Road operates at LOS E in the AM peak hour with an average delay of 56.2 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 27.5 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 SB ramps operates at LOS B in the AM peak hour with an average delay of 16.0 seconds. In the PM peak hour, the intersection operates at LOS A.

The signalized intersection of NC Hwy 73 at NC Hwy 16 NB ramps operates at LOS B in the AM peak hour with an average delay of 16.3 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 32.7 seconds.

The signalized intersection of NC Hwy 73 at NC Hwy 16 Business operates at LOS D in the AM peak hour with an average delay of 43.4 seconds. In the PM peak hour, the intersection operates at LOS E with an Average delay of 65.2 seconds.

The signalized intersection of NC Hwy 73 at Pilot Knob Road operates at LOS C in the AM peak hour with an Average delay of 26.5 seconds. In the PM peak hour, the intersection operates at LOS C with an average delay of 30.5 seconds.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS D in the AM peak hour with an average delay of 25.9 seconds. In the PM peak hour, the westbound approach operates at LOS E with an average delay of 41.9 seconds.

At the unsignalized intersection of NC Hwy 16 Business at S. Little Egypt Road, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay of 14.4 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 19.0 seconds.

At the unsignalized intersection of NC Hwy 16 Business at Advance Avenue, the northbound and southbound approaches operate at LOS A in the AM and PM peak hours. The eastbound approach operates at LOS B in the AM peak hour with an average delay

of 14.7 seconds. In the PM peak hour, the eastbound approach operates at LOS C with an average delay of 22.5 seconds.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A in the northbound and southbound approaches in both the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 23.3 seconds. In the PM peak hour, the westbound approach operates at LOS F with an average delay of 173.8 seconds.

The unsignalized intersection of S. Pilot Knob Road at Waterside Crossing Blvd operates at LOS B in the northbound approach in both the AM and PM peak hours with average delays of 12.6 seconds and 13.1 seconds, respectively. The southbound approach operates at LOS B in the AM peak hour with an average delay of 12.7 seconds. In the PM peak hour, the southbound approach operates at LOS C with an average delay of 18.0 seconds. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of NC Hwy 73 at Site Access 1/Walgreen's site access operates at LOS C in the northbound approach during the AM and PM peak hours with average delays of 16.3 seconds and 16.3 seconds, respectively. In the southbound approach, the LOS is B in the AM and PM peak hours with average delays of 13.4 seconds and 14.2 seconds, respectively. The eastbound and westbound approaches operate at LOS A in the AM and PM peak hours.

The unsignalized intersection of S. Little Egypt Road at Site Access 2 operates at LOS A on the southbound, eastbound, and westbound approaches in the AM and PM peak hours.

Table 10 shows the LOS results for the intersections in the Build Phase 2 scenarios.

**Figure 15: 2014 Build Phase 2 Traffic Volumes**

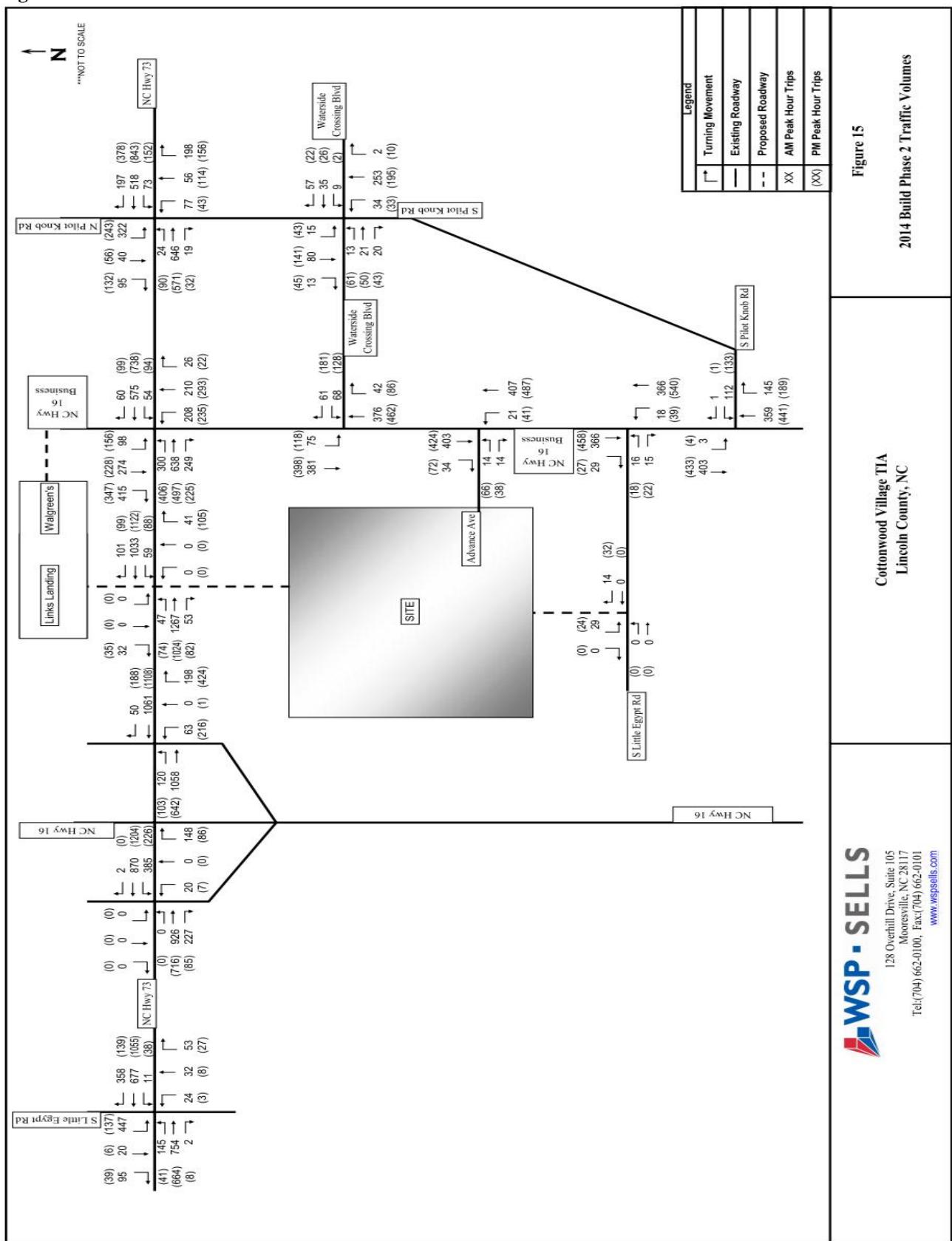


Figure 15

2014 Build Phase 2 Traffic Volumes

**Table 10: Level of Service - 2014 Build Phase 2**

Intersection	Approach	Build Phase 2 (2014)			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	56.2	E	C
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	16.0	B	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	16.3	B	C
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	43.4	D	E
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	26.5	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	0.1	A	A
		WB - S. Pilot Knob Rd	25.9	D	41.9
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.6	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - S. Little Egypt Rd	14.4	B	C
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.4	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - Advance Ave	14.7	B	C
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	2.1	A	A
		WB - Waterside Crossing Blvd	23.3	C	F
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.6	B	B
		SB - Waterside Crossing Blvd	12.7	B	C
		EB - S. Pilot Knob Rd	0.9	A	A
		WB - S. Pilot Knob Rd	1.1	A	A
NC Hwy 73 @ Site Access 1	unsignalized	NB - Site Access 1	16.3	C	C
		SB - Links Landing/Walgreen's	13.4	B	B
		EB - NC Hwy 73	0.4	A	A
		WB - NC Hwy 73	0.7	A	A
S. Little Egypt Rd (SR 1386) @ Site Access 2	unsignalized	SB - Site Access 2	8.7	A	A
		EB - S. Little Egypt Rd	0.0	A	A
		WB - S. Little Egypt Rd	0.0	A	A
unacceptable LOS and delay					

## 2014 BUILD WITH IMPROVEMENTS PHASE 2 ANALYSIS

The following improvements are recommended to mitigate the degradation of traffic operations due to site traffic:

### Improvements by Developer – Phase 2:

1. NC Hwy 16 Business @ S. Pilot Knob Road:
  - o Install a northbound right-turn lane with 125 ft of storage and appropriate taper and striping on NC Hwy 16 Business
2. NC Hwy 16 Business @ Waterside Crossing Blvd:
  - o Stripe the westbound approach to have a left-turn lane and right-turn lane  
Note: the existing shared lane is 24 feet wide therefore no additional pavement is necessary.

Note: although the LOS decreases from D to E from the No-Build Phase 2 to the Build Phase 2 scenarios at the intersection of NC Hwy 73 at Little Egypt Rd, the increase in delay is less than 10% therefore no improvements are recommended at this intersection.

These improvements are to be installed prior to the completion of construction of Phase 2 in accordance with NCDOT regulations.

After full build-out, NCDOT may consider a traffic signal at Site access 1 on NC Hwy 73 if warranted.

The unsignalized intersection of NC Hwy 16 Business at S. Pilot Knob Road operates at LOS A on the northbound and southbound approaches for the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 22.5 seconds and LOS D in the PM peak hour with an average delay of 32.2 seconds.

The unsignalized intersection of NC Hwy 16 Business at Waterside Crossing Blvd operates at LOS A on the northbound and southbound approaches for the AM and PM peak hours. The westbound approach operates at LOS C in the AM peak hour with an average delay of 19.6 seconds. In the PM peak hour, the westbound approach operates at LOS F with an average delay of 50.4 seconds. This is an improvement over the Build Phase 2 scenario, which has an average delay of 173.8 seconds, in the westbound approach.

Table 10 shows the LOS results for the intersections in the 2014 Build Phase 2 with Improvements scenarios.

**Table 11: Level of Service Analysis - 2014 Build Phase 2 w/ Improvements**

Intersection	Approach	Build Phase 2 (2014) with Improvements			
		AM		PM	
		Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	signalized	NB - S. Little Egypt Rd	56.2	E	C
		SB - N. Little Egypt Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 SB ramps	signalized	NB - NC Hwy 16 SB ramps	16.0	B	A
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 NB ramp	signalized	NB - NC Hwy 16 NB ramp	16.3	B	C
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ NC Hwy 16 Business	signalized	NB - NC Hwy 16 Business	43.5	D	E
		SB - NC Hwy 16 Business			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	signalized	NB - S. Pilot Knob Rd	25.9	C	C
		SB - N. Pilot Knob Rd			
		EB - NC Hwy 73			
		WB - NC Hwy 73			
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	0.1	A	A
		WB - S. Pilot Knob Rd	22.5	C	D
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	unsignalized	NB - NC Hwy 16 Business	0.4	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - S. Little Egypt Rd	14.4	B	C
NC Hwy 16 Business @ Advance Ave (SR 2069)	unsignalized	NB - NC Hwy 16 Business	0.4	A	A
		SB - NC Hwy 16 Business	0.0	A	A
		EB - Advance Ave	14.7	B	C
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - NC Hwy 16 Business	0.0	A	A
		SB - NC Hwy 16 Business	2.1	A	A
		WB - Waterside Crossing Blvd	19.6	C	F
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	unsignalized	NB - Glencrest Dr	12.6	B	B
		SB - Waterside Crossing Blvd	12.7	B	C
		EB - S. Pilot Knob Rd	0.9	A	A
		WB - S. Pilot Knob Rd	1.1	A	A
NC Hwy 73 @ Site Access 1	unsignalized	NB - Site Access 1	16.3	C	C
		SB - Links Landing/Walgreen's	13.4	B	B
		EB - NC Hwy 73	0.4	A	A
		WB - NC Hwy 73	0.7	A	A
S. Little Egypt Rd (SR 1386) @ Site Access 2	unsignalized	SB - Site Access 2	8.7	A	A
		EB - S. Little Egypt Rd	0.0	A	A
		WB - S. Little Egypt Rd	0.0	A	A
unacceptable LOS and delay					

## CONCLUSIONS

The study indicates that the proposed Cottonwood Village mixed use development will consist of apartment homes, office space, and retail space, and will be constructed in two phases. Phase 1 has a build-out year of 2012, and will include the construction of 222 apartment units. Phase 1 of Cottonwood Village will generate approximately 1,469 trips daily. Of these daily trips, 113 will be in the AM peak hour and 140 in the PM peak hour. Phase 2 has a build-out year of 2014, and will include the construction of 32 apartment units, 47,600 square feet (sf) of office space, and 33,200 sf of retail space. Phase 2 of Cottonwood Village will generate approximately 3,602 trips daily. Of these daily trips, 184 will be in the AM peak hour and 289 in the PM peak hour.

With the addition of site traffic, level of service on the westbound approach at the intersection of NC Hwy 16 Business and S. Pilot Knob Road degrades from LOS D in the PM peak hour (2014) to LOS E from the addition of site traffic. Therefore, improvements are necessary at this intersection.

Also, level of service degrades at the intersection of NC Hwy 16 Business at Waterside Crossing Blvd. In the existing (2009) condition, the westbound approach has a LOS E in the PM peak hour with an average delay of 45.2 seconds. In the No-Build Phase 1 (2012) scenario, the LOS on the westbound approach in the PM peak hour is an F with an average delay of 63.5 seconds. In the Build Phase 1 (2012) scenario, the westbound approach during the PM peak hour has LOS F with an average delay of 77.3 seconds. In the Build Phase 2 scenario (2014) the westbound approach LOS is an F with an average delay of 173.8 seconds in the PM peak hour. Improvements are necessary at this intersection.

Although the LOS at the intersection of NC Hwy 73 at Site Access 1 operates at acceptable LOS in the Phase 2 Build (2014) scenario, the intersection still experiences a drop in LOS from the No-Build to Build scenarios. It is recommended that improvements occur at this intersection.

Even though the intersection of S. Little Egypt at NC Hwy 16 Business operates at acceptable levels in all scenarios, there is limited site distance for the eastbound traffic to see vehicles coming from the south. Therefore, it is recommended that improvements are made at this intersection as well.

The remaining intersections maintain acceptable levels of service or do not degrade by more than the minimum so no mitigation is recommended at these intersections.

From the operational analysis, recommendations are as follows:

**Improvements by Developer:**

**Phase 1:**

1. NC Hwy 73 @ Site Access 1/Links Landing and Walgreen's access:
  - o Provide for a separate right-turn lane on the northbound approach for traffic exiting the site,
  - o Provide for a westbound left-turn lane (leftover) with 175 ft of storage and appropriate taper and striping,
2. NC Hwy 16 Business @ S. Little Egypt Road:
  - o Install a northbound left-turn lane with 50 ft of storage and appropriate taper and striping on NC Hwy 16 Business

**Phase 2:**

1. NC Hwy 16 Business @ S. Pilot Knob Road:
  - o Install a northbound right-turn lane with 125 ft of storage and appropriate taper and striping on NC Hwy 16 Business
2. NC Hwy 16 Business @ Waterside Crossing Blvd:
  - o Stripe the westbound approach to have a left-turn lane and right-turn lane  
Note: the existing shared lane is 24 feet wide therefore no additional pavement is necessary.

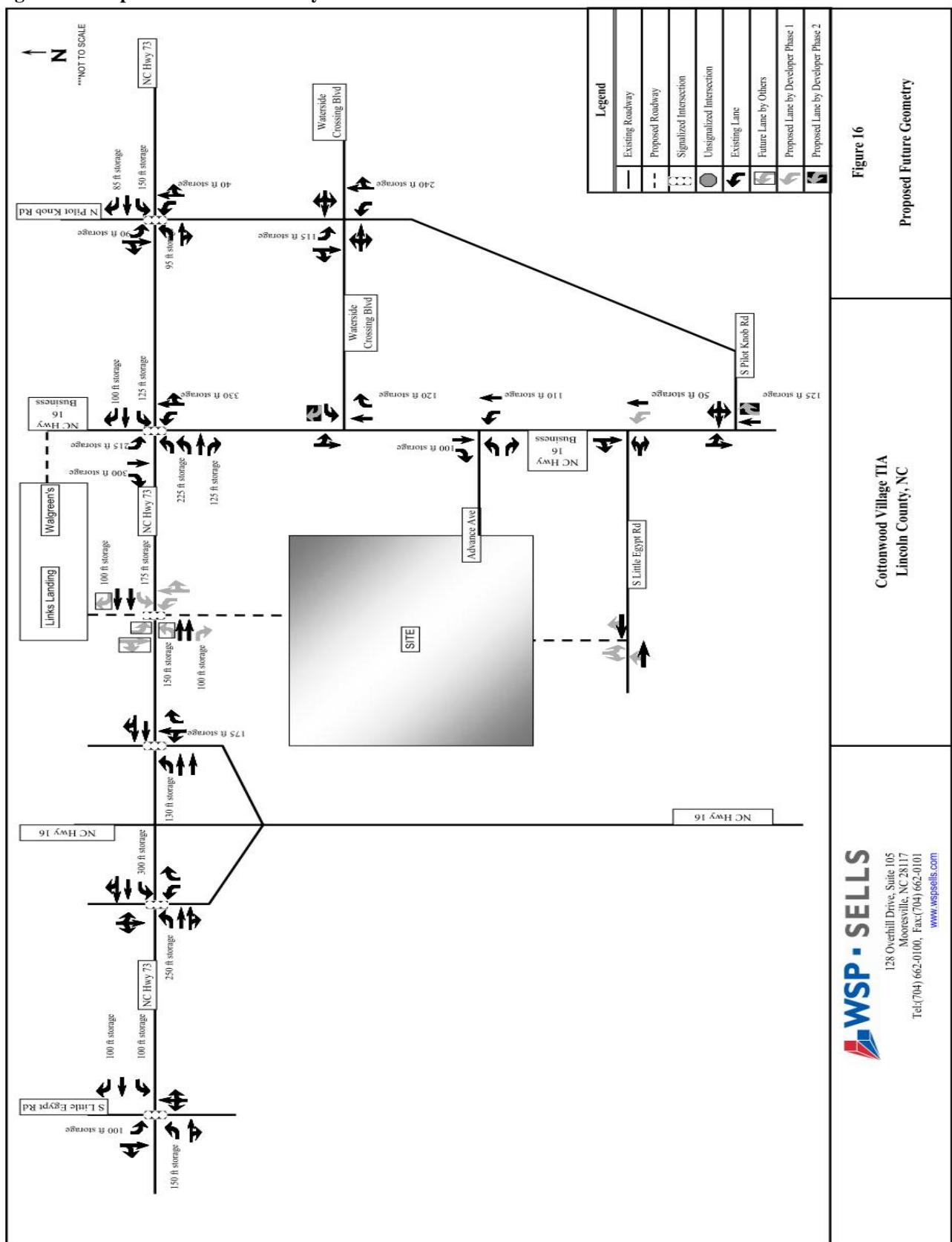
These improvements are to be installed prior to the completion of construction in accordance with NCDOT regulations.

Note: although the LOS decreases from D to E from the No-Build Phase 2 to the Build Phase 2 scenarios at the intersection of NC Hwy 73 at Little Egypt Rd, the increase in delay is less than 10% therefore no improvements are recommended at this intersection.

After full build-out, NCDOT may consider a traffic signal at Site access 1 on NC Hwy 73 if warranted.

Figure 16 displays the proposed future geometry.

**Figure 16: Proposed Future Geometry**



**Table 12: Overall Level of Service Analysis**

Intersection	Approach	Existing (2009)		No-Build Phase 1 (2012)		Build Phase 1 (2012)		Build Phase 1 (2012) with Improvements		No-Build Phase 2 (2014)		Build Phase 2 (2014)		Build Phase 2 (2014) with Improvements	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
NC Hwy 73 @ S. Little Egypt Rd (SR 1386)	NB - S. Little Egypt Rd	58.0	E	13.6	B	38.5	D	17.9	B	39.6	D	18.5	B	39.6	D
	SB - N. Little Egypt Rd	58.0	E	13.6	B	38.5	D	17.9	B	39.6	D	18.5	B	39.6	D
NC Hwy 73 @ NC Hwy 16 SB ramps	WB - NC Hwy 73	9.2	A	2.8	A	12.9	B	4.3	A	13.0	B	4.4	A	13.0	B
	NB - NC Hwy 16 SB ramps	9.2	A	13.7	B	11.8	B	24.6	C	12.0	B	25.1	C	15.1	B
NC Hwy 73 @ NC Hwy 16 NB ramp	NB - NC Hwy 16 NB ramp	9.1	A	13.7	B	11.8	B	24.6	C	12.0	B	25.1	C	15.1	B
	WB - NC Hwy 73	9.1	A	13.7	B	11.8	B	24.6	C	12.0	B	25.1	C	15.1	B
NC Hwy 73 @ NC Hwy 16 Business	NB - NC Hwy 16 Business	31.9	C	39.1	D	36.6	D	49.1	D	37.5	D	51.8	D	37.5	D
	WB - NC Hwy 73	31.9	C	39.1	D	36.6	D	49.1	D	37.5	D	51.8	D	37.5	D
NC Hwy 73 @ NC Hwy 16 Business	NB - S. Pilot Knob Rd	28.2	C	28.0	C	22.4	C	23.0	C	23.1	C	23.7	C	23.1	C
	WB - S. Pilot Knob Rd	28.2	C	28.0	C	22.4	C	23.0	C	23.1	C	23.7	C	23.1	C
NC Hwy 73 @ S. Pilot Knob Rd (SR 1394)	NB - NC Hwy 16 Business	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
	WB - NC Hwy 16 Business	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
NC Hwy 16 Business @ S. Pilot Knob Rd (SR 1394)	WB - S. Pilot Knob Rd	22.1	C	22.2	C	20.3	C	27.0	D	21.3	C	29.3	D	21.3	C
	NB - NC Hwy 16 Business	0.3	A	0.6	A	0.3	A	0.6	A	0.4	A	0.9	A	0.3	A
NC Hwy 16 Business @ S. Little Egypt Rd (SR 1386)	NB - NC Hwy 16 Business	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
	WB - S. Little Egypt Rd	14.1	B	15.0	C	14.6	B	14.9	B	13.3	B	16.4	C	13.3	B
NC Hwy 16 Business @ Advance Ave (SR 2069)	NB - NC Hwy 16 Business	0.0	A	0.4	A	0.0	A	0.4	A	0.0	A	0.4	A	0.0	A
	WB - NC Hwy 16 Business	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
NC Hwy 16 Business @ Waterside Crossing Blvd (SR 2039)	NB - NC Hwy 16 Business	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
	WB - Waterside Crossing Blvd	2.0	A	3.0	A	2.1	A	3.2	A	2.1	A	3.2	A	2.1	A
S. Pilot Knob Rd (SR 1394) @ Waterside Crossing Blvd (SR 2039)	NB - Glencrest Dr	12.5	B	12.2	B	12.6	B	12.2	B	12.6	B	12.5	B	13.0	B
	WB - Waterside Crossing Blvd	12.6	B	15.2	C	12.0	B	16.2	C	12.2	B	16.4	C	12.3	B
NC Hwy 73 @ Site Access 1	NB - S. Pilot Knob Rd	0.9	A	1.0	A	0.9	A	1.1	A	0.9	A	1.1	A	0.9	A
	WB - S. Pilot Knob Rd	1.1	A	1.5	A	1.1	A	1.5	A	1.1	A	1.4	A	1.1	A
S. Little Egypt Rd (SR 1386) @ Site Access 2	NB - Site Access 1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	WB - Site Access 2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S. Little Egypt Rd (SR 1386) @ Site Access 2	NB - Link Landing Walgreen's	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	WB - NC Hwy 73	0.1	A	0.5	A	0.1	A	0.5	A	0.1	A	0.5	A	0.1	A
unacceptable LOS and delay	NB - Site Access 1	0.0	A	0.0	A	0.1	A	0.3	A	0.1	A	0.3	A	0.0	A
	WB - S. Little Egypt Rd	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A

## **APPENDICES**