

Report

Transportation Impact Assessment

Briar Chapel
Chatham County, NC



Prepared for:

The John R. McAdams Company, Inc.

Prepared by:



Kimley-Horn
and Associates, Inc.

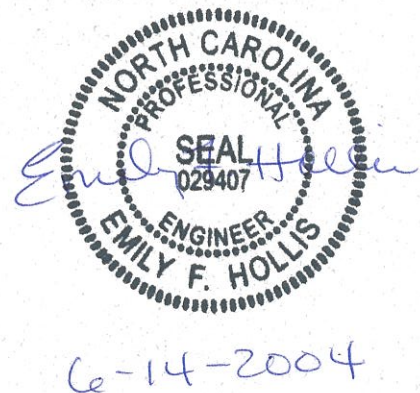
**Transportation Impact Assessment
for
Briar Chapel
Chatham County, North Carolina**

**Prepared for:
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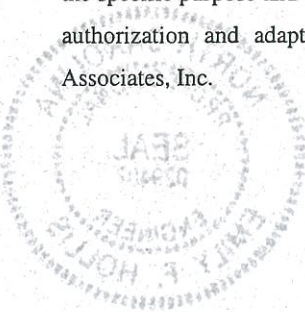


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1.0 Executive Summary

The proposed Briar Chapel Development is a mixed-use project to be developed in accordance with the Chatham County Compact Community Ordinance. The development is located in northeast Chatham County primarily west of U.S. 51-501 between Mann's Chapel Road to the north and Andrews Store Road to the south. There is a small office component on the east side of U.S. 15-501 in the vicinity of Andrews Store Road. The proposed development consists of approximately 1880 single-family homes, 515 multi-family housing units, 252,000 square feet of retail space, 270,000 square feet of office space, two schools serving a total of 1300 students, and a county park. The development is expected to be completed (built-out) in 2014.

Kimley-Horn and Associates was retained to determine the potential transportation impacts of this development in accordance with the traffic study guidelines in the *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and to identify mitigation measures required to address these impacts in accordance with Sections 11.1 and 11.2 of the Compact Community Ordinance. This report presents trip generation, distribution, traffic analyses, and recommendations for transportation improvements required to meet anticipated transportation demands.

The principal arterial road in the vicinity of the project is U.S. 15-501, designated a major thoroughfare in the Durham, Chapel Hill, Carrboro (DCHC) MPO Thoroughfare Plan. Under North Carolina Department of Transportation (NCDOT) project R-942B, U.S. 15-501 is currently being widened from a two-lane road to a four-lane median divided cross-section from Chapel Hill south through the project area. As part of the NCDOT project new traffic signals are being installed on U.S. 15-501 at the Lystra Road and Jack Bennett Road intersections and all of the existing and new signals incorporated into a coordinated closed-loop traffic signal system. The project is being built to address existing capacity needs and provide additional capacity for future development of northeast Chatham County. The construction is projected to be completed in October 2004.

In accordance with the Compact Community Ordinance, the project has multiple points of access, with two full-movement access points on U.S. 15-501 and one full-movement access point within one mile of U.S. 15-501 on Mann's Chapel Road.

The project is designed in accordance with the Compact Community Ordinance and the NCDOT *Traditional Neighborhood Development Guidelines* that call for compact, interconnected, transit-

friendly development. The project is designed with an integrated network of streets, sidewalks and trails that provide extensive interconnectivity and multiple paths to and from most of the development, both internally and externally, for vehicles, pedestrians, and bicyclists. Exceptions are principally due to environmental and topographic constraints. There is no transit service currently in the area but the street pattern and access points provide well for future transit when it is extended to serve the area. Locations for transit stops have been tentatively identified; to be confirmed and/or amended in conjunction with service providers.

The project is expected to generate 31,226 external vehicle trips daily at build out. These trips have been assigned to the surrounding road network. The resulting traffic volumes have been used to analyze the impacts of the project on the road network. The analysis is based on the existing conditions assuming no transit service in the area. When the project is served by transit in the future, the number of vehicle trips will be reduced. The analyses indicate that all of the intersections in the vicinity of the project will operate at acceptable levels of service with the following improvements (in addition to the improvements being made by NCDOT):

U.S. 15-501 & Mann's Chapel Road - add northbound and southbound through lanes on U.S. 15-501, extend the dual left turn lanes on Mann's Chapel Road to provide 500 feet of full-width storage.

U.S. 15-501 & Taylor Road – construct dual exclusive left turn lanes and one through-right lane on the eastbound approach of Taylor Road and one exclusive left turn lane and a through-right lane on the westbound approach of Taylor Road, install traffic signal with pedestrian signals

U.S. 15-501 & Andrews Store Road - construct separate left and through-right lanes eastbound and westbound; install traffic signal with pedestrian signals

U.S. 15-501 & Mt. Gilead Church Road - add westbound right turn lane on Mt. Gilead Church Road (needed for background traffic)

Mann's Chapel Road & Andrews Store Road – extend planned NCDOT right turn taper to provide 150 feet of full-width storage

Hamletts Chapel Road & River Forrest Road - install four-way stop

Lystra Road & Jack Bennett Road - add northbound right turn lane on Jack Bennett Road (needed for background traffic), install traffic signal when warranted

Lystra Road & Farrington Road – add southbound right turn lane on Farrington Road (needed currently), modify signal phasing to provide protected left turn phase for eastbound Lystra Road approach

U.S. 15-501 & Vickers (East Access Road) – construct separate left and through/right lanes eastbound, install a traffic signal with pedestrian signals

Mann's Chapel Road & North Access Road – construct separate left/through and right turn lanes northbound, install traffic signal when warranted

Andrews Store Road & South Access Road – construct separate left and through-right lanes southbound, construct exclusive eastbound left turn lane and exclusive westbound right turn lane on Andrews Store Road, install traffic signal when warranted

Andrews Store Road & Second South Access Road - construct separate left and right turn lanes southbound, construct exclusive eastbound left turn lane and exclusive westbound right turn lane on Andrews Store Road

With these improvements the impacts of the development will be mitigated in accordance with Section 11.2 of the Compact Community Ordinance. A detailed description of the methodology, analysis and recommendations for transportation improvements is contained in the technical report that follows.

2.0 Introduction

Newland Communities is proposing to develop Briar Chapel, a mixed-use project to be developed in accordance with the Chatham County Compact Community ordinance. The project is located primarily west of U.S. 15-501, north of Andrews Store Road and south of Mann's Chapel Road in northeast Chatham County, North Carolina. There is a small office component on the east side of U.S. 15-501 in the area of Andrews Store Road. The proposed development consists of 1,877 single-family homes, 432 town homes, 80 apartments, 200,000 square feet (SF) of retail space, 270,000 SF of office space, 52,000 SF of specialty retail space, a 900-student K-8 school, a 400-student charter school, and a county park. As currently envisioned, the development will be completed (built-out) in 2014.

Kimley-Horn and Associates was retained to determine the potential transportation impacts of this development in accordance with the traffic study guidelines in the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* and to identify mitigation measures required to address these impacts in accordance with Sections 11.1 and 11.2 of the Compact Community Ordinance. This report presents trip generation, distribution, traffic analyses, and recommendations for transportation improvements required to meet anticipated transportation demands.

The North Carolina Department of Transportation (NCDOT) and Chatham County were contacted to obtain background information and to ascertain the elements to be covered in this traffic impact analysis.

The principal arterial road in the vicinity of the project is U.S. 15-501, designated a major thoroughfare in the Durham, Chapel Hill, Carrboro (DCHC) MPO Thoroughfare Plan. Background information included plans for the widening of U.S. 15-501 in the project vicinity, which is currently under construction.

In accordance with the Compact Community Ordinance, the project has multiple points of access, with two full-movement access points on U.S. 15-501 and one full-movement access point within one mile of U.S. 15-501 on Mann's Chapel Road.

The project is designed in accordance with the Compact Community Ordinance and the NCDOT *Traditional Neighborhood Development Guidelines* that call for compact, integrated, transit-friendly

development. The project is designed with an inter-connected network of streets, sidewalks and trails that provide extensive interconnectivity and multiple paths to and from most of the development, both internally and externally, for vehicles, pedestrians, and bicyclists. While a significant number of internal trips are expected to be pedestrian or bicycle, these two modes are not anticipated to serve a significant number of external trips. Therefore this analysis focuses on external vehicular trips. Exceptions to interconnectivity and multiple-path concepts are principally due to environmental and topographic constraints.

There is no transit service currently in the area but the street pattern and access points provide well for future transit when it is extended to serve the area. Locations for transit stops have been tentatively identified; to be confirmed and/or amended in conjunction with service providers. Transit, when service is extended to the area, will reduce the number of external vehicle trips.

3.0 Inventory

3.1 Study Area

The study area for this TIA includes the following intersections:

- U.S. 15-501 & Smith Level Road
- U.S. 15-501 & Old Lystra Road
- U.S. 15-501 & Mann's Chapel Road
- U.S. 15-501 & Lystra Road
- U.S. 15-501 & Jack Bennett Road
- U.S. 15-501 & Taylor Road
- U.S. 15-501 & Andrews Store Road
- U.S. 15-501 & Village Way
- U.S. 15-501 & Mt. Gilead Church Road
- Mann's Chapel Road & Poythress Road
- Mann's Chapel Road & Andrews Store Road
- Hamletts Chapel Road & Mann's Chapel / River Forrest Road
- Jones Ferry Road & Damascus Church Road
- Lystra Road & Jack Bennett Road
- Lystra Road & Farrington Road
- U.S. 15-501 & Vickers Road (East Access Road)
- Mann's Chapel Road & North Access Road
- Andrews Store Road & South Access Road
- Andrews Store Road & Second South Access Road

This study area was determined based upon discussions with NCDOT and County staff. Figure 1 shows the site location and Figure 2 shows the proposed site plan.



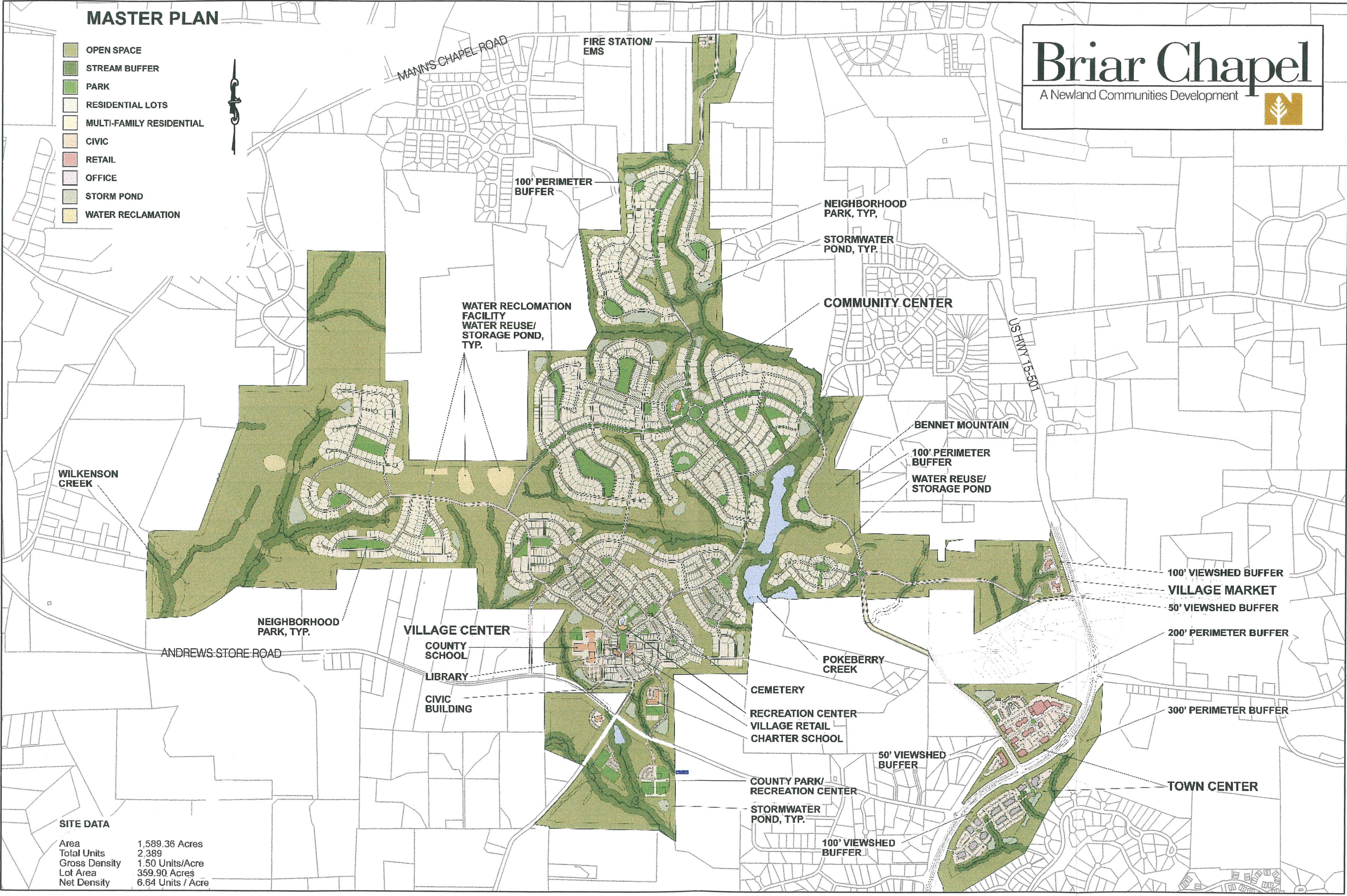
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BRIAR CHAPEL
TRANSPORTATION IMPACT
ASSESSMENT

SITE LOCATION

FIGURE
1

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SITE DATA

Area	1,589.36 Acres
Total Units	2,389
Gross Density	1.50 Units/Acre
Lot Area	359.90 Acres
Net Density	6.64 Units / Acre

3.2 Existing Conditions

The proposed Briar Chapel development is located primarily west of U.S. 15-501, north of Andrews Store Road and south of Mann's Chapel Road in northeast Chatham County, North Carolina. The immediate surrounding land is primarily agricultural or undeveloped, with some existing residential development in the vicinity of the project site. The principal arterial road in the vicinity of the project is U.S. 15-501, designated a major thoroughfare in the Durham, Chapel Hill, Carrboro (DCHC) MPO Thoroughfare Plan. The other major roadways in the immediate vicinity of the site include Smith Level Road, Mann's Chapel Road, Lystra Road, Jack Bennett Road, Hamletts Chapel Road, Village Way, Mount Gilead Church Road, Old Lystra Road, River Forrest Road, Andrews Store Road, Jones Ferry Road, Damascus Church Road, Poythress Road, and Farrington Road. There is no regularly-scheduled transit service currently available in the project vicinity.

U.S. 15-501 is a two-lane major arterial designated a Major Thoroughfare in the Durham/Chapel Hill/Carrboro (DCHC) adopted Thoroughfare Plan. In the project vicinity U.S. 15-501 carries a 2004 Average Daily Traffic (ADT) volume of approximately 16,000 vehicles per day. This thoroughfare has a posted speed limit of 55 mph in the project vicinity, except in the area of Mann's Chapel Road, where the posted speed limit is 45 mph. Under NCDOT project R-942, U.S. 15-501 is currently being widened from a two-lane road to a four-lane median divided cross-section from Chapel Hill south through the project area. As part of the NCDOT project new traffic signals are being installed on U.S. 15-501 at the Lystra Road and Jack Bennett Road intersections and all of the existing and new signals incorporated into a coordinated closed-loop traffic signal system. The project is being built to address existing capacity needs and provide additional capacity for future development of northeast Chatham County. The construction is projected to be completed in October 2004.

Smith Level Road (SR 1919) is a two-lane roadway in Orange County designated a Major Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it carries a 2004 ADT volume of approximately 7,500 vehicles per day and has a posted speed limit of 40 mph.

Mann's Chapel Road (SR 1532) is a two-lane major arterial designated a Major Thoroughfare in the DCHC adopted Thoroughfare Plan. It carries a 2004 ADT volume of approximately 3,000 vehicles per day in the project vicinity and has a posted speed limit of 45 mph in the vicinity of the project. NCDOT has a "Moving Ahead North Carolina" project scheduled for Mann's Chapel Road to provide minor widening and turn lanes at selected intersections.

Lystra Road (SR 1721) is a two-lane minor collector designated a Minor Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it carries a 2004 ADT volume of approximately 3,000 vehicles per day and has a posted speed limit of 55 mph.

Jack Bennett Road (SR 1717) is a two-lane local road designated a Major Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it has a 2004 ADT volume of approximately 3,000 vehicles per day and a posted speed limit of 45 mph.

Hamletts Chapel Road (SR 1525) is a two-lane major arterial designated a Major Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it has a 2004 ADT volume of approximately 4,000 vehicles per day and a posted speed limit of 45 mph.

Village Way (SR 1718) is a two-lane local road in the project vicinity with a 2004 ADT volume of approximately 4,000 vehicles per day and a statutory speed limit of 55 mph.

Mount Gilead Church Road (SR 1700) is a two-lane major arterial designated a Major Thoroughfare in the DCHC Thoroughfare Plan. It has a 2004 ADT volume of approximately 2,000 vehicles per day and a statutory speed limit of 55 mph in the project vicinity.

Old Lystra Road (SR 1724) is a two-lane local road designated a Minor Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it has a 2004 ADT volume of approximately 2,000 vehicles per day and a posted speed limit of 45 mph.

River Forrest Road (SR 1532) is a two-lane local road designated a Major Thoroughfare in the DCHC Thoroughfare Plan. It carries a 2004 ADT volume of approximately 1,200 vehicles per day and has a statutory speed limit of 45 mph in the project vicinity.

Andrews Store Road (SR 1526) is a two-lane local road in the project vicinity with a 2004 ADT volume of approximately 1,500 vehicles per day and a posted speed limit of 45 mph.

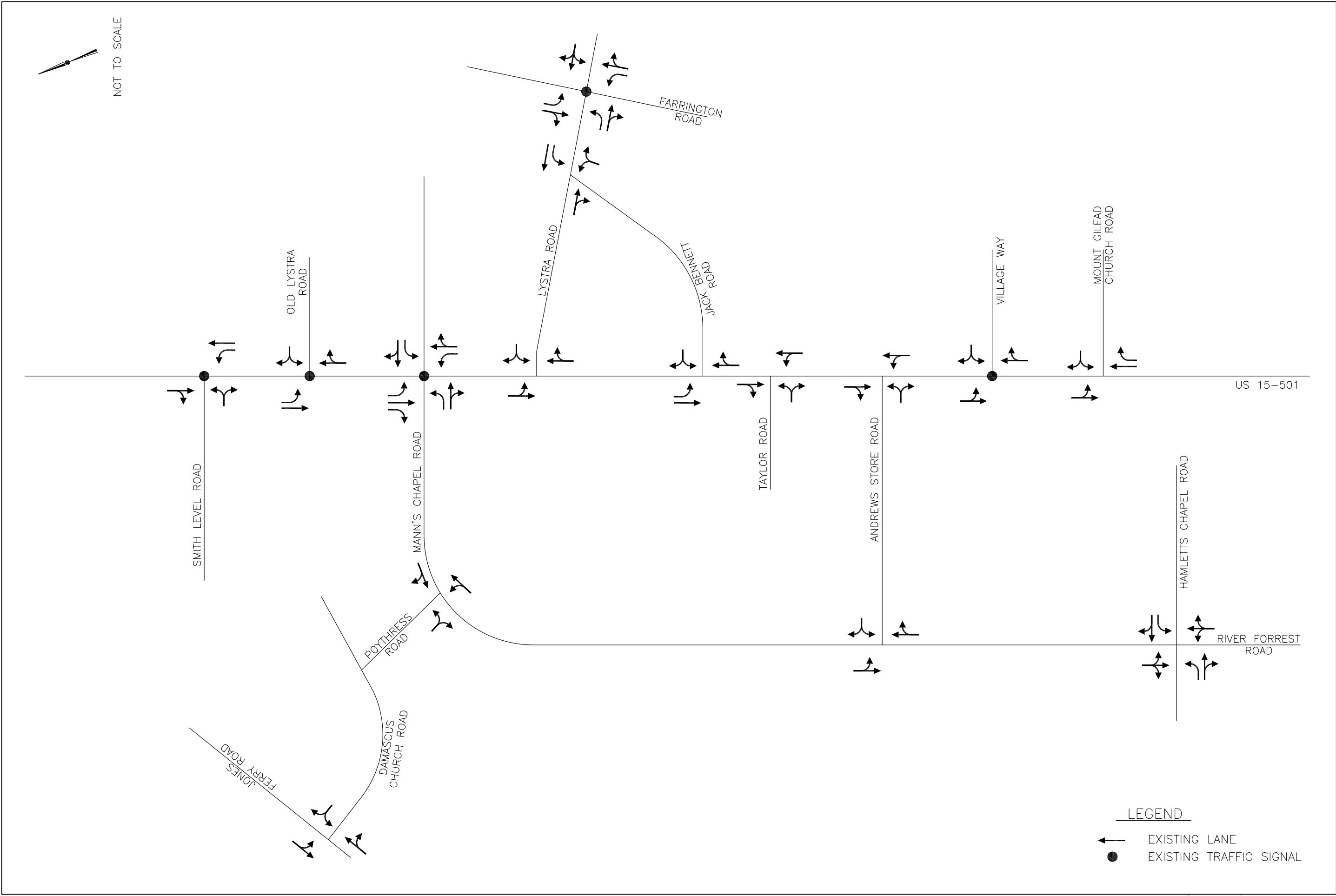
Jones Ferry Road (SR 1942/SR 1540) is a two-lane minor collector designated a Major Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it carries an approximate 2004 ADT volume of 5,000 vehicles per day and has a posted speed limit of 55 mph.

Damascus Church Road (SR 1939) is a two-lane roadway in Orange County designated a Major Thoroughfare in the DCHC Thoroughfare Plan. It has a 2004 ADT volume of approximately 1,500 vehicles per day and a posted speed limit of 45 mph in the project vicinity.

Poythress Road (SR 1534) is a two-lane local road designated a Major Thoroughfare in the DCHC Thoroughfare Plan. In the project vicinity it carries an approximate 2004 ADT volume of 2,000 vehicles per day and has a posted speed limit of 45 mph.

Farrington Road (SR 1008) is a two-lane local road designated a Major Thoroughfare in the DCHC Thoroughfare Plan located to the east of the development site location. The roadway currently carries 9,000 average daily trips and has a statutory speed limit of 55 mph near the study intersection of Lystra Road.

The existing roadway laneage is shown in Figure 3.



4.0 Traffic Generation

The traffic generation potential of the proposed Briar Chapel development was determined using the traffic generation rates published in *Trip Generation* (Institute of Transportation Engineers, Seventh Edition, 2003). Table 4.0 summarizes the estimated traffic generation for the proposed development.

Not all of the trips generated by this development will be new external trips. Based on the methodologies in the *Trip Generation Handbook* (Institute of Transportation Engineers, 1998), this mixed-use development is expected to have a daily internal capture rate of 15.0%. Internal capture was taken first for the Southern Mixed-Use Village and then for the project as a whole. These internal trips were applied to the trip generation potential of this development to account for trips that originate and terminate wholly within the development. Table 4.0 shows that the proposed development has the potential to generate 15,613 new external trips in and 15,613 new external trips out during a typical weekday.

Pass-by capture trips are trips that are already on the adjacent roadway network that will pass-by the new (typically retail) development. 20% of the projected retail trips were assigned as pass-by trips along U.S. 15-501. The pass-by trips were assigned in the PM peak hour according to the existing traffic pattern on U.S. 15-501. Table 4.0 details the trip generation for each proposed neighborhood in Briar Chapel, the internal capture assumed and the pass-by capture amount. NCDOT and Chatham County were consulted regarding the trip generation rates and methodology.

Table 4.0
Trip Generation
Briar Chapel

				Daily Total	AM Peak Hour			PM Peak Hour		
ITE LUC	Land Use	Intensity	units		Total	Enter	Exit	Total	Enter	Exit
North Neighborhood										
210	Single Family	223	DU	2,175	166	42	124	221	139	82
Central Neighborhoods										
210	Single Family	734	DU	6,507	523	131	392	645	406	239
230	Residential Condo/Townhouse	107	DU	680	55	9	46	64	43	21
Subtotal Trips				7,187	578	140	438	709	449	260
West Neighborhood										
210	Single Family	277	DU	2,655	203	51	152	268	169	99
East Neighborhood										
210	Single Family	67	DU	719	56	14	42	75	47	28
230	Residential Condo/Townhouse	14	DU	121	11	2	9	12	8	4
Subtotal Trips				840	67	16	51	87	55	32
Traditional Neighborhood										
210	Single Family	576	DU	5,206	413	103	310	518	326	192
230	Residential Condo/Townhouse	311	DU	1,684	128	22	106	152	102	50
536	Charter School	400	Students	992	310	189	121	68	29	39
920	Public School*	900	Students	1,588	375	259	116	126	59	67
412	County Park	141	Acres	321	1	1	0	8	3	5
814	Specialty Retail	12	1000 S.F.	551	175	84	91	50	22	28
Subtotal Trips				10,342	1,402	658	744	922	541	381
North Garden										
814	Specialty Retail	40	1000 S.F.	1,749	312	150	162	117	52	65
Southern Mixed Use Village										
220	Apartment	80	DU	631	43	9	34	62	40	22
710	General Office	270	1000 S.F.	2,866	415	365	50	381	65	316
820	General Retail	200	1000 S.F.	10,656	237	145	92	989	475	514
Subtotal Trips				14,153	695	519	176	1,432	580	852
Total Project Generated Trips				39,101	3,423	1,576	1,847	3,756	1,985	1,771
Total Internal Capture				5,863	106	53	53	400	200	200
Total Project Driveway Volumes				33,238	3,317	1,523	1,794	3,356	1,785	1,571
Total Project Pass-By Trips - Southern Village Retail			20%	2,012				165	81	84
Total Project New External Trips				31,226	3,317	1,523	1,794	3,191	1,704	1,488

Trip Generation Rates from ITE *Trip Generation*, 7th Edition, 2003

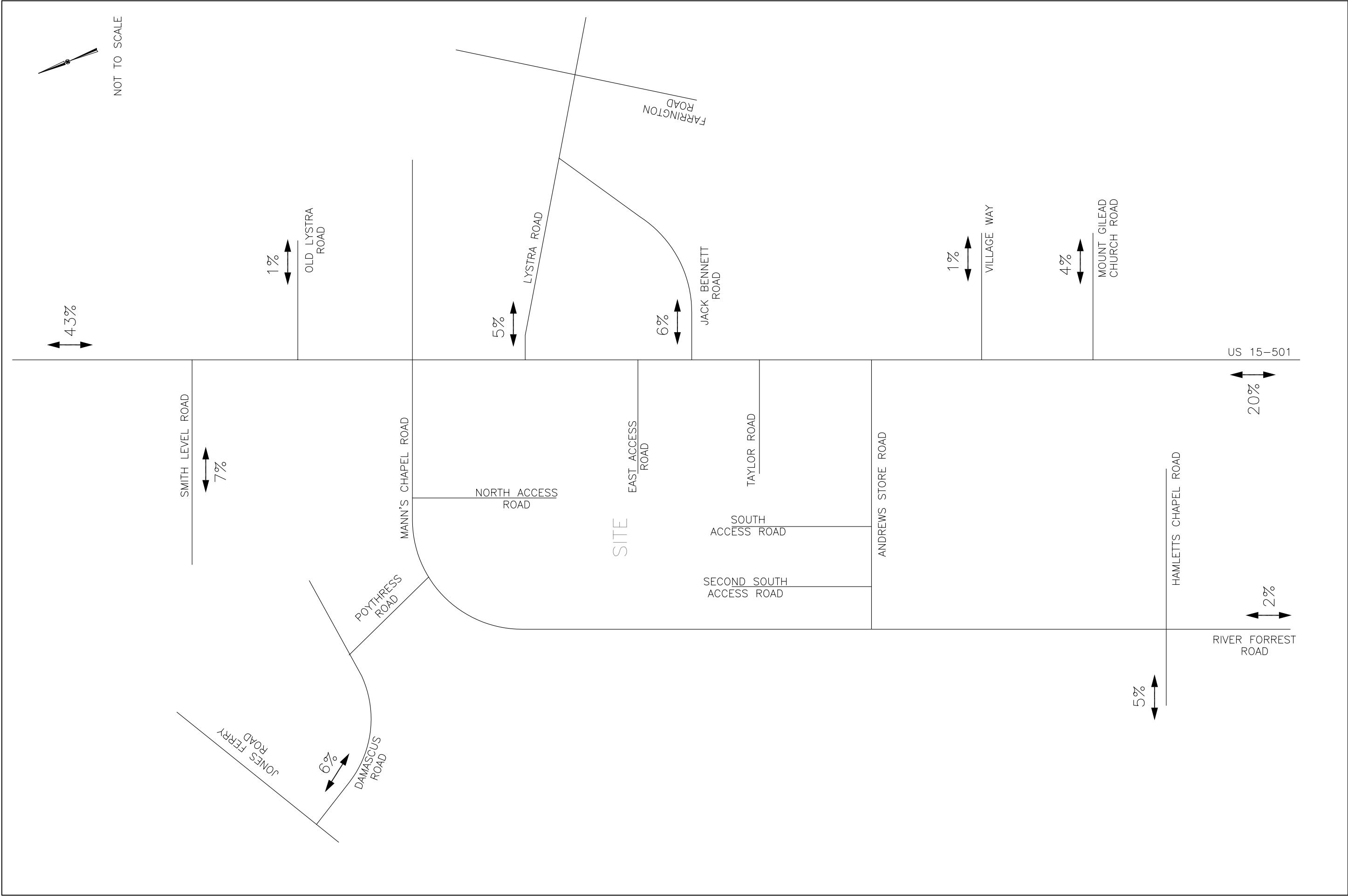
* Although intended to be K-8, the public school was generated as a high school to be conservative

5.0 Site Traffic Distribution

The proposed generated trips were associated with development sub-areas or “pods” within the larger overall development. The trips from each pod were then assigned to the surrounding roadway network. The project overall directional distribution and assignment was based on existing peak-hour turning movements, the land uses and population densities in the area, the surrounding roadway network and discussions with the Chatham County and NCDOT Division 8 staffs. The following distribution/assignment was used for the proposed development:

- 43% to/from the north on U.S. 15-501
- 6% to/from the north on Jones Ferry Road
- 20% to/from the south on U.S. 15-501
- 2% to/from the south on River Forrest Road
- 7% to/from the west on Smith Level Road
- 5% to/from the west on Hamletts Chapel Road
- 6% to/from the east on Jack Bennett Road
- 5% to/from the east on Lystra Road
- 4% to/from the east on Mount Gilead Church Road
- 1% to/from the east on Old Lystra Road
- 1% to/from the east on Village Way

The site traffic distribution is shown on Figure 4.



6.0 Projected Traffic Volumes

6.1 Existing Traffic

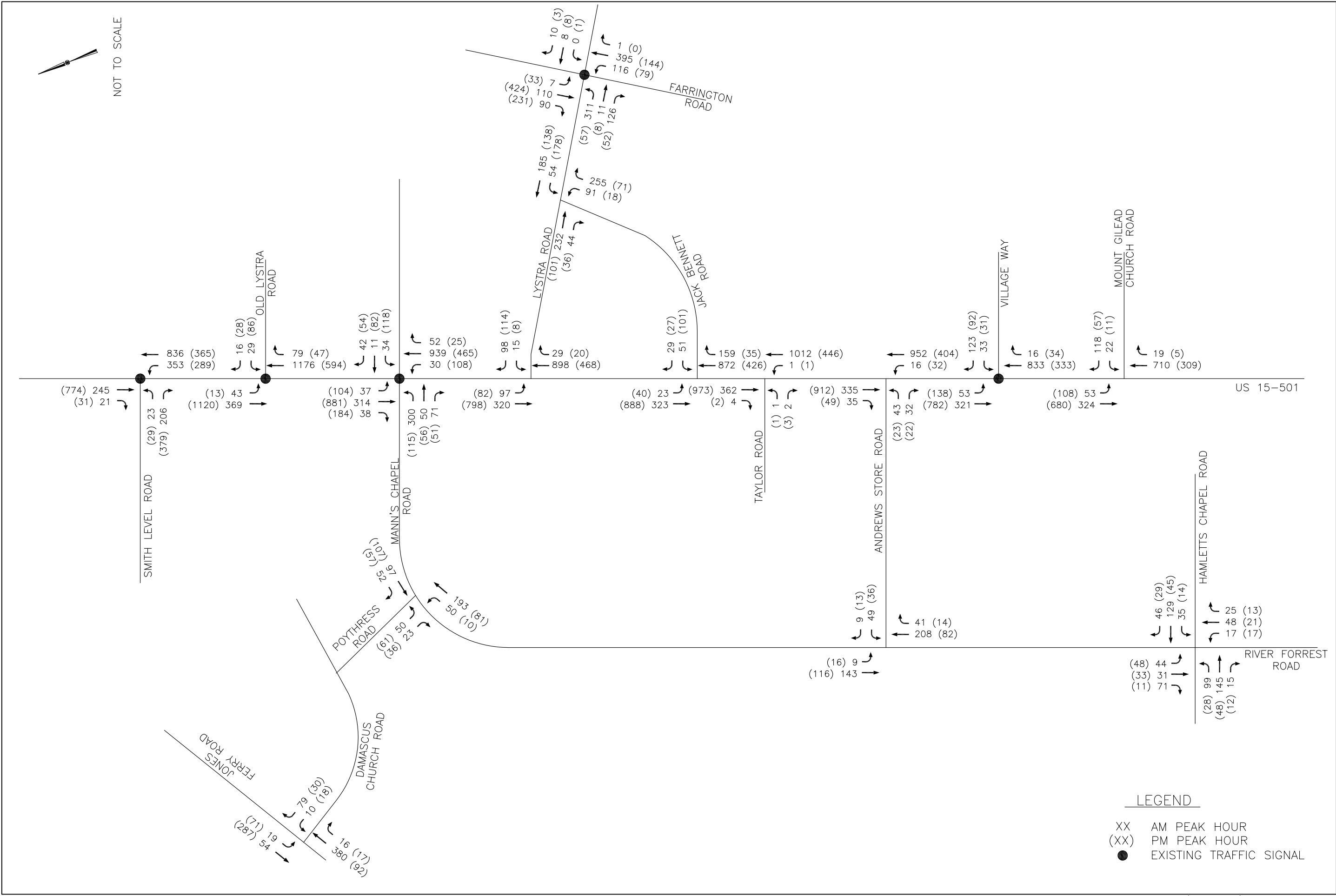
AM and PM weekday peak hour turning-movement counts were performed by Traffic Survey Services from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. on typical weekdays when both the Chatham County traditional-calendar schools and the University of North Carolina at Chapel Hill were in session. Counts were taken at the following intersections:

▪ U.S. 15-501 & Smith Level Road	Wednesday, March 17, 2004
▪ U.S. 15-501 & Old Lystra Road	Tuesday, March 16, 2004
▪ U.S. 15-501 & Mann's Chapel Road	Tuesday, March 16, 2004
▪ U.S. 15-501 & Lystra Road	Wednesday, March 17, 2004
▪ U.S. 15-501 & Jack Bennett Road	Tuesday, March 16, 2004
▪ U.S. 15-501 & Taylor Road	Wednesday, March 17, 2004
▪ U.S. 15-501 & Andrews Store Road	Thursday, March 18, 2004
▪ U.S. 15-501 & Village Way	Wednesday, March 17, 2004
▪ U.S. 15-501 & Mt. Gilead Church Road	Thursday, March 18, 2004
▪ Mann's Chapel Road & Poythress Road	Thursday, March 18, 2004
▪ Mann's Chapel Road & Andrews Store Road	Thursday, March 18, 2004
▪ Hamletts Chapel Road & Mann's Chapel Road	Tuesday, March 16, 2004
▪ Jones Ferry Road & Damascus Church Road	Tuesday, March 16, 2004
▪ Lystra Road & Jack Bennett Road	Wednesday, March 17, 2004
▪ Lystra Road & Farrington Road	Tuesday, March 16, 2004

A 16-hour turning-movement count was also performed at the intersection of U.S. 15-501 & Mann's Chapel Road on March 24, 2004 to verify that the peak hours on U.S. 15-501 occurred between 7:00 and 9:00 a.m. and between 4:00 and 6:00 p.m. Limited imbalances were found from intersection to intersection along the U.S. 15-501 corridor due to counts being taken on different weekdays. The existing volumes were increased as appropriate to balance conservatively along the U.S. 15-501 roadway network.

The AM and PM peak hour turning volumes for Vickers Road and Morris Road were estimated using the ADT projections shown on the U.S. 15-501 widening plans.

The balanced existing (2004) AM and PM peak-hour traffic volumes at the study intersections are shown on Figure 5. Traffic count data are included in the Appendix.



6.2 Approved Development Traffic

Approved development traffic is generated by approved, but not yet constructed, projects in the vicinity of the proposed project. Based on consultation with NCDOT & Chatham County staff, there are three approved developments that will have a significant impact on the study intersections:

- Fearington Village, east of U.S. 15-501 at Village Way
- Chatham Downs, southeast quadrant of the intersection of U.S. 15-501 & Lystra Road
- The Homestead, on Bigwoods Road south of Jack Bennett Road

The Fearington Village development is located on the east side of U.S. 15-501 at Village Way. The proposed development consists of a 240-dwelling retirement community, 325 single-family homes, and 30 town homes. The development is assumed to be built-out and occupied prior to buildout of the Briar Chapel development. The land use plan for this development was obtained from Chatham County.

The Chatham Downs development is located on the southeast quadrant of the intersection of U.S. 15-501 & Lystra Road. The proposed development consists of a 45,000 SF supermarket, 12,000 SF of general retail, and a 4,000 SF bank. The development is expected to be built-out in the year 2006. Trip generation for this development was obtained from the summary prepared by Mandala Services, Inc. in July 2003.

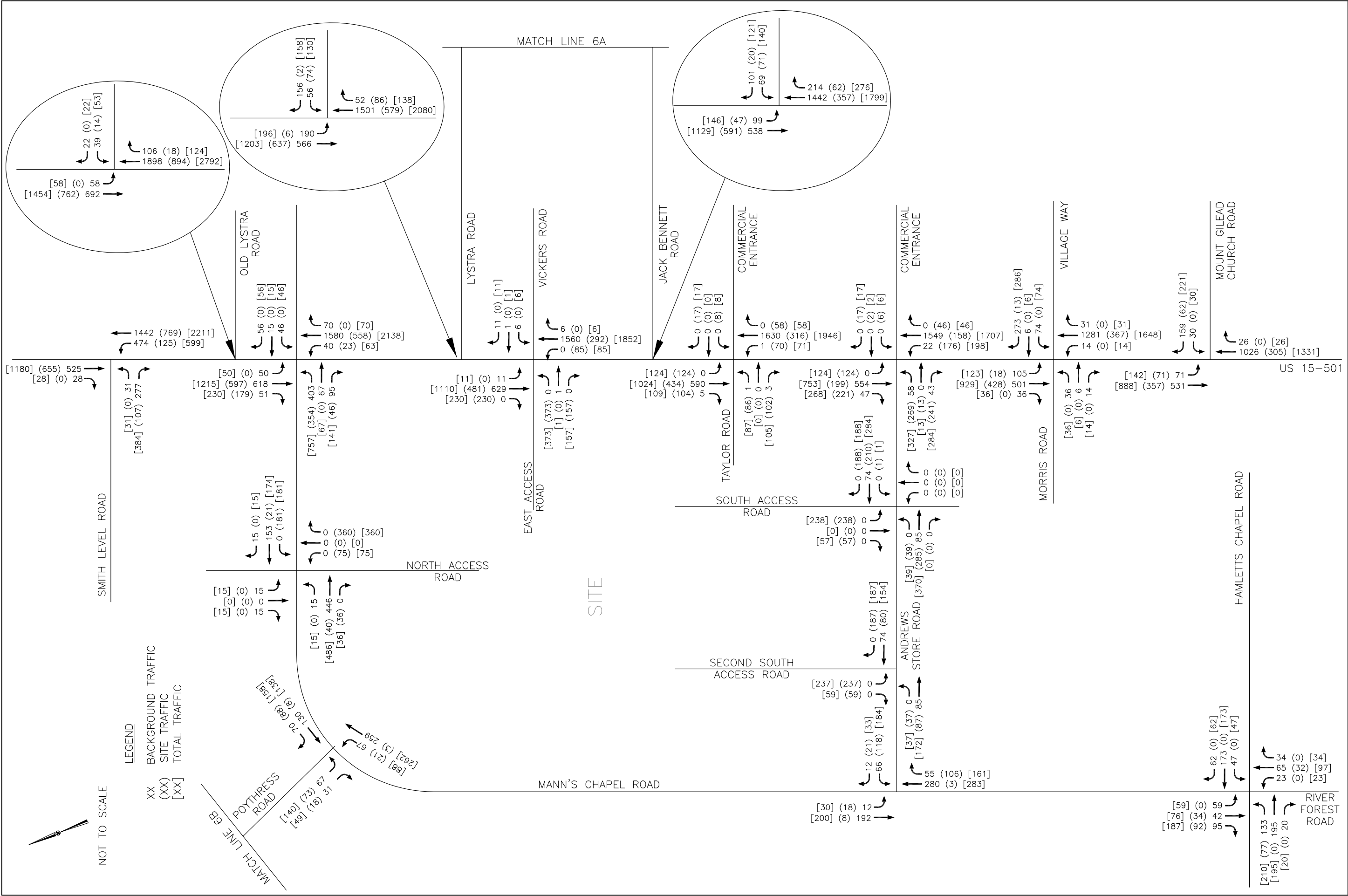
The Homestead development is located on Big Woods Road between Jack Bennett Road and U.S. 64. The proposed development consists of 475 single-family homes. The development is expected to be built-out and occupied in the year 2011. Trip generation for this development was obtained from the summary prepared by Ramey Kemp and Associates in October 2003.

6.3 Historical Growth Traffic

Historical growth traffic is the increase in traffic due to usage increases and non-specific growth throughout the area. A 3% annual growth rate, which is consistent with historical ADT volumes in the vicinity of the site, was applied to the existing traffic and combined with traffic from the approved developments to calculate background traffic volumes expected in 2014. NCDOT and Chatham County were consulted regarding the 3% growth rate applied.

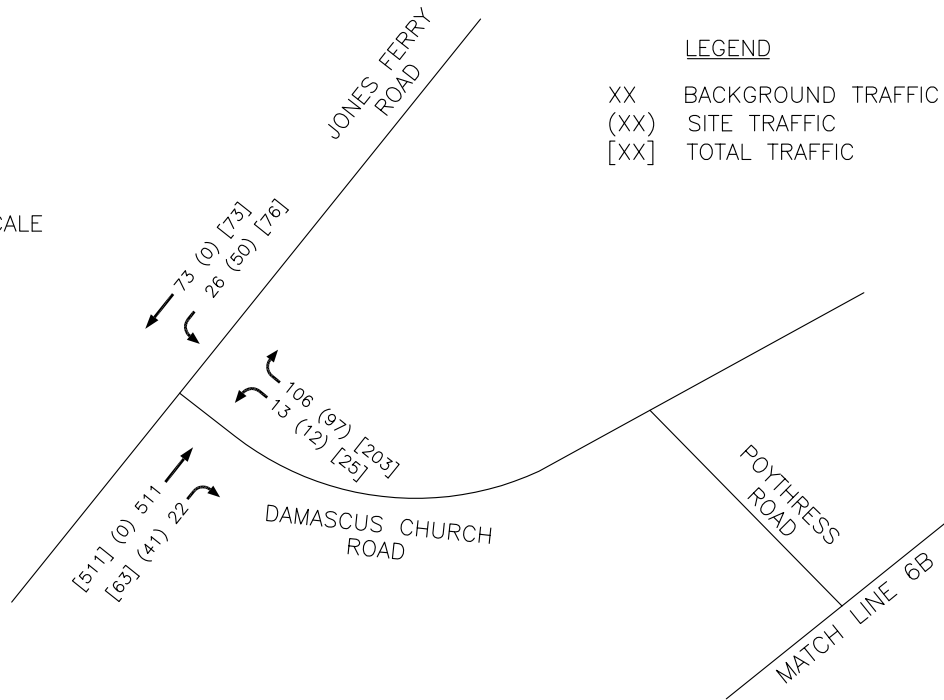
6.4 Total Traffic

To obtain total year 2014 build-out traffic volumes, the site traffic was added to the historical growth traffic and traffic projected to be generated by the approved developments. Including the effects of the approved development traffic taken into account, the overall background growth rate varies somewhat throughout the U.S. 15-501 corridor, but averages approximately 6% per year. Figures 6 and 7 show the projected 2014 AM and PM peak hour traffic volumes at the study intersections.



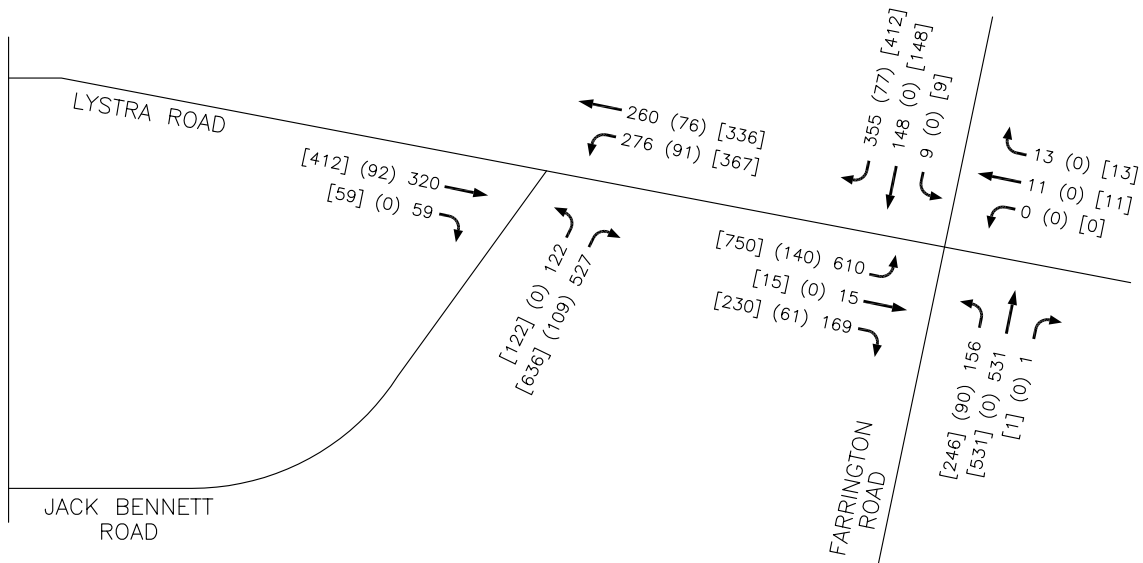
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NOT TO SCALE



MATCH LINE 6A

NOT TO SCALE



LEGEND

- XX BACKGROUND TRAFFIC
- (XX) SITE TRAFFIC
- [XX] TOTAL TRAFFIC

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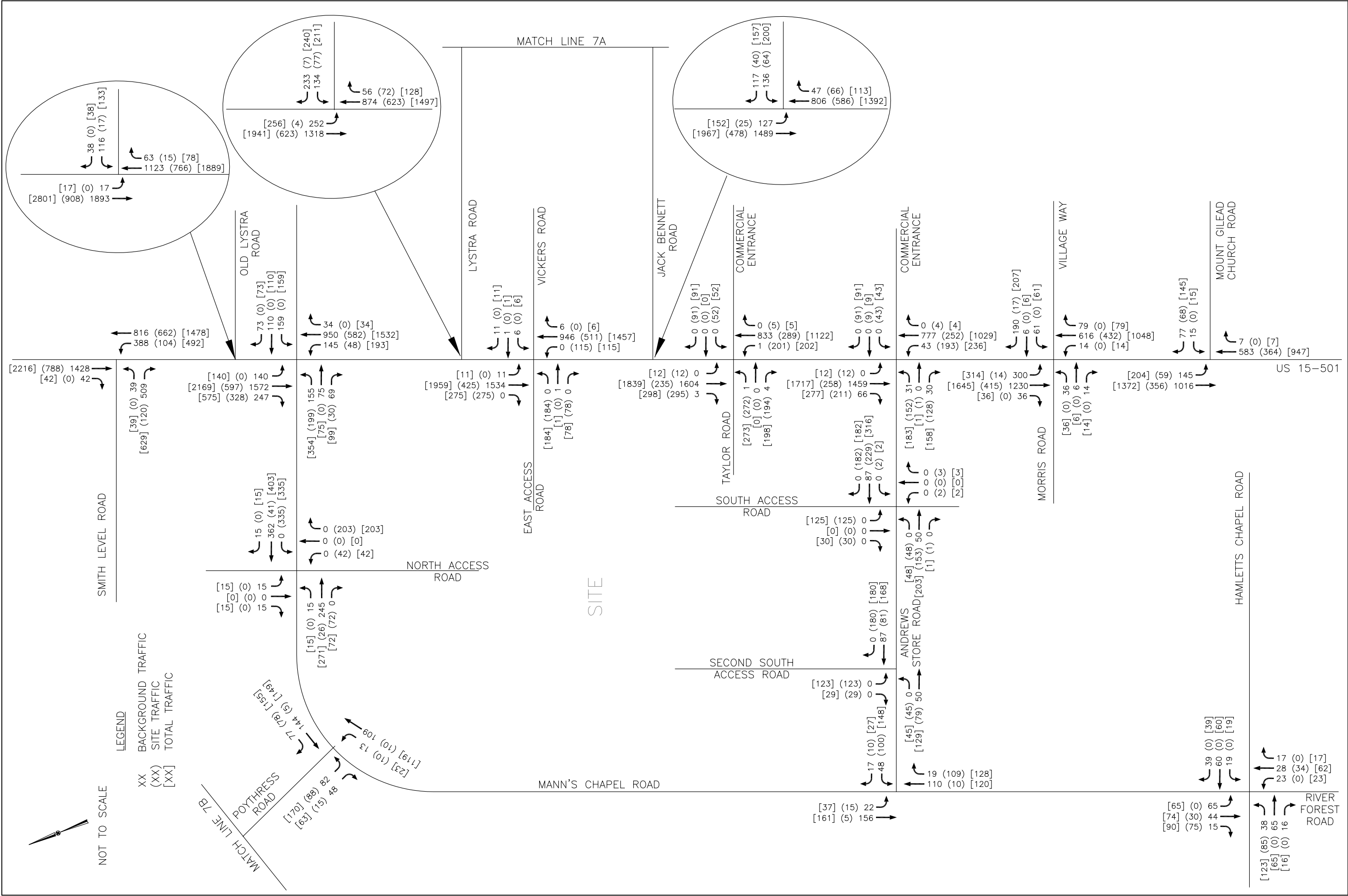


Kimley-Horn and Associates, Inc.

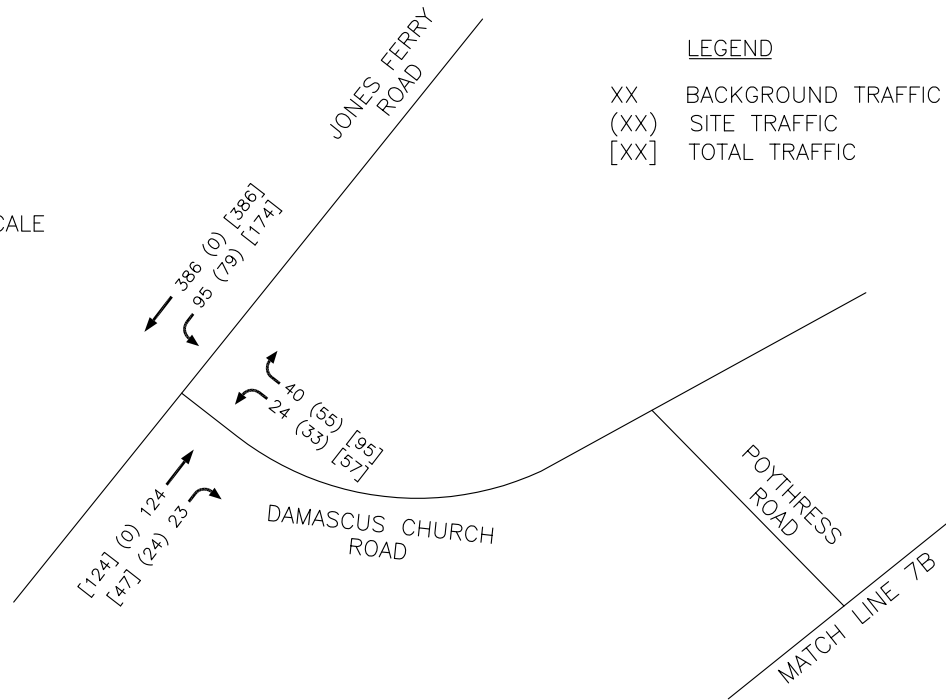
BRIAR CHAPEL
TRANSPORTATION IMPACT ASSESSMENT

PROJECTED 2014 AM
PEAK HOUR TRAFFIC VOLUMES

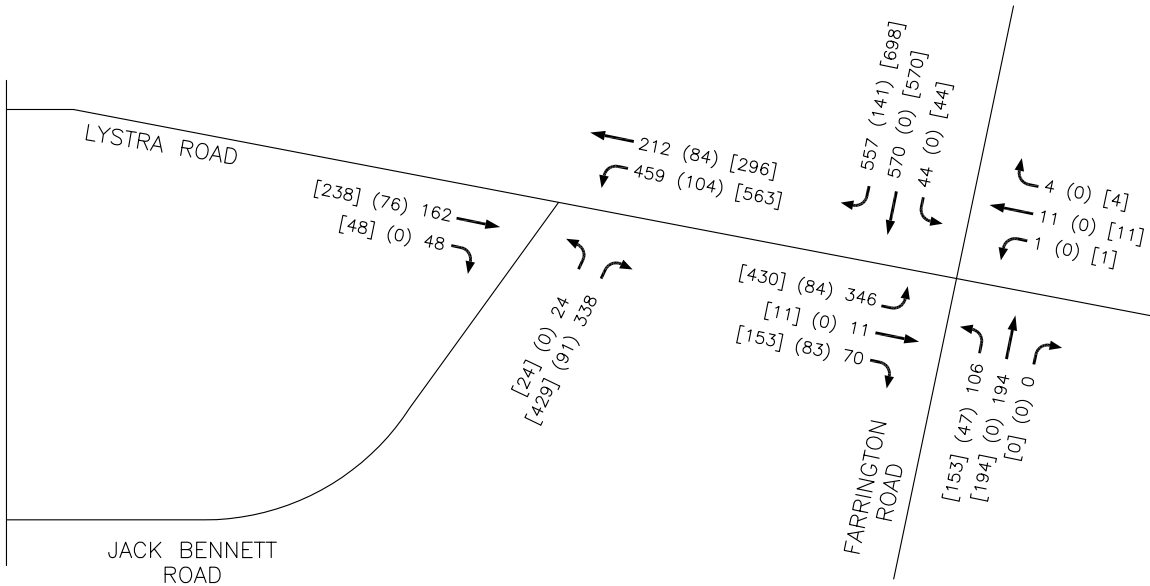
FIGURE
6A



NOT TO SCALE



MATCH LINE 7A



NOT TO SCALE



Kimley-Horn and Associates, Inc.

BRIAR CHAPEL
TRANSPORTATION IMPACT ASSESSMENT

PROJECTED 2014 PM
PEAK HOUR TRAFFIC VOLUMES

FIGURE
7A

7.0 Alternate Transportation Modes

The project is designed in accordance with the Compact Community Ordinance and the NCDOT *Traditional Neighborhood Development Guidelines* that call for compact, integrated, transit-friendly development. The project is designed with an inter-connected network of streets, sidewalks and trails that provide extensive interconnectivity and provide multiple paths to and from most of the development, both internally and externally, for vehicles, pedestrians, and bicyclists. Exceptions are principally due to environmental and topographic constraints.

There is no transit service currently in the area but the street pattern and access points provide well for future transit when it is extended to serve the area. Locations for transit stops have been tentatively identified, to be confirmed and/or amended in conjunction with service providers.

While a significant number of internal trips are expected to be pedestrian or bicycle, these two modes are not anticipated to serve a significant number of external trips. Therefore, this analysis focuses on external vehicular trips. The new signals recommended on U.S. 15-501 at Vickers Road, Taylor Road and Andrews Store Road are recommended to have pedestrian signals and crosswalks to facilitate external pedestrian access to the adjacent retail/office areas. All non-residential development areas will be equipped with bicycle racks.

8.0 Capacity Analysis

Capacity analyses were performed for the AM and PM peak hours for the existing traffic, 2014 background traffic, and 2014 build-out traffic conditions using Synchro Version 5 software to determine the operating characteristics of the adjacent road network and the impacts of the proposed project. The North Carolina Department of Transportation Congestion Management Group uses and reports Synchro Level-of-Service output for the analysis of intersection operating conditions. NCDOT and Chatham County were consulted regarding this analysis methodology.

Capacity is defined as the maximum number of vehicles that can pass over a particular road segment or through a particular intersection within set time duration. Capacity is combined with Level-of-Service (LOS) to describe the operating characteristics of a road segment or intersection. Level-of-Service is a qualitative measure that describes operational conditions and motorist perceptions within a traffic stream. Synchro Version 5 reports six levels of service, LOS A through LOS F, with A representing the shortest average delays and F representing the longest average delays. LOS D is considered an acceptable operating condition at signalized intersections in urban and suburban areas.

For signalized intersections, LOS is defined for the overall intersection operation. For unsignalized intersections, only the movements that must yield right-of-way experience control delay. LOS criteria for the overall intersection is not reported by Synchro Version 5 software or computable using methodology published in the *Highway Capacity Manual*. With Synchro software, a LOS between LOS A and LOS C for the side street approach represents short delays. A LOS between LOS D and LOS E for the side street approach represents moderate delays, and LOS F for the side street approach represents long delays. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay. Table 8.0-A lists the LOS control delay thresholds published in the *Highway Capacity Manual (HCM)* for signalized intersections. Synchro Version 5 software uses the same LOS thresholds as those published in the *HCM*.

Table 8.0-A Level-of-Service Control Delay Thresholds for Signalized Intersections	
Level-of-Service	Control Delay Per Vehicle [sec/veh]
A	≤ 10
B	$> 10 - 20$
C	$> 20 - 35$
D	$> 35 - 55$
E	$> 55 - 80$
F	> 80

Table 8.0-B lists the LOS control delay thresholds published in the *Highway Capacity Manual (HCM)* for unsignalized intersections.

Table 8.0-B Level-of-Service Control Delay Thresholds for Unsignalized Intersections	
Level-of-Service	Control Delay Per Vehicle [sec/veh]
A	≤ 10
B	$> 10 - 15$
C	$> 15 - 25$
D	$> 25 - 35$
E	$> 35 - 50$
F	> 50

Capacity analyses were performed for the 2004 existing traffic, 2014 background traffic conditions and projected 2014 build-out traffic conditions using the Level-of-Service reports generated by Synchro Version 5 software for the following intersections:

- U.S. 15-501 & Smith Level Road
- U.S. 15-501 & Old Lystra Road
- U.S. 15-501 & Mann's Chapel Road
- U.S. 15-501 & Lystra Road
- U.S. 15-501 & Jack Bennett Road
- U.S. 15-501 & Taylor Road

- U.S. 15-501 & Andrews Store Road
- U.S. 15-501 & Village Way
- U.S. 15-501 & Mt. Gilead Church Road
- Mann's Chapel Road & Poythress Road
- Mann's Chapel Road & Andrews Store Road
- Hamletts Chapel Road & Mann's Chapel / River Forrest Road
- Jones Ferry Road & Damascus Church Road
- Lystra Road & Jack Bennett Road
- Lystra Road & Farrington Road
- U.S. 15-501 & Vickers Road (East Access Road)
- Mann's Chapel Road & North Access Road
- Andrews Store Road & South Access Road
- Andrews Store Road & Second South Access Road

Table 8.0-C summarizes the LOS and delay (seconds per vehicle) for all of the study intersections for the three AM and PM peak hour traffic conditions listed above. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix and are briefly summarized in following sub-sections.

Table 8.0 – C Intersection Level of Service Summary						
Intersection	Existing LOS (Delay in sec)		2014 Background LOS (Delay in sec) with Committed Improvements		2014 Buildout LOS (Delay in sec) with Recommended Improvements	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
U.S. 15-501 & Smith Level Road	A (6.4)	C (20.6)	A (9.8)	B (19.2)	B (16.4)	C (33.9)
U.S. 15-501 & Old Lystra Road	D (35.1)	B (13.4)	A (7.7)	B (11.1)	C (34.1)	C (31.8)
U.S. 15-501 & Manns Chapel Road	D (41.1)	B (15.2)	C (26.3)	C (28.9)	C (31.1)	C (23.7)
U.S. 15-501 & Lystra Road	E (37.6)*	C (17.1)*	A (7.1)	A (9.6)	C (21.1)	B (15.9)
U.S. 15-501 & Jack Bennett Road	E (49.7)*	F (141.5)*	B (13.6)	A (5.5)	B (10.6)	B (14.1)
U.S. 15-501 & Taylor Road	C (18.2)*	C (23.1)*	C (18.1)*	E (40.5)*	A (7.7)	C (34.0)
U.S. 15-501 & Andrews Store Road	D (34.2)*	E (36.5)*	F (63.6)*	F (305.2)*	C (23.9)	C (20.1)
U.S. 15-501 & Village Way	A (5.5)	A (9.0)	B (13.6)	B (10.6)	C (21.7)	B (10.9)
U.S. 15-501 & Mt. Gilead Church Road	D (25.7)*	B (14.8)*	F (52.2)*	C (22.8)*	F (110.1)*	E (46.9)*
Manns Chapel Road & Poythress Road	B (11.7)*	B (10.4)*	B (14.0)*	B (11.5)*	C (21.9)*	C (15.1)*
Manns Chapel Road & Andrews Store Road	B (11.7)*	B (10.0)*	B (13.4)*	B (10.8)*	C (20.1)*	B (13.3)*
Hamletts Chapel Road & Manns Chapel Road / River Forrest Road	C (17.4)*	B (11.1)*	E (41.7)*	B (12.7)*	B (13.4)**	A (9.3)**
Jones Ferry Road & Damascus Church Road	B (12.1)*	B (10.9)*	B (14.9)*	B (12.6)*	C (21.6)*	C (18.3)*
Lystra Road & Jack Bennett Road	C (19.0)*	B (11.0)*	F (447.0)*	D (29.7)*	F (223.4)*	D (27.9)*
Lystra Road & Farrington Road	B (10.9)	B (15.0)	D (39.5)	F (97.4)	C (22.7)	B (16.3)
U.S. 15-501 & Vickers Road (East Access Road)	-	-	F (95.9)*	F (451.7)*	C (32.6)	C (33.9)
Manns Chapel Road & North Access Road	-	-	-	-	F (178.5)*	F (86.5)*
Andrews Store Road & South Access Road	-	-	-	-	F (76.1)*	C (20.2)*
Andrews Store Road & Second South Access Road	-	-	-	-	C (15.8)*	B (12.7)*

* Unsignalized intersection - LOS (Delay) for minor street approach with longest delay

** All way stop control - LOS (Delay) for intersection

8.1 U.S. 15-501 & Smith Level Road

Analyses indicate that the signalized intersection of U.S. 15-501 & Smith Level Road currently operates at LOS A in the AM peak hour and LOS C in the PM peak hour. In the year 2014, in the background condition without the proposed project, with committed NCDOT improvements in place, the intersection is expected to operate at a LOS A in the AM peak hour and LOS B in the PM peak hour. At project buildout, with the NCDOT committed roadway improvements in place, the intersection is expected to operate at LOS B in the AM peak hour and LOS C in the PM peak hour.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.1 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the signalized intersection of U.S. 15-501 & Smith Level Road.

Table 8.1 Level-of-Service U.S. 15-501 & Smith Level Road (Signalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	A (6.4)	C (20.6)
Background (2014) Traffic	A (9.8)	B (19.2)
Buildout (2014) Traffic	B (16.4)	C (33.9)

8.2 U.S. 15-501 & Old Lystra Road

Analyses indicate that the signalized intersection of U.S. 15-501 & Old Lystra Road currently operates at LOS D in the AM peak hour and LOS B in the PM peak hour. In the year 2014, without the proposed project, with the committed NCDOT committed roadway improvements in place, the intersection is expected to operate at LOS A in the AM peak hour and LOS B in the PM peak hour. At project buildout, with the committed NCDOT roadway improvements in place, the intersection is expected to operate at LOS C in the AM and PM peak hours.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.



Image 8.2: Existing intersection of U.S. 15-501 & Old Lystra Road looking west

Table 8.2 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the signalized intersection of U.S. 15-501 & Old Lystra Road.

Table 8.2 Level-of-Service U.S. 15-501 & Old Lystra Road (Signalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	D (35.1)	B (13.4)
Background (2014) Traffic	A (7.7)	B (11.1)
Buildout (2014) Traffic	C (34.1)	C (31.8)

8.3 U.S. 15-501 & Mann's Chapel Road

Analyses indicate that the signalized intersection of U.S. 15-501 & Mann's Chapel Road currently



Image 8.3: Existing intersection of U.S. 15-501 & Mann's Chapel Road looking east

operates at LOS D in the AM peak hour and LOS B in the PM peak hour. In the year 2014, with the committed NCDOT roadway improvements in place, without the proposed project, the intersection is expected to operate at LOS C in the AM and PM peak hours. In addition to the NCDOT committed roadway improvements, the following additional roadway improvements are recommended:

- Convert the northbound exclusive right turn lane on U.S. 15-501 into a through-right lane (approximately 700 feet)
- Construct an additional northbound departure lane on U.S. 15-501 (approximately 1,000 feet)
- Construct an additional southbound approach through lane on U.S. 15-501 (approximately 700 feet)
- Construct an additional southbound departure lane on U.S. 15-501 (approximately 1,000 feet)
- Extend the dual left turn lanes on Mann's Chapel Road to provide 500 feet of full-width storage

At project buildout, with the NCDOT committed roadway improvements and the additional roadway improvements listed above, the intersection is expected to operate at LOS C in the AM and PM peak hours.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.3 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the signalized intersection of U.S. 15-501 & Mann's Chapel Road.

Table 8.3 Level-of-Service U.S. 15-501 & Mann's Chapel Road (Signalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	D (41.1)	B (15.2)
Background (2014) Traffic	C (26.3)	C (28.9)
Buildout (2014) Traffic	C (31.1)	C (23.7)

8.4 U.S. 15-501 & Lystra Road

Analyses indicate that the unsignalized intersection of U.S. 15-501 & Lystra Road currently operates with moderate delays (LOS E) for the minor street approach in the AM peak hour and short delays (LOS C) for the minor street approach in the PM peak hour.

The intersection of U.S. 15-501 & Lystra Road is planned to be signalized as part of the committed NCDOT roadway improvements. In the year 2014, in the background condition without the proposed project in place, with the committed NCDOT roadway improvements in place including signalization, the intersection is expected to operate at LOS A in the AM and PM peak hours. At project buildout the signalized intersection is projected to operate at LOS C in the AM peak hour and LOS B in the PM peak hour.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.4 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the intersection of U.S. 15-501 & Lystra Road.

Table 8.4 Level-of-Service U.S. 15-501 & Lystra Road		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic (Unsignalized)	E (37.6)*	C (17.1)*
Background (2014) Traffic	A (7.1)	A (9.6)
Buildout (2014) Traffic	C (21.1)	B (15.9)

* Indicates LOS & delay for minor street approach with longest delay

8.5 U.S. 15-501 & Jack Bennett Road

Analyses indicate that the unsignalized intersection of U.S. 15-501 & Jack Bennett Road currently operates with moderate delays (LOS E) for the minor street approach in the AM peak hour and long delays (LOS F) for the minor street approach in the PM peak hour.

The intersection of U.S. 15-501 & Jack Bennett Road is planned to be signalized as part of the committed NCDOT roadway improvements. In the year 2014, without the proposed project, with the committed NCDOT roadway improvements in place, the intersection is expected to operate at LOS B in the AM peak hour and at LOS A in the PM peak hour. At project buildout the signalized intersection is projected to operate at LOS B in the AM and PM peak hours.



Image 8.5: Existing intersection of U.S. 15-501 & Jack Bennett Road looking south

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.5 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the intersection of U.S. 15-501 & Jack Bennett Road.

Table 8.5 Level-of-Service U.S. 15-501 & Jack Bennett Road		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic (Unsignalized)	E (49.7)*	F (141.5)*
Background (2014) Traffic	B (13.6)	A (5.5)
Buildout (2014) Traffic	B (10.6)	B (14.1)

* Indicates LOS & delay for minor street approach with longest delay

8.6 U.S. 15-501 & Taylor Road

Analyses indicate that the unsignalized intersection of U.S. 15-501 & Taylor Road currently operates with short delays (LOS C) for the minor street approach in the AM and PM peak hours. In the year 2014, without the proposed project, with the committed NCDOT roadway improvements in place, the intersection is expected to continue to operate with short delays (LOS C) for the minor street approach in the AM peak hour and moderate delays (LOS E) for the minor street approach in the PM peak hour.

At project buildout, it is anticipated that traffic volumes will meet signal warrant criteria published in the Federal Highway Administration's *Manual on Uniform Traffic Control Devices*. It is recommended that the intersection of U.S. 15-501 & Taylor be signalized when signal warrant criteria is met. At project buildout, with the committed NCDOT roadway improvements and recommended signal in place, the intersection is expected to operate at LOS A in the AM peak hour and at LOS C in the PM peak hour.

The recommended lane geometry for the eastbound approach of Taylor Road includes dual exclusive left turn lanes and one shared through-right lane. The recommended lane geometry for the westbound approach of the proposed project driveway includes one exclusive left turn lane and one shared through-right lane. This lane geometry was considered to be in place for the buildout condition analysis.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.6 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the intersection of U.S. 15-501 & Taylor Road.

Table 8.6 Level-of-Service U.S. 15-501 & Taylor Road		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic (Unsignalized)	C (18.2)*	C (23.1)*
Background (2014) Traffic (Unsignalized)	C (18.1)*	E (40.5)*
Buildout (2014) Traffic	A (7.7)	C (34.0)

* Indicates LOS & delay for minor street approach with longest delay

8.7 U.S. 15-501 & Andrews Store Road

Analyses indicate that the unsignalized intersection of U.S. 15-501 & Andrews Store Road currently operates with moderate delays (LOS D in the AM peak hour and LOS E in the PM peak hour) for the minor street approach in the AM and PM peak hours. In the year 2014, without the proposed project, with the committed NCDOT roadway improvements in place, the intersection is expected to operate with long delays (LOS F) for the minor street approach in the AM and PM peak hours.

It is anticipated that traffic volumes will meet signal warrant criteria published in the Federal Highway Administration's *Manual on Uniform Traffic Control Devices*. It is recommended that the intersection of U.S. 15-501 & Andrews Store Road be signalized when signal warrant criteria is met. At project buildout, with the committed NCDOT roadway improvements and recommended signal in place, the intersection is expected to operate at LOS C in the AM and PM peak hours.

The recommended lane geometry for the eastbound approach of Andrews Store Road includes one exclusive left turn lane and one shared through-right lane. The recommended lane geometry for the westbound approach of the proposed project driveway is one exclusive left turn lane and one shared through-right lane. This lane geometry was considered to be in place for the buildout condition analysis.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.7 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the intersection of U.S. 15-501 & Andrews Store Road.

Table 8.7 Level-of-Service U.S. 15-501 & Andrews Store Road		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic (Unsignalized)	D (34.2)*	E (36.5)*
Background (2014) Traffic (Unsignalized)	F (63.6)*	F (305.2)*
Buildout (2014) Traffic	C (23.9)	C (20.1)

* Indicates LOS & delay for minor street approach with longest delay

8.8 U.S. 15-501 & Village Way

Analyses indicate that the signalized intersection of U.S. 15-501 & Village Way currently operates at LOS A in the AM and PM peak hours. In the year 2014, without the proposed project, with the committed NCDOT roadway improvements in place, the intersection is expected to operate at LOS



Image 8.8: Existing intersection of U.S. 15-501 & Village Way looking north

B in the AM and PM peak hours. At project buildout, with the committed NCDOT roadway improvements in place, the signalized intersection is projected to operate at LOS C in the AM peak hour and at LOS B in the PM peak hour.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.8 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the signalized intersection of U.S. 15-501 & Village Way.

Table 8.8 Level-of-Service U.S. 15-501 & Village Way (Signalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	A (5.5)	A (9.0)
Background (2014) Traffic	B (13.6)	B (10.6)
Buildout (2014) Traffic	C (21.7)	B (10.9)

8.9 U.S. 15-501 & Mt. Gilead Church Road

Analyses indicate that the unsignalized intersection of U.S. 15-501 & Mt. Gilead Church Road currently operates with moderate delays (LOS D) for the minor street approach in the AM peak hour and short delays (LOS B) for the minor street approach in the PM peak hour. It is recommended that an exclusive westbound right turn lane be constructed on Mt. Gilead Church Road to accommodate traffic expected in the year 2014 background traffic condition without the proposed project in place. In the year 2014, without the proposed project, and with only the committed NCDOT roadway improvements in place, the intersection is expected to operate with long delays (LOS F) in the AM peak hour and operate with short delays (LOS C) in the PM peak hour.

At project buildout, with the committed NCDOT roadway improvements and the recommended westbound right turn lane in place, it is expected that the minor street approach will experience long delays (LOS F) in the AM peak hour and moderate delays (LOS E) in the PM peak hour. It is typical for long delays to be experienced by the side street at unsignalized intersections with a thoroughfare. It is not anticipated that traffic volumes will meet signal warrant criteria published in the MUTCD.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.9 summarizes the existing and projected operation of the unsignalized intersection of U.S. 15-501 & Mt. Gilead Church Road.

Table 8.9 Level-of-Service U.S. 15-501 & Mt. Gilead Church Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	D (25.7)*	B (14.8)*
Background (2014) Traffic	F (52.2)*	C (22.8)*
Buildout (2014) Traffic	F (110.1)*	E (46.9)*

* Indicates LOS & delay for minor street approach with longest delay

8.10 Mann's Chapel Road & Poythress Road

Analyses indicate that the unsignalized intersection of Mann's Chapel Road & Poythress Road currently operates with short delays (LOS B) for the minor street approach in the AM and PM peak hours. In the year 2014, without the proposed project, with NCDOT committed roadway improvements, the intersection is expected to continue to operate with short delays (LOS B) for the minor street approach in the AM and PM peak hours.

At project buildout, with committed NCDOT roadway improvements in place, the intersection is expected to continue to operate with short delays (LOS C) for the minor street approach in the AM and PM peak hours.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.



Image 8.10: Existing intersection of Mann's Chapel Road & Poythress Road looking west

Table 8.10 summarizes the existing and projected operation at the unsignalized intersection of Mann's Chapel Road & Poythress Road.

Table 8.10 Level-of-Service Mann's Chapel Road & Poythress Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	B (11.7)*	B (10.4)*
Background (2014) Traffic	B (14.0)*	B (11.5)*
Buildout (2014) Traffic	C (21.9)*	C (15.1)*

* Indicates LOS & delay for minor street approach with longest delay

8.11 Mann's Chapel Road & Andrews Store Road

Analyses indicate that the unsignalized intersection of Mann's Chapel Road & Andrews Store Road currently operates with short delays (LOS B) for the minor street approach in the AM and PM peak



Image 8.11: Existing intersection of Mann's Chapel Road & Andrews Store Road looking north

hours. In the year 2014, without the proposed project, with the committed NCDOT roadway improvements in place, the intersection is expected to continue to operate with short delays (LOS B) for the minor street approach in the AM and PM peak hours.

It is recommended that the northbound right turn taper on Mann's Chapel Road committed by NCDOT be extended to include 150 feet of full width storage. At project buildout, with committed NCDOT roadway improvements

and the recommended extended right turn lane in place, the intersection is expected to continue to operate with short delays (LOS C in the AM peak hour and LOS B in the PM peak hour) for the minor street approach in the AM and PM peak hours.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.11 summarizes the existing and projected operation of the unsignalized intersection of Mann's Chapel Road & Andrews Store Road.

Table 8.11 Level-of-Service Mann's Chapel Road & Andrews Store Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	B (11.7)*	B (10.0)*
Background (2014) Traffic	B (13.4)*	B (10.8)*
Buildout (2014) Traffic	C (20.1)*	B (13.3)*

* Indicates LOS & delay for minor street approach with longest delay

8.12 Hamletts Chapel Road & Mann's Chapel / River Forrest Road

Analyses indicate that the unsignalized intersection of Hamletts Chapel Road & Mann's Chapel / River Forrest Road currently operates with short delays (LOS C in the AM peak hour and LOS B in the PM peak hour) for the minor street approach in the AM and PM peak hours. In the year 2014, without the proposed project, the intersection is expected to operate with moderate delays (LOS E) for the minor street approach in the AM peak hour and short delays (LOS B) for the minor street approach in the PM peak hour.

It is recommended that the intersection be modified from its current two-way stop control condition to an all-way stop condition. At project buildout, with the all-way stop condition in place, the intersection is expected to operate at a LOS B in the AM peak hour and at a LOS A in the PM peak hour.



Image 8.12: Intersection of Hamletts Chapel Road & Mann's Chapel / River Forrest Road looking east

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.12 summarizes the existing and projected operation of the unsignalized intersection of Hamletts Chapel Road & Mann's Chapel / River Forrest Road.

Table 8.12 Operation Hamletts Chapel Road & Mann's Chapel / River Forrest Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	C (17.4)*	B (11.1)*
Background (2014) Traffic	E (41.7)*	B (12.7)*
Buildout (2014) Traffic (All-way stop)	B (13.4)	A (9.3)

* Indicates LOS & delay for minor street approach with longest delay

8.13 Jones Ferry Road & Damascus Church Road

Analyses indicate that the unsignalized intersection of Jones Ferry Road & Damascus Church Road currently operates with short delays (LOS B) for the minor street approach in the AM and PM peak



Image 8.13: Existing intersection of Jones Ferry Road & Damascus Church Road looking north

hours. In the year 2014, without the proposed project, the intersection is expected to continue to operate with short delays (LOS B) for the minor street approach in the AM and PM peak hours.

At project buildout, the intersection is expected to continue to operate with short delays (LOS C) for the minor street approach in the AM and PM peak hours. No additional roadway improvements are committed or recommended at this intersection.

LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.13 summarizes the existing and projected operation of the unsignalized intersection of Jones Ferry Road & Damascus Church Road.

Table 8.13 Level-of-Service Jones Ferry Road & Damascus Church Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	B (12.1)*	B (10.9)*
Background (2014) Traffic	B (14.9)*	B (12.6)*
Buildout (2014) Traffic	C (21.6)*	C (18.3)*

* Indicates LOS & delay for minor street approach with longest delay

8.14 Lystra Road & Jack Bennett Road

Analyses indicate that the unsignalized intersection of Lystra Road & Jack Bennett Road currently operates with short delays (LOS C in the AM peak hour and LOS B in the PM peak hour) for the minor street approach in the AM and PM peak hours. It is recommended that an exclusive northbound right turn lane be constructed on Jack Bennett Road to accommodate background traffic expected in the year 2014. In the year 2014 without the proposed project and no additional roadway improvements, the intersection is expected to operate with long delays (LOS F) for the minor street approach in the AM peak hour and with moderate delays (LOS D) for the minor street approach in the PM peak hour.



Image 8.14: Existing intersection of Lystra Road & Jack Bennett Road looking east

At project buildout, with the recommended right turn lane in place, the intersection is expected to continue to operate with long delays (LOS F) for the minor street approach in the AM peak hour and with moderate delays (LOS D) for the minor street approach in the PM peak hour. It is typical for minor street approaches of unsignalized intersections with thoroughfares to operate with long delays. The projected volumes indicate that the traffic volumes may meet signal warrant criteria published in the *MUTCD*. It is recommended that this intersection be monitored for signalization and that a traffic signal be installed when warranted.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.14 summarizes the existing and projected operation of the unsignalized intersection of Lystra Road & Jack Bennett Road.

Table 8.14 Level-of-Service Lystra Road & Jack Bennett Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	C (19.0)*	B (11.0)*
Background (2014) Traffic	F (447.0)*	D (29.7)*
Buildout (2014) Traffic	F (223.4)*	D (27.9)*

* Indicates LOS & delay for minor street approach with longest delay

8.15 Lystra Road & Farrington Road

Analyses indicate that the signalized intersection of Lystra Road & Farrington Road currently operates at LOS B in the AM and PM peak hours. It is recommended that an exclusive southbound



Image 8.15: Shoulder rutting on the southbound approach of Farrington Road

right turn lane be constructed on Farrington Road to accommodate an existing operational deficiency. The shoulder of the roadway is currently rutted indicating vehicles driving on the shoulder of the roadway as a defacto right turn lane. It is also recommended that the signal phasing be modified to provide a protected left turn phase for the eastbound approach of Lystra Road.

In the year 2014, without the proposed project and without recommended roadway improvements in place, the intersection is expected to operate at LOS D in the AM peak hour and LOS F in the PM peak hour. At project buildout, with the recommended improvements in place, the intersection is expected to operate at LOS C in the AM peak hour and LOS B in the PM peak hour.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.15 summarizes the existing and projected LOS and average control delay (seconds per vehicle) at the signalized intersection of Lystra Road & Farrington Road.

Table 8.15 Level-of-Service Lystra Road & Farrington Road (Signalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Existing (2004) Traffic	B (10.9)	B (15.0)
Background (2014) Traffic	D (39.5)	F (97.4)
Buildout (2014) Traffic	C (22.7)	B (16.3)

8.16 U.S. 15-501 & Hubert Herndon / Vickers Road

The intersection of U.S. 15-501 & Vickers Road is currently unsignalized and serves several residences. The intersection was not counted or included in existing analyses due to the low traffic volumes at this location. Traffic volume projections published by NCDOT were used to estimate traffic on the existing leg of the intersection for the 2014 buildout condition.

In the year 2014 without the proposed project and no additional roadway improvements, the intersection is expected to operate with long delays (LOS F) for the minor street approach in the AM and PM peak hours.

The proposed project will align a project access point with Vickers Road. It is anticipated that projected volumes with the buildout of the development will meet signal warrant criteria published in the *MUTCD*. It is recommended that a signal be installed when warrants are met. With a signal and committed NCDOT roadway improvements in place, the intersection is expected to operate at LOS C in the AM and PM peak hours. It is recommended that the eastbound approach of the Proposed Access Road include one exclusive left turn lane and one shared through-right lane.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.16 summarizes the existing and projected operation of the unsignalized intersection of U.S. 15-501 & Hubert Herndon / Vickers Road.

Table 8.16 Level-of-Service U.S. 15-501 & Hubert Herndon / Vickers Road		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Background (2014) Traffic	F (95.9)*	F (451.7)*
Buildout (2014) Traffic	C (32.6)	C (33.9)

* Indicates LOS & delay for minor street approach with longest delay

8.17 Mann's Chapel Road & North Access Road

Analyses indicate that the proposed unsignalized intersection of Mann's Chapel Road & the North Access Road is expected to operate with long delays (LOS F) for the minor street approach in the AM and PM peak hours. It is recommended that the northbound approach to intersection be constructed with one shared through-left lane and one exclusive right turn lane. It is also recommended that this intersection be monitored for signalization and that a traffic signal be installed when warranted.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.17 summarizes the projected operation of the proposed unsignalized intersection of Mann's Chapel Road & the North Access Road.

Table 8.17 Level-of-Service Mann's Chapel Road & North Access Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Buildout (2014) Traffic	F (178.5)*	F (86.5)*

* Indicates LOS & delay for minor street approach with longest delay

8.18 Andrews Store Road & South Access Road

Analyses indicate that the proposed unsignalized intersection of Andrews Store Road & the South Access Road is expected to operate with long delays (LOS F) for the minor street approach in the AM peak hour and with short delays (LOS C) for the minor street approach in the PM peak hours. It is recommended that the southbound project access road approach be constructed with two exiting lanes; one exclusive left turn lane and one shared through-right lane. It is also recommended that an exclusive eastbound left turn lane and exclusive westbound right turn lane be constructed on Andrews Store Road to accommodate entering project traffic.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.18 summarizes the projected operation of the proposed unsignalized intersection of Andrews Store Road & the South Access Road.

Table 8.18 Level-of-Service Andrews Store Road & South Access Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Buildout (2014) Traffic	F (76.1)*	C (20.2)*

* Indicates LOS & delay for minor street approach with longest delay

8.19 Andrews Store Road & Second South Access Road

Analyses indicate that the proposed unsignalized intersection of Andrews Store Road & the Second South Access Road is expected to operate with short delays (LOS C in the AM peak hour and LOS B in the PM peak hour) for the minor street approach in the AM and PM peak hours. It is recommended that the southbound project access road approach be constructed with two exiting lanes; one exclusive left turn lane and one exclusive right turn lane. It is also recommended that an exclusive eastbound left turn lane and exclusive westbound right turn lane be constructed on Andrews Store Road to accommodate entering project traffic.

Committed and recommended lane geometry is shown on Figure 8. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix.

Table 8.19 summarizes the projected operation of the proposed unsignalized intersection of Andrews Store Road & the Second South Access Road.

Table 8.19 Level-of-Service Andrews Store Road & Second South Access Road (Unsignalized)		
Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
Buildout (2014) Traffic	C (15.8)*	B (12.7)*

* Indicates LOS & delay for minor street approach with longest delay

9.0 Recommendations

At buildout of the project, all of the studied intersections will operate acceptably with the construction of the committed NCDOT roadway improvements and additional recommendations included in this traffic impact assessment. Recommendations include the following roadway improvements:

At the intersection of U.S. 15-501 & Mann's Chapel Road:

- Convert the northbound exclusive right turn lane on U.S. 15-501 into a through-right lane (approximately 700 feet)
- Construct an additional northbound departure lane on U.S. 15-501 (approximately 1,000 feet)
- Construct an additional southbound approach through lane on U.S. 15-501 (approximately 700 feet)
- Construct an additional southbound departure lane on U.S. 15-501 (approximately 1,000 feet)
- Extend the dual left turn lanes on Mann's Chapel Road to provide 500 feet of full-width storage

At the intersection of U.S. 15-501 & Taylor Road:

- Install a traffic signal with pedestrian signal heads when warranted
- Provide dual exclusive left turn lanes and a shared through-right lane on the eastbound approach of Taylor Road
- Provide an exclusive left turn lane and a shared through-right lane on the westbound approach of Taylor Road

At the intersection of U.S. 15-501 & Andrews Store Road

- Install a traffic signal with pedestrian signal heads when warranted
- Provide an exclusive left turn lane and shared through-right lane on the eastbound and westbound approach of Andrews Store Road

At the intersection of U.S. 15-501 & Mt. Gilead Church Road:

- To accommodate background traffic, construct an exclusive westbound right turn lane on Mt.

Gilead Church Road

At the intersection of Mann's Chapel Road & Andrews Store Road:

- Extend the committed right turn taper to provide 150 feet of full-width northbound right turn storage on Mann's Chapel Road

At the intersection of Mann's Chapel Road & Hamletts Chapel Road:

- Modify the stop control to allow for all-way stop control

At the intersection of Lystra Road & Jack Bennett Road:

- To accommodate an existing deficiency, construct an exclusive right turn lane on Jack Bennett Road
- Monitor intersection for traffic meeting MUTCD traffic signal warrant criteria

At the intersection of Lystra Road & Farrington Road:

- To accommodate an existing deficiency, construct an exclusive southbound right turn lane on Farrington Road
- Modify the signal phasing to provide a protected left turn phase for the eastbound Lystra Road approach

At the intersection of U.S. 15-501 & Vickers Road (East Access Road):

- Install a traffic signal with pedestrian signal heads when warranted
- Provide an exclusive left turn lane and a shared through-right lane on the eastbound approach of the East Access Road

At the intersection of Mann's Chapel Road & the North Access Road:

- Provide a shared left-through lane and an exclusive right turn lane on the Access Road
- Install a traffic signal with pedestrian signal heads when warranted

At the intersection of Andrews Store Road & the South Access Road:

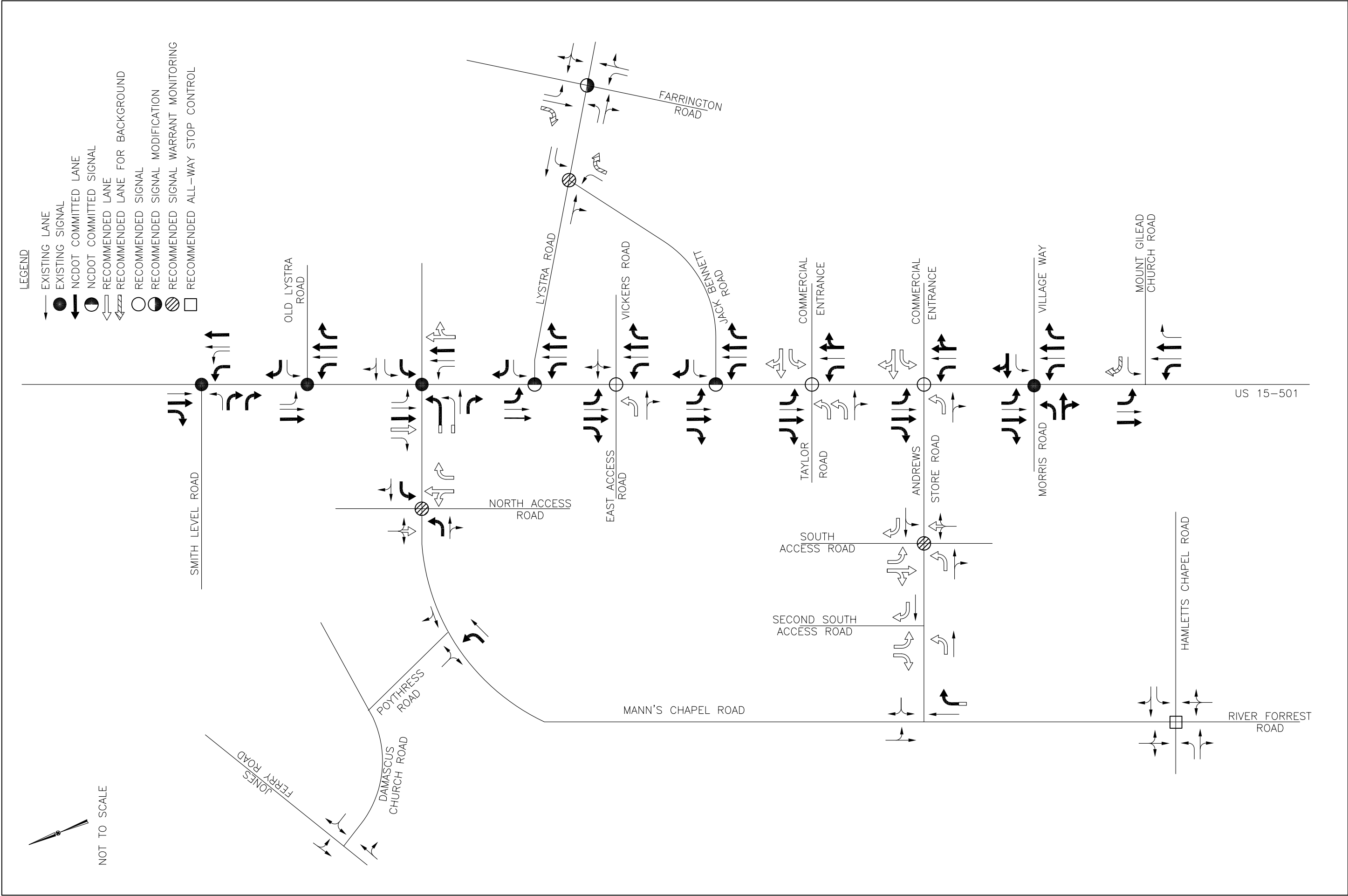
- Construct an exclusive eastbound left turn lane on Andrews Store Road
- Construct an exclusive westbound right turn lane on Andrews Store Road

- Provide exclusive left and right turn lanes on the Access Road
- Install a traffic signal with pedestrian signal heads when warranted

At the intersection of Andrews Store Road & the Second South Access Road:

- Construct an exclusive eastbound left turn lane on Andrews Store Road
- Construct an exclusive westbound right turn lane on Andrews Store Road
- Provide an exclusive left turn lane and an exclusive right turn lane on the Access Road

With these improvements the impacts of the development will be mitigated in accordance with Section 11.2 of the Compact Community Ordinance. The recommended roadway improvements are shown in Figure 8.



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10.0 Phasing

The Briar Chapel development will not be constructed all at once. It will be constructed in several phases over a number of years. The pace of development will vary with demand and economic conditions. The recommended individual improvements will be required at various times during the project development. The need for the recommended roadway improvements will vary dependent on the pace of development. To determine when specific improvements need to be constructed, capacity analyses were performed for the AM and PM peak hours for three thresholds of daily trip generation:

- 25% project build-out (approximately 7,700 daily trips)
- 50% project build-out (approximately 15,400 daily trips)
- 75% project build-out (approximately 23,100 daily trips)

Full build-out background traffic volumes were used in the analyses to provide “worst-case” scenarios rather than pro-rating the background traffic. Only the site traffic generation was reduced. Turning movement volumes at each of the three intermediate levels of trip generation are shown on Figures A-1, A-2, and A-3 in the Appendix. LOS reports generated by Synchro Version 5 software summarizing the capacity analyses are included in the Appendix. Recommendations for the phasing of roadway improvements are summarized below.

POINTS OF ACCESS:

Two full-movement, access points must be in place before daily trip generation exceeds 3,000 trips.

Three full-movement access points must be in place before daily trip generation exceeds 7,500 trips.

Before daily trip generation reaches 21,500 trips, a fourth full-movement access point should be in place. One of the four access points must be the proposed connection to Mann’s Chapel Road.

All recommended improvements at the project entrances should be made concurrent with the opening of those entrances to the public. At the intersection of 15-501 and Taylor Road, both left turn lanes should be constructed, but one may be striped out until the 15,000 daily trip (approximately 50% build-out) threshold is reached.

All intersections included in the study area for this Traffic Impact Analysis will operate at acceptable levels of service in each studied phase with the recommended roadway improvements in place. The phases in which the recommended roadway improvements are needed are listed below. All improvements listed for a particular phase were analyzed to be in place before the development reached that level of build-out.

Existing deficiencies (these improvements are needed to correct existing deficiencies and should be constructed by others):

At the intersection of U.S. 15-501 & Mt. Gilead Church Road:

- Construct an exclusive westbound right turn lane on Mt. Gilead Church Road (this improvement is necessary to accommodate background traffic)

At the intersection of Lystra Road & Jack Bennett Road:

- To accommodate an existing deficiency, construct an exclusive right turn lane on Jack Bennett Road

At the intersection of Lystra Road & Farrington Road:

- To accommodate an existing deficiency, construct an exclusive southbound right turn lane on Farrington Road

Before project new external trip generation exceeds 7,500 Daily Trips the following improvements must be in place:

At the intersection of U.S. 15-501 & Taylor Road:

- Provide an exclusive left turn lane and a shared through-right lane on the eastbound approach of Taylor Road (to be done when the Taylor Road access point is opened)
- Provide an exclusive left turn lane and a shared through-right lane on the westbound approach of Taylor Road (to be done when the Taylor Road access point is opened)

At the intersection of U.S. 15-501 & Andrews Store Road

- Provide an exclusive left turn lane and a shared through-right lane on the eastbound and westbound approach of Andrews Store Road (to be done when the South Access Road access point is opened)

- Install a traffic signal with pedestrian signal heads when warranted

At the intersection of U.S. 15-501 & Vickers Road (East Access Road):

- Provide an exclusive left turn lane and a shared through-right lane on the eastbound approach of the East Access Road (to be done when the East Access Road access point is opened)

At the intersection of Mann's Chapel Road & the North Access Road:

- Provide a shared left-through lane and an exclusive right turn lane on the Access Road (to be done when the North Access Road access point is opened)

At the intersection of Andrews Store Road & the South Access Road:

- Construct an exclusive eastbound left turn lane on Andrews Store Road (to be done when the South Access Road access point is opened)
- Construct an exclusive westbound right turn lane on Andrews Store Road (to be done when the South Access Road access point is opened)
- Provide an exclusive left turn lane and a shared through-right lane on the Access Road (to be done when the South Access Road access point is opened)

At the intersection of Andrews Store Road & the Second South Access Road:

- Construct an exclusive eastbound left turn lane on Andrews Store Road (to be done when the Second South Access Road access point is opened)
- Construct an exclusive westbound right turn lane on Andrews Store Road (to be done when the Second South Access Road access point is opened)
- Provide an exclusive left turn lane and an exclusive right turn lane on the Access Road (to be done when the Second South Access Road access point is opened)

Before project new external trip generation exceeds 15,000 Daily Trips the following improvements must be in place:

At the intersection of U.S. 15-501 & Mann's Chapel Road:

- Extend the dual eastbound left turn lanes on Mann's Chapel Road to provide 500 feet of full-width storage (if the project connection has not been made to Mann's Chapel Road, this improvement can be delayed until the connection is made).

At the intersection of Mann's Chapel Road & Andrews Store Road:

- Extend the committed right turn taper to provide 150 feet of full-width northbound right turn storage on Mann's Chapel Road (if the schools are constructed prior to the 15,000 daily trip threshold being reached, this extension will be required concurrent with the school openings)

At the intersection of U.S. 15-501 & Vickers Road (East Access Road):

- Install a traffic signal with pedestrian signal heads when warranted

Before project new external trip generation exceeds 23,000 Daily Trips the following improvements must be in place:

At the intersection of U.S. 15-501 & Mann's Chapel Road:

- Convert the northbound exclusive right turn lane on U.S. 15-501 into a through-right lane (approximately 700 feet)
- Construct an additional northbound departure lane on U.S. 15-501 (approximately 1,000 feet)
- Construct an additional southbound approach through lane on U.S. 15-501 (approximately 700 feet)
- Construct an additional southbound departure lane on U.S. 15-501 (approximately 1,000 feet)

At the intersection of U.S. 15-501 & Taylor Road:

- Install a traffic signal with pedestrian signal heads when warranted
- Construct an additional eastbound left turn lane to provide dual left turn lanes on that approach

At the intersection of Mann's Chapel Road & Hamletts Chapel Road:

- Modify the stop control to allow for all-way stop control

At the intersection of Lystra Road & Jack Bennett Road:

- Install a traffic signal if MUTCD traffic signal warrant criteria are met

At the intersection of Lystra Road & Farrington Road:

- Modify the signal phasing to provide a protected left turn phase for the eastbound Lystra Road approach

Before project new external trip generation exceeds 30,000 Daily Trips the following improvements must be in place:

At the intersection of Mann's Chapel Road & the North Access Road:

- Install a traffic signal with pedestrian signal heads when warranted

At the intersection of Andrews Store Road & the South Access Road:

- Install a traffic signal when warranted

With these improvements the impacts of the development will be mitigated in accordance with Section 11.2 of the Compact Community Ordinance. The recommended roadway improvements are shown in Figure 9 by phase.

