



Date: June 18, 2012

To: Amy Wolff, Durham City County Planning Department
From: Bill Judge PE, City of Durham Department of Transportation
Subject: Meadows at Southpoint (Z1200001) Traffic Impact Analysis

The Unified Development Ordinance (UDO) requires that a Traffic Impact Analysis (TIA) be prepared for proposed developments estimated to generate 150 or more peak-hour vehicle trips. The proposed Meadows at Southpoint development includes: 385 apartments, 150,000 square-foot of mini-storage and a 10 fueling position gas station. The development is expected to generate 6,188 daily trips with 358 a.m. peak-hour trips (121 entering and 237 exiting) and 456 p.m. peak-hour trips (263 entering and 193 exiting). The proposed development is located on the south side of NC 54 and east side Barbee Road. The expected completion year is 2014, and the TIA analysis year is 2015. The Meadows at Southpoint TIA was prepared by Ramey Kemp & Associates, Inc. in February 2012.

Study Area

The study area includes the following intersections:

- NC 54 and Barbee Road;
- Barbee Road and Grandale Drive;
- Barbee Road / Massey Chapel Road and Herndon Road;
- Barbee Road and Proposed Site Driveway #1 (Full Access);
- NC 54 and Proposed Site Driveway #2 (Left-Over); and
- NC 54 and Proposed Site Driveway #3 (Full Access).

Trip Generation

Trip generation numbers are based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 8th Edition, 2008*. The TIA used the following ITE trip generation uses for the proposed development:

USE	UNITS	ITE CODE
Apartment	385 apartments	220
Mini-Warehouse	150,000 square-foot	151
Gas Station Expansion	10 fueling positions	853

These proposed uses would generate 6,188 daily trips of which 358 trips would occur during the a.m. peak-hour and 456 trips would occur during the p.m. peak-hour. The proposed gas station is an expansion of an existing station from four fueling positions to ten. Therefore, the trip generation was reduced by four fueling positions to account for the existing site trips. Additionally, for the gas station expansion, the a.m. peak-hour trips were adjusted by 63% and the p.m. peak-hour trips were adjusted by 66% to account for pass-by trips. The final adjusted external trips for the proposed site resulted in an additional 3,566 daily trips, with 230 occurring during the a.m. peak-hour and 304 occurring during the p.m. peak-hour.

Traffic Data Collection

The peak-hour intersection turning movement counts were taken from 7-9 a.m. and 4-6 p.m. in September 2011, October 2011, and February 2012.

Trip Distribution and Assignment

The assignment of site traffic on the study area roadway network was based on the following trip distribution percentages:

- To/From the North via Barbee Road: 10% of site trips;
- To/From the West on NC 54: 20% of site trips;
- To/From the East on NC 54: 45% of site trips;
- To/From the Northwest on Herndon Road: 10% of site trips;
- To/From the South on Massey Chapel Road: 5% of site trips;
- To/From the Southeast on Barbee Road: 5% of site trips; and
- To/From the Southeast on Grandale Drive: 5% of site trips.

Approved Developments and Background Growth

For background traffic growth rate, variable rates between 0% and 3% were applied to the existing traffic counts depending on traffic volumes at specific intersections. For those intersections where traffic growth, due to approved developments, exceeded a 3% annual growth rate, a 0% growth rate was applied for background traffic. For those intersections where traffic growth, due to approved developments, came just below a 3% annual growth rate, a variable growth rate was applied as needed to ensure that total growth rate would equal or exceed 3% per year as required by the City of Durham TIA guidelines. The TIA used the traffic volume projections from the following approved developments:

- NC 751 Colvard Farms Mixed-Use Development: This development is located on the west side of NC 751 near the NC 751/Fayetteville Road intersection, north of the Chatham County line. The development includes: 1,300 residential units (700 apartments, 556 townhomes, and 44 single-family homes); 320,000 square feet of office space; 280,000 square feet of retail space; and 150,000 square feet of civic space that includes a 600-student public elementary school and a YMCA.
- The Hills at Southpoint: 150 additional single-family homes located on the east side of Fayetteville Road approximately 1.5 miles south of I-40.

TIP Roadway Improvements

NCDOT TIP Project U-5324 will improve NC 54 from I-40 to NC 55 to a multi-lane divided facility with bicycle, pedestrian and transit amenities. This project is currently unfunded through 2018.

Capacity Analysis

Capacity analyses were performed using the a.m. and p.m. peak-hour for the following scenarios:

- Existing (2011) conditions;
- No-Build (2015) conditions (2011 existing + background growth + approved development traffic);
- Build (2015) conditions (2011 existing + background growth + approved development traffic + site traffic); and
- Build (2015) with improvements conditions (2011 existing + background growth + approved development traffic + site traffic + improvements).

This development and project study area are located within the Suburban Tier where the adopted LOS standard is LOS D. The following table summarizes the average delay for the various Levels of Service (LOS) for unsignalized and signalized intersections:

	Signalized Intersections	Unsignalized Intersections
Level of Service	Average Vehicle Delay (Seconds)	Average Vehicle Delay (Seconds)
A	0-10	0-10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	>80	>50

NC 54 and Barbee Road

The following table summarizes the Levels of Service at this existing signalized intersection:

Scenario	a.m. LOS	p.m. LOS
Existing (2011)	C	C
No-Build (2015)	C	C
Build (2015)	C	D
Build (2015) with improvements	C	D

The intersection currently operates at a LOS C during both the a.m. and p.m. peak-hour. With the additional site traffic, the delays will increase slightly, but the intersection will remain at an acceptable LOS D or better for both peak hours. The TIA recommended the following required improvements to address queuing issues:

- Install protected-permitted left-turn phasing for northbound Barbee Road;
- Install an over-lap phase for the westbound right-turn on NC 54; and

- Extend the northbound left-turn lane on Barbee Road to provide a minimum of 175 feet of storage with a two-way left-turn between the northbound left-turn lane and the southbound left-turn lane at Site Driveway #1.

Barbee Road and Grandale Drive

The following table summarizes the Levels of Service at this existing unsignalized intersection:

Scenario	a.m. LOS	p.m. LOS
Existing (2011)	C*	C*
No-Build (2015)	D*	F*
Build (2015)	D*	F*
Build (2015) with improvements	C*	F*

* Unsignalized operation, with LOS reported for the worst (NB) approach

The intersection currently operates at a LOS C during both the a.m. and p.m. peak-hour. The stop-controlled northbound Grandale Road approach will operate at a LOS F during the p.m. peak-hour with No-Build and Build traffic volumes. To address potential safety concerns with excessive queuing and delays, the TIA recommended the following improvements for the No-Build condition:

- Construct a northbound left-turn lane on Grandale Drive with a minimum of 150 feet of minimum storage plus appropriate tapers; and
- Construct a westbound left-turn lane on Barbee Road with a minimum of 150 feet of storage plus appropriate tapers.

Although the TIA indicated these improvements should be the responsibility of others, they are also required of this development. With these improvements, the northbound approach will remain at a LOS F in the p.m. peak-hour with reduced delays and queuing. Although a LOS F is undesirable at signalized intersections, a LOS F is typical at many unsignalized intersections during a peak-hour until such time as a traffic signal is warranted. Given the existing intersection spacing from the Barbee Road/Massey Chapel Road and Herndon Road intersection, a traffic signal is not recommended for this location.

Barbee Road / Massey Chapel Road and Herndon Road

The following table summarizes the Levels of Service at this existing unsignalized intersection:

Scenario	a.m. LOS	p.m. LOS
Existing (2011)	C*	F*
No-Build (2015)	F*	F*
Build (2015)	F*	F*
Build (2015) with roundabout	B	B

* Unsignalized operation, with LOS reported for the worst (SB) approach

The intersection currently operates at a LOS C during the a.m. peak-hour and a LOS F in the p.m. peak-hour. The intersection will operate at a LOS F during both the a.m. and the p.m. peak-hour with No-Build and Build traffic volumes. To address potential safety concerns with excessive queuing and delays, the TIA recommended the following improvement for the No-Build condition:

- Construct a roundabout (as an alternative to signalization and to promote traffic calming while ensuring adequate traffic capacity).

Although the TIA indicated this improvement should be the responsibility of others, it is also required of this development. With this improvement, the intersection will operate at an acceptable LOS B for both the a.m. and the p.m. peak-hour.

Barbee Road and Site Driveway #1 (Full Access)

The following table summarizes the Levels of Service at this proposed unsignalized intersection:

Scenario	a.m. LOS	p.m. LOS
Build (2015)	B*	C*

* Unsignalized operation, with LOS reported for the worst (WB) approach

The westbound approach on Site Driveway #1 will operate at an acceptable LOS C or better during both peak hours with site traffic and the following recommended improvements:

- Construct an northbound right-turn lane on Barbee Road at Site Driveway #1 with a minimum of 75 feet of storage and appropriate tapers;
- Construct a southbound left-turn lane on Barbee Road to provide a minimum of 100 feet of storage and a two-way left-turn between the southbound left-turn lane and the northbound left-turn lane at NC 54; and
- Construct Site Driveway #1 with one ingress lane and two egress lanes with an appropriate internal tangent throat distance.

NC 54 and Site Driveway #2 (Left-Over Access)

The following table summarizes the Levels of Service at this proposed unsignalized intersection:

Scenario	a.m. LOS	p.m. LOS
Build (2015)	B*	B*

* Unsignalized operation, with LOS reported for the worst (NB) approach

The northbound approach on Site Driveway #2 will operate at an acceptable LOS B or better during both peak hours with site traffic and the following recommended improvements:

- Construct an eastbound right-turn lane on NC 54 at Site Driveway #2 with a minimum of 75 feet of storage and appropriate tapers;
- Construct a westbound left-turn lane on NC 54 at Site Driveway #2 with a minimum of 100 feet of storage extending as a two-way left-turn between the westbound left-turn lane at Site Driveway #2 and the westbound left-turn lane at Site Driveway #3;
- Construct a center median on NC 54 per NCDOT standards to limit the access for Site Driveway #2 to left-in / right-in and right-out only; and

- Construct Site Driveway #2 with one ingress lane and one egress lane with an appropriate internal tangent throat distance.

NC 54 and Site Driveway #3 (Full Access)

The following table summarizes the Levels of Service at this proposed unsignalized intersection:

Scenario	a.m. LOS	p.m. LOS
Build (2015)	D*	F*

* Unsignalized operation, with LOS reported for the worst (NB) approach

The northbound approach on Site Driveway #3 will operate at a LOS D in the a.m. peak hour and a LOS F in the p.m. peak-hour with site traffic and the following recommended improvements:

- Construct an eastbound right-turn lane on NC 54 at Site Driveway #3 with a minimum of 75 feet of storage and appropriate tapers;
- Construct a westbound left-turn lane on NC 54 at Site Driveway #3 with a minimum of 100 feet of storage extending as a two-way left-turn between the westbound left-turn lane at Site Driveway #3 and the westbound left-turn lane at Revere Road; and
- Construct Site Driveway #3 with one ingress lane and two egress lanes with an appropriate internal tangent throat distance.

Although a LOS F is undesirable at signalized intersections, a LOS F is typical at many unsignalized intersections during a peak-hour until such time as a traffic signal is warranted. Given the existing intersection spacing from the Barbee Road and Revere Road intersections, a traffic signal is not recommended for this location.

Summary of required improvements:

NC 54 and Barbee Road

1. Install protected-permitted left-turn phasing for northbound Barbee Road.
2. Install an over-lap phase for the westbound right-turn on NC 54.
3. Extend the northbound left-turn lane on Barbee Road to provide adequate storage with a two-way left-turn between the northbound left-turn lane and the southbound left-turn lane at Site Driveway #1.

Barbee Road and Grandale Drive

1. Construct a westbound left-turn lane on Barbee Road with adequate storage and appropriate tapers.

Barbee Road and Site Driveway #1 (Full Access)

1. Construct a northbound right-turn lane on Barbee Road at Site Driveway #1 with adequate storage and appropriate tapers.
2. Construct a southbound left-turn lane on Barbee Road to provide adequate storage with a two-way left-turn between the southbound left-turn lane and the northbound left-turn lane at NC 54.

3. Construct Site Driveway #1 with one ingress lane and two egress lanes with an appropriate internal tangent throat distance.

NC 54 and Site Driveway #2 (Left-Over Access)

1. Construct an eastbound right-turn lane on NC 54 at Site Driveway #2 with adequate storage and appropriate tapers.
2. Construct a westbound left-turn lane on NC 54 at Site Driveway #2 to provide adequate storage with a two-way left-turn between the westbound left-turn lane at Site Driveway #2 and the westbound left-turn lane at Site Driveway #3.
3. Construct a center median on NC 54 per NCDOT standards to limit the access for Site Driveway #2 to left-in / right-in and right-out only.
4. Construct Site Driveway #2 with one ingress lane and one egress lane with an appropriate internal tangent throat distance.

NC 54 and Site Driveway #3 (Full Access)

1. Construct an eastbound right-turn lane on NC 54 at Site Driveway #3 with adequate storage and appropriate tapers.
2. Construct a westbound left-turn lane on NC 54 at Site Driveway #3 to provide adequate storage with a two-way left-turn between the westbound left-turn lane at Site Driveway #3 and the westbound left-turn lane at Revere Road.
3. Construct Site Driveway #3 with one ingress lane and two egress lanes with an appropriate internal tangent throat distance.

Summary of improvements required by others which may also be required of this development:

Barbee Road and Grandale Drive

1. Construct a northbound left-turn lane on Grandale Drive with adequate storage and appropriate tapers.

Barbee Road / Massey Chapel Road and Herndon Road

1. Construct a roundabout (as an alternative to signalization and to promote traffic calming while ensuring adequate traffic capacity).