



Transportation Impact Analysis

501 South Greensboro Street
Carrboro, NC

Prepared for Woodhill NC, LLC

Revised: August 28, 2014

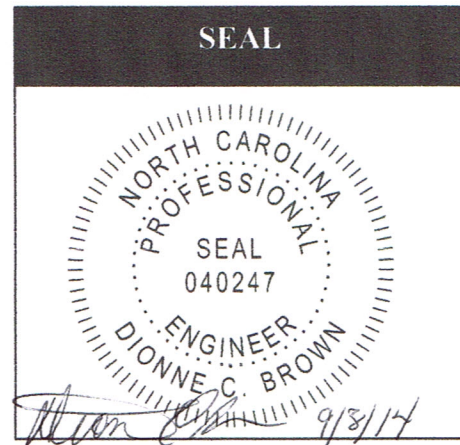
Original Submittal: August 28, 2013

Analysis by: Trisha Hartzell, P.E.
Dionne C. Brown, P.E.

Drafting/Graphics by: Trisha Hartzell, P.E.

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Mary Morgan, P.E.

Sealed by: Dionne C. Brown, P.E.



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NORTH CAROLINA
SOUTH CAROLINA
WEST VIRGINIA
VIRGINIA



501 South Greensboro Street – Transportation Impact Analysis
Prepared for Woodhill NC, LLC
August 28, 2014

Executive Summary

The proposed 501 South Greensboro Street development is located at the intersection with Old Pittsboro Road on the east side of South Greensboro Street. As currently planned, the development will be commercial with 34,500 square feet of retail, 2,800 square feet of office space and 5,400 square feet of sit-down restaurant. The site plan shows a full access driveway proposed on South Greensboro Street at the intersection with Old Pittsboro Road. Figure 1 presents the site plan. A vicinity map is provided as Figure 2.

The original Transportation Impact Analysis (TIA) was completed and approved in August 2013. Since the approval of the TIA, there have been changes to the land use and intensities which would increase the site trips. After coordination with North Carolina Department of Transportation (NCDOT) District Office, they have requested that an updated TIA be completed to reflect these changes.

DAVENPORT was retained to determine the potential traffic impacts of this development and to identify transportation improvements that may be required to accommodate the impacts of the new development traffic. DAVENPORT will also study and determine the safest and most efficient intersection design for the South Greensboro Street and Old Pittsboro Road/Proposed Site Access. Conceptual drawings of the recommended design will be included with this report. The following intersections were included in the study:

1. Smith Level Road @ Public Works Drive
2. Smith Level Road @ NC 54 EB Off-Ramp
3. South Greensboro Street @ Merritt Mill Road/NC 54 WB On-Ramp
4. South Greensboro Street @ West Main Street
5. South Greensboro Street @ Old Pittsboro Road/Proposed Access

Additionally, there is a potential opportunity for cut-thru traffic that could be added to Roberson Place Subdivision, due to the connection the proposed site will make to Purple Leaf Place. We understand the critical nature of this to the residents in this subdivision and therefore will estimate the amount of cut-thru traffic and make recommendations for traffic calming as needed. Therefore, data collections at the following two intersections were also included in the study:

6. Sweet Bay Place @ Roberson Street
7. South Greensboro Street @ Roberson Street

All of the intersections were analyzed during AM (7:00-9:00) and PM (4:00-6:00) peaks for the following conditions:

- 2014 Existing Conditions
- 2016 Future No-Build Conditions
- 2016 Future Build Conditions



- Site Access as a Traffic Signal
- Site Access as a Roundabout

The Town of Carrboro and the NCDOT District Office were coordinated with to ascertain the elements to be covered in this Transportation Impact Analysis (TIA). Information regarding the property was provided by Brunssen Engineering Services, P.A.

Connection to Purple Leaf Place

The proposed site will make a connection to Purple Leaf Place which will provide another opportunity for the residents of the Roberson Place Subdivision to access South Greensboro Street. Using the video data collection footage, we were able to determine that 23 vehicles in the AM peak hour and 16 vehicles in the PM currently travel to/from the south on South Greensboro Street from the Roberson Place Subdivision. Therefore, about every 5 minutes, 5 cars in the AM and 2 cars in the PM travel to/from the south on South Greensboro Street. Total two-way traffic is 39 vehicles during the peak hour.

In the 2016 build scenarios, these turning vehicles will be removed from the intersections of Sweet Bay Place/Roberson Street (northbound left & eastbound right), South Greensboro Street/Roberson Street (westbound left & northbound right) and South Greensboro Street/Old Pittsboro Road (southbound through & northbound through) and then added to the intersection of South Greensboro Street at Old Pittsboro Street/Proposed Site Access as westbound left turns and northbound right turns.

Additionally, we understand that due to this new connection there is a potential opportunity for cut-thru traffic that could be added to the Roberson Place Subdivision. 10% of the proposed site traffic (15 AM trips & 31 PM trips) has the potential to be added to the Roberson Place Subdivision roadway network. This breaks down to a total of 38 cars to/from Roberson Place through Rand Road in the AM peak and 47 cars would traverse Rand Road to Roberson Place in the PM peak.

Discussion of Results

The results of the study are discussed by intersection below:

Smith Level Road @ Public Works Drive

This signalized intersection currently operates at LOS D and LOS B during the existing AM and PM peaks, respectively. The LOS is projected to remain the same for the 2016 future no-build AM peak and degrade to a LOS C in the PM peak with the addition of the growth in the background traffic as well as the approved development traffic. With the addition of the site traffic, this signalized intersection is expected to remain at a LOS D and LOS C during the 2016 future build AM and PM peaks. No improvements are recommended for this intersection.

Smith Level Road @ NC 54 EB Off-Ramp

This signalized intersection currently operates at LOS C and LOS B during the existing AM and PM peaks, respectively. The LOS is projected to remain the same for the 2016 future no-build AM and PM peaks. With the addition of the site traffic, this signalized intersection is also expected to remain



at the LOS C and LOS B operation during the 2016 future build AM and PM peaks. No improvements are recommended for this intersection.

South Greensboro Street @ Merritt Mill Road/NC 54 WB On-Ramp

This signalized intersection currently operates at LOS B and LOS C during the existing AM and PM peaks, respectively. The LOS is projected to remain the same for the 2016 future no-build AM and PM peaks. With the addition of the site traffic, this signalized intersection is also expected to remain at the LOS B and LOS C operation during the 2016 future build AM and PM peaks. No improvements are recommended for this intersection.

South Greensboro Street @ West Main Street

This signalized intersection currently operates at LOS C during both the existing AM and PM peaks. The LOS is projected to degrade to a LOS D for both the 2016 future no-build AM and PM peaks with the addition of the growth in the background traffic as well as the approved development traffic. With the addition of the site traffic, this signalized intersection is expected to remain at the LOS D during both of the 2016 future build AM and PM peaks. No improvements are recommended for this intersection.

South Greensboro Street @ Old Pittsboro Road/Proposed Site Access

This unsignalized intersection currently operates at LOS B during both the existing AM and PM peaks. The LOS is projected to degrade to a LOS C for both the 2016 future no-build AM and PM peaks with the addition of the growth in the background traffic as well as the approved development traffic. At the 2016 future build, with the addition of the site traffic and the proposed site access, this unsignalized intersection is expected to operate at a LOS F during the AM and PM Peaks.

Two intersection improvement scenarios were considered for this intersection at the 2016 future build; traffic signal control and roundabout operation. The following sections discuss these analyses in more detail.

Signal Analysis

Under signalization, the intersection operates at a LOS A in the AM peak and a LOS B in the PM peak. The scenario does not present any queuing concerns along the corridor, most importantly; it does not affect the operation of the signalized intersection of Merritt Mill Road to the south.

While the Synchro analysis predicts an acceptable operation for the intersection, in order for a signal to be installed, it must meet The Manual for Uniform Traffic Control Devices (MUTCD) signal warrants for the future build year. Vehicular volumes are not high enough to warrant signalization through Warrants 1, 2 or 3B. **Based on the anticipated traffic volumes at the intersection, a signal is not recommended.** However, if background traffic volumes increase higher than expected along the South Greensboro Street corridor, a signal may be warranted at a future date. The intersection should be monitored on a routine basis if a roundabout concept is not implemented.

Roundabout Analysis



Utilizing the SIDRA roundabout analysis software, with the intersection operating as a single lane roundabout, the LOS is at an A during the AM peak hours and LOS B during the PM peak hours. Per the congestion management standards, a 20 year design analysis must also be completed for all roundabout recommendations. In 20 years, the roundabout will continue to operate at LOS A and LOS B during both the AM and PM peaks, respectively. The roundabout option predicts very minimal queue along South Greensboro Street. Specifically in year 2036, the predicted queue for the southbound approach under the roundabout operation is 237 feet, which is just over half of the 2016 predicted signalized queue of 421 feet.

Roundabout Design

A single lane roundabout has been designed for the intersection of Old Pittsboro Road/Proposed Site Access at South Greensboro Street. The roundabout has a 110 foot diameter and a crosswalk on the east leg (Proposed Site Access).

The NCDOT and Town of Carrboro presented some initial design concerns regarding the grade of the southbound approach. The grade of the southbound approach is approximately 8%. Ideally, approaches to roundabouts should not exceed 4-5%, where possible. In the process of our design we spoke with NCDOT Congestion Management regarding this design. They did not present any concerns regarding the southbound approach grade and additionally offered his support of a roundabout to be constructed at this location.

Additional right-of-way (R/W) will need to be acquired with the southwest quadrant from the existing mobile home community. This additional R/W should not affect the community and the land is currently being used as a pull off area for vehicles. Additionally, there may be slight R/W needed in the northwest quadrant. This may be eliminated during the final design plan preparations as it is a minimum need.

Level of Service Summary

Table A summarizes the level of service analysis.

Table A - Level of Service Summary						
AM Peak	2014 Existing	2016 No Build	2016 Build	2016 Build with Improvements (Signal)	2016 Build with Improvements (Roundabout)	2036 Design Year (Roundabout)
Smith Level Road @ Pub Works Drive	D (37.0)	D (45.7)	D (47.9)			
Smith Level Road @ NC 54 EB Off-Ramp	C (22.2)	C (24.0)	C (24.4)			
South Greensboro Street @ Merritt Mill Road	B (12.5)	B (13.3)	B (13.7)			
South Greensboro Street @ West Main Street	C (32.5)	D (39.5)	D (40.1)			
South Greensboro Street @ Old Pittsboro Road/Proposed Access	B (12.4) EB Approach	C (17.1) EB Approach	F (56.9) WB Approach	A (8.3)	A [0.569]	A [0.690]
PM Peak	2014 Existing	2016 No Build	2016 Build	2016 Build with Improvements (Signal)	2016 Build with Improvements (Roundabout)	2036 Design Year (Roundabout)
Smith Level Road @ Pub Works Drive	B (19.2)	C (20.2)	C (20.6)			
Smith Level Road @ NC 54 EB Off-Ramp	B (17.5)	B (18.2)	B (18.8)			
South Greensboro Street @ Merritt Mill Road	C (24.2)	C (24.8)	C (25.8)			
South Greensboro Street @ West Main Street	C (33.0)	D (36.9)	D (41.0)			
South Greensboro Street @ Old Pittsboro Road/Proposed Access	B (13.2) EB Approach	C (20.1) EB Approach	F (495.0) WB Approach	B (14.8)	B [0.617]	B [0.764]
LOS (delay in seconds per vehicle)						
LOS [v/c ratio]						
Note for unsignalized conditions, LOS and delay indicates only minor street approach with longest delay						

Summary and Conclusion

This revised analysis has been conducted based on the scope given by NCDOT and the Town of Carrboro. It has analyzed the network for existing deficiencies as well as potential impacts caused by the proposed site. Additionally, this study has analyzed two intersection operation scenarios for the proposed site access at Old Pittsboro Road/South Greensboro Street.

The ITE trip generation indicates that the 501 South Greensboro Street development is projected to generate 2,723 daily trips. This is based on 34,500 square feet of retail, 2,800 square feet of office space and 5,400 square feet of sit-down restaurant.

Table B below summarizes the recommended improvements for the 2016 future build scenario. It is recommended that this intersection be modified to operate as a single lane roundabout. This intersection operation presents no queuing along the corridor, minimal impacts to the existing R/W, specifically noting there would be minimal impacts to the historical trees along South Greensboro Street.

In conclusion, this study has determined that the proposed site will not impact the existing roadway network and therefore no improvements at the intersections are recommended. However, modifications to the proposed site access at the existing intersection of Old Pittsboro Road/South Greensboro Street have been identified. It is recommended that all driveways into the site should be constructed to comply with NCDOT Policy on Street and Driveway Access to North Carolina Highways and Town of Carrboro standards where applicable.

Table B - Recommended Improvement Summary	
Smith Level Road @ Pub Works Drive	No improvements are recommended for this intersection.
Smith Level Road @ NC 54 EB Off-Ramp	No improvements are recommended for this intersection.
South Greensboro Street @ Merritt Mill Road	No improvements are recommended for this intersection.
South Greensboro Street @ West Main Street	No improvements are recommended for this intersection.
South Greensboro Street @ Old Pittsboro Road/Proposed Access	<ul style="list-style-type: none"> • Modify the intersection to operate as a single lane roundabout; this shall also include the proposed site access (fourth leg of intersection) • We concur with the extension of the bike path from its location at Purple Leaf Place as depicted on the site plan • Provide a vehicle connection internally from the site to Purple Leaf Place as depicted on the site plan



August 13, 2014

Mr. Chuck Edwards, PE
District Engineer
NC Department of Transportation
127 East Crescent Square Dr.
Graham, NC 27253

RE: Revised Trip Generation for 501 S. Greensboro Street in Carrboro, NC - (DAVENPORT Project Number **13-414**)

Dear Mr. Edwards:

In August 2013, DAVENPORT submitted a Transportation Impact Analysis (TIA) to NCDOT for the project stated above. The project is located at the intersection with Old Pittsboro Road on the east side of South Greensboro Street. The development was studied to consist of 30,350 square feet of retail and a 3,000 square foot bank with 2 drive-thru lanes. After pass-by reductions, this development would generate 2,213 daily trips and 95 AM peak hour net trips and 218 PM peak hour net trips.

Since the submittal, the client has made some changes to the site plan that would affect the land use and intensities. Attached are the site plans (two options are being studied) along with the trip generation comparison table of the original and the revised site plans.

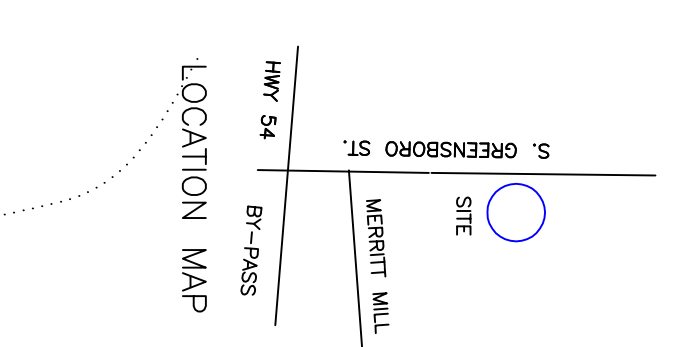
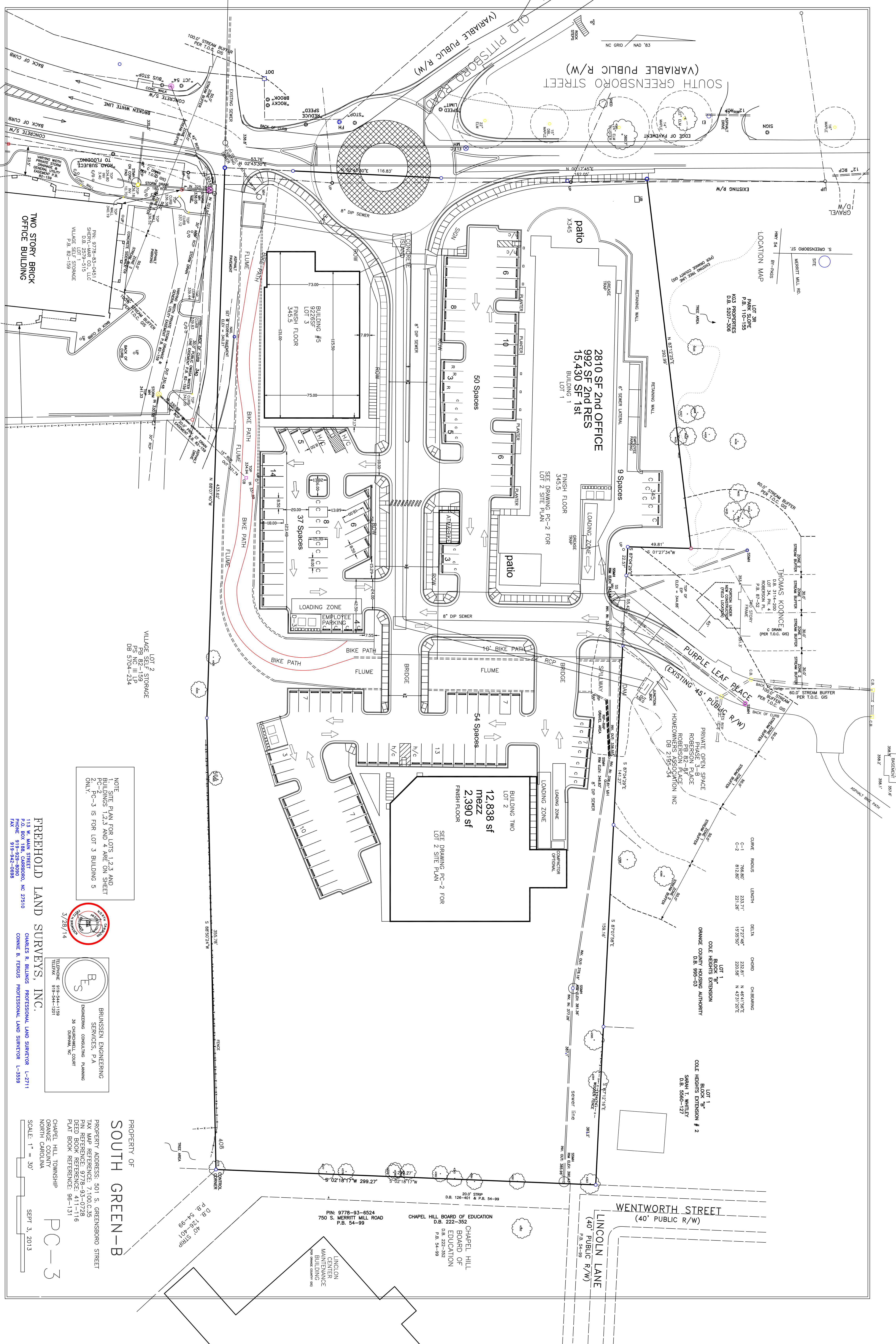
Please let know if a revised TIA is needed to reflect these changes or if this trip generation letter would suffice.

Please feel free to contact me with any questions at 336-744-1636.

Sincerely,

Dionne C. Brown

Dionne C. Brown, PE



LOT 3B
 P&B 110-155
 KCI PROPERTIES
 D.B. 5207-306

THOMAS KOONCE
 D.B. 3114-200
 LOTS 1-4
 LOTS 1-4
 P.B. 87-52
 (PER T.O.C. GIS)

CURVE	RADIUS	LENGTH	DELTA	CHORD	CHORD BEARING
C-1	766.60'	233.21'	1727.48"	232.81'	N 46°13'07"E
C-2	812.80'	221.26'	1535.90"	220.58'	N 43°13'07"E

LOT 1
 COLE HEIGHTS EXTENSION
 ORANGE COUNTY HOUSING AUTHORITY
 D.B. 995-03

LOT 1
 COLE HEIGHTS EXTENSION # 2
 SARAH T. WHITLEY
 D.B. 5560-127

NOTE
 1. SITE PLAN FOR LOTS 1, 2, 3 AND
 5. BUILDINGS 1, 2, 3 AND 4 ARE ON SHEET
 2. P.C.-3 IS FOR LOT 3 BUILDING 5
 ONLY.

FREEMOLD LAND SURVEYS, INC.
 113 W. MAIN STREET
 P.O. BOX 188 CARBORO, NC 27510
 PHONE 919-925-8090
 FAX 919-925-8098

CHARLES R. BILLINGS PROFESSIONAL LAND SURVEYOR L-2711
 CONNIE B. FERGUS PROFESSIONAL LAND SURVEYOR L-3559

BRUNNSEN ENGINEERING SERVICES, P.A.
 ENGINEERING CONSULTING PLANNING
 36 CHURCHWELL COURT
 DORCHESTER, NC

TELEPHONE 919-544-1159
 TELEFAX 919-544-1201

PROPERTY ADDRESS: 501 S. GREENSBORO STREET
SOUTH GREEN-B
 TAX MAP REFERENCE: 7100.C.35
 PIN REFERENCE: 978-93-0728
 DEED BOOK REFERENCE: 411-116
 PLAT BOOK REFERENCE: 96-151

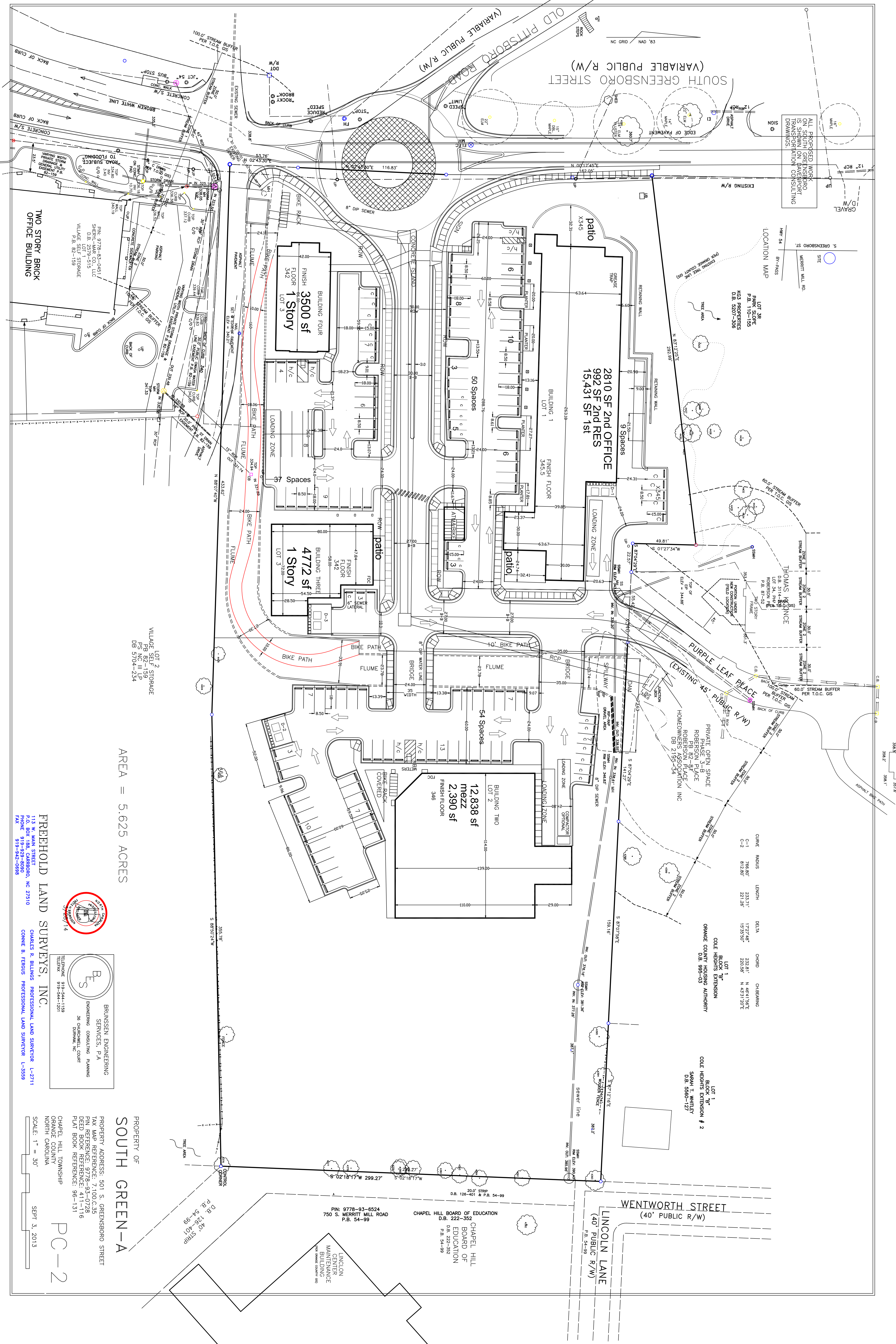
CHAPEL HILL TOWNSHIP
 ORANGE COUNTY
 NORTH CAROLINA
 SCALE: 1" = 30'
 SEPT 3, 2013

PIN: 9778-93-6524
 750 S. MERRITT MILL ROAD
 P.B. 54-99

CHAPEL HILL BOARD OF EDUCATION
 D.B. 222-352

CHAPEL HILL BOARD OF EDUCATION
 D.B. 222-352
 P.B. 54-99

LOT 1
 LINCOLN CENTER MAINTENANCE BUILDING
 (PER ORANGE COUNTY GIS)



ALL PROPOSED WORK ON SOUTH GREENSBORO STREET TRANSPORTATION CONSULTING DRAWINGS.

LOCATION MAP

LOT 38E
PARK SQUARE
P.B. 110-155
K03 PROPERTIES
D.B. 3207-308

THOMAS HADNORCE
LOT 34, PHASE 4
ROBERTSON PLACE
P.B. 07-202
D.B. 3114-488

PRIVATE OPEN SPACE
PHASE 3-B
ROBERTSON PLACE
ROBERTSON PLACE
HOMEOWNERS ASSOCIATION INC
D.B. 2195-34

LOT 1
BLOCK 7B
COLE HEIGHTS EXTENSION
ORANGE COUNTY HOUSING AUTHORITY
D.B. 995-03

LOT 1
BLOCK 7B
COLE HEIGHTS EXTENSION # 2
SARA T. WHITLEY
D.B. 5560-127

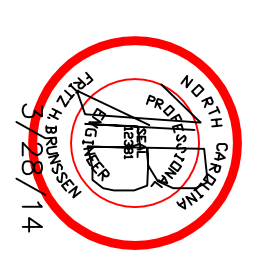
PIN: 9778-93-6524
750 S. MERRITT HILL ROAD
P.B. 54-99

CHapel Hill BOARD OF EDUCATION
D.B. 222-352
CHapel Hill BOARD OF EDUCATION
D.B. 222-352
P.B. 54-99

LANGTON CENTER MAINTENANCE BUILDING
P.B. 54-99

AREA = 5.625 ACRES

FREHOLD LAND SURVEYS, INC.
17 MARKET STREET
P.O. BOX 188
GREENSBORO, NC 27410
PHONE: 919-923-0890
FAX: 919-942-0898



BRUNSEN ENGINEERING SERVICES, P.A.
ENGINEERING CONSULTING PLANNING
35 CHURCHWELL COURT
DURHAM, NC

CHARLES R. BILGUS PROFESSIONAL LAND SURVEYOR L-2711
CONNIE B. FERIGS PROFESSIONAL LAND SURVEYOR L-3559

PROPERTY OF
SOUTH GREEN-A

PROPERTY ADDRESS: 501 S. GREENSBORO STREET
TAX MAP REFERENCE: 7.100.C.35
PIN REFERENCE: 9778-93-0728
DEED BOOK REFERENCE: 411-116
PLAT BOOK REFERENCE: 96-131

CHapel Hill TOWNSHIP
ORANGE COUNTY
NORTH CAROLINA
SCALE: 1" = 30'

PC-2
SEPT 3, 2013

Table XX.X - ITE Trip Generation - Original

Average Weekday Driveway Volumes				24 Hour	AM Peak Hour		PM Peak Hour	
				Two-Way				
<u>Land Use</u>	<u>ITE Land Code</u>	<u>Size</u>		<u>Volume</u>	<u>Enter</u>	<u>Exit</u>	<u>Enter</u>	<u>Exit</u>
Shopping Center	820	30.350	Th.Sq.Ft.GLA	3,129	46	30	140	146
Bank with Drive-Thru	912	2	Lanes	279	11	8	27	28
Total Unadjusted Trips				3,408	57	38	167	174
Shopping Center Pass-by Reduction (34% PM)				-1,064	0	0	-48	-50
Bank Pass-by Reduction (47% PM)				-131	0	0	-13	-13
Total Adjusted Trips				2,213	57	38	107	111

Table XX.X - ITE Trip Generation - CP3

Average Weekday Driveway Volumes				24 Hour	AM Peak Hour		PM Peak Hour	
				Two-Way				
<u>Land Use</u>	<u>ITE Land Code</u>	<u>Size</u>		<u>Volume</u>	<u>Enter</u>	<u>Exit</u>	<u>Enter</u>	<u>Exit</u>
Shopping Center	820	34.5	Th.Sq.Ft.GLA	3,400	50	31	141	153
General Office Space	710	2.8	Th.Sq.Ft.GLA	87	10	1	14	68
Sit-down Restaurant	932	5.4	Th.Sq.Ft.GLA	687	32	26	32	21
Total Unadjusted Trips				4,174	92	58	187	242
Shopping Center Pass-by Reduction (34% PM)				-1,156	0	0	-48	-52
Restaurant Pass-by Reduction (43% PM)				-295	0	0	-14	-9
Total Adjusted Trips				2,723	92	58	125	181

Table XX.X - ITE Trip Generation - CP2

Average Weekday Driveway Volumes				24 Hour	AM Peak Hour		PM Peak Hour	
				Two-Way				
<u>Land Use</u>	<u>ITE Land Code</u>	<u>Size</u>		<u>Volume</u>	<u>Enter</u>	<u>Exit</u>	<u>Enter</u>	<u>Exit</u>
Shopping Center	820	32.1	Th.Sq.Ft.GLA	3,245	48	30	134	146
General Office Space	710	2.8	Th.Sq.Ft.GLA	87	10	1	14	68
Sit-down Restaurant	932	5.4	Th.Sq.Ft.GLA	687	32	26	32	21
Total Unadjusted Trips				4,019	90	57	180	235
Shopping Center Pass-by Reduction (34% PM)				-1,103	0	0	-46	-50
Restaurant Pass-by Reduction (43% PM)				-295	0	0	-14	-9
Total Adjusted Trips				2,620	90	57	121	176



April 20, 2015

Town of Carrboro
Planning Department
Attn: Jeff Kleaveland, Planner/ ZDS, RLA
301 W. Main Street
Carrboro, NC 27510

Subject: Response to Questions and Concerns for 501 South Greensboro Street (DAVENPORT Job No. 13-414)

Dear Mr. Kleaveland,

On April 1, 2015, the Roberson Place South Green Committee submitted a list of questions and concerns regarding their neighborhood. DAVENPORT was tasked with responding to these questions and concerns since they were traffic related and involved our transportation impact analysis (TIA) that was submitted to the Town. The following responses correlate with the questions in the letter.

1. The number of site trips was estimated based on the ITE Trip Generation Manual 9th edition, an industry standard manual based on empirical data for developments with this type of land use. TripGen 2013 software uses the ITE Trip Generation Manual to give results for the number of site trips. The trip distribution is based on existing traffic patterns and engineering judgment, which all was approved and coordinated during the scoping of the project by the Town and NCDOT. Therefore, with those factors it was assumed that only 10% of traffic would use the extension causing an average of 1 trip per 4 minutes in the AM peak (15 trips) and 1 trip per 2 minutes in the PM peak (31 trips). The AM and PM peaks look at the worst case scenarios.
2. The analysis assumes that a portion of existing neighborhood traffic would use the new connection to access S Greensboro Street, and future traffic associated with the proposed site would cut through the Roberson Place Subdivision. However, it was not assumed that traffic external to the neighborhood and site would use this connection as a cut through. It is assumed that vehicles will stay on the main network streets because it reduces their travel time rather than weaving through a neighborhood street.
3. The TIA analyzes the worst case scenario which is the AM and PM peak period of the day. Therefore, the results in the document show what that the total volumes reported are expected to be the highest at those times of the day based on the ITE Trip Generation Manual and trip distribution that was approved by the Town and NCDOT. The responses in #1 and #2 also address this concern.
4. The TIA accounts and incorporates the approved developments in the area into the analysis. These trips were distributed throughout the network based on the information provided. Again, it is not assumed that these development trips will use the neighborhood street when utilizing the main streets will reduce the travel time.
5. The narrow streets, on street parking and low speed limits can have traffic calming effects. These factors can help encourage vehicles to use the main streets which will reduce their travel time and give a more direct travel path than the neighborhood streets.

Overall, the TIA was based upon typical industry standards and existing patterns and conditions that was approved and coordinated during the scoping of the project by the Town and NCDOT. The TIA analyzes the worst case scenarios by using the AM and PM peak volumes and site trips. The majority of traffic is assumed to stay on the main streets because it would reduce the travel time and the possibility of weaving through obstacles on neighborhood streets would be a deterrent.

Respectfully,

A handwritten signature in cursive script that reads 'Dionne C. Brown'.

Dionne C. Brown, PE