



MEMORANDUM

To: Stephen Blackwelder, Lancaster County Environmental Compliance Manager
Ashley Davis, Lancaster County Senior Planner
Allison Love, SCDOT Assistant District Permit Engineer – District 4

From: Amy Massey, PE
Kimley-Horn and Associates, Inc.

Date: December 2, 2022

Subject: Riverchase Estates Traffic Impact Analysis (TIA) Addendum

The purpose of this Addendum is to incorporate Lancaster County review comments and provide responses regarding the TIA prepared by Kimley-Horn and Associates, Inc. (9-07-2022) for the proposed Riverchase Estates project.

The County's Not Approved Letter (10-17-2022) and South Carolina Department of Transportation (SCDOT) concurrence letter (10-31-2022) are attached. The following responses are provided in *italics* to County and SCDOT comments in **bold** and regular print.

Review Comments (SCDOT):

SCDOT Comments on Specific Study Intersections:

- Rock Hill Highway (SC 5) and Riverside Road/W. Rebound Road
 - SCDOT is supportive of the developer working with Lancaster County Government to commit funding to the planned Catawba COG project. *Acknowledged.*
 - Installation of a signal cannot be considered until actual traffic meets the criteria set forth by the MUTCD. The developer or community may at their discretion choose to do a full warrant analysis which includes a 16-hour count in order to justify a signal at any point before full buildout or directly after to determine if a signal is actually warranted. *Acknowledged.*

SCDOT General Comments

- The proposed access location shall not be considered approved until required horizontal and vertical sight distances are verified by the developer's civil engineer and driveway and road separation requirements are met. *Acknowledged.*
- Construct appropriate tapers with all turn lanes. *Acknowledged.*

Review Comments (County Engineer):

Please see the attached documents from Infrastructure Consulting and Engineering (ICE) regarding the TIA submitted. If I need to coordinate a meeting with Eric Dillon from ICE, let me know. **Checklist comments:**

- Page 25 - Review need for roundabout vs. signal control. *Acknowledged. SIDRA 9 software was used to determine operating characteristics, level-of-service (LOS), and delay for the potential roundabout identified at the SC 5 and Riverside Road/W Rebound Road intersection. Based on this analysis, a single-lane roundabout intersection would be expected to operate with long delays along SC 5 during both peak hours; a multilane roundabout was also analyzed and produced acceptable LOS results under Lancaster County target guidelines. These results are shown in the attachments.*
- Page 26 - If signal control is preferred control for the intersection – most likely need SB left turn lane for operations and cross alignment. *As noted in the report, preliminary peak-hour signal warrants were satisfied for both peak hours under build-out conditions. Notably, a northbound left-turn lane is NOT recommended as developer mitigation but is shown as an option in the Target scenario required by Lancaster County. Should a northbound left-turn lane be constructed, a southbound left-turn lane may be useful for cross alignment, but, again, is not required to mitigate the site's impact on the intersection as the northbound and southbound approaches of Riverside/Rebound Road are already expected to operate with long delays under background conditions without the addition of site traffic. The addition of the signal with left-turn lanes along SC 5 is shown to provide the intersection with better results than background conditions. It should be noted that based on Lancaster County guidelines a target LOS is required where the existing/background LOS is below the following standards but is not recommended mitigation for the proposed development:*
 - *"For collector or local streets, Level-of-Service (LOS) C or better shall be maintained. On any arterial or higher order street, a LOS D or better shall be maintained. Where the existing LOS is below these standards, the traffic impact analysis shall identify those improvements required to ensure that development related traffic demands result in no net reduction in LOS, and identify additional improvements needed to raise the level of service to the standards on the applicable street to the adopted LOS standard."*
- Page 27 - Check for SB left turn lane on Riverside Road at University (quick check shows need for safety). *Upon review of SCDOT turn-lane warrants, a southbound left-turn lane is warranted for consideration under build-out conditions. However, the southbound approach operates with short delays without a turn lane. Additionally, the proposed site adds only 5% of projected site trips to the southbound left-turn movement (19 vehicles in the AM peak-hour and 15 vehicles in the PM peak-hour), and the intersection in question is not related to site access being over 4.5 miles from the site.*
- Page 28 - Do not recommend the striping for a left turn lane for NB lefts on Riverside Road onto SC 9 WB ramp as SCDOT needs to restrict this movement. *Acknowledged.*
- Page 34 - Do not recommend the restriction to a right turn only for EB approach of SC 5 onto US 521 to a right turn only as the left turns are the heaviest movement. Check for restriction of Old Church Road throughs and lefts to a right turn only and build U-Turn north and build an acceleration lane for the EB lefts onto NB US 521. *Acknowledged. As noted in the report and based on Lancaster County guidelines, a target LOS is required where the existing/background LOS is below a designated roadway's classification standards. However, it should be noted that these improvements analyzed in the "Build IMP Target LOS" scenario are not recommended mitigation for the proposed development. As shown in the Attachments, the requested analysis was performed and did not provide significant improvement in delay experienced at this intersection. Additionally, the construction*

of the aforementioned u-turn bulb would not be recommended as the westbound approach has less than 20 vehicles in either peak hour, and this mitigation measure would be costly.

- Page 37 - If signal control is considered for SC 5 at Riverside/W. Rebound Rd – along with EB and WB left turn lanes on SC 5, need right turn lanes on SC 5 onto Riverside/NB and SB turn lanes. *As discussed above, the north and southbound approaches of Riverside/Rebound Road are already expected to operate with long delays under background conditions without the addition of site traffic. The addition of the signal with left-turn lanes along SC 5 is shown to provide the intersection with better results than background conditions. The improvements shown in the Target LOS rows of the TIA are provided based on Lancaster County guidance and are not developer mitigation recommendations. However, it should be noted that auxiliary turn lane warrants for left- and right- turn lanes are not applicable to signalized intersections.*
- Page 37 - Note for sight distance for Access 1 meets requirements or site engineer will verify. *The TIA states: 'All additions and attachments to the State and County road system shall be properly permitted, designed, and constructed in conformance to standards maintained by the agencies.' This statement covers sight distance, as this is a standard that must be met in order to get permitted plans. It is noted that the site engineer is responsible for verifying sight distance.*

Recommendations:

- Verify sight distance for all access points. *Sight distance to be verified by site engineer.*
- Determine left and right turn lane needs at Riverside Road at University Drive. *Upon review of SCDOT turn-lane warrants, a southbound left-turn lane is warranted for consideration in the PM peak hour, but the northbound and southbound right-turn lanes are not warranted. It should be noted that the posted speed limit along Riverside Road is 45 mph. However, the southbound approach operates with short delays without a turn lane. The proposed site adds only 5% of projected site trips to the southbound left-turn movement, and the intersection in question is over 4.5 miles from the site.*
- SC 5 at Riverside Road/W. Rebound Road – If SCDOT would consider – check for roundabout vs. signal control. If signal control is preferred method of control – left turn lanes in all 4 approaches and the right turn lane for EB SC 5 movement onto Riverside Road. *Acknowledged. Coordination with the Catawba COG project is recommended to determine final layout and appropriate developer contribution.*
- Check for restricting Old Church Road to a right only and construction a U-turn north of the interchange and an acceleration lane for SC 5 EB lefts. *Not recommended as noted in comments above.*

The sealed TIA is attached without modification in addition to the SCDOT and County letters received.

Cc:

- Allison C. Love, AICP, SCDOT
- Patrick Murphy, PE, R. Joe Harris & Associates, Inc.

Attachments:

- SCDOT letter
- County letter, including sealed TIA
- Additional analysis results summaries and reports



South Carolina
Department of Transportation

Cherokee County
Chester County
Chesterfield County
Fairfield County
Lancaster County
Union County
York County

October 31, 2022

Amy B. Massey, P.E.
Kimley-Horn and Associates, Inc.
200 South Tryon Street, Suite 200
Charlotte, North Carolina 28202

RE: Riverchase Estates
Traffic Impact Analysis
Riverside Road (S-29-29)
Lancaster County

Dear Mrs. Massey,

Thank you for allowing us to review the Traffic Impact Analysis (TIA) regarding the site on Riverside Road (S-29-29). There are currently 122 single-family homes constructed and closed within the overall development. This TIA studies the impact of 814 additional single-family homes. The Department provides the following comments.

TIA Recommendations

Rock Hill Highway (SC 5) and Riverside Road/W. Rebound Road

- Cost sharing with the planned Catawba COG intersection and Nisbet development projects towards the following improvements:
 - Construction of an eastbound left-turn lane with 150 feet of storage.
 - Construction of a westbound left-turn lane with 150 feet of storage.
 - Installation of a traffic signal if/when warrants are met.

Riverside Road and Access 1

- Construction of Access 1 to include a single ingress lane, a single egress lane, and a 90-foot internal protected stem (IPS) with stop control.
- Construction of a northbound left-turn lane along Riverside Road with 150 feet of storage.
- Construction of a southbound right-turn lane along Riverside Road with 100 feet of storage.

SCDOT Comments on Specific Study Intersections

Rock Hill Highway (SC 5) and Riverside Road/W. Rebound Road

- SCDOT is supportive of the developer working with Lancaster County Government to commit funding to the planned Catawba COG project.
- Installation of a signal cannot be considered until actual traffic meets the criteria set forth by the MUTCD. The developer or community may at their discretion choose to do a full

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warrant analysis which includes a 16 hour count in order to justify a signal at any point before full buildout or directly after to determine if a signal is actually warranted.

SCDOT General Comments

- The proposed access location shall not be considered approved until required horizontal and vertical sight distances are verified by the developer's civil engineer and driveway and road separation requirements are met.
- Construct appropriate tapers with all turn lanes.

Once comments from all reviewers have been addressed, please submit a digital copy of the final draft to the Department. We look forward to the project proceeding to the encroachment permit process. At that time, all geometrical features, pavement designs, etc., will be reviewed by the appropriate office. If you have any additional questions or concerns, please contact the District 4 Permit Office at (803) 377-4155.

Sincerely,



C. Jason Johnston, P.E.
District 4 Engineering Administrator

CJJ/mrj

cc: Stephen Blackwelder, Lancaster County Engineering
Clint Beaver, Lancaster Resident Maintenance Engineer

File: D4/PO/ACL





Lancaster County
Planning Department
P. O. Box 1809
Lancaster, SC 29721
803.285.6005
planning@lancastercountysc.net

October 17, 2022

Patrick Murphy
R. Joe Harris & Associates, Inc.
127 Ben Casey Drive
Fort Mill, SC 29708

Project Number	20221205
Project Name	Riverchase Estates Section 3
Location	Riverside Road
Stage	Traffic Impact Analysis
Parcel(s)	0030-00-002.00
Status	Not Approved

Dear: Patrick Murphy

We have completed our review. The comments listed on the attached report must be addressed with a response letter.

Once revised plans are received, they will be submitted to staff for review.

Please be aware that plans will not be routed for review without a response letter

Sincerely,

A handwritten signature in black ink that reads "Chanda Kirkland".

Chanda Kirkland, Development Service Coordinator
Lancaster County Government
101 N Main St
Lancaster, SC 29720
P: (803) 416-9390

Plan Review Comments

County Engineer - Stephen Blackwelder - 8035482406
sblackwelder@lancastersc.net

Not Approved

Review Comments:

Please see the attached documents from Infrastructure Consulting and Engineering (ICE) regarding the TIA submitted.
If i need to coordinate a meeting with Eric Dillon from ICE, let me know.

Planning - Ashley Davis - 803-416-9433
adavis@lancastersc.net

Not Approved

Review Comments:

Project Name:

Riverchase

TIA Checklist

N/A	Yes	No	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	South Carolina PE Stamp and Signature on TIA/Plans
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Introduction and Executive Summary
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Study Area Descriptions and Roadway Classifications
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Analysis Period Correct
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing Traffic Operations
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Other projected transportation improvements in the study area
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trip Generation Summary
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trip Distribution and traffic assignment
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LOS Analysis: Background traffic growth and site build out
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Analysis of Sight Distance at Access Points <i>sight distance not verified in report for access</i>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Identify need for Turn Lanes, Capacity and Storage Length
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Identify need for Signalization
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Identify Measures to Mitigate LOS deficiencies
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Vicinity Map
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site Plan and Proposed Land Use
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing Peak hour volumes (counts conducted within the last 12 months)
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Projected Background Peak Hour Volumes -
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trip Distribution % Including Added Project Peak Hour Volumes
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Project Build-Out Volumes
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and Recommended Lane Configurations
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Intersection LOS (existing, background, build, mitigated)
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unified Development Ordinance Section 6.8

Comments:

Good Report – need additional checks for auxiliary turn lanes at 2 intersections and alternative mitigation strategies at two intersections.

1. Overview of Traffic Impact Analysis (TIA) Report

Kimley Horn submitted a traffic impact analysis report for single family housing development that will access Riverside Road south of SC 5. Amy Massey is the Engineer on Record (EOR) for producing the detailed traffic study. Nine intersections were analyzed for impacts – Riverside Road at Cobblestone Way, SC 5 at Riverside Road/W. Rebound Road, Riverside Road at University Drive/ Firetower Road, Riverside Road at South Lake Dr./ SC 9 WB on-ramp, Riverside Road at SC 9 WB off-ramp, Riverside Road at SC 9 EB off-ramp, SC 9 at SC 9 EB on-ramp, SC 5 at US 521, US 521 at SC 5/Old Church Road. Also, one new access point was reviewed on Riverside Road. The overall report contained a good breakdown of volumes and distribution among all study locations. The analysis period for build out included the proposed year of 2034 plus one year for a 2035 modeling period. There were some unacceptable levels of services for certain movements at intersections and the report showed mitigation for all mentioned in the report.

2. Items of Interest in the TIA Report

The TIA document was redlined with marks highlighting interest items below (pages noted below reflect pdf pages and not report pages):

- Page 25 – Review need for roundabout vs. signal control
- Page 26 – If signal control is preferred control for the intersection – most likely need SB left turn lane for operations and cross alignment.
- Page 27 – Check for SB left turn lane on Riverside Road at University (quick check shows need for safety)
- Page 28 – Do not recommend striping for a left turn lane for NB lefts on Riverside Road onto SC 9 WB ramp as SCDOT needs to restrict this movement.
- Page 34 – Do not recommend the restriction to a right turn only for EB approach of SC 5 onto US 521 to a right turn only as the left turns are the heaviest movement. Check for restriction of Old Church Road throughs and lefts to a right turn only and build U-Turn north and build an acceleration lane for the EB lefts onto NB US 521.
- Page 36 – Auxiliary turn lane checks for Riverside Road at University.
- Page 37 – Roundabout review for SC 5 at Riverside Road/W. Rebound Rd.
- Page 37 - If signal control is considered for SC 5 at Riverside/W. Rebound – along with EB and WB left turn lanes on SC 5, need right turn lanes on SC 5 onto Riverside/NB and SB turn lanes.
- Page 37 - Check turn lanes for Riverside at University.
- Page 37 - Check operations a US 521 with restricting Old Church to right t turn only and adding U-turn to the north on US 521 and adding acceleration lane NOB US 52 for SC 5 EB lefts.
- Page 37 - Note for sight distance for Access 1 meets requirements or site engineer will verify.

3. Checklist Comments

Attached is a TIA checklist that reviews all submitted information for proper TIA submittal. The analysis period did reflect UDO 6.8.2 D for analysis year after development which would be 2035 (Build plus 1 year). The TIA did not review driveway sight distance (usually covered under site plan permitting).

4. Recommendations

1. Verify sight distance for all access points.
2. Determine left and right turn lane needs at Riverside Road at University Drive.
3. SC 5 at Riverside Road/W. Rebound Road – If SCDOT would consider – check for roundabout versus signal control. If signal control is preferred method of control – left turn lanes in all 4 approaches and the right turn lane for EB SC 5 movement onto Riverside Road.
4. Check for restricting Old Church Road to a right only and construction a U-turn north of the interchange and an acceleration lane for SC 5 EB lefts.

1.0 Executive Summary

The purpose of this Traffic Impact Analysis (TIA) is to review vehicular traffic impacts as a result of the proposed Riverchase Estates development. The primary objectives of the study are:

- To estimate trip generation and distribution for the proposed development.
- To perform intersection capacity analyses for the identified study area.
- To determine the potential traffic impacts of the proposed development.
- To develop recommendations for needed roadway and operational improvements to accommodate the proposed development's traffic impacts.

The proposed site is located along the west side of Riverside Road, east of the Catawba River in Lancaster County, South Carolina. As currently envisioned, the overall development plan consists of a total of 936 single family homes, expected to be built-out in 2034. Based on information from the Client, 122 homes are currently constructed and closed, and are accounted for within existing traffic. Therefore, this TIA studies the impact of 814 additional single-family homes as an update to the prior *Traffic Impact Assessment for Lancaster River Front Subdivision* (3-29-2007).

Based on the current site plan, one additional access point along Riverside Road is proposed in addition to the existing Riverchase Estates access (Cobblestone Way).

Per the Lancaster County Unified Development Ordinance (UDO) Section 6.8, the impact of the development was analyzed for the year after the development is expected to be at full occupancy. Therefore, this TIA evaluates the traffic operations under 2022 existing conditions, 2035 background conditions (without the proposed development), and 2035 build-out conditions (with the proposed development) during the AM and PM peak hours. Through coordination with Lancaster County and South Carolina Department of Transportation (SCDOT) staff, the following study intersections are included:

1. Riverside Road (S-29) and Cobblestone Way
2. Riverside Road (S-29)/W Rebound Road (SC 75) and Rock Hill Highway (SC 5)
3. Riverside Road (S-29) and University Drive (S-56)/Firetower Road
4. Riverside Road (S-29) and South Lake Drive (S-206)/Chester Hwy (SC 9) WB On-Ramp
5. Riverside Road (S-29) and Chester Hwy (SC 9) WB Off-Ramp
6. Riverside Road (S-29)/W Meeting Street (SC 9) and Chester Hwy (SC 9) EB Off-Ramp
7. W Meeting Street (SC 9) and Chester Hwy (SC 9) EB On-Ramp
8. Rock Hill Highway (SC 5) and Charlotte Highway (US 521) Ramp
9. Charlotte Highway (US 521) and Rock Hill Highway (SC 5) Ramp/Old Church Road (S-378)
10. Riverside Road (S-29) and Access 1

For purposes of this study, US 521, Riverside Road, W Rebound Road, and W Meeting Street are referenced as north/south with the exception of Old Church Road at its intersection with SC 5; while all other roads are referenced as east/west.

Kimley-Horn was retained to determine the potential traffic impacts of this development (in accordance with the traffic study guidelines in the *SCDOT Access and Roadside Management Standards (ARMS) Manual* and the Lancaster County UDO Section 6.8), and to identify transportation improvements that may be required to accommodate these impacts. Based on the analyses contained herein, the following improvements are recommended as developer mitigation:

Rock Hill Highway (SC 5) and Riverside Road/W Rebound Road

Cost sharing with the planned Catawba COG intersection and Nisbet development projects towards the following improvements:

- Construction of an eastbound left-turn lane with 150 feet of storage.
- Construction of a westbound left-turn lane with 150 feet of storage.
- Installation of a traffic signal if/when warrants are met.

Riverside Road and Access 1

- Construction of Access 1 to include a single ingress lane, a single egress lane, and a 90-foot internal protected stem (IPS) with stop control.
- Construction of a northbound left-turn lane along Riverside Road with 150 feet of storage.
- Construction of a southbound right-turn lane along Riverside Road with 100 feet of storage.

The transportation improvements for the study intersections are subject to approval by SCDOT and Lancaster County. All additions and attachments to State and County roadway system shall be properly permitted, designed, and constructed in conformance to standards maintained by the agencies.

2.0 Introduction

The proposed site is located along the west side of Riverside Road, east of the Catawba River in Lancaster County, South Carolina. As currently envisioned, the overall development plan consists of a total of 936 single family homes, expected to be built-out in 2034. Based on information from the Client, 122 homes are currently constructed and closed, and are accounted for within existing traffic. Therefore, this TIA studies the impact of 814 additional single-family homes as an update to the prior Traffic Impact Assessment for Lancaster River Front Subdivision (3-29-2007). **Figure 2.1** shows the site location and study area.

Based on the current site plan, one additional access point along Riverside Road is proposed in addition to the existing Riverchase Estates access (Cobblestone Way). **Figure 2.2** shows the proposed site plan for the development.

Per the Lancaster County Unified Development Ordinance (UDO) Section 6.8, the impact of the development was analyzed for the year after the development is expected to be at full occupancy. Therefore, this TIA evaluates the traffic operations under 2022 existing conditions, 2035 background conditions (without the proposed development), and 2035 build-out conditions (with the proposed development) during the AM and PM peak hours.

Kimley-Horn was retained to determine the potential traffic impacts of this development (in accordance with the traffic study guidelines in the South Carolina Department of Transportation (SCDOT) *Access and Roadside Management Standards (ARMS) Manual* and the Lancaster County UDO Section 6.8), and to identify transportation improvements that may be required to accommodate these impacts.