MEMORANDUM

Date:	December 15, 2021
To:	Mr. Tim Crockett, P.E. – Crockett Engineering
From:	Ms. Shawn White, P.E., PTOE
CBB Job Number:	048-21
Project:	New Elementary School on Sinclair Road Proposed Mixed-Use Development – Sinclair Farms Columbia, Missouri

CBB completed a traffic impact study earlier this year, in June 2021, for the proposed Sinclair Farms mixed-use development. The development team was recently made aware the Columbia Public School District has plans to build a new elementary school on Sinclair Road adjacent to the existing John Warner Middle School to relieve overcrowding at the nearby elementary schools.

Based on the traffic counts collected as part of the Sinclair Farms Traffic Study, the morning peak hour occurred between 7:15 and 8:15 a.m. and the afternoon peak hour occurred between 4:45 and 5:45 a.m. While the start and end times are not known for the future elementary school, the area elementary schools have a start time of 8:20 a.m. and an end time of 3:20 p.m. Thus, the school dismissal impact would be entirely outside the commuter PM peak hour of 4:45 to 5:45 p.m. However, the school arrival trips would be expected to overlap with the end of the commuter AM peak hour of 7:15 and 8:15 a.m.

However, as noted in the Sinclair Farms Traffic Study with the recommended intersection improvements the intersections of Sinclair Road with Southampton Drive and with Nifong Boulevard are forecasted to operate at highly desirable LOS A and B with plenty of excess capacity to accommodate additional traffic.

The existing attendance boundaries for the area elementary schools is shown in **Figure 1**. The location of the future elementary school is noted by a yellow star in the figure.

Given the location of the area elementary schools it is likely that most of the attendance area for the new elementary school will be to the south on Sinclair Road, likely including the homes within the proposed Sinclair Farms development. That said, the new elementary school is not expected to have a notable impact on the intersections along Sinclair Road north of the proposed school (i.e., Southampton Drive and Nifong Boulevard); and the traffic volumes are much lower on Sinclair Road south of Southampton Drive, so the trips associated with the new school should be easily accommodated. It is likely the existing southbound left-turn lane on Sinclair Road at the

middle school would need to be extended to the north to also serve the future elementary school. Additionally, it is recommended sidewalks be provided along Sinclair Road to connect the future school to the area subdivisions.

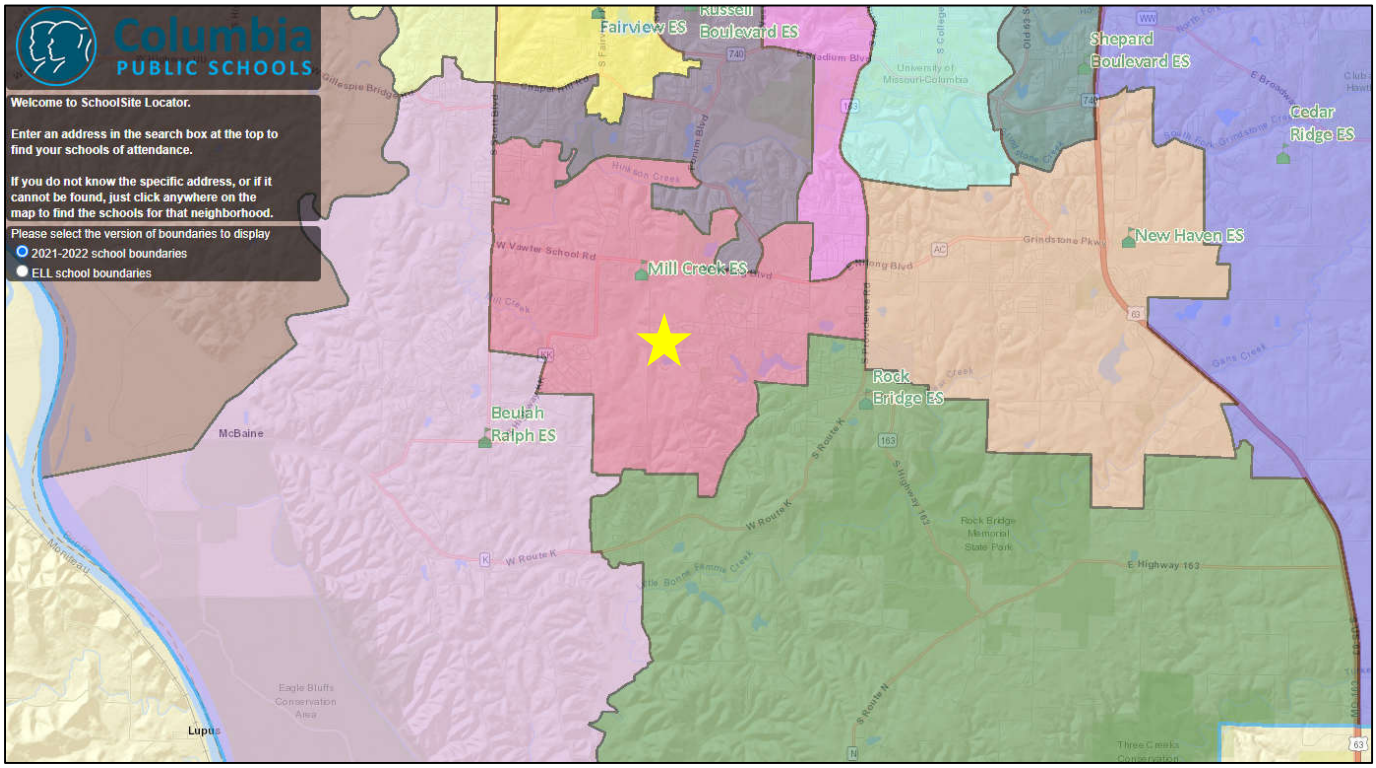

Figure 1: CPS Elementary School Attendance Area (2021)

Please do not hesitate to contact me via email at swhite@cbbtraffic.com or by phone at 314-449-9572 with any questions.

MEMORANDUM

Date:	October 6, 2021
To:	Mr. Tim Crockett, P.E. – Crockett Engineering
From:	Ms. Shawn White, P.E., PTOE
CBB Job Number:	048-21
Project:	Updated Site Plan Memo Proposed Mixed-Use Development – Sinclair Farms Columbia, Missouri

CBB completed a traffic study earlier this year, in June 2021, for the proposed Sinclair Farms mixed-use development. It is our understanding the site plan has been updated to reflect ongoing discussions with the City. Specifically, the new site plan reflects the extension of Southampton Drive to the west through the proposed development site. Furthermore, there have been slight modifications to the unit mix.

The original traffic study was based on the then proposed 450 single-family homes, 350 apartment units, and approximately 8 acres of neighborhood commercial. The current development plan consists of about the same amount of apartment units and commercial; however, the new plan proposes 490 single-family homes. The net difference is an increase of 40 single-family homes. The original Sinclair Farms concept plan is shown in **Exhibit 1** with the updated plan shown in **Exhibit 1A**.

Forecasts were prepared to estimate the amount of traffic that the additional 40 homes would generate during the weekday AM and PM peak periods. These forecasts were based upon information provided in the latest edition of the *Trip Generation Manual*.

As shown in **Table 1**, the additional 40 single-family homes would generate 35 trips during the AM peak hour and 40 trips during PM peak hour.

Table 1: Trip Generation Estimate – Additional 40 Single-Family Homes

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Single-Family Detached Housing ITE Code 210	40 Units	10	25	35	25	15	40

* Trips rounded to nearest 5 trips

Based on the original trip estimates in the June 2021 study of 605 trips during the AM peak hour and 865 trips during PM peak hour, the additional trips would amount to an approximate increase of five percent in the peak hours as compared to the original trip estimates which is well below the theoretical daily variation in traffic volumes of ten percent.

Although no specific traffic assignments or operational capacity evaluations were performed for the study intersections using the slighter higher trip estimates, it can be reasoned that operating conditions would be similar to the results reported in the June 2021 Traffic Study given the minimal change in trips. As such, the prior recommendations and findings would remain valid.

Please do not hesitate to contact me via email at swhite@cbbtraffic.com or by phone at 314-449-9572 with any questions.

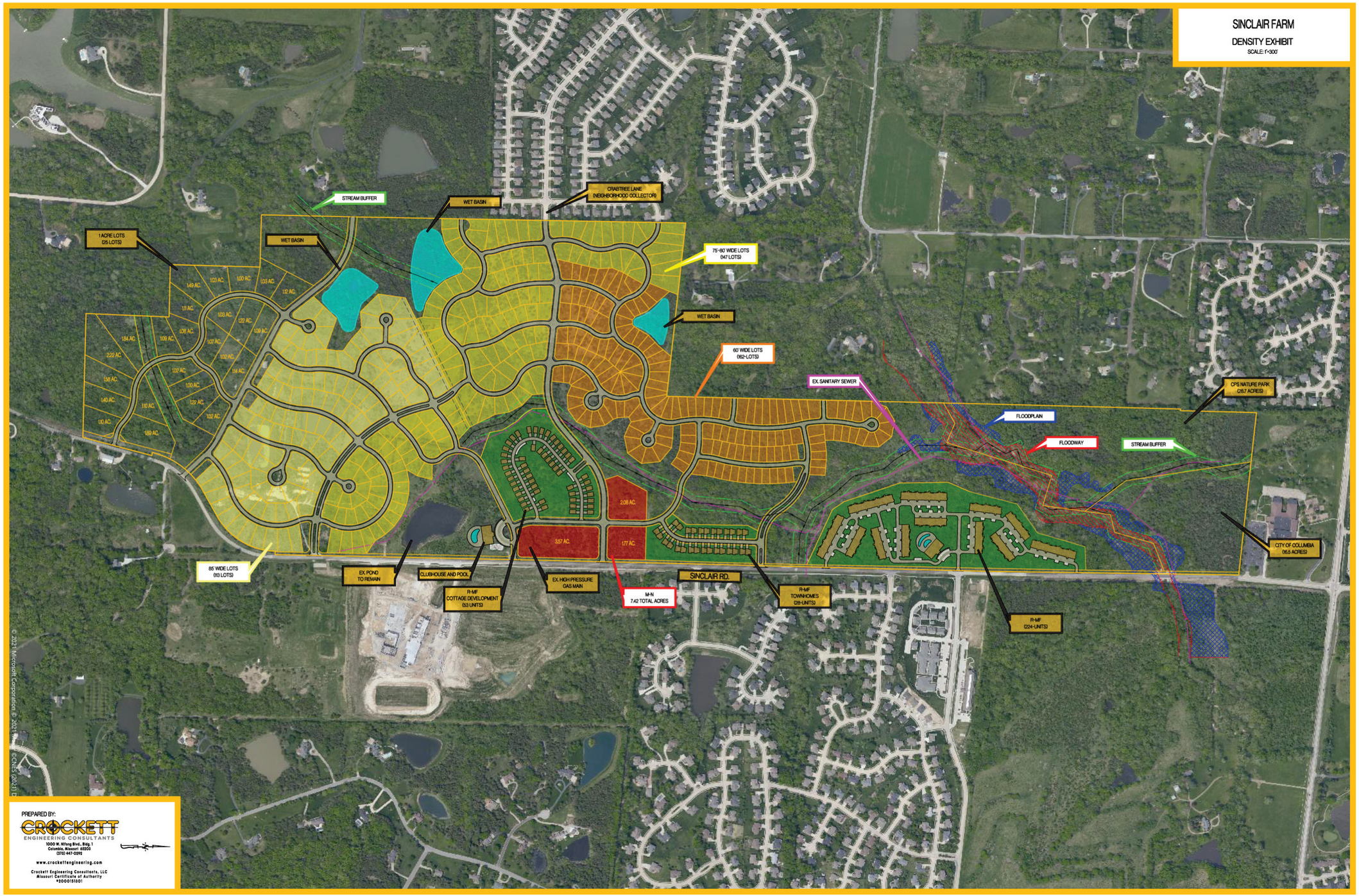

Exhibit 1: Preliminary Site Plan (provided by others)

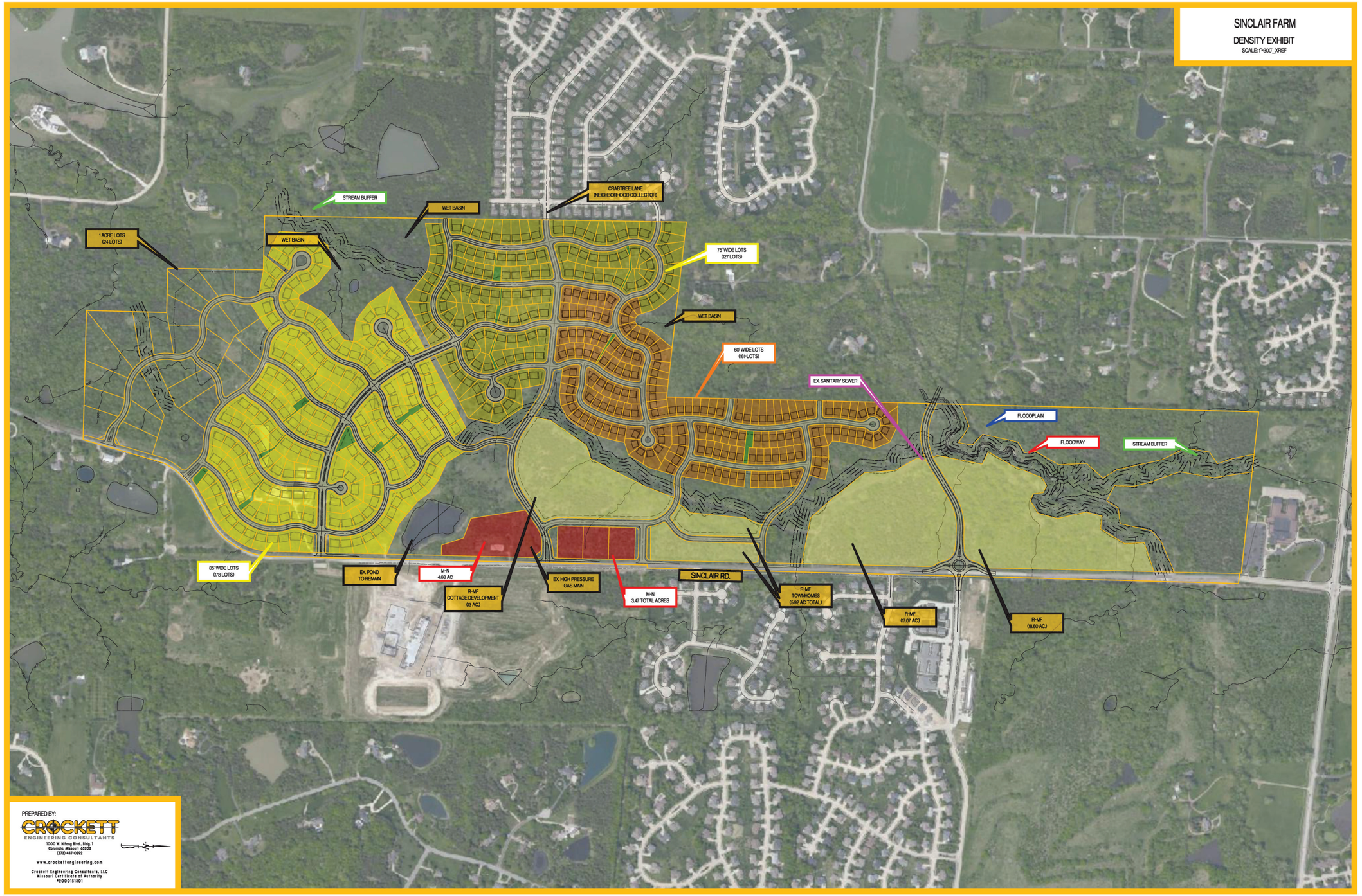

Exhibit 1A: Updated Preliminary Site Plan (provided by others)

June 24, 2021

Mr. Tim Crockett. P.E.
Crockett Engineering
1000 West Nifong Boulevard, Building 1
Columbia, MO 65203

RE: Traffic Impact Study – Sinclair Farms
Sinclair Road – South of Nifong Boulevard
Columbia, Missouri
CBB Job No. 048-21

Dear Mr. Crockett:

As requested, CBB has completed a traffic impact study pertaining to a proposed mixed-use development, known as Sinclair Farms, in Columbia, Missouri. The proposed site is located on the west side of Sinclair Road south of Nifong Boulevard. The location of the site relative to the surrounding area is depicted in **Figure 1**. Based on the latest site plan provided by Crockett Engineering, the proposed development will include single-family homes, multi-family units, and several commercial uses. A schematic of the concept plan provided is shown in **Exhibit 1**.

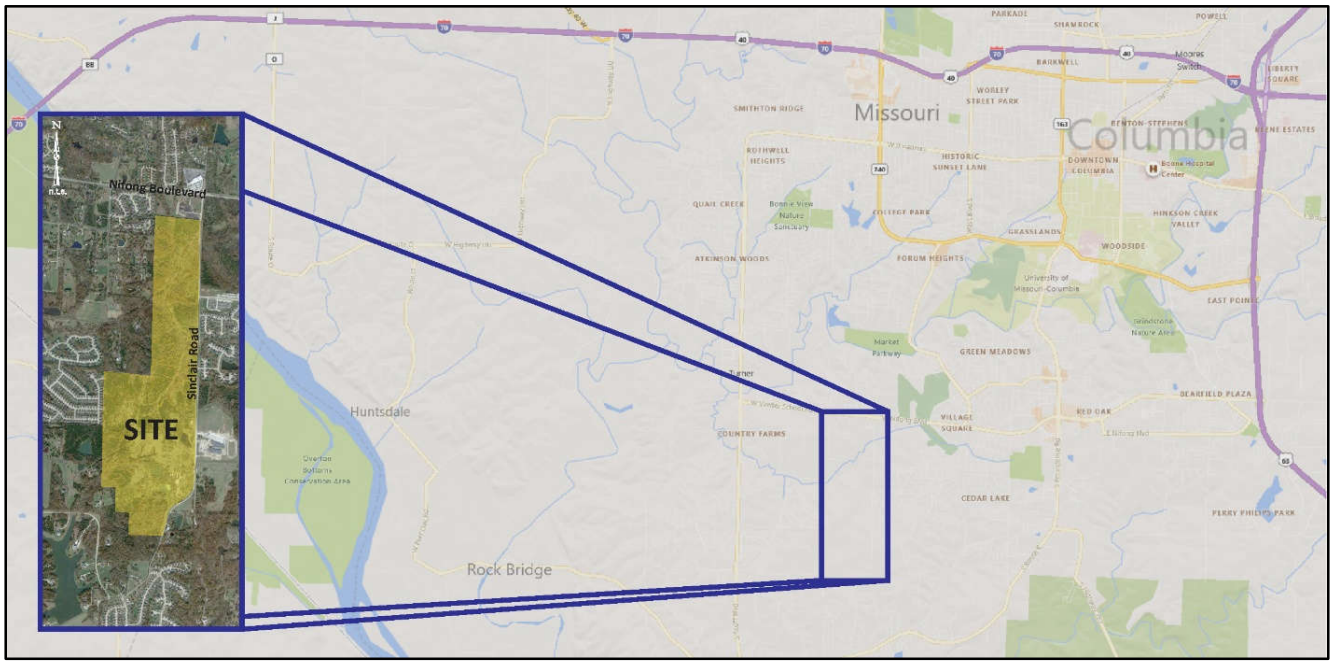

Figure 1: Location Map

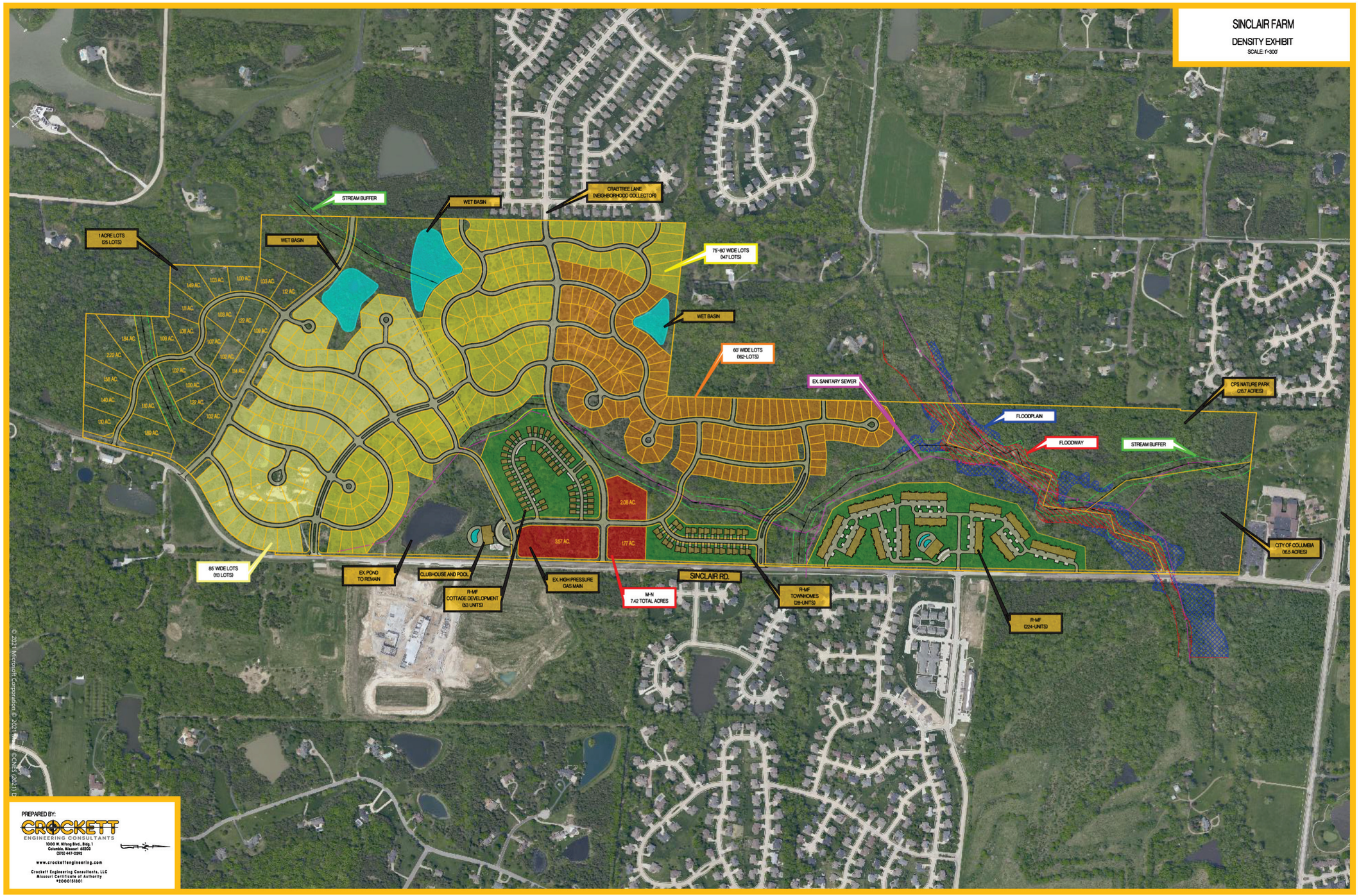

Exhibit 1: Preliminary Site Plan (provided by others)

The purpose of this study was to determine the number of additional trips that would be generated by the proposed development, assign the trips to the adjoining roadways, evaluate the impact of the additional trips on the operating conditions for the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. If necessary, roadway improvements (lane additions and/or traffic control modifications) would be recommended to mitigate the impact of the development and to accommodate the additional traffic. The focus of this study was the AM and PM peak hours of a typical weekday.

CBB discussed the scope of work for this traffic study with the City of Columbia at the commencement of the traffic study process. CBB also provided the City a Technical Memo summarizing the proposed site trip generation and directional distribution estimates and gained their consensus on the assumptions prior to completing the traffic analyses.

As requested by the City, the following intersections were included in the study:

- Sinclair Road and Nifong Boulevard;
- Sinclair Road and Southampton Drive;
- Sinclair Road and Highway K;
- Southampton Drive and Forum Boulevard;
- Southampton Drive and Bethel Street;
- Nifong Boulevard and Forum Boulevard;
- Nifong Boulevard and Old Mill Creek Road;
- Scott Boulevard and Vawter School Road; and
- Sinclair Road and the nine site access drives.

As requested, the traffic impact study evaluated the following analysis scenarios for the weekday AM and PM peak hours:

- 2021 Existing Conditions and
- 2021 Build Conditions (2021 Existing plus Site).

The following report presents the methodology and findings relative to the Existing and 2021 Build conditions.

EXISTING CONDITIONS

Area Roadway System: Nifong Boulevard is an east-west minor arterial roadway with a posted speed limit of 40 mph. Nifong Boulevard is owned and maintained by the City. Nifong Boulevard is primarily a two-lane road with one lane in each direction within the study area. However, Nifong Boulevard between Bethel Street and Willowcreek Lane provides four-lane roadway (two lanes in each direction). This segment of the roadway provides marked bike lanes, curb and gutter, and sidewalks on both side of the roadway. Paved shoulders are not provided in this segment. West of Willowcreek Lane, Nifong Boulevard provides one lane in each direction with paved shoulders and sidewalk adjacent to developed areas. Curb and gutters are also present on both sides of roadway.

Nifong Boulevard west of Old Mill Creek Road changes name to **Vawter School Road**. Sidewalks are provided on most developed parcels along the roadway. Paved shoulders are present along the roadway. Curb and gutters are also provided on both sides of the roadway. However, there are no marked bike lanes along the roadway.

Route K is a minor arterial, east-west, two-lane roadway (one lane in each direction) with a posted speed limit of 45 mph, within the study area. The roadway is owned and maintained by MoDOT. Marked bike lanes are not present on Route K. However, Route K provides paved shoulder on both sides of the roadway and some sidewalks are provided adjacent to the developed areas east of Sinclair Road.

Southampton Drive is classified as a major collector to the east of Forum Boulevard and a local road to the west. Southampton Drive is maintained by the City of Columbia. This east-west, two-lane (one lane in each direction) road has a posted speed limit of 30 mph. Sidewalks and marked bike lanes are present on both sides of the roadway between Bethel Street and Kirkdale Drive. West of Kirkdale Drive, sidewalk is provided only on south side of the roadway. Marked bike lanes are not present. Shoulders are not provided on Southampton Drive.

Bethel Street is a major collector that runs north-south through the study area and provides two travel lanes, one in each direction. Bethel Street is maintained by the City of Columbia. Bethel Street has a posted speed limit of 30 mph. Bike lanes and sidewalks are provided on both sides of the roadway. A “Bike Lane Ahead” sign is displayed near the Nikki Way intersection. Paved shoulders and curb and gutter are provided on both sides of Bethel Street. Note, Bethel Street changes name to Bethel Church Road south of Nikki Way and is under the jurisdiction of Boone County.

Forum Boulevard is classified as a major collector to the south of Nifong Boulevard and minor arterial to the north. Forum Boulevard is maintained by the City of Columbia. This road primarily runs north-south within the study area between Old Plank Road and Stadium Boulevard (Highway 740). Forum Boulevard has a posted speed limit of 35 mph north of Nifong Boulevard

and 30 mph south of Nifong Boulevard. North of Old Plank Road intersection, Forum Boulevard is a two-lane roadway (one lane in each direction). Sidewalks only exist on the west side of the roadway. Shoulders and marked bike lanes are not present. However, curb and gutters are provided along both sides of Forum Boulevard. Forum Boulevard between Dunbar Drive intersection and Green Meadows Road intersection provides sidewalk and marked bike lane on both sides of the roadway. "Right Lane Bike Only" signs are displayed near the Nifong intersection. North of Green Meadows Road Intersection, Forum Boulevard is a four-lane roadway with two lanes in each direction and changes into two-lane roadway (one lane at each direction) at the intersection of Woodrail Avenue (Crestwood Lane).

Sinclair Road is a major collector that runs north-south and provides two lane (one lane in each direction). Sinclair Road, within the study area, is maintained by the City of Columbia. Sinclair Road starts at Route K and ends approximately 0.25 mile north of Nifong Boulevard. The posted speed limit is 40 mph. Sidewalks are provided along the east side of the roadway between Nifong Boulevard to about one half mile south of Chesterfield Drive and Cascades Drive to Route K. There are no marked Bike lanes or shoulders provided along the roadway.

Old Mill Creek Road is a minor collector roadway that runs primarily north-south through the study area. Within the study area, Old Mill Creek Road has two lanes, one in each direction. The posted speed limit is 40 mph. Sidewalk is provided along the west side of the roadway near Nifong Boulevard. Some sidewalk is also provided on the west side of the roadway near Old Field Road. Shoulders and marked bike lanes are not provided along the roadway.

Old Mill Creek Road north of Nifong Boulevard changes names to Country Wood Road north of Nifong Boulevard. The posted speed limit on Country Wood Road is 30 mph. Sidewalks are provided along the west side of roadway near Nifong Boulevard. Shoulders and marked bike lanes are not provided along the roadway.

Scott Boulevard is a north-south minor arterial roadway. Within the study area, Scott Boulevard provides two-lanes (one lane in each direction). The road has a posted speed limit of 40 mph. North of Route KK, Scott Boulevard provides sidewalk and marked bike lane on both sides of the roadway. Paved shoulders are not present north of Route KK.

Scott Boulevard and Vawter School Road intersect at a roundabout. All the approaches consist of a single shared lane. **Figure 2** provides an aerial view of the Scott Boulevard and Vawter School Road roundabout.

Figure 2: Aerial View of the Scott Boulevard and Vawter School Road Intersection

Vawter School Road/Nifong Boulevard and Country Wood Road/Old Mill Creek Road intersect at a roundabout. All the approaches consist of a single shared lane. **Figure 3** provides an aerial view of the Vawter School Road/Nifong Boulevard and Country Wood Road/Old Mill Creek Road roundabout.

Nifong Boulevard and Sinclair Road intersect at a roundabout. All the approaches consist of a single shared lane. **Figure 4** provides an aerial view of the Nifong Boulevard and Sinclair Road roundabout.

Figure 3: Aerial View of the Nifong Boulevard and Old Mill Creek Road Intersection

Figure 4: Aerial View of the Nifong Boulevard and Sinclair Road Intersection

The intersection of Nifong Boulevard and Forum Boulevard is controlled by a traffic signal. The northbound and southbound approaches provide two left turn lanes, two through lanes and a right-turn lane. The eastbound approach provides two left turn lanes, one through lane, and a shared through/right-turn lane. The westbound approach provides a left-turn lane, two through lanes, and a right turn lane. All left-turns at the intersection operate under protected only phasing. The right-turns movements are channelized and controlled by a yield sign. **Figure 5** provides an aerial view of the Nifong Boulevard and Forum Boulevard intersection.

Figure 5: Aerial View of the Nifong Boulevard and Forum Boulevard Intersection

The intersection of Sinclair Road and Southampton Drive operates under side-street stop control with Southampton Drive stopping at Sinclair Road. All approaches consist of a single shared lane. **Figure 6** provides an aerial view of the Sinclair Road and Southampton Drive intersection.

The intersection of Forum Boulevard and Southampton Drive operates under All-Way STOP control. All approaches consist of a single lane (shared left/through/right-turn lane). **Figure 7** provides an aerial view of the Forum Boulevard and Southampton Drive intersection.

The intersection of Bethel Street and Southampton Drive also operates under All-Way STOP control. All approaches consist of a single lane (shared left/through/right-turn lane). **Figure 8** provides an aerial view of the Bethel Street and Southampton Drive intersection.

The intersection of Sinclair Road and Highway K operates under side-street stop control with Sinclair Road stopping at Highway K. All approaches consist of a single shared lane. **Figure 9** provides an aerial view of the Sinclair Road and Highway K intersection.

Figure 6: Aerial View of the Sinclair Road and Southampton Drive Intersection

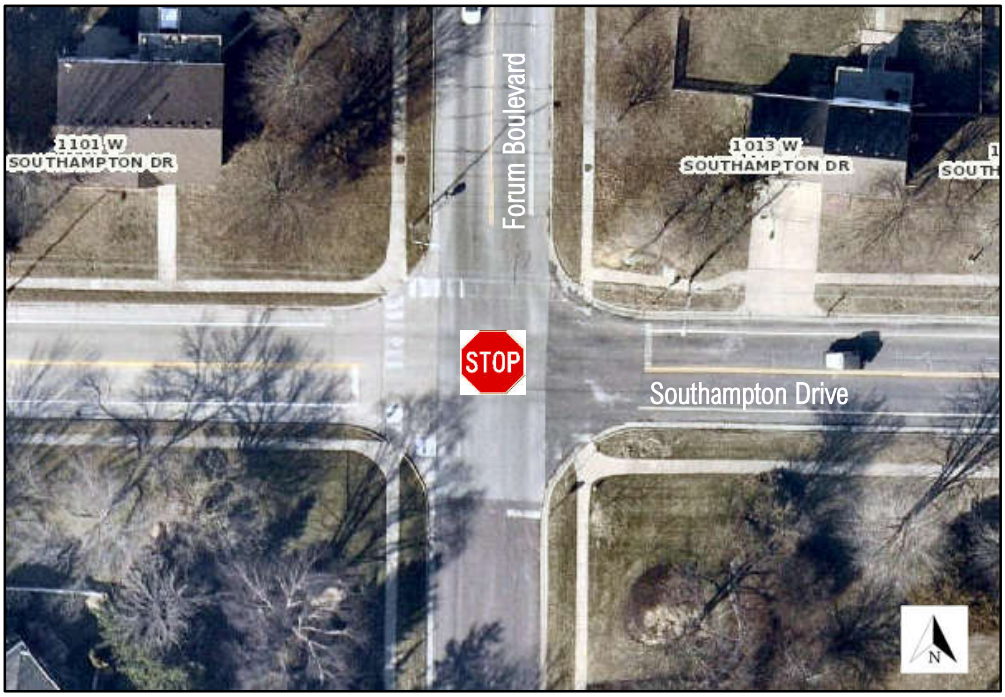

Figure 7: Aerial View of the Forum Boulevard and Southampton Drive Intersection

Figure 8: Aerial View of the Bethel Street and Southampton Drive Intersection

Figure 9: Aerial View of the Sinclair Road and Highway K Intersection

Existing Traffic Volumes: Video, turning movement traffic counts were conducted Thursday, April 22, 2021. A 13-hour turning movement count (7:00 a.m. - 8:00 p.m.) was collected at the intersection of Nifong Boulevard and Sinclair Road. Morning commuter peak period (7:00 - 9:00 a.m.) and afternoon commuter peak period (4:00 - 6:00 p.m.) video traffic counts were collected at the following intersections:

- Sinclair Road and Southampton Drive;
- Sinclair Road and Highway K;
- Southampton Drive and Forum Boulevard;
- Southampton Drive and Bethel Street;
- Nifong Boulevard and Forum Boulevard;
- Nifong Boulevard and Old Mill Creek Road; and
- Scott Boulevard and Vawter School Road.

Since the counts were collected during the lingering effects of COVID-19, CBB discussed the need to adjust the existing traffic count data to account of residual impacts of COVID-19 on traffic levels. Based on this discussion, it was decided the existing weekday PM peak hour traffic count would be used as counted and that the AM peak hour traffic counts would be increased by 15 percent to account for the slightly lower traffic levels during the AM peak hour as compared to pre-COVID levels.

Based on the traffic data collected, the morning peak hour occurred between 7:15 and 8:15 a.m. and the afternoon peak hour occurred between 4:45 and 5:45 p.m. The existing peak hour volumes are summarized in **Exhibit 2**.

Given the traffic characteristics in the area and the anticipated trip generation for the proposed development, the weekday AM and PM peak periods would represent a “worst-case scenario” with regards to the traffic impact. If traffic operations are acceptable during these peak periods, it can be reasoned that conditions would be acceptable throughout the remainder of the day.

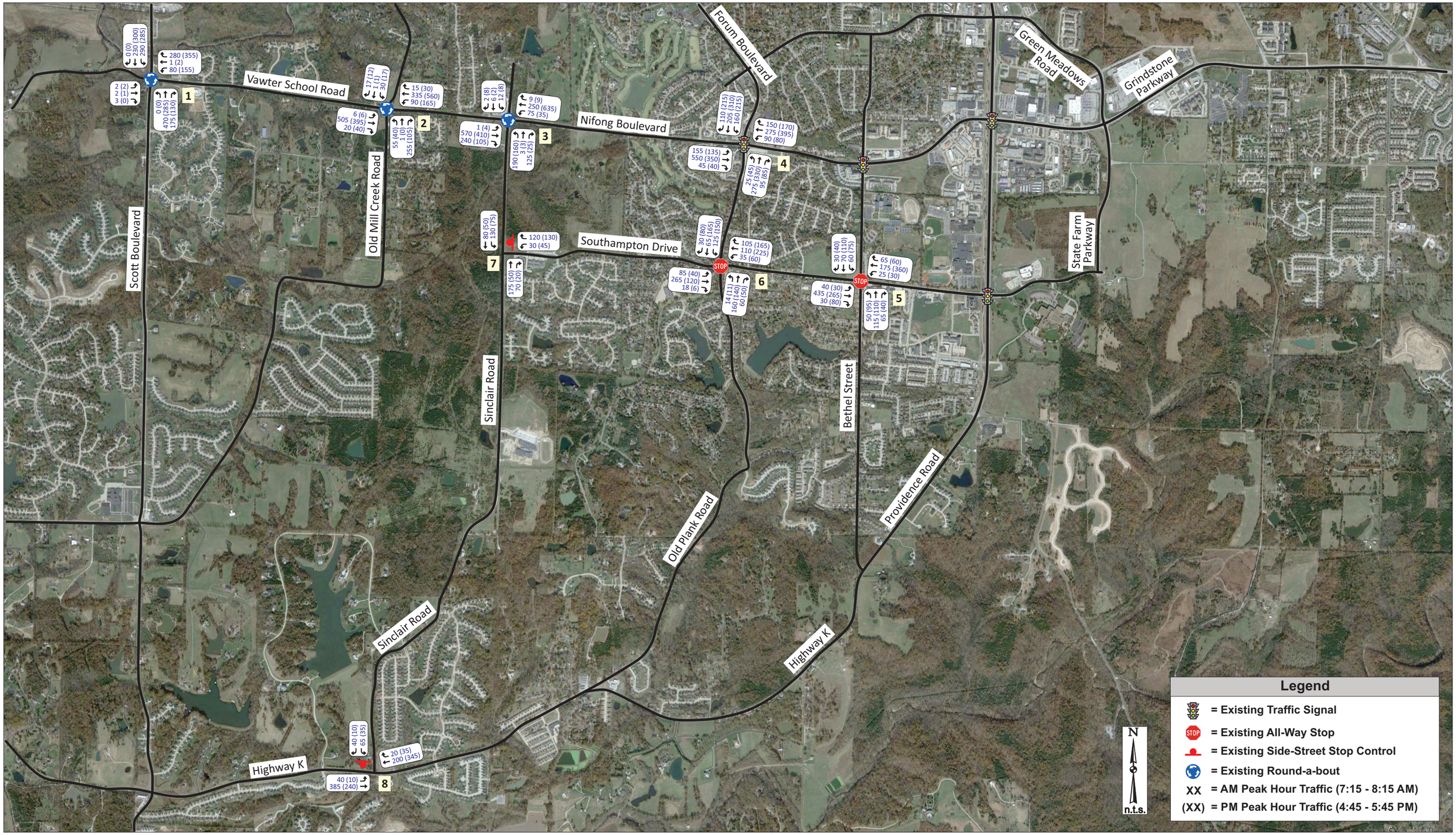

Exhibit 2: Existing Traffic Volumes

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06/24/2021

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PROPOSED SITE

Proposed Land Use: Based upon the concept plan provided by Crockett Engineering Consultants, previously shown in Exhibit 1, the proposed development will include approximately 424 single-family homes, 305 multi-family homes and 7.4 acres of neighborhood commercial uses. However as mentioned previously, the development plan is currently still in the concept phase and it is anticipated there could be more single-family and multi-family units than currently shown on the plan. As such, in an effort to be conservative, the traffic study will consider the impact of 450 single-family homes and 350 multi-family homes.

Site Access: As shown on the concept plan, access is proposed via nine new drives on Sinclair Road and via connection to the existing stub streets of Crabapple Lane and Cromford Mill Drive on the west side of the site. In addition, four stub streets are shown to connect to potential future development to the west.

Intersection Sight Distance: Based on guidelines published in *A Policy on Geometric Design of Highways and Streets* published by the American Association of State Highway and Transportation Officials (AASHTO) often referred to as the *Green Book,* the intersection sight distance requirement for the proposed drives on Sinclair Road is 500 feet (assuming a 40 mph posted speed limit and 45 mph design speed).

Note that the sight distance was not measured in the field to evaluate the available sight distance at the proposed site drives. It is recommended the site design engineer verify adequate sight distance is provided at the proposed site drives.

Furthermore, careful consideration should be given to sight distance obstructions when planning any future aesthetic enhancements, such as berms, fencing and landscaping, at any of the subdivision entrances to ensure that these improvements do not obstruct the view of entering and exiting traffic at the site intersections with the public roads. It is generally recommended that all improvements wider than two inches (posts, tree trunks, etc.) and higher than 3.5 feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

Trip Generation: Forecasts were prepared to estimate the amount of traffic that the proposed development would generate during the weekday AM and PM peak periods. These forecasts were based upon information provided in the latest edition of the *Trip Generation Manual*.

Trip estimates for the proposed development were based upon the following land uses:

- Land Use:210 – Single-Family Detached Housing for the assumed 450 homes;
- Land Use: 220 – Multifamily Housing (Low-Rise) for the assumed 350 apartments;
- Land Use: 710 – General Office Building for the assumed 15,000 SF of office space;

- Land Use: 932 – High-Turnover Sit-Down Restaurant for the assumed 10,000 SF restaurant spaces (assume half open in AM peak hour); and
- Land Use: 820 – Shopping Center for the assumed 35,000 SF commercial space.

The average trip rate per 1,000 gross square feet was used for the proposed restaurant using ITE Code 932: High-Turnover Sit-Down Restaurant and ITE Code: 820 Shopping Center. The fitted equation was used to estimate the single-family trips using ITE Code: 210 Single-Family Detached Housing, the office trips using ITE Code: 710 Office, and the multi-family trips using ITE Code: 220 Multi-Family Housing (Low-Rise). The peak hour of adjacent street traffic (one hour between 7:00 and 9:00 AM) was utilized for the AM peak hour and peak hour of adjacent street traffic (one hour between 4:00 and 6:00 PM) was utilized for the PM peak hour. Note, that one of the assumed sit-down restaurants is not expected to be open during the AM peak hour so a trip generation was not estimated.

It should be noted that not all of these trips would represent *new* traffic on the adjacent roadways. Nationwide studies have found that a percentage of convenience-oriented trips, such as restaurants and retail uses, would already be present on the adjacent roads and would be attracted to the development on their way to or from home, work or another destination (i.e., pass-by trips). Specifically, a portion of the traffic attracted to this site would already be traveling on the adjacent roadways as part of another trip (i.e., "pass-by" trip). The pass-by trips would not increase traffic on the adjacent roadways, but they would increase the turning movements at the drives serving the development site. Therefore, statistical information provided in the *Trip Generation Handbook, 3rd Edition*, published by ITE, was utilized to estimate pass-by percentages for the proposed uses.

As a result, pass-by percentages of 20% and 34% were applied to the shopping (retail) trips during the AM and PM peak hour, respectively and pass-by percentages of 30% and 43% were applied to the restaurant trips during the AM and PM peak hour, respectively. This represents about 20 pass-by trips during the AM peak hour and 70 pass-by trips during the PM peak hour.

As shown in **Table 1**, the proposed Sinclair Farms mixed-use development would generate 585 new vehicular trips with a majority outbound during the AM peak hour and 795 new vehicular trips with more inbound trips during PM peak hour.

Trip Distribution*:* The site-generated trips for the proposed development were then assigned into and out of the site based upon an estimated directional distribution. Based upon the existing travel patterns, the surrounding area and roadway network, and the proximity to similar uses, it is anticipated that the distribution of new site-generated trips would be as summarized in **Table 2**.

Table 1: Trip Generation Estimate – Sinclair Farms Mixed-Use Development

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Single-Family Detached Housing ITE Code 210	450 Units	80	245	325	270	160	430
Multi-Family Homes Low Rise ITE Code 220	350 Units	35	120	155	115	65	180
General Office ITE Code 710	15,000 SF	35	5	40	5	15	20
High-Turnover Sit-Down Restaurant ITE Code 932	5,000 SF				30	20	50
High-Turnover Sit-Down Restaurant ITE Code 932	5,000 SF	25	25	50	30	20	50
General Retail ITE Code 820	35,000 SF	20	15	35	65	70	135
Total Trips		195	410	605	515	350	865
Pass-by Trips		**10**	**10**	**20**	**35**	**35**	**70**
New Trips		**185**	**400**	**585**	**480**	**315**	**795**

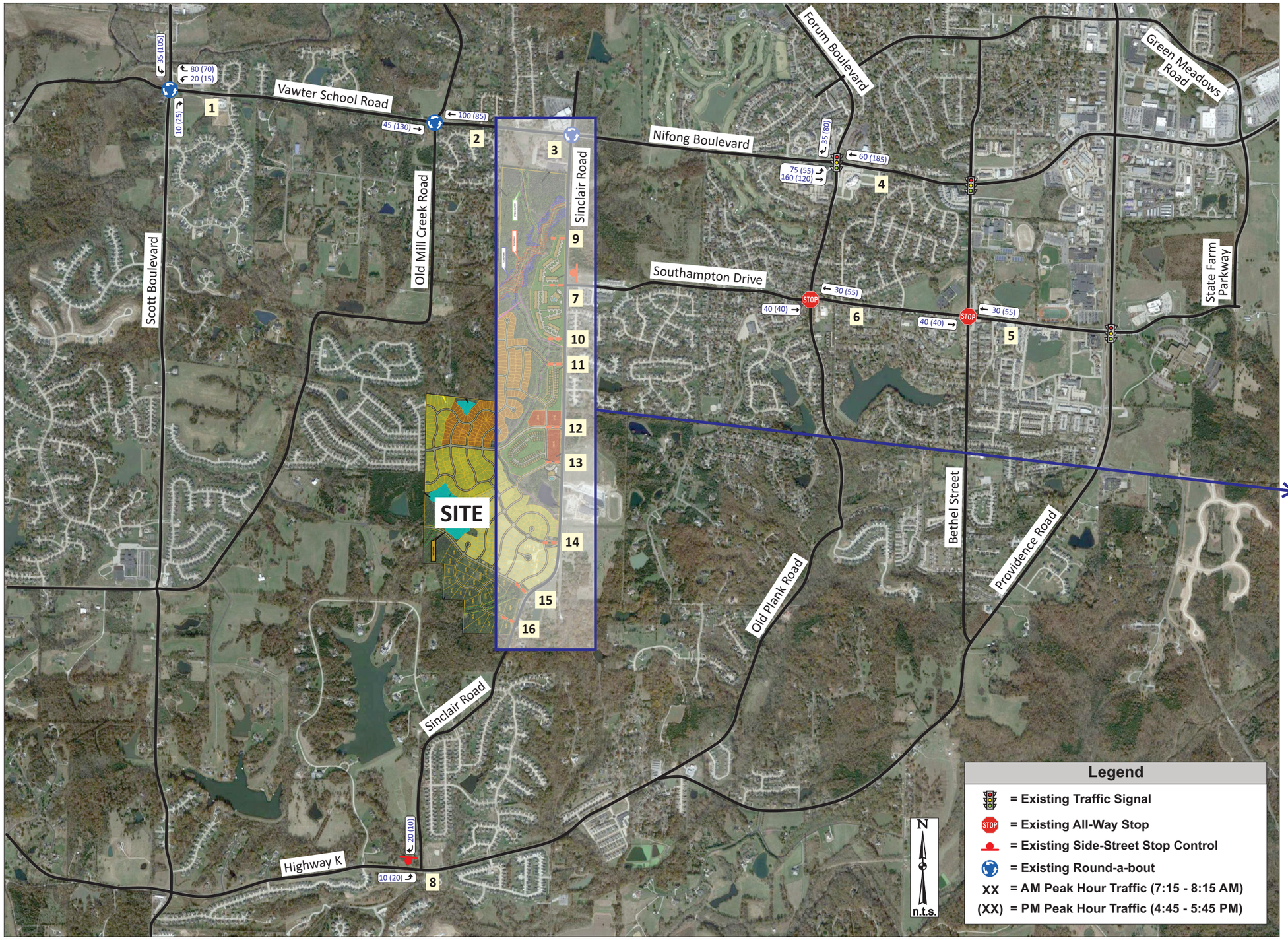
* Trips rounded to nearest 5 trips

Table 2: Trip Distribution Assumptions (New Trips)

Land Use	Trip Distribution Assumptions	
	Residential	Commercial
To/from the north on Scott Boulevard Via Vawter School	22%	20%
To/from the south on Scott Boulevard Via Vawter School and Highway K	3%	10%
To/from Old Mill Creek Road	0%	10%
To/from the south on Sinclair Road	3%	10%
To/from the east on Southampton Drive	10%	20%
To/from the east on Nifong Boulevard	62%	30%

Exhibit 3 illustrates the site-generated traffic assignment for the proposed development trips at the study intersections.

2021 Build Traffic Volumes: The traffic generated by the proposed development (Exhibit 3) was aggregated with the Existing Traffic volumes (Exhibit 2) to reflect the forecasted, or build, traffic volumes. **Exhibit 4** illustrates the 2021 Build Traffic Volumes.



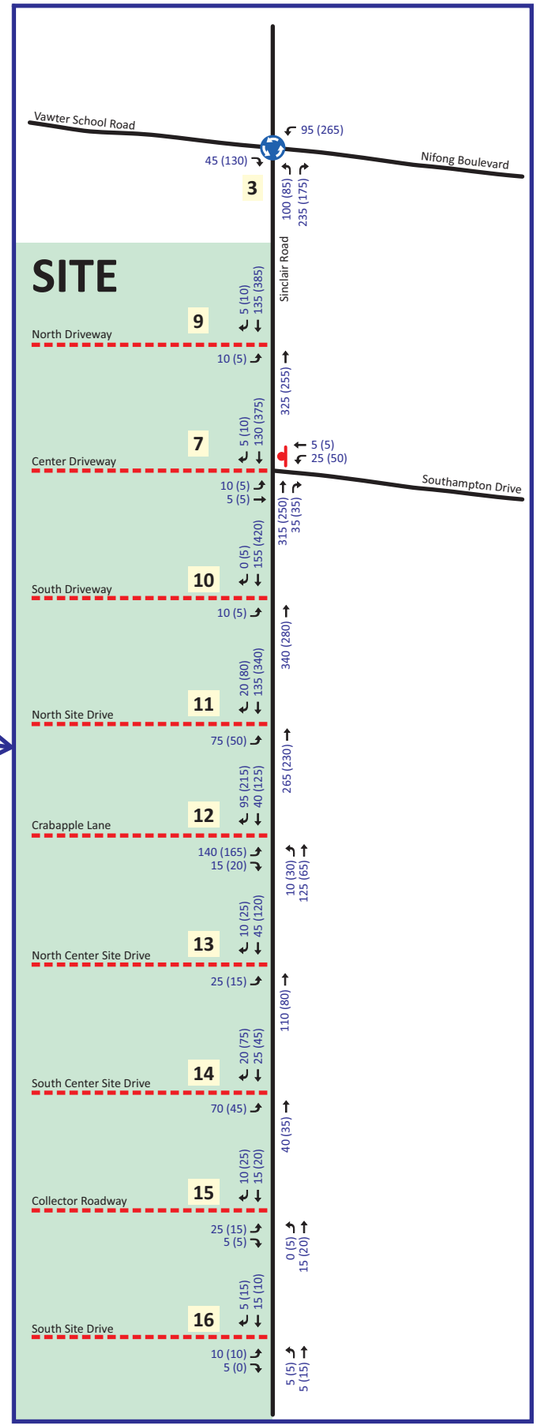


Exhibit 3: Site-Generated Trips

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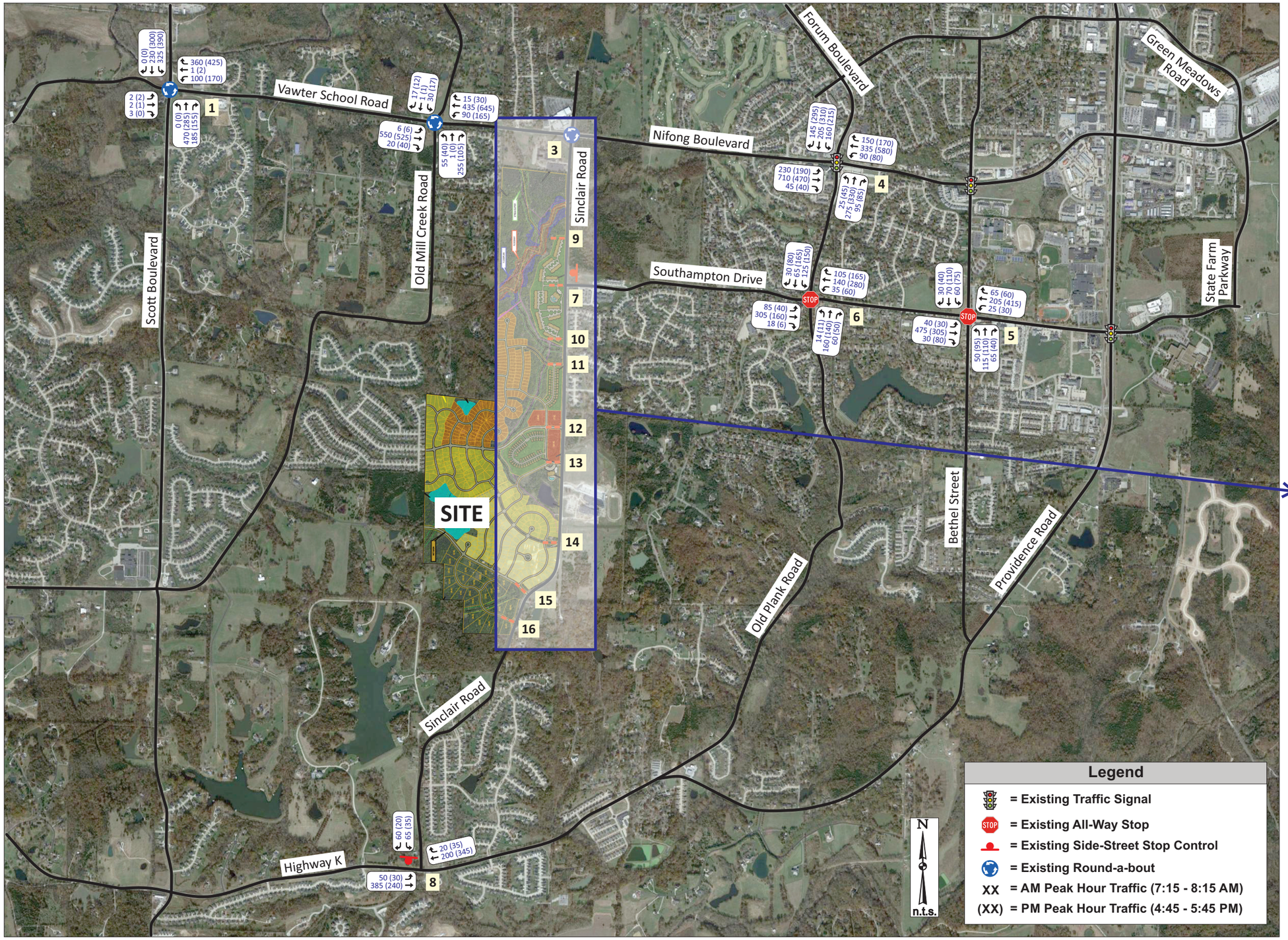

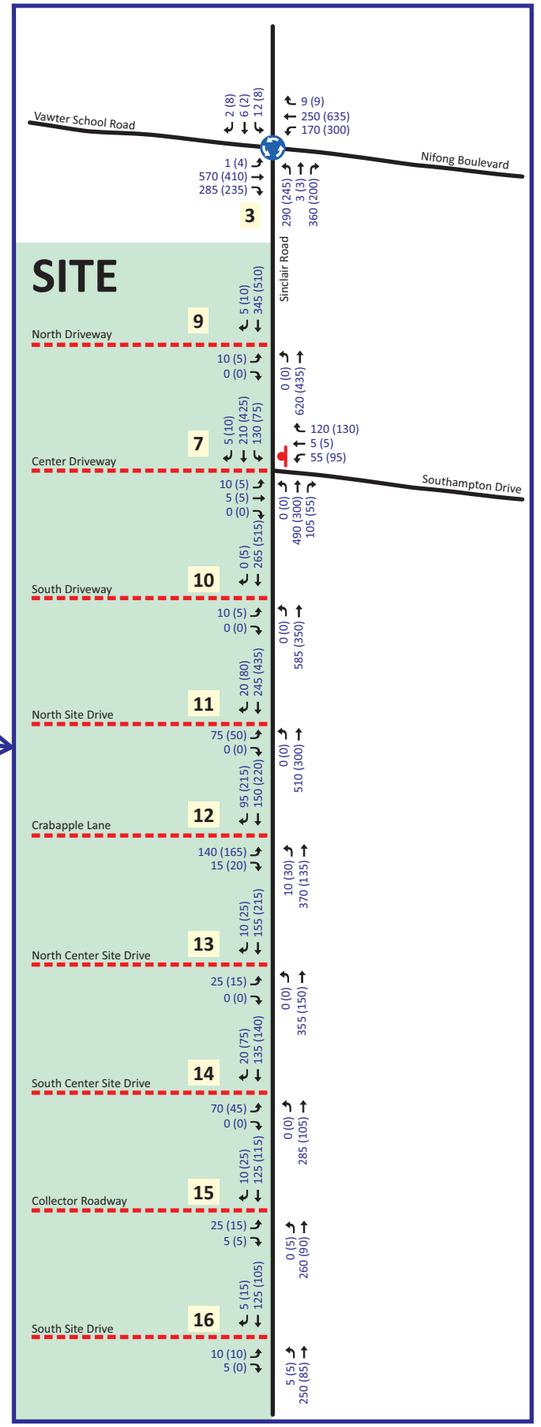

Exhibit 4: 2021 Build Traffic Volumes

Job# 048-21
06/24/2021

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TRAFFIC ANALYSIS

Study Procedure: The Existing and 2021 Build operating conditions for the study intersections were evaluated using SYNCHRO 10 and SIDRA for the roundabouts. Both SYNCHRO and SIDRA are based on procedures outlined in the *Highway Capacity Manual* to determine estimates of capacity and operational performance of signalized and unsignalized intersections. This manual, which is used universally by traffic engineers to measure roadway capacity, establishes six levels of traffic service: Level A ("Free Flow"), to Level F ("Fully Saturated"). Levels of service (LOS) are measures of traffic flow which consider such factors as speed, delay, traffic interruptions, safety, driver comfort, and convenience. Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, Level D is generally considered acceptable for peak period conditions.

The thresholds that define level of service at an intersection are based upon the type of control used (i.e., whether it is signalized or unsignalized) and the calculated delay. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and aggregated for each approach and then the intersection as a whole. At intersections with partial (side-street) stop control, delay is calculated for the minor movements only since motorists on the main road are not required to stop.

Level of service is directly related to control delay. At signalized intersections, the level of service criteria differs from that at unsignalized intersections primarily because varying transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes and consequently may experience greater delays than an unsignalized intersection. **Table 3** summarizes the thresholds used in the analysis for signalized and unsignalized intersections.

Table 3: Level of Service Thresholds

LEVEL OF SERVICE (LOS)	CONTROL DELAY PER VEHICLE (SEC/VEH)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 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

Auxiliary Left-Turn Lane Warrants: The need for northbound left-turn lanes on Sinclair Road at the proposed site drives were evaluated using the Left-Turn Guidelines for Two-lane Roadway nomograph which is based on criteria using *MoDOT's Access Management Guidelines* (AMG). The MoDOT criteria provide guidelines for separate left-turn lanes on the through roadway by comparing the total advancing volume (which includes all turning traffic) to the total opposing volume (which includes opposing through and right-turn movements) during the design hour with respect to the number of mainline left-turns. Then, the percentage of left-turns is determined by dividing the number of left-turns by the total advancing volume. If the point lies to the right of the percentage line, then a left-turn lane should be considered. If the point is to the left of the line, then a left-turn lane is not necessary. Since, the posted speed on Sinclair Road is 40 mph, the 45 mph graph was used. Note, the MoDOT AMG states that "a left-turn lane is not needed for a left turn volume less than 10 vph unless criteria other than volume, such as crash experience, justify the need". Thus, at site drives where the forecasted left-turn movement is 10 vph or less in the peak hours, a left-turn lane is not necessary.

Figure 10 graphically illustrate the northbound left-turn lane evaluations at Crabapple Lane, assuming the 2021 Build traffic volumes during the weekday AM and PM peak hours. As can be seen in **Figure 10**, a separate northbound left-turn lane on Sinclair Road is not warranted at Crabapple Lane.

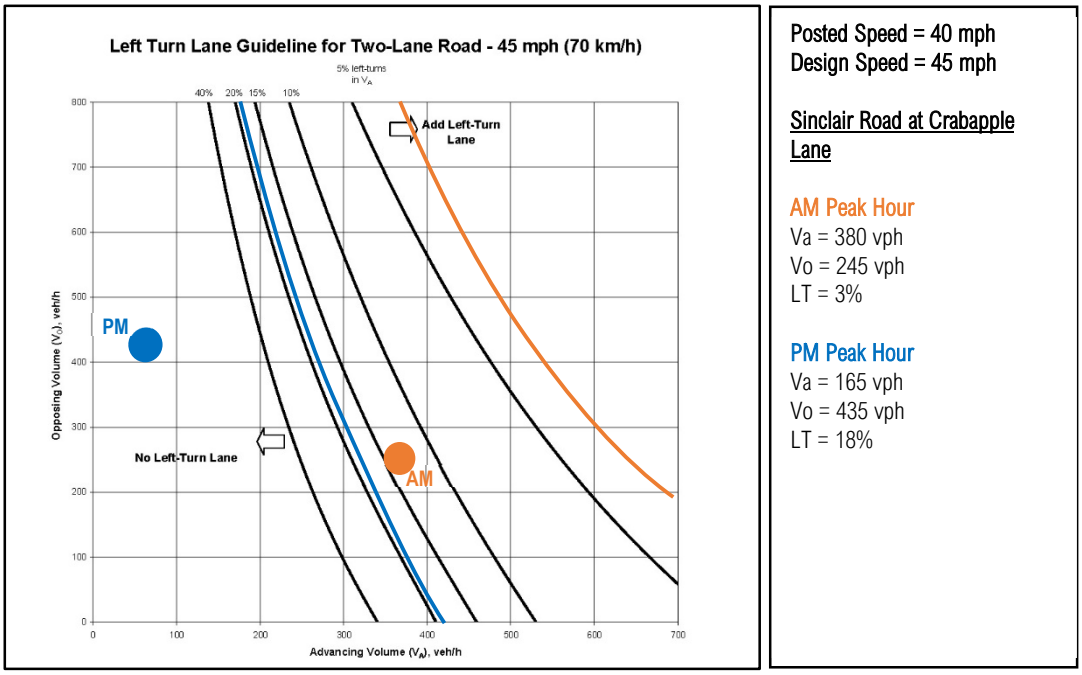


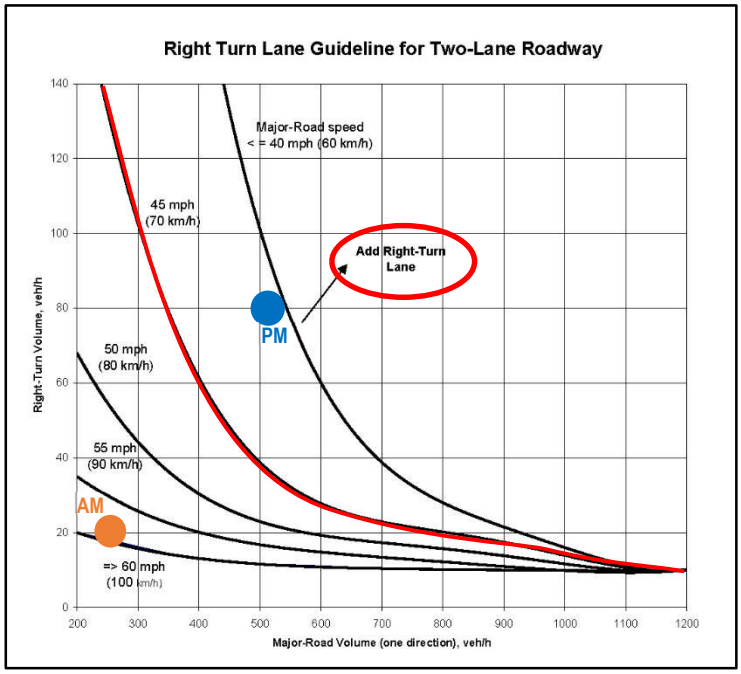
Figure 10: Northbound Sinclair Road Left-Turn Warrants – 2021 Build Crabapple Lane

Auxiliary Right-Turn Lane Warrants: The need for southbound right-turn lanes on Sinclair Road at the proposed site drives were evaluated using the Right-Turn Guidelines for Two-Lane Roadway nomograph which is based on criteria from MoDOT's AMG criteria. The MoDOT AMG provides guidelines for separate right-turn lanes on the through roadway by comparing the total advancing volume (which includes all turning traffic) to the number of mainline right-turns. The operating speed (posted speed limit) of the major roadway is used to determine if a right-turn lane is warranted. If the point lies to the right of the operating speed line, then a right-turn lane should be considered. If the plotted point is to the left of the line, then a left-turn lane is not necessary. Sinclair Road has a posted speed of 40 mph, so the 45 mph graph line was used. Note, the MoDOT AMG states that "a right-turn lane is not needed for a right turn volume less than 10 vph unless criteria other than volume, such as crash experience, justify the need". Thus, at site drives where the forecasted right-turn movement is 10 vph or less in the peak hours, a right-turn lane is not necessary.

Figures 11 through **16** graphically illustrate the southbound right-turn evaluations for the 2021 Build traffic volumes during the weekday AM and PM peak hours at the following intersections:

- Proposed North Site Drive (Figure 11);
- Crabapple Lane (Figure 12);
- Proposed North Center Site Drive (Figure 13);
- Proposed South Center Site Drive (Figure 14);
- Proposed Collector Roadway (Figure 15); and
- Proposed south site Drive (Figure 16).

As shown in **Figures 11** and **12**, a separate southbound right-turn lane is warranted at the proposed north site drive and at Crabapple Lane. As shown in **Figures 13** through **16**, separate southbound right-turn lanes are not warranted at the proposed north center site drive, proposed south center site drive, proposed collector roadway, and proposed south site drive.



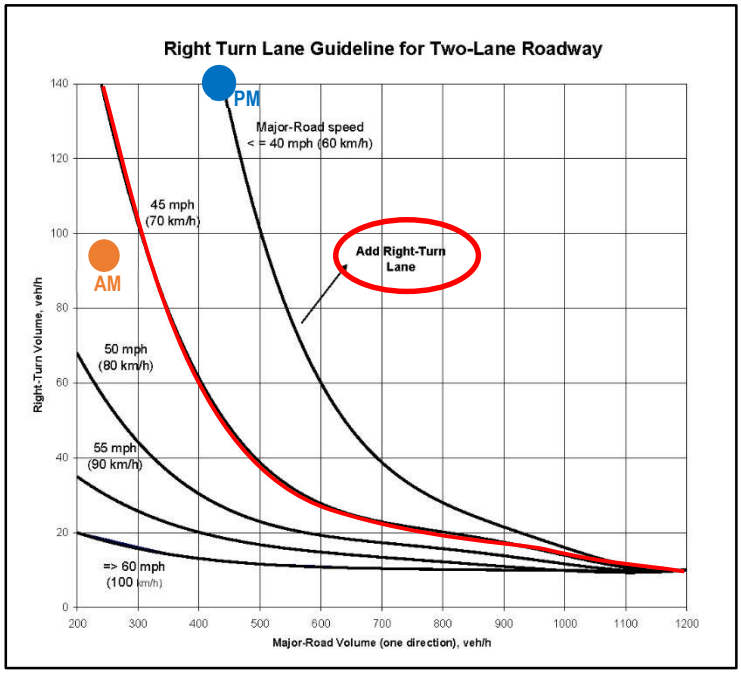
Posted Speed = 40 mph
Design Speed = 45 mph

Sinclair Road at Proposed North Site Drive

AM Peak Hour
Va = 265 vph
RT = 20 vph

PM Peak Hour
Va = 515 vph
RT = 80 vph

Figure 11: Southbound Sinclair Road Right-Turn Warrants – 2021 Build Proposed North Site Drive



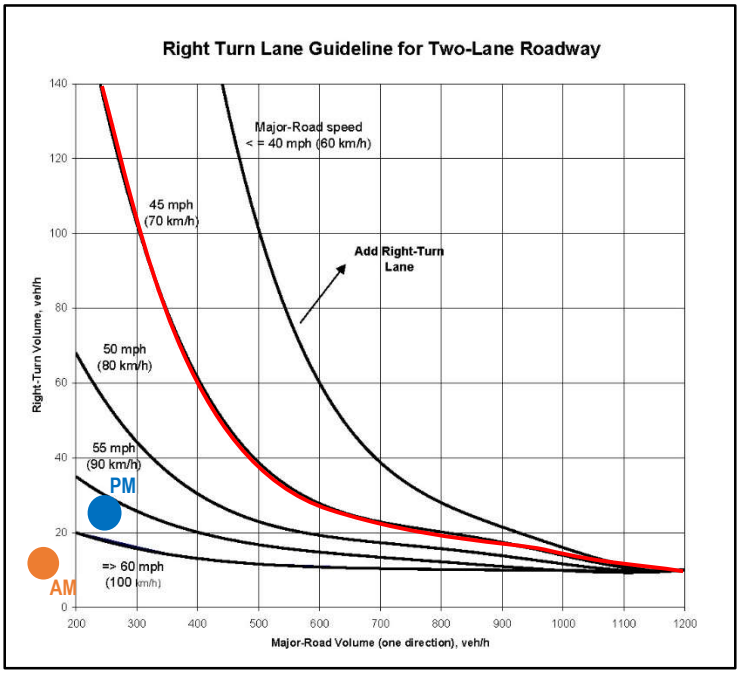
Posted Speed = 40 mph
Design Speed = 45 mph

Sinclair Road at Crabapple Lane

AM Peak Hour
Va = 245 vph
RT = 95 vph

PM Peak Hour
Va = 435 vph
RT = 215 vph

Figure 12: Southbound Sinclair Road Right-Turn Warrants – 2021 Build Crabapple Lane



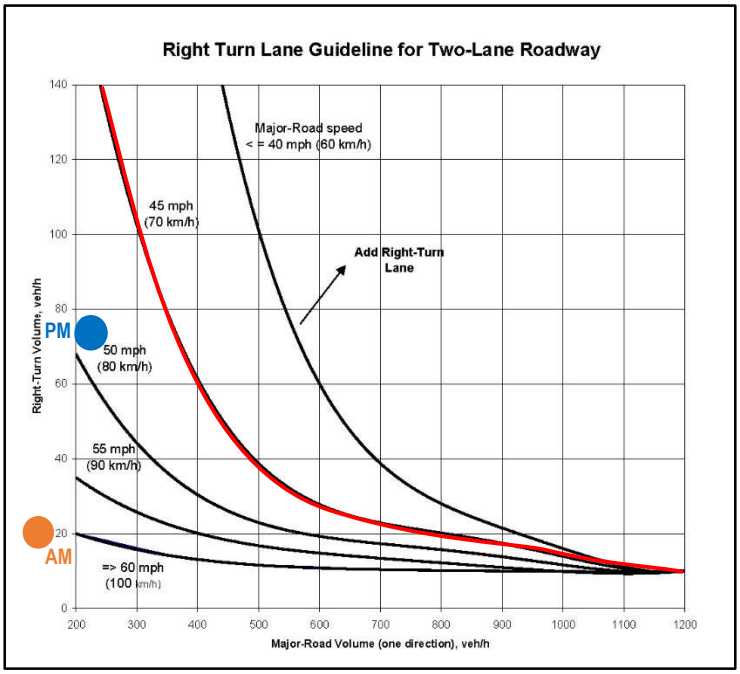
Posted Speed = 40 mph
Design Speed = 45 mph

Sinclair Road at Proposed
North Center Site Drive

AM Peak Hour
Va = 165 vph
RT = 10 vph

PM Peak Hour
Va = 240 vph
RT = 25 vph

Figure 13: Southbound Sinclair Road Right-Turn Warrants – 2021 Build Proposed North Center Site Drive



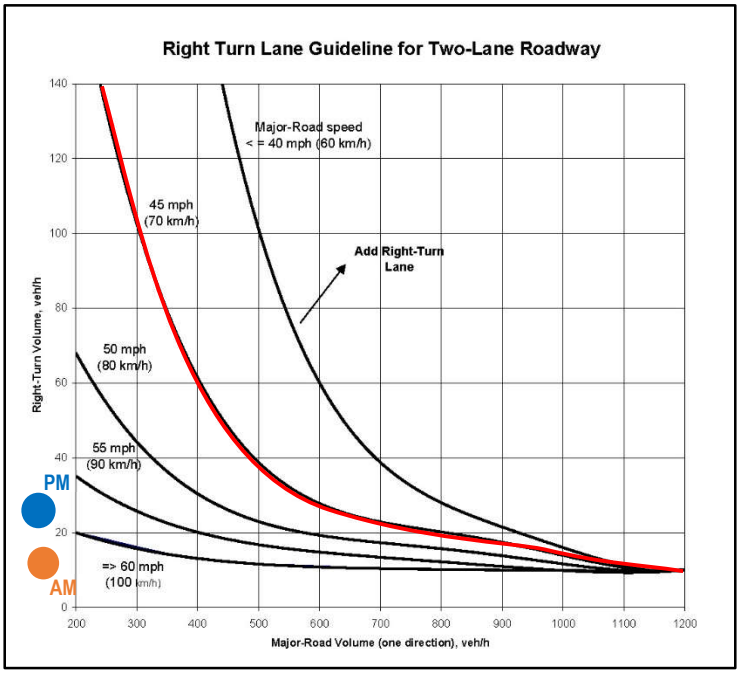
Posted Speed = 40 mph
Design Speed = 45 mph

Sinclair Road at Proposed
South Center Site Drive

AM Peak Hour
Va = 155 vph
RT = 20 vph

PM Peak Hour
Va = 215 vph
RT = 75 vph

Figure 14: Southbound Sinclair Road Right-Turn Warrants – 2021 Build Proposed South Center Site Drive



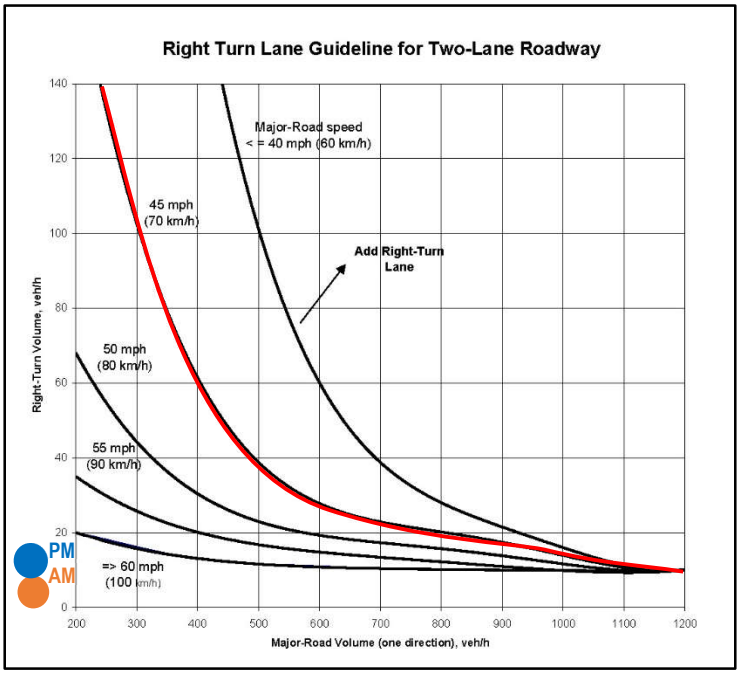
Posted Speed = 40 mph
Design Speed = 45 mph

Sinclair Road at Proposed Collector Road

AM Peak Hour
Va = 135 vph
RT = 10 vph

PM Peak Hour
Va = 140 vph
RT = 25 vph

Figure 15: Southbound Sinclair Road Right-Turn Warrants – 2021 Build Proposed Collector Road



Posted Speed = 40 mph
Design Speed = 45 mph

Sinclair Road at Proposed South Site Drive

AM Peak Hour
Va = 130 vph
RT = 5 vph

PM Peak Hour
Va = 120 vph
RT = 15 vph

Figure 16: Southbound Sinclair Road Right-Turn Warrants – 2021 Build Proposed South Site Drive

Operating Conditions: The study intersections were evaluated using the methodologies described above. **Table 4** summarizes the results of these analyses, which reflect the existing and 2021 Build operating conditions and average delays for each of the study intersections during the weekday AM and PM peak hours. The Synchro estimated 95th percentile queue is also noted for key movements at the study intersections. Note, the warranted southbound right-turn lanes on Sinclair Road at the proposed north site drive and Crabapple Lane were included in the traffic operations analysis section below shown in Table 5 for the 2021 Build conditions. All site drives were assumed to have one lane exiting with the exception of the Crabapple Lane extension which was assumed to have two lanes exiting (a right-turn lane and a left-turn lane).

Table 4: 2021 Operating Conditions Summary

Intersection / Approach	AM Peak Hour		PM Peak Hour	
	2021 Existing	2021 Build	2021 Existing	2021 Build
1 – Scott Boulevard and Brushwood Lake Road/Vawter School Road (Roundabout)				
Eastbound Brushwood Lake Road Approach	A (5.4)	A (5.8)	A (6.3)	A (7.3)
Westbound Vawter School Road Approach	B (11.9)	C (16.1)	B (11.8)	B (14.8)
Northbound Scott Boulevard Approach	C (17.5)	C (20.6)	A (9.4)	B (12.5)
Southbound Scott Boulevard Approach	A (7.8)	A (8.7)	B (10.4)	B (13.7)
Overall	**B (12.9)** v/c: 0.74	**C (15.4)** v/c: 0.79	**B (10.6)** v/c: 0.59	**B (13.7)** v/c: 0.69
2 – Nifong Boulevard and Old Mill Creek Road/Country Wood Road (Roundabout)				
Eastbound Nifong Boulevard Approach	A (8.7)	A (9.5)	A (8.0)	B (10.4)
Westbound Nifong Boulevard Approach	A (6.7)	A (7.9)	B (11.3)	B (13.6)
Northbound Old Mill Creek Road Approach	B (11.9)	B (13.0)	A (6.4)	A (7.7)
Southbound Country Wood Road Approach	A (5.4)	A (6.1)	A (7.2)	A (8.0)
Overall	**A (8.7)** v/c: 0.50	**A (9.6)** v/c: 0.55	**A (9.6)** v/c: 0.66	**B (11.8)** v/c: 0.73
3 – Nifong Boulevard and Sinclair Road (Roundabout)				
Eastbound Nifong Boulevard Approach	C (24.2) 95th Q: 850' TH	F (50.9) 95th Q: 1550' TH	A (7.3) 95th Q: 80' TH	C (18.2) 95th Q: 345' TH
Westbound Nifong Boulevard Approach	A (8.8) 95th Q: 65' TH	B (10.7) 95th Q: 115' TH	B (13.1) 95th Q: 215' TH	F (58.6) 95th Q: 1585' TH
Northbound Sinclair Road Approach	D (28.6) 95th Q: 260' LT	F (172.9) 95th Q: 2110' RT	A (7.0) 95th Q: 30' LT	B (13.6) 95th Q: 145' LT
Southbound Sinclair Road Approach	A (6.1)	A (6.8)	A (7.4)	B (10.9)
Overall	**C (21.8)** v/c: 0.87	**F (84.2)** v/c: 1.32	**B (10.1)** v/c: 0.68	**E (35.7)** v/c: 1.04

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)
95th percentile queue for the critical movement of the approach and lane (L-Left, TR-Shared Thru/Right, R-Right)

Table 4: 2021 Operating Conditions Summary (Continued)

Intersection / Approach	AM Peak Hour		PM Peak Hour	
	2021 Existing	2021 Build	2021 Existing	2021 Build
4 – Nifong Boulevard and Forum Boulevard (Signalized)				
Eastbound Nifong Boulevard Approach	C (30.0)	C (34.0)	C (33.9)	D (37.8)
Westbound Nifong Boulevard Approach	C (23.1)	C (23.7)	C (24.7)	C (27.5)
Northbound Forum Boulevard Approach	C (33.6)	C (33.6)	C (30.8)	C (30.8)
Southbound Forum Boulevard Approach	C (33.6)	C (32.3)	C (30.7)	C (28.8)
Overall	**C (29.8)** v/c: 0.65	**C (31.1)** v/c: 0.72	**C (29.8)** v/c: 0.63	**C (31.0)** v/c: 0.72
5 – Southampton Drive and Bethel Street (All-Way STOP)				
Eastbound Southampton Drive Approach	F (109.7)	F (154.9)	F (81.9)	F (115.0)
Westbound Southampton Drive Approach	C (24.1)	D (29.2)	F (129.4)	F (186.5)
Northbound Bethel Street Approach	C (19.5)	C (20.2)	E (46.9)	E (47.0)
Southbound Bethel Street Approach	C (16.7)	C (17.2)	D (32.5)	D (32.6)
Overall	**F (58.7)** v/c: 1.15	**F (80.6)** v/c: 1.26	**F (80.4)** v/c: 1.18	**F (110.9)** v/c: 1.32
6 – Southampton Drive and Forum Boulevard (All-Way STOP)				
Eastbound Southampton Drive Approach	D (25.2)	E (37.6)	C (17.8)	C (21.5)
Westbound Southampton Drive Approach	C (16.7)	C (20.9)	F (79.3)	F (142.0)
Northbound Forum Boulevard Approach	C (16.1)	C (18.1)	C (19.2)	C (20.7)
Southbound Forum Boulevard Approach	C (16.8)	C (18.9)	F (52.7)	F (60.8)
Overall	**C (19.4)** v/c: 0.73	**D (25.8)** v/c: 0.85	**F (52.3)** v/c: 1.05	**F (79.8)** v/c: 1.22
7 – Sinclair Road and Southampton Drive/Proposed Center Drive (Side-Street STOP)				
Eastbound Proposed Center Driveway Approach		F (87.7)		D (31.5)
Westbound Southampton Drive Approach	C (16.4)	F (139.0)	B (10.5)	F (53.9)
Northbound Sinclair Road Approach	Free Flow	Free Flow	Free Flow	Free Flow
Southbound Sinclair Road Approach	A (5.4)	A (5.7)	A (4.7)	A (2.1)
Overall	**A (5.6)** v/c: 0.41	**D (25.7)** v/c: 1.11	**A (6.7)** v/c: 0.25	**B (13.2)** v/c: 0.84

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)
95th percentile queue for the critical movement of the approach and lane (L-Left, TR-Shared Thru/Right, R-Right)

Table 4: 2021 Operating Conditions Summary (Continued)

Intersection / Approach	AM Peak Hour		PM Peak Hour	
	2021 Existing	2021 Build	2021 Existing	2021 Build
8 – Route K and Sinclair Road (Side-Street STOP)				
Eastbound Route K Approach	A (1.8)	A (2.2)	A (<1.0)	A (1.2)
Westbound Route K Approach	Free Flow	Free Flow	Free Flow	Free Flow
Southbound Sinclair Road Approach	C (21.6)	C (23.6)	B (14.8)	C (15.2)
Overall	**A (4.9)** v/c: 0.46	**A (6.1)** v/c: 0.54	**A (1.2)** v/c: 0.25	**A (1.8)** v/c: 0.25
9 – Proposed North Driveway and Sinclair Road (Side-Street STOP)				
Eastbound Proposed North Driveway Approach		C (20.0)		C (19.2)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		**A (<1.0)** v/c: 0.22		**A (<1.0)** v/c: 0.33
10 – Proposed South Driveway and Sinclair Road (Side-Street STOP)				
Eastbound Proposed Center Driveway Approach		C (17.5)		C (17.6)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		**A (<1.0)** v/c: 0.17		**A (<1.0)** v/c: 0.33
11 – Proposed North Site Drive and Sinclair Road (Side-Street STOP)				
Eastbound Proposed North Site Drive Approach		C (18.7)		C (17.0)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		**A (1.7)** v/c: 0.24		**A (1.0)** v/c: 0.28
12 – Crabapple Lane and Sinclair Road (Side-Street STOP)				
Eastbound Crabapple Lane Approach		C (15.7)		B (14.2)
Northbound Sinclair Road Approach		A (<1.0)		A (1.8)
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		**A (3.2)** v/c: 0.32		**A (3.7)** v/c: 0.33

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)
95th percentile queue for the critical movement of the approach and lane (L-Left, TR-Shared Thru/Right, R-Right)

Table 4: 2021 Operating Conditions Summary (Continued)

Intersection / Approach	AM Peak Hour		PM Peak Hour	
	2021 Existing	2021 Build	2021 Existing	2021 Build
13 – Proposed North Center Site Drive and Sinclair Road (Side-Street STOP)				
Eastbound Proposed North Center Site Drive Approach		B (12.8)		B (11.2)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		A (<1.0) v/c: 0.11		A (<1.0) v/c: 0.15
14 – Proposed South Center Site Drive and Sinclair Road (Side-Street STOP)				
Eastbound Proposed South Center Site Drive Approach		B (12.5)		B (10.7)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		A (1.7) v/c: 0.14		A (1.3) v/c: 0.14
15 – Proposed Collector Roadway and Sinclair Road (Side-Street STOP)				
Eastbound Proposed Collector Roadway Approach		B (11.1)		A (9.8)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		A (<1.0) v/c: 0.09		A (<1.0) v/c: 0.09
16 – Proposed South Site Drive and Sinclair Road (Side-Street STOP)				
Eastbound Proposed South Site Drive Approach		B (10.8)		A (9.8)
Northbound Sinclair Road Approach		Free Flow		Free Flow
Southbound Sinclair Road Approach		Free Flow		Free Flow
Overall		A (<1.0) v/c: 0.08		A (<1.0) v/c: 0.08

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)
95th percentile queue for the critical movement of the approach and lane (L-Left, TR-Shared Thru/Right, R-Right)

As shown in Table 5, most of the study intersections operate at overall favorable levels of service (i.e., LOS D or better) in the 2021 Existing conditions and would continue to operate at overall favorable levels of service during the peak hours for the 2021 Build conditions. In fact, most of the study intersections and the respective approaches to those intersections are forecasted to operate at highly desirable LOS C or better. Study intersections which warrant further discussion are discussed in the following paragraphs.

3 – Nifong Boulevard and Sinclair Road

As shown in Table 4, the intersection of Nifong Boulevard and Sinclair Road is expected to operate at LOS F and LOS E during the AM and PM peak hours, respectively, with long delays and queues in the full build-out conditions. This is due to the existing heavy eastbound and westbound through movements, as well as the additional traffic from the proposed development on the northbound approach during both peak hours.

Note that the existing traffic volumes for all study intersections were increased by 15% in the AM peak hour. However, it is likely the traffic volumes at the Nifong Boulevard and Sinclair Road intersection were already inflated due to the adjacent schools and the fact that many parents were driving their children to school given the pandemic and not wanting their children to ride the bus. Thus, it is likely the AM peak hour conditions will be better than shown in the table.

Furthermore, it is our understanding that in the future Nifong Boulevard is expected to be expanded from a two-lane roadway (one lane in each direction) to a four-lane roadway (two lanes in each direction). The newly constructed roundabout at Nifong Boulevard and Sinclair Road was designed to be expanded to a two-lane roundabout in the future when Nifong Boulevard is widened.

With the full build-out of the proposed development, a two-lane roundabout at Nifong Boulevard and Sinclair Road is expected to be needed to adequately accommodate the forecasted volumes. A two-lane roundabout at Nifong Boulevard and Sinclair Road was evaluated for the 2021 Build conditions during the AM and PM peak hours. As shown in **Table 5**, a two-lane roundabout would provide highly favorable operations at the intersection for the 2021 Build conditions.

Table 5: 2021 Operating Conditions Summary – Nifong Boulevard and Sinclair Road (Two-Lane Roundabout)

Intersection / Approach	AM Peak Hour 2021 Build	PM Peak Hour 2021 Build
3 – Nifong Boulevard and Sinclair Road (Roundabout)		
Eastbound Nifong Boulevard Approach	A (8.9) 95th Q: 70' TH	A (7.5) 95th Q: 45' TH
Westbound Nifong Boulevard Approach	A (6.8) 95th Q: 30' TH	A (9.2) 95th Q: 75' TH
Northbound Sinclair Road Approach	C (15.3) 95th Q: 130' RT	A (7.0) 95th Q: 30' LT
Southbound Sinclair Road Approach	A (6.3)	A (9.0)
Overall	**B (10.6)**	**A (8.2)**

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)
95th percentile queue for the critical movement of the approach and lane (L-Left, TR-Shared Thru/Right, R-Right)

5 – Southampton Drive and Bethel Street

As shown in Table 4, the intersection of Southampton Drive and Bethel Street currently operates at overall LOS F in both the AM and PM peak hours with long delays for the Southampton Drive approaches. This is due to the heavy eastbound/westbound approach volumes on Southampton Drive and the moderate northbound/southbound approach volumes on Bethel Street. As expected, any additional traffic at the intersection would make the already poor conditions during the peak hours slightly worse.

Under build conditions the eastbound and westbound through movements are expected to increase approximately 11% and 15%, during the AM and PM peak hours, respectively. The low percentage increase in the eastbound and westbound through movements are expected to slightly degrade intersections operations as compared to the existing poor levels of service. Based on preliminary discussions with the City, a roundabout should be considered to provide acceptable levels of service for the existing conditions. As such, the intersection of Southampton Drive and Bethel Street was reevaluated for the 2021 Build conditions as a single lane roundabout which is summarized in **Table 6**. As can be seen, a single lane roundabout would provide highly favorable operations at the intersection for the 2021 Build conditions.

Table 6: 2021 Operating Conditions Summary – Southampton Drive and Bethel Street (Single -Lane Roundabout)

Intersection / Approach	AM Peak Hour	PM Peak Hour
	2021 Build	2021 Build
5 – Southampton Drive and Bethel Street (Roundabout)		
Eastbound Southampton Drive Approach	B (11.0)	A (8.9)
Westbound Southampton Drive Approach	A (7.9)	B (11.8)
Northbound Bethel Street Approach	B (11.5)	A (9.8)
Southbound Bethel Street Approach	A (5.9)	B (10.5)
Overall	**A (9.6)**	**B (10.3)**

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

6 – Southampton Drive and Forum Boulevard

As shown in Table 4, Southampton Drive and Forum Boulevard intersection currently operates at overall LOS F during the PM peak hour. Any additional traffic at the intersection would be expected to make the already poor conditions during the PM peak hour slightly worse.

Under build conditions the eastbound and westbound through movements are expected to increase by a combined 28% during the PM peak hour. The moderate percentage increase in the eastbound and westbound through movements are expected to slightly degrade intersection operations. Based on preliminary discussions with the City, a roundabout should be considered to provide acceptable levels of service for the existing conditions. As such, the intersection of

Southampton Drive and Forum Boulevard was reevaluated for the 2021 Build conditions as a single lane roundabout which is summarized in **Table 7**. As can be seen, a single lane roundabout would provide highly favorable operations at the intersection for the 2021 Build conditions.

Table 7: 2021 Operating Conditions Summary – Southampton Drive and Forum Boulevard (Single-Lane Roundabout)

Intersection / Approach	AM Peak Hour 2021 Build	PM Peak Hour 2021 Build
6 – Southampton Drive and Forum Boulevard (Roundabout)		
Eastbound Southampton Drive Approach	A (8.5)	A (7.3)
Westbound Southampton Drive Approach	A (6.9)	B (10.2)
Northbound Forum Boulevard Approach	A (9.2)	A (6.9)
Southbound Forum Boulevard Approach	A (5.6)	B (11.1)
Overall	A (7.7)	A (9.5)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

7 – Southampton Drive/Proposed Center Drive and Sinclair Road

As shown in Table 4, the intersection of Southampton Drive and Sinclair Road is forecasted to decline from overall LOS A during both peak hours to overall LOS D and B during the AM and PM peak hours, respectively. Furthermore, the westbound Southampton Drive approach is expected to operate at LOS F during both peak hours. The proposed development will have the greatest impact on the Southampton Drive and Sinclair Road intersection with the traffic volumes at the intersection expected to almost double in the AM peak hour and triple in the PM peak hour. As such, a roundabout was considered to provide acceptable levels of service for the full build-out conditions. As shown in **Table 8**, a single lane roundabout would provide highly favorable operations at the intersection for the 2021 Build conditions.

Table 8: 2021 Operating Conditions Summary – Southampton Drive and Sinclair Road (One-Lane Roundabout)

Intersection / Approach	AM Peak Hour 2021 Build	PM Peak Hour 2021 Build
7 – Southampton Drive/Proposed Center Drive and Sinclair Road (Roundabout)		
Eastbound Southampton Drive Approach	A (4.9)	A (5.6)
Westbound Proposed Center Driveway Approach	A (9.7)	A (6.8)
Northbound Sinclair Road Approach	B (13.7)	A (6.1)
Southbound Sinclair Road Approach	A (6.5)	A (8.3)
Overall	B (10.7)	A (7.2)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

SUMMARY

CBB completed the preceding study to address the anticipated traffic impacts associated with the Sinclair Farms development located on the west side of Sinclair Road south of Nifong Boulevard in Columbia, Missouri.

In summary, the following findings and improvements should be considered based on the existing traffic volumes and conditions:

- In order to provide acceptable levels of service for the existing conditions, a single-lane roundabout should be considered at the intersection of Southampton Drive and Bethel Street and the intersection of Southampton Drive and Forum Boulevard.

In summary, the following findings and improvements should be considered in conjunction with the proposed Sinclair Farms development:

- The proposed development is estimated to add about 585 new trips in the AM peak hour and 795 new trips in the PM peak hour to the adjacent roadways.
- Southbound Sinclair Road right-turn lanes are warranted at the intersections of the proposed north site drive and the proposed Crabapple Lane connection.
- It is our understanding that in the future Nifong Boulevard is expected to be expanded from a two-lane roadway to a four-lane roadway. As such, the newly constructed roundabout was designed to be expanded to a two-lane roundabout in the future when Nifong Boulevard is widened. With the full build-out of the proposed development, a two-lane roundabout at Nifong Boulevard and Sinclair Road is expected to be needed to adequately accommodate the forecasted volumes.
- The proposed development will have the greatest impact on the Southampton Drive and Sinclair Road intersection with the traffic volumes at the intersection expected to nearly double in the AM peak hour and triple in the PM peak hour. As such, it is recommended that a roundabout be considered at the intersection of Southampton Drive/Proposed Center Drive and Sinclair Road to provide acceptable levels of service for the full build-out conditions.
- Careful consideration should be given to sight distance obstructions when planning any future aesthetic enhancements, such as berms, fencing and landscaping, at any of the development drives to ensure that these improvements do not obstruct the view of entering and exiting traffic at the site intersections with the public roads. It is generally recommended that all improvements wider than two inches (posts, tree trunks, etc.) and higher than 3.5 feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

We trust this traffic impact study adequately describes the forecasted traffic conditions that should be expected as a result of the proposed Sinclair Farms mixed-use development. If additional information is desired, please feel free to contact me at 314-449-9572 or via email at swhite@cbbtraffic.com.

Sincerely,

Shawn Lerai White, P.E., PTOE
Associate - Senior Traffic Engineer