

**Traffic Impact Analysis UPDATE for
Pettus Farm Development
Lancaster County, South Carolina**



Prepared for:

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1.0 Executive Summary

The purpose of this Traffic Impact Analysis (TIA) UPDATE is to review vehicular traffic impacts as a result of the proposed Pettus Farm 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 north of the Pettus Road/Camp Cox Circle intersection in Lancaster County, South Carolina. As currently envisioned, the proposed development consists of 99 single-family homes expected to be built-out in 2027, whereas in the 5-21-21 TIA completion was planned for 2026. Based on the site plan, access to the site is proposed via a full-movement connection to Pettus Road aligned with Camp Cox Circle, consistent with the TIA. A future connection to the Patterson Preserve development is also planned.

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, 2028 background conditions (without the proposed development), and 2028 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. Barberville Road and Harrisburg Road
2. Barberville Road and Pettus Road
3. Barberville Road and SC 160 (Fort Mill Highway)

For purposes of this study, Barberville Road is referenced as east/west at its intersections with Harrisburg Road and Pettus Road and is referenced as north/south at its intersection with SC 160 (Fort Mill Highway).

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)* 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:

- Construction of a westbound right-turn lane along Barberville Road at Pettus Road with 100 feet of storage.
- Construct the Site Access with a 55-foot internal protected stem (IPS) and stop sign.
- Per prior coordination with SCDOT, improvements to Pettus Road will be necessary to bring the pavement width and asphalt depth to an acceptable standard, along with the installation of a stop sign.

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. It is noted

that the site-civil engineer is responsible for confirming that the proposed access points meet current spacing and sight distance standards.

2.0 Introduction

The proposed site is located north of the Pettus Road/Camp Cox Circle intersection in Lancaster County, South Carolina. **Figure 2.1** shows the site location.

As currently envisioned, the proposed development consists of 99 single-family homes expected to be built-out in 2027, whereas in the 5-21-21 TIA completion was planned for 2026. Based on the site plan, access to the site is proposed via a full-movement connection to Pettus Road aligned with Camp Cox Circle. A future connection to the Patterson Preserve development is also planned. The proposed unit count and access is consistent with the TIA.

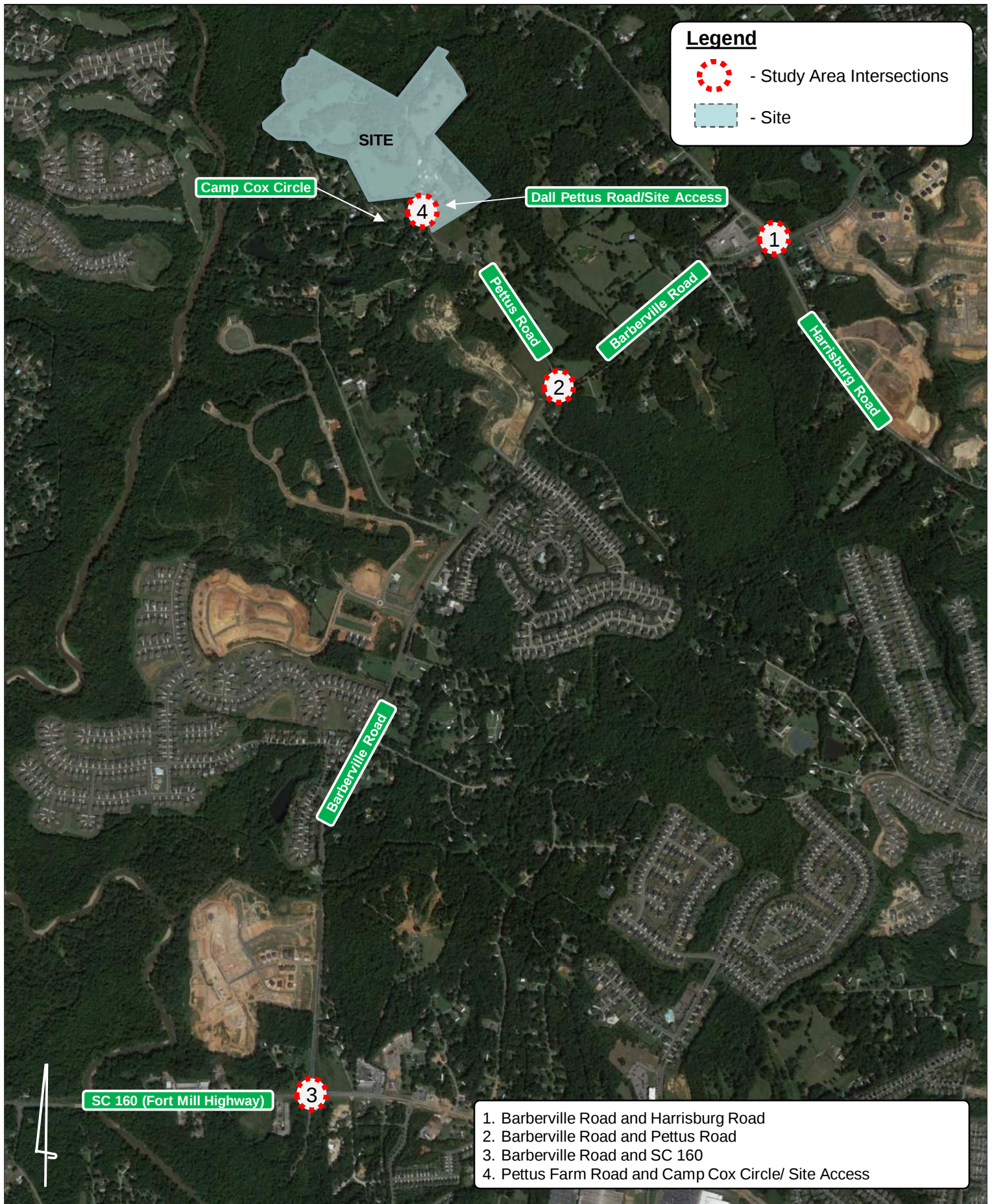
Figure 2.2 shows the proposed site plan for the development.

Per the Lancaster County 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, 2028 background conditions (without the proposed development), and 2028 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:

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



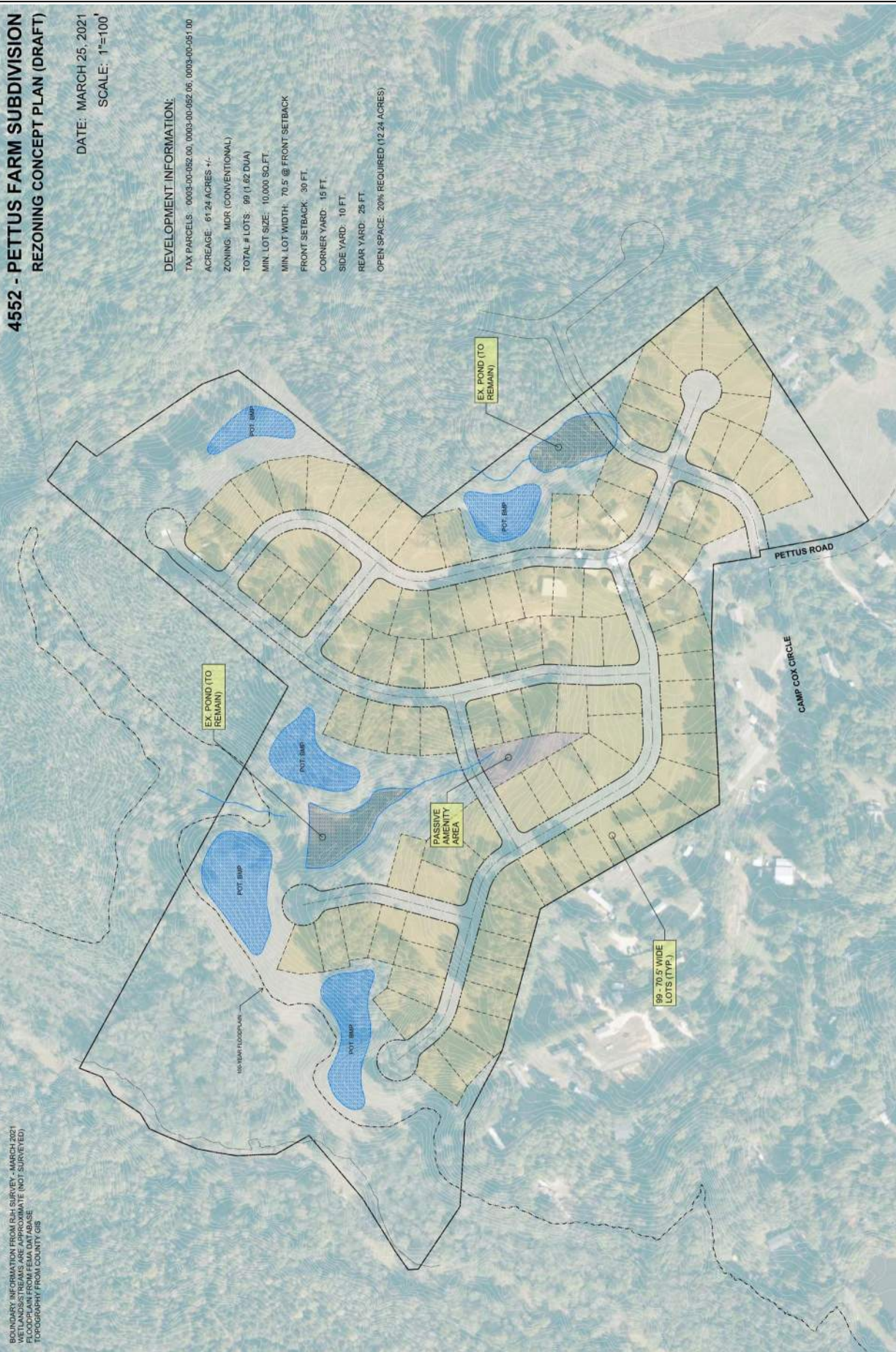
**4552 - PETTUS FARM SUBDIVISION
REZONING CONCEPT PLAN (DRAFT)**

DATE: MARCH 25, 2021
SCALE: 1"=100'

DEVELOPMENT INFORMATION:

TAX PARCELS: 0003-00-062.00, 0003-00-062.05, 0003-00-061.00
ACREAGE: 61.24 ACRES +/-
ZONING: MDR (CONVENTIONAL)
TOTAL # LOTS: 99 (182 DU/A)
MIN. LOT SIZE: 10,000 SQ. FT.
MIN. LOT WIDTH: 70.5' @ FRONT SETBACK
FRONT SETBACK: 30 FT.
CORNER YARD: 15 FT.
SIDE YARD: 10 FT.
REAR YARD: 25 FT.
OPEN SPACE: 20% REQUIRED (12.24 ACRES)

BOUNDARY INFORMATION FROM G&H SURVEY - MARCH 2021
WETLANDS/STREAMS ARE APPROXIMATE (NOT SURVEYED)
FLOODPLAIN FROM FEMA DATABASE
TOPOGRAPHY FROM COUNTY GIS



3.0 Existing Traffic Conditions

Existing traffic conditions were coordinated with Lancaster County and SCDOT staff and collected through field observations and turning-movement counts to establish the existing conditions baseline analysis.

3.1 STUDY AREA

The study area for this TIA consists of the following intersections:

1. Barberville Road and Harrisburg Road
2. Barberville Road and Pettus Road
3. Barberville Road and SC 160 (Fort Mill Highway)

Figure 3.1 shows the current roadway geometry at the study intersections. The primary roadways in the vicinity of the site are described in **Table 3.1** in terms of 2021 SCDOT annual average daily traffic (AADT) volumes in vehicles per day (vpd) available online, facility type and state functional classifications, and posted speed limits in miles per hour (mph).

Table 3.1- Study Area Roadways

Roadway	Section type	2021 AADT	Posted speed limit
Barberville Road	2-lane undivided major collector	8,000 N of SC 160	40 mph
Harrisburg Road	2-lane undivided major collector	6,400 N of Barberville 5,700 S of Barberville	40 mph
SC 160 (Fort Mill Highway)	2-lane undivided principal arterial	15,800 E of York County Line	45 mph
Pettus Road	2-lane undivided local road	Not Available	Not Posted (25 mph assumed)

3.2 EXISTING TRAFFIC CONDITIONS

AM (7:00-9:00) and PM (4:00-6:00) peak-period intersection turning-movement counts were collected by National Data & Surveying Services on Thursday, March 18, 2021 at the following intersections:

- Barberville Road and Harrisburg Road
- Barberville Road and Pettus Road
- Barberville Road and SC 160 (Fort Mill Highway)

In accordance with SCDOT's Revised Guidance for conducting Traffic Impact Studies during COVID19 (7-29-2020), March 2021 TMCs were factored up by 12% to account for changes in traffic patterns associated with the COVID-19 pandemic and grown an additional 4% for one year to represent existing 2022 volumes per the discussion in Section 4.1.

Volume balancing was not performed between the study area intersections due to the presence of streets/driveways.

Figure 3.2 shows the 2022 existing AM and PM peak-hour traffic volumes. Raw peak-hour intersection turning-movement count data is provided in the **Appendix**.

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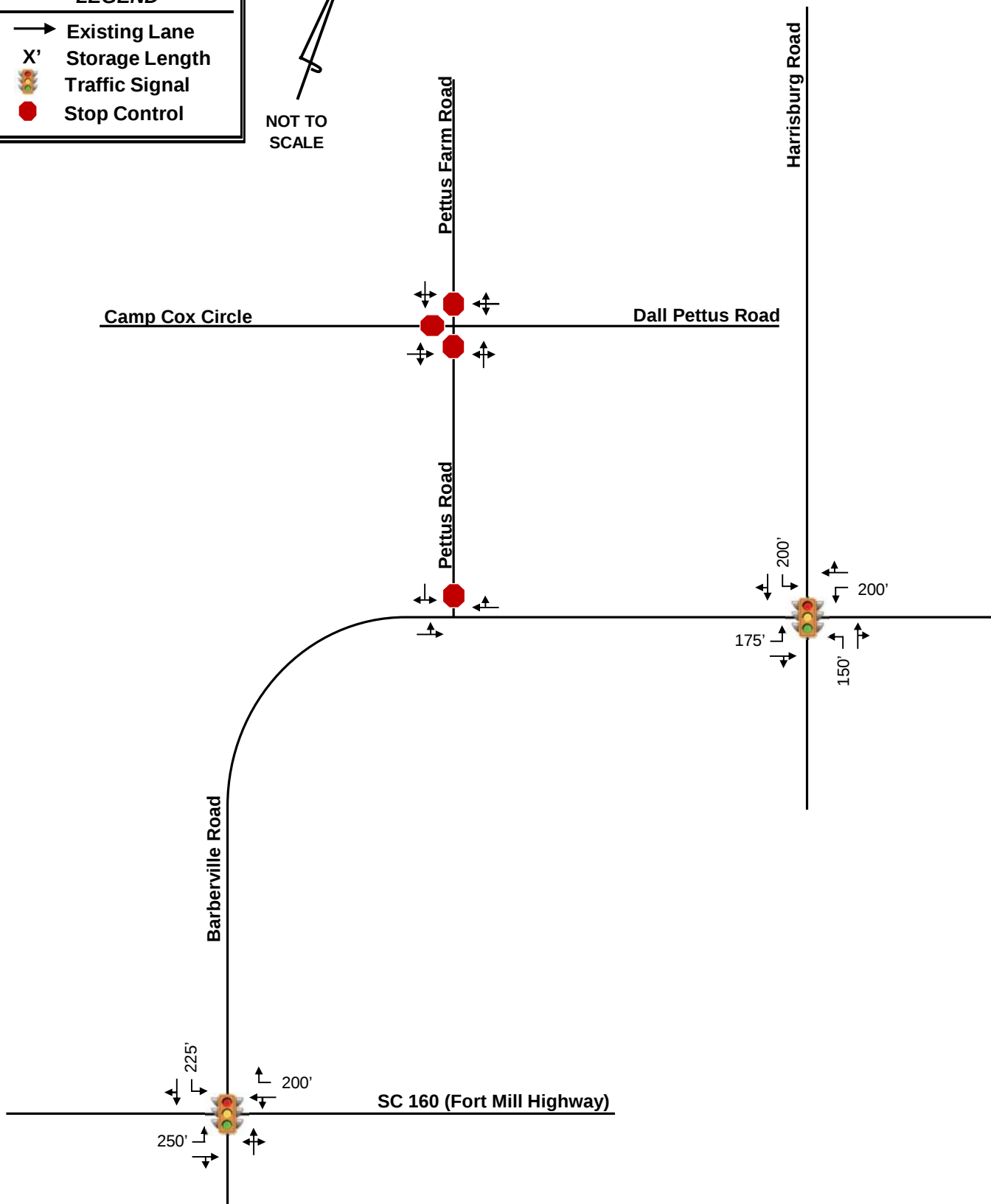
Existing Lane

X' Storage Length

Traffic Signal

Stop Control

NOT TO SCALE



4.0 Background Traffic Conditions

Projected background (non-project) traffic is defined as the expected growth or change in traffic volumes on the surrounding roadway network between the year the existing counts were collected and the expected build-out year absent the construction and opening of the proposed project. This includes both non-specific general growth based on historical increase in local traffic volumes (historical growth) and specific growth in traffic volumes caused by specific approved developments within the relative vicinity of the proposed development.

4.1 HISTORICAL GROWTH TRAFFIC

Historical growth is the increase in existing traffic volumes due to usage increases and non-specific growth throughout the area, and accounts for growth that is independent of specific approved off-site developments or planned transportation projects. Historical growth traffic is calculated using an annual growth rate, which is applied to the existing traffic volumes up to the future horizon year. Based on coordination with SCDOT and Lancaster County staff, the existing 2022 peak-hour traffic volumes were grown by an annual growth rate of 4% per year to the study's 2028 horizon year. Growth rate calculations can be seen in Table 4.1.

Table 4.1- Historical Growth Rate Calculations

SCDOT AADT					
	2019	2015	2009	Growth Rate (2015-2019)	Growth Rate (2009-2019)
Harrisburg Road (N of Barberville)	6,500	6,000	-	2.0%	-
Harrisburg Road (S of Barberville)	7,600	5,800	-	7.0%	-
Barberville Road (N of SC 160)	6,300	5,800	3,800	2.1%	5.2%
Average				3.7%	5.2%

4.2 APPROVED OFFSITE DEVELOPMENT TRAFFIC

Based on agency coordination, seven approved offsite developments within the vicinity of this study area were included in the 2028 background traffic. Each of these had associated approved TIAs. These developments, land uses and intensities, build-out percentages, and committed improvements are outlined in **Table 4.2**.

Offsite approved development traffic volumes were taken directly from each respective TIA and factored as appropriate give the approximate build-out percentages. Existing intersection splits were used to carry and assign volumes appropriately at study area intersections that were not included in the approved TIAs. Approved development data and calculations are included in the **Appendix**.

Table 4.2 – Approved Off-Site Developments

Development	Land Use/Intensity	% Built (2022*/2028)	Build- out Year	TIA	Required Improvements
Patterson Preserve	180 single family homes	0%/100%	2024	2-19	Harrisburg Rd/Barberville Rd -WBR w/125'
Harrisburg Rd Residential (Sugar Creek)	540 single family homes 235 townhomes	0%/100%	2023	10-18	Harrisburg Rd/Barberville Rd -Second EBL w/350' each -NB receiving lane w/1,000' -Extend NBL to 300' -Extend SBL to 250' -SBR w/150' -Perm/prot SBL phasing -Prot EBL phasing
Redwood Apartments	157 apartments	0%/100%	2024	8-20	No improvements within the study area
Covington	328 single family homes	40%/100%	2019	6-14	No improvements within the study area
Chateau Ridge	131 single family homes	0%/100%	2023	7-18 12-18	Harrisburg Rd/Barberville Rd -EBR w/100'
Patterson Property	53 single family homes	0%/100%	2020	10-17	No improvements within the study area
Lodges at Indian Land	329 apartments 124 townhomes	0%/100%	2022	12-19	No improvements within the study area

*Percentages based on review of available January 2021 Nearmap aerials

4.3 PLANNED TRANSPORTATION PROJECTS

Based on coordination with SCDOT and Lancaster County staff, SC 160 (Fort Mill Highway) had been planned to be widened to three lanes between the York County line and Rosemont Drive and to five lanes between Rosemont Drive and Possum Hollow Road. The SC 160 widening project was under construction as indicated in the TIA, planned to be completed by 2021. However, based on the SCODT provided roadway plans, no laneage changes were proposed at the study area intersections as part of the project.

4.4 2028 BACKGROUND TRAFFIC

2028 background traffic consists of existing 2022 traffic, 2028 historical growth traffic, and approved development traffic. **Figures 4.1 and 4.2** show the 2028 background AM and PM peak-hour traffic volumes, respectively.

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XX Existing + Historic Growth Traffic

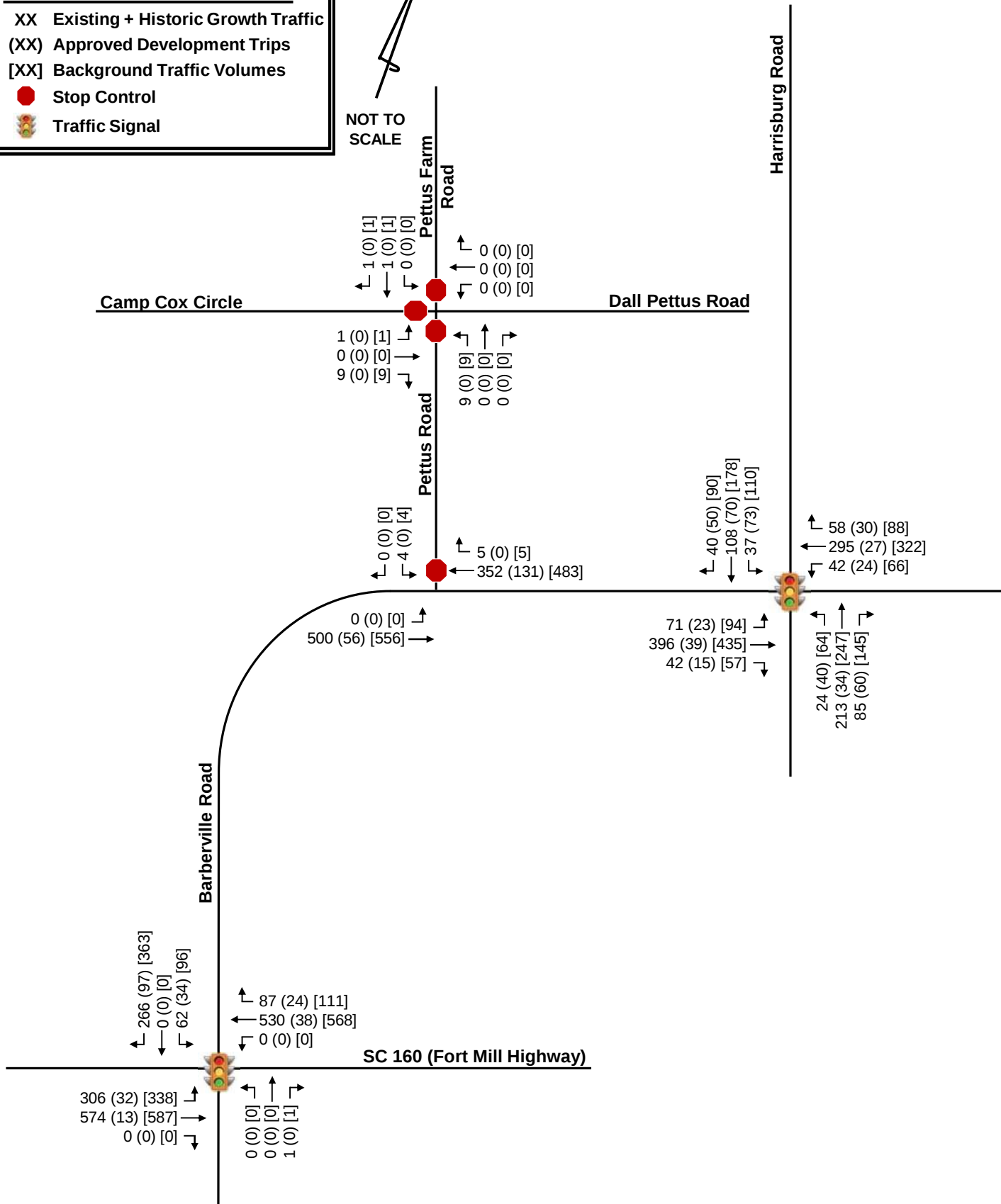
(XX) Approved Development Trips

[XX] Background Traffic Volumes

● Stop Control

🚦 Traffic Signal

NOT TO SCALE



LEGEND

XX Existing + Historic Growth Traffic

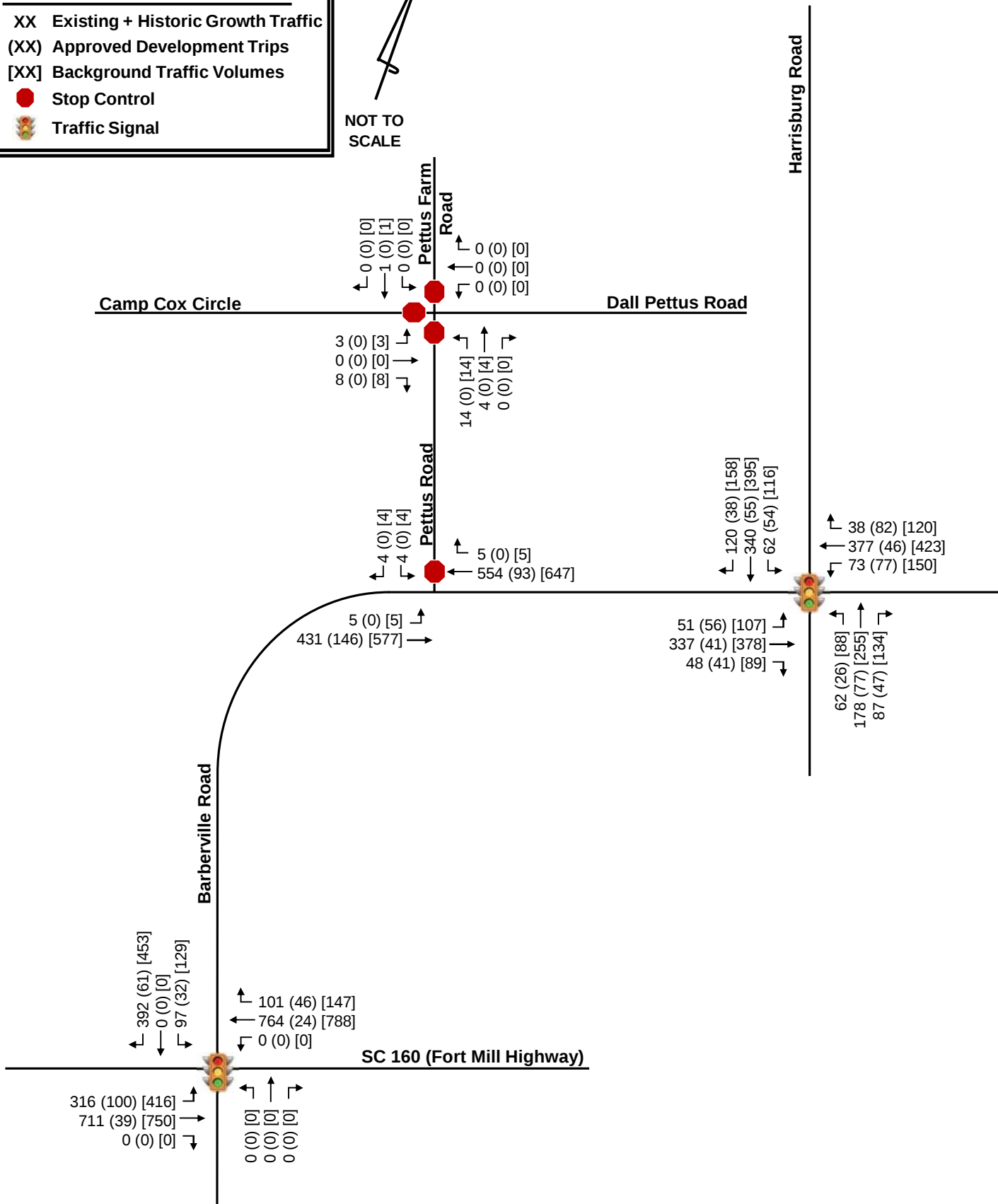
(XX) Approved Development Trips

[XX] Background Traffic Volumes

● Stop Control

🚦 Traffic Signal

NOT TO SCALE



5.0 Site Traffic Volume Development

Site traffic developed for this TIA is defined as the vehicle trips expected to be generated and added to the study area by the construction of the proposed development, and the distribution and assignment of that traffic within the identified study area.

5.1 TRAFFIC GENERATION

The traffic generation potential of the proposed development was determined using the trip generation rates published in *Trip Generation* (Institute of Transportation Engineers, 10th Edition for consistency with the original TIA) for 99 single-family homes.

Table 5.1 summarizes the projected trip generation for the proposed development.

Table 5.1 - Trip Generation										
ITE LUC	Land Use	Intensity		Daily	AM Peak Hour			PM Peak Hour		
					Total	In	Out	Total	In	Out
210	Single-Family Homes	99	DU	1,030	75	19	56	101	64	37

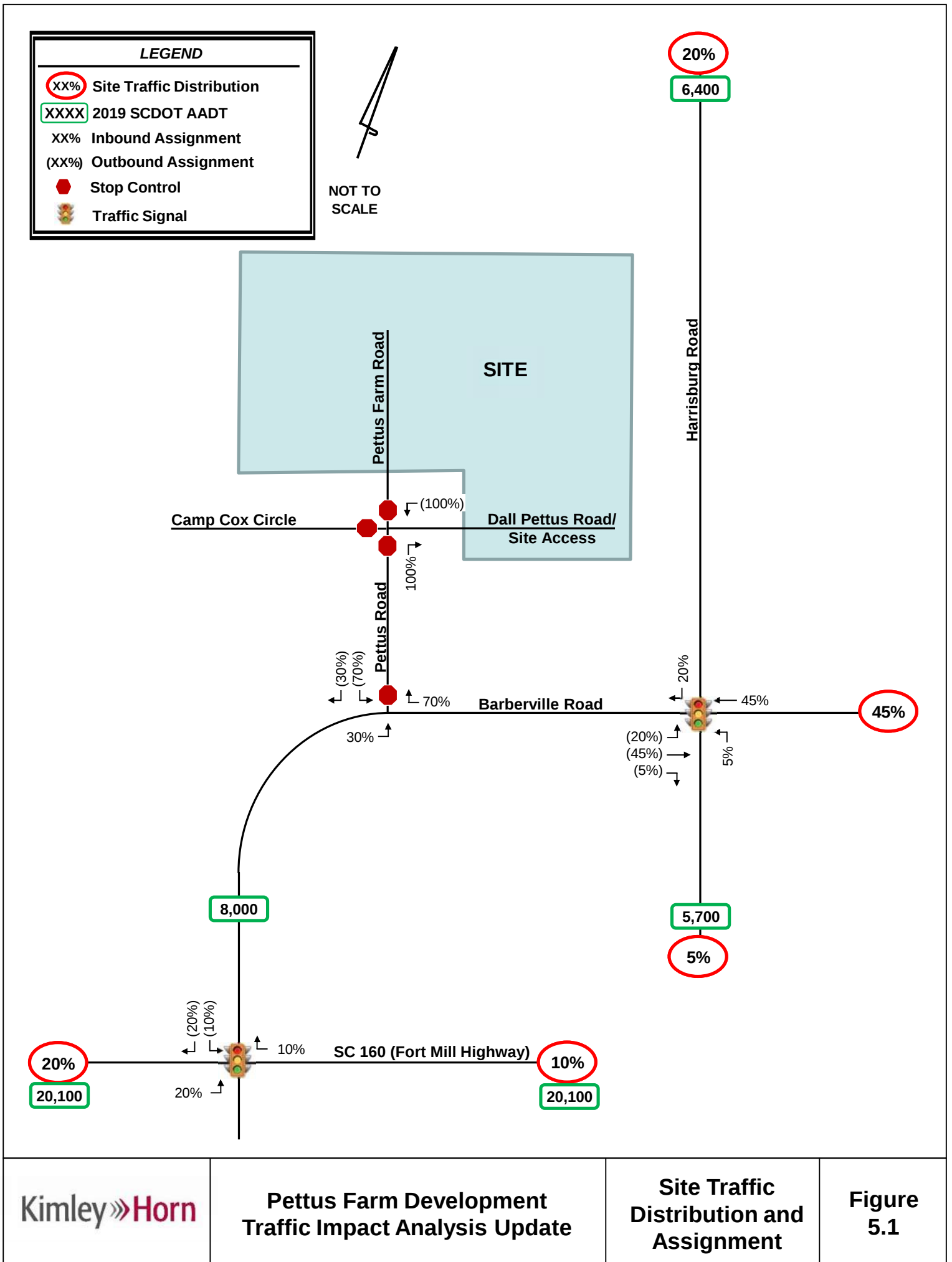
5.2 SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

The proposed development's trips were assigned to the surrounding network based on AADT data, approved development distribution, and the proposed site layout. The overall site traffic distribution and assignment, approved by SCDOT and Lancaster County staff, are shown in **Figure 5.1**.

5.3 2028 BUILD-OUT TRAFFIC VOLUMES

The 2028 build-out traffic volumes include the assignment of the projected site traffic generation and 2028 background traffic volumes. **Figures 5.2 and 5.3** show the projected 2028 build-out traffic volumes for the AM and PM peak-hours, respectively.

Intersection volume development worksheets for study area intersections are provided in the **Appendix**.



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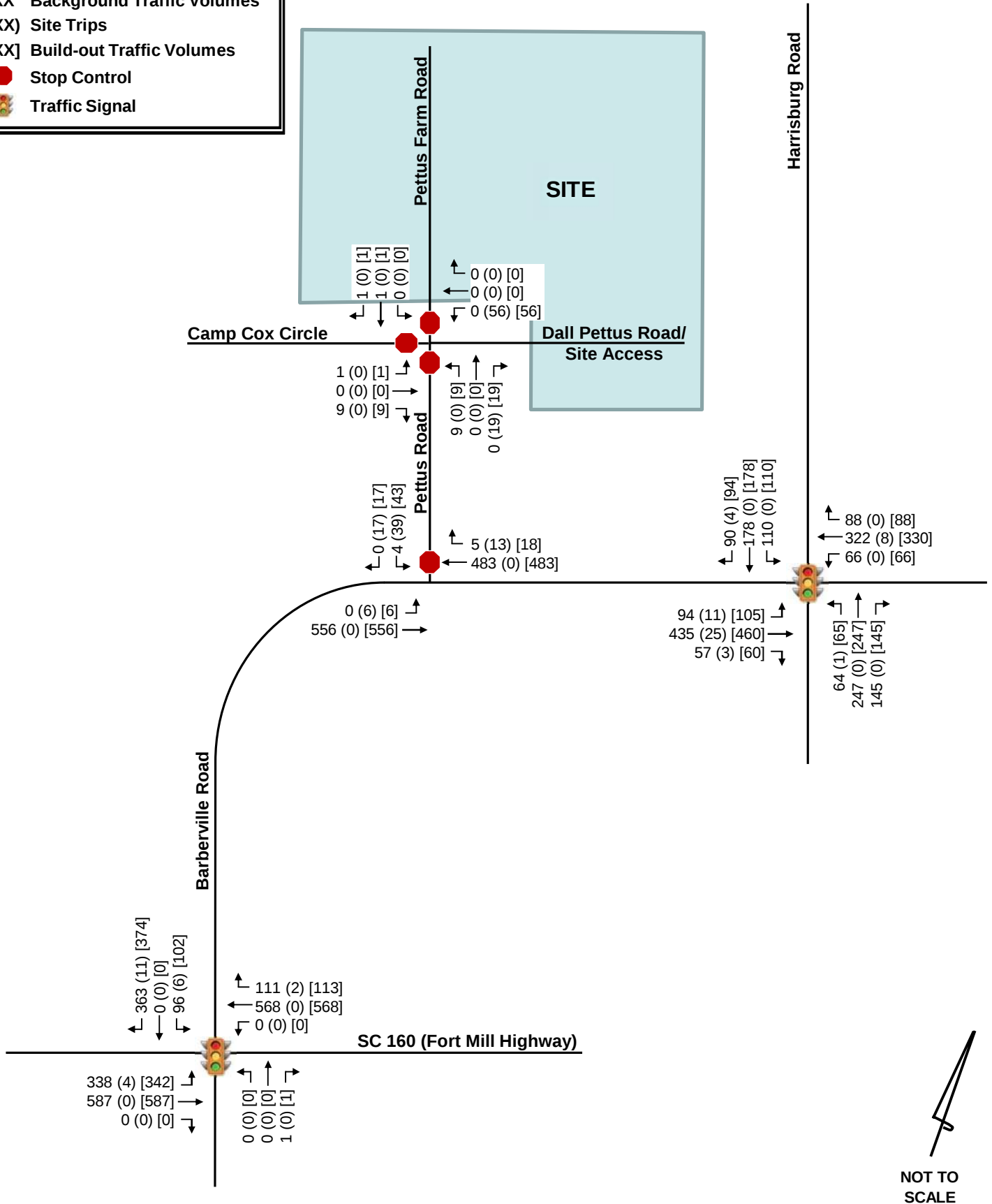
XX Background Traffic Volumes

(XX) Site Trips

[XX] Build-out Traffic Volumes

● Stop Control

🚦 Traffic Signal



LEGEND

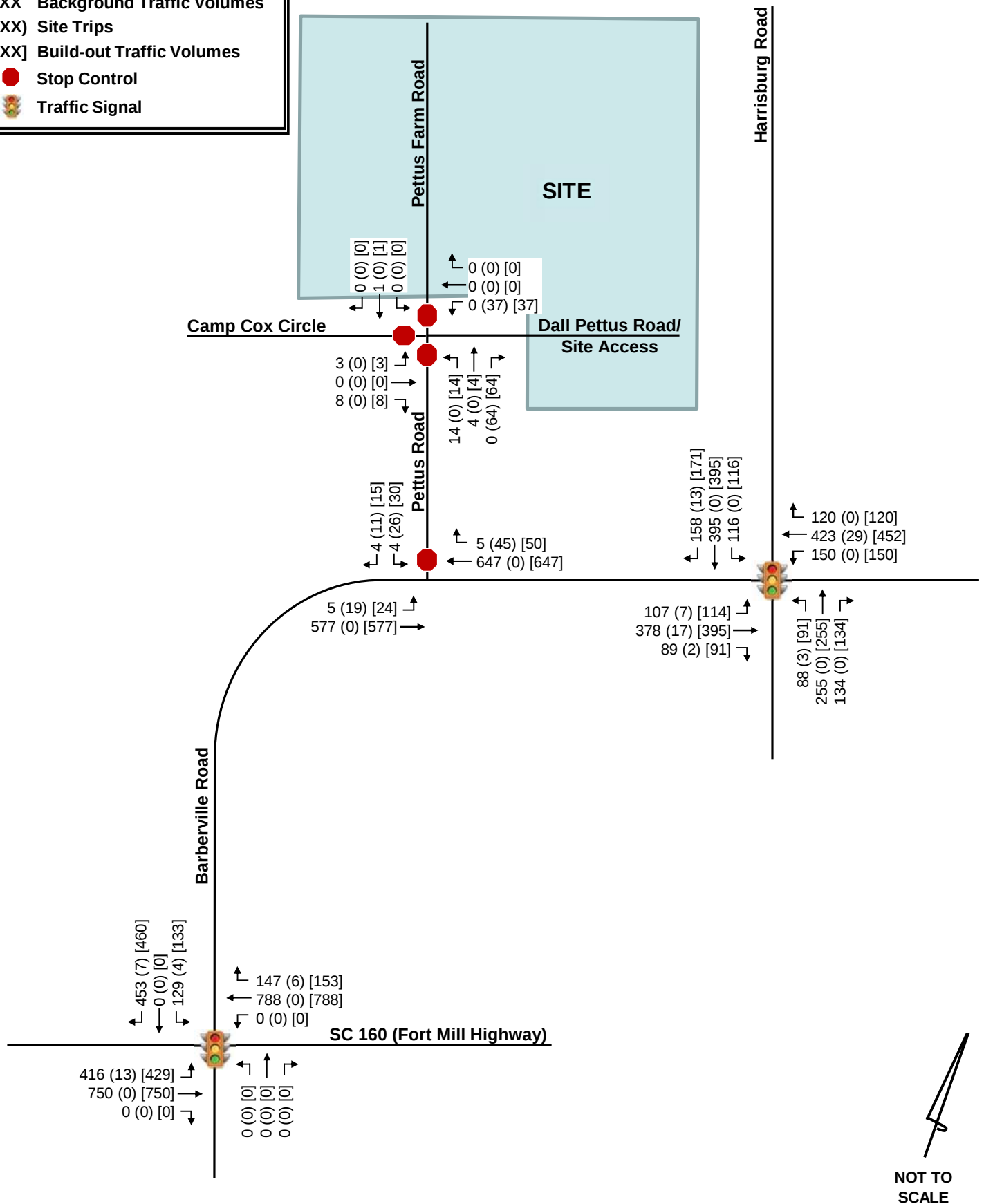
XX Background Traffic Volumes

(XX) Site Trips

[XX] Build-out Traffic Volumes

● Stop Control

🚦 Traffic Signal



NOT TO SCALE

6.0 Capacity Analysis

Capacity analyses were performed for the AM and PM peak hours using Synchro Version 11 software to determine the operating characteristics at the signalized and stop-controlled intersections of the adjacent street network and to evaluate the impacts of the proposed development. Capacity is defined as the maximum number of vehicles that can pass over a particular road segment, or through a particular intersection, within a specified period of time under prevailing operational, geometric and controlling conditions within a set time duration.

The *Highway Capacity Manual* (HCM) defines level of service (LOS) as a “quantitative stratification of a performance measure or measures representing quality of service”, and is used to “translate complex numerical performance results into a simple A-F system representative of travelers’ perceptions of the quality of service provided by a facility or service”. The HCM defines six levels of service, LOS A through LOS F, with A having the best operating conditions from the traveler’s perspective and F having the worst. However, it must be understood that “the LOS letter result hides much of the complexity of facility performance”, and that “the appropriate LOS for a given system element in the community is a decision for local policy makers”. According to the HCM, “for cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods but instead to provide some lower LOS that balances individual travelers’ desires against society’s desires and financial resources. Nevertheless, during low-volume periods of the day, a system element may operate at LOS A.”

LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay at the side-street approaches, typically during the highest volume periods of the day, the AM and PM peak periods. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. It is typical for stop sign-controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay.

LOS for all-way stop-controlled (AWSC) intersections are also determined by the control delay and reported for each stop-controlled approach, using the same control delay thresholds as the TWSC intersections. However, if the volume-to-capacity ratio on an approach of the intersection is greater than 1.0, that approach is reported as LOS F regardless of the reported control delay.

LOS for signalized intersections is reported for the intersection as a whole, also typically during the highest volume periods of the day, the AM and PM peak periods. One or more movements at an intersection may experience a low level-of-service, while the intersection as a whole may operate acceptably.

Table 6.0-A and **6.0-B** list the LOS control delay thresholds published in the HCM for unsignalized and signalized intersections, respectively, as well as the unsignalized operational descriptions assumed herein.

Table 6.0-A Level-of-Service Control Delay Thresholds for Unsignalized Intersections		
Level-of-Service	Average Control Delay per Vehicle [sec/veh]	
A	≤ 10	Short Delays
B	$> 10 - 15$	
C	$> 15 - 25$	
D	$> 25 - 35$	Moderate Delays
E	$> 35 - 50$	
F	> 50	Long Delays

Table 6.0-B Level-of-Service Control Delay Thresholds for Signalized Intersections	
Level-of-Service	Control Delay per Vehicle [sec/veh]
A	≤ 10
B	$> 10 - 20$
C	$> 20 - 35$
D	$> 35 - 55$
E	$> 55 - 80$
F	> 80

SCDOT staff provided signal plans for the signalized study area intersections of Barberville Road with Harrisburg Road and SC 160 (Fort Mill Highway), which were used in the development of the existing conditions Synchro network. The cycle lengths, splits and offsets included in the SCDOT-provided time of day plans for the coordinated intersection of SC 160 (Fort Mill Highway) and Barberville Road were used for the existing conditions network. Under future year conditions, cycle lengths at the coordinated signal were maintained and the splits were optimized with the planned signalization changes associated with the SC 160 widening project. The cycle lengths and splits at the uncoordinated Barberville Road and Harrisburg Road intersection were optimized under each scenario. Signal plans for both intersections are included in the **Appendix**.

Peak hour factors (PHFs) were taken directly from the count data for the existing conditions scenario. A PHF of 0.9 was assumed for future year analyses during the AM and PM peak hours. Heavy vehicle percentages were taken directly from field observations, subject to a two-percent minimum.

Capacity analyses were performed for the 2022 existing traffic conditions, 2028 background traffic conditions, and 2028 build-out traffic conditions. Reports generated by Synchro software are included in the **Appendix**. SimTraffic queueing/blocking reports for the build-out improved scenario are also included in the **Appendix**.

Mitigation for traffic impacts caused by the proposed development were noted and recommended based on Lancaster County and SCDOT mitigation requirements. When determining the proposed development's traffic impact to the study area intersections, the 2028 background and 2028 build-out conditions were compared. Based on Lancaster County guidelines "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.” For the purposes of this TIA, the capacity analyses identifying additional improvements needed to raise the LOS to the adopted standards is referred to as “Build IMP Target LOS.” Based on the SCDOT ARMS Manual, the TIA ‘should include proposed improvements or access management techniques that will mitigate any significant changes in the levels of service.’ For the purposes of this TIA, “significant changes” were assumed where the overall intersection or stop-controlled approach delay increases by more than 25% or drops by one or more LOS grade between 2028 background and 2028 build-out conditions.

6.1 BARBERVILLE ROAD AND HARRISBURG ROAD

Table 6.1 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection.

Table 6.1 - Baberville Road and Harrisburg Road													
Condition	Measure	EB			WB			NB		SB			Intersection LOS (Delay)
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBTR	SBL	SBT	SBR	
AM Peak Hour													
2022 Existing	LOS (Delay)	A (8.7)			A (7.9)			B (14.2)		A (9.9)			A (9.8)
	Synchro 95th C	19'	99'	-	13'	75'	-	12'	86'	19'	44'	-	
2028 Background	LOS (Delay)	C (22.1)			C (30.2)			D (41.1)		B (12.9)			C (26.9)
	Synchro 95th C	48'	279'	5'	67'	#294'	0'	63'	#371'	70'	105'	20'	
2028 Build-out	LOS (Delay)	C (23.1)			C (30.8)			D (41.4)		B (13.0)			C (27.3)
	Synchro 95th C	53'	300'	6'	68'	#304'	0'	64'	#371'	70'	105'	21'	
PM Peak Hour													
2022 Existing	LOS (Delay)	B (12.0)			B (12.6)			B (10.9)		B (18.1)			B (13.8)
	Synchro 95th C	20'	109'	-	27'	122'	-	29'	74'	25'	#150'	-	
2028 Background	LOS (Delay)	C (21.3)			D (35.2)			D (40.5)		B (17.8)			C (28.1)
	Synchro 95th C	60'	245'	24'	149'	#413'	20'	94'	#399'	83'	280'	37'	
2028 Build-out	LOS (Delay)	C (21.5)			D (43.9)			D (53.9)		B (18.8)			C (33.5)
	Synchro 95th C	63'	252'	24'	147'	#444'	20'	99'	#411'	85'	286'	39'	
Background Storage		350'		100'	200'		125'	300'		250'		150'	
# 95th percentile volume exceeds capacity, queue may be longer													

95th percentile volume exceeds capacity, queue may be longer

Table 6.1 shows that the overall intersection currently operates at LOS A during the AM peak hour and LOS B during the PM peak hour. As noted in Section 4.2, the following improvements are planned at this intersection prior to 2028 as part of approved off-site developments:

- Westbound right-turn lane along Barberville Road with 125 feet of storage
- Second eastbound left-turn lane along Barberville Road to create dual eastbound left-turn lanes with 350 feet of storage each
- Second northbound receiving lane with a minimum of 1,000 feet of storage
- Southbound right-turn lane with 150 feet of storage
- Eastbound right-turn lane with 100 feet of storage
- Extension of the northbound left-turn lane to include 300 feet of storage
- Extension of the southbound left-turn lane to include 250 feet of storage
- Implementation of permitted-protected phasing on the southbound left-turn movement and protected-only phasing on the eastbound left-turn movements

With these improvements in place under 2028 background and build-out conditions, the overall intersection is expected to operate at LOS C during both peak hours. Since the proposed development is not expected to have a significant impact on overall intersection operations, no developer improvements are recommended at this intersection.

6.2 BARBERVILLE ROAD AND PETTUS ROAD

Table 6.2 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection.

Table 6.2 - Barberville Road and Pettus Road						
Condition	Measure	EB	WB		SB	Intersection
		EBLT	WBT	WBR	SBLR	LOS (Delay)
AM Peak Hour						
2022 Existing	LOS (Delay)	A (0.0)	A (0.0)		C (15.3)	-
	Synchro 95th Q	0'	0'	-	3'	
2028 Background	LOS (Delay)	A (0.0)	A (0.0)		C (21.9)	-
	Synchro 95th Q	0'	0'	-	3'	
2028 Build-out	LOS (Delay)	A (0.1)	A (0.0)		C (24.2)	-
	Synchro 95th Q	0'	0'	-	25'	
2028 Build-out IMP WBR	LOS (Delay)	A (0.1)	A (0.0)		C (24.0)	-
	Synchro 95th Q	0'	0'	0'	25'	
PM Peak Hour						
2022 Existing	LOS (Delay)	A (0.2)	A (0.0)		C (15.9)	-
	Synchro 95th Q	0'	0'	-	3'	
2028 Background	LOS (Delay)	A (0.1)	A (0.0)		C (23.4)	-
	Synchro 95th Q	0'	0'	-	3'	
2028 Build-out	LOS (Delay)	A (0.4)	A (0.0)		E (38.6)	-
	Synchro 95th Q	3'	0'	-	33'	
2028 Build-out IMP WBR	LOS (Delay)	A (0.4)	A (0.0)		E (36.8)	-
	Synchro 95th Q	3'	0'	0'	30'	
2028 Build-out IMP Traffic Signal	LOS (Delay)	A (5.1)	A (5.6)		B (15.1)	A (5.7)
	Synchro 95th Q	201'	250'	-	31'	

As shown in Table 6.2, the stop-controlled southbound approach of Pettus Road currently operates with short delays during both peak hours and is expected to continue to operate with short delays during both peak hours under 2028 background conditions. When the proposed site traffic is added to the 2028 background conditions, the stop-controlled southbound approach is expected to operate with short delays during the AM peak hour and moderate delays during the PM peak hour.

Per Lancaster County guidelines, LOS C or better should be maintained for collector or local streets. Given the expected drop in southbound approach LOS below Lancaster County's identified standard during the PM peak hour, identification of mitigation improvements is required. The following improvement was considered to potentially mitigate the impact of the proposed site:

- Construction of a westbound right-turn lane along Barberville Road with 100 feet of storage.

With this improvement in place, the stop-controlled southbound approach delay is expected to decrease while continuing to operate beyond the identified LOS standard during the PM peak hour. In the 5-21-21 TIA, the addition of a westbound right-turn lane caused the background LOS C to drop to a LOS D (from build-out LOS E) since the 2027 build-out delay was closer to the 35-second delay demarcation point between LOS D and LOS E. However, in the 2028 build-out improved

scenario with the westbound right-turn lane in place, the southbound approach is expected to continue to operate at LOS E due to the additional 4% increase in volumes in moving from the 2027 to 2028 horizon year. Therefore, consideration was given to the addition of a southbound right-turn lane as well to further reduce the impact of the proposed site during the PM peak hour. With both turn lanes in place, the stop-controlled southbound approach delay would be expected to improve to LOS D during the PM peak hour; however, with a minimal delay decrease by approximately four seconds and only 15 right-turning vehicles during the PM peak hour, the addition of a southbound right-turn lane is not recommended.

A change in operational control, such as a traffic signal, would be needed to improve operations at this intersection to the LOS C target. With a traffic signal in place, the overall intersection would be expected to operate at LOS A with each approach operating LOS B or better during the PM peak hour. However, based on a preliminary peak-hour signal warrant assessment (Warrant 3), neither peak hour is expected to satisfy the warrant criteria. Therefore, a signal is not recommended as mitigation for the Pettus Farm development.

The westbound right-turn lane is also recommended as a warranted auxiliary lane based on Section 7. Its storage length of 100 feet is based on Synchro 95th percentile queues, SimTraffic maximum queues, and SCDOT ARMS manual minimums.

6.3 BARBERVILLE ROAD AND SC 160 (FORT MILL HIGHWAY)

Table 6.3 summarizes the LOS, control delay, and 95th percentile queue lengths at the signalized intersection.

Table 6.3 - Barberville Road and SC 160 (Fort Mill Highway)									
Condition	Measure	EB		WB		NB	SB		Intersection
		EBL	EBTR	WBLT	WBR	NBLTR	SBL	SBTR	LOS (Delay)
AM Peak Hour									
2022 Existing	LOS (Delay)	A (6.6)		B (12.3)		A (0.0)	B (15.6)		A (9.9)
	Synchro 95th Q	117'	237'	346'	8'	0'	75'	0'	
2028 Background	LOS (Delay)	B (11.5)		C (27.2)		A (0.0)	B (16.4)		B (17.7)
	Synchro 95th Q	255'	385'	#775'	29'	0'	133'	0'	
2028 Build-out	LOS (Delay)	B (12.9)		C (29.0)		A (0.0)	B (18.0)		B (19.3)
	Synchro 95th Q	283'	391'	#750'	27'	0'	139'	17'	
PM Peak Hour									
2022 Existing	LOS (Delay)	A (6.8)		B (14.3)		A (0.0)	B (18.2)		B (12.0)
	Synchro 95th Q	84'	218'	466'	10'	0'	106'	13'	
2028 Background	LOS (Delay)	B (17.6)		F (111.5)		A (0.0)	C (21.9)		D (51.3)
	Synchro 95th Q	381'	423'	#1169'	44'	0'	165'	80'	
2028 Build-out	LOS (Delay)	C (23.4)		F (103.8)		A (0.0)	D (35.7)		D (54.0)
	Synchro 95th Q	#567'	514'	#1054'	21'	0'	159'	240'	
Existing/Background Storage		250'			200'		225'		
# 95th percentile volume exceeds capacity, queue may be longer									

As shown in Table 6.3, the intersection currently operates at LOS A during the AM peak hour and LOS B during the PM peak hour.

Under 2028 background conditions, the overall intersection is expected to operate at LOS B during the AM peak hour and LOS D during the PM peak hour. When the proposed site traffic is added to the 2028 background conditions, the overall intersection is expected to continue to operate at LOS B during the AM peak hour and LOS D during the PM peak hour. It should be noted that in order to achieve an overall LOS D in the PM build scenario, a six-second adjustment to the splits to provide additional green time to the westbound through movement was made.

Since the proposed development is not expected to have a significant impact on overall intersection operations, no developer improvements are recommended at this intersection.

6.4 PETTUS FARM ROAD AND CAMP COX CIRCLE/SITE ACCESS

Table 6.4 summarizes the LOS, control delay, and 95th percentile queue lengths at the unsignalized intersection.

Table 6.4 - Pettus Farm Road and Camp Cox Circle/Site Access					
Condition	Measure	EB	WB	NB	SB
		EBLTR	WBLTR	NBLTR	SBLTR
AM Peak Hour					
2022 Existing	LOS (Delay)	A (8.2)	A (0.0)	A (7.2)	A (6.7)
	SimTraffic Max Q	64'	0'	32'	47'
2028 Background	LOS (Delay)	A (8.2)	A (0.0)	A (7.2)	A (6.7)
	SimTraffic Max Q	66'	0'	32'	53'
2028 Build-out	LOS (Delay)	A (8.3)	A (7.5)	A (6.9)	A (6.8)
	SimTraffic Max Q	65'	52'	52'	48'
PM Peak Hour					
2022 Existing	LOS (Delay)	A (7.5)	A (0.0)	A (7.4)	A (7.0)
	SimTraffic Max Q	59'	0'	56'	18'
2028 Background	LOS (Delay)	A (7.5)	A (0.0)	A (7.4)	A (7.0)
	SimTraffic Max Q	50'	0'	54'	18'
2028 Build-out	LOS (Delay)	A (7.7)	A (7.6)	A (7.2)	A (7.1)
	SimTraffic Max Q	49'	51'	63'	23'

As shown in Table 6.4, all of the stop-controlled approaches currently operate with short delays during both peak hours and are expected to continue to operate with short delays during both peak hours under 2028 background conditions. When the proposed site traffic is added to the 2028 background conditions, all the approaches are expected to continue to operate with short delays during both peak hours. Since the proposed development is not expected to have a significant impact on overall intersection operations, no developer improvements are recommended at this intersection for capacity purposes.

Based on the SCDOT ARMS Manual, the minimum throat length of unsignalized intersections with one exit lane is 30 feet. The SimTraffic maximum queue length is expected to be 52 feet. Therefore, a 55-foot internal protected stem (IPS), along with the installation of a stop sign, is recommended along the Site Access.

7.0 Auxiliary Turn Lane Warrants

Warrants for additional turn-lane improvements for unsignalized intersections beyond those necessary for capacity were determined based on a review of the figures 15.5A and 15.5G found on pages 15.5 (3) and 15.5 (9) in the *2003 SCDOT Highway Design Manual*. The results of the warrants for left and right-turn lanes under 2028 background and build-out conditions are summarized below and included in the **Appendix**.

The following turn lanes are warranted under 2028 background conditions:

Barberville Road and Pettus Road

- Eastbound left-turn lane should be considered

The following turn lanes are warranted under 2028 build-out conditions:

Barberville Road and Pettus Road

- Eastbound left-turn lane should be considered
- Westbound right-turn lane should be considered

As noted in Section 6.2, a westbound right-turn lane with 100 feet of storage is recommended for capacity purposes at this intersection.

Since the eastbound left-turn lane is warranted under both background and build-out conditions, the turn lane is not recommended to be constructed as part of the Pettus Farm development.

8.0 Conclusions

Based on the analyses contained herein, the following transportation improvements are recommended as developer mitigation:

- Construction of a westbound right-turn lane along Barberville Road at Pettus Road with 100 feet of storage.
- Construct the Site Access with a 55-foot IPS and stop sign.
- Per prior coordination with SCDOT, improvements to Pettus Road will be necessary to bring the pavement width and asphalt depth to an acceptable standard, along with the installation of a stop sign.

The recommended developer mitigation is shown in **Figure 8.1**. 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.

LEGEND

→ Existing Lane

X' Storage Length

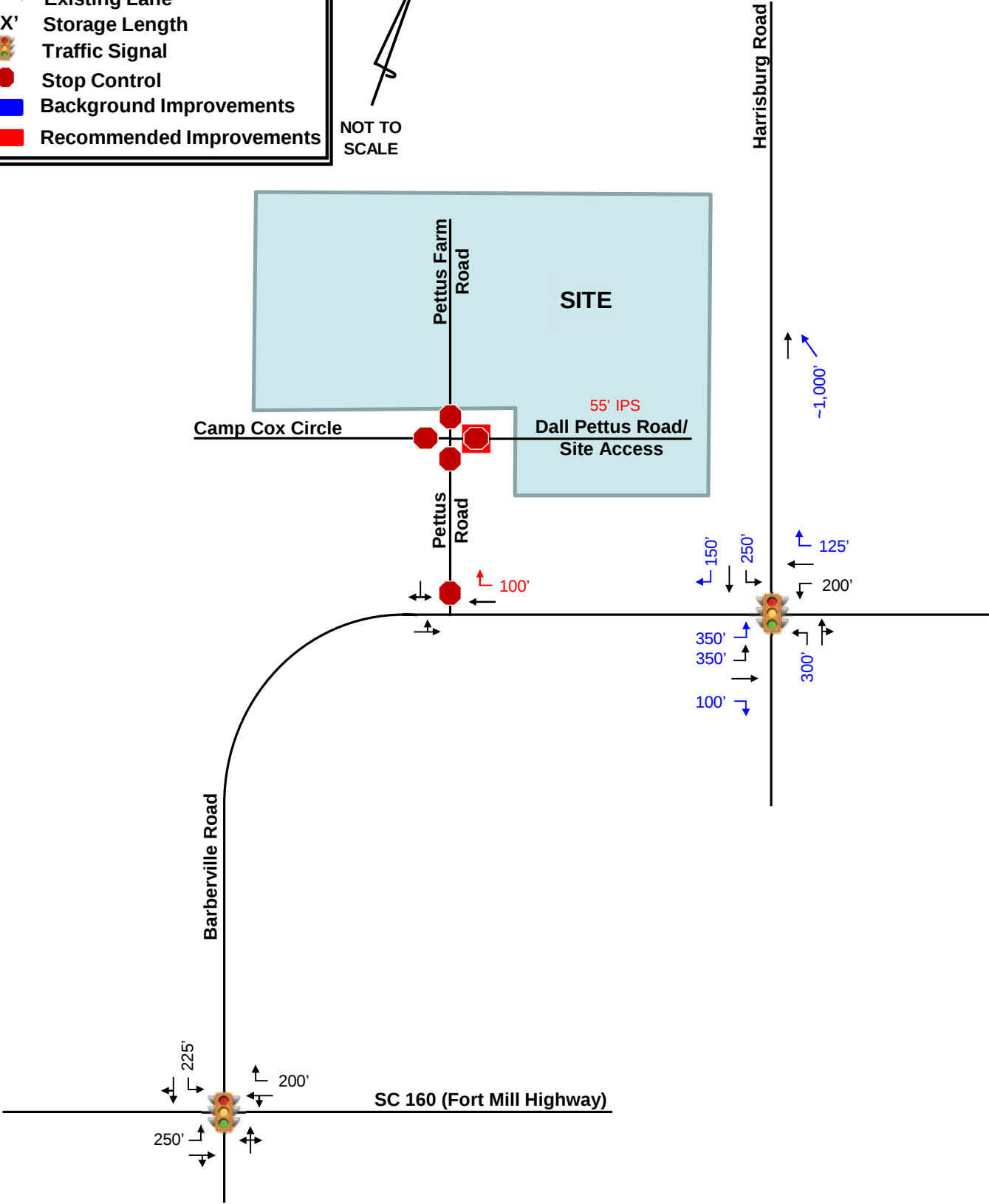
Traffic Signal

● Stop Control

Background Improvements

Recommended Improvements

NOT TO SCALE



Appendix