Revised Transportation Impact Letter
Couch Mill Road Subdivision
Knox County, Tennessee

12-I-21-RZ
TIL Version 2
11/15/2021

Prepared For:

Safe Harbor Development
308 Letterman Road
Knoxville, TN 37919

Prepared By:

Ajax Engineering, LLC
11812 Black Road
Knoxville, TN 37932
Robert W. Jacks, PE

ROBERT WILLIAM JACKS III
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 105730
STATE OF TENNESSEE

11/8/2021

Revised November 2021

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

11812 Black Road
Knoxville, Tennessee 37932
Phone (865) 556-0042
ajaxengineering@gmail.com

November 8, 2021

TO: Knoxville-Knox County Planning and
Knox County Engineering

RE: Couch Mill Road Subdivision – Revised Traffic Impact Letter
Knox County, Tennessee

This Traffic Impact Letter (TIL) is being submitted for a proposed residential subdivision in West Knox County. This subdivision is proposed to have 390 residential lots composed of single-family detached houses and townhouses off Couch Mill Road in West Knox County, Tennessee. This submittal addresses the Traffic Impact Letter requirements outlined in the "Transportation Impact Analysis Guidelines" adopted by the Knoxville-Knox County Planning Commission on January 9, 2020.

This TIL includes a project description summary, an overview of the adjacent road characteristics, proposed site plan, trip generation, traffic counts, data from a field review, and other pertinent data with supporting information in the Appendix. This submittal also provides a preliminary analysis of the intersection capacity of Sam Lee Road at Steele Road and Swafford Road.

If you have any questions or comments about this submittal, please feel free to contact me at any time. We look forward to your review and approval.

Sincerely,

Robert W. Jacks, P.E.
Ajax Engineering, LLC

PROJECT DESCRIPTION

- **GENERAL DESCRIPTION:**

At the initial design stage, the Couch Mill Road Subdivision is proposed to have 393 residential lots on 130 +/- acres. The developer is in the process of requesting a change in County zoning from Agricultural (A) to Planned Residential (PR) for the development property. As of now, the development is proposing 279 single-family detached houses and 114 townhouses. The initial design shows two access entrances, both off Couch Mill Road in West Knox County between Sam Lee Road and Williams Bend Road. The development property of 130 +/- acres will be a subdivision of an existing property that includes nearly 370 acres. Currently, the 130 acres marked for development include forested areas and open pasture used for farming purposes.

The subdivision is proposed to have fourteen internal roads that will meet Knox County Engineering specifications and design guidelines. The total length of these internal roads will be approximately 16,900 feet (3.2 miles). The internal roadways for the development will be paved with asphalt, include 8" extruded concrete curbs, and the lane widths will be 13 feet for a total of 26-foot pavement width. The street right-of-way within the development will be 50 feet. Knox County will maintain the streets in the subdivision after construction.

The subdivision design shows many common areas for the residents. Some of the common areas will incorporate stormwater controls, and others will contain amenity features for the subdivision residents. This project review assumed that the total construction build-out of the development and full occupancy would occur within the next seven years (2028).

- **SITE ACCESS & LOCATION:**

The Proposed East Entrance for the Couch Mill Road Subdivision is shown on the site plan 125' west of the Sam Lee Road at Couch Mill Road intersection. The Proposed West Entrance is shown on Couch Mill Road 1,300' west of the Proposed East Entrance. The location of this proposed subdivision is shown on a map in Figure 1. Figure 2 shows the initial concept site plan for the Couch Mill Road Subdivision prepared by Batson, Himes, Norvell & Poe. The plan shows road stub-outs to the remaining portion of the 370-acre property, but this is for speculative purposes only. The remaining property to the south is not for sale and has no plans for development.

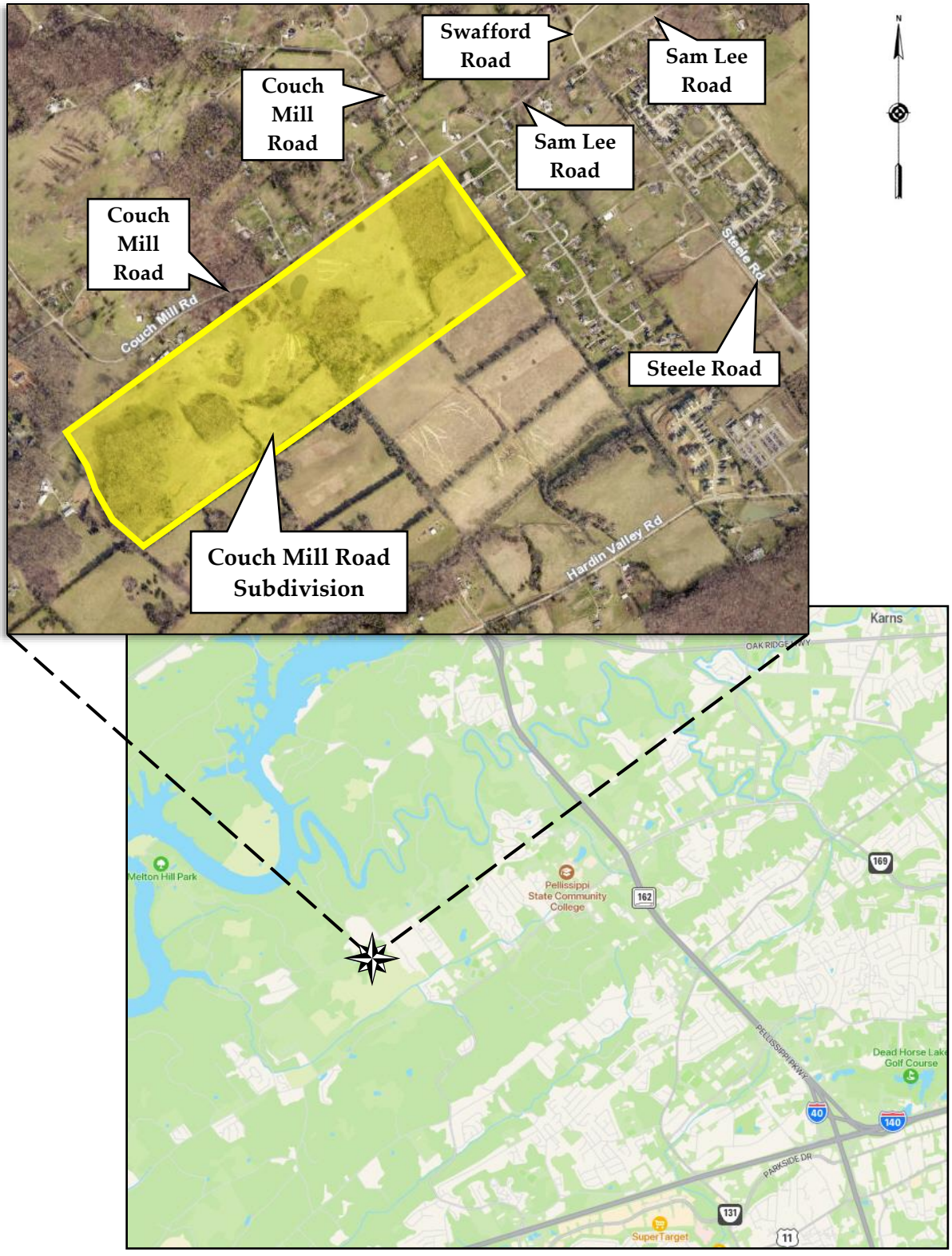


Figure 1
Location Map

Figure 2
Proposed Plan Layout
Couch Mill Road Subdivision

Not to Scale

DESCRIPTION OF EXISTING TRANSPORTATION CONDITIONS

- **EXISTING ADJACENT ROADWAYS:**

This proposed development will be located on the south side of Couch Mill Road in between Sam Lee Road and Williams Bend Road. The Proposed East Entrance for the subdivision on Couch Mill Road will be 1,700 feet to the southwest of the 4-way intersection of Sam Lee Road at Steele Road and Swafford Road.

There are a couple of other existing residential subdivisions, individual standalone residences, and undeveloped properties in the study area. This area of Knox County is rapidly being transitioned from a rural to a suburban setting.

Table 1 lists the characteristics of the existing roadways adjacent to the development property:

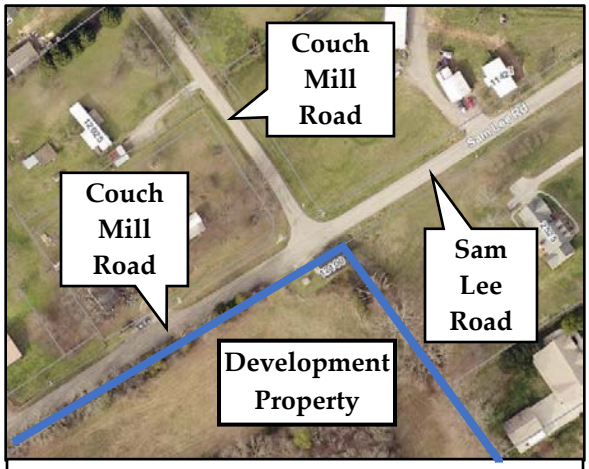
TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION [1]	SPEED LIMIT	LANES	ROAD WIDTH [2]	TRANSIT [3]	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Couch Mill Road	Major Collector	30 mph	2 undivided	18-20 feet	None	No sidewalks along roadway	No bike lanes
Sam Lee Road	Major Collector	30 mph	2 undivided	18.5-21 feet	None	No sidewalks along roadway	No bike lanes

[1] 2018 Major Road Plan by Knoxville/Knox County Planning
[2] Edge of pavement near project site
[3] According to Knoxville Area Transit System Map

Couch Mill Road is classified as a Major Collector and traverses in a very diverse pattern generally from the northeast to the southwest and is broken into two sections separated by Beaver Creek. From its beginning on the northwest side at a t-intersection with Guinn Road, the northern section of Couch Mill Road dead-ends to the southwest at Beaver Creek. The southern section of Couch Mill Road is where the proposed subdivision will have road access. This southern section begins on the south side of Beaver Creek. It makes several turns along its route, where it eventually ends at a t-intersection with East Gallaher Ferry Road/Williams Bend Road to the southwest. On the southern section, Couch Mill Road makes a sharp turn at a t-intersection with Sam Lee Road just slightly to the northwest of the proposed development property. At this t-

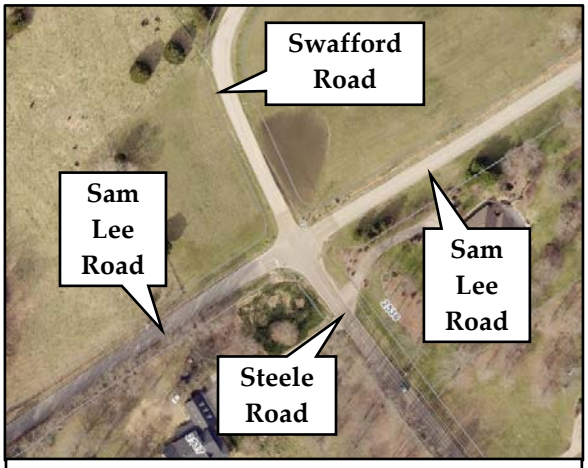
intersection, Sam Lee Road consists of the east approach, and Couch Mill Road consists of the north and west approaches. The north approach of Couch Mill Road is controlled by a Stop Sign (R1-1), with the east and west approaches being uncontrolled.



Intersection of Couch Mill Road at Sam Lee Road

Couch Mill Road currently consists of a 2-lane pavement section with faded white edge lines and a faded double yellow centerline adjacent to the subdivision property. Pavement widths along Couch Mill Road were measured to fluctuate between 18 feet in width to just over 20 feet. Roadway lighting is not present along Couch Mill Road. Couch Mill Road has relatively flat slopes outside the pavement but is occupied with trees, other vegetation, mailboxes, and fencing.

Sam Lee Road is classified as a Major Collector and traverses in a very diverse pattern from the northeast to the southwest. From the southwest, Sam Lee Road begins at the t-intersection with Couch Mill Road, crosses Steele Road and Swafford Road at a 4-way intersection, and continues for a total length of 2.6 miles to Solway Road. Near the development property, Sam Lee Road was measured with widths of 18.5 to 21 feet.



Intersection of Sam Lee Road at Steele Road and Swafford Road

The section of Sam Lee Road between Couch Mill Road and Steele Road and Swafford Road has more recently applied white edge lines and a double yellow centerline than what exists on Couch Mill Road adjacent to the development property. At the 4-way intersection at Steele Road and Swafford Road, the east and west approaches of Sam Lee Road operate under stop control. The Swafford Road and Steele Road approaches at the intersection operate freely. Steele Road provides access to Hardin Valley Road 0.9 miles to the south. Steele Road also provides access to Hardin Valley Elementary School, Hardin Valley Middle School, several dozen houses, and a shopping center with a Food City grocery store. Swafford Road traverses to the north for 2.1 miles, where

it terminates at Guinn Road. Swafford Road is characterized by single-family homes, undeveloped properties, and farms.

As part of the Transportation Impact Letter scope of work, road width measurements were made on Couch Mill Road and Sam Lee Road between the proposed development site and the 4-way intersection of Sam Lee Road at Steele Road and Swafford Road.

The following pages list the road width measurements between the subdivision's Proposed West Entrance and the 4-way intersection of Sam Lee Road at Steele Road and Swafford Road. Road width measurements were made every 250 feet.

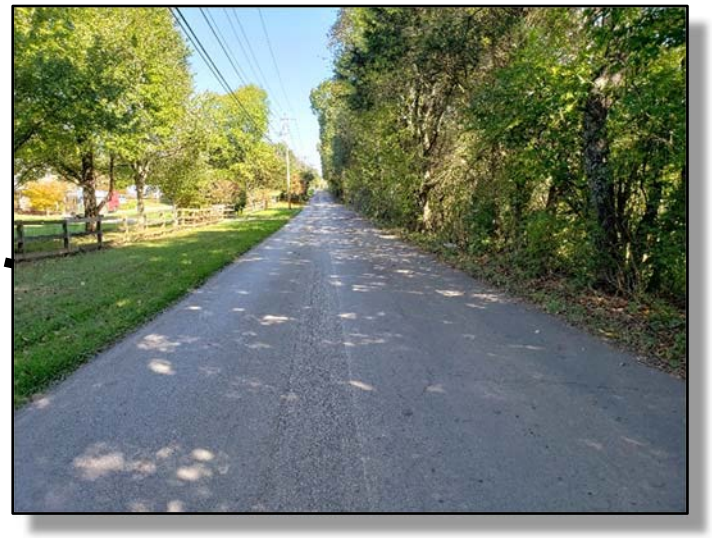
Following these pages, Figure 3 shows the lane configurations, pavement markings, and traffic signage on Couch Mill Road and Sam Lee Road between the project site property and the intersection of Sam Lee Road at Steele Road and Swafford Road.

Section 1 Information:

Pavement Width of Couch Mill Road @:
Station 0+00 = 19 feet (Proposed West Entrance Location)
Station 2+50 = 19.5 feet
Station 5+00 = 19 feet

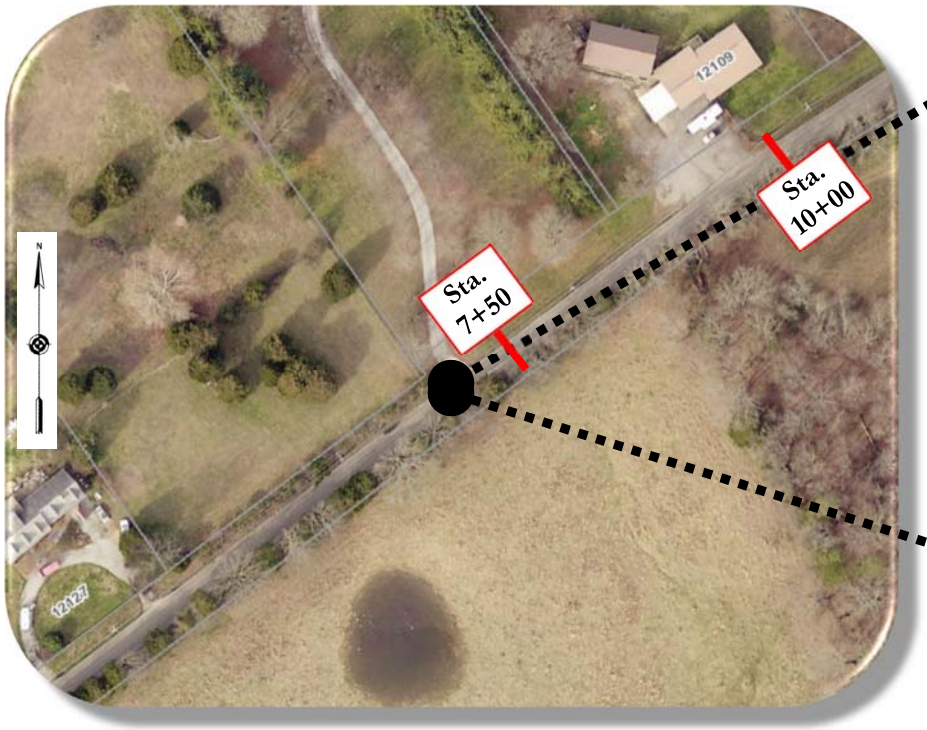
Couch Mill Road at Proposed West Entrance Location

View of Couch Mill Road (Looking Southwest)



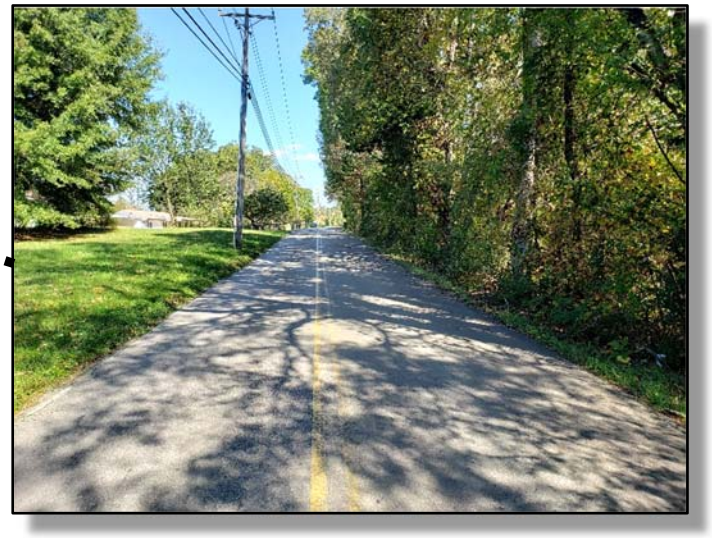
View of Couch Mill Road (Looking Northeast)

Section 2 Information:
Pavement Width of Couch Mill Road @:
Station 7+50 = 18 feet
Station 10+00 = 19.5 feet



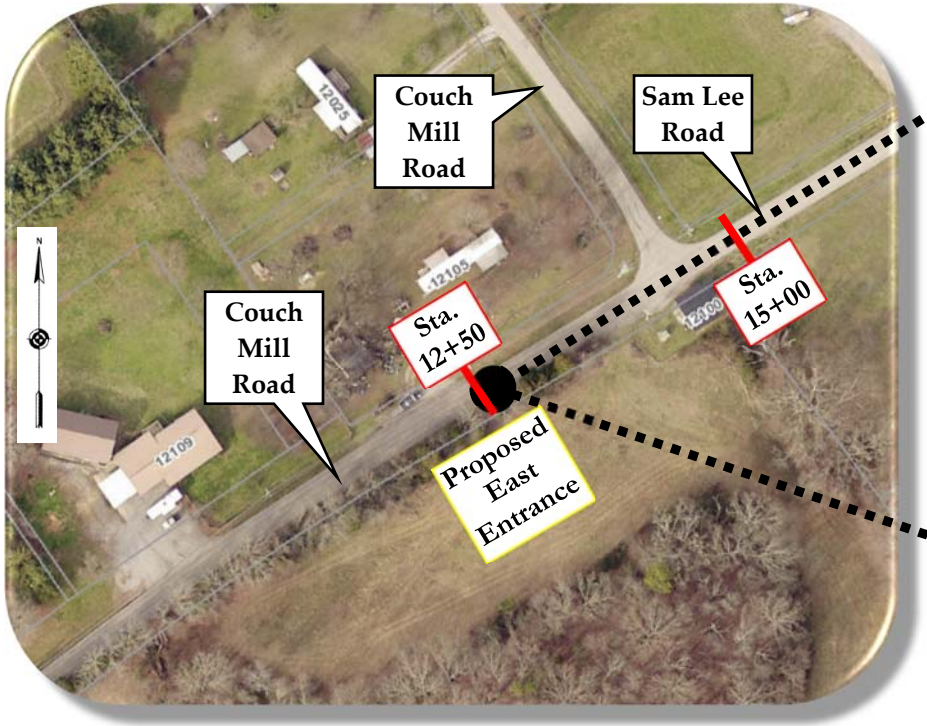
Couch Mill Road

View of Couch Mill Road
(Looking Southwest)



View of Couch Mill Road
(Looking Northeast)

Section 3 Information:
Pavement Width of Couch Mill Road @:
Station 12+50 = 20.5 feet (Approximate Proposed East Entrance Location)
Pavement Width of Sam Lee Road @:
Station 15+00 = 19.25 feet

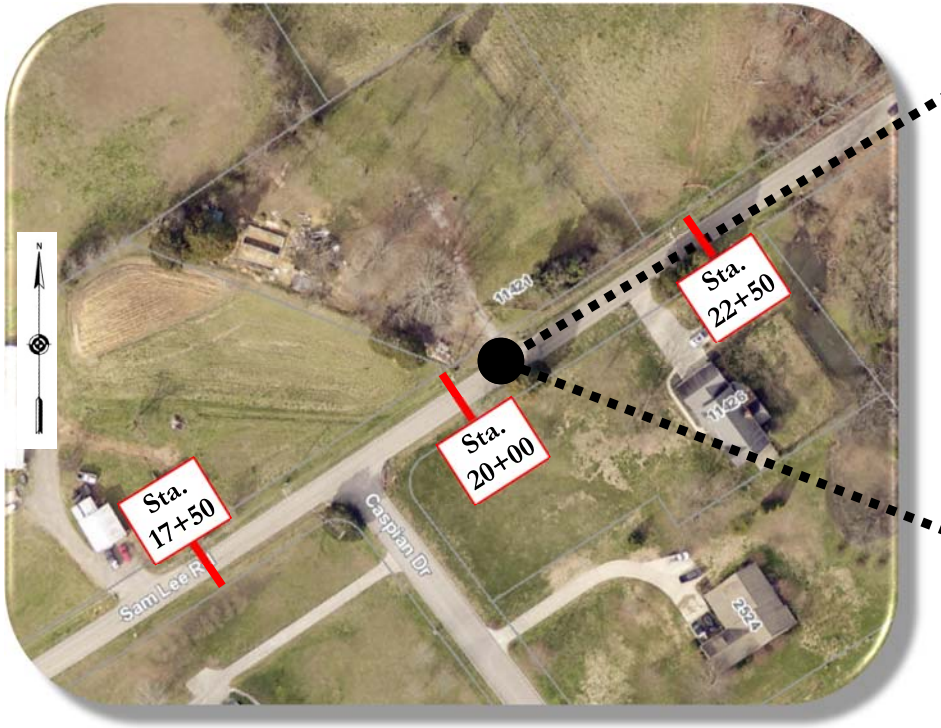


Couch Mill Road at Proposed East Entrance Location

View of Couch Mill Road (Looking Southwest)

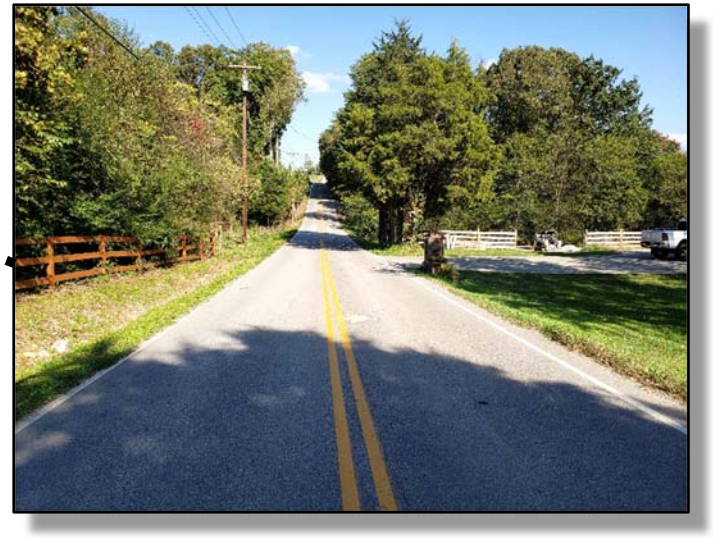
View of Couch Mill Road (Looking Northeast)

Section 4 Information:
Pavement Width of Sam Lee Road @:
Station 17+50 = 18.5 feet
Station 20+00 = 19.75 feet
Station 22+50 = 19 feet



Sam Lee Road at Caspian Drive

View of Sam Lee Road
(Looking Southwest)



View of Sam Lee Road
(Looking Northeast)

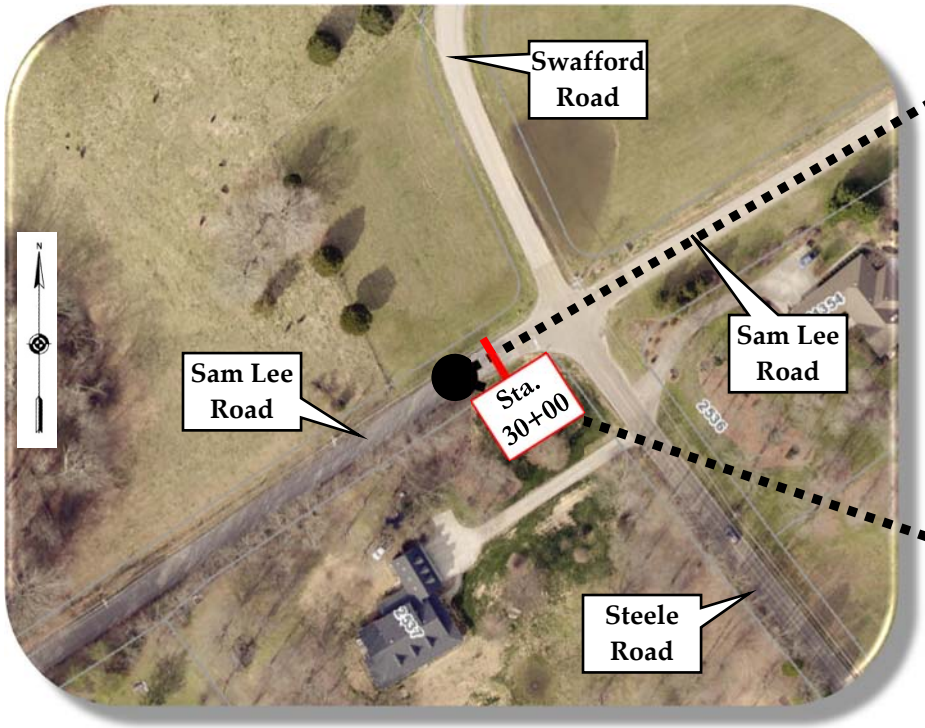
Section 5 Information:
Pavement Width of Sam Lee Road @:
Station 25+00 = 19.75 feet
Station 27+50 = 19 feet

Sam Lee Road

View of Sam Lee Road
(Looking Southwest)

View of Sam Lee Road
(Looking Northeast)

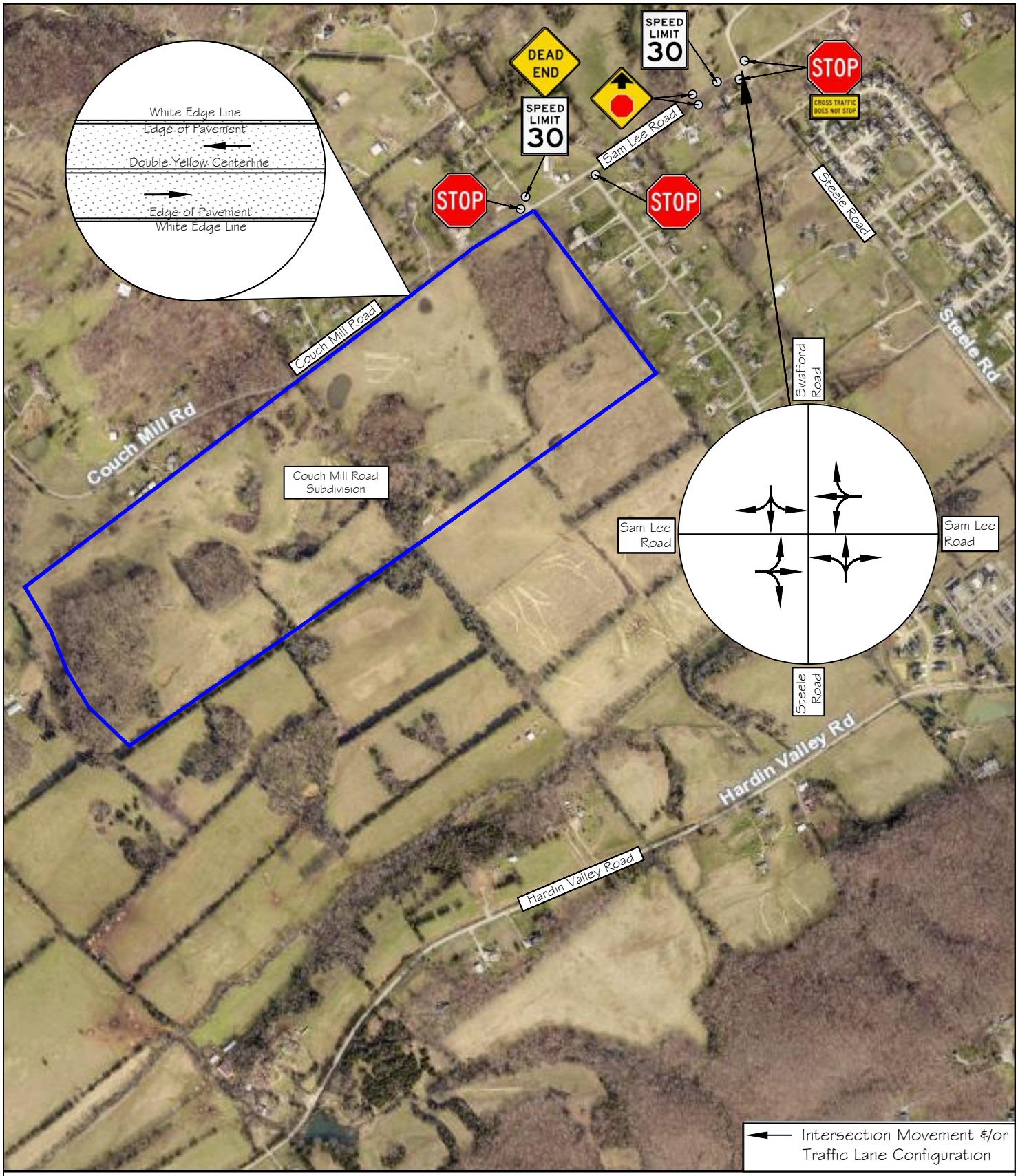
Section 6 Information:
Pavement Width of Sam Lee Road @:
Station 30+00 = 21.5 feet



Sam Lee Road at Steele Road and Swafford Road

View of Sam Lee Road (Looking Southwest)

View of Sam Lee Road (Looking Northeast)



AJAX ENGINEERING
11812 Black Road
Knoxville, TN 37932
Phone: (865) 556-0042
Email: ajaxengineering@gmail.com

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FIGURE 3

Couch Mill Road Subdivision

Traffic Signage & Existing Lane Configurations

▪ EXISTING VEHICULAR TRAFFIC VOLUMES:

Near the proposed project site, there is an established traffic count location. The Knoxville Regional Transportation Planning Organization (TPO) conducts this count every other year. The traffic count location data is the following:

- The Knoxville TPO reported an Average Daily Traffic (ADT) on Couch Mill Road, west of Steele Road, at 910 vehicles per day in 2019. From 2010 – 2019, this count station has indicated a flat 0.0% average annual growth rate. The historical traffic count data for this report can be viewed in the Appendix.

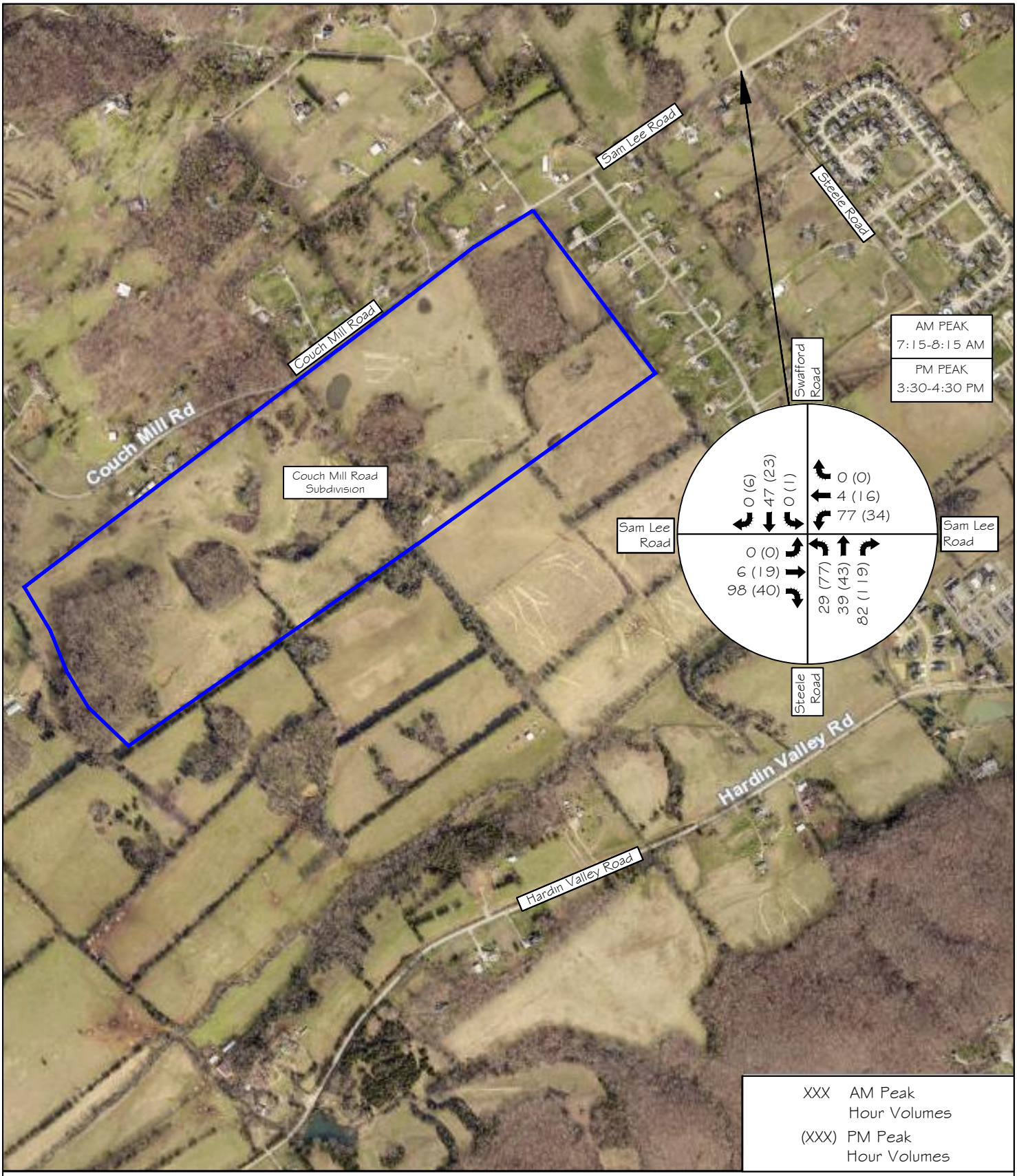
A traffic count was conducted at the intersection of Sam Lee Road at Steele Road and Swafford Road on October 19, 2021, by National Data & Surveying Services for Knox County Engineering. The data from this count for Knox County Engineering was obtained for this analysis. Based on this count, it was determined that the AM Peak Hour was 7:15 – 8:15 AM and the PM Peak Hour was 3:30 – 4:30 PM. The data from this traffic count is shown in Figure 4 and the Appendix. The data shows that the afternoon peak hour occurs earlier than the traditional rush hours, and this is suspected to occur due to the proximity of the Hardin Valley public schools to the south.

Capacity analyses were undertaken to determine the existing Level of Service (LOS) for the intersection of Sam Lee Road at Steele Road and Swafford Road. The capacity analyses were calculated following the methods outlined in the Highway Capacity Manual (HCM) and using Synchro Traffic Software (Version 8). The results are shown in Table 2 and the Appendix.

TABLE 2
2021 INTERSECTION CAPACITY ANALYSIS RESULTS -
SAM LEE ROAD AT STEELE ROAD/SWAFFORD ROAD
EXISTING CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Sam Lee Road at Steele Road/ Swafford Road	Unsignalized	Northbound	A	7.5	0.029	A	7.5	0.059
		Eastbound	A	9.5	0.122	B	10.9	0.111
		Westbound	B	13.7	0.213	B	14.9	0.209
		Southbound	A	0.0	-	A	7.8	0.003

Note: All analyses were calculated in Synchro 8 software and reported using HCM 2010 intersection methodology
[a] Level of Service
[b] Average Delay (sec/vehicle)
[c] Volume-to-Capacity Ratio



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11812 Black Road
Knoxville, TN 37932
Phone: (865) 556-0042
Email: ajaxengineering@gmail.com

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FIGURE 4

Couch Mill Road Subdivision

2021 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

TRANSPORTATION ANALYSIS OF PROJECTED CONDITIONS

- **TRIP GENERATION:**

The estimated amount of traffic that the 279 single-family detached houses will generate was calculated based upon rates and equations provided by the Trip Generation Manual, 11th Edition, a publication of the Institute of Transportation Engineers (ITE). The trip rates for the 114 attached townhouses were based upon equations provided by Knoxville-Knox County Planning via a local study. The data from ITE and the local study for the proposed land uses are shown in the Appendix. A summary of this information is presented in the following table:

TABLE 3
TRIP GENERATION FOR THE COUCH MILL ROAD SUBDIVISION
279 Single-Family Detached Homes and 114 Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	279 Houses	2,593	26%	74%		63%	37%	
				49	141	190	164	97	261
Local Trip Rate	Townhouses	114 Townhouses	1,073	22%	78%		55%	45%	
				13	47	60	47	39	86
Total New Volume Site Trips			**3,666**	**62**	**188**	**250**	**211**	**136**	**347**

ITE Trip Generation Manual, 11th Edition and Local Trip Rates
Trips calculated by using Fitted Curve Equation

For the proposed residential subdivision, with 393 residential lots with a mix of single-family detached houses and townhouses, it is estimated that 62 vehicles will enter and 188 will exit, for a total of 250 generated trips during the AM Peak Hour in the year 2028. Similarly, it is estimated that 211 vehicles will enter and 136 will exit, for a total of 347 generated trips during the PM Peak Hour in the year 2028. The calculated trips generated for an average weekday will be approximately 3,666 vehicles for the proposed residential development in 2028.

These projected generated traffic volumes are based on an approved rezoning change to Planned Residential (PR). This property is currently zoned under Agricultural (A) zoning, allowing one dwelling unit per acre. If the 130-acre development property maintained an Agricultural (A)

zoning, with a 1 unit/acre density, the development would generate 1,285 daily trips. In the AM Peak Hour, the development would generate 95 trips, and in the PM Peak Hour, the development would generate 127 trips. These calculations for the development maintaining an Agricultural (A) zoning assume that the units would be single-family detached houses and not include townhouses. The trip generation calculation for the development with 1 unit/acre is shown in the Appendix. If the requested Planned Residential (PR) zoning is allowed, the results show an increase of 2,381 daily trips, 155 trips in the AM Peak Hour, and 220 trips in the PM Peak Hour compared to the original zoning.

▪ PROJECTED HORIZON YEAR TRAFFIC CONDITIONS (WITHOUT THE PROJECT):

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). As previously stated, the build-out and full occupancy for this proposed development is assumed will occur by 2028. This horizon year corresponds to seven years for this development to reach full capacity and occupancy.

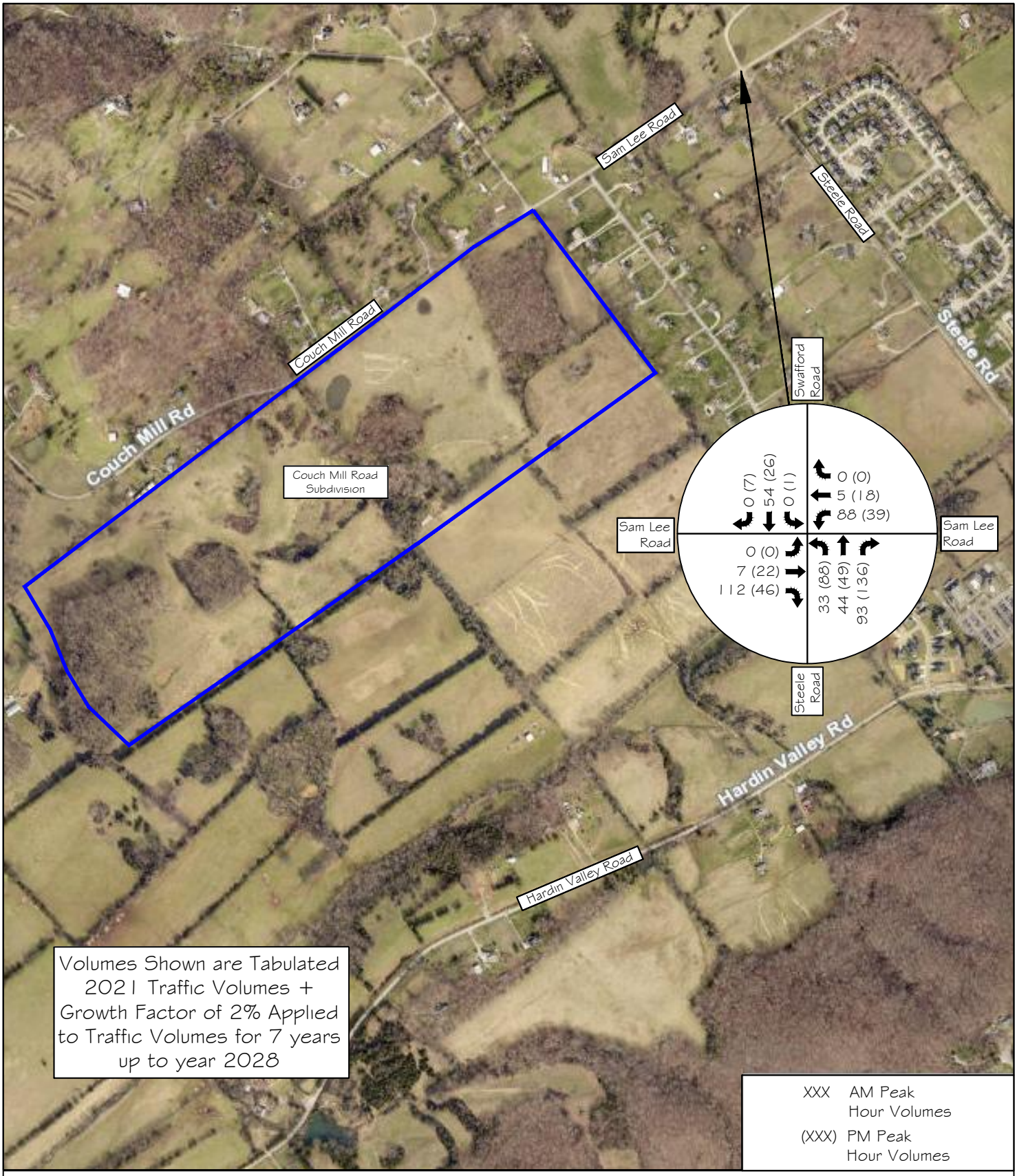
According to the nearby count station, traffic growth on Couch Mill Road has been flat over the past ten years (2010-2019). An increase in traffic volumes was recorded on Couch Mill Road in 2016, but the most recent tabulation in 2019 showed a subsequent decrease in traffic volumes, resulting in the same traffic volume as recorded in 2010. For this analysis, a +2% annual growth rate was assumed to consider any future development in the area, potential rising travel volumes, and a reasonable estimate to analyze the projected opening year traffic volumes for the year 2028 in the AM and PM peak hours at the studied intersection.

The recent traffic volumes collected at the intersection of Sam Lee Road at Steele Road and Swafford Road for Knox County Engineering were increased by 2% up to 2028. Figure 5 shows the projected horizon year traffic volumes at the intersection in 2028 during the AM and PM peak hours without the project. Capacity analyses were undertaken to determine the projected LOS for the intersection of Sam Lee Road at Steele Road and Swafford Road without the project. The results are shown in Table 4 and the Appendix.

TABLE 4
2028 INTERSECTION CAPACITY ANALYSIS RESULTS -
SAM LEE ROAD AT STEELE ROAD/SWAFFORD ROAD
PROJECTED CONDITIONS (WITHOUT THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Sam Lee Road at Steele Road/ Swafford Road	Unsignalized	Northbound	A	7.5	0.034	A	7.5	0.068
		Eastbound	A	9.7	0.144	B	11.5	0.137
		Westbound	C	15.3	0.270	C	17.0	0.269
		Southbound	A	0.0	-	A	7.9	0.003

Note: All analyses were calculated in Synchro 8 software and reported using HCM 2010 intersection methodology
[a] Level of Service
[b] Average Delay (sec/vehicle)
[c] Volume-to-Capacity Ratio



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11812 Black Road
Knoxville, TN 37932
Phone: (865) 556-0042
Email: ajaxengineering@gmail.com

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FIGURE 5

Couch Mill Road Subdivision

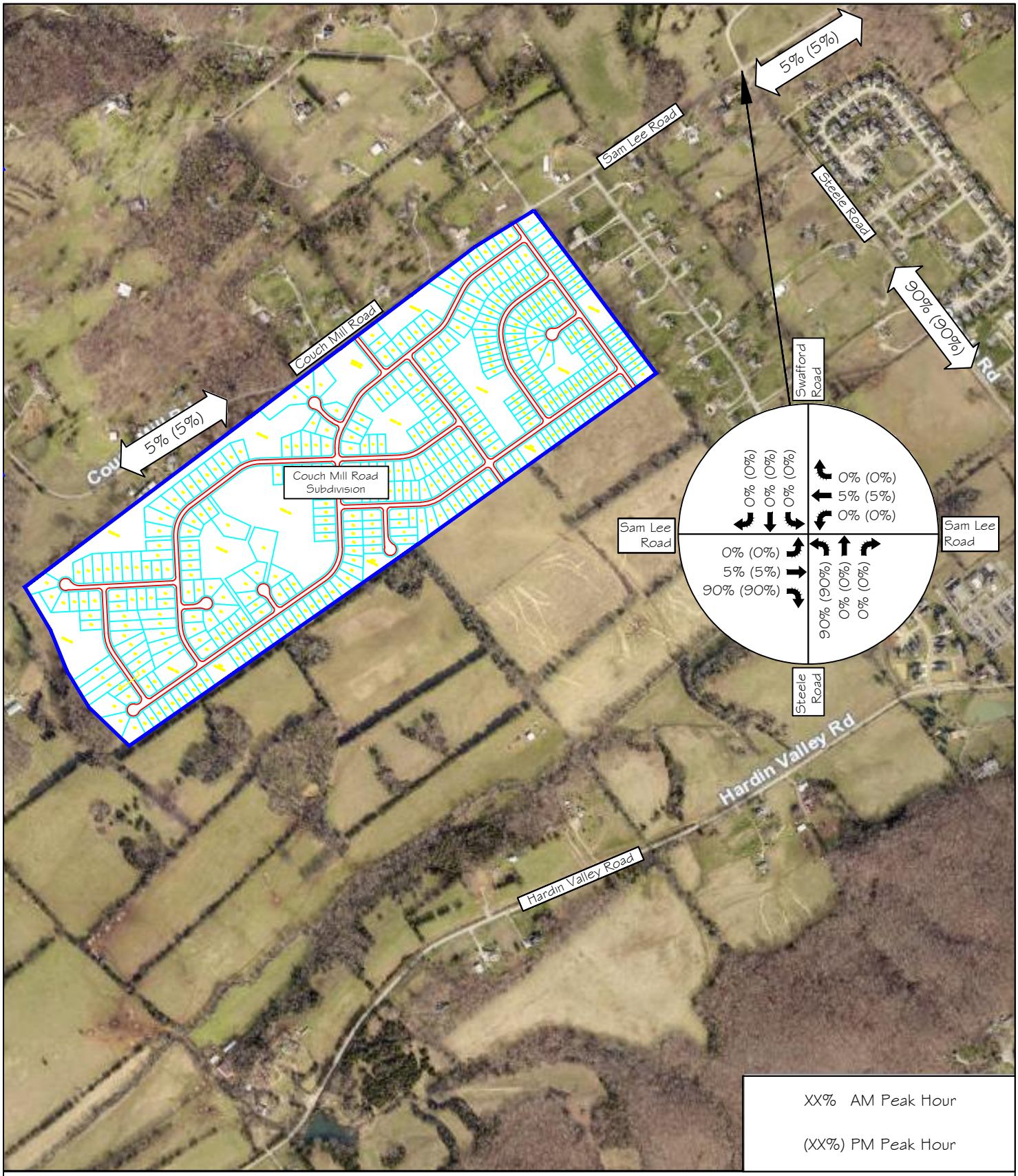
2028 Peak Hour Traffic Volumes - PROJECTED HORIZON YEAR TRAFFIC (WITHOUT THE PROJECT)

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

Figure 6 shows the projected distribution of traffic entering and exiting the proposed development. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the ITE and local trip rates.

The percentages assumed and shown in Figure 6 are based on the existing traffic count and engineering judgment with the reasonable assumption that most of the generated traffic will travel to and from Hardin Valley Road via Steele Road.

Figure 7 shows the traffic assignment of the computed trips generated by the development (Table 3) and applied to the intersection movements based on the assumed distribution of trips shown in Figure 6.



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11812 Black Road
Knoxville, TN 37932
Phone: (865) 556-0042
Email: ajaxengineering@gmail.com

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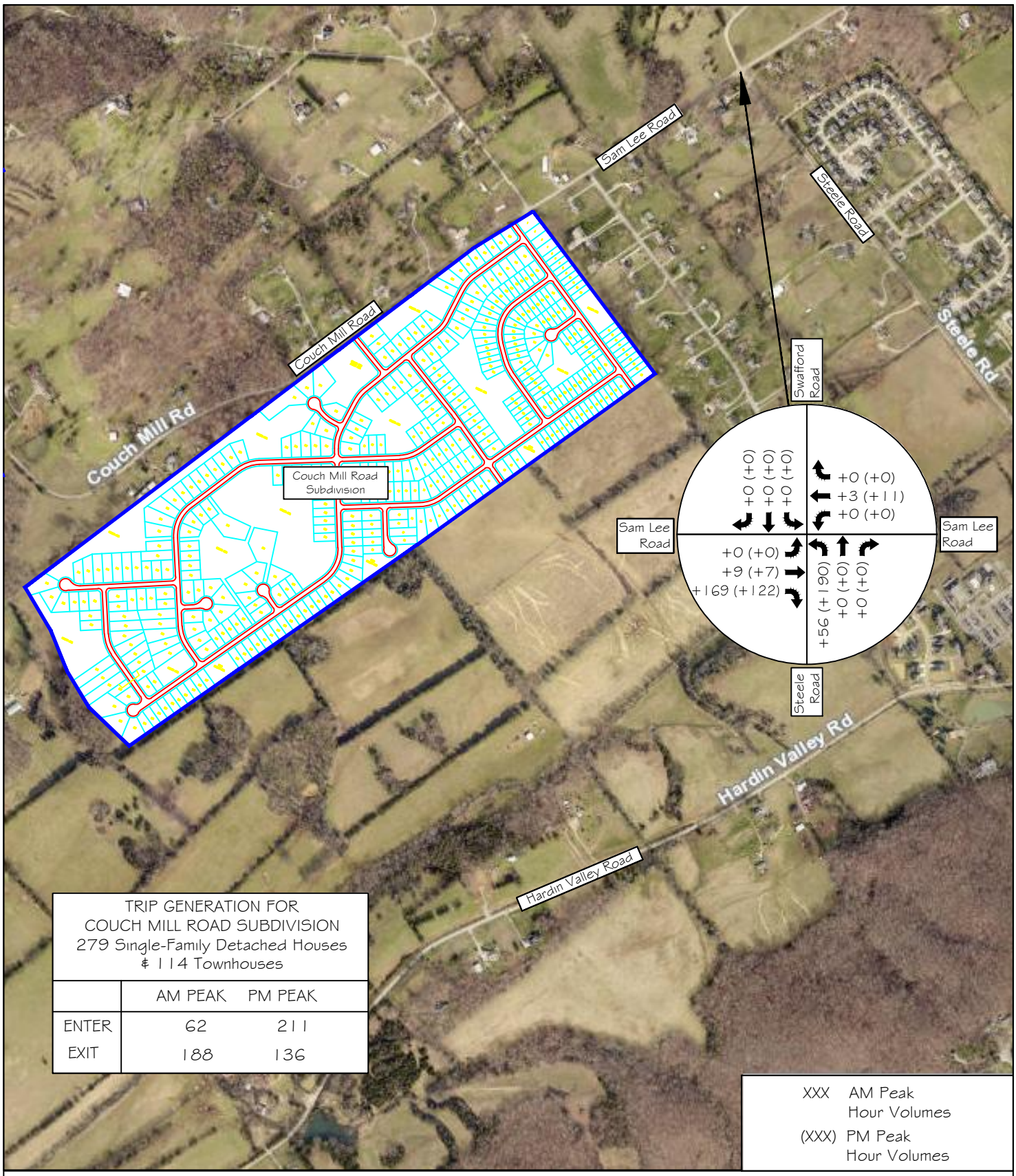
FIGURE 6

Couch Mill Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour



TRIP GENERATION FOR
COUCH MILL ROAD SUBDIVISION
279 Single-Family Detached Houses
& 114 Townhouses

	AM PEAK	PM PEAK
ENTER	62	211
EXIT	188	136

XXX AM Peak Hour Volumes

(XXX) PM Peak Hour Volumes

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11812 Black Road
Knoxville, TN 37932
Phone: (865) 556-0042
Email: ajaxengineering@gmail.com

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FIGURE 7

Couch Mill Road Subdivision

Traffic Assignment of Generated Traffic during AM and PM Peak Hour

- **PROJECTED HORIZON YEAR TRAFFIC CONDITIONS (WITH THE PROJECT):**

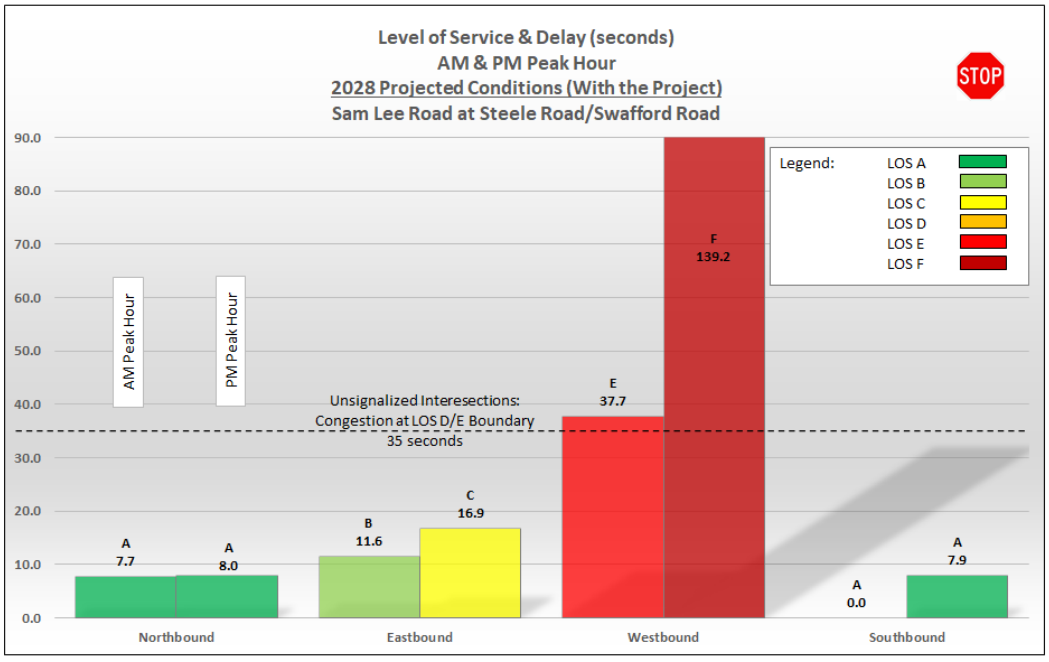
Figure 8 shows the projected 2028 AM and PM peak hour volumes with the generated development traffic at the studied intersection. Capacity analyses were undertaken to determine the projected Level of Service (LOS) for the intersection of Sam Lee Road at Steele Road and Swafford Road in 2028.

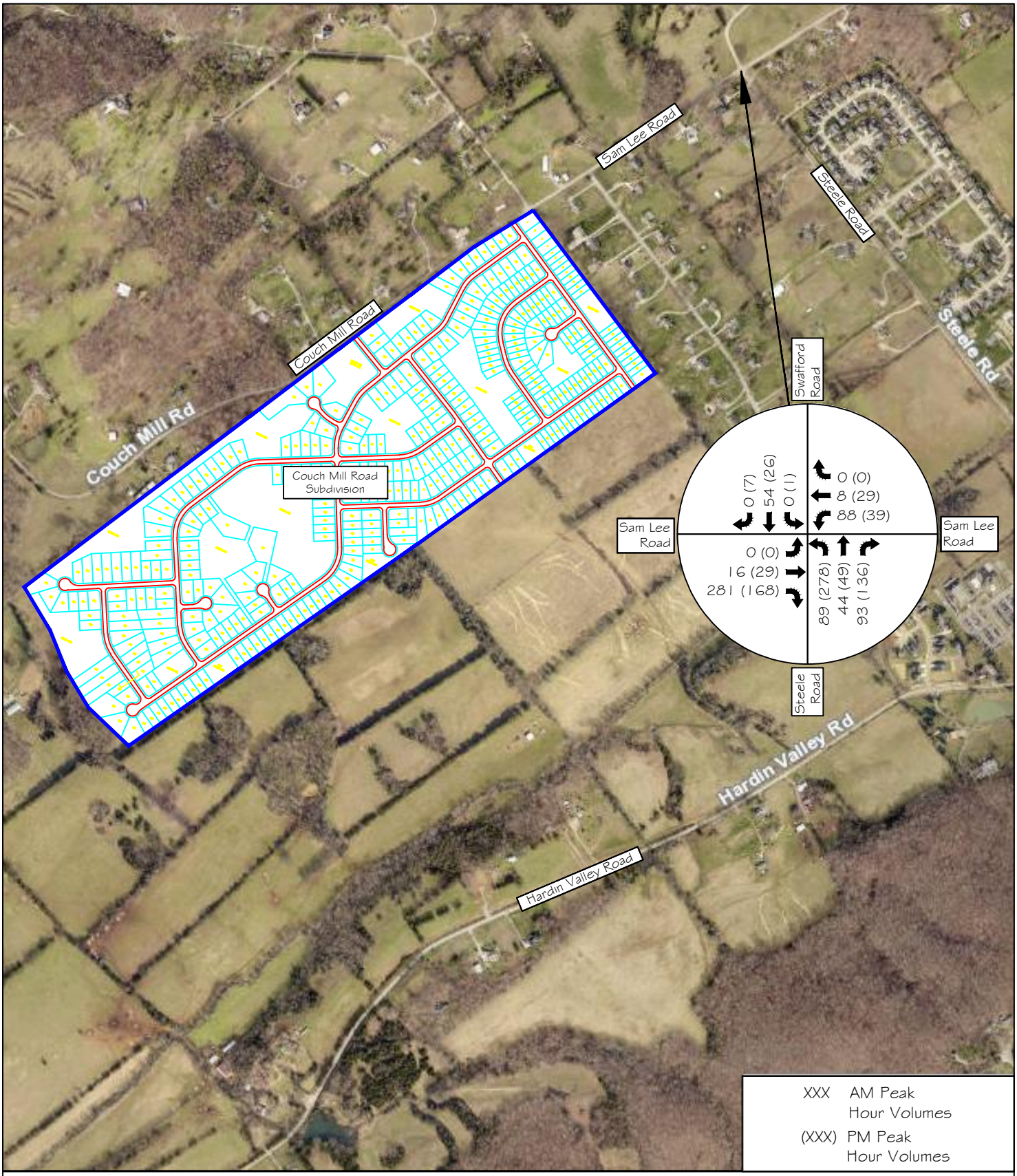
The projected peak hour vehicular traffic results can be seen in Table 5 for the intersection, with the worksheets included in the Appendix. The studied intersection is calculated to operate at acceptable levels with minimal to average vehicle delays for all the approaches except for the westbound approach of Sam Lee Road.

TABLE 5
2028 INTERSECTION CAPACITY ANALYSIS RESULTS -
SAM LEE ROAD AT STEELE ROAD/SWAFFORD ROAD
PROJECTED CONDITIONS (WITH THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Sam Lee Road at Steele Road/ Swafford Road	STOP Unsignalized	Northbound	A	7.7	0.091	A	8.0	0.214
		Eastbound	B	11.6	0.370	C	16.9	0.449
		Westbound	E	37.7	0.562	F	139.2	0.984
		Southbound	A	0.0	-	A	7.9	0.003

Note: All analyses were calculated in Synchro 8 software and reported using HCM 2010 intersection methodology
[a] Level of Service
[b] Average Delay (sec/vehicle)
[c] Volume-to-Capacity Ratio





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Email: ajaxengineering@gmail.com

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FIGURE 8

Couch Mill Road Subdivision

2028 Peak Hour Traffic Volumes - PROJECTED HORIZON YEAR TRAFFIC (WITH THE PROJECT)

- **INTERSECTION SIGHT DISTANCE:**

At the proposed project site, the speed limit is posted at 30 mph on the adjacent section of Couch Mill Road. Based on Knox County's policy of requiring 10 feet of sight distance per 1-mph of speed, the required sight distance is 300 feet.

Visual observations of the currently available sight distances at the proposed entrance locations shown in the site plan were undertaken. Using a Nikon Laser Rangefinder at the Proposed Entrance locations, the intersection sight distances were estimated to be adequate. The only exception was the Proposed West Entrance location looking to the southwest, which was estimated to be less than 300 feet. The sight distance at this proposed entrance looking to the southwest is reduced due to a vertical crest curve on Couch Mill Road.

Images of the existing sight distances are shown below and labeled with the required ISD and measured estimated sight distances at the proposed entrances:

View of Sight Distance on Couch Mill Road at Proposed East Entrance Location (Looking Southwest)

View of Sight Distance on Couch Mill Road at Proposed East Entrance Location (Looking Northeast)

View of Sight Distance on Couch Mill Road at Proposed West Entrance Location (Looking Southwest)

View of Sight Distance on Couch Mill Road at Proposed West Entrance Location (Looking Northeast)

OVERVIEW OF FINDINGS

The following is an overview of the findings for the proposed Couch Mill Road Subdivision based on the preliminary assessment of the existing and projected conditions:

- The sight distances at the proposed site entrance locations on Couch Mill Road have been measured to be adequate except for the Proposed West Entrance location looking to the southwest, which was estimated to be less than 300 feet. The sight distance at this proposed entrance looking to the southwest is reduced due to a vertical crest curve on Couch Mill Road. A more accurate measurement by a land surveyor will be required to determine if 300 feet of sight distance is available or if the entrance should be shifted further to the east on Couch Mill Road.

  Furthermore, the proposed site entrance locations will need to be re-located to meet Knox County's intersection separation standard. Couch Mill Road is a collector road which means that the proposed entrance roads will need to have 300 feet of separation from existing intersecting roads. Currently, the site plan shows 125 feet of separation between the Proposed East Entrance and the existing intersection of Sam Lee Road at Couch Mill Road. The proposed West Entrance is shown with approximately 160 feet of separation from Dusty Way. Both proposed entrances will need to be shifted further away to meet the Knox County standard intersection separation distance of 300 feet on collector roads. Ultimately, this would benefit the Proposed West Entrance sight distance since this will shift the intersection further away from the vertical curve on Couch Mill Road.

- The results of the projected level of service calculations for the Sam Lee Road at Steele Road and Swafford Road intersection in the year 2028 were determined to be adequate with respect to vehicle delays. The exception is Sam Lee Road's westbound approach, which is projected to operate at LOS E and F in the 2028 AM and PM peak hours, respectively.

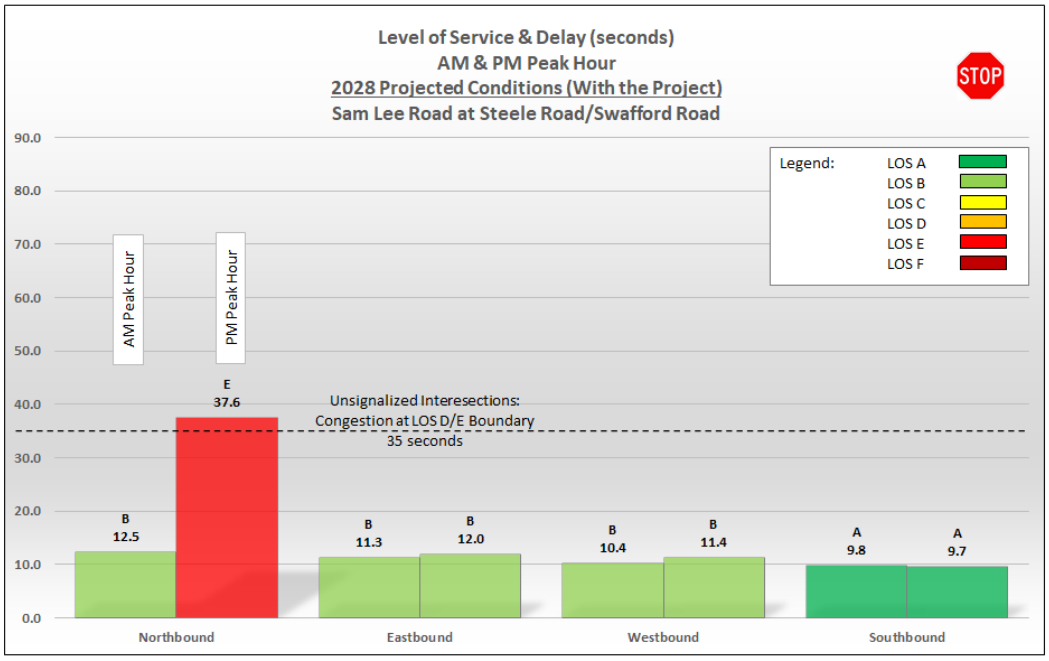
  This intersection currently operates with Steele Road and Swafford Road operating freely with the east and west approaches of Sam Lee Road operating under stop control.

An additional analysis was conducted with the intersection operating under All-Way Stop Control (AWSC). This type of control would force southbound motorists on Swafford Road and northbound motorists on Steele Road to come to a stop instead of operating freely. Modifying this intersection would allow for the Sam Lee Road westbound approach to operate with fewer vehicle delays. However, this modification would shift more vehicle delays and larger vehicle queues onto the northbound motorists on Steele Road, particularly during the PM peak hour. The results showed that the intersection operating under AWSC resulted in the following:

TABLE 6
2028 INTERSECTION CAPACITY ANALYSIS RESULTS -
SAM LEE ROAD AT STEELE ROAD/SWAFFORD ROAD
PROJECTED CONDITIONS (WITH THE PROJECT) - ALL-WAY STOP CONTROL (AWSC)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Sam Lee Road at Steele Road/ Swafford Road	STOP Unsignalized	Northbound	B	12.5	0.463	E	37.6	0.901
		Eastbound	B	11.3	0.423	B	12.0	0.382
		Westbound	B	10.4	0.217	B	11.4	0.231
		Southbound	A	9.8	0.167	A	9.7	0.098

Note: All analyses were calculated in Synchro 8 software and reported using HCM 2010 intersection methodology
[a] Level of Service
[b] Average Delay (sec/vehicle)
[c] Volume-to-Capacity Ratio



Operating under AWSC, the increased vehicle delay for the northbound approach is due to the high volume of projected right turns in the PM peak hour. However, if AWSC is implemented, this increased vehicle delay could be reduced if an exclusive northbound right-turn slip lane is constructed that operates under yield control. Further analyses would be required to determine if a slip lane would be practical concerning property acquisition and sight distances. Furthermore, additional analyses will need to be conducted to determine if the intersection fully meets MUTCD warrants for AWSC. This analysis would need to include vehicle speeds, crash history, and further traffic volume examinations.

Due to the ongoing and rapid suburbanization of the Hardin Valley area combined with other large and undeveloped property tracts remaining near this intersection, it is recommended that the County consider the possibility of converting this intersection to a roundabout in the future. The existing land around this intersection is relatively flat and is undeveloped on the north side. To the south, property acquisition from two existing single-family house owners would be required but has areas not currently occupied by structures or driveways.

- Knox County has published an informal minimum standard relating Average Daily Traffic (ADT) versus road widths. A graph of this minimum standard is shown in the Appendix.

  The road width measurements conducted for this study showed an average width of approximately 19 feet from the Proposed West Entrance location on Couch Mill Road to the intersection of Sam Lee Road at Steele Road and Swafford Road. Based on a road width of 19 feet and the Knox County standard, the maximum allowable ADT would be 3,000 vehicles per day. The existing ADT (2019) is 910 vehicles, and the projected amount of additional daily traffic that the Couch Mill Road Subdivision will contribute is expected to be 3,483 vehicles (total trip generation daily traffic = 3,666 x 95% of residents are expected to travel to and from the east of the subdivision). Adding these two volumes results in nearly 4,500 vehicles per day. This ADT would indicate that the road width between the proposed subdivision and the intersection of Sam Lee Road at Steele Road and Swafford Road would need to be widened to 21 feet along this entire route. Based on Knox County's ADT/road width minimum standard, a road width of 21 feet would be appropriate for up to 5,000 vehicles per day.

Ultimately, meeting this minimum standard would necessitate widening Couch Mill Road and Sam Lee Road 1 to 3 feet for approximately 3,050 feet between the Proposed West Entrance and the intersection of Sam Lee Road at Steele Road and Swafford Road.

- The following provides further context to the future road capacity of Couch Mill Road in the study area.

Based on the analysis methods presented in the latest Highway Capacity Manual, the Florida Department of Transportation (FDOT) developed LOSPLAN, a group of software evaluation tools that provides computational methods for analyzing freeways, highways, and arterials road sections. The software provides conceptual level planning results for determining roadway facilities' capacity and LOS. For this report, this software is regarded to be appropriate for use in this level of study.

Various factors are used to calculate the actual "real world" capacity of a roadway. In almost all cases, the actual roadway capacity is reduced as more heavy vehicles comprise the traffic flow, road grades increase, and other aspects are included. For 2-lane highway segments in the software, FDOT has set the maximum amount of vehicle flow in developed areas at 1,650 vehicles per hour per lane (vphpl).

In this study, values were inputted in the FDOT software to ensure conservative LOS results of Couch Mill Road. The analysis included Couch Mill Road's segment between the proposed development and the intersection of Sam Lee Road at Steele Road and Swafford Road for a total length of 0.3 miles. The major inputs in the software were the following:

- assumed a free-flow speed of 40 mph
- an AADT (Average Annual Daily Traffic) of 4,557 vehicles in 2028
- 2% heavy truck traffic
- Left turn/blockage impact is present due to the lack of left-turn storage bays
- Rolling terrain
- 0% no passing zones present

The AADT of 4,557 vehicles was based on the ADT volume of 910 vehicles on Couch Mill Road near the project site reported by the TPO in 2019, adjusting it upwards with 2% growth up to 2028 and by adding the daily volumes generated by the proposed Couch Mill Road Subdivision (3,666 daily trips) to and from the east. The additional daily traffic volumes on Couch Mill Road generated by the proposed development were calculated by multiplying the 3,666 total daily generated trips by 95%, which is the assumed distribution of travel to and from the east on Couch Mill Road.

Based on these factors and other inputs, the Level of Service for this segment of Couch Mill Road was calculated to be LOS B in 2028. This result was based on the projected conditions when the proposed Couch Mill Road Subdivision is fully built-out and occupied in 2028. The results from the software are shown in the Appendix.

The planning-level analysis of Couch Mill Road was conducted and resulted in a calculated LOS of B in 2028. Thus, it can be stated that the additional trips generated by the proposed project would not unreasonably impair traffic flow along Couch Mill Road through the adjacent Planned Growth Area.

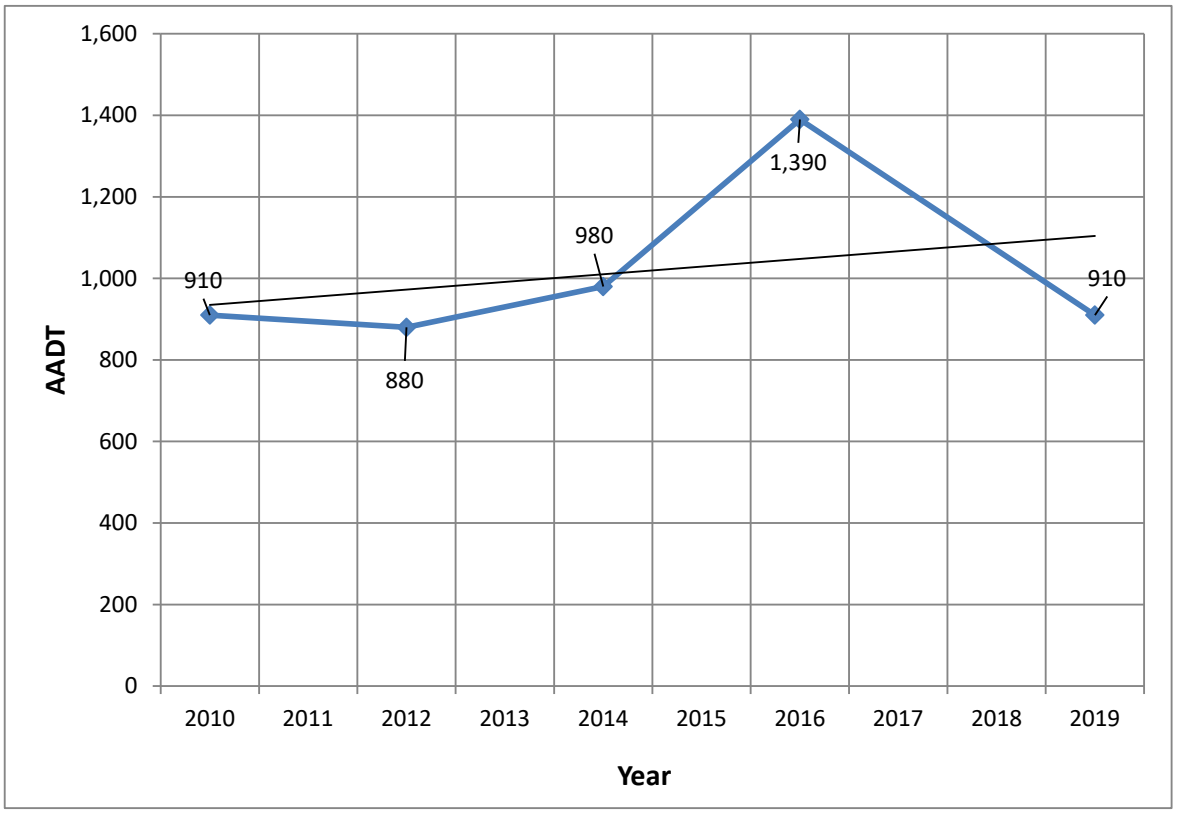
APPENDIX

Historical Traffic Counts

Organization: Knoxville TPO
Station ID #: 093M342
Location: Couch Mill Road, west of Steele Road

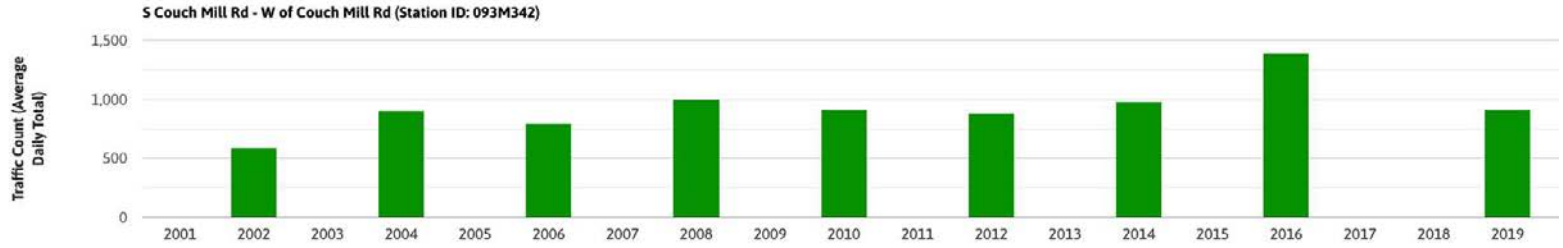
YEAR	ADT
2009	-
2010	910
2011	-
2012	880
2013	-
2014	980
2015	-
2016	1,390
2017	-
2018	-
2019	910

Trendline



2010 - 2019 Growth Rate = 0.0%
Average Annual Growth Rate = 0.0%


Hewitt Ln
Couch Mill Rd
Turpin Ln
Sam Lee Rd
Williams Bend Rd
George Miller Ln
S Couch Mill Rd
Caspian Dr
Steele Rd
Conner Creek
Find address or place


S Couch Mill Rd - W of Couch Mill Rd (Station ID: 093M342)
Traffic Count (Average Daily Total)
1,500
1,000
500
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

National Data & Surveying Services Intersection Turning Movement Count

Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville
Control: 2-Way Stop(EB/WB)

Project ID: 21-190057-001
Date: 10/19/2021

Data - Total

NS/EW Streets: Swafford Rd/Steele Rd | Swafford Rd/Steele Rd | Sam Lee Rd | Sam Lee Rd

AM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	1	3	6	0	0	12	0	0	0	1	23	0	9	2	0	0	57
7:15 AM	5	6	6	0	0	10	0	0	0	2	26	0	26	1	0	0	82
7:30 AM	4	12	28	0	0	23	0	0	0	1	26	0	17	0	0	0	111
7:45 AM	9	14	26	0	0	6	0	0	0	2	20	0	15	2	0	0	94
8:00 AM	11	7	22	0	0	8	0	0	0	1	26	0	19	1	0	0	95
8:15 AM	10	8	13	0	0	3	2	0	0	2	18	0	13	4	0	0	73
8:30 AM	7	4	9	0	0	5	0	0	2	0	11	0	1	0	0	1	40
8:45 AM	6	5	13	0	0	2	1	0	1	0	12	0	4	0	0	0	44
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	53	59	123	0	0	69	3	0	3	9	162	0	104	10	0	1	596
APPROACH %'s :	22.55%	25.11%	52.34%	0.00%	0.00%	95.83%	4.17%	0.00%	1.72%	5.17%	93.10%	0.00%	90.43%	8.70%	0.00%	0.87%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	29	39	82	0	0	47	0	0	0	6	98	0	77	4	0	0	382
PEAK HR FACTOR :	0.659	0.696	0.732	0.000	0.000	0.511	0.000	0.000	0.000	0.750	0.942	0.000	0.740	0.500	0.000	0.000	0.860
	0.765				0.511				0.929				0.750				

NOON

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
11:00 AM	9	2	2	0	0	0	1	0	0	1	9	0	1	0	0	0	25
11:15 AM	10	5	2	0	0	2	0	0	3	0	9	0	5	1	0	0	37
11:30 AM	8	1	5	0	0	3	2	0	0	0	10	0	2	0	0	0	31
11:45 AM	7	6	3	0	0	3	0	0	0	1	8	0	6	0	0	0	34
12:00 PM	11	4	5	0	0	3	1	0	1	2	14	0	4	3	0	0	48
12:15 PM	11	5	5	0	0	1	0	0	0	0	7	0	2	2	1	0	34
12:30 PM	12	3	2	0	0	3	1	0	0	2	4	0	0	1	1	0	29
12:45 PM	9	8	4	0	0	3	2	0	0	1	11	0	3	2	0	0	43
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	77	34	28	0	0	18	7	0	4	7	72	0	23	9	2	0	281
APPROACH %'s :	55.40%	24.46%	20.14%	0.00%	0.00%	72.00%	28.00%	0.00%	4.82%	8.43%	86.75%	0.00%	67.65%	26.47%	5.88%	0.00%	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	43	20	16	0	0	10	4	0	1	5	36	0	9	8	2	0	154
PEAK HR FACTOR :	0.896	0.625	0.800	0.000	0.000	0.833	0.500	0.000	0.250	0.625	0.643	0.000	0.563	0.667	0.500	0.000	0.802
	0.940				0.700				0.618				0.679				

PM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	10	2	6	0	0	2	0	0	1	1	13	0	4	0	1	0	40
2:15 PM	10	3	3	0	0	6	0	0	0	1	15	1	15	4	0	0	58
2:30 PM	11	7	9	0	1	3	1	0	0	3	11	0	9	2	0	0	57
2:45 PM	7	6	9	0	0	6	0	0	0	2	5	0	10	4	0	0	49
3:00 PM	19	2	12	0	1	6	0	0	0	3	10	0	4	2	0	0	59
3:15 PM	9	1	3	0	0	3	1	0	0	1	10	0	13	5	0	0	46
3:30 PM	16	8	39	1	1	7	2	0	0	2	9	0	17	5	0	0	107
3:45 PM	23	18	50	0	0	4	0	0	0	4	8	0	6	7	0	0	120
4:00 PM	19	7	17	0	0	3	3	0	0	6	12	0	6	2	0	0	75
4:15 PM	19	10	13	0	0	9	1	0	0	7	11	0	5	2	0	0	77
4:30 PM	12	10	12	0	0	2	2	0	0	2	12	0	8	2	0	0	62
4:45 PM	14	2	4	0	0	4	2	0	1	1	12	0	8	3	0	0	51
5:00 PM	21	6	4	0	0	4	2	0	0	4	24	0	9	2	0	0	76
5:15 PM	23	9	10	0	0	5	0	0	0	2	18	0	7	1	0	0	75
5:30 PM	19	3	10	0	0	2	0	0	1	5	16	0	1	1	0	0	58
5:45 PM	28	4	5	0	0	5	3	0	0	1	19	0	5	4	0	0	74
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	260	98	206	1	3	71	17	0	3	45	205	1	127	46	1	0	1084
APPROACH %'s :	46.02%	17.35%	36.46%	0.18%	3.30%	78.02%	18.68%	0.00%	1.18%	17.72%	80.71%	0.39%	72.99%	26.44%	0.57%	0.00%	
PEAK HR :	03:30 PM - 04:30 PM																TOTAL
PEAK HR VOL :	77	43	119	1	1	23	6	0	0	19	40	0	34	16	0	0	379
PEAK HR FACTOR :	0.837	0.597	0.595	0.250	0.250	0.639	0.500	0.000	0.000	0.679	0.833	0.000	0.500	0.571	0.000	0.000	0.790
	0.659				0.750				0.819				0.568				

National Data & Surveying Services Intersection Turning Movement Count

Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville
Control: 2-Way Stop(EB/WB)

Project ID: 21-190057-001
Date: 10/19/2021

Data - Cars

NS/EW Streets: Swafford Rd/Steele Rd | Swafford Rd/Steele Rd | Sam Lee Rd | Sam Lee Rd

AM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	1	3	6	0	0	12	0	0	0	1	23	0	8	2	0	0	56
7:15 AM	4	5	6	0	0	9	0	0	0	2	25	0	25	1	0	0	77
7:30 AM	3	12	28	0	0	23	0	0	0	1	25	0	17	0	0	0	109
7:45 AM	9	13	24	0	0	6	0	0	0	1	18	0	15	2	0	0	88
8:00 AM	10	7	21	0	0	8	0	0	0	1	25	0	19	1	0	0	92
8:15 AM	10	8	11	0	0	3	1	0	0	2	17	0	12	4	0	0	68
8:30 AM	6	4	9	0	0	5	0	0	2	0	11	0	1	0	0	1	39
8:45 AM	6	3	13	0	0	1	1	0	1	0	12	0	4	0	0	0	41
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	49	55	118	0	0	67	2	0	3	8	156	0	101	10	0	1	570
APPROACH %'s :	22.07%	24.77%	53.15%	0.00%	0.00%	97.10%	2.90%	0.00%	1.80%	4.79%	93.41%	0.00%	90.18%	8.93%	0.00%	0.89%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	26	37	79	0	0	46	0	0	0	5	93	0	76	4	0	0	366
PEAK HR FACTOR :	0.650	0.712	0.705	0.000	0.000	0.500	0.000	0.000	0.000	0.625	0.930	0.000	0.760	0.500	0.000	0.000	0.839
	0.772				0.500				0.907				0.769				

NOON

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
11:00 AM	9	2	2	0	0	0	0	0	0	1	9	0	0	0	0	0	23
11:15 AM	9	5	2	0	0	2	0	0	2	0	9	0	5	1	0	0	35
11:30 AM	8	1	4	0	0	3	1	0	0	0	10	0	2	0	0	0	29
11:45 AM	7	5	3	0	0	3	0	0	0	1	7	0	5	0	0	0	31
12:00 PM	10	4	3	0	0	2	1	0	0	2	14	0	4	3	0	0	43
12:15 PM	8	5	4	0	0	0	0	0	0	0	7	0	1	2	1	0	28
12:30 PM	12	3	2	0	0	3	1	0	0	2	4	0	0	1	1	0	29
12:45 PM	9	6	4	0	0	2	2	0	0	1	10	0	2	2	0	0	38
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	72	31	24	0	0	15	5	0	2	7	70	0	19	9	2	0	256
APPROACH %'s :	56.69%	24.41%	18.90%	0.00%	0.00%	75.00%	25.00%	0.00%	2.53%	8.86%	88.61%	0.00%	63.33%	30.00%	6.67%	0.00%	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	39	18	13	0	0	7	4	0	0	5	35	0	7	8	2	0	138
PEAK HR FACTOR :	0.813	0.750	0.813	0.000	0.000	0.583	0.500	0.000	0.000	0.625	0.625	0.000	0.438	0.667	0.500	0.000	0.802
	0.921				0.688				0.625				0.607				

PM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	10	2	6	0	0	2	0	0	1	1	12	0	3	0	1	0	38
2:15 PM	10	3	3	0	0	6	0	0	0	1	14	1	11	3	0	0	52
2:30 PM	11	5	6	0	1	3	1	0	0	3	10	0	8	2	0	0	50
2:45 PM	7	6	9	0	0	5	0	0	0	2	5	0	10	4	0	0	48
3:00 PM	18	2	11	0	1	6	0	0	0	3	10	0	4	2	0	0	57
3:15 PM	8	1	2	0	0	3	1	0	0	1	10	0	12	5	0	0	43
3:30 PM	15	8	39	1	1	7	2	0	0	1	8	0	16	5	0	0	103
3:45 PM	22	17	48	0	0	4	0	0	0	4	8	0	6	7	0	0	116
4:00 PM	19	7	16	0	0	3	3	0	0	6	10	0	6	2	0	0	72
4:15 PM	19	10	13	0	0	9	1	0	0	7	10	0	4	2	0	0	75
4:30 PM	12	10	11	0	0	2	2	0	0	1	12	0	8	2	0	0	60
4:45 PM	14	2	4	0	0	4	2	0	1	1	12	0	7	3	0	0	50
5:00 PM	20	6	4	0	0	4	2	0	0	4	23	0	9	2	0	0	74
5:15 PM	23	9	10	0	0	5	0	0	0	2	18	0	7	1	0	0	75
5:30 PM	19	3	10	0	0	2	0	0	1	5	13	0	1	1	0	0	55
5:45 PM	28	4	5	0	0	5	3	0	0	1	18	0	5	4	0	0	73
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	255	95	197	1	3	70	17	0	3	43	193	1	117	45	1	0	1041
APPROACH %'s :	46.53%	17.34%	35.95%	0.18%	3.33%	77.78%	18.89%	0.00%	1.25%	17.92%	80.42%	0.42%	71.78%	27.61%	0.61%	0.00%	
PEAK HR :	03:30 PM - 04:30 PM																TOTAL
PEAK HR VOL :	75	42	116	1	1	23	6	0	0	18	36	0	32	16	0	0	366
PEAK HR FACTOR :	0.852	0.618	0.604	0.250	0.250	0.639	0.500	0.000	0.000	0.643	0.900	0.000	0.500	0.571	0.000	0.000	0.789
	0.672				0.750				0.794				0.571				

National Data & Surveying Services Intersection Turning Movement Count

Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville
Control: 2-Way Stop(EB/WB)

Project ID: 21-190057-001
Date: 10/19/2021

Data - HT

NS/EW Streets: Swafford Rd/Steele Rd | Swafford Rd/Steele Rd | Sam Lee Rd | Sam Lee Rd

AM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
7:15 AM	1	1	0	0	0	1	0	0	0	0	1	0	1	0	0	0	5
7:30 AM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
7:45 AM	0	1	2	0	0	0	0	0	0	1	2	0	0	0	0	0	6
8:00 AM	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	3
8:15 AM	0	0	2	0	0	0	1	0	0	0	1	0	1	0	0	0	5
8:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	4	4	5	0	0	2	1	0	0	1	6	0	3	0	0	0	26
APPROACH %'s :	30.77%	30.77%	38.46%	0.00%	0.00%	66.67%	33.33%	0.00%	0.00%	14.29%	85.71%	0.00%	100.00%	0.00%	0.00%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	3	2	3	0	0	1	0	0	0	1	5	0	1	0	0	0	16
PEAK HR FACTOR :	0.750	0.500	0.375	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.625	0.000	0.250	0.000	0.000	0.000	0.667
	0.667				0.250				0.500				0.250				

NOON

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
11:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
11:15 AM	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
11:30 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
11:45 AM	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
12:00 PM	1	0	2	0	0	1	0	0	1	0	0	0	0	0	0	0	5
12:15 PM	3	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	6
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	2	0	0	0	1	0	0	0	0	1	0	1	0	0	0	5
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	5	3	4	0	0	3	2	0	2	0	2	0	4	0	0	0	25
APPROACH %'s :	41.67%	25.00%	33.33%	0.00%	0.00%	60.00%	40.00%	0.00%	50.00%	0.00%	50.00%	0.00%	100.00%	0.00%	0.00%	0.00%	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	4	2	3	0	0	3	0	0	1	0	1	0	2	0	0	0	16
PEAK HR FACTOR :	0.333	0.250	0.375	0.000	0.000	0.750	0.000	0.000	0.250	0.000	0.250	0.000	0.500	0.000	0.000	0.000	0.667
	0.563				0.750				0.500				0.500				

PM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2
2:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	4	1	0	0	6
2:30 PM	0	2	3	0	0	0	0	0	0	0	1	0	1	0	0	0	7
2:45 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
3:00 PM	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3:15 PM	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	3
3:30 PM	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	4
3:45 PM	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4
4:00 PM	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	3
4:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2
4:30 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
5:00 PM	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
5:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	5	3	9	0	0	1	0	0	0	2	12	0	10	1	0	0	43
APPROACH %'s :	29.41%	17.65%	52.94%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	14.29%	85.71%	0.00%	90.91%	9.09%	0.00%	0.00%	
PEAK HR :	03:30 PM - 04:30 PM																TOTAL
PEAK HR VOL :	2	1	3	0	0	0	0	0	0	1	4	0	2	0	0	0	13
PEAK HR FACTOR :	0.500	0.250	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.500	0.000	0.500	0.000	0.000	0.000	0.813
	0.375								0.625				0.500				

National Data & Surveying Services Intersection Turning Movement Count

Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville
Control: 2-Way Stop(EB/WB)

Project ID: 21-190057-001
Date: 10/19/2021

Data - Bikes

NS/EW Streets: Swafford Rd/Steele Rd | Swafford Rd/Steele Rd | Sam Lee Rd | Sam Lee Rd

AM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

NOON

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
APPROACH %'s :													0.00%	100.00%	0.00%	0.00%	
PEAK HR :	03:30 PM - 04:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services Intersection Turning Movement Count

Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville
Project ID: 21-190057-001
Date: 10/19/2021

Data - Pedestrians (Crosswalks)

NS/EW Streets:	Swafford Rd/Steele Rd		Swafford Rd/Steele Rd		Sam Lee Rd		Sam Lee Rd		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	07:15 AM - 08:15 AM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	12:00 PM - 01:00 PM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	03:30 PM - 04:30 PM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

Prepared by National Data & Surveying Services

Swafford Rd/Steele Rd & Sam Lee Rd

Peak Hour Turning Movement Count

ID: 21-190057-001
City: Knoxville

Day: Tuesday
Date: 10/19/2021

PEAK HOURS	
AM	07:15 AM - 08:15 AM
NOON	12:00 PM - 01:00 PM
PM	03:30 PM - 04:30 PM

COUNT PERIODS	
AM	7:00 AM - 09:00 AM
NOON	11:00 AM - 01:00 PM
PM	2:00 PM - 06:00 PM

SOUTHBOUND (Swafford Rd/Steele Rd)

	U-Turn	Left	Thru	Right	Total	
AM	0	47	0	0	39	AM
NOON	4	10	0	0	23	NOON
PM	6	23	1	0	43	PM
	0	1	0	0		

EASTBOUND (Sam Lee Rd)

AM	NOON	PM		
33	55	99		
0	0	0	0	U-Turn
0	1	0	0	Left
6	5	19	1	Thru
98	36	40	0	Right
AM	NOON	PM		

WESTBOUND (Sam Lee Rd)

PM	NOON	AM		
0	2	0	0	U-Turn
16	8	4	1	Left
34	9	77	0	Thru
0	0	0	0	Right
139	21	88		
PM	NOON	AM		

CONTROL

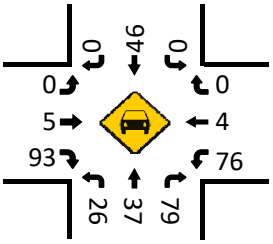
2-Way Stop(EB/WB)

	AM	NOON	PM
TEV	382	154	379
PHF	0.86	0.80	0.79

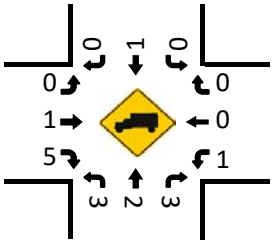
NORTHBOUND (Swafford Rd/Steele Rd)

	U-Turn	Left	Thru	Right	Total	
PM	98	1	77	43	119	PM
NOON	55	0	43	20	16	NOON
AM	222	0	29	39	82	AM
	0	0	1	0		

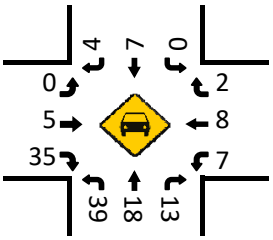
Cars (AM)



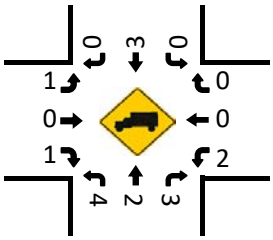
HT (AM)



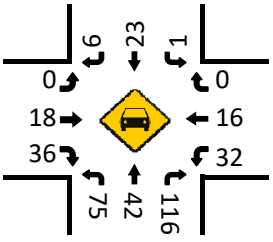
Cars (NOON)



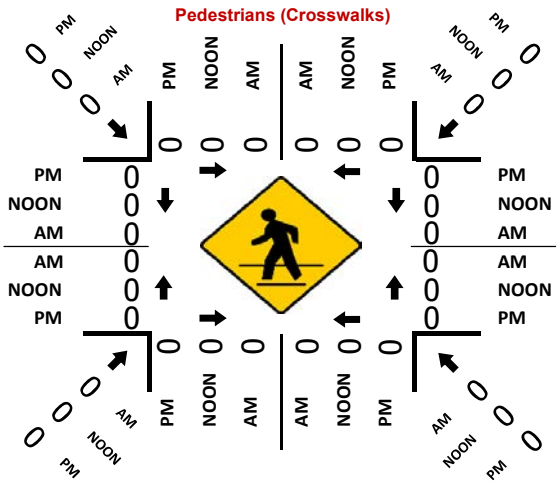
HT (NOON)



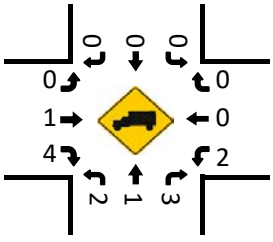
Cars (PM)



Pedestrians (Crosswalks)



HT (PM)



Project ID: 21-190057-001
Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville

Day: Tuesday
Date: 10/19/2021

Groups Printed - Cars, PU, Vans - Heavy Trucks

	Swafford Rd/Steele Rd Northbound						Swafford Rd/Steele Rd Southbound						Sam Lee Rd Eastbound						Sam Lee Rd Westbound						
Start Time	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Int. Total
7:00 AM	1	3	6	0	0	10	0	12	0	0	0	12	0	1	23	0	0	24	9	2	0	0	0	11	57
7:15 AM	5	6	6	0	0	17	0	10	0	0	0	10	0	2	26	0	0	28	26	1	0	0	0	27	82
7:30 AM	4	12	28	0	0	44	0	23	0	0	0	23	0	1	26	0	0	27	17	0	0	0	0	17	111
7:45 AM	9	14	26	0	0	49	0	6	0	0	0	6	0	2	20	0	0	22	15	2	0	0	0	17	94
Total	19	35	66	0	0	120	0	51	0	0	0	51	0	6	95	0	0	101	67	5	0	0	0	72	344
8:00 AM	11	7	22	0	0	40	0	8	0	0	0	8	0	1	26	0	0	27	19	1	0	0	0	20	95
8:15 AM	10	8	13	0	0	31	0	3	2	0	0	5	0	2	18	0	0	20	13	4	0	0	0	17	73
8:30 AM	7	4	9	0	0	20	0	5	0	0	0	5	2	0	11	0	0	13	1	0	0	1	0	2	40
8:45 AM	6	5	13	0	0	24	0	2	1	0	0	3	1	0	12	0	0	13	4	0	0	0	0	4	44
Total	34	24	57	0	0	115	0	18	3	0	0	21	3	3	67	0	0	73	37	5	0	1	0	43	252
BREAK																									
11:00 AM	9	2	2	0	0	13	0	0	1	0	0	1	0	1	9	0	0	10	1	0	0	0	0	1	25
11:15 AM	10	5	2	0	0	17	0	2	0	0	0	2	3	0	9	0	0	12	5	1	0	0	0	6	37
11:30 AM	8	1	5	0	0	14	0	3	2	0	0	5	0	0	10	0	0	10	2	0	0	0	0	2	31
11:45 AM	7	6	3	0	0	16	0	3	0	0	0	3	0	1	8	0	0	9	6	0	0	0	0	6	34
Total	34	14	12	0	0	60	0	8	3	0	0	11	3	2	36	0	0	41	14	1	0	0	0	15	127
12:00 PM	11	4	5	0	0	20	0	3	1	0	0	4	1	2	14	0	0	17	4	3	0	0	0	7	48
12:15 PM	11	5	5	0	0	21	0	1	0	0	0	1	0	0	7	0	0	7	2	2	1	0	0	5	34
12:30 PM	12	3	2	0	0	17	0	3	1	0	0	4	0	2	4	0	0	6	0	1	1	0	0	2	29
12:45 PM	9	8	4	0	0	21	0	3	2	0	0	5	0	1	11	0	0	12	3	2	0	0	0	5	43
Total	43	20	16	0	0	79	0	10	4	0	0	14	1	5	36	0	0	42	9	8	2	0	0	19	154
BREAK																									
2:00 PM	10	2	6	0	0	18	0	2	0	0	0	2	1	1	13	0	0	15	4	0	1	0	0	5	40
2:15 PM	10	3	3	0	0	16	0	6	0	0	0	6	0	1	15	1	0	17	15	4	0	0	0	19	58
2:30 PM	11	7	9	0	0	27	1	3	1	0	0	5	0	3	11	0	0	14	9	2	0	0	0	11	57
2:45 PM	7	6	9	0	0	22	0	6	0	0	0	6	0	2	5	0	0	7	10	4	0	0	0	14	49
Total	38	18	27	0	0	83	1	17	1	0	0	19	1	7	44	1	0	53	38	10	1	0	0	49	204
3:00 PM	19	2	12	0	0	33	1	6	0	0	0	7	0	3	10	0	0	13	4	2	0	0	0	6	59
3:15 PM	9	1	3	0	0	13	0	3	1	0	0	4	0	1	10	0	0	11	13	5	0	0	0	18	46
3:30 PM	16	8	39	1	0	64	1	7	2	0	0	10	0	2	9	0	0	11	17	5	0	0	0	22	107
3:45 PM	23	18	50	0	0	91	0	4	0	0	0	4	0	4	8	0	0	12	6	7	0	0	0	13	120
Total	67	29	104	1	0	201	2	20	3	0	0	25	0	10	37	0	0	47	40	19	0	0	0	59	332
4:00 PM	19	7	17	0	0	43	0	3	3	0	0	6	0	6	12	0	0	18	6	2	0	0	0	8	75
4:15 PM	19	10	13	0	0	42	0	9	1	0	0	10	0	7	11	0	0	18	5	2	0	0	0	7	77
4:30 PM	12	10	12	0	0	34	0	2	2	0	0	4	0	2	12	0	0	14	8	2	0	0	0	10	62
4:45 PM	14	2	4	0	0	20	0	4	2	0	0	6	1	1	12	0	0	14	8	3	0	0	0	11	51
Total	64	29	46	0	0	139	0	18	8	0	0	26	1	16	47	0	0	64	27	9	0	0	0	36	265
5:00 PM	21	6	4	0	0	31	0	4	2	0	0	6	0	4	24	0	0	28	9	2	0	0	0	11	76
5:15 PM	23	9	10	0	0	42	0	5	0	0	0	5	0	2	18	0	0	20	7	1	0	0	0	8	75
5:30 PM	19	3	10	0	0	32	0	2	0	0	0	2	1	5	16	0	0	22	1	1	0	0	0	2	58
5:45 PM	28	4	5	0	0	37	0	5	3	0	0	8	0	1	19	0	0	20	5	4	0	0	0	9	74
Total	91	22	29	0	0	142	0	16	5	0	0	21	1	12	77	0	0	90	22	8	0	0	0	30	283
Grand Total	390	191	357	1	0	939	3	158	27	0	0	188	10	61	439	1	0	511	254	65	3	1	0	323	1961
Apprch %	41.5	20.3	38.0	0.1	0.0		1.6	84.0	14.4	0.0	0.0		2.0	11.9	85.9	0.2	0.0		78.6	20.1	0.9	0.3	0.0		
Total %	19.9	9.7	18.2	0.1	0.0	47.9	0.2	8.1	1.4	0.0	0.0	9.6	0.5	3.1	22.4	0.1	0.0	26.1	13.0	3.3	0.2	0.1	0.0	16.5	
Cars, PU, Vans	376	181	339	1		897	3	152	24	0		179	8	58	419	1		486	237	64	3	1		305	1867
% Cars, PU, Vans	96.4	94.8	95.0	100.0		95.5	100.0	96.2	88.9	0.0		95.2	80.0	95.1	95.4	100.0		95.1	93.3	98.5	100.0	100.0		94.4	95.2
Heavy trucks	14	10	18	0		42	0	6	3	0		9	2	3	20	0		25	17	1	0	0		18	94
%Heavy trucks	3.6	5.2	5.0	0.0		4.5	0.0	3.8	11.1	0.0		4.8	20.0	4.9	4.6	0.0		4.9	6.7	1.5	0.0	0.0		5.6	4.8

Project ID: 21-190057-001
Location: Swafford Rd/Steele Rd & Sam Lee Rd
City: Knoxville

PEAK HOURS

Day: Tuesday
Date: 10/19/2021

AM

	Swafford Rd/Steele Rd Northbound					Swafford Rd/Steele Rd Southbound					Sam Lee Rd Eastbound					Sam Lee Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM - 09:00 AM																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
7:15 AM	5	6	6	0	17	0	10	0	0	10	0	2	26	0	28	26	1	0	0	27	82
7:30 AM	4	12	28	0	44	0	23	0	0	23	0	1	26	0	27	17	0	0	0	17	111
7:45 AM	9	14	26	0	49	0	6	0	0	6	0	2	20	0	22	15	2	0	0	17	94
8:00 AM	11	7	22	0	40	0	8	0	0	8	0	1	26	0	27	19	1	0	0	20	95
Total Volume	29	39	82	0	150	0	47	0	0	47	0	6	98	0	104	77	4	0	0	81	382
% App. Total	19.3	26.0	54.7	0.0	100	0.0	100.0	0.0	0.0	100	0.0	5.8	94.2	0.0	100	95.1	4.9	0.0	0.0	100	
PHF					0.765					0.511					0.929					0.750	0.860
Cars, PU, Vans	26	37	79	0	142	0	46	0	0	46	0	5	93	0	98	76	4	0	0	80	366
% Cars, PU, Vans	89.7	94.9	96.3	0.0	94.7	0.0	97.9	0.0	0.0	97.9	0.0	83.3	94.9	0.0	94.2	98.7	100.0	0.0	0.0	98.8	95.8
Heavy trucks	3	2	3	0	8	0	1	0	0	1	0	1	5	0	6	1	0	0	0	1	16
%Heavy trucks	10.3	5.1	3.7	0.0	5.3	0.0	2.1	0.0	0.0	2.1	0.0	16.7	5.1	0.0	5.8	1.3	0.0	0.0	0.0	1.2	4.2

NOON

	Swafford Rd/Steele Rd Northbound					Swafford Rd/Steele Rd Southbound					Sam Lee Rd Eastbound					Sam Lee Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 11:00 AM - 01:00 PM																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	11	4	5	0	20	0	3	1	0	4	1	2	14	0	17	4	3	0	0	7	48
12:15 PM	11	5	5	0	21	0	1	0	0	1	0	0	7	0	7	2	2	1	0	5	34
12:30 PM	12	3	2	0	17	0	3	1	0	4	0	2	4	0	6	0	1	1	0	2	29
12:45 PM	9	8	4	0	21	0	3	2	0	5	0	1	11	0	12	3	2	0	0	5	43
Total Volume	43	20	16	0	79	0	10	4	0	14	1	5	36	0	42	9	8	2	0	19	154
% App. Total	54.4	25.3	20.3	0.0	100	0.0	71.4	28.6	0.0	100	2.4	11.9	85.7	0.0	100	47.4	42.1	10.5	0.0	100	
PHF					0.940					0.700					0.618					0.679	0.802
Cars, PU, Vans	39	18	13	0	70	0	7	4	0	11	0	5	35	0	40	7	8	2	0	17	138
% Cars, PU, Vans	90.7	90.0	81.3	0.0	88.6	0.0	70.0	100.0	0.0	78.6	0.0	100.0	97.2	0.0	95.2	77.8	100.0	100.0	0.0	89.5	89.6
Heavy trucks	4	2	3	0	9	0	3	0	0	3	1	0	1	0	2	2	0	0	0	2	16
%Heavy trucks	9.3	10.0	18.8	0.0	11.4	0.0	30.0	0.0	0.0	21.4	100.0	0.0	2.8	0.0	4.8	22.2	0.0	0.0	0.0	10.5	10.4

PM

	Swafford Rd/Steele Rd Northbound					Swafford Rd/Steele Rd Southbound					Sam Lee Rd Eastbound					Sam Lee Rd Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 02:00 PM - 06:00 PM																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
3:30 PM	16	8	39	1	64	1	7	2	0	10	0	2	9	0	11	17	5	0	0	22	107
3:45 PM	23	18	50	0	91	0	4	0	0	4	0	4	8	0	12	6	7	0	0	13	120
4:00 PM	19	7	17	0	43	0	3	3	0	6	0	6	12	0	18	6	2	0	0	8	75
4:15 PM	19	10	13	0	42	0	9	1	0	10	0	7	11	0	18	5	2	0	0	7	77
Total Volume	77	43	119	1	240	1	23	6	0	30	0	19	40	0	59	34	16	0	0	50	379
% App. Total	32.1	17.9	49.6	0.4	100	3.3	76.7	20.0	0.0	100	0.0	32.2	67.8	0.0	100	68.0	32.0	0.0	0.0	100	
PHF					0.659					0.750					0.819					0.568	0.790
Cars, PU, Vans	75	42	116	1	234	1	23	6	0	30	0	18	36	0	54	32	16	0	0	48	366
% Cars, PU, Vans	97.4	97.7	97.5	100.0	97.5	100.0	100.0	100.0	0.0	100.0	0.0	94.7	90.0	0.0	91.5	94.1	100.0	0.0	0.0	96.0	96.6
Heavy trucks	2	1	3	0	6	0	0	0	0	0	0	1	4	0	5	2	0	0	0	2	13
%Heavy trucks	2.6	2.3	2.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	5.3	10.0	0.0	8.5	5.9	0.0	0.0	0.0	4.0	3.4

Land Use: 210
Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (https://www.ite.org/technical-resources/topics/trip-and-parking-generation/).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077,1078, 1079

Single-Family Detached Housing
(210)

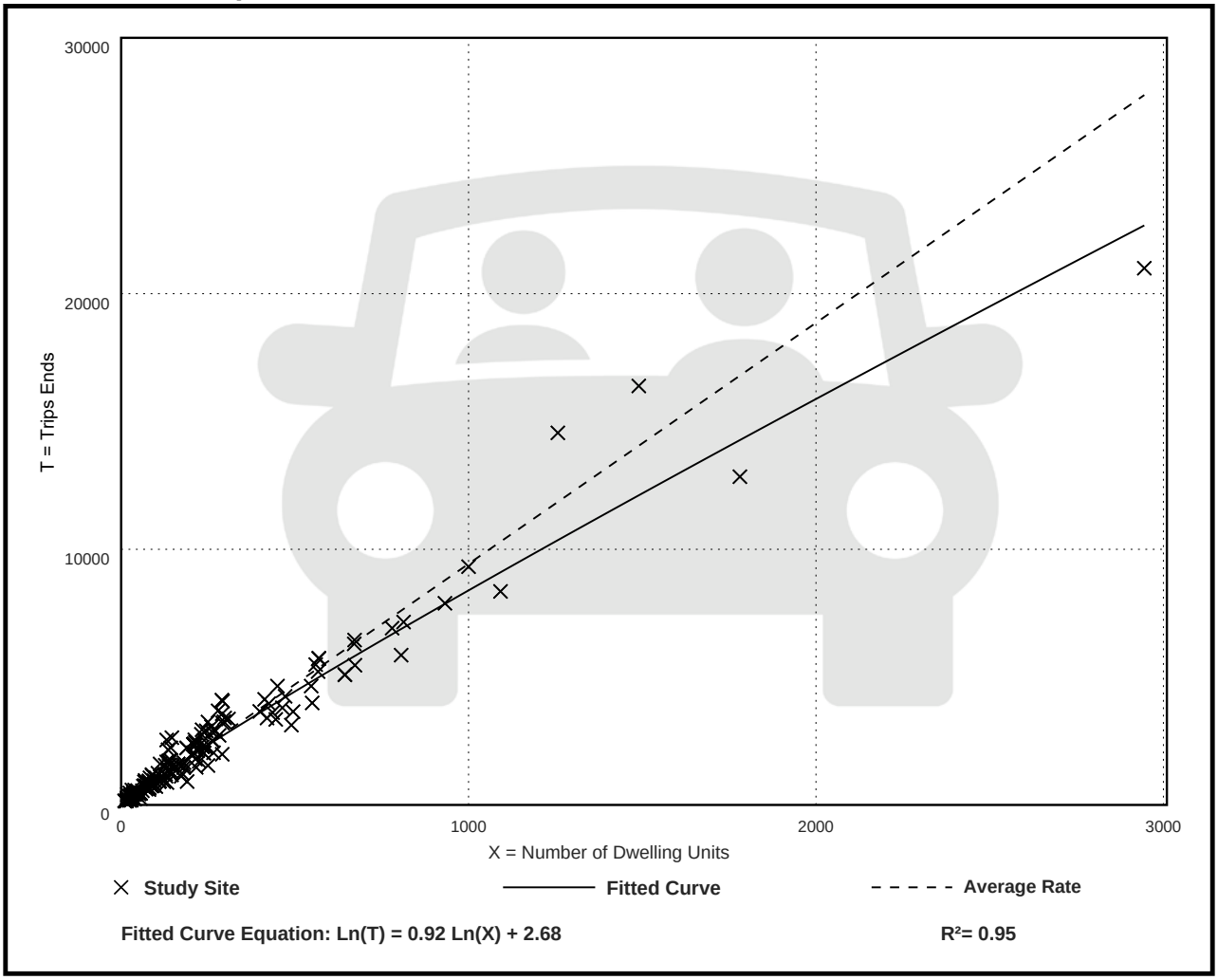
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 174
Avg. Num. of Dwelling Units: 246
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.68

R^2= 0.95

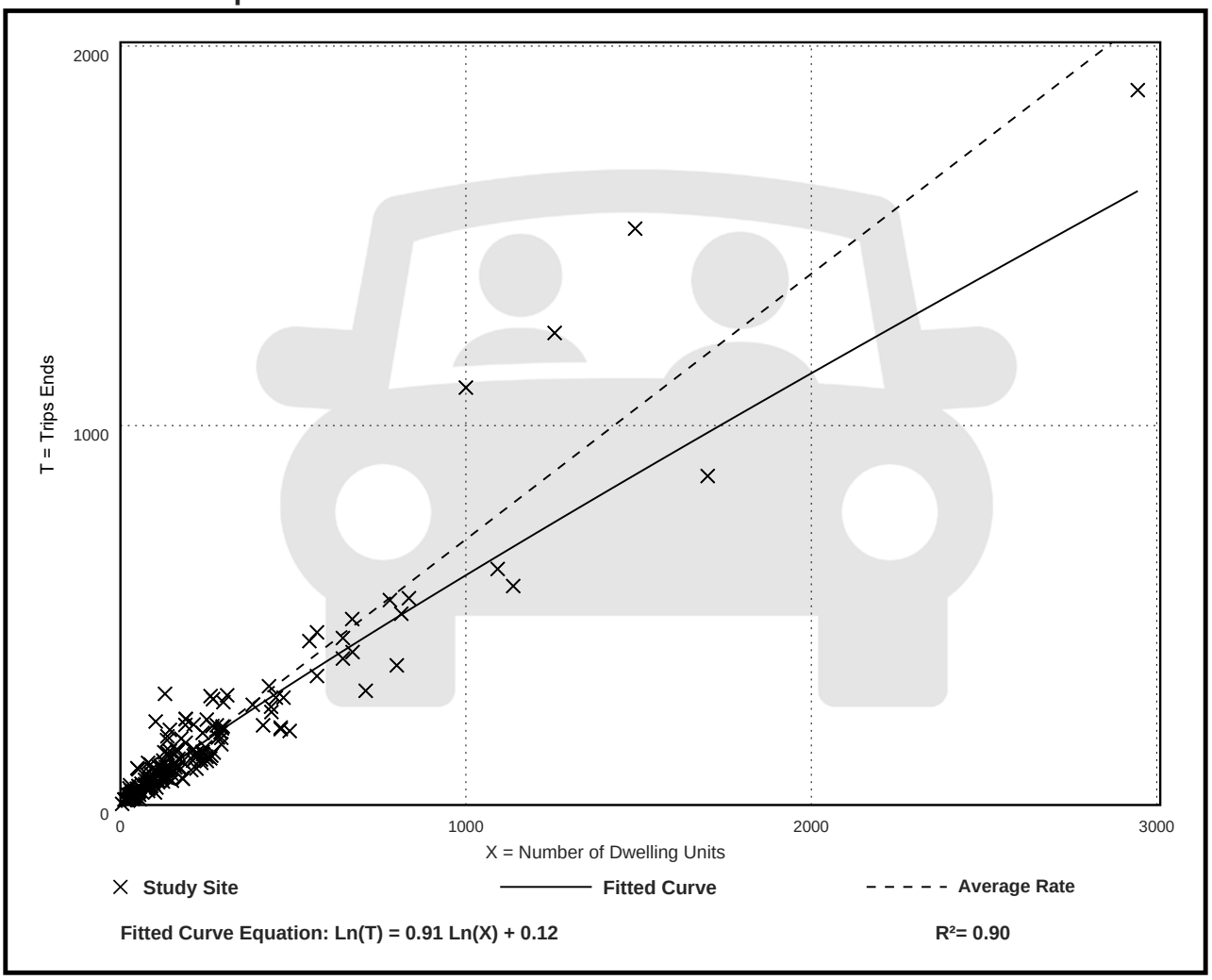
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 192
Avg. Num. of Dwelling Units: 226
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



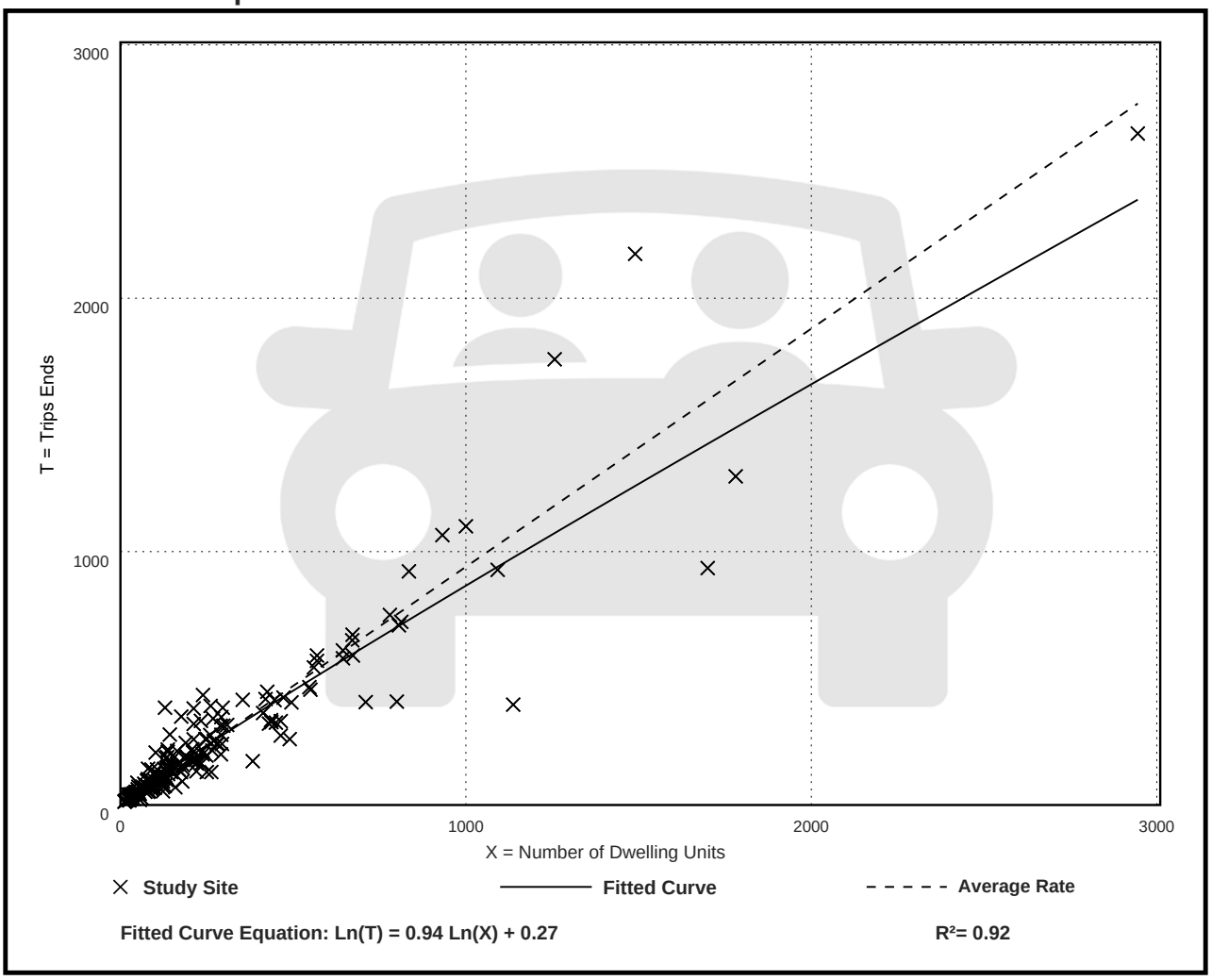
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 208
Avg. Num. of Dwelling Units: 248
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



Local Apartment
Trip Generation Study

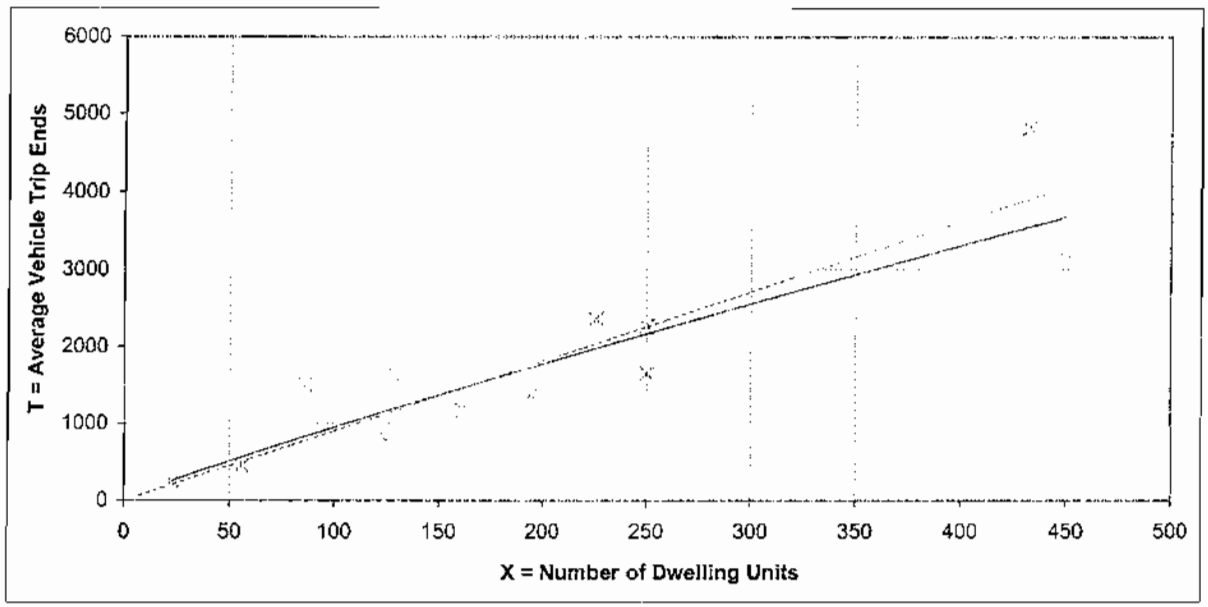
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: $T = 15.193(X)^{0.899}$ $R^2 = 0.88$

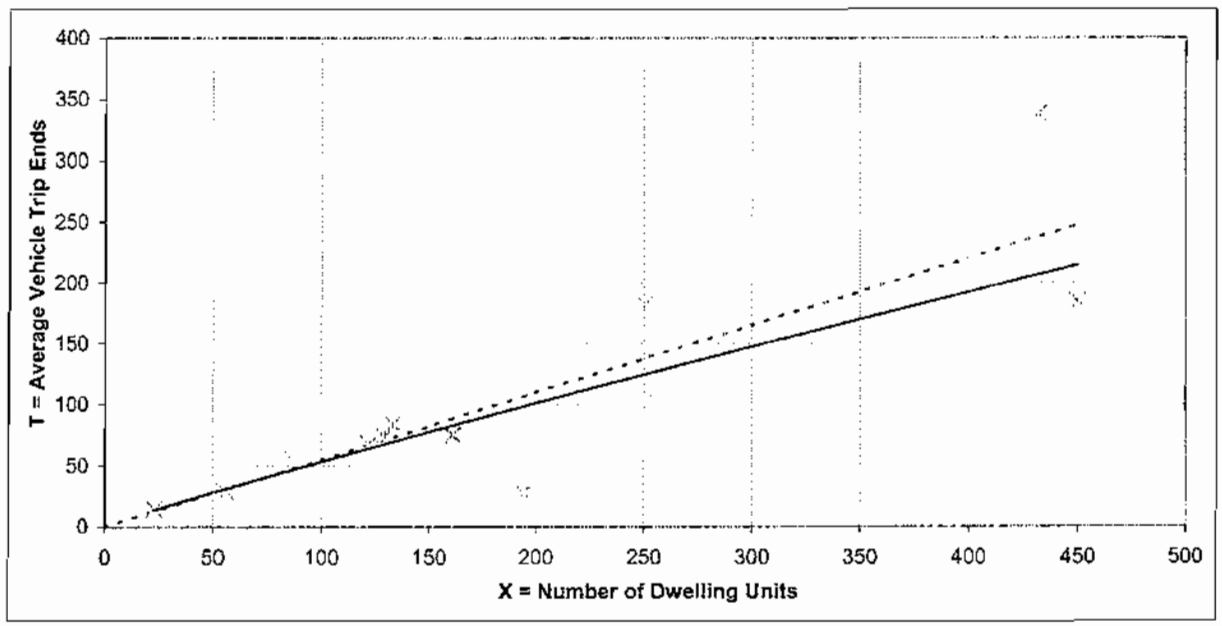
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 7 and 9 a.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: $T = 0.758(X)^{0.924}$ $R^2 = 0.75$

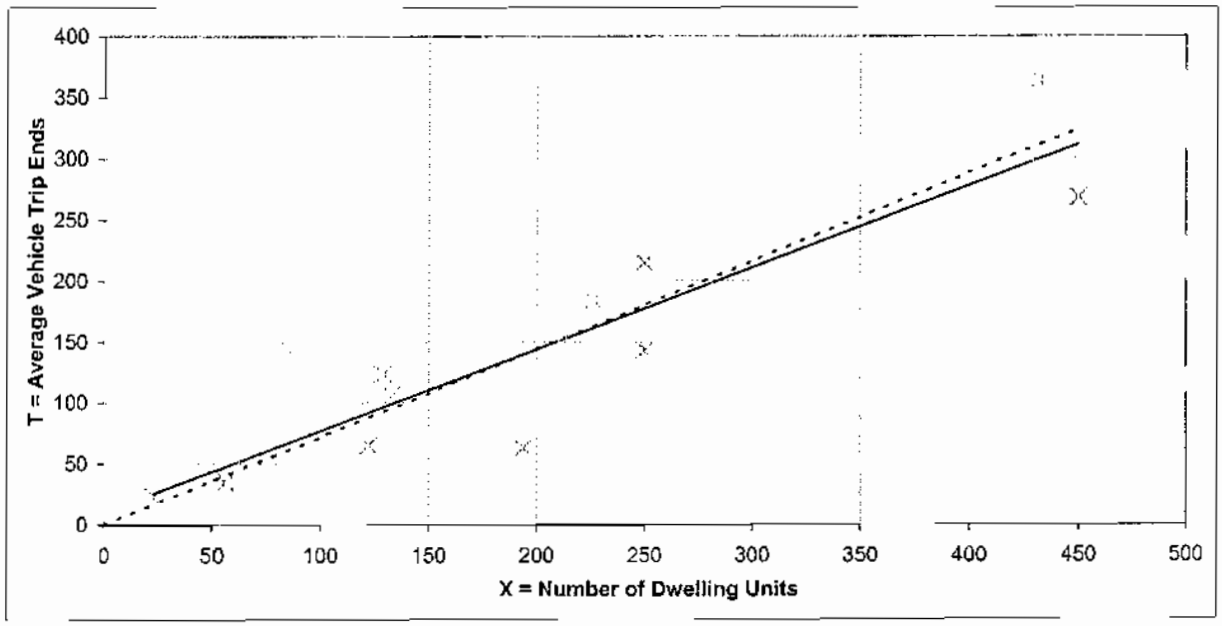
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

Fitted Curve Equation: T = 0.669(X) + 10.069 **R^2 = 0.79**

TRIP GENERATION FOR THE COUCH MILL ROAD SUBDIVISION

279 Single-Family Detached Homes and 114 Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	279 Houses	2,593	26%	74%		63%	37%	
				49	141	190	164	97	261
Local Trip Rate	Townhouses	114 Townhouses	1,073	22%	78%		55%	45%	
				13	47	60	47	39	86
Total New Volume Site Trips			**3,666**	**62**	**188**	**250**	**211**	**136**	**347**

ITE Trip Generation Manual, 11th Edition and Local Trip Rates

Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR THE COUCH MILL ROAD SUBDIVISION

279 Single-Family Detached Houses

279 Residential Houses = X

Weekday:

Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.68

Ln(T) =	0.92	*	5.63	+	2.68
Ln(T) =	7.86				
T =	**2,593 trips**				

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: Ln(T) = 0.91 Ln(X) + 0.12

T =	0.91	*	6	+	0.12
Ln(T) =	5.24				
T =	**190 trips**				

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: Ln(T) = 0.94 Ln(X) + 0.27

Ln(T) =	0.94	*	5.63	+	0.27
Ln(T) =	5.56				
T =	**261 trips**				

TRIP GENERATION FOR THE COUCH MILL ROAD SUBDIVISION

114 Townhouses

114 Residential Houses = X

Weekday:

Fitted Curve Equation: $T = 15.193(X)^{0.899}$

T = 15 * 70.66

T = 1,073 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.758(X)^{0.924}$

T = 0.758 * 80

T = 60 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $T = 0.669(X)+10.069$

T = 0.669 * 114 + 10.07

T = 86 trips

TRIP GENERATION FOR THE COUCH MILL ROAD SUBDIVISION

130 Single-Family Detached Houses - 1 unit/acre on 130 acres - Agricultural Zoning

130 Residential Houses = X

Weekday:

Fitted Curve Equation: $Ln(T) = 0.92\ Ln(X) + 2.68$

Ln(T) =	0.92	*	4.87	+	2.68
Ln(T) =	7.16				
T =	**1,285 trips**				

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $Ln(T) = 0.91\ Ln(X) + 0.12$

T =	0.91	*	5	+	0.12
Ln(T) =	4.55				
T =	**95 trips**				

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $Ln(T) = 0.94\ Ln(X) + 0.27$

Ln(T) =	0.94	*	4.87	+	0.27
Ln(T) =	4.85				
T =	**127 trips**				

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	6	98	77	4	0	29	39	82	0	47	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	75	94	74	50	90	66	70	73	90	51	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	8	104	104	8	0	44	56	112	0	92	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	296	348	92	348	292	112	92	0	0	168	0	0
Stage 1	92	92	-	200	200	-	-	-	-	-	-	-
Stage 2	204	256	-	148	92	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	656	576	965	607	619	941	1503	-	-	1410	-	-
Stage 1	915	819	-	802	736	-	-	-	-	-	-	-
Stage 2	798	696	-	855	819	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	633	557	965	522	599	941	1503	-	-	1410	-	-
Mov Cap-2 Maneuver	633	557	-	522	599	-	-	-	-	-	-	-
Stage 1	885	819	-	776	712	-	-	-	-	-	-	-
Stage 2	763	673	-	755	819	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	13.7	1.5	0
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1503	-	-	917	527	1410	-	-
HCM Lane V/C Ratio	0.029	-	-	0.122	0.213	-	-	-
HCM Control Delay (s)	7.5	0	-	9.5	13.7	0	-	-
HCM Lane LOS	A	A	-	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.8	0	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	19	40	34	16	0	77	43	119	1	23	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	68	83	50	57	90	84	60	59	25	64	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	28	48	68	28	0	92	72	202	4	36	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	420	507	42	444	412	173	48	0	0	273	0	0
Stage 1	50	50	-	356	356	-	-	-	-	-	-	-
Stage 2	370	457	-	88	56	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	544	468	1029	524	530	871	1559	-	-	1290	-	-
Stage 1	963	853	-	661	629	-	-	-	-	-	-	-
Stage 2	650	568	-	920	848	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	491	433	1029	448	491	871	1559	-	-	1290	-	-
Mov Cap-2 Maneuver	491	433	-	448	491	-	-	-	-	-	-	-
Stage 1	895	850	-	614	584	-	-	-	-	-	-	-
Stage 2	575	528	-	846	845	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.9	14.9	1.9	0.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1559	-	-	684	460	1290	-	-
HCM Lane V/C Ratio	0.059	-	-	0.111	0.209	0.003	-	-
HCM Control Delay (s)	7.5	0	-	10.9	14.9	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.4	0.8	0	-	-

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	7	112	88	5	0	33	44	93	0	54	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	75	94	74	50	90	66	70	73	90	51	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	9	119	119	10	0	50	63	127	0	106	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	338	396	106	397	333	127	106	0	0	190	0	0
Stage 1	106	106	-	227	227	-	-	-	-	-	-	-
Stage 2	232	290	-	170	106	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	616	541	948	563	587	923	1485	-	-	1384	-	-
Stage 1	900	807	-	776	716	-	-	-	-	-	-	-
Stage 2	771	672	-	832	807	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	590	520	948	471	565	923	1485	-	-	1384	-	-
Mov Cap-2 Maneuver	590	520	-	471	565	-	-	-	-	-	-	-
Stage 1	866	807	-	747	689	-	-	-	-	-	-	-
Stage 2	731	646	-	719	807	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.7	15.3	1.6	0
HCM LOS	A	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1485	-	-	895	477	1384	-	-
HCM Lane V/C Ratio	0.034	-	-	0.144	0.27	-	-	-
HCM Control Delay (s)	7.5	0	-	9.7	15.3	0	-	-
HCM Lane LOS	A	A	-	A	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	1.1	0	-	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	22	46	39	18	0	88	49	136	1	26	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	68	83	50	57	90	84	60	59	25	64	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	32	55	78	32	0	105	82	231	4	41	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	478	578	48	506	469	197	55	0	0	312	0	0
Stage 1	56	56	-	406	406	-	-	-	-	-	-	-
Stage 2	422	522	-	100	63	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	498	427	1021	477	492	844	1550	-	-	1248	-	-
Stage 1	956	848	-	622	598	-	-	-	-	-	-	-
Stage 2	609	531	-	906	842	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	440	390	1021	394	449	844	1550	-	-	1248	-	-
Mov Cap-2 Maneuver	440	390	-	394	449	-	-	-	-	-	-	-
Stage 1	875	845	-	569	547	-	-	-	-	-	-	-
Stage 2	525	486	-	822	839	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	17	1.9	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1550	-	-	640	408	1248	-	-
HCM Lane V/C Ratio	0.068	-	-	0.137	0.269	0.003	-	-
HCM Control Delay (s)	7.5	0	-	11.5	17	7.9	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.5	1.1	0	-	-

Intersection	
Int Delay, s/veh	11.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	16	281	88	8	0	89	44	93	0	54	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	75	94	74	50	90	66	70	73	90	51	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	21	299	119	16	0	135	63	127	0	106	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	510	566	106	662	502	127	106	0	0	190	0	0
Stage 1	106	106	-	396	396	-	-	-	-	-	-	-
Stage 2	404	460	-	266	106	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	474	434	948	375	471	923	1485	-	-	1384	-	-
Stage 1	900	807	-	629	604	-	-	-	-	-	-	-
Stage 2	623	566	-	739	807	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	424	389	948	227	422	923	1485	-	-	1384	-	-
Mov Cap-2 Maneuver	424	389	-	227	422	-	-	-	-	-	-	-
Stage 1	807	807	-	564	542	-	-	-	-	-	-	-
Stage 2	542	508	-	493	807	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.6	37.7	3.2	0
HCM LOS	B	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1485	-	-	865	240	1384	-	-
HCM Lane V/C Ratio	0.091	-	-	0.37	0.562	-	-	-
HCM Control Delay (s)	7.7	0	-	11.6	37.7	0	-	-
HCM Lane LOS	A	A	-	B	E	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	1.7	3.1	0	-	-

Intersection	
Int Delay, s/veh	23

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	29	168	39	29	0	278	49	136	1	26	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	68	83	50	57	90	84	60	59	25	64	50
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	43	202	78	51	0	331	82	231	4	41	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	940	1030	48	1037	922	197	55	0	0	312	0	0
Stage 1	56	56	-	859	859	-	-	-	-	-	-	-
Stage 2	884	974	-	178	63	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	244	233	1021	209	270	844	1550	-	-	1248	-	-
Stage 1	956	848	-	351	373	-	-	-	-	-	-	-
Stage 2	340	330	-	824	842	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	156	170	1021	108	197	844	1550	-	-	1248	-	-
Mov Cap-2 Maneuver	156	170	-	108	197	-	-	-	-	-	-	-
Stage 1	701	845	-	257	273	-	-	-	-	-	-	-
Stage 2	203	242	-	625	839	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.9	139.2	4.1	0.5
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1550	-	-	546	131	1248	-	-
HCM Lane V/C Ratio	0.214	-	-	0.449	0.984	0.003	-	-
HCM Control Delay (s)	8	0	-	16.9	139.2	7.9	0	-
HCM Lane LOS	A	A	-	C	F	A	A	-
HCM 95th %tile Q(veh)	0.8	-	-	2.3	6.8	0	-	-

Intersection	
Intersection Delay, s/veh	11.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	0	16	281	0	88	8	0	0	89	44	93
Peak Hour Factor	0.92	0.90	0.75	0.94	0.92	0.74	0.50	0.90	0.92	0.66	0.70	0.73
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	21	299	0	119	16	0	0	135	63	127
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	11.3	10.4	12.5
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	39%	0%	92%	0%
Vol Thru, %	19%	5%	8%	100%
Vol Right, %	41%	95%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	226	297	96	54
LT Vol	89	0	88	0
Through Vol	44	16	8	54
RT Vol	93	281	0	0
Lane Flow Rate	325	320	135	106
Geometry Grp	1	1	1	1
Degree of Util (X)	0.462	0.423	0.216	0.166
Departure Headway (Hd)	5.117	4.754	5.753	5.631
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	702	756	623	635
Service Time	3.153	2.792	3.798	3.678
HCM Lane V/C Ratio	0.463	0.423	0.217	0.167
HCM Control Delay	12.5	11.3	10.4	9.8
HCM Lane LOS	B	B	B	A
HCM 95th-tile Q	2.4	2.1	0.8	0.6

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	0	54	0
Peak Hour Factor	0.92	0.90	0.51	0.90
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	0	106	0
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9.8
HCM LOS	A

Lane

Intersection	
Intersection Delay, s/veh	27.1
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	0	29	168	0	39	29	0	0	278	49	136
Peak Hour Factor	0.92	0.90	0.68	0.83	0.92	0.50	0.57	0.90	0.92	0.84	0.60	0.59
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	43	202	0	78	51	0	0	331	82	231
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	12	11.4	37.6
HCM LOS	B	B	E

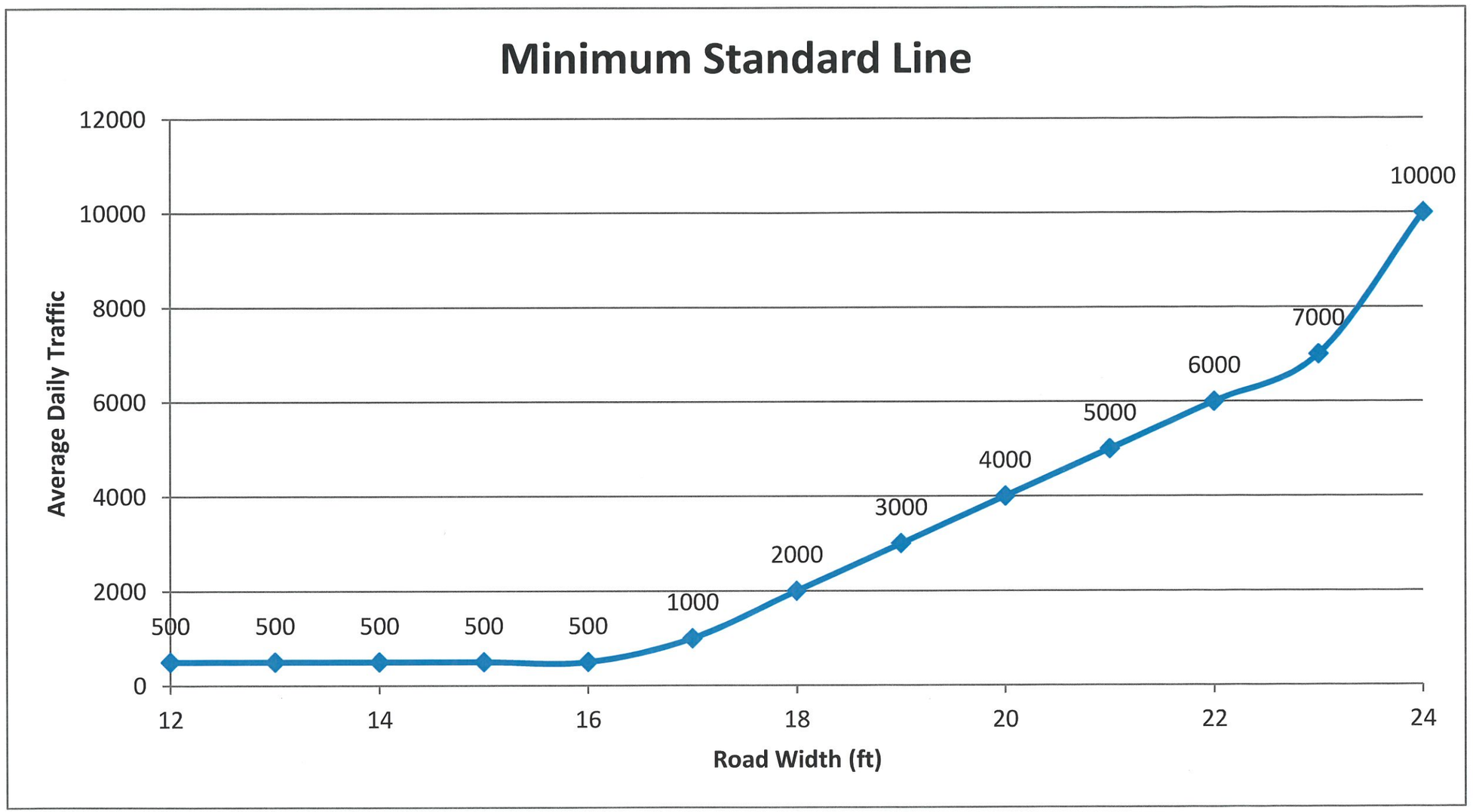
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	0%	57%	3%
Vol Thru, %	11%	15%	43%	76%
Vol Right, %	29%	85%	0%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	463	197	68	34
LT Vol	278	0	39	1
Through Vol	49	29	29	26
RT Vol	136	168	0	7
Lane Flow Rate	643	245	129	59
Geometry Grp	1	1	1	1
Degree of Util (X)	0.908	0.379	0.229	0.097
Departure Headway (Hd)	5.081	5.565	6.398	5.939
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	714	642	558	599
Service Time	3.124	3.632	4.475	4.019
HCM Lane V/C Ratio	0.901	0.382	0.231	0.098
HCM Control Delay	37.6	12	11.4	9.7
HCM Lane LOS	E	B	B	A
HCM 95th-tile Q	11.9	1.8	0.9	0.3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	1	26	7
Peak Hour Factor	0.92	0.25	0.64	0.50
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	4	41	14
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9.7
HCM LOS	A

Lane


Minimum Standard Line
Average Daily Traffic
12000
10000
8000
6000
4000
2000
0
500
500
500
500
500
1000
2000
3000
4000
5000
6000
7000
10000
12
14
16
18
20
22
24
Road Width (ft)

HIGHPLAN 2012 Conceptual Planning Analysis

Project Information

Analyst	RWJ	**Highway Name**	Couch Mill Road	**Study Period**	**Standard K**
Date Prepared	11/5/2021 4:29:34 PM	**From**	Project Site	**Analysis Type**	Two-Lane Segment
Agency	Ajax Engineering	**To**	Intersection of Sam Lee Road at Steele Road	**Program**	HIGHPLAN 2012
Area Type	Transitioning/Urban	**Peak Direction**	Eastbound	**Version Date**	12/12/2012
File Name	C:\Land Projects 2009\2117 - Couch Mill Road TIL\Report\couch mill road.xhp				
User Notes					

Highway Data

Roadway Variables				Traffic Variables			
Segment Length	0.300	**Median**	No	**AADT**	4457	**PHF**	0.900
# Thru Lanes	2	**Left Turn Impact**	Yes	**K**	0.090	**% Heavy Vehicles**	2.0
Terrain	Rolling	**Pass Lane Length**	N/A	**D**	0.950	**Base Capacity**	1700
Posted Speed	35	**% NPZ**	0	**Peak Dir. Hrly. Vol.**	381	**Local Adj. Factor**	0.90
Free Flow Speed	40	**Class**	3	**Off Peak Dir. Hrly. Vol.**	20	**Adjusted Capacity**	1216

LOS Results

v/c Ratio	0.36	**Density**	N/A	**PTSF**	48.4	**ATS**	34.7	**% FFS**	86.9
FFS Delay	4.1	**LOS Thresh. Delay**	9.5	**Service Measure**	PctFFS	**LOS**	B		

Service Volumes

Note: The maximum normally acceptable directional service volume for LOS E in Florida for this facility type and area type is 1650 veh/h/ln.

	A	B	C	D	E
Lanes	**Hourly Volume In Peak Direction**				
1	200	490	760	1000	1090
2					
3					
4					
Lanes	**Hourly Volume In Both Directions**				
2	220	520	800	1060	1150
4					
6					
8					
Lanes	**Annual Average Daily Traffic**				
2	2500	5800	8900	11800	12800

4
6
8

*** Cannot be achieved based on input data provided.**
 # Performance measure results are no longer applicable with the presence of passing lanes. Refer to the service volume tables to obtain the LOS.

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

11812 Black Road
Knoxville, Tennessee 37932
Phone (865) 556-0042
ajaxengineering@gmail.com

November 8, 2021

PROJECT NAME: Couch Mill Road Subdivision

TO: Knoxville-Knox County Planning

SUBJECT: TIL Comment Response Document for Couch Mill Road Subdivision Rezoning Review Comments dated November 5, 2021

Dear Knoxville-Knox County Planning Staff:

The following comment response document is submitted to address comments in a letter from Mike Conger, PE, dated November 5, 2021. This response letter is added to the end of the Appendix in the revised TIL.

1. **The TIL was specifically needed due to the requirements of the Knox County Growth Policy Plan for a rezoning of higher density than permitted under Ag zoning in the Rural Area of 1 DU per acre and as such this should be referenced in the report. Please include a quantification of the total number of daily trips that would be produced in a before and after scenario, i.e. under current 1 DU per acre versus what is being proposed for the rezoning case. Please also provide an additional statement in the Conclusion section confirming that the additional trips have been found to "not unreasonably impair traffic flow along the arterial roads through the adjacent Planned Growth Area" as specifically required by the Growth Policy Plan. We would like to see justification for this statement using the planning-level daily roadway capacity evaluation similar to what you used in the Hoppe Property Rezoning TIL.**

   Response: A quantification of the trips generated produced under one density unit per acre was included in the discussion at the end of the "Trip Generation" section, and the calculations are shown in the Appendix.

   A planning-level roadway capacity evaluation was included in the revised study, discussed at the end of the revised report, and the results are shown in the Appendix. A statement has been added to the end of the revised report and states, "The planning-level analysis of Couch Mill

Road resulted in a calculated LOS B in 2028. Thus, it can be stated that the additional trips generated by the proposed project would not unreasonably impair traffic flow along Couch Mill Road through the adjacent Planned Growth Area."

2. **Page 1- The proposed site access points are within 125 feet of the intersection of Sam Lee Road at Couch Mill Road and within about 160 feet (based on scale) of the intersection of Couch Mill Road at Dusty Way. The required intersection separation per Knox County Subdivision Regulations along a collector such as Couch Mill Road is 300 feet, so the access points will need to be shifted to comply with this minimum.**

   Response: It is understood that the proposed site entrances will need to be separated from existing roads on Couch Mill Road by 300 feet. The civil site designer has also been made aware of this and this revision will be made in the subsequent site plan submitted for approval. The revised TIL includes the original site plan and discusses the sight distances based on the original site plan's proposed entrance locations. However, the updated TIL does recommend 300 feet of intersection separation and recommends that the site plan be revised to reflect this standard. This recommendation is included in the Overview of Findings.

3. **Page 13 (Figure 3)- The traffic control detail at the intersection of Sam Lee Road/Steele Road/Swafford Road shows 3 STOP signs. However, one of these is a supplemental left-side mounted STOP sign facing eastbound traffic on Sam Lee Road. The figure gives the impression that 3 of the intersection approaches are required to stop when only two are STOP-controlled. The figure should be modified by removing the supplemental STOP sign symbol.**

   Response: In Figure 3, the eastbound supplemental Stop Sign on Sam Lee Road was removed to eliminate confusion.

4. **Page 16- The study cites the local trip generation data for multi-family housing, but the local plots of trips vs. DUs is not included in the Appendix.**

   Response: The study inadvertently left out the local trip generation data for multi-family housing. The Appendix has been updated to include this data.

5. **Page 17- The study discusses future traffic without the project. Please add the capacity analyses for this scenario.**

   Response: The study has been updated to include the capacity analyses for the projected traffic without the project at the intersection. A table has been added on Page 18, and the subsequent tables were renumbered.

6. **Page 26- Please correct "ASWC" to "AWSC" in first line of paragraph at bottom of page.**

Response: On Page 29 (previously on Page 26), in the first line of the paragraph at the top of the page, "ASWC" was changed to "AWSC".

7. **Appendix: Capacity analysis reports- a truck percentage of 16% was applied for the eastbound through movement based on the turning movement count. This is based on a very small sample size- 1 of the 6 vehicles counted in the morning peak was a truck. The default value of 2% should be used for this movement as on the other movements.**

   Response: The capacity analyses for the intersection were revised and updated to indicate a truck percentage of 2% for all the movements in all scenarios. This change is reflected in the Appendix and the updated capacity analysis results presented in the tables.

8. **The trip distribution assumed for Sam Lee Rd to the east at 5% appears to be on the low side based on the existing traffic volume split at the Sam Lee Rd at Steele Rd intersection. Additionally, the rate may increase in the future once the TDOT improvements at the Solway Interchange of SR-62 and SR-162 are completed which will enhance accessibility to destinations to the north. You can address this in the subsequent TIS stage through an additional scenario with higher traffic towards Sam Lee Rd.**

   Response: It is understood that the trip distribution should be increased in the subsequent TIS to reflect the future TDOT improvements at the Solway Interchange of SR 62 and SR 162. Since this will be addressed in the subsequent TIS, it was not changed in the revised TIL.

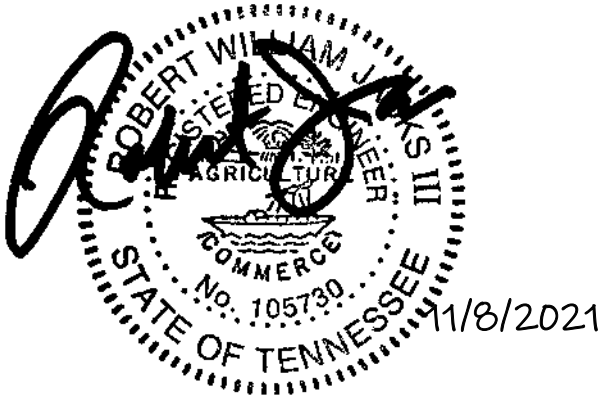
In addition to the requested revisions listed above, other changes in the report include the following:

- Updated Title Page and Page Footers
- Updated and Renumbered Table #'s
- Updated and Renumbered Page #'s
- Updated Appendix to include this response letter

If you have any questions or further comments, please feel free to contact me. We look forward to your review and approval.

Sincerely,

Ajax Engineering, LLC
Robert W. Jacks, P.E.



Ajax Engineering, LLC
11812 Black Road
Knoxville, TN 37932
ajaxengineering@gmail.com