

Addendum to:

1-SF-23-C / 1-E-23-DP

11-SA-22-C / 11-A-22-DP

(subdivisions combined)

Addendum Date: 1/30/2030

Original TIS Version Date: 12/22/2022



CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

January 30, 2023

PROJECT NAME: Beeler Road Subdivision

TO: Knoxville-Knox County Planning

SUBJECT: Memo for the Beeler Road Subdivision Transportation Impact Study (TIS)
(1-SF-23-C/1-E-23-DP)

Knoxville-Knox County Planning & Knox County Engineering Staff:

An email from Mike Conger, PE, dated January 30th, 2023, requested a response to address the number of proposed dwelling units and types being revised in the Beeler Road Subdivision development site plan.

The final TIS report for the Beeler Road Subdivision was submitted on December 22nd, 2022. This TIS included both the Beeler Road Subdivision and Fairview Road Subdivision since the Fairview Road Subdivision was proposed to have road access to Beeler Road via the Beeler Road Subdivision. The final TIS was based on trip generation calculations for 87 single-family detached houses for the Beeler Road Subdivision. The following table was included in this report:

TABLE 7
TRIP GENERATION FOR BEELER ROAD SUBDIVISION
87 Single-Family Detached Houses

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	87 Houses	888	26%	74%		63%	37%	
				17	49	66	55	32	87
Total New Volume Site Trips			888	17	49	66	55	32	87

IIE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

Since the final TIS submittal, the site plan designed by Batson, Himes, Norvell, and Poe has been revised and includes a different mixture of residential types. The new site plan includes 3 single-family detached houses and 87 multi-family attached townhouses. The updated trip generation is presented in the following table, and the calculations are attached to the end of this memo:

UPDATED TRIP GENERATION FOR BEELER ROAD SUBDIVISION - 1/30/2023

3 Single-Family Detached Homes & 87 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF 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	3	41	26%	74%		63%	37%	
				1	2	3	3	1	4
Local Trip Rate	Multi-Family Attached Townhouses	87	842	22%	78%		55%	45%	
				10	37	47	37	31	68
Total New Volume Site Trips			883	11	39	50	40	32	72

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

Trips calculated by using Fitted Curve Equations

Comparing the before and after shows that the updated total number of generated trips results in a slight reduction, as shown below:

REDUCTION IN NUMBER OF GENERATED TRIPS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
		ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Total New Volume Site Trips	-5	-6	-10	-16	-15	0	-15

Since the change in residential types resulted in an overall reduction of projected generated trips, the site plan revision does not alter the recommendations presented in the final TIS submitted on December 22nd, 2022.

If you have any questions or further comments, please feel free to contact me.

Sincerely,

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

UPDATED TRIP GENERATION FOR BEELER ROAD SUBDIVISION - 1/30/2023

3 Single-Family Detached Houses

3 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 1.10 + 2.68$$

$$\ln(T) = 3.69$$

$$T = \underline{\underline{41 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 1 + 0.12$$

$$\ln(T) = 1.12$$

$$T = \underline{\underline{3 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.94 * 1.10 + 0.27$$

$$\ln(T) = 1.30$$

$$T = \underline{\underline{4 \text{ trips}}}$$

UPDATED TRIP GENERATION FOR BEELER ROAD SUBDIVISION - 1/30/2023
87 Multi-Family Attached Townhouses

87 Residential Houses = X

Weekday:

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

$$T = 15 * 55.42$$
$$T = \underline{\underline{842 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 62$$
$$T = \underline{\underline{47 \text{ trips}}}$$

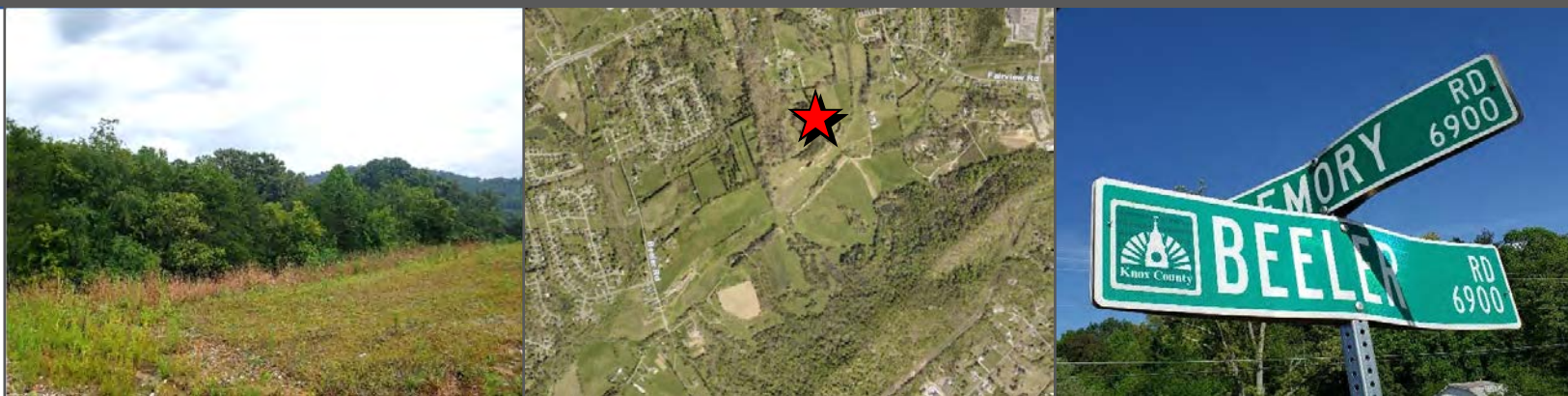
Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 87 + 10.07$$
$$T = \underline{\underline{68 \text{ trips}}}$$

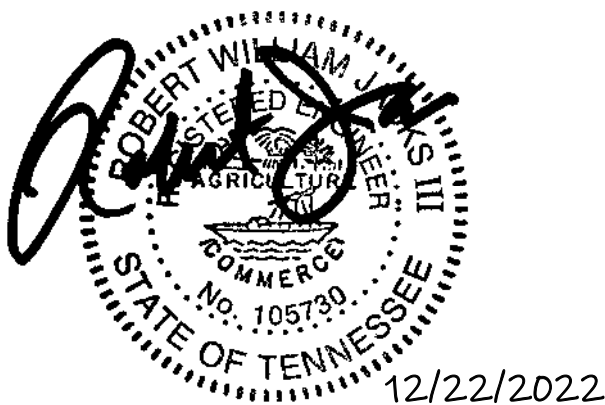


Transportation Impact Study Fairview Road Subdivision & Beeler Road Subdivision Knox County, Tennessee



Revised December 22, 2022

Prepared for:
Eagle Bend Development
Attn: Scott Davis
P.O. Box 11315
Knoxville, TN 37939



1-SF-23-C / 1-E-23-DP
and revision to:
11-SA-22-C / 11-A-22-DP
(subdivisions combined)

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EXECUTIVE SUMMARY

Beginning Commentary:

Since the original submission of the Transportation Impact Study (TIS) for Fairview Road Subdivision in August 2022 and Beeler Road Subdivision in June 2022, a substantial change to the proposed road access for the Fairview Road Subdivision has been made. The initial subdivision design for Fairview Road Subdivision proposed a single road access point via the end of the cul-de-sac in the existing, recently constructed Beeler Farms Subdivision off Beeler Road. Due to problems with access rights to Beeler Farms Subdivision, Fairview Road Subdivision is now proposing an access point to Beeler Road via another subdivision. The new access point will be via Beeler Road Subdivision. Beeler Road Subdivision has not begun construction and will be located directly south of Beeler Farms Subdivision and directly west of Fairview Road Subdivision. The Beeler Road Subdivision concept plan and TIS were approved earlier in June 2022 but have since been updated and modified to accommodate an access point for the Fairview Road Subdivision to Beeler Road. The modifications included re-designing the proposed internal roads in the Beeler Road Subdivision to provide a connection to Fairview Road Subdivision and also included a proposed land use change in the Beeler Road Subdivision from townhouses to single-family detached housing. Due to all these modifications, the Fairview Road Subdivision TIS has been revised in the following report. This revised report takes into account the modifications proposed for the Beeler Road Subdivision as it relates to the connection to the Fairview Road Subdivision. The Fairview Road Subdivision and the Beeler Road Subdivision will be developed separately but will be coordinated to facilitate road access. Both subdivisions are expected to reach full build-out and occupancy by 2027. This revised, updated report incorporates both developments in its analysis.

Preface:

Eagle Bend Development is proposing a residential development off Beeler Road in Northeast Knox County, TN. This report references the proposed development as “Fairview Road Subdivision” since a formal name has not yet been chosen. (Note: This name does not confer that the development will access Fairview Road).

The proposed Fairview Road Subdivision development will include 128 single-family detached houses on 93.44 +/- acres and is anticipated to be fully built and occupied by 2027. In addition to this subdivision, two other subdivisions have recently been proposed at Beeler Road, both adjacent and to the west of the proposed Fairview Road Subdivision. One of these other

subdivisions, Beeler Farms Subdivision, is currently reaching full construction build-out and occupancy. The other subdivision, Beeler Road Subdivision, has not begun construction. The Fairview Road Subdivision proposes a single access point to Beeler Road via the Beeler Road Subdivision entrance, which has not begun construction.

This study's primary purpose is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access roads and intersections and is a Level 1 study established by Knoxville/Knox County Planning. Recommendations and mitigation measures are offered if transportation operations are projected to be below recognized engineering standards.

Study Results:

The findings of this study include the following:

- The Fairview Road Subdivision, with 128 single-family detached houses, is estimated to generate 1,267 trips at full build-out and occupancy on an average weekday by 2027. Of these daily trips, 93 are estimated to occur during the AM peak hour and 125 in the PM peak hour.
- Fairview Road Subdivision will have a singular access point to Beeler Road via the entrance constructed for the Beeler Road Subdivision. The construction of left and right-turn lanes on Beeler Road at the Beeler Road Subdivision entrance for entering traffic is not necessary to accommodate the subdivisions. A single exiting lane at the Beeler Road Subdivision entrance approach will be sufficient for the residents in the proposed Beeler Road and Fairview Road Subdivisions.
- As required to be included in the study, the intersection of East Emory Road at Beeler Road has been calculated to operate with high vehicle delays for motorists on the northbound approach of Beeler Road at East Emory Road in the existing and projected 2027 conditions. A Tennessee Department of Transportation (TDOT) project provided through the IMPROVE Act will widen East Emory Road from 2 to 5 lanes by 2030 and will include a center turn lane. This road widening, coupled with the recommendations in this study, is projected to provide additional roadway capacity and mitigate the excessive vehicle delays on the northbound approach of Beeler Road at the intersection of East Emory Road.

Recommendations:

The following recommendations are offered based on the study analyses. The recommendations are to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety.

- A Stop Sign (R1-1) is recommended to be installed, and a 24" white stop bar be applied to the Beeler Road Subdivision entrance approach at Beeler Road. This Stop Sign (R1-1) and stop bar will control the exiting motorists from both Beeler Road and Fairview Road Subdivisions at Beeler Road. The stop bar should be applied a minimum of 4 feet away from the edge of Beeler Road and placed at the desired stopping point that maximizes the sight distance.
- The intersection and stopping sight distances from the Beeler Road Subdivision entrance approach location at Beeler Road were measured visually to be adequate. With a posted speed limit of 25-mph on Beeler Road, the required intersection sight distance is 250 feet looking in each direction from the Beeler Road Subdivision entrance approach. Based on the posted speed limit of 25-mph on Beeler Road and the existing road grades, the stopping sight distance is calculated to be 155 feet to the north and south at the intersection of the Beeler Road Subdivision entrance approach.
- The TDOT project provided through the IMPROVE Act will widen East Emory Road from 2 to 5 lanes and supply the necessary roadway capacity to limit vehicle delays and queues for the turning movements from East Emory Road onto Beeler Road.
- Before the TDOT widening project is completed, in the interim, an eastbound right-turn lane was recommended to be constructed on East Emory Road in the previous Transportation Impact Study (TIS) prepared for the Beeler Road Subdivision. Due to the physical limits present at this location, the eastbound right-turn lane was recommended to have 25 feet of storage with a 75-foot taper. This lane is recommended to be absorbed into the 5-lane road section that TDOT will construct in the future, and a separate right-turn lane will not be required when the TDOT project is completed in 2030.
- It is further recommended in this study that a northbound right-turn lane with 100 feet of vehicle storage be constructed on Beeler Road at East Emory Road. The recommended eastbound and northbound right-turn lanes at this intersection should be coordinated in design and construction to reduce costs and construction times. These lanes should be constructed once the Beeler Road and Fairview Road

Subdivisions commence construction to provide additional road capacity and moderate vehicle delays and queues until the TDOT project is completed.

- The 100-foot northbound right-turn lane on Beeler Road should be marked with a white turn arrow, as shown in TDOT Standard Drawing T-M-4.
- It is recommended that new traffic counts be conducted in the future to examine whether the intersection of East Emory Road at Beeler Road could meet traffic signal warrants once the subdivisions on Beeler Road are constructed and fully occupied, and the East Emory Road widening project is under design. Based on this study's projected 2030 volumes at the intersection, the primary warrant for a traffic signal, Warrant #1, will not be fully met. However, Warrant #2 is projected to be met. Higher growth than anticipated in this study could occur and increase traffic volumes large enough to meet Warrant #1.
- Two 25-mph Speed Limit (R2-1) signs are recommended to be installed on the connector road between Beeler Road and Fairview Road Subdivisions. One sign should be installed for eastbound travel into Fairview Road Subdivision and one for westbound travel into the Beeler Road Subdivision.
- Stop Signs (R1-1) and 24" white stop bars are recommended on the new internal roadways in the Fairview Road Subdivision, as shown in the report.
- Sight distance at the new internal subdivision road intersections must not be impacted by signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.
- The internal roads of "A" and "B" in the Fairview Road Subdivision have relatively long straight road segments. Straight road segments encourage motorists to travel at higher speeds, especially with steep grades. It is recommended that the site designer consider traffic calming measures on these internal roads. If implemented, speed humps and chokers are recommended for traffic calming in this development. Chokers are recommended when the internal road grades are greater than 8%. Details of any traffic calming should be coordinated with Knox County Engineering in the detailed design phase.
- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- Any sidewalk proposed in the subdivision should be 5 feet minimum in width to meet Knox County regulations. The provision of internal sidewalks in the Beeler

Road Subdivision has been removed. The provision of sidewalks in Fairview Road Subdivisions is not known.

- Knox County completed a greenway study in 2020. They recommended Beaver Creek as a preferred route for a new greenway connecting the area around Interstate 75 in Powell to the Knox County/Union County line. With Beaver Creek adjacent to the development site and on the development property to the south of the proposed houses, the developer should discuss with Knox County if this potential greenway path is feasible to implement while the property is being developed.
- For residential subdivisions with a single access point and more than 150 houses, Knox County has a long-standing unwritten design policy requiring a second entrance or a boulevard road typical section at the entrance. According to the County, the intent of a boulevard road typical section is to provide a substantial alternate travel path by constructing one up to an internal intersection. This requirement and the appropriate mitigation are evaluated on a case-by-case basis and may require further discussions at future stages of the design plan process. There is a potential for an additional access point to the north in Fairview Road Subdivision that would provide two travel paths. The final decision on the most appropriate way to address this policy will be decided by Knox County Engineering and Public Works.
- All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.

DESCRIPTION OF EXISTING CONDITIONS

▪ STUDY AREA:

The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located off Beeler Road in the Gibbs community in Northeast Knox County, TN. Beeler Farms Lane is a newly constructed residential street built for Beeler Farms Subdivision and will be located directly west of Fairview Road Subdivision. In addition to Beeler Farms Subdivision, the Fairview Road Subdivision will be located east and adjacent to another recently proposed residential subdivision. This other residential development will be directly to the south of Beeler Farms Subdivision and is referred to in this report as the Beeler Road Subdivision since an official name has not been announced. The Fairview Road Subdivision will have external road access via the proposed Beeler Road Subdivision entrance on Beeler Road by constructing a connector road between the two subdivisions.

As Knoxville/Knox County Planning requested, transportation impacts associated with the proposed Fairview Road Subdivision development were analyzed at the intersection of East Emory Road at Beeler Road, which is 1,900 feet to the north of the development site. The revised report for Fairview Road Subdivision includes an analysis of the subdivision entrance on Beeler Road at the Beeler Road Subdivision. The report also includes an analysis of the existing subdivision entrance, Beeler Farms Lane, for Beeler Farms Subdivision.



**Existing View of Proposed Fairview Road Subdivision Development Site
(Looking East from West End of Development Site)**

The proposed development property is in a rural and agricultural area undergoing increased development. The Gibbs community is a growing and independent area that is becoming more suburbanized and residential in nature. The growing number of residential units in the surrounding area includes stand-alone single-family residences and residential subdivisions with single-family detached houses in Beeler Farms, Opportunity Ridge, Twin Brooks, Victoria's Landing, and Huntington Place.

The Fairview Road Subdivision will be on a large, jigsaw puzzle-shaped property. The proposed development property is currently undeveloped with forested areas, but most of it is cleared for farm activities. The property is roughly divided in the center to the north and south by Beaver Creek and a 200-foot-wide Tennessee Valley Authority electric transmission line and easement. The residential houses are proposed on the northern side, and the southern side will remain undeveloped.

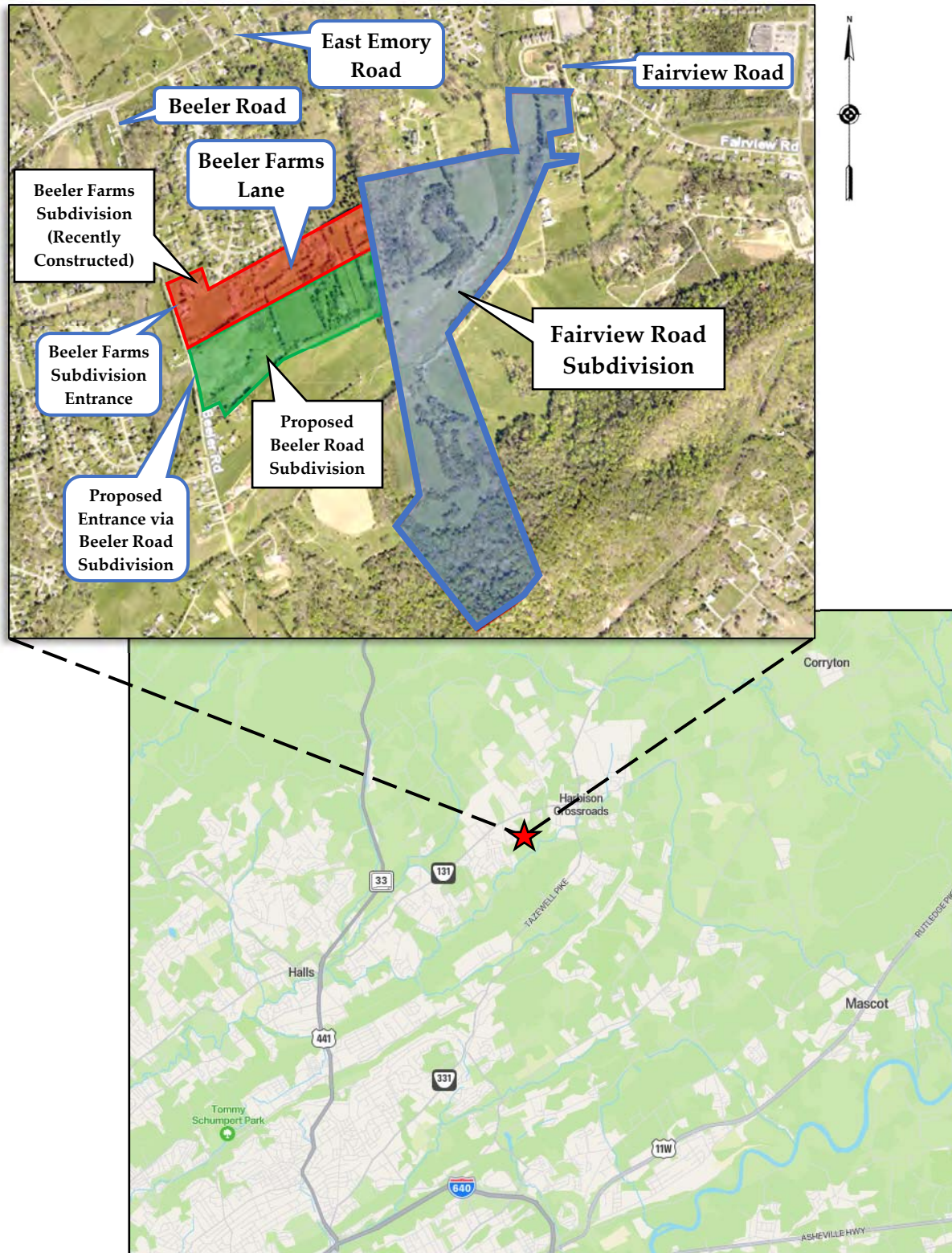


Figure 1
Location Map

▪ **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary access roadways adjacent to the development property and included in the study:

TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
East Emory Road (SR 131)	Major Arterial	45 mph	2 undivided	42 feet	None	None	None
Beeler Road	Major Collector *	25 mph	2 undivided	18.5 feet	None	None	None
Beeler Farms Lane	Local Street	25 mph	2 undivided	26 feet	None	None	None

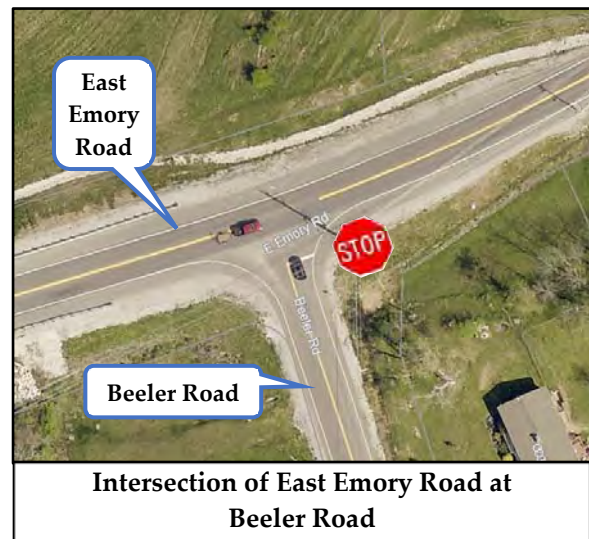
¹ 2018 Major Road Plan by Knoxville/Knox County Planning

² From edges of pavement

³ According to Knoxville Area Transit System Map

* Major Collector from Stormer Road to East Emory Road

East Emory Road (SR 131) is classified as a Major Arterial and generally traverses in a general southwest-northeast direction in the study area. East Emory Road is a state route and is a relatively straight road with minor horizontal and vertical curvature. The section of East Emory Road near the project site currently consists of a 2-lane pavement section approximately 42 feet wide with approximately 11.5-foot travel lanes and 8'-10' paved shoulders outside the travel lanes. The roadway pavement is marked with a double yellow centerline and white edge lines. Skip line rumble strips are provided outside the white edge lines on both sides. The posted speed limit on East Emory Road is 45-mph. A single utility light is provided at the intersection of East Emory Road at Beeler Road for road illumination.



The East Emory Road designation officially transitions from West Emory Road at the intersection with Heiskell Road/Central Avenue Pike to the west of Interstate 75. On the northeast end, the

road continues into Grainger County. The total length of East Emory Road in Knox County is approximately 18.5 miles.



**Box Culvert for Kerns Branch on
East Emory Road
(Looking West)**

The area around the intersection of East Emory Road at Beeler Road has been modified within the last few years. From 2017 to 2018, TDOT replaced a box culvert for Kerns Branch just west of the intersection. This replacement included shifting the alignment of East Emory Road further to the north and extending Beeler Road slightly further to the north. This project also included installing new guardrails and providing widened and paved shoulders.

In 2017, the State of Tennessee passed the IMPROVE Act (Improving Manufacturing, Public Roads and Opportunities for a Vibrant Economy Act). This act provided cuts to the state sales tax on groceries and the Hall income tax, increases in fuel taxes, and included a list of 962 transportation projects to be paid with the new funding. One of these TDOT projects includes widening East Emory Road (SR 131). This project is currently in the design phase and proposes widening East Emory Road from 2 to 5 lanes with a total length of 4.8 miles. This project is expected to be completed by 2030 and is estimated to cost \$70.6 million.

For the proposed development, East Emory Road will provide access to the southwest towards north Knoxville and the northeast towards Harbison Crossroads and further into the Gibbs community. East Emory Road primarily provides access to residential subdivisions, stand-alone residences, and farm properties in the study area.

Beeler Road is classified as a Major Collector between Stormer Road and East Emory Road and has a posted speed limit of 25-mph. It intersects East Emory Road twice with a circuitous route with a total length of 2.2 miles. On its east end, closer to the development site, Beeler Road intersects East Emory Road at an unsignalized t-intersection and continues southward past the proposed development property and the existing Twin Brooks Subdivision entrance. The road pavement narrows significantly and is more isolatedly populated beyond the Twin Brooks Subdivision entrance. Beeler Road continues west to Stormer Road and then northward back to East Emory Road at an unsignalized t-intersection. The two intersections of Beeler Road at East

Emory Road are separated by approximately 1 mile. Both approaches of Beeler Road at East Emory Road are controlled by a Stop Sign (R1-1) with single lanes. East Emory Road motorists operate freely at these intersections.

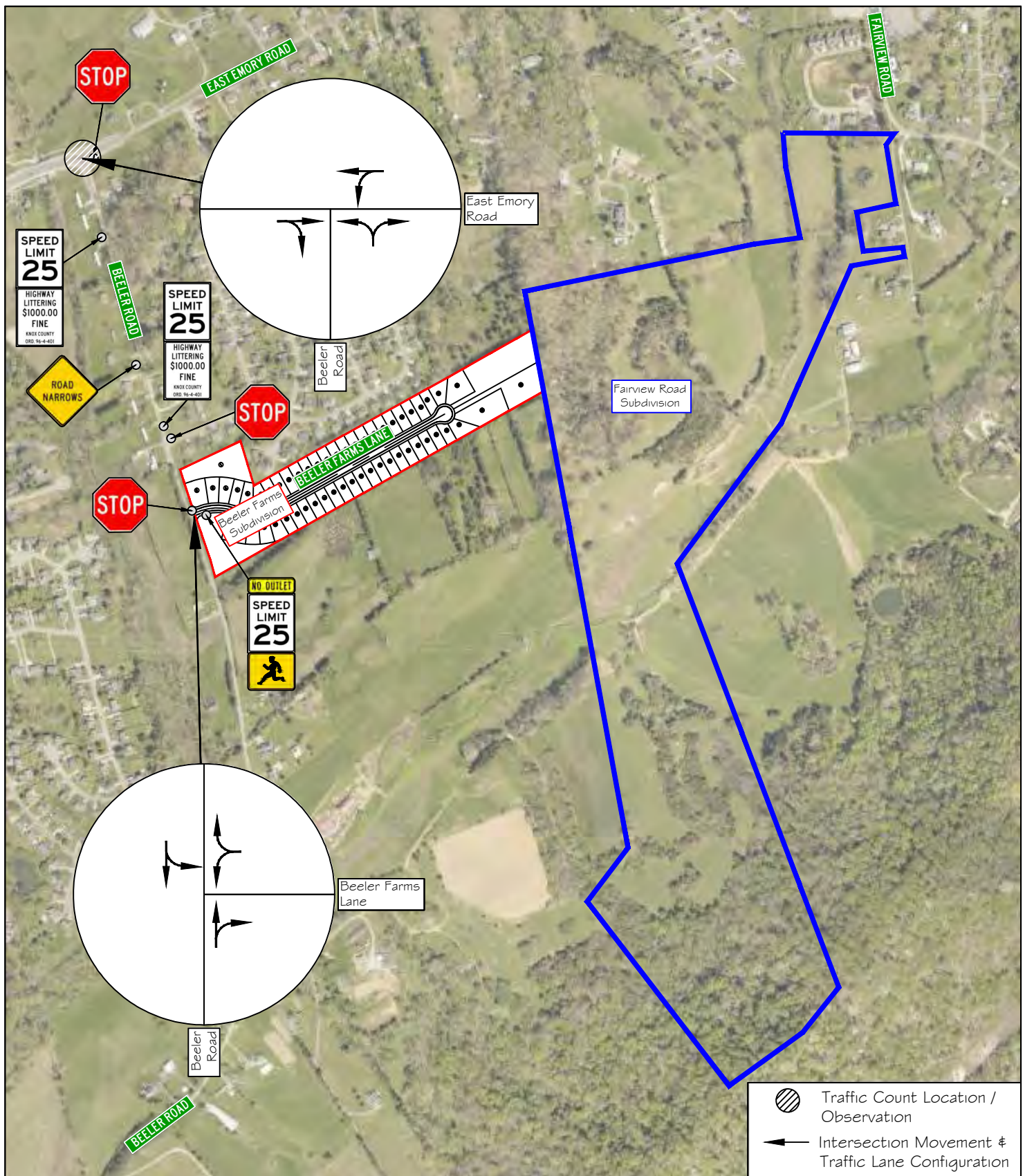
At the intersection of Beeler Road at East Emory Road included in this study, Beeler Road has 12-foot lanes with a total pavement width of about 30 feet. Wider lanes were provided during the box culvert reconstruction project on East Emory Road. About 250 feet south of this intersection, Beeler Road narrows down to 20 feet and continues to the south towards the development site averaging between 18 to 20 feet. Beeler Road is marked with a “Road Narrows” sign halfway between the development property and East Emory Road. Beeler Road was measured to be 18.5 feet wide immediately north and south of Beeler Farms Lane. The pavement on Beeler Road is marked with a double yellow centerline and is characterized by mailboxes, private driveways, trees, drainage ditches, and utility poles outside the roadway pavement.

Beeler Farms Lane was recently constructed for Beeler Farms Subdivision and has a posted speed limit of 25-mph. Fifty-three single-family detached houses were proposed for the Beeler Farms Subdivision. Nearly all these houses were built and occupied when the original Fairview Road Subdivision TIS was completed in August 2022. As of August 11th, 2022, only 14 houses remained that were not occupied. The remaining houses were either not entirely constructed or still for sale. At Beeler Road, Beeler Farms Lane provides a single exit lane; separate left and right-turn entering lanes on Beeler Road are not provided. Sidewalks are not provided on Beeler Farms Lane.



**End of Beeler Farms Lane at
Cul-de-Sac (Looking East)**

Figure 2 shows the lane configurations of the existing intersection examined in the study, the traffic count location for the study, and the current traffic road signage in the study area. The road signage shown in Figure 2 only includes warning and regulatory signage near the development site. The pages following Figure 2 give a further overview of the site study area with photographs.



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

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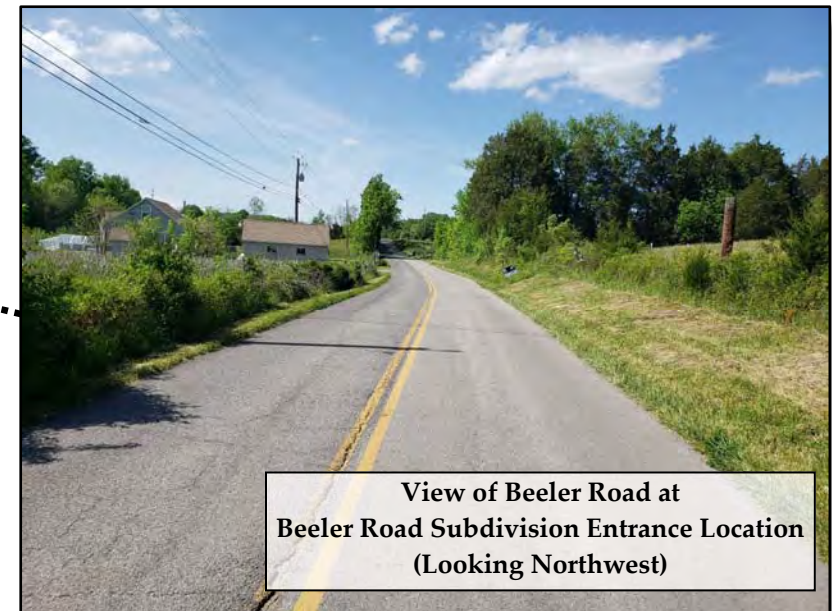
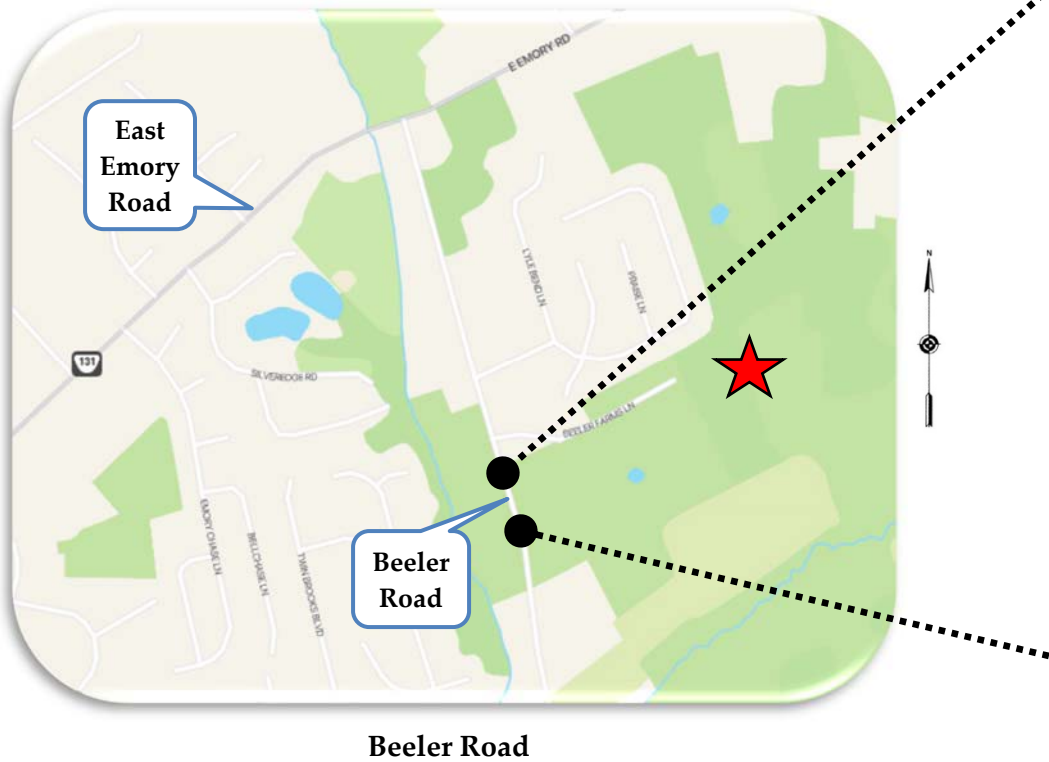


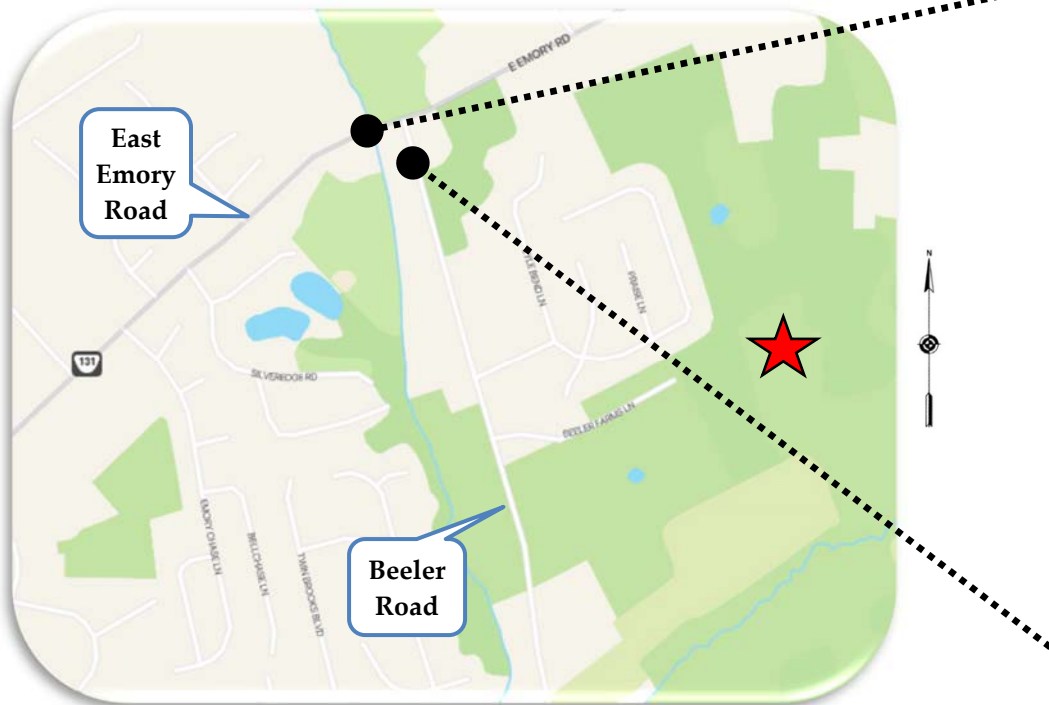
FIGURE 2

Fairview Road Subdivision

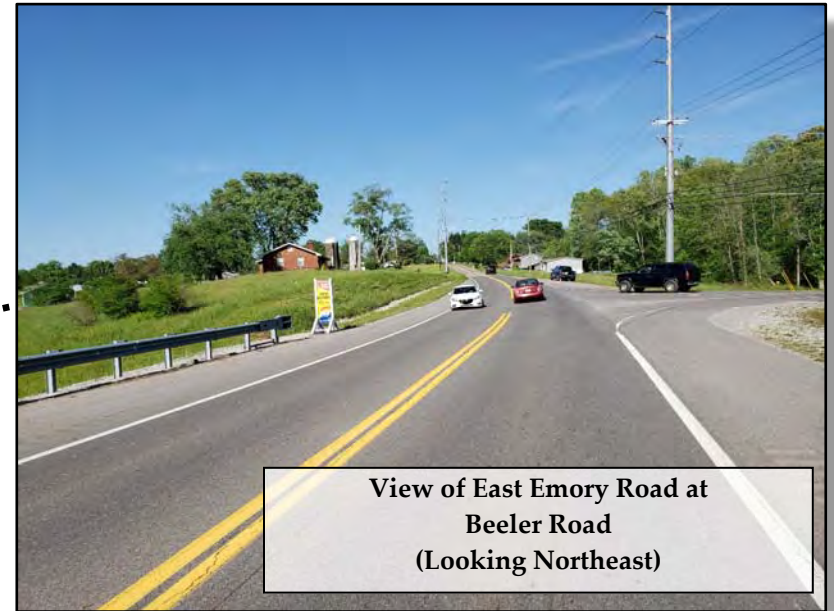
Traffic Count Location, Traffic Signage & Existing Lane Configurations

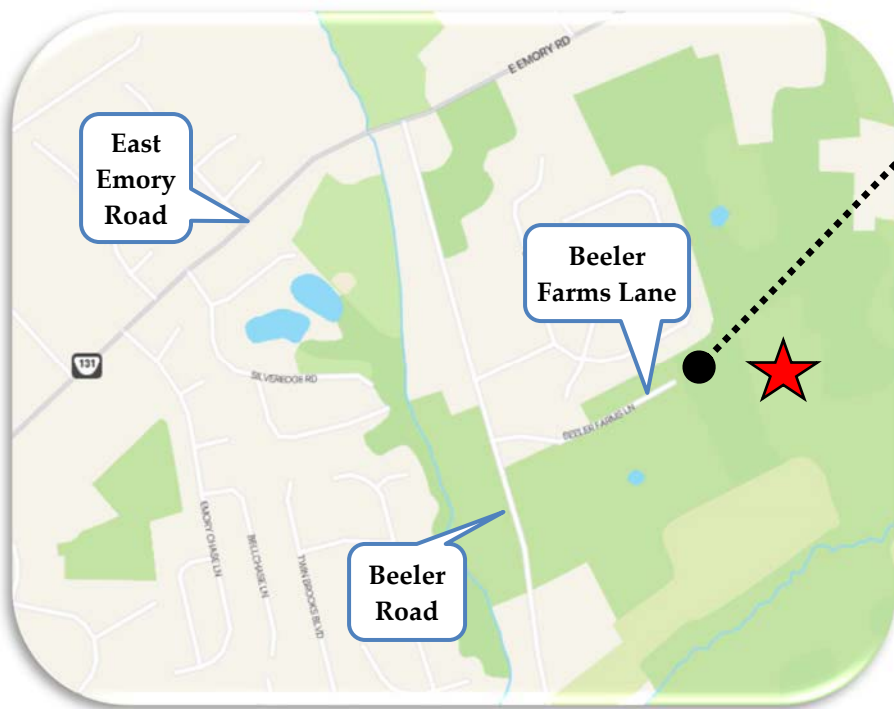
PHOTO EXHIBITS





Beeler Road at East Emory Road





Beeler Farms Lane

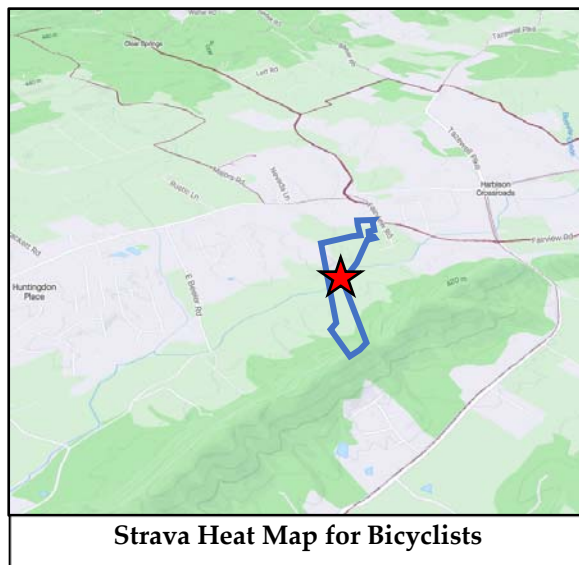


**View of Fairview Road Subdivision
Development Site at
End of Beeler Farms Lane
(Looking Northeast)**

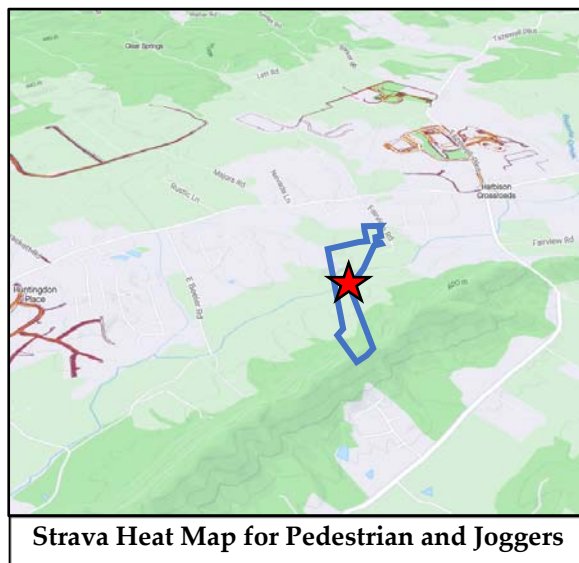
▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

One annual vehicular traffic count location exists nearby in the study area, and TDOT conducts this count. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
The TDOT reported an Average Daily Traffic (ADT) on East Emory Road, east of Tazewell Pike, at 5,702 vehicles per day in 2021. From 2011 to 2021, this count station has indicated a 0.5% average annual traffic growth rate.
- Existing bicycle and pedestrian volumes:
The average daily pedestrian and bicycle traffic is unknown along East Emory Road and Beeler Road. Due to the lack of facilities and nearby amenities, it is assumed that there is a minimal number of pedestrians and bicyclists on these roads in the study area. During the traffic counts for this project at the intersection of East Emory Road at Beeler Road, no pedestrians or bicyclists were observed over 8 hours.



An online website, [strava.com](https://www.strava.com), provides “heat” maps detailing exercise routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the roads with color intensities with lighter colors signifying higher activity. The Strava heat map



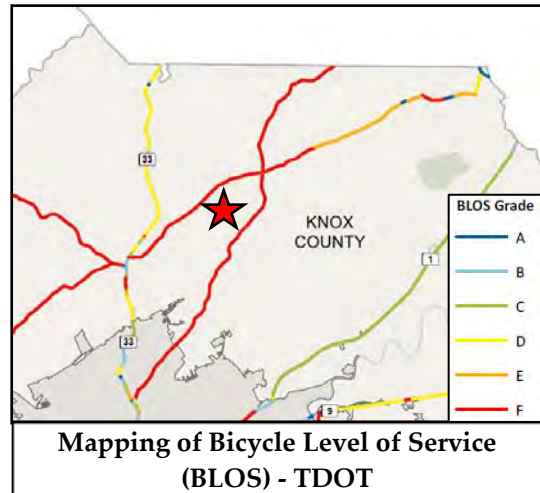
data shows that hardly any recorded pedestrian or bicycle traffic occurs in the study area. Some pedestrian activity has been recorded in the existing Huntington Place Subdivision west of the development site and Beeler Road. Some pedestrian activity is also shown around the public schools in the Gibbs community to the northeast.

▪ **ON-STREET PARKING:**

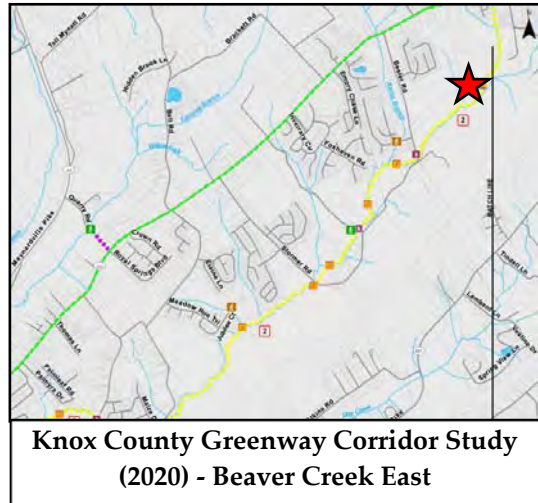
On-street parking was not observed during the site review and is not allowed on East Emory Road or Beeler Road adjacent to the project site. However, on-street parking is expected to occur along the future internal roads in Beeler Road and Fairview Road Subdivisions.

▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

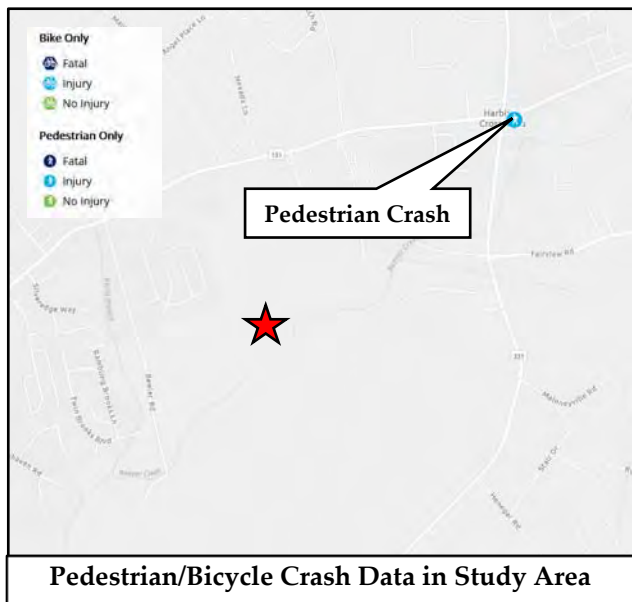
Bicycle facilities (lanes) are not available within the project site study area. Sidewalks are not provided either. Even though bicycle facilities are not provided on East Emory Road, TDOT has published mapping illustrating the Bicycle Level of Service (BLOS) for state routes in Knox County. BLOS is a nationally used measure of bicyclist comfort based on a roadway's geometry and traffic conditions. BLOS A designates the route as most suitable for bicyclists and BLOS F as the least suitable. The BLOS for East Emory Road (SR 11) in the study area at Beeler Road shows F grades.



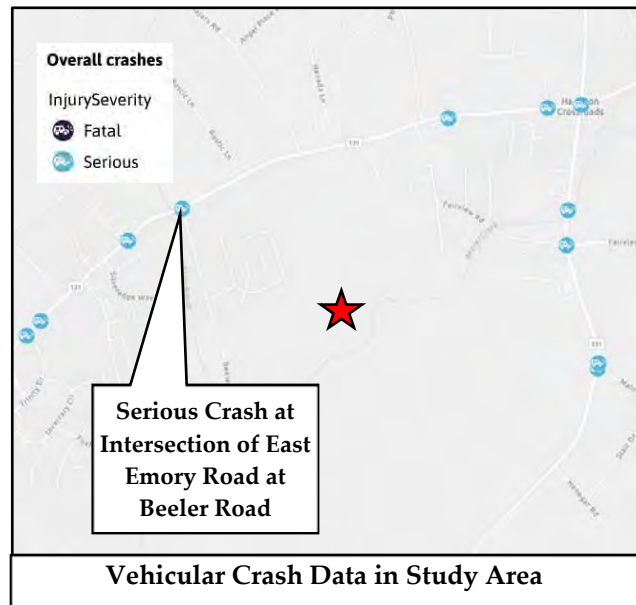
Knox County completed a Greenway Corridor Study in 2020. This study evaluated potential alignments for greenways throughout Knox County. One of the corridors, Beaver Creek East, was identified and evaluated in the study. This corridor would run from the area around Interstate 75 in Powell to the Knox County/Union County line. One of the preferred routes for this corridor is shown following Beaver Creek across the proposed development property and up to the intersection of East Emory Road at Fairview Road.



The executive summary in the Knox County greenway study states: “The greenway corridor study will be utilized when asking for greenway easements from developers and property owners as their proposed construction projects go through Knoxville-Knox County Planning for approval. The County’s policy is to acquire property or easements for greenways only through voluntary donation or sale.”



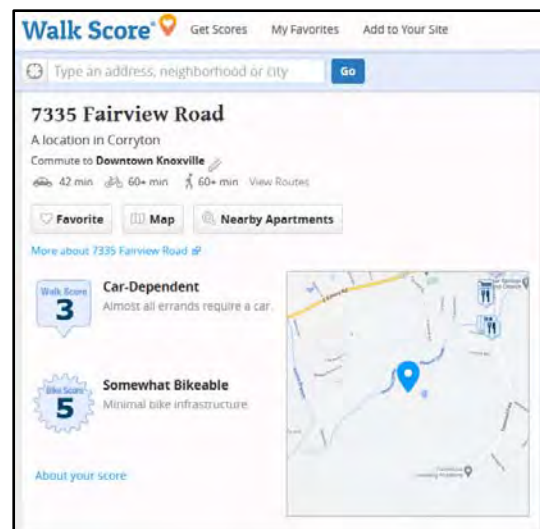
The Knoxville TPO provided a 2020 update to bicycle and pedestrian crash data for Knox County, Blount County, and other surrounding counties. According to the data, one of these incidents occurred near the study area in the past couple of years. This crash occurred on March 5th, 2019, near the intersection of East Emory Road at Tazewell Pike but did not list the cause of the crash. This incident involved a pedestrian and resulted in an injury.



The Knoxville TPO also provides data related to “Life-Altering Traffic Crashes”. This data lists “the location of 2,326 traffic crashes in the Knoxville region that resulted in a fatality or serious injury between January 2016 and June 2019.” Several “Serious” crashes are shown on this TPO mapping on East Emory Road in the vicinity of the proposed development site. The closest crash to the development site occurred at the intersection of East Emory Road at Beeler Road, but details of the crash are not listed. The other “Serious” crashes along East Emory Road included one involving a DUI and one with a teen driver.

▪ **WALK SCORE:**

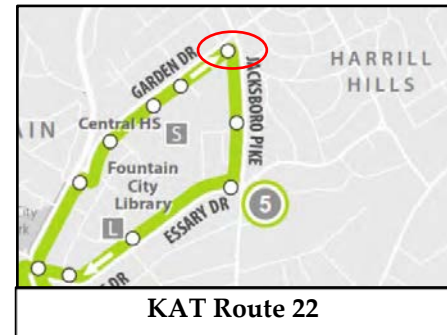
A private company offers an online website at walkscore.com that grades and gives scores to locations within the United States based on “walkability”, “bikeability”, and transit availability based on a patented system. According to the website, the numerical values assigned for the Walk Score and the Bike Score are based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.) and are graded from 0 to 100.



Appendix B shows maps and other information for the Walk Score, Bike Score, and Transit Score at the approximate development property address (7335 Fairview Road). The project site location is graded with a Walk Score of 3. This Walk Score indicates that all errands require a vehicle at the property site due to the lack of sidewalks and the travel lengths required to amenity locations. The site is graded with a Bike Score of 5, which means there is minimal bike infrastructure, but it is somewhat bikeable. The site is not given a Transit Score.

▪ **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available in this area, and the overall KAT bus system map is in Appendix C. The closest public transit bus stop is 7.5 miles away by roadway off N Broadway on Garden Drive and is on Route 22, “Broadway”. It operates on weekdays and weekends; this route map is included in Appendix C. KAT has had to reduce its service schedule due to workforce shortages. These changes took place on August 29th, 2022, and the reduced schedule for Route 22 is also included in Appendix C. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.



PROJECT DESCRIPTION

▪ LOCATION AND SITE PLAN:

The proposed plan layout with 128 single-family detached houses is designed by Urban Engineering and is shown in Figure 3. The figure also shows the existing Beeler Farms Subdivision and the proposed Beeler Road Subdivision (designed by others). As shown in the figure, one external road access point will be provided for the Fairview Road Subdivision. The access point for Fairview Road Subdivision to Beeler Road will be via roads constructed for Beeler Road Subdivision. As labeled in the Beeler Road Subdivision concept plan, these roads include Road "D" and the main subdivision entrance road, Road "A". With the construction of a connector road, the total roadway length between the western edge of the Fairview Road Subdivision property line and the Beeler Road Subdivision entrance at Beeler Road via Roads "A" and "D" will be approximately 2,150 feet.

In the Fairview Road Subdivision, four new streets labeled Road "A" thru Road "D" will be constructed internally with a total length of 4,210 feet (0.8 miles). This length includes the short connector road between Road "B" in Fairview Road Subdivision and Road "D" in Beeler Road Subdivision. All the internal roads will end at cul-de-sacs in Fairview Road Subdivision except for Road "D". The internal roadways in Fairview Road Subdivision will have a paved road width of 26 feet. Lot 197 in Fairview Road Subdivision on Road "B" has been called out as a potential public right-of-way for a stub-out road to the north. Whether this potential stub-out is pursued will be determined later in the design process.

The residents in the Fairview Road Subdivision will own the individual lots and houses, and the typical house lot size will be 6,600 square feet (120 feet x 55 feet), with several over 10,000 square feet in area. Each single-family house will have an individual driveway with a garage.

A mailbox delivery center for Fairview Road Subdivision will be constructed along with six parallel parking spaces alongside the connector road between the Beeler Road and Fairview Road Subdivisions. The provision of internal sidewalks in the Beeler Road Subdivision has been removed. The provision of sidewalks in Fairview Road Subdivisions is not known.

Stormwater detention ponds and controls will be constructed along the southern and eastern edges of the development property adjacent to Beaver Creek. All the houses will be built outside the 500-year flood plain. The 65-acre southern portion of the development property across Beaver

Creek will remain undeveloped.

The schedule for completing the Fairview Road Subdivision depends on economic factors and construction timelines. In the past couple of years, the real estate market in the area has been experiencing large amounts of activity and growth. However, the market has slowed down from its peak due to rising interest rates and other factors. This project is contingent on permitting, design, and other regulatory approvals. This study assumed that the total construction build-out of the development and full occupancy would occur within the next five years (2027). 2027 is the same horizon year assumed for the adjacent Beeler Road Subdivision that has not begun construction.

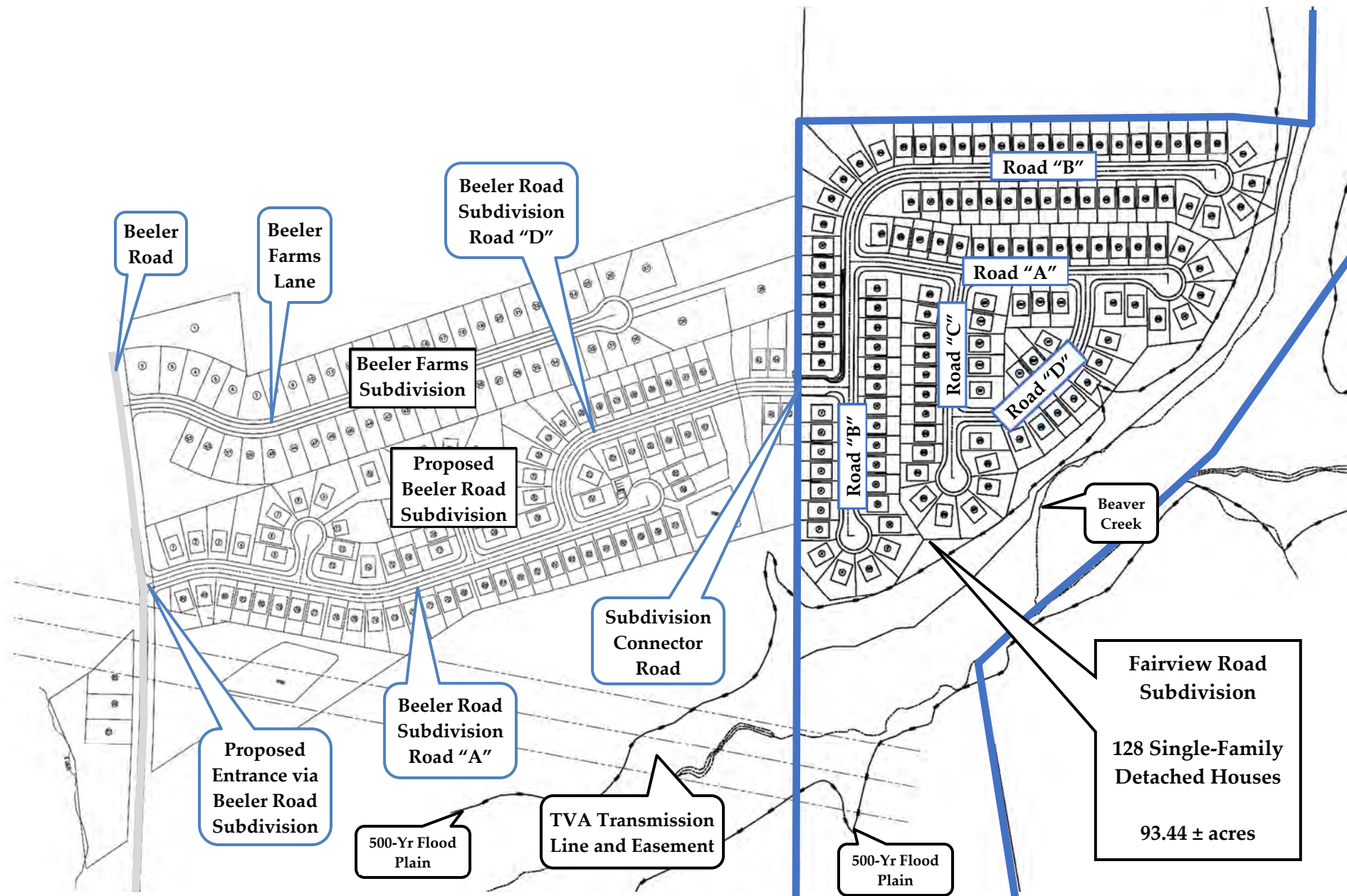
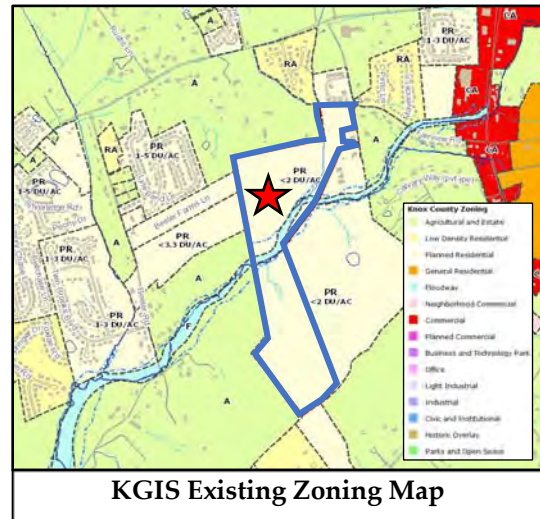


Figure 3
Proposed Plan Layout
Fairview Road Subdivision

Not to Scale

■ **PROPOSED USES AND ZONING REQUIREMENTS:**

The Fairview Road Subdivision development property is within Knox County, TN, and is zoned as Planned Residential (PR) with a maximum of two dwelling units per acre. The Planned Residential (PR) zone allows for various land uses primarily within the residential realm. Uses permitted in this zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. The most recently published online KGIS zoning map is provided in Appendix D and shown here. The existing adjacent surrounding zoning and land uses are the following:



- Fifty-three single-family detached houses will exist west of the development property in the Beeler Farms Subdivision. Thirty-nine houses in this new subdivision were sold and occupied as of May 5th, 2022. The remaining houses were either reaching the end of construction or had not yet sold. These residences to the west are in the Planned Residential (PR) zone with less than 3.25 density units per acre. Beeler Farms Subdivision only has access to Beeler Road to the west via Beeler Farms Lane.
- Another eighty-seven single-family detached houses will exist west of the development property in the proposed Beeler Road Subdivision. This development has not yet begun construction. These future residences in the Beeler Road Subdivision will be in the Planned Residential (PR) zone with less than 3.3 density units per acre. Beeler Road Subdivision will only have road access via Beeler Road to the west, and the entrance will provide external road access for the Fairview Road Subdivision.
- One large parcel is zoned as Agricultural (A) and is north of the proposed development property. This property has large undeveloped areas with a sprawling single-family residence with several outbuildings. This property has road access to East Emory Road to the north. To the northeast of the Fairview Road Subdivision property, a couple of parcels are zoned in the Planned Residential (PR) zone, consist of condominiums with access to Fairview Road, and are in the recently constructed Maria Meadows Condominium development.

- Nearly the entire length of the east side development property line is adjacent to a single large parcel in the Planned Residential (PR) zone. This parcel is undeveloped and currently used for farm purposes. This adjacent large parcel has road access to Fairview Road via a joint permanent easement.
- Two parcels are located to the south of the development property. These properties are zoned as Agricultural (A) and Planned Residential (PR), with both having access to Tazewell Pike to the south. The Agricultural (A) parcel is mainly undeveloped, and the Planned Residential (PR) property is also, except for a single-family house on the south end near Tazewell Pike.

▪ **DEVELOPMENT DENSITY:**

The Fairview Road Subdivision development's proposed density is based on a maximum of 128 single-family detached houses on 93.44 acres. One-hundred twenty-eight housing units over 93.44 acres computes to 1.37 dwelling units per acre which is less than the maximum allowed of two units per acre.

▪ **ON-SITE CIRCULATION:**

The internal roads in Fairview Road Subdivision will be designed and constructed to Knox County, TN specifications. The internal roads will be asphalt paved and include 6" concrete curbs. The lane widths will be 13 feet each, totaling a 26-foot pavement within a 50-foot right-of-way. The internal roads will be public and will be maintained in the future by Knox County. The provision of internal sidewalks in the Beeler Road Subdivision has been removed. The provision of sidewalks in Fairview Road Subdivisions is not known.

▪ **SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:**

Besides residential passenger vehicles, the internal development roads will also provide access to service, delivery, maintenance, and fire protection/rescue vehicles. None of these other vehicle types should impact roadway operations other than when they occasionally enter and exit the development.

It is expected that the future residents in the development will be provided the opportunity for public school and private trash collection services if desired. The internal roadways will be designed and constructed to Knox County specifications and are expected to be adequate for fire

protection and rescue vehicles, trash collection trucks, school buses, and single-unit delivery trucks. The development's internal road will accommodate the larger vehicle types and residents' standard passenger vehicles.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

▪ EXISTING TRAFFIC CONDITIONS:

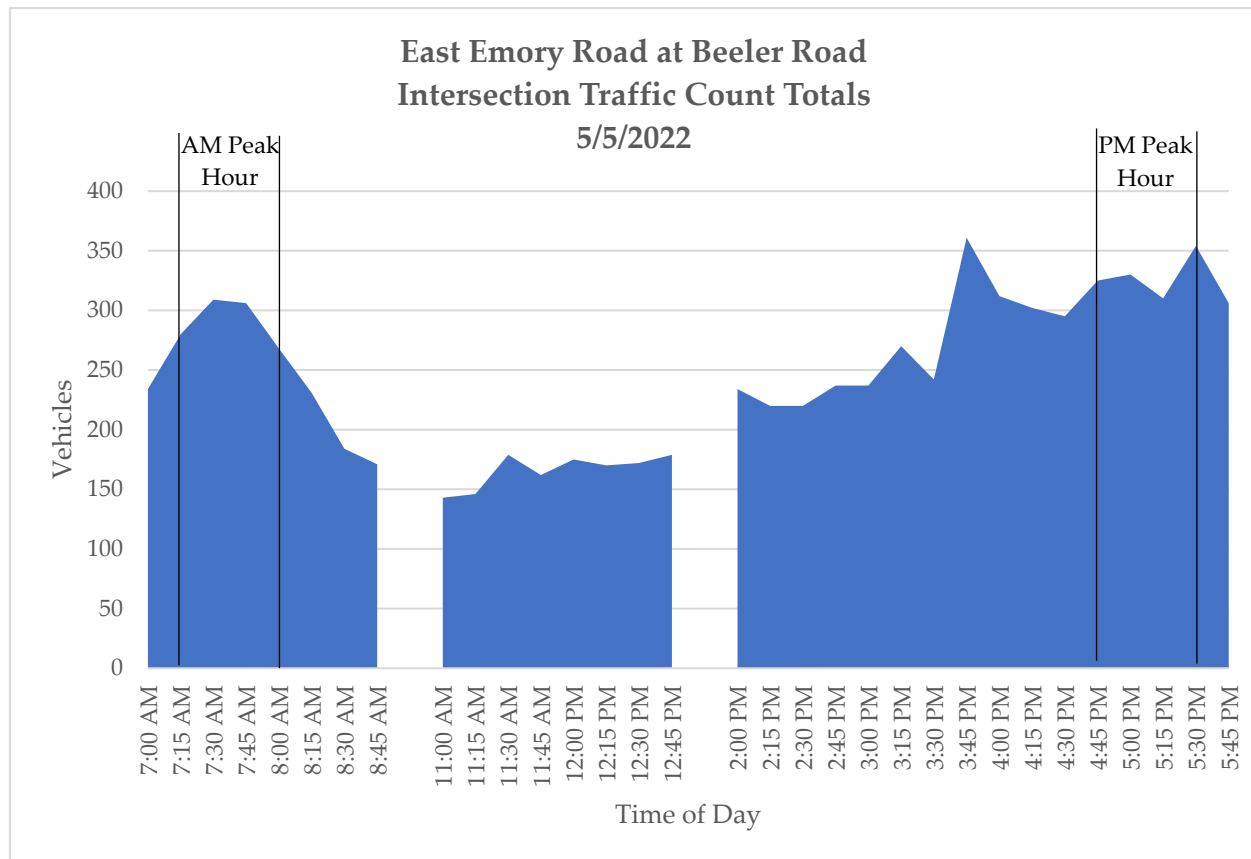
An 8-hour traffic count was conducted previously at the intersection of East Emory Road at Beeler Road on Thursday, May 5th, 2022, by Ajax Engineering, LLC, for the TIS for the proposed adjacent Beeler Road Subdivision. These counts were used in this study for the Fairview Road Subdivision. The manual traffic counts were conducted to tabulate the morning and afternoon peak period volumes and travel directions near the proposed development site. Based on the traffic volumes collected, the AM and PM peak hours were observed at 7:15 – 8:15 am and 4:45 – 5:45 pm at the intersection. Local county public schools were in session when the traffic counts were conducted.

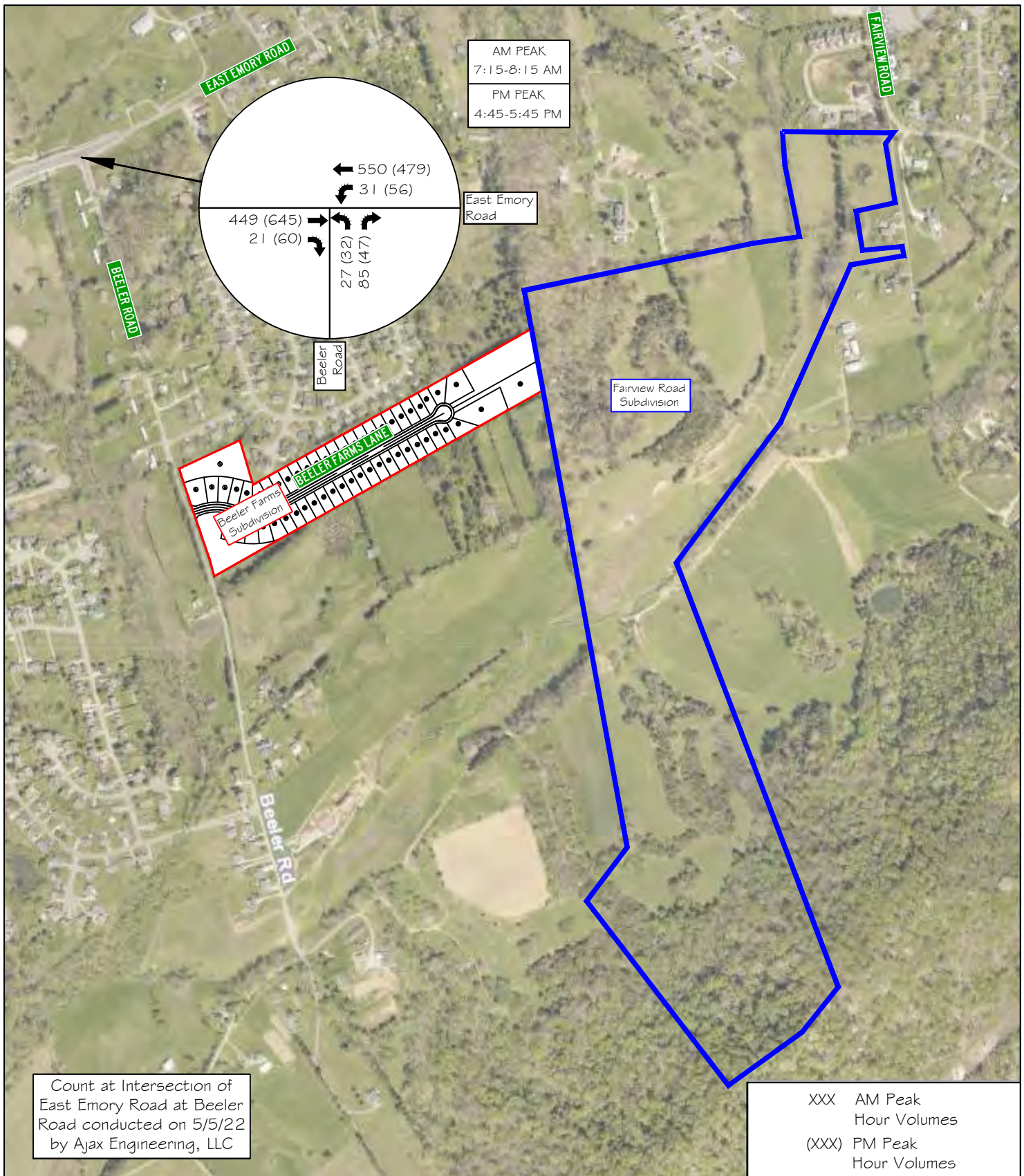
The manual tabulated traffic counts can be reviewed in Figure 4a and Appendix E, and some observations from the count are listed below.

- No bicyclists or pedestrians were observed during the traffic count.
- Most of the observed traffic was passenger vehicles, but the traffic stream on East Emory Road and Beeler Road also included public school buses and dump trucks. Vehicles associated with the adjacent Beeler Farms Subdivision construction were observed on Beeler Road. These vehicles included concrete mixer trucks and large work trucks with trailers. A few semi-tractor trailers were observed on East Emory Road.
- From 7-8 am, heavier traffic was observed turning right from Beeler Road towards the east onto East Emory Road than to the left. From 8-9 am, the number of right-turning and left-turning vehicles on Beeler Road averaged closer to each other. Since all the existing properties on Beeler Road are zoned for the Gibbs Schools located to the north and east, it is believed that this imbalance of right-turn motorists towards the east is partially contributable to parents taking their children to school. A brief spike in traffic was also observed around 3:30 pm at the intersection, coinciding with the Gibbs Middle and High School's dismissal.
- The existing northbound approach of Beeler Road is a single lane for left and right turns onto East Emory Road. However, the travel lane and the shoulder pavement width on Beeler Road provide enough width to simultaneously allow two vehicles to be side-by-side for both left and right-turns. Occasionally, when a left-turning motorist on Beeler Road had significant delays due to heavy traffic on East Emory Road, right-turning motorists were observed driving on the shoulder alongside the stopped left-turning

vehicle. This maneuver was taken to avoid the vehicle queue and allow the motorist to complete their turn to the right without waiting.

- Likewise, similar shoulder activity was observed on East Emory Road. Some eastbound motorists on East Emory Road turning right onto Beeler Road used the paved shoulder to remove themselves from the eastbound thru traffic stream. More dangerously, some impatient westbound motorists used the shoulder on East Emory Road to pass vehicles stopped on East Emory Road attempting to turn left onto Beeler Road. This maneuver was observed several times and included some motorists passing more than one stopped and queued vehicle. The riskiest observed maneuver was when a stopped westbound left-turn motorist on East Emory Road was courteous and allowed a left-turning motorist from Beeler Road to turn first onto East Emory Road. While this was occurring, a westbound thru motorist on East Emory Road passed the stopped vehicle by using the shoulder and nearly caused a sideswipe collision with the left-turning motorist from Beeler Road.





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

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FIGURE 4a

Fairview Road Subdivision

2022 Peak Hour Traffic Volumes -
EXISTING CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2022 traffic volumes shown in Figure 4a at the intersection of East Emory Road at Beeler Road. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 11).

Methodology:

LOS is a qualitative measurement developed by the transportation profession to express how well an intersection or roadway performs based on a driver's perception. LOS designations include LOS A through LOS F. The designation of LOS A signifies a roadway or intersection operating at best, while LOS F signifies road operations at worst. This grading system provides a reliable, straightforward means to communicate road operations to the public. The HCM lists level of service criteria for unsignalized intersections and signalized intersections.



LOS is defined by delay per vehicle (seconds), and roadway facilities are also characterized by the volume-to-capacity ratio (v/c). LOS designations, which are based on delay, are reported differently for unsignalized and signalized intersections. For example, a delay of 20 seconds at an unsignalized intersection would indicate LOS C, and this delay would represent the additional delay a motorist would experience traveling through the intersection. Also, for example, a v/c ratio of 0.75 for an approach at an unsignalized intersection would indicate that it is operating at 75% of its available capacity. This difference is primarily due to motorists having different expectations between the two road facilities. Generally, for most instances, the LOS D / LOS E boundary is considered the upper limit of acceptable delay during peak periods in urban and suburban areas.

For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure is an attempt to quantify delay that includes travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop and is not affected by the traffic on the minor side streets. Thus, the LOS for a two-way stop (or yield) controlled intersection is defined by

the delay for each minor approach and major street left-turn movements. Table 2 lists the level of service criteria for unsignalized intersections. The analysis results of unsignalized intersections using the HCM methodologies are conservative due to the more significant vehicle gap parameters used in the method. More often, in normal road conditions, drivers are more willing to accept smaller gaps in traffic than what is modeled using the HCM methodology. The unsignalized intersection methodology also does not account for more significant gaps sometimes produced by nearby upstream and downstream signalized intersections. For unsignalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 35 seconds.

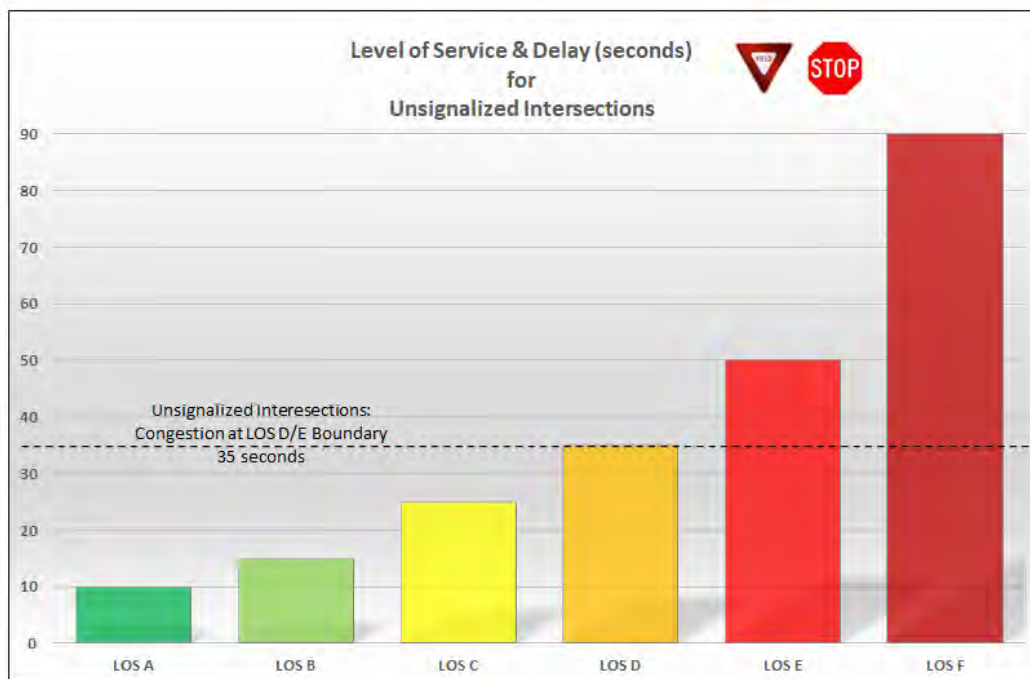
TABLE 2

LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS



LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Little or no delay	0 - 10
B	Short Traffic Delays	>10 - 15
C	Average Traffic Delays	>15 - 25
D	Long Traffic Delays	>25 - 35
E	Very Long Traffic Delays	>35 - 50
F	Extreme Traffic Delays	>50


Source: Highway Capacity Manual, 6th Edition



Intersection capacity results from the existing 2022 peak hour traffic are shown in Table 3. The intersection in the table is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix F includes the worksheets for the existing 2022 peak hour capacity analyses.

As shown in Table 3, the westbound left-turn movement on East Emory Road was calculated to be LOS A in the AM and PM peak hours. However, the northbound approach of Beeler Road is calculated with poor LOS and high vehicle delays in the existing 2022 conditions, particularly in the PM peak hour with LOS F.

TABLE 3
2022 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
East Emory Road (EB & WB) at Beeler Road (NB)		Northbound Left/Right	D	26.9	0.449	F	62.4	0.664
		Westbound Left/Thru	A	8.5	0.038	A	9.7	0.081

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

The original TIS for Fairview Road Subdivision (and Beeler Road Subdivision) was not required to analyze capacity at the new and proposed subdivision entrances on Beeler Road to the south. Thus, a traffic count was not conducted on the southern end of Beeler Road adjacent to these subdivisions. However, for this revised report, the two entrances on Beeler Road for the three subdivisions (Beeler Farms, Beeler Road, and Fairview Road Subdivisions) were analyzed with respect to intersection capacity and evaluating the need for turn lanes. The analysis for the Beeler Farms Subdivision at the intersection of Beeler Road at Beeler Farms Lane was included since the trips generated by the Beeler Road and Fairview Road Subdivisions will pass thru this intersection.

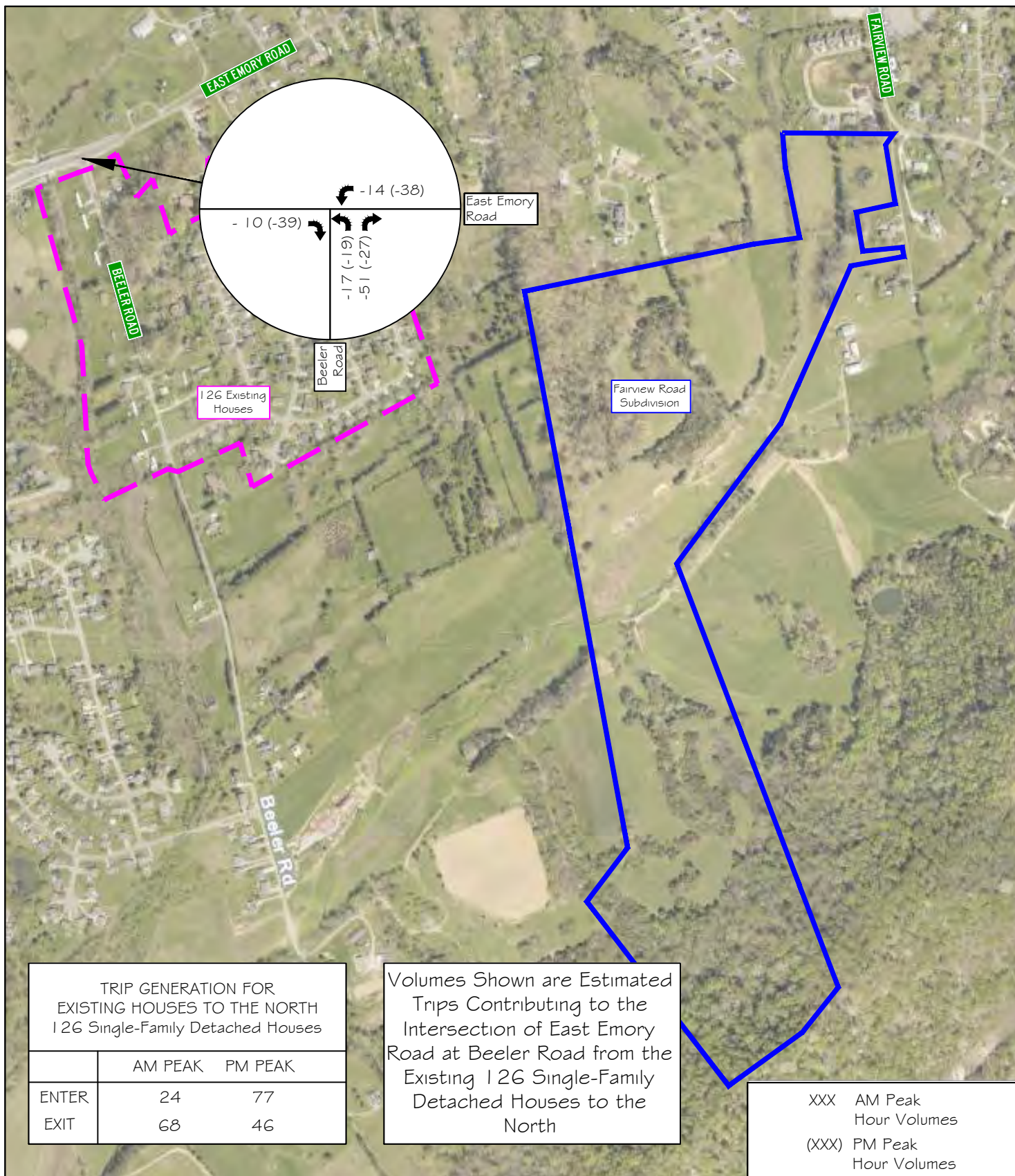
There are many existing houses between East Emory Road and the three subdivisions (Beeler Farms, Beeler Road, and Fairview Road Subdivisions) to the south. Therefore, a simple transfer of entering and exiting volumes on Beeler Road at East Emory Road to the subdivision entrances is not possible since these houses were contributing to the tabulated volumes at the intersection and would not be present at the two subdivision entrances to the south on Beeler Road (all travel is assumed to/from East Emory Road to the north). There are 126 existing houses between East

Emory Road and the two subdivision entrances to the south on Beeler Road. Most of these houses are single-family detached housing units in Opportunity Ridge Subdivision to the north, but some are manufactured homes along Beeler Road. For the analysis, all 126 houses were assumed to be single-family detached houses to simplify calculations.

Figures 4b, 4c, and 4d show the additional information used to estimate the existing thru traffic volumes on Beeler Road at the new and proposed subdivision entrances. Figure 4b shows the estimation of trips contributed to the intersection of East Emory Road at Beeler Road from the existing 126 single-family houses to the north of the three subdivisions. This estimation was made by utilizing trip generation calculations and assuming trip distribution, as described later in the report. The volumes in Figure 4b are shown as “negative” since these volumes are to be subtracted from the volumes tabulated during the traffic count at the intersection of East Emory Road at Beeler Road. These volumes were subtracted to calculate the thru volumes on Beeler Road to the south and adjacent to the two new and proposed subdivision entrances for Beeler Farms, Beeler Road, and Fairview Road Subdivisions.

Figure 4c also shows “negative” volumes at the intersection of East Emory Road at Beeler Road to account for the existing 27 houses constructed and occupied in the Beeler Farms Subdivision when the traffic count was conducted on May 5th, 2022. When the traffic counts were conducted, approximately half of the houses in the Beeler Farms Subdivision were constructed and occupied. Thus, the existing traffic count at the intersection of East Emory Road at Beeler Road included the trips generated by half the residents in the Beeler Farms Subdivision. The estimated volumes for these 27 houses in Beeler Farms Subdivision were also estimated using trip generation calculations and trip distribution methods, as described later in the report.

Figure 4d is the culmination of the subtracted trips from the tabulated volumes obtained on May 5th, 2022, at the intersection due to the contributions from the houses to the north and the 27 houses in the Beeler Farms Subdivision. This subtraction allows the calculation of the thru volumes on Beeler Road to the south and adjacent to the new and proposed subdivision entrances. Effectively, these volumes shown in Figure 4d represent the trips generated by the houses further to the south on Beeler Road, including a handful of stand-alone houses along Beeler Road and the several dozen single-family detached houses in the existing Twin Brooks Subdivision.



11812 Black Road
Knoxville, TN 37932
Phone: (865) 556-0042
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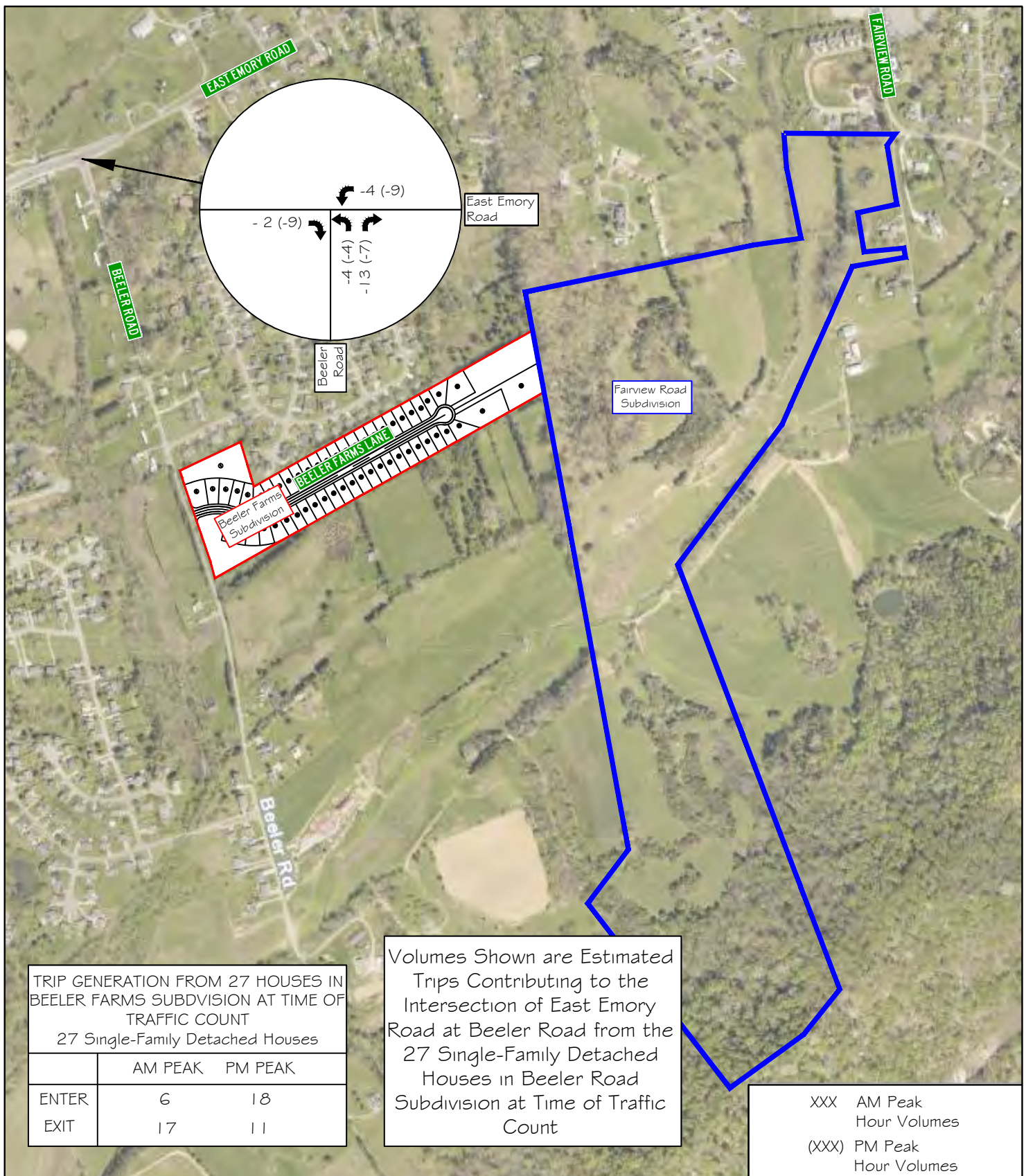
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FIGURE 4b

Fairview Road Subdivision

2022 Peak Hour Traffic Volumes -
EXISTING CONDITIONS (MINUS TRIPS
FROM EXISTING HOUSES TO THE NORTH)



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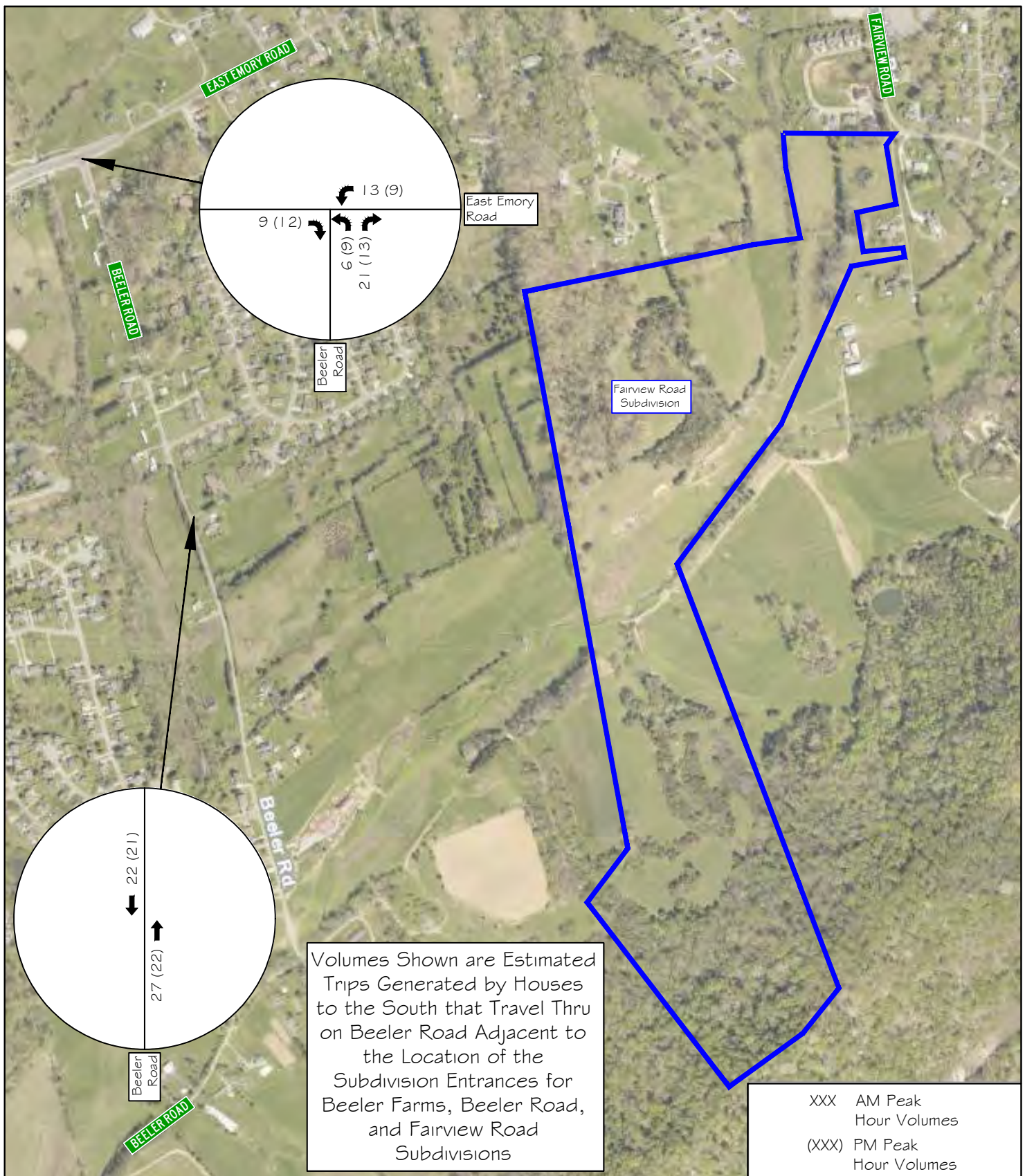
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FIGURE 4c

Fairview Road Subdivision

2022 Peak Hour Traffic Volumes -
EXISTING CONDITIONS (MINUS TRIPS
FROM BEELER FARMS SUBDIVISION)



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FIGURE 4d

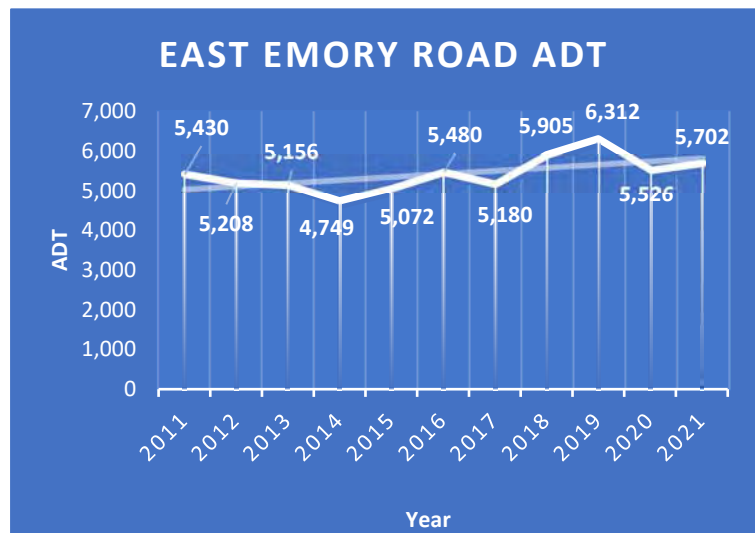
Fairview Road Subdivision

2022 Peak Hour Traffic Volumes -
EXISTING CONDITIONS (TRIPS FROM
HOUSES TO THE SOUTH ON BEELER ROAD)

▪ **PROJECTED 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). The build-out and full occupancy for the Fairview Road Subdivision development is assumed to occur by 2027. This horizon year corresponds to five years for this development to reach full capacity and occupancy. The same horizon year was assumed and used in the TIS for the adjacent Beeler Road Subdivision.

Vehicular traffic on East Emory Road in the study area has shown low annual growth over the past ten years (0.5%), according to the TDOT traffic count station and as shown in Appendix A. For this study, a higher annual growth rate of 1.0% was used to calculate future growth of the thru volumes on East Emory Road up to 2027 to account for potential traffic growth in the study area and provide a conservative analysis.



In addition to the possibility of general growth in the area, this study took into account the traffic growth as a result of the Beeler Farms and Beeler Road Subdivisions reaching completion and contributing trips to the intersections by 2027 without the construction of Fairview Road Subdivision. These trips were calculated and distributed as described in the following sections of the report.

Figure 5a shows the trips increased by the 53 houses in Beeler Farms Subdivision by 2027. These trips will add to the volumes at the intersection of East Emory Road at Beeler Road and the intersection of Beeler Road at Beeler Farms Lane.

Figure 5b shows the trips increased by the 87 houses in Beeler Road Subdivision by 2027. These trips will add to the volumes at the intersection of East Emory Road at Beeler Road, at the intersection of Beeler Road at Beeler Farms Lane, and the intersection of Beeler Road at the Beeler Road Subdivision entrance. As shown in the figure, a few trips will be added on Beeler Road at the Beeler Road Subdivision entrance to and from the south due to the proposed three single-

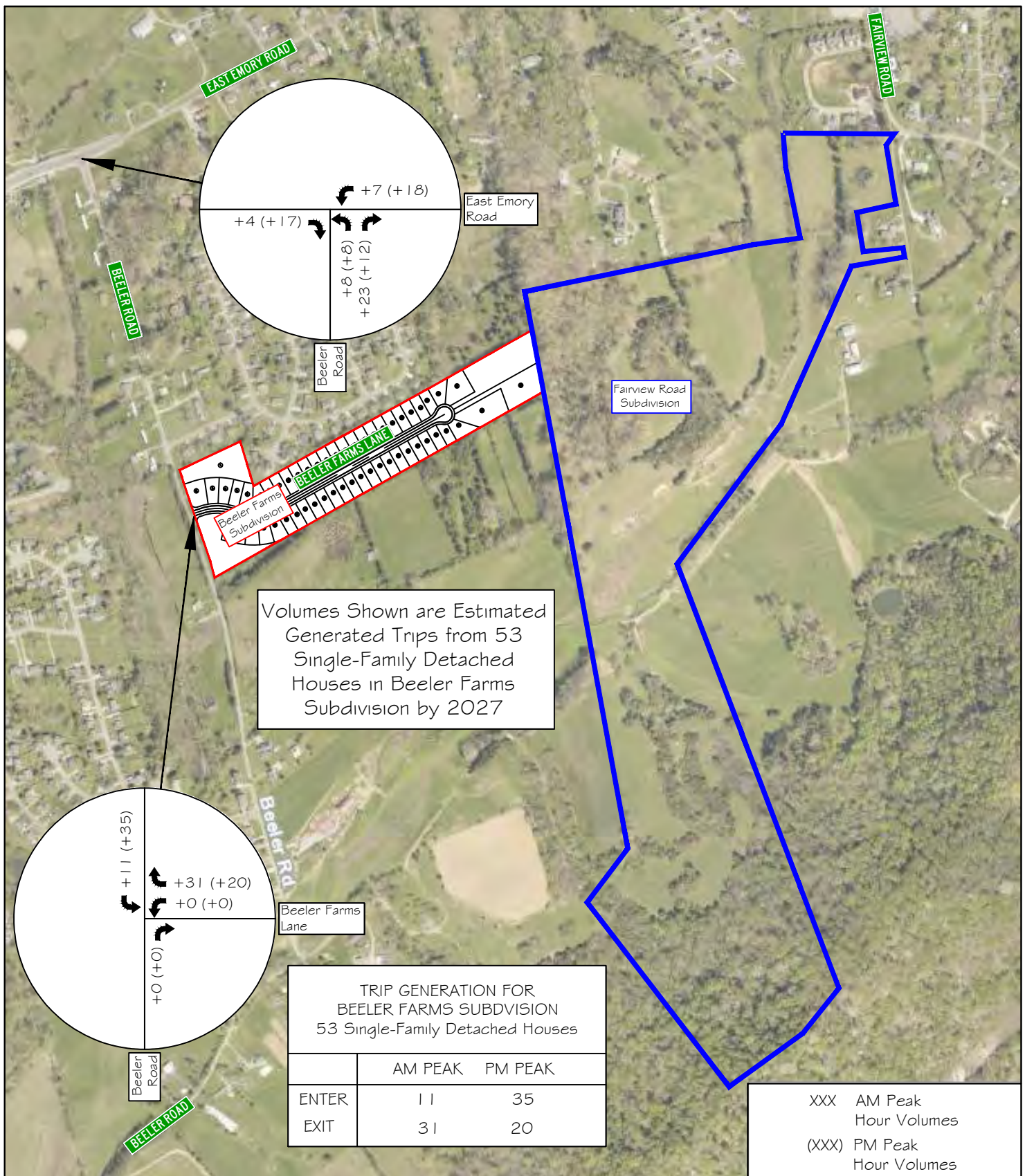
family detached houses that will be constructed across Beeler Road as a part of the Beeler Road Subdivision development.

Figure 5c shows the culmination of the trips added to the intersections generated by the 53 houses in the Beeler Farms Subdivision and the 87 houses in the Beeler Road Subdivision by 2027.

Finally, Figure 5d shows the cumulative 2027 traffic volumes at the intersections without the Fairview Road Subdivision development during the AM and PM peak hours. The volumes in Figure 5d include the assumed future growth of 1% for the eastbound and westbound thru volumes on East Emory Road. General traffic growth was not assumed to increase for the entering and exiting traffic volumes on Beeler Road at East Emory Road other than the included residential developments of Beeler Farms and Beeler Road Subdivisions. Thus, general future growth of 1% was not applied to entering and exiting traffic volumes to and from Beeler Road but only to the thru volumes on East Emory Road. (Note: Figure 5d includes the subtraction of the trips generated by the 27 houses in Beeler Farms Subdivision that were included during the traffic count conducted on May 5th, 2022, and shown in Figure 4c. This subtraction eliminates double counting of these trips to and from the Beeler Farms Subdivision.)

Capacity analyses were undertaken to determine the projected LOS in 2027 without the Fairview Road Subdivision project at the intersection of East Emory Road at Beeler Road, Beeler Road at Beeler Farms Lane, and Beeler Road at the Beeler Road Subdivision entrance. The results are shown in Table 4. The results in Table 4 show higher vehicle delays for the northbound approach of Beeler Road at East Emory Road compared to the existing 2022 results. Also, the v/c ratio in the PM peak hour for northbound Beeler Road at East Emory Road is calculated to be 1.417, indicating that the approach will operate above capacity, resulting in high vehicle delays. These results show that this intersection is projected to operate poorly in 2027 for northbound motorists on Beeler Road at East Emory Road, even if the Fairview Road Subdivision is not constructed.

The entrances for Beeler Farms and Beeler Road Subdivisions on Beeler Road in 2027 without the Fairview Road Subdivision are calculated to operate with very good LOS and low vehicle delays.



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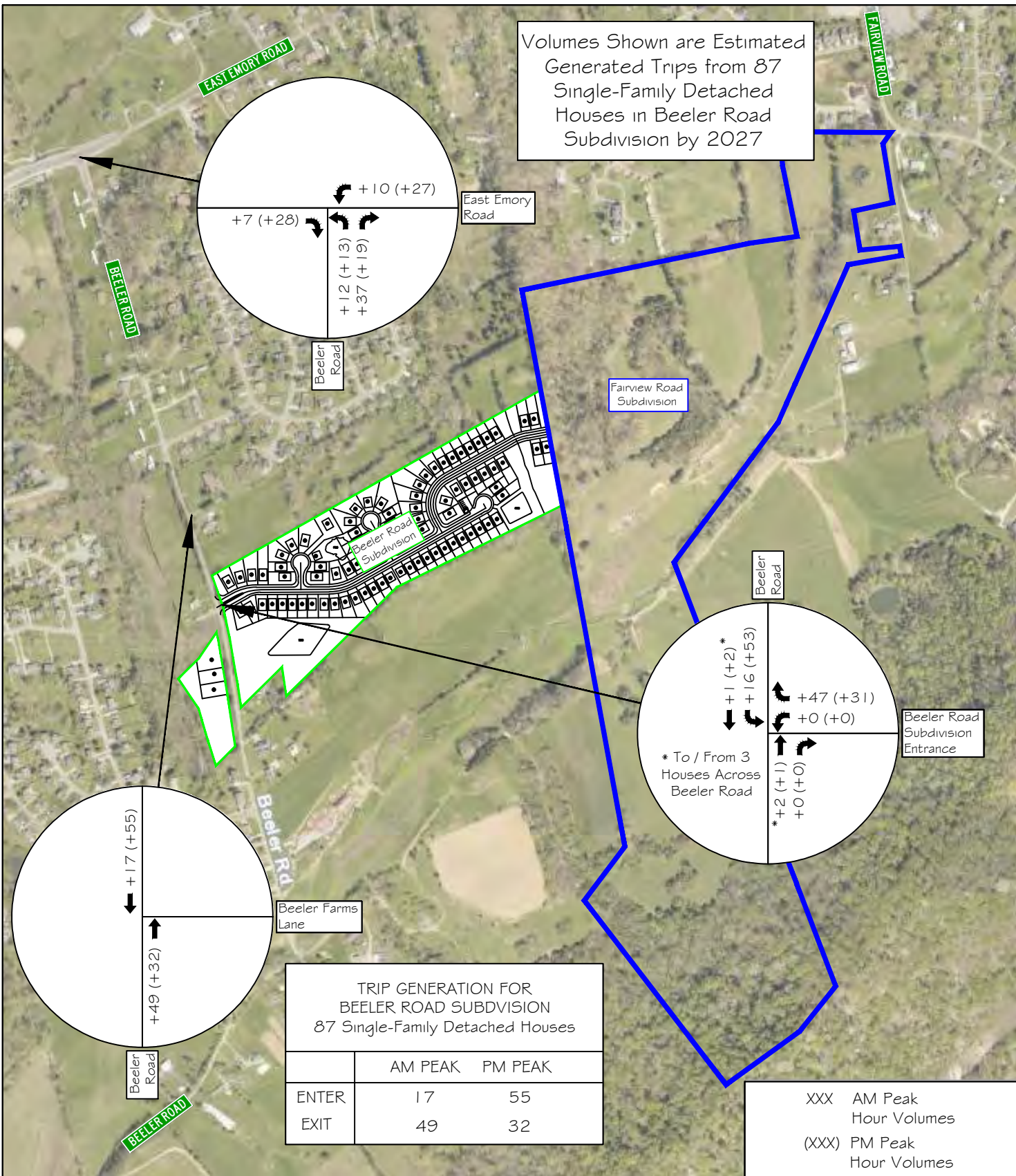


FIGURE 5a

Fairview Road Subdivision

2027 Peak Hour Traffic Volumes -
PROJECTED CONDITIONS (WITHOUT THE
PROJECT) WITH BEELER FARMS SUBDIVISION

Volumes Shown are Estimated
Generated Trips from 87
Single-Family Detached
Houses in Beeler Road
Subdivision by 2027



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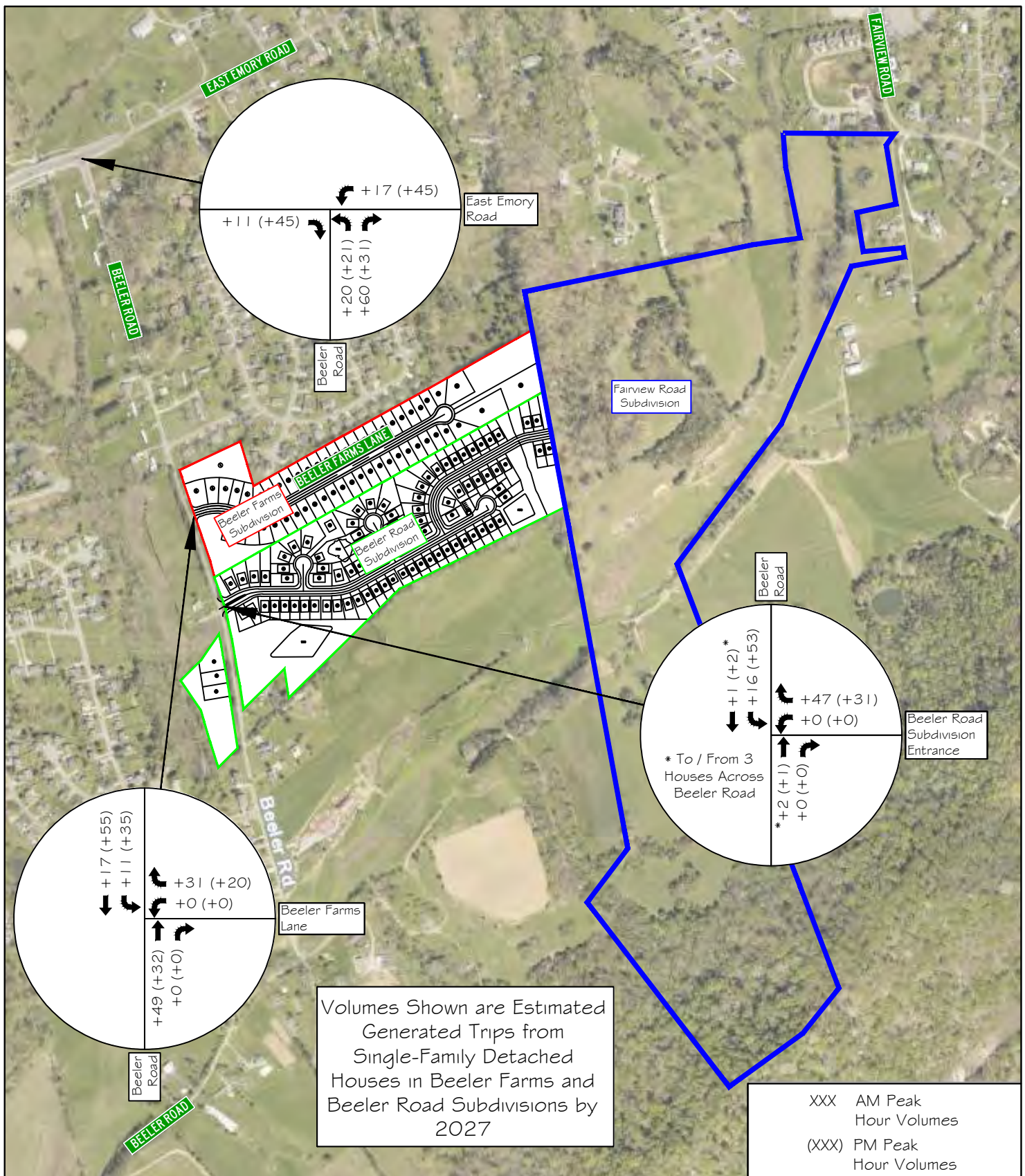
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FIGURE 5b

Fairview Road Subdivision

2027 Peak Hour Traffic Volumes -
PROJECTED CONDITIONS (WITHOUT THE
PROJECT) WITH BEELER ROAD SUBDIVISION



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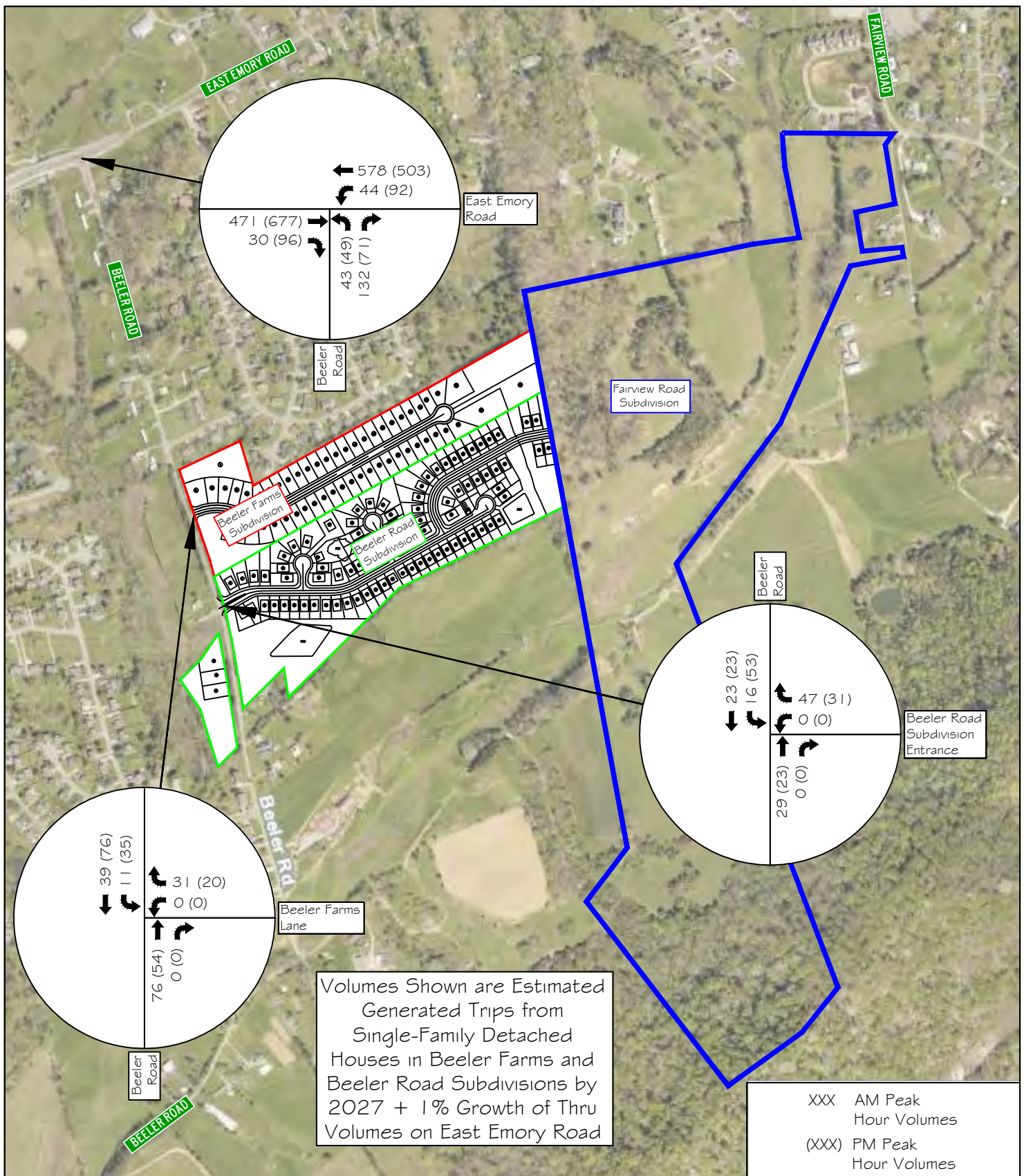
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FIGURE 5c

Fairview Road Subdivision

2027 Peak Hour Traffic Volumes -
PROJECTED CONDITIONS (WITHOUT THE PROJECT) WITH
BEELER FARMS AND BEELER ROAD SUBDIVISIONS



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FIGURE 5d

Fairview Road Subdivision

2027 Peak Hour Traffic Volumes -
PROJECTED CONDITIONS
(WITHOUT THE PROJECT)

TABLE 4
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITHOUT THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
East Emory Road (EB & WB) at Beeler Road (NB)	 Unsignalized	Northbound Left/Right	F	60.0	0.810	F	299.0	1.417
		Westbound Left/Thru	A	8.7	0.055	B	10.4	0.144
Beeler Road (SB & NB) at Beeler Farms Lane (WB)	 Unsignalized	Westbound Left/Right	A	8.8	0.035	A	8.7	0.022
		Southbound Left	A	7.4	0.008	A	7.4	0.025
Beeler Road (SB & NB) at Beeler Road Subdivision Entrance (WB)	 Unsignalized	Westbound Left/Right	A	8.6	0.050	A	8.5	0.033
		Southbound Left	A	7.3	0.011	A	7.3	0.037

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

▪ **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated amount of traffic that the 128 single-family detached houses in the Fairview Road Subdivision will generate was calculated based on rates and equations provided by the Trip Generation Manual, 11th Edition, a publication of the Institute of Transportation Engineers (ITE). The Trip Generation Manual is the traditional and most popular resource for determining trip generation rates when transportation impact studies are produced. The data and calculations for the proposed land use are shown in Appendix G. A summary of this information is presented in the following table:



TABLE 5
TRIP GENERATION FOR FAIRVIEW ROAD SUBDIVISION
128 Single-Family Detached Houses

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	128 Houses	1,267	26%	74%		63%	37%	
				24	69	93	79	46	125
Total New Volume Site Trips			1,267	24	69	93	79	46	125

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

For the proposed residential development, with 128 single-family detached houses, it is estimated that 24 vehicles will enter and 69 will exit, for a total of 93 generated trips during the AM peak hour in the year 2027. Similarly, it is estimated that 79 vehicles will enter and 46 will exit, for a total of 125 generated trips during the PM peak hour in the year 2027. The calculated trips generated for an average weekday are estimated to be 1,267 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

As discussed in the previous sections, trip generation calculations were conducted for Beeler Farms and Beeler Road Subdivisions, as shown in Figures 5a and 5b. Table 6 presents the trip generation results for the 53 houses in the Beeler Farms Subdivision. Table 7 shows the trip generation results for the proposed Beeler Road Subdivision. Table 7.1 shows the combination of the trip generation results for the Fairview Road and Beeler Road Subdivisions. The calculations for these adjacent subdivisions are shown in Appendix G. Appendix G includes the other

calculations discussed previously, including the 126 houses to the north along Beeler Road and the Opportunity Ridge Subdivision.

TABLE 6
TRIP GENERATION FOR BEELER FARMS SUBDIVISION
53 Single-Family Detached Houses

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	53 Houses	563	26%	74%		63%	37%	
				11	31	42	35	20	55
Total New Volume Site Trips			563	11	31	42	35	20	55

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

TABLE 7
TRIP GENERATION FOR BEELER ROAD SUBDIVISION
87 Single-Family Detached Houses

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	87 Houses	888	26%	74%		63%	37%	
				17	49	66	55	32	87
Total New Volume Site Trips			888	17	49	66	55	32	87

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

TABLE 7.1
TRIP GENERATION FOR FAIRVIEW ROAD & BEELER ROAD SUBDIVISIONS
215 Single-Family Detached Houses

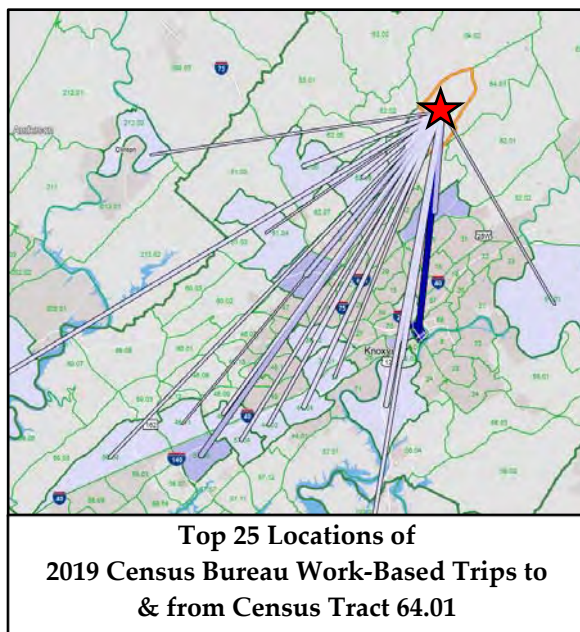
ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	215 Houses	2,155	26%	74%		63%	37%	
				41	118	159	134	78	212
Total New Volume Site Trips			2,155	41	118	159	134	78	212

ITE Trip Generation Manual, 11th Edition

Trips calculated by using Fitted Curve Equation

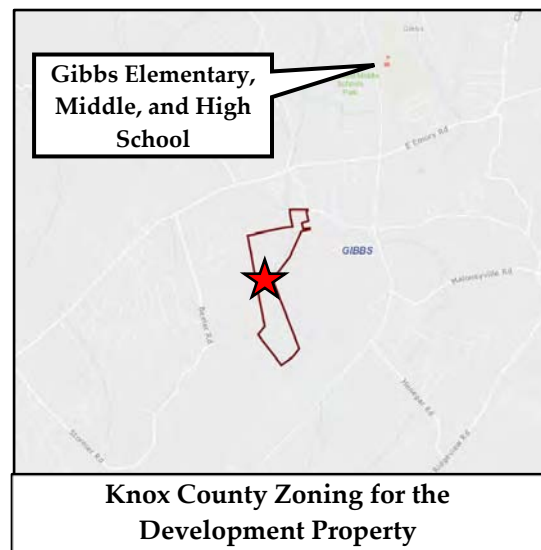
▪ **TRIP DISTRIBUTION AND ASSIGNMENT:**

Figure 6a shows the projected distribution of traffic entering and exiting the proposed Fairview Road Subdivision. The assumed percentages in Figure 6a are based on several sources and engineering judgments. The first and primary source is based on the traffic count volumes and the observed directions of travel collected at the existing intersection of East Emory Road at Beeler Road.



The second source for projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for generated trips by the development, and these trips are more likely to travel to and from the south and southwest. This assertion is based on data from the United States Bureau website for Census Tract 64.01, where the development property is located. Based on 2019 (latest available) census data and as shown in Appendix H, most work-based trips in the surrounding area correspond to downtown Knoxville (including the University of Tennessee) and other areas of West Knoxville.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The development property is currently zoned for Gibbs Elementary, Middle, and High School. All these schools are located next to each other and are 2.4 miles north and east of the development property off Tazewell Pike.

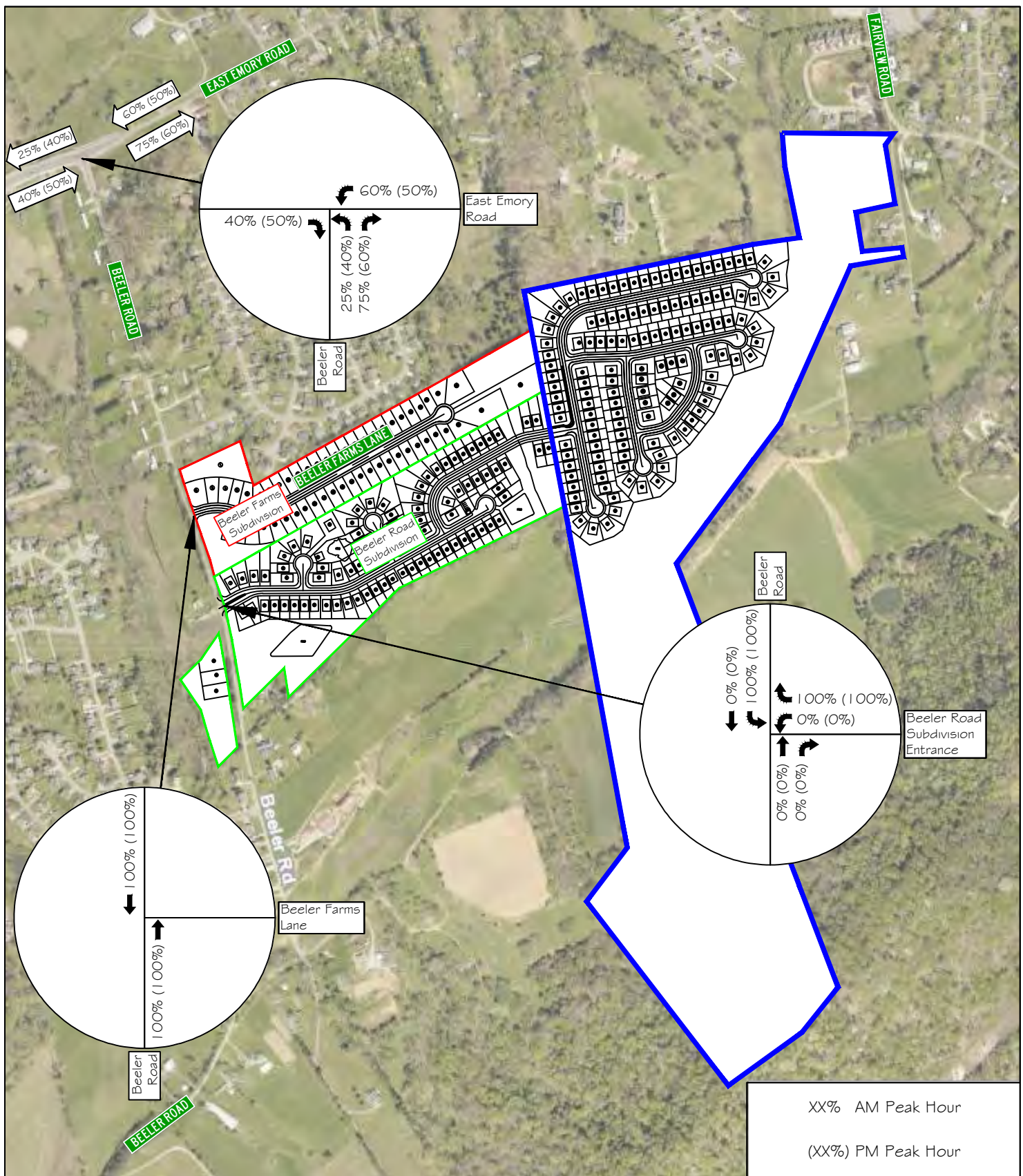


The Knox County Schools Transportation Department has developed Parental Responsibility Zones (PRZ) to determine whether students are offered transportation services to and from school. The PRZ is defined as being 1.5 miles for grades 6 – 12 and 1.0 miles for grades K – 5 from where the students' parcel is accessed to the point where the buses unload at the school. This development will be outside the PRZ for all the zoned schools, and all school-age children attending public schools in the development will be able to utilize this service if desired.

Overall, at first glance, a reasonable assumption would conclude that more traffic would be generated to and from the southwest via East Emory Road toward Knoxville. However, the existing traffic count showed that the existing residents along Beeler Road are heavily pulled towards the east and northeast towards Tazewell Pike. Much of this travel is assumed to be associated with the Gibbs Schools. Some travel can also be attributed to the shopping centers and other commercial developments in and around the Gibbs community to the northeast around Tazewell Pike.

The trip distribution rate at East Emory Road at Beeler Road was assumed heavily on the observed traffic for entering and exiting movements at the intersection. All entering and exiting subdivision traffic was assumed will travel via Beeler Road to and from the north. None of the subdivision trips are assumed will use Beeler Road's narrower and longer southern and western sections to reach East Emory Road. Figures 6b and 6c are supplements that show the assumed trip distribution for the Beeler Farms and Beeler Road Subdivisions trips that were calculated for the volumes shown earlier in Figures 5a and 5b (the projected 2027 traffic volumes without the Fairview Road Subdivision).

Figure 7 shows the traffic assignment of the computed trips generated by the Fairview Road Subdivision development shown in Table 5 based on the assumed distribution of trips shown in Figure 6a.



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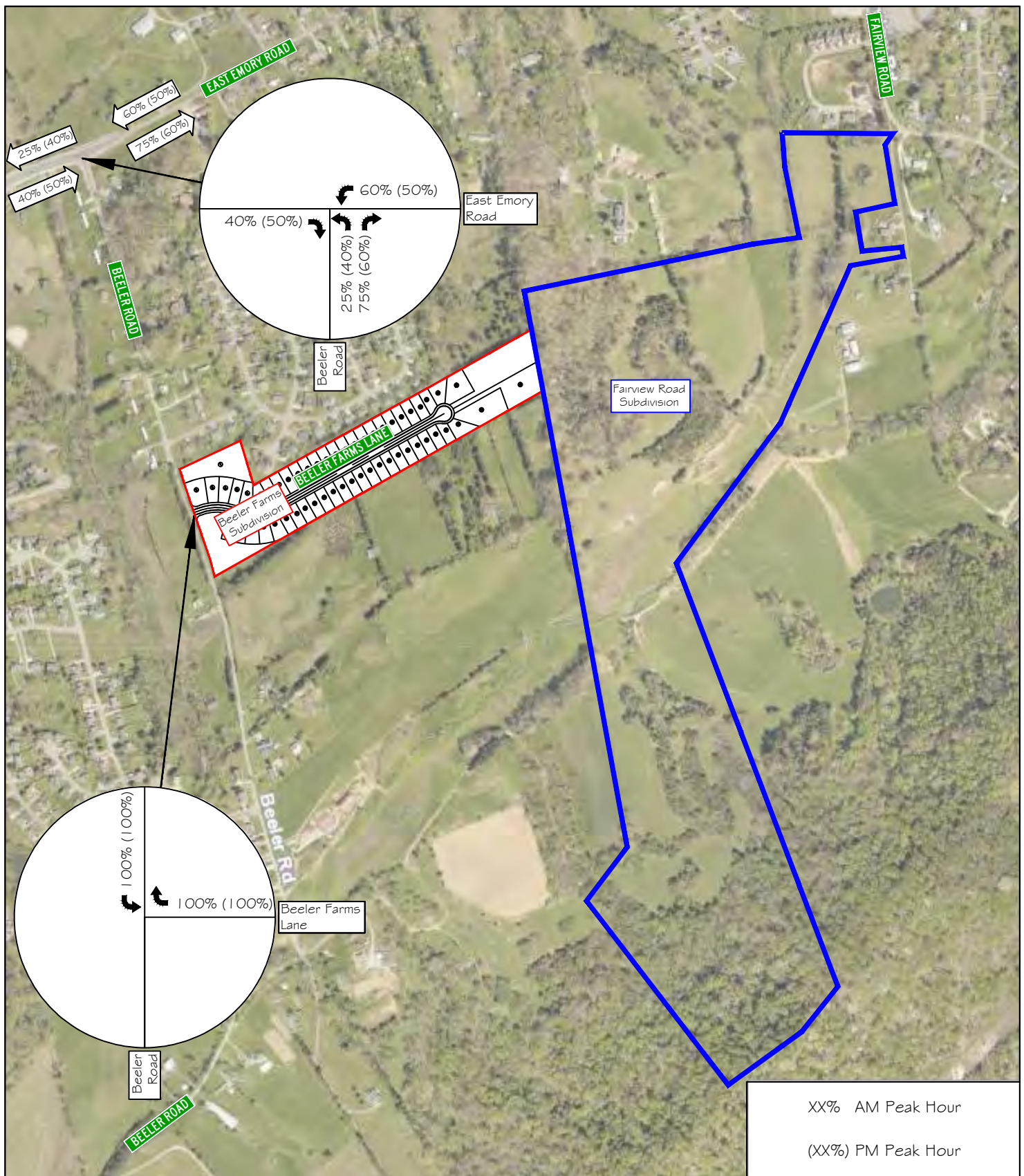
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FIGURE 6a

Fairview Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour for Fairview Road Subdivision



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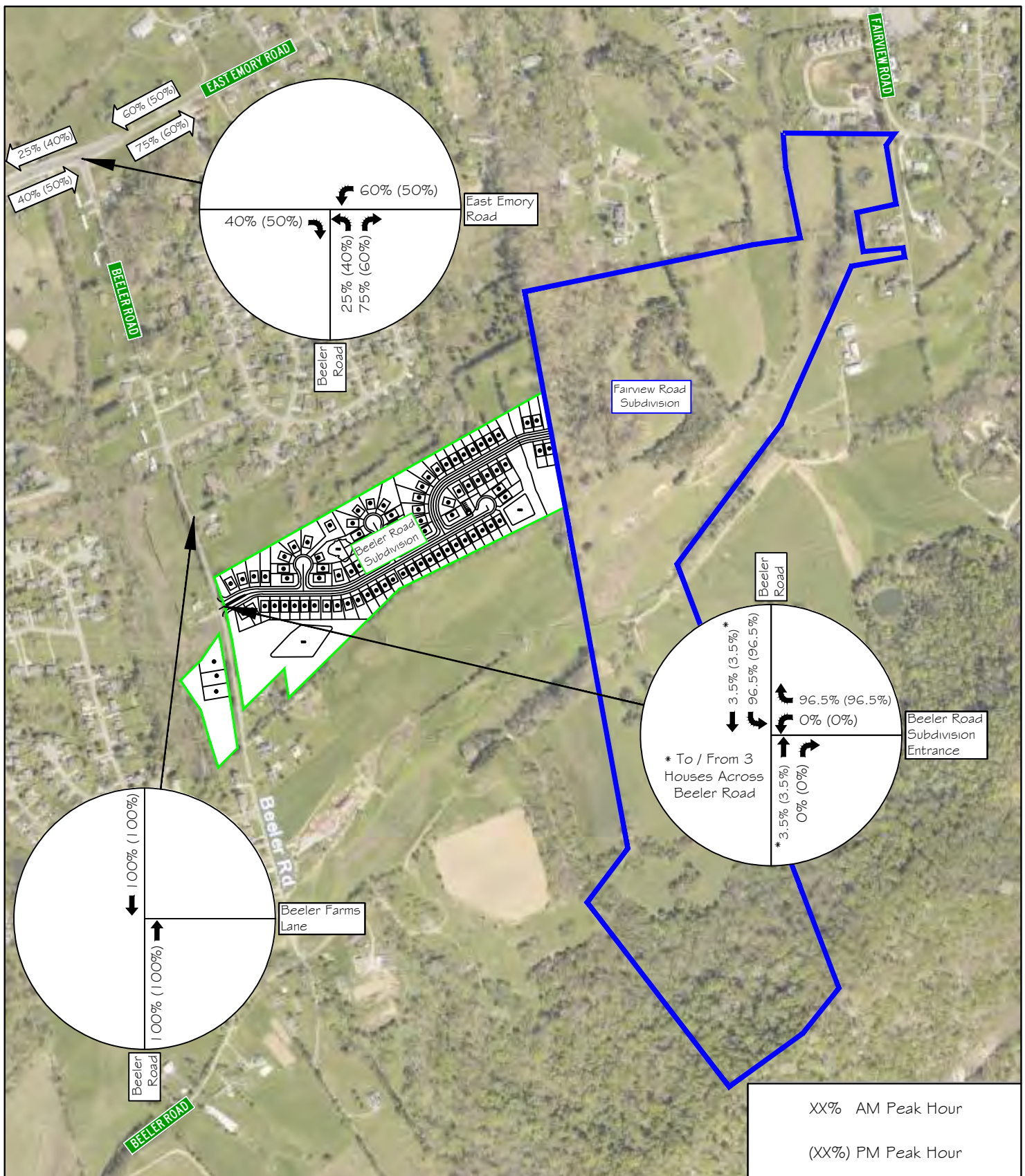
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FIGURE 6b

Fairview Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour for Beeler Farms Subdivision



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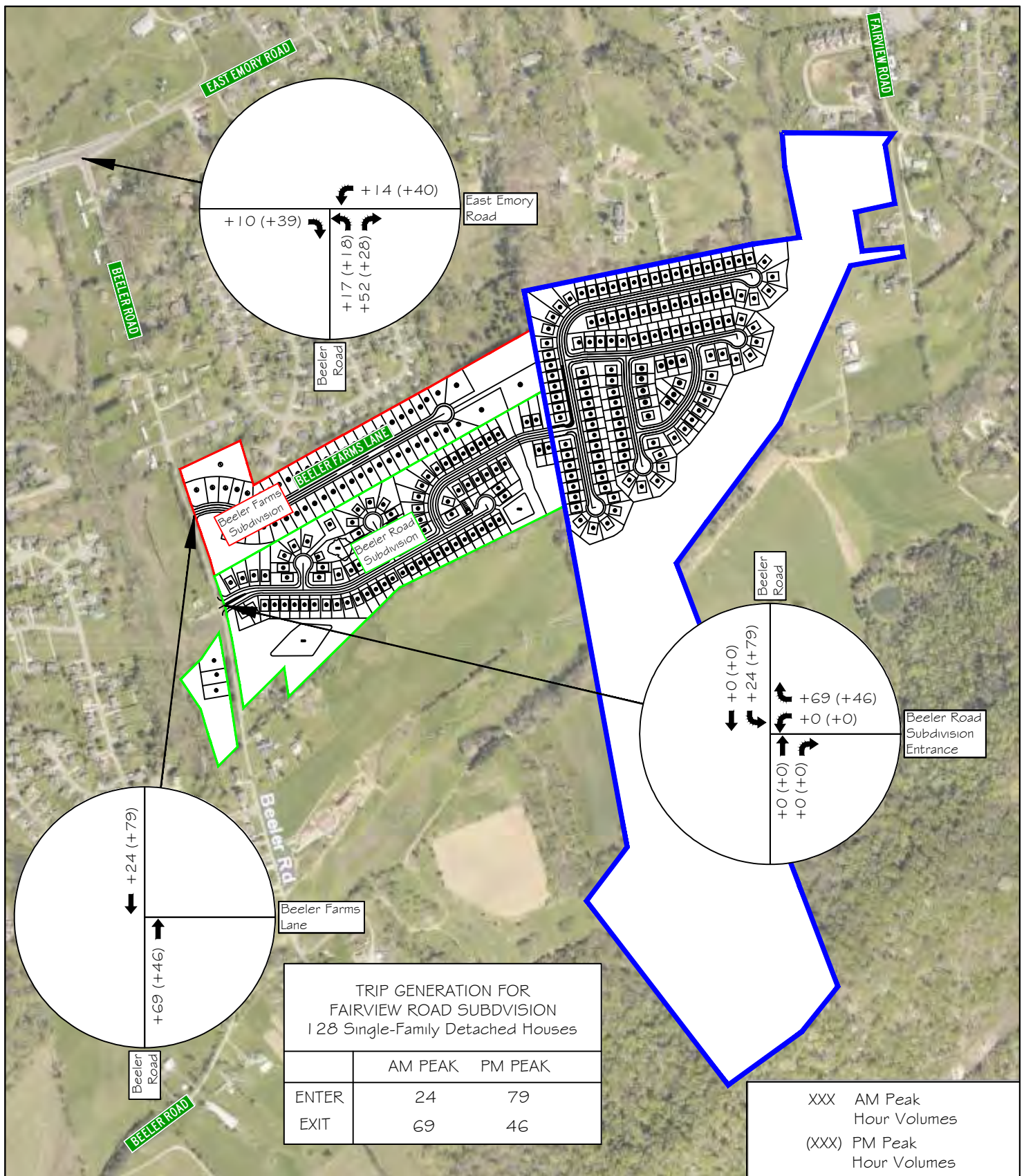
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FIGURE 6c

Fairview Road Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour for Beeler Road Subdivision



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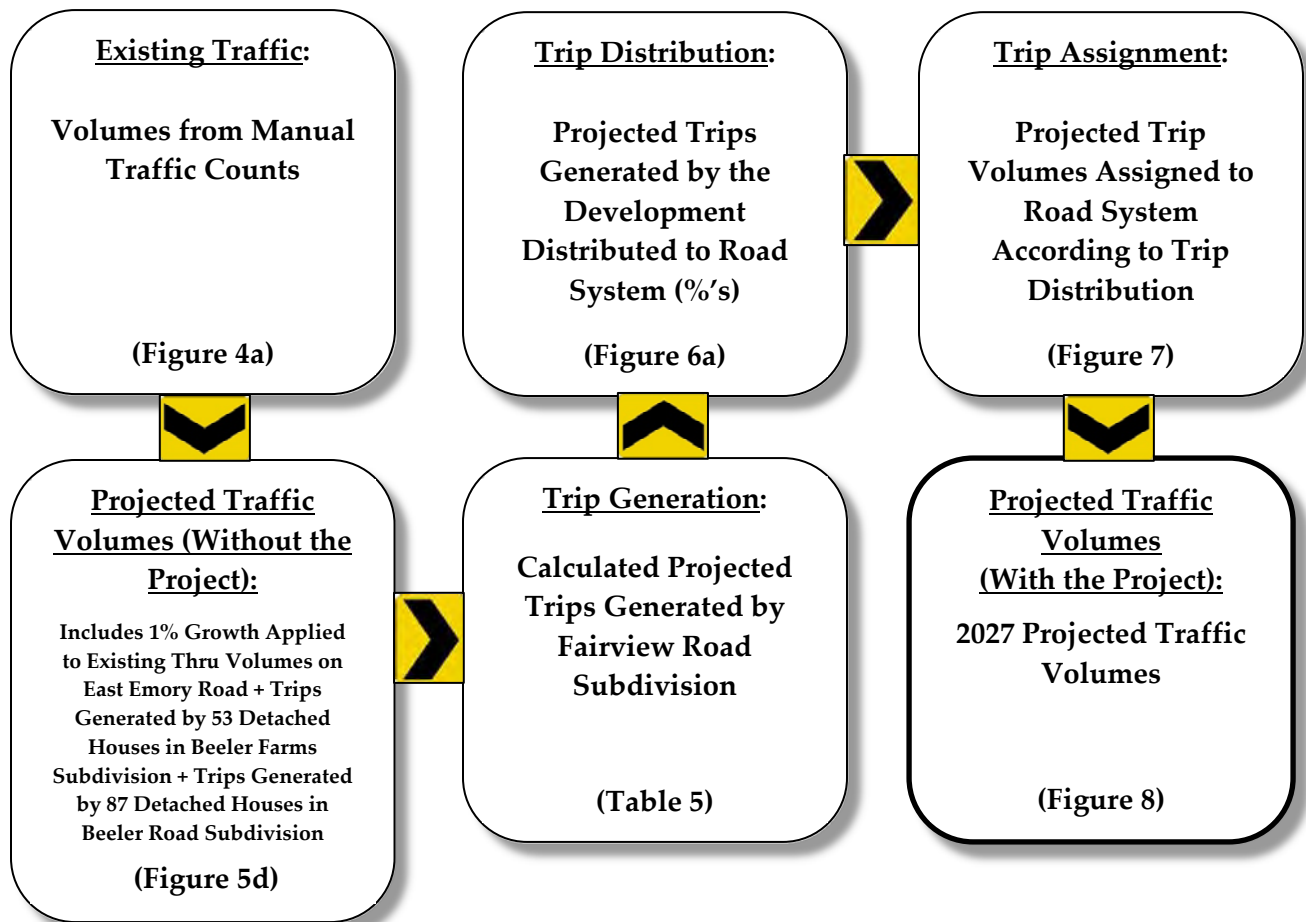
FIGURE 7

Fairview Road Subdivision

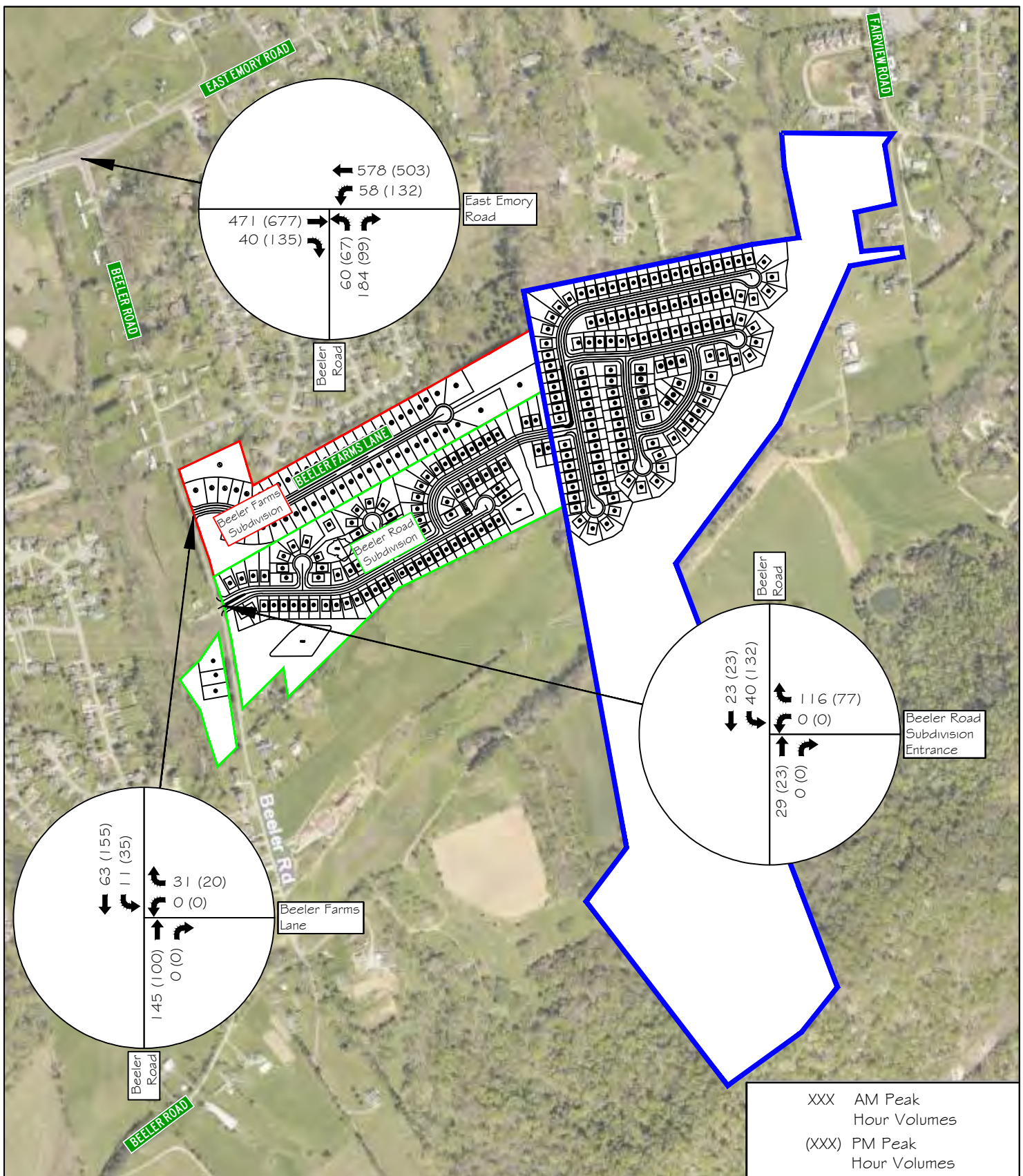
Traffic Assignment of Generated Traffic
from Fairview Road Subdivision during
AM and PM Peak Hour

▪ **PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT):**

Overall, several additive steps were taken to estimate the total projected traffic volumes at the studied intersections when the Fairview Road Subdivision, Beeler Farms Subdivision, and Beeler Road Subdivision are entirely constructed and occupied by 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 5) generated by the Fairview Road Subdivision was added to the 2027 horizon year traffic (Figure 5d) by following the predicted trip distributions and assignments (Figures 6a and 7). These procedures were completed to obtain the total projected traffic volumes when the proposed Fairview Road Subdivision development is fully built out and occupied in 2027. Figure 8 shows the projected 2027 AM and PM peak hour volumes with the generated development traffic at the studied intersections.



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FIGURE 8

Fairview Road Subdivision

2027 Peak Hour Traffic Volumes -
 PROJECTED CONDITIONS
 (WITH THE PROJECT)

Capacity analyses were conducted to determine the projected LOS at the intersections with all three subdivisions in 2027. The projected 2027 peak hour capacity results for the intersections with the project resulted in extremely poor LOS with high vehicle delays for the northbound approach on Beeler Road, as seen in Table 8. The v/c ratio in the AM and PM peak hours for northbound Beeler Road is calculated to be 1.215 and 2.584, indicating that the approach will operate above capacity during the 2027 peak hours. The subdivision entrance intersections have been calculated to operate very well in the projected 2027 conditions. Appendix F includes the worksheets for these capacity analyses.

TABLE 8
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
East Emory Road (EB & WB) at Beeler Road (NB)	 Unsignalized	Northbound Left/Right	F	172.0	1.215	F	820.2	2.584
		Westbound Left/Thru	A	8.9	0.074	B	11.2	0.217
Beeler Road (SB & NB) at Beeler Farms Lane (WB)	 Unsignalized	Westbound Left/Right	A	9.3	0.039	A	8.9	0.024
		Southbound Left	A	7.5	0.009	A	7.5	0.026
Beeler Road (SB & NB) at Beeler Road Subdivision Entrance (WB)	 Unsignalized	Westbound Left/Right	A	8.9	0.123	A	8.7	0.081
		Southbound Left	A	7.3	0.028	A	7.5	0.092

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

A summary of the East Emory Road at Beeler Road intersection capacity analysis results is presented in Table 9. This table provides a side-by-side summary and comparison of the intersection for the following: 2022 existing conditions, projected conditions in the year 2027 without the project (but with the trips from the Beeler Farms and Beeler Road Subdivisions), and the projected conditions in the year 2027 with all the subdivisions including the Fairview Road Subdivision. As seen in the summary, the northbound approach of Beeler Road at East Emory Road currently operates and will operate with very poor LOS and extremely high vehicle delays even before the proposed Fairview Road Subdivision is constructed.

TABLE 9
INTERSECTION CAPACITY ANALYSIS SUMMARY
EAST EMORY ROAD AT BEELER ROAD



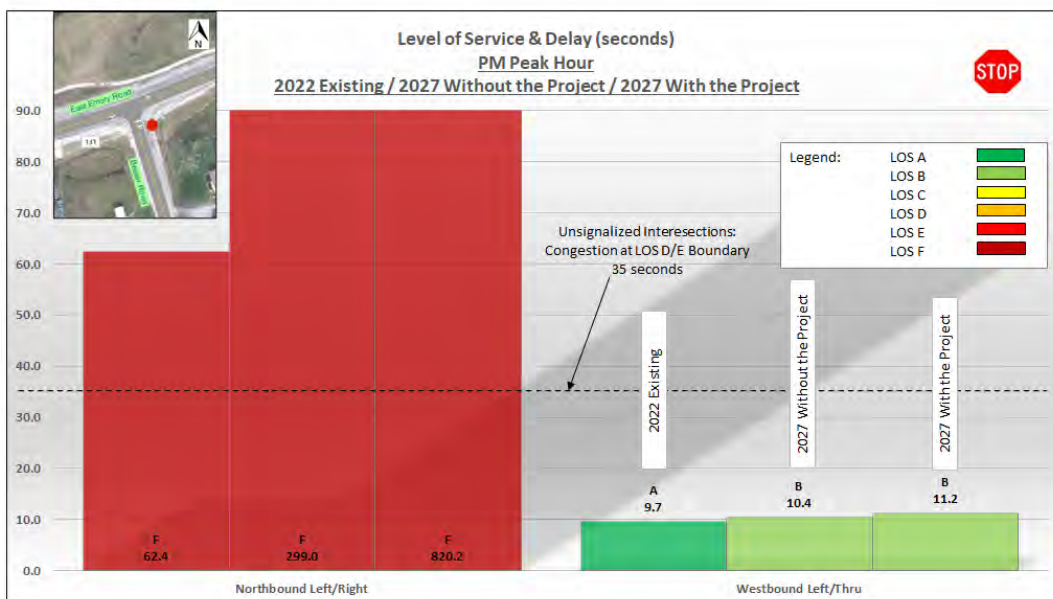
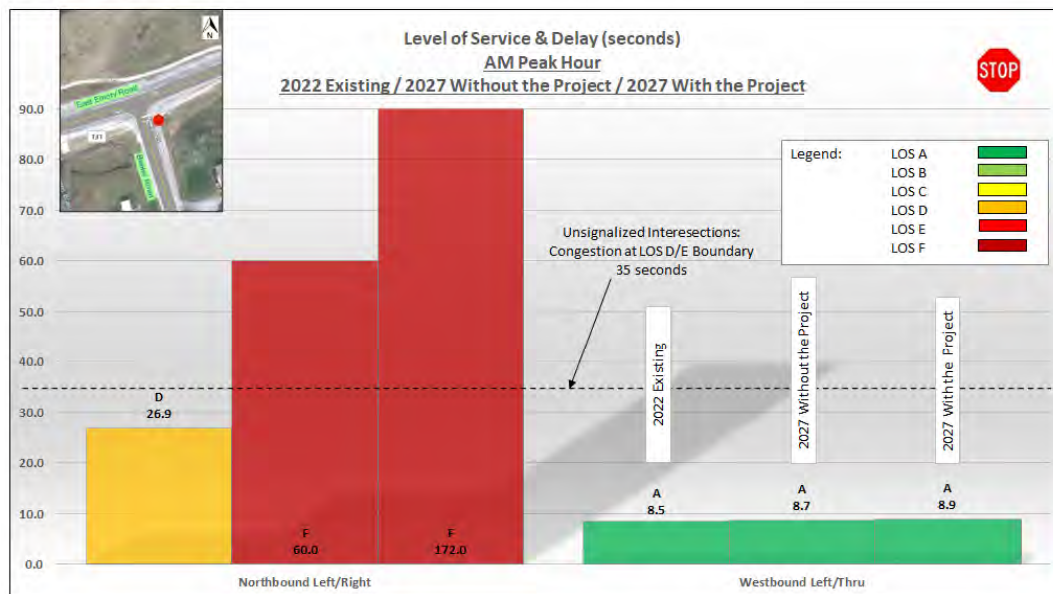
LOCATION / PEAK HOUR MOVEMENT	2022 EXISTING			2027 WITHOUT THE PROJECT			2027 WITH THE PROJECT		
	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c
AM Peak									
Northbound Left/Right	D	26.9	0.449	F	60.0	0.810	F	172.0	1.215
Westbound Left/Thru	A	8.5	0.038	A	8.7	0.055	A	8.9	0.074
PM Peak									
Northbound Left/Right	F	62.4	0.664	F	299.0	1.417	F	820.2	2.584
Westbound Left/Thru	A	9.7	0.081	B	10.4	0.144	B	11.2	0.217

Note: Analysis calculated in Synchro 11 software and reported with HCM 2010 methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio



▪ **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

The study area was investigated for potential existing and future safety issues when the development is completed. These adjacent transportation system features are discussed in the following pages.

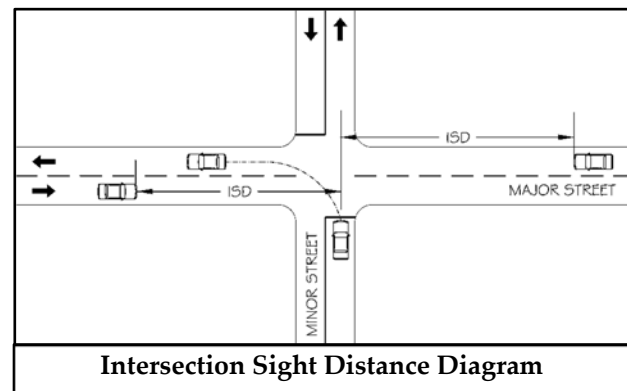
➤ **EVALUATION OF SIGHT DISTANCE**

For intersections, sight distance evaluations have two categories: Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD).

Methodology:

SSD is the distance required for a motorist on a major street to perceive, react, and the vehicle to come to a complete stop before colliding with an object on the road. For evaluating intersections, this object would be another vehicle entering the intersection from a minor street. SSD can be considered the minimum visibility distance standard for evaluating the safety of an intersection.

ISD is the required visibility distance standard for evaluating the safety of an intersection per section 3.04.J.5 in the Knoxville-Knox County Subdivision Regulations. ISD is based on the time required to perceive, react, and complete the desired traffic maneuver once a motorist on a minor street decides to perform a traffic maneuver.



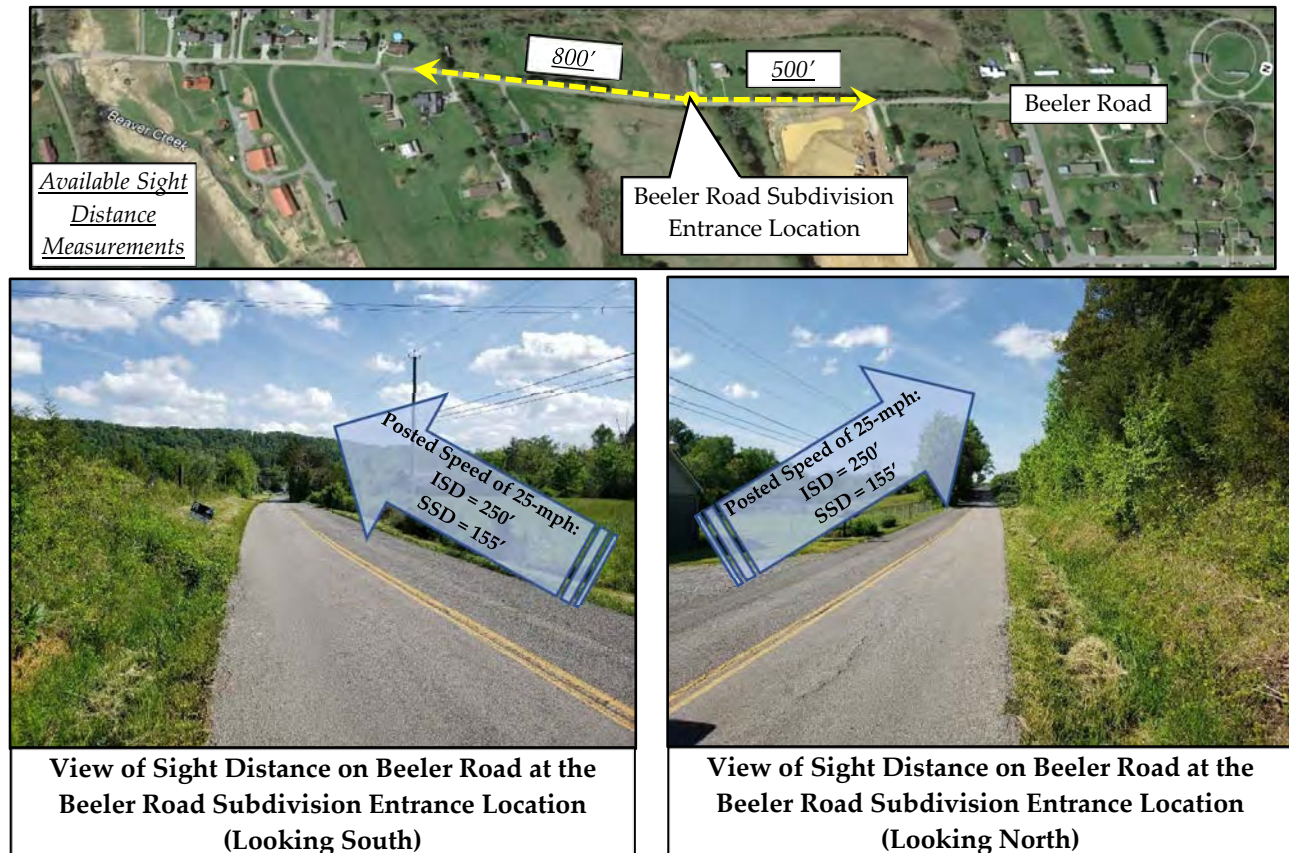
Three traffic maneuvers are available for vehicles stopped on a minor street at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left turns from the minor street. The ISD for this maneuver includes the time to turn left and clear half of the intersection without conflicting with the oncoming traffic from the left and accelerating to the road's operating speed without causing the approaching vehicles from the right to reduce their speed substantially.

With a posted speed limit of 25-mph on Beeler Road, the ISD is 250 feet looking north and south at the Beeler Road Subdivision entrance based on Knox County's requirement of 10 feet per 1-mph of the posted speed.

Fairview Road Subdivision will have external road access to Beeler Road via the Beeler Road Subdivision entrance. Beeler Road has a flat road grade at the Beeler Road Subdivision entrance location. Based on the posted speed limit of 25-mph on Beeler Road and the existing road grade, the SSD is calculated to be 155 feet to the north and 155 feet to the south.

Visual observations of the sight distances at the Beeler Road Subdivision entrance approach location were undertaken. Using a Nikon Laser Rangefinder at the future entrance approach location, the ISD was visually estimated to be 500 feet to the north and 800 feet to the south.

Based on visual observation, the intersection and stopping sight distances from the Beeler Road Subdivision entrance on Beeler Road will be adequate. Images of the existing sight distances at the Beeler Road Subdivision entrance location on Beeler Road are presented in the following, labeled with the ISD, SSD, and the rangefinder measured sight distances.



EVALUATION OF TURN LANE THRESHOLDS

An evaluation of the need for separate entering left-turn lanes into the development in the projected 2027 conditions was conducted for the new and proposed subdivision entrances on Beeler Road. An evaluation for right-turn lanes on Beeler Road at the subdivision entrances was not conducted since northbound right turns into the subdivisions are not projected to occur. An evaluation was also conducted for the intersection of East Emory Road at Beeler Road.

The criteria used for this turn lane evaluation were based on Knox County's "Access Control and Driveway Design Policy" and TDOT's "Highway System Access Manual". These design policies relate vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways.

According to Knox County's guidelines, with a posted speed limit of 25-mph, separate left-turn entering lanes on Beeler Road are not warranted at either of the two subdivision entrances based on the projected 2027 AM and PM peak hour traffic volumes.

According to Knox County's and TDOT's guidelines, with a posted speed limit of 45-mph, separate left and right-turn entering lanes on East Emory Road are warranted at Beeler Road based on the projected 2027 AM and PM peak hour traffic volumes.

A subsequent evaluation determined that the existing 2022 volumes currently warrant separate left and right-turn lanes on East Emory Road. The worksheets for these evaluations are provided in Appendix I.

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the proposed Fairview Road Subdivision with the other adjacent subdivisions on the transportation system while attempting to achieve an acceptable traffic flow and safety level.



Beeler Road at Beeler Farms Lane: The projected 2027 level of service calculations for this intersection resulted in excellent LOS and low vehicle delays. The construction of left and right-turn lanes on Beeler Road for entering traffic into Beeler Farms Subdivision at Beeler Farms Lane is not warranted. The single exit lane on Beeler Farms Lane at Beeler Road will be sufficient for the residents of Beeler Farms Subdivision.



Beeler Road at Beeler Road Subdivision Entrance: The projected 2027 level of service calculations for this intersection resulted in excellent LOS and low vehicle delays. The construction of left and right-turn lanes on Beeler Road for entering traffic into the Beeler Road Subdivision is not warranted. The single exit lane on the Beeler Road Subdivision entrance at Beeler Road will be sufficient for the residents of the Beeler Road Subdivision and the Fairview Road Subdivision.

- 2a) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Beeler Road Subdivision entrance approach at Beeler Road. This Stop Sign (R1-1) and stop bar will control the exiting motorists from both Beeler Road and Fairview Road Subdivisions at Beeler Road. The stop bar should be applied a minimum of 4 feet away from the edge of Beeler Road and placed at the desired stopping point that maximizes the sight distance.
- 2b) Sight distances at the Beeler Road Subdivision entrance approach must not be impacted by future landscaping, signage, or vegetation. A visual inspection determined that the intersection and stopping sight distances are available. Based on a posted speed limit of 25-mph on Beeler Road, the required intersection sight distance is 250 feet looking in each direction at each entrance. The stopping sight distance is calculated to be 155 feet to the north and the south at the Beeler Road Subdivision entrance location. The site designer must ensure that these sight distances are accounted for and provided in the design plans.

- 2c) Knox County requires specific minimum spacing between intersecting streets. Beeler Road is designated as a Major Collector at the new and proposed entrance locations on Beeler Road, and the minimum intersection spacing is 300 feet.

The proposed spacing between the proposed entrance road for Beeler Road Subdivision and Beeler Farms Lane in Beeler Farms Subdivision will be approximately 500 feet from centerline to centerline, greater than the Knox County minimum.



East Emory Road at Beeler Road: The existing 2022 and projected 2027 level of service calculations for the intersection of East Emory Road at Beeler Road resulted in extremely high vehicle delays for the northbound approach of Beeler Road in the AM and PM peak hours.

- 3a) The previous Transportation Impact Study (TIS) for the adjacent proposed Beeler Road Subdivision recommended an eastbound right-turn lane with a storage length of 25 feet and a taper length of 75 feet on East Emory Road at Beeler Road. This eastbound right-turn lane is expected to be constructed as an interim remediation before the TDOT project widens East Emory Road from 2 to 5 lanes. When East Emory Road is reconstructed, this eastbound right-turn lane can be absorbed into one of the new thru lanes, and a separate right-turn lane will not be required when the TDOT project is completed in 2030. Providing an eastbound right-turn lane prior to the reconstruction will slightly reduce the vehicle queue and delay for northbound motorists on Beeler Road attempting to turn left and right onto East Emory Road.
- 3b) As determined in this study and the TIS for the Beeler Road Subdivision, a westbound left-turn lane on East Emory Road at Beeler Road was warranted based on the existing and projected traffic volumes. However, it was determined in the previous TIS that the construction of a westbound left-turn lane would not be critically needed at this time. Any construction to install a “temporary” westbound left-turn lane on East Emory Road will be shortly replaced by the TDOT widening project. In the interim, a “No Passing on Shoulder” (R4-18) sign was recommended in the previous study to be installed on East Emory Road. This recommendation was offered to address the illegal movements committed by some motorists occasionally using the shoulder to pass stopped westbound left-turning vehicles on East Emory Road at Beeler Road.

All the calculated high vehicle delays at this intersection are projected to only occur for the northbound motorists on Beeler Road attempting to turn left and right on East Emory Road. Providing a temporary westbound left-turn lane at this time would only primarily benefit westbound thru vehicles on East Emory Road since they would not be impeded by stopped vehicles attempting to turn left onto Beeler Road. Westbound left turns from East Emory Road onto Beeler Road were calculated to operate with low vehicle delays in the existing and projected 2027 conditions. Some safety benefits would be provided if a left-turn lane on East Emory Road were provided at this time, but it would not provide significant vehicle delay reductions for this movement since it is


directly correlated to the number of opposing vehicles and is calculated with good LOS and low vehicle delays.

- 3c) The northbound approach of Beeler Road in 2027 was projected to operate with extremely high delays for the left and right-turning motorists. In addition to the recommended eastbound right-turn lane on East Emory Road from the previous TIS, it is recommended that a northbound right-turn lane with 100 feet of storage on Beeler Road be constructed. The existing and projected right turns at the northbound approach of Beeler Road at East Emory Road are much higher than left turns. Adding an exclusive right-turn lane on this approach would reduce delays for most northbound motorists. Several right-turning motorists on Beeler Road were observed during the traffic count using the shoulder to bypass vehicles waiting to turn left onto East Emory Road and avoid the delay. If not constructed, it is anticipated that more right-turning motorists will be tempted to use the shoulder to avoid excessive delays and queues. The recommended eastbound and northbound right-turn lanes at this intersection should be coordinated in design and construction to reduce costs and construction time. These lanes should be constructed once the Beeler Road and Fairview Road Subdivisions commence construction to provide additional road capacity and moderate vehicle delays and queues until the TDOT widening project is completed. The northbound right-turn lane on Beeler Road should be marked with a white turn arrow and lane markings, as shown in TDOT Standard Drawing T-M-4.

Separate left and right lanes at unsignalized intersections operating under stop conditions can be an issue due to motorists' potential to compete for sight distance. However, with the existing horizontal alignment on East Emory Road, it is anticipated that a northbound right-turn lane on Beeler Road could be constructed to allow left and right-turning motorists to see oncoming vehicles on East Emory Road in both directions freely without being obstructed by other vehicles.

Adding a northbound right-turn lane on Beeler Road would reduce the overall intersection delay and the excessive queue lengths on the northbound approach by spreading the vehicles into two lanes. The LOS calculation results of adding a northbound right-turn lane on Beeler Road with the previously recommended eastbound right-turn lane on East Emory Road in the projected 2027 conditions are shown in Table 10. The worksheets for these results are provided in Appendix F.

TABLE 10
2027 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)
INCLUDING RECOMMENDED EASTBOUND AND NORTHBOUND RIGHT-TURN LANES

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
East Emory Road (EB & WB) at Beeler Road (NB)		Northbound Left	F	108.8	0.769	F	611.8	1.912
		Northbound Right	C	16.0	0.389	C	19.5	0.354
		Westbound Left/Thru	A	8.9	0.074	B	11.2	0.217

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

Since the projected northbound left-turn lane is computed to remain at LOS F even with the addition of an eastbound and northbound right-turn lane, the projected vehicle queues were calculated. An additional software program was used to calculate the projected 2027 AM and PM peak hour vehicle queues at the studied intersection with the addition of the recommended eastbound and northbound right-turn lanes. The previously mentioned Synchro Traffic Software includes SimTraffic. The Synchro portion of the software performs the macroscopic calculations for intersections, and SimTraffic performs micro-simulation and animation of vehicular traffic. SimTraffic (Version 11) software was utilized to estimate the projected vehicle queues.

The 95th percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations. The calculated 95th percentile vehicle queue lengths at the intersection for the 2027 projected conditions with an eastbound and northbound right-turn lane are shown in Table 11. The vehicle queue worksheet results from the SimTraffic software are in Appendix J. As shown in Table 11, the longest vehicle queues will occur in the PM peak hour. In particular, the longest northbound left-turn queue is calculated to be 145 feet. Thus, even though the northbound left-turn lane will experience high vehicle delays, as shown in Table 10, the calculated 95th percentile queue is projected to be just under six passenger cars, assuming a length and spacing of 25 feet per vehicle.

TABLE 11
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2027 PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)
INCLUDING RECOMMENDED EASTBOUND AND NORTHBOUND RIGHT-TURN LANES

INTERSECTION	APPROACH/ MOVEMENT	PROPOSED STORAGE (ft)	ADEQUATE LENGTH?	95 th PERCENTILE QUEUE LENGTH (ft)	
				AM PEAK HOUR	PM PEAK HOUR
East Emory Road (EB & WB) at Beeler Road (NB)	Eastbound Right	75	Yes	5	20
	Westbound Left/Thru	n/a	n/a	105	216
	Northbound Left	n/a	n/a	72	145
	Northbound Right	100	Yes	79	99

Note: 95th percentile queues were calculated in SimTraffic 11 software

- 3d) This report has determined that the documented need for separate left and right-turn lanes on East Emory Road at Beeler Road will be satisfied by the capacity provided by the future TDOT widening project in 2030. TDOT proposes widening East Emory Road from 2 to 5 lanes. This project will include two thru lanes in each direction and a center turn lane. East Emory Road will be widened to provide a center turn lane for westbound left-turns at Beeler Road, and the two thru lanes (in each direction) will eliminate the need for a separate eastbound right-turn lane at Beeler Road.


The thru volumes on East Emory Road shown in Figure 8 were increased by an annual growth factor of 1% from 2027 to 2030 to provide an analysis of the intersection in 2030 with the TDOT road widening project. These volumes are shown in Figure 9.

The eastbound right-turn volume thresholds were examined in the projected 2030 conditions to provide evidence that the need for a separate eastbound right-turn lane will be eliminated with a 5-lane roadway section. This examination included the AM and PM peak hour projected 2030 volumes on East Emory Road with five lanes, as shown in Figure 9. The worksheets from this examination are shown in Appendix I and show that a separate eastbound right-turn lane at the intersection would not be required with a 5-lane roadway section on East Emory Road with the projected 2030 traffic volumes.

The capacity and vehicle queues calculations were re-analyzed with five lanes on East Emory Road and the recommended northbound right-turn lane on Beeler Road, combined with the projected 2030 traffic volumes. The results of these calculations are

shown in Tables 12 and 13. The worksheets for these results are provided in Appendix F and J.

TABLE 12
2030 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)
WITH TDOT WIDENING PROJECT AND NORTHBOUND RIGHT-TURN LANE ON BEELER ROAD

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
East Emory Road (EB & WB) at Beeler Road (NB)		Northbound Left	C	22.7	0.283	E	48.1	0.537
		Northbound Right	B	12.6	0.304	B	14.7	0.268
		Westbound Left	A	8.9	0.075	B	11.4	0.222

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

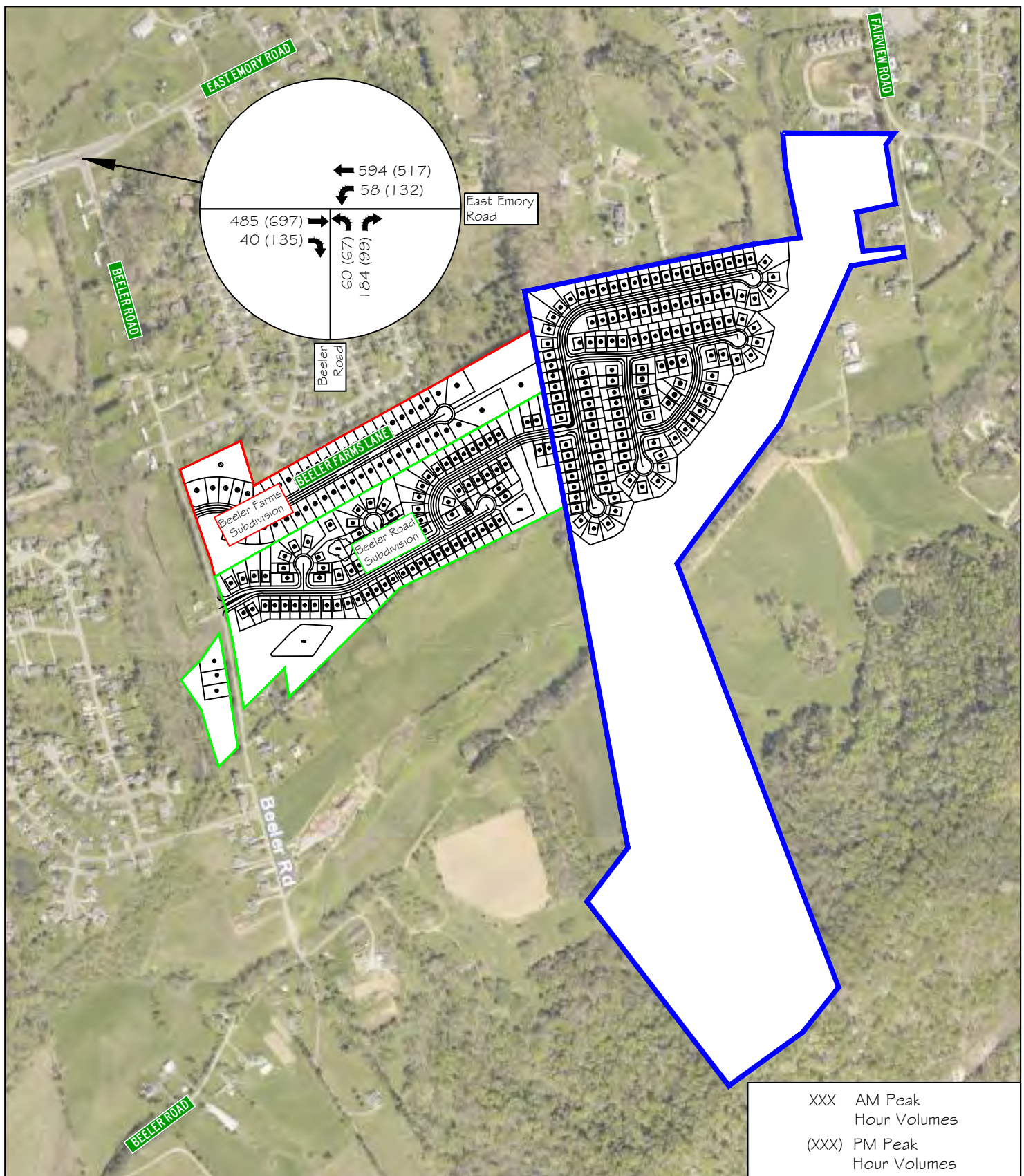
As shown in Table 12, the TDOT road widening project in 2030, coupled with the recommended northbound right-turn lane on Beeler Road, will provide the necessary road capacity to mitigate the excessive vehicle delays on the northbound approach at the intersection of East Emory Road at Beeler Road.

As shown in Table 13, the recommended northbound right-turn lane with 100 feet of storage will be adequate in the projected 2030 conditions since the longest 95th percentile vehicle queue is calculated to be 76 feet in the projected PM peak hour.

TABLE 13
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2030 PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)
WITH TDOT WIDENING PROJECT AND NORTHBOUND RIGHT-TURN LANE ON BEELER ROAD

INTERSECTION	APPROACH/ MOVEMENT	PROPOSED STORAGE (ft)	ADEQUATE LENGTH?	95 th PERCENTILE QUEUE LENGTH (ft)	
				AM PEAK HOUR	PM PEAK HOUR
East Emory Road (EB & WB) at Beeler Road (NB)	Eastbound Thru/Right	n/a	n/a	5	17
	Westbound Left	n/a	n/a	45	71
	Northbound Left	n/a	n/a	66	100
	Northbound Right	100	Yes	66	76

Note: 95th percentile queues were calculated in SimTraffic 11 software



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

NOT TO SCALE



FIGURE 9

Fairview Road Subdivision

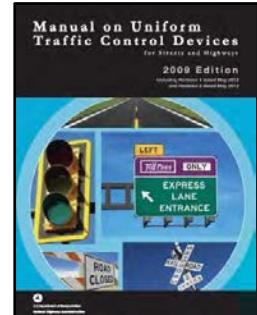
2030 Peak Hour Traffic Volumes -
PROJECTED CONDITIONS
(WITH THE PROJECT)

- 3e) As a further investigation into potential remediation for this intersection in future conditions, an evaluation was conducted with respect to traffic signal warrants.

Methodology:

The Manual on Uniform Traffic Control Devices – 2009 Edition

(MUTCD) presents nine different warrants that the traffic engineering profession has developed to determine whether a traffic signal is warranted. These warrants cover a broad range of minimum elements required to indicate whether a traffic signal is justified for any particular location. These elements include traffic volumes, pedestrian volumes, crash history, and other factors. The MUTCD explicitly states that a traffic control signal should not be installed unless one or more of the Manual's signal warrants are met. However, the satisfaction of a warrant does not entirely in itself justify the need for a traffic signal. Sometimes further engineering studies and judgments must be applied before justifying the need for a traffic signal installation. These additional studies are significant in ensuring that a traffic signal's installation will not degrade safety and efficiency.



The MUTCD defines nine different warrants, two of which are potentially applicable for this intersection at this time and are explained below:



Warrant #1, Eight-Hour Vehicular Volume:

Warrant #1 is comprised of 2 conditions – A and B. The Minimum Vehicular Volume, Condition A, is intended for applications where the volume of intersecting traffic is the principal reason for consideration of signal installation. The Interruption of Continuous Traffic, Condition B, is intended for use at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.



Warrant #2, Four-Hour Vehicular Volume:

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Even though nine warrants are offered to justify a traffic signal, according to the TDOT Traffic Signal Manual, the agency gives precedence to Warrant #1 (Eight Hour Vehicular Volume) and Warrant #7 (Crash Experience). Even though Warrant #2 is not a primary warrant used by TDOT, it is included in this study. Furthermore, TDOT does not allow installing a traffic signal on a state route based on speculative developments or unrealized traffic volumes.

The intersection of East Emory Road at Beeler Road was evaluated in the projected 2030 conditions with the volumes shown in Figure 9 to determine whether a traffic signal could be justified based on the MUTCD Warrants listed above. Beeler Road was used as the minor side street for the warrant analysis, and East Emory Road was the major street. Warrant #7 was not analyzed at this intersection for this study. Warrant #7 was not included because one of the primary criteria for an intersection to meet the warrant is that an “Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency...”; therefore, this warrant was not included in this study.

A spreadsheet was developed and used to calculate the 2030 traffic volumes generated by the developments being added to the intersection during the highest 8 hours of traffic based on the study’s assumed trip distribution and assignment. The volumes in the spreadsheet include the existing tabulated thru volumes on East Emory Road increased by 1% for eight years to the year 2030, and the generated traffic from the houses in Beeler Farms Subdivision, Beeler Road Subdivision, and the Fairview Road Subdivision. This spreadsheet is shown in Appendix K.

Traffic signal warrants for this intersection were analyzed with the additional lanes that will be provided on East Emory Road by the TDOT widening project. Based on the projected 2030 traffic volumes with the 5-lane section on East Emory Road, the results of this evaluation determined that Warrant #1 would not be fully met but would meet Warrant #2. Appendix K includes the traffic signal warrant spreadsheet for the projected traffic volumes in 2030, with East Emory Road having 5-lanes provided by the TDOT widening project.




In conclusion, since TDOT does not allow for a traffic signal to be constructed on speculative or projected volumes, it is recommended that traffic counts be re-conducted in the future once the subdivisions on Beeler Road are constructed and fully occupied,

and the road widening of East Emory Road is under design. Updated traffic counts will allow a re-examination of the Traffic Signal Warrants and establish a timeframe if this intersection could or should be signalized during the TDOT road widening project of East Emory Road. Traffic crash data should also be included in the examination.

Higher growth than anticipated in this study could occur and increase traffic volumes large enough to meet Warrant #1 fully.

In summary, and to provide a comparison of all the discussed options, Table 14 presents the calculated LOS and 95th percentile vehicle queues at the intersection of East Emory Road at Beeler Road for three scenarios. The scenarios in the table include the 2027 projected conditions with the project, the 2027 projected conditions with the project and an eastbound and northbound right-turn lane, and the 2030 projected conditions with the project with a northbound right-turn lane and the TDOT road widening with five lanes. As seen in the table, the vehicle delays and queues are reduced in each scenario when additional road capacity is provided.

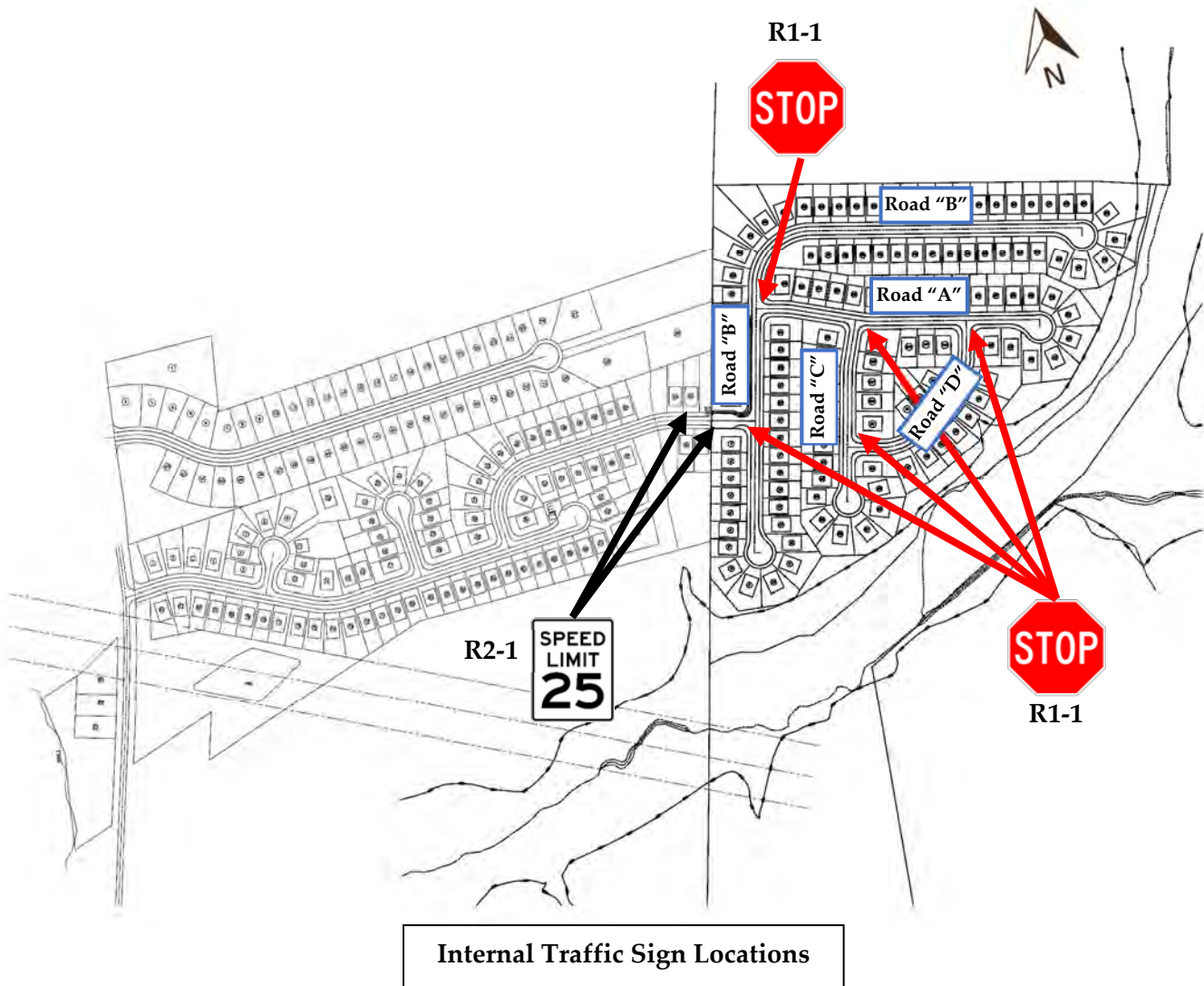
TABLE 14
INTERSECTION CAPACITY AND VEHICLE QUEUE ANALYSIS RESULTS -
EAST EMORY ROAD AT BEELER ROAD

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	QUEUE LENGTH (ft)	LOS	DELAY (seconds)	QUEUE LENGTH (ft)
2027 Projected Conditions (With the Project)	 Unsignalized	Northbound Left/Right	F	172.0	156	F	820.2	298
		Westbound Left/Thru	A	8.9	114	B	11.2	242
2027 Projected Conditions (With the Project) with EB and NB Right- Turn Lanes	 Unsignalized	Northbound Left	F	108.8	72	F	611.8	145
		Northbound Right	C	16.0	79	C	19.5	99
		Westbound Left/Thru	A	8.9	105	B	11.2	216
2030 Projected Conditions (With the Project) with 5-Lane TDOT Widening and NB Right-Turn Lane	 Unsignalized	Northbound Left	C	22.7	66	E	48.1	100
		Northbound Right	B	12.6	66	B	14.7	76
		Westbound Left	A	8.9	45	B	11.4	71



Fairview Road Subdivision Internal Roads: The layout plan shows one entrance via Beeler Road Subdivision, as shown in Figure 3 and below.

- 4a) Two 25-mph Speed Limit (R2-1) signs are recommended to be installed on the connector road between Beeler Road and Fairview Road Subdivisions. One sign should be installed for eastbound travel into Fairview Road Subdivision and one for westbound travel into the Beeler Road Subdivision. This recommendation will provide a reinforcement notification of the speed limit within the subdivisions.
- 4b) Stop Signs (R1-1) with 24" white stop bars and other traffic signage are recommended to be installed at the internal locations in Fairview Road Subdivision, as shown below:



- 4c) Sight distance at the new internal subdivision road intersections must not be impacted by signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for different proposed road grades.
- 4d) The internal roads of “A” and “B” in the Fairview Road Subdivision have relatively long and straight road segments. Straight road segments encourage motorists to travel at higher speeds, especially with steep grades. It is recommended that the site designer consider traffic calming measures on these internal roads. Roads “C” and “D” are relatively short and would not necessarily require traffic calming measures.

Speed humps are a prevalent traffic calming measure to install in residential areas to reduce vehicle speeds due to their relatively low cost. However, speed humps are not recommended on roads with grades greater than 8%.

If implemented, it is recommended that the site designer consider speed humps and chokers. Chokers are recommended when the internal road grades are greater than 8%. A choker is used to discourage motorists from speeding and is appropriate in residential settings. A choker is created by narrowing the road using curb extensions or can be created by installing a planting strip on an island at the road edge. Any road design with chokers must consider driveway placement, stormwater, and sight distance. Details of any traffic calming should be coordinated with Knox County Engineering in the detailed design phase.

- 4e) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- 4f) Any sidewalk proposed in the subdivision should be 5 feet minimum in width to meet Knox County regulations. The provision of internal sidewalks in the Beeler Road Subdivision has been removed. The provision of sidewalks in Fairview Road Subdivisions is not known.
- 4g) Knox County completed a greenway study in 2020. They recommended Beaver Creek as a preferred route for a new greenway connecting the area around Interstate 75 in

Powell to the Knox County/Union County line. With Beaver Creek adjacent to the development site and on the development property to the south of the proposed houses, the developer should discuss with Knox County if this potential greenway path is feasible to implement while the property is being developed.

- 4h) For residential subdivisions with a single access point and more than 150 houses, Knox County has a long-standing unwritten design policy requiring a second entrance or a boulevard road typical section at the entrance. According to the County, the intent of a boulevard road typical section is to provide a substantial alternate travel path by constructing one up to an internal intersection. This requirement and the appropriate mitigation are evaluated on a case-by-case basis and may require further discussions at future stages of the design plan process. There is a potential for an additional access point to the north in Fairview Road Subdivision that would provide two travel paths. The final decision on the most appropriate way to address this policy will be decided by Knox County Engineering and Public Works.
- 4i) All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

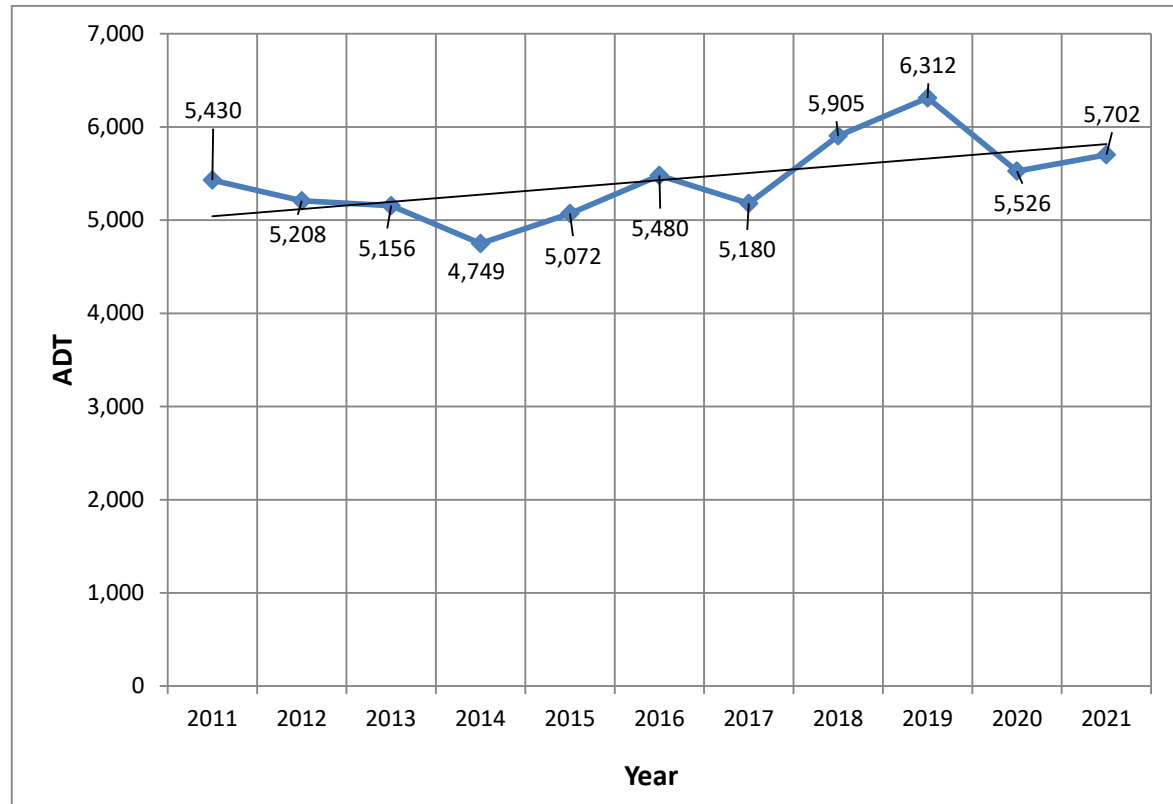
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000009

Location: East Emory Road, East of Tazewell Pike

YEAR	AADT	
2011	5,430	Trendline ↓
2012	5,208	
2013	5,156	
2014	4,749	
2015	5,072	
2016	5,480	
2017	5,180	
2018	5,905	
2019	6,312	
2020	5,526	
2021	5,702	



2011 - 2021 Growth Rate = 5.0%

Average Annual Growth Rate = 0.5%

TDOT
 Department of Transportation

MS2
 Transportation Data Management System

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[TMC](#)
[TCLS](#)
[TTDS](#)
[RSMS](#)
[NMDS](#)
[WOTS](#)
[RTTV](#)

[Login](#)
[+ Locate](#)
[+ Locate All](#)
[Email This](#)

Auto-Locate OFF

[List View](#)
[All Data](#)

Record 7066 of 15600 Goto Record go

Location ID	47000009	MPO ID	
Type	SPOI	HPMS ID	
On NHS		On HPMS	
LRS ID	47SH331001	LRS Loc Pt.	8488
SF Group	Urban	Route Type	
AF Group	1A	Route	
CF Group	Knox	Active	Yes
Class Dist Grp	10	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Funct'l Class	Minor Arterial	Milepost	
Located On	E. EMORY RD.		
Loc On Alias	E. OF HARBISON CROSS RDS		

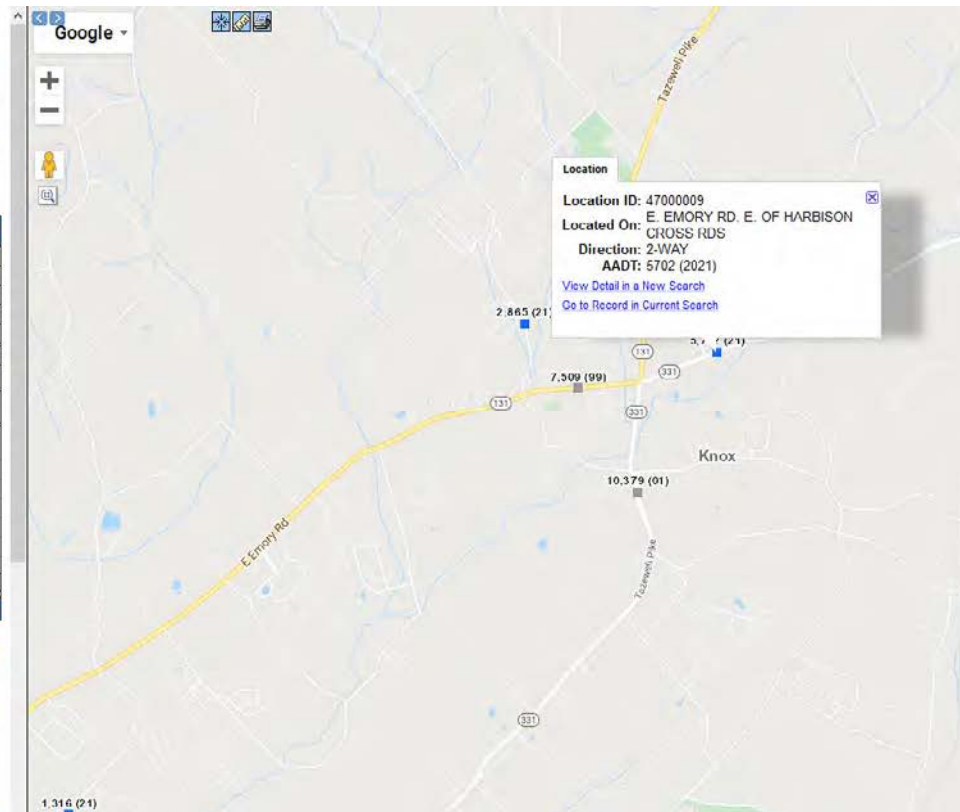
More Detail

STATION DATA

Directions: **2-WAY**

AADT							
Year	AADT	DIY-30	K %	D %	PA	DC	Src
2021	5,702	521	9	65	5,515 (97%)	187 (3%)	
2020	5,526	539	10	65	5,315 (96%)	211 (4%)	
2019	5,312		12	65			
2018	5,905		10	65			
2017	5,180		9	65			

1-5 of 37




APPENDIX B

WALK SCORE

WALKSCORE


(from walkscore.com)




Walk Score  [Get Scores](#) [My Favorites](#) [Add to Your Site](#)

[Go](#)


7335 Fairview Road

A location in Corryton

Commute to **Downtown Knoxville** 

 42 min  60+ min  60+ min [View Routes](#)

[Favorite](#) [Map](#) [Nearby Apartments](#)

[More about 7335 Fairview Road](#) 

Walk Score

3


Car-Dependent
Almost all errands require a car.

Bike Score

5

Somewhat Bikeable
Minimal bike infrastructure.

[About your score](#)



Scores for 7335 Fairview Road

Walk Score

3

Bike Score

5



Scores for 7335 Fairview Road

Walk Score

3

Bike Score

5

Walk Score	Transit Score	Bike Score
Transit Score measures how well a location is served by public transit based on the distance and type of nearby transit lines.		
90-100	Rider's Paradise World-class public transportation	
70-89	Excellent Transit Transit is convenient for most trips	
50-69	Good Transit Many nearby public transportation options	
25-49	Some Transit A few nearby public transportation options	
0-24	Minimal Transit It is possible to get on a bus	

Scores for 7335 Fairview Road

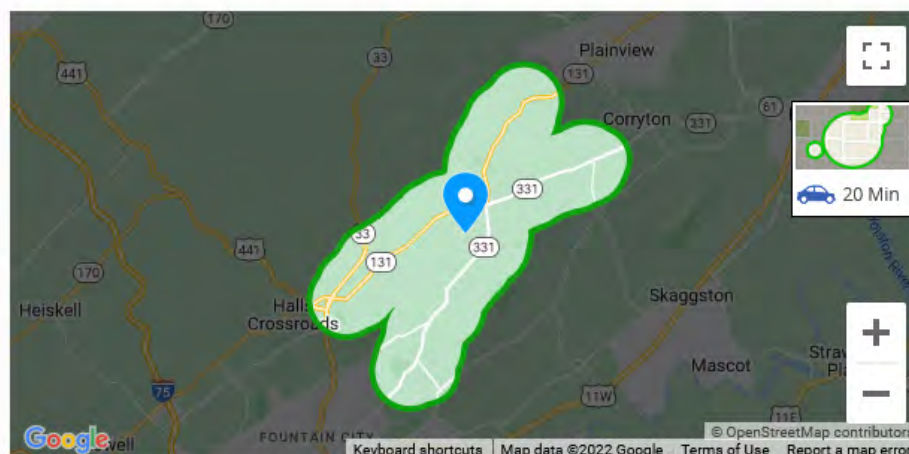


Walk Score	Transit Score	Bike Score
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.		
90-100	Biker's Paradise Daily errands can be accomplished on a bike	
70-89	Very Bikeable Biking is convenient for most trips	
50-69	Bikeable Some bike infrastructure	
0-49	Somewhat Bikeable Minimal bike infrastructure	

Travel Time Map

[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 7335 Fairview Road.



What's Nearby

Restaurants:

Coffees:

Bars:

Groceries:

Parks:

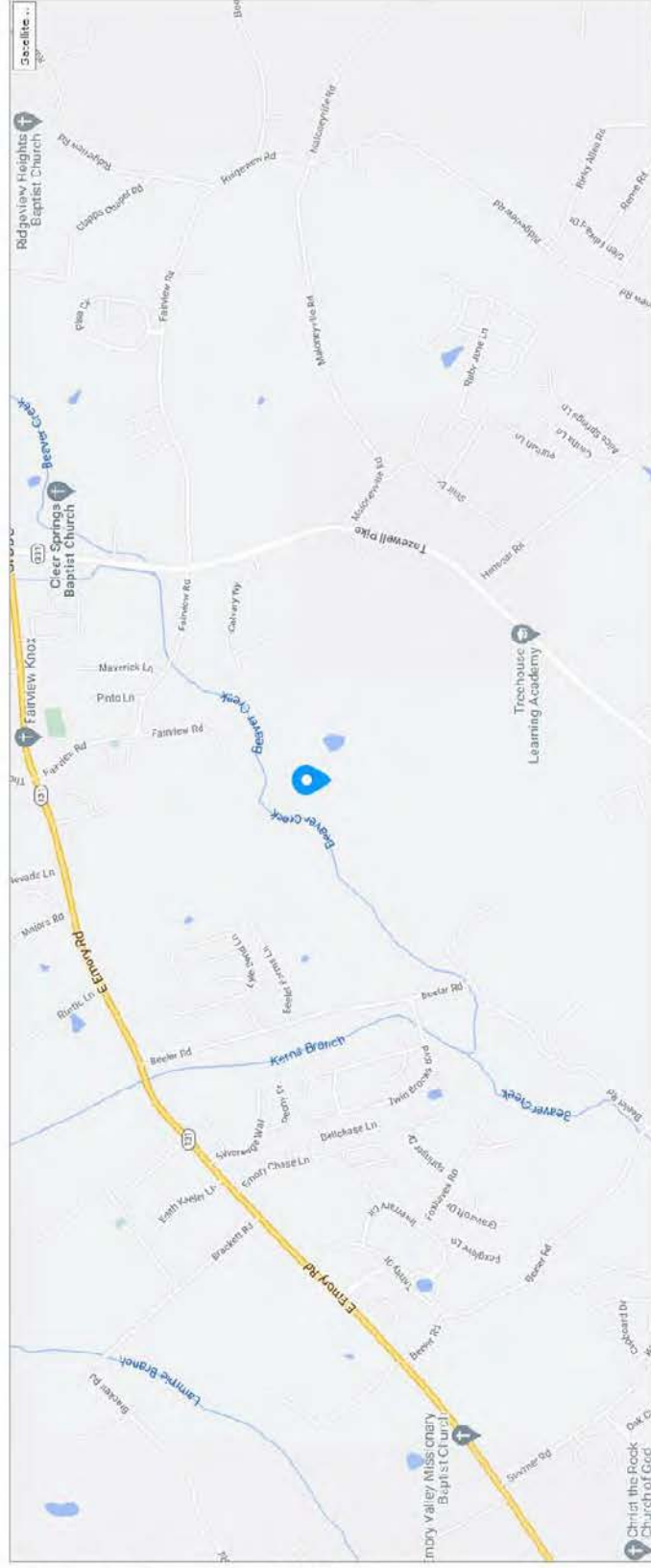
Schools:

Shopping:

Entertainment:

Errands:

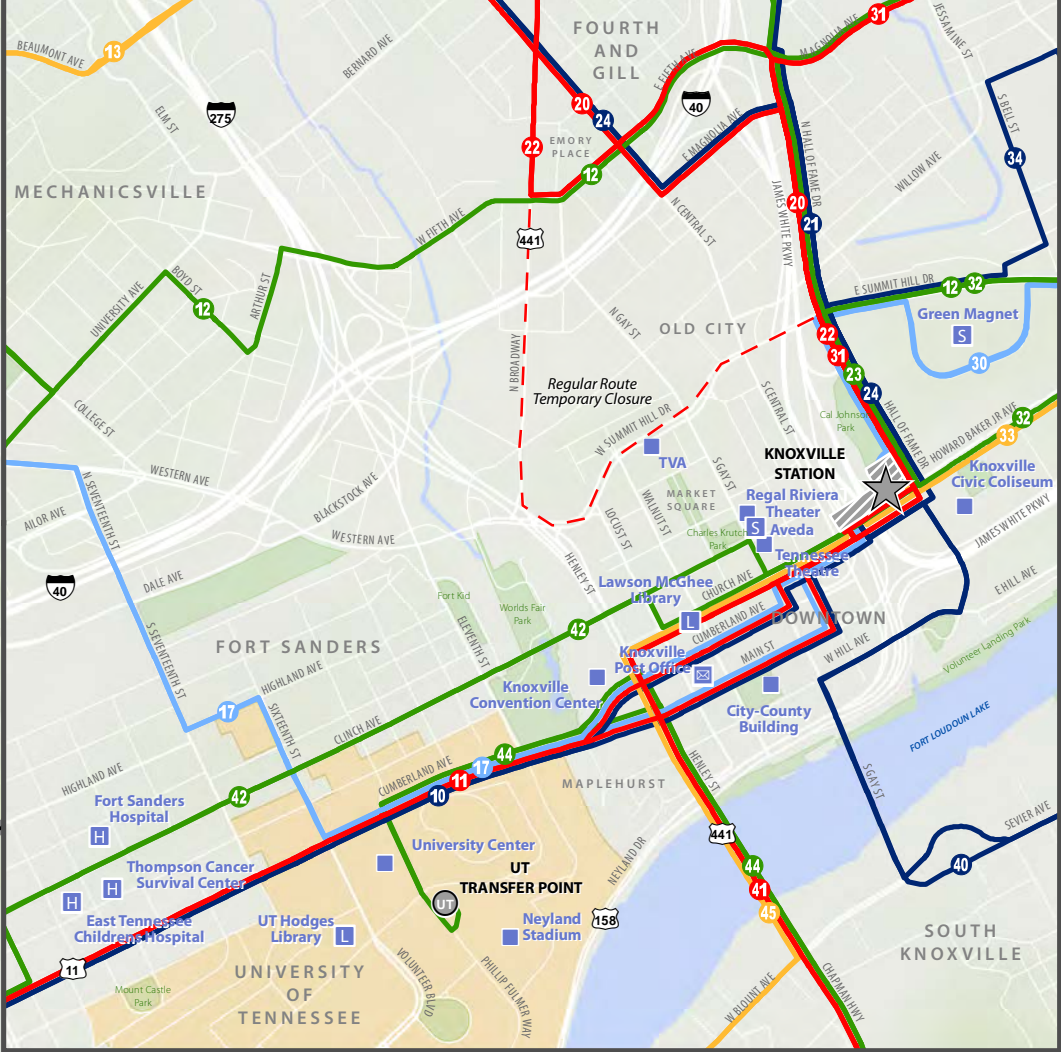
Search Nearby:



APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Knoxville City Center



Legend

Transfer Point

Lift Service Area Boundary

Points of Interest

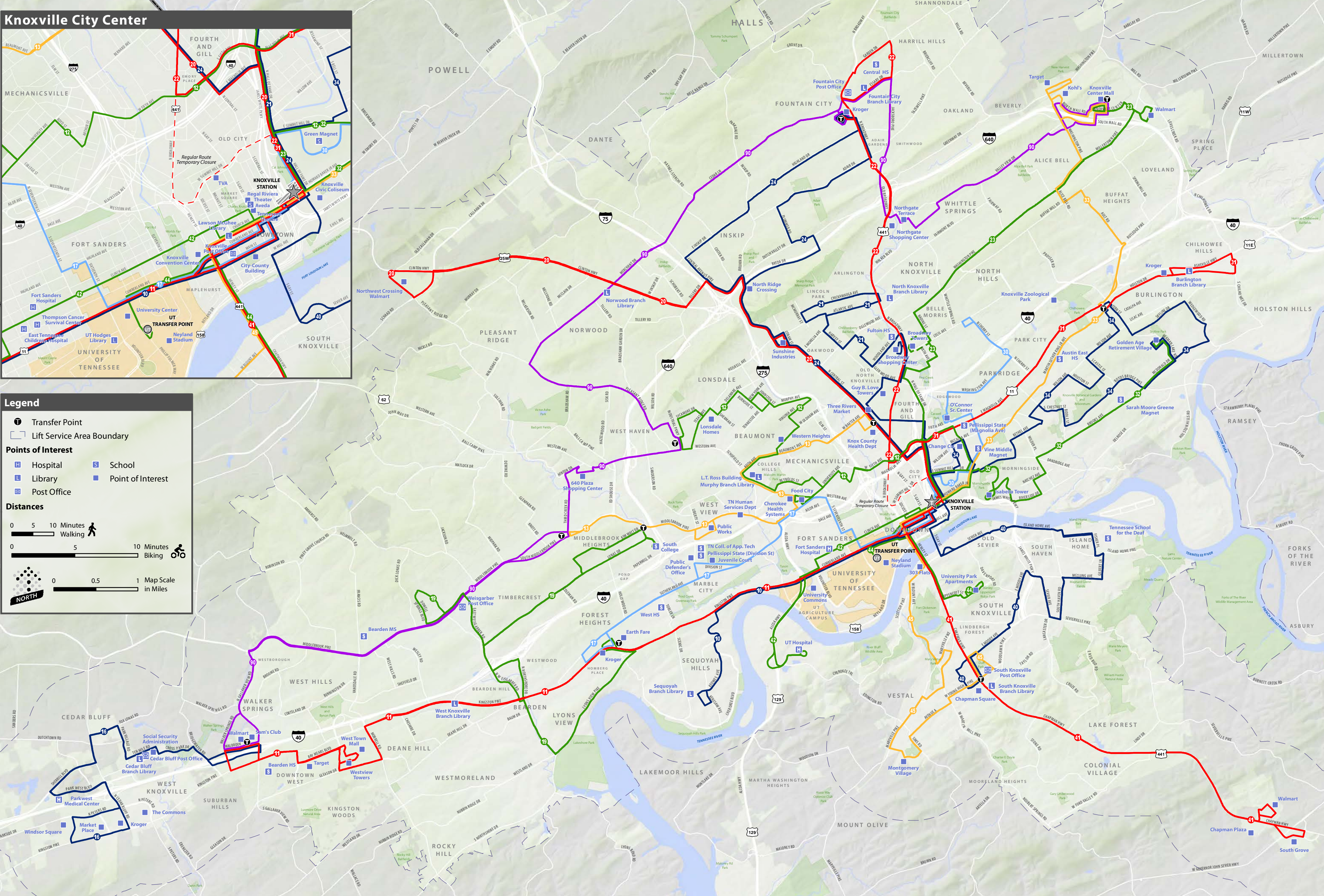
- Hospital
- School
- Library
- Point of Interest
- Post Office

Distances

0 5 10 Minutes Walking

0 5 10 Minutes Biking

0 0.5 1 Map Scale in Miles



FARE INFORMATION

With a base fare of \$1.50, KAT offers a variety of passes. Please note that only the fares marked with an asterisk can be purchased when boarding the bus. Others are available at KAT's Customer Service Counter at Knoxville Station (301 Church Ave.) or by mail via katbus.com.

FARE TYPE	REGULAR FARE	REDUCED FARE
One-Ride Pass*	\$1.50	\$0.75
1 Day Pass*	\$4.00	\$2.00
7 Day Pass	\$15.00	\$7.50
30 Day Pass	\$50.00	\$25.00
20 Ride Pass	\$25.00	\$12.50
Transfer*	\$0.50	\$0.25

REDUCED FARE INFORMATION

A reduced fare is available to those who qualify. Qualifying individuals include seniors age 65 or over, Medicare card holders, students under the age of 18, and persons with disabilities. Proper identification (Medicare card or a valid KAT I.D. card) is required before boarding. For more information on how to obtain a discounted-fare I.D. visit katbus.com/fares or call 637-3000.

BUS STOPS ONLY!

KAT buses stop ONLY at locations designated by bus stop signs. Generally, bus stops are located at least every ¼ mile along the route.

KAT HOLIDAYS

KAT buses do not run on the following holidays:

- New Year's Day
- Thanksgiving
- Independence Day
- Christmas

Please note that KAT's Knoxville Station Customer Service counter is also closed during those days.

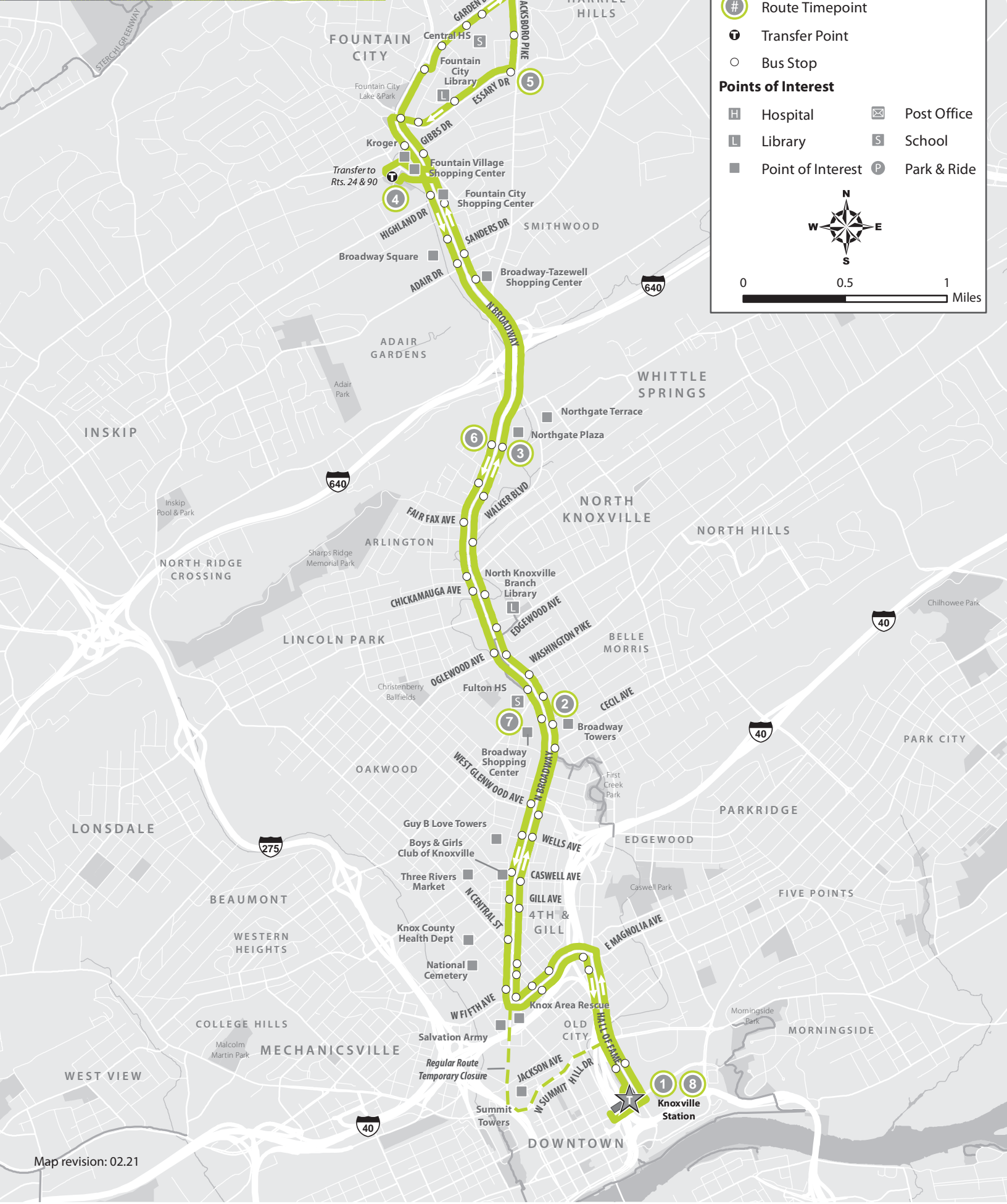
KAT buses run on a Saturday schedule on the following holidays:

- Martin Luther King, Jr. Day
- Day after Thanksgiving
- Memorial Day
- Christmas Eve
- Labor Day

KAT's administrative offices are closed on all holidays listed above.

22 BROADWAY

(Weekdays and Weekends)



Legend

Route Timepoint

Transfer Point

Bus Stop

Points of Interest

Hospital

Post Office

Library

School

Point of Interest

Park & Ride



0 0.5 1 Miles

22

BROADWAY

(Weekdays and Weekends)

SERVES:

★ Broadway Shopping Center

★ Central High School

★ Fountain City

★ Fountain City Library

★ Fulton High School

★ Knox Road/Kroger

★ Knoxville Station/Downtown

★ Northgate Shopping Center

★ North Knoxville Branch Library

LONG TERM
DETOUR

kat

KNOXVILLE
AREA TRANSIT

Information Updated: February 1, 2021

Weekday Schedule Route 22: Broadway

Going away from Downtown				Going toward Downtown			
T Transfer to:			Rts. 24 & 90				
Knoxville Station—Platform H	Broadway Shopping Center	Northgate Shopping Center	Fountain City Superstop	Jacksboro at Essary	Northgate Shopping Center	Broadway Shopping Center	Knoxville Station
1	2	3	4	5	6	7	8

WEEKDAY SCHEDULE								
A.M.	—	—	—	—	5:40	5:51	5:56	6:10
	—	—	—	—	5:55	6:06	6:11	6:25
	—	—	—	—	6:10	6:21	6:26	6:40
	—	—	—	—	6:25	6:36	6:41	6:55
	6:00	6:13	6:20	6:35	6:40	6:51	6:56	7:10
	6:15	6:28	6:35	6:50	6:55	7:06	7:11	7:25
	6:30	6:43	6:50	7:05	7:10	7:21	7:26	7:40
	6:45	6:58	7:05	7:20	7:25	7:36	7:41	7:55
	7:00	7:13	7:20	7:35	7:40	7:51	7:56	8:10
	7:15	7:28	7:35	7:50	7:55	8:06	8:11	8:25
	7:30	7:43	7:50	8:05	8:10	8:21	8:26	8:40
	7:45	7:58	8:05	8:20	8:25	8:36	8:41	8:55
	8:00	8:13	8:20	8:35	8:40	8:51	8:56	9:10
	8:15	8:28	8:35	8:50	8:55	9:06	9:11	9:25
	8:30	8:43	8:50	9:05	9:10	9:21	9:26	9:40
	8:45	8:58	9:05	9:20	9:25	9:36	9:41	9:55
	9:00	9:13	9:20	9:35	9:40	9:51	9:56	10:10
	9:30	9:43	9:50	10:05	10:10	10:21	10:26	10:40
	10:00	10:13	10:20	10:35	10:40	10:51	10:56	11:10
	10:30	10:43	10:50	11:05	11:10	11:21	11:26	11:40
	11:00	11:13	11:20	11:35	11:40	11:51	11:56	12:10
	11:30	11:43	11:50	12:05	12:10	12:21	12:26	12:40
P.M.	12:00	12:13	12:20	12:35	12:40	12:51	12:56	1:10
	12:30	12:43	12:50	1:05	1:10	1:21	1:26	1:40
	1:00	1:13	1:20	1:35	1:40	1:51	1:56	2:10
	1:30	1:43	1:50	2:05	2:10	2:21	2:26	2:40
	2:00	2:13	2:20	2:35	2:40	2:51	2:56	3:10
	2:30	2:43	2:50	3:05	3:10	3:21	3:26	3:40
	3:00	3:13	3:20	3:35	3:40	3:51	3:56	4:10
	—	—	—	—	3:55	4:06	4:11	4:25
	3:30	3:43	3:50	4:05	4:10	4:21	4:26	4:40
	3:45	3:58	4:05	4:20	4:25	4:36	4:41	4:55
	4:00	4:13	4:20	4:35	4:40	4:51	4:56	5:10
	4:15	4:28	4:35	4:50	4:55	5:06	5:11	5:25
	4:30	4:43	4:50	5:05	5:10	5:21	5:26	5:40
	4:45	4:58	5:05	5:20	5:25	5:36	5:41	5:55
	5:00	5:13	5:20	5:35	5:40	5:51	5:56	6:10
	5:15	5:28	5:35	5:50	5:55	6:06	6:11	6:25
	5:30	5:43	5:50	6:05	6:10	6:21	6:26	6:40
	5:45	5:58	6:05	6:20	6:25	6:36	6:41	6:55
	6:00	6:13	6:20	6:35	6:40	6:51	6:56	7:10
	6:15	6:28	6:35	6:50	6:55	7:06	7:11	7:25
	6:30	6:43	6:50	7:05	7:10	7:21	7:26	7:40
	6:45	6:58	7:05	7:20	7:25	7:36	7:41	7:55
	7:15	7:28	7:35	7:50	7:55	8:06	8:11	8:25
	7:45	7:58	8:05	8:15	8:25	8:36	8:41	8:55
	8:15	8:28	8:35	8:50	8:55	9:06	9:11	9:25
	8:45	8:58	9:05	9:20	9:25	9:36	9:41	9:55
	9:15	9:28	9:35	9:50	9:55	10:06	10:11	10:25
	9:45	9:58	10:05	10:20	10:25	10:36	10:41	10:55
	10:15	10:28	10:35	10:50	10:55	11:06	11:11	
	11:15	11:28	11:35	11:40	To Garage			

Need help reading this schedule?
Need other general information on how to ride?
Visit www.katbus.com or call 865-637-3000



BROADWAY

(Weekdays and Weekends)

SERVES:

- ★ Broadway Shopping Center
- ★ Central High School
- ★ Fountain City
- ★ Fountain City Library
- ★ Fulton High School

- ★ Knox Road/Kroger
- ★ Knoxville Station/Downtown
- ★ Northgate Shopping Center
- ★ North Knoxville Branch Library

LONG TERM DETOUR



Information Updated: February 1, 2021

Saturday-Sunday Schedule Route 22: Broadway

Going away from Downtown					Going toward Downtown			
T Transfer to:				Rts. 24 & 90				
Knoxville Station—Platform H	Broadway Shopping Center	Northgate Shopping Center	Fountain City Superstop	Jacksboro at Essary	Northgate Shopping Center	Broadway Shopping Center	Knoxville Station	
1	2	3	4	5	6	7	8	
SATURDAY SCHEDULE								
A.M.	7:00	7:13	7:20	7:35	7:40	7:51	7:56	8:10
	7:30	7:43	7:50	8:05	8:10	8:21	8:26	8:40
	8:00	8:13	8:20	8:35	8:40	8:51	8:56	9:10
	8:30	8:43	8:50	9:05	9:10	9:21	9:26	9:40
	9:00	9:13	9:20	9:35	9:40	9:51	9:56	10:10
	9:30	9:43	9:50	10:05	10:10	10:21	10:26	10:40
	10:00	10:13	10:20	10:35	10:40	10:51	10:56	11:10
	10:30	10:43	10:50	11:05	11:10	11:21	11:26	11:40
	11:00	11:13	11:20	11:35	11:40	11:51	11:56	12:10
	11:30	11:43	11:50	12:05	12:10	12:21	12:26	12:40
P.M.	12:00	12:13	12:20	12:35	12:40	12:51	12:56	1:10
	12:30	12:43	12:50	1:05	1:10	1:21	1:26	1:40
	1:00	1:13	1:20	1:35	1:40	1:51	1:56	2:10
	1:30	1:43	1:50	2:05	2:10	2:21	2:26	2:40
	2:00	2:13	2:20	2:35	2:40	2:51	2:56	3:10
	2:30	2:43	2:50	3:05	3:10	3:21	3:26	3:40
	3:00	3:13	3:20	3:35	3:40	3:51	3:56	4:10
	3:30	3:43	3:50	4:05	4:10	4:21	4:26	4:40
	4:00	4:13	4:20	4:35	4:40	4:51	4:56	5:10
	4:30	4:43	4:50	5:05	5:10	5:21	5:26	5:40
	5:00	5:13	5:20	5:35	5:40	5:51	5:56	6:10
	5:30	5:43	5:50	6:05	6:10	6:21	6:26	6:40
	6:00	6:13	6:20	6:35	6:40	6:51	6:56	7:10
	6:30	6:43	6:50	7:05	7:10	7:21	7:26	7:40
	7:00	7:13	7:20	7:35	7:40	7:51	7:56	8:10
	7:30	7:43	7:50	8:05	8:10	8:21	8:26	8:40
	8:00	8:13	8:20	8:35	8:40	8:51	8:56	9:10
	8:30	8:43	8:50	9:05	9:10	9:21	9:26	9:40
	9:00	9:13	9:20	9:35	9:40	9:51	9:56	10:10
	9:30	9:43	9:50	10:05	10:10	10:21	10:26	10:40
	10:00	10:13	10:20	10:35	10:40	10:51	10:56	11:10
	10:30	10:43	10:50	11:05	11:10	11:21	11:26	
	11:15	11:28	11:35	11:50	11:55	12:06	12:11	To Garage
SUNDAY SCHEDULE								
A.M.	8:15	8:28	8:35	8:44	—	8:48	8:55	9:10
	9:15	9:28	9:35	9:44	—	9:48	9:55	10:10
	10:15	10:28	10:35	10:44	—	10:48	10:55	11:10
	11:15	11:28	11:35	11:44	—	11:48	11:55	12:10
P.M.	12:15	12:28	12:35	12:44	—	12:48	12:55	1:10
	1:15	1:28	1:35	1:44	—	1:48	1:55	2:10
	2:15	2:28	2:35	2:44	—	2:48	2:55	3:10
	3:15	3:28	3:35	3:44	—	3:48	3:55	4:10
	4:15	4:28	4:35	4:44	—	4:48	4:55	5:10
	5:15	5:28	5:35	5:44	—	5:48	5:55	6:10
	6:15	6:28	6:35	6:44	—	6:48	6:55	7:10
	7:15	7:28	7:35	7:44	—	7:48	7:55	8:10
	8:15	8:28	8:35	8:40	To Garage			

Need help reading this schedule?
 Need other general information on how to ride?
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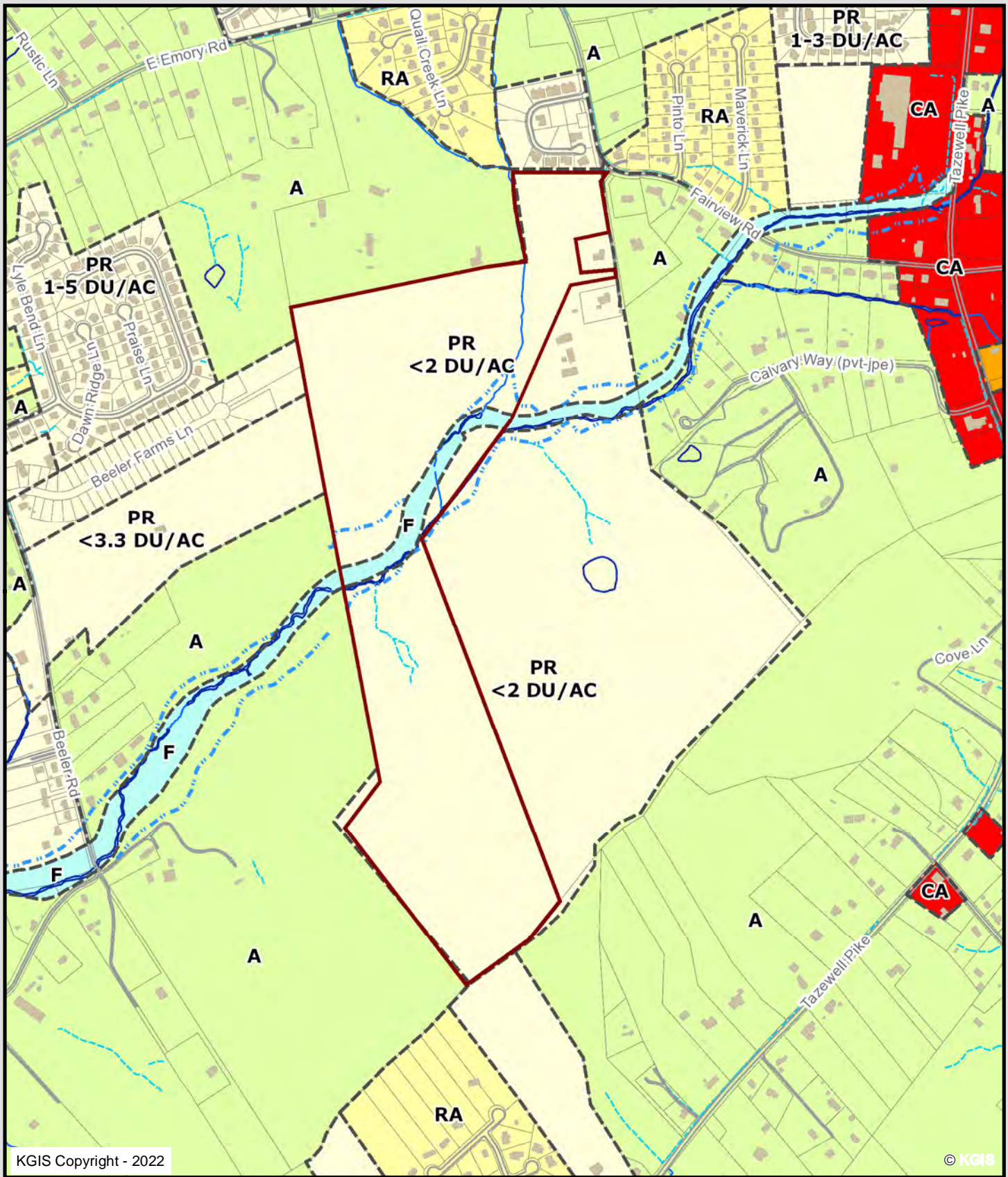
Route 22 - Broadway - WEEKDAY schedule

Effective Date: November 9, 2020

1	2	3	4	5	6	7	8
KNOXVILLE STATION	BROADWAY SHOPPING CTR	NORTHGATE SHOPPING CTR	KNOX ROAD	JACKSBORO AT ESSARY	NORTHGATE SHOPPING CTR	BROADWAY SHOPPING CTR	KNOXVILLE STATION
<i>Going away from downtown</i>				<i>Going toward downtown</i>			
			Transfer to 24, 90				
				5:55	6:06	6:11	6:25
				6:25	6:36	6:41	6:55
6:00	6:13	6:20	6:35	6:40	6:51	6:56	7:10
6:30	6:43	6:50	7:05	7:10	7:21	7:26	7:40
7:00	7:13	7:20	7:35	7:40	7:51	7:56	8:10
7:15	7:28	7:35	7:50	7:55	8:06	8:11	8:25
7:45	7:58	8:05	8:20	8:25	8:36	8:41	8:55
8:15	8:28	8:35	8:50	8:55	9:06	9:11	9:25
8:30	8:43	8:50	9:05	9:10	9:21	9:26	9:40
9:00	9:13	9:20	9:35	9:40	9:51	9:56	10:10
9:30	9:43	9:50	10:05	10:10	10:21	10:26	10:40
10:00	10:13	10:20	10:35	10:40	10:51	10:56	11:10
10:30	10:43	10:50	11:05	11:10	11:21	11:26	11:40
11:00	11:13	11:20	11:35	11:40	11:51	11:56	12:10
11:30	11:43	11:50	12:05	12:10	12:21	12:26	12:40
12:00	12:13	12:20	12:35	12:40	12:51	12:56	1:10
12:30	12:43	12:50	1:05	1:10	1:21	1:26	1:40
1:00	1:13	1:20	1:35	1:40	1:51	1:56	2:10
1:30	1:43	1:50	2:05	2:10	2:21	2:26	2:40
2:00	2:13	2:20	2:35	2:40	2:51	2:56	3:10
2:30	2:43	2:50	3:05	3:10	3:21	3:26	3:40
3:00	3:13	3:20	3:35	3:40	3:51	3:56	4:10
3:30	3:43	3:50	4:05	4:10	4:21	4:26	4:40
3:45	3:58	4:05	4:20	4:25	4:36	4:41	4:55
4:00	4:13	4:20	4:35	4:40	4:51	4:56	5:10
4:15	4:28	4:35	4:50	4:55	5:06	5:11	5:25
4:45	4:58	5:05	5:20	5:25	5:36	5:41	5:55
5:00	5:13	5:20	5:35	5:40	5:51	5:56	6:10
5:15	5:28	5:35	5:50	5:55	6:06	6:11	6:25
5:30	5:43	5:50	6:05	6:10	6:21	6:26	6:40
6:00	6:13	6:20	6:35	6:40	6:51	6:56	7:10
6:15	6:28	6:35	6:50	6:55	7:06	7:11	7:25
6:30	6:43	6:50	7:05	7:10	7:21	7:26	7:40
6:45	6:58	7:05	7:20	7:25	7:36	7:41	7:55
7:15	7:28	7:35	7:50	7:55	8:06	8:11	8:25
7:45	7:58	8:05	8:15	8:25	8:36	8:41	8:55
8:15	8:28	8:35	8:50	8:55	9:06	9:11	9:25
8:45	8:58	9:05	9:20	9:25	9:36	9:41	9:55
9:15	9:28	9:35	9:50	9:55	10:06	10:11	10:25
9:45	9:58	10:05	10:20	10:25	10:36	10:41	10:55
10:15	10:28	10:35	10:50	10:55	11:06	11:11	
11:15	11:28	11:35	11:40				

APPENDIX D

ZONING MAP



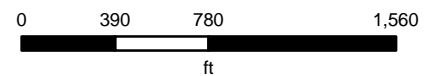
Zoning Map - 8.5.22

Fairview Road Subdivision

Knoxville - Knox County - KUB Geographic Information System



Printed: 8/5/2022 at 1:58:51 PM



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APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: East Emory Road (WB and EB)
 Minor Street: Beeler Road (NB)
 Traffic Control: Stop Sign on Beeler Road

5/5/2022 (Thursday)
 Warm, Sunny
 Conducted by: Ajax Engineering

	East Emory Road		Beeler Road		East Emory Road			
TIME	WESTBOUND		NORTHBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	LT	THRU	LT	RT	THRU	RT	TOTAL	HOURL
7:00 AM	3	108	9	27	82	5	234	
7:15 AM	8	117	9	22	119	5	280	7:15 AM - 8:15 AM
7:30 AM	10	148	8	24	115	4	309	
7:45 AM	9	161	5	16	111	4	306	
8:00 AM	4	124	5	23	104	8	268	
8:15 AM	7	113	11	4	93	3	231	
8:30 AM	4	105	5	13	52	5	184	
8:45 AM	8	86	5	6	55	11	171	
TOTAL	53	962	57	135	731	45	1983	
11:00 AM	1	59	9	7	62	5	143	
11:15 AM	5	62	6	2	68	3	146	
11:30 AM	6	77	8	4	76	8	179	
11:45 AM	5	62	11	8	68	8	162	
12:00 PM	8	64	11	6	73	13	175	12:00 PM - 1:00 PM
12:15 PM	5	66	7	2	84	6	170	
12:30 PM	2	70	10	1	83	6	172	
12:45 PM	5	61	5	10	91	7	179	
TOTAL	37	521	67	40	605	56	1326	
2:00 PM	10	97	4	10	110	3	234	
2:15 PM	7	89	4	7	106	7	220	
2:30 PM	7	78	6	10	113	6	220	
2:45 PM	10	95	4	11	110	7	237	
3:00 PM	11	102	8	15	96	5	237	
3:15 PM	10	109	10	8	123	10	270	
3:30 PM	18	98	6	6	107	7	242	
3:45 PM	21	178	11	5	135	11	361	
4:00 PM	11	129	10	8	144	10	312	
4:15 PM	14	113	7	10	147	11	302	
4:30 PM	11	103	10	9	151	11	295	
4:45 PM	17	120	4	9	164	11	325	4:45 PM - 5:45 PM
5:00 PM	16	109	8	12	173	12	330	
5:15 PM	12	112	11	16	143	16	310	
5:30 PM	11	138	9	10	165	21	354	
5:45 PM	13	115	6	13	150	9	306	
TOTAL	199	1785	118	159	2137	157	4555	

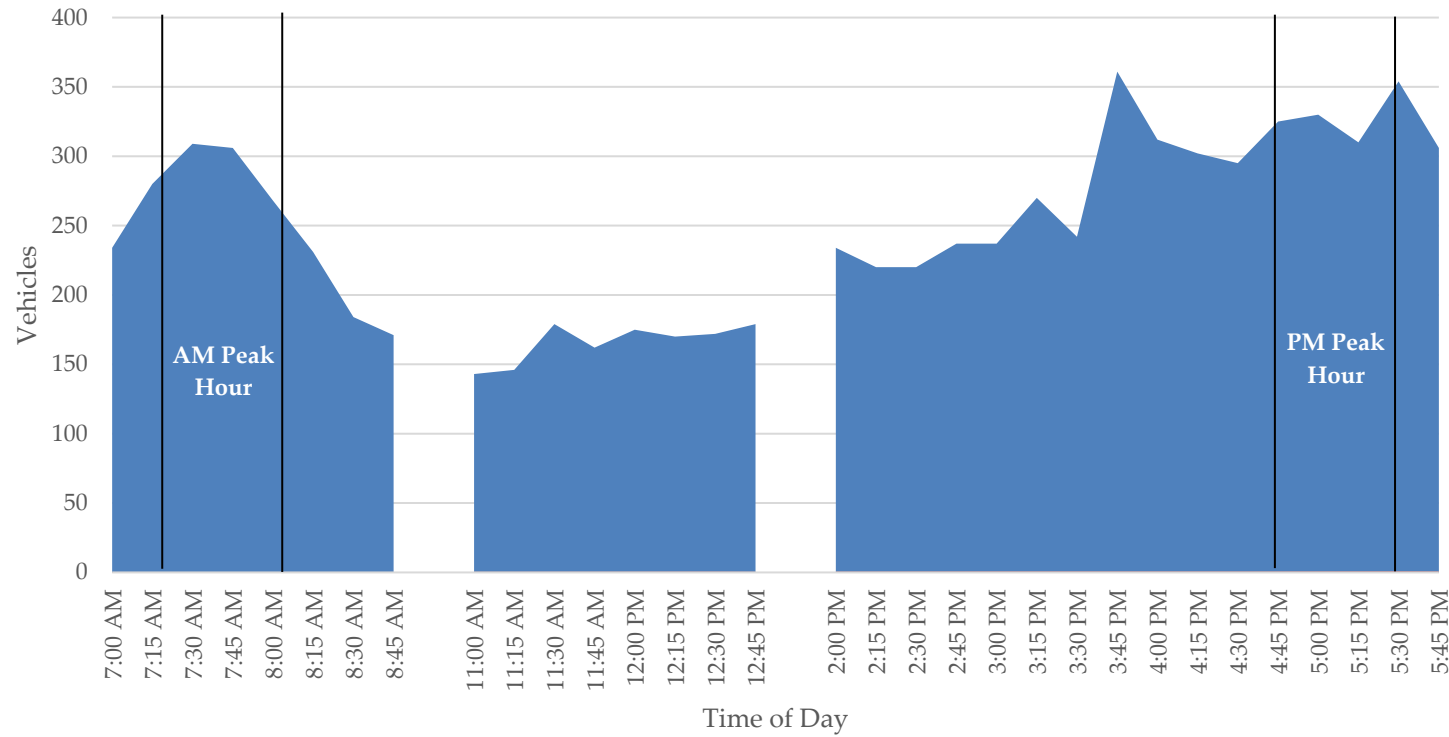
2022 AM Peak Hour **7:15 AM - 8:15 AM**

	East Emory Road		Beeler Road		East Emory Road	
TIME	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:15 AM	8	117	9	22	119	5
7:30 AM	10	148	8	24	115	4
7:45 AM	9	161	5	16	111	4
8:00 AM	4	124	5	23	104	8
TOTAL	31	550	27	85	449	21
PHF	0.78	0.85	0.75	0.89	0.94	0.66
Truck %	6.5%	2.0%	0.0%	2.4%	1.6%	9.5%

2022 PM Peak Hour **4:45 PM - 5:45 PM**

	East Emory Road		Beeler Road		East Emory Road	
TIME	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
4:45 PM	17	120	4	9	164	11
5:00 PM	16	109	8	12	173	12
5:15 PM	12	112	11	16	143	16
5:30 PM	11	138	9	10	165	21
TOTAL	56	479	32	47	645	60
PHF	0.82	0.87	0.73	0.73	0.93	0.71
Truck %	0.0%	1.0%	0.0%	0.0%	2.2%	0.0%




**East Emory Road at Beeler Road
Intersection Traffic Count Totals
5/5/2022**



APPENDIX F




CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)

EXISTING CONDITIONS

Intersection						
Int Delay, s/veh	2.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	449	21	31	550	27	85
Future Vol, veh/h	449	21	31	550	27	85
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	94	66	78	85	75	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	478	32	40	647	36	96
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	510	0	1221	494
Stage 1	-	-	-	-	494	-
Stage 2	-	-	-	-	727	-
Critical Hdwy	-	-	4.12	-	7.42	6.72
Critical Hdwy Stg 1	-	-	-	-	6.42	-
Critical Hdwy Stg 2	-	-	-	-	6.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1055	-	141	537
Stage 1	-	-	-	-	535	-
Stage 2	-	-	-	-	391	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1055	-	133	537
Mov Cap-2 Maneuver	-	-	-	-	133	-
Stage 1	-	-	-	-	535	-
Stage 2	-	-	-	-	368	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.5		26.9	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	293	-	-	1055	-	
HCM Lane V/C Ratio	0.449	-	-	0.038	-	
HCM Control Delay (s)	26.9	-	-	8.5	0	
HCM Lane LOS	D	-	-	A	A	
HCM 95th %tile Q(veh)	2.2	-	-	0.1	-	

Intersection

Int Delay, s/veh 4.9




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	645	60	56	479	32	47
Future Vol, veh/h	645	60	56	479	32	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	93	71	82	87	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	694	85	68	551	44	64




Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	779
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	838
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	838
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	62.4
HCM LOS			F




Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	163	-	-	838	-
HCM Lane V/C Ratio	0.664	-	-	0.081	-
HCM Control Delay (s)	62.4	-	-	9.7	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	3.8	-	-	0.3	-

PROJECTED CONDITIONS (WITHOUT THE PROJECT)

Intersection						
Int Delay, s/veh	8.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	471	30	44	578	43	132
Future Vol, veh/h	471	30	44	578	43	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	94	66	78	85	75	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	501	45	56	680	57	148
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	546	0	1316	524
Stage 1	-	-	-	-	524	-
Stage 2	-	-	-	-	792	-
Critical Hdwy	-	-	4.12	-	7.42	6.72
Critical Hdwy Stg 1	-	-	-	-	6.42	-
Critical Hdwy Stg 2	-	-	-	-	6.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1023	-	121	514
Stage 1	-	-	-	-	514	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1023	-	110	514
Mov Cap-2 Maneuver	-	-	-	-	110	-
Stage 1	-	-	-	-	514	-
Stage 2	-	-	-	-	326	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.7		60	
HCM LOS					F	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	254	-	-	1023	-	
HCM Lane V/C Ratio	0.81	-	-	0.055	-	
HCM Control Delay (s)	60	-	-	8.7	0	
HCM Lane LOS	F	-	-	A	A	
HCM 95th %tile Q(veh)	6.3	-	-	0.2	-	




Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	31	76	0	11	39
Future Vol, veh/h	0	31	76	0	11	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	2	-	8	-	-	4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	34	84	0	12	43
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	151	84	0	0	84	0
Stage 1	84	-	-	-	-	-
Stage 2	67	-	-	-	-	-
Critical Hdwy	6.8	6.4	-	-	4.1	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	831	976	-	-	1526	-
Stage 1	936	-	-	-	-	-
Stage 2	954	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	824	976	-	-	1526	-
Mov Cap-2 Maneuver	824	-	-	-	-	-
Stage 1	936	-	-	-	-	-
Stage 2	946	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.8	0		1.6		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 976		1526	-	
HCM Lane V/C Ratio	-	- 0.035		0.008	-	
HCM Control Delay (s)	-	- 8.8		7.4	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0.1		0	-	

Intersection						
Int Delay, s/veh	4.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	47	29	0	16	23
Future Vol, veh/h	0	47	29	0	16	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-2	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	52	32	0	18	26
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	94	32	0	0	32	0
Stage 1	32	-	-	-	-	-
Stage 2	62	-	-	-	-	-
Critical Hdwy	6	6	-	-	4.1	-
Critical Hdwy Stg 1	5	-	-	-	-	-
Critical Hdwy Stg 2	5	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	920	1049	-	-	1593	-
Stage 1	999	-	-	-	-	-
Stage 2	972	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	910	1049	-	-	1593	-
Mov Cap-2 Maneuver	910	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	961	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.6	0		3		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 1049		1593	-	
HCM Lane V/C Ratio	-	- 0.05		0.011	-	
HCM Control Delay (s)	-	- 8.6		7.3	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0.2		0	-	

Intersection						
Int Delay, s/veh	29.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	677	96	92	503	49	71
Future Vol, veh/h	677	96	92	503	49	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	93	71	82	87	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	728	135	112	578	67	97
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	863	0	1598	796
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	802	-
Critical Hdwy	-	-	4.12	-	7.42	6.72
Critical Hdwy Stg 1	-	-	-	-	6.42	-
Critical Hdwy Stg 2	-	-	-	-	6.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	779	-	75	347
Stage 1	-	-	-	-	356	-
Stage 2	-	-	-	-	353	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	779	-	~ 59	347
Mov Cap-2 Maneuver	-	-	-	-	~ 59	-
Stage 1	-	-	-	-	356	-
Stage 2	-	-	-	-	278	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.7		299	
HCM LOS					F	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	116	-	-	779	-	
HCM Lane V/C Ratio	1.417	-	-	0.144	-	
HCM Control Delay (s)	299	-	-	10.4	0	
HCM Lane LOS	F	-	-	B	A	
HCM 95th %tile Q(veh)	11.4	-	-	0.5	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection




Int Delay, s/veh 2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	20	54	0	35	76
Future Vol, veh/h	0	20	54	0	35	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	2	-	8	-	-	4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	22	60	0	39	84

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	222	60	0
Stage 1	60	-	-
Stage 2	162	-	-
Critical Hdwy	6.8	6.4	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	752	1008	-
Stage 1	961	-	-
Stage 2	856	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	732	1008	-
Mov Cap-2 Maneuver	732	-	-
Stage 1	961	-	-
Stage 2	834	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	2.3
HCM LOS	A		




Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1008	1556
HCM Lane V/C Ratio	-	-	0.022	0.025
HCM Control Delay (s)	-	-	8.7	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	31	23	0	53	23
Future Vol, veh/h	0	31	23	0	53	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-2	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	34	26	0	59	25
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	169	26	0	0	26	0
Stage 1	26	-	-	-	-	-
Stage 2	143	-	-	-	-	-
Critical Hdwy	6	6	-	-	4.1	-
Critical Hdwy Stg 1	5	-	-	-	-	-
Critical Hdwy Stg 2	5	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	842	1057	-	-	1601	-
Stage 1	1005	-	-	-	-	-
Stage 2	903	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	811	1057	-	-	1601	-
Mov Cap-2 Maneuver	811	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	870	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.5	0		5.1		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 1057		1601	-	
HCM Lane V/C Ratio	-	- 0.033		0.037	-	
HCM Control Delay (s)	-	- 8.5		7.3	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0.1		0.1	-	

PROJECTED CONDITIONS (WITH THE PROJECT)

Intersection




Int Delay, s/veh 31.2




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	471	40	58	578	60	184
Future Vol, veh/h	471	40	58	578	60	184
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	94	66	78	85	75	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	501	61	74	680	80	207




Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	562
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1009
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1009
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	172
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	236	-	-	1009	-
HCM Lane V/C Ratio	1.215	-	-	0.074	-
HCM Control Delay (s)	172	-	-	8.9	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	14	-	-	0.2	-




Intersection						
Int Delay, s/veh	1.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	31	145	0	11	63
Future Vol, veh/h	0	31	145	0	11	63
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	2	-	8	-	-	4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	34	161	0	12	70
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	255	161	0	0	161	0
Stage 1	161	-	-	-	-	-
Stage 2	94	-	-	-	-	-
Critical Hdwy	6.8	6.4	-	-	4.1	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	717	881	-	-	1430	-
Stage 1	857	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	711	881	-	-	1430	-
Mov Cap-2 Maneuver	711	-	-	-	-	-
Stage 1	857	-	-	-	-	-
Stage 2	917	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	9.3	0		1.1		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 881		1430	-	
HCM Lane V/C Ratio	-	- 0.039		0.009	-	
HCM Control Delay (s)	-	- 9.3		7.5	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0.1		0	-	

Intersection						
Int Delay, s/veh	6.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	116	29	0	40	23
Future Vol, veh/h	0	116	29	0	40	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-2	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	129	32	0	44	26
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	146	32	0	0	32	0
Stage 1	32	-	-	-	-	-
Stage 2	114	-	-	-	-	-
Critical Hdwy	6	6	-	-	4.1	-
Critical Hdwy Stg 1	5	-	-	-	-	-
Critical Hdwy Stg 2	5	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	865	1049	-	-	1593	-
Stage 1	999	-	-	-	-	-
Stage 2	928	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	841	1049	-	-	1593	-
Mov Cap-2 Maneuver	841	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	902	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	8.9	0	4.7			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	1049	1593	-	
HCM Lane V/C Ratio	-	-	0.123	0.028	-	
HCM Control Delay (s)	-	-	8.9	7.3	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-	

Intersection						
Int Delay, s/veh	99.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	677	135	132	503	67	99
Future Vol, veh/h	677	135	132	503	67	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	93	71	82	87	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	728	190	161	578	92	136
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	918	0	1723	823
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	900	-
Critical Hdwy	-	-	4.12	-	7.42	6.72
Critical Hdwy Stg 1	-	-	-	-	6.42	-
Critical Hdwy Stg 2	-	-	-	-	6.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	743	-	~ 61	333
Stage 1	-	-	-	-	343	-
Stage 2	-	-	-	-	309	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	743	-	~ 42	333
Mov Cap-2 Maneuver	-	-	-	-	~ 42	-
Stage 1	-	-	-	-	343	-
Stage 2	-	-	-	-	210	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.4		\$ 820.2	
HCM LOS	F					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	88	-	-	743	-	
HCM Lane V/C Ratio	2.584	-	-	0.217	-	
HCM Control Delay (s)	\$ 820.2	-	-	11.2	0	
HCM Lane LOS	F	-	-	B	A	
HCM 95th %tile Q(veh)	21.4	-	-	0.8	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection




Int Delay, s/veh 1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	20	100	0	35	155
Future Vol, veh/h	0	20	100	0	35	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	2	-	8	-	-	4
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	22	111	0	39	172

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	361	111	0
Stage 1	111	-	-
Stage 2	250	-	-
Critical Hdwy	6.8	6.4	-
Critical Hdwy Stg 1	5.8	-	-
Critical Hdwy Stg 2	5.8	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	617	942	-
Stage 1	907	-	-
Stage 2	774	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	599	942	-
Mov Cap-2 Maneuver	599	-	-
Stage 1	907	-	-
Stage 2	752	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	1.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	942	1492
HCM Lane V/C Ratio	-	-	0.024	0.026
HCM Control Delay (s)	-	-	8.9	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	6.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	77	23	0	132	23
Future Vol, veh/h	0	77	23	0	132	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	-2	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	92
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	0	86	26	0	147	25
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	345	26	0	0	26	0
Stage 1	26	-	-	-	-	-
Stage 2	319	-	-	-	-	-
Critical Hdwy	6	6	-	-	4.1	-
Critical Hdwy Stg 1	5	-	-	-	-	-
Critical Hdwy Stg 2	5	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	681	1057	-	-	1601	-
Stage 1	1005	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	618	1057	-	-	1601	-
Mov Cap-2 Maneuver	618	-	-	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	697	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.7	0		6.4		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 1057		1601	-	
HCM Lane V/C Ratio	-	- 0.081		0.092	-	
HCM Control Delay (s)	-	- 8.7		7.5	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0.3		0.3	-	

**PROJECTED CONDITIONS (WITH THE PROJECT) AND EB & NB RIGHT-TURN
LANES**

Intersection

Int Delay, s/veh 7.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑		↑	↑	↑
Traffic Vol, veh/h	471	40	58	578	60	184
Future Vol, veh/h	471	40	58	578	60	184
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	75	-	-	0	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	94	66	78	85	75	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	501	61	74	680	80	207

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	562
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1009
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1009
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	41.9
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	104	532	-	-	1009	-
HCM Lane V/C Ratio	0.769	0.389	-	-	0.074	-
HCM Control Delay (s)	108.8	16	-	-	8.9	0
HCM Lane LOS	F	C	-	-	A	A
HCM 95th %tile Q(veh)	4.2	1.8	-	-	0.2	-

Intersection

Int Delay, s/veh 32.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑		↑	↑	↑
Traffic Vol, veh/h	677	135	132	503	67	99
Future Vol, veh/h	677	135	132	503	67	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	75	-	-	0	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	93	71	82	87	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	728	190	161	578	92	136

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	918
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	743
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	743
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	258.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	48	383	-	-	743	-
HCM Lane V/C Ratio	1.912	0.354	-	-	0.217	-
HCM Control Delay (s)	\$ 611.8	19.5	-	-	11.2	0
HCM Lane LOS	F	C	-	-	B	A
HCM 95th %tile Q(veh)	9.2	1.6	-	-	0.8	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

**PROJECTED CONDITIONS (WITH THE PROJECT) WITH TDOT ROAD WIDENING
PROJECT AND NB RIGHT-TURN LANE ON BEELER ROAD**

Intersection							
Int Delay, s/veh	3.1						
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↑↑↱		↱	↑↑	↱	↱	
Traffic Vol, veh/h	485	40	58	594	60	184	
Future Vol, veh/h	485	40	58	594	60	184	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	None	-	None	-	None	
Storage Length	-	-	75	-	0	100	
Veh in Median Storage, #	0	-	-	0	1	-	
Grade, %	-5	-	-	-5	5	-	
Peak Hour Factor	94	66	78	85	75	89	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	516	61	74	699	80	207	
Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	577	0	1045	289	
Stage 1	-	-	-	-	547	-	
Stage 2	-	-	-	-	498	-	
Critical Hdwy	-	-	4.14	-	7.84	7.44	
Critical Hdwy Stg 1	-	-	-	-	6.84	-	
Critical Hdwy Stg 2	-	-	-	-	6.84	-	
Follow-up Hdwy	-	-	2.22	-	3.52	3.32	
Pot Cap-1 Maneuver	-	-	993	-	168	680	
Stage 1	-	-	-	-	467	-	
Stage 2	-	-	-	-	502	-	
Platoon blocked, %	-	-		-			
Mov Cap-1 Maneuver	-	-	993	-	155	680	
Mov Cap-2 Maneuver	-	-	-	-	283	-	
Stage 1	-	-	-	-	467	-	
Stage 2	-	-	-	-	464	-	
Approach	EB		WB		NB		
HCM Control Delay, s	0		0.9		15.4		
HCM LOS	C						
Minor Lane/Major Mvmt	NBLn1		NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	283		680	-	-	993	-
HCM Lane V/C Ratio	0.283		0.304	-	-	0.075	-
HCM Control Delay (s)	22.7		12.6	-	-	8.9	-
HCM Lane LOS	C		B	-	-	A	-
HCM 95th %tile Q(veh)	1.1		1.3	-	-	0.2	-

Intersection						
Int Delay, s/veh	4.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↱		↱	↑↑	↱	↱
Traffic Vol, veh/h	697	135	132	517	67	99
Future Vol, veh/h	697	135	132	517	67	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-5	5	-
Peak Hour Factor	93	71	82	87	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	749	190	161	594	92	136
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	939	0	1463	470
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	619	-
Critical Hdwy	-	-	4.14	-	7.84	7.44
Critical Hdwy Stg 1	-	-	-	-	6.84	-
Critical Hdwy Stg 2	-	-	-	-	6.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	726	-	~ 79	506
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	421	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	726	-	~ 61	506
Mov Cap-2 Maneuver	-	-	-	-	171	-
Stage 1	-	-	-	-	302	-
Stage 2	-	-	-	-	328	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.4		28.2	
HCM LOS	D					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	171	506	-	-	726	-
HCM Lane V/C Ratio	0.537	0.268	-	-	0.222	-
HCM Control Delay (s)	48.1	14.7	-	-	11.4	-
HCM Lane LOS	E	B	-	-	B	-
HCM 95th %tile Q(veh)	2.7	1.1	-	-	0.8	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

APPENDIX G

ITE TRIP GENERATION RATES

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

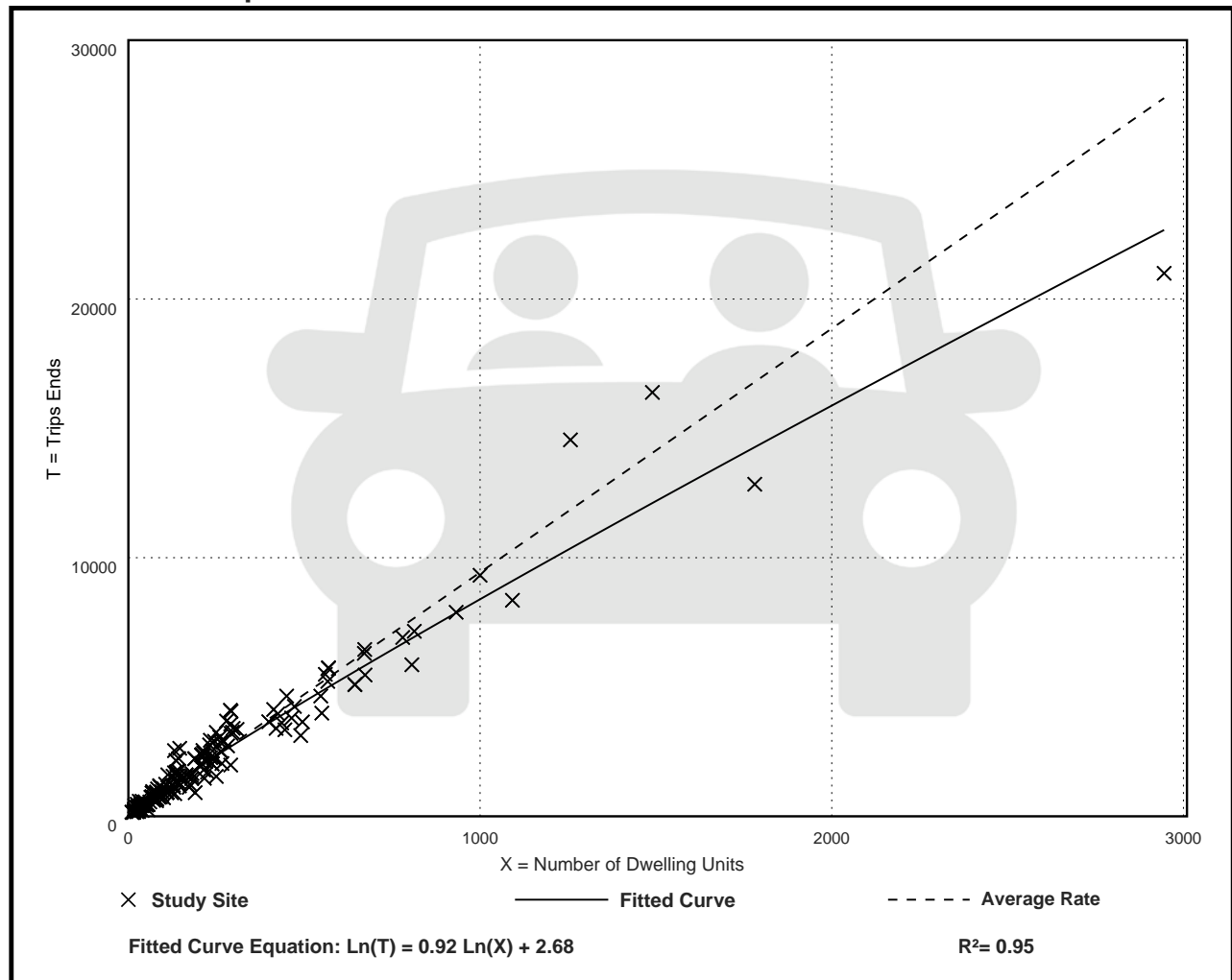
Avg. Num. of Dwelling Units: 246

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



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

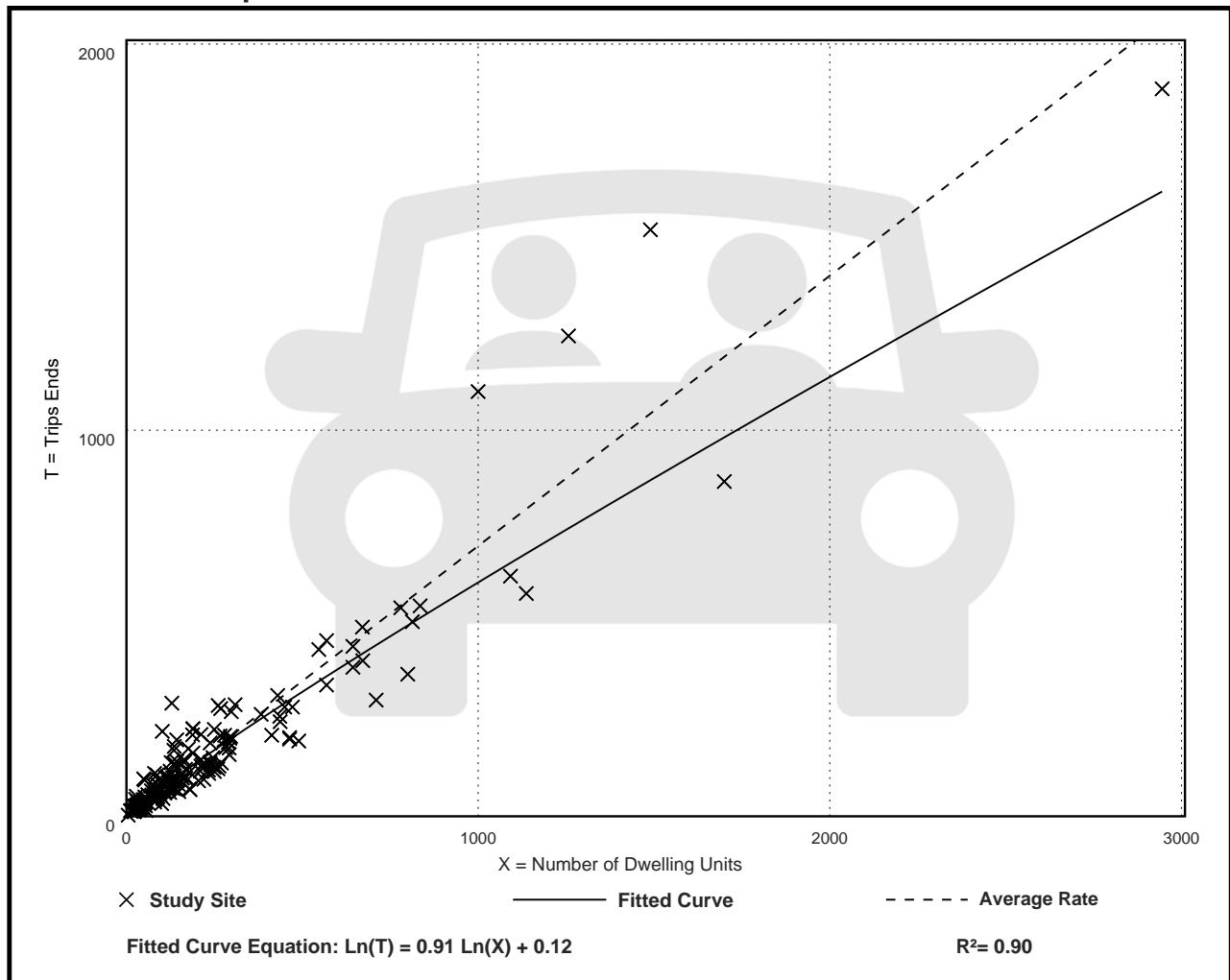
Avg. Num. of Dwelling Units: 226

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

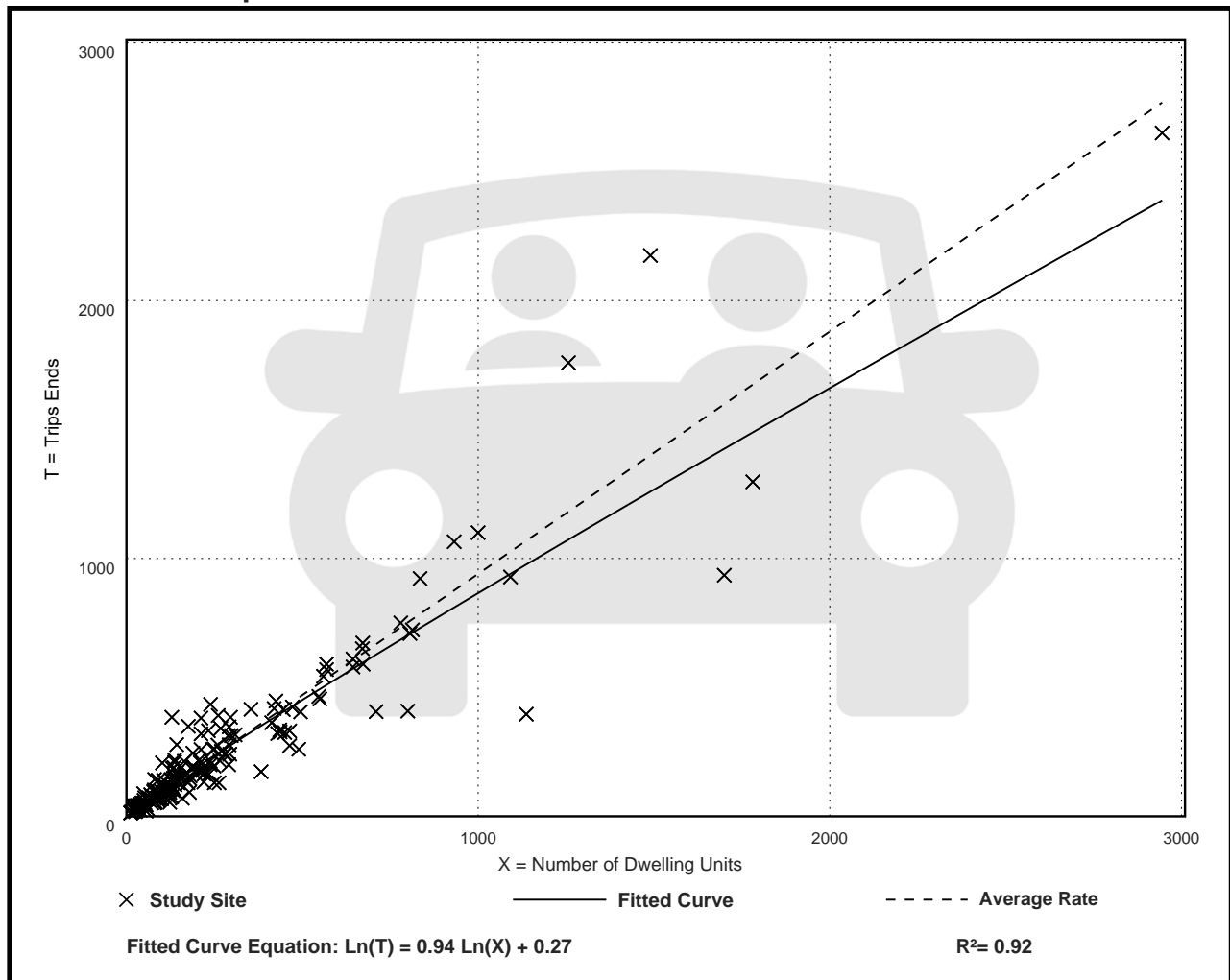
Avg. Num. of Dwelling Units: 248

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



TRIP GENERATION FOR FAIRVIEW ROAD SUBDIVISION

128 Single-Family Detached Houses

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	128 Houses	1,267	26%	74%		63%	37%	
				24	69	93	79	46	125
Total New Volume Site Trips			1,267	24	69	93	79	46	125

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

TRIP GENERATION FOR FAIRVIEW ROAD SUBDIVISION

128 Single-Family Detached Houses

128 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 4.85 + 2.68$$

$$\ln(T) = 7.14$$

$$T = \underline{\underline{1,267 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 5 + 0.12$$

$$\ln(T) = 4.54$$

$$T = \underline{\underline{93 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.94 * 4.85 + 0.27$$

$$\ln(T) = 4.83$$

$$T = \underline{\underline{125 \text{ trips}}}$$

TRIP GENERATION FOR BEELER FARMS SUBDIVISION

53 Single-Family Detached Houses

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	53 Houses	563	26%	74%		63%	37%	
				11	31	42	35	20	55
Total New Volume Site Trips			563	11	31	42	35	20	55

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

TRIP GENERATION FOR BEELER FARMS SUBDIVISION

53 Single-Family Detached Houses

53 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 3.97 + 2.68$$

$$\ln(T) = 6.33$$

$$T = \underline{\underline{563 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 4 + 0.12$$

$$\ln(T) = 3.73$$

$$T = \underline{\underline{42 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.94 * 3.97 + 0.27$$

$$\ln(T) = 4.00$$

$$T = \underline{\underline{55 \text{ trips}}}$$

TRIP GENERATION FOR BEELER ROAD SUBDIVISION

87 Single-Family Detached Houses

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	87 Houses	888	26%	74%		63%	37%	
				17	49	66	55	32	87
Total New Volume Site Trips			888	17	49	66	55	32	87

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

TRIP GENERATION FOR BEELER ROAD SUBDIVISION

87 Single-Family Detached Houses

87 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 4.47 + 2.68$$

$$\ln(T) = 6.79$$

$$T = \underline{\underline{888 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 4 + 0.12$$

$$\ln(T) = 4.18$$

$$T = \underline{\underline{66 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.94 * 4.47 + 0.27$$

$$\ln(T) = 4.47$$

$$T = \underline{\underline{87 \text{ trips}}}$$

TRIP GENERATION FOR FAIRVIEW ROAD & BEELER ROAD SUBDIVISIONS

215 Single-Family Detached Houses

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	215 Houses	2,155	26%	74%		63%	37%	
				41	118	159	134	78	212
Total New Volume Site Trips			2,155	41	118	159	134	78	212

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

**TRIP GENERATION FOR EXISTING HOUSES BETWEEN EAST EMORY ROAD &
 BEELER FARMS LANE**
126 Single-Family Detached Houses

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	126 Houses	1,249	26%	74%		63%	37%	
				24	68	92	77	46	123
Total New Volume Site Trips			1,249	24	68	92	77	46	123

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

TRIP GENERATION FOR EXISTING HOUSES BETWEEN EAST EMORY ROAD & BEELER FARMS LANE

126 Single-Family Detached Houses

126 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 4.84 + 2.68$$

$$\ln(T) = 7.13$$

$$T = \underline{\underline{1,249 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 5 + 0.12$$

$$\ln(T) = 4.52$$

$$T = \underline{\underline{92 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.94 * 4.84 + 0.27$$

$$\ln(T) = 4.82$$

$$T = \underline{\underline{123 \text{ trips}}}$$

TRIP GENERATION FOR BEELER FARMS SUBDIVISION

27 Single-Family Detached Houses

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	27 Houses	303	26%	74%		63%	37%	
				6	17	23	18	11	29
Total New Volume Site Trips			303	6	17	23	18	11	29

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

TRIP GENERATION FOR BEELER FARMS SUBDIVISION

27 Single-Family Detached Houses

27 Residential Houses = X

Weekday:

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

$$\ln(T) = 0.92 * 3.30 + 2.68$$

$$\ln(T) = 5.71$$

$$T = \underline{\underline{303 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 3 + 0.12$$

$$\ln(T) = 3.12$$

$$T = \underline{\underline{23 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.94 * 3.30 + 0.27$$

$$\ln(T) = 3.37$$

$$T = \underline{\underline{29 \text{ trips}}}$$

APPENDIX H

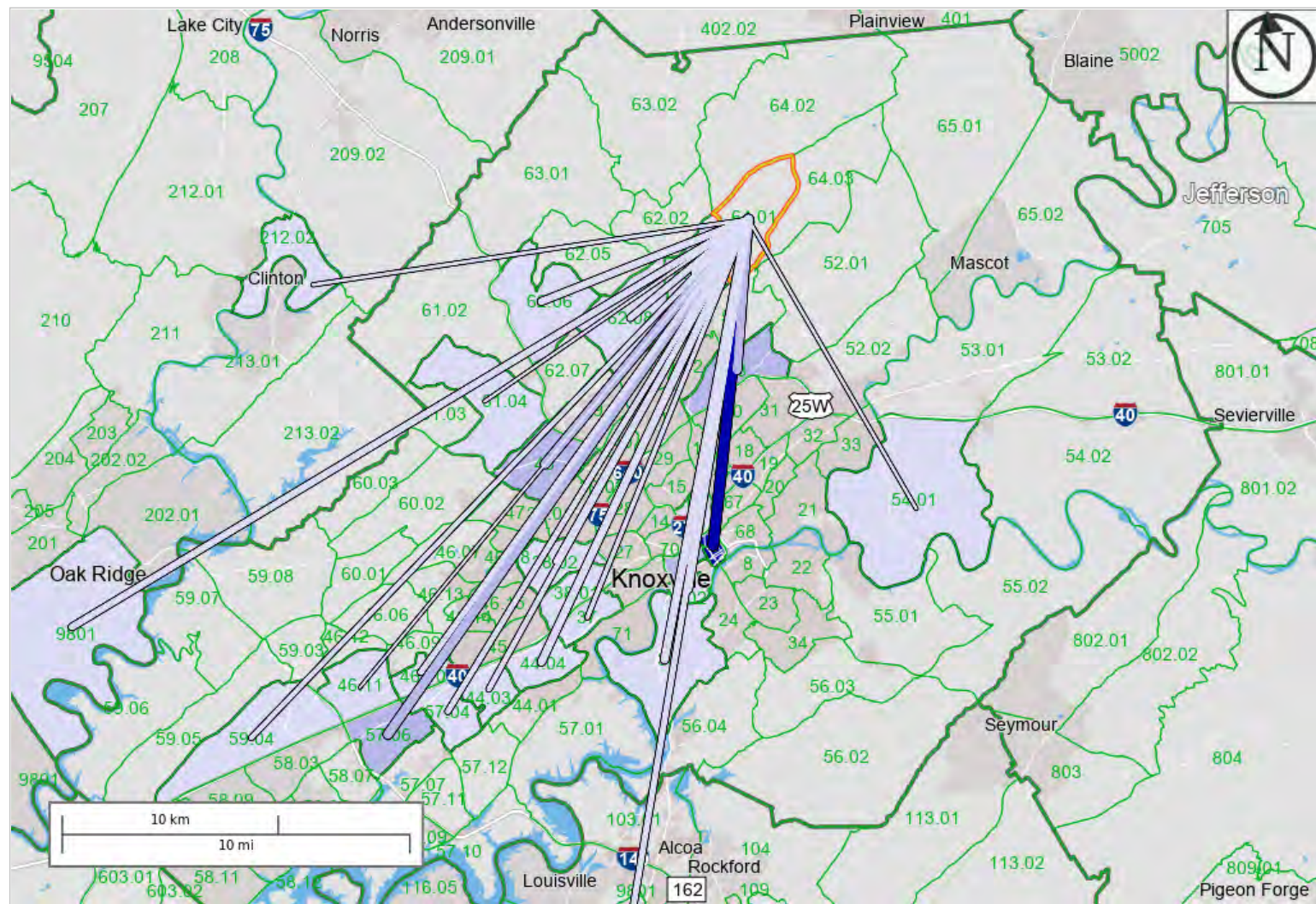
2019 CENSUS BUREAU DATA

Work Destination Report - Home Selection Area to Work Census Tracts All Jobs for All Workers in 2019

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 05/11/2022

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers



Map Legend

Job Count

- 184 - 210
- 157 - 183
- 130 - 156
- 104 - 129
- 77 - 103
- 50 - 76
- 23 - 49

Selection Areas

- ✦ Analysis Selection

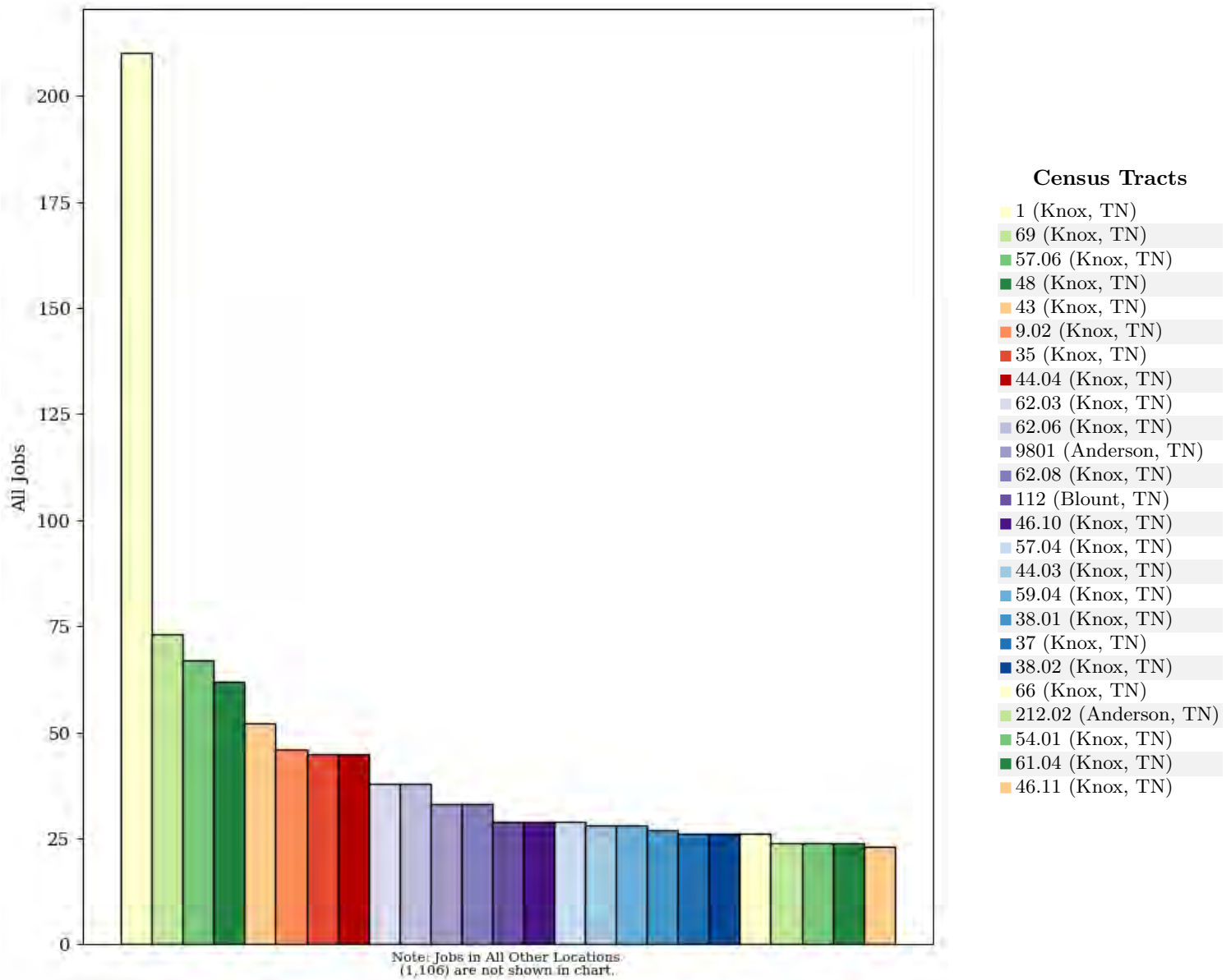
Job Count

- ✦ 184 - 210
- ✦ 157 - 183
- ✦ 130 - 156
- ✦ 104 - 129
- ✦ 77 - 103
- ✦ 50 - 76
- ✦ 23 - 49



All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers

Census Tracts as Work Destination Area	2019	
	Count	Share
All Census Tracts	2,191	100.0
1 (Knox, TN)	210	9.6
69 (Knox, TN)	73	3.3
57.06 (Knox, TN)	67	3.1
48 (Knox, TN)	62	2.8
43 (Knox, TN)	52	2.4
9.02 (Knox, TN)	46	2.1
35 (Knox, TN)	45	2.1
44.04 (Knox, TN)	45	2.1
62.03 (Knox, TN)	38	1.7
62.06 (Knox, TN)	38	1.7

Census Tracts as Work Destination Area	2019	
	Count	Share
9801 (Anderson, TN)	33	1.5
62.08 (Knox, TN)	33	1.5
112 (Blount, TN)	29	1.3
46.10 (Knox, TN)	29	1.3
57.04 (Knox, TN)	29	1.3
44.03 (Knox, TN)	28	1.3
59.04 (Knox, TN)	28	1.3
38.01 (Knox, TN)	27	1.2
37 (Knox, TN)	26	1.2
38.02 (Knox, TN)	26	1.2
66 (Knox, TN)	26	1.2
212.02 (Anderson, TN)	24	1.1
54.01 (Knox, TN)	24	1.1
61.04 (Knox, TN)	24	1.1
46.11 (Knox, TN)	23	1.0
All Other Locations	1,106	50.5

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2019
Job Type	All Jobs
Selection Area	64.01 (Knox, TN) from Census Tracts
Selected Census Blocks	41
Analysis Generation Date	05/11/2022 11:37 - OnTheMap 6.8.1
Code Revision	f9358819d46a60bb89052036516a1c8fe8bbbbeac
LODES Data Version	20211018_1647

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2019).

Notes

1. Race, Ethnicity, Educational Attainment, and Sex statistics are beta release results and are not available before 2009.
2. Educational Attainment is only produced for workers aged 30 and over.
3. Firm Age and Firm Size statistics are beta release results for All Private jobs and are not available before 2011.

APPENDIX I

KNOX COUNTY AND TDOT TURN LANE VOLUME THRESHOLD WORKSHEETS

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	<div>Beeler Road at Beeler Farms Lane</div> <div>2027 Projected AM Peak Hour SB Left Turns = 11</div> <div>SB Left-Turn Lane NOT Warranted</div>		115 105	100 90	80 70
300 - 349 350 - 399	155 135			95 85	80 70	65 60
400 - 449 450 - 499	120 105			75 70	65 60	55 50
500 - 549 550 - 599	95 85			65 60	55 50	50 45
600 - 649 650 - 699	75 70	65 60	60 55	55 50	45 40	40 35
700 - 749 750 or More	65 60	55 50	50 45	45 40	35 35	30 30

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	60 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

* Or through volume only if a right-turn lane exists.

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	170 150	140 125	115 105	100 90	80 70
300 - 349 350 - 399	155 135	<div>Beeler Road at Beeler Farms Lane</div> <div>2027 Projected PM Peak Hour SB Left Turns = 35</div> <div>SB Left-Turn Lane NOT Warranted</div>		95 85	80 70	65 60
400 - 449 450 - 499	120 105			75 70	65 60	55 50
500 - 549 550 - 599	95 85			65 60	55 50	50 45
600 - 649 650 - 699	75 70			55 50	45 40	40 35
700 - 749 750 or More	65 60			45 40	35 35	30 30

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	60 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

* Or through volume only if a right-turn lane exists.

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
29 + 0 = 29	29					
100 - 149	300	235	185	145	120	100
150 - 199	245	200	160	130	110	90
200 - 249	205	170	140	115	100	80
250 - 299	175	150	125	105	90	70
300 - 349	155	Beeler Road at Beeler Road Subdivision Entrance 2027 Projected AM Peak Hour SB Left Turns = 40 SB Left-Turn Lane NOT Warranted		95	80	65
350 - 399	135			85	70	60
400 - 449	120			75	65	55
450 - 499	105			70	60	50
500 - 549	95			65	55	50
550 - 599	85			60	50	45
600 - 649	75			55	45	40
650 - 699	70			50	40	35
700 - 749	65	55	50	45	35	30
750 or More	60	50	45	40	35	30

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	100	80	70	60	55	50
150 - 199	90	75	65	55	50	45
200 - 249	80	72	60	55	50	45
250 - 299	70	65	55	50	45	40
300 - 349	65	60	50	50	45	40
350 - 399	60	55	50	45	40	40
400 - 449	55	50	45	45	40	35
450 - 499	50	45	45	40	35	35
500 - 549	50	45	40	40	35	35
550 - 599	45	40	40	35	35	35
600 - 649	40	35	35	35	35	30
650 - 699	35	35	35	30	30	30
700 - 749	30	30	30	30	30	30
750 or More	30	30	30	30	30	30

* Or through volume only if a right-turn lane exists.

TABLE 4A

LEFT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 35 MPH OR LESS

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	300 245	235 200	185 160	145 130	120 110	100 90
200 - 249 250 - 299	205 175	<div>Beeler Road at Beeler Road Subdivision Entrance</div> <div>2027 Projected PM Peak Hour SB Left Turns = 132</div> <div>SB Left-Turn Lane NOT Warranted</div>		115 105	100 90	80 70
300 - 349 350 - 399	155 135			95 85	80 70	65 60
400 - 449 450 - 499	120 105			75 70	65 60	55 50
500 - 549 550 - 599	95 85			65 60	55 50	50 45
600 - 649 650 - 699	75 70	65 60	60 55	55 50	45 40	40 35
700 - 749 750 or More	65 60	55 50	50 45	45 40	35 35	30 30

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149 150 - 199	100 90	80 75	70 65	60 55	55 50	50 45
200 - 249 250 - 299	80 70	72 65	60 55	55 50	50 45	45 40
300 - 349 350 - 399	65 60	60 55	50 50	50 45	45 40	40 40
400 - 449 450 - 499	55 50	50 45	45 45	45 40	40 35	35 35
500 - 549 550 - 599	50 45	45 40	40 40	40 35	35 35	35 35
600 - 649 650 - 699	40 35	35 35	35 35	35 30	35 30	30 30
700 - 749 750 or More	30 30	30 30	30 30	30 30	30 30	30 30

* Or through volume only if a right-turn lane exists.

TABLE 5A

**LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	70	<div style="border: 1px dashed green; padding: 5px; text-align: center;"> East Emory Road at Beeler Road 2022 Existing AM Peak Hour WB Left Turns = 31 Left Turn Lane Warranted </div>		45	40	35
150 - 199	60			40	35	30
200 - 249	55			35	30	30
250 - 299	50			30	30	30
300 - 349	45			30	25	25
350 - 399	40			25	25	20
400 - 449	35			25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

* Or through volume only if a right-turn lane exists

TABLE 5B

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
21 Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes		Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes		Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes		Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

TABLE 5A

**LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

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OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249			40	35	30	30
250 - 299			35	30	30	30
300 - 349			35	30	25	25
350 - 399			30	25	25	20
400 - 449			30	25	20	20
450 - 499			25	20	20	20
500 - 549			20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

East Emory Road at
Beeler Road

2022 Existing PM Peak Hour
WB Left Turns = 56

Left Turn Lane
Warranted

$$645 + 60 = 705$$

* Or through volume only if a right-turn lane exists

TABLE 5B

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99					Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes	Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes			Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

East Emory Road at
Beeler Road
2022 Existing PM Peak Hour
EB Right Turns = 60
Right Turn Lane
Warranted

TABLE 5A

**LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	70	<div style="border: 2px dashed green; padding: 10px; text-align: center;"> East Emory Road at Beeler Road 2027 Projected AM Peak Hour WB Left Turns = 58 Left Turn Lane Warranted </div>		45	40	35
150 - 199	60			40	35	30
200 - 249	55			35	30	30
250 - 299	50			30	30	30
300 - 349	45			30	25	25
350 - 399	40			25	25	20
400 - 449	35			25	20	20
450 - 499	30			20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

* Or through volume only if a right-turn lane exists

TABLE 5B

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes			Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

East Emory Road at
Beeler Road

2027 Projected AM
EB Right Turns = 40

Right Turn Lane NOT
Warranted

* Or through volume only if a left-turn lane exists.

TABLE 5A

**LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	<div style="border: 1px dashed green; padding: 5px; text-align: center;"> East Emory Road at Beeler Road 2027 Projected PM Peak Hour WB Left Turns = 132 Left Turn Lane Warranted </div>		35	30	30
250 - 299	50			30	30	30
300 - 349	45			30	25	25
350 - 399	40			25	25	20
400 - 449	35			25	20	20
450 - 499	30			20	20	20
500 - 549	25			20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

$$677 + 135 = 812$$

* Or through volume only if a right-turn lane exists

TABLE 5B

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

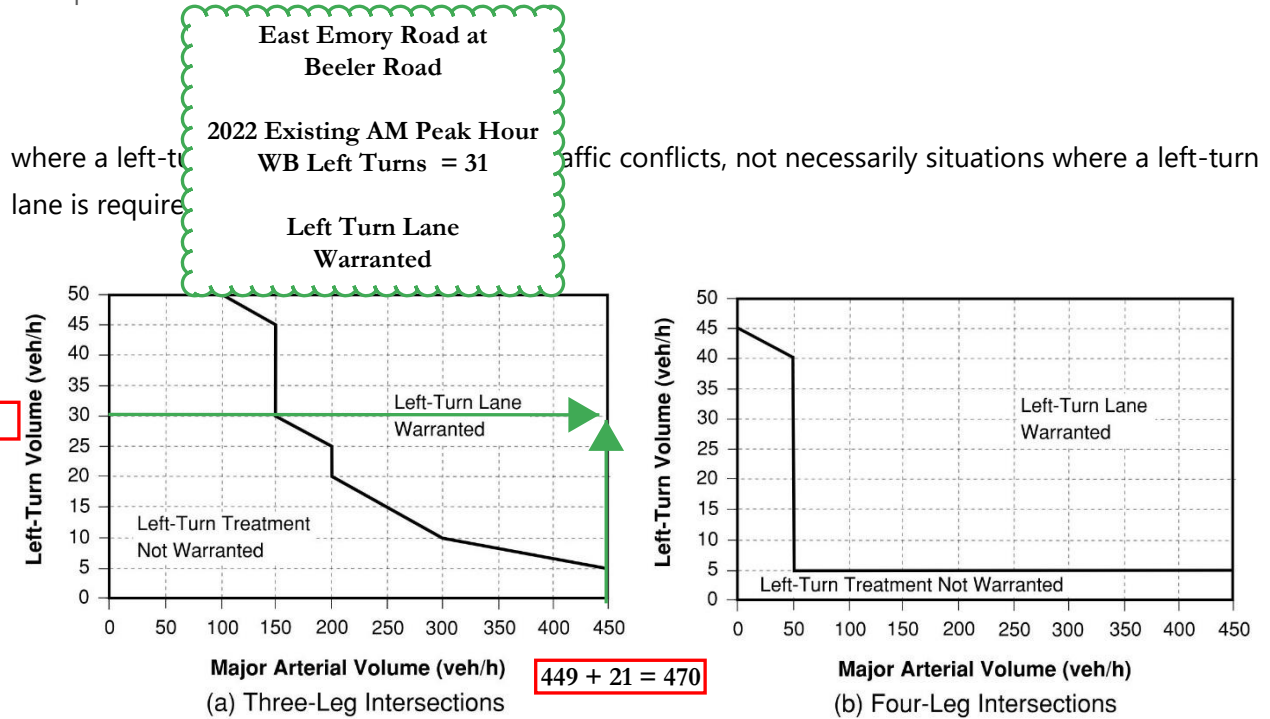
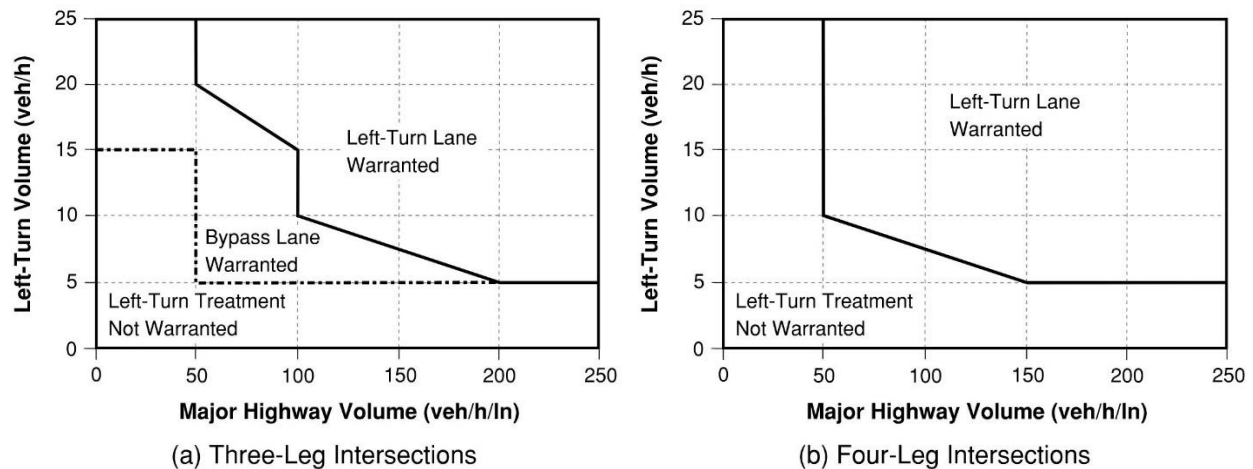
RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes			Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

East Emory Road at
Beeler Road

2027 Projected PM
EB Right Turns = 134

Right Turn Lane
Warranted

* Or through volume only if a left-turn lane exists.

Figure 3-15: Left-Turn Lane Warrant for Urban and Suburban Arterials (Unsignalized)^{20, 21}Figure 3-16: Left-Turn Lane Warrant for Two-Lane Rural Roadways (Unsignalized)^{20, 21}²⁰ TRB, NCHRP Report 745, Left-Turn Accommodations at Unsignalized Intersections (2013)²¹ AASHTO, A Policy on Geometric Design of Highways and Streets 7th Edition (2018)

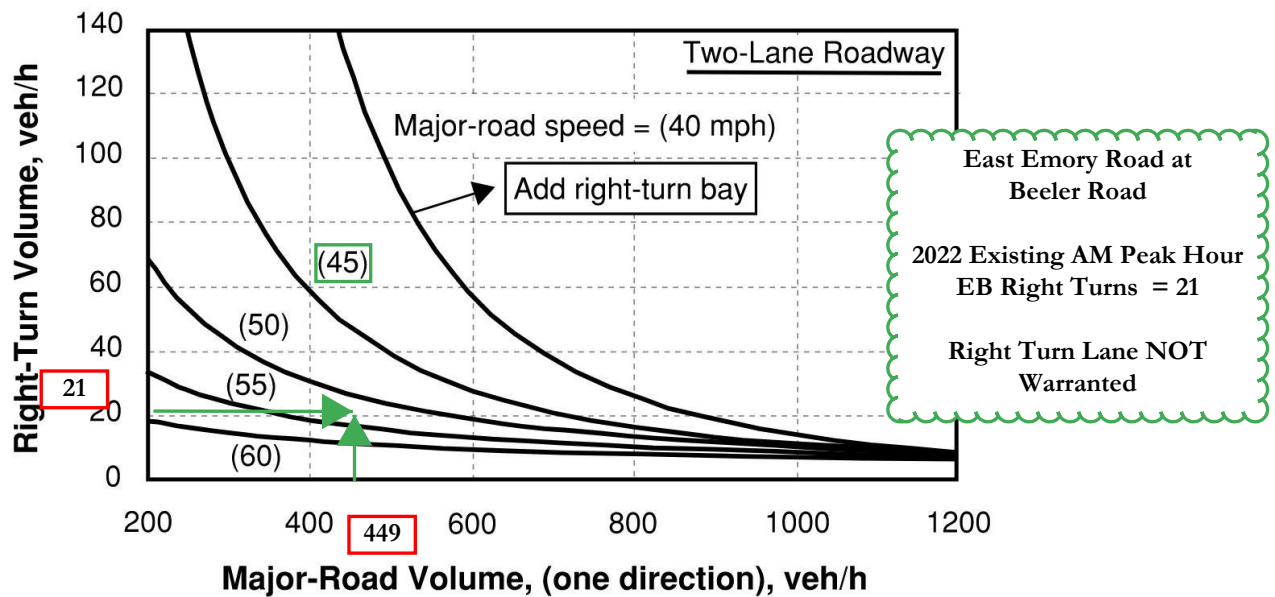


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

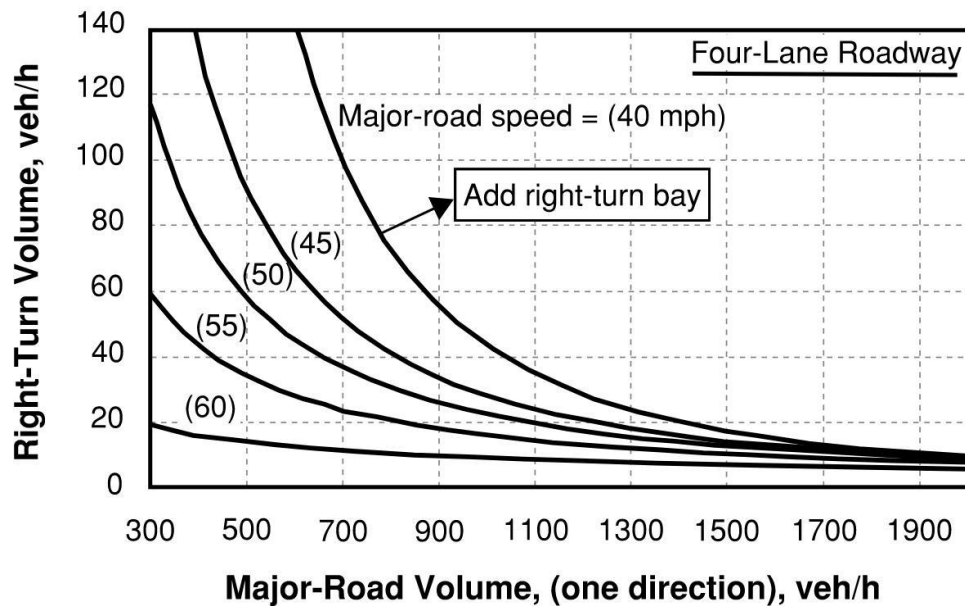


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

**East Emory Road at
Beeler Road**

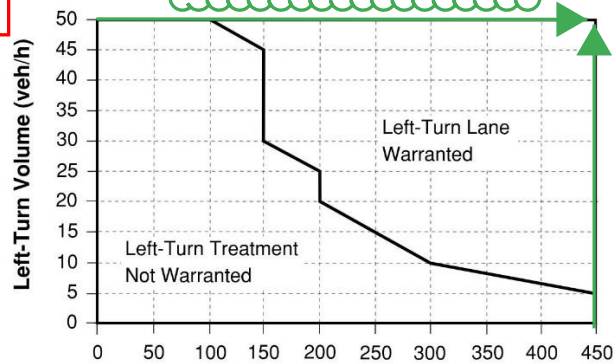
2022 Existing PM Peak Hour

WB Left Turns = 56

where a left-turn lane is required due to traffic conflicts, not necessarily situations where a left-turn lane is required.

**Left Turn Lane
Warranted**

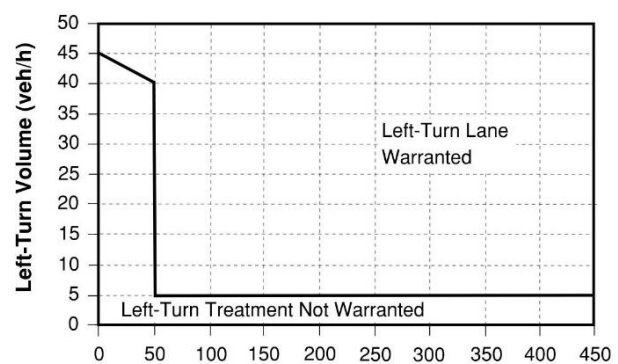
56



Major Arterial Volume (veh/h)

(a) Three-Leg Intersections

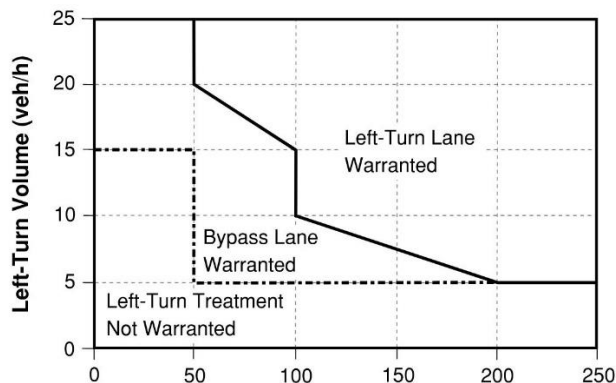
645 + 60 = 705



Major Arterial Volume (veh/h)

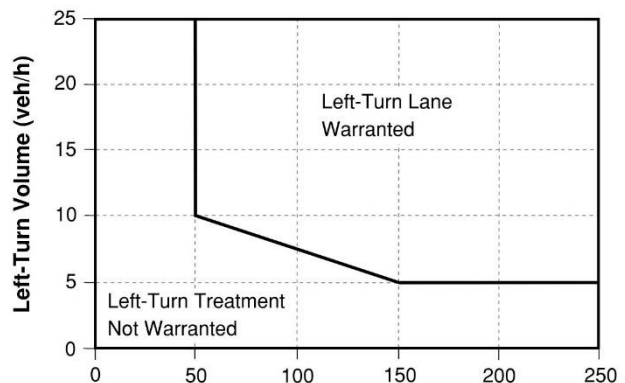
(b) Four-Leg Intersections

Figure 3-15: Left-Turn Lane Warrant for Urban and Suburban Arterials (Unsignalized)^{20, 21}



Major Highway Volume (veh/h/ln)

(a) Three-Leg Intersections



Major Highway Volume (veh/h/ln)

(b) Four-Leg Intersections

Figure 3-16: Left-Turn Lane Warrant for Two-Lane Rural Roadways (Unsignalized)^{20, 21}

²⁰ TRB, NCHRP Report 745, Left-Turn Accommodations at Unsignalized Intersections (2013)

²¹ AASHTO, A Policy on Geometric Design of Highways and Streets 7th Edition (2018)

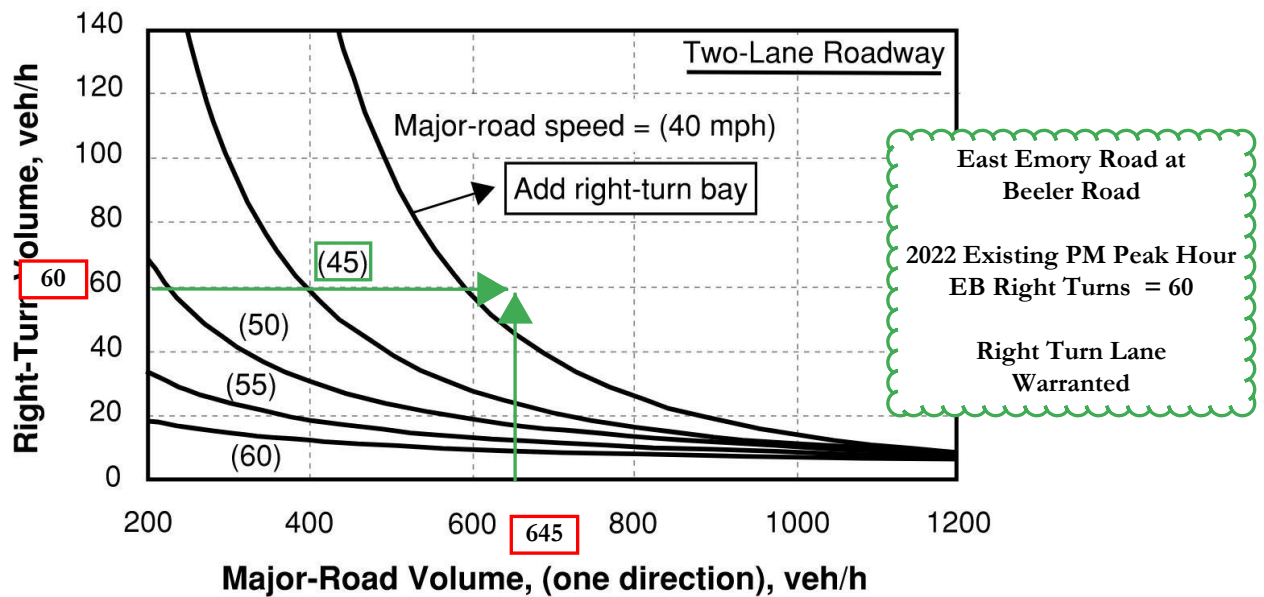


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

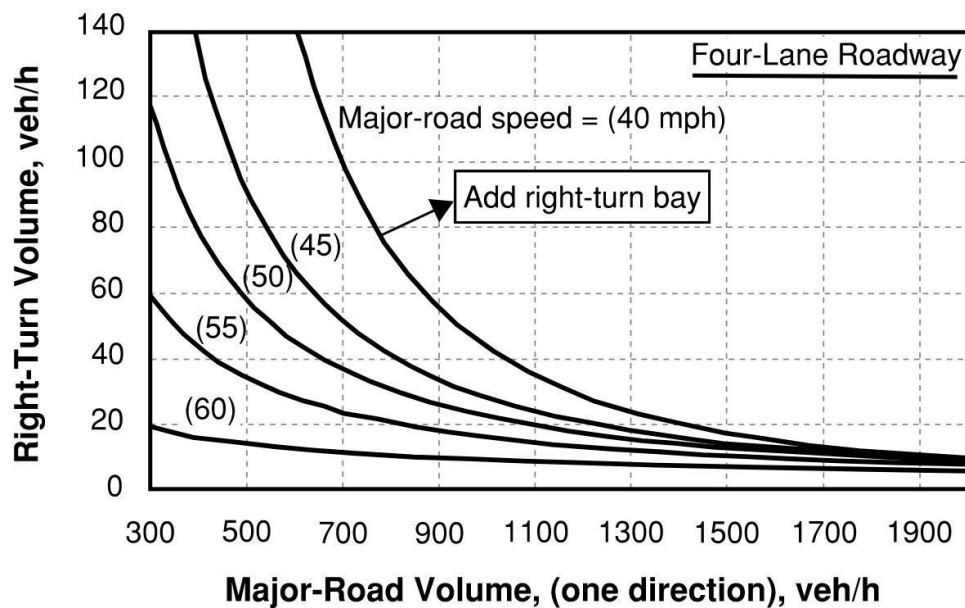


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

**East Emory Road at
Beeler Road**

**2027 Projected AM Peak Hour
WB Left Turns = 58**

**Left Turn Lane
Warranted**

where a left-turn lane
lane is required or

conflicts, not necessarily situations where a left-turn

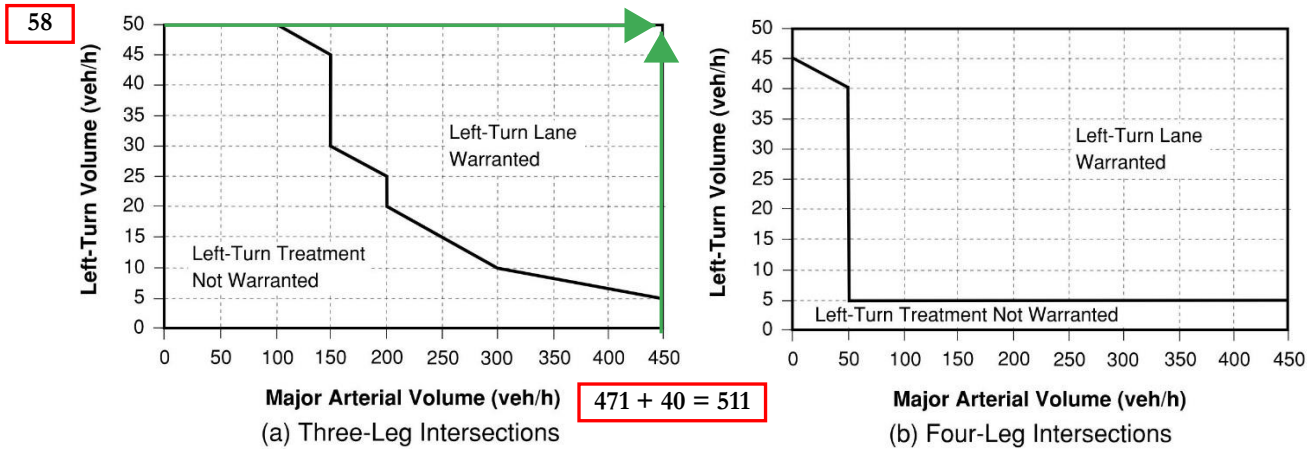


Figure 3-15: Left-Turn Lane Warrant for Urban and Suburban Arterials (Unsignalized)^{20, 21}

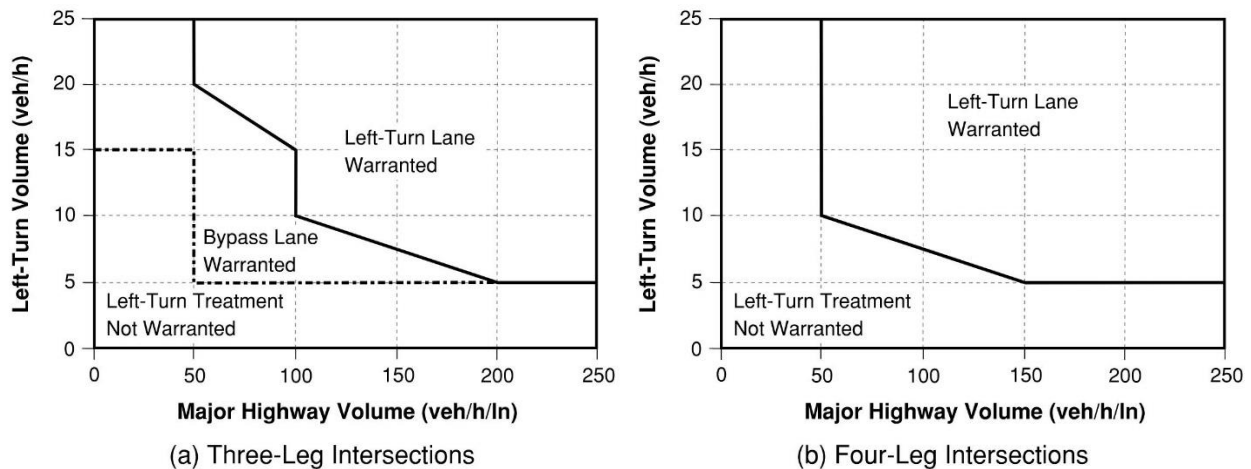


Figure 3-16: Left-Turn Lane Warrant for Two-Lane Rural Roadways (Unsignalized)^{20, 21}

²⁰ TRB, NCHRP Report 745, Left-Turn Accommodations at Unsignalized Intersections (2013)

²¹ AASHTO, A Policy on Geometric Design of Highways and Streets 7th Edition (2018)

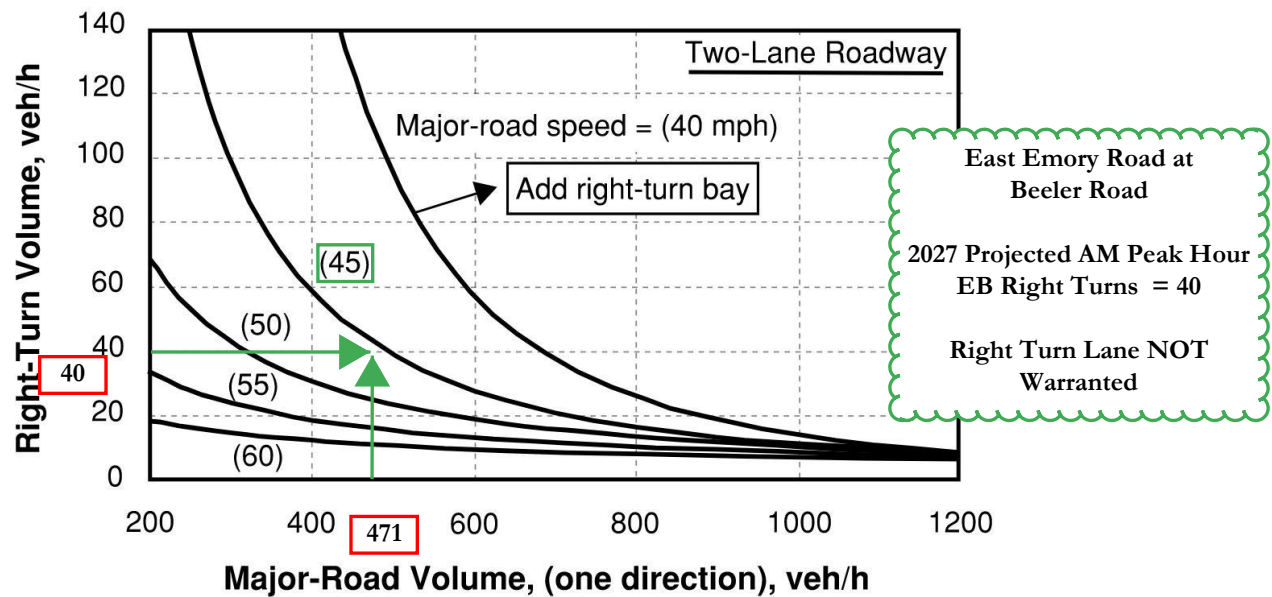


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

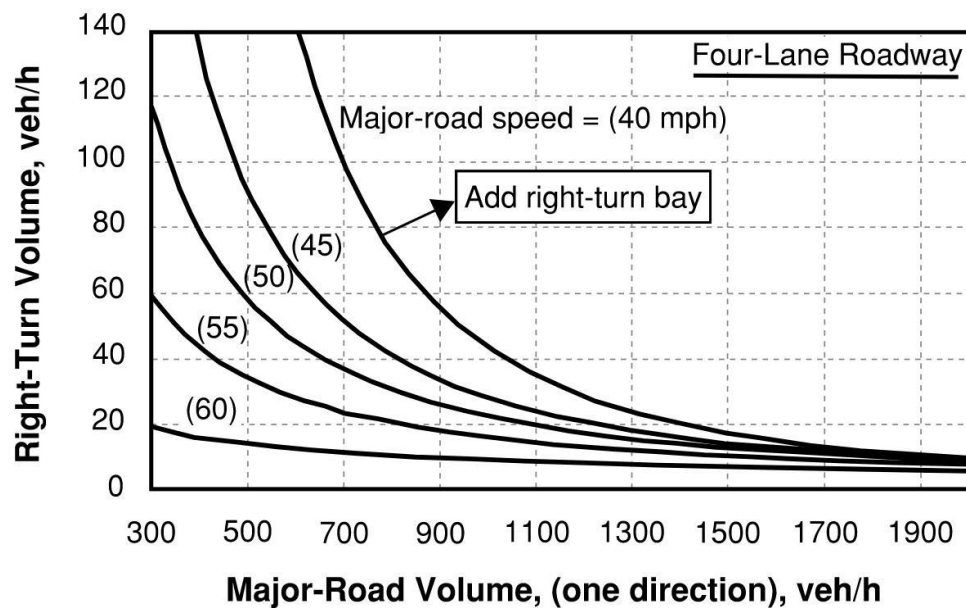


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

**East Emory Road at
Beeler Road**

**2027 Projected PM Peak Hour
WB Left Turns = 132**

**Left Turn Lane
Warranted**

where a left-turn lane
lane is required or not

conflicts, not necessarily situations where a left-turn

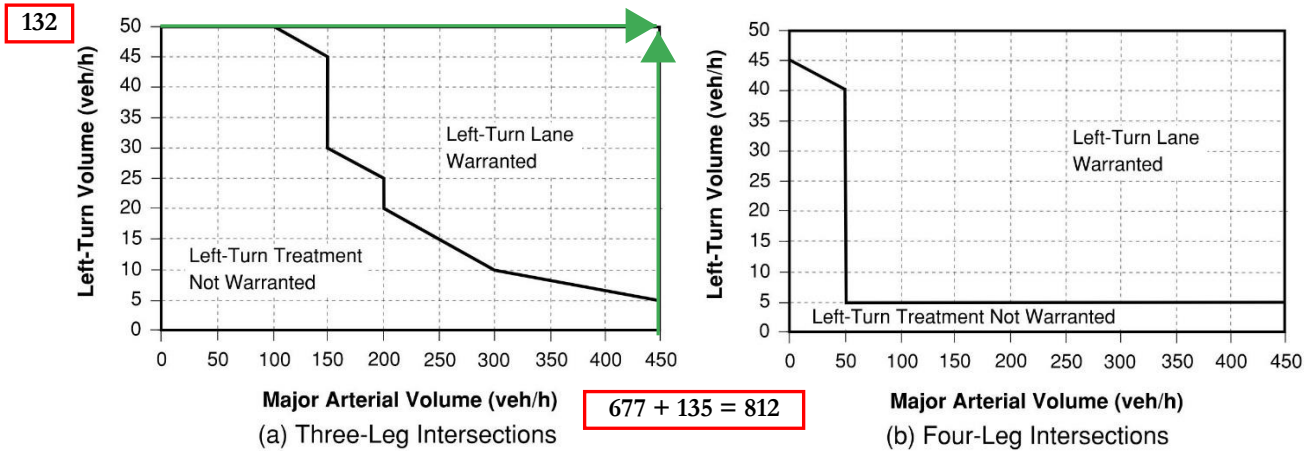


Figure 3-15: Left-Turn Lane Warrant for Urban and Suburban Arterials (Unsignalized)^{20, 21}

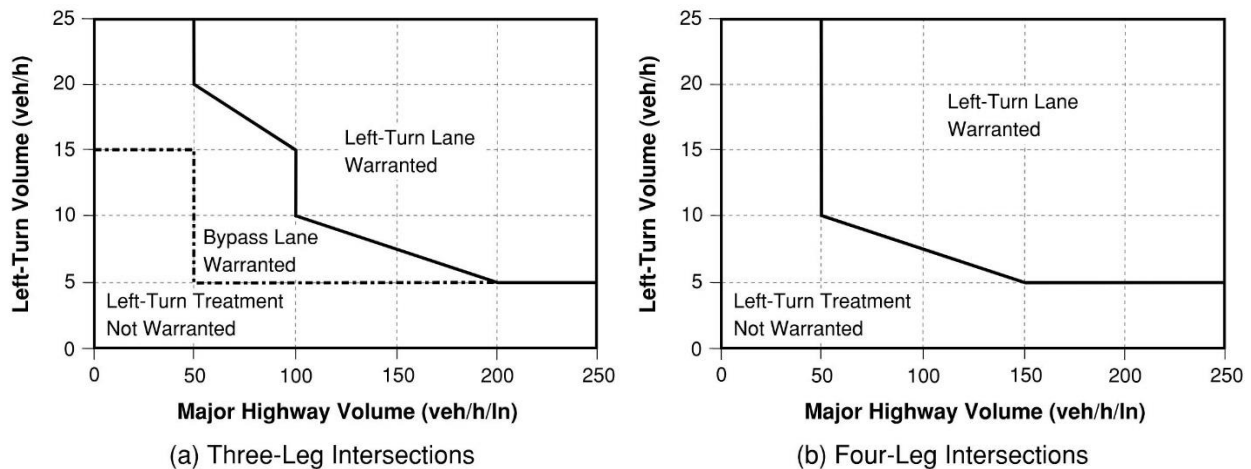


Figure 3-16: Left-Turn Lane Warrant for Two-Lane Rural Roadways (Unsignalized)^{20, 21}

²⁰ TRB, NCHRP Report 745, Left-Turn Accommodations at Unsignalized Intersections (2013)

²¹ AASHTO, A Policy on Geometric Design of Highways and Streets 7th Edition (2018)

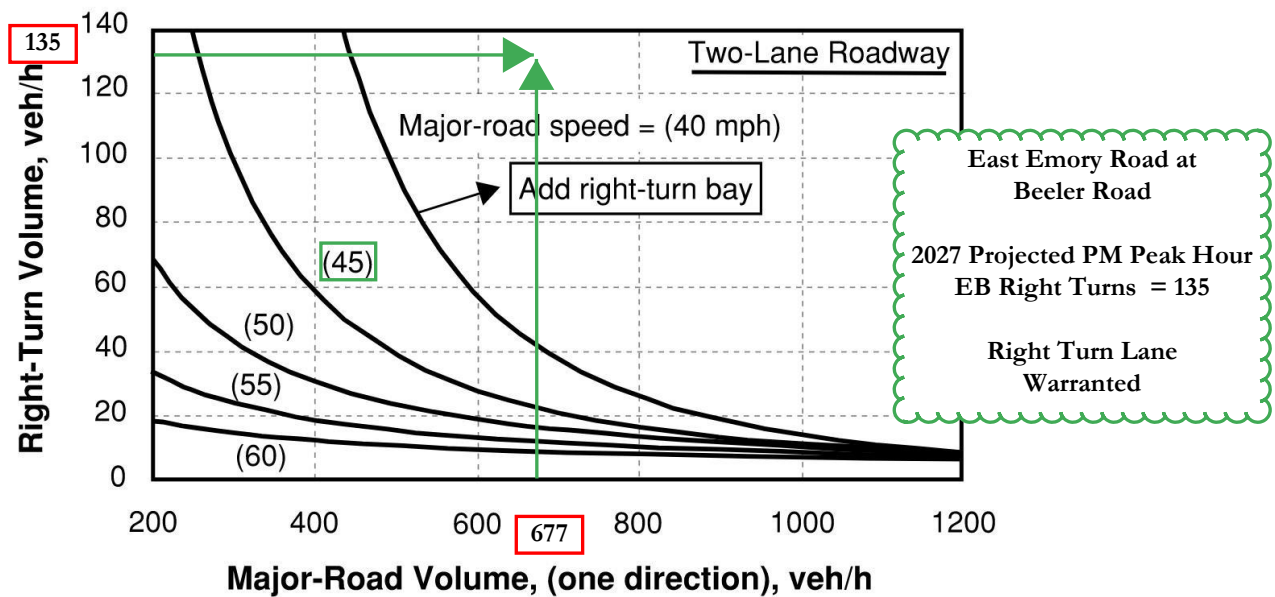


Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴

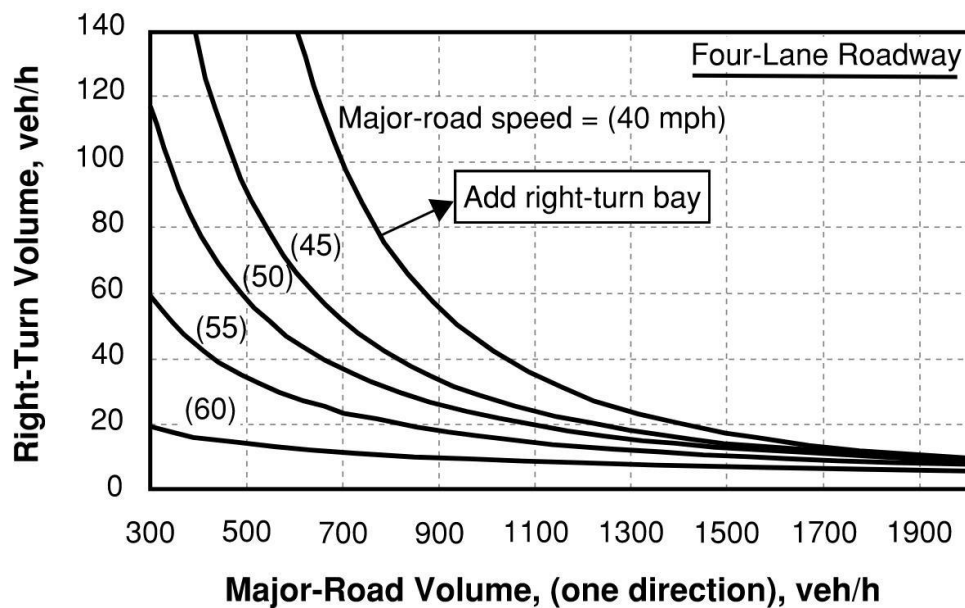


Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

TABLE 5B

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

$$485/2 = 235.5 * 1.05 = 255$$

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25						
25 - 49						
50 - 99						
100 - 149						
150 - 199						
200 - 249						Yes
250 - 299					Yes	Yes
300 - 349				Yes	Yes	Yes
350 - 399				Yes	Yes	Yes
400 - 449				Yes	Yes	Yes
450 - 499				Yes	Yes	Yes
500 - 549				Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

East Emory Road at
Beeler Road
(Widened to 5-Lanes)

2030 Projected AM Peak Hour
EB Right Turns = 40

Right Turn Lane NOT
Warranted

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25						
25 - 49					Yes	Yes
50 - 99				Yes	Yes	Yes
100 - 149			Yes	Yes	Yes	Yes
150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249	Yes	Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

TABLE 5B

**RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH**

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

$$697/2 = 348.5 * 1.05 = 366$$

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes			Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

East Emory Road at
Beeler Road
(Widened to 5-Lanes)

2030 Projected PM Peak Hour
EB Right Turns = 135

Right Turn Lane NOT
Warranted

* Or through volume only if a left-turn lane exists.

APPENDIX J

SIMTRAFFIC VEHICLE QUEUE WORKSHEETS

Intersection: 4: Beeler Road & East Emory Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	2	188	189
Average Queue (ft)	0	39	84
95th Queue (ft)	2	114	156
Link Distance (ft)	221	212	215
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Beeler Road & East Emory Road

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	36	235	252
Average Queue (ft)	3	125	191
95th Queue (ft)	17	242	298
Link Distance (ft)	221	212	215
Upstream Blk Time (%)		7	60
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
With NB and EB Right Turn Lanes

11/28/2022

Intersection: 4: Beeler Road & East Emory Road

Movement	EB	WB	NB	NB
Directions Served	R	LT	L	R
Maximum Queue (ft)	11	162	103	107
Average Queue (ft)	0	35	33	43
95th Queue (ft)	5	105	72	79
Link Distance (ft)		200	202	
Upstream Blk Time (%)		0	0	
Queuing Penalty (veh)		0	0	
Storage Bay Dist (ft)	75			100
Storage Blk Time (%)			0	0
Queuing Penalty (veh)			0	0

Queuing and Blocking Report
With NB and EB Right Turn Lanes

11/28/2022

Intersection: 4: Beeler Road & East Emory Road

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	LT	L	R
Maximum Queue (ft)	9	34	224	171	112
Average Queue (ft)	0	4	104	62	41
95th Queue (ft)	5	20	216	145	99
Link Distance (ft)	221		200	202	
Upstream Blk Time (%)			3	1	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (ft)		75			100
Storage Blk Time (%)				9	0
Queuing Penalty (veh)				8	0

Queuing and Blocking Report
With TDOT Widening & NB Right Turn Lane

11/28/2022

Intersection: 4: Beeler Road & East Emory Road

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	6	54	81	82
Average Queue (ft)	0	18	35	41
95th Queue (ft)	5	45	66	66
Link Distance (ft)	275		197	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		75		100
Storage Blk Time (%)		0	0	0
Queuing Penalty (veh)		0	0	0

Queuing and Blocking Report
With TDOT Widening & NB Right Turn Lane

11/28/2022

Intersection: 4: Beeler Road & East Emory Road

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	TR	L	T	L	R
Maximum Queue (ft)	6	29	85	10	121	110
Average Queue (ft)	0	3	40	0	47	37
95th Queue (ft)	4	17	71	10	100	76
Link Distance (ft)	275	275		340	197	
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)			75			100
Storage Blk Time (%)			1		3	0
Queuing Penalty (veh)			3		3	0

APPENDIX K

TRAFFIC SIGNAL WARRANT WORKSHEETS

PROJECTED FUTURE VOLUMES IN 2030
WITH TRAFFIC GROWTH AND GENERATED TRAFFIC
East Emory Road at Beeler Road

TIME BEGIN	East Emory Road		Beeler Road		East Emory Road	
	WESTBOUND		NORTHBOUND		EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
7:00 AM	3	108	9	27	82	5
7:15 AM	8	117	9	22	119	5
7:30 AM	10	148	8	24	115	4
7:45 AM	9	161	5	16	111	4
Sum	30	534	31	89	427	18
Growth from Beeler Farms Sub.	4	0	5	15	0	3
Growth from Beeler Road Sub.	11	0	16	47	0	7
General Growth	0	42.72	0	0	34.16	0
Trips Generated 7-8 am	18	0	21	63	0	12
2030	63	577	73	215	461	40
8:00 AM	4	124	5	23	104	8
8:15 AM	7	113	11	4	93	3
8:30 AM	4	105	5	13	52	5
8:45 AM	8	86	5	6	55	11
Sum	23	428	26	46	304	27
Growth from Beeler Farms Sub.	3	0	4	11	0	2
Growth from Beeler Road Sub.	8	0	12	35	0	5
General Growth	0	34.24	0	0	24.32	0
Trips Generated 8-9 am	13	0	16	48	0	9
2030	48	462	57	140	328	43
11:00 AM	1	59	9	7	62	5
11:15 AM	5	62	6	2	68	3
11:30 AM	6	77	8	4	76	8
11:45 AM	5	62	11	8	68	8
Sum	17	260	34	21	274	24
Growth from Beeler Farms Sub.	2	0	3	8	0	1
Growth from Beeler Road Sub.	5	0	8	24	0	4
General Growth	0	20.8	0	0	21.92	0
Trips Generated 11am-12 pm	9	0	11	33	0	6
2030	34	281	56	86	296	35
12:00 PM	8	64	11	6	73	13
12:15 PM	5	66	7	2	84	6
12:30 PM	2	70	10	1	83	6
12:45 PM	5	61	5	10	91	7
Sum	20	261	33	19	331	32
Growth from Beeler Farms Sub.	2	0	3	9	0	2
Growth from Beeler Road Sub.	6	0	9	27	0	4
General Growth	0	20.88	0	0	26.48	0
Trips Generated 12-1 pm	10	0	12	36	0	7
2030	39	282	57	91	357	44
2:00 PM	10	97	4	10	110	3
2:15 PM	7	89	4	7	106	7
2:30 PM	7	78	6	10	113	6
2:45 PM	10	95	4	11	110	7
Sum	34	359	18	38	439	23
Growth from Beeler Farms Sub.	3	0	4	11	0	2
Growth from Beeler Road Sub.	7	0	11	33	0	5
General Growth	0	28.72	0	0	35.12	0
Trips Generated 2-3 pm	13	0	15	45	0	8
2030	57	388	47	126	474	38
3:00 PM	11	102	8	15	96	5
3:15 PM	10	109	10	8	123	10
3:30 PM	18	98	6	6	107	7
3:45 PM	21	178	11	5	135	11
Sum	60	487	35	34	461	33
Growth from Beeler Farms Sub.	4	0	4	13	0	2
Growth from Beeler Road Sub.	9	0	14	41	0	6
General Growth	0	38.96	0	0	36.88	0
Trips Generated 3-4 pm	15	0	18	55	0	10
2030	88	526	71	143	498	52
4:00 PM	11	129	10	8	144	10
4:15 PM	14	113	7	10	147	11
4:30 PM	11	103	10	9	151	11
4:45 PM	17	120	4	9	164	11
Sum	53	465	31	36	606	43
Growth from Beeler Farms Sub.	4	0	5	15	0	3
Growth from Beeler Road Sub.	10	0	15	46	0	7
General Growth	0	37.2	0	0	48.48	0
Trips Generated 4-5 pm	17	0	21	62	0	12
2030	85	502	72	158	654	64
5:00 PM	16	109	8	12	173	12
5:15 PM	12	112	11	16	143	16
5:30 PM	11	138	9	10	165	21
5:45 PM	13	115	6	13	150	9
Sum	52	474	34	51	631	58
Growth from Beeler Farms Sub.	5	0	5	16	0	3
Growth from Beeler Road Sub.	11	0	17	50	0	8
General Growth	0	37.92	0	0	50.48	0
Trips Generated 5-6 pm	19	0	23	68	0	13
2030	87	512	79	185	681	81

Existing Volumes

Existing Volumes

Existing Volumes

Existing Volumes

Sum

Growth from Beeler Farms Subdivision

Growth from Beeler Road Subdivision

Growth Rate of 1.0% for 8 years

Trips Generated by Beeler Road Subdivision

Total Sum

Assumed Average Growth Rate (%)=	1.0%	0% Increase due to Covid
Number of years =	5	
Horizon Year =	2027	# of Horizon Years = 5

Note 1: The entering and exiting traffic volumes are estimated based on trip generation of the entire development, based on assumed amounts of entering and exiting traffic, assumed percentages of directional traffic, and the assumed percentage of trips based on time of day (from TDOT Table 4.2 in Traffic Design Manual)

Note 2: It is assumed that the construction of homes is linear growth

TODT Widening Project =	8	years	2030
-------------------------	---	-------	------

Daily Trips Generated by				
Entire Development:	1,267	Daily Trips Generated from Subdivision/Year	253	=
100% of trips			1267	trips by
				2027

	AM	PM
Traffic Movement Assumed Distribution:	25% to west East Emory, 75% to east East Emory 40% from west East Emory, 60% from east East Emory	40% to west East Emory, 60% to east East Emory 50% from west East Emory, 50% from east East Emory

Assume all townhouses

Entering and Exiting %'s (from ITE trip rate):

26% Enter	AM Hours
74% Exit	
50% Enter	Mid-Day Hours
50% Exit	
63% Enter	PM Hours
37% Exit	

Directional Distribution Assumptions:

25% to west East Emory Road
75% to east East Emory Road
40% from west East Emory Road
60% from east East Emory Road
25% to west East Emory Road
75% to east East Emory Road
40% from west East Emory Road
60% from east East Emory Road
40% to west East Emory Road
60% to east East Emory Road
50% from west East Emory Road
50% from east East Emory Road

Assume same DD for AM Peak Hour

TDOT Traffic Engineering Office - Table 4.2 - TDOT Traffic Design Manual

Population Tier = A (Knoxville)

TDOT Region 1 Average for Arterial Facilities (Two-Lane)

Time of Day	Percentage of Trips
7-8 am	9.03%
8-9 am	6.78%
11 am-Noon	4.68%
Noon-1 pm	5.17%
2-3 pm	6.34%
3-4 pm	7.83%
4-5 pm	8.79%
5-6 pm	9.64%
	58.26%

**PROJECTED FUTURE VOLUMES FROM GENERATED TRAFFIC FROM
REMAINING HOMES IN BEELER FARMS SUBDIVISION
East Emory Road at Beeler Road**

TIME BEGIN	East Emory Road WESTBOUND		Beeler Road NORTHBOUND		East Emory Road EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
7:00 AM						
7:15 AM						
7:30 AM						
7:45 AM						
Trips Generated 7-8 am	4	0	5	15	0	3
8:00 AM						
8:15 AM						
8:30 AM						
8:45 AM						
Trips Generated 8-9 am	3	0	4	11	0	2
11:00 AM						
11:15 AM						
11:30 AM						
11:45 AM						
Trips Generated 11am-12 pm	2	0	3	8	0	1
12:00 PM						
12:15 PM						
12:30 PM						
12:45 PM						
Trips Generated 12-1 pm	2	0	3	9	0	2
2:00 PM						
2:15 PM						
2:30 PM						
2:45 PM						
Trips Generated 2-3 pm	3	0	4	11	0	2
3:00 PM						
3:15 PM						
3:30 PM						
3:45 PM						
Trips Generated 3-4 pm	4	0	4	13	0	2
4:00 PM						
4:15 PM						
4:30 PM						
4:45 PM						
Trips Generated 4-5 pm	4	0	5	15	0	3
5:00 PM						
5:15 PM						
5:30 PM						
5:45 PM						
Trips Generated 5-6 pm	5	0	5	16	0	3

Growth from Beeler Farms Subdivision

Remaining Daily
Trips Generated by
Beeler Farms Subdivision: 303

	AM	PM
Traffic Movement Assumed Distribution:	25% to west East Emory, 75% to east East Emory 40% from west East Emory, 60% from east East Emory	40% to west East Emory, 60% to east East Emory 50% from west East Emory, 50% from east East Emory

Assume all townhouses

Entering and Exiting %'s (from ITE trip rate):		Directional Distribution Assumptions:	
26% Enter	AM Hours	25% to west East Emory Road	Assume same DD for AM Peak Hour
74% Exit		75% to east East Emory Road	
		40% from west East Emory Road	
		60% from east East Emory Road	
50% Enter	Mid-Day Hours	25% to west East Emory Road	Assume same DD for AM Peak Hour
50% Exit		75% to east East Emory Road	
		40% from west East Emory Road	
		60% from east East Emory Road	
63% Enter	PM Hours	40% to west East Emory Road	Assume same DD for AM Peak Hour
37% Exit		60% to east East Emory Road	
		50% from west East Emory Road	
		50% from east East Emory Road	

TDOT Traffic Engineering Office - Table 4.2 - TDOT Traffic Design Manual

Population Tier = A (Knoxville)

TDOT Region 1 Average for Arterial Facilities (Two-Lane)

Time of Day	Percentage of Trips
7-8 am	9.03%
8-9 am	6.78%
11 am-Noon	4.68%
Noon-1 pm	5.17%
2-3 pm	6.34%
3-4 pm	7.83%
4-5 pm	8.79%
5-6 pm	9.64%
	58.26%

**PROJECTED FUTURE VOLUMES FROM GENERATED TRAFFIC FROM
BEELER ROAD SUBDIVISION**
East Emory Road at Beeler Road

TIME BEGIN	East Emory Road WESTBOUND		Beeler Road NORTHBOUND		East Emory Road EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
7:00 AM						
7:15 AM						
7:30 AM						
7:45 AM						
Trips Generated 7-8 am	11	0	16	47	0	7
8:00 AM						
8:15 AM						
8:30 AM						
8:45 AM						
Trips Generated 8-9 am	8	0	12	35	0	5
11:00 AM						
11:15 AM						
11:30 AM						
11:45 AM						
Trips Generated 11am-12 pm	5	0	8	24	0	4
12:00 PM						
12:15 PM						
12:30 PM						
12:45 PM						
Trips Generated 12-1 pm	6	0	9	27	0	4
2:00 PM						
2:15 PM						
2:30 PM						
2:45 PM						
Trips Generated 2-3 pm	7	0	11	33	0	5
3:00 PM						
3:15 PM						
3:30 PM						
3:45 PM						
Trips Generated 3-4 pm	9	0	14	41	0	6
4:00 PM						
4:15 PM						
4:30 PM						
4:45 PM						
Trips Generated 4-5 pm	10	0	15	46	0	7
5:00 PM						
5:15 PM						
5:30 PM						
5:45 PM						
Trips Generated 5-6 pm	11	0	17	50	0	8

Growth from Beeler Road Subdivision

Trips Generated by
Beeler Road Subdivision: 888

	AM	PM
Traffic Movement Assumed Distribution:	25% to west East Emory, 75% to east East Emory 40% from west East Emory, 60% from east East Emory	40% to west East Emory, 60% to east East Emory 50% from west East Emory, 50% from east East Emory

Assume all townhouses

Entering and Exiting %'s (from local trip rate):		Directional Distribution Assumptions:	
22% Enter	AM Hours	25% to west East Emory Road	Assume same DD for AM Peak Hour
78% Exit		75% to east East Emory Road	
		40% from west East Emory Road	
		60% from east East Emory Road	
50% Enter	Mid-Day Hours	25% to west East Emory Road	Assume same DD for AM Peak Hour
50% Exit		75% to east East Emory Road	
		40% from west East Emory Road	
		60% from east East Emory Road	
55% Enter	PM Hours	40% to west East Emory Road	Assume same DD for AM Peak Hour
45% Exit		60% to east East Emory Road	
		50% from west East Emory Road	
		50% from east East Emory Road	

TDOT Traffic Engineering Office - Table 4.2 - TDOT Traffic Design Manual

Population Tier = A (Knoxville)

TDOT Region 1 Average for Arterial Facilities (Two-Lane)

Time of Day	Percentage of Trips
7-8 am	9.03%
8-9 am	6.78%
11 am-Noon	4.68%
Noon-1 pm	5.17%
2-3 pm	6.34%
3-4 pm	7.83%
4-5 pm	8.79%
5-6 pm	9.64%
	58.26%



Traffic Signal Warrant Analysis

Civil Engineering / Traffic Engineering

Project Name	Fairview Road Subdivision
Project/File #	#2223
Scenario	2030 - Projected Traffic Volumes (With TDOT Widening)

Intersection Information	
Major Street Name	East Emory Road
North/South or East/West	E/W
Speed Limit > 40 mph	Yes
# of Approach Lanes	2 or more
% of Right Turn Traffic to Include	0%
Minor Street Name	Beeler Road
# of Approach Lanes	1
% of Right Turn Traffic to Include	0%
Isolated Community < 10,000 pop	No

Additional Warrants to Consider	
Warrant 3, Peak Hour (A - Volume and Delay)	No
All-Way Stop Warrant	No



Traffic Signal Warrant Analysis

East Emory Road (Major Street) Volume

Eastbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM		461	40	
8 - 9 AM		328	43	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM		296	35	
12 - 1 PM		357	44	
1 - 2 PM				
2 - 3 PM		474	38	
3 - 4 PM		498	52	
4 - 5 PM		654	64	
5 - 6 PM		681	81	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			4,146	0

Westbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	63	577		
8 - 9 AM	48	462		
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	34	281		
12 - 1 PM	39	282		
1 - 2 PM				
2 - 3 PM	57	388		
3 - 4 PM	88	526		
4 - 5 PM	85	502		
5 - 6 PM	87	512		
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			4,031	0

Beeler Road (Minor Street) Volume

Northbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	73		215	
8 - 9 AM	57		140	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	56		86	
12 - 1 PM	57		91	
1 - 2 PM				
2 - 3 PM	47		126	
3 - 4 PM	71		143	
4 - 5 PM	72		158	
5 - 6 PM	79		185	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			1,656	0

Southbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM				
8 - 9 AM				
9 - 10 AM				
10 - 11 AM				
11 - 12 PM				
12 - 1 PM				
1 - 2 PM				
2 - 3 PM				
3 - 4 PM				
4 - 5 PM				
5 - 6 PM				
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			0	0

Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Fairview Road Subdivision
Project/File #	#2223
Scenario	2030 - Projected Traffic Volumes (With TDOT Widening)

Intersection Information			
Major Street (E/W Road)	East Emory Road	Minor Street (N/S Road)	Beeler Road
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	8177 vehicles	Total Approach Volume	1656 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	1 percent applied	Right turn reduction of	1 percent applied

Reduction applied to warrant thresholds due to high speed on East Emory Road

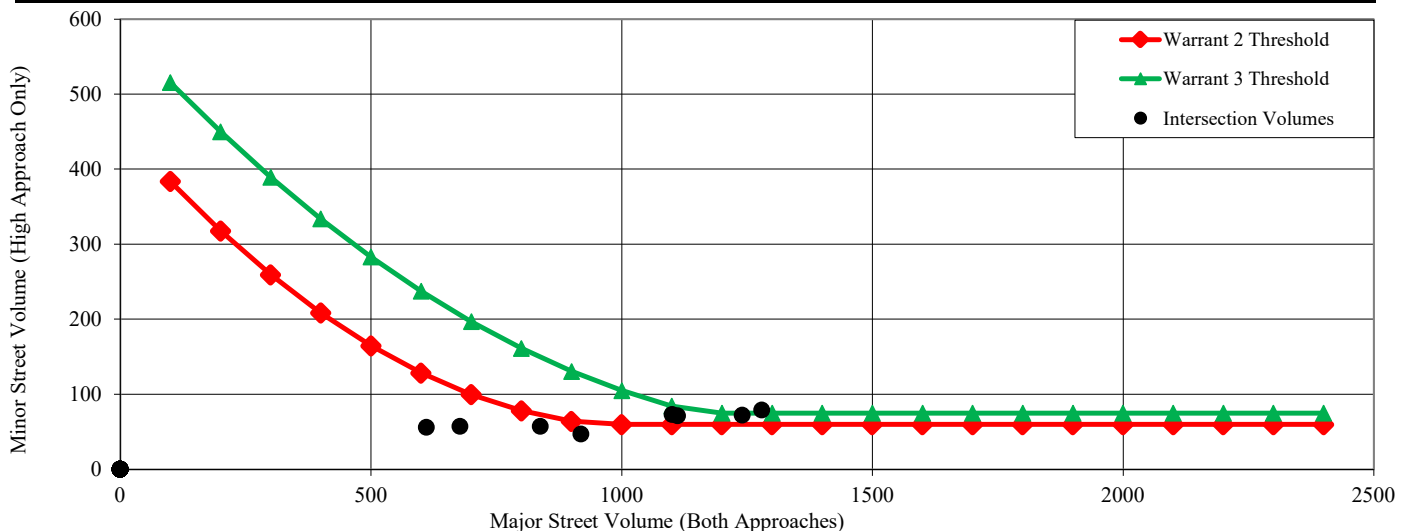
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not satisfied	Not satisfied	Not satisfied
Required values reached for	0 hours	6 hours	0 (Cond. A) & 8 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trail of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Satisfied
Required values reached for	4 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Not Examined	Satisfied
Required values reached for		1 hour
Criteria - Total Approach Volume (veh in one hour)		See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)		
Criteria - Minor Street High Side Delay (veh-hrs)		

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



APPENDIX L

RESPONSE LETTER TO ADDRESS COMMENTS



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

December 22, 2022

PROJECT NAME: Fairview Road Subdivision

TO: Knoxville-Knox County Planning

SUBJECT: Response Document for Fairview Road Subdivision TIS Review Comments

Knoxville-Knox County Planning and Knox County Engineering Staff:

The following response document addresses comments in an email from Mike Conger, PE, dated December 9, 2022. This letter is added to the end of the revised report in Appendix L.

1. **Please include text/reference on the title page that this TIS incorporates the development formerly known as "Beeler Road Subdivision" since this essentially functions as one overall development.**

Response: This requested change was made to the title page and denoted on Page 1 in the Beginning Commentary.

2. **On page 3, the 4th bullet discusses proposed eastbound right-turn lane on E. Emory Road at Beeler Road, but the last word in 4th line says westbound. Please clarify.**

Response: On Page 3, in the 4th bullet point, the last word in the 4th line was corrected and changed from "westbound" to "eastbound".

3. **On page 5 a boulevard section is recommended to Road B in the Beeler Road subdivision as a means of addressing the typical requirement for multiple access points with subdivisions greater than 150 lots. The intent of a boulevard section in this type of scenario typically involves constructing one to an internal intersection that provides substantial alternate travel paths. In this situation that would mean it should extend to the first connection to Fairview Road subdivision, i.e. "Road B" in the Fairview Road Subdivision plans. That being said, this requirement and appropriate mitigation is evaluated on a case-by-case basis with each development and may require further discussions at subsequent stages of the design plan process. Additionally, there has**

been mention by the developer of multiple stub road connections being provided which may serve to satisfy the multiple access requirement in this instance. Please rephrase this recommendation to note the typical requirement for an additional access point and the potential options as I've noted and stating that the final decision for the most appropriate way to address it will be up to Knox County Engineering & Public Works.

Response: The discussion regarding the boulevard typical section was updated on Pages 5 and 72.

4. On page 25 "Development Density"- the 2nd line cites "One-hundred twenty-six" but should be "One-hundred twenty-eight".

Response: On Page 25, in "Development Density", the 2nd line was corrected and changed from "One-Hundred twenty-six" to "One-Hundred twenty-eight".

5. In the "Trip Generation" section of the TIS please include either a separate table or an additional row in Table 7 that shows the final result of combining the trip generation for both the Beeler Road Subdivision and the Fairview Road Subdivision since these two are sharing the same access point.

Response: A table has been added to address this comment. This additional table is "Table 7.1 – Trip Generation for Fairview Road & Beeler Road Subdivisions". This revision was also included in Appendix G, where the trip generation calculations are presented.

6. It is the understanding of Knox County that the proposed layouts of Fairview Road subdivision and Beeler Road subdivision have been changed so that the internal street discussions are no longer valid. Most of this can be dealt with at later points of the design plan development process, but please work with the site engineer to incorporate the most current layouts following this Concept Plan review and revisions stage so that the TIS matches the site plan at this stage.

Response: The layout plan for Fairview Road Subdivision has not changed. The layout plan for Beeler Road Subdivision barely changed. The only change to this subdivision has been a boulevard typical section for a short length at the entrance at Beeler Road. Nonetheless, the layout plan for Beeler Road Subdivision has been updated in the report figures.

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

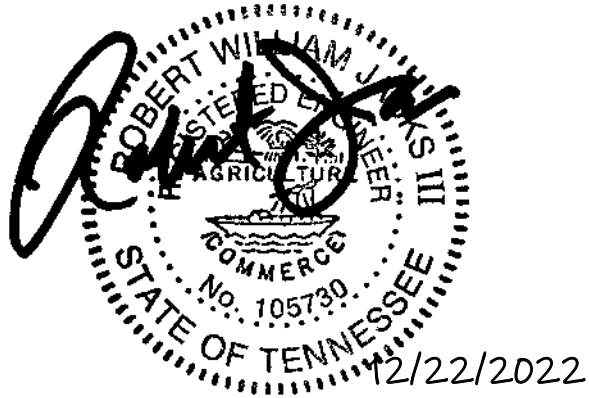
- Updated Title Page
- Updated Table of Contents
- Updated Page Footers
- A few minor grammatical updates
- Updated and/or deleted discussion of internal sidewalks on Pages 4-5, 21, 24, & 71

- Added a discussion regarding a potential stub-out road in Fairview Road Subdivision on Page 21
- Added Appendix L to include this response letter

If you have any questions or further comments, please feel free to contact me. I 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
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