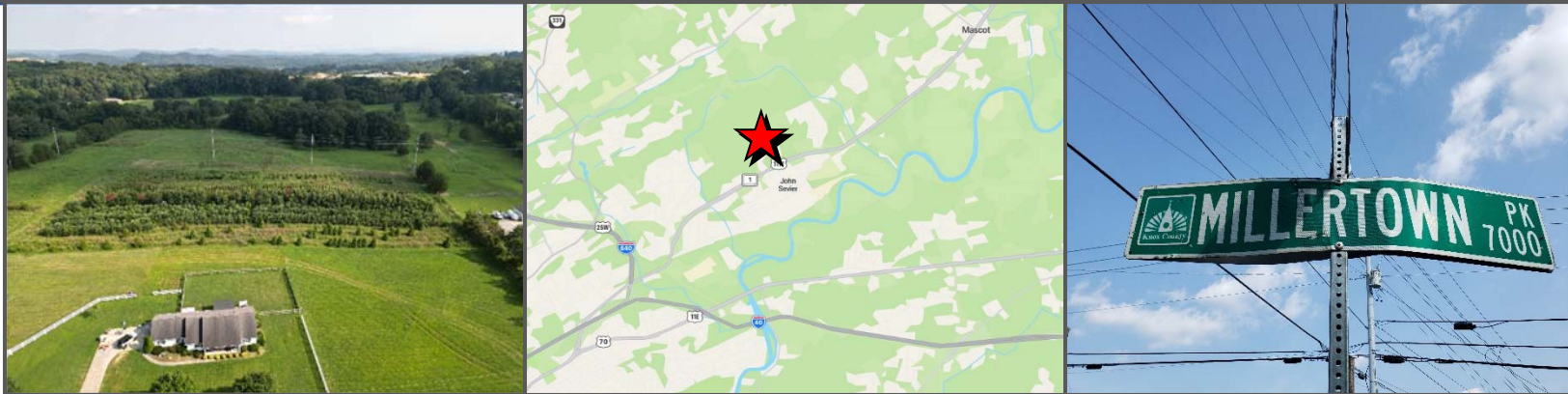


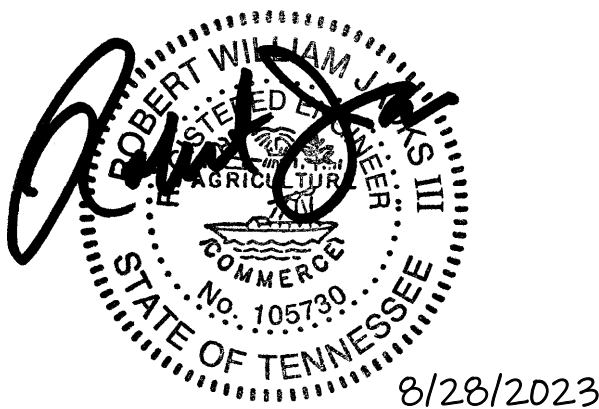


# Transportation Impact Study Mayer Property Subdivision Knox County, Tennessee



August 2023

Prepared for:  
Homestead Land Holdings, LLC  
122 Perimeter Park Drive  
Knoxville, TN 37922



10-SC-23-C / 10-C-23-DP  
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## EXECUTIVE SUMMARY

### **Preface:**

Homestead Land Holdings, LLC proposes a residential development at 7336 Millertown Pike between Harris Road and Ellistown Road in Northeast Knox County, TN. The proposed development will include constructing 130 attached townhouses and three single-family detached houses on 37.14 +/- acres, named and referenced in this study as “Mayer Property Subdivision” since an official name has not been chosen yet. The development proposes a single entrance on the south side of Millertown Pike, approximately 850 feet northeast of Presnell Lane. The development is anticipated to be fully built and occupied by 2027.

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 road and entrance intersection 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 significant findings of this study include the following:

- The Mayer Property Subdivision, with 130 attached townhouse units and three single-family detached houses, is estimated to generate 1,248 trips at full build-out and occupancy on an average weekday. Of these daily trips, 71 are estimated to occur during the AM peak hour and 101 in the PM peak hour in 2027.
- The Proposed Entrance at Millertown Pike is expected to operate with very reasonable vehicle delays in the projected AM and PM peak hours. The addition of the Proposed Entrance approach on Millertown Pike will operate adequately in 2027 with respect to vehicle capacity.
- The projected 2027 traffic volumes do not warrant the construction of separate left and right-turn lanes on Millertown Pike at the Proposed Entrance. A single exiting lane for the Proposed Entrance at Millertown Pike will be sufficient.

### **Recommendations:**

The following recommendations are offered based on the study analyses to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve

an acceptable traffic flow and improved safety. More details regarding all the recommendations are discussed at the end of the report.

- It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed Entrance approach at Millertown Pike. The stop bar should be applied a minimum of 4 feet away from the edge of Millertown Pike and placed at the desired stopping point that maximizes the sight distance.
- Based on a posted speed limit of 40-mph on Millertown Pike, the required intersection sight distance is 400 feet for exiting turning vehicles from the Proposed Entrance. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions. Intersection sight distance at the Proposed Entrance at Millertown Pike must not be impacted by future landscaping or signage. An existing sign is currently posted on the south side of Millertown Pike along the fence line, west of the Proposed Entrance location. The sign states, "Welcome / Arminda Community". It is assumed that this sign will be impacted due to the construction of the new subdivision and entrance. If relocated, it should be posted at an appropriate location that does not impact sight distance from the Proposed Entrance.
- The double yellow centerline on Millertown Pike should be removed within the approach of the new proposed entrance roadway, Road "A". Furthermore, Knox County should consider modifying the beginning location of the westbound passing zone on Millertown Pike. As currently laid out on Millertown Pike, this passing zone would begin 50 feet west of the centerline of the new proposed entrance road, Road "A". It is recommended that the passing zone begin at least 100 feet away from the centerline of the proposed entrance roadway, Road "A", to provide some buffer and a factor of safety at the new intersection.
- A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance off Millertown Pike. It is recommended that a "No Outlet" Sign (W14-2a) be installed at the front of the Mayer Property Subdivision at Millertown Pike. The "No Outlet" (W14-2a) sign can be installed above or below the street name sign or separately posted on Road "A".
- A Stop Sign (R1-1) and a 24" white stop bar are recommended to be installed on Road "B" at the intersection with Road "A" in the Mayer Property Subdivision.
- Sight distance at the new internal intersection must not be impacted by new signage, parked cars, or future landscaping in the subdivision. With a 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.

- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- Road "B" will have a bulb-out constructed along its length, accommodating access to several proposed lots in a corner of the development property. Construction of this bulb-out will create a large pavement area without traffic control on a horizontal road curve. At a minimum, it is recommended that a 4" white dashed pavement line be applied to the outside edge of the roadway adjacent to the bulb-out. Other potential traffic controls that should be considered include a stripped or raised delineated island. Details regarding potential traffic controls at this bulb-out should be discussed in the detailed design phase with Knox County Engineering.
- 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:**

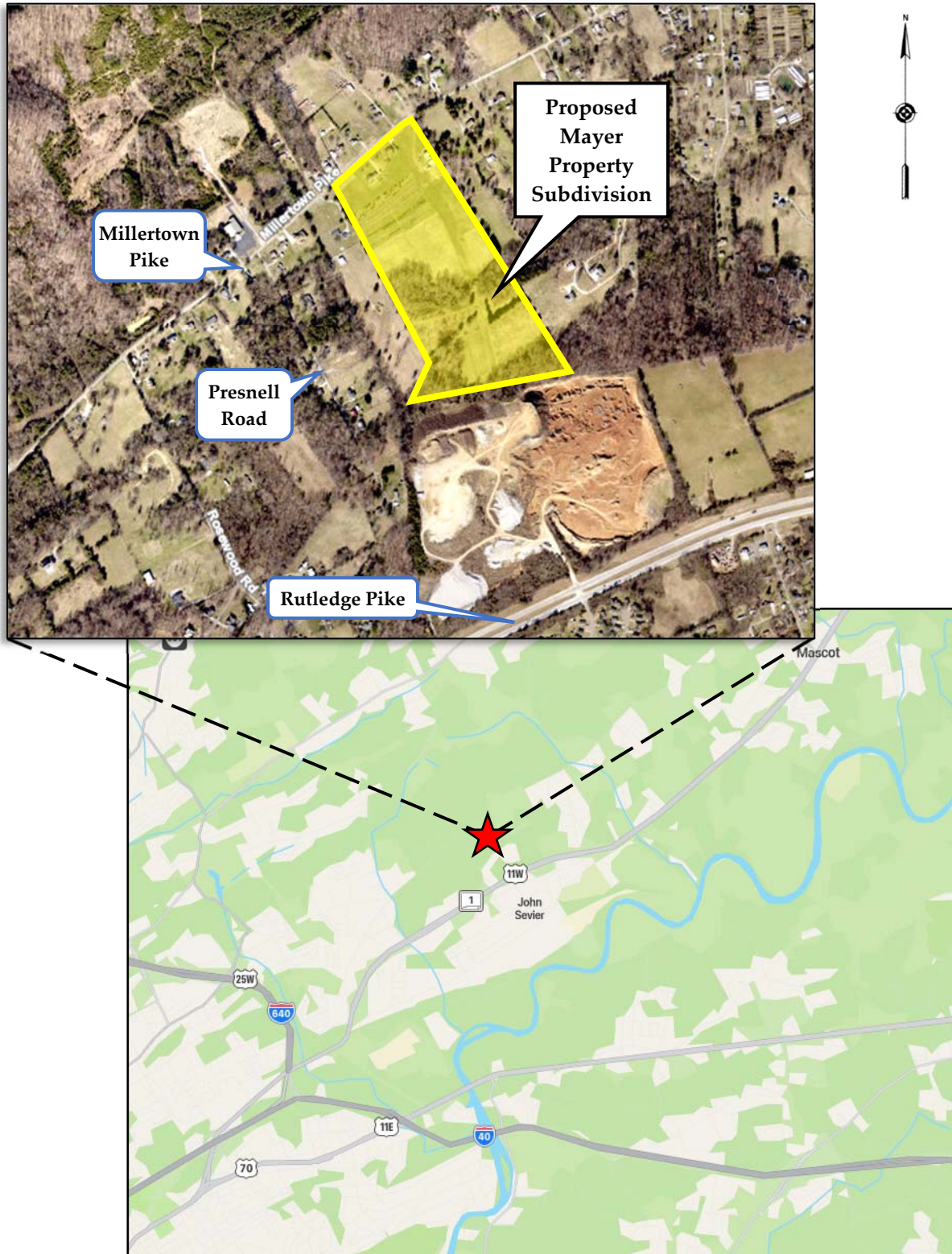
The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located off Millertown Pike in Northeast Knox County, TN. The development will be constructed from an existing single parcel. The Proposed Entrance for the development will be located on the south side of Millertown Pike, 850' east of Presnell Lane. As requested, transportation impacts associated with the development were analyzed on Millertown Pike, where the proposed development will have road access to and from external destinations.



The proposed development property is in a quasi-rural area of Northeast Knox County, TN. There are a few nearby established subdivisions, many standalone single-family homes, large undeveloped lots used for agricultural purposes, and unused/woodland properties. Immediately south of the development property, a contractor operates a borrow pit area and stone/gravel/soil storage area with road access from Rutledge Pike (US 11W/SR 1). This proposed residential development will be near Rutledge Pike, providing the most accessible and convenient roadway for external destinations.

The existing development site has relatively flat topography, with the property separated roughly halfway with a wet weather conveyance. The southern portion of the property is sloped towards the north towards the drainage way, and the reverse exists for the northern portion. An existing Knoxville Utilities Board (KUB) overhead powerline and easement further split the development property. The existing parcel has two single-family detached houses and a couple of barn structures. Most of the land is currently maintained, with some woodlands and growth from the remnants of a previously operated tree farm.





**Figure 1**  
**Location Map**

▪ **EXISTING ROADWAYS:**

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

**TABLE 1**  
**STUDY CORRIDOR CHARACTERISTICS**

NAME	CLASSIFICATION <sup>1</sup>	SPEED LIMIT	LANES	ROAD WIDTH <sup>2</sup>	TRANSIT <sup>3</sup>	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Millertown Pike	Minor Arterial	40 mph	2	21 - 22 feet	None	None	No bike lanes

<sup>1</sup> 2018 Major Road Plan by Knoxville/Knox County Planning

<sup>2</sup> Edge of curb to edge of curb or edge of pavements near project site

<sup>3</sup> According to Knoxville Area Transit System Map

**Millertown Pike** is a 2-lane minor arterial that traverses in a generally southwest-northeast direction. The posted speed limit on Millertown Pike is 40-mph at the project site. Millertown Pike is 8.5 miles long and runs between Washington Pike on the southwest side and ends to the northeast at Rutledge Pike (US 11W/SR 1) near East Knox County Elementary School and East Knox Park. Millertown Pike runs roughly parallel to Rutledge Pike to the north and provides access to Rutledge Pike to the south via several intersecting roadways. Millertown Pike provides access for travel on Interstate 640 via Exit 8 to the southwest of the development site. Near Exit 8 and Interstate 640, several significant developments provide numerous retail and commercial services, including a Walmart Supercenter, Sam’s Club, Food City, Lowe’s and Home Depot home improvement centers, and a yet-to-be-opened Amazon Fulfillment Center at the previous location of the Knoxville Center Mall.

The pavement of Millertown Pike is between 21 and 22 feet wide, near where the Proposed Entrance for the development will be constructed. Millertown Pike is delineated with a double yellow center line and white edge lines. Just fifty feet west of the Proposed Entrance for the development, the centerline of Millertown Pike is delineated by a single yellow centerline and a broken yellow line that delineates a passing zone for westbound



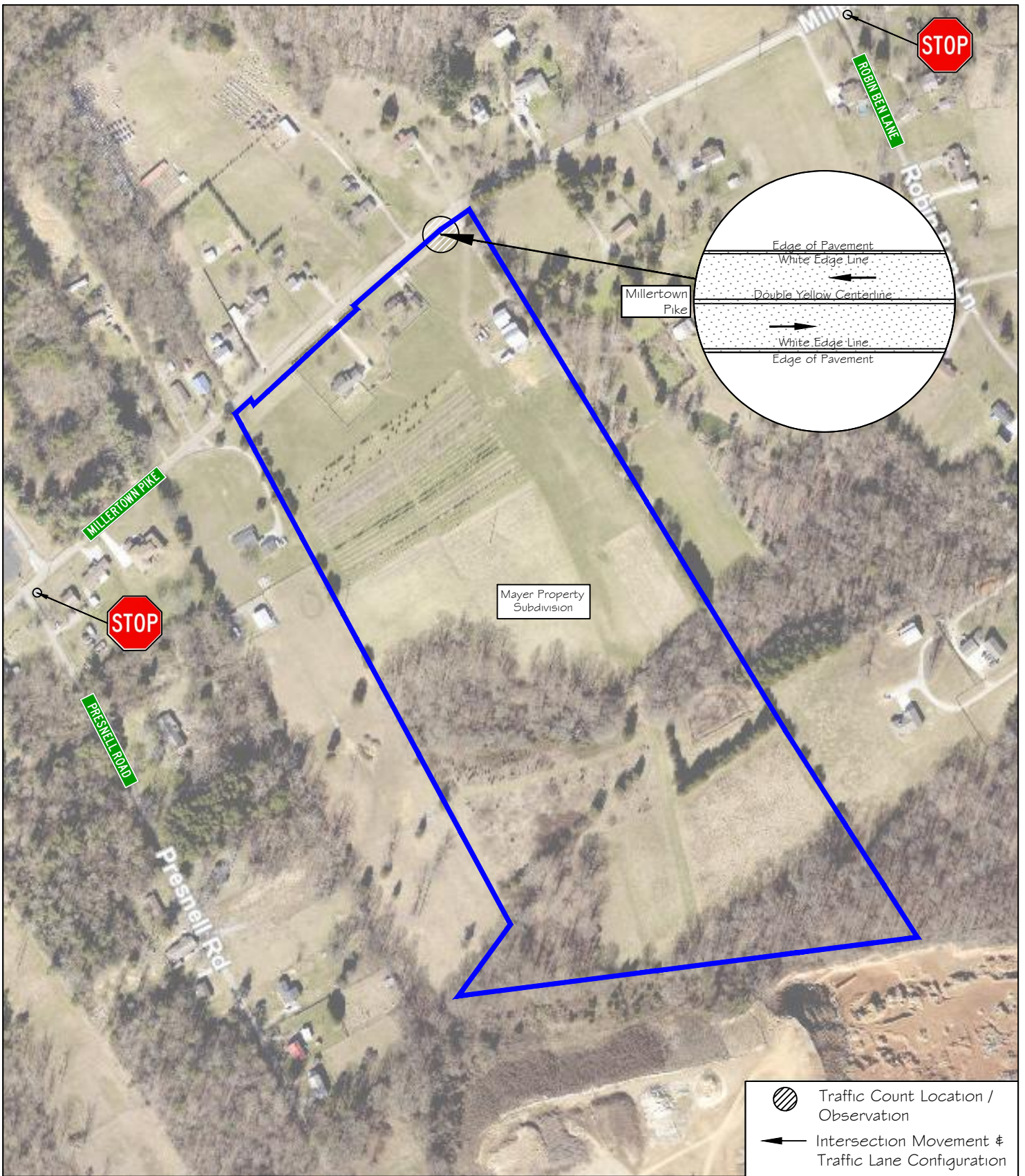
traffic. This passing zone for westbound traffic is 500 feet long before it transitions to an eastbound passing zone on Millertown Pike.

The pavement width outside the white edge line varies but ranges around 6 inches to 1 foot. Just west of the Millertown Pike does not have any curbing or sidewalks. Utility roadway lights are not provided on Millertown Pike in the adjacent study area; however, a few are located away from the roadway on the nearby properties.

The Proposed Entrance for the development will be located on Millertown Pike, approximately 210 feet west of the existing westernmost house's driveway on the development parcel (7336 Millertown Pike). Two existing driveways will be located across from the proposed development's entrance. These driveways provide access to single-family detached houses on the north side of the roadway at 7327 and 7329 Millertown Pike.

Figure 2 shows the existing lane configurations of the location where the traffic count was conducted for the study. There is no road signage on Millertown Pike near the development property except for Stop Signs (R1-1) on existing streets, Presnell Road and Robin Ben Lane, approaching Millertown Pike from the south. The pages following Figure 2 give a further overview of the site study area with photographs.





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NOT TO SCALE



FIGURE 2

Mayer Property Subdivision

Traffic Count Location, Traffic Signage & Existing Lane Configurations



PHOTO EXHIBITS

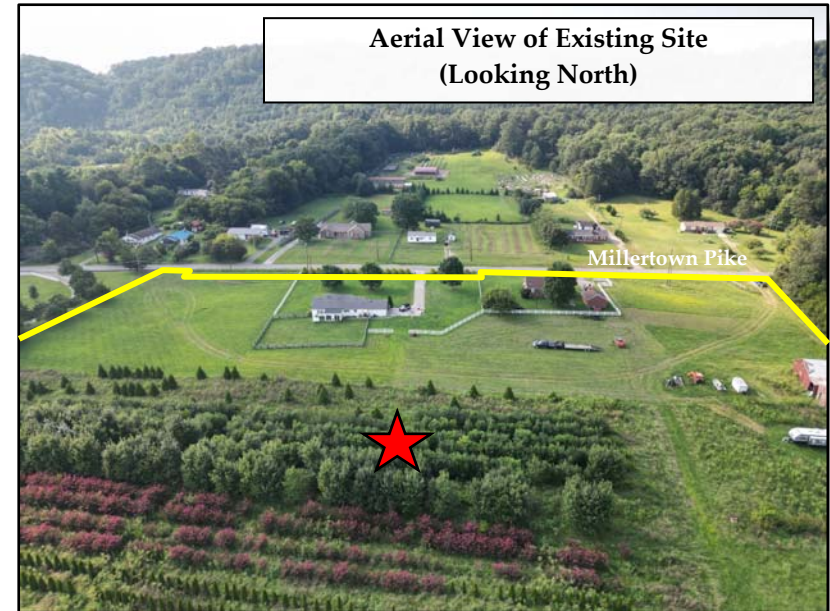
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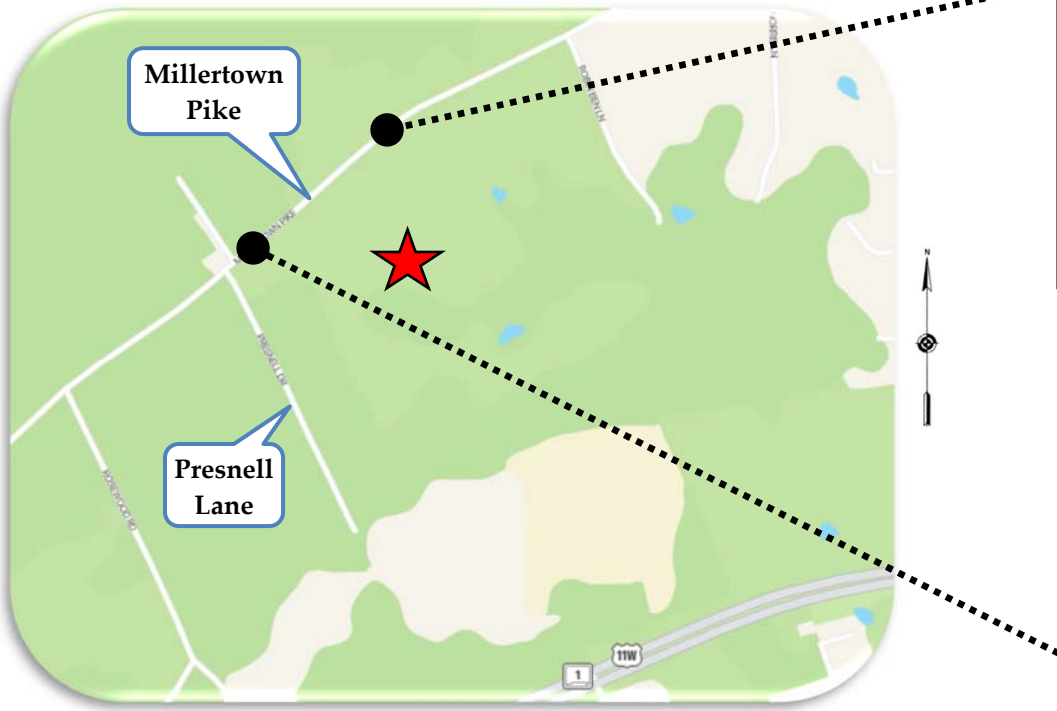
Millertown Pike at Proposed Development Site



Aerial View of Existing Site  
(Looking East)



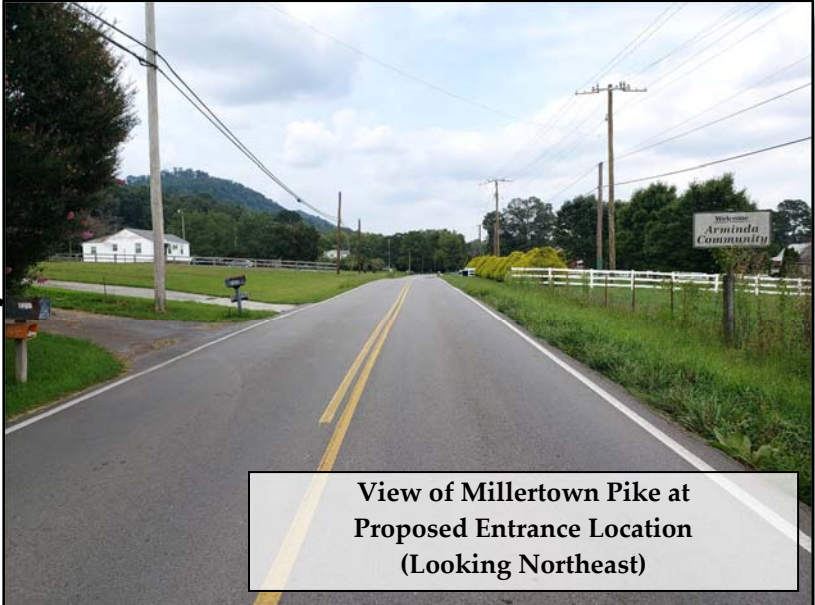
Aerial View of Existing Site  
(Looking North)



Millertown Pike at Proposed Development Site



View of Millertown Pike at Proposed Entrance Location (Looking Southwest)



View of Millertown Pike at Proposed Entrance Location (Looking Northeast)



Millertown Pike at Proposed Development Site





▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

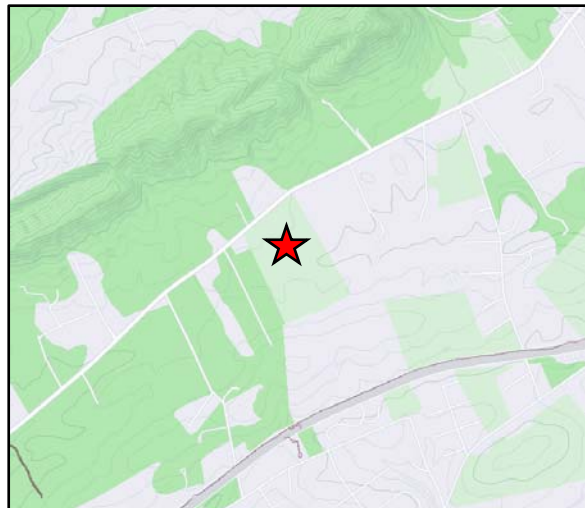
One annual vehicular traffic count location exists near the study area, and the Tennessee Department of Transportation (TDOT) conducts this count. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  - TDOT reported an Average Daily Traffic (ADT) on Millertown Pike, east of Robin Ben Lane and the development site, at 3,303 vehicles per day in 2022. From 2012 to 2022, this count station has indicated a +2.7% average annual traffic growth rate.

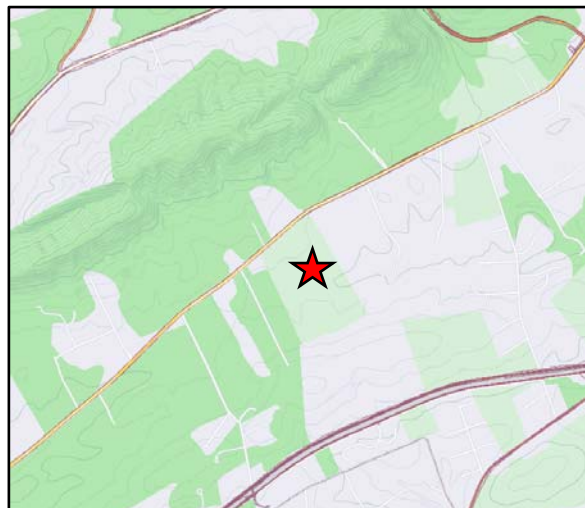
- Existing bicycle and pedestrian volumes:

The average daily pedestrian and bicycle traffic is unknown along Millertown Pike. However, with the lack of sidewalks and bike lanes, this corridor is assumed to have minimal pedestrian and bicyclist activity. During the 6-hour traffic count for this project, two bicyclists and no pedestrians were observed on Millertown Pike.

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 maps show minimal bicycle activity and no



**Strava Heat Map for Pedestrian and Joggers**



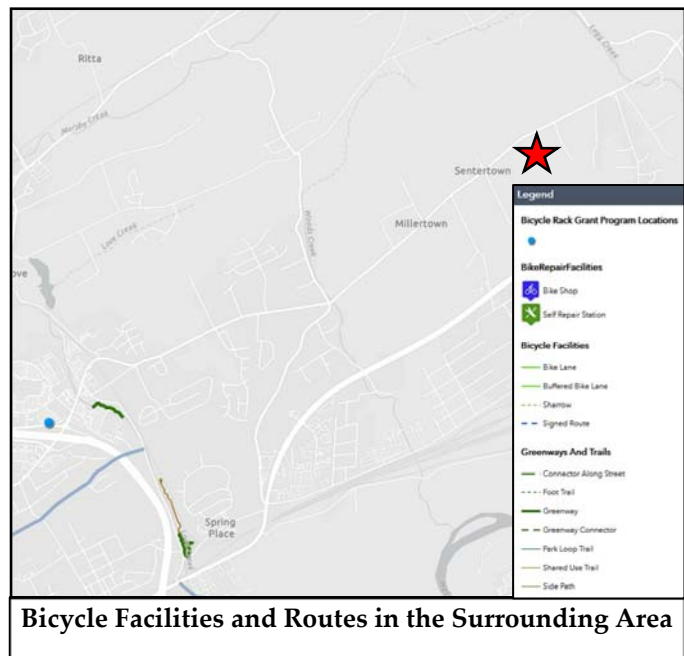
**Strava Heat Map for Bicyclists**

pedestrian activity along Millertown Pike adjacent to the development site. However, more bicycle activity is shown to the south along Rutledge Pike, along with minimal pedestrian activity.

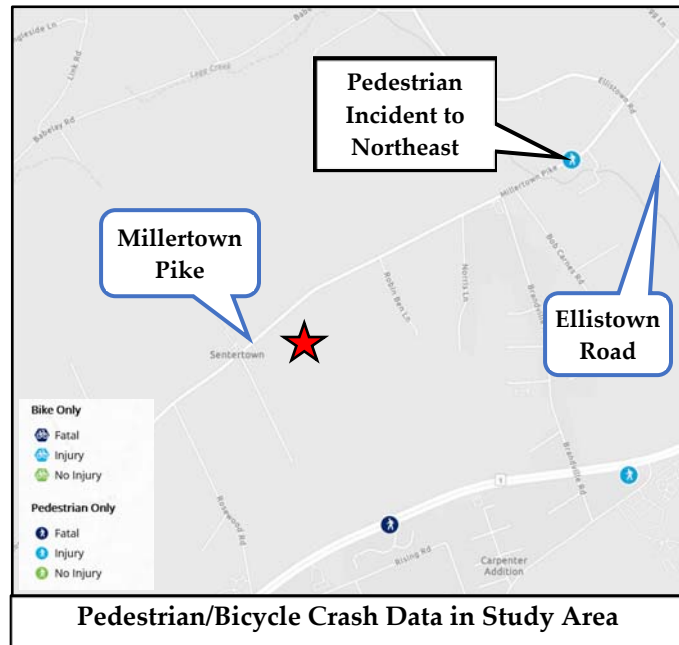
Due to the lack of sidewalks, bike facilities, and nearby retail and commercial developments, it is not expected that measurable bicycle or pedestrian trips will be generated that would significantly reduce vehicle trips to and from the proposed development on Millertown Pike. Thus, these potential alternative transportation modes are not used or accounted for vehicle trip reductions.

▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

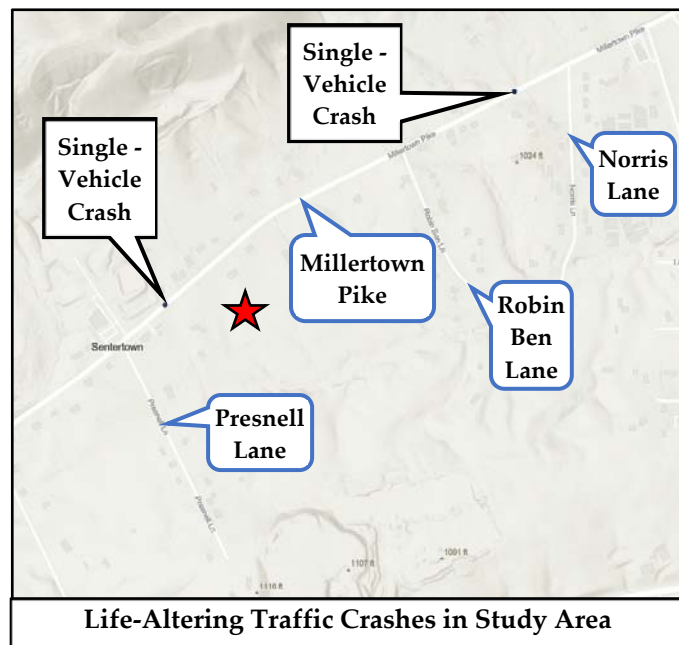
Sidewalks are not provided on Millertown Pike adjacent to the development property. Bike lanes are not available either. The closest bike facilities are located southwest at the Loves Creek Greenway and Spring Place Park. Other bike facilities in the surrounding area are on Buffat Mill Road to the southwest near Interstate 640, where Buffat Mill Road crosses over the interstate. This road is designated as a “Comfortable Route” on KGIS mapping. A “Comfortable Route” is defined as a route “based on low to medium traffic speeds and volumes along with other criteria”.



▪ **CRASH DATA:**



The Knoxville Transportation Planning Organization (TPO) published and provided a 2020 update to bicycle and pedestrian crash data for Knox County and surrounding counties. The data shows that none of these crash types occurred near the development site. However, one incident occurred on Millertown Pike to the northeast, closer to Ellistown Road. This incident involved a pedestrian on Millertown Pike, resulting in an injury. This incident occurred on July 10<sup>th</sup>, 2015, and a lack of a sidewalk was identified as a contributing factor since the pedestrian was walking along the road.



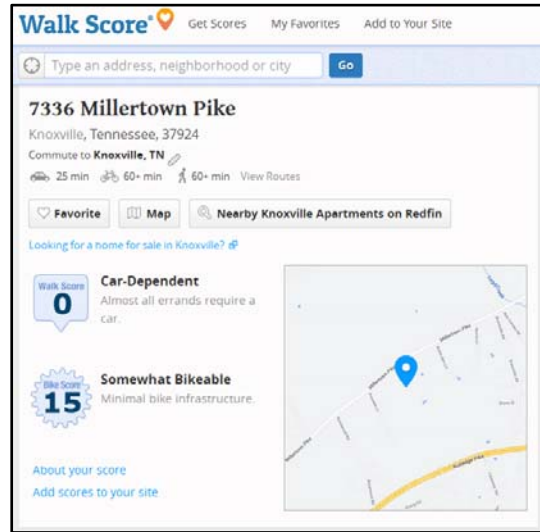
The Knoxville TPO also published data related to “Life-Altering Traffic Crashes”. This data lists the location of traffic crashes in the Knoxville region that resulted in a fatality or serious injury between October 2016 and September 2021. The data shows two serious vehicular incidents have occurred near the development site in the past few years: one to the southwest and one to the northeast.

To the northeast, a single-vehicle crash with a serious injury occurred on August 23<sup>rd</sup>, 2018, between Robin Ben Lane and

Norris Lane. This incident was listed as the driver suspected of operating under the influence (DUI). To the southwest of the development site, a single-vehicle crash with a serious injury occurred on November 9<sup>th</sup>, 2019. This incident was also suspected of being due to a driver operating under the influence.

▪ **WALK SCORE:**

A private company offers a website at [walkscore.com](http://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.

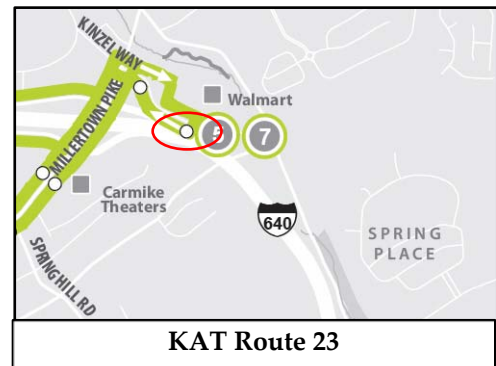


Appendix B shows maps and other information for the Walk, Transit, and Bike Score at the development property address at 7336 Millertown Pike. The project site location is graded with a Walk Score of 0. This Walk Score indicates that the site is car-dependent and that almost all errands currently require a vehicle for travel to and from the development property. The site is given a Transit Score of 0 since public transportation is unavailable near the development site. The site is given a Bike Score of 15. The lack of pedestrian and bike facilities and the distance to amenities reduce the Walk and Bike Scores at the development site.

▪ **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available near the development site. The overall KAT bus system map is provided in Appendix C.

The closest public transit bus service is 3.1 miles to the southwest in front of the Walmart Supercenter on Kinzel Way off Millertown Pike and is Route 23, “Millertown”. It operates on weekdays and weekends, and this route map is included in Appendix C. KAT had to reduce its service schedule due to workforce shortages. These changes took place on August 29<sup>th</sup>, 2022, and the reduced schedule for this route 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.

Since the distance to the nearest public bus service is over three miles away, with no sidewalks or bike lanes available on Millertown Pike to access the bus stop without the use of a private vehicle, the proposed development is not expected to have any reduced vehicle trips due to public transit usage.

## PROJECT DESCRIPTION

### ▪ LOCATION AND SITE PLAN:

The proposed plan layout with 130 attached townhouses and three single-family detached houses on 37.14 +/- acres is designed by Rackley Engineering, Inc. and is shown in Figure 3. The design shows two new streets constructed for the residential development. As shown in the figure, a single entrance will be constructed for the development at Millertown Pike on the western end of the road frontage. The proposed entrance road, Road "A", will be 1,325 feet long. Road "B" will intersect Road "A" in the development at a t-intersection and will have a total length of 810 feet. Both proposed roads will end at cul-de-sacs.



**View of Rear (South Side) of Development Property – Occupied by Easement and Electric Powerline**

The Mayer Property Subdivision will be located on one existing parcel. The two existing single-family detached houses adjacent to Millertown Pike will remain and be subdivided into separate parcels. The existing barn and outbuildings on the northeastern side of the property will be removed for construction.

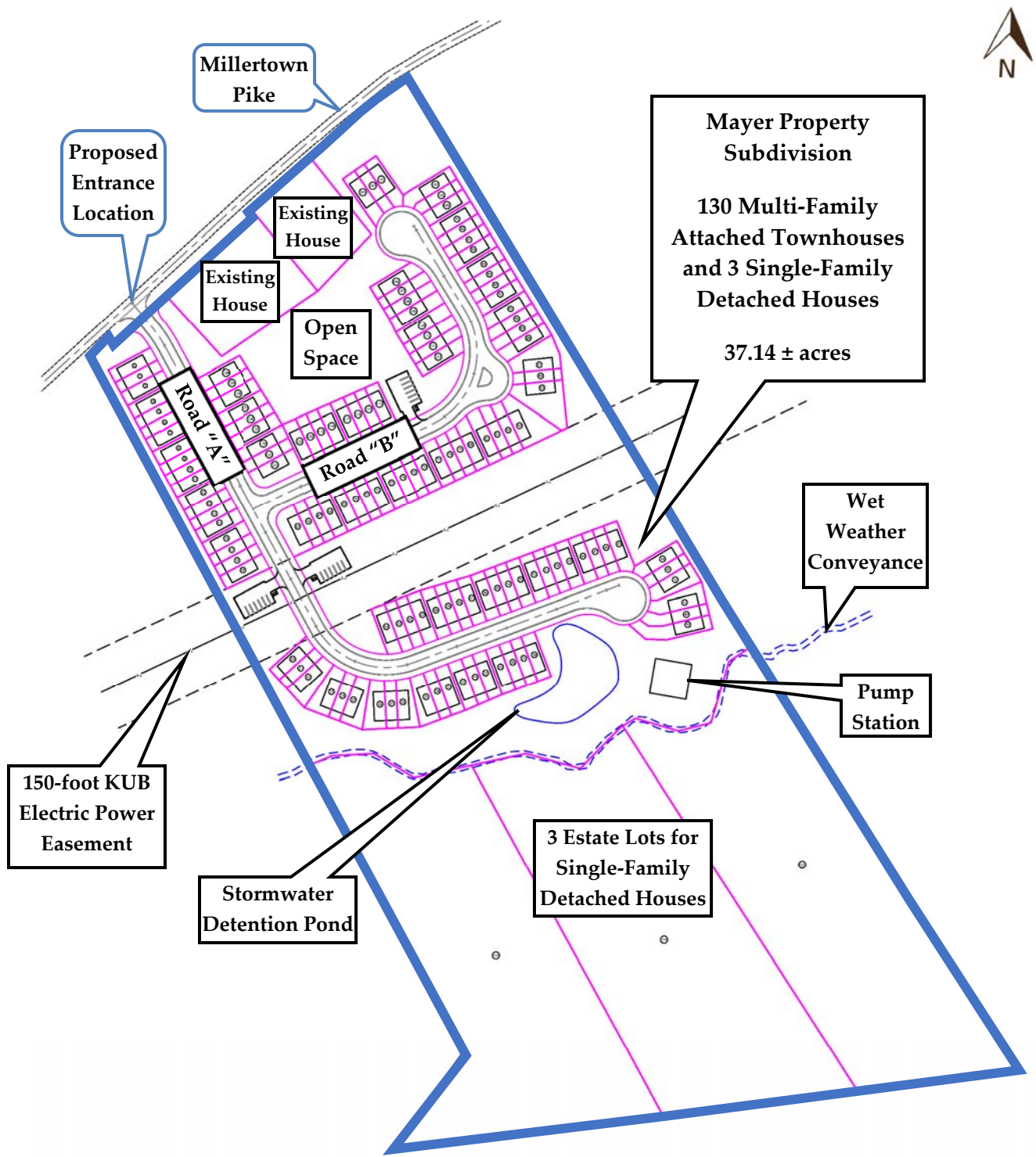
The total open space designated for the subdivision will be 9.45 acres. Midway on the property, north of the wet weather conveyance, a stormwater detention pond and a pump station facility will be constructed. The pump station facility will provide access to KUB sanitary sewer and Northeast Knox Utility District (NEKUD) water services. A 150-foot KUB electric powerline and easement currently bisects the development property. Two small parking lots on Road "A" with seven parking spaces each will be constructed under and within the powerline and easement. An additional small parking lot with seven parking spaces will also be built off Road "B". These parking areas will provide a location for internal mail delivery centers for the residents and guest parking for the townhouses.

To the south of the wet weather conveyance, three large parcels will be established for estate-sized lots. These lots will be for three separate single-family detached houses, with each lot slightly over five acres in size. These three lots will have a joint permanent easement utilizing an

existing culvert crossing the wet weather conveyance with access from the proposed cul-de-sac at the end of Road "A". These three lots will be restricted from future subdivisions.

Nearly all the townhouse lots in the development will be 0.05 or 0.06 acres in size (2,178 ft<sup>2</sup> – 2,613 ft<sup>2</sup>), with a handful greater than 0.10 acres. The largest lot will be 0.14 acres in size (6,098 ft<sup>2</sup>). Each townhouse will have a garage and driveway. Internal sidewalks are not proposed for this development. The developer is not proposing any on-site amenities for the future subdivision residents other than providing open space.

The schedule for this new residential development's completion depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. The area's real estate and rental market is still experiencing large amounts of activity and growth. This study assumed that the total construction build-out of the development and full occupancy would occur within the next four years (2027).



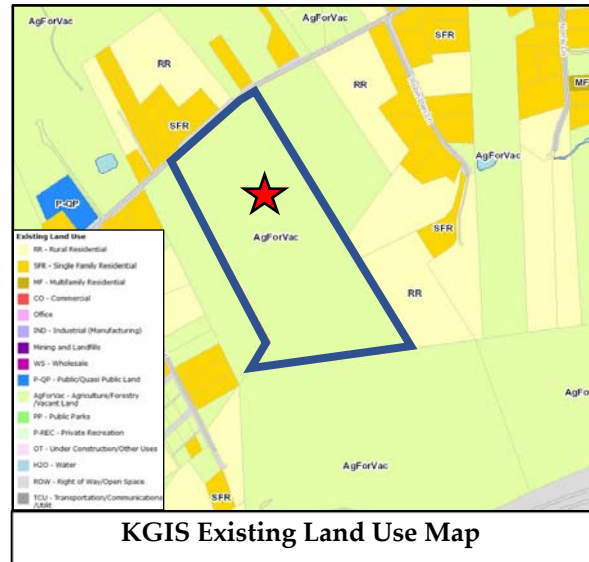
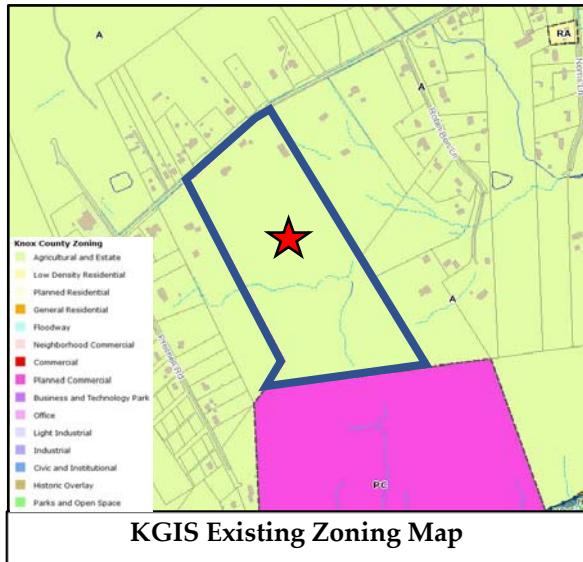
**Figure 3**  
**Proposed Plan Layout**  
**Mayer Property Subdivision**

Not to Scale

▪ **PROPOSED USES AND ZONING REQUIREMENTS:**

The existing parcel comprising the Mayer Property Subdivision development property is in Knox County and was recently requested to be rezoned. The rezoning was recommended to be approved by Knoxville/Knox County Planning, and the Knox County Commission will vote on the first reading on August 28<sup>th</sup>, 2023. The property's existing zoning is General Agricultural (A) and is requested to be changed to Planned Residential (PR) with a density of less than four units per acre. Uses permitted in the Planned Residential (PR) 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. The existing adjacent surrounding zoning and land uses are the following:

- Millertown Pike binds the development site to the north. To the north of the development site and across Millertown Pike, five parcels are zoned as Agricultural (A) and are occupied with single-family detached houses on large lots. All these properties have direct access to Millertown Pike to the south via separate driveways.
- To the east of the development site, the three adjacent parcels are occupied by single-family detached houses on large properties. These parcels are zoned as Agricultural (A). One of these properties has access to Millertown Pike to the north, and the other two have road access via Robin Ben Lane to the east. These properties to the east have land uses that include farm activities and woodlands.
- A single large parcel binds the proposed subdivision property to the south. Immediately to the south, a contractor operates a borrow pit area and stone/gravel/soil storage area. This property is zoned Planned Commercial (PC) and has direct road access to Rutledge Pike to the south.
- To the east of the development site, one adjacent narrow property is occupied by a single-family detached house and zoned as Agricultural (A). The single-family house is located on the northern portion, and the southern portion is used for farm operations. This narrow parcel has direct road access to Millertown Pike to the north via a single driveway.



▪ **ON-SITE CIRCULATION:**

The total length of the internal subdivision roads will be 2,135 feet (0.40 miles) and will be designed and constructed to Knox County specifications. The development will have asphalt-paved internal roadways with 8" extruded concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. The public right-of-way width within the development will be 50 feet. Concrete sidewalks are not proposed along the internal roads in this development. Knox County will maintain the streets in the development after construction, and these will be dedicated public roads.

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

Besides residential passenger vehicles, the internal roadways will provide access to service, delivery, maintenance, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Curbside private garbage collection services are expected to be available for this residential subdivision if desired. The new public streets will be designed and constructed to Knox County specifications and are expected to be adequate for fire protection and rescue vehicles, trash collection trucks, and single-unit delivery trucks. The development's internal drives will accommodate the larger vehicle types and residents' standard passenger vehicles.



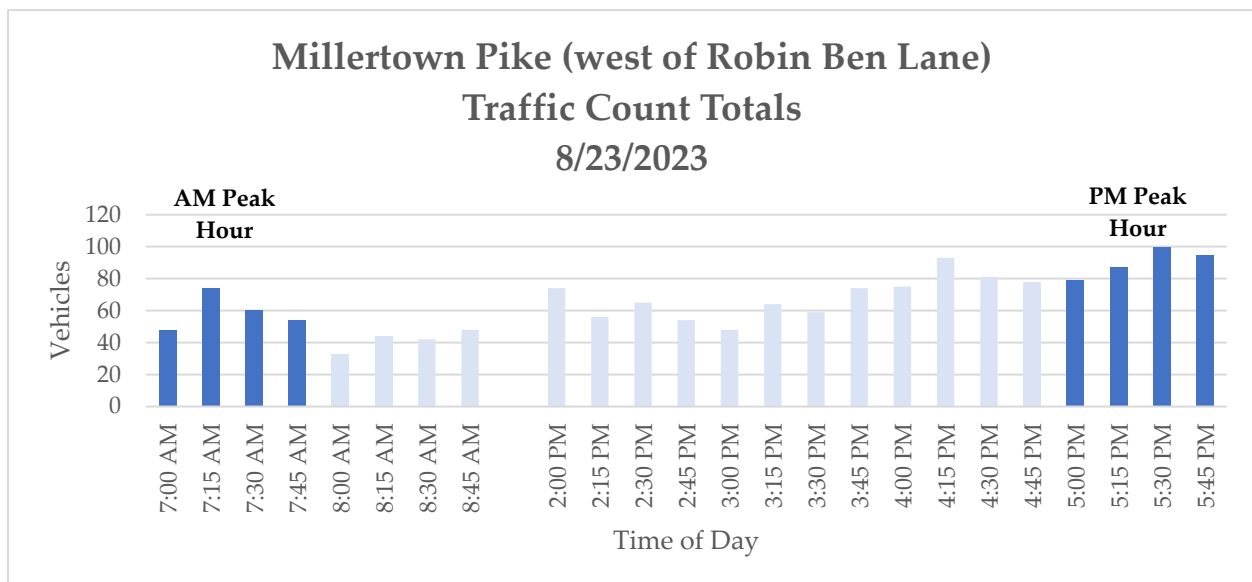
## ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

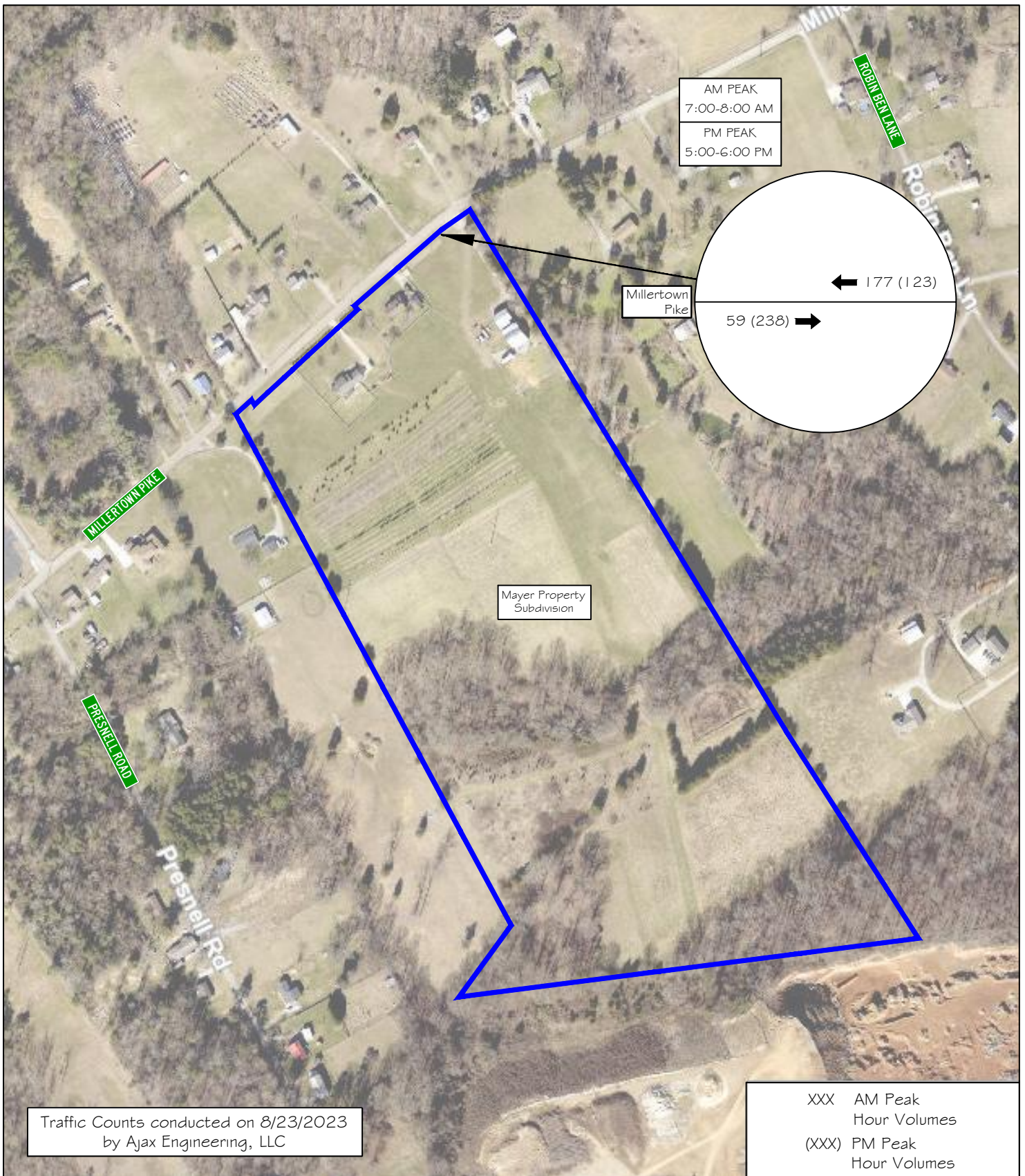
▪ **EXISTING TRAFFIC CONDITIONS:**

This study conducted a 6-hour traffic count at Millertown Pike, adjacent to the proposed development site, on Wednesday, August 23<sup>rd</sup>, 2023. Manual traffic counts were conducted to identify and tabulate the morning and afternoon peak period volumes and the travel directions near the proposed development site. Local public schools were in session when the traffic counts were conducted and had been open for two weeks. This two-week wait before counting allowed traffic patterns to normalize after school children returned from the summer break. Based on the traffic volumes collected at Millertown Pike, the AM and PM peak hours were observed at 7:00 – 8:00 a.m. and 5:00 – 6:00 p.m.

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

- Most vehicles observed during the traffic counts were typical passenger cars, with some large trucks and heavy vehicles in the thru movements on Millertown Pike. The large and heavy vehicles included a few several semi-tractor-trailer trucks and larger construction-related trucks. Many Knox County school buses were observed during the traffic counts traveling on Millertown Pike.
- Two bicyclists and no pedestrians were observed on Millertown Pike during the traffic count. One bicyclist was headed westbound, and one was headed eastbound, with both traveling during the afternoon.





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FIGURE 4

Mayer Property Subdivision

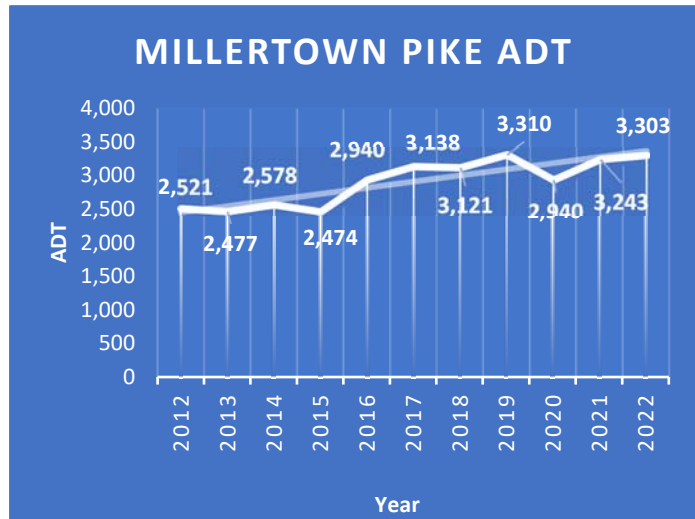
2023 Peak Hour Traffic Volumes -  
EXISTING TRAFFIC CONDITIONS



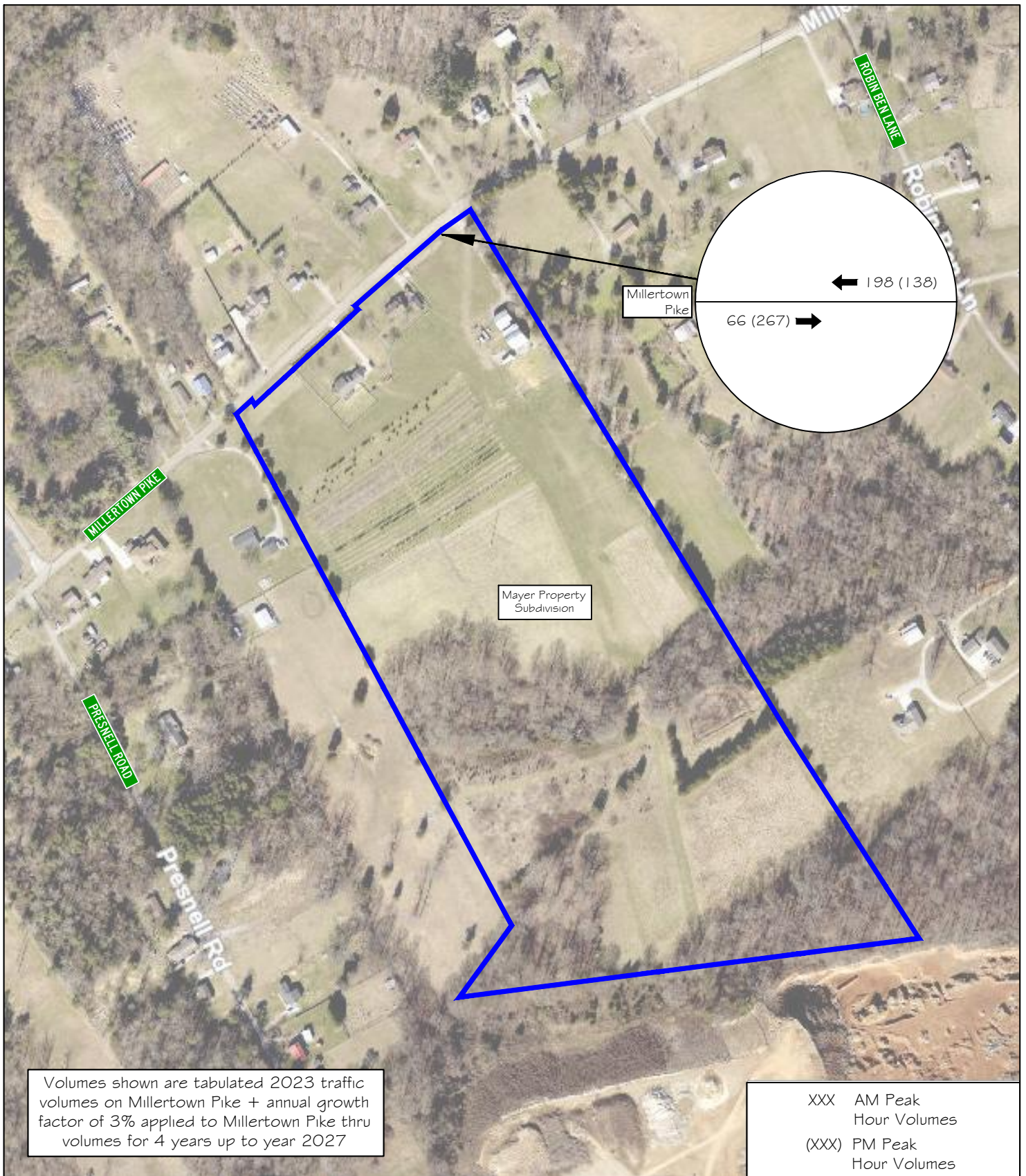
▪ **PROJECTED TRAFFIC CONDITIONS (WITHOUT THE PROJECT):**

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). This proposed development's build-out and full occupancy are assumed to occur by 2027.

According to the nearby TDOT count station, vehicular traffic on Millertown Pike has shown moderate growth over the past ten years. Data in Appendix A shows that Millertown Pike, east of Robin Ben Lane, has experienced annual growth of +2.7% over the past ten years.



An annual growth rate was assumed and applied to the existing thru 2023 volumes tabulated on Millertown Pike to estimate the future volumes in the horizon year of 2027 without the potential development traffic. For this study, a slightly higher annual growth rate of +3% was used to calculate future growth on Millertown Pike up to 2027 to account for potential traffic growth in the study area and result in a conservative analysis. Figure 5 shows the projected 2027 horizon year traffic volumes at Millertown Pike at the development site without the project during the AM and PM peak hours.



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FIGURE 5

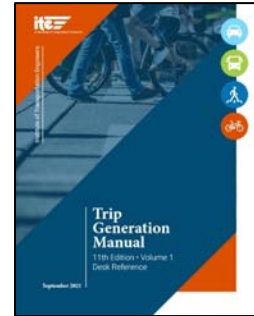
Mayer Property Subdivision

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



▪ **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated amount of traffic the proposed three single-family detached houses will generate was calculated based on rates and equations provided by the Trip Generation Manual, 11th Edition, an Institute of Transportation Engineers (ITE) publication. The Trip Generation Manual is the traditional and most popular resource for determining trip generation rates when transportation impact studies are produced. The trip rate for the 130 multi-family attached townhouses was based upon equations provided by Knoxville-Knox County Planning. These equations were developed from an extensive local study to estimate townhouse (and apartment) trip generation in the surrounding area and were published in December 1999. For Knox County, this is the preferred rate to use for townhouses and apartments. This local rate calculates higher trip rates than the similar ITE land use.



The data and calculations from the ITE and local trip generation study for the proposed land uses are shown in Appendix F. A summary of this information is presented in the following table:

**TABLE 2**  
**TRIP GENERATION FOR MAYER PROPERTY SUBDIVISION**  
**130 Attached Townhouses and 3 Single-Family Detached Houses**

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
Local Trip Rate	Multi-Family Attached Townhouses	130	1,208	22%	78%		55%	45%	
				15	53	68	53	44	97
#210	Single-Family Detached Housing	3	40	26%	74%		63%	37%	
				1	2	3	3	1	4
<b>Total New Volume Site Trips</b>			<b>1,248</b>	<b>16</b>	<b>55</b>	<b>71</b>	<b>56</b>	<b>45</b>	<b>101</b>

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

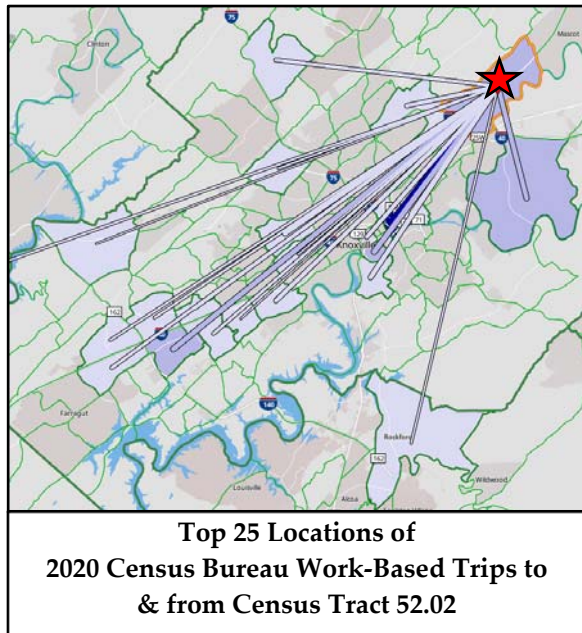
For the proposed residential development, it is estimated that 16 vehicles will enter and 55 will exit, for a total of 71 generated trips during the AM peak hour in the year 2027. Similarly, it is estimated that 56 vehicles will enter and 45 will exit, for a total of 101 generated trips during the

PM peak hour in the year 2027. The calculated trips generated for an average weekday are estimated to be 1,248 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

▪ **TRIP DISTRIBUTION AND ASSIGNMENT:**

The projected trip distribution and assignment for the Mayer Property Subdivision development are based on several sources and engineering judgment. The first source is based on the existing traffic count volumes and the observed travel directions collected at Millertown Pike adjacent to the proposed development site.

During the traffic count, distinct directional splits were observed for the eastbound and westbound Millertown Pike thru volumes during the morning and afternoon peak hours. In the AM peak hour, 75% of thru traffic on Millertown Pike was observed traveling west towards Knoxville and 25% east towards Ellistown Road. In the PM peak hour, roughly the opposite was observed, with 34% of thru traffic on Millertown Pike traveling westbound and 66% eastbound.



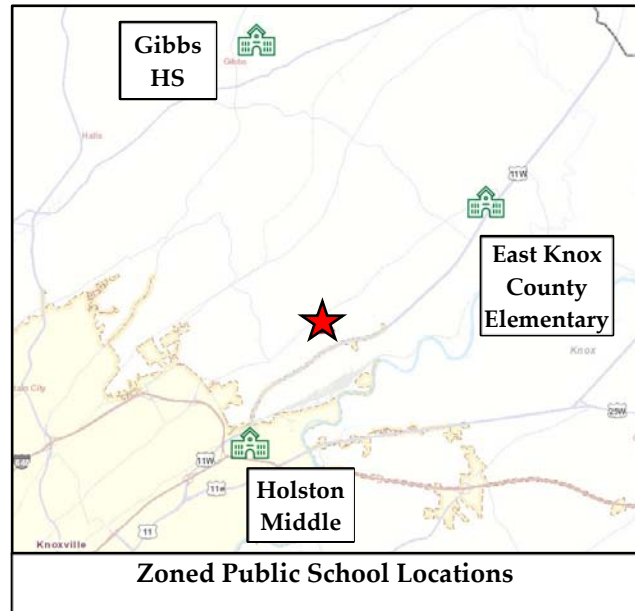
The second source for assisting in determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for generated trips by the development, and these trips are more likely to travel to and from the southwest and south. This assertion is based on data from the United States Bureau website for Census Tract 52.02, where the development property is located. Based on 2020 (latest available) census data and as shown in Appendix G, most work-based trips in the surrounding area correspond to downtown Knoxville, the University of Tennessee area, Forks of the River Industrial Park, and areas of West

Knoxville. For future work-related travel to and from the development site, the proximity of the Interstate 640 interchange at Millertown Pike to the southwest will draw a good portion of these trips. Furthermore, future work-related travel could be drawn to and from the Amazon Fulfillment Center near Interstate 640 to the southwest when it officially begins operations. Note: An official start date has not been announced even though the facility appears complete and ready for operations to begin.

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



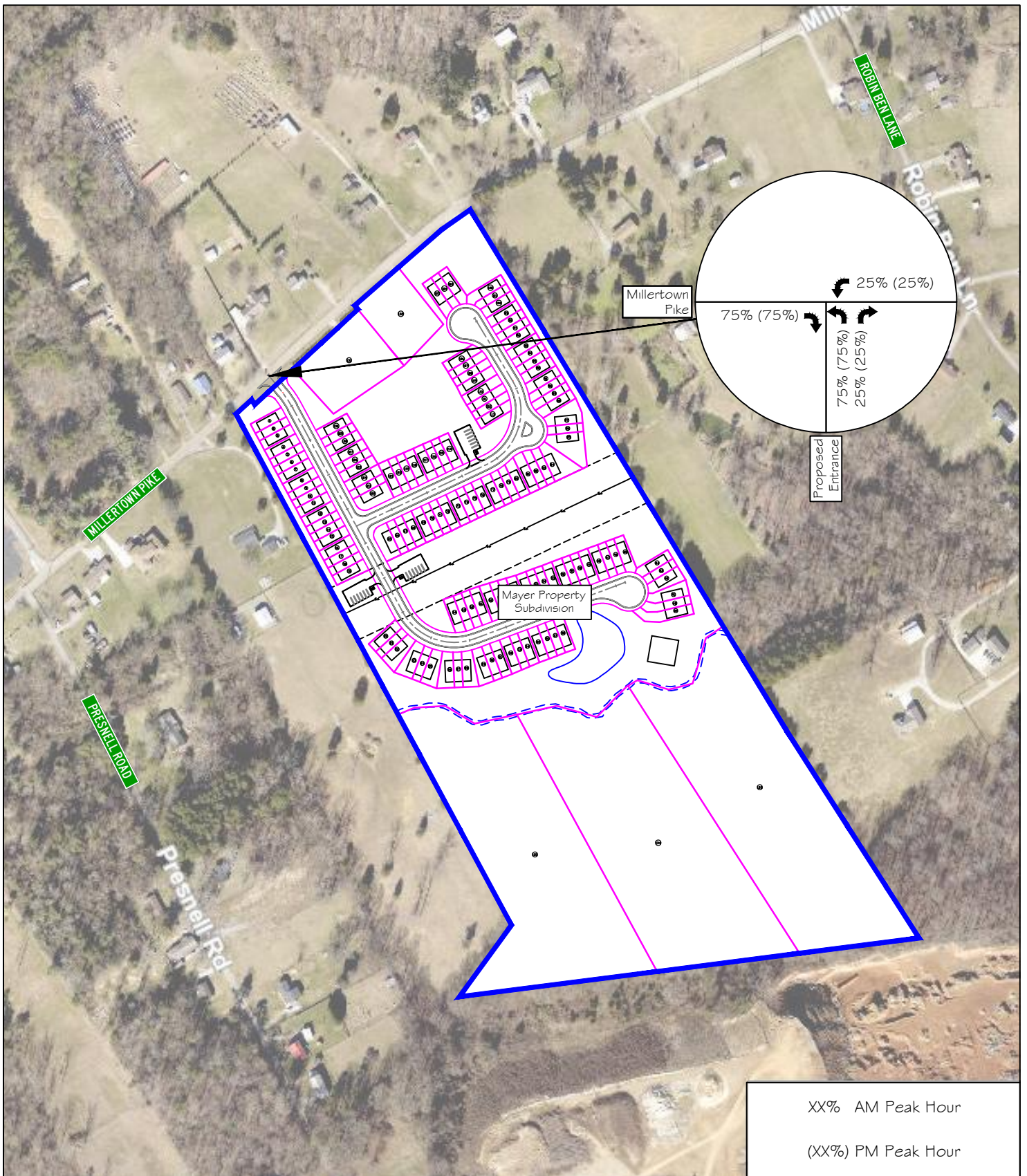
property is currently zoned for East Knox County Elementary, Holston Middle, and Gibbs High School. These zoned public schools are located northeast, north, and southwest of the development site. For parents and children not utilizing public school bus transportation, the most direct route to these schools is initially traveling on Millertown Pike and then utilizing other roads. Holston Middle is the closest school to the development site at 4.0 miles, and Gibbs High School is the furthest at 8.2 miles. The school with the most direct access via Millertown Pike will be East Knox County Elementary, 4.8 miles northeast of the development site.



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.

Figure 6 shows the projected distribution of traffic entering and exiting the development at the Proposed Entrance at Millertown Pike. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the ITE and local trip rates. Ultimately, the projected trip distribution was heavily based on the observed traffic adjacent to the site on Millertown Pike and the data indicating work-related destinations.

Figure 7 shows the traffic assignment of the computed trips generated by the development and is based on the assumed distribution of trips shown in Figure 6.



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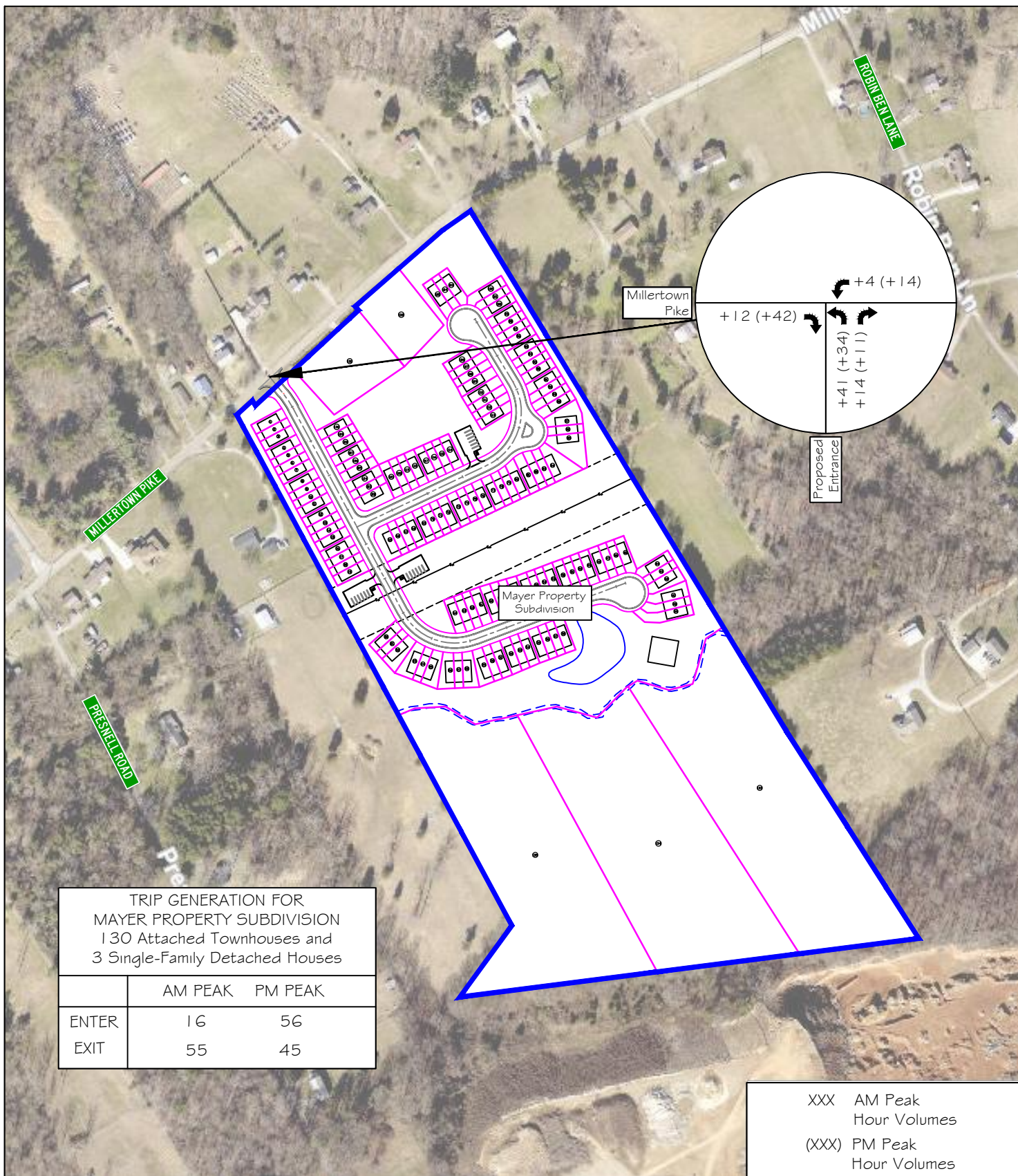


FIGURE 6

Mayer Property Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour





TRIP GENERATION FOR  
MAYER PROPERTY SUBDIVISION  
130 Attached Townhouses and  
3 Single-Family Detached Houses

	AM PEAK	PM PEAK
ENTER	16	56
EXIT	55	45

XXX AM Peak  
Hour Volumes  
(XXX) PM Peak  
Hour Volumes



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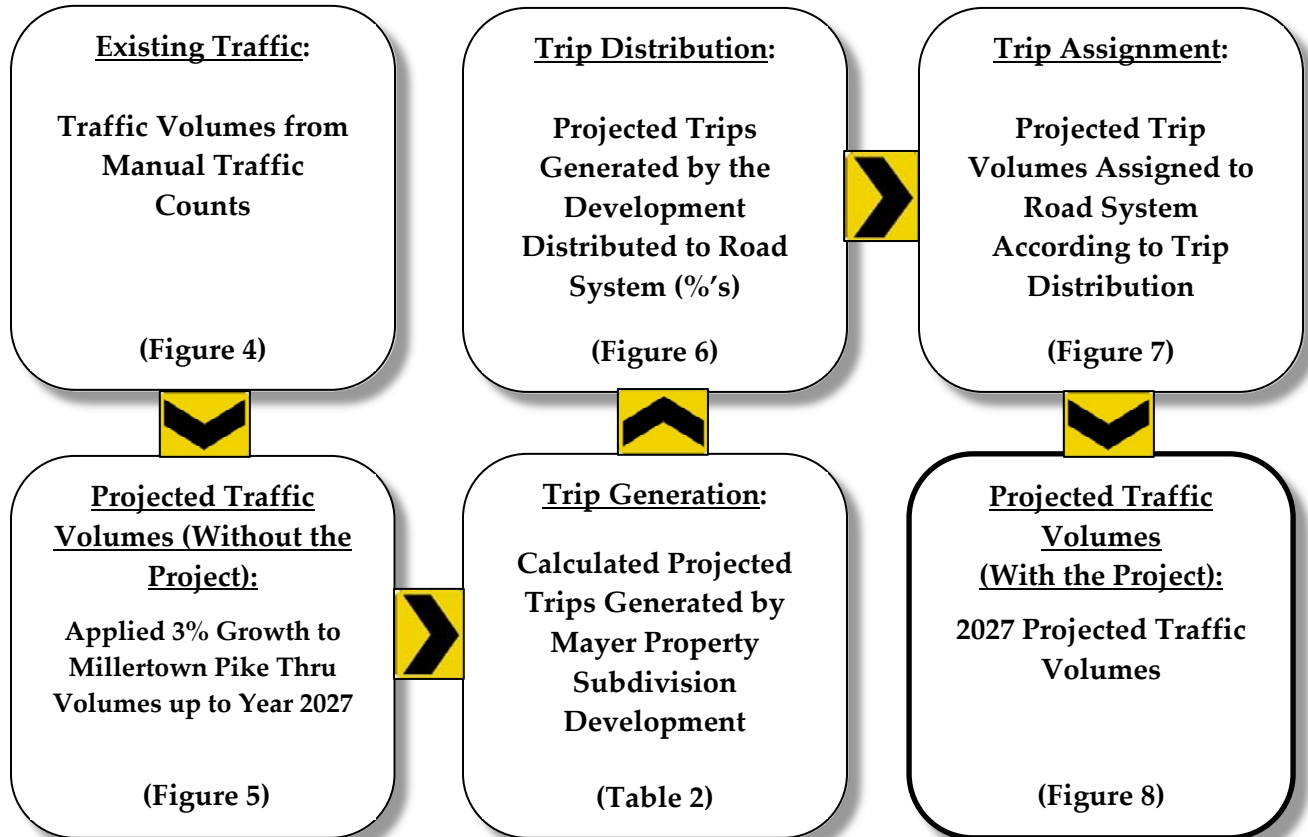
FIGURE 7

Mayer Property Subdivision

Traffic Assignment of Generated Traffic  
during AM and PM Peak Hour

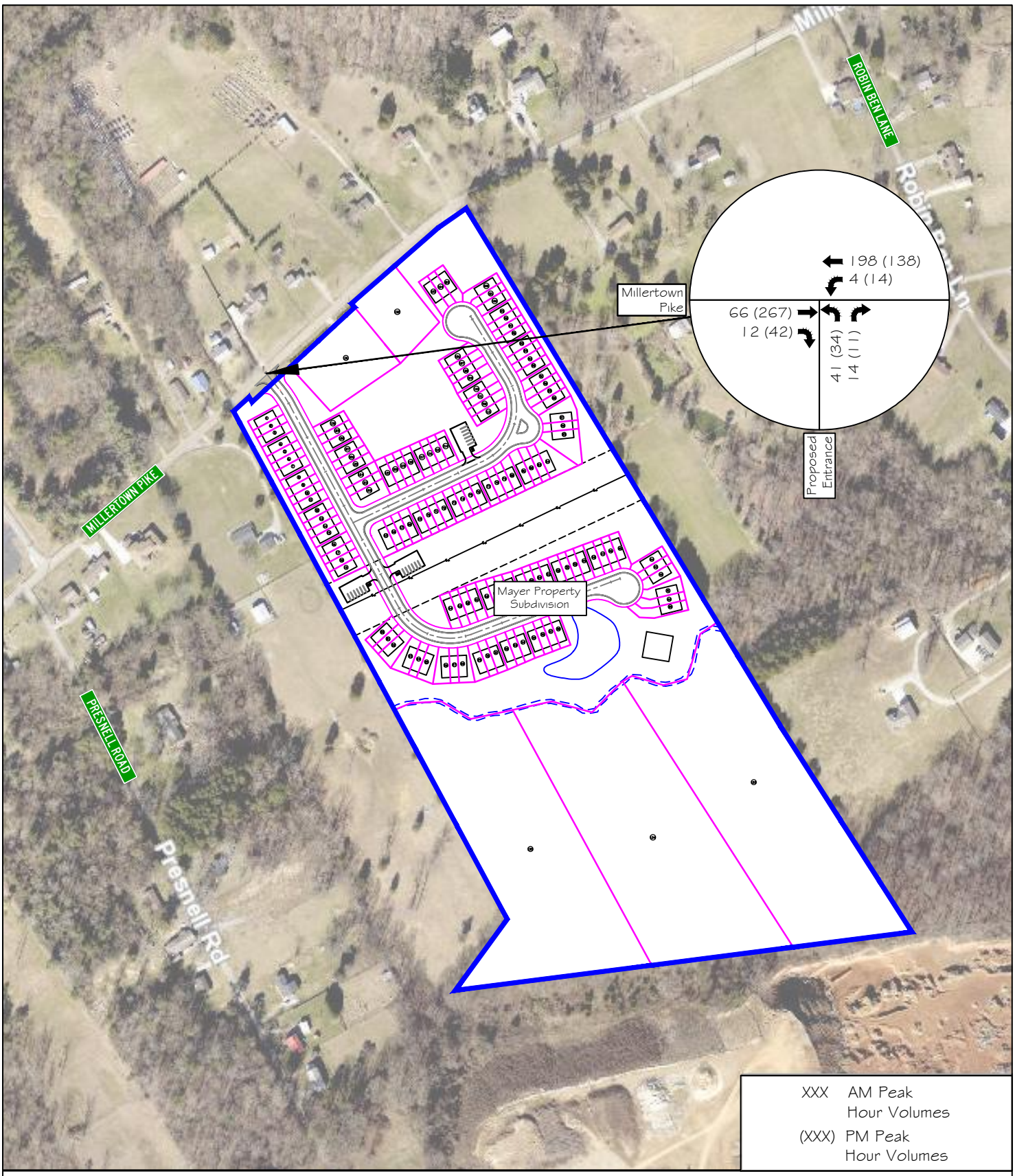
▪ **PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT):**

Several additive steps were taken to estimate the total projected traffic volumes at the Proposed Entrance intersection on Millertown Pike when the subdivision development is constructed and fully occupied in 2027. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 2) generated by the Mayer Property Subdivision development was added to the 2027 horizon year traffic (Figure 5) by following the predicted trip distributions and assignments (Figures 6 and 7). This procedure was completed to obtain the total projected traffic volumes at the entrance intersection when the Mayer Property Subdivision development is fully built and occupied in 2027. Figure 8 shows the projected 2027 AM and PM peak hour traffic volumes, which includes the generated development traffic entering and exiting the Proposed Entrance intersection.





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FIGURE 8

Mayer Property Subdivision

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

Capacity analyses were conducted to determine the projected LOS at the Proposed Entrance intersection with the development traffic in 2027, shown in Figure 8. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and 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, representing 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' 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, including 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

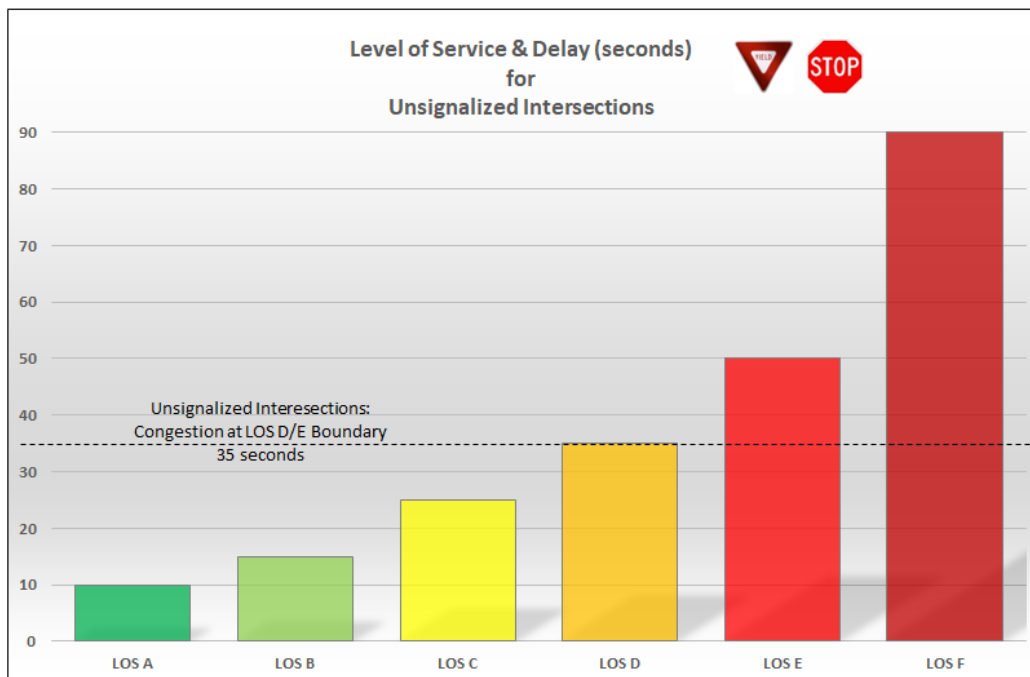
the delay for each minor approach and major street left-turn movements. Table 3 lists the level of service criteria for unsignalized intersections. The analysis results of unsignalized intersections using the HCM methodologies are conservative due to the more significant vehicle gap parameters used in 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 3**  
**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 projected 2027 peak hour traffic are shown in Table 4. 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 H includes the worksheets for the projected 2027 peak hour capacity analyses.

As shown in Table 4, the intersection is calculated to operate with excellent LOS and very reasonable vehicle delays in the projected 2027 conditions.

**TABLE 4**  
**2027 INTERSECTION CAPACITY ANALYSIS RESULTS -**  
**PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)**

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS <sup>a</sup>	DELAY <sup>b</sup> (seconds)	v/c <sup>c</sup>	LOS <sup>a</sup>	DELAY <sup>b</sup> (seconds)	v/c <sup>c</sup>
Millertown Pike (EB & WB) at Proposed Entrance (NB)		Northbound Left/Right	B	10.5	0.086	B	12.5	0.094
		Westbound Left/Thru	A	7.4	0.003	A	8.0	0.013

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

<sup>a</sup> Level of Service, <sup>b</sup> Average Delay (sec/vehicle), <sup>c</sup> Volume-to-Capacity Ratio



▪ **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

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

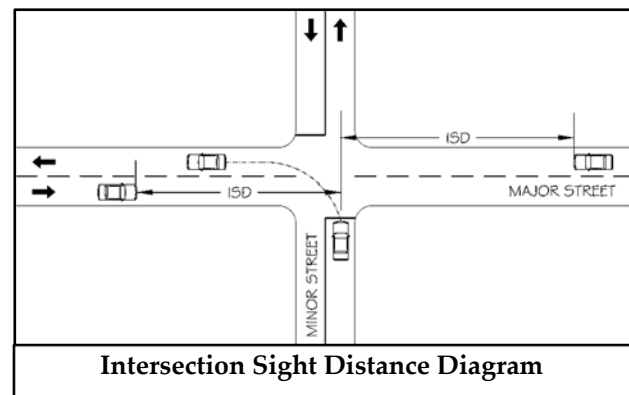
○ **EVALUATION OF SIGHT DISTANCE**

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.

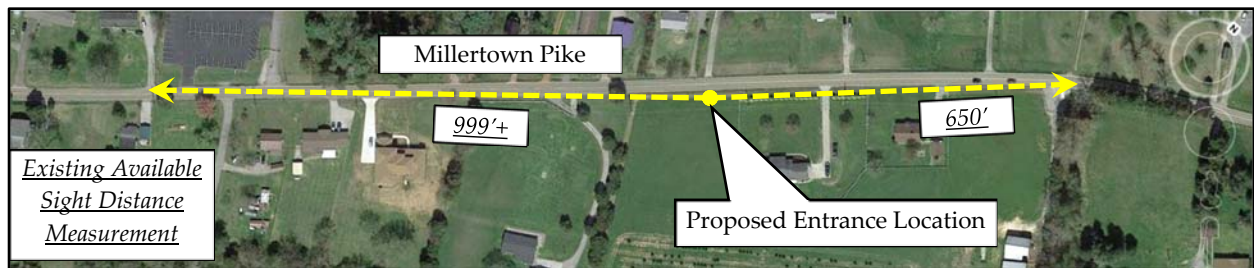


Three traffic maneuvers are available for vehicles stopped on a minor street at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being 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 speed limit of 40-mph on Millertown Pike at the Proposed Entrance, the ISD is calculated to be 400 feet based on Knox County's requirement of providing 10 feet of sight distance per 1 mph of vehicle speed.

Visual observations of the sight distances at the Proposed Entrance location on Millertown Pike were undertaken. Using a Nikon Laser Rangefinder at the Proposed Entrance location, the available sight distance was visually estimated to be 999'+ (limit of the rangefinder) to the southwest and 650' feet to the northeast. The sight distance to the northeast is smaller than the southwest due to the horizontal curvature on Millertown Pike.

Thus, the available sight distances from the Proposed Entrance on Millertown Pike will be adequate based on visual observations. Images of the existing sight distances at the Proposed Entrance location are labeled below with the ISD and rangefinder-measured sight distances.



**View of Sight Distance on Millertown Pike at the Proposed Entrance Location (Looking Southwest)**



**View of Sight Distance on Millertown Pike at the Proposed Entrance Location (Looking Northeast)**

○ **EVALUATION OF TURN LANE THRESHOLDS**

The need for separate entering turn lanes was evaluated in the projected 2027 conditions for Millertown Pike at the Proposed Entrance.

The criteria used for these turn lane evaluations were based on Knox County's "Access Control and Driveway Design Policy". This design policy relates vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways. The location of the Proposed Entrance on Millertown Pike is within a 40-mph speed zone; thus, it was evaluated based on this speed.

According to Knox County's guidelines with a posted speed limit of 40-mph, separate left and right-turn lanes on Millertown Pike at the Proposed Entrance are not warranted based on the projected peak hour 2027 traffic volumes. The worksheets for these evaluations are provided in Appendix I.

○ **PROJECTED VEHICLE QUEUES**

An additional software program was used to calculate the 2027 AM and PM peak hour projected vehicle queues at the studied intersection. 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 95<sup>th</sup> percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95<sup>th</sup> 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 in the software. The 95<sup>th</sup> percentile vehicle queue lengths at the intersection are shown in Table 5 for the projected 2027 conditions with the project. The vehicle queue worksheet results from the SimTraffic software are in Appendix J.

**TABLE 5**  
**VEHICLE QUEUE SUMMARY -**  
**2027 PROJECTED PEAK HOUR TRAFFIC (WITH THE PROJECT)**

INTERSECTION	APPROACH/ MOVEMENT	SIMTRAFFIC 95 <sup>th</sup> PERCENTILE QUEUE LENGTH (ft)	
		AM PEAK HOUR	PM PEAK HOUR
Millertown Pike (EB & WB) at Proposed Entrance (NB)	Westbound	4	22
	Northbound	45	44

Note: 95<sup>th</sup> percentile queues were calculated in SimTraffic 11 software

Table 5 shows minimal projected queue lengths at the intersection in the 2027 peak hour conditions. The projected vehicle queues for the exiting traffic in the 2027 AM and PM peak hours at the Proposed Entrance are calculated to be very reasonable. Results are not reported for the eastbound approach since the movements at this approach will be free-flowing and not dependent on conflicting vehicles.



## CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the Mayer Property Subdivision development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.



**Millertown Pike at the Proposed Entrance:** The 2027 projected level of service calculations for this intersection resulted in reasonable vehicle delays and LOS.

- 1a) The construction of separate left and right-turn lanes on Millertown Pike for entering vehicles at the Proposed Entrance is not warranted based on the projected 2027 traffic volumes.
- 1b) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed Entrance approach at Millertown Pike. The stop bar should be applied a minimum of 4 feet away from the edge of Millertown Pike and placed at the desired stopping point that maximizes the sight distance.
- 1c) A single exiting lane for the development entrance at Millertown Pike will be sufficient. The longest vehicle queue in the projected 2027 conditions on this exiting approach is calculated to be 45 feet in the AM peak hour and 44 feet in the PM peak hour. These queue lengths are reasonable and translate to just under two passenger cars, assuming a length of 25 feet per vehicle.
- 1d) Intersection sight distance at the proposed Road Entrance at Millertown Pike must not be impacted by future landscaping or signage. Based on a posted speed limit of 40-mph on Millertown Pike, the required intersection sight distance is 400 feet for exiting left and right-turning vehicles. The site designer must verify that these distances will be available. An existing sign is posted on the south



Existing Sign on Millertown Pike

side of Millertown Pike along the fence line, west of the Proposed Entrance location. The sign states, "Welcome / Arminda Community". It is assumed that this sign will be impacted due to the construction of the new subdivision and entrance. If relocated, it should be posted at an appropriate location that does not impact sight distance from the Proposed Entrance.

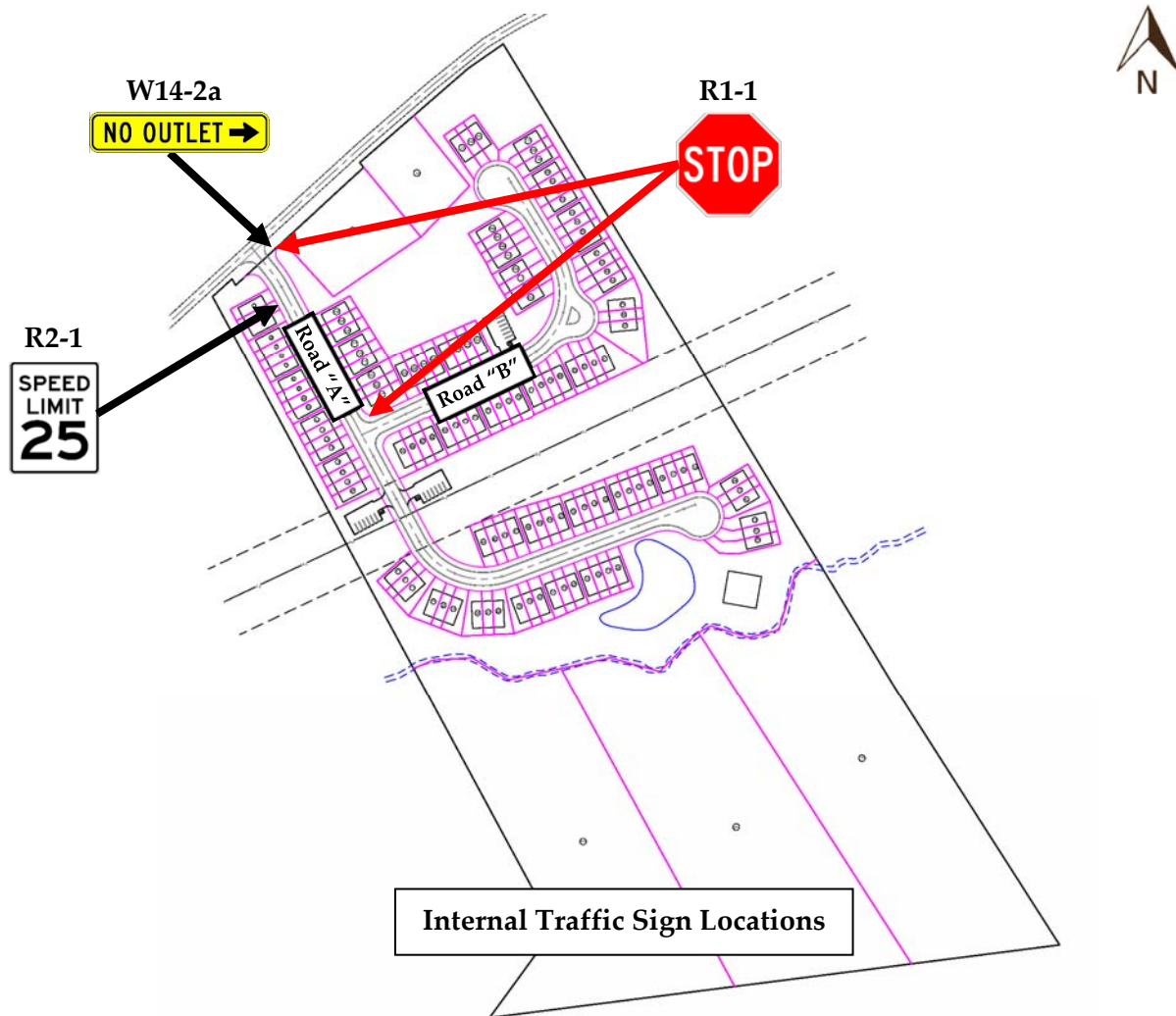
- 1e) The double yellow centerline on Millertown Pike should be removed within the approach of the new proposed entrance roadway, Road "A". Furthermore, Knox County should consider modifying the beginning location of the westbound passing zone on Millertown Pike. As currently laid out on Millertown Pike, this passing zone would begin 50 feet west of the centerline of the new proposed entrance road, Road "A". It is recommended that the passing zone begin at least 100 feet away from the centerline of the proposed entrance roadway, Road "A", to provide some buffer and a factor of safety at the new intersection. A rationale behind this 100-foot distance is based on [TN Code § 55-8-120 \(2021\)](#), which states (emphasis added):
  - a. No vehicle shall at any time be driven to the left side of the roadway under the following conditions:
    1. When approaching the crest of a grade or upon a curve in the highway where the driver's view is obstructed within three hundred feet (300') or such distance as to create a hazard in the event another vehicle might approach from the opposite direction;
    2. When approaching **within one hundred feet (100') of or traversing any intersection** or railroad grade crossing; or
    3. When the view is obstructed upon approaching within one hundred feet (100') of any bridge, viaduct or tunnel.

Extending the no-passing zone (double yellow centerline) 50 feet further to the west would reduce the overall length of the existing westbound passing zone from 500 feet to 450 feet.



**Mayer Property Subdivision Internal Roads:** The layout plan shows a single entrance at Millertown Pike constructed for the development, as shown in Figure 3.

- 2a) A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance off Millertown Pike. It is recommended that a “No Outlet” Sign (W14-2a) be installed at the front of the development at Millertown Pike. The “No Outlet” (W14-2a) sign can be installed above or below the street name sign or separately posted on Road “A”.
- 2b) Stop Signs (R1-1) with 24” white stop bars and other traffic signage are recommended to be installed at the internal locations, as shown below:

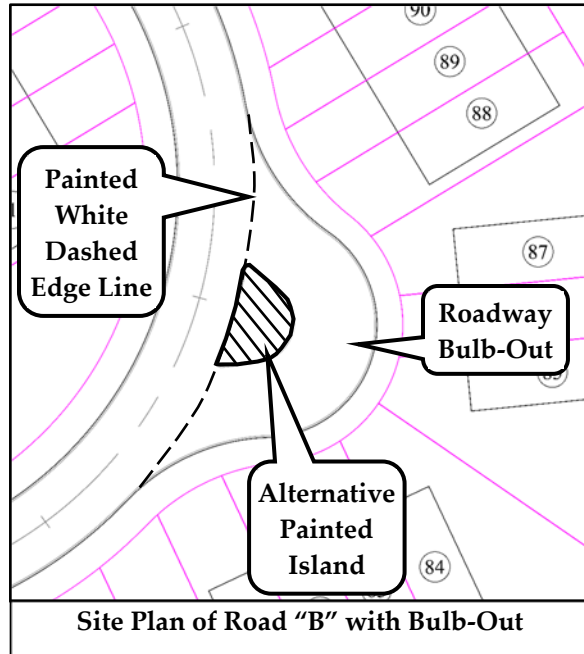


- 2c) Sight distance at the new internal intersection must not be impacted by new signage, parked cars, or future landscaping in the subdivision. With a speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required

stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met.

2d) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.

2e) Road "B" will have a bulb-out constructed along its length, accommodating access to several proposed lots in a corner of the development property. Construction of this bulb-out will create a large pavement area without traffic control on a horizontal road curve. At a minimum, it is recommended that a 4" white dashed pavement line be applied to the outside edge of the roadway adjacent to the bulb-out. Other potential traffic controls that should be considered include a stripped or raised delineated island.



Details regarding potential traffic controls at these bulb-outs should be discussed in the detailed design phase with Knox County Engineering.

2f) 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**

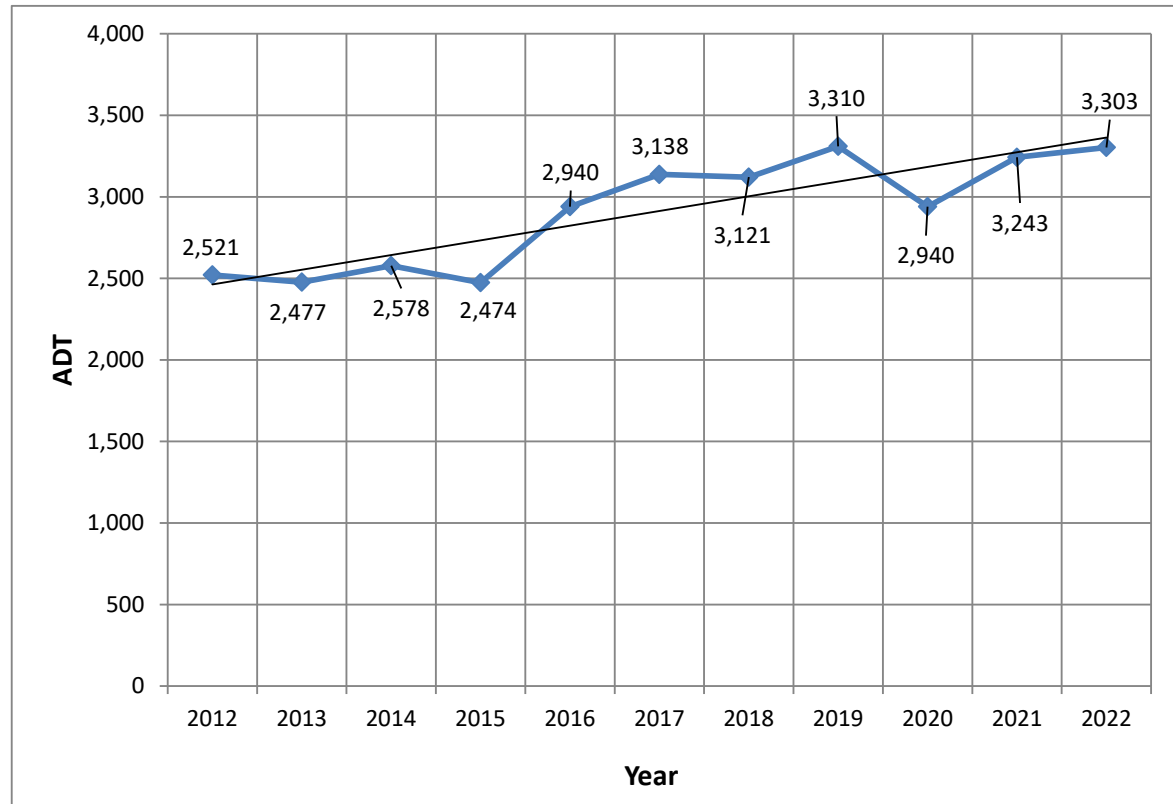
## Historical Traffic Counts

Organization: TDOT

Station ID #: 47000340

Location: Millertown Pike, east of Robin Ben Lane

YEAR	ADT	Trendline
2012	2,521	↓
2013	2,477	
2014	2,578	
2015	2,474	
2016	2,940	
2017	3,138	
2018	3,121	
2019	3,310	
2020	2,940	
2021	3,243	
2022	3,303	



2012 - 2022 Growth Rate = 31.0%

Average Annual Growth Rate = 2.7%

List View All DIRs

<a href="#">Record</a> <span style="float: right;">7518 of 15695 Goto Record <input type="text"/> go</span>	
Location ID	47000340
Type	SPOT
On NHS	On HPMS Yes
LRS ID	4702430001
SF Group	Urban
AF Group	Urban Minor Arterial
GF Group	Knox
Class Dist Grp	Urban Minor Arterial
Seas Class Grp	
WIM Group	
QC Group	Default
Funct Class	Minor Arterial
Located On	02430
Loc On Alias	MILLERTOWN PK.
More Detail	MILLERTOWN PK-NORTHEAST OF JOHN SEVIER

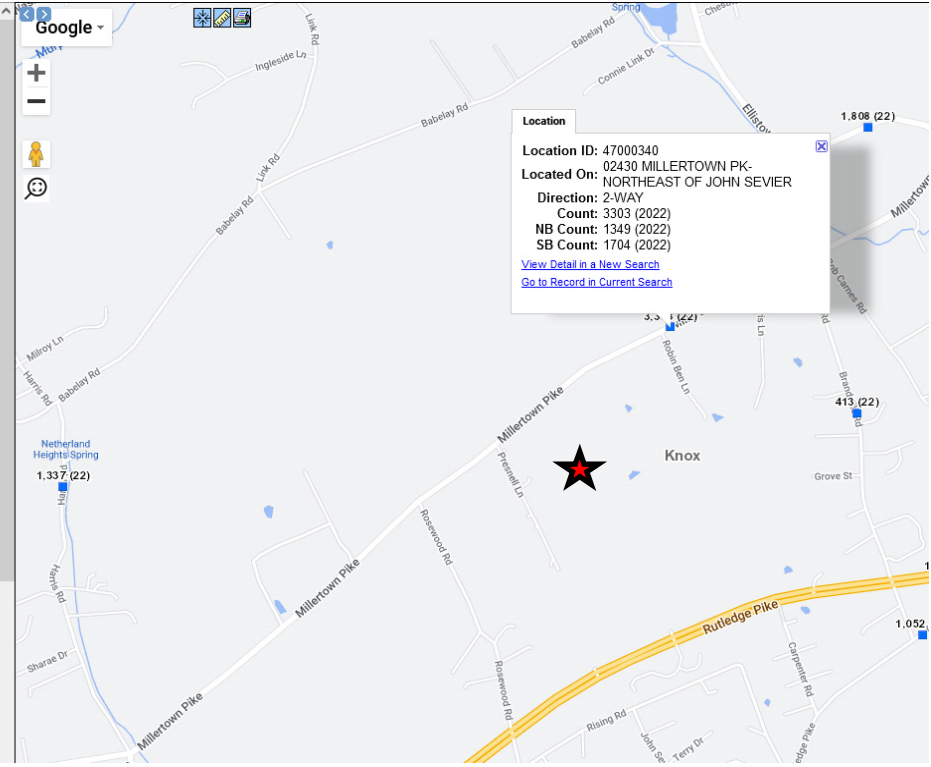
STATION DATA

Directions: **2-WAY** NB SB

1 1

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2022	3,303	308	9	67	3,211 (97%)	92 (3%)	
2021	3,243	335	10	67	3,139 (97%)	104 (3%)	
2020	2,940	317	11	67	2,894 (98%)	46 (2%)	
2019	3,310		12	65			
2018	3,121		10	65			

1-5 of 38




## **APPENDIX B**

### **WALK SCORE**



# WALKSCORE


(from walkscore.com)




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

[Go](#)


## 7336 Millertown Pike

Knoxville, Tennessee, 37924

Commute to **Knoxville, TN** 

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

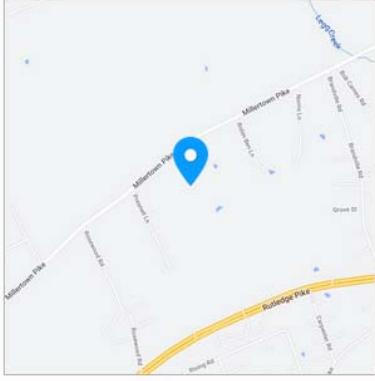
[Favorite](#) [Map](#) [Nearby Knoxville Apartments on Redfin](#)

[Looking for a home for sale in Knoxville?](#) 

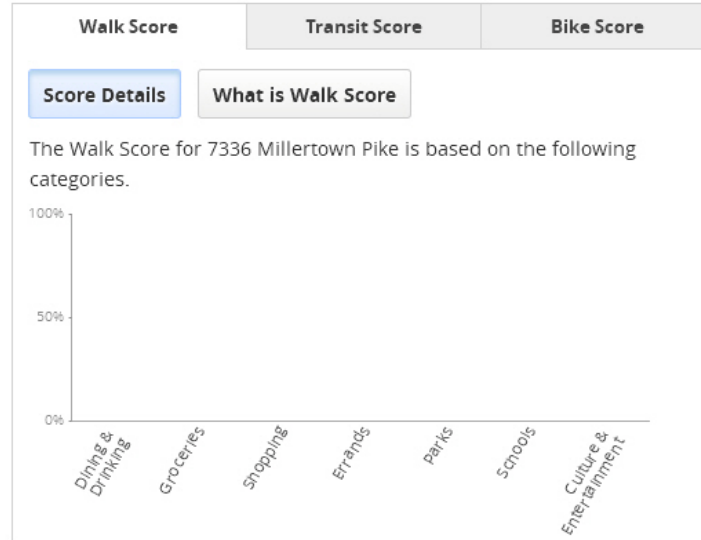
**Walk Score**  
**0**  
**Car-Dependent**  
Almost all errands require a car.

**Bike Score**  
**15**  
**Somewhat Bikeable**  
Minimal bike infrastructure.

[About your score](#)  
[Add scores to your site](#)



## Scores for 7336 Millertown Pike



## Scores for 7336 Millertown Pike



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

## Scores for 7336 Millertown Pike

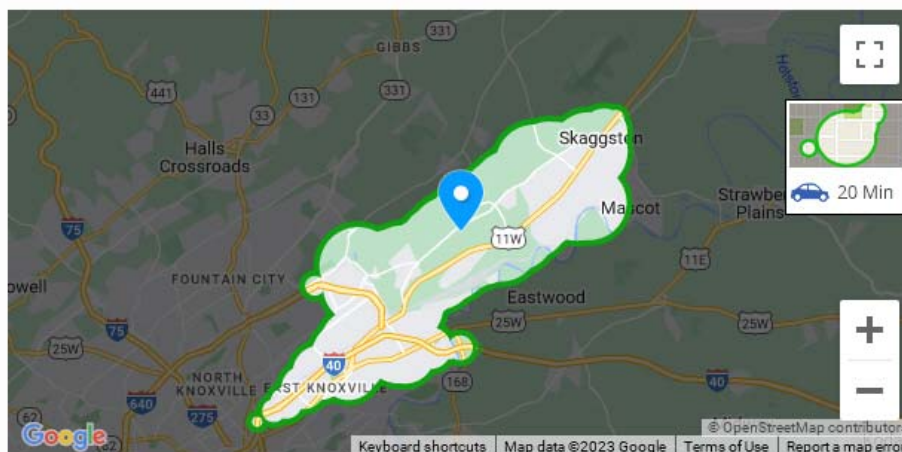


Walk Score	Transit Score	Bike Score
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.		
90-100	<b>Biker's Paradise</b>	Daily errands can be accomplished on a bike
70-89	<b>Very Bikeable</b>	Biking is convenient for most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

## Travel Time Map

[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 7336 Millertown Pike.







**APPENDIX C**

**KNOXVILLE AREA TRANSIT MAP AND INFORMATION**



# Knoxville City Center



**Legend**

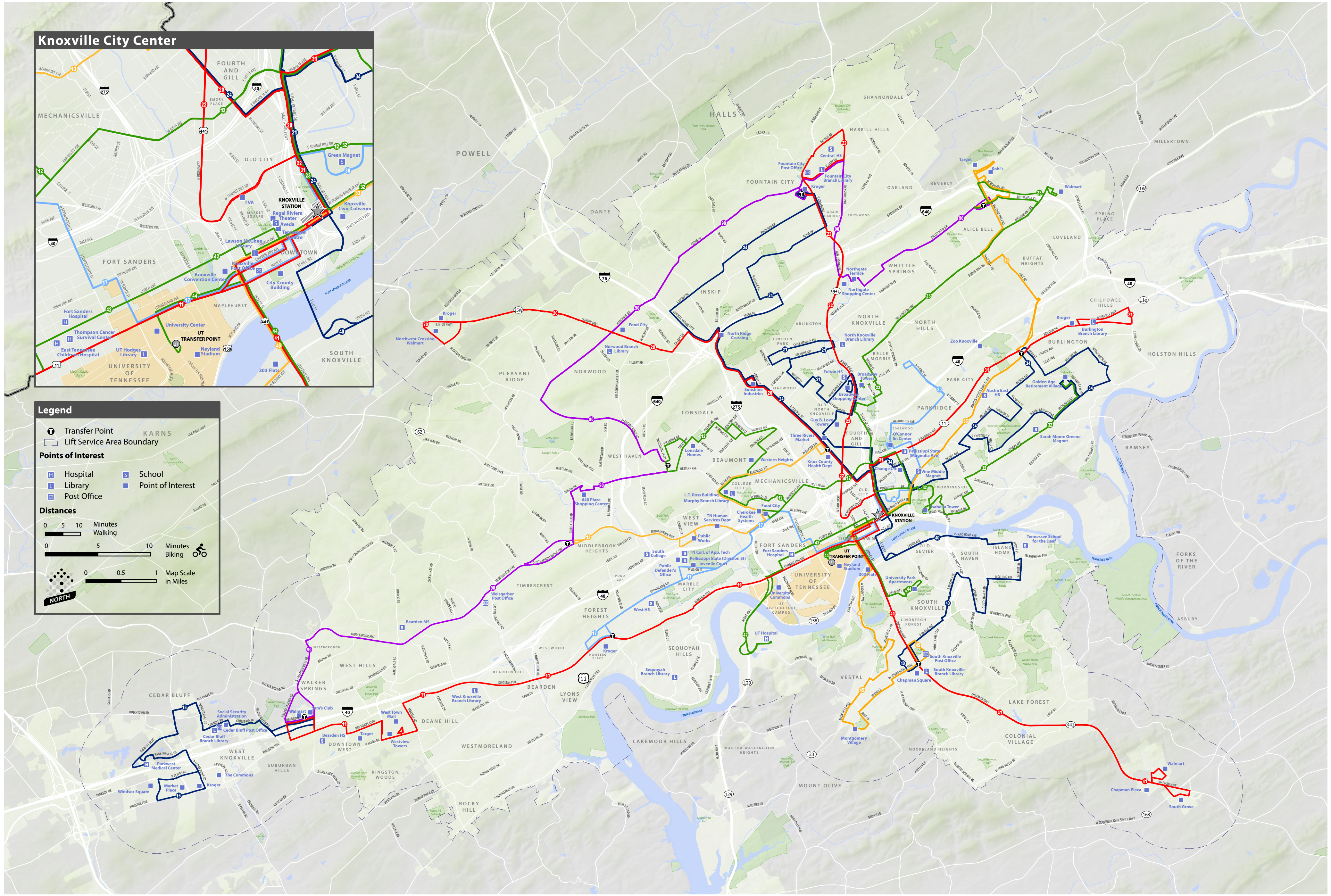
- Transfer Point
- Lift Service Area Boundary

**Points of Interest**

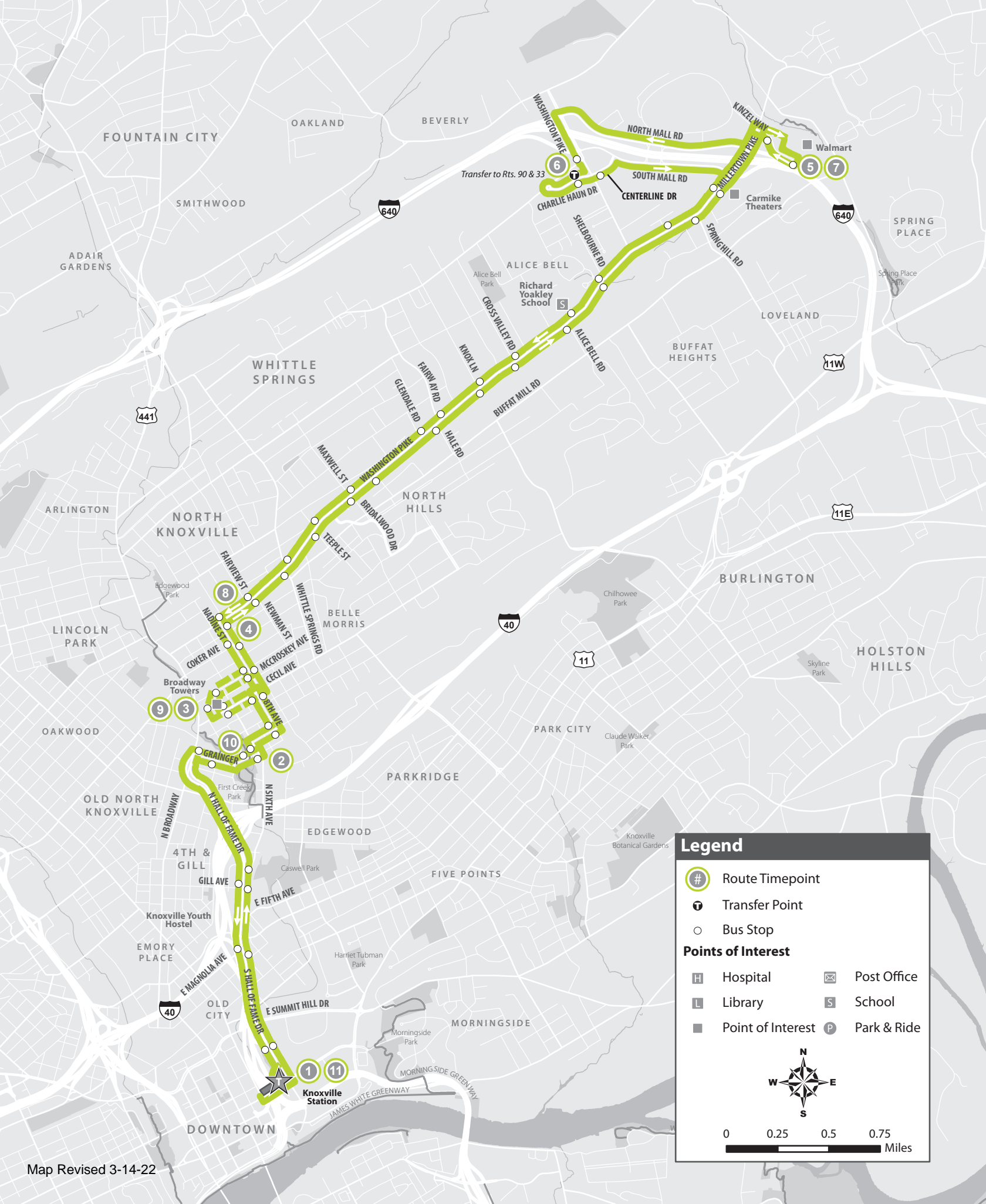
- Hospital
- School
- Library
- Post Office
- Point of Interest

**Distances**

- 0 5 10 Minutes Walking
- 0 5 10 Minutes Biking
- 0 0.5 1 Map Scale in Miles







**Legend**

- Route Timepoint
- Transfer Point
- Bus Stop

**Points of Interest**

Hospital	Post Office
Library	School
Point of Interest	Park & Ride

0      0.25      0.5      0.75  
 Miles

**Route 23 - Millertown: Weekdays**

Going away from downtown						Going toward downtown						
Knoxville Station Bay I	Grainger @ Sixth	Broadway Towers	Nadine @ Washington Pike	Walmart	Charlie Haun @ Washingt on Pike	Goes on to serve	Charlie Haun @ Washingt on Pike	Walmart	Washington Pike @ Fairview	Broadway Towers	Sixth @ Grainger	Knoxville Station Bay I
1	2	3	4	5	6		6	7	8	9	10	11
							5:30 AM	5:37 AM	5:49 AM		5:56 AM	6:10 AM
							6:30 AM	6:37 AM	6:49 AM		6:56 AM	7:10 AM
6:15 AM	6:24 AM		6:29 AM	6:45 AM	7:00 AM	Route 33	7:30 AM	7:37 AM	7:49 AM		7:56 AM	8:10 AM
7:15 AM	7:24 AM		7:29 AM	7:45 AM	8:00 AM	Route 33	8:30 AM	8:37 AM	8:49 AM	8:54 AM	8:56 AM	9:10 AM
8:15 AM	8:24 AM		8:29 AM	8:45 AM	9:00 AM	Route 33	9:30 AM	9:37 AM	9:49 AM	9:54 AM	9:56 AM	10:10 AM
9:15 AM	9:24 AM	9:27 AM	9:29 AM	9:45 AM	10:00 AM	Route 33	10:30 AM	10:37 AM	10:49 AM	10:54 AM	10:56 AM	11:10 AM
10:15 AM	10:24 AM	10:27 AM	10:29 AM	10:45 AM	11:00 AM	Route 33	11:30 AM	11:37 AM	11:49 AM	11:54 AM	11:56 AM	12:10 PM
11:15 AM	11:24 AM	11:27 AM	11:29 AM	11:45 AM	12:00 PM	Route 33	12:30 PM	12:37 PM	12:49 PM	12:54 PM	12:56 PM	1:10 PM
12:15 PM	12:24 PM	12:27 PM	12:29 PM	12:45 PM	1:00 PM	Route 33	1:30 PM	1:37 PM	1:49 PM	1:54 PM	1:56 PM	2:10 PM
1:15 PM	1:24 PM	1:27 PM	1:29 PM	1:45 PM	2:00 PM	Route 33	2:30 PM	2:37 PM	2:49 PM	2:54 PM	2:56 PM	3:10 PM
2:15 PM	2:24 PM	2:27 PM	2:29 PM	2:45 PM	3:00 PM	Route 33	3:30 PM	3:37 PM	3:49 PM	3:54 PM	3:56 PM	4:10 PM
3:15 PM	3:24 PM	3:27 PM	3:29 PM	3:45 PM	4:00 PM	Route 33	4:30 PM	4:37 PM	4:49 PM		4:56 PM	5:10 PM
4:15 PM	4:24 PM	4:27 PM	4:29 PM	4:45 PM	5:00 PM	Route 33	5:30 PM	5:37 PM	5:49 PM		5:56 PM	6:10 PM
5:15 PM	5:24 PM		5:29 PM	5:45 PM	6:00 PM	Route 33	6:30 PM	6:37 PM	6:49 PM		6:56 PM	7:10 PM
6:15 PM	6:24 PM		6:29 PM	6:45 PM	7:00 PM	Route 33	7:30 PM	7:37 PM	7:49 PM		7:56 PM	8:10 PM
7:15 PM	7:24 PM		7:29 PM	7:45 PM	8:00 PM	Route 33	8:30 PM	8:37 PM	8:49 PM		8:56 PM	9:10 PM
8:15 PM	8:24 PM		8:29 PM	8:45 PM	9:00 PM							
9:15 PM	9:24 PM		9:29 PM	9:45 PM	10:00 PM							

**Route 23 - Millertown: SATURDAYS**

Going away from downtown						Going toward downtown						
Knoxville Station Bay I	Grainger @ Sixth	Broadway Towers	Nadine @ Washington Pike	Walmart	Charlie Haun @ Washingt on Pike	Goes on to serve	Charlie Haun @ Washingt on Pike	Walmart	Washington Pike @ Fairview	Broadway Towers	Sixth @ Grainger	Knoxville Station Bay I
1	2	3	4	5	6		6	7	8	9	10	11
							7:30 AM	7:37 AM	7:49 AM		7:56 AM	8:10 AM
7:15 AM	7:24 AM		7:29 AM	7:45 AM	8:00 AM	Route 33	8:30 AM	8:37 AM	8:49 AM		8:56 AM	9:10 AM
8:15 AM	8:24 AM		8:29 AM	8:45 AM	9:00 AM	Route 33	9:30 AM	9:37 AM	9:49 AM		9:56 AM	10:10 AM
9:15 AM	9:24 AM		9:29 AM	9:45 AM	10:00 AM	Route 33	10:30 AM	10:37 AM	10:49 AM		10:56 AM	11:10 AM
10:15 AM	10:24 AM		10:29 AM	10:45 AM	11:00 AM	Route 33	11:30 AM	11:37 AM	11:49 AM		11:56 AM	12:10 PM
11:15 AM	11:24 AM		11:29 AM	11:45 AM	12:00 PM	Route 33	12:30 PM	12:37 PM	12:49 PM		12:56 PM	1:10 PM
12:15 PM	12:24 PM		12:29 PM	12:45 PM	1:00 PM	Route 33	1:30 PM	1:37 PM	1:49 PM		1:56 PM	2:10 PM
1:15 PM	1:24 PM		1:29 PM	1:45 PM	2:00 PM	Route 33	2:30 PM	2:37 PM	2:49 PM		2:56 PM	3:10 PM
2:15 PM	2:24 PM		2:29 PM	2:45 PM	3:00 PM	Route 33	3:30 PM	3:37 PM	3:49 PM		3:56 PM	4:10 PM
3:15 PM	3:24 PM		3:29 PM	3:45 PM	4:00 PM	Route 33	4:30 PM	4:37 PM	4:49 PM		4:56 PM	5:10 PM
4:15 PM	4:24 PM		4:29 PM	4:45 PM	5:00 PM	Route 33	5:30 PM	5:37 PM	5:49 PM		5:56 PM	6:10 PM
5:15 PM	5:24 PM		5:29 PM	5:45 PM	6:00 PM	Route 33	6:30 PM	6:37 PM	6:49 PM		6:56 PM	7:10 PM
6:15 PM	6:24 PM		6:29 PM	6:45 PM	7:00 PM	Route 33	7:30 PM	7:37 PM	7:49 PM		7:56 PM	8:10 PM
7:15 PM	7:24 PM		7:29 PM	7:45 PM	8:00 PM	Route 33	8:30 PM	8:37 PM	8:49 PM		8:56 PM	9:10 PM
8:15 PM	8:24 PM		8:29 PM	8:45 PM	9:00 PM							
9:15 PM	9:24 PM		9:29 PM	9:45 PM	10:00 PM							

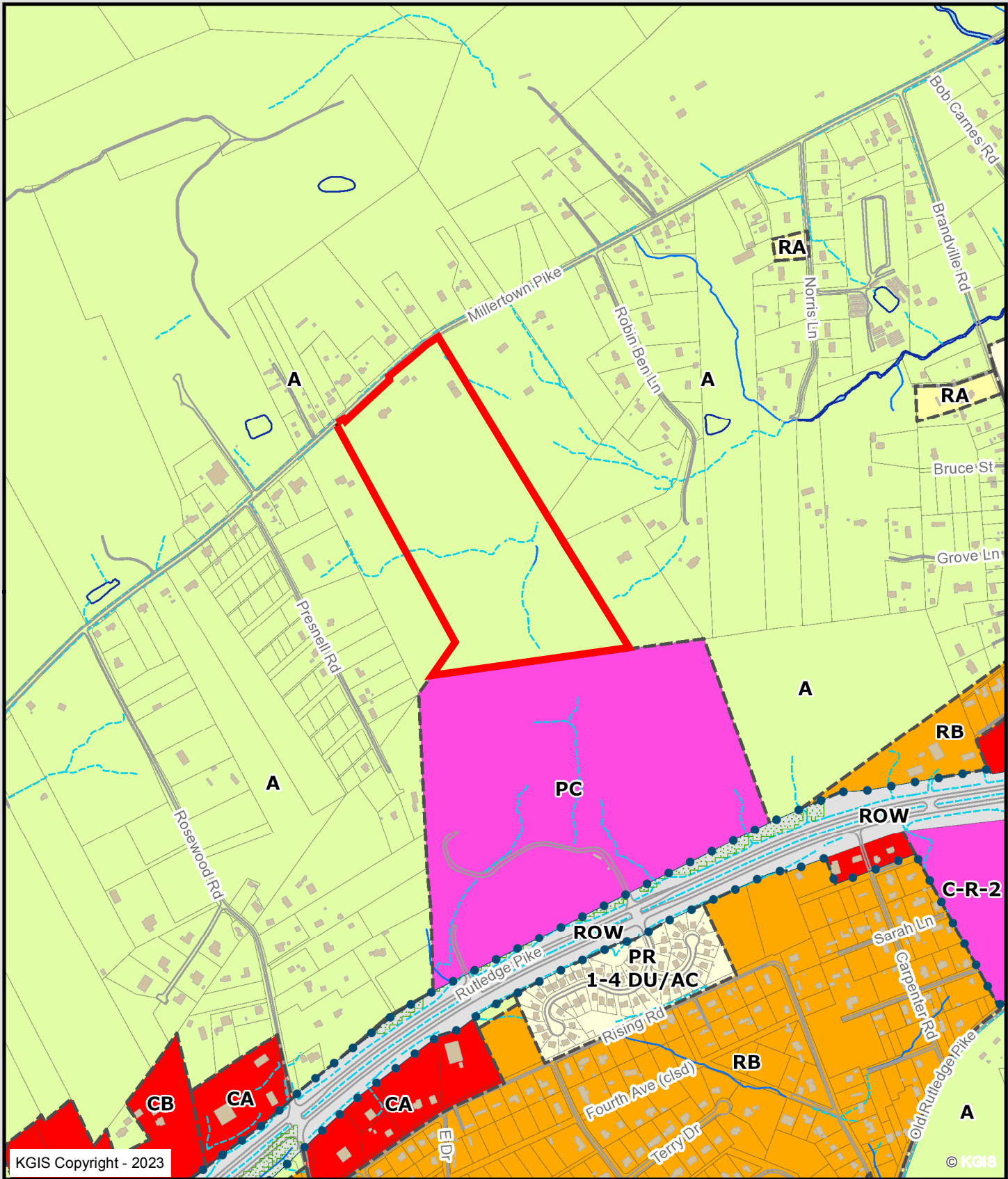
**Route 23 - Millertown: SUNDAYS**

Going away from downtown						Going toward downtown						
Knoxville Station Bay I	Grainger @ Sixth	Broadway Towers	Nadine @ Washington Pike	Walmart	Charlie Haun @ Washingt on Pike	Goes on to serve	Charlie Haun @ Washingt on Pike	Walmart	Washington Pike @ Fairview	Broadway Towers	Sixth @ Grainger	Knoxville Station Bay I
1	2	3	4	5	6		6	7	8	9	10	11
							7:30 AM	7:37 AM	7:49 AM		7:56 AM	8:10 AM
							8:30 AM	8:37 AM	8:49 AM		8:56 AM	9:10 AM
8:15 AM	8:24 AM		8:29 AM	8:45 AM	9:00 AM	Route 33	9:30 AM	9:37 AM	9:49 AM		9:56 AM	10:10 AM
9:15 AM	9:24 AM		9:29 AM	9:45 AM	10:00 AM	Route 33	10:30 AM	10:37 AM	10:49 AM		10:56 AM	11:10 AM
10:15 AM	10:24 AM		10:29 AM	10:45 AM	11:00 AM	Route 33	11:30 AM	11:37 AM	11:49 AM		11:56 AM	12:10 PM
11:15 AM	11:24 AM		11:29 AM	11:45 AM	12:00 PM	Route 33	12:30 PM	12:37 PM	12:49 PM		12:56 PM	1:10 PM
12:15 PM	12:24 PM		12:29 PM	12:45 PM	1:00 PM	Route 33	1:30 PM	1:37 PM	1:49 PM		1:56 PM	2:10 PM
1:15 PM	1:24 PM		1:29 PM	1:45 PM	2:00 PM	Route 33	2:30 PM	2:37 PM	2:49 PM		2:56 PM	3:10 PM
2:15 PM	2:24 PM		2:29 PM	2:45 PM	3:00 PM	Route 33	3:30 PM	3:37 PM	3:49 PM		3:56 PM	4:10 PM
3:15 PM	3:24 PM		3:29 PM	3:45 PM	4:00 PM	Route 33	4:30 PM	4:37 PM	4:49 PM		4:56 PM	5:10 PM
4:15 PM	4:24 PM		4:29 PM	4:45 PM	5:00 PM							
5:15 PM	5:24 PM		5:29 PM	5:45 PM	6:00 PM							



**APPENDIX D**

**ZONING MAP**



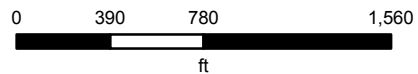
# Knox County Zoning Map

8.1.23

Knoxville - Knox County - KUB Geographic Information System



Printed: 8/1/2023 at 10:00:46 AM



KGIS makes no representation or warranty as to the accuracy of his map and its information nor to its fitness for use. Any user of this map product accepts the same AS IS ,WITH ALL FAULTS, and assumes all responsibility for the use thereof, and futher covenants and agrees to hold KGIS harmless from any and all damage, loss, or liability arising from any use of this map product.

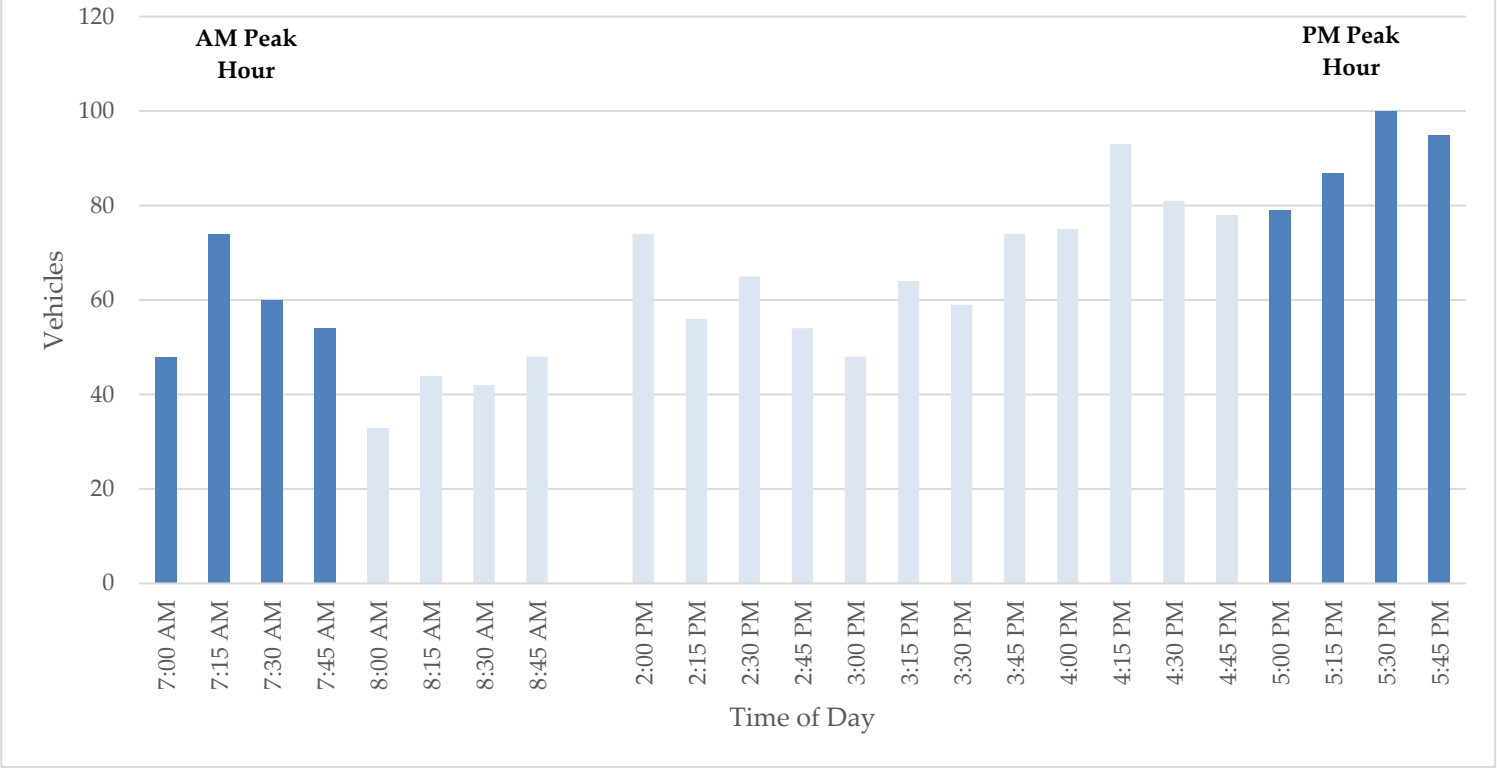
**APPENDIX E**

**MANUAL TRAFFIC COUNT DATA**





**Millertown Pike (west of Robin Ben Lane)  
Traffic Count Totals  
8/23/2023**



## **APPENDIX F**

### **ITE AND LOCAL 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

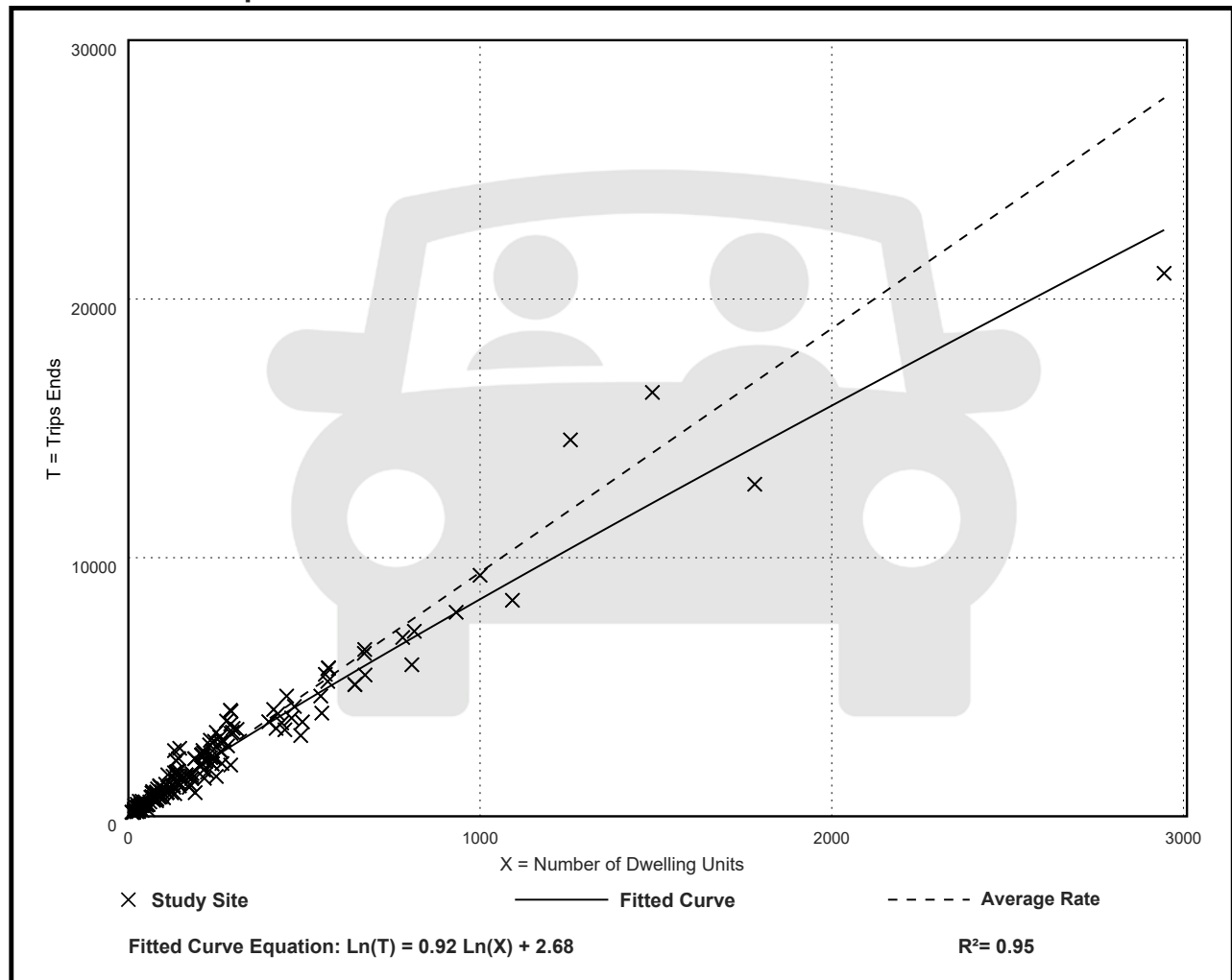
Avg. Num. of Dwelling Units: 246

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

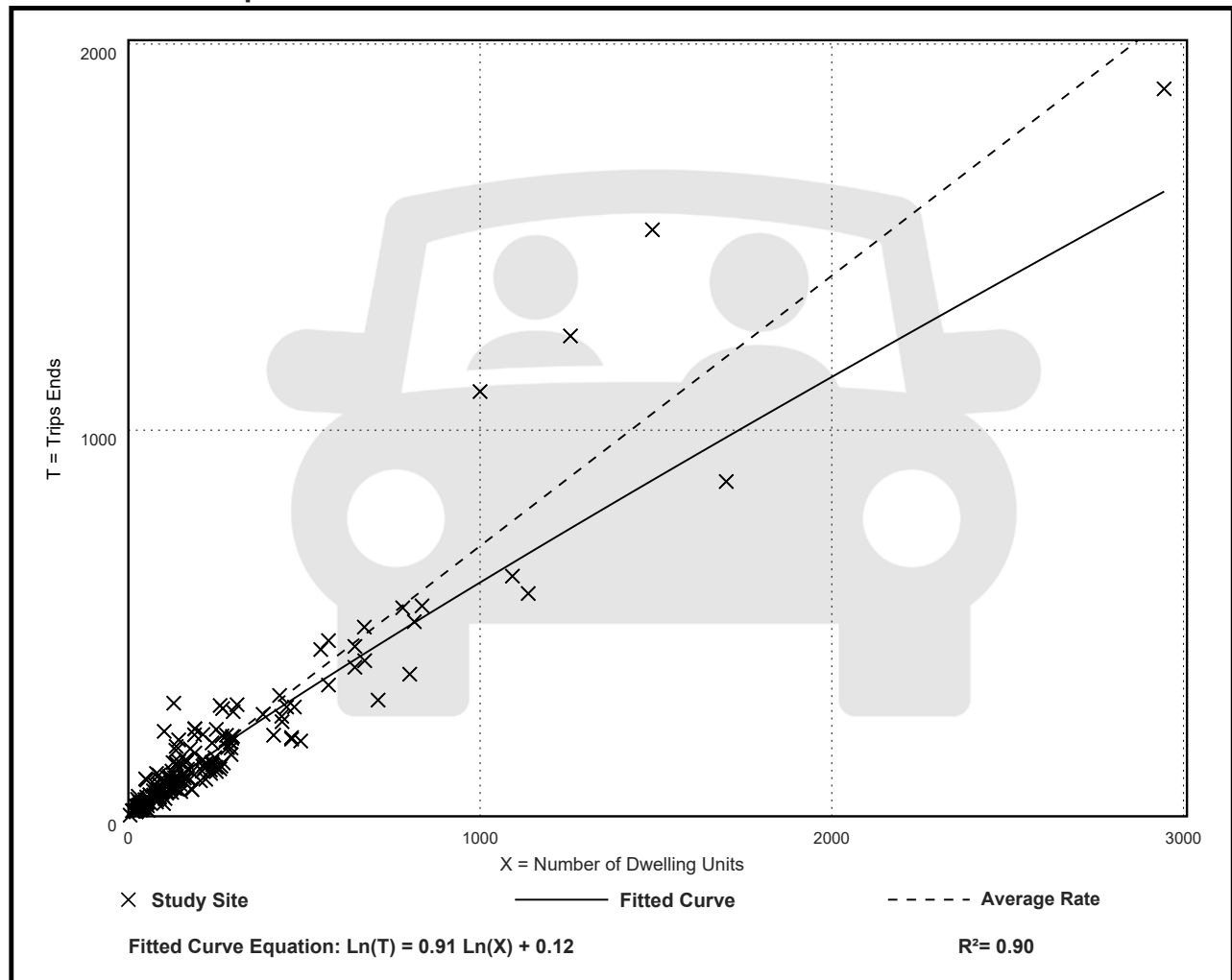
Avg. Num. of Dwelling Units: 226

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

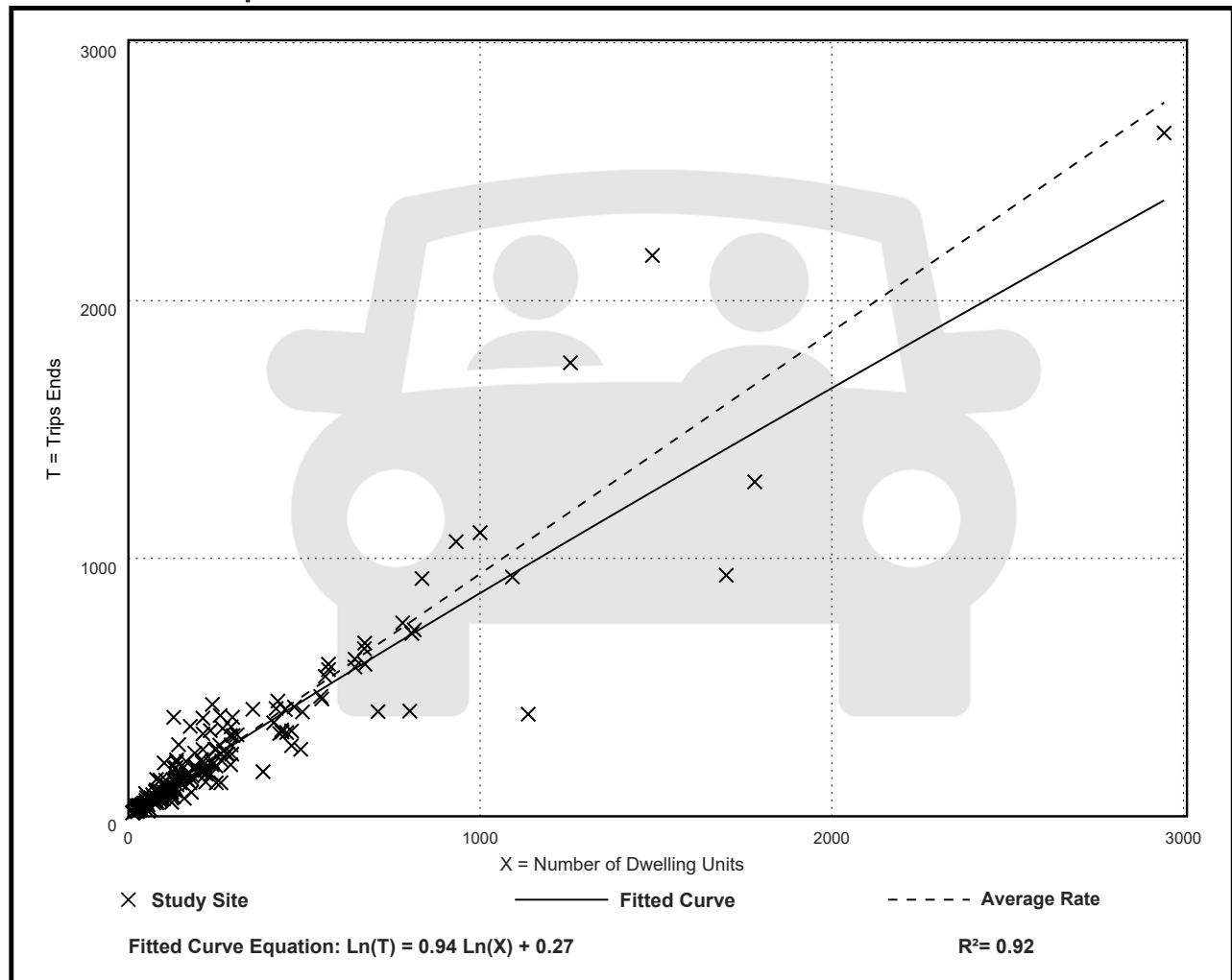
Avg. Num. of Dwelling Units: 248

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



# Local Apartment Trip Generation Study

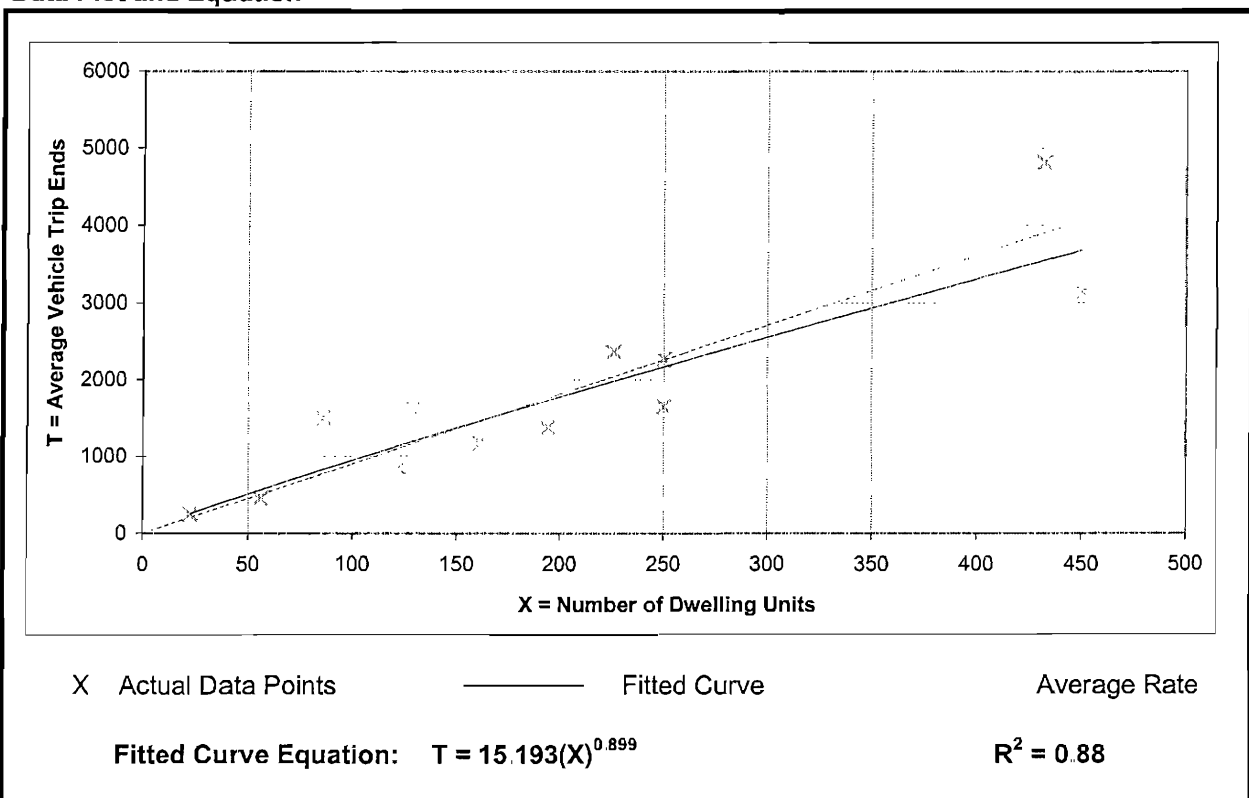
Average Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday

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

## Trip Generation Per Dwelling Unit

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

## Data Plot and Equation



# Local Apartment Trip Generation Study

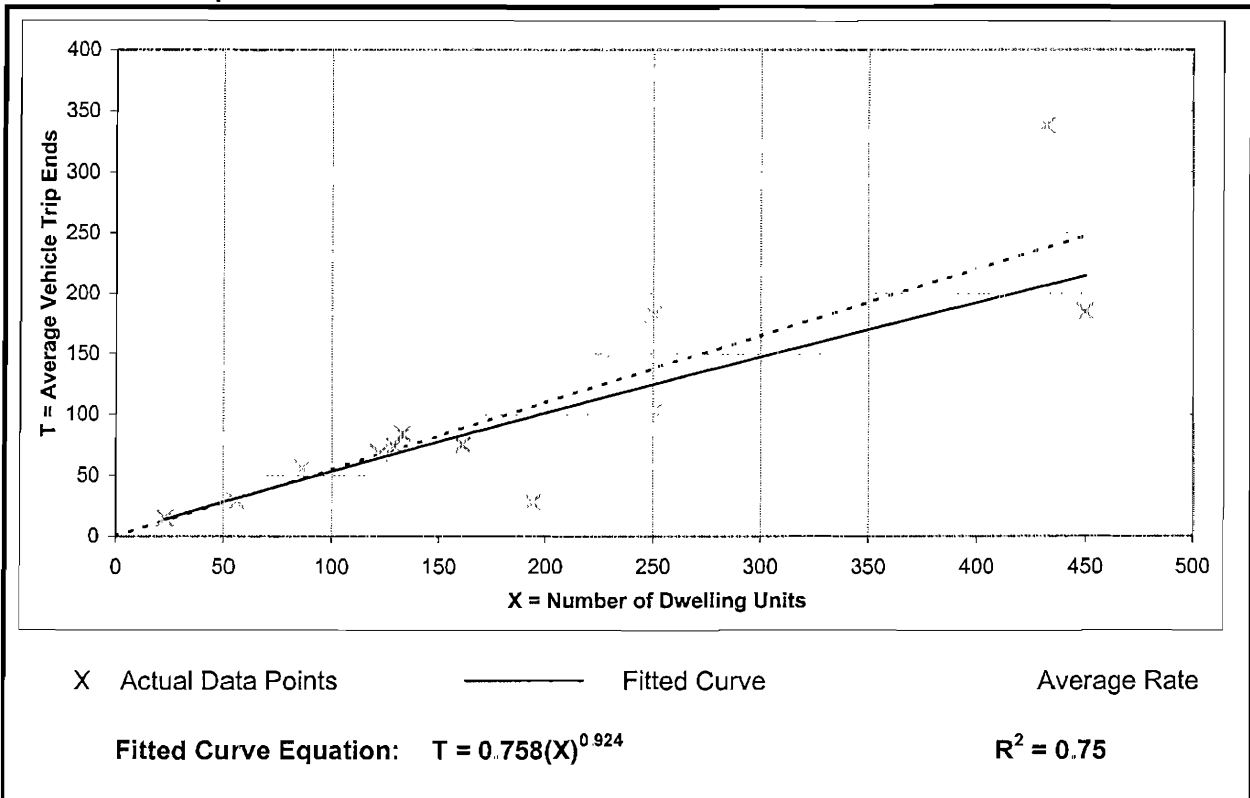
Average Vehicle Trip Ends vs: Dwelling Units  
 On a: Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 7 and 9 a.m.

Number of Studies: 13  
 Average Number of Dwelling Units: 193  
 Directional Distribution: 22% entering, 78% exiting

## Trip Generation Per Dwelling Unit

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

## Data Plot and Equation



# Local Apartment Trip Generation Study

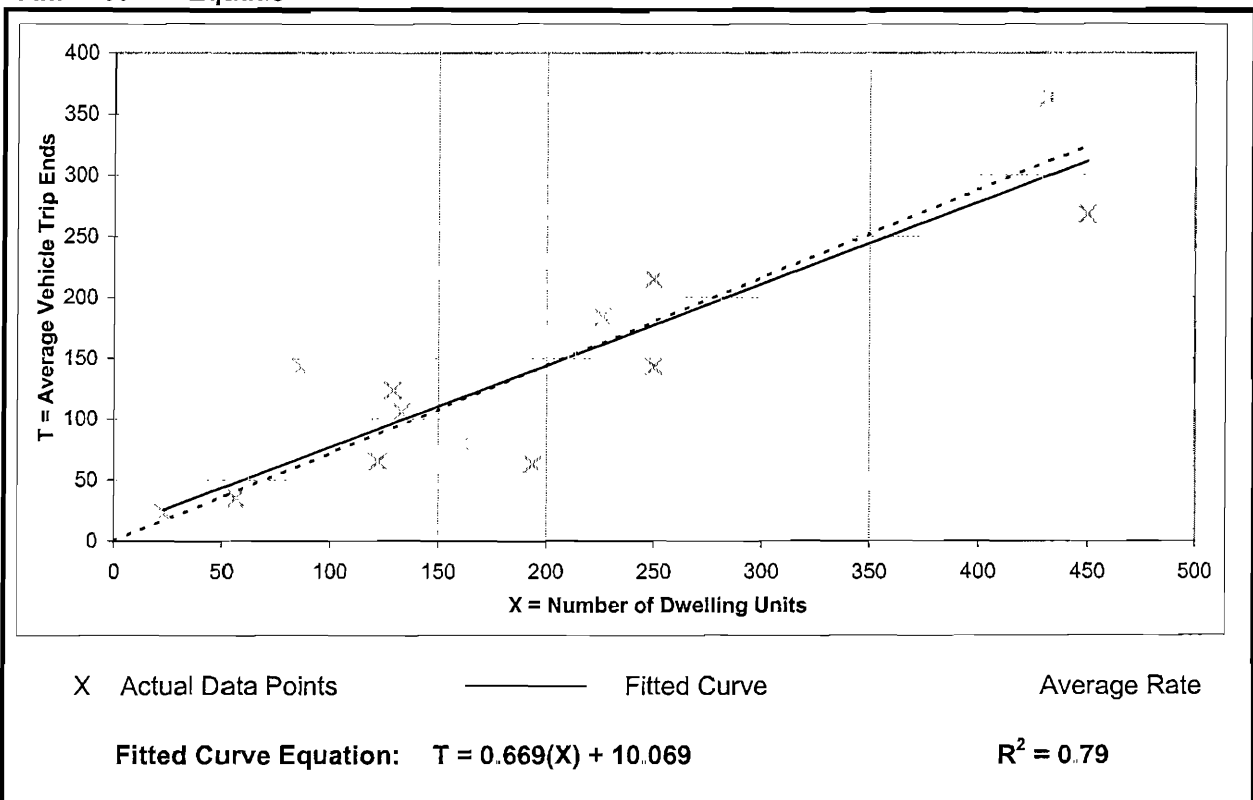
Average Vehicle Trip Ends vs: Dwelling Units  
 On a: Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 4 and 6 p.m.

Number of Studies: 13  
 Average Number of Dwelling Units: 193  
 Directional Distribution: 55% entering, 45% exiting

## Trip Generation Per Dwelling Unit

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

## Data Plot and Equation





**TRIP GENERATION FOR MAYER PROPERTY SUBDIVISION**

**130 Attached Townhouses and 3 Single-Family Detached Houses**

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
Local Trip Rate	Multi-Family Attached Townhouses	130	1,208	22%	78%		55%	45%	
				15	53	68	53	44	97
#210	Single-Family Detached Housing	3	40	26%	74%		63%	37%	
				1	2	3	3	1	4
<b>Total New Volume Site Trips</b>			<b>1,248</b>	<b>16</b>	<b>55</b>	<b>71</b>	<b>56</b>	<b>45</b>	<b>101</b>

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

**TRIP GENERATION FOR MAYER PROPERTY SUBDIVISION**  
**130 Attached Townhouses**

$$130 \text{ Units} = X$$

---

**Weekday:**

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

$$T = 15 * 79.51$$

$$T = \underline{\underline{1,208 \text{ trips}}}$$

---

**Peak Hour of Adjacent Traffic between 7 and 9 am:**

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

$$T = 0.758 * 90$$

$$T = \underline{\underline{68 \text{ trips}}}$$

---

**Peak Hour of Adjacent Traffic between 4 and 6 pm:**

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

$$T = 0.669 * 130 + 10.07$$

$$T = \underline{\underline{97 \text{ trips}}}$$

## TRIP GENERATION FOR MAYER PROPERTY SUBDIVISION

### 3 Single-Family Detached Houses

3 Residential Houses = X

---

#### Weekday:

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

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

$$\ln(T) = 3.69$$

$$\underline{\underline{T = 40 \text{ trips}}}$$

---

#### Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.91 * 1 + 0.12$$

$$\ln(T) = 1.12$$

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

---

#### Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

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

$$\ln(T) = 1.30$$

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

**APPENDIX G**

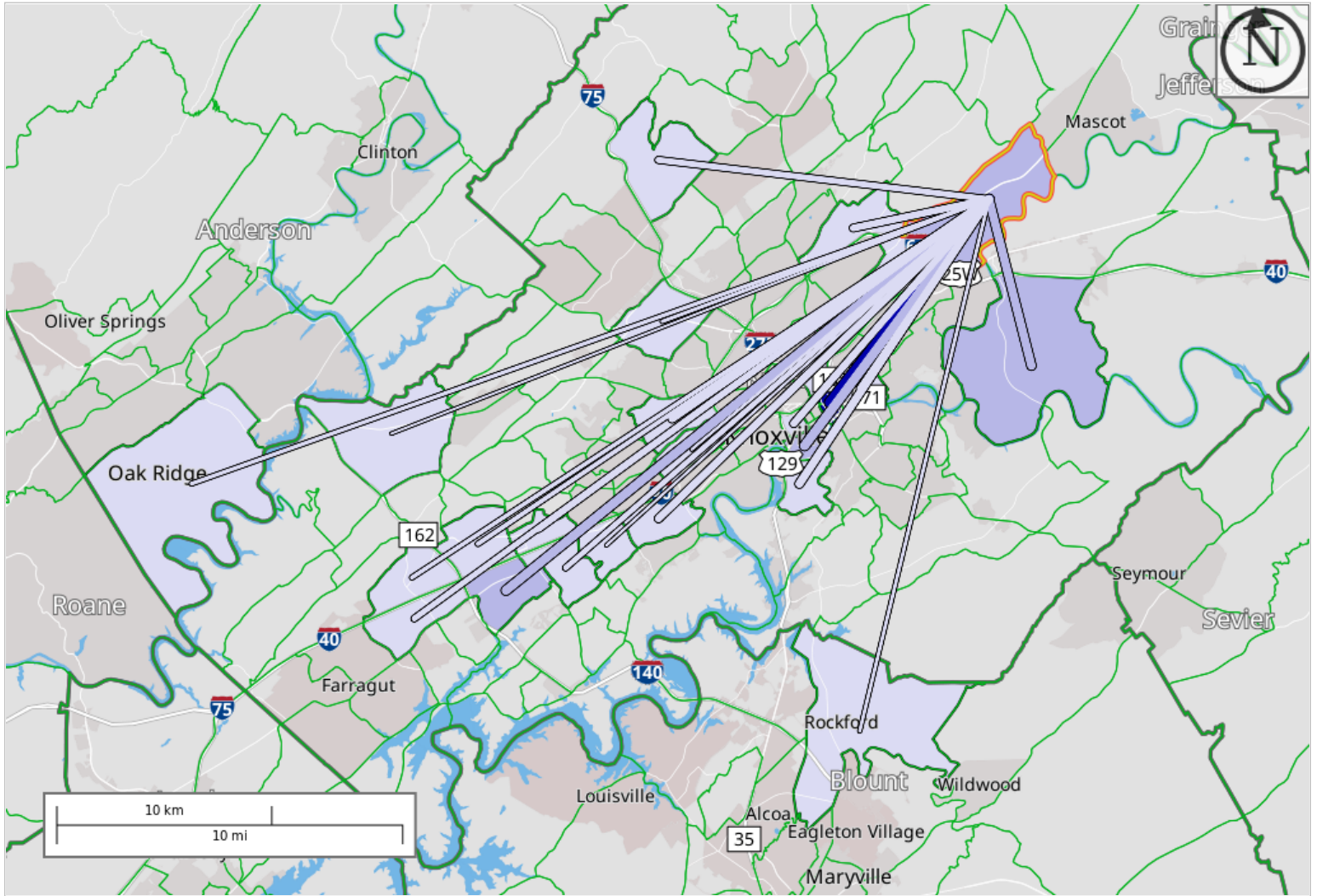
**2020 CENSUS BUREAU DATA**

## Work Destination Report - Home Selection Area to Work Census Tracts All Jobs for All Workers in 2020

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 08/01/2023

### Counts of All Jobs from Home Selection Area to Work Census Tracts in 2020

All Workers



#### Map Legend

**Job Count**

- 180 - 206
- 153 - 179
- 126 - 152
- 99 - 125
- 72 - 98
- 45 - 71
- 18 - 44

**Selection Areas**

- ▭ Home Area

**Job Count**

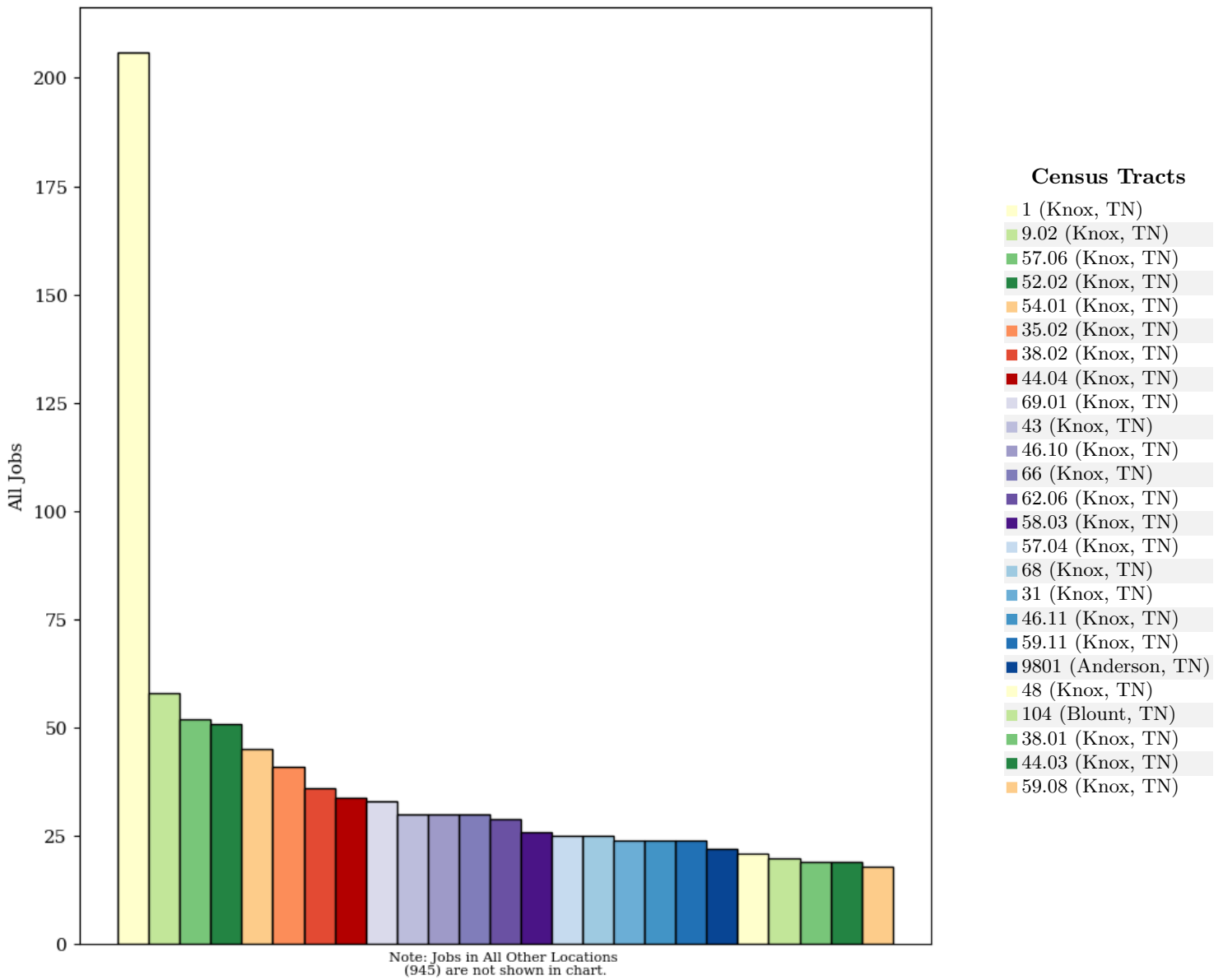
- ▭ 180 - 206
- ▭ 153 - 179
- ▭ 126 - 152
- ▭ 99 - 125
- ▭ 72 - 98
- ▭ 45 - 71
- ▭ 18 - 44





# All Jobs from Home Selection Area to Work Census Tracts in 2020

## All Workers



# All Jobs from Home Selection Area to Work Census Tracts in 2020

## All Workers

Census Tracts as Work Destination Area	2020	
	Count	Share
All Census Tracts	1,887	100.0
1 (Knox, TN)	206	10.9
9.02 (Knox, TN)	58	3.1
57.06 (Knox, TN)	52	2.8
52.02 (Knox, TN)	51	2.7
54.01 (Knox, TN)	45	2.4
35.02 (Knox, TN)	41	2.2
38.02 (Knox, TN)	36	1.9
44.04 (Knox, TN)	34	1.8
69.01 (Knox, TN)	33	1.7
43 (Knox, TN)	30	1.6

Census Tracts as Work Destination Area	2020	
	Count	Share
46.10 (Knox, TN)	30	1.6
66 (Knox, TN)	30	1.6
62.06 (Knox, TN)	29	1.5
58.03 (Knox, TN)	26	1.4
57.04 (Knox, TN)	25	1.3
68 (Knox, TN)	25	1.3
31 (Knox, TN)	24	1.3
46.11 (Knox, TN)	24	1.3
59.11 (Knox, TN)	24	1.3
9801 (Anderson, TN)	22	1.2
48 (Knox, TN)	21	1.1
104 (Blount, TN)	20	1.1
38.01 (Knox, TN)	19	1.0
44.03 (Knox, TN)	19	1.0
59.08 (Knox, TN)	18	1.0
All Other Locations	945	50.1

## Additional Information

### Analysis Settings

<b>Analysis Type</b>	Destination
<b>Destination Type</b>	Census Tracts
<b>Selection area as</b>	Home
<b>Year(s)</b>	2020
<b>Job Type</b>	All Jobs
<b>Selection Area</b>	52.02 (Knox, TN) from Census Tracts
<b>Selected Census Blocks</b>	99
<b>Analysis Generation Date</b>	08/01/2023 10:03 - OnTheMap 6.23.1
<b>Code Revision</b>	a0a13191a5f4f4a96c67a221fb70057ecc21a6d1
<b>LODES Data Vintage</b>	20230321_1647

### Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2020).

### 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 H**

**CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)**

**PROJECTED CONDITIONS (WITH THE PROJECT)**



HCM 2010 TWSC  
 4: Proposed Entrance & Millertown Pike

08/25/2023

Intersection						
Int Delay, s/veh	1.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	66	12	4	198	41	14
Future Vol, veh/h	66	12	4	198	41	14
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, %	1	-	-	1	0	-
Peak Hour Factor	82	90	90	79	90	90
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	80	13	4	251	46	16

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	93	0	346 87
Stage 1	-	-	-	-	87 -
Stage 2	-	-	-	-	259 -
Critical Hdwy	-	-	4.1	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	1514	-	655 977
Stage 1	-	-	-	-	941 -
Stage 2	-	-	-	-	789 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1514	-	653 977
Mov Cap-2 Maneuver	-	-	-	-	653 -
Stage 1	-	-	-	-	941 -
Stage 2	-	-	-	-	787 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	713	-	-	1514	-
HCM Lane V/C Ratio	0.086	-	-	0.003	-
HCM Control Delay (s)	10.5	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 2010 TWSC  
 4: Proposed Entrance & Millertown Pike

08/25/2023

Intersection						
Int Delay, s/veh	1.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	267	42	14	138	34	11
Future Vol, veh/h	267	42	14	138	34	11
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, %	1	-	-	1	0	-
Peak Hour Factor	84	90	90	79	90	90
Heavy Vehicles, %	0	0	0	1	0	0
Mvmt Flow	318	47	16	175	38	12

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	365	0	549
Stage 1	-	-	-	-	342
Stage 2	-	-	-	-	207
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1205	-	500
Stage 1	-	-	-	-	724
Stage 2	-	-	-	-	832
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1205	-	493
Mov Cap-2 Maneuver	-	-	-	-	493
Stage 1	-	-	-	-	724
Stage 2	-	-	-	-	820

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	532	-	-	1205	-
HCM Lane V/C Ratio	0.094	-	-	0.013	-
HCM Control Delay (s)	12.5	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

**APPENDIX I**

**KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEETS**

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	80	60	55	45
350 - 399	100	85	75	55	50	40
400 - 449	90	75	65	50	45	35
450 - 499	80	70	60	45	40	30
500 - 549	70	65	55	35	35	25
550 - 599	65	60	50	35	30	25
600 - 649	60	55	45	30	25	25
650 - 699	55	50	40	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

66 + 12 = 78

198

Millertown Pike at Proposed Entrance  
2027 Projected AM WB Left Turns = 4  
Left Turn Lane NOT Warranted

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	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	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
12 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
400 - 449 450 - 499		Yes	Yes	Yes	Yes	Yes
500 - 549 550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

66

Millertown Pike at Proposed Entrance

2027 Projected AM EB Right Turns = 12

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 50 - 99				Yes	Yes	Yes
100 - 149 150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249 250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349 350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449 450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549 550 - 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 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	110	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	60	50	45	40	35
450 - 499	80	55	45	40	35	30
500 - 549	70	45	35	35	30	25
550 - 599	65	40	35	30	25	20
600 - 649	60	35	30	25	25	20
650 - 699	55	35	30	25	20	20
700 - 749	50	30	25	20	20	20
750 or More	45	25	25	20	20	20

138

100 - 149

267 + 42  
= 309

Millertown Pike at  
Proposed Entrance  
  
2027 Projected PM  
WB Left Turns = 14  
  
Left Turn Lane NOT  
Warranted

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	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	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						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	Yes	Yes
550 - 599	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					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.

## **APPENDIX J**

### **SIMTRAFFIC VEHICLE QUEUE WORKSHEETS**

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**Intersection: 4: Proposed Entrance & Millertown Pike**

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Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	6	51
Average Queue (ft)	0	24
95th Queue (ft)	4	45
Link Distance (ft)	418	236
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

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Network wide Queuing Penalty: 0

---

Intersection: 4: Proposed Entrance & Millertown Pike

---

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	39	49
Average Queue (ft)	4	22
95th Queue (ft)	22	44
Link Distance (ft)	418	236
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

---

Network Summary

---

Network wide Queuing Penalty: 0



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