

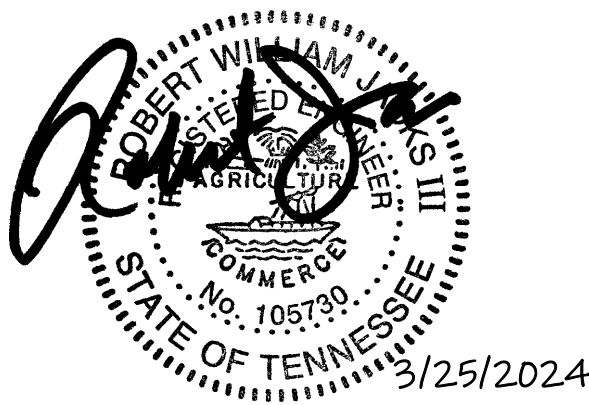


Transportation Impact Study Lennox Ridge Subdivision Knox County, Tennessee



March 2024

Prepared for:
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Knoxville, TN 37918



5-SB-24-C / 5-A-24-DP
TIS Version 1
3/25/2024

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EXECUTIVE SUMMARY

Preface:

Gregory Land Development, LLC proposes a residential development at 8721 Heiskell Road in Northwest Knox County between East / West Brushy Valley Drive and East / West Copeland Drive. The proposed development will include constructing 103 multi-family attached townhomes on 34.57 +/- acres. The development is named and referenced in this study as "Lennox Ridge Subdivision". The development proposes a single entrance on the west side of Heiskell Road, approximately 530 feet southeast of Red Hawk Lane. The development is anticipated to be fully built and occupied by 2028.

The primary purpose of this study 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 it is a Level 1 study established by Knoxville/Knox County Planning. A Transportation Impact Letter (TIL) was produced in December 2023 for this proposed development as part of the rezoning of the site property, and some of the information from it is included in this Transportation Impact Study (TIS). Recommendations and mitigation measures are offered to accommodate the new residential subdivision if transportation operations are projected to be below recognized engineering standards.

Study Results:

The significant findings of this study include the following:

- The Lennox Ridge Subdivision, with a total of 103 multi-family attached townhomes, is estimated to generate 980 trips at full build-out and occupancy on an average weekday. Of these daily trips, 55 are estimated to occur during the AM peak hour and 79 in the PM peak hour in 2028.
- The Proposed Entrance for the subdivision at Heiskell Road is expected to operate with low vehicle delays in the projected AM and PM peak hours. The addition of the Proposed Entrance approach on Heiskell Road will operate more than adequately in 2028 with respect to vehicle capacity.
- The projected 2028 traffic volumes will not warrant the construction of separate turn lanes on Heiskell Road at the Proposed Entrance. A single exiting lane for the Proposed Entrance at Heiskell Road will be sufficient.

Recommendations:

The following recommendations are 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.

Heiskell Road at the Proposed Entrance:

- 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 Heiskell Road. The stop bar should be applied a minimum of 4 feet away from the edge of Heiskell Road and placed at the desired stopping point that maximizes the sight distance.
- Based on a posted speed limit of 40-mph on Heiskell Road, the required intersection sight distance is 400 feet for turning vehicles at the Proposed Entrance. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions and were also certified by a land surveyor. Intersection sight distance at the Proposed Entrance at Heiskell Road must not be impacted by future landscaping, signage, or existing vegetation.

Lennox Ridge Subdivision Internal Road:

- A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance off Heiskell Road. It is recommended that a "No Outlet" Sign (W14-2a) be installed at the front of the development at Heiskell Road. The "No Outlet" sign can be installed above or below the street name sign or separately posted on the entrance road.
- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.
- The internal sidewalk should have a minimum width of 5 feet to meet Knox County standards.
- All road grade and intersection elements should be designed to AASHTO and Knox County specifications and guidelines to ensure proper operation.

DESCRIPTION OF EXISTING CONDITIONS

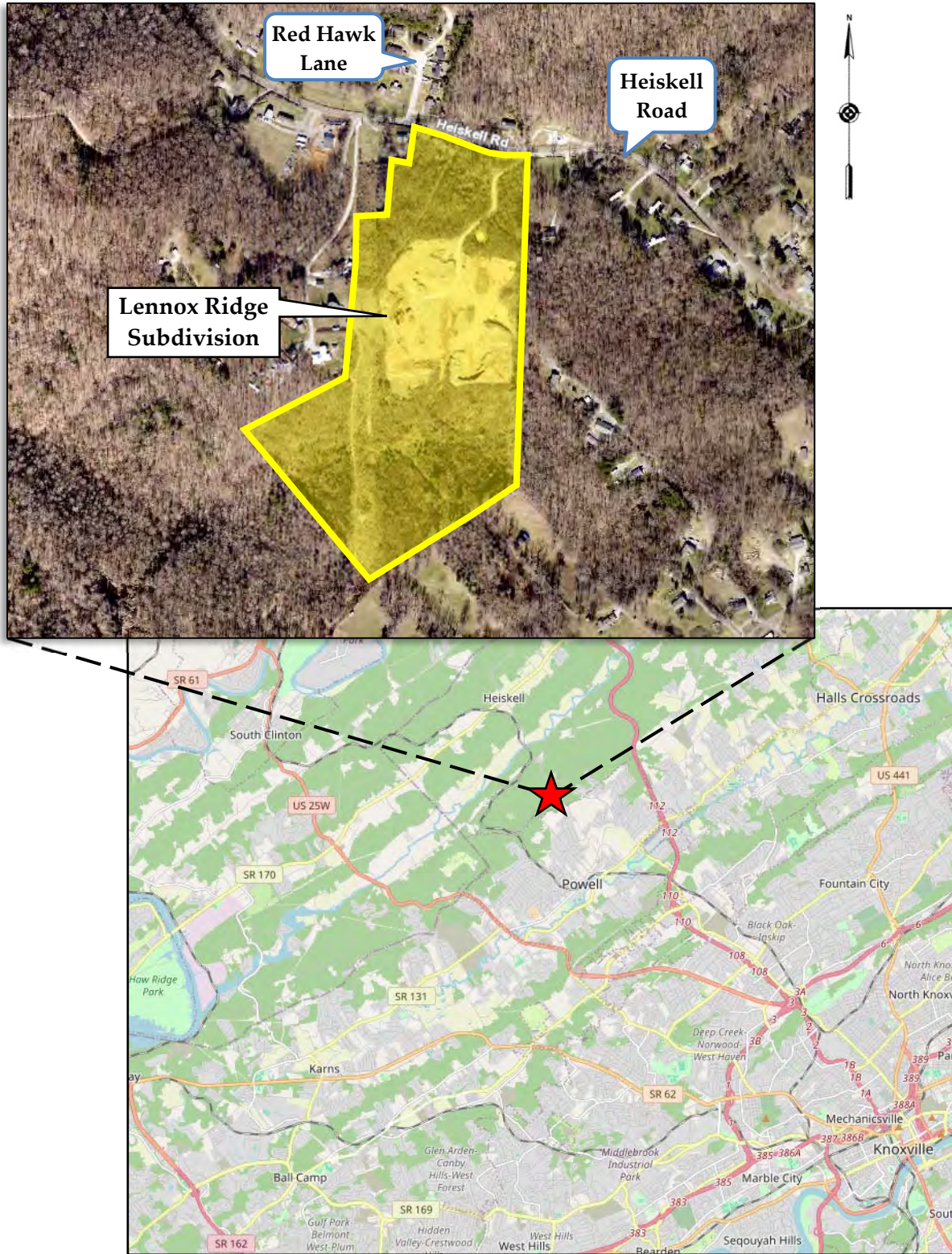
- **STUDY AREA:**

The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located off Heiskell Road in Northwest Knox County, TN. The development will be constructed on a portion of a large existing single parcel, with a single entrance on the west side of Heiskell Road. As requested, transportation impacts associated with the development were analyzed on Heiskell Road, where the proposed development will have road access to and from external destinations.



The proposed development property is in a rural area of Knox County, TN, in the Heiskell community, with residential developments slowly encroaching further into the unincorporated community. Near the development site are several established neighborhoods, standalone single-family homes, large undeveloped forested lots, a small electrical substation, and a church. The surrounding area is characterized by hilltops and Heiskell Road traversing through a valley between the hills.

The existing development site has steep topography and is designated with some hillside protection areas due to the steep slopes. The center of the property is flatter due to past soil excavation operations. Most of the existing property is covered with young forest, and the center flatter areas are disturbed, with open exposed soil at the surface. The ground surface has been exposed since the property was used as a source of fill material for the Kroger's Marketplace on East Emory Road, approximately 2.5 miles to the south.



▪ **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 ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Heiskell Road	Minor Arterial	40 mph	2	23.5 feet	None	None	No bike lanes

¹ 2018 Major Road Plan by Knoxville/Knox County Planning

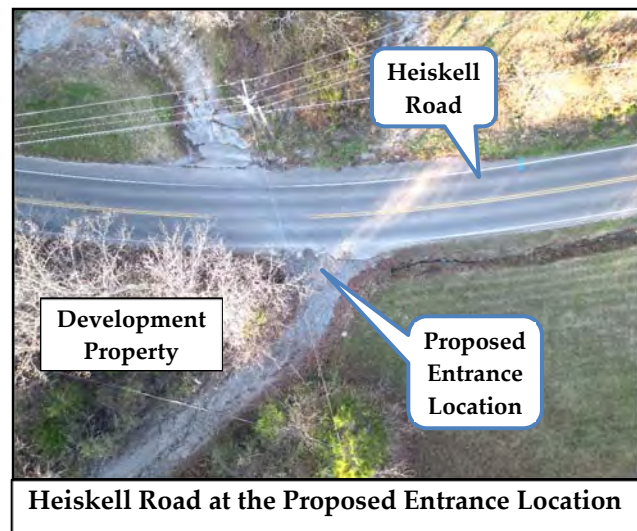
² Edge of pavements near Proposed Entrance Location

³ According to Knoxville Area Transit System Map

Heiskell Road is classified as a Minor Arterial and traverses generally in a northwest-southeast direction. Heiskell Road begins at a signalized intersection with East / West Emory Road (SR 131) and Central Avenue Pike on its south side. On its north side, the road terminates at the intersection with East / West Wolf Valley Road in Anderson County for a total length of 6.5 miles. Along its length, Heiskell Road has many horizontal curves and a few notable vertical curves, but for the most part, the vertical elevation changes are gradual.

At the subdivision's Proposed Entrance location, Heiskell Road has a 2-lane pavement section with white edge lines and a double yellow centerline. Roadway lighting is not present in the adjacent study area along Heiskell Road, but utility lighting is located off the roadway on some private residences. Along Heiskell Road, other roadway features, including curbing, sidewalks, bike lanes, and greenway paths are not provided.

Heiskell Road makes a slight horizontal change at a large radius curve at the subdivision's Proposed Entrance location. The subdivision's Proposed Entrance will intersect Heiskell Road, where an existing gravel driveway was used during the soil borrow operations. At the Proposed Entrance location, Heiskell Road has more of an east-west alignment but is analyzed in the study as

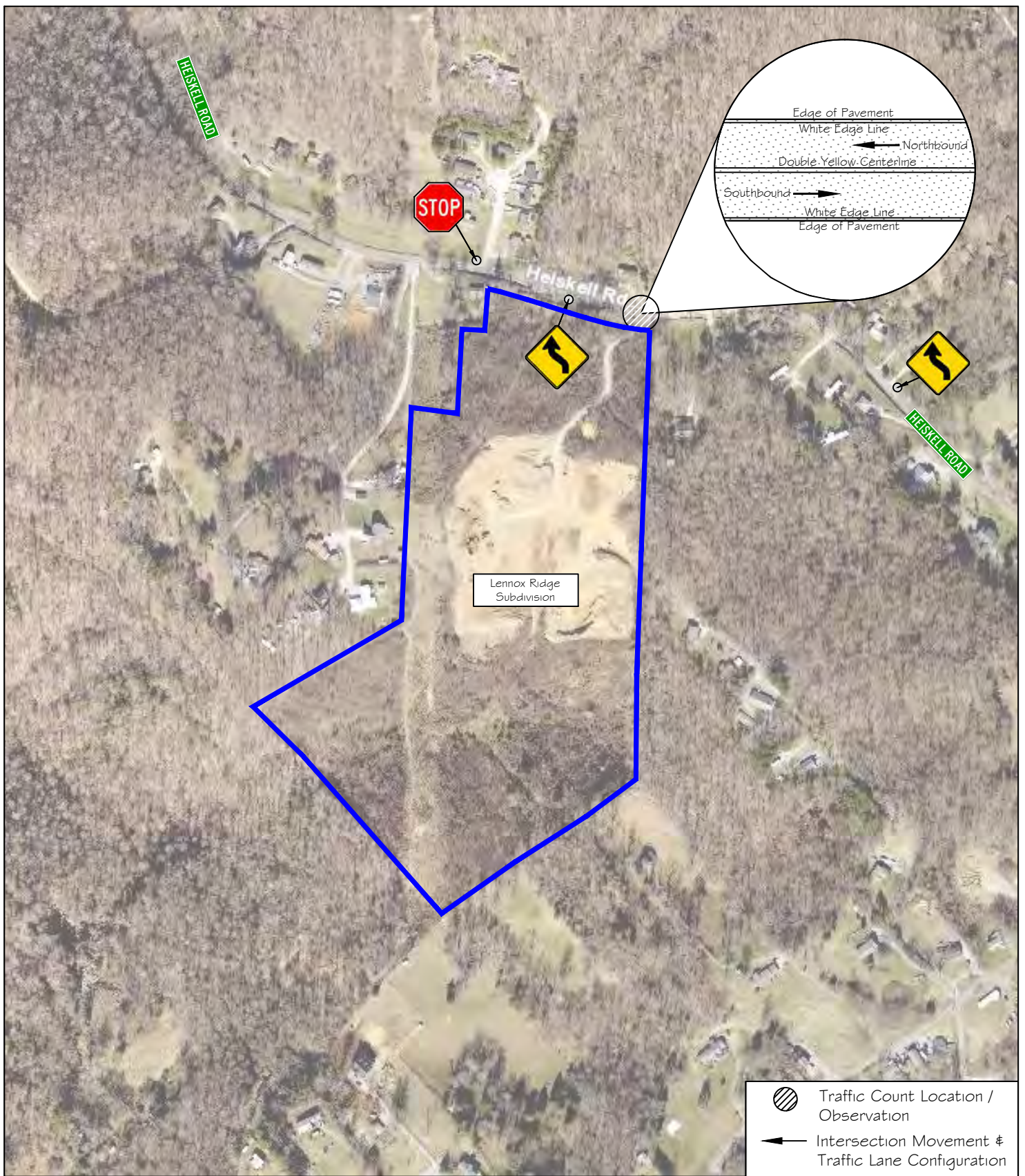


a north-south configuration.

Heiskell Road has relatively good pavement conditions between the proposed development site and East / West Emory Road to the south (approximately 2 miles) and is presumed will be the primary route for future subdivision residents. The asphalt pavement surface outside the white edge line on this section of Heiskell Road ranges from 6 inches to over a foot. Pavement widths along Heiskell Road between the proposed development site and East / West Emory Road are slightly variable and were measured to be between 20 to 24 feet overall. The pavement width at the Proposed Entrance is 23.5 feet. No paved shoulders are on Heiskell Road, with most of the shoulders outside the pavement consisting of grass surfaces.

The Proposed Entrance for the subdivision will be located 0.7 miles south of East / West Brushy Valley Drive and 0.6 miles north of East / West Copeland Drive. These roadways to the north and south are the closest collector streets to the Proposed Entrance to Lennox Ridge Subdivision.

Figure 2 shows the existing lane configurations of the location where the traffic count was conducted for the study. There are only two road signs on Heiskell Road near the development property besides a Stop Sign (R1-1) at the existing t-intersection with Red Hawk Lane. The pages following Figure 2 give a further overview of the site study area with photographs.



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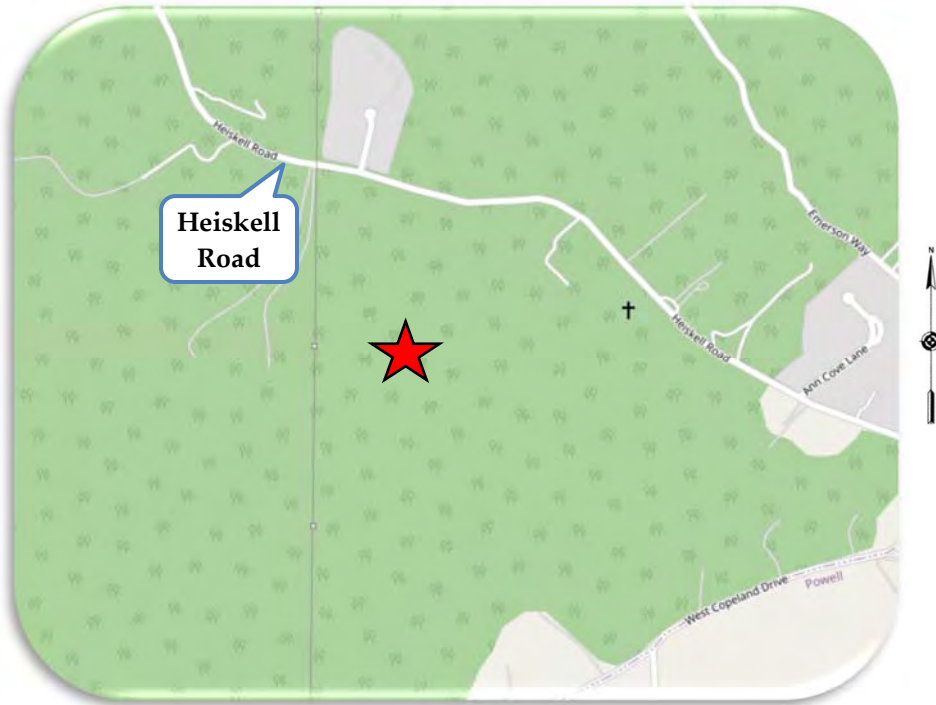


FIGURE 2

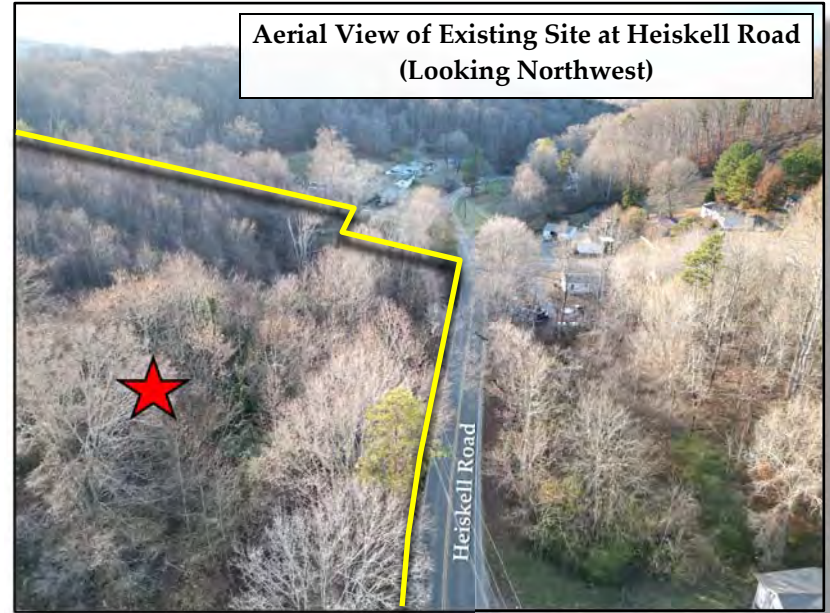
Lennox Ridge Subdivision

Traffic Count Location, Traffic Signage & Existing Lane Configurations

PHOTO EXHIBITS



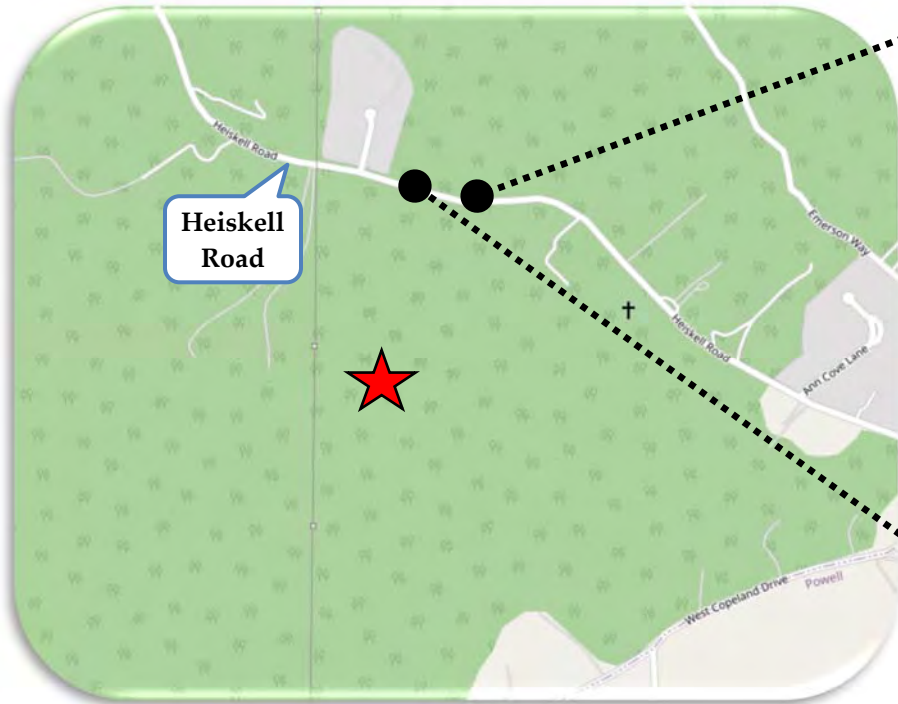
Heiskell Road at the Proposed Development Site



Aerial View of Existing Site at Heiskell Road (Looking Northwest)



Aerial View of Existing Site (Looking South)



Heiskell Road at the Proposed Development Site



View of Heiskell Road at the Proposed Entrance Location (Looking Northwest)



View of Heiskell Road at the Proposed Entrance Location (Looking Southeast)

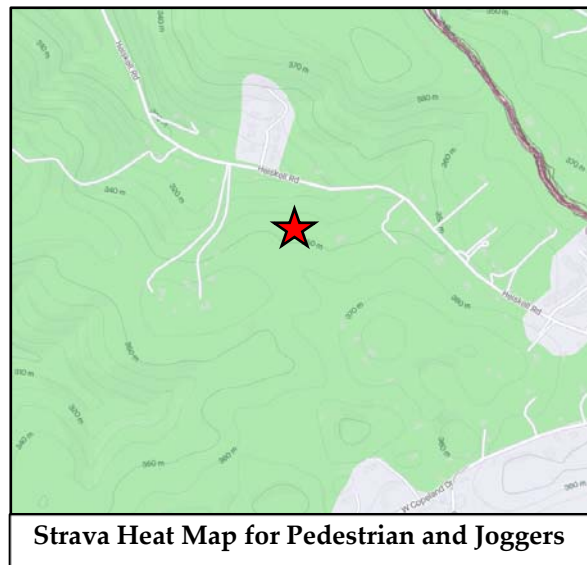
▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

One annual vehicular traffic count location is in 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:

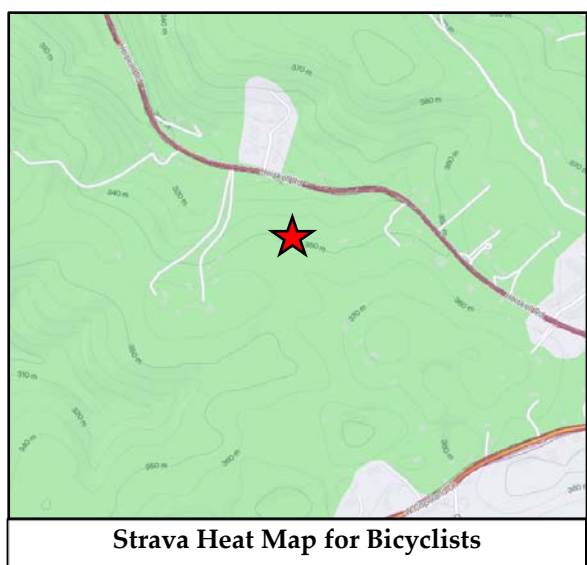
- Existing vehicular roadway traffic:
 - TDOT reported an Average Daily Traffic (ADT) on Heiskell Road, southeast of Stonebreeze Drive, Wakebridge Boulevard, and the proposed development site, at 8,176 vehicles per day in 2023. From 2013 to 2023, this count station has indicated a 4.3% average annual traffic growth rate.

- Existing bicycle and pedestrian volumes:

The average daily pedestrian and bicycle traffic along Heiskell Road is unknown. However, with the lack of sidewalks, bike lanes, and nearby “amenities”, this corridor is assumed to have minimal pedestrian and bicyclist activity. During the 6-hour traffic count for this project, no bicyclists or pedestrians were observed along Heiskell Road adjacent to the development site.



An online website, [strava.com](https://www.strava.com), provides “heat” maps detailing 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 some bicycle activity but no pedestrian activity along Heiskell Road adjacent to the development site.

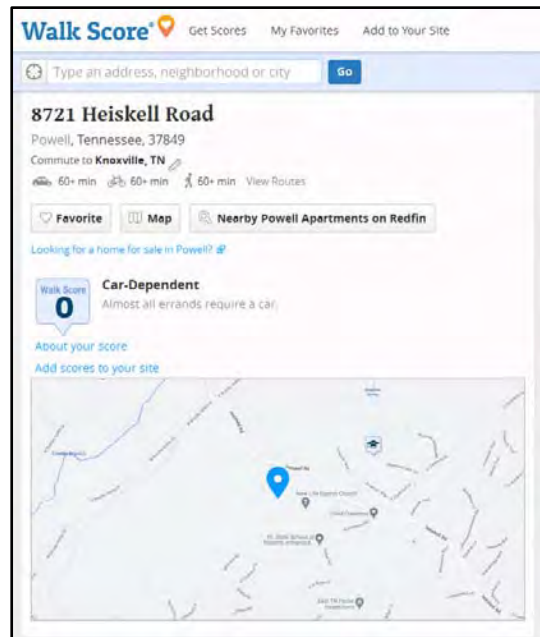
▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

Sidewalks are not provided on Heiskell Road. Bike lanes are not available either. The closest designated bike facilities are located to the southwest along West Emory Road at the Powell Greenway near Powell Middle and High Schools. This greenway is paved and is 1.51 miles long.



▪ **WALK SCORE:**

A private company offers a 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 at the development property address at 8721 Heiskell Road. The project site location is graded with a Walk Score of 0. This Walk Score indicates that the site is car-dependent and that all errands currently require a vehicle for travel to and from the development property. The site is not given a Bike Score. The lack of pedestrian

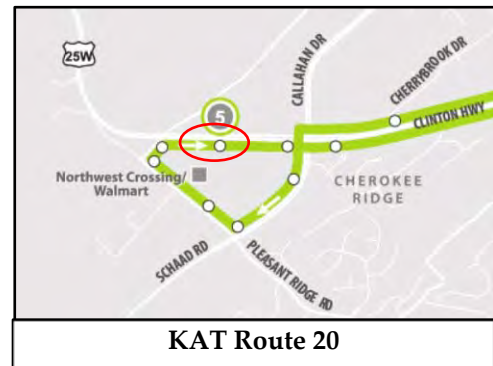
and bike facilities and the distance to amenities reduce the Walk and Bike Scores at the development site. The site is not given a Transit Score since public transportation is unavailable near the development site.

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

▪ **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.

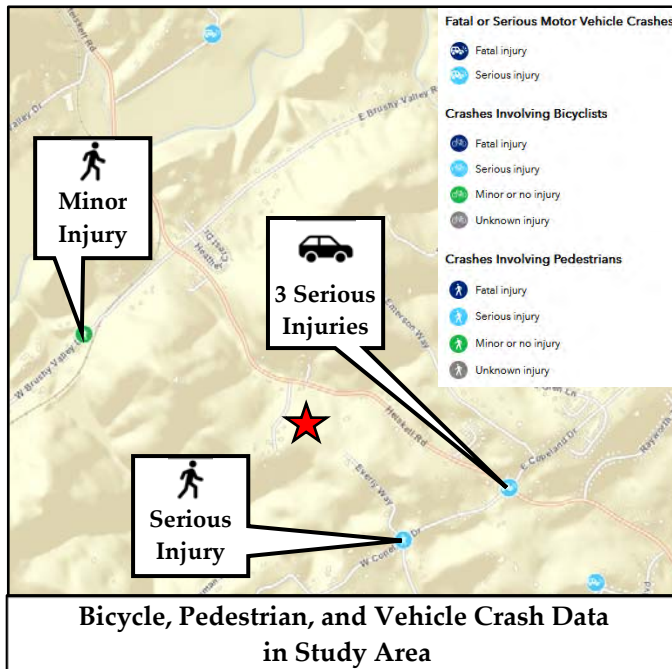
The closest public transit bus service is 5.8 miles to the south in front of the Walmart Supercenter on Clinton Highway and is Route 20, “Central Street”. It operates on weekdays and weekends, and this route map is included in Appendix C. KAT had to reduce its service schedule due to workforce shortages. These changes took place on August 29th, 2022, and the reduced schedule for this route is also included in Appendix C. However, according to



news reports, KAT plans to increase services on some routes on Sundays and evenings starting April 8, 2024. 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 several miles away, with no sidewalks or bike lanes available to access the bus stop without using a private vehicle, the proposed development is not expected to have any reduced vehicle trips due to public transit usage.

▪ **CRASH DATA:**



The Knoxville Transportation Planning Organization (TPO) provides a website that lists bicycle, pedestrian, and vehicle severe or fatal crashes from October 2016 to September 2021. The data shows none of these incidents occurred near the development site in the past few years. The closest incidents occurred northwest and southeast of the proposed development site. One incident occurred on March 6th, 2021, to the northwest on West Brushy Valley Road and involved a minor injury to a pedestrian. To the southeast, at the intersection of West Copeland Drive at Collier Road, one pedestrian was seriously injured on December 24th, 2018, and occurred due to a driver failing to yield. Three vehicular crashes occurred at the intersection of Heiskell Road at East / West Copeland Drive, and all involved serious injuries. No factors are listed regarding the causes, and these three separate crashes included two cars and a motorcycle. These crashes occurring on May 16th, 2017, June 28th, 2017, and March 6th, 2021.

One incident occurred on March 6th, 2021, to the northwest on West Brushy Valley Road and involved a minor injury to a pedestrian. To the southeast, at the intersection of West Copeland Drive at Collier Road, one pedestrian was seriously injured on December 24th, 2018, and occurred due to a driver failing to yield. Three vehicular crashes occurred at the intersection of Heiskell Road at East / West Copeland Drive, and all involved serious injuries. No factors are listed regarding the causes, and these three separate crashes included two cars and a motorcycle. These crashes occurring on May 16th, 2017, June 28th, 2017, and March 6th, 2021.

PROJECT DESCRIPTION

▪ LOCATION AND SITE PLAN:

The proposed plan layout with 103 multi-family attached townhomes on 34.57 +/- acres is designed by Urban Engineering, Inc. and is shown in Figure 3. The design shows one new street constructed for the residential development. As shown in the figure, a single entrance will be constructed for the development at Heiskell Road. The entrance road will be the only road constructed for the development and will be 1,958 feet long and constructed with a typical 26-foot-wide pavement section. The internal road will end at a cul-de-sac.



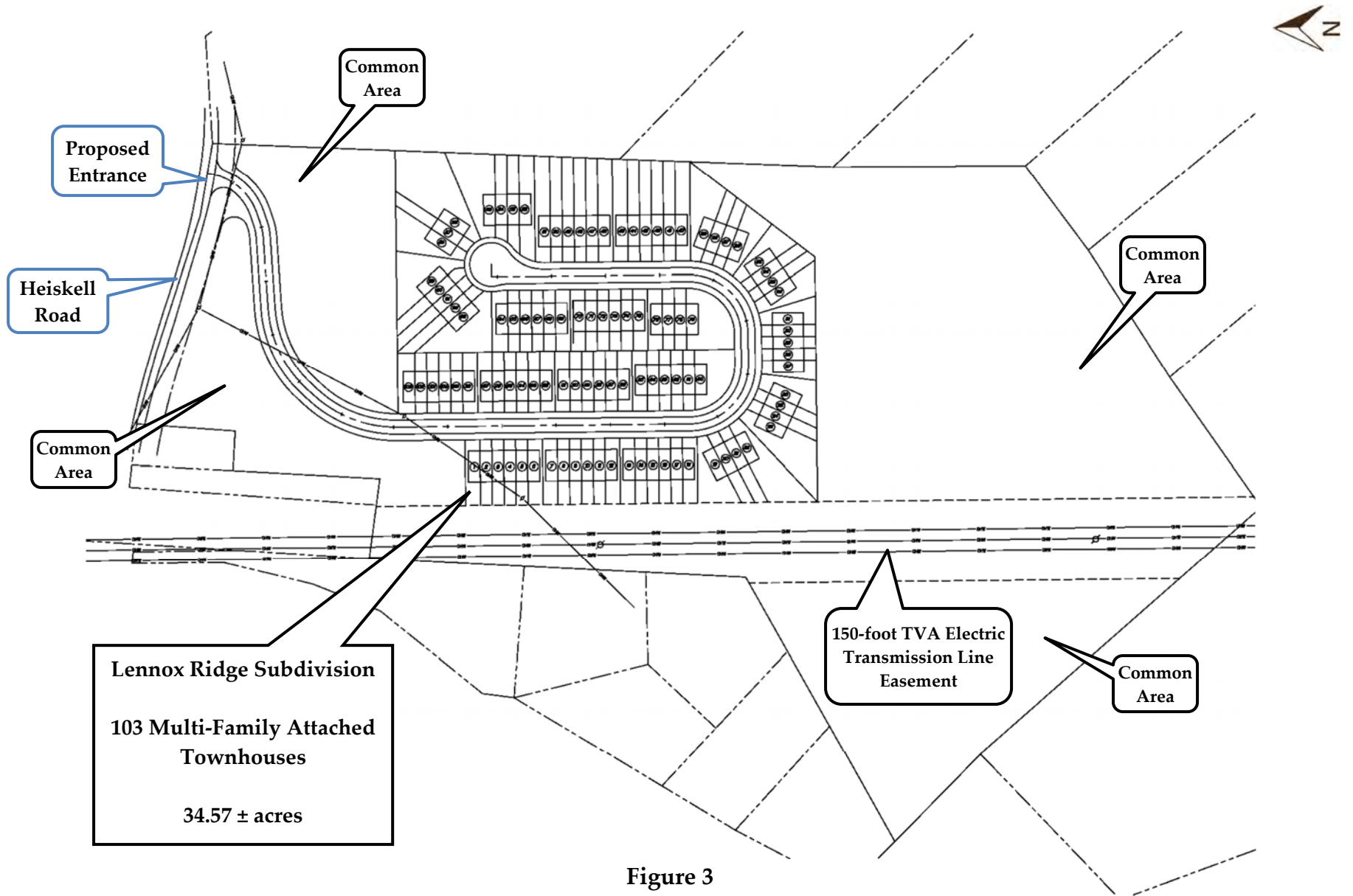
**View of Center of Development Property –
Existing Open Soil Areas**

The Lennox Ridge Subdivision will have a large amount of open space, including common areas, easements, and areas for stormwater controls. The total open space will be 22.72 acres and 65.7% of the entire development property parcel. The development property has a 150-foot TVA electrical transmission line easement that bisects the site's southern portion. This easement contains several large high-voltage electrical lines and

transmission towers. No existing structures on the property will need to be removed for construction.

The typical lot dimensions for the multi-family attached townhouses in the development will be 120 feet deep with a width of 22 feet or 27.5 feet, providing an area of 2,640 square feet or 3,300 square feet. Each townhouse will have a garage and driveway. The developer is not proposing on-site amenities for the future subdivision residents other than providing open common areas.

The schedule for the completion of this new residential development depends on economic factors and construction timelines. This project is also 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 four years (2028).



Lennox Ridge Subdivision
 103 Multi-Family Attached
 Townhouses
 34.57 ± acres

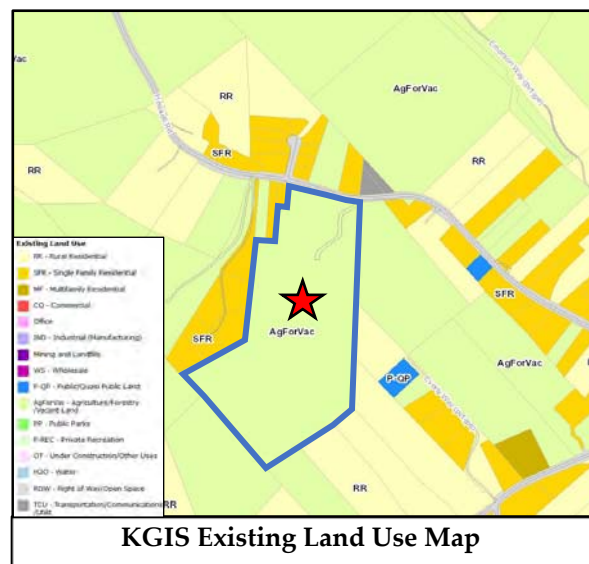
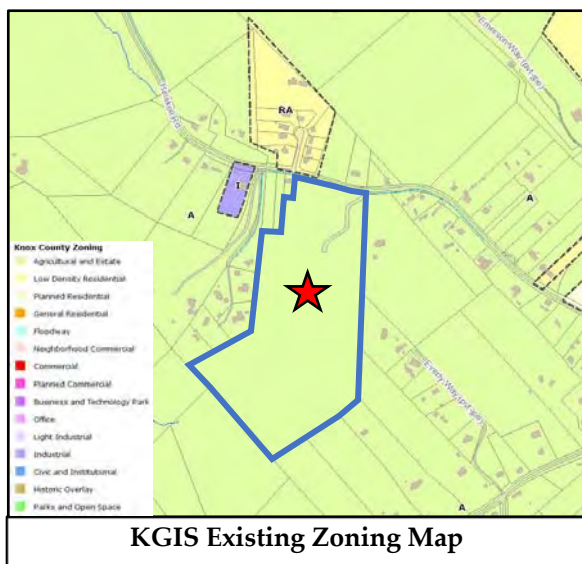
Figure 3
Proposed Plan Layout
Lennox Ridge Subdivision

Not to Scale

▪ **PROPOSED USES AND ZONING REQUIREMENTS:**

The existing parcel comprising the Lennox Ridge Subdivision development property is in Knox County and was recently requested to be rezoned. Knox County Commission will vote on the rezoning's first reading on March 25th, 2024. The property's existing zoning is Agricultural (A) and is requested to be changed to Planned Residential (PR). Knoxville/Knox County Planning approved the property rezoning with a density of up to 3 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:

- Heiskell Road binds the development site to the northeast. Across Heiskell Road, two parcels are zoned Agricultural (A), including an undeveloped property and a lot with a manufactured home that is currently occupied. Other properties to the north across Heiskell Road include single-family detached houses along Red Hawk Lane in the Shalom Subdivision, which is zoned as Low Density Residential (RA).
- All the adjacent properties surrounding the development property are zoned Agricultural (A) and consist of undeveloped forested properties or single-family detached houses that are not a part of any established subdivisions. These properties either have road access to Heiskell Road or to the south via West Copeland Drive or Everly Way, a private road with a joint permanent easement.



▪ **ON-SITE CIRCULATION:**

The total length of the internal subdivision road will be 1,958 feet (0.37 miles), designed and constructed to Knox County specifications, and will end at a cul-de-sac. The development will have an asphalt-paved internal roadway 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. A concrete sidewalk is proposed along one side of the internal road in this development. Knox County will maintain the street in the development after construction, and will be a dedicated public road.

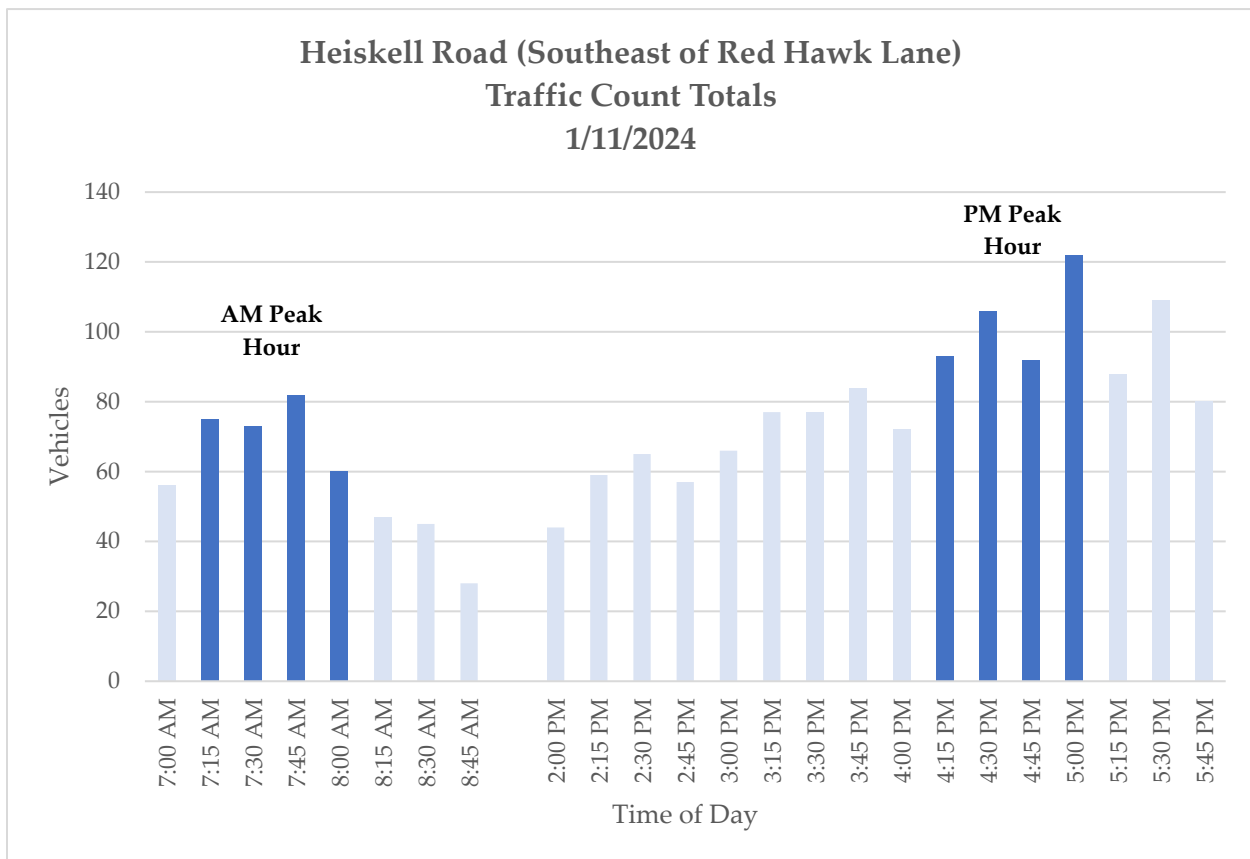
▪ **SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:**

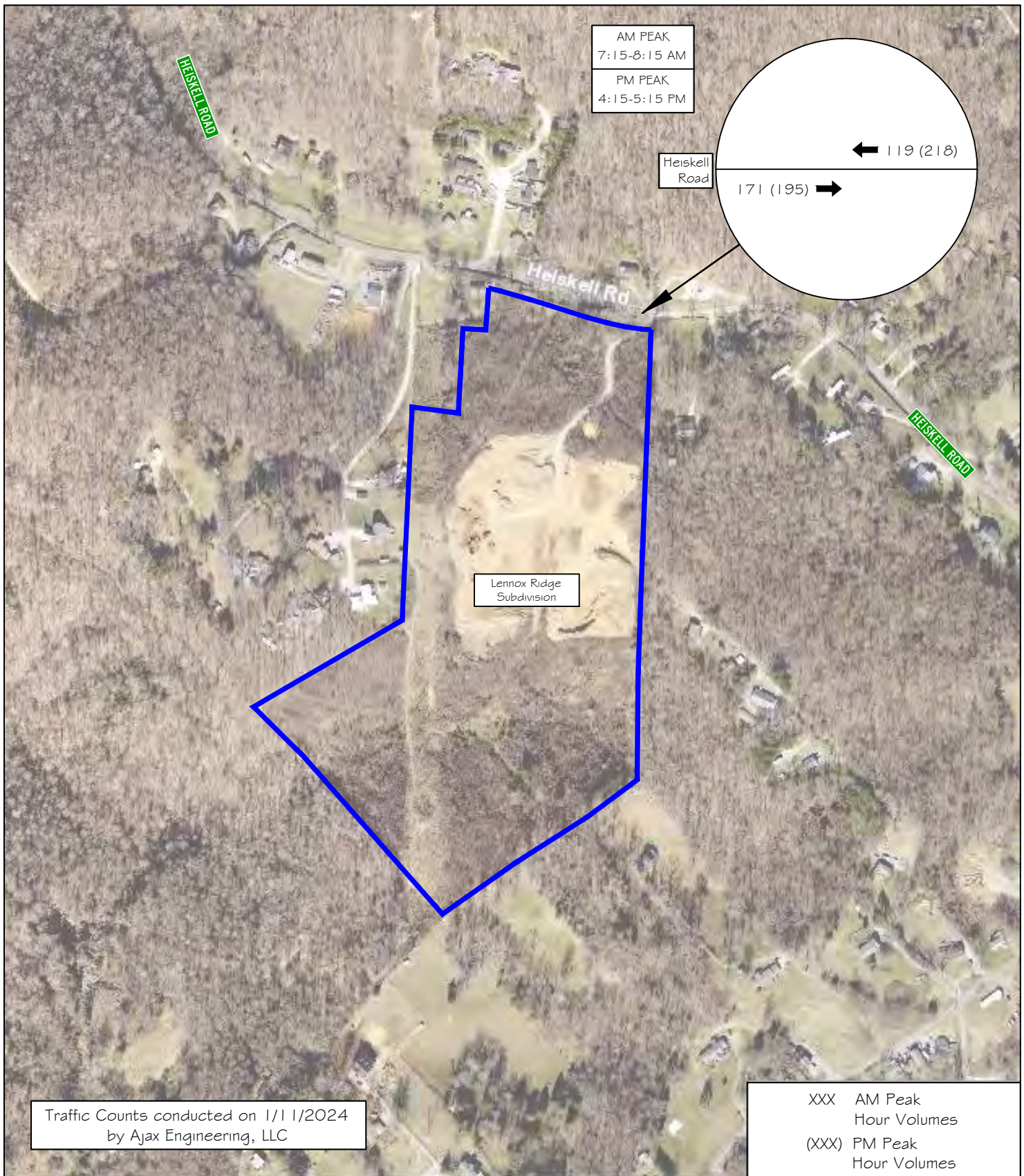
Besides residential passenger vehicles, the internal roadway will provide access to service, delivery, maintenance, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Curbside private garbage collection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

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

▪ **EXISTING TRAFFIC CONDITIONS:**

This study conducted a 6-hour traffic count on Heiskell Road adjacent to the proposed development site on Thursday, January 11th, 2024. 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. Based on the traffic volumes collected on Heiskell Road, the AM and PM peak hours were observed at 7:15 – 8:15 a.m. and 4:15 – 5:15 p.m. No pedestrians or bicyclists were observed during the traffic count. School buses were observed on Heiskell Road in both directions during the count. One semi-tractor-trailer was observed traveling northbound on Heiskell Road in the morning. Most of the traffic on Heiskell Road was typical passenger vehicles. The manual tabulated traffic counts can be reviewed in Figure 4 and Appendix E.





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FIGURE 4

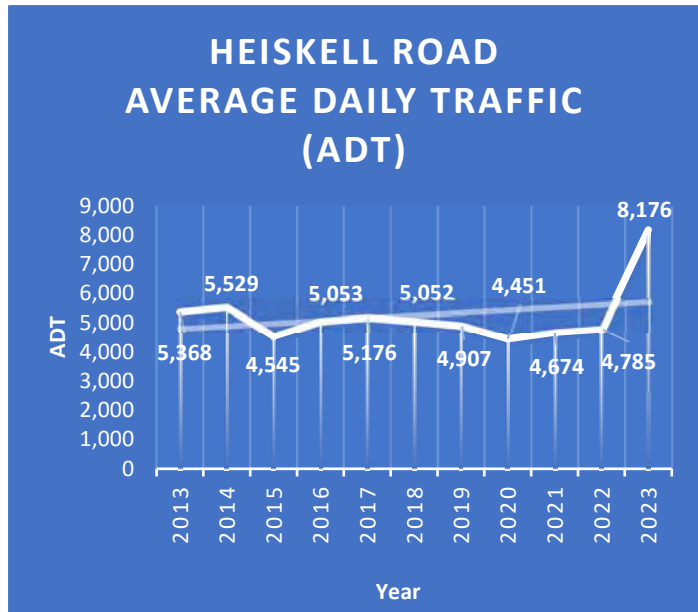
Lennox Ridge Subdivision

2024 Peak Hour Traffic Volumes -
EXISTING TRAFFIC CONDITIONS

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

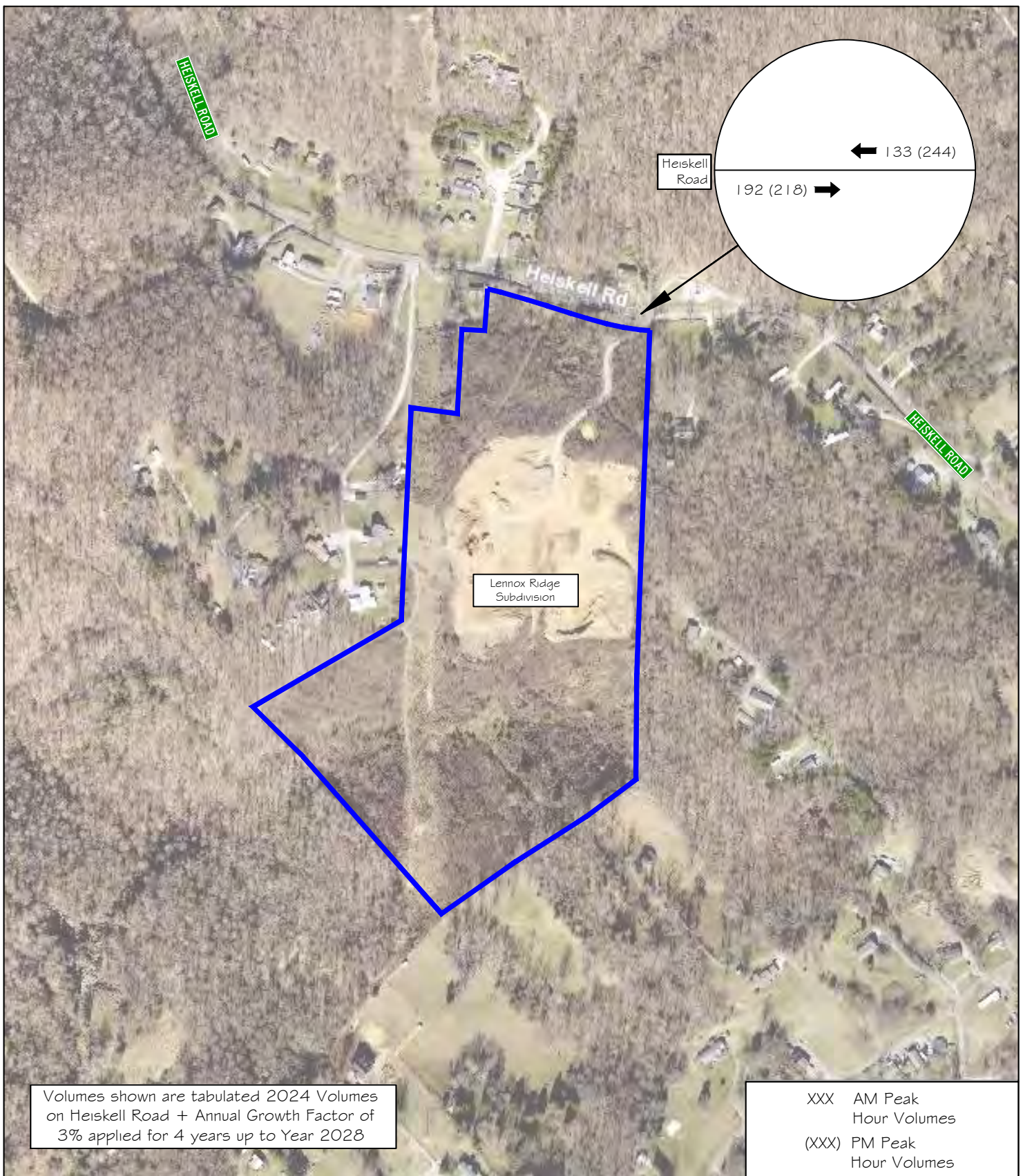
Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). This proposed development's build-out and full occupancy are assumed to occur by 2028.

According to the nearby TDOT count station, vehicular traffic on Heiskell Road has grown moderately over the past ten years. Data in Appendix A shows that Heiskell Road, north of East Emory Road, has experienced annual growth of +4.4% over the past ten years. As shown in the adjacent chart, the traffic volumes on Heiskell Road were consistent until the last year of data (2023), which showed an enormous traffic increase. It is unknown if this was a one-year occurrence or if it signifies long-term



higher traffic volumes on the roadway. However, no significant developments in the area are identified that would explain such a significant increase in traffic in a single year. Furthermore, this traffic count location is 1.5 miles away to the southeast of the proposed development site, within a much higher residential density. Thus, that count location is presumed to reflect much higher vehicular growth than the section of Heiskell Road adjacent to the development site.

Thus, for this study, an annual growth rate of +3% was used to calculate future growth on Heiskell Road adjacent to the development site up to 2028 to account for potential traffic growth in the study area. The annual growth rate was applied to the existing thru 2024 volumes tabulated on Heiskell Road to estimate the future volumes in the horizon year of 2028 without the potential development traffic. Figure 5 shows the projected 2028 horizon year traffic volumes on Heiskell Road at the development site without the project during the AM and PM peak hours.



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FIGURE 5

Lennox Ridge Subdivision

2028 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 traffic for the townhouses in the Lennox Ridge Subdivision was based on the 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 slightly higher trip rates than the similar land use in the often-referenced Institute of Transportation (ITE) Trip Generation Manual.

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

TABLE 2
TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION
103 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	103 Townhouses	980	22%	78%		55%	45%	
				12	43	55	43	36	79
Total New Volume Site Trips			980	12	43	55	43	36	79

Data from Local Trip Rates and calculated by using Fitted Curve Equations

For the proposed residential development, it is estimated that 12 vehicles will enter and 43 will exit, for a total of 55 generated trips during the AM peak hour in the year 2028. Similarly, it is estimated that 43 vehicles will enter and 36 will exit, for a total of 79 generated trips during the PM peak hour in the year 2028. The calculated trips generated for an average weekday are estimated to be 980 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 Lennox Ridge 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 on Heiskell Road near the proposed development site.

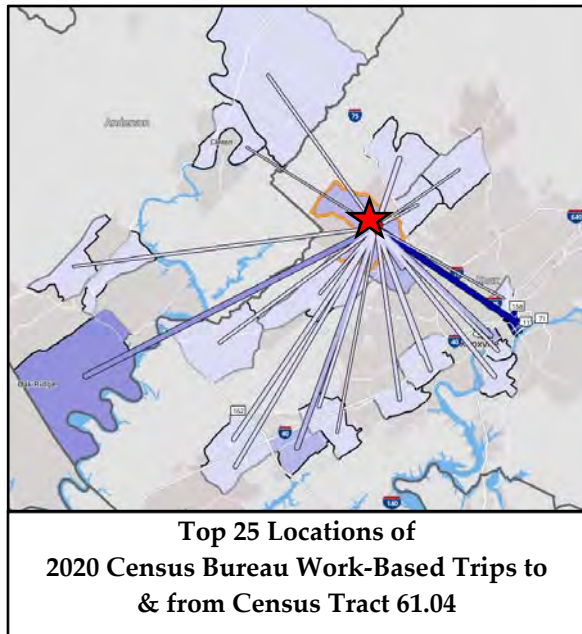
During the traffic count, distinct directional splits were observed for the northbound and southbound Heiskell Road thru volumes during the morning peak hours. In the AM peak hour, 59% of thru traffic on Heiskell Road was observed traveling south towards Knoxville and 41% north. In the PM peak hour, the directional flows were more even, with 47% of the traffic on Heiskell Road traveling southbound and 53% northbound.

As part of this study, an additional supplemental traffic count was conducted during the identified AM and PM peak hours at the intersection of Heiskell Road at Ann Cove Lane. This intersection is the sole road access for residents in The Villas at Tyler Gate Subdivision and is approximately 2,000 feet to the southeast of the proposed development. This subdivision has 26 single-family detached houses. The observed entering and exiting splits on Ann Cove Lane are projected to be a good analog for the future residents of the Lennox Ridge Subdivision development since this road serves a similar residential land use as proposed for the development site. The entering and exiting percentages during the observed AM and PM peak hours to and from Ann Cove Lane at Heiskell Road were the following:

**Observed Entering and Exiting Vehicle Distribution
 at Anne Cove Lane on Heiskell Road**

AM PEAK HOUR	
ENTER FROM SOUTH	100%
ENTER FROM NORTH	0%
EXIT TO SOUTH	73%
EXIT TO NORTH	27%
PM PEAK HOUR	
ENTER FROM SOUTH	78%
ENTER FROM NORTH	22%
EXIT TO SOUTH	83%
EXIT TO NORTH	17%

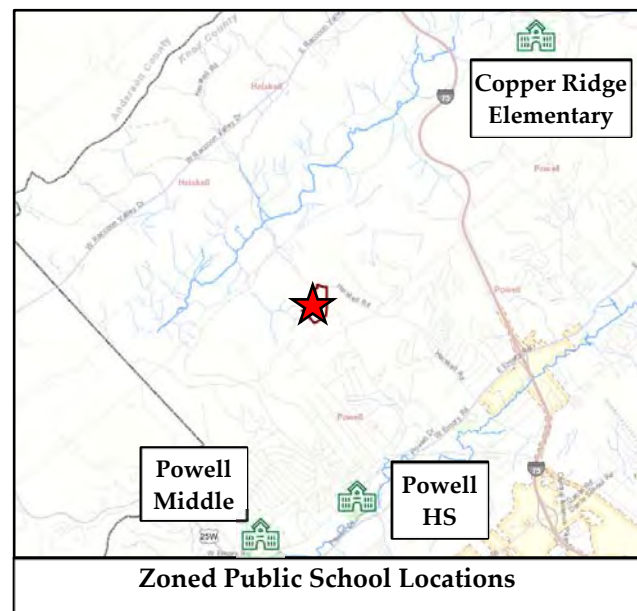
During the traffic count, as shown in the table, most vehicles entered and exited Ann Cove Lane to and from the south during the AM and PM peak hours.



The second source for 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 residential development, and these trips are more likely to travel to and from the southwest, south, and southeast. This assertion is based on data from the United States Bureau website for Census Tract 61.04, where the development property is located. Based on 2021 (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, Oak Ridge, and areas of West Knoxville.

For future work-related travel to and from the development site, the proximity of the Interstate 75 interchange at Emory Road to the southeast will draw a good portion of these trips.

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 Copper Ridge Elementary, Powell Middle, and Powell High School. These zoned public schools are located northeast and south of the development site. For parents and children not utilizing public school bus transportation, the most direct route to these schools would be initially traveling on Heiskell Road and then utilizing other roads to the schools.



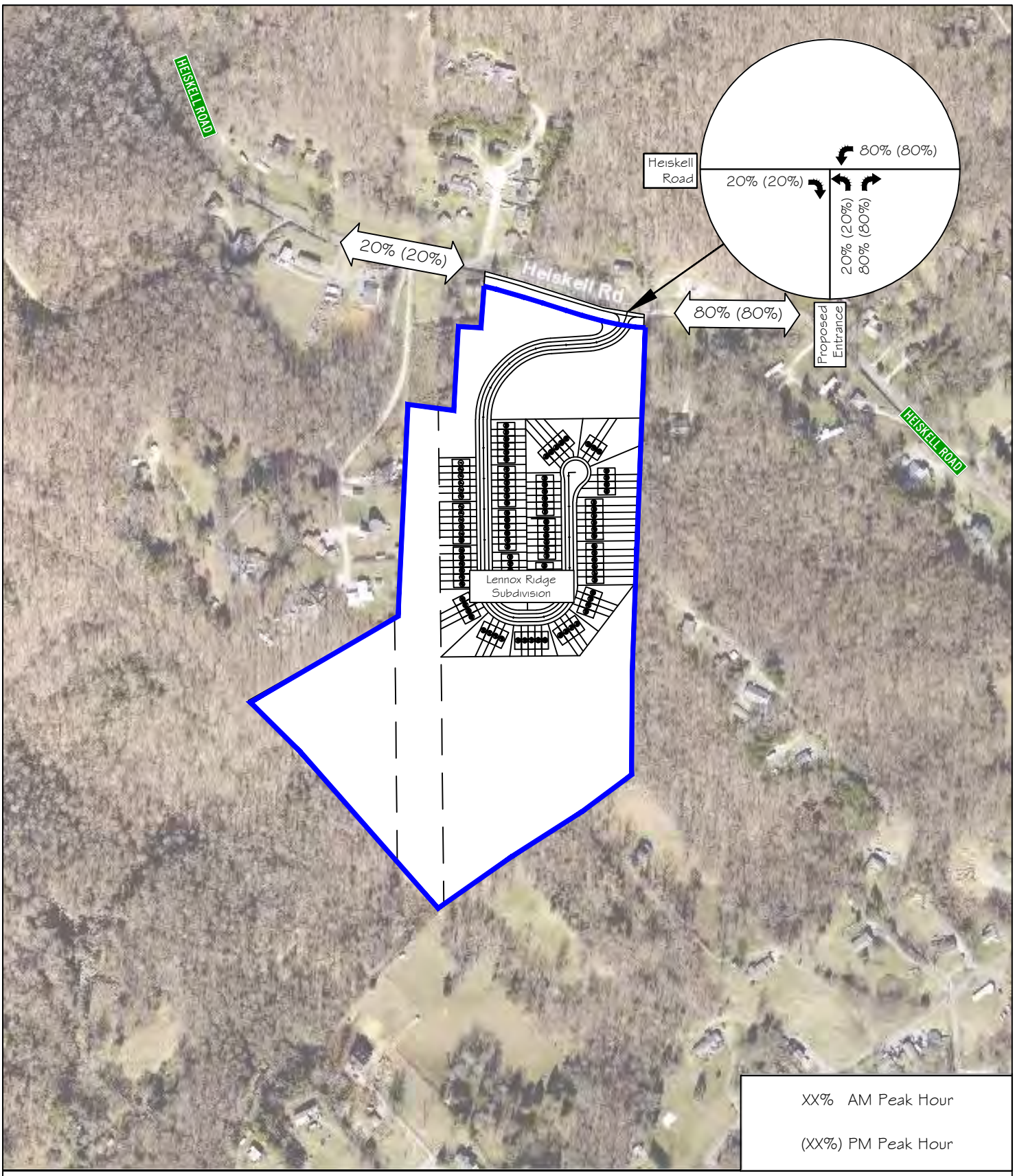
Powell High School is the closest to the development site at 3.1 miles, and Copper Ridge Elementary School is the furthest at 4.5 miles. Powell Middle School is 4.2 miles away, and both this school and the high school will be best accessed from the south via Heiskell Road, West Copeland Drive, Collier Road, and then West Emory Road. Copper Ridge Elementary will require residents to travel to and from the north on Heiskell Road for any elementary-age

students traveling by private vehicles.

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 Heiskell Road. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the local trip rates. Ultimately, the projected, assumed trip distribution was heavily based on the observed traffic entering and exiting Anne Cove Lane at Heiskell Road, with 80% to and from the south and 20% to and from the north.

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.



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

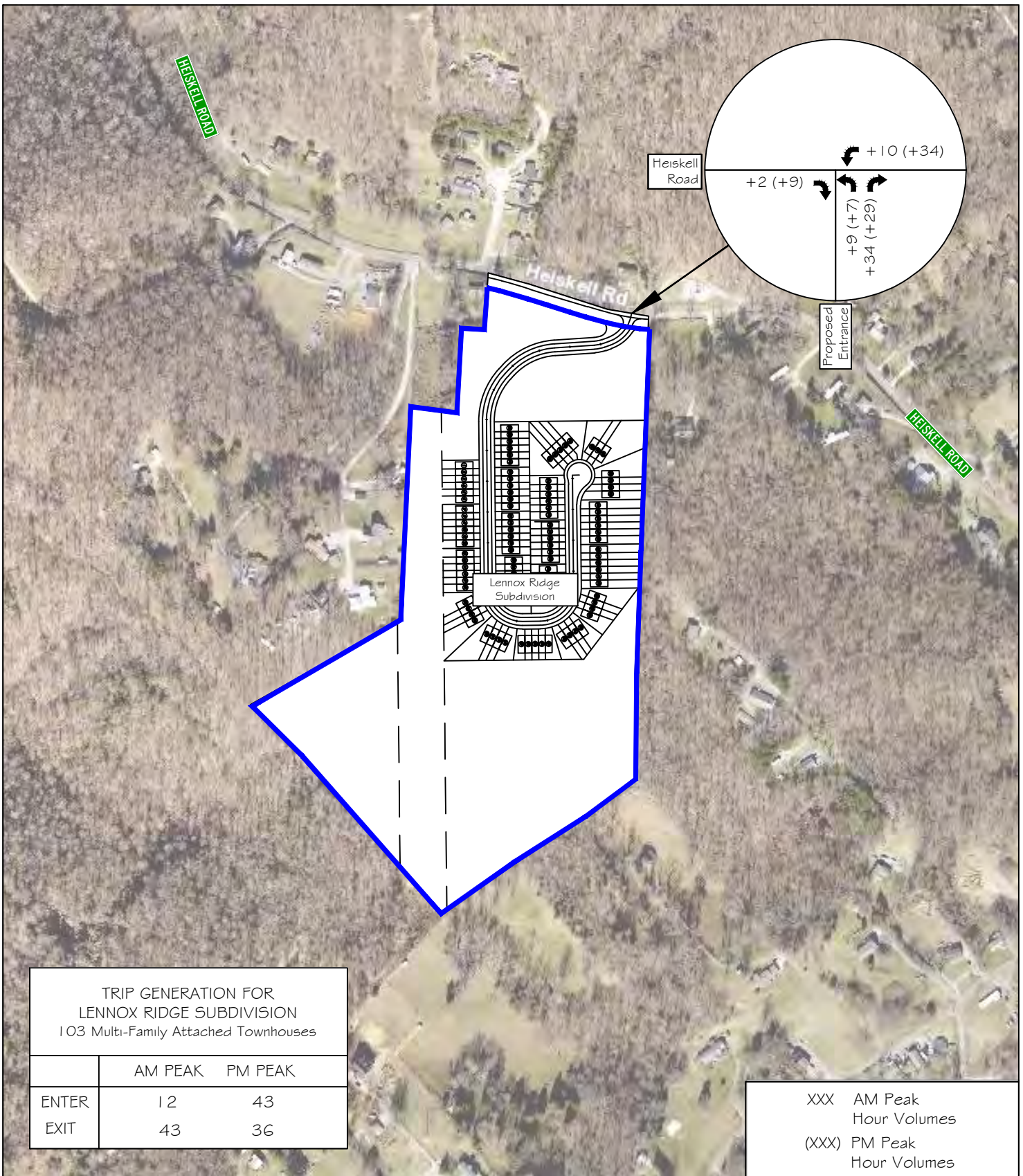
NOT TO SCALE



FIGURE 6

Lennox Ridge Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour



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

NOT TO SCALE



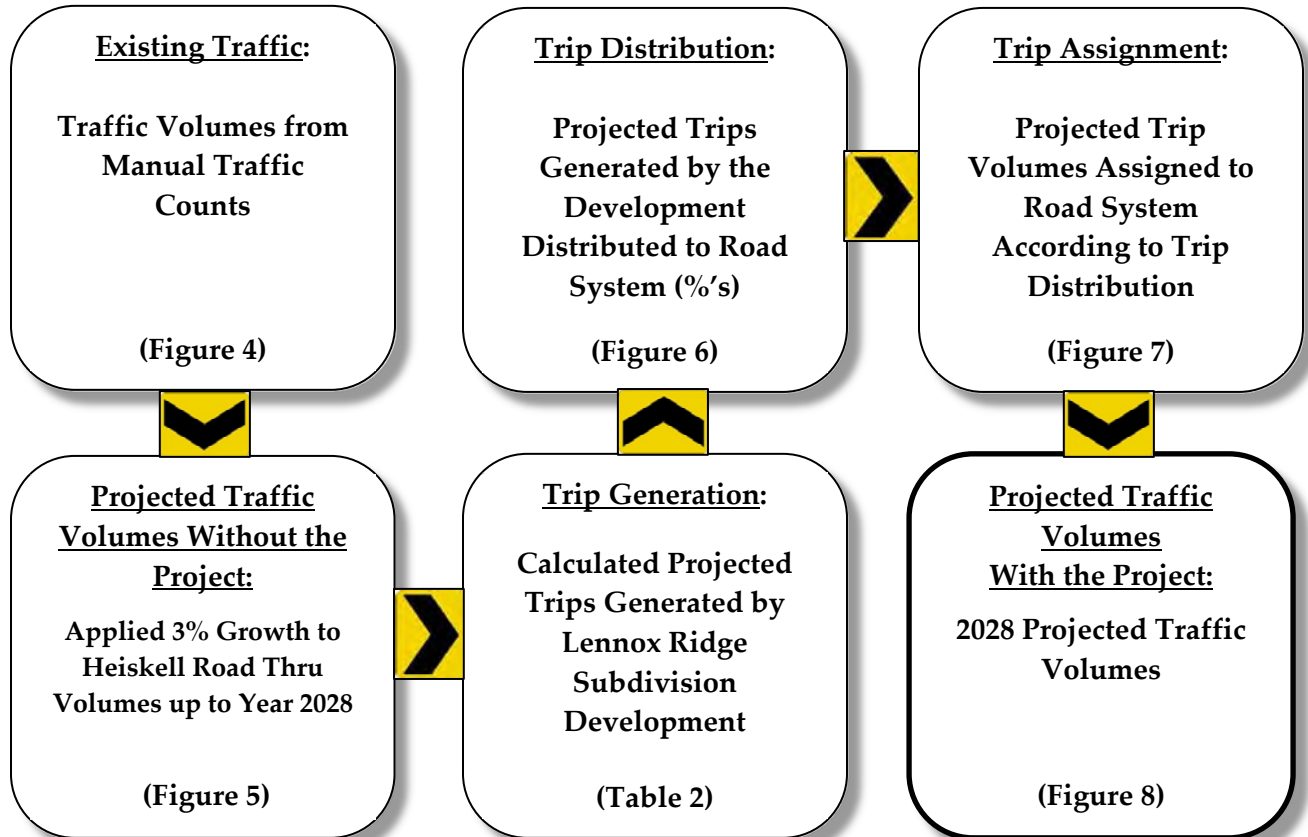
FIGURE 7

Lennox Ridge Subdivision

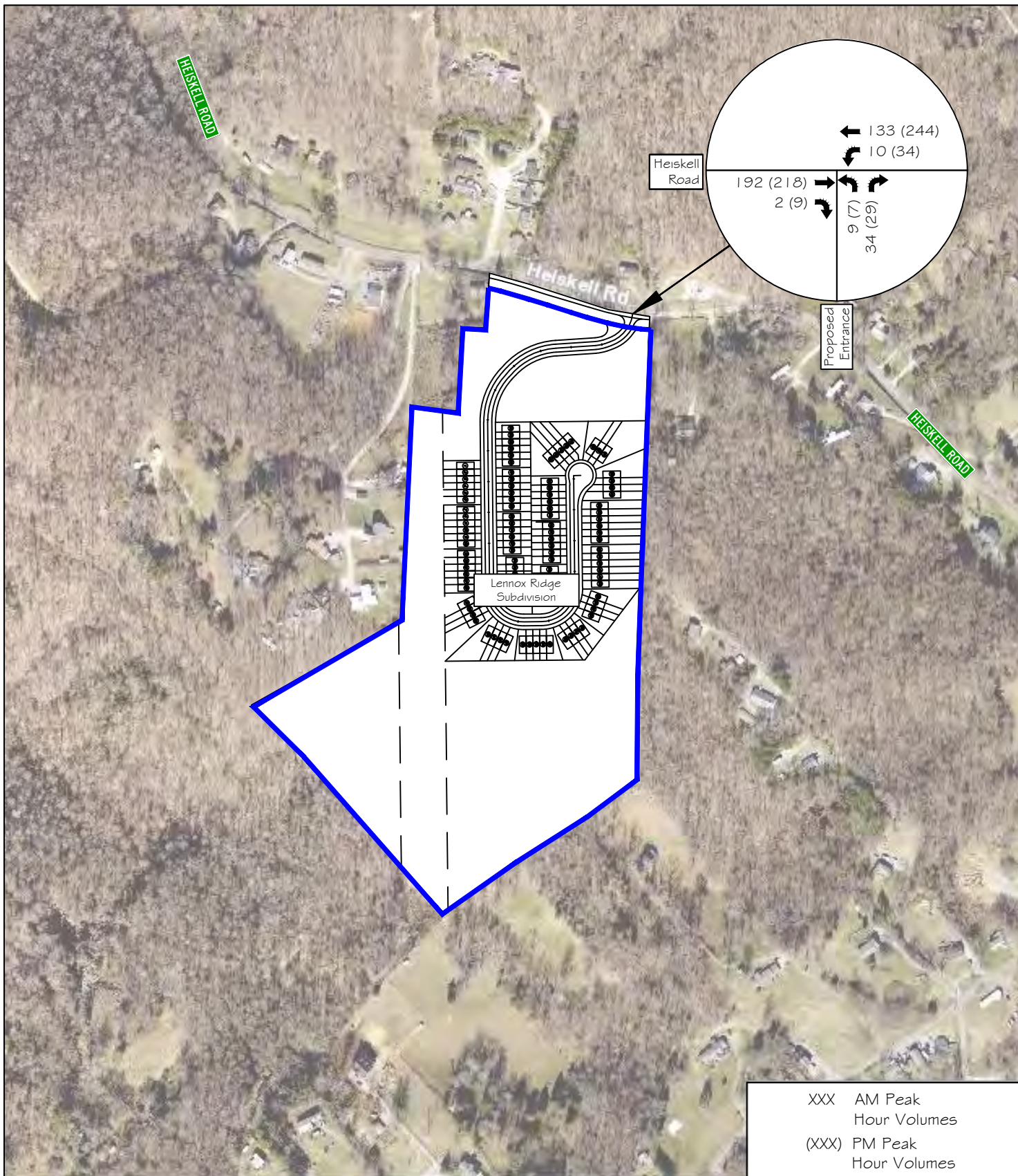
Traffic Assignment of Generated Traffic
during AM and PM Peak Hour

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

Several additive steps were taken to estimate the total projected traffic volumes at the Proposed Entrance intersection on Heiskell Road when the subdivision development is constructed and fully occupied in 2028. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 2) generated by the Lennox Ridge Subdivision development was added to the 2028 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 Proposed Entrance intersection when the Lennox Ridge Subdivision development is fully built and occupied in 2028. Figure 8 shows the projected 2028 AM and PM peak hour traffic volumes, which includes the generated development traffic entering and exiting the Proposed Entrance intersection and the projected thru volumes on Heiskell Road.



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

NOT TO SCALE



FIGURE 8

Lennox Ridge Subdivision

2028 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 2028, shown in Figure 8. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and Synchro Traffic Software (Version 12).

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

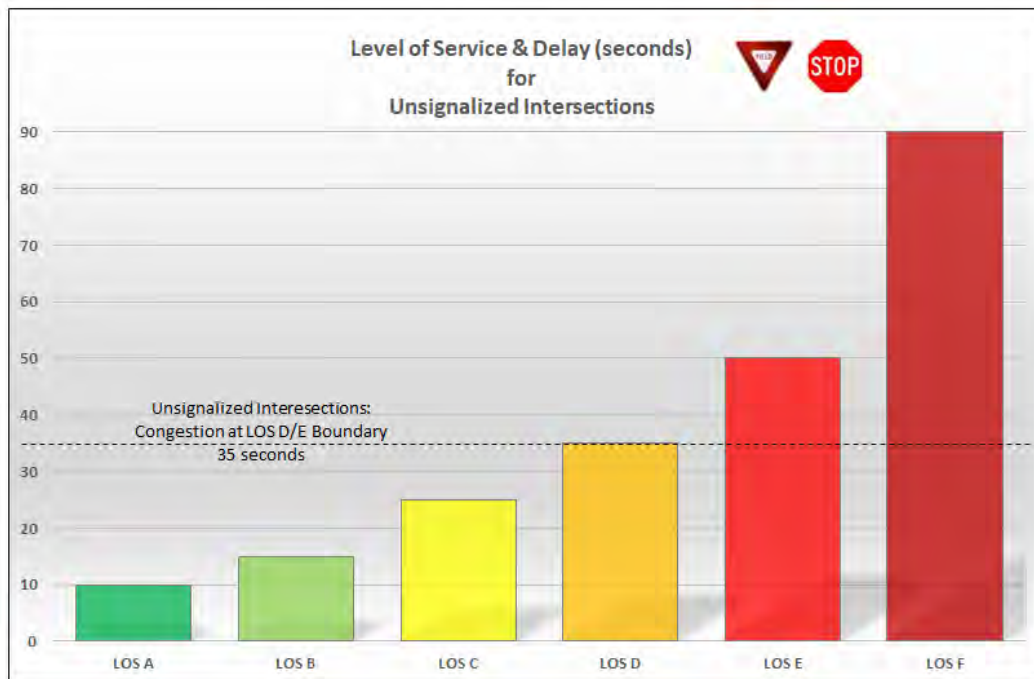
the delay for each minor approach and major street left-turn movements. Table 3 lists the level of service criteria for unsignalized intersections. The analysis results of unsignalized intersections using the HCM methodologies are conservative due to the more significant vehicle gap parameters used in 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, 7th Edition



Intersection capacity results from the projected 2028 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 2028 peak hour capacity analyses.

As shown in Table 4, the intersection is calculated to operate with excellent LOS and very short vehicle delays in the projected 2028 conditions.

TABLE 4
2028 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	v/c ^c	LOS ^a	DELAY ^b (seconds)	v/c ^c
Heiskell Road (SB & NB) at Proposed Entrance (EB)	 Unsignalized	Northbound Left	A	7.7	0.008	A	7.8	0.028
		Eastbound Left/Thru	A	9.5	0.057	A	9.8	0.050

Note: All analyses were calculated in Synchro 11 software and reported using HCM 7th Edition intersection 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 constructed. These transportation features are discussed in the following pages.

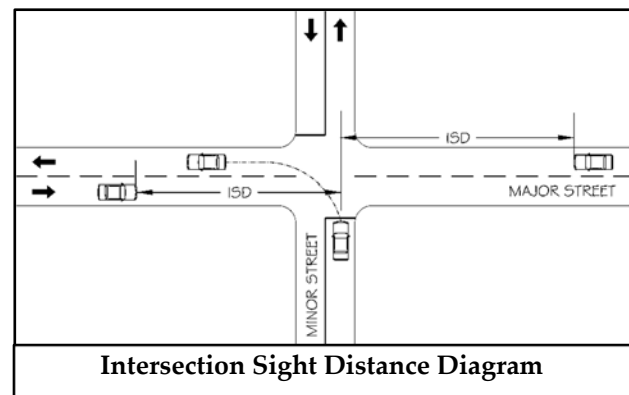
○ **EVALUATION OF SIGHT DISTANCE**

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.

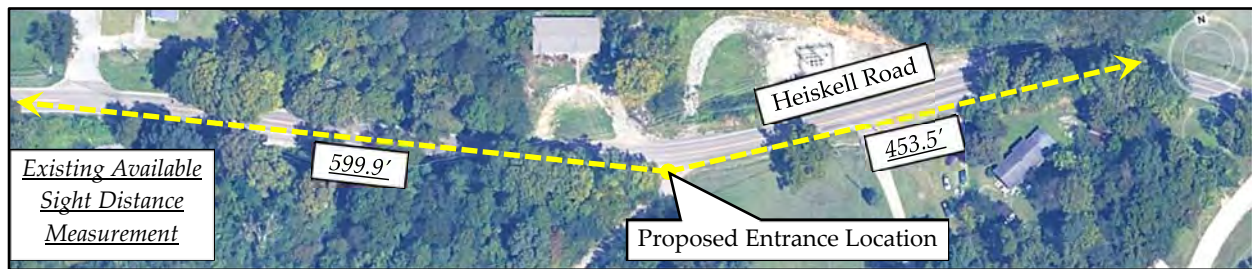


Intersection Sight Distance Diagram

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.

Heiskell Road has a posted speed limit of 40-mph. Based on Knox County's policy of requiring 10 feet of sight distance per 1-mph of speed, the required intersection sight distance is 400 feet. On October 11th, 2023, Trueline Land Surveying, LLC measured the sight distance from the Proposed Entrance location and determined that the available sight distance is adequate. The sight distance was measured to be 599.9 feet to the northwest and 453.5 feet to the southeast. A horizontal curve on Heiskell Road southeast of the Proposed Entrance limits the visual distance beyond 453.5 feet.

Images of the existing sight distances at the Proposed Entrance location are labeled below with the ISD and land surveyor-measured sight distances.



View of Sight Distance on Heiskell Road at the Proposed Entrance Location (Looking Northwest)



View of Sight Distance on Heiskell Road at the Proposed Entrance Location (Looking Southeast)

- **EVALUATION OF TURN LANE THRESHOLDS**

The need for separate entering turn lanes was evaluated in the projected 2028 conditions for the Proposed Entrance at Heiskell Road.

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 Heiskell Road 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 turn lanes on Heiskell Road at the Proposed Entrance will not be warranted based on the projected AM and PM peak hour 2028 traffic volumes. The worksheets for these evaluations are provided in Appendix I.

- **PROJECTED VEHICLE QUEUES**

An additional software program was used to calculate the 2028 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 12) 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 in the software. The 95th percentile vehicle queue lengths at the intersection are shown in Table 5 for the projected 2028 conditions with the project. The vehicle queue worksheet results from the SimTraffic software are in Appendix J.

**TABLE 5
 VEHICLE QUEUE SUMMARY -
 2028 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT**

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	SIMTRAFFIC 95 th PERCENTILE QUEUE LENGTH (ft)		AVAILABLE STORAGE (ft)	ADEQUATE?
			AM PEAK HOUR	PM PEAK HOUR		
Heiskell Road (SB & NB) at Proposed Entrance (EB)	 Unsignalized	Eastbound Left/Right	48	47	n/a	✓
		Northbound Left/Thru	16	34	n/a	✓

Note: 95th percentile queues were calculated in SimTraffic 12 software

Table 5 shows minimal projected queue lengths at the intersection in the 2028 peak hour conditions. The projected vehicle queues for the exiting traffic in the 2028 AM and PM peak hours at the Proposed Entrance are calculated to be very reasonable. The longest queue on the eastbound (exiting) approach on Heiskell Road at the Proposed Entrance with a shared left/right lane was calculated to be approximately two vehicles, assuming a length of 25 feet per vehicle. Results are not reported for the southbound approach on Heiskell Road 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 Lennox Ridge Subdivision development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.



Heiskell Road at the Proposed Entrance: The 2028 projected level of service calculations for this intersection resulted in short vehicle delays and good LOS.

- 1a) The construction of separate turn lanes on Heiskell Road for vehicles entering the Proposed Entrance is not warranted based on the projected 2028 PM peak hour 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 Heiskell Road. The stop bar should be applied a minimum of 4 feet away from the edge of Heiskell Road and placed at the desired stopping point that maximizes the sight distance.
- 1c) A single exiting lane for the development entrance at Heiskell Road will be sufficient. The eastbound exiting lane at Heiskell Road is proposed as a shared left/right turn lane. The longest vehicle queue in the projected 2028 conditions on this exiting approach is calculated to be 48 feet in the AM peak hour and 47 feet in the PM peak hour. These queue lengths are reasonable and translate to just two passenger cars, assuming a length of 25 feet per vehicle.
- 1d) Intersection sight distance at the Proposed Entrance at Heiskell Road must not be impacted by future landscaping, signage, or existing vegetation. Based on a posted speed limit of 40-mph on Heiskell Road, the required intersection sight distance is 400 feet for exiting left and right-turning vehicles. The existing sight distances at the Proposed Entrance location were estimated visually to be adequate in both directions and were also certified by a land surveyor.
- 1e) The Knox County requirement for intersection spacing on a Minor Arterial is 400 feet. This requirement will be met since the Proposed Entrance location on Heiskell Road will be 550 feet southeast of Red Hawk Lane and 2,110 feet northwest of Ann Cove Lane. These streets are the closest public roadways to the Proposed Entrance for the Lennox

Ridge Subdivision.



Lennox Ridge Subdivision Internal Road: The layout plan shows a single entrance at Heiskell Road 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 Heiskell Road. It is recommended that a “No Outlet” Sign (W14-2a) be installed at the front of the development at Heiskell Road. The “No Outlet” sign can be installed above or below the street name sign or separately posted on the proposed entrance road.
- 2b) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- 2c) If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.
- 2d) The internal sidewalk should have a minimum width of 5 feet to meet Knox County standards.
- 2e) All road grade and intersection elements should be designed to AASHTO and Knox County specifications and guidelines to ensure proper operation.



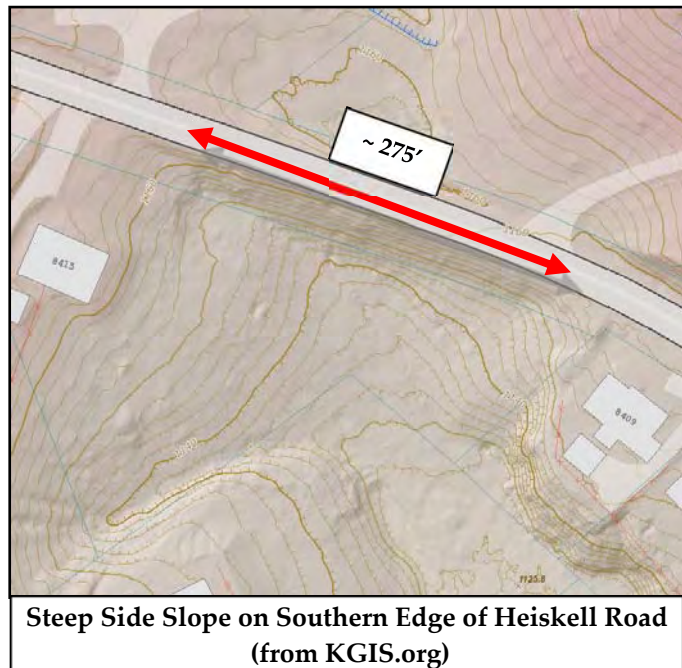
Previous Transportation Impact Letter (TIL) Findings: The previous TIL for the site property’s rezoning process, produced in December 2023, included an “Overview of Findings”. The safety-oriented findings in the TIL not discussed in this TIS include the following pertinent items. However, these items are outside the developer's responsibility since these are existing issues.

- 3a) During the field review of Heiskell Road between the Proposed Entrance and East / West Emory Road, three safety issues were observed, with two needing priority action and the other needing further investigation. The two priority issues are for missing and damaged traffic road signage. The first road sign issue was an existing 40-mph speed limit sign that was observed to have been struck and lying on the east side of Heiskell

Road. This speed limit sign is located approximately 30 feet to the northwest of the Home Federal Bank's northernmost driveway. The sign was lying on the side of the road. However, during the last site visit for this project, it was noted this speed limit sign had been reinstalled.

The other road sign issue is a missing Type 3 Object Marker on the east side of Heiskell Road, approximately 275 feet north of Hawthorne Oaks Way. A drainage sump is located adjacent to the roadway and is delineated by one Type 3 Object Marker sign (OM-3R) for northbound traffic, but the sign for southbound traffic (OM-3L) is missing. During the last site visit, this sign had not been replaced yet.

3b) The final observed potential safety issue was a short Heiskell Road segment that has a steep drop-off slope. This steep slope is approximately 400 feet northwest of East / West Copeland Drive and on the south side of Heiskell Road between the residences at 8409 and 8415 Heiskell Road. This steep slope along Heiskell Road is approximately 275 feet long and nearly 1.5:1, with very little lateral shoulder distance from



the edge of the pavement to the drop-off. The elevation change is over 20 feet from the roadway to the toe of the slope. Due to this near-road hazard, there should be some consideration in investigating the need to install a guardrail at this location, especially if there is any history of vehicles leaving the roadway.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

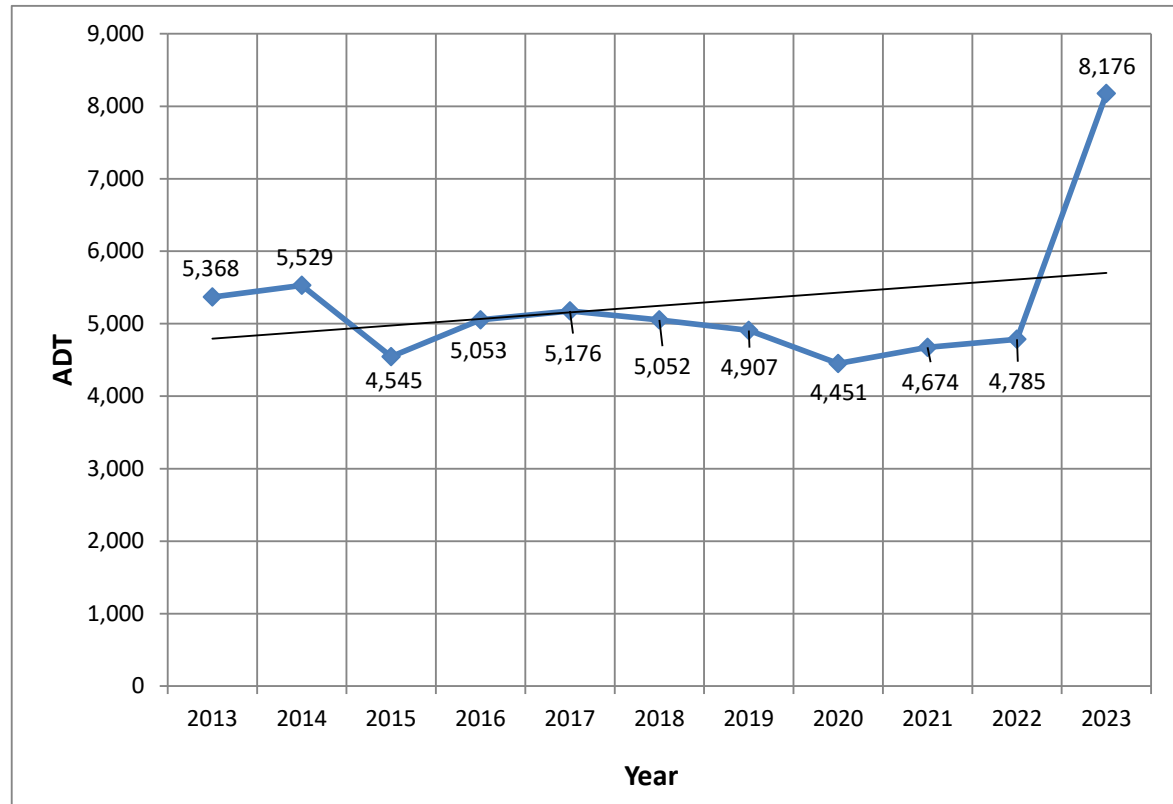
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000045

Location: Heiskell Road, north of East Emory Road

YEAR	ADT	Trendline ↓
2013	5,368	
2014	5,529	
2015	4,545	
2016	5,053	
2017	5,176	
2018	5,052	
2019	4,907	
2020	4,451	
2021	4,674	
2022	4,785	
2023	8,176	



2013 - 2023 Growth Rate = 52.3%

Average Annual Growth Rate = 4.3%

List View All DIRs

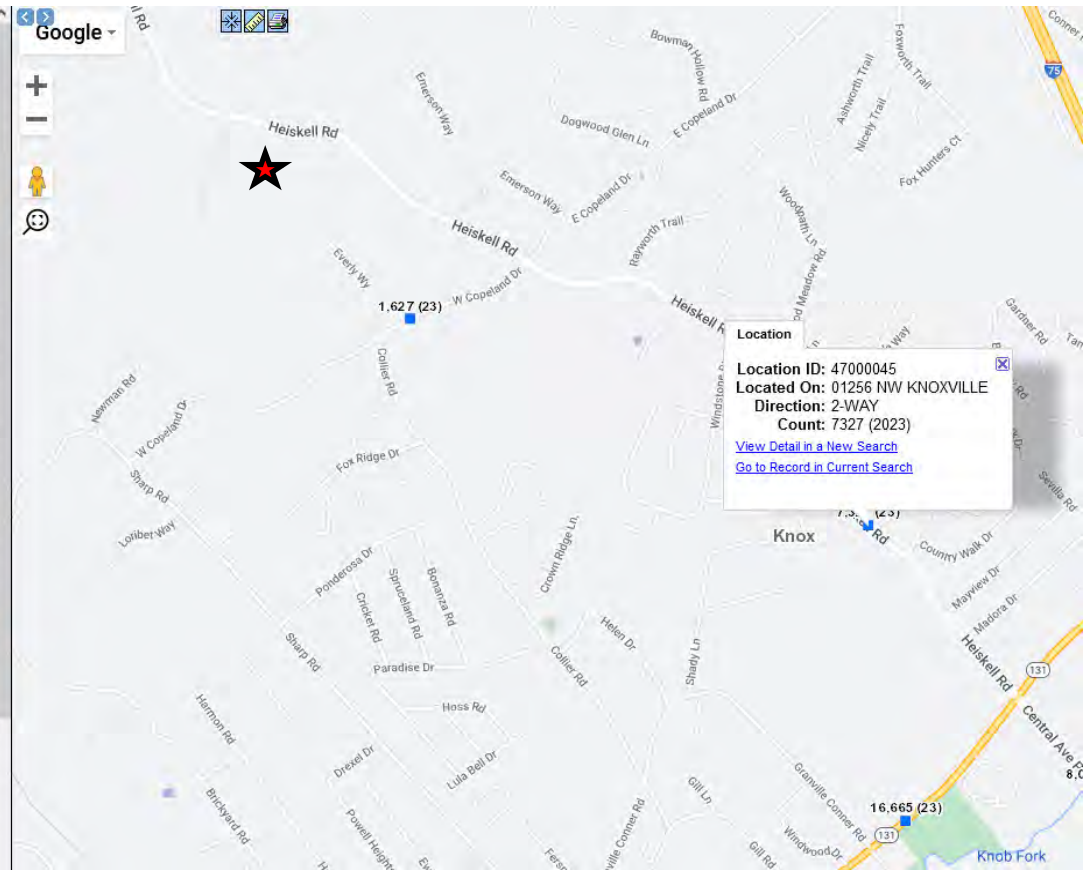
Record 7270 of 15934 Goto Record go

Location ID	47000045	MPO ID	
Type	SPOT	HPMS ID	
On MHS		On HPMS	
LRS ID	4701256001	LRS Loc Pt.	7.889
SF Group	Urban Minor Arterial	Route Type	
AF Group	Region 1 Urban Minor Arterial	Route	
GF Group	Knox	Active	Yes
Class Dist Grp	Region 1 Urban Minor Arterial	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Funct'l Class	Minor Arterial	Milepost	
Located On	01256		
Loc On Alias	HEISKELL RD.		
	NW KNOXVILLE		

STATION DATA

Directions: 2-WAY

AADT								
Year	AADT	DHV-30	K %	D %	PA	BC	Src	
2023	7,327	756	10	65	7,005 (96%)	322 (4%)		
2022	4,785	515	11	65	4,652 (97%)	133 (3%)		
2021	4,674 ³			65	4,521 (97%)	153 (3%)	Grown from 2020	
2020	4,451	534	12	65	4,282 (96%)	169 (4%)		
2019	4,907 ²		13	65				




APPENDIX B

WALK SCORE

WALKSCORE


(from walkscore.com)




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

[Go](#)


8721 Heiskell Road

Powell, Tennessee, 37849

Commute to **Knoxville, TN** 

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

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

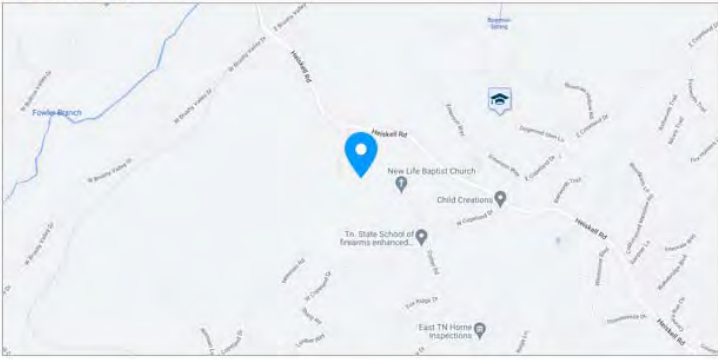
[Looking for a home for sale in Powell?](#) 

Walk Score **0** **Car-Dependent**

Almost all errands require a car.

[About your score](#)

[Add scores to your site](#)



Scores for 8721 Heiskell Road



Scores for 8721 Heiskell Road

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 8721 Heiskell 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

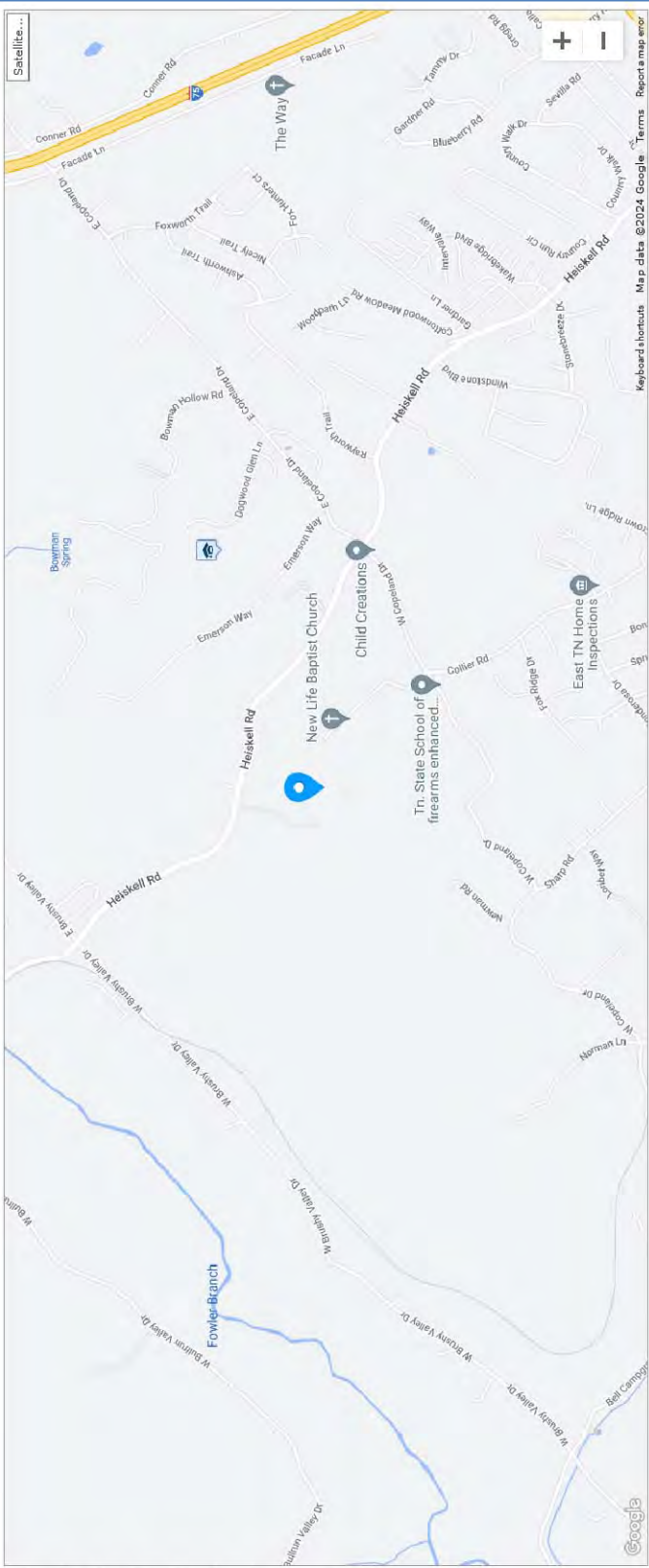
[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 8721 Heiskell Road.



What's Nearby

- Restaurants:**
 - The Front Porch 1.7mi
- Coffees:**
 - Wild Wing Cafe 1.8mi
- Bars:**
 - Oakley's Sports Grill 1.3mi
- Groceries:**
 - Nature's Fountain 1.8mi
- Parks:**
 - Powell Park 3mi
- Schools:**
 - Crossroads Academy .6mi
- Shopping:**
 - Reap The Sew 1.8mi
- Entertainment:**
 - Reabox 2.2mi
- Errands:**
 - Enroy's Barber & Styling Shop 1.9mi
- Search Nearby:**



APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Knoxville City Center



Legend

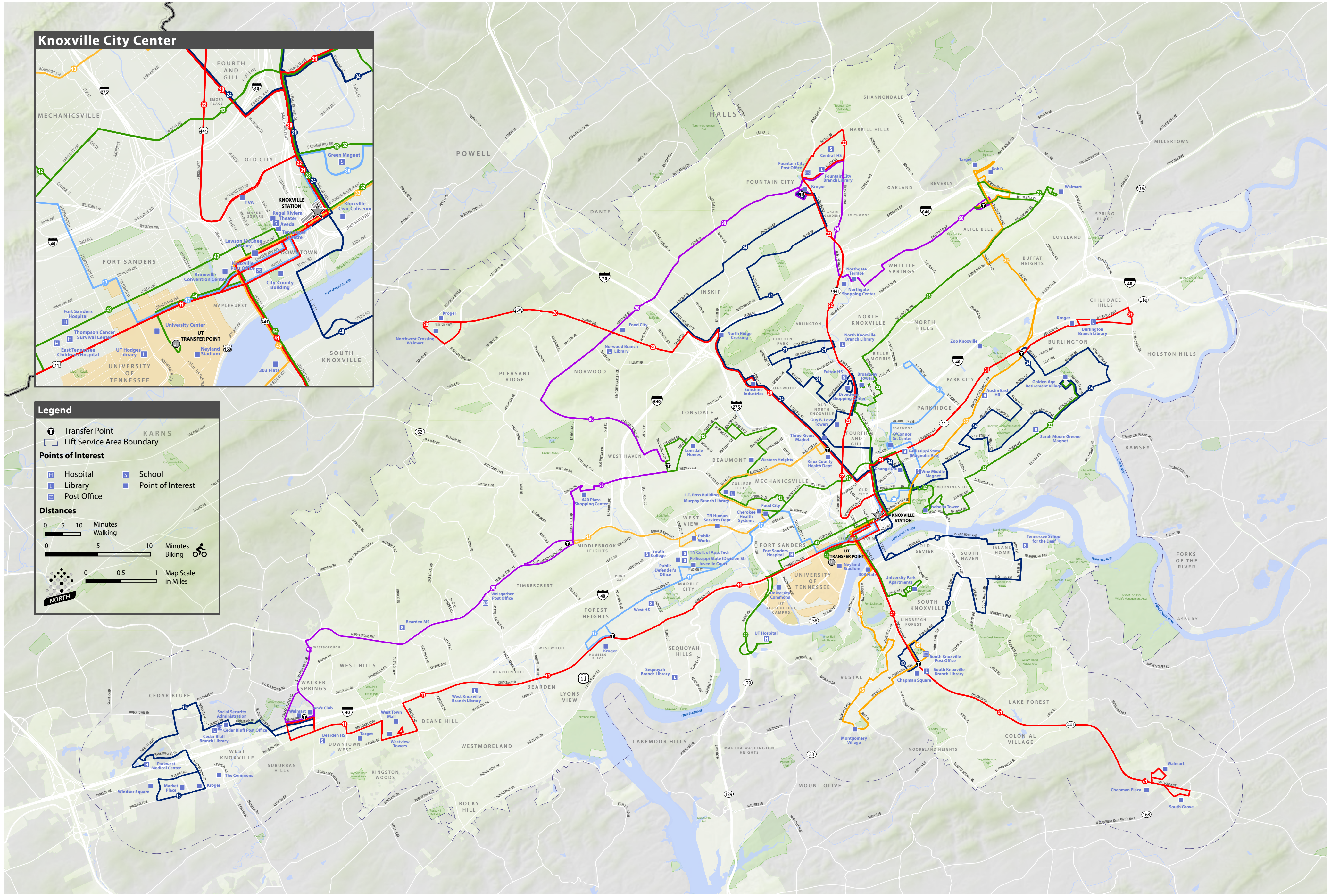
- Transfer Point
- Lift Service Area Boundary

Points of Interest

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

Distances

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



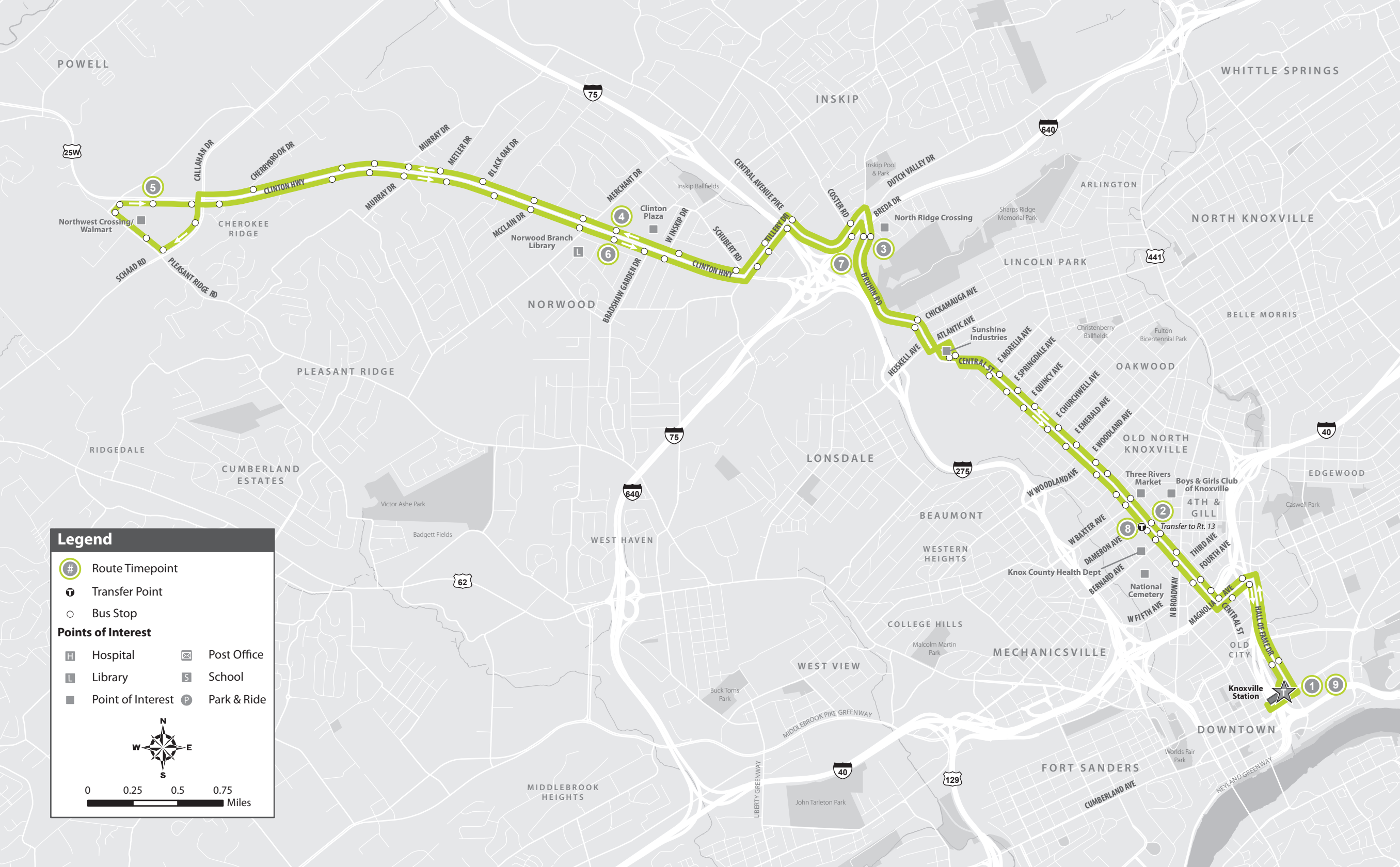
Legend

- 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 20 - Central: Weekdays

Going away from downtown				Going toward downtown				
Knoxville Station Bay G	Central @ Dameron	Bruhin @ Breda	Clinton Hwy @ Kermit Drive	Northwest Crossing	Clinton Hwy @ Orchid	Bruhin @ Breda	Central @ Dameron	Knoxville Station Bay A
1	2	3	4	5	6	7	8	9
6:15 AM	6:20 AM	6:31 AM	6:39 AM	6:48 AM	7:02 AM	7:08 AM	7:15 AM	7:25 AM
6:45 AM	6:50 AM	7:01 AM	7:09 AM	7:18 AM	7:32 AM	7:38 AM	7:45 AM	7:55 AM
7:15 AM	7:20 AM	7:31 AM	7:39 AM	7:48 AM	8:02 AM	8:08 AM	8:15 AM	8:25 AM
7:45 AM	7:50 AM	8:01 AM	8:09 AM	8:18 AM	8:32 AM	8:38 AM	8:45 AM	8:55 AM
8:15 AM	8:20 AM	8:31 AM	8:39 AM	8:48 AM	9:02 AM	9:08 AM	9:15 AM	9:25 AM
8:45 AM	8:50 AM	9:01 AM	9:09 AM	9:18 AM	9:32 AM	9:38 AM	9:45 AM	9:55 AM
9:15 AM	9:20 AM	9:31 AM	9:39 AM	9:48 AM	10:02 AM	10:08 AM	10:15 AM	10:25 AM
9:45 AM	9:50 AM	10:01 AM	10:09 AM	10:18 AM	10:32 AM	10:38 AM	10:45 AM	10:55 AM
10:15 AM	10:20 AM	10:31 AM	10:39 AM	10:48 AM	11:02 AM	11:08 AM	11:15 AM	11:25 AM
10:45 AM	10:50 AM	11:01 AM	11:09 AM	11:18 AM	11:32 AM	11:38 AM	11:45 AM	11:55 AM
11:15 AM	11:20 AM	11:31 AM	11:39 AM	11:48 AM	12:02 PM	12:08 PM	12:15 PM	12:25 PM
11:45 AM	11:50 AM	12:01 PM	12:09 PM	12:18 PM	12:32 PM	12:38 PM	12:45 PM	12:55 PM
12:15 PM	12:20 PM	12:31 PM	12:39 PM	12:48 PM	1:02 PM	1:08 PM	1:15 PM	1:25 PM
12:45 PM	12:50 PM	1:01 PM	1:09 PM	1:18 PM	1:32 PM	1:38 PM	1:45 PM	1:55 PM
1:15 PM	1:20 PM	1:31 PM	1:39 PM	1:48 PM	2:02 PM	2:08 PM	2:15 PM	2:25 PM
1:45 PM	1:50 PM	2:01 PM	2:09 PM	2:18 PM	2:32 PM	2:38 PM	2:45 PM	2:55 PM
2:15 PM	2:20 PM	2:31 PM	2:39 PM	2:48 PM	3:02 PM	3:08 PM	3:15 PM	3:25 PM
2:45 PM	2:50 PM	3:01 PM	3:09 PM	3:18 PM	3:32 PM	3:38 PM	3:45 PM	3:55 PM
3:15 PM	3:20 PM	3:31 PM	3:39 PM	3:48 PM	4:02 PM	4:08 PM	4:15 PM	4:25 PM
3:45 PM	3:50 PM	4:01 PM	4:09 PM	4:18 PM	4:32 PM	4:38 PM	4:45 PM	4:55 PM
4:15 PM	4:20 PM	4:31 PM	4:39 PM	4:48 PM	5:02 PM	5:08 PM	5:15 PM	5:25 PM
4:45 PM	4:50 PM	5:01 PM	5:09 PM	5:18 PM	5:32 PM	5:38 PM	5:45 PM	5:55 PM
5:15 PM	5:20 PM	5:31 PM	5:39 PM	5:48 PM	6:02 PM	6:08 PM	6:15 PM	6:25 PM
5:45 PM	5:50 PM	6:01 PM	6:09 PM	6:18 PM	6:32 PM	6:38 PM	6:45 PM	6:55 PM
6:15 PM	6:19 PM	6:29 PM	6:35 PM	6:41 PM	6:51 PM	6:56 PM	7:00 PM	7:10 PM
7:15 PM	7:19 PM	7:29 PM	7:35 PM	7:41 PM	7:51 PM	7:56 PM	8:00 PM	8:10 PM
8:15 PM	8:19 PM	8:29 PM	8:35 PM	8:41 PM	8:51 PM	8:56 PM	9:00 PM	9:10 PM
9:15 PM	9:19 PM	9:29 PM	9:35 PM	9:41 PM				

Route 20 - Central: SATURDAYS

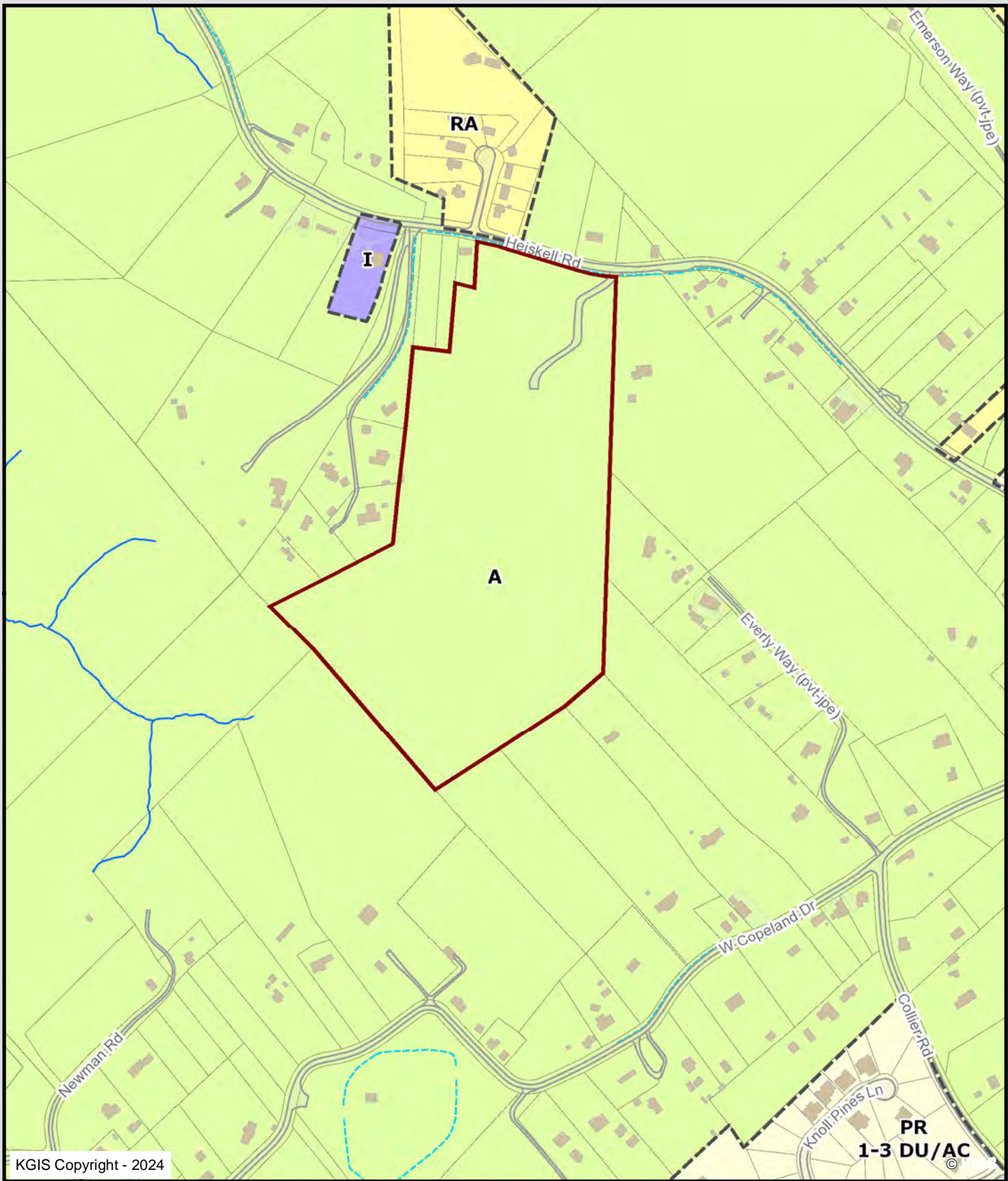
Going away from downtown				Going toward downtown				
Knoxville Station Bay G	Central @ Dameron	Bruhin @ Breda	Clinton Hwy @ Kermit Drive	Northwest Crossing	Clinton Hwy @ Orchid	Bruhin @ Breda	Central @ Dameron	Knoxville Station Bay A
1	2	3	4	5	6	7	8	9
7:15 AM	7:20 AM	7:31 AM	7:39 AM	7:48 AM	8:02 AM	8:08 AM	8:15 AM	8:25 AM
8:15 AM	8:20 AM	8:31 AM	8:39 AM	8:48 AM	9:02 AM	9:08 AM	9:15 AM	9:25 AM
9:15 AM	9:20 AM	9:31 AM	9:39 AM	9:48 AM	10:02 AM	10:08 AM	10:15 AM	10:25 AM
10:15 AM	10:20 AM	10:31 AM	10:39 AM	10:48 AM	11:02 AM	11:08 AM	11:15 AM	11:25 AM
11:15 AM	11:20 AM	11:31 AM	11:39 AM	11:48 AM	12:02 PM	12:08 PM	12:15 PM	12:25 PM
12:15 PM	12:20 PM	12:31 PM	12:39 PM	12:48 PM	1:02 PM	1:08 PM	1:15 PM	1:25 PM
1:15 PM	1:20 PM	1:31 PM	1:39 PM	1:48 PM	2:02 PM	2:08 PM	2:15 PM	2:25 PM
2:15 PM	2:20 PM	2:31 PM	2:39 PM	2:48 PM	3:02 PM	3:08 PM	3:15 PM	3:25 PM
3:15 PM	3:20 PM	3:31 PM	3:39 PM	3:48 PM	4:02 PM	4:08 PM	4:15 PM	4:25 PM
4:15 PM	4:20 PM	4:31 PM	4:39 PM	4:48 PM	5:02 PM	5:08 PM	5:15 PM	5:25 PM
5:15 PM	5:20 PM	5:31 PM	5:39 PM	5:48 PM	6:02 PM	6:08 PM	6:15 PM	6:25 PM
6:15 PM	6:19 PM	6:29 PM	6:35 PM	6:41 PM	6:51 PM	6:56 PM	7:00 PM	7:10 PM
7:15 PM	7:19 PM	7:29 PM	7:35 PM	7:41 PM	7:51 PM	7:56 PM	8:00 PM	8:10 PM
8:15 PM	8:19 PM	8:29 PM	8:35 PM	8:41 PM	8:51 PM	8:56 PM	9:00 PM	9:10 PM
9:15 PM	9:19 PM	9:29 PM	9:35 PM	9:41 PM	9:51 PM	9:56 PM	10:00 PM	

Route 20 - Central: SUNDAYS

Going away from downtown				Going toward downtown				
Knoxville Station Bay G	Central @ Dameron	Bruhin @ Breda	Clinton Hwy @ Kermit Drive	Northwest Crossing	Clinton Hwy @ Orchid	Bruhin @ Breda	Central @ Dameron	Knoxville Station Bay A
1	2	3	4	5	6	7	8	9
8:15 AM	8:19 AM	8:29 AM	8:35 AM	8:41 AM	8:51 AM	8:56 AM	9:00 AM	9:10 AM
9:15 AM	9:19 AM	9:29 AM	9:35 AM	9:41 AM	9:51 AM	9:56 AM	10:00 AM	10:10 AM
10:15 AM	10:19 AM	10:29 AM	10:35 AM	10:41 AM	10:51 AM	10:56 AM	11:00 AM	11:10 AM
11:15 AM	11:19 AM	11:29 AM	11:35 AM	11:41 AM	11:51 AM	11:56 AM	12:00 PM	12:10 PM
12:15 PM	12:19 PM	12:29 PM	12:35 PM	12:41 PM	12:51 PM	12:56 PM	1:00 PM	1:10 PM
1:15 PM	1:19 PM	1:29 PM	1:35 PM	1:41 PM	1:51 PM	1:56 PM	2:00 PM	2:10 PM
2:15 PM	2:19 PM	2:29 PM	2:35 PM	2:41 PM	2:51 PM	2:56 PM	3:00 PM	3:10 PM
3:15 PM	3:19 PM	3:29 PM	3:35 PM	3:41 PM	3:51 PM	3:56 PM	4:00 PM	4:10 PM
4:15 PM	4:19 PM	4:29 PM	4:35 PM	4:41 PM	4:51 PM	4:56 PM	5:00 PM	5:10 PM
5:15 PM	5:19 PM	5:29 PM	5:35 PM	5:41 PM	5:51 PM	5:56 PM	6:00 PM	

APPENDIX D

ZONING MAP



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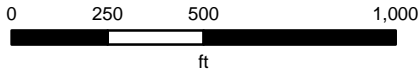
Zoning Map

3.17.24

Knoxville - Knox County - KUB Geographic Information System



Printed: 3/17/2024 at 3:27:31 PM



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APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Heiskell Road (SB-NB)
 (Southeast of Red Hawk Lane)
 Traffic Control: n/a

1/11/2024 (Thursday)
 Cold and Mostly Sunny
 Conducted by: Ajax Engineering

TIME BEGIN	Heiskell Road	Heiskell Road	VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND THRU	NORTHBOUND THRU		
7:00 AM	32	24	56	
7:15 AM	39	36	75	7:15 AM - 8:15 AM
7:30 AM	43	30	73	
7:45 AM	51	31	82	
8:00 AM	38	22	60	
8:15 AM	26	21	47	
8:30 AM	23	22	45	
8:45 AM	14	14	28	
TOTAL	266	200	466	
2:00 PM	23	21	44	
2:15 PM	29	30	59	
2:30 PM	34	31	65	
2:45 PM	21	36	57	
3:00 PM	32	34	66	
3:15 PM	30	47	77	
3:30 PM	32	45	77	
3:45 PM	35	49	84	
4:00 PM	33	39	72	
4:15 PM	48	45	93	4:15 PM - 5:15 PM
4:30 PM	47	59	106	
4:45 PM	47	45	92	
5:00 PM	53	69	122	
5:15 PM	47	41	88	
5:30 PM	44	65	109	
5:45 PM	44	36	80	
TOTAL	599	692	1291	

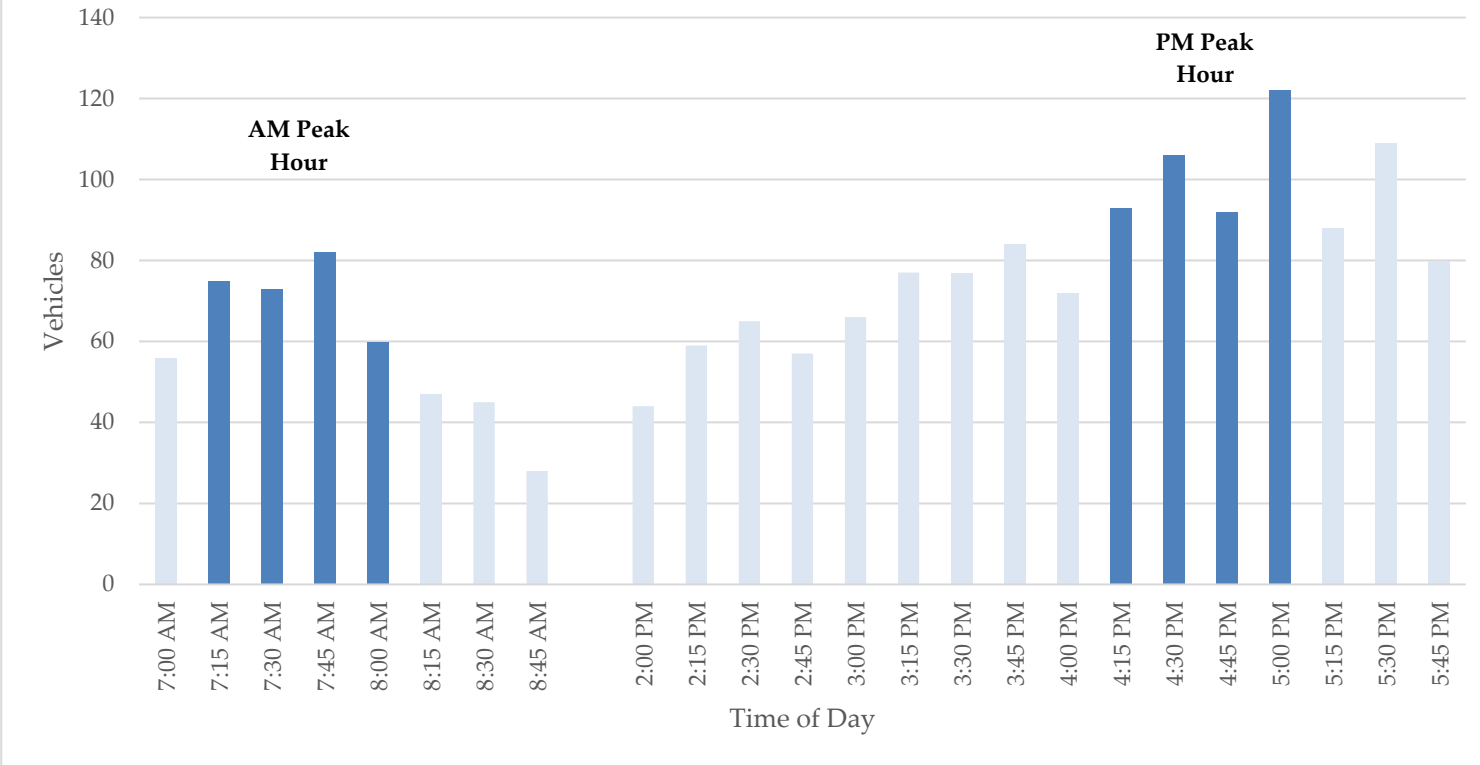
2024 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	Heiskell Road	Heiskell Road
	SOUTHBOUND THRU	NORTHBOUND THRU
7:15 AM	39	36
7:30 AM	43	30
7:45 AM	51	31
8:00 AM	38	22
TOTAL	171	119
PHF	0.84	0.83
Truck %	1.2%	1.7%

2024 PM Peak Hour **4:15 PM - 5:15 PM**

TIME BEGIN	Heiskell Road	Heiskell Road
	SOUTHBOUND THRU	NORTHBOUND THRU
4:15 PM	48	45
4:30 PM	47	59
4:45 PM	47	45
5:00 PM	53	69
TOTAL	195	218
PHF	0.92	0.79
Truck %	1.0%	0.0%

Heiskell Road (Southeast of Red Hawk Lane) Traffic Count Totals 1/11/2024



APPENDIX F

LOCAL TRIP GENERATION RATES

Local Apartment Trip Generation Study

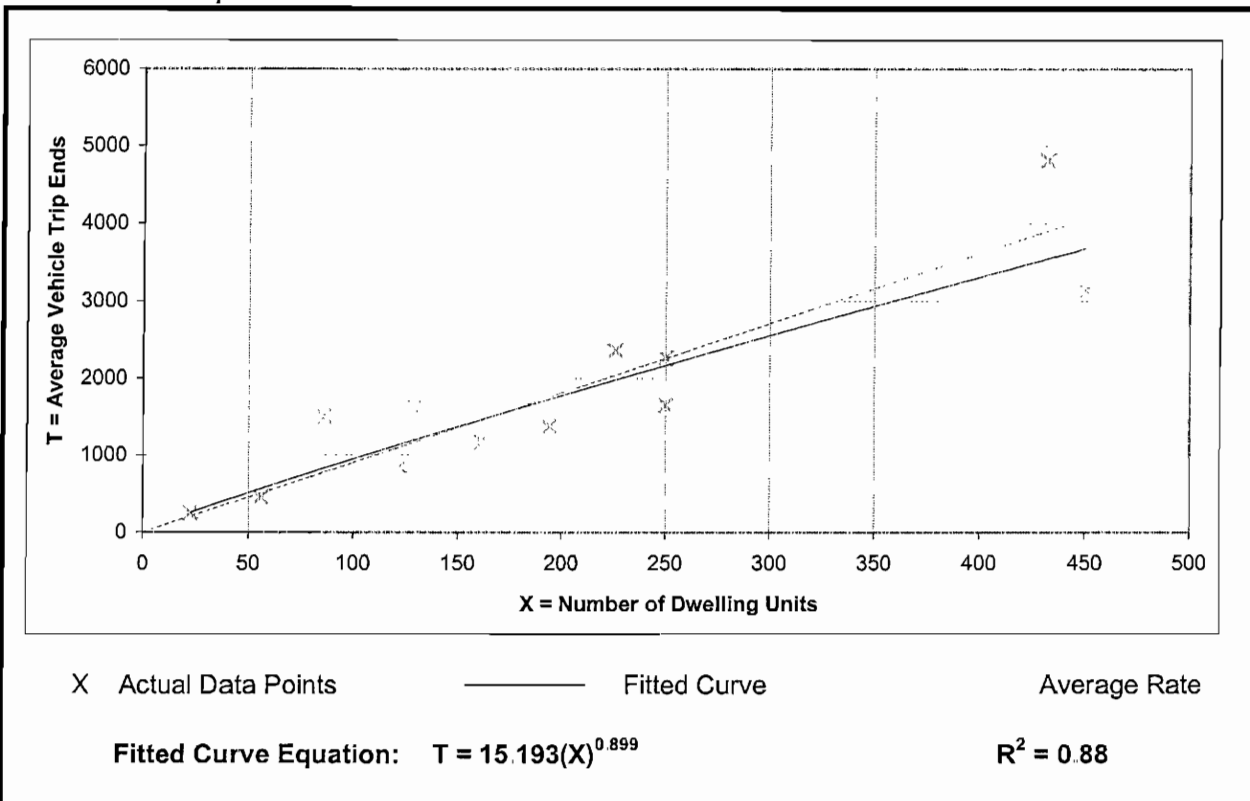
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

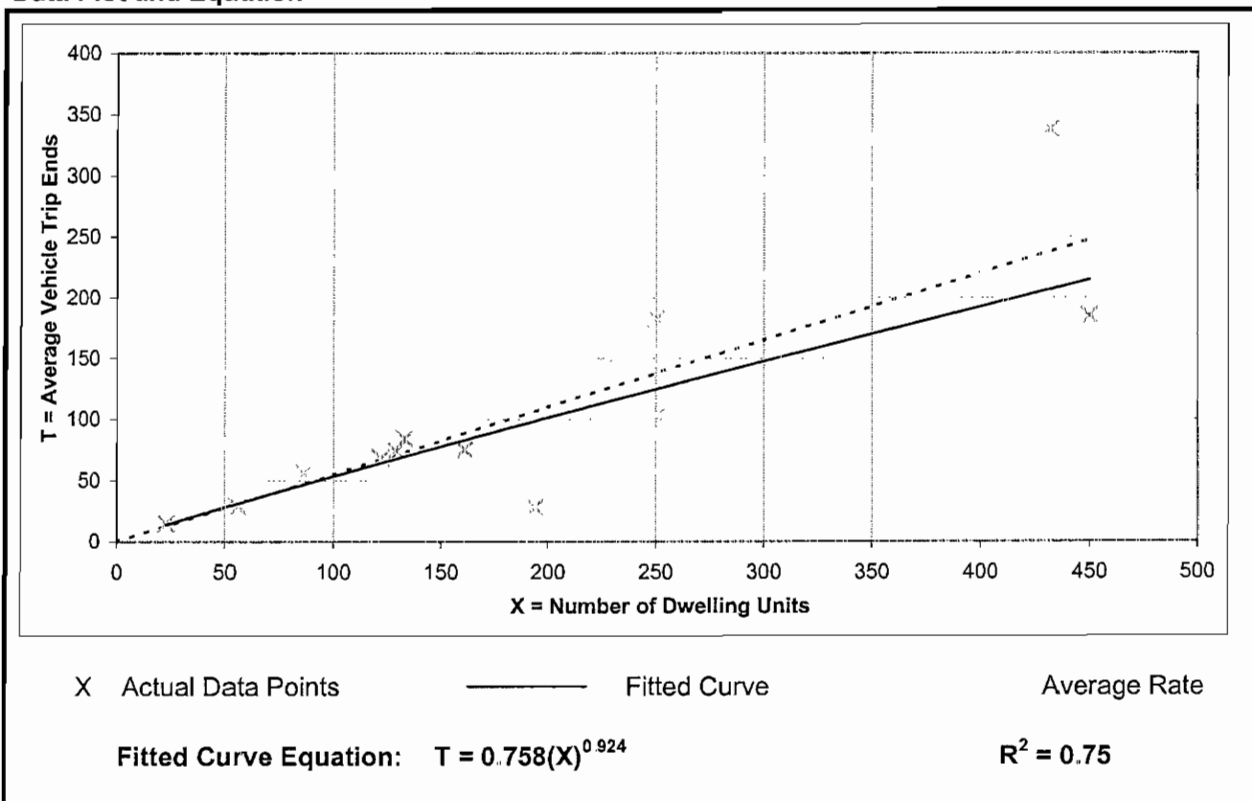
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

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

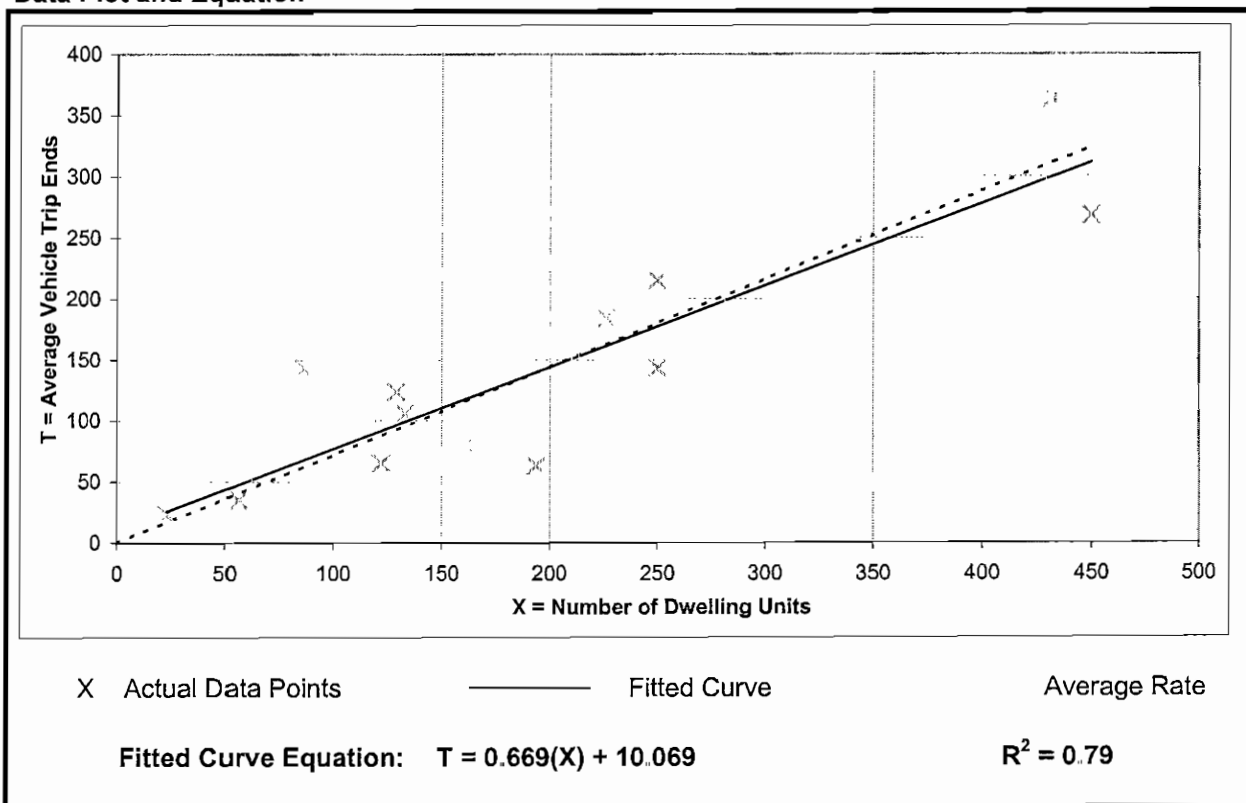
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

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 LENNOX RIDGE SUBDIVISION

103 Multi-Family Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Townhouses	103 Townhouses	980	22%	78%		55%	45%	
				12	43	55	43	36	79
Total New Volume Site Trips			980	12	43	55	43	36	79

Data from Local Trip Rates and calculated by using Fitted Curve Equations

TRIP GENERATION FOR LENNOX RIDGE SUBDIVISION

103 Townhouses

$$103 \text{ Units} = X$$

Weekday:

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

$$T = 15 * 64.50$$

$$T = \underline{\underline{980 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 72$$

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

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 103 + 10.07$$

$$T = \underline{\underline{79 \text{ trips}}}$$

APPENDIX G

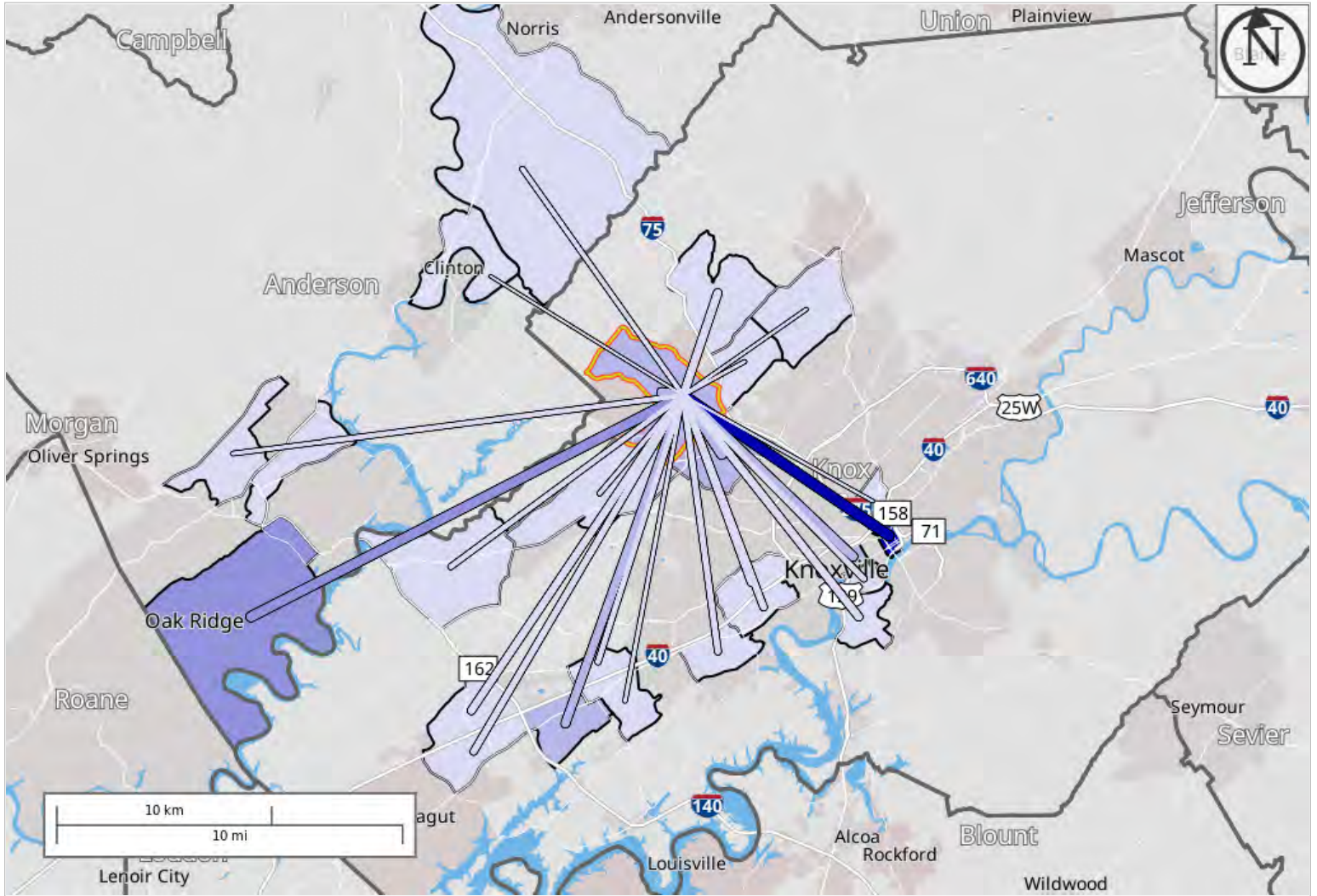
2021 CENSUS BUREAU DATA

Work Destination Report - Home Selection Area to Work Census Tracts All Jobs for All Workers in 2021

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 01/05/2024

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



Map Legend

Job Count

- 186 - 212
- 159 - 185
- 132 - 158
- 105 - 131
- 78 - 104
- 51 - 77
- 24 - 50

Selection Areas

- ▭ Home Area

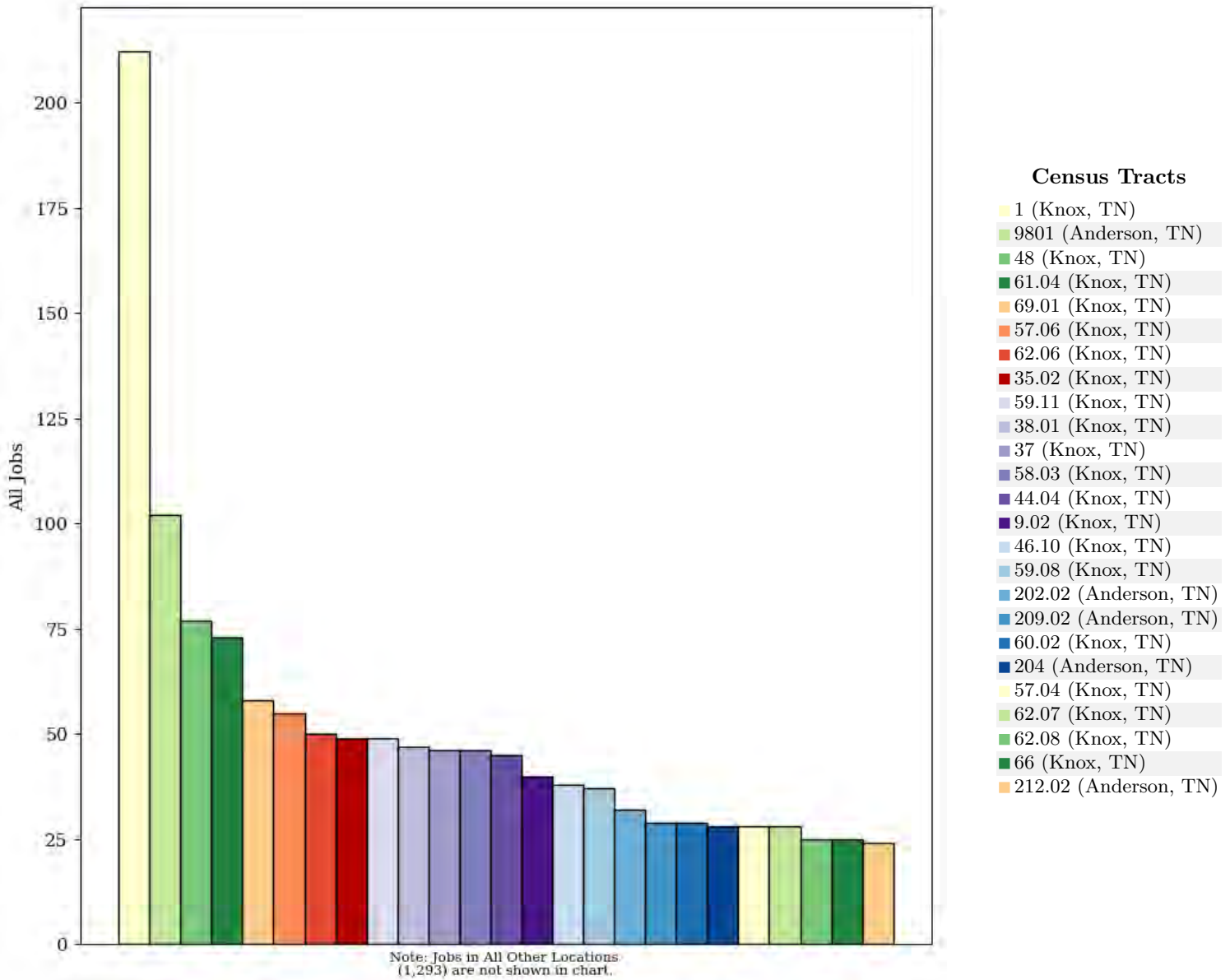
Job Count

- ▭ 186 - 212
- ▭ 159 - 185
- ▭ 132 - 158
- ▭ 105 - 131
- ▭ 78 - 104
- ▭ 51 - 77
- ▭ 24 - 50



All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2021

All Workers

Census Tracts as Work Destination Area	2021	
	Count	Share
All Census Tracts	2,565	100.0%
1 (Knox, TN)	212	8.3%
9801 (Anderson, TN)	102	4.0%
48 (Knox, TN)	77	3.0%
61.04 (Knox, TN)	73	2.8%
69.01 (Knox, TN)	58	2.3%
57.06 (Knox, TN)	55	2.1%
62.06 (Knox, TN)	50	1.9%
35.02 (Knox, TN)	49	1.9%
59.11 (Knox, TN)	49	1.9%
38.01 (Knox, TN)	47	1.8%

Census Tracts as Work Destination Area	2021	
	Count	Share
37 (Knox, TN)	46	1.8\%
58.03 (Knox, TN)	46	1.8\%
44.04 (Knox, TN)	45	1.8\%
9.02 (Knox, TN)	40	1.6\%
46.10 (Knox, TN)	38	1.5\%
59.08 (Knox, TN)	37	1.4\%
202.02 (Anderson, TN)	32	1.2\%
209.02 (Anderson, TN)	29	1.1\%
60.02 (Knox, TN)	29	1.1\%
204 (Anderson, TN)	28	1.1\%
57.04 (Knox, TN)	28	1.1\%
62.07 (Knox, TN)	28	1.1\%
62.08 (Knox, TN)	25	1.0\%
66 (Knox, TN)	25	1.0\%
212.02 (Anderson, TN)	24	0.9\%
All Other Locations	1,293	50.4\%

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2021
Job Type	All Jobs
Selection Area	61.04 (Knox, TN) from Census Tracts
Selected Census Blocks	75
Analysis Generation Date	01/05/2024 13:46 - OnTheMap 6.23.4
Code Revision	b83319a02a70b14bc14ccfe9d9a4e81022acdb73
LODES Data Vintage	20231016_1512

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2021).

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 7th TWSC
 4: Heiskell Road & Proposed Entrance

03/22/2024

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	9	34	10	133	192	2
Future Vol, veh/h	9	34	10	133	192	2
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, %	-10	-	-	-6	6	-
Peak Hour Factor	90	90	90	83	84	90
Heavy Vehicles, %	0	0	0	2	1	0
Mvmt Flow	10	38	11	160	229	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	412	230	231	0	0
Stage 1	230	-	-	-	-
Stage 2	182	-	-	-	-
Critical Hdwy	4.4	5.2	4.1	-	-
Critical Hdwy Stg 1	3.4	-	-	-	-
Critical Hdwy Stg 2	3.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	754	868	1349	-	-
Stage 1	924	-	-	-	-
Stage 2	945	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	748	868	1349	-	-
Mov Cap-2 Maneuver	748	-	-	-	-
Stage 1	916	-	-	-	-
Stage 2	945	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	9.55	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	117	-	840	-	-
HCM Lane V/C Ratio	0.008	-	0.057	-	-
HCM Control Delay (s/veh)	7.7	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

HCM 7th TWSC
 4: Heiskell Road & Proposed Entrance

03/22/2024

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	29	34	244	218	9
Future Vol, veh/h	7	29	34	244	218	9
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, %	-10	-	-	-6	6	-
Peak Hour Factor	90	90	90	79	92	90
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	8	32	38	309	237	10

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	626	242	247	0	0
Stage 1	242	-	-	-	-
Stage 2	384	-	-	-	-
Critical Hdwy	4.4	5.2	4.1	-	-
Critical Hdwy Stg 1	3.4	-	-	-	-
Critical Hdwy Stg 2	3.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	639	858	1331	-	-
Stage 1	918	-	-	-	-
Stage 2	857	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	617	858	1331	-	-
Mov Cap-2 Maneuver	617	-	-	-	-
Stage 1	887	-	-	-	-
Stage 2	857	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s/v	9.75	0.85	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	196	-	797	-	-
HCM Lane V/C Ratio	0.028	-	0.05	-	-
HCM Control Delay (s/veh)	7.8	0	9.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

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)

133

192+2 =
194

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	200	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	85	65	60	50
300 - 349	110	90	60	55	55	45
350 - 399	100	80	55	50	50	40
400 - 449	90	70	50	45	45	35
450 - 499	80	65	45	40	40	30
500 - 549	70	60	35	35	35	25
550 - 599	65	55	35	30	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

Heiskell Road at the Proposed Entrance
2028 Projected AM NB Left Turns = 10
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

192

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
2 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
400 - 449 450 - 499		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

Heiskell Road at the Proposed Entrance

2028 Projected AM SB Right Turns = 2

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	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	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	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	70	55	50	40
400 - 449	90	70	70	50	45	35
450 - 499	80	65	65	45	40	30
500 - 549	70	60	60	35	35	25
550 - 599	65	55	55	35	30	25
600 - 649	60	45	45	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

218+9 =
227

244

Heiskell Road at the
Proposed Entrance

2028 Projected PM
NB Left Turns = 34

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

218

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
9 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
400 - 449 450 - 499		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

Heiskell Road at the Proposed Entrance
2028 Projected PM SB Right Turns = 9
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	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	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	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.

APPENDIX J

SIMTRAFFIC VEHICLE QUEUE WORKSHEETS

Intersection: 4: Heiskell Road & Proposed Entrance

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	47	35
Average Queue (ft)	24	2
95th Queue (ft)	48	16
Link Distance (ft)	217	248
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

Intersection: 4: Heiskell Road & Proposed Entrance

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	50	47
Average Queue (ft)	22	9
95th Queue (ft)	47	34
Link Distance (ft)	217	248
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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