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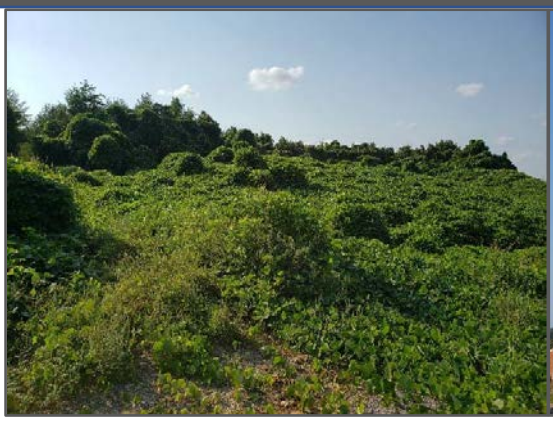
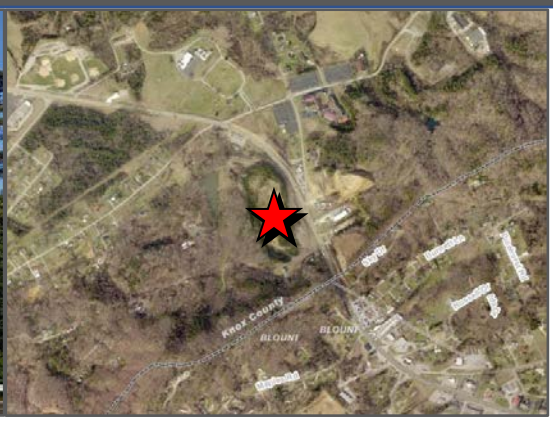
Transportation Impact Study

Terri's Place Townhouses

Knox County, Tennessee





Revised October 2021

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EXECUTIVE SUMMARY

Preface:

Land Art USA is proposing a residential development on the west side of Chapman Highway near the southern limits of Knox County, TN. This proposed residential development is named "Terri's Place" and will consist of 118 multi-family attached townhouses on 12.37 acres. This development is anticipated to be fully built out and occupied by 2025 and proposes one entrance on the west side of Chapman Highway. 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 intersection and is a Level 1 study established by Knoxville/Knox County Planning. Recommendations and mitigation measures are offered if transportation operations have been projected to be below recognized engineering standards.

Study Results:

The findings of this study include the following:

- The Terri's Place Townhouses development with 118 multi-family attached townhouses is calculated to generate 1,107 trips at full build-out and occupancy on an average weekday. Of these trips, 62 will occur during the AM peak hour and 89 in the PM peak hour in 2025.
- This development will have one entrance on Chapman Highway, at a 4-lane undivided road section with a center two-way left-turn lane. The entrance will be on the west side of Chapman Highway, 483 feet to the south of Sevierville Pike. The Proposed Entrance on Chapman Highway was analyzed regarding intersection capacity and is calculated to operate with average vehicle delays in the projected 2025 peak hour conditions. The only exception is exiting left turns in the PM peak hour, which will operate with higher-than-average vehicle delays.

Recommendations:

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

- The results indicate that the northbound left-turn storage provided in the recently constructed center two-way left-turn lane (TWLTL) on Chapman Highway will be adequate based on an available storage length of 102-feet. Due to the minimal projected northbound left-turns at the Proposed Entrance, it is not specifically recommended that the newly applied TWLTL pavement markings be modified on Chapman Highway.
- It is recommended that an exclusive right-turn lane on Chapman Highway be provided for southbound traffic entering the proposed development. With a posted speed limit of 50-mph on Chapman Highway, it is recommended that the southbound right-turn lane be a minimum of 11-feet in width, have a 100-foot bay taper plus a minimum deceleration length of 350 feet (total distance of 450'). The right-turn lane should include the appropriate right-turn arrow pavement markings.
- It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the Proposed Entrance approach pavement at Chapman Highway. The stop bar should be applied at a minimum of four feet away from the pavement edge of Chapman Highway and placed at the desired stopping point that maximizes sight distance.
- Intersection sight distance at the Proposed Entrance must not be impacted by existing or future landscaping or signage. Based on a posted speed limit of 50-mph on Chapman Highway and based on TDOT's guidelines, the required intersection sight distance at the Proposed Entrance is 625 feet looking to the north and south. However, based on Knox County's standards, the intersection sight distance requirement is 500 feet. Due to the physical layout of Chapman Highway and the vertical curve to the south, meeting TDOT's requirement of 625 feet is not feasible without shifting the entrance so far north that it would encroach upon the intersection operations of Sevierville Pike at Chapman Highway. Based on these facts, it is recommended that the Proposed Entrance location remain as shown in the site plan with an available sight distance of 570 feet looking to the south.
- The construction of the Proposed Entrance on Chapman Highway will require a TDOT Highway Entrance Permit. The site designer will need to apply for this

permit and coordinate with TDOT as to their specific requirements for this entrance.

- A 15-mph Speed Limit Sign (R2-1) is recommended to be installed near the beginning of Road "A" within the development off Chapman Highway.
- Stop Signs (R1-1) and 24" white stop bars should be installed on the new internal roadways and locations, as shown in the report.
- Sight distance at the new internal intersections in the development must not be impacted by new signage, future landscaping, parked vehicles, or other structures. With a proposed internal speed limit of 15-mph, the internal intersection sight distance requirement is 170 feet, and the stopping sight distance required is 80 feet for a level road grade. The site designer should ensure that internal sight distance lengths are provided and account for other designed road grades.
- All drainage grates and covers for the residential development need to be pedestrian and bicycle safe.
- Traffic calming measures may be needed to decrease internal vehicle speeds. The north-south internal roadways have long and straight segments. It is recommended that the site designer consider installing speed humps or speed tables within the development to reduce internal speeds.
- All internal and external road and intersection elements should be designed to AASHTO, Tennessee Department of Transportation (TDOT), and Knox County specifications and guidelines to ensure proper operations.

DESCRIPTION OF EXISTING CONDITIONS

- **STUDY AREA:**

The proposed location of this new development is shown on a map in Figure 1. The proposed development will be located on the west side of Chapman Highway between Sevierville Pike and the Knox County southern limit with Blount County. The residential development will comprise a single entrance with two internal roads for 118 multi-family attached townhouses on 12.37 acres. Transportation impacts associated with the proposed development were analyzed at the Proposed Entrance on Chapman Highway, where the most significant impact is expected and as requested by Knoxville/Knox County Planning.

View of Proposed Development Site
(Looking West from East Side of Chapman Highway)

The proposed development property is in a rural area, slowly transforming to a suburban setting due to increased residential development. The most significant development pressure in this area of Knox County is suspected to be primarily from Seymour, an unincorporated community located just to the southeast in Blount and Sevier County. This development will be located 450 feet to the north of the southern limit of Knox County. There are single-family residential subdivisions, stand-alone single-family houses, unused/woodland properties, commercial businesses, a church, and a cemetery in the vicinity of this proposed residential development. The proposed site property is currently undeveloped, but earth grading has disturbed it previously. It is currently covered almost entirely with kudzu vegetation.

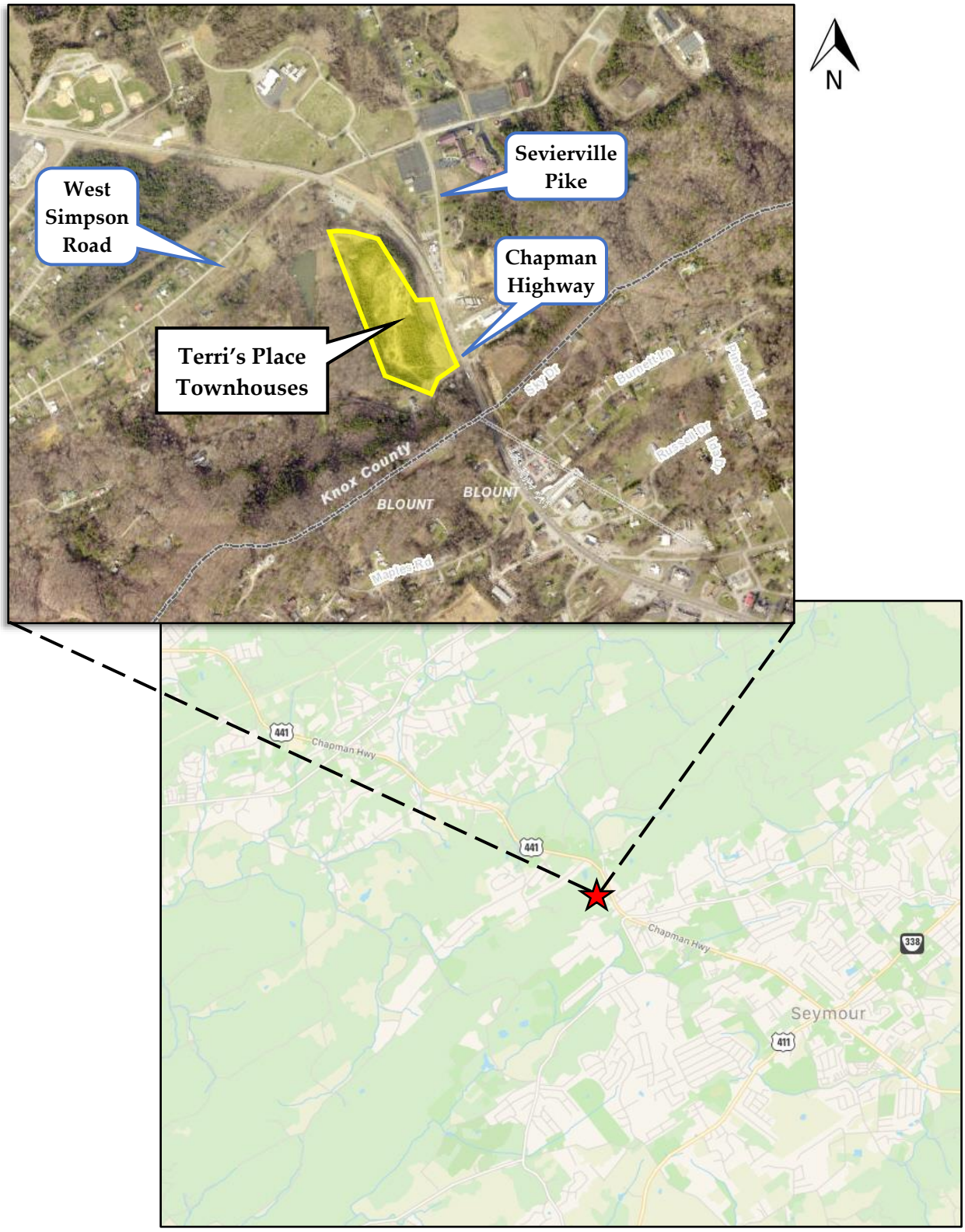


Figure 1
Location Map

- **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 [1]	SPEED LIMIT	LANES	ROAD WIDTH [2]	TRANSIT [3]	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Chapman Highway (US 441 / SR 71)	Major Arterial	50 mph	4 with TWLTL	62 feet	None	No sidewalks	No bike lanes

[1] 2018 Major Road Plan by Knoxville/Knox County Planning
[2] Edge of curb to edge of curb or edge of pavements near project site
[3] According to Knoxville Area Transit System Map
TWLTL = Two-Way Left Turn Lane

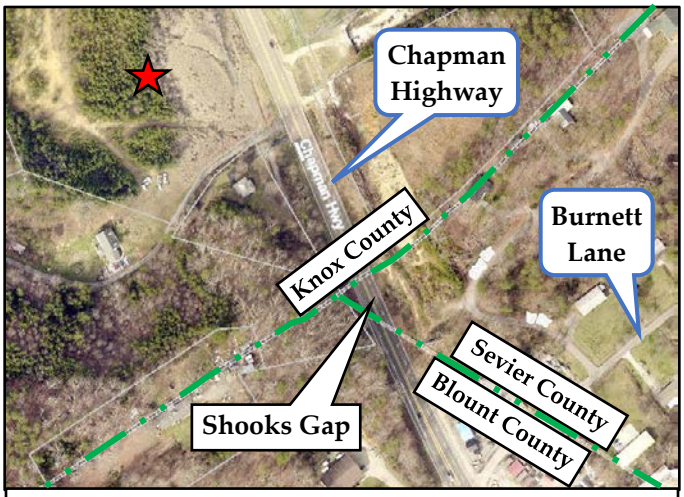
Chapman Highway is classified as a 4-lane major arterial and adjacent to the development site has a recently constructed center two-way left-turn lane (TWLTL). The highway traverses in a generally northwest-southeast direction and is a very heavily traveled route. Chapman Highway is designated as US 411 and State Route 71 and is maintained by the Tennessee Department of Transportation (TDOT).

View of Chapman Highway near Project Site (Looking North)

US 411 has a total length of 309.7 miles in between Leeds, Alabama, and Newport, Tennessee. Chapman Highway comprises a portion of US 411 and has a total length of nearly 22 miles. Chapman Highway begins at the intersection of Henley Street and Blount Avenue near downtown Knoxville and ends near the western outskirts of Sevierville, TN. According to Wikipedia, Chapman Highway is named after David C. Chapman, an American soldier, politician, and business leader from Knoxville who led the effort to establish the Great Smoky Mountains National Park.

TDOT has recently undertaken a multi-section improvement and remediation of Chapman Highway in Knox, Blount, and Sevier Counties. This remediation was part of an effort to address many safety and operational aspects of the highway. One of the Chapman Highway sections included Evans Road to Burnett Road (0.9 miles) and included widening the undivided four-lane

roadway to include a center TWLTL. This project appears to be nearly complete and, according to TDOT, is projected to be fully complete in Fall 2021. The four travel lanes have been re-constructed with a width of 11-feet each and a TWLTL of 12 feet. The shoulders have been paved with a width of 3 feet, and a level graded gravel shoulder is provided outside the edge of pavement. As part of the widening of Chapman Highway in the area, several intersecting roads have been re-aligned to improve safety and access. These re-aligned roads include East and West Simpson Road and Sevierville Pike.



Shooks Gap

The TDOT project provides a TWLTL on the north side of Shooks Gap that matches an existing TWLTL provided on Chapman Highway on the south side of Shooks Gap. Shooks Gap is a narrow section of Chapman Highway cut out of a ridge just south of the proposed development site. Shooks Gap on Chapman Highway is located near the corner of Knox, Sevier, and Blount Counties. A TWLTL is not provided through Shooks Gap due to the topography and lack of development through the gap.

The re-constructed section of Chapman Highway near the development site is currently signed with an advisory speed limit of 40-mph. This limit is notified with changeable message signs located on the north and south of Chapman Highway and also states, "New Traffic Pattern". Once construction is completed, this section of Chapman Highway will revert to 50 mph. Utility streetlights are not present on Chapman Highway near the development site. Near the proposed site, there are a couple of single-family houses to the south and west and a couple of commercial businesses on the east side of Chapman Highway. These businesses include a septic sewer service and a sign and crane company.

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

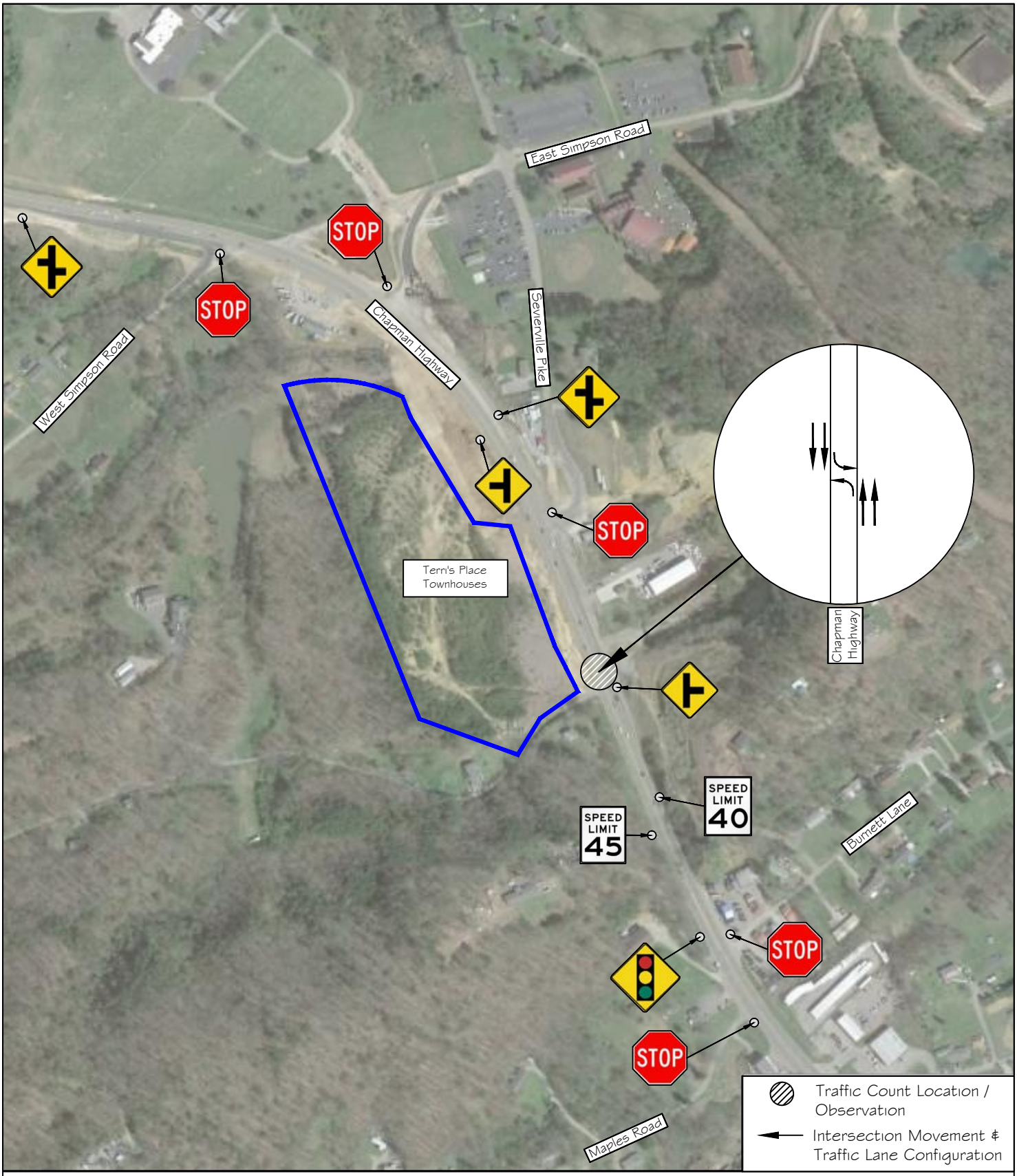


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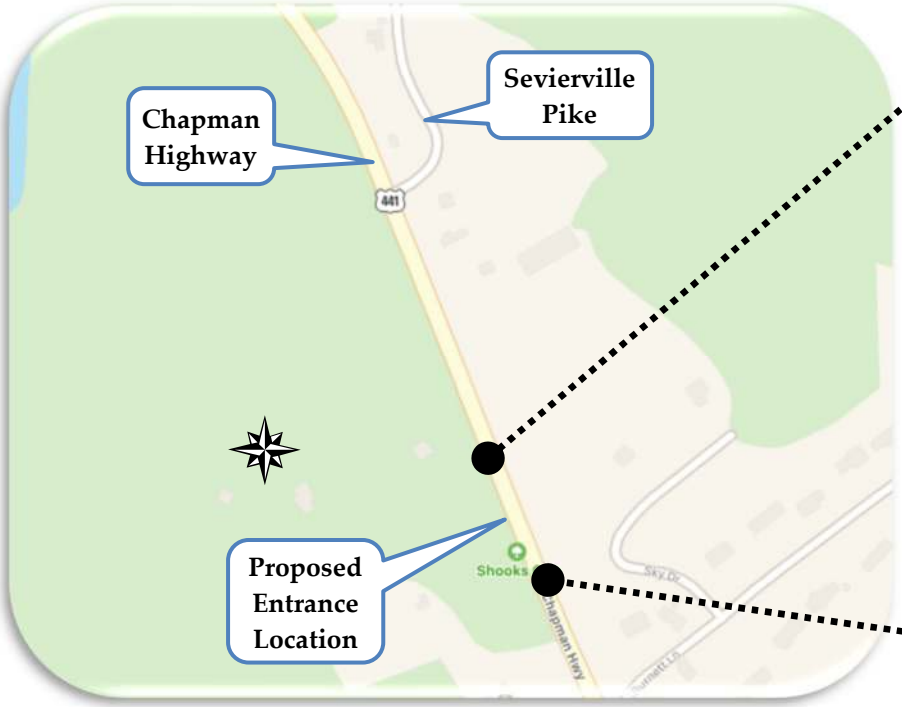
FIGURE 2

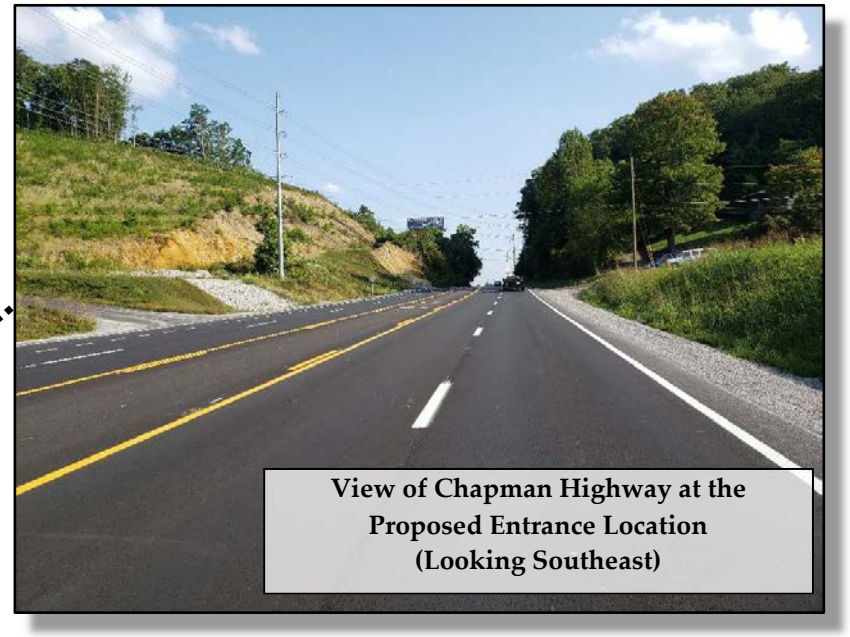
Terri's Place Townhouses

Traffic Count Location, Traffic Signage & Existing Lane Configurations

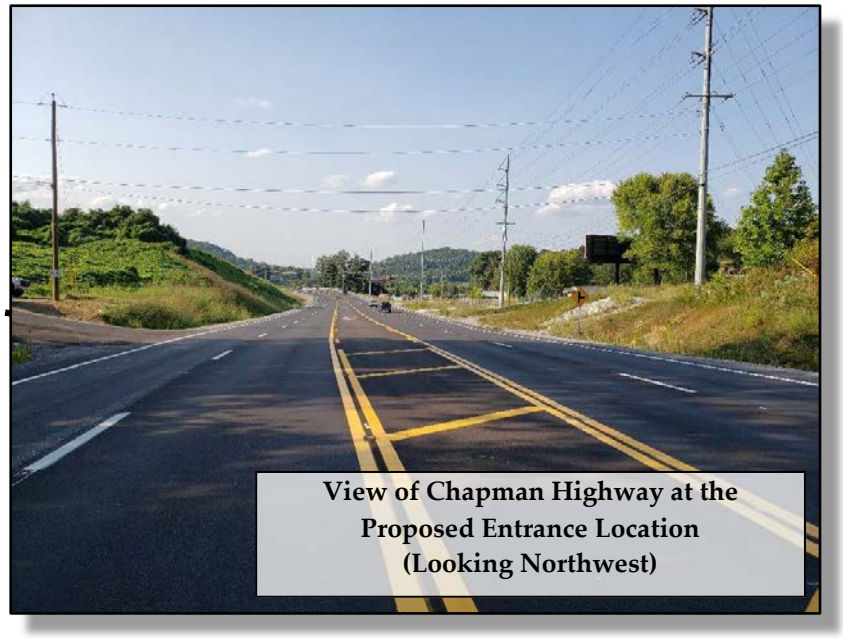
PHOTO EXHIBITS



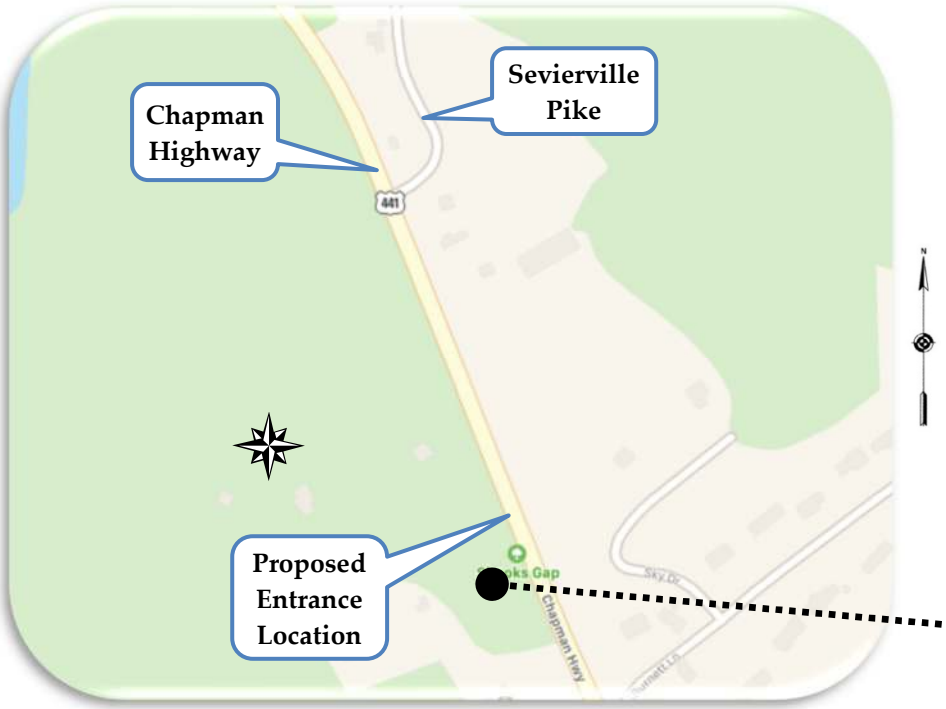
Chapman Highway at the Proposed Entrance Location



View of Chapman Highway at the Proposed Entrance Location (Looking Southeast)



View of Chapman Highway at the Proposed Entrance Location (Looking Northwest)



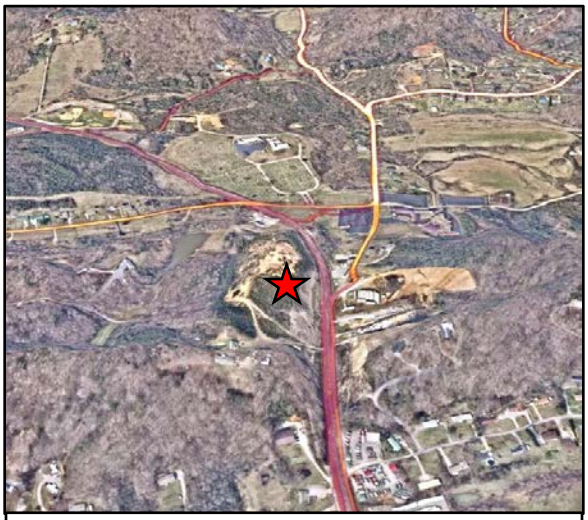
Chapman Highway at Proposed Entrance

- **EXISTING TRANSPORTATION VOLUMES PER MODE**:

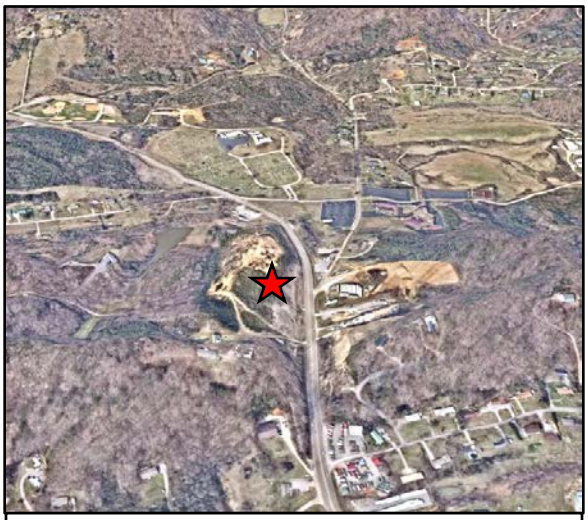
One annual vehicular traffic count location exists near the development site, and this count location is conducted by TDOT every year. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  - TDOT reported an Average Daily Traffic (ADT) on Chapman Highway southeast of Burnett Lane (in Sevier County) and the development site at 25,199 vehicles per day in 2020. From 2016 – 2020, this count station has indicated a 2.3% average annual growth rate.

- Existing bicycle and pedestrian volumes:
  The average daily pedestrian and bicycle traffic along Chapman Highway is unknown but is estimated to be minimal to non-existent due to the lack of facilities and high vehicle speeds and volumes. An online website, strava.com, provides "heat" maps detailing exercise routes taken by pedestrians, joggers, and bicyclists. This data is gathered from individuals allowing their smart devices to track and compile their routes (over 700 million activities). Based on the heat maps, some bicycle traffic occurs on Chapman Highway, but there are no recordings of exercise-related pedestrians or joggers using Chapman Highway. The activities in the maps are shown on the roads with color intensities.



Strava Heat Map for Bicyclists



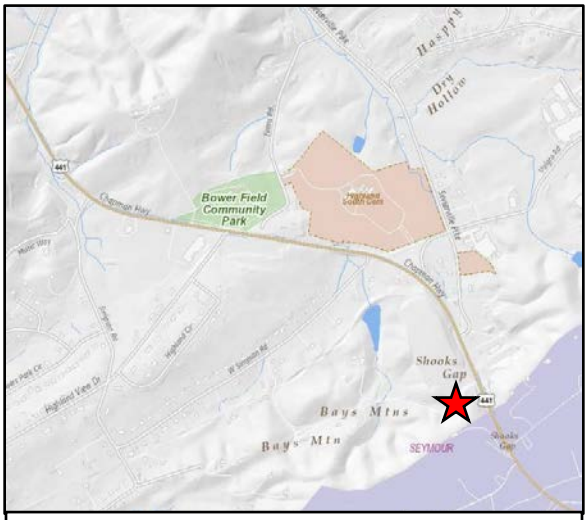
Strava Heat Map for Pedestrian and Joggers

- **ON-STREET PARKING:**

On-street parking was not observed during the site review and is not allowed on Chapman Highway adjacent to the project site.

- **PEDESTRIAN AND BICYCLE FACILITIES:**

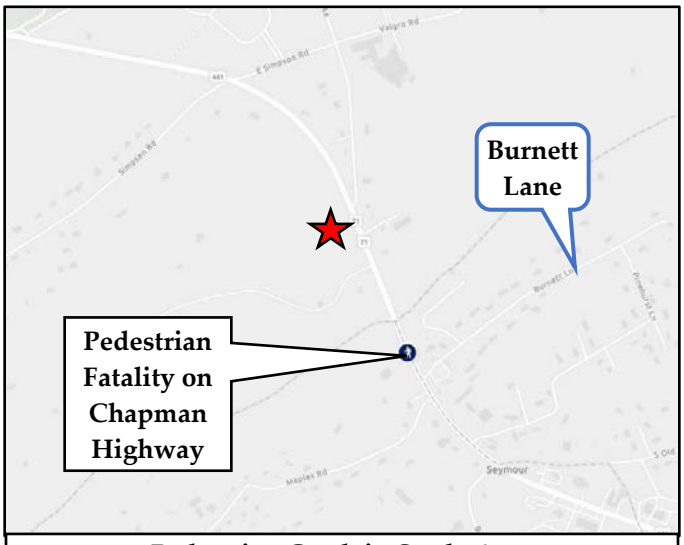
Bicycle lanes are not currently available within the project site study area, and they will also not be provided by the TDOT reconstruction of Chapman Highway. The closest park is Bower Field Community Park, but it does not specifically include facilities for bicyclists or pedestrians. This park is located 0.7 miles to the north of the development site via Chapman Highway and has several ball fields and a playground.



Map of Park Facilities in the Area

Mapping of Bicycle Level of Service (BLOS) - TDOT

Even though bicycle facilities are not provided on Chapman Highway, TDOT has published mapping illustrating the Bicycle Level of Service (BLOS) for state routes. BLOS is a nationally used measure of bicyclist comfort based on a roadway's geometry and traffic conditions. BLOS A designates the route as most suitable for bicyclists and BLOS F as the least suitable. The BLOS for Chapman Highway in the study area is shown with a grade of F. This designation is not expected to change substantially after the highway remediation project is completed.

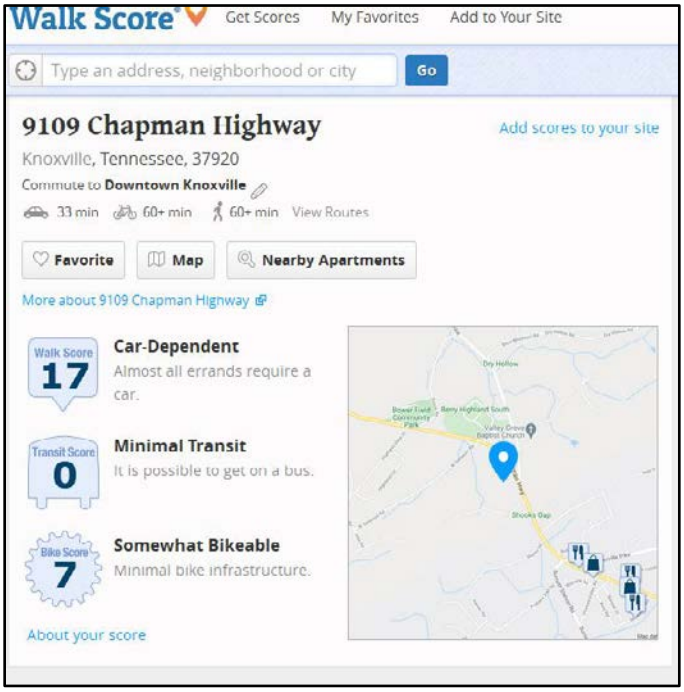


Pedestrian Crash in Study Area

The Knoxville TPO (Transportation Planning Organization) provided a 2020 update to bicycle and pedestrian crash data for Knox County, Blount County, and other surrounding counties. According to the data, only one of these incidents occurred near the study area in the past couple of years. Unfortunately, this incident included a pedestrian fatality. This incident occurred on Chapman Highway, south of the proposed development site and north of Burnett Lane, on May 20th, 2019. It occurred at 11:42 pm and was a hit-and-run in which the pedestrian was struck crossing Chapman Highway at a mid-block location. An online search of news reporting was unsuccessful in determining if the hit-and-run perpetrator was ever determined.

- **WALK SCORE**:

A private company offers an online website at walkscore.com that grades and gives scores to locations within the United States based on "walkability", "bikeability", and transit availability. 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 0 to 100.



Appendix B shows maps and other information for the Walk Score, Bike Score, and Transit Score at the property side address (9109 Chapman Highway). The project site location is graded with a Walk Score of 17. This low score can be attributed to the lack of sidewalks even though some

amenities are located near the south on Chapman Highway. This Walk Score indicates that almost all errands and travel require a vehicle from this site location. The site is graded with a Bike Score of 7, which means there is minimal bike infrastructure. The site is given a Transit Score of 0.

- **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available in the site development area. The overall KAT bus system map is in Appendix C. The closest public transit bus service is 3.1 miles away to the north (by roadway) at the Lowe's Home Improvement shopping center near the intersection of Chapman Highway at Governor John Sevier Highway. This route is designated as Route 41, "Chapman Highway". This bus stop is the southernmost stop on the route. It operates on weekdays and weekends, and this route map is also included in Appendix C. Other transit services include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee, which provides transportation services when requested.

Bus Stop at Lowe's Home Improvement Center – Route 41

PROJECT DESCRIPTION

- **LOCATION AND SITE PLAN:**

The proposed site plan layout designed by Romans Engineering is shown in Figure 3. The figure shows two new private streets constructed for the 118 multi-family attached townhouses. The total length of the new streets in the development will be 2,161 feet (0.41 miles).

The residential development will have one access point on Chapman Highway, and the Proposed Entrance will intersect Chapman Highway 483 feet to the south of Sevierville Pike. The Proposed Entrance is shown in Figure 3 with one entering lane and two exiting lanes.

The 12.37-acre residential development will incorporate a large common area on the north side of the site that will contain a stormwater detention pond. A total of 49 automobile parking spaces for the development are shown in the design, along with a centralized mail center/kiosk for the residents. The townhouse lots will average around 2,750 to 3,000 square feet, with some up to 7,500 square feet (0.17 acres). Each townhouse will have a garage and driveway and will have either 2 or 3 bedrooms. The layout of the townhouses will include clusters of 4, 6, and 8 units. Sidewalks are not proposed for this development.

View of Site Property from across Chapman Highway (Looking Northwest)

The schedule for completion of this new residential development is dependent on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. Currently, the real estate market in the Knoxville area is 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 (2025).

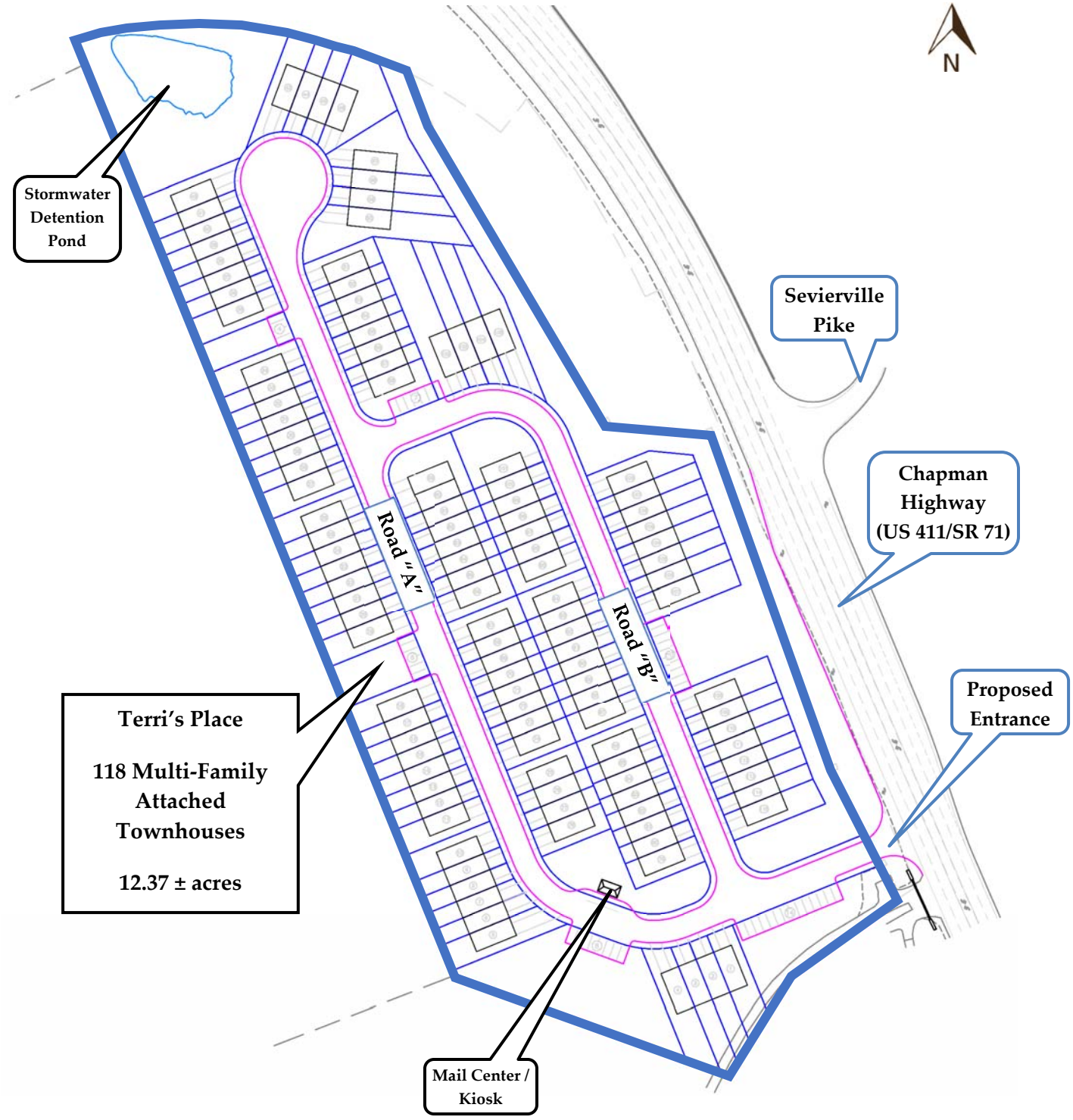


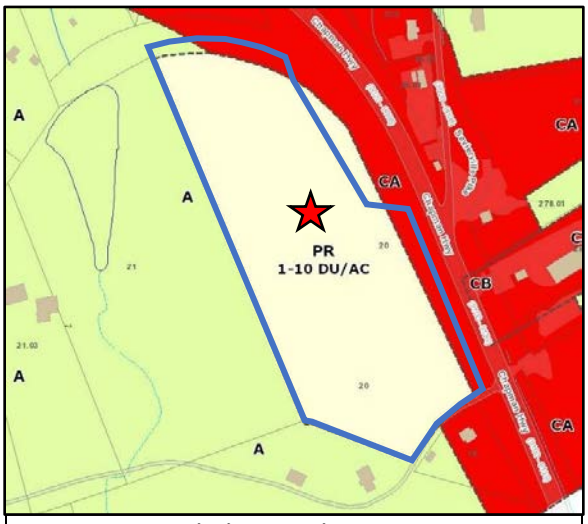
Figure 3
Proposed Plan Layout
Terri's Place Townhouses

Not to Scale

- **PROPOSED USES AND ZONING REQUIREMENTS:**

The development property is just inside the southern Knox County limits and has a zoning designation of Planned Residential (PR) with a density of 1 – 10 density units per acre. This property was rezoned to Planned Residential (PR) in 2002. The most recent published KGIS zoning map is provided in Appendix D. The Planned Residential (PR) zone allows for various land uses primarily within the residential realm. Uses permitted in this zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. The existing adjacent surrounding zoning and land uses are the following:

- The properties to the west of the development site are zoned as Agricultural (A). These properties consist of a few single-family houses, undeveloped forested land, and a large pond to the northwest.
- Except for one, all the properties are zoned as General Business (CA) to the east and along Chapman Highway. This exception is zoned Business and Manufacturing Zone (CB) and Commercial Sign and Crane, LLC operates on this property. Another property across Chapman Highway zoned General Business (CA) includes Seymour Septic Services at the corner of Chapman Highway at Sevierville Pike. The other properties along Chapman Highway are used for truck trailer storage, auto storage, soil excavation, and non-descript purposes.
- A parcel is zoned General Business (CA) to the north and consists of a neighborhood U-Haul dealer. One property is zoned Agricultural (A) to the south and southwest, consists of single-family house structures, and is almost entirely forested.



Existing Zoning Map

Existing Land Use Map

- **DEVELOPMENT DENSITY:**

Terri's Place Townhouses' proposed density is based on a maximum of 118 townhouses on 12.37 acres. The density computes to 9.54 units per acre which is less than the allowable zoning of 10 units per acre.

- **ON-SITE CIRCULATION:**

The total length of the internal roads will be 2,161 feet (0.41 miles) and designed and constructed to Knox County, TN specifications. The new internal roads shown in Figure 3 are labeled as Road "A" and "B", with Road "A" consisting of the Proposed Entrance. The internal roads will be asphalt paved and include concrete curbs. The lane widths will be 13 feet each for a total 26-foot pavement roadway. Concrete sidewalks are not proposed for this development. The internal roads will be private and will be maintained by the development.

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

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

The new internal roads will be designed and constructed to Knox County specifications and adequate for fire protection and rescue vehicles. The development's internal roads will accommodate the larger vehicle types and residents' standard passenger vehicles.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

▪ EXISTING TRAFFIC CONDITIONS:

For this study, traffic counts were conducted on Chapman Highway adjacent to the proposed development site as requested by Knoxville/Knox County Planning.

Manual traffic counts were obtained on Tuesday, September 14th, 2021, for a total of eight hours. The counts were conducted to tabulate the morning and afternoon peak periods and the direction of travel during the peak periods. Local public county schools were in session when the traffic counts were conducted. Based on the traffic volumes collected, the AM and PM peak hours were observed at 7:00 – 8:00 am and 5:00 – 6:00 pm on Chapman Highway. Overall, the traffic distribution on Chapman Highway during the peak hours was the following:

- AM Peak Hour: 67% Northbound and 33% Southbound
- PM Peak Hour: 40% Northbound and 60% Southbound

The manual tabulated traffic counts can be reviewed in Appendix E, and some observations are listed below.

- Many school buses were observed during the traffic counts on Chapman Highway. Since this traffic count was conducted near the southern limit of Knox County, it is assumed that the observed school buses were due to travel to and from a bus owner/operator(s) located and operating inside and outside Knox, Blount, and Sevier Counties.
- During the traffic count, construction workers associated with the reconstruction of Chapman Highway were observed. This activity included blocking off the outside, southbound lane with traffic cones from 9:00 am to 2:00 pm. Blocking the lane allowed a compact backhoe with a blade to perform some grading of the gravel shoulder. This lane closure is not suspected of

Image of Lane Closure during Traffic Count

having impacted the traffic count results. This construction activity occurred during off-peak hours, and no traffic backups were observed.

- A higher-than-normal amount of motorcycle activity was observed during the traffic count on Chapman Highway. These motorcyclists were single riders and not associated with groups.
- No bicyclists or pedestrians were observed during the traffic counts.
- A fair number of vehicles turning south (left) from Sevierville Pike onto Chapman Highway were observed using the new TWLTL to find gaps in the oncoming traffic. The TWLTL was also used to provide an opportunity to accelerate up to the operating speeds of the southbound traffic on Chapman Highway.

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FIGURE 4

Terri's Place Townhouses

2021 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

- **TRIP GENERATION:**

For the Terri's Place Townhouses development, the estimated amount of traffic that the 118 multi-family attached townhouses will generate was calculated based on Knoxville/Knox County Planning equations. These equations were developed from local studies to estimate apartment (and townhouse) trip generation in the surrounding area and were published in December 1999. This local rate calculates higher trip rates than the similar Institute of Transportation Engineers (ITE) equations provided in the Trip Generation Manual. For Knox County, this is the preferred rate to use for apartments and townhouses. The data and calculations from the local 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 TERRI'S PLACE TOWNHOUSES
118 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	118	1,107	22%	78%		55%	45%	
				14	48	62	49	40	89
Total New Volume Site Trips			**1,107**	**14**	**48**	**62**	**49**	**40**	**89**

Local Trip Rates
Trips calculated by using Fitted Curve Equation

For the proposed residential development, with 118 multi-family attached townhouses, it is estimated that 14 vehicles will enter and 48 will exit, for a total of 62 generated trips during the AM peak hour in the year 2025. Similarly, it is estimated that 49 vehicles will enter, and 40 will exit, for a total of 89 generated trips during the PM peak hour in the year 2025. The calculated trips generated for an average weekday are 1,107 vehicles for the proposed development. No trip reductions were included in the analysis.

- **PROJECTED HORIZON YEAR TRAFFIC CONDITIONS (WITHOUT THE PROJECT):**

Horizon year traffic conditions represent the projected traffic volumes in the study area without the proposed project being developed (no-build option). As previously stated, the build-out and full occupancy for this proposed development is assumed will occur by 2025. This horizon year corresponds to four years for this development to reach full capacity and occupancy.

Vehicular traffic on Chapman Highway in the study area has shown moderate annual growth over the past five years (2.3%), according to the annual TDOT traffic count station and as shown in Appendix A. A slightly higher annual growth rate of 2.5% was used to calculate future growth on Chapman Highway up to 2025 to account for potential traffic growth in the study area and provide a conservative analysis.

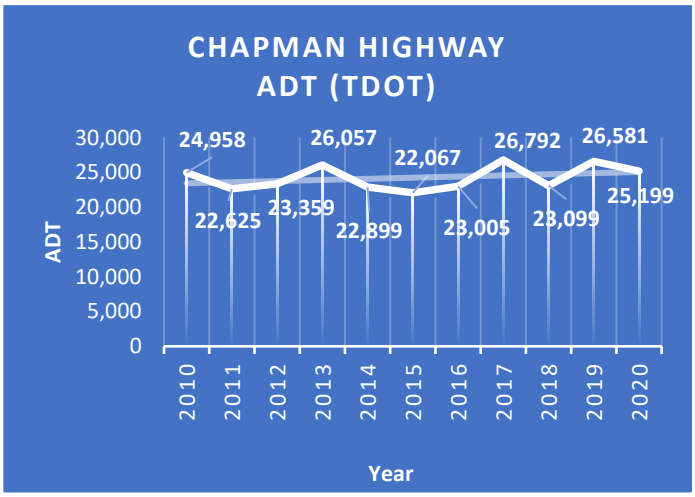

Figure 5 shows the projected horizon year traffic volumes on Chapman Highway in 2025 during the AM and PM peak hours without the project.

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NOT TO SCALE

NORTH

FIGURE 5

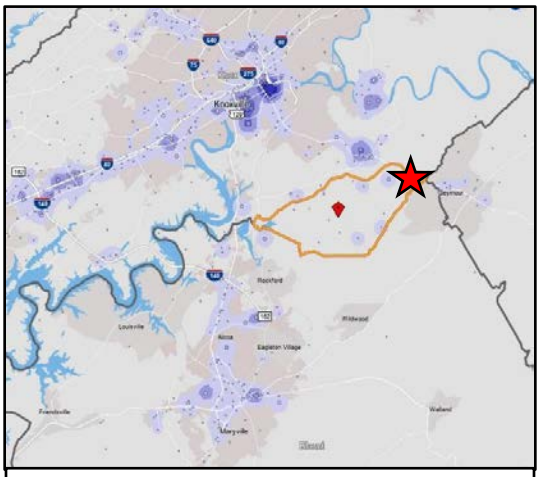
Terri's Place Townhouses

2025 Peak Hour Traffic Volumes - PROJECTED HORIZON YEAR TRAFFIC (WITHOUT THE PROJECT)

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

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

The percentages assumed and shown in Figure 6 are based on several sources and factors. The first source is based on the traffic count results collected on Chapman Highway adjacent to the proposed site and the existing observed direction of travel.



2018 Census Bureau Work-Based Trips to/from Census Tract 56.02

The second source for projected trip distribution is based on work-related trips in the area. Work-based trips will be a significant driver of generated trips by the development, and these trips are more likely to travel to and from the north and northwest. This assertion is based on data from the United States Bureau website for Census Tract 56.02, where the development property is located. Based on 2018 (latest available) census data and shown in Appendix G, most work-based trips in the area correspond to downtown Knoxville, West Knoxville, and businesses around the intersection of Chapman Highway at Governor John Sevier Highway. Some trips are shown to and from Alcoa, Maryville, and Sevier County.

In addition to employment centers and commercial developments, some generated traffic will travel to and from various public and private elementary, middle, and high schools. This site development property is currently zoned for New Hopewell Elementary School, South-Doyle Middle School, and South-Doyle High School. All these schools are located north of the proposed development and will require travel on Chapman Highway.

Overall, the study assumed a 65% / 35% trip distribution on Chapman Highway. Figure 7 shows the traffic assignment of the computed trips generated by the development (Table 2) and applied to the intersection movements based on the assumed distribution of trips shown in Figure 6.

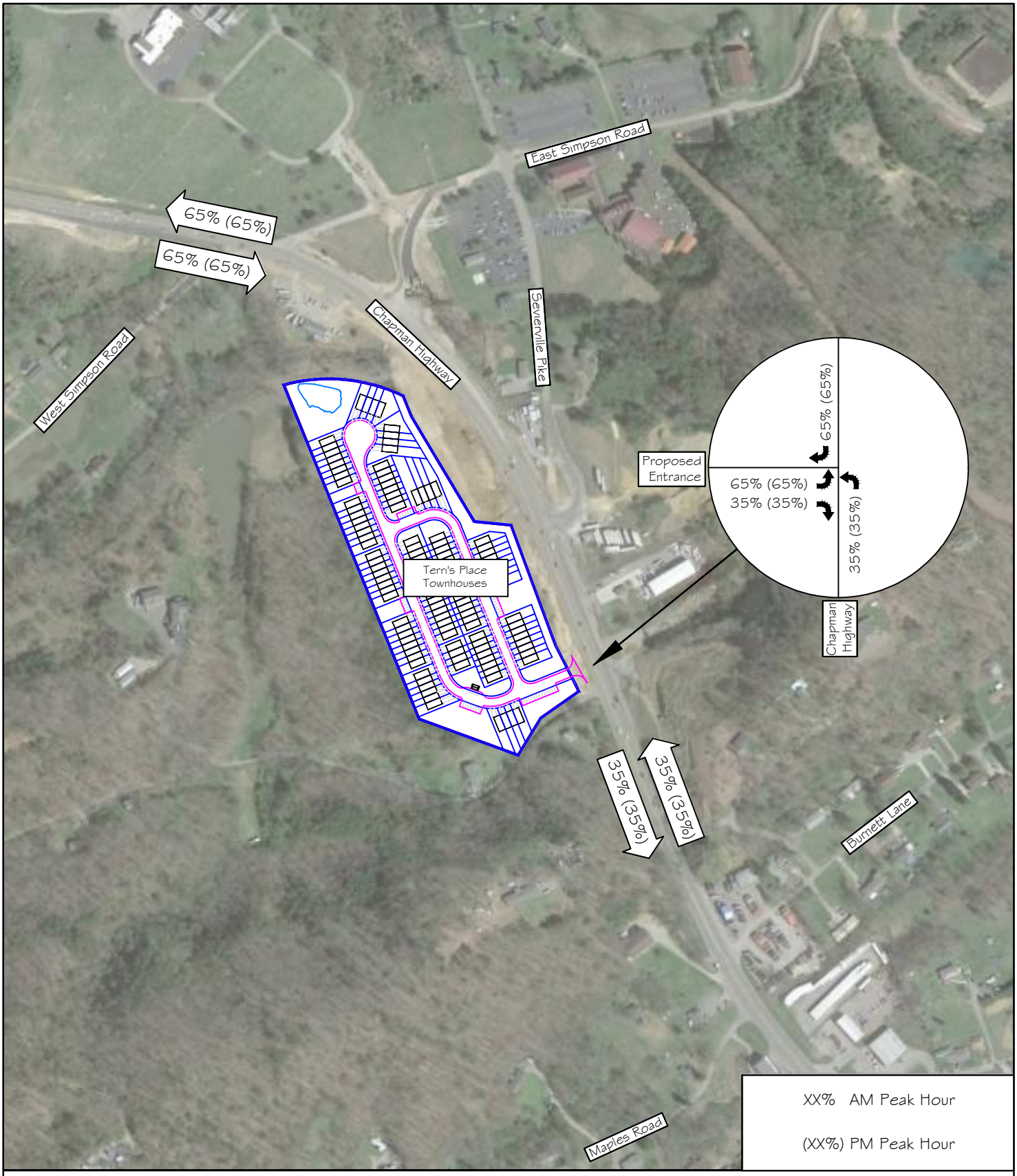


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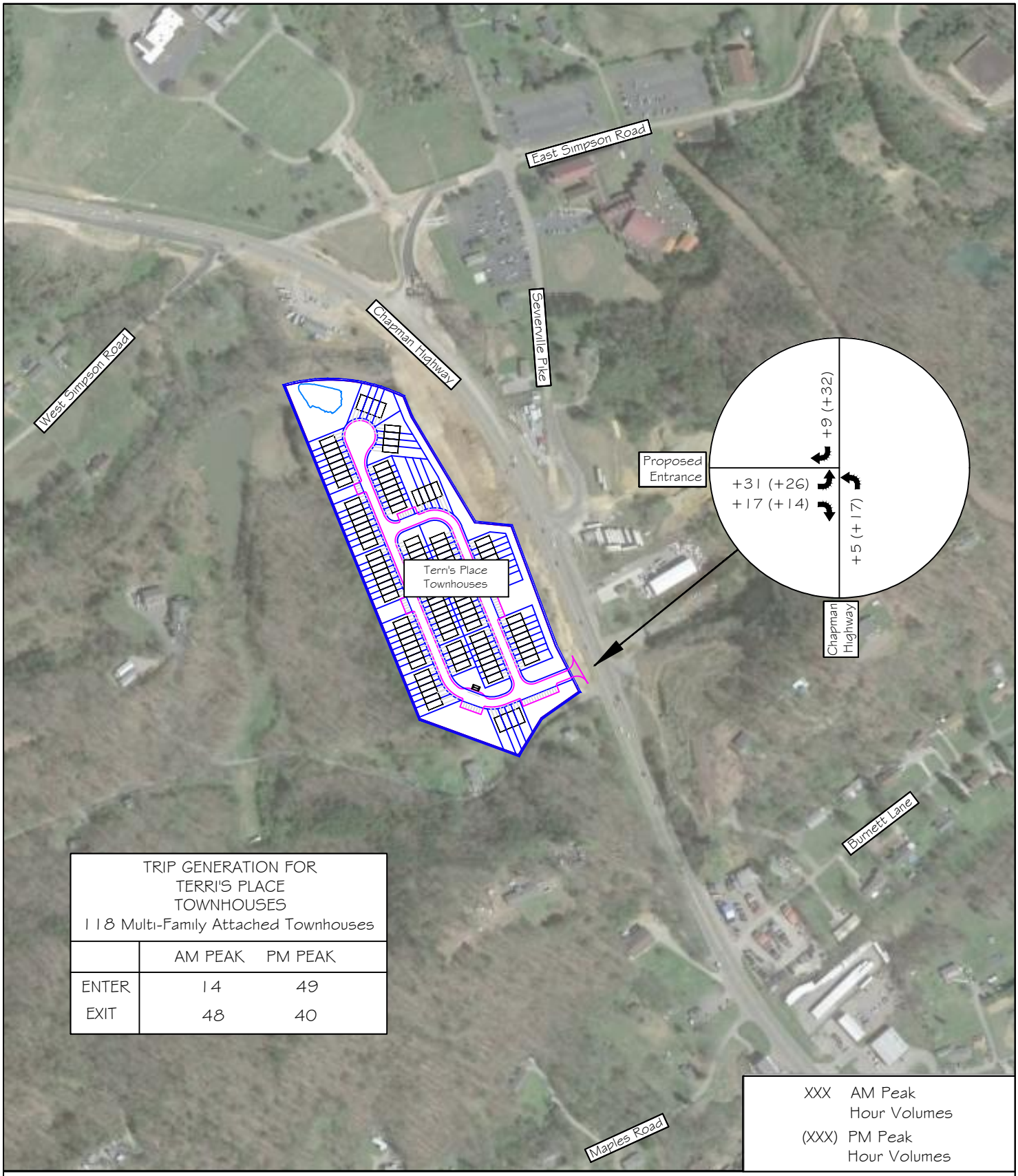
FIGURE 6

Terri's Place Townhouses

Directional Distribution of Generated Traffic during AM and PM Peak Hour



TRIP GENERATION FOR TERRI'S PLACE TOWNHOUSES 118 Multi-Family Attached Townhouses		
	AM PEAK	PM PEAK
ENTER	14	49
EXIT	48	40

XXX AM Peak Hour Volumes

(XXX) PM Peak Hour Volumes

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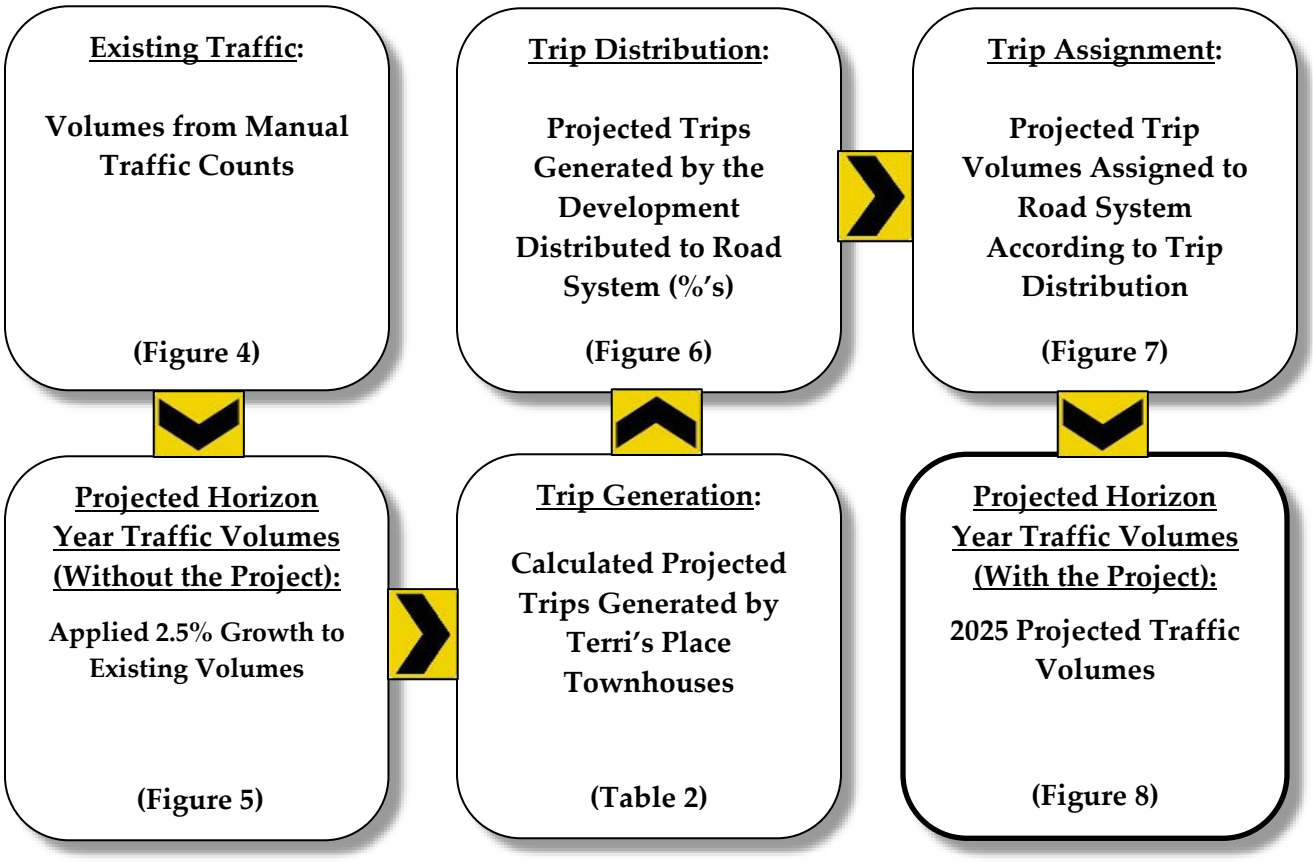
FIGURE 7

Terri's Place Townhouses

Traffic Assignment of Generated Traffic during AM and PM Peak Hour

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

Overall, several additive steps were taken to estimate the total horizon year projected traffic volumes at the intersection of Chapman Highway at the Proposed Entrance when the Terri's Place Townhouses development is entirely constructed and occupied by 2025. The steps are illustrated below for clarity:



The calculated peak hour traffic (Table 2) generated by the Terri's Place Townhouses development was added to the 2025 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 when the proposed development is fully built out and occupied in 2025. Figure 8 shows the projected 2025 AM and PM peak hour volumes with the generated development traffic on Chapman Highway at the Proposed Entrance intersection.

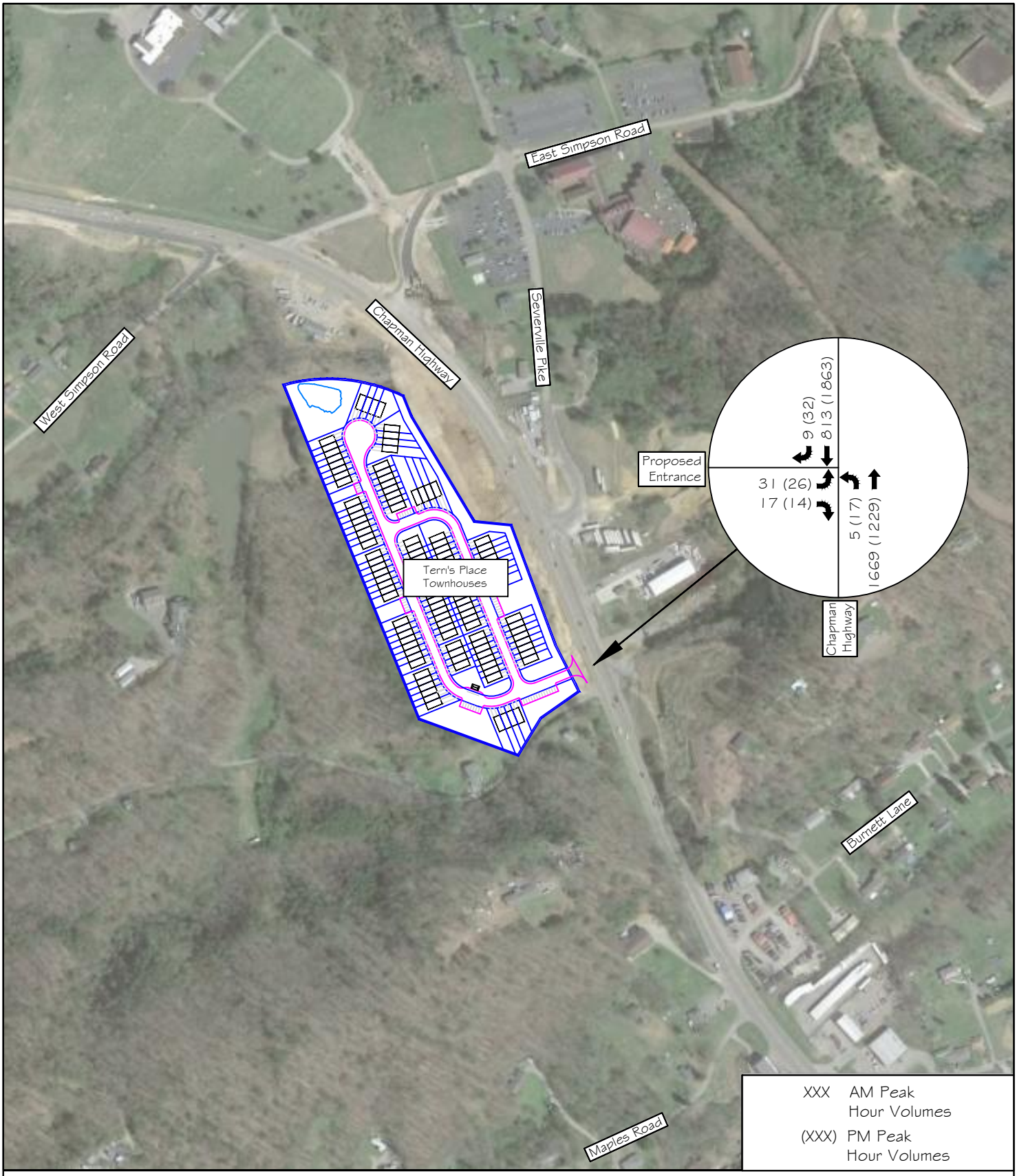


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FIGURE 8

Terri's Place Townhouses

2025 Peak Hour Traffic Volumes - PROJECTED HORIZON YEAR TRAFFIC (WITH THE PROJECT)

Capacity analyses were undertaken to determine the Level of Service (LOS) at the Proposed Entrance at Chapman Highway intersection for the projected 2025 traffic volumes shown in Figure 8. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 8).

Methodology:

LOS is a qualitative measurement developed by the transportation engineering profession to express how well a transportation facility (intersection, roadway, etc.) performs based on a user's perception. LOS designations include LOS A through LOS F. The designation of LOS A signifies a transportation facility operating at best, while LOS F signifies operations at its worst. This grading system provides a reliable, straightforward means to communicate transportation operation measurements to the public. The HCM lists the level of service criteria for unsignalized and signalized intersections, roadway segments, and pedestrian and bicycle facilities.

For unsignalized and signalized intersections, LOS is defined by delay per vehicle in seconds. For example, a delay of 20 seconds at an unsignalized intersection would indicate LOS C. This delay represents the additional delay a motorist would experience traveling through the intersection. Intersections and individual approaches are also characterized by the volume-to-capacity ratio (v/c). For example, a v/c ratio of 0.75 for an approach at an unsignalized intersection would indicate that it operates at 75% of its available capacity. LOS designations, which are ranked based on vehicle delay, are reported differently for unsignalized and signalized intersections. This difference is primarily due to motorists having different expectations between the two intersection types. 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.

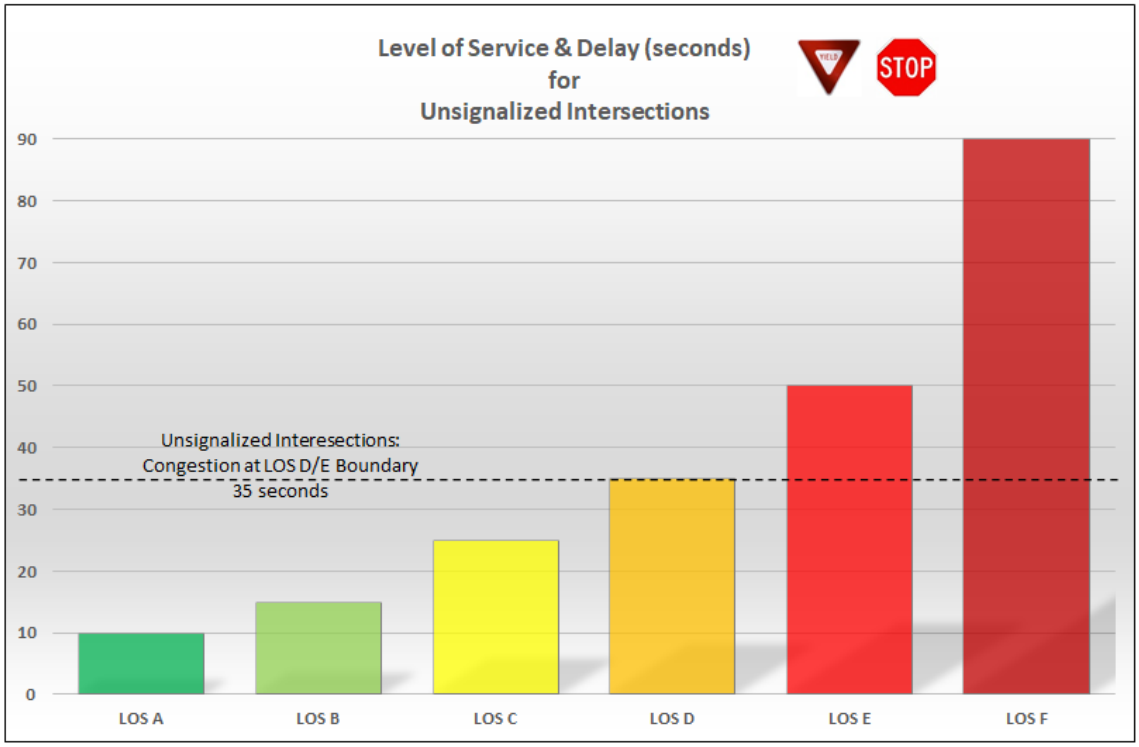
For unsignalized intersections, LOS is measured in terms of delay in seconds. This measure attempts to quantify vehicle delay that includes travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the

mainline thru and right turn traffic does not stop and is not affected by the vehicles 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 2025 projected peak hours of 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 peak hour capacity analyses.

The intersection of Chapman Highway at the Proposed Entrance is calculated to operate with good to average LOS and vehicle delays in the 2025 projected AM and PM peak hours for northbound left-turns and eastbound right-turns. The eastbound exiting left-turn movement is projected to operate at LOS E in the 2025 PM peak hour with an average delay of 40.8 seconds.

TABLE 4
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED HORIZON YEAR (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]
Chapman Highway at Proposed Entrance	STOP Unsignalized	Northbound Left	A	9.7	0.007	C	17.8	0.063
		Eastbound Left	C	21.0	0.133	E	40.8	0.224
		Eastbound Right	B	11.2	0.031	C	18.2	0.054

Note: Analysis of 2-way Stops calculated in Synchro 8 software and reported with HCM 2010 methodology
[a] Level of Service
[b] Average Delay (sec/vehicle)
[c] Volume-to-Capacity Ratio

- **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

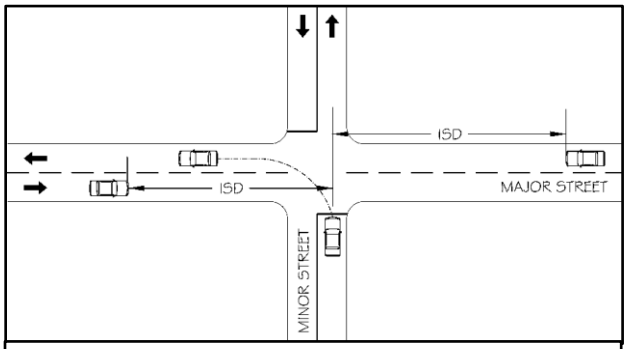
The study area was investigated for potential existing and future safety issues when the development is completed. A couple of features of the adjacent transportation system are discussed in the following pages.

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 to perceive, react, and the vehicle to come to a complete stop before colliding with an object in 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.



Intersection Sight Distance Diagram

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. ISD is considered the desirable visibility distance standard for evaluating the safety of an intersection. In general, SSD is more critical than ISD; however, the ISD must be at least the same distance or greater than SSD for safe operations at an intersection.

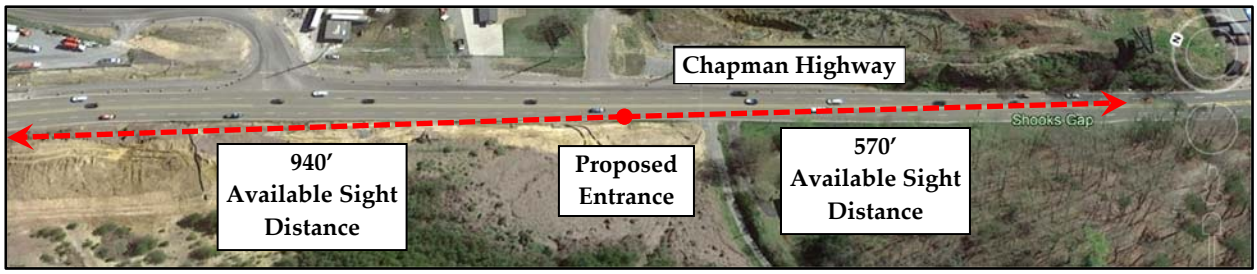
The development is proposing one entrance on Chapman Highway. Based on a posted speed limit of 50-mph on Chapman Highway, the ISD would be 625 feet looking from the Proposed Entrance in each direction, north and south. This distance is based on the guidelines outlined in A Policy on Geometric Design of Highway and Streets by AASHTO (American Association of State Highway and Transportation Officials) and also shown in TDOT's Roadway Design Guidelines. However, Knox County has a different distance requirement for ISD, which requires 10 feet of sight distance per 1-mph of speed. For a posted speed limit of 50-mph on Chapman Highway, the ISD would be 500 feet from the Proposed Entrance under Knox County guidelines.

Based on a posted speed limit of 50-mph on Chapman Highway, the SSD is calculated to be the following:

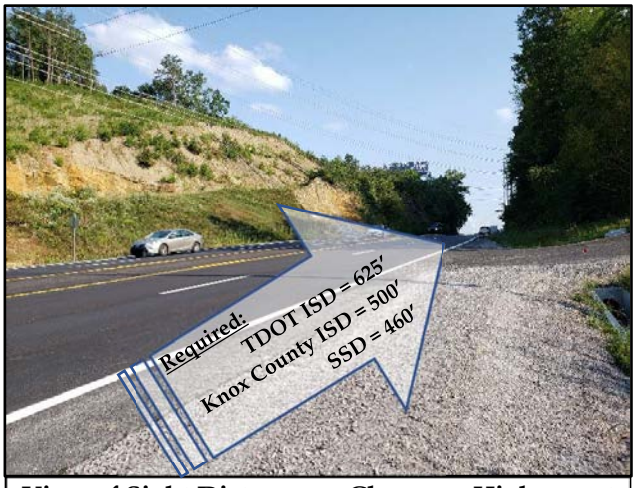
- At the Proposed Entrance, with Chapman Highway having a 4.4% road grade (downhill towards north): 460 feet looking south and 400 feet looking north

Romans Engineering land-surveyed the available sight distance from the Proposed Entrance location on Chapman Highway as shown on the site plan. The sight distance was officially measured to be 940 feet to the north and 570 feet to the south. Based on these measurements, both the Knox County ISD requirement of 500 feet and the TDOT required ISD of 625 feet are available to the north. The Knox County ISD requirement of 500 feet would be met looking to the south; however, the available sight distance to the south would not meet TDOT's ISD requirement of 625 feet. The vertical crest curve of Chapman Highway to the south reduces the available sight distance.

Images of the existing sight distances are shown below and labeled with the required TDOT and Knox County ISD and SSD at the Proposed Entrance. They also include the land-surveyed distances measured by Romans Engineering.



View of Sight Distance on Chapman Highway at the Proposed Entrance Location (Looking North)



View of Sight Distance on Chapman Highway at the Proposed Entrance Location (Looking South)

EVALUATION OF TURN LANE THRESHOLDS

An evaluation of the need for separate turn lanes for entering vehicles into the development in the projected 2025 conditions was conducted for the Proposed Entrance at Chapman Highway. In this case, with an already provided center TWLTL, the evaluation only examined the need for a separate southbound right-turn lane on Chapman Highway.

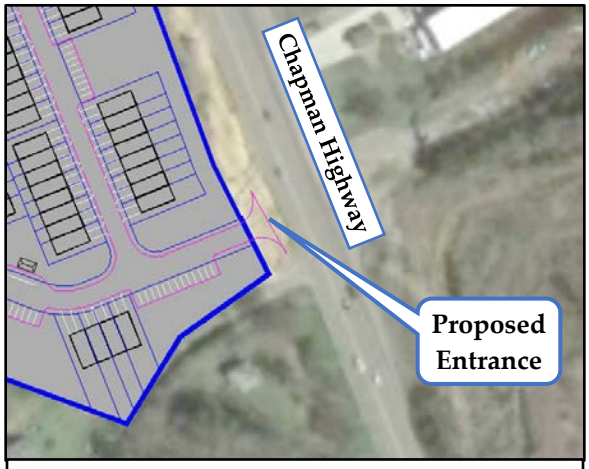
The criteria used for this turn lane evaluation is based on "Knox County's Access Control and Driveway Design Policy". This design policy relates vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways. This Knox County policy follows TDOT and nationally accepted guidelines for unsignalized intersections.

With a posted speed limit of 50-mph on Chapman Highway, a separate southbound right-turn is warranted at the Proposed Entrance intersection based on the projected 2025 PM peak hour traffic volumes. The worksheets for these evaluations are provided in Appendix I.

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the impacts of the proposed Terri's Place Townhouses development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.

1 **Chapman Highway at the Proposed Entrance**: This intersection was calculated to operate adequately in the projected 2025 conditions with respect to vehicle delays. However, motorists attempting to turn left from the Proposed Entrance towards the north on Chapman Highway during the PM peak hour will experience relatively high vehicle delays due to the large volumes on Chapman Highway. The 2025 projected intersection capacity of this proposed intersection was modeled with separate exiting eastbound left and right-turn lanes and with existing left-turn storage provided in the TWLTL on Chapman Highway. The results shown in Table 4 were also based on providing an exclusive southbound right-turn lane which is warranted based on the projected volumes and speeds on Chapman Highway.



Chapman Highway at the Proposed Entrance

Due to the limited northbound left-turn storage length newly provided in the center TWLTL on Chapman Highway, it is critical to ensure that enough storage length will be available. An additional software program was used to determine the projected northbound left-turn vehicle queues at the intersection to ensure storage length adequacy. 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. However, both programs estimate 95th percentile vehicle queue lengths.

The 95th percentile vehicle queue length 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.

For this proposed intersection, the projected vehicle queue results for the eastbound exiting lanes were calculated from the Synchro software. The northbound left-turn queue lengths were calculated from the SimTraffic software. Both software packages were used since SimTraffic cannot accurately model intersections with center TWLTL's and their effects on vehicle gap acceptance. SimTraffic will only model vehicles to wait for gaps in both directions of traffic before turning (i.e., the vehicles are not allowed to cross halfway into the center TWLTL and wait for another gap to enter the opposite lane traffic stream). Due to this limitation, the Synchro 95th percentile vehicle queue results are recommended to determine the eastbound exiting left-turn queue lengths since it accounts for two-stage left-turns when the median is sufficient to store a vehicle temporarily. The results from the Synchro software for the eastbound entering lanes are included in the worksheets included in the capacity analyses and shown in Appendix H.

The calculated vehicle queue results for the northbound left-turn vehicle queues were based on averaging the outcome obtained during ten traffic simulations in the SimTraffic software. The vehicle queue results from the SimTraffic software for the northbound left-turn lane (TWLTL) are in Appendix J. The 95th percentile vehicle queue lengths at the intersection for the projected 2025 conditions are shown in Table 5.

TABLE 5
TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -
2025 AM AND PM PEAK HOUR TRAFFIC VOLUMES

INTERSECTION	APPROACH/ MOVEMENT	STORAGE PROVIDED	95th PERCENTILE QUEUE LENGTH		ADEQUATE LENGTH?
			AM PEAK HOUR	PM PEAK HOUR	
Chapman Highway at Proposed Entrance	Eastbound Left *	n/a	12.5'	20'	n/a
	Eastbound Right *	75'	2.5'	5'	YES
	Northbound Left (TWLTL) **	102'	18'	41'	YES

* 95th percentile queues were calculated in Synchro 8 software
** 95th percentile queues were calculated in SimTraffic 8 software

The available storage for northbound left-turns in the center TWLTL of Chapman Highway is 102 feet. This storage length was determined by obtaining the TDOT design files that detailed the center transverse pavement markings and inserting the Proposed Entrance location into the TDOT design file. The transverse markings signify where the center lane decreases in width and ends the TWLTL as it approaches Shooks Gap to the south. The calculated results indicate that the existing provided in the TWLTL vehicle storage is adequate.

To further ensure the capability of the provided northbound vehicle storage length in the center TWLTL, a worst-case analysis was completed that assumed 65% of the entering PM peak hour traffic would occur from the south instead of the north, as shown in Figure 6. The PM peak hour was examined since it is the most critical with the larger conflicting southbound traffic volumes on Chapman Highway. The results indicated that the existing storage length would also be adequate if 65% of entering traffic in the PM peak hour came from the south (northbound). The 95th percentile for this scenario was calculated to be 56 feet for the northbound left-turns in the TWLTL. The results of this worst-case scenario are also provided in Appendix J.

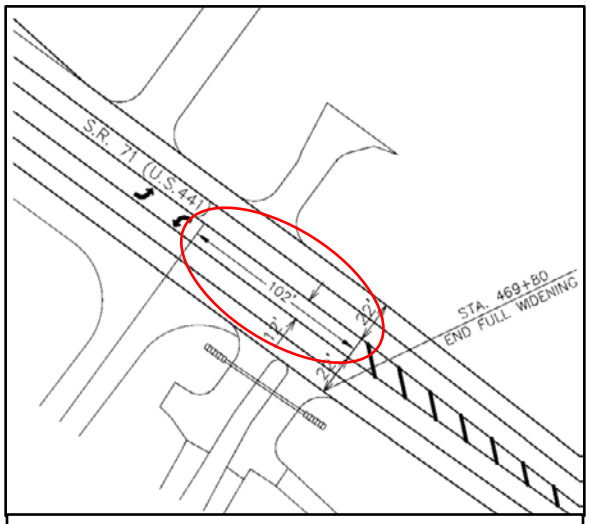
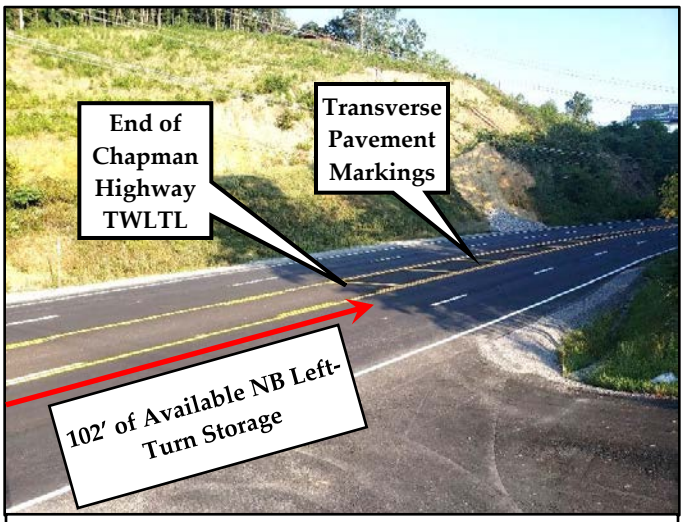


Image of TDOT Design File with Proposed Entrance Location

1a) The results indicate that the northbound left-turn storage provided in the recently constructed center TWLTL on Chapman Highway will be adequate in length based on an available storage length of 102-feet. Due to the minimal projected northbound left-turns at the Proposed Entrance, it is not specifically recommended that the newly applied TWLTL pavement markings be modified on Chapman Highway.



View of TWLTL on Chapman Highway near the Proposed Entrance (Looking Southeast)

1b) It is recommended that an exclusive right-turn lane on Chapman Highway be provided for southbound traffic entering the proposed development. As discussed previously, this turn-lane is warranted based on the projected volumes and the associated vehicle speeds. With a posted speed limit of 50-mph on Chapman Highway, it is recommended

that the southbound right-turn lane be a minimum of 11-feet in width, have a 100-foot bay taper plus a minimum deceleration length of 350 feet (total distance of 450'). These recommended distances are based on values presented in Table 9-22 of the 2011 Green Book by AASHTO that assumes that the speed differential between turning vehicles and following thru vehicles is 10-mph when the turning vehicle clears the thru-lane. These distances also adhere to TDOT Roadway Design Guidelines in Chapter 2, Table 2-3. In Table 2-3, TDOT lists a recommended deceleration length of 425 feet for vehicles to come to a complete stop. However, for the right-turn lane at this development, the entering vehicles will not come to a complete stop. The right-turn lane should include the appropriate right-turn arrow pavement markings (Refer to TDOT standard drawing T-M-4).

1c) 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 Chapman Highway. The stop bar should be applied a minimum of 4 feet away from the pavement edge of Chapman Highway and placed at the desired stopping point that maximizes the sight distance.

1d) Intersection sight distance at the Proposed Entrance must not be impacted by existing or future landscaping or signage. Based on a posted speed limit of 50-mph on Chapman Highway, the required intersection sight distance (ISD) at the Proposed Entrance is 625 feet looking to the north and south based on TDOT standards. However, based on Knox County's standards, the ISD requirement is 500 feet. Based on an existing road grade of 4.4% on Chapman Highway and a posted speed limit of 50-mph, the stopping sight distance (SSD) is calculated to be 460 feet for northbound vehicles and 400 feet for southbound vehicles on Chapman Highway. Visual observation and a land survey determined that the required SSD's are available. The available sight distance meets TDOT and Knox County ISD requirements looking to the north. To the south, the available sight distance meets Knox County ISD requirements but does not meet TDOT's.

Due to the physical layout of Chapman Highway and the vertical curve to the south, meeting TDOT's requirement of 625 feet is not feasible without shifting the entrance so far north that it would encroach upon the intersection operations of Sevierville Pike at Chapman Highway. Ultimately, shifting the Proposed Entrance further to the north to meet a TDOT requirement of 625 feet would not be achievable until the Proposed Entrance is located less than 400 feet to Sevierville Pike. Knox County requires a spacing

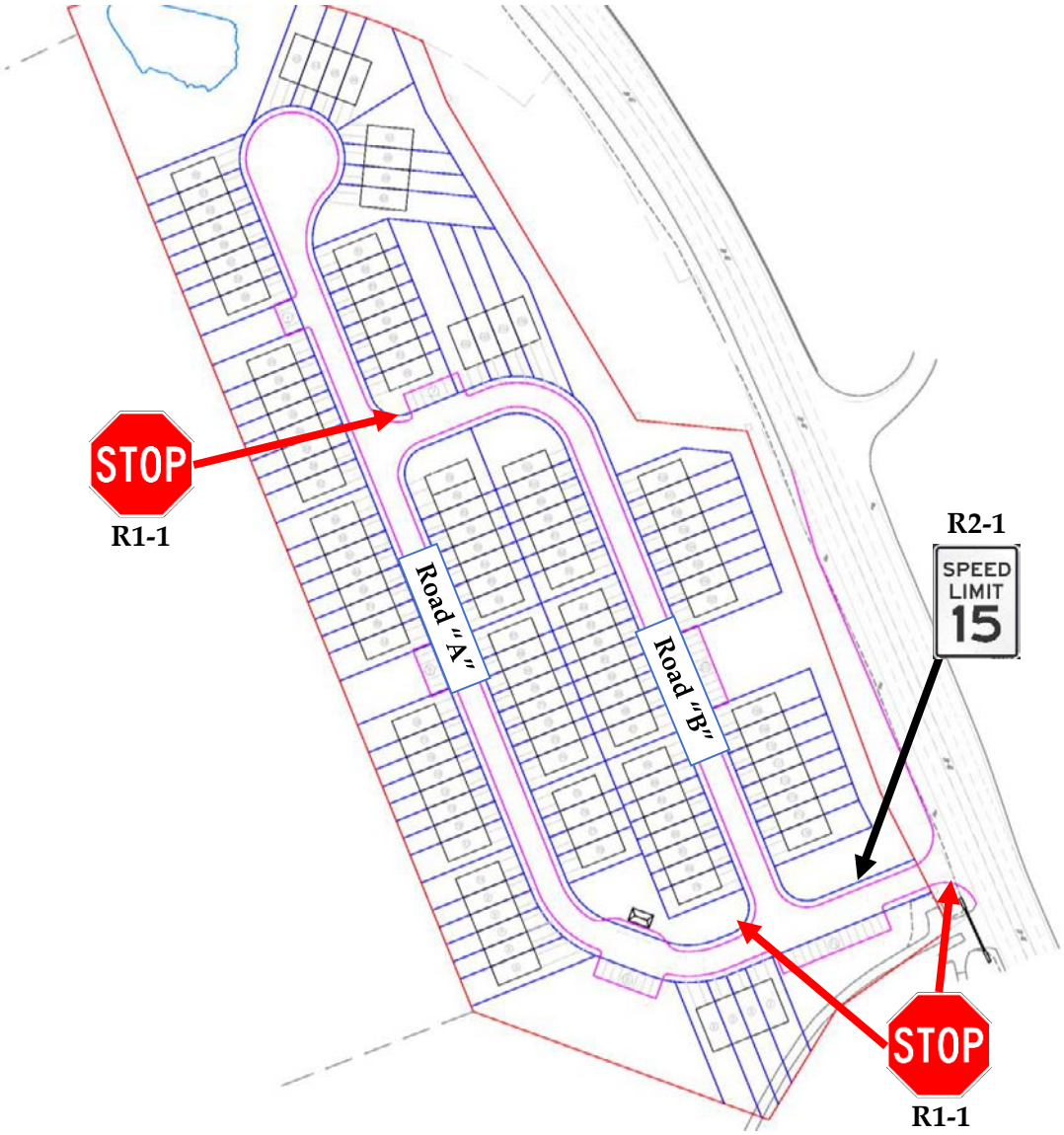
of intersecting roads on an arterial road of at least 400 feet. Based on these facts, it is recommended that the Proposed Entrance location remain as shown in the site plan with an available sight distance of 570 feet looking to the south.

1e) The construction of the Proposed Entrance on Chapman Highway will require a TDOT Highway Entrance Permit, and the site designer will need to apply for this permit and coordinate with TDOT as to their specific requirements for this entrance.

2 **Terri's Place Townhouses Internal Roads:** The proposed plan layout shows two new private roads constructed within the development, as shown below and in Figure 3.

2a) A 15-mph Speed Limit Sign (R2-1) is recommended to be installed near the beginning of Road "A" within the development off Chapman Highway. Since the internal development roads will not be public, a posted speed limit of less than 25-mph is acceptable and recommended.

2b) Stop Signs (R1-1) with 24" white stop bars and other traffic signage should be installed at the locations, as shown below:



Internal Traffic Sign Locations

2c) Sight distance at the new internal intersections in the development must not be impacted by new signage, future landscaping, parked vehicles, or other structures. With a proposed internal speed limit of 15-mph, the internal intersection sight distance requirement is 170 feet, and the stopping sight distance required is 80 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met and account for other designed road grades.

The internal southern intersection of Road "A" and Road "B" will need particular attention due to the proposed geometrics of the intersection and the location of parked vehicles across from the mail center/kiosk, potentially reducing sight distance.

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

2e) Traffic calming measures may be needed to decrease internal vehicle speeds. The north-south internal roadways have long and straight segments. It is recommended that the site designer consider installing speed humps or speed tables within the development to reduce internal speeds.

2f) All internal and external road and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operations.

APPENDIX A

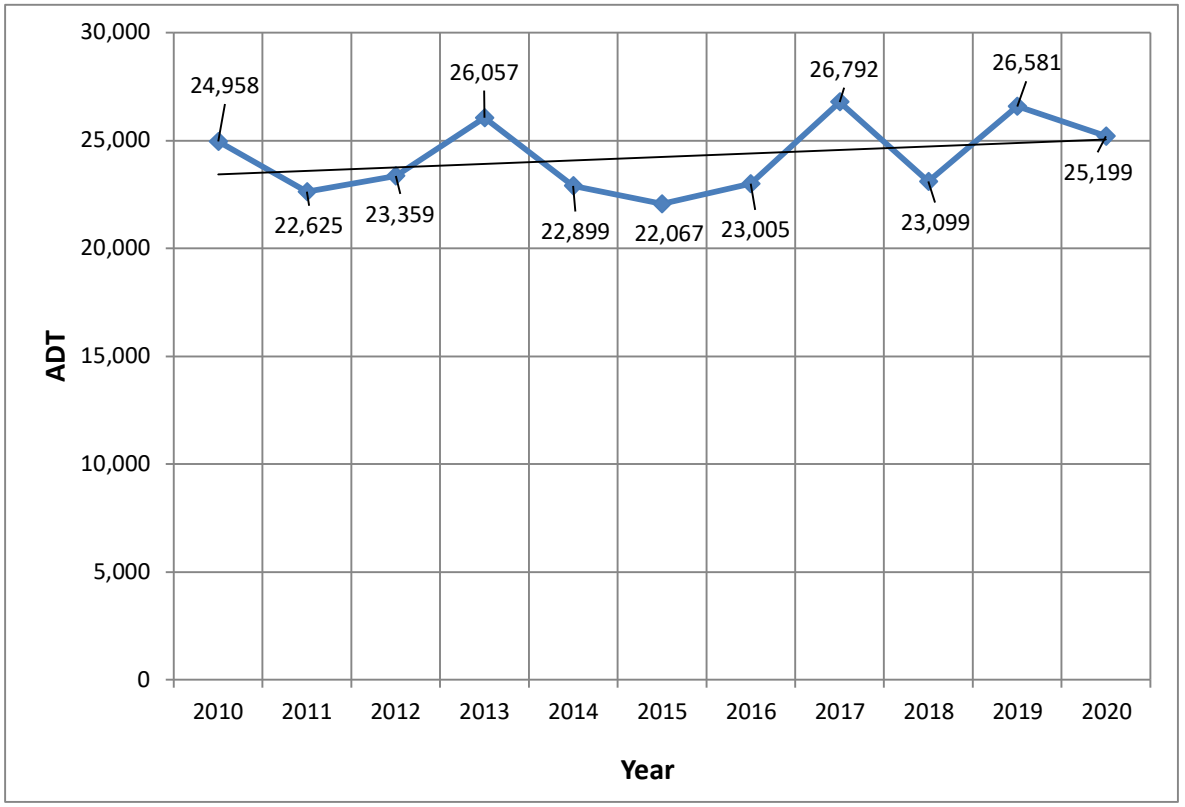
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

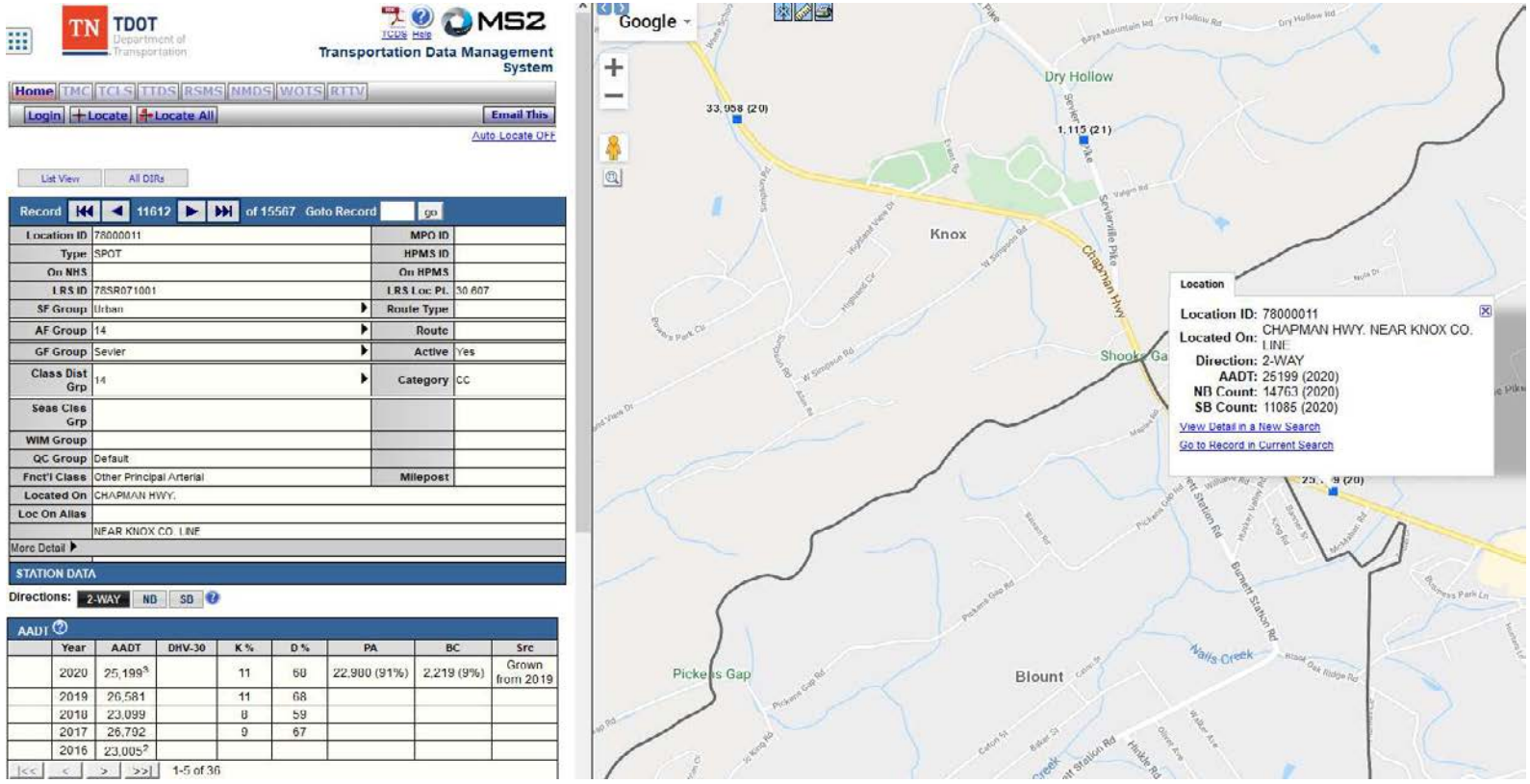
Organization: TDOT
Station ID #: 78000011
Location: Chapman Highway, South of Old Sevierville Pike (Sevier County)

YEAR	AADT
2010	24,958
2011	22,625
2012	23,359
2013	26,057
2014	22,899
2015	22,067
2016	23,005
2017	26,792
2018	23,099
2019	26,581
2020	25,199

Trendline



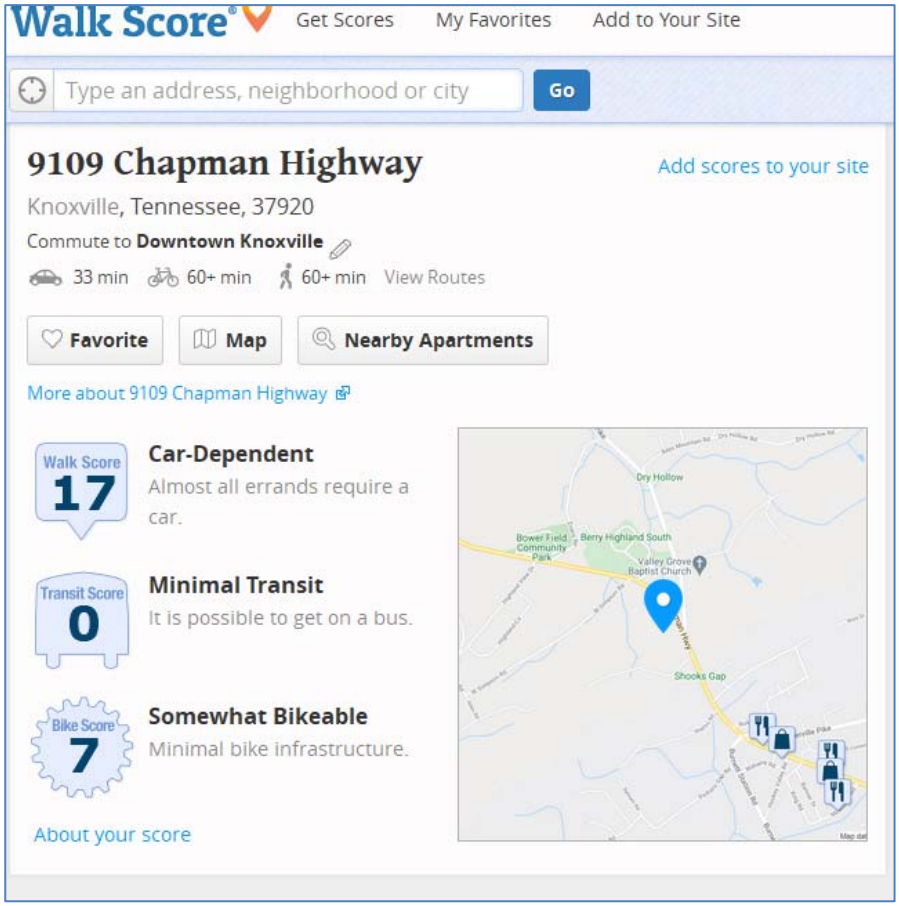
2016 - 2020 Growth Rate = 9.5%
Average Annual Growth Rate = 2.3%


TN TDOT Department of Transportation
TCDS Help MS2
Transportation Data Management System
Home TMC TCLS TTDS RSMS NMDS WQTS RTTV
Login Locate Locate All Email This
Auto Locate OFF
List View All DIRs
Record 11612 of 15567 Goto Record go
Location ID 78000011 MPO ID
Type SPOT HPMS ID
On NHS On HPMS
LRS ID 78SR071001 LRS Loc Pt. 30.607
SF Group Urban Route Type
AF Group 14 Route
GF Group Sevier Active Yes
Class Dist Grp 14 Category CC
Seas Clss Grp
WIM Group
QC Group Default
Fnct'l Class Other Principal Arterial Milepost
Located On CHAPMAN HWY.
Loc On Alias
NEAR KNOX CO. LINE
More Detail
STATION DATA
Directions: 2-WAY NB SB
AADT
Year AADT DHV-30 K % D % PA BC Src
2020 25,199[3] 11 60 22,980 (91%) 2,219 (9%) Grown from 2019
2019 26,581 11 68
2018 23,099 9 59
2017 26,792 9 67
2016 23,005[2]
1-5 of 36
Google
Dry Hollow
33,958 (20)
1,115 (21)
Knox
Chapman Hwy
Location
Location ID: 78000011
Located On: CHAPMAN HWY. NEAR KNOX CO. LINE
Direction: 2-WAY
AADT: 25199 (2020)
NB Count: 14763 (2020)
SB Count: 11085 (2020)
View Detail in a New Search
Go to Record in Current Search
Pickens Gap
Blount
Nails Creek

APPENDIX B

WALK SCORE

WALKSCORE
(from walkscore.com)

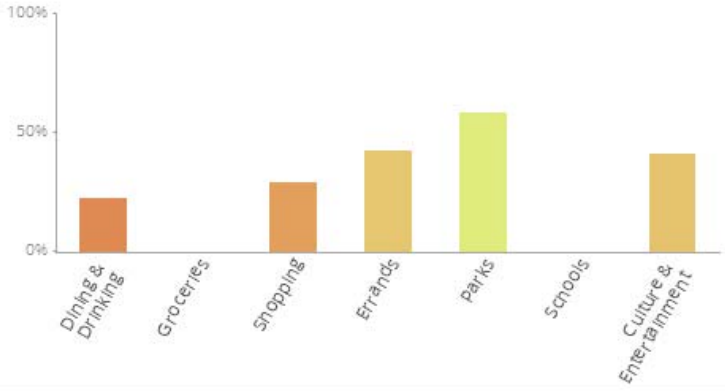


Walk Score 17 Bike Score 7

Walk Score | Transit Score | Bike Score

Score Details | What is Walk Score

The Walk Score for 9109 Chapman Highway is based on the following categories.



Methodology

Close

Scores for 9109 Chapman Highway

Walk Score 17 Bike Score 7

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 9109 Chapman Highway

Walk Score 17

Bike Score 7

Walk Score	Transit Score	Bike Score

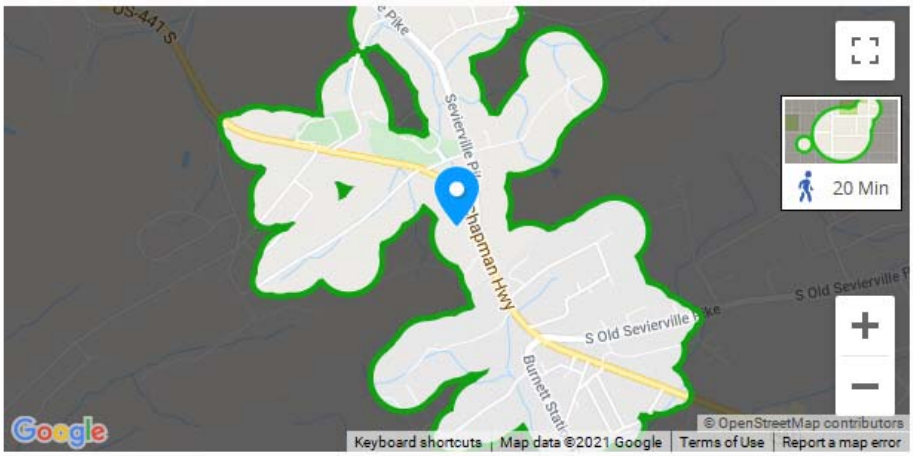
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.

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 9109 Chapman Highway.



What's Nearby

Restaurants:
Partons Smokin Butz BBQ .5mi

Coffee:
Sipz Coffee House 1.4mi

Bars:
Chatterbox 1.5mi

Groceries:
Kroger 1.4mi

Parks:
Bower Field .6mi

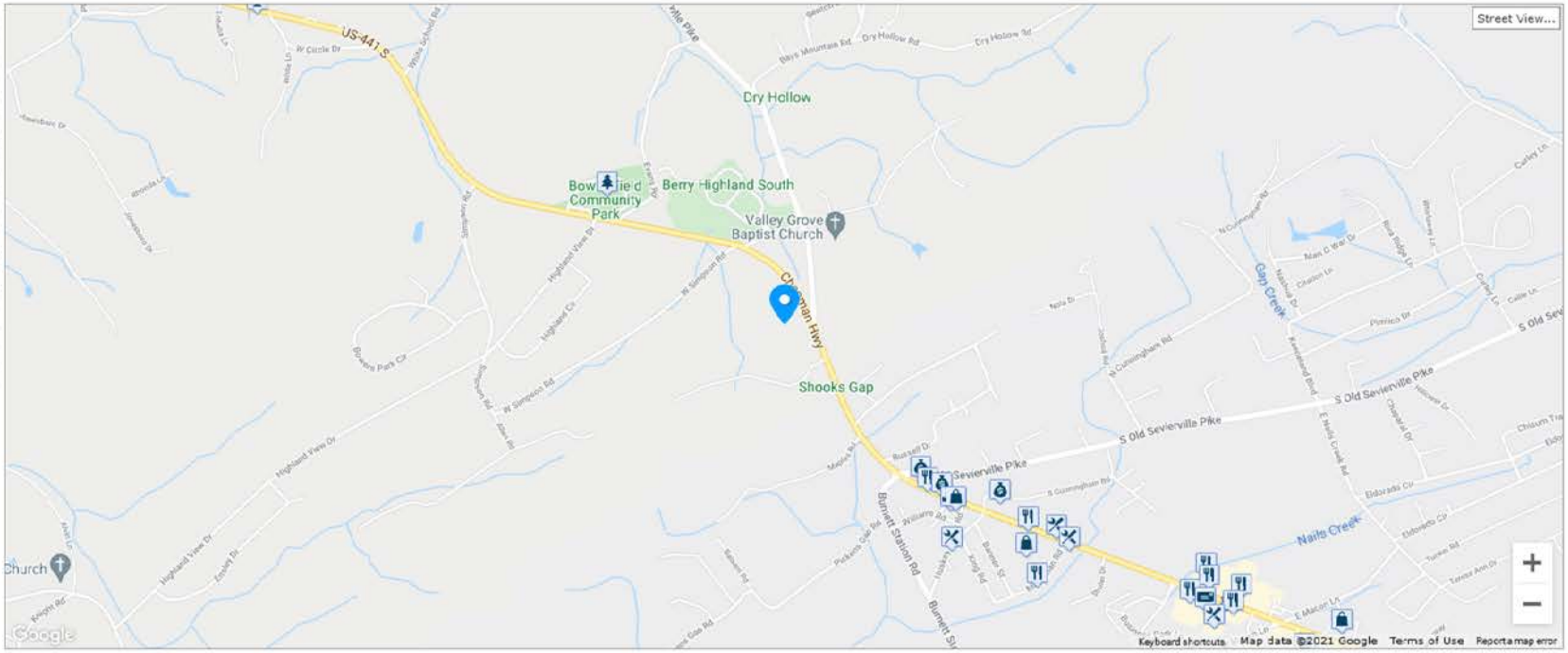
Schools:
Seymour Community Christia... 1.7mi

Shopping:
Treasures From The Heart .6mi

Entertainment:
Cheyenne's Dance Hall .6mi

Errands:
First Choice Community Credi... .5mi

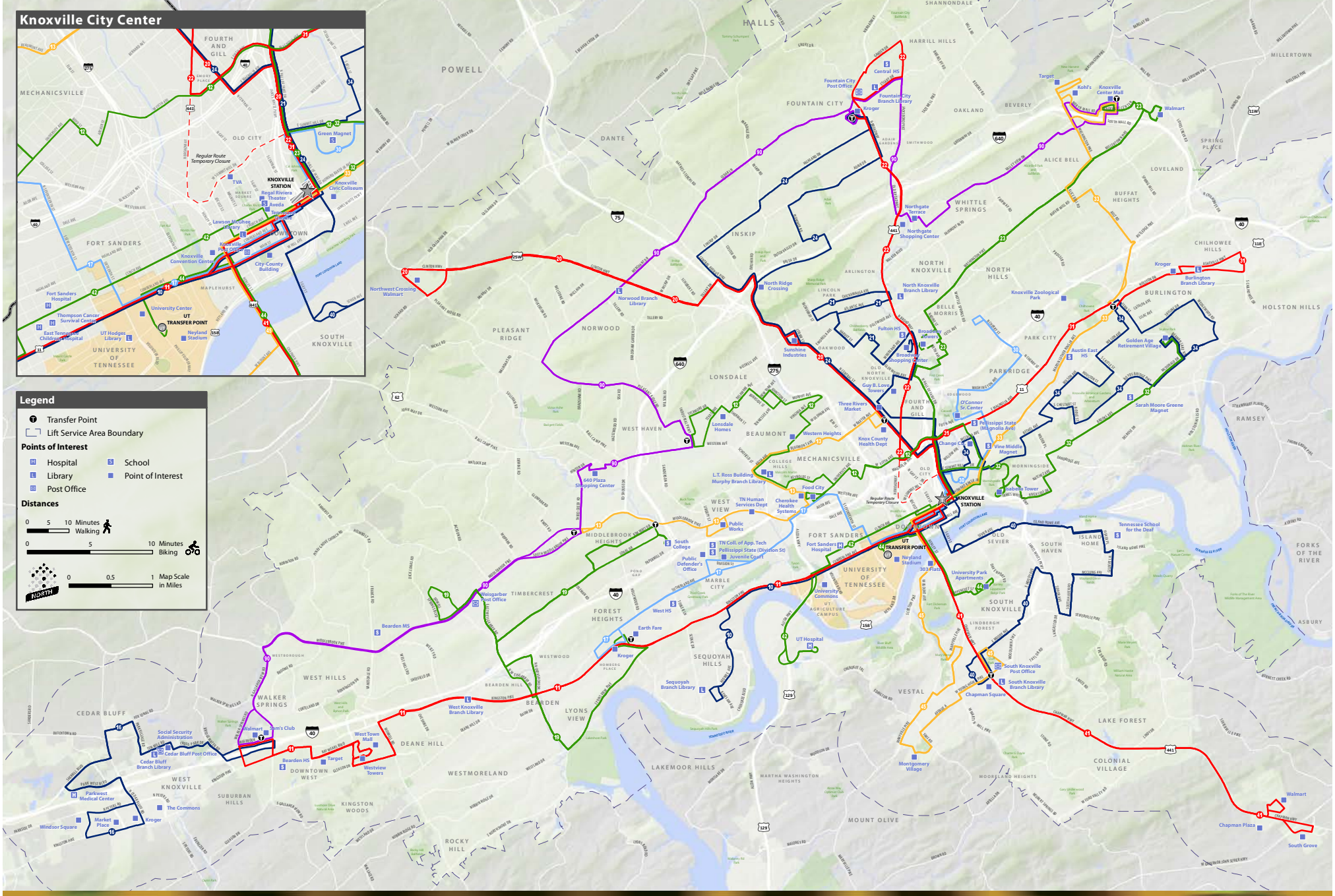
Search Nearby:



Something missing? Add a place

APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION



FARE INFORMATION

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

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

REDUCED FARE INFORMATION

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

BUS STOPS ONLY!

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

KAT HOLIDAYS

KAT buses do not run on the following holidays:

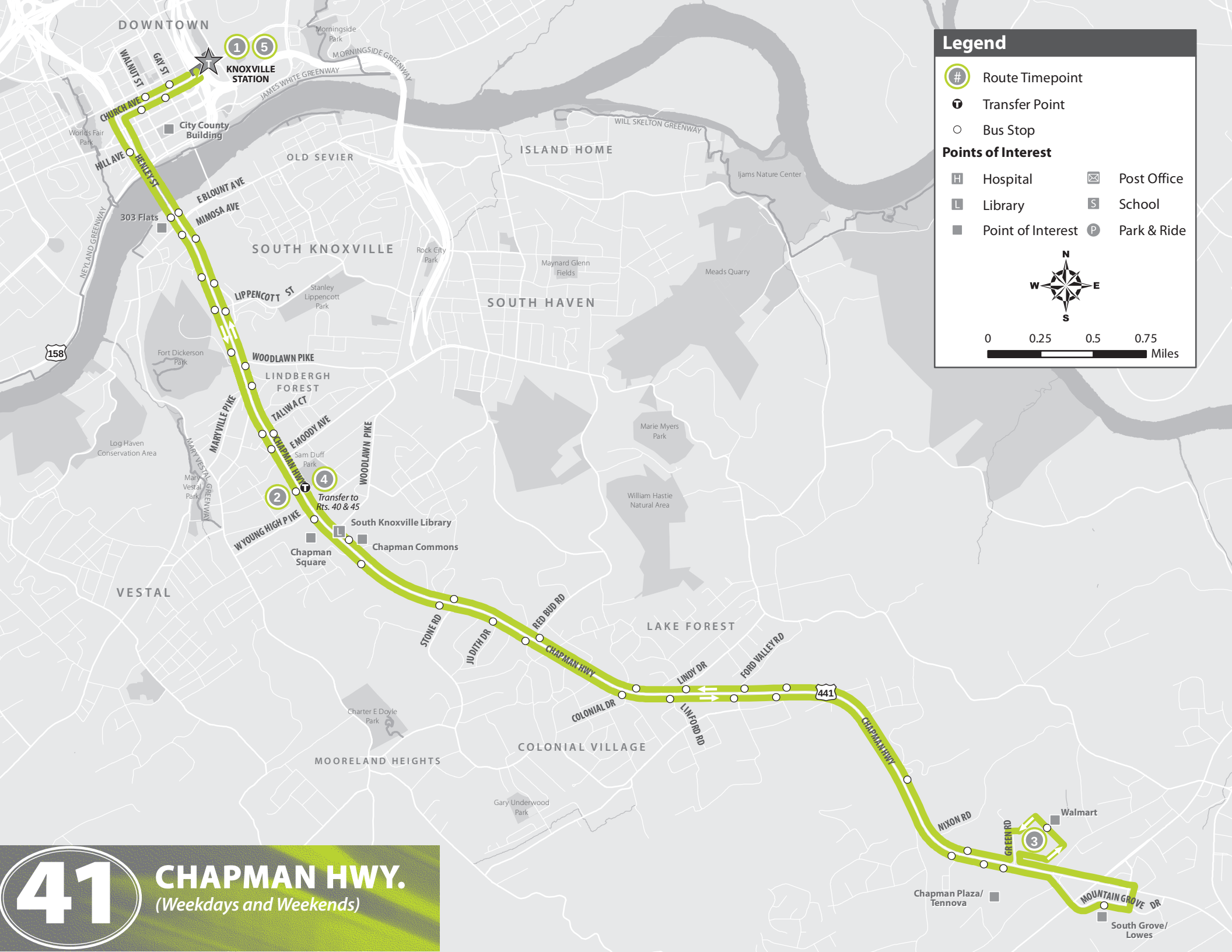
- New Year's Day
- Independence Day
- Thanksgiving
- Christmas

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

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

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

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


DOWNTOWN
KNOXVILLE STATION
WALNUT ST
GAY ST
CHURCH AVE
HILL AVE
HENLEY ST
E BLOUNT AVE
MIMOSA AVE
LIPPENCOTT ST
WOODLAWN PIKE
MARYVILLE PIKE
TALIWA CT
E MOODY AVE
CHAPMAN HWY
WOODLOWN PIKE
W YOUNG HIGH PIKE
STONE RD
JUDITH DR
RED BUD RD
LINDY DR
FORD VALLEY RD
COLONIAL DR
LINFORD RD
NIXON RD
GREEN RD
MOUNTAIN GROVE DR
JAMES WHITE GREENWAY
MORNINGSIDE GREENWAY
WILL SKELTON GREENWAY
NEYLAND GREENWAY
MARY VESTAL GREENWAY
Worlds Fair Park
Morningside Park
City County Building
303 Flats
OLD SEVIER
ISLAND HOME
Ijams Nature Center
SOUTH KNOXVILLE
Rock City Park
Maynard Glenn Fields
Meads Quarry
Stanley Lippencott Park
SOUTH HAVEN
158
Fort Dickerson Park
LINDBERGH FOREST
Log Haven Conservation Area
Sam Duff Park
Mary Vestal Park
Marie Myers Park
William Hastie Natural Area
Transfer to Rts. 40 & 45
South Knoxville Library
Chapman Commons
Chapman Square
VESTAL
LAKE FOREST
Charter E Doyle Park
COLONIAL VILLAGE
MOORELAND HEIGHTS
Gary Underwood Park
441
Walmart
Chapman Plaza/ Tennova
South Grove/ Lowes
Legend
Route Timepoint
Transfer Point
Bus Stop
Points of Interest
Hospital
Library
Point of Interest
Post Office
School
Park & Ride
N
W
E
S
0
0.25
0.5
0.75
Miles
41
CHAPMAN HWY.
(Weekdays and Weekends)

41 CHAPMAN HIGHWAY

(Weekdays and Weekends)

SERVES:

- Chapman Commons
- Chapman Plaza
- Chapman Square
- Knoxville Station/Downtown
- South Grove Shopping Center
- South Knoxville Branch Library
- Tennova South
- Walmart

kat KNOXVILLE AREA TRANSIT

Effective Date: January 6, 2020

WEEKDAY SCHEDULE

	Going away from Downtown			Going toward Downtown	
	Knoxville Station—Platform P (1)	Chapman Hwy. past Moody (2)	Walmart (3)	Chapman Hwy. past Young High Pike (4)	Knoxville Station (5)
A.M.			5:41	5:50	6:10
	6:15	6:26	6:41	6:50	7:10
	6:45	6:56	7:11	7:20	7:40
	7:15	7:26	7:41	7:50	8:10
	7:45	7:56	8:11	8:20	8:40
	8:15	8:26	8:41	8:50	9:10
	8:45	8:56	9:11	9:20	9:40
	9:15	9:26	9:41	9:50	10:10
	9:45	9:56	10:11	10:20	10:40
	10:15	10:26	10:41	10:50	11:10
	10:45	10:56	11:11	11:20	11:40
	11:15	11:26	11:41	11:50	**12:10**
	11:45	11:56	**12:11**	**12:20**	**12:40**
P.M.	**12:15**	**12:26**	**12:41**	**12:50**	**1:10**
	12:45	**12:56**	**1:11**	**1:20**	**1:40**
	1:15	**1:26**	**1:41**	**1:50**	**2:10**
	1:45	**1:56**	**2:11**	**2:20**	**2:40**
	2:15	**2:26**	**2:41**	**2:50**	**3:10**
	2:45	**2:56**	**3:11**	**3:20**	**3:40**
	3:15	**3:26**	**3:41**	**3:50**	**4:10**
	3:45	**3:56**	**4:11**	**4:20**	**4:40**
	4:15	**4:26**	**4:41**	**4:50**	**5:10**
	4:45	**4:56**	**5:11**	**5:20**	**5:40**
	5:15	**5:26**	**5:41**	**5:50**	**6:10**
	5:45	**5:56**	**6:11**	**6:20**	**6:40**
	6:15	**6:26**	**6:41**	**6:50**	**7:10**
	6:45	**6:56**	**7:11**	**7:20**	**7:40**
	7:15	**7:26**	**7:41**	**7:50**	**8:10**
	7:45	**7:56**	**8:11**	**8:20**	**8:40**
	8:15	**8:26**	**8:41**	**8:50**	**9:10**
	8:45	**8:56**	**9:11**	**9:20**	**9:40**
	9:15	**9:26**	**9:41**	**9:50**	**10:10**
	9:45	**9:56**	**10:11**	**10:20**	**10:40**
	10:15	**10:26**	**10:41**	**10:50**	**11:10**
	11:15	**11:26**	**11:41**	**11:50**	*To Garage*

SATURDAY SCHEDULE

	Going away from Downtown			Going toward Downtown	
	Knoxville Station—Platform P (1)	Chapman Hwy. past Moody (2)	Walmart (3)	Chapman Hwy. past Young High Pike (4)	Knoxville Station (5)
A.M.	7:15	7:26	7:41	7:50	8:10
	7:45	7:56	8:11	8:20	8:40
	8:15	8:26	8:41	8:50	9:10
	8:45	8:56	9:11	9:20	9:40
	9:15	9:26	9:41	9:50	10:10
	9:45	9:56	10:11	10:20	10:40
	10:15	10:26	10:41	10:50	11:10
	10:45	10:56	11:11	11:20	11:40
	11:15	11:26	11:41	11:50	**12:10**
	11:45	11:56	**12:11**	**12:20**	**12:40**
P.M.	**12:15**	**12:26**	**12:41**	**12:50**	**1:10**
	12:45	**12:56**	**1:11**	**1:20**	**1:40**
	1:15	**1:26**	**1:41**	**1:50**	**2:10**
	1:45	**1:56**	**2:11**	**2:20**	**2:40**
	2:15	**2:26**	**2:41**	**2:50**	**3:10**
	2:45	**2:56**	**3:11**	**3:20**	**3:40**
	3:15	**3:26**	**3:41**	**3:50**	**4:10**
	3:45	**3:56**	**4:11**	**4:20**	**4:40**
	4:15	**4:26**	**4:41**	**4:50**	**5:10**
	4:45	**4:56**	**5:11**	**5:20**	**5:40**
	5:15	**5:26**	**5:41**	**5:50**	**6:10**
	5:45	**5:56**	**6:11**	**6:20**	**6:40**
	6:15	**6:26**	**6:41**	**6:50**	**7:10**
	6:45	**6:56**	**7:11**	**7:20**	**7:40**
	7:15	**7:26**	**7:41**	**7:50**	**8:10**
	7:45	**7:56**	**8:11**	**8:20**	**8:40**
	8:15	**8:26**	**8:41**	**8:50**	**9:10**
	8:45	**8:56**	**9:11**	**9:20**	**9:40**
	9:15	**9:26**	**9:41**	**9:50**	**10:10**
	9:45	**9:56**	**10:11**	**10:20**	**10:40**
	10:15	**10:26**	**10:41**	**10:50**	**11:10**
	10:45	**10:56**	**11:11**	**11:20**	**11:40**
	11:15	**11:26**	**11:41**	**11:50**	*To Garage*

SUNDAY SCHEDULE

A.M.	8:15	8:26	8:41	8:50	9:10
	9:15	9:26	9:41	9:50	10:10
	10:15	10:26	10:41	10:50	11:10
	11:15	11:26	11:41	11:50	**12:10**
P.M.	**12:15**	**12:26**	**12:41**	**12:50**	**1:10**
	1:15	**1:26**	**1:41**	**1:50**	**2:10**
	2:15	**2:26**	**2:41**	**2:50**	**3:10**
	3:15	**3:26**	**3:41**	**3:50**	**4:10**
	4:15	**4:26**	**4:41**	**4:50**	**5:10**
	5:15	**5:26**	**5:41**	**5:50**	**6:10**
	6:15	**6:26**	**6:41**	**6:50**	**7:10**
	7:15	**7:26**	**7:41**	**7:50**	**8:10**
	8:15	**8:26**	**8:41**	*To Garage*	

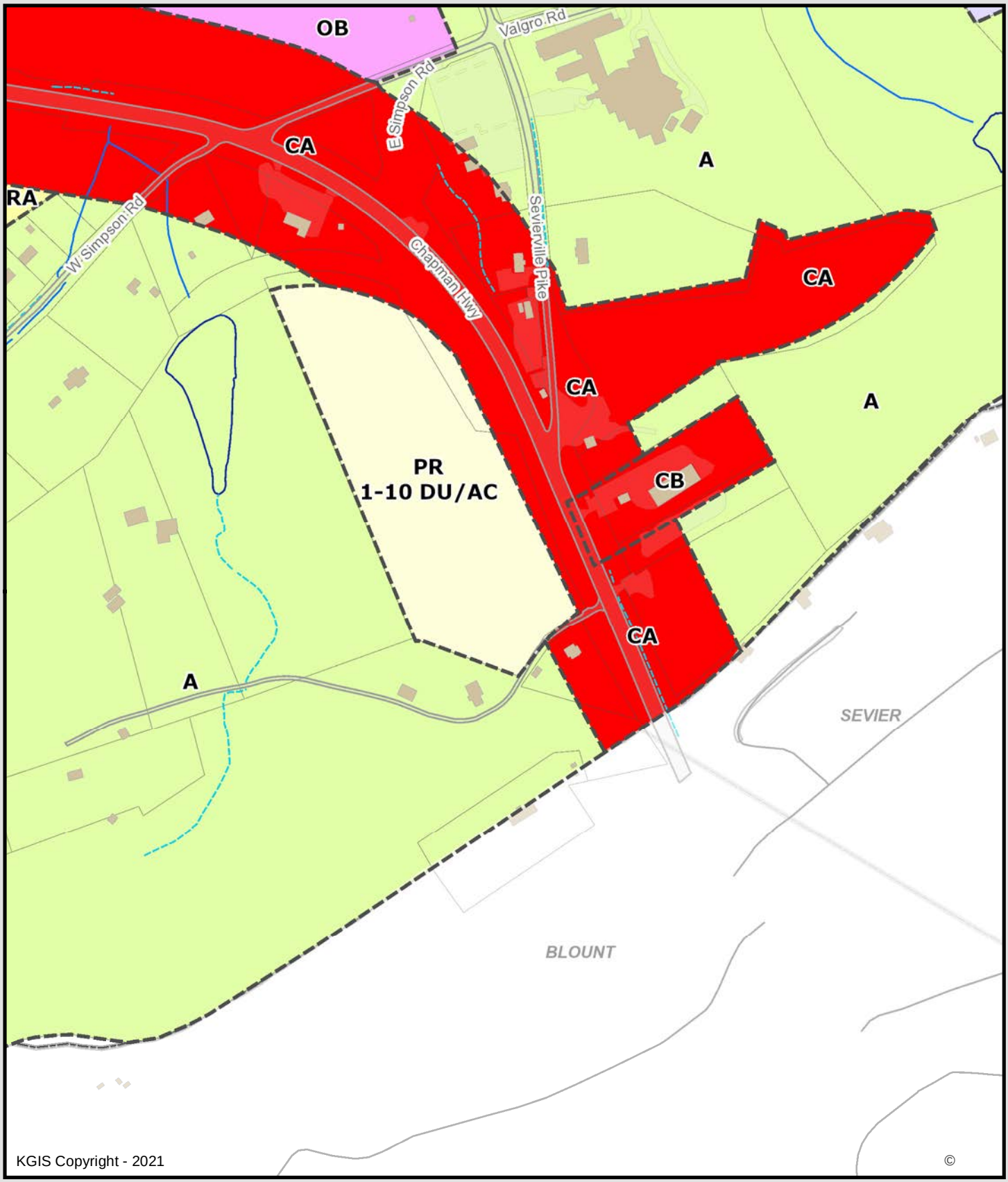
Need help reading this schedule?

Need other general information on how to ride?

Click here to Download the General Schedule Information pdf available from katbus.com

APPENDIX D

ZONING MAP



Zoning Map

Terri's Place

Knoxville - Knox County - KUB Geographic Information System

Printed: 9/16/2021 at 4:26:26 PM

0 200 400 800

ft

APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Chapman Highway (SB-NB) 9/14/2021 (Tuesday)
Minor Street: n/a Sunny, Hot
Traffic Control: n/a Conducted by: Ajax Engineering

	Chapman Highway	Chapman Highway		
TIME	SOUTHBOUND	NORTHBOUND	VEHICLE	PEAK
BEGIN	THRU	THRU	TOTAL	HOUR
7:00 AM	148	358	506	**7:00 AM - 8:00 AM**
7:15 AM	185	380	565	
7:30 AM	202	428	630	
7:45 AM	204	351	555	
8:00 AM	158	334	492	
8:15 AM	171	260	431	
8:30 AM	174	275	449	
8:45 AM	160	268	428	
TOTAL	1402	2654	4056	
11:00 AM	192	236	428	
11:15 AM	207	223	430	
11:30 AM	185	237	422	
11:45 AM	193	207	400	
12:00 PM	238	213	451	**12:00 PM - 1:00 PM**
12:15 PM	232	277	509	
12:30 PM	264	235	499	
12:45 PM	231	222	453	
TOTAL	1742	1850	3592	
2:00 PM	262	226	488	
2:15 PM	295	227	522	
2:30 PM	304	241	545	
2:45 PM	308	227	535	
3:00 PM	263	247	510	
3:15 PM	324	251	575	
3:30 PM	304	222	526	
3:45 PM	340	224	564	
4:00 PM	333	276	609	
4:15 PM	354	227	581	
4:30 PM	376	245	621	
4:45 PM	402	214	616	
5:00 PM	445	271	716	**5:00 PM - 6:00 PM**
5:15 PM	448	268	716	
5:30 PM	410	289	699	
5:45 PM	391	289	680	
TOTAL	5559	3944	9503	

2021 AM Peak Hour **7:00 AM - 8:00 AM**

	Chapman Highway	Chapman Highway
TIME	SOUTHBOUND	NORTHBOUND
BEGIN	THRU	THRU
7:00 AM	148	358
7:15 AM	185	380
7:30 AM	202	428
7:45 AM	204	351
TOTAL	**739**	**1517**
PHF	**0.91**	**0.89**

2021 PM Peak Hour **5:00 PM - 6:00 PM**

	Chapman Highway	Chapman Highway
TIME	SOUTHBOUND	NORTHBOUND
BEGIN	THRU	THRU
5:00 PM	445	271
5:15 PM	448	268
5:30 PM	410	289
5:45 PM	391	289
TOTAL	**1694**	**1117**
PHF	**0.95**	**0.97**

APPENDIX F

LOCAL TRIP GENERATION RATES

Local Apartment
Trip Generation Study

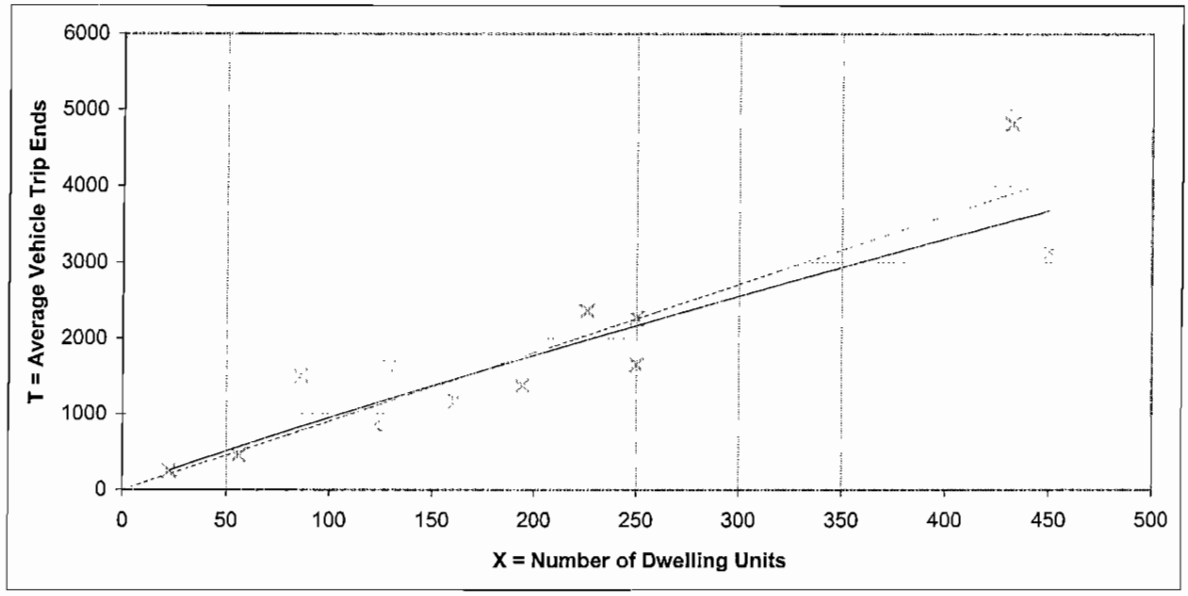
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

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



X Actual Data Points ——— Fitted Curve Average Rate

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

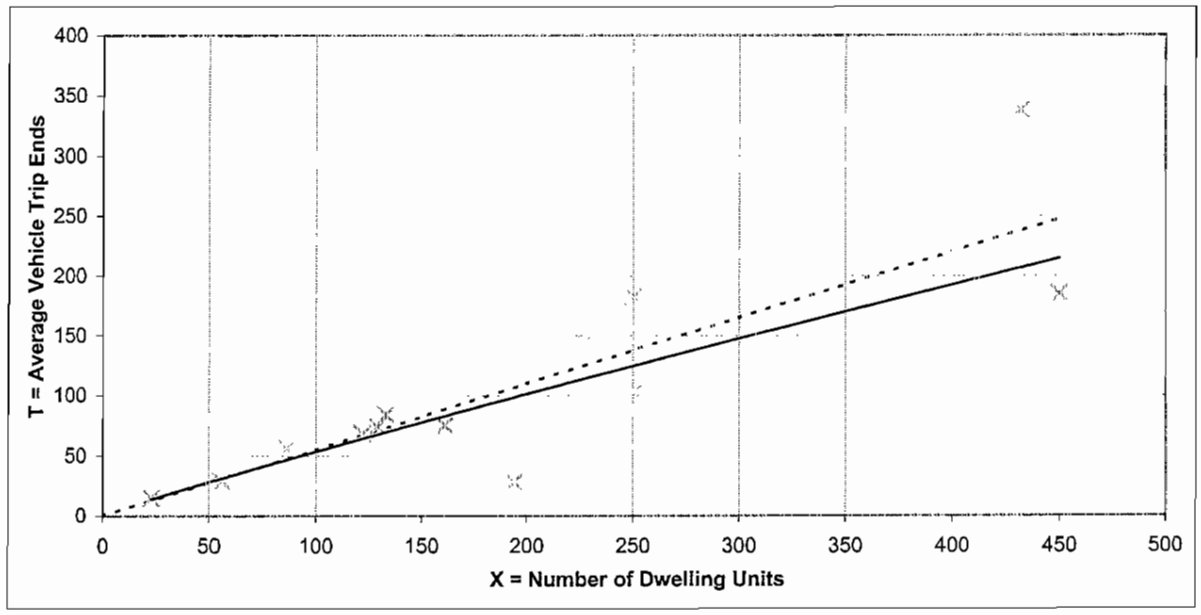
Local Apartment
Trip Generation Study

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

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

Local Apartment
Trip Generation Study

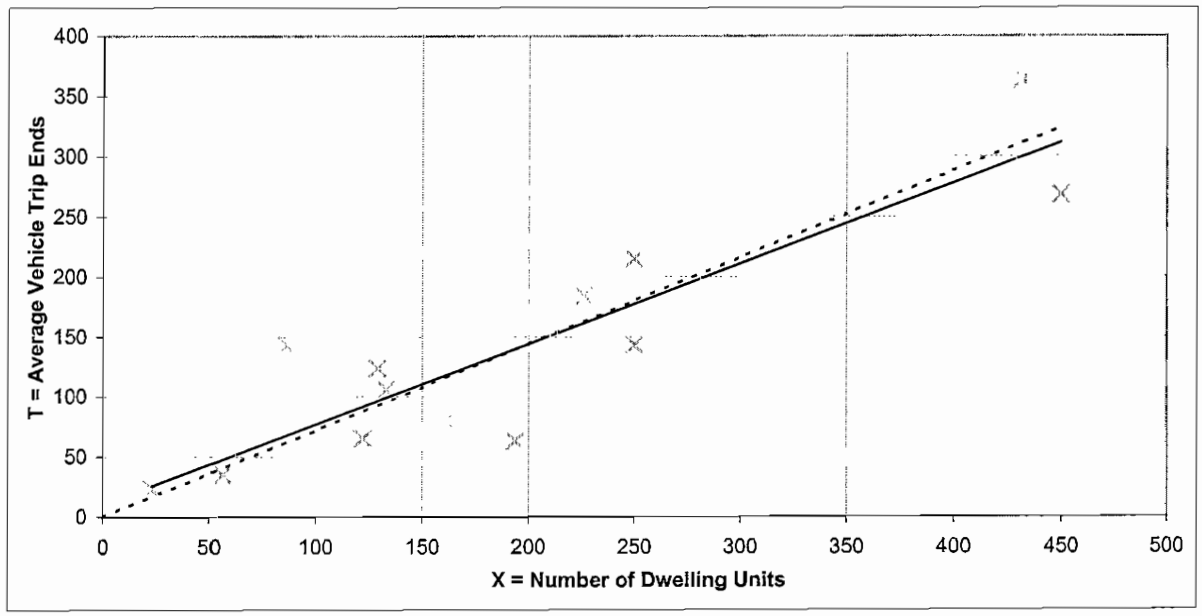
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



X Actual Data Points ——— Fitted Curve Average Rate

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

TRIP GENERATION FOR TERRI'S PLACE TOWNHOUSES

118 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	118	1,107	22%	78%		55%	45%	
				14	48	62	49	40	89
Total New Volume Site Trips			**1,107**	**14**	**48**	**62**	**49**	**40**	**89**

Local Trip Rates

Trips calculated by using Fitted Curve Equation

TRIP GENERATION FOR TERRI'S PLACE TOWNHOUSES

118 Townhouses

118 Residences = X

Weekday:

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

T = 15 * 72.88

T = 1107 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

T = 0.758 * 82

T = 62 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

T = 0.669 * 118 + 10.07

T = 89 trips

APPENDIX G

2018 CENSUS BUREAU DATA

OnTheMap

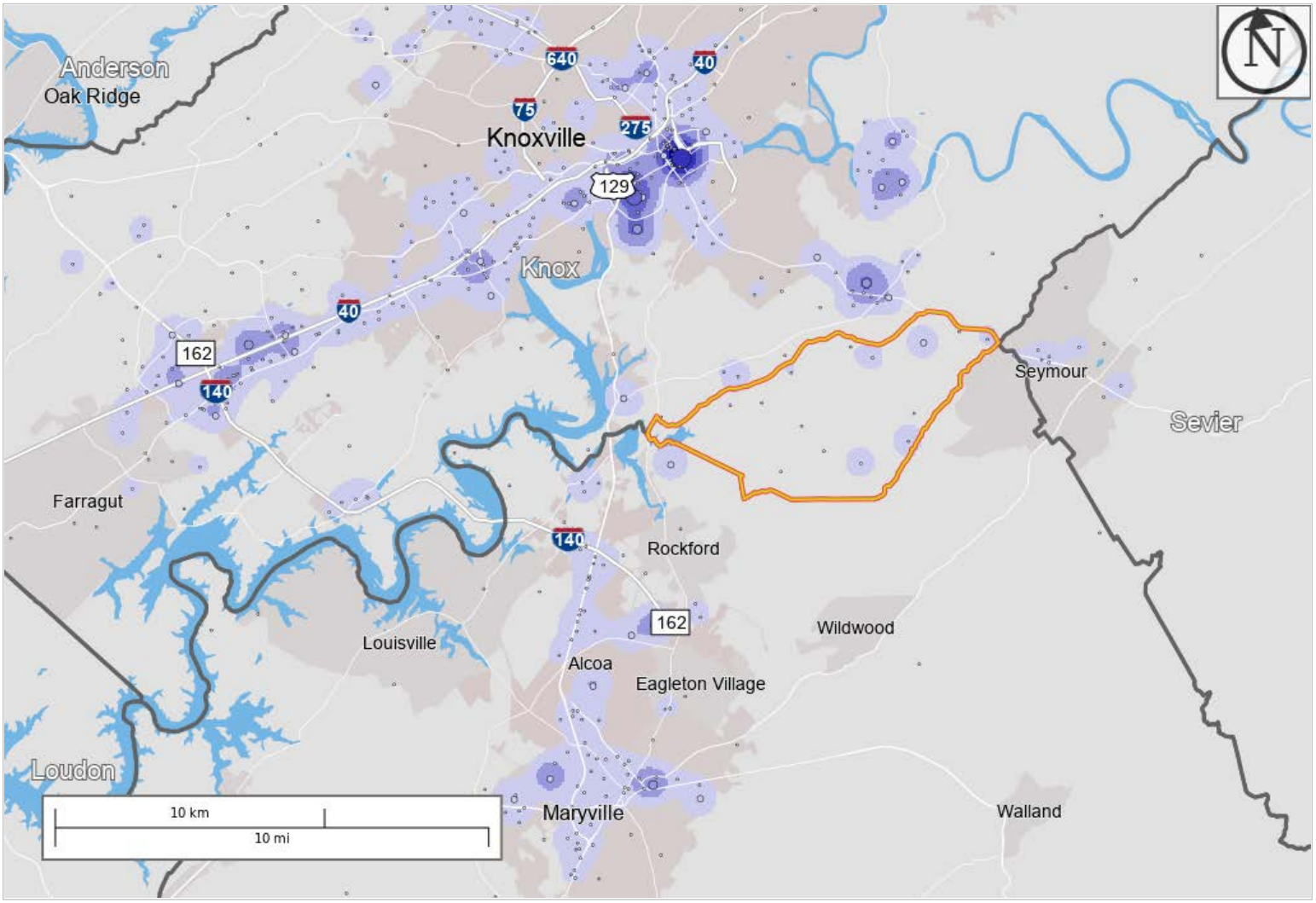
Distance/Direction Report - Home to Work

All Jobs for All Workers in 2018

Created by the U.S. Census Bureau's OnTheMap `https://onthemap.ces.census.gov` on 09/20/2021

Counts and Density of Work Locations for All Jobs in Home Selection Area in 2018

All Workers



Map Legend

Job Density [Jobs/Sq. Mile]

- 5 - 21
- 22 - 70
- 71 - 152
- 153 - 266
- 267 - 414

Job Count [Jobs/Census Block]

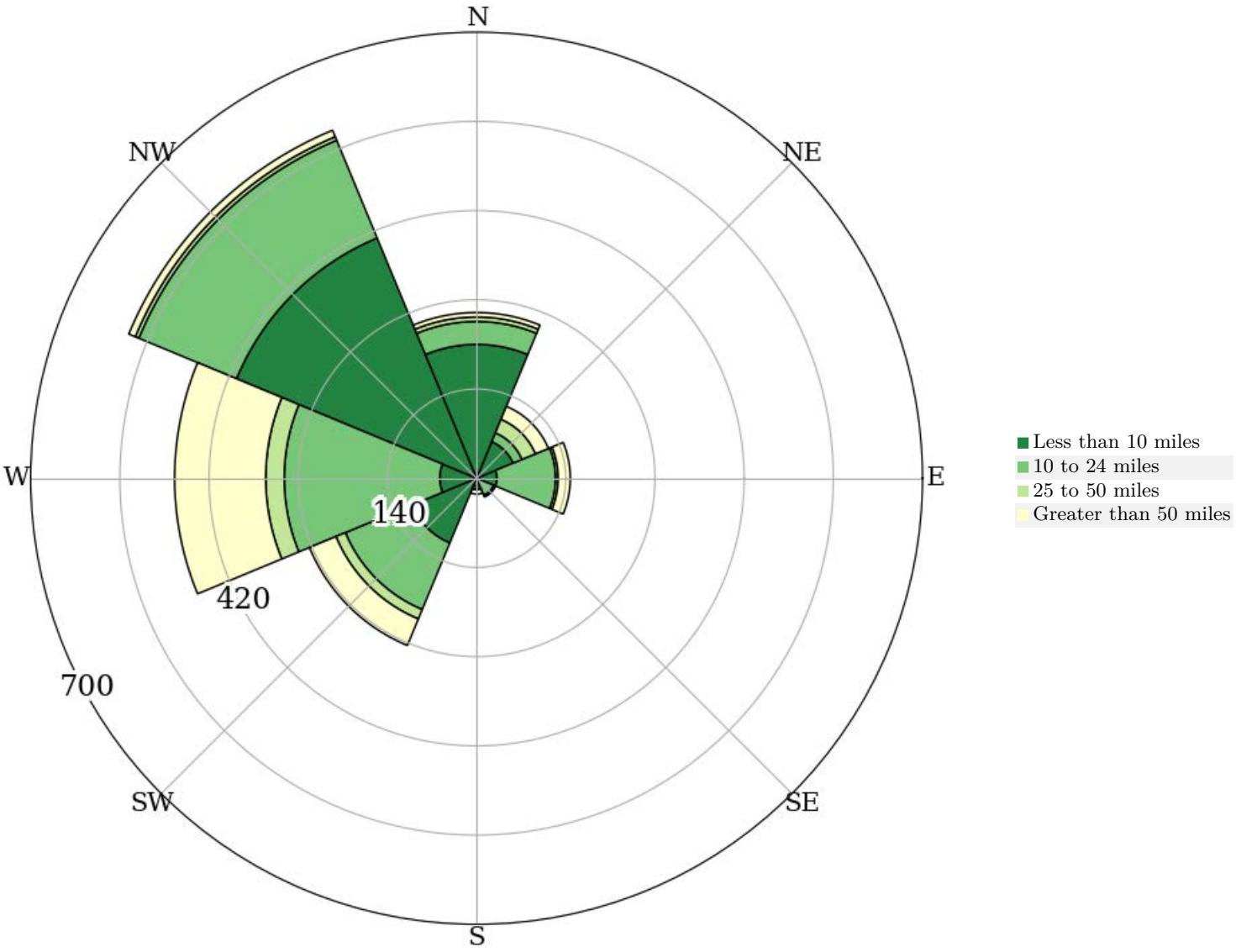
- 1 - 5
- 6 - 18
- 19 - 39
- 40 - 70
- 71 - 109

Selection Areas

- Analysis Selection

All Jobs for All Workers in 2018

Distance and Direction from Home Census Block to Work Census Block, Living in Selection Area



All Jobs for All Workers in 2018

Distance from Home Census Block to Work Census Block, Living in Selection Area

Distance	2018 Count	2018 Share
Total All Jobs	1,935	100.0
Less than 10 miles	899	46.5
10 to 24 miles	694	35.9
25 to 50 miles	86	4.4
Greater than 50 miles	256	13.2

Additional Information

Analysis Settings

Analysis Type	Distance/Direction
Selection area as	Home
Year(s)	2018
Job Type	All Jobs
Selection Area	56.02 (Knox, TN) from Census Tracts
Selected Census Blocks	88
Analysis Generation Date	09/20/2021 16:21 - OnTheMap 6.8
Code Revision	5dc8e60ec2609d78ebfa7d4b188db13aacbb1ba6
LODES Data Version	20201117_1559

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2018).

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 and in 2018.

APPENDIX H

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 8)

OPENING YEAR TRAFFIC CONDITIONS (WITH THE PROJECT)

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	31	17	5	1669	813	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	75	100	-	-	275
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-4	4	-
Peak Hour Factor	90	90	90	89	91	90
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	34	19	6	1875	893	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1842	447	893	0	-	0
Stage 1	893	-	-	-	-	-
Stage 2	949	-	-	-	-	-
Critical Hdwy	5.8	6.4	4.1	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	114	601	768	-	-	-
Stage 1	468	-	-	-	-	-
Stage 2	444	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	113	601	768	-	-	-
Mov Cap-2 Maneuver	259	-	-	-	-	-
Stage 1	468	-	-	-	-	-
Stage 2	441	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.5	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	768	-	259	601	-	-
HCM Lane V/C Ratio	0.007	-	0.133	0.031	-	-
HCM Control Delay (s)	9.7	-	21	11.2	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	26	14	17	1229	1863	32
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	75	100	-	-	275
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-4	4	-
Peak Hour Factor	90	90	90	97	95	90
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	29	16	19	1267	1961	36

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2632	981	1961	0	-	0
Stage 1	1961	-	-	-	-	-
Stage 2	671	-	-	-	-	-
Critical Hdwy	5.8	6.4	4.1	-	-	-
Critical Hdwy Stg 1	4.8	-	-	-	-	-
Critical Hdwy Stg 2	4.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	41	289	301	-	-	-
Stage 1	169	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	38	289	301	-	-	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	169	-	-	-	-	-
Stage 2	536	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	32.9	0.3	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	301	-	129	289	-	-
HCM Lane V/C Ratio	0.063	-	0.224	0.054	-	-
HCM Control Delay (s)	17.8	-	40.8	18.2	-	-
HCM Lane LOS	C	-	E	C	-	-
HCM 95th %tile Q(veh)	0.2	-	0.8	0.2	-	-

APPENDIX I

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEETS

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 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						Yes
200 - 249 250 - 299				Yes	Yes Yes	Yes Yes
300 - 349 350 - 399			Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes Yes	Yes Yes	Yes Yes	Yes Yes	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

813/2 * 1.05 = 427

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	Yes Yes
100 - 149 150 - 199	Yes			Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Chapman Highway at Proposed Entrance

2025 Projected AM SB Right Turns = 9

Right Turn Lane NOT Warranted

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

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 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						Yes
200 - 249 250 - 299				Yes	Yes Yes	Yes Yes
300 - 349 350 - 399			Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes Yes	Yes Yes	Yes Yes	Yes Yes	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

1863/2 * 1.05 = 978

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	Yes Yes
100 - 149 150 - 199	Yes			Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes			Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes			Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes			Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

Chapman Highway at Proposed Entrance

2025 Projected AM SB Right Turns = 32

Right Turn Lane Warranted

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

APPENDIX J

SIMTRAFFIC VEHICLE QUEUE LENGTHS

Intersection: 4: Chapman Highway & Proposed Entrance

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	220	99	30
Average Queue (ft)	91	22	3
95th Queue (ft)	239	80	18
Link Distance (ft)	425		
Upstream Blk Time (%)	1		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)		75	100
Storage Blk Time (%)	42	0	
Queuing Penalty (veh)	7	0	

Network Summary

Network wide Queuing Penalty: 7

Intersection: 4: Chapman Highway & Proposed Entrance

Movement	EB	EB	NB
Directions Served	L	R	L
Maximum Queue (ft)	428	100	50
Average Queue (ft)	325	12	15
95th Queue (ft)	531	65	41
Link Distance (ft)	425		
Upstream Blk Time (%)	41		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)		75	100
Storage Blk Time (%)	96	0	
Queuing Penalty (veh)	13	0	

Network Summary

Network wide Queuing Penalty: 13

Intersection: 4: Chapman Highway & Proposed Entrance

Movement	EB	EB	NB	SB
Directions Served	L	R	L	R
Maximum Queue (ft)	428	100	66	2
Average Queue (ft)	335	10	24	0
95th Queue (ft)	536	58	56	2
Link Distance (ft)	425			
Upstream Blk Time (%)	46			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)		75	100	275
Storage Blk Time (%)	95	0	0	
Queuing Penalty (veh)	13	0	2	

Network Summary

Network wide Queuing Penalty: 16

APPENDIX K

RESPONSE LETTER TO ADDRESS REVIEW COMMENTS

AJAX ENGINEERING
CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

October 25, 2021

PROJECT NAME: Terri's Place Townhouses TIS

TO: Knoxville-Knox County Planning

SUBJECT: TIS Comment Response Document for Terri's Place Townhouses Review Comments dated October 7, 2021

Dear Knoxville-Knox County Planning Staff:

The following comment response document is submitted to address comments from an email from Mike Conger, PE, dated October 7, 2021. This letter is added to the end of the revised report in Appendix K.

1. **You have proposed potential traffic calming in coordination with Knox County within the site. However, per the study the site roads will be private, and as such the County would not participate in any traffic calming measures. That would be up to the development owners as the ones who maintain the roads. Please revise accordingly.**

   Response: The recommendation regarding traffic calming has been revised to reflect that the internal roads will be private, and Knox County will not participate in these potential measures. This change has been made on Pages 3 and 44.

2. **We are not in agreement with the PM Peak trip distribution percentages that were assumed since we believe that the site traffic would be more heavily weighted to and from the north as reflected by the traffic count. Please revise the TIS to show that 65% of the site traffic exit to the north both AM and PM and enter from the north both AM and PM. Traffic to and from the south AM and PM should be 35%.**

   Response: The original distribution percentages were due to the assumption that the majority of residents exiting the townhouse development in the PM peak would be more likely to travel to the south towards Seymour. Since this

development is located so far south of Knoxville, the attractiveness of the retail, commercial, and restaurant businesses in and along Seymour persuaded assuming the distribution as shown.

However, to meet the expectations and address the comment, the study has been revised to show 65% of the site traffic exiting and entering from the north during the AM and PM peak hours. Likewise, traffic distribution has been changed to show 35% to and from the south during the AM and PM peak hours. This distribution change is shown in Figure 6. This update changes Figures 7 and 8 and the results shown in Tables 4 and 5.

3. **Please note the specific obstruction that is inhibiting the sight distance to the south such as vegetation or curvature of the roadway.**

   Response: The specific obstruction that reduces sight distance to the south is due to the vertical curvature of Chapman Highway and is discussed in the second-to-last paragraph on Page 35.

4. **Please specifically address the design of the NB left turn lane in terms of whether a dedicated storage and taper should be provided or can just be left as-is with the standard TWLTL striping and hatched transition area. You should note also that TDOT will need to be coordinated regarding driveway permits and all associated requirements that they stipulate will need to be met.**

   Response: The report has been updated on Pages 2 and 40 to state that "it is not specifically recommended that the newly applied TWLTL pavement markings be modified on Chapman Highway" for northbound left turns. Also, on Page 2 and 42, a note has been added that states that the site designer will need to apply for a TDOT Highway Entrance Permit to construct the Proposed Entrance.

5. **Please cite the analysis/equations used to determine the required storage and taper length of the recommended SB right turn lane. Also please more clearly denote whether the length of 350' included the 100' taper or if they are separate.**

   Response: The report has been updated to include a brief discussion of the basis for the recommended right-turn lane distances. The length of the right-turn lane has been clarified in the report to state that the 100-foot and 350-foot distances are separate and result in a total length of 450'. This update has been made on Pages 2 and 41.

6. **We would like for both the site plan and TIS to reflect specific dimensions of the newly constructed TWLTL by TDOT and show it in relation to the development's driveway location. I have reached out to TDOT Region 1 Project Development staff and they indicated that the CADD files can be requested for you to incorporate in your plans by submitting the attached form. Please fill out the form and submit to**

Eric Wilson (eric.wilson@tn.gov) with TDOT as soon as possible to request the design file.

Response: The CADD files for Chapman Highway were obtained from TDOT. An image was added in the TIS to show the distance between the Proposed Entrance location and the ending of the full TWLTL (and the beginning of the transverse pavement markings). This additional information is shown in a figure on Page 40.

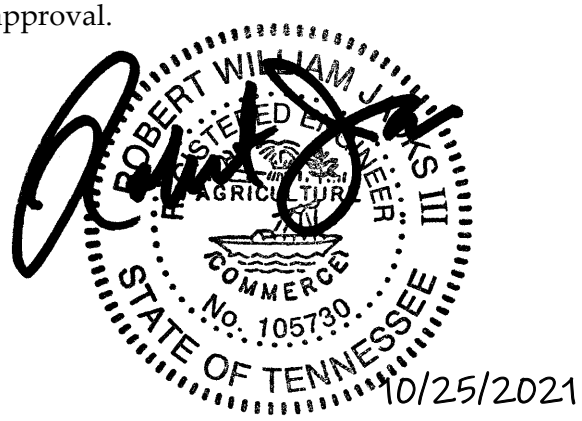
In addition to the requested revisions listed above, other changes in the report include the following:

- Updated Title Page
- Updated Table of Contents
- Updated Page Footers
- Updated Figure 3
- Updated Appendix H, I, and J
- Added Appendix K to include this response letter

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

Sincerely,

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



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