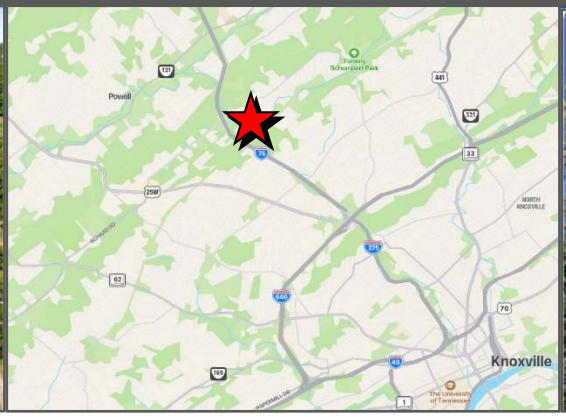
AJAX ENGINEERING

CIVIL ENGINEERING / TRAFFIC ENGINEERING

Transportation Impact Study
Hamilton Park Subdivision
Knoxville, Tennessee



July 2023

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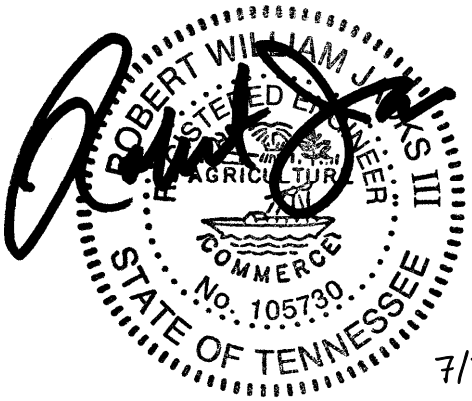

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TABLE OF CONTENTS

SECTION **PAGE**

APPENDIX

LIST OF FIGURES

FIGURE **PAGE**

LIST OF TABLES

TABLE **PAGE**

EXECUTIVE SUMMARY

Preface:

Beaver Creek Development, LLC proposes a residential development off Central Avenue Pike between Callahan Drive/Dante Road and Merchant Drive/Cedar Lane in Northwest Knoxville, TN. The proposed development will include constructing 105 attached townhouses on 31.46 +/- acres, named and referenced in this study as "Hamilton Park Subdivision". The development proposes two entrances on the east side of Central Avenue Pike at an existing t-intersection with Barberry Drive and at an existing commercial driveway. The development is anticipated to be fully built and occupied by 2026.

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

Study Results:

The significant findings of this study include the following:

- The Hamilton Park Subdivision, with 105 attached townhouse units, is estimated to generate 997 trips at full build-out and occupancy on an average weekday. Of these daily trips, 56 are estimated to occur during the AM peak hour and 80 in the PM peak hour in 2026.
- The proposed Road "A" North and South Entrances at Central Avenue Pike are expected to operate with reasonable vehicle delays in the projected AM and PM peak hours. The addition of the proposed Road "A" North and South Entrance approaches on Central Avenue Pike will operate adequately in 2026 with respect to vehicle capacity.
- The projected 2026 traffic volumes do not warrant the construction of separate left and right-turn lanes on Central Avenue Pike at either of the proposed entrances. Single exiting lanes for the proposed Road "A" North and South Entrances at Central Avenue Pike will be sufficient.

Recommendations:

The following recommendations are offered based on the study analyses to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. The recommendation marked with an asterisk indicates an existing transportation need and is not associated with the proposed development's projected impacts. More details regarding all the recommendations are discussed at the end of the report.

- The construction of separate left and right-turn lanes on Central Avenue Pike for entering vehicles at the proposed Road "A" North and South Entrances are not warranted based on the projected 2026 traffic volumes.
- It is recommended that Stop Signs (R1-1) be installed and 24" white stop bars be applied to the proposed Road "A" North and South Entrance approaches at Central Avenue Pike. The stop bars should be applied a minimum of 4 feet away from the edge of Central Avenue Pike and placed at the desired stopping point that maximizes the sight distance.
- Based on a posted speed limit of 40-mph on Central Avenue Pike, the required intersection sight distance is 445 feet for exiting left-turning vehicles at the Road "A" Entrances and 385 feet for exiting right-turning and crossing vehicles. The existing sight distances at the proposed Road "A" North entrance were estimated visually to be adequate in both directions. The existing sight distance to the north at the proposed Road "A" South entrance was estimated to be adequate but substandard to the south. A licensed land surveyor and the site designer must determine the extent of vegetation and earthen bank removal to the south along the east side of Central Avenue Pike that will need to be removed to ensure safe vehicle operations. Intersection sight distance at the proposed Road "A" Entrances at Central Avenue Pike must not be impacted by future landscaping or signage.
- When the new proposed Road "A" North Entrance is constructed, it is recommended that the existing Side Road Intersection (W2-2R) warning sign for southbound motorists on Central Avenue Pike to the north of Barberry Drive be replaced with a Cross Road Intersection (W2-1) warning sign.
- When the new proposed Road "A" South Entrance is constructed, due to the horizontal curvature of Central Avenue Pike, it is recommended that a Side Road Intersection (W2-2R) warning sign for northbound motorists on Central Avenue Pike be installed approximately 150 feet in advance of the new entrance road.

- When the new proposed Road "A" South Entrance is constructed, the existing Curve Sign (W1-2L) on the east side of Central Avenue Pike may need to be slightly adjusted in height or location to allow for the proper sight distance to the north from the entrances.

* • The existing sight distance from Barberry Drive, looking north on Central Avenue Pike, is severely restricted by two shrubs in the front yard at 100 Barberry Drive. These two shrubs are directly lined up with each other and should be removed. These shrubs are located outside the right-of-way and are located inside Knox County. Knox County will need to work with the homeowner to allow for the removal of these shrubs.

- 25-mph Speed Limit Signs (R2-1) are recommended to be posted near the beginning of the development entrances off Central Avenue Pike.
- Stop Signs (R1-1) and 24" white stop bars are recommended at both entrances at Central Avenue Pike and both ends of Road "B" in the proposed development.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping in the subdivisions. With a speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met.
- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- Internal sidewalks are proposed along Roads "A" and "B". Sidewalks should have appropriate ADA-compliant ramps at intersection corners, and the internal sidewalks are recommended to be 5 feet minimum in width to meet the City of Knoxville regulations. White crosswalks should be marked on the road pavement internally where pedestrians are expected to cross.
- All road grade and intersection elements should be designed to AASHTO, TDOT, and City of Knoxville 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 Central Avenue Pike, between Callahan Drive/Dante Road and Merchant Drive/Cedar Lane in Northwest Knoxville, TN. The development will be across from and east of Briarwood Estates, an older, established residential subdivision that has 35 single-family detached houses with singular access to Central Avenue Pike via Barberry Drive. The proposed entrances for the development will be located on Central Avenue Pike. One will be located at the existing t-intersection with Barberry Drive, and the other entrance will be located across from a driveway entrance to a small strip mall. As requested, transportation impacts associated with the development were analyzed on Central Avenue Pike, where the proposed development will have road access to and from external destinations.

View of Development Site along Central Avenue Pike
(Looking Southeast across from Central Avenue Pike)

The proposed development property is in a suburbanized area of Northwest Knoxville, TN. There is an established subdivision, a few standalone single-family homes, apartments, some remaining unused/woodland properties, two electric power substations, and many commercial and retail businesses near the proposed development site. The residential development will be close to Interstate 75, with the nearest access via Callahan Drive at Exit 110. This interstate interchange will be a half-mile from the development.

The existing development site has challenging topography, with the southern portion of the property sloped towards the north. The development property will be built on a single existing parcel. The existing property does not have any buildings or occupied houses. Most of the land is currently occupied with woodlands and scrub brush. Easements and powerline structures heavily occupy the property's rear (eastern side).

Figure 1
Location Map

- **EXISTING ROADWAYS:**

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

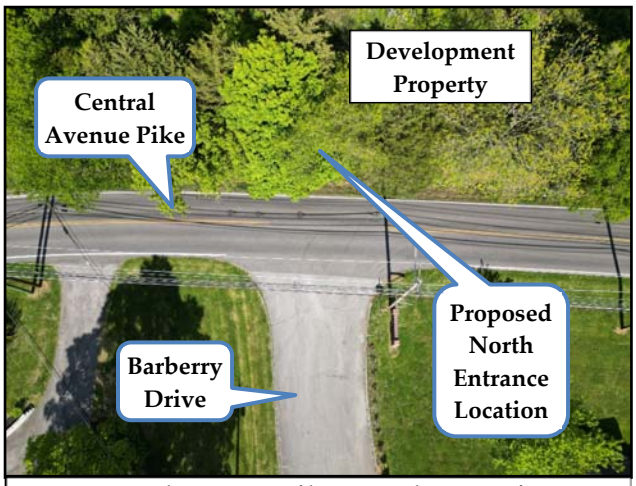
TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION [1]	SPEED LIMIT	LANES	ROAD WIDTH [2]	TRANSIT [3]	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Central Avenue Pike	Minor Arterial	40 mph	2	24.5 feet	None	None	No bike lanes
Barberry Drive	Local Street	25 mph	2	26 feet	None	None	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

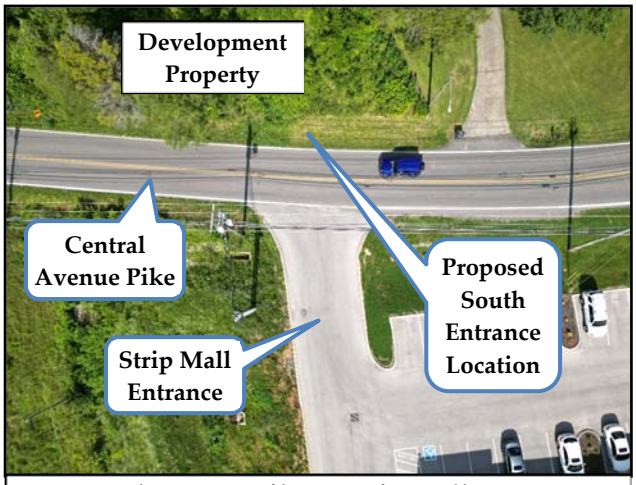
Central Avenue Pike is a 2-lane minor arterial that traverses in a generally north-south direction. Central Avenue Pike is 4.4 miles long and runs between East Emory Road (SR 131) at Heiskell Road on the north side and ends at a vertical curve below a railroad underpass to the south. On the other side of this railroad underpass, the vertical curve continues to the east, and the roadway name transitions to Dutch Valley Drive. Central Avenue Pike provides convenient access to Callahan Drive for northbound and southbound travel on Interstate 75 at Exit 110. A quarter-mile north of the development site, Central Avenue Pike intersects Callahan Drive and Dante Road at a 4-way intersection controlled by a traffic signal. The posted speed limit on Central Avenue Pike is 40 mph at the project site.

The pavement of Central Avenue Pike is 24.5 feet wide at Barberry Drive, where the proposed north entrance for the development will be constructed. Central Avenue Pike is delineated with a double yellow center line and white edge lines. The pavement width outside the white edge line varies but ranges around 1 to 2 feet. Central Avenue Pike does not have any curbing or sidewalks. LED utility street lights are provided along Central



Central Avenue Pike at Barberry Drive

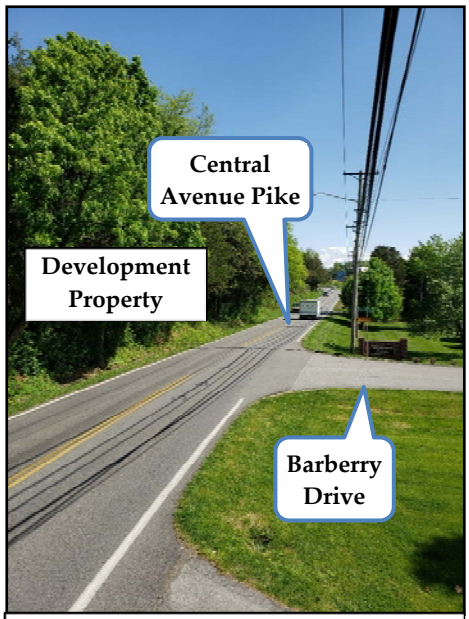
Avenue Pike in the adjacent study area. As stated earlier, Central Avenue Pike provides access to numerous commercial and retail businesses near the study area. These businesses are located north and south of the proposed development site. Most of these businesses are to the north around the intersection of Central Avenue Pike at Callahan Drive and Dante Road. Near the southern end of the development property, a small 8-unit strip mall is located on the opposite side of Central Avenue Pike. The proposed south entrance for the proposed development will be located across from the strip mall entrance driveway. At this location, the pavement on Central Avenue Pike is 22 feet in width. Further south on Central Avenue Pike, two businesses operate with larger vehicle operations: Aurora Pool, Spa and Billiards and Company Wrench, a heavy equipment sales and rental service. Due to larger vehicles entering and exiting these businesses, advance curve warning signage on Central Avenue Pike is posted in both directions with supplemental signage stating "Trucks Entering Highway".



Central Avenue Pike at Strip Mall Entrance

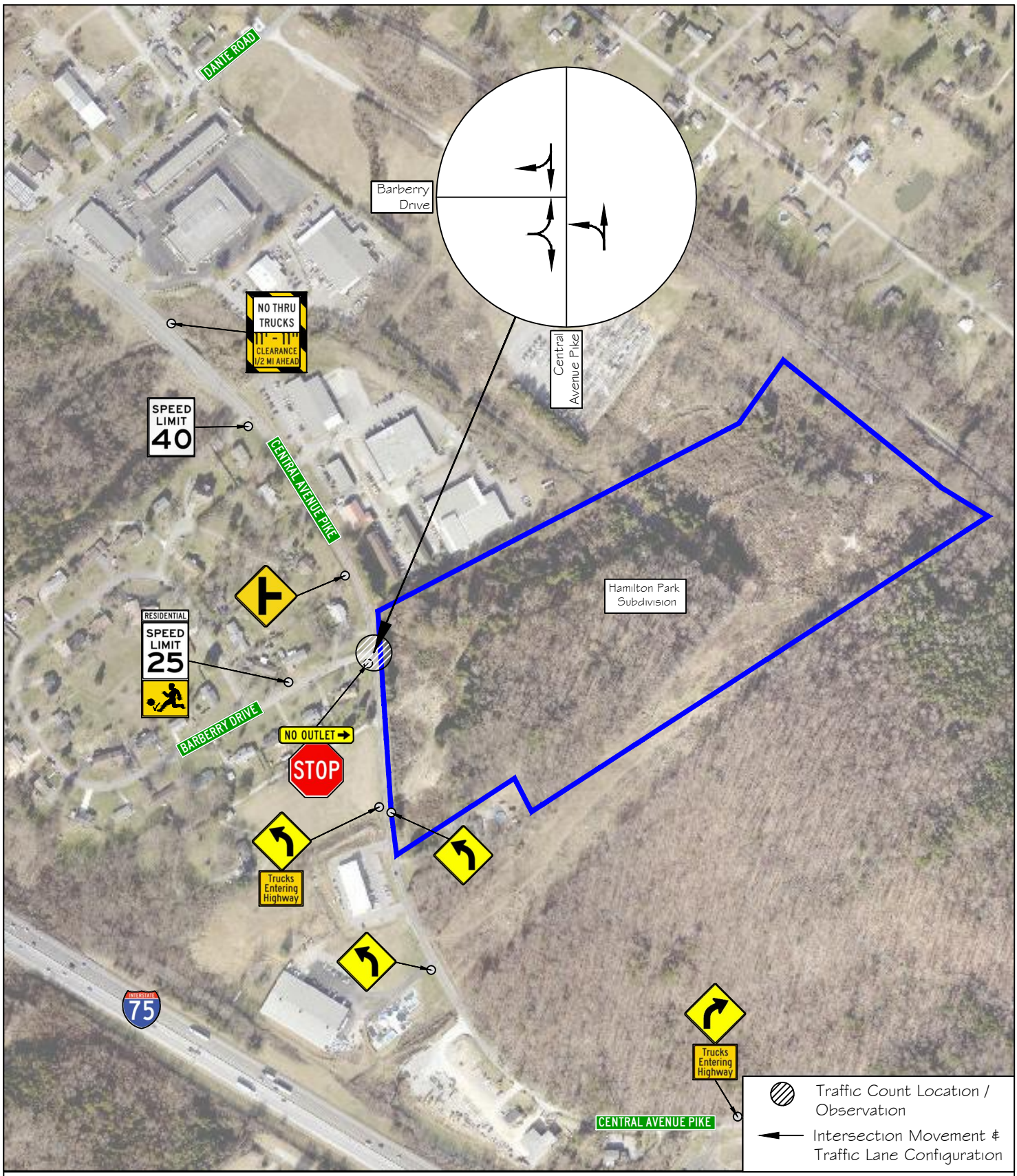
<u>Barberry Drive</u> intersects Central Avenue Pike to the west and on the other side of the proposed development property. The intersection of Central Avenue Pike at Barberry Drive is an unsignalized t-intersection. Barberry Drive operates under stop control at Central Avenue Pike.

Barberry Drive provides road access to Briarwood Estates, an older, established subdivision with 35 single-family detached houses. Barberry Drive is 26 feet in width from the edge of curb to the edge of curb and completes a circuitous pattern internally in the subdivision.



Central Avenue Pike at Barberry Drive (Looking South)

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



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NOT TO SCALE

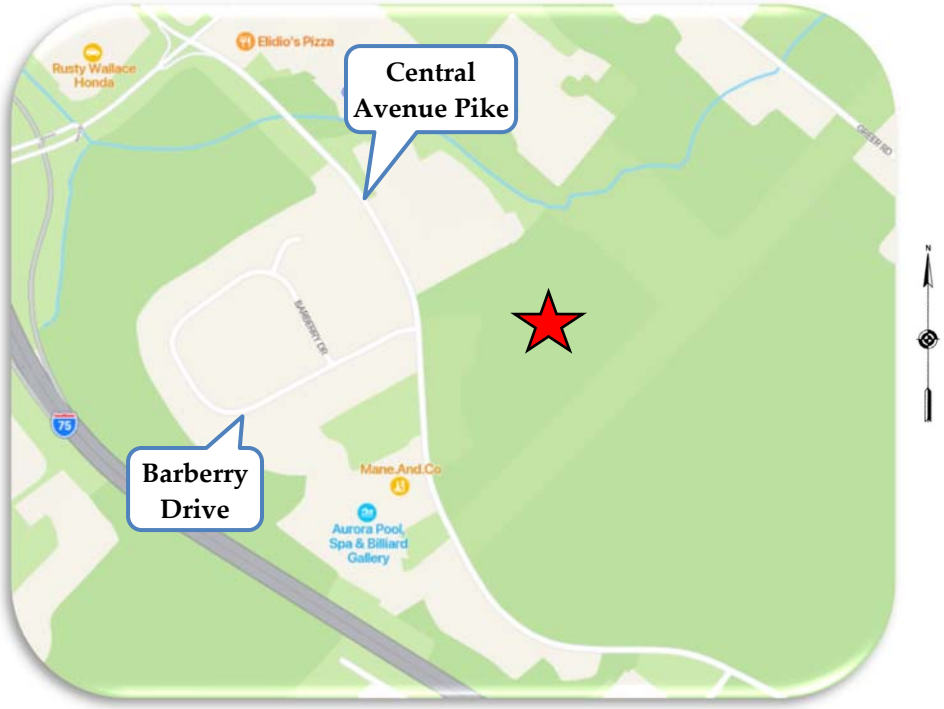
NORTH

FIGURE 2

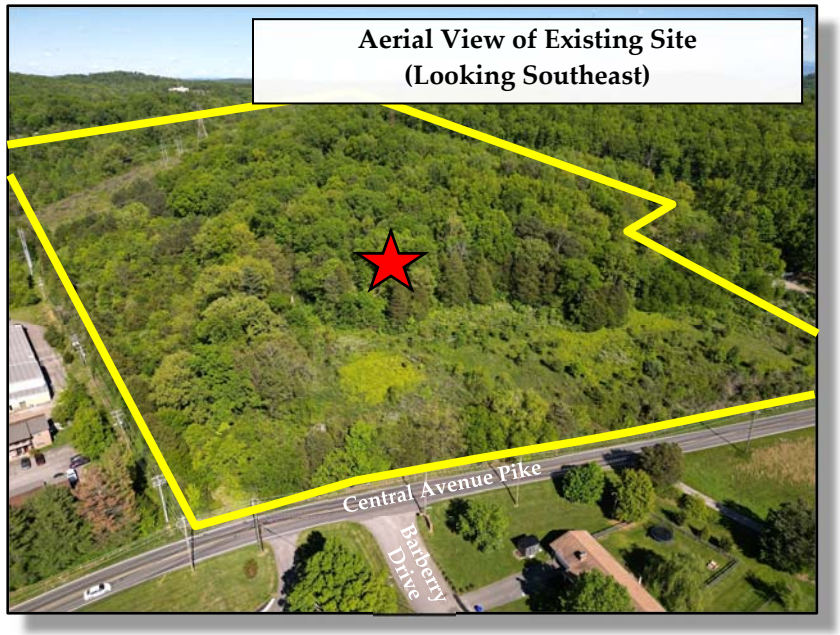
Hamilton Park Subdivision

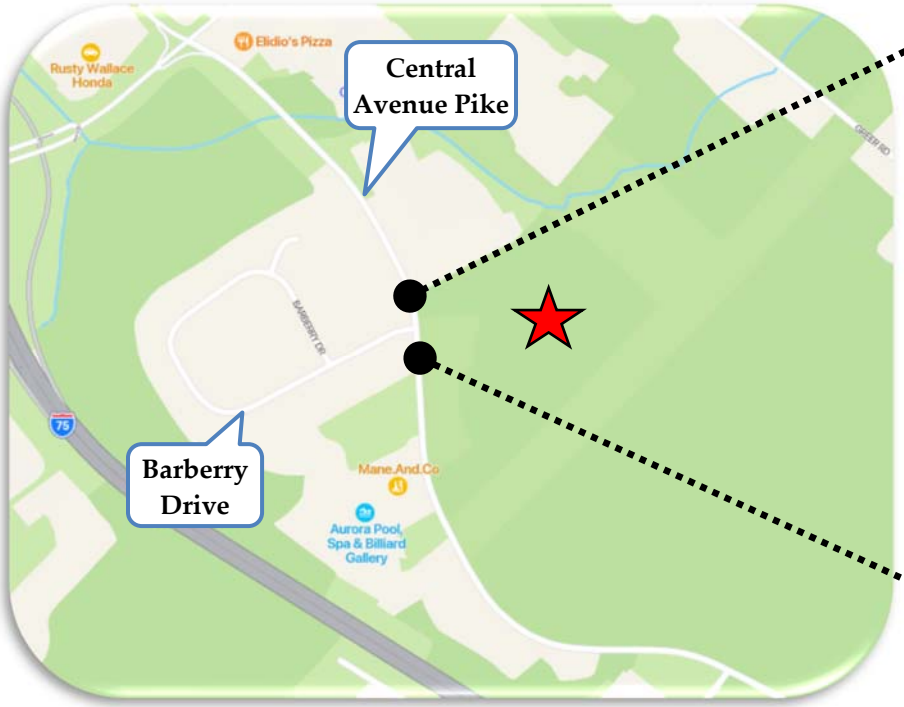
Traffic Count Location, Traffic Signage & Existing Lane Configurations

PHOTO EXHIBITS

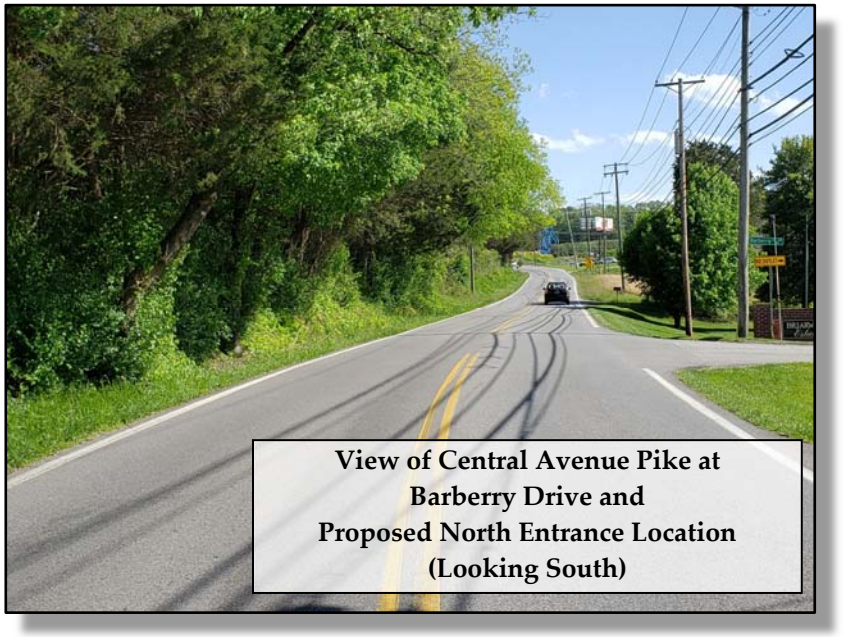


Central Avenue Pike at Proposed Development Site

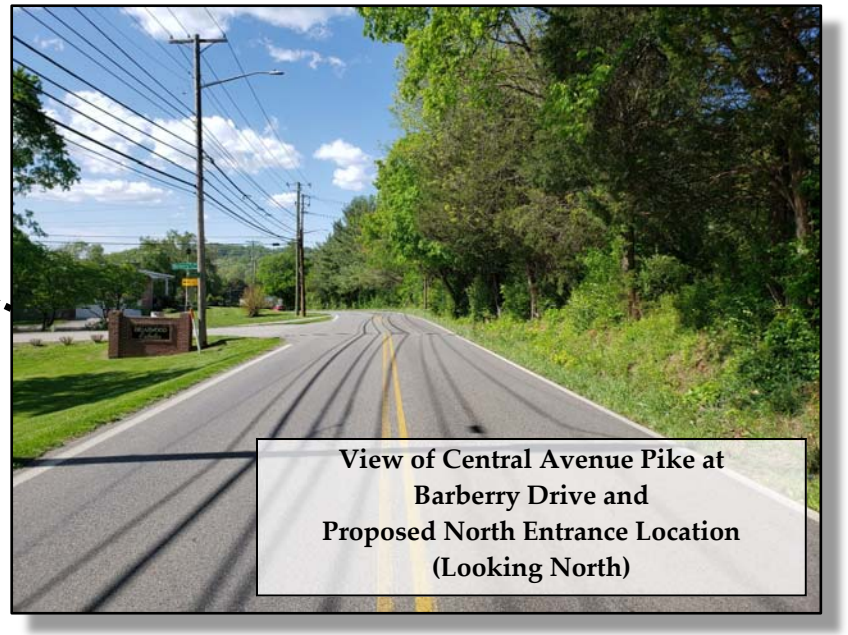




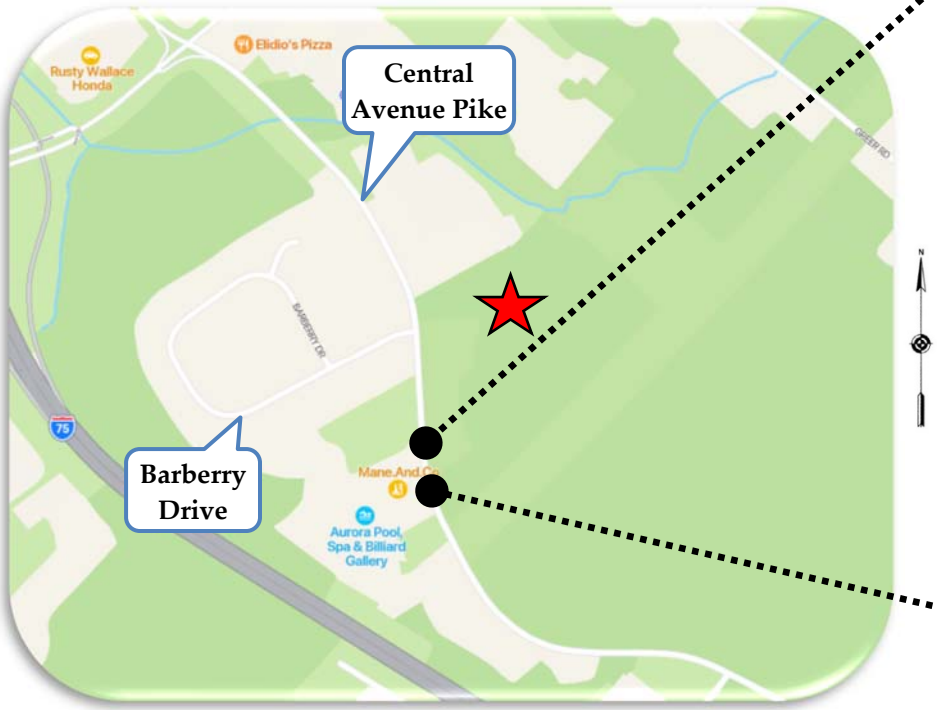
Central Avenue Pike and Barberry Drive at Proposed North Entrance Location



View of Central Avenue Pike at Barberry Drive and Proposed North Entrance Location (Looking South)

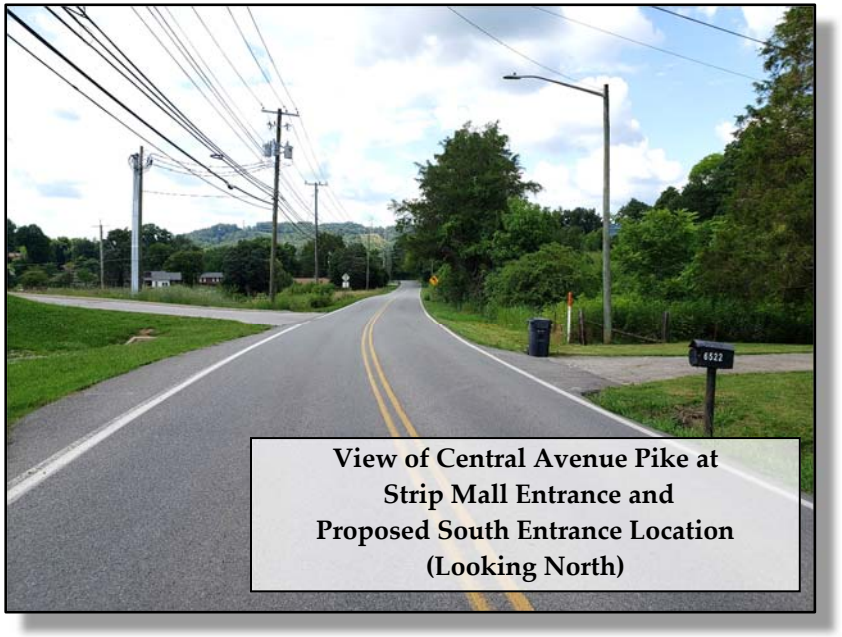


View of Central Avenue Pike at Barberry Drive and Proposed North Entrance Location (Looking North)



Central Avenue Pike and Strip Mall Entrance at Proposed South Entrance Location

View of Central Avenue Pike at Strip Mall Entrance and Proposed South Entrance Location (Looking South)



View of Central Avenue Pike at Strip Mall Entrance and Proposed South Entrance Location (Looking North)

- **EXISTING TRANSPORTATION VOLUMES PER MODE**:

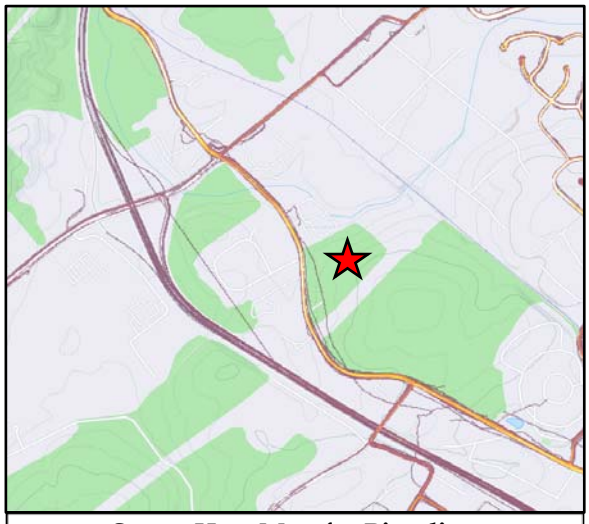
One annual vehicular traffic count location exists near the study area, and the Knoxville Regional Transportation Planning Organization (TPO) conducts this count. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
  - TPO reported an Average Daily Traffic (ADT) on Central Avenue Pike, south of Barberry Drive and the development site, at 7,026 vehicles per day in 2022. This count station has been conducted intermittently. From 2013 to 2022, this count station has indicated a 0.2% average annual traffic growth rate.

- Existing bicycle and pedestrian volumes:
  The average daily pedestrian and bicycle traffic is unknown along Central Avenue Pike. However, with the lack of sidewalks and bike lanes, this corridor is assumed to have minimal pedestrian and bicyclist activity. However, the commercial and retail developments north and south of the study area could generate some non-motorized traffic. During the 6-hour traffic count for this project, no bicyclists or pedestrians were observed on Central Avenue Pike.

  An online website, strava.com, provides "heat" maps detailing exercise routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the roads with color

Strava Heat Map for Pedestrian and Joggers



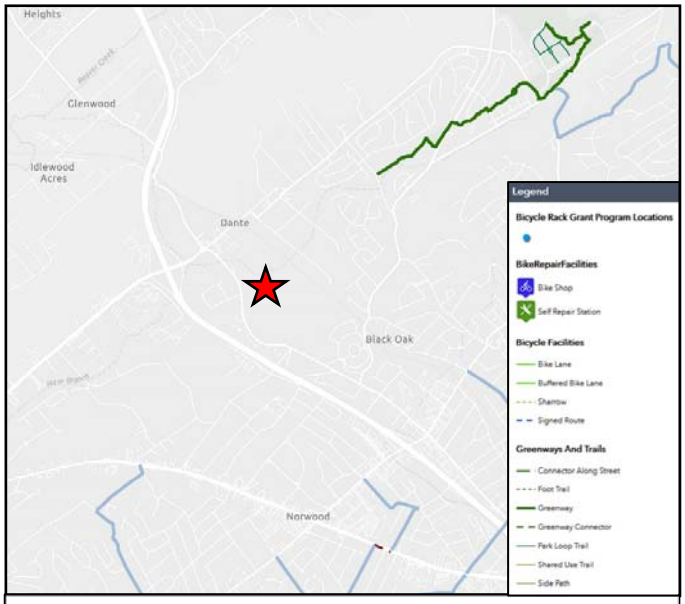
Strava Heat Map for Bicyclists

intensities with lighter colors signifying higher activity. The Strava heat maps show some bicycle and pedestrian activity in the study area. Higher bicycle activity than pedestrian activity is shown along Central Avenue Pike.

The proposed Hamilton Park Subdivision will be located south of retail and commercial developments at the intersection of Central Avenue Pike at Callahan Drive and Dante Road. The subdivision will also be north and east of the small 8-unit strip mall. These businesses could generate pedestrian activity but are not expected to generate measurable bicycle or pedestrian trips that would significantly reduce vehicle trips to and from the proposed development. Thus, these potential vehicle trip reductions are ignored for the study analyses.

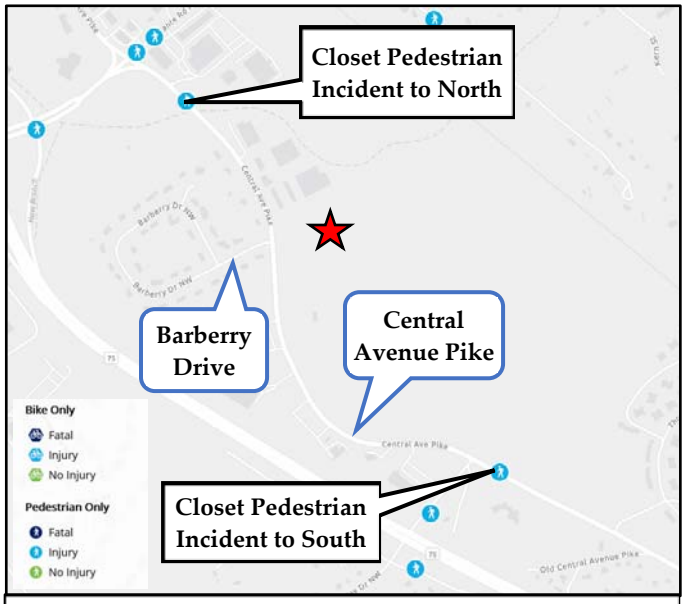
- **PEDESTRIAN AND BICYCLE FACILITIES**:

Sidewalks are not provided on Central Avenue Pike adjacent to the development property. Bike lanes are not available either. The closest bike facilities are located to the northeast at the Sterchi Hills Greenway and Sterchi Hills Park. Other bike facilities in the surrounding area are on roadways south of Cedar Lane and the other side of Interstate 75. These roads are designated as a "Comfortable Route" on KGIs mapping. A "Comfortable Route" is defined as a route "based on low to medium traffic speeds and volumes along with other criteria.



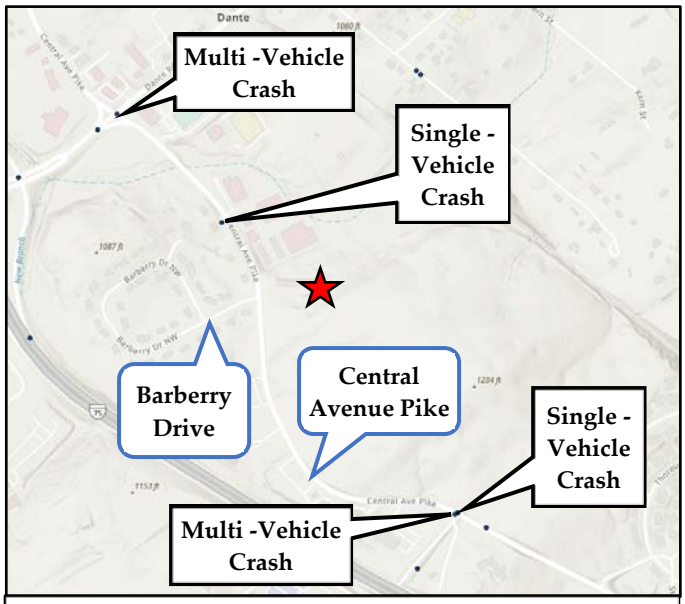
Bicycle Facilities and Routes in the Surrounding Area

- **CRASH DATA**:



Pedestrian/Bicycle Crash Data in Study Area

The Knoxville Transportation Planning Organization (TPO) provided a 2020 update to bicycle and pedestrian crash data for Knox County and other surrounding counties. The data shows none of these incident types occurred near the development site. However, several incidents have occurred near the Central Avenue Pike at Callahan Drive and Dante Road intersection. The nearest incident to the north involved a pedestrian on Central Avenue Pike, resulting in an injury. This incident occurred on June 16th, 2017, and no identification of crash factors was provided. The closest incident to the south on Central Avenue Pike occurred on March 14th, 2018, involved a pedestrian, and resulted in an injury. A lack of sidewalks was listed as a contributing factor to this incident.



Vehicular Crash Data in Study Area

The Knoxville TPO also provides data related to "Life-Altering Traffic Crashes". This data lists the location of traffic crashes in the Knoxville region that resulted in a fatality or serious injury between October 2016 and September 2021. The data shows several serious and fatal vehicular incidents have occurred north and south of the development site in the past few years.

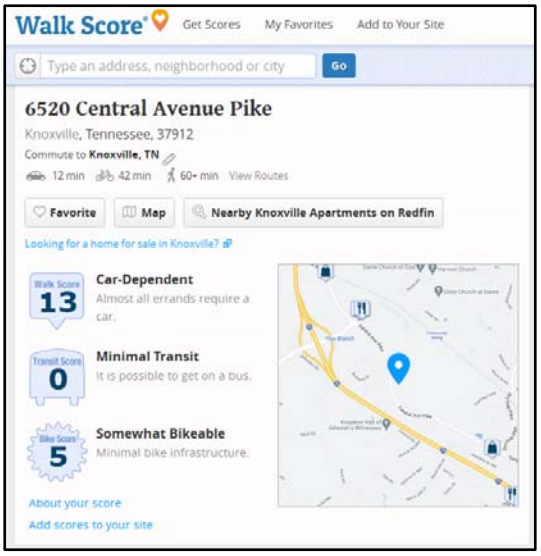
A multi-vehicle crash with a serious injury occurred on June 16th, 2017, at the Central Avenue Pike and Callahan Drive/Dante Road intersection. No crash factors for this incident are listed as being identified. To the south of this intersection and north of the

development site, a single-vehicle fatal crash occurred on February 14th, 2019. This incident was suspected of being due to a driver operating under the influence.

Two incidents are recorded at the intersection of Central Avenue Pike and Murray Drive to the south of the development site. The first one listed at the intersection was a single-vehicle fatal crash that occurred on August 1st, 2018. No crash factors for this incident are listed as being identified. The other crash involved multiple vehicles, resulted in a serious injury, and involved a teen and a senior driver. This incident occurred on May 24th, 2021, and no crash factors were identified.

- **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, Transit, and Bike Score at the approximate development property address at 6520 Central Avenue Pike. The project site location is graded with a Walk Score of 13. This Walk Score indicates that the site is car-dependent and that most errands currently require a vehicle for travel to and from the development property. The site is given a Transit Score of 0 since public transportation is unavailable near the development site. The site is given a Bike Score of 5. The lack of pedestrian and bike facilities and the distance to amenities reduce the Walk and Bike Scores at the development site.

- **TRANSIT SERVICES:**

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

KAT Route 90

The closest public transit bus service is 1.4 miles away to the southeast at the Central Avenue Pike and Cedar Lane intersection and is Route 90, "Crosstown". It operates on weekdays and weekends, and this route map is also 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 included in Appendix C. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.

Since the distance to the nearest public bus service is over a mile away, with no sidewalks or bike lanes available on Central Avenue Pike to access the bus stop, the proposed development is not expected to have reduced vehicle trips due to public transit usage.

PROJECT DESCRIPTION

- **LOCATION AND SITE PLAN:**

The proposed plan layout with 105 attached townhouses on 31.46 +/- acres is designed by Urban Engineering, Inc. and is shown in Figure 3. The design shows two new streets constructed for the residential development. The entrance road, Road "A", will be 2,228 feet long, complete a loop inside the proposed development, and comprise the two entrances at Central Avenue Pike. Road "B" will intersect Road "A" twice in the development at t-intersections and will have a total length of 367 feet.

As shown in the figure, a north entrance will be constructed for the development at the intersection of Central Avenue Pike at Barberry Drive. This entrance will convert the exiting t-intersection into a 4-way intersection and will become the east approach. A south entrance will be constructed at the strip mall driveway, creating a 4-way intersection, and will become the east approach. The entrances for the development in the study are labeled as Road "A" North and South. For this study, the vehicle volumes entering and exiting the strip mall entrance are assumed to be minimal and ignored.

Rear (East Side) of Development Property – Occupied by Easements and Electric Powerlines

The Hamilton Park Subdivision will be located on one existing parcel. The total open space designated for the subdivision will be 12.99 acres. A portion of the open space will be reserved on the corners of the development property adjacent to Central Avenue Pike, which will be used for stormwater controls. Most of the open space will be on the development site's rear (east side) portion. This open space will remain undeveloped and is currently heavily occupied by easements for the Tennessee Valley Authority (TVA) and the Knoxville Utilities Board (KUB). These easements provide corridors for powerline transmission towers for electricity distribution from the adjacent TVA and KUB substations north of the development site off Dante Road. The rear of the property will also be adjacent to a single track owned by Norfolk Southern Railway. According to their inventory report, this track is on their Oakdale line and typically operates three times during the day and one time at night.

The total area of the development property covered by hillside protection is 24.83 acres. A short length of Knob Fork exists on the far northeastern portion of the Hamilton Park Subdivision development property and will not be impacted.

The smallest lot size for the attached townhouses will be 2,800 square feet (0.06 acre), with several lots closer to half-acre in area. Each townhouse will have a garage and driveway. An internal concrete sidewalk is proposed for this development and will complete a loop along Roads "A" and "B". A path will also be installed to connect the internal looped sidewalk with the large open space on the eastern side of the development. Two internal parking lots will be constructed with 34 vehicle parking spaces. One of the parking lots will be provided for a centralized USPS mail center, and both will be used for overflow parking for the residents.

The schedule for this new residential development's completion depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. The area's real estate and rental market is still experiencing large amounts of activity and growth. This study assumed that the total construction build-out of the development and full occupancy would occur within the next three years (2026).

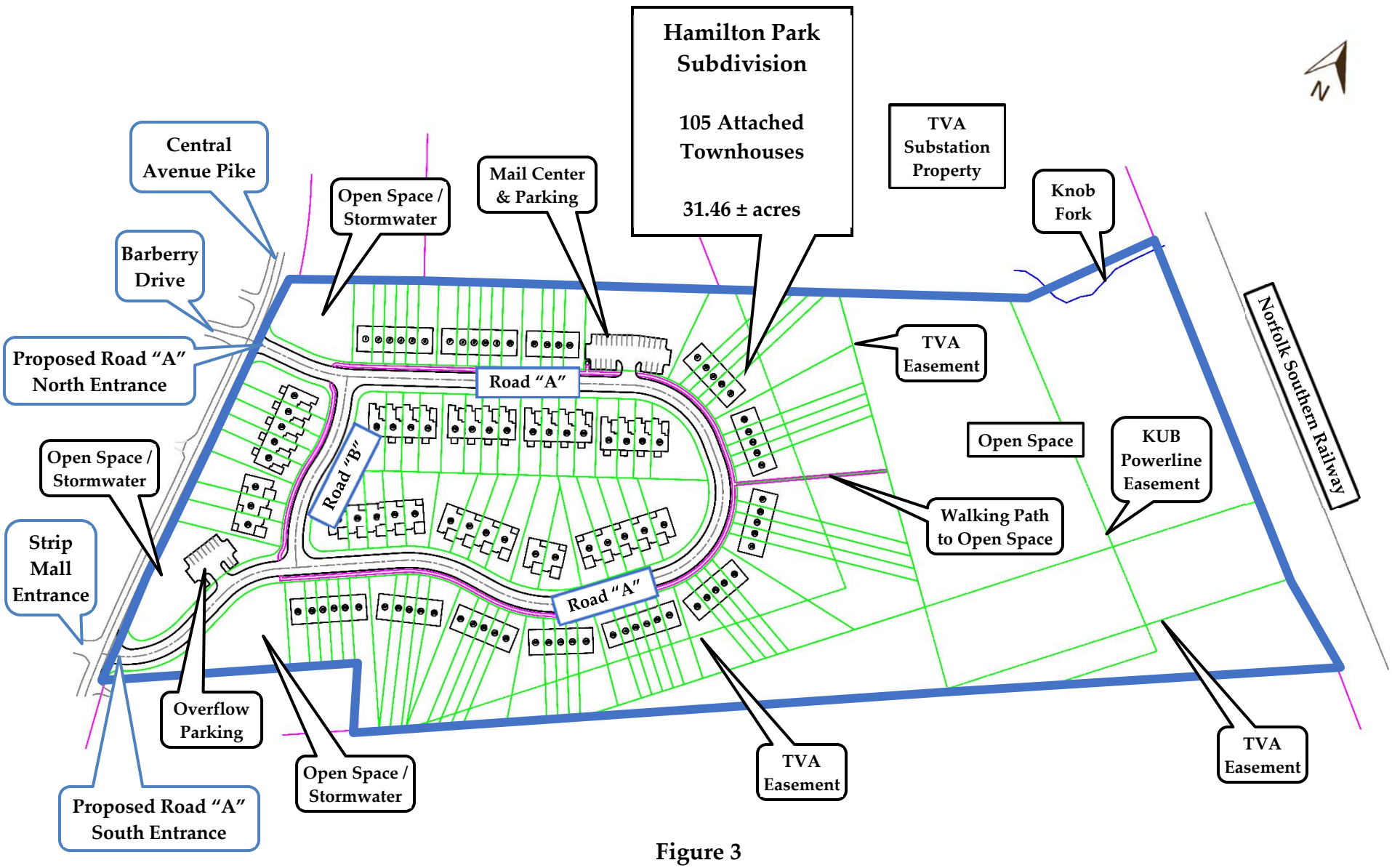


Figure 3
Proposed Plan Layout
Hamilton Park Subdivision

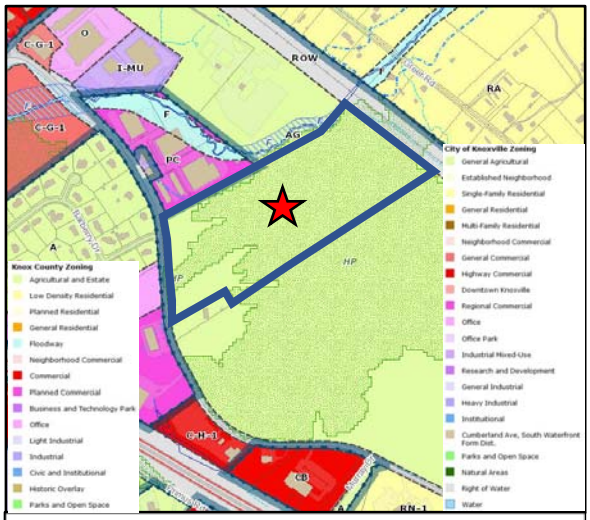
Not to Scale

- **PROPOSED USES AND ZONING REQUIREMENTS:**

The existing parcel comprising the Hamilton Park Subdivision development property is in the City of Knoxville and was recently requested to be rezoned. The rezoning was recommended to be approved by Knoxville/Knox County Planning and voted on by the Knoxville City Council on May 16th and May 30th. The property's existing zoning is General Agricultural (A) and is requested to be changed to General Residential Neighborhood (RN-3). The General Residential Neighborhood (RN-3) zone "is intended to accommodate medium density residential neighborhoods in the City of Knoxville characterized by one and two-family homes. Townhouse dwellings may be allowed by special use approval to facilitate a more urban development form." The most recently published online KGIS zoning map is provided in Appendix D. The existing adjacent surrounding zoning and land uses are the following:

- Central Avenue Pike binds the development site to the west. To the northwest of the development site and across Central Avenue Pike, two parcels are zoned as Agricultural (A), are in Briarwood Estates Subdivision, and are occupied with single-family detached houses. Briarwood Estates Subdivision is in Knox County, and the 35 single-family houses in the subdivision have road access to Central Avenue Pike via Barberry Drive. To the west and across Central Avenue Pike, one parcel is in Knox County and zoned as Office, Medical and Related Services (OB) and is occupied by a single-family detached house that appears to be abandoned. To the southwest and across Central Avenue Pike, one parcel is in Knox County and zoned Planned Commercial (PC). This parcel has two developments – a small 8-unit strip mall and Aurora Pool, Spa and Billiards.
- To the north of the development site, the three adjacent parcels are occupied separately by an apartment complex, a large commercial building, and a TVA substation. The apartment complex and the large commercial building are outside the city limits, and the parcels are zoned as Planned Commercial (PC). These properties have access to Central Avenue Pike to the north at a shared driveway entrance via internal paved areas. The TVA property is in the City of Knoxville, is zoned as General Agriculture (A), and has external road access via a long driveway to the north to Dante Road. The properties to the north and the proposed subdivision property both have a small sliver of an area zoned as Floodway (F) along Knob Fork.
- The development property is bound to the east by the Norfolk Southern Railway and is zoned as Right-of-Way (ROW).

- A single large parcel binds most of the proposed subdivision property to the south. This parcel is undeveloped, covered in woodlands, located in the City of Knoxville, and currently zoned as General Agricultural (A). This property has recently been requested to change its zoning to Multi-Family Residential Neighborhood (RN-6). At the time of this study, no specific development plans for this property have been submitted to Knoxville/Knox County Planning.
- To the southwest of the development site, one adjacent small property is occupied by a single-family detached house and zoned as General Agricultural (A) in the City of Knoxville. This parcel has direct road access to Central Avenue Pike via a single driveway.



KGIS Existing Zoning Map

KGIS Existing Land Use Map

- **DEVELOPMENT DENSITY:**

The Hamilton Park Subdivision development's proposed density is based on a maximum of 105 units on 31.46 acres. One-hundred-fifteen dwelling units on 31.46 acres compute to 3.34 dwelling units per acre.

- **ON-SITE CIRCULATION:**

The total length of the internal subdivision roads will be 2,595 feet (0.49 miles) and will be designed and constructed to the City of Knoxville specifications. The development will have asphalt-paved internal roadways with 8" extruded concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. The public right-of-way width within the

development will be 50 feet. Concrete sidewalks are proposed along the internal roads in this development. The City of Knoxville will maintain the streets in the development after construction, and these will be dedicated public roads.

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

Besides residential passenger vehicles, the internal roadways will provide access to service, delivery, maintenance, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. The City of Knoxville is expected to provide garbage collection services for this residential subdivision.

The new public streets will be designed and constructed to the City of Knoxville specifications and are expected to be adequate for fire protection and rescue vehicles, trash collection trucks, and single-unit delivery trucks. The development's internal drives will accommodate the larger vehicle types and residents' standard passenger vehicles.

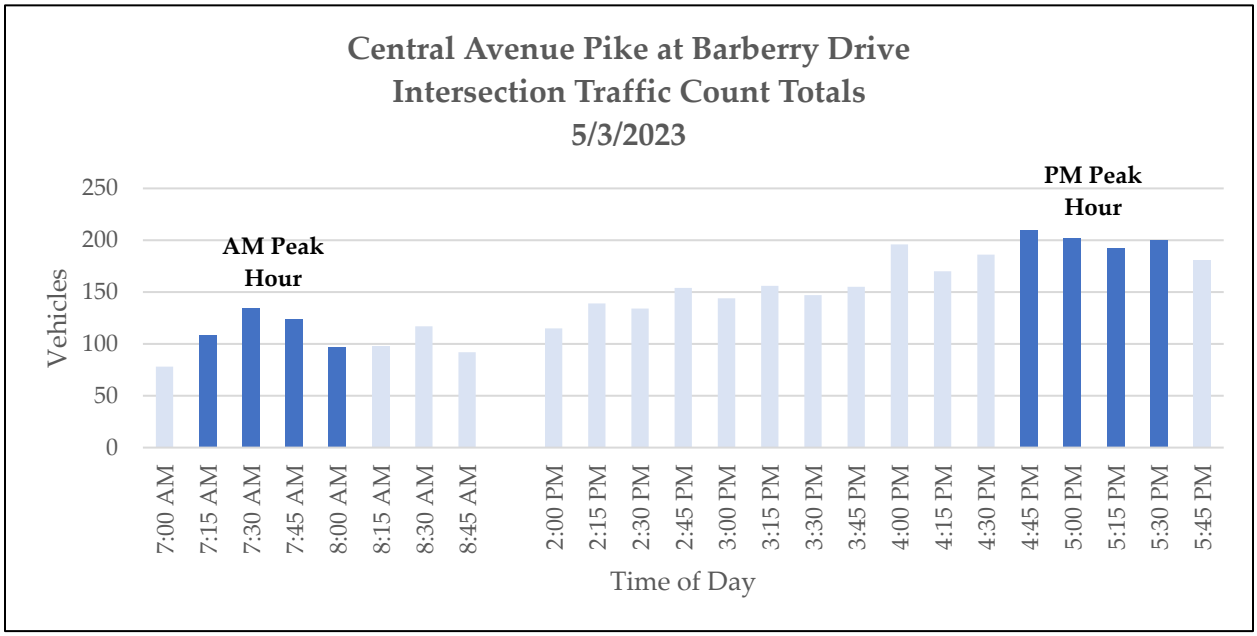
ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

- **EXISTING TRAFFIC CONDITIONS:**

This study conducted a 6-hour traffic count at the unsignalized t-intersection of Central Avenue Pike at Barberry Drive, adjacent to the proposed development site, on Wednesday, May 3rd, 2023. Manual traffic counts were conducted to tabulate the morning and afternoon peak period volumes, travel directions, and patterns near the proposed development site. Local schools were in session when the counts were conducted. Based on the traffic volumes collected at the intersection of Central Avenue Pike at Barberry Drive, the AM and PM peak hours were observed at 7:15 – 8:15 am and 4:45 – 5:45 pm.

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

- Most traffic observed during the traffic counts were typical passenger vehicles, with some large trucks and heavy vehicles in the thru movements on Central Avenue Pike. The large and heavy vehicles included trash collection trucks, several semi-tractor-trailer trucks, and larger construction-related trucks. Many Knox County school buses were observed during the traffic counts traveling on Central Avenue Pike.
- During the traffic count, no pedestrians or bicyclists were observed on Central Avenue Pike or Barberry Drive. However, one person was observed traveling northbound on Central Avenue Pike on the edge of the southbound lane on a motorized/electric scooter.



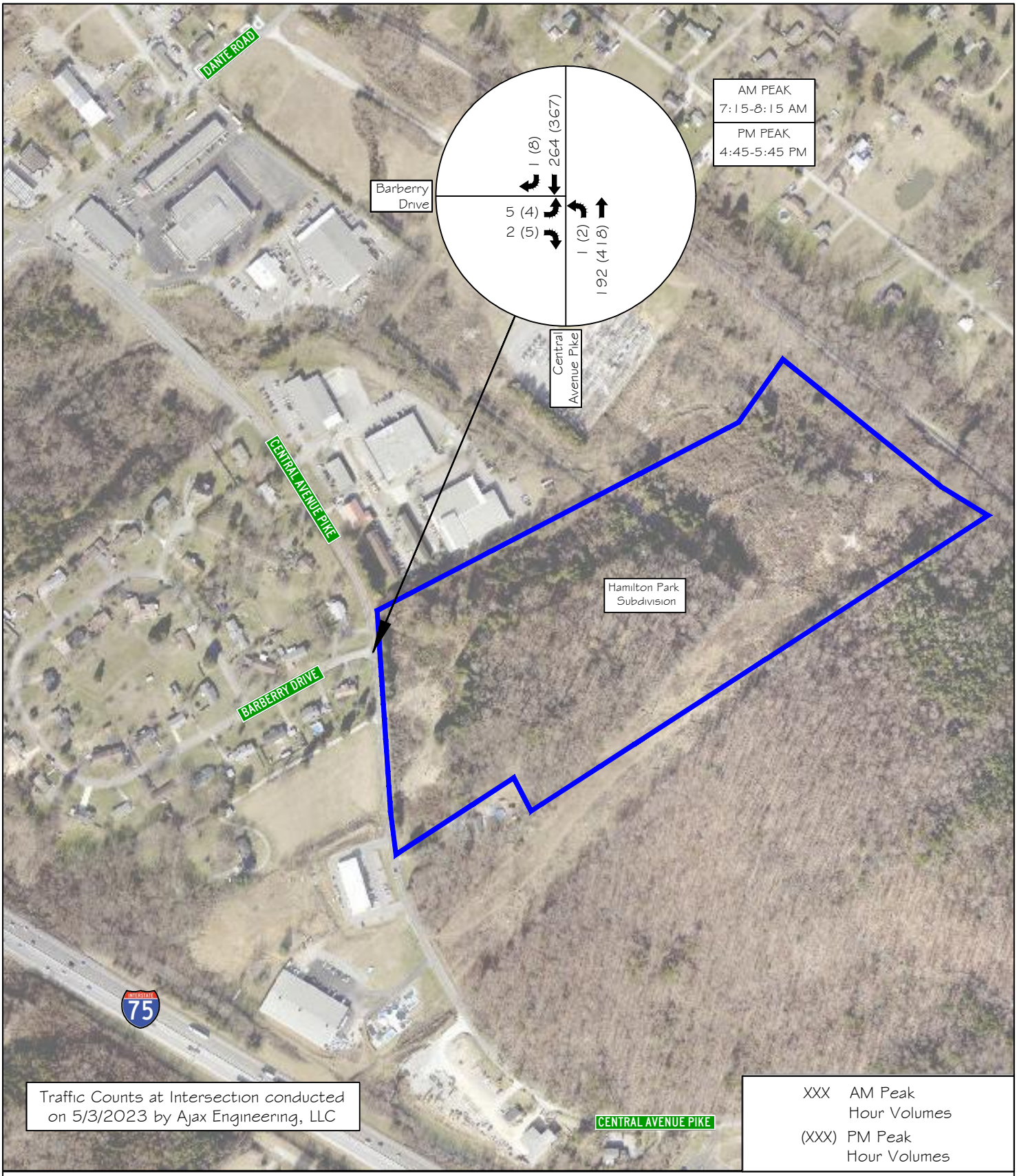


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FIGURE 4

Hamilton Park Subdivision

2023 Peak Hour Traffic Volumes - EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2023 traffic volumes shown in Figure 4 at the intersection of Central Avenue Pike at Barberry Drive. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and Synchro Traffic Software (Version 11).

Methodology:

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

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

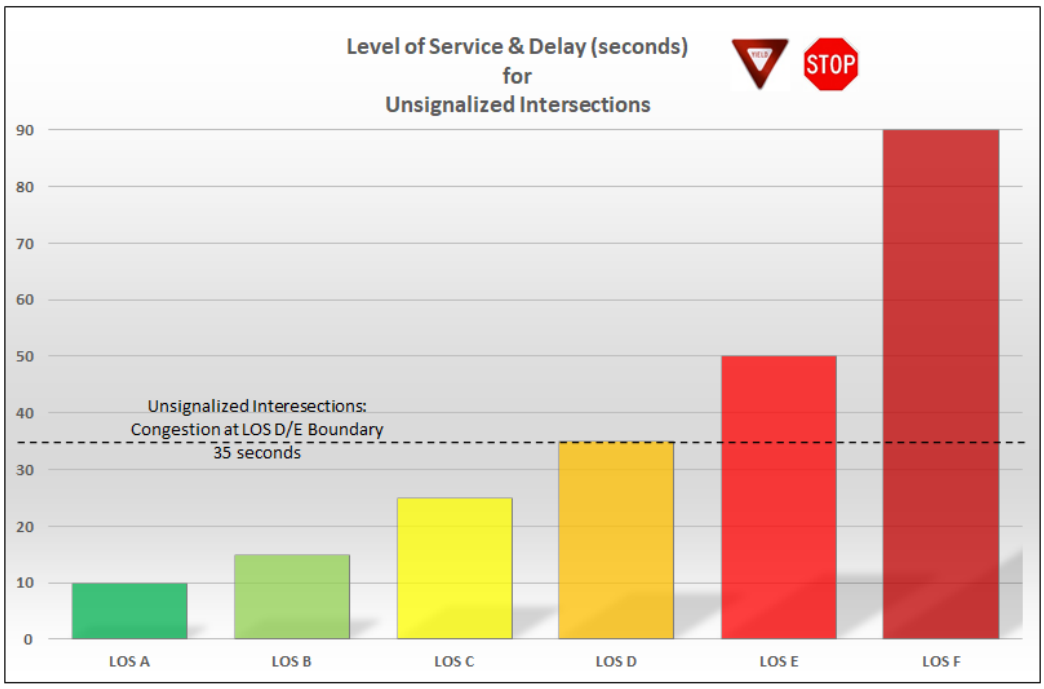
For unsignalized intersections, LOS is measured in terms of delay (in seconds). This measure is an attempt to quantify delay, including travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right-turn traffic does not stop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

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

TABLE 2
LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS

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

Source: Highway Capacity Manual, 6th Edition



Intersection capacity results from the existing 2023 peak hour traffic are shown in Table 3. The intersection in the table is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix F includes the worksheets for the existing 2023 peak hour capacity analyses.

As shown in Table 3, the intersection is calculated to operate with good to average LOS and reasonable vehicle delays in the existing 2023 conditions.

TABLE 3
2023 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING TRAFFIC CONDITIONS

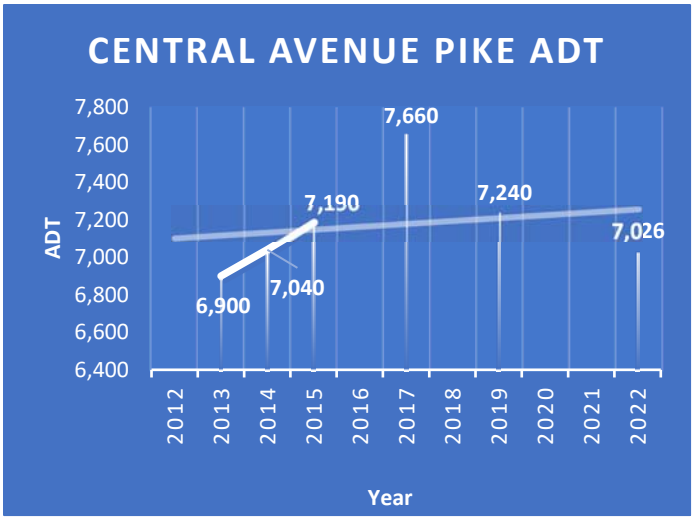
INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS [a]	DELAY [b] (seconds)	v/c [c]	LOS [a]	DELAY [b] (seconds)	v/c [c]
Central Avenue Pike (SB & NB) at Barberry Drive (EB)	STOP Unsignalized	Northbound Left	A	7.8	0.003	A	8.1	0.007
		Eastbound Left/Right	B	11.9	0.030	C	15.5	0.044

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **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 2026.

According to the TPO count station, vehicular traffic on Central Avenue Pike has shown minimal growth over the past nine years. Data in Appendix A shows that Central Avenue Pike, south of Barberry Drive, has experienced annual growth of only +0.2% over the past nine years. This data has been collected intermittently over the past nine years.



Annual growth rates were assumed and applied to the existing thru 2023 volumes tabulated on Central Avenue Pike to estimate the future volumes in the horizon year of 2026 without the potential development traffic. For this study, an annual growth rate of +2% was used to calculate future growth on Central Avenue Pike up to 2026 to account for potential traffic growth in the study area. Assuming a higher growth rate results in a conservative analysis. Capacity analyses were undertaken to determine the projected LOS in 2026 at the Central Avenue Pike at Barberry Drive intersection without the proposed developments' generated traffic. The results are shown in Table 4, and Appendix F includes the capacity analysis worksheets. The results in Table 4 are similar to the existing 2023 results shown in Table 3, but with slightly increased vehicle delays. Figure 5 shows the projected 2026 horizon year traffic volumes at the Central Avenue Pike at Barberry Drive intersection without the project during the AM and PM peak hours.

TABLE 4
2026 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED TRAFFIC CONDITIONS (WITHOUT 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]
Central Avenue Pike (SB & NB) at Barberry Drive (EB)	STOP Unsignalized	Northbound Left	A	7.8	0.003	A	8.2	0.007
		Eastbound Left/Right	B	12.2	0.031	C	16.3	0.048

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

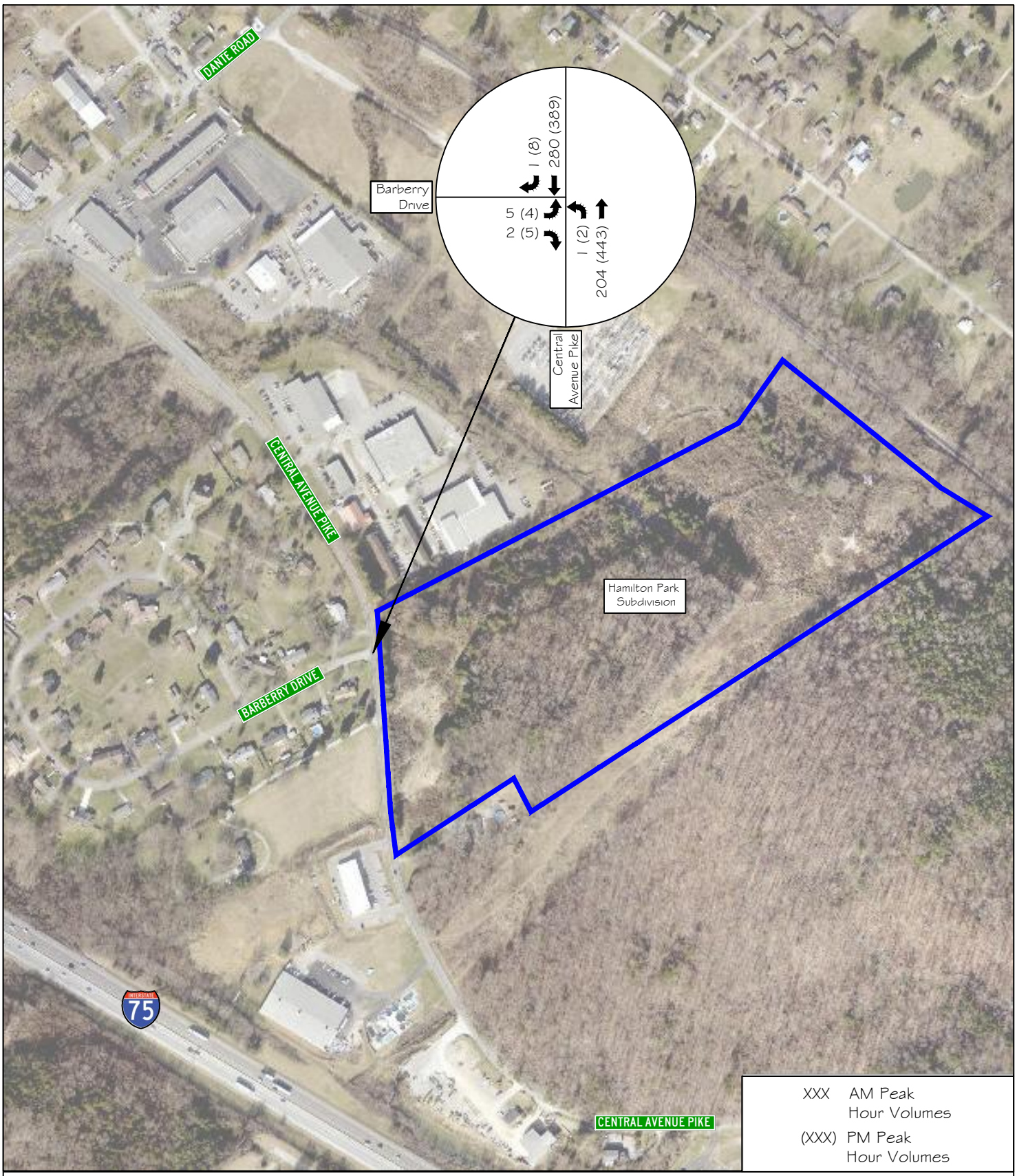


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FIGURE 5

Hamilton Park Subdivision

2026 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 Hamilton Park 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 G. A summary of this information is presented in the following table:

TABLE 5
TRIP GENERATION FOR HAMILTON PARK SUBDIVISION
105 Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Attached Townhouses	105	997	22%	78%		55%	45%	
				12	44	56	44	36	80
Total New Volume Site Trips			**997**	**12**	**44**	**56**	**44**	**36**	**80**

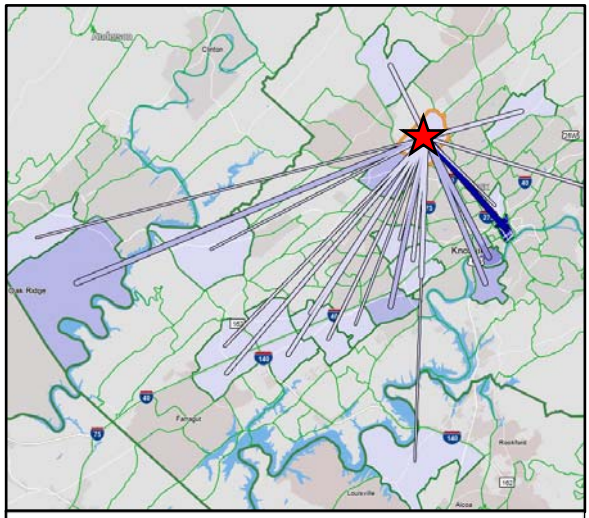
Data from Local Trip Rates and calculated by using Fitted Curve Equations

For the proposed residential development, it is estimated that 12 vehicles will enter and 44 will exit, for a total of 56 generated trips during the AM peak hour in the year 2026. Similarly, it is estimated that 44 vehicles will enter and 36 will exit, for a total of 80 generated trips during the PM peak hour in the year 2026. The calculated trips generated for an average weekday are estimated to be 997 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

- **TRIP DISTRIBUTION AND ASSIGNMENT:**

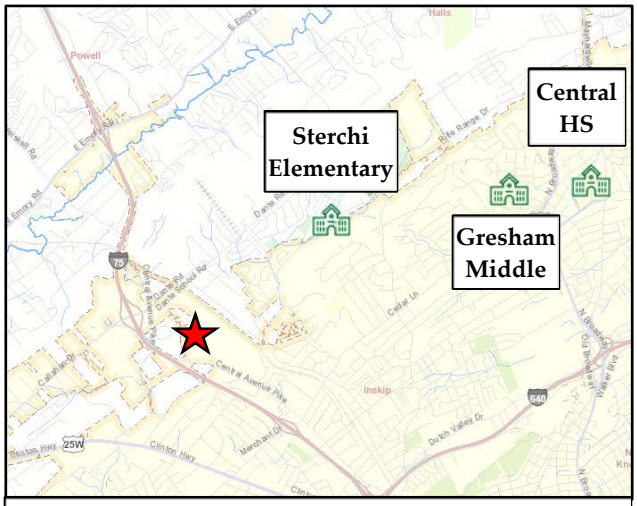
The projected trip distribution and assignment for the Hamilton Park Subdivision development are based on several sources and engineering judgment. The first source is based on the existing traffic count volumes and the observed travel directions collected at the intersection of Central Avenue Pike at Barberry Drive adjacent to the proposed development site.

During the traffic count, distinct directional splits were observed for the northbound and southbound Central Avenue Pike thru volumes during the morning and afternoon peak hours. In the AM peak hour, 58% of thru traffic on Central Avenue Pike was observed traveling south towards Cedar Lane and 42% north towards Callahan Drive/Dante Road. In the PM peak hour, the split on Central Avenue Pike was more even, with 47% heading south and 53% north. The vehicles entering the adjacent Briarwood Estates Subdivision at Barberry Drive were split evenly in the AM peak hour. In the PM peak hour, heavier entering traffic was observed from the north versus the south. In the AM peak hour, more vehicles exiting Barberry Drive headed north on Central Avenue Pike. More exiting vehicles were observed traveling south on Central Avenue Pike during the PM peak hour.



Top 25 Locations of
2019 Census Bureau Work-Based Trips to & from Census Tract 49

The second source for assisting in determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for generated trips by the development, and these trips are more likely to travel to and from the southwest and south. This assertion is based on data from the United States Bureau website for Census Tract 49, where the development property is located. Based on 2020 (latest available) census data and as shown in Appendix H, most work-based trips in the surrounding area correspond to downtown Knoxville, the University of Tennessee area, Oak Ridge, and areas of West Knoxville. For future travel to and from the development site, the proximity of the Interstate 75 interchange at Callahan Drive just to the northwest will likely draw a good portion of these trips.



Zoned Public School Locations

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 Sterchi Elementary, Gresham Middle, and Central High School. All these zoned public schools are located northeast of the development site. For parents and children not utilizing public school bus transportation, the most direct access to these schools will be by traveling south on Central Avenue Pike and the opposite for the return trips. Sterchi Elementary is the closest school to the development site at 2.4 miles away, and Central High School is the furthest at 5.0 miles away.

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 Road "A" Entrances at Central Avenue Pike. The splits shown at the two proposed entrances were based on the internal layout of the subdivision. 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 trip distribution was heavily based on the observed traffic at the intersection of Central Avenue Pike at Barberry Drive and the thru traffic flows adjacent to the site on Central Avenue Pike. The assumed distribution for the proposed subdivision retained the heavier entering southbound movements and exiting southbound movements in the PM peak hour to and from the Briarwood Estates Subdivision that was observed during the traffic count.

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

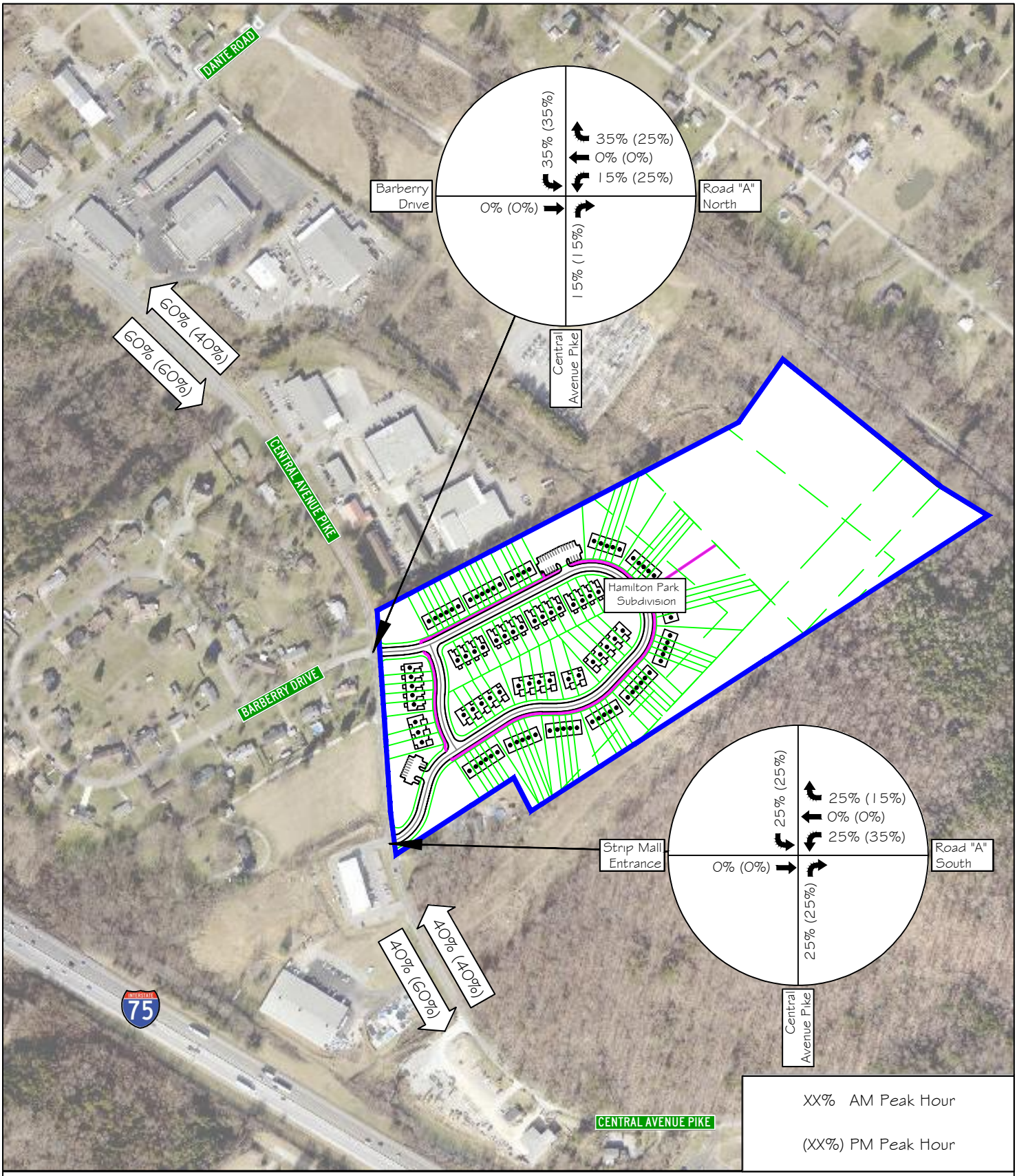


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FIGURE 6

Hamilton Park Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour

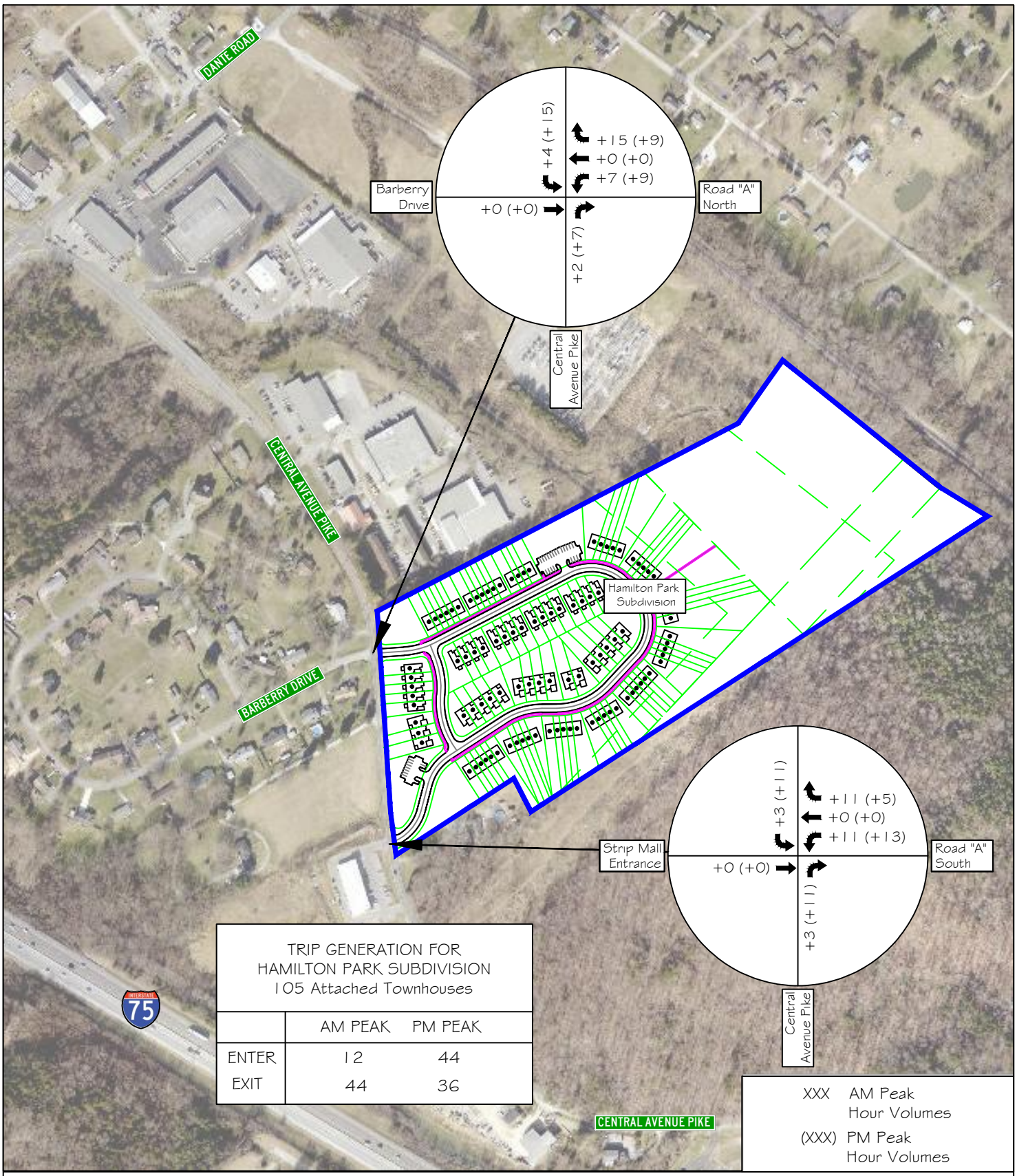

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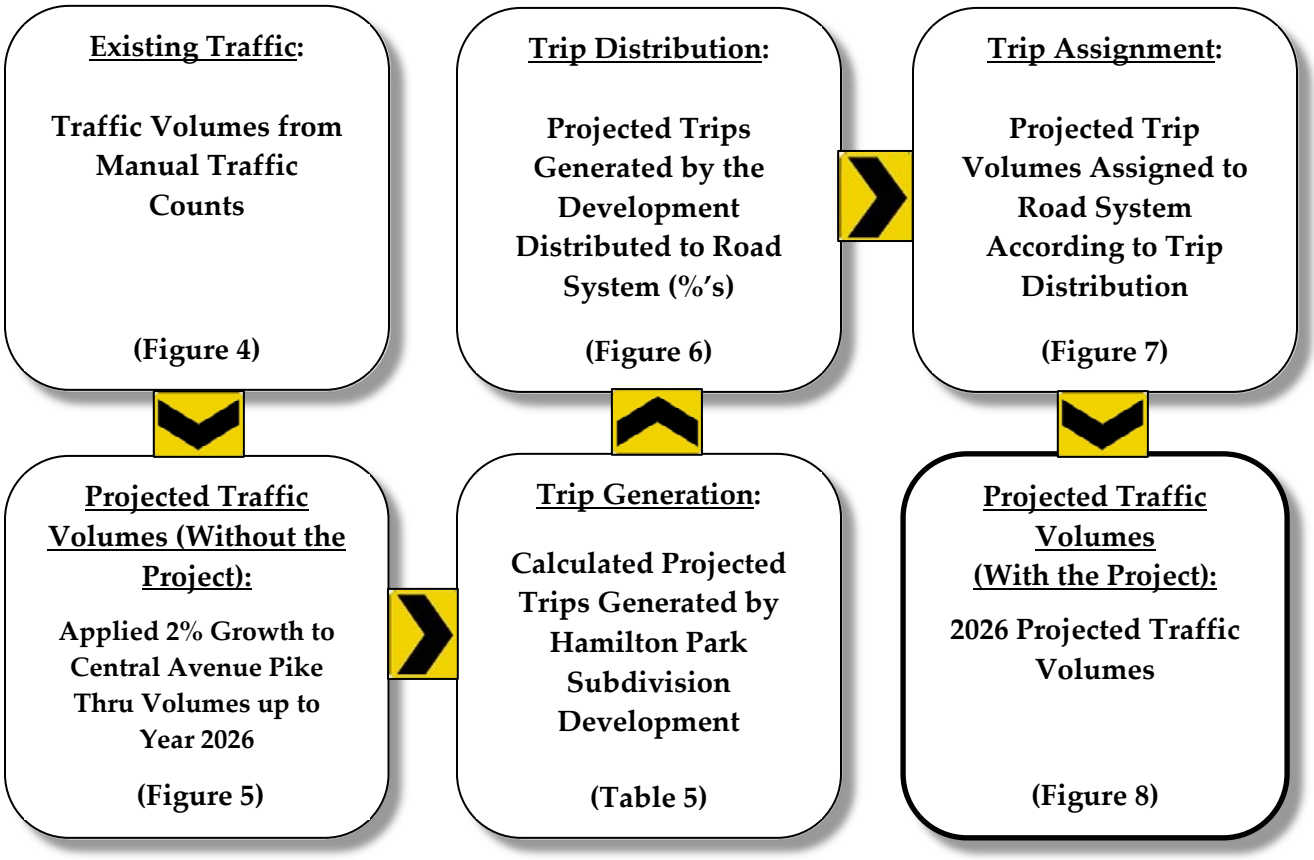
FIGURE 7

Hamilton Park 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 Road "A" Entrance intersections on Central Avenue Pike when the subdivision development is constructed and fully occupied in 2026. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 5) generated by the Hamilton Park Subdivision development was added to the 2026 horizon year traffic (Figure 5) by following the predicted trip distributions and assignments (Figures 6 and 7). This procedure was completed to obtain the total projected traffic volumes at the entrance intersections when the Hamilton Park Subdivision development is fully built and occupied in 2026. Figure 8 shows the projected 2026 AM and PM peak hour traffic volumes, including the generated development traffic at the intersections. The existing strip mall approach was not included in the Road "A" South entrance analysis due to the assumed minimal vehicle turning movements entering and exiting the strip mall driveway and is ignored for the analysis.

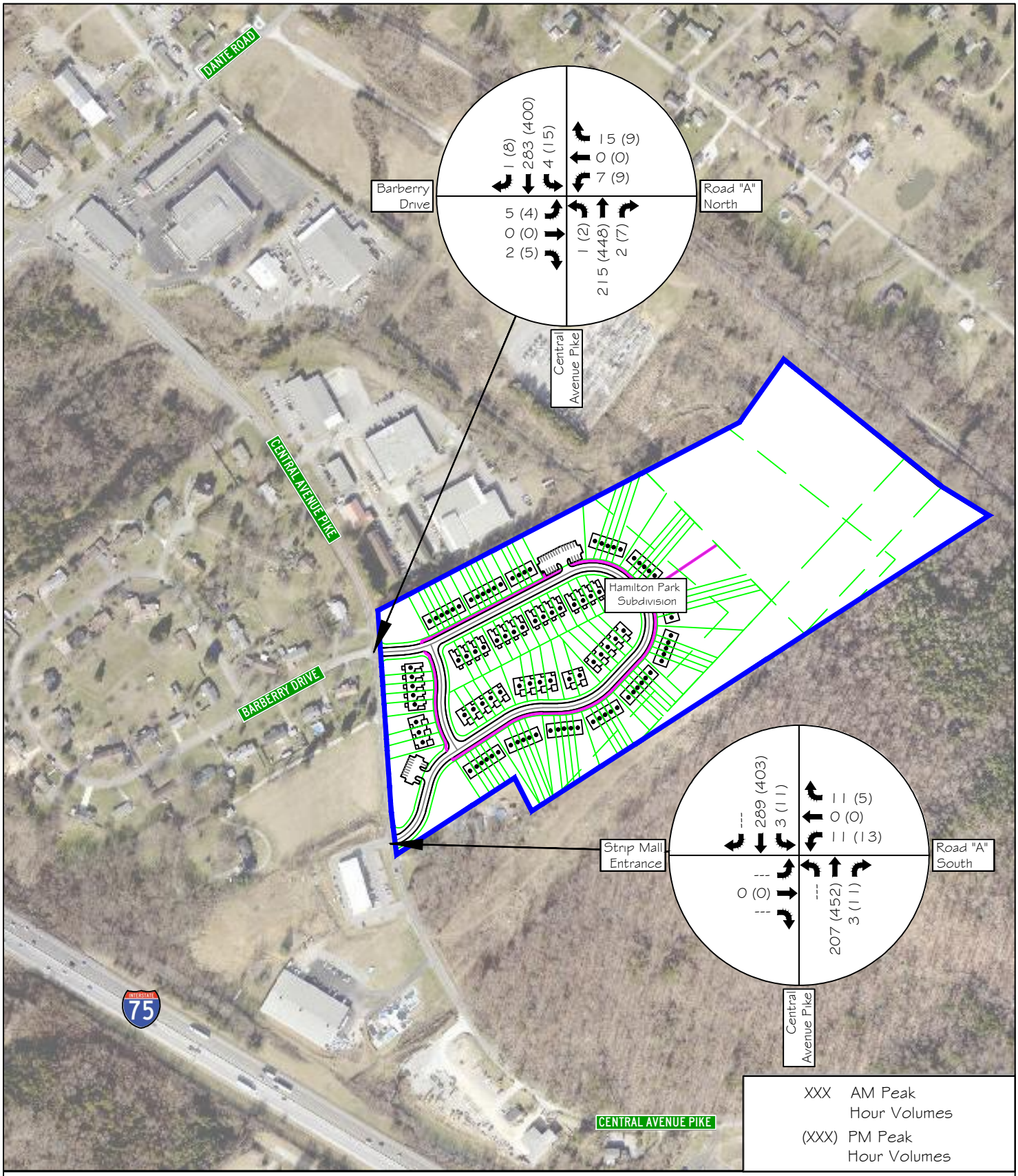


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FIGURE 8

Hamilton Park Subdivision

2026 Peak Hour Traffic Volumes - PROJECTED TRAFFIC CONDITIONS (WITH THE PROJECT)

Capacity analyses were conducted to determine the projected LOS at the entrance intersections with the development traffic in 2026. Appendix F includes the worksheets for these capacity analyses. The projected 2026 peak hour calculations with the project resulted in good to average LOS with reasonable vehicle delays, as shown in Table 6.

TABLE 6
2026 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]
Central Avenue Pike (SB & NB) at Barberry Drive (EB) and Proposed Road "A" North (WB)	Unsignalized	Northbound Left	A	7.8	0.003	A	8.2	0.007
		Eastbound Left/Thru/Right	B	13.3	0.035	C	19.7	0.061
		Westbound Left/Thru/Right	B	11.4	0.042	C	16.9	0.062
		Southbound Left	A	7.8	0.003	A	8.4	0.015
Central Avenue Pike (SB & NB) at Strip Mall Entrance (EB) and Proposed Road "A" South (WB)	Unsignalized	Northbound Left	-	-	-	-	-	-
		Eastbound Left/Thru/Right	-	-	-	-	-	-
		Westbound Left/Thru/Right	B	11.5	0.042	C	16.5	0.060
		Southbound Left	A	7.8	0.003	A	8.4	0.011

Note: All analyses were calculated in Synchro 11 software and reported using HCM 2010 intersection methodology
[a] Level of Service , [b] Average Delay (sec/vehicle) , [c] Volume-to-Capacity Ratio

- **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

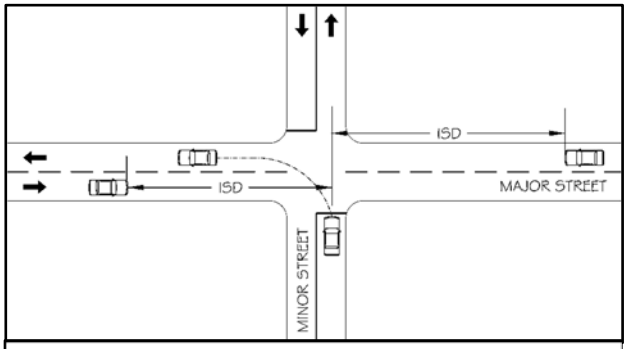
The study area was investigated for potential existing and future safety issues when the development is constructed. These transportation system features are discussed in the following pages.

- **EVALUATION OF SIGHT DISTANCE**

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

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

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



Intersection Sight Distance Diagram

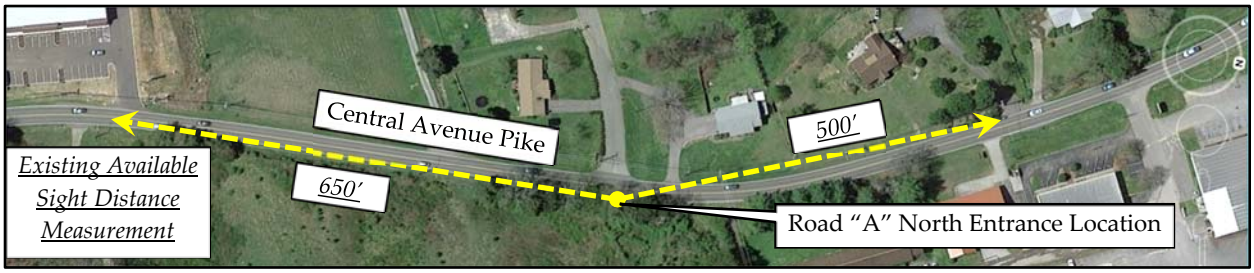
Three traffic maneuvers are available for vehicles stopped on a minor street at a 4-way intersection: (1) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being 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.

With a posted speed limit of 40-mph on Central Avenue Pike at the proposed Road "A" Entrances, the ISD is 385 feet for exiting right-turn (and crossing) movements and is calculated based on AASHTO's (American Association of State Highway Transportation Officials) guidance. For exiting left-turn movements at the proposed Road "A" Entrance, the ISD is calculated to be 445 feet.

Visual observations of the sight distances at the proposed entrance locations on Central Avenue Pike were undertaken. Using a Nikon Laser Rangefinder at the proposed Road "A" North Entrance location, the available sight distance was visually estimated to be 650' feet to the south and 500' feet to the north. The available sight distances from the proposed Road "A" North Entrance on Central Avenue Pike will be adequate based on visual observations. However, the sight distance to the north is reduced due to the nearby existing horizontal curve on Central Avenue Pike.

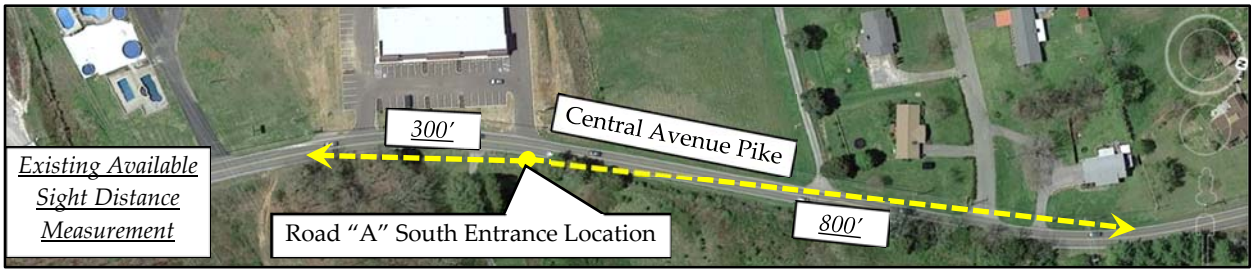
At the proposed Road "A" South Entrance location, the available sight distance was visually estimated to be 300' feet to the south and 800' feet to the north. The observation to the north is based on assuming that the existing roadside vegetation on the east side of Central Avenue Pike will be removed for construction. Based on visual observations, the available sight distances from the proposed Road "A" South Entrance on Central Avenue Pike will be adequate to the north. However, the sight distance to the south is reduced due to the nearby existing horizontal curve, vegetation, and earthen bank on the eastern side of Central Avenue Pike.

Images of the existing sight distances at the proposed Road "A" Entrance locations are labeled below with the ISD and rangefinder-measured sight distances.



View of Sight Distance on Central Avenue Pike at the Proposed Road "A" North Entrance Location (Looking South)

View of Sight Distance on Central Avenue Pike at the Proposed Road "A" North Entrance Location (Looking North)



View of Sight Distance on Central Avenue Pike at the Proposed Road "A" South Entrance Location (Looking South)

View of Sight Distance on Central Avenue Pike at the Proposed Road "A" South Entrance Location (Looking North)

- **EVALUATION OF TURN LANE THRESHOLDS**

The need for separate entering turn lanes was evaluated in the projected 2026 conditions for Central Avenue Pike at the proposed Road "A" Entrances.

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 entrances on Central Avenue Pike is within a 40-mph speed zone; thus, it was evaluated based on this speed.

According to Knox County's guidelines, separate left and right-turn lanes on Central Avenue Pike at the proposed subdivision entrances are not warranted based on the projected peak hour 2026 traffic volumes. The worksheets for these evaluations are provided in Appendix I.

- **PROJECTED VEHICLE QUEUES**

An additional software program was used to calculate the 2026 AM and PM peak hour projected vehicle queues at the studied intersection. The previously mentioned Synchro Traffic Software includes SimTraffic. The Synchro portion of the software performs the macroscopic calculations for intersections, and SimTraffic performs micro-simulation and animation of vehicular traffic. SimTraffic (Version 11) software was utilized to estimate the projected vehicle queues.

The 95th percentile vehicle queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The calculated vehicle queue results were based on averaging the outcome obtained during ten traffic simulations. The 95th percentile vehicle queue lengths at the intersection approaches are shown in Table 7 for the projected 2026 conditions with the project. The vehicle queue worksheet results from the SimTraffic software are in Appendix J.

TABLE 7
VEHICLE QUEUE SUMMARY -
2026 PROJECTED PEAK HOUR TRAFFIC (WITH THE PROJECT)

INTERSECTION	APPROACH/ MOVEMENT	SIMTRAFFIC 95th PERCENTILE QUEUE LENGTH (ft)	
		AM PEAK HOUR	PM PEAK HOUR
Central Avenue Pike (SB & NB) at Barberry Drive (EB) and Proposed Road "A" North (WB)	Eastbound	27	27
	Westbound	41	37
	Northbound	3	5
	Southbound	4	40
Central Avenue Pike (SB & NB) at Strip Mall Entrance (EB) and Proposed Road "A" South (WB)	Eastbound	-	-
	Westbound	35	34
	Northbound	-	-
	Southbound	9	22

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

Table 7 shows minimal projected queues at the intersections in the 2026 peak hour conditions. The projected vehicle queues for the exiting traffic in the 2026 AM and PM peak hours at the proposed Road "A" North and South Entrances are calculated to be reasonable.

CONCLUSIONS & RECOMMENDATIONS

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

Central Avenue Pike at Barberry Drive and Proposed Road "A" North Entrance: The 2026 projected level of service calculations for this intersection resulted in good to average vehicle delays and LOS.

1a) The construction of separate left and right-turn lanes on Central Avenue Pike for entering vehicles at the proposed Road "A" North Entrance is not warranted based on the projected 2026 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 Road "A" North Entrance approach at Central Avenue Pike. The stop bar should be applied a minimum of 4 feet away from the edge of Central Avenue Pike and placed at the desired stopping point that maximizes the sight distance.

1c) A single exiting lane for the Road "A" North development entrance at Central Avenue Pike will be sufficient. The westbound exiting lane of Road "A" North at Central Avenue Pike is proposed as a shared lane. The longest vehicle queue in the projected 2026 conditions on this exiting approach is calculated to be 41 feet in the AM peak hour and 37 feet in the PM peak hour. These queue lengths are reasonable and translate to just under two passenger cars, assuming a length of 25 feet per vehicle.

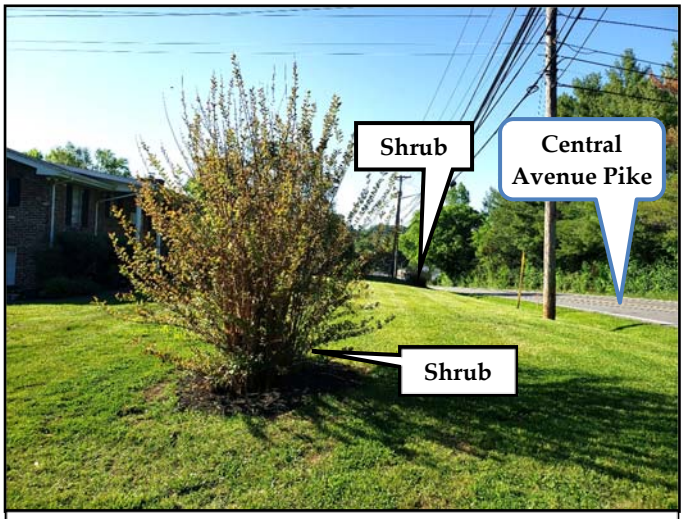
1d) Intersection sight distance at the proposed Road "A" North Entrance at Central Avenue Pike and Barberry Drive must not be impacted by future landscaping or signage. Based on a posted speed limit of 40-mph on Central Avenue Pike, the required intersection sight distance is 445 feet for exiting left-turning vehicles and 385 feet for exiting right-turning and crossing vehicles. The site designer must verify that these distances will be available.

1e) When the new proposed Road "A" North Entrance is constructed, it is recommended that the existing Side Road Intersection (W2-2R) warning sign for southbound motorists on Central Avenue Pike to the north of

W2-1

Barberry Drive be replaced with a Cross Road Intersection (W2-1) warning sign.

1f) The existing sight distance from Barberry Drive to the north on Central Avenue Pike is severely restricted by two shrubs in the front yard at 100 Barberry Drive. These two shrubs are directly lined up with each other and should be removed. These shrubs are located outside the right-of-way and are located inside Knox County. The horizontal curve on Central Avenue Pike and these shrubs offer a severe restriction of sight looking north from Barberry Drive. Knox County will need to work with the homeowner to allow for the removal of these shrubs.



Shrubs in Front Yard at 100 Barberry Drive (Looking North)

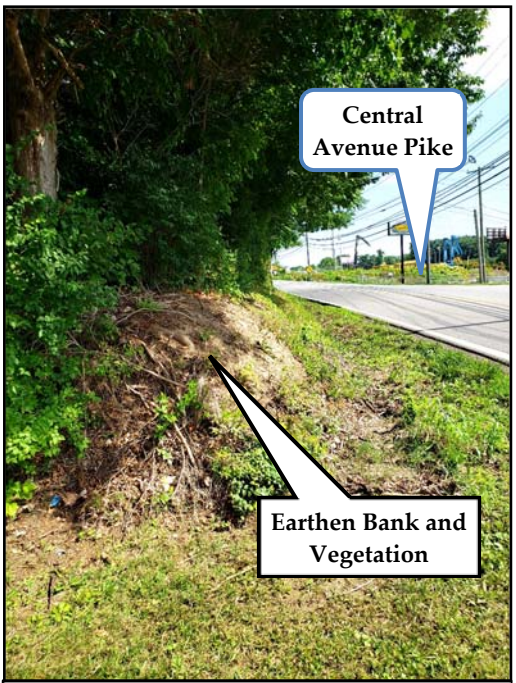
Central Avenue Pike at Strip Mall Entrance and Proposed Road "A" South Entrance: The 2026 projected level of service calculations for this intersection resulted in good to average vehicle delays and LOS.

2a) The construction of separate left and right-turn lanes on Central Avenue Pike for entering vehicles at the proposed Road "A" South Entrance is not warranted based on the projected 2026 traffic volumes.

2b) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the proposed Road "A" South Entrance approach at Central Avenue Pike. The stop bar should be applied a minimum of 4 feet away from the edge of Central Avenue Pike and placed at the desired stopping point that maximizes the sight distance.

2c) A single exiting lane for the Road "A" South development entrance at Central Avenue Pike will be sufficient. The westbound exiting lane of Road "A" South at Central Avenue Pike is proposed as a shared lane. The longest vehicle queue in the projected 2026 conditions on this exiting approach is calculated to be 35 feet in the AM peak hour and 34 feet in the PM peak hour. These queue lengths are reasonable and translate to just under two passenger cars, assuming a length of 25 feet per vehicle.

2d) Intersection sight distance at the proposed Road "A" South Entrance at Central Avenue Pike must not be impacted by future landscaping or signage. Based on a posted speed limit of 40-mph on Central Avenue Pike, the required intersection sight distance is 445 feet for exiting left-turning vehicles and 385 feet for exiting right-turning and crossing vehicles. The sight distances were found to be substandard looking to the south. A licensed land surveyor must document the sight distance at this intersection to the south. The amount of vegetation and the earthen bank should be delineated that must be removed to ensure safe vehicle operations. The site designer must verify that the required sight distances will be available at this approach.

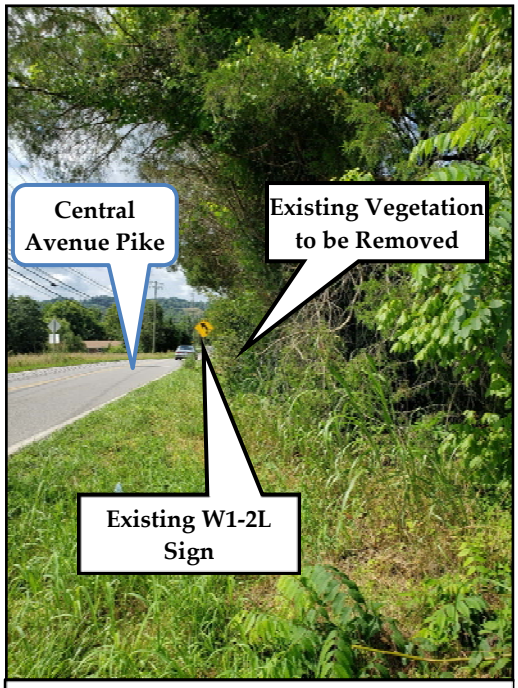


Sight Obstructions to the South of the Proposed Road "A" South Entrance on the East Side of Central Avenue Pike

2e) When the new proposed Road "A" South Entrance is constructed, due to the horizontal curvature of Central Avenue Pike, it is recommended that a Side Road Intersection (W2-2R) warning sign for northbound motorists on Central Avenue Pike be installed approximately 150 feet in advance of the new entrance road.

W2-2R

2f) When the new proposed Road "A" South Entrance is constructed, the existing Curve Sign (W1-2L) on the east side of Central Avenue Pike may need to be slightly adjusted in height or location to allow for the proper sight distance to the north. In addition, the existing vegetation on the east side of Central Avenue Pike should be removed, allowing for full availability of sight distance to the north.

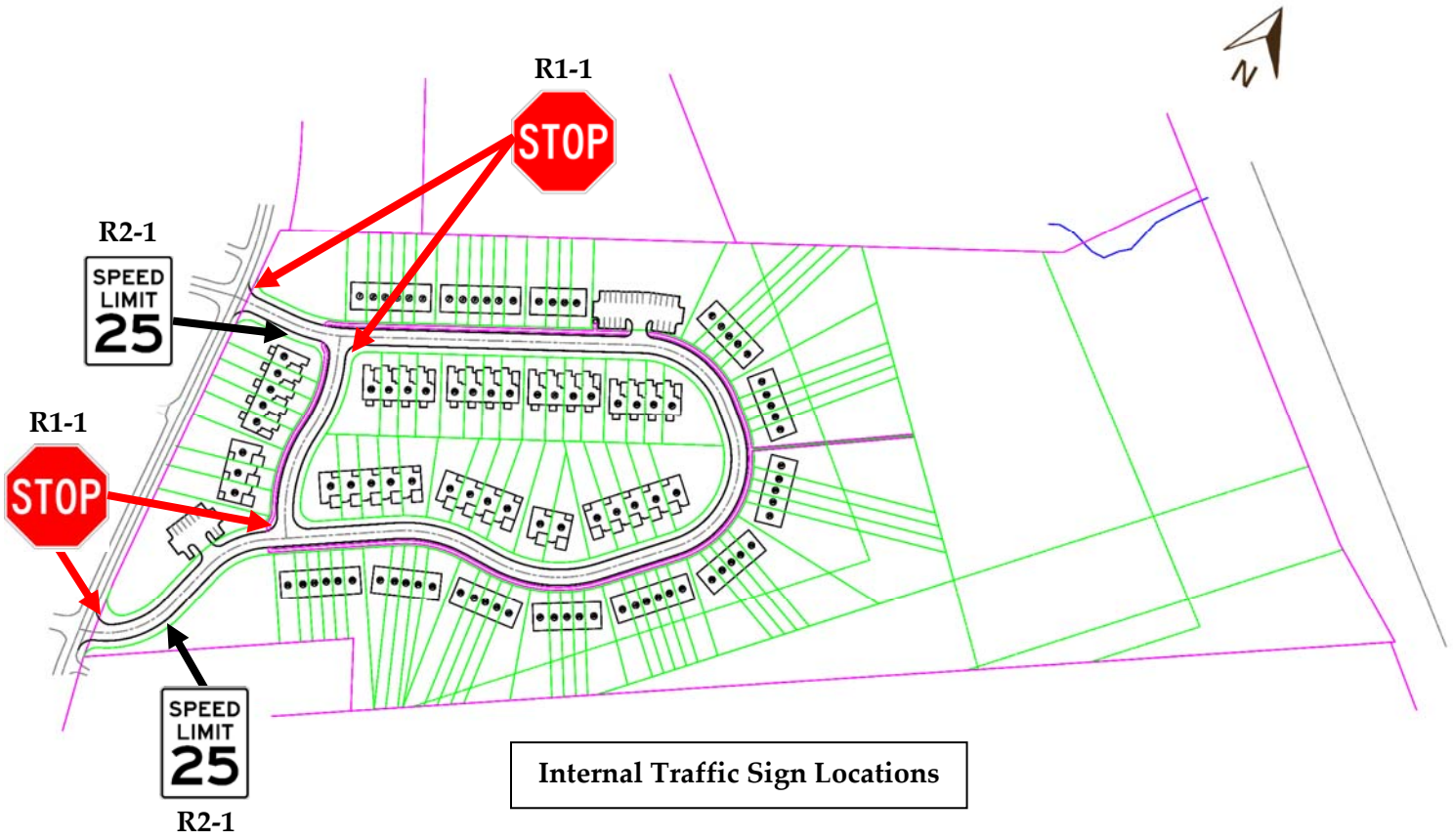


View on East Side of Central Avenue Pike to the North from the Proposed Road "A" South Entrance Location

Hamilton Park Subdivision Internal Roads: The layout plan shows two entrances on Central Avenue Pike constructed for the development, as shown in Figure 3.

3a) 25-mph Speed Limit Signs (R2-1) are recommended to be posted near the beginning of the development entrances off Central Avenue Pike.

3b) Stop Signs (R1-1) with 24" white stop bars and the other traffic signage are recommended to be installed at the internal locations, as shown below:



Internal Traffic Sign Locations

3c) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping in the subdivisions. With a speed limit of 25-mph in the development, the internal intersection sight distance is 250 feet. The required stopping sight distance is 155 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met.

3d) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.

3e) Internal sidewalks are proposed along Roads "A" and "B". Sidewalks should have appropriate ADA-compliant ramps at intersection corners, and the internal sidewalks are recommended to be 5 feet minimum in width to meet the City of Knoxville regulations. White crosswalks should be marked on the road pavement internally where pedestrians are expected to cross.

3f) All road grade and intersection elements should be designed to AASHTO, TDOT, and City of Knoxville specifications and guidelines to ensure proper operation.

APPENDIX A

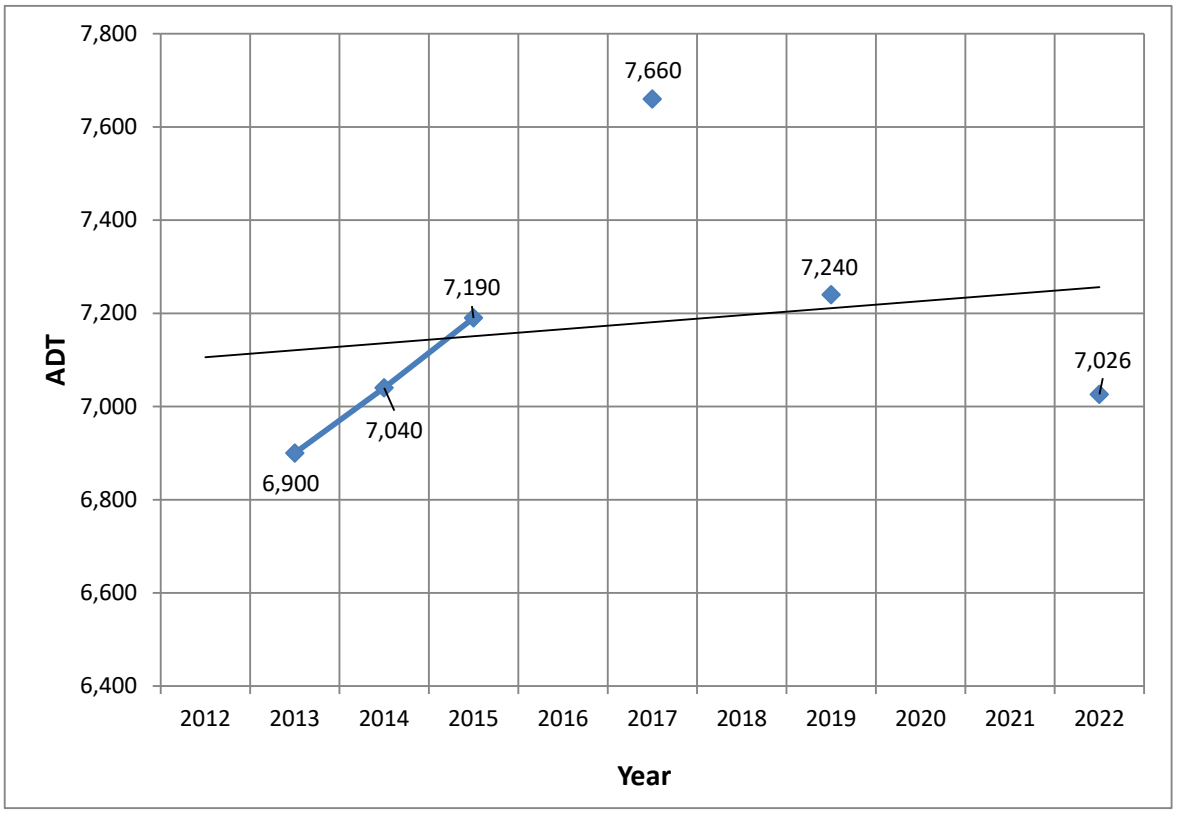
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

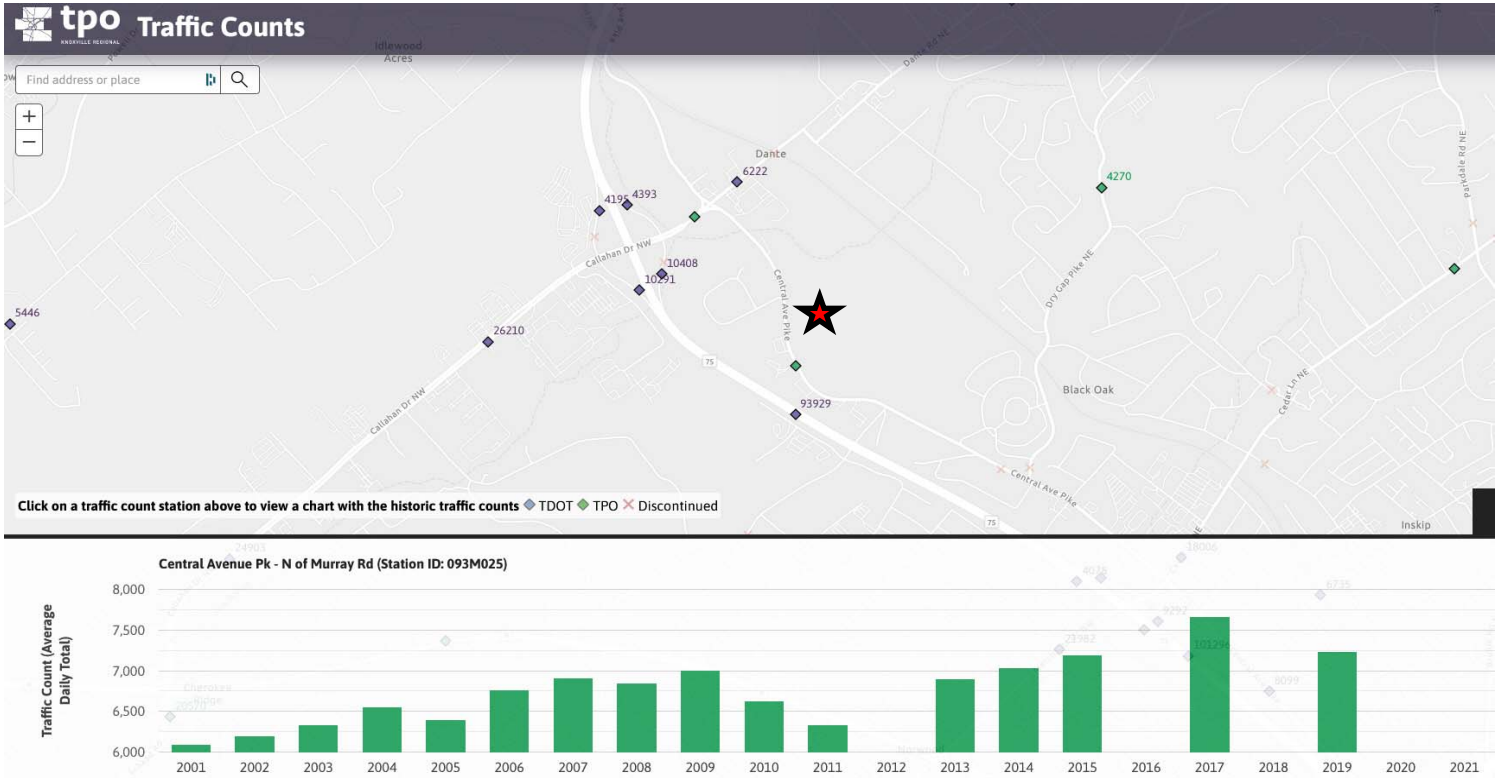
Organization: TPO
Station ID #: 093M025
Location: Central Avenue Pike, North of Murray Drive

YEAR	ADT
2012	
2013	6,900
2014	7,040
2015	7,190
2016	
2017	7,660
2018	
2019	7,240
2020	
2021	
2022	7,026

Trendline



2013 - 2022 Growth Rate = 1.8%
Average Annual Growth Rate = 0.2%

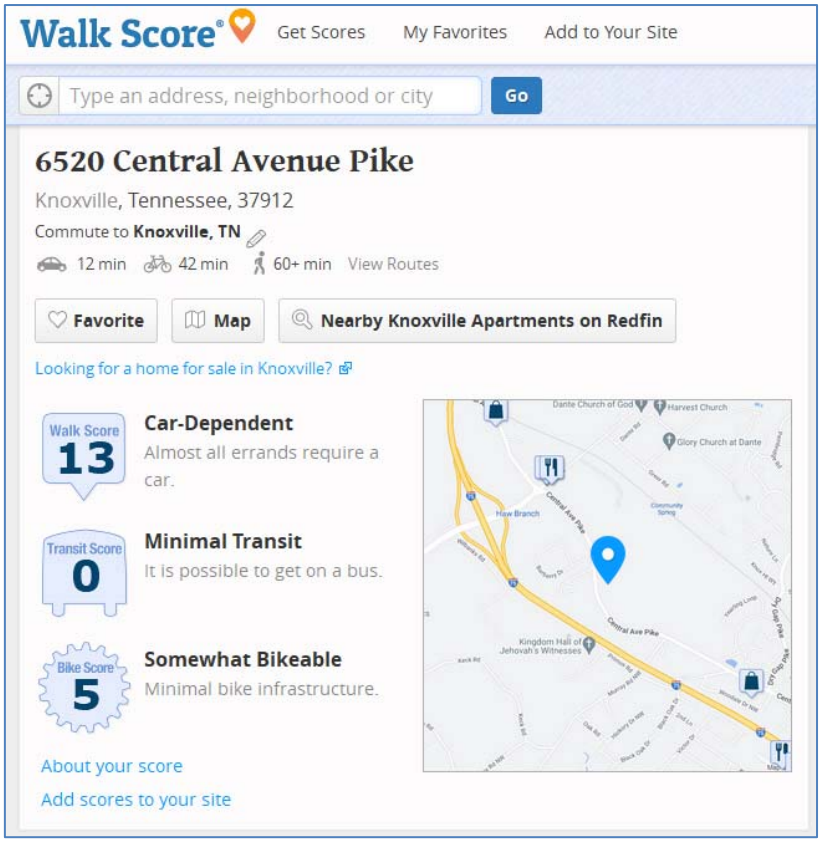

tpo
KNOXVILLE REGIONAL
Traffic Counts
Find address or place
Idlewood Acres
Dante
6222
4270
4195
4393
Callahan Dr NW
10408
10291
5446
26210
Central Ave Pike
Dry Gap Pike NE
Parkdale Rd NE
Black Oak
93929
Cedar Ln NE
Inskip
Click on a traffic count station above to view a chart with the historic traffic counts
TDOT
TPO
Discontinued
Central Avenue Pk - N of Murray Rd (Station ID: 093M025)
Traffic Count (Average Daily Total)
8,000
7,500
7,000
6,500
6,000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021

APPENDIX B

WALK SCORE

WALKSCORE

(from walkscore.com)



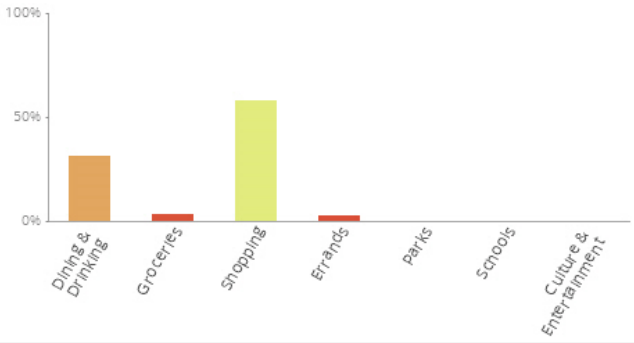
Scores for 6520 Central Avenue Pike

Walk Score 13 | Bike Score 5

Walk Score | Transit Score | Bike Score

Score Details | What is Walk Score

The Walk Score for 6520 Central Avenue Pike is based on the following categories.



Scores for 6520 Central Avenue Pike

Walk Score 13 | Bike Score 5

Walk Score | Transit Score | Bike Score

Transit Score measures how well a location is served by public transit based on the distance and type of nearby transit lines.

90–100	**Rider's Paradise** World-class public transportation
70–89	**Excellent Transit** Transit is convenient for most trips
50–69	**Good Transit** Many nearby public transportation options
25–49	**Some Transit** A few nearby public transportation options
0–24	**Minimal Transit** It is possible to get on a bus

Scores for 6520 Central Avenue Pike

Walk Score 13

Bike Score 5

Walk Score	Transit Score	Bike Score

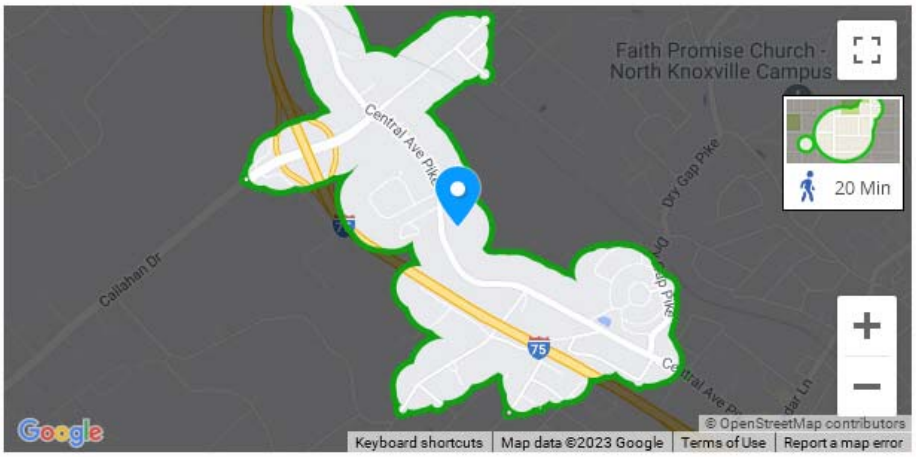
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.

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 6520 Central Avenue Pike.



What's Nearby

Restaurants:
Asian River .5mi

Coffee:
Starbucks 1.2mi

Bars:

Groceries:
Clinton Highway Wine & Spirits 1mi

Parks:
Mead Park 1.3mi

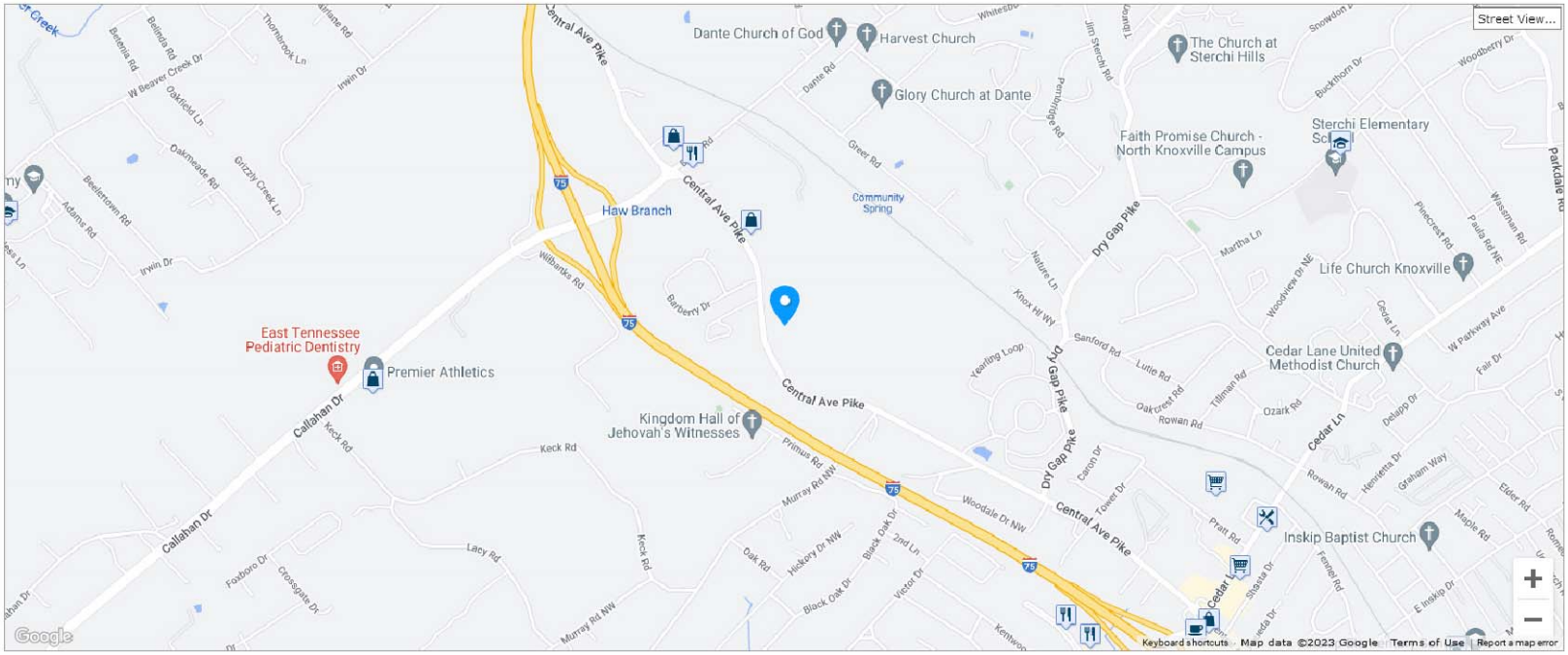
Schools:
Starchi Elementary School 1.4mi

Shopping:
Ultra Distributors .3mi

Entertainment:
Knoxville Expo Center 1.3mi

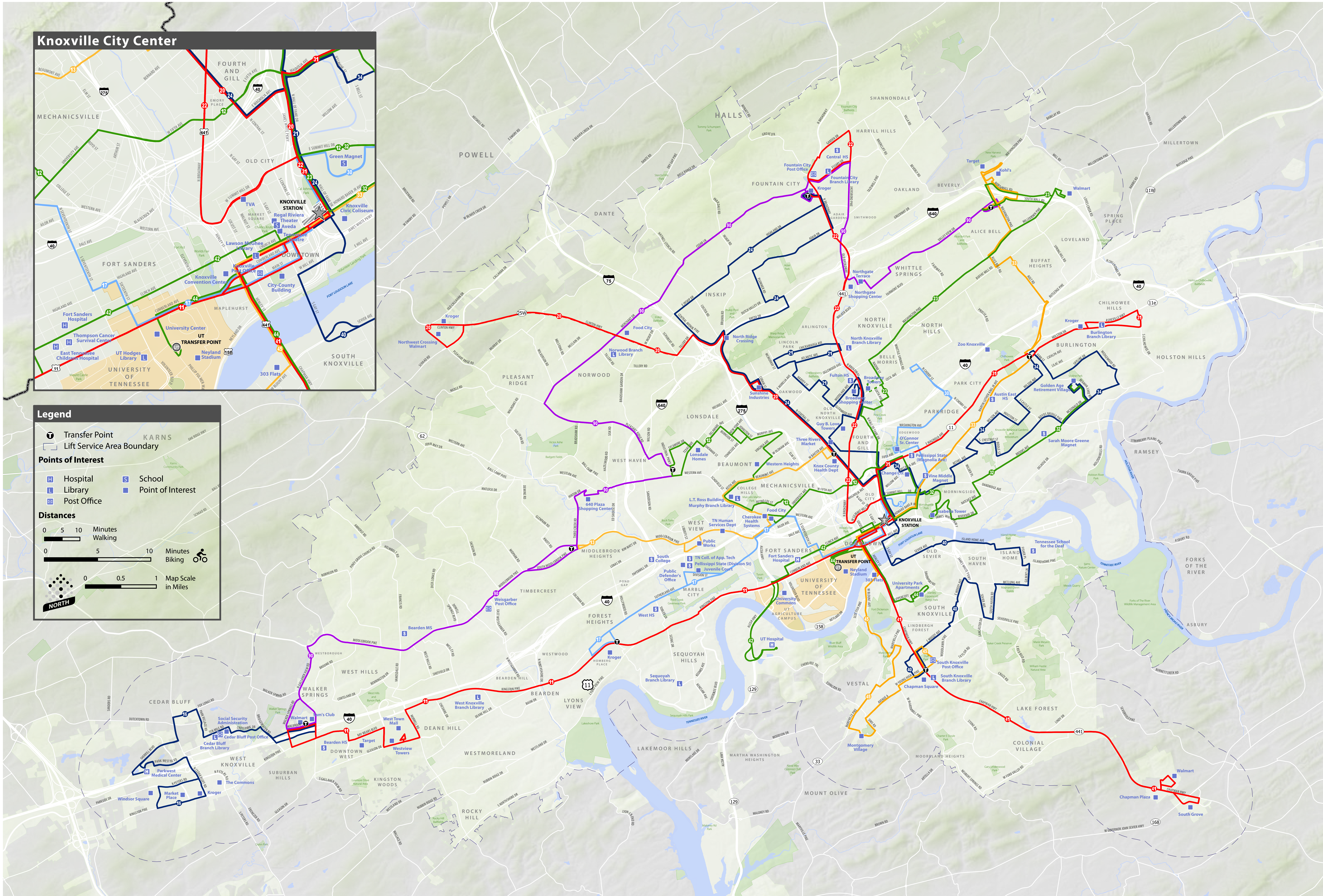
Errands:
US Post Office 1mi

Search Nearby:

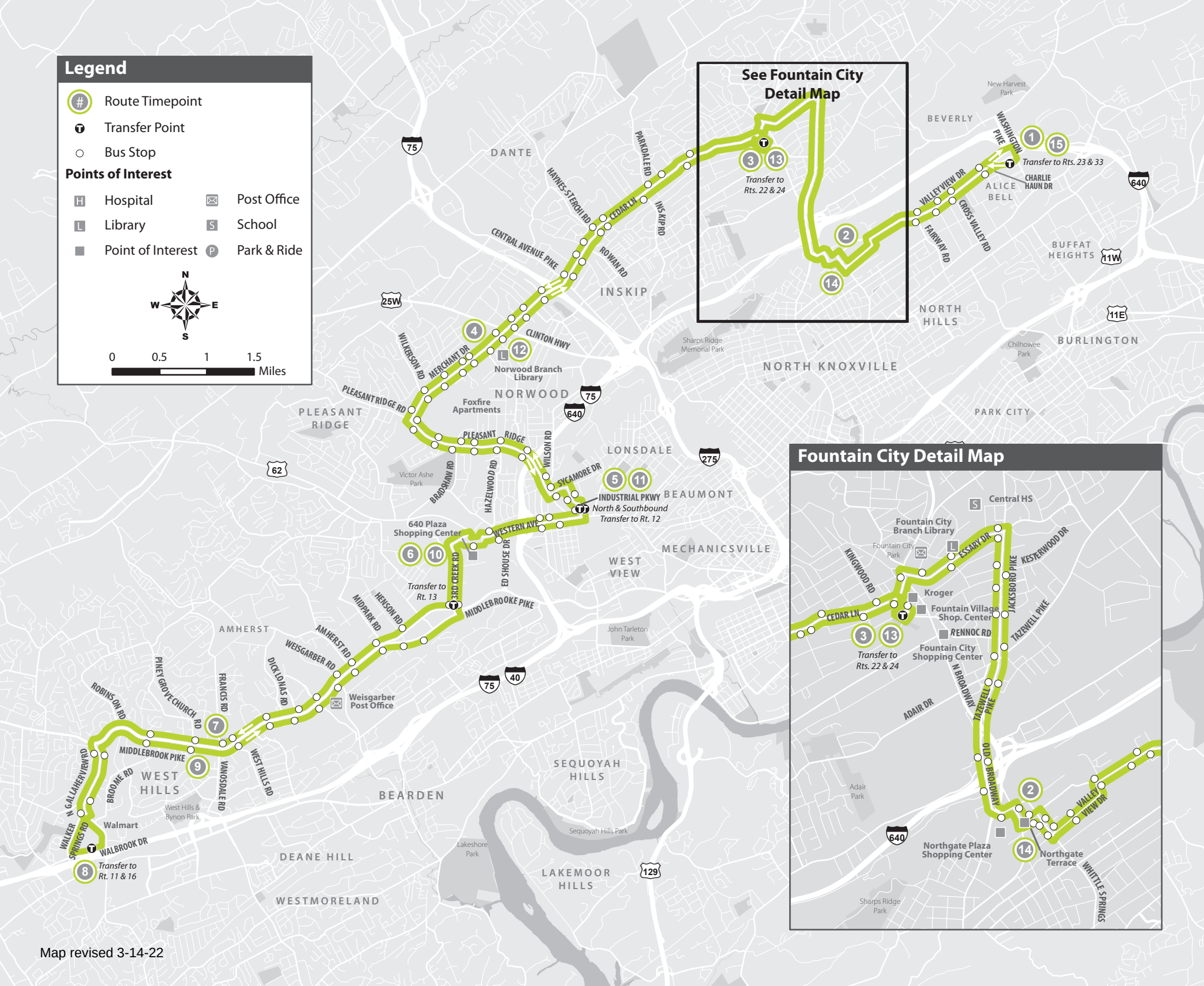


APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION



Knoxville City Center
FOURTH AND GILL
MECHANICSVILLE
OLD CITY
FORT SANDERS
MAPLEHURST
DOWNTOWN
SOUTH KNOXVILLE
UNIVERSITY OF TENNESSEE
KNOXVILLE STATION
UT TRANSFER POINT
Green Magnet
Knoxville Civic Coliseum
Regal Riviera Theater
Aveda
Tennessee Theatre
Lawson McGhee Library
Knoxville Post Office
Knoxville Convention Center
City-County Building
Fort Sanders Hospital
Thompson Cancer Survival Center
East Tennessee Children's Hospital
UT Hodges Library
University Center
Neyland Stadium
303 Flats
TVA
Legend
Transfer Point
Lift Service Area Boundary
Points of Interest
Hospital
Library
Post Office
School
Point of Interest
Distances
Minutes Walking
Minutes Biking
Map Scale in Miles
NORTH
HALLS
POWELL
SHANNONDALE
HARRILL HILLS
FOUNTAIN CITY
OAKLAND
BEVERLY
MILLERTOWN
DANTE
SPRING PLACE
ALICE BELL
LOVELAND
WHITTLE SPRINGS
BUFFAT HEIGHTS
INSKIP
NORTH KNOXVILLE
NORTH HILLS
CHILHOWEE HILLS
ARLINGTON
BURLINGTON
HOLSTON HILLS
PLEASANT RIDGE
NORWOOD
LINCOLN PARK
BELLE MORRIS
PARK CITY
LONSDALE
OAKWOOD
PARKRIDGE
KARNS
WEST HAVEN
BEAUMONT
RAMSEY
COLLEGE HILLS
MORNINGSIDE
WEST VIEW
MIDDLEBROOK HEIGHTS
FORT SANDERS
OLD SEVIER
ISLAND HOME
SOUTH HAVEN
FORKS OF THE RIVER
TIMBERCREST
MARBLE CITY
FOREST HEIGHTS
SEQUOYAH HILLS
LINDBERGH FOREST
ASBURY
WESTWOOD
WEST HILLS
WALKER SPRINGS
BEARDEN
LYONS VIEW
VESTAL
CEDAR BLUFF
WEST KNOXVILLE
DEANE HILL
LAKE FOREST
DOWNTOWN WEST
WESTMORELAND
LAKEMOOR HILLS
MARTHA WASHINGTON HEIGHTS
COLONIAL VILLAGE
SUBURBAN HILLS
KINGSTON WOODS
MOORELAND HEIGHTS
MOUNT OLIVE
ROCKY HILL
Walmart
Target
Kroger
Kohl's
Food City
Northgate Terrace
Northgate Shopping Center
Zoo Knoxville
Austin East HS
Golden Age Retirement Village
Sarah Moore Greene Magnet
Burlington Branch Library
Fulton HS
Broadway Shopping Center
Three Rivers Market
Knox County Health Dept
Western Heights
Lonsdale Homes
640 Plaza Shopping Center
South College
Public Works
West HS
UT Hospital
Sequoyah Branch Library
South Knoxville Branch Library
Chapman Square
Montgomery Village
Chapman Plaza
South Grove
West Town Mall
Westview Towers
Bearden HS
Bearden MS
Cedar Bluff Post Office
Cedar Bluff Branch Library
Social Security Administration
Parkwest Medical Center
The Commons
Market Place
Windsor Square
West Knoxville Branch Library
Weisgarber Post Office
Northwest Crossing Walmart
Norwood Branch Library
North Ridge Crossing
Sunshine Industries
Fountain City Post Office
Fountain City Branch Library
Central HS
North Knoxville Branch Library
Vine Middle Magnet
Isabella Tower
Tennessee School for the Deaf
University Park Apartments
University Commons
South Knoxville Post Office
Cherokee Health Systems
TN Human Services Dept
TN Coll. of App. Tech
Pellissippi State (Division St)
Juvenile Court
Public Defender's Office
L.T. Ross Building
Murphy Branch Library
O'Connor Sr. Center
Pellissippi State (Magnolia Ave)
Guy B. Love Towers
Kroger


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
0.5
1
1.5
Miles
See Fountain City Detail Map
Fountain City Detail Map
Transfer to Rts. 22 & 24
Transfer to Rts. 23 & 33
Norwood Branch Library
Foxfire Apartments
640 Plaza Shopping Center
Transfer to Rt. 13
INDUSTRIAL PKWY
North & Southbound
Transfer to Rt. 12
Weisgarber Post Office
Walmart
Transfer to Rt. 11 & 16
Central HS
Fountain City Branch Library
Kroger
Fountain Village Shop. Center
Fountain City Shopping Center
Northgate Plaza Shopping Center
Northgate Terrace
DANTE
INSKIP
NORWOOD
PLEASANT RIDGE
LONSDALE
BEAUMONT
MECHANICSVILLE
WEST VIEW
NORTH KNOXVILLE
BEVERLY
ALICE BELL
BUFFAT HEIGHTS
NORTH HILLS
BURLINGTON
PARK CITY
AMHERST
WEST HILLS
BEARDEN
SEQUOYAH HILLS
DEANE HILL
LAKEMOOR HILLS
WESTMORELAND
Map revised 3-14-22

Route 90 - Crosstown: Weekdays

Going toward Walbrook Superstop | *Going away from Walbrook Superstop*

Charlie Haun @ Washington Pike	Northgate Terrace	Fountain City Superstop	Merchants @ Expo Center	Industrial Pkwy	I-640 Plaza	Middlebrook @ Vanosdale	Walmart	Middelbrook @ Piney Grove Church Rd.	I-640 Plaza	Industrial Pkwy	Merchants @ Marguerite	Fountain City Superstop	Northgate Terrace	Charlie Haun @ Washington Pike
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
							5:55 AM	6:05 AM	6:13 AM	6:25 AM	6:35 AM	7:05 AM	7:11 AM	7:25 AM
		6:05 AM	6:15 AM	6:25 AM	6:34 AM	6:42 AM	6:55 AM	7:05 AM	7:13 AM	7:25 AM	7:35 AM	8:05 AM	8:11 AM	8:25 AM
6:30 AM	6:45 AM	7:05 AM	7:15 AM	7:25 AM	7:34 AM	7:42 AM	7:55 AM	8:05 AM	8:13 AM	8:25 AM	8:35 AM	9:05 AM	9:11 AM	9:25 AM
7:30 AM	7:45 AM	8:05 AM	8:15 AM	8:25 AM	8:34 AM	8:42 AM	8:55 AM	9:05 AM	9:13 AM	9:25 AM	9:35 AM	10:05 AM	10:11 AM	10:25 AM
8:30 AM	8:45 AM	9:05 AM	9:15 AM	9:25 AM	9:34 AM	9:42 AM	9:55 AM	10:05 AM	10:13 AM	10:25 AM	10:35 AM	11:05 AM	11:11 AM	11:25 AM
9:30 AM	9:45 AM	10:05 AM	10:15 AM	10:25 AM	10:34 AM	10:42 AM	10:55 AM	11:05 AM	11:13 AM	11:25 AM	11:35 AM	12:05 PM	12:11 PM	12:25 PM
10:30 AM	10:45 AM	11:05 AM	11:15 AM	11:25 AM	11:34 AM	11:42 AM	11:55 AM	12:05 PM	12:13 PM	12:25 PM	12:35 PM	1:05 PM	1:11 PM	1:25 PM
11:30 AM	11:45 AM	12:05 PM	12:15 PM	12:25 PM	12:34 PM	12:42 PM	12:55 PM	1:05 PM	1:13 PM	1:25 PM	1:35 PM	2:05 PM	2:11 PM	2:25 PM
12:30 PM	12:45 PM	1:05 PM	1:15 PM	1:25 PM	1:34 PM	1:42 PM	1:55 PM	2:05 PM	2:13 PM	2:25 PM	2:35 PM	3:05 PM	3:11 PM	3:25 PM
1:30 PM	1:45 PM	2:05 PM	2:15 PM	2:25 PM	2:34 PM	2:42 PM	2:55 PM	3:05 PM	3:13 PM	3:25 PM	3:35 PM	4:05 PM	4:11 PM	4:25 PM
2:30 PM	2:45 PM	3:05 PM	3:15 PM	3:25 PM	3:34 PM	3:42 PM	3:55 PM	4:05 PM	4:13 PM	4:25 PM	4:35 PM	5:05 PM	5:11 PM	5:25 PM
3:30 PM	3:45 PM	4:05 PM	4:15 PM	4:25 PM	4:34 PM	4:42 PM	4:55 PM	5:05 PM	5:13 PM	5:25 PM	5:35 PM	6:05 PM	6:11 PM	6:25 PM
4:30 PM	4:45 PM	5:05 PM	5:15 PM	5:25 PM	5:34 PM	5:42 PM	5:55 PM	6:05 PM	6:13 PM	6:25 PM	6:35 PM	7:05 PM	7:11 PM	7:25 PM
5:30 PM	5:45 PM	6:05 PM	6:15 PM	6:25 PM	6:34 PM	6:42 PM	6:55 PM	7:05 PM	7:13 PM	7:25 PM	7:35 PM	8:15 PM	8:21 PM	8:35 PM
6:30 PM	6:45 PM	7:05 PM	7:15 PM	7:25 PM	7:34 PM	7:42 PM	7:55 PM	8:05 PM	8:13 PM					
7:30 PM	7:45 PM	8:05 PM	8:15 PM	8:25 PM	8:34 PM	8:42 PM								

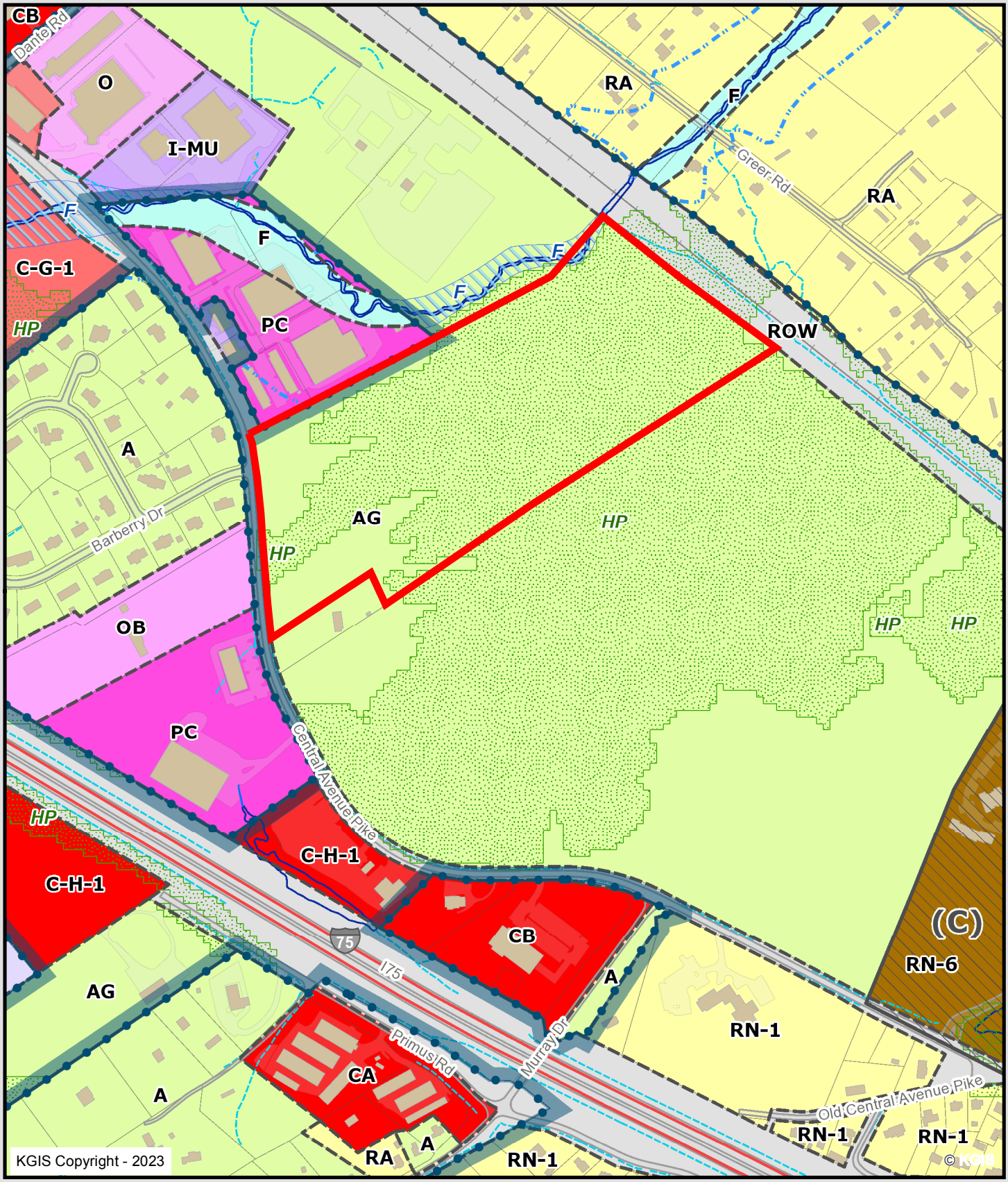
Route 90 - Crosstown: SATURDAYS

Going toward Walbrook Superstop | *Going away from Walbrook Superstop*

Charlie Haun @ Washington Pike	Northgate Terrace	Fountain City Superstop	Merchants @ Expo Center	Industrial Pkwy	I-640 Plaza	Middlebrook @ Vanosdale	Walmart	Middelbrook @ Piney Grove Church Rd.	I-640 Plaza	Industrial Pkwy	Merchants @ Marguerite	Fountain City Superstop	Northgate Terrace	Charlie Haun @ Washington Pike
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
							6:55 AM	7:05 AM	7:13 AM	7:25 AM	7:35 AM	8:05 AM	8:11 AM	8:25 AM
6:30 AM	6:45 AM	7:05 AM	7:15 AM	7:25 AM	7:34 AM	7:42 AM	7:55 AM	8:05 AM	8:13 AM	8:25 AM	8:35 AM	9:05 AM	9:11 AM	9:25 AM
7:30 AM	7:45 AM	8:05 AM	8:15 AM	8:25 AM	8:34 AM	8:42 AM	8:55 AM	9:05 AM	9:13 AM	9:25 AM	9:35 AM	10:05 AM	10:11 AM	10:25 AM
8:30 AM	8:45 AM	9:05 AM	9:15 AM	9:25 AM	9:34 AM	9:42 AM	9:55 AM	10:05 AM	10:13 AM	10:25 AM	10:35 AM	11:05 AM	11:11 AM	11:25 AM
9:30 AM	9:45 AM	10:05 AM	10:15 AM	10:25 AM	10:34 AM	10:42 AM	10:55 AM	11:05 AM	11:13 AM	11:25 AM	11:35 AM	12:05 PM	12:11 PM	12:25 PM
10:30 AM	10:45 AM	11:05 AM	11:15 AM	11:25 AM	11:34 AM	11:42 AM	11:55 AM	12:05 PM	12:13 PM	12:25 PM	12:35 PM	1:05 PM	1:11 PM	1:25 PM
11:30 AM	11:45 AM	12:05 PM	12:15 PM	12:25 PM	12:34 PM	12:42 PM	12:55 PM	1:05 PM	1:13 PM	1:25 PM	1:35 PM	2:05 PM	2:11 PM	2:25 PM
12:30 PM	12:45 PM	1:05 PM	1:15 PM	1:25 PM	1:34 PM	1:42 PM	1:55 PM	2:05 PM	2:13 PM	2:25 PM	2:35 PM	3:05 PM	3:11 PM	3:25 PM
1:30 PM	1:45 PM	2:05 PM	2:15 PM	2:25 PM	2:34 PM	2:42 PM	2:55 PM	3:05 PM	3:13 PM	3:25 PM	3:35 PM	4:05 PM	4:11 PM	4:25 PM
2:30 PM	2:45 PM	3:05 PM	3:15 PM	3:25 PM	3:34 PM	3:42 PM	3:55 PM	4:05 PM	4:13 PM	4:25 PM	4:35 PM	5:05 PM	5:11 PM	5:25 PM
3:30 PM	3:45 PM	4:05 PM	4:15 PM	4:25 PM	4:34 PM	4:42 PM	4:55 PM	5:05 PM	5:13 PM	5:25 PM	5:35 PM	6:05 PM	6:11 PM	6:25 PM
4:30 PM	4:45 PM	5:05 PM	5:15 PM	5:25 PM	5:34 PM	5:42 PM	5:55 PM	6:05 PM	6:13 PM	6:25 PM	6:35 PM	7:05 PM	7:11 PM	7:25 PM
5:30 PM	5:45 PM	6:05 PM	6:15 PM	6:25 PM	6:34 PM	6:42 PM	6:55 PM	7:05 PM	7:13 PM	7:25 PM	7:35 PM	8:05 PM	8:11 PM	8:25 PM
6:30 PM	6:45 PM	7:05 PM	7:15 PM	7:25 PM	7:34 PM	7:42 PM	7:55 PM	8:05 PM	8:13 PM	8:25 PM	8:35 PM	9:05 PM	9:11 PM	9:25 PM
7:30 PM	7:45 PM	8:05 PM	8:15 PM	8:25 PM	8:34 PM	8:42 PM	8:55 PM	9:05 PM	9:13 PM					

APPENDIX D

ZONING MAP



Zoning Map

5.2.23

Knoxville - Knox County - KUB Geographic Information System

Printed: 5/2/2023 at 11:56:56 AM

0 250 500 1,000

ft

APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Central Avenue Pike (SB and NB)
Minor Street: Barberry Drive (EB)
Traffic Control: Stop Condition on Barberry Drive

5/3/2023 (Wednesday)
Mostly Sunny
Conducted by: Ajax Engineering

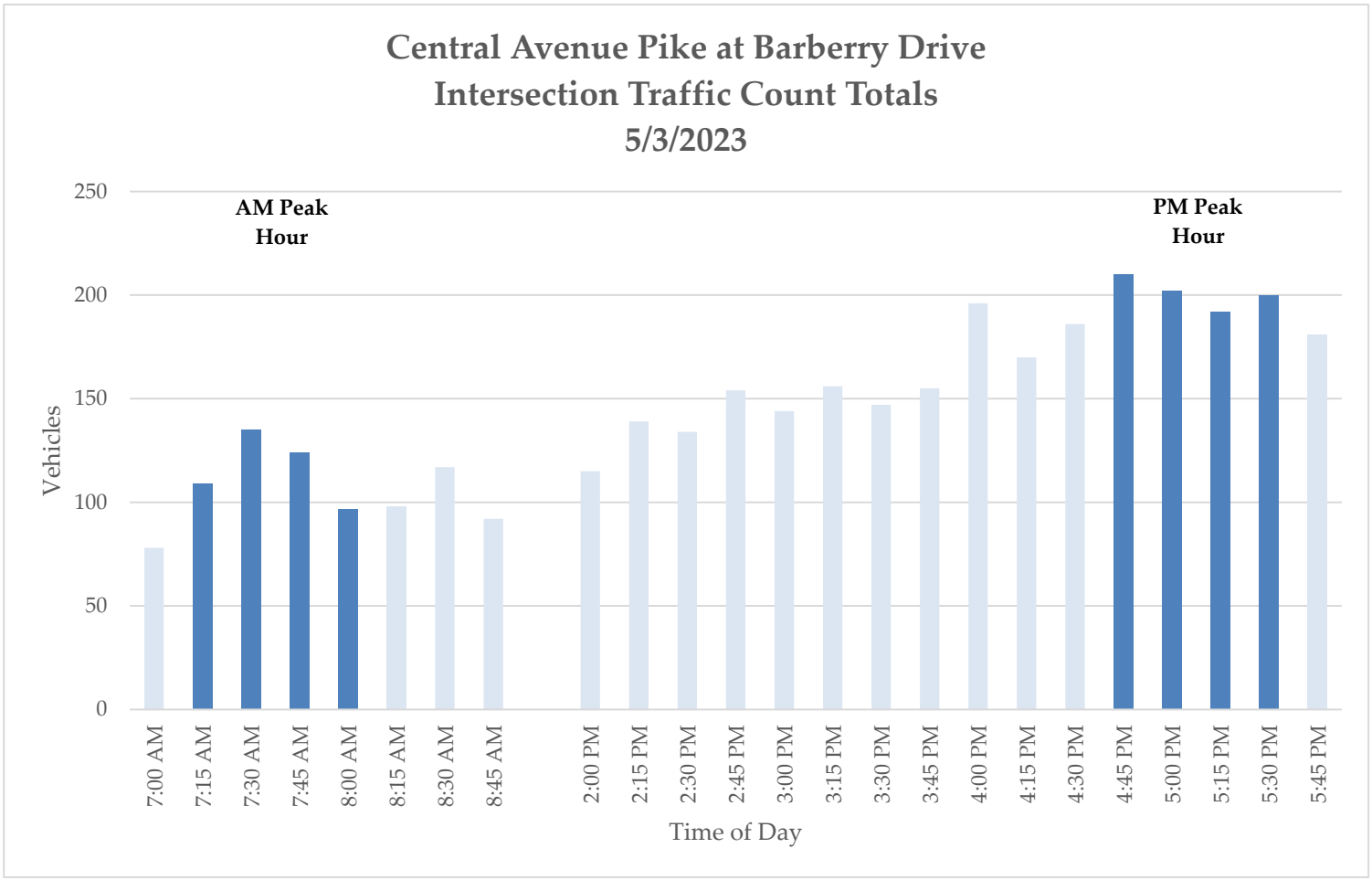
	Central Avenue Pike		Central Avenue Pike		Barberry Drive			
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND		VEHICLE	PEAK
BEGIN	THRU	RT	LT	THRU	LT	RT	TOTAL	HOUR
7:00 AM	42	0	0	34	1	1	78	
7:15 AM	59	1	0	45	2	2	109	**7:15 AM - 8:15 AM**
7:30 AM	68	0	1	65	1	0	135	
7:45 AM	70	0	0	52	2	0	124	
8:00 AM	67	0	0	30	0	0	97	
8:15 AM	52	0	2	41	2	1	98	
8:30 AM	64	3	0	48	1	1	117	
8:45 AM	46	1	2	38	2	3	92	
TOTAL	468	5	5	353	11	8	850	
2:00 PM	61	0	2	51	1	0	115	
2:15 PM	52	3	1	81	2	0	139	
2:30 PM	69	1	1	61	2	0	134	
2:45 PM	73	0	0	79	1	1	154	
3:00 PM	69	2	1	70	1	1	144	
3:15 PM	64	2	1	87	1	1	156	
3:30 PM	66	4	2	72	3	0	147	
3:45 PM	75	5	1	70	3	1	155	
4:00 PM	88	3	0	103	1	1	196	
4:15 PM	73	0	1	95	1	0	170	
4:30 PM	83	2	0	100	0	1	186	
4:45 PM	94	2	0	111	2	1	210	**4:45 PM - 5:45 PM**
5:00 PM	101	2	2	97	0	0	202	
5:15 PM	83	2	0	104	1	2	192	
5:30 PM	89	2	0	106	1	2	200	
5:45 PM	106	0	0	74	1	0	181	
TOTAL	1246	30	12	1361	21	11	2681	

2023 AM Peak Hour **7:15 AM - 8:15 AM**

	Central Avenue Pike		Central Avenue Pike		Barberry Drive	
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND	
BEGIN	THRU	RT	LT	THRU	LT	RT
7:15 AM	59	1	0	45	2	2
7:30 AM	68	0	1	65	1	0
7:45 AM	70	0	0	52	2	0
8:00 AM	67	0	0	30	0	0
TOTAL	**264**	**1**	**1**	**192**	**5**	**2**
PHF	**0.94**	**0.25**	**0.25**	**0.74**	**0.63**	**0.25**
Truck %	**1.1%**	**0.0%**	**0.0%**	**1.0%**	**0.0%**	**0.0%**

2023 PM Peak Hour **4:45 PM - 5:45 PM**

	Central Avenue Pike		Central Avenue Pike		Barberry Drive	
TIME	SOUTHBOUND		NORTHBOUND		EASTBOUND	
BEGIN	THRU	RT	LT	THRU	LT	RT
4:45 PM	94	2	0	111	2	1
5:00 PM	101	2	2	97	0	0
5:15 PM	83	2	0	104	1	2
5:30 PM	89	2	0	106	1	2
TOTAL	**367**	**8**	**2**	**418**	**4**	**5**
PHF	**0.91**	**1.00**	**0.25**	**0.94**	**0.50**	**0.63**
Truck %	**0.0%**	**0.0%**	**0.0%**	**0.5%**	**0.0%**	**0.0%**


Central Avenue Pike at Barberry Drive
Intersection Traffic Count Totals
5/3/2023
AM Peak Hour
PM Peak Hour
Vehicles
250
200
150
100
50
0
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
2:00 PM
2:15 PM
2:30 PM
2:45 PM
3:00 PM
3:15 PM
3:30 PM
3:45 PM
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
Time of Day

PEAK HOUR DATA

Major Street: Central Avenue Pike (SB and NB)
Minor Street: Barberry Drive (EB)
Traffic Control: Stop Condition on Barberry Drive

5/3/2023 (Wednesday)
Mostly Sunny
Conducted by: Ajax Engineering

AM PEAK HOUR

7:15 AM - 8:15 AM

Total Vehicles On Approach		462	
Vehicles Entering Intersection	265	Vehicles Exiting Intersection	197
Southbound			
Truck %	**0.0%**	**1.1%**	**-**
Total	**1**	**264**	**-**

Total Vehicles on Approach	Vehicles Entering Intersection	Eastbound	Truck %	Total
9	7		0.0%	5
	Vehicles Exiting Intersection 2		-	-
			0.0%	2

Total	**1**	**192**	**-**
Truck %	**0.0%**	**1.0%**	**-**
Northbound			
Vehicles Entering Intersection	193	Vehicles Exiting Intersection	266
Total Vehicles On Approach		459	

PM PEAK HOUR

4:45 PM - 5:45 PM

Total Vehicles On Approach		797	
Vehicles Entering Intersection	375	Vehicles Exiting Intersection	422
Southbound			
Truck %	**0.0%**	**0.0%**	**-**
Total	**8**	**367**	**-**

Total Vehicles on Approach	Vehicles Entering Intersection	Eastbound	Truck %	Total
19	9		0.0%	4
	Vehicles Exiting Intersection 10		-	-
			0.0%	5

Total	**2**	**418**	**-**
Truck %	**0.0%**	**0.5%**	**-**
Northbound			
Vehicles Entering Intersection	420	Vehicles Exiting Intersection	372
Total Vehicles On Approach		792	

APPENDIX F

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)

EXISTING CONDITIONS

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	2	1	192	264	1
Future Vol, veh/h	5	2	1	192	264	1
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, %	5	-	-	-3	3	-
Peak Hour Factor	63	25	25	74	94	25
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	8	8	4	259	281	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	550	283	285	0	-	0
Stage 1	283	-	-	-	-	-
Stage 2	267	-	-	-	-	-
Critical Hdwy	7.4	6.7	4.1	-	-	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	429	731	1289	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	727	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	427	731	1289	-	-	-
Mov Cap-2 Maneuver	427	-	-	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	727	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1289	-	540	-	-
HCM Lane V/C Ratio	0.003	-	0.03	-	-
HCM Control Delay (s)	7.8	0	11.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	5	2	418	367	8
Future Vol, veh/h	4	5	2	418	367	8
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, %	5	-	-	-3	3	-
Peak Hour Factor	50	63	25	94	91	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	8	8	445	403	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	868	407	411	0	-	0
Stage 1	407	-	-	-	-	-
Stage 2	461	-	-	-	-	-
Critical Hdwy	7.4	6.7	4.1	-	-	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	256	613	1159	-	-	-
Stage 1	604	-	-	-	-	-
Stage 2	562	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	254	613	1159	-	-	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	599	-	-	-	-	-
Stage 2	562	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.5	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1159	-	359	-	-
HCM Lane V/C Ratio	0.007	-	0.044	-	-
HCM Control Delay (s)	8.1	0	15.5	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

PROJECTED CONDITIONS (WITHOUT THE PROJECT)

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	2	1	204	280	1
Future Vol, veh/h	5	2	1	204	280	1
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, %	5	-	-	-3	3	-
Peak Hour Factor	63	25	25	74	94	25
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	8	8	4	276	298	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	584	300	302	0	-	0
Stage 1	300	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	7.4	6.7	4.1	-	-	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	406	714	1270	-	-	-
Stage 1	696	-	-	-	-	-
Stage 2	710	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	404	714	1270	-	-	-
Mov Cap-2 Maneuver	404	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	710	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.2	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1270	-	517	-	-
HCM Lane V/C Ratio	0.003	-	0.031	-	-
HCM Control Delay (s)	7.8	0	12.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	5	2	443	389	8
Future Vol, veh/h	4	5	2	443	389	8
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, %	5	-	-	-3	3	-
Peak Hour Factor	50	63	25	94	91	100
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	8	8	471	427	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	918	431	435	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	487	-	-	-	-	-
Critical Hdwy	7.4	6.7	4.1	-	-	-
Critical Hdwy Stg 1	6.4	-	-	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	236	592	1135	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	543	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	234	592	1135	-	-	-
Mov Cap-2 Maneuver	234	-	-	-	-	-
Stage 1	579	-	-	-	-	-
Stage 2	543	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.3	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1135	-	335	-	-
HCM Lane V/C Ratio	0.007	-	0.048	-	-
HCM Control Delay (s)	8.2	0	16.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

PROJECTED CONDITIONS (WITH THE PROJECT)

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	0	2	7	0	15	1	215	2	4	283	1
Future Vol, veh/h	5	0	2	7	0	15	1	215	2	4	283	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	5	-	-	0	-	-	-3	-	-	3	-
Peak Hour Factor	63	90	25	90	90	90	25	74	90	90	94	25
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	0
Mvmt Flow	8	0	8	8	0	17	4	291	2	4	301	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	620	612	303	615	613	292	305	0	0	293	0	0
Stage 1	311	311	-	300	300	-	-	-	-	-	-	-
Stage 2	309	301	-	315	313	-	-	-	-	-	-	-
Critical Hdwy	8.1	7.5	6.7	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	7.1	6.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	7.1	6.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	339	347	711	406	410	752	1267	-	-	1280	-	-
Stage 1	645	607	-	713	669	-	-	-	-	-	-	-
Stage 2	647	615	-	700	661	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	330	344	711	399	407	752	1267	-	-	1280	-	-
Mov Cap-2 Maneuver	330	344	-	399	407	-	-	-	-	-	-	-
Stage 1	642	605	-	710	666	-	-	-	-	-	-	-
Stage 2	630	613	-	689	658	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.3	11.4	0.1	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1267	-	-	451	587	1280	-	-
HCM Lane V/C Ratio	0.003	-	-	0.035	0.042	0.003	-	-
HCM Control Delay (s)	7.8	0	-	13.3	11.4	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	11	207	3	3	289
Future Vol, veh/h	11	11	207	3	3	289
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, %	0	-	-5	-	-	5
Peak Hour Factor	90	90	74	90	90	94
Heavy Vehicles, %	0	0	1	0	0	1
Mvmt Flow	12	12	280	3	3	307

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	595	282	0	0	283	0
Stage 1	282	-	-	-	-	-
Stage 2	313	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	470	762	-	-	1291	-
Stage 1	770	-	-	-	-	-
Stage 2	746	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	469	762	-	-	1291	-
Mov Cap-2 Maneuver	469	-	-	-	-	-
Stage 1	770	-	-	-	-	-
Stage 2	744	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	581	1291	-
HCM Lane V/C Ratio	-	-	0.042	0.003	-
HCM Control Delay (s)	-	-	11.5	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	0	5	9	0	9	2	448	7	15	400	8
Future Vol, veh/h	4	0	5	9	0	9	2	448	7	15	400	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	5	-	-	0	-	-	-3	-	-	3	-
Peak Hour Factor	50	90	63	90	90	90	25	94	90	90	91	100
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	0	8	10	0	10	8	477	8	17	440	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	980	979	444	979	979	481	448	0	0	485	0	0
Stage 1	478	478	-	497	497	-	-	-	-	-	-	-
Stage 2	502	501	-	482	482	-	-	-	-	-	-	-
Critical Hdwy	8.1	7.5	6.7	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	7.1	6.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	7.1	6.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	176	192	581	231	252	589	1123	-	-	1088	-	-
Stage 1	501	489	-	559	548	-	-	-	-	-	-	-
Stage 2	483	475	-	569	557	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	169	186	581	222	244	589	1123	-	-	1088	-	-
Mov Cap-2 Maneuver	169	186	-	222	244	-	-	-	-	-	-	-
Stage 1	496	479	-	553	543	-	-	-	-	-	-	-
Stage 2	470	470	-	549	545	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	19.7	16.9	0.1	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1123	-	-	261	322	1088	-	-
HCM Lane V/C Ratio	0.007	-	-	0.061	0.062	0.015	-	-
HCM Control Delay (s)	8.2	0	-	19.7	16.9	8.4	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	5	452	11	11	403
Future Vol, veh/h	13	5	452	11	11	403
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, %	0	-	-5	-	-	5
Peak Hour Factor	90	90	94	90	90	91
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	14	6	481	12	12	443

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	954	487	0	0	493	0
Stage 1	487	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	289	585	-	-	1081	-
Stage 1	622	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	285	585	-	-	1081	-
Mov Cap-2 Maneuver	285	-	-	-	-	-
Stage 1	622	-	-	-	-	-
Stage 2	625	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.5	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	332	1081	-
HCM Lane V/C Ratio	-	-	0.06	0.011	-
HCM Control Delay (s)	-	-	16.5	8.4	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

APPENDIX G

LOCAL TRIP GENERATION RATES

Local Apartment
Trip Generation Study

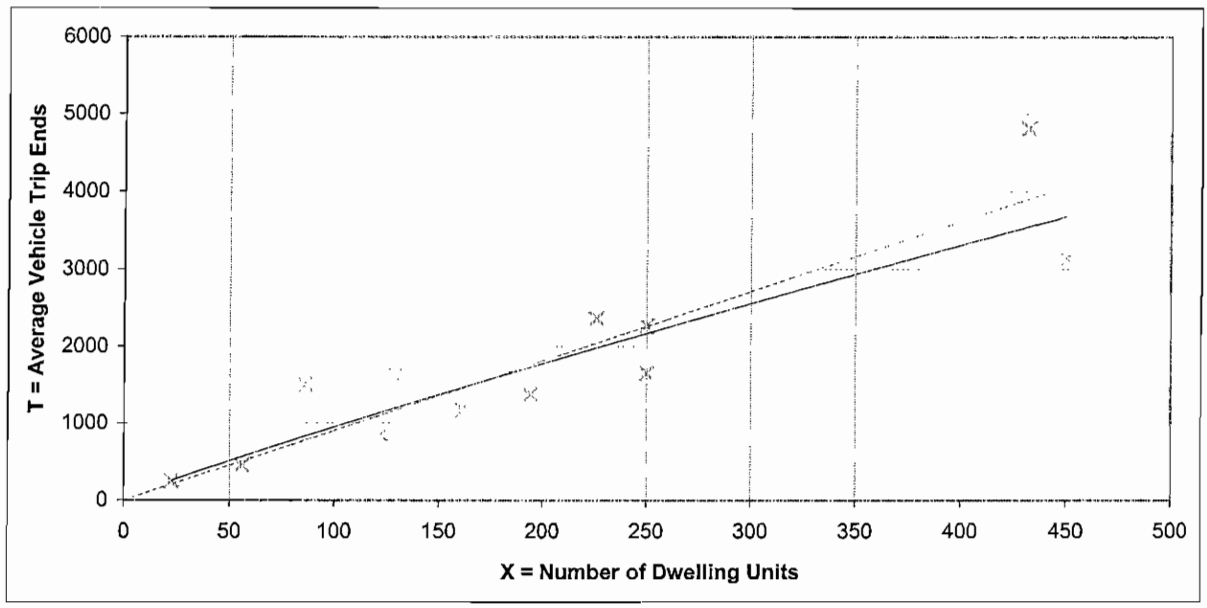
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

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

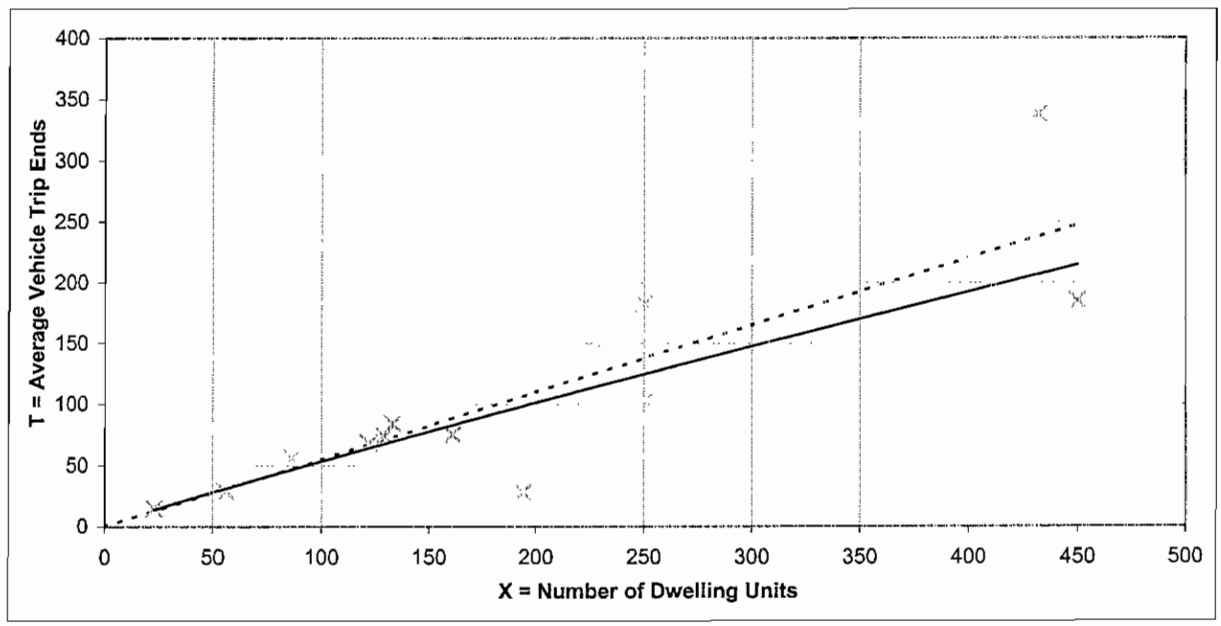
Local Apartment
Trip Generation Study

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

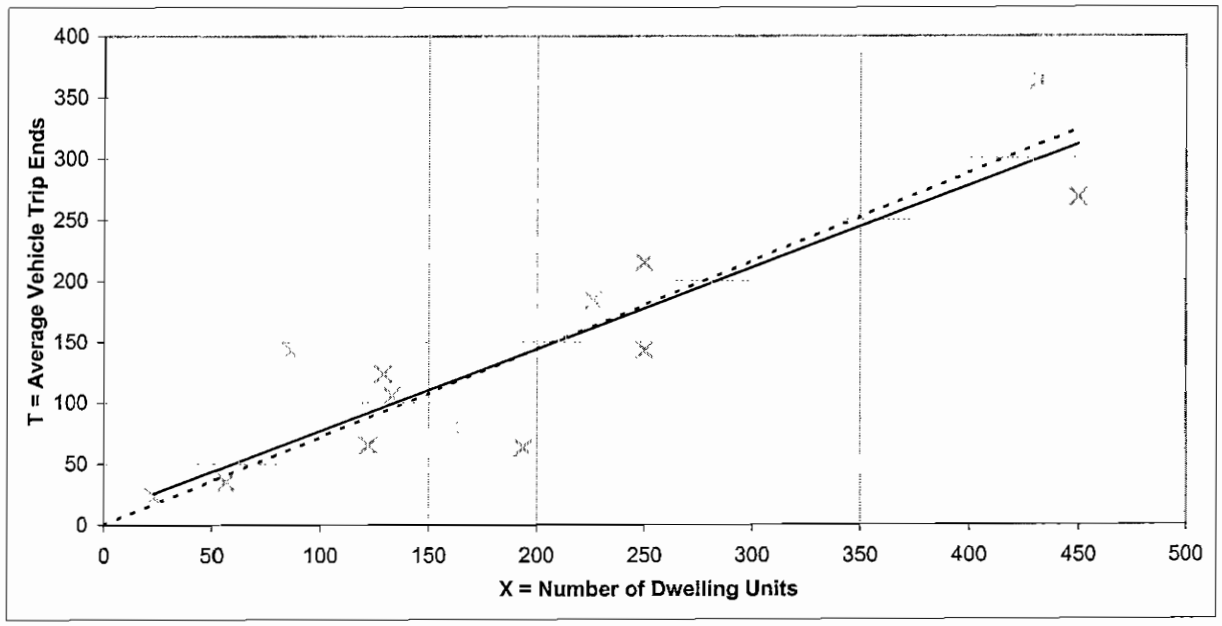
Local Apartment
Trip Generation Study

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 HAMILTON PARK SUBDIVISION

105 Attached Townhouses

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Attached Townhouses	105	997	22%	78%		55%	45%	
				12	44	56	44	36	80
Total New Volume Site Trips			**997**	**12**	**44**	**56**	**44**	**36**	**80**

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

TRIP GENERATION FOR HAMILTON PARK SUBDIVISION

105 Attached Townhouses

105 Units = X

Weekday:

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

T = 15 * 65.62

T = 997 trips

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

T = 0.758 * 74

T = 56 trips

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

T = 0.669 * 105 + 10.07

T = 80 trips

APPENDIX H

2020 CENSUS BUREAU DATA

United States Census Bureau OnTheMap

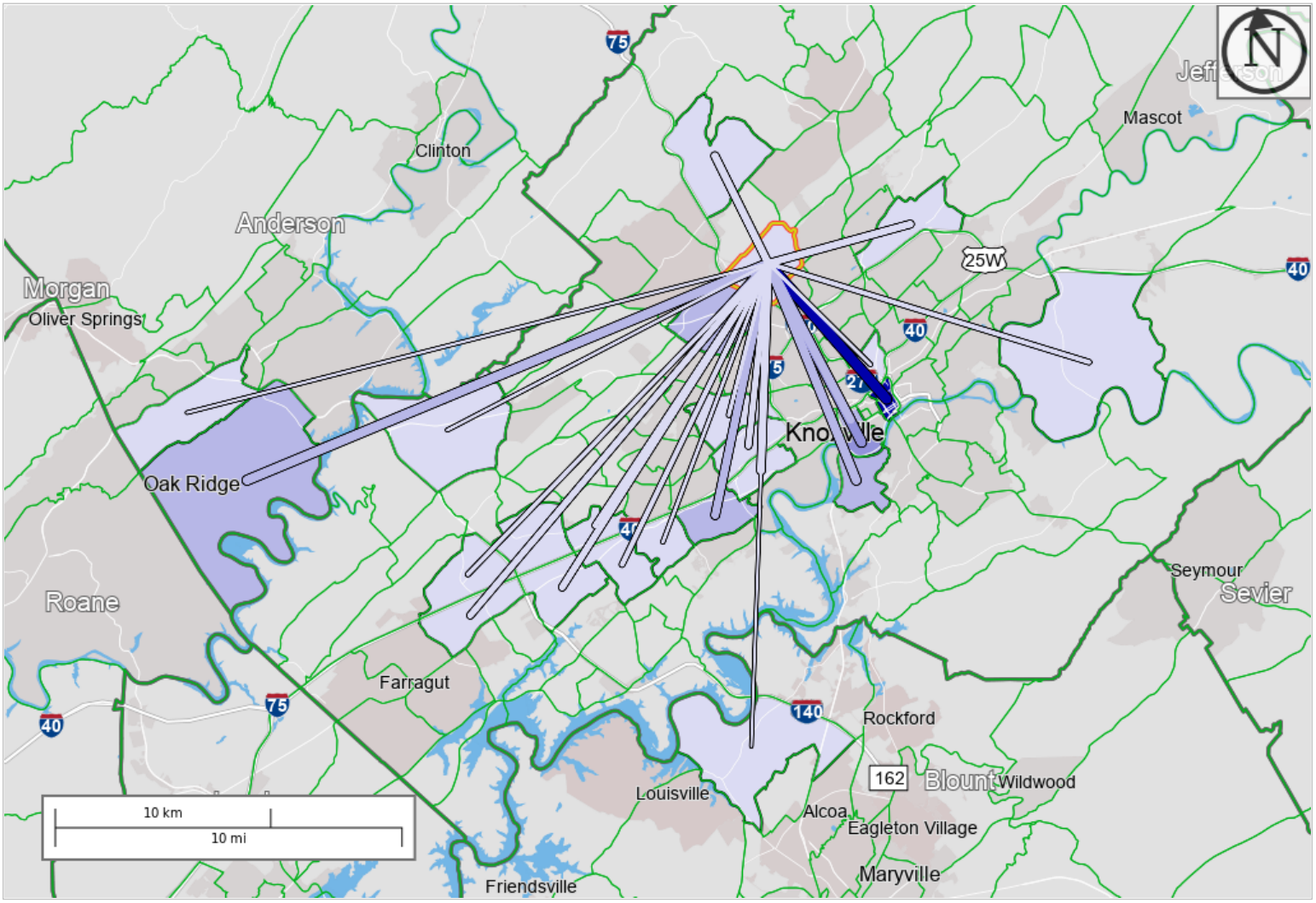
Work Destination Report - Home Selection Area to Work Census Tracts

All Jobs for All Workers in 2020

Created by the U.S. Census Bureau's OnTheMap https://onthemap.ces.census.gov on 05/01/2023

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

All Workers



Map Legend

Job Count
- 210 - 240
- 179 - 209
- 148 - 178
- 117 - 147
- 86 - 116
- 55 - 85
- 24 - 54

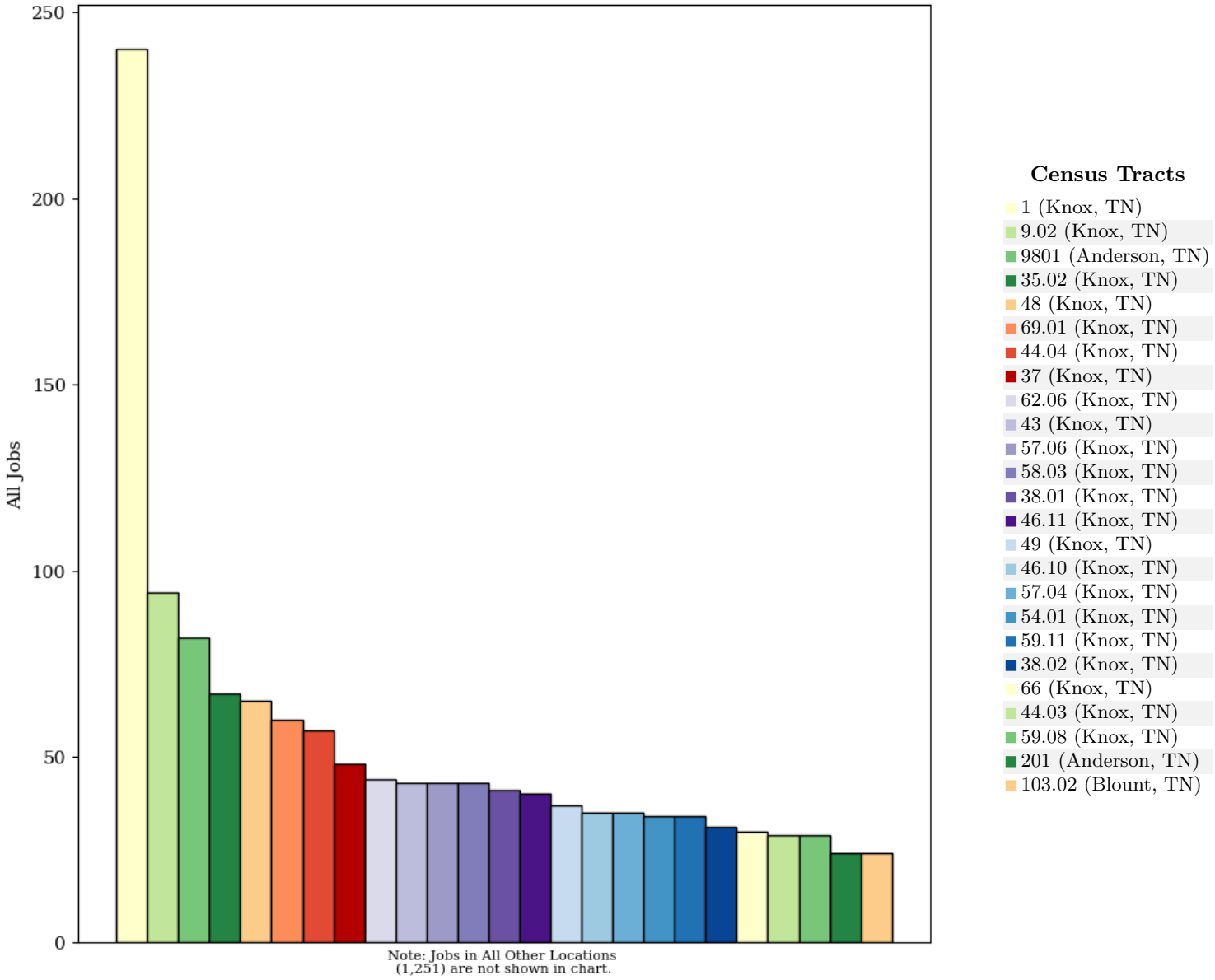
Selection Areas
- Home Area

Job Count
- 210 - 240
- 179 - 209
- 148 - 178
- 117 - 147
- 86 - 116
- 55 - 85
- 24 - 54

United States Census Bureau

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

All Workers



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

All Workers

Census Tracts as Work Destination Area	2020 Count	Share
All Census Tracts	2,560	100.0
1 (Knox, TN)	240	9.4
9.02 (Knox, TN)	94	3.7
9801 (Anderson, TN)	82	3.2
35.02 (Knox, TN)	67	2.6
48 (Knox, TN)	65	2.5
69.01 (Knox, TN)	60	2.3
44.04 (Knox, TN)	57	2.2
37 (Knox, TN)	48	1.9
62.06 (Knox, TN)	44	1.7
43 (Knox, TN)	43	1.7

Census Tracts as Work Destination Area	2020 Count	2020 Share
57.06 (Knox, TN)	43	1.7
58.03 (Knox, TN)	43	1.7
38.01 (Knox, TN)	41	1.6
46.11 (Knox, TN)	40	1.6
49 (Knox, TN)	37	1.4
46.10 (Knox, TN)	35	1.4
57.04 (Knox, TN)	35	1.4
54.01 (Knox, TN)	34	1.3
59.11 (Knox, TN)	34	1.3
38.02 (Knox, TN)	31	1.2
66 (Knox, TN)	30	1.2
44.03 (Knox, TN)	29	1.1
59.08 (Knox, TN)	29	1.1
201 (Anderson, TN)	24	0.9
103.02 (Blount, TN)	24	0.9
All Other Locations	1,251	48.9

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2020
Job Type	All Jobs
Selection Area	49 (Knox, TN) from Census Tracts
Selected Census Blocks	86
Analysis Generation Date	05/01/2023 12:47 - OnTheMap 6.23.1
Code Revision	30c3afd99705bf092ebd0183d29001038c5276b8
LODES Data Version	20230307_1010

Data Sources

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

Notes

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

APPENDIX 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)

1+283 = 284

1+215+2 = 218

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

Central Avenue Pike at Barberry Drive and Proposed Road "A" North

2026 Projected AM SB Left Turns = 4

Left Turn Lane NOT Warranted

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

1+215 = 216

2

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

Central Avenue Pike at Barberry Drive and Proposed Road "A" North

2026 Projected AM NB 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 - 149 150 - 199	250 200	180 140	140 105	110 90	80 70	70 60
200 - 249 250 - 299	160 130	115 100	85 75	75 65	65 60	55 50
300 - 349 350 - 399	110 100	90 80	70 65	60 55	55 50	45 40
400 - 449 450 - 499	90 80	70 65	60 55	50 45	45 40	35 30
500 - 549 550 - 599	70 65	60 55	45 40	35 35	35 30	25 25
600 - 649 650 - 699	60 55	45 35	35 35	30 30	25 25	25 20
700 - 749 750 or More	50 45	35 35	30 25	25 25	20 20	20 20

8+400 = 408

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

2+448+7 = 457

Central Avenue Pike at Barberry Drive and Proposed Road "A" North

2026 Projected PM SB Left Turns = 15

Left Turn Lane NOT Warranted

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

TABLE 5B

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

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

2+448 = 450

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
7 Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199				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

Central Avenue Pike at Barberry Drive and Proposed Road "A" North

2026 Projected PM NB Right Turns = 7

Right Turn Lane NOT Warranted

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

TABLE 5A

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

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

289

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

207+3 = 210

Central Avenue Pike at Strip Mall Entrance and Proposed Road "A" South

2026 Projected AM SB Left Turns = 3

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 - 149 150 - 199	70 60	60 55	50 45	45 40	40 35	35 30
200 - 249 250 - 299	55 50	50 45	40 35	35 30	30 30	30 30
300 - 349 350 - 399	45 40	40 35	35 30	30 25	25 25	25 20
400 - 449 450 - 499	35 30	30 25	30 25	25 20	20 20	20 20
500 - 549 550 - 599	25 25	25 20	20 20	20 20	20 20	15 15
600 - 649 650 - 699	25 20	20 20	20 20	20 20	20 20	15 15
700 - 749 750 or More	20 20	20 20	20 20	15 15	15 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

207

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

Central Avenue Pike at Strip Mall Entrance and Proposed Road "A" South

2026 Projected AM NB Right Turns = 3

Right Turn Lane NOT Warranted

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

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

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

403

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

452+11 = 463

Central Avenue Pike at Strip Mall Entrance and Proposed Road "A" South

2026 Projected PM SB Left Turns = 11

Left Turn Lane NOT Warranted

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

TABLE 5B

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

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

452

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
11 Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199				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

Central Avenue Pike at Strip Mall Entrance and Proposed Road "A" South

2026 Projected PM NB Right Turns = 11

Right Turn Lane NOT Warranted

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

APPENDIX J

SIMTRAFFIC VEHICLE QUEUE WORKSHEETS

Intersection: 4: Central Avenue Pike & Barberry Drive/Road "A" North

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	37	40	3	5
Average Queue (ft)	7	15	0	0
95th Queue (ft)	27	41	3	4
Link Distance (ft)	241	147	530	314
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Central Avenue Pike & Road "A" South

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	40	19
Average Queue (ft)	13	1
95th Queue (ft)	35	9
Link Distance (ft)	203	530
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: Central Avenue Pike & Barberry Drive/Road "A" North

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	34	43	10	75
Average Queue (ft)	7	12	0	8
95th Queue (ft)	27	37	5	40
Link Distance (ft)	241	147	530	314
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Central Avenue Pike & Road "A" South

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	33	40
Average Queue (ft)	13	4
95th Queue (ft)	34	22
Link Distance (ft)	203	530
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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CIVIL ENGINEERING / TRAFFIC ENGINEERING