

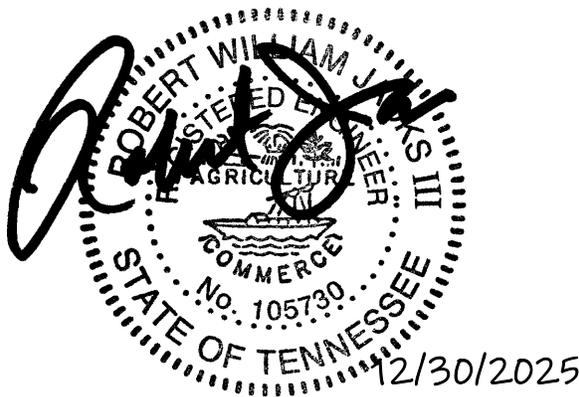


Transportation Impact Study Northbrook Park Subdivision Knox County, Tennessee



Revised with Addendum December 30, 2025

Prepared for:
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EXECUTIVE SUMMARY

Preface:

Clear Water Partners, GP, proposes a residential development adjacent to and north of E Beaver Creek Drive in North Knox County, TN. The proposed development will include the construction of 153 multi-family attached townhouses and 312 apartments for a total of 465 units on approximately 43.58 acres. The development is named as and referred to as “Northbrook Park Subdivision” in this study. This development proposes a single entrance to E Beaver Creek Drive across from Stone Cutter Way and 382 feet northeast of the 4-way intersection of E Beaver Creek Drive with Hannah Brook Road and Stanfort Lane. The proposed Northbrook Park Subdivision is anticipated to be fully built and occupied by 2028.

The primary purpose of this study is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access road, the entrance intersection, and the existing signalized t-intersection of E Beaver Creek Drive at Central Avenue Pike, approximately 0.85 miles to the southwest. This report is a Level 2 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 Northbrook Park Subdivision, with 153 multi-family attached townhouses and 312 apartments, is estimated to generate 3,799 vehicle trips on an average weekday at full build-out and occupancy. Of these daily trips, 221 are estimated to occur during the AM peak hour and 321 in the PM peak hour in 2028.
- The signalized intersection of E Beaver Creek Drive at Central Avenue Pike is calculated in the existing and projected conditions to operate with reasonable vehicle delays. However, during the morning peak periods in the current conditions, the westbound approach of E Beaver Creek Drive has been observed with relatively brief, yet substantial vehicle queues. During the afternoon peak periods, the southbound left-turn lane on Central Avenue Pike was observed to have protected left-turn green arrow times that were less than desirable for serving the existing vehicular load. Future conditions, including general growth in the area and the proposed development, will exacerbate these issues. They can be

addressed by modifying the signal timing to offset the expected increase in vehicle traffic.

- In the projected 2028 conditions, the intersection of E Beaver Creek Drive/Stone Cutter Way at the Proposed Entrance is calculated with reasonable vehicle delays and flows on the main throughfare of E Beaver Creek Drive. However, the minor approaches of Stone Cutter Way and the Proposed Entrance are projected to experience considerable vehicle delays during peak hours due to substantial thru volumes on E Beaver Creek Drive. Notwithstanding the high vehicle delays, the vehicle queues on these minor approaches are projected to be acceptable in length.
- The future 2028 entering volumes into the proposed Northbrook Park Subdivision are projected to meet threshold warrants for a separate eastbound left-turn lane on E Beaver Creek Drive at the Proposed Entrance. A separate westbound right-turn lane on E Beaver Creek Drive is not projected to be fully warranted at the Proposed Entrance.
- Two southbound exiting lanes for the Proposed Entrance approach will be necessary to facilitate the motorists exiting the proposed subdivision.
- The intersection of E Beaver Creek Drive at the Proposed Entrance and Stone Cutter Way was examined with respect to a potential traffic signal, and it was estimated that the intersection will not meet traffic signal warrants under projected 2028 conditions.

Recommendations:

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

E Beaver Creek Drive/Stone Cutter Way at Proposed Entrance:

- A separate eastbound left-turn lane on E Beaver Creek Drive is warranted at the Proposed Entrance based on the projected 2028 volumes and Knox County thresholds. As recommended by Knox County Engineering & Public Works, the minimum storage length for this turn lane should be 90 feet, which would accommodate at least three passenger cars. It is recommended that the approach

and departure tapers for this new turn lane be 160 feet, with the approach taper length including an 80-foot bay taper.

- Two southbound exit lanes for the Proposed Entrance approach should be provided, with a shared left/thru lane and a separate right-turn-only lane separated by a white lane line, and white pavement arrows indicating the assignment.
- It is recommended that the intersection radius for the Proposed Entrance approach be increased from the typical standard. To facilitate entering and exiting movements, it is recommended that the intersection radius for the Proposed Entrance approach be at least 40 feet. With limited road frontage right-of-way along E Beaver Creek Drive, it is also recommended that as much road pavement as possible be provided outside the thru lane for westbound right-turn movements to aid in removing these motorists from the thru movements and help maintain flows on E Beaver Creek Drive.
- It is recommended that the eastbound and westbound approaches on E Beaver Creek Drive be posted with cross road intersection warning signs and street name plaques in advance of Stone Cutter Way and the entrance roadway for the proposed Northbrook Park Subdivision.
- Future landscaping, existing vegetation, grading, or proposed signage must not impact the intersection sight distances looking from the Proposed Entrance to the east and west on E Beaver Creek Drive.
- The civil site design engineer must ensure that a minimum of 400 feet of intersection sight distance is made available for exiting left and right-turning vehicles from the Proposed Entrance at E Beaver Creek Drive.
- It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Entrance approach at E Beaver Creek Drive. The stop bar should be applied a minimum of 4 feet away from the traveled edge of E Beaver Creek Drive and placed at the desired stopping point that maximizes sight distance.

E Beaver Creek Drive at Central Avenue Pike:

- * • Due to substantial vehicle queues on the westbound approach to E Beaver Creek Drive at Central Avenue Pike during the AM peak periods, it is recommended that the signal timing be modified to increase the minimum initial and green time assigned to this approach.

- * • Due to the vehicular load in the existing and projected conditions for the southbound left-turn lane on Central Avenue Pike at E Beaver Creek Drive in the PM peak periods, it is recommended that the signal timing be modified to increase the amount of protected left-turn arrow green time assigned to this lane.
- * • It is recommended that Knox County consider supplementing the existing “No Turn on Red” (R10-11a) sign that is hung on the span wire with a posted sign on the right-hand side of the road at or near the southbound thru lane stop bar with an additional “No Turn on Red” (R10-11) sign, with this sign including a red ball on the sign.

Northbrook Park Subdivision Internal Roads:

- A 10 mph Speed Limit Sign (R2-1) with additional plaque signage, as shown in the report, is recommended to be posted near the beginning of the Proposed Entrance road off E Beaver Creek Drive. It is also recommended that a “No Outlet” Sign (W14-2a) be posted at the front of the subdivision off E Beaver Creek Drive. This sign can be posted above or below the private street name sign.
- Stop Signs (R1-1) are recommended to be installed at the internal road intersections.
- Yield Signs (R1-2) will be required at the internal roundabout in addition to Roundabout Circulation Plaques (R6-5P) and Pedestrian Signs (W11-2). Pavement markings for the roundabout should follow TDOT Standard Drawing T-M-17.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. The civil site designer should ensure internal sight distances are met.
- At the front of the subdivision, where access is proposed to the parking lot for the office/clubhouse, the southbound exiting approach of the entrance drive should include a white box, approximately 20' x 24', with 4 to 6-inch solid white lines and a single crosshatch from corner to corner applied to the pavement. The white box should be accompanied by a road sign facing southbound traffic exiting the development stating, “Do Not Block Driveway” (R10-7).
- The civil site designer should provide a centralized mail delivery center location within the development for the subdivision residents.
- All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.
- Concrete sidewalks should be 5 feet wide and have appropriate ADA-compliant ramps at intersection corners with detectable surfaces. White-painted crosswalks

should be applied to the internal road pavement where pedestrians are expected to cross. Internal crosswalks should have a white transverse marking as shown in TDOT Standard Drawing T-M-4.

- Knox County completed a greenway study and evaluated one of the corridors, Beaver Creek East. One of the preferred routes for this corridor is shown traversing the Northbrook Park Subdivision development property along Beaver Creek. Without knowing the final alignment and path of this greenway, the following should be considered as a potential part of the civil site design:
 - A greenway easement along Beaver Creek in a location and width acceptable to the Knox County Recreation Department.
 - Pedestrian connections in the form of sidewalks and/or trails from the subdivision to the proposed greenway along Beaver Creek.
- Since the proposed layout of the Northbrook Park Subdivision provides only one means of ingress and egress, the subdivision entrance will need to be designed and constructed as a boulevard roadway. This design should be coordinated with Knox County Engineering and Public Works and subject to their review and approval.
- All road and intersection elements should be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) and the Manual on Uniform Traffic Control Devices (MUTCD), as well as Knox County's specifications and guidelines, to ensure proper roadway operations.

DESCRIPTION OF EXISTING CONDITIONS

- **STUDY AREA:**

The location of the proposed Northbrook Park Subdivision is shown on a map in Figure 1. This development will be situated on the northern side of E Beaver Creek Drive in North Knox County, Tennessee, with a proposed entrance across from Stone Cutter Way, which provides the sole access to 44 townhouses in the Valley Ridge development on the south side of E Beaver Creek Drive.

The Northbrook Park Subdivision will be constructed from a few existing parcels, including a small property adjacent to E Beaver Creek Drive with an existing single-family house (531 E Beaver Creek Drive) and a larger parcel to the rear, which will comprise the vast majority of the development property. This larger parcel is primarily undeveloped, except for a single-family house near the road at 525 E Beaver Creek Drive. It primarily lies between E Beaver Creek Drive and Beaver Creek to the north. The development property parcels have a combined total of 290 feet of road frontage along E Beaver Creek Drive.

As requested, transportation impacts associated with the development were analyzed at the intersection of E Beaver Creek Drive at the Proposed Entrance, where the subdivision will have sole road access to and from external destinations, and the signalized t-intersection of E Beaver Creek Drive at Central Avenue Pike, 0.85 miles to the southwest.

The proposed development property is situated in a suburban area of Knox County, which continues to experience growth in residential and commercial development. Many subdivision developments and standalone houses are in the surrounding area along E Beaver Creek Drive. In addition to residential areas, there are pockets of forest, undeveloped properties, and a church nearby. A large amount of the Northbrook Park Subdivision property is currently cleared and used for hay production, with the rest along the edges being forested. The existing single-family houses at 525 and 531 E Beaver Creek Drive on the development parcels will be removed during the construction of the subdivision. The topography of the proposed subdivision property is defined by moderate slopes, with a high point in the center of the property, and falls towards Beaver Creek to the north, which flows from east to west. On the north side of the property, a couple of unnamed tributaries of Beaver Creek and Beaver Creek itself cross the development property.

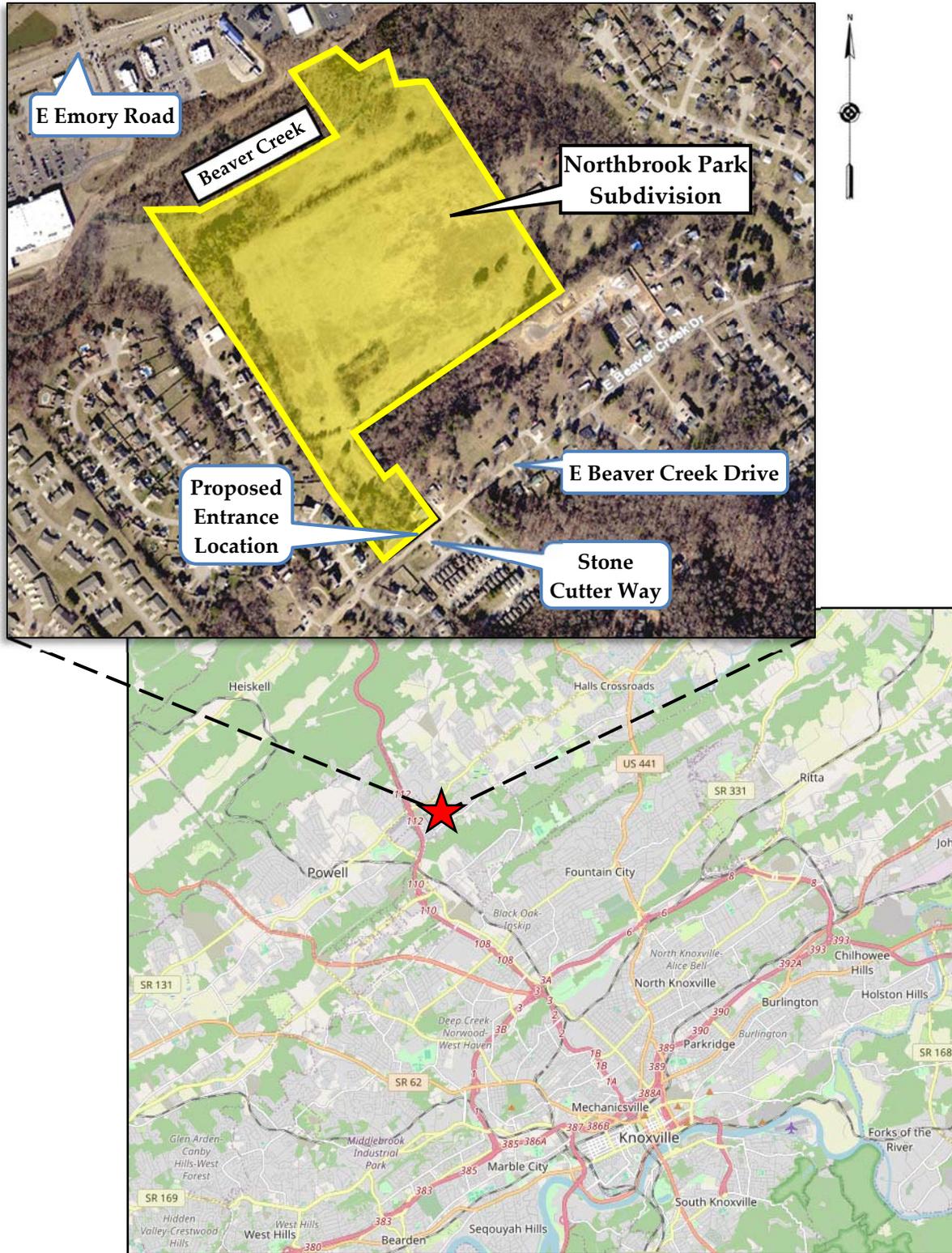


Figure 1
Location Map

▪ **EXISTING ROADWAYS:**

Table 1 lists the characteristics of the existing primary roadways near 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
E Beaver Creek Drive	Major Collector	40 mph	2 lanes undivided	20.5 feet	None	None	No bike lanes
Central Avenue Pike	Minor Arterial	40 mph	2 lanes undivided	40 feet	None	None	No bike lanes

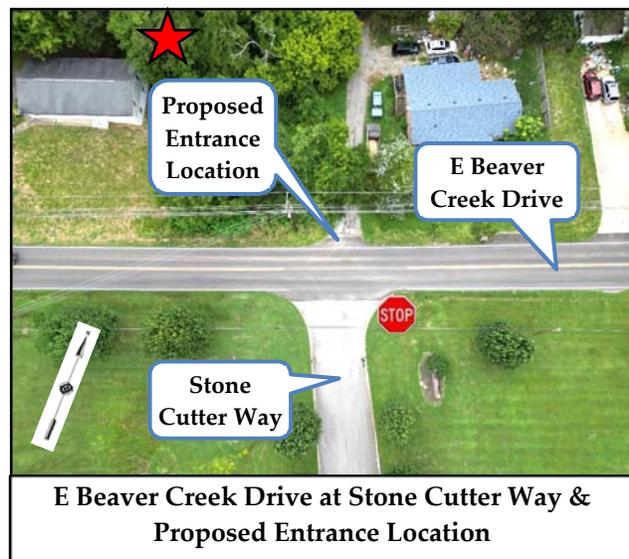
¹ 2018 Major Road Plan by Knoxville/Knox County Planning

² Edge of pavements at Proposed Entrance location

³ According to Knoxville Area Transit System Map

E Beaver Creek Drive is categorized as a Major Collector and traverses southwest to northeast adjacent to the proposed development property. Adjacent to the site, the roadway has a 2-lane section with one lane in each direction. To the southwest, E Beaver Creek Drive begins at a Y-shaped signalized intersection with Central Avenue Pike, adjacent to an Interstate 75 overpass. To the northeast, E Beaver Creek Drive transitions to Cunningham Road at the signalized 4-way intersection with Dry Gap Pike, and the roadway continues towards Maynardville Pike. E Beaver Creek Drive is 2.2 miles long.

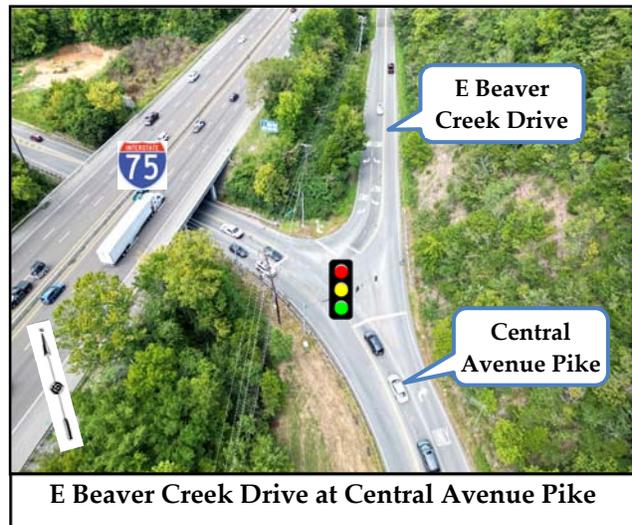
The posted speed limit on E Beaver Creek Drive is 40 mph. Sidewalks and bike lanes are not provided along E Beaver Creek Drive adjacent to the site. A utility light for road illumination is provided on E Beaver Creek Drive at the intersection with Stone Cutter Way, where the Proposed Entrance will be located on the opposite, north side. Stone Cutter Way is controlled by a Stop Sign (R1-1), and the traffic on E Beaver Creek Drive operates freely without control.



E Beaver Creek Drive is delineated with a double yellow centerline and white edge lines, with just inches of pavement outside the white edge lines. Outside the pavement edge, the roadway is lined with grass, vegetation, ditches, and private driveways.

The Proposed Entrance for the development will be located on the north side, directly across from Stone Cutter Way, where the existing driveway for the residential house at 531 E Beaver Creek Drive currently exists.

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 begins at the intersection of W/E Emory Road (SR 131) and Heiskell Road on the north end. It terminates at a vertical curve below a railroad underpass to the south near Interstate 640. To the south of W/E Emory Road and E Beaver Creek Drive, Central Avenue Pike provides access to Callahan Drive for northbound and southbound travel on Interstate 75 at Exit 110.



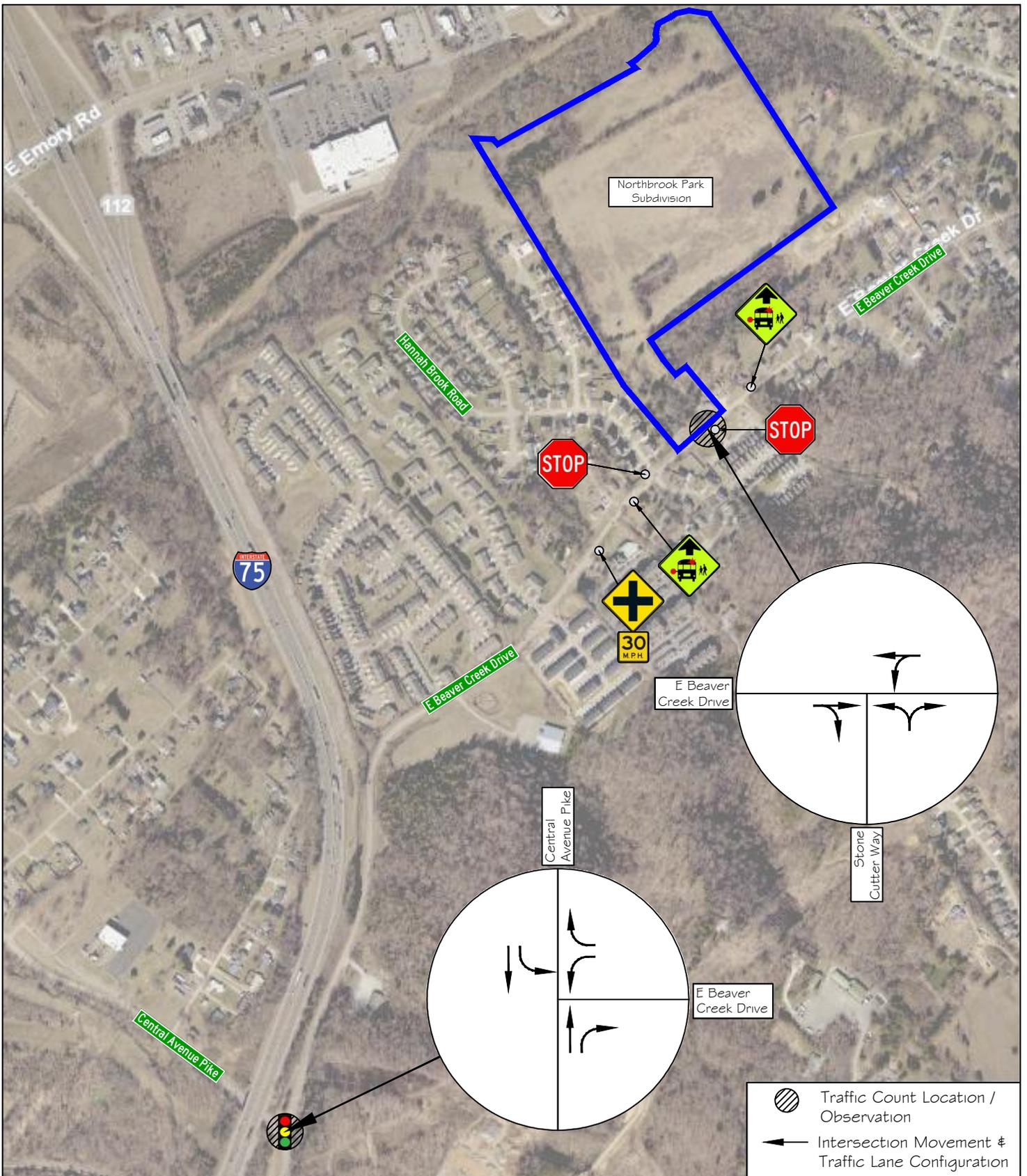
The posted speed limit on Central Avenue Pike is 40 mph, and there are no sidewalks or bike lanes.

There is a narrow railroad underpass on Central Avenue Pike, approximately 700 feet south of the signalized intersection of E Beaver Creek Drive and Central Avenue Pike. For vehicles on Central Avenue Pike, numerous warning signs are provided in both directions about the low clearance of this railroad underpass. The warning signs state a height of 11 feet, 11 inches, and that thru trucks are prohibited.

At the traffic signal with E Beaver Creek Drive, Central Avenue Pike has two lanes on each approach, with a left-turn lane and a thru lane on its southbound approach and a thru lane and a separate right-turn-only lane on its northbound approach. The left-turn lane on Central Avenue Pike's southbound approach has a designated vehicle storage length of 180 feet. The right-turn lane on Central Avenue Pike's northbound approach has a generous designated vehicle storage length of 275 feet.

At the traffic signal, E Beaver Creek Drive features separate left and right-turn lanes for turns towards the south and north on Central Avenue Pike, with the left-turn lane transitioning from the thru lane on E Beaver Creek Drive. The right-turn lane on E Beaver Creek Drive has a designated vehicle storage length of 140 feet. All traffic signal heads are hung from span wires suspended by metal strain poles.

Figure 2 shows the traffic count locations for the study and the current traffic signage along E Beaver Creek Drive adjacent to the proposed development site. The traffic signage shown in Figure 2 includes only warning and regulatory signage near the proposed development site, but not directional or guidance signage. The pages following Figure 2 provide a further overview of the site study area, accompanied by photographs.



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NOT TO SCALE



FIGURE 2

Northbrook Park Subdivision

Traffic Count Locations, Traffic Signage & Existing Lane Configurations

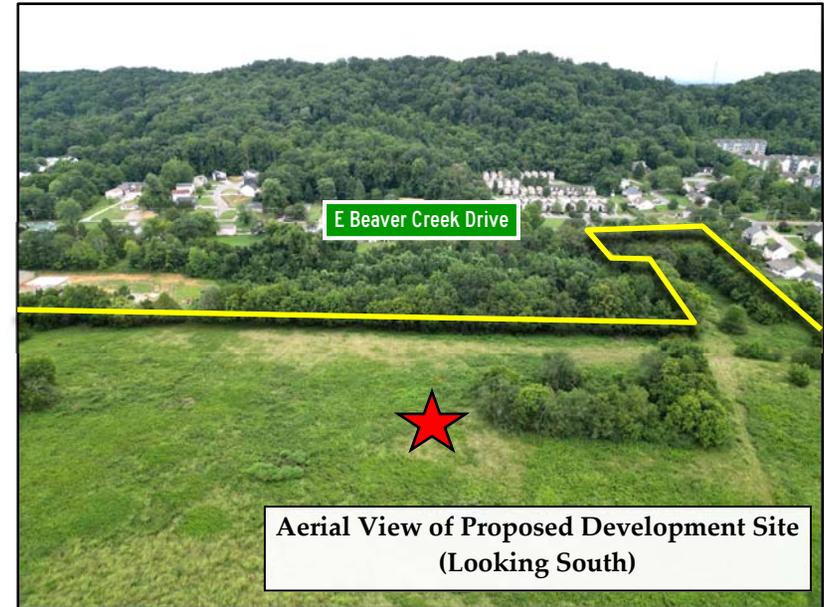
PHOTO EXHIBITS



Proposed Development Site

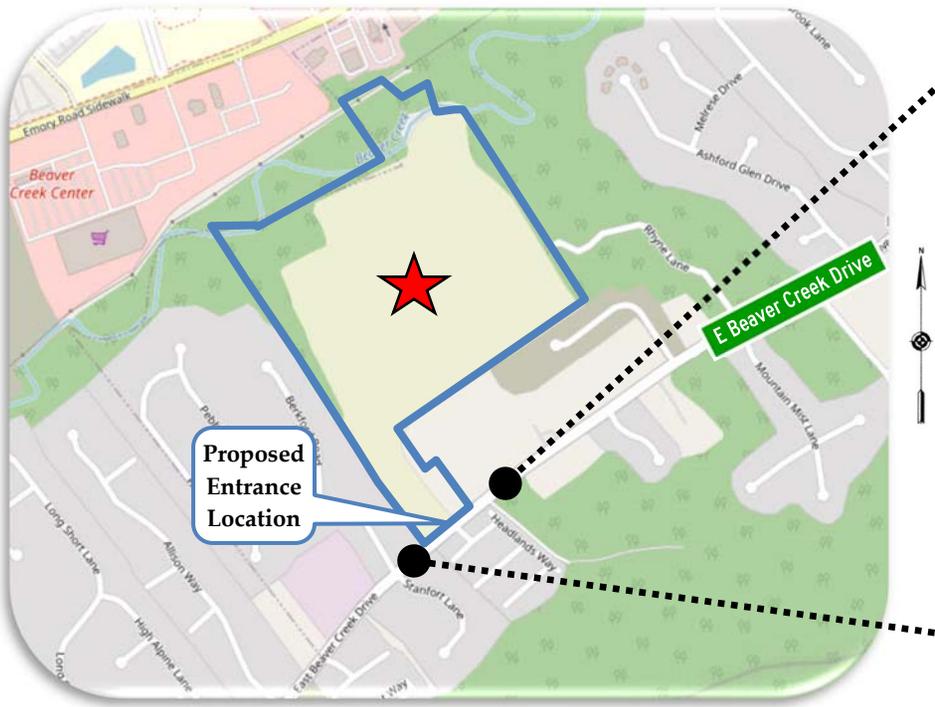


**Aerial View of Proposed Development Site
(Looking North)**



**Aerial View of Proposed Development Site
(Looking South)**

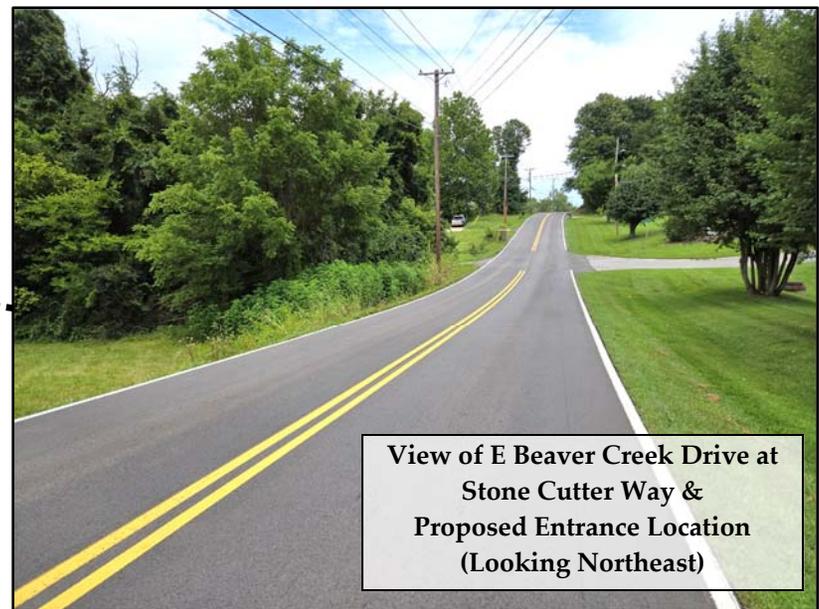
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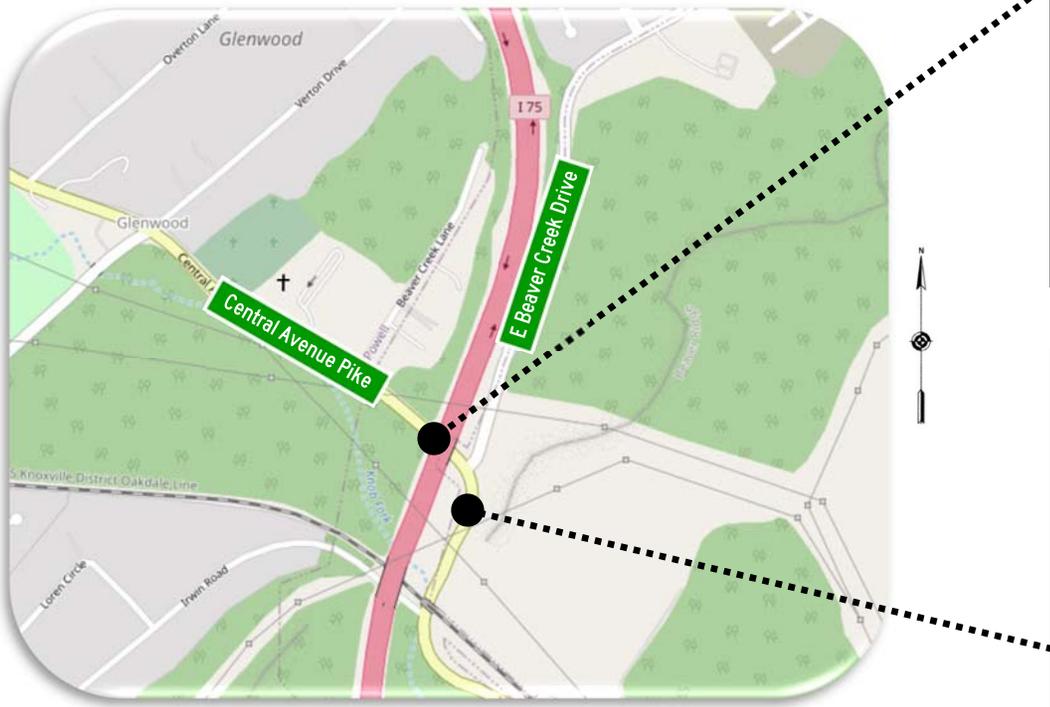
Development Site at Proposed Entrance Location



View of E Beaver Creek Drive at Stone Cutter Way & Proposed Entrance Location (Looking Southwest)



View of E Beaver Creek Drive at Stone Cutter Way & Proposed Entrance Location (Looking Northeast)



Central Avenue Pike at E Beaver Creek Drive



▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

A couple of annual vehicular traffic count locations are located near the study area, and the Knoxville Transportation Planning Organization (TPO) and the Tennessee Department of Transportation (TDOT) conduct these counts. The TPO count has been conducted sporadically over the past 10 years. The count location data is the following and can be viewed with further details in Appendix A:

○ Existing vehicular roadway traffic:

The Knoxville TPO reported the following Average Daily Traffic (ADT):

- E Beaver Creek Drive, northeast of the project site, at 8,780 vehicles per day in 2023. From 2014 to 2023, this count station has reported an average annual growth rate of +0.9 %.

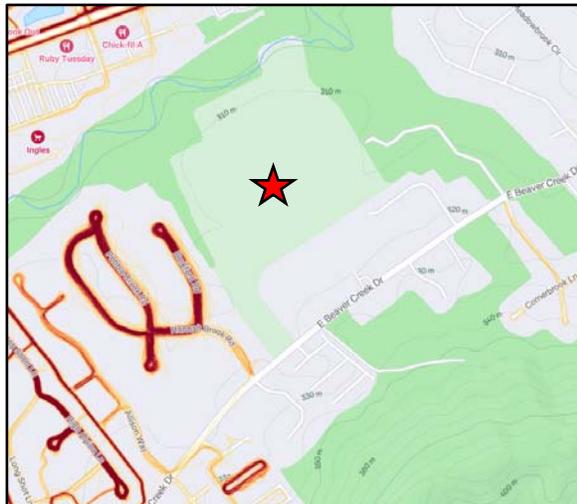
TDOT reported the following Average Annual Daily Traffic (AADT):

- E Beaver Creek Drive, southwest of the project site, at 9,413 vehicles per day in 2024. Between 2014 and 2024, this count station has shown an average annual growth rate of +0.4 %.
- Central Avenue Pike, southwest of the project site, at 8,437 vehicles per day in 2024. Between 2014 and 2024, this count station has shown an average annual growth rate of 1.7%.

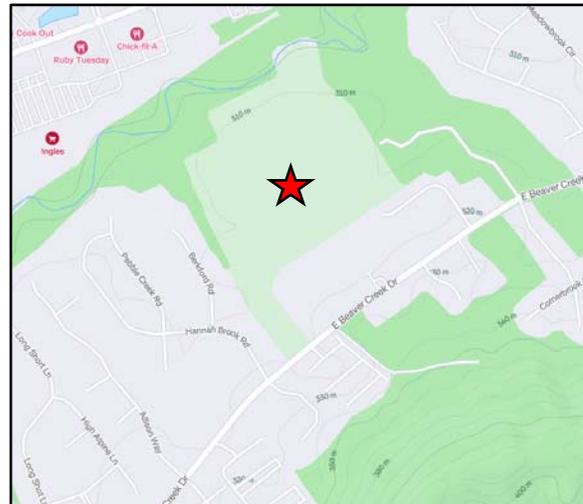
○ Existing bicycle and pedestrian volumes:

The average daily pedestrian and bicycle traffic along E Beaver Creek Drive is unknown. However, without sidewalks and nearby amenities, this roadway is assumed to have minimal pedestrian and bicyclist activity. During the traffic counts for this project, no bicyclists or pedestrians were observed along E Beaver Creek Drive.

An online website, [strava.com](https://www.strava.com), provides “heat” maps detailing routes taken by pedestrians, joggers, and bicyclists. The provided heat maps display data from the last two years, are updated monthly, and are compiled from individuals who have allowed their smart devices to track and record their routes (millions of users). The activities in the maps are represented on the roads by color intensities, with darker colors indicating higher activity. The Strava heat maps show no pedestrian or bicyclist activity along E Beaver Creek Drive near the development site. A fair amount of pedestrian activity is observed in the adjacent existing residential subdivisions, but bicyclist activity is absent.



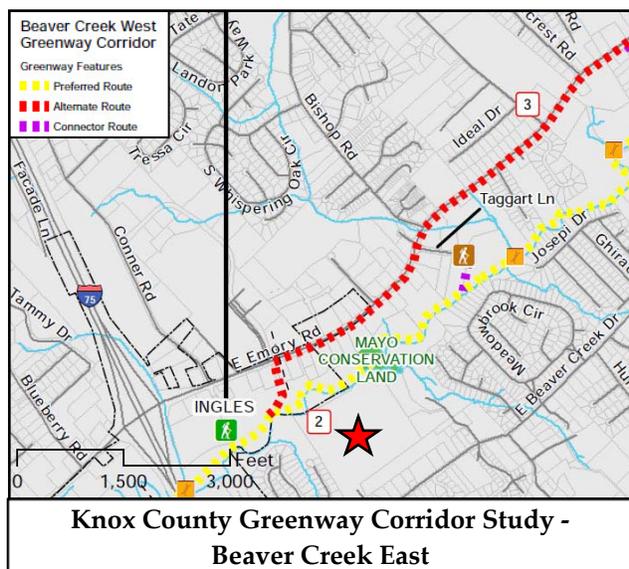
Strava Heat Map for Pedestrian and Joggers



Strava Heat Map for Bicyclists

▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

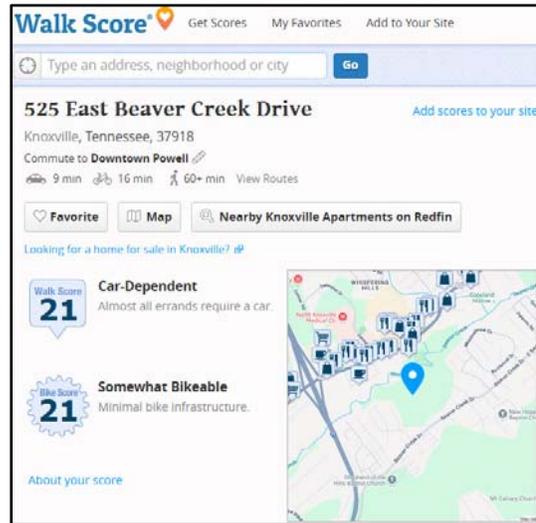
Knox County completed a Greenway Corridor Study in 2020. This study evaluated potential alignments for greenways throughout Knox County. The study identified and evaluated one corridor, Beaver Creek East. This corridor would run from Interstate 75 in Powell to the Union County line in Gibbs. The preferred route for this corridor is shown traversing along Beaver Creek in the northern section of the development property.



The executive summary in the Knox County study states: “The greenway corridor study will be utilized when asking for greenway easements from developers and property owners as their proposed construction projects go through Knoxville-Knox County Planning for approval. The County’s policy is to acquire property or easements for greenways only through voluntary donation or sale.” The mapping from this study indicates the preferred route on the north side of Beaver Creek, possibly across the development property, but this route may be subject to change.

▪ **WALK SCORE:**

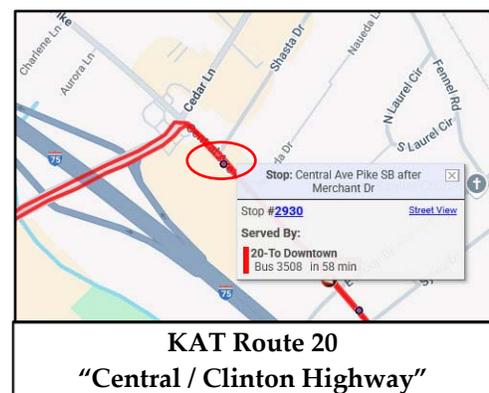
A private company offers a website at walkscore.com that grades and gives scores to locations within the United States based on “walkability”, “bikeability”, and transit availability based on a patented system. According to the website, the numerical values assigned to the Walk Score and Bike Score are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



The project site location is graded with a Walk Score of 21 at the approximate development property address (525 E Beaver Creek Drive). This Walk Score indicates that almost all errands currently require a vehicle for travel at the development property location. The Walk Score is graded very low due to the lack of sidewalks and nearby amenities. The site is assigned a Bike Score of 21, indicating minimal infrastructure, but somewhat bikeable. A Transit Score is not provided since there are no public transportation opportunities near the development site. Overall, this study assumed that future residents of the Northbrook Park Subdivision would not have any reduction in vehicle trips due to pedestrian or bicyclist activity.

▪ **TRANSIT SERVICES:**

The City of Knoxville offers a network of public transit options through Knoxville Area Transit (KAT). However, this bus service is not available near the development site. The closest public transit bus stop to the development site is located 3.4 miles to the south on Route 20, “Central / Clinton Highway”. This closest bus station is located on Central Avenue Pike at Shasta Drive. This route has established bus service every 60 minutes at this bus stop, and this route map is also included in Appendix B. It operates on weekdays and weekends. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provide transportation services upon request.

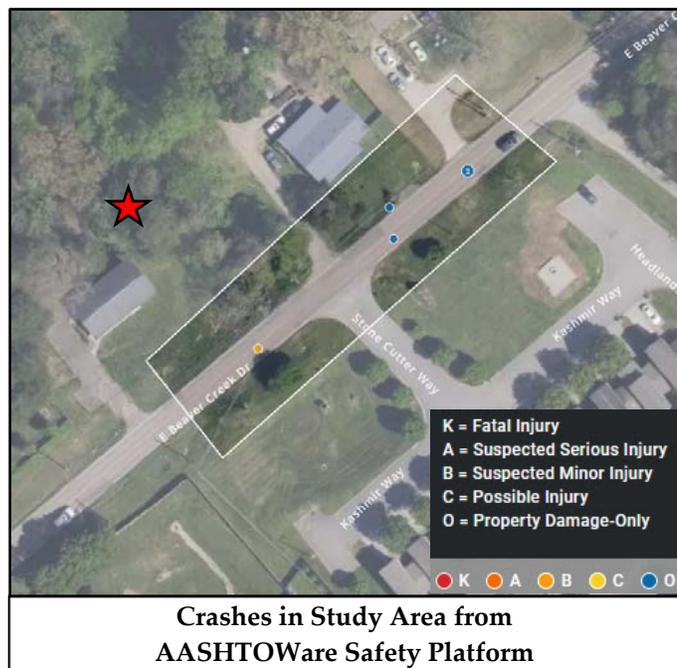


Given that the nearest public bus service is several miles away and there are no sidewalks or bike lanes to reach the bus stop without a vehicle, the proposed subdivision is not expected to experience a reduction in vehicle trips due to public transit.

▪ **CRASH DATA:**

For this project, access to the AASHTOWare Safety online platform was provided. This AASHTO (American Association of State Highway and Transportation Officials) platform is a component of several offerings that include compiling crash data for local state DOTs to use in safety analyses. TDOT provides vehicle crash data to this system and is an extension of its existing E-TRIMS (Enhanced Tennessee Roadway Information Management System) database. The crash data in the E-TRIMS system is from the statewide TITAN (Tennessee Integrated Traffic Analysis Network) database. The TITAN database includes all reportable vehicle crash data from Tennessee law enforcement agencies.

In the vicinity of the proposed residential subdivision entrance on E Beaver Creek Drive, five crashes occurred during the past 3 years between October 23rd, 2022, and October 23rd, 2025. All five crashes occurred along the roadway, outside intersections. One crash occurred due to suspected alcohol use. The crashes outside the roadway included two collisions with an embankment and one with a utility pole. One of the crashes was a rear-end crash, and the fifth crash did not list the crash type. Four of the five crashes resulted in property damage only, and one involved a suspected minor injury.



The crash data along E Beaver Creek Drive does not readily indicate potential issues with additional vehicles generated by a new proposed residential subdivision. However, the increase in vehicular trips due to the proposed subdivision would potentially increase the exposure of conflicting vehicles. The recommendations provided in this study will help mitigate this increased exposure.

PROJECT DESCRIPTION

▪ LOCATION AND SITE PLAN:

The proposed plan layout with 153 multi-family attached townhouses and 312 apartments on 43.58 +/- acres is designed by Silvus Engineering Consulting and illustrated in Figure 3. The design features numerous internal drives and aisleways to provide access to the apartments and townhouses. As shown in the figure, the sole entrance to the development will be constructed on the north side of E. Beaver Creek Drive, and this entrance street will be configured with a boulevard typical section. This main entrance street will run from north to south, and internally, a roundabout is proposed, intersecting an internal aisleway running east-west.



The Northbrook Park Subdivision will have a fair amount of open space and common areas for residents, as the northern section of the development property, adjacent to Beaver Creek, will include a 7-acre private park. At the front of the development, an office/clubhouse is shown just inside the property off E Beaver Creek Drive. This building will include 26 parking spaces, and residents will be provided with an outdoor swimming pool, playground, and an outdoor kitchen to the rear. Other proposed amenities in

the subdivision include a secondary swimming pool, a decorative pond with a fountain, two dog parks, three grill stations, an additional outdoor kitchen area, a mail center, a dog-washing area, and a walking trail to the office/clubhouse. Sidewalks will also be provided throughout the development.

The townhouses will be located on the eastern portion of the property, and the apartments on the western portion. The townhouses will provide parking for 413 vehicles, including one-car driveways, garages, and visitor stalls.

The apartments will be spread across 14 buildings, each between 2 and 3 stories tall. The

proposed mix of apartments includes the following: 134 1-bedroom units, 142 2-bedroom units, and 36 3-bedroom units, for a total of 526 bedrooms. Parking for the apartments will include 658 stalls and 28 garage spaces. All parking spaces on the site will be 9' x 17.5', and all aisleways and drives will be 26 feet in width.

As part of the development's construction and to provide a road connection to E Beaver Creek Drive, the entire intersection of E Beaver Creek Drive/Stone Cutter Way will undergo substantial modifications, including raising the grade of the existing roadways. This raising of the road grade on E Beaver Creek Drive will reduce the existing depth of the sag vertical curve at Stone Cutter Way, where the Proposed Entrance will tie into and create a 4-way intersection.

The completion schedule for this new residential development depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. Overall, the local real estate market for new housing remains quite competitive due to population growth and other factors. This study assumed that the total construction build-out of the Northbrook Park Subdivision and full occupancy would occur by 2028.

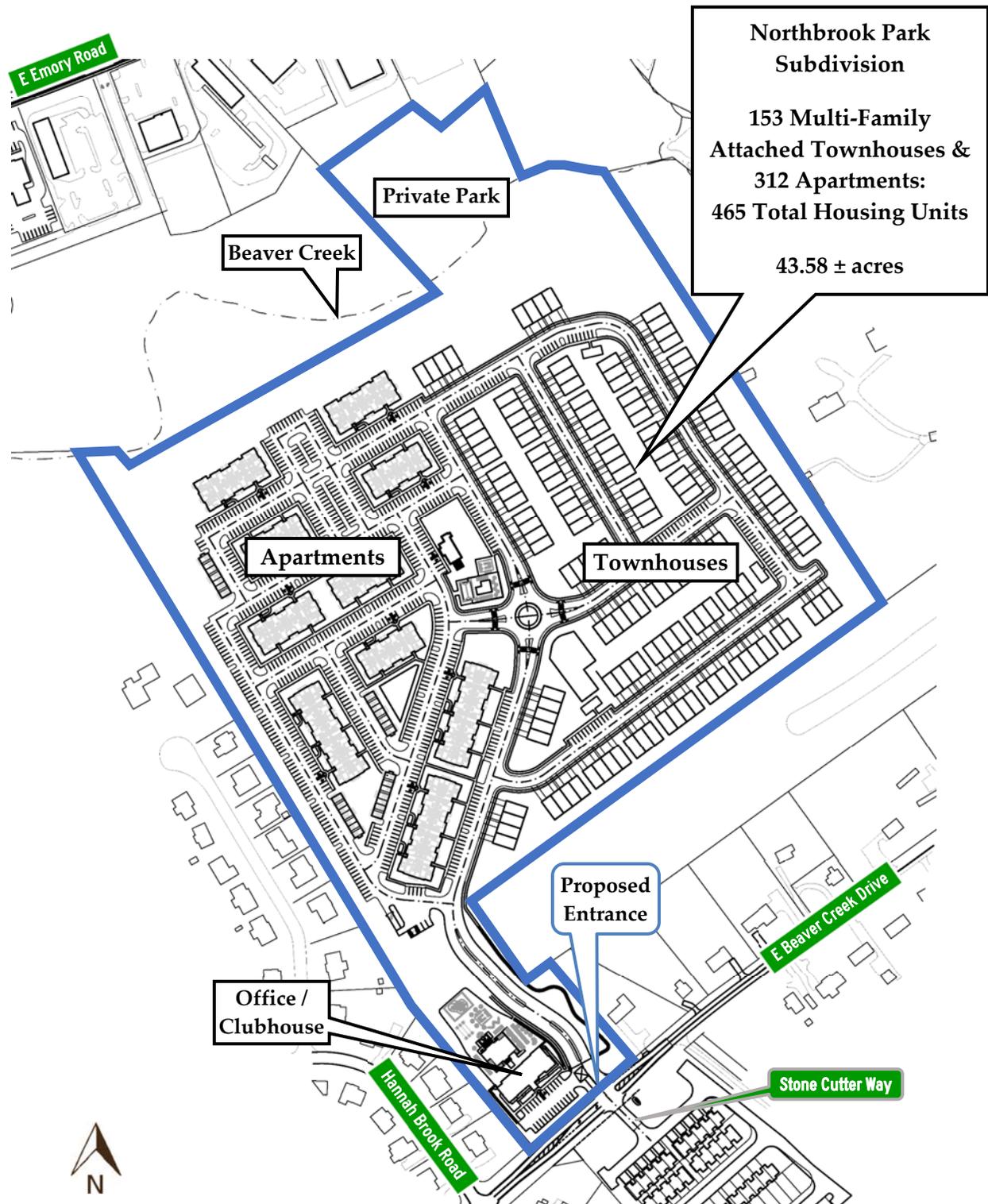


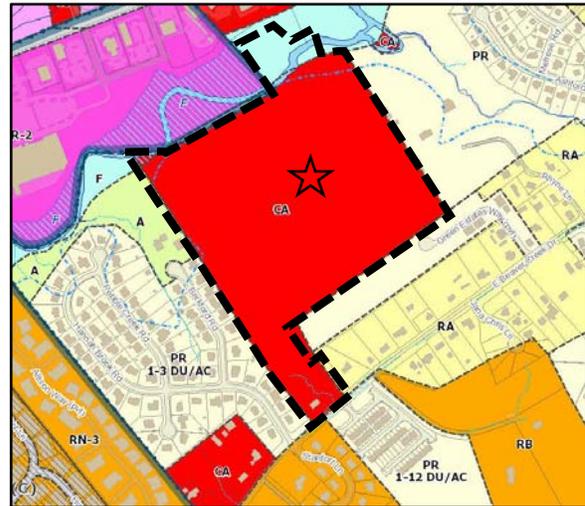
Figure 3
Proposed Plan Layout
Northbrook Park Subdivision

Not to Scale –
Annotated by Ajax
Engineering for
Display Purposes



▪ **PROPOSED USES AND ZONING REQUIREMENTS:**

The existing parcels comprising the Northbrook Park Subdivision development property are in Knox County, TN. The small parcel at 531 E Beaver Creek Drive is zoned as Low Density Residential (RA), and the larger parcel is zoned as General Business (CA) and Floodway (F). The most recently published online KGIS zoning map is provided in Appendix C and shown here. The existing adjacent surrounding zoning and land uses are the following:



KGIS Existing Zoning Map

- The properties to the north are zoned as Floodway (F) and Regional Commercial Zoning District (C-R-2) in the City of Knoxville. The property is also zoned as Floodway (F), where it lines Beaver Creek. The properties to the north in the C-R-2 District in Knoxville are adjacent to E Emory Road with road access to the north. These properties include many businesses, such as Chick-fil-A, Salsarita’s, a car wash, and a credit union. Beaver Creek has been designated and is being established as a Water Trail in Knox County, and the development property abuts the creek and this water trail. According to Knox County, “This initiative is focused on clearing, cleaning, and caring for a 44-mile stretch of navigable water across five communities between Clayton Park in Halls and Melton Hill in Hardin Valley”.
- To the west, a single parcel is zoned Agricultural (A), and several others are zoned Planned Residential (PR), adjacent to the development property. The Planned Residential (PR) parcels are occupied by single-family detached houses, with road access to Berkford Road and Hannah Brook Road. The Agricultural (A) property is also in the Hidden Brook Subdivision and includes a single-family house at the end of Berkford Road.
- To the south and across E Beaver Creek Drive, the development property is bound by single-family detached houses in the Summit View North Subdivision along Stanford Lane and townhouses in the Valley Ridge development. The townhouses in the Valley Ridge development have external road access to E Beaver Creek Drive via Stone Cutter Way. The Summit View North Subdivision properties are zoned as General Residential (RB), and the townhouse properties in Valley Ridge are zoned as Planned Residential (PR).

- To the south of the Northbrook Park Subdivision, but on the north side of E Beaver Creek Drive, the proposed development property is adjacent to a few condominiums in Green Estates, an L-shaped property zoned Planned Residential (PR). Green Estates Way provides access to E Beaver Creek Drive for these condominiums. The remaining undeveloped property at the end of Green Estates Way was just recently rezoned to Planned Residential (PR) with a density of up to 8 units per acre. Slightly south of these properties at Green Estates Way, standalone single-family detached houses line the northern edge of E Beaver Creek Drive; all are zoned as Low Density Residential (RA) and have private driveways.
 - The adjacent property to the east is zoned Planned Residential (PR). Two single-family detached houses occupy this parcel, and they have access to E Beaver Creek Drive via Rhyne Lane.
- **ON-SITE CIRCULATION:**

The new internal drives and aisleways in the Northbrook Park Subdivision will be designed and constructed in accordance with Knox County specifications. The development will have asphalt-paved internal roadways with extruded concrete curbs. The lane widths internally will be 13 feet each, for a total pavement width of 26 feet. Sidewalks will be provided along most internal drives and aisleways in this development. All internal roads within the development will be private. The owner/developer will own and maintain these in the future.

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

In addition to residential passenger vehicles, the internal roadways will provide access for service, delivery, maintenance, waste disposal, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Trash collection areas are designed and shown in the concept plan for the apartment residents in the development complex.

The new private aisleways and proposed entrances will be designed and constructed to Knox County specifications and are expected to be adequate for fire protection and rescue vehicles, trash collection trucks, and single-unit delivery trucks. The development's internal drives will accommodate larger vehicles and residents' standard passenger vehicles.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

▪ EXISTING TRAFFIC CONDITIONS:

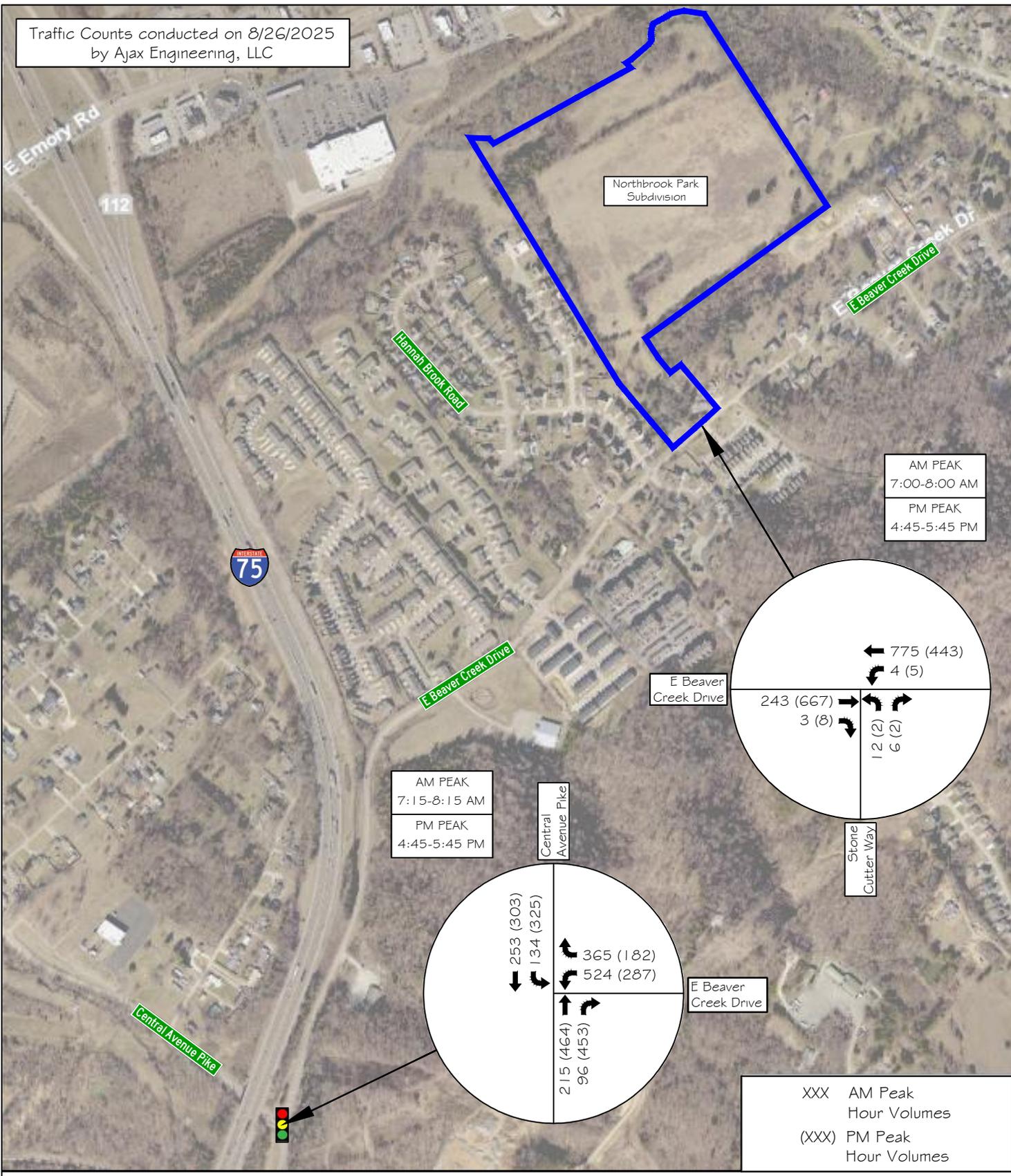
This study conducted an 8-hour traffic count at the intersection of E Beaver Creek Drive at Stone Cutter Way and a 6-hour traffic count at the intersection of E Beaver Creek Drive at Central Avenue Pike on Tuesday, August 26th, 2025. Local schools were in session for at least two weeks after the summer break. Manual traffic counts were conducted to identify and tabulate the morning and afternoon peak period volumes, as well as the travel directions, near the proposed development site. The intersection of E Beaver Creek Drive at Stone Cutter Way was observed to have morning and afternoon peak hours from 7:00 to 8:15 am and from 4:45 to 5:45 pm, respectively. The signalized intersection of E Beaver Creek Drive at Central Avenue Pike had the same PM peak hour, but slightly later AM peak hour from 7:15 to 8:15 am. The manual tabulated traffic counts at the intersections can be reviewed in Figure 4 and Appendix D. Some observations of the adjacent E Beaver Creek Drive and Central Avenue Pike corridors include the following:

- No bicyclists or pedestrians were observed at the intersections during the morning or afternoon traffic counts.
- The majority of observed vehicles during the traffic count were passenger cars. However, several school buses, dump trucks, trash collection vehicles, and construction trucks with trailers were observed.
- During the traditional school pickup and dismissal periods in the morning and afternoon, school buses made stops at Stone Cutter Way, Hannah Brook Road, and other locations along E Beaver Creek Drive. For the most part, the school bus stops traveled eastbound in the morning and westbound in the afternoon. These school bus stops along E Beaver Creek Drive were observed with long trains of trailing vehicles for several minutes afterward due to the numerous bus stops. These trailing “trains” created a nearly “impenetrable wall” for other vehicles attempting to enter E Beaver Creek Drive for minutes afterward.
- Overall traffic on E Beaver Creek Drive showed a distinct pattern: westbound (towards Central Avenue Pike) in the morning and eastbound (away from Central Avenue Pike) in the afternoon.
- At the signalized intersection, the predominant flows were southward in the morning and northward in the afternoon. The morning periods showed predominant flows on E Beaver Creek Drive, turning left towards the south, with relatively low volumes turning onto E Beaver Creek Drive from the north and south on Central Avenue Pike.

In the afternoon peak, heavy northbound right turns and southbound left turns from Central Avenue Pike to E Beaver Creek Drive eastward were observed, with much lower westbound volumes on E Beaver Creek Drive turning left or right onto Central Avenue Pike.

- Due to “rumors” of long vehicle queues on E Beaver Creek Drive from the signalized intersection with Central Avenue Pike, a traffic camera was installed in front of The Fraternal Order of Eagles at 210 E Beaver Creek Drive. This organization is approximately 750 feet from the signalized intersection. During the AM peak hour, brief but numerous vehicle queues were observed forming on E Beaver Creek Drive from the traffic signal extending up to and past The Fraternal Order of Eagles. These long vehicle queues were primarily rolling, without hard stops, and were exacerbated by the school bus stops on E Beaver Creek Drive, creating long trains of trailing vehicles. In the afternoon, vehicle queues on E Beaver Creek Drive at the traffic signal were much reasonable due to the lower westbound volumes.
- At the traffic signal during afternoon peak periods, southbound left-turn vehicles from Central Avenue Pike onto E Beaver Creek Drive were regularly underserved during their protected left-turn green arrow phase, with a few vehicles not making it through the intersection in a single traffic signal cycle. This lane has a storage length of 180 feet, and if exceeded, could block southbound thru traffic on Central Avenue Pike.
- A malfunction of the traffic signal was observed at 7:08 am, where the southbound approach on Central Avenue Pike had a flashing yellow indication concurrently with a green indication on the westbound approach of E Beaver Creek Drive. This malfunction was reported immediately to Knox County Engineering and forwarded to their traffic signal contractor.
- The southbound approach of Central Avenue Pike at the signal is posted with a “No Turn on Right” Sign (R10-11a) on the span wire facing the approach. This sign is posted due to the unique Y-configuration of the intersection. Right-on-red movements on the southbound approach would create conflicts with left-turning vehicles from E Beaver Creek Drive. Further, the Y-shaped intersection layout can encourage motorists to proceed through the intersection despite a red indication and the “No Turn on Red” Sign. However, even with the prohibition, one southbound motorist on Central Avenue Pike was observed proceeding through the intersection during a red indication, and several other motorists were observed encroaching beyond the stop bar and behaving as if they might attempt to proceed through without a green signal.

Traffic Counts conducted on 8/26/2025
by Ajax Engineering, LLC



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FIGURE 4

Northbrook Park Subdivision

2025 Peak Hour Traffic Volumes - Existing Traffic Conditions

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2025 intersection traffic volumes in Figure 4, shown at the intersections of E Beaver Creek Drive at Stone Cutter Way and E Beaver Creek Drive at Central Avenue Pike. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro (Version 12) traffic software.

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 range from LOS A to 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 the level of service criteria for unsignalized intersections and signalized intersections.



LOS is defined by the delay per vehicle (in 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 indicates 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 attempts 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 the left-turn movements on the major street. 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. 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 that nearby upstream and downstream signalized intersections can sometimes produce. For unsignalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 35 seconds.

For signalized intersections, LOS is based on delay (in seconds) for various movements within the intersection and the overall operation of all the traffic entering the intersection. This delay measures driver discomfort, frustration, fuel consumption, and lost travel time, and depends on traffic signal cycle lengths, the length of green phases, and the quality of traffic progression. This control delay includes deceleration/acceleration delay, queue move-up time, and stopped delay time. For signalized intersections, in most instances, the upper limit of acceptable delay during peak hours is the LOS D/E boundary at 55 seconds. Table 3 lists the level of service criteria for signalized intersections.

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, 7th Edition

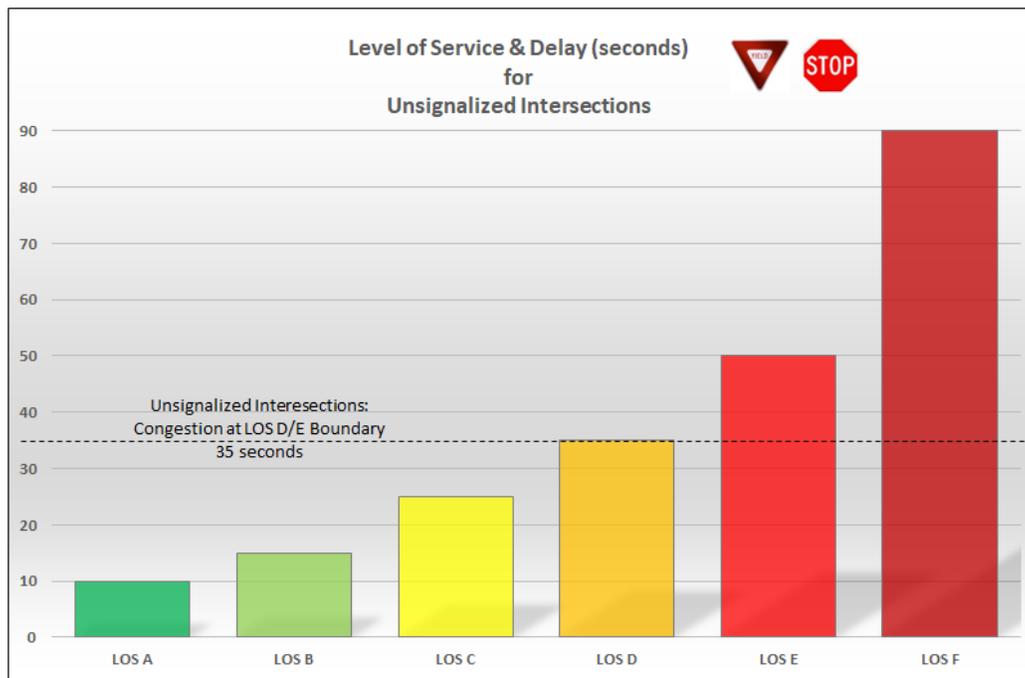
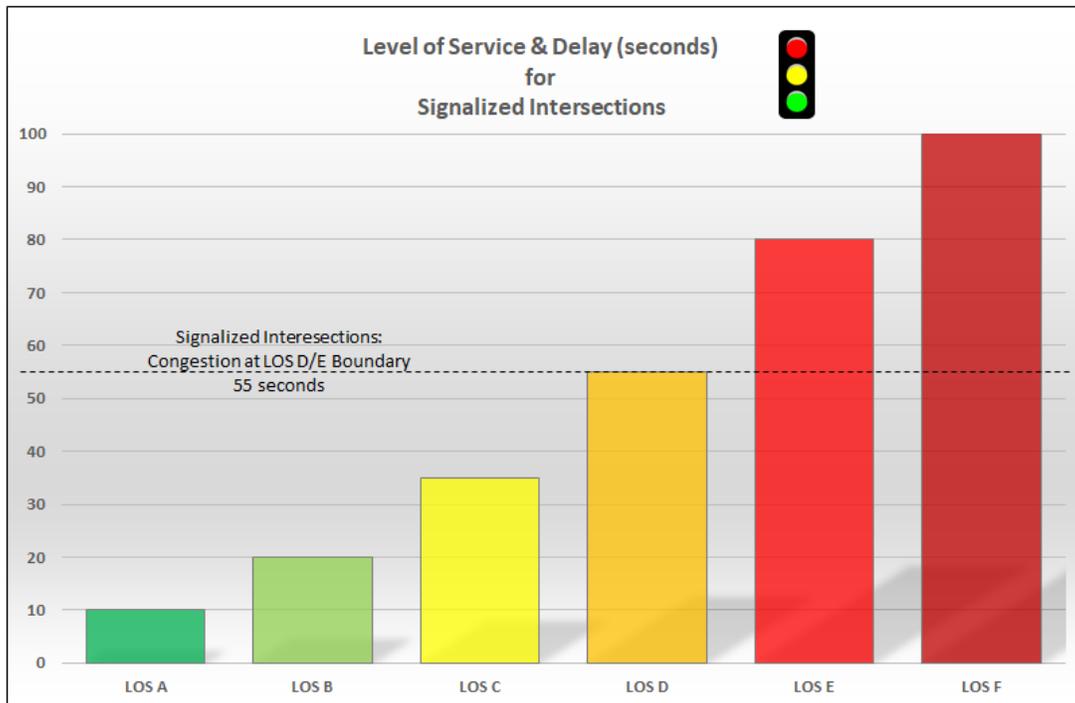


TABLE 3
LEVEL OF SERVICE AND DELAY FOR SIGNALIZED INTERSECTIONS



LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (seconds/vehicle)
A	Operation with very low control delay. Progression is extremely favorable and most vehicles do not stop at all.	≤10.0
B	Generally good level of progression. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10 - 20
C	Higher delays with individual cycle failures may begin at this level. Many vehicles may still pass through without stopping.	> 20 - 35
D	Approaching unstable flow. The influence of congestion becomes more noticeable. Many vehicles stop.	> 35 - 55
E	Considered the limit of acceptable delay. High delays indicated by poor progression, long cycle lengths, and high v/c ratios.	> 55 - 80
F	Unacceptable delay occurs. Progression is extremely poor with long cycle lengths and high v/c ratios.	>80

Source: Highway Capacity Manual, 7th Edition



The intersection capacity results for the existing 2025 peak hour traffic are shown in Table 4. The intersections in the table are shown with a LOS (Level of Service) designation, delay (in seconds), and v/c ratio (volume-to-capacity ratio) for the AM and PM peak hours. Appendix E includes the software worksheets for the existing 2025 peak hour capacity analyses.

As shown in Table 4, the intersections operate with good to average LOS and low to moderate vehicle delays during the existing 2025 peak hour conditions, even though excessive vehicle queues were observed at peak times.

TABLE 4
INTERSECTION CAPACITY ANALYSIS RESULTS -
2025 EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	Max v/c ^c	LOS ^a	DELAY ^b (seconds)	Max v/c ^c
Central Avenue Pike (SB & NB) at E Beaver Creek Drive (WB)	 Signalized	Westbound	B	17.7		C	20.8	
		Northbound	C	24.7		C	20.0	
		Southbound	B	15.9		B	16.4	
		Summary	B	18.7	0.79	B	19.1	0.81
E Beaver Creek Drive (WB & EB) at Stone Cutter Way (NB)	 Unsignalized	Northbound Left/Right	C	17.0	0.066	C	15.9	0.012
		Westbound Left	A	7.8	0.004	A	9.0	0.006

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology

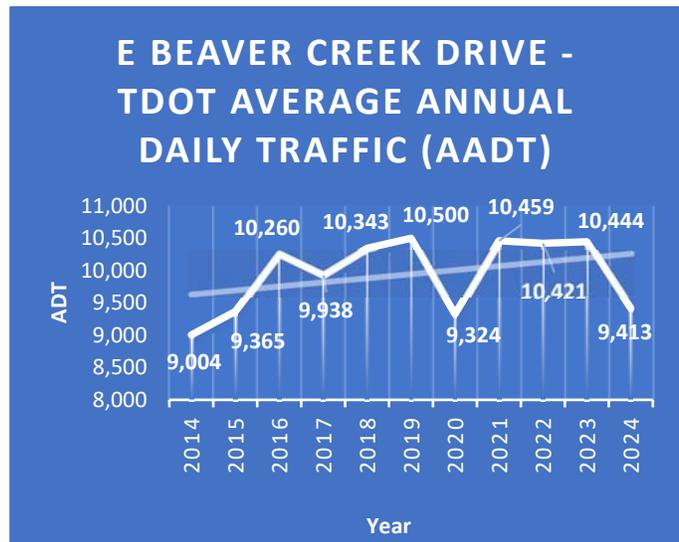
^a Level of Service, ^b Average Delay (sec/vehicle), ^c Volume-to-Capacity Ratio

The signal timing used to analyze the signalized intersection was obtained from Knox County Engineering and Public Works and is included in Appendix E. This traffic signal operates in isolation and not in coordination with any others. The signal timings were used as given in the analyses.

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

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

According to the nearby traffic count stations, vehicular traffic has increased modestly over the past few years. Specifically, while sporadically collected, the TPO data shown in Appendix A indicate that E Beaver Creek Drive, located to the northeast of the development site, has experienced an annual growth rate of +0.9% over the past nine years, from 2014 to 2023. The other location, on E Beaver Creek Drive, southwest of the development site, and conducted by

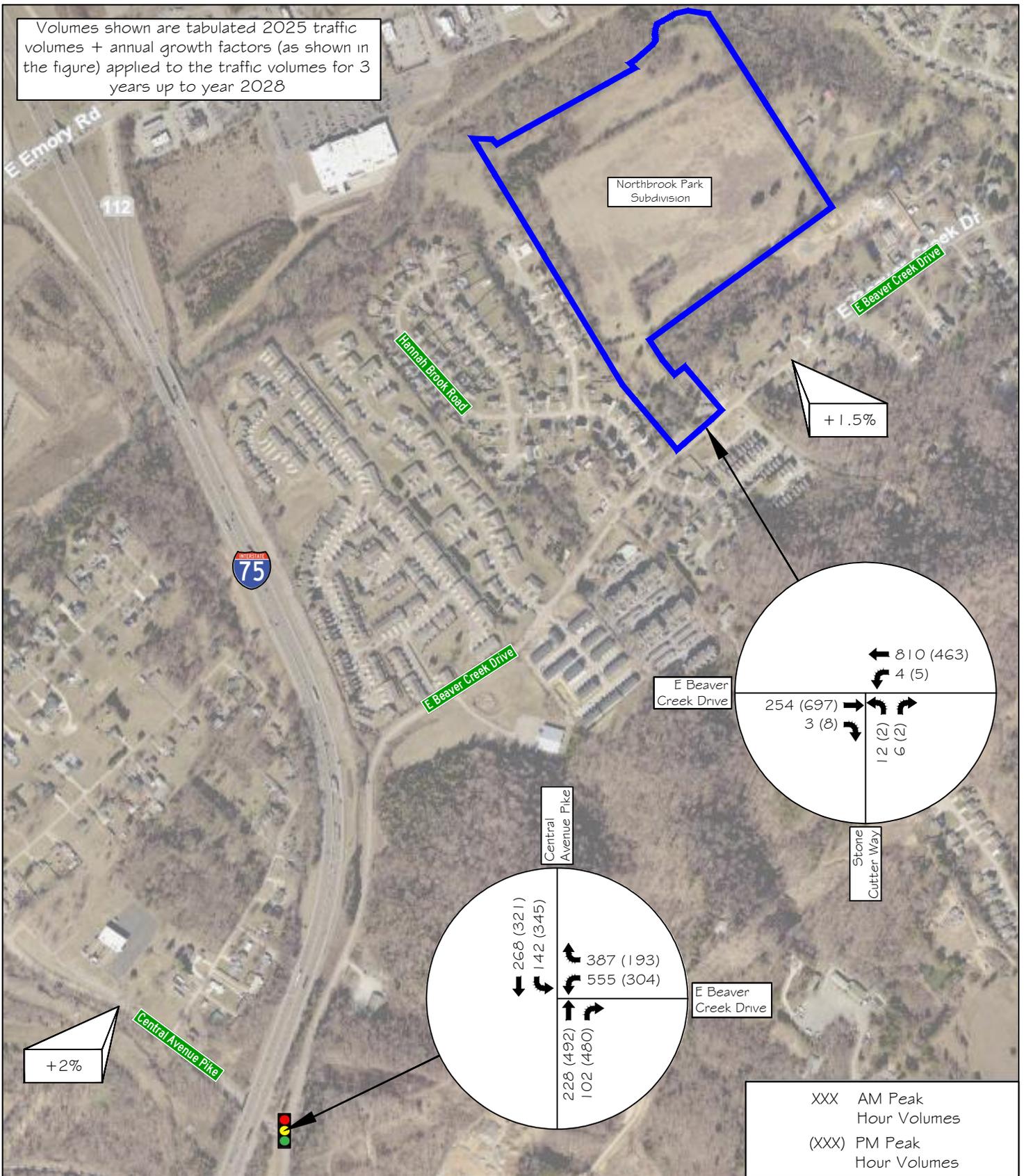


TDOT, showed a growth of +0.4% between 2014 and 2024. The TDOT count on Central Avenue Pike has shown growth of +1.7% over the past decade.

Thus, this study used an annual growth rate of +1.5% to calculate future growth for E Beaver Creek Drive and +2.0% for Central Avenue Pike through 2028, to ensure a conservative result. The annual growth rates were applied to the existing 2025 volumes tabulated on E Beaver Creek Drive and Central Avenue Pike to estimate future volumes in the horizon year of 2028, without the proposed development traffic.

Figure 5 shows the projected horizon year traffic volumes at the studied intersections for the 2028 AM and PM peak hours without the proposed residential subdivision development.

Volumes shown are tabulated 2025 traffic volumes + annual growth factors (as shown in the figure) applied to the traffic volumes for 3 years up to year 2028



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FIGURE 5

Northbrook Park Subdivision

2028 Peak Hour Traffic Volumes -
 Projected Traffic Conditions
 Without the Project

Capacity analyses were conducted to determine the projected LOS in 2028, without any development trips, at the studied intersections. The results are presented in Table 5, and Appendix E includes the capacity analysis worksheets generated by the software.

The results in Table 5 indicate just slightly worse vehicle delays at the intersections in the 2028 projected conditions compared to the existing 2025 conditions. This result is due to the small increase in traffic volumes resulting from the assumed general growth over the three years.

TABLE 5
INTERSECTION CAPACITY ANALYSIS RESULTS -
2028 PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	Max v/c ^c	LOS ^a	DELAY ^b (seconds)	Max v/c ^c
Central Avenue Pike (SB & NB) at E Beaver Creek Drive (WB)	 Signalized	Westbound	C	20.6	0.85	C	22.7	0.84
		Northbound	C	25.1		C	21.8	
		Southbound	B	16.0		B	20.0	
		Summary	C	20.4		B	21.4	
E Beaver Creek Drive (WB & EB) at Stone Cutter Way (NB)	 Unsignalized	Northbound Left/Right	C	17.8	0.070	C	16.5	0.013
		Westbound Left	A	7.8	0.004	A	9.1	0.006

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition methodology

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

▪ **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The trips generated by the 153 townhouses and 312 apartments in the Northbrook Park Subdivision, totaling 465 units, were based on equations provided by Knoxville/Knox County Planning. These equations from Knoxville/Knox County Planning were developed from an extensive local study to estimate townhouse (and apartment) trip generation in the surrounding area. For Knox County, this is the preferred rate to use for townhouses and apartments. This local rate is slightly higher than the trip rates for similar land uses in the ITE Trip Generation Manual.

The data and calculations from the local trip generation study for the proposed land uses and 465 units are shown in Appendix F. A summary of this information is presented in Table 6:

TABLE 6
TRIP GENERATION FOR NORTHBROOK PARK SUBDIVISION
115 Attached Townhouses and 350 Apartments = 465 Total Units

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	Townhouses & Apartments	465	3,799	22%	78%		55%	45%	
				49	172	221	177	144	321
Total New Volume Site Trips			3,799	49	172	221	177	144	321

From Local Trip Rates

Trips calculated by using Fitted Curve Equations

For the proposed Northbrook Park Subdivision, it is estimated that 49 vehicles will enter and 172 will exit, resulting in a total of 221 generated trips during the AM peak hour in 2028. Similarly, it is estimated that 177 vehicles will enter and 144 will exit, resulting in a total of 321 generated trips during the PM peak hour in 2028. The calculated generated trips for an average weekday are estimated at 3,799 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis. All these estimated vehicle trips will enter and exit via the Proposed Entrance at E Beaver Creek Drive (and Stone Cutter Way) since this intersection will be the sole road access point for the subdivision residents to and from external destinations.

▪ **TRIP DISTRIBUTION AND ASSIGNMENT:**

The projected trip distribution and assignment for the Northbrook Park Subdivision development are based on several sources and engineering judgment. The first source is based on existing traffic counts and observed travel directions collected on E Beaver Creek Drive and Central Avenue Pike.

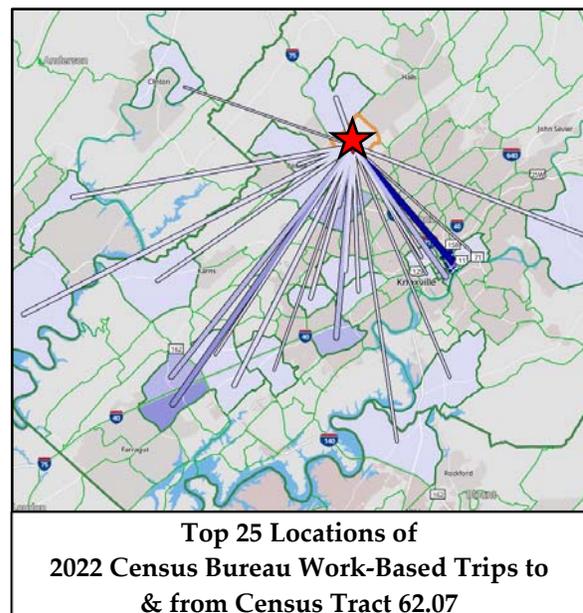
In addition to the studied intersections, a brief, peak-hour-only count was conducted at the intersection of E Beaver Creek Drive at Hannah Brook Road, the sole entrance for the Hidden Brook Subdivision. The observed entering and exiting splits on Hannah Brook Road are projected to be a good analog for the future residents of the Northbrook Park Subdivision development, since this road serves a similar residential land use to that proposed for the development site and is adjacent to it. This adjacent subdivision has 76 occupied single-family detached houses. The entering and exiting percentages during the observed AM and PM peak hours to and from Hannah Brook Road in the Hidden Brook Subdivision are shown in the adjacent table:

Observed Entering and Exiting Vehicle Distribution at Hannah Brook Road and E Beaver Creek Drive

AM PEAK HOUR		
	Volumes	%
ENTER FROM WEST	7	50%
ENTER FROM EAST	7	50%
EXIT TO WEST	33	83%
EXIT TO EAST	7	17%
PM PEAK HOUR		
ENTER FROM WEST	17	65%
ENTER FROM EAST	9	35%
EXIT TO WEST	11	61%
EXIT TO EAST	7	39%

Overall, the entering and exiting volumes for the Hidden Brook Subdivision showed a distinct preference for westbound traffic exiting during both the morning and afternoon peak hours. In the AM peak hour, the entering splits were evenly split, and in the PM peak hour, 65% entered from the west and 35% from the east.

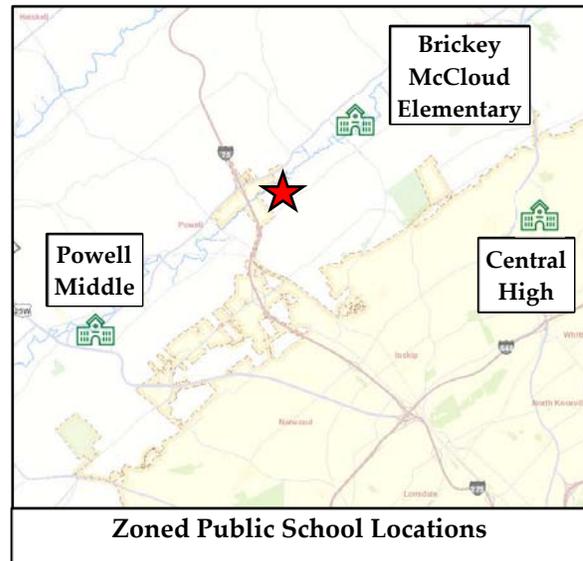
Another source for determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for trips generated by the development, and these trips are more likely to travel to and from the southwest, south, and southeast. This assertion is based on data from the United States



Bureau website for Census Tract 62.07, where the proposed subdivision property is located. Based on 2022 (latest available) census data and as presented in Appendix G, most work-based trips in the surrounding area correspond to downtown Knoxville, the University of Tennessee, areas of West Knoxville, and Alcoa/Maryville, TN. Some of the work-based trips also correspond to the Forks of the River Industrial Park and Oak Ridge areas. This data indicates a fairly substantial inclination to and from the west on E Beaver Creek Drive by future residents for work-related trips.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another incentive for taking external trips. The subdivision parcels are currently zoned for Brickey McCloud Elementary, Powell Middle, and Central High School. The zoned public schools for these development properties are located northeast, east, and southwest of the development site. The zoned schools are between 2.4 and 6.6 miles from the proposed subdivision by roadway. All school-related travel to and from the proposed subdivision will have to use E Beaver Creek Drive, either eastbound or westbound. The closest school is Brickey McCloud Elementary, located 2.4 miles northeast near the intersection of Dry Gap Pike and E Emory Road. Powell Middle School, off W Emory Road and near Clinton Highway, will be 4.6 miles away to the southwest of the proposed subdivision. Central Avenue High School will be located 6.6 miles to the east, off North Broadway in Fountain City.

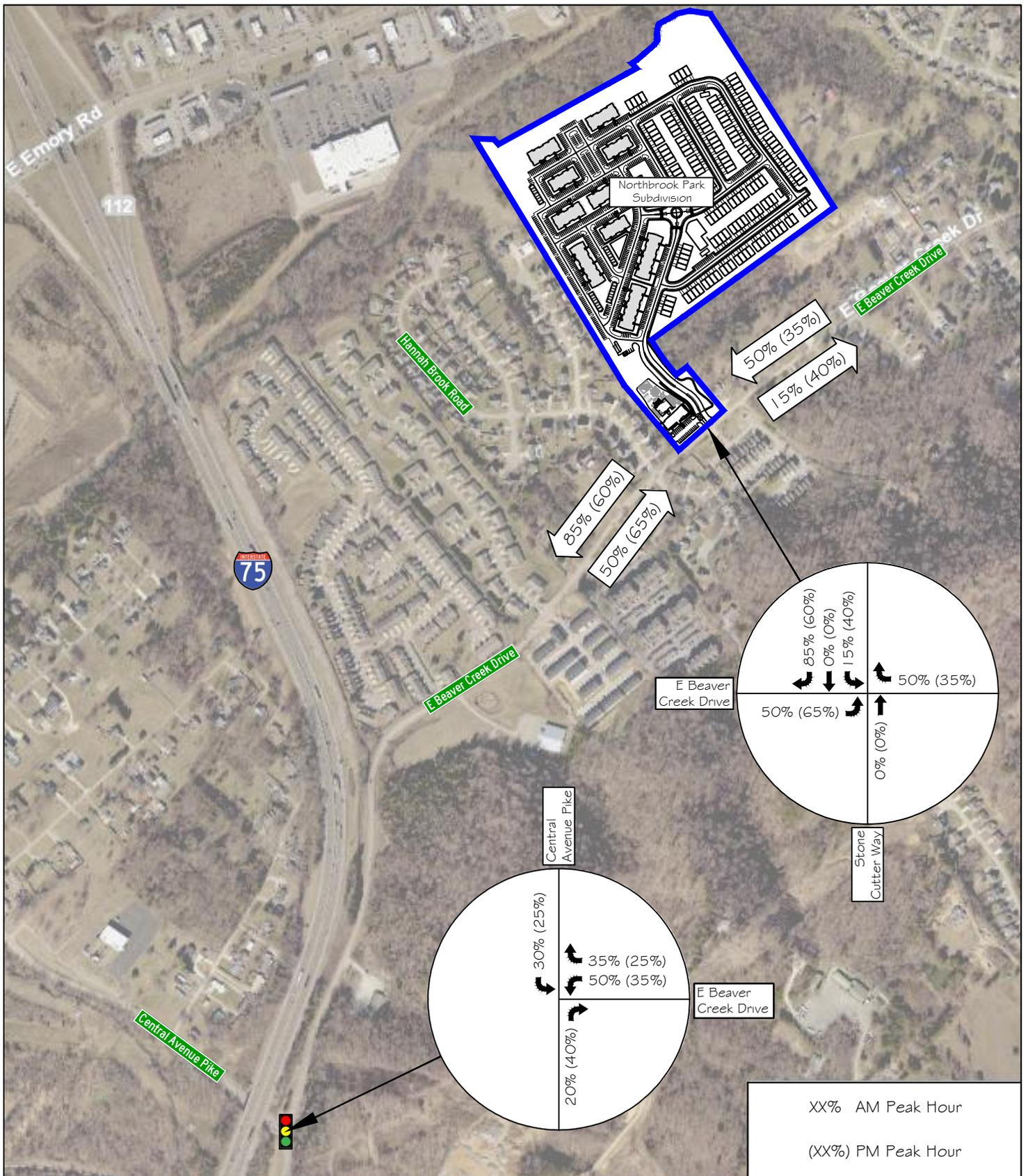
The Knox County Schools Transportation Department has developed Parental Responsibility Zones (PRZs) to determine whether students are eligible for transportation services to and from school. The PRZ is defined as being 1.5 miles for grades 6–12 and 1.0 miles for grades K–5, from where the students'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



Based on all these factors, Figure 6 shows the projected distribution of traffic entering and exiting the proposed residential subdivision at the Proposed Entrance on E Beaver Creek Drive and the subsequent travel through the intersection of E Beaver Creek Drive at Central Avenue Pike. The

percentages shown in the figure pertain only to the trips generated by the proposed dwellings in the Northbrook Park Subdivision, calculated from the local trip rates. Ultimately, the projected trip distribution was heavily based on the observed residential traffic at the intersection of E Beaver Creek Drive and Hannah Brook Road. The traffic splits at the signalized intersection were assumed based on the observations during the traffic counts.

Figure 7 shows the traffic assignment of the computed trips generated by the Northbrook Park Subdivision based on the assumed distribution of trips shown in Figure 6.



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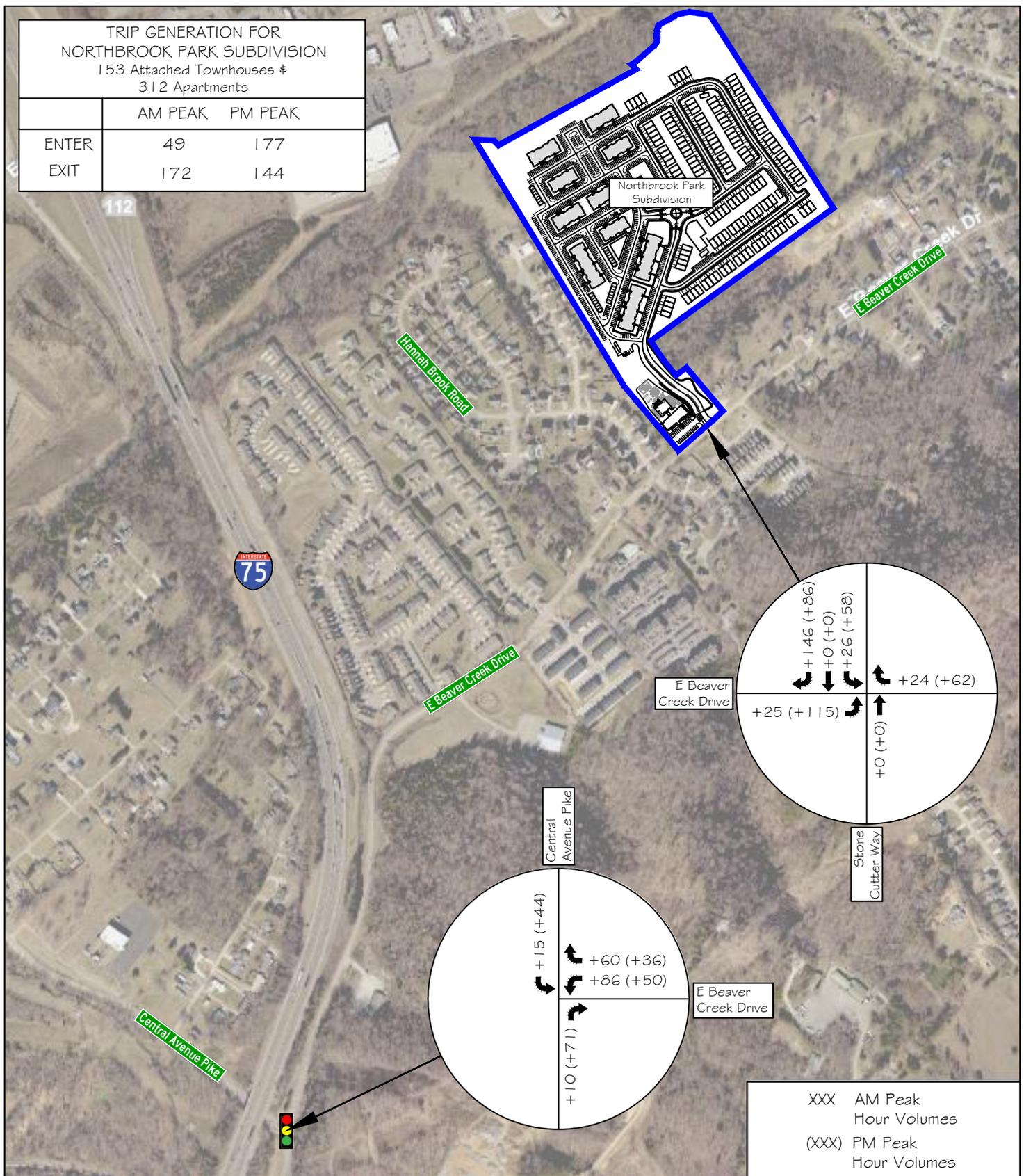
FIGURE 6

Northbrook Park Subdivision

Directional Distribution of Generated Traffic during AM and PM Peak Hour

TRIP GENERATION FOR
NORTHBROOK PARK SUBDIVISION
153 Attached Townhouses &
312 Apartments

	AM PEAK	PM PEAK
ENTER	49	177
EXIT	172	144



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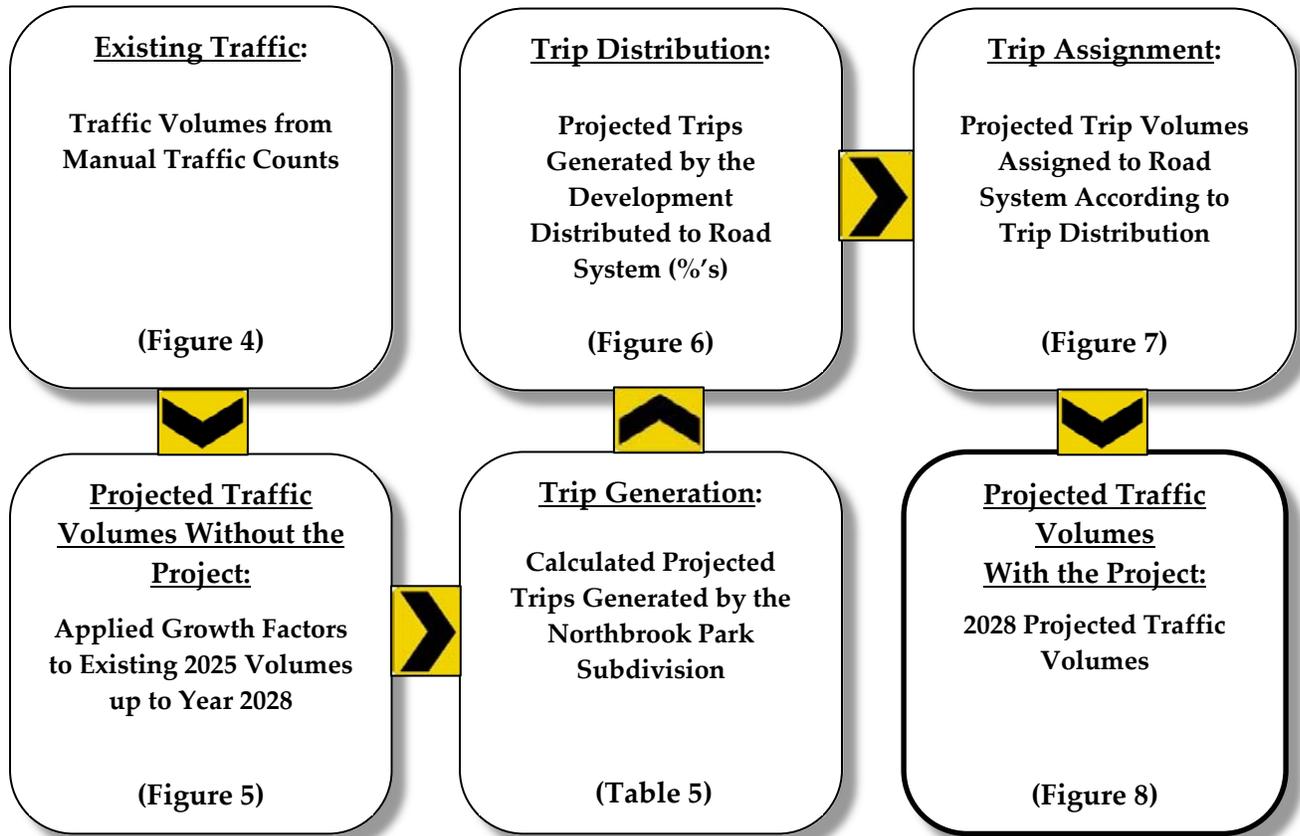
FIGURE 7

Northbrook Park Subdivision

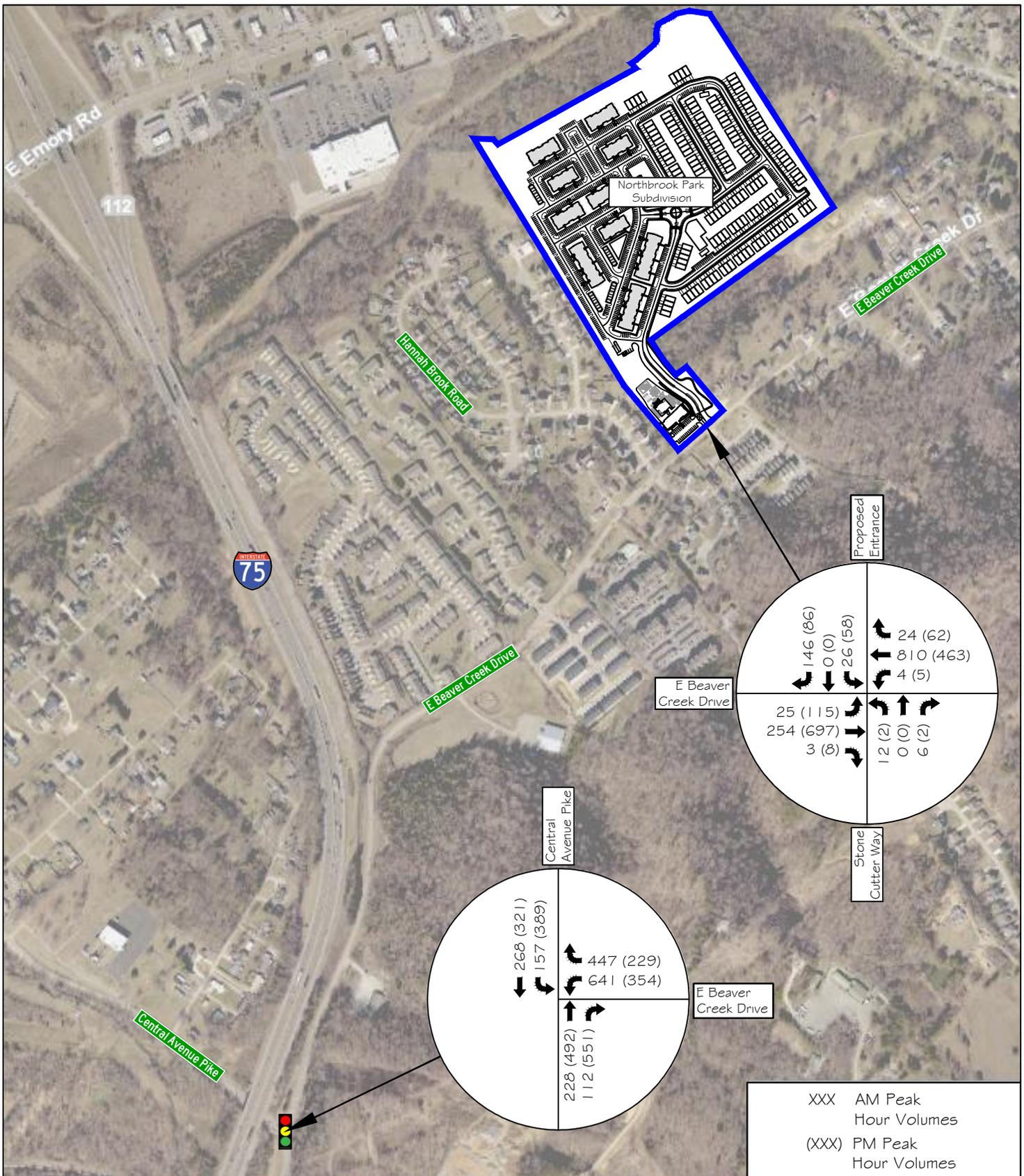
Traffic Assignment of Generated Trips
during AM and PM Peak Hour

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

Several additive steps were taken to estimate the total projected traffic volumes at the Proposed Entrance intersection at E Beaver Creek Drive and the signalized intersection of E Beaver Creek Drive at Central Avenue Pike when the Northbrook Park Subdivision is constructed and fully occupied in 2028. The steps are illustrated below for clarity and review:



The calculated peak hour traffic generated by the Northbrook Park Subdivision was added to the 2028 horizon year traffic by following the predicted trip distributions and assignments. This procedure was completed to obtain the total projected traffic volumes at the Proposed Entrance intersection at E Beaver Creek Drive and the signalized intersection of E Beaver Creek Drive at Central Avenue Pike. Figure 8 shows the projected volumes at these intersections in 2028.



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FIGURE 8

Northbrook Park Subdivision

2028 Peak Hour Traffic Volumes -
 Projected Traffic Conditions
 With the Project

The intersection capacity results from the projected 2028 peak hour traffic with the new subdivision are shown in Table 7. Appendix E includes the capacity analysis worksheets from the software. The results in the table show that the signalized intersection of E Beaver Creek Drive at Central Avenue Pike is projected to operate with average LOS and vehicle delays during the AM and PM peak hours. The projected number of new vehicles at this intersection due to the proposed development will be moderate compared to the existing number. Overall, the “exiting” volumes leaving the proposed development will increase the existing “exiting volumes” from E Beaver Creek Drive at the intersection by 16% in the AM peak hour and 18% in the PM peak hour. Likewise, the “entering” volumes at the intersection due to the proposed development will be increased from Central Avenue Pike towards the development by 11% in the AM peak hour and 15% in the PM peak hour.

For the projected analysis, the Proposed Entrance approach was evaluated with two exiting lanes - a separate southbound right-turn lane and a shared left/thru lane. Furthermore, the results shown below for the intersection of E Beaver Creek Drive/Stone Cutter Way at the Proposed Entrance assume that a separate left-turn lane on E Beaver Creek Drive would be provided for the eastbound entering turns into the subdivision, but not a separate westbound right-turn lane. The evaluation for the necessity of these entering turn lanes on E Beaver Creek Drive is discussed in the following sections.

The unsignalized intersection minor approaches of Stone Cutter Way and the Proposed Entrance approach at E Beaver Creek Drive are shown with poor LOS. During the AM peak hour, the northbound approach of Stone Cutter Way, with an existing single exit lane, is calculated to have a LOS F. The southbound shared left/thru lane for the Proposed Entrance approach is calculated with a LOS F during the AM and PM peak hours.

TABLE 7
INTERSECTION CAPACITY ANALYSIS RESULTS -
2028 PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS ^a	DELAY ^b (seconds)	Max v/c ^c	LOS ^a	DELAY ^b (seconds)	Max v/c ^c
Central Avenue Pike (SB & NB) at E Beaver Creek Drive (WB)	 Signalized	Westbound	C	33.3		C	24.9	
		Northbound	C	24.6		C	23.1	
		Southbound	B	16.1		C	29.0	
		Summary	C	27.8	0.99	C	25.3	0.90
E Beaver Creek Drive (WB & EB) at Stone Cutter Way (NB) & Proposed Entrance (SB)	 Unsignalized	Northbound Left/Thru/Right	F	55.2	0.229	D	27.5	0.025
		Eastbound Left	B	10.3	0.041	A	8.9	0.116
		Westbound Left	A	7.8	0.004	A	9.1	0.006
		Southbound Left/Thru	F	56.4	0.307	F	169.9	0.862
		Southbound Right	D	34.6	0.599	B	13.0	0.166

Note: All analyses were calculated in Synchro 12 software and reported with HCM 7th Edition 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 that may arise when the development is constructed.

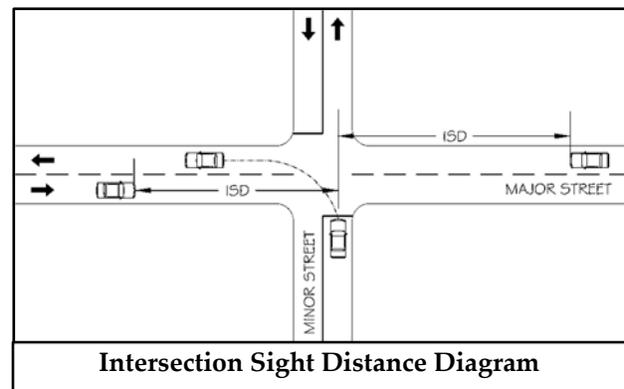
○ **EVALUATION OF SIGHT DISTANCE**

For intersections, sight distance evaluations are categorized into two types: 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. ISD is based on the time required to perceive, react, and complete the desired traffic maneuver once a motorist on a minor street decides to perform a traffic maneuver. Three traffic maneuvers are available for vehicles stopped on a minor street



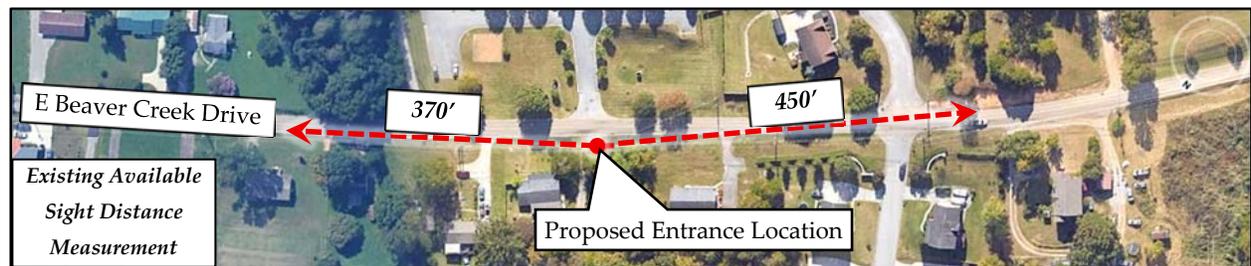
at a 4-way intersection: (1) a left-turn, (2) a right-turn, or (3) a crossing maneuver across the major street. For turns from the minor street, the ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left 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 the posted speed limit on E Beaver Creek Drive at the Proposed Entrance location being 40 mph, the ISD is 400 feet, based on Knox County's policy of requiring 10 feet of sight distance per

1 mph of speed. This distance is required for a motorist to exit safely to the left (eastbound) and the right (westbound) from the Proposed Entrance at E Beaver Creek Drive.

Visual observations of the sight distances at the Proposed Entrance location at E Beaver Creek Drive were undertaken. Existing vegetation blocked the prescribed measuring point 14.5 feet from the edge of the traveled way, and the measurements were made accordingly, assuming this vegetation would be removed for construction. Using a Nikon Laser Rangefinder at the Proposed Entrance location, the available sight distance was visually estimated to be 370 feet to the east and 450 feet to the west on E Beaver Creek Drive. Based on visual observation, the available sight distance from the Proposed Entrance at E Beaver Creek Drive will not be adequate to the east for future vehicles exiting the development, given the existing road geometry. A vertical crest curve on E Beaver Creek Drive to the east restricts further sight distance to the east beyond 370 feet. This result indicates that motorists currently exiting Stone Cutter Way likely do not have adequate sight distance when entering E Beaver Creek Drive. The sight distance to the west, however, is adequate, as it exceeds 400 feet.

Images of the existing sight distances from the Proposed Entrance location on E Beaver Creek Drive are labeled in the following with the required ISD and the rangefinder-measured sight distances in bolded italics.



View of Sight Distance on E Beaver Creek Drive at the Proposed Entrance Location (Looking East)



View of Sight Distance on E Beaver Creek Drive at the Proposed Entrance Location (Looking West)

○ **EVALUATION OF TURN LANE THRESHOLDS**

The need for separate entering turn lanes was evaluated in the projected 2028 conditions for the Proposed Entrance at E Beaver Creek Drive.

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 Proposed Entrance intersection is located within a 40 mph speed zone; therefore, the intersection was evaluated based on the posted speed limit. The worksheets for these evaluations are provided in Appendix H.

Based on the projected 2028 traffic volumes at the Proposed Entrance intersection, a separate westbound right-turn entering lane on E Beaver Creek Drive will be just under the warrant thresholds. However, as mentioned in the previous discussion, a separate eastbound left-turn lane on E Beaver Creek Drive will be warranted and recommended.

○ **PROJECTED VEHICLE QUEUES**

An additional software program calculated the projected vehicle queues at the Proposed Entrance intersection on E Beaver Creek Drive during the 2028 AM and PM peak hours. The previously mentioned Synchro traffic software includes SimTraffic. The Synchro portion of the software performs macroscopic calculations for intersections, while SimTraffic handles micro-simulation and animation of vehicular traffic. SimTraffic software was utilized to estimate the projected vehicle queues at the intersections.

The 95th percentile vehicle queue is the recognized measurement in the transportation engineering profession, serving as the design standard for 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 outcomes from 10 one-hour traffic simulations in the software.

The 95th percentile vehicle queue lengths at the Proposed Entrance intersection are shown in Table 8 for the projected 2028 conditions. The vehicle queue worksheet results from the SimTraffic software are in Appendix I. The results shown in the table include separate exiting lanes on the Proposed Entrance approach and a separate entering eastbound left-turn lane on E Beaver Creek Drive.

**TABLE 8
VEHICLE QUEUE SUMMARY -
2028 PROJECTED PEAK HOUR TRAFFIC CONDITIONS WITH THE PROJECT**

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	95 th PERCENTILE VEHICLE QUEUE LENGTH (ft)	
			AM PEAK HOUR	PM PEAK HOUR
E Beaver Creek Drive (WB & EB) at Stone Cutter Way (NB) & Proposed Entrance (SB)	 <i>Unsignalized</i>	Eastbound Left	33	53
		Westbound Left/Thru/Right	20	29
		Northbound Left/Thru/Right	41	22
		Southbound Left/Thru	47	83
		Southbound Right	101	59

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

Table 8 shows low to minimal vehicle queue lengths on the intersection approaches during the 2028 AM and PM peak hours, even though the minor approaches are expected to experience high vehicle delays due to the large competing thru volumes on E Beaver Creek Drive.

The longest vehicle queue at the intersection is calculated for the southbound right-turn-only exiting lane on the Proposed Entrance approach, with a length of 101 feet during the AM peak hour. Based on these results, the longest vehicle queue at this intersection will consist of approximately four passenger vehicles, assuming each vehicle is 25 feet long. During the PM peak hour, the longest vehicle queue is projected to be the southbound left/thru lane on the Proposed Entrance approach, measuring 83 feet, equivalent to just over three passenger vehicles. The longest vehicle queue on E Beaver Creek Drive, shown for the warranted separate eastbound left-turn lane, is 53 feet during the PM peak hour, approximately two passenger cars.

CONCLUSIONS & RECOMMENDATIONS

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



E Beaver Creek Drive/Stone Cutter Way at Proposed Entrance: The intersection of E Beaver Creek Drive/Stone Cutter Way at the Proposed Entrance is calculated with reasonable delays and flows on the main throughfare of E Beaver Creek Drive. However, the minor approaches of Stone Cutter Way and the Proposed Entrance are projected to experience significant vehicle delays during peak hours due to high traffic volumes on E Beaver Creek Drive. Nonetheless, the vehicle queues on these minor approaches are expected to be relatively short.

- 1a) A separate eastbound left-turn lane on E Beaver Creek Drive is warranted at the Proposed Entrance based on the projected 2028 volumes and Knox County thresholds.
 - i. The longest 95th percentile vehicle queues for the separate eastbound left-turn lane were calculated to be 33 feet in the AM peak hour and 53 feet in the PM peak hour. As recommended by Knox County Engineering & Public Works, the minimum storage length for this turn lane should be 90 feet, which would accommodate at least three passenger cars.
 - ii. It is recommended that the approach and departure tapers for this new turn lane be 160 feet, with the approach taper length including an 80-foot bay taper.
- 1b) Two southbound exit lanes for the Proposed Entrance approach should be provided, with a shared left/thru lane and a separate right-turn-only lane separated by a white lane line, and white pavement arrows indicating the assignment.
- 1c) Due to the higher classification of E Beaver Creek Drive, the higher vehicle speeds, nearly meeting the warrant threshold, and to facilitate westbound right-turn movements off the roadway into the development, it is recommended that the intersection radius for the Proposed Entrance be increased from the typical standard. To facilitate entering and exiting, it is recommended that the intersection radius for the Proposed Entrance be at least 40 feet. With limited road frontage right-of-way along E Beaver Creek Drive, it is also recommended that as much road pavement as possible be

provided outside the thru lane for westbound right-turn movements to aid in removing these motorists from the thru movements and help maintain flows on E Beaver Creek Drive.

- 1d) Due to the constrained conditions along E Beaver Creek Drive with numerous intersecting streets and driveways in addition to its vertical curves which reduces sight distance, it is recommended that the eastbound and westbound approaches on E Beaver Creek Drive be posted with cross road intersection warning signs and street name plaques in advance of Stone Cutter Way and the entrance roadway for the proposed Northbrook Park Subdivision. For both approaches on E Beaver Creek Drive, the signs should be the Cross Road Intersection Signs (W2-1). For the eastbound and westbound approaches, the signs should be posted 250 feet (but no less than 175 feet) in advance of the intersection. For the eastbound approach of E Beaver Creek Drive, the signage with the street name plaque (W16-8aP) should include the "Proposed Entrance" name on the top of the plaque with an arrow to the left and Stone Cutter Way with an arrow to the right. For the westbound approach of E Beaver Creek Drive, the signage with the street name plaque (W16-8aP) should flip the order of the street names, with the name of Stone Cutter Way on the top.



- 1e) Future landscaping, existing vegetation, grading, or proposed signage must not impact the intersection sight distances looking from the Proposed Entrance to the east and west on E Beaver Creek Drive.
- 1f) Based on a posted speed limit of 40 mph on E Beaver Creek Drive, the required intersection sight distance is 400 feet for exiting left and right-turning vehicles. The existing sight distances from the Proposed Entrance at E Beaver Creek Drive were visually estimated to be adequate to the west, but less than adequate to the east due to a vertical curve on E Beaver Creek Drive. However, the Proposed Entrance designed by Silvus Engineering Consulting includes raising the entire grade of E Beaver Creek Drive by approximately 4 feet. Raising the grade of the roadway at this location, where a vertical sag curve currently exists on E Beaver Creek Drive, will increase the available sight distance for vehicles exiting the Proposed Entrance for the Northbrook Park Subdivision and for the Valley Ridge development residents exiting from Stone Cutter Way. Based on the current design with the raised grade, the approximate sight distance

from the Proposed Entrance to the east will be 429.7 feet and 501.9 feet to the west, both of which exceed the Knox County standard of 400 feet for a 40-mph posted speed.

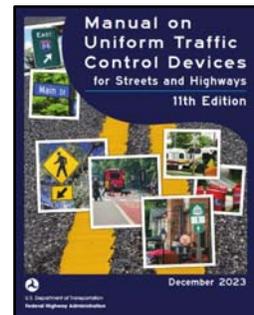
Furthermore, while the proposed Northbrook Park development will increase vehicle delays for motorists exiting the Valley Ridge department at Stone Cutter Way, this will be partly offset by the increased safety provided by the improved sight distance resulting from the raising of E Beaver Creek Drive, and subsequently, Stone Cutter Way.

- 1g) It is recommended that a Stop Sign (R1-1) be installed and a 24" white stop bar be applied to the Proposed Entrance approach at E Beaver Creek Drive. The stop bar should be applied a minimum of 4 feet away from the traveled edge of E Beaver Creek Drive and placed at the desired stopping point that maximizes sight distance.
- 1h) Due to the calculated high vehicle delays for the northbound and southbound approaches of Stone Cutter Way and the Proposed Entrance in the projected 2028 peak hours, a further investigation was made to determine if this intersection could potentially meet traffic signal warrants. The overall methodology of determining whether an intersection could be signalized is presented in the following:

Methodology:

The Manual on Uniform Traffic Control Devices – 11th Edition

(MUTCD) presents nine warrants developed by the transportation engineering profession to determine whether a traffic signal is warranted. These warrants encompass a broad range of minimum elements necessary to determine whether a traffic signal is justified for any particular location. These elements include traffic volumes, pedestrian volumes, crash history, and other factors. The MUTCD explicitly states that a traffic control signal should not be installed unless one or more of the Manual's signal warrants are met. However, the satisfaction of a warrant does not, in itself, entirely justify the need for a traffic signal. Sometimes, further engineering studies and assessments are necessary to justify the need for traffic signal installation. These additional studies ensure that installing a traffic signal will not compromise safety or efficiency.



The MUTCD defines nine different warrants, four of which are listed below, with two of which are potentially applicable for this intersection based on the most commonly

employed and preferred by Knox County Engineering and Public Works (and TDOT), and are explained in the following:



Warrant #1, Eight-Hour Vehicular Volume:

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



Warrant #2, Four-Hour Vehicular Volume:

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



Warrant #3, Peak Hour:

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that, for a minimum of 1 hour of an average day, the minor street traffic suffers undue delay when entering or crossing the major street. This warrant has two conditions, A and B, and if either is satisfied, it can be used to justify a traffic signal. This warrant is used for unique situations.



Warrant #7, Crash Experience

The Crash Experience signal warrant conditions are intended for applications where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Even though nine warrants are offered to justify a traffic signal, according to Knox County Engineering and Public Works, the agency emphasizes Warrant #1 (Eight Hour Vehicular Volume) and Warrant #7 (Crash Experience). However, for this study, Knox

County Engineering requested that Warrants #2 and #3 also be included in this study's analysis.

Thus, for this study, the intersection of E Beaver Creek Drive/Stone Cutter Way at the Proposed Entrance was evaluated in the projected 2028 conditions to determine whether a traffic signal could be justified based on the four MUTCD Warrants listed above. The Proposed Entrance and Stone Cutter Way were used as the minor side streets for the warrant analysis, and E Beaver Creek Drive was the major street.

Ultimately, Warrant #7 was not included in the assessment for this intersection and was omitted because one of the primary criteria for an intersection to meet this warrant is an "Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency..." As far as is known, this existing intersection (minus the Proposed Entrance) has not undergone any trials or observations since the crash data previously discussed in the report did not indicate any vehicle crashes at this intersection over the past three years. It is therefore unlikely to be considered an intersection requiring attention or review due to crash experience.

A spreadsheet was developed to estimate the projected 2028 traffic volumes generated by the new Northbrook Park Subdivision at the intersection during the highest 8 hours of traffic based on the study's assumptions and results. This spreadsheet is included in Appendix J. Appendix J also includes the traffic signal warrant spreadsheet for this intersection evaluation under projected 2028 conditions. The traffic signal warrant spreadsheet used was published by the Ohio Department of Transportation (ODOT) and is based on the MUTCD.

In conclusion, regarding traffic signal warrants, this intersection is not expected to meet any of the signalization Warrants #1, #2, or #3 based on projected 2028 traffic volumes.



E Beaver Creek Drive at Central Avenue Pike: The projected 2028 level of service calculations for this signalized intersection yielded reasonable LOS during the AM and PM peak periods. The vehicle queues observed under current conditions were excessive for the westbound approach of E Beaver Creek Drive during the morning peak periods. Additionally, the vehicle load on the southbound left-turn movement during peak afternoon periods was underserved, resulting in insufficient protected green-arrow time to clear the stacked vehicle queues within a single traffic signal cycle.

- 2a) Due to substantial vehicle queues on the westbound approach to E Beaver Creek Drive at Central Avenue Pike during the AM peak periods, it is recommended that the signal timing be modified to increase the minimum initial and green time assigned to this approach.
- 2b) Due to the vehicular load in the existing and projected conditions for the southbound left-turn lane on Central Avenue Pike at E Beaver Creek Drive in the PM peak periods, it is recommended that the signal timing be modified to increase the amount of protected left-turn arrow green time assigned to this lane. If this is not addressed, the potential for southbound left-turning motorists exceeding the provided storage length increases the risk of blocking southbound thru vehicles on Central Avenue Pike.
- 2c) The traffic count collection at this intersection included an observation of a southbound motorist proceeding thru the intersection during a red indication, even though there is a “No Turn on Red” (R10-11a) sign installed on the span wire facing this approach. Several other motorists appeared to be inching forward past the stop bar and contemplated proceeding thru, as well, during a red indication. Because of these observations and to reinforce the prohibition, it is recommended that Knox County consider supplementing the existing sign that is hung on the span wire with a posted sign on the right-hand side of the road at or near the southbound thru lane stop bar with an additional “No Turn on Red” (R10-11) sign, with this sign including a red ball on the sign.
- 2d) Overall, this traffic signal’s timing will need to be reviewed and optimized as needed due to general growth in the area and the attractiveness of this corridor for travel.



R10-11



Northbrook Park Subdivision Internal Roads: The layout plan shows numerous new drives and aisleways, as shown in Figure 3.

- 3a) A 10 mph Speed Limit Sign (R2-1) with additional plaque signage, as shown in the image below, is recommended to be posted near the beginning of the Proposed Entrance road off E Beaver Creek Drive. Since the entrance driveways will not be public roads, a posted speed limit of less than 25-mph is acceptable.
- 3b) It is also recommended that a “No Outlet” Sign (W14-2a) be posted at the front of the subdivision off E Beaver Creek Drive. This sign can be posted above or below the private street name sign. Stop Signs (R1-1) are recommended to be installed at the internal intersections.
- 3c) Yield Signs (R1-2) will be required at the internal roundabout in addition to Roundabout Circulation Plaques (R6-5P) and Pedestrian Signs (W11-2). Pavement markings for the roundabout should follow TDOT Standard Drawing T-M-17.
- 3d) At the front of the subdivision, where access is proposed to the parking lot for the office/clubhouse, the southbound exiting approach of the entrance drive should include a white box, approximately 20' x 24', with 4 to 6-inch solid white lines and a single crosshatch from corner to corner applied to the pavement. The white box should be accompanied by a road sign facing southbound traffic exiting the development stating, “Do Not Block Driveway” (R10-7).
- 3e) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a proposed speed limit of 10 mph in the development, the required sight distances are 100 feet. The civil site designer should ensure internal sight distances are met.
- 3f) The civil site designer should provide a centralized mail delivery center location within the development for the subdivision residents.
- 3g) All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.
- 3h) Sidewalks are proposed along the internal roads and aisleways. Concrete sidewalks

should be 5 feet wide and have appropriate ADA-compliant ramps at intersection corners with detectable surfaces. White-painted crosswalks should be applied to the internal road pavement where pedestrians are expected to cross. Internal crosswalks should have a white transverse marking as shown in TDOT Standard Drawing T-M-4.

- 3i) As mentioned, Knox County completed a greenway study and evaluated one of the corridors, Beaver Creek East. One of the preferred routes for this corridor is shown traversing the Northbrook Park Subdivision development property along Beaver Creek. Without knowing the final alignment and path of this greenway, the following should be considered as a potential part of the civil site design:
- A greenway easement along Beaver Creek in a location and width acceptable to the Knox County Recreation Department.
 - Pedestrian connections in the form of sidewalks and/or trails from the subdivision to the proposed greenway along Beaver Creek.
- 3j) For residential subdivisions with more than 150 housing units, Knox County has a longstanding unwritten design policy requiring a boulevard road section at the entrance if a secondary access point is not provided. Since the proposed layout of the Northbrook Park Subdivision provides only one means of ingress and egress, the subdivision entrance will need to be designed and constructed as a boulevard roadway. This design should be coordinated with Knox County Engineering and Public Works and subject to their review and approval.
- 3k) All road and intersection elements should be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) and the Manual on Uniform Traffic Control Devices (MUTCD), as well as Knox County's specifications and guidelines, to ensure proper roadway operations.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

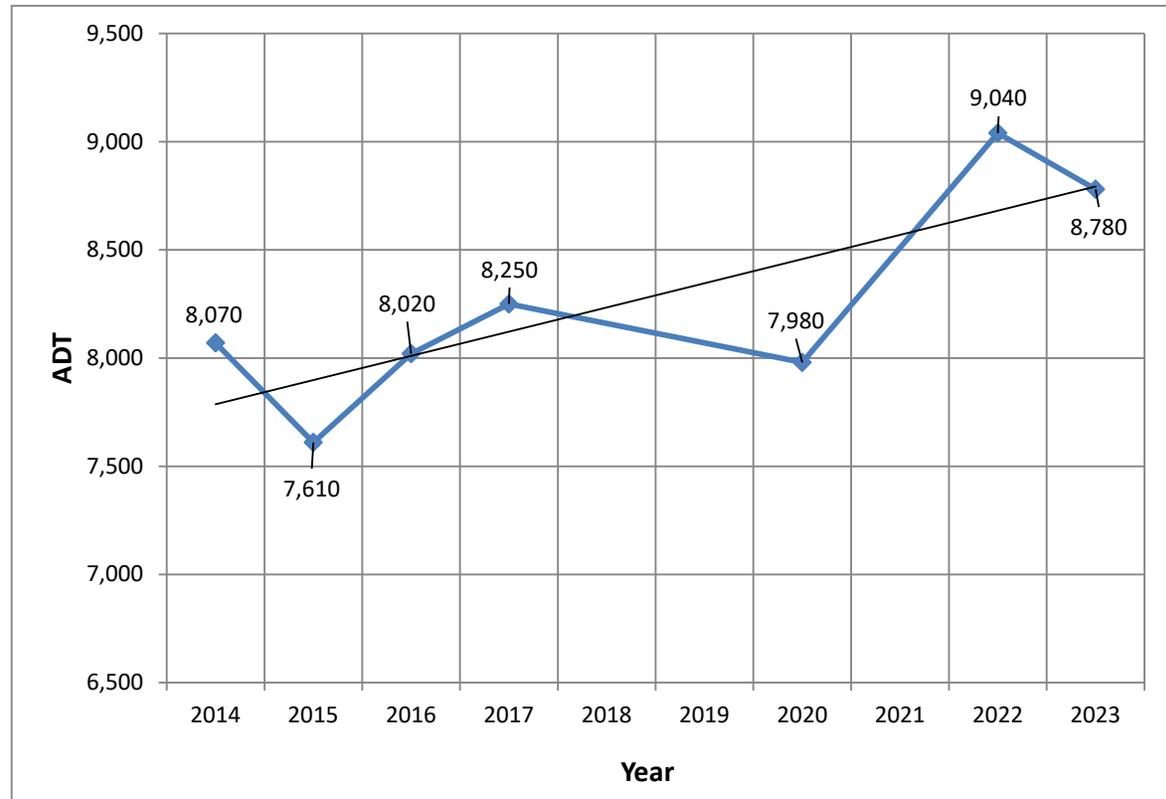
Historical Traffic Counts

Organization: Knoxville Regional TPO

Station ID #: 093M029

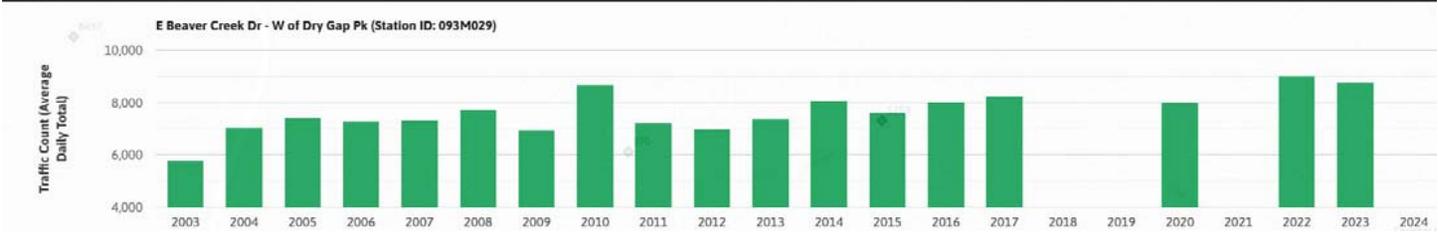
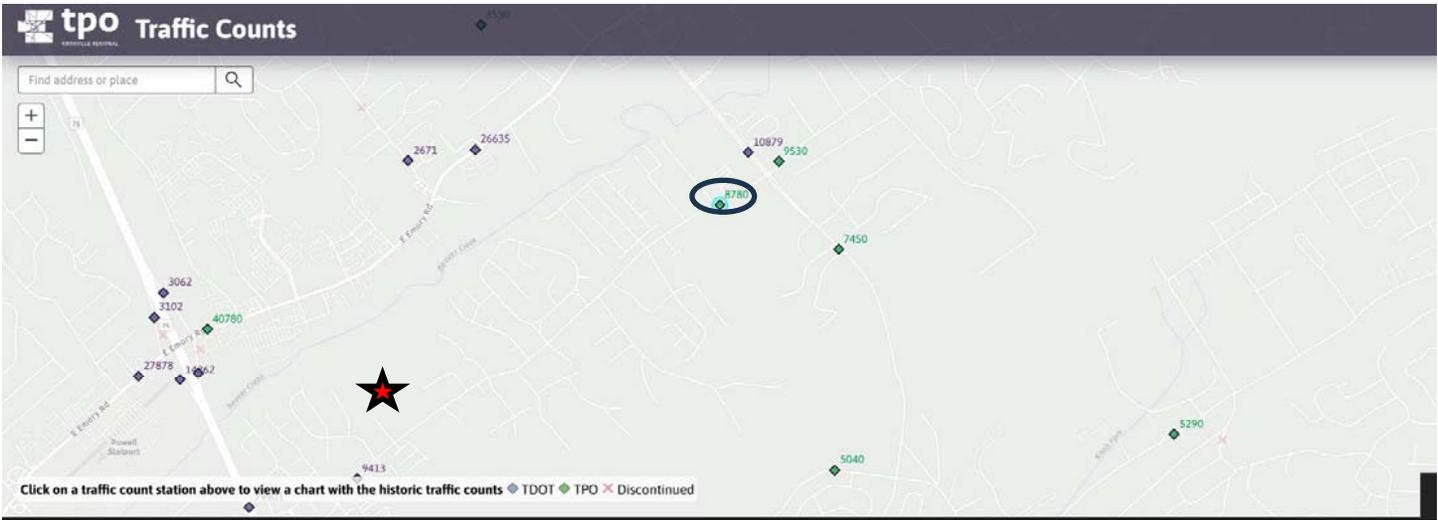
Location: E Beaver Creek Drive, west of Dry Gap Pike

YEAR	AADT	
2014	8,070	Trendline ↓
2015	7,610	
2016	8,020	
2017	8,250	
2018	-	
2019	-	
2020	7,980	
2021	-	
2022	9,040	
2023	8,780	
2024	-	



2014 - 2023 Growth Rate = 8.8%

Average Annual Growth Rate = 0.9%



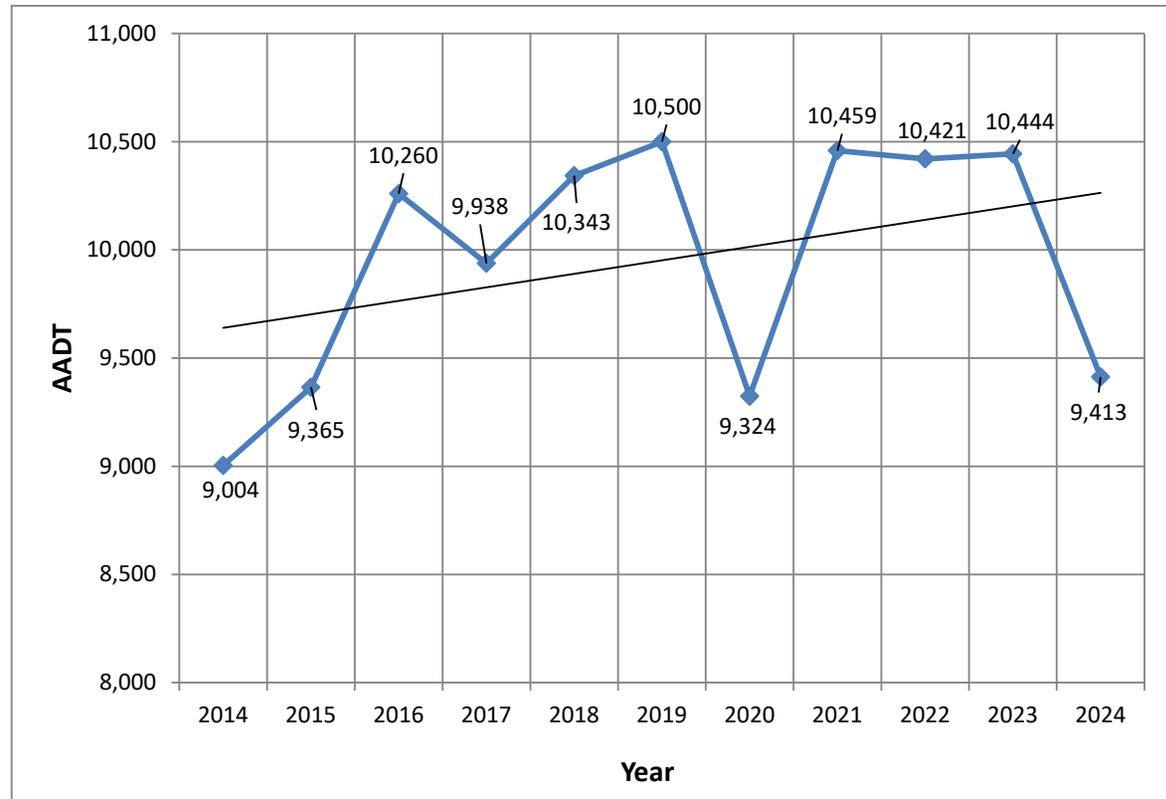
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000467

Location: E Beaver Creek Drive, east of Hannah Brook Road

YEAR	AADT	Trendline
2014	9,004	
2015	9,365	
2016	10,260	
2017	9,938	
2018	10,343	
2019	10,500	
2020	9,324	
2021	10,459	
2022	10,421	
2023	10,444	
2024	9,413	



2014 - 2024 Growth Rate = 4.5%

Average Annual Growth Rate = 0.4%

Traffic Count (TCDS)

Home
Locate
Locate All
Email This
Auto-Locate:

List View All DIRs

Record 7943 of 16430 Goto Record go

Location ID	47000467	MPO ID	
Type	SPOT	HPMS ID	
On NHS		On HPMS	
LRS ID	47L562201P00000	LRS Loc Pt.	0.699
SF Group	Lower FC (2025)	Route Type	
AF Group	Region 1 Urban Major Collector (2025)	Route	
GF Group	Knox (2025)	Active	Yes
Class Dist Grp	Region 1 Urban Major Collector (2025)	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Fncfl Class	Major Collector	Milepost	
Located On	05622		
Loc On Alias	BEAVER CREEK DR. NW OF KNOXVILLE		

STATION DATA
 Directions: 2-WAY

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2024	9,413	978	10	65	9,151 (97%)	262 (3%)	
2023	10,444	1,038	10	65	10,216 (98%)	228 (2%)	
2022	10,421	1,080	10	65	10,172 (98%)	249 (2%)	
2021	10,459	1,069	10	65	10,146 (97%)	313 (3%)	
2020	9,324 ²		13	65	8,980 (96%)	344 (4%)	Grown from 2019

Location
 Location ID: 47000467
 Located On: 05622 NW OF KNOXVILLE
 Direction: 2-WAY
 AADT: 9413 (2024)
[View Detail in a New Search](#)
[Go to Record in Current Search](#)

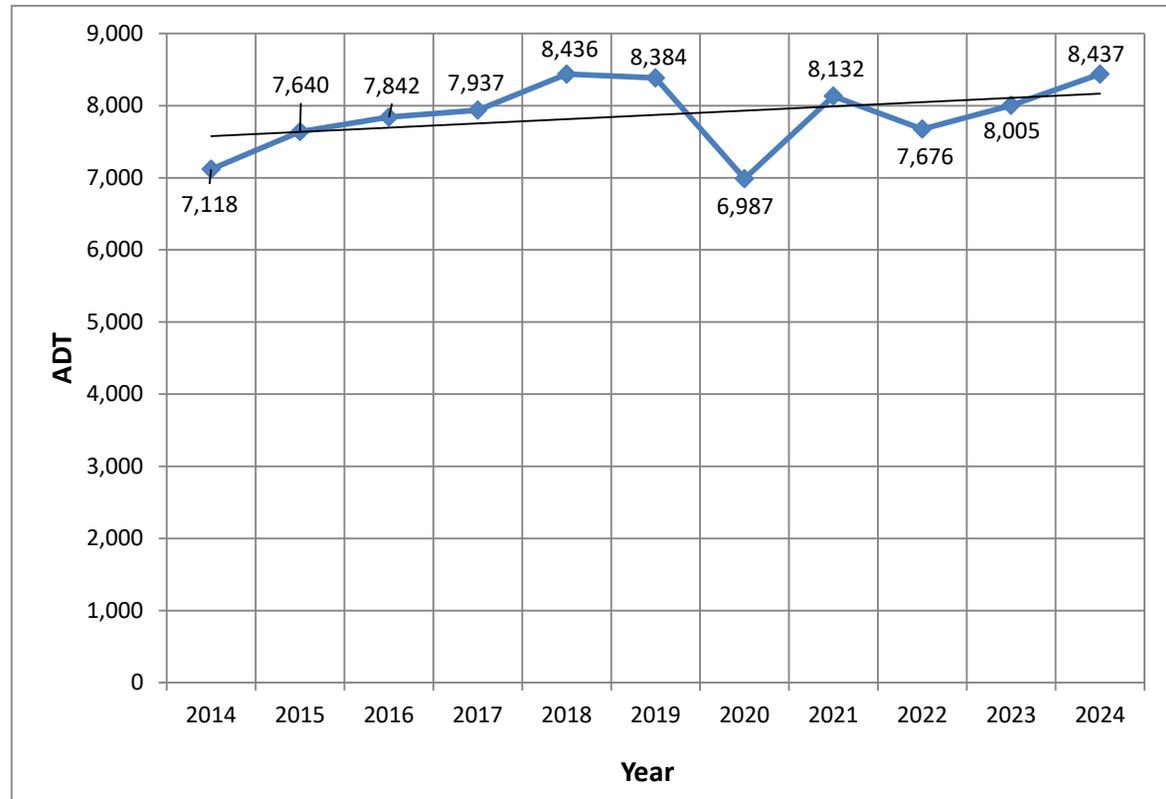
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000043

Location: Central Avenue Pike, south of West Emory Road

YEAR	ADT	Trendline ↓
2014	7,118	
2015	7,640	
2016	7,842	
2017	7,937	
2018	8,436	
2019	8,384	
2020	6,987	
2021	8,132	
2022	7,676	
2023	8,005	
2024	8,437	



2014 - 2024 Growth Rate = 18.5%

Average Annual Growth Rate = 1.7%

Traffic Count (TCDS)

Home
Locate
Locate All
Email This
Auto-Locate:

List View
All DIRs

Record
7474
of 16430
Goto Record
go

Location ID	47000043	MPO ID	
Type	SPOT	HPMS ID	
On NHS		On HPMS	
LRS ID	47L125601P00000	LRS Loc Pt.	7.144
SF Group	Urban Minor Arterial (2025)	Route Type	
AF Group	Region 1 Urban Minor Arterial (2025)	Route	
GF Group	Knox (2025)	Active	Yes
Class Dist Grp	Region 1 Urban Minor Arterial (2025)	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Functl Class	Minor Arterial	Milepost	
Located On	01256		
Loc On Alias	CENTRAL AVE. PK. SOUTH OF EMORY RD		

More Detail ▶

STATION DATA

Directions: **2-WAY**

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2024	8,437 ²		10	65	8,169 (97%)	268 (3%)	Grown from 2023
2023	8,005	826	10	65	7,653 (96%)	352 (4%)	
2022	7,676	824	11	65	7,460 (97%)	216 (3%)	
2021	8,132	759	9	65	7,864 (97%)	268 (3%)	
2020	6,987	863	12	65	6,721 (96%)	266 (4%)	

1-5 of 40

APPENDIX B

KNOXVILLE AREA TRANSIT (KAT) MAP AND INFORMATION



Route 20 - Central / Clinton Hwy WEEKDAY

Going away from downtown				Going toward downtown				
Knoxville Station Bay G	Central St NB and Dameron	Bruhin Rd NB and Ferguson St	Clinton Hwy after Merchant Dr	Northwest Crossing	Merchants Dr EB after Clinton Hwy	Bruhin and Breda	Central St SB and Dameron	Knoxville Station Bay G
1	2	3	4	5	6	7	8	9
				5:28 AM	5:38 AM	5:48 AM	6:00 AM	6:10 AM
				5:58 AM	6:08 AM	6:18 AM	6:30 AM	6:40 AM
				6:28 AM	6:38 AM	6:48 AM	7:00 AM	7:10 AM
6:15 AM	6:24 AM	6:34 AM	6:47 AM	6:58 AM	7:08 AM	7:18 AM	7:30 AM	7:40 AM
6:45 AM	6:54 AM	7:04 AM	7:17 AM	7:28 AM	7:38 AM	7:48 AM	8:00 AM	8:10 AM
7:15 AM	7:24 AM	7:34 AM	7:47 AM	7:58 AM	8:08 AM	8:18 AM	8:30 AM	8:40 AM
7:45 AM	7:54 AM	8:04 AM	8:17 AM	8:28 AM	8:38 AM	8:48 AM	9:00 AM	9:10 AM
8:15 AM	8:24 AM	8:34 AM	8:47 AM	8:58 AM	9:08 AM	9:18 AM	9:30 AM	9:40 AM
8:45 AM	8:54 AM	9:04 AM	9:17 AM	9:28 AM	9:38 AM	9:48 AM	10:00 AM	10:10 AM
9:15 AM	9:24 AM	9:34 AM	9:47 AM	9:58 AM	10:08 AM	10:18 AM	10:30 AM	10:40 AM
9:45 AM	9:54 AM	10:04 AM	10:17 AM	10:28 AM	10:38 AM	10:48 AM	11:00 AM	11:10 AM
10:15 AM	10:24 AM	10:34 AM	10:47 AM	10:58 AM	11:08 AM	11:18 AM	11:30 AM	11:40 AM
10:45 AM	10:54 AM	11:04 AM	11:17 AM	11:28 AM	11:38 AM	11:48 AM	12:00 PM	12:10 PM
11:15 AM	11:24 AM	11:34 AM	11:47 AM	11:58 AM	12:08 PM	12:18 PM	12:30 PM	12:40 PM
11:45 AM	11:54 AM	12:04 PM	12:17 PM	12:28 PM	12:38 PM	12:48 PM	1:00 PM	1:10 PM
12:15 PM	12:24 PM	12:34 PM	12:47 PM	12:58 PM	1:08 PM	1:18 PM	1:30 PM	1:40 PM
12:45 PM	12:54 PM	1:04 PM	1:17 PM	1:28 PM	1:38 PM	1:48 PM	2:00 PM	2:10 PM
1:15 PM	1:24 PM	1:34 PM	1:47 PM	1:58 PM	2:08 PM	2:18 PM	2:30 PM	2:40 PM
1:45 PM	1:54 PM	2:04 PM	2:17 PM	2:28 PM	2:38 PM	2:48 PM	3:00 PM	3:10 PM
2:15 PM	2:24 PM	2:34 PM	2:47 PM	2:58 PM	3:08 PM	3:18 PM	3:30 PM	3:40 PM
2:45 PM	2:54 PM	3:04 PM	3:17 PM	3:28 PM	3:38 PM	3:48 PM	4:00 PM	4:10 PM
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4:45 PM	4:54 PM	5:04 PM	5:17 PM	5:28 PM	5:38 PM	5:48 PM	6:00 PM	6:10 PM
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6:15 PM	6:24 PM	6:34 PM	6:47 PM	6:58 PM	7:08 PM	7:18 PM	7:30 PM	7:40 PM
6:45 PM	6:54 PM	7:04 PM	7:17 PM	7:28 PM	7:38 PM	7:48 PM	8:00 PM	8:10 PM
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8:45 PM	8:54 PM	9:04 PM	9:17 PM	9:28 PM	9:38 PM	9:48 PM	10:00 PM	10:10 PM
9:15 PM	9:24 PM	9:34 PM	9:47 PM	9:58 PM	10:08 PM	10:18 PM	10:30 PM	10:40 PM
9:45 PM	9:54 PM	10:04 PM	10:17 PM	10:28 PM	10:38 PM	10:48 PM	11:00 PM	11:10 PM
10:15 PM	10:24 PM	10:34 PM	10:47 PM	10:58 PM	11:08 PM	11:18 PM	11:30 PM	
11:15 PM	11:24 PM	11:34 PM	11:47 PM	11:58 PM				



Route 20 - Central / Clinton Hwy SATURDAY

Going away from downtown				Going toward downtown				
Knoxville Station Bay G	Central St NB and Dameron	Bruhin Rd NB and Ferguson St	Clinton Hwy after Merchant Dr	Northwest Crossing	Merchants Dr EB after Clinton Hwy	Bruhin and Breda	Central St SB and Dameron	Knoxville Station Bay G
1	2	3	4	5	6	7	8	9
				6:28 AM	6:38 AM	6:48 AM	7:00 AM	7:10 AM
				6:58 AM	7:08 AM	7:18 AM	7:30 AM	7:40 AM
				7:28 AM	7:38 AM	7:48 AM	8:00 AM	8:10 AM
7:15 AM	7:24 AM	7:34 AM	7:47 AM	7:58 AM	8:08 AM	8:18 AM	8:30 AM	8:40 AM
7:45 AM	7:54 AM	8:04 AM	8:17 AM	8:28 AM	8:38 AM	8:48 AM	9:00 AM	9:10 AM
8:15 AM	8:24 AM	8:34 AM	8:47 AM	8:58 AM	9:08 AM	9:18 AM	9:30 AM	9:40 AM
8:45 AM	8:54 AM	9:04 AM	9:17 AM	9:28 AM	9:38 AM	9:48 AM	10:00 AM	10:10 AM
9:15 AM	9:24 AM	9:34 AM	9:47 AM	9:58 AM	10:08 AM	10:18 AM	10:30 AM	10:40 AM
9:45 AM	9:54 AM	10:04 AM	10:17 AM	10:28 AM	10:38 AM	10:48 AM	11:00 AM	11:10 AM
10:15 AM	10:24 AM	10:34 AM	10:47 AM	10:58 AM	11:08 AM	11:18 AM	11:30 AM	11:40 AM
10:45 AM	10:54 AM	11:04 AM	11:17 AM	11:28 AM	11:38 AM	11:48 AM	12:00 PM	12:10 PM
11:15 AM	11:24 AM	11:34 AM	11:47 AM	11:58 AM	12:08 PM	12:18 PM	12:30 PM	12:40 PM
11:45 AM	11:54 AM	12:04 PM	12:17 PM	12:28 PM	12:38 PM	12:48 PM	1:00 PM	1:10 PM
12:15 PM	12:24 PM	12:34 PM	12:47 PM	12:58 PM	1:08 PM	1:18 PM	1:30 PM	1:40 PM
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6:15 PM	6:24 PM	6:34 PM	6:47 PM	6:58 PM	7:08 PM	7:18 PM	7:30 PM	7:40 PM
6:45 PM	6:54 PM	7:04 PM	7:17 PM	7:28 PM	7:38 PM	7:48 PM	8:00 PM	8:10 PM
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7:45 PM	7:54 PM	8:04 PM	8:17 PM	8:28 PM	8:38 PM	8:48 PM	9:00 PM	9:10 PM
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8:45 PM	8:54 PM	9:04 PM	9:17 PM	9:28 PM	9:38 PM	9:48 PM	10:00 PM	10:10 PM
9:15 PM	9:24 PM	9:34 PM	9:47 PM	9:58 PM	10:08 PM	10:18 PM	10:30 PM	10:40 PM
9:45 PM	9:54 PM	10:04 PM	10:17 PM	10:28 PM	10:38 PM	10:48 PM	11:00 PM	11:10 PM
10:15 PM	10:24 PM	10:34 PM	10:47 PM	10:58 PM	11:08 PM	11:18 PM	11:30 PM	
11:15 PM	11:24 PM	11:34 PM	11:47 PM	11:58 PM				



Route 20 - Central / Clinton Hwy SUNDAY

Going away from downtown				Going toward downtown				
Knoxville Station Bay G	Central St NB and Dameron	Bruhin Rd NB and Ferguson St	Clinton Hwy after Merchant Dr	Northwest Crossing	Merchants Dr EB after Clinton Hwy	Bruhin and Breda	Central St SB and Dameron	Knoxville Station Bay G
1	2	3	4	5	6	7	8	9
				7:58 AM	8:08 AM	8:18 AM	8:30 AM	8:40 AM
				8:28 AM	8:38 AM	8:48 AM	9:00 AM	9:10 AM
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10:15 AM	10:24 AM	10:34 AM	10:47 AM	10:58 AM	11:08 AM	11:18 AM	11:30 AM	11:40 AM
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6:15 PM	6:24 PM	6:34 PM	6:47 PM	6:58 PM	7:08 PM	7:18 PM	7:30 PM	7:40 PM
6:45 PM	6:54 PM	7:04 PM	7:17 PM	7:28 PM	7:38 PM	7:48 PM	8:00 PM	8:10 PM
7:15 PM	7:24 PM	7:34 PM	7:47 PM	7:58 PM	8:08 PM	8:18 PM	8:30 PM	
8:15 PM	8:24 PM	8:34 PM	8:47 PM	8:58 PM	9:08 PM	9:18 PM	9:30 PM	

POWELL

WHITTLE SPRINGS

25W

75

640

Northwest Crossing/Walmart

CHEROKEE RIDGE

Norwood Branch Library

Clinton Plaza

Inskip Ballfields

Inskip Pool & Park

North Ridge Crossing

Sharps Ridge Memorial Park

NORTH KNOXVILLE

441

LINCOLN PARK

BELLE MORRIS

PLEASANT RIDGE

RIDGEDALE

CUMBERLAND ESTATES

Victor Ashe Park

75

640

LONSDALE

275

BEAUMONT

OLD NORTH KNOXVILLE

40

EDGEWOOD

WEST HAVEN

62

Three Rivers Market

Boys & Girls Club of Knoxville

4TH & GILL

Caswell Park

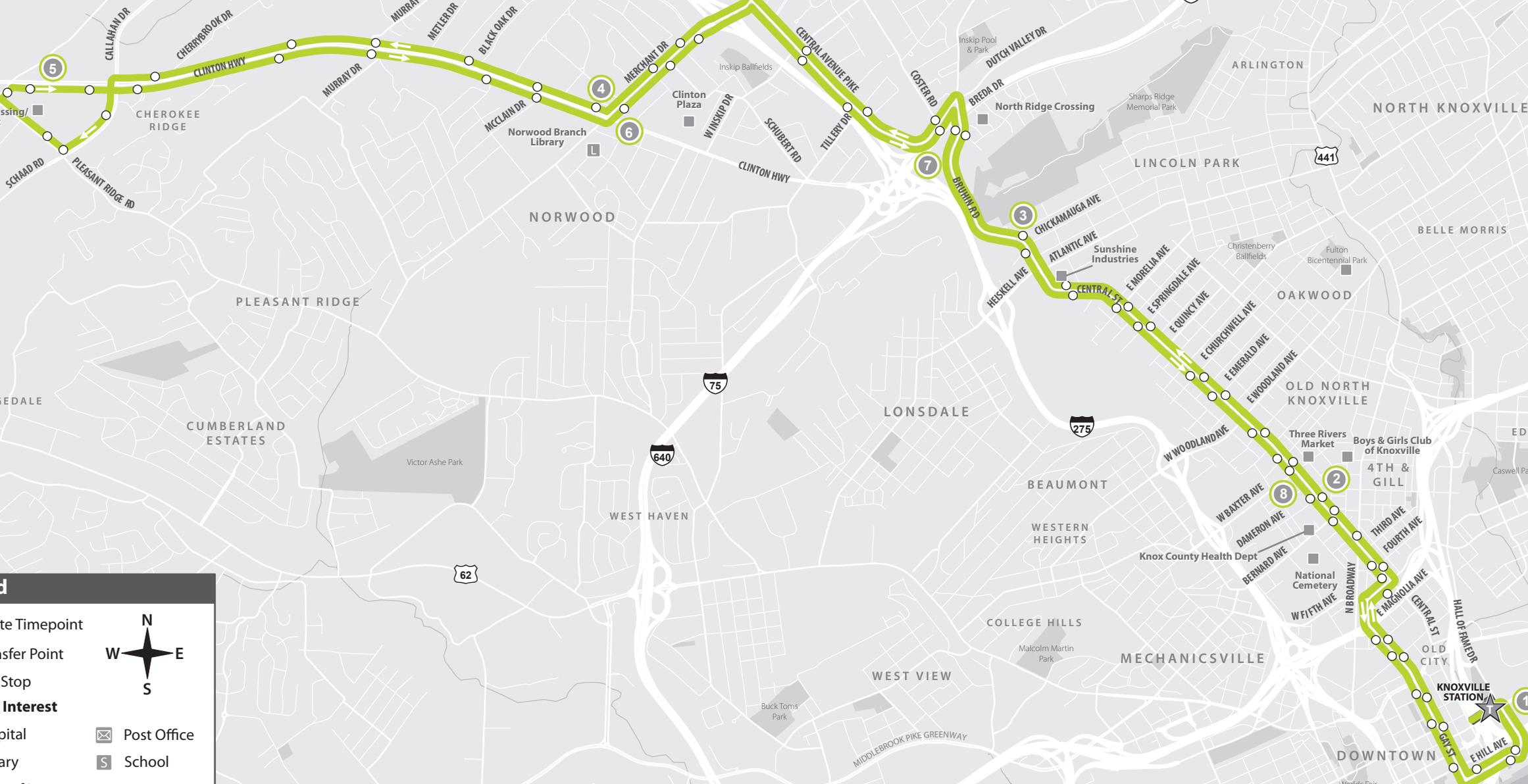
Legend

- Route Timepoint
- Transfer Point
- Bus Stop

Points of Interest

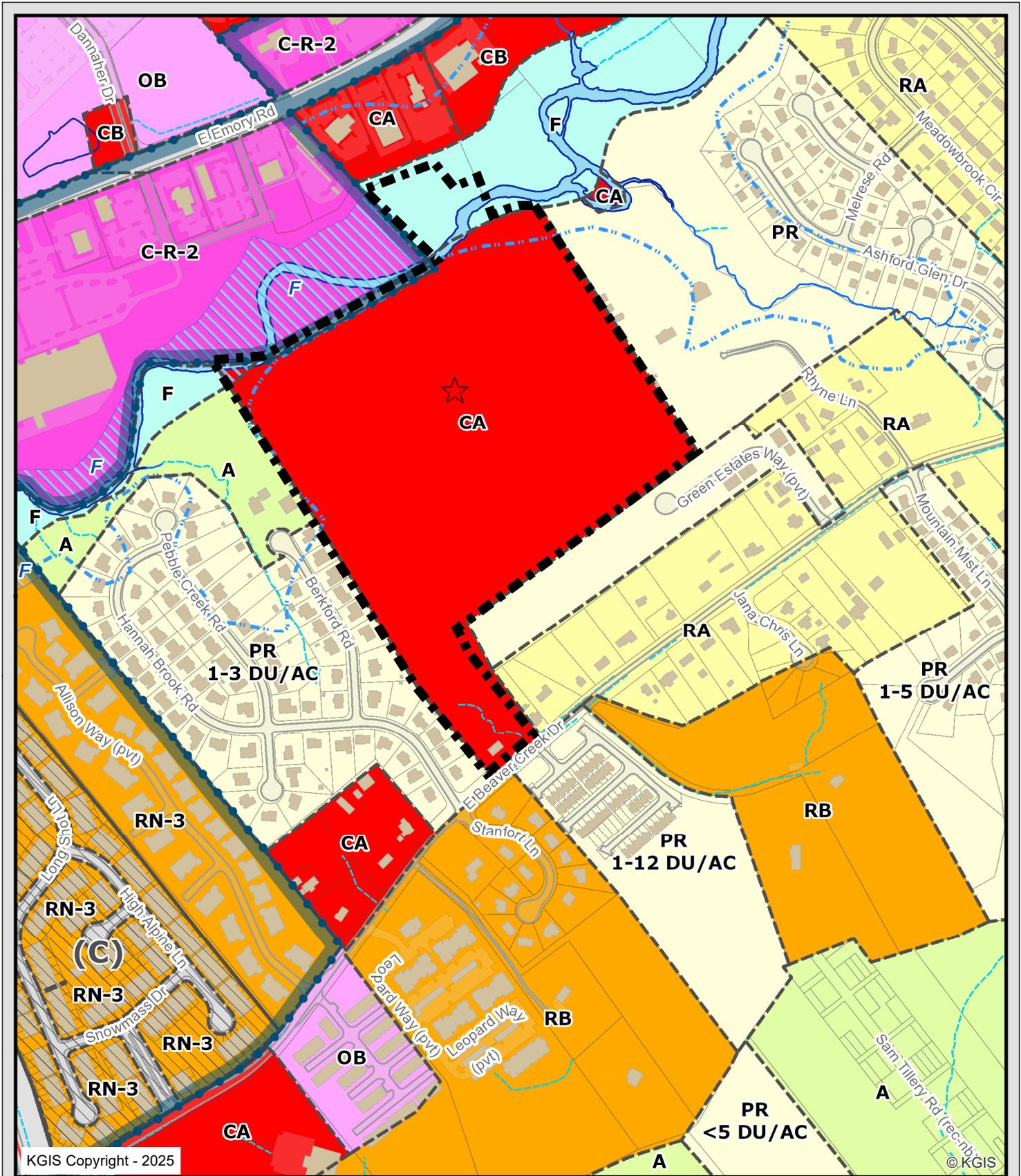
- Hospital
- Library
- Point of Interest
- Post Office
- School

0 0.25 0.5 0.75 Miles



APPENDIX C

ZONING MAP



Zoning Map

8.4.25

Printed: 8/4/2025 at 10:22:22 AM

0 250 500 1,000
ft

Knoxville - Knox County - KUB Geographic Information System

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APPENDIX D

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: E Beaver Creek Drive (WB & EB)
 Minor Street: Stone Cutter Way (NB)
 Traffic Control: Stop Control on Minor Street

8/26/2025 (Tuesday)
 Mostly Sunny and Temperate
 Conducted by: Ajax Engineering

TIME BEGIN	E Beaver Creek Drive		Stone Cutter Way		E Beaver Creek Drive		VEHICLE TOTAL	PEAK HOUR
	WESTBOUND		NORTHBOUND		EASTBOUND			
	LT	THRU	LT	RT	THRU	RT		
7:00 AM	2	145	3	1	49	1	201	7:00 AM - 8:00 AM
7:15 AM	2	162	8	3	65	2	242	
7:30 AM	0	243	1	1	48	0	293	
7:45 AM	0	225	0	1	81	0	307	
8:00 AM	0	130	0	0	52	0	182	
8:15 AM	0	120	1	2	66	0	189	
8:30 AM	1	94	6	1	52	0	154	
8:45 AM	0	112	2	1	68	0	183	
TOTAL	5	1231	21	10	481	3	1751	
11:00 AM	0	61	0	1	55	2	119	
11:15 AM	0	61	1	0	47	0	109	
11:30 AM	0	63	0	1	77	0	141	
11:45 AM	0	82	1	1	72	2	158	11:45 AM - 12:45 PM
12:00 PM	0	65	2	0	71	1	139	
12:15 PM	1	76	2	0	74	1	154	
12:30 PM	0	56	1	0	86	0	143	
12:45 PM	0	67	0	0	71	0	138	
TOTAL	1	531	7	3	553	6	1101	
2:00 PM	0	83	1	0	94	1	179	
2:15 PM	0	78	0	1	86	0	165	
2:30 PM	1	94	0	1	100	0	196	
2:45 PM	1	86	0	0	103	0	190	
3:00 PM	2	91	0	0	106	1	200	
3:15 PM	0	102	2	0	132	2	238	
3:30 PM	0	84	0	1	150	1	236	
3:45 PM	0	100	3	1	147	4	255	
4:00 PM	1	94	1	0	119	1	216	
4:15 PM	1	87	0	1	167	1	257	
4:30 PM	0	94	0	0	149	1	244	
4:45 PM	0	102	1	0	157	1	261	4:45 PM - 5:45 PM
5:00 PM	1	123	1	1	166	3	295	
5:15 PM	1	100	0	0	181	3	285	
5:30 PM	3	118	0	1	163	1	286	
5:45 PM	1	88	0	1	164	2	256	
TOTAL	12	1524	9	8	2184	22	3759	

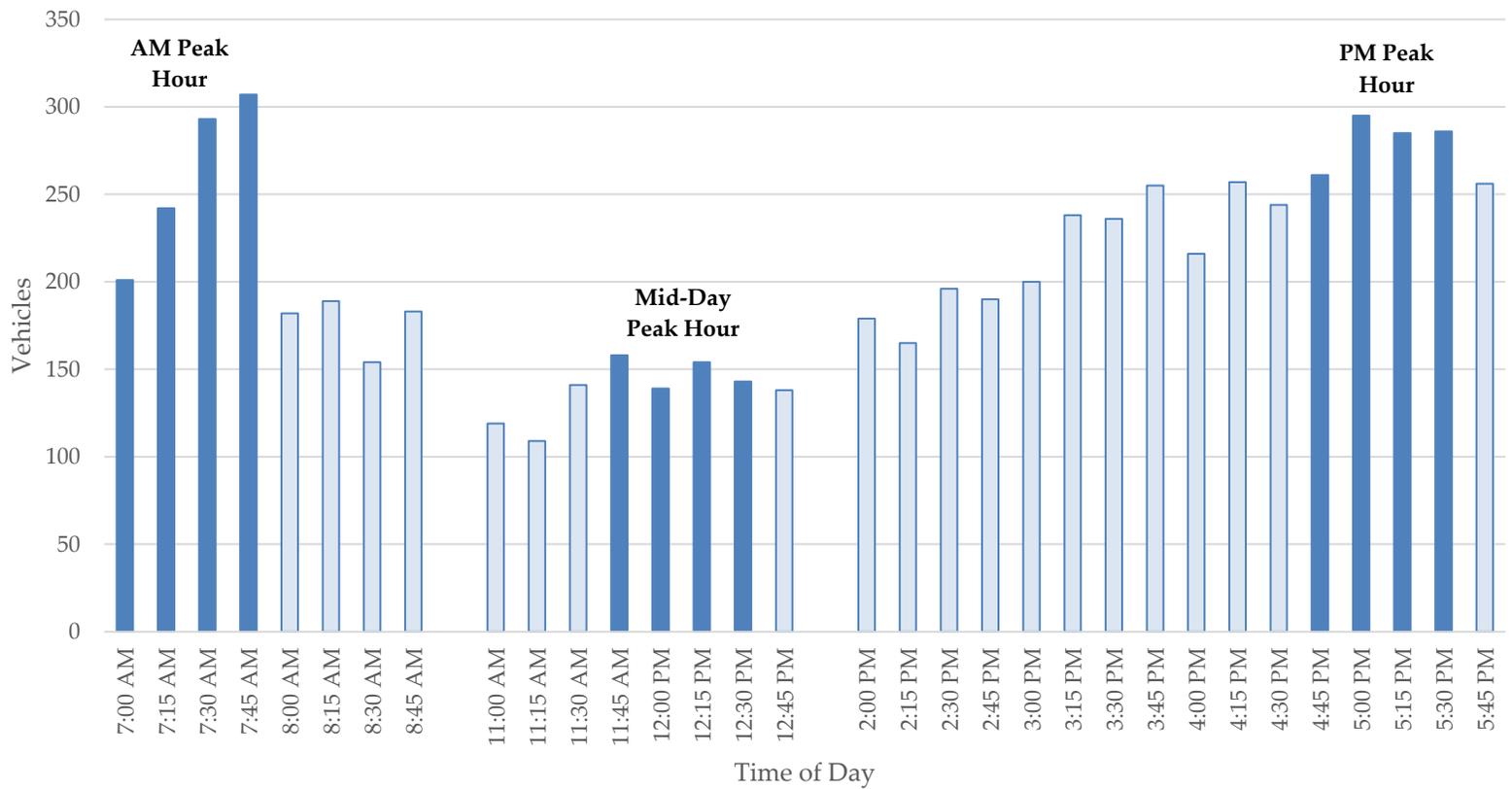
2025 AM Peak Hour 7:00 AM - 8:00 AM

TIME BEGIN	E Beaver Creek Drive		Stone Cutter Way		E Beaver Creek Drive	
	WESTBOUND		NORTHBOUND		EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
7:00 AM	2	145	3	1	49	1
7:15 AM	2	162	8	3	65	2
7:30 AM	0	243	1	1	48	0
7:45 AM	0	225	0	1	81	0
TOTAL	4	775	12	6	243	3
Truck %	0.0%	0.3%	0.0%	0.0%	0.0%	0.4%
PHF_{mvmt}	0.50	0.80	0.38	0.50	0.75	0.38
PHF_{app}	0.80		0.06		0.76	
PHF_{int}	0.85					

2025 PM Peak Hour 4:45 PM - 5:45 PM

TIME BEGIN	E Beaver Creek Drive		Stone Cutter Way		E Beaver Creek Drive	
	WESTBOUND		NORTHBOUND		EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
4:45 PM	0	102	1	0	157	1
5:00 PM	1	123	1	1	166	3
5:15 PM	1	100	0	0	181	3
5:30 PM	3	118	0	1	163	1
TOTAL	5	443	2	2	667	8
TRUCK %	0.0%	0.7%	0.0%	0.0%	0.4%	0.0%
PHF_{mvmt}	0.42	0.90	0.50	0.50	0.92	0.67
PHF_{app}	0.90		0.50		0.92	
PHF_{int}	0.96					

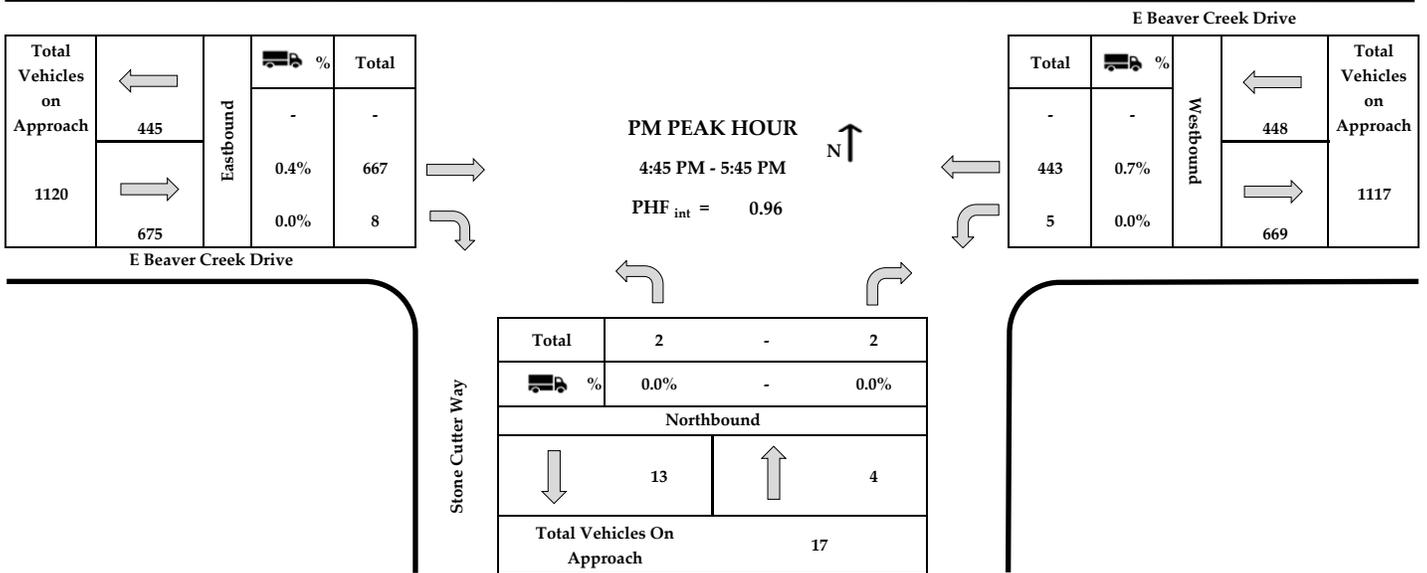
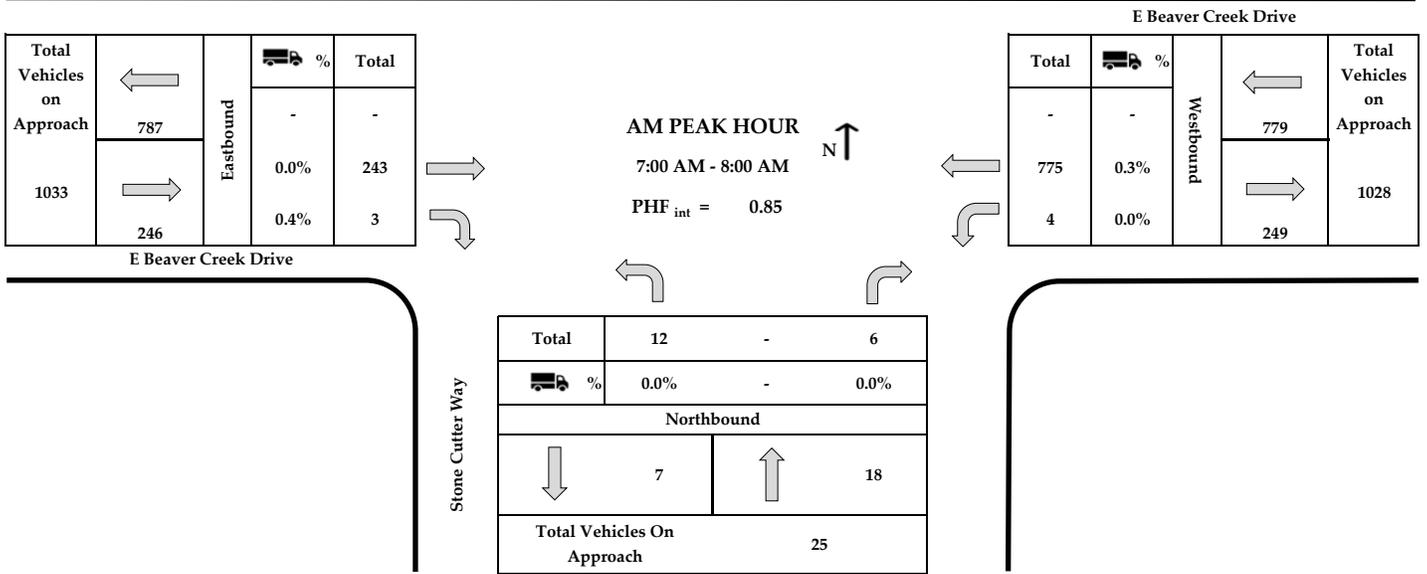
**E Beaver Creek Drive at Stone Cutter Way
Intersection Traffic Count Totals
8/26/2025**



PEAK HOUR DATA

Major Street: E Beaver Creek Drive (WB & EB)
 Minor Street: Stone Cutter Way (NB)
 Traffic Control: Stop Control on Minor Street

8/26/2025 (Tuesday)
 Mostly Sunny and Temperate
 Conducted by: Ajax Engineering



TRAFFIC COUNT DATA

Major Street: Central Avenue Pike (SB and NB)
 Minor Street: E Beaver Creek Drive (WB)
 Traffic Control: Traffic Signal

8/26/2025 (Tuesday)
 Mostly Sunny and Temperate
 Conducted by: Ajax Engineering

TIME BEGIN	Central Avenue Pike		E Beaver Creek Drive		Central Avenue Pike		VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND		WESTBOUND		NORTHBOUND			
	LT	THRU	LT	RT	THRU	RT		
7:00 AM	21	44	134	54	28	26	307	
7:15 AM	28	54	136	55	41	25	339	7:15 AM - 8:15 AM
7:30 AM	26	46	149	133	68	22	444	
7:45 AM	46	77	133	121	63	29	469	
8:00 AM	34	76	106	56	43	20	335	
8:15 AM	30	72	96	39	43	44	324	
8:30 AM	27	56	104	43	37	29	296	
8:45 AM	19	59	103	34	47	51	313	
TOTAL	231	484	961	535	370	246	2827	
2:00 PM	37	52	64	29	77	74	333	
2:15 PM	43	65	50	37	90	48	333	
2:30 PM	37	55	63	40	79	72	346	
2:45 PM	32	60	44	40	94	87	357	
3:00 PM	50	67	53	45	80	75	370	
3:15 PM	58	57	67	31	110	86	409	
3:30 PM	80	93	61	40	97	96	467	
3:45 PM	61	78	57	44	86	110	436	
4:00 PM	62	78	53	42	74	85	394	
4:15 PM	68	69	49	41	98	120	445	
4:30 PM	74	70	61	46	110	102	463	
4:45 PM	72	78	68	40	117	114	489	4:45 PM - 5:45 PM
5:00 PM	87	91	86	46	120	97	527	
5:15 PM	83	63	53	46	115	127	487	
5:30 PM	83	71	80	50	112	115	511	
5:45 PM	62	73	75	37	100	138	485	
TOTAL	989	1120	984	654	1559	1546	6852	

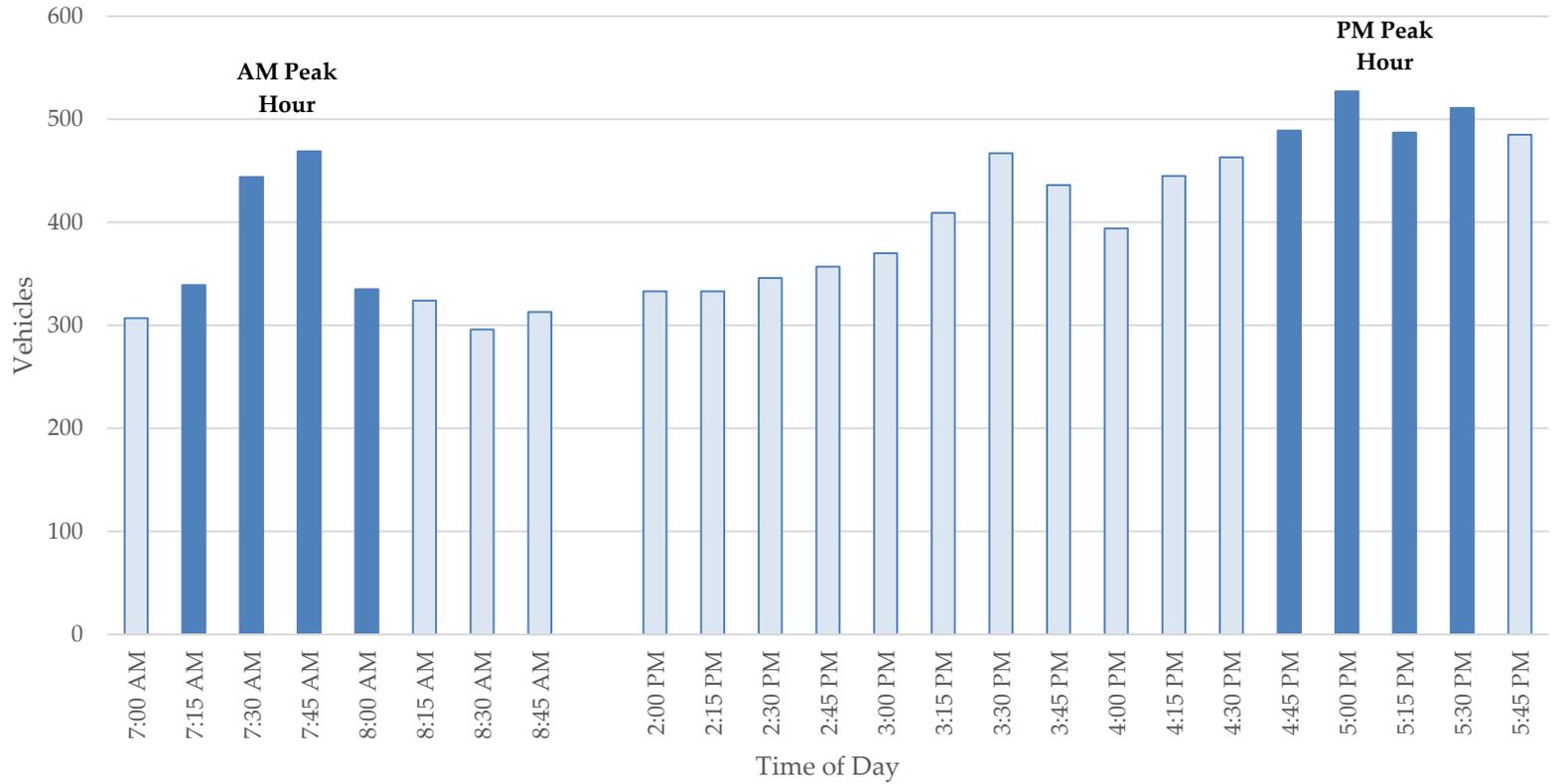
2025 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	Central Avenue Pike		E Beaver Creek Drive		Central Avenue Pike	
	SOUTHBOUND		WESTBOUND		NORTHBOUND	
	LT	THRU	LT	RT	THRU	RT
7:15 AM	28	54	136	55	41	25
7:30 AM	26	46	149	133	68	22
7:45 AM	46	77	133	121	63	29
8:00 AM	34	76	106	56	43	20
TOTAL	134	253	524	365	215	96
TRUCK %	0.0%	0.8%	0.2%	0.3%	0.0%	1.0%
PHF_{mvt}	0.73	0.82	0.88	0.69	0.79	0.83
PHF_{app}	0.79		0.79		0.85	
PHF_{int}	0.85					

2025 PM Peak Hour **4:45 PM - 5:45 PM**

TIME BEGIN	Central Avenue Pike		E Beaver Creek Drive		Central Avenue Pike	
	SOUTHBOUND		WESTBOUND		NORTHBOUND	
	LT	THRU	LT	RT	THRU	RT
4:45 PM	72	78	68	40	117	114
5:00 PM	87	91	86	46	120	97
5:15 PM	83	63	53	46	115	127
5:30 PM	83	71	80	50	112	115
TOTAL	325	303	287	182	464	453
TRUCK %	0.3%	0.0%	1.1%	0.3%	0.4%	0.4%
PHF_{mvt}	0.93	0.83	0.83	0.91	0.97	0.89
PHF_{app}	0.88		0.89		0.95	
PHF_{int}	0.96					

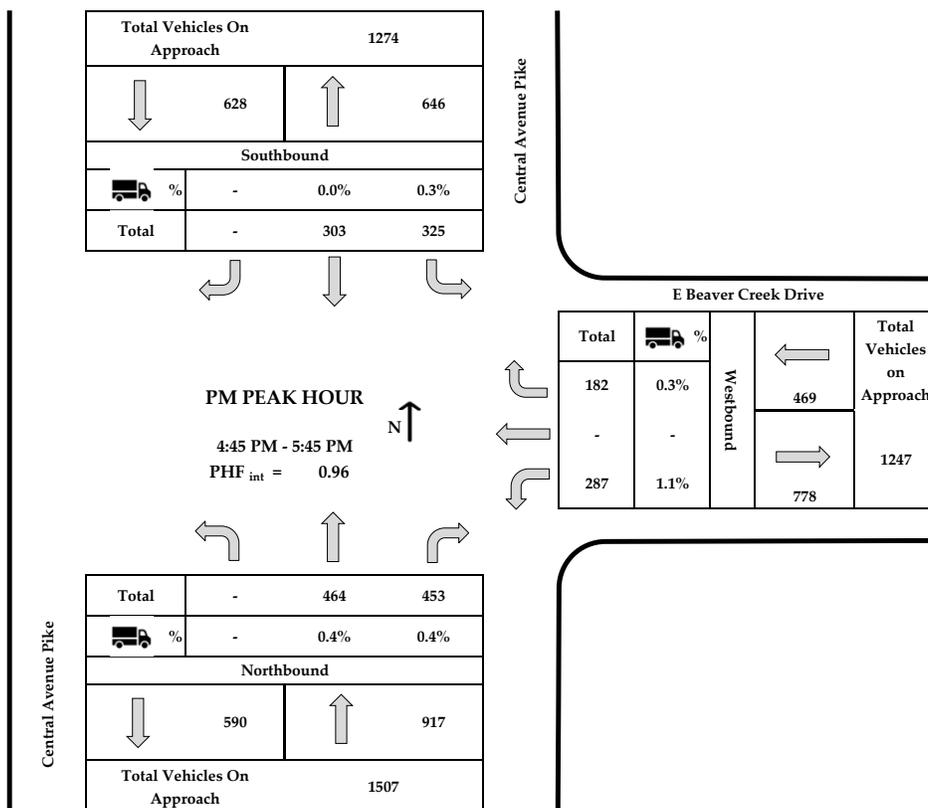
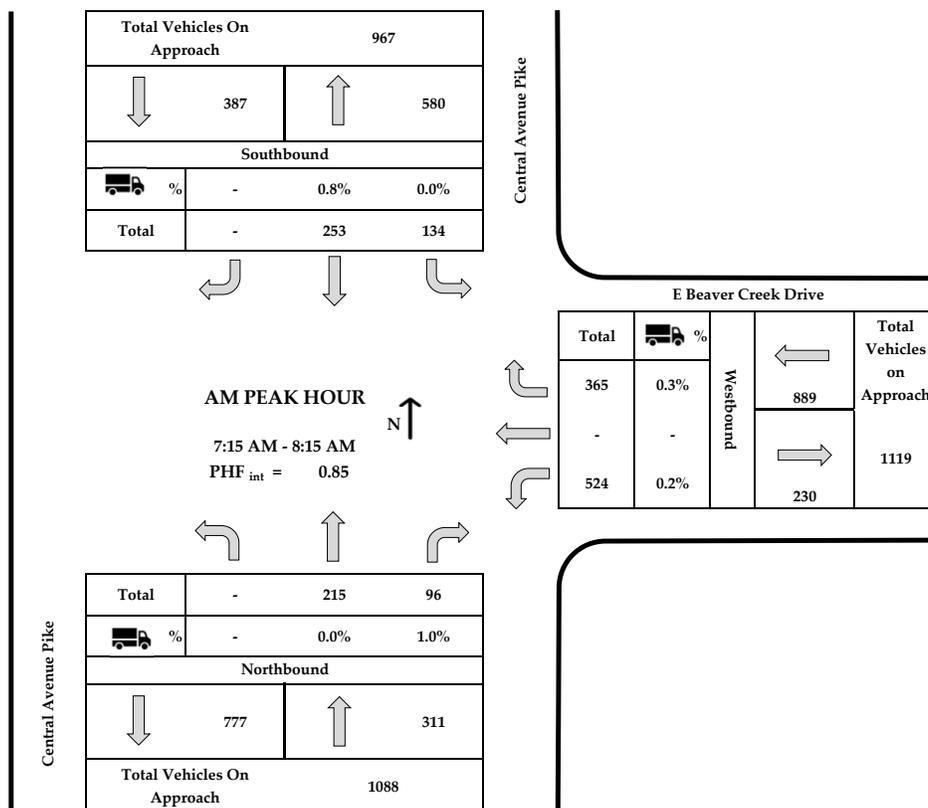
Central Avenue Pike at E Beaver Creek Drive
Intersection Traffic Count Totals
8/26/2025



PEAK HOUR DATA

Major Street: Central Avenue Pike (SB and NB)
 Minor Street: E Beaver Creek Drive (WB)
 Traffic Control: Traffic Signal

8/26/2025 (Tuesday)
 Mostly Sunny and Temperate
 Conducted by: Ajax Engineering



APPENDIX E

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 12)

EXISTING CONDITIONS

Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	524	365	215	96	134	253
Future Volume (vph)	524	365	215	96	134	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-8%		3%			0%
Storage Length (ft)	0	140		275	180	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1877	1680	1872	1575	1805	1881
Flt Permitted	0.950				0.360	
Satd. Flow (perm)	1877	1680	1872	1575	684	1881
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		272		113		
Link Speed (mph)	40		40			40
Link Distance (ft)	625		414			552
Travel Time (s)	10.7		7.1			9.4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	1%	0%	1%
Adj. Flow (vph)	616	429	253	113	158	298
Shared Lane Traffic (%)						
Lane Group Flow (vph)	616	429	253	113	158	298
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	10.0	6.0	10.0	10.0	6.0	10.0
Minimum Split (s)	16.5	11.5	16.0	16.5	11.5	16.0
Total Split (s)	42.0	13.0	25.0	42.0	13.0	38.0
Total Split (%)	52.5%	16.3%	31.3%	52.5%	16.3%	47.5%
Maximum Green (s)	35.5	7.5	19.0	35.5	7.5	32.0
Yellow Time (s)	5.0	4.0	4.5	5.0	4.0	4.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	5.5	6.0	6.5	5.5	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	25.8	39.7	13.8	45.7	27.2	26.6
Actuated g/C Ratio	0.40	0.61	0.21	0.70	0.42	0.41
v/c Ratio	0.83	0.38	0.64	0.10	0.39	0.39
Control Delay (s/veh)	28.9	3.5	33.4	0.8	17.0	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	28.9	3.5	33.4	0.8	17.0	16.9
LOS	C	A	C	A	B	B

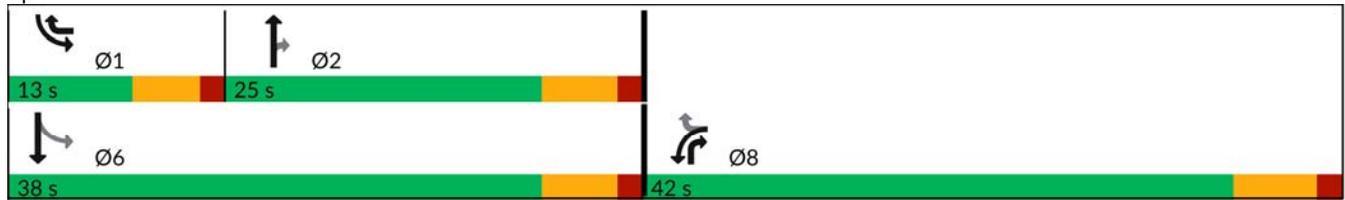
Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (s/veh)	18.5		23.3			16.9
Approach LOS	B		C			B
Queue Length 50th (ft)	209	23	93	0	39	80
Queue Length 95th (ft)	339	59	173	8	84	155
Internal Link Dist (ft)	545		334			472
Turn Bay Length (ft)		140		275	180	
Base Capacity (vph)	1052	1138	562	1367	417	951
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.38	0.45	0.08	0.38	0.31

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	65.3
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.83
Intersection Signal Delay (s/veh):	19.0
Intersection LOS:	B
Intersection Capacity Utilization:	62.8%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 8: Central Avenue Pike & E Beaver Creek Drive



HCM 7th TWSC
 3: Stone Cutter Way & E Beaver Creek Drive

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	243	3	4	775	12	6
Future Vol, veh/h	243	3	4	775	12	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-3	-3	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	286	4	5	912	14	7

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	289	0	1209
Stage 1	-	-	-	-	288
Stage 2	-	-	-	-	921
Critical Hdwy	-	-	4.1	-	5.8
Critical Hdwy Stg 1	-	-	-	-	4.8
Critical Hdwy Stg 2	-	-	-	-	4.8
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1284	-	249
Stage 1	-	-	-	-	803
Stage 2	-	-	-	-	456
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1284	-	248
Mov Cap-2 Maneuver	-	-	-	-	248
Stage 1	-	-	-	-	803
Stage 2	-	-	-	-	453

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.04	17.04
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	320	-	-	9	-
HCM Lane V/C Ratio	0.066	-	-	0.004	-
HCM Ctrl Dly (s/v)	17	-	-	7.8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	287	182	464	453	325	303
Future Volume (vph)	287	182	464	453	325	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-8%		3%			0%
Storage Length (ft)	0	140		275	180	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1859	1680	1872	1591	1805	1900
Flt Permitted	0.950				0.201	
Satd. Flow (perm)	1859	1680	1872	1591	382	1900
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		190		203		
Link Speed (mph)	40		40			40
Link Distance (ft)	625		414			552
Travel Time (s)	10.7		7.1			9.4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	299	190	483	472	339	316
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	190	483	472	339	316
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	10.0	6.0	10.0	10.0	6.0	10.0
Minimum Split (s)	16.5	11.5	16.0	16.5	11.5	16.0
Total Split (s)	25.0	19.0	36.0	25.0	19.0	55.0
Total Split (%)	31.3%	23.8%	45.0%	31.3%	23.8%	68.8%
Maximum Green (s)	18.5	13.5	30.0	18.5	13.5	49.0
Yellow Time (s)	5.0	4.0	4.5	5.0	4.0	4.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	5.5	6.0	6.5	5.5	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	15.3	32.9	21.0	42.5	38.0	37.5
Actuated g/C Ratio	0.23	0.50	0.32	0.65	0.58	0.57
v/c Ratio	0.69	0.20	0.81	0.43	0.75	0.29
Control Delay (s/veh)	34.6	2.6	32.7	4.2	20.7	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	34.6	2.6	32.7	4.2	20.7	8.2
LOS	C	A	C	A	C	A

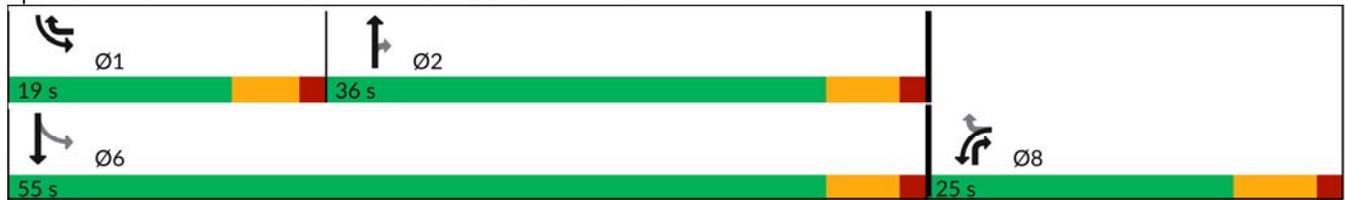
Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (s/veh)	22.1		18.6			14.6
Approach LOS	C		B			B
Queue Length 50th (ft)	113	0	184	39	67	62
Queue Length 95th (ft)	#230	31	306	85	#159	106
Internal Link Dist (ft)	545		334			472
Turn Bay Length (ft)		140		275	180	
Base Capacity (vph)	543	1007	887	1182	524	1452
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.19	0.54	0.40	0.65	0.22

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	65.8
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.81
Intersection Signal Delay (s/veh):	18.2
Intersection LOS:	B
Intersection Capacity Utilization:	73.3%
ICU Level of Service:	D
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 8: Central Avenue Pike & E Beaver Creek Drive



HCM 7th TWSC
 3: Stone Cutter Way & E Beaver Creek Drive

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1			1	2	
Traffic Vol, veh/h	667	8	5	443	2	2
Future Vol, veh/h	667	8	5	443	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-3	-3	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	695	8	5	461	2	2

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	703	0	1171
Stage 1	-	-	-	-	699
Stage 2	-	-	-	-	472
Critical Hdwy	-	-	4.1	-	5.8
Critical Hdwy Stg 1	-	-	-	-	4.8
Critical Hdwy Stg 2	-	-	-	-	4.8
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	904	-	261
Stage 1	-	-	-	-	558
Stage 2	-	-	-	-	684
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	904	-	259
Mov Cap-2 Maneuver	-	-	-	-	259
Stage 1	-	-	-	-	558
Stage 2	-	-	-	-	678

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.1	15.91
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	334	-	-	20	-
HCM Lane V/C Ratio	0.012	-	-	0.006	-
HCM Ctrl Dly (s/v)	15.9	-	-	9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

PROJECTED CONDITIONS WITHOUT THE PROJECT

Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	555	387	228	102	142	268
Future Volume (vph)	555	387	228	102	142	268
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-8%		3%			0%
Storage Length (ft)	0	140		275	180	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1877	1680	1872	1575	1805	1881
Flt Permitted	0.950				0.333	
Satd. Flow (perm)	1877	1680	1872	1575	633	1881
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		250		120		
Link Speed (mph)	40		40			40
Link Distance (ft)	625		414			552
Travel Time (s)	10.7		7.1			9.4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	1%	0%	1%
Adj. Flow (vph)	653	455	268	120	167	315
Shared Lane Traffic (%)						
Lane Group Flow (vph)	653	455	268	120	167	315
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	10.0	6.0	10.0	10.0	6.0	10.0
Minimum Split (s)	16.5	11.5	16.0	16.5	11.5	16.0
Total Split (s)	42.0	13.0	25.0	42.0	13.0	38.0
Total Split (%)	52.5%	16.3%	31.3%	52.5%	16.3%	47.5%
Maximum Green (s)	35.5	7.5	19.0	35.5	7.5	32.0
Yellow Time (s)	5.0	4.0	4.5	5.0	4.0	4.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	5.5	6.0	6.5	5.5	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	27.8	41.8	14.3	48.4	27.8	27.3
Actuated g/C Ratio	0.41	0.61	0.21	0.71	0.41	0.40
v/c Ratio	0.85	0.40	0.68	0.10	0.44	0.42
Control Delay (s/veh)	30.5	4.1	35.6	0.8	18.5	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	30.5	4.1	35.6	0.8	18.5	18.0
LOS	C	A	D	A	B	B

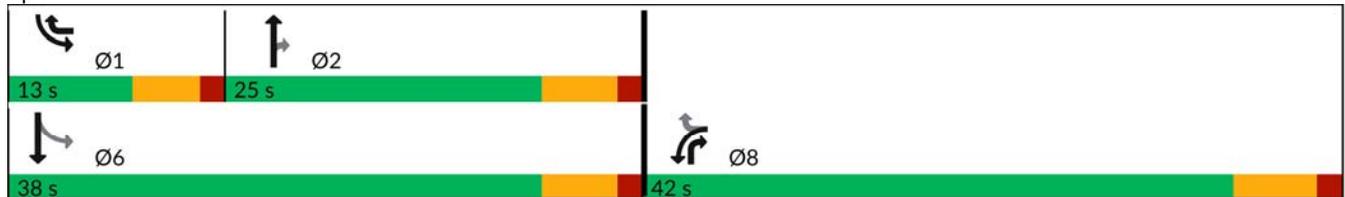
Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (s/veh)	19.6		24.8			18.2
Approach LOS	B		C			B
Queue Length 50th (ft)	237	33	108	0	46	96
Queue Length 95th (ft)	369	72	183	8	89	164
Internal Link Dist (ft)	545		334			472
Turn Bay Length (ft)		140		275	180	
Base Capacity (vph)	1009	1138	538	1339	391	911
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.40	0.50	0.09	0.43	0.35

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	68
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.85
Intersection Signal Delay (s/veh):	20.3
Intersection LOS:	C
Intersection Capacity Utilization:	65.6%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 8: Central Avenue Pike & E Beaver Creek Drive



HCM 7th TWSC
 3: Stone Cutter Way & E Beaver Creek Drive

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	254	3	4	810	12	6
Future Vol, veh/h	254	3	4	810	12	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-3	-3	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	299	4	5	953	14	7

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	302	0	1263 301
Stage 1	-	-	-	-	301 -
Stage 2	-	-	-	-	962 -
Critical Hdwy	-	-	4.1	-	5.8 5.9
Critical Hdwy Stg 1	-	-	-	-	4.8 -
Critical Hdwy Stg 2	-	-	-	-	4.8 -
Follow-up Hdwy	-	-	2.2	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	1270	-	233 763
Stage 1	-	-	-	-	794 -
Stage 2	-	-	-	-	439 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1270	-	232 763
Mov Cap-2 Maneuver	-	-	-	-	232 -
Stage 1	-	-	-	-	794 -
Stage 2	-	-	-	-	435 -

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.04	17.83
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	302	-	-	9	-
HCM Lane V/C Ratio	0.07	-	-	0.004	-
HCM Ctrl Dly (s/v)	17.8	-	-	7.8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	304	193	492	480	345	321
Future Volume (vph)	304	193	492	480	345	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-8%		3%			0%
Storage Length (ft)	0	140		275	180	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1859	1680	1872	1591	1805	1900
Flt Permitted	0.950				0.178	
Satd. Flow (perm)	1859	1680	1872	1591	338	1900
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		181		169		
Link Speed (mph)	40		40			40
Link Distance (ft)	625		414			552
Travel Time (s)	10.7		7.1			9.4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	317	201	513	500	359	334
Shared Lane Traffic (%)						
Lane Group Flow (vph)	317	201	513	500	359	334
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	10.0	6.0	10.0	10.0	6.0	10.0
Minimum Split (s)	16.5	11.5	16.0	16.5	11.5	16.0
Total Split (s)	25.0	19.0	36.0	25.0	19.0	55.0
Total Split (%)	31.3%	23.8%	45.0%	31.3%	23.8%	68.8%
Maximum Green (s)	18.5	13.5	30.0	18.5	13.5	49.0
Yellow Time (s)	5.0	4.0	4.5	5.0	4.0	4.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	5.5	6.0	6.5	5.5	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	15.8	34.0	22.5	44.5	40.1	39.6
Actuated g/C Ratio	0.23	0.50	0.33	0.65	0.59	0.58
v/c Ratio	0.74	0.22	0.83	0.46	0.81	0.30
Control Delay (s/veh)	37.9	3.3	34.8	5.1	27.5	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	37.9	3.3	34.8	5.1	27.5	8.3
LOS	D	A	C	A	C	A

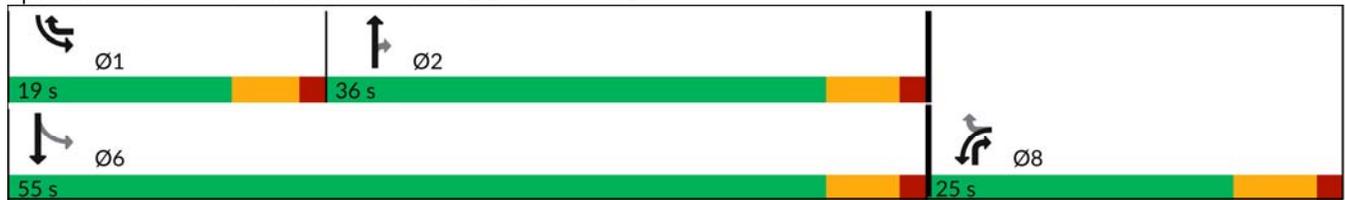
Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (s/veh)	24.4		20.1			18.2
Approach LOS	C		C			B
Queue Length 50th (ft)	129	4	211	54	82	70
Queue Length 95th (ft)	#261	38	332	106	#216	112
Internal Link Dist (ft)	545		334			472
Turn Bay Length (ft)		140		275	180	
Base Capacity (vph)	519	981	849	1163	498	1408
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.20	0.60	0.43	0.72	0.24

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	68.4
Natural Cycle:	70
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.83
Intersection Signal Delay (s/veh):	20.5
Intersection LOS:	C
Intersection Capacity Utilization:	76.9%
ICU Level of Service:	D
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 8: Central Avenue Pike & E Beaver Creek Drive



HCM 7th TWSC
 3: Stone Cutter Way & E Beaver Creek Drive

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1			1	2	
Traffic Vol, veh/h	697	8	5	463	2	2
Future Vol, veh/h	697	8	5	463	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-3	-	-	-3	-3	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	726	8	5	482	2	2

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	734	0	1223
Stage 1	-	-	-	-	730
Stage 2	-	-	-	-	493
Critical Hdwy	-	-	4.1	-	5.8
Critical Hdwy Stg 1	-	-	-	-	4.8
Critical Hdwy Stg 2	-	-	-	-	4.8
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	880	-	245
Stage 1	-	-	-	-	543
Stage 2	-	-	-	-	671
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	880	-	243
Mov Cap-2 Maneuver	-	-	-	-	243
Stage 1	-	-	-	-	543
Stage 2	-	-	-	-	666

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.1	16.53
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	316	-	-	19	-
HCM Lane V/C Ratio	0.013	-	-	0.006	-
HCM Ctrl Dly (s/v)	16.5	-	-	9.1	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

PROJECTED CONDITIONS WITH THE PROJECT

Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	641	447	228	112	157	268
Future Volume (vph)	641	447	228	112	157	268
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-8%		3%			0%
Storage Length (ft)	0	140		275	180	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1877	1680	1872	1575	1805	1881
Flt Permitted	0.950				0.316	
Satd. Flow (perm)	1877	1680	1872	1575	600	1881
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		250		132		
Link Speed (mph)	40		40			40
Link Distance (ft)	625		414			552
Travel Time (s)	10.7		7.1			9.4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	1%	0%	1%
Adj. Flow (vph)	754	526	268	132	185	315
Shared Lane Traffic (%)						
Lane Group Flow (vph)	754	526	268	132	185	315
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	10.0	6.0	10.0	10.0	6.0	10.0
Minimum Split (s)	16.5	11.5	16.0	16.5	11.5	16.0
Total Split (s)	42.0	13.0	25.0	42.0	13.0	38.0
Total Split (%)	52.5%	16.3%	31.3%	52.5%	16.3%	47.5%
Maximum Green (s)	35.5	7.5	19.0	35.5	7.5	32.0
Yellow Time (s)	5.0	4.0	4.5	5.0	4.0	4.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	5.5	6.0	6.5	5.5	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	32.0	45.8	14.7	52.8	28.0	27.5
Actuated g/C Ratio	0.44	0.63	0.20	0.73	0.39	0.38
v/c Ratio	0.91	0.45	0.71	0.11	0.52	0.44
Control Delay (s/veh)	36.2	4.9	38.4	0.7	21.7	19.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	36.2	4.9	38.4	0.7	21.7	19.5
LOS	D	A	D	A	C	B

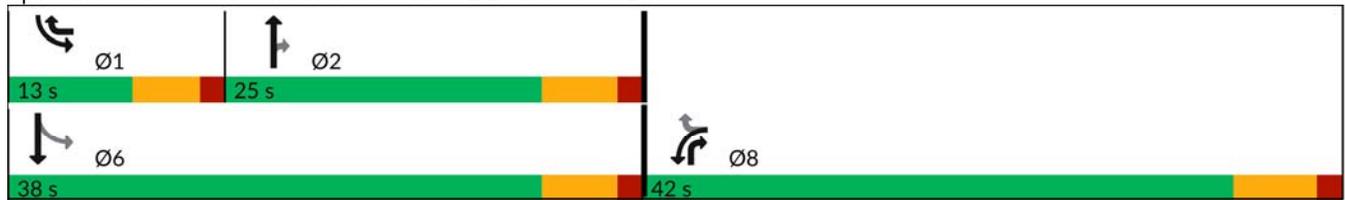
Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (s/veh)	23.4		26.0			20.3
Approach LOS	C		C			C
Queue Length 50th (ft)	303	47	119	0	59	110
Queue Length 95th (ft)	#509	99	183	9	98	164
Internal Link Dist (ft)	545		334			472
Turn Bay Length (ft)		140		275	180	
Base Capacity (vph)	938	1165	500	1268	360	847
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.45	0.54	0.10	0.51	0.37

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	72.2
Natural Cycle:	70
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.91
Intersection Signal Delay (s/veh):	23.1
Intersection LOS:	C
Intersection Capacity Utilization:	71.2%
ICU Level of Service:	C
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 8: Central Avenue Pike & E Beaver Creek Drive



HCM 7th TWSC

3: Stone Cutter Way/Proposed Entrance & E Beaver Creek Drive

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	254	3	4	810	24	12	0	6	26	0	146
Future Vol, veh/h	25	254	3	4	810	24	12	0	6	26	0	146
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	75	-	-	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	-3	-	-	-3	-	-	3	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	29	299	4	5	953	28	14	0	7	31	0	172

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	981	0	0	302	0	0	1322	1350	301	1334	1338	967
Stage 1	-	-	-	-	-	-	359	359	-	976	976	-
Stage 2	-	-	-	-	-	-	962	991	-	358	361	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.5	5.9	5.9	7.7	7.1	6.5
Critical Hdwy Stg 1	-	-	-	-	-	-	5.5	4.9	-	6.7	6.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.5	4.9	-	6.7	6.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	712	-	-	1270	-	-	168	190	763	106	124	287
Stage 1	-	-	-	-	-	-	704	669	-	259	282	-
Stage 2	-	-	-	-	-	-	364	385	-	626	593	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	712	-	-	1270	-	-	64	181	763	100	118	287
Mov Cap-2 Maneuver	-	-	-	-	-	-	64	181	-	100	118	-
Stage 1	-	-	-	-	-	-	675	642	-	257	280	-
Stage 2	-	-	-	-	-	-	145	382	-	594	568	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.91			0.04			55.24			37.91		
HCM LOS							F			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)		92	712	-	-	9	-	-	100	287
HCM Lane V/C Ratio		0.229	0.041	-	-	0.004	-	-	0.307	0.599
HCM Ctrl Dly (s/v)		55.2	10.3	-	-	7.8	0	-	56.4	34.6
HCM Lane LOS		F	B	-	-	A	A	-	F	D
HCM 95th %tile Q(veh)		0.8	0.1	-	-	0	-	-	1.2	3.6

Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	354	229	492	551	389	321
Future Volume (vph)	354	229	492	551	389	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	-8%		3%			0%
Storage Length (ft)	0	140		275	180	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				100	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1859	1680	1872	1591	1805	1900
Flt Permitted	0.950				0.165	
Satd. Flow (perm)	1859	1680	1872	1591	314	1900
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		181		125		
Link Speed (mph)	40		40			40
Link Distance (ft)	625		414			552
Travel Time (s)	10.7		7.1			9.4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	369	239	513	574	405	334
Shared Lane Traffic (%)						
Lane Group Flow (vph)	369	239	513	574	405	334
Turn Type	Prot	pm+ov	NA	pm+ov	pm+pt	NA
Protected Phases	8	1	2	8	1	6
Permitted Phases		8		2	6	
Detector Phase	8	1	2	8	1	6
Switch Phase						
Minimum Initial (s)	10.0	6.0	10.0	10.0	6.0	10.0
Minimum Split (s)	16.5	11.5	16.0	16.5	11.5	16.0
Total Split (s)	25.0	19.0	36.0	25.0	19.0	55.0
Total Split (%)	31.3%	23.8%	45.0%	31.3%	23.8%	68.8%
Maximum Green (s)	18.5	13.5	30.0	18.5	13.5	49.0
Yellow Time (s)	5.0	4.0	4.5	5.0	4.0	4.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	5.5	6.0	6.5	5.5	6.0
Lead/Lag		Lead	Lag		Lead	
Lead-Lag Optimize?		Yes	Yes		Yes	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	2.0	2.0
Recall Mode	None	None	Min	None	None	Min
Act Effct Green (s)	17.4	36.7	23.1	46.6	41.8	41.3
Actuated g/C Ratio	0.24	0.51	0.32	0.65	0.58	0.58
v/c Ratio	0.82	0.25	0.85	0.53	0.91	0.30
Control Delay (s/veh)	43.7	4.2	37.1	6.9	41.3	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	43.7	4.2	37.1	6.9	41.3	8.5
LOS	D	A	D	A	D	A

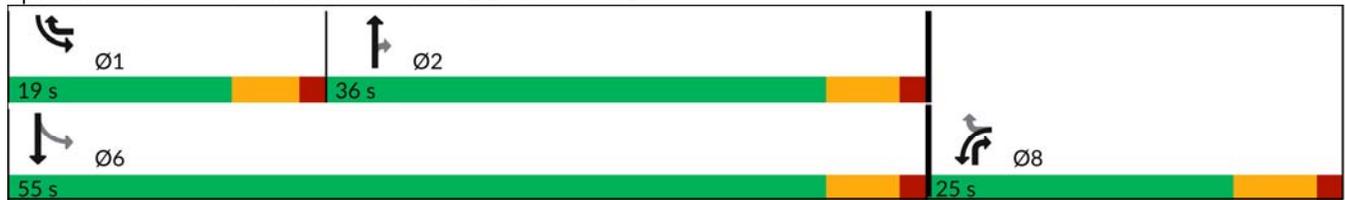
Lanes, Volumes, Timings
 8: Central Avenue Pike & E Beaver Creek Drive



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (s/veh)	28.1		21.2			26.5
Approach LOS	C		C			C
Queue Length 50th (ft)	160	12	216	87	114	70
Queue Length 95th (ft)	#325	52	332	152	#285	112
Internal Link Dist (ft)	545		334			472
Turn Bay Length (ft)		140		275	180	
Base Capacity (vph)	490	973	800	1110	470	1327
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.25	0.64	0.52	0.86	0.25

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	71.5
Natural Cycle:	80
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.91
Intersection Signal Delay (s/veh):	24.5
Intersection LOS:	C
Intersection Capacity Utilization:	82.1%
ICU Level of Service:	E
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 8: Central Avenue Pike & E Beaver Creek Drive



HCM 7th TWSC

3: Stone Cutter Way/Proposed Entrance & E Beaver Creek Drive

Intersection												
Int Delay, s/veh	8.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	115	697	8	5	463	62	2	0	2	58	0	86
Future Vol, veh/h	115	697	8	5	463	62	2	0	2	58	0	86
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	75	-	-	-	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-3	-	-	-3	-	-	-3	-	-	3	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	120	726	8	5	482	65	2	0	2	60	0	90

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	547	0	0	734	0	0	1463	1527	730	1491	1499	515
Stage 1	-	-	-	-	-	-	970	970	-	525	525	-
Stage 2	-	-	-	-	-	-	493	557	-	966	974	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.5	5.9	5.9	7.7	7.1	6.5
Critical Hdwy Stg 1	-	-	-	-	-	-	5.5	4.9	-	6.7	6.1	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.5	4.9	-	6.7	6.1	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1033	-	-	880	-	-	137	153	452	80	96	540
Stage 1	-	-	-	-	-	-	361	393	-	494	488	-
Stage 2	-	-	-	-	-	-	610	565	-	263	283	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1033	-	-	880	-	-	101	134	452	70	84	540
Mov Cap-2 Maneuver	-	-	-	-	-	-	101	134	-	70	84	-
Stage 1	-	-	-	-	-	-	319	347	-	490	484	-
Stage 2	-	-	-	-	-	-	504	561	-	231	250	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	1.25			0.09			27.46			76.17		
HCM LOS							D			F		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	164	1033	-	-	17	-	-	70	540
HCM Lane V/C Ratio	0.025	0.116	-	-	0.006	-	-	0.862	0.166
HCM Ctrl Dly (s/v)	27.5	8.9	-	-	9.1	0	-	169.9	13
HCM Lane LOS	D	A	-	-	A	A	-	F	B
HCM 95th %tile Q(veh)	0.1	0.4	-	-	0	-	-	4.2	0.6

APPENDIX F

LOCAL TRIP GENERATION DATA

Local Apartment Trip Generation Study

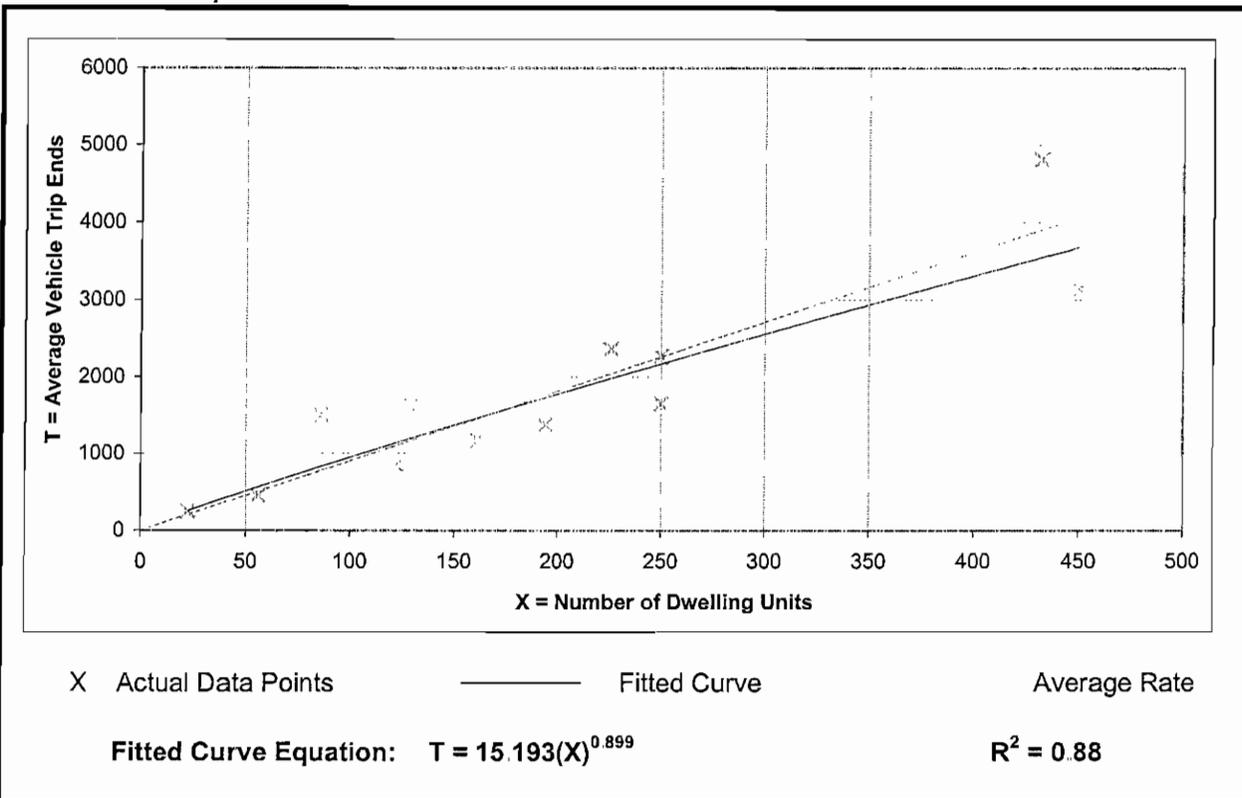
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Local Apartment Trip Generation Study

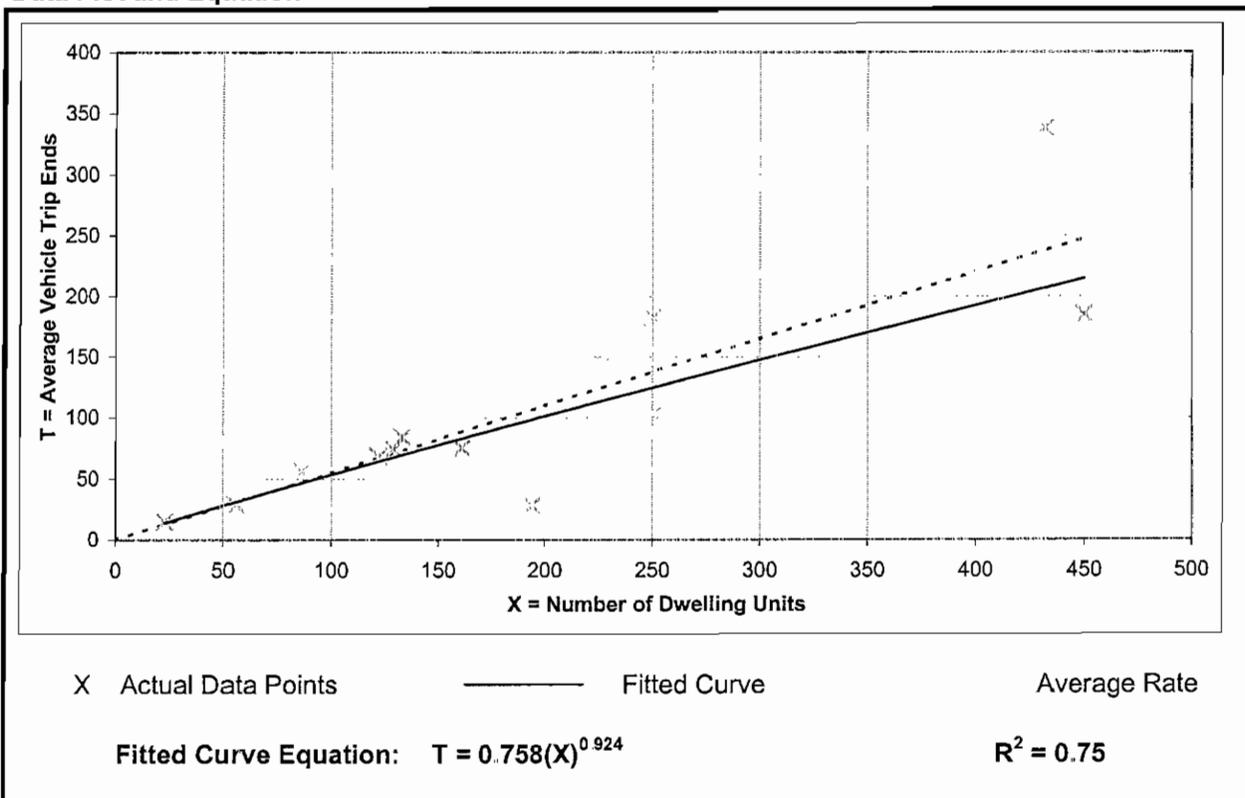
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Local Apartment Trip Generation Study

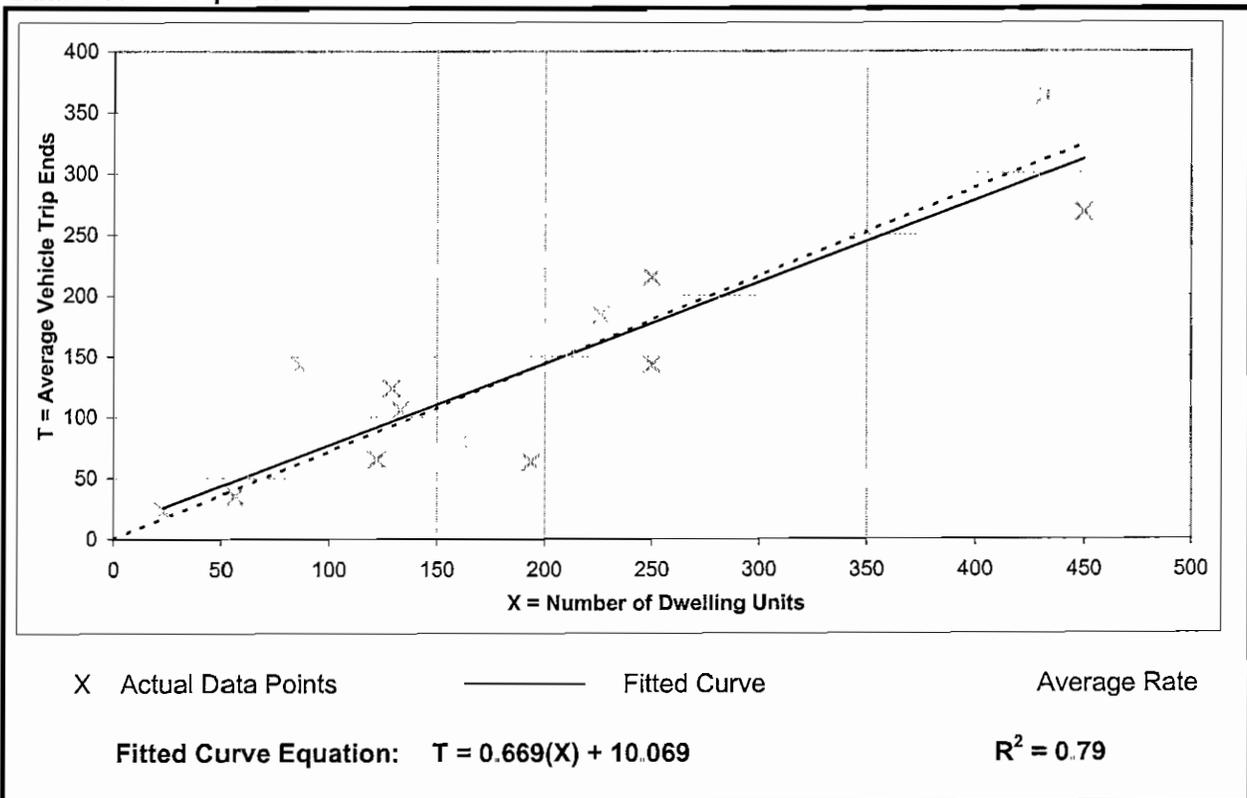
Average Vehicle Trip Ends vs: Dwelling Units
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



TRIP GENERATION FOR NORTHBROOK PARK SUBDIVISION

115 Attached Townhouses and 350 Apartments = 465 Total Units

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	Townhouses & Apartments	465	3,799	22%	78%		55%	45%	
				49	172	221	177	144	321
Total New Volume Site Trips			3,799	49	172	221	177	144	321

From Local Trip Rates

Trips calculated by using Fitted Curve Equations

TRIP GENERATION FOR NORTHBROOK PARK SUBDIVISION

115 Attached Townhouses and 350 Apartments = 465 Total Units

$$465 \text{ Units} = X$$

Weekday:

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

$$T = 15 * 250.06$$

$$T = \underline{\underline{3,799 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 292$$

$$T = \underline{\underline{221 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 465 + 10.07$$

$$T = \underline{\underline{321 \text{ trips}}}$$

APPENDIX G

2022 CENSUS BUREAU DATA

Destination Analysis

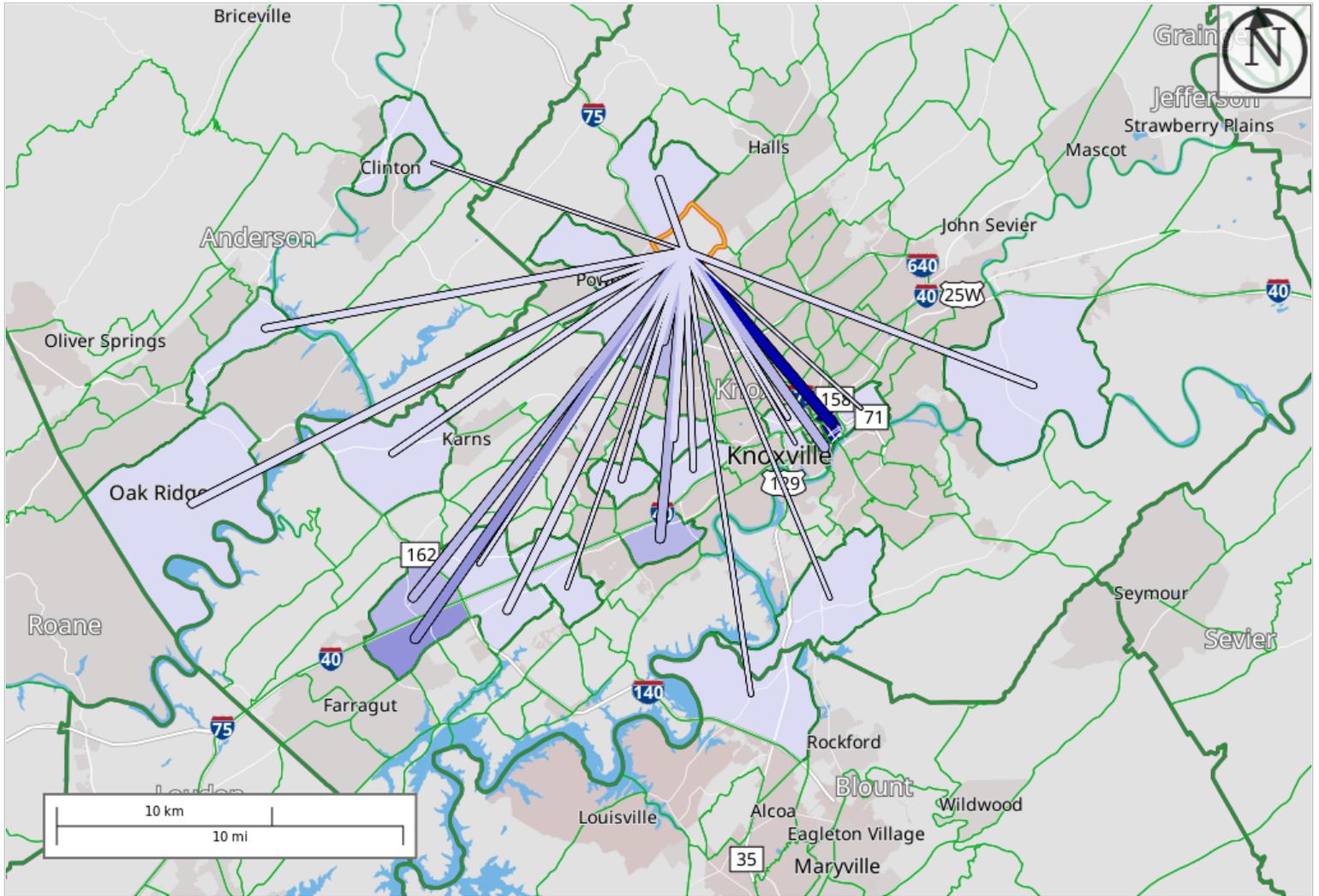
Workers: Living in 62.07 (Knox, TN)

Showing: Employment locations grouped by Census Tracts

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 07/28/2025

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2022

All Workers



Map Legend

Job Count

- 157 - 179
- 134 - 156
- 111 - 133
- 88 - 110
- 65 - 87
- 42 - 64
- 19 - 41

Selection Areas

- ▭ Home Area

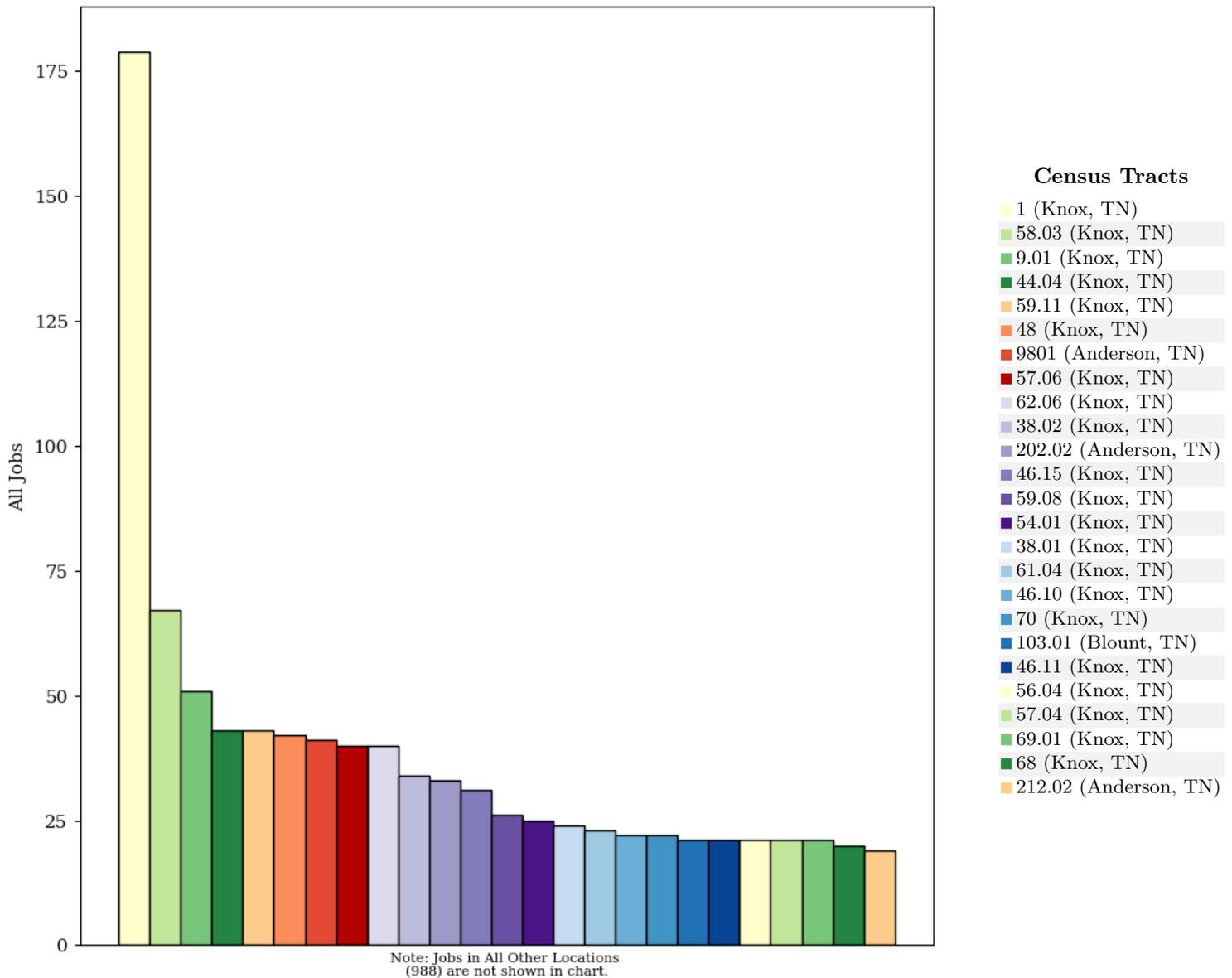
Job Count

- ▭ 157 - 179
- ▭ 134 - 156
- ▭ 111 - 133
- ▭ 88 - 110
- ▭ 65 - 87
- ▭ 42 - 64
- ▭ 19 - 41



All Jobs from Home Selection Area to Work Census Tracts in 2022

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2022

All Workers

Census Tracts as Work Destination Area	2022	
	Count	Share
All Census Tracts	1,918	100.0%
1 (Knox, TN)	179	9.3%
58.03 (Knox, TN)	67	3.5%
9.01 (Knox, TN)	51	2.7%
44.04 (Knox, TN)	43	2.2%
59.11 (Knox, TN)	43	2.2%
48 (Knox, TN)	42	2.2%
9801 (Anderson, TN)	41	2.1%
57.06 (Knox, TN)	40	2.1%
62.06 (Knox, TN)	40	2.1%
38.02 (Knox, TN)	34	1.8%

Census Tracts as Work Destination Area	2022	
	Count	Share
202.02 (Anderson, TN)	33	1.7%
46.15 (Knox, TN)	31	1.6%
59.08 (Knox, TN)	26	1.4%
54.01 (Knox, TN)	25	1.3%
38.01 (Knox, TN)	24	1.3%
61.04 (Knox, TN)	23	1.2%
46.10 (Knox, TN)	22	1.1%
70 (Knox, TN)	22	1.1%
103.01 (Blount, TN)	21	1.1%
46.11 (Knox, TN)	21	1.1%
56.04 (Knox, TN)	21	1.1%
57.04 (Knox, TN)	21	1.1%
69.01 (Knox, TN)	21	1.1%
68 (Knox, TN)	20	1.0%
212.02 (Anderson, TN)	19	1.0%
All Other Locations	988	51.5%

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2022
Job Type	All Jobs
Selection Area	62.07 (Knox, TN) from Census Tracts
Selected Census Blocks	35
Analysis Generation Date	07/28/2025 11:31 - OnTheMap 6.25.2
Code Revision	bd5bc0a714230c9c2b909d905c8753cb532970e8
LODES Data Vintage	20241022_1605

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2022).

Notes

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

APPENDIX H

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)

$254 + 3 = 257$

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	E Beaver Creek Drive at Proposed Entrance	85	75	65	55
250 - 299	130		75	65	60	50
300 - 349	110	2028 Projected AM EB Left Turns = 25	70	60	55	45
350 - 399	100		65	55	50	40
400 - 449	90	Left Turn Lane Warranted	60	50	45	35
450 - 499	80		55	45	40	30
500 - 549	70	55	45	35	35	25
550 - 599	65		40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

$4 + 810 + 24 = 838$

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

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

TABLE 5B

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

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

4 + 810 = 814

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
24 Fewer Than 25 25 - 49 50 - 99				Yes	Yes	Yes
100 - 149 150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	E Beaver Creek Drive at Proposed Entrance 2028 Projected AM WB Right Turns = 24 Right Turn Lane NOT Warranted		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
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

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

TABLE 5A

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

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

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

697 + 8 =
705

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	70	70	70	45	40	35
150 - 199	60	65	65	40	35	30
200 - 249	55	60	60	35	30	30
250 - 299	50	55	55	30	30	30
300 - 349	45	50	50	30	25	25
350 - 399	40	40	40	25	25	20
400 - 449	35	35	35	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

E Beaver Creek Drive at
Proposed Entrance

2028 Projected AM
EB Left Turns = 115

Left Turn Lane
Warranted

5 + 463
+ 62 =
530

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

TABLE 5B

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

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

5 + 463 =
468

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

62

E Beaver Creek Drive at
Proposed Entrance

2028 Projected PM
WB Right Turns = 62

Right Turn Lane NOT
Warranted

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

APPENDIX I

VEHICLE QUEUE WORKSHEETS (SIMTRAFFIC 12)

Queuing and Blocking Report

Intersection: 3: Stone Cutter Way/Proposed Entrance & E Beaver Creek Drive

Movement	EB	WB	NB	SB	SB
Directions Served	L	LTR	LTR	LT	R
Maximum Queue (ft)	38	43	49	60	132
Average Queue (ft)	12	2	14	18	57
95th Queue (ft)	33	20	41	47	101
Link Distance (ft)		307	97	164	164
Upstream Blk Time (%)					0
Queuing Penalty (veh)					0
Storage Bay Dist (ft)	75				
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 0

Queuing and Blocking Report

Intersection: 3: Stone Cutter Way/Proposed Entrance & E Beaver Creek Drive

Movement	EB	WB	NB	SB	SB
Directions Served	L	LTR	LTR	LT	R
Maximum Queue (ft)	69	64	33	106	72
Average Queue (ft)	27	4	4	40	35
95th Queue (ft)	53	29	22	83	59
Link Distance (ft)		307	97	193	193
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	75				
Storage Blk Time (%)	0				
Queuing Penalty (veh)	1				

Zone Summary

Zone wide Queuing Penalty: 1

APPENDIX J

TRAFFIC SIGNAL WARRANT ANALYSIS

**PROJECTED FUTURE VOLUMES IN
WITH TRAFFIC GROWTH AND GENERATED TRAFFIC
E Beaver Creek Drive at Proposed Entrance & Stone Cutter Way**

2028

TIME BEGIN	Proposed Entrance SOUTHBOUND			E Beaver Creek Drive WESTBOUND			Stone Cutter Way NORTHBOUND			E Beaver Creek Drive EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:00 AM	0	0	0	2	145	0	3	0	1	0	49	1
7:15 AM	0	0	0	2	162	0	8	0	3	0	65	2
7:30 AM	0	0	0	0	243	0	1	0	1	0	48	0
7:45 AM	0	0	0	0	225	0	0	0	1	0	81	0
Existing Hourly Sum	0	0	0	4	775	0	12	0	6	0	243	3
General Growth	0	0	0	0.18	34.875	0	0.54	0	0.27	0	10.935	0.135
Trips Generated 7-8 am	29	0	166	0	0	28	0	0	0	28	0	0
7:00 AM	7	0	42	2	154	7	3	0	1	7	52	1
7:15 AM	7	0	42	2	171	7	8	0	3	7	68	2
7:30 AM	7	0	42	0	252	7	1	0	1	7	51	0
7:45 AM	7	0	42	0	234	7	0	0	1	7	84	0
2028	28	0	168	4	811	28	12	0	6	28	255	3
8:00 AM	0	0	0	0	130	0	0	0	0	0	52	0
8:15 AM	0	0	0	0	120	0	1	0	2	0	66	0
8:30 AM	0	0	0	1	94	0	6	0	1	0	52	0
8:45 AM	0	0	0	0	112	0	2	0	1	0	68	0
Sum	0	0	0	1	456	0	9	0	4	0	238	0
General Growth	0	0	0	0.045	20.52	0	0.405	0	0.18	0	10.71	0
Trips Generated 8-9 am	27	0	151	0	0	25	0	0	0	25	0	0
8:00 AM	7	0	38	0	135	6	0	0	0	6	55	0
8:15 AM	7	0	38	0	125	6	1	0	2	6	69	0
8:30 AM	7	0	38	1	99	6	6	0	1	6	55	0
8:45 AM	7	0	38	0	117	6	2	0	1	6	71	0
2028	28	0	152	1	476	24	9	0	4	24	250	0
11:00 AM	0	0	0	0	61	0	0	0	1	0	55	2
11:15 AM	0	0	0	0	61	0	1	0	0	0	47	0
11:30 AM	0	0	0	0	63	0	0	0	1	0	77	0
11:45 AM	0	0	0	0	82	0	1	0	1	0	72	2
Sum	0	0	0	0	267	0	2	0	3	0	251	4
General Growth	0	0	0	0	12.015	0	0.09	0	0.135	0	11.295	0.18
Trips Generated 11am-12 pm	44	0	44	0	0	44	0	0	0	44	0	0
11:00 AM	11	0	11	0	64	11	0	0	1	11	58	2
11:15 AM	11	0	11	0	64	11	1	0	0	11	50	0
11:30 AM	11	0	11	0	66	11	0	0	1	11	80	0
11:45 AM	11	0	11	0	85	11	1	0	1	11	75	2
2028	44	0	44	0	279	44	2	0	3	44	263	4
12:00 PM	0	0	0	0	65	0	2	0	0	0	71	1
12:15 PM	0	0	0	1	76	0	2	0	0	0	74	1
12:30 PM	0	0	0	0	56	0	1	0	0	0	86	0
12:45 PM	0	0	0	0	67	0	0	0	0	0	71	0
Sum	0	0	0	1	264	0	5	0	0	0	302	2
General Growth	0	0	0	0.045	11.88	0	0.225	0	0	0	13.59	0.09
Trips Generated 12-1 pm	47	0	47	0	0	47	0	0	0	47	0	0
12:00 PM	12	0	12	0	68	12	2	0	0	12	74	1
12:15 PM	12	0	12	1	79	12	2	0	0	12	77	1
12:30 PM	12	0	12	0	59	12	1	0	0	12	89	0
12:45 PM	12	0	12	0	70	12	0	0	0	12	74	0
2028	48	0	48	1	276	48	5	0	0	48	314	2

Existing Volumes from Traffic Count

Sum

Growth Rate of for 3 years

Trips Generated by Northbrook Park Subdivision

15-minute Volumes: These volumes are calculated by spreading the additional hourly volumes (growth+ generated trips) into 15-minute volumes by dividing by 4

Total Sum

2:00 PM	0	0	0	0	83	0	1	0	0	0	94	1
2:15 PM	0	0	0	0	78	0	0	0	1	0	86	0
2:30 PM	0	0	0	1	94	0	0	0	1	0	100	0
2:45 PM	0	0	0	1	86	0	0	0	0	0	103	0
Sum	0	0	0	2	341	0	1	0	2	0	383	1
General Growth	0	0	0	0.09	15.345	0	0.045	0	0.09	0	17.235	0.045
Trips Generated 2-3 pm	38	0	56	0	0	40	0	0	0	75	0	0
2:00 PM	9	0	14	0	87	10	1	0	0	19	98	1
2:15 PM	9	0	14	0	82	10	0	0	1	19	90	0
2:30 PM	9	0	14	1	98	10	0	0	1	19	104	0
2:45 PM	9	0	14	1	90	10	0	0	0	19	107	0
2028	36	0	56	2	357	40	1	0	2	76	399	1
3:00 PM	0	0	0	2	91	0	0	0	0	0	106	1
3:15 PM	0	0	0	0	102	0	2	0	0	0	132	2
3:30 PM	0	0	0	0	84	0	0	0	1	0	150	1
3:45 PM	0	0	0	0	100	0	3	0	1	0	147	4
Sum	0	0	0	2	377	0	5	0	2	0	535	8
General Growth	0	0	0	0.09	16.965	0	0.225	0	0.09	0	24.075	0.36
Trips Generated 3-4 pm	42	0	64	0	0	45	0	0	0	84	0	0
3:00 PM	11	0	16	2	95	11	0	0	0	21	112	1
3:15 PM	11	0	16	0	106	11	2	0	0	21	138	2
3:30 PM	11	0	16	0	88	11	0	0	1	21	156	1
3:45 PM	11	0	16	0	104	11	3	0	1	21	153	4
2028	44	0	64	2	393	44	5	0	2	84	559	8
4:00 PM	0	0	0	1	94	0	1	0	0	0	119	1
4:15 PM	0	0	0	1	87	0	0	0	1	0	167	1
4:30 PM	0	0	0	0	94	0	0	0	0	0	149	1
4:45 PM	0	0	0	0	102	0	1	0	0	0	157	1
Sum	0	0	0	2	377	0	2	0	1	0	592	4
General Growth	0	0	0	0.09	16.965	0	0.09	0	0.045	0	26.64	0.18
Trips Generated 4-5 pm	54	0	81	0	0	58	0	0	0	107	0	0
4:00 PM	14	0	20	1	98	14	1	0	0	27	126	1
4:15 PM	14	0	20	1	91	14	0	0	1	27	174	1
4:30 PM	14	0	20	0	98	14	0	0	0	27	156	1
4:45 PM	14	0	20	0	106	14	1	0	0	27	164	1
2028	56	0	80	2	393	56	2	0	1	108	620	4
5:00 PM	0	0	0	1	123	0	1	0	1	0	166	3
5:15 PM	0	0	0	1	100	0	0	0	0	0	181	3
5:30 PM	0	0	0	3	118	0	0	0	1	0	163	1
5:45 PM	0	0	0	1	88	0	0	0	1	0	164	2
Sum	0	0	0	6	429	0	1	0	3	0	674	9
General Growth	0	0	0	0.27	19.305	0	0.045	0	0.135	0	30.33	0.405
Trips Generated 5-6 pm	65	0	97	0	0	69	0	0	0	129	6	0
5:00 PM	16	0	24	1	128	17	1	0	1	32	175	3
5:15 PM	16	0	24	1	105	17	0	0	0	32	190	3
5:30 PM	16	0	24	3	123	17	0	0	1	32	172	1
5:45 PM	16	0	24	1	93	17	0	0	1	32	173	2
2028	64	0	96	6	449	68	1	0	3	128	710	9

This spreadsheet is used to estimate the future project hourly volumes to determine if a intersection will meet traffic signal warrants

Assumed Average Growth Rate (%)=	1.5%
Number of years =	3
Horizon Year =	2028

of Horizon Years = 3

Note: The entering and exiting traffic volumes are estimated based on trip generation of the entire development, based on assumed amounts of entering and exiting traffic, assumed percentages of directional traffic, and the assumed percentage of trips based on time of day (from ITE Trip Generation Manual, 12th Edition)

Dutchtown Market

Daily Trips Generated by Entire Development:	3,799	Daily Trips Generated from Development/Year	1266	=	3,799 / 3
100% of trips			3,799	trips by	2028

Northbrook Park Subdivision

Entering and Exiting %'s from Local Trip Rate

Entering and Exiting %'s from Local Trip Rate			Directional Distribution Assumptions:	
22% Enter	AM Hours	EXIT	85.0% to west E Beaver Creek Drive (SB Right)	
78% Exit		EXIT	0.0% to Stone Cutter Way (SB Thru)	
		EXIT	15.0% to east E Beaver Creek Drive (SB Left)	
		ENTER	50.0% from west E Beaver Creek Drive (EB Left)	
		ENTER	0.0% from south Stone Cutter Way (NB Thru)	
		ENTER	50.0% from east E Beaver Creek Drive (WB Right)	
50% Enter	Mid-Day Hours	EXIT	50.0% to west E Beaver Creek Drive (SB Right)	Assume 50/50 split for Mid-Day
50% Exit		EXIT	0.0% to Stone Cutter Way (SB Thru)	
		EXIT	50.0% to east E Beaver Creek Drive (SB Left)	
		ENTER	50.0% from west E Beaver Creek Drive (EB Left)	
		ENTER	0.0% from south Stone Cutter Way (NB Thru)	
		ENTER	50.0% from east E Beaver Creek Drive (WB Right)	
55% Enter	PM Hours	EXIT	60.0% to west E Beaver Creek Drive (SB Right)	
45% Exit		EXIT	0.0% to Stone Cutter Way (SB Thru)	
		EXIT	40.0% to east E Beaver Creek Drive (SB Left)	
		ENTER	65.0% from west E Beaver Creek Drive (EB Left)	
		ENTER	0.0% from south Stone Cutter Way (NB Thru)	
		ENTER	35.0% from east E Beaver Creek Drive (WB Right)	

ITE Trip Generation Manual - 12th Edition: Land Use #220, Multifamily Housing (Low-Rise)	
Time of Day	% of 24-Hour Vehicle Trips
7-8 am	6.60%
8-9 am	6.00%
11 am-Noon	4.60%
Noon-1 pm	5.00%
2-3 pm	5.50%
3-4 pm	6.20%
4-5 pm	7.90%
5-6 pm	9.50%
	51.30%

STUDY AND ANALYSIS INFORMATION

Municipality:	Knoxville, TN	Traffic Volumes Obtained By:	Ajax Engineering, LLC
County:		Analysis Date:	11/8/2025
ODOT Engineering District:		Agency/ Company Name Performing Warrant Analysis:	Ajax Engineering, LLC
Google map link:	Map		

Analysis Information

Data Collection Date:
Day of the Week:

Is the intersection in a built-up area of an isolated community of <10,000 population?

Existing Traffic Signal at intersection:

Total Number of Approaches at Intersection:

Major Street Information

Major Street Name and Route Number:

Major Street Approach Direction:

Number of Thru Lanes on Each Major Street Approach: LANE(S)

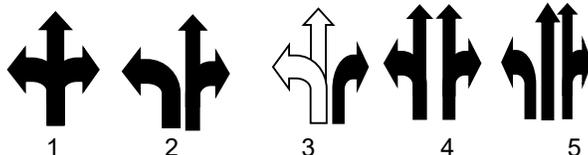
Speed Limit or 85th Percentile Speed on the Major Street*: MPH
*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number:

Minor Street Approach Configuration:

1	N-Bound
3	S-Bound



Number of Thru Lanes on Each Minor Street Approach: LANE(S)

Apply Right Turn Lane Reduction*:

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	100% Warrant Satisfied?	Notes and Comments: <small>*Known error: if Speed Limit < 45mph, it may not state that it passes at 70%.</small>			
Warrant 1, Eight-Hour Vehicular Volume	Yes	No				
Warrant 2, Four-Hour Vehicular Volume	Yes	No				
Warrant 3, Peak Hour	Yes	No	Signals installed under Warrant 3 should be traffic actuated. <table border="1" style="float: right; margin-top: 5px;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">5:00 PM</td></tr> <tr><td style="text-align: center;">6:00 PM</td></tr> </table>	Peak Hour	5:00 PM	6:00 PM
Peak Hour						
5:00 PM						
6:00 PM						
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)						
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. <table border="1" style="float: right; margin-top: 5px;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">5:00 PM</td></tr> <tr><td style="text-align: center;">6:00 PM</td></tr> </table>	Peak Hour	5:00 PM	6:00 PM
Peak Hour						
5:00 PM						
6:00 PM						
Warrant 5, School Crossing	No		N/A			
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.			
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9			
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.			

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:
1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The Modeling and Forecasting Section should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. Please fill inputs on PHB Score Sheet and submit to ODOT.

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: Do Not Install New Traffic Signal

Notes:

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach						NOTES:
	Southbound						Westbound						Northbound						Eastbound						
	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	
12:00 AM						0						0						0						0	
12:15 AM						0						0						0						0	
12:30 AM						0						0						0						0	
12:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1:00 AM						0						0						0						0	
1:15 AM						0						0						0						0	
1:30 AM						0						0						0						0	
1:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:00 AM						0						0						0						0	
2:15 AM						0						0						0						0	
2:30 AM						0						0						0						0	
2:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:00 AM						0						0						0						0	
3:15 AM						0						0						0						0	
3:30 AM						0						0						0						0	
3:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:00 AM						0						0						0						0	
4:15 AM						0						0						0						0	
4:30 AM						0						0						0						0	
4:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 AM						0						0						0						0	
5:15 AM						0						0						0						0	
5:30 AM						0						0						0						0	
5:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:00 AM						0						0						0						0	
6:15 AM						0						0						0						0	
6:30 AM						0						0						0						0	
6:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:00 AM	42	0	7			49	7	154	2			163	1	0	3			4	1	52	7			60	
7:15 AM	42	0	7			49	7	171	2			180	3	0	8			11	2	68	7			77	
7:30 AM	42	0	7			49	7	252	0			259	1	0	1			2	0	51	7			58	
7:45 AM	42	0	7			49	7	234	0			241	1	0	0			1	0	84	7			91	
Hourly Total	168	0	28	0	0	196	28	811	4	0	0	843	6	0	12	0	0	18	3	255	28	0	0	286	
8:00 AM	38	0	7			45	6	135	0			141	0	0	0			0	0	55	6			61	
8:15 AM	38	0	7			45	6	125	0			131	2	0	1			3	0	69	6			75	
8:30 AM	38	0	7			45	6	99	1			106	1	0	6			7	0	55	6			61	
8:45 AM	38	0	7			45	6	117	0			123	1	0	2			3	0	71	6			77	
Hourly Total	152	0	28	0	0	180	24	476	1	0	0	501	4	0	9	0	0	13	0	250	24	0	0	274	
9:00 AM						0						0						0						0	
9:15 AM						0						0						0						0	
9:30 AM						0						0						0						0	
9:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:00 AM						0						0						0						0	
10:15 AM						0						0						0						0	
10:30 AM						0						0						0						0	
10:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:00 AM	11	0	11			22	11	64	0			75	1	0	0			1	2	58	11			71	
11:15 AM	11	0	11			22	11	64	0			75	0	0	1			1	0	50	11			61	
11:30 AM	11	0	11			22	11	66	0			77	1	0	0			1	0	80	11			91	
11:45 AM	11	0	11			22	11	85	0			96	1	0	1			2	2	75	11			88	
Hourly Total	44	0	44	0	0	88	44	279	0	0	0	323	3	0	2	0	0	5	4	263	44	0	0	311	
12:00 PM	12	0	12			24	12	68	0			80	0	0	2			2	1	74	12			87	
12:15 PM	12	0	12			24	12	79	1			92	0	0	2			2	1	77	12			90	
12:30 PM	12	0	12			24	12	59	0			71	0	0	1			1	0	89	12			101	
12:45 PM	12	0	12			24	12	70	0			82	0	0	0			0	0	74	12			86	
Hourly Total	48	0	48	0	0	96	48	276	1	0	0	325	0	0	5	0	0	5	2	314	48	0	0	364	
1:00 PM						0						0						0						0	
1:15 PM						0						0						0						0	
1:30 PM						0						0						0						0	
1:45 PM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:00 PM	14	0	9			23	10	87	0			97	0	0	1			1	1	98	19			118	
2:15 PM	14	0	9			23	10	82	0			92	1	0	0			1	0	90	19			109	
2:30 PM	14	0	9			23	10	98	1			109	1	0	0			1	0	104	19			123	
2:45 PM	14	0	9			23	10	90	1			101	0	0	0			0	0	107	19			126	
Hourly Total	56	0	36	0	0	92	40	357	2	0	0	399	2	0	1	0	0	3	1	399	76	0	0	476	
3:00 PM	16	0	11			27	11	95	2			108	0	0	0			0	1	112	21			134	
3:15 PM	16	0	11			27	11	106	0			117	0	0	2			2	2	138	21			161	
3:30 PM	16	0	11			27	11	88	0			99	1	0	0			1	1	156	21			178	
3:45 PM	16	0	11			27	11	104	0			115	4	0	3			4	4	153	21			178	
Hourly Total	64	0	44	0	0	108	44	393	2	0	0	439	2	0	5	0	0	7	8	559	84	0	0	651	
4:00 PM	20	0	14			34	14	98	1			113	0	0	1			1	1	126	27			154	
4:15 PM	20	0	14			34	14	91	1			106	1	0	0			1	1	174	27			202	

It should be noted that if data is copied overtop of the Hourly Totals or Approach Totals, that the 'AutoSum' Formula will be lost. This should not affect the actual totals if the data was copied from a program that performs the calculations for the user.

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **No**

**Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)*

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
			Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1	X		500	150	420	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
2:00 AM	0	0																
2:15 AM	0	0																
2:30 AM	0	0																
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5:00 AM	0	0																
5:15 AM	0	0																
5:30 AM	0	0																
5:45 AM	0	0																
6:00 AM	0	0																
6:15 AM	223	18																
6:30 AM	480	35			1					1				1		1		
6:45 AM	797	66	1					1		1	1			1	1			
7:00 AM	1129	112																
7:15 AM	1108	102																
7:30 AM	1057	100			1							1			1	1	1	1
7:45 AM	907	83	1					1	1	1	1			1	1			
8:00 AM	775	74																
8:15 AM	573	50																
8:30 AM	367	33			1										1			
8:45 AM	200	17																
9:00 AM	0	0																
9:15 AM	0	0																
9:30 AM	0	0																
9:45 AM	0	0																
10:00 AM	0	0																
10:15 AM	146	14																
10:30 AM	282	28													1			
10:45 AM	450	42			1						1						1	1
11:00 AM	634	55	1											1				
11:15 AM	655	57								1	1							
11:30 AM	701	58													1			
11:45 AM	705	59			1						1						1	1
12:00 PM	689	60	1							1	1			1	1			
12:15 PM	522	45																
12:30 PM	340	30													1			
12:45 PM	168	15																
1:00 PM	0	0																
1:15 PM	215	13																
1:30 PM	416	25			1						1				1			
1:45 PM	648	38	1							1				1				1
2:00 PM	875	50							1					1				
2:15 PM	902	53																
2:30 PM	979	55			1						1				1			
2:45 PM	1024	58	1							1	1			1			1	1
3:00 PM	1090	60						1										
3:15 PM	1115	64																
3:30 PM	1145	68			1						1				1			
3:45 PM	1164	72	1							1	1			1	1		1	1

4:00 PM	1183	76					1	1										
4:15 PM	1272	84																
4:30 PM	1312	87			1					1				1	1			
4:45 PM	1364	90	1						1	1			1	1		1	1	
5:00 PM	1370	93					1	1										
5:15 PM	1014	66																
5:30 PM	666	44			1					1				1				
5:45 PM	318	22																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
7:00 PM	0	0																
7:15 PM	0	0																
7:30 PM	0	0																
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10:30 PM	0	0																
10:45 PM	0	0																
11:00 PM	0	0																
11:15 PM	0	0																
11:30 PM	0	0																
11:45 PM	0	0																
HOURS MET			8	0	10	0	6	3	8	7	9	0	8	5	11	2	8	6
WARRANT SATISFIED?			NO		N/A		NO		N/A		NO				NO			

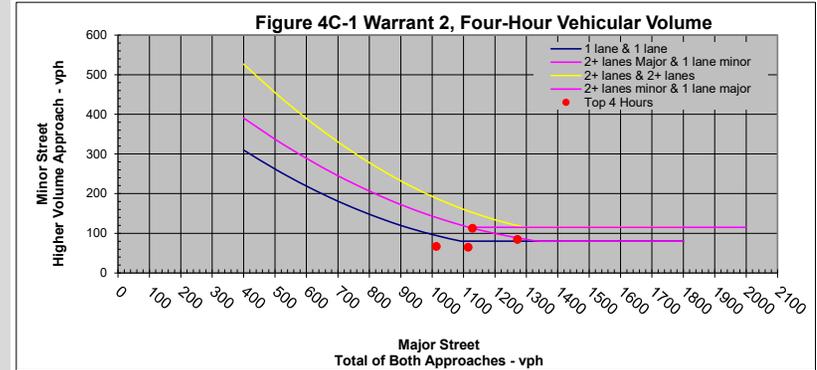
Warrant Met: **No**

Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

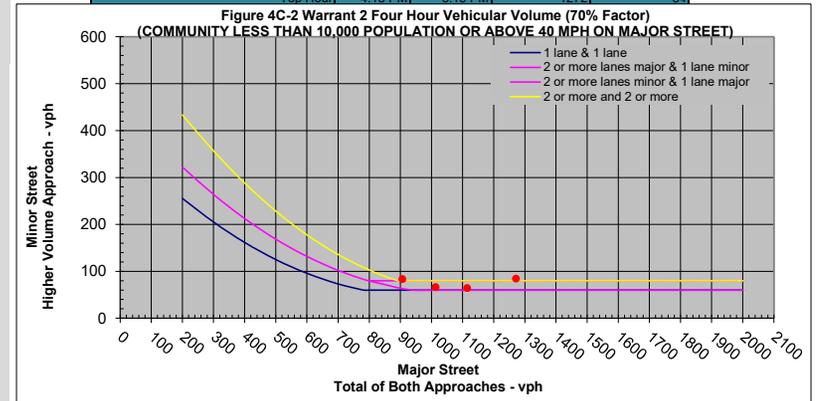
Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	2
Major street: 1 Lane	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	5
Minor Street: 1 Lane		
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?		
No		

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Required Minimum Minor Street For 4C-1	Required Minimum Minor Street For 4C-2	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Proposed Entrance & Stone Cutt		Major - E Beaver Creek Drive							
	N-Bound	S-Bound	W-Bound	E-Bound						
12:00 AM	0	0	0	0	0	550	377	0		
12:15 AM	0	0	0	0	0	550	377	0		
12:30 AM	0	0	0	0	0	550	377	0		
12:45 AM	0	0	0	0	0	550	377	0		
1:00 AM	0	0	0	0	0	550	377	0		
1:15 AM	0	0	0	0	0	550	377	0		
1:30 AM	0	0	0	0	0	550	377	0		
1:45 AM	0	0	0	0	0	550	377	0		
2:00 AM	0	0	0	0	0	550	377	0		
2:15 AM	0	0	0	0	0	550	377	0		
2:30 AM	0	0	0	0	0	550	377	0		
2:45 AM	0	0	0	0	0	550	377	0		
3:00 AM	0	0	0	0	0	550	377	0		
3:15 AM	0	0	0	0	0	550	377	0		
3:30 AM	0	0	0	0	0	550	377	0		
3:45 AM	0	0	0	0	0	550	377	0		
4:00 AM	0	0	0	0	0	550	377	0		
4:15 AM	0	0	0	0	0	550	377	0		
4:30 AM	0	0	0	0	0	550	377	0		
4:45 AM	0	0	0	0	0	550	377	0		
5:00 AM	0	0	0	0	0	550	377	0		
5:15 AM	0	0	0	0	0	550	377	0		
5:30 AM	0	0	0	0	0	550	377	0		
5:45 AM	0	0	0	0	0	550	377	0		
6:00 AM	0	0	0	0	0	550	377	0		
6:15 AM	4	18	163	60	223	406	243	18		
6:30 AM	15	35	343	137	480	271	132	35		
6:45 AM	16	66	602	195	797	149	60	66		Met
7:00 AM	17	112	843	286	1129	80	60	112	Met	
7:15 AM	12	102	821	287	1108	80	60	102		
7:30 AM	5	100	772	285	1057	86	60	100		
7:45 AM	10	83	619	288	907	118	60	83		Met
8:00 AM	13	74	501	274	775	156	61	74		
8:15 AM	13	50	360	213	573	230	103	50		
8:30 AM	10	33	229	138	367	327	175	33		
8:45 AM	3	17	123	77	200	420	255	17		
9:00 AM	0	0	0	0	0	550	377	0		
9:15 AM	0	0	0	0	0	550	377	0		
9:30 AM	0	0	0	0	0	550	377	0		
9:45 AM	0	0	0	0	0	550	377	0		
10:00 AM	0	0	0	0	0	550	377	0		
10:15 AM	1	14	75	71	146	453	286	14		
10:30 AM	2	28	150	132	282	373	213	28		
10:45 AM	3	42	227	223	450	285	142	42		
11:00 AM	4	55	323	311	634	206	87	55		
11:15 AM	6	57	328	327	655	198	82	57		
11:30 AM	7	58	345	356	701	181	73	58		
11:45 AM	7	59	339	366	705	179	72	59		
12:00 PM	5	60	325	364	689	185	75	60		
12:15 PM	3	45	245	277	522	252	118	45		
12:30 PM	1	30	153	187	340	341	187	30		
12:45 PM	0	15	82	86	168	440	273	15		
1:00 PM	0	0	0	0	0	550	377	0		
1:15 PM	1	13	97	118	215	411	247	13		
1:30 PM	2	25	189	227	416	302	155	25		
1:45 PM	3	38	298	350	648	200	84	38		
2:00 PM	3	50	399	476	875	127	60	50		



Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	7:00 AM	8:00 AM	1129	112
2nd Highest Hour	4:15 PM	5:15 PM	1272	84
3rd Highest Hour	3:15 PM	4:15 PM	1115	64
4th Highest Hour	5:15 PM	6:15 PM	1014	66

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	4:15 PM	5:15 PM	1272	84



2:15 PM	1	53	410	492	902	120	60	53		
2:30 PM	3	55	435	544	979	101	60	55		
2:45 PM	3	58	425	599	1024	92	60	58		
3:00 PM	7	60	439	651	1090	80	60	60		
3:15 PM	8	64	444	671	1115	80	60	64	Met	
3:30 PM	7	68	433	712	1145	80	60	68		
3:45 PM	6	72	446	718	1164	80	60	72		
4:00 PM	3	76	451	732	1183	80	60	76		
4:15 PM	4	84	484	788	1272	80	60	84	Met	Met
4:30 PM	4	87	501	811	1312	80	60	87		
4:45 PM	4	90	532	832	1364	80	60	90		
5:00 PM	3	93	523	847	1370	80	60	93		
5:15 PM	2	66	377	637	1014	94	60	66	Met	
5:30 PM	1	44	254	412	666	194	80	44		
5:45 PM	1	22	111	207	318	353	197	22		
6:00 PM	0	0	0	0	0	550	377	0		
6:15 PM	0	0	0	0	0	550	377	0		
6:30 PM	0	0	0	0	0	550	377	0		
6:45 PM	0	0	0	0	0	550	377	0		
7:00 PM	0	0	0	0	0	550	377	0		
7:15 PM	0	0	0	0	0	550	377	0		
7:30 PM	0	0	0	0	0	550	377	0		
7:45 PM	0	0	0	0	0	550	377	0		
8:00 PM	0	0	0	0	0	550	377	0		
8:15 PM	0	0	0	0	0	550	377	0		
8:30 PM	0	0	0	0	0	550	377	0		
8:45 PM	0	0	0	0	0	550	377	0		
9:00 PM	0	0	0	0	0	550	377	0		
9:15 PM	0	0	0	0	0	550	377	0		
9:30 PM	0	0	0	0	0	550	377	0		
9:45 PM	0	0	0	0	0	550	377	0		
10:00 PM	0	0	0	0	0	550	377	0		
10:15 PM	0	0	0	0	0	550	377	0		
10:30 PM	0	0	0	0	0	550	377	0		
10:45 PM	0	0	0	0	0	550	377	0		
11:00 PM	0	0	0	0	0	550	377	0		
11:15 PM	0	0	0	0	0	550	377	0		
11:30 PM	0	0	0	0	0	550	377	0		
11:45 PM	0	0	0	0	0	550	377	0		

Are the requirements for Warrant 2 met?:

OMUTCD WARRANT 3, PEAK HOUR			
Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	5:00 PM
Major Street:	1 Lane	Peak Hour End Time	6:00 PM
Minor Street:	1 Lane		

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1370	112	119	75

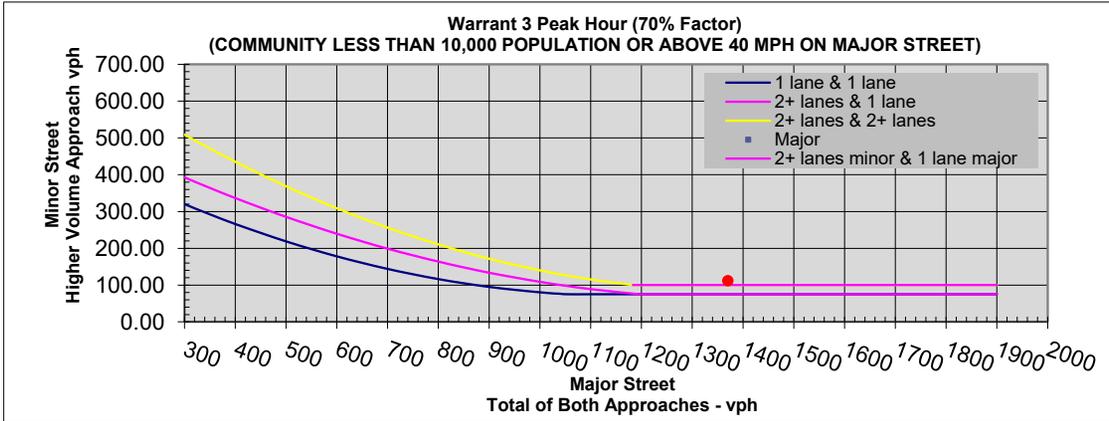
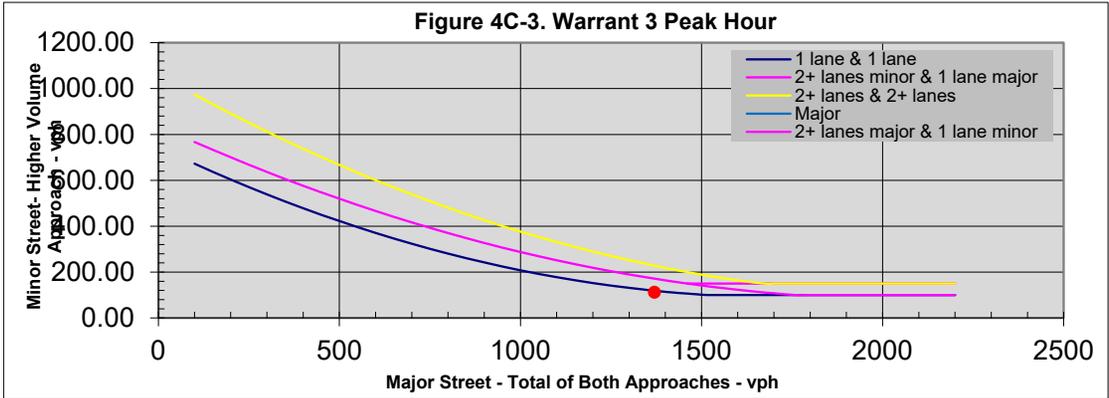
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?	No
---	----

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	No
---	----

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	Yes
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes

Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes
<i>*If applicable, attach all supporting calculations and documentation.</i>	

Are the requirements for Warrant 3 met?: No



APPENDIX K

LETTER RESPONSE TO ADDRESS COMMENTS & ADDENDUM



CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

November 11, 2025

PROJECT NAME: Northbrook Park Subdivision
TO: Knox County Engineering & Public Works
SUBJECT: Response Document for the Northbrook Park Subdivision Review Comments

Knox County Engineering & Public Works Staff:

The following response document addresses the comments in Alan Childers, P.E.'s email dated November 4th, 2025. This letter is added to the end of the revised report in Appendix K.

1) The taper lengths for the left-turn lane do not comply with TDOT standards. I have given recommendations to Paul Beebe to provide the roadway designer.

Response: The taper and storage length recommendations for the new turn lane at the Proposed Entrance have been updated in the report as requested. These changes were made on Pages 2-3 and 48.

2) The increase in delay to the side street is a major concern. Please provide a traffic signal warrant assessment using all warrants; 8 hr., 4 hr. and Peak hour.

Response: The results of this additional analysis determined that the projected 2028 traffic volumes are estimated not to meet Warrants 1, 2, or 3 for a traffic signal. On Page 2, the 4th bullet point under "Study Results" has been updated to reflect this outcome. A detailed discussion has also been added on Pages 50-52 regarding this signal warrant analysis.

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

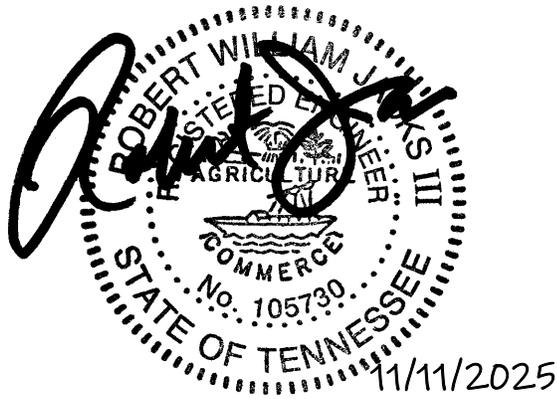
- Updated Title Page
- Updated Table of Contents
- Updated Page Footers and Page Numbers
- Updated the first sentence on Page 24 to denote that the intersection of E Beaver Creek Drive at Stone Cutter Way was counted for 8 hours (previously 6 hours)
- Updated Appendix D to include additional traffic count volumes (total of 8 hours) at the existing intersection of E Beaver Creek Drive at Stone Cutter Way

- Added Appendix J to include traffic signal warrant analysis spreadsheet outputs
- Added Appendix K to include this response letter

If you have any questions or further comments, don't hesitate to contact me. We look forward to your approval.

Sincerely,

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





CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

December 30, 2025

PROJECT NAME: Northbrook Park Subdivision
TO: Knox County Engineering & Public Works
SUBJECT: Addendum for the Northbrook Park Subdivision TIS

Knox County Engineering & Public Works Staff:

The following is an addendum to the revised Northbrook Park Subdivision TIS (stamped and dated 11.11.25). This letter reflects the updated information from Knox County Engineering regarding potential traffic signalization at the Proposed Entrance for the Northbrook Park Subdivision at E Beaver Creek Drive. This addendum is added to the revised TIS report in Appendix K.

The revised TIS report from 11.11.25 examined the potential for meeting traffic signal warrants for the Proposed Entrance intersection at E Beaver Creek Drive (and Stone Cutter Way). This revised report stated that vehicular volumes at the intersection would not meet the warrants for a traffic signal under projected 2028 conditions.

After the revised TIS report was submitted, Knox County Engineering contended that the future intersection should be signalized, based on the updated information they collected and provided after the initial review. This additional information included a speed study on E Beaver Creek Drive that determined that the 85th percentile speeds "ranged between 45.4 and 50.4" mph, and thus, allowed the signal warrants to be evaluated with speeds greater than 40 mph.

According to the Manual on Uniform Traffic Control Devices (MUTCD), vehicle speeds greater than 40 mph allow and provide reduced volume thresholds for several volume-based warrants. This adjustment accounts for higher vehicle speeds, which create fewer safe gaps for minor-street traffic, making signals potentially more vital at lower volumes. In this updated analysis for this intersection, with vehicle speeds greater than 40 mph on E Beaver Creek Drive, the reduced-volume thresholds for higher speeds were applied.

Furthermore, in signal warrant analyses, right-turn adjustment factors can be applied to the minor street volumes. In this updated analysis for this intersection, due to high thru volumes on the major approach and higher vehicle speeds, no reductions were applied to the minor street

right-turn volumes.

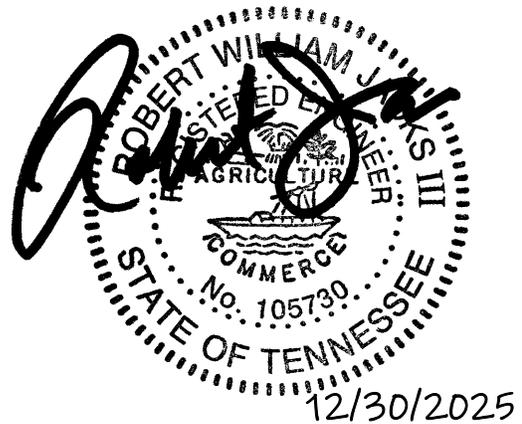
Thus, considering these factors and the needs of Knox County, the updated signal warrant analysis determined that Warrant #2, Four-Hour Vehicular Volumes and Warrant #3, Peak Hour, could be met based on projected 2028 volumes. The updated spreadsheet reflecting this revised evaluation of signal warrants is attached to the end of this letter.

If you have any questions or further comments regarding this addendum, don't hesitate to contact me.

Sincerely,

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

Attachments: Updated Signal Warrant Worksheets



STUDY AND ANALYSIS INFORMATION

Municipality:	Knoxville, TN	Traffic Volumes Obtained By:	Ajax Engineering, LLC
County:		Analysis Date:	11/8/2025
ODOT Engineering District:		Agency/ Company Name Performing Warrant Analysis:	Ajax Engineering, LLC
Google map link:	Map		

Analysis Information

Data Collection Date:
Day of the Week:

Is the intersection in a built-up area of an isolated community of <10,000 population?

Existing Traffic Signal at intersection:

Total Number of Approaches at Intersection:

Major Street Information

Major Street Name and Route Number:

Major Street Approach Direction:

Number of Thru Lanes on Each Major Street Approach: LANE(S)

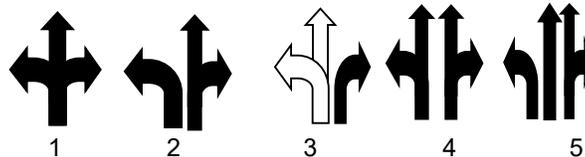
Speed Limit or 85th Percentile Speed on the Major Street*: MPH
*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number:

Minor Street Approach Configuration:

1	N-Bound
3	S-Bound



Number of Thru Lanes on Each Minor Street Approach: LANE(S)

Apply Right Turn Lane Reduction*:

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	100% Warrant Satisfied?	Notes and Comments: <small>*Known error: if Speed Limit < 45mph, it may not state that it passes at 70%.</small>
Warrant 1, Eight-Hour Vehicular Volume	Yes	No	Condition B (70%) was met.
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes	Figure 4C-1 (100%)
Warrant 3, Peak Hour	Yes	Yes	Signals installed under Warrant 3 should be traffic actuated.
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)			
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.
Warrant 5, School Crossing	No		N/A
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

<p>If no warrants are satisfied, additional options may be considered:</p> <ol style="list-style-type: none"> 1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks. 2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The Modeling and Forecasting Section should provide the projected traffic volumes. 3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. Please fill inputs on PHB Score Sheet and submit to ODOT.
--

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: Install New Traffic Signal

Notes:

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach						NOTES:
	Southbound						Westbound						Northbound						Eastbound						
	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	
12:00 AM						0						0						0						0	
12:15 AM						0						0						0						0	
12:30 AM						0						0						0						0	
12:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1:00 AM						0						0						0						0	
1:15 AM						0						0						0						0	
1:30 AM						0						0						0						0	
1:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:00 AM						0						0						0						0	
2:15 AM						0						0						0						0	
2:30 AM						0						0						0						0	
2:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:00 AM						0						0						0						0	
3:15 AM						0						0						0						0	
3:30 AM						0						0						0						0	
3:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:00 AM						0						0						0						0	
4:15 AM						0						0						0						0	
4:30 AM						0						0						0						0	
4:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 AM						0						0						0						0	
5:15 AM						0						0						0						0	
5:30 AM						0						0						0						0	
5:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:00 AM						0						0						0						0	
6:15 AM						0						0						0						0	
6:30 AM						0						0						0						0	
6:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:00 AM	42	0	7			49	7	154	2			163	1	0	3		4	1	52	7			60		
7:15 AM	42	0	7			49	7	171	2			180	3	0	8		11	2	68	7			77		
7:30 AM	42	0	7			49	7	252	0			259	1	0	1		2	0	51	7			58		
7:45 AM	42	0	7			49	7	234	0			241	1	0	0		1	0	84	7			91		
Hourly Total	168	0	28	0	0	196	28	811	4	0	0	843	6	0	12	0	18	3	255	28	0	0	286		
8:00 AM	38	0	7			45	6	135	0			141	0	0	0		0	0	55	6			61		
8:15 AM	38	0	7			45	6	125	0			131	2	0	1		3	0	69	6			75		
8:30 AM	38	0	7			45	6	99	1			106	1	0	6		7	0	55	6			61		
8:45 AM	38	0	7			45	6	117	0			123	1	0	2		3	0	71	6			77		
Hourly Total	152	0	28	0	0	180	24	476	1	0	0	501	4	0	9	0	13	0	250	24	0	0	274		
9:00 AM						0						0						0						0	
9:15 AM						0						0						0						0	
9:30 AM						0						0						0						0	
9:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10:00 AM						0						0						0						0	
10:15 AM						0						0						0						0	
10:30 AM						0						0						0						0	
10:45 AM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11:00 AM	11	0	11			22	11	64	0			75	1	0	0		1	2	58	11			71		
11:15 AM	11	0	11			22	11	64	0			75	0	0	1		1	0	50	11			61		
11:30 AM	11	0	11			22	11	66	0			77	1	0	0		1	0	80	11			91		
11:45 AM	11	0	11			22	11	85	0			96	1	0	1		2	2	75	11			88		
Hourly Total	44	0	44	0	0	88	44	279	0	0	0	323	3	0	2	0	5	4	263	44	0	0	311		
12:00 PM	12	0	12			24	12	68	0			80	0	0	2		2	1	74	12			87		
12:15 PM	12	0	12			24	12	79	1			92	0	0	2		2	1	77	12			90		
12:30 PM	12	0	12			24	12	59	0			71	0	0	1		1	0	89	12			101		
12:45 PM	12	0	12			24	12	70	0			82	0	0	0		0	0	74	12			86		
Hourly Total	48	0	48	0	0	96	48	276	1	0	0	325	0	0	5	0	5	2	314	48	0	0	364		
1:00 PM						0						0						0						0	
1:15 PM						0						0						0						0	
1:30 PM						0						0						0						0	
1:45 PM						0						0						0						0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2:00 PM	14	0	9			23	10	87	0			97	0	0	1		1	1	98	19			118		
2:15 PM	14	0	9			23	10	82	0			92	1	0	0		1	0	90	19			109		
2:30 PM	14	0	9			23	10	98	1			109	1	0	0		1	0	104	19			123		
2:45 PM	14	0	9			23	10	90	1			101	0	0	0		0	0	107	19			126		
Hourly Total	56	0	36	0	0	92	40	357	2	0	0	399	2	0	1	0	3	1	399	76	0	0	476		
3:00 PM	16	0	11			27	11	95	2			108	0	0	0		0	1	112	21			134		
3:15 PM	16	0	11			27	11	106	0			117	0	0	2		2	2	138	21			161		
3:30 PM	16	0	11			27	11	88	0			99	1	0	0		1	1	156	21			178		
3:45 PM	16	0	11			27	11	104	0			115	4	0	3		4	4	153	21			178		
Hourly Total	64	0	44	0	0	108	44	393	2	0	0	439	2	0	5	0	7	8	559	84	0	0	651		
4:00 PM	20	0	14			34	14	98	1			113	0	0	1		1	1	126	27			154		
4:15 PM	20	0	14			34	14	91	1			106	1	0	0		1	1	174	27			202		

It should be noted that if data is copied overtop of the Hourly Totals or Approach Totals, that the 'AutoSum' Formula will be lost. This should not affect the actual totals if the data was copied from a program that performs the calculations for the user.

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

**Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)*

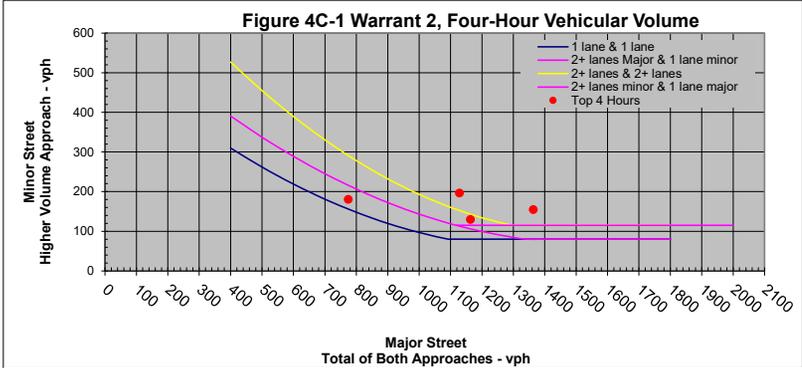
Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1	X		500	150	420	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
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5:15 AM	0	0																
5:30 AM	0	0																
5:45 AM	0	0																
6:00 AM	0	0																
6:15 AM	223	49																
6:30 AM	480	98			1					1				1	1	1	1	
6:45 AM	797	147	1				1	1	1	1			1	1				
7:00 AM	1129	196																
7:15 AM	1108	192																
7:30 AM	1057	188			1	1				1	1			1	1	1	1	
7:45 AM	907	184	1	1			1	1	1	1			1	1				
8:00 AM	775	180																
8:15 AM	573	135																
8:30 AM	367	90			1									1	1			
8:45 AM	200	45																
9:00 AM	0	0																
9:15 AM	0	0																
9:30 AM	0	0																
9:45 AM	0	0																
10:00 AM	0	0																
10:15 AM	146	22																
10:30 AM	282	44												1				
10:45 AM	450	66			1					1						1	1	
11:00 AM	634	88	1										1	1				
11:15 AM	655	90								1	1							
11:30 AM	701	92												1	1			
11:45 AM	705	94			1					1						1	1	
12:00 PM	689	96	1							1	1			1	1			
12:15 PM	522	72																
12:30 PM	340	48												1				
12:45 PM	168	24																
1:00 PM	0	0																
1:15 PM	215	23																
1:30 PM	416	46			1					1				1				
1:45 PM	648	69	1							1	1			1	1		1	1
2:00 PM	875	92						1	1									
2:15 PM	902	96																
2:30 PM	979	100			1					1				1	1			
2:45 PM	1024	104	1							1	1			1	1		1	1
3:00 PM	1090	108						1	1									
3:15 PM	1115	115																
3:30 PM	1145	122			1	1				1	1			1	1			
3:45 PM	1164	129	1							1	1			1	1		1	1

4:00 PM	1183	136					1	1										
4:15 PM	1272	142																
4:30 PM	1312	148			1	1					1	1			1	1		
4:45 PM	1364	154	1	1					1	1			1	1			1	1
5:00 PM	1370	160					1	1										
5:15 PM	1014	120																
5:30 PM	666	80			1						1					1		
5:45 PM	318	40																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
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10:45 PM	0	0																
11:00 PM	0	0																
11:15 PM	0	0																
11:30 PM	0	0																
11:45 PM	0	0																
HOURS MET			8	2	10	3	6	6	8	8	9	3	8	8	11	7	8	8
WARRANT SATISFIED?			NO	NO	NO	NO	NO	YES	NO									

Warrant Met: **No**

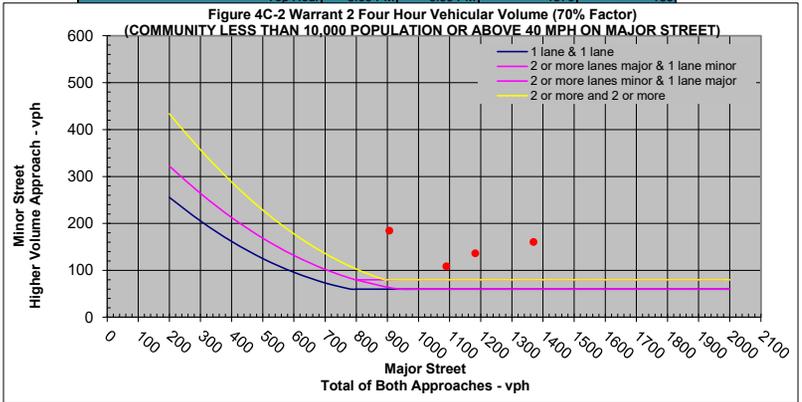
Notes: Condition B (70%) was met.

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME										
Number of Lanes for Moving Traffic on Each Approach					Total Number of Unique Hours Met on Figure 4C-1			5		
Major street: 1 Lane					Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)			8		
Minor Street: 1 Lane										
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes										
Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Required Minimum Minor Street For 4C-1	Required Minimum Minor Street For 4C-2	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Proposed Entrance & Stone Cutt		Major - E Beaver Creek Drive							
	N-Bound	S-Bound	W-Bound	E-Bound						
12:00 AM	0	0	0	0	0	550	377	0		
12:15 AM	0	0	0	0	0	550	377	0		
12:30 AM	0	0	0	0	0	550	377	0		
12:45 AM	0	0	0	0	0	550	377	0		
1:00 AM	0	0	0	0	0	550	377	0		
1:15 AM	0	0	0	0	0	550	377	0		
1:30 AM	0	0	0	0	0	550	377	0		
1:45 AM	0	0	0	0	0	550	377	0		
2:00 AM	0	0	0	0	0	550	377	0		
2:15 AM	0	0	0	0	0	550	377	0		
2:30 AM	0	0	0	0	0	550	377	0		
2:45 AM	0	0	0	0	0	550	377	0		
3:00 AM	0	0	0	0	0	550	377	0		
3:15 AM	0	0	0	0	0	550	377	0		
3:30 AM	0	0	0	0	0	550	377	0		
3:45 AM	0	0	0	0	0	550	377	0		
4:00 AM	0	0	0	0	0	550	377	0		
4:15 AM	0	0	0	0	0	550	377	0		
4:30 AM	0	0	0	0	0	550	377	0		
4:45 AM	0	0	0	0	0	550	377	0		
5:00 AM	0	0	0	0	0	550	377	0		
5:15 AM	0	0	0	0	0	550	377	0		
5:30 AM	0	0	0	0	0	550	377	0		
5:45 AM	0	0	0	0	0	550	377	0		
6:00 AM	0	0	0	0	0	550	377	0		
6:15 AM	4	49	163	60	223	406	243	49		
6:30 AM	15	98	343	137	480	271	132	98		
6:45 AM	17	147	602	195	797	149	60	147		Met
7:00 AM	18	196	843	286	1129	80	60	196	Met	
7:15 AM	14	192	821	287	1108	80	60	192		
7:30 AM	6	198	772	285	1057	86	60	188		
7:45 AM	11	184	619	288	907	118	60	184		Met
8:00 AM	13	180	501	274	775	156	61	180	Met	
8:15 AM	13	135	360	213	573	230	103	135		
8:30 AM	10	90	229	138	367	327	175	90		
8:45 AM	3	45	123	77	200	420	255	45		
9:00 AM	0	0	0	0	0	550	377	0		
9:15 AM	0	0	0	0	0	550	377	0		
9:30 AM	0	0	0	0	0	550	377	0		
9:45 AM	0	0	0	0	0	550	377	0		
10:00 AM	0	0	0	0	0	550	377	0		
10:15 AM	1	22	75	71	146	453	286	22		
10:30 AM	2	44	150	132	282	373	213	44		
10:45 AM	3	66	227	223	450	285	142	66		
11:00 AM	5	88	323	311	634	206	87	88		Met
11:15 AM	6	90	328	327	655	198	82	90		
11:30 AM	7	92	345	356	701	181	73	92		
11:45 AM	7	94	339	366	705	179	72	94		
12:00 PM	5	96	325	364	689	185	75	96		Met
12:15 PM	3	72	245	277	522	252	118	72		
12:30 PM	1	48	153	187	340	341	187	48		
12:45 PM	0	24	82	86	168	440	273	24		
1:00 PM	0	0	0	0	0	550	377	0		
1:15 PM	1	23	97	118	215	411	247	23		
1:30 PM	2	46	189	227	416	302	155	46		
1:45 PM	3	69	298	350	648	200	84	69		
2:00 PM	3	92	399	476	875	127	60	92		Met



Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	7:00 AM	8:00 AM	1129	196
2nd Highest Hour	4:45 PM	5:45 PM	1364	154
3rd Highest Hour	3:45 PM	4:45 PM	1164	129
4th Highest Hour	8:00 AM	9:00 AM	775	180

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	5:00 PM	6:00 PM	1370	160



2:15 PM	2	96	410	492	902	120	60	96		
2:30 PM	3	100	435	544	979	101	60	100		
2:45 PM	3	104	425	599	1024	92	60	104	Met	
3:00 PM	7	108	439	651	1090	80	60	108		Met
3:15 PM	8	115	444	671	1115	80	60	115		
3:30 PM	7	122	433	712	1145	80	60	122		
3:45 PM	6	129	446	718	1164	80	60	129	Met	
4:00 PM	3	136	451	732	1183	80	60	136		Met
4:15 PM	4	142	484	788	1272	80	60	142		
4:30 PM	3	148	501	811	1312	80	60	148		
4:45 PM	4	154	532	832	1364	80	60	154	Met	
5:00 PM	4	160	523	847	1370	80	60	160		Met
5:15 PM	2	120	377	637	1014	94	60	120		
5:30 PM	2	80	254	412	666	194	80	80		
5:45 PM	1	40	111	207	318	353	197	40		
6:00 PM	0	0	0	0	0	550	377	0		
6:15 PM	0	0	0	0	0	550	377	0		
6:30 PM	0	0	0	0	0	550	377	0		
6:45 PM	0	0	0	0	0	550	377	0		
7:00 PM	0	0	0	0	0	550	377	0		
7:15 PM	0	0	0	0	0	550	377	0		
7:30 PM	0	0	0	0	0	550	377	0		
7:45 PM	0	0	0	0	0	550	377	0		
8:00 PM	0	0	0	0	0	550	377	0		
8:15 PM	0	0	0	0	0	550	377	0		
8:30 PM	0	0	0	0	0	550	377	0		
8:45 PM	0	0	0	0	0	550	377	0		
9:00 PM	0	0	0	0	0	550	377	0		
9:15 PM	0	0	0	0	0	550	377	0		
9:30 PM	0	0	0	0	0	550	377	0		
9:45 PM	0	0	0	0	0	550	377	0		
10:00 PM	0	0	0	0	0	550	377	0		
10:15 PM	0	0	0	0	0	550	377	0		
10:30 PM	0	0	0	0	0	550	377	0		
10:45 PM	0	0	0	0	0	550	377	0		
11:00 PM	0	0	0	0	0	550	377	0		
11:15 PM	0	0	0	0	0	550	377	0		
11:30 PM	0	0	0	0	0	550	377	0		
11:45 PM	0	0	0	0	0	550	377	0		

Are the requirements for Warrant 2 met?:

OMUTCD WARRANT 3, PEAK HOUR			
Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	7:00 AM
Major Street:	1 Lane	Peak Hour End Time	8:00 AM
Minor Street:	1 Lane		

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1129	196	170	75

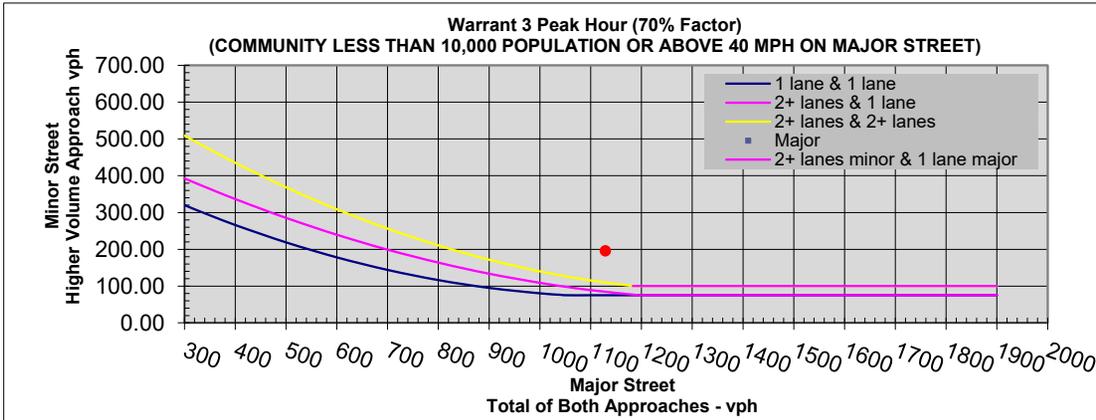
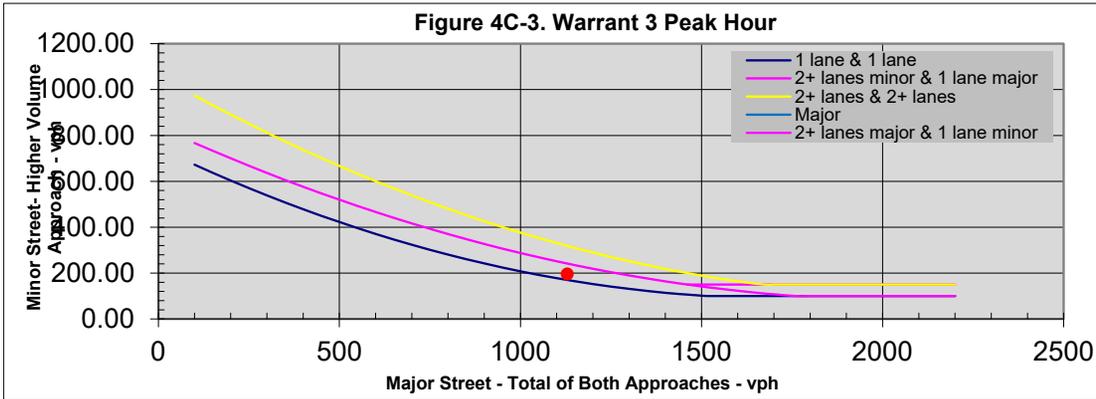
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes
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Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	No
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Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	Yes
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes

Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes
<i>*If applicable, attach all supporting calculations and documentation.</i>	

Are the requirements for Warrant 3 met?: Yes



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CIVIL ENGINEERING / TRAFFIC ENGINEERING