

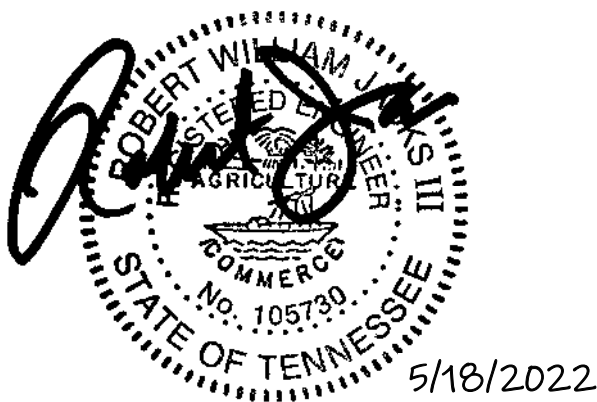


Transportation Impact Study Icon Apartment Homes at Lovell Road Knox County, Tennessee



Revised May 2022

Prepared for:
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EXECUTIVE SUMMARY

Preface:

Braxton Development II LLC is proposing a residential development on the west side of Lovell Road with a single entrance at the intersection with Lovell View Drive in West Knox County, TN. This proposed residential development is named the “Icon Apartment Homes at Lovell Road”. The development will include 315 multi-family apartments on 21.40 +/- acres and is anticipated to be fully built out and occupied by 2025. This study’s primary purpose is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access roads and intersections and is a Level 1 study established by Knoxville/Knox County Planning. Recommendations and mitigation measures are offered if transportation operations are projected to be below recognized engineering standards.

Study Results:

The findings of this study include the following:

- The Icon Apartment Homes at Lovell Road development with 315 multi-family apartments is calculated to generate 2,677 trips on an average weekday at full build-out and occupancy. Of these daily trips, 154 are estimated to occur during the AM peak hour and 221 in the PM peak hour in 2025.
- The intersection of Lovell Road at Lovell View Drive with the addition of the Proposed Entrance approach in the year 2025 does not meet warrants for traffic signalization based on the assumptions and calculations provided in this study.
- The projected 2025 southbound volumes on Lovell Road at the Proposed Entrance do not fully meet warrants for an exclusive right-turn lane for traffic entering the residential development. However, warrants for this lane are nearly met in the projected 2025 PM peak hour. Nonetheless, TDOT has indicated that an exclusive southbound right-turn lane will be required at the Proposed Entrance. Northbound entering left-turns into the development will be adequately served by the existing two-way left-turn lane in the center of Lovell Road.

Recommendations:

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

- 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 Lovell Road. The stop bar should be applied a minimum of 4 feet away from the edge of Lovell Road and placed at the desired stopping point that maximizes the sight distance.
- Based on a posted speed limit of 45-mph on Lovell Road, the desirable intersection sight distance is 565 feet looking in each direction at the Proposed Entrance. The required stopping sight distance is calculated to be 370 feet looking to the north and 355 feet to the south at the Proposed Entrance. A visual inspection determined that these sight distances are available. Sight distances at the Proposed Entrance approach must not be impacted by future landscaping, signage, or vegetation. The site designer must ensure that these intersection and stopping sight distances are accounted for and provided in the design plans.
- An exclusive eastbound exiting left-turn lane is recommended to be constructed at the Proposed Entrance approach with a minimum storage length of 50 feet. The eastbound exiting lane from the apartment buildings over to Lovell Road is recommended to transition directly to a right-turn lane at Lovell Road. Thru movements from the Proposed Entrance across Lovell Road to Lovell View Drive are not expected (and vice versa). Thus, the eastbound exiting thru movement can be assigned and marked on the pavement either at the exclusive left-turn lane or right-turn lane, whichever lines up more directly in the design with the opposing lane across Lovell Road at Lovell View Drive.
- If the developer of this residential complex predicts any near-term future expansion or additional units, it is recommended that the development construct a southbound exclusive right-turn lane on Lovell Road in anticipation of future expansion. The design of this lane should follow TDOT guidelines. Due to the constraints of the available property frontage on Lovell Road, the right-turn lane should have a taper of 15:1 (12-foot lane = 180 feet), and the remaining available frontage should be constructed with a full lane storage length of 95 feet resulting in an overall length of 275 feet.
- A 15-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance driveway off Lovell Road.

- Stop Signs (R1-1) and 24" white stop bars are recommended to be installed on the new internal aisleways and locations, as shown in the report.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 15-mph in the development, the internal intersection sight distance is 170 feet. The required stopping sight distance is 80 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met.
- With long and straight internal parking lot aisleways, it is recommended that speed humps or tables be considered to reduce internal traffic speeds in the development. Alternatively, parking lot islands could be extended toward the aisleways. Extending the parking lot islands a few feet would narrow the aisleway widths and reduce the available driving surface. A narrower aisleway design would reduce driver comfort and internal vehicle speeds.
- All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- Internal sidewalks are proposed throughout the development. The internal sidewalk system should connect to the existing external sidewalk system provided on the west side of Lovell Road. Sidewalks should have appropriate ADA-compliant ramps at intersection corners, and the internal sidewalks are recommended to be 5 feet minimum in width to meet Knox County regulations. White crosswalks should be marked on the road pavement internally where pedestrians are expected to cross.
- The site designer should provide the appropriate accommodations for the existing bike lane and sidewalks on the west side of Lovell Road at the Proposed Entrance.
- All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.

DESCRIPTION OF EXISTING CONDITIONS

▪ STUDY AREA:

The proposed location of this new residential development is shown on a map in Figure 1. This proposed development will be located on the west side of Lovell Road between Snyder Road/Alameda Drive and Cornerstone Drive in West Knox County, TN. The development has proposed one entrance on Lovell Road at an existing unsignalized t-intersection at Lovell View Drive. Transportation impacts associated with the proposed development were analyzed at the Proposed Entrance on Lovell Road at Lovell View Drive, where the most significant impact is expected and as requested by Knoxville/Knox County Planning.

The proposed development property is in a suburbanized area of West Knox County, TN, and in an area with a residential character. However, the property is also located near large pockets of businesses and commercial developments. This property is located roughly midway on Lovell Road between Pellissippi Parkway (SR 162) to the north and Interstate 40/75 to the south. Standalone single-family residences, established subdivisions, and undeveloped woodland and open properties are adjacent to the proposed development property. To the southeast and across Lovell Road, US Cellular Soccer Park Complex provides a walking trail and six soccer fields on 23 acres.



**View of Proposed Development Site
(Looking West from Lovell Road)**

The proposed development site is currently undeveloped, with most of it occupied by young woodlands and scrub vegetation.

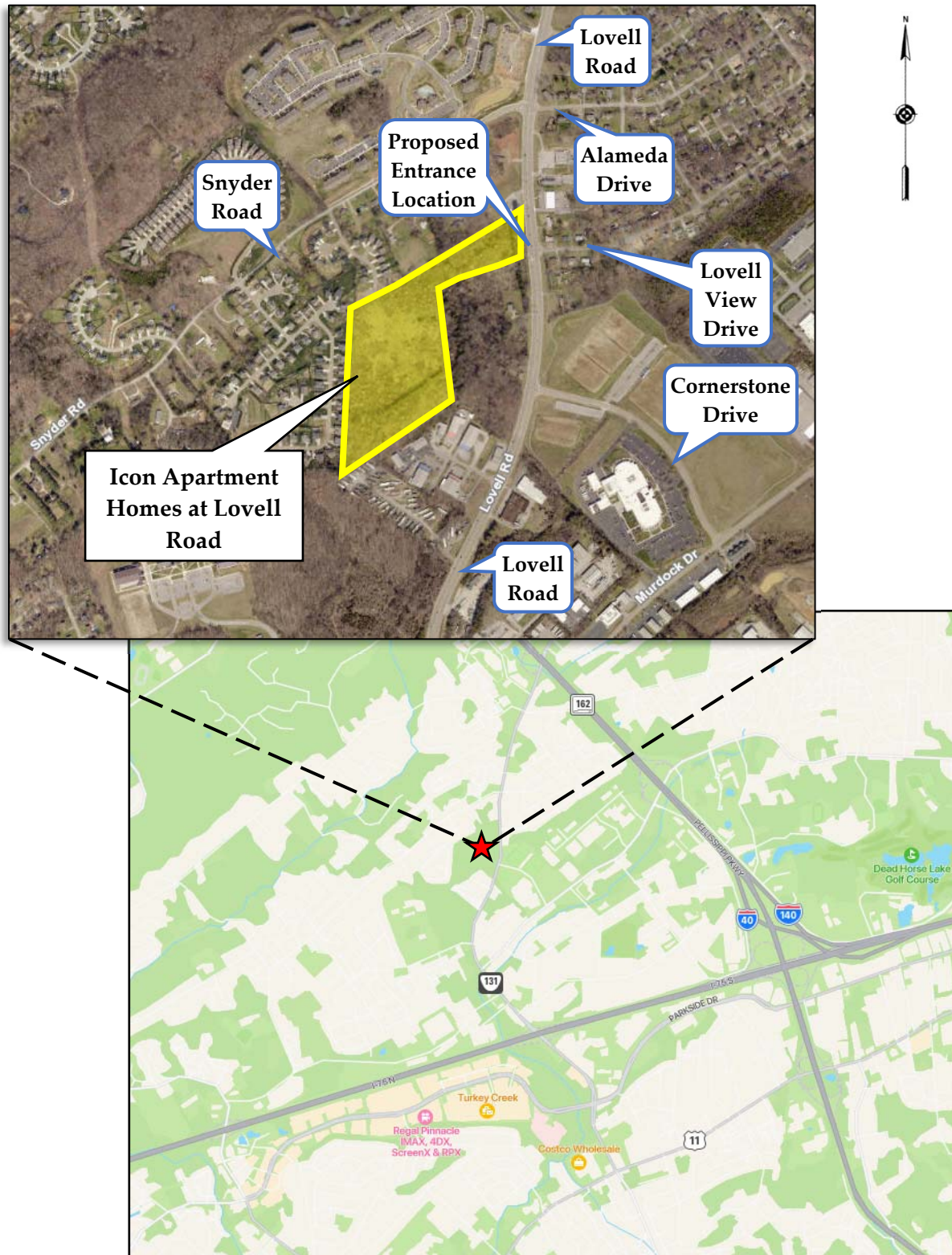


Figure 1
Location Map

▪ **EXISTING ROADWAYS:**

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

TABLE 1
STUDY CORRIDOR CHARACTERISTICS

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Lovell Road (SR 131)	Minor Arterial	45 mph	4 undivided with TWLTL	71 feet	None	Sidewalks on both sides	Bike lanes on both sides
Lovell Heights Drive	Local Street	25 mph	2 undivided	26 feet	None	No sidewalks along roadway	No bike lanes

¹ 2018 Major Road Plan by Knoxville/Knox County Planning

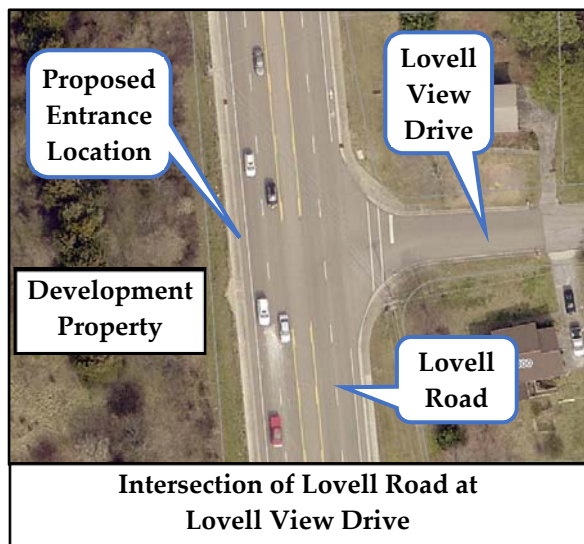
² From edges of pavement and face of curbs near project site

³ According to Knoxville Area Transit System Map

Lovell Road (SR 131) is classified as a Minor Arterial and generally traverses north to south and is crossed by significant roadways along its route. Lovell Road is a Tennessee State Route and is maintained by TDOT. Lovell Road begins on the south side at the signalized intersection of Kingston Pike (SR 1) at Canton Hollow Road. Lovell Road formally ends on its north side at the signalized intersection with Middlebrook Pike, Ball Camp Byington Road, and Ball Camp Pike. Lovell Road has a total length of 6 miles. According to online sources at the Knoxville Civil War Roundtable website, Lovell was a “corrupted” name of the village that used to exist near the intersection of Kingston Pike and the current Lovell Road. This village was known as Loveville and was established in 1797 by Robert Loveville, a companion of General James White, recognized as the founder of Knoxville, TN.

Closer to the study area, Lovell Road provides convenient access to Pellissippi Parkway to the north for travel to the south towards Interstate 40/75/140 and, in particular, for travel to the north towards Oak Ridge, TN. To the south, Lovell Road provides access to Interstate 40/75, the Turkey Creek Shopping area, and Kingston Pike. The posted speed limit on Lovell Road is 45 mph near the project site.

Lovell Road, adjacent to the proposed development site, is a 4-lane undivided roadway with a continuous center two-way left-turn lane (TWLTL). The TWLTL has a width of 12 feet with 11.5-foot wide dual-thru lanes in both directions. Each side of Lovell Road is flanked with 4.5-foot wide bike lanes, curb and gutter, and concrete sidewalks 4.5 feet in width.

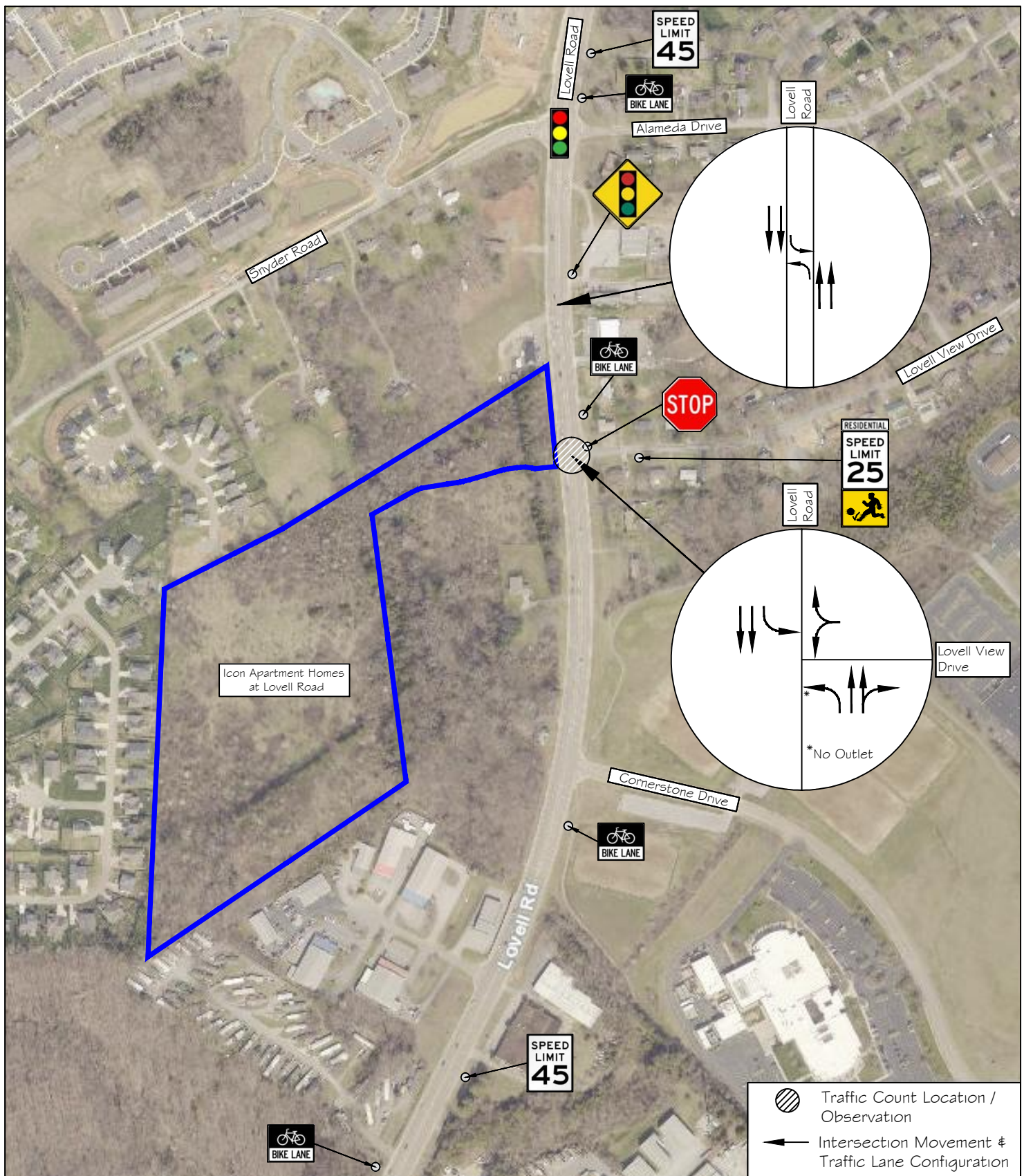


The proposed development will tie from the west side onto Lovell Road at Lovell View Drive. Lovell View Drive is located in the Lovell View Subdivision, which has four entrances for exterior travel. One of these entrances is provided on Bob Gray Road to the north, and the other three are along Lovell Road. One of these subdivision entrances is located at a signalized 4-way intersection 1,030 feet north of the proposed development entrance. This signalized intersection includes Snyder Road to the west and Alameda Drive to the east. Alameda Drive is

located in Lovell View Subdivision and allows subdivision residents to enter and exit at a controlled intersection on Lovell Road.

Lovell View Drive is classified as a Local Street and traverses in an east-west direction with a very straight horizontal alignment except at its east end, where it ends in a circuitous pattern. Lovell View Drive has single lanes for inbound and outbound subdivision traffic at Lovell Road. The Lovell View Drive approach has a painted white crosswalk at Lovell Road and has a total length of 0.84 miles. Near Lovell Road, Lovell View Drive has a width of 26 feet. Lovell View Drive provides direct access to several dozen single-family detached houses. Speed humps have been installed on Lovell View Drive and Terra Rosa Drive in the Lovell View Subdivision.

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



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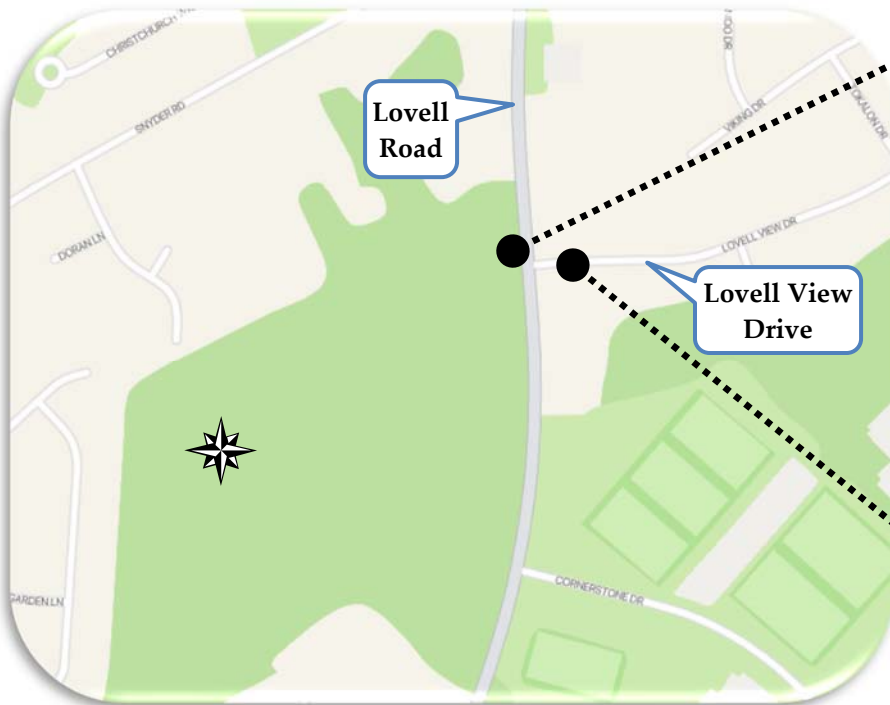


FIGURE 2

Icon Apartment Homes at Lovell Road

Traffic Count Location, Traffic Signage & Existing Lane Configurations

PHOTO EXHIBITS



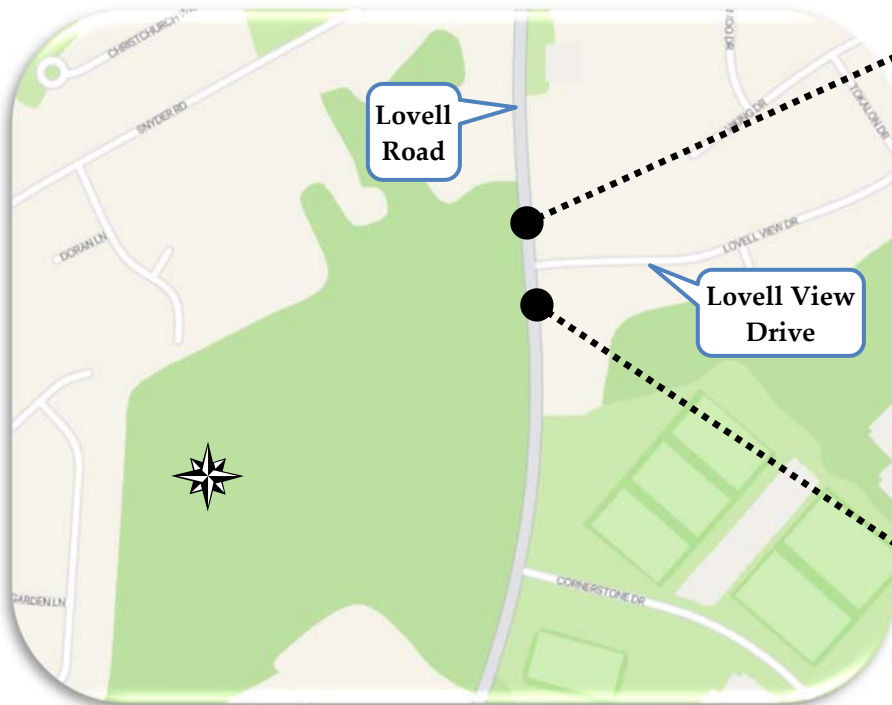
Lovell Road at Lovell View Drive



**View of Intersection of Lovell Road at
Lovell View Drive
(Looking Southeast)**

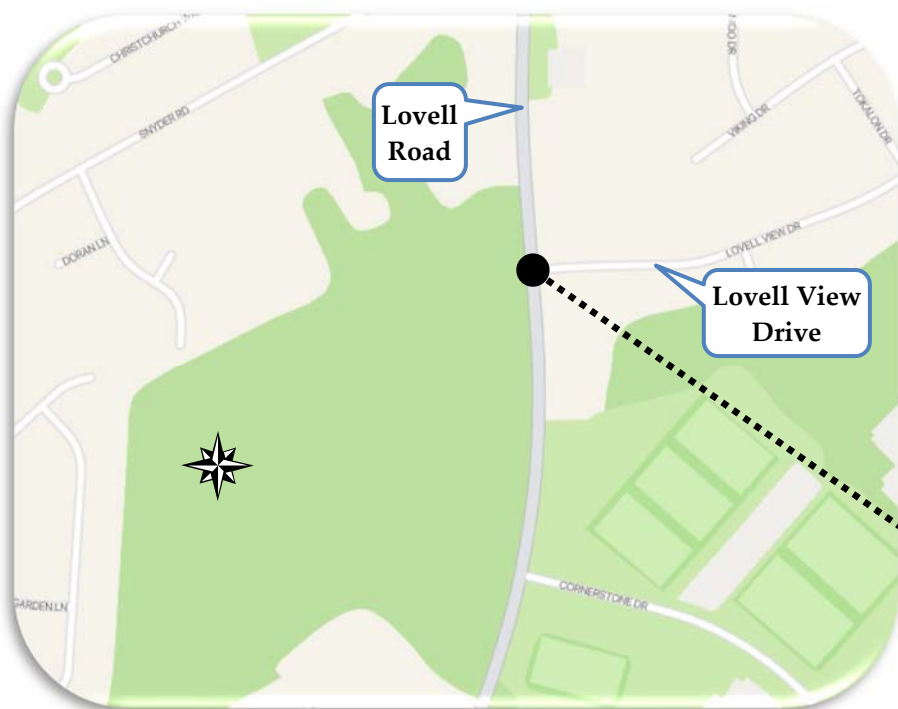


**View of Lovell View Drive at Lovell Road
(Looking West)**

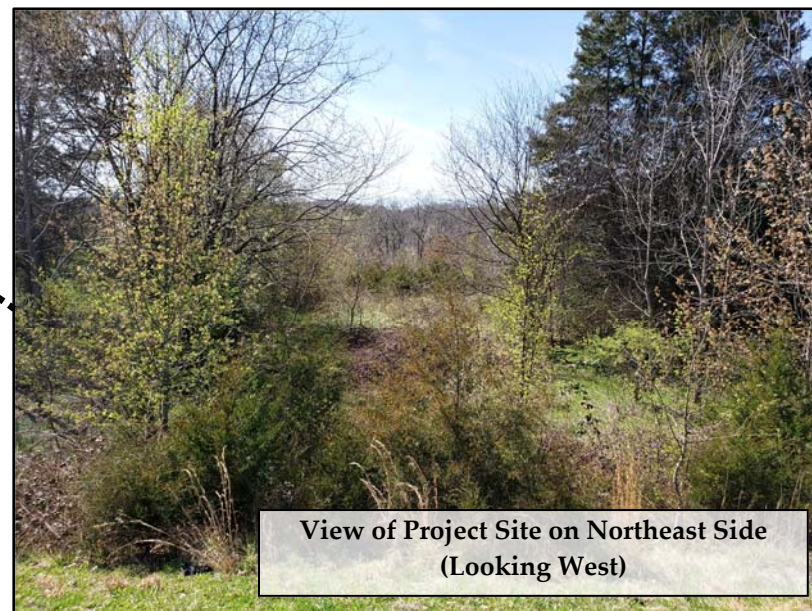


Lovell Road at Lovell View Drive





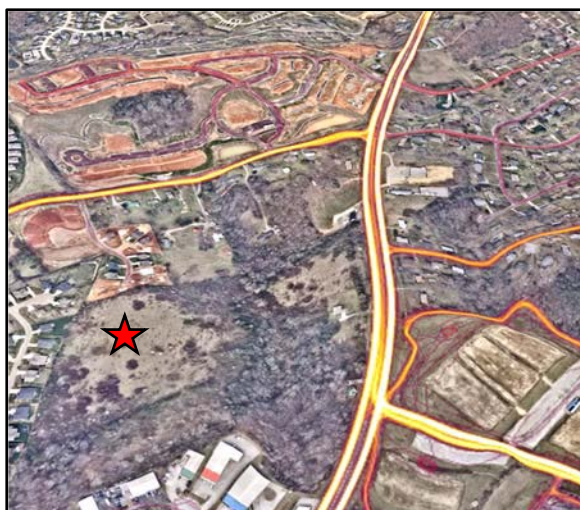
Lovell Road at Lovell View Drive



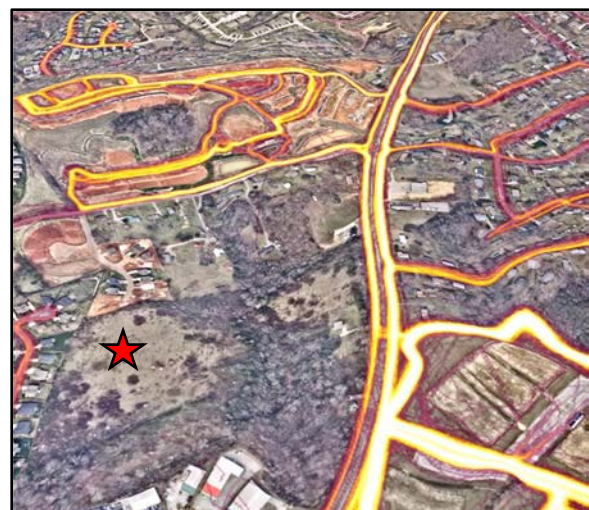
▪ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

One annual vehicular traffic count location exists near the development site just to the south, and TDOT conducts this count. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
TDOT reported an Average Daily Traffic (ADT) on Lovell Road between Gilbert Drive and Cornerstone Drive at 17,443 vehicles per day in 2021. From 2011 to 2021, this count station has indicated a 1.4% average annual traffic growth rate.
- Existing bicycle and pedestrian volumes:
The average daily pedestrian and bicycle traffic along Lovell Road is unknown but may be considerable due to the provided sidewalks and bike lanes. However, during the traffic counts for this project, no bicyclists and only ten pedestrians were observed over 8 hours on Lovell Road. An online website, [strava.com](https://www.strava.com), provides “heat” maps detailing exercise routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The activities in the maps are shown on the roads with color intensities with lighter colors signifying higher activity. Based on the Strava heat map data, some bicycle traffic occurs in the study area. Higher amounts of pedestrians and joggers have been recorded at the nearby soccer complex and walking trails.



Strava Heat Map for Bicyclists



Strava Heat Map for Pedestrian and Joggers

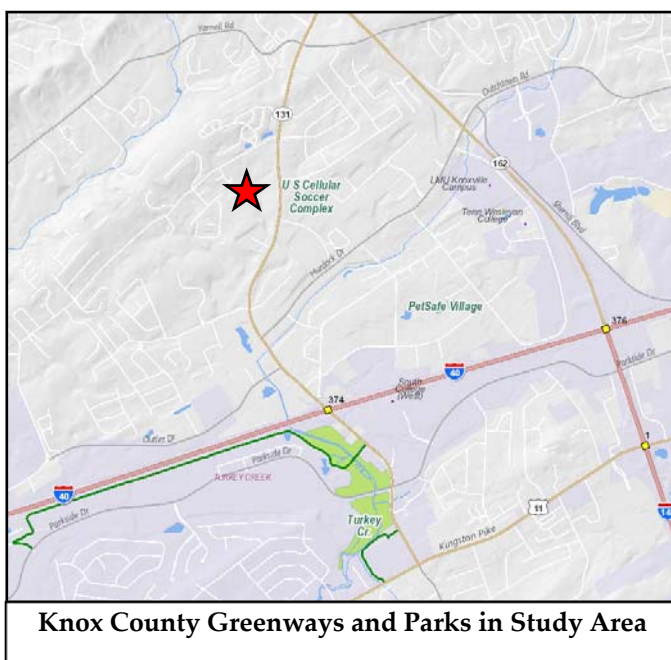
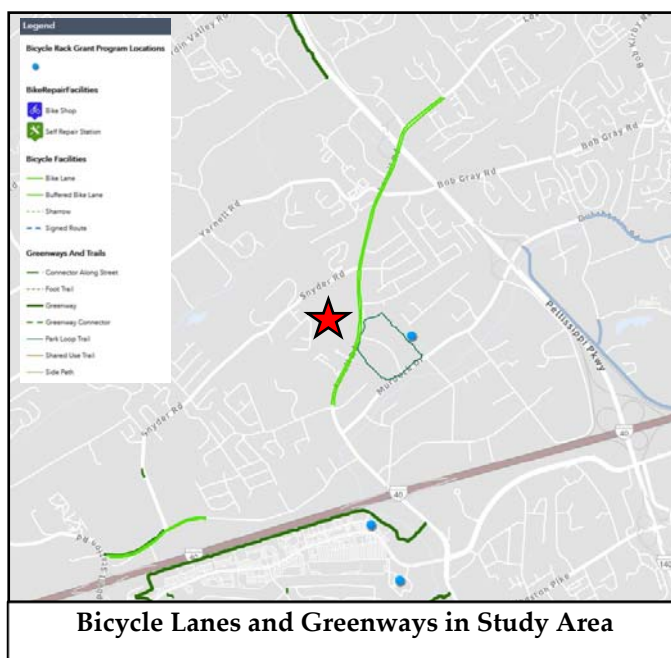
▪ **ON-STREET PARKING:**

On-street parking was not observed during the site review and is not allowed on Lovell Road adjacent to the project site. On-street parking was observed on Lovell View Drive in the Lovell View Subdivision.

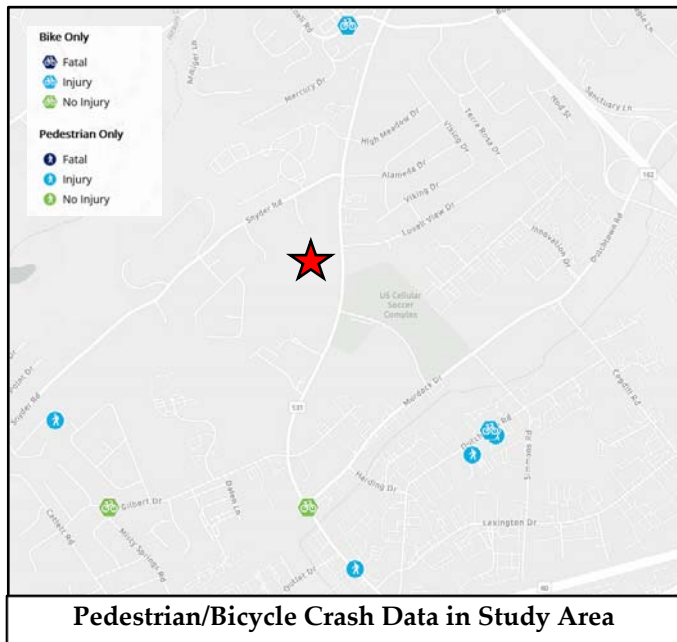
▪ **PEDESTRIAN AND BICYCLE FACILITIES:**

Bicycle lanes are available within the project study area. The bicycle facilities include 4.5-foot wide bike lanes on both sides and directions on Lovell Road and are striped with pavement markings and posted signs along the roadway. The bike lanes on Lovell Road begin on the south side near Gilbert Drive and continue to the north up to Cedardale Lane, where Lovell Road transitions to a 2-lane road section. The current total length of the bike lanes on Lovell Road is approximately 1.9 miles. The bike lanes will continue further north when Lovell Road is widened from Cedardale Lane to the intersection of Middlebrook Pike/Ball Camp Pike/ Ball Camp Byington Road. This reconstruction project is listed on the Knoxville TPO (Transportation Planning Organization) website with a horizon year of 2030.

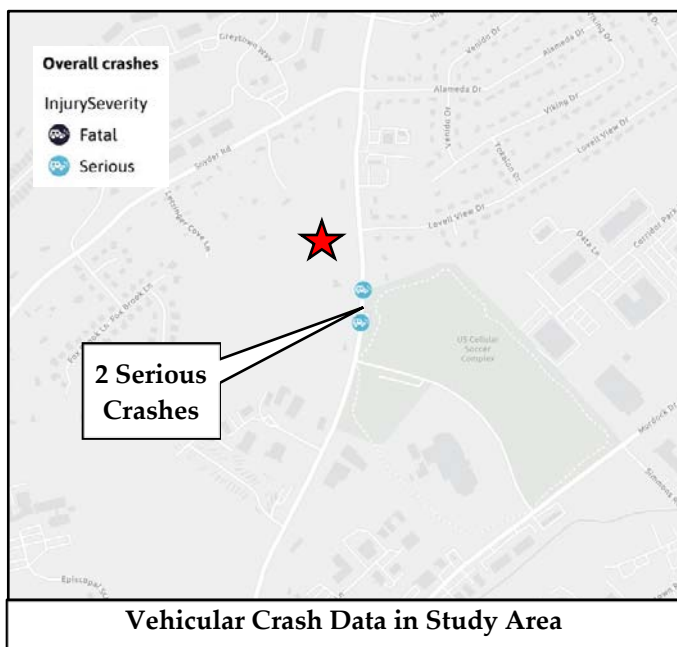
The sidewalk system along Lovell Road allows pedestrians and joggers to travel from Kingston Pike on the south side up to Cedardale Lane to the north, where Lovell Road transitions to a 2-lane road section with a total length of 3.5 miles. The



closest park is the US Cellular Soccer Complex which provides a 0.3-mile paved walking trail. The closest greenway, the Parkside Greenway, is located to the south across Interstate 40/75 near and along the Turkey Creek Shopping area.



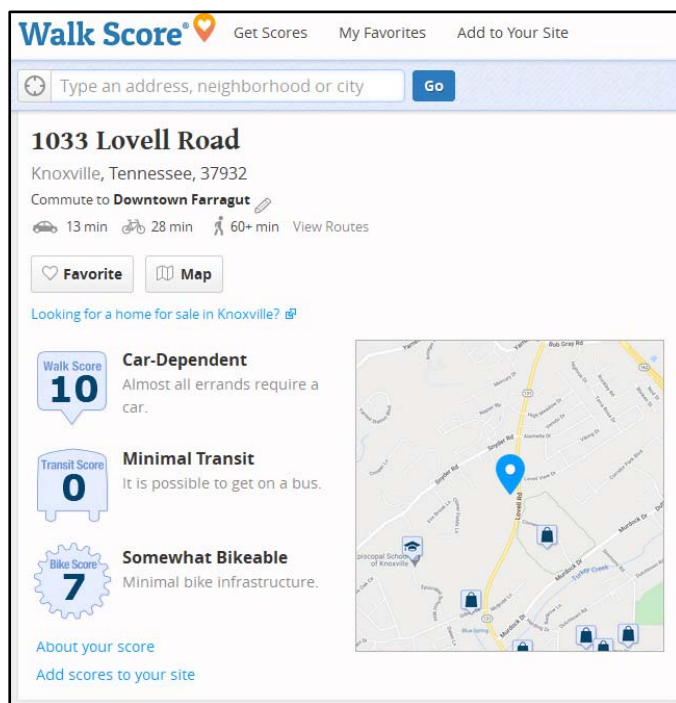
The Knoxville TPO provided a 2020 update to bicycle and pedestrian crash data for Knox County, Blount County, and other surrounding counties. According to the data, none of these incidents occurred near the study area in the past couple of years.



The Knoxville TPO also provides data related to “Life-Altering Traffic Crashes”. This data lists “the location of 2,326 traffic crashes in the Knoxville region that resulted in a fatality or serious injury between January 2016 and June 2019.” Two “Serious” crashes are shown on this TPO mapping just south of the proposed development site on Lovell Road. One of these crashes is listed as a DUI-related crash, and the other is a crash involving a senior driver.

▪ **WALK SCORE:**

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



Appendix B shows maps and other information for the Walk Score, Bike Score, and Transit Score at the development property address (1033 Lovell Road). The project site location is graded with a Walk Score of 10. This lower score is due to the lack of close-by amenities. This Walk Score indicates that the property site depends almost entirely on vehicles for errands and travel. The site is graded with a Bike Score of 7, which means there is minimal bike infrastructure, but it is somewhat bikeable. The site is given a Transit Score of zero.

▪ **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available in this area, and the overall KAT bus system map is in Appendix C. The closest public transit bus stop is 3.8 miles away by roadway at Parkwest Medical Center off Sherrill Boulevard and is on Route 16, “Cedar Bluff Connector”. It operates on weekdays and weekends, and this route map is also included in Appendix C. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.

PROJECT DESCRIPTION

▪ LOCATION AND SITE PLAN:

The proposed plan layout with 315 apartments on 21.40 +/- acres is designed by Silvus Engineering Consulting and is shown in Figure 3. The development property is a subdivision from a parent tract of 32.67 acres. As shown in the figure, one new driveway will be constructed for the development and will tie into the existing t-intersection of Lovell Road at Lovell View Drive from the west side. The total length of the driveway entrance and all the parking lot aiseways will be approximately 5,840 feet (1.1 miles). The driveway entrance and internal aiseways will have a width of 26 feet. The Proposed Entrance on Lovell Road is approximately 1,030 feet to the south of the existing Snyder Road/Alameda Drive signalized intersection and 1,000 feet to the north of the existing Cornerstone Drive unsignalized t-intersection.

The plan shown in Figure 3 shows sixteen buildings containing 315 apartment units. The apartment complex will offer 85 – 1 bedroom apartments, 179 – 2 bedroom apartments, and 51 – 3 bedroom apartments. One small building on the northwest side of the property will be for property maintenance and a dog bath. Another building near the front of the property at Lovell Road will be a clubhouse constructed for numerous uses for the residents. These uses include an exercise room, conference room, swimming pool, and mail center. It will also contain the development leasing office and provide areas for golf cart storage, a pool equipment room, and restrooms.

A total of 627 parking spaces will be provided in several internal parking lots and will include the appropriate number of ADA-accessible parking spaces. In addition to traditional parking spaces, the development will also provide “tucked under” parking spaces. “Tucked under” parking spaces are garages provided under the dwellings, and there will be one on each side of the large residential buildings. Five and six and a half-foot concrete sidewalks are proposed internally for this development.

The schedule for completing the Icon Apartment Homes at Lovell Road depends on economic factors and construction timelines. This project is contingent on permitting, design, and other regulatory approvals. Currently, the area's real estate and housing market is experiencing tremendous activity and growth. This study assumed that the total construction build-out of the development and full occupancy would occur within the next three years (2025).

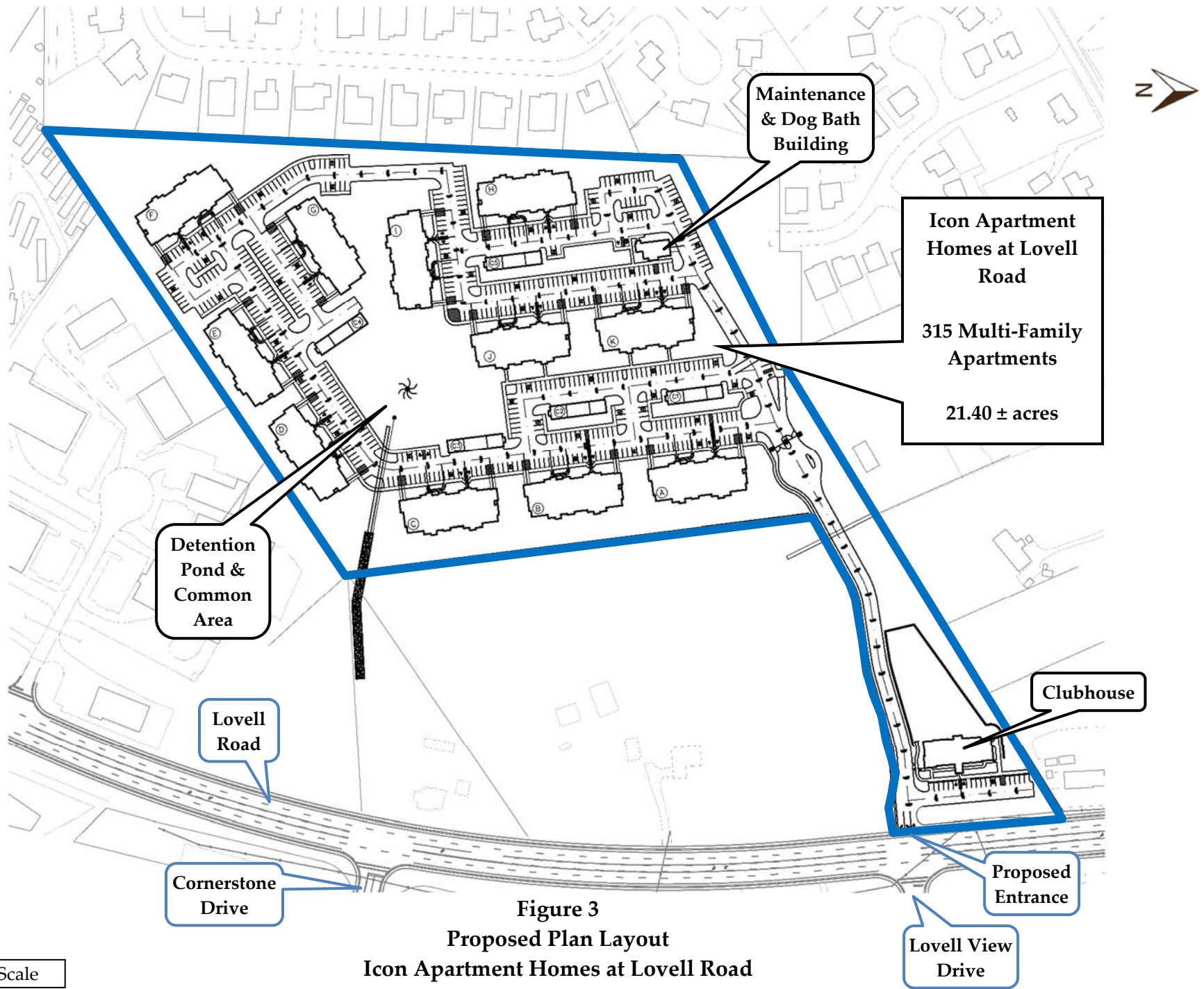


Figure 3
Proposed Plan Layout
Icon Apartment Homes at Lovell Road

Not to Scale

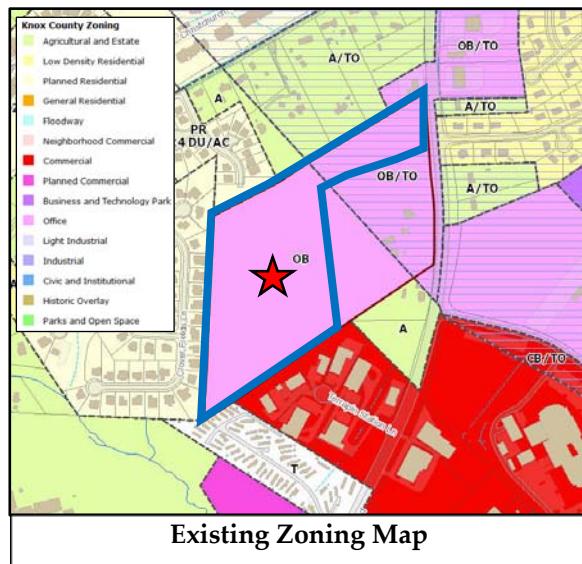
▪ **PROPOSED USES AND ZONING REQUIREMENTS:**

The Icon Apartment Homes at Lovell Road development property is currently zoned OB (Office, Medical, and Related Services) on the west side and OB/TO (Office, Medical, and Related Services/Technology Overlay) on the east side. The most recent published online KGIS zoning map is provided in Appendix D. The OB zone “is intended to provide areas for professional and business offices and related activities,” and the uses permitted include any use allowed in the General Residential Zone. The General Residential Zone allows houses and multi-family dwellings. The TO zone was “established to provide for physical development review in the Tennessee Technology Corridor area of Knox County by the Tennessee Technology Corridor Development Authority (TTCDA)”. The Tennessee Technology Corridor is “a 7,000-acre technology overlay zone stretching through West Knox County along the Pellissippi Parkway, north of I-40/75.” The development property is not requesting to be rezoned.

The existing adjacent surrounding zoning and land uses are the following:

- The properties to the west and northwest of the development site are zoned as Planned Residential (PR). These properties consist of single-family detached houses within the Hunter Estates and Letsinger Ridge Subdivisions.
- The properties to the north are zoned as Agricultural (A) and Agricultural (A)/Technology Overlay (TO). These properties consist of a couple of single-family houses with small amounts of open and undeveloped forested land.
- To the east, Lovell Road binds the development property. Across Lovell Road, three single-family houses located along Lovell Road are in the Agricultural (A)/Technology Overlay (TO) zone. The entire Lovell View Subdivision across Lovell Road is in the Low Density Residential (RA)/ Technology Overlay (TO) zone.
- Across Lovell Road to the northeast, four parcels are in the OB/TO zone (Office, Medical, and Related Services/Technology Overlay). These parcels contain commercial businesses and include Kinney Sharpening and Guardian Foundation Repair.
- Across Lovell Road to the southeast, one large parcel is in the OB/TO zone (Office, Medical, and Related Services/Technology Overlay). This parcel contains the US Cellular Soccer Complex.
- To the south, the property is bound by properties located in the Agricultural (A) zone, Business and Manufacturing (CB) zone, and the Transition (T) zone. The

property located in the Agricultural (A) zone consists of an abandoned single-family house adjacent to Lovell Road. The properties located in the Business and Manufacturing (CB) zone consist of businesses and workplaces, including KB Collision, American Home Improvements, Novatech, Inc. – Knoxville, National Auto Warehouse, and the Stephen Gould Cooperation. The property located in the Transition (T) zone contains the Lovell Road Mobile Home Park.



Existing Zoning Map



Existing Land Use Map

DEVELOPMENT DENSITY:

The Icon Apartment Homes at Lovell Road development's proposed density is based on a maximum of 315 apartments on 21.40 acres. The density computes to 14.72 dwelling units per acre.

ON-SITE CIRCULATION:

The total length of the driveway and parking lot aisleways will be approximately 5,840 feet (1.1 miles) and designed and constructed to Knox County, TN specifications. The internal drive and aisleways will be asphalt paved and include 6" concrete curbs. The lane widths will be 13 feet each for a total 26-foot pavement driveway and parking lot aisle width. Five and six and a half-foot concrete sidewalks are being proposed internally along the parking lot aisleways. The driveway entrance and aisleways will be private and will be maintained in the future by the development.

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

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

A trash collection area is designed for the apartment residents on the north-central side of the complex. Residents will park and drop trash over a wall into a top-loaded compactor chute. A concrete pad is shown in front of the trash collection area to provide a heavy-duty pavement to resist surface damage from trash collection trucks.

The new driveway and parking lot aisleways will be designed and constructed to Knox County specifications and are expected to be adequate for fire protection and rescue vehicles, truck collection trucks, and single-unit delivery trucks. The development's internal drive will accommodate the larger vehicle types and residents' standard passenger vehicles.

A large-paved area, 80 feet in diameter, will be constructed on the west end of the entrance driveway in front of a controlled access gate. This large-paved area will allow vehicles to turn around before the gate. Knox County recommends a turn-around area of this size in front of controlled access gates at private developments.

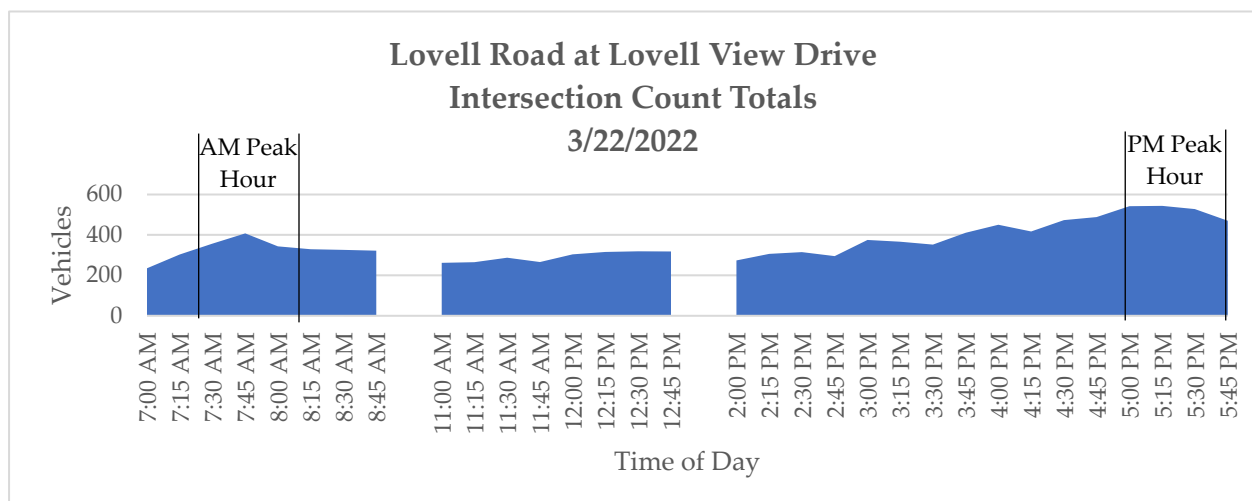
ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

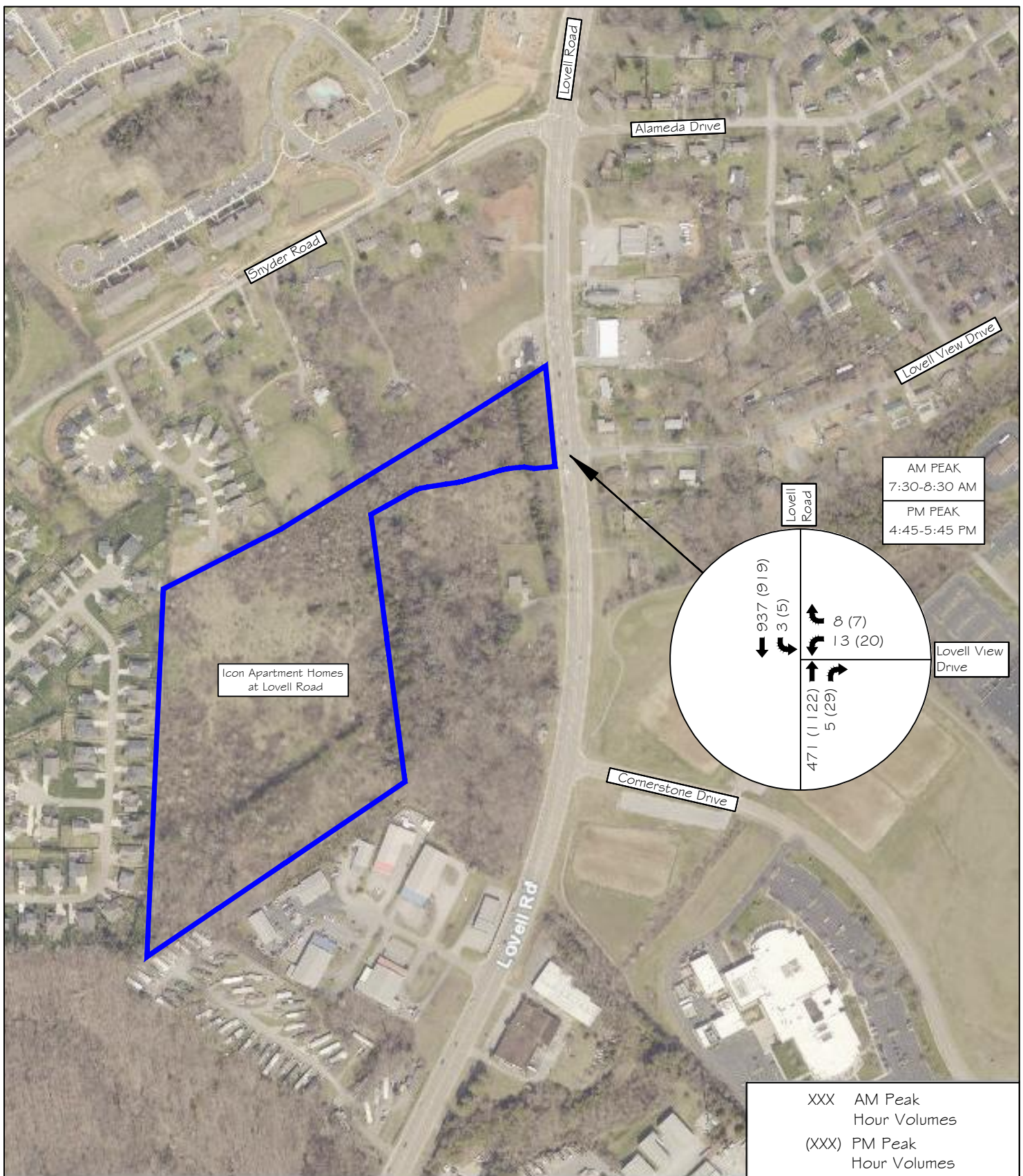
▪ EXISTING TRAFFIC CONDITIONS:

For this study, a traffic count was conducted at the intersection of Lovell Road at Lovell View Drive on March 22, 2022. The manual traffic counts tabulated the morning and afternoon peak period volumes and travel directions. Based on the traffic volumes collected, the AM and PM peak hours were observed at 7:30 – 8:30 am and 4:45 – 5:45 pm at the intersection. Local county public schools were in session when the traffic counts were conducted.

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

- Most of the observed traffic was passenger vehicles, but the traffic stream also included public school buses, dump trucks, concrete trucks, and a few tractor-trailers.
- No bicyclists were observed during the traffic counts. A total of 10 pedestrians and/or joggers were observed walking north and south along the east side of Lovell Road, and all crossed the Lovell View Drive approach. Some of these were the same individuals returning in the opposite direction. No pedestrians were observed on the western side of Lovell Road during the traffic counts.
- Many motorists turning left from Lovell View Drive towards the south on Lovell Road were observed using the TWLTL as a refuge and sometimes as an acceleration lane to enter the southbound Lovell Road traffic stream.





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FIGURE 4

Icon Apartment Homes at Lovell Road

2022 Peak Hour Traffic Volumes -
EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2022 traffic volumes shown in Figure 4 at the unsignalized intersection of Lovell Road at Lovell View Drive. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 11).

Methodology:

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



LOS is defined by delay per vehicle (seconds), and roadway facilities are also characterized by the volume-to-capacity ratio (v/c). For example, a delay of 20 seconds at an unsignalized intersection would indicate LOS C. This delay represents the additional delay a motorist would experience traveling through the intersection. Also, for example, a v/c ratio of 0.75 for an approach at an unsignalized intersection would indicate that it operates at 75% of its available capacity. LOS designations, which are based on delay, are reported differently for unsignalized and signalized intersections. This difference is primarily due to motorists having 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 that includes travel time, driver discomfort, and fuel consumption. For unsignalized intersections, the analysis assumes that the mainline thru and right turn traffic does not stop and is not affected by the traffic on the minor side streets. Thus, the LOS for a two-way stop (or yield) controlled intersection is defined by

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

Intersection capacity results from the existing 2022 peak hour traffic are shown in Table 3. The intersections in the table are shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix F includes the worksheets for the existing 2022 peak hour capacity analyses.

As shown in Table 3, all the traffic movements at the intersection are calculated to operate with good to average LOS and vehicle delays in the existing 2022 conditions except for the Lovell View Drive westbound approach in the PM peak hour. This approach was calculated to be at LOS D in the PM peak hour.

TABLE 2
LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS



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

Source: Highway Capacity Manual, 6th Edition

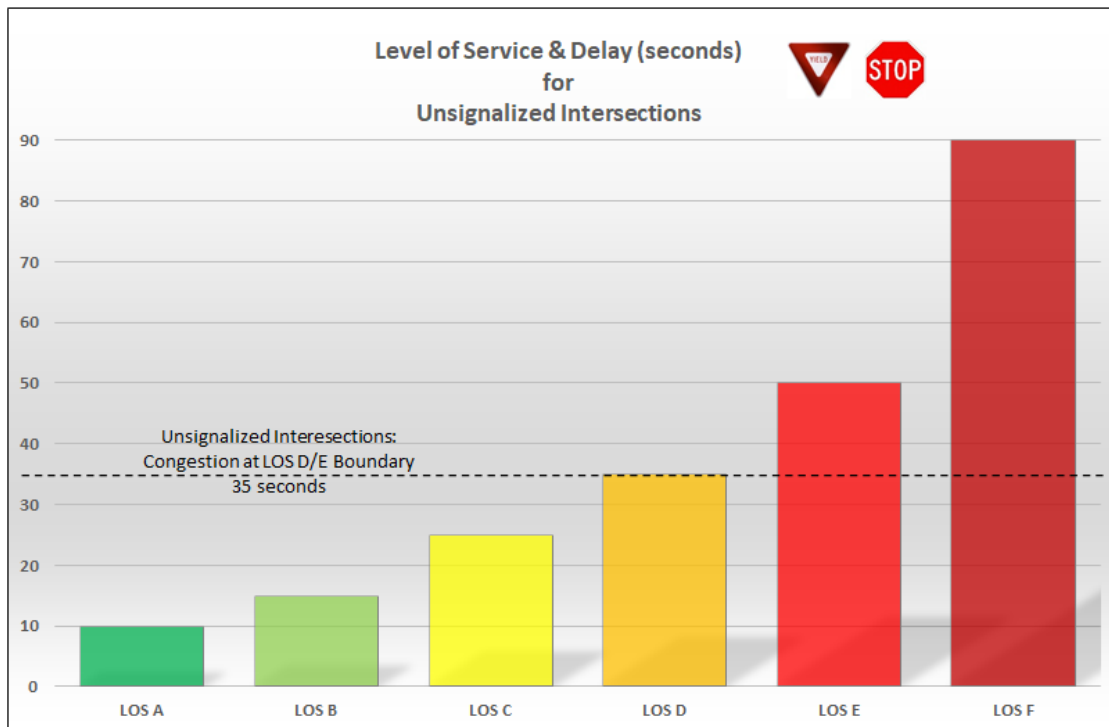



TABLE 3
2022 INTERSECTION CAPACITY ANALYSIS RESULTS -
EXISTING CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Lovell Road at Lovell View Drive	 Unsignalized	Westbound Left/Right	B	14.1	0.100	D	32.7	0.288
		Southbound Left	A	8.3	0.004	B	11.7	0.022

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

^a Level of Service

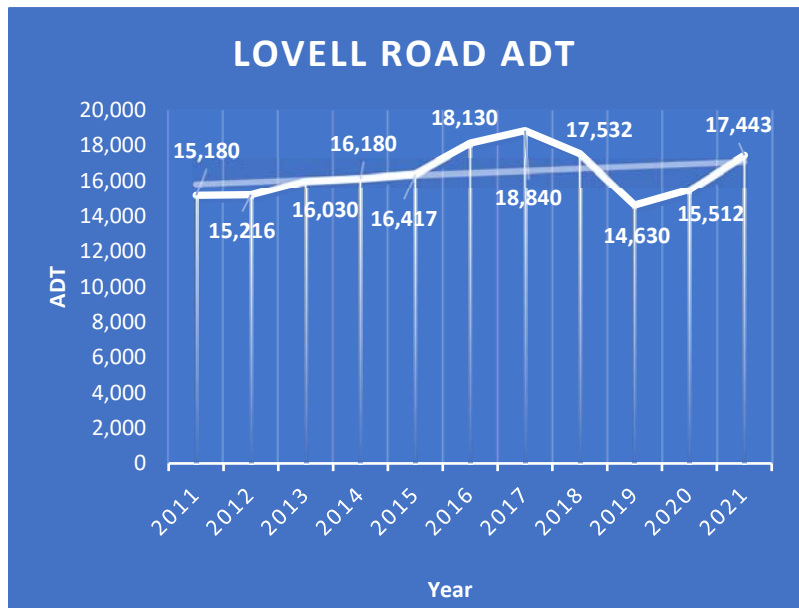
^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

▪ **PROJECTED HORIZON YEAR 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). The build-out and full occupancy for this proposed development is assumed to occur by 2025. This horizon year corresponds to three years for this development to reach full capacity and occupancy.


Vehicular traffic on Lovell Road in the study area has shown lower but stable annual growth over the past ten years (1.4%), according to the annual TDOT traffic count station and as shown in Appendix A. A slightly higher annual growth rate of 1.5% was used to calculate future growth on Lovell Road up to 2025 to account for potential traffic growth in the study area and provide a conservative analysis.



This assumed growth rate was only applied to the existing thru volumes on Lovell Road. It was not applied to the turning movements at Lovell View Drive since this existing subdivision is completely built-out and is not expected to experience increases in traffic growth.

Capacity analyses were undertaken to determine the projected LOS in 2025 without the project at the intersection, and the results are shown in Table 4. The results shown in Table 4 are similar to the existing 2022 results; however, the westbound approach of Lovell View Drive drops to LOS E in the projected conditions without the project. Figure 5 shows the projected horizon year traffic volumes without the project at the intersection in 2025 during the AM and PM peak hours.

TABLE 4
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED HORIZON YEAR (WITHOUT THE PROJECT)

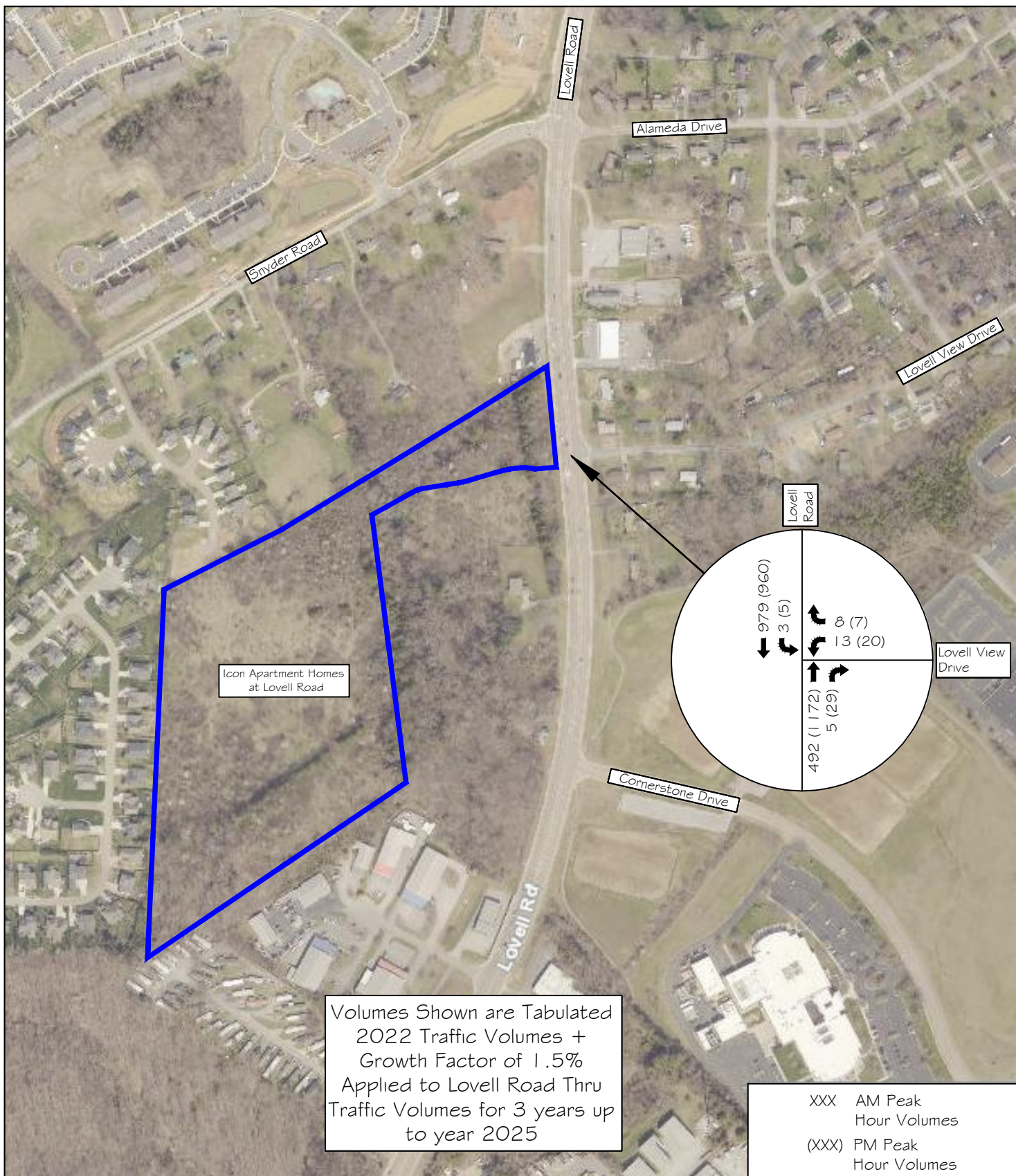
INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Lovell Road at Lovell View Drive	 Unsignalized	Westbound Left/Right	B	14.4	0.104	E	35.5	0.308
		Southbound Left	A	8.4	0.004	B	12.1	0.023

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

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio



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FIGURE 5

Icon Apartment Homes at Lovell Road

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

▪ **TRIP GENERATION:**

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated number of trips that the 315 multi-family apartments will generate was calculated based on Knoxville/Knox County Planning equations. These equations were developed from local studies to estimate apartment (and townhouse) trip generation in the surrounding area and were published in December 1999. For Knox County, these are the preferred trip generation rates to use for apartments and townhouses. The data and calculations for the proposed land use are shown in Appendix G. A summary of this information is presented in the following table:

TABLE 5
TRIP GENERATION FOR ICON APARTMENT HOMES AT LOVELL ROAD
315 Multi-Family Apartments

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Multi-Family Apartments	315	2,677	22%	78%		55%	45%	
				34	120	154	122	99	221
Total New Volume Site Trips			2,677	34	120	154	122	99	221

Calculated from Local Trip Rates

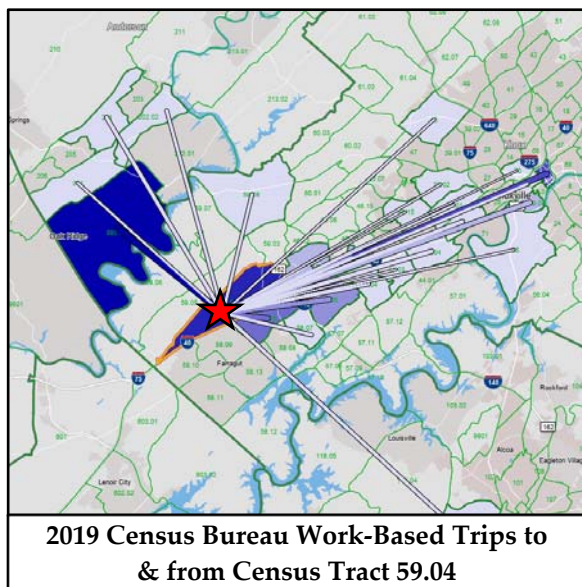
Trips calculated by using Fitted Curve Equations

For the proposed residential development, with 315 multi-family apartments, it is estimated that 34 vehicles will enter and 120 will exit, for a total of 154 generated trips during the AM peak hour in the year 2025. Similarly, it is estimated that 122 vehicles will enter and 99 will exit, for a total of 221 generated trips during the PM peak hour in the year 2025. The calculated trips generated for an average weekday are estimated to be 2,667 vehicles for the proposed development. No vehicle trip reductions were included in the analysis even though pedestrian and bicycle facilities are available near the development site.

▪ **TRIP DISTRIBUTION AND ASSIGNMENT:**

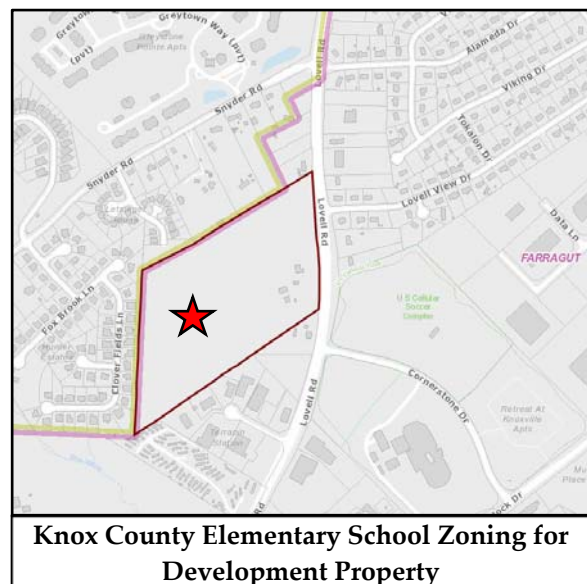
Figure 6 shows the projected distribution of traffic entering and exiting the proposed development. The percentages shown in the figure only pertain to the trips generated by the proposed dwellings in the development calculated from the local trip rates.

The percentages assumed and shown in Figure 6 are based on several sources and engineering judgment. The first source is based on the traffic count volumes and the observed directions of travel collected at the existing intersection adjacent to the proposed development site.



The second source for projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for generated trips by the development, and these trips are more likely to travel to and from the north and east. This assertion is based on data from the United States Bureau website for Census Tract 59.04, where the development property is located. Based on 2019 (latest available) census data and as shown in Appendix H, most work-based trips in the surrounding area correspond to Oak Ridge, Oak Ridge National Labs (ORNL), downtown Knoxville (including the University of Tennessee), and other areas of West Knoxville.

In addition to employment centers, some generated traffic will travel to and from various public and private schools. These public and other private schools in the area will be another impetus for external trip-making. The development property is currently zoned for Farragut Elementary, Hardin Valley Middle, and Hardin Valley High School (Academy). Farragut Elementary is located 3.6 miles away to the southwest by roadway via Lovell Road, Interstate 40/75, and North Campbell Station Road. The Hardin Valley schools are located 4.2 miles away

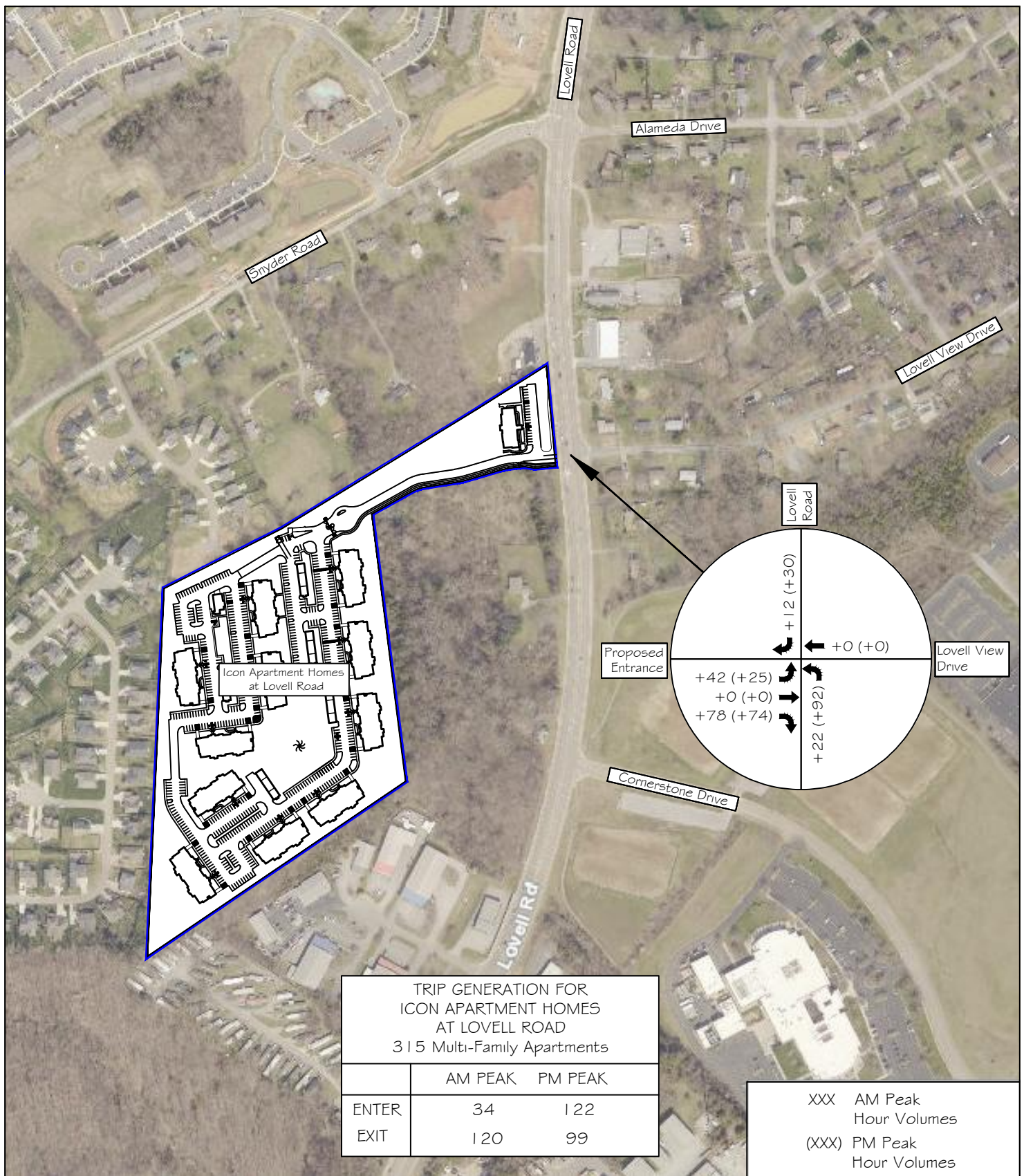


by roadway to the northwest via Lovell Road, Pellissippi Parkway, and Hardin Valley Road. The Hardin Valley and Farragut Elementary school zone boundary is located along the rear property line of the development.

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

Overall, the study used a 65%/35% split in the AM Peak Hour, with 65% of trips assumed to and from the south on Lovell Road and 35% of trips to and from the north. The study assumed a 75%/25% split in the PM Peak Hour, with 75% of trips to and from the south on Lovell Road and 25% of trips to and from the north. Overall, the attraction to and from Interstate 40/75 and the Turkey Creek Shopping area is assumed to be greater than the attraction to and from the north.

Figure 7 shows the traffic assignment of the computed trips generated by the development (Table 5) based on the assumed distribution of trips shown in Figure 6.



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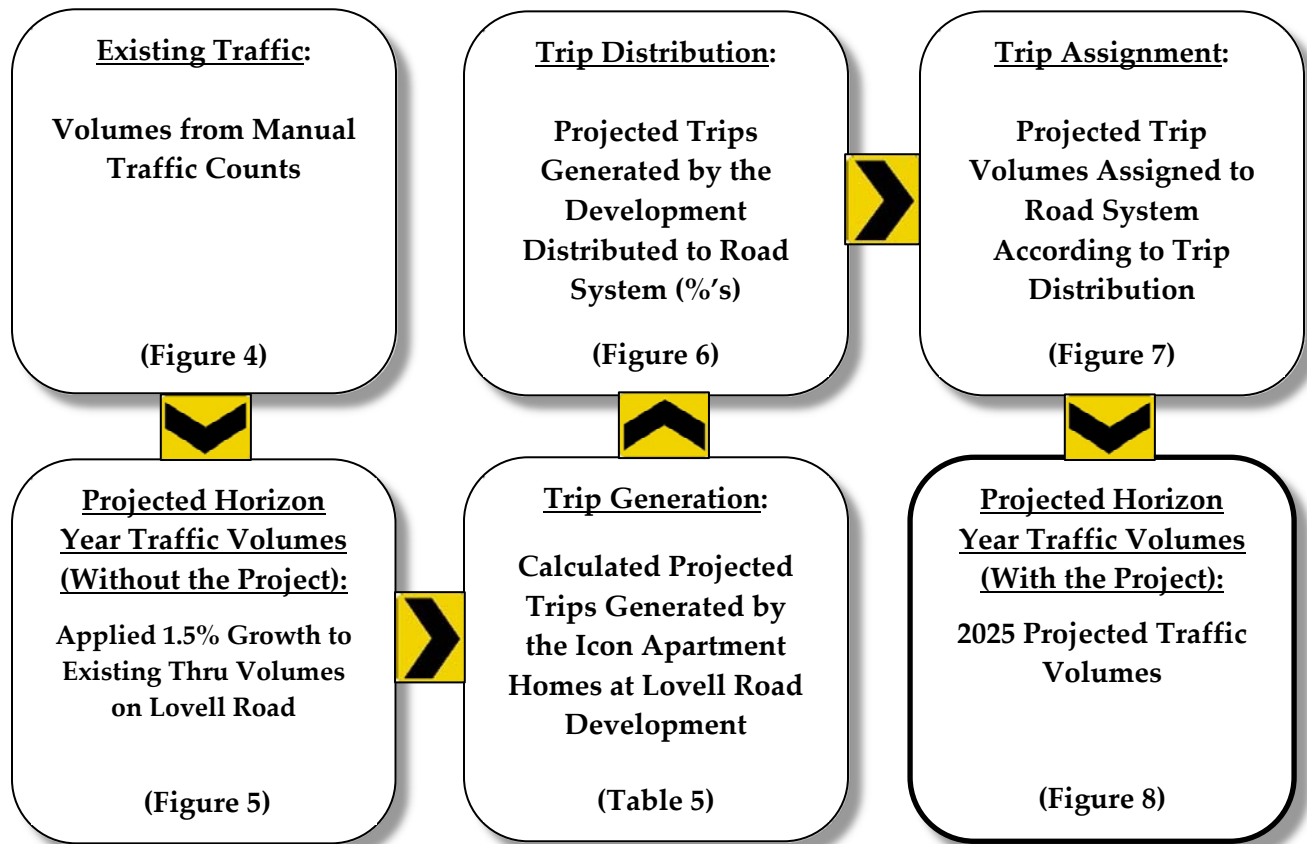
FIGURE 7

Icon Apartment Homes at Lovell Road

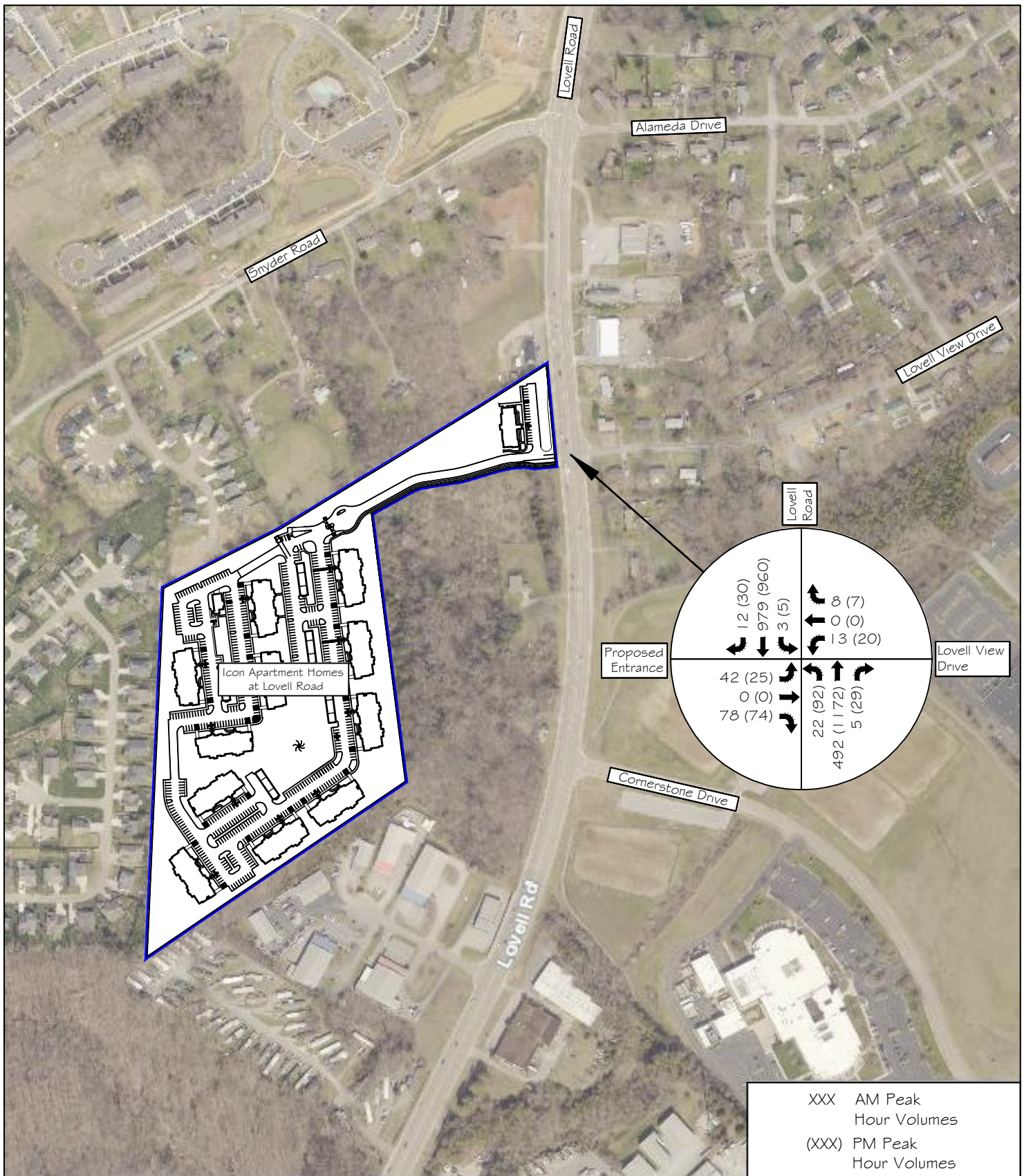
Traffic Assignment of Generated Traffic
during AM and PM Peak Hour

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

Overall, several additive steps were taken to estimate the total projected horizon year traffic volumes at the studied intersection when the Icon Apartment Homes at Lovell Road development is entirely constructed and occupied by 2025. The steps are illustrated below for clarity and review:



The calculated peak hour traffic (Table 5) generated by the Icon Apartment Homes at Lovell Road development was added to the 2025 horizon year traffic (Figure 5) by following the predicted trip distributions and assignments (Figures 6 and 7). This procedure was completed to obtain the total projected traffic volumes when the proposed development is fully built out and occupied in 2025. Figure 8 shows the projected 2025 AM and PM peak hour volumes with the generated development traffic at the studied intersection.



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FIGURE 8


Icon Apartment Homes at Lovell Road

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

Capacity analyses were conducted to determine the projected LOS at the studied intersection with the development traffic in 2025. The additional traffic generated from the proposed development increased the calculated vehicle delays in the projected 2025 conditions for the Lovell View Drive approach. These higher vehicle delays are a direct result of the generated trips competing with a large number of thru volumes on Lovell Road. The westbound Lovell View Drive approach in the 2025 PM peak hour is calculated at LOS F. This capacity analysis was conducted with the eastbound approach, the Proposed Entrance, with a single exiting lane. It was calculated to be LOS D in the AM and PM peak hours. The projected 2025 peak hour capacity results for the intersection with the project can be seen in Table 6. Appendix F includes the worksheets for these capacity analyses.

A summary of the Lovell Road at Lovell View Drive (and the Proposed Entrance in the projected conditions) intersection analysis results are presented in Table 7. This table provides a side-by-side summary and comparison of the intersection for the following: 2022 existing conditions, projected conditions in the year 2025 without the project, and the projected conditions in the year 2025 with the project. In Table 7, the traffic movements associated with the addition of the Proposed Entrance on Lovell Road at Lovell View Drive are only included in the 2025 projected conditions.

TABLE 6
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED HORIZON YEAR (WITH THE PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Lovell Road at Lovell View Drive and Proposed Entrance		Northbound Left	B	11.3	0.041	B	11.3	0.152
		Eastbound Left/Thru/Right	D	29.8	0.485	D	25.9	0.393
		Westbound Left/Thru/Right	C	18.1	0.139	F	99.0	0.613
		Southbound Left	A	8.4	0.004	B	12.1	0.023

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

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

TABLE 7
INTERSECTION CAPACITY ANALYSIS SUMMARY
LOVELL ROAD AT LOVELL VIEW DRIVE



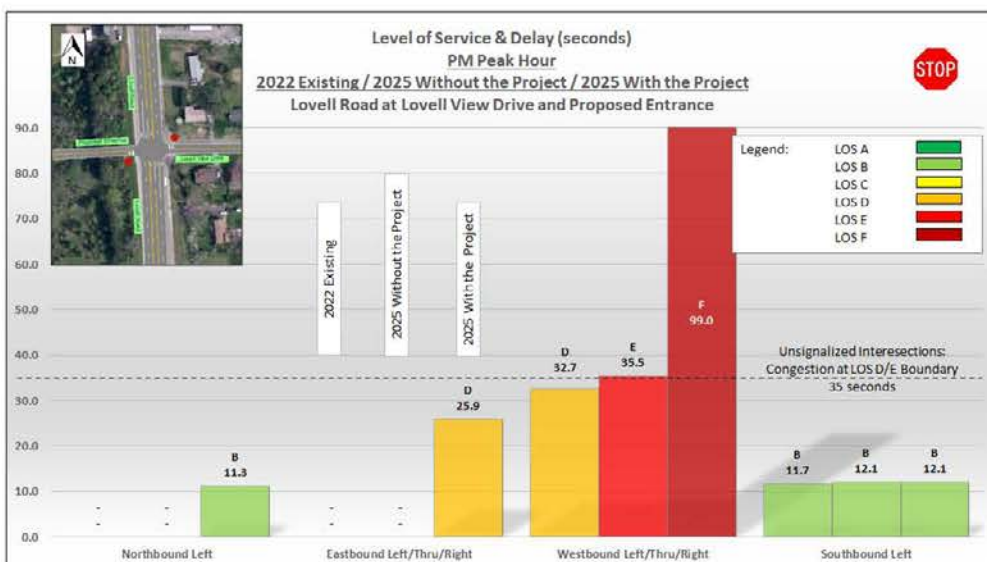
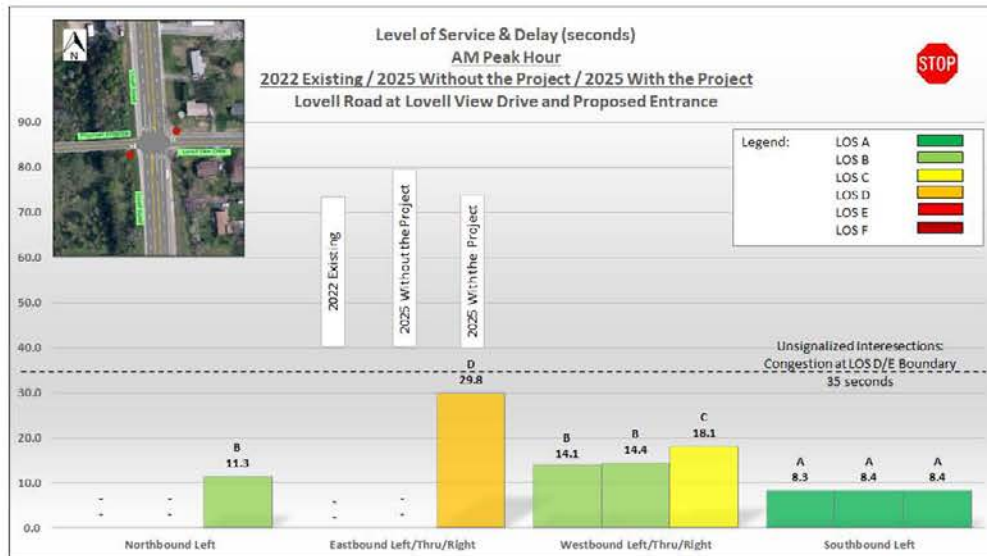
LOCATION / PEAK HOUR MOVEMENT	2022 EXISTING			2025 WITHOUT THE PROJECT			2025 WITH THE PROJECT		
	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c	LOS ^a	Delay ^b	v/c ^c
AM Peak									
Northbound Left	-	-	-	-	-	-	B	11.3	0.041
Eastbound Left/Thru/Right	-	-	-	-	-	-	D	29.8	0.485
Westbound Left/Thru/Right	B	14.1	0.100	B	14.4	0.104	C	18.1	0.139
Southbound Left	A	8.3	0.004	A	8.4	0.004	A	8.4	0.004
PM Peak									
Northbound Left	-	-	-	-	-	-	B	11.3	0.152
Eastbound Left/Thru/Right	-	-	-	-	-	-	D	25.9	0.393
Westbound Left/Thru/Right	D	32.7	0.288	E	35.5	0.308	F	99.0	0.613
Southbound Left	B	11.7	0.022	B	12.1	0.023	B	12.1	0.023

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

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio



▪ **POTENTIAL TRANSPORTATION SAFETY ISSUES:**

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

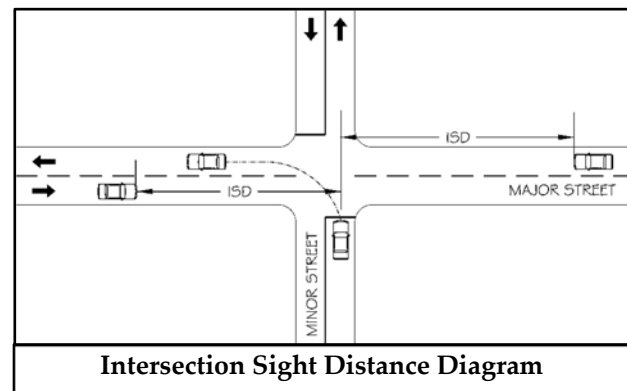
➤ **EVALUATION OF SIGHT DISTANCE**

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

Methodology:

SSD is the distance required for a motorist 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 considered the desirable 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) left-turn, (2) right-turn, (3) or a crossing maneuver across the major street. For turns from the minor street, ISD is needed to allow a stopped motorist to turn onto a major street without being overtaken by an approaching vehicle. The most critical ISD is for left-turns from the minor street. The ISD for this maneuver includes the time to turn left and clear half of the intersection without conflicting with the oncoming traffic from the left and accelerating to the road's operating speed without causing the approaching vehicles from the right to reduce their speed substantially.

With a posted speed limit of 45-mph on Lovell Road, the ISD is 565 feet calculated based on AASHTO's (American Association of State Highway Transportation Officials) guidance.

Lovell Road has a 1.0% road grade downhill to the south at the Proposed Entrance location. Based on the posted speed limit of 45-mph on Lovell Road and the existing road grade, the SSD is calculated to be 370 feet looking to the north and 355 feet to the south.

Visual observations of the sight distances at the Proposed Entrance location on Lovell Road were undertaken. Using a Nikon Laser Rangefinder at the Proposed Entrance location, the ISD was visually estimated to be 999+ feet (limit of the rangefinder) to the north and 650 feet to the south. The intersection sight and stopping sight distances from the Proposed Entrance will be adequate based on visual observation.

Images of the existing sight distances at the Proposed Entrance location are presented in the following, labeled with the ISD and SSD and the rangefinder measured sight distances.



View of Sight Distance on Lovell Road at the Proposed Entrance (Looking North)



View of Sight Distance on Lovell Road at the Proposed Entrance (Looking South)

EVALUATION OF TURN LANE THRESHOLDS

An evaluation of the need for separate entering turn lanes into the development in the projected 2025 conditions was conducted for the Proposed Entrance on Lovell Road. The evaluation did not include left-turn entering movements since an existing TWLTL is already provided in the center of Lovell Road.

The criteria used for this turn lane evaluation were based on Knox County's "Access Control and Driveway Design Policy" and TDOT's "Highway System Access Manual". These design policies relate vehicle volume thresholds based on prevailing speeds for two-lane and four-lane roadways.

According to Knox County's and TDOT's guidelines, with a posted speed limit of 45-mph on Lovell Road, a separate southbound right-turn entering lane is not warranted at the Proposed Entrance based on the projected 2025 AM and PM peak hour traffic volumes. However, the projected 2025 PM volumes in the PM peak hour nearly meet the warrant for a right-turn lane based on Knox County's and TDOT's guidelines. To fully meet the right-turn lane warrant in the projected PM peak hour, the number of apartments would have to be increased by an additional 212 units or, more realistically, the number of southbound thru volumes on Lovell Road would have to be increased by 88 vehicles. The worksheets for these evaluations are provided in Appendix I.

CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the proposed Icon Apartment Homes at Lovell Road development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level.

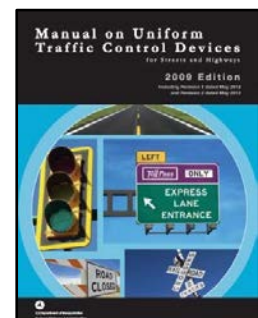


Lovell Road at Lovell View Drive and Proposed Entrance: The results of the 2025 projected level of service calculations for the Lovell Road at Lovell View Drive and the Proposed Entrance were determined to be poor with respect to vehicle delays for the eastbound (Proposed Entrance approach) and westbound (Lovell View Drive) approaches in the AM and PM peak hours. Projected northbound and southbound left-turn movements on Lovell Road were calculated with excellent LOS.

- 1a) It is recommended that a Stop Sign (R1-1) be installed, and a 24" white stop bar be applied to the westbound Proposed Entrance approach at Lovell Road. The stop bar should be applied a minimum of 4 feet away from the edge of Lovell Road and placed at the desired stopping point that maximizes the sight distance.
- 1b) Sight distances at the Proposed Entrance approach must not be impacted by future landscaping, signage, or vegetation. Based on a posted speed limit of 45-mph on Lovell Road, the desirable ISD is 565 feet looking in each direction at the entrance, and the required SSD is calculated to be 370 feet looking to the north and 355 feet to the south at the Proposed Entrance. A visual inspection determined that these sight distances are available. The site designer must ensure that these intersection and stopping sight distances are accounted for and provided in the design plans.
- 1c) As an investigation into potential remediation for this intersection, an evaluation was conducted with respect to traffic signal warrants.

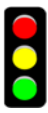
Methodology:

The Manual on Uniform Traffic Control Devices – 2009 Edition (MUTCD) presents nine different warrants that the traffic engineering profession has developed to determine whether a traffic signal is warranted. These warrants cover a broad range of minimum elements required to indicate whether a traffic signal is justified for any particular location. These elements consist of



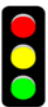
traffic volumes, pedestrian volumes, crash history, and other factors. The MUTCD explicitly states that a traffic control signal should not be installed unless one or more of the manual's signal warrants are met. However, the satisfaction of a warrant does not entirely in itself justify the need for a traffic signal. Sometimes further engineering studies and judgments must be applied before justifying the need for a traffic signal installation. These additional studies are significant in ensuring that a traffic signal's installation will not degrade safety and efficiencies.

The MUTCD defines nine different warrants, two of which are potentially applicable for this intersection at this time and are explained below:



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.

Even though nine warrants are offered to justify a traffic signal, according to the TDOT Traffic Signal Manual, the agency gives precedence to Warrant #1 (Eight Hour Vehicular Volume) and Warrant #7 (Crash Experience). Even though Warrant #2 is not a primary warrant used by TDOT, it is included in this study. Furthermore, TDOT does not allow installing a traffic signal on a state route based on speculative developments or unrealized traffic volumes.

The intersection of Lovell Road at Lovell View Drive and the Proposed Entrance was evaluated in the projected 2025 conditions to determine whether a traffic signal could


be justified based on the MUTCD Warrants listed above. The Proposed Entrance approach and Lovell View Drive were used as the minor side streets for the warrant analysis, and Lovell Road was the major street. Warrant #7 was not analyzed at this intersection for this study. Warrant #7 was not included because one of the primary criteria for an intersection to meet the warrant is that an “Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency...” It is not believed that any specific alternatives have been implemented and observed at this intersection; therefore, this warrant was not included in this study.

A spreadsheet was used to calculate the 2025 traffic volumes generated by the development being added to the intersection during the highest 8 hours of traffic based on the assumed trip distribution. This spreadsheet is shown in Appendix J. It is calculated that this intersection will not meet Warrant #1 or Warrant #2 in 2025 based on this spreadsheet output and evaluating the results against the traffic signal warrant thresholds. Appendix J shows the traffic signal warrant spreadsheet for this evaluation.

- 1d) This intersection was examined with the addition of an additional exiting lane for the Proposed Entrance at Lovell Road.

An additional capacity analysis was conducted for the intersection with the addition of an exclusive exiting left-turn lane on the Proposed Entrance approach coupled with a separate exiting right-turn lane. With the addition of an exclusive left-turn lane on the Proposed Entrance approach, the capacity analyses determined that the overall intersection delay would be reduced, particularly for eastbound exiting right-turn movements towards the south on Lovell Road. However, higher vehicle delays will still be experienced by the Icon Apartment residents exiting left towards the north and the exiting residents from the Lovell View Subdivision at Lovell View Drive. The results of this analysis are shown in Table 8.

TABLE 8
2025 INTERSECTION CAPACITY ANALYSIS RESULTS -
PROJECTED HORIZON YEAR (WITH THE PROJECT) - ADDITION OF EXCLUSIVE EASTBOUND LEFT-TURN LANE

INTERSECTION	TRAFFIC CONTROL	APPROACH/ MOVEMENT	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Lovell Road at Lovell View Drive and Proposed Entrance		Northbound Left	B	11.3	0.041	B	11.3	0.152
		Eastbound Left	E	36.8	0.294	E	43.4	0.230
		Eastbound Thru/Right	B	14.9	0.192	B	13.5	0.163
		Westbound Left/Thru/Right	C	18.1	0.139	F	99.0	0.613
		Southbound Left	A	8.4	0.004	B	12.1	0.023

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

^a Level of Service

^b Average Delay (sec/vehicle)

^c Volume-to-Capacity Ratio

Furthermore, as part of evaluating the projected conditions, estimated vehicle queue lengths at the intersection with two exiting lanes at the Proposed Entrance were calculated based on the projected 2025 traffic volumes.

The 95th percentile vehicle queue length is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point.

The projected vehicle queue results were calculated from the Synchro software. The Synchro software calculates the 95th percentile vehicle queues and takes into account two-stage left-turns when the median width is sufficient to store a vehicle temporarily. The Synchro software was inputted with values that included a sufficient median width due to the provided TWLTL on Lovell Road. The vehicle queue results from the Synchro software for the intersection approaches are shown in the worksheets from the capacity analyses shown in Appendix F. The 95th percentile vehicle queue lengths at the intersection for the projected 2025 conditions in the AM and PM peak hours are summarized in Table 9.

TABLE 9
VEHICLE QUEUE SUMMARY -
2025 AM AND PM PEAK HOUR TRAFFIC VOLUMES

INTERSECTION	APPROACH/ MOVEMENT	95 th PERCENTILE QUEUE LENGTH (FT)	
		AM PEAK HOUR	PM PEAK HOUR
Lovell Road at Lovell View Drive and Proposed Entrance	Northbound Left (TWLTL)	2.5	12.5
	Eastbound Left	30.0	20.0
	Eastbound Thru/Right	17.5	15.0
	Westbound Left/Thru/Right	12.5	70.0
	Southbound Left (TWLTL)	0.0	2.5

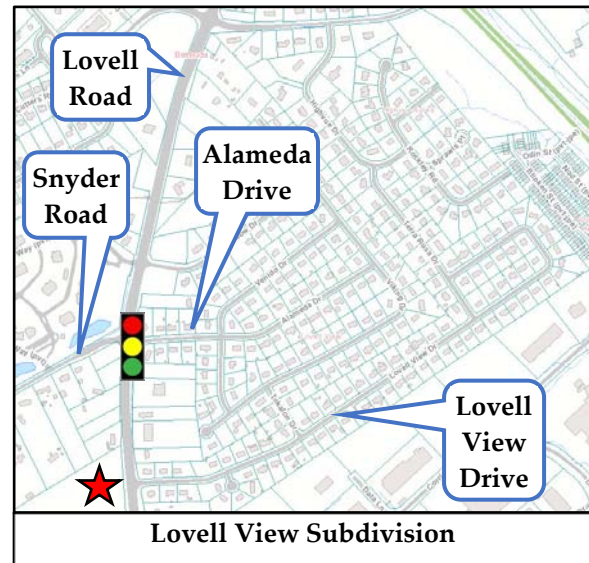
95th percentile queues were calculated in Synchro 11 software
Synchro 11 vehicle length = 25 feet

Since most of the exiting apartment traffic is expected to turn right towards the south at Lovell Road, the eastbound exiting lane from the apartment buildings over to Lovell Road is recommended to transition directly to a right-turn lane at Lovell Road. Thru movements from the Proposed Entrance across Lovell Road to Lovell View Drive are not expected (and vice versa). Thus, the eastbound exiting thru movement can be assigned and marked on the pavement either at the exclusive left-turn lane or right-turn lane, whichever lines up more directly in the design with the opposing lane across Lovell Road at Lovell View Drive. Based on these results, the eastbound exiting left-turn lane on the Proposed Entrance approach is recommended to have a minimum storage length of 50 feet.

The 2025 projected vehicle delays for eastbound left-turns at the Proposed Entrance approach and the westbound turn movements from Lovell View Drive are projected to experience higher vehicle delays. However, the vehicle queue lengths are estimated to be reasonable, with the longest queue length calculated to be 30 feet in the PM peak hour at the Proposed Entrance and 70 feet for the Lovell View Drive westbound approach.

It is surmised that the capacity analyses computed for these movements might understate the level of service and overstate the potential vehicle delays. The influence of the traffic signal north of the Proposed Entrance and Lovell View Drive should provide gaps in the traffic flow on Lovell Road that will allow more egress than can be accurately modeled in this analysis. This traffic signal will form vehicle platoons with potential gaps in the traffic stream to allow more significant egress and ingress.

Furthermore, while slightly more inconvenient for some residents in the Lovell View Subdivision, the traffic signal to the north at the intersection of Lovell Road at Snyder Road/Alameda Drive does provide a safer and more regulated means of access to Lovell Road. After the Icon Apartment Homes at Lovell Road is constructed, some residents who currently use Lovell View Drive to access Lovell Road to the south may choose to exit the subdivision via the traffic signal provided at Alameda Drive, especially if longer vehicle queues and delays are experienced on Lovell View Drive at Lovell Road. All residents in the Lovell View Subdivision have road access via Alameda Drive to the traffic signal on Lovell Road at Snyder Road.



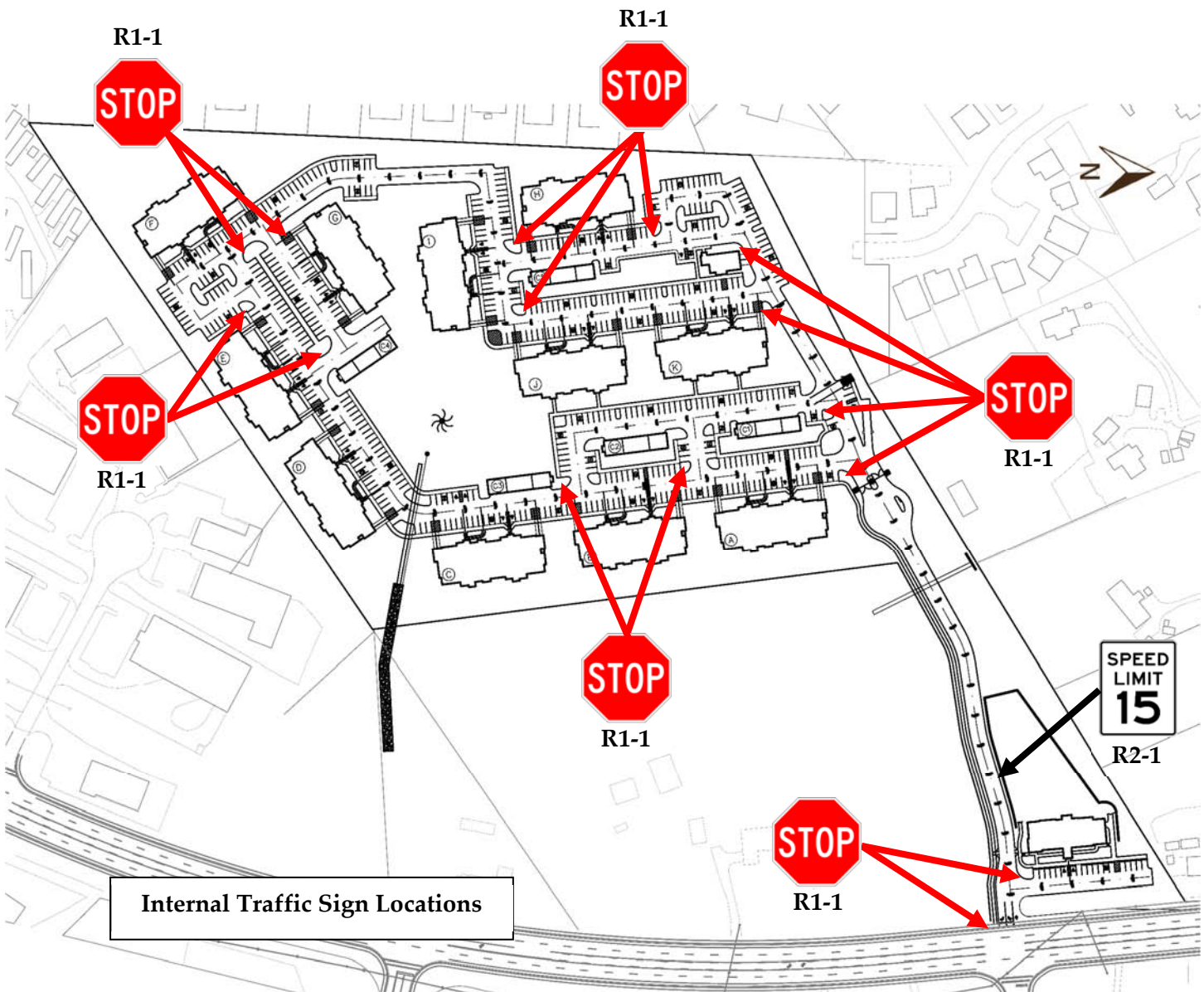
- 1e) The evaluation determined that the projected AM and PM 2025 volumes will not meet the Knox County or TDOT warrants for constructing an exclusive southbound right-turn lane on Lovell Road. However, in the 2025 PM peak hour, the warrants are nearly met in both guideline evaluations. TDOT has indicated that an exclusive southbound right-turn lane will be required at the Proposed Entrance.

The design of this lane should follow TDOT guidelines. Due to the constraints of the available property frontage on Lovell Road, a speed of 10-mph less than the design speed can be considered by assuming some deceleration will occur before the lane change. Thus, with a design speed target of 35-mph, the right-turn lane should have a taper of 15:1 (12-foot lane = 180 feet). The remaining available frontage should be constructed with a full lane storage length of 95 feet resulting in an overall length of 275 feet. This reduced storage length is acceptable since desirable deceleration lengths are provided for fully-stopping vehicles, which would not apply in this case to right-turning vehicles at speeds closer to 15 mph.



Icon Apartment Homes at Lovell Road Internal Drive/Parking Lot Aisleways: The current layout plan shows a single entrance driveway with several parking lot aisleways constructed for the development, as shown in Figure 3.

- 2a) A 15-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the development entrance driveway off Lovell Road. Since the entrance driveway will not be a public road, a posted speed limit of less than 25-mph is acceptable.
- 2b) Stop Signs (R1-1) with 24" white stop bars and other traffic signage are recommended to be installed at the internal locations, as shown below:



- 2c) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a speed limit of 15-mph in the development, the internal intersection sight distance is 170 feet. The required stopping sight distance is 80 feet for a level road grade. The site designer should ensure that internal sight distance lengths are met.
- 2d) With long and straight internal parking lot aisleways, it is recommended that speed humps or tables be considered to reduce internal traffic speeds in the development. Alternatively, parking lot islands could be extended toward the aisleways. Extending the parking lot islands a few feet would narrow the aisleway widths and reduce the available driving surface. A narrower aisleway design would reduce driver comfort and internal vehicle speeds.
- 2e) All drainage grates and covers for the residential development must be pedestrian and bicycle safe.
- 2f) Internal sidewalks are proposed throughout the development. The internal sidewalk system should connect to the existing external sidewalk system provided on the west side of Lovell Road. Sidewalks should have appropriate ADA-compliant ramps at intersection corners, and the internal sidewalks are recommended to be 5 feet minimum in width to meet Knox County regulations. White crosswalks should be marked on the road pavement internally where pedestrians are expected to cross.
- 2g) The site designer should provide the appropriate accommodations for the existing bike lane and sidewalks on the west side of Lovell Road at the Proposed Entrance.
- 2h) All road grade and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

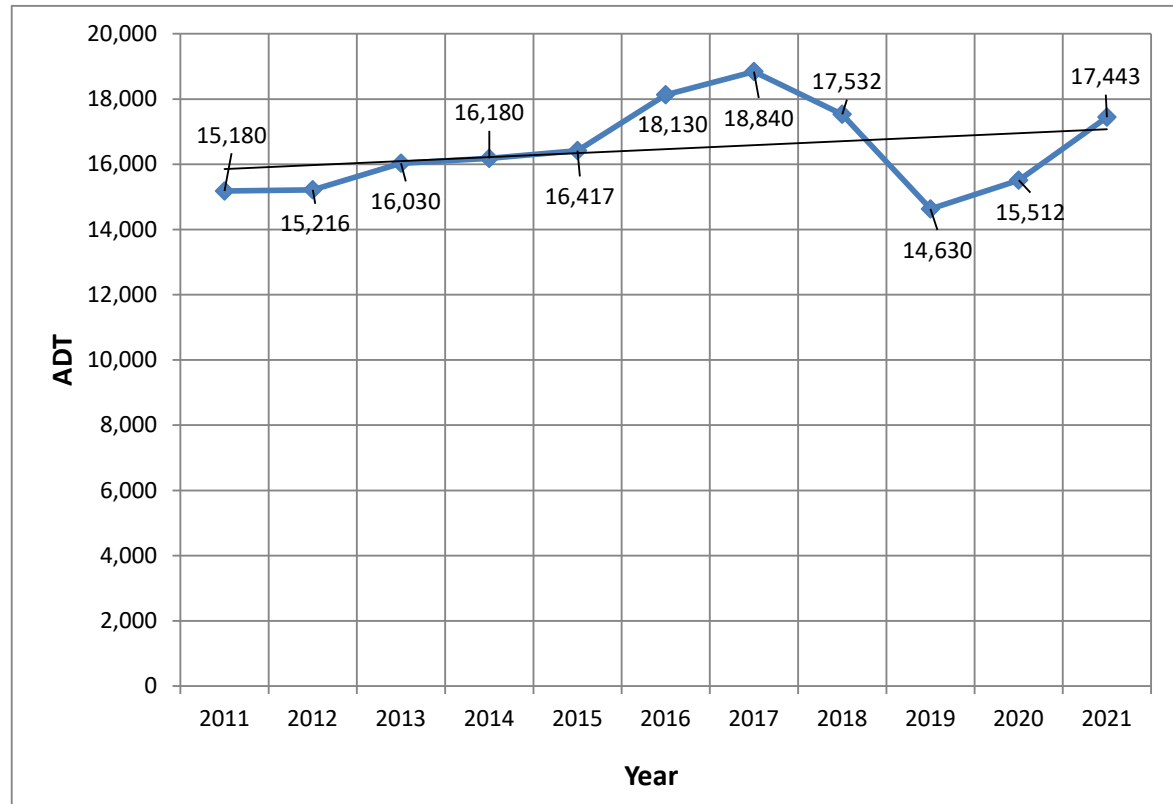
Historical Traffic Counts

Organization: TDOT

Station ID #: 47000285

Location: Lovell Road, between Gilbert Drive and Cornerstone Drive

YEAR	AADT	
2011	15,180	Trendline ↓
2012	15,216	
2013	16,030	
2014	16,180	
2015	16,417	
2016	18,130	
2017	18,840	
2018	17,532	
2019	14,630	
2020	15,512	
2021	17,443	



2011 - 2021 Growth Rate = 14.9%

Average Annual Growth Rate = 1.4%

TN

TDOT

Department of Transportation

MS2

Transportation Data Management System

[Home](#)
[TMC](#)
[TCLS](#)
[TIDS](#)
[TSMs](#)
[NMDS](#)
[WOTS](#)
[RLIV](#)

[Login](#)
[Locate](#)
[Locate All](#)
[Email This](#)

1 of 1

Goto Record

go

Location ID	47000205	MPO ID	
Type	SPOT	HPMS ID	
On IHS		On HPMS	
LRS ID	475R131001	LRS Loc Pt	1.717
SF Group	Urban	Route Type	
AF Group	R1 Int/Art	Route	
GF Group	Knox	Active	Yes
Class Dist Grp	R1 Int/Art	Category	CC
Seas Class Grp			
WIM Group			
QC Group	Default		
Functl Class	Minor Arterial	Milepost	
Located On	LOVELL RD.		
Loc On Alias	NORTH OF I-40		

More Detail

STATION DATA

Directions:

2-WAY

NB

SB

AADT

Year	AADT	DHV 30	K %	D %	PA	BC	Src
2020	15,512	1,748	11	52	14,921 (96%)	591 (4%)	
2019	14,630		12	53			
2018	17,532		10	53			
2017	18,840		9	55			
2016	18,130		10	52			

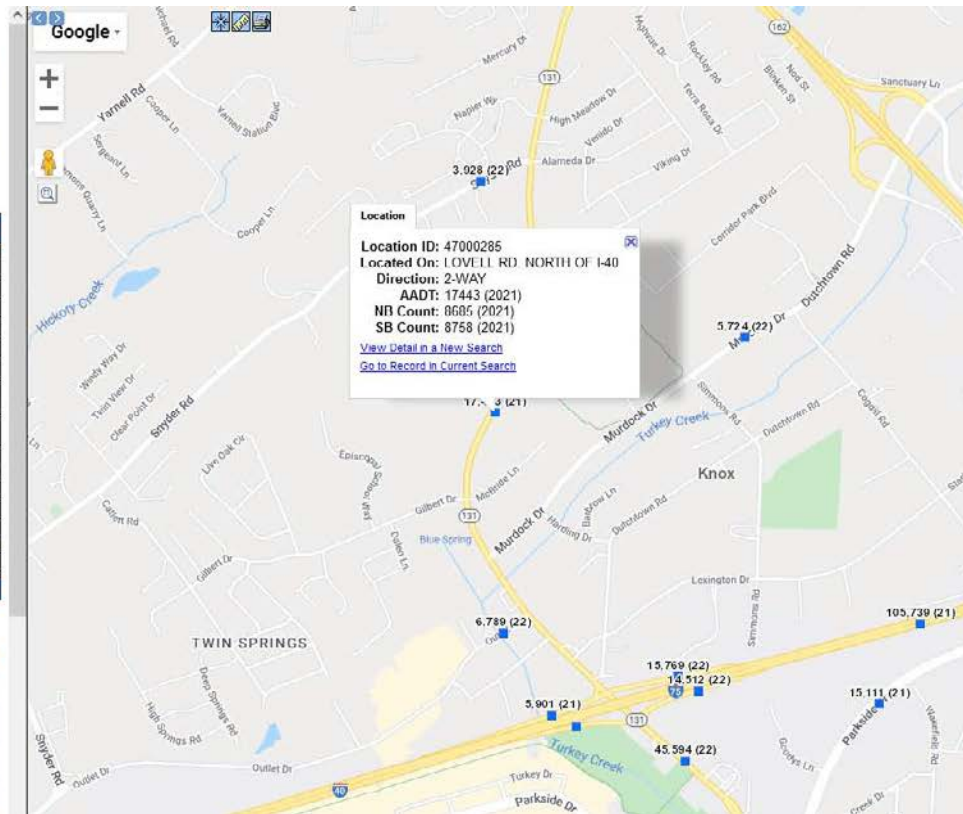
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1-5 of 37





APPENDIX B

WALK SCORE

WALKSCORE


(from walkscore.com)




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

 [Go](#)


1033 Lovell Road

Knoxville, Tennessee, 37932

Commute to **Downtown Farragut** 

 13 min  28 min  60+ min [View Routes](#)

[Favorite](#) [Map](#)

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

Walk Score

10

Car-Dependent
Almost all errands require a car.

Transit Score

0

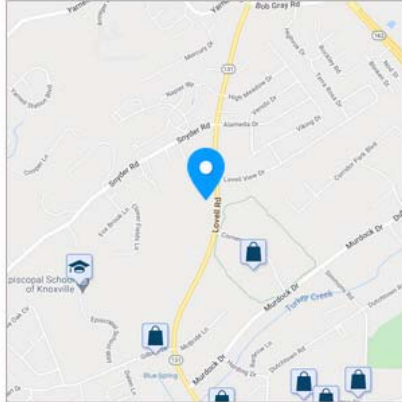
Minimal Transit
It is possible to get on a bus.

Bike Score

7

Somewhat Bikeable
Minimal bike infrastructure.

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

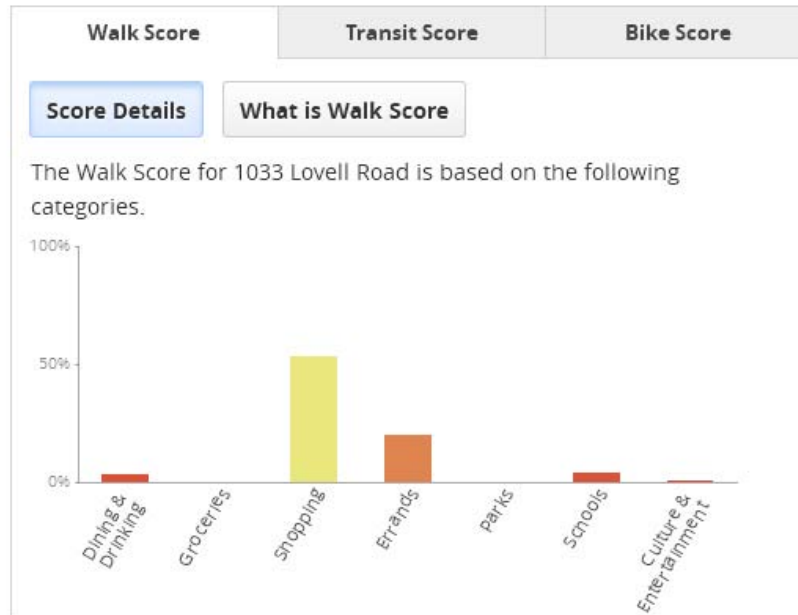


Scores for 1033 Lovell Road



Walk Score
10

Bike Score
7



Scores for 1033 Lovell Road



Walk Score
10

Bike Score
7

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

Scores for 1033 Lovell Road

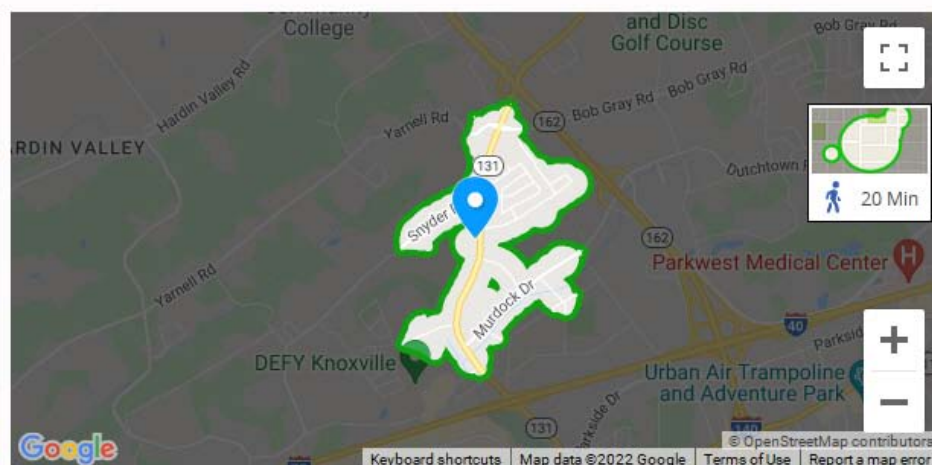


Walk Score	Transit Score	Bike Score
Bike Score measures whether an area is good for biking based on bike lanes and trails, hills, road connectivity, and destinations.		
90-100	Biker's Paradise Daily errands can be accomplished on a bike	
70-89	Very Bikeable Biking is convenient for most trips	
50-69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

Travel Time Map

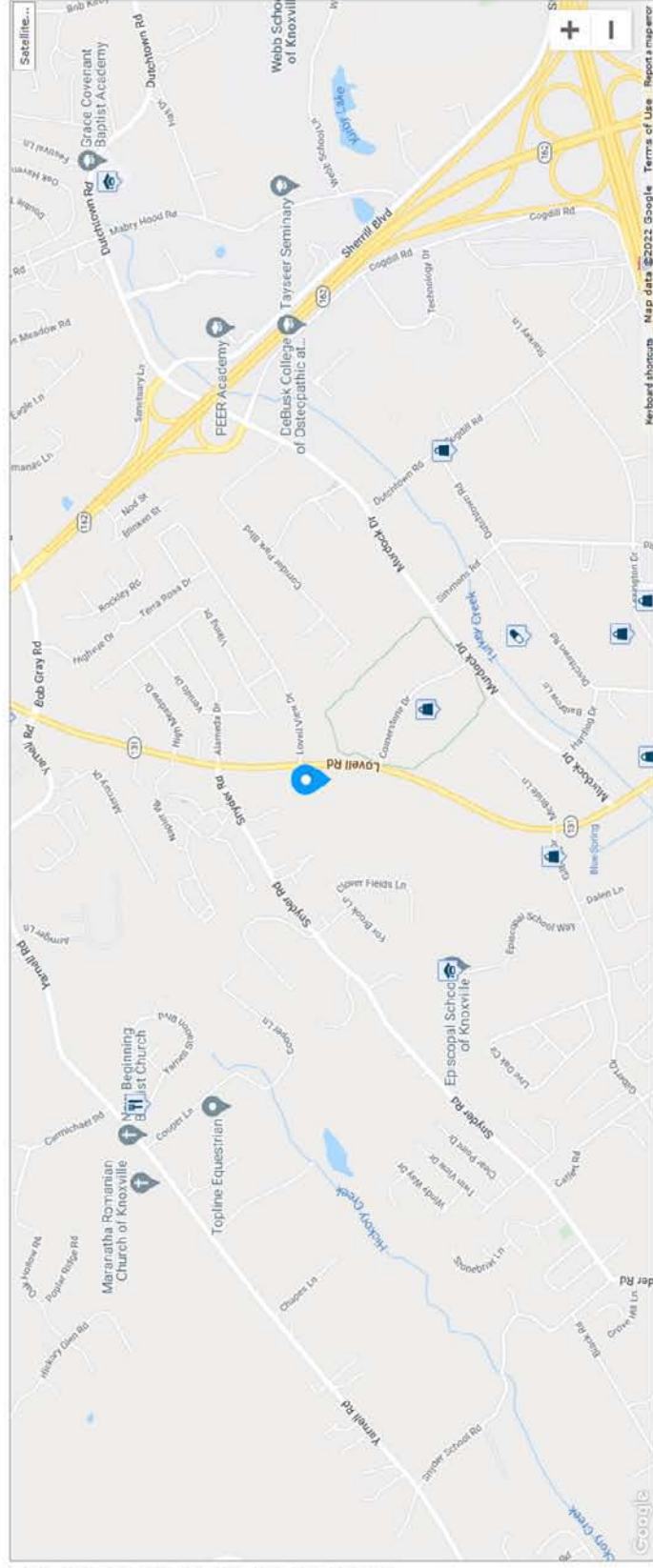
[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 1033 Lovell Road.



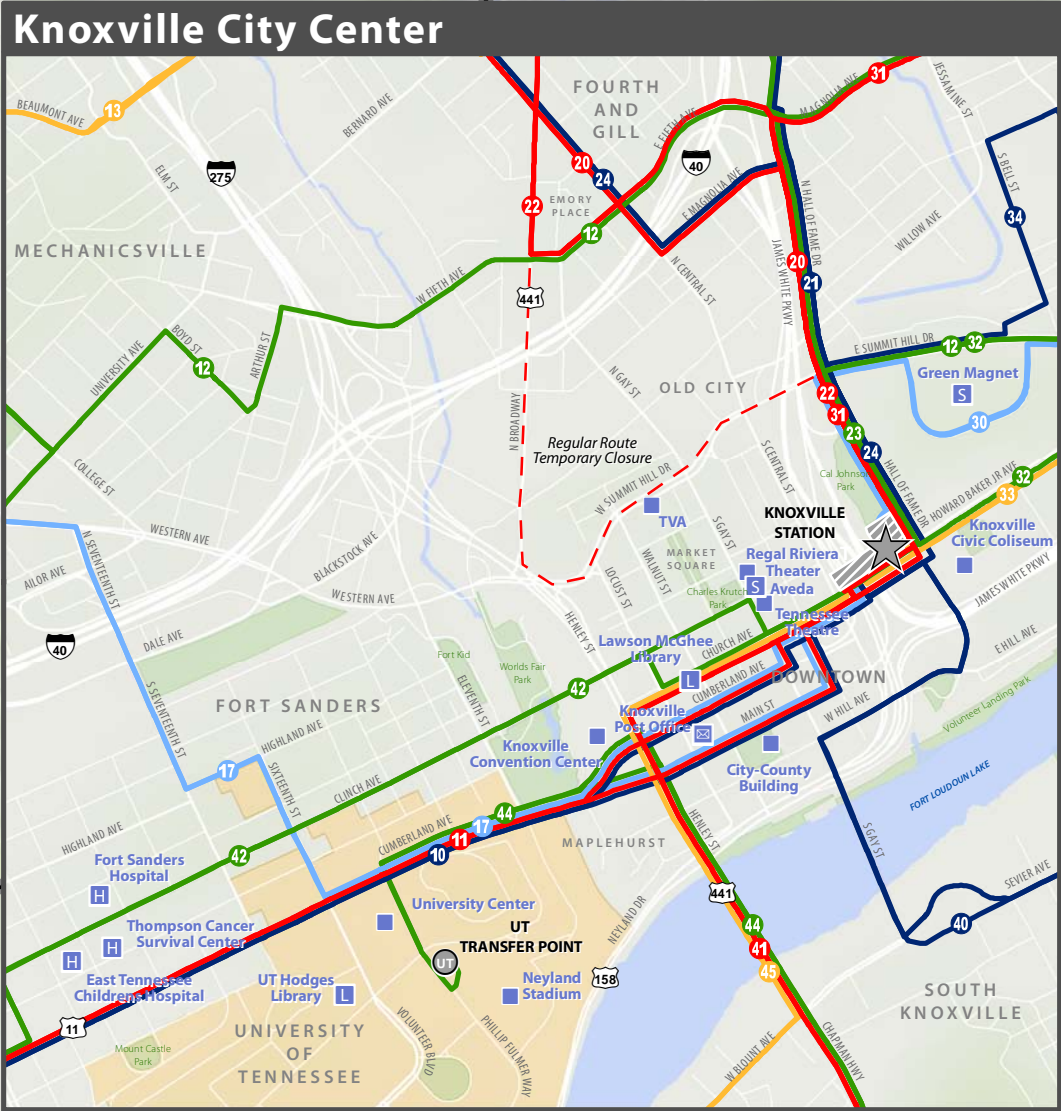
What's Nearby

Restaurants:	
Auntie Anne's	.9mi
Coffee:	
Starbucks	1.3mi
Bars:	
Roger	3mi
Groceries:	
Turkey Creek Wine & Spirits	1.1mi
Parks:	
Ball Camp Park	3mi
Schools:	
Episcopal School of Knoxville	.5mi
Shopping:	
US Cellular	.3mi
Entertainment:	
Ketch One	1.1mi
Errands:	
Return Solutions	.6mi
Search Nearby:	



APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION



Legend

Transfer Point

Lift Service Area Boundary

Points of Interest

Hospital

School

Library

Point of Interest

Post Office

Distances

0

5

10

Minutes Walking

0

5

10

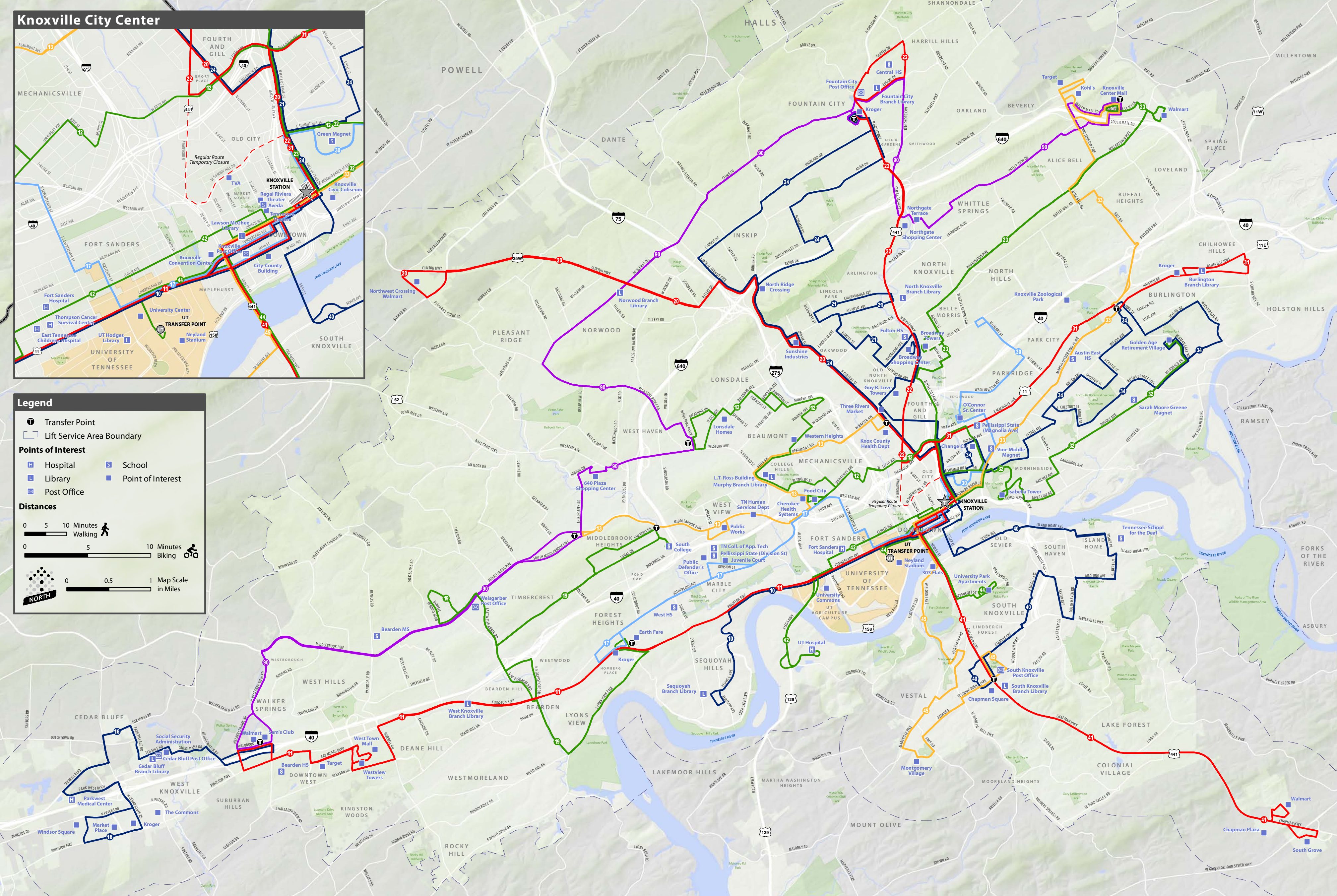
Minutes Biking

0

0.5

1

Map Scale in Miles



FARE INFORMATION

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

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

REDUCED FARE INFORMATION

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

BUS STOPS ONLY!

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

KAT HOLIDAYS

KAT buses do not run on the following holidays:

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

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

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

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

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

16

CEDAR BLUFF CONNECTOR
(Weekdays and Saturdays)

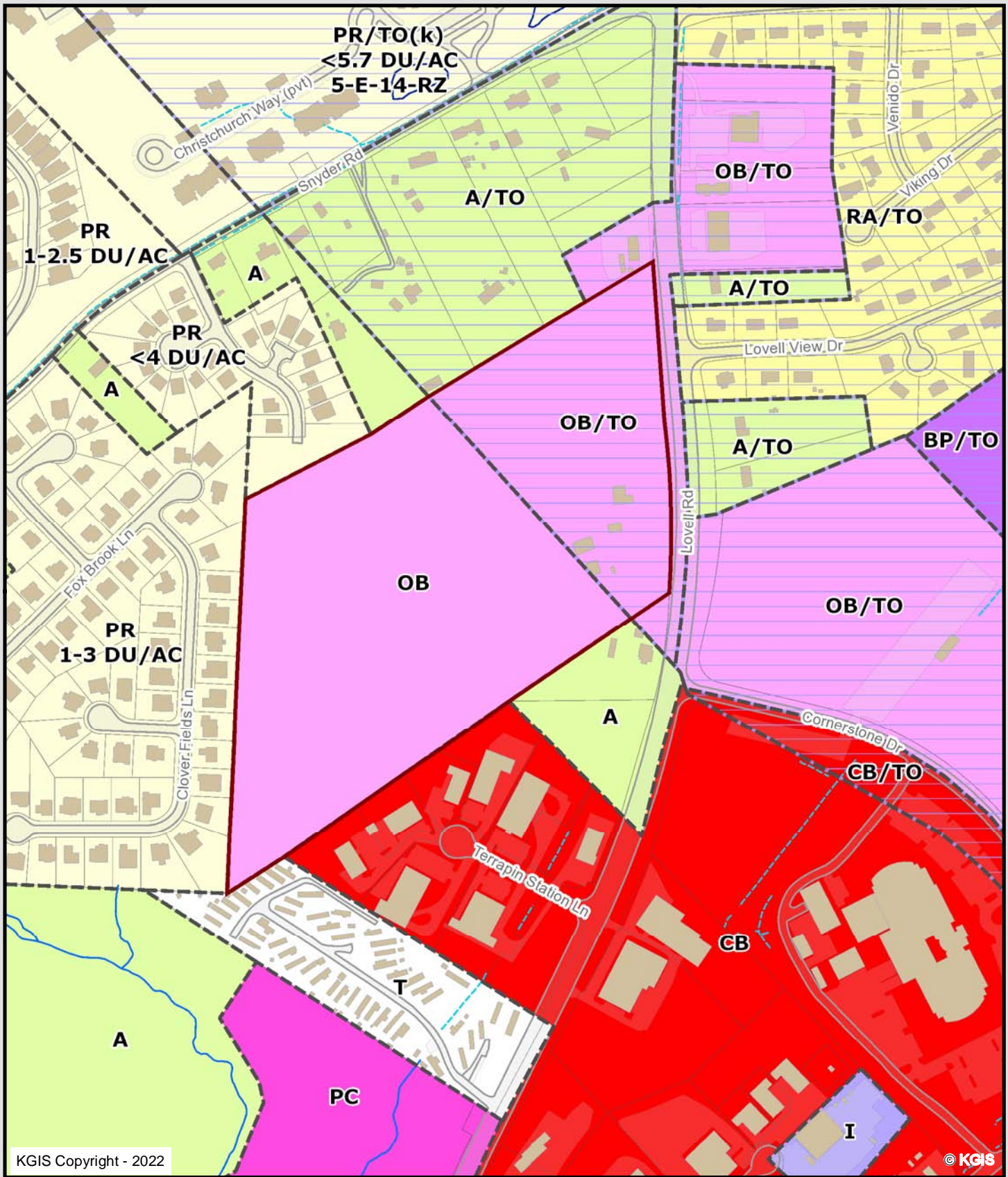


Going from Wal Mart to Windsor Square				Going from Windsor Square to Wal Mart			
T Transfer to:							Rts. 11 & 90
Walmart	Park Village at Woodpark	Parkwest Hospital	Windsor Square	Parkwest Hospital	Cedar Bluff at Fox Lonas	Walmart	
1	2	3	4	5	6	7	
WEEKDAY SCHEDULE							
A.M.	6:15	6:27	6:32	6:42	6:50	6:54	7:10
	7:15	7:27	7:32	7:42	7:50	7:54	8:10
	8:15	8:27	8:32	8:42	8:50	8:54	9:10
	9:15	9:27	9:32	9:42	9:50	9:54	10:10
	10:15	10:27	10:32	10:42	10:50	10:54	11:10
	11:15	11:27	11:32	11:42	11:50	11:54	12:10
P.M.	12:15	12:27	12:32	12:42	12:50	12:54	1:10
	1:15	1:27	1:32	1:42	1:50	1:54	2:10
	2:15	2:27	2:32	2:42	2:50	2:54	3:10
	3:15	3:27	3:32	3:42	3:50	3:54	4:10
	4:15	4:27	4:32	4:42	4:50	4:54	5:10
	5:15	5:27	5:32	5:42	5:50	5:54	6:10
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	7:15	7:27	7:32	7:42	7:50	7:54	8:10
	8:15	8:27	8:32	8:42	8:50	8:54	9:10
	9:15	9:27	9:32	9:42	9:50	9:54	10:10
SATURDAY SCHEDULE							
A.M.	7:15	7:27	7:32	7:42	7:50	7:54	8:10
	8:15	8:27	8:32	8:42	8:50	8:54	9:10
	9:15	9:27	9:32	9:42	9:50	9:54	10:10
	10:15	10:27	10:32	10:42	10:50	10:54	11:10
	11:15	11:27	11:32	11:42	11:50	11:54	12:10
P.M.	12:15	12:27	12:32	12:42	12:50	12:54	1:10
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	7:15	7:27	7:32	7:42	7:50	7:54	8:10
	8:15	8:27	8:32	8:42	8:50	8:54	9:10
	9:15	9:27	9:32	9:42	9:50	9:54	10:10

Need help reading this schedule?
 Need other general information on how to ride?
 Visit www.katbus.com or call 865-637-3000

APPENDIX D

ZONING MAP

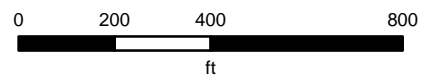


Existing Zoning Map

Knoxville - Knox County - KUB Geographic Information System



Printed: 3/21/2022 at 1:12:59 PM



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APPENDIX E

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Lovell Road (NB and SB)
 Minor Street: Lovell View Drive (WB)
 Traffic Control: Stop Sign on Lovell View Drive

3/22/2022 (Tuesday)
 Mostly Sunny/Mild
 Conducted by: Ajax Engineering

TIME	Lovell Road		Lovell View Drive		Lovell Road		VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND	THRU	WESTBOUND	RT	THRU	RT		
7:00 AM	0	144	4	0	87	0	235	
7:15 AM	0	193	2	1	104	3	303	
7:30 AM	1	238	3	5	109	1	357	7:30 AM - 8:30 AM
7:45 AM	1	281	6	1	118	1	408	
8:00 AM	1	215	2	2	122	1	343	
8:15 AM	0	203	2	0	122	2	329	
8:30 AM	0	208	5	1	112	0	326	
8:45 AM	1	198	5	2	115	1	322	
TOTAL	4	1680	29	12	889	9	2623	
11:00 AM	2	131	3	4	119	3	262	
11:15 AM	0	144	1	0	116	4	265	
11:30 AM	1	162	5	1	116	2	287	
11:45 AM	0	128	2	1	134	1	266	
12:00 PM	1	153	3	1	142	4	304	12:00 PM - 1:00 PM
12:15 PM	2	150	1	0	154	9	316	
12:30 PM	2	156	4	2	154	1	319	
12:45 PM	0	166	2	3	146	1	318	
TOTAL	8	1190	21	12	1081	25	2337	
2:00 PM	0	111	7	1	150	5	274	
2:15 PM	0	143	4	5	151	3	306	
2:30 PM	0	143	3	1	164	4	315	
2:45 PM	1	147	0	1	142	4	295	
3:00 PM	4	165	2	1	199	4	375	
3:15 PM	0	168	4	1	188	5	366	
3:30 PM	1	173	5	0	168	5	352	
3:45 PM	1	192	5	2	202	9	411	
4:00 PM	0	221	6	1	217	5	450	
4:15 PM	2	189	1	0	220	5	417	
4:30 PM	0	207	3	1	255	7	473	
4:45 PM	3	235	10	2	231	7	488	4:45 PM - 5:45 PM
5:00 PM	1	221	4	2	304	10	542	
5:15 PM	0	221	2	3	313	5	544	
5:30 PM	1	242	4	0	274	7	528	
5:45 PM	1	189	4	0	270	6	470	
TOTAL	15	2967	64	21	3448	91	6606	

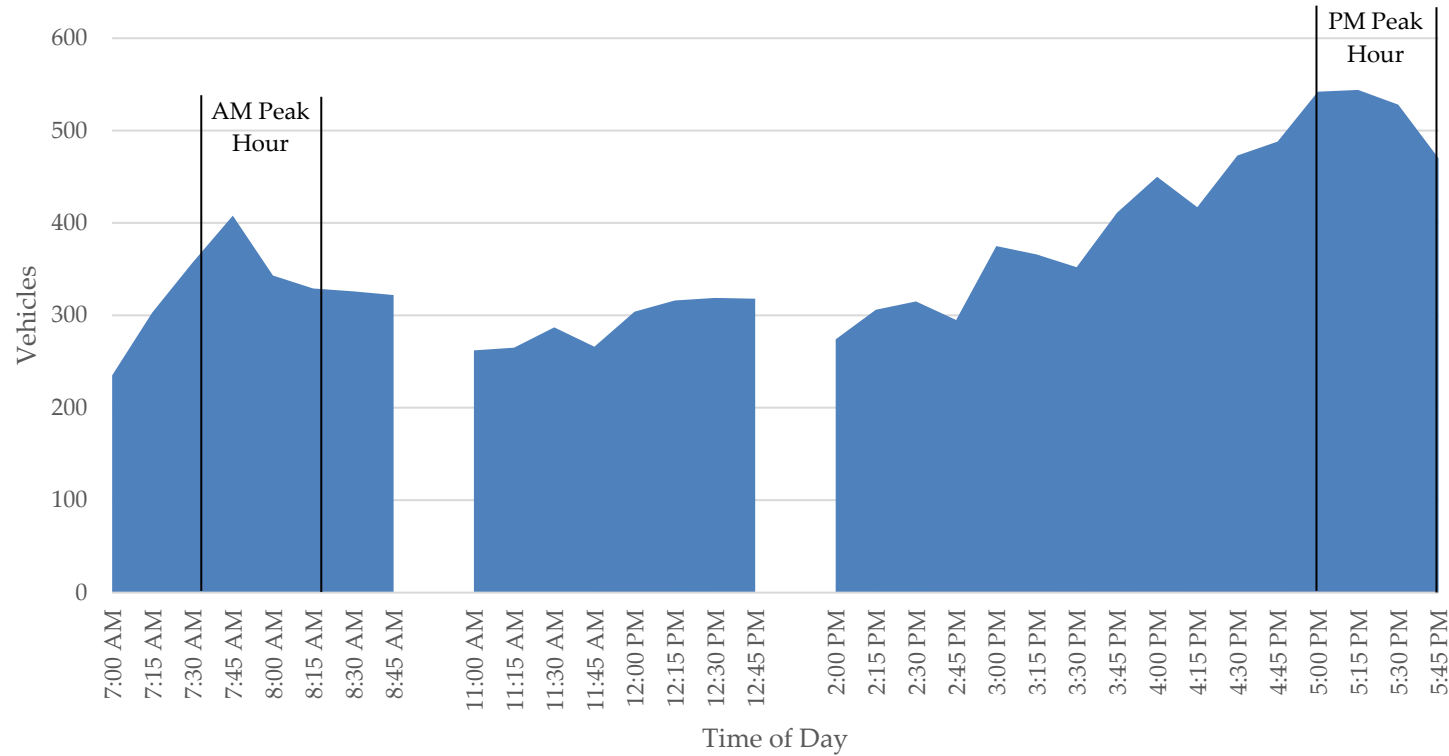
2022 AM Peak Hour 7:30 AM - 8:30 AM

TIME	Lovell Road		Lovell View Drive		Lovell Road	
	SOUTHBOUND	THRU	WESTBOUND	RT	THRU	RT
7:30 AM	1	238	3	5	109	1
7:45 AM	1	281	6	1	118	1
8:00 AM	1	215	2	2	122	1
8:15 AM	0	203	2	0	122	2
TOTAL	3	937	13	8	471	5
PHF	0.75	0.83	0.54	0.40	0.97	0.63

2022 PM Peak Hour 4:45 PM - 5:45 PM

TIME	Lovell Road		Lovell View Drive		Lovell Road	
	SOUTHBOUND	THRU	WESTBOUND	RT	THRU	RT
4:45 PM	3	235	10	2	231	7
5:00 PM	1	221	4	2	304	10
5:15 PM	0	221	2	3	313	5
5:30 PM	1	242	4	0	274	7
TOTAL	5	919	20	7	1122	29
PHF	0.42	0.95	0.50	0.58	0.90	0.73

**Lovell Road at Lovell View Drive
Intersection Count Totals
3/22/2022**



APPENDIX F

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 11)





EXISTING CONDITIONS

HCM 2010 TWSC
4: Lovell Road & Lovell View Drive

04/11/2022

Intersection

Int Delay, s/veh 0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	8	471	5	3	937
Future Vol, veh/h	13	8	471	5	3	937
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	2	-	1	-	-	-1
Peak Hour Factor	54	40	97	63	75	83
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	24	20	486	8	4	1129

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1063	247	0
Stage 1	490	-	-
Stage 2	573	-	-
Critical Hdwy	7.2	7.1	-
Critical Hdwy Stg 1	6.2	-	-
Critical Hdwy Stg 2	6.2	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	197	749	-
Stage 1	556	-	-
Stage 2	500	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	196	749	-
Mov Cap-2 Maneuver	329	-	-
Stage 1	556	-	-
Stage 2	498	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	0
HCM LOS	B		





Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	441	1080
HCM Lane V/C Ratio	-	-	0.1	0.004
HCM Control Delay (s)	-	-	14.1	8.3
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0

HCM 2010 TWSC
4: Lovell Road & Lovell View Drive

04/11/2022

Intersection

Int Delay, s/veh 0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	7	1122	29	5	919
Future Vol, veh/h	20	7	1122	29	5	919
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	2	-	1	-	-	-1
Peak Hour Factor	50	58	90	73	42	95
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	40	12	1247	40	12	967

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1775	644	0
Stage 1	1267	-	-
Stage 2	508	-	-
Critical Hdwy	7.2	7.1	-
Critical Hdwy Stg 1	6.2	-	-
Critical Hdwy Stg 2	6.2	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	62	406	-
Stage 1	202	-	-
Stage 2	543	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	61	406	-
Mov Cap-2 Maneuver	155	-	-
Stage 1	202	-	-
Stage 2	531	-	-

Approach	WB	NB	SB
HCM Control Delay, s	32.7	0	0.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	181	546
HCM Lane V/C Ratio	-	-	0.288	0.022
HCM Control Delay (s)	-	-	32.7	11.7
HCM Lane LOS	-	-	D	B
HCM 95th %tile Q(veh)	-	-	1.1	0.1





PROJECTED HORIZON YEAR (WITHOUT THE PROJECT)

HCM 2010 TWSC
4: Lovell Road & Lovell View Drive

04/11/2022

Intersection

Int Delay, s/veh 0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	8	492	5	3	979
Future Vol, veh/h	13	8	492	5	3	979
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	2	-	1	-	-	-1
Peak Hour Factor	54	40	97	63	75	83
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	24	20	507	8	4	1180

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1109	258	0
Stage 1	511	-	-
Stage 2	598	-	-
Critical Hdwy	7.2	7.1	-
Critical Hdwy Stg 1	6.2	-	-
Critical Hdwy Stg 2	6.2	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	183	736	-
Stage 1	541	-	-
Stage 2	484	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	182	736	-
Mov Cap-2 Maneuver	315	-	-
Stage 1	541	-	-
Stage 2	482	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	425	1061
HCM Lane V/C Ratio	-	-	0.104	0.004
HCM Control Delay (s)	-	-	14.4	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0





HCM 2010 TWSC

4: Lovell Road & Lovell View Drive

04/11/2022

Intersection

Int Delay, s/veh 0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	7	1172	29	5	960
Future Vol, veh/h	20	7	1172	29	5	960
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	2	-	1	-	-	-1
Peak Hour Factor	50	58	90	73	42	95
Heavy Vehicles, %	0	0	2	0	0	2
Mvmt Flow	40	12	1302	40	12	1011

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1852	671	0
Stage 1	1322	-	-
Stage 2	530	-	-
Critical Hdwy	7.2	7.1	-
Critical Hdwy Stg 1	6.2	-	-
Critical Hdwy Stg 2	6.2	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	55	389	-
Stage 1	188	-	-
Stage 2	528	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	54	389	-
Mov Cap-2 Maneuver	144	-	-
Stage 1	188	-	-
Stage 2	516	-	-

Approach	WB	NB	SB
HCM Control Delay, s	35.5	0	0.1
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	169	520
HCM Lane V/C Ratio	-	-	0.308	0.023
HCM Control Delay (s)	-	-	35.5	12.1
HCM Lane LOS	-	-	E	B
HCM 95th %tile Q(veh)	-	-	1.2	0.1







PROJECTED HORIZON YEAR (WITH THE PROJECT)

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Vol, veh/h	42	0	78	13	0	8	22	492	5	3	979	12
Future Vol, veh/h	42	0	78	13	0	8	22	492	5	3	979	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	2	-	-	1	-	-	-1	-
Peak Hour Factor	90	90	90	54	90	40	90	97	63	75	83	90
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	47	0	87	24	0	20	24	507	8	4	1180	13








Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1497	1758	597	1157	1760	258	1193	0	0	515	0	0
Stage 1	1195	1195	-	559	559	-	-	-	-	-	-	-
Stage 2	302	563	-	598	1201	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.9	6.9	7.1	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	86	86	451	135	70	736	592	-	-	1061	-	-
Stage 1	201	262	-	457	483	-	-	-	-	-	-	-
Stage 2	688	512	-	431	228	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	81	82	451	105	67	736	592	-	-	1061	-	-
Mov Cap-2 Maneuver	159	188	-	216	154	-	-	-	-	-	-	-
Stage 1	193	261	-	438	463	-	-	-	-	-	-	-
Stage 2	642	491	-	347	227	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	29.8		18.1		0.5		0	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	592	-	-	275	318	1061	-
HCM Lane V/C Ratio	0.041	-	-	0.485	0.139	0.004	-
HCM Control Delay (s)	11.3	-	-	29.8	18.1	8.4	-
HCM Lane LOS	B	-	-	D	C	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.5	0.5	0	-

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	0	74	20	0	7	92	1172	29	5	960	30
Future Vol, veh/h	25	0	74	20	0	7	92	1172	29	5	960	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	2	-	-	1	-	-	-1	-
Peak Hour Factor	90	90	90	50	90	58	90	90	73	42	95	90
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	28	0	82	40	0	12	102	1302	40	12	1011	33
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1907	2598	522	2056	2594	671	1044	0	0	1342	0	0
Stage 1	1052	1052	-	1526	1526	-	-	-	-	-	-	-
Stage 2	855	1546	-	530	1068	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.9	6.9	7.1	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	43	25	505	~ 26	19	389	674	-	-	520	-	-
Stage 1	246	306	-	106	153	-	-	-	-	-	-	-
Stage 2	323	178	-	477	267	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	36	21	505	~ 19	16	389	674	-	-	520	-	-
Mov Cap-2 Maneuver	121	95	-	69	73	-	-	-	-	-	-	-
Stage 1	209	299	-	90	130	-	-	-	-	-	-	-
Stage 2	266	151	-	390	261	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	25.9		99		0.8		0.1					
HCM LOS	D		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	674	-	-	280	85	520	-	-				
HCM Lane V/C Ratio	0.152	-	-	0.393	0.613	0.023	-	-				
HCM Control Delay (s)	11.3	-	-	25.9	99	12.1	-	-				
HCM Lane LOS	B	-	-	D	F	B	-	-				
HCM 95th %tile Q(veh)	0.5	-	-	1.8	2.8	0.1	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				








**PROJECTED HORIZON YEAR (WITH THE PROJECT) – ADDITION OF EXCLUSIVE
EASTBOUND LEFT-TURN LANE**

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	42	0	78	13	0	8	22	492	5	3	979	12
Future Vol, veh/h	42	0	78	13	0	8	22	492	5	3	979	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	2	-	-	1	-	-	-1	-
Peak Hour Factor	90	90	90	54	90	40	90	97	63	75	83	90
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	47	0	87	24	0	20	24	507	8	4	1180	13

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1497	1758	597	1157	1760	258	1193	0	0	515	0	0
Stage 1	1195	1195	-	559	559	-	-	-	-	-	-	-
Stage 2	302	563	-	598	1201	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.9	6.9	7.1	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	86	86	451	135	70	736	592	-	-	1061	-	-
Stage 1	201	262	-	457	483	-	-	-	-	-	-	-
Stage 2	688	512	-	431	228	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	81	82	451	105	67	736	592	-	-	1061	-	-
Mov Cap-2 Maneuver	159	188	-	216	154	-	-	-	-	-	-	-
Stage 1	193	261	-	438	463	-	-	-	-	-	-	-
Stage 2	642	491	-	347	227	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	22.6		18.1		0.5		0	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	592	-	-	159	451	318	1061	-	-
HCM Lane V/C Ratio	0.041	-	-	0.294	0.192	0.139	0.004	-	-
HCM Control Delay (s)	11.3	-	-	36.8	14.9	18.1	8.4	-	-
HCM Lane LOS	B	-	-	E	B	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.2	0.7	0.5	0	-	-

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	0	74	20	0	7	92	1172	29	5	960	30
Future Vol, veh/h	25	0	74	20	0	7	92	1172	29	5	960	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	50	-	-	50	-	-
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	2	-	-	1	-	-	-1	-
Peak Hour Factor	90	90	90	50	90	58	90	90	73	42	95	90
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	2	0
Mvmt Flow	28	0	82	40	0	12	102	1302	40	12	1011	33
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1907	2598	522	2056	2594	671	1044	0	0	1342	0	0
Stage 1	1052	1052	-	1526	1526	-	-	-	-	-	-	-
Stage 2	855	1546	-	530	1068	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.9	6.9	7.1	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.9	5.9	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	43	25	505	~ 26	19	389	674	-	-	520	-	-
Stage 1	246	306	-	106	153	-	-	-	-	-	-	-
Stage 2	323	178	-	477	267	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	36	21	505	~ 19	16	389	674	-	-	520	-	-
Mov Cap-2 Maneuver	121	95	-	69	73	-	-	-	-	-	-	-
Stage 1	209	299	-	90	130	-	-	-	-	-	-	-
Stage 2	266	151	-	390	261	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	21.1		99		0.8		0.1					
HCM LOS	C		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR			
Capacity (veh/h)	674	-	-	121	505	85	520	-	-			
HCM Lane V/C Ratio	0.152	-	-	0.23	0.163	0.613	0.023	-	-			
HCM Control Delay (s)	11.3	-	-	43.4	13.5	99	12.1	-	-			
HCM Lane LOS	B	-	-	E	B	F	B	-	-			
HCM 95th %tile Q(veh)	0.5	-	-	0.8	0.6	2.8	0.1	-	-			
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s			+: Computation Not Defined				*: All major volume in platoon			

APPENDIX G

LOCAL TRIP GENERATION RATES

Local Apartment Trip Generation Study

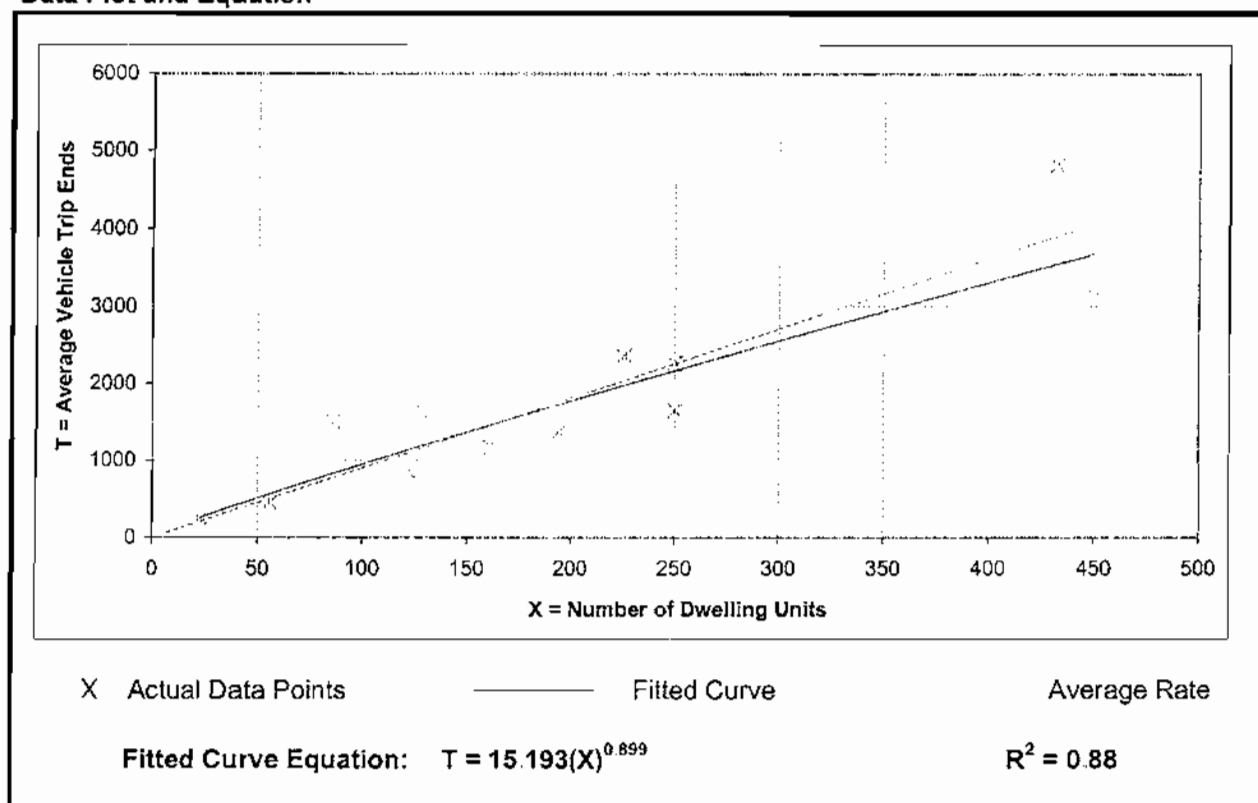
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



Local Apartment Trip Generation Study

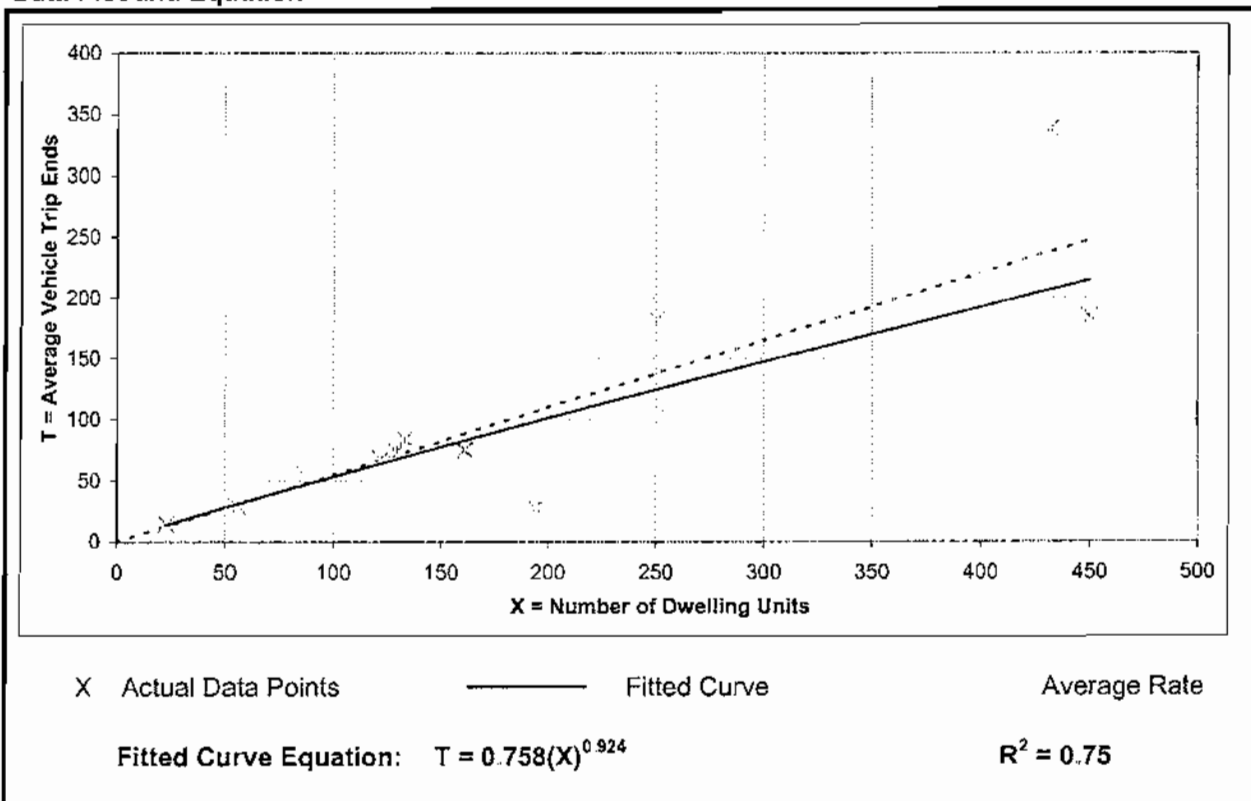
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

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

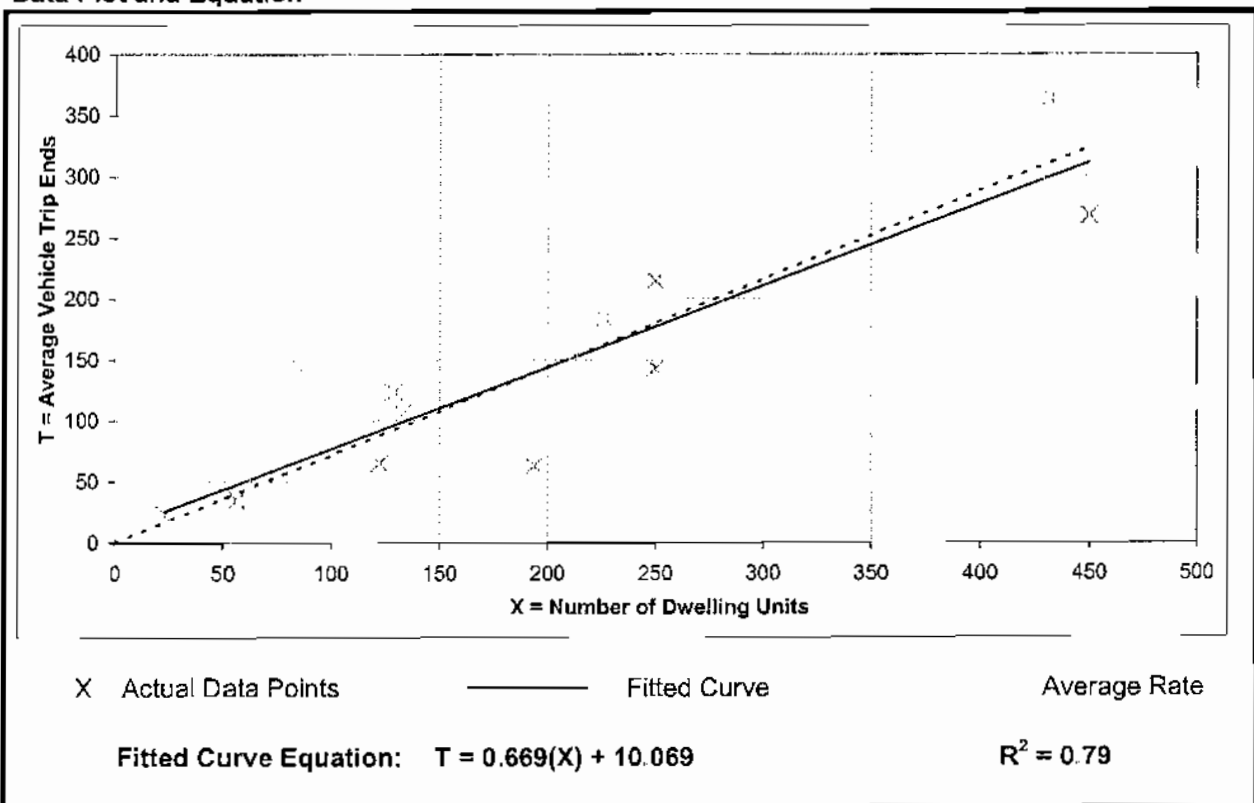
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

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 ICON APARTMENT HOMES AT LOVELL ROAD

315 Multi-Family Apartments

ITE LAND USE CODE	LAND USE DESCRIPTION	# OF UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Local Trip Rate	Multi-Family Apartments	315	2,677	22%	78%		55%	45%	
				34	120	154	122	99	221
Total New Volume Site Trips			2,677	34	120	154	122	99	221

Calculated from Local Trip Rates

Trips calculated by using Fitted Curve Equations

TRIP GENERATION FOR ICON APARTMENT HOMES AT LOVELL ROAD

315 Multi-Family Apartments

315 Apartments = X

Weekday:

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

$$T = 15 * 176.19$$

$$T = \underline{\underline{2,677 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.758 * 203$$

$$T = \underline{\underline{154 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$T = 0.669 * 315 + 10.07$$

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

APPENDIX H

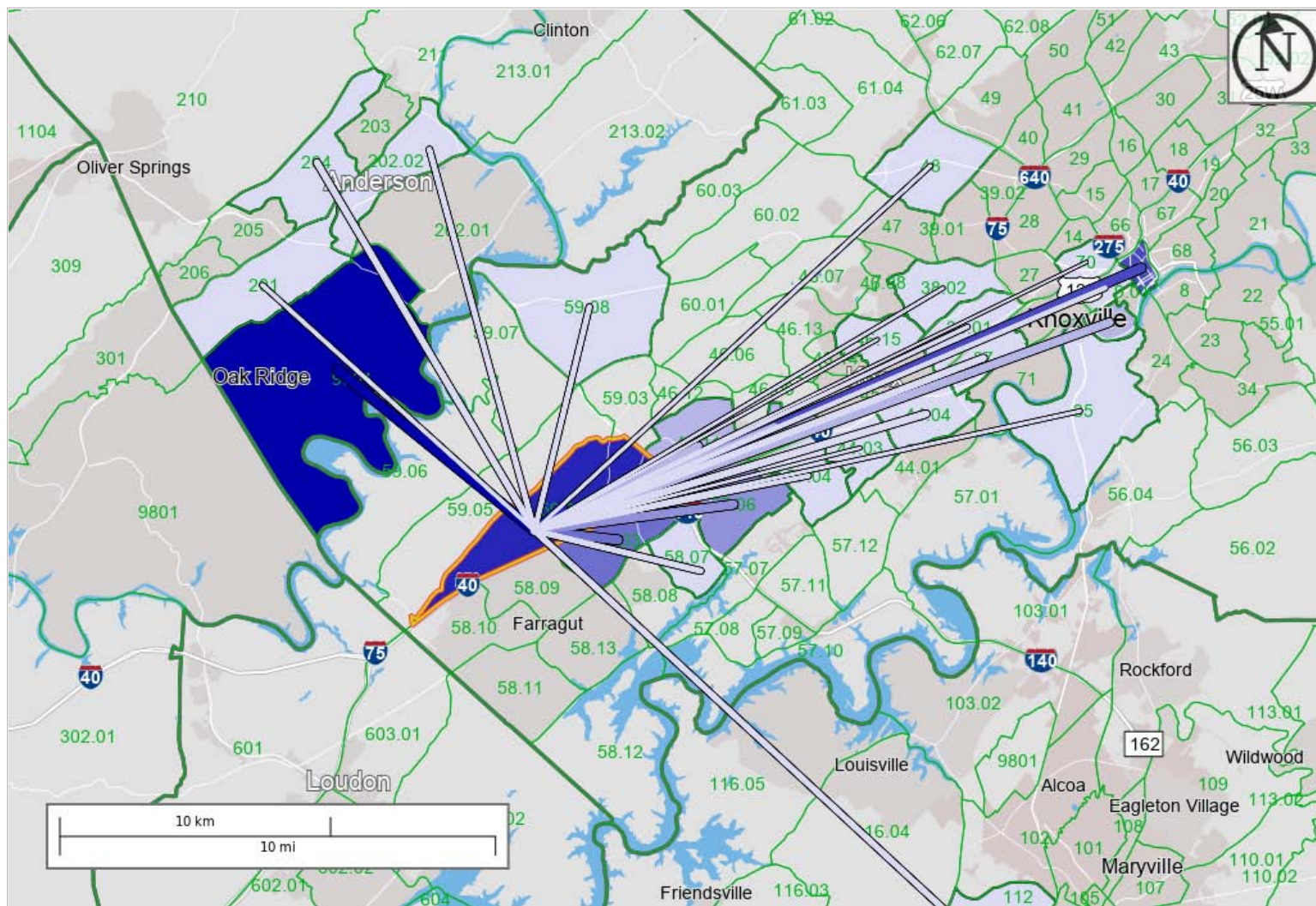
2019 CENSUS BUREAU DATA

Work Destination Report - Home Selection Area to Work Census Tracts All Jobs for All Workers in 2019

Created by the U.S. Census Bureau's OnTheMap <https://onthemap.ces.census.gov> on 03/22/2022

Counts of All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers



Map Legend

Job Count

- 249 - 285
- 212 - 248
- 175 - 211
- 138 - 174
- 101 - 137
- 64 - 100
- 27 - 63

Selection Areas

- ★ Analysis Selection

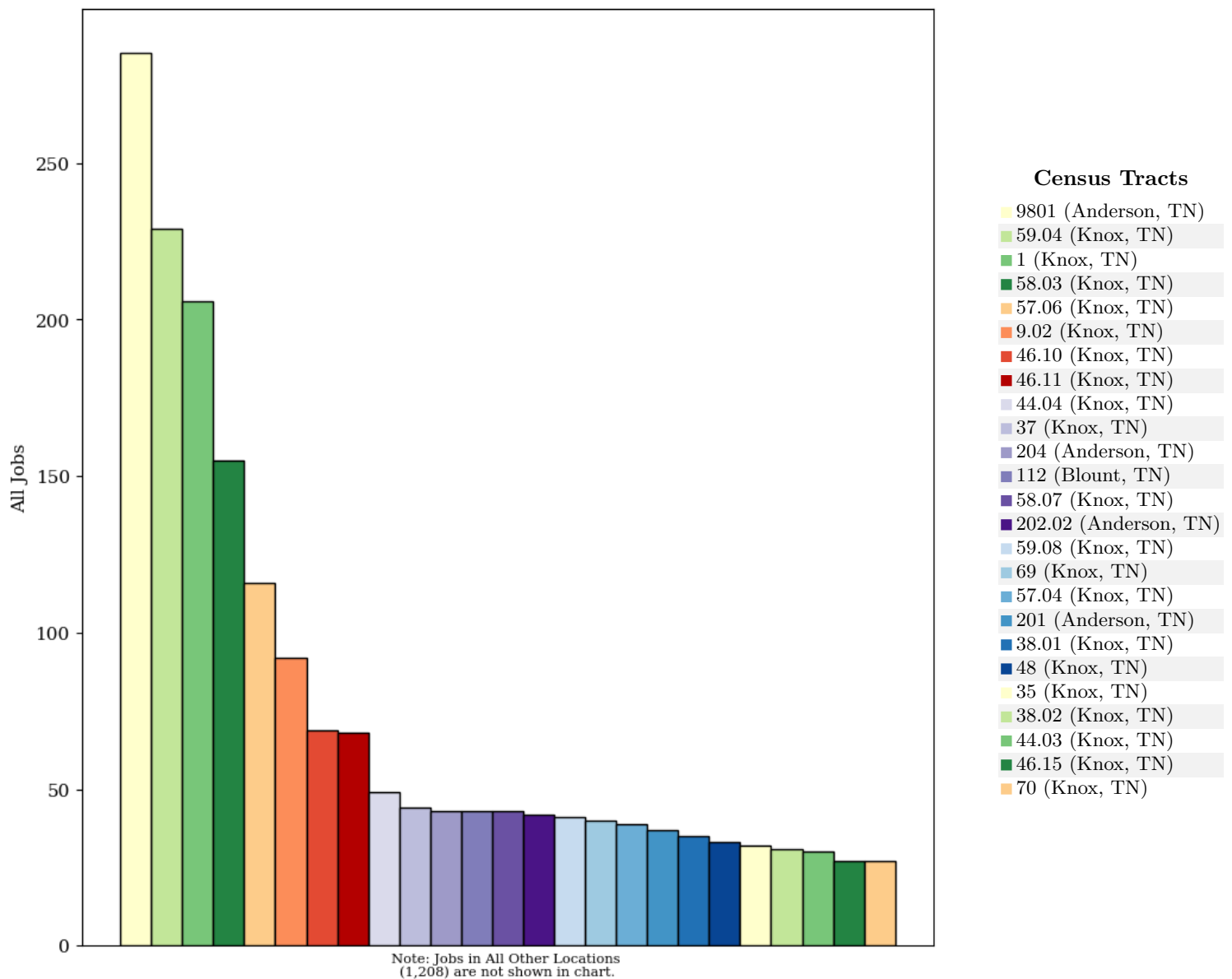
Job Count

- 249 - 285
- 212 - 248
- 175 - 211
- 138 - 174
- 101 - 137
- 64 - 100
- 27 - 63



All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers



All Jobs from Home Selection Area to Work Census Tracts in 2019

All Workers

Census Tracts as Work Destination Area	2019	
	Count	Share
All Census Tracts	3,064	100.0
9801 (Anderson, TN)	285	9.3
59.04 (Knox, TN)	229	7.5
1 (Knox, TN)	206	6.7
58.03 (Knox, TN)	155	5.1
57.06 (Knox, TN)	116	3.8
9.02 (Knox, TN)	92	3.0
46.10 (Knox, TN)	69	2.3
46.11 (Knox, TN)	68	2.2
44.04 (Knox, TN)	49	1.6
37 (Knox, TN)	44	1.4

Census Tracts as Work Destination Area	2019	
	Count	Share
204 (Anderson, TN)	43	1.4
112 (Blount, TN)	43	1.4
58.07 (Knox, TN)	43	1.4
202.02 (Anderson, TN)	42	1.4
59.08 (Knox, TN)	41	1.3
69 (Knox, TN)	40	1.3
57.04 (Knox, TN)	39	1.3
201 (Anderson, TN)	37	1.2
38.01 (Knox, TN)	35	1.1
48 (Knox, TN)	33	1.1
35 (Knox, TN)	32	1.0
38.02 (Knox, TN)	31	1.0
44.03 (Knox, TN)	30	1.0
46.15 (Knox, TN)	27	0.9
70 (Knox, TN)	27	0.9
All Other Locations	1,208	39.4

Additional Information

Analysis Settings

Analysis Type	Destination
Destination Type	Census Tracts
Selection area as	Home
Year(s)	2019
Job Type	All Jobs
Selection Area	59.04 (Knox, TN) from Census Tracts
Selected Census Blocks	97
Analysis Generation Date	03/22/2022 12:25 - OnTheMap 6.8.1
Code Revision	f9358819d46a60bb89052036516a1c8fe8bbbbeac
LODES Data Version	20211018_1647

Data Sources

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2019).

Notes

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

APPENDIX I

KNOX COUNTY & TDOT TURN LANE VOLUME THRESHOLD WORKSHEETS

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 Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

$$979/2 * 1.05 = 514$$

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

Lovell Road at Lovell
View Drive and
Proposed Entrance

2025 Projected AM
SB Right Turns = 12

Right Turn Lane NOT
Warranted

* Or through volume only if a left-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 Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

$$960/2 * 1.05 = 504$$

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

Lovell Road at Lovell
View Drive and
Proposed Entrance

2025 Projected PM
SB Right Turns = 30

Right Turn Lane
NEARLY
Warranted

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

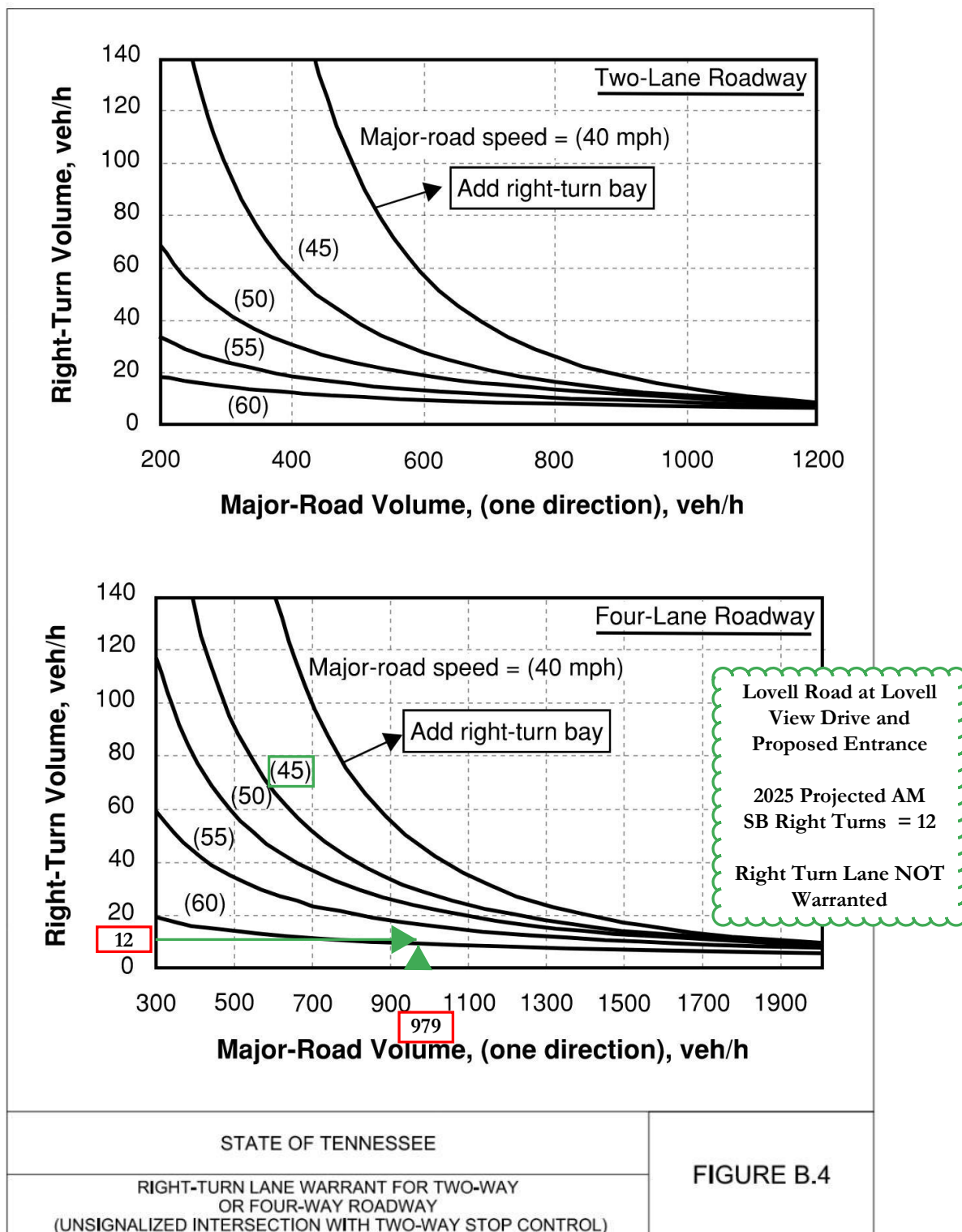


Figure B.4: Right-Turn Lane Warrant for Two-Way or Four-Way Roadway (Unsignalized Intersection with Two-Way Stop Control)

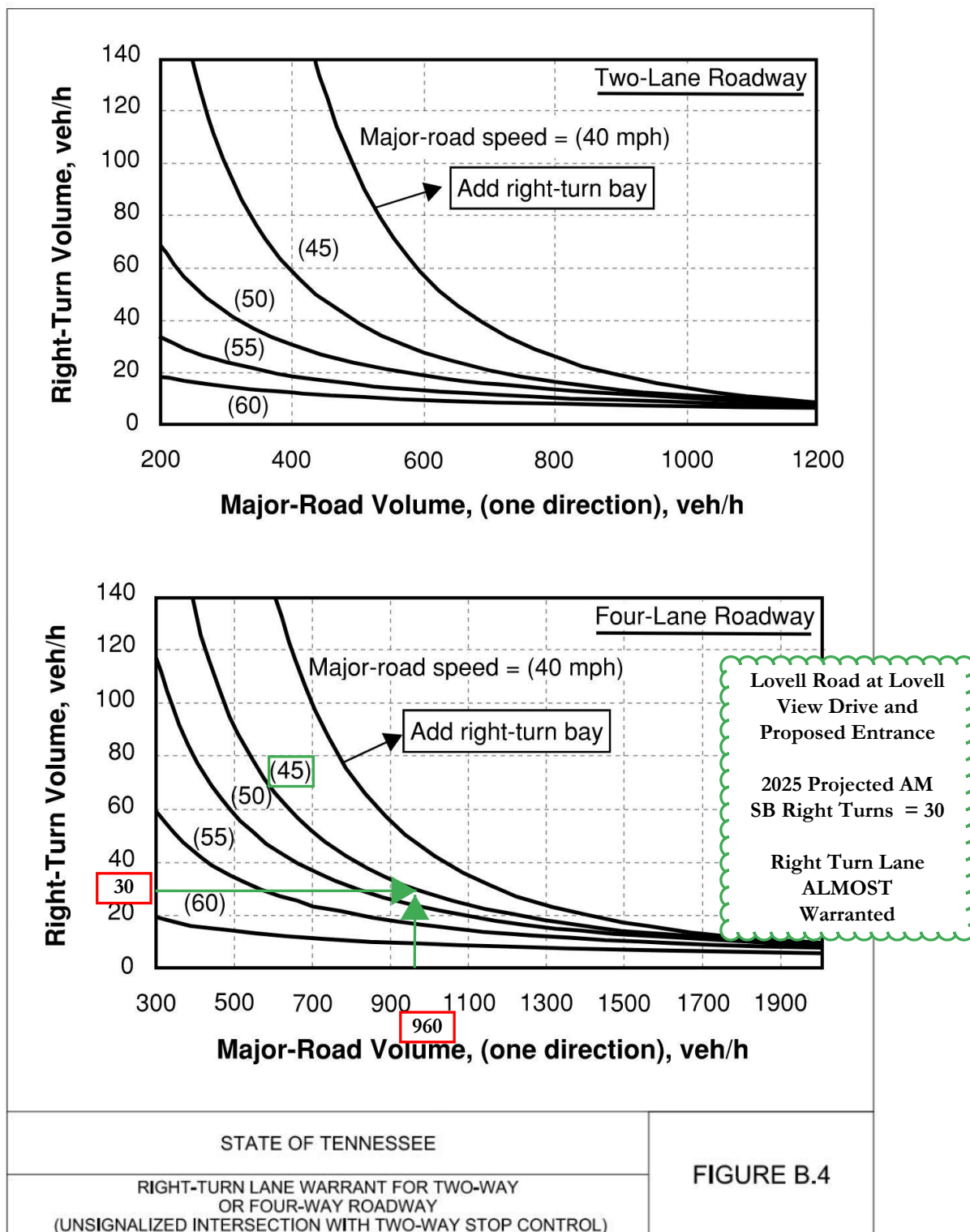


Figure B.4: Right-Turn Lane Warrant for Two-Way or Four-Way Roadway (Unsignalized Intersection with Two-Way Stop Control)

APPENDIX J

TRAFFIC SIGNAL WARRANTS

PROJECTED FUTURE VOLUMES IN YEAR 2025 WITH TRAFFIC GROWTH AND GENERATED TRAFFIC
Lovell Road at Lovell View Drive and Proposed Entrance

TIME	Lovell Road			Lovell View Drive			Lovell Road			Proposed Entrance		
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:00 AM	0	144	0	4	0	0	0	87	0	0	0	0
7:15 AM	0	193	0	2	0	1	0	104	3	0	0	0
7:30 AM	1	238	0	3	0	5	0	109	1	0	0	0
7:45 AM	1	281	0	6	0	1	0	118	1	0	0	0
Sum	2	856	0	15	0	7	0	418	5	0	0	0
General Growth	0.09	38.52	0	0.675	0	0.315	0	18.81	0.225	0	0	0
Trips Generated 7-8 am	0	0	15	0	0	0	28	0	0	53	0	98
2025	2	895	15	16	0	7	28	437	5	53	0	98
8:00 AM	1	215	0	2	0	2	0	122	1	0	0	0
8:15 AM	0	203	0	2	0	0	0	122	2	0	0	0
8:30 AM	0	208	0	5	0	1	0	112	0	0	0	0
8:45 AM	1	198	0	5	0	2	0	115	1	0	0	0
Sum	2	824	0	14	0	5	0	471	4	0	0	0
+20% Increase	2	824	0	14	0	5	0	471	4	0	0	0
General Growth	0.09	37.08	0	0.63	0	0.225	0	21.195	0.18	0	0	0
Trips Generated 8-9 am	0	0	14	0	0	0	25	0	0	48	0	90
2025	2	861	14	15	0	5	25	492	4	48	0	90
11:00 AM	2	131	0	3	0	4	0	119	3	0	0	0
11:15 AM	0	144	0	1	0	0	0	116	4	0	0	0
11:30 AM	1	162	0	5	0	1	0	116	2	0	0	0
11:45 AM	0	128	0	2	0	1	0	134	1	0	0	0
Sum	3	565	0	11	0	6	0	485	10	0	0	0
General Growth	0.135	25.425	0	0.495	0	0.27	0	21.825	0.45	0	0	0
Trips Generated 11am-12 pm	0	0	26	0	0	0	48	0	0	26	0	48
2025	3	590	26	11	0	6	48	507	10	26	0	48
12:00 PM	1	153	0	3	0	1	0	142	4	0	0	0
12:15 PM	2	150	0	1	0	0	0	154	9	0	0	0
12:30 PM	2	156	0	4	0	2	0	154	1	0	0	0
12:45 PM	0	166	0	2	0	3	0	146	1	0	0	0
Sum	5	625	0	10	0	6	0	596	15	0	0	0
General Growth	0.225	28.125	0	0.45	0	0.27	0	26.82	0.675	0	0	0
Trips Generated 12-1 pm	0	0	29	0	0	0	53	0	0	29	0	53
2025	5	653	29	10	0	6	53	623	16	29	0	53
2:00 PM	0	111	0	7	0	1	0	150	5	0	0	0
2:15 PM	0	143	0	4	0	5	0	151	3	0	0	0
2:30 PM	0	143	0	3	0	1	0	164	4	0	0	0
2:45 PM	1	147	0	0	0	1	0	142	4	0	0	0
Sum	1	544	0	14	0	8	0	607	16	0	0	0
General Growth	0.045	24.48	0	0.63	0	0.36	0	27.315	0.72	0	0	0
Trips Generated 2-3 pm	0	0	24	0	0	0	71	0	0	19	0	58
2025	1	568	24	15	0	8	71	634	17	19	0	58
3:00 PM	4	165	0	2	0	1	0	199	4	0	0	0
3:15 PM	0	168	0	4	0	1	0	188	5	0	0	0
3:30 PM	1	173	0	5	0	0	0	168	5	0	0	0
3:45 PM	1	192	0	5	0	2	0	202	9	0	0	0
Sum	6	698	0	16	0	4	0	757	23	0	0	0
General Growth	0.27	31.41	0	0.72	0	0.18	0	34.065	1.035	0	0	0
Trips Generated 3-4 pm	0	0	27	0	0	0	81	0	0	22	0	66
2025	6	729	27	17	0	4	81	791	24	22	0	66
4:00 PM	0	221	0	6	0	1	0	217	5	0	0	0
4:15 PM	2	189	0	1	0	0	0	220	5	0	0	0
4:30 PM	0	207	0	3	0	1	0	255	7	0	0	0
4:45 PM	3	235	0	10	0	2	0	231	7	0	0	0
Sum	5	852	0	20	0	4	0	923	24	0	0	0
General Growth	0.225	38.34	0	0.9	0	0.18	0	41.535	1.08	0	0	0
Trips Generated 4-5 pm	0	0	31	0	0	0	94	0	0	26	0	77
2025	5	890	31	21	0	4	94	965	25	26	0	77
5:00 PM	1	221	0	4	0	2	0	304	10	0	0	0
5:15 PM	0	221	0	2	0	3	0	313	5	0	0	0
5:30 PM	1	242	0	4	0	0	0	274	7	0	0	0
5:45 PM	1	189	0	4	0	0	0	270	6	0	0	0
Sum	3	873	0	14	0	5	0	1161	28	0	0	0
General Growth	0.135	39.285	0	0.63	0	0.225	0	52.245	1.26	0	0	0
Trips Generated 5-6 pm	0	0	35	0	0	0	106	0	0	29	0	86
2025	3	912	35	15	0	5	106	1213	29	29	0	86

Existing Volumes
Existing Volumes
Existing Volumes
Existing Volumes
Sum
Growth Rate of
Trips Generated
Total Sum

1.5% for 3 years

Assumed Average Growth Rate (%)=	1.5%	0% Increase due to Covid
Number of years =	3	
Horizon Year =	2025	# of Horizon Years = 3

Note 1: 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 TDOT Table 4.2 in Traffic Design Manual)

Note 2: It is assumed that the construction of homes is linear growth

Trips Generated by Entire Development:	2,677	Daily Trips Generated from Subdivision/Year	892	=	2,677 / 3
100% of trips			2677	trips by	2025

	AM	PM
Traffic Movement Assumed Distribution:	0% to/from Lovell View Drive, 35% to/from north Lovell Road, and 65% to/from south Lovell Road	0% to/from Lovell View Drive, 25% to/from north Lovell Road, and 75% to/from south Lovell Road

Assume all multi-family apartments

Entering and Exiting %'s (from local trip rate):		Directional Distribution Assumptions:
22% Enter	AM Hours	0% to/from Lovell View
78% Exit		35% to/from north Lovell Road
		65% to/from south Lovell Road
50% Enter	Mid-Day Hours	0% to/from Lovell View
50% Exit		35% to/from north Lovell Road
		65% to/from south Lovell Road
55% Enter	PM Hours	0% to/from Lovell View
45% Exit		25% to/from north Lovell Road
		75% to/from south Lovell Road

TDOT Traffic Engineering Office - Table 4.2 - TDOT Traffic Design Manual

Population Tier = A (Knoxville)

TDOT Region 1 Average for Arterial Facilities (Multi-Lane)

Time of Day	Percentage of Trips
7-8 am	7.20%
8-9 am	6.60%
11 am-Noon	5.52%
Noon-1 pm	6.11%
2-3 pm	6.39%
3-4 pm	7.34%
4-5 pm	8.48%
5-6 pm	9.57%
	57.21%



Traffic Signal Warrant Analysis

CIVIL ENGINEERING / TRAFFIC ENGINEERING

Project Name	Icon Apartment Homes at Lovell Road
Project/File #	#2202
Scenario	2025 - Projected Traffic Volumes

Intersection Information	
Major Street Name	Lovell Road
North/South or East/West	N/S
Speed Limit > 40 mph	Yes
# of Approach Lanes	2 or more
% of Right Turn Traffic to Include	0%
Minor Street Name	Lovell View Drive/Proposed Entrance
# of Approach Lanes	1
% of Right Turn Traffic to Include	0%
Isolated Community < 10,000 pop	No

Additional Warrants to Consider	
Warrant 3, Peak Hour (A - Volume and Delay)	Yes
All-Way Stop Warrant	No

Traffic Signal Warrant Analysis

Lovell Road (Major Street) Volume

Northbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	28	437	5	
8 - 9 AM	25	492	4	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	48	507	10	
12 - 1 PM	53	623	16	
1 - 2 PM				
2 - 3 PM	71	634	17	
3 - 4 PM	81	791	24	
4 - 5 PM	94	965	25	
5 - 6 PM	106	1213	29	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			6,298	0

Southbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	2	895	15	
8 - 9 AM	2	861	14	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	3	590	26	
12 - 1 PM	5	653	29	
1 - 2 PM				
2 - 3 PM	1	568	24	
3 - 4 PM	6	729	27	
4 - 5 PM	5	890	31	
5 - 6 PM	3	912	35	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			6,326	0

Lovell View Drive/Proposed Entrance (Minor Street) Volume

Eastbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	53	0	98	
8 - 9 AM	48	0	90	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	26	0	48	
12 - 1 PM	29	0	53	
1 - 2 PM				
2 - 3 PM	19	0	58	
3 - 4 PM	22	0	66	
4 - 5 PM	26	0	77	
5 - 6 PM	29	0	86	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			828	0

Westbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	16	0	7	
8 - 9 AM	15	0	5	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	11	0	6	
12 - 1 PM	10	0	6	
1 - 2 PM				
2 - 3 PM	15	0	8	
3 - 4 PM	17	0	4	
4 - 5 PM	21	0	4	
5 - 6 PM	15	0	5	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			165	0

Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	Icon Apartment Homes at Lovell Road
Project/File #	#2202
Scenario	2025 - Projected Traffic Volumes

Intersection Information			
Major Street (N/S Road)	Lovell Road	Minor Street (E/W Road)	Lovell View Drive/Proposed Entrance
Analyzed with	2 or more approach lanes	Analyzed with	1 Approach Lane
Total Approach Volume	12624 vehicles	Total Approach Volume	993 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	1 percent applied	Right turn reduction of	1 percent applied

Reduction applied to warrant thresholds due to high speed on Lovell Road

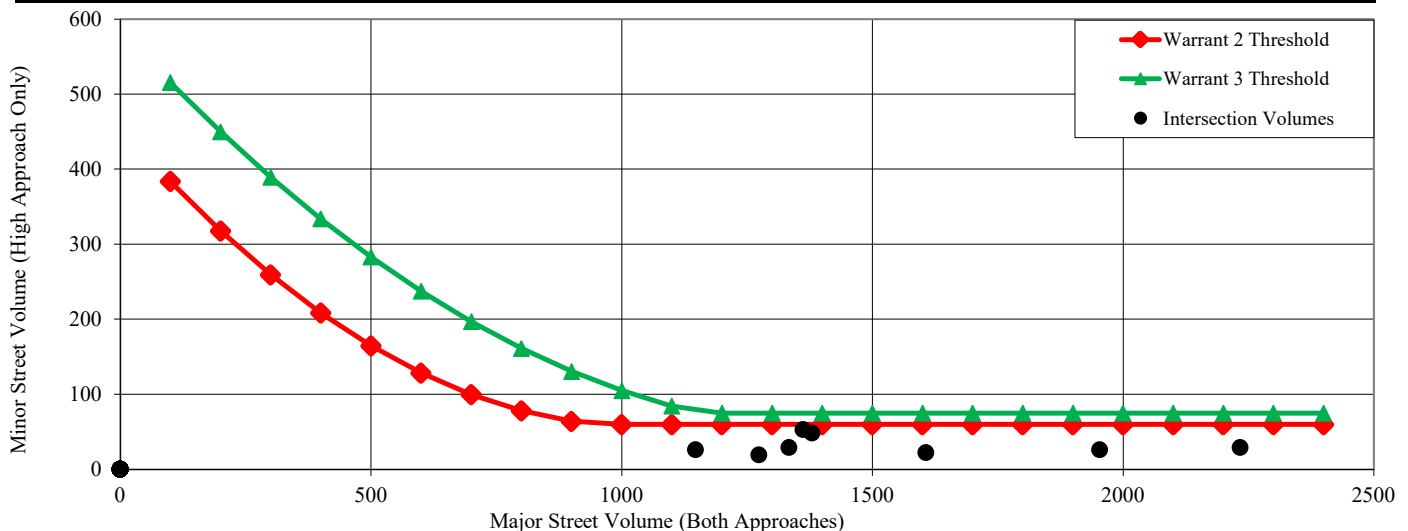
Warrant 1, Eight Hour Vehicular Volume			
	Condition A	Condition B	Condition A+B*
Condition Satisfied?	Not satisfied	Not satisfied	Not satisfied
Required values reached for	0 hours	1 hour	0 (Cond. A) & 2 (Cond. B)
Criteria - Major Street (veh/hr)	420	630	336 (Cond. A) & 504 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

* Should be applied only after an adequate trail of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not satisfied
Required values reached for	0 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
	Condition A	Condition B
Condition Satisfied?	Satisfied	Not Satisfied
Required values reached for	799 total, 150 minor, 6.3 delay	0 hours
Criteria - Total Approach Volume (veh in one hour)	650	See Figure Below
Criteria - Minor Street High Side Volume (veh in one hour)	150	
Criteria - Minor Street High Side Delay (veh-hrs)	5	

Figure 4C-2 (Warrant 2 - 70% Factor) & Figure 4C-4 (Warrant 3 - 70% Factor)



APPENDIX K

RESPONSE LETTER TO ADDRESS REVIEW COMMENTS



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

May 18, 2022

PROJECT NAME: Icon Apartments at Lovell Road TIS

TO: Knoxville-Knox County Planning

**SUBJECT: Comment Response Document for Icon Apartments at Lovell Road TIS -
From Email Comments dated May 16, 2022**

Dear Knoxville-Knox County Planning, Knox County Engineering, and TDOT Staff:

The following comment response document is submitted to address comments from an email from Mike Conger, PE, and an email comment from Stephanie Hargrove, PE, both dated May 16, 2022. This letter is added to the end of the revised report in Appendix K.

- 1. The TIS states in multiple locations that a SB right turn lane is "nearly" warranted on Lovell Rd at the proposed access. It would be preferable if you could provide quantification in terms of the number of additional right turns that would trigger the warrant and an associated # of additional apartment units.**

Response: The report has been revised on Page 1, 41, and 47. These revisions also address Comment #2 below. On Page 1 and 47, the following sentence has been added, "TDOT has indicated that an exclusive southbound right-turn lane will be required at the Proposed Entrance."

On Page 41, the following sentence has been added to the last paragraph: "To fully meet the right-turn lane warrant in the projected PM peak hour, the number of apartments would have to be increased by an additional 212 units or, more realistically, the number of southbound thru volumes on Lovell Road would have to be increased by 88 vehicles."

- 2. It appears that a SB right turn lane is being proposed per the site/civil plans that have been submitted and TDOT has indicated that one will be required so this fact should be noted in the TIS.**

Response: This has been addressed in the response provided in Comment #1 above.

3. The final design details of the new entrance will need to be coordinated with TDOT through their access permit process, but some initial concerns were raised with how best to accommodate pedestrian crossings and maximize vehicular sight distance in terms of the stop bar location relative to the crosswalk. Please coordinate with the site engineer to determine preferred design treatments including whether it may be preferable to pull the stop bar forward with a crosswalk going behind the length of one vehicle. The current configuration appears to have the stop bar too far back which will either inhibit sight distance and/or encourage vehicles to stop in the crosswalk area while waiting to turn. The sign placement in the current configuration is also a concern from a sight distance standpoint.

Response: The site designer is aware of this issue and will coordinate with Knox County Engineering and TDOT to address this concern.

4. On page 32 in the third paragraph, it is stated that the PM distribution is 75% north and 35% south. This needs to be changed to 75% north and 25% south.

Response: On Page 32, in the third paragraph, the document has been changed to correct this minor error.

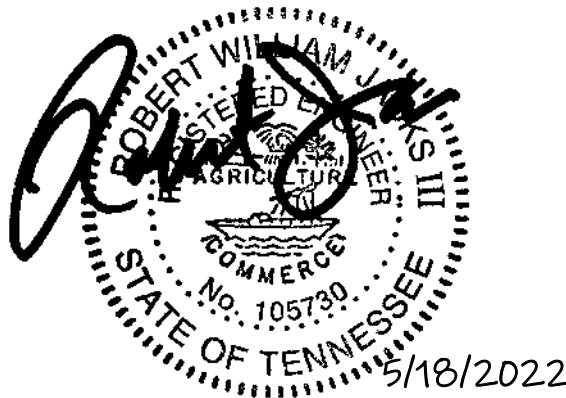
In addition to the requested revisions listed above, other changes in the report include the following:

- Updated Title Page
- Updated Table of Contents
- Updated Page Footers
- Added Appendix K to include this response letter

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

Sincerely,

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



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