

Transportation Impact Study 8014 Asheville Highway Subdivision Knox County, Tennessee



Revised October 2024

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EXECUTIVE SUMMARY

Preface:

Mesana Investments, LLC proposes a residential development adjacent to Asheville Highway in East Knox County, TN. The proposed development will include constructing 172 multi-family attached townhouses and 66 single-family detached houses on 49.18 +/- acres. The development is named and referenced in this study as "8014 Asheville Highway Subdivision" since a name has not yet been chosen. The development proposes two entrances from the south to Asheville Highway, east of Cash Road. One entrance is proposed at an existing driveway and median opening, and the other will be on the west end of the development property at another existing median opening on Asheville Highway. The development is anticipated to be fully built and occupied by 2028.

The primary purpose of this study is to determine and evaluate the potential impacts of the development on the adjacent transportation system. The study includes a review of the primary access road and the entrance intersections. This report is a Level 1 study established by Knoxville/Knox County Planning. This study also includes the impact and increase in traffic due to other nearby unrelated planned residential subdivisions along Asheville Highway. Recommendations and mitigation measures are offered if transportation operations are projected to be below recognized engineering standards.

Study Results:

The significant findings of this study include the following:

- The 8014 Asheville Highway Subdivision, with 172 multi-family attached townhouses and 66 single-family detached houses, is estimated to generate 2,242 vehicle trips at full build-out and occupancy on an average weekday. Of these daily trips, 139 are estimated to occur during the AM peak hour and 192 in the PM peak hour in 2028.
- With the 8014 Asheville Highway Subdivision and the other nearby residential developments being completed and occupied by 2028, the proposed northbound exiting left-turn lane at the Proposed Main Entrance is projected to operate at Level of Service (LOS) F during the projected AM and PM peak hours. This exiting lane at the entrance is projected to have moderate volumes but high vehicle delays due to the large conflicting thru volumes on Asheville Highway during peak hours. This left-turn lane will also experience long vehicle queues, particularly during the PM peak hour. Further analysis determined that the Proposed Main Entrance at



Asheville Highway will not likely meet warrants for traffic signalization in the projected 2028 conditions to resolve this poor performance.

• The exiting approach of the Proposed Secondary Entrance at Asheville Highway is projected to operate at LOS C and D during the projected 2028 AM and PM peak hours. The exit at this entrance is projected to have lower entering and exiting volumes than the Proposed Main Entrance further to the east.

Recommendations:

The following recommendations are offered based on the study analyses to minimize the impacts of the proposed development on the adjacent transportation system while attempting to achieve an acceptable traffic flow and improved safety. These recommendations also take into account the contribution of additional traffic from the other known nearby planned residential subdivisions. More details regarding all the recommendations are discussed at the end of the report.

Asheville Highway at Proposed Main Entrance:

- This intersection is not expected to meet signalization warrants based on the projected 2028 traffic volumes. However, once and if the 8014 Asheville Highway Subdivision is entirely constructed as proposed, it is recommended that a traffic count be re-conducted to document that the actual, realized traffic volumes do not exceed what has been estimated in this study and meet traffic signal warrant thresholds.
- Overall, providing a secondary entrance for this development will provide a relief valve for exiting left turns towards the west, and the results that show worse vehicle delays and queues at the Proposed Main Entrance will be less than calculated with the Proposed Secondary Entrance slightly higher. The projections assumed a 3 to 2 split of trips to and from the west between the proposed entrances, with more assumed will occur at the Proposed Main Entrance. If exiting westbound motorists face long delays and queues at the main entrance, they will most likely alter their initial travel and utilize the secondary entrance and, in effect, balance the exiting left turn vehicle delay and queues at both entrances more equally than shown in the results of this study.
- The construction of a westbound left-turn lane on Asheville Highway at the Proposed Main Entrance for entering traffic into the proposed subdivision is warranted based on the projected 2028 traffic volumes and TDOT's thresholds. The recommended lengths for this proposed left-turn lane in the center median



include a lane change and deceleration distance of 340 feet and a storage length of 50 feet, for a total of 390 feet. The bay taper length within the lane change and deceleration distance is recommended to be 180 feet (15:1). With a 180-foot bay taper, the full-width left-turn lane will be 210 feet long.

- Based on TDOT's warrant thresholds and the projected 2028 traffic volumes, an eastbound right turn lane is warranted and recommended to be constructed for the Proposed Main Entrance. This lane should have a lane change and deceleration distance of 340 feet. The bay taper length within the lane change and deceleration distance is recommended to be 180 feet (15:1), and these distances will provide a full-width lane length of 160 feet.
- Since substantial left-turning vehicle queues are anticipated, the Proposed Main Entrance should have separate left and right turn lanes for the Road "A" approach at Asheville Highway. It is recommended that the left-turn lane at the Proposed Main Entrance be the continuation of Road "A" from the south and that the rightturn lane have a separate lane with a minimum vehicle storage of 150 feet. The separate left and right exiting lanes for the development at Asheville Highway should be marked on the pavement with the appropriate white turn arrows and delineated with white lane lines.
- The construction of the Proposed Main Entrance on Asheville Highway will require a TDOT Highway Entrance Permit. The developer will need to apply for this permit and coordinate with TDOT regarding their specific requirements for this entrance and any other proposed median modifications.
- Many regulatory signs should be installed to avoid and help prevent wrong-way vehicles on Asheville Highway at the Proposed Main Entrance. Figure 2.10 in TDOT's Traffic Design Manual illustrates the signage required for the Proposed Main Entrance at Asheville Highway.

Asheville Highway at Proposed Secondary Entrance:

- The construction of the Proposed Secondary Entrance on Asheville Highway will require a TDOT Highway Entrance Permit. The developer will need to apply for this permit and coordinate with TDOT regarding their specific requirements for this entrance.
- Many regulatory signs should be installed to avoid and help prevent wrong-way vehicles on Asheville Highway at the Proposed Main Entrance. Figure 2.10 in TDOT's Traffic Design Manual illustrates the signage required for the Proposed Main Entrance at Asheville Highway.



- Based on TDOT's warrant thresholds and the projected 2028 traffic volumes, an eastbound right turn lane is warranted and recommended to be constructed for the Proposed Secondary Entrance. This lane should have a lane change and deceleration distance of 340 feet. The bay taper length within the lane change and deceleration distance is recommended to be 180 feet (15:1), and these distances will provide a full-width lane length of 160 feet.
- If any further future development is proposed, particularly towards the western end of the development, a second exiting lane may be needed at the Proposed Secondary Entrance to provide separate left and right-turn lanes.

8014 Asheville Highway Subdivision Internal Roads:

- A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the Proposed Main Entrance, Road "A", and the Proposed Secondary Entrance, Road "B", off Asheville Highway.
- Stop Signs (R1-1) with 24" white stop bars are recommended to be installed at the internal road locations, as shown in the study.
- At the internal intersection of Road "D" and "E", a four-way intersection is proposed. Stop Signs (R1-1) are shown on the Road "D" approaches in the provided image in the Conclusions and Recommendations. However, it is recommended that a mini-roundabout with the appropriate signage at this intersection be considered. If a mini-roundabout is not feasible, further discussion with Knox County Engineering in the detailed design phase should include whether this internal intersection should include Stops Signs (R1-1) on all approaches, the reverse as shown, or as proposed.
- The Stop Sign (R1-1) on the entrance approaches to Asheville Highway should include a One-Way Sign (R6-1) and a Divided Highway Sign (R6-3), as shown in Figure 2.10 in the TDOT Traffic Design Manual.
- Dual end-of-roadway object markers (OM4-1) should be installed at the end of subdivision Road "C", as shown in the report. The end of this internal road should include a hammerhead turnaround to facilitate vehicle returns in the opposite direction.
- An additional sign should be posted internally at the western end of Road "C" to follow Knoxville-Knox County Subdivision regulations. This sign is for notification of possible future street connections. It should state, "NOTICE This road may be extended and connected to the west for more info. contact Knox Co. Engineering & Public Works (865) 215-5800".



- The proposed lots within the development adjacent to and south of Asheville Highway should not be allowed direct access.
- Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the required internal intersection sight distance is 250 feet. The site designer should ensure that this internal sight distance length is met.
- If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.
- All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.
- Several internal roads in the proposed subdivision will have long, straight road segments. Straight road segments encourage higher vehicle speeds. It is recommended that the civil site designer consider including traffic calming measures on these internal roads, such as speed humps or tables. Specifics regarding this recommendation should be discussed in the design phase with Knox County Engineering.
- All road and intersection elements should be designed to AASHTO, TDOT, and Knox County specifications and guidelines to ensure proper operation.



DESCRIPTION OF EXISTING CONDITIONS

• <u>STUDY AREA</u>:

The location of this new residential development is shown on a map in Figure 1. This proposed development will be located on the south side of Asheville Highway, approximately 1,300 feet east of Cash Road in East Knox County, TN. The Proposed Main Entrance will be located on Asheville Highway, where an existing gravel driveway with a median opening is located. It will also be approximately 550 feet west of Tribute Lane. Tribute Lane intersects Asheville Highway from the south and does not have a median opening. This road was recently built as part of a new sports therapy clinic building (Andrews Physical Therapy) at 8020 Asheville Highway. The Proposed Secondary Entrance will tie into Asheville Highway between Cash Road to the west and the Proposed Main Entrance to the east.

The development will be constructed from three existing parcels that, when combined, span an area between Asheville Highway to the north and Strawberry Plains Pike to the south. As requested, transportation impacts associated with the development were analyzed at the Proposed Main and Secondary Entrances at Asheville Highway, where the development will have road access to and from external destinations. These entrances will be constructed at two existing median openings on Asheville Highway, 865 feet from each other.



The proposed development property is in a formerly rural area, very slowly transitioning to a more suburban area of East Knox County, TN. There are many residential subdivisions and stand-alone houses in the surrounding area, as well as commercial development along Asheville





Existing Structures on Proposed Development Property (Looking South)

Highway. The adjacent commercial properties include the previously mentioned therapy sports clinic, а multi-unit storage/garage facility, a plumbing contractor, and a portable building sales business. There are also many unoccupied properties nearby as well. One of these unoccupied properties includes a 16.74-acre parcel owned by Habitat for Humanity. A concept plan for this property was recently submitted for a residential subdivision that will include 37 lots with 74 multi-family attached duplexes. This

subdivision will be adjacent to and slightly east of the 8014 Asheville Highway Subdivision. It will have external access to and from Asheville Highway to the north via Tribute Lane and the proposed entrances to the 8014 Asheville Highway Subdivision via a new road connection. Likewise, the existing sports therapy clinic currently has access to Tribute Lane and a gravel driveway and median opening to the west, where the proposed 8014 Asheville Highway Subdivision main entrance will be located. This business will be adjacent to both proposed subdivisions. The clinic will also have access to the proposed entrances for the 8014 Asheville Highway Subdivision to the west and maintain access to Tribute Lane to the east.

The 8014 Asheville Highway Subdivision property is mainly cleared on the north side of the property near Asheville Highway. A house on the property near Asheville Highway was recently demolished. Several outbuildings, large metal sheds, and shipping containers are located on the property, and these structures will be removed during the construction of the subdivision. A single-family detached house is located on the southern end of the property with a private gravel driveway to Strawberry Plains Pike and is presumed to remain. The topography for the subdivision property is mostly defined by rolling terrain but has a couple of major drainage swales with significant elevation changes in the center. A small area of hillside protection is also located on the property.

Major road access to this area of Knox County is provided by Asheville Highway, which traverses east towards Jefferson City and Dandridge and Knoxville to the west. Brakebill Road, further to the west and south, provides minor access to the area by traversing between Asheville Highway to the north and Strawberry Plains Pike to the south, where it intersects near Interstate 40.





Figure 1 Location Map



• EXISTING ROADWAYS:

Table 1 lists the characteristics of the existing primary roadway near the development property and included in the study:

TABLE 1 STUDY CORRIDOR CHARACTERISTICS

| NAME | CLASSIFICATION ¹ | SPEED LIMIT | LANES | ROAD WIDTH ² | TRANSIT ³ | PEDESTRIAN FACILITIES | BICYCLE FACILITIES |
|---|-----------------------------|----------------|-----------------------------------|----------------------------|----------------------|-------------------------------|-----------------------|
| Asheville Highway (US 25E/US 11E/US 70/SR 9) | Principal Arterial | 55 mph | 4 lanes with divided median | 100 feet | None | No sidewalks along roadway | No bike lanes |

¹ TDOT Functional Classification Map (9.14.18)

² From edges of pavement near project site

³ According to Knoxville Area Transit System Map

<u>Asheville Highway (US 25E/US 11E/US 70/SR 9)</u> is a 4-lane Principal Arterial that traverses in a generally east-west direction. Closer to the study area, Asheville Highway provides convenient access to Knoxville to the west, Jefferson City to the northeast (via Andrew Johnson Highway), and Dandridge to the east. The posted speed limit on Asheville Highway is 55 mph at the development property.

Asheville Highway is a divided highway at the development property with a grassed median and an average 30-foot width. A median opening is currently provided on Asheville Highway at the existing private driveway and the Proposed Main Entrance location. The existing driveway operates under stop control, but a Stop Sign (R1-1) is not posted. Turn lanes are not provided at this median opening, and there is no approach or driveway from the north. The median opening is 50 feet wide between the noses of the median.



Existing Driveway / Proposed Main Entrance

A median opening is also currently provided on Asheville Highway at the Proposed Secondary Entrance location. The existing driveway at this location to the south is no longer used. This





Description of Existing Conditions

entrance once provided access to a small group of efficiency apartments, but they were demolished with rubble remaining on-site. Turn lanes are not provided at this median opening, and there is no approach or driveway from the north. The median opening is 50 feet wide between the noses of the median.

In both directions, grooved pavement rumble strips are located just outside the white edge lines along the shoulder of Asheville

Highway. Along this stretch of Asheville Highway, the road has a very straight alignment with a few minor vertical curves. Roadway features, including sidewalks, bike lanes, and greenway paths, are not provided along Asheville Highway.

Asheville Highway has relatively good pavement conditions and will be the primary road for future residents of the 8014 Asheville Highway Subdivision to and from external destinations. All lanes on Asheville Highway are 12 feet in width, and the paved shoulders are 10 feet in width.

The median openings do not have direct commercial or residential development access from the north. A single-family detached house and a plumbing contractor are to the north, with private driveways to Asheville Highway.

Figure 2 shows the lane configurations of the existing intersection 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.





PHOTO EXHIBITS



Proposed Development Site









Proposed Development Site









Proposed Development Site









Proposed Development Site





Proposed Main Entrance at Asheville Highway (Looking North)



• EXISTING TRANSPORTATION VOLUMES PER MODE:

One annual vehicular traffic count location is located near the study area, and the Tennessee Department of Transportation (TDOT) conducts this count on Asheville Highway. The count location data is the following and can be viewed with further details in Appendix A:

- Existing vehicular roadway traffic:
 - The Tennessee Department of Transportation (TDOT) reported an Average Daily Traffic (ADT) on Asheville Highway east of the project site at 20,381 vehicles per day in 2023. From 2013 – 2023, this count station has indicated a -0.9% average annual growth rate.
- Existing bicycle and pedestrian volumes: 0 The average daily pedestrian and bicycle traffic along Asheville Highway is unknown. However, with the lack of sidewalks and bike lanes, as well as high vehicular volumes, this roadway is assumed to have minimal pedestrian and bicyclist activity. During the traffic counts for this project, no bicyclists and handful of "pedestrians" were а observed on Asheville Highway near the The observed development site. "pedestrians" were members of a litter crew cleaning the shoulders and median along Asheville Highway.

An online website, <u>strava.com</u>, provides "heat" maps detailing routes taken by pedestrians, joggers, and bicyclists. The provided heat maps show the last two years of data, are updated monthly, and are gathered from individuals allowing their smart devices to track and compile their routes (millions of users). The



Strava Heat Map for Pedestrian and Joggers



Strava Heat Map for Bicyclists



activities in the maps are shown on the roads with color intensities with darker colors signifying higher activity. The Strava heat maps show no pedestrian, jogger, or bicycle activity along Asheville Highway or any roads in the surrounding area.

PEDESTRIAN AND BICYCLE FACILITIES:

TDOT has published mapping illustrating the Bicycle Level of Service (BLOS) for State Routes. BLOS is a nationally used measure of bicyclist comfort based on a roadway's geometry and traffic conditions. BLOS A designates the route as most suitable for bicyclists and BLOS F as the least suitable. At the development site, the BLOS for Asheville Highway, State Route 9, has a grade of D, suggesting that the highway is unsuitable for bicycle traffic near the proposed development site.



WALK SCORE:

A private company offers a website at <u>walkscore.com</u> 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.

The project site location is graded with a Walk Score of 12 at the development property address. This



Walk Score indicates that almost all errands currently require a vehicle for travel at the development property. The Walk Score is graded very low due to the lack of sidewalks, lack of nearby amenities, and the high vehicular volumes on the highway adjacent to the site. The site



is given a Bike Score of 13, meaning there is minimal bike infrastructure. The site is not given a Transit Score since no public transportation opportunities are near the development site. Overall, for this study, no vehicle trip reductions for pedestrian or bicyclist activity were used or assumed.

• <u>TRANSIT SERVICES</u>:

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available near the development site.

The closest public transit to the development site is 5.3 miles to the southwest by roadway. The closest bus stop to the proposed development is on Route 34, "Burlington Shopper", at the intersection of North Chilhowee Drive



at Asheville Highway. KAT made several changes and improvements to their routes that began on August 26th, 2024. This recent change has established bus service every 30 minutes at this bus stop. It operates on weekdays and weekends; the route map is also included in Appendix B. Other transit services in the area include the East Tennessee Human Resource Agency (ETHRA) and the Community Action Committee (CAC), which provides transportation services when requested.

Since the distance to the nearest public bus service is several miles away, with no sidewalks or bike lanes available to access the bus stop without using a private vehicle, the proposed development is not expected to have any reduced vehicle trips due to public transit usage.

• <u>CRASH DATA</u>:

The Knoxville Transportation Planning Organization (TPO) provides a website that lists bicycle, pedestrian, and vehicle severe or fatal crashes from October 2016 to September 2021. The data shows that, unfortunately, two fatal crashes occurred to the east near the intersection of Asheville Highway at South and North Molly Bright Road on May 19th, 2017, and on January 8th, 2018. No crash factors were listed as the causes of these crashes, but one involved a senior driver, and another involved a teen driver. Subsequently, an online news search was undertaken to determine further details of these crashes, and news reports were found on the <u>Knoxville News</u> <u>Sentinel</u> website. The fatal crash that occurred in 2017 involved a man walking along the highway who stepped out from the shoulder and was hit by two sedans. No charges were filed against



either of the two drivers. The other fatality is assumed to have occurred when a vehicle left the roadway and went down an embankment near South Molly Bright Road. This crash occurred during cold and icy conditions, but the news article did not report a fatality, and it is assumed that the driver later passed away. A third crash that involved a teen driver occurred on August 27th, 2019, resulted in serious injuries, and occurred just south of Asheville Highway on South Molly Bright Road.



TDOT publishes and lists State crash data on its website that has involved a serious injury or a fatality over the past three calendar years. Between 2022 and 2024, the data shows no serious or fatal crashes near the proposed development site.



Ultimately, the crash data from the Knoxville TPO and TDOT is not specific enough to ascertain crash patterns or types to incorporate into the recommendations for this proposed development. However, TDOT continually monitors for high crash locations and conducts further investigations if a spot location or intersection experiences above-average crash rates.



PROJECT DESCRIPTION

LOCATION AND SITE PLAN:

The proposed plan layout with 172 multi-family attached townhouses and 66 single-family detached houses on 49.18 +/- acres is designed by Urban Engineering and is shown in Figure 3. The three proposed property parcels will create a jigsaw-shaped subdivision when formed for the development. The design shows six new internal streets, Roads "A" through "F". As shown in the figure, the entrances will be constructed for the development on the south side of Asheville Road. Road "A" will be the entrance street for the Proposed Main Entrance off Asheville Highway, with a median opening already provided. Road "B" will be the entrance street for the Proposed Secondary Entrance off Asheville Highway, with a median opening already provided.

One of the internal streets is shown in the proposed layout, Road "C", ending abruptly with a potential for further development, and three others will end at cul-de-sacs. A road connection behind the physical therapy clinic will tie into Roads "A" and "B" in the proposed 8014 Asheville Highway Subdivision and at Tribute Lane to the east. This will allow clinic patients and future Habitat for Humanity Subdivision residents to access the entrances in the subdivision, with median openings on Asheville Highway. Tribute Lane does not have a median opening that



allows for exiting left turns towards the west. Due to this restriction, all exiting westbound clinic patients and residents in the Habitat for Humanity Subdivision are expected to use the 8014 Asheville Highway Subdivision entrances to travel towards Knoxville.

The 8014 Asheville Highway Subdivision will have several common areas. Some of these common areas will include stormwater controls for the proposed subdivision.

The townhouses will be located on the development site's west and northwest portions, and the single-family detached houses will be located on the southern and southeastern portions. The typical lot dimensions for the attached townhouses in the subdivision will be 100 feet deep and



either 22 or 27 feet wide, providing a typical townhouse lot area of 2,200 or 2,700 square feet. The typical lot dimensions for the single-family detached houses in the subdivision will be 125 feet deep and 55 feet wide, providing a typical single-family house lot area of 6,875 square feet. Each townhouse and single-family house will have a garage and driveway. The developer is not proposing on-site amenities for the future subdivision residents other than providing open common areas. Internal sidewalks are not proposed for this subdivision.

The schedule for the completion of this new residential development depends on economic factors and construction timelines. This project is also contingent on permitting, design, and other regulatory approvals. Overall, the local real estate market for new housing remains quite competitive. This study assumed that the total construction build-out of the development and full occupancy would occur within the next four years (2028) to provide a conservative outlook.





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PROPOSED USES AND ZONING REQUIREMENTS:

The three parcels comprising the 8014 Asheville Highway Subdivision development property are in Knox County and were recently requested to be rezoned. The Knoxville/Knox County Planning Commission approved the rezoning, and the Knox County Commission gave final approval on July 15th, 2024. The property's previous zoning was Agricultural (A) and General Business (CA), and it was requested to be changed to Planned Residential (PR). The property rezoning was approved with a density of up to 5 units per acre. Uses permitted in the Planned Residential (PR) zone include single-family dwellings, duplexes, and multi-dwelling structures and developments. The most recently published online KGIS zoning map is provided in Appendix C. The existing adjacent surrounding zoning and land uses are the following:

- Asheville Highway binds the development property to the north. Across Asheville Highway, the properties are zoned as Agricultural (A). A plumbing contractor, a single-family detached house, and undeveloped property occupy the parcels to the north, with road access to the south at Asheville Highway provided by private driveways. None of these private driveways from the north have median openings on Asheville Highway for access to the south.
- One adjacent parcel to the northwest on the south side of Asheville Highway is zoned as Commercial (CA). It is currently unoccupied, except for rubble, and at one time was occupied by a small group of efficiency apartments. The property to the northeast and on the south side of Asheville Highway is zoned as Office (OA) and is occupied by the Andrews Physical Therapy clinic. The clinic has access to Tribute Lane to the east and the existing gravel driveway to the west at 8014 Asheville Highway, where a median opening and the subdivision's Proposed Main Entrance will be located. The access to this existing driveway is currently provided via an existing gravel driveway.
- To the east, one parcel is zoned Planned Residential (PR) with a density of up to 4.5 units per acre and is owned by Habitat for Humanity. This property was recently approved for a residential subdivision and is proposed to have 74 multi-family attached duplexes on 37 lots. Access to this subdivision will be via Tribute Lane to Asheville Highway. The Habitat for Humanity Subdivision will be allowed access to and from the 8014 Asheville Highway Subdivision via a new road connection built behind the physical therapy clinic. All exiting westbound clinic patients and residents in the Habitat for Humanity Subdivision are expected to use the 8014 Asheville Highway Subdivision are expected to use the 8014 Asheville Highway Subdivision entrances towards Knoxville since Tribute Lane does not have a median opening.



All the other properties to the west, southwest, and southeast are zoned as Agricultural (A). These properties include undeveloped land, forested areas, and single-family detached houses. For the most part, these properties all have or potentially have road access to the south at Strawberry Plains Pike or the west at South Wooddale Road.





• <u>ON-SITE CIRCULATION</u>:

The total length of the six internal roads in the 8014 Asheville Highway Subdivision will be 6,042 feet (1.14 miles), designed and constructed to Knox County specifications. The development will have asphalt-paved internal roadways with 8" extruded concrete curbs. The lane widths internally will be 13 feet each for a total 26-foot pavement width. The public right-of-way width within the development will be 50 feet. No sidewalks are proposed on the internal roads in this development. Road "C" in the development will remain private. Knox County will maintain the other streets in the development after construction, and these will be dedicated public roads.

SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION:

Besides residential passenger vehicles, the internal roadways will provide access for service, delivery, maintenance, and fire protection/rescue vehicles. These vehicle types will not impact roadway operations except when they occasionally enter and exit the development. Curbside private garbage collection services are expected to be available for this residential subdivision if desired. The new public streets will be designed and constructed to Knox County specifications and are expected to be adequate for fire protection and rescue vehicles, trash collection trucks,



and single-unit delivery trucks. The development's internal drives with cul-de-sacs will accommodate the larger vehicle types and residents' standard passenger vehicles and be sufficiently sized to allow vehicles to turn around.

ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

EXISTING TRAFFIC CONDITIONS:

This study conducted an 8-hour traffic count at the intersection of Asheville Highway at the existing driveway / Proposed Main Entrance location on Wednesday, September 4th, 2024. Manual traffic counts were conducted to identify and tabulate the morning and afternoon peak period volumes and the travel directions near the proposed development site. The intersection had an AM and PM peak hour at 7:00 – 8:00 a.m. and 3:30 – 4:30 p.m. The manual tabulated traffic counts can be reviewed in Figure 4 and Appendix D. The volumes shown on the western end of Asheville Highway were obtained from the intersection volumes. Some observations at the intersection include the following:

- o No pedestrians or bicyclists were observed in the morning or afternoon traffic counts except for a litter crew cleaning up Asheville Highway.
- Most vehicles at the intersections were passenger vehicles, but school buses, semitractor trailer trucks, single-unit trucks, and construction vehicles with trailers were observed.
- Much higher westbound volumes on Asheville Highway and turning volumes to the west were observed in the morning versus eastbound volumes. In the afternoon, the opposite occurred, with more vehicles overall heading east versus west. This pattern indicated most motorists in the area heading towards Knoxville in the morning and returning in the afternoon.
- A few U-turns were observed on Asheville Highway at the median opening at the existing driveway and where the Proposed Main Entrance will be located.
- The observed volumes to and from the existing driveway were primarily individuals entering and leaving the sports therapy clinic. The clinic is connected to the existing driveway median opening via a gravel path. This median opening and existing driveway provide motorists entering from the east and leaving towards the west on Asheville Highway access to the clinic since the other entrance is at Tribute Lane, where a median opening is not provided.
- Most of the exiting northbound left-turning motorists from the existing driveway on Asheville Highway found a gap in traffic, crossed the eastbound lanes, used the center median as a temporary refuge, and then waited for an appropriate gap in the westbound traffic stream before fully completing their turn.





Capacity analyses were undertaken to determine the Level of Service (LOS) for the existing 2024 intersection traffic volumes shown in Figure 4. The capacity analyses were calculated following the Highway Capacity Manual (HCM) methods and utilizing Synchro Traffic Software (Version 12).

<u>Methodology</u>:

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 the level of service criteria for unsignalized intersections and signalized intersections.



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

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



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

TABLE 2

LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS

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

Source: Highway Capacity Manual, 7th Edition





Intersection capacity results from the existing 2024 peak hour traffic are shown in Table 3. The intersection in the table is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. Appendix E includes the worksheets for the existing 2024 peak hour capacity analyses.

As shown in Table 3, the intersection of Asheville Highway at the existing private driveway is calculated to operate with good to average LOS and vehicle delays in the existing peak hour 2024 conditions. The northbound approach, the private driveway, is shown operating at LOS C and D in the AM and PM peak hours, respectively.

TABLE 32024 INTERSECTION CAPACITY ANALYSIS RESULTS -EXISTING TRAFFIC CONDITIONS

| | TRAFFIC | APPROACH/ | AM PEAK | | | PM PEAK | | |
|--------------------------------|---------|-----------------------|---------|-----------|-------|---------|-----------|-------|
| INTERSECTION | CONTROL | MOVEMENT | LOS | DELAY | V/C | LOS | DELAY | V/C |
| | | | | (seconds) | | | (seconds) | |
| Asheville Highway (WB & EB) at | zed | Northbound Left/Right | С | 19.8 | 0.047 | D | 26.9 | 0.088 |
| Private Driveway (NB) | STOP | Westbound Left | А | 9.2 | 0.018 | С | 15.3 | 0.022 |
| | Unsign | | | | | | | |

 $Note: \ All \ analyses \ were \ calculated \ in \ Synchro \ 12 \ software \ and \ reported \ using \ 7th \ Edition \ intersection \ methodology$

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



PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT:

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

According to the nearby TDOT count station, vehicular traffic on Asheville Highway has shown negative growth over the past few years. Specifically, the TDOT data in Appendix A shows that Asheville Highway has experienced annual growth of -0.9% over the past ten years. The traffic count station showed a drop in vehicular volumes in 2020 due to the pandemic, remained lower in 2021, rebounded in 2022, but dropped again in 2023.

Nonetheless, this study used an annual



growth rate of +2% to calculate future growth on Asheville Highway up to 2028. The annual growth rate was applied to the existing 2024 thru volumes on Asheville Highway to estimate the future volumes in the horizon year of 2028 without the potential additional development traffic. Figure 5 shows the projected 2028 horizon year traffic volumes at the studied intersection without the project during the AM and PM peak hours.




Capacity analyses were undertaken to determine the projected LOS in 2028 without the project at the studied intersection. The results are shown in Table 4, and Appendix E includes the capacity analysis worksheets from the software.

As expected, the results in Table 4 show slightly worse vehicle delays at the intersection in the 2028 projected conditions versus the existing 2024 conditions. This result is due to the moderate increase in traffic volumes on Asheville Highway due to the assumed general growth.

TABLE 42028 INTERSECTION CAPACITY ANALYSIS RESULTS -PROJECTED TRAFFIC CONDITIONS WITHOUT THE PROJECT

| | TRAFFIC | APPROACH/ | | AM PEAK | | | PM PEAK | |
|---|--------------|---|--------|-------------|----------------|--------|--------------|-------|
| INTERSECTION | CONTROL | MOVEMENT | LOS | DELAY | V/C | LOS | DELAY | V/C |
| | | | | (seconds) | | | (seconds) | |
| Asheville Highway (WB & EB) at | zed | Northbound Left/Right | С | 22.1 | 0.054 | D | 30.3 | 0.100 |
| Private Driveway (NB) | STOP E | Westbound Left | А | 9.4 | 0.019 | С | 16.7 | 0.025 |
| | | | | | | | | |
| Asheville Highway (WB & EB) at Private Driveway (NB) | Unsignalized | Northbound Left/Right Westbound Left | C A | 22.1 9.4 | 0.054 0.019 | D C | 30.3 16.7 | 0.100 |

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

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



• <u>TRIP GENERATION</u>:

A generated trip is a single or one-direction vehicle movement entering or exiting the study site. The estimated traffic the 8014 Asheville Highway Subdivision will generate was based on the equations provided by two sources. The trips generated by the 66 single-family detached houses were calculated using rates and equations provided by the <u>Trip Generation Manual, 11th Edition</u>, an Institute of Transportation Engineers (ITE) publication. The trips generated by the 172 townhouses were based on equations provided by Knoxville/Knox County Planning. These equations from Knoxville/Knox County Planning were developed from an extensive local study to estimate townhouse (and apartment) trip generation in the surrounding area. For Knox County, this is the preferred rate to use for townhouses and apartments. This local rate calculates slightly higher trip rates than the similar land use in the ITE Trip Generation Manual.

The data and calculations from the ITE and local trip generation study for the proposed land uses are shown in Appendix F. A summary of this information is presented in Table 5a:

TABLE 5aTRIP GENERATION FOR 8014 ASHEVILLE HIGHWAY SUBDIVISION172 Attached Townhouses and 66 Single-Family Detached Houses

| | | | | GENERATED | | | GENERATED | | |
|------------|-------------------|------------|-----------|-----------|---------|-------|-----------|---------|-------|
| | | | GENERATED | | TRAFFIC | | | TRAFFIC | |
| ITE LAND | LAND USE | # OF UNITS | DAILY | AM | РЕАК НС | OUR | PM | PEAK HC | OUR |
| USE CODE | DESCRIPTION | | TRAFFIC | | | | | | |
| | | | | ENTER | EXIT | TOTAL | ENTER | EXIT | TOTAL |
| Local Trip | Multi-Family | | | 22% | 78% | | 55% | 45% | |
| Rate | Attached | 172 | 1,554 | 10 | 69 | 88 | 69 | 56 | 125 |
| Rate | Townhouses | | | 17 | 07 | 00 | 07 | 50 | 125 |
| | Single-Family | | | 26% | 74% | | 63% | 37% | |
| #210 | Detached | 66 | 688 | 13 | 39 | 51 | 42 | 25 | 67 |
| | Housing | | | 15 | 30 | 51 | 42 | 25 | 67 |
| Tota | 1 New Volume Site | Trips | 2,242 | 32 | 107 | 139 | 111 | 81 | 192 |

ITE Trip Generation Manual, 11th Edition and Local Trip Rates Trips calculated by using Fitted Curve Equations

For the proposed 8014 Asheville Highway Subdivision, it is estimated that 32 vehicles will enter and 107 will exit, for a total of 139 generated trips during the AM peak hour in the year 2028. Similarly, it is estimated that 111 vehicles will enter and 81 will exit, for a total of 192 generated trips during the PM peak hour in the year 2028. The calculated trips generated for an average



weekday are estimated to be 2,242 vehicles for the proposed development. No vehicle trip reductions were included in the calculations or analysis.

Additional trip generation calculations were also made for the adjacent, non-related, proposed Habitat for Humanity Subdivision, which is planned but has not yet been constructed. This subdivision proposes 74 multi-family attached duplexes that have not begun contributing trips to and from Asheville Highway. This subdivision will have access to the highway via Tribute Lane and will have access to the proposed entrances for the 8014 Asheville Highway Subdivision. The trips generated for the single-family attached duplexes in this adjacent subdivision were calculated using rates and equations provided by the Knoxville/Knox County Planning local study. The data and calculations from the local study for this other subdivision are shown in Appendix F. A summary of this information is presented in the following table:

TABLE 5b TRIP GENERATION FOR ADJACENT HABITAT FOR HUMANITY SUBDIVISION 74 Attached Duplexes

| ITE LAND USE CODE | LAND USE DESCRIPTION | # OF UNITS | GENERATED DAILY TRAFFIC | GE AM I | NERATI TRAFFIC PEAK H(| ED DUR | GE · PM I | ENERATI IRAFFIC PEAK HO | ED 2 DUR | | |
|----------------------|-------------------------|------------|-------------------------------|------------|------------------------------|-----------|-----------------|-------------------------------|----------------|----|----|
| | | - | | | EXIT | TOTAL | ENTER | EXIT | TOTAL | | |
| Local Trip | Multi-Family | 1.000 | 1.1.1 | 22% | 78% | | 55% | 45% | - | | |
| Rate | Attached Duplexes | 74 728 | 728 | 728 | 728 | 9 | 32 | 41 | 33 | 27 | 60 |
| Tota | l New Volume Site | Trips | 728 | 9 | 32 | 41 | 33 | 27 | 60 | | |

Trips calculated by using Fitted Curve Equations from Local Trip Rates



• <u>TRIP DISTRIBUTION AND ASSIGNMENT</u>:

The projected trip distribution and assignment for the 8014 Asheville Highway Subdivision are based on several sources and engineering judgment. The first source is based on the existing traffic count volumes and the observed travel directions collected at the existing driveway intersection and where the Proposed Main Entrance will be located.

During the traffic counts, motorists on Asheville Highway showed a distinct inclination for westbound travel towards Knoxville in the morning and the opposite in the afternoon peak period.



The second source for determining the projected trip distribution is based on work-related trips in the local area. Work-based trips will be a significant impetus for trips generated by the development, and these trips are more likely to travel to and from the west and southwest. This assertion is based on data from the United States Bureau website for Census Tract 53.01, where the development property is located. Based on 2021 (latest available) census data and as presented in Appendix G, most work-based trips in the surrounding area correspond to Oak Ridge, TN, downtown Knoxville, the University of

Tennessee, and areas of West Knoxville. Some of these work-based trips also correspond to Alcoa and Maryville, TN areas. Very few of these work-based trips are shown east of the proposed subdivision.

In addition to employment centers, some generated traffic will travel to and from public and private schools. Schools will be another impetus for external trip-making. The development property is currently zoned for Carter Elementary, Middle, and High School. The zoned public schools for this development property are all located east of the development site. The zoned schools are between 1.5 and 2.6 miles from the proposed subdivision by roadway. The shortest and quickest routes from the proposed subdivision to and from these schools will be made by traveling to and from the east on Asheville Highway. Carter Elementary, however, is a bit further to the south and on Strawberry Plains Pike. Traveling to and from this school will likely include



travel on South Molly Bright Road, east of the development site, which intersects Strawberry Plains Pike just southwest of the elementary school.

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 - 12and 1.0 miles for grades K - 5 from where the students' parcel is accessed to the point where the buses unload at the school. This development will be outside the PRZ for all the zoned schools, and all school-age children attending public schools in the development will be able to utilize this service if desired.



Based on these factors, Figure 6 shows the projected distribution of traffic entering and exiting the proposed residential subdivision at the Proposed Main and Secondary Entrances. Overall, the majority of traffic generated by future residents in the subdivision, 80%, is expected to occur to and from the west on Asheville Highway. The remaining 20% will be to and from the east. All entering and exiting trips from the east are projected to enter at the Proposed Main Entrance. The entering and exiting trips to and from the west were projected to have a 3 to 2 split of the 80% at the Proposed Main Entrance and Secondary Entrance, respectively.

Figure 7a shows the traffic assignment of the computed trips generated by the 8014 Asheville Highway Subdivision. This assignment is based on the assumed distribution of trips shown in Figure 6.

Furthermore, several other additional proposed non-related residential subdivisions are in various development stages and are expected to also impact the studied intersection due to their generated trips. These other residential subdivisions include the previously discussed Habitat for Humanity Subdivision, additional phases in the Neal's Landing and The Ridge at Neals Landing Subdivisions, and the 0 Asheville Highway Subdivision. Other than the Habitat for Humanity Subdivision, all of these known proposed residential subdivisions are a bit further to the west off Asheville Highway. The additional phases in the Neal's Landing and The Ridge at



Neals Landing Subdivisions will be north of the signalized intersection of Asheville Highway at Brakebill Road and Neals Landing Road, approximately 1 mile away. The 0 Asheville Highway Subdivision will be slightly east of Cash Road, approximately 1,500 feet away.

Figure 7b shows the traffic assignment of the computed trips generated by the adjacent Habitat for Humanity Subdivision and takes into account that this future subdivision will have access to the proposed entrances at 8014 Asheville Highway. Figure 7c shows the proposed 0 Asheville Highway Subdivision assignment. Figure 7d shows the proposed additional phases in the Neal's Landing and The Ridge at Neals Landing Subdivisions assignment. These additional future residential developments are also assumed to be fully occupied by 2028, and the trips shown in Figures 7b, 7c, and 7d are also based on the projected distribution patterns shown in Figure 6. These projected traffic volumes for the other subdivisions were obtained from the other transportation impact studies Ajax Engineering, LLC produced.













PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT:

Several additive steps were taken to estimate the <u>total</u> projected traffic volumes at the Proposed Main and Secondary Entrances when the 8014 Asheville Highway Subdivision and other nearby subdivisions are constructed and fully occupied in 2028. The steps are illustrated below for clarity and review:



The calculated peak hour traffic generated by the 8014 Asheville Highway Subdivision was added to the 2028 horizon year traffic by following the predicted trip distributions and assignments. This procedure was completed to obtain the <u>total</u> projected traffic volumes at the Proposed Main and Secondary Entrances when the 8014 Asheville Highway Subdivision is fully built and occupied in 2028. In addition to the 8014 Asheville Highway Subdivision trips, projected 2028 volumes also included the additional trips by the other known proposed residential developments, including the Neals Landing Subdivisions phases, 0 Asheville Highway, and Habitat for Humanity Subdivisions. Figure 8 shows the projected 2028 AM and PM peak hour volumes for the 8014 Asheville Highway Subdivision trips at the Proposed Main and Secondary Entrances and includes the trips from the other proposed non-related residential developments that are expected to be fully built and occupied by 2028.





Capacity analyses were conducted to determine the projected LOS at the Proposed Main and Secondary Entrances with all the development traffic in 2028, shown in Figure 8. Intersection capacity results from the projected 2028 peak hour traffic are shown in Table 6. Appendix E includes the worksheets for the projected 2028 peak hour capacity analyses.

As shown in Table 6, the northbound left-turn lane at the Proposed Main Entrance is projected to operate at LOS F with substantial delays in the PM peak hour. Note: The Proposed Main Entrance was modeled in the software with two northbound lanes - one for exiting right turns towards the east and one for exiting left turns towards the west. The entrance was also modeled with an exclusive westbound left lane in the median of Asheville Highway. This turn lane and others are discussed further in the following sections of the report.

TABLE 62028 INTERSECTION CAPACITY ANALYSIS RESULTS -PROJECTED TRAFFIC CONDITIONS WITH THE PROJECT

| | TRAFFIC | APPROACH/ | | AM PEAK | | | PM PEAK | |
|----------------------------------|--|-----------------------|-----|-----------|-------|-----|-----------|-------|
| INTERSECTION | CONTROL | MOVEMENT | LOS | DELAY | V/C | LOS | DELAY | V/C |
| | | | | (seconds) | | | (seconds) | |
| Asheville Highway (WB & EB) at | zed | Northbound Left | F | 52.7 | 0.729 | F | 244.2 | 1.313 |
| Proposed Main Entrance (NB) | STOP E | Northbound Right | В | 10.5 | 0.035 | В | 14.1 | 0.043 |
| | in the second se | Westbound Left | А | 9.6 | 0.044 | С | 16.4 | 0.190 |
| | Ω | | | | | | | |
| Asheville Highway (WB & EB) at | zed | Northbound Left/Right | С | 22.4 | 0.146 | D | 34.3 | 0.179 |
| Proposed Secondary Entrance (NB) | STOP E | Westbound Left | А | 0.0 | - | Α | 0.0 | - |
| | | | | | | | | |
| | - 5 | | | | | | | |

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

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



<u>POTENTIAL TRANSPORTATION SAFETY ISSUES</u>:

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

• EVALUATION OF SIGHT DISTANCE

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

Methodology:

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

ISD is the <u>required</u> 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 55 mph on Asheville Highway with four lanes and a 30-foot median, the ISD is 750 feet for left turns exiting the development site. This value is calculated based on



AASHTO's (American Association of State Highway Transportation Officials) and TDOT's guidance. This distance is required for a motorist to safely exit to the left (westbound) onto Asheville Highway from the Proposed Main and Secondary Entrances. The ISD for a right-turn movement from the proposed entrances is 530 feet.

Visual observations of the sight distances at the proposed entrances' locations were undertaken. Using a Nikon Laser Rangefinder at the Proposed Main Entrance location, the available sight distance was visually estimated to be 999'+ (limit of the rangefinder) to the east and west. At the Proposed Secondary Entrance location, the available sight distance was visually estimated to be 825 feet to the east and 750 feet to the west. Based on these visual observations, the available sight distances from the Proposed Main and Secondary Entrances are expected to be adequate for motorists exiting the subdivision.

Images of the existing sight distance at the Proposed Main and Secondary Entrance locations are labeled in the following images with the required ISD and rangefinder-measured sight distances.









• EVALUATION OF TURN LANE THRESHOLDS

The need for separate left and right-turn lanes was evaluated in the projected 2028 conditions for the Proposed Main and Secondary Entrances at Asheville Highway.

The criteria used for the turn lane evaluation at the proposed entrances on Asheville Highway was based on TDOT's "Highway System Access Manual" since it is located on a State Route. The evaluation was based on the posted speed limit of 55 mph on Asheville Highway. This design policy relates vehicle volume thresholds based on prevailing speeds for two- and four-lane roadways.

According to TDOT's guidelines and based on the projected 2028 peak hour traffic volumes, the warrant threshold for a separate eastbound right-turn lane on Asheville Highway at the Proposed Main and Secondary Entrances are met in the PM peak hours. The threshold for a separate westbound left-turn lane was also fully met in the AM and PM 2028 projected conditions at the Proposed Main Entrance but not at the Proposed Secondary Entrance. The worksheets for these evaluations are provided in Appendix H.

• **PROJECTED VEHICLE QUEUES**

The Synchro traffic software also calculates the 95th percentile vehicle queues. The 95th percentile vehicle queue is the recognized measurement in the transportation engineering profession as the design standard used when considering vehicle queue lengths. Vehicle queues are another component of an intersection's assessment. A 95th percentile vehicle queue length means 95% certainty that the vehicle queue will not extend beyond that point. The assessment results are shown in Table 7 and provided within the Synchro capacity result worksheets in Appendix E.

In most instances, SimTraffic, a companion software to Synchro, is used to simulate traffic and generate vehicle queue lengths. However, SimTraffic cannot accurately model intersections with center medians and truly reflect the effects of vehicle gap acceptance. SimTraffic will only model/allow a vehicle to turn left when a gap in both directions of traffic is sufficient (i.e., the vehicles are not allowed to cross halfway into the center median and wait for another gap to enter the opposite lane traffic stream). Due to this limitation, the Synchro 95th percentile vehicle queue results are included since they account for two-stage left turns when the median is sufficient to store a vehicle temporarily. With a median width of 30 feet on Asheville Highway, Synchro was used to measure the 95th percentile queues since adequate storage space for a single vehicle will



be available as a temporary refuge before a motorist completes its entire movement. This maneuver was observed in the existing conditions.

As noted in the table, the long vehicle queue results obtained during the AM and PM peak hours for the northbound left lane at the Proposed Main Entrance should be taken under advisement. This warning is due to this movement operating with high vehicle delays that lead to unstable conditions. As a result, the vehicle queue reported could be longer due to the large volumes on Asheville Highway. The other reportable vehicle queue lengths are shown to be minimal in the projected 2028 AM and PM peak hours.

TABLE 7

TURN LANE STORAGE & VEHICLE QUEUE SUMMARY -2028 PROJECTED PEAK HOUR TRAFFIC WITH THE PROJECT

| INTERSECTION | TRAFFIC | APPROACH/ | SYNCHRO 95 ^t QUEUE LE | ^h PERCENTILE NGTH (ft) ¹ |
|----------------------------------|------------|-----------------------|-------------------------------------|---|
| | CONTROL | MOVEMENT | AM PEAK HOUR | PM PEAK HOUR |
| Asheville Highway (WB & EB) at | zed | Northbound Left | 125 * | 285 * |
| Proposed Main Entrance (NB) | STOP HE | Northbound Right | 3 | 3 |
| | E E | Westbound Left | 3 | 18 |
| | Ц | | | |
| Asheville Highway (WB & EB) at | zed | Northbound Left/Right | 13 | 15 |
| Proposed Secondary Entrance (NB) | Unsignaliz | Westbound Left | 0 | 0 |
| | | | | |

¹ Distances listed are based on vehicle length = 25 feet

* Actual vehicle queue result could be longer due to unstable conditions



CONCLUSIONS & RECOMMENDATIONS

The following is an overview of recommendations to minimize the transportation impacts of the 8014 Asheville Highway Subdivision on the adjacent transportation system while attempting to achieve an acceptable traffic flow and safety level. The recommendations also take into account the nearby non-related proposed residential subdivisions along Asheville Highway.



Asheville Highway at Proposed Main Entrance: This intersection is projected to operate with average vehicle delays and minimal vehicle queues for all movements except for exiting northbound left turns towards the west. This movement will experience considerable vehicle delays and queues in the AM and PM peak hours.

1a) Due to this significant, calculated vehicle delay and queues for the northbound left-turn lane at the Proposed Main Entrance in the peak hours, a further investigation was made to determine if this intersection could potentially meet traffic signal warrants in the projected 2028 conditions. The overall methodology of determining whether an intersection could be signalized is presented in the following:

<u>Methodology</u>:

<u>The Manual on Uniform Traffic Control Devices – 11th Edition</u> (MUTCD) presents nine different warrants 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 include traffic volumes, pedestrian volumes, crash history, and other factors. The MUTCD



explicitly states that a traffic control signal should not be installed unless one or more of the Manual's signal warrants are met. However, the satisfaction of a warrant does not 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 ensure that a traffic signal's installation will not degrade safety and efficiency.

The MUTCD defines nine different warrants, four are listed below, and two of which are potentially applicable for this intersection at this time based on TDOT's preference and are explained in the following:



Warrant #1, Eight-Hour Vehicular Volume:

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



Warrant #2, Four-Hour Vehicular Volume:

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



Warrant #3, Peak Hour:

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



Warrant #7, Crash Experience

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

Even though nine warrants are offered to justify a traffic signal, according to the TDOT Traffic Signal Manual, the agency heavily emphasizes Warrant #1 (Eight Hour Vehicular Volume) and Warrant #7 (Crash Experience). Even though Warrant #2 and 3 are not primary warrants used by TDOT, they are included in this study.



The intersection of Asheville Highway at the Proposed Main Entrance was evaluated in the projected 2028 conditions to determine whether a traffic signal could be justified based on the MUTCD Warrants listed above. Road "A" was used as the minor side street for the warrant analysis, and Asheville Highway was the major street. Warrant #7 was not analyzed at this intersection for this study and was omitted because one of the primary criteria for an intersection to meet the warrant is an "Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency..." Furthermore, the TDOT crash data discussed previously in the report did not show any vehicle crashes at this intersection over the past three calendar years.

A spreadsheet was used to calculate the potential 2028 traffic volumes generated by the new subdivisions being added to the intersection during the highest 8 hours of traffic based on the assumed trip distribution, and it is included in Appendix I. The analysis determined that Warrants #1, #2, and #3 are not expected to be met in the projected 2028 conditions. Appendix I includes the traffic signal warrant spreadsheet for this intersection evaluation in the projected 2028 conditions.

In conclusion, concerning traffic signal warrants, this intersection is not expected to meet signalization warrants based on the projected 2028 traffic volumes. However, once and if the 8014 Asheville Highway Subdivision is entirely constructed as proposed, it is recommended that a traffic count be re-conducted to document that the actual, realized traffic volumes do not exceed what has been estimated in this study and meet traffic signal warrant thresholds.

Overall, providing a secondary entrance for this development will provide a relief valve for exiting left turns towards the west, and the results that show worse vehicle delays and queues at the Proposed Main Entrance will be less than calculated with the Proposed Secondary Entrance slightly higher. The projections assumed a 3 to 2 split of trips to and from the west between the proposed entrances, with more assumed will occur at the Proposed Main Entrance. If exiting westbound motorists face long delays and queues at the main entrance, they will most likely alter their initial travel and utilize the secondary entrance and, in effect, balance the exiting left turn vehicle delay and queues at both entrances more equally than shown in the results of this study.

1b) The construction of a westbound left-turn lane on Asheville Highway at the Proposed Main Entrance for entering traffic into the proposed subdivision is warranted based on



the projected 2028 traffic volumes and TDOT's thresholds. The recommended lengths for this proposed left-turn lane in the center median include a lane change and deceleration distance of 340 feet and a storage length of 50 feet, for a total of 390 feet. The bay taper length within the lane change and deceleration distance is recommended to be 180 feet (15:1). With a 180-foot bay taper, the full-width left-turn lane will be 210 feet long.

According to TDOT's <u>Highway System Access Manual</u>, the functional area for an exclusive turn lane includes the "lane change and deceleration distance" and the storage length. The bay taper length is included in the lane change and deceleration distance, as shown in the following TDOT diagram:



The lane change and deceleration distance are a function of vehicle speeds, and the designer can assume some deceleration before the lane change. A speed of 10 mph less than the posted speed was assumed for this location. For this proposed left-turn lane on Asheville Highway, a vehicle speed of 45 mph was assumed, with vehicle speeds slightly reduced due to some deceleration occurring before the lane change. The longest 95th percentile vehicle queue length for the eastbound left-turn lane on Asheville Highway at the Proposed Main Entrance was calculated to be 5 and 25 feet in the AM and PM peak hours, respectively, in 2028 and will be fully contained within a storage length of 50 feet.

1c) Based on TDOT's warrant thresholds and the projected 2028 traffic volumes, an eastbound right turn lane is warranted and recommended to be constructed for the Proposed Main Entrance. This lane should have a lane change and deceleration distance of 340 feet. The bay taper length within the lane change and deceleration distance is



recommended to be 180 feet (15:1), and these distances will provide a full-width lane length of 160 feet.

- 1d) Since substantial left-turning vehicle queues are anticipated, the Proposed Main Entrance should have separate left and right turn lanes for the Road "A" approach at Asheville Highway. It is recommended that the left-turn lane at the Proposed Main Entrance be the continuation of Road "A" from the south and that the right-turn lane have a separate lane with a minimum vehicle storage of 150 feet. The separate left and right exiting lanes for the development at Asheville Highway should be marked on the pavement with the appropriate white turn arrows and delineated with white lane lines.
- 1e) The construction of the Proposed Main Entrance on Asheville Highway will require a TDOT Highway Entrance Permit. The developer will need to apply for this permit and coordinate with TDOT regarding their specific requirements for this entrance and any other proposed median modifications.
- 1f) Many regulatory signs should be installed to avoid and help prevent wrong-way vehicles on Asheville Highway at the Proposed Main Entrance. Figure 2.10 in TDOT's Traffic Design Manual illustrates the signage required for the Proposed Main Entrance at Asheville Highway.







<u>Asheville Highway at Proposed Secondary Entrance</u>: The Proposed Secondary Entrance will operate sufficiently with a single exiting lane for left and right turn movements. This entrance is not expected to have any exiting right-turn movements.

- 2a) The construction of the Proposed Secondary Entrance on Asheville Highway will require a TDOT Highway Entrance Permit. The developer will need to apply for this permit and coordinate with TDOT regarding their specific requirements for this entrance and any other proposed median modifications.
- 2b) Many regulatory signs should be installed to avoid and help prevent wrong-way vehicles on Asheville Highway at the Proposed Main Entrance. Figure 2.10 in TDOT's Traffic Design Manual illustrates the signage required for the Proposed Main Entrance at Asheville Highway.
- 2c) Based on TDOT's warrant thresholds and the projected 2028 traffic volumes, an eastbound right turn lane is warranted and recommended to be constructed for the Proposed Secondary Entrance. This lane should have a lane change and deceleration distance of 340 feet. The bay taper length within the lane change and deceleration distance is recommended to be 180 feet (15:1), and these distances will provide a full-width lane length of 160 feet.
- 2d) If any further future development is proposed, particularly towards the western end of the development, a second exiting lane may be needed at the Proposed Secondary Entrance to provide separate left and right-turn lanes.





<u>8014 Asheville Highway Subdivision Internal Roads</u>: The layout plan shows six new streets, as shown in Figure 3.

- 3a) A 25-mph Speed Limit Sign (R2-1) is recommended to be posted near the beginning of the Proposed Main Entrance, Road "A", and the Proposed Secondary Entrance, Road "B", off Asheville Highway.
- 3b) Stop Signs (R1-1) with 24" white stop bars are recommended to be installed at the internal road locations, as shown in the image below.





At the internal intersection of Road "D" and "E", a four-way intersection is proposed. The above image shows stop Signs (R1-1) on the Road "D" approaches. However, it is recommended that a mini-roundabout with the appropriate signage at this intersection be considered. If a mini-roundabout is not feasible, further discussion with Knox County Engineering in the detailed design phase should include whether this intersection should include Stops Signs (R1-1) on all approaches, the reverse as shown, or as proposed in the image.

- 3c) The Stop Sign (R1-1) on the entrance approaches to Asheville Highway should include a One-Way Sign (R6-1) and a Divided Highway Sign (R6-3), as shown in Figure 2.10 in the TDOT Traffic Design Manual.
- 3d) Dual end-of-roadway object markers (OM4-1) should be installed at the end of subdivision Road "C", as shown in the report. The end of this internal road should include a hammerhead turnaround to facilitate vehicle returns in the opposite direction.
- 3e) An additional sign should be posted internally at the western end of Road "C" to follow Knoxville-Knox County Subdivision regulations. This sign is for notification of possible future street connections. It should state, "NOTICE – This road may be extended and connected to the west – for more info. contact Knox Co. Engineering & Public Works (865) 215-5800".
- 3f) The proposed lots within the development adjacent to and south of Asheville Highway should not be allowed direct access.
- 3g) Sight distance at the new internal intersections must not be impacted by new signage, parked cars, or future landscaping. With a proposed speed limit of 25-mph in the development, the required internal intersection sight distance is 250 feet. The site designer should ensure that this internal sight distance length is met.
- 3h) If directed by the local post office, the site designer should include a parking area and a centralized mail delivery center within the development for the subdivision residents.
- 3i) All drainage grates and covers for the residential development must be pedestrian and bicycle-safe.



- 3j) Several internal roads in the proposed subdivision will have long, straight road segments. Straight road segments encourage higher vehicle speeds. It is recommended that the civil site designer consider including traffic calming measures on these internal roads, such as speed humps or tables. Specifics regarding this recommendation should be discussed in the design phase with Knox County Engineering.
- 3k) All road 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 #: 47000058

Location: Asheville Highway, east of Molly Bright Road





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| 2021 20,557 1,697 8 61 19,879 (97%) 678 (3%) |
| 2020 20,616 ⁷ 11 62 19,831 (96%) 785 (4%) |
| |
| <u>(< < > >>)</u> 1-5 of 39 |

APPENDIX B

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Route 34: Burlington Shopper



| Going away from downtown | | | Going toward downtown | | | | | | |
|----------------------------|---------------------|--------------------------------|-----------------------|-----------------------------|--|----------------------------|--|--|--|
| Knoxville Station Bay H | Austin East High | Kirkwood St Superstop WB | Walmart | Kirkwood St Superstop EB | MLK at Beal Bourne Street (Austin-East High School) | Knoxville Station Bay H | | | |
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How to Read this Schedule



To determine when the bus serves a stop in between timepoints, look at when it is due at the timepoint before your stop and the timepoint after your stop, and you can estimate when it will arrive. Always be at your stop 5 minutes early!

These symbols indicate transfer points or Superstops, which are specific stops where you can transfer to a different route. Routes serving a transfer point or Superstop are indicated at the top of the times schedule, just above the name of the stop.

Cómo leer este horario

Conecte el número dentro del circulo en el mapa con la columna del horario con el mismo número para ver cuándo el bus para en ese lugar (esos lugares se llaman "tímepoints").

Para determinar cuándo un bus atiende una parada entre timepoints, mire a qué hora debería llegar al timepoint antes de su parada y el timepoint después de su parada, y podrá estimar la hora de llegada. Siempre llegue a su parada con 5 minutos de antelación!

Estos símbolos indican puntos de trasbordo Superstops que son paradas especificas donde puedes trasbordar a una ruta diferente. Las rutas que atienden un punto de trasbordo o Superstop están indicadas en la parte superior del horario, justo encima del nombre de la parada.



All KAT buses are lift-equipped. Paratransit service is also available to those who qualify. For more information, visit katbus.com or call 865-637-3000.

Bike racks are available on all KAT buses. Bikes ride free.

(IFI) All buses have FREE WI-FI.

katbus.com • Customer Service: 865-637-3000

Rider Tools and Tips

Fare Information

| Fare Type | Regular Fare | Discounted Fare |
|--------------|--------------|------------------------|
| 1-Ride pass | \$1.00 | \$.50 |
| 1-Day pass | \$2.00 | \$1.00 |
| 20-Ride pass | \$15.00 | \$7.50 |
| 30-Day Pass | \$30.00 | \$15.00 |
| SU Day rass | \$30.00 | \$13.00 |

Discounted fare for seniors 65+, Medicare cardholders, and persons with disabilities. KAT ID or Medicare card required.

Children 4 and under ride free.

Knox County School Students also ride free with the Youth Freedom Pass.

To learn more about our fares, the Youth Freedom Pass, and how to buy tickets, visit katbus.com.

Riding Tips

- Plan your trip using this map, the free Transit app, or our homepage trip planner on katbus.com.
- Always arrive at your bus stop 5 minutes early.
 When you see your bus coming, wave to the operator so
- When you see you bus coming, wave to the operator so they know you want to board.
 Have your fare ready when the bus arrives.
- When nearing your destination, pull the cord next to the windows to alert the operator that you want to get off at the next stop.
- View our Passenger Ride Guide at katbus.com.

KAT Holidays

KAT Services do not operate on the following holidays: New Year's Day, Independence Day, Thanksgiving & Christmas.

KAT buses run on a Sunday schedule on the following holidays: Martin Luther King, Jr. Day, Memorial Day, Juneteenth, Labor Day, day after Thanksgiving, day before Christmas.

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

Go paperless!

PLAN your trip, PAY your fare, and SCAN your ticket, all in our FREE official app:



Scan QR code to download Transit



Herramientas y consejos para los pasajeros

Información sobre tarifas

| Tarifa regular | Tarifa con descuento |
|----------------|--|
| \$1.00 | \$.50 |
| \$2.00 | \$1.00 |
| \$15.00 | \$7,50 |
| \$30.00 | \$15.00 |
| | Tarifa regular \$1.00 \$2.00 \$15.00 \$30.00 |

Tarifa descontada para mayores de 65 años, personas con tarjeta de Medicare y personas con discapacidades. Se necesita el ID de KAT o tarjeta de Medicare.

Los niños menores de 4 años viajan gratis.

Los estudiantes de las escuelas públicas del Condado de Knox también viajan gratis con el pase Youth Freedom Pass.

Visite katbus.com para averiguar más sobre nuestras tarifas, el pase para jóvenes y para comprar boletos.

Consejos para viajar

- Planifique su trayecto con este mapa, la aplicación gratuita Transit o el planificador en katbus.com.
- Siempre legue a la parada del autobús 5 minutos antes.
 Cuando vea que llega el autobús, haga una seña al
- operador para que sepa que quiere subir. • Tenga su pago listo cuando lega el autobús.
- Cuando se acerque a su destino, jale del cordón cercano a
- la ventana para alertar al operador de que quiere bajarse en la siguiente parada.
- · Repase nuestra Guía del Pasajero en katbus.com.

Los servicios de KAT no funcionan en los siguientes días feriados: Año Nuevo, Día de la Independencia, Acción de Gracias y Navidad.

Los autobuses de KAT siguen los horarios de los domingos en los siguientes feriados: día de Martin Luther King Jr., Día de los Caídos (Memorial Day), Juneteenth, Día del Trabajador, día después del Día de Acción de Gracias, día antes de Navidad.

Las oficinas de KAT estarán cerradas en todos esos días feriados.

¡Haga todo sin papel!

PLANIFIQUE su viaje, PAGUE la tarifa y ESCANEE su boleto, todo en Transit, jnuestra aplicación oficial gratuita! La aplicación se configura en el mismo idioma de su teléfono. Escanee el código QR para descargar Transit.

Accesibilidad

Todos los autobuses de KAT van equipados con un elevador. También existe servicio de paratránsito para quienes cualifiquen. Para más información, visite katbus.com o llame a KAT al 865-637-3000.



"Información en español en el intenos"

Serves/ Servir:

- Austin-East High School
- Burlington
- Chilhowee Intermediate School
- Chilhowee Park/ Jacob Building
- Civic Auditorium and Coliseum
- + Dr. Walter Hardy Park
- First Creek at Austin
- Five Points Neighborhood
- Harriet Tubman Park.
- Knoxville Family Justice Center
- Wnoxville Station/ Downtown
- Kroger
- The Change Center
- Wine Middle Magnet School
- · Walmart

KAT Reimagined

Effective Date: August 26, 2024



noppe


Route 34: Burlington Shopper

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| 9:15 AM | 9:35 AM | 9:38 AM | 9:55 AM | 10:15 AM | 10:20 AM | 10:35 AM |
| 9:45 AM | 10:05 AM | 10:08 AM | 10:25 AM | 10:45 AM | 10:50 AM | 11:05 AM |
| 10:15 AM | 10:35 AM | 10:38 AM | 10:55 AM | 11:15 AM | 11:20 AM | 11:35 AM |
| 10:45 AM | 11:05 AM | 11:08 AM | 11:25 AM | 11:45 AM | 11:50 AM | 12:05 PM |
| 11:15 AM | 11:35 AM | 11:38 AM | 11:55 AM | 12:15 PM | 12:20 PM | 12:35 PM |
| 11:45 AM | 12:05 PM | 12:08 PM | 12:25 PM | 12:45 PM | 12:50 PM | 1:05 PM |
| 12:15 PM | 12:35 PM | 12:38 PM | 12:55 PM | 1:15 PM | 1:20 PM | 1:35 PM |
| 12:45 PM | 1:05 PM | 1:08 PM | 1:25 PM | 1:45 PM | 1:50 PM | 2:05 PM |
| 1:15 PM | 1:35 PM | 1:38 PM | 1:55 PM | 2:15 PM | 2:20 PM | 2:35 PM |
| 1:45 PM | 2:05 PM | 2:08 PM | 2:25 PM | 2:45 PM | 2:50 PM | 3:05 PM |
| 2:15 PM | 2:35 PM | 2:38 PM | 2:55 PM | 3:15 PM | 3:20 PM | 3:35 PM |
| 2:45 PM | 3:05 PM | 3:08 PM | 3:25 PM | 3:45 PM | 3:50 PM | 4:05 PM |
| 3:15 PM | 3:35 PM | 3:38 PM | 3:55 PM | 4:15 PM | 4:20 PM | 4:35 PM |
| 3:45 PM | 4:05 PM | 4:08 PM | 4:25 PM | 4:45 PM | 4:50 PM | 5:05 PM |
| 4:15 PM | 4:35 PM | 4:38 PM | 4:55 PM | 5:15 PM | 5:20 PM | 5:35 PM |
| 4:45 PM | 5:05 PM | 5:08 PM | 5:25 PM | 5:45 PM | 5:50 PM | 6:05 PM |
| 5:15 PM | 5:35 PM | 5:38 PM | 5:55 PM | 6:15 PM | 6:20 PM | 6:35 PM |
| 5:45 PM | 6:05 PM | 6:08 PM | 6:25 PM | 6:45 PM | 6:50 PM | 7:05 PM |
| 6:15 PM | 6:35 PM | 6:38 PM | 6:55 PM | 7:15 PM | 7:20 PM | 7:35 PM |
| 6:45 PM | 7:05 PM | 7:08 PM | 7:25 PM | 7:45 PM | 7:50 PM | 8:05 PM |
| 7:15 PM | 7:35 PM | 7:38 PM | 7:55 PM | 8:15 PM | 5:20 PM | 8:35 PM |
| 7:45 PM | 8:05 PM | 8:08 PM | 8:25 PM | 8:45 PM | 8:50 PM | 9:05 PM |
| 8:15 PM | 8:35 PM | 8:38 PM | 8:55 PM | 9:15 PM | 9:20 PM | 9:35 PM |
| 8:45 PM | 9:05 PM | 9:08 PM | 9:25 PM | 9:45 PM | 9:50 PM | 10:05 PM |
| 9:15 PM | 9:35 PM | 9:38 PM | 9:55 PM | 10:15 PM | 10:20 PM | 10:35 PM |
| 9:45 PM | 10:05 PM | 10:08 PM | 10:25 PM | 10:45 PM | 10:50 PM | 11:05 PM |
| 10:15 PM | 10:35 PM | 10:38 PM | 10:55 PM | 11:15 PM | 11:20 PM | |
| 11:15 PM | 11-35 PM | 11-38 PM | 11-55 DM | | | |

 $I \rightarrow$

APPENDIX C

ZONING MAP



APPENDIX D

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Asheville Highway (EB and WB)

Minor Street: Private Driveway at 8014 Asheville Highway (NB) Traffic Control: Stop Conditions on Minor Street 9/4/2024 (Wednesday) Partly Cloudy and Hot Conducted by: Ajax Engineering

| | A | Asheville High | way | Private I | Driveway | A | sheville Highw | ay |] | |
|----------|--------|----------------|------|-----------|----------|--------|----------------|----|---------|--------------------|
| TIME | | WESTBOUN | D | NORTH | BOUND | | EASTBOUND | - | VEHICLE | PEAK |
| BEGIN | U-TURN | LT | THRU | LT | RT | U-TURN | THRU | RT | TOTAL | HOUR |
| 7:00 AM | 0 | 0 | 297 | 0 | 0 | 0 | 97 | 1 | 395 | 7:00 AM - 8:00 AM |
| 7:15 AM | 0 | 1 | 325 | 1 | 0 | 0 | 142 | 0 | 469 | |
| 7:30 AM | 0 | 3 | 363 | 3 | 0 | 0 | 125 | 5 | 499 | |
| 7:45 AM | 1 | 4 | 295 | 2 | 0 | 0 | 127 | 1 | 430 | |
| 8:00 AM | 0 | 1 | 250 | 1 | 0 | 0 | 136 | 0 | 388 | |
| 8:15 AM | 0 | 1 | 242 | 1 | 0 | 0 | 141 | 0 | 385 | |
| 8:30 AM | 0 | 0 | 233 | 0 | 0 | 0 | 143 | 0 | 376 | |
| 8:45 AM | 2 | 3 | 216 | 0 | 0 | 0 | 126 | 2 | 349 | |
| TOTAL | 3 | 13 | 2221 | 8 | 0 | 0 | 1037 | 9 | 3291 | |
| | | | | | | | | | | |
| 11:00 AM | 1 | 1 | 166 | 1 | 0 | 0 | 113 | 2 | 283 | |
| 11:15 AM | 0 | 0 | 139 | 2 | 0 | 1 | 133 | 0 | 275 | |
| 11:30 AM | 0 | 0 | 166 | 1 | 0 | 2 | 128 | 0 | 297 | |
| 11:45 AM | 0 | 0 | 124 | 0 | 0 | 0 | 149 | 1 | 274 | |
| 12:00 PM | 1 | 0 | 153 | 2 | 0 | 0 | 139 | 1 | 295 | 12:00 PM - 1:00 PM |
| 12:15 PM | 0 | 2 | 176 | 6 | 0 | 0 | 162 | 0 | 346 | |
| 12:30 PM | 0 | 1 | 160 | 1 | 0 | 0 | 131 | 2 | 295 | |
| 12:45 PM | 2 | 1 | 131 | 1 | 0 | 0 | 152 | 3 | 288 | |
| TOTAL | 4 | 5 | 1215 | 14 | 0 | 3 | 1107 | 9 | 2353 | |
| | | | • | • | • | • | | • | • | • |
| 2:00 PM | 1 | 1 | 159 | 2 | 0 | 0 | 145 | 1 | 309 | |
| 2:15 PM | 0 | 0 | 159 | 0 | 0 | 1 | 177 | 0 | 337 | |
| 2:30 PM | 0 | 1 | 143 | 0 | 0 | 0 | 173 | 0 | 317 | |
| 2:45 PM | 3 | 2 | 165 | 0 | 1 | 0 | 205 | 0 | 376 | |
| 3:00 PM | 1 | 0 | 141 | 2 | 0 | 1 | 198 | 0 | 343 | |
| 3:15 PM | 0 | 0 | 155 | 0 | 0 | 0 | 246 | 0 | 401 | |
| 3:30 PM | 1 | 1 | 219 | 1 | 0 | 0 | 257 | 0 | 479 | 3:30 PM - 4:30 PM |
| 3:45 PM | 1 | 2 | 256 | 0 | 0 | 0 | 290 | 1 | 550 | |
| 4:00 PM | 2 | 1 | 178 | 4 | 0 | 1 | 251 | 0 | 437 | |
| 4:15 PM | 0 | 0 | 156 | 1 | 0 | 0 | 286 | 0 | 443 | |
| 4:30 PM | 0 | 0 | 169 | 0 | 0 | 0 | 300 | 0 | 469 | |
| 4:45 PM | 0 | 0 | 162 | 0 | 1 | 0 | 292 | 2 | 457 | |
| 5:00 PM | 0 | 1 | 170 | 1 | 2 | 0 | 312 | 2 | 488 | |
| 5:15 PM | 0 | 0 | 145 | 3 | 2 | 0 | 307 | 1 | 458 | |
| 5:30 PM | 0 | 0 | 178 | 2 | 0 | 0 | 307 | 0 | 487 | |
| 5:45 PM | 1 | 0 | 145 | 0 | 0 | 0 | 296 | 0 | 442 | |
| TOTAL | 10 | 9 | 2700 | 16 | 6 | 3 | 4042 | 7 | 6793 | |

2024 AM Peak Hour

7:00 AM - 8:00 AM

| | А | sheville Highv | way | Private D | Driveway | As | sheville Highw | ay |
|---------|--------|----------------|------|-----------|----------|--------|----------------|------|
| TIME | | WESTBOUND |) | NORTH | BOUND | | EASTBOUND | |
| BEGIN | U-TURN | LT | THRU | LT | RT | U-TURN | THRU | RT |
| 7:00 AM | 0 | 0 | 297 | 0 | 0 | 0 | 97 | 1 |
| 7:15 AM | 0 | 1 | 325 | 1 | 0 | 0 | 142 | 0 |
| 7:30 AM | 0 | 3 | 363 | 3 | 0 | 0 | 125 | 5 |
| 7:45 AM | 1 | 4 | 295 | 2 | 0 | 0 | 127 | 1 |
| TOTAL | 1 | 8 | 1280 | 6 | 0 | 0 | 491 | 7 |
| PHF | 0.25 | 0.50 | 0.88 | 0.50 | - | - | 0.86 | 0.35 |
| Truck % | 0.0% | 0.0% | 3.8% | 0.0% | 0.0% | 0.0% | 6.1% | 0.0% |

2024 PM Peak Hour

3:30 PM - 4:30 PM

| | А | sheville Highv | vay | Private I | Driveway | As | sheville Highw | ay |
|---------|--------|----------------|------|-----------|----------|--------|----------------|------|
| TIME | | WESTBOUNI |) | NORTH | BOUND | | EASTBOUND | |
| BEGIN | U-TURN | LT | THRU | LT | RT | U-TURN | THRU | RT |
| 3:30 PM | 1 | 1 | 219 | 1 | 0 | 0 | 257 | 0 |
| 3:45 PM | 1 | 2 | 256 | 0 | 0 | 0 | 290 | 1 |
| 4:00 PM | 2 | 1 | 178 | 4 | 0 | 1 | 251 | 0 |
| 4:15 PM | 0 | 0 | 156 | 1 | 0 | 0 | 286 | 0 |
| TOTAL | 4 | 4 | 809 | 6 | 0 | 1 | 1084 | 1 |
| PHF | 0.50 | 0.50 | 0.79 | 0.38 | - | 0.25 | 0.93 | 0.25 |
| Truck % | 0.0% | 0.0% | 3.3% | 0.0% | 0.0% | 0.0% | 2.3% | 0.0% |



PEAK HOUR DATA

Major Street: Asheville Highway (EB and WB) Minor Street: Private Driveway at 8014 Asheville Highway (NB) Traffic Control: Stop Conditions on Minor Street 9/4/2024 (Wednesday) Partly Cloudy and Hot Conducted by: Ajax Engineering





APPENDIX E

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 12)

EXISTING CONDITIONS

1

Intersection

Int Delay, s/veh

| Movement | EBT | EBR | WBU | WBL | WBT | NBL | NBR |
|------------------------|--------------|------|------|------|------|------|------|
| Lane Configurations | _ ≜ ⊅ | | | | 41 | ۰¥ | |
| Traffic Vol, veh/h | 491 | 7 | 1 | 8 | 1280 | 6 | 0 |
| Future Vol, veh/h | 491 | 7 | 1 | 8 | 1280 | 6 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | - | None | - | None |
| Storage Length | - | - | - | - | - | 0 | - |
| Veh in Median Storage | , # 0 | - | - | - | 0 | 1 | - |
| Grade, % | 0 | - | - | - | 0 | 0 | - |
| Peak Hour Factor | 86 | 35 | 25 | 50 | 88 | 50 | 90 |
| Heavy Vehicles, % | 6 | 0 | 0 | 0 | 4 | 0 | 0 |
| Mvmt Flow | 571 | 20 | 4 | 16 | 1455 | 12 | 0 |
| | | | | | | | |

| Major/Minor | Majo | or1 | N | lajor2 | | 1 | Minor1 | |
|----------------------|------|-----|------|--------|-----|-------|--------|-----|
| Conflicting Flow All | | 0 | 0 | 591 | 591 | 0 | 1349 | 296 |
| Stage 1 | | - | - | - | - | - | 581 | - |
| Stage 2 | | - | - | - | - | - | 768 | - |
| Critical Hdwy | | - | - | 6.4 | 4.1 | - | 6.8 | 6.9 |
| Critical Hdwy Stg 1 | | - | - | - | - | - | 5.8 | - |
| Critical Hdwy Stg 2 | | - | - | - | - | - | 5.8 | - |
| Follow-up Hdwy | | - | - | 2.5 | 2.2 | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuve | r | - | - | 614 | 995 | - | 144 | 706 |
| Stage 1 | | - | - | - | - | - | 528 | - |
| Stage 2 | | - | - | - | - | - | 424 | - |
| Platoon blocked, % | | - | - | | | - | | |
| Mov Cap-1 Maneuve | er | - | - | 885 | 885 | - | 127 | 706 |
| Mov Cap-2 Maneuve | er | - | - | - | - | - | 255 | - |
| Stage 1 | | - | - | - | - | - | 528 | - |
| Stage 2 | | - | - | - | - | - | 374 | - |
| | | | | | | | | |
| Approach | | EB | | WB | | | NB | |
| HCM Control Delay, | S | 0 | | 1.2 | | | 19.8 | |
| HCM LOS | | | | | | | С | |
| | | | | | | | | |
| Minor Lane/Major M | vmt | NB | Ln1 | EBT | EBR | WBL | WBT | |
| Capacity (veh/h) | | | 255 | - | - | 885 | - | |
| HCM Lane V/C Ratio | 0 | 0. | 047 | - | - | 0.018 | - | |
| HCM Control Delay | (S) | 1 | 19.8 | - | - | 9.2 | 1.1 | |
| HCM Lane LOS | ., | | С | - | - | А | А | |
| HCM 95th %tile O(ve | eh) | | 0.1 | - | _ | 01 | - | |

1

Intersection

Int Delay, s/veh

| Movement | EBU | EBT | EBR | WBU | WBL | WBT | NBL | NBR |
|------------------------|------|---------------|------|------|------|-------------|------|------|
| Lane Configurations | | _ ≜ î≽ | | | | {1 † | ۰¥ | |
| Traffic Vol, veh/h | 1 | 1084 | 1 | 4 | 4 | 809 | 6 | 0 |
| Future Vol, veh/h | 1 | 1084 | 1 | 4 | 4 | 809 | 6 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | None |
| Storage Length | - | - | - | - | - | - | 0 | - |
| Veh in Median Storage | ,# - | 0 | - | - | - | 0 | 1 | - |
| Grade, % | - | 0 | - | - | - | 0 | 0 | - |
| Peak Hour Factor | 25 | 93 | 25 | 50 | 50 | 79 | 38 | 90 |
| Heavy Vehicles, % | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 |
| Mvmt Flow | 4 | 1166 | 4 | 8 | 8 | 1024 | 16 | 0 |

| Major/Minor | Major1 | | ſ | Major2 | | N | Ainor1 | | |
|----------------------|--------|-------|-----|--------|-------|-----|--------|-----|--|
| Conflicting Flow All | 1024 | 0 | 0 | 1170 | 1170 | 0 | 1720 | 585 | |
| Stage 1 | - | - | - | - | - | - | 1176 | - | |
| Stage 2 | - | - | - | - | - | - | 544 | - | |
| Critical Hdwy | 6.4 | - | - | 6.4 | 4.1 | - | 6.8 | 6.9 | |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 5.8 | - | |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 5.8 | - | |
| Follow-up Hdwy | 2.5 | - | - | 2.5 | 2.2 | - | 3.5 | 3.3 | |
| Pot Cap-1 Maneuver | 326 | | - | 263 | 604 | - | 82 | 459 | |
| Stage 1 | - | - | - | - | - | - | 260 | - | |
| Stage 2 | - | - | - | - | - | - | 551 | - | |
| Platoon blocked, % | | - | - | | | - | | | |
| Mov Cap-1 Maneuver | 326 | | - | 366 | 366 | - | 71 | 459 | |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 180 | - | |
| Stage 1 | - | - | - | - | - | - | 251 | - | |
| Stage 2 | - | - | - | - | - | - | 495 | - | |
| | | | | | | | | | |
| Approach | EB | | | WB | | | NB | | |
| HCM Control Delay, s | 0.1 | | | 1.7 | | | 26.9 | | |
| HCM LOS | | | | | | | D | | |
| | | | | | | | | | |
| Minor Lane/Major Mvr | nt | NBLn1 | EBT | EBR | WBL | WBT | | | |
| Capacity (veh/h) | | 180 | - | - | 366 | - | | | |
| HCM Lane V/C Ratio | | 0.088 | - | - | 0.022 | - | | | |
| HCM Control Delay (s | ;) | 26.9 | - | - | 15.3 | 1.5 | | | |
| HCM Lane LOS | | D | - | - | С | А | | | |
| HCM 95th %tile Q(vel | ר) | 0.3 | - | - | 0.1 | - | | | |

PROJECTED CONDITIONS WITHOUT THE PROJECT

Intersection

| in Delay, siven | 1.4 | | | | | | | |
|------------------------|------|------|------|------|--------------|------|------|--|
| Movement | EBT | EBR | WBU | WBL | WBT | NBL | NBR | |
| Lane Configurations | | | | | - € † | ۰¥ | | |
| Traffic Vol, veh/h | 530 | 7 | 1 | 8 | 1382 | 6 | 0 | |
| Future Vol, veh/h | 530 | 7 | 1 | 8 | 1382 | 6 | 0 | |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Sign Control | Free | Free | Free | Free | Free | Stop | Stop | |
| RT Channelized | - | None | - | - | None | - | None | |
| Storage Length | - | - | - | - | - | 0 | - | |
| Veh in Median Storage, | # 0 | - | - | - | 0 | 1 | - | |
| Grade, % | 0 | - | - | - | 0 | 0 | - | |
| Peak Hour Factor | 86 | 35 | 25 | 50 | 88 | 50 | 90 | |
| Heavy Vehicles, % | 6 | 0 | 0 | 0 | 4 | 0 | 0 | |
| Mvmt Flow | 616 | 20 | 4 | 16 | 1570 | 12 | 0 | |

| Major/Minor | Maj | jor1 | Ν | /lajor2 | | | Vinor1 | |
|----------------------|-----|------|------|---------|-----|-------|--------|-----|
| Conflicting Flow All | | 0 | 0 | 636 | 636 | 0 | 1451 | 318 |
| Stage 1 | | - | - | - | - | - | 626 | - |
| Stage 2 | | - | - | - | - | - | 825 | - |
| Critical Hdwy | | - | - | 6.4 | 4.1 | - | 6.8 | 6.9 |
| Critical Hdwy Stg 1 | | - | - | - | - | - | 5.8 | - |
| Critical Hdwy Stg 2 | | - | - | - | - | - | 5.8 | - |
| Follow-up Hdwy | | - | - | 2.5 | 2.2 | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuve | r | - | - | 575 | 957 | - | 124 | 684 |
| Stage 1 | | - | - | - | - | - | 501 | - |
| Stage 2 | | - | - | - | - | - | 396 | - |
| Platoon blocked, % | | - | - | | | - | | |
| Mov Cap-1 Maneuv | er | - | - | 845 | 845 | - | 101 | 684 |
| Mov Cap-2 Maneuv | er | - | - | - | - | - | 222 | - |
| Stage 1 | | - | - | - | - | - | 501 | - |
| Stage 2 | | - | - | - | - | - | 322 | - |
| | | | | | | | | |
| Approach | | EB | | WB | | | NB | |
| HCM Control Delay | S | 0 | | 1.8 | | | 22.1 | |
| HCM LOS | | 0 | | 110 | | | С | |
| | | | | | | | Ŭ | |
| | | | | EDT | EDD | | WDT | |
| Minor Lane/Major M | vmt | NE | 3Ln1 | FRL | EBK | WBL | WBL | |
| Capacity (veh/h) | | | 222 | - | - | 845 | - | |
| HCM Lane V/C Rati | 0 | 0 | .054 | - | - | 0.019 | - | |
| HCM Control Delay | (S) | | 22.1 | - | - | 9.4 | 1.7 | |
| HCM Lane LOS | | | С | - | - | А | А | |
| HCM 95th %tile Q(v | eh) | | 0.2 | - | - | 0.1 | - | |

Intersection

| Int Delay, s/veh | 1.3 | | | | | | | |
|------------------------|-------|-------------|------|------|------|------|------|------|
| Movement | EBU | EBT | EBR | WBU | WBL | WBT | NBL | NBR |
| Lane Configurations | | ≜ î≽ | | | | -4↑ | ۰¥ | |
| Traffic Vol, veh/h | 1 | 1171 | 1 | 4 | 4 | 874 | 6 | 0 |
| Future Vol, veh/h | 1 | 1171 | 1 | 4 | 4 | 874 | 6 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | None |
| Storage Length | - | - | - | - | - | - | 0 | - |
| Veh in Median Storage | e,# - | 0 | - | - | - | 0 | 1 | - |
| Grade, % | - | 0 | - | - | - | 0 | 0 | - |
| Peak Hour Factor | 25 | 93 | 25 | 50 | 50 | 79 | 38 | 90 |
| Heavy Vehicles, % | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 |
| Mvmt Flow | 4 | 1259 | 4 | 8 | 8 | 1106 | 16 | 0 |

| Major/Minor | Major1 | | ľ | Major2 | | Ν | /linor1 | | |
|----------------------|--------|-------|-----|--------|-------|-----|---------|-----|--|
| Conflicting Flow All | 1106 | 0 | 0 | 1263 | 1263 | 0 | 1854 | 632 | |
| Stage 1 | - | - | - | - | - | - | 1269 | - | |
| Stage 2 | - | - | - | - | - | - | 585 | - | |
| Critical Hdwy | 6.4 | - | - | 6.4 | 4.1 | - | 6.8 | 6.9 | |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 5.8 | - | |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 5.8 | - | |
| Follow-up Hdwy | 2.5 | - | - | 2.5 | 2.2 | - | 3.5 | 3.3 | |
| Pot Cap-1 Maneuver | 289 | - | - | 229 | 557 | - | 67 | 428 | |
| Stage 1 | - | - | - | - | - | - | 232 | - | |
| Stage 2 | - | - | - | - | - | - | 526 | - | |
| Platoon blocked, % | | - | - | | | - | | | |
| Mov Cap-1 Maneuver | 289 | - | - | 325 | 325 | - | 56 | 428 | |
| Mov Cap-2 Maneuver | | - | - | - | - | - | 158 | - | |
| Stage 1 | - | - | - | - | - | - | 221 | - | |
| Stage 2 | - | - | - | - | - | - | 459 | - | |
| | | | | | | | | | |
| Approach | EB | | | WB | | | NB | | |
| HCM Control Delay, s | s 0.1 | | | 2.3 | | | 30.3 | | |
| HCM LOS | | | | | | | D | | |
| | | | | | | | | | |
| Minor Lane/Major Mvi | mt | NBLn1 | EBT | EBR | WBL | WBT | | | |
| Capacity (veh/h) | | 158 | - | - | 325 | - | | | |
| HCM Lane V/C Ratio | | 0.1 | - | - | 0.025 | - | | | |
| HCM Control Delay (s | 5) | 30.3 | - | - | 16.7 | 2.1 | | | |
| HCM Lane LOS | | D | - | - | С | А | | | |
| HCM 95th %tile Q(vel | h) | 0.3 | - | - | 0.1 | - | | | |

PROJECTED CONDITIONS WITH THE PROJECT

Intersection

| Int Delay, s/veh | 3.8 | | | | | | |
|------------------------|------|------|------|-----------|----------|--------|------|
| Movement | EBT | EBR | WBU | WBL | WBT | NBL | NBR |
| Lane Configurations | - 11 | 1 | | <u>ار</u> | ^ | ۲ ۲ | 1 |
| Traffic Vol, veh/h | 567 | 23 | 1 | 16 | 1391 | 86 | 21 |
| Future Vol, veh/h | 567 | 23 | 1 | 16 | 1391 | 86 | 21 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | - | None | - | None |
| Storage Length | - | 235 | - | 285 | - | 0 | 100 |
| Veh in Median Storage | ,# 0 | - | - | - | 0 | 1 | - |
| Grade, % | 0 | - | - | - | 0 | 0 | - |
| Peak Hour Factor | 86 | 35 | 25 | 50 | 88 | 50 | 90 |
| Heavy Vehicles, % | 6 | 0 | 0 | 0 | 4 | 0 | 0 |
| Mvmt Flow | 659 | 66 | 4 | 32 | 1581 | 172 | 23 |

| Major/Minor | Major1 | | Major2 | | | Minor1 | | | | |
|-----------------------|--------|--------|----------|---------|-----|--------|----------|-------------|--------------------------------|--|
| Conflicting Flow All | 0 | 0 | 659 | 725 | 0 | 1522 | 330 | | | |
| Stage 1 | - | - | - | - | - | 659 | - | | | |
| Stage 2 | - | - | - | - | - | 862 | - | | | |
| Critical Hdwy | - | - | 6.4 | 4.1 | - | 6.8 | 6.9 | | | |
| Critical Hdwy Stg 1 | - | - | - | - | - | 5.8 | - | | | |
| Critical Hdwy Stg 2 | - | - | - | - | - | 5.8 | - | | | |
| Follow-up Hdwy | - | - | 2.5 | 2.2 | - | 3.5 | 3.3 | | | |
| Pot Cap-1 Maneuver | - | - | 556 | 887 | - | ~ 111 | 672 | | | |
| Stage 1 | - | - | - | - | - | 482 | - | | | |
| Stage 2 | - | - | - | - | - | 379 | - | | | |
| Platoon blocked, % | - | - | | | - | | | | | |
| Mov Cap-1 Maneuver | - | - | 827 | 827 | - | ~ 106 | 672 | | | |
| Mov Cap-2 Maneuver | - | - | - | - | - | 236 | - | | | |
| Stage 1 | - | - | - | - | - | 482 | - | | | |
| Stage 2 | - | - | - | - | - | 362 | - | | | |
| | | | | | | | | | | |
| A 1 | | | | | | ND | | | | |
| Approach | EB | | WB | | | NB | | | | |
| HCM Control Delay, s/ | /v 0 | | 0.21 | | | 47.64 | | | | |
| HCM LOS | | | | | | E | | | | |
| | | | | | | | | | | |
| Minor Lane/Maior Mvn | nt | NBLn1 | NBLn2 | EBT | EBR | WBL | WBT | | | |
| Capacity (veh/h) | | 236 | 672 | - | - | 827 | - | | | |
| HCM Lane V/C Ratio | | 0.729 | 0.035 | - | - | 0.044 | - | | | |
| HCM Control Delay (s | /veh) | 52.7 | 10.5 | - | - | 9.6 | - | | | |
| HCM Lane LOS | | F | B | - | - | A | - | | | |
| HCM 95th %tile Q(veh | 1) | 5 | 0.1 | - | - | 0.1 | - | | | |
| | ., | Ū | . | | | ••• | | | | |
| Notes | | | | | | | | | | |
| ~: Volume exceeds ca | pacity | \$: De | elay exc | eeds 30 | 00s | +: Com | putation | Not Defined | *: All major volume in platoon | |

Projected 2028 Conditions With the Project - AM Peak Hour RWJ

| Intersection | | | | | | |
|------------------------|-------------|------|------|------|------|------|
| Int Delay, s/veh | 0.3 | | | | | |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | ∱ î≽ | | | -4î† | ۰¥ | |
| Traffic Vol, veh/h | 590 | 10 | 0 | 1477 | 32 | 0 |
| Future Vol, veh/h | 590 | 10 | 0 | 1477 | 32 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 0 | - |
| Veh in Median Storage | e, # 0 | - | - | 0 | 1 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 86 | 90 | 90 | 88 | 90 | 90 |
| Heavy Vehicles, % | 6 | 0 | 0 | 4 | 0 | 0 |
| Mvmt Flow | 686 | 11 | 0 | 1678 | 36 | 0 |

| Major/Minor | Majo | r1 | Ν | lajor2 | 1 | Vinor1 | |
|----------------------|-------|----|-------|--------|-----|--------|-----|
| Conflicting Flow All | | 0 | 0 | 697 | 0 | 1531 | 349 |
| Stage 1 | | - | - | - | - | 692 | - |
| Stage 2 | | - | - | - | - | 839 | - |
| Critical Hdwy | | - | - | 4.1 | - | 6.8 | 6.9 |
| Critical Hdwy Stg 1 | | - | - | - | - | 5.8 | - |
| Critical Hdwy Stg 2 | | - | - | - | - | 5.8 | - |
| Follow-up Hdwy | | - | - | 2.2 | - | 3.5 | 3.3 |
| Pot Cap-1 Maneuver | | - | - | 908 | - | 110 | 653 |
| Stage 1 | | - | - | - | - | 464 | - |
| Stage 2 | | - | - | - | - | 389 | - |
| Platoon blocked, % | | - | - | | - | | |
| Mov Cap-1 Maneuver | | - | - | 908 | - | 110 | 653 |
| Mov Cap-2 Maneuver | | - | - | - | - | 243 | - |
| Stage 1 | | - | - | - | - | 464 | - |
| Stage 2 | | - | - | - | - | 389 | - |
| | | | | | | | |
| Approach | E | D | | | | ND | |
| Approach | | | | | | | |
| HCM Control Delay, s | /V | 0 | | 0 | | 22.36 | |
| HCM LOS | | | | | | C | |
| | | | | | | | |
| Minor Lane/Major Mvr | nt | Ν | BLn1 | EBT | EBR | WBL | WBT |
| Capacity (veh/h) | | | 243 | - | - | 908 | - |
| HCM Lane V/C Ratio | | (| 0.146 | - | - | - | - |
| HCM Control Delay (s | /veh) | | 22.4 | - | - | 0 | _ |
| HCM Lane LOS | | | C | - | - | A | - |
| HCM 95th %tile Q(veh | ו) | | 0.5 | - | - | 0 | - |

15.5

Intersection

Int Delay, s/veh

| Movement | EBU | EBT | EBR | WBU | WBL | WBT | NBL | NBR |
|------------------------|-------|------|------|------|------|----------|------|------|
| Lane Configurations | | - 11 | 1 | | | ^ | | 1 |
| Traffic Vol, veh/h | 1 | 1220 | 57 | 4 | 33 | 906 | 69 | 16 |
| Future Vol, veh/h | 1 | 1220 | 57 | 4 | 33 | 906 | 69 | 16 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | None |
| Storage Length | - | - | 235 | - | 285 | - | 0 | 100 |
| Veh in Median Storage | , # - | 0 | - | - | - | 0 | 1 | - |
| Grade, % | - | 0 | - | - | - | 0 | 0 | - |
| Peak Hour Factor | 25 | 93 | 25 | 50 | 50 | 79 | 38 | 90 |
| Heavy Vehicles, % | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 |
| Mvmt Flow | 4 | 1312 | 228 | 8 | 66 | 1147 | 182 | 18 |

| Major/Minor | Major1 | | ľ | Major2 | | ľ | Minor1 | | | |
|----------------------|---|--------|----------|---------|------|--------|----------|------------|-----------------------------------|--|
| Conflicting Flow All | 1147 | 0 | 0 | 1312 | 1540 | 0 | 2041 | 656 | | |
| Stage 1 | - | · - | - | - | - | - | 1320 | - | | |
| Stage 2 | - | · - | - | - | - | - | 721 | - | | |
| Critical Hdwy | 6.4 | | - | 6.4 | 4.1 | - | 6.8 | 6.9 | | |
| Critical Hdwy Stg 1 | - | · - | - | - | - | - | 5.8 | - | | |
| Critical Hdwy Stg 2 | - | · - | - | - | - | - | 5.8 | - | | |
| Follow-up Hdwy | 2.5 | - | - | 2.5 | 2.2 | - | 3.5 | 3.3 | | |
| Pot Cap-1 Maneuver | 272 | - | - | 213 | 437 | - | ~ 50 | 413 | | |
| Stage 1 | - | | - | - | - | - | 218 | - | | |
| Stage 2 | - | · - | - | - | - | - | 448 | - | | |
| Platoon blocked, % | | - | - | | | - | | | | |
| Mov Cap-1 Maneuver | 272 | - | - | 389 | 389 | - | ~ 39 | 413 | | |
| Mov Cap-2 Maneuver | • - | | - | - | - | - | ~ 138 | - | | |
| Stage 1 | - | · - | - | - | - | - | 212 | - | | |
| Stage 2 | - | · - | - | - | - | - | 362 | - | | |
| | | | | | | | | | | |
| Approach | EB | | | WB | | | NB | | | |
| HCM Control Delay, s | /v 0.05 | | | 0.99 | | 2 | 223.71 | | | |
| HCM LOS | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | | 0.00 | | - | F | | | |
| | | | | | | | | | | |
| | | | | | | | MOT | | | |
| Minor Lane/Major Mvi | mt | NBLn1 | VBLn2 | EBT | EBR | WBL | WBI | | | |
| Capacity (veh/h) | | 138 | 413 | - | - | 389 | - | | | |
| HCM Lane V/C Ratio | | 1.313 | 0.043 | - | - | 0.19 | - | | | |
| HCM Control Delay (s | s/veh) | 244.2 | 14.1 | - | - | 16.4 | - | | | |
| HCM Lane LOS | | F | В | - | - | С | - | | | |
| HCM 95th %tile Q(vel | n) | 11.4 | 0.1 | - | - | 0.7 | - | | | |
| Notes | | | | | | | | | | |
| ~: Volume exceeds ca | apacity | \$: De | elay exc | eeds 30 |)0s | +: Com | putatior | Not Define | ed *: All major volume in platoon | |

Projected 2028 Conditions With the Project - PM Peak Hour RWJ

| Intersection | | | | | | |
|------------------------|---------------|------|------|------|------|------|
| Int Delay, s/veh | 0.3 | | | | | |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | _ ∱ î≽ | | | {î† | ۰¥ | |
| Traffic Vol, veh/h | 1278 | 33 | 0 | 975 | 24 | 0 |
| Future Vol, veh/h | 1278 | 33 | 0 | 975 | 24 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | - | - | 0 | - |
| Veh in Median Storage | e, # 0 | - | - | 0 | 1 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 93 | 90 | 90 | 79 | 90 | 90 |
| Heavy Vehicles, % | 2 | 0 | 0 | 3 | 0 | 0 |
| Mvmt Flow | 1374 | 37 | 0 | 1234 | 27 | 0 |

| Major/Minor N | 1ajor1 | ľ | Major2 | 1 | Minor1 | | |
|------------------------|--------|-----------|--------|-----|--------|-----|--|
| Conflicting Flow All | 0 | 0 | 1411 | 0 | 2010 | 705 | |
| Stage 1 | - | - | - | - | 1393 | - | |
| Stage 2 | - | - | - | - | 617 | - | |
| Critical Hdwy | - | - | 4.1 | - | 6.8 | 6.9 | |
| Critical Hdwy Stg 1 | - | - | - | - | 5.8 | - | |
| Critical Hdwy Stg 2 | - | - | - | - | 5.8 | - | |
| Follow-up Hdwy | - | - | 2.2 | - | 3.5 | 3.3 | |
| Pot Cap-1 Maneuver | - | - | 490 | - | 53 | 383 | |
| Stage 1 | - | - | - | - | 199 | - | |
| Stage 2 | - | - | - | - | 506 | - | |
| Platoon blocked, % | - | - | | - | | | |
| Mov Cap-1 Maneuver | - | - | 490 | - | 53 | 383 | |
| Mov Cap-2 Maneuver | - | - | - | - | 149 | - | |
| Stage 1 | - | - | - | - | 199 | - | |
| Stage 2 | - | - | - | - | 506 | - | |
| | | | | | | | |
| Approach | EB | | WB | | NB | | |
| HCM Control Delay, s/v | 0 | | 0 | | 34.33 | | |
| HCM LOS | | | | | D | | |
| | | | | | | | |
| Minor Lane/Major Mymt | | NRI n1 | FBT | FBR | WBI | WBT | |
| Canacity (veh/h) | | 149 | | | 490 | | |
| HCM Lane V/C Ratio | | 0 179 | _ | _ | | _ | |
| HCM Control Delay (s/v | eh) | 34.3 | _ | _ | 0 | _ | |
| HCM Lane LOS | 011) | 04.0 D | - | - | A | - | |
| HCM 95th %tile Q(veh) | | 0.6 | - | - | 0 | - | |

APPENDIX F

TRIP GENERATION DATA

Local Apartment Trip Generation Study

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

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

Trip Generation Per Dwelling Unit

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

Data Plot and Equation



- 124

Local Apartment Trip Generation Study

| Average Vehicle Trip Ends vs: On a: | Dwelling Units 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 Ra | te Ranges of Ra | ates Standard Deviation |
|------------|-----------------|-------------------------|
| 0.55 | 0.14 - 0.78 | 0.18 |

Data Plot and Equation



International International

Local Apartment Trip Generation Study

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



-

Land Use: 210 Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (https://www.ite.org/technical-resources/topics/trip-and-parking-generation/).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077,1078, 1079

Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 174

Avg. Num. of Dwelling Units: 246

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|--------------|----------------|--------------------|
| 9.43 | 4.45 - 22.61 | 2.13 |

Data Plot and Equation



Single-Family Detached Housing (210)

| Vehicle Trip Ends vs: Dw | velling Units |
|---------------------------------|-------------------------------------|
| On a: We | eekday, |
| Pe | ak Hour of Adjacent Street Traffic, |
| On | ne Hour Between 7 and 9 a.m. |
| Setting/Location: Ge | eneral Urban/Suburban |
| Number of Studies: 19 | 2 |
| Avg. Num. of Dwelling Units: 22 | 6 |
| Directional Distribution: 26 | % entering, 74% exiting |

Vehicle Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|--------------|----------------|--------------------|
| 0.70 | 0.27 - 2.27 | 0.24 |

Data Plot and Equation





Single-Family Detached Housing (210)

| Vehicle Trip Ends vs: Dwelling Units | |
|---|--|
| On a: Weekday, | |
| Peak Hour of Adjacent Street Traffic | |
| One Hour Between 4 and 6 p.m. | |
| Setting/Location: General Urban/Suburban | |
| Number of Studies: 208 | |
| Avg. Num. of Dwelling Units: 248 | |
| Directional Distribution: 63% entering, 37% exiting | |

Vehicle Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|--------------|----------------|--------------------|
| 0.94 | 0.35 - 2.98 | 0.31 |

Data Plot and Equation



TRIP GENERATION FOR 8014 ASHEVILLE HIGHWAY SUBDIVISION

172 Attached Townhouses and 66 Single-Family Detached Houses

| ITE LAND USE CODE | LAND USE DESCRIPTION | # OF UNITS | GENERATED DAILY TRAFFIC | GENERATED TRAFFIC AM PEAK HOUR | | GI PM | ENERATE TRAFFIC PEAK HO | D DUR | |
|----------------------|-------------------------|------------|-------------------------------|--------------------------------------|------|----------|-------------------------------|----------|-------|
| | | | | ENTER | EXIT | TOTAL | ENTER | EXIT | TOTAL |
| Local Trip | Multi-Family | | | 22% | 78% | | 55% | 45% | |
| Rate | Attached Townhouses | 172 | 1,554 | 19 | 69 | 88 | 69 | 56 | 125 |
| | Single-Family | | | 26% | 74% | | 63% | 37% | |
| #210 | Detached Housing | 66 | 688 | 13 | 38 | 51 | 42 | 25 | 67 |
| Tota | l New Volume Site | Trips | 2,242 | 32 | 107 | 139 | 111 | 81 | 192 |

ITE Trip Generation Manual, 11th Edition and Local Trip Rates Trips calculated by using Fitted Curve Equations

TRIP GENERATION FOR 8014 ASHEVILLE HIGHWAY SUBDIVISION 172 Attached Townhouses

172 Units = X

<u>Weekday:</u>

| | - | 1,001 | mps | = |
|--|-----|-------|-------|--------|
| | Т= | 1.554 | trips | |
| | T = | 15 | * | 102.27 |
| Fitted Curve Equation: $T = 15.193(X)^{\circ}$ | | | 399 | |

Peak Hour of Adjacent Traffic between 7 and 9 am:

| $\mathbf{T} = 8$ | 3 trips | _ |
|---|---------|-----|
| T = 0.758 | 3 * | 116 |
| Fitted Curve Equation: $T = 0.758(X)^{0}$ | 924 | |

Peak Hour of Adjacent Traffic between 4 and 6 pm:

| | T = | 125 trips | : | |
|------------------------|---------|--------------|-----|---------|
| | T = | 0.669 * | 172 | + 10.07 |
| Fitted Curve Equation: | T = 0.6 | 69(X)+10.069 | | |

TRIP GENERATION FOR 8014 ASHEVILLE HIGHWAY SUBDIVISION 66 Single-Family Detached Houses

66 Residential Houses = X

Weekday:

| Fitted Curve Equation: | Ln(T) = | $= 0.92 \operatorname{Ln}(X) + 2.68$ | |
|------------------------|---------|--------------------------------------|--------|
| | Ln(T) = | 0.92 * 4.19 | + 2.68 |
| | Ln(T) = | 6.53 | |
| | T = | 688 trips | |
| | | | |

Peak Hour of Adjacent Traffic between 7 and 9 am:

| Ln(T) = 0.91 Ln(X) + 0.12 | | | |
|---------------------------|---|--|--|
| T = | 0.91 * 4 | + 0.12 | |
| Ln(T) = | 3.93 | | |
| T = | 51 trips | | |
| | Ln(T) = T = Ln(T) = <u>T =</u> | Ln(T) = 0.91 Ln(X) + 0.12 $T = 0.91 * 4$ $Ln(T) = 3.93$ $T = 51 trips$ | |

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: Ln(T) = 0.94 Ln(X) + 0.27 Ln(T) = 0.94 * 4.19 + 0.27 Ln(T) = 4.21<u>T = 67 trips</u>

TRIP GENERATION FOR ADJACENT HABITAT FOR HUMANITY SUBDIVISION 74 Attached Duplexes

| ITE LAND USE CODE | LAND USE DESCRIPTION | # OF UNITS | GENERATED DAILY TRAFFIC | GENERATED TRAFFIC AM PEAK HOUR | | GI PM I | ENERATE TRAFFIC PEAK HC | D DUR | |
|----------------------|-------------------------|------------|-------------------------------|--------------------------------------|------|------------|-------------------------------|----------|-------|
| | | | | ENTER | EXIT | TOTAL | ENTER | EXIT | TOTAL |
| Local Trip | Multi-Family | | | 22% | 78% | | 55% | 45% | |
| Rate | Attached Duplexes | 74 | 728 | 9 | 32 | 41 | 33 | 27 | 60 |
| Tota | l New Volume Site | Trips | 728 | 9 | 32 | 41 | 33 | 27 | 60 |

Trips calculated by using Fitted Curve Equations from Local Trip Rates

TRIP GENERATION FOR ADJACENT HABITAT FOR HUMANITY SUBDIVISION 74 Attached Duplexes

74 Units = X

<u>Weekday:</u>

| | T = | 728 trips |
|------------------------|----------|-------------------------|
| | T = | 15 * 47.91 |
| Fitted Curve Equation: | T = 15.1 | 193(X) ^{0.899} |

Peak Hour of Adjacent Traffic between 7 and 9 am:

| T = 41 tri | ps |
|---|------|
| T = 0.758 [*] | * 53 |
| Fitted Curve Equation: $T = 0.758(X)^{0.924}$ | |

Peak Hour of Adjacent Traffic between 4 and 6 pm:

| | 1 = | 60 trips | | |
|------------------------|--------------|----------------|----|---------|
| | T = | 0.669 * | 74 | + 10.07 |
| Fitted Curve Equation: | T = 0.60 | 69(X)+10.069 | | |
| | T 0 (| (0,0) $(10,0)$ | | |

APPENDIX G

2021 CENSUS BUREAU DATA

Census OnTheMap

Destination Analysis

Workers: Living in 53.01 (Knox, TN) Showing: Employment locations grouped by Census Tracts

Created by the U.S. Census Bureau's OnTheMap https://onthemap.ces.census.gov on 09/10/2024

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



Map Legend

Selection Areas

⊄ Home Area

Job Count

- **2**01 231
- **170 200**
- **1**39 169
- **109 138**
- **78 108**
- **47 7**
- 16 46

| Job Count | | | | |
|-----------|-----------|--|--|--|
| | 201 - 231 | | | |
| | 170 - 200 | | | |
| | 139 - 169 | | | |
| | 109 - 138 | | | |
| | 78 - 108 | | | |
| | 47 - 77 | | | |
| M | 16 46 | | | |





All Workers



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

All Workers

| | 2021 | |
|--|-------|--------|
| Census Tracts as Work Destination Area | Count | Share |
| All Census Tracts | 1,977 | 100.0% |
| 1 (Knox, TN) | 231 | 11.7% |
| 54.01 (Knox, TN) | 78 | 3.9% |
| 53.01 (Knox, TN) | 74 | 3.7% |
| 35.02 (Knox, TN) | 49 | 2.5% |
| 57.06 (Knox, TN) | 47 | 2.4% |
| 69.01 (Knox, TN) | 36 | 1.8% |
| 44.04 (Knox, TN) | 32 | 1.6% |
| 59.11 (Knox, TN) | 32 | 1.6% |
| 9.02 (Knox, TN) | 31 | 1.6% |
| 38.01 (Knox, TN) | 29 | 1.5% |



| | 2021 | |
|--|-------|-------|
| Census Tracts as Work Destination Area | Count | Share |
| 9801 (Anderson, TN) | 29 | 1.5% |
| 38.02 (Knox, TN) | 26 | 1.3% |
| 68 (Knox, TN) | 24 | 1.2% |
| 46.10 (Knox, TN) | 23 | 1.2% |
| 58.03 (Knox, TN) | 23 | 1.2% |
| 112.01 (Blount, TN) | 21 | 1.1% |
| 37 (Knox, TN) | 21 | 1.1% |
| 57.04 (Knox, TN) | 20 | 1.0% |
| 46.11 (Knox, TN) | 18 | 0.9% |
| 52.02 (Knox, TN) | 18 | 0.9% |
| 62.06 (Knox, TN) | 18 | 0.9% |
| 31 (Knox, TN) | 17 | 0.9% |
| 43 (Knox, TN) | 17 | 0.9% |
| 808.01 (Sevier, TN) | 17 | 0.9% |
| 801.01 (Sevier, TN) | 16 | 0.8% |
| All Other Locations | 1,030 | 52.1% |


Analysis Settings

| Analysis Type | Destination |
|--------------------------|--|
| Destination Type | Census Tracts |
| Selection area as | Home |
| Year(s) | 2021 |
| Job Type | All Jobs |
| Selection Area | 53.01 (Knox, TN) from Census Tracts |
| Selected Census Blocks | 122 |
| Analysis Generation Date | 09/10/2024 10:26 - On The Map 6.24.1 |
| Code Revision | bc 639735180 b6 b7 a de 65403 c2 b e d fe 53 b70 b1 e 56 |
| LODES Data Vintage | 20231016_1512 |

Data Sources

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

Notes

1. Race, Ethnicity, Educational Attainment, and Sex statistics are beta release results and are not available before 2009.

2. Educational Attainment is only produced for workers aged 30 and over.

3. Firm Age and Firm Size statistics are beta release results for All Private jobs and are not available before 2011.



APPENDIX H

TDOT TURN LANE VOLUME THRESHOLD WORKSHEETS



phasing is required. Refer to the <u>TDOT Traffic Design Manual</u>, Chapter 7.3.1 for current policies for the need for left-turn phasing at a signalized intersection. Exclusive left-turn lanes at signalized intersections should be considered where left-turn volumes exceed 100 vehicles per hour (veh/h). Left-turn lanes may be provided for lower volumes as well based on the assessment of need or additional traffic analysis. Consider impacts to pedestrian crossings when analyzing turn lane benefits for these lower volume cases. When left-turn volumes exceed 300 veh/h, a dual left-turn lane should be considered. A capacity analysis will help determine the benefits of an additional lane.

²² TRB, NCHRP Repot 745, Left-Turn Accommodations at Unsignalized Intersections (2013)

²³ AASHTO, A Policy on Geometric Design of Highways and Streets 7th Edition (2018)



Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴



Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

²⁴ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)

²⁵ TRB, NCHRP 457, Evaluating Intersection Improvements (2001)



phasing is required. Refer to the <u>TDOT Traffic Design Manual</u>, Chapter 7.3.1 for current policies for the need for left-turn phasing at a signalized intersection. Exclusive left-turn lanes at signalized intersections should be considered where left-turn volumes exceed 100 vehicles per hour (veh/h). Left-turn lanes may be provided for lower volumes as well based on the assessment of need or additional traffic analysis. Consider impacts to pedestrian crossings when analyzing turn lane benefits for these lower volume cases. When left-turn volumes exceed 300 veh/h, a dual left-turn lane should be considered. A capacity analysis will help determine the benefits of an additional lane.

²² TRB, NCHRP Repot 745, Left-Turn Accommodations at Unsignalized Intersections (2013)

²³ AASHTO, A Policy on Geometric Design of Highways and Streets 7th Edition (2018)



Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴



Figure 3-19: Right-Turn Lane Warrant along Four-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁵

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Exclusive left-turn lanes at a signalized intersections should be installed where exclusive left-turn signal phasing is required. Refer to the <u>TDOT Traffic Design Manual</u>, Chapter 7.3.1 for current policies for the need for left-turn phasing at a signalized intersection. Exclusive left-turn lanes at signalized intersections should be considered where left-turn volumes exceed 100 vehicles per hour (veh/h). Left-turn lanes may be provided for lower volumes as well based on the assessment of need or additional traffic analysis. Consider impacts to pedestrian crossings when analyzing turn lane benefits for these lower volume cases. When left-turn volumes exceed 300 veh/h, a dual left-turn lane should be considered. A capacity analysis will help determine the benefits of an additional lane.

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Figure 3-18: Right-Turn Lane Warrant along Two-Lane Roadway (Unsignalized Intersection with Two-Way Stop-Control)²⁴



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APPENDIX I

TRAFFIC SIGNAL WARRANT ANALYSIS

PROJECTED FUTURE VOLUMES IN 2028 WITH TRAFFIC GROWTH AND GENERATED TRAFFIC Asheville Highway at Proposed Entrance to 8014 Asheville Highway Subdivision

| | As | sheville Highwa | v | | Road "A" | | As | heville Highw | vay | ľ |
|----------------------------|-----------|-----------------|----|--------|----------|-----|----|---------------|--------|---------------|
| TIME | V | VESTBOUND | , | N | ORTHBOUN | JD | I | EASTBOUNI |)) | |
| BEGIN | LT/U-Turn | THRU | RT | LT | THRU | RT | LT | THRU | RT | |
| 7:00 AM | 0 | 207 | m | 0 | mine | 0 | | 07 | 1 | Existing |
| 7:15 AM | 1 | 325 | | 1 | | 0 | | 142 | 0 | Existing |
| 7.20 AM | 2 | 323 | | 2 | | 0 | | 195 | 5 | Existing |
| 7.45 AM | 5 | 305 | | 3 | | 0 | | 123 | 3 | Existing |
| /:45 AM | 5 | 295 | | 2 | | 0 | | 127 | 1 | Existing |
| Existing Hourly Sum | 9 | 1280 | | 6 | | 0 | | 491 | 7 | Sum |
| General Growth | 0 | 102.4 | | 0 | | 0 | | 39.28 | 0 | Growth |
| Trips Generated 7-8 am | 8 | 0 | | 98 | | 25 | | 0 | 31 | Trips Ge |
| Habitat for Humanity Trips | 2 | 0 | | 33 | | 0 | | 9 | 0 | Trips Ge |
| Other Subdivisions Trips | 0 | 11 | | 0 | | 0 | | 34 | 0 | Trips Ge |
| 7:00 AM | 3 | 325 | | 33 | | 6 | | 118 | 9 | <u>15-mir</u> |
| 7:15 AM | 4 | 353 | | 34 | | 6 | | 163 | 8 | are cale |
| 7:30 AM | 6 | 391 | | 36 | | 6 | | 146 | 13 | hourly |
| 7:45 AM | 8 | 323 | | 35 | | 6 | | 148 | 9 | into 15 |
| 2028 | 21 | 1202 | | 129 | | 24 | | 575 | 20 | Tatal Co |
| 2028 | 21 | 1392 | | 130 | | 24 | | 575 | 39 | Total Su |
| 8:00 AM | 1 | 250 | | 1 | | 0 | | 136 | 0 | |
| 8:15 AM | 1 | 242 | | 1 | | 0 | | 141 | 0 | |
| 8:30 AM | 0 | 233 | | 0 | | 0 | L | 143 | 0 | Į |
| 8:45 AM | 5 | 216 | | 0 | | 0 | | 126 | 2 | J |
| Sum | 7 | 941 | | 2 | | 0 | | 546 | 2 | 1 |
| General Growth | 0 | 75.28 | | 0 | | 0 | | 43.68 | 0 | 1 |
| Trips Generated 8-9 am | 7 | 0 | | 90 | | 22 | | 0 | 28 | 1 |
| Habitat for Humanity Tring | 2 | 0 | | 30 | | 0 | | 8 | 0 | 1 |
| Other Subdivisions Tria | 0 | 10 | | 0 | | 0 | | 31 | 0 | 1 |
| e.oo AM | 2 | 271 | | 21 | | 0 | | 157 | 7 | |
| 8:00 AM | 3 | 2/1 | | | | 0 | | 15/ | 1 | |
| 8:15 AM | 3 | 263 | | 31 | | 6 | | 162 | 7 | 1 |
| 8:30 AM | 2 | 254 | | 30 | | 6 | | 164 | 7 | |
| 8:45 AM | 7 | 237 | | 30 | | 6 | | 147 | 9 | |
| 2028 | 15 | 1025 | | 122 | | 24 | | 630 | 30 | |
| 11:00 AM | 2 | 166 | | 1 | | 0 | | 113 | 2 | |
| 11:15 AM | 0 | 139 | | 2 | | 0 | | 133 | 0 | |
| 11:30 AM | 0 | 166 | | 1 | | 0 | | 128 | 0 | 1 |
| 11:45 AM | 0 | 124 | | 0 | | 0 | | 149 | 1 | |
| 11.+5 / IW | 0 | 505 | | 0 | | 0 | | 502 | 2 | |
| Sum | 2 | 595 | | 4 | | 0 | | 523 | 3 | |
| General Growth | 0 | 4/.6 | | 0 | | 0 | | 41.84 | 0 | |
| Trips Generated 11am-12 pm | 12 | 0 | | 50 | | 12 | | 0 | 50 | |
| Habitat for Humanity Trips | 4 | 0 | | 16 | | 0 | | 16 | 0 | |
| Other Subdivisions Trips | 0 | 17 | | 0 | | 0 | | 17 | 0 | |
| 11:00 AM | 6 | 182 | | 17 | | 3 | | 132 | 14 | |
| 11:15 AM | 4 | 155 | | 18 | | 3 | | 152 | 12 | |
| 11:30 AM | 4 | 182 | | 17 | | 3 | | 147 | 12 | |
| 11:45 AM | 4 | 140 | | 16 | | 3 | | 168 | 13 | |
| 2028 | 18 | 659 | | 68 | | 12 | | 599 | 51 | |
| 12:00 DM | 1 | 152 | | 2 | | 0 | | 120 | 1 | ł |
| 12.00 FM | 2 | 133 | | 4 | | 0 | | 1.59 | 0 | |
| 12:15 PM | 2 | 1/0 | | 6 | | 0 | | 162 | 0 | |
| 12:30 PM | 1 | 160 | | 1 | | 0 | | 131 | 2 | |
| 12:45 PM | 3 | 131 | | 1 | | 0 | | 152 | 3 | |
| Sum | 7 | 620 | | 10 | | 0 | | 584 | 6 | 1 |
| General Growth | 0.56 | 49.6 | | 0 | | 0 | | 46.72 | 0 | l |
| Trips Generated 12-1 pm | 14 | 0 | | 55 | | 14 | | 0 | 55 | l |
| Habitat for Humanity Trips | 4 | 0 | | 18 | | 0 | | 18 | 0 | 1 |
| Other Subdivisions Trips | 0 | 19 | | 0 | | 0 | | 19 | 0 | 1 |
| 12:00 PM | 6 | 170 | | 20 | | 3 | | 160 | 15 | 1 |
| 12:15 PM | 7 | 193 | | 24 | | 3 | | 183 | 14 | 1 |
| 12.15 TM 12.20 DM | 6 | 175 | | 10 | | 3 | | 152 | 16 | 1 |
| 12.30 PM | 0 | 1// | | 19 | | 2 | | 172 | 10 | |
| 12:43 PM | 0 | 148 | | 19 | | 5 | | 1/3 | 1/ | |
| 2028 | 27 | 688 | | 82 | | 12 | | 668 | 62 | ļ |
| 2:00 PM | 2 | 159 | | 2 | | 0 | | 145 | 1 | l |
| 2:15 PM | 0 | 159 | | 0 | | 0 | | 177 | 0 | J |
| 2:30 PM | 1 | 143 | | 0 | | 0 | | 173 | 0 | I |
| 2:45 PM | 5 | 165 | | 0 | | 1 | | 205 | 0 | 1 |
| Sum | 8 | 626 | | 2 | | 1 | | 700 | 1 | 1 |
| Correct Correct | 0 | 50.00 | | 2 0 | | 0 | | 54 | 0 | 1 |
| General Growth | 17 | 50.08 | | 47 | | 10 | | 30 | 0 | 1 |
| I rips Generated 2-3 pm | 1/ | 0 | | 4/ | | 12 | | 0 | 68 | 1 |
| Habitat for Humanity Trips | 5 | 0 | | 17 | | 0 | | 20 | 0 | 1 |
| Other Subdivisions Trips | 0 | 24 | | 0 | | 0 | | 16 | 0 | |
| 2:00 PM | 8 | 177 | | 18 | | 3 | | 168 | 18 | |
| 2:15 PM | 6 | 177 | | 16 | | 3 | | 200 | 17 | |
| 2:30 PM | 7 | 161 | | 16 | | 3 | | 196 | 17 | 1 |
| 2:45 PM | 11 | 183 | | 16 | | 4 | | 228 | 17 | 1 |
| 2029 | 32 | 698 | | 66 | | 13 | | 792 | 60 | 1 |
| 2028 | 52 | 090 | | 00 | | 1.5 | | 192 | 09 | |

Existing Volumes from Traffic Count Sum

Growth Rate of for 4 years Trips Generated by 8014 Asheville Highway Trips Generated by Habitat for Humanity Trips Generated by Other Subdivisions <u>15-minute Volumes</u>: These volumes are calculated by spreading the additional hourly volumes (growth+ generated trips) into 15-minute volumes by dividing by 4

Page 1

| 3:00 PM | 1 | 141 | 2 | 0 | 198 | 0 |
|----------------------------|----|-------|-----|----|---------|-----|
| 3:15 PM | 0 | 155 | 0 | 0 | 246 | Ő |
| 3:30 PM | 2 | 219 | 1 | 0 | 257 | 0 |
| 3:45 PM | 3 | 256 | 0 | 0 | 290 | 1 |
| Sum | 6 | 771 | 3 | 0 | 991 | 1 |
| General Growth | 0 | 61.68 | 0 | 0 | 79.28 | 0 |
| Trips Generated 3-4 pm | 19 | 0 | 54 | 13 | 0 | 78 |
| Habitat for Humanity Trips | 6 | 0 | 19 | 0 | 24 | 0 |
| Other Subdivisions Trips | 0 | 27 | 0 | 0 | 19 | 0 |
| 3:00 PM | 7 | 163 | 20 | 3 | 228 | 19 |
| 3:15 PM | 6 | 177 | 18 | 3 | 276 | 19 |
| 3:30 PM | 8 | 241 | 19 | 3 | 287 | 19 |
| 3:45 PM | 9 | 278 | 18 | 3 | 320 | 20 |
| 2028 | 30 | 859 | 75 | 12 | 1111 | 77 |
| 4:00 PM | 3 | 178 | 4 | 0 | 251 | 0 |
| 4:15 PM | 0 | 156 | 1 | 0 | 286 | Õ |
| 4:30 PM | 0 | 169 | 0 | 0 | 300 | Õ |
| 4:45 PM | Ő | 162 | 0 | 1 | 292 | 2 |
| Sum | 3 | 665 | 5 | 1 | 1129 | 2 |
| General Growth | 0 | 53.2 | 0 | 0 | 90.32 | 0 |
| Trips Generated 4-5 pm | 22 | 0 | 62 | 16 | 0 | 90 |
| Habitat for Humanity Trips | 7 | 0 | 22 | 0 | 27 | 0 |
| Other Subdivisions Trips | 0 | 31 | 0 | 0 | 22 | 0 |
| 4:00 PM | 10 | 199 | 25 | 4 | 286 | 22 |
| 4:15 PM | 7 | 177 | 22 | 4 | 321 | 22 |
| 4:30 PM | 7 | 190 | 21 | 4 | 335 | 22 |
| 4:45 PM | 7 | 183 | 21 | 5 | 327 | 24 |
| 2028 | 31 | 749 | 89 | 17 | 1269 | 90 |
| 5:00 PM | 1 | 170 | 1 | 2 | 312 | 2 |
| 5:15 PM | 0 | 145 | 3 | 2 | 307 | 1 |
| 5:30 PM | 0 | 178 | 2 | 0 | 307 | 0 |
| 5:45 PM | 1 | 145 | 0 | 0 | 296 | 0 |
| Sum | 2 | 638 | 6 | 4 | 1222 | 3 |
| General Growth | 0 | 51.04 | 0 | 0 | 97.76 | 0 |
| Trips Generated 5-6 pm | 25 | 0 | 70 | 17 | 0 | 101 |
| Habitat for Humanity Trips | 8 | 0 | 25 | 0 | 30 | 0 |
| Other Subdivisions Trips | 0 | 35 | 0 | 0 | 24 | 0 |
| 5:00 PM | 9 | 192 | 25 | 6 | 350 | 27 |
| 5:15 PM | 8 | 167 | 27 | 6 | 345 | 26 |
| 5:30 PM | 8 | 200 | 26 | 4 | 345 | 25 |
| 5:45 PM | 9 | 167 | 24 | 4 | 334 | 25 |
| 2028 | 34 | 726 | 102 | 20 | 1374 | 103 |

| | А | ssumed Avera | ge Growth Rate (%)= Number of years = Horizon Year = | 2.0% 4 2028 | | # of Ho | rizon Years = | 4 | |
|---|---|---|--|--|--|--|------------------------------|--------------------------------|----------------------|
| Note 1 Note 2 | The entering and exiting traf development, based on assu of directional traffic, and the It is assumed that the constru- | fic volumes ar med amounts e assumed perc uction of hom | e estimated based on trij of entering and exiting t centage of trips based or es is linear growth | o generation of the enti raffic, assumed percent time of day (from TD | ire tages OT Table 4.2 in Trafi | fic Design Manual) | | | |
| <u>8014 A</u> | sheville Highway Subdivision Daily Trips Generated by Entire Development: 100% of trips | 2,242 | D | aily Trips Generated fr | om Subdivision/Year | 561 2,242 | = trips by | 2,242 2028 | / 4 |
| | | | | AM | | 1 | DA | ſ | |
| | Traffic Movement Assumed | Distribution: | 80% to west Asheville F | Hwy. 20% to east Asher | ville Hwv | 80% to west Asheville | Hwy. 20% to | east Asheville | Hwv |
| | | | 80% from west Ashevil | e Hwy, 20% from east | Asheville Hwy | 80% from west Ashev | ille Hwy, 20% | from east As | heville Hwy |
| Assume all houses Entering and Exitin 24% Enter 76% Exit 50% Enter 50% Exit 59% Enter 41% Exit | g %'s (average of ITE & local AM Hours Mid-Day Hours PM Hours <u>PM Hours</u> <u>CAT FOR HUMANITY SUBI</u> Daily Trips Generated by Adjacent Development | trip rate): EXIT ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER DIVISION: 728 | Directional Distribution 80% tr 20% tr 80% fr 20% fr 20% fr 20% fr 20% fr 20% fr 20% fr 20% fr 20% fr 20% fr | Assumptions:) west Asheville Hwy) east Asheville Hwy com west Asheville Hwy) west Asheville Hwy) west Asheville Hwy com east Asheville Hwy) west Asheville Hwy) west Asheville Hwy) west Asheville Hwy) west Asheville Hwy i we | y y y y om Subdivision/Year | Assume same DD as . | AM Peak Hot = trips by | ır 728 2028 | / 4 |
| | Traffic Movement Assumed | Distribution: | 80% to west Asheville F 80% from west Ashevill | Hwy, 20% to east Asheve he Hwy, 20% from east | ville Hwy Asheville Hwy | 80% to west Asheville 80% from west Ashev | Hwy, 20% to ille Hwy, 20% | east Asheville from east As | e Hwy heville Hwy |
| <u>Multi-family attache</u> Entering and Exitir 22% Enter | <u>ed duplexes</u> g %'s (from local trip rate): AM Hours | EXIT | Directional Distribution 80% to | Assumptions: 9 west Asheville Hwy v | ria Main Entrance LT | turn | | | |
| 78% Exit | | EXIT ENTER ENTER | 20% to 80% fi 20% fi | o east Asheville Hwy vi rom west Asheville Hw rom east from WB Left | ia Tribute Lane - ignor 7y - EB Thru Volume t Turn Volume at Mai | red at Intersection n Entrance | | | |
| 50% Enter | Mid-Day Hours | EXIT | 80% to | o west Asheville Hwy v | ria Tribute Lane to WI | B Thru Volume at Inte | rsection | | |
| 50% Exit | | EXIT | 20% te | o east Asheville Hwy vi | ia Tribute Lane - ignor | red | | | Assume same DD |
| | | ENTER | 80% f | rom west Asheville Hw | y via Tribute Lane fro | om EB Thru Volume a | t Intersection | | as AM Peak Hour |
| 55% Enter | PM Hours | ENTER | 20% fi 80% tr | o west Asheville Hwy | y via Tribute Lane from ria Tribute Lane to WI | B Thru Volume at Inte | rsection | 211 | |
| 45% Exit | | EXIT | 20% to | o east Asheville Hwy vi | ia Tribute Lane - ignor | red | | | |
| | | ENTER | 80% fi | rom west Asheville Hw | y via Tribute Lane fro | om EB Thru Volume a | t Intersection | | |
| | | ENTER | 20% f | rom east Asheville Hwy | y via Tribute Lane from | m WB U-Turn Volum | e at Intersectio | on | |

OTHER SUBDIVISIONS: Neals Landing and 0 Asheville Highway to the West

| | Daily Trips Generated by | | | | | | |
|---------------------|------------------------------|-----------------|--|-----------------------|---------------|------------------------|---------|
| | Nearby Developments | 3,132 | Daily Trips Generated from Subdivision/Year | 783 | = | 3,132 / 0 | |
| | | | | 3132 | trips by | 2028 | |
| | | | | | | | |
| | | | AM | | PN | 1 | |
| | Traffic Movement Assumed | l Distribution: | 80% to west Asheville Hwy, 20% to east Asheville Hwy | 80% to west Asheville | e Hwy, 20% to | east Asheville Hwy | |
| | | | 80% from west Asheville Hwy, 20% from east Asheville Hwy | 80% from west Ashev | ille Hwy, 20% | from east Asheville Hw | у |
| | | | | | | | |
| Assume all houses | | | | | | | |
| Entering and Exitin | g %'s (average of ITE & loca | l trip rate): | | | | | |
| | | | Directional Distribution Assumptions: | | | | |
| 24% Enter | AM Hours | ENTER | . 20% from east Asheville Hwy / added to WB Thru | Volume at Intersectio | n | | |
| 76% Exit | | EXI'I | 20% to east Asheville Hwy / added to EB Thru Vo | olume at Intersection | | | |
| | | | | | | | |
| | | | | | | | |
| 50% Enter | Mid-Day Hours | EXI'I | 20% from east Asheville Hwy / added to WB Thru | Volume at Intersectio | n | | |
| 50% Exit | | EXI'I | 20% to east Asheville Hwy / added to EB Thru Vo | olume at Intersection | | Assume sa | ame DD |
| | | | | | | as AM Pe | ak Hour |
| | | | | | | | |
| 59% Enter | PM Hours | EXI'I | 20% from east Asheville Hwy / added to WB Thru | Volume at Intersectio | n | | |
| 41% Exit | | EXI'I | 20% to east Asheville Hwy / added to EB Thru Vo | olume at Intersection | | | |
| | | | | | | | |
| | | | | | | | |

| TDOT Traffic | Engineering Office - Table 4.2 | TDOT Traffic Design M | Ianual June 2020 | | |
|-----------------|--------------------------------|-----------------------|------------------|--|--|
| Population Ties | r = A (Knoxville) | | | | |
| TDOT Region | 1 Average for Multi-Lane Facil | ties | | | |
| | n (m) | | | | |
| 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 | 9.50% | | | | |
| | 57.14% | | | | |



| TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS | | | | | | | | | | | | | |
|--|-------------|-----------------------|---|--|--|--|--|--|--|--|--|--|--|
| | Applicable? | Warrant Satisfied? | Notes and Comments: | | | | | | | | | | |
| Warrant 1, Eight-Hour Vehicular Volume | Yes | No | | | | | | | | | | | |
| Warrant 2, Four-Hour Vehicular Volume | Yes | No | Figure 4C-2 (70% Factor) | | | | | | | | | | |
| Warrant 3, Peak Hour | Yes | No | Signals installed under Warrant 3 should be traffic actuated. 8:00 AM | | | | | | | | | | |
| For Warrants 1-3, new 0 | ODOT signal | s must be bas | ed off of 100% volume thresholds (TEM 402-3.2) | | | | | | | | | | |
| Warrant 4, Pedestrian Volume | No | | If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. Peak Hour 7:00 AM 8:00 AM 8:00 AM | | | | | | | | | | |
| Warrant 5, School Crossing | No | | N/A | | | | | | | | | | |
| Warrant 6, Coordinated Signal System | No | | (Shall not be used as the sole warrant in the analysis) | | | | | | | | | | |
| Warrant 7, Crash Experience | No | | If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection. | | | | | | | | | | |
| Warrant 8, Roadway Network | No | | (Shall not be used as the sole warrant in the analysis) | | | | | | | | | | |
| Warrant 9, Intersection Near a Grade Crossing | No | | | | | | | | | | | | |
| Multi-Way Stop Warrant | No | | May be used as an interim measure if traffic signal warrants are satisfied. | | | | | | | | | | |

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

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.

2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.

3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

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

| _ | Conclusion: | |
|--------|-------------|--|
| Notes: | | |
| | | |

| Start Time | Dista | S | outhboun South | d Approach bound | n Ai | ор | Dista | We | estbound Westb | Approac | h | Арр | Dista | N | Iorthbound Nouth | d Approac | ch Dudu | Арр | Diebt | E | Eastbound Eastb | d Approa | ch | Арр | NOTES: |
|-------------------------|-------|----|-------------------|---------------------|-------|----------|-------|------------|-------------------|---------|----------|------------|---------|----|---------------------|-----------|------------|------------|-----------|-------------|--------------------|----------|------|-------------|--|
| 12:00 AM | Right | mu | Len | 0-Tulli | To To | tal) | Right | mu | Leit | 0-Tulli | Feus | Total 0 | Right | mu | Leit | 0-Tuill | Feus | Total 0 | Right | THIC | Leit | 0-Tum | reus | Total 0 | It should be noted that if data is |
| 12:15 AM 12:30 AM | | | | | (|) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 0 | copied overtop of the Hourly Totals or Approach Totals that |
| 12:45 AM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | the 'AutoSum' Formula will be |
| 1:00 AM 1:15 AM | | | | | (|) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 0 | actual totals if the data was |
| 1:30 AM 1:45 AM | | | | | (|) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 | performs the calculations for the |
| ourly Total 2:00 AM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | u361. |
| 2:15 AM 2:30 AM | | | | | |) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 | |
| 2:45 AM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3:00 AM 3:15 AM | | | | | (|) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 3:30 AM 3:45 AM | | | | | |) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 | |
| ourly Total 4:00 AM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4:15 AM 4:30 AM | | | | | |) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 | |
| 4:45 AM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5:00 AM 5:15 AM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 5:30 AM 5:45 AM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| ourly Total 6:00 AM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6:15 AM | | | | | | 5 | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 6:45 AM | 0 | 0 | 0 | 0 | 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7:00 AM | | , | , | ~ | | | | 325 | 3 | ~ | <u> </u> | 328 357 | 6 | , | 33 34 | | | 39 40 | 9 | 118 | , | , | | 127 171 | |
| 7:30 AM | | | | | | | | 391 323 | 6 | | | 397 331 | 6 | | 36 | | | 42 | 13 | 146 | | | | 159 | |
| ourly Total | 0 | 0 | 0 | 0 | 0 (|) | 0 | 1392 | 21 | 0 | 0 | 1413 | 24 | 0 | 138 | 0 | 0 | 162 | 39 | 575 | 0 | 0 | 0 | 614 164 | |
| 8:15 AM | | | | | |) | | 263 | 3 | | | 266 | 6 | | 31 | | | 37 | 7 | 162 | | | | 169 | |
| 8:45 AM | 0 | 0 | 0 | 0 | | 5 | 0 | 237 | 7 | 0 | 0 | 244 | 6 | 0 | 30 | 0 | 0 | 36 | 9 | 147 | 0 | 0 | 0 | 156 | |
| 9:00 AM | | 0 | 0 | U | | 2 | U | 1023 | 15 | 0 | | 0 | 24 | 0 | 122 | 0 | | 0 | 30 | 030 | 0 | 0 | | 0 | |
| 9:30 AM | | | | | | 2 | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 9:45 AM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10:15 AM | | | | | | 2 | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 10:30 AM 10:45 AM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 11:00 AM | 0 | 0 | 0 | U | |) | 0 | 182 | 6 | U | 0 | 188 | 3 | 0 | 17 | 0 | 0 | 20 | 14 | 132 | U | 0 | 0 | 146 | [|
| 11:15 AM 11:30 AM | | | | | |) | | 155 182 | 4 | | | 159 186 | 3 | | 18 | | | 21 20 | 12 | 152 147 | | | | 164 159 | |
| 11:45 AM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 140 659 | 4 | 0 | 0 | 144 677 | 3 12 | 0 | 16 68 | 0 | 0 | 19 80 | 13 51 | 168 599 | 0 | 0 | 0 | 181 650 | |
| 12:00 PM 12:15 PM | | | | | |) | | 170 | 6 7 | | | 176 200 | 3 | | 20 | | | 23 27 | 15 14 | 160 | | | | 175 197 | |
| 12:30 PM 12:45 PM | | | | | (|) | | 177 | 6 8 | | | 183 156 | 3 | | 19 19 | | | 22 | 16 17 | 152 | | | | 168 190 | |
| ourly Total 1:00 PM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 688 | 27 | 0 | 0 | 715 0 | 12 | 0 | 82 | 0 | 0 | 94 0 | 62 | 668 | 0 | 0 | 0 | 730 | |
| 1:15 PM 1:30 PM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 1:45 PM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2:00 PM 2:15 PM | | | | | 0 |) | | 177 177 | 8 | | | 185 183 | 3 | | 18 16 | | | 21 19 | 18 17 | 168 200 | | | | 186 217 | |
| 2:30 PM 2:45 PM | | | | | 0 |) | | 161 183 | 7 | | | 168 194 | 3 4 | | 16 16 | | | 19 20 | 17 17 | 196 228 | | | | 213 245 | |
| ourly Total 3:00 PM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 698 163 | 32 7 | 0 | 0 | 730 | 13 3 | 0 | 66 20 | 0 | 0 | 79 23 | 69 19 | 792 228 | 0 | 0 | 0 | 861 247 | [|
| 3:15 PM 3:30 PM | | | | | (|) | | 177 241 | 6 8 | | | 183 249 | 3 | | 18 19 | | | 21 22 | 19 19 | 276 287 | | | | 295 306 | |
| 3:45 PM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 278 859 | 9 30 | 0 | 0 | 287 889 | 3 12 | 0 | 18 75 | 0 | 0 | 21 87 | 20 77 | 320 1111 | 0 | 0 | 0 | 340 1188 | |
| 4:00 PM 4:15 PM | | | | | (|) | | 199 177 | 10 7 | | | 209 184 | 4 | | 25 22 | | | 29 26 | 22 22 | 286 321 | | | | 308 343 | |
| 4:30 PM 4:45 PM | | | | | (|) | | 190 183 | 7 7 | | | 197 190 | 4 | | 21 21 | | | 25 26 | 22 24 | 335 327 | | | | 357 351 | |
| ourly Total 5:00 PM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 749 192 | 31 9 | 0 | 0 | 780 201 | 17 6 | 0 | 89 25 | 0 | 0 | 106 31 | 90 27 | 1269 350 | 0 | 0 | 0 | 1359 377 | [|
| 5:15 PM 5:30 PM | | | | | (|) | | 167 200 | 8 | | | 175 208 | 6 4 | | 27 26 | | | 33 30 | 26 25 | 345 345 | | | | 371 370 | |
| 5:45 PM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 167 726 | 9 34 | 0 | 0 | 176 760 | 4 20 | 0 | 24 102 | 0 | 0 | 28 122 | 25 103 | 334 1374 | 0 | 0 | 0 | 359 1477 | |
| 6:00 PM 6:15 PM | | | | | (|) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 0 | |
| 6:30 PM 6:45 PM | | | | | |) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 | |
| ourly Total 7:00 PM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7:15 PM 7:30 PM | | | | | |) | | | | | | 0 0 | | | | | | 0 0 | | | | | | 0 | |
| 7:45 PM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8:00 PM 8:15 PM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 8:30 PM 8:45 PM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| ourly Total 9:00 PM | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9:15 PM 9:30 PM | | | | | | | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 9:45 PM ourly Total | 0 | 0 | 0 | 0 | 0 0 |) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10:00 PM 10:15 PM | | | , | | |) | | | , | | | 0 | | | | - | | 0 | | | | | | 0 | |
| 10:30 PM | | | | | |) | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| ourly Total | 0 | 0 | 0 | 0 | 0 (|) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11:15 PM | | | | | | 2 | | | | | | 0 | | | | | | 0 | | | | | | 0 | |
| 11:45 PM | | 0 | 0 | 0 | | 5 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| comy notal | U | U | U | 0 | 0 (| , | U | U | U | U | U | U | U | U | U | U | U | U | U | 0 | U | U | U | U | |

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

| Number of La on Ea | nes for Moving Traffic ach Approach |
|-----------------------|--|
| Major Street: | 2 or More Lanes |
| Minor Street: | 2 or More Lanes |

Adjusted

Lanes

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

Combination A/B*

Condition A Condition B Major/ Volumes Cond. A Cond. B Cond. A Cond. B Minor 100% 70% 100% 80% 56% 56% 70% 80% Major Minor Maj. Min. 750 600 1/1 500 350 525 400 60 280 42 150 105 75 53 120 84 420 2+/1 600 150 420 105 900 75 630 53 480 120 720 60 336 84 504 42 2 + / 2 +V 600 200 420 140 900 100 630 70 480 160 720 80 336 112 504 56

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

| 21/21 | | N | 000 | 200 | 420 | 140 | 000 | 100 | 000 | 10 | 400 | 100 | 120 | 00 | 000 | 112 | 004 | 00 |
|----------|------|----------|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|----|-----|-----|--------------|----|
| 1 / 2+ | | | 500 | 200 | 350 | 140 | 750 | 100 | 525 | 70 | 400 | 160 | 600 | 80 | 280 | 112 | 420 | 56 |
| 12:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 12:15 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 12:30 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 12:45 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 1:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 1:15 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 1:30 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 1:45 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 2:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 2:15 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 2:30 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 2:45 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 3:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 3:15 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 3:30 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 3:45 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 4:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 4:15 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 4:30 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 4·45 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 5:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 5:15 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 5:30 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 5:45 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 6:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 6:15 AM | 455 | 36 | | | 1 | | | | | | | | | | 1 | | | |
| 6:30 AM | 983 | 12 | 1 | | | | 1 | | 1 | 1 | 1 | | 1 | | | | 1 | 1 |
| 0:45 AM | 2027 | 1/18 | | | | | | | | | | | | | | | | |
| 7:15 AM | 2027 | 140 | | | 1 | 1 | | | | | | | | | 1 | 1 | ┣───┙ | |
| 7:30 AM | 1917 | 143 | 1 | | | | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | | | 1 | 1 |
| 7:45 AM | 1788 | 137 | | | | | | | | | | | | | | | · · | |
| 8:00 AM | 1700 | 132 | | | | | | | | | | | | | | | | |
| 8:15 AM | 1262 | 99 | | | 1 | | | | | | | | | | 1 | | | |
| 8:30 AM | 827 | 65 | 1 | | | | | | 1 | | 1 | | 1 | | | | 1 | 1 |
| 8:45 AM | 400 | 33 | | | | | | | | | | | | | | | | |
| 9:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
| 9:15 AM | 0 | 0 | | | | | | | | | | | | | | | └── ′ | |
| 9:30 AM | 0 | 0 | | | | | | | | | | | | | | | └── ′ | |
| 9:45 AM | 0 | 0 | | | | | | | | | | | | | | | | |

ODOT+Signal+Warrant+Spreadsheet_March2022.xlsx

| 10:00 AM | 0 | 0 | | | | | | | | | | | | | | | | |
|----------|---------|-----|----|---|----|---|---|---|-----|---|----|---|----|---|----|---|----|---|
| 10:15 AM | 334 | 19 | | | | | | | | | | | | | | | | |
| 10:30 AM | 657 | 38 | 1 | | 1 | | | | 1 | | 1 | | | | 1 | | 1 | |
| 10:45 AM | 1002 | 56 | | | | | 1 | | | | | | 1 | | | | | |
| 11:00 AM | 1327 | 73 | | | | | | | | | | | | | | | | |
| 11:15 AM | 1344 | 76 | | | | | | | | | | | | | | | | |
| 11:30 AM | 1418 | 82 | 1 | | 1 | | | | 1 | 1 | 1 | | | | 1 | | 1 | 1 |
| 11:45 AM | 1424 | 84 | | | | | 1 | | | | | | 1 | 1 | | | | |
| 12:00 PM | 1445 | 87 | | | | | | | | | | | | | | | | |
| 12:15 PM | 1094 | 66 | | | | | | | | | | | | | | | | |
| 12:30 PM | 697 | 41 | 1 | | 1 | | | | 1 | | 1 | | | | 1 | | 1 | |
| 12:45 PM | 346 | 21 | | | | | | | | | | | | | | | | |
| 1:00 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 1:15 PM | 371 | 20 | | | | | | | | | | | | | | | | |
| 1:30 PM | 771 | 37 | 1 | | 1 | | | | 1 | | 1 | | 1 | | 1 | | 1 | |
| 1:45 PM | 1152 | 54 | | | | | 1 | | | | | | | | | | | |
| 2:00 PM | 1591 | 72 | | | | | | | | | | | | | | | | |
| 2:15 PM | 1637 | 74 | | 1 | 1 | | | | | | | | | | | | | |
| 2:30 PM | 1715 | 76 | 1 | | 1 | | | | 1 | 1 | 1 | | 1 | | 1 | | 1 | 1 |
| 2:45 PM | 1889 | 79 | | | | | 1 | | | | | | | | | | | |
| 3:00 PM | 2077 | 80 | | | | | | | | | | | | | | | | |
| 3:15 PM | 2177 | 86 | | | | | | | | | | | | | | | | |
| 3:30 PM | 2226 | 90 | 1 | | 1 | | | | 1 | 1 | 1 | | 1 | 1 | 1 | | 1 | 1 |
| 3:45 PM | 2225 | 92 | | | | | 1 | | | | | | | | | | | |
| 4.00 PM | 2139 | 96 | | | | | | | | | | | | | | | | |
| 4·15 PM | 2200 | 97 | | | | | | | | | | | | | | | | |
| 4:30 PM | 2219 | 103 | 1 | | 1 | | | | 1 | 1 | 1 | | 1 | 1 | 1 | | 1 | 1 |
| 4·45 PM | 2243 | 108 | | | | | 1 | 1 | | | | | | | | | | |
| 5:00 PM | 2237 | 110 | | | | | | | | | | | | | | | | |
| 5:15 PM | 1659 | 83 | | | | | | | | | | | | | | | | |
| 5:30 PM | 1113 | 54 | 1 | | 1 | | | | 1 | | 1 | | 1 | | 1 | | 1 | |
| 5:45 PM | 535 | 26 | | | | | | | | | | | | | | | | |
| 6:00 PM | 000 | 0 | | | | | | | | | | | | | | | | |
| 6.15 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 6:30 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 6:45 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 7.00 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 7:15 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 7:30 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 7:45 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 8:00 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 8:15 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 8:30 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 8:45 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| | 0 | 0 | | | | | | | | | | | | | | | | |
| 9:15 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 9:30 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| 9:45 PM | 0 | 0 | | | | | | | | | | | | | | | | |
| | 0 | | 11 | 0 | 11 | 1 | 9 | 2 | 11 | 6 | 11 | 0 | 10 | Λ | 11 | 1 | 11 | 7 |
| | ATIOC | | | | | | 0 | ~ | | | | | | 4 | | | | |
| WARKANIS | AIISFIL | | | U | N | U | N | 0 | I N | U | | N | U | | | N | 0 | |

Warrant Met: No

Notes:

| OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME | | | | | | | | |
|---|---|----------|--------------|---------------|-----------------------|----------------|--------------|--------------|
| Number of Lanes for Moving Traffic on Each Approach Total Number of Unique Hou | | | | ique Hours | rs Met on Figure 4C-1 | | 2 | |
| Major street: Minor Street: | Total Number of Unique Hours Met on Figure 4C-2 (70% Factor) | | | | 6 | | | |
| Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? | | | | | | | | Yes |
| | | Raw Traf | fic Counts | • | Total Major | Highest Actual | 1 | Hour |
| Hour Interval | Minor - F | Road "A" | Major - Ashe | ville Highway | Approach | Minor Street | Hour Mot2 | Met? |
| Beginning At | N-Bound | S-Bound | W-Bound | E-Bound | Volumes | Volumes | wet? | (70% Factor) |
| 6:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 6:15 AM | 36 | 0 | 328 | 127 | 455 | 36 | | |
| 6:45 AM | 111 | 0 | 1082 | 457 | 1539 | 111 | | Met |
| 7:00 AM | 148 | 0 | 1413 | 614 | 2027 | 148 | Met | |
| 7:15 AM | 146 | 0 | 1359 | 651 | 2010 | 146 | | |
| 7:30 AM 7:45 AM | 143 | 0 | 1268 | 649 661 | 1917 | 143 | | Met |
| 8:00 AM | 132 | 0 | 1040 | 660 | 1700 | 132 | Met | WIGT |
| 8:15 AM | 99 | 0 | 766 | 496 | 1262 | 99 | | |
| 8:30 AM | 65 | 0 | 500 | 327 | 827 | 65 | | |
| 8:45 AM | 33 | 0 | 244 | 156 | 400 | 33 | | |
| 9:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 9:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 9:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 10:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 10:30 AM | 38 | 0 | 347 | 310 | 657 | 38 | | |
| 10:45 AM | 56 | 0 | 533 | 469 | 1002 | 56 | | |
| 11:00 AM | 73 | 0 | 677 | 650 | 1327 | 73 | | |
| 11:15 AM | 76 | 0 | 665 | 679 | 1344 | 76 | | Mot |
| 11:45 AM | 84 | 0 | 700 | 721 | 1418 | 84 | | Met |
| 12:00 PM | 87 | 0 | 715 | 730 | 1445 | 87 | | |
| 12:15 PM | 66 | 0 | 539 | 555 | 1094 | 66 | | |
| 12:30 PM | 41 | 0 | 339 | 358 | 697 | 41 | | |
| 12.43 PM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 1:15 PM | 20 | 0 | 185 | 186 | 371 | 20 | | |
| 1:30 PM | 37 | 0 | 368 | 403 | 771 | 37 | | |
| 1:45 PM | 54 | 0 | 536 | 616 | 1152 | 54 | | |
| 2:15 PM | 74 | 0 | 730 | 922 | 1637 | 74 | | |
| 2:30 PM | 76 | 0 | 715 | 1000 | 1715 | 76 | | |
| 2:45 PM | 79 | 0 | 796 | 1093 | 1889 | 79 | | |
| 3:00 PM | 08 88 | 0 | 889 028 | 1188 | 2077 | 08 88 | | Met |
| 3:30 PM | 90 | 0 | 920 | 1249 | 2226 | 90 | 1 | INICL |
| 3:45 PM | 92 | 0 | 877 | 1348 | 2225 | 92 | | |
| 4:00 PM | 96 | 0 | 780 | 1359 | 2139 | 96 | | M - 4 |
| 4:15 PM | 97 103 | 0 | 763 | 1428 | 2200 | 97 103 | | Met |
| 4:45 PM | 103 | 0 | 774 | 1469 | 2243 | 103 | 1 | L |
| 5:00 PM | 110 | 0 | 760 | 1477 | 2237 | 110 | | |
| 5:15 PM | 83 | 0 | 559 | 1100 | 1659 | 83 | | Met |
| 5:30 PM | 54 26 | 0 | 384 | 729 | 1113 535 | 54 26 | | |
| 6:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 6:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | L | |
| 6:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 6:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 7:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | ļ |
| 7:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 7:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 8:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |



Are the requirements for Warrant 2 met?: No



| Hour Vehicular Volume | | | | | | | |
|-------------------------------------|--|---|---|--|--|--|--|
| Hour Interval Beginning At | Major Street Combined Vehicles Per Hour (VPH) | Highest Minor Street Approach Vehicles Per Hour (VPH) | Sum of Major Street and Highest Minor Street | Sum of Major Street and Combined Minor Street | | | |
| 6:00 AM | 0 | 0 | 0 | 0 | | | |
| 6.12 AM | 455 | 36 | 491 | 491 | | | |
| 6:30 AM | 983 | 72 | 1055 | 1055 | | | |
| 6:45 AM | 1539 | 111 | 1650 | 1650 | | | |
| 0.45 AM | 2027 | 1/9 | 2175 | 2175 | | | |
| 7:00 AW | 2027 | 140 | 2175 | 2175 | | | |
| 7:15 AM | 2010 | 140 | 2150 | 2100 | | | |
| 7.30 AM | 1917 | 143 | 2000 | 2060 | | | |
| 8:00 AM | 1700 | 137 | 1925 | 1925 | | | |
| 8:15 AM | 1262 | 99 | 1361 | 1361 | | | |
| 8:30 AM | 827 | 65 | 892 | 892 | | | |
| 8:45 AM | 400 | 33 | 433 | 433 | | | |
| 9:00 AM | 0 | 0 | 0 | 0 | | | |
| 9:15 AM | 0 | 0 | 0 | 0 | | | |
| 9:30 AM | 0 | 0 | 0 | 0 | | | |
| 9:45 AM | 0 | 0 | 0 | 0 | | | |
| 10:00 AM | 0 | 0 | 0 | 0 | | | |
| 10:15 AM | 334 | 19 | 353 | 353 | | | |
| 10:30 AM | 657 | 38 | 695 | 695 | | | |
| 10:45 AM | 1002 | 56 | 1058 | 1058 | | | |
| 11:00 AM | 1327 | 73 | 1400 | 1400 | | | |
| 11:15 AM | 1344 | 76 | 1420 | 1420 | | | |
| 11:30 AM | 1418 | 82 | 1500 | 1500 | | | |
| 11:45 AM | 1424 | 84 | 1508 | 1508 | | | |
| 12:00 PM | 1445 | 87 | 1532 | 1532 | | | |
| 12:15 PM | 1094 | 66 | 1160 | 1160 | | | |
| 12:30 PM | 697 | 41 | 738 | 738 | | | |
| 12:45 PM | 346 | 21 | 367 | 367 | | | |
| 1:00 PM | 0 | 0 | 0 | 0 | | | |
| 1:15 PM | 371 | 20 | 391 | 391 | | | |
| 1:30 PM | //1 | 37 | 808 | 808 | | | |
| 1:45 PM | 1152 | 54 | 1206 | 1206 | | | |
| 2:00 FM | 1091 | 74 | 1003 | 1003 | | | |
| 2:30 PM | 1715 | 76 | 1791 | 1791 | | | |
| 2:45 PM | 1889 | 79 | 1968 | 1968 | | | |
| 3:00 PM | 2077 | 80 | 2157 | 2157 | | | |
| 3:15 PM | 2177 | 86 | 2263 | 2263 | | | |
| 3:30 PM | 2226 | 90 | 2316 | 2316 | | | |
| 3:45 PM | 2225 | 92 | 2317 | 2317 | | | |
| 4:00 PM | 2139 | 96 | 2235 | 2235 | | | |
| 4:15 PM | 2200 | 97 | 2297 | 2297 | | | |
| 4:30 PM | 2219 | 103 | 2322 | 2322 | | | |
| 4.40 PM | 2243 | 108 | 2351 | 2351 | | | |
| 5:15 PM | 1659 | 83 | 1742 | 1742 | | | |
| 5:30 PM | 1113 | 54 | 1167 | 1167 | | | |
| 5:45 PM | 535 | 26 | 561 | 561 | | | |
| 6:00 PM | 0 | 0 | 0 | 0 | | | |
| 6:15 PM | 0 | 0 | 0 | 0 | | | |
| 6:30 PM | 0 | 0 | 0 | 0 | | | |
| 6:45 PM | 0 | 0 | 0 | 0 | | | |
| 7:00 PM | 0 | 0 | 0 | 0 | | | |
| 7:15 PM | 0 | 0 | 0 | 0 | | | |
| 7.30 PIVI 7.45 PM | 0 | 0 | 0 | 0 | | | |
| 8:00 PM | 0 | 0 | 0 | 0 | | | |
| 0.00110 | | | | 0 | | | |

| Actual Peak Hour Major Traffic Volume | Actual Peak Hour Minor Traffic Volume | Required Peak Hour Minor Traffic Volume for Fig. 4C-3 | Required Peak Hour Minor Traffic Volume for Fig. 4C-4 |
|---|--|--|--|
| 2027 | 148 | 150 | 100 |

APPENDIX J

Response Letter to Address Comments – 10.28.24



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

October 28, 2024

PROJECT NAME: 8014 Asheville Highway Subdivision (11-SG-24-C / 11-J-24-DP) TO: Knoxville-Knox County Planning SUBJECT: Response Document for 8014 Asheville Highway Subdivision TIS Review Comments

Knoxville-Knox County Planning, City of Knoxville Department of Engineering, Knox County Engineering and Public Works, and Tennessee Department of Transportation Staff:

The following response document addresses the comments in a memorandum from Mike Conger, PE, dated October 21, 2024. This letter is added to the end of the revised report in Appendix J.

- 1) A comment is being provided to the site engineer/developer that a secondary access point to a public road may be required based on the total lot count of the development. The TIS should note the options for additional access such as to Strawberry Plains Pk and Tribute Ln as well as noting the typical Knox County standard of multiple access points for developments with more than 150 lots. If other access points are provided then the TIS analyses need to be revised accordingly.
 - <u>Response</u>: A secondary entrance is now being proposed on the west end of the property at an existing median opening on Asheville Highway. The report has been updated throughout to reflect this change.
- 2) Somewhat related to comment #1, the proposed connections between this proposed subdivision and the existing physical therapy business as well as the proposed Habitat subdivision need to be further clarified since it is not clear if connections are possible between all developments via Tribute Ln or not. Please also coordinate with the site engineer to show the access connections in this area and locate in an optimal position relative to the other internal street network for the proposed subdivision.
 - <u>Response</u>: The initial report stated that the physical therapy clinic would have access to the Proposed Entrance for the 8014 Asheville Highway, but the future Habitat for Humanity Subdivision would not. However, a secondary entrance is now being proposed on the west end of the property at an existing median opening on

Asheville Highway. Additionally, the site plan has also been updated to show a connection between the 8014 Asheville Highway Subdivision and Tribute Lane, allowing the future residents of the Habitat for Humanity Subdivision to access the proposed entrances at Asheville Highway. This change is reflected throughout the updated report.

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

- Updated Title Page
- Updated Table of Contents
- Updated Page Footers and Page Numbers
- Updated worksheets in Appendix E
- Updated trip generation calculations in Appendix F
- Added additional left-turn lane warrant threshold sheets for the Proposed Secondary Entrance in Appendix H
- Updated sheets in Appendix I
- Added Appendix J to include this response letter

If you have any questions or further comments, please contact me. We look forward to your approval.

Sincerely,

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





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