



CIVIL ENGINEERING / TRAFFIC ENGINEERING

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July 2, 2018

PROJECT NAME: Carter Ridge Subdivision

TO: Knoxville/Knox County Metropolitan Planning Commission (MPC)
Knox County Engineering Department

SUBJECT: TIS Comment Response Document for Carter Ridge Subdivision
Review Comments dated July 2, 2018

Dear MPC and Knox County Staff,

The following comment response document is submitted to address comments dated July 2, 2018. The responses are addressed below each comment.

1. **Reviewer Comment:** Page 7, please mention that Carter Mill Drive is a Minor Collector in the Major Road Plan.

Response: On Page 7, the section regarding Carter Mill Drive has been updated to state that it is a Minor Collector.

2. **Reviewer Comment:** Page 8, please mention that South Carter School Road is both a Minor Arterial and a Major Collector within the area described in the Major Road Plan.

Response: On Page 8, the section regarding South Carter School Road has been updated to state that it is a Minor Collector and a Major Collector in the area.

3. **Reviewer Comment:** Page 23, delete the last sentence in the second paragraph. In the third paragraph, revise the first sentence to say "1.5% annual growth rate", not "1.5% growth"

Response: On Page 23, the last sentence was deleted in the second paragraph. In the third paragraph, the first sentence was revised to say "1.5% annual growth rate".

4. **Reviewer Comment:** Page 32, correct the second paragraph halfway down from "LOS E" to "LOS D". The table says the NB left/thru/right at the intersection of Strawberry Plains Pike at Woodsedge Rd is LOS D.

Response: On Page 32, the second paragraph wording was changed to "LOS D" to match the table.

5. **Reviewer Comment:** Page 35, the sight distance for the proposed new intersection of Carter Mill Drive at Road "S" was not given. The study said it was to be well in excess of the required distance. Please give the projected measured sight distance.

Response: On Page 35, the paragraph was changed to state that the projected sight distance measured by a rolling measuring wheel was estimated to be 700+ feet.

6. **Reviewer Comment:** Page 37, the cross section does not have sidewalk on one side which was on the site plan and a requirement per the conditions. In section 2, please revise your comment concerning the "potential for vehicle accidents are high". There is no crash history or analysis to support this statement. If this information is needed, please let me know.

Response: On Page 37, the cross section was revised to show a sidewalk on one side to match the site plan. In section 2, the last sentence was removed which referenced potential traffic accidents.

7. **Reviewer Comment:** Page 38, the calculated LOS for the year 2020 once Phase IV is completed says "LOS E", but data in the appendix shows it at LOS D. Please revise.

Response: On Pages 38, the LOS for the year 2020 was revised from "LOS E" to "LOS D" to match the data in the appendix.

The revised seven pages have been attached to this letter. If you have any questions or further comments, please feel free to contact me at any time. I look forward to your review and approval.

Sincerely,

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



east of the intersection of Strawberry Plains Pike at Woodsedge Road. This traffic signal controls a four-legged intersection of Asheville Highway (US 25E) at Strawberry Plains Pike/Kitts Road and is approximately 500 feet away from Woodsedge Road. Woodsedge Road is controlled with a stop sign at the intersection of Strawberry Plains Pike. Carter Elementary School was opened in 2013 and is located on Strawberry Plains Pike just over a half-mile away from Woodsedge Road.

Woodsedge Road is a local residential street that provides access to the Carter Mill Subdivision and Carter Ridge Subdivision from Strawberry Plains Pike. It traverses in a general north-south direction and has two traffic calming speed bumps along its length. Woodsedge Road consists of 2 – 13 foot vehicular lanes with concrete curbing. Roadway lighting is not present on Woodsedge Road. Three additional traffic calming speed humps are located further inside Phase I and II (on Drakewood Road) in between Strawberry Plains Pike and Carter Mill Drive.

Carter View Lane is a local residential street that provides access to the Carter Mill Subdivision from Carter Mill Drive. It traverses in a general north-south direction. Carter View Lane consists of 2 – 13 foot vehicular lanes with concrete curbing. Roadway lighting is not present on Carter View Lane. Carter View Lane is to the north of Carter Mill Drive and is controlled by a stop sign at its approach to Carter Mill Drive. There are no sidewalks on Carter View Lane.

Carter Mill Drive is a minor collector and traverses in a general northeast-southwest direction and the total length is just at 1.6 miles. Carter Mill Drive traverses in between McCubbins Road from the southwest to South Carter School Road to the northeast. Adjacent to the project study area, the roadway has some mild roadway horizontal and vertical curvature. Carter Mill Drive has no posted speed limit in either direction. To the east of this residential development, Carter Mill Drive provides access to Paschal Carter Memorial Park. Several hundred feet to the west of the intersection with Carter Ridge Drive/Carter View Lane, Carter Mill Drive narrows to a total pavement width of approximately 16 feet and the double yellow center line is dropped. The western portion of Carter Mill Drive provides access to a handful of residences and farm properties. A large portion of Carter Mill Drive was widened for the previous residential phases.

Carter Ridge Drive is a local residential street that provides access to the Carter Ridge Subdivision from Carter Mill Drive. It traverses in a general north-south direction. Carter Ridge Drive consists of 2 – 13 foot vehicular lanes with concrete curbing. Roadway lighting is not

present on Carter Ridge Drive. Carter Ridge Drive is to the south of Carter Mill Drive and is controlled by a stop sign at its approach to Carter Mill Drive. Carter Ridge Drive is currently the only access to the existing Phase III of the development. Phase III is close to being 75% build-out with respect to home construction. Carter Ridge Drive has sporadic sections of sidewalk.

South Carter School Road is both a minor arterial and a major collector within the area and traverses in a general north-south direction. South Carter School Road It is located to the east of the residential development. South Carter School Road traverses in between Asheville Highway (US 25E) to the north to Thorngrove Pike to the south. To the north of Asheville Highway (US 25E), South Carter School Road transitions its name to North Carter School Road. North Carter School Road provides access to Carter Middle School and Carter High School. At the intersection with Carter Mill Drive, the road grades are fairly steep. Carter Mill Drive is controlled by a stop sign at the intersection with South Carter School Road.

Figure 3 shows the lane configurations of the study area roadways and intersections and also shows the study traffic count locations. The pages following Figure 3 give an overview of the site study area with photographs.

■ **OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT):**

Opening year traffic volume estimates represent the future condition the proposed study area is potentially subject to without the proposed project being developed (no-build option). As previously stated, the build-out and full occupancy for this proposed new residential development was assumed to occur in the year 2020. This corresponds with almost three full years for the development to reach full capacity and occupancy.

Traffic growth on nearby roadways has shown flat to negative growth over the past 10 years according to TDOT count stations (historical traffic data is shown in Appendix A). Currently, there are no known relevant significant upcoming developments adjacent to the proposed site that would indicate large future increased traffic volumes in the study area in the short term. There are plans for a business park to the southeast of the site but is not expected to open for several years. The Midway Business Park is proposed to be located approximately 2 – 3 miles away by Knox County.




Nonetheless, to insure a reasonable and conservative estimate for this study, a 1.5% annual growth rate was used to take into account any future development in the area and potential rising travel volumes. This would also take into account traffic generated by the construction of additional homes in the remaining lots of Phases I thru III. The results of this growth rate application to the existing traffic volumes can be seen in Figure 6 for the year 2020. Figure 6 shows the background traffic volumes during the AM and PM peak hours.

The application of opening year traffic to the existing intersections did not appreciably change the LOS designations from the existing traffic volume analysis for the AM and PM peak hours. However, the intersection of Strawberry Plains Pike at Woodsedge Road was calculated to operate at LOS D in the year 2020 during the AM peak. This corresponds to the traffic generated by the local schools. Table 4 reports the LOS designation, delay (in seconds), and v/c ratio (volume/capacity). Appendix E contains the LOS capacity worksheets for the opening year conditions (without project). It is important to point out that these projected LOS designations for the intersection could potentially exist in the future even without the proposed residential project being constructed and developed.

Capacity analyses were once again undertaken to determine the projected Level of Service (LOS) for vehicles at the studied intersections. Appendix E includes the worksheets for these capacity analyses.

The results of the capacity calculations of the projected peak hour vehicular traffic can be seen in Table 6 for the studied intersections for the year 2020. The entrance at Carter Mill Drive for Phase IV of the development is labeled as Road “S” which follows the road naming convention from the proposed plan layout shown in Figure 4. As can be seen in the table, the northbound approach at Strawberry Plains Pike at Woodsedge Road is projected to operate at LOS D in the year 2020 during the AM peak hour. However, once the AM peak school traffic is subsided, the intersection operates well with respect to capacity. The other approaches and intersection movements are projected to operate very well. These results shown are based on the year 2020 projected volumes for Phase IV of the residential subdivision at full build-out for the AM and PM peak hour.

TABLE 6
2020 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Strawberry Plains Pike at Woodsedge Road	 Unsignalized	Northbound Left/Thru/Right	D	35.0	0.63	C	16.5	0.19
		Westbound Left	A	0.8	0.03	A	1.8	0.06
Carter Mill Drive at Carter View Lane/ Carter Ridge Drive	 Unsignalized	Northbound Left/Thru/Right	A	10.0	0.11	A	9.7	0.05
		Eastbound Left	A	1.0	0.00	A	1.1	0.01
		Westbound Left	A	1.0	0.01	A	2.7	0.02
		Southbound Left/Thru/Right	B	10.1	0.07	B	10.1	0.08
Carter Mill Drive at S. Carter School Road	 Unsignalized	Northbound Left	A	0.4	0.01	A	1.7	0.02
		Eastbound Left/Thru/Right	B	10.2	0.07	B	10.1	0.05

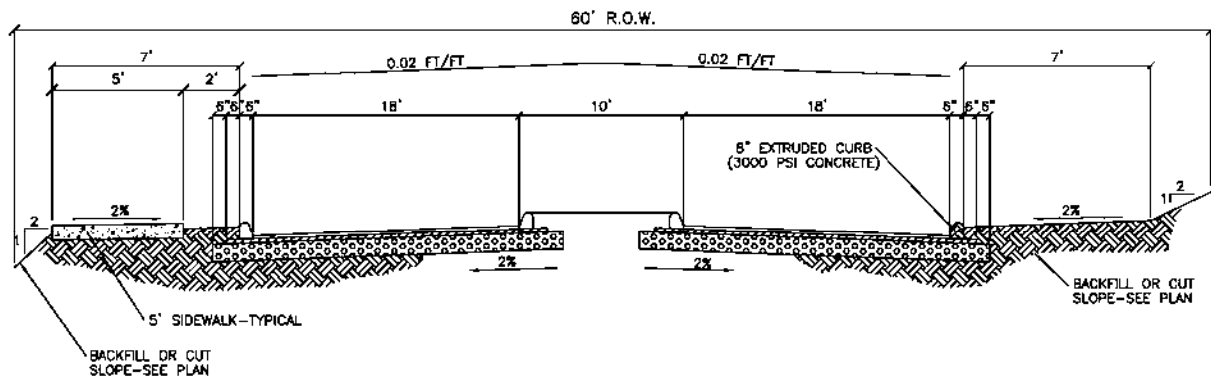
Note: All analyses were calculated in Synchro 8 software and reported with HCM 2000 methodology



**View of Carter Mill Drive at Proposed Road “S” Intersection
(Looking West)**

Using a rolling measuring wheel, the sight distance looking west at the proposed new intersection on Carter Mill Drive at Road “S” was measured to be well in excess of the required distance at the roadway edge. The projected sight distance measured by a rolling measuring wheel was estimated to be 700+ feet. Sight distance at the proposed new intersection on Carter Mill Drive at Road “S” looking east also was measured to be around 500 feet at the roadway edge. Additional sight distance would be gained by clearing some of the roadside of vegetation within the right-of-way in the inside radius of the horizontal curve just to the east on Carter Mill Drive. Suppressing vegetation within this area will need to be maintained in the future. The site designer should ensure that these sight distance lengths are met and they should be labeled on the plans. A land surveyor should measure the sight distance available and verify these estimates.

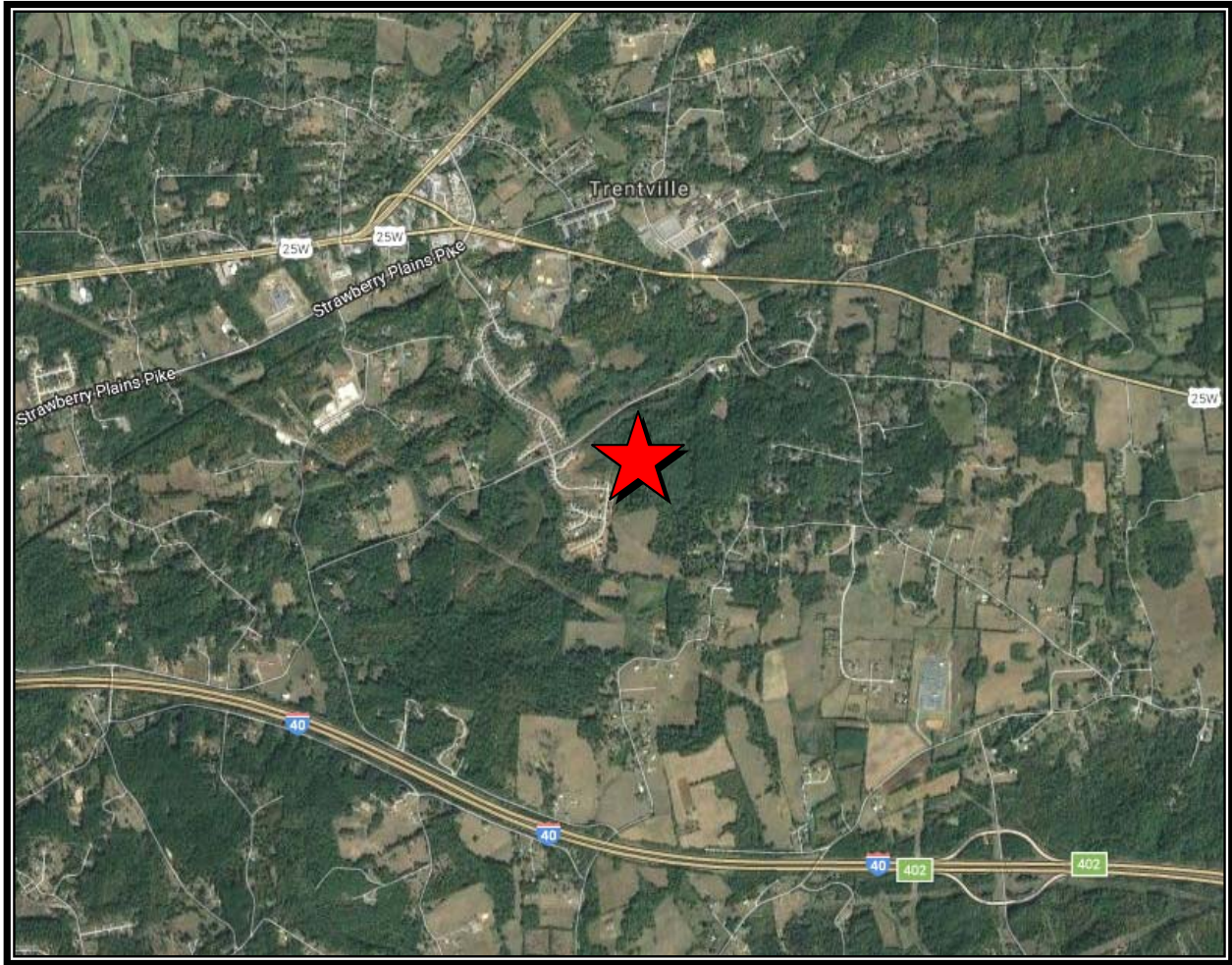
- 1d) Intersection sight distance at the new proposed Road “S” entrance at Carter Mill Drive must not be impacted by new signage, future landscaping or existing vegetation.
- 1e) Road “S” is proposed on the concept plans as having a boulevard roadway cross section. The boulevard cross section at a minimum should have a 10 foot median with 2 - 18 foot lanes within 60 feet of right-of-way. See below for an example of a boulevard typical section. The boulevard road section of Road “S” should be constructed up to the Madison Oaks Road intersection.



TYPICAL BOULEVARD ROAD CROSS SECTION
NOT TO SCALE

- 2) **Carter Mill Drive at South Carter School Road:** From the capacity calculations, it has been shown (Table 6) that the traffic movements at this existing intersection should operate very well with minimal delays during the AM and PM peak periods once Phase IV of the development is complete. It should be noted that due to the horizontal curvature and vertical curvature of this intersection, there is little room for error for vehicles turning left from Carter Mill Drive onto South Carter School Road. Knox County should consider minor clearing and grading of the right-of-way on the east side of the horizontal curve just to the south of the intersection.

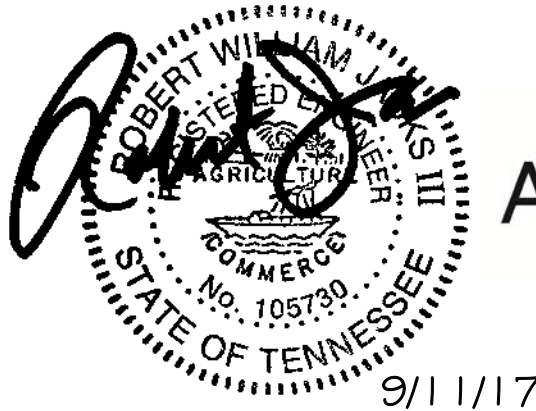
- 3) **Strawberry Plains Pike at Woodsedge Road:** From the capacity calculations, it has been shown (Table 6) that the traffic movements at this existing intersection should operate very well with respect to level of service except for the northbound approach during the AM peak hour. The northbound approach of this intersection during the AM peak hour could experience fairly large delays. Large volumes at this intersection occur in the AM peak hour due to the confluence of school traffic and typical rush hour traffic. The existing level of service was calculated to be LOS C, the background level of service in the year 2020 is estimated to be at LOS D, and calculated to be LOS D in the year 2020 once Phase IV of the Carter Ridge subdivision is completed. However, it is surmised that the capacity analyses undertaken for these northbound movements might understate the level of service. The influence of the traffic signal just to the northeast of this intersection should provide gaps in the traffic flow on Strawberry Plains Pike that would allow greater egress for northbound vehicles than can be accurately modeled in the analysis. Future phases of Carter Ridge may necessitate intersection improvements at this location to reduce northbound delays.



TRANSPORTATION IMPACT STUDY CARTER RIDGE SUBDIVISION – PHASE IV KNOX COUNTY, TENNESSEE

-Prepared For-

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-Prepared By-



September 2017

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EXECUTIVE SUMMARY

Preface:

Carter Mill, G.P. is proposing to develop a subsequent phase of an existing residential development adjacent to Carter Mill Drive in east Knox County, TN. The name of the existing residential development is “Carter Ridge” and this report addresses Phase IV of this development. The purpose of this study is to determine and evaluate the potential impacts of the proposed Phase IV development on the adjacent transportation system. The study includes a review of the operating characteristics of the transportation system that will provide access to the proposed site. Recommendations and mitigation measures will be analyzed and offered where traffic operations have been estimated to be below traffic engineering standards.

Study Results:

The findings of this study include the following:

- At full build-out, the proposed 75 lot residential development of Phase IV is expected to generate approximately 807 new trips on an average weekday. Approximately 63 of these new trips are estimated to occur during the AM peak hour and 82 trips in the PM peak hour at full build-out of Phase IV.
- With the addition of Phase IV of the Carter Ridge Subdivision, the three existing intersections studied for this development and the one proposed new intersection are anticipated to operate fairly well in the future conditions for vehicular traffic up to the year 2020. The only exception being that in the year 2020, the northbound approach of Woodsedge Road at Strawberry Plains Pike is expected to operate at LOS D during the AM peak hour due to rush hour and school traffic. However, it is expected that this approach could operate with less delays than calculated due to the gaps in traffic provided by the nearby traffic signal located at Strawberry Plains Pike at Asheville Highway (US 25E).

Recommendations:

The following recommendations are offered based on the study analyses:

- Phase IV of the proposed single unit residential development is not expected to generate a need for additional roadway improvements to the adjacent studied intersections or roadways. Existing vehicular capacity of the intersections and roadways should be adequate to accommodate this phase of the proposed development.
- Phase IV of the Carter Ridge Subdivision should include design elements of the appropriate sight distance requirements, appropriate road signage, and construction of sidewalks that will integrate with the existing sidewalk system of Phase III.
- Any future proposed phases of the Carter Ridge subdivision development should be investigated with subsequent traffic impact studies. These future phases include Phase V to the east of Phase IV and Phase VI which is located to the west of the existing Phase III. This report does not include an analysis for potential impacts by future developments in each additional phase. These future phases will need to be studied in a similar manner to assess cumulative impacts.

DESCRIPTION OF EXISTING CONDITIONS

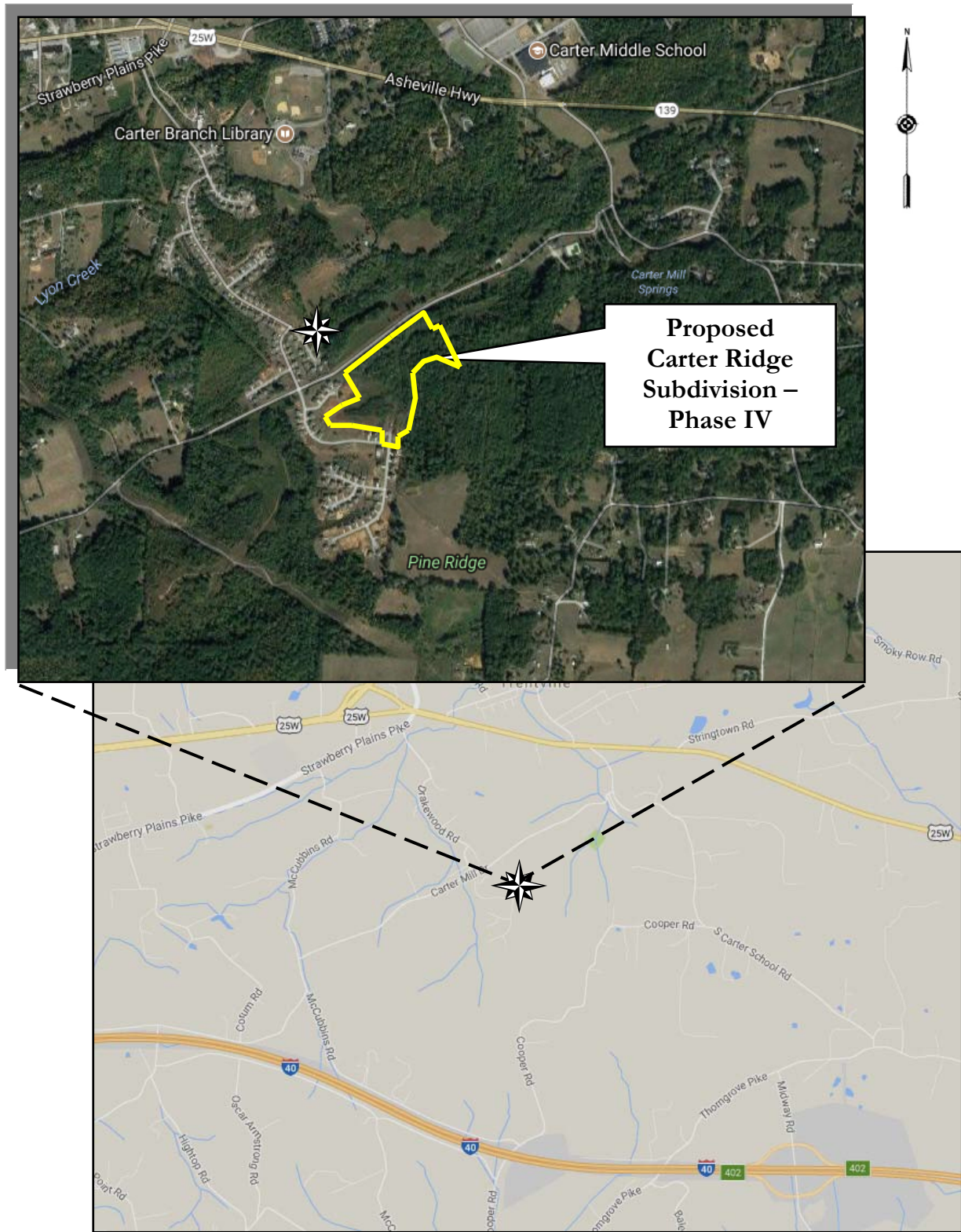
■ STUDY AREA:

The proposed location of Phase IV of Carter Ridge subdivision is shown on a map in Figure 1. This phase of the development is located adjacent to Carter Mill Drive and is to the east of Knoxville, TN in Knox County. The proposed new development in Phase IV is to be comprised of several internal paved roadways and will contain 75 single family residential lots on approximately 19 acres. In order to analyze the transportation impacts associated with the proposed development, the following existing and proposed roadways and intersections were reviewed where the greatest impact is expected:

- Strawberry Plains Pike at Woodsedge Road
- Carter Mill Drive at South Carter School Road
- Carter Mill Drive at Carter Ridge Drive/Carter View Lane
- Proposed New Subdivision Road Entrance (Road “S”) at Carter Mill Drive

In the adjacent vicinity of this development, there are several residential areas, unused/agricultural properties, and public schools. Some of the adjacent residential areas are within existing subdivisions and others exist as single residential lots and farm properties. The proposed development site of Phase IV currently consists of undeveloped woodlands and scrubland.

Phase IV of this residential development is one of a total of 6 proposed phases. Phase I and II were constructed and developed several years ago and are located to the north of the proposed Phase IV in between Strawberry Plains Pike and Carter Mill Drive. Phase I and II lots are located along Woodsedge Road, Drakewood Road, Carter View Lane, and several other side street cul-de-sacs. Phase I and II of the residential development is identified as “Carter Mill Subdivision” and is nearly fully built-out. Phase III thru Phase VI is identified as “Carter Ridge Subdivision”. Phase III of Carter Ridge Subdivision is currently under construction and many homes have been built. Phase IV is bound by Carter Mill Drive to the north, existing Phase III to the west, and future Phase V to the east. Figure 2 shows the current project phasing and the relation of Phase IV to the other phases. This figure is provided by David Campbell, PE with Ideal Engineering Solutions, Inc.



**Figure 1
Location Map**

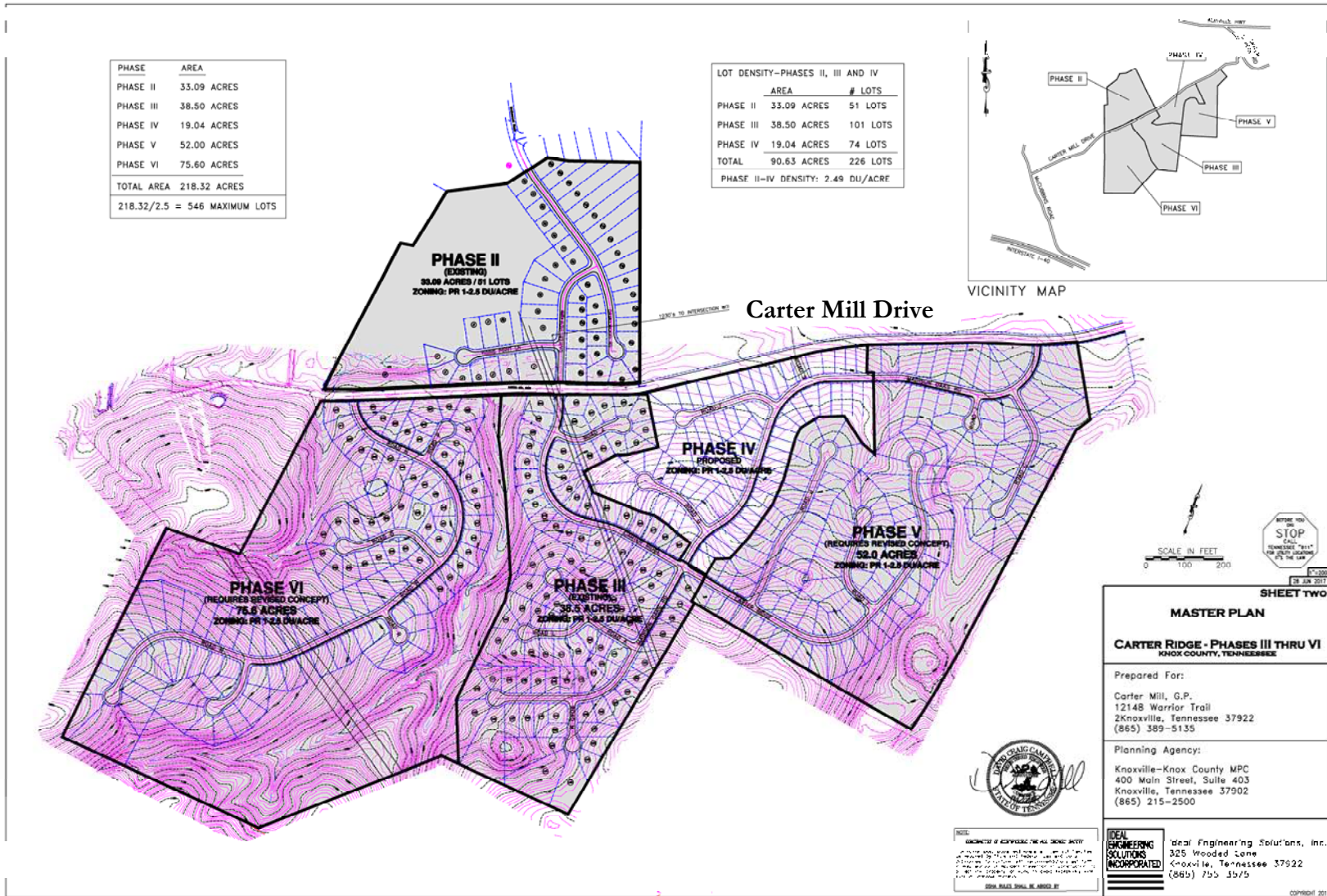


Figure 2
Carter Ridge Subdivision Phasing

▪ **EXISTING ROADWAYS:**

Table 1 shows the characteristics of the key existing roadways included in the study:

**TABLE 1
STUDY CORRIDOR CHARACTERISTICS**

NAME	CLASSIFICATION ¹	SPEED LIMIT	LANES	ROAD WIDTH ²	TRANSIT ³	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Strawberry Plains Pike	Minor Arterial	45 mph	2 undivided	23 feet	None	No sidewalks along roadway	No bike lanes
Woodsedge Road	Local Road	25 mph	2 undivided	26 feet	None	No sidewalks along roadway	No bike lanes
Carter View Lane	Local Road	25 mph	2 undivided	26 feet	None	No sidewalks along roadway	No bike lanes
Carter Mill Drive	Minor Collector	Not Posted	2 undivided	20 feet	None	Sidewalk on south side of road running alongside limits of Phase III	No bike lanes
Carter Ridge Drive	Local Road	25 mph	2 undivided	26 feet	None	Sidewalk on small portions of east side of road	No bike lanes
S. Carter School Road	Minor Arterial	40 mph	2 undivided	21 feet	None	No sidewalks along roadway	No bike lanes

¹ Major Road Plan - May 2011 by Knoxville/Knox County Metropolitan Planning Commission

² Edge of curb to edge of curb or edge of pavements near project site

³ According to Knoxville Area Transit System Map

Strawberry Plains Pike traverses in a general northeast-southwest direction and runs in between Andrew Johnson Highway (US 11E) on its northeast side to John Sevier Highway to the southwest. Strawberry Plains Pike intersects Interstate 40 to the southwest of the project site and this roadway provides fairly convenient access to the interstate system. From the intersection of Strawberry Plains Pike at Woodsedge Road, Interstate 40 is less than 3 miles away.

The intersection of Asheville Highway (US 25E) and Andrew Johnson Highway (US 11E/SR 34) is located just to the north of the intersection of Strawberry Plains Pike at Woodsedge Road. Asheville Highway and Andrew Johnson Highway are major arterials that provide access to Knoxville and other areas to the north and east. A traffic signal is located just to the north and

east of the intersection of Strawberry Plains Pike at Woodsedge Road. This traffic signal controls a four-legged intersection of Asheville Highway (US 25E) at Strawberry Plains Pike/Kitts Road and is approximately 500 feet away from Woodsedge Road. Woodsedge Road is controlled with a stop sign at the intersection of Strawberry Plains Pike. Carter Elementary School was opened in 2013 and is located on Strawberry Plains Pike just over a half-mile away from Woodsedge Road.

Woodsedge Road is a local residential street that provides access to the Carter Mill Subdivision and Carter Ridge Subdivision from Strawberry Plains Pike. It traverses in a general north-south direction and has two traffic calming speed bumps along its length. Woodsedge Road consists of 2 – 13 foot vehicular lanes with concrete curbing. Roadway lighting is not present on Woodsedge Road. Three additional traffic calming speed humps are located further inside Phase I and II (on Drakewood Road) in between Strawberry Plains Pike and Carter Mill Drive.

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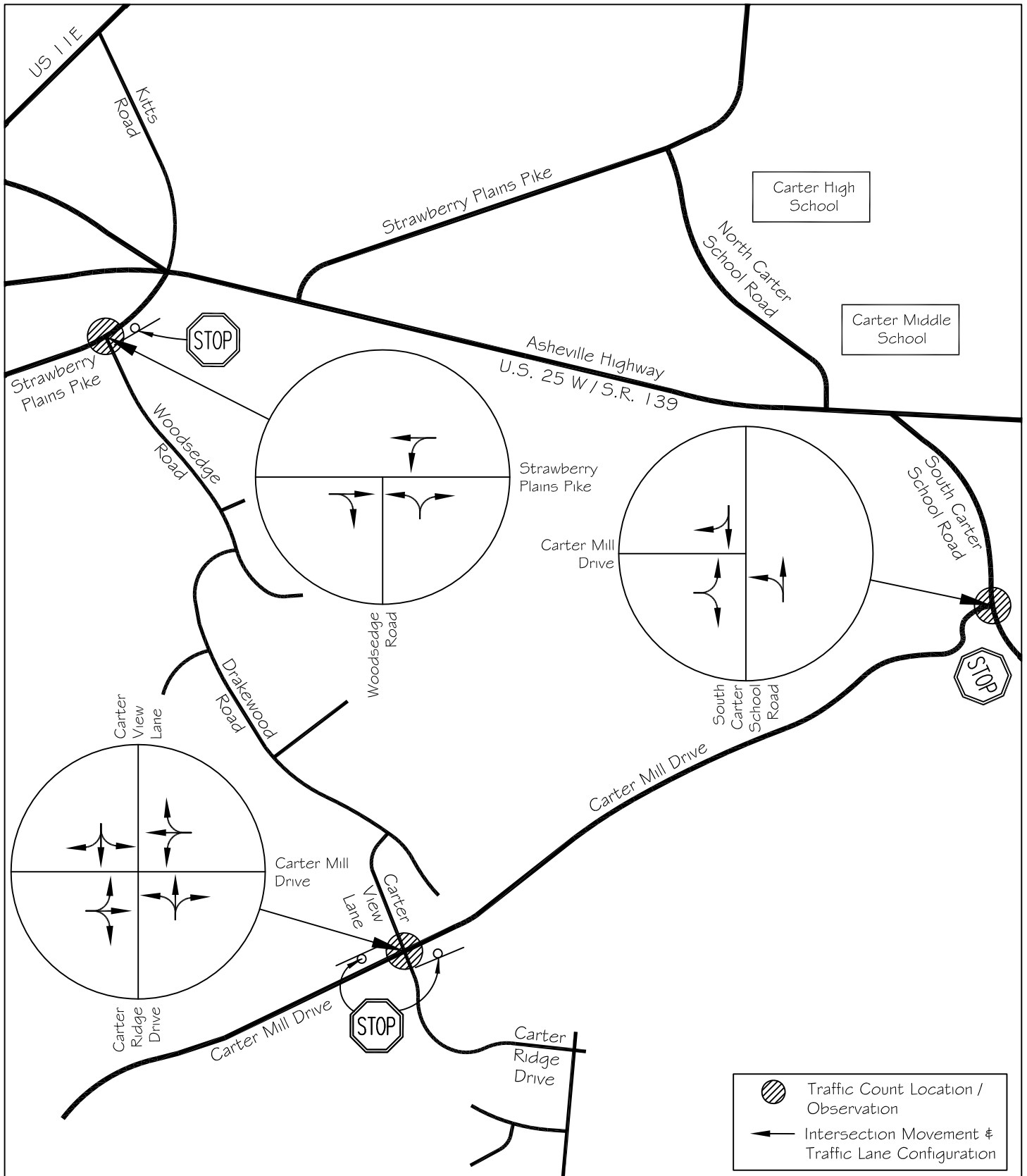
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South Carter School Road traverses in a general north-south direction and is located to the east of the residential development. South Carter School Road traverses in between Asheville Highway (US 25E) to the north to Thorngrove Pike to the south. To the north of Asheville Highway (US 25E), South Carter School Road transitions its name to North Carter School Road. North Carter School Road provides access to Carter Middle School and Carter High School. At the intersection with Carter Mill Drive, the road grades are fairly steep. Carter Mill Drive is controlled by a stop sign at the intersection with South Carter School Road.

Figure 3 shows the lane configurations of the study area roadways and intersections and also shows the study traffic count locations. The pages following Figure 3 give an overview of the site study area with photographs.



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NOT TO SCALE



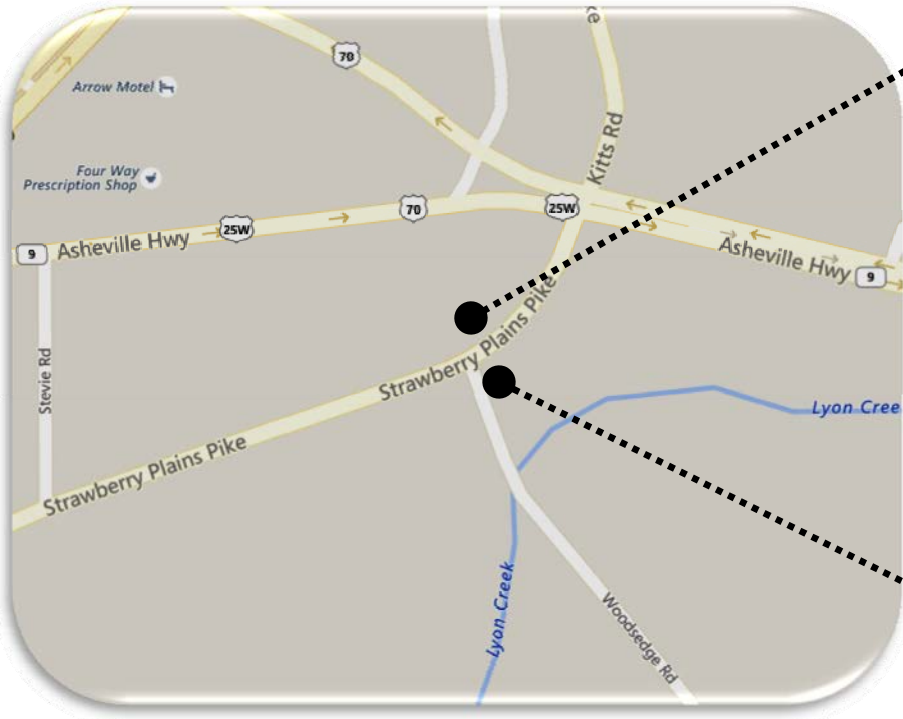
FIGURE 3

Carter Ridge Subdivision - Phase IV

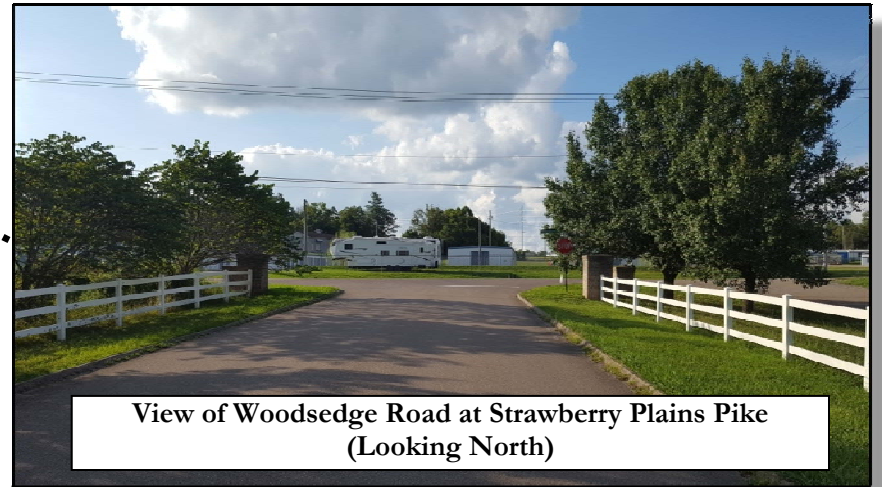
Traffic Count Locations & Existing Lane Configurations

PHOTO EXHIBITS

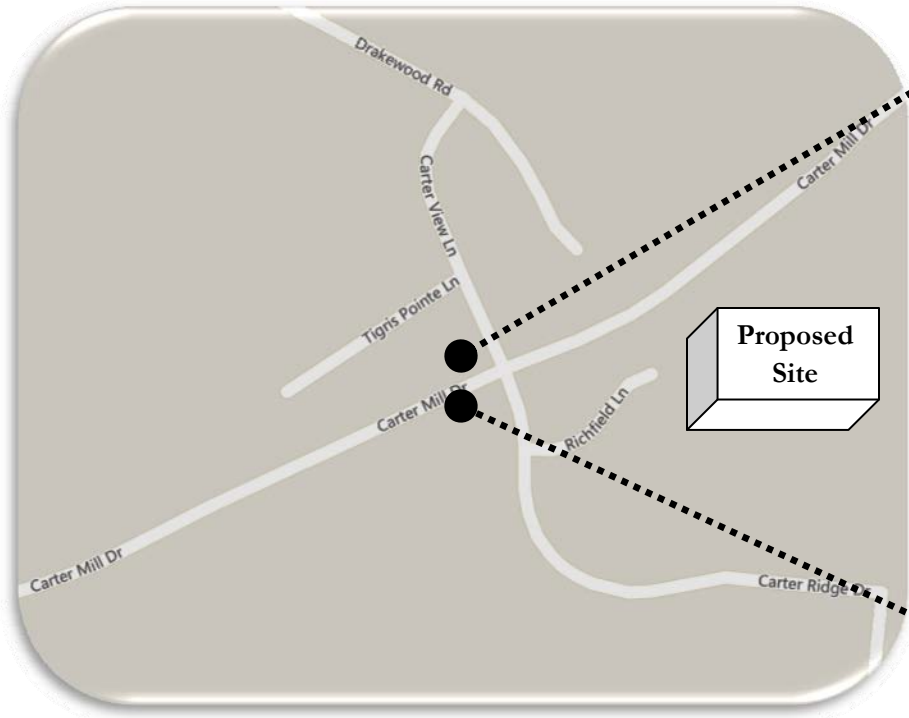
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**View of Strawberry Plains Pike at Woodsedge Road
(Looking Southwest)**



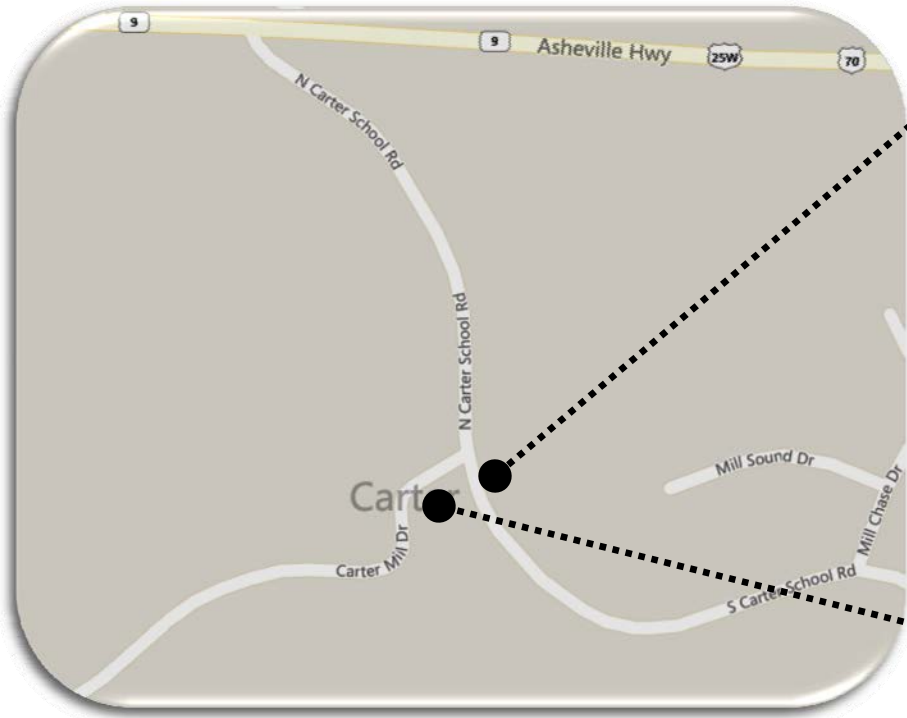
**View of Woodsedge Road at Strawberry Plains Pike
(Looking North)**



View of Carter View Lane/Carter Ridge Drive at Carter Mill Drive (Looking South)



View of Carter Mill Drive at Carter View Lane/Carter Ridge Drive (Looking East)



**View of South Carter School Road at Carter Mill Drive
(Looking North)**



**View of Carter Mill Drive at South Carter School Road
(Looking East)**

■ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

- Existing vehicular roadway traffic:
 - Average Daily Traffic (ADT) on Asheville Highway (US 25E) north and east of the project site was reported by the Tennessee Department of Transportation (TDOT) at 4,893 vehicles per day in 2016. From 2006 – 2016, this count station has indicated a -1.2% annual growth rate.
 - Average Daily Traffic (ADT) on Strawberry Plains Pike to the east of the project site was reported by the Tennessee Department of Transportation (TDOT) at 6,776 vehicles per day in 2016. From 2006 – 2016, this count station has indicated a 0.7% annual growth rate.
 - Average Daily Traffic (ADT) on South Carter School Road south and east of the project site was reported by the Tennessee Department of Transportation (TDOT) at 1,258 vehicles per day in 2016. From 2006 – 2016, this count station has indicated a -0.7% annual growth rate. Historical traffic count data can be viewed in Appendix A.
- Existing bicycle and pedestrian volumes: The average daily pedestrian and bicycle traffic along the study corridor is not known. Sidewalks and bicycle lanes are not provided on the majority of roadways examined. There are no bike lanes in the study area. However, during the manual traffic counts, a handful of pedestrians were observed at the intersection of Carter Mill Drive at Carter Ridge Drive/Carter View Lane. At the other studied intersections, a few pedestrians were also observed even though there is a lack of sidewalks and appropriate shoulders for pedestrian travel.

■ **ON-STREET PARKING:**

Currently, on-street parking is occurring and appears to be allowed on all of the local residential streets within the subdivision studied for this report. However, on-street parking is not allowed on Strawberry Plains Pike, Carter Mill Drive, and South Carter School Road.

- **PEDESTRIAN AND BICYCLE FACILITIES:**

Bicycle facilities (lanes) are not currently available within the project site study area on any of the studied roadways. A 4 foot concrete sidewalk currently exists on the south side along Carter Mill Drive in front of Phase III of the Carter Ridge Subdivision for approximately 525 feet. There is sporadic construction of sidewalks on Carter Ridge Drive.

- **WALK SCORE:**

A private company offers an online website that grades and gives scores to locations within the United States based on “walkability”. According to the website, the numerical value assigned (the Walk Score) is based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.).

Appendix B shows a map and gives information for the proposed site development Walk Score at Carter Mill Drive. Based on the project location, the site is given a Walk Score of 5. This Walk Score indicates that the site is almost exclusively dependent on vehicles for errands and travel. This is due to the complete lack of sidewalks in the study area to outside destinations/amenities.

- **TRANSIT SERVICES:**

There are currently no public transit services available in this portion of Knox County. The East Tennessee Human Resource Agency (ETHRA) does provide transportation services in Knox County when requested along with private taxis, and ride-sharing opportunities (Uber, etc.).

Knox County school busses were observed at all of the studied intersections during the traffic counts. One school bus stopped within the intersection of Carter Mill Drive at Carter Ridge Drive/Carter View Lane during the afternoon traffic count to allow for several students to disembark. One other school bus stopped at the intersection of Strawberry Plains Pike at Woodsedge Road during the afternoon traffic count to allow for one student to disembark.

PROJECT DESCRIPTION

■ **LOCATION AND SITE PLAN:**

The proposed plan layout designed by Ideal Engineering Solutions, Inc. is shown in Figure 4. As can be seen in the figure, for Phase IV, one new entrance will tie onto Carter Mill Drive on the north side of the development. Phase IV of the residential development is expected to be comprised of 75 single family residential lots on approximately 19 acres. The residential lots in Phase IV will average approximately 1/4 acre to 1/3 acre in size.

The proposed subdivision is expected to be comprised of three new internal paved roadways within the development and an extension of an existing road from Phase III. Two of the new roads will be short cul-de-sacs and the other will be a short extension to tie onto Carter Mill Drive.

The actual schedule for completion of this new phase of the residential development is dependent on economic factors and construction timelines. This project is also contingent on permitting, design, and other issues. However, for the purposes of this study, it was assumed that the total construction build-out of Phase IV of the development and full occupancy will occur by the year 2020 (in 3 years). The developer is planning to begin construction once permits and approvals are acquired.

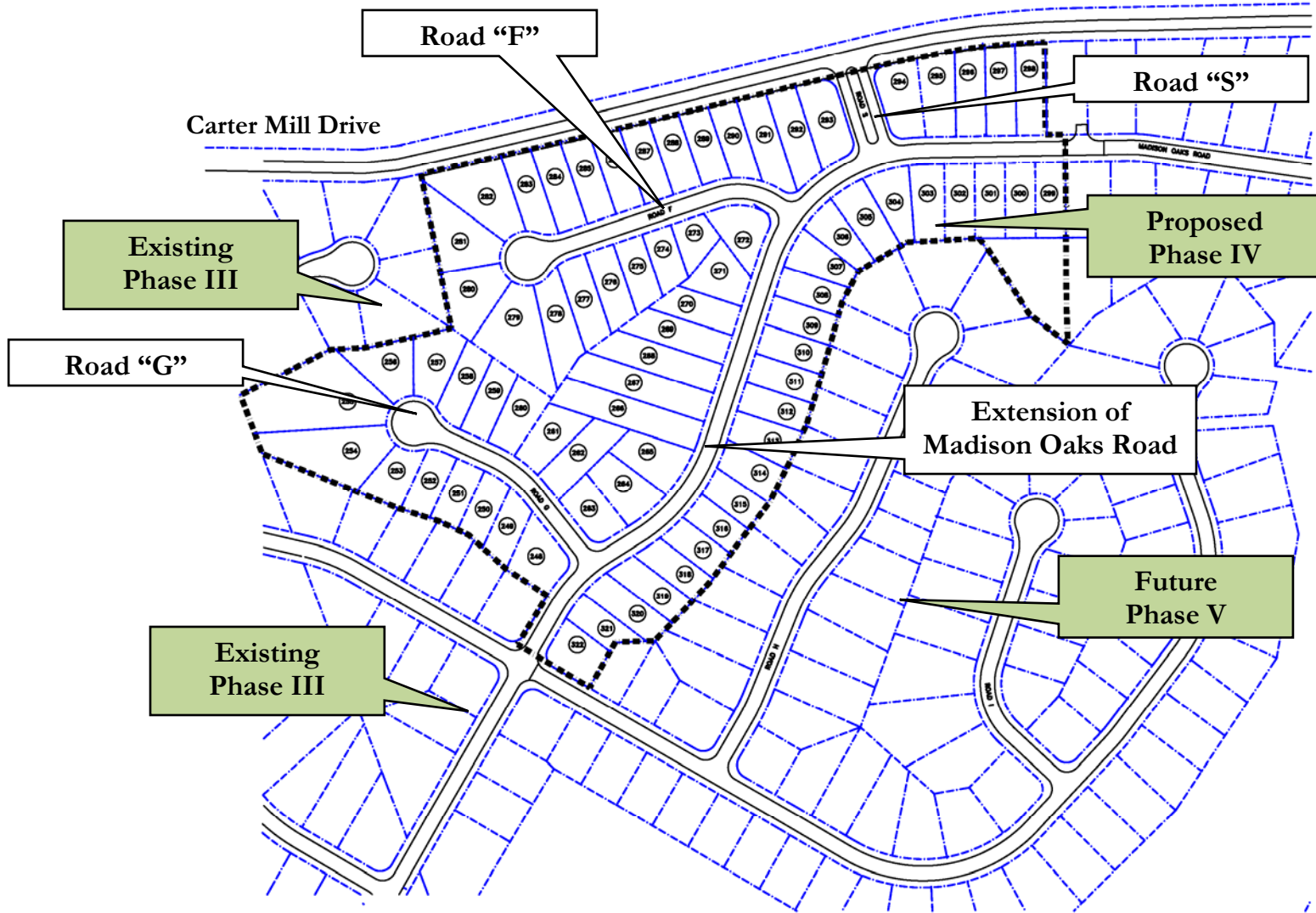


Figure 4
Proposed Plan Layout
Carter Ridge Subdivision – Phase IV

■ **PROPOSED USES AND ZONING REQUIREMENTS:**

At the end of the total build-out of Phase IV, the proposed single family unit residential development is expected to be comprised of additional new internal roadways with 75 lots on approximately 19 acres. The site will also have several areas dedicated as green space that will incorporate the stormwater controls for the development.

The site property is currently zoned as Planned Residential (PR). The adjacent surrounding land uses are the following:

- The properties to the north on Carter Mill Drive are zoned Planned Residential (PR) and consists of undeveloped land/farming areas.
- The properties to the west are Phase III of Carter Ridge Subdivision and are zoned Planned Residential (PR).
- To the south, the site is bounded by Agricultural (A) zoned property with undeveloped property and single family residences/farming properties.
- Future Phase V of the Carter Ridge Subdivision is located to the east of Phase IV and is also zoned Planned Residential (PR). Paschal Carter Memorial Park is located further to the east of future Phase V and is zoned Agricultural (A).

The Planned Residential (PR) zone allows for a variety of land uses primarily within the residential realm. Uses permitted in this zone include single family dwellings, duplexes, and multi-dwelling structures and developments. Additionally, commercial uses permitted include community facilities and day care homes. The current zoning map is provided in Appendix C.

■ **DEVELOPMENT DENSITY:**

The proposed density for the residential development is 2.49 dwelling units per acre based on 75 lots on 19 acres. This density is calculated by taking the total areas from Phase II thru Phase IV that includes a total of 226 lots on 90.63 acres. This density is less than 2.5 units per acre as required in the regulations.

- **ON-SITE CIRCULATION:**

Phase IV of the subdivision will be constructed with two new cul-de-sac roads and will extend an existing road from Phase III. This Phase III road, Madison Oaks Road, will be extended approximately 1,500 feet. A short length of roadway will be constructed to tie the extended Madison Oaks Road to Carter Mill Drive. The total length of the new internal roadways within Phase IV will be approximately 2,675 feet in length. The roads shown on the concept plan for Phase IV by Ideal Engineering Solutions, Inc. have been labeled as Road “F”, Road “G”, and Road “S”. Road “F” and “G” are short cul-de-sac roads and Road “S” will tie Carter Mill Drive to the Madison Oaks Road extension. The internal roadways for the development shown in Figure 4 will be paved, include 8” extruded concrete curbing, and the lane widths will be 13 feet for a total of 26 foot pavement width. A five foot sidewalk will be provided on one side of the Phase IV internal roadways and a sidewalk will also be constructed along the south side of Carter Mill Drive along the frontage of Phase IV. This sidewalk on Carter Mill Drive for Phase IV will tie into the Phase III sidewalk.

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

In addition to passenger vehicles, the proposed internal roadways will also provide access for service, delivery, and maintenance vehicles. It is not expected that any of these vehicles will interfere with off-site adjacent roadway operations other than that these vehicles will occasionally be entering and exiting the development. The internal roadways in the subdivision are expected to be able to accommodate these types of vehicles along with passenger vehicles.

TRAFFIC ANALYSIS OF EXISTING AND PROPOSED CONDITIONS

■ EXISTING TRAFFIC CONDITIONS

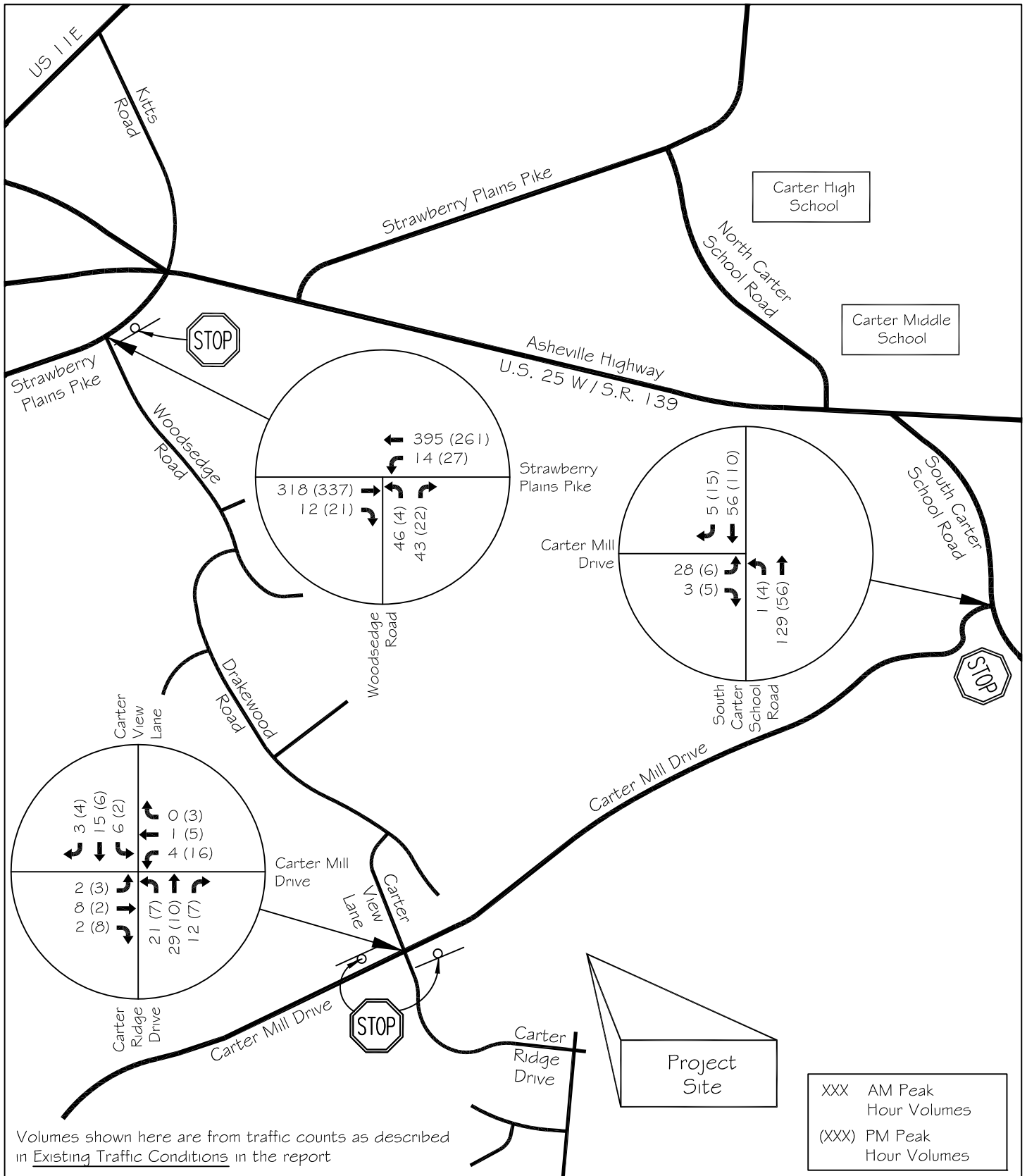
Traffic counts were conducted at the following existing unsignalized intersections as directed by Knox County Engineering:

- Strawberry Plains Pike at Woodsedge Road
- Carter Mill Drive at South Carter School Road
- Carter Mill Drive at Carter Ridge Drive/Carter View Lane

Traffic counts at Carter Mill Drive at South Carter School Road and Carter Mill Drive at Carter Ridge Drive/Carter View Lane were obtained on Wednesday, August 23, 2017 for a total of 6 hours at each intersection. Traffic counts at Strawberry Plains Pike and Woodsedge Road were obtained on Thursday, August 24, 2017 for a total of 6 hours. The counts were conducted during the morning and afternoon peak periods. The local schools were in session when the traffic counts were conducted and had been open over 2 weeks since the beginning of the school year. Based on the traffic volumes counted, the AM and PM peak hour of traffics were observed at the following times:

- Strawberry Plains Pike at Woodsedge Road
7:15 – 8:15 AM / 3:00 – 4:00 PM
- Carter Mill Drive at South Carter School Road
7:15 – 8:15 AM / 3:15 – 4:15 PM
- Carter Mill Drive at Carter Ridge Drive/Carter View Lane
7:00 – 8:00 AM / 3:45 – 4:45 PM

The manual tabulated traffic counts can be reviewed in Appendix D. In Figure 5, the volumes shown are from the existing traffic counts volumes during the AM and PM peak hours observed at each intersection.



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FIGURE 5

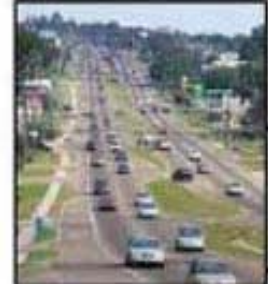
Carter Ridge Subdivision - Phase IV
 2017 Peak Hour Traffic Volumes -
 EXISTING TRAFFIC CONDITIONS

Capacity analyses were undertaken to determine the existing Level of Service (LOS) for the studied intersections with respect to vehicular traffic. The capacity analyses were calculated by following the methods outlined in the Highway Capacity Manual and using Synchro Traffic Software (Version 8). LOS is a qualitative measurement developed by the transportation profession of 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 the worst. This grading system provides a reliable straightforward means to communicate road operations to the public. The Highway Capacity Manual (HCM) lists level of service criteria for unsignalized intersections and signalized intersections. For unsignalized intersections, Level of Service is measured in terms of delay (in seconds). This measure is an attempt to quantify delay that includes travel time, driver discomfort, and fuel consumption. 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 movement. Generally, LOS D is usually considered the lowest acceptable LOS by government agencies. Table 2 lists the level of service criteria for unsignalized intersections.

A/B



C/D



E/F



(Source: FDOT)

From the capacity calculations, the results from the existing peak hour vehicular traffic can be seen in Table 3 for the unsignalized intersections. The intersection is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours in the table. A v/c ratio of 1 would indicate that the traffic volumes are at the roadway capacity. Appendix E includes the worksheets from the capacity analyses for the existing peak hour vehicular traffic. For the intersections, the existing peak hour levels of service are shown to operate at a good level during the AM and PM peak hours for vehicular traffic.

TABLE 2



LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS



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

Source: Highway Capacity Manual

TABLE 3
2017 PEAK HOUR LEVEL OF SERVICE & DELAY - EXISTING TRAFFIC CONDITIONS

INTERSECTION	TRAFFIC CONTROL	APPROACH	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Strawberry Plains Pike at Woodsedge Road	Unsignalized	Northbound Left/Thru/Right	C	25.0	0.46	B	13.4	0.09
		Westbound Left	A	0.6	0.02	A	1.3	0.04
Carter Mill Drive at Carter View Lane/ Carter Ridge Drive	Unsignalized	Northbound Left/Thru/Right	A	9.5	0.09	A	9.3	0.05
		Eastbound Left	A	1.2	0.00	A	2.4	0.00
		Westbound Left	A	5.5	0.01	A	4.7	0.02
		Southbound Left/Thru/Right	A	9.4	0.05	A	9.3	0.03
Carter Mill Drive at S. Carter School Road	Unsignalized	Northbound Left	A	0.2	0.00	A	1.1	0.01
		Eastbound Left/Thru/Right	A	10.0	0.05	A	9.6	0.02

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2000 methodology

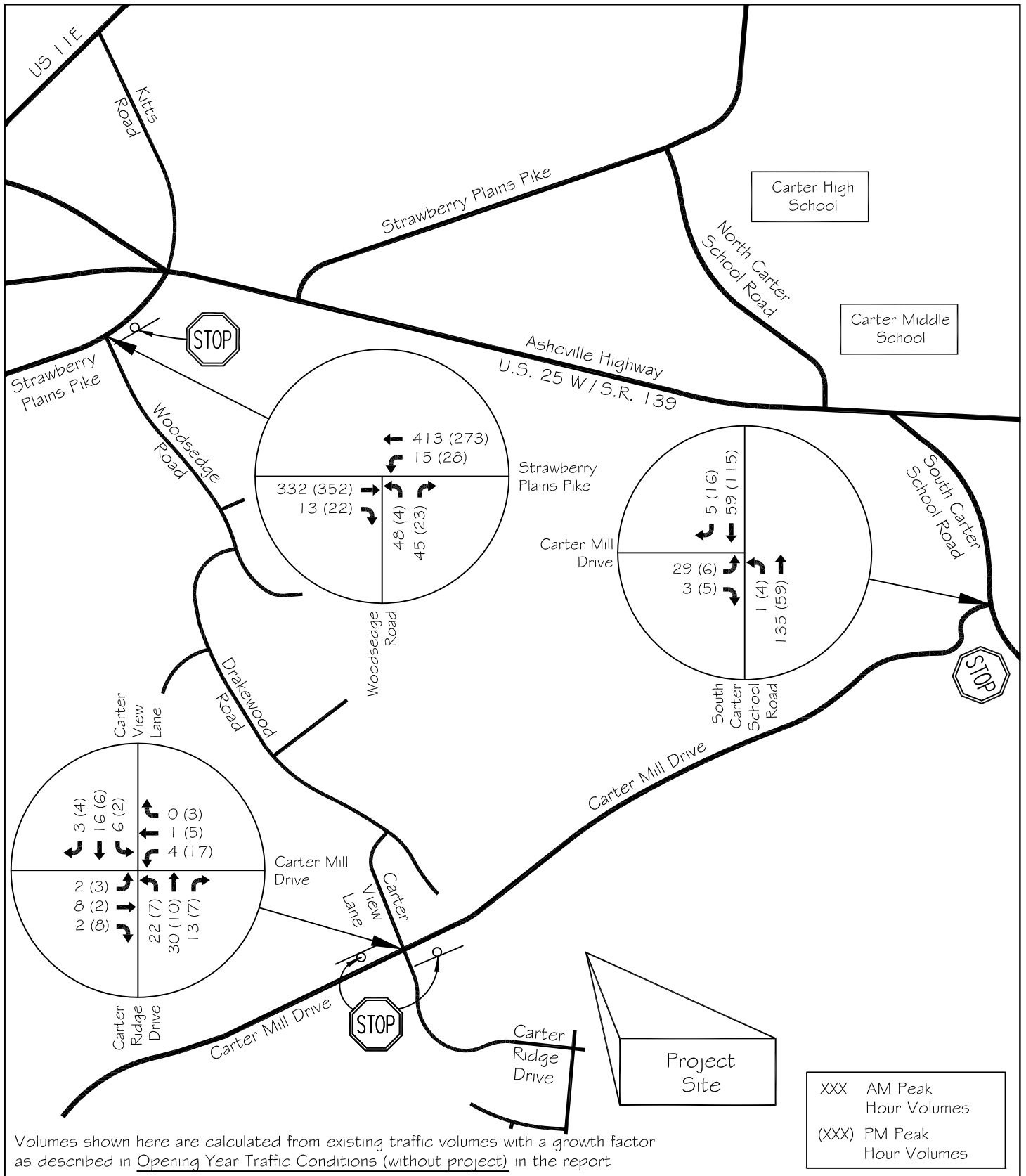
■ **OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT):**

Opening year traffic volume estimates represent the future condition the proposed study area is potentially subject to without the proposed project being developed (no-build option). As previously stated, the build-out and full occupancy for this proposed new residential development was assumed to occur in the year 2020. This corresponds with almost three full years for the development to reach full capacity and occupancy.

Traffic growth on nearby roadways has shown flat to negative growth over the past 10 years according to TDOT count stations (historical traffic data is shown in Appendix A). Currently, there are no known relevant significant upcoming developments adjacent to the proposed site that would indicate large future increased traffic volumes in the study area in the short term. There are plans for a business park to the southeast of the site but is not expected to open for several years. The Midway Business Park is proposed to be located approximately 2 – 3 miles away by Knox County. This business park has been under design and discussion for several years, but has been held up due to lawsuits and other public opposition.

Nonetheless, to insure a reasonable and conservative estimate for this study, a 1.5% growth was used to take into account any future development in the area and potential rising travel volumes. This would also take into account traffic generated by the construction of additional homes in the remaining lots of Phases I thru III. The results of this growth rate application to the existing traffic volumes can be seen in Figure 6 for the year 2020. Figure 6 shows the background traffic volumes during the AM and PM peak hours.

The application of opening year traffic to the existing intersections did not appreciably change the LOS designations from the existing traffic volume analysis for the AM and PM peak hours. However, the intersection of Strawberry Plains Pike at Woodsedge Road was calculated to operate at LOS D in the year 2020 during the AM peak. This corresponds to the traffic generated by the local schools. Table 4 reports the LOS designation, delay (in seconds), and v/c ratio (volume/capacity). Appendix E contains the LOS capacity worksheets for the opening year conditions (without project). It is important to point out that these projected LOS designations for the intersection could potentially exist in the future even without the proposed residential project being constructed and developed.




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FIGURE 6
 Carter Ridge Subdivision - Phase IV
 2020 Peak Hour Traffic Volumes -
 OPENING YEAR TRAFFIC (WITHOUT
 PROJECT)

**TABLE 4
2020 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITHOUT PROJECT)**

INTERSECTION	TRAFFIC CONTROL	APPROACH	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Strawberry Plains Pike at Woodsedge Road	 Unsignalized	Northbound Left/Thru/Right	D	28.1	0.51	B	13.7	0.10
		Westbound Left	A	0.6	0.02	A	1.3	0.04
Carter Mill Drive at Carter View Lane/ Carter Ridge Drive	 Unsignalized	Northbound Left/Thru/Right	A	9.5	0.10	A	9.3	0.05
		Eastbound Left	A	1.2	0.00	A	2.4	0.00
		Westbound Left	A	5.5	0.01	A	4.8	0.02
		Southbound Left/Thru/Right	A	9.4	0.05	A	9.3	0.03
Carter Mill Drive at S. Carter School Road	 Unsignalized	Northbound Left	A	0.2	0.00	A	1.1	0.01
		Eastbound Left/Thru/Right	B	10.1	0.05	A	9.6	0.03

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2000 methodology

■ **TRIP GENERATION**

The estimated amount of traffic that will be generated by Phase IV of the proposed residential development was calculated based upon rates and equations for peak hour trips provided by Trip Generation Manual, 9th Edition, a publication of the Institute of Transportation Engineers (ITE). A generated trip is a single or one-direction vehicle movement that is either entering or exiting the study site. The Trip Generation Manual is the traditional and most-sourced resource for determining trip generation rates when traffic impact studies are produced. The Manual lists and includes data for a variety of land uses. The data from ITE for the proposed land use is shown in Appendix F. A summary of this information is presented in the following table:

**TABLE 5
TRIP GENERATION FOR CARTER RIDGE SUBDIVISION - PHASE IV**

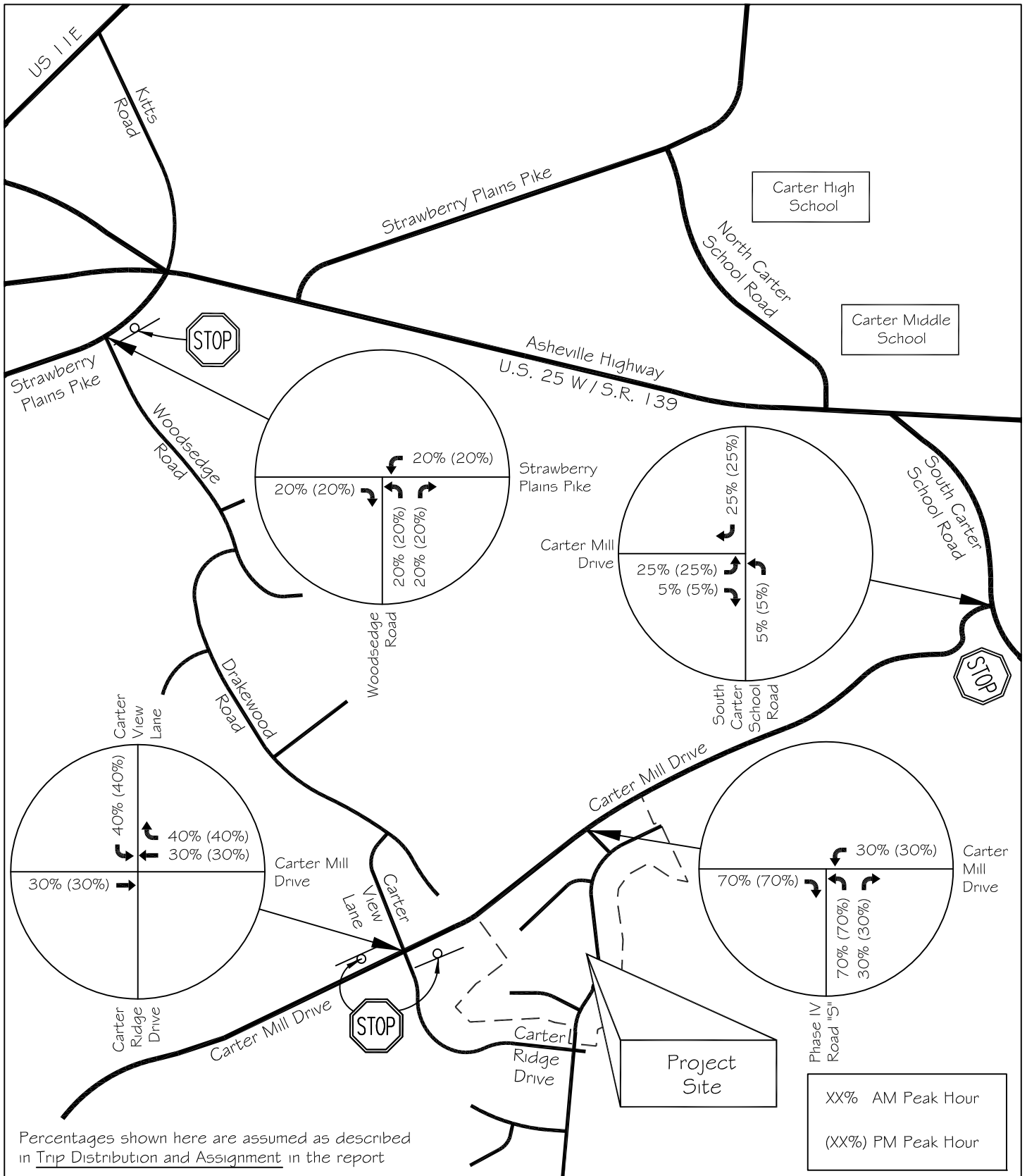
ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR			GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
#210	Single-Family Detached Housing	75 Lots	807	25%	75%		63%	37%	
				16	47	63	52	30	82
Total New Volume Site Trips			807	16	47	63	52	30	82

With a total of 75 single family residences, based on the calculations, it is estimated that 16 vehicles will enter the development, 47 will exit, for a total of 63 new generated trips during the AM Peak Hour in the year 2020. Similarly, it is estimated that 52 vehicles will enter the development, 30 will exit, for a total of 82 new generated trips during the PM Peak Hour in the year 2020. The calculated trips generated for an average weekday could be expected to be approximately 807 vehicles for the entire 75 lot development. No trip reductions were included either for pass-by or internal trips.

■ TRIP DISTRIBUTION AND ASSIGNMENT

Figure 7 shows the projected distribution for traffic entering/exiting the new residential subdivision during the future AM peak hour and the future PM peak hour at the existing studied intersections and at the new proposed subdivision road entrance on Carter Mill Drive. The percentages shown only pertain to the new trips generated by the new proposed residential dwellings in the subdivision for Phase IV that were calculated from the ITE Trip Generation Manual. There are a variety of developments and destinations that will potentially “attract” the projected traffic to and from the new residential development. The projected trip distributions of Figure 7 are based on the existing traffic movements at the examined intersections and are also surmised from surrounding concentrations of development and population.

Figure 8 shows the Traffic Assignment of the computed trips that will be generated by the development and applied to the various intersection movements based on the assumed distribution of trips shown in Figure 7.



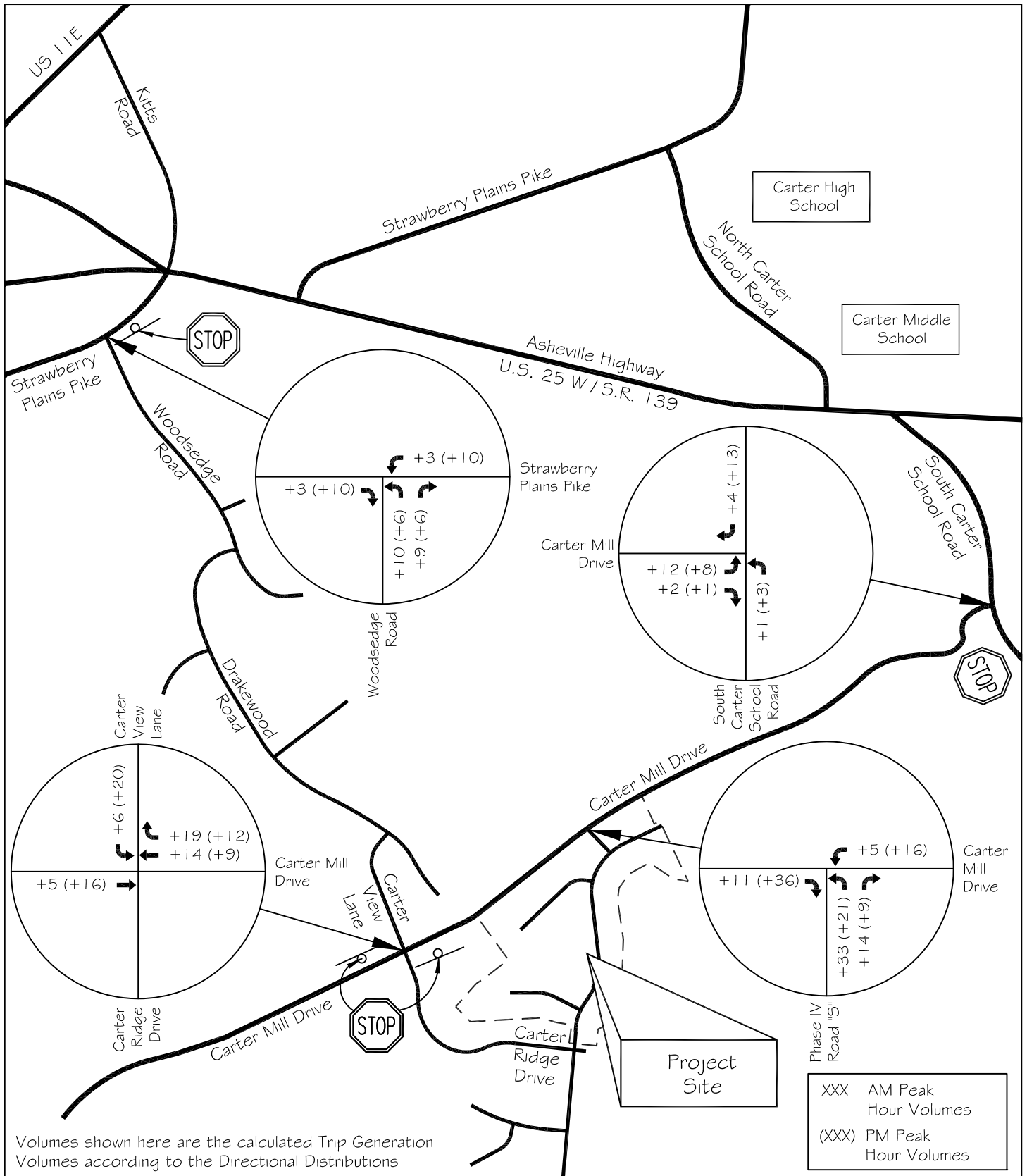
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FIGURE 7
 Carter Ridge Subdivision - Phase IV
 Directional Distribution of Generated Traffic during AM and PM Peak Hour



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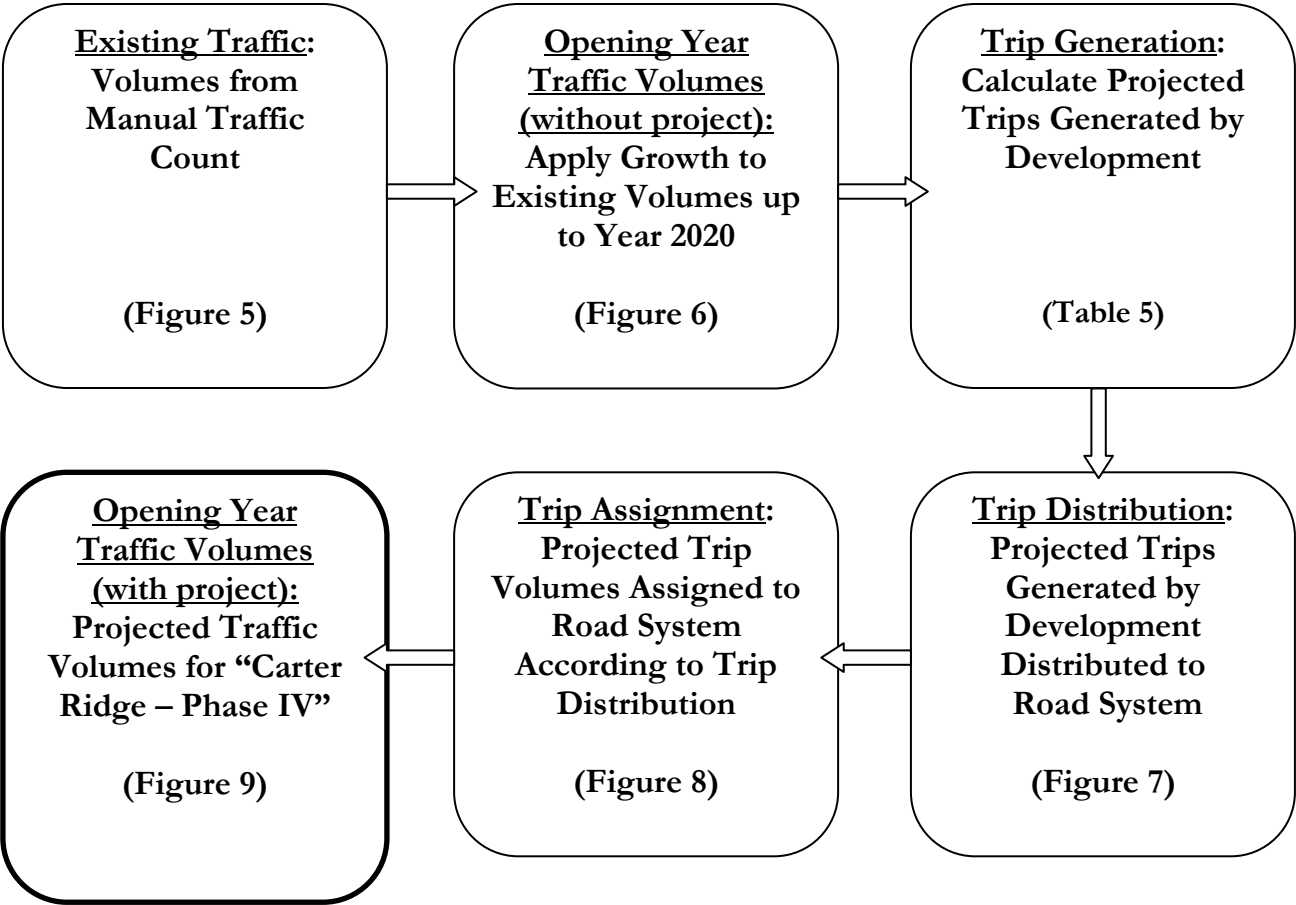
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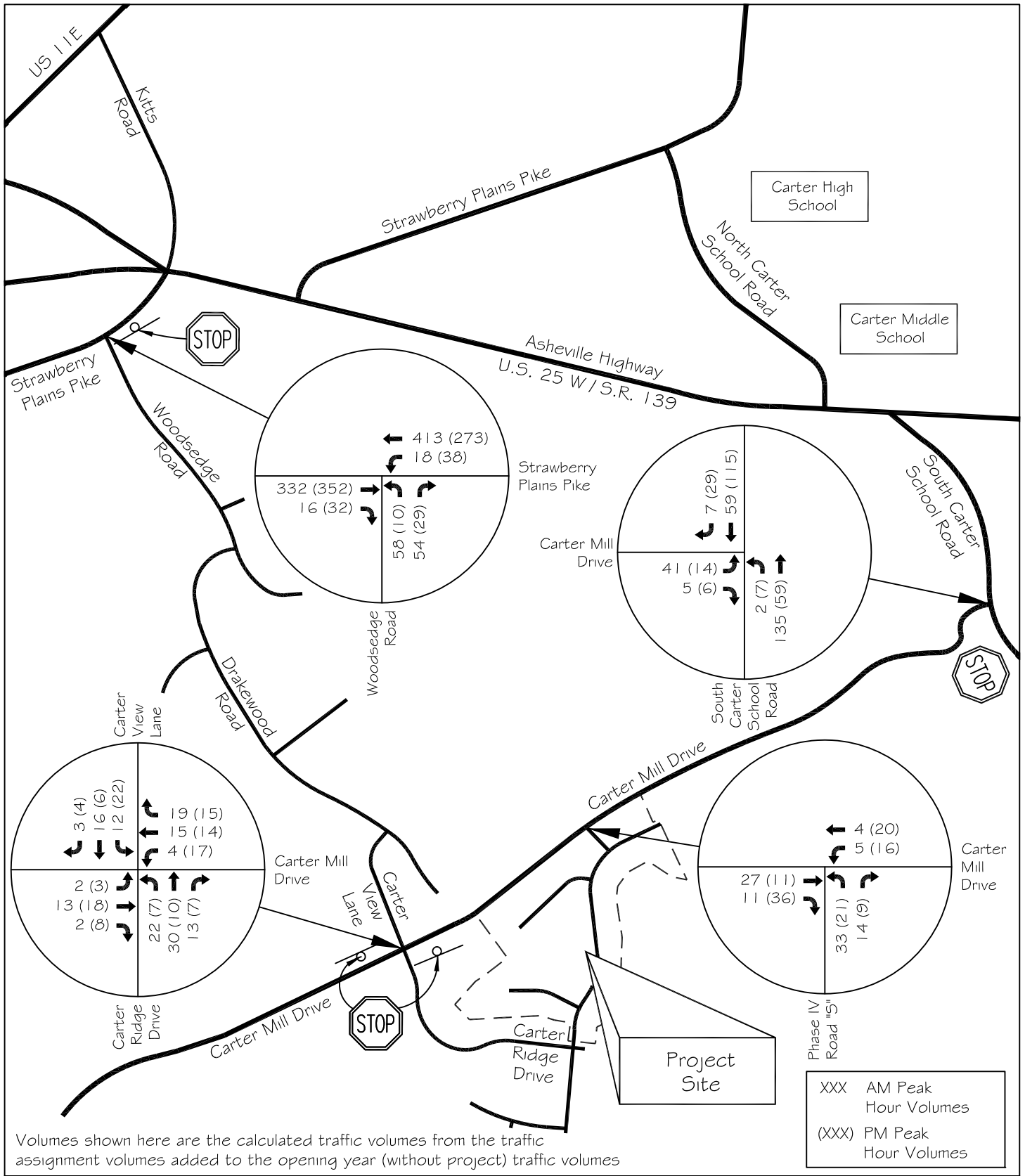
FIGURE 8
Carter Ridge Subdivision - Phase IV
Traffic Assignment of Generated Traffic during AM and PM Peak Hour

■ **OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)**

Overall, several additive steps were taken to estimate the total opening year projected traffic volumes at the studied intersections when Phase IV of the residential development is fully constructed and occupied. The steps are illustrated below for clarity:



To calculate the total future projected traffic volumes at the studied intersections, the calculated peak hour traffic (from ITE Trip Generation) generated by the new proposed Phase IV residential development was added to the 2020 opening year traffic volumes (shown in Figure 6) in accordance with the predicted directional distributions and assignments (shown in Figures 7 and 8). This procedure was necessary to obtain the total projected traffic volumes at the time the development is fully built-out. Figure 9 shows the projected AM and PM peak hour volumes at the studied intersections for the year 2020.



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FIGURE 9
 Carter Ridge Subdivision - Phase IV
 2020 Peak Hour Traffic Volumes -
 OPENING YEAR TRAFFIC (WITH
 PROJECT)

Capacity analyses were once again undertaken to determine the projected Level of Service (LOS) for vehicles at the studied intersections. Appendix E includes the worksheets for these capacity analyses.

The results of the capacity calculations of the projected peak hour vehicular traffic can be seen in Table 6 for the studied intersections for the year 2020. The entrance at Carter Mill Drive for Phase IV of the development is labeled as Road “S” which follows the road naming convention from the proposed plan layout shown in Figure 4. As can be seen in the table, the northbound approach at Strawberry Plains Pike at Woodsedge Road is projected to operate at LOS E in the year 2020 during the AM peak hour. However, once the AM peak school traffic is subsided, the intersection operates well with respect to capacity. The other approaches and intersection movements are projected to operate very well. These results shown are based on the year 2020 projected volumes for Phase IV of the residential subdivision at full build-out for the AM and PM peak hour.

TABLE 6
2020 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT)

INTERSECTION	TRAFFIC CONTROL	APPROACH	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Strawberry Plains Pike at Woodsedge Road	 Unsignalized	Northbound Left/Thru/Right	D	35.0	0.63	C	16.5	0.19
		Westbound Left	A	0.8	0.03	A	1.8	0.06
Carter Mill Drive at Carter View Lane/ Carter Ridge Drive	 Unsignalized	Northbound Left/Thru/Right	A	10.0	0.11	A	9.7	0.05
		Eastbound Left	A	1.0	0.00	A	1.1	0.01
		Westbound Left	A	1.0	0.01	A	2.7	0.02
		Southbound Left/Thru/Right	B	10.1	0.07	B	10.1	0.08
Carter Mill Drive at S. Carter School Road	 Unsignalized	Northbound Left	A	0.4	0.01	A	1.7	0.02
		Eastbound Left/Thru/Right	B	10.2	0.07	B	10.1	0.05

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2000 methodology

▪ **POTENTIAL SAFETY ISSUES**

The study area was investigated for potential safety issues. Several features of the adjacent transportation system were identified and are discussed in the following pages as having potential safety issues.

▬ **SPOT SPEED STUDY**

As a further investigation of the study area, a spot speed study was conducted. The spot speed study was conducted on Carter Mill Drive to sample and tabulate the existing vehicle speeds along the road in the vicinity of the proposed development. The equipment used for the speed study was a Bushnell Speedster III Radar Speed Gun. The vehicles that were counted for the study were the eastbound and westbound motorists along Carter Mill Drive near the proposed intersection with Road “S”.

The results of the study indicate that the majority of the traffic along Carter Mill Drive travels at a greater speed than the assumed speed limit. There is not a posted speed limit on Carter Mill Drive, but Knox County ordinance states that in the absence of a posted speed limit sign, the regulatory speed is 30 MPH. The results of the spot speed study indicate that the observed 85th percentile speed was 46 mph. The spot speed field observations are provided in Appendix G.

▬ **EVALUATION OF TURN LANE THRESHOLDS**

With a new intersection being created on Carter Mill Drive at Road “S”, this intersection was evaluated for the need for separate left and right turn lanes on Carter Mill Drive for entering vehicles into the development. Based on the projected traffic volumes at the intersection on Carter Mill Drive and according to “Knox County’s Access Control and Driveway Design Policy”, it appears that separate left turn lanes and separate right turn lanes are not warranted for entering vehicles. The Knox County turn lane policy worksheets are located in Appendix H and the results shown in the Appendix are based on the projected volumes during the PM peak hour since this time period is estimated to have the highest volumes at the proposed intersection.

The design policy for turn lane warrants relate volume thresholds based on prevailing speeds for two-lane roadways. The speed classification that was chosen for this evaluation was based on the spot speed study that showed the 85th percentile speed was 46 mph. Therefore, this study evaluation used the Knox County classification for speeds of 46 to 55 mph and the calculated projected volumes.

➤ **EVALUATION OF SIGHT DISTANCE**

Based on a 85th percentile observed speed of 46 mph on Carter Mill Drive; the recommended intersection sight distance is 460 feet looking east and west at the intersection of Carter Mill Drive at Road “S”.

There are some roadside features on Carter Mill Drive near the proposed intersection with Road “S” that could potentially interfere with having the recommended sight distance. Existing vegetation on the south side of the road potentially obstructs views looking to the east in addition to the sight reductions due to the existing curvature of the roadway on Carter Mill Drive. Looking to the west, there is vegetation along the roadway but sight distance is more than available to meet the requirements.



**View of Carter Mill Drive at Proposed Road “S” Intersection
(Looking East)**



**View of Carter Mill Drive at Proposed Road “S” Intersection
(Looking West)**

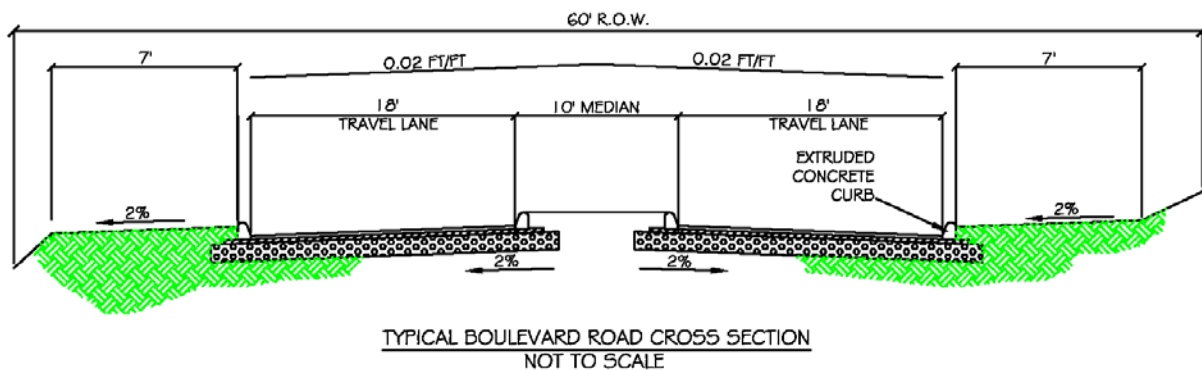
Using a rolling measuring wheel, the sight distance looking west at the proposed new intersection on Carter Mill Drive at Road “S” was measured to be well in excess of the required distance at the roadway edge. Sight distance at the proposed new intersection on Carter Mill Drive at Road “S” looking east also was measured to be around 500 feet at the roadway edge. Additional sight distance would be gained by clearing some of the roadside of vegetation within the right-of-way in the inside radius of the horizontal curve just to the east on Carter Mill Drive. Suppressing vegetation within this area will need to be maintained in the future. The site designer should ensure that these sight distance lengths are met and they should be labeled on the plans. A land surveyor should measure the sight distance available and verify these estimates.

CONCLUSIONS AND RECOMMENDATIONS

The following is an overview of recommendations to minimize the traffic impacts of the proposed development with the surrounding road system while attempting to achieve an acceptable level of traffic flow and safety.

- 1) **Carter Mill Drive at Road “S”:** From the capacity calculations, it has been shown (Table 6) that the traffic movements at the new entrance should operate very well during the AM and PM peak periods once the development is complete with minimal delays.
 - 1a) **From the capacity calculations, the analysis shows that only a single exiting lane for left and right exiting vehicles is required at the Carter Mill Phase IV (Road “S”) entrance. Also, a separate left turn lane or right turn lane on Carter Mill Drive into the development is not required due to the low projected volumes.**
 - 1b) There is not a posted speed limit on Carter Mill Drive, but is assumed to be 30 mph based on Knox County regulations. Based on an 85th percentile observed speed of 46 mph on Carter Mill Drive, the recommended intersection sight distance requirement is 460 feet and should be available at the proposed intersection location. The site designer should ensure that these sight distance lengths are met and they should be labeled on the plans. Vegetation should be maintained on the south side of Carter Mill Drive along the right of way to maintain the necessary distances. A sight distance easement might be necessary for lots to the east of the Road “S” intersection. A land surveyor should measure the sight distance available and verify these estimates. The overall required sight distance should be measured at the intersection at a minimum of 15 feet off of the edge of the roadway per Knox County subdivision regulations (Section 62-88).
 - 1c) **It is recommended that the main entrance approach (Road “S”) at the intersection with Carter Mill Drive be designed and constructed with a 24” white stop bar and with a Stop Sign (R1-1).**

- 1d) **Intersection sight distance at the new proposed Road “S” entrance at Carter Mill Drive must not be impacted by new signage, future landscaping or existing vegetation.**
- 1e) **Road “S” is proposed on the concept plans as having a boulevard roadway cross section. The boulevard cross section at a minimum should have a 10 foot median with 2 - 18 foot lanes within 60 feet of right-of-way. See below for an example of a boulevard typical section. The boulevard road section of Road “S” should be constructed up to the Madison Oaks Road intersection.**

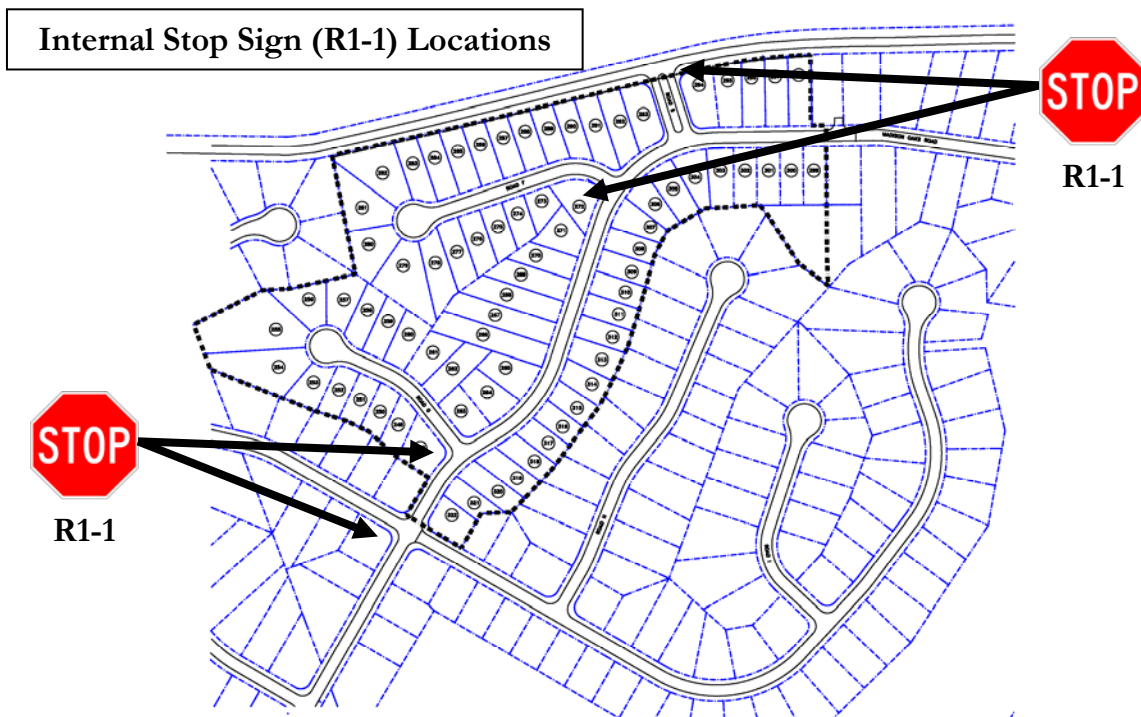


- 2) **Carter Mill Drive at South Carter School Road:** From the capacity calculations, it has been shown (Table 6) that the traffic movements at this existing intersection should operate very well with minimal delays during the AM and PM peak periods once Phase IV of the development is complete. It should be noted that due to the horizontal curvature and vertical curvature of this intersection, there is little room for error for vehicles turning left from Carter Mill Drive onto South Carter School Road. Knox County should consider minor clearing and grading of the right-of-way on the east side of the horizontal curve just to the south of the intersection. Potential for vehicle accidents are high due to the combination of the horizontal curvature on the south side of South Carter School Road at the intersection, the down grade on South Carter School Road, and the steepness of the eastbound approach of Carter Mill Drive at the intersection.

- 3) **Strawberry Plains Pike at Woodsedge Road:** From the capacity calculations, it has been shown (Table 6) that the traffic movements at this existing intersection should operate very well with respect to level of service except for the northbound approach during the AM peak hour. The northbound approach of this intersection during the AM peak hour could experience fairly large delays. Large volumes at this intersection occur in the AM peak hour due to the confluence of school traffic and typical rush hour traffic. The existing level of service was calculated to be LOS C, the background level of service in the year 2020 is estimated to be at LOS D, and calculated to be LOS E in the year 2020 once Phase IV of the Carter Ridge subdivision is completed. However, it is surmised that the capacity analyses undertaken for these northbound movements might understate the level of service. The influence of the traffic signal just to the northeast of this intersection should provide gaps in the traffic flow on Strawberry Plains Pike that would allow greater egress for northbound vehicles than can be accurately modeled in the analysis. Future phases of Carter Ridge may necessitate intersection improvements at this location to reduce northbound delays.

4) **Carter Ridge Phase IV Subdivision Internal Roads:** The current layout plan shows several new roadways being constructed within Phase IV of the development as shown on Figure 4.

4a) **Stop Signs (R1-1) should be installed at internal intersections as shown below:**



As shown above, in addition to the stop signs being installed for Phase IV, a Stop Sign (R1-1) should be installed at the eastbound approach of the intersection of Carter Ridge Drive at Madison Oaks Road. End of roadway signage should be installed at any of the internal roads that abruptly end prior to constructing the roadways further to the east for future Phase V. See TDOT Standard Drawing T-S-18 for end of roadway signage.

4b) **It is recommended that a 25 mph speed limit be posted on Road “S” into the new residential subdivision.**

- 4c) **Sight distance at the new internal intersections must not be impacted by new signage, future landscaping, or parked vehicles.** For an assumed posted 25 mph speed for the internal development streets, the internal intersection sight distance requirement is 250 feet. The road layout designer should insure that these sight distance lengths are met, maximized, and they should be labeled on the plans.
- 4d) **All road grade and intersection elements internally and externally should be designed to AASHTO, TDOT, and Knox County Engineering specifications and guidelines to ensure proper operation.**
- 4e) **The proposed lots within the development that are adjacent to Road “S” and Carter Mill Drive should not be allowed to have direct access to either roadway.** This includes Lots 282 thru 298 and these lots should only be allowed to have access to the internal roadways.
- 4f) **Traffic calming measures should be considered for this phase of the development.** The road alignment of the new portion of Madison Oak Road within Phase IV has a straight horizontal alignment and will have a fairly steep grade. The possible need for traffic calming measures inside the project for the new roads will need to be coordinated with the Knox County Engineering and Public Works during the detailed design phase. Speed humps could be considered to lower speeds through this portion of the subdivision.
- 5) **Pedestrian and Bicycle Considerations:** The sidewalk system within Phase IV of the Carter Ridge subdivision should tie into the existing sidewalks provided by Phase III of the development.
 - 5a) **Construct a 5 foot concrete sidewalk with a minimum 2 foot planting strip along Carter Mill Drive, Road “F”, Road “G”, Road “S”, and the extension of Madison Oaks Road.** This is also specified in the Knoxville/Knox County Metropolitan Planning Commission Subdivision Report dated 7/13/17 and is included in Appendix I.

- 5b) **The sidewalks that are proposed for the development should have appropriate ADA compliant curbed ramps at the intersection corners and the sidewalks should be 5 feet in width.** The sidewalks should at a minimum be at one side of each internal roadway.
- 5c) All drainage grates and covers for the residential development need to be pedestrian and bicycle friendly.
- 6) **Future Carter Ridge Subdivision Phases:** It is the recommendation of this report that any future proposed phases of the Carter Ridge subdivision development be investigated with subsequent traffic impact studies. These future phases include Phase V to the east of Phase IV and Phase VI which is located to the west of the existing Phase III. In the future conditions, more practical assumptions and observable traffic patterns will allow for definitive recommendations to incorporate Phase V and VI into the adjacent road system.

APPENDIX A

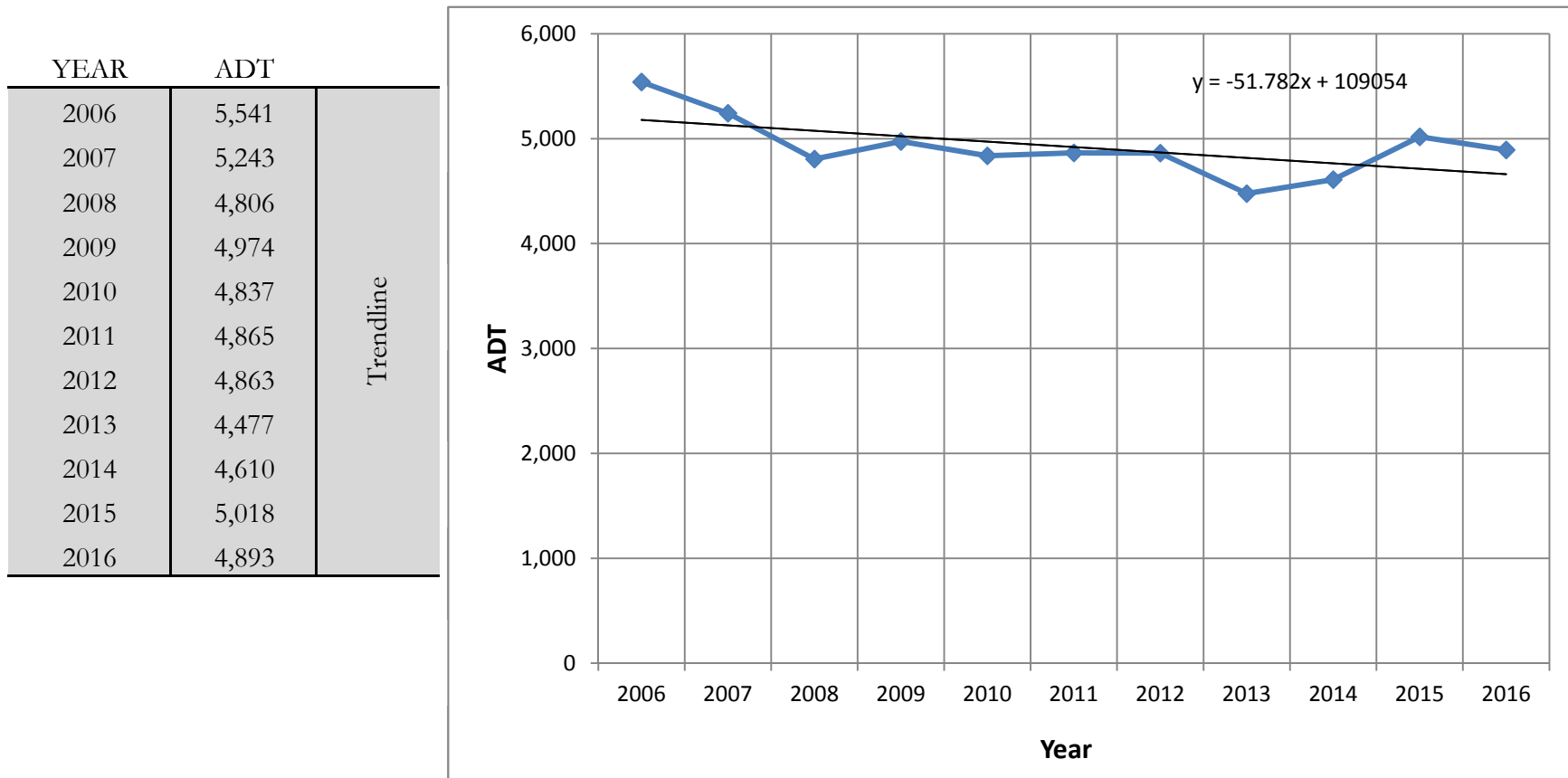
HISTORICAL TRAFFIC COUNT DATA

Historical Traffic Counts

Organization: TDOIT

Station ID #: 000062

Location: Asheville Highway - Near Jefferson County Line



2006 - 2016 Growth Rate = -11.7%

Annual Growth Rate = -1.2%



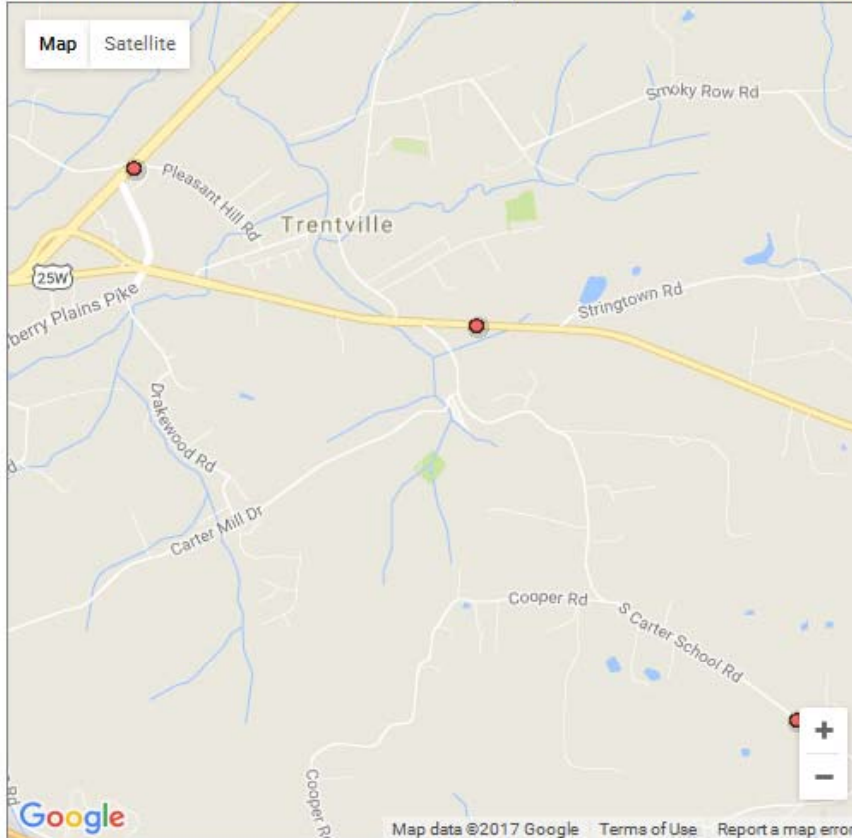
Traffic History

Traffic History reflects the Annual Average Daily Traffic (AADT) count along specific locations on Tennessee's road network

View stations on map:

Non-Map Record Search:

Station Number:



Station Information	
Station	000062
Route	SR009
Location	NEAR JEFFERSON CO LINE
County	Knox
2016	4893
2015	5018
2014	4610
2013	4477
2012	4863
2011	4865
2010	4837
2009	4974
2008	4806
2007	5243
2006	5541
2005	5916
2004	5481
2003	5708
2002	5733
2001	5801
2000	5956
1999	5451
1998	5751

Download File:

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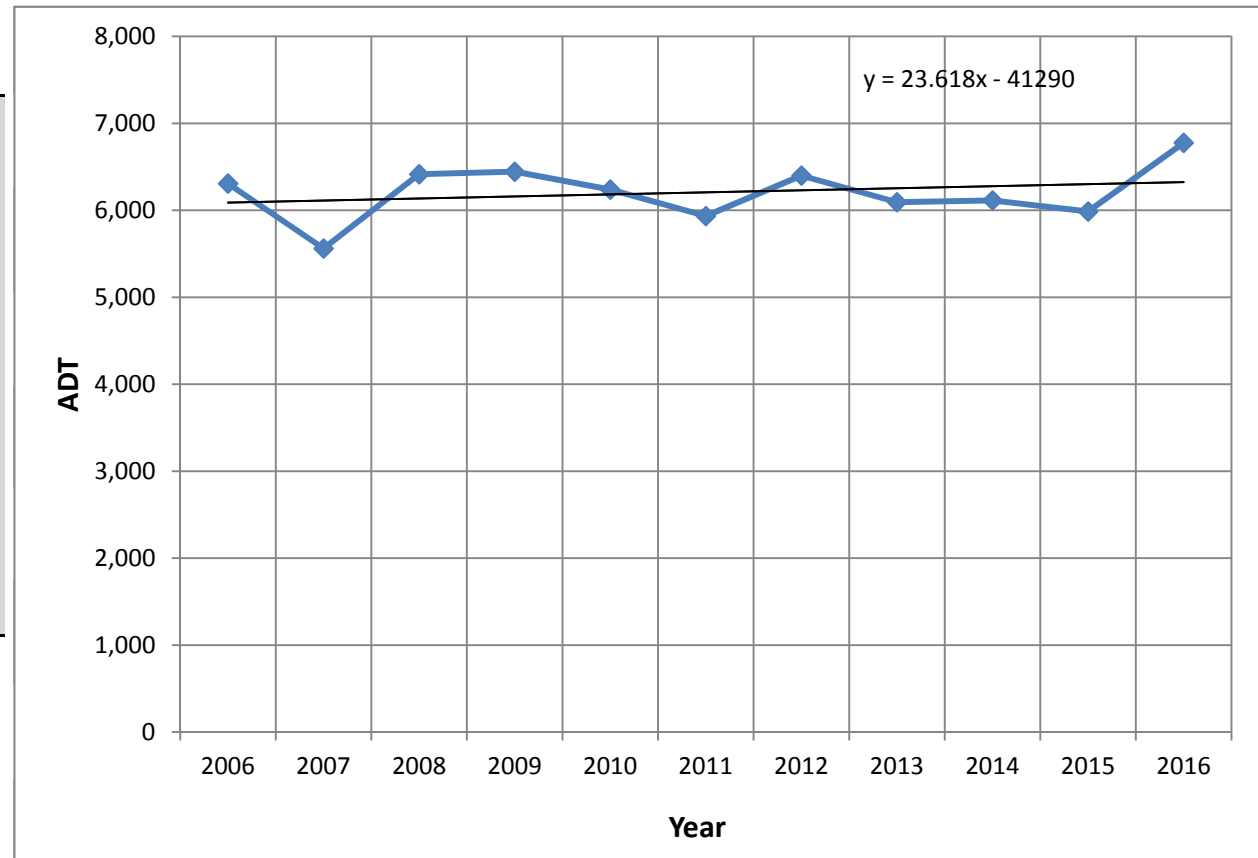
Historical Traffic Counts

Organization: TDOT

Station ID #: 000059

Location: Strawberry Plains Pike - West of Trentville

YEAR	ADT	Trendline
2006	6,308	
2007	5,561	
2008	6,415	
2009	6,444	
2010	6,238	
2011	5,934	
2012	6,399	
2013	6,094	
2014	6,114	
2015	5,986	
2016	6,776	



2006 - 2016 Growth Rate = 7.4%

Annual Growth Rate = 0.7%



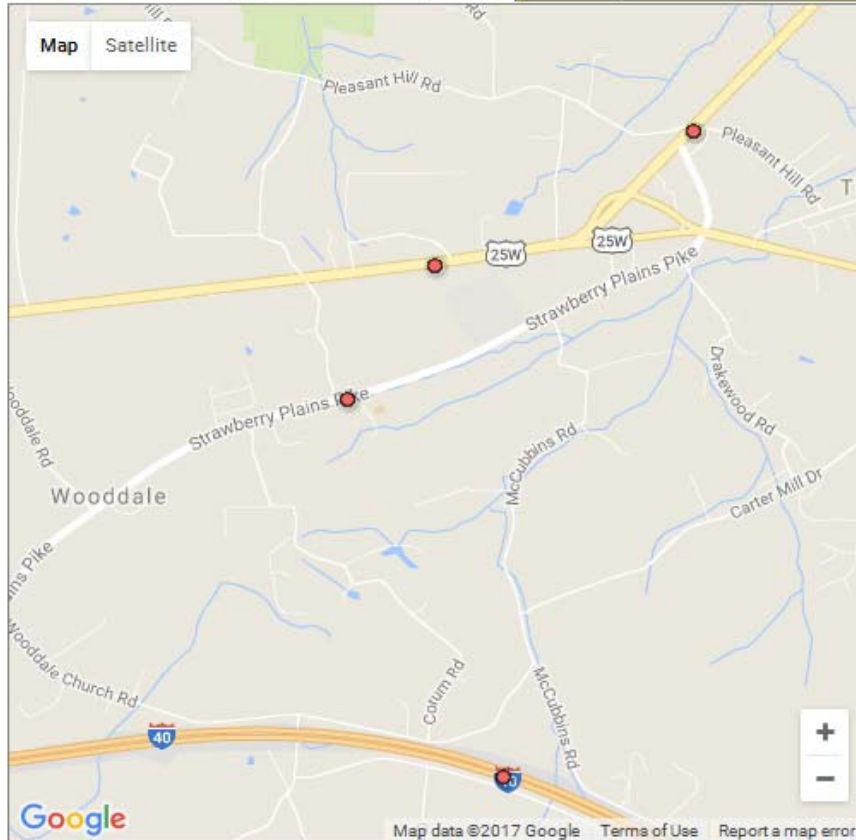
Traffic History

Traffic History reflects the Annual Average Daily Traffic (AADT) count along specific locations on Tennessee's road network

View stations on map:

Non-Map Record Search:

Station Number:



Station Information	
Station	000059
Route	01124
Location	WEST OF TRENTVILLE
County	Knox
2016	6776
2015	5986
2014	6114
2013	6094
2012	6399
2011	5934
2010	6238
2009	6444
2008	6415
2007	5561
2006	6308
2005	7041
2004	7326
2003	7292
2002	6792
2001	6842
2000	6560
1999	6204
1998	5998

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Open With:

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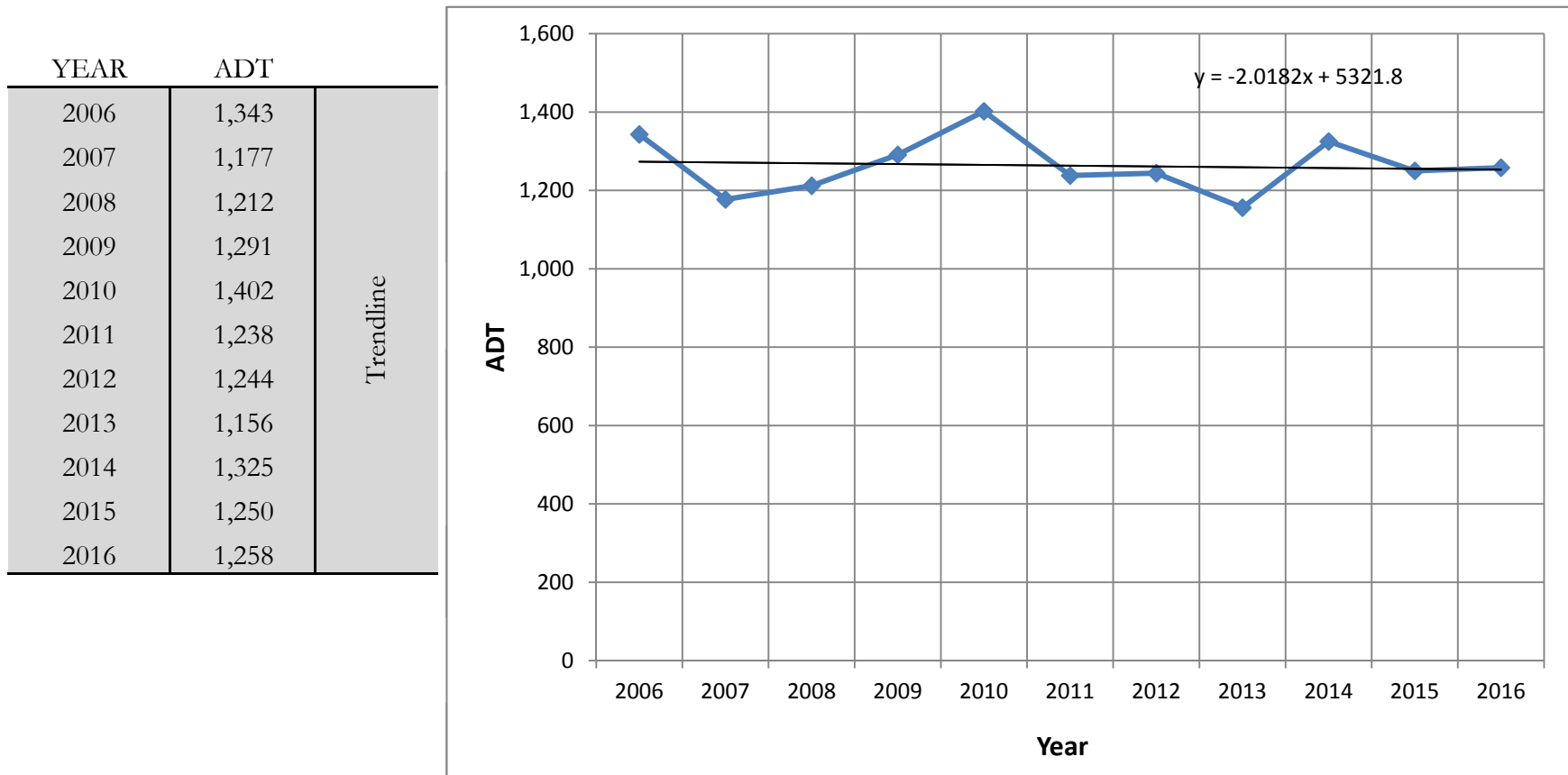
[MS Access or Excel](#)

Historical Traffic Counts

Organization: TDOT

Station ID #: 000063

Location: South Carter School Road - Near Jefferson County Line



2006 - 2016 Growth Rate = -6.3%

Annual Growth Rate = -0.7%



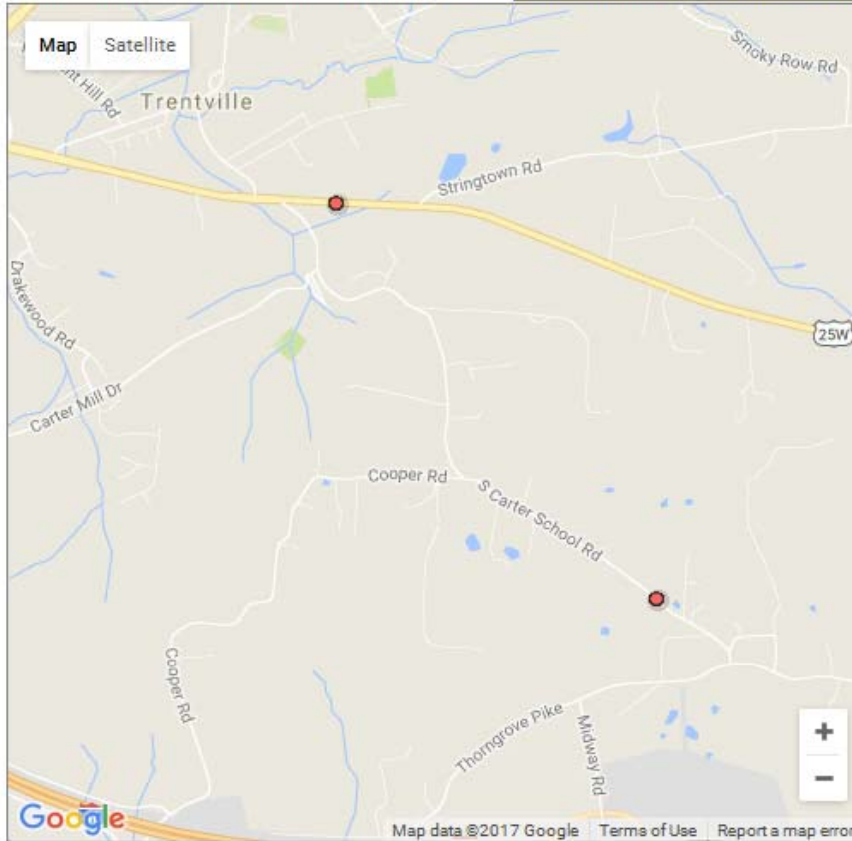
Traffic History

Traffic History reflects the Annual Average Daily Traffic (AADT) count along specific locations on Tennessee's road network

View stations on map:

Non-Map Record Search:

Station Number:



Station Information

Station	000063
Route	02426
Location	SCHOOL RD-NEAR JEFFERSON CO LINE
County	Knox
2016	1258
2015	1250
2014	1325
2013	1156
2012	1244
2011	1238
2010	1402
2009	1291
2008	1212
2007	1177
2006	1343
2005	1449
2004	1598
2003	1525
2002	1524
2001	1707
2000	1724
1999	1598

Download File:

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[Database Table](#)

Open With:

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APPENDIX B

WALK SCORE


WALK SCORE
(from walkscore.com)




Walk Score  Get Scores Find Apartments My Favorites Add to Your Site


Type an address, neighborhood or city

9100 Carter Mill Drive

Knoxville, Tennessee, 37924

Commute to **Downtown Knoxville** 

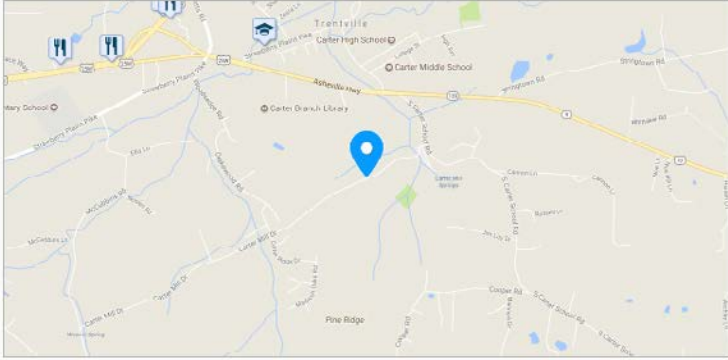
 3 / min  60+ min  60+ min [View Routes](#)

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

Walk Score
5

Car-Dependent
Almost all errands require a car

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



About this Location



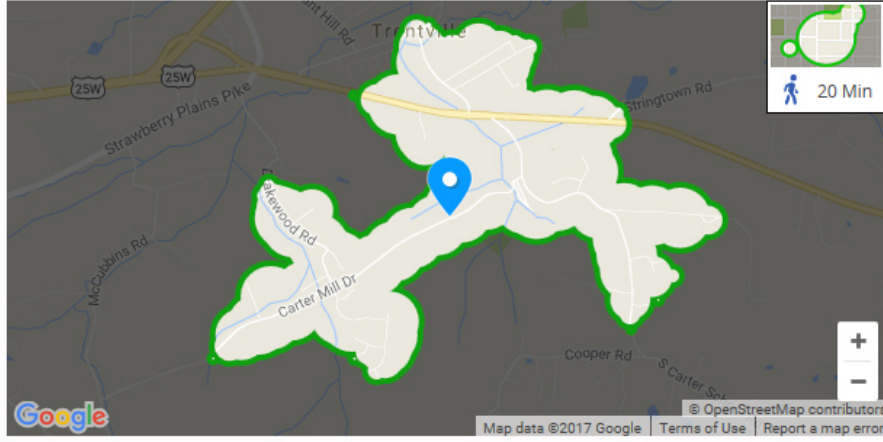
9100 Carter Mill Drive has a Walk Score of 5 out of 100. This location is a Car-Dependent neighborhood so almost all errands require a car.

This location is in Knoxville. The closest park is Carter Community Park.

Travel Time Map

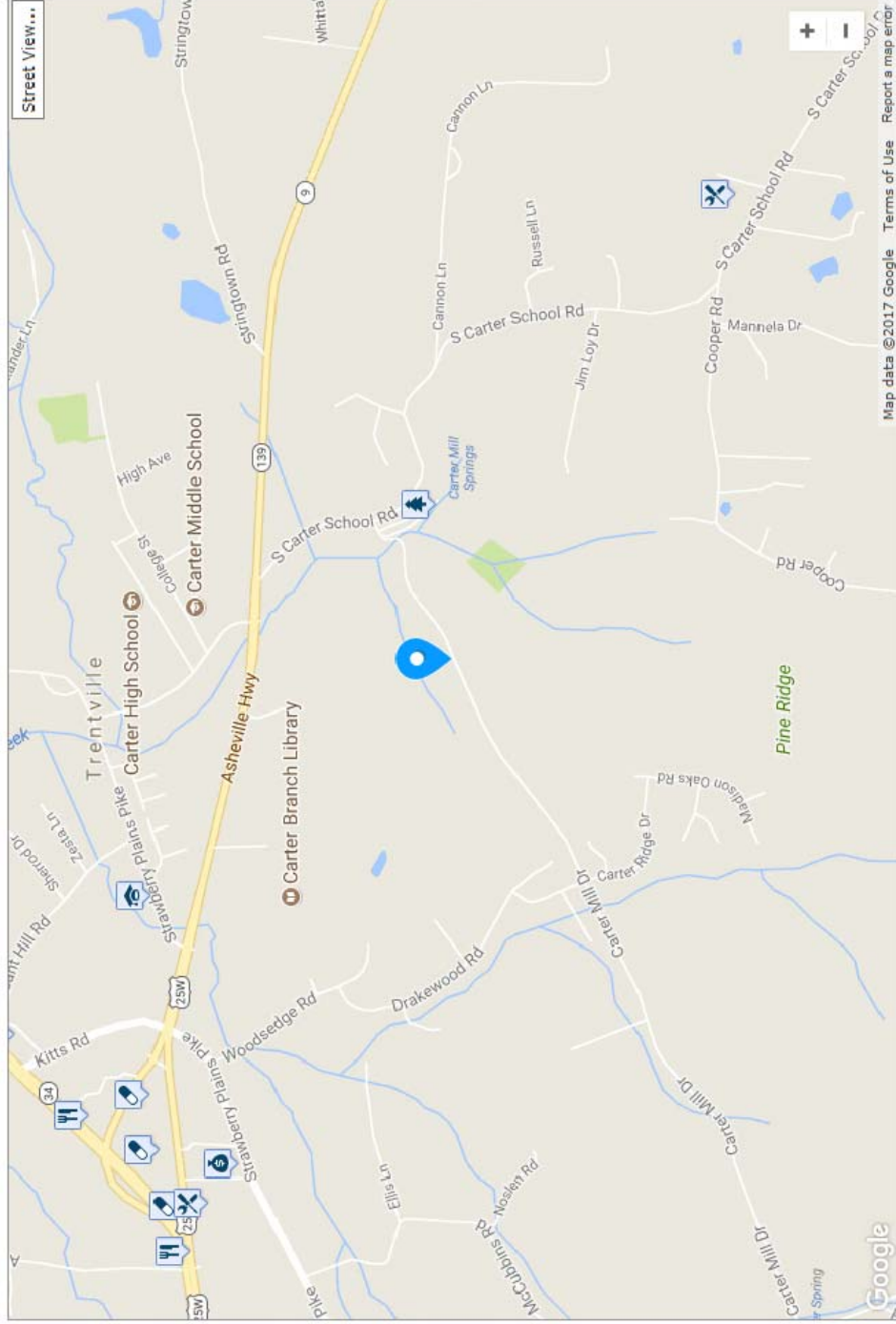
[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 9100 Carter Mill Drive.



What's Nearby

- Restaurants:** Pizza Plus 1mi
- Coffee:** Clark Brothers Coffee 5.7mi
- Bars:** Six Pockets Sports Grill 4mi
- Groceries:** Price Less Foods 1.3mi
- Parks:** Carter Community Park .3mi
- Schools:** Carter High School .6mi
- Shopping:** Family Dollar Store 1.4mi
- Entertainment:** Tennessee Firefighters Museum 3.6mi
- Errands:** Good Neighbor Pharmacy .9mi
- Search Nearby:**



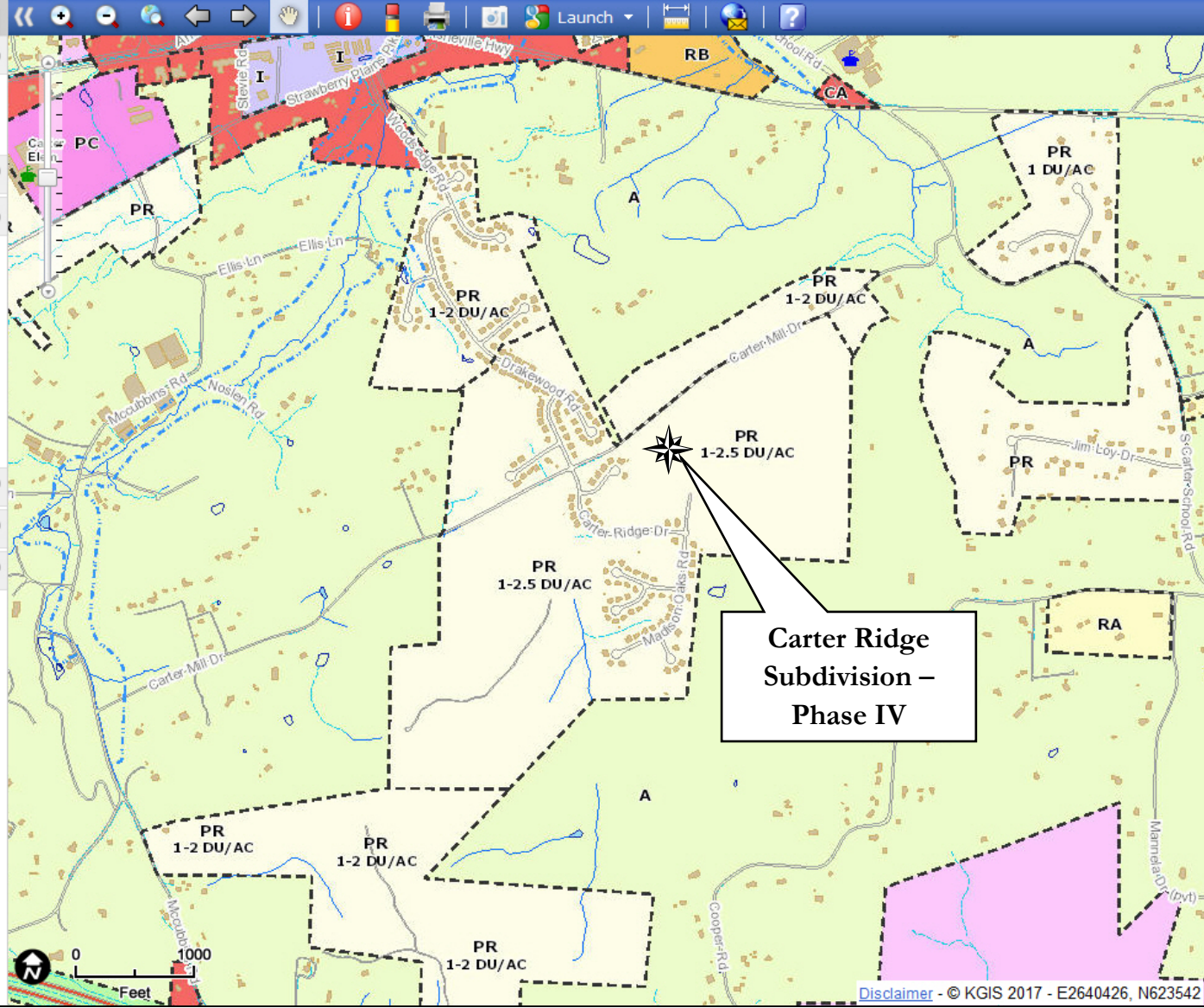
Map data ©2017 Google Terms of Use Report a map error

Something missing? Add a place

APPENDIX C

ZONING MAP

- Intro **Maps** Results Legend Help
- Standard Maps**
 - Standard Map
 - Aerial
- Historical Aerials**
- Planning and Zoning Maps**
 - Existing Landuse
 - FEMA Flood Map
 - Growth Plan
 - Historic Districts and Pre-1865 Structures
 - One Year Plan
 - Sector Plan
 - Zoning
- Political District Maps**
- School District Maps**
- Other Maps**



APPENDIX D
MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Carter Mill Drive (WB - EB)
 Minor Street: Carter View Lane (SB) / Carter Ridge Drive (NB)
 Traffic Control: Stop Controlled on Carter View Lane and Carter Ridge Drive

8/23/2017 (Wednesday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME BEGIN	Carter View Lane SOUTHBOUND			Carter Mill Drive WESTBOUND			Carter Ridge Road NORTHBOUND			Carter Mill Drive EASTBOUND			VEHICLE TOTAL	PEAK HOUR
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT		
7:00 AM	0	1	1	0	0	0	6	7	2	1	0	2	20	7:00 AM - 8:00 AM
7:15 AM	1	3	1	0	1	0	6	11	3	0	3	0	29	
7:30 AM	2	5	0	1	0	0	6	6	4	0	2	0	26	
7:45 AM	3	6	1	3	0	0	3	5	3	1	3	0	28	
8:00 AM	1	4	0	1	0	0	3	3	5	1	1	0	19	
8:15 AM	1	2	2	1	3	2	3	0	2	0	2	0	18	
8:30 AM	1	0	0	0	0	0	1	2	1	0	0	0	5	
8:45 AM	0	1	0	1	1	1	0	1	0	0	0	1	6	
TOTAL	9	22	5	7	5	3	28	35	20	3	11	3	151	
2:00 PM	1	1	1	0	1	0	0	2	1	0	0	1	8	
2:15 PM	0	1	0	1	0	1	0	0	0	2	1	1	7	
2:30 PM	0	2	0	1	1	1	0	2	3	1	1	2	14	
2:45 PM	0	2	0	0	0	0	3	3	2	0	1	2	13	
3:00 PM	0	6	0	0	2	0	0	6	0	0	0	0	14	
3:15 PM	1	3	1	1	2	1	0	1	1	0	0	2	13	
3:30 PM	1	5	0	1	1	0	0	0	1	0	1	2	12	
3:45 PM	1	3	1	4	3	1	4	3	3	1	0	3	27	3:45 PM - 4:45 PM
4:00 PM	0	0	0	2	1	1	0	3	1	0	0	1	9	
4:15 PM	0	2	2	3	1	1	1	3	1	2	1	2	19	
4:30 PM	1	1	1	7	0	0	2	1	2	0	1	2	18	
4:45 PM	0	2	0	0	1	0	0	4	1	0	0	2	10	
5:00 PM	0	3	1	1	0	0	2	0	1	1	1	3	13	
5:15 PM	1	2	0	2	1	0	0	2	1	0	0	1	10	
5:30 PM	0	4	0	3	1	3	0	4	1	1	0	6	23	
5:45 PM	0	3	0	4	2	0	2	3	0	2	0	3	19	
TOTAL	6	40	7	30	17	9	14	37	19	10	7	33	229	

Existing Traffic Volumes were collected and tabulated using CountCam System

2017 AM Peak Hour 7:00 AM - 8:00 AM

TIME BEGIN	Carter View Lane SOUTHBOUND			Carter Mill Drive WESTBOUND			Carter Ridge Road NORTHBOUND			Carter Mill Drive EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:30 AM	0	1	1	0	0	0	6	7	2	1	0	2
7:45 AM	1	3	1	0	1	0	6	11	3	0	3	0
8:00 AM	2	5	0	1	0	0	6	6	4	0	2	0
8:15 AM	3	6	1	3	0	0	3	5	3	1	3	0
TOTAL	6	15	3	4	1	0	21	29	12	2	8	2
PHF	0.50	0.63	0.75	0.33	0.25	-	0.88	0.66	0.75	0.50	0.67	0.25

2017 PM Peak Hour 3:45 PM - 4:45 PM

TIME BEGIN	Carter View Lane SOUTHBOUND			Carter Mill Drive WESTBOUND			Carter Ridge Road NORTHBOUND			Carter Mill Drive EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
4:45 PM	1	3	1	4	3	1	4	3	3	1	0	3
5:00 PM	0	0	0	2	1	1	0	3	1	0	0	1
5:15 PM	0	2	2	3	1	1	1	3	1	2	1	2
5:30 PM	1	1	1	7	0	0	2	1	2	0	1	2
TOTAL	2	6	4	16	5	3	7	10	7	3	2	8
PHF	0.50	0.50	0.50	0.57	0.42	0.75	0.44	0.83	0.58	0.38	0.50	0.67

TRAFFIC COUNT DATA

Major Street: South Carter School Road (NB - SB)
 Minor Street: Carter Mill Drive (EB)
 Traffic Control: Stop Control on Carter Mill Drive

8/23/2017 (Wednesday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME BEGIN	S. Carter School Road SOUTHBOUND		S. Carter School Road NORTHBOUND		Carter Mill Drive EASTBOUND		VEHICLE TOTAL	PEAK HOUR
	THRU	RIGHT	LT	THRU	LT	RT		
7:00 AM	8	0	0	21	1	2	32	7:15 AM - 8:15 AM
7:15 AM	11	1	0	36	7	0	55	
7:30 AM	7	1	0	36	7	2	53	
7:45 AM	28	2	1	24	7	1	63	
8:00 AM	10	1	0	33	7	0	51	
8:15 AM	14	6	0	21	7	0	48	
8:30 AM	11	0	0	16	1	1	29	
8:45 AM	4	3	0	17	0	0	24	
TOTAL	93	14	1	204	37	6	355	
2:00 PM	19	1	0	17	3	0	40	
2:15 PM	11	2	0	16	1	0	30	
2:30 PM	12	2	1	17	2	2	36	
2:45 PM	15	0	0	18	2	0	35	
3:00 PM	21	1	1	15	1	0	39	
3:15 PM	25	5	0	19	0	2	51	3:15 PM - 4:15 PM
3:30 PM	25	3	0	16	1	1	46	
3:45 PM	32	6	1	16	2	2	59	
4:00 PM	28	1	3	5	3	0	40	
4:15 PM	20	5	0	12	0	2	39	
4:30 PM	22	4	3	19	3	0	51	
4:45 PM	22	4	0	13	3	0	42	
5:00 PM	27	2	0	12	3	0	44	
5:15 PM	27	3	2	17	2	1	52	
5:30 PM	30	3	3	14	0	1	51	
5:45 PM	20	8	2	17	1	0	48	
TOTAL	356	50	16	243	27	11	703	

Existing Traffic Volumes were collected and tabulated using CountCam System

2017 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	S. Carter School Road SOUTHBOUND		S. Carter School Road NORTHBOUND		Carter Mill Drive EASTBOUND	
	THRU	RIGHT	LT	THRU	LT	RT
7:30 AM	11	1	0	36	7	0
7:45 AM	7	1	0	36	7	2
8:00 AM	28	2	1	24	7	1
8:15 AM	10	1	0	33	7	0
TOTAL	56	5	1	129	28	3
PHF	0.50	0.63	0.25	0.90	1.00	0.38

2017 PM Peak Hour **3:15 PM - 4:15 PM**

TIME BEGIN	S. Carter School Road SOUTHBOUND		S. Carter School Road NORTHBOUND		Carter Mill Drive EASTBOUND	
	THRU	RIGHT	LT	THRU	LT	RT
5:00 PM	25	5	0	19	0	2
5:15 PM	25	3	0	16	1	1
5:30 PM	32	6	1	16	2	2
5:45 PM	28	1	3	5	3	0
TOTAL	110	15	4	56	6	5
PHF	0.86	0.63	0.33	0.74	0.50	0.63

TRAFFIC COUNT DATA

Major Street: Strawberry Plains Pike (WB - EB)
 Minor Street: Woodsedge Road (NB)
 Traffic Control: Stop Control on Woodsedge Road

8/24/2017 (Thursday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME	Strawberry Plains Pike		Woodsedge Road		Strawberry Plains Pike		VEHICLE TOTAL	PEAK HOUR
	WESTBOUND		NORTHBOUND		EASTBOUND			
BEGIN	LT	THRU	LT	RT	THRU	RT		
7:00 AM	0	84	15	8	45	3	155	
7:15 AM	0	137	25	7	65	2	236	7:15 AM - 8:15 AM
7:30 AM	5	112	13	12	101	5	248	
7:45 AM	3	73	4	13	85	5	183	
8:00 AM	6	73	4	11	67	0	161	
8:15 AM	5	84	1	7	52	1	150	
8:30 AM	1	50	8	7	37	1	104	
8:45 AM	3	32	0	3	23	3	64	
TOTAL	23	645	70	68	475	20	1301	
2:00 PM	6	53	4	3	49	3	118	
2:15 PM	4	46	1	5	60	2	118	
2:30 PM	1	41	4	5	45	1	97	
2:45 PM	3	36	3	4	75	4	125	
3:00 PM	1	46	1	2	106	11	167	3:00 PM - 4:00 PM
3:15 PM	7	38	3	8	101	2	159	
3:30 PM	8	85	0	5	64	3	165	
3:45 PM	11	92	0	7	66	5	181	
4:00 PM	7	37	0	3	82	5	134	
4:15 PM	4	45	5	5	64	5	128	
4:30 PM	7	47	8	4	86	5	157	
4:45 PM	6	47	3	6	96	9	167	
5:00 PM	5	54	3	6	86	7	161	
5:15 PM	8	47	6	5	105	9	180	
5:30 PM	16	45	4	9	78	9	161	
5:45 PM	9	37	0	8	83	10	147	
TOTAL	103	796	45	85	1246	90	2365	

Existing Traffic Volumes were collected and tabulated using CountCam System

2017 AM Peak Hour **7:15 AM - 8:15 AM**

TIME	Strawberry Plains Pike		Woodsedge Road		Strawberry Plains Pike	
	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
7:30 AM	0	137	25	7	65	2
7:45 AM	5	112	13	12	101	5
8:00 AM	3	73	4	13	85	5
8:15 AM	6	73	4	11	67	0
TOTAL	14	395	46	43	318	12
PHF	0.58	0.72	0.46	0.83	0.79	0.60

2017 PM Peak Hour **3:00 PM - 4:00 PM**

TIME	Strawberry Plains Pike		Woodsedge Road		Strawberry Plains Pike	
	WESTBOUND		NORTHBOUND		EASTBOUND	
BEGIN	LT	THRU	LT	RT	THRU	RT
5:00 PM	1	46	1	2	106	11
5:15 PM	7	38	3	8	101	2
5:30 PM	8	85	0	5	64	3
5:45 PM	11	92	0	7	66	5
TOTAL	27	261	4	22	337	21
PHF	0.61	0.71	0.33	0.69	0.79	0.48





Carter Mill Drive at Carter Ridge Drive/Carter View Lane





7 - 9 AM

File Name: carter mill at carter ridge 7-9
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive		In = 17	
Out = 38	11	3	0
3	0	2%	0%
Right	Thru	Left	U-Turn
			

Carter View Lane			
Out = 41		In = 36	
5	22	9	0
0	0	0	0
3%	15%	6%	0%
Right	Thru	Left	U-Turn
			

Total Volumes
 07:00 to 09:00
 Volume = 151
 Cars = 151
 Trucks = 0

Carter Mill Drive		Out = 40		In = 15	
3	5	7	0	0	0
0	0	0	0	0	0
2%	3%	5%	0%	0%	0%
Right	Thru	Left	U-Turn		
					

			
U-Turn	Left	Thru	Right
0	28	35	20
0	0	0	0
0%	19%	23%	13%
Out = 32		In = 83	
Carter Ridge Drive			





Carter Mill Drive at Carter Ridge Drive/Carter View Lane





7 - 9 AM

File Name: carter mill at carter ridge 7-9
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive			
0	U-Turn		
2	Left		
8	Thru		
2	Right		

Carter View Lane			
3	15	6	0
Right	Thru	Left	U-Turn
			

AM Peak Hour Statistics
AM Peak Hour Begins: 07:00
AM Peak Hour Volume: 103
AM Peak Hour Factor: 0.888

Carter Mill Drive			
0	Right		
1	Thru		
4	Left		
0	U-Turn		

			
U-Turn	Left	Thru	Right
0	21	29	12
Carter Ridge Drive			





Report Title 1





2 - 6 PM

File Name: carter mill at carter ridge 2-6
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive		In = 50		Out = 38	
		U-Turn	Left	Thru	Right
		0	10	7	33
		0%	4%	3%	14%
					

Carter View Lane			
Out = 56		In = 53	
7	40	6	0
0	0	0	0
3%	17%	3%	0%
Right	Thru	Left	U-Turn
			

Total Volumes
 14:00 to 18:00
 Volume = 229
 Cars = 229
 Trucks = 0

Carter Mill Drive		Out = 32		In = 56	
		Right	Thru	Left	U-Turn
		9	17	30	0
		0	0	0	0
		4%	7%	13%	0%
					

U-Turn	Left	Thru	Right
			
0	14	37	19
0%	6%	16%	8%
Out = 103		In = 70	
Carter Ridge Drive			





Report Title 1





2 - 6 PM

File Name: carter mill at carter ridge 2-6
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive			
0	U-Turn		
3	Left		
2	Thru		
8	Right		

Carter View Lane			
4	6	2	0
Right	Thru	Left	U-Turn
			

PM Peak Hour Statistics
 PM Peak Hour Begins: 15:45
 PM Peak Hour Volume: 73
 PM Peak Hour Factor: 0.676

Carter Mill Drive			
3	Right		
5	Thru		
16	Left		
0	U-Turn		

			
U-Turn	Left	Thru	Right
0	7	10	7
Carter Ridge Drive			





Carter Mill Drive at South Carter School Road





7 - 9 AM

File Name: carter mill at carter school 7-9
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive		In = 43		Out = 15	
		U-Turn	Left	Thru	Right
		0	37	0	6
		0%	10%	0%	2%
					

South Carter School Road			
Out = 241		In = 107	
14	93	0	0
0	0	0	0
4%	26%	0%	0%
Right	Thru	Left	U-Turn
			

Total Volumes
 07:00 to 09:00
 Volume = 355
 Cars = 355
 Trucks = 0

		Out = 0		In = 0	
		U-Turn	Left	Thru	Right
		0	0	0	0
		0%	0%	0%	0%
					

South Carter School Road			
U-Turn	Left	Thru	Right
0	1	204	0
0%	0%	57%	0%
Out = 99		In = 205	
			





Carter Mill Drive at South Carter School Road





7 - 9 AM

File Name: carter mill at carter school 7-9
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive			
0	U-Turn		
28	Left		
0	Thru		
3	Right		

South Carter School Road			
5	56	0	0
Right	Thru	Left	U-Turn
			

AM Peak Hour Statistics
 AM Peak Hour Begins: 07:15
 AM Peak Hour Volume: 222
 AM Peak Hour Factor: 0.881

	Right	0
	Thru	0
	Left	0
	U-Turn	0

			
U-Turn	Left	Thru	Right
0	1	129	0
South Carter School Road			





Carter Mill Drive at South Carter School Road





2 - 6 PM

File Name: carter mill at carter school 2-6
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive		In = 38		Out = 68	
		U-Turn	Left	Thru	Right
		0	27	0	11
		0	0	0	0
		0%	4%	0%	2%
					

South Carter School Road			
Out = 270		In = 408	
50	356	0	0
2	0	0	0
7%	50%	0%	0%
Right	Thru	Left	U-Turn
			

Total Volumes
 14:00 to 18:00
 Volume = 705
 Cars = 703
 Trucks = 2

		Out = 0		In = 0	
		Right	Thru	Left	U-Turn
		0	0	0	0
		0%	0%	0%	0%
					

South Carter School Road			
U-Turn	Left	Thru	Right
0	16	243	0
0	0	0	0
0%	2%	34%	0%
Out = 367		In = 259	
   			





Carter Mill Drive at South Carter School Road





2 - 6 PM

File Name: carter mill at carter school 2-6
Location: Knoxville, TN





Site Code:
Study Date: 08/23/2017





All Vehicles

Carter Mill Drive	0	U-Turn	
	6	Left	
	0	Thru	
	2	Right	

South Carter School Road			
17	104	0	0
Right	Thru	Left	U-Turn
			

PM Peak Hour Statistics
 PM Peak Hour Begins: 17:00
 PM Peak Hour Volume: 196
 PM Peak Hour Factor: 0.831

	Right	0
	Thru	0
	Left	0
	U-Turn	0

			
U-Turn	Left	Thru	Right
0	7	60	0
South Carter School Road			

Strawberry Plains Pike at Woodsege Road

7 - 9 AM

File Name: strawberry plains at woodsedge

Site Code:

Location: Knoxville, TN

All Vehicles

Study Date: 08/24/2017

Strawberry Plains Pike		In = 495		Out = 715	
	U-Turn	0	0	20	2%
	Left	0	0	475	36%
	Thru	0	0	0	0%
	Right	0	0	0	0%

Out = 2		In = 0	
0	0	0	0
0	0	0	0
0%	0%	0%	0%
Right	Thru	Left	U-Turn

Total Volumes
07:00 to 09:00
Volume = 1303
Cars = 1303
Trucks = 0

Strawberry Plains Pike		Out = 543		In = 668	
	U-Turn	0	0	23	0
	Left	0	0	645	50%
	Thru	0	0	0	2%
	Right	0	0	0	0%

U-Turn	Left	Thru	Right
0	70	2	68
0	0	0	0
0%	5%	0%	5%
Out = 43		In = 140	
Woodsedge Road			

Strawberry Plains Pike at Woodsege Road

7 - 9 AM





File Name: strawberry plains at woodsedge





Location: Knoxville, TN

Site Code:





Study Date: 08/24/2017





All Vehicles

Strawberry Plains Pike	0	U-Turn	
	0	Left	
	318	Thru	
	12	Right	

0	0	0	0
Right	Thru	Left	U-Turn
			

AM Peak Hour Statistics
 AM Peak Hour Begins: 07:15
 AM Peak Hour Volume: 829
 AM Peak Hour Factor: 0.832

Strawberry Plains Pike	0	Right	
	395	Thru	
	14	Left	
	0	U-Turn	

			
U-Turn	Left	Thru	Right
0	46	1	43
Woodsedge Road			

Strawberry Plains Pike at Woodsedge Road

2 - 6 PM





File Name: strawberry plains at woodsedge 2-6





Site Code:

Location:





All Vehicles





Study Date: 08/24/2017

Strawberry Plains Pike		In = 1336	
Out = 841	1246	0	0
90	0	0	0
4%	53%	0%	0%
Right	Thru	Left	U-Turn
			

Out = 0		In = 0	
0	0	0	0
0	0	0	0
0%	0%	0%	0%
Right	Thru	Left	U-Turn
			

Total Volumes
14:00 to 18:00
Volume = 2365
Cars = 2365
Trucks = 0

Strawberry Plains Pike		In = 899	
Out = 1331	796	103	0
0	0	0	0
0%	34%	4%	0%
Right	Thru	Left	U-Turn
			

			
U-Turn	Left	Thru	Right
0	45	0	85
0	0	0	0
0%	2%	0%	4%
Out = 193		In = 130	
Woodsedge Road			

Strawberry Plains Pike at Woodsedge Road

2 - 6 PM





File Name: strawberry plains at woodsedge 2-6





Site Code:

Location:





All Vehicles





Study Date: 08/24/2017

Strawberry Plains Pike			
21	337	0	0
Right	Thru	Left	U-Turn
			

0	0	0	0
Right	Thru	Left	U-Turn
			

PM Peak Hour Statistics
 PM Peak Hour Begins: 15:00
 PM Peak Hour Volume: 672
 PM Peak Hour Factor: 0.928

			
U-Turn	Left	Thru	Right
0	4	0	22
Woodsedge Road			

Strawberry Plains Pike			
0	261	27	0
Right	Thru	Left	U-Turn
			

APPENDIX E

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 8)

HCM Unsignalized Intersection Capacity Analysis
 6: Carter Ridge Drive/Carter View Lane & Carter Mill Drive

8/29/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	2	8	2	4	1	0	21	29	12	6	15	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-4%			4%	
Peak Hour Factor	0.50	0.67	0.25	0.33	0.25	0.90	0.88	0.66	0.75	0.50	0.63	0.75
Hourly flow rate (vph)	4	12	8	12	4	0	24	44	16	12	24	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4			20			68	52	16	90	56	4
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4			20			68	52	16	90	56	4
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			97	95	99	99	97	100
cM capacity (veh/h)	1631			1609			899	835	1069	844	830	1085

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	24	16	84	40
Volume Left	4	12	24	12
Volume Right	8	0	16	4
cSH	1631	1609	890	855
Volume to Capacity	0.00	0.01	0.09	0.05
Queue Length 95th (ft)	0	1	8	4
Control Delay (s)	1.2	5.5	9.5	9.4
Lane LOS	A	A	A	A
Approach Delay (s)	1.2	5.5	9.5	9.4
Approach LOS			A	A

Intersection Summary			
Average Delay		7.9	
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

2: S. Carter School Road & Carter Mill Drive

8/29/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	28	3	1	129	56	5
Sign Control	Stop			Free	Free	
Grade	10%			-10%	10%	
Peak Hour Factor	1.00	0.38	0.25	0.90	0.50	0.63
Hourly flow rate (vph)	28	8	4	143	112	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	267	116	120			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	267	116	120			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	100			
cM capacity (veh/h)	723	941	1480			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	36	147	120			
Volume Left	28	4	0			
Volume Right	8	0	8			
cSH	762	1480	1700			
Volume to Capacity	0.05	0.00	0.07			
Queue Length 95th (ft)	4	0	0			
Control Delay (s)	10.0	0.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	10.0	0.2	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			17.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 11: Woodsedge Road & Strawberry Plains Pike

8/29/2017



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	318	12	14	395	46	43
Sign Control	Free			Free	Stop	
Grade	1%			-1%	2%	
Peak Hour Factor	0.79	0.60	0.58	0.72	0.46	0.83
Hourly flow rate (vph)	403	20	24	549	100	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			423		1009	413
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			423		1009	413
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		62	92
cM capacity (veh/h)			1148		262	644

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	423	573	152
Volume Left	0	24	100
Volume Right	20	0	52
cSH	1700	1148	329
Volume to Capacity	0.25	0.02	0.46
Queue Length 95th (ft)	0	2	58
Control Delay (s)	0.0	0.6	25.0
Lane LOS		A	C
Approach Delay (s)	0.0	0.6	25.0
Approach LOS			C

Intersection Summary			
Average Delay		3.6	
Intersection Capacity Utilization	44.0%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 6: Carter Ridge Drive/Carter View Lane & Carter Mill Drive

8/29/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	3	2	8	16	5	3	7	10	7	2	6	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-4%			4%	
Peak Hour Factor	0.38	0.50	0.67	0.57	0.42	0.75	0.44	0.83	0.58	0.50	0.50	0.50
Hourly flow rate (vph)	8	4	12	28	12	4	16	12	12	4	12	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	16			16			110	98	10	114	102	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	16			16			110	98	10	114	102	14
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			98	98	99	100	98	99
cM capacity (veh/h)	1615			1615			842	779	1077	834	774	1072

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	24	44	40	24
Volume Left	8	28	16	4
Volume Right	12	4	12	8
cSH	1615	1615	878	865
Volume to Capacity	0.00	0.02	0.05	0.03
Queue Length 95th (ft)	0	1	4	2
Control Delay (s)	2.4	4.7	9.3	9.3
Lane LOS	A	A	A	A
Approach Delay (s)	2.4	4.7	9.3	9.3
Approach LOS			A	A

Intersection Summary			
Average Delay		6.5	
Intersection Capacity Utilization		13.3%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

2: S. Carter School Road & Carter Mill Drive

8/29/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	5	4	56	110	15
Sign Control	Stop			Free	Free	
Grade	10%			-10%	10%	
Peak Hour Factor	0.50	0.63	0.33	0.74	0.86	0.63
Hourly flow rate (vph)	12	8	12	76	128	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	240	140	152			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	240	140	152			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	99			
cM capacity (veh/h)	746	913	1442			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	20	88	152			
Volume Left	12	12	0			
Volume Right	8	0	24			
cSH	804	1442	1700			
Volume to Capacity	0.02	0.01	0.09			
Queue Length 95th (ft)	2	1	0			
Control Delay (s)	9.6	1.1	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.6	1.1	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			16.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: Woodsedge Road & Strawberry Plains Pike

8/29/2017



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	337	21	27	261	4	22
Sign Control	Free			Free	Stop	
Grade	1%			-1%	2%	
Peak Hour Factor	0.79	0.48	0.61	0.71	0.33	0.69
Hourly flow rate (vph)	427	44	44	368	12	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			470		905	448
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			470		905	448
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		96	95
cM capacity (veh/h)			1102		297	614

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	470	412	44
Volume Left	0	44	12
Volume Right	44	0	32
cSH	1700	1102	475
Volume to Capacity	0.28	0.04	0.09
Queue Length 95th (ft)	0	3	8
Control Delay (s)	0.0	1.3	13.4
Lane LOS		A	B
Approach Delay (s)	0.0	1.3	13.4
Approach LOS			B

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		46.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

6: Carter Ridge Drive/Carter View Lane & Carter Mill Drive

9/10/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	2	8	2	4	1	0	22	30	13	6	16	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-4%			4%	
Peak Hour Factor	0.50	0.67	0.25	0.33	0.25	0.90	0.88	0.66	0.75	0.50	0.63	0.75
Hourly flow rate (vph)	4	12	8	12	4	0	25	45	17	12	25	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4			20			69	52	16	92	56	4
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4			20			69	52	16	92	56	4
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			97	95	98	99	97	100
cM capacity (veh/h)	1631			1609			897	835	1069	839	830	1085

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	24	16	88	41
Volume Left	4	12	25	12
Volume Right	8	0	17	4
cSH	1631	1609	891	852
Volume to Capacity	0.00	0.01	0.10	0.05
Queue Length 95th (ft)	0	1	8	4
Control Delay (s)	1.2	5.5	9.5	9.4
Lane LOS	A	A	A	A
Approach Delay (s)	1.2	5.5	9.5	9.4
Approach LOS			A	A

Intersection Summary			
Average Delay		7.9	
Intersection Capacity Utilization	15.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

2: S. Carter School Road & Carter Mill Drive

9/10/2017

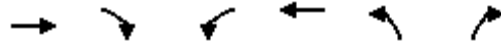


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	29	3	1	135	59	5
Sign Control	Stop			Free	Free	
Grade	10%			-10%	10%	
Peak Hour Factor	1.00	0.38	0.25	0.90	0.50	0.63
Hourly flow rate (vph)	29	8	4	150	118	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	280	122	126			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	280	122	126			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	100			
cM capacity (veh/h)	711	934	1473			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	37	154	126			
Volume Left	29	4	0			
Volume Right	8	0	8			
cSH	749	1473	1700			
Volume to Capacity	0.05	0.00	0.07			
Queue Length 95th (ft)	4	0	0			
Control Delay (s)	10.1	0.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.1	0.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization		17.9%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: Woodsedge Road & Strawberry Plains Pike

9/10/2017



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	↘	↙
Volume (veh/h)	332	13	15	413	48	45
Sign Control	Free			Free	Stop	
Grade	1%			-1%	2%	
Peak Hour Factor	0.79	0.60	0.58	0.72	0.46	0.83
Hourly flow rate (vph)	420	22	26	574	104	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			442		1056	431
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			442		1056	431
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		58	91
cM capacity (veh/h)			1129		246	628

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	442	599	159
Volume Left	0	26	104
Volume Right	22	0	54
cSH	1700	1129	310
Volume to Capacity	0.26	0.02	0.51
Queue Length 95th (ft)	0	2	69
Control Delay (s)	0.0	0.6	28.1
Lane LOS		A	D
Approach Delay (s)	0.0	0.6	28.1
Approach LOS			D

Intersection Summary			
Average Delay		4.0	
Intersection Capacity Utilization	46.0%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

6: Carter Ridge Drive/Carter View Lane & Carter Mill Drive

9/10/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	3	2	8	17	5	3	7	10	7	2	6	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-4%			4%	
Peak Hour Factor	0.38	0.50	0.67	0.57	0.42	0.75	0.44	0.83	0.58	0.50	0.50	0.50
Hourly flow rate (vph)	8	4	12	30	12	4	16	12	12	4	12	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	16			16			113	101	10	117	105	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	16			16			113	101	10	117	105	14
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			98	98	99	100	98	99
cM capacity (veh/h)	1615			1615			837	774	1077	828	770	1072

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	24	46	40	24
Volume Left	8	30	16	4
Volume Right	12	4	12	8
cSH	1615	1615	875	861
Volume to Capacity	0.00	0.02	0.05	0.03
Queue Length 95th (ft)	0	1	4	2
Control Delay (s)	2.4	4.8	9.3	9.3
Lane LOS	A	A	A	A
Approach Delay (s)	2.4	4.8	9.3	9.3
Approach LOS			A	A

Intersection Summary			
Average Delay		6.5	
Intersection Capacity Utilization	13.4%		ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis

2: S. Carter School Road & Carter Mill Drive

9/10/2017

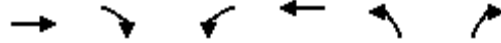


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	5	4	59	115	16
Sign Control	Stop			Free	Free	
Grade	10%			-10%	10%	
Peak Hour Factor	0.50	0.63	0.33	0.74	0.86	0.63
Hourly flow rate (vph)	12	8	12	80	134	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	250	146	159			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	250	146	159			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	99			
cM capacity (veh/h)	735	906	1433			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	20	92	159			
Volume Left	12	12	0			
Volume Right	8	0	25			
cSH	795	1433	1700			
Volume to Capacity	0.03	0.01	0.09			
Queue Length 95th (ft)	2	1	0			
Control Delay (s)	9.6	1.1	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.6	1.1	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			17.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: Woodsedge Road & Strawberry Plains Pike

9/10/2017



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↗
Volume (veh/h)	352	22	28	273	4	23
Sign Control	Free			Free	Stop	
Grade	1%			-1%	2%	
Peak Hour Factor	0.79	0.48	0.61	0.71	0.33	0.69
Hourly flow rate (vph)	446	46	46	385	12	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			491		945	468
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			491		945	468
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		96	94
cM capacity (veh/h)			1082		280	599

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	491	430	45
Volume Left	0	46	12
Volume Right	46	0	33
cSH	1700	1082	460
Volume to Capacity	0.29	0.04	0.10
Queue Length 95th (ft)	0	3	8
Control Delay (s)	0.0	1.3	13.7
Lane LOS		A	B
Approach Delay (s)	0.0	1.3	13.7
Approach LOS			B

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization	47.7%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

6: Carter Ridge Drive/Carter View Lane & Carter Mill Drive

9/10/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	2	13	2	4	15	19	22	30	13	12	16	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-4%			4%	
Peak Hour Factor	0.50	0.67	0.25	0.33	0.25	0.90	0.88	0.66	0.75	0.50	0.63	0.75
Hourly flow rate (vph)	4	19	8	12	60	21	25	45	17	24	25	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	81			27			143	137	23	166	130	71
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	81			27			143	137	23	166	130	71
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			97	94	98	97	97	100
cM capacity (veh/h)	1529			1599			801	750	1059	747	756	998

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	31	93	88	53
Volume Left	4	12	25	24
Volume Right	8	21	17	4
cSH	1529	1599	812	766
Volume to Capacity	0.00	0.01	0.11	0.07
Queue Length 95th (ft)	0	1	9	6
Control Delay (s)	1.0	1.0	10.0	10.1
Lane LOS	A	A	A	B
Approach Delay (s)	1.0	1.0	10.0	10.1
Approach LOS			A	B

Intersection Summary			
Average Delay		5.8	
Intersection Capacity Utilization	14.4%		ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis

2: S. Carter School Road & Carter Mill Drive

9/10/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	41	5	2	135	59	7
Sign Control	Stop			Free	Free	
Grade	10%			-10%	10%	
Peak Hour Factor	1.00	0.38	0.25	0.90	0.50	0.63
Hourly flow rate (vph)	41	13	8	150	118	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	290	124	129			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	290	124	129			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	99	99			
cM capacity (veh/h)	700	932	1469			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	54	158	129			
Volume Left	41	8	0			
Volume Right	13	0	11			
cSH	745	1469	1700			
Volume to Capacity	0.07	0.01	0.08			
Queue Length 95th (ft)	6	0	0			
Control Delay (s)	10.2	0.4	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.2	0.4	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			18.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: Woodsedge Road & Strawberry Plains Pike

9/10/2017



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	332	16	18	413	58	54
Sign Control	Free			Free	Stop	
Grade	1%			-1%	2%	
Peak Hour Factor	0.79	0.60	0.58	0.72	0.46	0.83
Hourly flow rate (vph)	420	27	31	574	126	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			447		1069	434
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			447		1069	434
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		47	90
cM capacity (veh/h)			1124		240	626

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	447	605	191
Volume Left	0	31	126
Volume Right	27	0	65
cSH	1700	1124	304
Volume to Capacity	0.26	0.03	0.63
Queue Length 95th (ft)	0	2	99
Control Delay (s)	0.0	0.8	35.0
Lane LOS		A	D
Approach Delay (s)	0.0	0.8	35.0
Approach LOS			D

Intersection Summary			
Average Delay		5.7	
Intersection Capacity Utilization	49.5%		ICU Level of Service
Analysis Period (min)	15		A

HCM Unsignalized Intersection Capacity Analysis

6: Carter Ridge Drive/Carter View Lane & Carter Mill Drive

9/10/2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	3	18	8	17	14	15	7	10	7	22	6	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-4%			4%	
Peak Hour Factor	0.38	0.50	0.67	0.57	0.42	0.75	0.44	0.83	0.58	0.50	0.50	0.50
Hourly flow rate (vph)	8	36	12	30	33	20	16	12	12	44	12	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	53			48			175	171	42	179	167	43
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	53			48			175	171	42	179	167	43
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			98	98	99	94	98	99
cM capacity (veh/h)	1565			1572			762	709	1035	754	712	1033

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	56	83	40	64
Volume Left	8	30	16	44
Volume Right	12	20	12	8
cSH	1565	1572	808	771
Volume to Capacity	0.01	0.02	0.05	0.08
Queue Length 95th (ft)	0	1	4	7
Control Delay (s)	1.1	2.7	9.7	10.1
Lane LOS	A	A	A	B
Approach Delay (s)	1.1	2.7	9.7	10.1
Approach LOS			A	B

Intersection Summary			
Average Delay		5.4	
Intersection Capacity Utilization		16.9%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis

2: S. Carter School Road & Carter Mill Drive

9/10/2017

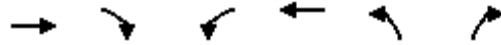


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	14	6	7	59	115	29
Sign Control	Stop			Free	Free	
Grade	10%			-10%	10%	
Peak Hour Factor	0.50	0.63	0.33	0.74	0.86	0.63
Hourly flow rate (vph)	28	10	21	80	134	46
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	279	157	180			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	279	157	180			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	98			
cM capacity (veh/h)	703	894	1408			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	101	180			
Volume Left	28	21	0			
Volume Right	10	0	46			
cSH	744	1408	1700			
Volume to Capacity	0.05	0.02	0.11			
Queue Length 95th (ft)	4	1	0			
Control Delay (s)	10.1	1.7	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.1	1.7	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization		19.0%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: Woodsedge Road & Strawberry Plains Pike

9/10/2017



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↗
Volume (veh/h)	352	32	38	273	10	29
Sign Control	Free			Free	Stop	
Grade	1%			-1%	2%	
Peak Hour Factor	0.79	0.48	0.61	0.71	0.33	0.69
Hourly flow rate (vph)	446	67	62	385	30	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			512		988	479
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			512		988	479
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		88	93
cM capacity (veh/h)			1063		260	591

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	512	447	72
Volume Left	0	62	30
Volume Right	67	0	42
cSH	1700	1063	385
Volume to Capacity	0.30	0.06	0.19
Queue Length 95th (ft)	0	5	17
Control Delay (s)	0.0	1.8	16.5
Lane LOS		A	C
Approach Delay (s)	0.0	1.8	16.5
Approach LOS			C

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX F

ITE TRIP GENERATION RATES

Land Use: 210

Single-Family Detached Housing

Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

Additional Data

The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project and had a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed between the late 1960s and the 2000s throughout the United States and Canada.

Source Numbers

1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 26, 34, 35, 36, 38, 40, 71, 72, 84, 91, 98, 100, 105, 108, 110, 114, 117, 119, 157, 167, 177, 187, 192, 207, 211, 246, 275, 283, 293, 300, 319, 320, 357, 384, 435, 550, 552, 579, 598, 601, 603, 611, 614, 637, 711, 735

Single-Family Detached Housing (210)

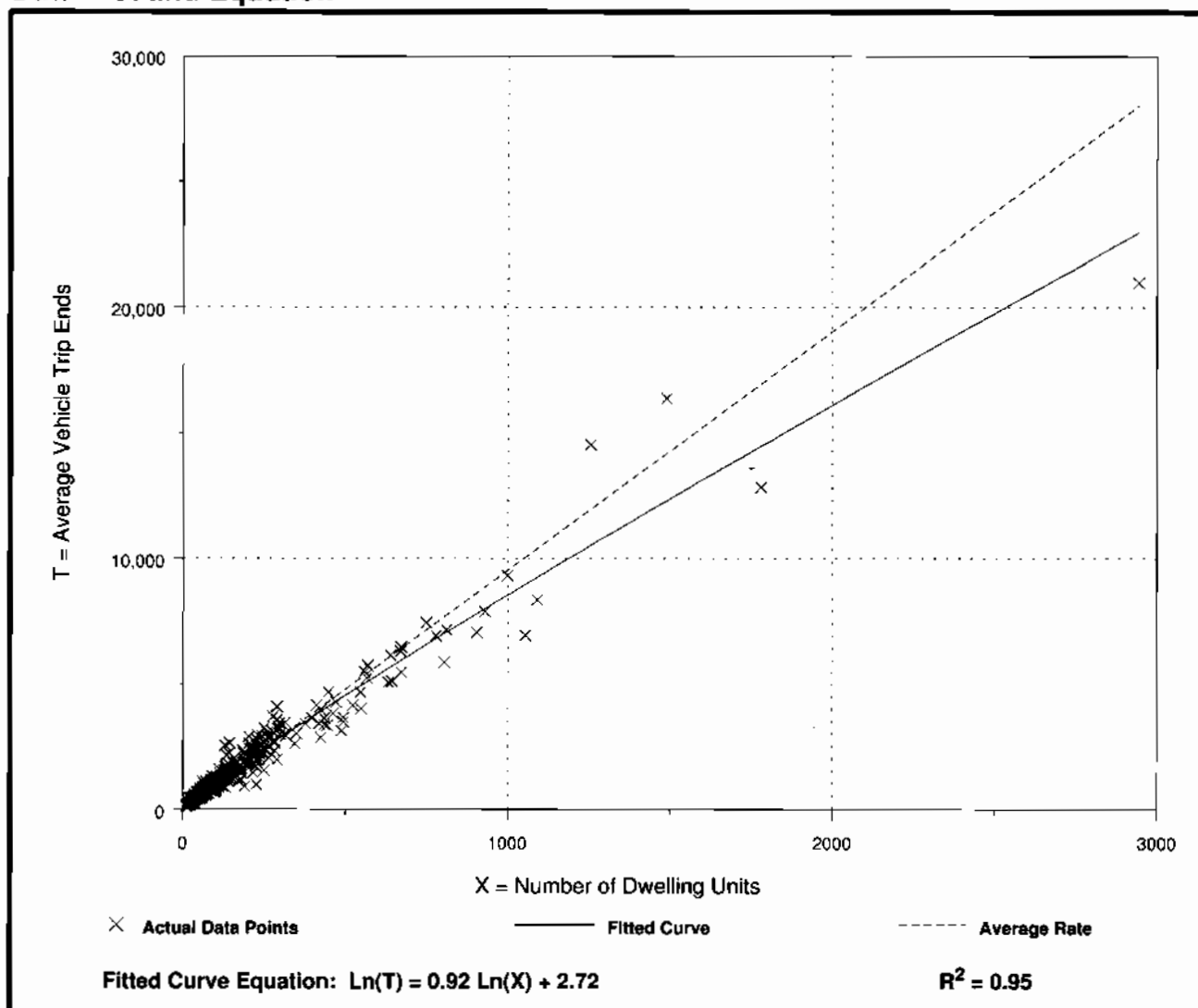
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Number of Studies: 355
Avg. Number of Dwelling Units: 198
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.52	4.31 - 21.85	3.70

Data Plot and Equation



Single-Family Detached Housing (210)

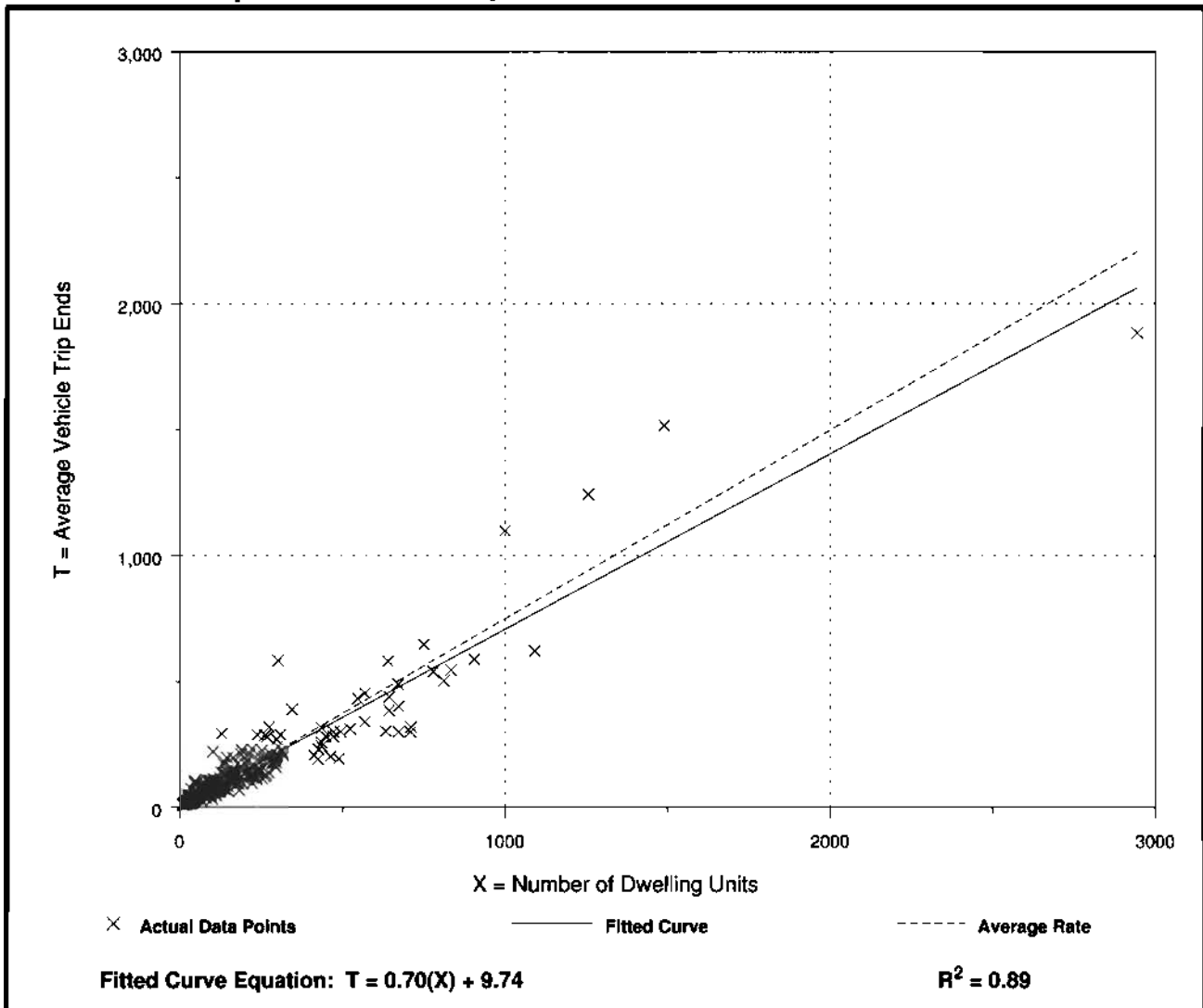
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 292
 Avg. Number of Dwelling Units: 194
 Directional Distribution: 25% entering, 75% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.75	0.33 - 2.27	0.90

Data Plot and Equation



Single-Family Detached Housing (210)

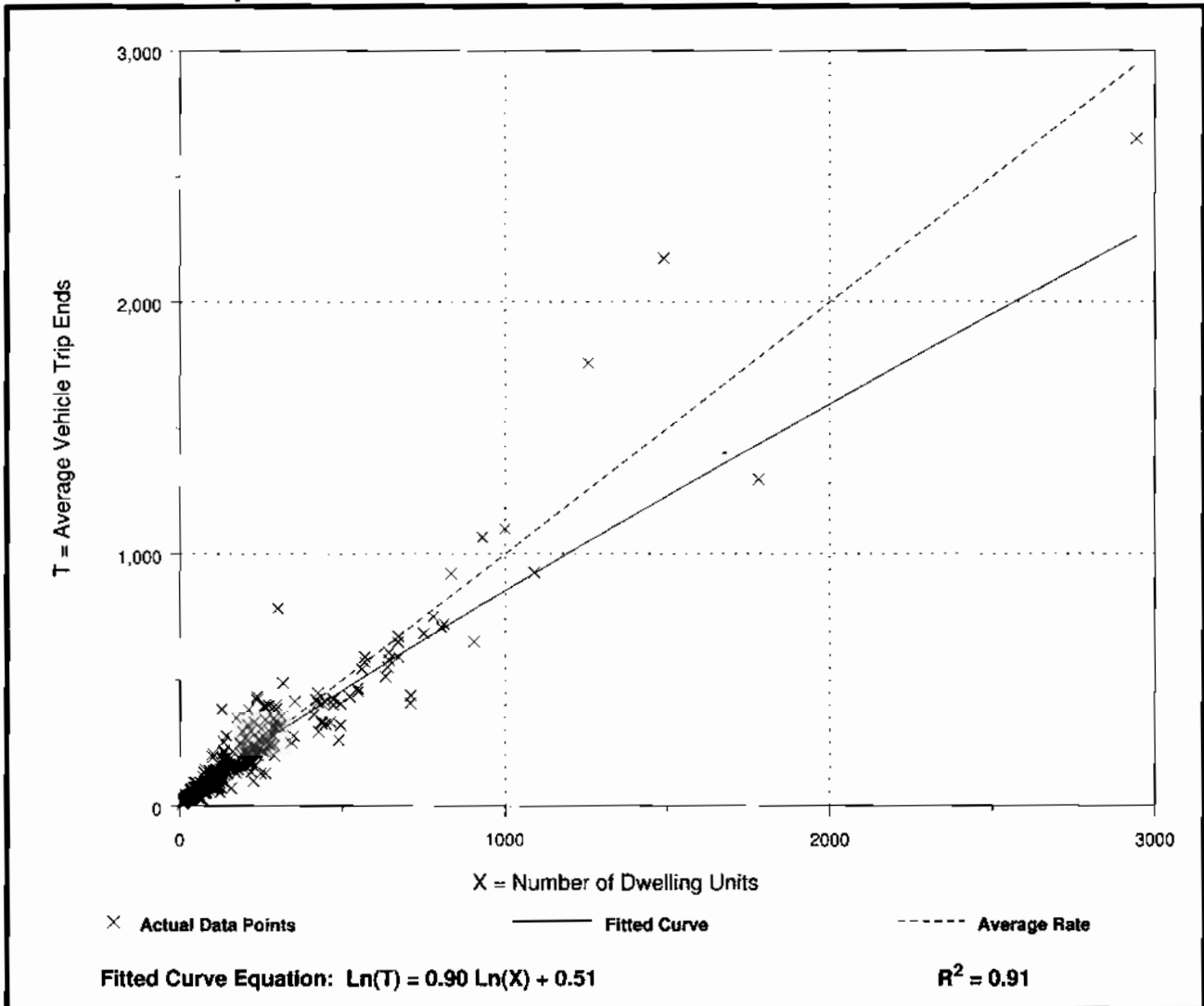
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 321
 Avg. Number of Dwelling Units: 207
 Directional Distribution: 63% entering, 37% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.00	0.42 - 2.98	1.05

Data Plot and Equation



TRIP GENERATION FOR CARTER RIDGE SUBDIVISION - PHASE IV

75 Residential Units = X

Weekday:

Fitted Curve Equation: $\ln(T) = 0.92 \ln(X) + 2.72$

$$\ln(T) = 0.92 * 4.32 + 2.72$$

$$\ln(T) = 6.69$$

$$\underline{\underline{T = 807 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $T = 0.70(X) + 9.74$

$$T = 0.70 * 75 + 9.74$$

$$\underline{\underline{T = 63 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $\ln(T) = 0.90 \ln(X) + 0.51$

$$\ln(T) = 0.90 * 4.32 + 0.51$$

$$\ln(T) = 4.40$$

$$\underline{\underline{T = 82 \text{ trips}}}$$

APPENDIX G
SPOT SPEED STUDY

SPOT SPEED STUDY

Location: Carter Mill Drive (near Carter Ridge Drive/Carter View Lane intersection)
 Posted Speed Limit: Assumed to be 30 mph (not posted)
 Equipment: Bushnell Speedster III Radar Speed Gun
 Direction: Eastbound and Westbound

Date: 8/23/17
 Weather: Hot/Sunny
 Time: 3:00 PM

Vehicle #	Speed (mph)
1	42
2	40
3	40
4	38
5	54
6	26
7	33
8	39
9	46
10	44
11	38
12	46
13	45
14	44
15	40
16	40
17	37
18	44
19	41
20	43
21	32
22	39
23	45
24	37
25	42

Vehicle #	Speed (mph)
26	44
27	43
28	45
29	47
30	36
31	43
32	45
33	50
34	44
35	49
36	41
37	48
38	42
39	44
40	41
41	43
42	46
43	39
44	43
45	42
46	46
47	45
48	44
49	42
50	41

Sample Size Requirements (*ITE Manual of Transportation Engineering Studies*)

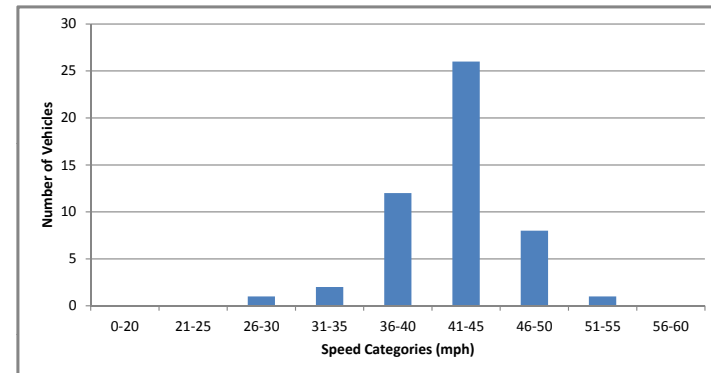
$$N = (S * K/E)^2$$

where:

- N = minimum number of measured speeds
- S = estimated sample standard deviation (mph)
- K = constant corresponding to desired confidence level
- E = permitted error in the average speed estimate (mph)

S = 5 mph (Table 3-2, page 38)
 K = 2.58 (Confidence level of 99% - Table 3-3, page 38)
 E = 2 mph assumed error range

Therefore, N = 42 observations needed



Average speed = 42.2 mph
 50th percentile speed = 43.0 mph
 85th percentile speed = 46.0 mph

APPENDIX H

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEET

TABLE 6A

LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

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

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	200 175	140 120	100 85	75 65	60 55	50 45
200 - 249 250 - 299	150 130		75 65	60 55	50 45	40 35
300 - 349 350 - 399	110 95		60 55	50 45	40 35	30 25
400 - 449 450 - 499	80 70		50 45	40 35	30 25	25 20
500 - 549 550 - 599	60 50	50 45	40 35	30 25	25 20	20 20
600 - 649 650 - 699	45 40	40 35	30 30	25 20	20 20	20 20
700 - 749 750 or More	35 35	35 35	25 25	20 20	20 15	15 15

PM Left Turns = 16 < 200
 Turn Lane NOT Warranted

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

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

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

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

PM Right Turns = 36
Turn Lane NOT Warranted

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

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

APPENDIX I

**KNOXVILLE/KNOX COUNTY METROPOLITAN PLANNING COMMISSION
SUBDIVISION REPORT**



**KNOXVILLE/KNOX COUNTY METROPOLITAN PLANNING COMMISSION
SUBDIVISION REPORT - CONCEPT/USE ON REVIEW**

▶ **FILE #:** 7-SA-17-C
7-C-17-UR

AGENDA ITEM #: 0.18
AGENDA DATE: 7/13/2017

▶ **SUBDIVISION:** CARTER RIDGE
▶ **APPLICANT/DEVELOPER:** CARTER MILL G.P.
OWNER(S): Carter Mill G.P.

TAX IDENTIFICATION: 74 002PT 074-00101PT
JURISDICTION: County Commission District 8
STREET ADDRESS:

[View map on KGIS](#)

▶ **LOCATION:** South side of Carter Mill Dr., east of Carter View Ln.

SECTOR PLAN: East County
GROWTH POLICY PLAN: Planned Growth Area
WATERSHED: Lyon Creek

▶ **APPROXIMATE ACREAGE:** 19.04 acres

▶ **ZONING:** PR (Planned Residential)

▶ **EXISTING LAND USE:** Vacant land

▶ **PROPOSED USE:** Detached residential subdivision

SURROUNDING LAND USE AND ZONING: Property in the area is zoned PR residential and A agricultural. Development in the area consists of Phases 1-3 of Carter Mill / Carter Ridge Subdivisions and other single family residences that are scattered throughout the area. A Knox County park adjoins the site.

▶ **NUMBER OF LOTS:** 75

SURVEYOR/ENGINEER: Ideal Engineering Solutions, Inc

ACCESSIBILITY: Access is via Carter Mill Dr., a collector street with a pavement width of 20' within a 40' to 60' wide right-of-way.

▶ **SUBDIVISION VARIANCES REQUIRED:** 1. Vertical curve variance from 75' to 48' at sta. 0+35.95 on Road S

STAFF RECOMMENDATION:

▶ **APPROVE variance 1 because the site's topography, site features and location restrict compliance with the Subdivision Regulations and the proposed variance will not create a traffic hazard.**

APPROVE the Concept Plan subject to 15 conditions.

1. Connection to sanitary sewer and meeting any other relevant requirements of the Knox County Health Department.
2. Provision of street names which are consistent with the Uniform Street Naming and Addressing System within Knox County (Ord 91-1-102).
3. Installation of 5' wide sidewalks with a minimum of a 2' wide planting strip on Carter Mill Dr., Road F, Road

G, Road S, Carter Ridge Dr. and Madison Oaks Rd. as identified on the concept plan. All sidewalk construction shall meet all applicable requirements of the Americans with Disabilities Act (ADA) and the Knox County Department of Engineering and Public Works. A bond shall be provided to the Knox County Department of Engineering and Public Works by the developer in an amount sufficient to guarantee the installation of the sidewalks

4. Provide high visibility cross walks as may be required by the Knox County Dept. of Engineering and Public Works
5. Provision of "stop control" at the intersection of Madison Oaks Rd. and Road S as required by the Knox County Dept. of Engineering and Public Works
6. Certification on the final plat by the applicant's surveyor that the sight distance in both directions at the intersection of Road S and Carter Mill Dr. meet or exceed the minimum required by the Subdivision Regulations. The minimum sight distance must equal 10 times the posted speed limit for Carter Mill Dr.
7. Provision of the minimum required road cross section for the proposed Boulevard (Road S). The typical cross section is: 60' wide right-of-way, 2 18' wide paved sections and a 10' wide landscaped median
8. After public schools are back in session and before final plat approval of this unit of Carter Ridge Subdivision, update the existing traffic study. Additional traffic studies will be required as further development occurs in this subdivision. The applicant will be responsible for the costs and construction of any road improvements identified as needed by the traffic impact study(s) as required by the Knox County Dept. of Engineering and Public Works
9. Place a note on the final plat that all lots will have access only to the internal street system. Additionally note that lots 293 and 294 are to be accessed via Madison Oaks Rd. only
10. Place a note on the final plat that states the maintenance access easement to the permanent storm water drainage facilities shall be traversable and maintained free of obstructions
11. As part of the Design Plan process prepare a detailed erosion prevention and sediment control plan to address the major elevation change along Madison Oak Ln.
12. Meeting all applicable requirements of the Knox County Department of Engineering and Public Works.
13. Prior to certification of the final plat for the subdivision, establishing a property owners association that will be responsible for the maintenance of the storm drainage system and any other commonly held assets
14. Elimination of variance #2 as called out in the notes section. The variance as requested is not required.
15. A final plat application based on this concept plan will not be accepted for review by the MPC until certification of design plan approval has been submitted to the MPC staff.

► **APPROVE the revised development plan for Carter Ridge Subdivision to permit up to 75 detached dwellings on individual lots in Phase 4 of the development as shown subject to 2 conditions**

1. Correct the "setbacks" as called out in the notes to match the "typical lot layout" as shown
2. Meeting all applicable requirements of the Knox County Zoning Ordinance

COMMENTS:

In 2005 this applicant received approval of a concept plan and use on review that would permit up to 412 lots/dwellings in the Carter Ridge / Carter Mill development on approximately 185 acres. A traffic impact study (TIS) was completed at that time. That TIS called for widening of Carter Mill Dr. That work has been completed. Due to the age of the TIS staff would normally need the study to be updated before moving forward with this phase of the project. The study was based on 412 lots and at this time only 152 lots have been recorded. With the 75 lots proposed in this phase of the project are brought on line, only 55% of the development will have been completed or have an active plan in place. The applicant will be required to update the existing TIS after schools are back in session and before a final plat for this phase of the project is approved. It is staff's belief that no additional improvements will be needed due to the development of Phase 4. If that is found to not be the case, the applicant will be responsible for the costs and construction of any road improvements that are identified in the updated study. Additional traffic studies will be required as other phases of the project are submitted for review.

Sidewalks were to be constructed along Carter Mill Dr. and within the previously approved phases of the development. Units 2 and 3 are completed and the sidewalk along Carter Mill Dr. has been constructed as required. However, the construction of the internal sidewalks has not been consistently enforced. In order to insure the sidewalks are constructed in the future staff will require that bonds be put in place to guarantee the installation. The Knox County Code Administration Dept. has been asked to require sidewalk construction as part of the building permits for the remaining lots in the earlier phase of this project.

The lots in the previously approved sections of this project are 70' - 75' wide. The proposed width of the lots in Phase 4 are 55' wide. Staff is supporting these narrower lots because of the topographic constraints that will impact the remainder site. Staff anticipates that the proposed density of the future units of the development

will be lower in order to comply with the requirements of the Hillside and Ridgetop Protection Plan.

EFFECT OF THE PROPOSAL ON THE SUBJECT PROPERTY, SURROUNDING PROPERTY AND THE COMMUNITY AS A WHOLE

1. The proposed development will have minimal impact on local services since all utilities are nearby to serve this site.
2. The proposed lots in this phase are somewhat smaller than previously approved. However, the overall density of the project will most likely go down in the future units because of topographic constraints.

CONFORMITY OF THE PROPOSAL TO CRITERIA ESTABLISHED BY THE KNOX COUNTY ZONING ORDINANCE

1. The detached residential subdivision meets the standards for development within the PR (Planned Residential) Zone and all other requirements of the Zoning Ordinance..
2. The proposed development is consistent with the general standards for uses permitted on review: The proposed development is consistent with the adopted plans and policies of the General Plan and Sector Plan. The use is in harmony with the general purpose and intent of the Zoning Ordinance. The use is compatible with the character of the neighborhood where it is proposed. The use will not significantly injure the value of adjacent property. The use will not draw additional traffic through residential areas.
3. The approved zoning density of this site is 1- 2.5 dwellings per acre. The developed portion the subdivision along with the proposed unit will be at a density of .2.49 du/ac. There are 127.6 acres of the previously approved concept plan for Carter Ridge (Phases 5 and 6) that will have to be reviewed by MPC in the future. A large part of the remaining acreage falls within a hillside protection area.

CONFORMITY OF THE PROPOSAL TO ADOPTED PLANS

1. The East County Sector Plan identifies this property for low density residential use and hillside protection. The PR zoning for this site will allow a density up to 2.5 du/ac. which is consistent with the Sector Plan and the other development found in the area.
2. The site is shown in the Planned Growth Area on the Knoxville, Knox County, Farragut Growth Plan.

ESTIMATED TRAFFIC IMPACT: 796 (average daily vehicle trips)

Average Daily Vehicle Trips are computed using national average trip rates reported in the latest edition of "Trip Generation," published by the Institute of Transportation Engineers. Average Daily Vehicle Trips represent the total number of trips that a particular land use can be expected to generate during a 24-hour day (Monday through Friday), with a "trip" counted each time a vehicle enters or exits a proposed development.

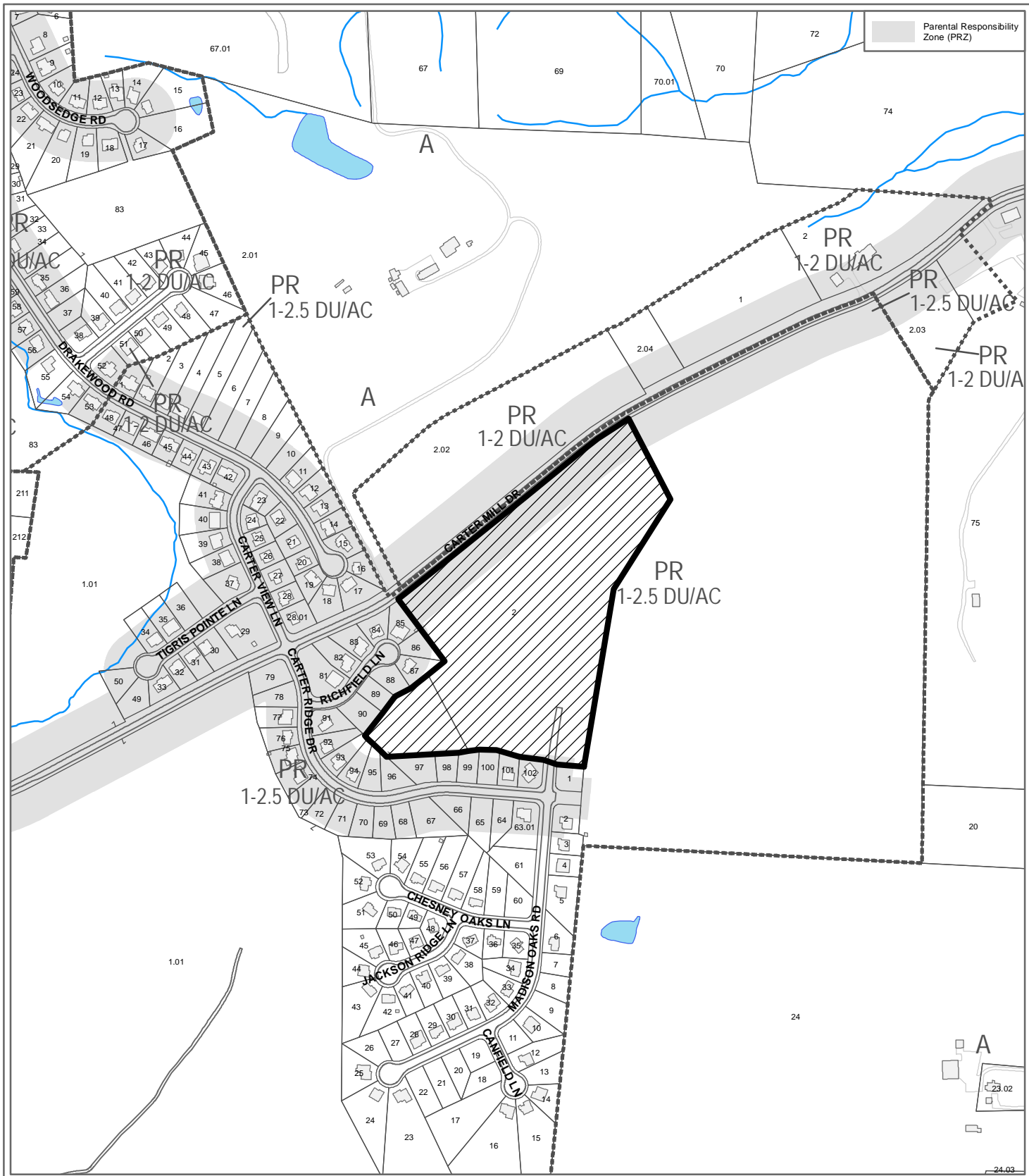
ESTIMATED STUDENT YIELD: 25 (public school children, ages 5-18 years)

Schools affected by this proposal: Carter Elementary, Carter Middle, and Carter High.

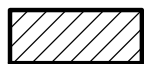
- School-age population (ages 5–18) is estimated by MPC using data from a variety of sources.
- Students are assigned to schools based on current attendance zones as determined by Knox County Schools. Zone boundaries are subject to change.
- Estimates presume full build-out of the proposed development. Build-out is subject to market forces, and timing varies widely from proposal to proposal.
- Student yields from new development do not reflect a net addition of children in schools. Additions occur incrementally over the build-out period. New students may replace current population that ages through the system or moves from the attendance zone.

MPC's approval or denial of this concept plan request is final, unless the action is appealed to Knox County Chancery Court. The date of the Knox County Chancery Court hearing will depend on when the appeal application is filed.

MPC's approval or denial of this use on review request is final, unless the action is appealed to the Knox County Board of Zoning Appeals. The date of the Knox County Board of Zoning Appeals hearing will depend on when the appeal application is filed.



**7-SA-17-C / 7-C-17-UR
CONCEPT PLAN/USE ON REVIEW**



Detached residential subdivision in PR (Planned Residential)

Original Print Date: 6/15/2017
 Metropolitan Planning Commission * City / County Building * Knoxville, TN 37902

Revised:

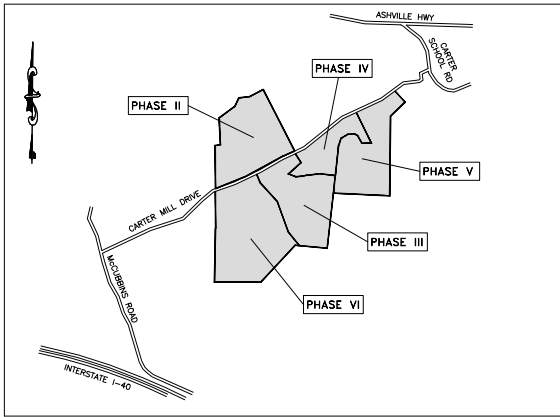
Petitioner: Carter Mill G.P.
 Carter Mill

Map No: 74
 Jurisdiction: County

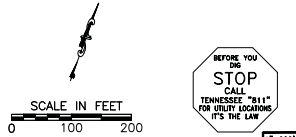


PHASE	AREA
PHASE II	33.09 ACRES
PHASE III	38.50 ACRES
PHASE IV	19.04 ACRES
PHASE V	52.00 ACRES
PHASE VI	75.60 ACRES
TOTAL AREA	218.32 ACRES
218.32/2.5 = 546 MAXIMUM LOTS	

LOT DENSITY—PHASES II, III AND IV		
AREA	# LOTS	
PHASE II	33.09 ACRES	51 LOTS
PHASE III	38.50 ACRES	101 LOTS
PHASE IV	19.04 ACRES	74 LOTS
TOTAL	90.63 ACRES	226 LOTS
PHASE II-IV DENSITY: 2.49 DU/ACRE		



VICINITY MAP



1"=200'
28 JUN 2017
SHEET TWO

MASTER PLAN

**CARTER RIDGE - PHASES III THRU VI
KNOX COUNTY, TENNESSEE**

Prepared For:
Carter Mill, G.P.
12148 Warrior Trail
2Knoxville, Tennessee 37922
(865) 389-5135

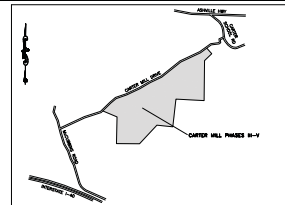
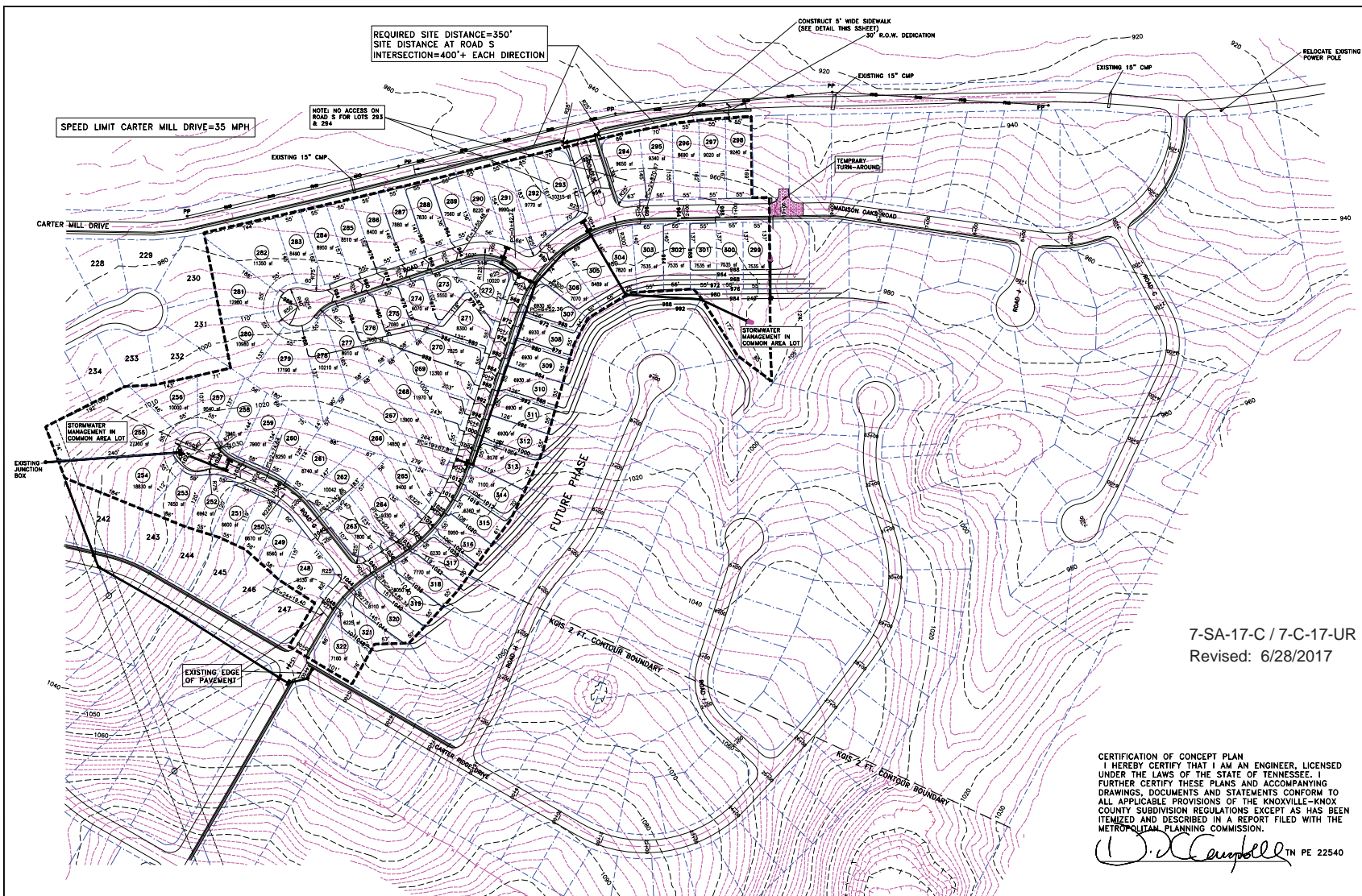
Planning Agency:
Knoxville-Knox County MPC
400 Main Street, Suite 403
Knoxville, Tennessee 37902
(865) 215-2500



7-SA-17-C / 7-C-17-UR
Revised: 6/28/2017

NOTE:
CONTRACTOR IS RESPONSIBLE FOR ALL TRENCH SAFETY
Contractor shall shore and brace all open cut trenches
as required by state and Federal Laws and Local
Ordinances to conform with recommendations set forth
in applicable accident prevention instructions to
protect life, property, or work to avoid accessively side
cuts in unstable materials.
OSHA RULES SHALL BE ADHERED BY

IDEAL ENGINEERING SOLUTIONS INCORPORATED
Ideal Engineering Solutions, Inc.
325 Wooded Lane
Knoxville, Tennessee 37922
(865) 755-3575



- GENERAL NOTES:
- CONTRACTOR TO VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION. LOCATION OF UTILITIES IS BASED ON THE BEST AVAILABLE INFORMATION. CALL TENNESSEE "811" AT LEAST 72 HOURS PRIOR TO CONSTRUCTION ACTIVITIES FOR UTILITIES LOCATION.
 - CONTRACTOR RESPONSIBLE FOR COMPLIANCE WITH OSHA REQUIREMENTS FOR SLOPE STABILITY, SHORING, AND SLOPE CONTROL DURING CONSTRUCTION.
 - BACK FILL MUST BE PLACED AND COMPACTED TO SIZE OF STANDARD PROCTOR PRIOR TO UTILITY INSTALLATION.
 - CONTRACTOR IS RESPONSIBLE FOR VERIFYING GRADES, ELEVATIONS AND ALIGNMENTS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES OR INCONSISTENCIES TO IDEAL ENGINEERING SOLUTIONS, INC. AT 755-3575.
 - TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
 - THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE PROVISIONS OF THE MANUAL OF ACCIDENT PREVENTION IN CONSTRUCTION ISSUED BY THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC.
 - DEMOLITION OF EXISTING STRUCTURES AND ABANDONMENT OF EXISTING UTILITIES TO BE PERMITTED AND COORDINATED WITH KNOX COUNTY.

- PROPERTY NOTES:
- TOTAL AREA = 19.04± ACRES (PHASE IV)
 - LOT AND PARCELS: 07A, PARCEL 001 (PARTIAL) AND PARCEL 002
 - EXISTING ZONING: PR
 - PROPOSED NUMBER OF LOTS: 75
 - LOT DRAINAGE AND UTILITY EASEMENT INSIDE EXTERIOR AND ROAD FRONTAGE LOT LINES, 5' EACH SIDE OF ALL INTERIOR LOT LINES, EXCEPT UNDER PROPOSED ZERO LOT LINE.
 - ALL LOTS TO HAVE VEHICULAR ACCESS TO INTERNAL STREETS ONLY.
 - TRAFFIC CALMING AS REQUIRED BY KNOX COUNTY ENGINEERING AND PUBLIC WORKS
 - ALL DRIVEWAY GRADES MUST BE LESS THAN 15%.

- SETBACKS:
- FRONT: 30 FT.
SIDE: 8 FT.
REAR: 35 FT.

- UTILITIES:
- WATER: KNOX UTILITIES BOARD
SEWER: KNOX UTILITIES BOARD
ELECTRIC: KNOX UTILITIES BOARD
SOLID WASTE: PRIVATE HAULER
TELEPHONE: AT&T

- VARIANCES REQUESTED:
- ROAD 5 STA 6+36 REDUCTION OF VERTICAL CURVE FROM K+25 TO K+16
 - ROAD 5 STA 6+84 REDUCTION OF VERTICAL CURVE FROM K+28 TO K+16

7-SA-17-C / 7-C-17-UR
Revised: 6/28/2017

BEFORE YOU
DIG
STOP
TENNESSEE "811"
FOR UTILITY LOCATING
28 JUN 2017

SCALE IN FEET
0 100 200

CERTIFICATION OF CONCEPT PLAN
I HEREBY CERTIFY THAT I AM AN ENGINEER, LICENSED UNDER THE LAWS OF THE STATE OF TENNESSEE. I FURTHER CERTIFY THESE PLANS AND ACCOMPANYING DRAWINGS, DOCUMENTS AND STATEMENTS CONFORM TO ALL APPLICABLE PROVISIONS OF THE KNOXVILLE-KNOX COUNTY SUBDIVISION REGULATIONS EXCEPT AS HAS BEEN ITEMIZED AND DESCRIBED IN A REPORT FILED WITH THE METROPOLITAN PLANNING COMMISSION.

W. D. Campbell TN PE 22540

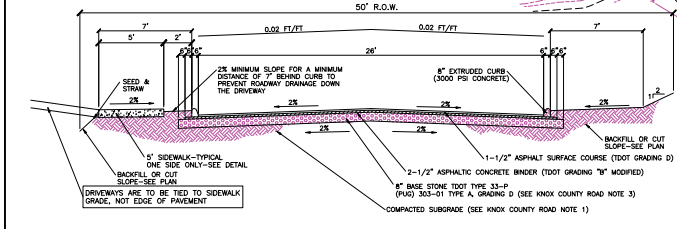
CONCEPT PLAN
CARTER RIDGE - PHASE IV
KNOX COUNTY, TENNESSEE

Prepared For:
Carter Mill, G.P.
12148 Warrior Trail
Knoxville, Tennessee 37922
(865) 389-5135

Planning Agency:
Knoxville-Knox County MPC
400 Main Street, Suite 403
Knoxville, Tennessee 37902
(865) 215-2500



NOTE:
CONTRACTOR IS RESPONSIBLE FOR ALL TRENCH SAFETY. Contractor shall shore and brace all open cut trenches as required by state and Federal Laws and local Ordinances to conform with recommendations set forth in applicable standards. Professional Engineer in Construction to protect life, property, or work to avoid accessively wide cuts in unstable materials. PREVENTION IN CONSTRUCTION. OSHA RULES SHALL BE ADHERED BY.



KNOX COUNTY ROAD CROSS SECTION
NOT TO SCALE

IDEAL ENGINEERING SOLUTIONS INCORPORATED

Ideal Engineering Solutions, Inc.
325 Wooded Lane
Knoxville, Tennessee 37922
(865) 755-3575

KNOXVILLE-KNOX COUNTY
M P C
 METROPOLITAN
 P L A N N I N G
 C O M M I S S I O N
T E N N E S S E E
 Suite 403 • City County Building
 400 Main Street
 Knoxville, Tennessee 37902
 865 • 215 • 2600
 F A X • 215 • 2068
 www.knoxmpc.org

SUBDIVISION - CONCEPT



Name of Applicant: Carter Mill G.P.
 Date Filed: 5/24/17 Meeting Date: 7/13/17
 Application Accepted by: DK
 Fee Amount: 2720.⁰⁰ File Number: Subdivision - Concept 7-SA-17-C
 Fee Amount: 1200.⁰⁰ Related File Number: Development Plan 7-C-17-UR

PROPERTY INFORMATION

Subdivision Name: Carter Ridge

Unit/Phase Number: Phase IV

General Location: Carter mill Rd

Tract Size: 19.04 AC No. of Lots: 74

Zoning District: _____

Existing Land Use: PR

Planning Sector: East County

Growth Policy Plan Designation: Planned Growth

Census Tract: _____

Traffic Zone: _____

Parcel ID Number(s): 074 Parcel 002

Jurisdiction: City Council _____ District
 County Commission 8 District

PROPERTY OWNER/OPTION HOLDER

PLEASE PRINT
 Name: Carter Mill GP

Company: _____

Address: 12148 Warrior Trail

City: Knoxville State: TN Zip: 37922

Telephone: 865-389-5135

Fax: _____

E-mail: WinstonD Cox @GMail.com

PROJECT SURVEYOR/ENGINEER

PLEASE PRINT
 Name: David Campbell

Company: Ideal Engineering Solutions

Address: 325 Wooded Lane

City: Knoxville State: TN Zip: 37922

Telephone: 865-755-3575

Fax: 865-777-9403

E-mail: dcamp44@+DS.net

AVAILABILITY OF UTILITIES

List utility districts proposed to serve this subdivision:

Sewer KUB

Water KUB

Electricity KUB

Gas KUB

Telephone ATT

APPLICATION CORRESPONDENCE

All correspondence relating to this application (including plat corrections) should be directed to:

PLEASE PRINT
 Name: David Campbell

Company: Ideal Engineering Solutions

Address: 325 Wooded Lane

City: Knoxville State: TN Zip: 37922

Telephone: 865-755-3575

Fax: 865-777-9403

E-mail: dcamp44@+DS.net

TRAFFIC IMPACT STUDY REQUIRED

No Yes

USE ON REVIEW No Yes

Approval Requested:

Development Plans in Planned District or Zone

Other (be specific): _____

VARIANCE(S) REQUESTED

No Yes (If Yes, see reverse side of this form)

VARIANCES REQUESTED

1. _____
Justify variance by indicating hardship: _____

2. _____
Justify variance by indicating hardship: _____

3. _____
Justify variance by indicating hardship: _____

4. _____
Justify variance by indicating hardship: _____

5. _____
Justify variance by indicating hardship: _____

6. _____
Justify variance by indicating hardship: _____

7. _____
Justify variance by indicating hardship: _____

APPLICATION AUTHORIZATION

I hereby certify that I am the authorized applicant, representing ALL property owners involved in this request or holders of option on same, as listed on this form. I further certify that any and all variances needed to meet regulations are requested above, or are attached. I understand and agree that no additional variances can be acted upon by the legislative body upon appeal and none will be requested. I hereby waive the requirement for approval or disapproval of the plat within sixty (60) days after its submission, in accordance with the provisions of Tennessee Code Annotated 13-3-404.

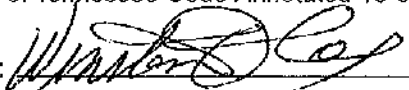
PLEASE PRINT

Name: Winston D. Cox

Address: 12148 WARRIOR TRAIL

City: KNOXVILLE State: TN Zip: 37922

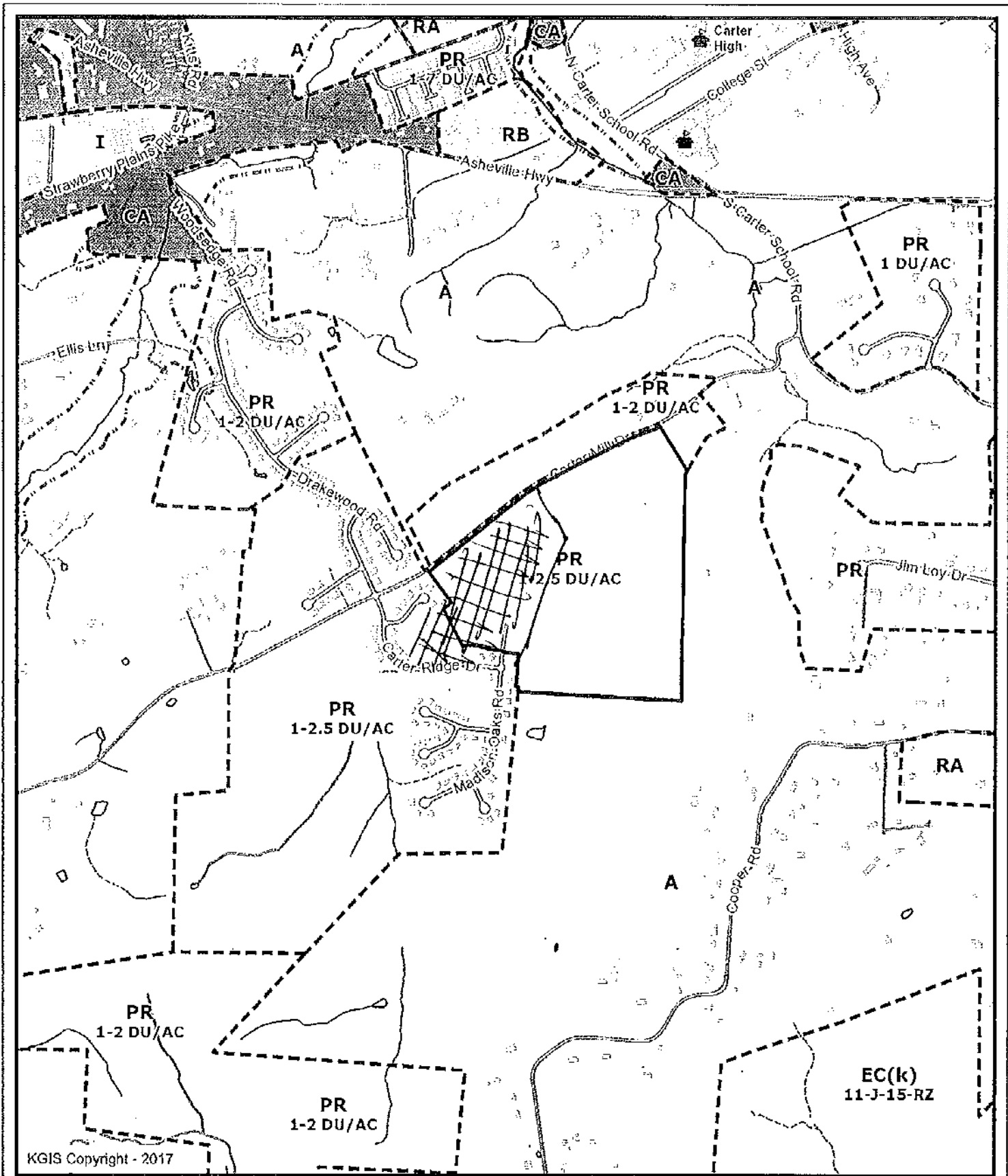
Telephone: 865-389-5135

Signature: 

Fax: _____

Date: 5-26-17

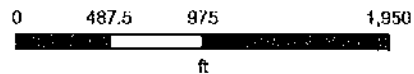
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