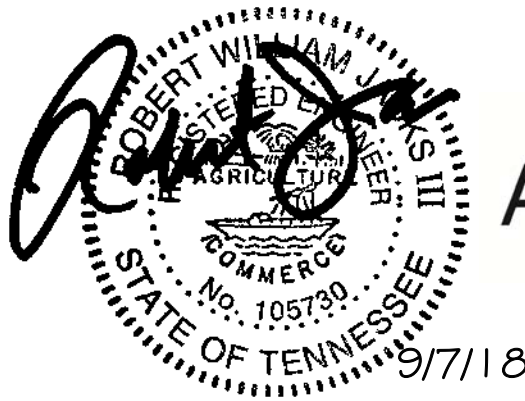


TRANSPORTATION IMPACT STUDY THE HIGHLANDS AT CLEAR SPRING KNOXVILLE, TENNESSEE

-Prepared For-

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TABLE OF CONTENTS

SECTION	PAGE
EXECUTIVE SUMMARY	1
DESCRIPTION OF EXISTING CONDITIONS.....	4
STUDY AREA	4
EXISTING ROADWAYS.....	7
PHOTO EXHIBITS	12
EXISTING TRANSPORTATION VOLUMES PER MODE	16
ADJACENT RAILROAD SYSTEM.....	16
ON-STREET PARKING	17
PEDESTRIAN AND BICYCLE FACILITIES.....	17
WALK AND TRANSIT SCORE	18
TRANSIT SERVICES	18
PROJECT DESCRIPTION.....	19
LOCATION AND SITE PLAN	19
PROPOSED USES AND ZONING REQUIREMENTS.....	22
DEVELOPMENT DENSITY.....	23
ON-SITE CIRCULATION AND VEHICLE PARKING.....	23
SERVICE AND DELIVERY VEHICLE ACCESS AND CIRCULATION	23
TRAFFIC ANALYSIS OF EXISTING AND PROJECTED CONDITIONS.....	24
EXISTING TRAFFIC CONDITIONS.....	24
OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT).....	29
TRIP GENERATION	32
TRIP DISTRIBUTION AND ASSIGNMENT	34
OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)	37
DISCUSSION OF VEHICLE CRASHES ON MILLERTOWN PIKE.....	40
POTENTIAL SAFETY ISSUES	45
CONCLUSIONS & RECOMMENDATIONS.....	47
MILLERTOWN PIKE AT GLEN CREEK ROAD	47
OLD MILLERTOWN PIKE AT GLEN CREEK ROAD	55
GLEN CREEK ROAD AT LAUREL CREEK WAY / MEADOW WELLS DRIVE	56
MILLERTOWN PIKE AT SABLE POINT LANE / MARY EMILY LANE	57
PARASOL LANE ROAD CONNECTION	59
THE HIGHLANDS AT CLEAR SPRING SUBDIVISION INTERNAL ROADS.....	61

APPENDIX

APPENDIX

APPENDIX A -	HISTORICAL TRAFFIC COUNT DATA
APPENDIX B -	RAILROAD INFORMATION
APPENDIX C -	WALK SCORE
APPENDIX D -	KNOXVILLE AREA TRANSIT MAP AND INFORMATION
APPENDIX E -	ZONING MAP
APPENDIX F -	MANUAL TRAFFIC COUNT DATA
APPENDIX G -	CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 8)
APPENDIX H -	ITE TRIP GENERATION RATES
APPENDIX I -	TDOT STATEWIDE CRASH RATES & SPREADSHEET CALCULATIONS
APPENDIX J -	KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEETS
APPENDIX K -	TRAFFIC SIGNALIZATION WARRANTS
APPENDIX L -	SIMTRAFFIC QUEUE LENGTH CALCULATIONS

LIST OF FIGURES

FIGURE	PAGE
1. LOCATION MAP	6
2. TRAFFIC COUNT LOCATIONS & EXISTING LANE CONFIGURATIONS	11
3. PROPOSED PLAN LAYOUT – THE HIGHLANDS AT CLEAR SPRING	21
4. 2018 PEAK HOUR TRAFFIC VOLUMES – EXISTING TRAFFIC CONDITIONS.....	26
5. 2022 PEAK HOUR TRAFFIC VOLUMES – OPENING YEAR TRAFFIC (WITHOUT PROJECT)	30
6. DIRECTIONAL DISTRIBUTION OF GENERATED TRAFFIC DURING AM AND PM PEAK HOUR.....	35
7. TRAFFIC ASSIGNMENT OF GENERATED TRAFFIC DURING AM AND PM PEAK HOUR	36
8. 2022 PEAK HOUR TRAFFIC VOLUMES – OPENING YEAR TRAFFIC (WITH PROJECT)	38
9. VEHICLE CRASH LOCATIONS ON MILLERTOWN PIKE.....	42
10. PROPOSED RIGHT TURN LANE - MILLERTOWN PIKE AT GLEN CREEK ROAD.....	49

LIST OF TABLES

TABLE	PAGE
1. STUDY CORRIDOR CHARACTERISTICS.....	7
2. LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS	28
3. 2018 PEAK HOUR LEVEL OF SERVICE & DELAY - EXISTING TRAFFIC CONDITIONS.....	28
4. 2022 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITHOUT PROJECT).....	31
5A. TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT ENTIRE DEVELOPMENT	32
5B. TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT 271 SINGLE-FAMILY DETACHED HOMES.....	33
5C. TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT 22 SINGLE-FAMILY ATTACHED HOMES (8 CONDOMINIUMS+14 TOWNHOUSES)	33
6. 2022 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT).....	39
7. CRASH RATES ON MILLERTOWN PIKE	44
8. 2022 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITHOUT PROJECT) MILLERTOWN PIKE AT GLEN CREEK ROAD WITH ADDED EB RIGHT TURN LANE.....	52

EXECUTIVE SUMMARY

Preface:

Trans South Properties, GP is proposing to develop a subsequent phase of an existing residential development that is nearby to Millertown Pike in northeast Knoxville, TN. The name of this subsequent proposed residential development is “The Highlands at Clear Spring”. The initial phase of this residential development was originally approved in 2006 and dozens of homes have been constructed in Phase 1 of the development. The initial phase, Phase 1, ultimately included 111 single-family residential detached lots, 8 condominium units, 14 townhouses and is named Clear Springs Plantation. A concept plan for the subsequent phase, Phase 2, of the development has been submitted to allow for further residential home construction adjacent to Phase 1. With the addition of up to 160 single-family residential detached lots in Phase 2, this report addresses the transportation impacts of both existing Phase 1 and proposed Phase 2 of the entire residential development. The purpose of this study is to determine and evaluate the potential impacts of the residential 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 Clear Spring residential development of both phases is expected to generate approximately 2,801 new trips on an average weekday. Approximately 216 of these new trips are estimated to occur during the AM peak hour and 276 trips in the PM peak hour at full build-out.
- When both phases in Clear Spring are fully constructed and occupied, two of the intersections studied for this development are anticipated to operate quite well in the projected conditions with respect to vehicular delays up to the year 2022. However, both northbound approaches at the intersection of Millertown Pike at Glen Creek Road and Millertown Pike at Sable Point Lane / Mary Emily Lane were calculated to operate at Level of Service (LOS) F during the PM peak

hour in the projected conditions in the year 2022. The intersection of Millertown Pike at Glen Creek Road was analyzed to see if traffic signal warrants were met for potential traffic signalization. It was determined that based on the projected volumes in the year 2022, the intersection will not meet warrants for signalization. However, as explained in the report, it is expected that the northbound approach at the intersection of Millertown Pike at Glen Creek Road will operate with smaller delays than projected.

The intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane is the only access point for an existing subdivision, Meadows of Millertown, located to the east of the Clear Spring development. This intersection was included in this study since there is a possibility that the two subdivisions could potentially be connected via a new road link. It is projected that the northbound approach of Millertown Pike at Sable Point Lane / Mary Emily Lane will reach LOS F whether or not Phase 2 of the Clear Spring development is constructed.

Recommendations:

The following recommendations are listed here and offered based on the study analyses:

- An exclusive eastbound right turn lane should be constructed at the intersection of Millertown Pike at Glen Creek Road. The right turn lane should be 100 feet in length and have a 150-foot taper. If a detailed survey and design determines that there is not enough distance to accommodate these recommended lengths in between Glen Creek Road and an existing driveway at 5528 Millertown Pike, it is recommended that the 150-foot taper be maintained, and the storage length be reduced to no less than a total of 75 feet.
- The sight distance available looking east and to the west from Glen Creek Road at Millertown Pike has been measured by a licensed land surveyor and it was determined that the sight distance looking to the west (left) is 362 feet and the sight distance looking to the east (right) is 478 feet. The required sight distance at this intersection is 400 feet based on the posted speed limit. It is recommended that the cedar tree limbs on the north side of Millertown Pike and to the west of Glen Creek Road be trimmed to provide a minimum of 400 feet of sight distance.

- Due to the minimal sight distance available looking to the west from Glen Creek Road, it is recommended that a Side Road Sign (W2-2) be installed for eastbound traffic on Millertown Pike just prior to the beginning of the proposed right turn lane. This sign should be located at least 250 feet away to the east of the existing Reverse Turn Sign (W1-3) that is located across from 5521 Millertown Pike. This Side Road Sign is recommended to warn eastbound approaching motorists to the upcoming Glen Creek Road intersection since the intersection sight distance is at a minimum and because the intersection is not clearly visible due to it being located on a horizontal curve.
- 24” white stop bars should be installed at the northbound approach of Millertown Pike at Glen Creek Road and at the eastbound approach of Old Millertown Pike at Glen Creek Road. Pavement markings also need to be applied at the existing roundabout of Glen Creek Road at Laurel Creek Way / Meadow Wells Drive.
- Vegetation needs continued maintenance within the landscaped island on Glen Creek Road to ensure sight distance is available at the intersection of Old Millertown Pike and at the roundabout.
- A speed limit of 25 mph should be posted on Glen Creek Road just to the south of the intersection of Old Millertown Pike.
- Phase 2 should construct and install sidewalks at a minimum of one side of each roadway. The sidewalks should be 5 feet in width and have ADA compliant ramps at all intersections.
- The Highlands at Clear Spring should include design elements with the appropriate sight distance and appropriate road signage.
- A road link between the Clear Spring Development and the Meadows of Millertown can or could be provided to allow for secondary access to Millertown Pike for both residential developments. It is not expected that providing a road link between these residential subdivisions will result in significant decreased traffic operations to either the intersection of Millertown Pike at Glen Creek Road or at the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane. If a road connection is provided by extending Parasol Lane to Autumn Creek Drive, a Stop Sign (R1-1) should be installed for the westbound approach of Parasol Lane at Autumn Creek Drive.

DESCRIPTION OF EXISTING CONDITIONS

■ **STUDY AREA:**

The proposed location of The Highlands at Clear Spring residential subdivision is shown on a map in Figure 1 and its location relative to Phase 1, Clear Springs Plantation. Phase 2 of the development, The Highlands at Clear Spring, is located to the rear (south) of Phase 1 which is adjacent to Millertown Pike and is in the northeast area of Knoxville, TN. The proposed residential development in Phase 2 is to be comprised of three new internal paved roadways, an extension of two existing roads from Phase 1 and will contain a maximum of 160 single-family residential lots on approximately 63.7 acres. Phase 1 is nearly filled with completed and occupied homes and consists of a total of 8 condominium units, 14 townhouses, and 111 single-family residential detached lots. All the condominium and townhouse units have been constructed and nearly three-quarters of the single-family residential detached homes have been constructed. To analyze the transportation impacts associated with the proposed development, the following roadways and intersections were reviewed where the greatest impact is expected:

- Millertown Pike at Glen Creek Road
- Old Millertown Pike at Glen Creek Road
- Glen Creek Road at Laurel Creek Way / Meadow Wells Drive
- Millertown Pike at Sable Point Lane / Mary Emily Lane

In the adjacent vicinity of this development, there are several single-family residences, unused/agricultural properties, commercial properties, a church with a cemetery and an electrical substation. Some of the adjacent residential areas are within existing subdivisions and others exist as single residential properties.

The proposed development site of Phase 2 currently consists of woodlands and areas that were partially graded for the future roadways during the initial Phase 1 construction. The roadways and infrastructure for Phase 1 were constructed and developed several years ago. Phase 1 lots are located along Laurel Creek Way (private – joint permanent easement), Meadow Wells Drive, Autumn Creek Drive, and McCampbell Wells Way (private – joint permanent easement). Glen Creek Road was constructed in Phase 1 and provides access in

between Millertown Pike and the Clear Spring residential development.

Phase 2 will be bounded by Phase 1 to the north, Norfolk Southern Railroad to the west, and single-family residential subdivisions to the east and south. The property is also bisected by two electrical transmissions lines.

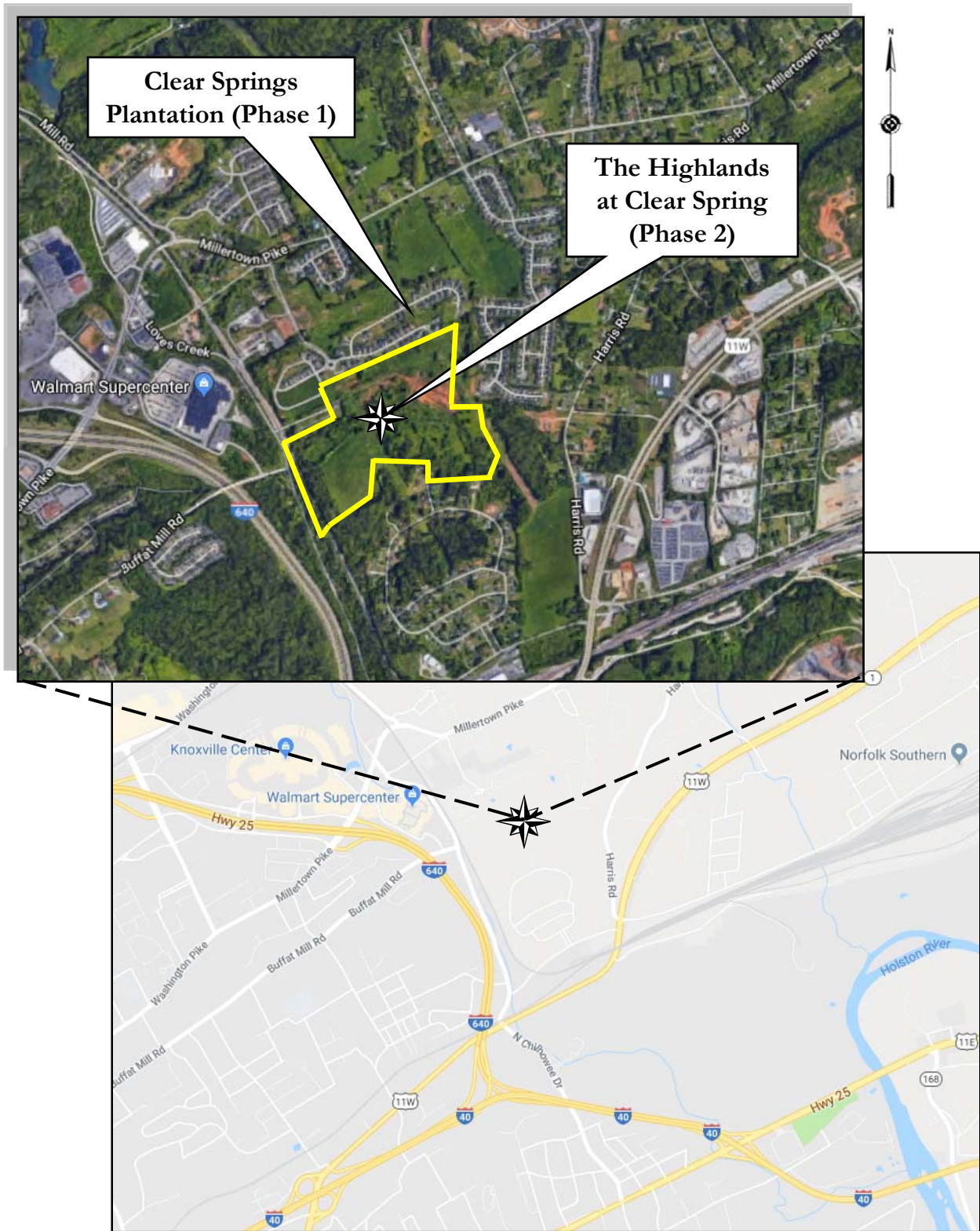


Figure 1
Location Map

■ **EXISTING ROADWAYS:**

Table 1 shows the characteristics of the primary 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
Millertown Pike	Minor Arterial	40 mph	2 undivided	22 feet	None	No sidewalks along roadway	No bike lanes
Old Millertown Pike	Local Street	Not Posted	2 undivided	16.5 feet	None	No sidewalks along roadway	No bike lanes
Glen Creek Road	Local Street	Not Posted	2 boulevard	46 feet	None	5' sidewalk on one side of roadway	No bike lanes
Laurel Creek Way	Local Street (private - joint permanent easement)	Not Posted	2 undivided	26 feet	None	5' sidewalk on one side of roadway	No bike lanes
Meadow Wells Drive	Local Street	Not Posted	2 undivided	26 feet	None	No sidewalks along roadway	No bike lanes
Sable Point Lane	Local Street	25 mph	2 undivided	26 feet	None	No sidewalks along roadway	No bike lanes
Mary Emily Lane	Local Street	Not Posted	2 undivided	25 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

Millertown Pike is a minor arterial that traverses in a general northeast-southwest direction. Millertown Pike is nearly 10 miles in total length and runs in between Rutledge Pike (US 11W) from the northeast to Washington Pike to the southwest. Closer to the study area, Millertown Pike provides convenient access to the Knoxville Center Mall area and Interstate 640. Just to the west of the development site on Millertown Pike,



there are numerous shopping and retail centers, restaurants, and grocery stores. Millertown Pike has a 40-mph speed limit in the study area adjacent to the development site but is reduced to 35 mph to the west within the more developed commercial areas closer to Interstate 640.

For the most part, Millertown Pike has a straight horizontal road alignment and a level vertical road alignment. However, near the intersection of Millertown Pike at Glen Creek Road, Millertown Pike has two successive horizontal curves. Traffic signs (Reverse Turn / W1-3) providing advanced warning of these road curves are provided to the east and west on Millertown Pike. A guardrail is also provided on the south side of Millertown Pike to the west of Glen Creek Road. Traffic movements at the 3-way intersection of Millertown Pike at Glen Creek Road are controlled by a Stop Sign (R1-1) for the Glen Creek Road approach. There are not any street lights at this intersection. Further to the east of this intersection, Millertown Pike has permitted passing zones for eastbound and westbound traffic as designated by the centerline pavement markings. To the west of this intersection, a traffic signal operates at the intersection of Millertown Pike and Mill Road. This signalized intersection is approximately 1,100 feet away from the intersection of Millertown Pike at Glen Creek Road.



W1-3

Old Millertown Pike is a local street and is the remnants of the turnpike prior to the route re-alignment constructed by the current alignment of Millertown Pike located to the north. The current Millertown Pike alignment provides an overpass over Norfolk Southern Railroad tracks. Old Millertown Pike runs in between Loves Creek Road and Glen Creek Road and is approximately 1,600 feet in length. Old Millertown Pike crosses 2 tracks of Norfolk Southern Railroad at an at-grade crossing. Advanced railroad warning signage is provided but there are not any active warning signals or crossing gates for the crossing. Speed limit signs are not posted on Old Millertown Pike.

Along its length, Old Millertown Pike has 8 single-family residences and a landscape company on the west end at Loves Creek Road. The road alignment is fairly straight except for the last 150 feet on the east end where the roadway makes a sharp horizontal turn and intersects Glen Creek Road approximately 80 feet to the south of the Millertown Pike at Glen Creek Road intersection. This sharp turn and re-alignment of the road was created when Glen Creek Road was constructed for Phase 1. Prior to the re-alignment of Old Millertown Pike and the construction of Glen Creek Road, the roadway intersected Millertown Pike at very undesirable

angle. The 150 feet of Old Millertown Pike that was re-aligned is approximately 26 feet in width. To the west of this re-alignment section, Old Millertown Pike is reduced in width to approximately 16.5 feet.



View of Old Millertown Pike at Millertown Pike prior to re-alignment (KGIS, 2003 Aerial Map)

Glen Creek Road is a local street that traverses in a general northwest-southeast direction between Millertown Pike on the north side and into the first phase of the Clear Spring development. It currently ends at a roundabout intersection. Glen Creek Road has a



Intersection of Glen Creek Road and Laurel Creek Way / Meadow Wells Drive

a boulevard road section with 18-foot lanes and a landscaped 10-foot median that runs in between Millertown Pike and the roundabout intersection. The landscaped median is continuous except for an opening approximately midway that provides access to a TVA and Knoxville Utilities Board electrical substation. Speed limit signs are not posted on Glen Creek Road. Minor residential street lighting is provided within the landscaped median. A 5' sidewalk has been constructed on the west side of Glen Creek Road and runs in between Old Millertown Pike and

terminates within the first phase of construction along Laurel Creek Way. The roundabout intersection of Glen Creek Road at Laurel Creek Way / Meadow Wells Drive is controlled by Yield Signs (R1-2) at each approach. The center of the roundabout is landscaped and has a small covered structure.

Laurel Creek Way / Meadow Wells Drive are local streets and both traverse in a general

northeast-southwest direction. Laurel Creek Way is a private drive and operates as a joint private easement. Laurel Creek Way provides access to the condominium and townhouse units from the initial phase of the development. It also provides access to 36 single-family residential detached lots to the west of the existing roundabout.

Meadow Wells Drive is a public street and provides access to single-family residential detached lots. Meadow Wells Drive provides access to Autumn Creek Road and both roads together share 75 single-family residential detached lots. Nearly all the single-family residential lots have homes constructed and occupied on these 2 streets. There are no sidewalks on Meadow Wells Drive or Autumn Creek Road except for one lot near the current end of Autumn Creek Road. Minor residential lighting is provided along Meadow Wells Drive and Autumn Creek Road. Speed limit signs are not posted on either street.

Sable Point Lane / Mary Emily Lane are local streets and both traverse in a general northwest-southeast direction. Sable Point Lane provides access to a fairly large residential subdivision named Meadows of Millertown.

Currently, the only access to this subdivision is via Sable Point Lane at Millertown Pike. Sable Point Lane has a short boulevard road section (approximately 100 feet) at the intersection with Millertown Pike. Mary Emily Lane provides access to about a dozen older homes. Its length is approximately 1,800 feet and dead ends abruptly. A single roadway light is provided at the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane. Speed limit signs are not posted on Mary Emily Lane, but Sable Point Lane is posted with a speed limit of 25 mph for the Meadows of Millertown subdivision.

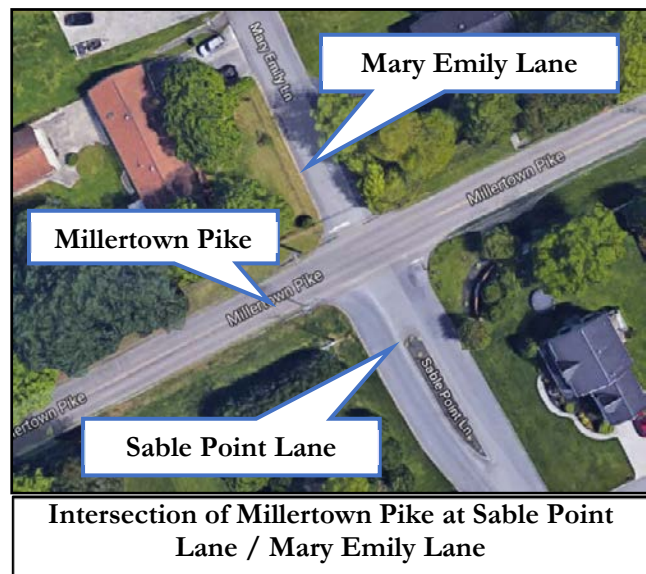
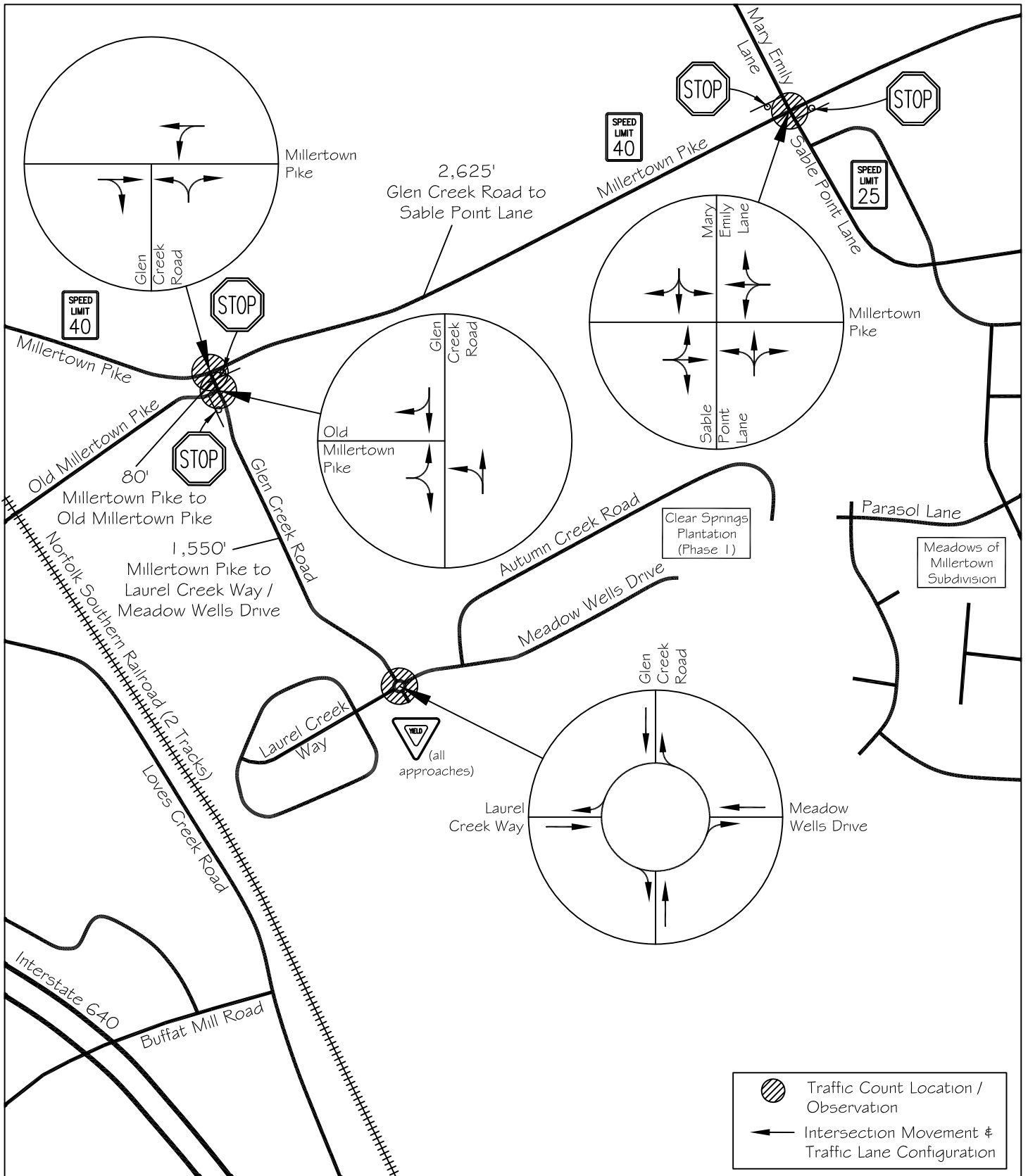


Figure 2 shows the lane configurations of the study area roadways and intersections and shows the study traffic count locations. It also shows the posted speed limits in the area along with distances in between the studied intersections. The pages following Figure 2 give an overview of the site study area with photographs.



11812 Black Road
 Knoxville, TN 37932
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NOT TO SCALE



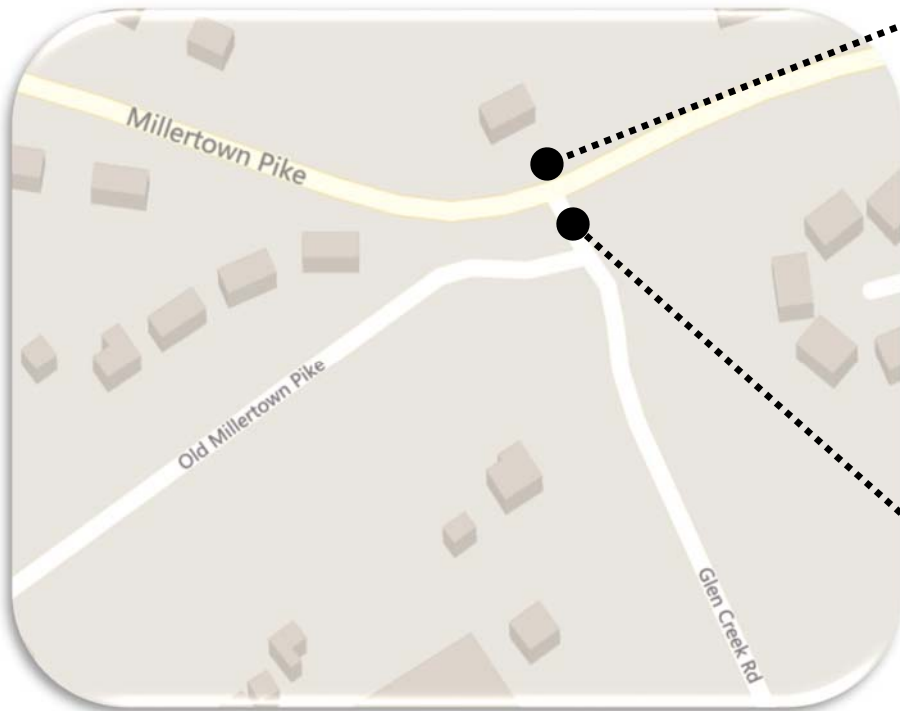
FIGURE 2

The Highlands at Clear Spring

Traffic Count Locations & Existing Lane Configurations

PHOTO EXHIBITS

12



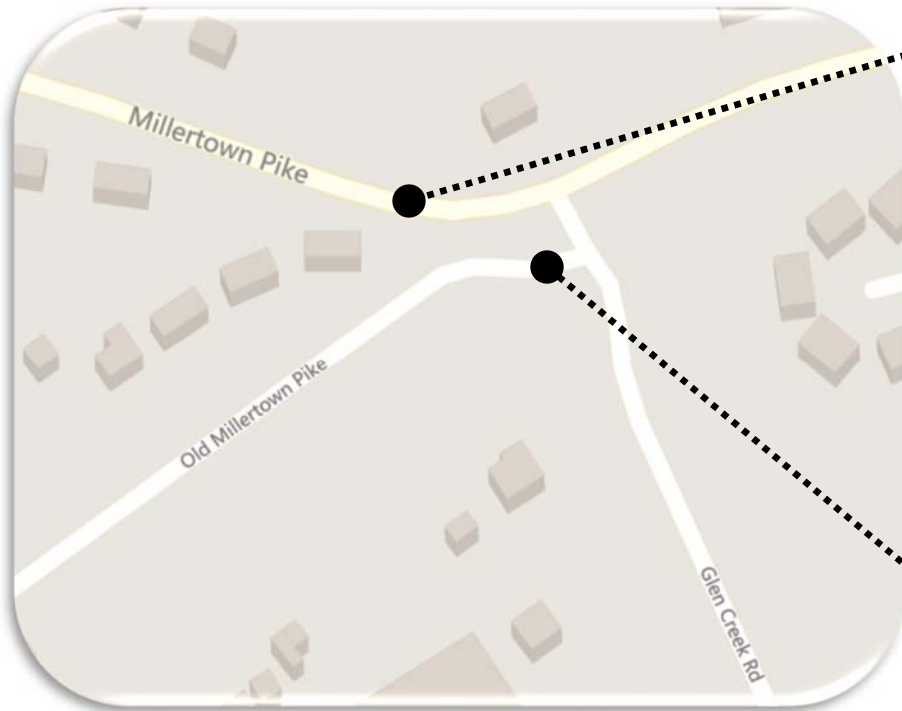
Millertown Pike & Old Millertown Pike at Glen Creek Road



**View of Glen Creek Road at Millertown Pike
(Looking Southeast)**



**View of Millertown Pike at Glen Creek Road
(Looking Northwest)**



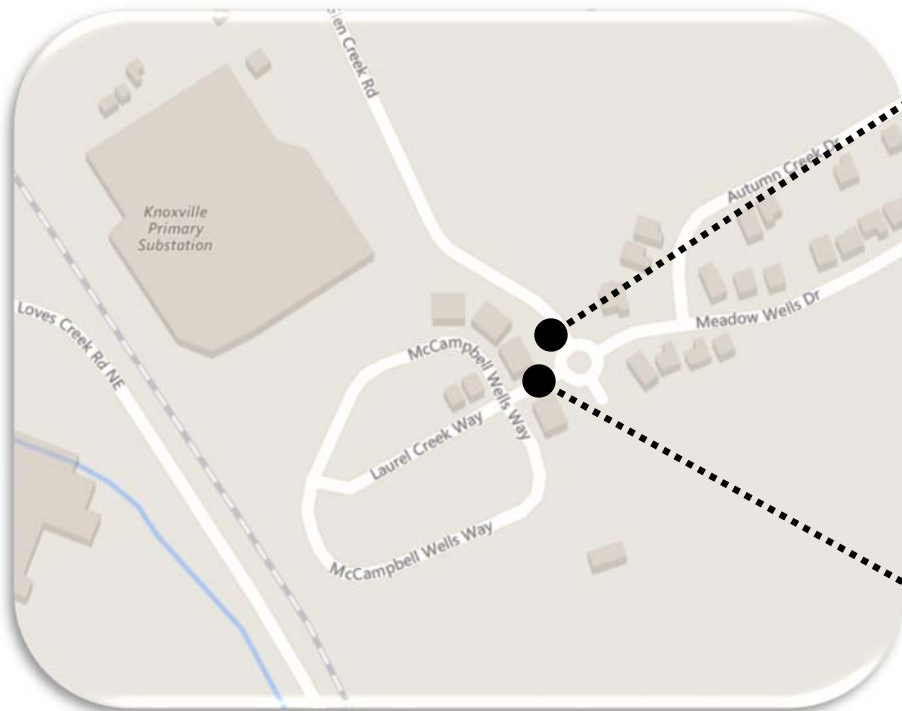
Millertown Pike & Old Millertown Pike at Glen Creek Road



**View of Millertown Pike at Glen Creek Road
(Looking East)**



**View of Old Millertown Pike at Glen Creek Road
(Looking East)**



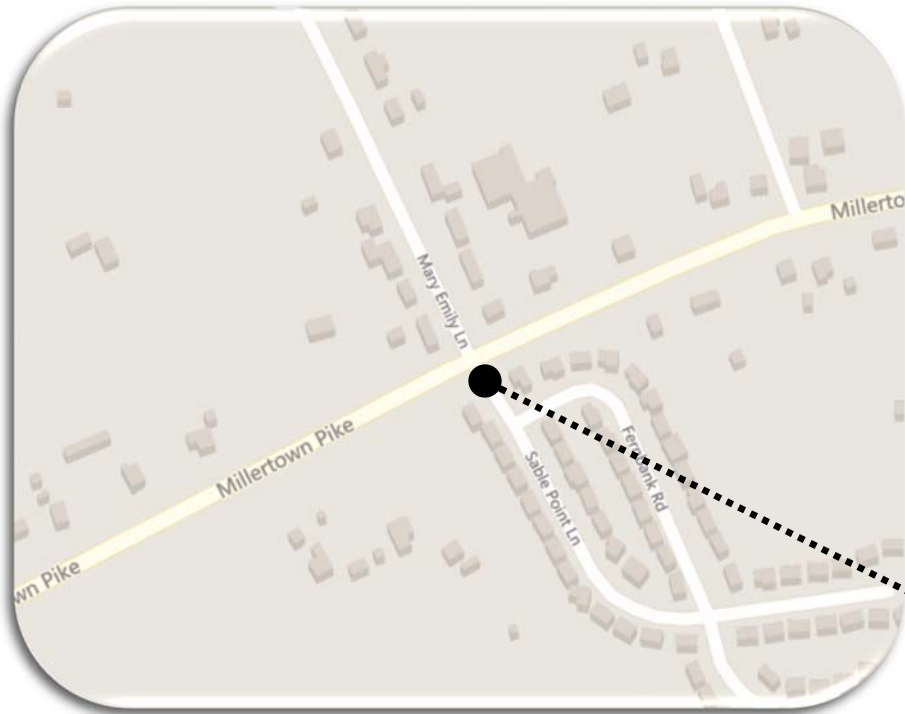
Glen Creek Road at Laurel Creek Way / Meadow Wells Drive



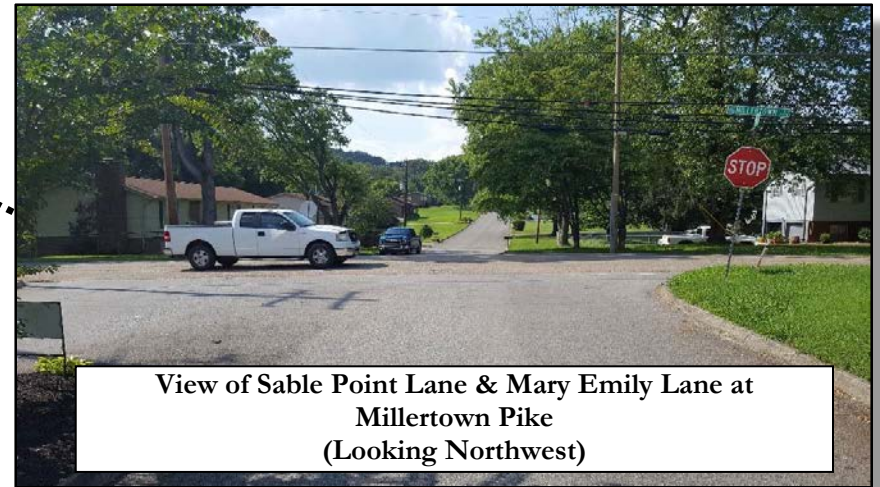
View of Glen Creek Road at Laurel Creek Way (Looking Southeast)



View of Laurel Creek Way at Glen Creek Road (Looking Northeast)



Millertown Pike at Sable Point Lane / Mary Emily Lane



View of Sable Point Lane & Mary Emily Lane at Millertown Pike (Looking Northwest)

■ **EXISTING TRANSPORTATION VOLUMES PER MODE:**

There is one annual vehicular traffic count location adjacent to this project site.

- Existing vehicular roadway traffic:
 - Average Daily Traffic (ADT) on Millertown Pike near the project site was reported by the Tennessee Department of Transportation (TDOT) at 7,417 vehicles per day in 2016. From 2006 – 2016, this count station has indicated a 2.1% average annual growth rate. The researched historical traffic count data for this report 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. A couple of pedestrians were observed at the intersections during the manual traffic counts. It is reasonably assumed that these volumes are minimal to non-existent in the study area.

■ **ADJACENT RAILROAD SYSTEM:**

Norfolk Southern operates a dual railroad track just to the west of the intersection of Old Millertown Road and Glen Creek Road. This railroad line is part of the Alabama Railroad Division of Norfolk Southern. The railroad crossing has Railroad Grade Crossing (crossbuck) signs (R15-1)



**View of Norfolk Southern Railroad Crossing
on Old Millertown Pike (Looking West)**

on both approaches but does not have railroad crossing signals or crossing gates. Railroad Grade Crossing Advance Warning (W10-1) signs are posted for both approaches on Old

Millertown Pike. The advance railroad pavement markings are worn away (or non-existent) at both approaches to the railroad crossing.

The railroad crossing on Old Millertown Pike is marked as #730480D. Appendix B includes the U.S. DOT Crossing Inventory Form from the Federal Railroad Administration for this railroad crossing. According to the railroad forms, an average of 4 trains per day pass through this crossing. Trains on this track operate 24 hours a day, seven days a week, 365 days a year. On average, a quarter of the trains operate from 6 AM to 6 PM and the other three-fourths operates from 6 PM to 6 AM. The maximum track speed is 50 mph for freight trains on this track, but the typical average speed is 30 to 40 mph in this section.

Appendix B also contains a summary of the accident reports at this rail crossing. The past accident record of the railroad crossing included historical data back to 1977. Data indicated that 2 crashes since 1977 were recorded at this crossing and consisted of 2 automobile/train crashes. One of the accidents involved a vehicle stopped at the railroad crossing and the other one involved a vehicle moving across the railroad crossing when being struck. Both accidents occurred in 1977. None of the accidents had injuries or fatalities.

■ **ON-STREET PARKING:**

Currently, on-street parking is not allowed on Millertown Pike. However, on-street parking was observed and appears to be allowed at all the other studied residential roadways except for Old Millertown Pike.

■ **PEDESTRIAN AND BICYCLE FACILITIES:**

Bicycle facilities (lanes) and pedestrian sidewalks are not currently available on Millertown Pike, Old Millertown Pike, and nearly all the studied local streets. The only sidewalk that is provided in the study area exists on the west side of Glen Creek Road in between Old Millertown Pike and Laurel Creek Way. Laurel Creek Way continues the sidewalk within the west side of the Phase 1 development.

■ **WALK AND TRANSIT SCORE:**

A private company offers an online website that grades and gives scores to locations within the United States based on “walkability” and transit availability. According to the website, the numerical value assigned for the Walk Score is based on the distance to the closest amenity in various relevant categories (businesses, schools, parks, etc.) and is graded from 0 to 100. The Transit Score measures how well a location is served by public transit based on distance and type of nearby transit. The Transit Score is also graded from 0 to 100.

Appendix C shows a map and gives information for the Clear Spring development Walk Score and Transit Score at Laurel Creek Way within the first phase of the development. Based on the project location, the site is given a Walk Score of 13. This Walk Score indicates that the site is almost completely dependent on vehicles for errands and travel. This low walkability score is due to the complete absence of sidewalks on Millertown Pike or Old Millertown Pike to outside destinations/amenities even though there are several potential destinations/amenities to the west of the site. Based on the project location, the site is given a Transit Score of 24. This indicates that it is possible to get bus service.

■ **TRANSIT SERVICES:**

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is available fairly close to the development site. The overall KAT bus system map is in Appendix D. The closest public transit bus service is located at Wal-Mart approximately 1 mile away to the west via Millertown Pike. This KAT service is Route 23 “Millertown”. It operates on weekdays and Saturdays and this route map is also included in Appendix D.

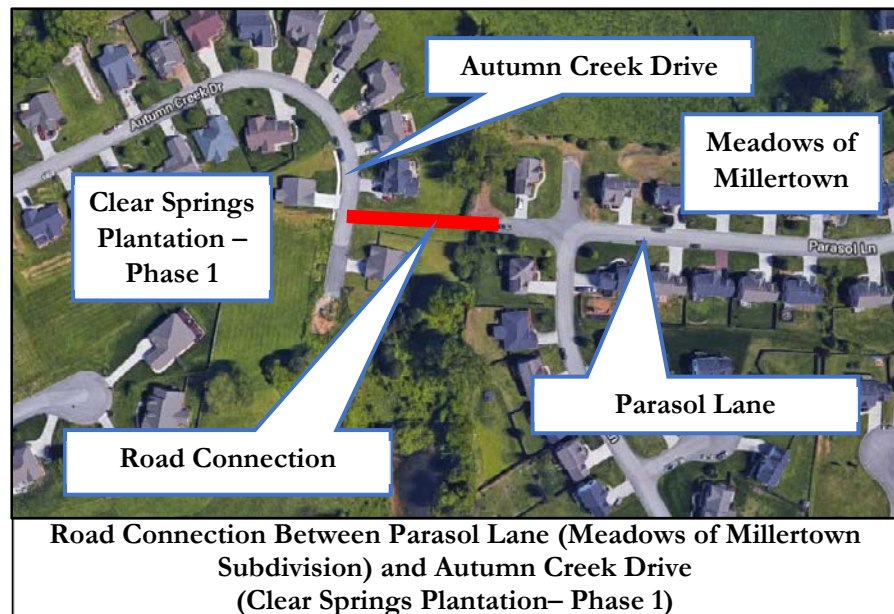
Other transit services include the East Tennessee Human Resource Agency (ETHRA) and Knoxville-Knox County Community Action Committee (CAC) which provides transportation services in Knox County when requested. Other services include private taxis and ride-sharing opportunities (Uber, etc.).

PROJECT DESCRIPTION

■ **LOCATION AND SITE PLAN:**

The proposed plan layout for The Highlands at Clear Spring (Phase 2) designed by W. Scott Williams and Associates is shown in Figure 3. As can be seen in the figure, Phase 2 of the development will have two access points via existing roadways. Three completely new streets will be constructed, and these will tie into an extension of Glen Creek Road and Autumn Creek Drive.

While not shown in Figure 3, the potential exists for this second phase to include constructing a link in between the Clear Spring development and the existing residential



development to the east, Meadows of Millertown, by extending Parasol Lane. This would provide both developments with secondary access points to Millertown Pike. While the decision to build this road link has not been made final, this potential connection will be taken into consideration for this traffic study.

The Clear Spring development (both phases) is completely contained within the City of Knoxville limits. The Knoxville city limit exists at the property boundary on the south and east sides.

Phase 2 of the residential development is expected to be comprised of a maximum of 160 single-family residential detached lots on approximately 63.7 acres. The size of the residential lots in Phase 2 will be similar to Phase 1 and will be a minimum of 55 feet wide and 125 feet deep for a total area of 6,875 square feet. Phase 1 is nearly filled with completed and

occupied homes and consists of a total of 8 condominium units, 14 townhouses, and 111 single-family residential detached lots. All the condominium and townhouse units have been constructed and nearly three-quarters of the single-family residential detached homes have been constructed.

The actual schedule for completion of this residential developments is dependent on economic factors and construction timelines. This project is also contingent on permitting, design, and other issues. The developer is expecting continued high demand for housing in the Knoxville market and is estimating full construction and occupancy of both phases occurring within the next 3.5 years. Thus, for the purposes of this study, it was assumed that the total construction build-out and full occupancy of the entire development will occur by the year 2022.

At this point, the development is expected to start construction for Phase 2 as soon as possible and home construction in-filling will continue for the first phase of the development for the remaining undeveloped lots.

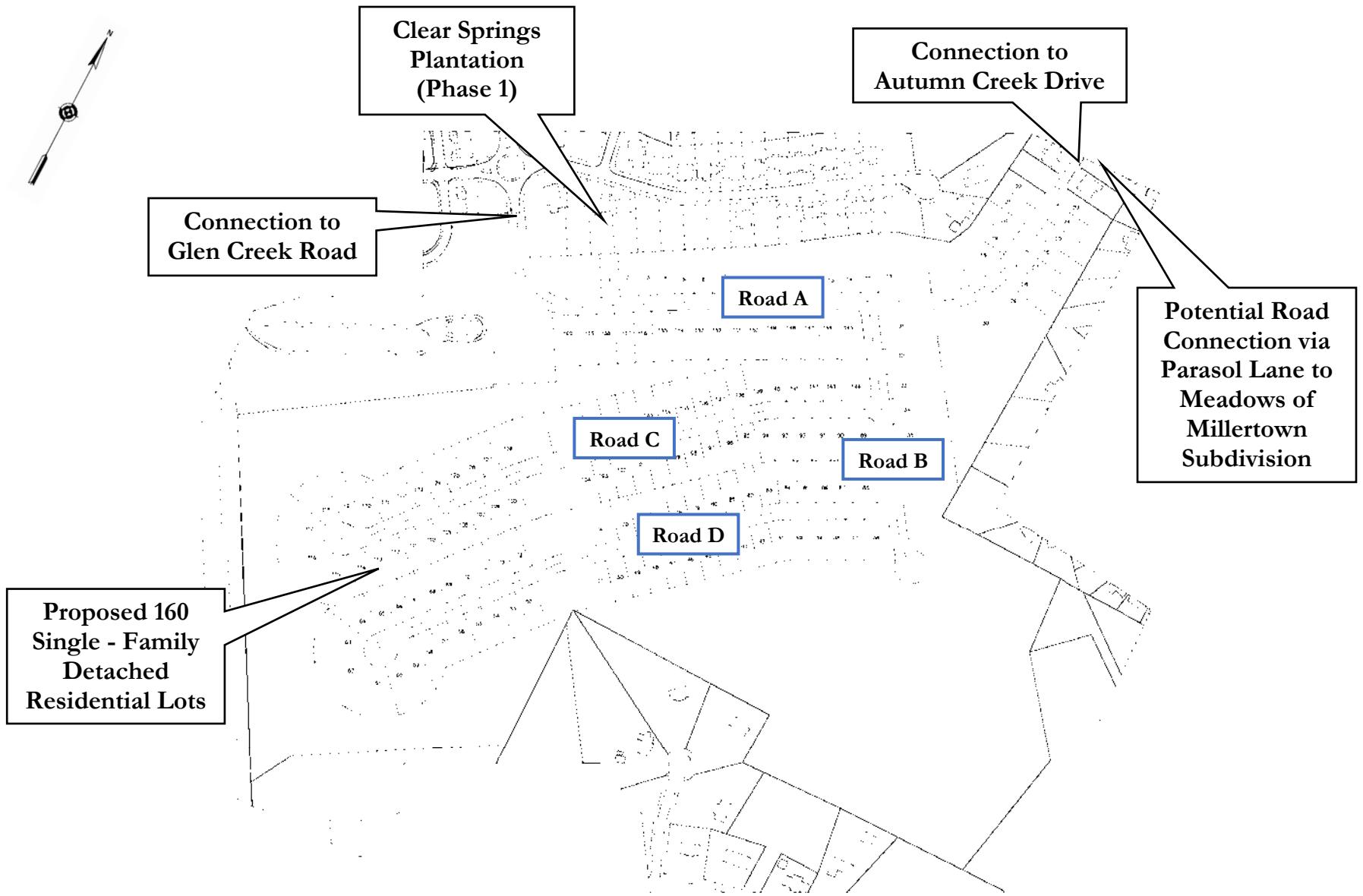


Figure 3
Proposed Plan Layout
The Highlands at Clear Spring

■ **PROPOSED USES AND ZONING REQUIREMENTS:**

The second phase of this residential development, The Highlands at Clear Spring, is expected to be comprised of three new internal roadways and an extension of Glen Creek Road and Autumn Creek Drive from Phase 1 with a maximum of 160 lots on approximately 63.7 acres.

The property for Phase 2 is currently zoned within Knoxville, TN as Planned Residential District (RP-1). This Planned Residential District (RP-1) allows for up to 24 dwelling units per acre. The development property, however, is currently zoned to allow 1 to 3 dwelling units per acre. The current zoning map for the project site is provided in Appendix E. The adjacent surrounding land uses for Phase 2 are the following:

- The property to the east is located outside the Knoxville city limits (within Knox County, TN) and is zoned as Planned Residential (PR) for the Meadows of Millertown subdivision. The property to the southeast is also outside the Knoxville city limits and is zoned General Residential (RB) and consists of single-family residences.
- To the west, the development property is bound by Norfolk Southern Railroad. The adjacent property to the southwest of the proposed development is outside the city limits and is zoned Low Density Residential (RA) and is undeveloped. Another adjacent property located to the northwest of the proposed development is within the city limits and is zoned General Agricultural District (A-1) and consists of Spring Place Church and a cemetery.
- To the south, the adjacent property is zoned General Residential (RB) and consists of the Spring Place subdivision.
- The property to the north, Clear Springs Plantation (Phase 1), is also zoned Planned Residential District (RP-1) with a density of 1 to 3 dwelling units per acre.

The Planned Residential District (RP-1) 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.

- **DEVELOPMENT DENSITY:**

The allowable density by the City of Knoxville for this development is 1 to 3 dwelling units per acre based on the zoning. 160 single-family residential detached lots located on 63.7 acres results in a density of approximately 2.51 dwelling units per acre.

- **ON-SITE CIRCULATION AND VEHICLE PARKING:**

Phase 2 of the proposed residential development is expected to be comprised of three new internal paved roadways and an extension of Glen Creek Road and Autumn Creek Drive from Phase 1. The three new internal roads will consist of cul-de-sacs. The new roads in Phase 2 shown in Figure 3 are labeled as Road “A” thru Road “D”. The road extension that connects Glen Creek Road and Autumn Creek Drive is labeled as Road “A” and is approximately 2,173 feet. The three new roads, Road “B”, “C”, and “D” combined length is approximately 4,224 feet. The total length of all new roadways in Phase 2 will be nearly 6,400 feet.

The internal roadways for the development will be paved, include extruded concrete curbing, and the lane widths will be 13 feet for a total of 26-foot pavement width within a 50-foot right-of-way. All the home sites will have 2 garage spaces for vehicle parking.

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

In addition to passenger vehicles, the proposed internal roadways will also provide access to service, delivery, maintenance, and fire protection vehicles. It is not expected that any of these vehicles will impact off-site adjacent roadway operations other than when these vehicle-types will occasionally enter and exit the development. The internal roadways in all portions of the development are expected to be able to accommodate these types of vehicles along with passenger vehicles.

TRAFFIC ANALYSIS OF EXISTING AND PROJECTED CONDITIONS

■ EXISTING TRAFFIC CONDITIONS

Traffic counts were conducted at the following existing unsignalized intersections as directed by the MPC:

- Millertown Pike at Glen Creek Road
- Old Millertown Pike at Glen Creek Road
- Glen Creek Road at Laurel Creek Way / Meadow Wells Drive
- Millertown Pike at Sable Point Lane / Mary Emily Lane

Traffic counts were obtained on Thursday, July 26th, 2018. The counts were conducted during the morning, mid-day, and afternoon peak periods. Local schools were not in session when the traffic counts were conducted.

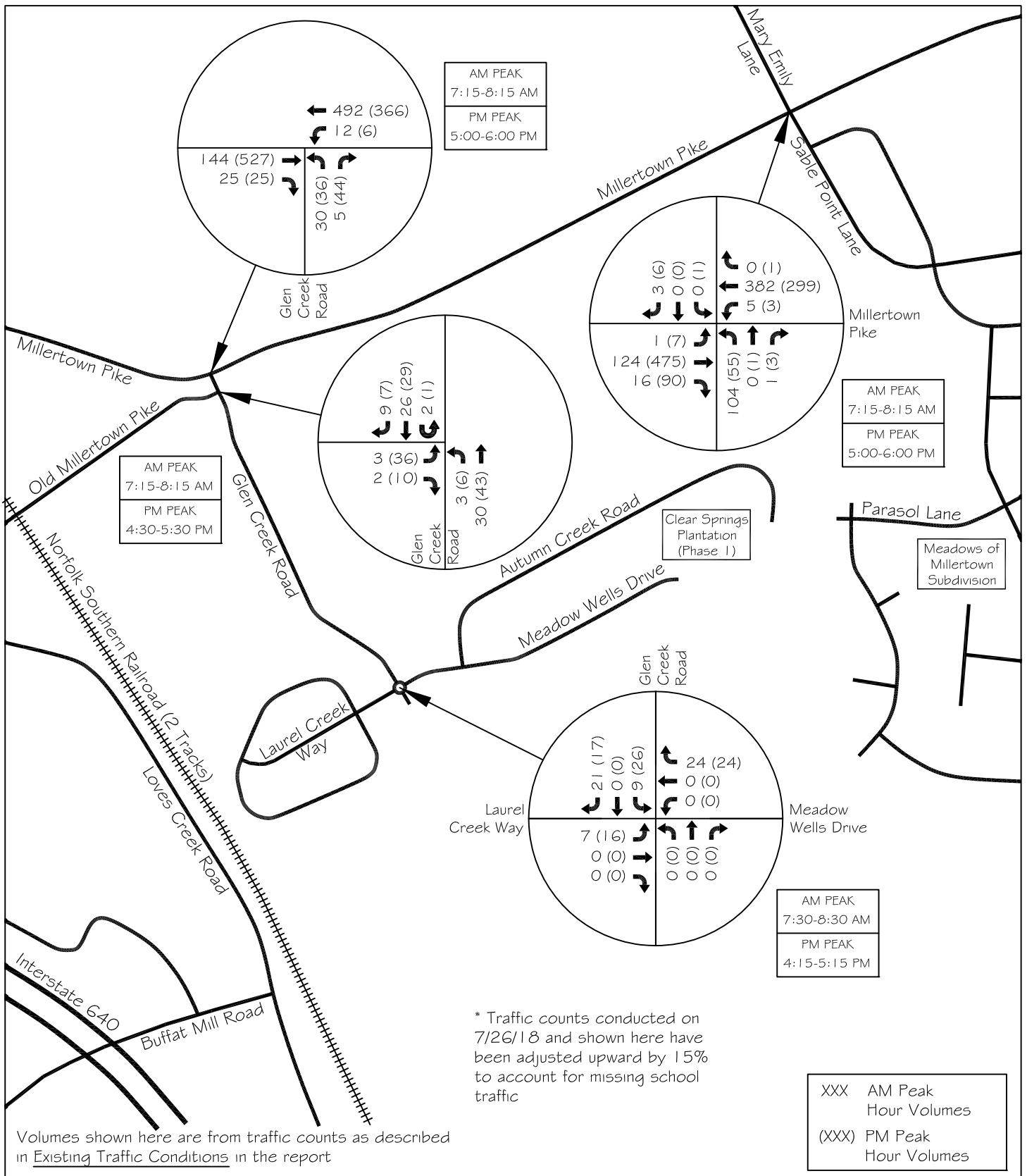
The intersections of Old Millertown Pike at Glen Creek Road, Glen Creek Road at Laurel Creek Way / Meadow Wells Drive, and Millertown Pike at Sable Point Lane / Mary Emily Lane were counted from 7 – 9 am and 3 – 6 pm. The intersection of Millertown Pike at Glen Creek Road was counted from 7 – 9 am, 11 am – 1 pm, and 2 – 6 pm. Based on the traffic volumes counted at the intersections, the AM and PM peak hour of traffic were observed at the following times:

- Millertown Pike at Glen Creek Road
7:15 – 8:15 AM / 5:00 – 6:00 PM
- Old Millertown Pike at Glen Creek Road
7:15 – 8:15 AM / 4:30 – 5:30 PM
- Glen Creek Road at Laurel Creek Way / Meadow Wells Drive
7:30 – 8:30 AM / 4:15 – 5:15 PM
- Millertown Pike at Sable Point Lane / Mary Emily Lane
7:15 – 8:15 AM / 5:00 – 6:00 PM

The manual tabulated traffic counts can be reviewed in Appendix F. In Figure 4, the volumes are shown from the existing traffic counts during the AM and PM peak hours

observed at each intersection. Based on the existing traffic counts conducted, and as shown in Figure 4, it appears that there is a significant amount of cut-through traffic utilizing Old Millertown Pike during the PM peak hour to reduce travel times heading east instead of using Millertown Pike. It is assumed that these motorists are coming from south Loves Creek Road or from motorists cutting through prior to the traffic signal at the intersection of Millertown Pike at Loves Creek Road. There were also a handful of motorists using the entrance of Millertown Pike at Glen Creek Road as a U-turn opportunity to change direction on Millertown Pike. Due to the on-going home construction occurring in the first phase of Clear Spring, a fair amount of entering and exiting traffic at Millertown Pike at Glen Creek Road consisted of construction vehicles.

It is expected that the AM and PM peak hour would be observed earlier if this traffic count was conducted while schools were in session. It is also expected that this report will be updated with new traffic counts once schools are back in session in August 2018. The existing counts that are shown in Appendix F have been adjusted in Figure 4 by increasing the observed volumes by 15% to account for the missing school traffic.



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FIGURE 4

The Highlands at Clear Spring

2018 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. Table 2 lists the level of service criteria for unsignalized intersections.

From the capacity calculations, the results from the existing peak hour vehicular traffic can be seen in Table 3 for the intersections. The intersections in the table are shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours. A v/c ratio of 1 would indicate that the traffic volumes are at the roadway capacity. Appendix G includes the worksheets from the capacity analyses for the existing peak hour vehicular traffic. All the studied intersection approaches and intersections are shown to operate at an adequate level during the existing AM and PM peak hours for vehicular traffic except for the northbound approach of Sable Point Lane at Millertown Pike which was calculated to be LOS E in the PM peak hour.

A/B



C/D



E/F



(Source: FDOT)

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
2018 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
Millertown Pike at Glen Creek Road	Unsignalized	Northbound Left/Right	B	14.0	0.113	C	17.3	0.285
		Westbound Left	A	7.7	0.014	A	8.8	0.015
Old Millertown Pike at Glen Creek Road	Unsignalized	Northbound Left	A	7.3	0.005	A	7.3	0.009
		Eastbound Left/Right	A	9.0	0.013	A	9.5	0.075
Glen Creek Road at Laurel Creek Way / Meadows Well Drive	Roundabout	Eastbound Left/Thru/Right	A	3.3	0.009	A	3.4	0.017
		Westbound Left/Thru/Right	A	3.5	0.037	A	3.4	0.024
		Northbound Left/Thru/Right	A	3.3	0.000	A	3.4	0.000
		Southbound Left/Thru/Right	A	3.5	0.032	A	3.6	0.052
Millertown Pike at Sable Point Lane / Mary Emily Lane	Unsignalized	Northbound Left/Thru/Right	C	20.1	0.336	E	44.9	0.550
		Eastbound Left	A	8.3	0.004	A	8.1	0.023
		Westbound Left	A	7.6	0.011	A	9.0	0.004
		Southbound Left/Thru/Right	B	11.4	0.014	C	15.8	0.039

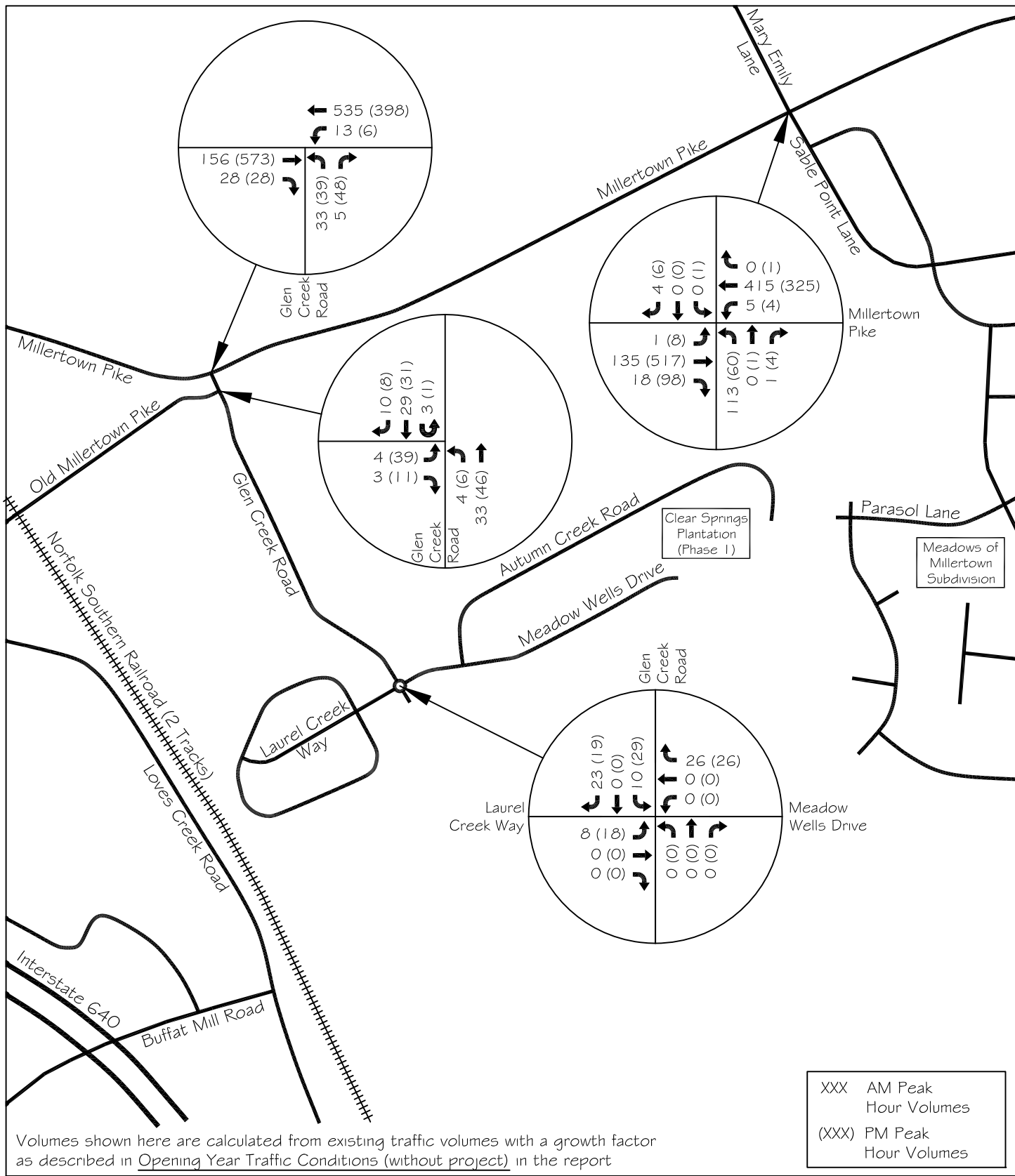
Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology for unsignalized intersections

■ **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 residential development were assumed to occur in the year 2022. This corresponds with nearly 3-1/2 years for the entire development to be constructed and reach full occupancy.

Vehicular traffic over the past 10 years has shown an average annual growth rate of 2.1% according to the TDOT count station on Millertown Pike (historical traffic data is shown in Appendix A). Currently, there are no known significant upcoming developments adjacent to the proposed site that would indicate large future increased traffic volumes in the study area. To ensure a reasonable traffic growth estimate for this study and to account for any potential traffic growth in the study area, an average annual growth rate of 2.5% was used to calculate future growth up to the year 2022 for the studied intersections. The results of this growth rate to the existing traffic volumes can be seen in Figure 5. Figure 5 shows the projected opening year traffic volumes in 2022 during the AM and PM peak hours without the project being developed.

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 northbound approach at the intersection of Millertown Pike and Sable Point Lane / Mary Emily Lane was calculated to operate at LOS F in the year 2022 during the PM peak. Table 4 reports the LOS designation, delay (in seconds), and v/c ratio (volume/capacity). Appendix G 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 intersections could potentially exist in the future even without the subsequent proposed residential project being fully constructed and developed.







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NORTH

FIGURE 5
 The Highlands at Clear Spring
 2022 Peak Hour Traffic Volumes -
 OPENING YEAR TRAFFIC (WITHOUT PROJECT)

TABLE 4
2022 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
Millertown Pike at Glen Creek Road	 Unsignalized	Northbound Left/Right	B	14.9	0.133	C	19.5	0.339
		Westbound Left	A	7.7	0.015	A	9.0	0.015
Old Millertown Pike at Glen Creek Road	 Unsignalized	Northbound Left	A	7.3	0.007	A	7.3	0.009
		Eastbound Left/Right	A	9.0	0.018	A	9.6	0.082
Glen Creek Road at Laurel Creek Way / Meadows Well Drive	 Roundabout	Eastbound Left/Thru/Right	A	3.3	0.011	A	3.5	0.018
		Westbound Left/Thru/Right	A	3.6	0.040	A	3.5	0.027
		Northbound Left/Thru/Right	A	3.3	0.000	A	3.4	0.000
		Southbound Left/Thru/Right	A	3.5	0.036	A	3.7	0.058
Millertown Pike at Sable Point Lane / Mary Emily Lane	 Unsignalized	Northbound Left/Thru/Right	C	23.3	0.400	F	67.3	0.703
		Eastbound Left	A	8.5	0.004	A	8.2	0.028
		Westbound Left	A	7.6	0.011	A	9.2	0.006
		Southbound Left/Thru/Right	B	11.9	0.020	C	17.4	0.044

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology for unsignalized intersections

■ **TRIP GENERATION**

A generated trip is a single or one-direction vehicle movement that is either entering or exiting the development site. The Trip Generation Manual, a publication of the Institute of Transportation Engineers, 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 estimated amount of traffic that will be generated by the single-family detached lots, the condominium units, and townhouses for this entire development (both phases) was calculated based upon rates and equations for peak hour trips provided by Trip Generation Manual, 9th Edition.

The trip generation data and calculations for the proposed land uses are shown in Appendix H. A summary of this information is presented in the following tables. Table 5a shows the overall total potential generated traffic for the entire development that includes Phase 1 and 2. Tables 5b and 5c show the potential generated traffic broken down into the 2-individual land uses in the development.

TABLE 5A
TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
Entire Development

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
Total New Volume Site Trips			2,801	53	163	216	175	101	276

In both phases with a total of 271 single-family detached residential lots, 8 condominiums, and 14 townhouses; based on the calculations, it is estimated that 53 vehicles will enter the development, 163 will exit, for a total of 216 new generated trips during the AM Peak Hour in the year 2022. Similarly, it is estimated that 175 vehicles will enter the development, 101 will exit, for a total of 276 new generated trips during the PM Peak Hour in the year 2022. The calculated trips generated for an average weekday could be expected to be 2,801 vehicles for the entire development. For this study, no trip reductions were included for pass-by or internal trips.

**TABLE 5B
TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
271 Single-Family Detached Homes**

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	271 Lots	2,628	25%	75%		63%	37%	
				50	150	200	163	95	258
Total New Volume Site Trips			2,628	50	150	200	163	95	258

ITE Trip Generation Manual, 9th Edition

**TABLE 5C
TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
22 Single-Family Attached Homes
(8 Condominiums + 14 Townhouses)**

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
#230	Residential Condominium / Townhouse	22 Dwellings	173	17%	83%		67%	33%	
				3	13	16	12	6	18
Total New Volume Site Trips			173	3	13	16	12	6	18

ITE Trip Generation Manual, 9th Edition

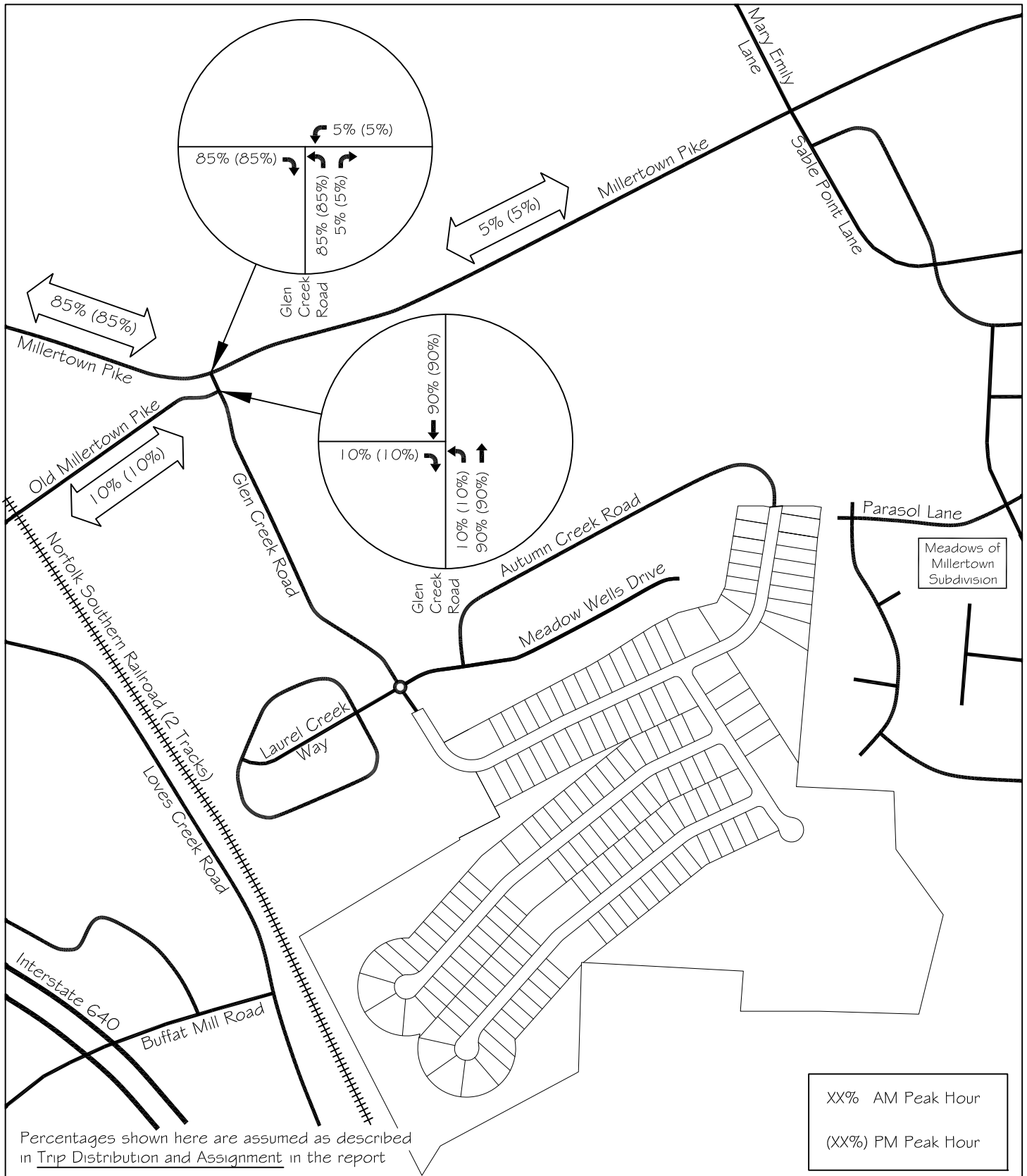
■ TRIP DISTRIBUTION AND ASSIGNMENT

Figure 6 shows the projected distribution for traffic entering and exiting for the entire development (both phases) during the future AM and PM peak hour at the existing intersections of Millertown Pike at Glen Creek Road and at Old Millertown Pike at Glen Creek Road. The percentages shown in the figure only pertain to the trips generated by the existing and proposed single-family detached homes from both phases and the existing condominium and townhouse units in Phase 1 that were calculated from the ITE trip generation rates.

There are a variety of destinations that will potentially “attract” the projected traffic to and from the new development. The vast majority of these will be to and from the west. These destinations will be accessed by utilizing Millertown Pike and Old Millertown Pike. In addition to employment centers and commercial development, traffic will travel to and from a variety of public and private elementary, middle, and high schools. This residential development is zoned for Rita Elementary School, Holston Middle School, and Gibbs High School.

Figure 7 shows the Traffic Assignment of the generated trips by the development at the studied intersections for traffic entering and exiting the development during the future AM and PM peak hours. This is based on the assumed distribution of trips shown in Figure 6 and the total trips generated shown in Table 5a.

The generated trips that are distributed and shown in Figure 7 at the roundabout intersection of Glen Creek Road at Laurel Creek Way / Meadow Wells Drive are based on the location of the various residential types within both phases of the development. The condominiums and townhouses from Phase 1 are all assigned entering and exiting the east side of the roundabout intersection. The single-family residential detached lots are portioned at the roundabout intersection based on 36 lots from Phase 1 located to the west side of the roundabout intersection, 75 lots from Phase 1 located to the east of the roundabout intersection, and the proposed 160 lots for Phase 2 located to the south of the roundabout intersection. These additional “portioning” calculations are shown with the trip generation calculations shown in Appendix H.



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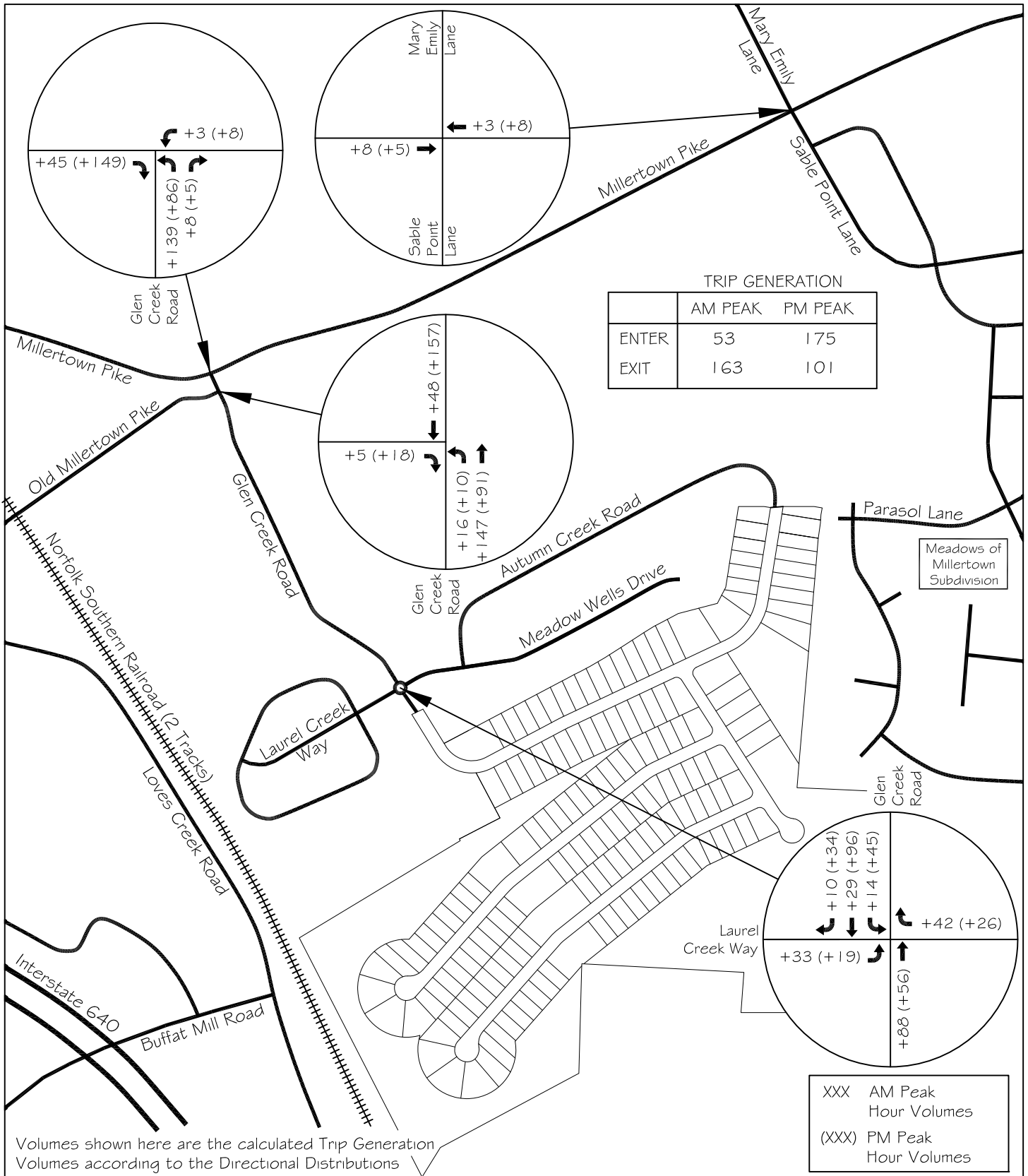
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FIGURE 6

The Highlands at Clear Spring

Directional Distribution of Generated Traffic during AM and PM Peak Hour



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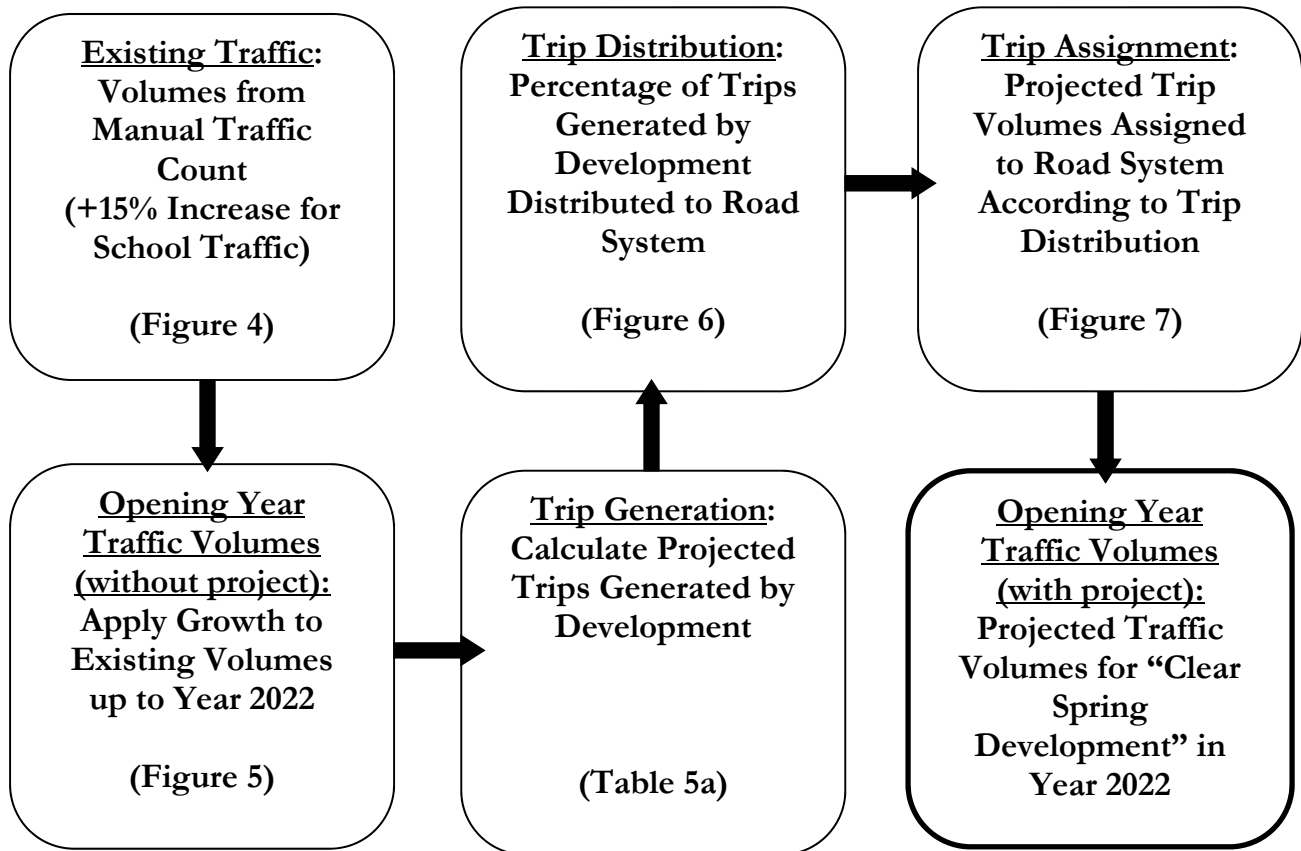
FIGURE 7

The Highlands at Clear Spring

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 the Clear Spring development (Phase 1, Clear Springs Plantation and Phase 2, The Highlands at Clear Spring) is fully constructed and occupied in the year 2022. The steps are illustrated below for clarity:



To calculate the total future projected traffic volumes at the studied intersections, the trips generated (from the ITE trip rates) by the entire residential development (both phases) were added to the 2022 opening year traffic volumes (shown in Figure 5) in accordance with the predicted directional distributions and assignments (shown in Figures 6 and 7). This procedure was necessary to obtain the total projected traffic volumes at the time the development is fully built-out and occupied in the year 2022. Figure 8 shows the projected AM and PM peak hour volumes at the studied intersections for the year 2022 with the development traffic.



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FIGURE 8
 The Highlands at Clear Spring
 2022 Peak Hour Traffic Volumes -
 OPENING YEAR TRAFFIC (WITH
 PROJECT)

Capacity analyses were conducted to determine the projected Level of Service for vehicles at the studied intersections for the year 2022 with the development traffic. Appendix G includes the worksheets for these capacity analyses.

The results of the capacity calculations of the projected 2022 peak hour vehicular traffic volumes at the studied intersections can be seen in Table 6 for the AM and PM peak hour. As can be seen in the table, the northbound turn movements at the intersection of Millertown Pike at Glen Creek Road are projected to operate at LOS F during the PM peak hour in the year 2022. The northbound intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane is also again projected to operate at LOS F in the PM peak hour as previously shown in Table 4 during the projected conditions without the project.

TABLE 6
2022 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
Millertown Pike at Glen Creek Road	 Unsignalized	Northbound Left/Right	D	33.0	0.703	F	87.6	0.964
		Westbound Left	A	7.8	0.019	A	9.9	0.043
Old Millertown Pike at Glen Creek Road	 Unsignalized	Northbound Left	A	7.5	0.036	A	7.8	0.029
		Eastbound Left/Right	B	10.6	0.040	B	13.1	0.176
Glen Creek Road at Laurel Creek Way / Meadows Well Drive	 Roundabout	Eastbound Left/Thru/Right	A	4.0	0.058	A	4.5	0.047
		Westbound Left/Thru/Right	A	4.9	0.121	A	4.0	0.058
		Northbound Left/Thru/Right	A	4.4	0.096	A	4.2	0.063
		Southbound Left/Thru/Right	A	4.1	0.103	A	5.7	0.272
Millertown Pike at Sable Point Lane / Mary Emily Lane	 Unsignalized	Northbound Left/Thru/Right	C	24.0	0.409	F	71.1	0.721
		Eastbound Left	A	8.5	0.004	A	8.2	0.028
		Westbound Left	A	7.6	0.011	A	9.3	0.006
		Southbound Left/Thru/Right	B	11.9	0.020	C	17.7	0.046

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology for unsignalized intersections

■ DISCUSSION OF VEHICLE CRASHES ON MILLERTOWN PIKE

As part of the study process, the MPC and the Knox County Engineering Department requested that the vehicle crash history be examined at and near the intersection of Millertown Pike at Glen Creek Road.

- The Knox County Engineering Department provided traffic crash data for the past 3-1/4 years at and near the intersection of Millertown Pike at Glen Creek Road. The crash data included the individual crash reports that were obtained for 6 crashes reported from the Knox County Sheriff's Department and 1 crash reported by the Tennessee Highway Patrol. Thus, over the past 3-1/4 years, the data showed a total of 7 vehicle crashes occurring at or near the intersection of Millertown Pike at Glen Creek Road. The traffic crash information is summarized in the following and the locations shown in Figure 9:

7 Total Vehicle Crashes from 5/17/15 to 7/25/18:

- Vehicle Crash Categories:
 - 4 Vehicle Crashes with no injuries (property damage only)
 - 2 Vehicle Crashes with three injuries (one incapacitating, one suspected serious, and one possibly injured)
 - 1 Vehicle Crash with one fatality
- Vehicle Crash Types:
 - 3 Rear-End crashes (no injuries or fatalities)
 - 2 Vehicle Crashes with objects (two injuries in 1 crash)
 - 1 Overturning Vehicle Crash (with one fatality)
 - 1 Vehicle Crash involving striking one pedestrian (one incapacitating injury)

Based on evaluating the obtained individual traffic crash reports from Millertown Pike, 5 of the 7 crashes occurred near the intersection and 2 of the crashes occurred at the intersection of Millertown Pike at Glen Creek Road. Based on a review of the 7 crashes; road conditions and weather did not appear to be a causative factor.

Of the three serious crashes involving injuries and the fatality, different factors and causes were contributed to the cause. They are summarized in the following:

- The fatality accident was a single vehicle crash. According to the traffic crash report, a driver in a concrete mixer truck was traveling westbound at excessive speed, failed to negotiate the road curve on Millertown Pike (west of Glen Creek Road), which caused the vehicle to overturn and strike a guardrail and a utility pole causing the fatality.
- The vehicle crash that caused 2 injuries when striking an object was also a single vehicle crash. According to the traffic crash report, a passenger vehicle was heading eastbound and operated by a driver who was impaired by alcohol. The vehicle left the roadway and struck a tree and injured the driver and a passenger. One of the injuries was “possible” and the other was suspected to be serious.
- The vehicle crash that involved injuring a pedestrian occurred at night when two pedestrians were attempting to cross Millertown Pike at Glen Creek Road. According to the traffic crash report, a driver in a passenger vehicle heading eastbound attempted to miss hitting the first pedestrian but ended up striking a second pedestrian causing an incapacitating injury.

The less serious vehicle crashes (vehicle property damage only) were rear-end crashes and one crash involving an object in the road. They are summarized in the following:

- The vehicle crash involving an object was an eastbound single vehicle crash that struck a deer in the roadway.
- The rear-end crashes occurred at 3 locations at or near the intersection of Millertown Pike at Glen Creek Road. One rear-end crash occurred west of Glen Creek Road due to a westbound vehicle queue from the signalized intersection of Millertown Pike at Mill Road. One rear-end crash occurred at the intersection of Millertown Pike at Glen Creek Road due to a westbound vehicle queue from a vehicle attempting to turn left onto Glen Creek Road. The other rear-end crash occurred due to one driver stopping quickly to avoid hitting a dog on Millertown Pike.

Vehicle Crashes

On Millertown Pike near Glen Creek Road
5/17/15 to 7/25/18

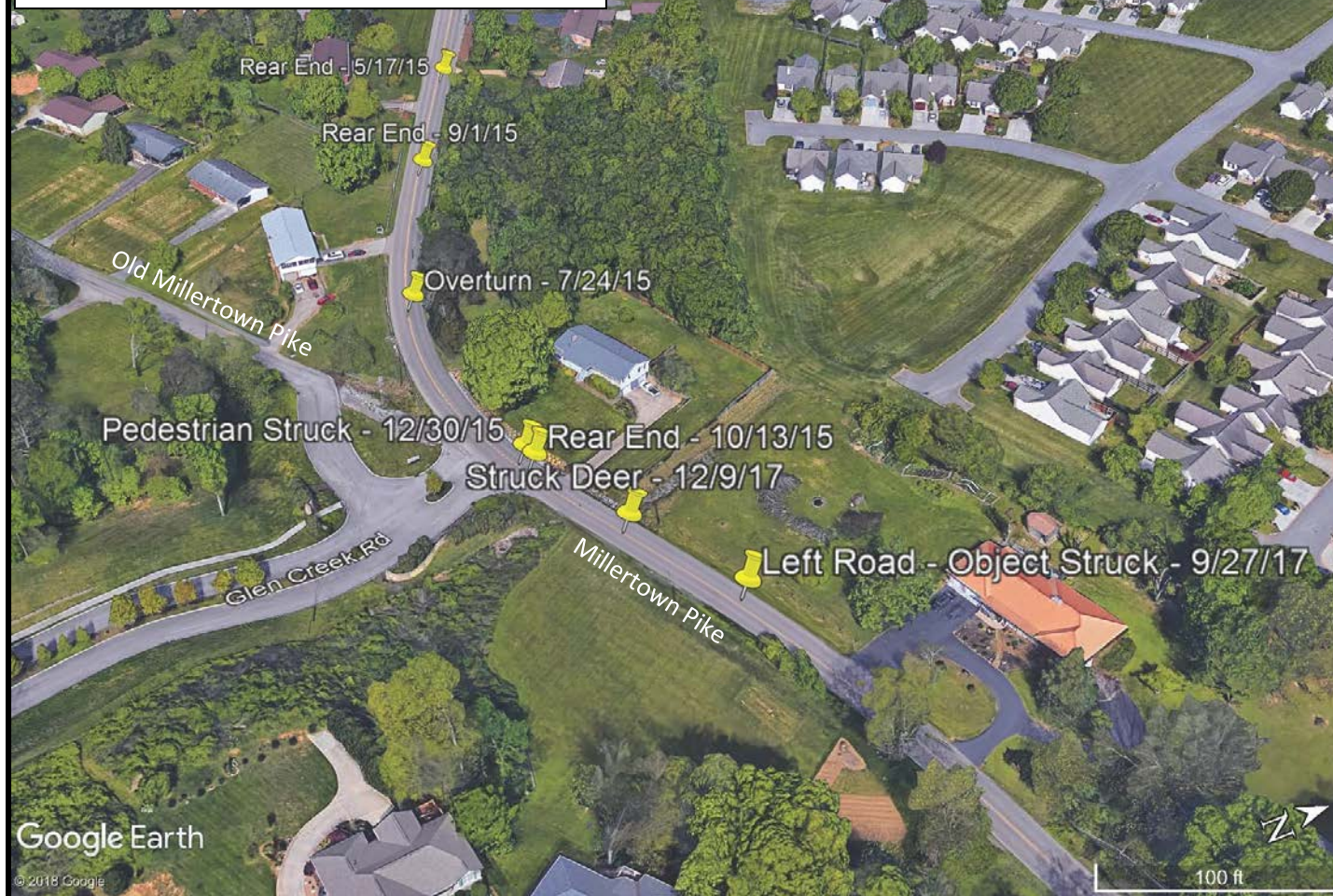


Figure 9
Vehicle Crash Locations
on Millertown Pike

Based on statewide vehicle crash data, TDOT has compiled and calculated statewide crash rates for various types of intersections, road sections, and road spots in Tennessee based on rolling data from the past 3 years of current data. (TDOT defines a spot location as a section of roadway less than or equal to 0.10 mile.) This data is categorized by urban and rural locations, route type (major collector, local, etc.), type of roadway facility (number of lanes, etc.), and location type (intersection, section, or spot). The statewide crash rate tables for intersections, sections, and spots from TDOT was obtained for this study and is provided in Appendix I.

The intersection of Millertown Pike at Glen Creek Road was calculated for an intersection crash rate. Additionally, a section was examined on Millertown Pike from just to the east and to the west of Glen Creek Road where the 7 crashes have occurred in the past 3 years over 0.13 mile.

TDOT has developed a crash analysis file that compares the actual crash rates at roadway intersections, sections, and spots versus the state average. Based on the number of crashes reported at the intersection of Millertown Pike at Glen Creek Road, and the section on Millertown Pike for the past 3 years; it does not appear that the calculated crash rates are considered high enough to obtain TDOT safety funding.

To obtain TDOT safety funding, the ratio of the actual crash rate to the critical crash rate (A/C ratio) would need to be 3.5 or higher. Appendix I includes the crash rate calculations for the intersection and road section. The calculations show the actual crash rate vs. the statewide average crash rate (A/S) and the ratio of the actual crash rate vs. the critical crash rate (A/C). The critical crash rate (A/C) gives more weight to specific crash severities while the statewide average comparison (A/S) only considers total numbers. The calculated ratios are shown in the following tables for the intersection and road section respectively:

Table 7
Crash Rates on Millertown Pike

Millertown Pike,	Knox County			LM 0.000
Intersection (Millertown Pike at Glen Creek Road)				
2 Crashes	- 2015 - 2018	Actual	- 0.242	Acc/MVM
State Average	- 0.121	Acc/MVM	Critical	- 0.463
A/S Ratio	= 2.00	A/C Ratio	= 0.52	
0 Fatal Crash	1 Incap. Injury Crash	0 Other Injury Crash		

Millertown Pike,	Knox County			LM 0.000
Section (east and west of Glen Creek Road)				
7 Crashes	- 2015 - 2018	Actual	- 6.630	Acc/MVM
State Average	- 2.832	Acc/MVM	Critical	- 7.117
A/S Ratio	= 2.34	A/C Ratio	= 0.93	
1 Fatal Crash	1 Incap. Injury Crash	2 Other Injury Crash		

▪ **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.

➤ **EVALUATION OF TURN LANE THRESHOLDS**

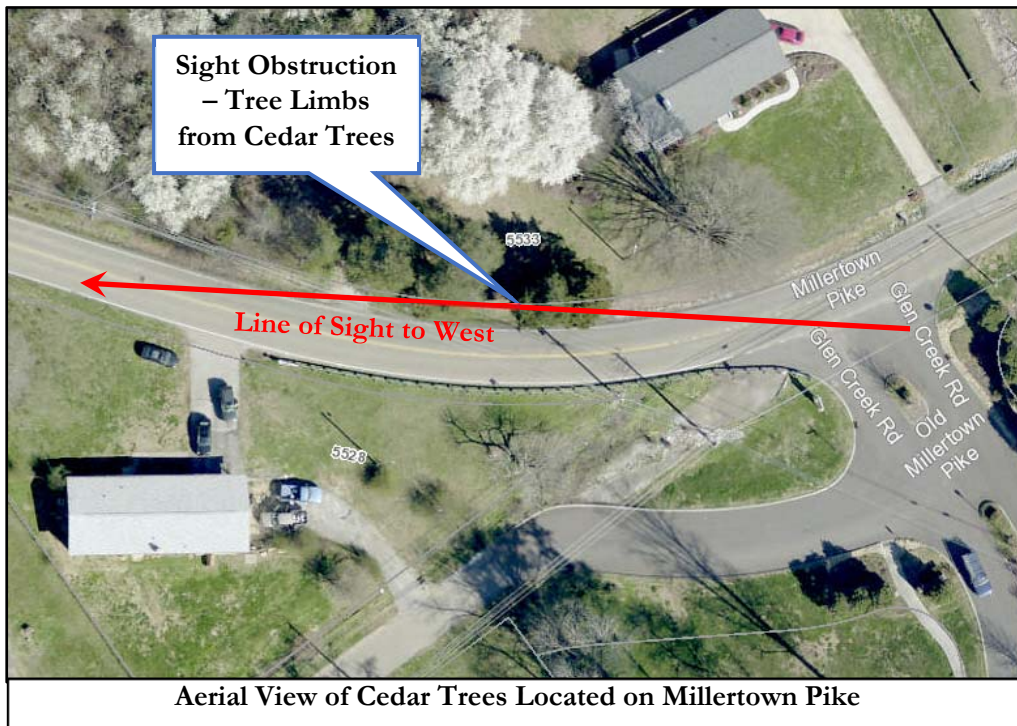
The Millertown Pike at Glen Creek Road intersection was evaluated for the need for separate turn lanes on Millertown Pike for entering vehicles into the development. Based on the projected traffic volumes at the intersection of Millertown Pike at Glen Creek Road and according to “Knox County’s Access Control and Driveway Design Policy”, a separate left turn lane is not warranted, but a right turn lane is warranted for entering vehicles. The Knox County turn lane policy worksheet is in Appendix J. The results shown in the Appendix are based on the projected volumes during the AM and PM peak hour. The PM peak hour projected traffic volumes are estimated to be at a level that will require the need for a separate right turn lane for eastbound right turns off Millertown Pike onto Glen Creek Road.

The design policy for turn lane warrants relates volume thresholds based on prevailing speeds for two-lane roadways. The speed classification that was chosen for this evaluation was based on the posted speed limit of 40 mph. Therefore, this study evaluation used the Knox County classification for speeds of 36 mph – 45 mph and the calculated projected volumes.

➤ **EVALUATION OF SIGHT DISTANCE**

Based on a posted speed limit of 40 mph on Millertown Pike, the required intersection sight distance should be a minimum of 400 feet looking east and west on Millertown Pike from Glen Creek Road based on Knox County policy of requiring 10 feet of sight distance per 1 mph of speed. The sight distance at the intersection of Glen Creek Road at Millertown Pike was measured on September 5th, 2018 by Scott Williams, PE, RLS. The following results were obtained from Glen Creek Road at Millertown Pike: the sight distance looking to the west (left) is 362 feet and the sight distance looking to the east (right) is 478 feet. These measurements were taken on Glen Creek Road 15 feet away from the edge of pavement of

Millertown Pike. The surveyor believes that 400 feet of sight distance is potentially available looking to the west (left) if tree limbs are removed from the cedar trees located on the north side of Millertown Pike (and west of the intersection). It is believed that the cedar tree limbs are within the right-of-way, however, the trees themselves are located on private property at 5533 Millertown Pike.



CONCLUSIONS AND RECOMMENDATIONS

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

1) MILLERTOWN PIKE AT GLEN CREEK ROAD

- 1a) A separate right turn lane on Millertown Pike for turning vehicles onto Glen Creek Road is recommended based on the projected volumes. The Millertown Pike at Glen Creek Road intersection turn lane evaluation was evaluated based on the projected 2022 traffic volumes at the intersection and according to “Knox County’s Access Control and Driveway Design Policy”.

The traffic impact study for the original development that was conducted in 2005 by Wilbur Smith Associates also recommended a right turn lane be constructed for entering traffic off Millertown Pike onto Glen Creek Road. As recommended in the original study; this current study also recommends that this right turn lane be 100 feet in length with a 150-foot taper length. As stated in the original traffic study, the length recommended by A Policy on Geometric Design of Highway and Streets by AASHTO (American Association of State Highway and Transportation Officials) is 330 feet to decelerate from 40 mph. However, this recommended length is based on vehicles coming to a complete stop and the right turning vehicles coming off Millertown Pike onto Glen Creek Road will not completely stop. A 100 -foot right turn storage length is a reasonable distance that is consistent with similar developments in Knox County. The taper length is based on 11-foot wide lanes on Millertown Pike and an approach speed of 40 mph.

There is a residential driveway located to the west of this intersection at 5528 Millertown Pike. This existing residential driveway could reduce the amount of distance available to construct a right turn lane with a recommended 100 feet of storage and a 150-foot taper length. Once an accurate survey and design is completed, the available right turn lane length will be more defined. If there is not

enough distance in between Glen Creek Road and the residential driveway, it is recommended that the 150-foot taper be maintained, and the storage length be reduced to no less than a total of 75 feet.

Scott Williams, PE, RLS has completed a rough layout of the right turn lane on Millertown Pike and this layout is included in Figure 10. The construction of this turn lane will involve relocating guardrail, a utility pole, and will also require property acquisition and fill slopes.

The developer is planning on designing and constructing the right turn lane on Millertown Pike as soon as The Highlands at Clear Spring has been approved by the County.

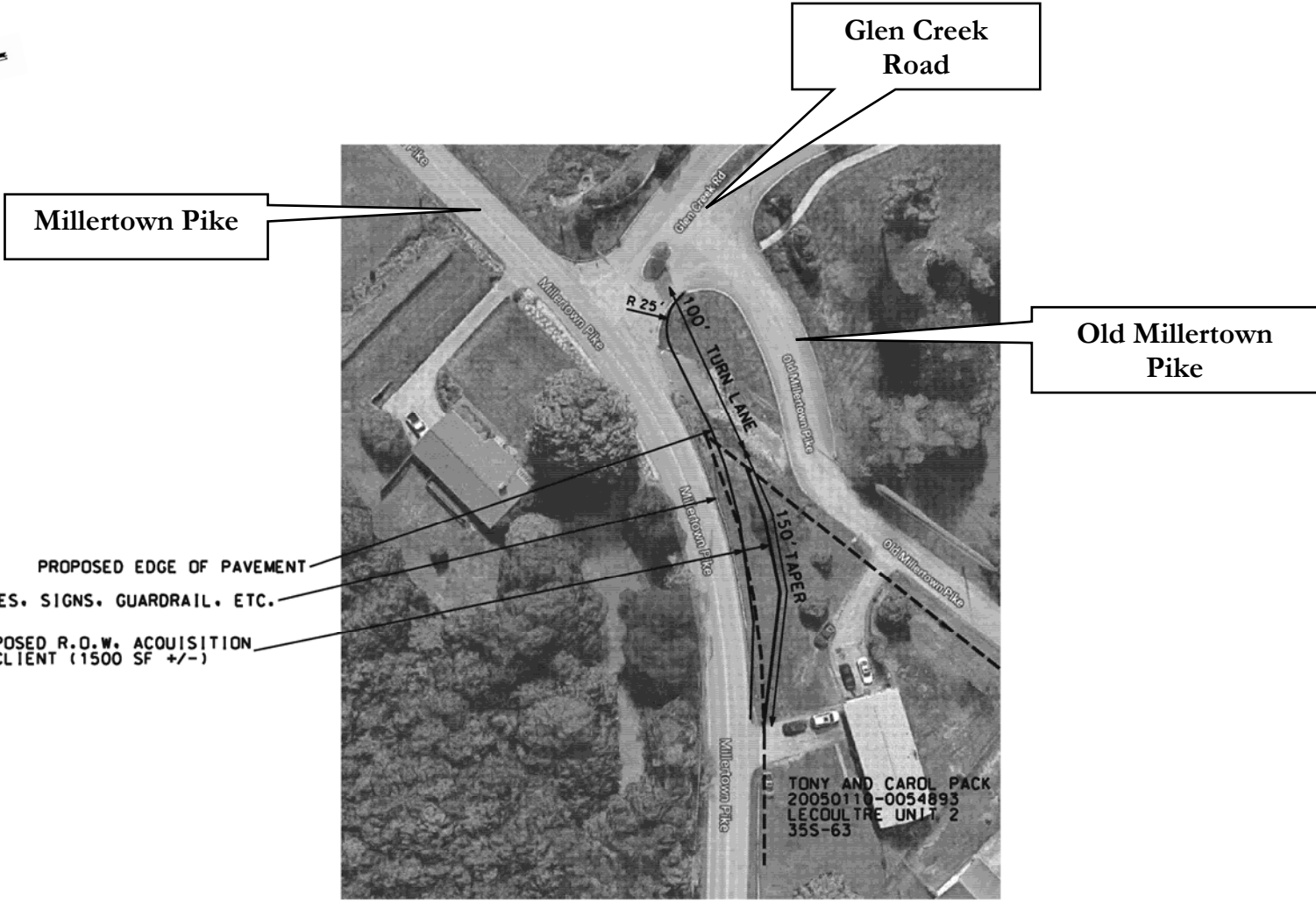
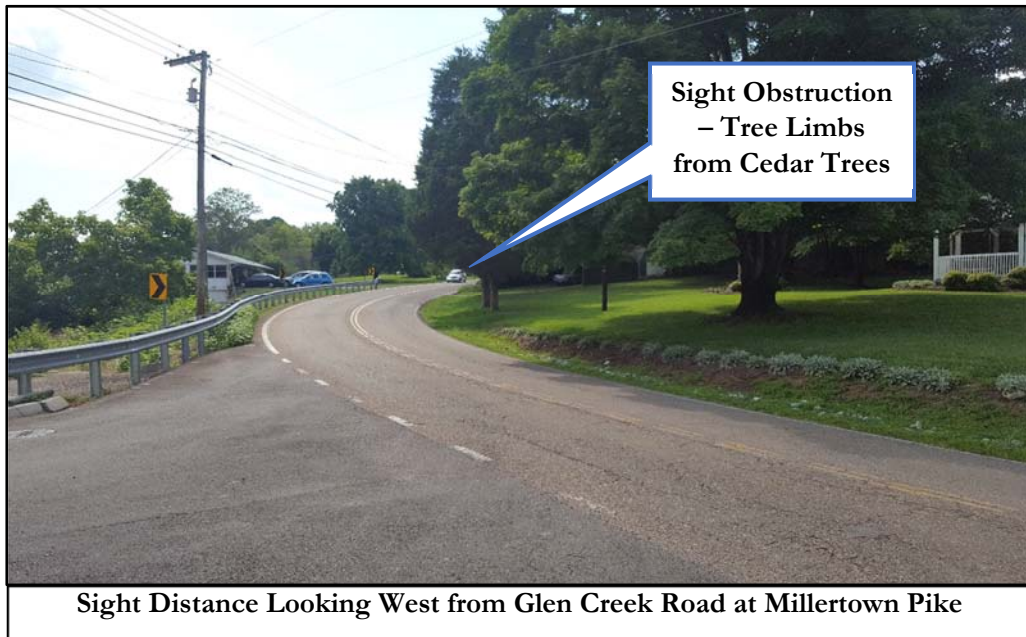


Figure 10
Proposed Right Turn Lane
Millertown Pike at Glen Creek Road
(NTS)

1b) Based on a posted speed limit of 40 mph on Millertown Pike, the required intersection sight distance should be a minimum of 400 feet looking east and west from Glen Creek Road. The sight distance was measured by a licensed land surveyor and determined that the sight distance looking to the west (left) is 362 feet and the sight distance looking to the east (right) is 478 feet. These measurements were taken on Glen Creek Road 15 feet away from the edge of pavement of Millertown Pike. The surveyor believes that 400 feet of sight distance is potentially available looking to the west (left) if tree limbs are removed from the cedar trees located on the north side of Millertown Pike (and west of the intersection). It is believed that the cedar tree limbs are within the right-of-way, however, the trees themselves are located on private property. The images below give an indication of the current view available looking east and west on Millertown Pike from Glen Creek Road and the sight obstructions and potential sight obstructions.





It is recommended that the limbs from the cedar trees on the north side of Millertown Pike (at 5533 Millertown Pike) be removed/trimmed to increase and maximize the sight distance looking to the west from Glen Creek Road. The sight distance in both directions at this intersection on Millertown Pike will need to be maintained in the future.

In addition, due to the minimal sight distance available looking to the west from Glen Creek Road, it is recommended that a Side Road Sign (W2-2) be installed for eastbound traffic on Millertown Pike just prior to the beginning of the proposed right turn lane. This sign should be located at least 250 feet away to the east of the existing Reverse Turn Sign (W1-3) that is located across from 5521 Millertown Pike. This Side Road Sign is recommended to warn eastbound approaching motorists of the upcoming Glen Creek Road intersection since the intersection sight distance is at a minimum and because the intersection is not readily visible due to it being located on a horizontal curve.




W2-2

- 1c) This intersection was calculated currently to operate adequately in 2018 but projected to operate poorly with respect to the level of service for northbound turns during the year 2022 when the development is expected to be fully constructed and

occupied.

Capacity analyses were re-calculated for the intersection of Millertown Pike at Glen Creek Road with an eastbound right turn lane added to the intersection as recommended. Appendix G includes the worksheets for these capacity analyses. The results of the capacity calculations with the projected 2022 peak hour vehicular traffic volumes at this intersection and including an eastbound right turn lane reduced the delay for the northbound approach by over 30 seconds in the PM peak hour. This is due to the large amounts of right turns being removed from the thru lane movement. The results are shown below in Table 8.

TABLE 8
2022 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT)
MILLERTOWN PIKE AT GLEN CREEK ROAD WITH ADDED EB RIGHT TURN LANE

INTERSECTION	TRAFFIC CONTROL	APPROACH	AM PEAK			PM PEAK		
			LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Millertown Pike at Glen Creek Road	 Unsignalized	Northbound Left/Right	D	30.2	0.675	F	54.2	0.827
		Westbound Left	A	7.6	0.018	A	8.9	0.035

Note: All analyses were calculated in Synchro 8 software and reported with HCM 2010 methodology for unsignalized intersections

In addition, it is expected that the influence of the traffic signal at Mill Road west of the intersection of Millertown Pike and Glen Creek Road will provide gaps in the traffic flow along Millertown Pike and this will allow greater egress than can be modeled in this analysis. There are also additional factors that would indicate this intersection will operate at a higher level of service in the projected conditions. First, the existing traffic generated by the existing homes in Phase 1 are included in the capacity calculations. Including these volumes in the calculations overestimates (double counts) the projected traffic volumes in the year 2022. Secondly, the existing traffic count showed that a substantial number of eastbound motorists are using Old Millertown Pike as a cut-through or as a time-saving route to head east on Millertown Pike during the PM peak hour. This was observed from the significant amount of eastbound left turns at Old Millertown Pike at Glen Creek Road and subsequent right turns at Millertown Pike at Glen Creek Road. It is suspected that as the Clear Spring development increases in size and increases the

amount of northbound traffic at Millertown Pike at Glen Creek Road, it is expected that fewer motorists will use Old Millertown Pike as a cut-through or as a time-saving route to head east on Millertown Pike. This would then reduce the overall northbound volumes and decrease delay at the intersection of Millertown Pike at Glen Creek Road.

- 1d) As an investigation into a potential remediation for the projected high northbound vehicle delays, this intersection was examined with the projected 2022 traffic volumes with respect to traffic signal warrants. The traffic counts at this intersection were conducted from 7-9 am, 11 am–1 pm and 2-6 pm for a total of 8 hours.

The Manual on Uniform Traffic Control Devices – 2009 Edition (MUTCD) presents 9 different warrants that have been developed by the traffic engineering profession to determine whether a traffic signal is warranted. These warrants cover a broad range of minimum elements required to indicate whether a traffic signal is justified for any particular location. These elements consist of traffic volumes, pedestrian volumes, crash history, and other factors. The MUTCD explicitly states that a traffic control signal should not be installed unless one or more of the signal warrants in the manual are met. However, the satisfaction of a warrant does not entirely in itself justify the need for a traffic signal. Sometimes further engineering studies and judgments also need to be applied before justifying the need for a traffic signal to be installed. These further studies are a very important step in ensuring that an installation of a traffic signal will not actually bring about degradations in safety and efficiencies.

The MUTCD defines 9 different warrants, two of which are potentially applicable for this intersection at this time and are explained below:

■ Warrant 1, Eight-Hour Vehicular Volume:

Warrant 1 is comprised of 2 conditions – A and B. The Minimum Vehicular Volume, Condition A, is intended for application where the volume of intersecting traffic is the principal reason for consideration of signal installation. The Interruption of Continuous Traffic, Condition B, is intended for

application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

■ Warrant 2, Four-Hour Vehicular Volume:

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

The intersection of Millertown Pike and Glen Creek Road was evaluated for possible justification for a traffic signal based on the MUTCD Warrants listed above and the projected 2022 traffic count volumes. Glen Creek Road was used as the minor side street for the warrant analysis and Millertown Pike was the major street. The analysis shows that this intersection does not meet Warrant 1 or 2 in the projected 2022 conditions. The results of the traffic signal warrant assessment at this intersection for the projected volumes of 2022 are in Appendix K.

- 1e) As part of the analysis of the intersection, the projected queue length of the northbound lane on Glen Creek Road in the year 2022 was calculated.

To estimate the projected queue length, SimTraffic (Version 8) software was employed. SimTraffic performs micro-simulation and animation of vehicular traffic and calculates various vehicle parameters such as intersection vehicle queue lengths. Based on the projected volumes during the AM and PM peak hours, the 95th percentile queue lengths were calculated. The 95th percentile queue is the recognized measurement in the traffic engineering profession as the design standard used when considering vehicle queue lengths. A 95th percentile queue means that there is a 95% certainty the queue will not extend beyond that point. The calculated queue results were based on averaging the outcome obtained during 10 traffic simulations. The queue results from the SimTraffic software are in Appendix L.

The results shown in the Appendix indicate that the 95th percentile queue length for the northbound approach of Glen Creek Road at Millertown Pike was

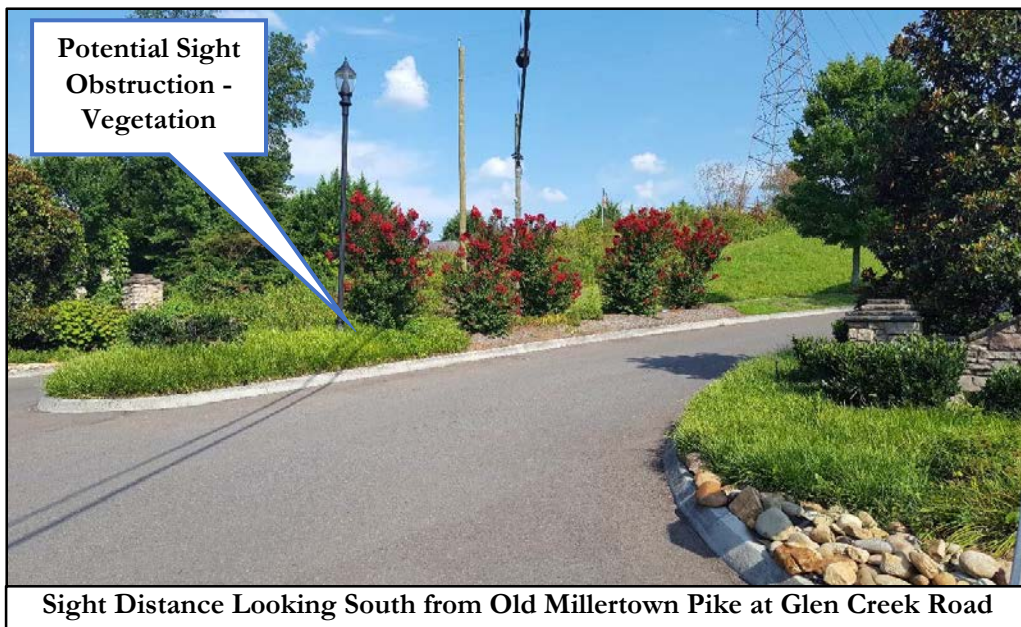
calculated to be 31 feet during the projected AM peak hour and 31 feet during the projected PM peak hour in the year 2022. This would indicate that even though the level of service will be quite poor during these peak hours, the estimated queue lengths are reasonable. A queue length of 31 feet would be just over one car length.

If the projected turns at the northbound approach at the intersection of Millertown Pike at Glen Creek Road were more balanced between left and right turns, an argument could be made to recommend separate left and right turn lanes. Since the vast majority of northbound traffic will turn left to head west, coupled with the minimal queue lengths, it is believed that constructing another lane would not be justified despite the poor level of service during the peak periods.

- 1f) Based on the number of crashes reported at the intersection of Millertown Pike at Glen Creek Road, and the section on Millertown Pike for the past 3 years; it does not appear that the calculated crash rates are considered high enough to obtain TDOT safety funding.
- 1g) The approach of Glen Creek Road at Millertown Pike has a Stop Sign (R1-1) installed but it is recommended to also have a 24" white stop bar installed.

2) **OLD MILLERTOWN PIKE AT GLEN CREEK ROAD**

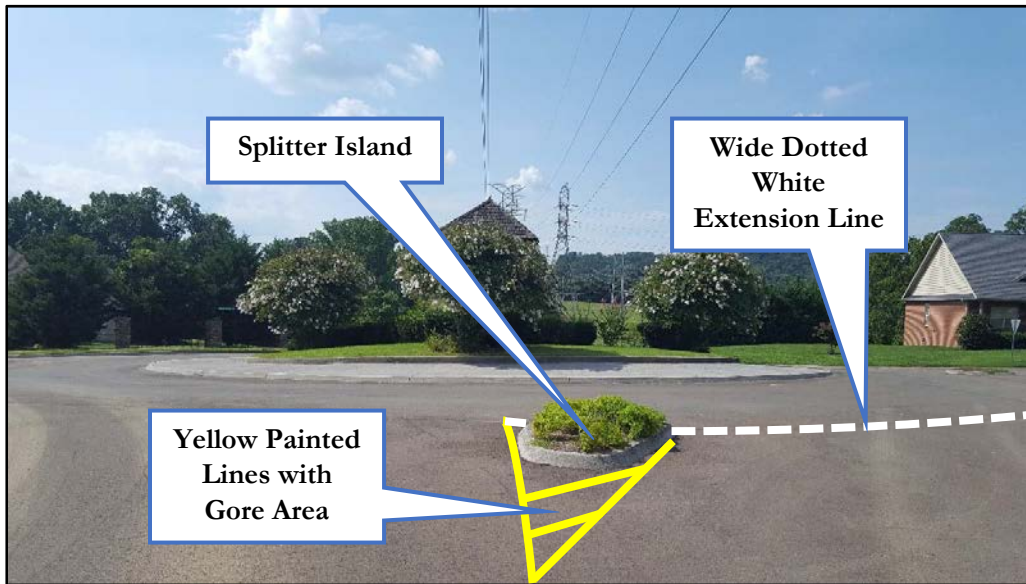
- 2a) The intersection of Old Millertown Pike at Glen Creek Road was calculated to operate very well with respect to level of service under unsignalized conditions in the year 2022.
- 2b) Vegetation in the landscaped island on Glen Creek Road could cause issues with sight distance if it is not properly maintained. Landscaping will need to be maintained on a regular basis to ensure proper sight distance. The image below gives an indication of the current view available looking south on Glen Creek from Old Millertown Pike.



- 2c) The approach of Old Millertown Pike at Glen Creek Road has a Stop Sign (R1-1) installed but it is recommended to also have a 24” white stop bar installed.

3) GLEN CREEK ROAD AT LAUREL CREEK WAY / MEADOW WELLS DRIVE

- 3a) The intersection of Glen Creek Road at Laurel Creek Way / Meadow Wells Drive was calculated to operate very well with respect to level of service under unsignalized (roundabout) conditions in the year 2022.
- 3b) The existing roundabout approaches need to be marked with the appropriate pavement markings as shown in Chapter 7 of the Roundabout – An Informational Guide, 2nd Edition and in the MUTCD. At a minimum, it is recommended that the splitter islands be marked with yellow lines on each side of the islands and with a gore area to help delineate the separation of traffic and the presence of the splitter islands. It is also recommended that a wide dotted white extension of the circulatory roadway edge line be installed at each roundabout entering approach. Refer to Chapter 3C, Roundabout Markings in the MUTCD for further details.



3c) Intersection sight distance at the roundabout must not be impacted by future landscaping or signage. The landscaped vegetation will need to be maintained in the future.

4) MILLERTOWN PIKE AT SABLE POINT LANE / MARY EMILY LANE

4a) This intersection was calculated to be operating poorly in the PM peak hour with respect to the level of service for the northbound during the existing conditions. The northbound approach was calculated to operate at LOS E currently and estimated to be LOS F in the year 2022. For the analysis of this intersection in the year 2022, no traffic volumes were added or removed except for the thru volumes on Millertown Pike associated with the increased trips generated to and from the east for the Clear Spring development. This intersection currently provides the sole access to Millertown Pike for the Meadows of Millertown subdivision.

This intersection was included in this study due to the possibility for the second phase of Clear Spring to include completing a road link in between the Clear Spring development and the existing residential development to the east, Meadows of

Millertown, by extending Parasol Lane. This would provide both residential developments with secondary access points to and from Millertown Pike. If this link is provided, it is estimated that a portion of the traffic generated by the Meadows of Millertown could shift their driving patterns by utilizing this link. It is assumed that this link will be attractive to some of the Meadows of Millertown residents to reduce their travel times since most of the traffic in the study area travels to and from the west. For the same reason, it is not expected that any traffic to and from the Clear Spring development will utilize this potential link to access the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane to and from the east.

Based on projected travel times, at most, it is estimated that 50 homes (some of the homes on Parasol Lane, and the homes on Mosaic Lane, Grasswalk Lane, Gateswalk Lane, and Wallflower Lane) out of the existing 201 lots of Meadows of Millertown would consider traveling to and from the Clear Spring development to reduce travel time and distance. 50 single-family detached homes would result in an additional 45 trips during the AM peak hour and 57 trips during the PM peak hour traveling to the intersection of Millertown Pike at Glen Creek Road via Parasol Lane and would cause a similar reduction of the number of trips at the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane.

However, it is theorized that some of these residents using the new route via Parasol Lane would reconsider and return to using the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane. As more residents use this new road link and delays increase at the intersection of Millertown Pike at Glen Creek Road, the residents will perceive that the travel time and distance saved is negated and will revert to the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane.

- 4b) As part of the analysis of the intersection, the projected queue length of the northbound lane on Sable Point Lane at Millertown Pike in the year 2022 was calculated. To estimate the projected queue length, SimTraffic (Version 8) software was employed. Based on the projected volumes during the AM and PM peak hours, the 95th percentile queue distance was calculated. The calculated queue results were

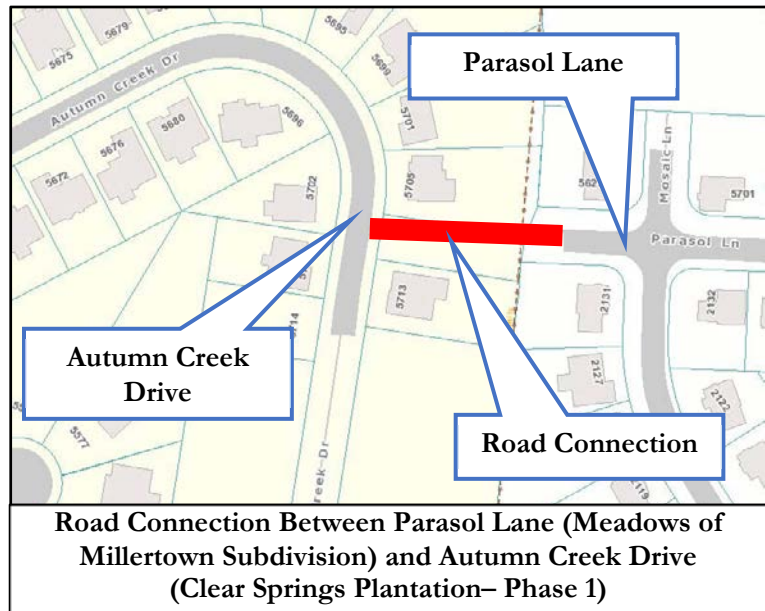
based on averaging the outcome obtained during 10 traffic simulations. The queue results from the SimTraffic software are in Appendix L.

The results shown in the Appendix indicate that the 95th percentile queue length for the northbound approach of Sable Point Lane at Millertown Pike was calculated to be 65 feet during the projected AM peak hour and 61 feet during the projected PM peak hour in the year 2022. This would indicate that even though the level of service will be quite poor during the peak hours, the estimated queue lengths are reasonable. A queue length of 68 feet would be around three car lengths.

If the projected turns at the northbound approach at the intersection of Millertown Pike at Sable Point Lane / Mary Emily Lane were more balanced between left and right turns, an argument could be made to recommend separate left and right turn lanes. Since the vast majority of northbound traffic will turn left to head west, coupled with the minimal queue lengths, it is believed that constructing another lane would not be justified despite the poor level of service during the peak periods.

5) PARASOL LANE ROAD CONNECTION

As described earlier, with the construction of The Highlands at Clear Spring, the developer is offering to provide a connection between the existing residential subdivisions of Clear Springs Plantation and the Meadows of Millertown. This link would provide a secondary access point



for each subdivision to Millertown Pike.

The proposed road connection link will occur in between Autumn Creek Drive and Parasol Lane. Parasol Lane will need to be extended approximately 215 feet. The corridor where the road connection would traverse in between the two subdivisions is currently an empty lot in the Clear Springs Plantation subdivision. The road connection (via the extension of Parasol Lane) will require a Stop Sign (R1-1) be installed for the westbound approach at Autumn Creek Drive. Based on a posted speed limit of 25 mph within the subdivision, sight distance at this intersection will need to be provided to ensure that there is at least 250 feet of sight distance looking north and south from Parasol Lane on Autumn Creek Drive. This may require obtaining a sight distance easement for the properties to the northwest due to the sharp horizontal curve of Autumn Creek Drive.

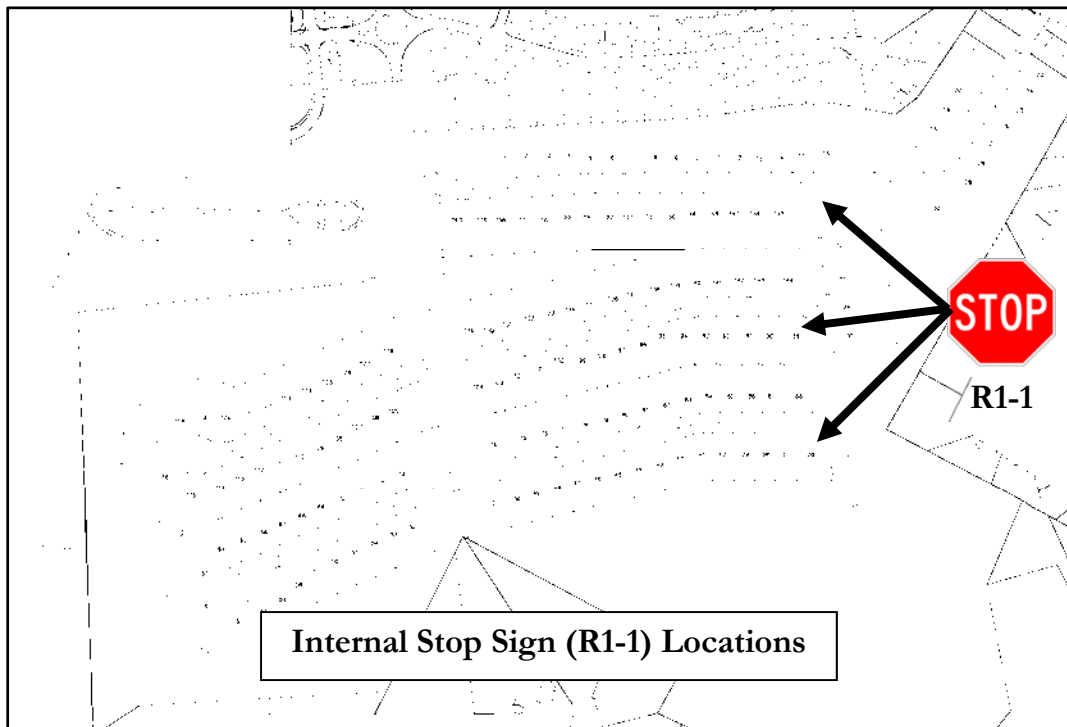


**Current End of Parasol Lane
(Looking West Towards Clear Springs Plantation)**

6) THE HIGHLANDS AT CLEAR SPRING SUBDIVISION INTERNAL ROADS

The current concept plan shows three new roads and the extension of two existing roads being constructed within The Highlands at Clear Spring as shown in Figure 3.

- 6a) It is recommended that a 25-mph speed limit be posted at the entrance of the Clear Spring development on Glen Creek Road just to the south of Old Millertown Pike.
- 6b) Stop Signs (R1-1) should be installed at the internal intersections as shown below:



- 6c) All drainage grates and covers for the residential development need to be pedestrian and bicycle-safe.
- 6d) Sight distance at the new internal intersections must not be impacted by new signage, future landscaping, or parked vehicles.

- 6e) The internal sidewalks that are proposed for the development should have appropriate ADA compliant curbed ramps at intersection corners and the sidewalks are recommended to be 5 feet minimum in width.

- 6f) All road grade and intersection elements internally and externally should be designed to AASHTO, TDOT, and Knoxville Engineering specifications and guidelines to ensure proper operation.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

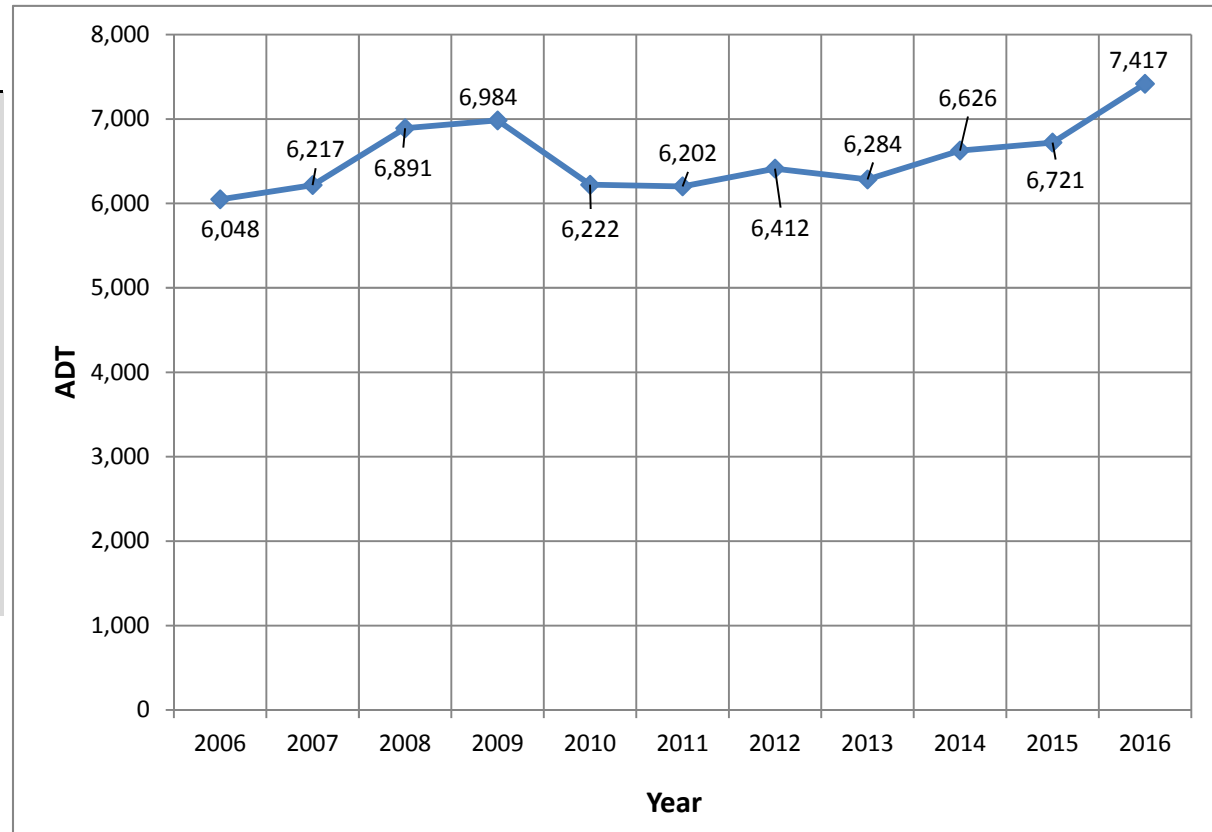
Historical Traffic Counts

Organization: TDOT

Station ID #: 000261

Location: Millertown Pike (North of John Sevier)

YEAR	ADT	Trendline
2006	6,048	
2007	6,217	
2008	6,891	
2009	6,984	
2010	6,222	
2011	6,202	
2012	6,412	
2013	6,284	
2014	6,626	
2015	6,721	
2016	7,417	



2006- 2016 Growth Rate = 22.0%

Average Annual Growth Rate = 2.1%



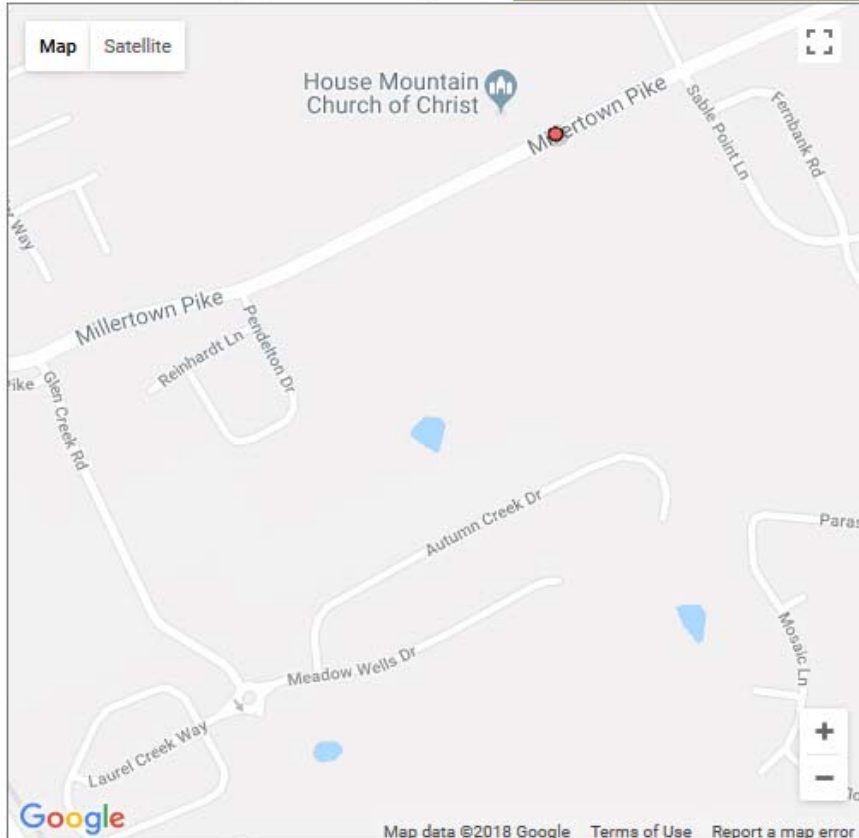
Traffic History

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	000261
Route	03773
Location	MILLERTOWN PK-NORTH OF JOHN SEVIER
County	Knox
2016	7417
2015	6721
2014	6626
2013	6284
2012	6412
2011	6202
2010	6222
2009	6984
2008	6891
2007	6217
2006	6048
2005	6005
2004	4861
2003	5074
2002	4541
2001	4182
2000	4444
1999	4174

Download File:

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[ESRI Geodatabase](#)

[ESRI Shapefile](#)

[Database Table](#)

Open With:

[Google Earth](#)

[ArcGIS Explorer](#)

[MS Access or Excel](#)

APPENDIX B

RAILROAD INFORMATION

U. S. DOT CROSSING INVENTORY FORM

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

OMB No. 2130-0017

Instructions for the initial reporting of the following types of new or previously unreported crossings: For public highway-rail grade crossings, complete the entire inventory Form. For private highway-rail grade crossings, complete the Header, Parts I and II, and the Submission Information section. For public pathway grade crossings (including pedestrian station grade crossings), complete the Header, Parts I and II, and the Submission Information section. For Private pathway grade crossings, complete the Header, Parts I and II, and the Submission Information section. For grade-separated highway-rail or pathway crossings (including pedestrian station crossings), complete the Header, Part I, and the Submission Information section. For changes to existing data, complete the Header, Part I Items 1-3, and the Submission Information section, in addition to the updated data fields. Note: For private crossings only, Part I Item 20 and Part III Item 2.K. are required unless otherwise noted. An asterisk * denotes an optional field.

A. Revision Date (MM/DD/YYYY) 03 / 21 / 2018	B. Reporting Agency <input checked="" type="checkbox"/> Railroad <input type="checkbox"/> Transit <input type="checkbox"/> State <input type="checkbox"/> Other	C. Reason for Update (Select only one) <input checked="" type="checkbox"/> Change in Data <input type="checkbox"/> New Crossing <input type="checkbox"/> Closed <input type="checkbox"/> Re-Open <input type="checkbox"/> Date Change Only <input type="checkbox"/> Change in Primary Operating RR <input type="checkbox"/> No Train Traffic <input type="checkbox"/> Quiet Zone Update <input type="checkbox"/> Admin. Correction	D. DOT Crossing Inventory Number 730480D
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Part I: Location and Classification Information

1. Primary Operating Railroad Norfolk Southern Railway Company [NS]		2. State TENNESSEE		3. County KNOX	
4. City / Municipality <input checked="" type="checkbox"/> In <input type="checkbox"/> Near KNOXVILLE		5. Street/Road Name & Block Number OLD MILLERTOWN PK (Street/Road Name) * (Block Number)		6. Highway Type & No. Is	
7. Do Other Railroads Operate a Separate Track at Crossing? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, Specify RR			8. Do Other Railroads Operate Over Your Track at Crossing? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, Specify RR		
9. Railroad Division or Region <input type="checkbox"/> None ALABAMA		10. Railroad Subdivision or District <input type="checkbox"/> None KNOXVILLE WEST		11. Branch or Line Name <input type="checkbox"/> None OAKDALE LINE	
12. RR Milepost 0001.410 CO (prefix) (nnnn.nnn) (suffix)		13. Line Segment *		14. Nearest RR Timetable Station * KNOXVILLE	
15. Parent RR (if applicable) <input checked="" type="checkbox"/> N/A		16. Crossing Owner (if applicable) <input checked="" type="checkbox"/> N/A		17. Crossing Type <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private	
18. Crossing Purpose <input checked="" type="checkbox"/> Highway <input type="checkbox"/> Pathway, Ped. <input type="checkbox"/> Station, Ped.		19. Crossing Position <input checked="" type="checkbox"/> At Grade <input type="checkbox"/> RR Under <input type="checkbox"/> RR Over		20. Public Access (if Private Crossing) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
21. Type of Train <input checked="" type="checkbox"/> Freight <input type="checkbox"/> Intercity Passenger <input type="checkbox"/> Commuter <input type="checkbox"/> Transit <input type="checkbox"/> Shared Use Transit <input type="checkbox"/> Tourist/Other		22. Average Passenger Train Count Per Day <input type="checkbox"/> Less Than One Per Day <input type="checkbox"/> Number Per Day 0		23. Type of Land Use <input type="checkbox"/> Open Space <input type="checkbox"/> Farm <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Institutional <input type="checkbox"/> Recreational <input type="checkbox"/> RR Yard	
24. Is there an Adjacent Crossing with a Separate Number? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, Provide Crossing Number			25. Quiet Zone (FRA provided) <input checked="" type="checkbox"/> No <input type="checkbox"/> 24 Hr <input type="checkbox"/> Partial <input type="checkbox"/> Chicago Excused Date Established		
26. HSR Corridor ID <input checked="" type="checkbox"/> N/A		27. Latitude in decimal degrees (WGS84 std: nn.nnnnnnn) 36.0343346		28. Longitude in decimal degrees (WGS84 std: -nnn.nnnnnnn) -83.8665336	
29. Lat/Long Source <input checked="" type="checkbox"/> Actual <input type="checkbox"/> Estimated		30.A. Railroad Use *		31.A. State Use *	
30.B. Railroad Use *		31.B. State Use *		30.C. Railroad Use *	
30.D. Railroad Use *		31.C. State Use *		30.D. Railroad Use *	
32.A. Narrative (Railroad Use) *		32.B. Narrative (State Use) *		33. Emergency Notification Telephone No. (posted) 800-946-4744	
34. Railroad Contact (Telephone No.) 800-946-4744		35. State Contact (Telephone No.) 615-741-9558			

Part II: Railroad Information

1. Estimated Number of Daily Train Movements				
1.A. Total Day Thru Trains (6 AM to 6 PM) 1	1.B. Total Night Thru Trains (6 PM to 6 AM) 3	1.C. Total Switching Trains 2	1.D. Total Transit Trains 0	1.E. Check if Less Than One Movement Per Day <input type="checkbox"/> How many trains per week? _____
2. Year of Train Count Data (YYYY) 2017		3. Speed of Train at Crossing 3.A. Maximum Timetable Speed (mph) 50 3.B. Typical Speed Range Over Crossing (mph) From 30 to 40		
4. Type and Count of Tracks Main 2 Siding 0 Yard 0 Transit 0 Industry 0				
5. Train Detection (Main Track only) <input type="checkbox"/> Constant Warning Time <input type="checkbox"/> Motion Detection <input type="checkbox"/> AFO <input type="checkbox"/> PTC <input type="checkbox"/> DC <input type="checkbox"/> Other <input checked="" type="checkbox"/> None				
6. Is Track Signaled? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		7.A. Event Recorder <input type="checkbox"/> Yes <input type="checkbox"/> No		7.B. Remote Health Monitoring <input type="checkbox"/> Yes <input type="checkbox"/> No

U. S. DOT CROSSING INVENTORY FORM

A. Revision Date (MM/DD/YYYY) 03/21/2018		PAGE 2		D. Crossing Inventory Number (7 char.) 730480D	
Part III: Highway or Pathway Traffic Control Device Information					
1. Are there Signs or Signals? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		2. Types of Passive Traffic Control Devices associated with the Crossing			
2.A. Crossbuck Assemblies (count) 2		2.B. STOP Signs (R1-1) (count) 0	2.C. YIELD Signs (R1-2) (count)	2.D. Advance Warning Signs (Check all that apply; include count) <input type="checkbox"/> None <input checked="" type="checkbox"/> W10-1 _____ <input type="checkbox"/> W10-3 _____ <input type="checkbox"/> W10-11 _____ <input type="checkbox"/> W10-2 _____ <input type="checkbox"/> W10-4 _____ <input type="checkbox"/> W10-12 _____	
2.E. Low Ground Clearance Sign (W10-5) <input type="checkbox"/> Yes (count _____) <input checked="" type="checkbox"/> No		2.F. Pavement Markings <input type="checkbox"/> Stop Lines <input type="checkbox"/> Dynamic Envelope <input type="checkbox"/> RR Xing Symbols <input checked="" type="checkbox"/> None		2.G. Channelization Devices/Medians <input type="checkbox"/> All Approaches <input type="checkbox"/> Median <input type="checkbox"/> One Approach <input checked="" type="checkbox"/> None	2.H. EXEMPT Sign (R15-3) <input type="checkbox"/> Yes <input type="checkbox"/> No
2.I. ENS Sign (I-13) Displayed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		2.J. Other MUTCD Signs <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Specify Type _____ Count _____ Specify Type _____ Count _____ Specify Type _____ Count _____	2.K. Private Crossing Signs (if private) <input type="checkbox"/> Yes <input type="checkbox"/> No	2.L. LED Enhanced Signs (List types)	
3. Types of Train Activated Warning Devices at the Grade Crossing (specify count of each device for all that apply)					
3.A. Gate Arms (count) Roadway 0 Pedestrian 0	3.B. Gate Configuration <input type="checkbox"/> 2 Quad <input type="checkbox"/> Full (Barrier) Resistance <input type="checkbox"/> 3 Quad <input type="checkbox"/> Median Gates	3.C. Cantilevered (or Bridged) Flashing Light Structures (count) Over Traffic Lane 0 <input type="checkbox"/> Incandescent Not Over Traffic Lane 0 <input type="checkbox"/> LED		3.D. Mast Mounted Flashing Lights (count of masts) 0 <input type="checkbox"/> Incandescent <input type="checkbox"/> LED <input type="checkbox"/> Back Lights Included <input type="checkbox"/> Side Lights Included	3.E. Total Count of Flashing Light Pairs 0
3.F. Installation Date of Current Active Warning Devices: (MM/YYYY) ____/____/____ <input checked="" type="checkbox"/> Not Required		3.G. Wayside Horn <input type="checkbox"/> Yes Installed on (MM/YYYY) ____/____/____ <input checked="" type="checkbox"/> No		3.H. Highway Traffic Signals Controlling Crossing <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	3.I. Bells (count) 0
3.J. Non-Train Active Warning <input type="checkbox"/> Flagging/Flagman <input type="checkbox"/> Manually Operated Signals <input type="checkbox"/> Watchman <input type="checkbox"/> Floodlighting <input checked="" type="checkbox"/> None				3.K. Other Flashing Lights or Warning Devices Count 0 Specify type _____	
4.A. Does nearby Hwy Intersection have Traffic Signals? <input type="checkbox"/> Yes <input type="checkbox"/> No	4.B. Hwy Traffic Signal Interconnection <input type="checkbox"/> Not Interconnected <input type="checkbox"/> For Traffic Signals <input type="checkbox"/> For Warning Signs	4.C. Hwy Traffic Signal Preemption <input type="checkbox"/> Simultaneous <input type="checkbox"/> Advance	5. Highway Traffic Pre-Signals <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Storage Distance * 0 Stop Line Distance * 0	6. Highway Monitoring Devices (Check all that apply) <input type="checkbox"/> Yes - Photo/Video Recording <input type="checkbox"/> Yes - Vehicle Presence Detection <input type="checkbox"/> None	
Part IV: Physical Characteristics					
1. Traffic Lanes Crossing Railroad Number of Lanes 1 <input type="checkbox"/> One-way Traffic <input type="checkbox"/> Two-way Traffic <input type="checkbox"/> Divided Traffic		2. Is Roadway/Pathway Paved? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	3. Does Track Run Down a Street? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	4. Is Crossing Illuminated? (Street lights within approx. 50 feet from nearest rail) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
5. Crossing Surface (on Main Track, multiple types allowed) Installation Date * (MM/YYYY) ____/____/____ Width * _____ Length * _____ <input type="checkbox"/> 1 Timber <input type="checkbox"/> 2 Asphalt <input type="checkbox"/> 3 Asphalt and Timber <input type="checkbox"/> 4 Concrete <input type="checkbox"/> 5 Concrete and Rubber <input type="checkbox"/> 6 Rubber <input type="checkbox"/> 7 Metal <input type="checkbox"/> 8 Unconsolidated <input type="checkbox"/> 9 Composite <input checked="" type="checkbox"/> 10 Other (specify) _____					
6. Intersecting Roadway within 500 feet? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, Approximate Distance (feet) _____			7. Smallest Crossing Angle <input type="checkbox"/> 0° - 29° <input type="checkbox"/> 30° - 59° <input checked="" type="checkbox"/> 60° - 90°		8. Is Commercial Power Available? * <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Part V: Public Highway Information					
1. Highway System <input type="checkbox"/> (01) Interstate Highway System <input type="checkbox"/> (02) Other Nat Hwy System (NHS) <input type="checkbox"/> (03) Federal AID, Not NHS <input checked="" type="checkbox"/> (08) Non-Federal Aid		2. Functional Classification of Road at Crossing <input type="checkbox"/> (0) Rural <input checked="" type="checkbox"/> (1) Urban <input type="checkbox"/> (1) Interstate <input type="checkbox"/> (5) Major Collector <input type="checkbox"/> (2) Other Freeways and Expressways <input type="checkbox"/> (3) Other Principal Arterial <input type="checkbox"/> (6) Minor Collector <input type="checkbox"/> (4) Minor Arterial <input checked="" type="checkbox"/> (7) Local		3. Is Crossing on State Highway System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	4. Highway Speed Limit 30 _____ MPH <input checked="" type="checkbox"/> Posted <input type="checkbox"/> Statutory
5. Linear Referencing System (LRS Route ID) *					
6. LRS Milepost *					
7. Annual Average Daily Traffic (AADT) Year 2006 AADT 000256		8. Estimated Percent Trucks 06 _____ %	9. Regularly Used by School Buses? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Average Number per Day 7 _____		10. Emergency Services Route <input type="checkbox"/> Yes <input type="checkbox"/> No
Submission Information - This information is used for administrative purposes and is not available on the public website.					
Submitted by _____ Organization _____ Phone _____ Date _____					
Public reporting burden for this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. According to the Paperwork Reduction Act of 1995, a federal agency may not conduct or sponsor, and a person is not required to, nor shall a person be subject to a penalty for failure to comply with, a collection of information unless it displays a currently valid OMB control number. The valid OMB control number for information collection is 2130-0017. Send comments regarding this burden estimate or any other aspect of this collection, including for reducing this burden to: Information Collection Officer, Federal Railroad Administration, 1200 New Jersey Ave. SE, MS-25 Washington, DC 20590.					

HIGHWAY-RAIL GRADE CROSSING

ACCIDENT/INCIDENT REPORT

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION (FRA)

OMB Approval No. 2130-0500

Name Of				Alphabetic Code	RR Accident/Incident No.
1. Reporting Railroad SOUTHERN RAILWAY COMPANY [SOU]				1a. SOU	1b. GC0777043
2. Other Railroad Involved in Train Accident/Incident				2a.	2b.
3. Railroad Responsible for Track Maintenance SOUTHERN RAILWAY COMPANY [SOU]				3a. SOU	3b. GC0777043
4. U.S. DOT-AAR Grade Crossing ID No. 730480D		5. Date of Accident/Incident 05/18/77		6. Time of Accident/Incident 04:50 AM	
7. Nearest Railroad Station KNOXVILLE		8. Division		9. County KNOX	
11. City (if in a city)		12. Highway Name or No. OLD MILLERTOWN		10. State Code Abbr. 47 TN	
11. City (if in a city)		12. Highway Name or No. OLD MILLERTOWN		<input checked="" type="checkbox"/> Public <input type="checkbox"/> Private	
Highway User Involved				Rail Equipment Involved	
13. Type C. Truck-trailer F. Bus J. Other Motor Vehicle Code A. Auto D. Pick-up truck G. School Bus K. Pedestrian B. Truck E. Van H. Motorcycle M. Other (specify) A				17. Equipment 4. Car(s) (moving) 8. Other (specify) Code 1. Train (units pulling) 5. Car(s) (standing) A. Train pulling- RCL 2. Train (units pushing) 6. Light loco(s) (moving) B. Train pushing- RCL 3. Train (standing) 7. Light loco(s) (standing) C. Train standing- RCL 1	
14. Vehicle Speed (est. mph at impact) 0		15. Direction (geographical) Code 1. North 2. South 3. East 4. West 2		18. Position of Car Unit in Train 1	
16. Position 1. Stalled on crossing 3. Moving over crossing Code 2. Stopped on Crossing 4. Trapped 2		19. Circumstance 1. Rail equipment struck highway user Code 2. Rail equipment struck by highway user 1		20a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? Code 1. Highway User 2. Rail Equipment 3. Both 4. Neither 4	
20b. Was there a hazardous materials release by Code 1. Highway User 2. Rail Equipment 3. Both 4. Neither					
20c. State the name and quantity of the hazardous material released, if any					
21. Temperature (specify if minus) 70 °F		22. Visibility (single entry) Code 1. Dawn 2. Day 3. Dusk 4. Dark 4		23. Weather (single entry) Code 1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow 1	
24. Type of Equipment A. Spec. MoW Equip Consist 1. Freight train 4. Work train 7. Yard/Switching (single entry) 2. Passenger train 5. Single car 8. Light loco(s) Code 3. Commuter train 6. Cut of cars 9. Main./inspect. car 1				25. Track Type Used by Rail Code Equipment Involved 1. Main 2. Yard 3. Siding 4. Industry 1	
26. Track Number or Name SOUTHBOUND OAKD		27. FRA Track Class 4		28. Number of Locomotive Units 4	
29. Number of Cars 92		30. Consist Speed (Recorded if available) Code R. Recorded E. Estimated 10 mph E		31. Time Table Direction Code 1. North 2. South 3. East 4. West 2	
32. Type of Crossing 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew Warning 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (specify) 3. Standard FLS 6. Audible 9. Watchman 12. None				33. Signaled Crossing Warning 34. Whistle Ban Code 1. Yes 2. No 3. Unknown	
35. Location of Warning Code 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach 1		36. Crossing Warning Interconnected with Highway Signals Code 1. Yes 2. No 3. Unknown 2		37. Crossing Illuminated by Street Lights or Special Lights Code 1. Yes 2. No 3. Unknown 2	
38. Driver's Age		39. Driver's Gender Code 1. Male 2. Female		40. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train Code 1. Yes 2. No 3. Unknown 3	
41. Driver Code 1. Drove around or thru the gate 4. Stopped on crossing 2. Stopped and then proceeded 5. Other (specify) 3. Did not stop 4		42. Driver Passed Standing Highway Vehicle Code 1. Yes 2. No 3. Unknown 2			
43. View of Track Obscured by (primary obstruction) Code 1. Permanent Structure 3. Passing Train 5. Vegetation 7. Other (specify) 2. Standing railroad equipment 4. Topography 6. Highway Vehicles 8. Not Obstructed 8				44. Driver was Code 1. Killed 2. Injured 3. Uninjured 3	
45. Was Driver in the Vehicle? Code 1. Yes 2. No 2		46. Highway-Rail Crossing Users 0 0		47. Highway Vehicle Property Damage (est. dollar damage) \$700	
48. Total Number of Highway-Rail Crossing Users (include driver) 0		49. Railroad Employees 0 0		50. Total Number of People on Train (include passengers and crew)	
51. Is a Rail Equipment Accident / Incident Report Being Filed Code 1. Yes 2. No 2		52. Passengers on Train 0 0		53a. Special Study Block	
53b. Special Study Block		54. Narrative Description			
55. Typed Name and Title		56. Signature			57. Date

HIGHWAY-RAIL GRADE CROSSING

ACCIDENT/INCIDENT REPORT

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION (FRA)

OMB Approval No. 2130-0500

Name Of				Alphabetic Code	RR Accident/Incident No.
1. Reporting Railroad SOUTHERN RAILWAY COMPANY [SOU]				1a. SOU	1b. GC0777022
2. Other Railroad Involved in Train Accident/Incident				2a.	2b.
3. Railroad Responsible for Track Maintenance SOUTHERN RAILWAY COMPANY [SOU]				3a. SOU	3b. GC0777022
4. U.S. DOT-AAR Grade Crossing ID No. 730480D		5. Date of Accident/Incident 02/24/77		6. Time of Accident/Incident 09:12 AM	
7. Nearest Railroad Station KNOXVILLE		8. Division		9. County KNOX	
11. City (if in a city)		12. Highway Name or No. OLD MILLERTOWN		10. State Code Abbr. 47 TN	
11. City (if in a city)		12. Highway Name or No. OLD MILLERTOWN		<input checked="" type="checkbox"/> Public <input type="checkbox"/> Private	
Highway User Involved			Rail Equipment Involved		
13. Type C. Truck-trailer F. Bus J. Other Motor Vehicle Code A. Auto D. Pick-up truck G. School Bus K. Pedestrian B. Truck E. Van H. Motorcycle M. Other (specify) A			17. Equipment 4. Car(s) (moving) 8. Other (specify) Code 1. Train (units pulling) 5. Car(s) (standing) A. Train pulling- RCL 2. Train (units pushing) 6. Light loco(s) (moving) B. Train pushing- RCL 3. Train (standing) 7. Light loco(s) (standing) C. Train standing- RCL 1		
14. Vehicle Speed (est. mph at impact) 25		15. Direction (geographical) 1. North 2. South 3. East 4. West 2		18. Position of Car Unit in Train 1	
16. Position 1. Stalled on crossing 3. Moving over crossing Code 2. Stopped on Crossing 4. Trapped 3		19. Circumstance 1. Rail equipment struck highway user Code 2. Rail equipment struck by highway user 1		20a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? Code 1. Highway User 2. Rail Equipment 3. Both 4. Neither 4	
20c. State the name and quantity of the hazardous material released, if any					
21. Temperature (specify if minus) 50 °F		22. Visibility (single entry) Code 1. Dawn 2. Day 3. Dusk 4. Dark 2		23. Weather (single entry) Code 1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow 2	
24. Type of Equipment A. Spec. MoW Equip Consist 1. Freight train 4. Work train 7. Yard/Switching (single entry) 2. Passenger train 5. Single car 8. Light loco(s) Code 3. Commuter train 6. Cut of cars 9. Main./inspect. car 1			25. Track Type Used by Rail Code Equipment Involved 1. Main 2. Yard 3. Siding 4. Industry 1		26. Track Number or Name BEVERLY CUT OFF
27. FRA Track Class 4		28. Number of Locomotive Units 4	29. Number of Cars 22	30. Consist Speed (Recorded if available) Code R. Recorded E. Estimated 25 mph E	31. Time Table Direction Code 1. North 2. South 3. East 4. West 2
32. Type of Crossing 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew Warning 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (specify) 3. Standard FLS 6. Audible 9. Watchman 12. None			33. Signaled Crossing Warning		34. Whistle Ban Code 1. Yes 2. No 3. Unknown
35. Location of Warning Code 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach 1			36. Crossing Warning Interconnected with Highway Signals Code 1. Yes 2. No 3. Unknown 2		37. Crossing Illuminated by Street Lights or Special Lights Code 1. Yes 2. No 3. Unknown 2
38. Driver's Age	39. Driver's Gender Code 1. Male 2. Female	40. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train Code 1. Yes 2. No 3. Unknown 2		41. Driver Code 1. Drove around or thru the gate 4. Stopped on crossing 2. Stopped and then proceeded 5. Other (specify) 3. Did not stop 2	
42. Driver Passed Standing Highway Vehicle Code 1. Yes 2. No 3. Unknown 1		43. View of Track Obscured by (primary obstruction) Code 1. Permanent Structure 3. Passing Train 5. Vegetation 7. Other (specify) 2. Standing railroad equipment 4. Topography 6. Highway Vehicles 8. Not Obstructed 5			
Casualties to:		Killed	Injured	44. Driver was Code 1. Killed 2. Injured 3. Uninjured 3	
46. Highway-Rail Crossing Users		0	0	47. Highway Vehicle Property Damage (est. dollar damage) \$2,500	
49. Railroad Employees		0	0	50. Total Number of People on Train (include passengers and crew)	
52. Passengers on Train		0	0	51. Is a Rail Equipment Accident / Incident Report Being Filed Code 1. Yes 2. No 2	
53a. Special Study Block			53b. Special Study Block		
54. Narrative Description					
55. Typed Name and Title			56. Signature		57. Date

APPENDIX C

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 **GO**

5431 Laurel Creek Way

Knoxville, Tennessee, 37924

Commute to **Downtown Knoxville**

14 min 46 min 43 min 60+ min View Routes

Favorite **Map** **Nearby Apartments**

[More about 5431 Laurel Creek Way](#)

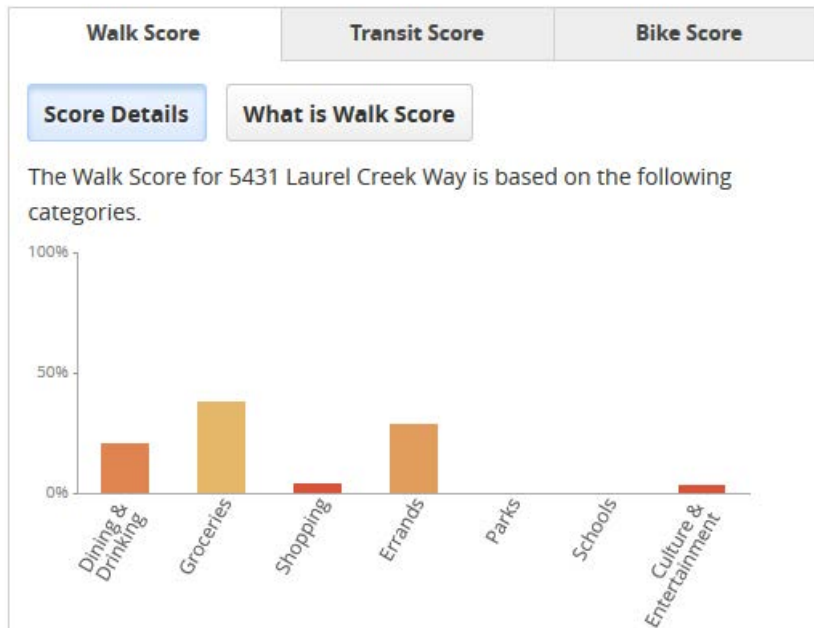
Walk Score 13 **Car-Dependent**
Almost all errands require a car.

Transit Score 24 **Minimal Transit**
It is possible to get on a bus.

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

Scores for 5431 Laurel Creek Way

Walk Score 13 **Transit Score 24**



Scores for 5431 Laurel Creek Way



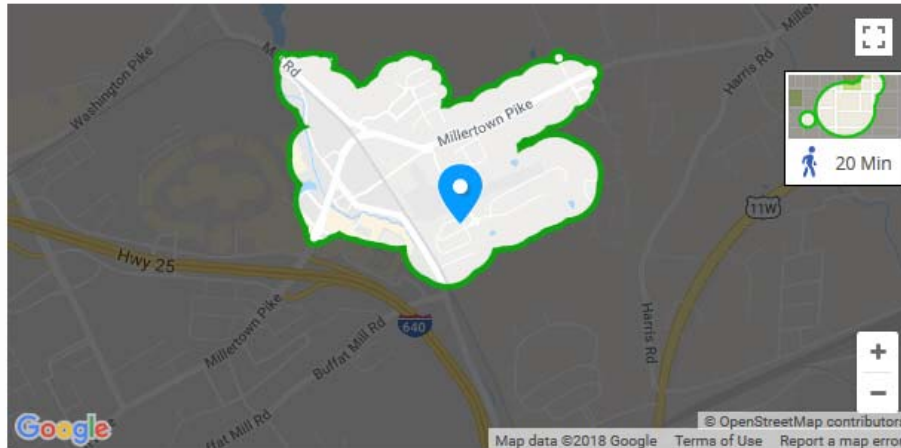
Walk Score **13** Transit Score **24**

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

Travel Time Map

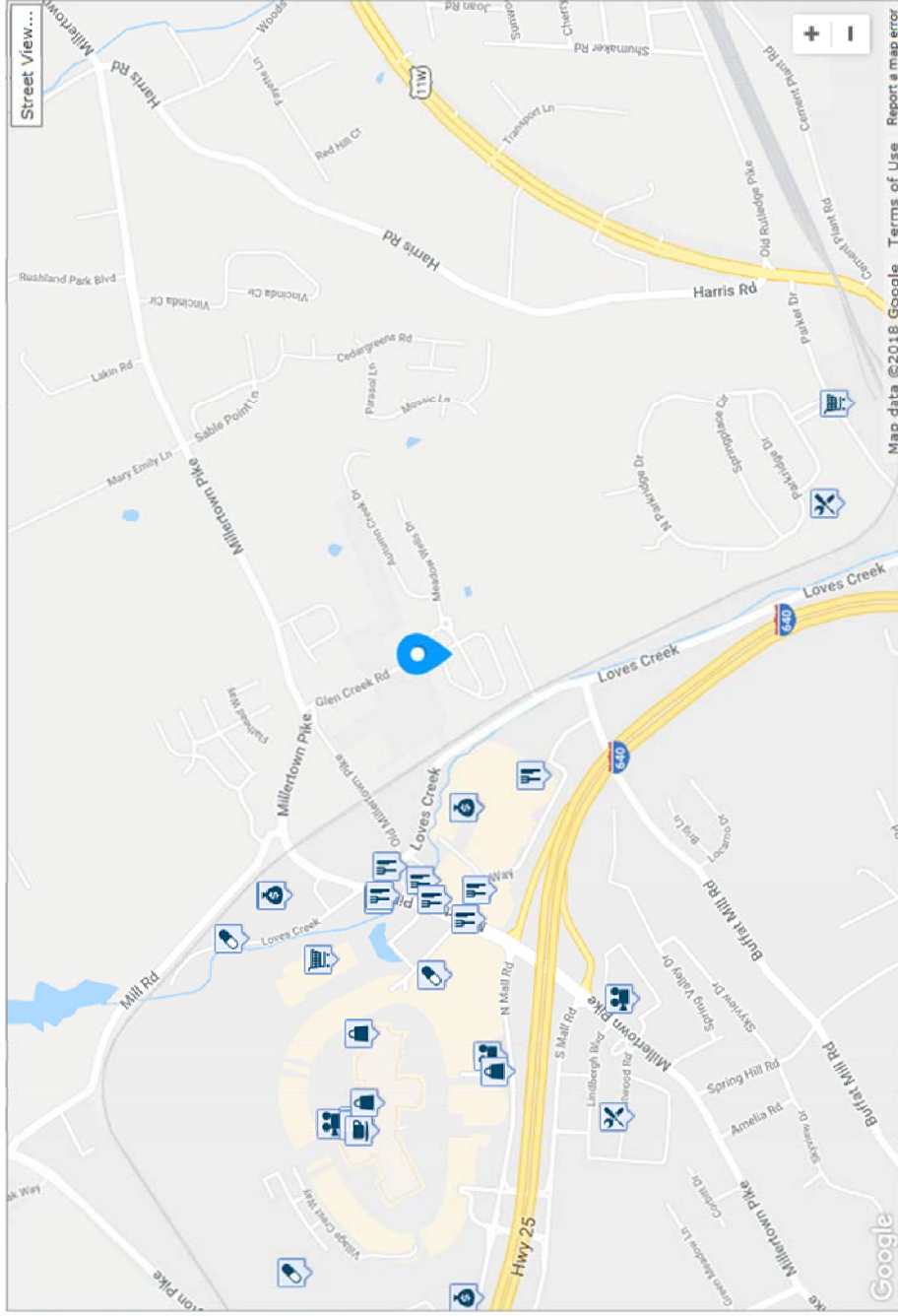
[Add to your site](#)

Explore how far you can travel by car, bus, bike and foot from 5431 Laurel Creek Way.



What's Nearby

- Restaurants:** Texas Roadhouse .2mi
- Coffee:** The Coffee Bean .8mi
- Bars:** Jimmy's Original Southern Pub 3.5mi
- Groceries:** Walmart Supercenter .3mi
- Parks:** Volunteer Park 2.1mi
- Schools:** Educational Resource Center .8mi
- Shopping:** Sears .7mi
- Entertainment:** Carmike 10 .7mi
- Errands:** SunTrust Bank .3mi
- Search Nearby:**



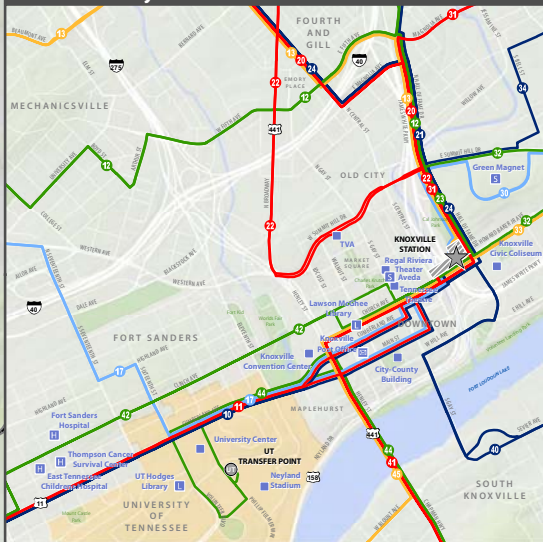
Map data ©2018 Google Terms of Use Report a map error

Something missing? Add a place

APPENDIX D

KNOXVILLE AREA TRANSIT MAP AND INFORMATION

Knoxville City Center



Legend

- Transfer Point
- Lift Service Area Boundary

Points of Interest

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

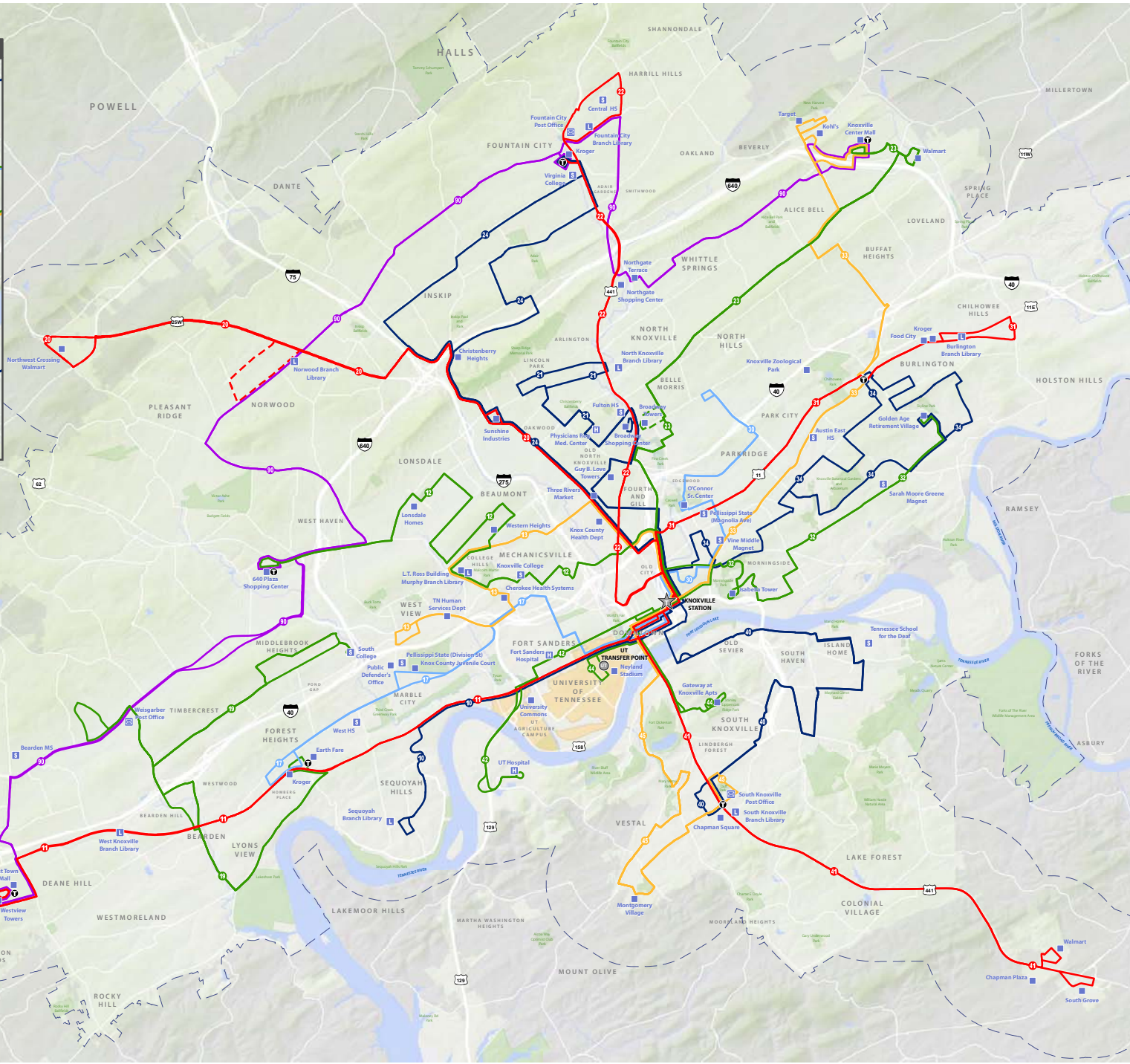
Distances

0 5 10 Minutes Walking

0 5 10 Minutes Biking

0 0.5 1 Map Scale in Miles

North



MILLERTOWN

(Weekdays and Saturdays)

23



Legend

- # Route Timepoint
- Ⓜ Transfer Point
- Bus Stop

Points of Interest

H Hospital	☒ Post Office
L Library	S School
■ Point of Interest	P Park & Ride

0 0.25 0.5 0.75

Miles



MILLERTOWN

(Weekdays and Saturdays)

NEW SUNDAY SERVICE
JANUARY 2017

SERVES:

- ★ Broadway Towers
- ★ Carmike 10 Cinemas
- ★ Knoxville Center Mall
- ★ Knoxville Station/Downtown

Regal Knoxville Center 10
 Walmart: Millertown Pike



Information Updated: January 9, 2017

Weekday Schedule Route 23: Millertown

Going away from downtown						Going toward downtown						
Transfer to:						Rt. 90 Westbound						
Knoxville Station—Platform I	Grainger at Sixth	Broadway Towers	Nadine at Washington Pk	Walmart	Knoxville Center Mall (Arrives)	Bus Goes On To Serve	Knoxville Center Mall (Leaves)	Walmart	Washington at Fairview	Broadway Towers	Sixth at Grainger	Knoxville Station
1	2	3	4	5	6		6	7	8	9	10	11

WEEKDAY SCHEDULE													
A.M.	—	—	—	—	—	—	—	5:30	5:37	5:49	—	5:56	6:10
	—	—	—	—	—	—	—	6:30	6:37	6:49	—	6:56	7:10
	6:15	6:24	—	6:29	6:45	6:55	Rt. 33	7:30	7:37	7:49	—	7:56	8:10
	7:15	7:24	—	7:29	7:45	7:55	Rt. 33	8:30	8:37	8:49	8:54	8:56	9:10
	8:15	8:24	—	8:29	8:45	8:55	Rt. 33	9:30	9:37	9:49	9:54	9:56	10:10
	9:15	9:24	9:27	9:29	9:45	9:55	Rt. 33	10:30	10:37	10:49	10:54	10:56	11:10
	10:15	10:24	10:27	10:29	10:45	10:55	Rt. 33	11:30	11:37	11:49	11:54	11:56	12:10
	11:15	11:24	11:27	11:29	11:45	11:55	Rt. 33	12:30	12:37	12:49	12:54	12:56	1:10
P.M.	12:15	12:24	12:27	12:29	12:45	12:55	Rt. 33	1:30	1:37	1:49	1:54	1:56	2:10
	1:15	1:24	1:27	1:29	1:45	1:55	Rt. 33	2:30	2:37	2:49	2:54	2:56	3:10
	2:15	2:24	2:27	2:29	2:45	2:55	Rt. 33	3:30	3:37	3:49	3:54	3:56	4:10
	3:15	3:24	3:27	3:29	3:45	3:55	Rt. 33	4:30	4:37	4:49	—	4:56	5:10
	4:15	4:24	4:27	4:29	4:45	4:55	Rt. 33	5:30	5:37	5:49	—	5:56	6:10
	5:15	5:24	—	5:29	5:45	5:55	Rt. 33	6:30	6:37	6:49	—	6:56	7:10
	6:15	6:24	—	6:29	6:45	6:55	Rt. 33	7:30	7:37	7:49	—	7:56	8:10
	7:15	7:24	—	7:29	7:45	7:55	Rt. 33	8:30	8:37	8:49	—	8:56	9:10
	8:15	8:24	—	8:29	8:45	8:55	Rt. 33	9:30	9:37	9:49	—	9:56	10:10
	9:15	9:24	—	9:29	9:45	9:55	Rt. 33	10:30	10:37	10:49	—	10:56	11:10
	10:15	10:24	—	10:29	10:45	10:55	—	I-40 to Downtown		—	—	—	11:10
	11:15	11:24	—	11:29	11:45	To Garage							



MILLERTOWN

(Weekdays and Saturdays)

NEW SUNDAY SERVICE
JANUARY 2017

SERVES:

- ★ Broadway Towers
- ★ Carmike 10 Cinemas
- ★ Knoxville Center Mall
- ★ Knoxville Station/Downtown

Regal Knoxville Center 10
Walmart: Millertown Pike



Information Updated: January 9, 2017

Saturday-Sunday Schedule Route 23: Millertown

Going away from downtown							Going toward downtown						
Transfer to:						Rt. 90 Westbound							
Knoxville Station—Platform I	Grainger at Sixth	Broadway Towers	Nadine at Washington Pk	Walmart	Knoxville Center Mall (Arrives)		Knoxville Center Mall (Leaves)	Walmart	Washington at Fairview	Broadway Towers	Sixth at Grainger	Knoxville Station	
1	2	3	4	5	6	Bus Goes On To Serve	6	7	8	9	10	11	
SATURDAY SCHEDULE													
A.M.	—	—	—	—	—	—	7:30	7:37	7:49	—	7:56	8:10	
	7:15	7:24	—	7:29	7:45	7:55	Rt. 33	8:30	8:37	8:49	—	8:56	9:10
	8:15	8:24	—	8:29	8:45	8:55	Rt. 33	9:30	9:37	9:49	—	9:56	10:10
	9:15	9:24	—	9:29	9:45	9:55	Rt. 33	10:30	10:37	10:49	—	10:56	11:10
	10:15	10:24	—	10:29	10:45	10:55	Rt. 33	11:30	11:37	11:49	—	11:56	12:10
	11:15	11:24	—	11:29	11:45	11:55	Rt. 33	12:30	12:37	12:49	—	12:56	1:10
P.M.	12:15	12:24	—	12:29	12:45	12:55	Rt. 33	1:30	1:37	1:49	—	1:56	2:10
	1:15	1:24	—	1:29	1:45	1:55	Rt. 33	2:30	2:37	2:49	—	2:56	3:10
	2:15	2:24	—	2:29	2:45	2:55	Rt. 33	3:30	3:37	3:49	—	3:56	4:10
	3:15	3:24	—	3:29	3:45	3:55	Rt. 33	4:30	4:37	4:49	—	4:56	5:10
	4:15	4:24	—	4:29	4:45	4:55	Rt. 33	5:30	5:37	5:49	—	5:56	6:10
	5:15	5:24	—	5:29	5:45	5:55	Rt. 33	6:30	6:37	6:49	—	6:56	7:10
	6:15	6:24	—	6:29	6:45	6:55	Rt. 33	7:30	7:37	7:49	—	7:56	8:10
	7:15	7:24	—	7:29	7:45	7:55	Rt. 33	8:30	8:37	8:49	—	8:56	9:10
	8:15	8:24	—	8:29	8:45	8:55	Rt. 33	9:30	9:37	9:49	—	9:56	10:10
	9:15	9:24	—	9:29	9:45	9:55	Rt. 33	10:30	10:37	10:49	—	10:56	11:10
	10:15	10:24	—	10:29	10:45	10:55	—	I-40 to Downtown		—	—	—	11:10
	11:15	11:24	—	11:29	11:45	To Garage							
SUNDAY SCHEDULE													
A.M.	—	—	—	—	—	—	7:30	7:37	7:49	—	7:56	8:10	
	—	—	—	—	—	—	8:30	8:37	8:49	—	8:56	9:10	
	8:15	8:24	—	8:29	8:45	8:55	Rt. 33	9:30	9:37	9:49	—	9:56	10:10
	9:15	9:24	—	9:29	9:45	9:55	Rt. 33	10:30	10:37	10:49	—	10:56	11:10
	10:15	10:24	—	10:29	10:45	10:55	Rt. 33	11:30	11:37	11:49	—	11:56	12:10
	11:15	11:24	—	11:29	11:45	11:55	Rt. 33	12:30	12:37	12:49	—	12:56	1:10
P.M.	12:15	12:24	—	12:29	12:45	12:55	Rt. 33	1:30	1:37	1:49	—	1:56	2:10
	1:15	1:24	—	1:29	1:45	1:55	Rt. 33	2:30	2:37	2:49	—	2:56	3:10
	2:15	2:24	—	2:29	2:45	2:55	Rt. 33	3:30	3:37	3:49	—	3:56	4:10
	3:15	3:24	—	3:29	3:45	3:55	Rt. 33	4:30	4:37	4:49	—	4:56	5:10
	4:15	4:24	—	4:29	4:45	4:55	Rt. 33	5:30	5:37	5:49	—	5:56	6:10
	5:15	5:24	—	5:29	5:45	5:55	Rt. 33	6:30	6:37	6:49	—	6:56	7:10
	6:15	6:24	—	6:29	6:45	6:55	Rt. 33	7:30	7:37	7:49	—	7:56	8:10
	7:15	7:24	—	7:29	7:45	7:55	—	To Garage					
	8:15	8:24	—	8:29	8:45	8:55	—	To Garage					

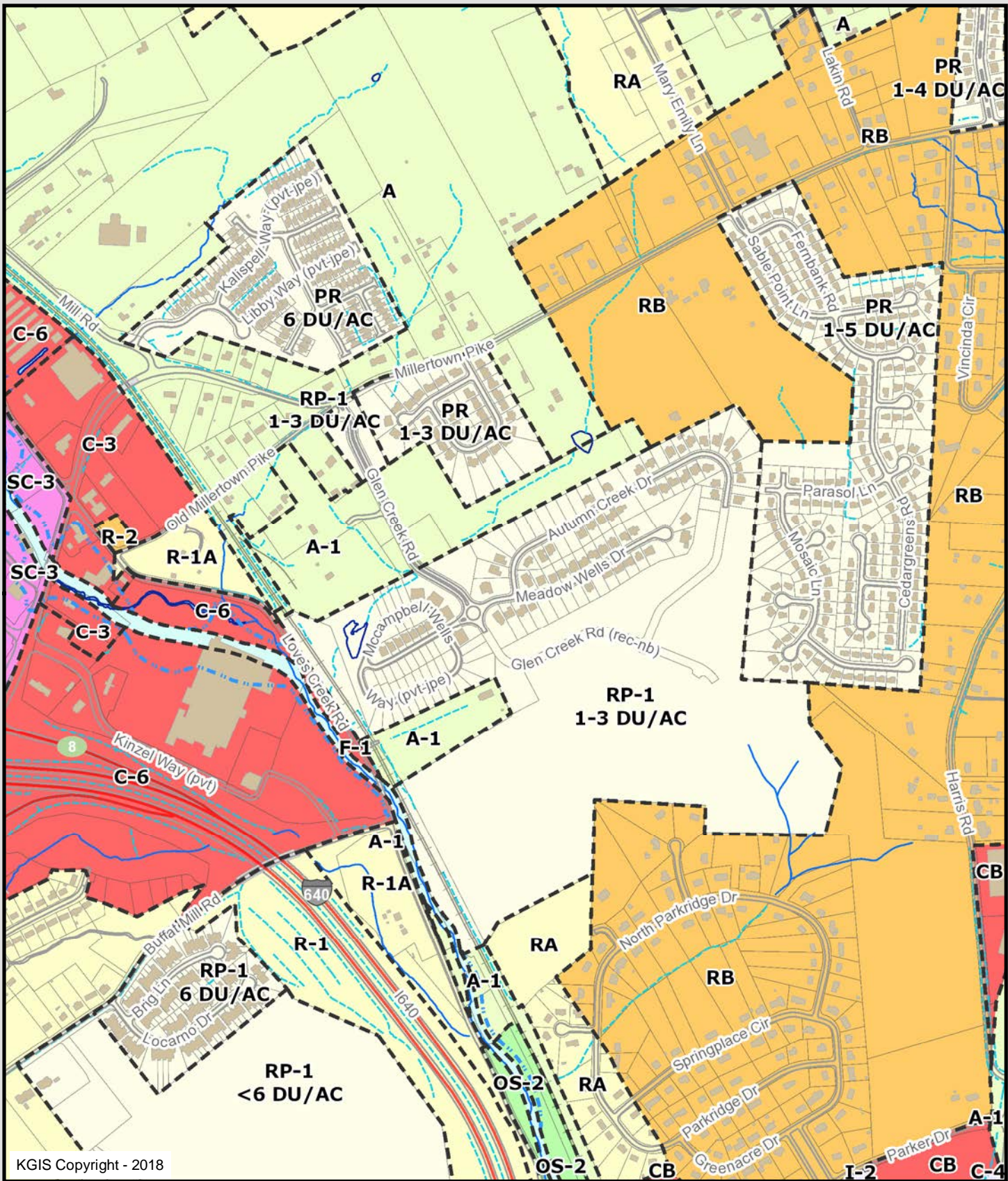
Need help reading this schedule?

Need other general information on how to ride?

[Click here to Download the General Schedule Information pdf](#) available from katbus.com

APPENDIX E

ZONING MAP



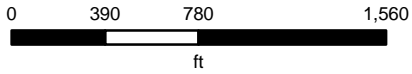
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Zoning Map Clear Springs Plantation

Knoxville - Knox County - KUB Geographic Information System



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APPENDIX F

MANUAL TRAFFIC COUNT DATA

TRAFFIC COUNT DATA

Major Street: Millertown Pike (WB - EB)
 Minor Street: Glen Creek Road (NB)
 Traffic Control: Stop Control on Glen Creek Road

7/26/2018 (Thursday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME BEGIN	Millertown Pike		Glen Creek Road		Millertown Pike		VEHICLE TOTAL	PEAK HOUR
	WESTBOUND		NORTHBOUND		EASTBOUND			
	LT	THRU	LT	RT	THRU	RT		
7:00 AM	0	79	8	0	27	1	115	
7:15 AM	2	117	6	1	31	3	160	7:15 AM - 8:15 AM
7:30 AM	3	127	3	1	30	8	172	
7:45 AM	4	104	10	1	27	5	151	
8:00 AM	1	80	7	1	37	6	132	
8:15 AM	2	76	3	1	34	5	121	
8:30 AM	1	77	8	1	24	3	114	
8:45 AM	1	69	8	2	35	4	119	
TOTAL	14	729	53	8	245	35	1084	
11:00 AM	0	51	6	2	41	3	103	
11:15 AM	0	51	4	3	52	6	116	
11:30 AM	2	57	3	1	58	4	125	
11:45 AM	0	47	4	3	50	2	106	
12:00 PM	0	73	12	0	70	5	160	12:00 PM - 1:00 PM
12:15 PM	4	69	5	2	70	10	160	
12:30 PM	0	56	7	2	81	9	155	
12:45 PM	3	54	6	1	63	6	133	
TOTAL	9	458	47	14	485	45	1058	
2:00 PM	1	65	8	4	75	4	157	
2:15 PM	1	52	3	4	61	5	126	
2:30 PM	1	48	6	3	68	5	131	
2:45 PM	0	50	5	1	82	11	149	
3:00 PM	0	59	5	4	88	9	165	
3:15 PM	3	69	5	4	85	4	170	
3:30 PM	2	61	4	3	79	4	153	
3:45 PM	2	45	9	2	83	9	150	
4:00 PM	0	48	7	2	95	7	159	
4:15 PM	1	69	9	4	127	11	221	
4:30 PM	0	73	5	7	112	7	204	
4:45 PM	3	51	7	6	98	7	172	
5:00 PM	3	64	11	10	127	6	221	5:00 PM - 6:00 PM
5:15 PM	2	65	7	14	116	4	208	
5:30 PM	0	83	7	7	116	8	221	
5:45 PM	0	106	6	7	99	4	222	
TOTAL	16	793	82	70	1225	80	2266	

Existing Traffic Volumes were collected and tabulated using CountCam System
 Unadjusted School Volumes

2018 AM Peak Hour **7:15 AM - 8:15 AM**

TIME BEGIN	Millertown Pike		Glen Creek Road		Millertown Pike	
	WESTBOUND		NORTHBOUND		EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
7:15 AM	2	117	6	1	31	3
7:30 AM	3	127	3	1	30	8
7:45 AM	4	104	10	1	27	5
8:00 AM	1	80	7	1	37	6
TOTAL	10	428	26	4	125	22
PHF	0.63	0.84	0.65	1.00	0.84	0.69

Unadjusted School Volumes

2018 Mid-Day Peak Hour **12:00 PM - 1:00 PM**

TIME BEGIN	Millertown Pike		Glen Creek Road		Millertown Pike	
	WESTBOUND		NORTHBOUND		EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
12:00 PM	0	73	12	0	70	5
12:15 PM	4	69	5	2	70	10
12:30 PM	0	56	7	2	81	9
12:45 PM	3	54	6	1	63	6
TOTAL	7	252	30	5	284	30
PHF	0.44	0.86	0.63	0.63	0.88	0.75

Unadjusted School Volumes

2018 PM Peak Hour **5:00 PM - 6:00 PM**

TIME BEGIN	Millertown Pike		Glen Creek Road		Millertown Pike	
	WESTBOUND		NORTHBOUND		EASTBOUND	
	LT	THRU	LT	RT	THRU	RT
5:00 PM	3	64	11	10	127	6
5:15 PM	2	65	7	14	116	4
5:30 PM	0	83	7	7	116	8
5:45 PM	0	106	6	7	99	4
TOTAL	5	318	31	38	458	22
PHF	0.42	0.75	0.70	0.68	0.90	0.69

Unadjusted School Volumes

TRAFFIC COUNT DATA

Major Street: Glen Creek Road (NB - SB)
 Minor Street: Old Millertown Pike (EB)
 Traffic Control: Stop Control on Old Millertown Pike

7/26/2018 (Thursday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME BEGIN	Glen Creek Road SOUTHBOUND			Glen Creek Road NORTHBOUND		Old Millertown Pike EASTBOUND		VEHICLE TOTAL	PEAK HOUR
	THRU	RT	U-TURN	LT	THRU	LT	RT		
7:00 AM	1	0	0	1	8	0	0	10	
7:15 AM	3	2	0	0	7	0	0	12	7:15 AM - 8:15 AM
7:30 AM	8	2	1	2	3	1	1	18	
7:45 AM	7	3	0	1	9	2	0	22	
8:00 AM	5	1	1	0	7	0	1	15	
8:15 AM	5	1	1	0	3	0	1	11	
8:30 AM	2	2	0	2	8	1	2	17	
8:45 AM	3	1	1	0	7	2	0	14	
TOTAL	34	12	0	6	52	6	5	115	
3:00 PM	5	3	1	0	4	4	1	18	
3:15 PM	4	2	1	0	7	1	0	15	
3:30 PM	3	2	1	0	3	5	1	15	
3:45 PM	6	3	2	0	7	2	1	21	
4:00 PM	7	0	0	1	6	2	1	17	
4:15 PM	10	1	1	0	8	4	0	24	
4:30 PM	7	0	0	3	6	6	3	25	4:30 PM - 5:30 PM
4:45 PM	8	2	0	0	8	5	3	26	
5:00 PM	4	4	1	1	11	9	3	33	
5:15 PM	6	0	0	1	12	11	0	30	
5:30 PM	7	0	1	0	4	7	1	20	
5:45 PM	5	0	0	0	6	7	2	20	
TOTAL	72	17	8	6	82	63	16	264	

Existing Traffic Volumes were collected and tabulated using CountCam System
 Unadjusted School Volumes

2018 AM Peak Hour 7:15 AM - 8:15 AM

TIME BEGIN	Glen Creek Road SOUTHBOUND			Glen Creek Road NORTHBOUND		Old Millertown Pike EASTBOUND	
	THRU	RT	U-TURN	LT	THRU	LT	RT
7:15 AM	3	2	0	0	7	0	0
7:30 AM	8	2	1	2	3	1	1
7:45 AM	7	3	0	1	9	2	0
8:00 AM	5	1	1	0	7	0	1
TOTAL	23	8	2	3	26	3	2
PHF	0.72	0.67	0.50	0.38	0.72	0.38	0.50

Unadjusted School Volumes

2018 PM Peak Hour 4:30 PM - 5:30 PM

TIME BEGIN	Glen Creek Road SOUTHBOUND			Glen Creek Road NORTHBOUND		Old Millertown Pike EASTBOUND	
	THRU	RT	U-TURN	LT	THRU	LT	RT
4:30 PM	7	0	0	3	6	6	3
4:45 PM	8	2	0	0	8	5	3
5:00 PM	4	4	1	1	11	9	3
5:15 PM	6	0	0	1	12	11	0
TOTAL	25	6	1	5	37	31	9
PHF	0.78	0.38	0.25	0.42	0.77	0.70	0.75

Unadjusted School Volumes

TRAFFIC COUNT DATA

Major Street: Glen Creek Road (NB - SB)
 Minor Street: Meadow Wells Drive (WB) / Laurel Creek Way (EB)
 Traffic Control: Roundabout (Yield)

7/26/2018 (Thursday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME BEGIN	Glen Creek Road SOUTHBOUND			Meadow Wells Drive WESTBOUND			Glen Creek Road NORTHBOUND			Laurel Creek Way EASTBOUND			VEHICLE TOTAL	PEAK HOUR
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT		
7:00 AM	0	0	2	0	0	6	0	0	0	3	0	0	11	
7:15 AM	1	0	2	0	1	5	0	0	0	2	0	0	11	
7:30 AM	1	0	5	0	0	3	0	0	0	3	0	0	12	7:30 AM - 8:30 AM
7:45 AM	3	0	4	0	0	9	0	0	0	1	0	0	17	
8:00 AM	1	0	4	0	0	6	0	0	0	1	0	0	12	
8:15 AM	3	0	5	0	0	3	0	0	0	1	0	0	12	
8:30 AM	2	0	0	0	0	3	0	0	0	5	0	0	10	
8:45 AM	1	0	2	0	0	6	0	0	0	2	0	0	11	
TOTAL	12	0	24	0	1	41	0	0	0	18	0	0	96	
3:00 PM	4	0	2	0	0	2	0	0	0	2	1	0	11	
3:15 PM	1	0	2	0	0	4	0	0	0	3	0	0	10	
3:30 PM	3	0	2	0	0	2	0	0	0	1	0	0	8	
3:45 PM	4	0	3	0	0	4	0	0	0	3	0	0	14	
4:00 PM	5	0	2	0	0	1	0	0	0	6	1	0	15	
4:15 PM	6	0	4	0	0	4	0	0	0	4	0	0	18	4:15 PM - 5:15 PM
4:30 PM	6	0	5	0	0	6	0	0	0	4	0	0	21	
4:45 PM	8	0	3	0	0	6	0	0	0	2	0	0	19	
5:00 PM	3	0	3	0	0	5	0	0	0	4	0	0	15	
5:15 PM	5	0	0	0	0	5	0	0	0	7	0	0	17	
5:30 PM	7	0	0	0	0	4	0	0	0	0	1	0	12	
5:45 PM	4	0	3	0	0	4	0	0	0	3	0	0	14	
TOTAL	56	0	29	0	0	47	0	0	0	39	3	0	174	

Existing Traffic Volumes were collected and tabulated using CountCam System
 Unadjusted School Volumes

2018 AM Peak Hour 7:30 AM - 8:30 AM

TIME BEGIN	Glen Creek Road SOUTHBOUND			Meadow Wells Drive WESTBOUND			Glen Creek Road NORTHBOUND			Laurel Creek Way EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:30 AM	1	0	5	0	0	3	0	0	0	3	0	0
7:45 AM	3	0	4	0	0	9	0	0	0	1	0	0
8:00 AM	1	0	4	0	0	6	0	0	0	1	0	0
8:15 AM	3	0	5	0	0	3	0	0	0	1	0	0
TOTAL	8	0	18	0	0	21	0	0	0	6	0	0
PHF	0.67	-	0.90	-	-	0.58	-	-	-	0.50	-	-

Unadjusted School Volumes

2018 PM Peak Hour 4:15 PM - 5:15 PM

TIME BEGIN	Glen Creek Road SOUTHBOUND			Meadow Wells Drive WESTBOUND			Glen Creek Road NORTHBOUND			Laurel Creek Way EASTBOUND		
	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
4:15 PM	6	0	4	0	0	4	0	0	0	4	0	0
4:30 PM	6	0	5	0	0	6	0	0	0	4	0	0
4:45 PM	8	0	3	0	0	6	0	0	0	2	0	0
5:00 PM	3	0	3	0	0	5	0	0	0	4	0	0
TOTAL	23	0	15	0	0	21	0	0	0	14	0	0
PHF	0.72	-	0.75	-	-	0.88	-	-	-	0.88	-	-

Unadjusted School Volumes

TRAFFIC COUNT DATA

Major Street: Millertown Pike (WB - EB)
 Minor Street: Mary Emily Lane (SB) / Sable Point Lane (NB)
 Traffic Control: Stop Controlled on Mary Emily Lane and Sable Point Lane

7/26/2018 (Thursday)
 Sunny/Hot
 Conducted by: Ajax Engineering

TIME	Mary Emily Lane			Millertown Pike			Sable Point Lane			Millertown Pike			VEHICLE TOTAL	PEAK HOUR
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND				
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT		
7:00 AM	0	0	2	0	58	0	16	0	1	0	26	2	105	
7:15 AM	0	0	1	3	85	0	23	0	0	0	23	3	138	7:15 AM - 8:15 AM
7:30 AM	0	0	2	0	106	0	25	0	0	1	24	5	163	
7:45 AM	0	0	0	0	77	0	25	0	1	0	28	3	134	
8:00 AM	0	0	0	1	64	0	17	0	0	0	33	3	118	
8:15 AM	0	0	2	1	63	1	12	0	3	0	26	4	112	
8:30 AM	1	0	2	1	53	0	18	0	0	1	21	4	101	
8:45 AM	0	0	0	0	55	0	19	0	2	1	24	12	113	
TOTAL	1	0	9	6	561	1	155	0	7	3	205	36	984	
3:00 PM	0	0	1	1	48	1	6	1	1	3	86	8	156	
3:15 PM	1	0	1	2	57	0	8	0	0	2	66	11	148	
3:30 PM	0	0	0	1	58	1	8	0	0	0	65	15	148	
3:45 PM	0	0	0	0	38	0	10	0	1	0	69	15	133	
4:00 PM	0	0	1	2	38	0	1	0	0	0	94	6	142	
4:15 PM	0	0	0	0	57	0	12	0	0	1	100	13	183	
4:30 PM	0	0	0	0	62	0	11	0	0	1	104	20	198	
4:45 PM	0	0	1	0	52	0	2	0	0	1	82	10	148	
5:00 PM	0	0	0	1	53	0	8	0	0	1	99	23	185	5:00 PM - 6:00 PM
5:15 PM	0	0	1	0	55	0	10	0	1	2	121	20	210	
5:30 PM	1	0	2	1	71	1	9	1	1	1	104	17	209	
5:45 PM	0	0	2	1	81	0	21	0	1	2	89	18	215	
TOTAL	2	0	9	9	670	3	106	2	5	14	1079	176	2075	

Existing Traffic Volumes were collected and tabulated using CountCam System
 Unadjusted School Volumes

2018 AM Peak Hour 7:15 AM - 8:15 AM

TIME	Mary Emily Lane			Millertown Pike			Sable Point Lane			Millertown Pike		
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
7:15 AM	0	0	1	3	85	0	23	0	0	0	23	3
7:45 AM	0	0	2	0	106	0	25	0	0	1	24	5
8:00 AM	0	0	0	0	77	0	25	0	1	0	28	3
8:15 AM	0	0	0	1	64	0	17	0	0	0	33	3
TOTAL	0	0	3	4	332	0	90	0	1	1	108	14
PHF	-	-	0.38	0.33	0.78	-	0.90	-	0.25	0.25	0.82	0.70

Unadjusted School Volumes

2018 PM Peak Hour 5:00 PM - 6:00 PM

TIME	Mary Emily Lane			Millertown Pike			Sable Point Lane			Millertown Pike		
	SOUTHBOUND			WESTBOUND			NORTHBOUND			EASTBOUND		
BEGIN	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT	LT	THRU	RT
5:00 PM	0	0	0	1	53	0	8	0	0	1	99	23
5:15 PM	0	0	1	0	55	0	10	0	1	2	121	20
5:30 PM	1	0	2	1	71	1	9	1	1	1	104	17
5:45 PM	0	0	2	1	81	0	21	0	1	2	89	18
TOTAL	1	0	5	3	260	1	48	1	3	6	413	78
PHF	0.25	-	0.63	0.75	0.80	0.25	0.57	0.25	0.75	0.75	0.85	0.85

Unadjusted School Volumes

APPENDIX G

CAPACITY ANALYSES – HCM WORKSHEETS (SYNCHRO 8)

EXISTING TRAFFIC CONDITIONS

HCM 2010 Roundabout
 6: Glen Creek Road & Laurel Creek Way/Meadow Wells Drive

7/31/2018

Intersection				
Intersection Delay, s/veh	3.5			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	12	45	0	41
Demand Flow Rate, veh/h	12	45	0	41
Vehicles Circulating, veh/h	15	12	27	0
Vehicles Exiting, veh/h	26	15	0	57
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.3	3.6	0.0	3.5
Approach LOS	A	A	-	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	12	45	0	41
Cap Entry Lane, veh/h	1113	1116	1100	1130
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	12	45	0	41
Cap Entry, veh/h	1113	1116	1100	1130
V/C Ratio	0.011	0.040	0.000	0.036
Control Delay, s/veh	3.3	3.6	3.3	3.5
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

Intersection

Int Delay, s/veh 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	156	28	13	535	33	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	84	100	63	84	65	100
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	186	28	21	637	51	5

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	214
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	1368
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1368
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	14.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	420	-	-	1368	-
HCM Lane V/C Ratio	0.133	-	-	0.015	-
HCM Control Delay (s)	14.9	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Intersection

Int Delay, s/veh 3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	135	18	5	415	0	113	0	1	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	-2	-	-	0	-	-	2	-
Peak Hour Factor	25	82	70	33	78	90	90	90	25	90	90	38
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	4	165	26	15	532	0	126	0	4	0	0	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	532	0	0	190	0	0	753	747	177	749	760	532
Stage 1	-	-	-	-	-	-	185	185	-	562	562	-
Stage 2	-	-	-	-	-	-	568	562	-	187	198	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1046	-	-	1396	-	-	329	344	871	304	311	535
Stage 1	-	-	-	-	-	-	821	751	-	484	482	-
Stage 2	-	-	-	-	-	-	511	513	-	803	725	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1046	-	-	1396	-	-	318	337	871	298	305	535
Mov Cap-2 Maneuver	-	-	-	-	-	-	318	337	-	298	305	-
Stage 1	-	-	-	-	-	-	818	748	-	482	475	-
Stage 2	-	-	-	-	-	-	493	505	-	796	722	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	23.3	11.9
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	324	1046	-	-	1396	-	-	535
HCM Lane V/C Ratio	0.4	0.004	-	-	0.011	-	-	0.02
HCM Control Delay (s)	23.3	8.5	0	-	7.6	0	-	11.9
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.9	0	-	-	0	-	-	0.1

HCM 2010 Roundabout
 6: Glen Creek Road & Laurel Creek Way/Meadow Wells Drive

7/31/2018

Intersection				
Intersection Delay, s/veh	3.5			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	10	41	0	36
Demand Flow Rate, veh/h	10	41	0	36
Vehicles Circulating, veh/h	13	10	23	0
Vehicles Exiting, veh/h	23	13	0	51
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.3	3.5	0.0	3.5
Approach LOS	A	A	-	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	10	41	0	36
Cap Entry Lane, veh/h	1115	1119	1104	1130
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	10	41	0	36
Cap Entry, veh/h	1115	1119	1104	1130
V/C Ratio	0.009	0.037	0.000	0.032
Control Delay, s/veh	3.3	3.5	3.3	3.5
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

Intersection

Int Delay, s/veh 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	144	25	12	492	30	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	84	69	63	84	65	100
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	171	36	19	586	46	5

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	208
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	1375
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1375
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	14
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	453	-	-	1375	-
HCM Lane V/C Ratio	0.113	-	-	0.014	-
HCM Control Delay (s)	14	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection

Int Delay, s/veh 3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	124	16	5	382	0	104	0	1	0	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	-2	-	-	0	-	-	2	-
Peak Hour Factor	25	82	70	33	78	90	90	90	25	90	90	38
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	4	151	23	15	490	0	116	0	4	0	0	8

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	490	0	0	174	0	0	695	691	163	693	702	490
Stage 1	-	-	-	-	-	-	171	171	-	520	520	-
Stage 2	-	-	-	-	-	-	524	520	-	173	182	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1084	-	-	1415	-	-	359	370	887	334	338	567
Stage 1	-	-	-	-	-	-	836	761	-	512	505	-
Stage 2	-	-	-	-	-	-	540	535	-	818	738	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1084	-	-	1415	-	-	349	363	887	328	332	567
Mov Cap-2 Maneuver	-	-	-	-	-	-	349	363	-	328	332	-
Stage 1	-	-	-	-	-	-	833	758	-	510	497	-
Stage 2	-	-	-	-	-	-	524	527	-	811	735	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	20.1	11.4
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	356	1084	-	-	1415	-	-	567
HCM Lane V/C Ratio	0.336	0.004	-	-	0.011	-	-	0.014
HCM Control Delay (s)	20.1	8.3	0	-	7.6	0	-	11.4
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.4	0	-	-	0	-	-	0

Intersection

Int Delay, s/veh 1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	3	2	3	30	26	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	5	-
Peak Hour Factor	38	50	38	72	72	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	4	8	42	36	13

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	100	43	50
Stage 1	43	-	-
Stage 2	57	-	-
Critical Hdwy	7.4	6.7	4.1
Critical Hdwy Stg 1	6.4	-	-
Critical Hdwy Stg 2	6.4	-	-
Follow-up Hdwy	3.5	3.3	2.2
Pot Cap-1 Maneuver	879	1027	1570
Stage 1	973	-	-
Stage 2	955	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	875	1027	1570
Mov Cap-2 Maneuver	875	-	-
Stage 1	973	-	-
Stage 2	950	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	1.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1570	-	921	-	-
HCM Lane V/C Ratio	0.005	-	0.013	-	-
HCM Control Delay (s)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection				
Intersection Delay, s/veh	3.5			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	18	27	0	59
Demand Flow Rate, veh/h	18	27	0	59
Vehicles Circulating, veh/h	36	18	54	0
Vehicles Exiting, veh/h	23	36	0	45
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.4	3.4	0.0	3.6
Approach LOS	A	A	-	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	18	27	0	59
Cap Entry Lane, veh/h	1090	1110	1071	1130
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	18	27	0	59
Cap Entry, veh/h	1090	1110	1071	1130
V/C Ratio	0.017	0.024	0.000	0.052
Control Delay, s/veh	3.4	3.4	3.4	3.6
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

Intersection

Int Delay, s/veh 1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	527	25	6	366	36	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	90	69	42	75	70	68
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	586	36	14	488	51	65

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	622
Stage 1	-	-	604
Stage 2	-	-	517
Critical Hdwy	-	4.1	5.4
Critical Hdwy Stg 1	-	-	4.4
Critical Hdwy Stg 2	-	-	4.4
Follow-up Hdwy	-	2.2	3.5
Pot Cap-1 Maneuver	-	969	314
Stage 1	-	-	650
Stage 2	-	-	696
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	969	308
Mov Cap-2 Maneuver	-	-	308
Stage 1	-	-	650
Stage 2	-	-	682

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	17.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	407	-	-	969	-
HCM Lane V/C Ratio	0.285	-	-	0.015	-
HCM Control Delay (s)	17.3	-	-	8.8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0	-

Intersection

Int Delay, s/veh 4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	7	475	90	3	299	1	55	1	3	1	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	-2	-	-	0	-	-	2	-
Peak Hour Factor	25	82	70	75	80	25	57	25	75	25	90	63
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	28	579	129	4	374	4	96	4	4	4	0	10

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	378	0	0	708	0	0	1089	1086	644	1088	1148	376
Stage 1	-	-	-	-	-	-	700	700	-	384	384	-
Stage 2	-	-	-	-	-	-	389	386	-	704	764	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1192	-	-	900	-	-	195	218	476	173	176	661
Stage 1	-	-	-	-	-	-	433	444	-	616	589	-
Stage 2	-	-	-	-	-	-	639	614	-	398	382	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1192	-	-	900	-	-	185	208	476	163	168	661
Mov Cap-2 Maneuver	-	-	-	-	-	-	185	208	-	163	168	-
Stage 1	-	-	-	-	-	-	416	426	-	591	585	-
Stage 2	-	-	-	-	-	-	626	610	-	375	367	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	44.9	15.8
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	190	1192	-	-	900	-	-	347
HCM Lane V/C Ratio	0.55	0.023	-	-	0.004	-	-	0.039
HCM Control Delay (s)	44.9	8.1	0	-	9	0	-	15.8
HCM Lane LOS	E	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	2.9	0.1	-	-	0	-	-	0.1

Intersection

Int Delay, s/veh 3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	36	10	6	43	29	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	5	-
Peak Hour Factor	70	75	42	77	78	38
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	51	13	14	56	37	18

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	130	46	56
Stage 1	46	-	-
Stage 2	84	-	-
Critical Hdwy	7.4	6.7	4.1
Critical Hdwy Stg 1	6.4	-	-
Critical Hdwy Stg 2	6.4	-	-
Follow-up Hdwy	3.5	3.3	2.2
Pot Cap-1 Maneuver	838	1023	1562
Stage 1	969	-	-
Stage 2	923	-	-
Platoon blocked, %			-
Mov Cap-1 Maneuver	830	1023	1562
Mov Cap-2 Maneuver	830	-	-
Stage 1	969	-	-
Stage 2	915	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	1.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1562	-	864	-	-
HCM Lane V/C Ratio	0.009	-	0.075	-	-
HCM Control Delay (s)	7.3	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT)

Intersection

Int Delay, s/veh 1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	3	4	33	29	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	5	-
Peak Hour Factor	38	50	38	72	72	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	6	11	46	40	15

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	115	48	55 0
Stage 1	48	-	- -
Stage 2	67	-	- -
Critical Hdwy	7.4	6.7	4.1 -
Critical Hdwy Stg 1	6.4	-	- -
Critical Hdwy Stg 2	6.4	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	858	1020	1563 -
Stage 1	967	-	- -
Stage 2	943	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	852	1020	1563 -
Mov Cap-2 Maneuver	852	-	- -
Stage 1	967	-	- -
Stage 2	936	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	9	1.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1563	-	906	-	-
HCM Lane V/C Ratio	0.007	-	0.018	-	-
HCM Control Delay (s)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 2010 Roundabout
 6: Glen Creek Road & Laurel Creek Way/Meadow Wells Drive

7/31/2018

Intersection				
Intersection Delay, s/veh	3.6			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	20	30	0	65
Demand Flow Rate, veh/h	20	30	0	65
Vehicles Circulating, veh/h	40	20	60	0
Vehicles Exiting, veh/h	25	40	0	50
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.5	3.5	0.0	3.7
Approach LOS	A	A	-	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	20	30	0	65
Cap Entry Lane, veh/h	1086	1108	1064	1130
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	20	30	0	65
Cap Entry, veh/h	1086	1108	1064	1130
V/C Ratio	0.018	0.027	0.000	0.058
Control Delay, s/veh	3.5	3.5	3.4	3.7
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

Intersection

Int Delay, s/veh 1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	573	28	6	398	39	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	90	69	42	75	70	68
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	637	41	14	531	56	71

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	677
Stage 1	-	-	657
Stage 2	-	-	559
Critical Hdwy	-	4.1	5.4
Critical Hdwy Stg 1	-	-	4.4
Critical Hdwy Stg 2	-	-	4.4
Follow-up Hdwy	-	2.2	3.5
Pot Cap-1 Maneuver	-	924	283
Stage 1	-	-	624
Stage 2	-	-	673
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	924	277
Mov Cap-2 Maneuver	-	-	277
Stage 1	-	-	624
Stage 2	-	-	659

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	19.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	373	-	-	924	-
HCM Lane V/C Ratio	0.339	-	-	0.015	-
HCM Control Delay (s)	19.5	-	-	9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.5	-	-	0	-

Intersection

Int Delay, s/veh 6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	8	517	98	4	325	1	60	1	4	1	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	-2	-	-	0	-	-	2	-
Peak Hour Factor	25	82	70	75	80	25	57	25	75	25	90	63
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	32	630	140	5	406	4	105	4	5	4	0	10

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	410	0	0	770	0	0	1188	1185	700	1188	1253	408
Stage 1	-	-	-	-	-	-	764	764	-	419	419	-
Stage 2	-	-	-	-	-	-	424	421	-	769	834	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1160	-	-	854	-	-	167	191	443	146	151	633
Stage 1	-	-	-	-	-	-	399	416	-	588	566	-
Stage 2	-	-	-	-	-	-	612	592	-	364	352	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1160	-	-	854	-	-	157	180	443	136	142	633
Mov Cap-2 Maneuver	-	-	-	-	-	-	157	180	-	136	142	-
Stage 1	-	-	-	-	-	-	379	395	-	559	561	-
Stage 2	-	-	-	-	-	-	598	587	-	338	334	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	67.3	17.4
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	163	1160	-	-	854	-	-	304
HCM Lane V/C Ratio	0.703	0.028	-	-	0.006	-	-	0.044
HCM Control Delay (s)	67.3	8.2	0	-	9.2	0	-	17.4
HCM Lane LOS	F	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	4.2	0.1	-	-	0	-	-	0.1

Intersection

Int Delay, s/veh 3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	39	11	6	46	31	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	5	-
Peak Hour Factor	70	75	42	77	78	38
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	56	15	14	60	40	21

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	138	50	61 0
Stage 1	50	-	- -
Stage 2	88	-	- -
Critical Hdwy	7.4	6.7	4.1 -
Critical Hdwy Stg 1	6.4	-	- -
Critical Hdwy Stg 2	6.4	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	828	1017	1555 -
Stage 1	964	-	- -
Stage 2	918	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	821	1017	1555 -
Mov Cap-2 Maneuver	821	-	- -
Stage 1	964	-	- -
Stage 2	910	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	9.6	1.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1555	-	855	-	-
HCM Lane V/C Ratio	0.009	-	0.082	-	-
HCM Control Delay (s)	7.3	0	9.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)

HCM 2010 Roundabout
 6: Glen Creek Road & Laurel Creek Way/Meadow Wells Drive

8/1/2018

Intersection				
Intersection Delay, s/veh	4.4			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	61	117	98	116
Demand Flow Rate, veh/h	61	117	98	116
Vehicles Circulating, veh/h	79	159	97	0
Vehicles Exiting, veh/h	37	36	43	276
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.0	4.9	4.4	4.1
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	61	117	98	116
Cap Entry Lane, veh/h	1044	964	1025	1130
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	61	117	98	116
Cap Entry, veh/h	1044	964	1025	1130
V/C Ratio	0.058	0.121	0.096	0.103
Control Delay, s/veh	4.0	4.9	4.4	4.1
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

Intersection

Int Delay, s/veh 7.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	156	73	16	535	172	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	84	100	63	84	65	100
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	186	73	25	637	265	13

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	259
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	1317
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1317
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	33
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	395	-	-	1317	-
HCM Lane V/C Ratio	0.703	-	-	0.019	-
HCM Control Delay (s)	33	-	-	7.8	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	5.2	-	-	0.1	-

Intersection

Int Delay, s/veh 3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	143	18	5	418	0	113	0	1	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	-2	-	-	0	-	-	2	-
Peak Hour Factor	25	82	70	33	78	90	90	90	25	90	90	38
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	4	174	26	15	536	0	126	0	4	0	0	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	536	0	0	200	0	0	766	761	187	763	774	536
Stage 1	-	-	-	-	-	-	195	195	-	566	566	-
Stage 2	-	-	-	-	-	-	571	566	-	197	208	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1042	-	-	1384	-	-	322	337	860	297	304	532
Stage 1	-	-	-	-	-	-	811	743	-	481	480	-
Stage 2	-	-	-	-	-	-	509	511	-	792	717	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1042	-	-	1384	-	-	311	331	860	291	298	532
Mov Cap-2 Maneuver	-	-	-	-	-	-	311	331	-	291	298	-
Stage 1	-	-	-	-	-	-	808	740	-	479	473	-
Stage 2	-	-	-	-	-	-	491	503	-	785	714	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	24	11.9
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	317	1042	-	-	1384	-	-	532
HCM Lane V/C Ratio	0.409	0.004	-	-	0.011	-	-	0.02
HCM Control Delay (s)	24	8.5	0	-	7.6	0	-	11.9
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.9	0	-	-	0	-	-	0.1

Intersection

Int Delay, s/veh 1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	8	20	180	77	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	5	-
Peak Hour Factor	38	50	38	72	72	67
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	11	16	53	250	107	15

Major/Minor	Minor2	Major1		Major2
Conflicting Flow All	469	114	122	0
Stage 1	114	-	-	-
Stage 2	355	-	-	-
Critical Hdwy	7.4	6.7	4.1	-
Critical Hdwy Stg 1	6.4	-	-	-
Critical Hdwy Stg 2	6.4	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-
Pot Cap-1 Maneuver	488	929	1478	-
Stage 1	887	-	-	-
Stage 2	647	-	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	468	929	1478	-
Mov Cap-2 Maneuver	468	-	-	-
Stage 1	887	-	-	-
Stage 2	620	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1478	-	668	-	-
HCM Lane V/C Ratio	0.036	-	0.04	-	-
HCM Control Delay (s)	7.5	0	10.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

HCM 2010 Roundabout
 6: Glen Creek Road & Laurel Creek Way/Meadow Wells Drive

8/1/2018

Intersection				
Intersection Delay, s/veh	5.2			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	42	59	62	307
Demand Flow Rate, veh/h	42	59	62	307
Vehicles Circulating, veh/h	236	104	145	0
Vehicles Exiting, veh/h	71	103	133	163
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.5	4.0	4.2	5.7
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	42	59	62	307
Cap Entry Lane, veh/h	892	1018	977	1130
Entry HV Adj Factor	1.000	1.000	1.000	1.000
Flow Entry, veh/h	42	59	62	307
Cap Entry, veh/h	892	1018	977	1130
V/C Ratio	0.047	0.058	0.063	0.272
Control Delay, s/veh	4.5	4.0	4.2	5.7
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	1

Intersection

Int Delay, s/veh 13.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	573	177	14	398	125	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	90	69	42	75	70	68
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	637	257	33	531	179	78

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	893
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	768
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	768
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	87.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	266	-	-	768	-
HCM Lane V/C Ratio	0.964	-	-	0.043	-
HCM Control Delay (s)	87.6	-	-	9.9	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	9.2	-	-	0.1	-

Intersection

Int Delay, s/veh 6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	8	522	98	4	333	1	60	1	4	1	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	2	-	-	-2	-	-	0	-	-	2	-
Peak Hour Factor	25	82	70	75	80	25	57	25	75	25	90	63
Heavy Vehicles, %	0	2	0	0	2	0	0	0	0	0	0	0
Mvmt Flow	32	637	140	5	416	4	105	4	5	4	0	10

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	420	0	0	777	0	0	1205	1202	707	1204	1270	418
Stage 1	-	-	-	-	-	-	771	771	-	429	429	-
Stage 2	-	-	-	-	-	-	434	431	-	775	841	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.5	6.9	6.4
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.9	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1150	-	-	848	-	-	162	186	439	142	147	625
Stage 1	-	-	-	-	-	-	396	413	-	580	560	-
Stage 2	-	-	-	-	-	-	604	586	-	361	349	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1150	-	-	848	-	-	153	175	439	132	139	625
Mov Cap-2 Maneuver	-	-	-	-	-	-	153	175	-	132	139	-
Stage 1	-	-	-	-	-	-	376	392	-	551	556	-
Stage 2	-	-	-	-	-	-	590	581	-	335	332	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	71.1	17.7
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	159	1150	-	-	848	-	-	297
HCM Lane V/C Ratio	0.721	0.028	-	-	0.006	-	-	0.046
HCM Control Delay (s)	71.1	8.2	0	-	9.3	0	-	17.7
HCM Lane LOS	F	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	4.3	0.1	-	-	0	-	-	0.1

Intersection

Int Delay, s/veh 2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	39	29	16	137	188	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	5	-
Peak Hour Factor	70	75	42	77	78	38
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	56	39	38	178	241	21

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	506	252	262 0
Stage 1	252	-	- -
Stage 2	254	-	- -
Critical Hdwy	7.4	6.7	4.1 -
Critical Hdwy Stg 1	6.4	-	- -
Critical Hdwy Stg 2	6.4	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	460	764	1314 -
Stage 1	741	-	- -
Stage 2	739	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	445	764	1314 -
Mov Cap-2 Maneuver	445	-	- -
Stage 1	741	-	- -
Stage 2	715	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	13.1	1.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1314	-	537	-	-
HCM Lane V/C Ratio	0.029	-	0.176	-	-
HCM Control Delay (s)	7.8	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.6	-	-

**OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)
MILLERTOWN PIKE AT GLEN CREEK ROAD WITH EB RIGHT TURN LANE**

Intersection

Int Delay, s/veh 7.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	156	73	16	535	172	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	84	100	63	84	65	100
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	186	73	25	637	265	13

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	186
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	1401
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1401
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	30.2
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	411	-	-	1401	-
HCM Lane V/C Ratio	0.675	-	-	0.018	-
HCM Control Delay (s)	30.2	-	-	7.6	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	4.8	-	-	0.1	-

Intersection

Int Delay, s/veh 8.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	573	177	14	398	125	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	-5	-	-	-2	-5	-
Peak Hour Factor	90	69	42	75	70	68
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	637	257	33	531	179	78

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	637
Stage 1	-	-	637
Stage 2	-	-	597
Critical Hdwy	-	-	4.1
Critical Hdwy Stg 1	-	-	4.4
Critical Hdwy Stg 2	-	-	4.4
Follow-up Hdwy	-	-	2.2
Pot Cap-1 Maneuver	-	-	956
Stage 1	-	-	633
Stage 2	-	-	654
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	956
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	633
Stage 2	-	-	622

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	54.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	310	-	-	956	-
HCM Lane V/C Ratio	0.827	-	-	0.035	-
HCM Control Delay (s)	54.2	-	-	8.9	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	7	-	-	0.1	-

APPENDIX H

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)

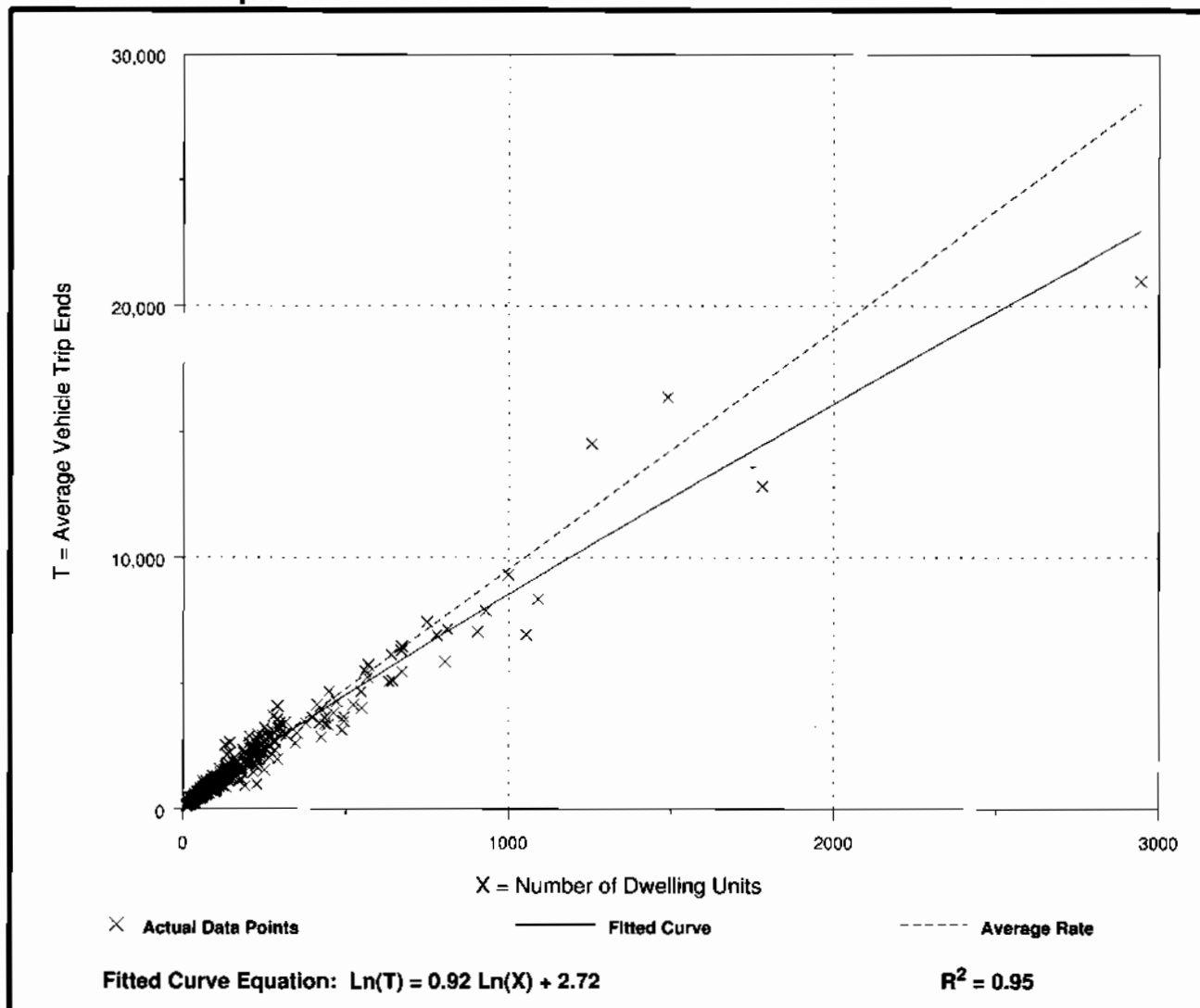
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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)

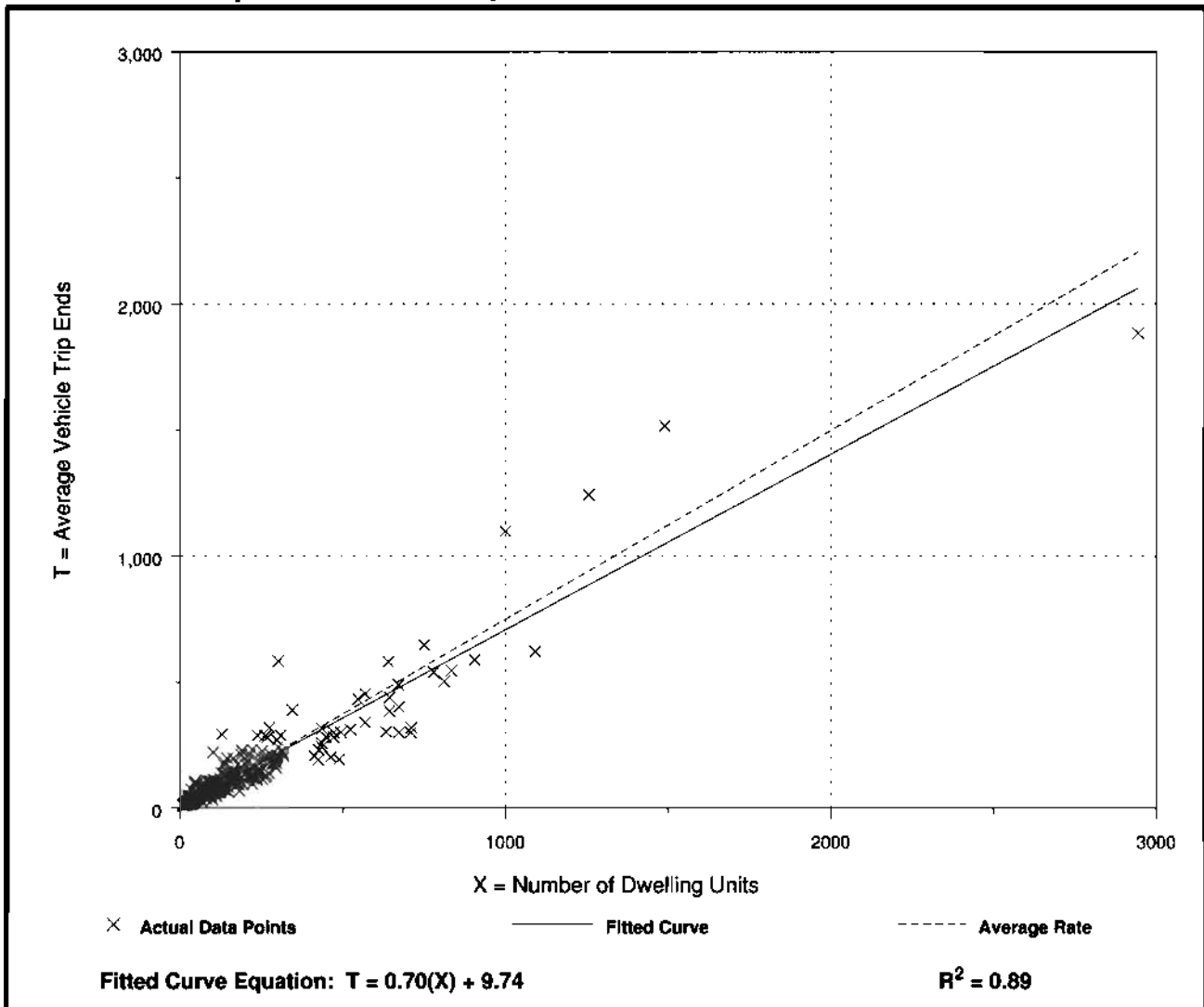
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

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)

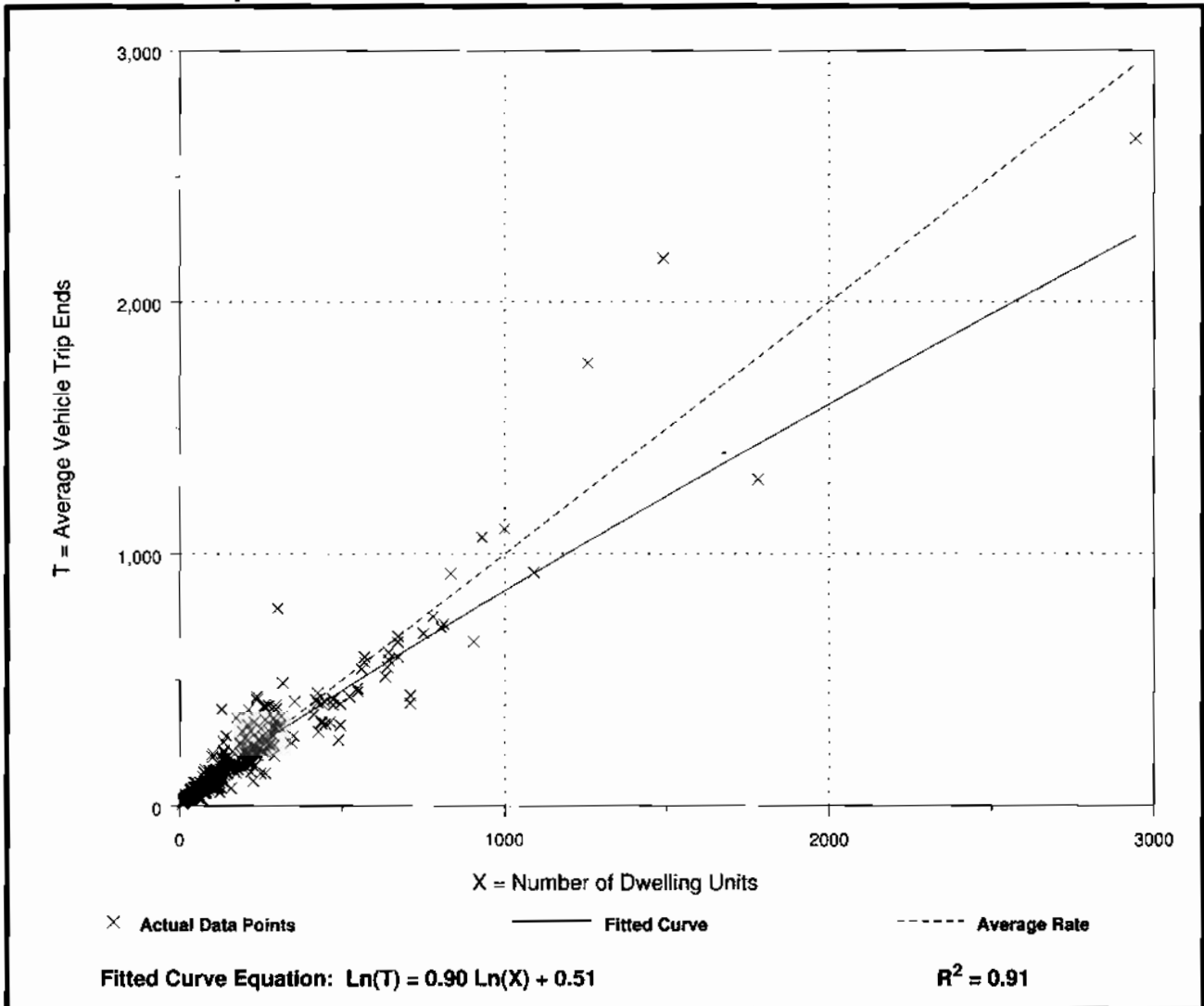
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

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



Land Use: 230

Residential Condominium/Townhouse

Description

Residential condominiums/townhouses are defined as ownership units that have at least one other owned unit within the same building structure. **Both condominiums and townhouses are included in this land use.** The studies in this land use did not identify whether the condominiums/townhouses were low-rise or high-rise. Low-rise residential condominium/townhouse (Land Use 231), high-rise residential condominium/townhouse (Land Use 232) and luxury condominium/townhouse (Land Use 233) are related uses.

Additional Data

The number of vehicles and the number of 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 is usually readily available, easy to project and had a high correlation with average weekday vehicle trip ends.

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

The sites were surveyed between the mid-1970s and the 2000s throughout the United States and Canada.

Source Numbers

4, 92, 94, 95, 97, 100, 105, 106, 114, 168, 186, 204, 237, 253, 293, 319, 320, 321, 390, 412, 418, 561, 562, 583, 638

Residential Condominium/Townhouse (230)

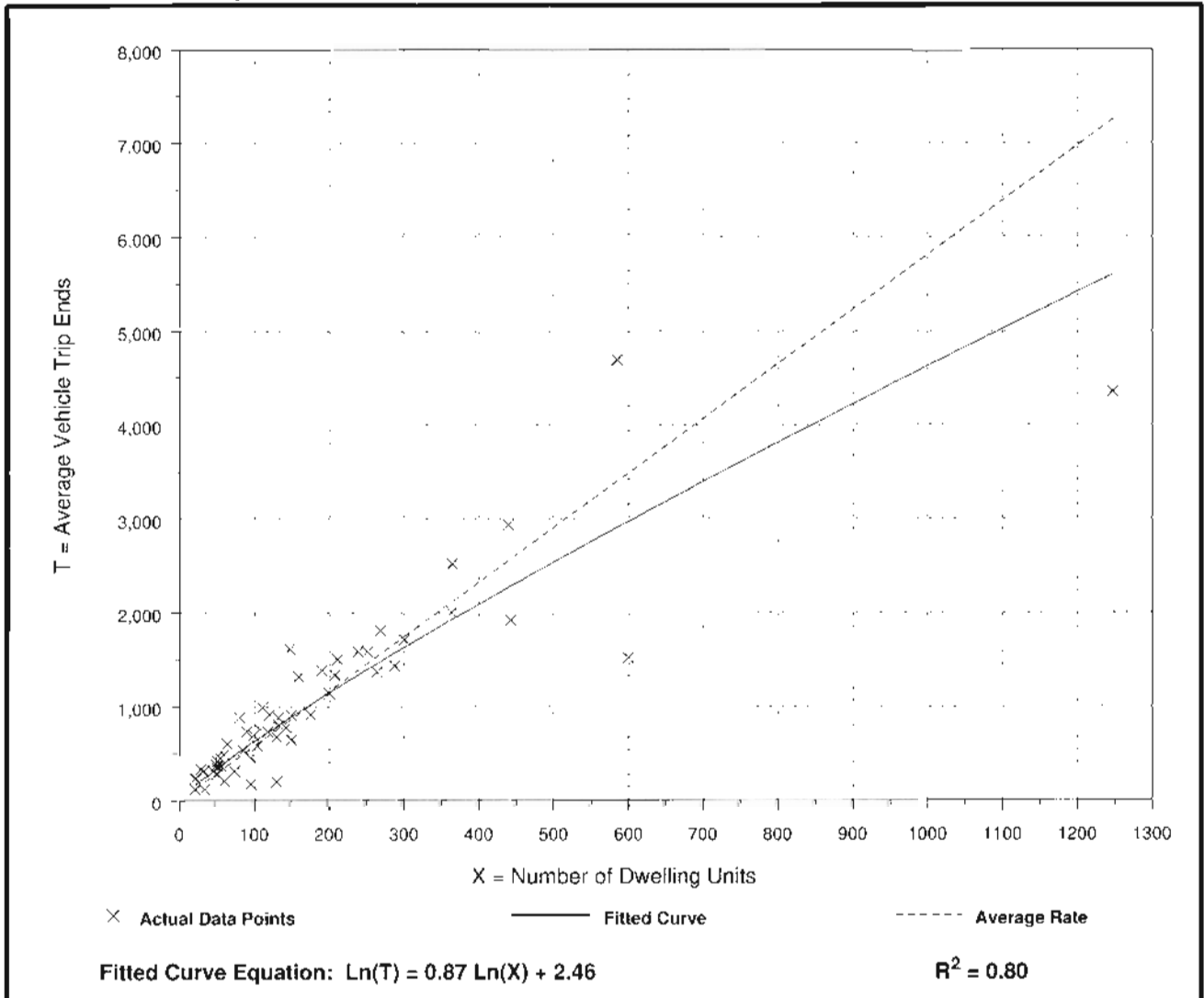
**Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday**

Number of Studies: 56
Avg. Number of Dwelling Units: 179
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
5.81	1.53 - 11.79	3.11

Data Plot and Equation



Residential Condominium/Townhouse (230)

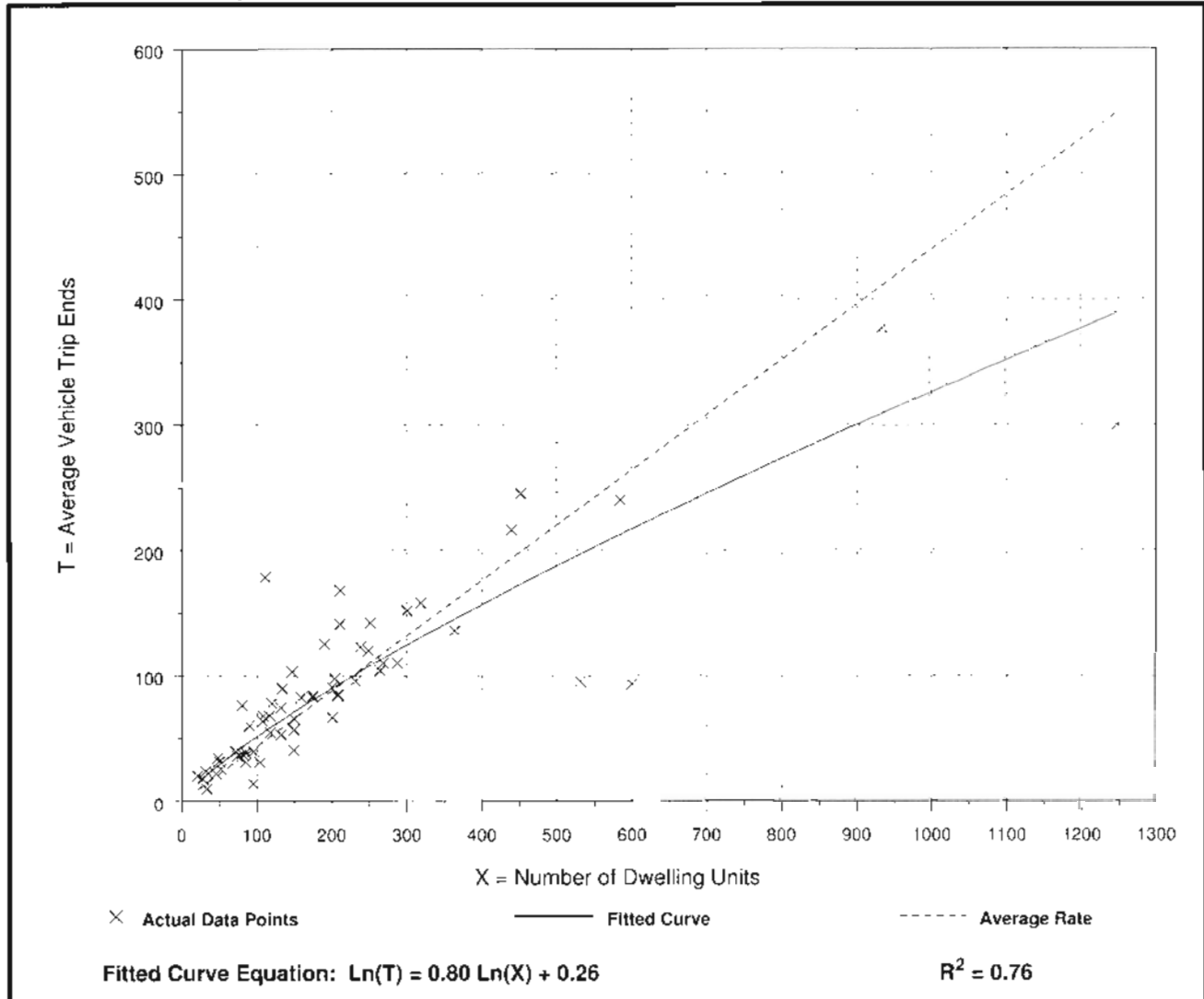
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 59
 Avg. Number of Dwelling Units: 213
 Directional Distribution: 17% entering, 83% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.61	0.69

Data Plot and Equation



Residential Condominium/Townhouse (230)

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: 62
 Avg. Number of Dwelling Units: 205
 Directional Distribution: 67% entering, 33% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.52	0.18 - 1.24	0.75

Data Plot and Equation

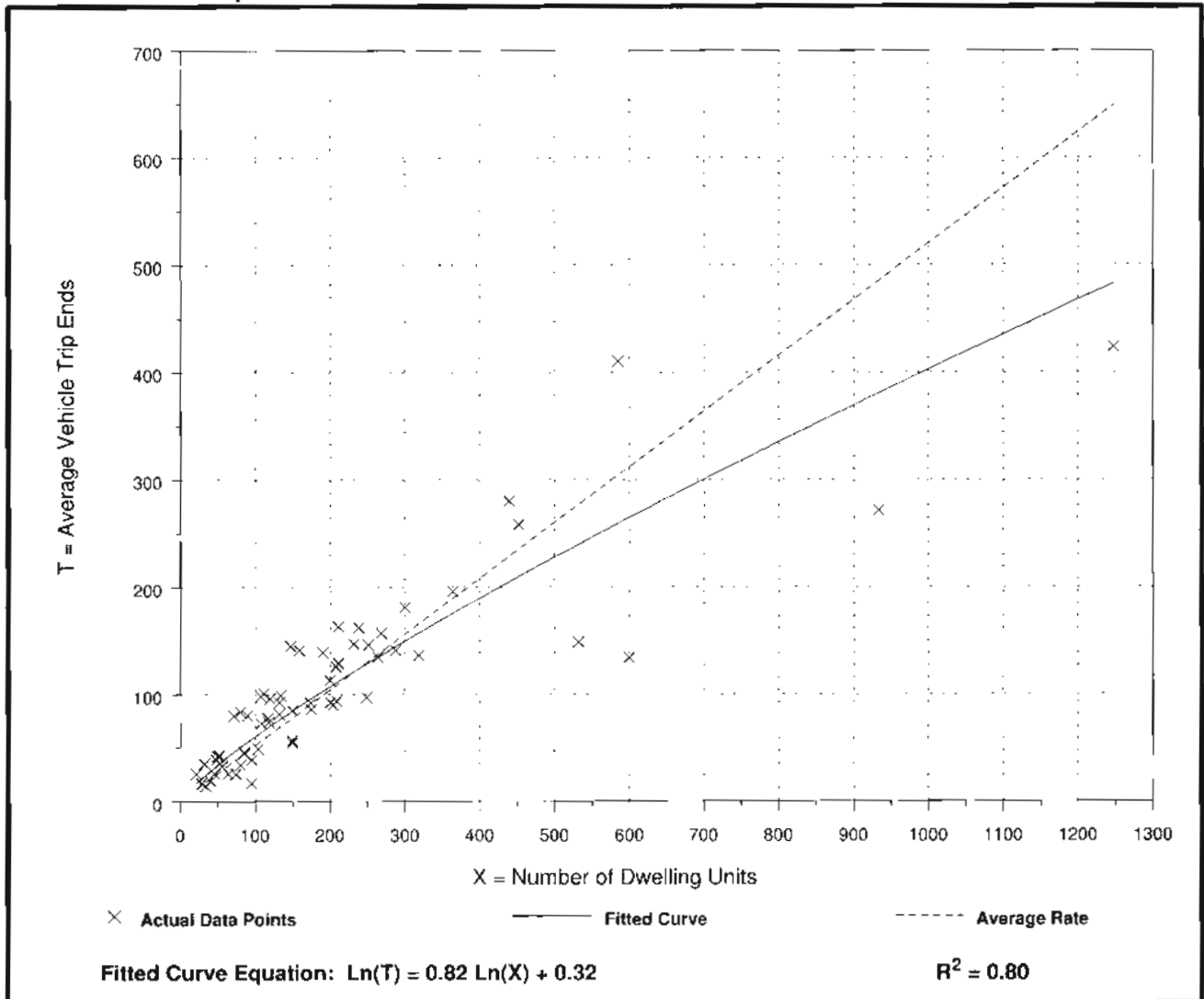


TABLE 5A
TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
Entire Development

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
Total New Volume Site Trips			2,801	53	163	216	175	101	276

TABLE 5B
TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
271 Single-Family Detached Homes

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	271 Lots	2,628	25%	75%		63%	37%	
				50	150	200	163	95	258
Total New Volume Site Trips			2,628	50	150	200	163	95	258

ITE Trip Generation Manual, 9th Edition

36 single family detached homes - East side of Phase 1

AM	ENTER	36 lots out of	271 lots =	0.13	*	50 =	7	trips
	EXIT	36 lots out of	271 lots =	0.13	*	150 =	20	trips
PM	ENTER	36 lots out of	271 lots =	0.13	*	163 =	22	trips
	EXIT	36 lots out of	271 lots =	0.13	*	95 =	13	trips

75 single family detached homes - West side of Phase 1

AM	ENTER	75 lots out of	271 lots =	0.28	*	50 =	14	trips
	EXIT	75 lots out of	271 lots =	0.28	*	150 =	42	trips
PM	ENTER	75 lots out of	271 lots =	0.28	*	163 =	45	trips
	EXIT	75 lots out of	271 lots =	0.28	*	95 =	26	trips

160 single family detached homes - Phase 2

AM	ENTER	160 lots out of	271 lots =	0.59	*	50 =	30	trips
	EXIT	160 lots out of	271 lots =	0.59	*	150 =	89	trips
PM	ENTER	160 lots out of	271 lots =	0.59	*	163 =	96	trips
	EXIT	160 lots out of	271 lots =	0.59	*	95 =	56	trips

458

TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
271 single family detached homes

271 Residential Units = X

Weekday:

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

$$\ln(T) = 0.92 * 5.60 + 2.72$$

$$\ln(T) = 7.87$$

$$\underline{\underline{T = 2,628 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

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

$$T = 0.70 * 271 + 9.74$$

$$\underline{\underline{T = 200 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

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

$$\ln(T) = 0.90 * 5.60 + 0.51$$

$$\ln(T) = 5.55$$

$$\underline{\underline{T = 258 \text{ trips}}}$$

TABLE 5C
TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT
22 Single-Family Attached Homes
(8 Condominiums + 14 Townhouses)

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
#230	Residential Condominium / Townhouse	22 Dwellings	173	17%	83%		67%	33%	
				3	13	16	12	6	18
Total New Volume Site Trips			173	3	13	16	12	6	18

ITE Trip Generation Manual, 9th Edition

22 attached homes - East side of Phase 1

AM	ENTER	3	trips
	EXIT	13	trips
PM	ENTER	12	trips
	EXIT	6	trips
		34	

TRIP GENERATION FOR CLEAR SPRING DEVELOPMENT

22 attached homes

22 Dwelling Units = X

Weekday:

Fitted Curve Equation: $\ln(T) = 0.87 \ln(X) + 2.46$

$$\ln(T) = 0.87 * 3.09 + 2.46$$

$$\ln(T) = 5.15$$

$$\underline{\underline{T = 173 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: $\ln(T) = 0.80 \ln(X) + 0.26$

$$\ln(T) = 0.80 * 3.09 + 0.26$$

$$\ln(T) = 2.73$$

$$\underline{\underline{T = 16 \text{ trips}}}$$

Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: $\ln(T) = 0.82 \ln(X) + 0.32$

$$\ln(T) = 0.82 * 3.09 + 0.32$$

$$\ln(T) = 2.85$$

$$\underline{\underline{T = 18 \text{ trips}}}$$

APPENDIX I

**TDOT STATEWIDE CRASH RATES &
SPREADSHEET CALCULATIONS**

**Tennessee Department of Transportation
Statewide Intersection Crash Rates**

Study: OFFICIAL HSIP STUDY 2014 - 2016

Begin Date: 1/1/2014 End Date: 12/31/2016

		Rural					Urban				
		Multi-Lane					Multi-Lane				
		2 Lane	2 Ln w/Turn	Univided	Divided	Turn Lane	2 Lane	2 Ln w/Turn	Univided	Divided	Turn Lane
Signalized Intersections											
	Non-injury	0.456	0.525	0.699	0.401	0.392	0.595	0.452	0.633	0.545	0.507
	Injury	0.109	0.109	0.134	0.141	0.129	0.167	0.130	0.180	0.157	0.160
	Incap Inj	0.020	0.027	0.017	0.032	0.027	0.012	0.010	0.016	0.018	0.013
	Fatal	0.001	0.001	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001
	Total	0.586	0.661	0.850	0.577	0.549	0.774	0.592	0.830	0.721	0.682
Full Stop Intersections											
	Non-injury	0.425	0.898	0.564	0.443	0.900	0.379	0.653	0.110	0.550	0.001
	Injury	0.088	0.225	0.564	0.194	0.053	0.100	0.087	0.110	0.167	0.001
	Incap Inj	0.006	0.001	0.001	0.001	0.001	0.010	0.001	0.001	0.015	0.001
	Fatal	0.001	0.001	0.001	0.001	0.001	0.002	0.044	0.001	0.001	0.001
	Total	0.519	1.122	1.128	0.637	0.953	0.490	0.783	0.219	0.731	0.001
Other Intersections											
	Non-injury	0.079	0.073	0.075	0.048	0.042	0.127	0.117	0.165	0.120	0.105
	Injury	0.033	0.020	0.026	0.025	0.016	0.040	0.033	0.049	0.039	0.033
	Incap Inj	0.008	0.007	0.003	0.008	0.003	0.005	0.004	0.005	0.006	0.004
	Fatal	0.001	0.000	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
	Total	0.121	0.099	0.104	0.083	0.062	0.173	0.154	0.220	0.166	0.143

Intersection Rates: Crashes / Million Entering Vehicles

**Tennessee Department of Transportation
Statewide Average Crash Rates for Sections and Spots**

Study: OFFICIAL HSIP STUDY 2014 - 2016

Begin Date: 1/1/2014 End Date: 12/31/2016

Route Type	Rural / Urban	Location Type	Highway Type	Fatal Rate	Incap. Rate	Other Inj. Rate	Pd. Rate	Total Rate	Severe Crash Rate	Total Veh. Miles (in millions)
Interstates and State Routes										
IS & SR	Rural	Section	2 OR 3 LN	0.024	0.116	0.403	1.106	1.647	0.139	22,121
IS & SR	Rural	Section	2 OR 3 LN W/TL	0.011	0.078	0.358	1.583	2.030	0.089	628
IS & SR	Rural	Section	4 OR MORE UNDIV	0.011	0.064	0.379	1.225	1.679	0.075	359
IS & SR	Rural	Section	4 OR MORE DIV	0.009	0.047	0.156	0.484	0.696	0.056	7,213
IS & SR	Rural	Section	4 OR MORE W TL	0.018	0.042	0.194	0.641	0.896	0.061	2,673
IS & SR	Rural	Section	FREEWAY	0.006	0.027	0.103	0.392	0.528	0.033	25,129
IS & SR	Rural	Spot	2 OR 3 LN	0.007	0.033	0.117	0.323	0.480	0.040	77,767
IS & SR	Rural	Spot	2 OR 3 LN W/TL	0.002	0.013	0.066	0.297	0.378	0.015	3,560
IS & SR	Rural	Spot	4 OR MORE UNDIV	0.003	0.012	0.065	0.210	0.290	0.015	2,268
IS & SR	Rural	Spot	4 OR MORE DIV	0.003	0.013	0.044	0.138	0.196	0.016	26,451
IS & SR	Rural	Spot	4 OR MORE W TL	0.004	0.010	0.048	0.158	0.221	0.015	11,151
IS & SR	Rural	Spot	FREEWAY	0.001	0.004	0.017	0.064	0.086	0.005	154,522
IS & SR	Urban	Section	2 OR 3 LN	0.015	0.085	0.559	1.915	2.574	0.100	10,470
IS & SR	Urban	Section	2 OR 3 LN W/TL	0.009	0.071	0.583	2.315	2.978	0.080	1,877
IS & SR	Urban	Section	4 OR MORE UNDIV	0.013	0.086	0.813	3.042	3.954	0.098	2,910
IS & SR	Urban	Section	4 OR MORE DIV	0.009	0.051	0.397	1.537	1.994	0.059	17,187
IS & SR	Urban	Section	4 OR MORE W TL	0.011	0.078	0.680	2.525	3.294	0.089	14,184
IS & SR	Urban	Section	FREEWAY	0.005	0.025	0.225	0.857	1.112	0.030	50,490
IS & SR	Urban	Spot	2 OR 3 LN	0.002	0.013	0.087	0.311	0.414	0.015	74,483
IS & SR	Urban	Spot	2 OR 3 LN W/TL	0.001	0.010	0.075	0.308	0.394	0.011	15,299
IS & SR	Urban	Spot	4 OR MORE UNDIV	0.001	0.009	0.092	0.363	0.465	0.010	37,084
IS & SR	Urban	Spot	4 OR MORE DIV	0.001	0.007	0.057	0.224	0.289	0.008	132,270
IS & SR	Urban	Spot	4 OR MORE W TL	0.001	0.009	0.080	0.301	0.392	0.011	126,015
IS & SR	Urban	Spot	FREEWAY	0.001	0.003	0.027	0.103	0.133	0.004	423,396
Note: Section rates are crashes per million vehicle miles.										
Note: Spot rates are crashes per million vehicles. Spots are sections of roadway less than or equal to .10 mile.										
Note: Severe crash rates are the sum of rates for fatal and incapacitating injury crashes.										

Tennessee Department of Transportation
Statewide Average Crash Rates for Sections and Spots

Study: OFFICIAL HSIP STUDY 2014 - 2016

Begin Date: 1/1/2014 End Date: 12/31/2016

Route Type	Rural / Urban	Location Type	Highway Type	Fatal Rate	Incap. Rate	Other Inj. Rate	Pd. Rate	Total Rate	Severe Crash Rate	Total Veh. Miles (in millions)
Functionally Classified Local Roads										
FUNCT.	Rural	Section	2 OR 3 LN	0.034	0.179	0.676	1.943	2.832	0.213	7,033
FUNCT.	Rural	Section	2 OR 3 LN W/TL	0.024	0.096	0.358	1.194	1.671	0.119	42
FUNCT.	Rural	Section	4 OR MORE UNDIV	0.001	0.001	1.814	4.405	6.219	0.001	4
FUNCT.	Rural	Section	4 OR MORE DIV	0.001	0.001	0.001	0.001	0.001	0.001	0
FUNCT.	Rural	Section	4 OR MORE W TL	0.001	0.001	0.001	0.001	0.001	0.001	0
FUNCT.	Rural	Section	FREEWAY	0.001	1.323	2.646	6.615	10.583	1.323	1
FUNCT.	Rural	Spot	2 OR 3 LN	0.016	0.083	0.313	0.901	1.312	0.098	15,243
FUNCT.	Rural	Spot	2 OR 3 LN W/TL	0.001	0.022	0.076	0.305	0.403	0.022	183
FUNCT.	Rural	Spot	4 OR MORE UNDIV	0.001	0.041	0.326	0.856	1.223	0.041	25
FUNCT.	Rural	Spot	FREEWAY	0.001	0.151	0.302	0.905	1.357	0.151	7
FUNCT.	Urban	Section	2 OR 3 LN	0.011	0.098	0.734	2.776	3.618	0.109	15,443
FUNCT.	Urban	Section	2 OR 3 LN W/TL	0.004	0.068	0.692	3.053	3.817	0.072	1,639
FUNCT.	Urban	Section	4 OR MORE UNDIV	0.011	0.076	0.924	3.518	4.529	0.087	2,736
FUNCT.	Urban	Section	4 OR MORE DIV	0.007	0.044	0.552	2.445	3.047	0.050	3,750
FUNCT.	Urban	Section	4 OR MORE W TL	0.016	0.064	0.737	2.713	3.530	0.079	4,650
FUNCT.	Urban	Section	FREEWAY	0.004	0.025	0.470	1.958	2.457	0.030	475
FUNCT.	Urban	Spot	2 OR 3 LN	0.002	0.017	0.128	0.497	0.643	0.018	94,012
FUNCT.	Urban	Spot	2 OR 3 LN W/TL	0.001	0.009	0.094	0.428	0.532	0.010	12,328
FUNCT.	Urban	Spot	4 OR MORE UNDIV	0.001	0.009	0.110	0.456	0.576	0.010	27,060
FUNCT.	Urban	Spot	4 OR MORE DIV	0.001	0.006	0.074	0.330	0.410	0.006	32,186
FUNCT.	Urban	Spot	4 OR MORE W TL	0.002	0.008	0.091	0.342	0.443	0.010	39,317
FUNCT.	Urban	Spot	FREEWAY	0.001	0.003	0.064	0.277	0.344	0.004	4,234

Tennessee Department of Transportation
Statewide Average Crash Rates for Sections and Spots

Study: OFFICIAL HSIP STUDY 2014 - 2016

Begin Date: 1/1/2014 End Date: 12/31/2016

Route Type	Rural / Urban	Location Type	Highway Type	Fatal Rate	Incap. Rate	Other Inj. Rate	Pd. Rate	Total Rate	Severe Crash Rate	Total Veh. Miles (in millions)
High Risk Rural Roads										
MAJOR COL.	Rural	Section	2 OR 3 LN	0.029	0.151	0.533	1.470	2.183	0.181	7,712
MAJOR COL.	Rural	Section	2 OR 3 LN W/TL	0.016	0.087	0.309	1.774	2.186	0.103	126
MAJOR COL.	Rural	Section	4 OR MORE UNDIV	0.001	0.214	0.357	1.928	2.500	0.214	14
MAJOR COL.	Rural	Section	4 OR MORE DIV	0.001	0.001	0.687	1.899	2.585	0.001	25
MAJOR COL.	Rural	Section	4 OR MORE W TL	0.018	0.071	0.285	1.017	1.391	0.089	56
MAJOR COL.	Rural	Section	FREEWAY	0.001	0.001	0.535	2.407	2.942	0.001	4
MAJOR COL.	Rural	Spot	2 OR 3 LN	0.010	0.053	0.187	0.517	0.767	0.063	22,204
MAJOR COL.	Rural	Spot	2 OR 3 LN W/TL	0.002	0.016	0.062	0.357	0.437	0.018	675
MAJOR COL.	Rural	Spot	4 OR MORE UNDIV	0.001	0.036	0.072	0.346	0.453	0.036	84
MAJOR COL.	Rural	Spot	4 OR MORE DIV	0.001	0.001	0.159	0.484	0.642	0.001	126
MAJOR COL.	Rural	Spot	4 OR MORE W TL	0.003	0.012	0.047	0.186	0.249	0.015	338
MAJOR COL.	Rural	Spot	FREEWAY	0.001	0.001	0.071	0.318	0.388	0.001	28
MIN COL.	Rural	Section	2 OR 3 LN	0.034	0.180	0.663	1.891	2.768	0.214	6,421
MIN COL.	Rural	Section	2 OR 3 LN W/TL	0.001	0.081	0.269	1.022	1.372	0.081	37
MIN COL.	Rural	Section	4 OR MORE UNDIV	0.001	0.001	1.814	4.405	6.219	0.001	4
MIN COL.	Rural	Section	4 OR MORE DIV	0.001	0.001	0.001	0.001	0.001	0.001	0
MIN COL.	Rural	Section	4 OR MORE W TL	0.001	0.001	0.001	0.001	0.001	0.001	0
MIN COL.	Rural	Section	FREEWAY	0.001	2.484	2.484	4.968	9.936	2.484	0
MIN COL.	Rural	Spot	2 OR 3 LN	0.017	0.089	0.327	0.934	1.366	0.105	13,065
MIN COL.	Rural	Spot	2 OR 3 LN W/TL	0.001	0.018	0.053	0.260	0.331	0.018	169
MIN COL.	Rural	Spot	4 OR MORE UNDIV	0.001	0.041	0.326	0.856	1.223	0.041	25
MIN COL.	Rural	Spot	FREEWAY	0.001	0.483	0.483	1.448	2.414	0.483	2

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY = **Knox** Date: 8/2/2018
 Route = **Millertown Pike**
 Location = **Intersection (Millertown Pike at Glen Creek Road)**
 Highway Type = **2-lane undivided**
 FUNTIONAL CLASS **Minor Arterial**
 DATA YEARS = **2015 - 2018 TITAN Data**
 ADT YEARS USED= **2016**
 COMMENTS =
 ANALYZED BY = **RWJ**

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN 0.10 MILE					
BLM	ELM	Length	Average AADT	VMT	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	

0.00 0 0

INTERSECTION		Leg	Traffic AADT	
Log Mile =		North =	250	estimated
		East =	7,417	assumed
		South =		
		West =	7,417	
		Entering AADT =		7,542
		2016		

2-Lane Undivided
2015 - 2018 Titan Data

		Total	Fatal	Incap. Injury	*Severe Crashes	Other	Injury
No. of Crashes	=	2	0	1	1		0
No. of Years	=	3.0					
SW avg. rate	=	0.121	0.001	0.008	0.009		0.033
2014 - 2016 HSIP							
Exposure (E)	=	8.2585					
Crash Rate (A)	=	0.242	0.000	0.121	0.121		0.000
Critical Rate (C)	=	0.463					
Severity Index (SI)	=	1.0000					
Actual Rate/SW Average	=	2.00	0.00	15.14	13.45		0.00
Ratio of A/C	=	0.52					

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Millertown Pike, Knox County		LM 0.000	
Intersection (Millertown Pike at Glen Creek Road)			
2 Crashes	- 2015 - 2018	Actual	- 0.242 Acc/MVM
State Average	- 0.121 Acc/MVM	Critical	- 0.463 Acc/MVM
A/S Ratio	= 2.00	A/C Ratio	= 0.52

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY = Knox Date: 8/2/2018
 Route = Millertown Pike
 Location = Section (east and west of Glen Creek Road)
 Highway Type = 2-lane undivided
 FUNCTIONAL CLASS Minor Arterial
 DATA YEARS = 2015 - 2018 TITAN Data
 ADT YEARS USED= 2017
 COMMENTS =
 ANALYZED BY = RWJ

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
0.00	0.13	0.13	7,417	964
0.00	0.00	0.00	0	0
0.00	0.00	0.00	0	0
0.00	0.00	0.00	0	0
0.00	0.00	0.00	0	0
0.00	0.00	0.00	0	0
0.00	0.00	0.00	0	0

0.13 7,417 964

INTERSECTION Leg Traffic AADT
 Log Mile = North =
East =
South =
West =
Entering AADT =
2017

2-Lane Undivided
 2015 - 2018 Titan Data

		Total	Fatal	Incap. Injury	*Severe Crashes	Other	Injury
No. of Crashes	=	7	1	1	2		2
No. of Years	=	3.0					
SW avg. rate	=	2.832	0.034	0.179	0.213		0.676
2014 - 2016 HSIP							
Exposure (E)	=	1.0558					
Crash Rate (A)	=	6.630	0.947	0.947	1.894		1.894
Critical Rate (C)	=	7.117					
Severity Index (SI)	=	1.1429					
Actual Rate/SW Average	=	2.34	27.86	5.29	8.89		2.80
Ratio of A/C	=	0.93					

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 5/12/2010

Millertown Pike, Knox County		LM 0.000	
Section (east and west of Glen Creek Road)			
7 Crashes	- 2015 - 2018	Actual	- 6.630 Acc/MVM
State Average	- 2.832 Acc/MVM	Critical	- 7.117 Acc/MVM
A/S Ratio	= 2.34	A/C Ratio	= 0.93

APPENDIX J

KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEET

TABLE 5A

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

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

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

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

Millertown Pike at
Glen Creek Road
Projected AM
Left Turns = 16

Left Turn Lane
NOT Warranted

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

TABLE 5B

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

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

Millertown Pike at
Glen Creek Road
Projected AM
Right Turns = 73

Right Turn Lane
NOT Warranted

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

TABLE 5A

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

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

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

Millertown Pike at
Glen Creek Road
Projected PM
Left Turns = 14

Left Turn Lane
NOT Warranted

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

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

TABLE 5B

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

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

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
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

Millertown Pike at
Glen Creek Road
Projected PM
Right Turns = 177

Right Turn Lane
Warranted

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

APPENDIX K

TRAFFIC SIGNALIZATION WARRANTS



Traffic Signal Warrant Analysis

CIVIL ENGINEERING / TRAFFIC ENGINEERING

Project Name	The Highlands at Clear Spring
Project/File #	1808
Scenario	2022 - Projected Traffic Volumes

Intersection Information	
Major Street Name	Millertown Pike
North/South or East/West	E/W
Speed Limit > 40 mph	Yes
# of Approach Lanes	1
% of Right Turn Traffic to Include	100%
Minor Street Name	Glen Creek Road
# of Approach Lanes	1
% of Right Turn Traffic to Include	100%
Isolated Community < 10,000 pop	No

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



Traffic Signal Warrant Analysis

Civil Engineering Traffic Engineering

Millertown Pike (Major Street) Volume

Eastbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM		125	22	
8 - 9 AM		141	20	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM		219	16	
12 - 1 PM		309	33	
1 - 2 PM				
2 - 3 PM		311	27	
3 - 4 PM		364	28	
4 - 5 PM		470	35	
5 - 6 PM		557	28	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			2,705	0

Westbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	10	464		
8 - 9 AM	5	328		
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	2	224		
12 - 1 PM	8	274		
1 - 2 PM				
2 - 3 PM	3	234		
3 - 4 PM	8	254		
4 - 5 PM	4	262		
5 - 6 PM	5	424		
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			2,509	0

Glen Creek Road (Minor Street) Volume

Northbound Volume by Hour				
Time	Left Turns	Through	Right Turns	Peds/Bikes
12 - 1 AM				
1 - 2 AM				
2 - 3 AM				
3 - 4 AM				
4 - 5 AM				
5 - 6 AM				
6 - 7 AM				
7 - 8 AM	66		4	
8 - 9 AM	48		5	
9 - 10 AM				
10 - 11 AM				
11 - 12 PM	44		10	
12 - 1 PM	59		5	
1 - 2 PM				
2 - 3 PM	59		13	
3 - 4 PM	74		14	
4 - 5 PM	83		21	
5 - 6 PM	85		45	
6 - 7 PM				
7 - 8 PM				
8 - 9 PM				
9 - 10 PM				
10 - 11 PM				
11 - 12 AM				
Total Vehicles (unadjusted)			635	0

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



Traffic Signal Warrant Analysis

Warrants 1 - 3 (Volume Warrants)

Project Name	The Highlands at Clear Spring
Project/File #	1808
Scenario	2022 - Projected Traffic Volumes

Intersection Information			
Major Street (E/W Road)	Millertown Pike	Minor Street (N/S Road)	Glen Creek Road
Analyzed with	1 approach lane	Analyzed with	1 Approach Lane
Total Approach Volume	5214 vehicles	Total Approach Volume	635 vehicles
Total Ped/Bike Volume	0 crossings	Total Ped/Bike Volume	0 crossings
Right turn reduction of	0 percent applied	Right turn reduction of	0 percent applied

Reduction applied to warrant thresholds due to high speed on Millertown Pike

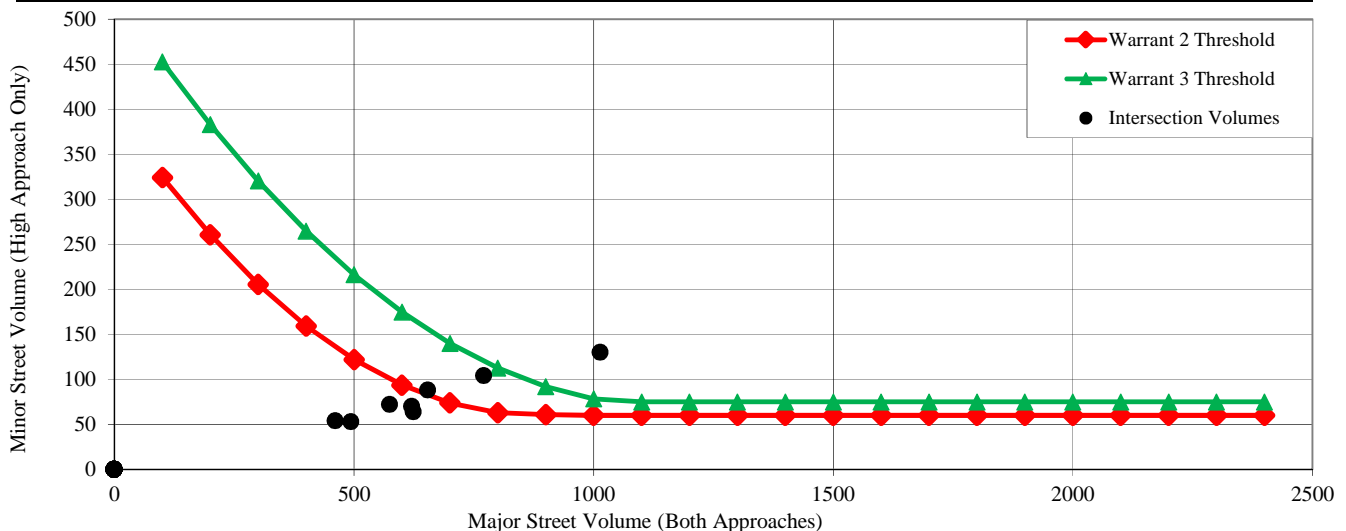
Warrant 1, Eight Hour Vehicular Volume			
Condition Satisfied?	Not satisfied	Condition B	Condition A+B*
Required values reached for	1 hour	Not satisfied	3 (Cond. A) & 8 (Cond. B)
Criteria - Major Street (veh/hr)	350	6 hours	280 (Cond. A) & 420 (Cond. B)
Criteria - Minor Street (veh/hr)	105	53	84 (Cond. A) & 42 (Cond. B)

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

Warrant 2, Four Hour Vehicular Volume	
Condition Satisfied?	Not satisfied
Required values reached for	3 hours
Criteria	See Figure Below

Warrant 3, Peak Hour Vehicular Volume		
Condition Satisfied?	Condition A	Condition B
Required values reached for	Not Examined	Satisfied
Criteria - Total Approach Volume (veh in one hour)		1 hour
Criteria - Minor Street High Side Volume (veh in one hour)		See Figure Below
Criteria - Minor Street High Side Delay (veh-hrs)		

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



APPENDIX L

SIMTRAFFIC QUEUE LENGTH CALCULATIONS

Intersection: 2: Glen Creek Road & Millertown Pike

Movement	EB	WB	NB
Directions Served	R	LT	LR
Maximum Queue (ft)	4	62	30
Average Queue (ft)	0	6	30
95th Queue (ft)	3	32	31
Link Distance (ft)		218	5
Upstream Blk Time (%)			32
Queuing Penalty (veh)			58
Storage Bay Dist (ft)	100		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 12: Sable Point Lane/Mary Emily Lane & Millertown Pike

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	6	24	78	33
Average Queue (ft)	0	1	40	4
95th Queue (ft)	5	13	65	22
Link Distance (ft)	535	487	449	268
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Glen Creek Road & Millertown Pike

Movement	EB	WB	NB
Directions Served	R	LT	LR
Maximum Queue (ft)	16	91	32
Average Queue (ft)	1	12	30
95th Queue (ft)	7	53	31
Link Distance (ft)		218	5
Upstream Blk Time (%)		0	42
Queuing Penalty (veh)		0	73
Storage Bay Dist (ft)	100		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

9/6/2018

Intersection: 12: Sable Point Lane/Mary Emily Lane & Millertown Pike

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	61	44	74	33
Average Queue (ft)	4	2	33	6
95th Queue (ft)	31	19	61	27
Link Distance (ft)	535	487	449	268
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				



CIVIL ENGINEERING / TRAFFIC ENGINEERING

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

September 9, 2018

PROJECT NAME: The Highlands at Clear Spring

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

SUBJECT: TIS Comment Response Document for The Highlands at Clear Spring
Review Comments Dated September 4, 2018 (9-G-18-UR & 9-SE-18-C)

Dear MPC, City of Knoxville, and Knox County Staff,

The following comment response document is submitted to address comments dated September 4, 2018. Below, the first set of reviewer comments is from John Sexton, PE with Knox County Engineering and the second set of reviewer comments is from Tarren Barrett with the MPC.

John Sexton, PE, Knox County Engineering:

Reviewer Comment: Page 2: 2nd paragraph, last line- add “or not” after “whether”.

Response: On Page 2, in the 2nd paragraph, last line - “or not” was added after “whether”.

Reviewer Comment: Page 7: Table 1 indicates that Glen Creek Road is 2-lane undivided road 26 feet wide. However, it is a boulevard cross-section.

Response: On Page 7, Table 1 was revised to show Glen Creek Road as a 2-lane boulevard with a road width of 46 feet.

Reviewer Comment: Page 10: 1st paragraph, last line- Please verify if the 36 SF lots are east of the roundabout or west of it.

Response: On Page 10, in the 1st paragraph on the last line, the wording was changed for the 36 single-family residential detached lots and was corrected to state that they are west of the roundabout.

Reviewer Comment: Page 31: The reported HCM delay for the AM peak at Millertown Pike/Glen Creek Road is 7.7 seconds instead of 7.6 seconds.

Response: On Page 31 in Table 4, the reported HCM delay for the AM peak at Millertown Pike/Glen Creek Road for the westbound left turn movement was changed to 7.7 seconds instead of 7.6 seconds.

Reviewer Comment: Page 34: The last paragraph references 36 single-family lots east of the roundabout and 75 to the west. Are these reversed? See page 10 comment above.

Response: On Page 34 in the last paragraph, the location of the single-family detached lots was corrected to reflect the proper existing distribution of lots to the east and west of the roundabout.

Reviewer Comment: Page 36: Please add a traffic volume bubble at the intersection of Millertown Pike/Sable Point Lane/Mary Emily Lane showing the through traffic generated by the project.

Response: On Page 36, Figure 7, a traffic volume “bubble” was added at the intersection of Millertown Pike/Sable Point Lane/Mary Emily Lane showing the through traffic generated by the project.

Reviewer Comment: Page 38: The AM peak northbound left-turn volume on Glen Creek Road at Millertown Pike should be 172 instead of 169. Also make this correction in the affected capacity analysis and any affected reports of LOS, delay, and v/c.

Response: On Page 38, Figure 8, the AM peak northbound left-turn volume on Glen Creek Road at Millertown Pike was changed to 172 instead of 169. This volume revision also resulted in updates to Table 6, Table 8 and the LOS reports in Appendix G.

Reviewer Comment: Page 39: The AM peak LOS for eastbound Old Millertown Pike at Glen Creek Road should be B instead of A.

Response: On Page 39, the AM peak LOS for eastbound Old Millertown Pike at Glen Creek Road in Table 6 was changed to B instead of A.

Reviewer Comment: Page 40: The section title, “Discussion of Vehicle Crashes on Millertown Pike” should be bulleted but not underscored to match other subheading formats.

Response: On Page 40, the section title, “Discussion of Vehicle Crashes on Millertown Pike” was changed from underscored to a bulleted format.

Reviewer Comment: Page 45: Please provide actual field measurements of the available sight distance at Millertown Pike/Glen Creek Road. Based on County measurements, the available sight distance is 330 feet to the left and 350 feet to the right.

Response: The sight distance at the intersection of Glen Creek Road at Millertown Pike was measured on September 5th, 2018 by Scott Williams, PE, RLS. The following results were obtained from Glen Creek Road at Millertown Pike: the sight distance looking to the west (left) is 362 feet and the sight distance looking to the east (right) is 478 feet. These measurements were taken on Glen Creek Road 15 feet away from the edge of pavement of Millertown Pike. The surveyor believes that 400 feet of sight distance is potentially available looking to the west (left) if tree limbs are removed from the cedar trees located on the north side of Millertown Pike (and west of the intersection). It is believed that the cedar tree limbs are within the right-of-way, however, the trees themselves are located on private property. This new information is included on Pages 45-46 and 48 in the revised report.

Reviewer Comment: Page 51: Section 2C- Change the intersection road names to Old Millertown Pike at Glen Creek Road.

Response: On Page 56 (previously Page 51), in Section 2C – the intersection road names were changed to Old Millertown Pike at Glen Creek Road.

Reviewer Comment: Appendix I: Please highlight or otherwise identify which factors from the TDOT tables were used in the crash rate calculations.

Response: In Appendix I, the TDOT factors are highlighted that were used in the crash rate calculations.

Tarren Barrett, MPC:

1. **Reviewer Comment:** In the first full paragraph on page 8, please rephrase the first sentence. It is unclear what is meant by a “straight horizontal and vertical road alignment.”

Response: On Page 8, in the first full paragraph, the first sentence was rephrased by splitting the original sentence into 2 sentences.

2. **Reviewer Comment:** On page 25 half-way through the continued paragraph, correct “cutting thru” to “cutting through.”

Response: On Page 25, half-way through the continued paragraph, the wording was corrected to “cutting through” from “cutting thru.”

3. **Reviewer Comment:** On page 34 third paragraph, please rephrase the first sentence since it is too long and is unclear on the point that is trying to be made.

Response: On Page 34 in the third paragraph, the sentence was re-worded to make the discussion point clearer.

4. **Reviewer Comment:** On page 39, the table references a LOS of F for the Northbound Left/Right of Millertown Pike at Glen Creek Road and the Northbound Left/Thru/Right of Millertown Pike at Sable Point Lane/Mary Emily Lane, but there are no recommendations on how to improve the internal street structure. Please look at providing recommendations for these. There was no mention of this in the Conclusions and Recommendations section.

Response: Further discussion of the internal street structure of the Millertown Pike at Glen Creek Road intersection is provided on Pages 54-55. Further discussion of the internal street structure of the Millertown Pike at Sable Point Lane / Mary Emily Lane intersection is provided on Pages 58-59.

5. **Reviewer Comment:** On page 46 last paragraph, please mention the right-turn lane requirement in the previous approval from 2005. It was mentioned that a right-turn lane was needed “by the time the next 40 homes are constructed in the Clear Springs development (either in Phase 1 or 2).” There are homes currently being constructed for previous phases. What does this mean, and what lot number out of the whole does it trigger the right-turn lane?

Response: On Page 48 (previously Page 47), the discussion involving the timing of the construction of the right turn lane has been removed. The developer has stated that they will begin design and construction of the

right turn lane immediately once The Highlands at Clear Spring has been approved by the County.

6. **Reviewer Comment:** On page 47, please give what the measured sight distance is.

Response: As stated earlier in this response letter, the sight distance at the intersection of Glen Creek Road at Millertown Pike was measured on September 5, 2018 by Scott Williams, PE, RLS. The following results were obtained from Glen Creek Road at Millertown Pike: the sight distance looking to the west (left) is 362 feet and the sight distance looking to the east (right) is 478 feet. These measurements were taken on Glen Creek Road 15 feet away from the edge of pavement of Millertown Pike. The surveyor believes that 400 feet of sight distance is potentially available looking to the west (left) if tree limbs are removed from the cedar trees located on the north side of Millertown Pike (and west of the intersection). It is believed that the cedar tree limbs are within the right-of-way, however, the trees themselves are located on private property. This new information is included on Page 45-46 and 48 in the revised report. In addition, a recommendation has been added on Page 51 that states a Side Road Sign (W2-2) should be installed for eastbound traffic on Millertown Pike.

7. **Reviewer Comment:** The study needs to reflect a connection to and evaluation of Parasol Lane from Autumn Creek Drive, which the developer has agreed to connect to.

Response: In addition to the existing discussion of this road connection on Pages 57-58, an additional discussion was added on Pages 59-60.

8. **Reviewer Comment:** Include a detailed figure with dimensions of the right-turn lane of Millertown Pike at Glen Creek Road per the 100 ft storage length and 150 ft taper length. If a full right-turn lane is not feasible given the utility pole, close proximity of the adjacent property owner's driveway, severe grades and guard rail, then please work with Knox County Engineering to determine a better solution given the constraints.

Response: Scott Williams, PE, RLS has designed a rough layout for a right turn lane on Millertown Pike at Glen Creek Road. This layout does not consider right-of-way, existing utilities, grading, and drainage but does provide a conceptual level layout. This layout has been provided in the revised report and is labeled as Figure 10 on Page 49.

9. **Reviewer Comment: Please refer to John Sexton's (Knox County Engineer) attached comments for further revisions.**

Response: The response to the comments made by John Sexton are provided at the beginning of this response letter.

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

- Updated Page Footers
- Updated Title Page
- Updated Table of Contents
- Updated Recommendations on Page 2
- Added Figure 10
- Added Appendix L

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.

