

# **TRANSPORTATION IMPACT STUDY BOULDER POINT SUBDIVISION** KNOX COUNTY, TENNESSEE

-Prepared For-

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#### **EXECUTIVE SUMMARY**

#### Preface:

MJM Development, Inc. is proposing to develop a subsequent phase of an existing residential development that is adjacent to Stanley Road in northwest Knox County, TN near the Anderson County, TN line. The name of this residential development is "Boulder Point". Phase 1 of this residential subdivision was approved several years ago and several homes have been constructed. Since Phase 1 of the residential development was only 75 lots, a traffic impact study was not required when it was initially approved in 2008. With the addition of an additional 61 lots in Phase 2, this report addresses the transportation impacts of the existing Phase 1 and the proposed Phase 2 of the development. The purpose of this study is to determine and evaluate the potential impacts of the proposed development on the adjacent transportation system. The study includes a review of the operating characteristics of the transportation system that will provide access to the proposed site. Recommendations and mitigation measures will be analyzed and offered where traffic operations have been estimated to be below traffic engineering standards.

#### Study Results:

The findings of this study include the following:

- At full build-out, the proposed total 136 lot residential development of both phases is expected to generate approximately 1,394 new trips on an average weekday. Approximately 105 of these new trips are estimated to occur during the AM peak hour and 139 trips in the PM peak hour at full build-out.
- With the addition of Phase 1 and Phase 2 of the Boulder Point Subdivision at Stanley Road, the intersection studied for this development is anticipated to operate very well in the projected conditions for vehicular traffic in the year 2022.

#### **Recommendations**:

The following recommendations are offered based on the study analyses:

• Phase 1 and Phase 2 of the single unit residential development is not expected to generate a need for additional roadway improvements to the studied intersection

or adjacent roadway. The existing vehicular capacity of the studied intersection and roadway should be adequate to accommodate both phases of the proposed development.

- Phase 2 should include design elements of the appropriate sight distance requirements and appropriate road signage.
- Vegetation needs to be removed from the west side of Stanley Road and to the south of Boulder Point Lane to maintain sight distance.
- Debris (gravel) should be removed from the edge of Stanley Road at the intersection with Boulder Point Lane.
- A 24" white stop bar should be applied to the approach of Boulder Point Lane at Stanley Road. The stop bar should be applied at a minimum of 4 feet away from the edge of Stanley Road and should be placed at the desired stopping point that provides the maximum sight distance.
- Traffic calming measures should be considered for Poplar Grove Lane in the development. Speed humps should be considered to lower speeds through this roadway in the subdivision.

#### **DESCRIPTION OF EXISTING CONDITIONS**

#### STUDY AREA:

The proposed location of Phase 2 of Boulder Point subdivision is shown on a map in Figure 1 and its location relative to Phase 1. Phase 2 of the development is located to the rear of Phase 1 which is adjacent to Stanley Road and is to the northwest of Knoxville, TN in Knox County. The proposed new development in Phase 2 is to be comprised of two new internal paved roadways and will contain a maximum of 61 single-family residential lots on approximately 20.5 acres. Phase 1 is partially filled with homes and consists of a total of 75 lots on approximately 23.75 acres. To analyze the transportation impacts associated with the proposed development, the intersection of Stanley Road at Boulder Point Lane was reviewed where the greatest impact is expected.

In the adjacent vicinity of this development, there are several single-family residences, unused/agricultural properties, commercial properties and a mobile home park. 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 undeveloped woodlands.

The infrastructure for Phase 1 was constructed and developed several years ago. Phase 1 lots are located along Boulder Point Lane, Mill Park Lane, Elkton Lane, and Poplar Grove Lane. Phase 1 has dozens of homes already constructed and occupied and some homes are currently under construction.

Phase 2 will be bounded by Grand Oaks Mobile Home Park to the north, existing Phase 1 to the east, single-family residences to the south along Stanley Road, and the Anderson County, TN line to the east.



#### Figure 1 Location Map

Boulder Point Knox County, TN

#### EXISTING ROADWAYS:

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

NAME	CLASSIFICATION <sup>1</sup>	SPEED LIMIT	LANES	ROAD WIDTH <sup>2</sup>	TRANSIT <sup>3</sup>	PEDESTRIAN FACILITIES	BICYCLE FACILITIES
Stanley Road	Local Street	30 mph	2 undivided	18 feet	None	No sidewalks along roadway	No bike lanes
Boulder Point Lane	Local Street	25 mph	2 undivided	26 feet	None	No sidewalks along roadway	No bike lanes

 TABLE 1

 STUDY CORRIDOR CHARACTERISTICS

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

<sup>2</sup> Edge of curb to edge of curb or edge of pavements near project site

<sup>3</sup> According to Knoxville Area Transit System Map

**Stanley Road** traverses in a generally east-west direction but does so in a circuitous manner. Stanley Road runs in between Clinton Highway (US 25W) on its east side to Old Clinton Highway to the west past the Anderson County, TN line. Stanley Road intersects Clinton Highway to the northeast of the project site and Clinton Highway provides convenient access to other areas within Anderson County to the north and Knox County to the south. From the intersection of Stanley Road at Clinton Highway, the junction of Interstate 75/275/640 is 6 miles away.

The total length of Stanley Road is just over one mile. Stanley Road at the Boulder Point Subdivision is approximately 18 feet in width but towards the other end of the road (the west side); Stanley Road narrows down to 14 feet and then reduced further as it approaches Old Clinton Pike. The speed limit is posted at 30 mph at the western end (heading eastbound) on Stanley Road near Old Clinton Pike. There is not a posted speed limit in the opposite direction on the more traveled end of Stanley Road adjacent to Boulder Point Subdivision. The western portion of Stanley Road provides access to about three dozen individual residences. Roadway lighting is not provided at the intersection at Boulder Point Lane with Stanley Road but there is some minor lighting from the subdivision entrance signage.

**Boulder Point Lane** is a local residential street that provides access to the Boulder Point Subdivision from Stanley Road. It traverses in a generally east-west direction. Boulder Point Lane consists of 2-13-foot vehicular lanes with 8" extruded concrete curbing. Roadway lighting is not present along Boulder Point Lane or on the other internal roadways. Boulder Point Lane will provide the sole roadway access to Phase 1 and is controlled by a stop sign at its approach to Stanley Road. There are no sidewalks on Boulder Point Lane or any of the other internal roads of Phase 1.

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



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#### **PHOTO EXHIBITS**



Stanley Road at Boulder Point Lane













Boulder Point Knox County, TN

#### **EXISTING TRANSPORTATION VOLUMES PER MODE:**

There are not any permanent traffic count locations adjacent to this project site. The closest locations are on Old Clinton Pike to the north and West Emory Road to the south of the development site and conducted by the Tennessee Department of Transportation (TDOT).

- Existing vehicular roadway traffic:
  - Average Daily Traffic (ADT) on Old Clinton Pike north of the project site was reported by TDOT at 703 vehicles per day in 2016. From 2006 – 2016, this count station has indicated a -3.9% annual growth rate.
  - Average Daily Traffic (ADT) on Clinton Highway just over the county line and north of the project site was reported by TDOT at 16,332 vehicles per day in 2014. From 2004 2014, this count station has indicated a -0.7% annual growth rate.
  - Average Daily Traffic (ADT) on West Emory Road south of the project site was reported by TDOT at 9,985 vehicles per day in 2016. From 2006 2016, this count station has indicated a 1.2% annual growth rate. Historical traffic count data can be viewed in Appendix A.
- Existing bicycle and pedestrian volumes: The average daily pedestrian and bicycle traffic along the study corridor is not known. Sidewalks and bicycle lanes are not provided on the roadways examined and thus assumed to be minimal. However, during the manual traffic counts, a handful of children were observed walking to and from Boulder Point Lane along Stanley Road to and from Clinton Highway to ride/disembark the school bus. These children walked along Stanley Road on the grassed roadside.

#### • **ON-STREET PARKING:**

Currently, on-street parking is occurring and appears to be allowed on the residential streets within Phase 1 of the subdivision. However, on-street parking is not allowed on Stanley Road.

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#### PEDESTRIAN AND BICYCLE FACILITIES:

Bicycle facilities (lanes) and pedestrian sidewalks are not currently available within the project site study area on any of the studied roadways.

#### WALK SCORE:

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

Appendix B shows a map and gives information for the proposed site development Walk Score at Boulder Point Lane. Based on the project location, the site is given a Walk Score of 18. This Walk Score indicates that the site is almost completely dependent on vehicles for errands and travel. This is due to the complete lack of sidewalks in the study area to outside destinations/amenities.

#### TRANSIT SERVICES:

The City of Knoxville has a network of public transit opportunities offered by Knoxville Area Transit (KAT). Bus service is not available in this area of Knox County. The overall KAT bus system map is in Appendix C. The closest public transit bus service is located approximately 2.7 miles away (by roadway) at the Northwest Crossing Shopping Center/Wal-Mart near Old Callahan Drive at Clinton Highway. This KAT service is Route 20 "Central Avenue/Clinton Highway". It operates on weekdays and Saturdays and this route map is also included in Appendix C.

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

Knox County school busses were not observed at the studied intersection during the traffic counts. For school children in the Boulder Point Subdivision and the Grand Oaks Mobile

Home Park, the Knox County school busses picked up and dropped off children at a vacant lot at the intersection of Clinton Highway at Stanley Road. Children from both residential areas either walked to and from this lot. Parents and guardians were also observed driving children back and forth from this lot.

#### **PROJECT DESCRIPTION**

#### LOCATION AND SITE PLAN:

The proposed plan layout for Phase 2 designed by Batson, Himes, Norvell, and Poe is shown in Figure 3a. As can be seen in the figure, Phase 2 will connect to Phase 1 by extending Poplar Grove Lane from Phase 1. Figure 3b shows both Phase 1 and Phase 2 for a perspective of the two phases. Phase 2 of the residential development is expected to be comprised of a maximum of 61 single family residential lots on approximately 20.5 acres. The size of the residential lots in Phase 2 will be similar to Phase 1 and will average approximately 1/4 acre to 1/3 acre in size. Phase 1 has a total of 75 lots. As of the date of this study, 41 homes have been constructed and are occupied in Phase 1. There are also currently 5 homes under construction in Phase 1. With the homes constructed and under construction, Phase 1 is approximately 60% full. Phase 2 is expected to be comprised of two new internal paved roadways and an extension of Poplar Grove Lane from Phase 1.

The actual schedule for completion of this new phase of the residential development is dependent on economic factors and construction timelines. This project is also contingent on permitting, design, and other issues. However, for the purposes of this study, it was assumed that the total construction build-out of Phase 2 of the development and full occupancy of both phases will occur by the year 2022 (5 years). The developer is planning to begin construction once permits and approvals are acquired.



Figure 3a Proposed Plan Layout Boulder Point Subdivision – Phase 2

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Figure 3b Plan Layout Boulder Point Subdivision – Phase 1 and 2

#### PROPOSED USES AND ZONING REQUIREMENTS:

The second phase of Boulder Point is expected to be comprised of two new internal roadways and an extension of Poplar Grove Lane from Phase 1 with a maximum of 61 lots on approximately 20.5 acres. Phase 2 will have lots dedicated to green space that will incorporate the stormwater controls for the development. Some areas of the proposed property for Phase 2 include steep slopes that limit the amount of development allowed.

The property for Phase 2 is currently zoned as Agricultural (A). The property has recently been requested to be rezoned to Planned Residential (PR) to match Phase 1. The agenda date for the Knoxville/Knox County Metropolitan Planning Commission (MPC) rezoning was November 9, 2017. The rezoning was approved internally by the MPC and the official determination for rezoning is currently set to be voted on by the Knox County Commission on December 18th, 2017. Appendix D contains the MPC Rezoning Report from November 9, 2017 meeting. The adjacent surrounding land uses for Phase 2 are the following:

- The property to the north is zoned General Residential (RB) and consists of Grand Oaks Mobile Home Park.
- The properties to the west are within Anderson County, TN and are comprised of woodlands and single-family residences.
- To the south, the property is zoned Agricultural (A) and consists of undeveloped property and single-family residences/farming properties along Stanley Road
- The property to the east is zoned Planned Residential (PR) and consists of Phase 1 of Boulder Point subdivision at a density of 3 dwelling units per acre.

The Planned Residential (PR) zone allows for a variety of land uses primarily within the residential realm. Uses permitted in this zone include single family dwellings, duplexes, and multi-dwelling structures and developments. The current zoning map (prior to the requested rezoning) is also provided in Appendix D.

### **DEVELOPMENT DENSITY:**

The proposed density for the residential development is 3 dwelling units per acre based on 61 lots on 20.5 acres.

#### • **ON-SITE CIRCULATION:**

Phase 2 of the proposed subdivision is expected to be comprised of two new internal paved roadways and an extension of Poplar Grove Lane from Phase 1. The two new roads will be short cul-de-sacs and the total length of these will be nearly 940 feet. The extension of Poplar Grove Lane into Phase 2 will be approximately 1,460 feet for a total length of 2,400 feet of roads in Phase 2.

The two new cul-de-sac roads in Phase 2 shown in Figure 3a are labeled as Road "E" and Road "F". The internal roadways for the development will be paved, include 8" 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.

#### **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 interfere with off-site adjacent roadway operations other than when these vehicles occasionally enter and exit the development. The internal roadways in both phases of the subdivision are expected to be able to accommodate these types of vehicles along with passenger vehicles.

### TRAFFIC ANALYSIS OF EXISTING AND PROPOSED CONDITIONS

#### EXISTING TRAFFIC CONDITIONS

Traffic counts were conducted at the existing unsignalized intersection of Stanley Road at Boulder Point Lane as directed by Knox County Engineering.

Traffic counts at Stanley Road at Boulder Point Lane were obtained on Tuesday, November 14, 2017 for a total of 5 hours. The counts were conducted during the morning and afternoon peak periods. Local schools were in session when the traffic counts were conducted. Based on the traffic volumes counted, the AM peak hour was observed from 7:15 - 8:15 AM. The PM peak hour of traffic was observed from 3:45 - 4:45 PM.

The manual tabulated traffic counts can be reviewed in Appendix E. In Figure 4, the volumes shown are from the existing traffic count volumes during the AM and PM peak hours observed at the intersection. Very low (to non-existent) volumes were observed for right turns from Boulder Point Lane to southbound Stanley Road. The same was observed for northbound left turns onto Boulder Point Lane from Stanley Road. A handful of school children from Boulder Point Subdivision were observed walking to and from the school bus pickup area at the corner of Clinton Highway at Stanley Road during the morning and afternoon.

Due to the ongoing residential construction in Phase 1 of the Boulder Point Subdivision, some construction traffic was observed during the traffic counts. This construction traffic included dump trucks and trucks with work trailers.



Capacity analyses were undertaken to determine the existing Level of Service (LOS) for the studied intersection 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 LOS is a qualitative measurement developed by the 8). transportation profession of how well an intersection or roadway performs based on a driver's perception. LOS designations include LOS A through LOS F. The designation of LOS A signifies a roadway or intersection operating at best, while LOS F signifies road operations at the worst. This grading system provides a reliable straightforward means to communicate road operations to the public. The Highway Capacity Manual (HCM) lists level of service criteria for unsignalized intersections and signalized intersections. For unsignalized intersections, Level of Service is measured in terms of delay (in seconds). This measure is an attempt to quantify delay that includes travel time, driver discomfort, and fuel consumption. The LOS for a two-way stop (or yield) controlled intersection is defined by the delay for each minor approach and major street left-turn movement. Generally, LOS D is usually considered the lowest acceptable LOS by



(Source: FDOT)

government agencies. 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 unsignalized intersection. The intersection is shown with a LOS designation, delay (in seconds), and v/c ratio (volume/capacity) for the AM and PM peak hours in the table. A v/c ratio of 1 would indicate that the traffic volumes are at the roadway capacity. Appendix F includes the worksheets from the capacity analyses for the existing peak hour vehicular traffic. For the intersection, the existing peak hour levels of service are shown to operate at a very good level during the AM and PM peak hours for vehicular traffic. No results for the northbound left turn movement are shown in the table due to no recorded vehicles for the traffic movement during the AM and PM peak hours.

#### TABLE 2



#### LEVEL OF SERVICE AND DELAY FOR UNSIGNALIZED INTERSECTIONS



LEVEL OF SERVICE	DESCRIPTION	DELAY RANGE (seconds/vehicle)
А	Little or no delay	≤ 10
В	Short Traffic Delays	>10 and $\le$ 15
С	Average Traffic Delays	>15 and $\leq 25$
D	Long Traffic Delays	$>25$ and $\leq 35$
Е	Very Long Traffic Delays	$>35$ and $\leq 50$
F	Extreme Traffic Delays	>50

Source: Highway Capacity Manual

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

	TRAFFIC			AM PEAK		PM PEAK		
INTERSECTION	CONTROL	APPROACH	LOS	DELAY (seconds)	V/C	LOS	DELAY (seconds)	V/C
Stanley Road at	-13	Northbound Left	А	-	-	А	-	-
Boulder Point Road	lize	Eastbound Left/Right	А	9.0	0.046	А	8.7	0.016
	Unsigna							

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

#### • **OPENING YEAR TRAFFIC CONDITIONS (WITHOUT PROJECT):**

Opening year traffic volume estimates represent the future condition the proposed study area is potentially subject to without the proposed project being developed (no-build option). As previously stated, the build-out and full occupancy for both phases of this residential development were assumed to occur in the year 2022. This corresponds to nearly five years for the development to reach full capacity and occupancy.

There are not any permanent traffic count locations adjacent to this project site. To the south of the development, traffic growth on West Emory Road has seen a minimal amount of growth over the past 10 years according to the TDOT count station (historical traffic data is shown in Appendix A). Currently, there are no known relevant significant upcoming developments adjacent to the proposed site that would indicate large future increased traffic volumes in the study area in the short term.

To insure a reasonable and conservative estimate for this study, a 2% annual growth rate was used to take into account any future development in the area and potential rising travel volumes. The results of this growth rate application to the existing traffic volumes can be seen in Figure 5 for the year 2022. Figure 5 shows the background traffic volumes during the AM and PM peak hours only on Stanley Road. Since this report is examining both Phase 1 and 2 in the future conditions, the existing volumes tabulated during the traffic counts turning in and out of the subdivision have been removed from Figure 5. Thus, capacity calculations at the intersection were not performed for the future conditions in the year 2022.



#### TRIP GENERATION

The estimated amount of traffic that will be generated by both Phase 1 and 2 of the residential development was calculated based upon rates and equations for peak hour trips provided by <u>Trip Generation Manual</u>, <u>9th Edition</u>, a publication of the Institute of Transportation Engineers (ITE). A generated trip is a single or one-direction vehicle movement that is either entering or exiting the study site. The <u>Trip Generation Manual</u> is the traditional and most popular resource for determining trip generation rates when traffic impact studies are produced. The Manual lists and includes data for a variety of land uses and correlates trips generated based on different variables such as dwelling units, square footage, etc. The data from ITE for the proposed land use is shown in Appendix G. A summary of this information is presented in the following table:

TABLE 4
<b>FRIP GENERATION FOR BOULDER POINT SUBDIVISION</b>
Phase 1 and 2

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED GENERATED TRAFFIC DAILY AM PEAK HOUR TRAFFIC		GE , PM :	CNERATE TRAFFIC PEAK HO	ED DUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
	C'			25%	75%		63%	37%	
#210	Detached Housing	136 Lots	1,394	26	79	105	88	51	139
Total New Volume Site Trips		1,394	26	79	105	88	51	139	

ITE Trip Generation Manual, 9th Edition

With a total of 136 single family residences in Phase 1 and 2, based on the calculations, it is estimated that 26 vehicles will enter the development, 79 will exit, for a total of 105 new generated trips during the AM Peak Hour in the year 2022. Similarly, it is estimated that 88 vehicles will enter the development, 51 will exit, for a total of 139 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 approximately 1,394 vehicles for the entire 136 lot development. No trip reductions were included either for pass-by or internal trips.

Note: Trip generation estimates based on the existing 41 homes constructed in Phase 1 were also calculated to gauge how well it would correlate to the actual vehicles counted during the traffic counts. Based on the ITE trip generation rates, the number of calculated generated trips by the existing 41 lots correlated quite close (but slightly overestimated) to the actual vehicles counted during the AM peak hour. However, the number of calculated generated trips overestimated the actual amount of trips during the PM peak hour that was tabulated during the traffic count. These results could indicate that the total number of calculated generated trips for both phases shown in Table 5 might be an overestimation in the future conditions. These additional calculations based on 41 lots are also included in Appendix G.

#### TRIP DISTRIBUTION AND ASSIGNMENT

Figure 6 shows the projected distribution for traffic entering/exiting the new residential subdivision during the future AM peak hour and the future PM peak hour at the existing entrance of Stanley Road at Boulder Point Lane. The percentages that are shown only pertain to the new trips generated by the proposed residential dwellings in Phase 1 and 2 of the subdivision that were calculated from the ITE <u>Trip Generation Manual</u>. There are a variety of developments and destinations that will potentially "attract" the projected traffic to and from the residential development. The projected trip distributions of Figure 6 are based on the existing traffic movements at the examined intersection and are also surmised from surrounding concentrations of development and population. For this study, it is assumed and estimated that all the traffic to and from the development will travel north and south to and from Clinton Highway. Nearly all the existing traffic from Phase 1 of the subdivision tabulated during the traffic count headed to and returned from Clinton Highway.

Figure 7 shows the Traffic Assignment of the computed trips that will be generated by the development (from Table 4) and applied to the various intersection movements based on the assumed distribution of trips shown in Figure 6.





#### • **OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)**

Overall, several additive steps were taken to estimate the <u>total</u> opening year projected traffic volumes at the studied intersection when Phase 1 and 2 of the residential development 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 intersection, the calculated peak hour traffic (from ITE Trip Generation) generated by Phase 1 and 2 of the residential development 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. Figure 8 shows the projected AM and PM peak hour volumes at the studied intersection for the year 2022.



Capacity analyses were undertaken to determine the projected Level of Service (LOS) for vehicles at the studied intersection in the year 2022. Appendix F includes the worksheets for these capacity analyses.

The results of the capacity calculations of the projected peak hour vehicular traffic can be seen in Table 5 for the studied intersection for the year 2022. As can be seen in the table, the intersection of Stanley Road at Boulder Point Lane is calculated to operate very well with respect to the level of service. No results for the northbound left turn movement are shown in the table due to no amount of projected vehicles estimated to make this traffic movement during the AM and PM peak hours.

 TABLE 5

 2022 PEAK HOUR LEVEL OF SERVICE & DELAY - OPENING YEAR (WITH PROJECT)

	TRAFFIC	APPROACH		AM PEAK		PM PEAK		
INTERSECTION	CONTROL		LOS	DELAY	V/C	LOS	DELAY	V/C
				(seconds)			(seconds)	
Stanley Road at	Jlized	Northbound Left	А	-	-	А	-	-
Boulder Point Road		Eastbound Left/Right	А	9.5	0.149	А	9.4	0.097
	Unsigna							

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

#### POTENTIAL SAFETY ISSUES

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

#### SPOT SPEED STUDY

A spot speed study was conducted on Stanley Road to sample and tabulate the existing vehicle speeds along the road in the vicinity of the proposed development. The equipment used for the speed study was a Bushnell Speedster III Radar Speed Gun. The vehicles that were counted for the study were the northbound and southbound motorists along Stanley Road near the intersection with Boulder Point Lane.

The results of the study indicate that the majority of the traffic along Stanley Road at this location travels at a greater speed than the posted speed limit. The posted speed limit on Stanley Road on the west side (heading eastbound) is 30 mph. A posted speed limit is not placed on Stanley Road on the northeast side coming off of Clinton Highway. The results of the spot speed study indicate that the observed 85<sup>th</sup> percentile speed was 41.7 mph. The spot speed field observations are provided in Appendix H.

The speeds that were measured were the maximum speed attained by the vehicles at the bottom of the vertical sag curve on Stanley Road. The bottom of this existing vertical sag curve exists adjacent to the intersection of Stanley Road at Boulder Point Lane. The vehicles prior to approaching this intersection are traveling initially at much slower speeds. Many of the vehicles coming from Clinton Highway and heading south on Stanley Road are entering from a stop or slowed condition. The vehicles heading north on Stanley Road towards Clinton Highway have to navigate a significant horizontal curve prior to the intersection at Boulder Point Lane which significantly reduces vehicle speeds. Vehicle speeds, however, do tend to increase as they approach the intersection of Stanley Road at Boulder Point Lane since the vehicles from both directions are traveling downhill towards this intersection.
#### EVALUATION OF TURN LANE THRESHOLDS

The Stanley Road at Boulder Point Lane intersection was evaluated for the need of a separate right turn lane on Stanley Road for entering vehicles into the development. Based on the projected traffic volumes at the intersection on Stanley Road and according to "Knox County's Access Control and Driveway Design Policy", a separate right turn lane is not warranted for entering vehicles. The Knox County turn lane policy worksheet is located in Appendix I and the results are shown in the Appendix are based on the projected volumes during the PM peak hour since this time period is estimated to have the highest volumes at the intersection. Entering left turns were not evaluated due to the non-existent estimated left turns into the development from Stanley 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 spot speed study that showed the 85<sup>th</sup> percentile speed was 41.7 mph. Therefore, this study evaluation used the Knox County classification for speeds of 36 to 45 mph and the calculated projected volumes.

#### **EVALUATION OF SIGHT DISTANCE**

Based on an 85<sup>th</sup> percentile observed speed of 41.7 mph on Stanley Road; the typical required intersection sight distance would be 420 feet looking north and south at the intersection of Stanley Road at Boulder Point Lane based on Knox County policy of requiring 10 feet of sight distance per 1 mph of speed. However, as stated earlier in the Spot Speed Study section of the report, these are not sustained speeds thru the intersection since vehicles from both directions are starting at much slower speeds. Thus, the recommended sight distance would be less than 420 feet.

The distance to the north in between Boulder Point Lane and Clinton Highway is approximately 430 feet. The distance to the south in between Boulder Point Lane and to the end of the horizontal curve on Stanley Road is right at 420 feet. Sight distance looking to the north from Boulder Point Lane currently includes the entire distance up to Clinton Highway. Looking to the north from Boulder Point Lane, there is vegetation along the roadway, but sight distance is more than available currently to meet the requirement. Sight distance looking south from Boulder Point Lane is approximately 450 feet but is partially obscured by vegetation. This obstruction would be more pronounced if observed while leaves are present on the vegetation. There is some existing vegetation on the west side of Stanley Road that partially obstructs views looking to the south from Boulder Point Lane in addition to the sight reductions to the south due to the existing horizontal curvature of the roadway on Stanley Road.



iew of Sight Distance from Boulder Point Lane (Looking North towards Clinton Highway)



Revised December 2017 Transportation Impact Study Boulder Point Knox County, TN

#### **CONCLUSIONS AND RECOMMENDATIONS**

The following 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) **Stanley Road at Boulder Point Lane:** From the capacity calculations, it has been shown (Table 5) that the traffic movements at this entrance should operate very well during the AM and PM peak periods once Phase 1 and 2 of the development is complete with minimal delays.
  - 1a) The analysis shows that only a single exiting lane for left and right exiting vehicles is required at the Boulder Point Lane entrance (as is currently). Also, a separate left turn lane or right turn lane on Stanley Road into the development is not required due to the low projected volumes.
  - 1b) The recommended intersection sight distance requirement is slightly less than 420 feet and should be available at the existing intersection. Vegetation should be maintained on the west side of Stanley Road to the north and south of Boulder Point Lane along the right of way to maintain the necessary distances. In particular, a sycamore tree along the west side of Stanley Road and to the south of the Boulder Point Lane intersection needs to be cut back or removed. The sycamore branches are overhanging Stanley Road and reduce the available sight distance. If the field review had been done in the summer time, the obstruction would be worse due to leaves on the tree branches.
  - 1c) It is recommended that a 24" white stop bar be applied to the pavement of the Boulder Point Lane approach at Stanley Road. The stop bar should be applied at a minimum of 4 feet away from the edge of Stanley Road and should be placed at the desired stopping point that provides the maximum sight distance. A Stop Sign (R1-1) is already posted at this approach.
  - 1d) Intersection sight distance at the Boulder Point entrance at Stanley Road must not be impacted by future landscaping or by existing or future vegetation to the north

and south of the intersection. Vegetation control is currently needed to the south of the intersection and on the west side of Stanley Road.

- 1e) There is a fair amount of loose gravel on the edge of Stanley Road at the Boulder Point Lane intersection that should be removed. It is not known if this debris is from construction traffic into/out of the development or if it is from the roadside during large rain events. This intersection is located at the bottom of a vertical curve on Stanley Road and a creek flows under this intersection which could contribute to debris accumulating during large storm events.
- Boulder Point Subdivision Internal Roads: The current layout plan shows a couple of new roadways being constructed within Phase 2 of the development as shown in Figure 3a.
  - 2a) Stop Signs (R1-1) in Phase 2 should be installed at the internal intersections as shown below:



Revised December 2017 Transportation Impact Study Boulder Point Knox County, TN

- 2b) Sight distance at the new internal intersections must not be impacted by new signage, future landscaping, or parked vehicles. For an assumed posted 25 mph speed for the internal development streets, the internal intersection sight distance requirement is 250 feet. The road layout designer should insure that these sight distance lengths are met, maximized, and they should be labeled on the plans.
- 2c) All road grade and intersection elements internally and externally should be designed to AASHTO, TDOT, and Knox County Engineering specifications and guidelines to ensure proper operation.
- 2d) Traffic calming measures should be considered for Poplar Grove Lane for Phase 2 of the development. The road alignment of the new portion of Poplar Grove Lane within Phase 2 has a straight horizontal alignment and will have a fairly steep grade. The possible need for traffic calming measures inside the project for the new road will need to be coordinated with the Knox County Engineering and Public Works during the detailed design phase. Speed humps should be considered to lower speeds through this portion of the subdivision.

#### 3) <u>Pedestrian and Bicycle Considerations</u>:

- 3a) Since there are not any sidewalks located in Phase 1 of the development and there are not any sidewalks immediately outside of the subdivision, while desirable in Phase 2, sidewalks are not specifically recommended.
- 3b) All drainage grates and covers for the residential development need to be pedestrian and bicycle friendly.

APPENDIX A

HISTORICAL TRAFFIC COUNT DATA

#### Historical Traffic Counts

Organization: TDOT

Station ID #: 000185

Location: Old Clinton Pike (near Bell Campground Road)



2006 - 2016 Growth Rate = -32.5%

Annual Growth Rate = -3.9%



## Traffic History

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



© 2017 - TDOT Applications

#### Historical Traffic Counts

Organization: TDOT

Station ID #: 000047

Location: West Emory Road (near Rio Grande Drive)



2006 - 2016 Growth Rate = 12.5%

Annual Growth Rate = 1.2%



## **Traffic History**



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

© 2017 - TDOT Applications

#### **Historical Traffic Counts**

Organization: TDOT

Station ID #: 000184

Location: Clinton Highway (just over Anderson County line)



2004 - 2014 Growth Rate = -6.8%

Annual Growth Rate = -0.7%



25,000 Traffic Count (Average Daily Total) 22,500 20,000 17,500 15,000 

Clinton Hwy - At Anderson Co Line (Station ID: 093T184)

Year

#### APPENDIX B

WALK SCORE

#### WALK SCORE

(from walkscore.com)



# **Travel Time Map**

#### Add to your site

Explore how far you can travel by car, bus, bike and foot from Boulder Point Lane.





APPENDIX C

KNOXVILLE AREA TRANSIT MAP AND INFORMATION





# **CENTRAL AVENUE/ CLINTON HIGHWAY**

(Weekdays and Saturdays)

#### **SERVES:**

- **Christenberry Heights**
- **Clinton Plaza**
- Knox County Health Dept.

**Knoxville Station/Downtown Northwest Crossing/Walmart** Willow Creek Apts.



Information Updated: August 24, 2015

# Weekday Schedule Route 20: Central Ave/Clinton Hwy

		Going a	way from D	owntown		Going toward Downtown					
	Knoxville Station- Platform G	Central at Bearden Pl	Bruhin at Breda	Clinton Hwy at Merchants	Northwest Crossing	Melstone at Merchants	Clinton Hwy at Orchid	Bruhin at Breda	Central at Bernard	Knoxville Station	
	1	2	3	4	5	6	7	8	9	10	Bus Goes On To Serve
				W	/EEKDAY	SCHEDU	LE				
A.M.	6:15	6:20	6:31	6:39	6:48	_	7:02	7:08	7:15	7:25	Rt. 32
	6:45	6:50	7:01	7:09	7:18	_	7:32	7:38	7:45	7:55	Rt. 32
	7:15	7:20	7:31	7:39	7:48	7:58	8:02	8:08	8:15	8:25	Rt. 32
	7:45	7:50	8:01	8:09	8:18	8:28	8:32	8:38	8:45	8:55	Rt. 32
	8:15	8:20	8:31	8:39	8:48	_	9:02	9:08	9:15	9:25	Rt. 32
	8:45	8:50	9:01	9:09	9:18	_	9:32	9:38	9:45	9:55	Rt. 32
	9:15	9:20	9:31	9:39	9:48	_	10:02	10:08	10:15	10:25	Rt. 32
	9:45	9:50	10:01	10:09	10:18	10:28	10:32	10:38	10:45	10:55	Rt. 32
	10:15	10:20	10:31	10:39	10:48	_	11:02	11:08	11:15	11:25	Rt. 32
	10:45	10:50	11:01	11:09	11:18	_	11:32	11:38	11:45	11:55	Rt. 32
	11:15	11:20	11:31	11:39	11:48	_	12:02	12:08	12:15	12:25	Rt. 32
	11:45	11:50	12:01	12:09	12:18	12:28	12:32	12:38	12:45	12:55	Rt. 32
P.M.	12:15	12:20	12:31	12:39	12:48	—	1:02	1:08	1:15	1:25	Rt. 32
	12:45	12:50	1:01	1:09	1:18	—	1:32	1:38	1:45	1:55	Rt. 32
	1:15	1:20	1:31	1:39	1:48	—	2:02	2:08	2:15	2:25	Rt. 32
	1:45	1:50	2:01	2:09	2:18	2:28	2:32	2:38	2:45	2:55	Rt. 32
	2:15	2:20	2:31	2:39	2:48	—	3:02	3:08	3:15	3:25	Rt. 32
	2:45	2:50	3:01	3:09	3:18	—	3:32	3:38	3:45	3:55	Rt. 32
	3:15	3:20	3:31	3:39	3:48	3:58	4:02	4:08	4:15	4:25	Rt. 32
	3:45	3:50	4:01	4:09	4:18	4:28	4:32	4:38	4:45	4:55	Rt. 32
	4:15	4:20	4:31	4:39	4:48	—	5:02	5:08	5:15	5:25	Rt. 32
	4:45	4:50	5:01	5:09	5:18	—	5:32	5:38	5:45	5:55	Rt. 32
	5:15	5:20	5:31	5:39	5:48	_	6:02	6:08	6:15	6:25	Rt. 32
	5:45	5:50	6:01	6:09	6:18	6:28	6:32	6:38	6:45	6:55	To Garage
	6:15	6:19	6:29	6:35	6:41	_	6:51	6:56	7:00	7:10	Rt. 32
	7:15	7:19	7:29	7:35	7:41	—	7:51	7:56	8:00	8:10	Rt. 32
	8:15	8:19	8:29	8:35	8:41	—	8:51	8:56	9:00	9:10	Rt. 32
	9:15	9:19	9:29	9:35	9:41	_	9:51	9:56	10:00	10:10	Rt. 32
	10:15	10:19	10:29	10:35	10:41		10:51	10:56	11:00	11:10	Rt. 32
	11:15	11:19	11:29	11:35	11:41	_	11:51	11:56		To Garage	2

# **CENTRAL AVENUE/ CLINTON HIGHWAY** (Weekdays and Saturdays)

**SERVES:** 

- Christenberry Heights
- Clinton Plaza
- Knox County Health Dept.

Knoxville Station/Downtown Northwest Crossing/Walmart Willow Creek Apts.



Information Updated: August 24, 2015

# Saturday Schedule Route 20: Central Ave/Clinton Hwy

	Going away from Downtown Going toward Downtown										
	Knoxville Station— Platform G	Central at Bearden Pl	Bruhin at Breda	Clinton Hwy at Merchants	Northwest Crossing	Melstone at Merchants	Clinton Hwy at Orchid	Bruhin at Breda	Central at Bernard	Knoxville Station	Bus
	1	2	3	4	5	6	7	8	9	10	Goes On To Serve
				SA	<b>FURDAY</b> S	<b>SCHEDUL</b>	E				
A.M.	7:15	7:20	7:31	7:39	7:48	_	8:02	8:08	8:15	8:25	Rt. 32
	8:15	8:20	8:31	8:39	8:48	_	9:02	9:08	9:15	9:25	Rt. 32
	9:15	9:20	9:31	9:39	9:48		10:02	10:08	10:15	10:25	Rt. 32
	10:15	10:20	10:31	10:39	10:48	_	11:02	11:08	11:15	11:25	Rt. 32
	11:15	11:20	11:31	11:39	11:48		12:02	12:08	12:15	12:25	Rt. 32
P.M.	12:15	12:20	12:31	12:39	12:48	_	1:02	1:08	1:15	1:25	Rt. 32
	1:15	1:20	1:31	1:39	1:48	_	2:02	2:08	2:15	2:25	Rt. 32
	2:15	2:20	2:31	2:39	2:48	_	3:02	3:08	3:15	3:25	Rt. 32
	3:15	3:20	3:31	3:39	3:48	_	4:02	4:08	4:15	4:25	Rt. 32
	4:15	4:20	4:31	4:39	4:48	_	5:02	5:08	5:15	5:25	Rt. 32
	5:15	5:20	5:31	5:39	5:48	_	6:02	6:08	6:15	6:25	Rt. 32
	6:15	6:19	6:29	6:35	6:41	_	6:51	6:56	7:00	7:10	Rt. 32
	7:15	7:19	7:29	7:35	7:41	_	7:51	7:56	8:00	8:10	Rt. 32
	8:15	8:19	8:29	8:35	8:41	_	8:51	8:56	9:00	9:10	Rt. 32
	9:15	9:19	9:29	9:35	9:41	_	9:51	9:56	10:00	10:10	Rt. 32
	10:15	10:19	10:29	10:35	10:41	_	10:51	10:56	11:00	11:10	Rt. 32
	11:15	11:19	11:29	11:35	11:41	_	11:51	11:56	٦	lo Garage	
				SUN	DAY SCH	FDUI F					
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	9:15	9:19	9:29	9:35	9:41	_	9:51	9:56	10:00	10:10	
	10:15	10:19	10:29	10:35	10:41	—	10:51	10:56	11:00	11:10	
	11:15	11:19	11:29	11:35	11:41		11:51	11:56	12:00	12:10	
P.M.	12:15	12:19	12:29	12:35	12:41	_	12:51	12:56	1:00	1:10	
	1:15	1:19	1:29	1:35	1:41	-	1:51	1:56	2:00	2:10	
	2:15	2:19	2:29	2:35	2:41	—	2:51	2:56	3:00	3:10	
	3:15	3:19	3:29	3:35	3:41	_	3:51	3:56	4:00	4:10	-
	4:15	4:19	4:29	4:35	4:41	_	4:51	4:56	5:00	5:10	-
	5:15	5:19	5:29	5:35	5:41	_	5:51	5:56	6:00	6:10	-
	6:15	6:19	6:29	6:35	6:41	_	6:51	6:56	7:00	7:10	-
	7:15	7:19	7:29	7:35	7:41	_	7:51	7:56	8:00	8:10	-
	8:15	8:19	8:29	8:35	8:41	—	8:51	8:56	9:00	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 D

ZONING MAP AND MPC REZONING REPORT





#### KNOXVILLE/KNOX COUNTY METROPOLITAN PLANNING COMMISSION REZONING REPORT

۲	FILE #: 11-D-17-RZ	AGENDA ITEM #: 35
		AGENDA DATE: 11/9/2017
►	APPLICANT:	MJM DEVELOPMENT, INC.
	OWNER(S):	MJM Development, Inc.
	TAX ID NUMBER:	55 042 View map on KGIS
	JURISDICTION:	County Commission District 6
	STREET ADDRESS:	
Þ	LOCATION:	Northwest terminus of Poplar Grove Ln., northwest of Boulder Point Ln. and Stanley Rd.
۲	APPX. SIZE OF TRACT:	20.5 acres
	SECTOR PLAN:	Northwest County
	GROWTH POLICY PLAN:	Planned Growth Area
	ACCESSIBILITY:	Access is from Poplar Grove Ln., a local street in the adjacent Boulder Poin subdivision with 25' of pavement width within 50' of right-of-way
	UTILITIES:	Water Source: Hallsdale-Powell Utility District
		Sewer Source: Hallsdale-Powell Utility District
	WATERSHED:	Beaver Creek
۲	PRESENT ZONING:	A (Agricultural)
۲	ZONING REQUESTED:	PR (Planned Residential)
۲	EXISTING LAND USE:	Vacant land
۲	PROPOSED USE:	Detached residential subdivision
	DENSITY PROPOSED:	5 du/ac
	EXTENSION OF ZONE:	Yes, extension of PR from the southeast
	HISTORY OF ZONING:	None noted
	SURROUNDING LAND	North: Mobile home park / RB (General Residential)
	USE AND ZONING:	South: Houses and vacant land / A (Agricultural)
		East: Boulder Point subdivision / PR (Planned Residential) at 3 du/ac
		West: Anderson County
	NEIGHBORHOOD CONTEXT:	This area accessed from Stanley Rd. is developed with agricultural and rural to low density resdential uses under A, RB and PR zoning.

#### **STAFF RECOMMENDATION:**

# RECOMMEND that County Commission APPROVE PR (Planned Residential) zoning at a density of up to 3 du/ac (Applicant requested 5 du/ac),

PR zoning at the recommended density will allow reasonable development of the site, consistent with the sector plan and the adjacent subdivision from which it is accessed, and also consistent with the residential density guidelines of the Hillside and Ridgetop Protection Plan (HRPP).

#### COMMENTS:

REZONING REQUIREMENTS FROM ZONING ORDINANCES (must meet all of these): THE PROPOSED AMENDMENT SHALL BE NECESSARY BECAUSE OF SUBSTANTIALLY CHANGED OR

AGENDA ITEM #: 35	FILE #: 11-D-17-RZ	11/2/2017 03:17 PM	MICHAEL BRUSSEAU	PAGE #:	35-1

CHANGING CONDITIONS IN THE AREA AND DISTRICTS AFFECTED, OR IN THE CITY/COUNTY GENERALLY:

1. The recommended zoning and density for the subject property are appropriate to allow reasonable use of the site, while remaining compatible with surrounding development and zoning, and consistent with the policies of the HRPP.

2. With application of the residential density and land disturbance guidelines from the HRPP, the maximum density should be about 3 du/ac. The slope analysis, map and calculations are attached.

3. The adjacent PR development (Boulder Point) to the southeast is zoned PR at up to 3 du/ac. The recommended PR at up to 3 du/ac is a logical extension of the Boulder Point subdivision, from which the subject property will be accessed.

4. The PR zone requires use on review approval of a development plan by MPC prior to construction. This will provide the opportunity for staff to review the plan and address issues such as traffic circulation, lot layout, recreational amenities, drainage, types of units and other potential development concerns. It will also give the opportunity for public comment at the MPC meeting.

THE PROPOSED AMENDMENT SHALL BE CONSISTENT WITH THE INTENT AND PURPOSE OF THE APPLICABLE ZONING ORDINANCE:

1. PR zoning is intended to provide optional methods of land development which encourage more imaginative solutions to environmental design problems. Residential areas thus established would be characterized by a unified building and site development program, open space for recreation and provision for commercial, religious, educational and cultural facilities which are integrated with the total project by unified architectural and open space treatment.

2. Additionally, the zoning states that each development shall be compatible with the surrounding or adjacent zones. Such compatibility shall be determined by the Planning Commission by review of development plans. Staff maintains that PR is the most appropriate zone for this development.

THE PROPOSED AMENDMENT SHALL NOT ADVERSELY AFFECT ANY OTHER PART OF THE COUNTY, NOR SHALL ANY DIRECT OR INDIRECT ADVERSE EFFECTS RESULT FROM SUCH AMENDMENT: 1. Staff's recommended zoning and density will be compatible with the scale and intensity of the surrounding development and zoning pattern.

2. Sidewalks will be required on at least one side of each street within the development.

3. To the southeast is a developing subdivision at the same density that is recommended. The proposed density of 5 du/ac is out of character with the adjacent subdivision and would allow higher density development to be accessed through a lower density area.

4. The PR zoning district has provisions for preservation of open space and providing recreational amenities as part of the development plan. The applicant will be expected to demonstrate how these provisions are met as part of the required development plan review.

5. The proposed PR zoning at a density of up to 4 du/ac would allow for a maximum of 100 dwelling units to be proposed for the site. That number of detached units, as proposed. would add approximately 1037 vehicle trips per day to the street system and would add approximately 41 children under the age of 18 to the school system. The recommended PR zoning at a density of up to 3 du/ac would allow for a maximum of 60 dwelling units to be proposed for the site. That number of detached units would add approximately 648 vehicle trips per day to the street system and would add approximately 25 children under the age of 18 to the school system.

# THE PROPOSED AMENDMENT SHALL BE CONSISTENT WITH AND NOT IN CONFLICT WITH THE GENERAL PLAN OF KNOXVILLE AND KNOX COUNTY, INCLUDING ANY OF ITS ELEMENTS, MAJOR ROAD PLAN, LAND USE PLAN, COMMUNITY FACILITIES PLAN, AND OTHERS:

1. The Northwest County Sector Plan designates thissite for low density residential (LDR) uses and hillside protection, consistent with the recommended PR zoning and density. The requested density of 5 du/ac is allowable within the LDR designation but exceeds the residential density that should be permitted with application of the residential density guidelines from the HRPP.

2. Approval of this request could lead to future requests for PR zoning in this area.

3. The recommended zoning and density do not present any apparent conflicts with any other adopted plans.

Upon final approval of the rezoning, the developer will be required to submit a development plan for MPC consideration of use on review approval prior to the property's development. The plan will show the property's proposed development, landscaping and street network and will also identify the types of residential units that may be constructed. Grading and drainage plans may also be required at this stage, if deemed necessary by Knox County Engineering and MPC staff.

ESTIMATED TRAFFIC IMPACT: 1037 (average daily vehicle trips)

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

ESTIMATED STUDENT YIELD: 41 (public school children, ages 5-18 years)

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

• School-age population (ages 5–18) is estimated by MPC using data from a variety of sources.

• Students are assigned to schools based on current attendance zones as determined by Knox County Schools. Zone boundaries are subject to change.

• Estimates presume full build-out of the proposed development. Build-out is subject to market forces, and timing varies widely from proposal to proposal.

• Student yields from new development do not reflect a net addition of children in schools. Additions occur incrementally over the build-out period. New students may replace current population that ages through the system or moves from the attendance zone.

If approved, this item will be forwarded to Knox County Commission for action on 12/18/2017. If denied, MPC's action is final, unless the action to deny is appealed to Knox County Commission. The date of the appeal hearing will depend on when the appeal application is filed. Appellants have 30 days to appeal an MPC decision in the County.





11-D-17-RZ Slope Analysis

Non-Hillsi	de Portions		Acreage 0.99
Hillside an	d Ridgetop Protect	ion Area	
Value	Percent Slope	Count	Acres
1	0%-15%	13526	7.76
2	15%-25%	16540	9.49
3	25%-40%	3140	1.80
4	>40%	113	0.06
			19.12
Ridgetop	Area		0
		Site Total	20.11

#### MPC STAFF - SLOPE / DENSITY ANALYSIS 11-D-17-RZ - MJM Development, Inc. - A to PR

CATEGORY	ACRES	RECOMMENDED DENSITY (Dwelling Units / Acre)	NUMBER OF UNITS
Non-Hillside	0.99	5.00	5.0
0-15% Slope	7.76	5.00	38.8
15-25% Slope	9.49	2.00	19.0
25-40% Slope	1.8	0.50	0.9
Greater than 40% Slope	0.06	0.20	0.0
Ridgetops	0	5.00	0.0
Subtotal: Sloped Land	19.11		58.7
Maximum Density Guideline (Hillside & Ridgetop Protection Plan)	20.1	3.17	63.6
Proposed Density (Applicant)	20.1	5.00	100.0

#### From Hillside & Ridgetop Protection Plan, page 33

#### LOW DENSITY AND RURAL RESIDENTIAL USES

#### **Density and Land Disturbance Guidelines**

As proposals for changes to the zoning map and development plans/concept plans are considered, the following factors are recommended to determine the overall allowable density for residential rezonings and the overall land disturbance allowable in new development or subdivisions for those portions of parcels that are within the Hillside and Ridgetop Protection Area. These factors should be codified as regulations in the future. The areas of the Growth Policy Plan referenced below are presented on page 18.

#### Table 3: Residential Density and Land Disturbance Guidelines for Recommendations on Changes to the Zoning Map and Development Plan/ Concept Plan Review within the Hillside and Ridgetop Protection Area that is within the Urban Growth and the Planned Growth Area

Percent of Slope	Recommended Maximum Density Factor*	Recommended Maximum Land Disturbance Factor**
0 - 15	Knox County: 5 dua City of Knoxville: 6 dua	100%
15 - 25	2 dua	50%
25 - 40	0.5 dua	20%
40 or more	0.2 dua	10%
Ridgetops***	***	***

#### dua: dwelling units per acre

- \* These factors should be considered guidelines to determine an overall recommended residential density for requests for changes to the zoning map to planned residential (RP-1 in the city and PR in the county) zone districts that are considered by the Metropolitan Planning Commission prior to being considered by the appropriate legislative body. The resulting zone district development right would be considered a budget for dwelling units to be applied over the entire proposed development.
- \*\* Until such time as regulations are codified by the appropriate legislate body, these factors should be considered guidelines to determine an overall recommended land disturbance area for development plans and concept plans that are considered for approval by the Metropolitan Planning Commission. The overall land disturbance area would be considered a budget for land disturbance to be applied over the entire proposed development.
- \*\*\* Ridgetops are generally the more level areas on the highest elevations of a ridge. Because the shapes of Knox County ridges are so varied (see pages 8 – 9), the ridgetop area should be determined on a case-by-case basis with each rezoning and related development proposal.

The Knoxville Knox County Hillside and Ridgetop Protection Plan - 33

#### APPENDIX E

MANUAL TRAFFIC COUNT DATA

#### TRAFFIC COUNT DATA

Major Street: Stanley Road (NB - SB) Minor Street: Boulder Point Lane (EB) Traffic Control: Stop Control on Boulder Point Lane

11/14/2017 (Tuesday) Partly Sunny/Cool Conducted by: Ajax Engineering

	Stanle	y Road	Stanle	y Road	Boulder Point Lane			
TIME	SOUTH	BOUND	NORTH	BOUND	EASTB	OUND	VEHICLE	PEAK
BEGIN	THRU	RT	LT	THRU	LT	RT	TOTAL	HOUR
7:00 AM	1	2	0	4	4	0	11	
7:15 AM	0	2	0	5	11	0	18	7:15 AM - 8:15 AM
7:30 AM	2	6	0	3	4	0	15	
7:45 AM	5	0	0	10	5	0	20	
8:00 AM	2	3	0	4	5	0	14	
8:15 AM	2	2	0	2	2	0	8	
8:30 AM	2	0	0	3	5	0	10	
8:45 AM	0	1	0	1	0	0	2	
TOTAL	14	16	0	32	36	0	98	
3:00 PM	2	5	0	2	1	0	10	
3:15 PM	5	6	0	1	3	1	16	
3:30 PM	4	0	0	2	5	0	11	
3:45 PM	5	4	0	3	2	0	14	3:45 PM - 4:45 PM
4:00 PM	4	6	0	2	0	0	12	
4:15 PM	6	0	0	4	2	1	13	
4:30 PM	3	7	0	2	3	0	15	
4:45 PM	4	1	0	1	2	0	8	
5:00 PM	0	3	0	3	1	0	7	
5:15 PM	0	3	0	2	0	0	5	
5:30 PM	7	5	0	3	2	0	17	
5:45 PM	6	8	1	1	4	0	20	
TOTAL	46	48	1	26	25	2	148	

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

	Stanle	y Road	Stanle	y Road	Boulder Point Lane		
TIME	SOUTH	BOUND	NORTH	BOUND	EASTBOUND		
BEGIN	THRU	RT	LT	THRU	LT	RT	
7:15 AM	0	2	0	5	11	0	
7:30 AM	2	6	0	3	4	0	
7:45 AM	5	0	0	10	5	0	
8:00 AM	2	3	0	0 4		0	
TOTAL	9 11		0	22	25	0	
PHF	0.45	0.46	-	0.55	0.57	-	

2017 PM Peak Hour

#### 3:45 PM - 4:45 PM

	Stanle	y Road	Stanle	y Road	Boulder Point Lane		
TIME	SOUTH	BOUND	NORTH	BOUND	EASTBOUND		
BEGIN	THRU RT		LT	THRU	LT	RT	
3:45 PM	5 4		0	3	2	0	
4:00 PM	4 6		0	2	0	0	
4:15 PM	6	0	0	4	2	1	
4:30 PM	3 7		0	0 2		0	
TOTAL	18 17		0	11	7	1	
PHF	0.75	0.61	- 0.69		0.58	0.25	

APPENDIX F

CAPACITY ANALYSES - HCM WORKSHEETS (SYNCHRO 8)

**EXISTING TRAFFIC CONDITIONS** 

3.1

#### Intersection

Int Delay, s/veh

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	25	0	0	22	9	11
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, %	-4	-	-	-2	-4	-
Peak Hour Factor	57	90	90	55	45	46
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	44	0	0	40	20	24

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	72	32	44	0	-	0	
Stage 1	32	-	-	-	-	-	
Stage 2	40	-	-	-	-	-	
Critical Hdwy	5.6	5.8	4.1	-	-	-	
Critical Hdwy Stg 1	4.6	-	-	-	-	-	
Critical Hdwy Stg 2	4.6	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	2.2	-	-	-	
Pot Cap-1 Maneuver	952	1051	1577	-	-	-	
Stage 1	1003	-	-	-	-	-	
Stage 2	996	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	952	1051	1577	-	-	-	
Mov Cap-2 Maneuver	952	-	-	-	-	-	
Stage 1	1003	-	-	-	-	-	
Stage 2	996	-	-	-	-	-	

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

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR	
Capacity (veh/h)	1577	- 952	-	-	
HCM Lane V/C Ratio	-	- 0.046	-	-	
HCM Control Delay (s)	0	- 9	-	-	
HCM Lane LOS	А	- A	-	-	
HCM 95th %tile Q(veh)	0	- 0.1	-	-	

1.7

#### Intersection

Int Delay, s/veh

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	7	1	0	11	18	17
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, %	-4	-	-	-2	-4	-
Peak Hour Factor	58	25	90	69	75	61
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	12	4	0	16	24	28

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	54	38	52	0	-	0	
Stage 1	38	-	-	-	-	-	
Stage 2	16	-	-	-	-	-	
Critical Hdwy	5.6	5.8	4.1	-	-	-	
Critical Hdwy Stg 1	4.6	-	-	-	-	-	
Critical Hdwy Stg 2	4.6	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	2.2	-	-	-	
Pot Cap-1 Maneuver	971	1044	1567	-	-	-	
Stage 1	998	-	-	-	-	-	
Stage 2	1016	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	971	1044	1567	-	-	-	
Mov Cap-2 Maneuver	971	-	-	-	-	-	
Stage 1	998	-	-	-	-	-	
Stage 2	1016	-	-	-	-	-	

Approach	EB	NB	SB	
HCM Control Delay, s	8.7	0	0	
HCM LOS	А			

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR	
Capacity (veh/h)	1567	- 988	-	-	
HCM Lane V/C Ratio	-	- 0.016	-	-	
HCM Control Delay (s)	0	- 8.7	-	-	
HCM Lane LOS	А	- A	-	-	
HCM 95th %tile Q(veh)	0	- 0.1	-	-	

11/15/2017

**OPENING YEAR TRAFFIC CONDITIONS (WITH PROJECT)**
5

#### Intersection

Int Delay, s/veh

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	79	0	0	24	10	26
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, %	-4	-	-	-2	-4	-
Peak Hour Factor	57	90	90	55	45	46
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	139	0	0	44	22	57

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	94	50	79	0	-	0	
Stage 1	50	-	-	-	-	-	
Stage 2	44	-	-	-	-	-	
Critical Hdwy	5.6	5.8	4.1	-	-	-	
Critical Hdwy Stg 1	4.6	-	-	-	-	-	
Critical Hdwy Stg 2	4.6	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	2.2	-	-	-	
Pot Cap-1 Maneuver	930	1030	1532	-	-	-	
Stage 1	989	-	-	-	-	-	
Stage 2	993	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	930	1030	1532	-	-	-	
Mov Cap-2 Maneuver	930	-	-	-	-	-	
Stage 1	989	-	-	-	-	-	
Stage 2	993	-	-	-	-	-	

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

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR	
Capacity (veh/h)	1532	- 930	-	-	
HCM Lane V/C Ratio	-	- 0.149	-	-	
HCM Control Delay (s)	0	- 9.5	-	-	
HCM Lane LOS	А	- A	-	-	
HCM 95th %tile Q(veh)	0	- 0.5	-	-	

3

#### Intersection

Int Delay, s/veh

Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Vol, veh/h	51	0	0	12	20	88	
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, %	-4	-	-	-2	-4	-	
Peak Hour Factor	58	25	90	69	75	61	
Heavy Vehicles, %	0	0	0	0	0	0	
Mvmt Flow	88	0	0	17	27	144	

Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	116	99	171	0	-	0	
Stage 1	99	-	-	-	-	-	
Stage 2	17	-	-	-	-	-	
Critical Hdwy	5.6	5.8	4.1	-	-	-	
Critical Hdwy Stg 1	4.6	-	-	-	-	-	
Critical Hdwy Stg 2	4.6	-	-	-	-	-	
Follow-up Hdwy	3.5	3.3	2.2	-	-	-	
Pot Cap-1 Maneuver	908	973	1418	-	-	-	
Stage 1	951	-	-	-	-	-	
Stage 2	1015	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	908	973	1418	-	-	-	
Mov Cap-2 Maneuver	908	-	-	-	-	-	
Stage 1	951	-	-	-	-	-	
Stage 2	1015	-	-	-	-	-	

Approach	EB	NB	SB	
HCM Control Delay, s	9.4	0	0	
HCM LOS	А			

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR	
Capacity (veh/h)	1418	- 908	-	-	
HCM Lane V/C Ratio	-	- 0.097	-	-	
HCM Control Delay (s)	0	- 9.4	-	-	
HCM Lane LOS	А	- A	-	-	
HCM 95th %tile Q(veh)	0	- 0.3	-	-	

APPENDIX G

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: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.			
Number of Studies: Avg. Number of Dwelling Units: Directional Distribution:	292 194 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: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.	
Number of Studies: Avg. Number of Dwelling Units: Directional Distribution:	321 207 63% enterina, 37% exitina	

## Average Rate Range of Rates Standard Deviation

### <u>1.00</u> <u>0.42</u> - 2.98 <u>1.05</u>

#### **Data Plot and Equation**



## TABLE 4 TRIP GENERATION FOR BOULDER POINT SUBDIVISION Phase 1 and 2

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED ERATED TRAFFIC PAILY AM PEAK HOUR PAFFIC		GE PM	GENERATED TRAFFIC PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
	Single Family			25%	75%		63%	37%	
#210	Detached Housing	136 Lots	1,394	26	79	105	88	51	139
Total New Volume Site Trips		1,394	26	79	105	88	51	139	

ITE Trip Generation Manual, 9th Edition

#### TRIP GENERATION FOR BOULDER POINT SUBDIVISION

ITE Trip Generation Manual, 9th Edition

136 Residential Units = X

#### Weekday:

Fitted Curve Equation: Ln(T) = 0.92 Ln(X)+2.72

Ln(T) = 0.92 \* 4.91 + 2.72 Ln(T) = 7.24<u>T = 1,394 trips</u>

#### Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: T = 0.70(X) + 9.74 T = 0.70 \* 136 + 9.74T = 105 trips

#### Peak Hour of Adjacent Traffic between 4 and 6 pm:

Fitted Curve Equation: Ln(T) = 0.90 Ln(X)+0.51 Ln(T) = 0.90 \* 4.91 + 0.51 Ln(T) = 4.93<u>T = 139 trips</u>

#### TRIP GENERATION FOR BOULDER POINT SUBDIVISION 41 lots in Phase 1

ITE LAND USE CODE	LAND USE DESCRIPTION	UNITS	GENERATED DAILY TRAFFIC	GENERATED TRAFFIC AM PEAK HOUR		GENERATED GENERATED ATED TRAFFIC TRAFFIC LY AM PEAK HOUR PM PEAK HOU FFIC		D UR	
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
	Simula Equila			25%	75%		63%	37%	
#210	Detached Housing	41 Lots	1,394	10	29	39	30	18	48
Total New Volume Site Trips		1,394	10	29	39	30	18	48	

ITE Trip Generation Manual, 9th Edition

#### TRIP GENERATION FOR BOULDER POINT SUBDIVISION

ITE Trip Generation Manual, 9th Edition

41 Residential Units = X

#### Weekday:

Fitted Curve Equation: Ln(T) = 0.92 Ln(X)+2.72

Ln(T) = 0.92 \* 3.71 + 2.72 Ln(T) = 6.14 <u>T = 463 trips</u>

#### Peak Hour of Adjacent Traffic between 7 and 9 am:

Fitted Curve Equation: T = 0.70(X) + 9.74 T = 0.70 \* 41 + 9.74T = 39 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 \* 3.71 + 0.51 Ln(T) = 3.85<u>T = 48 trips</u>

APPENDIX H

SPOT SPEED STUDY

#### SPOT SPEED STUDY

Location:	Stanley Road
Posted Speed Limit:	30 mph
Equipment:	Bushnell Speedster III Radar Speed Gun
Direction:	Northbound and Southbound

Vehicle #	Speed
	(mph)
1	29
2	34
3	40
4	28
5	24
6	31
7	32
8	47
9	29
10	43
11	31
12	32
13	28
14	32
15	35
16	25
17	23
18	33
19	32
20	42
21	42
22	36
23	34
24	33
25	40

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

Date: 11/14/17 Weather: Cool/Clear Time: 3:00 PM





Average speed = 50th percentile speed = 85th percentile speed = 34.4 mph 33.0 mph

41.7 mph

**APPENDIX I** 

#### KNOX COUNTY TURN LANE VOLUME THRESHOLD WORKSHEET

#### TABLE 5B

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

RIGHT-TURN	<b>THROUGH VOLUME PLUS LEFT-TURN VOLUME *</b>					<u>*</u>
VOLUME	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99			Projected PM Right Turns =	88		
100 - 149 150 - 199			Turn Lane NO Warranted	Т		
200 - 249 250 - 299			funnin		Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN	THR	OUGH VOLU	ME PLUS LI	EFT-TURN	VOLUM	E *
VOLUME	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 ar More	Yes	Yes	Yes	Yes	Yes	Yes

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

A-7



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

December 22, 2017

#### TO: Ms. Tarren Barrett Transportation Engineer, MPC/TPO

#### RE: Boulder Point Traffic Impact Study Review Knox County, Tennessee

We received your comments concerning the Boulder Point Traffic Impact Study Review in an email dated December 21, 2017. Below is an itemized summary of the response to your comments on the report:

Response to #1:	In the Executive Summary in the first paragraph, the original wording "was less than 75 lots" was changed to "was only 75 lots".
Response to #2:	The TDOT count station on Clinton Highway was added to page 10 and was also added to Appendix A. This count station was not included in the original report since it is not listed on the TDOT count station website.
Response to #3:	On page 11 under Transit Services, the CAC was added to the discussion as another transit service available.
Response to #4:	On page 17 under Existing Traffic Conditions, the "s" at the end of "counts" was removed in the third paragraph.
Response to #5:	On page 21 under Opening Year Traffic Conditions (without project), the original wording "2% growth" was changed to "2% annual growth rate".
Response to #6:	On page 32, the recommended sight distance discussion was revised to include the estimated actual sight distance at the intersection of Stanley Road at Boulder Point Lane.

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

- Updated footers
- Updated Title Page
- Updated Table of Contents
- Updated Appendix A
- Made a few grammatical changes to improve readability

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.