

**TRAFFIC IMPACT ANALYSIS FOR
KELLER MARKETPLACE
KELLER, TEXAS**

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EXECUTIVE SUMMARY

This traffic study was conducted to analyze the traffic impacts of the proposed Keller Marketplace development in Keller, Texas on the study area roadway network. The specific focus of this study was to determine the impact that traffic generated by the development would have on the intersections and roadways adjacent to the development.

The development is planned to be located on the north side of Keller Parkway (FM 1709) between Country Brook Drive and Chandler Road with build-out expected in 2013. The development is comprised of medical offices (40,000 ft²), restaurants (22,000 ft²), a bank (4 drive thru lanes), a retail center (9,500 ft²), and a proposed theater (900 seats). It is estimated that 9,684 trips will be generated by this development at build-out on a daily basis – 769 during the AM peak hour and 901 during the PM peak hour.

Keller Parkway (FM 1709) is a six-lane divided arterial with a posted speed limit of 45 mph adjacent to our development. Keller Smithfield Road is a four-lane undivided collector road north of Keller Parkway (FM 1709) and has a posted speed limit of 30 mph.

Capacity Analysis

Capacity analyses were performed for the study area roadways and intersections during the AM and PM peak hours for Existing (2012), Build-Out Year (2013), and Horizon Year (2018) conditions for both background and total conditions.

Under Existing (2012) conditions, the signalized intersection of Keller Parkway (FM 1709) and Keller Smithfield currently operates at an acceptable level of service during the AM and PM peak hour. The southbound approach and the westbound right turn movement operate at unacceptable levels of service during the PM peak hour. The introduction of westbound and southbound right turn lanes is predicted to allow the intersection to maintain an acceptable level of service during the Build-Out Year (2013) and Horizon Year (2018) background conditions. Under Build-Out Year (2013) and Horizon Year (2018) total conditions, signal timing adjustments will be necessary to maintain an acceptable level of service at this intersection.

The southbound left turn movements at each proposed site driveway along Keller Parkway (FM 1709) are predicted to operate at unacceptable levels of service due to the high traffic volumes along Keller Parkway (FM 1709). If delays for the left turning traffic exiting the site become unacceptable, motorists have the option to exit the site at North Drive 1 and utilize the existing traffic signal at Keller Parkway (FM 1709) and Keller Smithfield Road. The site traffic will be stored on private property and is not predicted to impact the adjacent roadways.

Access Management

Sight Distance observations in the field indicated that adequate sight distance is available at all site driveways except for North Drive 1. Based on the field observations, sight distance for the eastbound approach at North Drive 1 has restricted visibility to the left due to a large utility box, existing mature trees, a six foot (6') brick screening wall, and the existing roadway curvature.

Based on the projected site traffic volumes, TxDOT's volume threshold for consideration of a right turn deceleration lane is met for the westbound approach on Keller Parkway (FM 1709) at West Drive 1. Based on the proposed site plan, existing median openings, TxDOT's *Roadway Design Manual* (Table 3-3A), and a 45 mph speed limit, a minimum storage length of 30 feet and a minimum deceleration length of 275 feet (15 mph speed differential) should be provided for the westbound right turn lane along Keller Parkway (FM 1709).

The right turn volumes for Keller Parkway (FM 1709) at Country Brook Drive, West Drive 2 and East Drive do not exceed TxDOT's threshold. However, the westbound right turn volume at West Drive 2 is within three (3) vehicles of TxDOT's threshold. The proposed land use adjacent to this driveway, Medical, creates a very low traffic volume. If the land uses for Lots 1, 2, 3, or 4 of the proposed development changes, Country Brook Drive and West Drive 2 should be reanalyzed with the new land use(s).

Eastbound left turn deceleration lanes will be installed on Keller Parkway (FM 1709) at Country Brook Drive and at West Drive 1. Based on the proposed site plan (Figure 1), existing median openings, TxDOT's *Roadway Design Manual* (Table 3-3A), and a 45 mph speed limit, a minimum storage length of 100 feet and a minimum deceleration length of 215 feet (20 mph speed differential) should be provided for a left turn lane.

INTRODUCTION

This traffic study was conducted to analyze the traffic impacts of the proposed Keller Marketplace development in Keller, Texas on the area roadway network. The specific focus of this study was to determine the impact that traffic generated by the development would have on the adjacent roadways and intersections.

The development is planned to be located on the north side of Keller Parkway (FM 1709) between Country Brook Drive and Chandler Road with build-out in 2013. **Figure 1** presents a vicinity map of the proposed development. The site plan for the proposed development is shown in **Figure 2**.

The study area for this traffic study included the following existing intersections and the proposed site driveways:

- Keller Parkway (FM 1709) and Country Brook Drive
- Keller Parkway (FM 1709) and Keller Smithfield Road
- Keller Parkway (FM 1709) and Chandler Road

Figure 3 provides the existing lane configurations for the area roadways and intersections. A brief description of the existing area roadways is provided below:

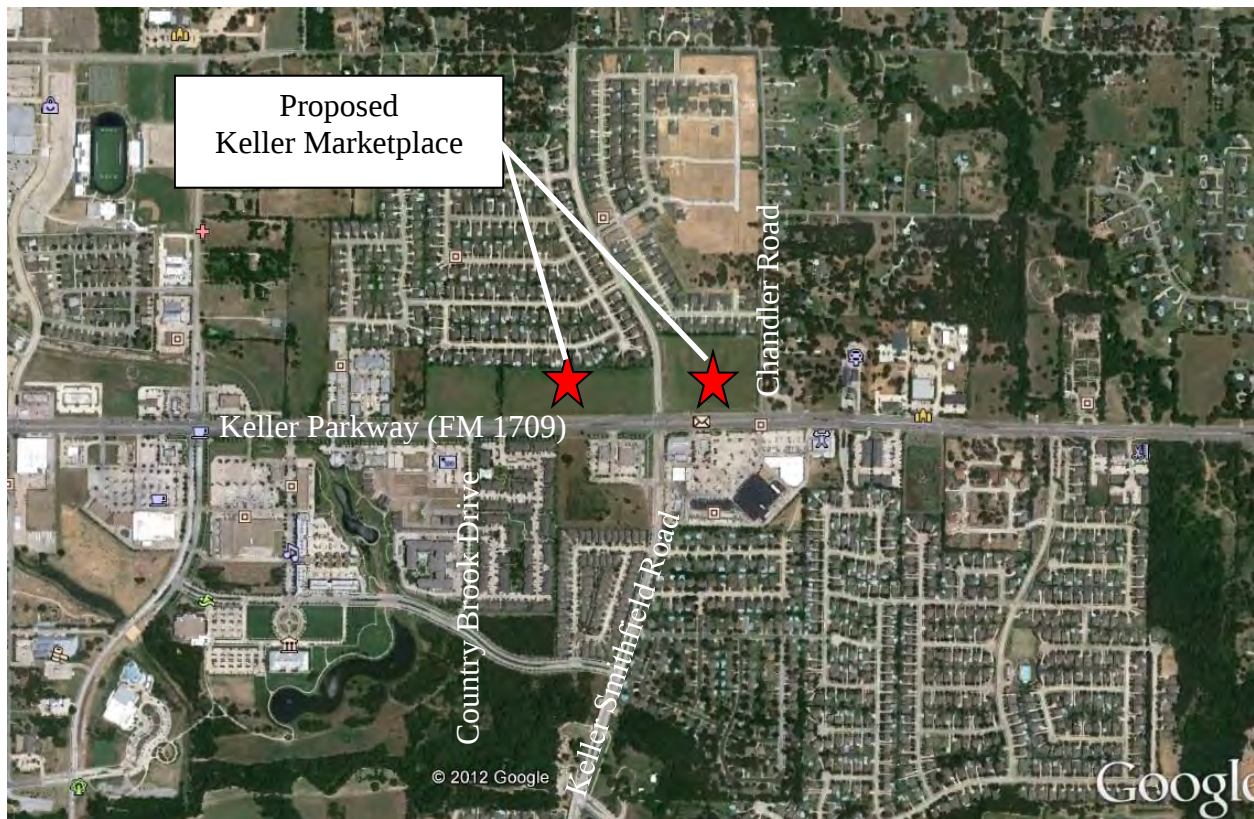
Keller Parkway (FM 1709) – Keller Parkway (FM 1709) is a six-lane divided roadway with a posted speed limit of 45 miles per hour (mph) in the vicinity of the proposed development. It is classified as a six lane divided arterial (A6D) in the City of Keller Comprehensive Thoroughfare Plan dated November 2004. As an A6D, Keller Parkway (FM 1709) is built to its ultimate configuration (six-lane divided). The proposed development will be accessible from Keller Parkway (FM 1709) via three (3) access points.

Keller Smithfield Road – Keller Smithfield Road is a four-lane undivided roadway with a posted speed limit of 30 mph in the vicinity of the proposed development. It is classified as a four lane undivided collector (C4U) north of Keller Parkway (FM 1709) and a four-lane divided arterial south of Keller Parkway (FM 1709) in the City of Keller Comprehensive Thoroughfare Plan dated November 2004. The proposed development will be accessible from Keller Smithfield Road via two (2) access points.

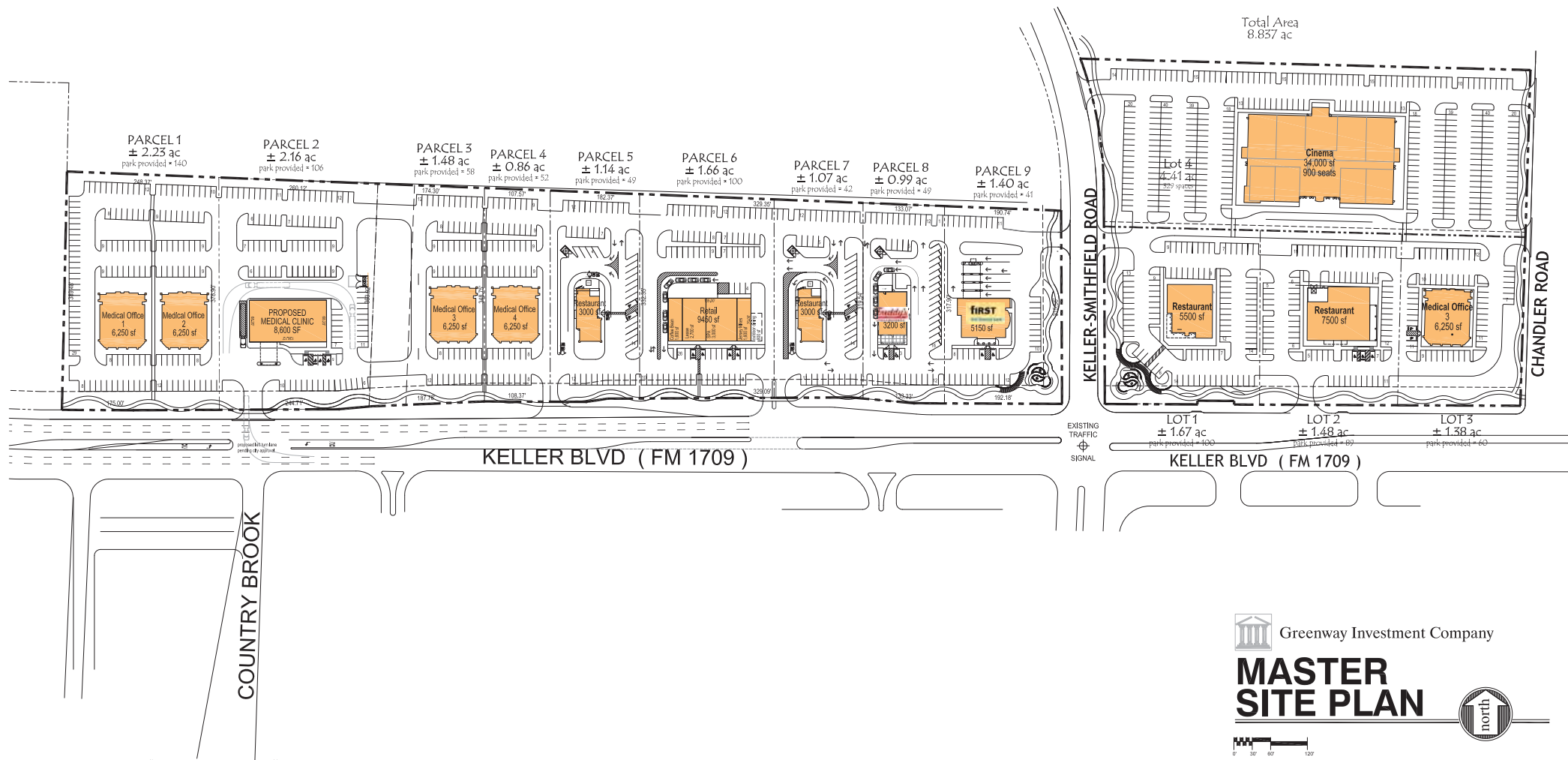
Country Brook Drive – Country Brook Drive is two-lane undivided roadway with an assumed speed limit of 30 mph in the vicinity of the proposed development. This roadway is not shown on the City of Keller Comprehensive Thoroughfare Plan dated November 2004. The development will create a driveway that will align with Country Brook Drive on the north side of Keller Parkway (FM 1709).

Chandler Road – Chandler Road is two-lane undivided roadway with an assumed speed limit of 30 mph in the vicinity of the proposed development. This roadway is not shown on the City of Keller Comprehensive Thoroughfare Plan dated November 2004.

Figure 1 – Keller Marketplace Vicinity Map



Staff Attachment
Figure 2 - Site Plan



THIS PLAN IS PROVIDED SUBJECT TO (i) ERRORS AND OMISSIONS IN THE INFORMATION, AND (ii) MODIFICATION WITHOUT NOTICE OF THE INFORMATION, SPECIFICATIONS, STANDARDS AND/OR REGULATIONS SET FORTH IN THE PLAN HAVE BEEN DERIVED FROM DOCUMENTS BELIEVED TO BE RELIABLE. HOWEVER, THIS PLAN MAY BE INCOMPLETE AND/OR INACCURATE AND NO REPRESENTATION OR WARRANTY, EXPRESSED OR IMPLIED, IS MADE BY THE ARCHITECT OR ANY OTHER PERSONS IN CONNECTION WITH THE PREPARATION OF THIS PLAN. THE USER OF THIS PLAN ASSUMES ALL LIABILITY FOR ANY AND ALL DAMAGES, LOSSES AND EXPENSES, INCLUDING REASONABLE ATTORNEY'S FEES, ARISING OUT OF OR IN CONNECTION WITH THE USE OF THIS PLAN. THE ARCHITECT AND ANY OTHER PERSONS SHALL NOT BE RESPONSIBLE FOR ANY SUCH DAMAGES, LOSSES AND EXPENSES.

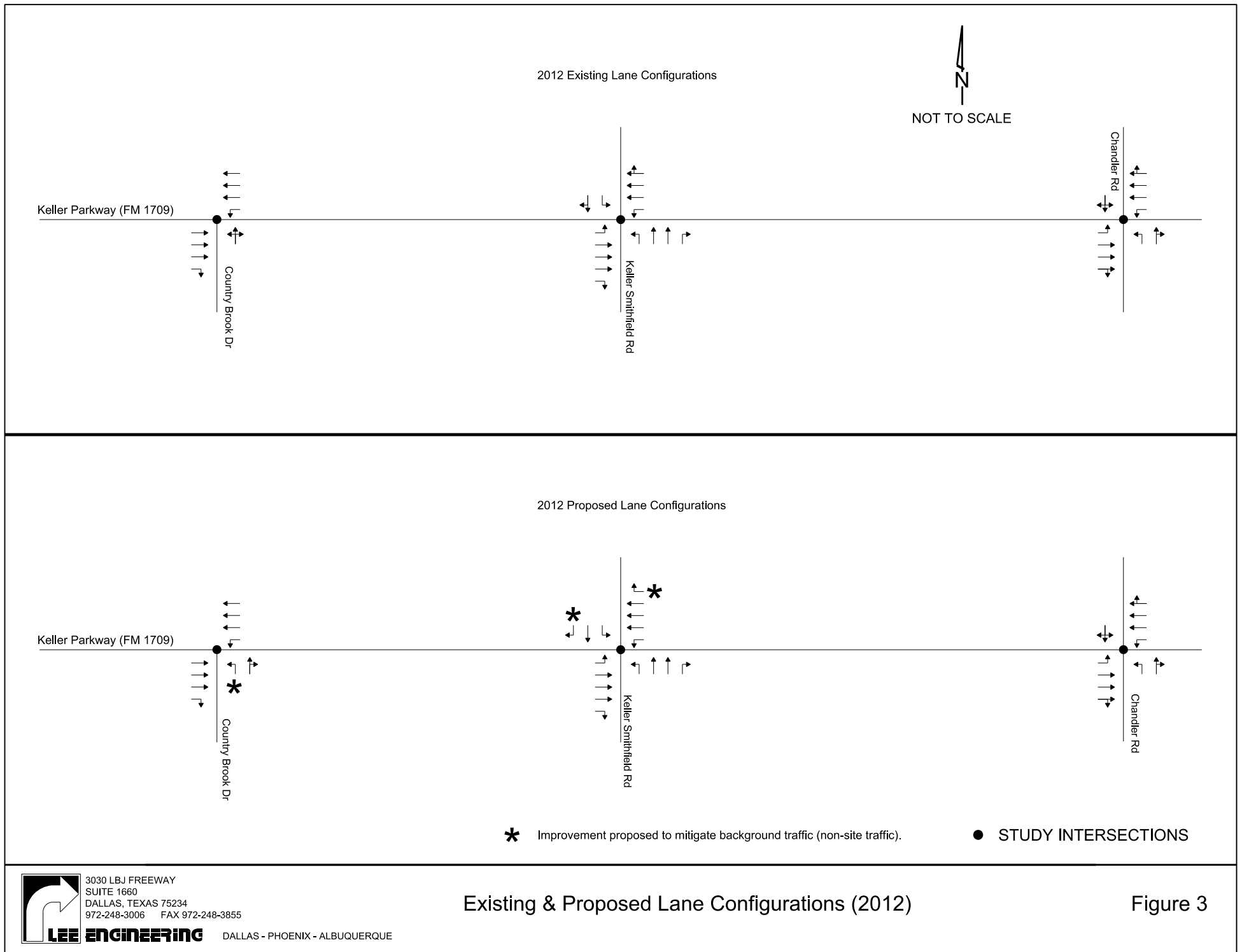
The Architect's office is not responsible for the design of any building or structure shown on this plan. The Architect's office is not responsible for the design of any building or structure shown on this plan. The Architect's office is not responsible for the design of any building or structure shown on this plan.

KELLER MARKETPLACE FM 1709 at Keller-Smithfield Road KELLER, TEXAS

 Greenway Investment Company
MASTER SITE PLAN

0' 30' 60' 120'



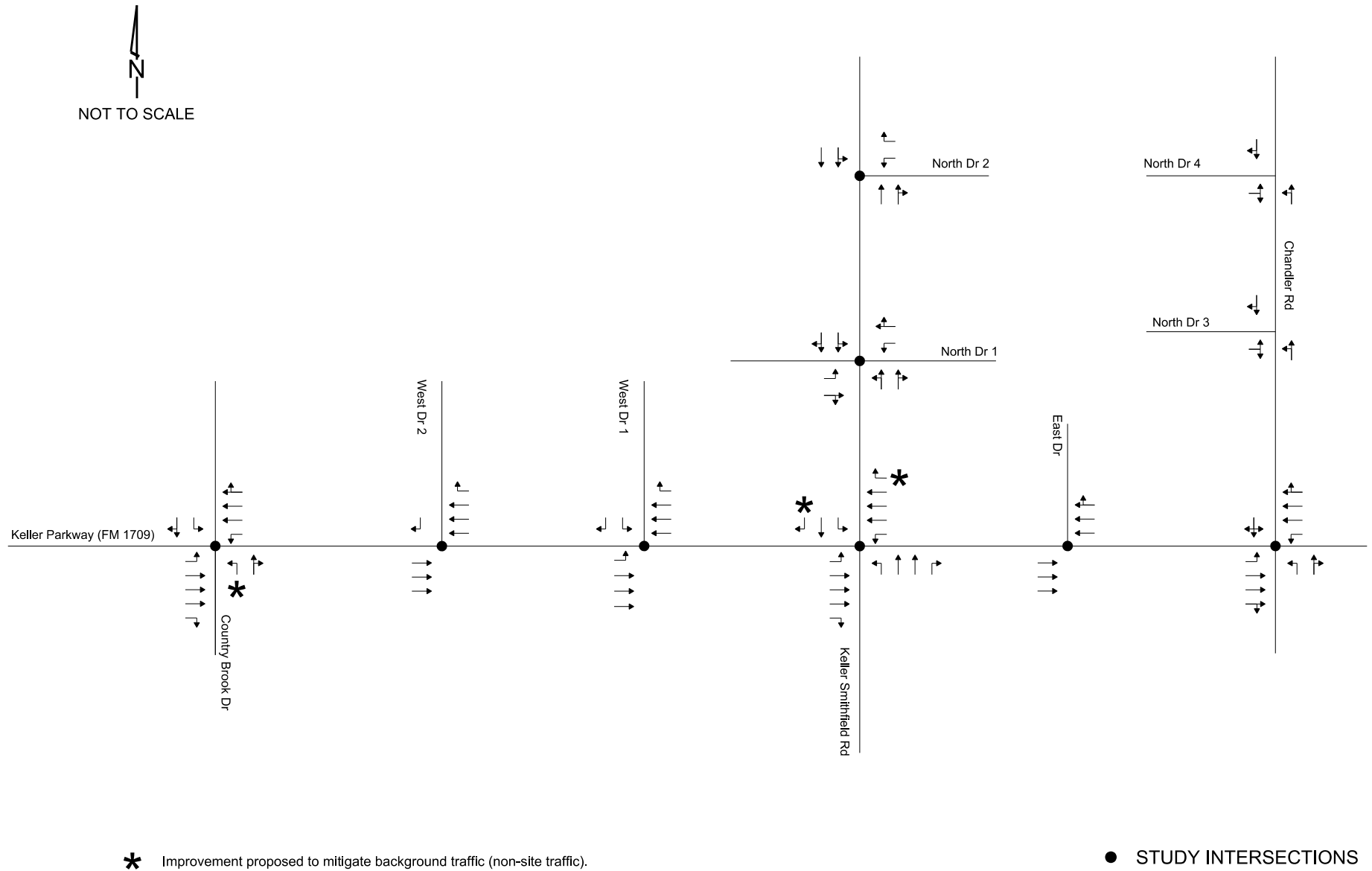


Keller Marketplace
September 2012

In addition to the existing intersections listed about, the following site driveway intersections were analyzed:

- Keller Parkway (FM 1709) and West Drive 1
- Keller Parkway (FM 1709) and West Drive 2
- Keller Parkway (FM 1709) and East Drive
- Keller Smithfield Road and North Drive 1
- Keller Smithfield Road and North Drive 2

Figure 4 shows the proposed lane configurations for the existing intersections and the new site access points.



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Proposed Lane Configurations at
Site Build-out (2013 and 2018)

Figure 4

TRIP GENERATION AND DESIGN HOUR VOLUMES

The proposed Keller Marketplace is planned to be located on the north side of Keller Parkway (FM 1709) from Country Brook Drive to Chandler Road in the City of Keller, Texas with build-out scheduled for 2013.

The number of trips generated by a development is a function of the type and quantity of the land use of the development. The number of vehicle trips generated by the Keller Marketplace were estimated based on the trip generation rates/equations provided in the publication entitled *Trip Generation, Eighth Edition*, by the Institute of Transportation Engineers (ITE). Estimates of the number of trips generated by the site were made for the AM and PM peak hours, as well as on a daily basis. The trip generation rates/equations used for this development and the directional splits for the proposed land uses are shown in **Tables 1 and 2**. The trip generation estimates for the proposed development are shown in **Table 3**.

Table 1 – Keller Marketplace Trip Generation Rates/Equations

Land Use		Rates/Equations ¹		
Description	ITE Code	Average Weekday	AM Peak Hour	PM Peak Hour
Theater w/ Matinee	444	---	---	$T = 0.07Z$
Medical Office	720	$T = 36.16X$	$T = 2.30X$	$T = 3.52X$
Shopping Center	820	$\ln(T) = 0.65*\ln(X) + 5.83$	$\ln(T) = 0.59*\ln(X) + 2.32$	$\ln(T) = 0.67*\ln(X) + 3.37$
Drive In Bank	912	$T = 139.25Y$	$T = 9.44Y$	$T = 27.41Y$
High Turnover (Sit-Down) Restaurant	932	$T = 127.15X$	$T = 11.52X$	$T = 11.15X$
Fast Food with Drive-Thru	934	$T = 496.12X$	$T = 49.35X$	$T = 33.84X$

¹T = Trips Ends; X = 1,000 ft²; Y = Number of Drive Thru Lanes; Z = Seats

Table 2 – Keller Marketplace Directional Splits

Land Use		Directional Split ¹		
Description	ITE Code	Average Weekday	AM Peak Hour	PM Peak Hour
Theater	444	---	---	39 / 61
Medical Office	720	50 / 50	79 / 21	27 / 73
Shopping Center	820	50 / 50	61 / 39	49 / 51
Drive In Bank	912	50 / 50	58 / 42	49 / 51
High Turnover (Sit-Down) Restaurant	932	50 / 50	52 / 48	59 / 41
Fast Food with Drive-Thru	934	50 / 50	51 / 49	52 / 48

¹XX / YY = % entering vehicles / % exiting vehicles

Table 3 – Estimated Trip Generation for Proposed Keller Marketplace

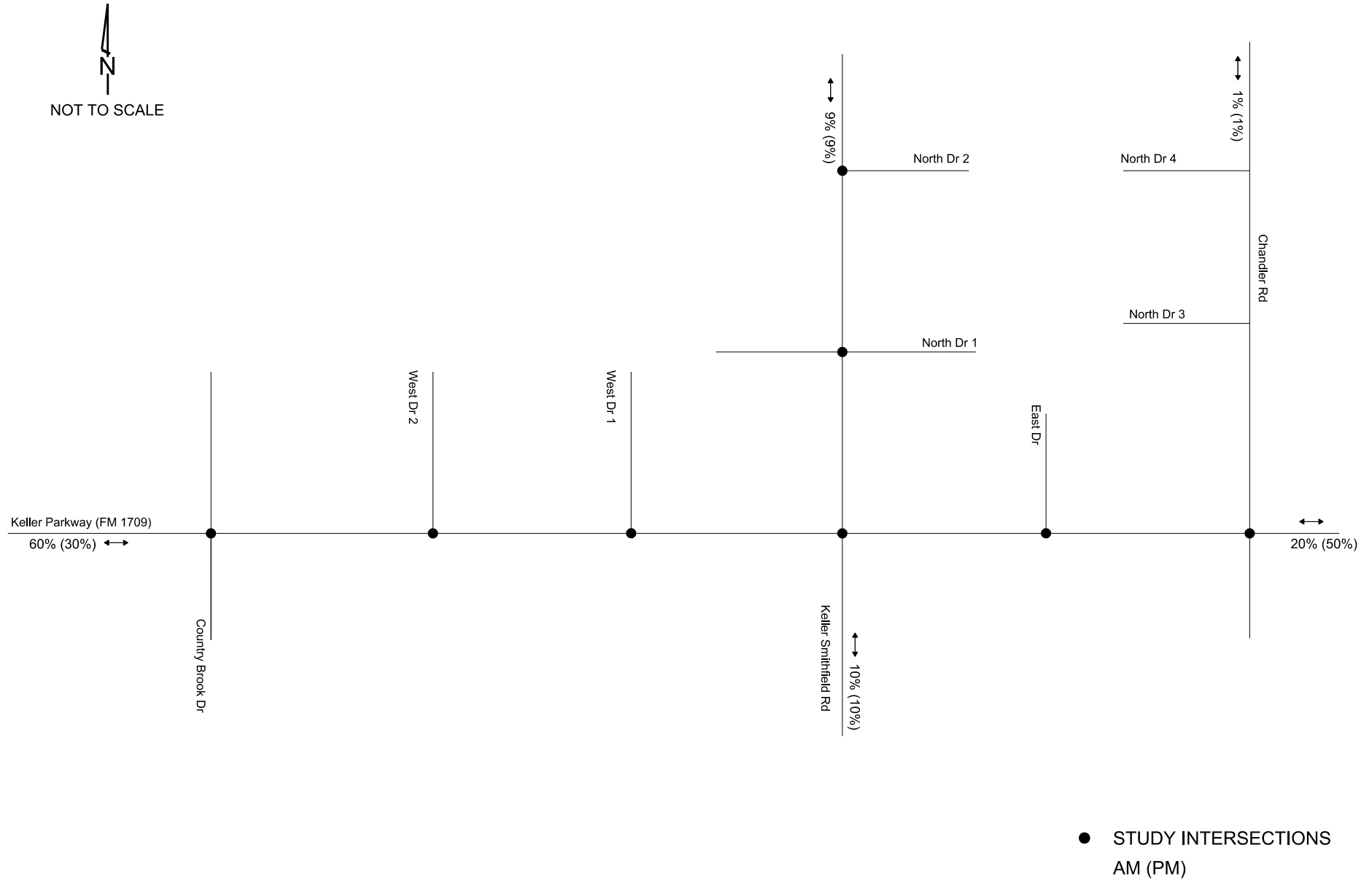
Land Use	Units	Average Weekday			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
Medical Office	6,250 ft ²	113	113	226	11	3	14	6	16	22
Medical Office	6,250 ft ²	113	113	226	11	3	14	6	16	22
Medical Office	8,600 ft ²	156	156	311	16	4	20	8	22	30
Medical Office	6,250 ft ²	113	113	226	11	3	14	6	16	22
Medical Office	6,250 ft ²	113	113	226	11	3	14	6	16	22
Fast Food with Drive-Thru	3,000 ft ²	744	744	1,488	75	73	148	53	49	102
Shopping Center	9,450 ft ²	733	733	1,466	23	15	38	64	67	131
Fast Food with Drive-Thru	3,000 ft ²	744	744	1,488	75	73	148	53	49	102
Fast Food with Drive-Thru	3,200 ft ²	794	794	1,588	81	77	158	56	52	108
Drive In Bank	4	279	279	558	22	16	38	54	56	110
High Turnover (Sit-Down) Restaurant	5,500 ft ²	350	350	700	33	30	63	36	25	61
High Turnover (Sit-Down) Restaurant	7,500 ft ²	477	477	954	45	41	86	50	34	84
Medical Office	6,250 ft ²	113	113	226	11	3	14	6	16	22
Theater	900 seats	---	---	---	---	---	---	22	38	63
TOTAL		4,842	4,842	9,684	425	344	769	429	472	901

Trip Distribution

The distribution of site generated traffic entering and leaving the development on the area roadways was developed based on the layout of the development, locations of principal roadways, and a review of existing traffic volumes and land uses in the vicinity of the study location. The directional distribution used for the analysis is shown in **Figure 5**.

Trip Assignment

Traffic volumes expected to be generated by the proposed Keller Marketplace were assigned to the area roadways and site access locations based on the directional distribution identified in Figure 5. The site-generated traffic volumes at Build-Out (2013) are provided in **Figure 6**.

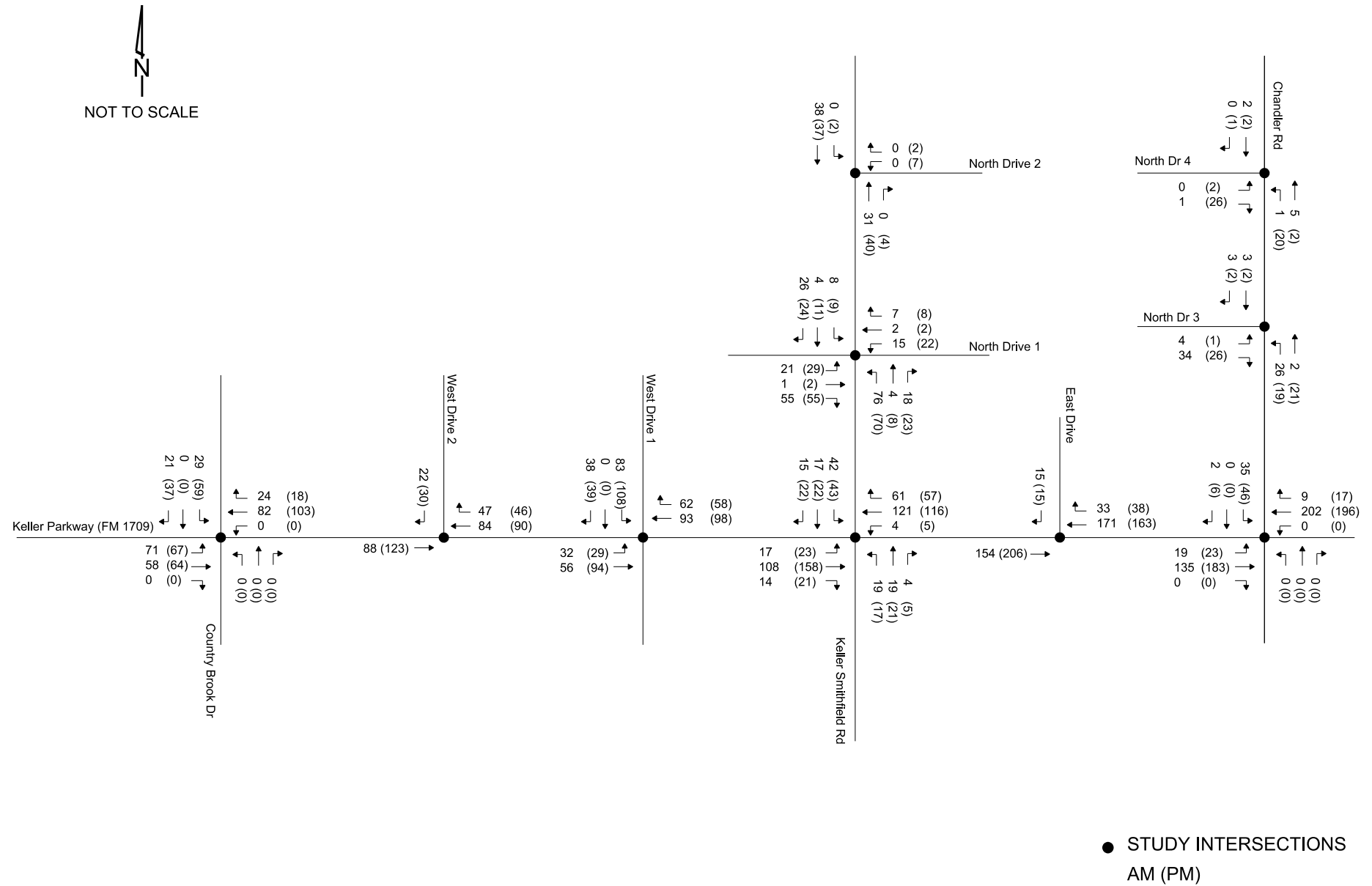


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Assumed Directional Distribution

Figure 5



Site Generated Traffic Volumes

Figure 6

EXISTING AND PROJECTED TRAFFIC VOLUMES

Existing Traffic Volumes

AM and PM peak period turning movement counts were collected on Thursday, August 2, 2012, at the following study area intersections:

- Keller Parkway (FM 1709) and Country Brook Drive
- Keller Parkway (FM 1709) and Keller Smithfield Road
- Keller Parkway (FM 1709) and Chandler Road

The AM peak period counts were collected between the hours of 7:00 AM and 9:00 AM, while the PM peak period counts were performed between 4:00 PM and 6:00 PM. The raw counts are included in the Appendix. The existing AM and PM peak hour traffic counts are summarized in **Figure 7**.

Historical Traffic Volumes

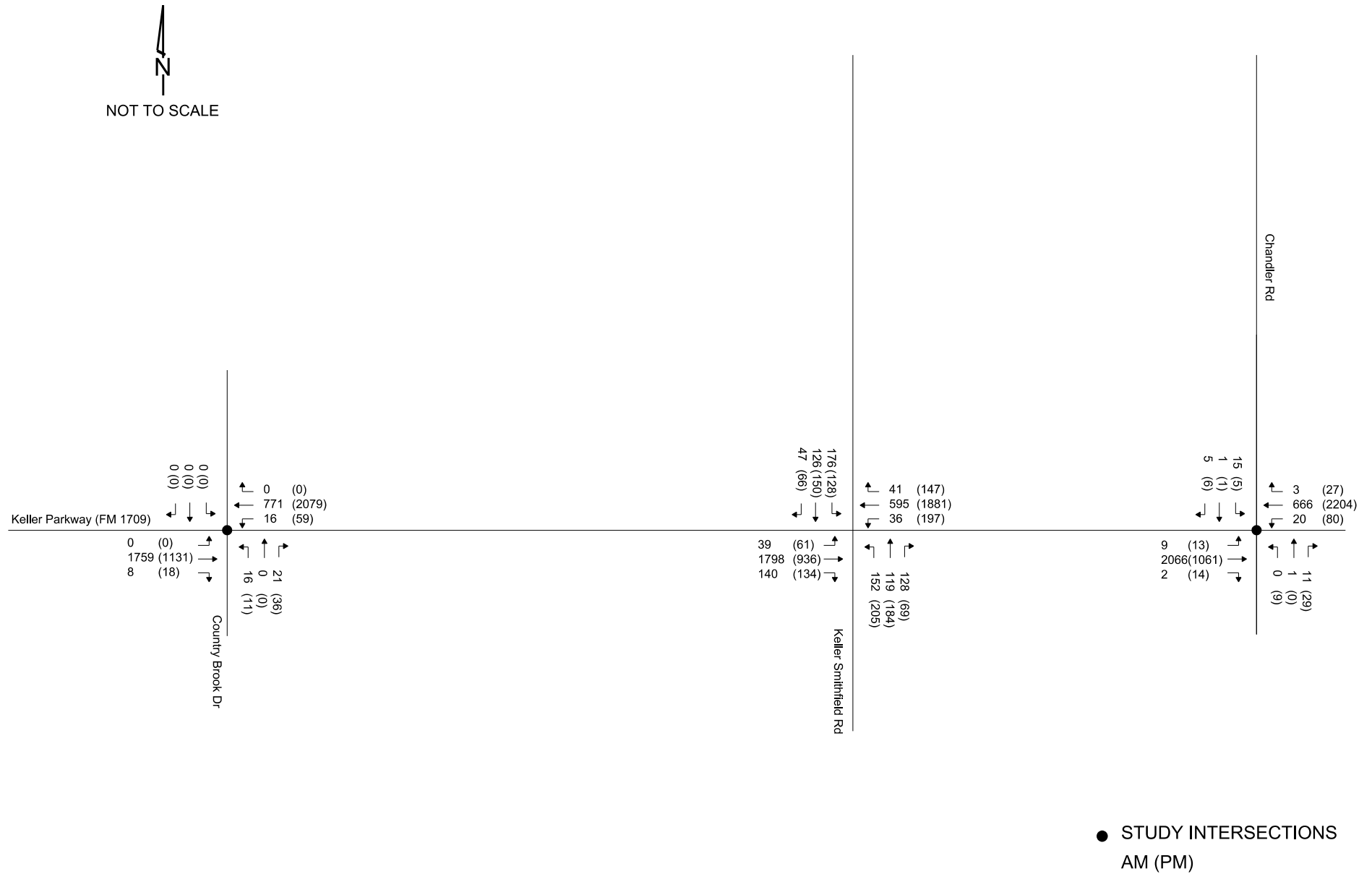
Historical traffic volumes were gathered from available TxDOT District count maps and compared with the existing traffic count volumes collected. These volumes were used in estimating the annual growth rate necessary to grow the existing background traffic volumes to Build-Out (2013). These volumes are presented in **Table 4**.

Table 4 – Historical 24-Hour Traffic Volumes

Year	Keller Parkway (FM 1709)
2006	39,000
2007	38,000
2008	38,000
2009	38,000
2010	36,000
Growth Rate	-2%

Source: TxDOT Traffic Count Maps

The historical traffic volumes shown in Table 4 indicate that traffic volumes along Keller Parkway (FM 1709) have decreased by approximately two percent (2%) annually since 2006. Although this area has seen traffic volumes decrease in recent years and there is no data available to provide any indication that this pattern will change significantly, this study uses an annual growth rate of one percent (1%) for determining traffic conditions in the Build-Out Year (2013) and Horizon Year (2013). **Figure 8** presents the Build-Out Year (2013) Background traffic volumes and **Figure 9** presents the Horizon Year (2018) Background traffic volumes.

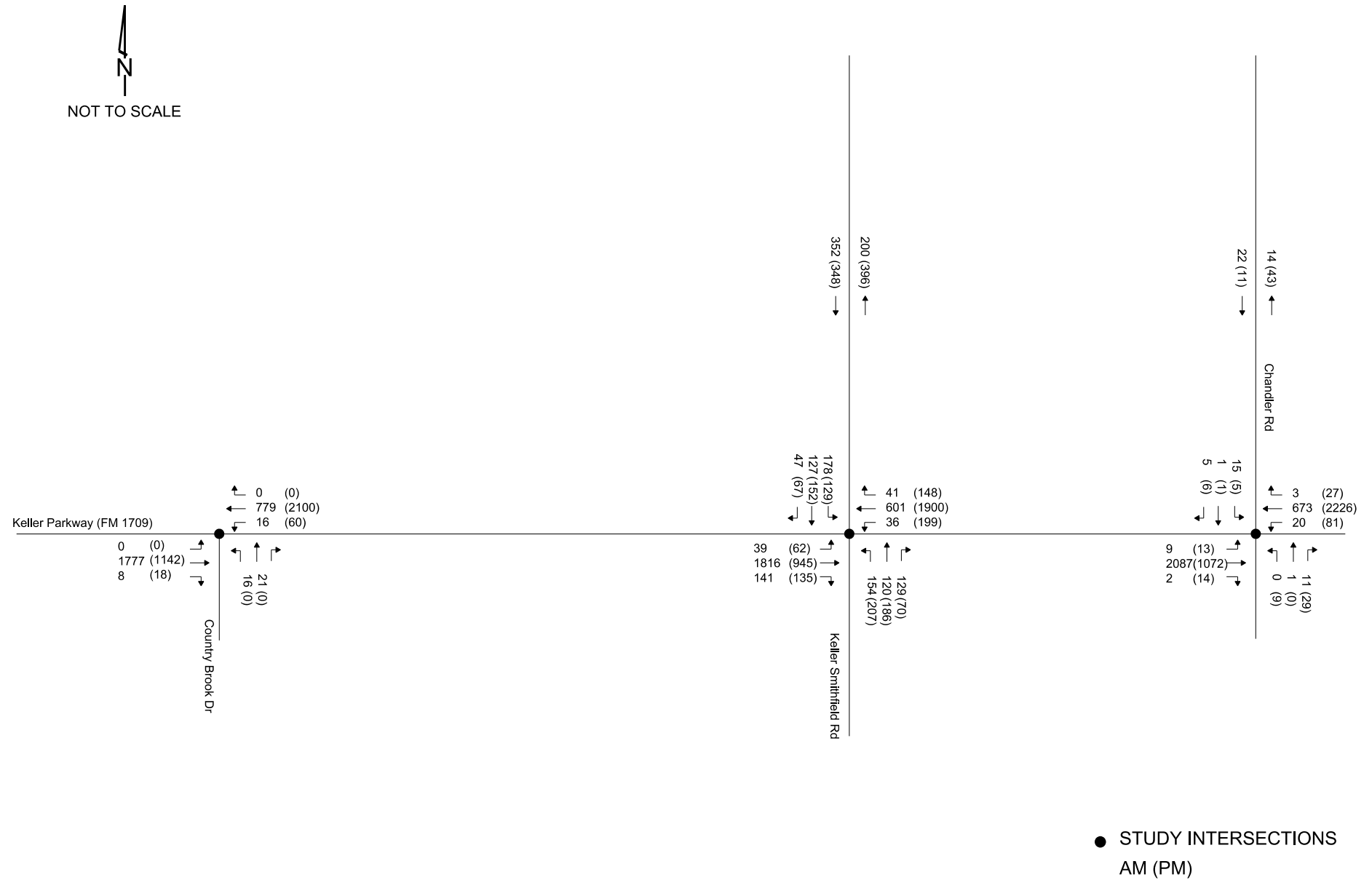


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Existing Traffic Volumes

Figure 7

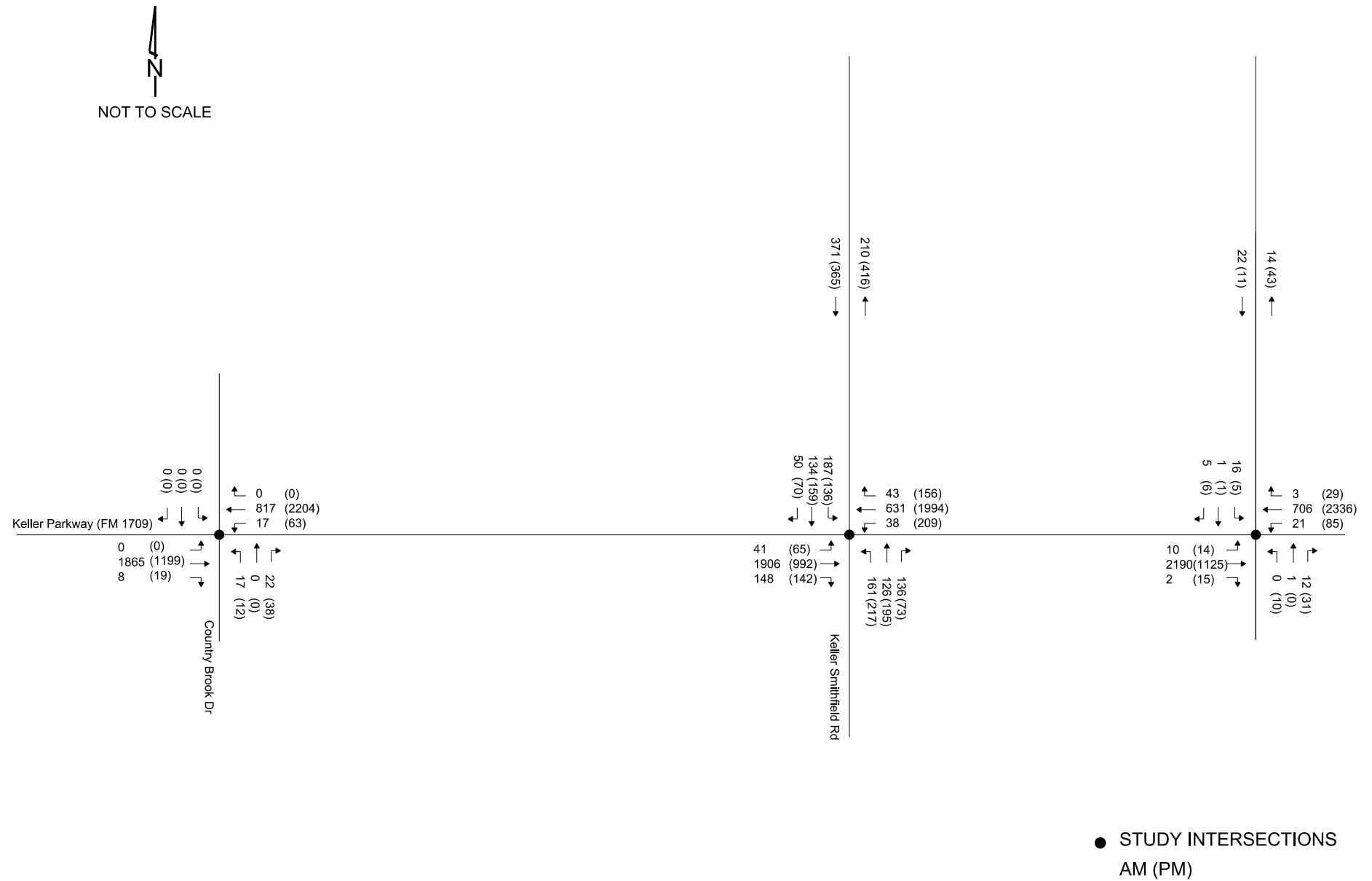


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Build-Out Year (2013) Background Traffic Volumes

Figure 8



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Horizon Year (2018) Background Traffic Volumes

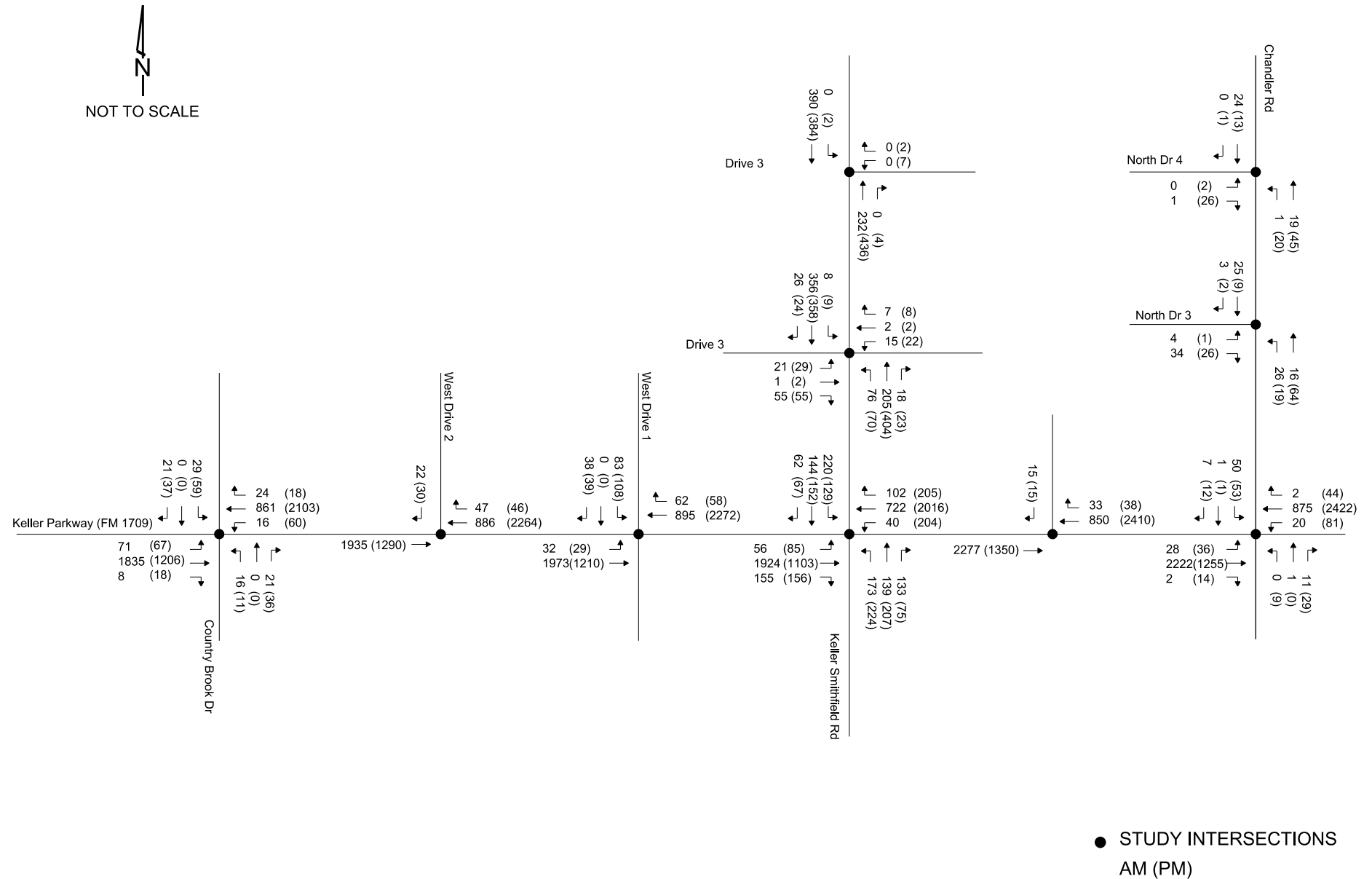
Figure 9

Build-Out Year (2013) Total Traffic Volumes

To obtain the projected total traffic volumes for Build-Out Year (2013), the site generated traffic volumes (Figure 6) were added to the background traffic volumes under Build-Out Year (2013) conditions (Figure 8). The projected total traffic volumes under Build-Out Year (2013) conditions are shown in **Figure 10**.

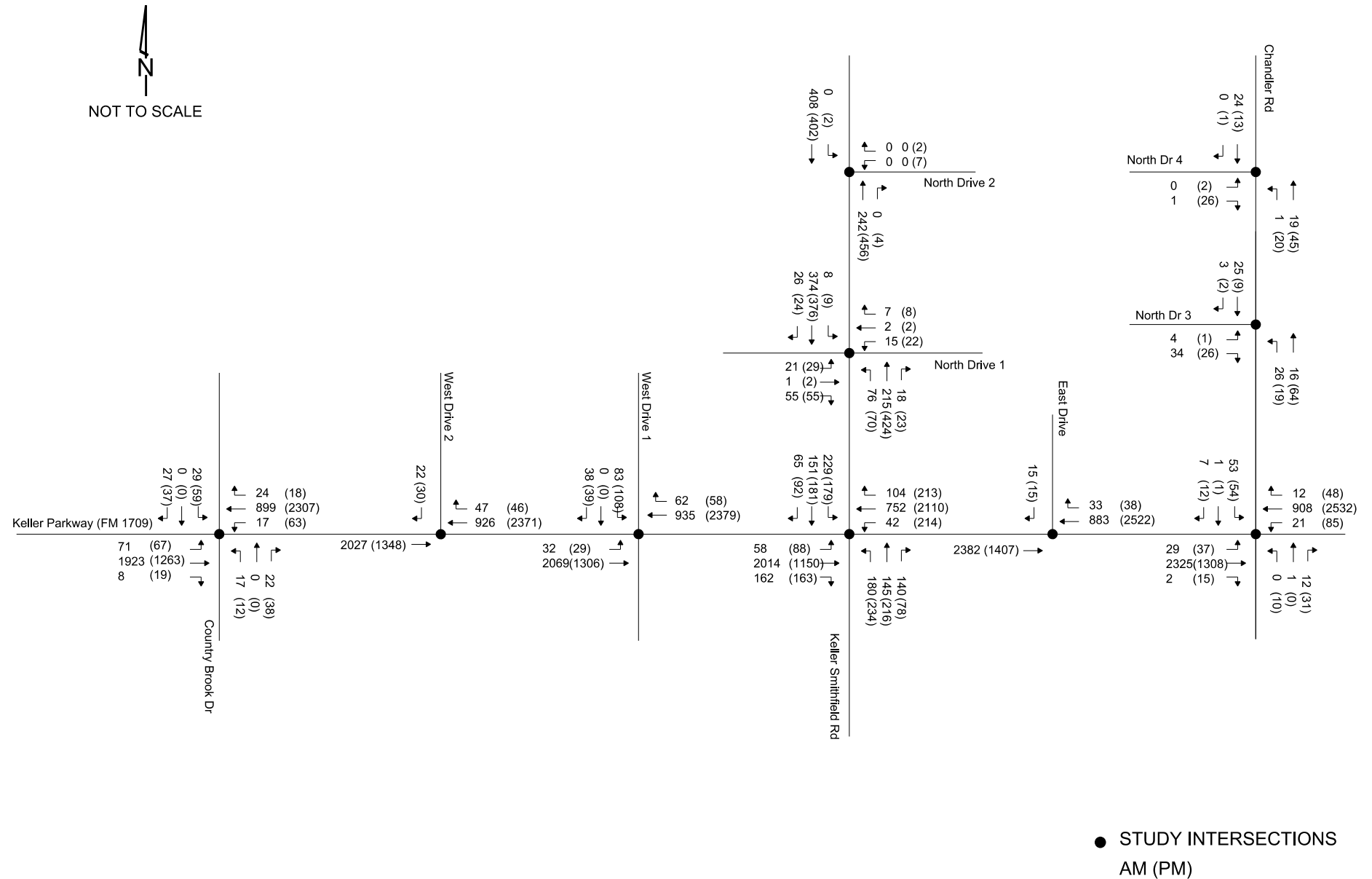
Horizon Year (2018) Total Traffic Volumes

To obtain the projected total traffic volumes under Horizon Year (2018) conditions, the site generated traffic volumes at Build-Out (Figure 6) were added to the background traffic volumes under Horizon Year (2018) conditions (Figure 9). The projected total traffic volumes under Horizon Year (2018) traffic conditions are shown in **Figure 11**.



Build-Out Year (2013) Total Traffic Volumes

Figure 10



Horizon Year (2018) Total Traffic Volumes

Figure 11

TRAFFIC ANALYSES

Intersection Capacity and Level of Service

The Level of Service (LOS) of an intersection is a qualitative measure of capacity and operating conditions and is directly related to vehicle delay. The LOS criteria for a signalized intersection are shown in **Table 5**. LOS is given a letter designation from A to F, with LOS A representing very short delays (less than 10 seconds of average control delay per vehicle) and LOS F representing very long delays (more than 80 seconds of average control delay per vehicle). LOS D, ranging from 35.1 to 55 seconds of average control delay per vehicle, is typically considered the minimum acceptable condition.

For unsignalized intersections, the levels of service, as shown in **Table 6**, are defined by average control delay in seconds per vehicle. For unsignalized analyses, LOS D is also the minimum typically acceptable condition.

Capacity analyses were conducted for the study area intersections under the following analysis scenarios:

- Existing Conditions (2012)
- Build-Out Year (2013) – Background Traffic Conditions
- Build-Out Year (2013) – Total Traffic Conditions
- Horizon Year (2018) – Background Traffic Conditions
- Horizon Year (2018) – Total Traffic Conditions

The intersection capacity analyses were conducted using HCM methodologies in Synchro, a analysis software package. For background traffic conditions, the intersection lane configurations provided in Figure 3 (2012 Proposed Lane Configuration) were used and the intersections were assumed to remain under existing control (stop control or signal control). For total conditions, the intersection lane configurations provided in Figure 4 were used and the intersections were assumed to remain under existing control (stop control or signal control).

Table 5 – Level of Service Criteria for Signalized Intersections

Level-of-Service (LOS)	Average Control Delay (seconds/vehicle)	Description
A	≤ 10.0	Very low vehicle delays, free flow, signal progression extremely favorable, most vehicles arrive during given signal phase.
B	10.1 to 20.0	Good signal progression, more vehicles stop and experience higher delays than for LOS A.
C	20.1 to 35.0	Stable flow, fair signal progression, significant number of vehicles stop at signals.
D	35.1 to 55.0	Congestion noticeable, longer delays and unfavorable signal progression, many vehicles stop at signals.
E	55.1 to 80.0	Limit of acceptable delay, unstable flow, poor signal progression, traffic near roadway capacity, frequent cycle failures.
F	> 80.0	Unacceptable delays, extremely unstable flow and congestion, traffic exceeds roadway capacity, stop-and-go conditions.

SOURCE: *Highway Capacity Manual, HCM 2010*, Transportation Research Board, 2010.

Table 6 – Level of Service Criteria for Unsignalized Intersections

Level-of-Service (LOS)	Average Control Delay (seconds/vehicle)	Description
A	≤ 10.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
B	10.1 to 15.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
C	15.1 to 25.0	Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches.
D	25.1 to 35.0	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No standing long lines formed.
E	35.1 to 50.0	Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 50.0	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown.

SOURCE: *Highway Capacity Manual, HCM 2010*, Transportation Research Board, 2010.

Existing Conditions (2012)

Existing (2012) conditions analyses were performed using the existing lane configurations (Figure 3), existing signal timings, and the existing traffic volumes shown in Figure 7. The results of this analysis are presented in **Table 7**.

Table 7 – Capacity Analysis Results – Existing (2012) Conditions

Keller Parkway (FM 1709) at Keller Smithfield Road (Signalized)					
	Intersection	EB	WB	NB	SB
AM Peak	33.8 (C) ¹	34.2 (C)	20.2 (C)	39.4 (D)	49.4 (D)
PM Peak	47.3 (D)	29.7 (C)	54.1 (D)	39.1 (D)	67.6 (E)
Keller Parkway (FM 1709) at Country Brook Drive (TWSC)					
	Intersection	EB	WB	NB	SB
AM Peak		0.0 (A)	2.5 (A)	261.5 (F)	---
PM Peak		0.0 (A)	1.5 (A)	26.7 (D)	---
Keller Parkway (FM 1709) at Chandler Road (TWSC)					
	Intersection	EB	WB	NB	SB
AM Peak		0.2 (A)	0.5 (A)	20.8 (C)	16.3 (C)
PM Peak		6.7 (A)	0.6 (A)	> 300 (F)	> 300 (F)

¹ Delay in seconds/vehicle (Level of Service)

As shown in Table 7, the intersection of Keller Parkway (FM 1709) and Keller Smithfield Road is operating at LOS D or better in the AM and PM peak hours. The southbound approach is operating at LOS E during the PM peak hour. In addition, during the PM peak hour, the westbound right turn movement is operating at LOS F.

The northbound approach at Keller Parkway (FM 1709) and Country Brook Drive is currently operating at an unacceptable level of service during the AM peak hour due to the high traffic volumes on Keller Parkway (FM 1709).

During the PM peak hour, the northbound and southbound approaches to the intersection of Keller Parkway (FM 1709) and Chandler Road are operating at LOS F. The poor level of service is due to the high traffic volumes on Keller Parkway (FM 1709).

Existing Conditions (2012) – Mitigated

To mitigate the poor levels of service at the study intersections under Existing (2012) traffic conditions, the following improvements are recommended:

- Install a southbound right turn lane at the intersection of Keller Parkway (FM 1709) and Keller Smithfield.
- Install a westbound right turn lane at the intersection of Keller Parkway (FM 1709) and Keller Smithfield.
- Restripe the northbound approach to provide a northbound left turn lane and a through/right shared lane at the intersection of Keller Parkway (FM 1709) and Country Brook Drive.

The results of these analyses with the proposed improvements are presented in **Table 8**.

Table 8 – Capacity Analysis Results – Existing (2012) Conditions (Mitigated)

Keller Parkway (FM 1709) at Keller Smithfield Road (Signalized)					
	Intersection	EB	WB	NB	SB
AM Peak	31.0 (C)	31.8 (C)	19.0 (B)	40.3 (D)	37.8 (D)
PM Peak	33.2 (C)	27.5 (C)	33.5 (C)	35.4 (D)	44.5 (D)
Keller Parkway (FM 1709) at Country Brook Drive (TWSC)					
	Intersection	EB	WB	NB	SB
AM Peak		0.0 (A)	2.5 (A)	158.2 (F)	---
PM Peak		0.0 (A)	1.5 (A)	22.8 (C)	---
Keller Parkway (FM 1709) at Chandler Road (TWSC)					
	Intersection	EB	WB	NB	SB
AM Peak		0.2 (A)	0.5 (A)	20.8 (C)	16.3 (C)
PM Peak		6.7 (A)	0.6 (A)	>300 (F)	> 300 (F)

¹ Delay in seconds/vehicle (Level of Service)

As shown in Table 8, the intersection of Keller Parkway (FM 1709) and Keller Smithfield Road and all approaches are expected to operate at LOS D or better during the AM and PM peak hours with the proposed westbound and southbound right turn lanes in place.

The introduction of a northbound left turn lane on Country Brook Drive at Keller Parkway (FM 1709) is expected to reduce the delay for the northbound approach from 261 seconds to 158 seconds during the AM peak hour.

During the PM peak hour, the northbound and southbound approaches to the intersection of Keller Parkway (FM 1709) and Chandler Road are operating at LOS F due to the high traffic volumes on Keller Parkway (FM 1709).

Build-Out Year (2013) Background Conditions

All improvements proposed to mitigate the poor levels of service under existing traffic conditions were assumed to be in place for the Build-Out Year (2013) Background Conditions analysis. Build-Out Year (2013) background traffic analyses were performed using the Build-Out Year (2013) background traffic volumes (Figure 8) and the proposed lane configurations shown in Figure 3. The results of this analysis are presented in **Table 9**.

Table 9 – Capacity Analysis Results – Build-Out Year (2013) Background Conditions

Keller Parkway (FM 1709) at Keller Smithfield Road (Signalized)					
	Intersection	EB	WB	NB	SB
AM Peak	27.5 (C)	25.4 (C)	19.1 (B)	40.5 (D)	37.9 (D)
PM Peak	33.9 (C)	27.8 (C)	34.7 (C)	35.6 (D)	44.8 (D)
Keller Parkway (FM 1709) at Country Brook Drive (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.0 (A)	2.5 (A)	166.0 (F)	---
PM Peak		0.0 (A)	1.6 (A)	28.3 (D)	---
Keller Parkway (FM 1709) at Chandler Road (Unsignalized)					
AM Peak		0.2 (A)	0.6 (A)	22.1 (C)	17.0 (C)
PM Peak		6.9 (A)	0.6 (A)	>300 (F)	>300 (F)

¹ Delay in seconds/vehicle (Level of Service)

As shown in Table 9, the intersection of Keller Parkway (FM 1709) and Keller Smithfield Road is predicted to continue to operate at an acceptable level of service (LOS D or better) during the AM and PM peak hours with the proposed improvements in place.

The unsignalized intersections along Keller Parkway (FM 1709) at Country Brook Drive and at Chandler Road are predicted to continue to operate in a manner similar to the Existing Conditions (2012) – Mitigated.

Build-Out Year (2013) Total Conditions

Build out year (2013) total traffic conditions analyses were performed using the Build-Out Year (2013) total traffic volumes (Figure 10) and proposed lane configurations (Figure 4). **Table 10** presents the results of the analysis.

As shown in Table 10, the signalized intersection of Keller Parkway (FM 1709) and Keller Smithfield is predicted to operate at an acceptable level of service during the AM and PM peak hours. During the PM peak hour, the westbound approach is predicted to operate a LOS E due to the high volume (2,445 vph) along Keller Parkway. It should be noted that by optimizing the signal timings, without modifying the signal cycle length, the westbound approach is predicted to operate at LOS D or better.

Some of the unsignalized intersections (especially the left turn movements out of the site) along Keller Parkway (FM 1709) are predicted to operate at unacceptable LOS during the AM/PM peak hours due to the high traffic volumes along Keller Parkway (FM 1709). If delays for the left turning traffic exiting the site become unacceptable, motorists have the option to exit the site at North Drive 1 and utilize the traffic signal at Keller Smithfield Road. The site traffic will be stored on private property and is not predicted to impact the adjacent roadways.

Table 10 – Capacity Analysis Results – Build-Out (2013) Total Conditions

Keller Parkway (FM 1709) at Keller Smithfield Road (Signalized)					
	Intersection	EB	WB	NB	SB
AM Peak	37.6 (D)	41.6 (D)	22.3 (C)	43.7 (D)	42.6 (D)
PM Peak	48.4 (D)	32.2 (C)	59.4 (E)	38.3 (D)	47.2 (D)
Keller Parkway (FM 1709) at Country Brook Drive (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.4 (A)	5.4 (A)	269.6 (F)	75.8 (F)
PM Peak		1.1 (A)	5.7 (A)	43.2 (E)	> 300 (F)
Keller Parkway (FM 1709) at Chandler Road (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.6 (A)	0.5 (A)	62.8 (F)	25.9 (D)
PM Peak		1.5 (A)*	0.6 (A)	> 300 (F)	> 300 (F)
Keller Parkway (FM 1709) at West Drive 2 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		0.2 (A)	0.0 (A)	---	32.8 (D)
PM Peak		0.3 (A)	0.0 (A)	---	235.1 (F)
Keller Parkway (FM 1709) at West Drive 1 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		0.0 (A)	0.0 (A)	---	8.1 (A)
PM Peak		0.0 (A)	0.0 (A)	---	10.9 (B)
Keller Parkway (FM 1709) at East Drive (Unsignalized)					
		EB	WB	NB	SB
AM Peak		0.0 (A)	0.0 (A)	---	13.2 (B)
PM Peak		0.0 (A)	0.0 (A)	---	38.4 (E)
Keller Smithfield at North Drive 1 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		11.6 (B)	12.8 (B)	2.3 (A)	0.2 (A)
PM Peak		11.6 (B)	13.8 (B)	1.4 (A)	0.2 (A)
Keller Smithfield at North Drive 2 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		---	0.0 (A)	0.0 (A)	0.0 (A)
PM Peak		---	10.5 (B)	0.0 (A)	0.0 (A)
Chandler Road at North Drive 3 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		8.7 (A)	---	4.5 (A)	0.0 (A)
PM Peak		8.7 (A)	---	3.6 (A)	0.0 (A)
Chandler Road at North Drive 4 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		8.4 (A)	---	0.4 (A)	0.0 (A)
PM Peak		8.5 (A)	---	2.2 (A)	0.0 (A)

¹ Delay in seconds/vehicle (Level of Service)

Horizon Year (2018) Background Conditions

Traffic analysis for horizon year background traffic conditions was performed using the Horizon Year (2018) background traffic volumes (Figure 9) and the proposed lane configurations (Figure 3). The results of this analysis are presented in **Table 11**.

Table 11 – Capacity Analysis Results – Build-Out Year (2018) Background Conditions

Keller Parkway (FM 1709) at Keller Smithfield Road (Signalized)					
	Intersection	EB	WB	NB	SB
AM Peak	35.3 (D)	38.7 (D)	20.1 (C)	41.6 (D)	38.7 (D)
PM Peak	38.6 (D)	29.2 (C)	42.2 (D)	37.1 (D)	45.8 (D)
Keller Parkway (FM 1709) at Country Brook Drive (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.0 (A)	2.2 (A)	216.4 (F)	---
PM Peak		0.0 (A)	1.9 (A)	32.7 (D)	---
Keller Parkway (FM 1709) at Chandler Road (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.2 (A)	0.6 (A)	28.1 (D)	20.5 (C)
PM Peak		11.2 (B)	0.6 (A)	> 300 (F)	> 300 (F)

¹ Delay in seconds/vehicle (Level of Service)

As shown in Table 11, the intersection of Keller Parkway (FM 1709) and Keller Smithfield Road is predicted to continue to operate at an acceptable level of service (LOS D or better) during the AM and PM peak hours with the proposed improvements in place.

The unsignalized intersections along Keller Parkway (FM 1709) at Country Brook Drive and at Chandler Road are predicted to continue to operate in a manner similar to the Existing Conditions (2012) – Mitigated.

Horizon Year (2018) Total Conditions

The horizon year total traffic conditions analysis was performed using the Horizon Year (2018) Total traffic volumes (Figure 11) and proposed lane configurations (Figure 4). **Table 12** presents the results of the analysis.

As shown in Table 12, the signalized intersections on Keller Parkway (FM 1709) and Keller Smithfield is predicted to operate at an acceptable level of service during the AM and PM peak hours. It should be noted that this traffic analysis presents a very conservative scenario. While there has not been any increase in traffic volumes in the last five years (2006 to 2010) along Keller Parkway (FM 1709), this analysis assumes an annual growth rate of one percent (1%). In addition, the analysis does not account for pass-by trips.

Under the Horizon Year (2018) total conditions, some of the unsignalized intersections along Keller Parkway (FM 1709) are predicted to continue to operate at unacceptable LOS due to the high traffic volumes along Keller Parkway (FM 1709). As stated earlier in the report, if delays for left turning traffic exiting the site become unacceptable, motorists have the option to exit the site at North Drive 1 and utilize the signal at Keller Smithfield Road.

Table 12 – Capacity Analysis Results – Build-Out (2018) Total Conditions

Keller Parkway (FM 1709) at Keller Smithfield Road (Signalized)					
	Intersection	EB	WB	NB	SB
AM Peak	42.9 (D)	50.8 (D)	23.0 (C)	44.7 (D)	45.0 (D)
PM Peak	52.9 (D)	33.1 (C)	65.2 (E)	44.0 (D)	53.6 (D)
Keller Parkway (FM 1709) at Country Brook Drive (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.4 (A)	7.7 (A)	> 300 (F)	118.0 (F)
PM Peak		1.0 (A)	7.6 (A)	51.0 (F)	> 300 (F)
Keller Parkway (FM 1709) at Chandler Road (Unsignalized)					
	Intersection	EB	WB	NB	SB
AM Peak		0.6 (A)	0.5 (A)	108.7 (F)	42.1 (E)
PM Peak		1.9 (A)*	0.6 (A)	>300 (F)	>300 (F)
Keller Parkway (FM 1709) at West Drive 2 (Unsignalized)					
		EBL	WB	NB	SB
AM Peak		0.1 (A)	0.0 (A)	---	40.4 (E)
PM Peak		0.2 (A)	0.0 (A)	---	>300 (F)
Keller Parkway (FM 1709) at West Drive 1 (Unsignalized)					
		EBL	WB	NB	SB
AM Peak		0.0 (A)	0.0 (A)	---	8.1 (A)
PM Peak		0.0 (A)	0.0 (A)	---	11.2 (B)
Keller Parkway (FM 1709) at East Drive (Unsignalized)					
		EBL	WB	NB	SB
AM Peak		0.0 (A)	0.0 (A)	---	13.4 (B)
PM Peak		0.0 (A)	0.0 (A)	---	42.2 (E)
Keller Smithfield at North Drive 1 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		11.6 (B)	12.6 (B)	2.2 (A)	0.1 (A)
PM Peak		12.0 (B)	14.4 (B)	1.4 (A)	0.2 (A)
Keller Smithfield at North Drive 2 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		---	0.0 (A)	0.0 (A)	0.0 (A)
PM Peak		---	10.4 (B)	0.0 (A)	0.0 (A)
Chandler Road at North Drive 3 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		8.7 (A)	---	4.5 (A)	0.0 (A)
PM Peak		8.07 (A)	---	1.6 (A)	0.0 (A)
Chandler Road at North Drive 4 (Unsignalized)					
		EB	WB	NB	SB
AM Peak		8.5 (A)	---	0.4 (A)	0.0 (A)
PM Peak		8.6 (A)	---	2.2 9A)	0.0 (A)

¹ Delay in seconds/vehicle (Level of Service)

*Synchro 8 – Synchro analysis, not HCM

SIGHT DISTANCE

As part of this traffic analysis, the amount of available intersection sight distance was evaluated at each proposed access point along Keller Parkway (FM 1709) and Keller Smithfield Road. The sight distance required at these locations were estimated using procedures developed by the American Association of State Highway and Transportation Officials (AASHTO) and published in the 2004 edition of *A Policy on Geometric Design of Highways and Streets*. At these locations, motorists should be able to see if and when adequate gaps exist to perform their desired maneuver.

AASHTO specifies that the required sight distance generally be calculated using the design speed of the major roadway. In the absence of information relating to design speed of the roadway, AASHTO recommends the use of the 85th percentile operating speed for that roadway. However, a speed study was not conducted as part of this work effort. Since the posted speed limit is typically based on the 85th percentile speed of the roadway, the required sight distances were calculated using the posted speed limit on the subject roadway. These critical distances are shown in **Table 13**. Field investigation results of the available sight distance at the proposed driveways were compared to the required sight distance values. The sight distance was measured in the field at the proposed access location at a distance approximately 15 feet behind the edge of the travel way on Keller Parkway (FM 1709) and Keller Smithfield Road, which is the assumed location of the driver's eye.

Table 13 – Sight Distance Requirements

Major Roadway	Keller Parkway (FM 1709)				Keller Smithfield		
Posted Speed Limit	45 mph				30 mph		
Minor Roadway	Country Brook	West 1	West 2	East	North 1		North 2
Approach	SB	SB	SB	SB	EB	WB	WB
Required Intersection Sight Distance	565'	565'	565'	565'	355'	355'	355'
Available Sight Distance to the Left	>1000'	>1000'	>1000'	740'	75'	790'	950'
Available Sight Distance to the Right	>1000'	>1000'	>1000'	NA	750'	570'	950'
Sight Distance Available > Required							
To the Left	YES	YES	YES	YES	NO	YES	YES
To the Right	YES	YES	YES	YES	YES	YES	YES

Sight distance observations in the field indicated that the available sight distance along Keller Parkway (FM 1709) exceed the minimum requirements. Sight Distance along Keller Smithfield Road exceeds minimum requirements for the westbound approaches for both North Drive 1 and North Drive 2; however, sight distance for the eastbound approach for North Drive 1 is restricted due to utility box, trees, screening wall, and roadway curvature (**Figure 12**). Final driveway locations may need to be adjusted for this driveway to provide adequate visibility.

Figure 12 – Sight Restriction from North Drive 1



ACCESS MANAGEMENT ANALYSES

As part of this study, access management analyses were performed to assess the need for deceleration lanes and to determine if adequate driveway spacing is provided for the site driveways.

Right Turn Deceleration Lane Analysis

Each site access point at the Keller Marketplace was analyzed to determine the need for a right turn deceleration lane. Guidelines provided in TxDOT's *Access Management Manual* indicate that a right turn deceleration lane is usually considered on a roadway with a posted speed limit of greater than 45 mph when peak hour right turn volumes are greater than 50 vehicles per hour. For roadways with a posted speed limit of less than or equal to 45 mph, the threshold is 60 vehicles per hour. **Table 14** summarizes the predicted right turn volumes under Build-Out Year (2018) total traffic conditions.

Table 14 – Right Turn Deceleration Lane Analysis Results

Intersection	Approach	Speed Limit (mph)	Volume (vph)	Threshold (vph)	Exceed Threshold
Keller Parkway (FM 1709) and Country Brook Drive	WB	45	24 (18)	50	No
Keller Parkway (FM 1709) and West Drive 1	WB	45	47 (46)	50	No
Keller Parkway (FM 1709) and West Drive 2	WB	45	62 (58)	50	Yes
Keller Parkway (FM 1709) and East Drive	WB	45	33 (38)	50	No
Keller Smithfield Road and North Drive 1	NB	30	18 (23)	60	No
Keller Smithfield Road and North Drive 1	SB	30	26 (24)	60	No
Keller Smithfield Road and North Drive 2	NB	30	0 (4)	60	No

Based on the projected site traffic volumes, TxDOT's volume threshold for consideration of a right turn deceleration lane is met for the westbound approach on Keller Parkway (FM 1709) at West Drive 1. Based on the proposed site plan, existing median openings, TxDOT's *Roadway Design Manual* (Table 3-3A), and a 45 mph speed limit, a minimum storage length of 30 feet and a minimum deceleration length of 275 feet (15 mph speed differential) should be provided for the westbound right turn lane along Keller Parkway (FM 1709).

The right turn volumes for Keller Parkway (FM 1709) at Country Brook Drive, West Drive 2 and East Drive do not exceed TxDOT's threshold. Based on this analysis, westbound right turn deceleration lanes are not recommended at these driveways. However, the westbound right turn volume at West Drive 2 is within three (3) vehicles of TxDOT's threshold. The proposed land

Keller Marketplace

September 2012

use adjacent to this driveway, Medical, creates a very low traffic volume. If the land uses for Lots 1, 2, 3, or 4 of the proposed development changes, Country Brook Drive and West Drive 2 should be reanalyzed with the new land use(s).

Left Turn Deceleration Lane Analysis

As part of the proposed development, an eastbound left turn deceleration lane is planned at the existing median opening on Keller Parkway (FM 1709) at Country Brook Drive and at the proposed median opening at West Drive 1. TxDOT's *Roadway Design Manual* (Table 3-3A) shows that, for a speed of 45 mph, a minimum deceleration length of 215 feet (20 mph speed differential) should be provided for a left turn lane, in addition to 100 feet of storage. The proposed eastbound left turn deceleration lane length (Total 315 feet) at the intersection of Keller Parkway (FM 1709) and Country Brook Drive will maintain the existing westbound left turn storage and deceleration that serves the intersection of Keller Parkway (FM 1709) and Prewitt Street.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this traffic study for the proposed Keller Marketplace in Keller, Texas, the following conclusions and recommendations are made:

- The Keller Marketplace development is predicted to generate approximately 9,684 trips on a daily basis at build-out in 2013 – 769 trips during the AM peak hour and 901 trips during the PM peak hour.

Existing (2012) Conditions

- The intersection of Keller Parkway (FM 1709) and Keller Smithfield Road is operating at LOS D or better in the AM and PM peak hours. The southbound approach is operating at LOS E under both scenarios and the westbound right turn movement is operating at LOS F during the PM peak hour. The introduction of a westbound and southbound right turn lane at the intersections allows all approaches to the intersection to operate at acceptable levels of service.
- The northbound and southbound approaches at the intersections of Keller Parkway (FM 1709) with Country Brook Drive and with Chandler Road currently operate at unacceptable level of service during the AM (Country Brook Drive) and PM (Chandler Road) peak hours due to the high traffic volumes on Keller Parkway (FM 1709).

Build-Out (2013) Background Conditions

- The intersection of Keller Parkway (FM 1709) and Keller Smithfield Road is predicted to continue to operate at an acceptable level of service (LOS D or better) during the AM and PM peak hours with the proposed westbound and southbound right turn lanes.
- The unsignalized intersections along Keller Parkway (FM 1709) at Country Brook Drive and at Chandler Road are predicted to continue to operate in a manner similar to the Existing Conditions (2012) – Mitigated.

Build-Out (2013) Total Conditions

- The intersection of Keller Parkway (FM 1709) and Keller Smithfield is predicted to operate at an acceptable level of service during the AM and PM peak hours with the modification of existing signal timing.
- The southbound left turn movements at each proposed site driveway along Keller Parkway (FM 1709) are predicted to operate at unacceptable levels of service due to the high traffic volumes along Keller Parkway (FM 1709). If delays for the left turning traffic exiting the site become unacceptable, motorists have the option to exit the site at North Drive 1 and utilize the traffic signal at Keller Smithfield Road. The site traffic will be stored on private property and is not predicted to impact the adjacent roadways.

Horizon Year (2018) Background Conditions

- The intersection of Keller Parkway (FM 1709) and Keller Smithfield Road is predicted to continue to operate at an acceptable level of service (LOS D or better) during the AM and PM peak hours with the proposed improvements in place.
- The unsignalized intersections along Keller Parkway (FM 1709) at Country Brook Drive and at Chandler Road are predicted to continue to operate in a manner similar to the Existing Conditions (2012) – Mitigated.

Horizon Year (2018) Total Conditions

- The signalized intersection of Keller Parkway (FM 1709) and Keller Smithfield is predicted to operate at an acceptable level of service during the AM and PM peak hours with modifications to existing signal timings.
- The southbound left turn movements at each proposed site driveway along Keller Parkway (FM 1709) are predicted to operate at unacceptable levels of service due to the high traffic volumes along Keller Parkway (FM 1709). As stated earlier, motorists have the option to exit the site at North Drive 1 and utilize the traffic signal at Keller Smithfield Road. The site traffic will be stored on private property and is not predicted to impact the adjacent roadways.

Access Management

- Sight distance observations in the field indicate that the available sight distance at site driveways along Keller Parkway (FM 1709), Keller Smithfield at North Drive 2, and the westbound approach to Keller Smithfield Drive and North Drive 1 exceed the minimum requirements.
- Based on the field observations, sight distance for the eastbound approach at North Drive 1 has restricted visibility to the left due to a large utility box, existing mature trees, a six foot (6') brick screening wall, and the existing roadway curvature.
- A westbound right turn deceleration lane is recommended on Keller Parkway (FM 1709) at West Drive 1. Based on the proposed site plan, existing median openings, TxDOT's *Roadway Design Manual* (Table 3-3A), and a 45 mph speed limit, a minimum storage length of 30 feet and a minimum deceleration length of 275 feet (15 mph speed differential) should be provided for the westbound right turn lanes along Keller Parkway (FM 1709).
- The right turn volumes for Keller Parkway (FM 1709) at Country Brook Drive, West Drive 2 and East Drive do not exceed TxDOT's threshold. Based on this analysis, westbound right turn deceleration lanes are not recommended at these driveways. However, the westbound right turn volume at West Drive 2 is within three (3) vehicles of TxDOT's threshold. The proposed land use adjacent to this driveway, Medical, creates a very low traffic volume. If the land uses for Lots 1, 2, 3, or 4 of the proposed development changes, Country Brook Drive and West Drive 2 should be reanalyzed with the new land use(s).
- Eastbound left turn deceleration lanes will be installed on Keller Parkway (FM 1709) at Country Brook Drive and at West Drive 1. Based on the proposed site plan (Figure 1), existing median openings, TxDOT's *Roadway Design Manual* (Table 3-3A), and a 45 mph speed limit, a minimum storage length of 100 feet and a minimum deceleration length of 215 feet (20 mph speed differential) should be provided for left turn lanes.

APPENDIX

Raw Traffic Volumes

GRAM Traffic North Texas, Inc.

1120 W. Lovers Lane
Arlington, Texas 76013

File Name : FM 1709 @ KELLER-SMITHFIELD
Site Code : 00000031
Start Date : 8/2/2012
Page No : 1

Groups Printed- Cars

	KELLER-SMITHFIELD Southbound					FM 1709 Westbound					KELLER-SMITHFIELD Northbound					FM 1709 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Int. Total
07:00	42	27	12	0	81	9	83	4	0	96	12	12	22	0	46	4	433	18	0	455	678
07:15	40	27	6	0	73	9	109	9	0	127	31	21	31	0	83	6	446	30	0	482	765
07:30	59	43	6	0	108	7	143	11	0	161	49	41	28	0	118	4	479	26	1	510	897
07:45	43	32	14	0	89	8	181	12	1	202	47	33	32	0	112	11	449	49	3	512	915
Total	184	129	38	0	351	33	516	36	1	586	139	107	113	0	359	25	1807	123	4	1959	3255
08:00	44	28	16	0	88	11	113	7	0	131	32	29	37	0	98	6	421	32	2	461	778
08:15	30	23	11	0	64	10	158	11	1	180	24	16	31	0	71	18	449	33	4	504	819
08:30	42	30	16	0	88	8	146	13	0	167	29	19	47	0	95	17	358	13	1	389	739
08:45	45	23	13	0	81	13	205	13	2	233	49	25	35	0	109	16	372	26	2	416	839
Total	161	104	56	0	321	42	622	44	3	711	134	89	150	0	373	57	1600	104	9	1770	3175
16:00	26	18	14	0	58	43	350	21	0	414	54	20	11	0	85	14	211	37	2	264	821
16:15	24	16	10	0	50	42	418	28	0	488	46	27	20	0	93	28	257	39	4	328	959
16:30	39	45	16	0	100	40	419	27	1	487	39	45	25	0	109	13	238	26	3	280	976
16:45	31	33	8	0	72	59	473	39	0	571	53	37	20	0	110	22	277	30	4	333	1086
Total	120	112	48	0	280	184	1660	115	1	1960	192	129	76	0	397	77	983	132	13	1205	3842
17:00	26	37	15	0	78	42	432	35	1	510	51	26	18	0	95	18	234	30	1	283	966
17:15	43	35	18	0	96	55	470	35	0	560	38	53	17	0	108	12	273	31	2	318	1082
17:30	30	40	20	0	90	49	445	36	0	530	55	60	16	1	132	19	193	42	0	254	1006
17:45	29	38	13	0	80	51	534	41	0	626	61	45	18	0	124	12	236	31	3	282	1112
Total	128	150	66	0	344	197	1881	147	1	2226	205	184	69	1	459	61	936	134	6	1137	4166
Grand Total	593	495	208	0	1296	456	4679	342	6	5483	670	509	408	1	1588	220	5326	493	32	6071	14438
Apprch %	45.8	38.2	16	0		8.3	85.3	6.2	0.1		42.2	32.1	25.7	0.1		3.6	87.7	8.1	0.5		
Total %	4.1	3.4	1.4	0	9	3.2	32.4	2.4	0	38	4.6	3.5	2.8	0	11	1.5	36.9	3.4	0.2	42	

	KELLER-SMITHFIELD Southbound					FM 1709 Westbound					KELLER-SMITHFIELD Northbound					FM 1709 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Int. Total

Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:30

07:30	59	43	6	0	108	7	143	11	0	161	49	41	28	0	118	4	479	26	1	510	897
07:45	43	32	14	0	89	8	181	12	1	202	47	33	32	0	112	11	449	49	3	512	915
08:00	44	28	16	0	88	11	113	7	0	131	32	29	37	0	98	6	421	32	2	461	778
08:15	30	23	11	0	64	10	158	11	1	180	24	16	31	0	71	18	449	33	4	504	819
Total Volume	176	126	47	0	349	36	595	41	2	674	152	119	128	0	399	39	1798	140	10	1987	3409
% App. Total	50.4	36.1	13.5	0		5.3	88.3	6.1	0.3		38.1	29.8	32.1	0		2	90.5	7	0.5		
PHF	.746	.733	.734	.000	.808	.818	.822	.854	.500	.834	.776	.726	.865	.000	.845	.542	.938	.714	.625	.970	.931

Staff Attachment

Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 17:00

17:00	26	37	15	0	78	42	432	35	1	510	51	26	18	0	95	18	234	30	1	283	966
17:15	43	35	18	0	96	55	470	35	0	560	38	53	17	0	108	12	273	31	2	318	1082
17:30	30	40	20	0	90	49	445	36	0	530	55	60	16	1	132	19	193	42	0	254	1006
17:45	29	38	13	0	80	51	534	41	0	626	61	45	18	0	124	12	236	31	3	282	1112
Total Volume	128	150	66	0	344	197	188	147	1	2226	205	184	69	1	459	61	936	134	6	1137	4166
% App. Total	37.	43.	19.	0		8.8	84.	6.6	0		44.	40.	15	0.2		5.4	82.	11.	0.5		
	2	6	2	0			5				7	1					3	8			
PHF	.74	.93	.82	.00	.896	.89	.88	.89	.25	.889	.84	.76	.95	.25	.869	.80	.85	.79	.50	.894	.937
	4	8	5	0		5	1	6	0		0	7	8	0		3	7	8	0		

GRAM Traffic North Texas, Inc.

1120 W. Lovers Lane
Arlington, Texas 76013

File Name : FM 1709 @ COUNTRY BROOK

Site Code : 00000031

Start Date : 8/2/2012

Page No : 1

Groups Printed- Cars

	COUNTRY BROOK Southbound					FM 1709 Westbound					COUNTRY BROOK Northbound					FM 1709 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Int. Total
07:00	0	0	0	0	0	3	107	0	0	110	4	0	3	0	7	0	404	1	0	405	522
07:15	0	0	0	0	0	0	138	0	0	138	3	0	8	0	11	0	505	3	0	508	657
07:30	0	0	0	0	0	2	205	0	0	207	7	0	4	0	11	0	403	2	0	405	623
07:45	0	0	0	0	0	5	239	0	0	244	4	0	6	0	10	0	488	1	0	489	743
Total	0	0	0	0	0	10	689	0	0	699	18	0	21	0	39	0	1800	7	0	1807	2545
08:00	0	0	0	0	0	9	189	0	0	198	2	0	3	0	5	0	363	2	0	365	568
08:15	0	0	0	0	0	2	184	0	1	187	4	0	4	0	8	0	406	3	0	409	604
08:30	0	0	0	0	0	2	205	0	1	208	0	0	12	0	12	0	391	3	0	394	614
08:45	0	0	0	0	0	4	224	0	0	228	1	0	6	0	7	0	398	3	0	401	636
Total	0	0	0	0	0	17	802	0	2	821	7	0	25	0	32	0	1558	11	0	1569	2422
16:00	0	0	0	0	0	8	417	0	4	429	5	0	11	0	16	0	270	2	0	272	717
16:15	0	0	0	0	0	9	468	0	1	478	2	0	6	0	8	0	313	5	0	318	804
16:30	0	0	0	0	0	4	480	0	1	485	2	0	6	0	8	0	277	1	0	278	771
16:45	0	0	0	0	0	7	516	0	2	525	4	0	11	0	15	0	297	2	0	299	839
Total	0	0	0	0	0	28	1881	0	8	1917	13	0	34	0	47	0	1157	10	0	1167	3131
17:00	0	0	0	0	0	9	466	0	1	476	4	0	6	0	10	0	280	3	0	283	769
17:15	0	0	0	0	0	14	521	0	4	539	2	0	8	0	10	0	310	5	0	315	864
17:30	0	0	0	0	0	18	501	0	6	525	3	0	12	0	15	0	250	4	0	254	794
17:45	0	0	0	0	0	18	591	0	6	615	2	0	10	0	12	0	291	6	0	297	924
Total	0	0	0	0	0	59	2079	0	17	2155	11	0	36	0	47	0	1131	18	0	1149	3351
Grand Total	0	0	0	0	0	114	5451	0	27	5592	49	0	116	0	165	0	5646	46	0	5692	11449
Apprch %	0	0	0	0		2	97.5	0	0.5		29.7	0	70.3	0		0	99.2	0.8	0		
Total %	0	0	0	0	0	1	47.6	0	0.2	48.8	0.4	0	1	0	1.4	0	49.3	0.4	0	49.7	

	COUNTRY BROOK Southbound					FM 1709 Westbound					COUNTRY BROOK Northbound					FM 1709 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Int. Total

Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:15

07:15	0	0	0	0	0	0	138	0	0	138	3	0	8	0	11	0	505	3	0	508	657
07:30	0	0	0	0	0	2	205	0	0	207	7	0	4	0	11	0	403	2	0	405	623
07:45	0	0	0	0	0	5	239	0	0	244	4	0	6	0	10	0	488	1	0	489	743
08:00	0	0	0	0	0	9	189	0	0	198	2	0	3	0	5	0	363	2	0	365	568
Total Volume	0	0	0	0	0	16	771	0	0	787	16	0	21	0	37	0	1759	8	0	1767	2591
% App. Total	0	0	0	0		2	98	0	0		43.2	0	56.8	0		0	99.5	0.5	0		
PHF	.000	.000	.000	.000	.000	.444	.806	.000	.000	.806	.571	.000	.656	.000	.841	.000	.871	.667	.000	.870	.872

Staff Attachment

Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 17:00

17:00	0	0	0	0	0	9	466	0	1	476	4	0	6	0	10	0	280	3	0	283	769
17:15	0	0	0	0	0	14	521	0	4	539	2	0	8	0	10	0	310	5	0	315	864
17:30	0	0	0	0	0	18	501	0	6	525	3	0	12	0	15	0	250	4	0	254	794
17:45	0	0	0	0	0	18	591	0	6	615	2	0	10	0	12	0	291	6	0	297	924
Total Volume	0	0	0	0	0	59	2079	0	17	2155	11	0	36	0	47	0	1131	18	0	1149	3351
% App. Total	0	0	0	0		2.7	96.5	0	0.8		23.4	0	76.6	0		0	98.4	1.6	0		
PHF	.000	.000	.000	.000	.000	.819	.879	.000	.708	.876	.688	.000	.750	.000	.783	.000	.912	.750	.000	.912	.907

GRAM Traffic North Texas, Inc.

1120 W. Lovers Lane
Arlington, Texas 76013

File Name : FM 1709 @ CHANDLER
Site Code : 00000031
Start Date : 8/2/2012
Page No : 1

Groups Printed- Cars

	CHANDLER Southbound					FM 1709 Westbound					CHANDLER Northbound					FM 1709 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Int. Total
07:00	4	3	1	0	8	1	116	0	0	117	0	0	2	0	2	6	520	0	0	526	653
07:15	3	0	1	0	4	5	115	2	0	122	0	0	3	0	3	1	468	0	0	469	598
07:30	5	0	0	0	5	6	170	0	0	176	0	0	2	0	2	3	608	1	0	612	795
07:45	4	0	2	0	6	8	194	1	1	204	0	0	1	0	1	3	491	0	0	494	705
Total	16	3	4	0	23	20	595	3	1	619	0	0	8	0	8	13	2087	1	0	2101	2751
08:00	3	0	1	0	4	2	136	1	0	139	0	0	3	0	3	2	507	0	1	510	656
08:15	3	1	2	0	6	4	166	1	1	172	0	1	5	0	6	1	460	1	0	462	646
08:30	3	0	3	0	6	4	167	1	0	172	0	0	5	0	5	1	485	1	0	487	670
08:45	2	0	0	0	2	8	217	0	0	225	0	0	1	0	1	4	406	4	0	414	642
Total	11	1	6	0	18	18	686	3	1	708	0	1	14	0	15	8	1858	6	1	1873	2614
16:00	0	1	1	0	2	15	419	5	1	440	3	1	11	0	15	2	271	6	0	279	736
16:15	0	0	2	0	2	29	469	6	0	504	3	0	11	0	14	2	255	3	1	261	781
16:30	0	0	0	0	0	16	491	5	1	513	3	0	7	0	10	2	306	4	0	312	835
16:45	3	0	1	0	4	18	551	7	1	577	3	0	9	0	12	2	273	6	0	281	874
Total	3	1	4	0	8	78	1930	23	3	2034	12	1	38	0	51	8	1105	19	1	1133	3226
17:00	4	0	0	0	4	18	500	5	0	523	1	0	4	0	5	3	296	2	0	301	833
17:15	0	1	4	0	5	18	548	7	1	574	2	0	9	0	11	3	276	5	0	284	874
17:30	1	0	0	0	1	25	537	9	2	573	3	0	8	0	11	2	270	2	0	274	859
17:45	0	0	2	0	2	19	619	6	0	644	3	0	8	0	11	5	219	5	0	229	886
Total	5	1	6	0	12	80	2204	27	3	2314	9	0	29	0	38	13	1061	14	0	1088	3452
Grand Total	35	6	20	0	61	196	5415	56	8	5675	21	2	89	0	112	42	6111	40	2	6195	12043
Apprch %	57.4	9.8	32.8	0		3.5	95.4	1	0.1		18.8	1.8	79.5	0		0.7	98.6	0.6	0		
Total %	0.3	0	0.2	0	0.5	1.6	45	0.5	0.1	47.1	0.2	0	0.7	0	0.9	0.3	50.7	0.3	0	51.4	

	CHANDLER Southbound					FM 1709 Westbound					CHANDLER Northbound					FM 1709 Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Uturn	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 11:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	5	0	0	0	5	6	170	0	0	176	0	0	2	0	2	3	608	1	0	612	795
07:45	4	0	2	0	6	8	194	1	1	204	0	0	1	0	1	3	491	0	0	494	705
08:00	3	0	1	0	4	2	136	1	0	139	0	0	3	0	3	2	507	0	1	510	656
08:15	3	1	2	0	6	4	166	1	1	172	0	1	5	0	6	1	460	1	0	462	646
Total Volume	15	1	5	0	21	20	666	3	2	691	0	1	11	0	12	9	2066	2	1	2078	2802
% App. Total	71.4	4.8	23.8	0		2.9	96.4	0.4	0.3		0	8.3	91.7	0		0.4	99.4	0.1	0		
PHF	.750	.250	.625	.000	.875	.625	.858	.750	.500	.847	.000	.250	.550	.000	.500	.750	.850	.500	.250	.849	.881

Staff Attachment

Peak Hour Analysis From 12:00 to 17:45 - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 17:00

17:00	4	0	0	0	4	18	500	5	0	523	1	0	4	0	5	3	296	2	0	301	833
17:15	0	1	4	0	5	18	548	7	1	574	2	0	9	0	11	3	276	5	0	284	874
17:30	1	0	0	0	1	25	537	9	2	573	3	0	8	0	11	2	270	2	0	274	859
17:45	0	0	2	0	2	19	619	6	0	644	3	0	8	0	11	5	219	5	0	229	886
Total Volume	5	1	6	0	12	80	220	27	3	2314	9	0	29	0	38	13	106	14	0	1088	3452
% App. Total	41. 7	8.3	50	0		3.5	95. 2	1.2	0.1		23. 7	0	76. 3	0		1.2	97. 5	1.3	0		
PHF	.31 3	.25 0	.37 5	.00 0	.600	.80 0	.89 0	.75 0	.37 5	.898	.75 0	.00 0	.80 6	.00 0	.864	.65 0	.89 6	.70 0	.00 0	.904	.974