



ARIZONA
TEXAS
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November 10, 2014

Matt Mildren
Provident Realty Advisors, Inc.
10210 N. Central Expressway, Suite 300
Dallas, Texas 75231

Re: *Traffic Study for Eastern Hills Village in Garland, Texas*

Dear Mr. Mildren:

Lee Engineering has completed a traffic analysis for the proposed Eastern Hills Village residential development located at the existing site of the closed Eastern Hills Country Club on the east side of S Country Club Road in Garland, Texas. **Figure 1** provides an aerial view of the existing property.

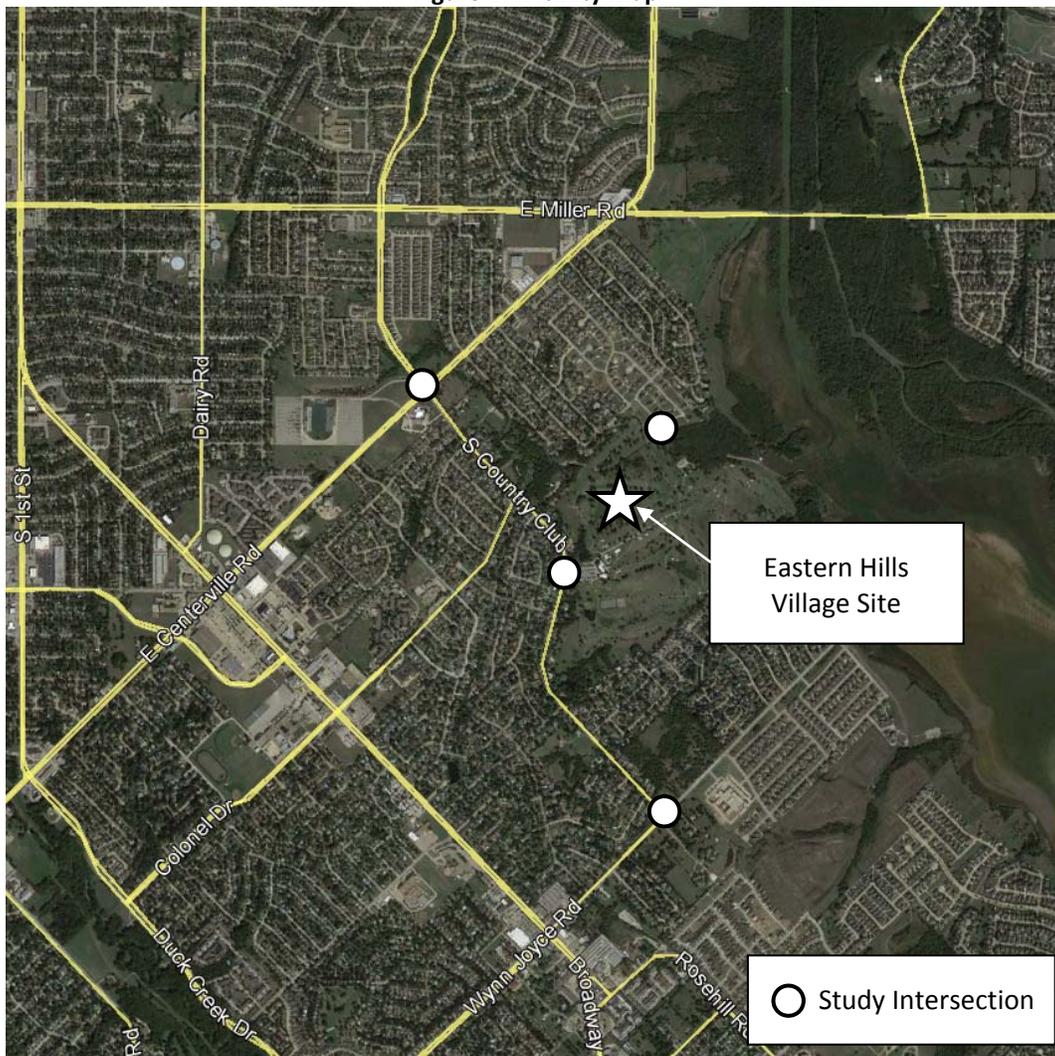
Background Information

Based on discussion with Provident Realty Advisors, Inc., the proposed development would include approximately 550 to 600 single family homes. An initial concept plan for the development is shown in **Figure 2**. For analysis purposes, it was assumed that the Eastern Hills Village development would include 600 single family homes. Access to the development will be provided on S Country Club Road at the location of the existing country club driveway. An additional access point will be provided on Bishop's Bridge Lane, as shown in Figure 2.

S Country Club Road is a two-lane undivided roadway with a posted speed limit of 30 miles per hour (mph) south of E Centerville Road. North of E Centerville Road, S Country Club Road is a four-lane divided roadway with a posted speed limit of 40 mph. S Country Club Road is classified as a Type G roadway in the City of Garland *Major Thoroughfare Plan*. E Centerville Road is a six-lane divided roadway with a posted speed limit of 40 mph, and is classified as a Type B roadway in the City of Garland *Major Thoroughfare Plan*. Wynn Joyce Road is a three lane roadway with a two-way center left-turn lane and a posted speed limit of 35 mph. Wynn Joyce Road is classified as a Type F roadway in the City of Garland *Major Thoroughfare Plan*.

The existing intersection of S Country Club Road and E Centerville Road is signalized. The existing intersection of S Country Club Road and Wynn Joyce Road is a roundabout with one lane on all approaches. The existing intersection lane configurations are shown in **Figure 3**, along with the lane configurations for the proposed driveway on Bishop's Bridge Lane.

Figure 1: Vicinity Map



Existing AM and PM peak hour traffic volumes were collected at the following intersections on Tuesday, October 28, 2014:

- S Country Club Road and E Centerville Road; and
- S Country Club Road and Wynn Joyce Road.

Existing 24-hour directional volumes were also collected on Tuesday, October 28, 2014, and Wednesday, October 29, 2014, at the following locations:

- S Country Club Road south of Colonel Drive; and
- S Country Club Road south of Marilee Drive.

As part of another study, traffic counts had previously been collected at the intersection of S Country Club Road and E Centerville Road on Monday, March 24, 2014. Vehicular volumes were significantly higher for the southbound left turn and the westbound thru movements during the PM peak hour for turning movement counts collected on October 28, 2014. Because of the discrepancy observed between March 24 and October 28 counts, we manually counted traffic volumes for the southbound

left turn and westbound through movements during a field visit on November 5, 2014. Between 5:00 PM and 5:30 PM, we counted 403 westbound thru vehicles and 9 southbound left turn vehicles.

The higher volumes collected on October 29 likely occurred due to the football game taking place at Homer B Johnson Stadium located northeast of the intersection of S Country Club Road and E Centerville Road. Therefore, the southbound left turn volume and the westbound thru volume collected during the PM peak hour in March were used for this study.

Existing peak hour and daily traffic volumes are shown in **Figure 4**. Raw count data is included as an attachment.

Historical daily traffic volumes were gathered from available TxDOT District traffic count maps and were used in estimating the annual growth percentage necessary to grow the existing traffic volumes to the assumed Build-Out year (2021). These volumes are presented in **Table 1**.

Table 1: Historical Daily Traffic Volumes

Year	SH 78 South of SH 66	SH 78 North of SH 66	SH 66 East of SH 78	SH 66 West of SH 78
2008	22,000	22,000	21,000	32,000
2009	22,000	25,000	22,000	33,000
2010	20,000	24,000	19,700	31,000
2011	23,000	27,000	21,000	34,000
2012	22,000	25,000	22,000	35,000
Average Annual Growth	0%	3%	1%	2%

The traffic volumes in Table 1 indicate that the average historical annual growth in traffic in the study area has varied in the past five years. However, to provide a conservative analysis, this report assumes an average annual growth rate of three percent (3%). It should be noted that S Country Club Road is not expected to experience much background traffic volume growth. The Build-Out Year (2021) Background traffic volumes at the study intersection, assuming an annual growth rate of 3% from Existing (2014) traffic volumes, are provided in **Figure 5**.

Trip Generation

The number of trips generated by the development is a function of the type and quantity of land use for the development. The number of vehicle trips generated by the proposed development was estimated based on the trip generation rates and equations provided in the publication entitled *Trip Generation Manual, Ninth 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 hour, as well as on a daily basis. The trip generation equations, directional splits, and estimated number of trips generated by the proposed development at build-out are provided in **Table 2**. For analysis purposes, 600 dwelling units were assumed to present a worst-case scenario.

Table 2: Trip Generation Calculations for Eastern Hills Village

Land Use	ITE Code	Average Weekday	AM Peak Hour	PM Peak Hour						
Equation/Rates¹										
Single-Family Detached Housing	210	$\ln(T) = 0.92 * \ln(X) + 2.72$	$T = 0.70 * X + 9.74$	$\ln(T) = 0.90 * \ln(X) + 0.51$						
Directional Splits²										
Single-Family Detached Housing	210	50 / 50	25 / 75	63 / 37						
Trips Generated for 600 Dwelling Units										
Single-Family Detached Housing	210	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
		5,460	2,730	2,730	430	108	322	527	322	195

¹ T = Trip Ends; X = Dwelling Units

² XX / YY = % entering vehicles / % exiting vehicles

Directional Distribution

The existing traffic volumes in the area, knowledge of the study area, and the proposed site layout were used to determine the directions from which traffic would approach and depart the development. The directional distribution used for the analysis is shown in **Figure 6**.

Traffic Volumes

Traffic volumes expected to be generated by the proposed residential development were assigned to the area roadways and site access points based on the directional distribution identified in Figure 6. The estimated site generated traffic volumes for the AM and PM peak hours for the assumed 600-lot residential development are shown in **Figure 7**.

Build-Out (2021) Total traffic volumes were obtained by adding the site generated traffic volumes (Figure 7) to the Build-Out Year (2021) Background traffic volumes (Figure 5) and are shown in **Figure 8**.

Operational Analysis of Study Area Intersections

The Level of Service (LOS) of an intersection is a qualitative measure of capacity and operating conditions that is directly related to vehicle delay. The LOS criteria for a signalized intersection are shown in **Table 3**. 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). As a practical consideration, LOS D, ranging from 35.1 to 55 seconds of average control delay per vehicle, is typically considered the limit of acceptable operation.

Table 3: 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

For unsignalized intersections, the levels of service, as shown in **Table 4**, are defined by average control delay in seconds per vehicle. For unsignalized analyses, LOS D is also the limit of acceptable operation.

Table 4: 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

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operations. For example, at two-way stop controlled intersections, main street traffic volumes may impose longer average delays for a small number of side-street vehicles, thus creating vehicle delays which correspond to a poor level of service. Motorists and agencies will typically accept longer delays (LOS E to F) if gaps in the traffic stream are anticipated within a reasonable timeframe and the side street traffic volumes do not warrant a traffic signal. As a general guide, gap acceptance thresholds for the longer delay values can be defined when the v/c ratios are under 0.85, which corresponds to 85 percent capacity usage for that movement. Therefore, a traffic movement with a poor level of service and a v/c value under 0.85 could be considered as operating acceptably.

The intersection capacity analyses were conducted using HCM methodologies in the *Synchro 7* traffic analysis software package for the following scenarios:

- Existing (2014) traffic conditions;
- Build-Out Year (2021) Background traffic conditions; and
- Build-Out (2021) Total traffic conditions.

Results for the roundabout at the intersection of S Country Club Road and Wynn Joyce Road were obtained using *SIDRA Intersection 6* software.

The results of the capacity analyses are presented in **Table 5**. The shaded cells in the table indicate intersections, approaches, and/or movements which currently operate or are anticipated to operate beyond LOS D.

Table 5: Intersection Capacity Analysis Results

S Country Club Road and E Centerville Road (Signalized)						
Traffic Condition	Peak Hour	Intersection	EB	WB	NB	SB
Existing (2014)	AM	22.1 (C) ¹	13.2 (B)	19.1 (B)	42.1 (D)	36.1 (D)
	PM	14.7 (B)	8.4 (A)	8.1 (A)	53.3 (D)	51.2 (D)
Build-Out Year (2021) Background	AM	25.4 (C)	18.4 (B)	23.5 (C)	43.7 (D)	33.3 (C)
	PM	17.4 (B)	12.3 (B)	10.5 (B)	54.0 (D)	49.3 (D)
Build-Out (2021) Total	AM	32.0 (C)	24.4 (C)	32.2 (C)	48.9 (D)	29.4 (C)
	PM	31.1 (C)	28.5 (C)	23.4 (C)	57.9 (E) ³	42.5 (D)
S Country Club Road and Wynn Joyce Road (Roundabout)						
Traffic Condition	Peak Hour	Intersection	EB	WB	NB	SB
Existing (2014)	AM	7.8 (A)	7.5 (A)	8.3 (A)	---	6.7 (A)
	PM	4.9 (A)	5.1 (A)	4.9 (A)	---	4.4 (A)
Build-Out Year (2021) Background	AM	9.6 (A)	9.2 (A)	10.3 (B)	---	8.1 (A)
	PM	5.4 (A)	5.6 (A)	5.4 (A)	---	4.7 (A)
Build-Out (2021) Total	AM	10.9 (B)	10.3 (B)	11.2 (B)	---	11.2 (B)
	PM	6.4 (A)	6.7 (A)	6.4 (A)	---	5.6 (A)
S Country Club Road and Main Entrance (TWSC)						
Traffic Condition	Peak Hour	Intersection ²	EB	WB	NB	SB
Build-Out (2021) Total	AM	---	---	12.2 (B)	0.0 (A)	2.4 (A)
	PM	---	---	13.6 (B)	0.0 (A)	5.0 (A)
Bishop's Bridge Lane and Drive 2 (TWSC)						
Traffic Condition	Peak Hour	Intersection ²	EB	WB	NB	SB
Build-Out (2021) Total	AM	---	8.6 (A)	---	7.2 (A)	0.0 (A)
	PM	---	8.7 (A)	---	7.3 (A)	0.0 (A)

¹ Delay in seconds/vehicle (Level of Service)

² HCM methodology does not provide intersection-wide delay for TWSC analysis

³ The v/c ratio is 0.83 for the thru/right lane and only 0.21 for the left turn lane

As shown by the results in Table 5, the existing intersections of S Country Club Road with E Centerville Road and with Wynn Joyce Road are predicted to at acceptable levels of service for Existing (2014) traffic conditions, and are predicted to continue to operate at acceptable levels of service for 2016 Background and Total traffic conditions. The northbound approach of S Country Club Road at E Centerville Road is anticipated to operate at LOS E during the PM peak hour for Build-Out (2021) Total traffic conditions; however, the v/c ratios are less than 0.85 for each lane.

The proposed site access driveways are predicted to operate at acceptable levels of service for Build-Out (2021) Total traffic conditions.

Roadway Capacity Analysis

Roadway capacity is defined as the volume of traffic that a roadway can accommodate based on the road's width, traffic control, parking conditions, and several other factors. Capacity values for divided/one-way roadways and undivided roadways by area type and functional class are presented in **Table 6**. These values were obtained from the North Central Texas Council of Governments' (NCTCOG) *Dallas-Fort Worth Regional Travel Model (2008)* and are used to determine planning level directional hourly capacities on roadway links within the model. Table 6 also summarizes the roadway level of service (LOS) classifications used within the model.

Table 6: NCTCOG Roadway Capacity Analysis and Level of Service Guidelines
Hourly Service Volume Per Lane* (Undivided Roads)

Area Type	Functional Class						
	Freeway	Principal Arterial	Minor Arterial	Collector	Freeway Ramp	Frontage Road	HOV
CBD	n/a	650	650	425	1250	650	n/a
Outer Business District	n/a	725	725	450	1375	725	n/a
Urban Residential	n/a	775	750	475	1425	750	n/a
Suburban Residential	n/a	875	825	525	1600	825	n/a
Rural	n/a	925	875	550	1725	875	n/a

* Service volumes at Level of Service E (the model requires LOS E service volumes)

- if Volume/Service Volume Ratio is ≤ 0.45 , then LOS = A or B
- if Volume/Service Volume Ratio is > 0.45 and ≤ 0.65 , then LOS = C
- if Volume/Service Volume Ratio is > 0.65 and ≤ 0.80 , then LOS = D
- if Volume/Service Volume Ratio is > 0.80 and ≤ 1.00 , then LOS = E
- if Volume/Service Volume Ratio is > 1.00 , then LOS = F

For this traffic study, using the information presented in Table 6, it was assumed that S Country Club Road was a collector in a suburban residential area. Roadway capacity analyses were performed for S Country Club Road north and south of the Eastern Hills Entrance for the following scenarios:

- Existing (2014) Traffic Conditions;
- Build-Out Year (2021) Background Traffic Conditions; and
- Build-Out (2021) Total Traffic Conditions.

The resulting roadway link level of service values for these roadway links within each scenario are provided in **Table 7**.

Table 7: Roadway Link Capacity Analysis (Assuming 600 Units)

Analysis Period	Direction	Capacity ¹	Volume ¹		V/C		LOS	
			AM	PM	AM	PM	AM	PM
S Country Club Road in the vicinity of the Country Club Entrance								
Existing (2014)	NB	525	145	98	0.28	0.19	A/B	A/B
	SB	525	132	125	0.25	0.24	A/B	A/B
Build-Out Year (2021) Background Conditions	NB	525	178	121	0.34	0.23	A/B	A/B
	SB	525	162	154	0.31	0.29	A/B	A/B
S Country Club Road North of Main Entrance								
Build-Out (2021) Total Conditions	NB	525	355	227	0.68	0.43	D	A/B
	SB	525	220	330	0.42	0.63	A/B	C
S Country Club Road South of Main Entrance								
Build-Out (2021) Total Conditions	NB	525	216	234	0.41	0.45	A/B	A/B
	SB	525	275	223	0.52	0.42	C	A/B

¹ Vehicles/hour

As shown in Table 7, S Country Club Road currently operates at acceptable levels of service (LOS D or better) under Existing (2014) conditions and is predicted to continue operating at acceptable levels of service under the future scenarios analyzed.

Right Turn Lane Analysis

The site access driveways were analyzed to determine if right turn deceleration lanes would be required. Based on guidelines presented in TxDOT's *Access Management Manual* and used by several cities in the Dallas-Fort Worth area, right turn deceleration lanes are typically considered under the following conditions:

- Right turn volumes greater than 50 vph (if posted speed limit greater than 45 mph)
- Right turn volumes greater than 60 vph (if posted speed limit less than/equal to 45 mph)

Table 8 summarizes the predicted right turn volumes under Build-Out (2021) Total traffic conditions.

Table 8. Right Turn Deceleration Lane Analysis Results

Intersection	Approach	Speed Limit (mph)	Volume AM (PM)	Threshold (vph)	Exceed Threshold AM (PM)
Main Entrance at S Country Club Road	NB	30	38 (113)	60	No (YES)
Drive 2 at Bishop's Bridge Lane	SB	30	10 (27)	60	No (No)

Based on the posted speed limit of the adjacent roadways, the projected peak hour right turning traffic volumes at the site driveway, and the guidelines specified by TxDOT, a northbound right turn deceleration lane should be considered for the Main Entrance on S Country Club Road. However,

based on existing conditions (location of existing homes), construction of a northbound right turn lane is not feasible at this time.

Left Turn Lane Analysis

As part of the analysis of the study area intersections, the site access driveway on S Country Club Road was analyzed to determine the need for a southbound left turn deceleration lane. This analysis was performed based on the peak hour traffic volumes under Build-Out (2021) Total traffic conditions (Figure 8). Left turn deceleration lane guidelines are provided in TxDOT's *Roadway Design Manual* and presented in **Table 9**. Guidelines are not provided for 30 mph in the *Roadway Design Manual*; therefore, the guidelines for 40 mph were used in this analysis. The advancing volume threshold would be higher for the lower speed.

Table 9. Guidelines for Left Turn Lanes on Two-Lane Highways

Opposing Volumes	Advancing Volumes			
	5% Left Turns	10% Left Turns	20% Left Turns	30% Left Turns
40 mph Design Speed				
800	330	240	180	160
600	410	305	225	200
400	510	380	275	245
200	640	470	350	305
100	720	515	390	340

Table 10 presents the southbound left turn deceleration analysis results for the intersection of S Country Club Road and Main Entrance.

Table 10. Southbound Left Turn Lane Analysis for S Country Club Road at Main Entrance

Peak	Opposing (NB) Volume (vph)	Advancing (SB) Volume (vph)			Guidelines Met or Exceeded?
		Percent Left Turns	Build-Out (2021) Total Approach Volume	Guidelines (40 mph)	
AM Peak	216	26%	220	~320	NO
PM Peak	234	53%	330	~200	YES

Based on the traffic volumes and results shown in this table, a southbound left turn deceleration lane should be considered along S Country Club Road at Main Entrance. Based on simulation performed using SimTraffic, a microscopic traffic analysis software, the 95th percentile PM peak hour southbound queue length is anticipated to be approximately three vehicles. A southbound left turn lane with a storage length of approximately 50 feet or more could be considered on S Country Club Road at the Main Entrance. However, existing roadway geometry and home locations may limit options for installing a left turn lane.

Driveway Roundabout Analysis

Due to the existing geometry of the roadway and locations of the existing nearby homes, the ability to install a northbound right turn lane or a southbound left turn along S Country Club Road lane may be limited. One option to consider is installation of a roundabout at the intersection of S Country Club Road and Main Entrance. **Table 11** shows the roundabout intersection capacity analysis for Build-Out (2021) Total traffic conditions, assuming a one-lane approach in each direction.

Table 11: Intersection Capacity Analysis Results – Roundabout at S Country Club Road and Main Entrance

S Country Club Road and Main Entrance (Roundabout)						
Traffic Condition	Peak Hour	Intersection	EB	WB	NB	SB
Build-Out (2021) Total	AM	5.8 (A) ¹	---	5.7 (A)	5.6 (A)	6.1 (A)
	PM	6.7 (A)	---	5.6 (A)	6.9 (A)	7.1 (A)

¹ Delay in seconds/vehicle (Level of Service)

As shown in Table 11, all approaches and the intersection are anticipated to operate at LOS A. Installation of a roundabout with one-lane on all approaches should be considered at the intersection of S Country Club Road and Main Entrance.

Sight Distance Evaluation

As part of this traffic analysis, the available and required intersection sight distances for motorists accessing the adjacent roadways from the proposed site access driveways were analyzed. The sight distance required at the proposed site driveways was estimated using the procedures developed by the American Association of State Highway and Transportation Officials (AASHTO) and published in the 2011 edition of *A Policy on Geometric Design of Highways and Streets*. At these locations, the motorist should be able to see if and when adequate gaps exist to perform their desired maneuver. **Table 12** presents the required and available sight distance for vehicles exiting the proposed site driveway on S Country Club Road.

Table 12. Site Driveway Sight Distance

Major Roadway	S Country Club Road
Driveway	Main Entrance
Posted Speed Limit	30 mph
Design Vehicle	Passenger Car
Required Intersection Sight Distance	335'
Available Sight Distance to the Left	>1,000'
Available Sight Distance to the Right	355' ¹
Sight Distance Available > Required:	
To the Left	Yes
To the Right	Yes

¹ Due to horizontal curvature of the roadway

Comparing the field investigation results of the available sight distance to the required sight distance indicates that adequate sight distance is provided for passenger cars at Main Entrance along S Country Club Road. While sight distance to the right (north) is limited due to the curvature of the road, it exceeds the minimum required sight distance.

Bishop's Bridge Lane is approximately 550 feet long. Vehicles exiting Drive 2 onto Bishop's Bridge Lane will be able to see along the entire length of Bishop's Bridge Lane.

Conclusions and Recommendations

Based on the analysis of the proposed site plan and characteristics of the proposed Eastern Hills Village residential development in Garland, Texas, the following conclusions can be made:

1. The proposed residential development will include approximately 550 to 600 single family homes. For analysis purposes, 600 dwelling units were assumed to present a worst-case scenario. The proposed development is expected to generate 5,460 trips on a daily basis, including 430 trips during the AM peak hour and 527 trips during the PM peak hour.
2. The existing intersections of S Country Club Road with E Centerville Road and with Wynn Joyce Road are predicted to at acceptable levels of service for Existing (2014) traffic conditions, and are predicted to continue to operate at acceptable levels of service for 2016 Background and Total traffic conditions. The proposed site access driveways are predicted to operate at acceptable levels of service for Build-Out (2021) Total traffic conditions.
3. S Country Club Road currently operates at acceptable levels of service (LOS D or better) under Existing (2014) conditions and is predicted to continue operating at acceptable levels of service under the future scenarios analyzed.

4. While the projected PM peak hour right turning traffic volumes at the Main Entrance exceed the threshold volumes specified by TxDOT, construction of a northbound right turn lane along S Country Club Road is not feasible at this time due to the location of existing homes.
5. Based on the projected southbound left turn traffic volumes, a southbound left turn deceleration lane should be considered along S Country Club Road at Main Entrance. Based on simulation performed using SimTraffic, a microscopic traffic analysis software, the 95th percentile PM peak hour southbound queue length is anticipated to be approximately three vehicles. A southbound left turn lane with a storage length of approximately 50 feet or more could be considered on S Country Club Road at the Main Entrance; however, this may not be feasible due to existing geometry and home location.
6. Installation of a roundabout with one-lane approaches should be considered at the intersection of S Country Club Road and Main Entrance. A roundabout is anticipated to operate at LOS A for Build-Out (2021) Total traffic conditions.
7. Comparing the field investigation results of the available sight distance to the required sight distance indicates that adequate sight distance is provided for passenger cars at both site access driveway locations.

If you have any questions regarding this study, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services.

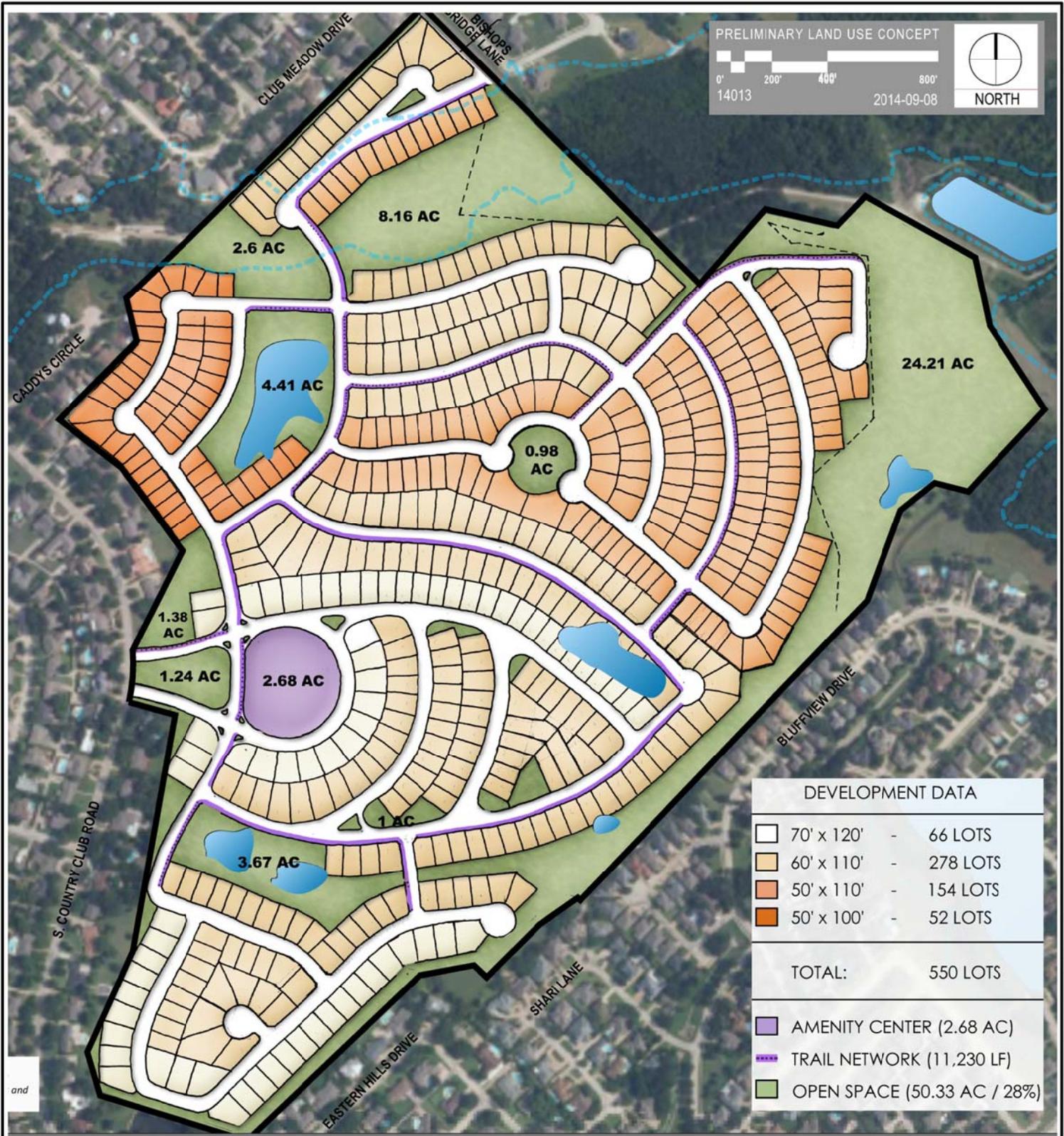
Sincerely,



Dharmesh M. Shah, P.E., PTOE
Vice President
Lee Engineering, LLC
TBPE Firm F-450



Attachments



PRELIMINARY LAND USE CONCEPT

0' 200' 400' 800'

14013 2014-09-08

NORTH

DEVELOPMENT DATA		
	70' x 120'	- 66 LOTS
	60' x 110'	- 278 LOTS
	50' x 110'	- 154 LOTS
	50' x 100'	- 52 LOTS
TOTAL:		550 LOTS
	AMENITY CENTER (2.68 AC)	
	TRAIL NETWORK (11,230 LF)	
	OPEN SPACE (50.33 AC / 28%)	

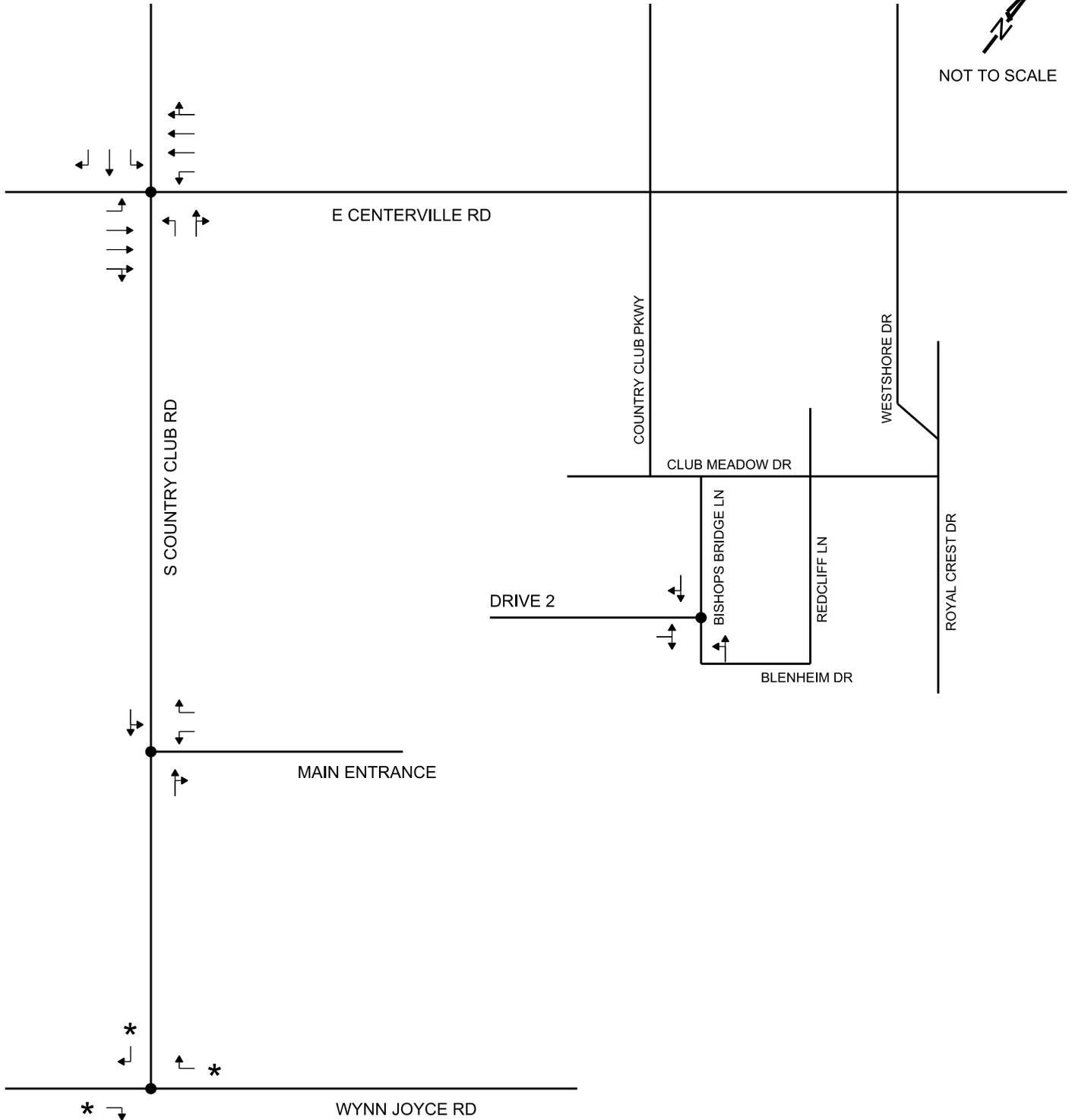
TY, INC

EASTERN HILLS VILLAGE

INC. GARLAND, TX / DALLAS COUNTY



NOT TO SCALE



LEGEND

- Study Intersection
- * Roundabout



3030 LBJ FREEWAY
 SUITE 1660
 DALLAS, TEXAS 75234
 972-248-3006 FAX 972-248-3855

LEE ENGINEERING

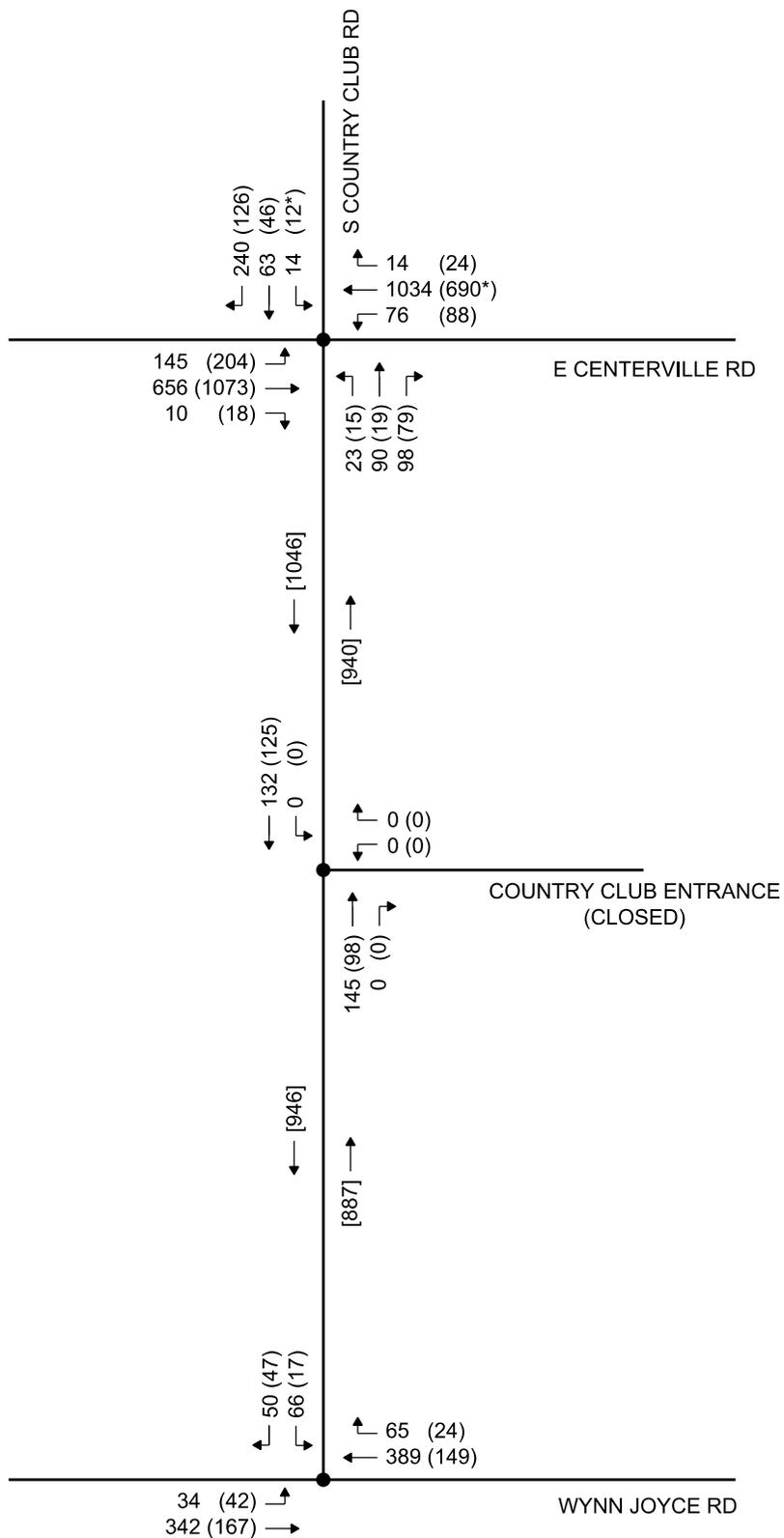
DALLAS - PHOENIX - ALBUQUERQUE
 OKLAHOMA CITY - SAN ANTONIO

**Existing Intersection Lane Configurations
 and Proposed Driveway Lane Configurations**

Figure 3



NOT TO SCALE



Turning movement volumes were collected on Tuesday, October 28, 2014.

24-hour volumes were collected on Tuesday, October 28, 2014 and Wednesday, October 29, 2014.

* SB LT and WB Thru at S Country Club Rd and E Centerville Rd for the PM peak are based on counts collected Monday, March 24, 2014.

LEGEND

- Study Intersection
- AM Peak Hour (PM Peak Hour)
- [24-Hour Volume]



3030 LBJ FREEWAY
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LEE ENGINEERING

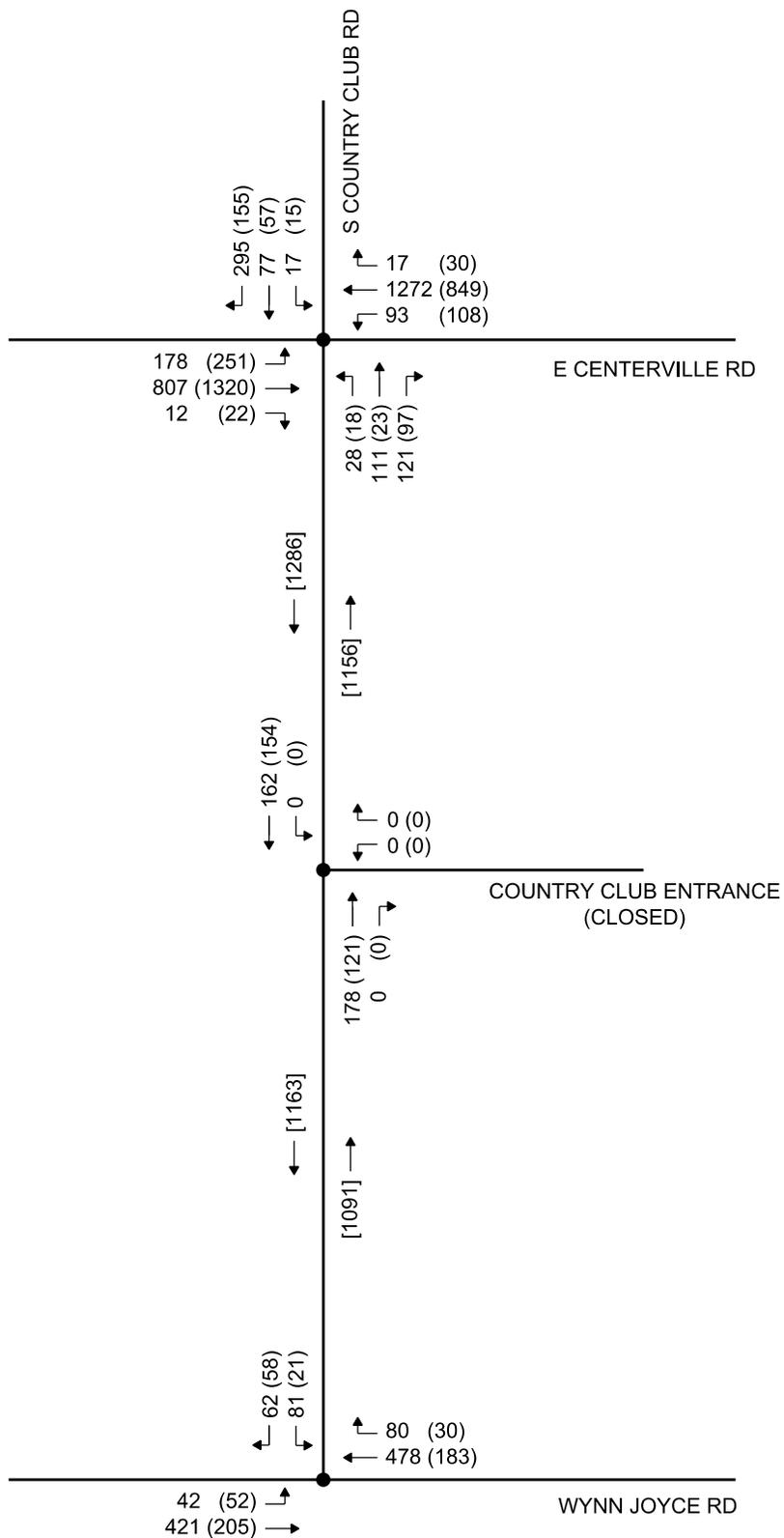
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Existing (2014) Peak Hour and Daily Traffic Volumes

Figure 4



NOT TO SCALE



LEGEND

- Study Intersection
- AM Peak Hour (PM Peak Hour)
- [24-Hour Volume]



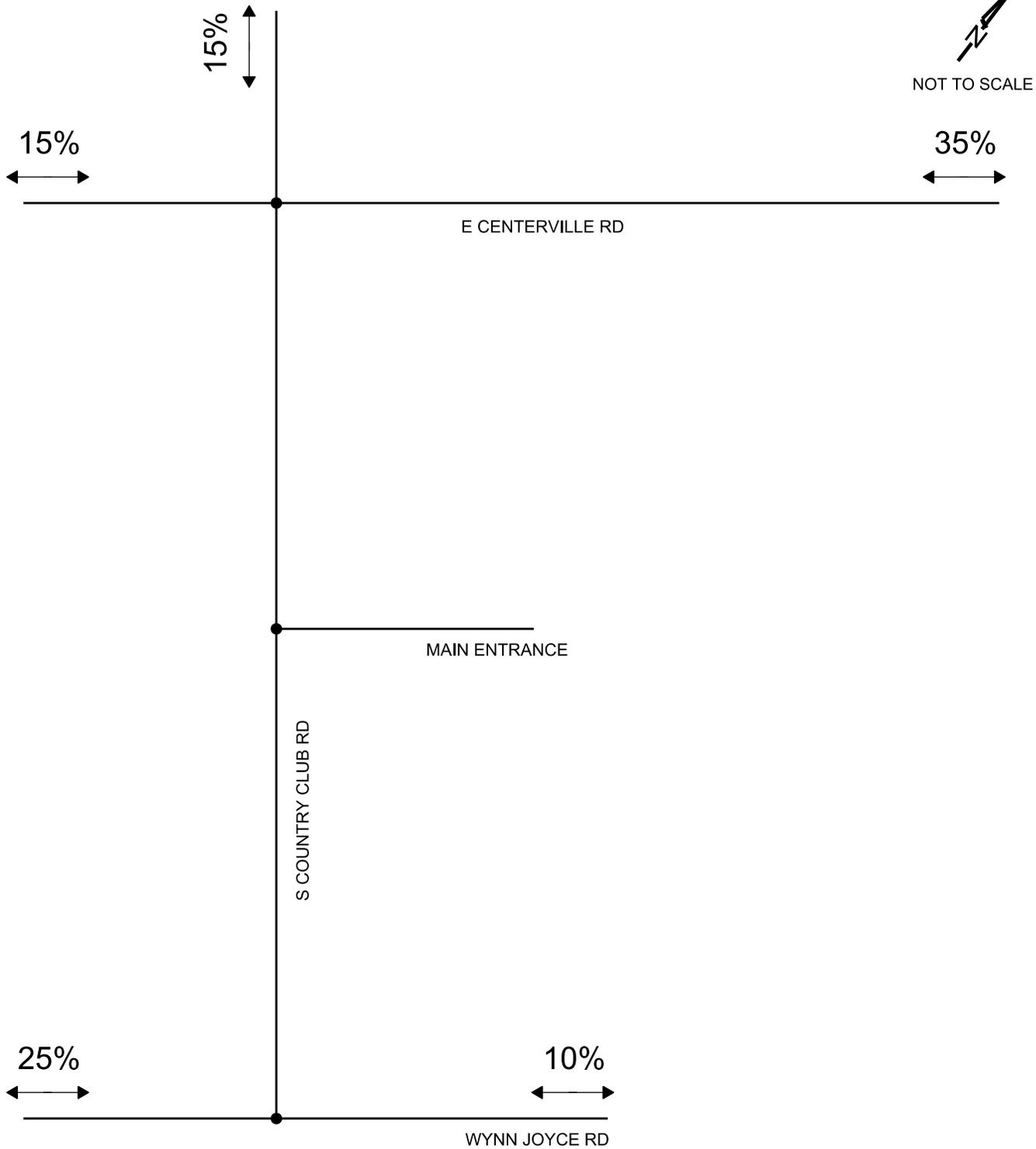
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Build-Out Year (2021) Background Peak Hour and Daily Traffic Volumes

Figure 5



3030 LBJ FREEWAY
 SUITE 1660
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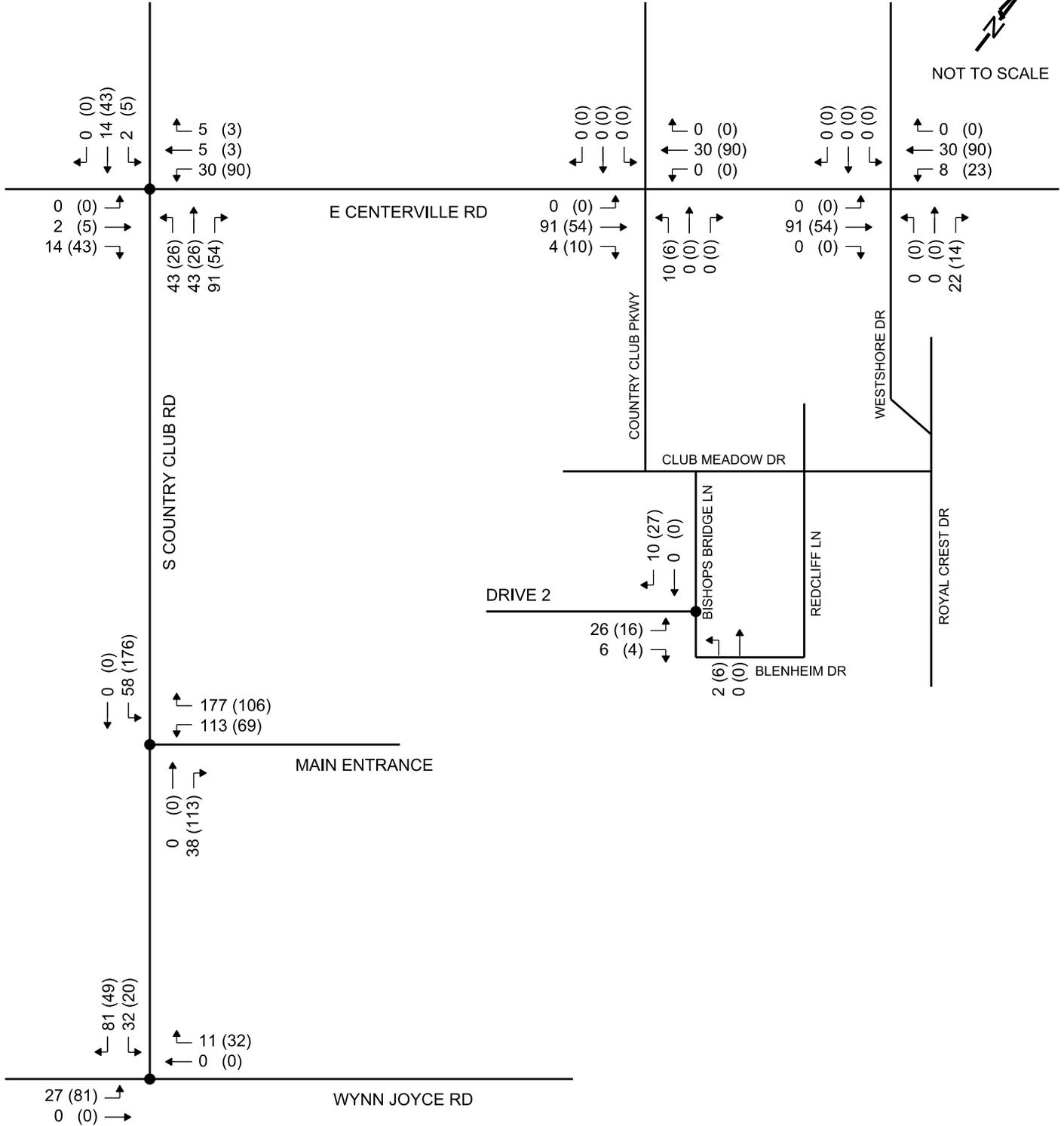
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Assumed Directional Distribution

Figure 6



NOT TO SCALE



LEGEND

- Study Intersection
- AM Peak Hour (PM Peak Hour)



3030 LBJ FREEWAY
 SUITE 1660
 DALLAS, TEXAS 75234
 972-248-3006 FAX 972-248-3855

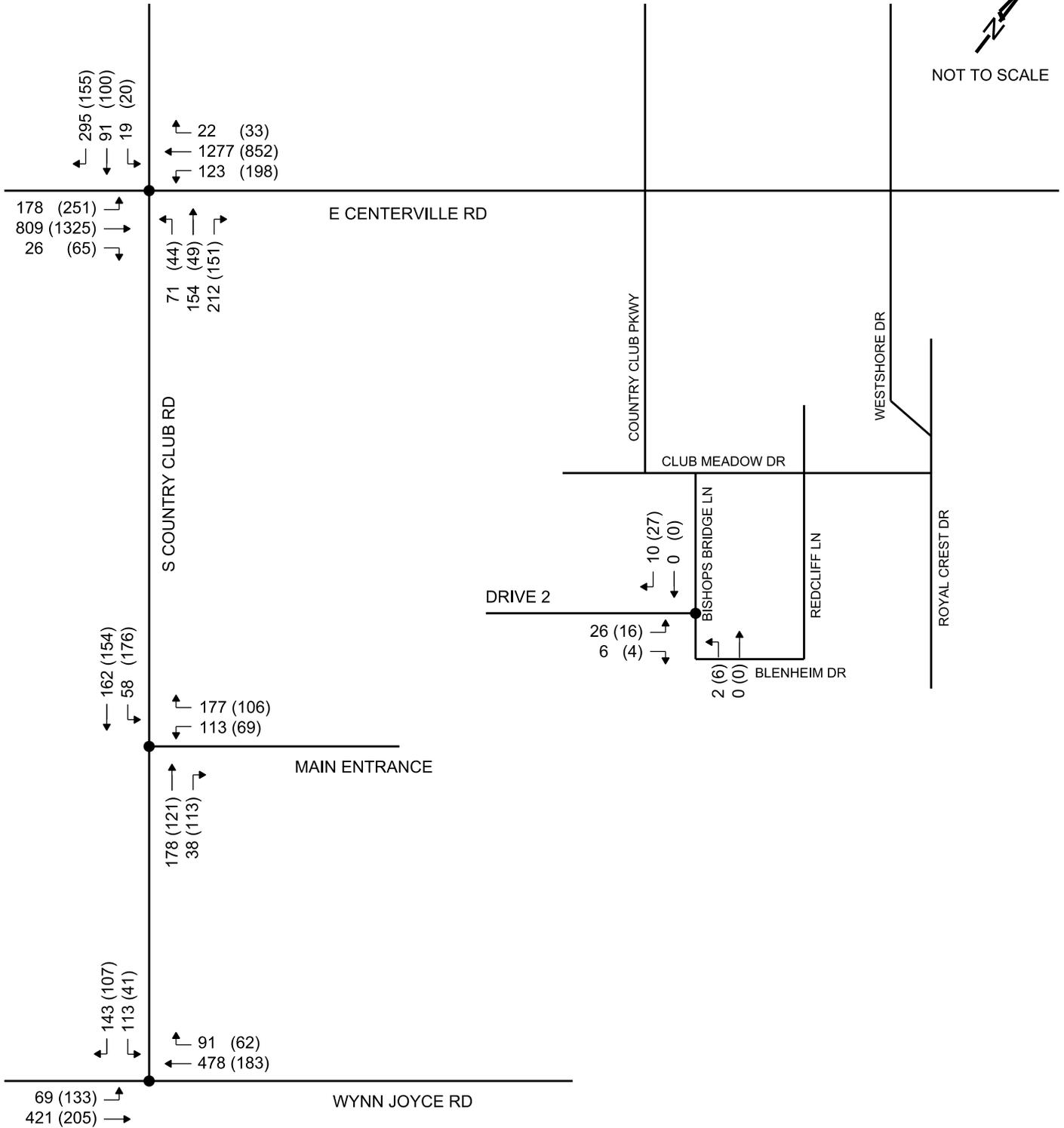
Site Generated Traffic Volumes
 (Assuming 600 Units)

Figure 7

DALLAS - PHOENIX - ALBUQUERQUE
 OKLAHOMA CITY - SAN ANTONIO



NOT TO SCALE



LEGEND

- Study Intersection
- AM Peak Hour (PM Peak Hour)



3030 LBJ FREEWAY
 SUITE 1660
 DALLAS, TEXAS 75234
 972-248-3006 FAX 972-248-3855

Build-Out (2019) Total Peak Hour Traffic Volumes

Figure 8

DALLAS - PHOENIX - ALBUQUERQUE
 OKLAHOMA CITY - SAN ANTONIO

Accurate Counts
Traffic Data Collection Services
(214) 681-6468

Location: Centerville @ Country Club
Weather: Cool
Counted By: PI

File Name : centerville at country club
Site Code : 00000000
Start Date : 10/28/2014
Page No : 1

Groups Printed- Unshifted

Start Time	COUNTRY CLUB Southbound					E CENTERVILLE Westbound					COUNTRY CLUB Northbound					E CENTERVILLE Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00	3	8	50	0	61	11	224	4	0	239	3	10	13	0	26	28	164	0	0	192	518
07:15	2	11	78	0	91	21	285	4	0	310	6	19	22	0	47	32	183	0	0	215	663
07:30	2	15	54	0	71	21	260	5	0	286	2	22	20	0	44	49	181	1	0	231	632
07:45	6	30	67	0	103	22	272	3	0	297	6	32	32	0	70	22	148	5	0	175	645
Total	13	64	249	0	326	75	1041	16	0	1132	17	83	87	0	187	131	676	6	0	813	2458
08:00	4	7	41	0	52	12	217	2	0	231	9	17	24	0	50	42	144	4	0	190	523
08:15	3	4	24	0	31	13	230	6	0	249	6	16	17	0	39	15	116	2	0	133	452
08:30	2	7	39	0	48	9	181	6	0	196	2	12	16	0	30	23	132	2	0	157	431
08:45	0	2	30	0	32	9	176	2	0	187	5	7	10	0	22	18	126	3	0	147	388
Total	9	20	134	0	163	43	804	16	0	863	22	52	67	0	141	98	518	11	0	627	1794
16:00	3	13	41	0	57	22	212	3	0	237	2	4	15	0	21	45	244	3	0	292	607
16:15	1	6	38	0	45	20	187	2	0	209	3	9	19	0	31	36	234	5	0	275	560
16:30	37	10	35	0	82	24	237	3	0	264	6	7	17	0	30	38	228	4	0	270	646
16:45	50	14	32	0	96	12	240	8	0	260	4	10	16	0	30	34	242	7	0	283	669
Total	91	43	146	0	280	78	876	16	0	970	15	30	67	0	112	153	948	19	0	1120	2482
17:00	42	16	30	0	88	21	235	7	0	263	3	2	11	0	16	52	263	2	0	317	684
17:15	19	14	31	2	66	32	283	4	0	319	5	5	20	0	30	57	278	3	0	338	753
17:30	24	2	33	0	59	23	279	5	0	307	3	2	32	0	37	61	290	6	0	357	760
17:45	15	5	27	0	47	29	235	8	0	272	0	6	21	0	27	40	247	6	0	293	639
Total	100	37	121	2	260	105	1032	24	0	1161	11	15	84	0	110	210	1078	17	0	1305	2836
Grand Total	213	164	650	2	1029	301	3753	72	0	4126	65	180	305	0	550	592	3220	53	0	3865	9570
Apprch %	20.7	15.9	63.2	0.2		7.3	91.0	1.7	0.0		11.8	32.7	55.5	0.0		15.3	83.3	1.4	0.0		
Total %	2.2	1.7	6.8	0.0	10.8	3.1	39.2	0.8	0.0	43.1	0.7	1.9	3.2	0.0	5.7	6.2	33.6	0.6	0.0	40.4	

Start Time	COUNTRY CLUB Southbound					E CENTERVILLE Westbound					COUNTRY CLUB Northbound					E CENTERVILLE Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

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

Intersection	07:15																				
Volume	14	63	240	0	317	76	1034	14	0	1124	23	90	98	0	211	145	656	10	0	811	2463
Percent	4.4	19.9	75.7	0.0		6.8	92.0	1.2	0.0		10.9	42.7	46.4	0.0		17.9	80.9	1.2	0.0		
Volume	07:15																				
Volume	2	11	78	0	91	21	285	4	0	310	6	19	22	0	47	32	183	0	0	215	663
Peak Factor																					0.929
High Int.	07:45					07:15					07:45					07:30					
Volume	6	30	67	0	103	21	285	4	0	310	6	32	32	0	70	49	181	1	0	231	
Peak Factor	0.769					0.906					0.754					0.878					

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

Intersection	16:45																				
Volume	135	46	126	2	309	88	1037	24	0	1149	15	19	79	0	113	204	1073	18	0	1295	2866
Percent	43.7	14.9	40.8	0.6		7.7	90.3	2.1	0.0		13.3	16.8	69.9	0.0		15.8	82.9	1.4	0.0		
Volume	17:30																				
Volume	24	2	33	0	59	23	279	5	0	307	3	2	32	0	37	61	290	6	0	357	760
Peak Factor																					0.943
High Int.	16:45					17:15					17:30					17:30					
Volume	50	14	32	0	96	32	283	4	0	319	3	2	32	0	37	61	290	6	0	357	
Peak Factor	0.805					0.900					0.764					0.907					

Accurate Counts
Traffic Data Collection Services
(214) 681-6468

Location: Wynn Joyce @ Country Club
Weather: Warm
Counted By: DS

File Name : wynn joyce at country club
Site Code : 00000000
Start Date : 10/28/2014
Page No : 1

Groups Printed- Unshifted

Start Time	COUNTRY CLUB Southbound					WYNN JOYCE Westbound					COUNTRY CLUB Northbound					WYNN JOYCE Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00	5	0	7	0	12	0	40	6	0	46	0	0	0	0	0	2	13	0	0	15	73
07:15	9	0	8	0	17	0	55	5	0	60	0	0	0	0	0	14	46	0	0	60	137
07:30	16	0	20	0	36	0	101	12	0	113	0	0	0	0	0	9	116	0	0	125	274
07:45	28	0	12	0	40	0	130	21	0	151	0	0	0	0	0	4	148	0	0	152	343
Total	58	0	47	0	105	0	326	44	0	370	0	0	0	0	0	29	323	0	0	352	827
08:00	13	0	10	0	23	0	103	27	0	130	0	0	0	0	0	7	32	0	0	39	192
08:15	3	0	9	0	12	0	45	2	0	47	0	0	0	0	0	18	22	0	0	40	99
08:30	3	0	3	0	6	0	29	2	0	31	0	0	0	0	0	5	15	0	0	20	57
08:45	1	0	15	0	16	0	32	2	0	34	0	0	0	0	0	3	20	0	0	23	73
Total	20	0	37	0	57	0	209	33	0	242	0	0	0	0	0	33	89	0	0	122	421
16:00	6	0	12	0	18	0	72	7	0	79	0	0	0	0	0	14	66	0	0	80	177
16:15	3	0	12	0	15	0	29	8	0	37	0	0	0	0	0	6	29	0	0	35	87
16:30	6	0	13	0	19	0	26	6	0	32	0	0	0	0	0	14	39	0	0	53	104
16:45	2	0	10	0	12	0	22	3	0	25	0	0	0	0	0	8	33	0	0	41	78
Total	17	0	47	0	64	0	149	24	0	173	0	0	0	0	0	42	167	0	0	209	446
17:00	5	0	10	0	15	0	16	2	0	18	0	0	0	0	0	8	46	0	0	54	87
17:15	11	0	12	0	23	0	26	5	0	31	0	0	0	0	0	13	43	0	0	56	110
17:30	2	0	15	0	17	0	25	3	0	28	0	0	0	0	0	11	48	0	0	59	104
17:45	8	0	14	0	22	0	26	5	0	31	0	0	0	0	0	14	60	0	0	74	127
Total	26	0	51	0	77	0	93	15	0	108	0	0	0	0	0	46	197	0	0	243	428
Grand Total	121	0	182	0	303	0	777	116	0	893	0	0	0	0	0	150	776	0	0	926	2122
Apprch %	39.9	0.0	60.1	0.0		0.0	87.0	13.0	0.0		0.0	0.0	0.0	0.0		16.2	83.8	0.0	0.0		
Total %	5.7	0.0	8.6	0.0	14.3	0.0	36.6	5.5	0.0	42.1	0.0	0.0	0.0	0.0	0.0	7.1	36.6	0.0	0.0	43.6	

Start Time	COUNTRY CLUB Southbound					WYNN JOYCE Westbound					COUNTRY CLUB Northbound					WYNN JOYCE Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour From 07:00 to 11:45 - Peak 1 of 1																					
Intersection 07:15																					
Volume	66	0	50	0	116	0	389	65	0	454	0	0	0	0	0	34	342	0	0	376	946
Percent	56.9	0.0	43.1	0.0		0.0	85.7	14.3	0.0		0.0	0.0	0.0	0.0		9.0	91.0	0.0	0.0		
07:45																					
Volume	28	0	12	0	40	0	130	21	0	151	0	0	0	0	0	4	148	0	0	152	343
Peak Factor																					0.690
High Int. 07:45																					
Volume	28	0	12	0	40	0	130	21	0	151	0	0	0	0	0	4	148	0	0	152	
Peak Factor				0.725					0.752											0.618	
Peak Hour From 12:00 to 17:45 - Peak 1 of 1																					
Intersection 16:00																					
Volume	17	0	47	0	64	0	149	24	0	173	0	0	0	0	0	42	167	0	0	209	446
Percent	26.6	0.0	73.4	0.0		0.0	86.1	13.9	0.0		0.0	0.0	0.0	0.0		20.1	79.9	0.0	0.0		
16:00																					
Volume	6	0	12	0	18	0	72	7	0	79	0	0	0	0	0	14	66	0	0	80	177
Peak Factor																					0.630
High Int. 16:30																					
Volume	6	0	13	0	19	0	72	7	0	79	0	0	0	0	0	14	66	0	0	80	
Peak Factor				0.842					0.547											0.653	

Accurate Counts
TWO CHANNEL SUMMARY
10/28/2014 TO 10/29/2014

Site Reference: 000010281402
Site ID: 000010281402
Location: Country Club-S of Colonel

File: D1028006.prn
City: Garland
County:

TIME	LANE 1 NORTH		LANE 2 SOUTH		TOTAL	
	am	pm	am	pm	am	pm
00:15	1	9	1	12	2	21
00:30	0	7	0	10	0	17
00:45	0	8	1	7	1	15
01:00	0 1	9 33	0 2	6 35	0 3	15 68
01:15	0	13	0	9	0	22
01:30	0	10	0	15	0	25
01:45	0	18	2	10	2	28
02:00	0 0	21 62	0 2	12 46	0 2	33 108
02:15	1	9	0	13	1	22
02:30	0	16	0	18	0	34
02:45	0	16	0	9	0	25
03:00	0 1	18 59	0 0	22 62	0 1	40 121
03:15	0	16	0	20	0	36
03:30	0	24	0	24	0	48
03:45	0	22	1	20	1	42
04:00	3 3	16 78	2 3	27 91	5 6	43 169
04:15	1	24	1	31	2	55
04:30	1	22	0	24	1	46
04:45	0	23	0	25	0	48
05:00	2 4	12 81	0 1	20 100	2 5	32 181
05:15	1	13	0	29	1	42
05:30	1	18	0	39	1	57
05:45	3	28	3	26	6	54
06:00	5 10	16 75	0 3	30 124	5 13	46 199
06:15	7	18	4	30	11	48
06:30	9	12	5	18	14	30
06:45	19	10	7	17	26	27
07:00	19 54	17 57	6 22	18 83	25 76	35 140
07:15	24	8	21	18	45	26
07:30	29	15	26	20	55	35
07:45	38	6	27	13	65	19
08:00	45 136	9 38	35 109	14 65	80 245	23 103
08:15	33	6	30	17	63	23
08:30	18	4	19	15	37	19
08:45	19	4	11	15	30	19
09:00	10 80	5 19	14 74	5 52	24 154	10 71
09:15	16	2	12	13	28	15
09:30	9	2	12	5	21	7
09:45	7	2	11	11	18	13
10:00	12 44	6 12	5 40	9 38	17 84	15 50
10:15	11	1	8	7	19	8
10:30	13	0	11	5	24	5
10:45	8	0	4	0	12	0
11:00	12 44	2 3	9 32	2 14	21 76	4 17
11:15	8	3	3	3	11	6
11:30	11	2	7	2	18	4
11:45	12	0	12	4	24	4
12:00	9 40	1 6	16 38	1 10	25 78	2 16
<hr/>						
TOTALS	940		1046		1986	
AM Times	07:30		07:30		07:30	
AM Peaks	145		118		263	
Factors	PHF: .80		PHF: .84		PHF: .82	
PM Times	15:30		17:30		17:30	
PM Peaks	86		125		205	
Factors	PHF: .89		PHF: .80		PHF: .89	

Accurate Counts
TWO CHANNEL SUMMARY
10/28/2014 TO 10/29/2014

Site Reference: 000010281418
Site ID: 000010281418
Location: Country Club-S of Manillee

File: D1028007.prn
City: Garland
County:

TIME	LANE 1 NORTH		LANE 2 SOUTH		TOTAL	
	am	pm	am	pm	am	pm
00:15	1	9	0	13	1	22
00:30	0	7	1	10	1	17
00:45	0	10	0	7	0	17
01:00	0 1	9 35	1 2	5 35	1 3	14 70
01:15	0	11	0	6	0	17
01:30	0	9	0	16	0	25
01:45	1	16	1	7	2	23
02:00	1 2	16 52	0 1	13 42	1 3	29 94
02:15	0	11	0	11	0	22
02:30	0	18	0	17	0	35
02:45	0	15	0	10	0	25
03:00	0 0	17 61	0 0	27 65	0 0	44 126
03:15	0	23	0	21	0	44
03:30	0	31	0	23	0	54
03:45	0	24	0	21	0	45
04:00	3 3	20 98	2 2	23 88	5 5	43 186
04:15	1	20	1	25	2	45
04:30	1	23	0	20	1	43
04:45	1	19	0	23	1	42
05:00	1 4	12 74	0 1	16 84	1 5	28 158
05:15	0	13	0	25	0	38
05:30	1	23	1	33	2	56
05:45	2	20	1	33	3	53
06:00	4 7	22 78	1 3	16 107	5 10	38 185
06:15	6	8	1	21	7	29
06:30	7	9	5	15	12	24
06:45	14	12	8	15	22	27
07:00	18 45	13 42	9 23	12 63	27 68	25 105
07:15	19	8	17	10	36	18
07:30	20	12	34	15	54	27
07:45	46	6	31	9	77	15
08:00	35 120	7 33	36 118	9 43	71 238	16 76
08:15	34	5	31	17	65	22
08:30	16	8	17	13	33	21
08:45	17	3	13	5	30	8
09:00	14 81	7 23	12 73	3 38	26 154	10 61
09:15	10	0	9	7	19	7
09:30	7	3	14	8	21	11
09:45	6	4	10	7	16	11
10:00	7 30	3 10	5 38	5 27	12 68	8 37
10:15	9	1	9	7	18	8
10:30	11	0	11	5	22	5
10:45	6	1	4	1	10	2
11:00	12 38	1 3	5 29	3 16	17 67	4 19
11:15	10	3	5	4	15	7
11:30	9	2	9	0	18	2
11:45	15	0	13	2	28	2
12:00	8 42	0 5	14 41	1 7	22 83	1 12
<hr/>						
TOTALS	887		946		1833	
AM Times	07:30		07:30		07:30	
AM Peaks	135		132		267	
Factors	PHF: .73		PHF: .91		PHF: .86	
PM Times	15:15		17:00		15:00	
PM Peaks	98		107		187	
Factors	PHF: .79		PHF: .81		PHF: .86	