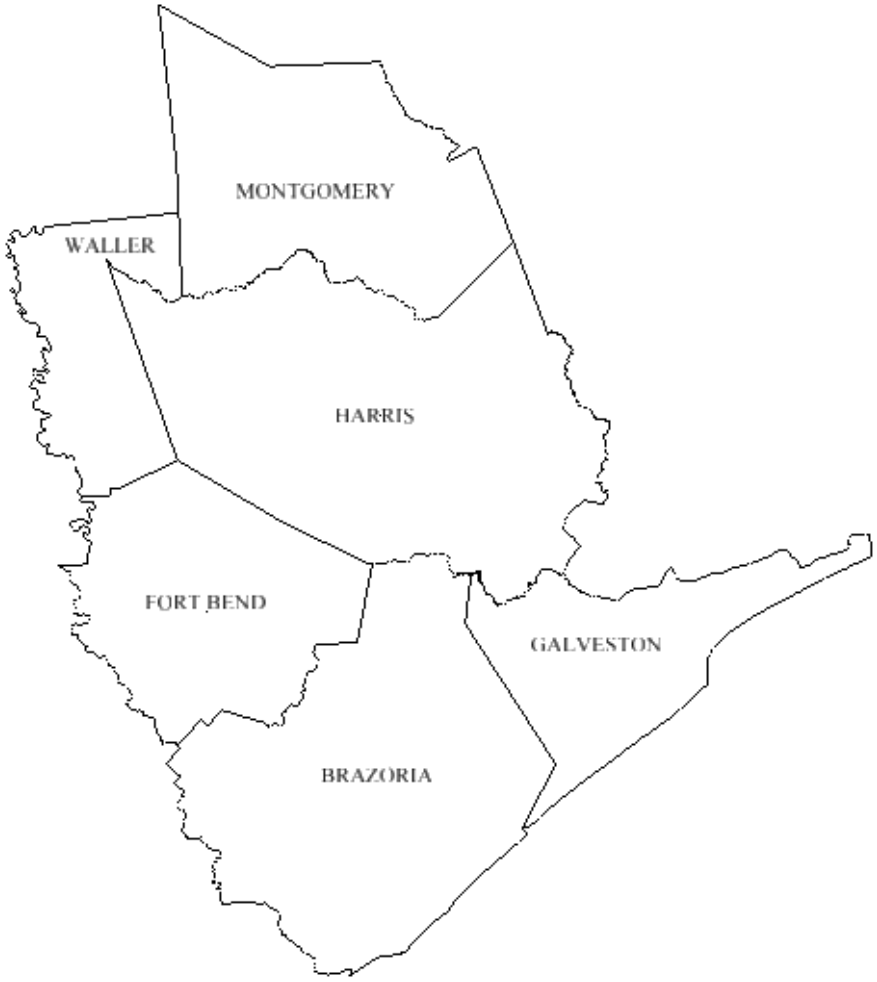
EL DORADO BOULEVARD
AT HICKORY KNOLL DRIVE
HARRIS COUNTY, TEXAS

TRAFFIC ENGINEERING STUDY



Prepared For

HARRIS COUNTY

Prepared By

TEDSI INFRASTRUCTURE GROUP
Consulting Engineers
TEDSI
TBPE F-1640
738 Highway 6 South ♦ Suite 430 ♦ Houston, Texas 77079
Tel: (832) 619-1000
Fax: (832) 619-1018

DECEMBER 2017

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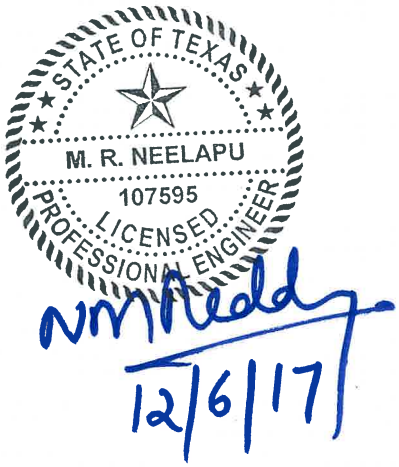


Prepared By

TEDSI INFRASTRUCTURE GROUP

738 Highway 6 South

SUITE 430

HOUSTON, TEXAS 77079

TEL # (832) 619-1000

FAX # (832) 619-1018

TEDSI PROJECT # 2016-1196-02

DECEMBER 2017

REPORT

INTRODUCTION

The purpose of this report is to conduct a traffic engineering study to determine if a conventional traffic signal control is warranted at the intersection of El Dorado Boulevard at Hickory Knoll Drive for current traffic conditions. Improvements, if any, will be recommended as part of this report.

The study intersection is located in Harris County Precinct 2 (Key Map # 618C), Texas. A vicinity map identifying the study location is shown below in **Figure 1**.

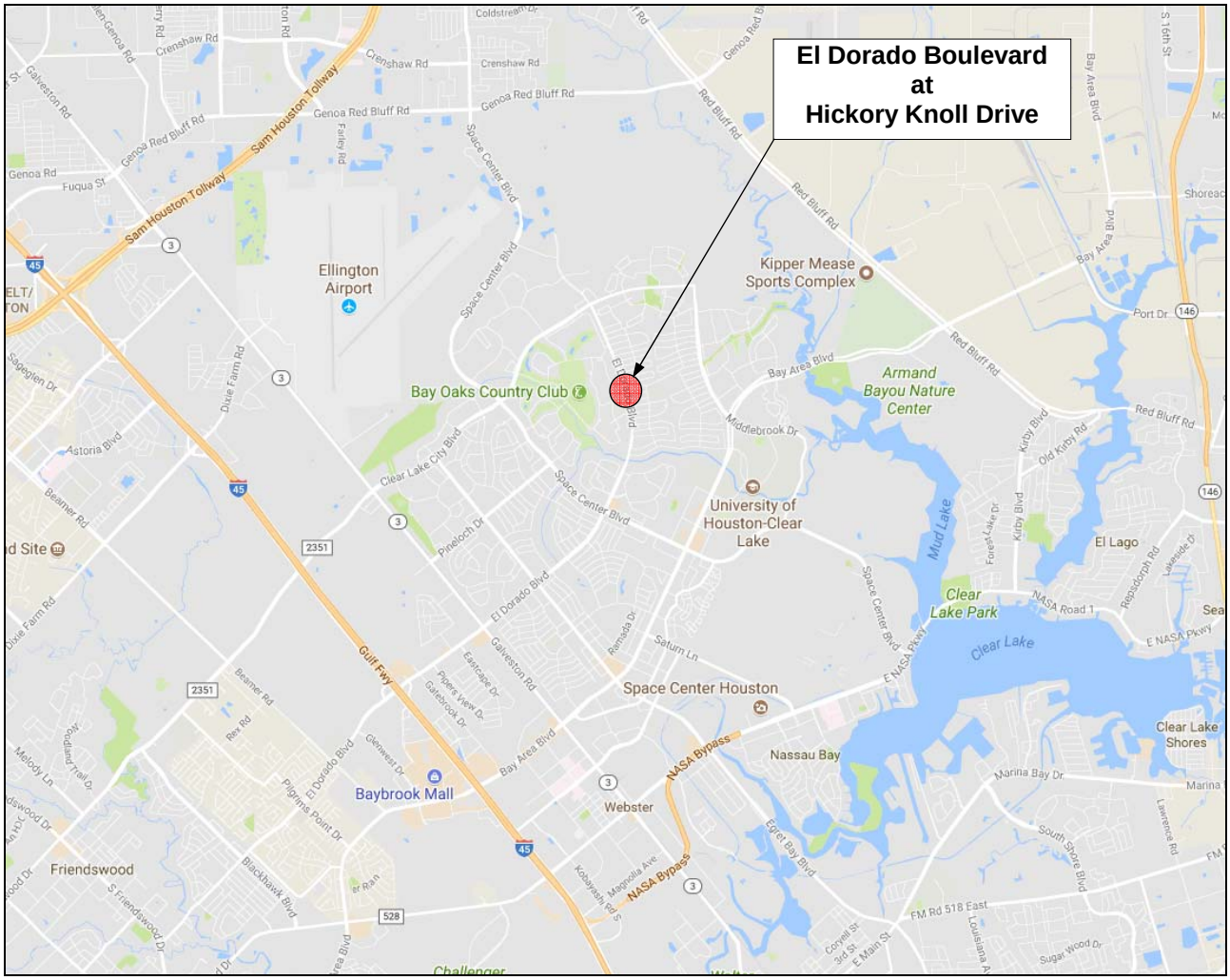


Figure 1. *Site Map – El Dorado Boulevard at Hickory Knoll Drive*
(Source: maps.google.com)

This study is based on field data collected by TEDSI Infrastructure Group (TEDSI); background information obtained from Harris County; and "Warrants for Traffic Signal Installation" as found in the 2011 Texas Manual on Uniform Traffic Control Devices for Streets (TMUTCD).

EXISTING CONDITIONS

Roadway and Development

El Dorado Boulevard is aligned approximately north – south in the vicinity of Hickory Knoll Drive. It is a two-lane undivided concrete roadway with curb-and-gutter on both sides. Roadway pavement and associated markings are in fair condition. Speed limit is posted as 35 miles per hour (mph) along this roadway. Land use along El Dorado Boulevard is primarily residential.

Hickory Knoll Drive is aligned approximately east – west and terminates on the east side of El Dorado Boulevard. An east – west private gravel driveway, which serves as an access to/from Clear Lake City water tank, exists on the west side of El Dorado Boulevard facing Hickory Knoll Drive. Hickory Knoll Drive is a two-lane undivided concrete roadway with curb-and-gutter on both sides. Roadway pavement is in fair condition. There are no pavement markings along Hickory Knoll Drive in the study vicinity. Speed limit is posted as 30 mph along this roadway. Land use along Hickory Knoll Drive is primarily residential.

El Dorado Boulevard at Hickory Knoll Drive Intersection: Currently the intersection of El Dorado Boulevard and Hickory Knoll Drive is controlled by a "STOP" (R1-1) sign on the westbound approach of Hickory Knoll Drive. Intersection sight distance for westbound traffic (looking north) appears to be restricted by tree branches located at the northeast quadrant of the intersection. For all other approaches, sight distances appear to be adequate. Land use is vacant at the southwest quadrant and residential at all other quadrants of the intersection.

St. Clare of Assisi Catholic Elementary and Middle School is located near the southwest quadrant of the study intersection. A school zone speed limit of 20 mph is posted along El Dorado Boulevard just south of the study intersection.

Nearby signalized intersections along El Dorado Boulevard include Clear Lake City Boulevard located 0.85 miles to the north of Hickory Knoll Drive and Brook Forest Drive located approximately 0.6 miles to the south of Hickory Knoll Drive. There are no signalized intersections along Hickory Knoll Drive.

Aerial map of the study intersection is shown in **Figure 2**. Existing conditions in the vicinity of the study intersection are illustrated in **Figure 3**. Photographs taken at the study site are included in **Appendix A** of this report.

Traffic Data

Intersection Turning Movement Counts: Current weekday traffic turning movement volumes at the study intersection were recorded on Wednesday, November 1, 2017. The volumes were recorded at 15-minute intervals for 12-hours (between 6:30 AM and 6:30 PM). There was a very limited pedestrian activity at this intersection. Summary of vehicle turning movement counts for the study intersection is shown in **Table 1.** Actual count data sheets are included in **Appendix B**.

Figure 2. *Aerial Map – El Dorado Boulevard at Hickory Knoll Drive (Not To Scale)*
(Source: Google Earth)

Table 1. *Summary of Intersection Turning Movement Counts*
El Dorado Boulevard at Hickory Knoll Drive

Approach:	**Westbound**				**Northbound**				**Eastbound**				**Southbound**			
Street:	Hickory Knoll Drive				El Dorado Boulevard				Private Driveway				El Dorado Boulevard			
Direction:	Right	Thru	Left	U-turn	Right	Thru	Left	U-turn	Right	Thru	Left	U-turn	Right	Thru	Left	U-turn
Designation:	1	2	3	4	6	7	8	9	11	12	13	14	16	17	18	19
Time Starts																
6:30 AM	64	0	55	0	31	123	0	0	0	0	0	0	0	177	23	0
7:30 AM	66	0	107	0	56	173	0	0	0	0	0	0	0	287	58	0
8:30 AM	49	0	75	0	48	148	0	0	0	0	0	0	0	167	31	0
9:30 AM	40	0	49	0	75	162	0	1	0	0	0	0	0	121	30	0
10:30 AM	42	0	58	0	46	132	0	0	0	0	0	0	0	134	30	0
11:30 AM	55	0	63	0	59	175	0	0	0	0	0	0	0	164	43	0
12:30 PM	43	0	64	0	49	177	0	0	0	0	0	0	0	151	35	0
1:30 PM	25	0	66	0	70	175	0	0	0	0	0	0	0	175	42	0
2:30 PM	46	0	102	0	103	243	0	0	0	0	0	0	0	214	61	0
3:30 PM	46	0	72	0	94	250	0	0	0	0	0	0	0	230	49	0
4:30 PM	70	0	81	0	111	302	0	0	0	0	0	0	0	269	82	0
5:30 PM	47	0	114	0	103	295	0	0	0	0	0	0	0	322	85	0

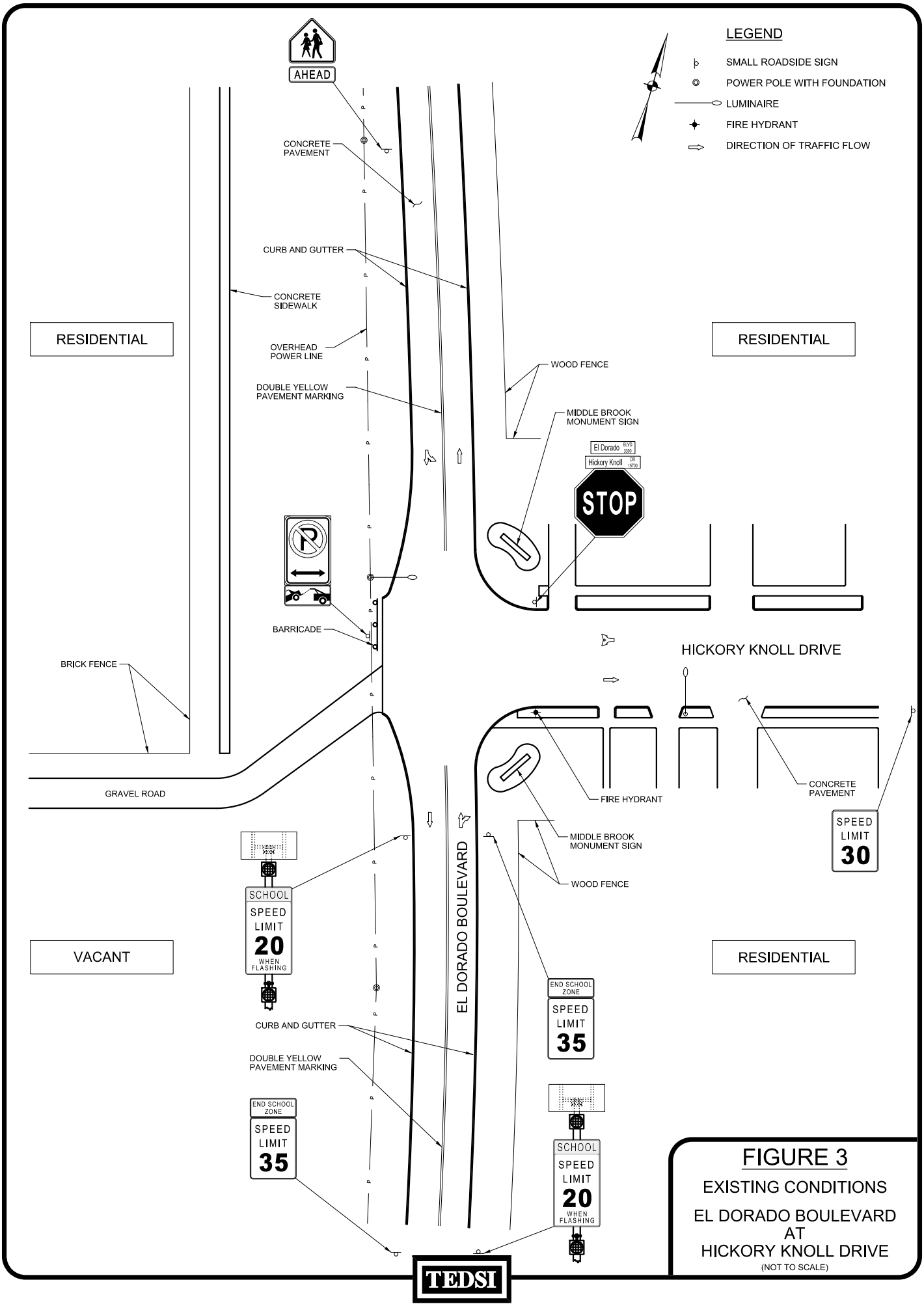


FIGURE 3

EXISTING CONDITIONS

EL DORADO BOULEVARD
AT
HICKORY KNOLL DRIVE

(NOT TO SCALE)

TEDSI

PROPOSED CONDITIONS

Roadway and Development

El Dorado Boulevard is proposed to be widened by Harris County in the near future in the vicinity of the study intersection. The roadway will be widened from its current two-lane concrete undivided roadway configuration to a four-lane concrete boulevard section with two lanes in each direction separated by a raised median in the center.

Crash Data: Since the existing roadway configuration along El Dorado Boulevard in the vicinity of the study intersection is proposed to be altered, current crash records at the study intersection are not applicable for the purposes of the signal warrant analysis; hence, not considered in the study.

ANALYSIS

Signal Warrant Analysis

Since El Dorado Boulevard is proposed to be widened by Harris County in the near future in the vicinity of the study intersection, the proposed roadway configuration and the current traffic volumes are considered in the signal warrant analysis as requested by Harris County. El Dorado Boulevard is considered the major street and Hickory Knoll Drive is considered the minor street for signal warrant analysis purposes based on the proposed geometry, existing traffic volumes, and the posted speed limit. The warrants are analyzed for urban conditions and 100% of the volume requirements are considered since the posted speed limits on El Dorado Boulevard do not exceed 40 mph. Warrants 3, 6, 7, 8 and 9 are not applicable to this study location. Based on the analysis, none of the applicable warrants satisfied the criteria for existing traffic and proposed roadway conditions. A summary of all warrants is shown in **Table 2**. Warrant analysis forms and graphs are included in **Appendix C**.

Table 2. *Results of Signal Warrant Analysis*
El Dorado Boulevard at Hickory Knoll Drive

Warrant	Analysis Result
1. Eight-Hour Vehicular Volume	Not Satisfied
2. Four Hour Vehicular Volume	Not Satisfied
3. Peak Hour Vehicular Volume	*Not Applicable*
4. Pedestrian Volume	Not Satisfied
5. School Crossing	Not Satisfied
6. Coordinated Signal System	*Not Applicable*
7. Crash Experience	*Not Applicable*
8. Roadway Network	*Not Applicable*
9. Intersection Near Grade Crossing	*Not Applicable*

Note: According to the TMUTCD, Warrant 3 shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. None of these facilities exist at the study intersection; hence, Warrant 3 is not applicable.

CONCLUSIONS

Based on the analysis of existing traffic and proposed roadway conditions at the intersection of El Dorado Boulevard at Hickory Knoll Drive, our findings are as follows:

1. A signal is not warranted at the intersection of El Dorado Boulevard at Hickory Knoll Drive based on weekday traffic volumes.
2. Intersection sight distance for westbound traffic (looking north) appears to be restricted by tree branches located at the northeast quadrant of the intersection. For all other approaches, sight distances appear to be adequate.

RECOMMENDATIONS

Based on the analysis, we recommend the following:

1. Maintain the existing "STOP" sign control on the westbound approach of Hickory Knoll Drive at El Dorado Boulevard.
2. Install pavement markings including stop bar along Hickory Knoll Drive at the study intersection during the widening of El Dorado Boulevard.
3. Consider trimming the lower branches of the tree located at the northeast quadrant of the intersection to improve sight distance for westbound traffic (looking north).

APPENDIX A
SITE PHOTOGRAPHS

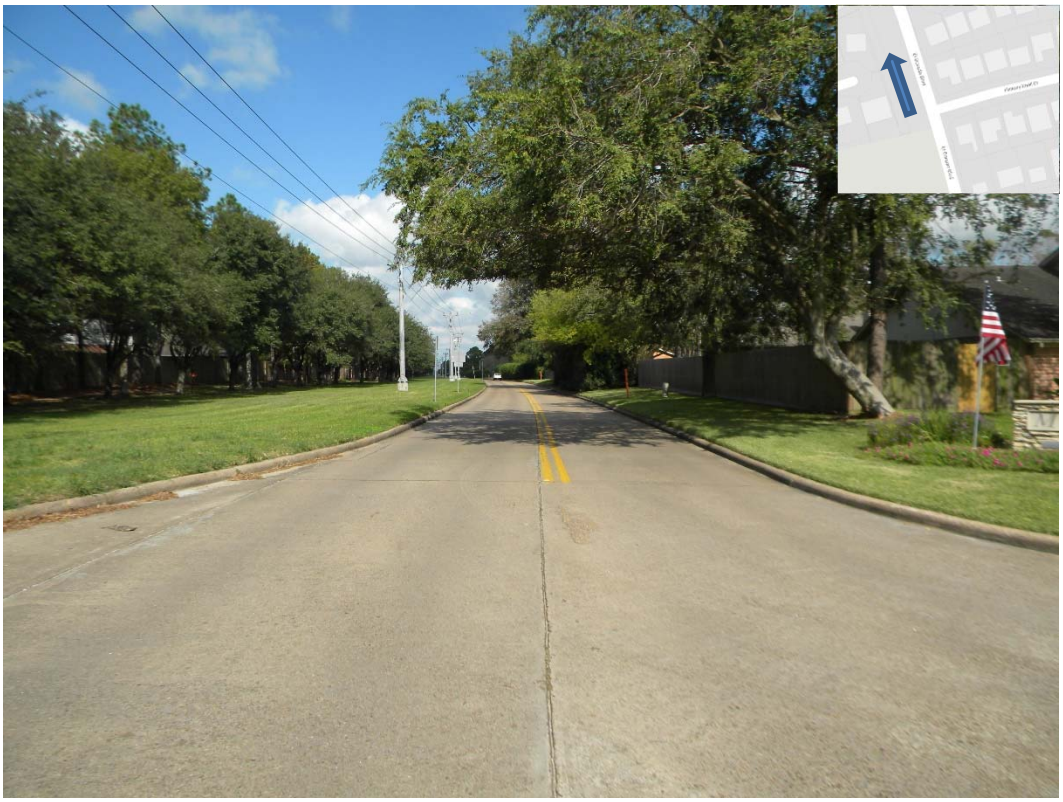
Facing West on Hickory Knoll Drive – East of El Dorado Boulevard

Facing East on Hickory Knoll Drive – East of El Dorado Boulevard

Facing North on El Dorado Boulevard – South of Hickory Knoll Drive

Facing South on El Dorado Boulevard – South of Hickory Knoll Drive

Facing South on El Dorado Boulevard – North of Hickory Knoll Drive



Facing North on El Dorado Boulevard – North of Hickory Knoll Drive

APPENDIX B
INTERSECTION TURNING MOVEMENT COUNTS

EL DORADO BOULEVARD AT HICKORY KNOLL DRIVE

Intersection Traffic Movement Counts

City:	HOUSTON	*Intersection:*	EL DORADO BOULEVARD AT HICKORY KNOLL DRIVE
County:	HARRIS COUNTY		
Date:	11/1/2017	*Speed Limit:*	EL DORADO - 35MPH, HICKORY KNOLL - 30MPH
Weather:	CLEAR	*Road Conditions:*	DRY

Approach:	**Westbound**					**Northbound**					**Eastbound**					**Southbound**				
Street:	Hickory Knoll Drive					El Dorado Boulevard					Private Driveway					El Dorado Boulevard				
Direction:	Right	Thru	Left	U-turn	Peds	Right	Thru	Left	U-turn	Peds	Right	Thru	Left	U-turn	Peds	Right	Thru	Left	U-turn	Peds
Designation:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Time Starts																				
5:30 AM																				
5:45 AM																				
6:00 AM																				
6:15 AM																				
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
6:30 AM	14	0	9	0	0	4	21	0	0	0	0	0	0	0	0	0	22	2	0	0
6:45 AM	17	0	14	0	0	7	26	0	0	0	0	0	0	0	0	0	58	4	0	0
7:00 AM	17	0	11	0	0	9	32	0	0	0	0	0	0	0	0	0	52	6	0	0
7:15 AM	16	0	21	0	0	11	44	0	0	0	0	0	0	0	0	0	45	11	0	0
Total	**64**	**0**	**55**	**0**	**0**	**31**	**123**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**177**	**23**	**0**	**0**
7:30 AM	15	0	24	0	0	10	33	0	0	0	0	0	0	0	0	0	53	12	0	0
7:45 AM	20	0	22	0	0	22	51	0	0	0	0	0	0	0	0	0	94	20	0	0
8:00 AM	20	0	27	0	0	15	53	0	0	0	0	0	0	0	0	0	58	13	0	0
8:15 AM	11	0	34	0	0	9	36	0	0	0	0	0	0	0	0	0	82	13	0	0
Total	**66**	**0**	**107**	**0**	**0**	**56**	**173**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**287**	**58**	**0**	**0**
8:30 AM	18	0	18	0	0	9	32	0	0	0	0	0	0	0	0	0	54	12	0	0
8:45 AM	14	0	27	0	0	16	46	0	0	0	0	0	0	0	0	0	33	9	0	0
9:00 AM	11	0	19	0	0	16	23	0	0	0	0	0	0	0	0	0	42	4	0	0
9:15 AM	6	0	11	0	0	7	47	0	0	0	0	0	0	0	0	0	38	6	0	0
Total	**49**	**0**	**75**	**0**	**0**	**48**	**148**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**167**	**31**	**0**	**0**
9:30 AM	4	0	14	0	0	24	50	0	0	0	0	0	0	0	0	0	42	4	0	0
9:45 AM	15	0	11	0	0	22	54	0	1	0	0	0	0	0	0	0	27	8	0	0
10:00 AM	12	0	13	0	0	14	27	0	0	0	0	0	0	0	0	0	22	9	0	0
10:15 AM	9	0	11	0	0	15	31	0	0	0	0	0	0	0	0	0	30	9	0	0
Total	**40**	**0**	**49**	**0**	**0**	**75**	**162**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**121**	**30**	**0**	**0**
10:30 AM	8	0	19	0	0	16	29	0	0	0	0	0	0	0	0	0	30	5	0	0
10:45 AM	14	0	11	0	0	13	29	0	0	0	0	0	0	0	0	0	37	11	0	0
11:00 AM	14	0	16	0	0	4	38	0	0	0	0	0	0	0	0	0	29	4	0	0
11:15 AM	6	0	12	0	0	13	36	0	0	0	0	0	0	0	0	0	38	10	0	0
Total	**42**	**0**	**58**	**0**	**0**	**46**	**132**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**134**	**30**	**0**	**0**
11:30 AM	13	0	14	0	0	15	39	0	0	0	0	0	0	0	0	0	43	12	0	0
11:45 AM	12	0	16	0	0	16	52	0	0	0	0	0	0	0	0	0	36	12	0	0
12:00 PM	16	0	15	0	0	17	40	0	0	0	0	0	0	0	0	0	42	13	0	0
12:15 PM	14	0	18	0	0	11	44	0	0	0	0	0	0	0	0	0	43	6	0	0
Total	**55**	**0**	**63**	**0**	**0**	**59**	**175**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**164**	**43**	**0**	**0**

AM Vol.	**316**	**0**	**407**	**0**	**0**	**315**	**913**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,050**	**215**	**0**	**0**
%	9.82%	0.00%	12.65%	0.00%		9.79%	28.38%	0.00%	0.03%		0.00%	0.00%	0.00%	0.00%		0.00%	32.64%	6.68%	0.00%	
AM App. Vol.	**723**					**1,229**					**0**					**1,265**				
%	22.47%					38.20%					0.00%					39.32%				
% of AM App. Vol.	43.71%	0.00%	56.29%	0.00%		25.63%	74.29%	0.00%	0.08%		0.00%	0.00%	0.00%	0.00%		0.00%	83.00%	17.00%	0.00%	

EL DORADO BOULEVARD AT HICKORY KNOLL DRIVE

Intersection Traffic Movement Counts

City:	HOUSTON	*Intersection:*	EL DORADO BOULEVARD AT HICKORY KNOLL DRIVE
County:	HARRIS COUNTY		
Date:	11/1/2017	*Speed Limit:*	EL DORADO - 35MPH, HICKORY KNOLL - 30MPH
Weather:	CLEAR	*Road Conditions:*	DRY

Approach:	**Westbound**					**Northbound**					**Eastbound**					**Southbound**				
Street:	Hickory Knoll Drive					El Dorado Boulevard					Private Driveway					El Dorado Boulevard				
Direction:	Right	Thru	Left	U-turn	Peds	Right	Thru	Left	U-turn	Peds	Right	Thru	Left	U-turn	Peds	Right	Thru	Left	U-turn	Peds
Designation:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Time Starts																				
12:30 PM	11	0	13	0	0	11	40	0	0	0	0	0	0	0	0	0	34	11	0	0
12:45 PM	12	0	11	0	0	14	43	0	0	0	0	0	0	0	0	0	42	6	0	0
1:00 PM	8	0	21	0	0	12	56	0	0	0	0	0	0	0	0	0	33	6	0	0
1:15 PM	12	0	19	0	0	12	38	0	0	0	0	0	0	0	0	0	42	12	0	0
Total	**43**	**0**	**64**	**0**	**0**	**49**	**177**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**151**	**35**	**0**	**0**
1:30 PM	5	0	13	0	1	12	55	0	0	0	0	0	0	0	0	0	46	7	0	1
1:45 PM	5	0	24	0	0	13	39	0	0	0	0	0	0	0	0	0	41	18	0	0
2:00 PM	9	0	17	0	0	17	35	0	0	0	0	0	0	0	0	0	44	8	0	0
2:15 PM	6	0	12	0	0	28	46	0	0	0	0	0	0	0	0	0	44	9	0	0
Total	**25**	**0**	**66**	**0**	**1**	**70**	**175**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**175**	**42**	**0**	**1**
2:30 PM	8	0	16	0	0	23	45	0	0	0	0	0	0	0	0	0	38	14	0	0
2:45 PM	10	0	23	0	0	23	65	0	0	0	0	0	0	0	0	0	72	14	0	0
3:00 PM	15	0	25	0	0	40	78	0	0	0	0	0	0	0	0	0	54	19	0	0
3:15 PM	13	0	38	0	0	17	55	0	0	0	0	0	0	0	0	0	50	14	0	0
Total	**46**	**0**	**102**	**0**	**0**	**103**	**243**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**214**	**61**	**0**	**0**
3:30 PM	6	0	20	0	0	21	74	0	0	0	0	0	0	0	0	0	61	11	0	0
3:45 PM	15	0	18	0	0	19	61	0	0	0	0	0	0	0	0	0	43	11	0	0
4:00 PM	10	0	19	0	0	23	58	0	0	0	0	0	0	0	0	0	68	19	0	0
4:15 PM	15	0	15	0	0	31	57	0	0	0	0	0	0	0	0	0	58	8	0	0
Total	**46**	**0**	**72**	**0**	**0**	**94**	**250**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**230**	**49**	**0**	**0**
4:30 PM	19	0	23	0	1	19	54	0	0	0	0	0	0	0	0	0	47	21	0	0
4:45 PM	10	0	15	0	0	24	81	0	0	0	0	0	0	0	0	0	65	28	0	0
5:00 PM	27	0	21	0	0	32	85	0	0	0	0	0	0	0	0	0	74	15	0	0
5:15 PM	14	0	22	0	0	36	82	0	0	0	0	0	0	0	0	0	83	18	0	0
Total	**70**	**0**	**81**	**0**	**1**	**111**	**302**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**269**	**82**	**0**	**0**
5:30 PM	10	0	22	0	0	27	85	0	0	0	0	0	0	0	0	0	71	33	0	0
5:45 PM	15	0	28	0	0	28	72	0	0	0	0	0	0	0	0	0	84	17	0	0
6:00 PM	10	0	35	0	0	19	69	0	0	0	0	0	0	0	0	0	71	22	0	0
6:15 PM	12	0	29	0	0	29	69	0	0	0	0	0	0	0	0	0	96	13	0	0
Total	**47**	**0**	**114**	**0**	**0**	**103**	**295**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**322**	**85**	**0**	**0**
6:30 PM																				
6:45 PM																				
7:00 PM																				
7:15 PM																				
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:30 PM																				
7:45 PM																				
8:00 PM																				
8:15 PM																				
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

PM Vol.	**277**	**0**	**499**	**0**	**2**	**530**	**1,442**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,361**	**354**	**0**	**1**
%	6.21%	0.00%	11.18%	0.00%		11.88%	32.31%	0.00%	0.00%		0.00%	0.00%	0.00%	0.00%		0.00%	30.50%	7.93%	0.00%	
PM App. Vol.	**776**					**1,972**					**0**					**1,715**				
%	17.39%					44.19%					0.00%					38.43%				
% of PM App. Vol.	35.70%	0.00%	64.30%	0.00%		26.88%	73.12%	0.00%	0.00%		0.00%	0.00%	0.00%	0.00%		0.00%	79.36%	20.64%	0.00%	

Day Vol.	**593**	**0**	**906**	**0**	**2**	**845**	**2,355**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,411**	**569**	**0**	**1**
%	7.72%	0.00%	11.80%	0.00%		11.00%	30.66%	0.00%	0.01%		0.00%	0.00%	0.00%	0.00%		0.00%	31.39%	7.41%	0.00%	
Day App. Vol.	**1,499**					**3,201**					**0**					**2,980**				
%	19.52%					41.68%					0.00%					38.80%				
% of Day App. Vol.	39.56%	0.00%	60.44%	0.00%		26.40%	73.57%	0.00%	0.03%		0.00%	0.00%	0.00%	0.00%		0.00%	80.91%	19.09%	0.00%	

APPENDIX C
SIGNAL WARRANT ANALYSIS – CURRENT YEAR 2017

EL DORADO BOULEVARD AT HICKORY KNOLL DRIVE
SUPPLEMENT TO TRAFFIC SURVEY-COUNT ANALYSIS FORM

Time Period	Traffic Volumes					Rank
	Major Street			Minor Street High Volume Approach	Total Volume	
	Northbound	Southbound	Both Apps.			
6:30 am - 7:30 am	154	200	354	119	473	-
7:30 am - 8:30 am	229	345	574	173	747	4
8:30 am - 9:30 am	196	198	394	124	518	-
9:30 am - 10:30 am	238	151	389	89	478	-
10:30 am - 11:30 am	178	164	342	100	442	-
11:30 am - 12:30 pm	234	207	441	118	559	6
12:30 pm - 1:30 pm	226	186	412	107	519	8
1:30 pm - 2:30 pm	245	217	462	91	553	7
2:30 pm - 3:30 pm	346	275	621	148	769	3
3:30 pm - 4:30 pm	344	279	623	118	741	5
4:30 pm - 5:30 pm	413	351	764	151	915	2
5:30 pm - 6:30 pm	398	407	805	161	966	1

Traffic Survey — Count Analysis

Texas Department of Transportation

Form Revised 2/27/2012

2011 TMUTCD Warrants

County: Harris District: Houston

City: Houston Population: Survey Date: 11/1/2017

	Route #	Name	Control	Section	Posted Speed (mph)
Major		El Dorado Boulevard			35
Minor		Hickory Knoll Drive			30

Eight Highest Hours: Include the same 8 hours for the Major and Minor St. volumes.

Time Ends	Major St. - Both App.		Minor St. - Hi. Vol. App.	
	Veh. Total	Ped. Total	Veh. Total	Ped. Total
6:30 PM	805		161	
5:30 PM	764		151	1
3:30 PM	621		148	
8:30 AM	574		173	
4:30 PM	623		118	
12:30 PM	441		118	
2:30 PM	462	1	91	1
1:30 PM	412		107	

Comments:
100% of the volume requirements are considered since speed limit along El Dorado Boulevard is not more than 40 mph.

Major Street 8th Highest Hour = 412

Minor Street 8th Highest Hour = 91

Warrant 1. Eight Hour Vehicular Volume ***Not Satisfied***

☐ Yes ☑ No Meets 70%[c] (and major-street speed exceeds 40 mph or population less than 10,000) *or* 100%[a] (regardless of speed) of Condition A.

– or –

☐ Yes ☑ No Meets 70%[c] (and major-street speed exceeds 40 mph or population less than 10,000) *or* 100%[a] (regardless of speed) of Condition B.

– or –

☐ Yes ☑ No Meets 80%[b] of Conditions A and B.

– or –

☐ Yes ☑ No Meets 56%[d] of Conditions A and B (and major-street speed exceeds 40 mph or population less than 10,000).

Condition A - Minimum Vehicle Volume

Number of Lanes		Vehicles per hour on Major St (Total of Both Approaches)					Vehicles per hour on higher-volume Minor St approach (One Direction Only)				
Major	Minor	Required				Existing	Required				Existing
Street	Street	**100%[a]**	**80%[b]**	70%[c]	56%[d]	**69%**	**100%[a]**	**80%[b]**	70%[c]	56%[d]	**61%**
1	1	**500**	**400**	350	280		**150**	**120**	105	84	
2 or more	1	**600**	**480**	420	336	**412**	**150**	**120**	105	84	**91**
2 or more	2 or more	**600**	**480**	420	336		**200**	**160**	140	112	
1	2 or more	**500**	**400**	350	280		**200**	**160**	140	112	

Condition B - Interruption of Continuous Traffic

Number of Lanes		Vehicles per hour on Major St (Total of Both Approaches)					Vehicles per hour on higher-volume Minor St approach (One Direction Only)				
Major	Minor	Required				Existing	Required				Existing
Street	Street	**100%[a]**	**80%[b]**	70%[c]	56%[d]	**46%**	**100%[a]**	**80%[b]**	70%[c]	56%[d]	**100+%**
1	1	**750**	**600**	525	420		**75**	**60**	53	42	
2 or more	1	**900**	**720**	630	504	**412**	**75**	**60**	53	42	**91**
2 or more	2 or more	**900**	**720**	630	504		**100**	**80**	70	56	
1	2 or more	**750**	**600**	525	420		**100**	**80**	70	56	

[a]Basic minimum hourly volume.

[b]Used for combination of Conditions A and B after adequate trial of other remedial measures.

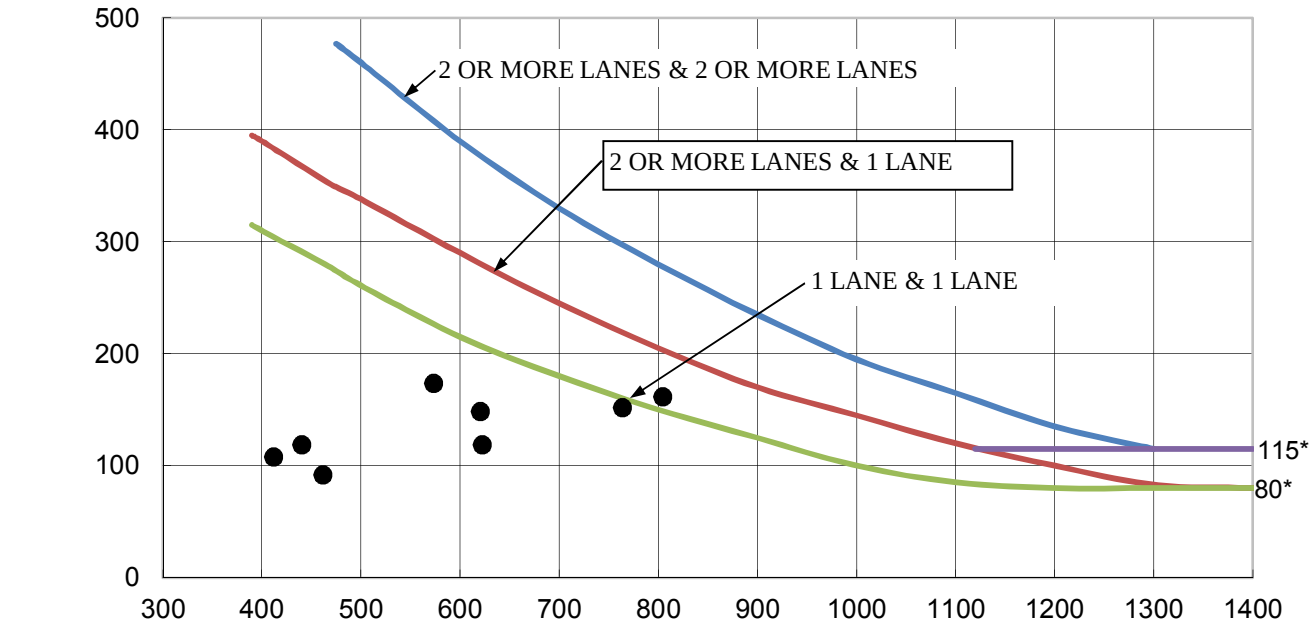
[c]May be used when the major-street speed exceeds 40 mph or in a community with a population of less than 10,000.

[d]May be used for combination of Conditions A and B after adequat trial of other remedial measures when major street exceeds 40 mph or in an isolated community with a population of less than 10,000.

*Percentages were calculated by comparing the 8th highest hour volumes with the 70% of the volume requirements.

Warrant 2. Four Hour Volumes ***Not Satisfied***

☐ Yes ☑ No	Meets each of 4 Highest Hours (Warrant 2 — see Figure 1).



(805, 161)	(623, 118)
(764, 151)	(441, 118)
(621, 148)	(462, 91)
(574, 173)	(412, 107)

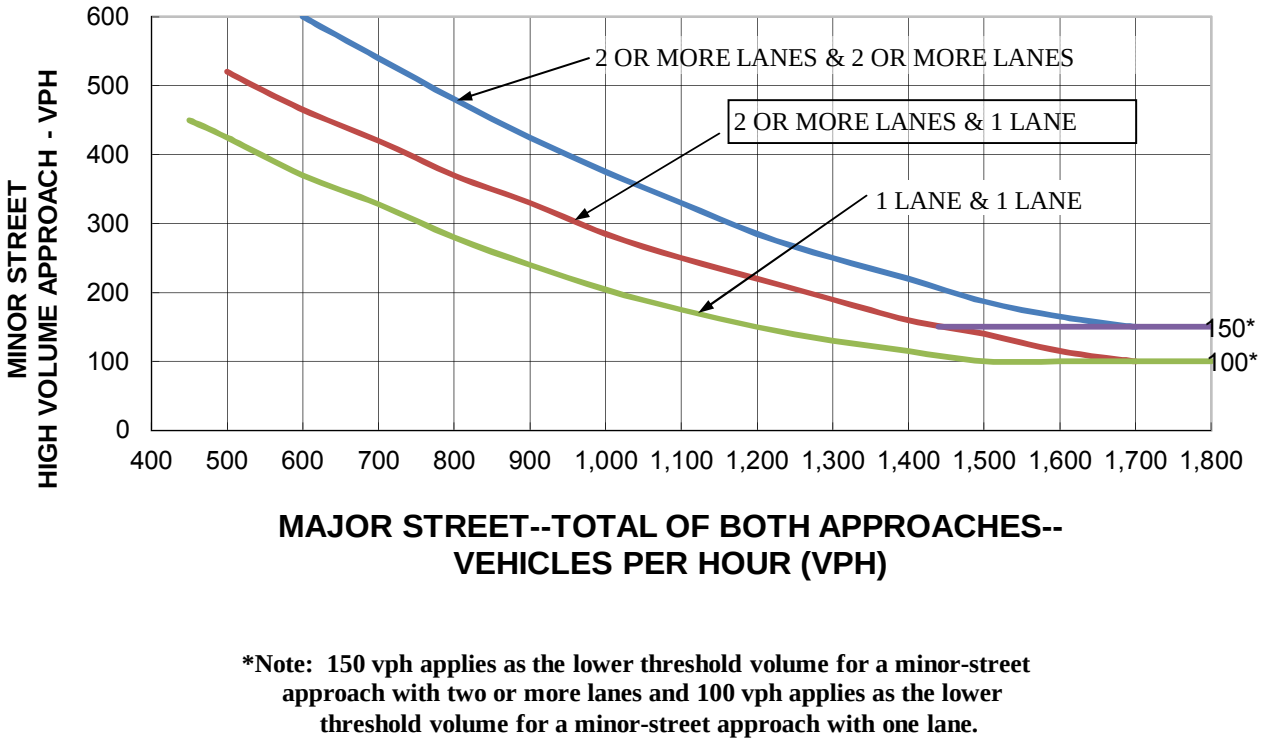
MAJOR STREET -- TOTAL OF BOTH APPROACHES-- VEHICLES PER HOUR (VPH)

***Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 1. Four-hour volume warrant. (Warrant 2.)

Warrant 3. Peak Hour ***Not Applicable***

☐ Yes ☐ No	Are all of the following conditions true for any four consecutive 15 minute periods? 1. The total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds 4 vehicle-hours for a one-lane approach and 5 vehicle-hours for a two-lane approach, *and* 2. The volume of the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, *and* 3. The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four (or more) approaches.
	– or –
☐ Yes ☐ No	Meets one High Hour (Warrant 3 — see Figure 2).

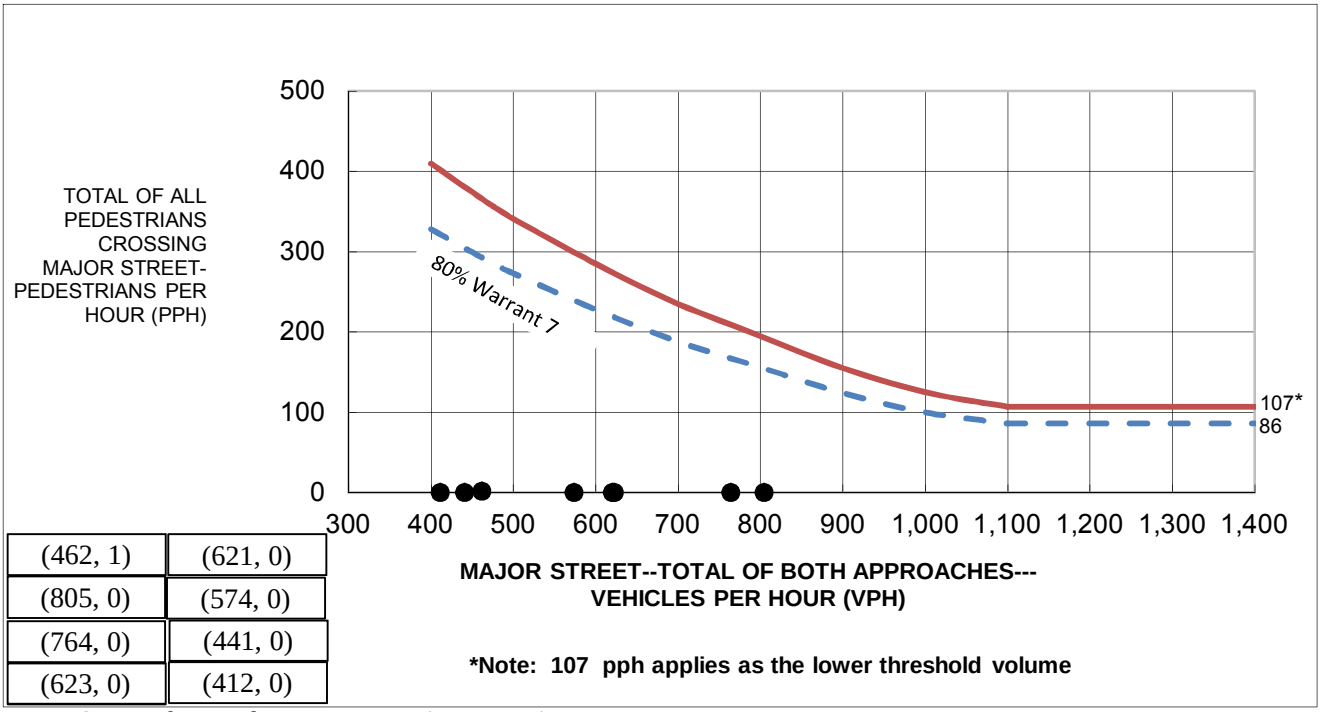


***Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.**

Figure 2. Peak hour volume warrant. (Warrant 3.)

Warrant 4. Four Hour Pedestrian Volumes *Not Satisfied*

☐ Yes	☑ No	Meets each of 4 Highest Hours (Warrant4 — see Figure 3).

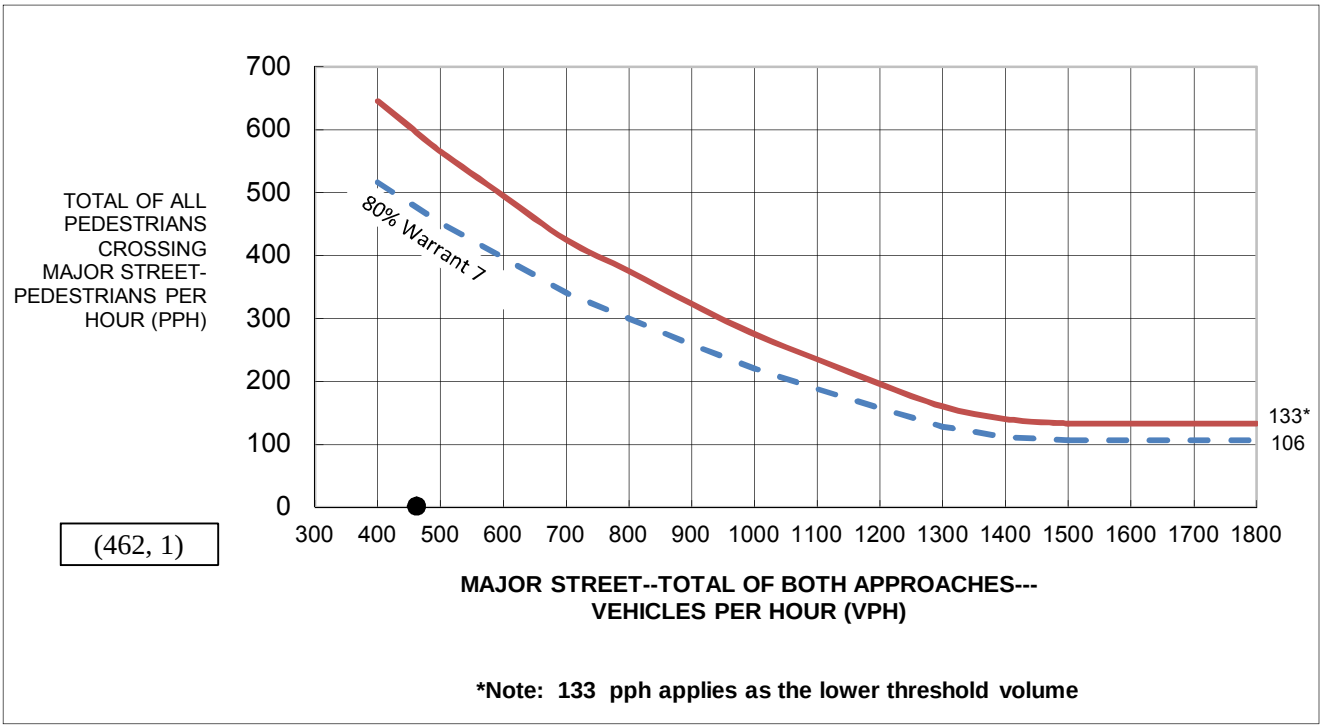


(462, 1)	(621, 0)
(805, 0)	(574, 0)
(764, 0)	(441, 0)
(623, 0)	(412, 0)

Figure 3. Four-hour pedestrian warrant. (Warrant 4.)

Warrant 4. Peak Hour Pedestrian Volumes *Not Satisfied*

☐ Yes	☑ No	Meets Peak Hour Pedestrian (Warrant4 — see Figure 4).



(462, 1)

Figure 4. Peak hour pedestrian warrant. (Warrant 4.)

Warrant 5. School Crossing ***Not Satisfied***

☐ Yes	☐ No	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
		– and –
☐ Yes	☑ No	Is there a minimum of 20 students during the highest crossing hour?
		– and –
☑ Yes	☐ No	Is the nearest signal located more than 300 feet away? (This warrant may be applied, if the proposed signal is less than 300 feet and does not restrict the progressive movement of traffic.)

Warrant 6. Coordinated Signal System ***Not Applicable***

☐ Yes	☐ No	On a one-way street or a street with traffic predominantly in one direction, are the adjacent signals far enough apart that the necessary degree of vehicle platooning does not occur?
		– or –
☐ Yes	☐ No	On a two-way street, are the adjacent signals far enough appart that the necessary degree of vehicle platooning does not occur and would the proposed and adjacent traffic control signal provide a progressive operation?

Warrant 7. Crash Experience ***Not Applicable***

☐ Yes	☐ No	Is one of the following conditions met?: ♦ 80% of Condition A or Condition B in Warrant 1 ♦ 56% of Condition A or B in Warrant 1 (major-street speed exceeding 40 mph or population less than 10,000) ♦ 80 % or more of Warrant 4 met?
		– and –
☐ Yes	☐ No	Have there been 5 or more reportable crashes susceptible to correction by a traffic signal within a 12 month period?

Warrant 8. Roadway Network ***Not Applicable***

☐ Yes	☐ No	Is the total existing, or immediately projected, entering volume on all approaches greater than 1000 vehicles for each of any 5 hours of a Saturday and/or Sunday.
		– or –
☐ Yes	☐ No	Is the total existing, or immediately projected, entering volume greater than 1000 vehicles for the peak hour of a typical weekday, and do the 5 year projected traffic volumes meet one or more of Warrants 1, 2, and 3 during an average weekday?

Check applicable characteristics of each route:

Major Street	Minor Street	
☑	☐	It is part of street or highway system that serves as the principal roadway network for through traffic flow.
☐	☐	It includes rural or suburban highways outside, entering, or traversing a city.
☑	☐	It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.

Warrant 9. Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing) ***Not Applicable***

☐ Yes ☐ No	Meets one High Hour (Warrant 9 — see Figure 5).

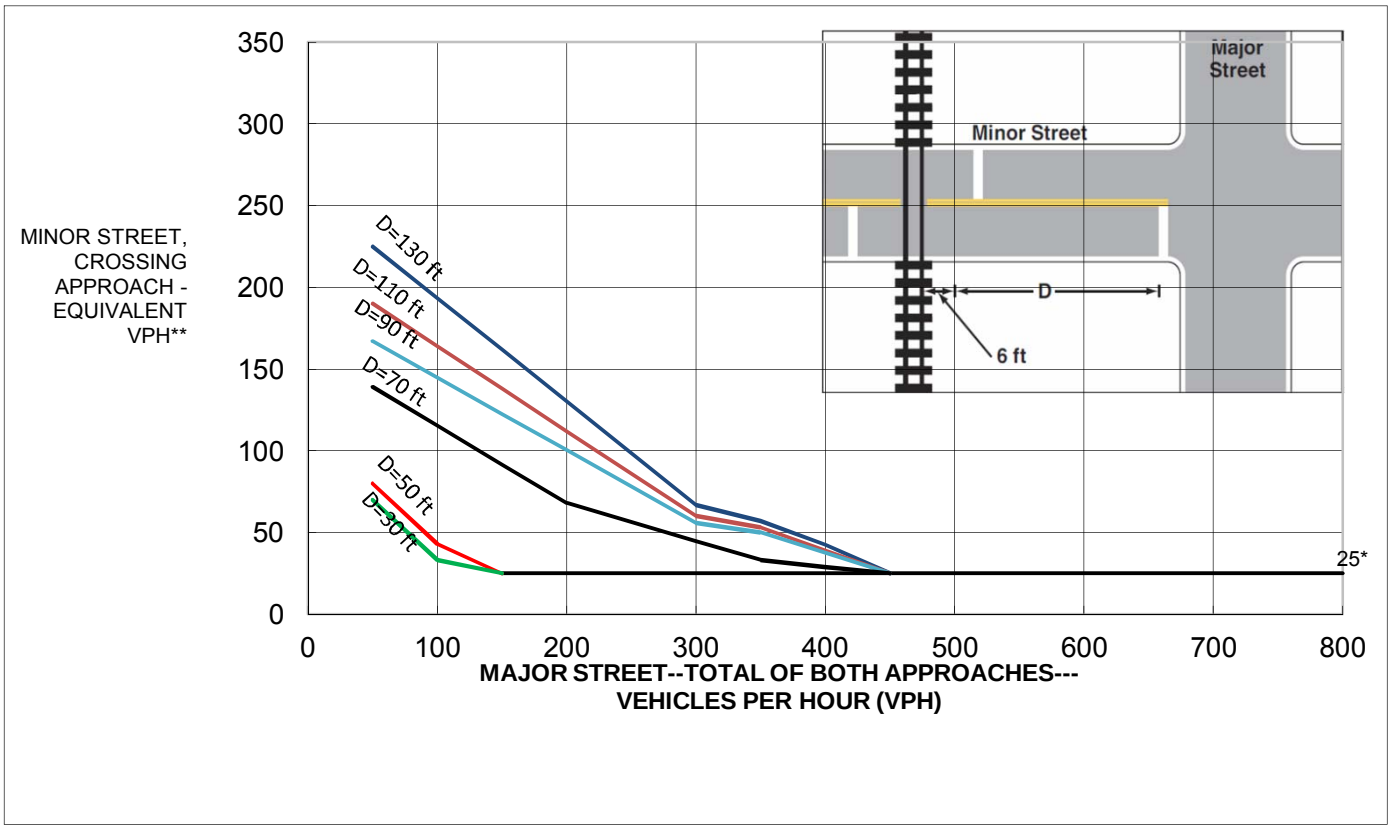


Figure 5. Railroad Grade Crossing (One Approach Lane at the Track Crossing). (Warrant 9.)

*25 vph applies as the lower threshold volume
** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

Remarks:
Traffic signal is not warranted.
Warrants 1, 2, 4, and 5 are not satisfied.
Warrants 3, 6, 7, 8, and 9 are not applicable.