

**ACCEPTED for FILE**  
**Engineering Review**

05/02/2019 11:06:26 AM

dsdrice

JeffRice@elpasoco.com

(719) 520-7877

**EPC Planning & Community  
Development Department**

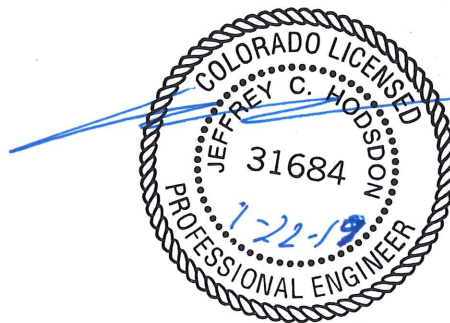
**LSC TRANSPORTATION CONSULTANTS, INC.**  
545 East Pikes Peak Avenue, Suite 210  
Colorado Springs, CO 80903  
(719) 633-2868  
FAX (719) 633-5430  
E-mail: [lsc@lsctrans.com](mailto:lsc@lsctrans.com)  
Website: <http://www.lsctrans.com>



**Lorson Ranch East Filing No. 3**  
**Transportation Memorandum**  
(LSC #194010)  
January 22, 2019


**Traffic Engineer's Statement**

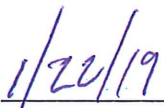
This traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.



**Developer's Statement**

I, the Developer, have read and will comply with all commitments made on my behalf within this report.

  
\_\_\_\_\_

  
\_\_\_\_\_  
Date

**SF-19-003**



**LSC TRANSPORTATION CONSULTANTS, INC.**  
**545 East Pikes Peak Avenue, Suite 210**  
**Colorado Springs, CO 80903**  
**(719) 633-2868**  
**FAX (719) 633-5430**  
**E-mail: [lsc@lsctrans.com](mailto:lsc@lsctrans.com)**  
**Website: <http://www.lsctrans.com>**

January 18, 2019

Mr. Jeff Mark  
The Landhuis Company  
212 North Wahsatch Avenue, Suite 301  
Colorado Springs, CO 80903

RE: Lorson Ranch East Filing No. 3  
El Paso County, Colorado  
Transportation Memorandum  
LSC #194010

Dear Mr. Mark:

LSC Transportation Consultants, Inc. has prepared this transportation memorandum to accompany the submittal for the Lorson Ranch East Filing No. 3 residential development to be located within the Lorson Ranch development in El Paso County, Colorado. The site location is shown in Figure 1. LSC prepared a traffic impact study (TIS) for the entire Lorson Ranch East Preliminary Plan dated November 9, 2017 and revised January 8, 2018. LSC also prepared transportation memoranda for Filing No. 1 dated May 2, 2018 and Filing No. 2 dated October 25, 2018. A separate traffic impact study was also submitted for the school site (by LSC, dated May 11, 2018). The lot and street plan has not changed since completion of the overall TIS. The site plan is shown in Figure 2. This memorandum contains the following:

- Recent/current street and traffic conditions in the vicinity of the site including the street widths, lane geometries, traffic controls, posted speed limits, street classification, etc.
- Existing traffic volumes at the key intersections in the vicinity of the site and estimates of short-term background traffic volumes.
- The projected average weekday and peak-hour vehicle-trips to be generated by Filing 3.
- The assignment of the projected trips to the existing and planned street system.
- The resulting short-term total traffic volumes on the street system.
- The resulting traffic impacts. The traffic impacts have been quantified by determining the future levels of service at the intersections of Marksheffel Road/Lorson Boulevard, Marksheffel Road/Fontaine Boulevard, and Lamprey Drive/Fontaine Boulevard.
- Recommendations regarding the need for a fair-share contribution toward the future traffic signal at the intersection of Marksheffel Road and Lorson Boulevard.
- Recommendations for street functional classifications for streets within Filing 3.
- The required Countywide Road Impact Fees.

## ROADWAY AND TRAFFIC CONDITIONS

### Area Roadways

Figure 1 shows the roadways in the vicinity of the site. The major roadways are identified below followed by a brief description of each.

- **Marksheffel Road** extends north from the Link Road/C&S Road intersection in Fountain, Colorado to north of Woodmen Road. Marksheffel Road is shown as a future four-lane Expressway on the County *Major Transportation Corridors Plan (MTCP)*. The posted speed limit on Marksheffel Road is 55 miles per hour (mph). The PPRTA has completed the Marksheffel Road upgrade between Mesa Ridge Parkway and Bradley Road. This included intersection improvements at the Fontaine Boulevard intersection.
- **Fontaine Boulevard** is designated as a four-lane Urban Principal Arterial east of Marksheffel Road and it exists as such from Marksheffel Road east to Old Glory Drive. As part of Lorson Ranch East Filing No 1 Fontaine Boulevard will be extended east from Old Glory Drive (the road extension is close to completion, but as of mid-January 2019, is not yet open to the public). An Urban Non-Residential Collector Street has been constructed east of Stingray Lane. The posted speed limit on Fontaine Boulevard is 35 mph just east of (and a short distance west of) Marksheffel Road. The speed limit increases to 45 mph just east of the bridge over Jimmy Camp Creek.
- **Lorson Boulevard** currently extends east from Marksheffel Road to Wando Drive. The posted speed limit is 35 mph. The section of Lorson Boulevard connecting Stingray Lane and Willapa Drive via a bridge over the east tributary will be constructed as part of Filing 1. Lorson Boulevard is classified as an Urban Non-Residential Collector Street (modified for a 44-foot street width rather than the standard 52-foot street width) with an 80-foot-wide right-of-way. The section between the east boundary of Carriage Meadows Drive and Stingray Lane will be constructed with Filing 2. East of Stingray Lane, Lorson Boulevard will be classified as an Urban Non-Residential Collector Street (modified for a 44-foot street width rather than the standard 52-foot street width). The right-of-way will vary from 64 feet to 72 feet to accommodate anticipated future right-turn deceleration lanes. The right-of-way not adjacent to right-turn lanes would be 64 feet. Also, tracts adjacent to the right-of-way will allow for future right-of-way expansion to 80 feet if ever needed. The proposed cross section includes two 14-foot "shared-use" travel lanes, a striped two-way left-turn lane, and right-turn deceleration lanes where warranted.

### Baseline Traffic Volumes

Figure 3 shows the recent traffic volumes at the intersection of Marksheffel Road/Fontaine Boulevard. These "baseline" traffic volumes were based on traffic counts conducted by LSC in March 2018. The traffic count reports are attached.

## Baseline Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A represents control delay of less than 10 seconds for unsignalized and signalized intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections and more than 80 seconds for signalized intersections. Table 1 shows the level of service delay ranges.

<b>Table 1</b>			
<b>Intersection Levels of Service Delay Ranges</b>			
<b>Level of Service</b>	<b>Signalized Intersections</b>		<b>Unsignalized Intersections</b>
	<b>Average Control Delay (seconds per vehicle)</b>	<b>V/C<sup>(1)</sup></b>	<b>Average Control Delay (seconds per vehicle)<sup>(2)</sup></b>
A	10.0 sec or less	less than 0.60	10.0 sec or less
B	10.1-20.0 sec	0.60-0.69	10.1-15.0 sec
C	20.1-35.0 sec	0.70-0.79	15.1-25.0 sec
D	35.1-55.0 sec	0.80-0.89	25.1-35.0 sec
E	55.1-80.0 sec	0.90-0.99	35.1-50.0 sec
F	80.1 sec or more	1.00 and greater	50.1 sec or more
(1) Source: <i>Transportation Research Circular 212</i>			
(2) For unsignalized intersections if V/C ratio is greater than 1.0 the level of service is LOS F regardless of the projected average control delay per vehicle.			

The intersection of Marksheffel/Fontaine was analyzed to determine the baseline levels of service using Synchro. Figure 3 shows the level of service analysis results. As shown on the figure, all movements at this intersection are level of service C or better during the peak hours. The level of service (LOS) reports are attached. The short-term Synchro analysis was updated from prior Lorson East reports to take the newer volume data into account. The baseline and short-term Synchro analysis was modified based on these new counts conducted at Marksheffel/Fontaine in 2018. These counts were taken after the opening of the connection of Mesa Ridge Parkway to Marksheffel Road.

## SHORT-TERM (YEAR 2020) BACKGROUND TRAFFIC

Background traffic is the traffic estimated to be on the roadways without the Lorson Ranch East Filing 3 traffic. The short-term background traffic volumes are shown in Figure 4. The background traffic volumes are based on the baseline traffic volumes shown in Figure 3 with a portion of the volumes assumed to be rerouted with the construction of Lorson Boulevard from Marksheffel Road to Willapa Drive including crossing both the Jimmy Camp Creek main channel and east tributary. The short-term background traffic also includes additional traffic generated by buildout of the residential portion of Lorson Ranch subdivisions north of Lorson Boulevard between Jimmy Camp

Creek and the east tributary, the Carriage Meadows North and Carriage Meadows South subdivisions located west of Jimmy Camp Creek, Lorson Ranch East Filings 1 and 2, Creekside at Lorson Ranch Filing 1, and the school located northeast of Fontaine Boulevard and Lamprey Drive but assumes zero traffic generated by Lorson Ranch East Filing 3.

## **SITE DEVELOPMENT AND LAND USE**

### **Filing No. 3**

Figure 2 shows the proposed site plan for Lorson Ranch East Filing 3. There are no changes to the lot layout, street network, and access points from the plan shown in the Preliminary Plan Traffic Impact Study. As shown in Figure 2, Filing 3 is planned to include 81 lots for single-family homes. Note: the location of these lots is **not** in the same location assumed in the Preliminary Plan TIS for the remaining 28 lots included as part of Phase 1. One additional full-movement access is proposed to Lamprey Drive with Filing 3. This access is located about 550 feet east of the eastern Filing 2 access point.

### **Previously-Submitted Land Use**

#### Filing No. 1 and the Lorson Ranch School Site

Lorson Ranch East Filing 1 is planned to include 303 lots for single-family homes. This is 28 fewer lots than were included in Phase 1 of the Preliminary Plan Traffic Impact Study. A separate Transportation Memorandum dated May 2, 2018 has been submitted for this filing. The school site north of Fontaine Boulevard and east of Lamprey Drive is also planned to be developed in the short-term future. A separate traffic impact study has been submitted for the school site dated May 11, 2018.

As part of Filing 1, Fontaine Boulevard has been extended (but as of mid-January 2018, is not yet open to the public) east from its current terminus at the intersection of Stingray Lane and Old Glory (east) to the east boundary of the school site. Plans show Lamprey Drive extending north from Fontaine Boulevard to the north Lorson Ranch East Filing 2 access point (Shavers Drive) and south to Lorson Boulevard.

#### Filing No. 2

Filing 2 is planned to include 196 lots for single-family homes. The location of these lots is **not** in the same location assumed in the Preliminary Plan TIS for the remaining 28 lots included as part of Phase 1.

One full-movement access (Edisto Drive) is proposed to Fontaine Boulevard about 390 feet east of Lamprey Drive. Two additional full-movement access points are proposed to Lamprey Drive.

## **TRIP GENERATION**

Estimates of the traffic volumes expected to be generated by the site have been made using the nationally published trip generation rates found in *Trip Generation, 10<sup>th</sup> Edition, 2017* by the Institute of Transportation Engineers (ITE). Table 2 shows the results of the trip generation estimates.

As shown in Table 2, Lorson Ranch East Filing 3 is projected to generate about 765 new vehicle-trips on the average weekday, with about one-half of the vehicles entering and one-half of the vehicles exiting in a 24-hour period. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 15 vehicles would enter and 45 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:30 and 6:30 p.m., about 51 vehicles would enter and 30 vehicles would exit the site.

## **TRIP DISTRIBUTION AND ASSIGNMENT**

The directional distribution of the site-generated traffic volumes on the street and roadway system serving the site is one of the most important factors in determining the site's traffic impacts. Figure 5 shows the external trip distribution estimates (external to Lorson Ranch). The directional distribution estimates have been based on the location of the site with respect to the regional residential employment, commercial, and activity centers; the land use proposed; the access/roadway connections assumed; the roadway network; and the most recent traffic counts conducted at the intersection of Marksheffel/Fontaine.

When the external trip distribution percentages (from Figure 5) are applied to the trip generation estimates (from Table 2), the resulting site-generated traffic volumes can be determined. Figure 6 shows the short-term site-generated traffic volume estimates. The short-term site-generated traffic volumes assume all trips generated by Lorson Ranch East Filing 3 have origins and destinations outside of Lorson Ranch.

The short-term site-generated traffic volumes assume Lorson Boulevard has been constructed from Wando Drive east across both the main Jimmy Camp Creek bed and the east tributary to Lamprey Drive.

## **PROJECTED SHORT-TERM TOTAL TRAFFIC**

Figure 7 shows the short-term total traffic volumes. These volumes are the sum of the short-term background traffic volumes (from Figure 4) plus the short-term site-generated traffic volumes (from Figure 6).

## **2040 TOTAL TRAFFIC**

Figure 8 shows the 2040 total traffic volumes at the site access points to Lamprey Drive and the projected buildout average weekday traffic volumes on key street segments within Filing 3. Please refer to Preliminary Plan Traffic Impact Study for the 2040 total traffic volumes and level of service analysis of all other intersections.

## **PROJECTED LEVELS OF SERVICE**

The intersections of Marksheffel/Lorson, Marksheffel Road/Fontaine Boulevard, and Fontaine/Lamprey have been analyzed to determine the projected levels of service for the short-term background and total traffic volumes based on the signalized method of analysis from Synchro and the unsignalized method of analysis procedures outlined in the *Highway Capacity Manual, 2010 Edition* by the Transportation Research Board. The level of service reports are attached. The results of the analysis are shown in Figures 4 and 7.

Note: New counts were conducted at Marksheffel/Fontaine in 2018 after the opening of the connection of Mesa Ridge Parkway to Marksheffel Road. As such, the short-term baseline volumes and Synchro analyses were adjusted accordingly. The short-term background and total traffic volumes in this report also account for the Lorson Boulevard connection across the Jimmy Camp Creek main channel. The 2040 analysis in the Preliminary Plan report already accounts for the Mesa Ridge connection to Marksheffel, the future Lorson Boulevard connection, and other considerations for the long-term future.

### **Marksheffel/Fontaine**

The signal-controlled Marksheffel Road/Fontaine Boulevard intersection is projected to operate at a level of service C or better for all movements based on the short-term background and total traffic conditions.

### **Marksheffel/Lorson**

Based on the projected short-term background and total traffic volumes the westbound left-turn movement at the intersection of Marksheffel/Lorson is projected to operate at LOS F during the morning peak hour and LOS E during the afternoon peak hour if this intersection remains a conventional, stop-sign-controlled, full-movement intersection. Assuming either a conventional, signal-controlled intersection or a modern roundabout, all movements are projected to operate at LOS B or better during the peak hours based on both short-term traffic volumes.

### **Fontaine/Lamprey**

Based on the projected short-term total traffic volumes, the intersection of Fontaine/Lamprey is projected to operate at LOS A for all approaches during the peak hours as a one-lane modern roundabout.

### **TRAFFIC SIGNAL WARRANT ANALYSIS**

The intersection of Marksheffel/Lorson was analyzed to determine if a Four-Hour Vehicular Volume Traffic Signal Warrant will be met or close to being met based on the projected short-term total traffic volumes. Note: Filing 3 is not projected to add traffic to the minor street approach (Lorson Boulevard) at this intersection. This analysis has been included for consistency with other traffic reports.

The results of the analysis are shown in Figure 8. As shown in the figure, this intersection is projected to meet the thresholds for a Four-Hour Vehicular Volume Traffic Signal Warrant during the morning and afternoon peak hours. This analysis using the peak hours is intended to provide an indication that a warrant may be met or is close to being met. In order for a Four-Hour Traffic Signal Warrant to be satisfied, the volume threshold would need to be met for two additional hours of the day. For example, the four-hour warrant would be satisfied with the volume thresholds met for the one hour in the morning, two hours (instead of the one-hour peak) during the afternoon peak period, and an hour during the mid-afternoon. The satisfaction of warrants does not indicate that a signal must be installed. The decision to require a signal to be installed at this location rests with El Paso County. Alternate control such as a “channelized T” type intersection or a modern roundabout may be considered for this intersection rather than constructing a traffic signal in the short term.

### **TRAFFIC SIGNAL ESCROW AMOUNTS**

The Lorson Ranch Preliminary Plan TIS estimated a fair share contribution towards a future signal at the intersection of Marksheffel/Lorson would be \$154,804 (for all of Lorson Ranch East). This contribution was further broken down into \$93,950 for the first 331 lots and \$60,854 for the remaining 450 lots. Table 3 presents an amended signal escrow analysis for this intersection including the previously identified amounts for the 303 lots proposed as part of Filing 1 and the 196 lots proposed as part of Filing 2, the proposed amount for Filing No. 3, and the remaining amount for future filings. As shown on Table 3, the contribution for Lorson Ranch East Filing No. 3 is \$0 based on the volume of westbound left turning traffic projected from this filing at this intersection (zero). Escrow for the remaining Lorson East amount would be with the future Lorson East filings, which will be located south of Fontaine Boulevard.

### **ROADWAY CLASSIFICATIONS**

As shown on Figure 9, all of the internal streets within Lorson Ranch East Filing 3 should be classified as Urban Local. This is consistent with the recommendations shown in Figure 15 of the Preliminary Plan TIS.



## ROADWAY IMPROVEMENT FEE PROGRAM

This project will be required to participate in the El Paso County Road Improvement Fee Program. Lorson Ranch East Filing 3 will join the ten-mil PID. The ten-mil PID building permit fee portion associated with this option is \$923 per single-family dwelling unit. Based on 81 lots, the total building permit fee would be \$74,763.

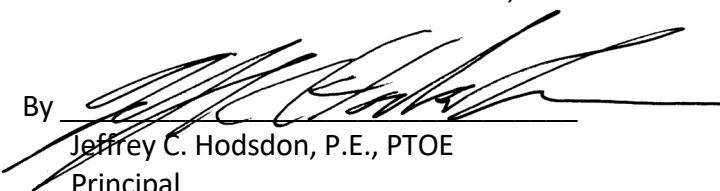
\* \* \* \* \*

Please contact me if you have any questions or need further assistance.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By



Jeffrey C. Hodsdon, P.E., PTOE  
Principal

JCH:KDF:bjwb

Enclosures:   Tables 2-3  
                  Figures 1-9  
                  Traffic Count Reports  
                  Level of Service Reports

<p style="text-align: center;"><b>Table 2</b>  <b>Trip Generation Estimate</b>  <b>Lorson Ranch East Filing No. 3</b></p>
-----------------------------------------------------------------------------------------------------------------------------------

Table 1. Trip Generation Rates and Total Trips Generated														
Land Use Code		Land Use Description	Trip Generation Units	Trip Generation Rates <sup>(1)</sup>					Total Trips Generated					
				Average Weekday Traffic	Morning		Afternoon		Average Weekday Traffic	Morning		Afternoon		
					Peak Hour	In	Out	Peak Hour		In	Out	Peak Hour	In	Out
210	Single-Family Detached Housing	81 DU <sup>(2)</sup>	9.44	0.19	0.56	0.62	0.37	765	15	45	51	30		

Notes:

(1) Source: "Trip Generation, 10th Edition, 2017" by the Institute of Transportation Engineers (ITE)

(2) DU = dwelling unit

Source: LSC Transportation Consultants, Inc.

<b>Table 3</b> <b>Signal Escrow Analysis</b> <b>Lorson Boulevard/Marksheffel Road</b> <b>Lorson Ranch East Filing 3</b>							
Shown in Lorson Ranch East Preliminary Plan TIA			Updated/Currently Proposed				
Phase	Number of Lots	Signal Escrow Amounts	Lorson Ranch East Subdivisions and "Future Filings"		Number of Lots	Projected Westbound Left-Turn AM+PM Peak-Hour Volumes	Signal Escrow Amounts
Phase 1	331	\$93,950	Filing 1		303	81	\$86,003
			Balance of the "Phase 1" Lots not included w/ Fil 1 (thus the strikethrough)		<del>28</del>	<del>7</del>	<del>\$7,947</del>
Future Phases*	495	\$60,854	Filing 2		196	0	\$0
			<b>Filing 3</b>		<b>81</b>	<b>0</b>	<b>\$0</b>
			Future Filings	Original "Phase 1" Lots not included in Fils 1-3 - <b>shifted</b> to be included with "Future Filings"	28	7	\$7,947
				Lots included in "Future Phases" as shown in Prelim Plan Report, <b>LESS the 277 Filing 2 &amp; 3 lots</b>	218	57	\$60,854
<b>Total</b>	<b>826</b>	<b>\$154,804</b>			<b>826</b>	<b>145</b>	<b>\$154,804</b>
*Original "Future Phases" beyond "Phase 1" as described in Preliminary Plan Report							
Source: LSC Transportation Consultants, Inc.							



Approximate Scale  
Scale: 1" = 3,000'

Figure 1  
**Vicinity  
Map**

Lorson Ranch East Filing 3 (LSC #194010)



Approximate Scale  
Scale: 1"= 200'

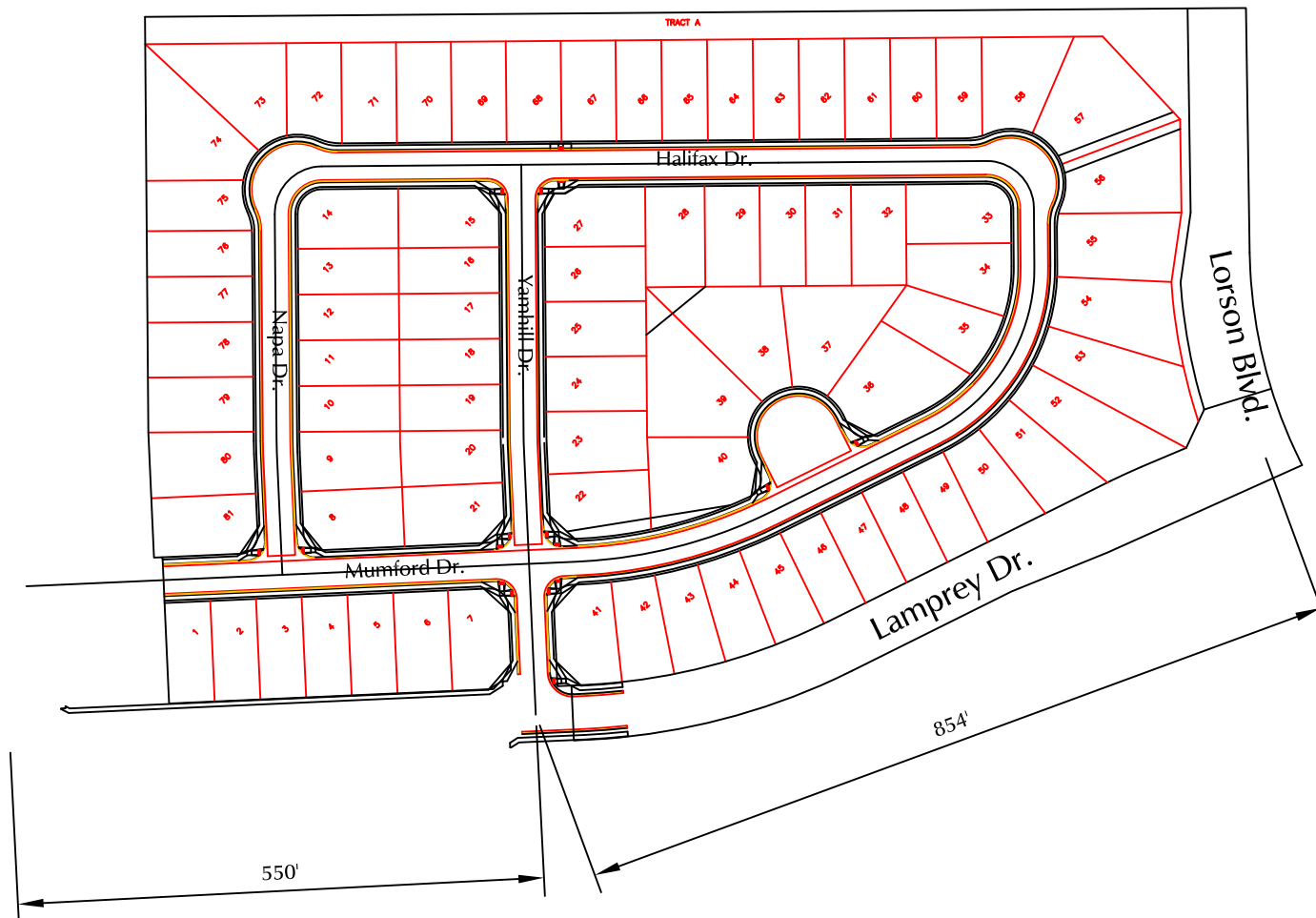


Figure 2

# Site Plan

Lorson Ranch East Filing 3 (LSC #194010)

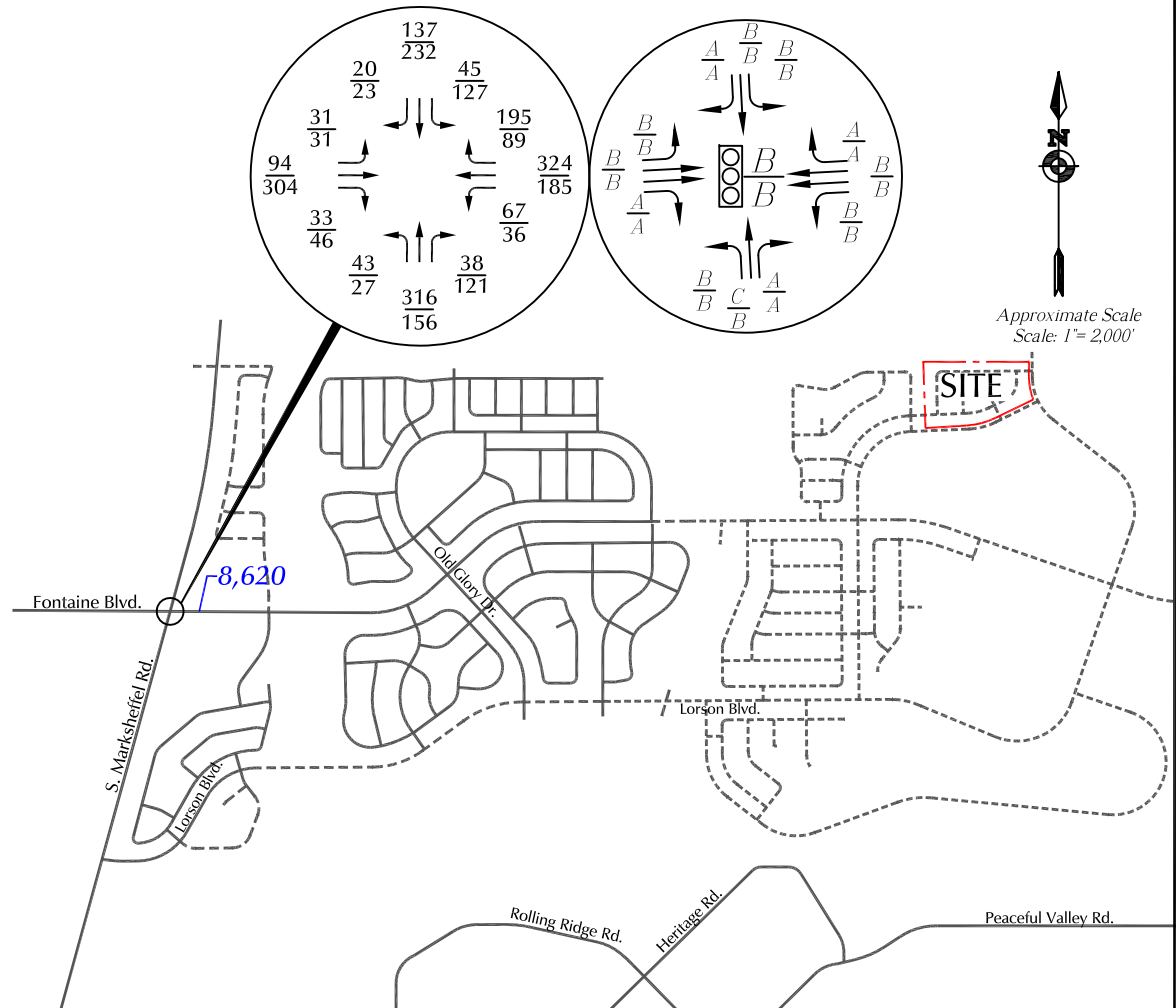
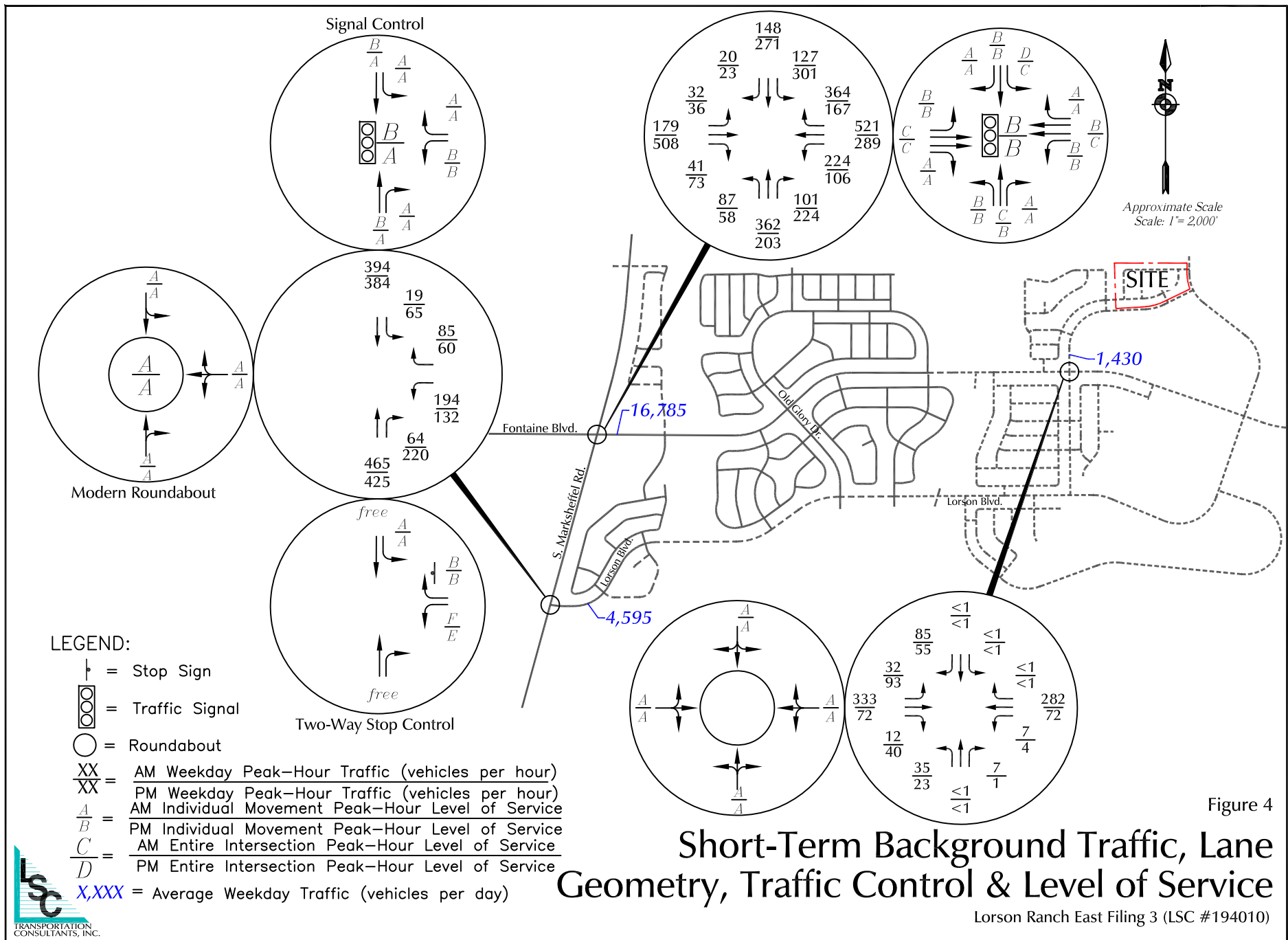
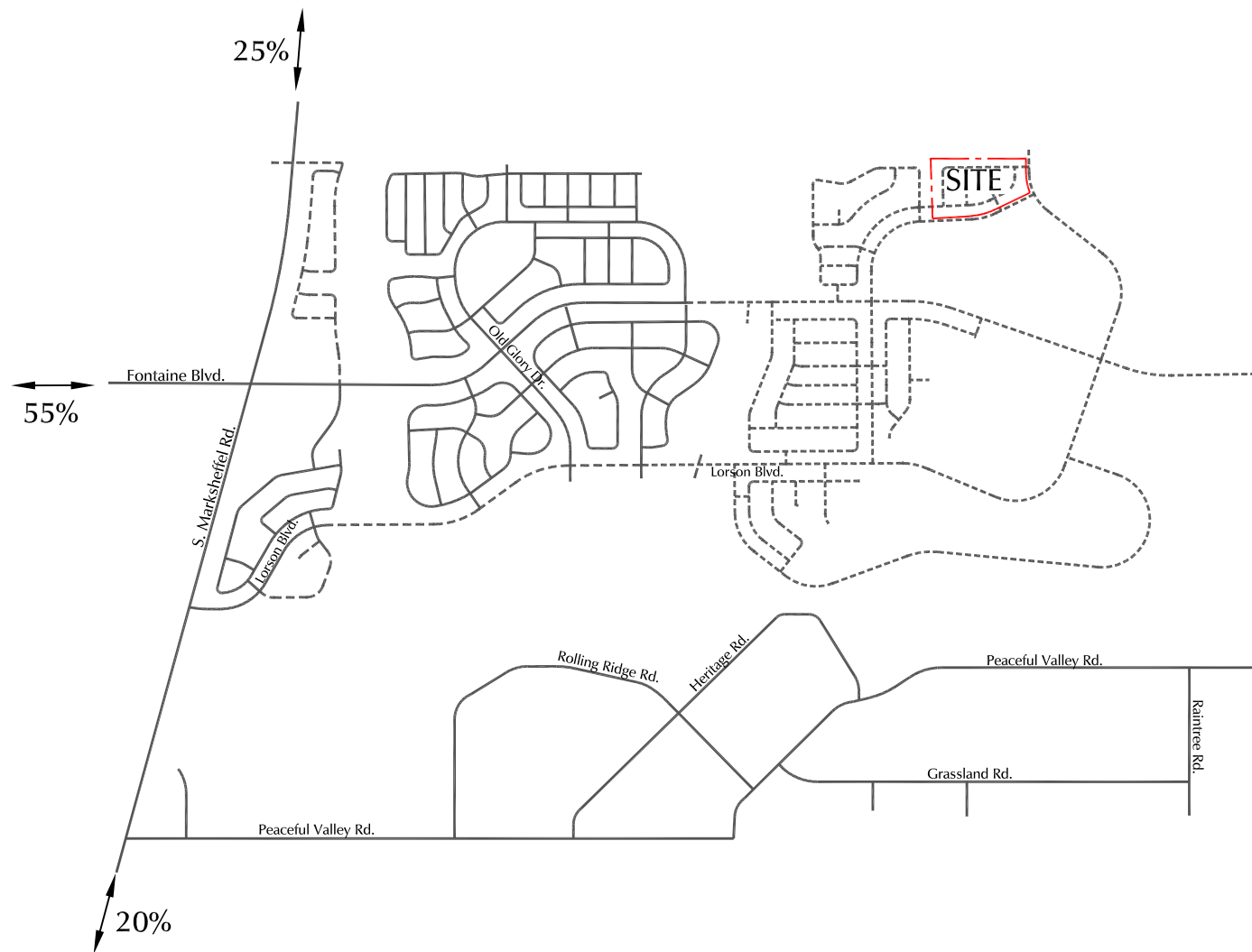


Figure 3

# Existing Traffic Volumes

Lorson Ranch East Filing 3 (LSC #194010)





Approximate Scale  
Scale: 1" = 3,000'

# LEGEND:

XX% = Percent Directional Distribution

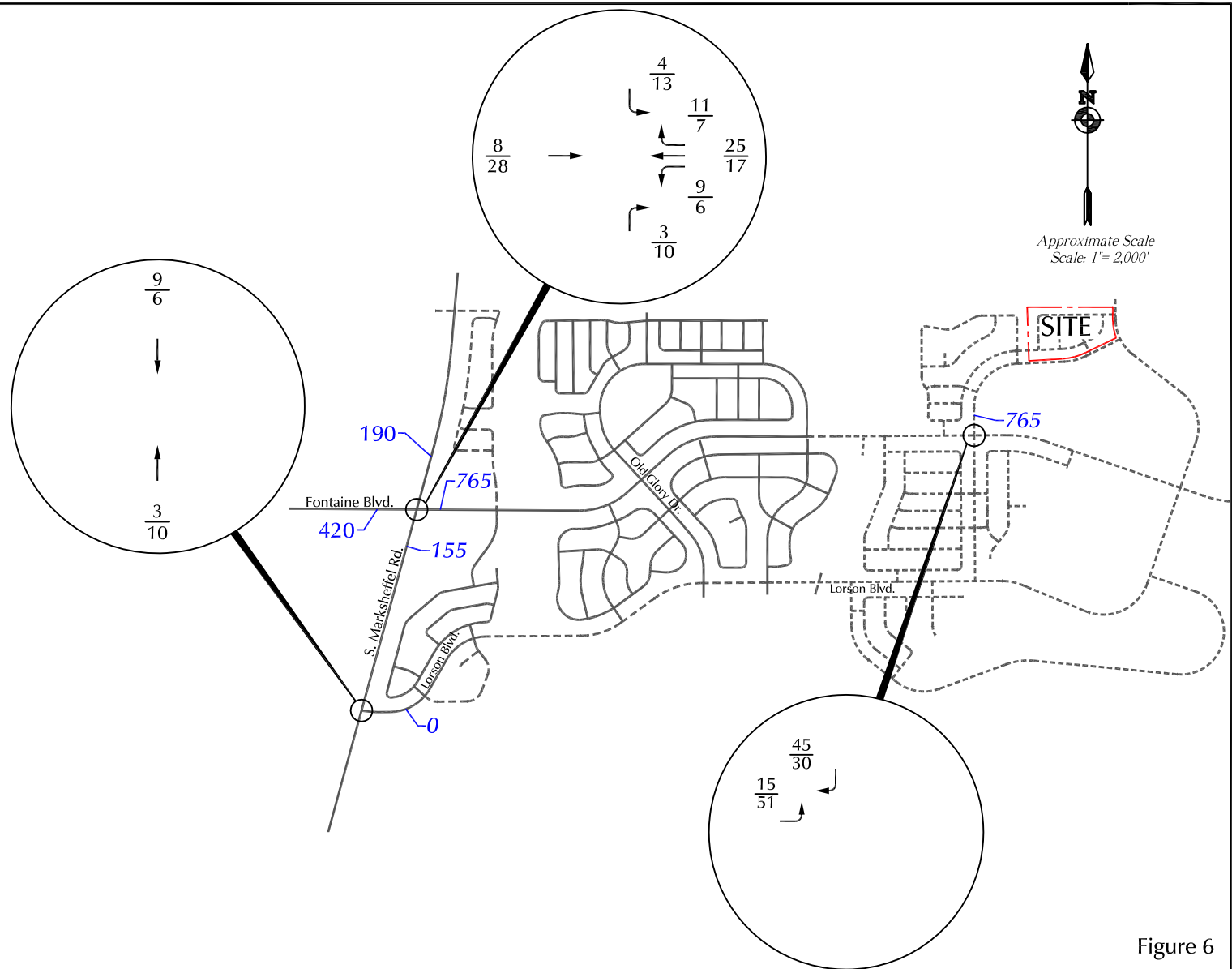
**LSC**  
TRANSPORTATION  
CONSULTANTS, INC.

Figure 5

## Directional Distribution of Site-Generated Traffic

Lorson Ranch East Filing 3 (LSC #194010)





#### LEGEND:

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)

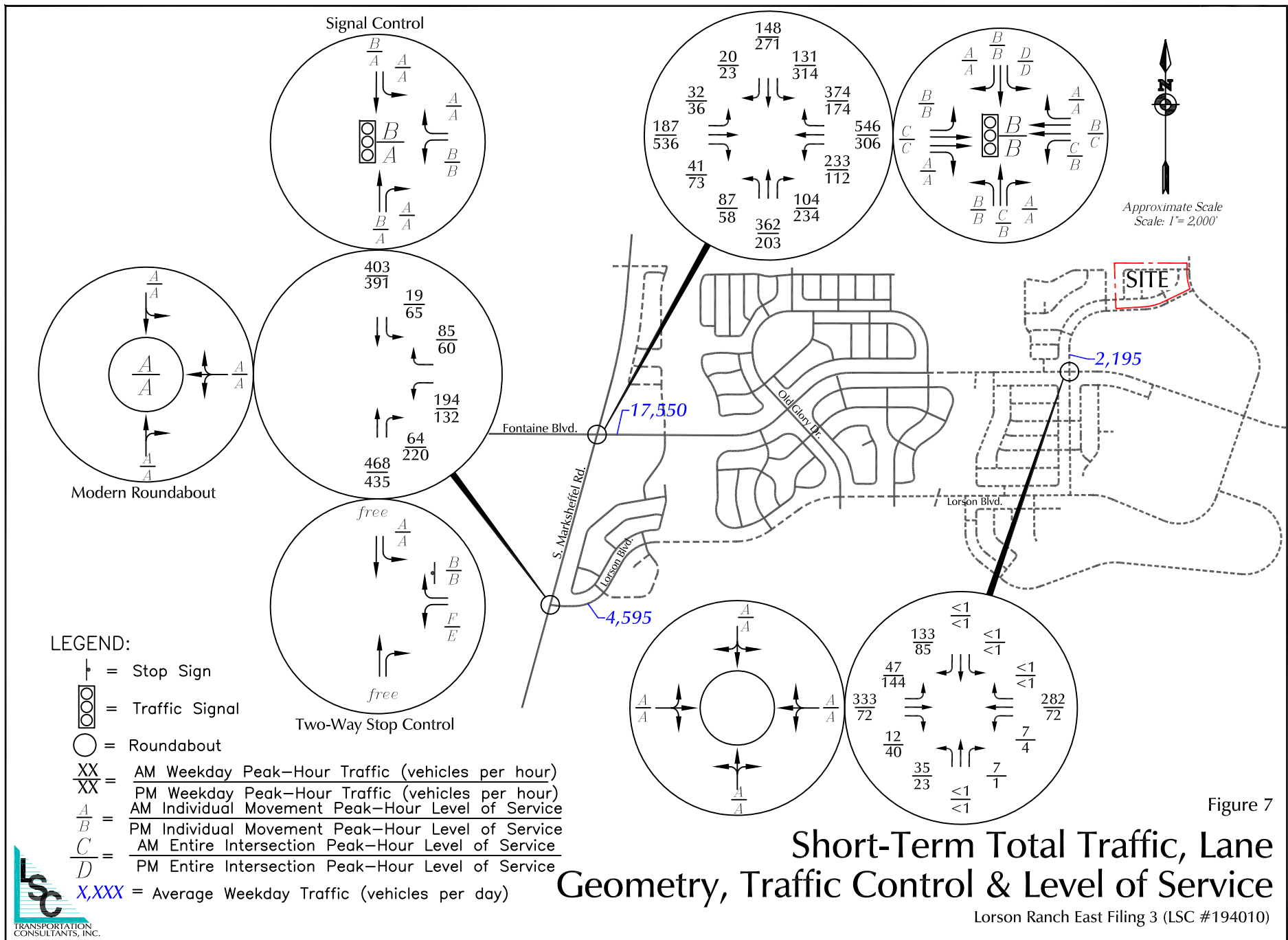
X,XXX = Average Weekday Traffic (vehicles per day)

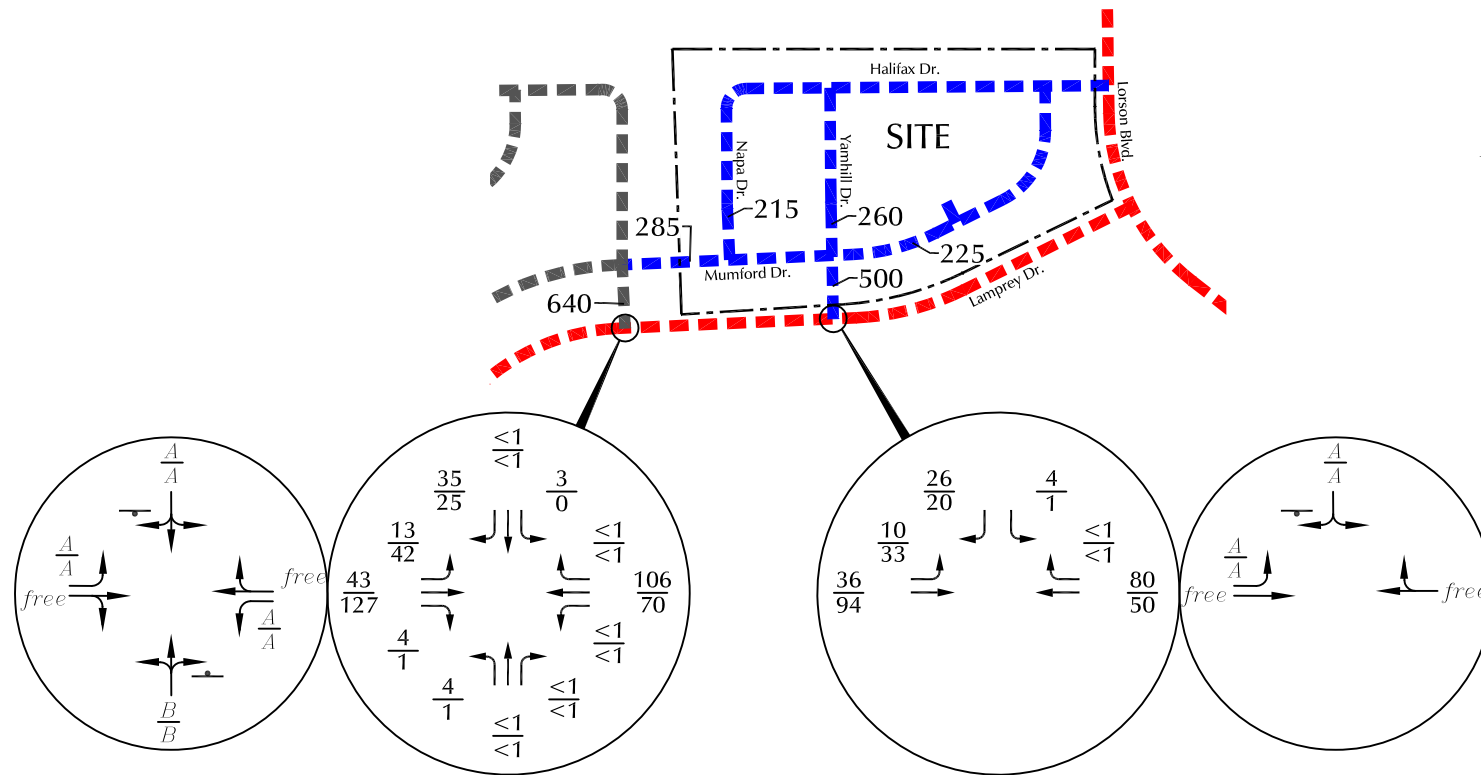
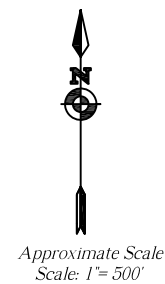


## Assignment of Site-Generated Traffic

Lorson Ranch East Filing 3 (LSC #194010)

Figure 6





#### LEGEND:

└ = Stop Sign

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)

$\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)

$\frac{A}{B}$  = AM Individual Movement Peak-Hour Level of Service

$\frac{A}{B}$  = PM Individual Movement Peak-Hour Level of Service

X,XXX = Average Weekday Traffic (vehicles per day)

■ ■ ■ ■ = Urban Residential Collector

■ ■ ■ ■ = Urban Local

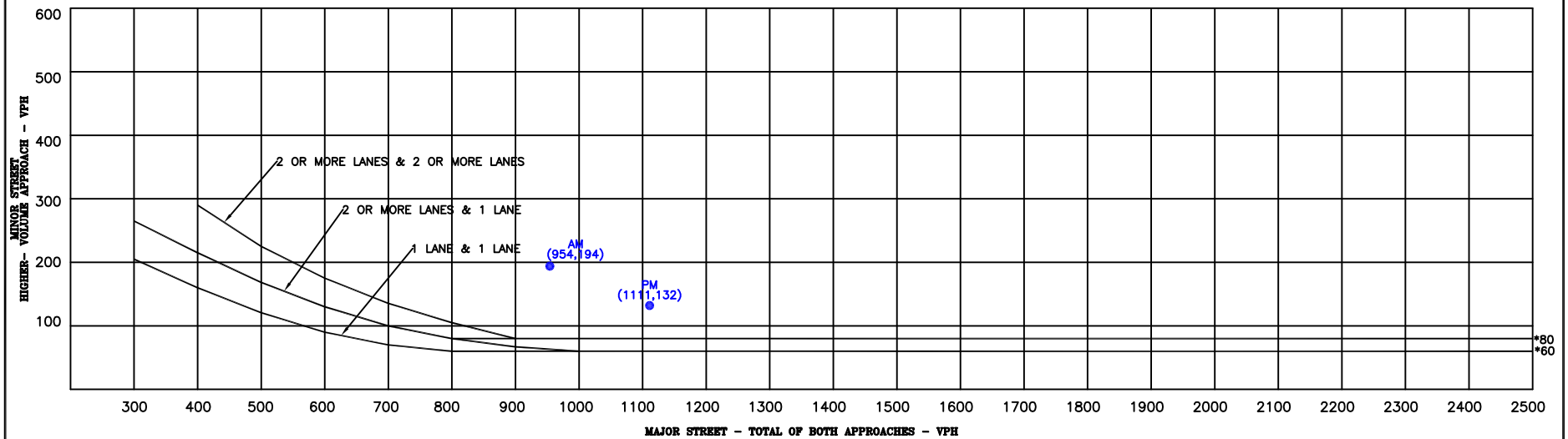


## Year 2040 Total Traffic, Lane Geometry, Traffic Control, Level of Service and Street Classification

Figure 8

Lorson Ranch East Filing 3 (LSC #194010)

**Figure 4C-2. Warrant 2 Four-Hour Vehicular Volume (70% Factor)**  
 (Community Less than 10,000 population or above 40 mph on Major Street)



\* Note: 80 vph applies as the lower threshold volumes for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

● Short-Term Total Traffic

# COUNTER MEASURES INC.

1889 YORK STREET  
DENVER, COLORADO  
303-333-7409

N/S STREET:  
E/W STREET:  
CITY:  
COUNTY:

File Name : Marksheffel Rd - Fontaine Blvd AM  
Site Code : 00174850  
Start Date : 3/1/2018  
Page No : 1

## Groups Printed- VEHICLES

	Marksheffel Rd Southbound				Fontaine Blvd Westbound				Marksheffel Rd Northbound				Fontaine Blvd Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
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	
06:30 AM	5	30	4	0	21	74	38	0	10	80	7	0	8	18	6	0	301
06:45 AM	7	37	2	0	15	104	45	0	8	72	8	0	4	22	6	0	330
Total	12	67	6	0	36	178	83	0	18	152	15	0	12	40	12	0	631
07:00 AM	9	28	4	0	20	86	65	0	12	96	11	0	15	18	8	0	372
07:15 AM	14	32	7	0	12	84	45	0	9	74	11	0	5	29	12	0	334
07:30 AM	15	40	7	0	20	50	40	0	14	74	8	0	7	25	7	0	307
07:45 AM	14	20	2	0	13	59	25	0	5	42	12	0	7	38	5	0	242
Total	52	120	20	0	65	279	175	0	40	286	42	0	34	110	32	0	1255
08:00 AM	13	37	2	0	20	93	38	0	8	53	10	0	6	32	3	0	315
08:15 AM	6	34	4	0	18	96	23	0	12	39	6	0	5	22	9	0	274
Grand Total	83	258	32	0	139	646	319	0	78	530	73	0	57	204	56	0	2475
Apprch %	22.3	69.2	8.6	0.0	12.6	58.5	28.9	0.0	11.5	77.8	10.7	0.0	18.0	64.4	17.7	0.0	
Total %	3.4	10.4	1.3	0.0	5.6	26.1	12.9	0.0	3.2	21.4	2.9	0.0	2.3	8.2	2.3	0.0	

# COUNTER MEASURES INC.

1889 YORK STREET  
DENVER.COLORADO  
303-333-7409

N/S STREET:  
E/W STREET:  
CITY:  
COUNTY:

File Name : Marksheffel Rd - Fontaine Blvd PM  
Site Code : 00174850  
Start Date : 3/1/2018  
Page No : 1

## Groups Printed- VEHICLES

























	Marksheffel Rd Southbound				Fontaine Blvd Westbound				Marksheffel Rd Northbound				Marksheffel Blvd Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
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	
04:00 PM	31	70	8	0	5	35	16	0	4	46	19	0	11	68	12	0	325
04:15 PM	42	74	11	0	4	40	19	0	4	51	21	0	10	77	10	0	363
04:30 PM	35	59	12	0	8	45	20	0	11	46	23	0	10	70	14	0	353
04:45 PM	30	67	15	0	6	34	14	0	4	35	34	0	13	72	8	0	332
Total	138	270	46	0	23	154	69	0	23	178	97	0	44	287	44	0	1373
05:00 PM	27	54	8	0	6	40	22	0	4	37	35	0	6	54	18	0	311
05:15 PM	30	60	4	0	8	44	22	0	7	42	26	0	12	76	12	0	343
05:30 PM	33	65	6	0	9	42	25	0	9	41	23	0	4	103	10	0	370
05:45 PM	37	53	5	0	13	59	20	0	7	36	37	0	9	71	6	0	353
Total	127	232	23	0	36	185	89	0	27	156	121	0	31	304	46	0	1377
Grand Total	265	502	69	0	59	339	158	0	50	334	218	0	75	591	90	0	2750
Apprch %	31.7	60.0	8.3	0.0	10.6	61.0	28.4	0.0	8.3	55.5	36.2	0.0	9.9	78.2	11.9	0.0	
Total %	9.6	18.3	2.5	0.0	2.1	12.3	5.7	0.0	1.8	12.1	7.9	0.0	2.7	21.5	3.3	0.0	

# Timings

## 1: Marksheffel Rd & Fountaine Blvd

# Existing Traffic

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	94	33	67	324	195	43	316	38	45	137	20
Future Volume (vph)	31	94	33	67	324	195	43	316	38	45	137	20
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	11.5	26.5	26.5	11.5	26.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
Total Split (s)	12.0	28.0	28.0	12.0	28.0	28.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	35.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5	7.5	7.5	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	24.4	20.2	20.2	27.0	24.9	24.9	21.8	21.8	21.8	21.8	21.8	21.8
Actuated g/C Ratio	0.37	0.31	0.31	0.41	0.38	0.38	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.07	0.09	0.06	0.15	0.28	0.30	0.13	0.61	0.07	0.18	0.22	0.03
Control Delay	11.2	18.3	0.2	11.6	16.5	4.6	17.0	24.0	0.2	18.5	17.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	18.3	0.2	11.6	16.5	4.6	17.0	24.0	0.2	18.5	17.7	0.1
LOS	B	B	A	B	B	A	B	C	A	B	B	A
Approach Delay		13.1			12.0			21.0			16.1	
Approach LOS		B			B			C			B	

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 65.3

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 15.5



















Intersection LOS: B

Intersection Capacity Utilization 74.8%

ICU Level of Service D

Analysis Period (min) 15

## Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

























								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s
								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s

# Timings

## 1: Marksheffel Rd & Fountaine Blvd

# Existing Traffic

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	304	46	36	185	89	27	156	121	127	232	23
Future Volume (vph)	31	304	46	36	185	89	27	156	121	127	232	23
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	11.5	26.5	26.5	11.5	26.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
Total Split (s)	12.0	28.0	28.0	12.0	28.0	28.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	35.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5	7.5	7.5	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	22.2	20.2	20.2	22.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2
Actuated g/C Ratio	0.38	0.34	0.34	0.38	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.08	0.31	0.09	0.08	0.15	0.14	0.07	0.24	0.19	0.33	0.39	0.04
Control Delay	10.1	16.2	0.3	10.2	15.2	1.5	16.1	16.8	4.0	18.9	18.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.1	16.2	0.3	10.2	15.2	1.5	16.1	16.8	4.0	18.9	18.4	0.1
LOS	B	B	A	B	B	A	B	B	A	B	B	A
Approach Delay		13.8			10.7			11.6			17.5	
Approach LOS		B			B			B			B	

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 58.8

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 13.7



















Intersection LOS: B

Intersection Capacity Utilization 77.5%

ICU Level of Service D

Analysis Period (min) 15

## Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s
								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s



























# Timings

## 1: Marksheffel Rd & Fountaine Blvd

# Short-Term Background Traffic

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	179	41	224	521	364	87	362	101	127	148	20
Future Volume (vph)	32	179	41	224	521	364	87	362	101	127	148	20
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	11.5	26.5	26.5	11.5	26.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
Total Split (s)	12.0	28.0	28.0	12.0	28.0	28.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	35.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5	7.5	7.5	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	26.2	20.7	20.7	30.4	28.3	28.3	23.9	23.9	23.9	23.9	23.9	23.9
Actuated g/C Ratio	0.37	0.29	0.29	0.43	0.40	0.40	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.09	0.19	0.08	0.52	0.43	0.50	0.26	0.69	0.20	0.68	0.26	0.04
Control Delay	13.0	20.3	0.3	19.7	19.1	7.0	18.5	26.6	3.4	38.4	17.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.0	20.3	0.3	19.7	19.1	7.0	18.5	26.6	3.4	38.4	17.9	0.1
LOS	B	C	A	B	B	A	B	C	A	D	B	A
Approach Delay		16.1			15.2			21.1			25.5	
Approach LOS		B			B			C			C	

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 70.7

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 18.1



















Intersection LOS: B







Intersection Capacity Utilization 88.1%

ICU Level of Service E

Analysis Period (min) 15

## Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s
								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s

Intersection						
Int Delay, s/veh	10.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	194	85	465	64	19	394
Future Vol, veh/h	194	85	465	64	19	394
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	83	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	211	92	560	70	21	428

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1030	560	0	0	630
Stage 1	560	-	-	-	-
Stage 2	470	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	259	528	-	-	952
Stage 1	572	-	-	-	-
Stage 2	629	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	253	528	-	-	952
Mov Cap-2 Maneuver	253	-	-	-	-
Stage 1	559	-	-	-	-
Stage 2	629	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	48.5	0	0.4
HCM LOS	E		













Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	- 253 528	952	-
HCM Lane V/C Ratio	-	- 0.833 0.175	0.022	-
HCM Control Delay (s)	-	- 63.9 13.3	8.9	-
HCM Lane LOS	-	- F B	A	-
HCM 95th %tile Q(veh)	-	- 6.6 0.6	0.1	-

Intersection				
Intersection Delay, s/veh	5.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	491	362	46	94
Demand Flow Rate, veh/h	501	369	47	96
Vehicles Circulating, veh/h	9	73	488	407
Vehicles Exiting, veh/h	494	462	22	35
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.1	5.5	4.9	5.0
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	501	369	47	96
Cap Entry Lane, veh/h	1367	1281	839	911
Entry HV Adj Factor	0.980	0.981	0.979	0.979
Flow Entry, veh/h	491	362	46	94
Cap Entry, veh/h	1340	1256	821	892
V/C Ratio	0.366	0.288	0.056	0.105
Control Delay, s/veh	6.1	5.5	4.9	5.0
LOS	A	A	A	A
95th %tile Queue, veh	2	1	0	0

Intersection			
Intersection Delay, s/veh	8.1		
Intersection LOS	A		
Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	303	630	449
Demand Flow Rate, veh/h	309	642	458
Vehicles Circulating, veh/h	571	21	215
Vehicles Exiting, veh/h	92	652	665
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	9.9	7.5	7.7
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	309	642	458
Cap Entry Lane, veh/h	771	1351	1108
Entry HV Adj Factor	0.981	0.981	0.981
Flow Entry, veh/h	303	630	449
Cap Entry, veh/h	756	1325	1087
V/C Ratio	0.401	0.475	0.413
Control Delay, s/veh	9.9	7.5	7.7
LOS	A	A	A
95th %tile Queue, veh	2	3	2

# Timings 5: Marksheffel Rd & Lorson Blvd

Short-Term Background Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	194	85	465	64	19	394
Future Volume (vph)	194	85	465	64	19	394
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	15.0	15.0	75.0	75.0	75.0	75.0
Total Split (%)	16.7%	16.7%	83.3%	83.3%	83.3%	83.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	10.1	10.1	16.0	16.0	16.0	16.0
Actuated g/C Ratio	0.28	0.28	0.44	0.44	0.44	0.44
v/c Ratio	0.43	0.18	0.68	0.09	0.08	0.56
Control Delay	15.4	5.0	12.6	2.1	6.1	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	5.0	12.6	2.1	6.1	10.5
LOS	B	A	B	A	A	B
Approach Delay	12.2		11.5			10.3
Approach LOS	B		B			B
Intersection Summary						
Cycle Length: 90						
Actuated Cycle Length: 36.3						
Natural Cycle: 45						
Control Type: Actuated-Uncoordinated						
Maximum v/c Ratio: 0.68						
Intersection Signal Delay: 11.3				Intersection LOS: B		
Intersection Capacity Utilization 43.6%				ICU Level of Service A		
Analysis Period (min) 15						

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd



























# Timings

## 1: Marksheffel Rd & Fountaine Blvd

# Short-Term Background Traffic

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	508	73	106	289	167	58	203	224	301	271	23
Future Volume (vph)	36	508	73	106	289	167	58	203	224	301	271	23
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	11.5	26.5	26.5	11.5	26.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
Total Split (s)	12.0	28.0	28.0	12.0	28.0	28.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	35.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5	7.5	7.5	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	25.2	21.0	21.0	26.5	23.5	23.5	26.0	26.0	26.0	26.0	26.0	26.0
Actuated g/C Ratio	0.36	0.30	0.30	0.38	0.33	0.33	0.37	0.37	0.37	0.37	0.37	0.37
v/c Ratio	0.10	0.60	0.16	0.37	0.27	0.28	0.17	0.32	0.33	0.77	0.43	0.04
Control Delay	14.0	25.6	1.7	17.5	20.6	5.3	16.9	17.9	3.7	33.7	19.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	25.6	1.7	17.5	20.6	5.3	16.9	17.9	3.7	33.7	19.4	0.1
LOS	B	C	A	B	C	A	B	B	A	C	B	A
Approach Delay		22.1			15.5			11.2			25.9	
Approach LOS		C			B			B			C	

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 70.4

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 19.2



















Intersection LOS: B







Intersection Capacity Utilization 79.2%

ICU Level of Service D

Analysis Period (min) 15

## Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s
								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s













Intersection						
Int Delay, s/veh	5.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	132	60	425	220	65	384
Future Vol, veh/h	132	60	425	220	65	384
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	143	65	462	239	71	417
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1021	462	0	0	701	0
Stage 1	462	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	262	600	-	-	896	-
Stage 1	634	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	241	600	-	-	896	-
Mov Cap-2 Maneuver	241	-	-	-	-	-
Stage 1	584	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	31	0	1.4			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 241 600	896	-		
HCM Lane V/C Ratio	-	- 0.595 0.109	0.079	-		
HCM Control Delay (s)	-	- 39.8 11.7	9.4	-		
HCM Lane LOS	-	- E B	A	-		
HCM 95th %tile Q(veh)	-	- 3.4 0.4	0.3	-		

Intersection				
Intersection Delay, s/veh	3.8			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	222	82	26	60
Demand Flow Rate, veh/h	227	84	27	61
Vehicles Circulating, veh/h	4	128	183	109
Vehicles Exiting, veh/h	166	81	48	103
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.0	3.6	3.5	3.4
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	227	84	27	61
Cap Entry Lane, veh/h	1374	1211	1145	1235
Entry HV Adj Factor	0.980	0.981	0.963	0.984
Flow Entry, veh/h	222	82	26	60
Cap Entry, veh/h	1347	1188	1103	1214
V/C Ratio	0.165	0.069	0.024	0.049
Control Delay, s/veh	4.0	3.6	3.5	3.4
LOS	A	A	A	A
95th %tile Queue, veh	1	0	0	0



# Timings 5: Marksheffel Rd & Lorson Blvd

Short-Term Background Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	132	60	425	220	65	384
Future Volume (vph)	132	60	425	220	65	384
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	15.0	15.0	75.0	75.0	75.0	75.0
Total Split (%)	16.7%	16.7%	83.3%	83.3%	83.3%	83.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	None	None
Act Effect Green (s)	9.1	9.1	16.9	16.9	16.9	16.9
Actuated g/C Ratio	0.30	0.30	0.56	0.56	0.56	0.56
v/c Ratio	0.27	0.13	0.45	0.24	0.16	0.43
Control Delay	12.7	4.9	8.2	1.9	6.8	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	4.9	8.2	1.9	6.8	8.2
LOS	B	A	A	A	A	A
Approach Delay	10.2		6.0			8.0
Approach LOS	B		A			A

## Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 30.3

Natural Cycle: 40

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 7.4

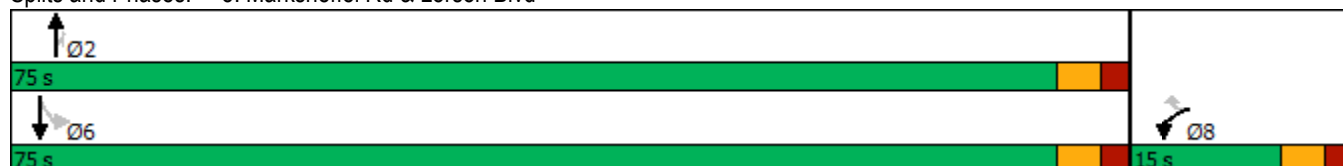
Intersection LOS: A

Intersection Capacity Utilization 45.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd



























# Timings

## 1: Marksheffel Rd & Fountaine Blvd

# Short-Term Total Traffic

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	187	41	233	546	375	87	362	104	131	148	20
Future Volume (vph)	32	187	41	233	546	375	87	362	104	131	148	20
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	11.5	26.5	26.5	11.5	26.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
Total Split (s)	12.0	28.0	28.0	12.0	28.0	28.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	35.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5	7.5	7.5	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	26.2	20.7	20.7	30.3	28.3	28.3	23.9	23.9	23.9	23.9	23.9	23.9
Actuated g/C Ratio	0.37	0.29	0.29	0.43	0.40	0.40	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.10	0.20	0.08	0.55	0.45	0.52	0.25	0.69	0.20	0.70	0.26	0.04
Control Delay	13.0	20.4	0.3	20.6	19.3	7.5	18.5	26.6	3.6	39.9	17.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.0	20.4	0.3	20.6	19.3	7.5	18.5	26.6	3.6	39.9	17.8	0.1
LOS	B	C	A	C	B	A	B	C	A	D	B	A
Approach Delay		16.3			15.8			21.0			26.3	
Approach LOS		B			B			C			C	

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 70.7

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 18.5







Intersection LOS: B

Intersection Capacity Utilization 88.6%

ICU Level of Service E







Analysis Period (min) 15

## Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

 Ø2	 Ø3	 Ø4
40 s	12 s	28 s
 Ø6	 Ø7	 Ø8
40 s	12 s	28 s

HCM 6th TWSC  
5: Marksheffel Rd & Lorson Blvd

Short-Term Total Traffic  
AM Peak Hour

Intersection						
Int Delay, s/veh	11.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	194	85	468	64	19	403
Future Vol, veh/h	194	85	468	64	19	403
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	83	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	211	92	564	70	21	438
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1044	564	0	0	634	0
Stage 1	564	-	-	-	-	-
Stage 2	480	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	254	525	-	-	949	-
Stage 1	569	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	248	525	-	-	949	-
Mov Cap-2 Maneuver	248	-	-	-	-	-
Stage 1	556	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	51.1	0	0.4			
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 248 525	949	-		
HCM Lane V/C Ratio	-	- 0.85 0.176	0.022	-		
HCM Control Delay (s)	-	- 67.6 13.3	8.9	-		
HCM Lane LOS	-	- F B	A	-		
HCM 95th %tile Q(veh)	-	- 6.9 0.6	0.1	-		

HCM 6th Roundabout  
14: Lamprey Dr & Fontaine Blvd

Short-Term Total Traffic  
AM Peak Hour

Intersection				
Intersection Delay, s/veh	5.9			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	507	362	46	141
Demand Flow Rate, veh/h	517	369	47	144
Vehicles Circulating, veh/h	9	89	504	407
Vehicles Exiting, veh/h	542	462	22	51
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.2	5.6	5.0	5.6
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	517	369	47	144
Cap Entry Lane, veh/h	1367	1260	825	911
Entry HV Adj Factor	0.981	0.981	0.979	0.979
Flow Entry, veh/h	507	362	46	141
Cap Entry, veh/h	1341	1236	808	892
V/C Ratio	0.378	0.293	0.057	0.158
Control Delay, s/veh	6.2	5.6	5.0	5.6
LOS	A	A	A	A
95th %tile Queue, veh	2	1	0	1













HCM 6th Roundabout  
5: Marksheffel Rd & Lorson Blvd

Short-Term Total Traffic  
AM Peak Hour

Intersection			
Intersection Delay, s/veh	8.2		
Intersection LOS	A		
Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	303	634	459
Demand Flow Rate, veh/h	309	646	468
Vehicles Circulating, veh/h	575	21	215
Vehicles Exiting, veh/h	92	662	669
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	10.0	7.6	7.8
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	309	646	468
Cap Entry Lane, veh/h	768	1351	1108
Entry HV Adj Factor	0.981	0.981	0.981
Flow Entry, veh/h	303	634	459
Cap Entry, veh/h	753	1325	1087
V/C Ratio	0.403	0.478	0.422
Control Delay, s/veh	10.0	7.6	7.8
LOS	A	A	A
95th %tile Queue, veh	2	3	2

# Timings 5: Marksheffel Rd & Lorson Blvd

Short-Term Total Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	194	85	468	64	19	403
Future Volume (vph)	194	85	468	64	19	403
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	15.0	15.0	75.0	75.0	75.0	75.0
Total Split (%)	16.7%	16.7%	83.3%	83.3%	83.3%	83.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	None	None
Act Effect Green (s)	10.1	10.1	16.1	16.1	16.1	16.1
Actuated g/C Ratio	0.28	0.28	0.44	0.44	0.44	0.44
v/c Ratio	0.43	0.18	0.68	0.09	0.08	0.57
Control Delay	15.5	5.1	12.7	2.1	6.1	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.5	5.1	12.7	2.1	6.1	10.7
LOS	B	A	B	A	A	B
Approach Delay	12.3		11.5			10.5
Approach LOS	B		B			B

## Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 36.4

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 11.3

Intersection LOS: B

Intersection Capacity Utilization 43.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd



























# Timings

## 1: Marksheffel Rd & Fountaine Blvd

# Short-Term Total Traffic

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	536	73	112	306	174	58	203	234	314	271	23
Future Volume (vph)	36	536	73	112	306	174	58	203	234	314	271	23
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	11.5	26.5	26.5	11.5	26.5	26.5	27.5	27.5	27.5	27.5	27.5	27.5
Total Split (s)	12.0	28.0	28.0	12.0	28.0	28.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	15.0%	35.0%	35.0%	15.0%	35.0%	35.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5	7.5	7.5	7.5	7.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	25.2	21.1	21.1	26.6	23.6	23.6	26.7	26.7	26.7	26.7	26.7	26.7
Actuated g/C Ratio	0.35	0.30	0.30	0.37	0.33	0.33	0.38	0.38	0.38	0.38	0.38	0.38
v/c Ratio	0.10	0.63	0.16	0.42	0.28	0.29	0.17	0.32	0.34	0.79	0.42	0.04
Control Delay	14.2	26.7	1.7	19.0	21.0	5.3	16.8	17.7	3.6	35.1	19.2	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.2	26.7	1.7	19.0	21.0	5.3	16.8	17.7	3.6	35.1	19.2	0.1
LOS	B	C	A	B	C	A	B	B	A	D	B	A
Approach Delay		23.2			16.0			11.0			26.7	
Approach LOS		C			B			B			C	

## Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 71.2

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 19.8



















Intersection LOS: B







Intersection Capacity Utilization 80.3%

ICU Level of Service D

Analysis Period (min) 15

## Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s
								
40 s	12 s	28 s	40 s	12 s	28 s	40 s	12 s	28 s

Intersection						
Int Delay, s/veh	5.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	132	60	435	220	65	391
Future Vol, veh/h	132	60	435	220	65	391
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	143	65	473	239	71	425

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1040	473	0	0	712
Stage 1	473	-	-	-	-
Stage 2	567	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	255	591	-	-	888
Stage 1	627	-	-	-	-
Stage 2	568	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	235	591	-	-	888
Mov Cap-2 Maneuver	235	-	-	-	-
Stage 1	577	-	-	-	-
Stage 2	568	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	32.4	0	1.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	- 235 591	888	-
HCM Lane V/C Ratio	-	- 0.611 0.11	0.08	-
HCM Control Delay (s)	-	- 41.7 11.8	9.4	-
HCM Lane LOS	-	- E B	A	-
HCM 95th %tile Q(veh)	-	- 3.6 0.4	0.3	-



HCM 6th Roundabout  
14: Lamprey Dr & Fontaine Blvd

Short-Term Total Traffic  
PM Peak Hour

Intersection				
Intersection Delay, s/veh	4.1			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	278	82	26	92
Demand Flow Rate, veh/h	284	84	27	94
Vehicles Circulating, veh/h	4	185	240	109
Vehicles Exiting, veh/h	199	81	48	160
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.4	3.8	3.7	3.6
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	284	84	27	94
Cap Entry Lane, veh/h	1374	1143	1080	1235
Entry HV Adj Factor	0.980	0.981	0.963	0.979
Flow Entry, veh/h	278	82	26	92
Cap Entry, veh/h	1347	1121	1040	1208
V/C Ratio	0.207	0.074	0.025	0.076
Control Delay, s/veh	4.4	3.8	3.7	3.6
LOS	A	A	A	A
95th %tile Queue, veh	1	0	0	0













HCM 6th Roundabout  
5: Marksheffel Rd & Lorson Blvd

Short-Term Total Traffic  
PM Peak Hour

Intersection			
Intersection Delay, s/veh	8.4		
Intersection LOS	A		
Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	208	712	496
Demand Flow Rate, veh/h	212	726	506
Vehicles Circulating, veh/h	482	72	146
Vehicles Exiting, veh/h	316	579	548
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.1	9.4	7.5
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	212	726	506
Cap Entry Lane, veh/h	844	1282	1189
Entry HV Adj Factor	0.981	0.980	0.981
Flow Entry, veh/h	208	712	496
Cap Entry, veh/h	828	1257	1167
V/C Ratio	0.251	0.566	0.426
Control Delay, s/veh	7.1	9.4	7.5
LOS	A	A	A
95th %tile Queue, veh	1	4	2

Timings  
5: Marksheffel Rd & Lorson Blvd

Short-Term Total Traffic  
PM Peak Hour







						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	132	60	435	220	65	391
Future Volume (vph)	132	60	435	220	65	391
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	15.0	15.0	75.0	75.0	75.0	75.0
Total Split (%)	16.7%	16.7%	83.3%	83.3%	83.3%	83.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	None	None
Act Effct Green (s)	9.1	9.1	17.1	17.1	17.1	17.1
Actuated g/C Ratio	0.30	0.30	0.56	0.56	0.56	0.56
v/c Ratio	0.27	0.13	0.45	0.24	0.16	0.44
Control Delay	12.8	5.0	8.2	1.8	6.8	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.8	5.0	8.2	1.8	6.8	8.3
LOS	B	A	A	A	A	A
Approach Delay	10.4		6.1			8.1
Approach LOS	B		A			A
Intersection Summary						
Cycle Length: 90						
Actuated Cycle Length: 30.6						
Natural Cycle: 40						
Control Type: Actuated-Uncoordinated						
Maximum v/c Ratio: 0.45						
Intersection Signal Delay: 7.4				Intersection LOS: A		
Intersection Capacity Utilization 46.3%				ICU Level of Service A		
Analysis Period (min) 15						

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd



HCM 6th TWSC  
29: School Bus Loop/Shavers Dr & Lamprey Dr





2040 Total Traffic  
AM Peak Hour

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	43	4	0	106	0	4	0	0	3	0	35
Future Vol, veh/h	13	43	4	0	106	0	4	0	0	3	0	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	205	-	-	205	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	50	92	92	92	50	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	47	8	0	115	0	8	0	0	3	0	38

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	115	0	0	55	0	0	213	194	51	194	198	115
Stage 1	-	-	-	-	-	-	79	79	-	115	115	-
Stage 2	-	-	-	-	-	-	134	115	-	79	83	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1474	-	-	1550	-	-	744	701	1017	765	698	937
Stage 1	-	-	-	-	-	-	930	829	-	890	800	-
Stage 2	-	-	-	-	-	-	869	800	-	930	826	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1474	-	-	1550	-	-	708	695	1017	760	692	937
Mov Cap-2 Maneuver	-	-	-	-	-	-	708	695	-	760	692	-
Stage 1	-	-	-	-	-	-	922	822	-	882	800	-
Stage 2	-	-	-	-	-	-	834	800	-	921	819	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.5			0			10.1			9.1		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	708	1474	-	-	1550	-	-	920
HCM Lane V/C Ratio	0.011	0.01	-	-	-	-	-	0.045
HCM Control Delay (s)	10.1	7.5	-	-	0	-	-	9.1
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	36	80	0	4	26
Future Vol, veh/h	10	36	80	0	4	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	205	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	39	87	0	4	28







Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	87	0	0	148	87
Stage 1	-	-	-	87	-
Stage 2	-	-	-	61	-
Critical Hdwy	4.12	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	3.518	3.318
Pot Cap-1 Maneuver	1509	-	-	844	971
Stage 1	-	-	-	936	-
Stage 2	-	-	-	962	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1509	-	-	838	971
Mov Cap-2 Maneuver	-	-	-	838	-
Stage 1	-	-	-	929	-
Stage 2	-	-	-	962	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1509	-	-	-	951
HCM Lane V/C Ratio	0.007	-	-	-	0.034
HCM Control Delay (s)	7.4	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 6th TWSC  
29: School Bus Loop/Shavers Dr & Lamprey Dr





2040 Total Traffic  
PM Peak Hour

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	42	127	1	0	70	0	1	0	0	0	0	25
Future Vol, veh/h	42	127	1	0	70	0	1	0	0	0	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	205	-	-	205	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	50	92	92	92	50	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	46	138	2	0	76	0	2	0	0	0	0	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	76	0	0	140	0	0	321	307	139	307	308	76
Stage 1	-	-	-	-	-	-	231	231	-	76	76	-
Stage 2	-	-	-	-	-	-	90	76	-	231	232	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1523	-	-	1443	-	-	632	607	909	645	606	985
Stage 1	-	-	-	-	-	-	772	713	-	933	832	-
Stage 2	-	-	-	-	-	-	917	832	-	772	713	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1523	-	-	1443	-	-	600	589	909	630	588	985
Mov Cap-2 Maneuver	-	-	-	-	-	-	600	589	-	630	588	-
Stage 1	-	-	-	-	-	-	749	692	-	905	832	-
Stage 2	-	-	-	-	-	-	892	832	-	749	692	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0	11	8.8
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	600	1523	-	-	1443	-	-	985
HCM Lane V/C Ratio	0.003	0.03	-	-	-	-	-	0.028
HCM Control Delay (s)	11	7.4	-	-	0	-	-	8.8
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	33	94	50	0	1	20
Future Vol, veh/h	33	94	50	0	1	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	205	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	102	54	0	1	22

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	54	0	0 228 54
Stage 1	-	-	- 54 -
Stage 2	-	-	- 174 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1551	-	- 760 1013
Stage 1	-	-	- 969 -
Stage 2	-	-	- 856 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1551	-	- 743 1013
Mov Cap-2 Maneuver	-	-	- 743 -
Stage 1	-	-	- 947 -
Stage 2	-	-	- 856 -

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	8.7
HCM LOS	A		

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1551	-	-	-	996
HCM Lane V/C Ratio	0.023	-	-	-	0.023
HCM Control Delay (s)	7.4	-	-	-	8.7
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1