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Lorson Ranch East Filing No. 2
SF 1819
Transportation Memorandum
(LSC #184540)
September 24, 2018

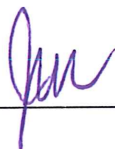
Traffic Engineer's Statement

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.



9/24/18
Date

**ACCEPTED for FILE
Engineering Review**

01/23/2019 11:58:40 AM

dsdrice

EPC Planning & Community
Development Department



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September 24, 2018

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

RE: Lorson Ranch East Filing No. 2
SF 1819
El Paso County, Colorado
Transportation Memorandum
LSC #184540

Dear Mr. Mark:

LSC Transportation Consultants, Inc. has prepared this transportation memorandum to accompany the submittal for the Lorson Ranch East Filing No. 2 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 a transportation memorandum for Filing No. 1 dated May 2, 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 2.
- 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, Lamprey Drive/Fontaine Boulevard and the proposed site access point intersection on 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 2.
- 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 at Fontaine Boulevard is 45 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 has been constructed 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 adjacent to the site. In the interim, an Urban Non-Residential Collector Street will be constructed east of Stingray Lane as development progresses. The applicant will be dedicating 100 feet of right-of-way. 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** is a planned future roadway that will ultimately extend from Marksheffel Road about one-half mile south of Fontaine Boulevard. 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 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) 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.

Table 1			
Intersection Levels of Service Delay Ranges			
Level of Service	Signalized Intersections		Unsignalized Intersections
	Average Control Delay (seconds per vehicle)	V/C⁽¹⁾	Average Control Delay (seconds per vehicle)⁽²⁾
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 2 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 Filing 1, and the school located

northeast of Fontaine Boulevard and Lamprey Drive but assumes zero traffic generated by Lorson Ranch East Filing 2.

SITE DEVELOPMENT AND LAND USE

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 is planned to be extended east from its current terminus at the intersection of Stingray Lane and Old Glory (east) to the east boundary of the school site. Lamprey Drive would be constructed north from Fontaine Boulevard to the north Lorson Ranch East Filing 2 access point (Shavers Drive) and south to Lorson Boulevard.

Filing No. 2

Figure 2 shows the proposed site plan for Lorson Ranch East Filing 2. 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 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 Phase 1.

One full-movement access (Edisto Drive) is proposed to Fontaine Boulevard about 390 feet east of Lamprey Drive. This approved access location does not meet the criteria for intersection spacing on a Principal Arterial. However, the street will function as a Collector street for the foreseeable future and will be constructed as an interim Urban Non-Residential Collector street. Once Fontaine Boulevard is constructed as a Principal Arterial, this access points would likely be restricted to right-in/right-out only. Please refer to the overall TIS for details. Two additional full-movement access points are proposed to Lamprey Drive.

Dwelling Unit Cap

The proposed 196 single-family homes would cause the total number of dwelling units within Lorson Ranch to exceed the allowable 1,750 single-family equivalent dwelling units east of the main channel of Jimmy Camp Creek as per the amended development agreement. The development agreement states:

Amendment Regarding Second Access. The Parties stipulate and agree that Lorson and LRMD shall be required to construct a second access benefitting all lots to that portion of Lorson Ranch lying east of the main channel of Jimmy Camp Creek only at such time as Lorson, or its successor or assign, submits a development application to the County that will increase the number of single-family-equivalent residential units above 1750 units approved or planned within that same area of Lorson Ranch.

Table 2 shows the updated dwelling unit cap status table with the proposed Lorson East Filing 2 added. As the dwelling unit cap will be exceeded, Lorson Boulevard must be constructed from the Carriage Meadows South east boundary to Stingray Lane including a crossing of the main Jimmy Camp Creek channel with this filing.

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, 10th Edition, 2017* by the Institute of Transportation Engineers (ITE). Table 3 shows the results of the trip generation estimates.

As shown in Table 3, Lorson Ranch East Filing 2 is projected to generate about 1,850 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 36 vehicles would enter and 109 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 122 vehicles would enter and 72 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 6) are applied to the trip generation estimates (from Table 3), the resulting site-generated traffic volumes can be determined. Figure 6 show the short-term site-generated traffic volume estimates. The Phase 1 site-generated traffic volumes assume all trips generated by Lorson Ranch East Filing 2 have origins and destinations outside of Lorson Ranch.

The short-term site-generated traffic volumes assume Lorson Boulevard has been constructed from Marksheffel Road 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

Please refer to Preliminary Plan Traffic Impact Study for the 2040 total traffic volumes and level of service analysis.

PROJECTED LEVELS OF SERVICE

The intersections of Marksheffel/Lorson, Marksheffel Road/Fontaine Boulevard, Fontaine/Lamprey, Fontaine/Edisto 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 total traffic volumes, the intersection of Marksheffel/Lorson is projected to operate at LOS C or better for all approaches during the peak hours as a Stop-sign-controlled intersection (Stop-sign on the westbound approach).

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.

Fontaine/Edisto

The intersection of Fontaine Boulevard/Edisto Drive is projected to operate at level of service C or better for all movements as a Stop-sign-controlled intersection based on the projected short-term total traffic volumes.

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. 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. As noted in the Level of Service section above, all movements at this intersection are projected to operate at a satisfactory level of service as a stop-sign-controlled intersection based on the projected short-term total traffic volumes. The decision to require a signal to be installed at this location rests with El Paso County.

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 4 presents an amended signal escrow analysis for this intersection including the previously identified amount for the 303 lots proposed as part of Filing 1, the proposed amount for Filing No. 2, and the remaining amount for future filings. As shown on Table 4 the contribution for Lorson Ranch East Filing No. 2 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 2 should be classified as either Urban Local (Low Volume) or 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 2 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 196 lots, the total building permit fee would be \$180,908.

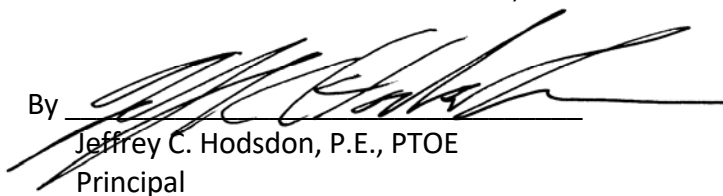
* * * * *

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 2-4
Figures 1-9
Traffic Count Reports
Level of Service Reports

Table 2
Lorson Ranch Subdivision Status
Relative to Dwelling Unit Cap

Subdivision	Plats Already Recorded OR Planned for Recording in the Short Term	Recorded Plats	Number of Building Permits Issued
Townhomes	46	46	46
Pioneer Landing Filing #1	118	118	118
Ponderosa Filings #1 & #2	204	204	204
Allegiant	97	97	97
Meadows Filing #2	109	109	109
Meadows Filing #1	97	97	97
Meadows Filing #3	138	138	138
Meadows Filing #4	236	236	234
Buffalo Crossing	204	204	204
Pioneer Landing Filing #2	158	158	158
Pioneer Landing Filing #3	12	12	2
Subtotal	1,419	1,419	1,407
Lorson Ranch East Filing #1	303	0	0
Lorson Ranch East Filing #2	196	0	0
Total	1,918	1,419	1,407
Current Dwelling Unit Cap			1,750

Source: LSC Transportation Consultants, Inc. 6/28/2019

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

			Trip Generation Rates ⁽¹⁾						Total Trips Generated			
Land Use Code	Land Use Description	Trip Generation Units	Average Weekday Traffic	Morning		Afternoon		Average Weekday Traffic	Morning		Afternoon	
				Peak Hour	Peak Hour	Peak Hour	Peak Hour		Peak Hour	Peak Hour		
			In	Out	In	Out	In	Out	In	Out		
210	Single-Family Detached Housing	196 DU ⁽²⁾	9.44	0.19	0.56	0.62	0.37	1,850	36	109	122	72

Notes:

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

(2) DU = dwelling unit

Source: LSC Transportation Consultants, Inc.

Table 4
Signal Escrow Analysis
Lorson Blvd./Marksheffel Rd.
Lorson Ranch East Preliminary Plan and Filing 2

Shown in Preliminary Plan TIA			Updated/Currently Proposed				
Phase	Number of Lots	Signal Escrow Amounts	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)		28	7	\$7,947
Future Phases*	495	\$60,854	Filing 2		196	0	\$0
			Future Filings	Original "Phase 1" Lots not included in Fil 1 - shifted to be included with "Future Filings"	28	7	\$7,947
				Lots included in "Future Phases" as shown in Prelim Plan Report, LESS the 196 Filing 2 lots		299	57
Total	826	\$154,804			826	145	\$154,804
*Original "Future Phases" beyond "Phase 1" as described in Preliminary Plan Report							
Source: LSC Transportation Consultants, Inc. September 23, 2018							



Approximate Scale
Scale: 1" = 3,000'

Figure 1
**Vicinity
Map**

Lorson Ranch East Filing 2 (LSC #184540)

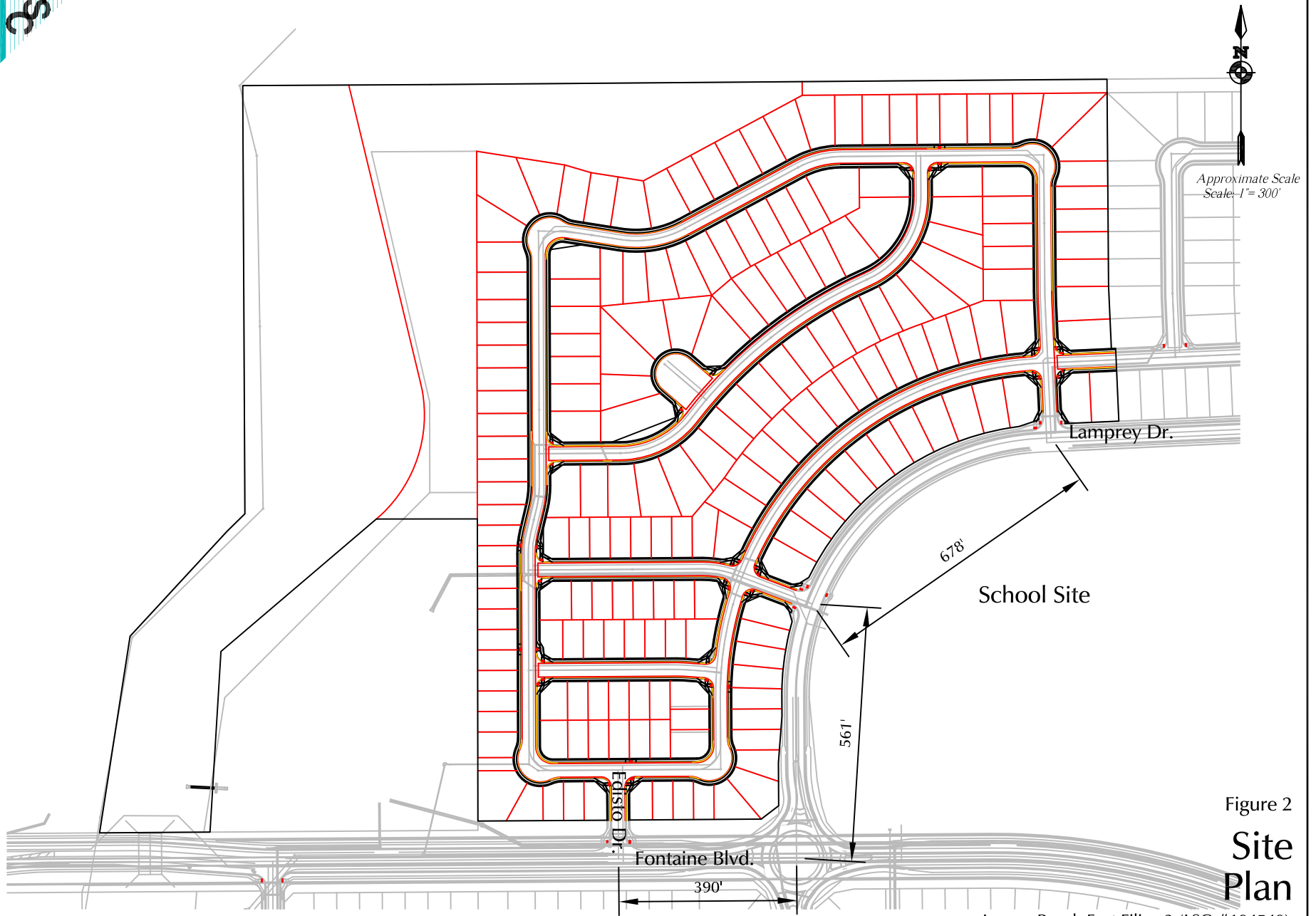
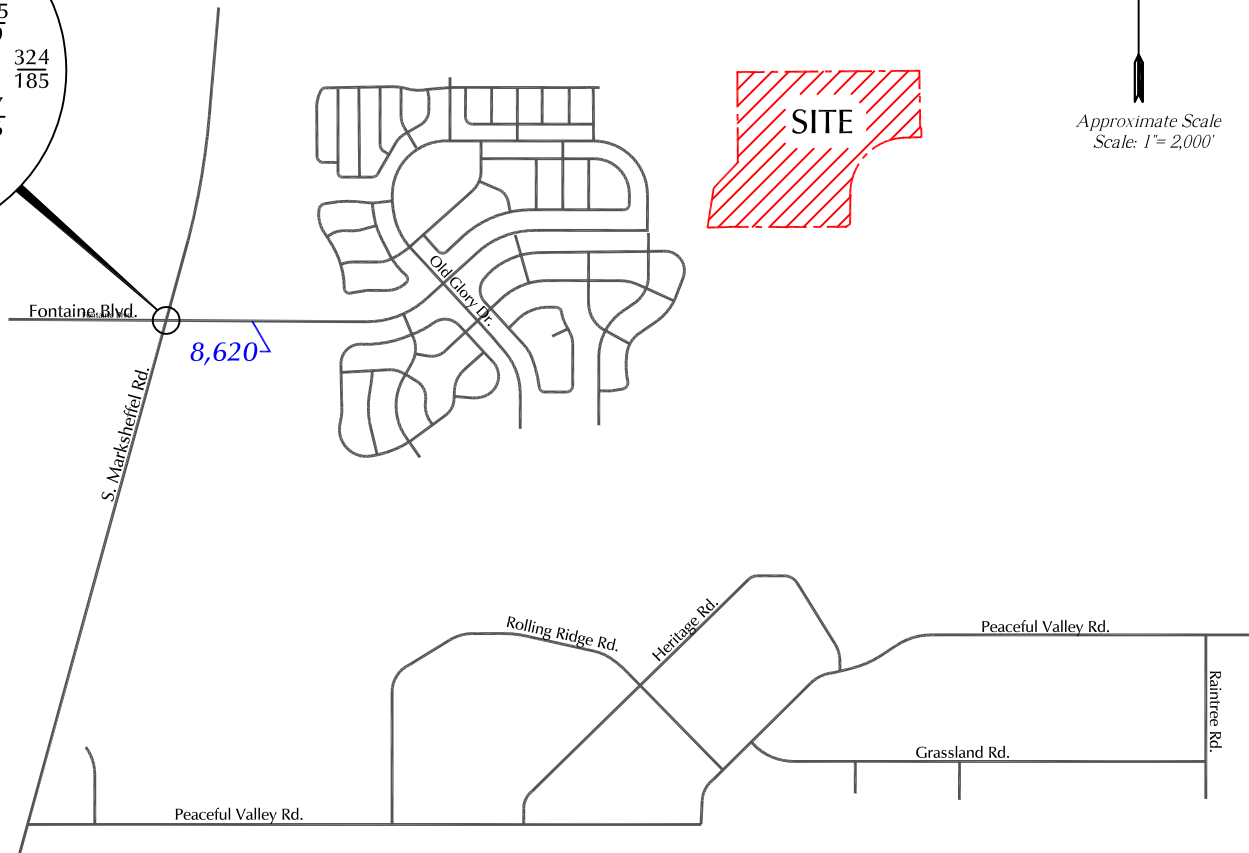
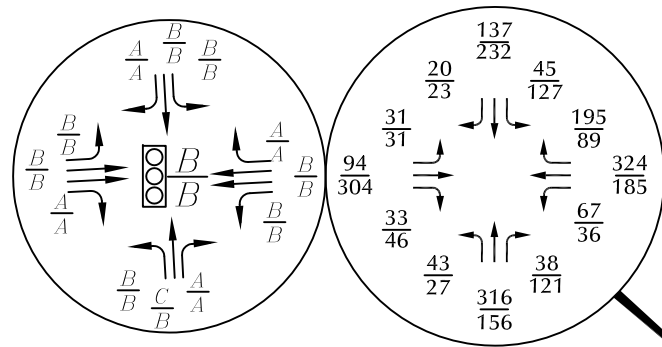


Figure 2
Site Plan

Lorson Ranch East Filing 2 (LSC #184540)



LEGEND:

$\frac{XX}{XX}$ = AM Weekday Peak-Hour Traffic (vehicles per hour) Based on counts by LSC March 2018
 $\frac{XX}{XX}$ = PM Weekday Peak-Hour Traffic (vehicles per hour)

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



Figure 3

Existing Traffic Volumes

Lorson Ranch East Filing 2 (LSC #184540)

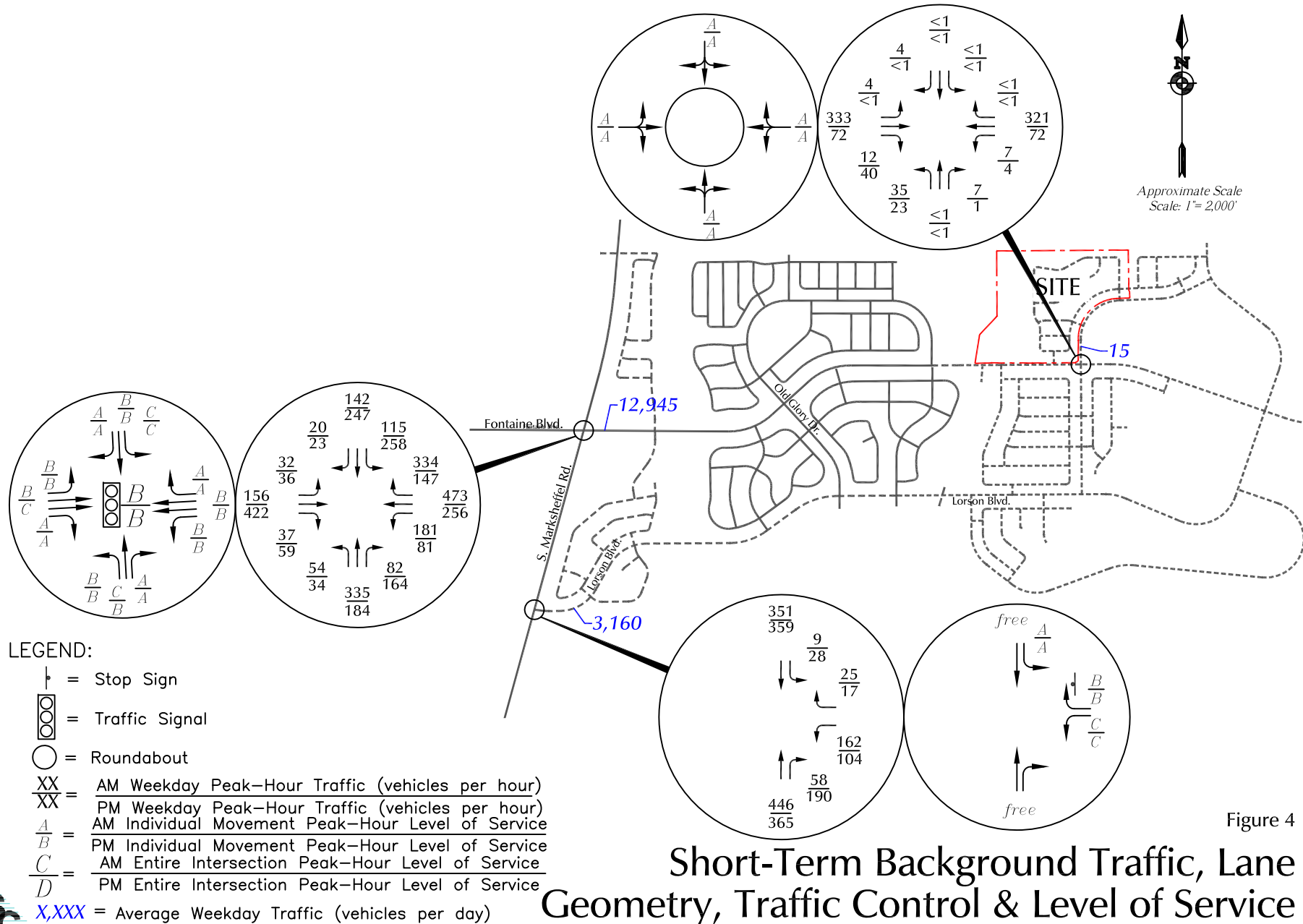
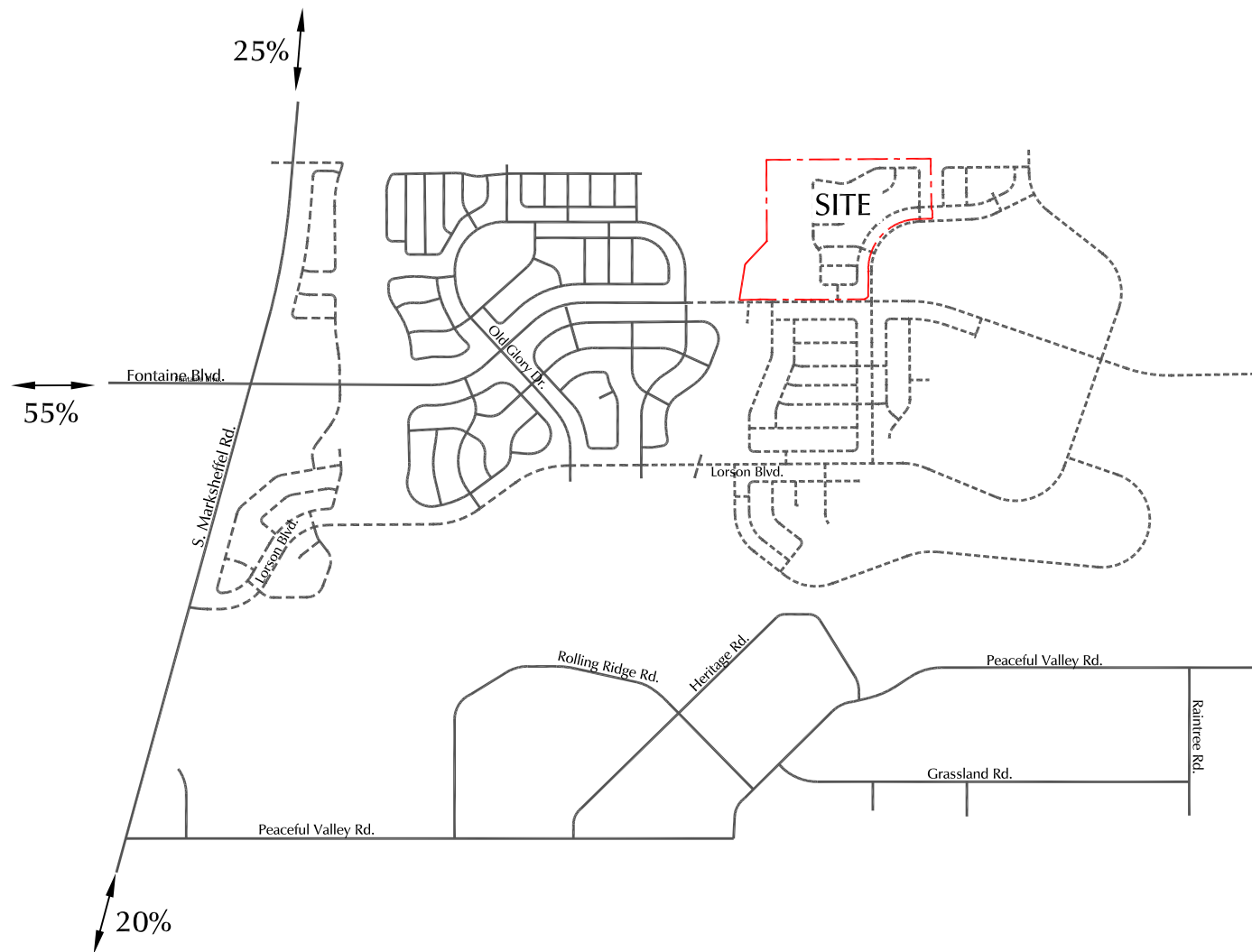


Figure 4

Short-Term Background Traffic, Lane Geometry, Traffic Control & Level of Service

Lorson Ranch East Filing 2 (LSC #184540)



Approximate Scale
Scale: 1" = 3,000'

LEGEND:

35% = Percent Directional Distribution

LSC
TRANSPORTATION
CONSULTANTS, INC.

Figure 5

Directional Distribution of Site-Generated Traffic

Lorson Ranch East Filing 2 (LSC #184540)

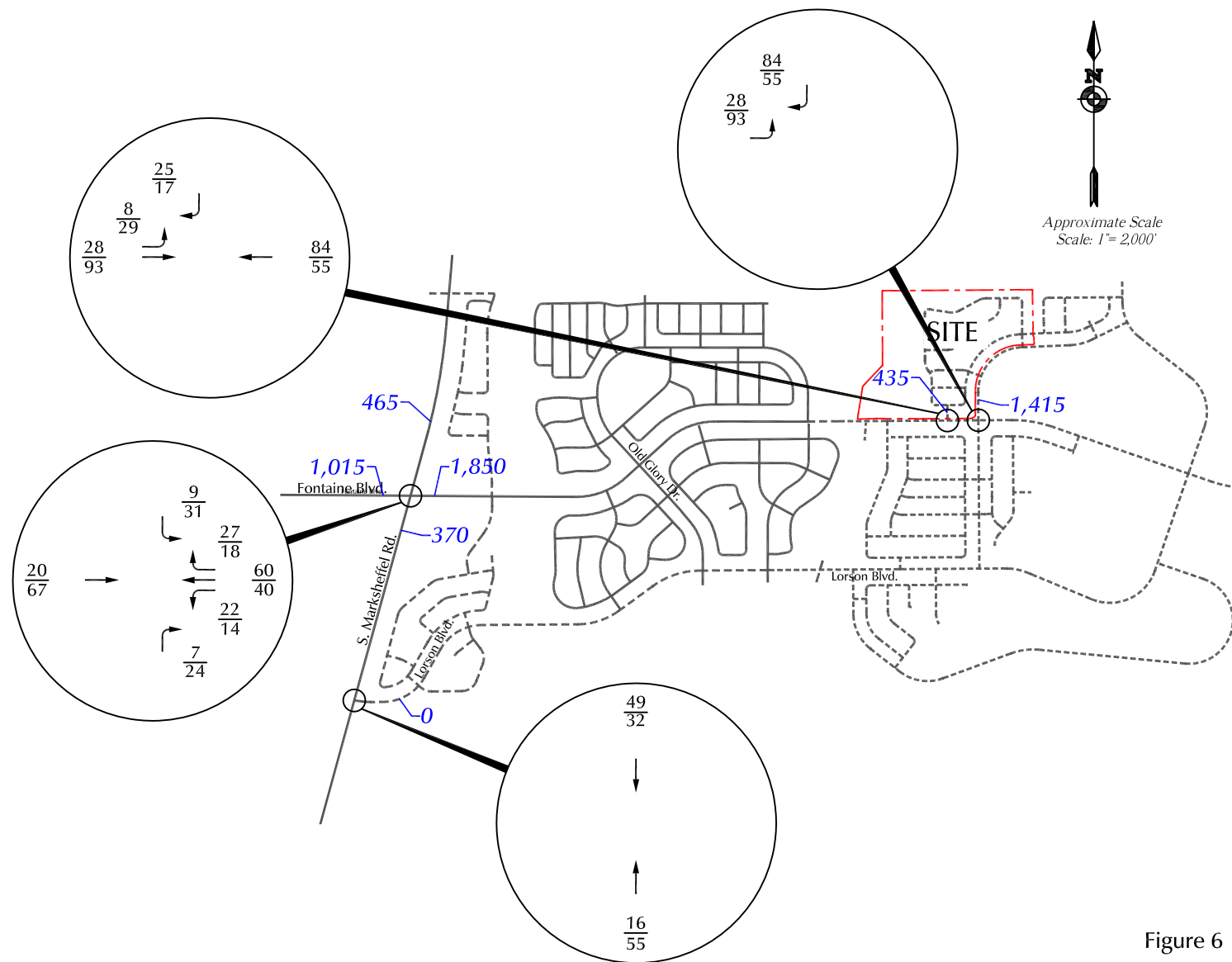


Figure 6

Assignment of Site-Generated Traffic

Lorson Ranch East Filing 2 (LSC #184540)

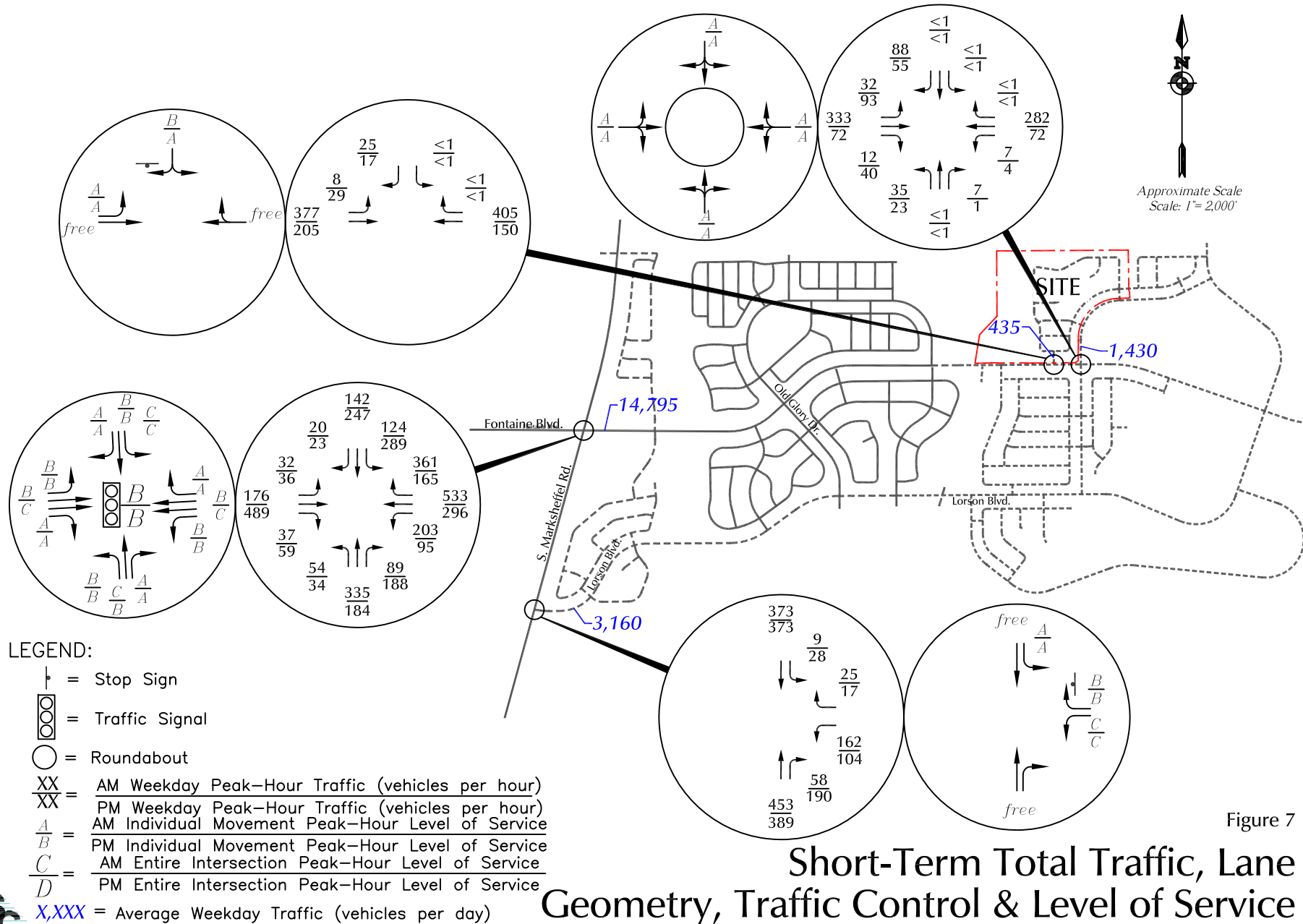
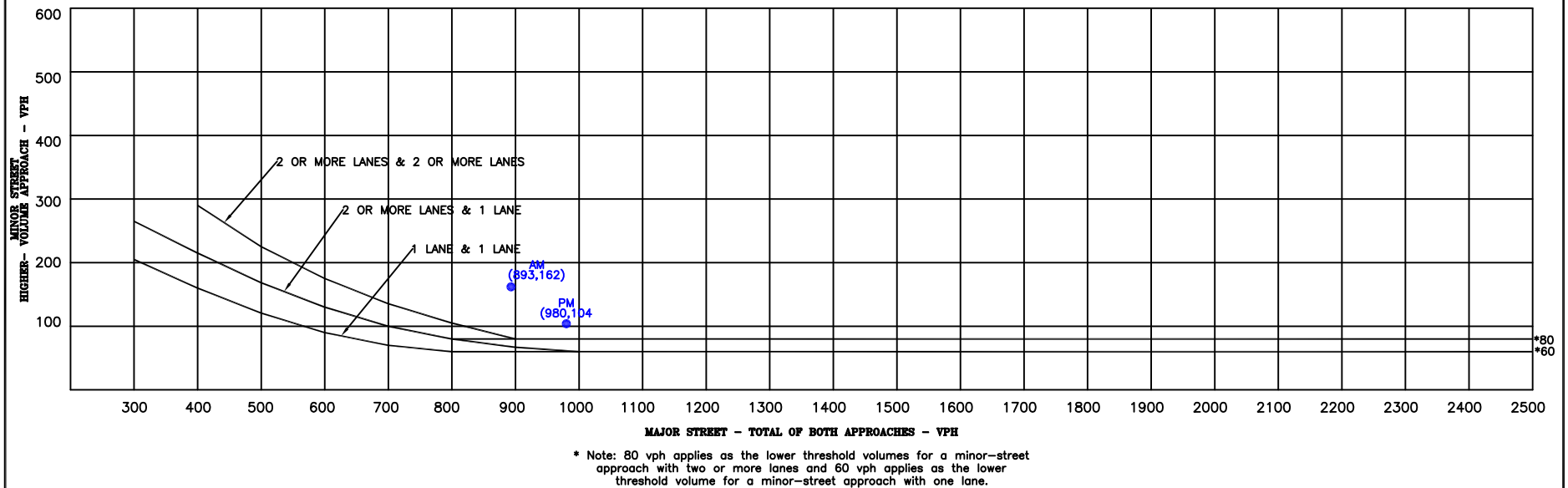


Figure 7

Short-Term Total Traffic, Lane Geometry, Traffic Control & Level of Service

Lorson Ranch East Filing 2 (LSC #184540)

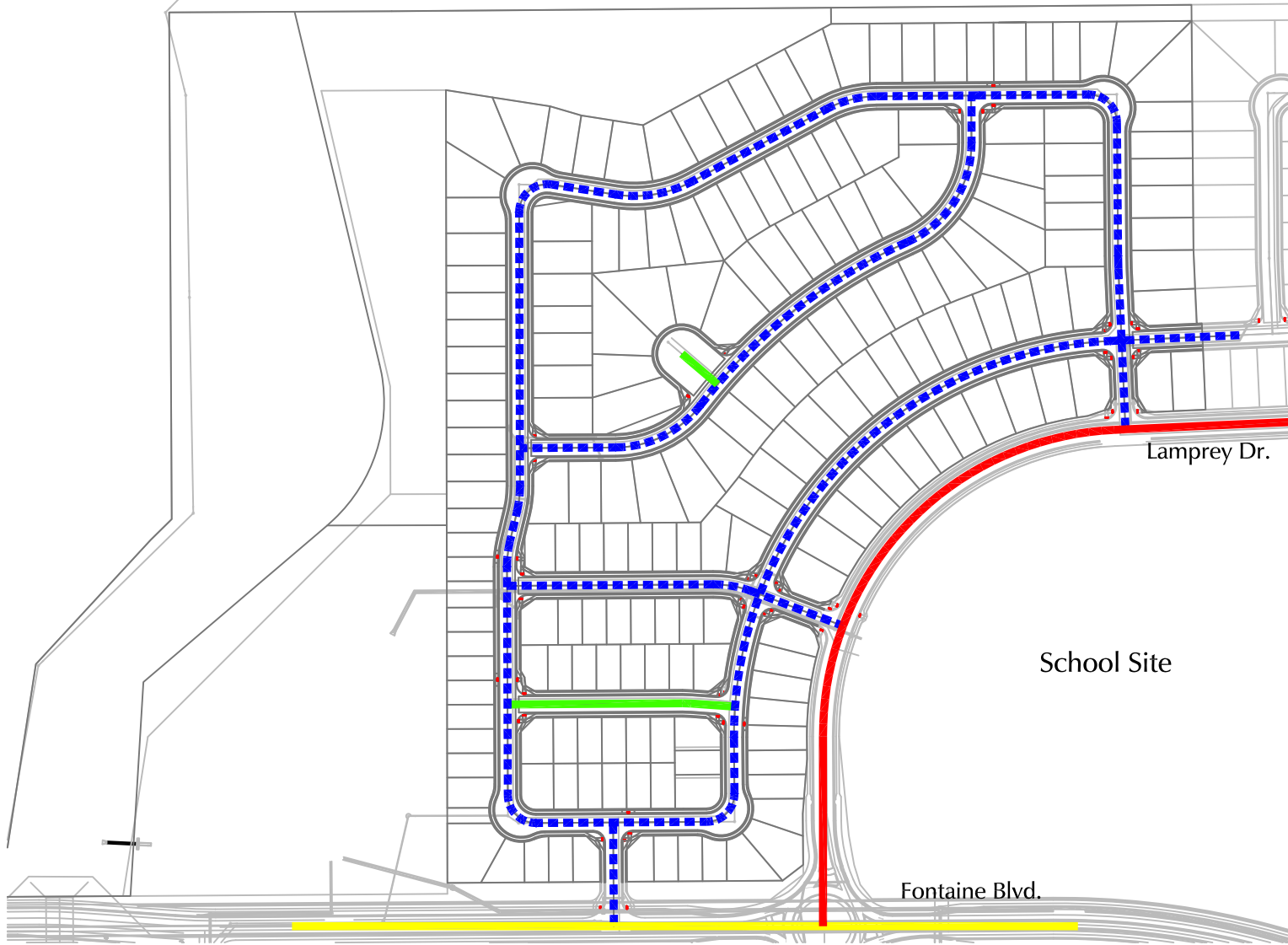
Figure 4C-2. Warrant 2 Four-Hour Vehicular Volume (70% Factor)
 (Community Less than 10,000 population or above 40 mph on Major Street)



● Short-Term Total Traffic



Approximate Scale
Scale: 1" = 300'



LEGEND:

- = Four-Lane Principal Arterial
- = Four-Lane Principal Arterial (Ultimate Classification)
Interim/Lorson Ranch Buildout 2-Lane Urban Non-Residential Collector
Street in a 100-foot R.O.W.
- = Urban Local (Low Volume)
- - - = Urban Local
- = Urban Residential Collector (60' R.O.W.)

Figure 9

Recommended Classifications

Lorson Ranch East Filing 2 (LSC #184540)

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		

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	156	37	181	473	334	54	335	82	115	142	20
Future Volume (vph)	32	156	37	181	473	334	54	335	82	115	142	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)	26.0	20.5	20.5	30.1	28.1	28.1	22.6	22.6	22.6	22.6	22.6	22.6
Actuated g/C Ratio	0.38	0.30	0.30	0.43	0.41	0.41	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.09	0.16	0.07	0.41	0.38	0.45	0.16	0.67	0.16	0.57	0.25	0.04
Control Delay	12.0	19.3	0.2	15.9	17.8	4.7	17.5	26.0	2.1	31.0	18.2	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	12.0	19.3	0.2	15.9	17.8	4.7	17.5	26.0	2.1	31.0	18.2	0.1
LOS	B	B	A	B	B	A	B	C	A	C	B	A
Approach Delay		15.1			13.0			20.9			22.2	
Approach LOS		B			B			C			C	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 69.2

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 16.4







Intersection LOS: B







Intersection Capacity Utilization 84.3%

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

Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	162	25	446	58	9	351
Future Vol, veh/h	162	25	446	58	9	351
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	176	27	537	63	10	382
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	939	537	0	0	600	0
Stage 1	537	-	-	-	-	-
Stage 2	402	-	-	-	-	-
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	293	544	-	-	977	-
Stage 1	586	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	290	544	-	-	977	-
Mov Cap-2 Maneuver	414	-	-	-	-	-
Stage 1	580	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	18.9	0	0.2			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 414 544	977	-		
HCM Lane V/C Ratio	-	- 0.425 0.05	0.01	-		
HCM Control Delay (s)	-	- 20 12	8.7	-		
HCM Lane LOS	-	- C B	A	-		
HCM 95th %tile Q(veh)	-	- 2.1 0.2	0	-		

























Intersection				
Intersection Delay, s/veh	5.5			
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	461	362	46	4
Demand Flow Rate, veh/h	470	369	47	4
Vehicles Circulating, veh/h	9	42	457	407
Vehicles Exiting, veh/h	402	462	22	4
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.8	5.2	4.8	4.0
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	470	369	47	4
Cap Entry Lane, veh/h	1367	1322	866	911
Entry HV Adj Factor	0.981	0.981	0.979	1.000
Flow Entry, veh/h	461	362	46	4
Cap Entry, veh/h	1341	1297	847	911
V/C Ratio	0.344	0.279	0.054	0.004
Control Delay, s/veh	5.8	5.2	4.8	4.0
LOS	A	A	A	A
95th %tile Queue, veh	2	1	0	0

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	422	59	81	256	147	34	184	164	258	247	23
Future Volume (vph)	36	422	59	81	256	147	34	184	164	258	247	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)	24.8	20.6	20.6	26.1	23.0	23.0	23.7	23.7	23.7	23.7	23.7	23.7
Actuated g/C Ratio	0.37	0.30	0.30	0.39	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35
v/c Ratio	0.10	0.48	0.12	0.24	0.23	0.25	0.10	0.31	0.27	0.68	0.41	0.04
Control Delay	12.9	22.7	0.4	14.1	19.1	5.4	16.2	18.1	3.9	29.0	19.5	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	12.9	22.7	0.4	14.1	19.1	5.4	16.2	18.1	3.9	29.0	19.5	0.1
LOS	B	C	A	B	B	A	B	B	A	C	B	A
Approach Delay		19.5			14.1			11.8			23.3	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 67.7

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 17.7



















Intersection LOS: B







Intersection Capacity Utilization 77.8%

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

Intersection						
Int Delay, s/veh	2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	104	17	365	190	28	359
Future Vol, veh/h	104	17	365	190	28	359
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	113	18	397	207	30	390
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	847	397	0	0	604	0
Stage 1	397	-	-	-	-	-
Stage 2	450	-	-	-	-	-
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	332	652	-	-	974	-
Stage 1	679	-	-	-	-	-
Stage 2	642	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	322	652	-	-	974	-
Mov Cap-2 Maneuver	436	-	-	-	-	-
Stage 1	658	-	-	-	-	-
Stage 2	642	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	15.3	0	0.6			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 436 652	974	-		
HCM Lane V/C Ratio	-	- 0.259 0.028	0.031	-		
HCM Control Delay (s)	-	- 16.1 10.7	8.8	-		
HCM Lane LOS	-	- C B	A	-		
HCM 95th %tile Q(veh)	-	- 1 0.1	0.1	-		

























Intersection				
Intersection Delay, s/veh	3.3			
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	121	82	26	0
Demand Flow Rate, veh/h	124	84	27	0
Vehicles Circulating, veh/h	4	25	80	109
Vehicles Exiting, veh/h	105	81	48	0
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.4	3.2	3.1	0.0
Approach LOS	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	124	84	27	0
Cap Entry Lane, veh/h	1374	1345	1272	1235
Entry HV Adj Factor	0.979	0.981	0.963	1.000
Flow Entry, veh/h	121	82	26	0
Cap Entry, veh/h	1346	1320	1225	1235
V/C Ratio	0.090	0.062	0.021	0.000
Control Delay, s/veh	3.4	3.2	3.1	2.9
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	0

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	176	37	203	533	361	54	335	89	124	142	20
Future Volume (vph)	32	176	37	203	533	361	54	335	89	124	142	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	20.6	20.6	30.3	28.2	28.2	22.6	22.6	22.6	22.6	22.6	22.6
Actuated g/C Ratio	0.38	0.30	0.30	0.44	0.41	0.41	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.09	0.18	0.07	0.46	0.43	0.48	0.16	0.67	0.18	0.62	0.25	0.04
Control Delay	12.0	19.4	0.2	17.1	18.3	5.8	17.6	26.2	2.7	34.0	18.2	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	12.0	19.4	0.2	17.1	18.3	5.8	17.6	26.2	2.7	34.0	18.2	0.1
LOS	B	B	A	B	B	A	B	C	A	C	B	A
Approach Delay		15.5			13.9			20.8			23.8	
Approach LOS		B			B			C			C	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 69.3

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 17.0







Intersection LOS: B







Intersection Capacity Utilization 85.5%

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

Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	162	25	453	58	9	373
Future Vol, veh/h	162	25	453	58	9	373
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	176	27	546	63	10	405

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	971	546	0	0	609	0
Stage 1	546	-	-	-	-	-
Stage 2	425	-	-	-	-	-
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	280	538	-	-	970	-
Stage 1	580	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	277	538	-	-	970	-
Mov Cap-2 Maneuver	404	-	-	-	-	-
Stage 1	574	-	-	-	-	-
Stage 2	659	-	-	-	-	-





Approach	WB	NB	SB
HCM Control Delay, s	19.5	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	- 404 538	970	-
HCM Lane V/C Ratio	-	- 0.436 0.051	0.01	-
HCM Control Delay (s)	-	- 20.6 12	8.7	-
HCM Lane LOS	-	- C B	A	-
HCM 95th %tile Q(veh)	-	- 2.2 0.2	0	-

HCM 6th Roundabout
14: Lamprey Dr & Fontaine Blvd

Short-Term Total Traffic
AM Peak Hour

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						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	377	405	0	0	25
Future Vol, veh/h	8	377	405	0	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	75	75	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	503	540	0	0	27
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	540	0	-	0	1061	540
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	521	-
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	1028	-	-	-	248	542
Stage 1	-	-	-	-	584	-
Stage 2	-	-	-	-	596	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1028	-	-	-	246	542
Mov Cap-2 Maneuver	-	-	-	-	246	-
Stage 1	-	-	-	-	579	-
Stage 2	-	-	-	-	596	-
Approach	EB	WB		SB		
HCM Control Delay, s	0.1	0		12		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1028	-	-	-	542	
HCM Lane V/C Ratio	0.008	-	-	-	0.05	
HCM Control Delay (s)	8.5	-	-	-	12	
HCM Lane LOS	A	-	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.2	

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	489	59	95	296	165	34	184	188	289	247	23
Future Volume (vph)	36	489	59	95	296	165	34	184	188	289	247	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)	25.1	20.9	20.9	26.5	23.5	23.5	25.2	25.2	25.2	25.2	25.2	25.2
Actuated g/C Ratio	0.36	0.30	0.30	0.38	0.34	0.34	0.36	0.36	0.36	0.36	0.36	0.36
v/c Ratio	0.10	0.57	0.13	0.32	0.27	0.27	0.10	0.30	0.29	0.74	0.40	0.04
Control Delay	13.6	24.7	0.4	15.9	20.1	5.3	16.0	17.8	3.8	31.8	19.1	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	13.6	24.7	0.4	15.9	20.1	5.3	16.0	17.8	3.8	31.8	19.1	0.1
LOS	B	C	A	B	C	A	B	B	A	C	B	A
Approach Delay		21.5			15.0			11.1			24.9	
Approach LOS		C			B			B			C	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 69.5

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 18.8



















Intersection LOS: B

Intersection Capacity Utilization 78.6%

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

HCM 6th TWSC
5: Marksheffel Rd & Lorson Blvd





Short-Term Total Traffic
PM Peak Hour

Intersection						
Int Delay, s/veh	2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	104	17	389	190	28	373
Future Vol, veh/h	104	17	389	190	28	373
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	113	18	423	207	30	405
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	888	423	0	0	630	0
Stage 1	423	-	-	-	-	-
Stage 2	465	-	-	-	-	-
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	314	631	-	-	952	-
Stage 1	661	-	-	-	-	-
Stage 2	632	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	304	631	-	-	952	-
Mov Cap-2 Maneuver	422	-	-	-	-	-
Stage 1	640	-	-	-	-	-
Stage 2	632	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	15.8	0	0.6			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 422 631	952	-		
HCM Lane V/C Ratio	-	- 0.268 0.029	0.032	-		
HCM Control Delay (s)	-	- 16.6 10.9	8.9	-		
HCM Lane LOS	-	- C B	A	-		
HCM 95th %tile Q(veh)	-	- 1.1 0.1	0.1	-		

HCM 6th Roundabout
14: Lamprey Dr & Fontaine Blvd

Short-Term Total Traffic
PM Peak Hour

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

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	205	150	0	0	17
Future Vol, veh/h	29	205	150	0	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	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	32	223	163	0	0	18
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	163	0	-	0	450	163
Stage 1	-	-	-	-	163	-
Stage 2	-	-	-	-	287	-
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	1416	-	-	-	567	882
Stage 1	-	-	-	-	866	-
Stage 2	-	-	-	-	762	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1416	-	-	-	554	882
Mov Cap-2 Maneuver	-	-	-	-	554	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	762	-
Approach	EB	WB		SB		
HCM Control Delay, s	0.9	0		9.2		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1416	-	-	-	882	
HCM Lane V/C Ratio	0.022	-	-	-	0.021	
HCM Control Delay (s)	7.6	-	-	-	9.2	
HCM Lane LOS	A	-	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	