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Sterling Ranch Filing No. 5  
Traffic Impact Study  
PUDSP-23-002  
(LSC #S224610)  
November 15, 2023

**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.

J. L. O. V. P.

11/2/2024  
Date

# **Sterling Ranch Filing No. 5**

## **Traffic Impact Study**

Prepared for:

Classic SRJ

Loren Moreland

2138 Flying Horse Club Drive

Colorado Springs, CO 80921

**NOVEMBER 15, 2023**

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LSC Transportation Consultants

Prepared by: Kirstin D. Ferrin, P.E.

Reviewed by: Jeffrey C. Hodsdon, P.E.

LSC #S224610

PCS File No.: PUDSP-22-002



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November 15, 2023

Classic SRJ  
Loren Moreland  
2138 Flying Horse Club Drive  
Colorado Springs, CO 80921

RE: Sterling Ranch Filing No. 5  
El Paso County, CO  
Traffic Impact Study  
PUDSP-22-002  
LSC #S224610

Dear Mr. Moreland:

LSC Transportation Consultants, Inc. has prepared this traffic impact study (TIS) for the proposed Sterling Ranch Filing No. 5 residential development. As shown in Figure 1, the site is located east of Vollmer Road and north of the future extension of Marksheffel Road currently under construction in El Paso County, Colorado.

## REPORT CONTENTS

This report presents:

- A list of previous Sterling Ranch traffic reports and the context of this project;
- The existing roadway and traffic conditions in the site's vicinity including the roadway widths, surface conditions, lane geometries, traffic controls, and posted speed limits;
- A summary of the proposed land use and access plan;
- The projected average weekday and peak-hour vehicle trips to be generated by the proposed future development;
- The assignment of the projected site-generated traffic volumes to the area roadways;
- Estimates of projected short-term and long-term background traffic volumes;
- The projected short-term and long-term total traffic volumes on the area roadways;
- The projected levels of service at the key intersections within the study area;
- Signal-warrant threshold analysis;
- The recommended street classifications;
- A list of deviation requests;

- Findings and recommendations for study-area roadways and intersections, including number of lanes, auxiliary turn lanes, intersection traffic control, etc.; and
- The project's obligation to the County roadway improvement fee program.

## **RECENT TRAFFIC REPORTS**

LSC prepared a previous master traffic impact study (TIS) for the entire Sterling Ranch development, Sterling Ranch Updated Traffic Impact Analysis (SKP07007) dated June 5, 2008. This master study was recently updated. The most current version of *the Sterling Ranch Sketch Plan Amendment Master Traffic Impact Study* (SKP 224) is dated February 10, 2023. Since 2008, LSC and SM Rocha, LLC have completed multiple studies for individual filings and phases within Sterling Ranch. Appendix Table 1, which includes a list of other traffic studies within Sterling Ranch and in the vicinity of area of study completed within the past five years (that LSC is aware of), is attached for reference.

El Paso County is currently studying the Briargate Stapleton Corridor as part of a Pikes Peak Rural Transportation Authority (PPRTA) study. A draft version of the Briargate-Stapleton Corridor Study by Wilson & Company was published December 9, 2021.

## **REPORT SCENARIOS**

### **Short-Term Scenario**

The short-term scenario includes the roadway segments to be added in the short term only, as shown in Figure 2. This scenario includes traffic to be generated by the currently-proposed Sterling Ranch Filing No. 5 and traffic to be generated in the short term by buildout of Homestead at Sterling Ranch, Branding Iron at Sterling Ranch, Sterling Ranch Filings 2-4, Homestead North at Sterling Ranch Filings 1-3, the Retreat at TimberRidge Filings 1-3, Sterling Ranch East Filings 1 and 2, FourSquare at Sterling Ranch East, and Copper Chase at Sterling Ranch. Trips projected from these other short-term developments outside of the currently-proposed Sterling Ranch Filing No. 5 are included as short-term “background traffic” in this report.

### **Long-Term Scenario**

The long-term scenario is essentially the same as the 2043 long-term scenario contained in the most current version of the *Sterling Ranch Sketch Plan Amendment Master Traffic Impact Study* (SKP 224) dated February 10, 2023 with additional detail added for this application – including the analysis of minor intersections and street segments that are part of the currently-proposed development. The study area of this report is more focused than the Sketch Plan.

## RECENT TRAFFIC REPORTS

- LSC completed an updated master traffic study (MTIS) for the entire Sterling Ranch development, dated March 17, 2023. Appendix Table 1 includes a link to the El Paso County Electronic Development Application Review Program (EDARP) page where a copy of the latest version of that MTIS can be obtained.
- A list of other traffic studies within Sterling Ranch and in the vicinity of the area of study completed within the past five years (that LSC is aware of) is attached for reference (Appendix Table 1).
- El Paso County is currently studying the Briargate Stapleton Corridor as part of a Pikes Peak Rural Transportation Authority (PPRTA) study. A draft version of the *Briargate-Stapleton Corridor Study* by Wilson & Company was published December 9, 2021.

## EXISTING ROAD AND TRAFFIC CONDITIONS

The adjacent streets are shown in Figures 1 and 2 and are described below. Copies of the *2016 El Paso County Major Transportation Corridors Plan (MTCP)*, *2040 Roadway Plan*, and *2016 MTCP 2060 Corridor Preservation Plan* with the site location identified on them have been attached to this report.

**Vollmer Road** is currently a five-lane urban street within the City of Colorado Springs limits between Black Forest Road and Cowpoke Road and a two-lane, rural, paved roadway north of Cowpoke Road extending to north of Hodgen Road. Improvements to a section of Vollmer Road in the vicinity of the future Marksheffel Road are currently under construction. In the southbound direction, Vollmer Road has a posted speed limit of 45 mph. South of Cowpoke Road, Vollmer Road has a 40-mph posted speed limit. The *2040 El Paso County Major Transportation Corridors Plan (MTCP)* and the 2023 Sterling Ranch master traffic study show Vollmer Road as a four-lane Urban Minor Arterial in the vicinity of the site. Note: The new Connect COS City of Colorado Springs transportation plan shows Vollmer as a Principal Arterial.

**Marksheffel Road** is a Principal Arterial extending north from the City of Fountain to Woodmen Road. Marksheffel Road is planned to ultimately be widened to six lanes and extended north and west from Woodmen Road to connect to Research Parkway at Black Forest Road. Marksheffel Road is shown as a four-lane Principal Arterial through the site on the El Paso County *MTCP*. The City of Colorado Springs intends to take ownership and maintenance of Marksheffel Road when it is constructed from Vollmer to the east and south to where it will connect to the segment constructed north of Woodmen Road in the City.

The section of Marksheffel Road adjacent to Sterling Ranch is currently under construction on 107 feet of right-of-way to the City's required cross section(s) and criteria. It is anticipated that Marksheffel Road will be connected between Vollmer Road and Woodmen Road by the end of 2023.

**Briargate Parkway** is a six-lane, Principal Arterial that extends east from Interstate (I)-25 to Grand Lawn Circle (about one-half mile east of Powers Boulevard). Briargate Parkway is planned ultimately to extend to Towner Drive. The segment of Briargate Parkway between Vollmer Road and Sterling Ranch Road is planned to be constructed in the short term with the Sterling Ranch East Preliminary Plan.

**Sterling Ranch Road** is a planned Non-Residential Collector shown extending through the Sterling Ranch development between Marksheffel Road and the north end of the Sketch Plan area (Arroya Road). The segment between Marksheffel Road and Dines Boulevard has been constructed and the segment between Dines Boulevard and Briargate Parkway will be constructed in the short term with the Sterling Ranch East Preliminary Plan.

## **LAND USE AND ACCESS**

The area planned for Sterling Ranch Filing No. 5 was included in the Sterling Ranch Master TIS as Traffic Analysis Zone (TAZ) 16. The Sterling Ranch Master TIS assumed TAZ 16 would be developed with 82 single-family homes. The currently-proposed Sterling Ranch Filing No. 5 is planned to include 72 residential dwelling units, including 37 duplexes and 35 single-family homes.

A full-movement access point (Manor House Way) is proposed to Dines Boulevard about 518 feet north of Sterling Ranch Road. A second access is proposed to form the northeast leg of the intersection of School House Drive/Hazlett Drive which was approved as part of Sterling Ranch Filing No. 2. Figure 3 shows the proposed site plan.

## **Intersection Sight Distance**

Figure 4 shows a sight-distance analysis at the proposed intersection to Dines Boulevard and at the intersection of Dines Boulevard/Sterling Ranch Road. Based on a design speed of 40 miles per hour (mph) and the criteria contained in Table 2-21 of the *Engineering Criteria Manual (ECM)*, the required intersection sight distance at these intersections is 445 feet. Based on the criteria contained in Table 2-17 of the *ECM*, the required stopping sight distance approaching these intersections is 305 feet. As shown in Figure 4, the proposed intersection of Dines/Manor House and the intersection of Dines/Sterling Ranch will meet the criteria.

## **Pedestrian and Bicycle Analysis**

Figure 3 shows the location of all planned trails and sidewalks in the vicinity of the site. Connections are also proposed to the planned future Sand Creek Regional Trail (west of Dines Boulevard).

A detached sidewalk will be provided along the west side of Sterling Ranch Road. The multi-use paved shoulder on Sterling Ranch Road will accommodate bicycles.

There are no existing schools within two miles of the site. However, multiple school sites are planned within Sterling Ranch northeast of the intersection of Sterling Ranch Road/Dines Boulevard. School pedestrians would travel to/from the intersection of Sterling Ranch/Dines on the sidewalks and trails identified in Figure 3. The need for additional pedestrian facilities and/or school crossings should be identified when the school site(s) are developed.

### **Safety Analysis**

Most of the roadways in the vicinity of the site have not yet been constructed. The Colorado State Patrol (CSP) provided LSC with crash history data for Vollmer Road between Tahiti Drive and Burgess Road from September 2019 through September 2022. During the reported time period, there were twelve reported crashes. Of the twelve reports, ten were single-vehicle non-intersection-related crashes on Vollmer Road. One crash involved a southbound vehicle that turned right onto Poco Road and crashed into several cars parked on Poco Road partially in the lane. The only intersection related crash occurred in June 2022. A vehicle heading northbound on Vollmer Road was slowing to turn left at Lochwinnoch Road and the vehicle behind them attempted to pass on the left side. The crash history data has been attached.

### **TRIP GENERATION**

Sterling Ranch Filing No. 5 site-generated vehicle trips have been estimated using the nationally-published trip-generation rates from *Trip Generation, 11th Edition, 2021* by the Institute of Transportation Engineers (ITE). Table 1 shows the trip-generation estimate. Table 1 also shows the trip-generation estimate for the same parcel assumed in the *Sterling Ranch Master TIS* (MTIS) for comparison.

Sterling Ranch Filing No. 5 is expected to generate 596 vehicle trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. This is about 177 fewer vehicle trips per day than were assumed for the same area in the Sterling Ranch MTIS. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 11 vehicles would enter and 32 vehicles would exit the site. This is about 4 fewer entering vehicles and 11 fewer exiting vehicles than were assumed for the same area in the Sterling Ranch MTIS. During the afternoon peak hour, which generally occurs for one hour between 4:15 and 6:15 p.m., about 33 vehicles would enter and 21 vehicles would exit the site. This is about 15 fewer entering vehicles and 4 fewer exiting vehicles than were assumed for the same area in the Sterling Ranch MTIS.

### **TRIP DISTRIBUTION AND ASSIGNMENT**

The directional distribution of the site-generated traffic volumes on the street and roadway system serving the site is an important factor in determining the site's traffic impacts. The distribution estimates for short-term and long-term residential-related traffic are shown in Figure 5. The short-term directional-distribution estimate assumes the short-term roadway

network shown in Figure 2 only and the long-term directional-distribution estimate assumes buildout of the roadway network. The directional-distribution estimates are based, in part, on the estimates contained in the sketch plan TIS report. Factors include: the location of the site with respect to the Colorado Springs metropolitan area, the planned access system for the site, the street and roadway system serving the site, and the land uses proposed for the site.

When the distribution percentages (from Figure 5) are applied to the new, external trip-generation estimates (from Table 1), the resulting site-generated traffic volumes can be determined. Figures 6 and 7 show the short-term and long-term site-generated traffic volumes, respectively. The short-term site-generated traffic volumes assume only the street network shown in Figure 2 and the long-term site-generated traffic volumes assume buildout of the area roadway network.

## **BACKGROUND TRAFFIC VOLUMES**

Background traffic is the traffic estimated to be on the adjacent roadways and at adjacent intersections without the proposed development's trip generation of site-generated traffic volumes. Background traffic (for a specified horizon year) includes the through traffic and the traffic generated by nearby developments (existing and planned, including traffic generated by existing and planned developments within the greater Sterling Ranch overall development) but assumes zero traffic generated by land uses within Sterling Ranch Filing No. 5.

### **Short-Term Scenario Background Conditions**

Figure 8 shows the projected volumes for the short-term background scenario. This scenario includes traffic to be generated in the short term by buildout of Homestead at Sterling Ranch, Branding Iron at Sterling Ranch, Sterling Ranch Filings 2-4, Homestead North at Sterling Ranch Filings 1-3, the Retreat at TimberRidge Filings 1-3, Sterling Ranch East Filings 1 and 2, FourSquare at Sterling Ranch, and Copper Chase at Sterling Ranch.

### **Long-Term Scenario Background Conditions**

Figure 9 shows the projected 2043 background daily traffic volumes on key street segments at the key area intersections. These volumes assume buildout of the area street network, including the completion of Marksheffel Road between Vollmer Road and Black Forest Road, Briargate Parkway between Meridian Road and Black Forest Road, and Sterling Ranch Road between Marksheffel Road and Briargate Parkway.

The 2043 background traffic volumes are estimates by LSC, based on the traffic projections in the LSC February 10, 2023 Master TIS report. The 2043 background daily traffic volumes assume buildout of all other land uses within the Sterling Ranch Master Plan.

## TOTAL TRAFFIC VOLUMES

### Short-Term Scenario Total Conditions

Figure 10 shows the projected volumes for the short-term total scenario. These volumes are the sum of the short-term background scenario (from Figure 8) plus the short-term site-generated traffic volumes (from Figure 6).

### Long-Term Scenario Total Conditions

Figure 11 shows the projected volumes for the 2043 total scenario. These volumes are the sum of the 2043 background scenario (from Figure 9) plus the long-term site-generated traffic volumes (from Figure 7).

## 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 intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections. Table 1 shows the level of service delay ranges.

**Table 2: Intersection Levels of Service Delay Ranges**

Level of Service	Signalized Intersections	Unsignalized Intersections
	Average Control Delay (seconds per vehicle)	Average Control Delay (seconds per vehicle) <sup>(1)</sup>
A	10.0 sec or less	10.0 sec or less
B	10.1-20.0 sec	10.1-15.0 sec
C	20.1-35.0 sec	15.1-25.0 sec
D	35.1-55.0 sec	25.1-35.0 sec
E	55.1-80.0 sec	35.1-50.0 sec
F	80.1 sec or more	50.1 sec or more

(1) 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 study-area stop-sign-controlled intersections have been analyzed based on the unsignalized-intersection analysis procedures from the *Highway Capacity Manual, 6th Edition* by the Transportation Research Board. The future signalized intersections of Vollmer Road/Marksheffel Road and Sterling Ranch Road /Marksheffel Road have been analyzed using Synchro.

### **Vollmer Road /Marksheffel Road**

Marksheffel Road is planned to be constructed between Vollmer Road and Sterling Ranch Road in the short-term future. The intersection of Marksheffel/Vollmer is initially planned to be stop-sign controlled. Based on the projected short-term total traffic volumes, the westbound left-turn movement is projected to operate at LOS E during the morning peak hour and LOS F during the afternoon peak hour. This intersection is planned as a future signalized intersection. However, traffic-signal warrant(s) may not be met in the short-term. It is not uncommon for the minor movements at a stop-sign-controlled intersection to operate at LOS E or F as the traffic volumes approach the levels needed to meet vehicular-volume traffic-signal warrants.

By 2043, it was assumed that Marksheffel Road would be constructed west to Briargate Parkway and that the intersection of Vollmer/Marksheffel will be converted to traffic-signal control. The intersection of Vollmer/Marksheffel is projected to operate at an overall LOS C or better during the peak hours as a signalized intersection, based on the projected 2043 total traffic volumes.

### **Sterling Ranch Road /Marksheffel Road**

Marksheffel Road is planned to be constructed between Vollmer Road and Sterling Ranch Road in the short-term future. The intersection of Marksheffel/Sterling Ranch is initially planned to be stop-sign controlled. Based on the projected short-term total traffic volumes, the southbound left-turn movement is projected to operate at LOS C during the morning peak hour and LOS E during the afternoon peak hour. This intersection is planned as a future signalized intersection. However, traffic-signal warrant(s) may not be met in the short-term. It is not uncommon for the minor-street movements at a stop-sign-controlled intersection to operate at LOS E or F as the traffic volumes approach the levels needed to meet vehicular-volume traffic-signal warrants.

By 2043, it was assumed that Sterling Ranch would be constructed south of Marksheffel Road and that the intersection of Sterling Ranch/Marksheffel will be converted to traffic-signal control. The intersection of Sterling Ranch/Marksheffel is projected to operate at an overall LOS C or better during the peak hours as a signalized intersection, based on the projected 2043 total traffic volumes.

### **Sterling Ranch Road /Hazlett Drive**

All movements at the stop-sign-controlled intersection of Sterling Ranch Road/Hazlett Drive are projected to operate at LOS C or better during the peak hours, based on the projected short-term total traffic volumes. By 2043, the northbound approach of this intersection is projected to operate at LOS E during the afternoon peak hour, based on both the background and total traffic volumes. A vehicular-volume traffic-signal warrant is unlikely to be met at this intersection. Although this movement is projected to operate at LOS E, the V/C ratio is well below 1.0.



### **Sterling Ranch Road /Dines Boulevard**

All movements at the stop-sign-controlled intersection of Sterling Ranch Road/Dines Boulevard are projected to operate at LOS D or better during the peak hours, based on the projected short-term and 2043 total traffic volumes.

### **Dines Boulevard/Manor House Drive**

All movements at the stop-sign-controlled intersection of Dines/Manor House are projected to operate at LOS A during the peak hours, based on the projected short-term and 2043 total traffic volumes.

### **SIGNAL WARRANT THRESHOLD ANALYSIS – AM AND PM PEAK HOURS**

The intersections of Marksheffel/Vollmer and Marksheffel/Sterling Ranch were analyzed to determine if the thresholds for Four-Hour and/or Eight-Hour Vehicular-Volume Traffic-Signal Warrant thresholds would be reached or exceeded, based on the projected short-term traffic volumes.

The off-peak-hour volumes are estimates by LSC, based on the peak-hour traffic volumes, 72-hour machine counts conducted by LSC on Vollmer Road in November 2020, and vehicle time-of-day distribution data for single-family homes published by the Institute of Transportation Engineers.

### **Marksheffel/Vollmer**

Table 3 shows the results of the analysis for the intersection of Marksheffel/Vollmer. As shown in Table 3, in the short-term, only three of the hours analyzed are projected to meet the thresholds for an Eight-Hour Vehicular-Volume Traffic-Signal Warrant and none of the hours analyzed are projected to meet the thresholds for a Four-Hour Vehicular-Volume Traffic-Signal Warrant. This analysis indicates that traffic-signal warrant(s) will likely **not** be met at the intersection of Marksheffel/Vollmer in the short-term.

### **Marksheffel/Sterling Ranch**

Table 4 shows the results of the analysis for the intersection of Marksheffel/Sterling Ranch. As shown in Table 4, in the short-term, only four of the hours analyzed are projected to meet the thresholds for an Eight-Hour Vehicular-Volume Traffic-Signal and only one of the hours analyzed are projected to meet the thresholds for a Four-Hour Vehicular-Volume Traffic-Signal Warrant. This analysis indicates that traffic-signal warrant(s) will likely **not** be met at the intersection of Marksheffel/Sterling Ranch in the short-term.

## **SUBDIVISION STREET CLASSIFICATIONS**

All of the internal streets within Sterling Ranch Filing No. 5 should be classified as Urban Local. Figure 12 shows the recommended street classifications for the internal streets and the streets in the vicinity of the site.

## **DEVIATION REQUESTS**

It is our understanding that no requests for deviations to the criteria contained in the *El Paso County Engineering Criteria Manual (ECM)* are being submitted with this filing.

## **ROADWAY IMPROVEMENTS**

Table 4 from the *Sterling Ranch Sketch Plan Amendment Master TIS* contained a summary of needed area improvements. Appendix Table 2 is a copy of this table with updated notes and with the improvements needed either prior to or with Sterling Ranch Filing No. 5 highlighted. Please see Figure 13 for a map of the key street-segment locations.

The following auxiliary lanes shown will be required with Sterling Ranch Filing No. 5 if not completed with Sterling Ranch Filing No. 2. Note: These are shown on the construction plans by JR Engineering for these adjacent roadways and construction is underway:

- Marksheffel/Vollmer
  - 155-foot northbound right-turn deceleration lane on Vollmer approaching Marksheffel, plus a 160-foot taper.
  - 310-foot southbound left-turn lane on Vollmer approaching Marksheffel, plus a 160-foot taper.
  - 425-foot westbound left-turn lane on Marksheffel approaching Vollmer, plus a 200-foot taper.
  - 235-foot westbound right-turn deceleration lane on Marksheffel approaching Vollmer, plus a 200-foot taper.
- Sterling Ranch/Marksheffel
  - 470-foot eastbound left-turn lane on Marksheffel approaching Sterling Ranch, plus a 200-foot taper.
  - A 285-foot southbound left-turn lane on Sterling Ranch approaching Marksheffel, plus a 90-foot reverse-curve taper.
  - A 155-foot southbound right-turn lane on Sterling Ranch approaching Marksheffel, plus a 160-foot taper.
- Sterling Ranch/Hazlett
  - A 305-foot northeast-bound left-turn lane on Sterling Ranch Road approaching Hazlett, plus a 90-foot reverse-curve taper.

- Sterling Ranch/Dines
  - A 305-foot northeast-bound left-turn lane on Sterling Ranch Road approaching Hazlett, plus a 90-foot reverse-curve taper.
  - A 155-foot southeast-bound right-turn deceleration lane on Dines Boulevard approaching Sterling Ranch Road.
- Dines/Manor House
  - Based on the projected short-term and 2043 total traffic volumes and the criteria contained in the *ECM*, no auxiliary turn lanes would be required at the intersection of Dines/Manor House.

### **ROADWAY IMPROVEMENT FEE PROGRAM**

This project will be required to participate in the El Paso County Road Improvement Fee Program. Sterling Ranch Filing No. 5 will join the ten-mil PID. The 2019 ten-mil PID building permit fee portion associated with this option is \$1,221 per single-family dwelling unit. Based on 72 lots, the total building permit fee would be \$87,912. Note: program fees are subject to change.

\* \* \* \* \*

Please contact me if you have any questions regarding this report.

Respectfully Submitted,

LSC TRANSPORTATION CONSULTANTS, INC.

By: Jeffrey C. Hodsdon, P.E.  
Principal

JCH/KDF:jas

Enclosures: Tables 1, 3, and 4  
Figures 1-13  
Level of Service Reports  
MTCP Maps  
Appendix Tables 1-2

# Tables 1, 3, and 4



**Table 1  
Trip Generation Estimate  
Sterling Ranch Filing No. 5**

Sketch Plan TAZ	ITE Code	ITE Land Use	Quantity	Unit	Trip Generation Rates <sup>(1)</sup>					Total Trip Generated				
					Daily	AM Peak Hour		PM Peak Hour		Daily	AM Peak Hour		PM Peak Hour	
						In	Out	In	Out		In	Out	In	Out
<b>Trip Generation Estimate Based on the Currently Proposed Land Use</b>														
16	215	Single Family Attached Housing	37	DU <sup>(2)</sup>	7.20	0.12	0.36	0.34	0.23	266	4	13	12	9
	210	Single-Family Detached Housing	35	DU	9.43	0.18	0.53	0.59	0.35	330	6	18	21	12
			<b>72</b>	<b>DU</b>						<b>596</b>	<b>11</b>	<b>32</b>	<b>33</b>	<b>21</b>
<b>Trip Generation Estimate From the Sterling Ranch Sketch Plan Amendment Master Traffic Impact Study, March 17, 2023</b>														
16	210	Single-Family Detached Housing	82	DU	9.43	0.18	0.52	0.59	0.35	773	15	42	49	29
										<b>-177</b>	<b>-4</b>	<b>-11</b>	<b>-15</b>	<b>-8</b>

Notes:

(1) Source: "Trip Generation, 11th Edition, 2021" by the Institute of Transportation Engineers (ITE)

(2) DU = Dwelling Unit

Source: LSC Transportation Consultants, Inc.

May-23

**Table 3**  
**Traffic Signal Warrant Analysis**  
 Marksheffel Road/Vollmer Road

Warrant Analysis <sup>(1)</sup>																				
Hour	Short-Term Background Traffic						Sterling Ranch Fil 5 Generated Traffic				Short-Term Total Traffic		Warrant 1: Eight Hour Vehicular Volume Evaluation				Warrant 2: Four Hour Vehicular Volume Evaluation			
													Warrant Thresholds				Warrant Threshold Met?		Short-Term Background	
	Major <sup>(2)</sup>		Minor <sup>(3)</sup>		Major		Minor		Major		Minor		Condition A		Condition B		Condition A		Condition B	
	Vollmer		Marksheffel		Vollmer		Marksheffel		Vollmer		Marksheffel		Major		Minor		A		B	
Short-Term Total Traffic <sup>(4)</sup>																				
12-1 AM	48	3	1	0	49	3	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
1-2 AM	23	3	0	0	23	3	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
2-3 AM	16	0	0	0	16	0	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
3-4 AM	25	3	0	0	25	3	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
4-5 AM	41	10	0	1	41	11	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
5-6 AM	109	25	1	3	110	28	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
6-7 AM	323	75	3	9	326	84	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
7-8 AM	777	129	5	16	782	145	600	150	900	75	No	No	No	No	212	No	209	No		
8-9 AM	868	109	6	13	874	122	600	150	900	75	No	No	No	No	183	No	182	No		
9-10 AM	750	68	5	8	755	76	600	150	900	75	No	No	No	No	225	No	223	No		
10-11 AM	869	68	7	8	876	76	600	150	900	75	No	No	No	No	183	No	181	No		
11-12 PM	981	65	8	8	989	73	600	150	900	75	No	No	No	No	155	No	153	No		
12-1 PM	829	64	9	8	838	72	600	150	900	75	No	No	No	No	193	No	191	No		
1-2 PM	822	68	10	9	832	77	600	150	900	75	No	No	No	No	195	No	192	No		
2-3 PM	945	71	11	9	956	80	600	150	900	75	No	No	No	Yes	164	No	161	No		
3-4 PM	1003	69	14	9	1017	78	600	150	900	75	No	No	No	Yes	149	No	145	No		
4-5 PM	1042	86	17	11	1059	97	600	150	900	75	No	Yes	No	Yes	137	No	132	No		
5-6 PM	872	85	17	11	889	96	600	150	900	75	No	No	No	No	182	No	178	No		
6-7 PM	595	68	14	9	609	77	600	150	900	75	No	No	No	No	293	No	286	No		
7-8 PM	374	49	10	6	384	55	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
8-9 PM	304	36	10	5	314	41	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
9-10 PM	194	28	7	4	201	32	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
10-11 PM	110	13	4	2	114	15	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
11-12 AM	59	8	2	1	61	9	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No		
Numbers of Hours the Warrant Thresholds Are Met												0	1	0	3					
Warrant Met?												No		No						
																0			0	
																No			No	

Notes:

- (1) Thresholds are based on 2 or more lanes on the major approach and 1 lane on the minor approach (Warrant evaluation assuming the westbound left turn only for the minor street)
- (2) The major street traffic includes all movements (left, through, and right)
- (3) The minor street traffic includes only the left turns from the minor street
- (4) Off peak hour traffic volumes are based on the projected peak hour traffic volumes, 72-hour machine counts conducted on Vollmer Road in November 2020 and vehicle time-of-day distribution data for single-family residential published by the Institute of Transportation Engineers

Source: LSC Transportation Consultants, Inc.

**Table 4**  
**Traffic Signal Warrant Analysis**  
Marksheffel Road/Sterling Ranch Road

Warrant Analysis <sup>(1)</sup>																						
Warrant 1: Eight Hour Vehicular Volume Evaluation											Warrant 2: Four Hour Vehicular Volume Evaluation											
Hour	Short-Term Background Traffic		Sterling Ranch Filing No. 5 Generated Traffic		Short-Term Total Traffic		Warrant Thresholds				Warrant Threshold Met?		Short-Term Background		Short-Term Total		Warrant Threshold Minimum	Warrant Threshold Met? WB	Warrant Threshold Minimum	Warrant Threshold Met? WB		
	Major <sup>(2)</sup> Marksheffel	Minor <sup>(3)</sup> Sterling Ranch	Major Marksheffel	Minor Sterling Ranch	Major Marksheffel	Minor Sterling Ranch	Condition A		Condition B		Condition A	Condition B	Condition A	Condition B	Warrant Threshold Minimum	Warrant Threshold Met? WB					Warrant Threshold Minimum	Warrant Threshold Met? WB
							Major	Minor	Major	Minor												
	Condition A	Condition B	Condition A	Condition B																		
<b>Short-Term Total Traffic<sup>(4)</sup></b>																						
12-1 AM	30	7	2	0	32	7	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
1-2 AM	14	7	0	0	14	7	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
2-3 AM	11	0	0	0	11	0	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
3-4 AM	14	7	0	0	14	7	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
4-5 AM	22	27	0	1	22	28	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
5-6 AM	52	67	2	3	54	70	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
6-7 AM	157	197	5	8	162	205	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
7-8 AM	358	341	9	13	367	354	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
8-9 AM	403	288	11	11	414	299	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
9-10 AM	349	181	9	7	358	188	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
10-11 AM	416	181	12	7	428	188	600	150	900	75	No	No	No	No	Low Volume	No	376	No				
11-12 PM	489	171	15	7	504	178	600	150	900	75	No	No	No	No	346	No	338	No				
12-1 PM	507	169	0	0	507	169	600	150	900	75	No	No	No	No	337	No	337	No				
1-2 PM	523	178	16	7	539	185	600	150	900	75	No	No	No	No	Low Volume	No	321	No				
2-3 PM	606	187	17	7	623	194	600	150	900	75	Yes	No	Yes	No	288	No	281	No				
3-4 PM	686	181	20	7	706	188	600	150	900	75	Yes	No	Yes	No	256	No	247	No				
4-5 PM	779	226	25	7	804	233	600	150	900	75	Yes	No	Yes	No	211	Yes	199	Yes				
5-6 PM	712	223	30	9	742	232	600	150	900	75	Yes	No	Yes	No	244	No	229	Yes				
6-7 PM	547	178	30	9	577	187	600	150	900	75	No	No	No	No	Low Volume	No	302	No				
7-8 PM	376	130	25	7	401	137	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
8-9 PM	356	93	18	5	374	98	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
9-10 PM	246	72	18	4	264	76	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
10-11 PM	126	33	13	3	139	36	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
11-12 AM	72	21	7	1	79	22	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No				
<b>Numbers of Hours the Warrant Thresholds Are Met</b>											4	0	4	0		1		2				
<b>Warrant Met?</b>											No		No			No		No				

Notes:

- (1) Thresholds are based on 2 or more lanes on the major approach and 1 lane on the minor approach (Warrant evaluation assuming the southbound left turn only for the minor street)
- (2) The major street traffic includes all movements (left, through, and right)
- (3) The minor street traffic includes only the left turns from the minor street
- (4) Off peak hour traffic volumes are based on the projected peak hour traffic volumes, 72-hour machine counts conducted on Vollmer Road in November 2020 and vehicle time-of-day distribution data for single-family residential published by the Institute of Transportation Engineers

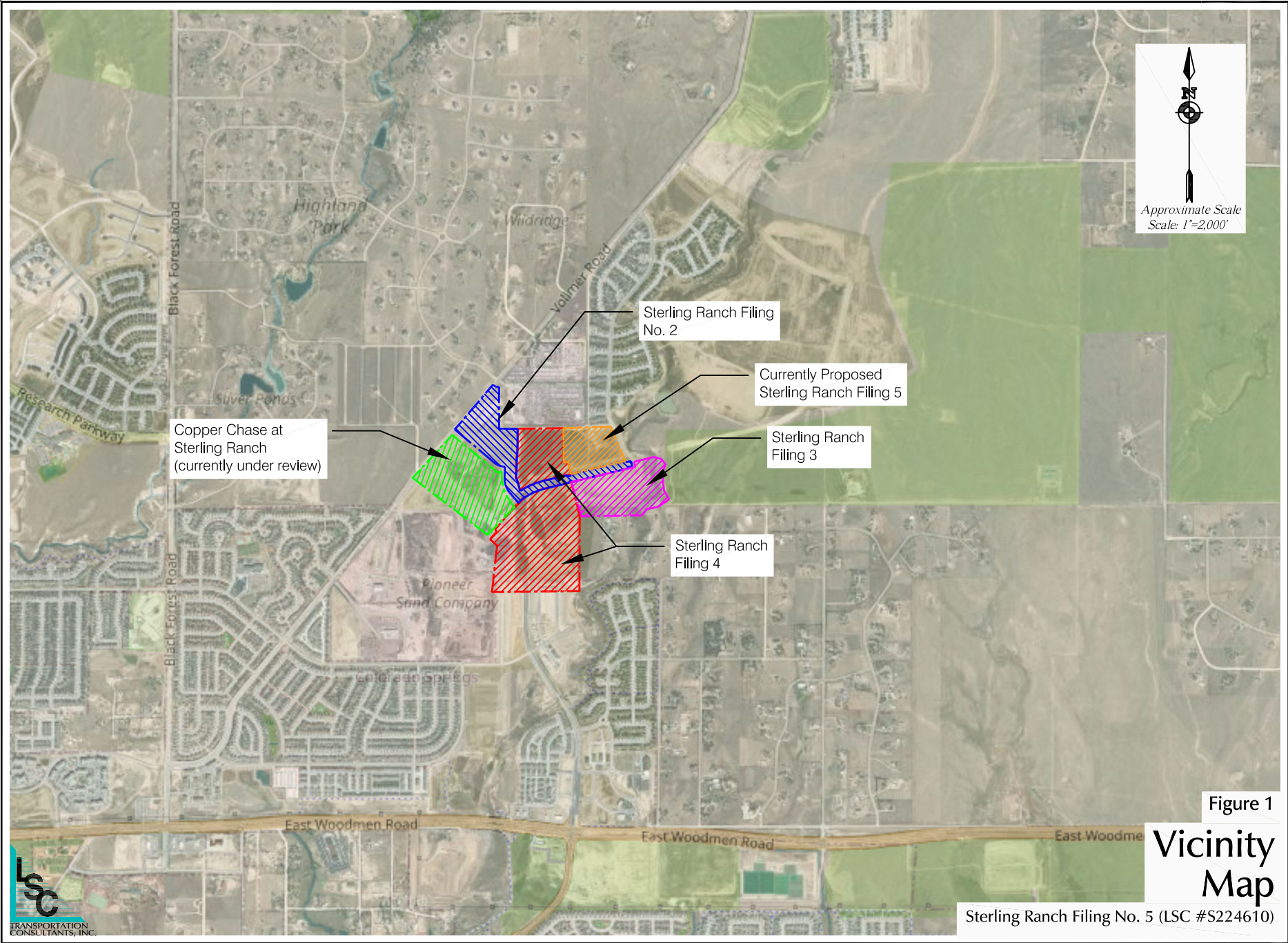
Source: LSC Transportation Consultants, Inc.

# Figures 1-13

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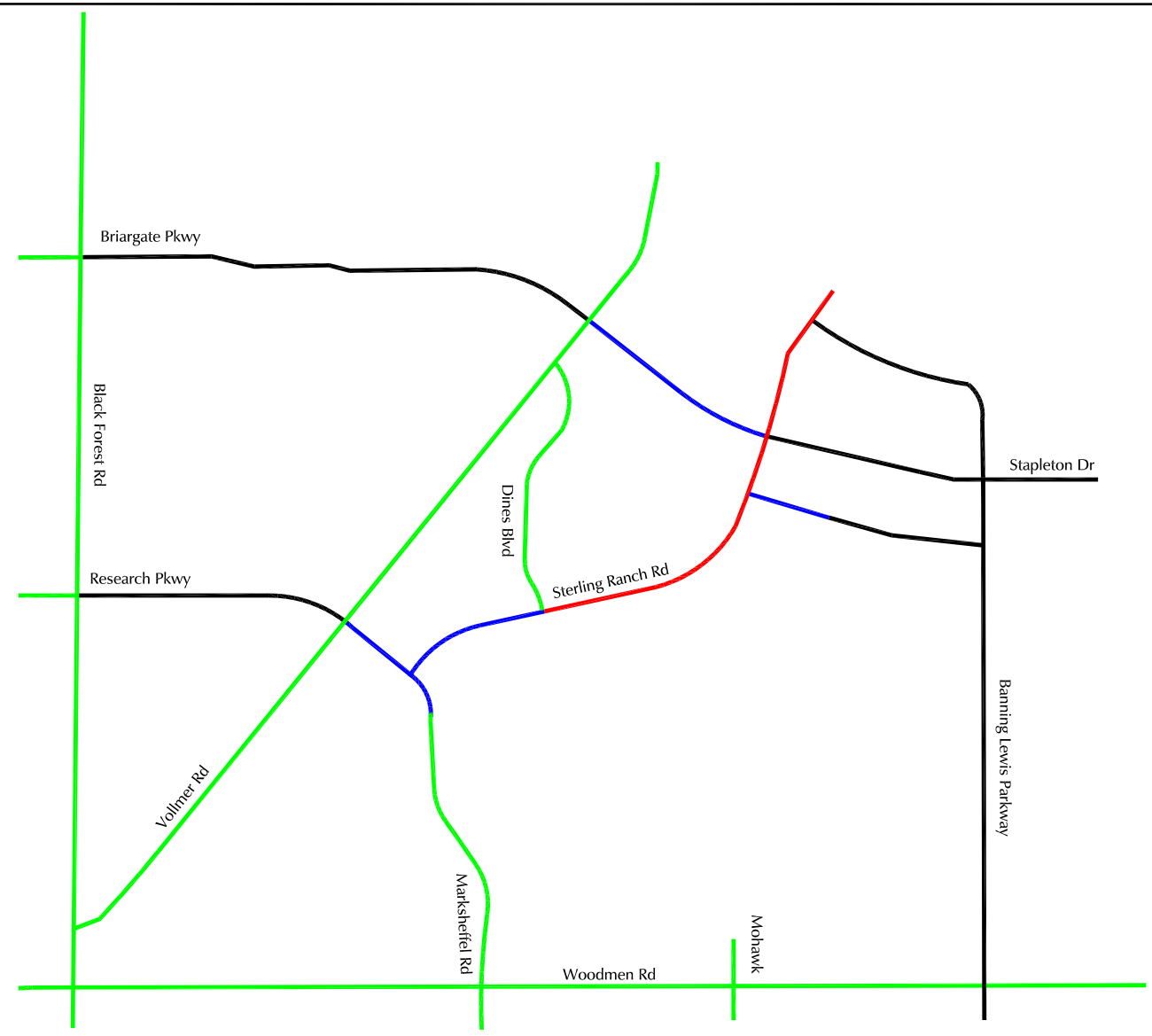
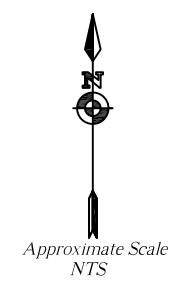
Approximate Scale  
Scale: 1"=2,000'

Figure 1

# Vicinity Map

Sterling Ranch Filing No. 5 (LSC #S224610)





- LEGEND:**
- Roadway connection planned with Sterling Ranch East Preliminary Plan 1
  - Roadway connection planned to be completed by the end of 2023
  - Existing Roadway
  - Future Roadway

# Short-Term Roadway Connections

Figure 2

Sterling Ranch Filing No. 5 (LSC #S224610)



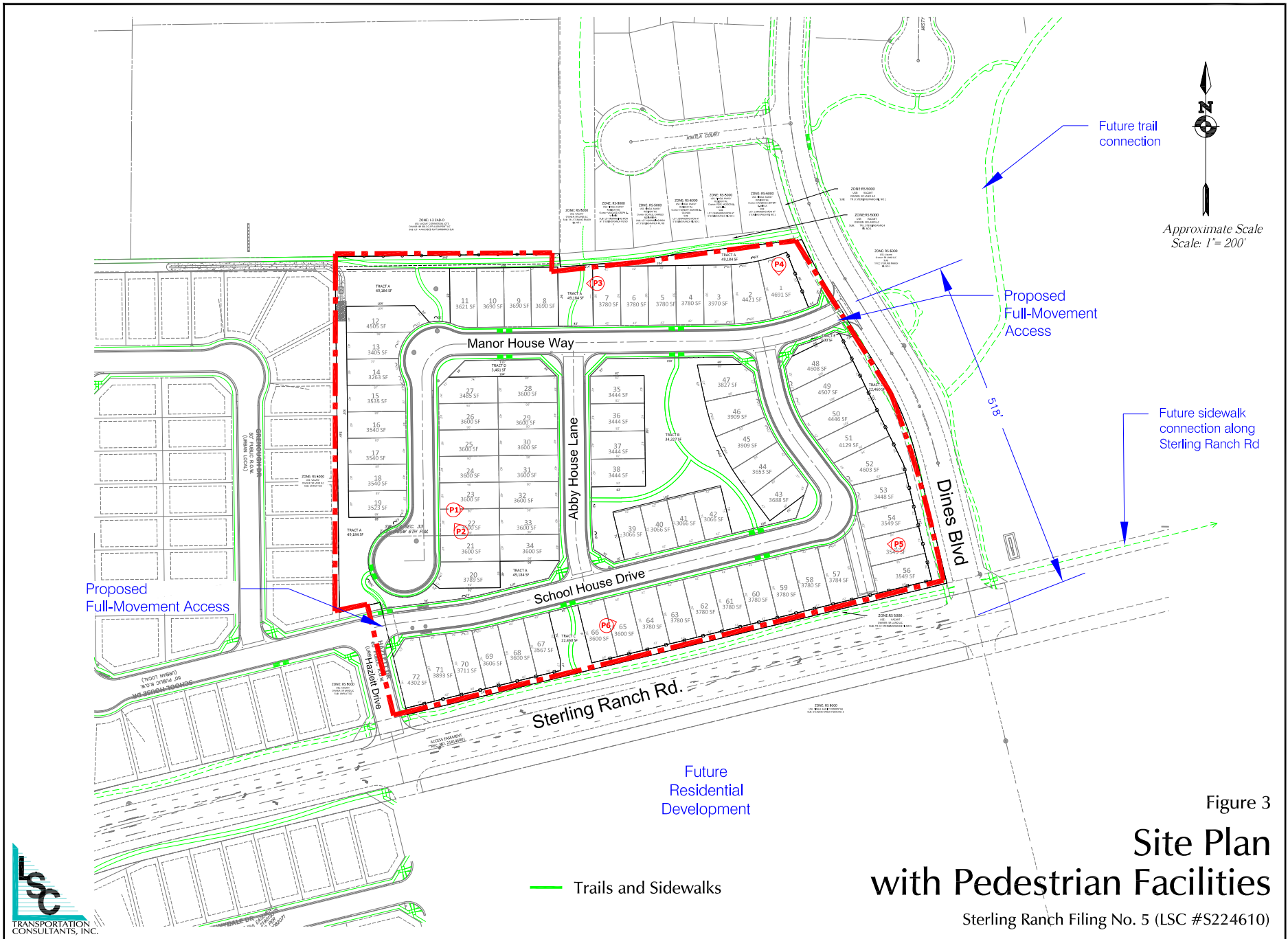
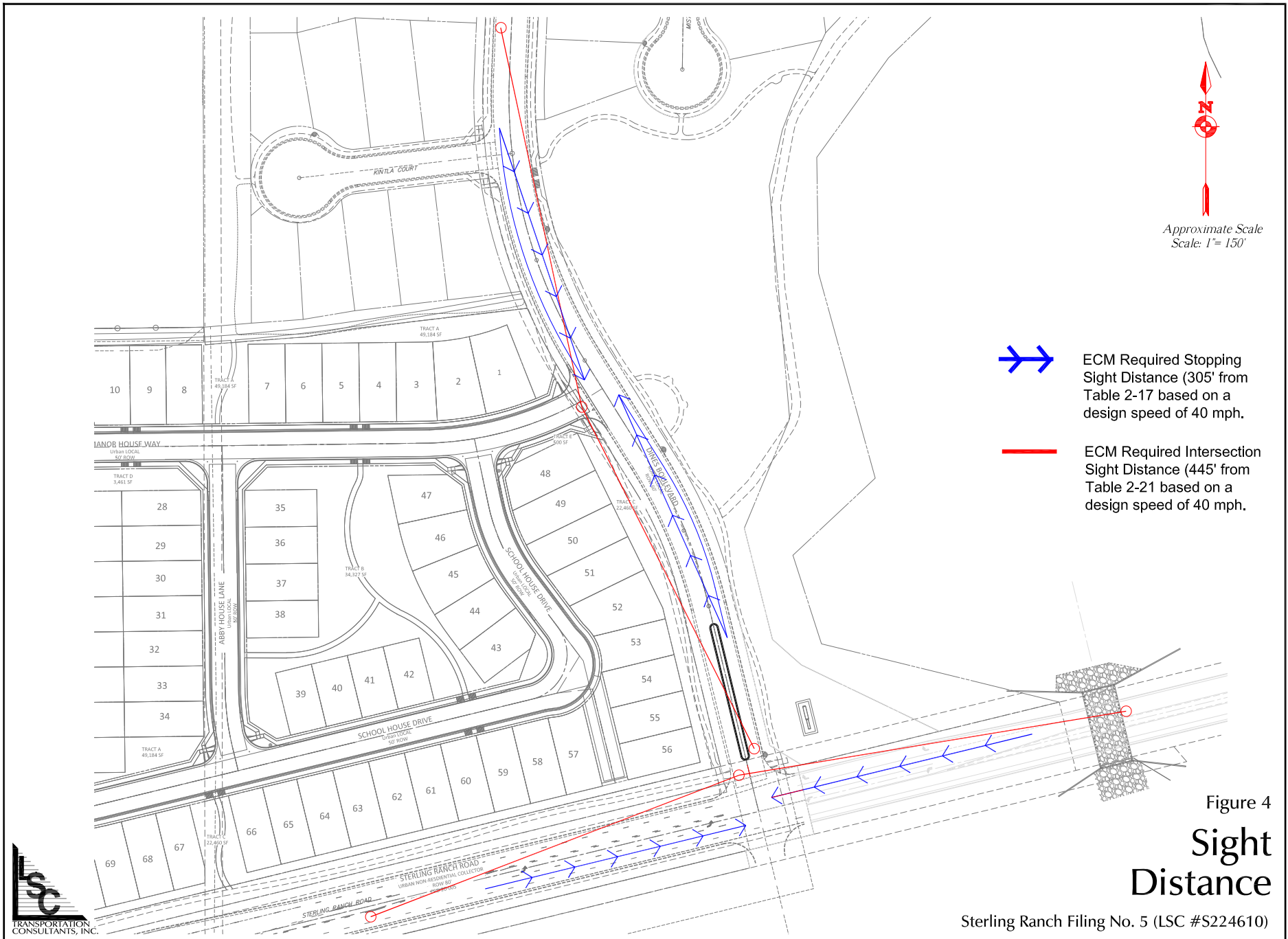


Figure 3  
**Site Plan  
 with Pedestrian Facilities**  
 Sterling Ranch Filing No. 5 (LSC #S224610)



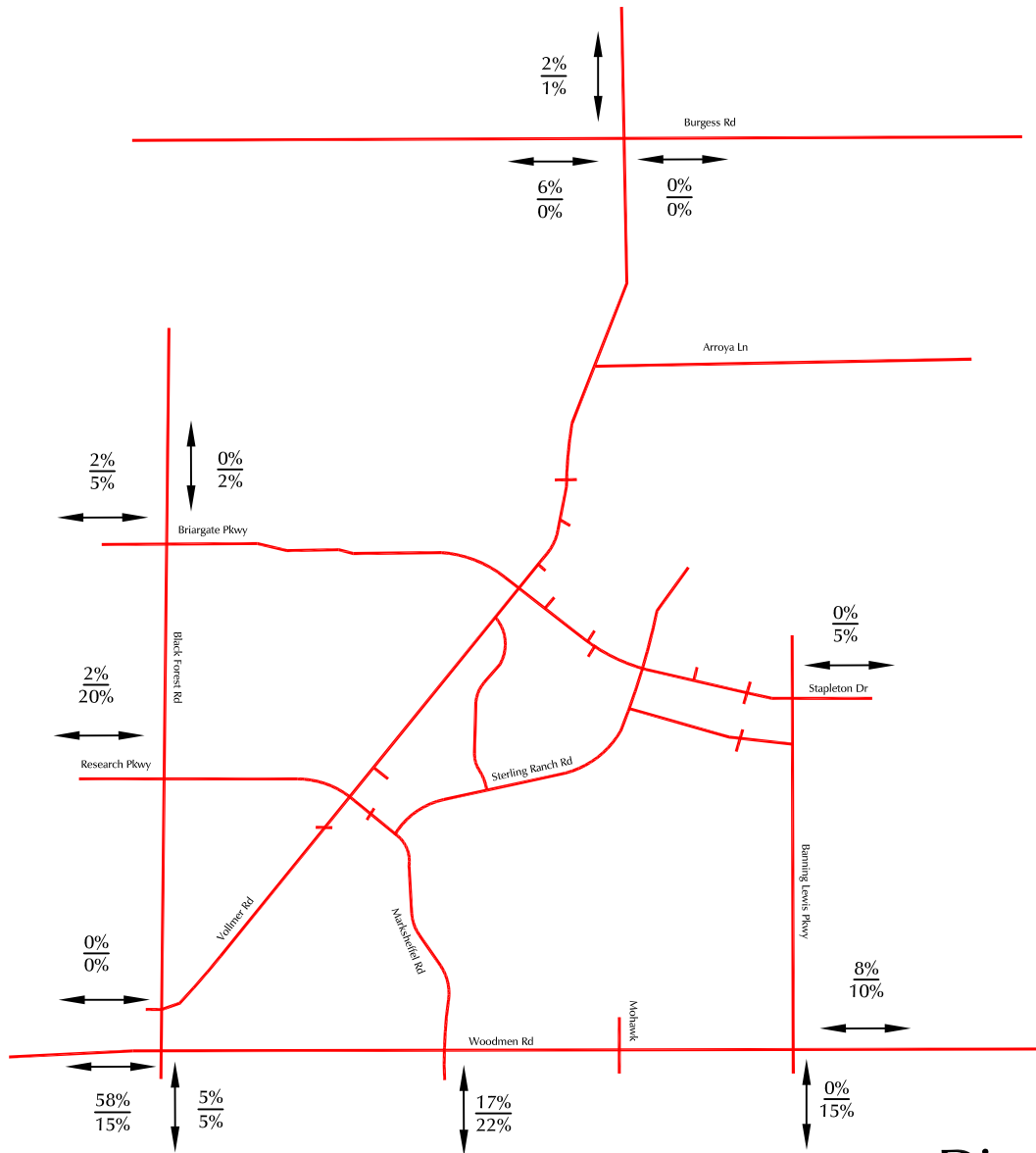
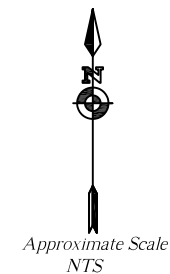


**➔** ECM Required Stopping Sight Distance (305' from Table 2-17 based on a design speed of 40 mph.

**—** ECM Required Intersection Sight Distance (445' from Table 2-21 based on a design speed of 40 mph.

Figure 4  
Sight Distance



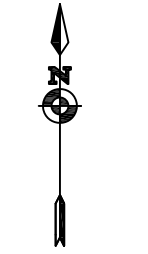


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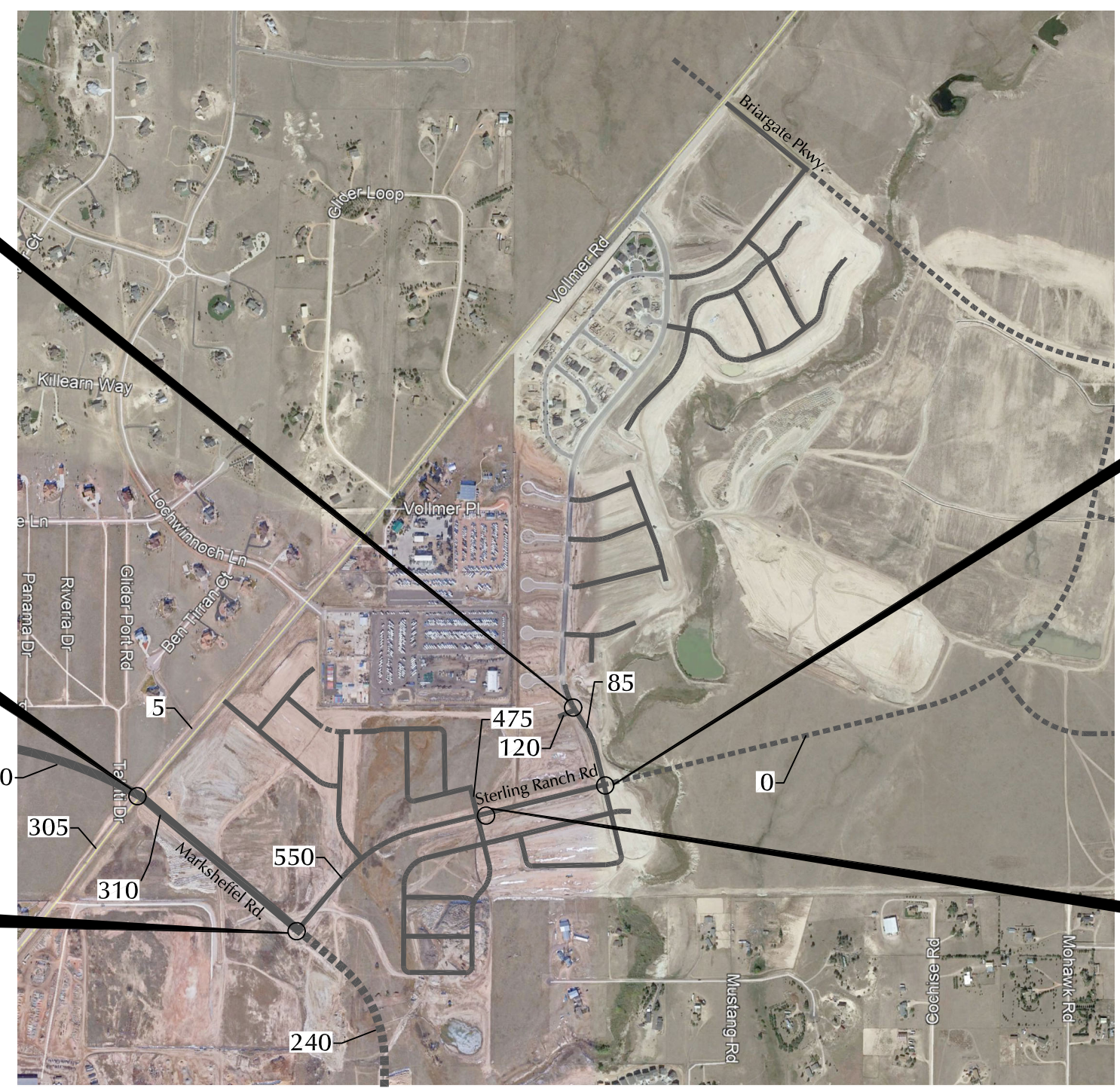
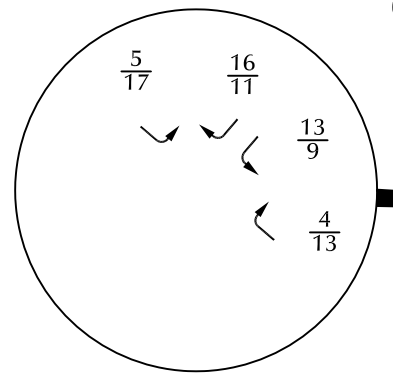
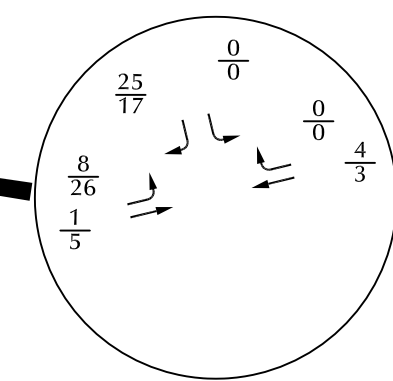
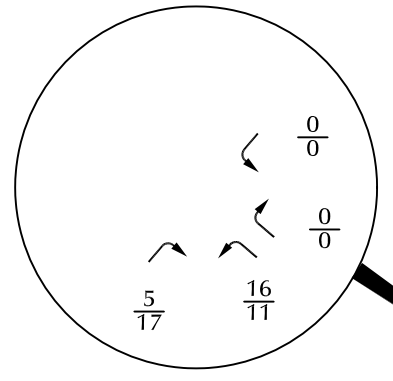
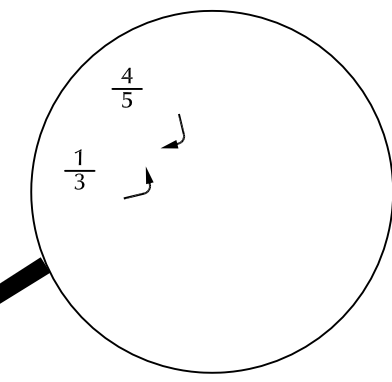
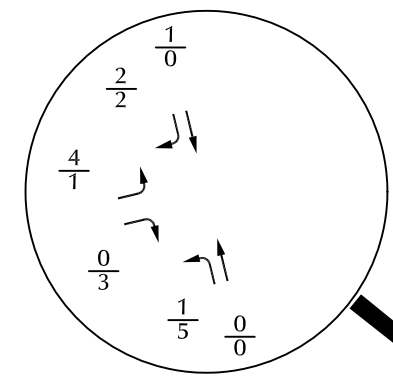
$\frac{XX\%}{XX\%}$  =  $\frac{\text{Short-Term Percent Directional Distribution}}{\text{Long-Term Percent Directional Distribution}}$

Figure 5  
**Directional Distribution of Site-Generated Traffic**  
 Sterling Ranch Filing No. 5 (LSC #S224610)





Approximate Scale  
Scale: 1" = 1,000'



LEGEND:

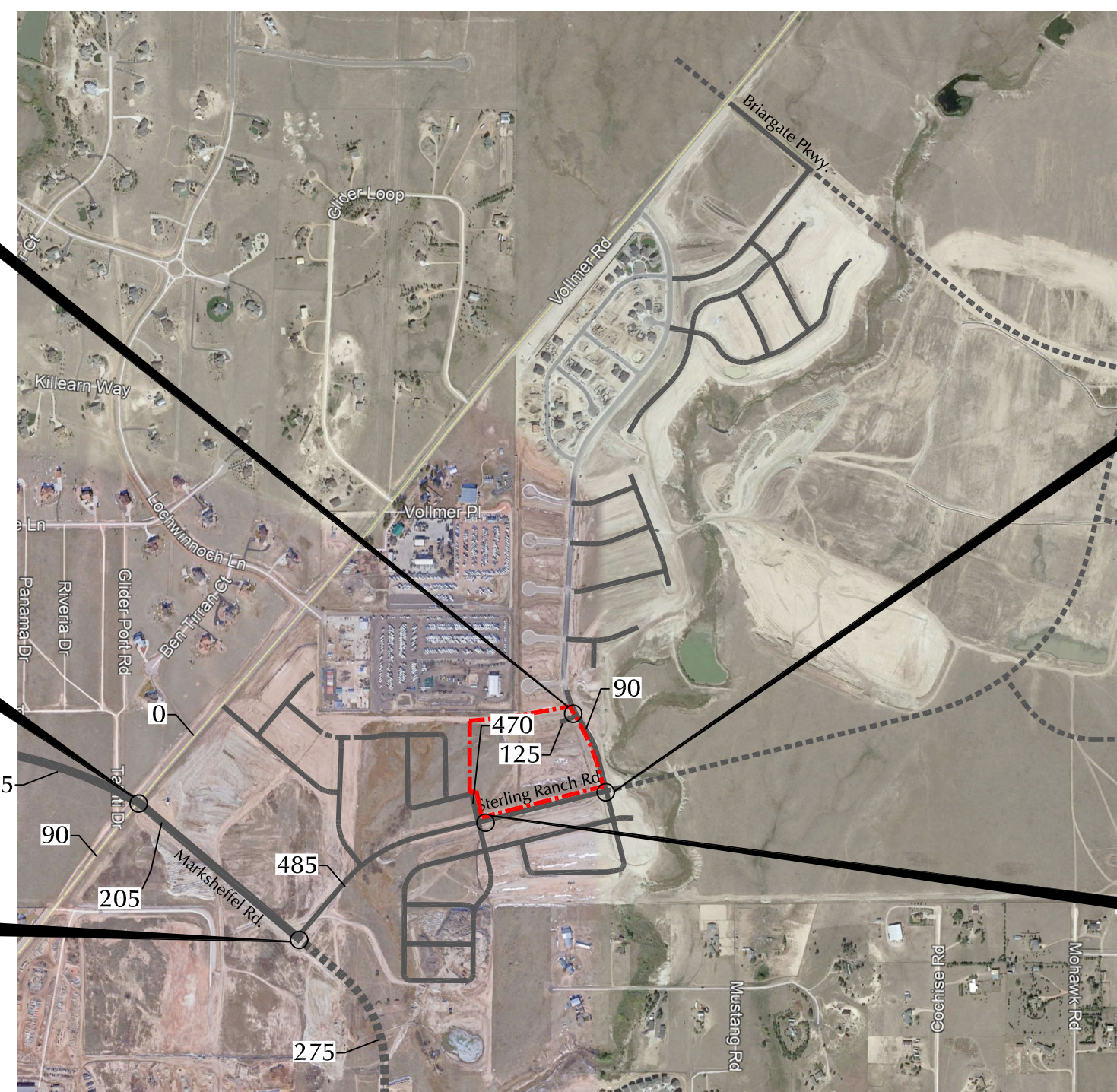
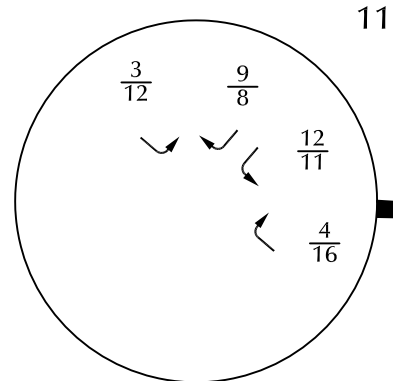
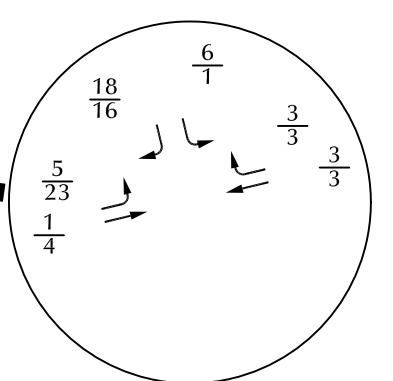
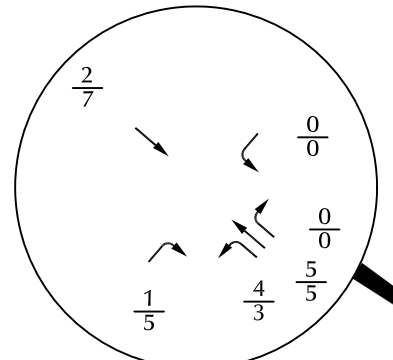
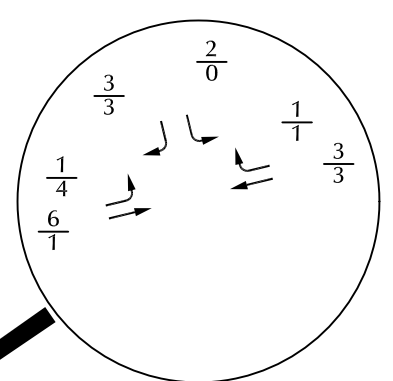
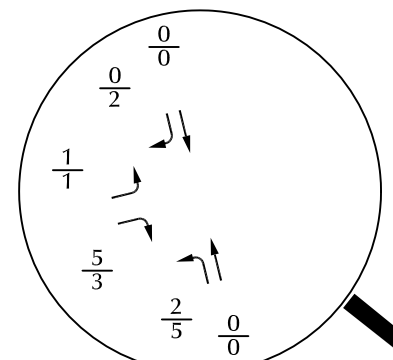
$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)

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



Figure 6  
**Short-Term Assignment of Site-Generated Traffic**  
 Sterling Ranch Filing No. 5 (LSC #S224610)





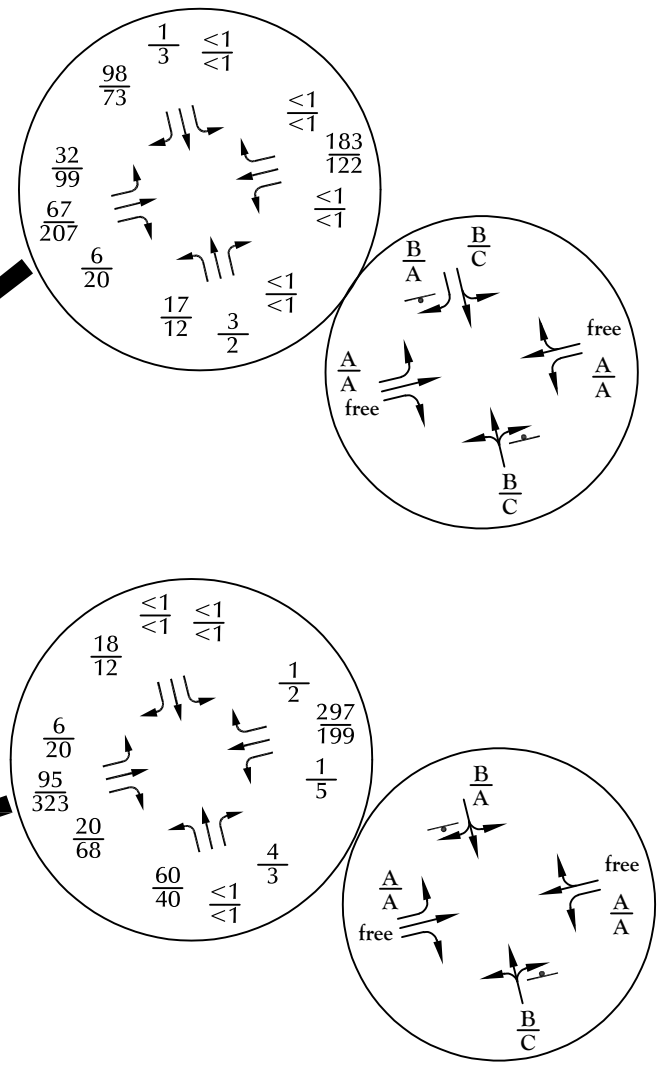
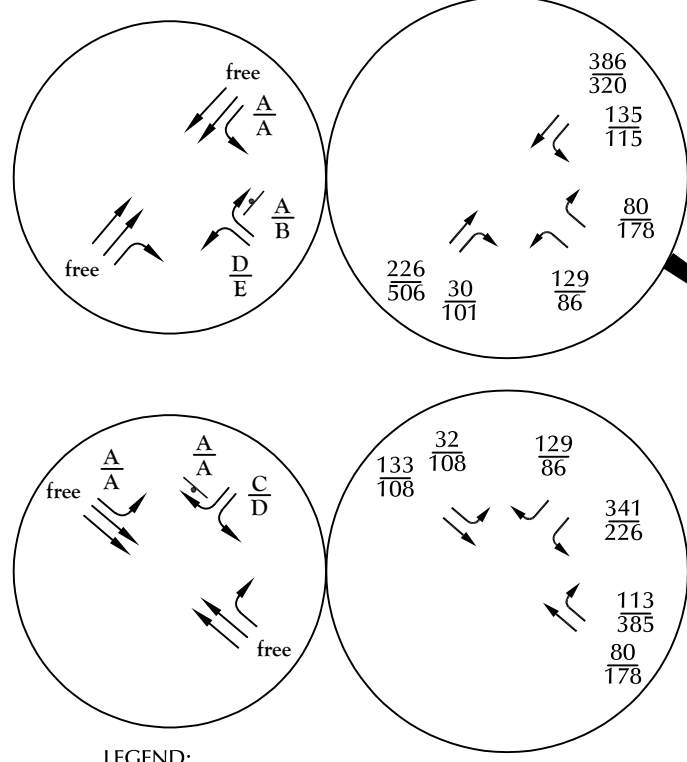
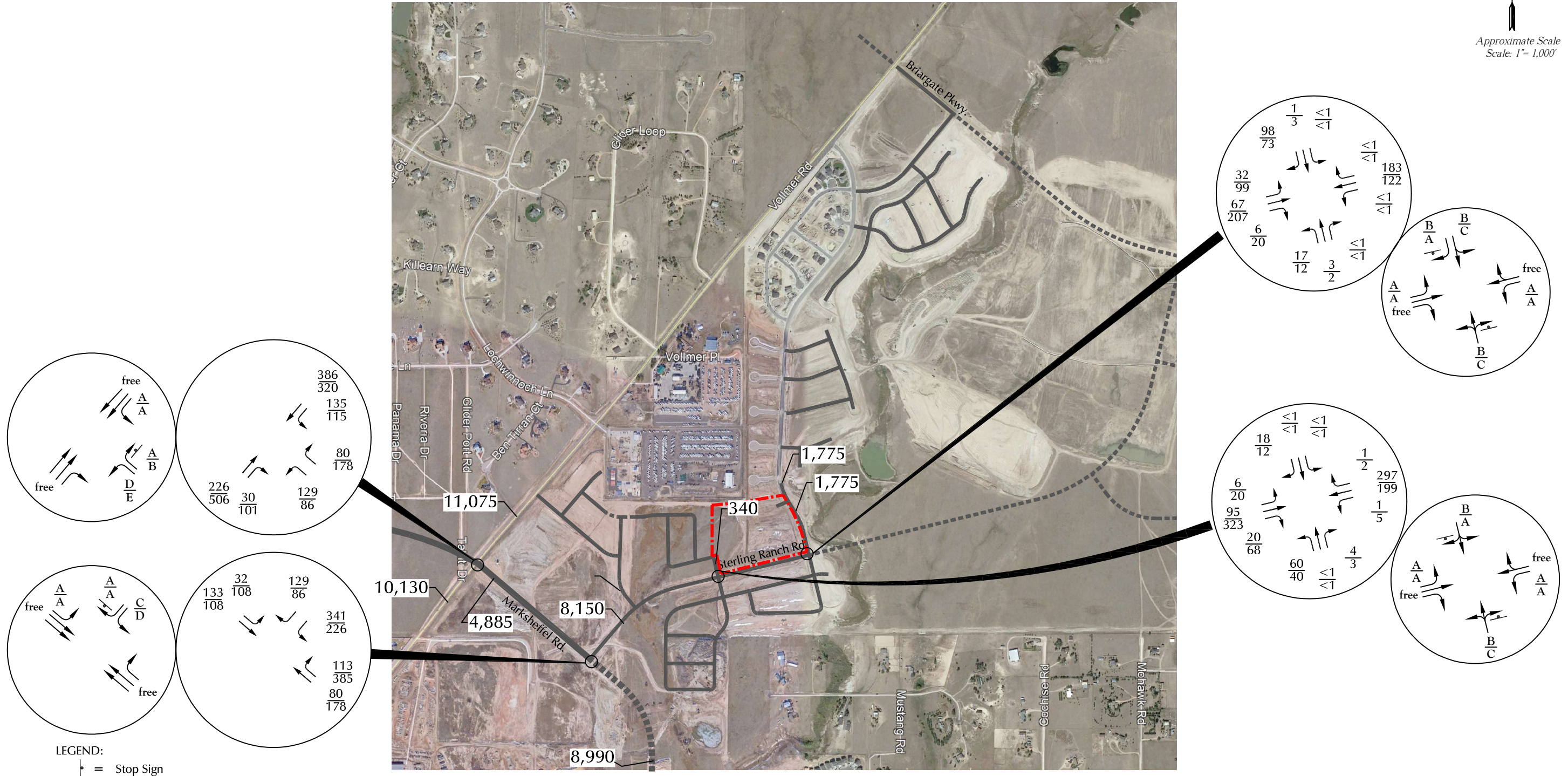
LEGEND:

- $\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)
- $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)
- X,XXX = Average Daily Traffic (vehicles per day)



Figure 7  
Long-Term Assignment of  
Site-Generated Traffic





LEGEND:  
 T = Stop Sign  
 [Traffic Signal Symbol] = Traffic Signal  
 $\frac{XX}{XX}$  = 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  
 $\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
 $\frac{C}{C}$  = PM Entire Intersection Peak-Hour Level of Service  
 X,XXX = Average Daily Traffic (vehicles per day)

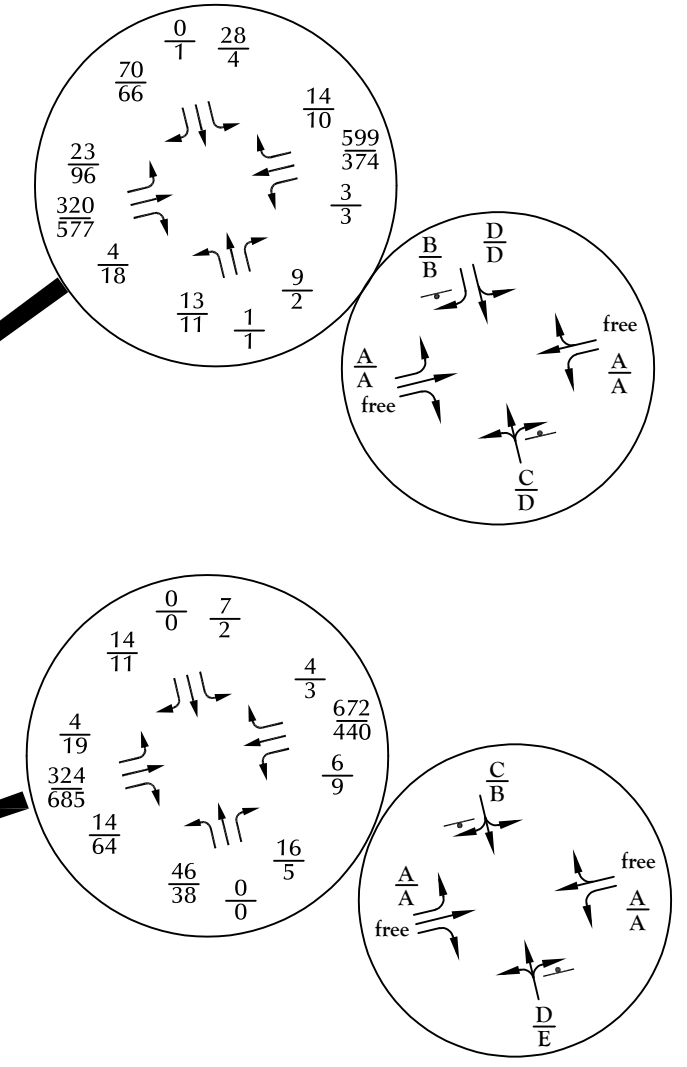
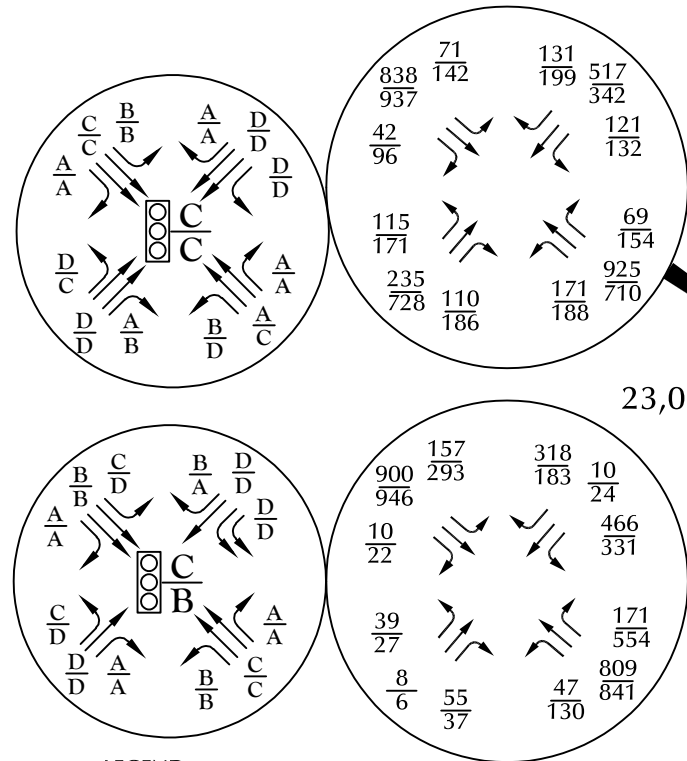
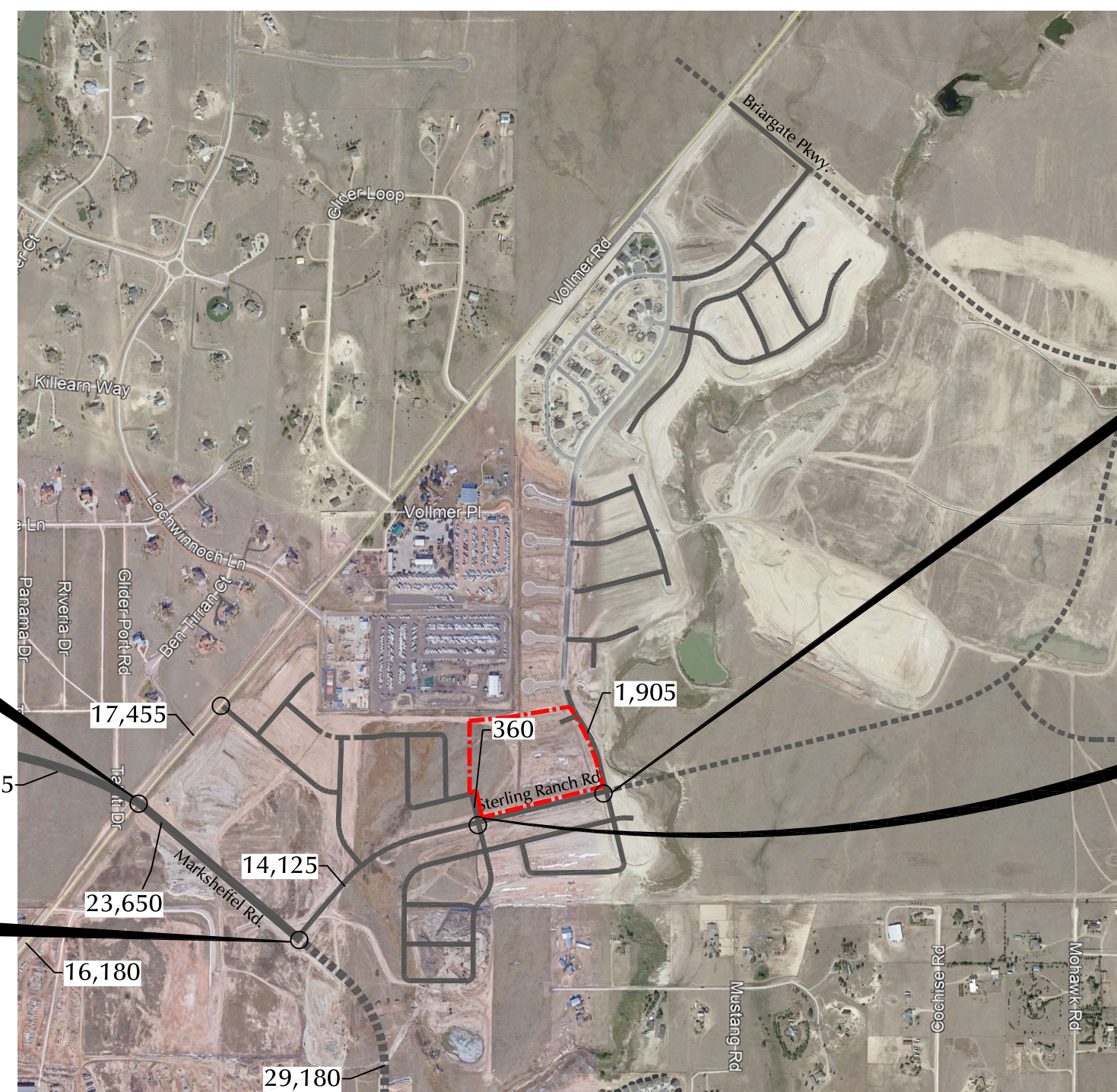


Figure 8  
**Short-Term  
 Background Traffic, Lane Geometry,  
 Traffic Control and Level of Service**  
 Sterling Ranch Filing No. 5 (LSC #S224610)





Approximate Scale  
Scale: 1" = 1,000'



LEGEND:  
 | = Stop Sign  
 [ ] = Traffic Signal  
 $\frac{XX}{XX}$  = 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  
 $\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
 $\frac{C}{C}$  = PM Entire Intersection Peak-Hour Level of Service  
 X,XXX = Average Daily Traffic (vehicles per day)



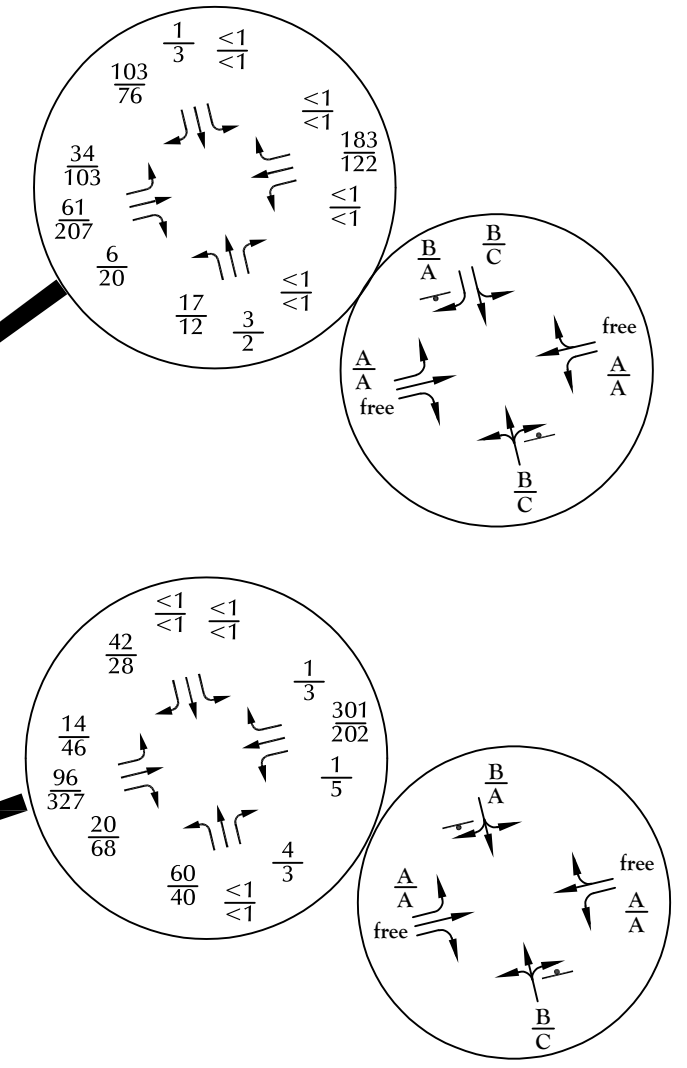
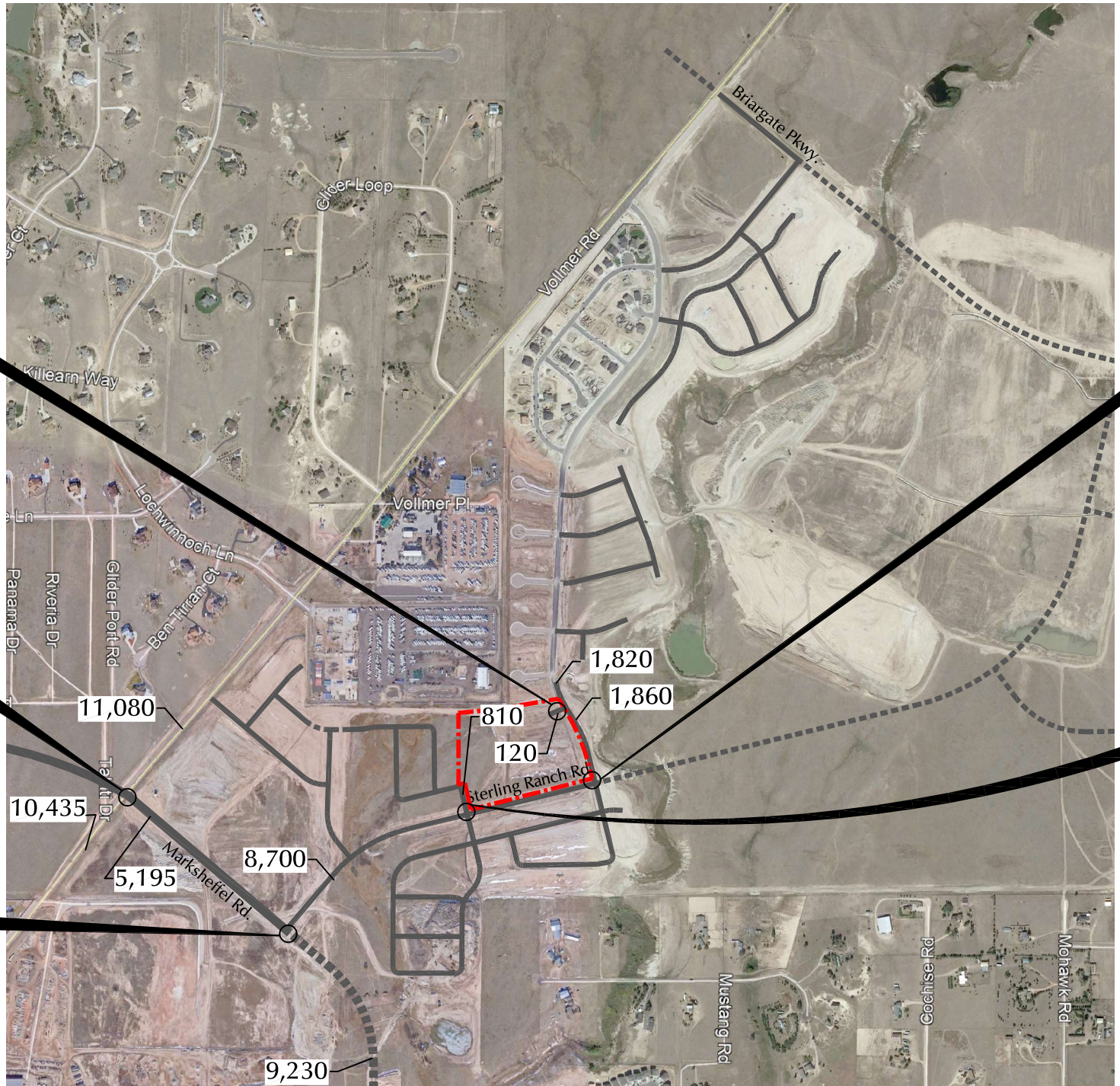
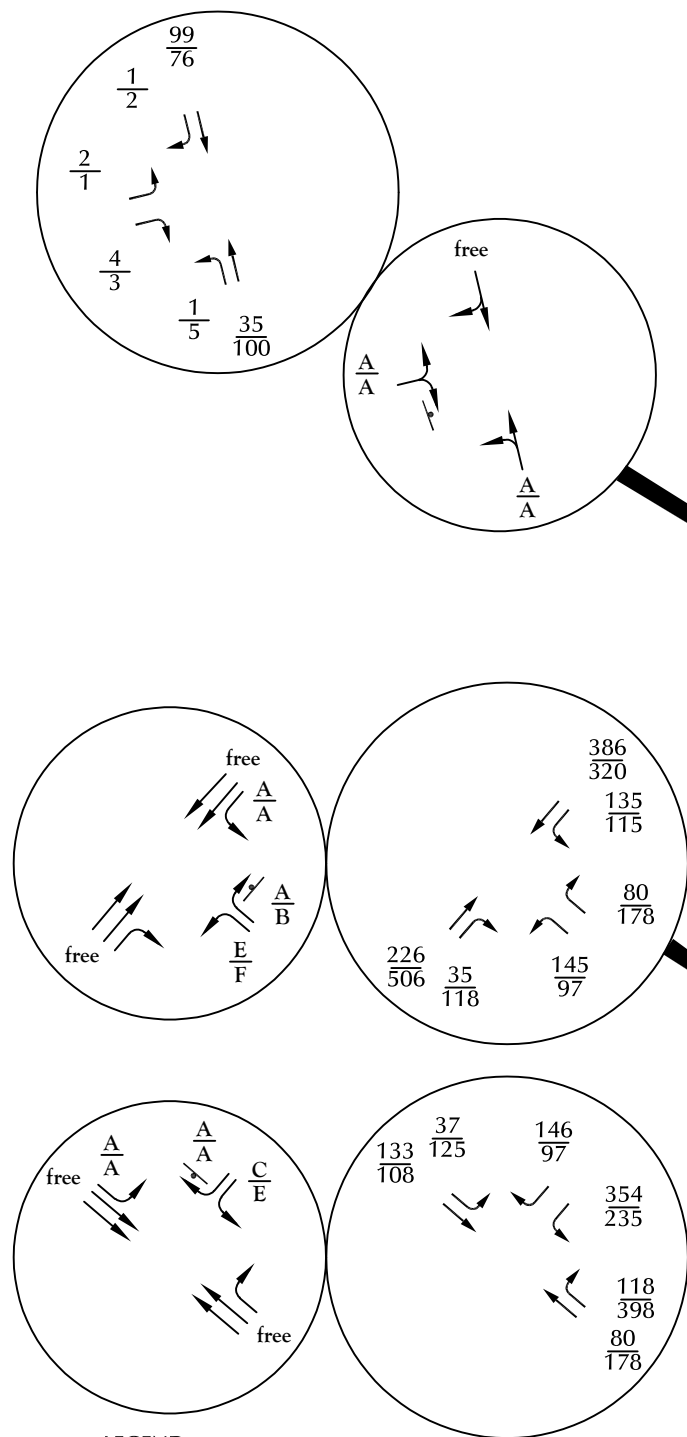
Figure 9  
 2043 Background Traffic, Lane Geometry,  
 Traffic Control and Level of Service

Sterling Ranch Filing No. 5 (LSC #S224610)





Approximate Scale  
Scale: 1" = 1,000'



LEGEND:  
 | = Stop Sign  
 [ ] = Traffic Signal  
 $\frac{XX}{XX}$  = 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  
 $\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
 $\frac{C}{C}$  = PM Entire Intersection Peak-Hour Level of Service  
 X,XXX = Average Daily Traffic (vehicles per day)



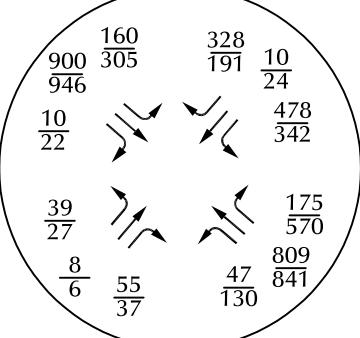
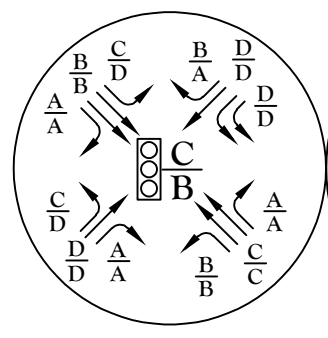
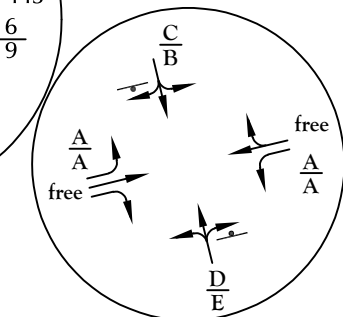
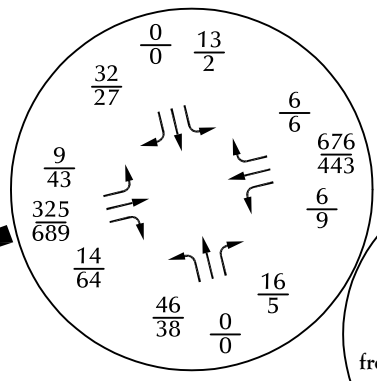
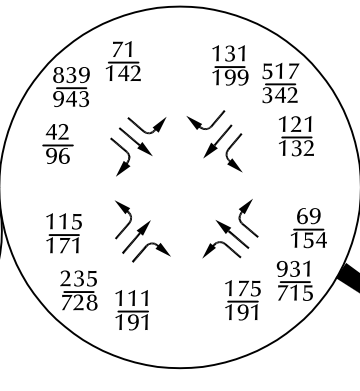
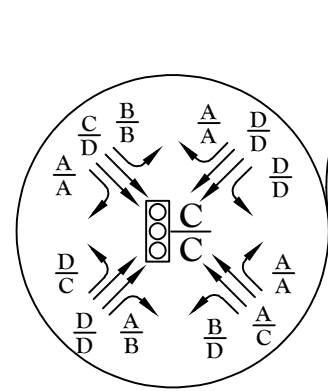
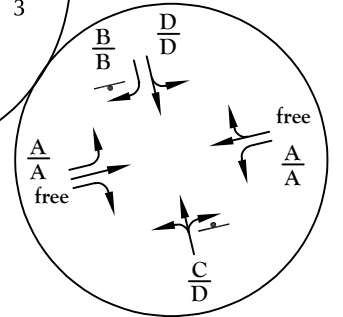
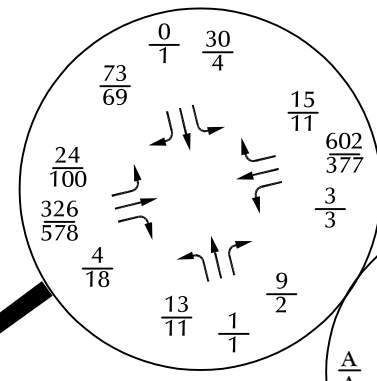
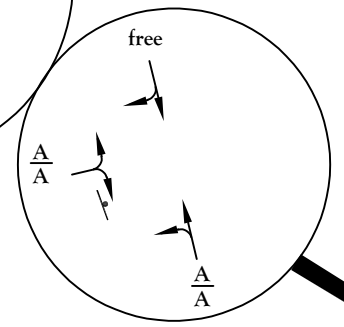
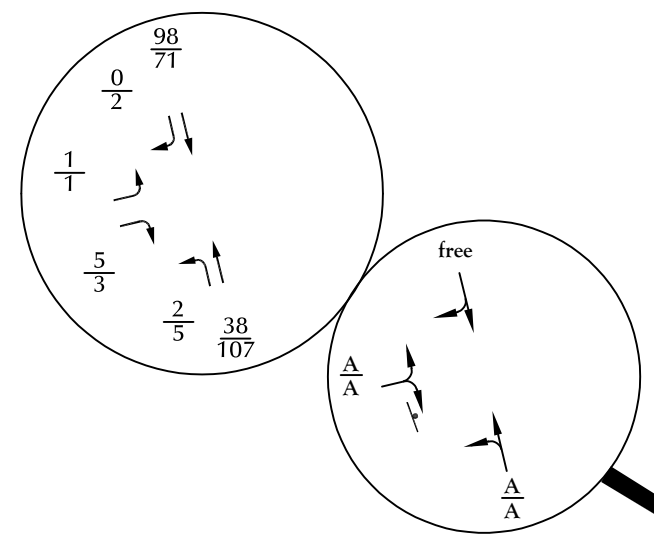
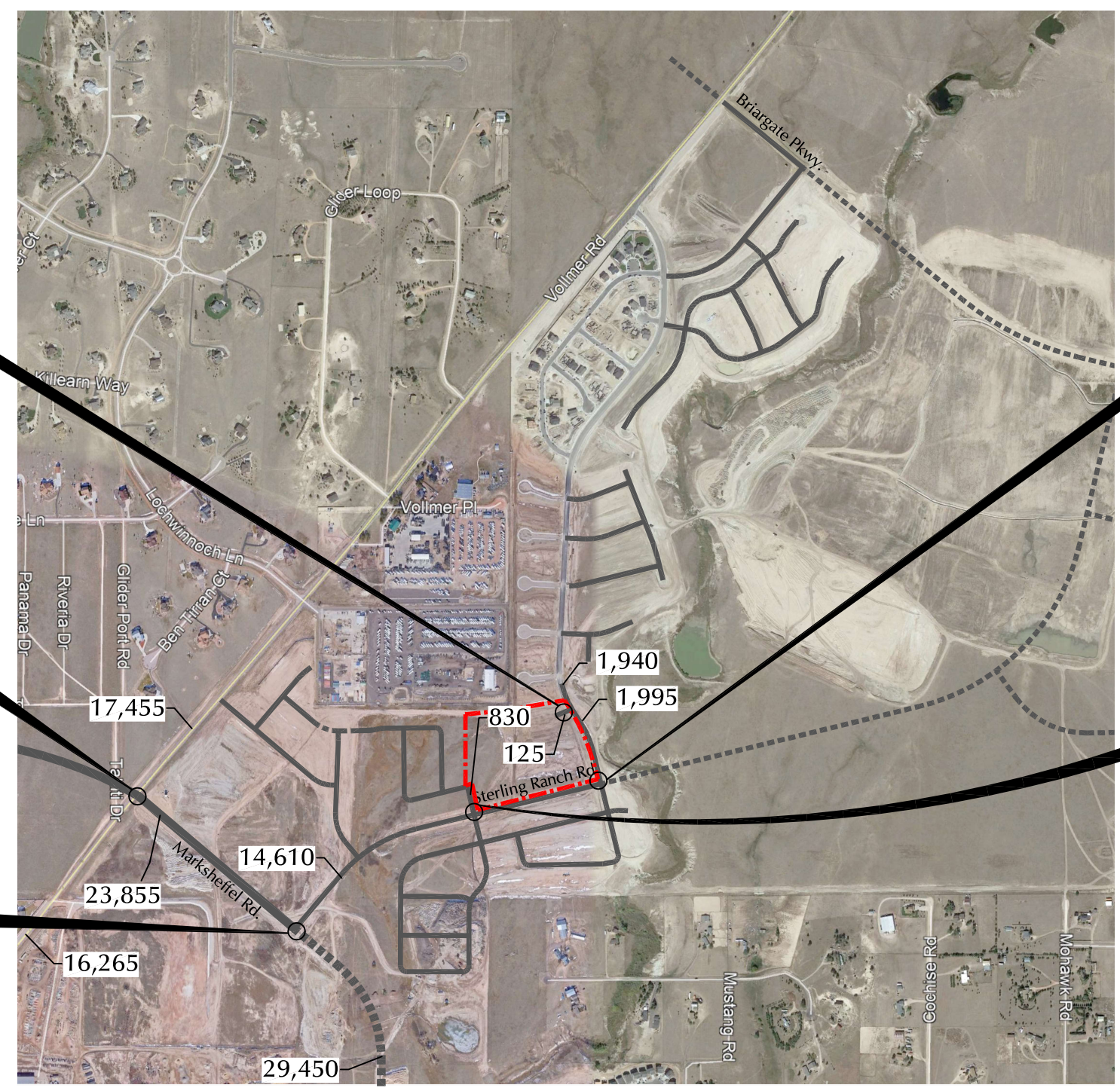
Figure 10  
**Short-Term  
 Total Traffic, Lane Geometry,  
 Traffic Control and Level of Service**

Sterling Ranch Filing No. 5 (LSC #S224610)





Approximate Scale  
Scale: 1" = 1,000'

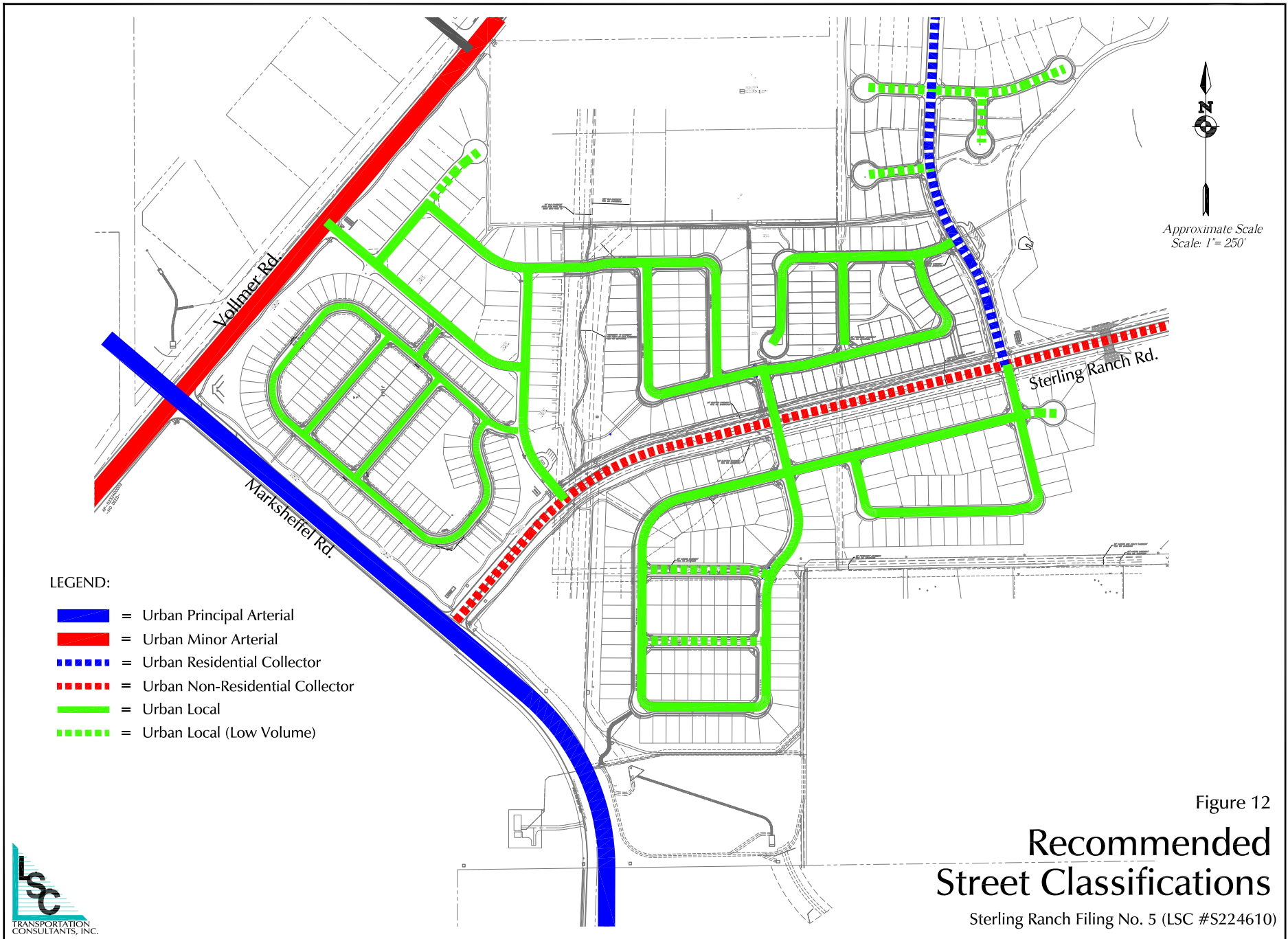


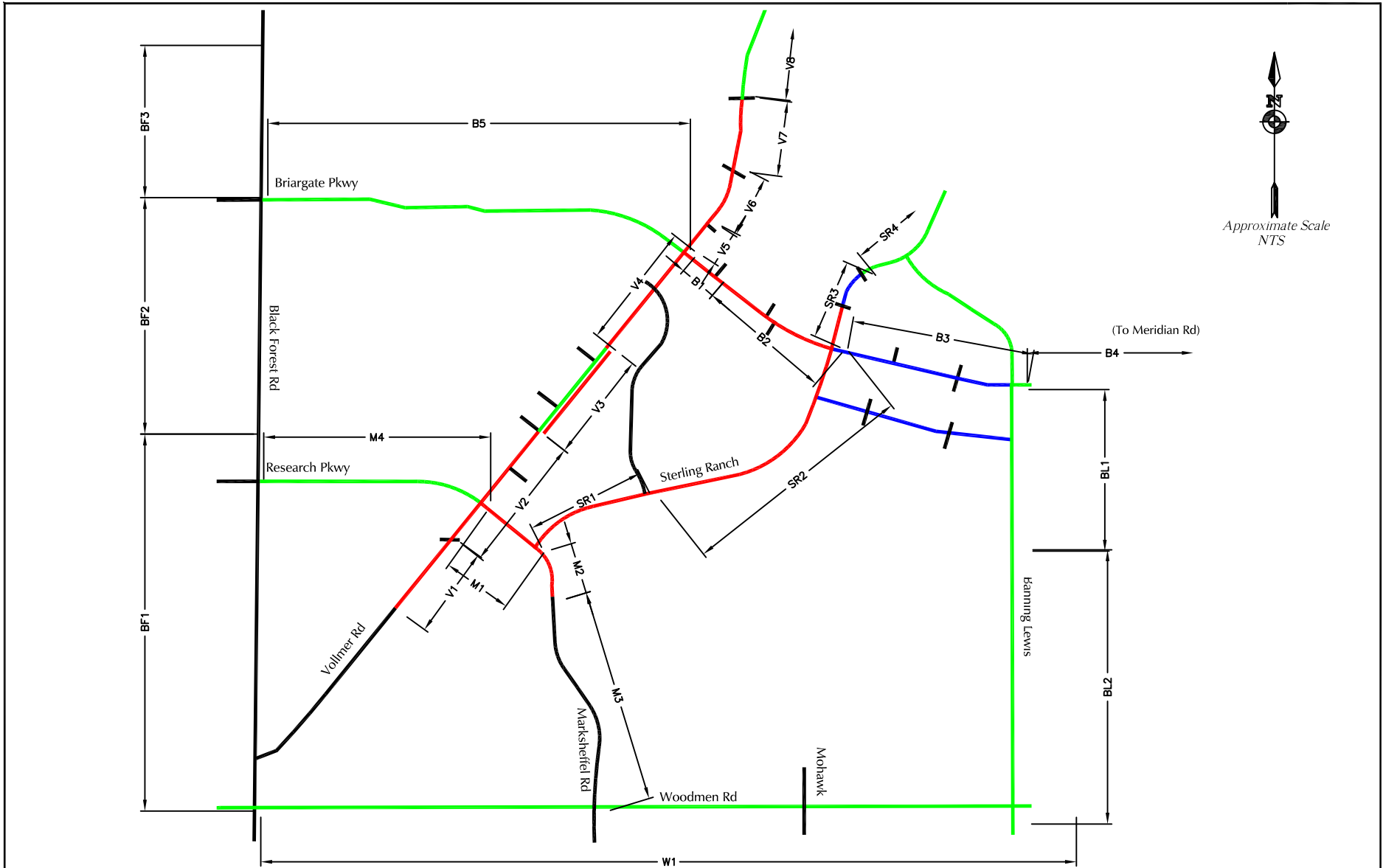
- LEGEND:
- = Stop Sign
  - = Traffic Signal
  - $\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
PM Weekday Peak-Hour Traffic (vehicles per hour)
  - $\frac{A}{B}$  = AM Individual Movement Peak-Hour Level of Service  
PM Individual Movement Peak-Hour Level of Service
  - $\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
PM Entire Intersection Peak-Hour Level of Service
  - X,XXX = Average Daily Traffic (vehicles per day)



Figure 11  
2043 Total Traffic, Lane Geometry,  
Traffic Control and Level of Service







LEGEND: V1, B4, SR3, etc - Segment Identifier (See Appendix Table 2 for recommended roadway segment improvements for each segment)

- Short-Term
- Intermediate-Term
- Long-Term

\*Source: Sterling Ranch Sketch Plan  
 Amendment Master Traffic Impact Study  
 by LSC Transportation Consultants, Inc  
 March 17, 2023

# Roadway Improvement Segments\*

Sterling Ranch Filing No. 5 (LSC #S224610)

Figure 13



# Level of Service Reports

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Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	↗
Traffic Vol, veh/h	32	61	6	0	183	0	17	3	0	0	1	98
Future Vol, veh/h	32	61	6	0	183	0	17	3	0	0	1	98
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	72	7	0	215	0	20	4	0	0	1	115

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	215	0	0	79	0	0	421	363	72	369	370	215
Stage 1	-	-	-	-	-	-	148	148	-	215	215	-
Stage 2	-	-	-	-	-	-	273	215	-	154	155	-
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	1355	-	-	1519	-	-	543	565	990	588	560	825
Stage 1	-	-	-	-	-	-	855	775	-	787	725	-
Stage 2	-	-	-	-	-	-	733	725	-	848	769	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1355	-	-	1519	-	-	456	549	990	573	544	825
Mov Cap-2 Maneuver	-	-	-	-	-	-	456	549	-	573	544	-
Stage 1	-	-	-	-	-	-	831	753	-	765	725	-
Stage 2	-	-	-	-	-	-	630	725	-	820	747	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.5	0	13.1	10.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	468	1355	-	-	1519	-	-	544	825
HCM Lane V/C Ratio	0.05	0.028	-	-	-	-	-	0.002	0.14
HCM Control Delay (s)	13.1	7.7	-	-	0	-	-	11.6	10.1
HCM Lane LOS	B	A	-	-	A	-	-	B	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0	0.5

Intersection						
Int Delay, s/veh	6.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	129	80	226	30	135	386
Future Vol, veh/h	129	80	226	30	135	386
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	155	300	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	152	94	266	35	159	454

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	811	133	0	0	301	0
Stage 1	266	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	317	892	-	-	1257	-
Stage 1	754	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	277	892	-	-	1257	-
Mov Cap-2 Maneuver	277	-	-	-	-	-
Stage 1	754	-	-	-	-	-
Stage 2	476	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.8	0	2.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	277	892	1257	-
HCM Lane V/C Ratio	-	-	0.548	0.106	0.126	-
HCM Control Delay (s)	-	-	32.7	9.5	8.3	-
HCM Lane LOS	-	-	D	A	A	-
HCM 95th %tile Q(veh)	-	-	3	0.4	0.4	-



Intersection						
Int Delay, s/veh	8.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	32	133	80	113	341	129
Future Vol, veh/h	32	133	80	113	341	129
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	205	155	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	156	94	133	401	152

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	227	0	-	0	248
Stage 1	-	-	-	-	94
Stage 2	-	-	-	-	154
Critical Hdwy	4.14	-	-	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	2.22	-	-	-	3.52
Pot Cap-1 Maneuver	1339	-	-	-	719
Stage 1	-	-	-	-	919
Stage 2	-	-	-	-	858
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1339	-	-	-	699
Mov Cap-2 Maneuver	-	-	-	-	699
Stage 1	-	-	-	-	893
Stage 2	-	-	-	-	858

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	14.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1339	-	-	-	699	1012
HCM Lane V/C Ratio	0.028	-	-	-	0.574	0.15
HCM Control Delay (s)	7.8	-	-	-	16.9	9.2
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.1	-	-	-	3.7	0.5

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	6	95	20	1	297	1	60	0	4	0	0	18
Future Vol, veh/h	6	95	20	1	297	1	60	0	4	0	0	18
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	112	24	1	349	1	71	0	5	0	0	21

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	350	0	0	136	0	0	488	478	112	493	502	350
Stage 1	-	-	-	-	-	-	126	126	-	352	352	-
Stage 2	-	-	-	-	-	-	362	352	-	141	150	-
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	1209	-	-	1448	-	-	490	486	941	486	471	693
Stage 1	-	-	-	-	-	-	878	792	-	665	632	-
Stage 2	-	-	-	-	-	-	657	632	-	862	773	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1209	-	-	1448	-	-	473	483	941	481	468	693
Mov Cap-2 Maneuver	-	-	-	-	-	-	473	483	-	481	468	-
Stage 1	-	-	-	-	-	-	873	787	-	661	631	-
Stage 2	-	-	-	-	-	-	636	631	-	853	768	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	13.7	10.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	488	1209	-	-	1448	-	-	693
HCM Lane V/C Ratio	0.154	0.006	-	-	0.001	-	-	0.031
HCM Control Delay (s)	13.7	8	-	-	7.5	-	-	10.4
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	99	207	20	0	122	0	12	2	0	0	3	73
Future Vol, veh/h	99	207	20	0	122	0	12	2	0	0	3	73
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	116	244	24	0	144	0	14	2	0	0	4	86

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	144	0	0	268	0	0	665	620	244	633	644	144
Stage 1	-	-	-	-	-	-	476	476	-	144	144	-
Stage 2	-	-	-	-	-	-	189	144	-	489	500	-
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	1438	-	-	1296	-	-	374	404	795	392	391	903
Stage 1	-	-	-	-	-	-	570	557	-	859	778	-
Stage 2	-	-	-	-	-	-	813	778	-	561	543	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1438	-	-	1296	-	-	315	371	795	366	359	903
Mov Cap-2 Maneuver	-	-	-	-	-	-	315	371	-	366	359	-
Stage 1	-	-	-	-	-	-	524	512	-	789	778	-
Stage 2	-	-	-	-	-	-	732	778	-	513	499	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	0	16.8	9.6
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	322	1438	-	-	1296	-	-	359	903
HCM Lane V/C Ratio	0.051	0.081	-	-	-	-	-	0.01	0.095
HCM Control Delay (s)	16.8	7.7	-	-	0	-	-	15.1	9.4
HCM Lane LOS	C	A	-	-	A	-	-	C	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0	0.3

Intersection						
Int Delay, s/veh	5.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	86	178	506	101	115	320
Future Vol, veh/h	86	178	506	101	115	320
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	155	300	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	101	209	595	119	135	376

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1053	298	0	0	714
Stage 1	595	-	-	-	-
Stage 2	458	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	222	698	-	-	882
Stage 1	514	-	-	-	-
Stage 2	604	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	188	698	-	-	882
Mov Cap-2 Maneuver	188	-	-	-	-
Stage 1	514	-	-	-	-
Stage 2	512	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.9	0	2.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	188	698	882
HCM Lane V/C Ratio	-	-	0.538	0.3	0.153
HCM Control Delay (s)	-	-	44.5	12.4	9.8
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	2.8	1.3	0.5

Intersection						
Int Delay, s/veh	7.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	108	108	178	385	226	86
Future Vol, veh/h	108	108	178	385	226	86
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	205	155	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	127	127	209	453	266	101

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	662	0	-	0	527 105
Stage 1	-	-	-	-	209 -
Stage 2	-	-	-	-	318 -
Critical Hdwy	4.14	-	-	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	2.22	-	-	-	3.52 3.32
Pot Cap-1 Maneuver	922	-	-	-	481 929
Stage 1	-	-	-	-	806 -
Stage 2	-	-	-	-	710 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	922	-	-	-	415 929
Mov Cap-2 Maneuver	-	-	-	-	415 -
Stage 1	-	-	-	-	695 -
Stage 2	-	-	-	-	710 -

Approach	EB	WB	SB
HCM Control Delay, s	4.8	0	22.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	922	-	-	-	415	929
HCM Lane V/C Ratio	0.138	-	-	-	0.641	0.109
HCM Control Delay (s)	9.5	-	-	-	27.9	9.3
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0.5	-	-	-	4.3	0.4

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	20	323	68	5	199	2	40	0	3	0	0	12
Future Vol, veh/h	20	323	68	5	199	2	40	0	3	0	0	12
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	380	80	6	234	2	47	0	4	0	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	236	0	0	460	0	0	682	676	380	717	755	235
Stage 1	-	-	-	-	-	-	428	428	-	247	247	-
Stage 2	-	-	-	-	-	-	254	248	-	470	508	-
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	1331	-	-	1101	-	-	364	375	667	345	338	804
Stage 1	-	-	-	-	-	-	605	585	-	757	702	-
Stage 2	-	-	-	-	-	-	750	701	-	574	539	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1331	-	-	1101	-	-	351	366	667	337	330	804
Mov Cap-2 Maneuver	-	-	-	-	-	-	351	366	-	337	330	-
Stage 1	-	-	-	-	-	-	594	574	-	743	698	-
Stage 2	-	-	-	-	-	-	733	697	-	561	529	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			16.5			9.6		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	363	1331	-	-	1101	-	-	804
HCM Lane V/C Ratio	0.139	0.018	-	-	0.005	-	-	0.018
HCM Control Delay (s)	16.5	7.8	-	-	8.3	-	-	9.6
HCM Lane LOS	C	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	3.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	↗
Traffic Vol, veh/h	34	61	6	0	183	0	17	3	0	0	1	103
Future Vol, veh/h	34	61	6	0	183	0	17	3	0	0	1	103
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	40	72	7	0	215	0	20	4	0	0	1	121

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	215	0	0	79	0	0	428	367	72	373	374	215
Stage 1	-	-	-	-	-	-	152	152	-	215	215	-
Stage 2	-	-	-	-	-	-	276	215	-	158	159	-
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	1355	-	-	1519	-	-	537	562	990	584	557	825
Stage 1	-	-	-	-	-	-	850	772	-	787	725	-
Stage 2	-	-	-	-	-	-	730	725	-	844	766	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1355	-	-	1519	-	-	447	545	990	568	540	825
Mov Cap-2 Maneuver	-	-	-	-	-	-	447	545	-	568	540	-
Stage 1	-	-	-	-	-	-	825	749	-	763	725	-
Stage 2	-	-	-	-	-	-	622	725	-	815	743	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.6	0	13.3	10.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	459	1355	-	-	1519	-	-	540	825
HCM Lane V/C Ratio	0.051	0.03	-	-	-	-	-	0.002	0.147
HCM Control Delay (s)	13.3	7.7	-	-	0	-	-	11.7	10.1
HCM Lane LOS	B	A	-	-	A	-	-	B	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0	0.5

Intersection						
Int Delay, s/veh	7.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	145	80	226	35	135	386
Future Vol, veh/h	145	80	226	35	135	386
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	155	300	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	171	94	266	41	159	454

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	811	133	0	0	307	0
Stage 1	266	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	317	892	-	-	1250	-
Stage 1	754	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	277	892	-	-	1250	-
Mov Cap-2 Maneuver	277	-	-	-	-	-
Stage 1	754	-	-	-	-	-
Stage 2	476	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.1	0	2.2
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	277	892	1250	-
HCM Lane V/C Ratio	-	-	0.616	0.106	0.127	-
HCM Control Delay (s)	-	-	36.8	9.5	8.3	-
HCM Lane LOS	-	-	E	A	A	-
HCM 95th %tile Q(veh)	-	-	3.8	0.4	0.4	-



Intersection						
Int Delay, s/veh	9.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	37	133	80	118	354	146
Future Vol, veh/h	37	133	80	118	354	146
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	205	155	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	156	94	139	416	172

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	233	0	-	0	260 47
Stage 1	-	-	-	-	94 -
Stage 2	-	-	-	-	166 -
Critical Hdwy	4.14	-	-	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	2.22	-	-	-	3.52 3.32
Pot Cap-1 Maneuver	1332	-	-	-	707 1012
Stage 1	-	-	-	-	919 -
Stage 2	-	-	-	-	846 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1332	-	-	-	684 1012
Mov Cap-2 Maneuver	-	-	-	-	684 -
Stage 1	-	-	-	-	889 -
Stage 2	-	-	-	-	846 -

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	15.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1332	-	-	-	684	1012
HCM Lane V/C Ratio	0.033	-	-	-	0.609	0.17
HCM Control Delay (s)	7.8	-	-	-	18.1	9.3
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.1	-	-	-	4.2	0.6

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↕			↕	
Traffic Vol, veh/h	14	96	20	1	301	1	60	0	4	0	0	42
Future Vol, veh/h	14	96	20	1	301	1	60	0	4	0	0	42
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	113	24	1	354	1	71	0	5	0	0	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	355	0	0	137	0	0	526	502	113	517	526	355
Stage 1	-	-	-	-	-	-	145	145	-	357	357	-
Stage 2	-	-	-	-	-	-	381	357	-	160	169	-
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	1204	-	-	1447	-	-	462	471	940	469	457	689
Stage 1	-	-	-	-	-	-	858	777	-	661	628	-
Stage 2	-	-	-	-	-	-	641	628	-	842	759	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1204	-	-	1447	-	-	424	464	940	461	451	689
Mov Cap-2 Maneuver	-	-	-	-	-	-	424	464	-	461	451	-
Stage 1	-	-	-	-	-	-	847	767	-	652	627	-
Stage 2	-	-	-	-	-	-	595	627	-	827	749	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0	14.9	10.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	439	1204	-	-	1447	-	-	689
HCM Lane V/C Ratio	0.172	0.014	-	-	0.001	-	-	0.072
HCM Control Delay (s)	14.9	8	-	-	7.5	-	-	10.6
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.2

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	4	1	35	99	1
Future Vol, veh/h	2	4	1	35	99	1
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	5	1	41	116	1

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	160	117	117	0	-	0
Stage 1	117	-	-	-	-	-
Stage 2	43	-	-	-	-	-
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	831	935	1471	-	-	-
Stage 1	908	-	-	-	-	-
Stage 2	979	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	830	935	1471	-	-	-
Mov Cap-2 Maneuver	830	-	-	-	-	-
Stage 1	907	-	-	-	-	-
Stage 2	979	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1471	-	897	-	-
HCM Lane V/C Ratio	0.001	-	0.008	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	↗
Traffic Vol, veh/h	103	207	20	0	122	0	12	2	0	0	3	76
Future Vol, veh/h	103	207	20	0	122	0	12	2	0	0	3	76
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	121	244	24	0	144	0	14	2	0	0	4	89

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	144	0	0	268	0	0	677	630	244	643	654	144
Stage 1	-	-	-	-	-	-	486	486	-	144	144	-
Stage 2	-	-	-	-	-	-	191	144	-	499	510	-
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	1438	-	-	1296	-	-	367	399	795	386	386	903
Stage 1	-	-	-	-	-	-	563	551	-	859	778	-
Stage 2	-	-	-	-	-	-	811	778	-	554	538	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1438	-	-	1296	-	-	307	365	795	359	354	903
Mov Cap-2 Maneuver	-	-	-	-	-	-	307	365	-	359	354	-
Stage 1	-	-	-	-	-	-	516	505	-	787	778	-
Stage 2	-	-	-	-	-	-	727	778	-	505	493	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.4			0			17.1			9.6		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	314	1438	-	-	1296	-	-	354	903
HCM Lane V/C Ratio	0.052	0.084	-	-	-	-	-	0.01	0.099
HCM Control Delay (s)	17.1	7.7	-	-	0	-	-	15.3	9.4
HCM Lane LOS	C	A	-	-	A	-	-	C	A
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0	0.3

Intersection						
Int Delay, s/veh	6.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑↑	↗	↘	↑↑
Traffic Vol, veh/h	97	178	506	118	115	320
Future Vol, veh/h	97	178	506	118	115	320
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	155	300	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	114	209	595	139	135	376

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1053	298	0	0	734
Stage 1	595	-	-	-	-
Stage 2	458	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	222	698	-	-	867
Stage 1	514	-	-	-	-
Stage 2	604	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	187	698	-	-	867
Mov Cap-2 Maneuver	187	-	-	-	-
Stage 1	514	-	-	-	-
Stage 2	510	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.8	0	2.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	187	698	867
HCM Lane V/C Ratio	-	-	0.61	0.3	0.156
HCM Control Delay (s)	-	-	50.5	12.4	9.9
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	3.4	1.3	0.6

Intersection						
Int Delay, s/veh	9.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	125	108	178	398	235	97
Future Vol, veh/h	125	108	178	398	235	97
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	300	-	-	205	155	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	147	127	209	468	276	114

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	677	0	-	0	567
Stage 1	-	-	-	-	209
Stage 2	-	-	-	-	358
Critical Hdwy	4.14	-	-	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	2.22	-	-	-	3.52
Pot Cap-1 Maneuver	911	-	-	-	454
Stage 1	-	-	-	-	806
Stage 2	-	-	-	-	678
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	911	-	-	-	381
Mov Cap-2 Maneuver	-	-	-	-	381
Stage 1	-	-	-	-	676
Stage 2	-	-	-	-	678

Approach	EB	WB	SB
HCM Control Delay, s	5.2	0	28.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	911	-	-	-	381	929
HCM Lane V/C Ratio	0.161	-	-	-	0.726	0.123
HCM Control Delay (s)	9.7	-	-	-	35.8	9.4
HCM Lane LOS	A	-	-	-	E	A
HCM 95th %tile Q(veh)	0.6	-	-	-	5.6	0.4

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	46	327	68	5	202	3	40	0	3	0	0	28
Future Vol, veh/h	46	327	68	5	202	3	40	0	3	0	0	28
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	385	80	6	238	4	47	0	4	0	0	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	242	0	0	465	0	0	762	747	385	787	825	240
Stage 1	-	-	-	-	-	-	493	493	-	252	252	-
Stage 2	-	-	-	-	-	-	269	254	-	535	573	-
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	1324	-	-	1096	-	-	322	341	663	309	308	799
Stage 1	-	-	-	-	-	-	558	547	-	752	698	-
Stage 2	-	-	-	-	-	-	737	697	-	529	504	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1324	-	-	1096	-	-	298	325	663	297	294	799
Mov Cap-2 Maneuver	-	-	-	-	-	-	298	325	-	297	294	-
Stage 1	-	-	-	-	-	-	535	525	-	721	695	-
Stage 2	-	-	-	-	-	-	703	694	-	505	483	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.2			18.9			9.7		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	310	1324	-	-	1096	-	-	799
HCM Lane V/C Ratio	0.163	0.041	-	-	0.005	-	-	0.041
HCM Control Delay (s)	18.9	7.8	-	-	8.3	-	-	9.7
HCM Lane LOS	C	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	0.1

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			4	4	
Traffic Vol, veh/h	1	3	5	100	76	2
Future Vol, veh/h	1	3	5	100	76	2
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	4	6	118	89	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	220	90	91	0	0
Stage 1	90	-	-	-	-
Stage 2	130	-	-	-	-
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	768	968	1504	-	-
Stage 1	934	-	-	-	-
Stage 2	896	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	765	968	1504	-	-
Mov Cap-2 Maneuver	765	-	-	-	-
Stage 1	930	-	-	-	-
Stage 2	896	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1504	-	908	-	-
HCM Lane V/C Ratio	0.004	-	0.005	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-



Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↔			↖	↗
Traffic Vol, veh/h	23	320	4	3	599	14	13	1	9	28	0	70
Future Vol, veh/h	23	320	4	3	599	14	13	1	9	28	0	70
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	337	4	3	631	15	14	1	9	29	0	74

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	646	0	0	341	0	0	1067	1037	337	1037	1034	639
Stage 1	-	-	-	-	-	-	385	385	-	645	645	-
Stage 2	-	-	-	-	-	-	682	652	-	392	389	-
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	939	-	-	1218	-	-	200	231	705	209	232	476
Stage 1	-	-	-	-	-	-	638	611	-	461	467	-
Stage 2	-	-	-	-	-	-	440	464	-	633	608	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	939	-	-	1218	-	-	165	225	705	201	226	476
Mov Cap-2 Maneuver	-	-	-	-	-	-	165	225	-	201	226	-
Stage 1	-	-	-	-	-	-	621	595	-	449	466	-
Stage 2	-	-	-	-	-	-	371	463	-	607	592	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0	21.7	17.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	240	939	-	-	1218	-	-	201	476
HCM Lane V/C Ratio	0.101	0.026	-	-	0.003	-	-	0.147	0.155
HCM Control Delay (s)	21.7	8.9	-	-	8	-	-	26	13.9
HCM Lane LOS	C	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.5	0.5

Timings  
12: Vollmer Rd & Marksheffel Rd

2042 Background Traffic  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	838	42	171	925	69	115	235	110	121	517	131
Future Volume (vph)	71	838	42	171	925	69	115	235	110	121	517	131
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Total Split (s)	12.0	66.0	66.0	12.0	66.0	66.0	12.0	30.0	30.0	12.0	30.0	30.0
Total Split (%)	10.0%	55.0%	55.0%	10.0%	55.0%	55.0%	10.0%	25.0%	25.0%	10.0%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max	Max	None	Max	Max
Act Effct Green (s)	67.7	61.0	61.0	69.0	63.4	63.4	32.0	25.0	25.0	32.0	25.0	25.0
Actuated g/C Ratio	0.56	0.51	0.51	0.58	0.53	0.53	0.27	0.21	0.21	0.27	0.21	0.21
v/c Ratio	0.25	0.49	0.05	0.55	0.52	0.08	0.65	0.34	0.28	0.41	0.74	0.32
Control Delay	11.8	20.5	0.1	17.0	9.8	0.2	49.2	41.9	8.9	36.2	51.3	9.6
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	11.8	20.5	0.1	17.0	9.8	0.2	49.2	41.9	8.9	36.2	51.3	9.6
LOS	B	C	A	B	A	A	D	D	A	D	D	A
Approach Delay		18.9			10.3			35.8			41.8	
Approach LOS		B			B			D			D	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 23.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 70.0%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd



Timings  
13: Sterling Ranch Rd & Marksheffel Rd

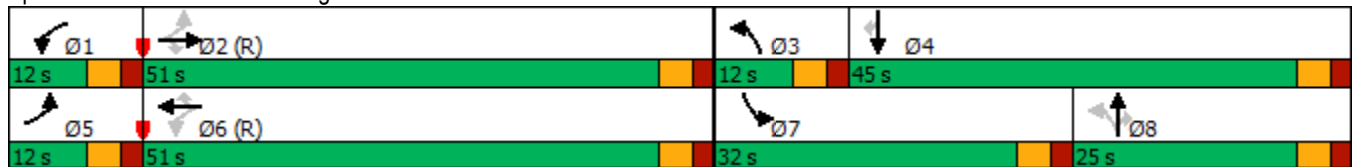
2042 Background Traffic  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	157	900	10	47	809	171	39	8	55	466	10	318
Future Volume (vph)	157	900	10	47	809	171	39	8	55	466	10	318
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	20.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	15.0	15.0	25.0	20.0	20.0
Total Split (s)	12.0	51.0	51.0	12.0	51.0	51.0	12.0	25.0	25.0	32.0	45.0	45.0
Total Split (%)	10.0%	42.5%	42.5%	10.0%	42.5%	42.5%	10.0%	20.8%	20.8%	26.7%	37.5%	37.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	74.5	65.4	65.4	66.5	59.6	59.6	14.6	10.0	10.0	22.8	25.2	25.2
Actuated g/C Ratio	0.62	0.54	0.54	0.55	0.50	0.50	0.12	0.08	0.08	0.19	0.21	0.21
v/c Ratio	0.43	0.49	0.01	0.15	0.48	0.21	0.22	0.05	0.21	0.75	0.03	0.62
Control Delay	20.2	15.4	0.0	12.1	23.0	3.7	32.7	51.6	1.8	53.7	35.6	14.6
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	20.2	15.4	0.0	12.1	23.0	3.7	32.7	51.6	1.8	53.7	35.6	14.6
LOS	C	B	A	B	C	A	C	D	A	D	D	B
Approach Delay		15.9			19.3			17.4			37.8	
Approach LOS		B			B			B			D	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.75  
 Intersection Signal Delay: 23.0  
 Intersection LOS: C  
 Intersection Capacity Utilization 63.5%  
 ICU Level of Service B  
 Analysis Period (min) 15

Splits and Phases: 13: Sterling Ranch Rd & Marksheffel Rd



Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	4	324	14	6	672	4	46	0	16	7	0	14
Future Vol, veh/h	4	324	14	6	672	4	46	0	16	7	0	14
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	341	15	6	707	4	48	0	17	7	0	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	711	0	0	356	0	0	1078	1072	341	1086	1085	709
Stage 1	-	-	-	-	-	-	349	349	-	721	721	-
Stage 2	-	-	-	-	-	-	729	723	-	365	364	-
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	888	-	-	1203	-	-	196	220	701	194	217	434
Stage 1	-	-	-	-	-	-	667	633	-	419	432	-
Stage 2	-	-	-	-	-	-	414	431	-	654	624	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	888	-	-	1203	-	-	188	218	701	188	215	434
Mov Cap-2 Maneuver	-	-	-	-	-	-	188	218	-	188	215	-
Stage 1	-	-	-	-	-	-	664	630	-	417	430	-
Stage 2	-	-	-	-	-	-	398	429	-	635	621	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.1			26.5			17.9		
HCM LOS							D			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	232	888	-	-	1203	-	-	302
HCM Lane V/C Ratio	0.281	0.005	-	-	0.005	-	-	0.073
HCM Control Delay (s)	26.5	9.1	-	-	8	-	-	17.9
HCM Lane LOS	D	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0.2

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	96	577	18	3	374	10	11	1	2	4	1	66
Future Vol, veh/h	96	577	18	3	374	10	11	1	2	4	1	66
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	101	607	19	3	394	11	12	1	2	4	1	69

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	405	0	0	626	0	0	1250	1220	607	1226	1234	400
Stage 1	-	-	-	-	-	-	809	809	-	406	406	-
Stage 2	-	-	-	-	-	-	441	411	-	820	828	-
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	1154	-	-	956	-	-	150	180	496	155	177	650
Stage 1	-	-	-	-	-	-	374	394	-	622	598	-
Stage 2	-	-	-	-	-	-	595	595	-	369	386	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1154	-	-	956	-	-	124	164	496	143	161	650
Mov Cap-2 Maneuver	-	-	-	-	-	-	124	164	-	143	161	-
Stage 1	-	-	-	-	-	-	341	359	-	567	596	-
Stage 2	-	-	-	-	-	-	529	593	-	334	352	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.2			0.1			33.3			12.6		
HCM LOS							D			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	142	1154	-	-	956	-	-	146	650
HCM Lane V/C Ratio	0.104	0.088	-	-	0.003	-	-	0.036	0.107
HCM Control Delay (s)	33.3	8.4	-	-	8.8	-	-	30.6	11.2
HCM Lane LOS	D	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0.3	0.3	-	-	0	-	-	0.1	0.4



Timings  
12: Vollmer Rd & Marksheffel Rd

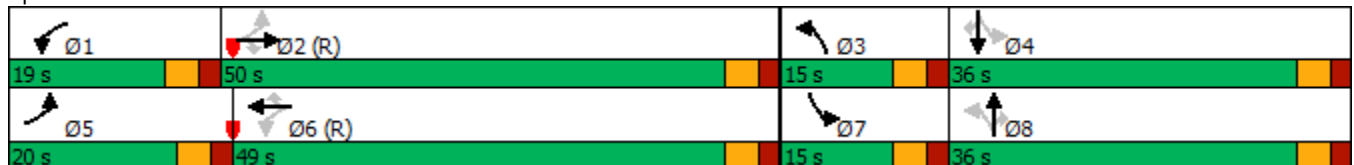
2042 Background Traffic  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	937	96	188	710	154	171	728	186	132	342	199
Future Volume (vph)	142	937	96	188	710	154	171	728	186	132	342	199
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Total Split (s)	20.0	50.0	50.0	19.0	49.0	49.0	15.0	36.0	36.0	15.0	36.0	36.0
Total Split (%)	16.7%	41.7%	41.7%	15.8%	40.8%	40.8%	12.5%	30.0%	30.0%	12.5%	30.0%	30.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max	Max	None	Max	Max
Act Effct Green (s)	57.6	46.9	46.9	60.4	48.3	48.3	41.2	31.4	31.4	40.8	31.2	31.2
Actuated g/C Ratio	0.48	0.39	0.39	0.50	0.40	0.40	0.34	0.26	0.26	0.34	0.26	0.26
v/c Ratio	0.43	0.71	0.15	0.71	0.52	0.22	0.50	0.83	0.38	0.68	0.39	0.37
Control Delay	18.6	34.7	4.5	51.0	22.4	5.3	31.4	50.7	13.6	43.5	38.2	6.7
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	18.6	34.7	4.5	51.0	22.4	5.3	31.4	50.7	13.6	43.5	38.2	6.7
LOS	B	C	A	D	C	A	C	D	B	D	D	A
Approach Delay		30.3			25.0			41.3			29.9	
Approach LOS		C			C			D			C	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 31.8  
 Intersection LOS: C  
 Intersection Capacity Utilization 80.4%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd



Timings  
13: Sterling Ranch Rd & Marksheffel Rd

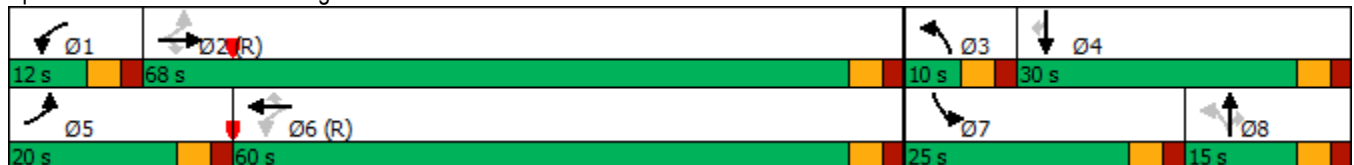
2042 Background Traffic  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	946	22	130	841	554	27	6	37	331	24	183
Future Volume (vph)	293	946	22	130	841	554	27	6	37	331	24	183
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	20.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	15.0	15.0	25.0	20.0	20.0
Total Split (s)	20.0	68.0	68.0	12.0	60.0	60.0	10.0	15.0	15.0	25.0	30.0	30.0
Total Split (%)	16.7%	56.7%	56.7%	10.0%	50.0%	50.0%	8.3%	12.5%	12.5%	20.8%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	80.3	69.1	69.1	69.9	62.9	62.9	11.0	10.0	10.0	20.0	23.0	23.0
Actuated g/C Ratio	0.67	0.58	0.58	0.58	0.52	0.52	0.09	0.08	0.08	0.17	0.19	0.19
v/c Ratio	0.73	0.49	0.02	0.41	0.48	0.53	0.20	0.04	0.12	0.61	0.07	0.42
Control Delay	37.4	10.4	0.0	12.8	20.8	3.5	37.8	51.3	0.8	51.5	39.2	8.5
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	37.4	10.4	0.0	12.8	20.8	3.5	37.8	51.3	0.8	51.5	39.2	8.5
LOS	D	B	A	B	C	A	D	D	A	D	D	A
Approach Delay		16.5			13.8			19.1			36.3	
Approach LOS		B			B			B			D	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 18.5  
 Intersection LOS: B  
 Intersection Capacity Utilization 71.4%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 13: Sterling Ranch Rd & Marksheffel Rd



Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	19	685	64	9	440	3	38	0	5	2	0	11
Future Vol, veh/h	19	685	64	9	440	3	38	0	5	2	0	11
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	721	67	9	463	3	40	0	5	2	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	466	0	0	788	0	0	1250	1245	721	1280	1311	465
Stage 1	-	-	-	-	-	-	761	761	-	483	483	-
Stage 2	-	-	-	-	-	-	489	484	-	797	828	-
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	1095	-	-	831	-	-	150	174	427	143	159	597
Stage 1	-	-	-	-	-	-	398	414	-	565	553	-
Stage 2	-	-	-	-	-	-	561	552	-	380	386	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1095	-	-	831	-	-	144	169	427	138	154	597
Mov Cap-2 Maneuver	-	-	-	-	-	-	144	169	-	138	154	-
Stage 1	-	-	-	-	-	-	391	407	-	555	547	-
Stage 2	-	-	-	-	-	-	544	546	-	368	379	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.2			37.2			14.4		
HCM LOS							E			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	156	1095	-	-	831	-	-	395
HCM Lane V/C Ratio	0.29	0.018	-	-	0.011	-	-	0.035
HCM Control Delay (s)	37.2	8.3	-	-	9.4	-	-	14.4
HCM Lane LOS	E	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	1.1	0.1	-	-	0	-	-	0.1

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↔			↖	↗
Traffic Vol, veh/h	24	326	4	3	602	15	13	1	9	30	0	73
Future Vol, veh/h	24	326	4	3	602	15	13	1	9	30	0	73
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	343	4	3	634	16	14	1	9	32	0	77

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	650	0	0	347	0	0	1080	1049	343	1048	1045	642
Stage 1	-	-	-	-	-	-	393	393	-	648	648	-
Stage 2	-	-	-	-	-	-	687	656	-	400	397	-
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	936	-	-	1212	-	-	196	227	700	206	229	474
Stage 1	-	-	-	-	-	-	632	606	-	459	466	-
Stage 2	-	-	-	-	-	-	437	462	-	626	603	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	936	-	-	1212	-	-	161	220	700	198	222	474
Mov Cap-2 Maneuver	-	-	-	-	-	-	161	220	-	198	222	-
Stage 1	-	-	-	-	-	-	615	590	-	447	465	-
Stage 2	-	-	-	-	-	-	365	461	-	600	587	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0	22.2	17.7
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	234	936	-	-	1212	-	-	198	474
HCM Lane V/C Ratio	0.103	0.027	-	-	0.003	-	-	0.159	0.162
HCM Control Delay (s)	22.2	9	-	-	8	-	-	26.6	14.1
HCM Lane LOS	C	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.6	0.6

Timings  
12: Vollmer Rd & Marksheffel Rd

2042 Total Traffic  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	839	42	175	931	69	115	235	111	121	517	131
Future Volume (vph)	71	839	42	175	931	69	115	235	111	121	517	131
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Total Split (s)	12.0	66.0	66.0	12.0	66.0	66.0	12.0	30.0	30.0	12.0	30.0	30.0
Total Split (%)	10.0%	55.0%	55.0%	10.0%	55.0%	55.0%	10.0%	25.0%	25.0%	10.0%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max	Max	None	Max	Max
Act Effct Green (s)	67.7	61.0	61.0	69.0	63.4	63.4	32.0	25.0	25.0	32.0	25.0	25.0
Actuated g/C Ratio	0.56	0.51	0.51	0.58	0.53	0.53	0.27	0.21	0.21	0.27	0.21	0.21
v/c Ratio	0.25	0.49	0.05	0.56	0.52	0.08	0.65	0.34	0.28	0.41	0.74	0.32
Control Delay	11.9	20.5	0.1	17.6	9.9	0.2	49.2	41.9	8.8	36.2	51.3	9.6
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	11.9	20.5	0.1	17.6	9.9	0.2	49.2	41.9	8.8	36.2	51.3	9.6
LOS	B	C	A	B	A	A	D	D	A	D	D	A
Approach Delay		19.0			10.5			35.8			41.8	
Approach LOS		B			B			D			D	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 23.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 70.2%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd





Timings  
13: Sterling Ranch Rd & Marksheffel Rd

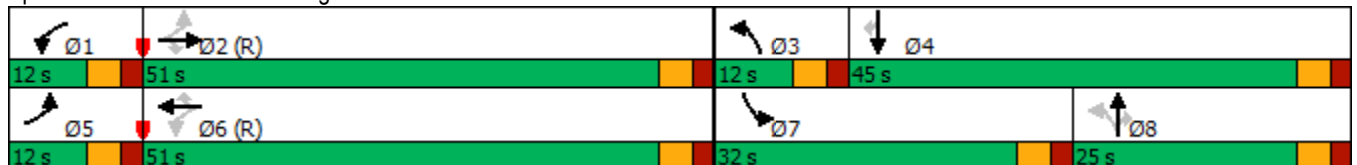
2042 Total Traffic  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	900	10	47	809	175	39	8	55	478	10	328
Future Volume (vph)	160	900	10	47	809	175	39	8	55	478	10	328
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	20.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	15.0	15.0	25.0	20.0	20.0
Total Split (s)	12.0	51.0	51.0	12.0	51.0	51.0	12.0	25.0	25.0	32.0	45.0	45.0
Total Split (%)	10.0%	42.5%	42.5%	10.0%	42.5%	42.5%	10.0%	20.8%	20.8%	26.7%	37.5%	37.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	74.4	65.2	65.2	66.0	59.1	59.1	14.6	10.0	10.0	23.0	25.5	25.5
Actuated g/C Ratio	0.62	0.54	0.54	0.55	0.49	0.49	0.12	0.08	0.08	0.19	0.21	0.21
v/c Ratio	0.44	0.49	0.01	0.15	0.49	0.21	0.22	0.05	0.21	0.76	0.03	0.63
Control Delay	21.0	15.5	0.0	12.3	23.4	3.7	32.6	51.6	1.8	54.0	35.4	15.6
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	21.0	15.5	0.0	12.3	23.4	3.7	32.6	51.6	1.8	54.0	35.4	15.6
LOS	C	B	A	B	C	A	C	D	A	D	D	B
Approach Delay		16.2			19.6			17.3			38.3	
Approach LOS		B			B			B			D	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 75  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.76  
 Intersection Signal Delay: 23.4  
 Intersection LOS: C  
 Intersection Capacity Utilization 64.0%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 13: Sterling Ranch Rd & Marksheffel Rd



Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	9	325	14	6	676	6	46	0	16	13	0	32
Future Vol, veh/h	9	325	14	6	676	6	46	0	16	13	0	32
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	342	15	6	712	6	48	0	17	14	0	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	718	0	0	357	0	0	1104	1090	342	1103	1102	715
Stage 1	-	-	-	-	-	-	360	360	-	727	727	-
Stage 2	-	-	-	-	-	-	744	730	-	376	375	-
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	883	-	-	1202	-	-	188	215	701	189	212	431
Stage 1	-	-	-	-	-	-	658	626	-	415	429	-
Stage 2	-	-	-	-	-	-	407	428	-	645	617	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	883	-	-	1202	-	-	171	212	701	182	209	431
Mov Cap-2 Maneuver	-	-	-	-	-	-	171	212	-	182	209	-
Stage 1	-	-	-	-	-	-	651	620	-	411	427	-
Stage 2	-	-	-	-	-	-	373	426	-	623	611	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.1			29.4			18.7		
HCM LOS							D			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	212	883	-	-	1202	-	-	309
HCM Lane V/C Ratio	0.308	0.011	-	-	0.005	-	-	0.153
HCM Control Delay (s)	29.4	9.1	-	-	8	-	-	18.7
HCM Lane LOS	D	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1.2	0	-	-	0	-	-	0.5

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	1	5	2	38	98	0
Future Vol, veh/h	1	5	2	38	98	0
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	6	2	45	115	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	164	115	115	0	-	0
Stage 1	115	-	-	-	-	-
Stage 2	49	-	-	-	-	-
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	827	937	1474	-	-	-
Stage 1	910	-	-	-	-	-
Stage 2	973	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	826	937	1474	-	-	-
Mov Cap-2 Maneuver	826	-	-	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	973	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1474	-	916	-	-
HCM Lane V/C Ratio	0.002	-	0.008	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	↗
Traffic Vol, veh/h	100	578	18	3	377	11	11	1	2	4	1	69
Future Vol, veh/h	100	578	18	3	377	11	11	1	2	4	1	69
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	-	155	205	-	-	-	-	-	-	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	105	608	19	3	397	12	12	1	2	4	1	73

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	409	0	0	627	0	0	1264	1233	608	1238	1246	403
Stage 1	-	-	-	-	-	-	818	818	-	409	409	-
Stage 2	-	-	-	-	-	-	446	415	-	829	837	-
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	1150	-	-	955	-	-	146	177	496	152	174	647
Stage 1	-	-	-	-	-	-	370	390	-	619	596	-
Stage 2	-	-	-	-	-	-	591	592	-	365	382	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1150	-	-	955	-	-	120	160	496	140	158	647
Mov Cap-2 Maneuver	-	-	-	-	-	-	120	160	-	140	158	-
Stage 1	-	-	-	-	-	-	336	355	-	563	594	-
Stage 2	-	-	-	-	-	-	522	590	-	329	347	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.2			0.1			34.4			12.6		
HCM LOS							D			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	137	1150	-	-	955	-	-	143	647
HCM Lane V/C Ratio	0.108	0.092	-	-	0.003	-	-	0.037	0.112
HCM Control Delay (s)	34.4	8.4	-	-	8.8	-	-	31.1	11.3
HCM Lane LOS		D	A	-	-	A	-	D	B
HCM 95th %tile Q(veh)	0.4	0.3	-	-	0	-	-	0.1	0.4

Timings  
12: Vollmer Rd & Marksheffel Rd

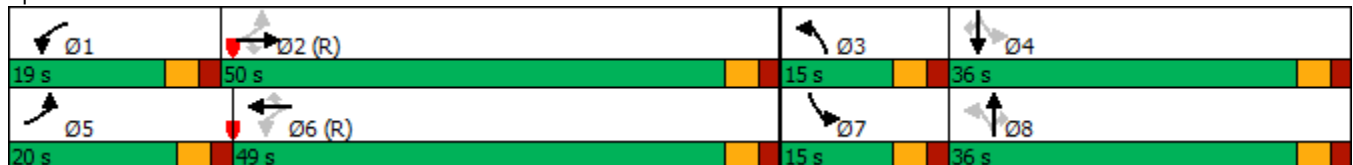
2042 Total Traffic  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	943	96	191	715	154	171	728	191	132	342	199
Future Volume (vph)	142	943	96	191	715	154	171	728	191	132	342	199
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Total Split (s)	20.0	50.0	50.0	19.0	49.0	49.0	15.0	36.0	36.0	15.0	36.0	36.0
Total Split (%)	16.7%	41.7%	41.7%	15.8%	40.8%	40.8%	12.5%	30.0%	30.0%	12.5%	30.0%	30.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max	Max	None	Max	Max
Act Effct Green (s)	57.4	46.8	46.8	60.6	48.3	48.3	41.2	31.4	31.4	40.8	31.2	31.2
Actuated g/C Ratio	0.48	0.39	0.39	0.50	0.40	0.40	0.34	0.26	0.26	0.34	0.26	0.26
v/c Ratio	0.43	0.72	0.15	0.72	0.53	0.22	0.50	0.83	0.39	0.68	0.39	0.37
Control Delay	18.7	35.1	4.5	52.2	22.5	5.4	31.4	50.7	13.7	43.5	38.2	6.7
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	18.7	35.1	4.5	52.2	22.5	5.4	31.4	50.7	13.7	43.5	38.2	6.7
LOS	B	D	A	D	C	A	C	D	B	D	D	A
Approach Delay		30.6			25.3			41.2			29.9	
Approach LOS		C			C			D			C	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 32.0  
 Intersection LOS: C  
 Intersection Capacity Utilization 80.8%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd





Timings  
13: Sterling Ranch Rd & Marksheffel Rd

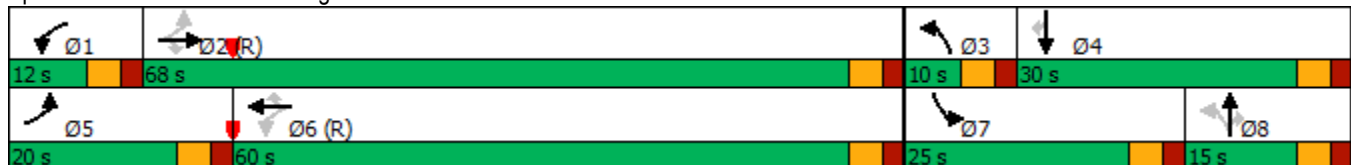
2042 Total Traffic  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	305	946	22	130	841	570	27	6	37	342	24	191
Future Volume (vph)	305	946	22	130	841	570	27	6	37	342	24	191
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	10.0	10.0	20.0	10.0	10.0
Minimum Split (s)	10.0	20.0	20.0	10.0	20.0	20.0	10.0	15.0	15.0	25.0	20.0	20.0
Total Split (s)	20.0	68.0	68.0	12.0	60.0	60.0	10.0	15.0	15.0	25.0	30.0	30.0
Total Split (%)	16.7%	56.7%	56.7%	10.0%	50.0%	50.0%	8.3%	12.5%	12.5%	20.8%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	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	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)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	80.6	69.1	69.1	69.6	62.7	62.7	11.0	10.0	10.0	20.0	23.0	23.0
Actuated g/C Ratio	0.67	0.58	0.58	0.58	0.52	0.52	0.09	0.08	0.08	0.17	0.19	0.19
v/c Ratio	0.75	0.49	0.02	0.41	0.48	0.54	0.20	0.04	0.12	0.63	0.07	0.43
Control Delay	39.5	10.5	0.0	12.9	20.9	3.5	37.8	51.3	0.8	52.1	39.2	8.5
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	39.5	10.5	0.0	12.9	20.9	3.5	37.8	51.3	0.8	52.1	39.2	8.5
LOS	D	B	A	B	C	A	D	D	A	D	D	A
Approach Delay		17.3			13.8			19.1			36.6	
Approach LOS		B			B			B			D	

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.75  
 Intersection Signal Delay: 18.9  
 Intersection LOS: B  
 Intersection Capacity Utilization 73.0%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 13: Sterling Ranch Rd & Marksheffel Rd



Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	43	689	64	9	443	6	38	0	5	2	0	27
Future Vol, veh/h	43	689	64	9	443	6	38	0	5	2	0	27
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	155	-	155	155	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	45	725	67	9	466	6	40	0	5	2	0	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	472	0	0	792	0	0	1316	1305	725	1338	1369	469
Stage 1	-	-	-	-	-	-	815	815	-	487	487	-
Stage 2	-	-	-	-	-	-	501	490	-	851	882	-
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	1090	-	-	829	-	-	135	160	425	130	146	594
Stage 1	-	-	-	-	-	-	371	391	-	562	550	-
Stage 2	-	-	-	-	-	-	552	549	-	355	364	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1090	-	-	829	-	-	124	152	425	123	138	594
Mov Cap-2 Maneuver	-	-	-	-	-	-	124	152	-	123	138	-
Stage 1	-	-	-	-	-	-	356	375	-	539	544	-
Stage 2	-	-	-	-	-	-	520	543	-	336	349	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.2			44.6			13.2		
HCM LOS							E			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	135	1090	-	-	829	-	-	470
HCM Lane V/C Ratio	0.335	0.042	-	-	0.011	-	-	0.065
HCM Control Delay (s)	44.6	8.4	-	-	9.4	-	-	13.2
HCM Lane LOS	E	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	1.4	0.1	-	-	0	-	-	0.2

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	1	3	5	107	71	2
Future Vol, veh/h	1	3	5	107	71	2
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	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	4	6	126	84	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	223	85	86	0	0
Stage 1	85	-	-	-	-
Stage 2	138	-	-	-	-
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	765	974	1510	-	-
Stage 1	938	-	-	-	-
Stage 2	889	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	762	974	1510	-	-
Mov Cap-2 Maneuver	762	-	-	-	-
Stage 1	934	-	-	-	-
Stage 2	889	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0.3	0
HCM LOS	A		

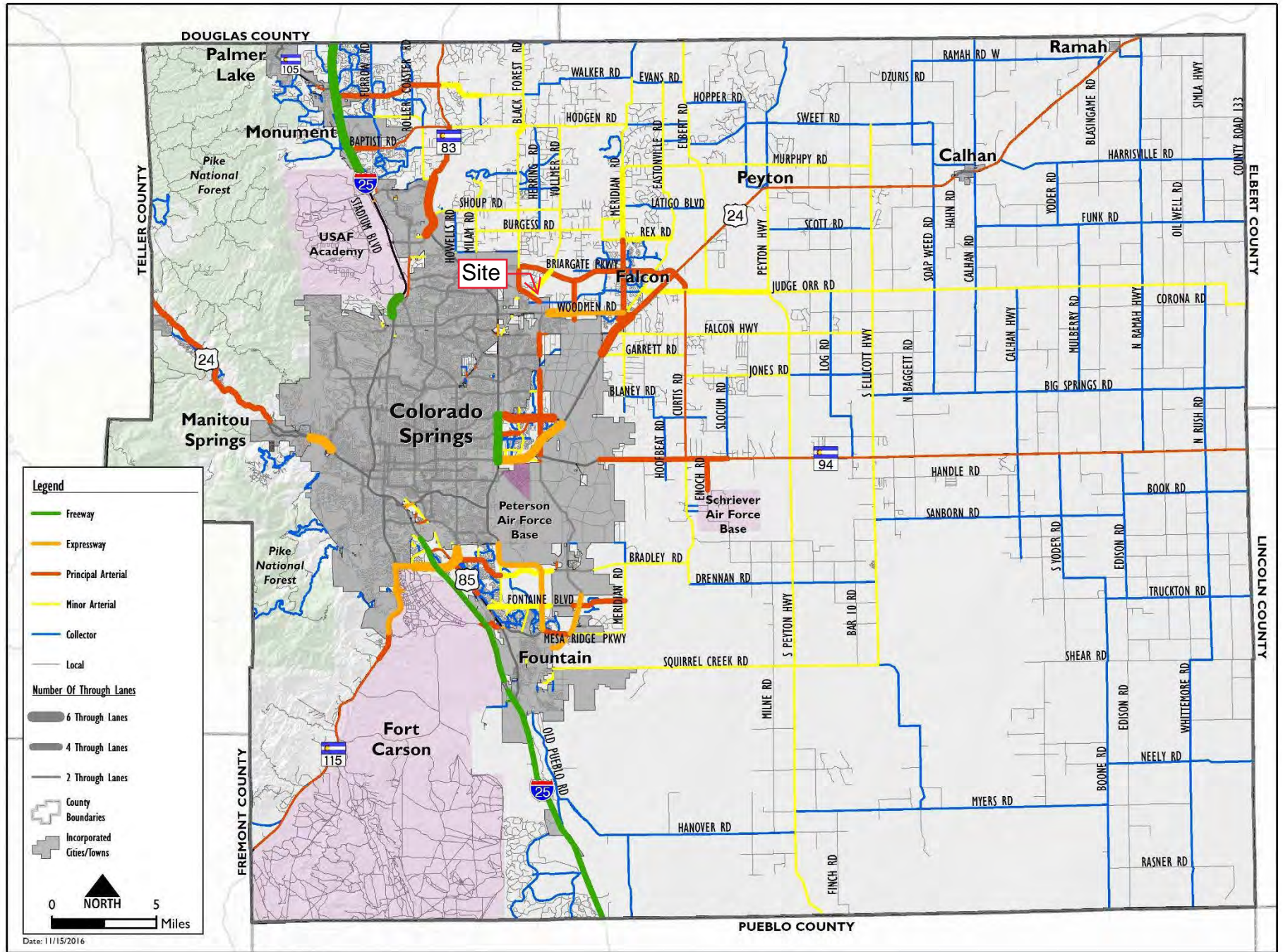
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1510	-	911	-	-
HCM Lane V/C Ratio	0.004	-	0.005	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

# MTCP Maps

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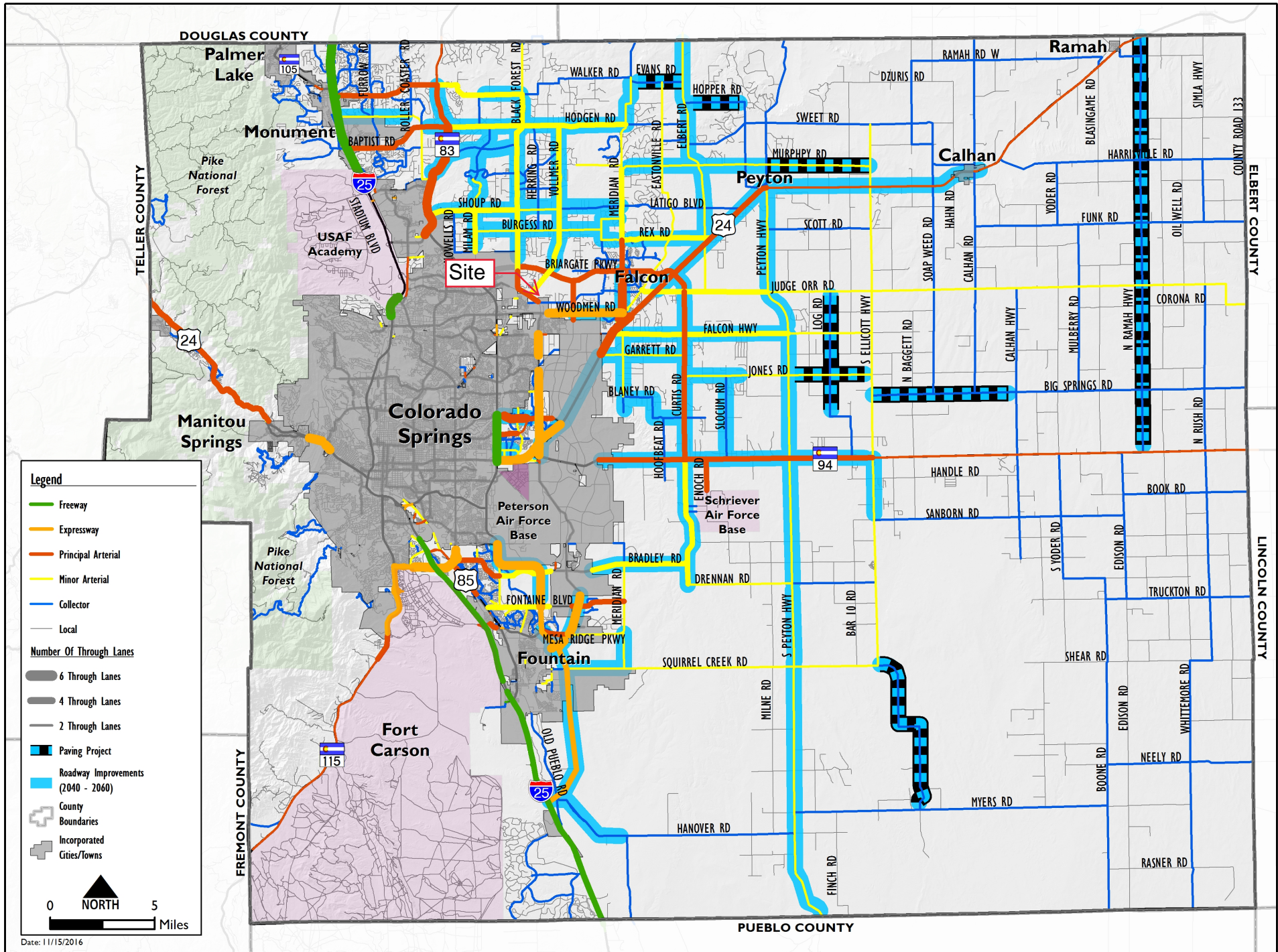




Map 14: 2040 Roadway Plan (Classification and Lanes)



# Map 17: 2060 Corridor Preservation



# Appendix Tables 1-2

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**Appendix Table 1  
Area Traffic Impact Studies  
Sterling Ranch Filing No. 5**

<b>Study</b>	<b>PCD File No<sup>(1)</sup></b>	<b>Consultant</b>	<b>Date</b>
<b>Sterling Ranch Reports</b>			
Sterling Ranch Updated Traffic Impact Analysis	<a href="#">SKP07007</a>	LSC Transportation Consultants, Inc	June 5, 2008
Sterling Ranch Phase 1 Traffic Impact Study	<a href="#">P151</a>	LSC Transportation Consultants, Inc	March 16, 2015
Sterling Ranch Phases 1-3 Transportation Memorandum	<a href="#">SP1415</a>	LSC Transportation Consultants, Inc	October 2, 2017
Branding Iron at Sterling Ranch Filing No. 1 and Homestead at Sterling Ranch Filing No. 1 Transportation	<a href="#">SF1724</a> <a href="#">SF1725</a>	LSC Transportation Consultants, Inc	December 19, 2017
Sterling Ranch Filing No. 2 Transportation Memorandum	<a href="#">SF1820</a>	LSC Transportation Consultants, Inc	April 3, 2018
Sterling Ranch Phase 2 Preliminary Plan Traffic Impact Study	<a href="#">SP203</a>	LSC Transportation Consultants, Inc	December 20, 2018
Homestead at Sterling Ranch Filing No. 2 Transportation Memorandum	<a href="#">SF194</a>	LSC Transportation Consultants, Inc	March 3, 2020
Branding Iron at Sterling Ranch Filing No. 2 Transportation Memorandum	<a href="#">SF1918</a>	LSC Transportation Consultants, Inc	May 6, 2020
Sterling Ranch Filing No. 2 and Phase 2 Traffic Impact Study	<a href="#">SF2015</a> <a href="#">SP191</a>	LSC Transportation Consultants, Inc	June 23, 2021
Sterling Ranch Filing No. 3 Transportation Memorandum	<a href="#">SF2132</a>	LSC Transportation Consultants, Inc	April 19, 2022
Homestead North Phase 1 Updated Transportation Memorandum	<a href="#">SP208</a>	LSC Transportation Consultants, Inc	January 11, 2022
Homestead North Filing No. 1 Traffic Technical Memorandum	<a href="#">SF2213</a>	LSC Transportation Consultants, Inc	February 2, 2022
Homestead North Filing No. 2 Traffic Technical Memorandum	<a href="#">SF2218</a>	LSC Transportation Consultants, Inc	April 15, 2022
Homestead North Filing 3 Traffic Impact Study	<a href="#">SF2229</a>	LSC Transportation Consultants, Inc	June 17, 2022
The Villages at Sterling Ranch East Preliminary Plan/Traffic Generation Analysis	<a href="#">PUDSP226</a>	SM Rocha, LLC	July 1, 2022
Sterling Ranch Sketch Plan Amendment Master Traffic Impact Study	<a href="#">SKP224</a>	LSC Transportation Consultants, Inc	March 17, 2023
Sterling Ranch East - Rezoning & Preliminary Plan Traffic Impact Study	<a href="#">SP-22-004, P-22-012, P-22-013</a>	LSC Transportation Consultants, Inc	March 17, 2023 <sup>(2)</sup>
Sterling Ranch East Filing Nos 1 & 2 Traffic Technical Memorandum	<a href="#">SF2235</a> <a href="#">SF2237</a>	LSC Transportation Consultants, Inc	February 10, 2023
Sterling Ranch Filing No. 4 Transportation Memorandum	<a href="#">SF2230</a>	LSC Transportation Consultants, Inc	February 21, 2023
Foursquare at Sterling Ranch East Transportation Memorandum	<a href="#">SF2236</a>	LSC Transportation Consultants, Inc	April 20, 2023
Copper Chase at Sterling Ranch Traffic Impact Study	<a href="#">PUDSP222</a>	LSC Transportation Consultants, Inc	April 28, 2023
<b>Retreat at TimberRidge Reports</b>			
The Retreat at TimberRidge Traffic Impact Analysis	<a href="#">PUD173</a>	LSC Transportation Consultants, Inc	January 25, 2018
The Retreat at TimberRidge Preliminary Plan Traffic Technical Memorandum	<a href="#">SP182</a>	LSC Transportation Consultants, Inc	June 29, 2018
The Retreat at TimberRidge Filing No. 1 Traffic Technical Memorandum	<a href="#">SF199</a>	LSC Transportation Consultants, Inc	April 3, 2020
The Retreat at TimberRidge Filing No. 2 Updated Traffic Technical Memorandum	<a href="#">SF2121</a>	LSC Transportation Consultants, Inc	October 4, 2021
The Retreat at TimberRidge Filing No. 3 Traffic Technical Memorandum	<a href="#">SF2241</a>	LSC Transportation Consultants, Inc	July 1, 2022
<b>Other Area Reports</b>			
Wolf Ranch School Site Traffic Impact Study	<a href="#">OAR1720</a>	Matrix Design Group, Inc.	5-May-17
The Ranch Sketch Plan Traffic Impact Analysis	<a href="#">SKP186</a>	LSC Transportation Consultants, Inc	July 9, 2019
Lodge III Traffic Impact Study	OAR	LSC Transportation Consultants, Inc	December 13, 2019
Continental 613 Traffic Impact Study	<a href="#">OAR2177</a>	LSC Transportation Consultants, Inc	July 16, 2021
Solace at Black Forest Traffic Impact and Access Analysis	<a href="#">OAR2134</a>	LSC Transportation Consultants, Inc	August 13, 2021
Traffic Impact Study Addendum for Percheron	<a href="#">OAR2173</a>	SM Rocha, LLC	October, 2021
Woodmen East Commercial Center Traffic Impact Analysis	<a href="#">OAR2191</a>	LSC Transportation Consultants, Inc	December 8, 2021
Traffic Impact Study for Jaynes Property	<a href="#">SKP225</a>	SM Rocha, LLC	May, 2022
Traffic Impact Study for Rhetoric Site	<a href="#">P2216</a>	SM Rocha, LLC	June, 2022
Briargate-Stapleton Corridor Study (DRAFT)	<a href="#">briargate-stapleton.com</a>	Wilson & Company	December 9, 2021
Notes:			
(1) Follow the links listed below to obtain the most recent version of each listed study. To obtain a copy of the version of each study used in preparing this report please contact LSC Transportation Consultants, Inc.			
(2) With minor revision 4/3/2023			
Source: LSC Transportation Consultants, Inc.			



## Appendix Table 2

### Roadway Segment Improvements

Sterling Ranch Filing 5

(Page 1 of 2)

Segment ID <sup>(1)</sup> (See Figure 14 for map)	Improvement Description	Timing	Design ADT (vpd)	Projected 2042 ADT (vpd)	Responsibility
V1 <a href="#">(Short-Term)</a> Northbound	UPDATE (November 2023): It is our understanding that a meeting(s) with JR Engineering/the applicant, City staff and County staff were held, that a short-term/interim improvement to segment V1 will not be required. The original LSC recommendation for this segment was for restriping. However, City staff indicated that the striped bike lane in the southbound direction needs to remain. Per the City of Colorado Springs, an outside paved shoulder will need to be added along the east side of Vollmer Road from Dry Needle Place up to the south end of segment V2 improvements.	Updated 11/13/2023 - It is our understanding that following a meeting with the City of Colorado Springs and El Paso County, a V1 interim shoulder this improvement will no longer be required, in the short term	5,500 (Directional northbound)	16,275	<a href="#">N/A Sterling Ranch</a>
V1 <a href="#">(Short-Term)</a> Southbound			10,000 (Directional southbound)		
V1	Improve Vollmer Road between Dry Needle Place and the Sterling Ranch south boundary to a standard 4-Lane Urban Minor Arterial Cross Section (Add a second northbound through lane and painted center median) <sup>(2)</sup>	Intermediate-Term Future	20,000		Sterling Ranch, if necessary prior to construction by Others
V2	Improve Vollmer Road between the Sterling Ranch south boundary to Lochwinnoch Lane/Sterling property boundary to a standard 4-Lane Urban Minor Arterial Cross Section <sup>(2)</sup>	Short-Term Future (With Sterling Ranch Fil No. 2 Or Sterling Ranch Phase 2) <u>Updated 11/15/2023:</u> <u>In Progress to be complete by November 2023</u>	20,000 (Note: Existing Capacity 8,000 <sup>(3)</sup> )	17,475	Sterling Ranch
V3	<b>Short Term:</b> Improve Vollmer Road from Lochwinnoch Lane to Sterling Ranch boundary (northeast of Glider Loop) to provide 36' of pavement (existing pavement 1 approx. 23.38') and stripe for one through lane and plus a 6' paved, striped outside shoulder in each direction <sup>(2)</sup>	Short-Term Future (With Homestead North) <u>Updated 11/15/202: Construction Document Approved</u>	11,000 (Note: Existing Capacity 8,000)	17,380	Sterling Ranch
	<b>Long Term:</b> Improve Vollmer Road from Lochwinnoch Lane to Sterling Ranch boundary (northeast of Glider Loop) to a standard 4-Lane Urban Minor Arterial Cross Section <sup>(2)</sup>	Long-Term Future	20,000		By others - pursuant to the recent development agreement between Sterling Ranch and EPC.
V4	Improve Vollmer Road from Sterling Ranch boundary (northeast of Glider Loop) to Briargate Parkway to a standard 4-Lane Urban Minor Arterial Cross Section <sup>(2)</sup>	Sections V4, V5, V6 to be constructed by <b>May 2024</b>	20,000	16,445	Sterling Ranch
V5	Improve Vollmer Road from Briargate Parkway to Jane Kirkham Drive to a standard 4-Lane Urban Minor Arterial Cross Section <sup>(2)</sup>	Sections V4, V5, v6 to be constructed by <b>May 2024</b>	20,000	11,690	Sterling Ranch
V6	Improve Vollmer Road from Jane Kirkham Drive to Sam Bass Drive to a standard 4-Lane Urban Minor Arterial Cross Section <sup>(2)</sup>	Sections V4, V5, v6 to be constructed by <b>May 2024</b>	20,000	11,425	Sterling Ranch
V7	Improve Vollmer Road between Sam Bass Drive and Poco Road to a 4-lane Urban Minor Arterial but with necessary lane transitions, redirect tapers, etc. south of Poco to adequately transition between the 4-Lane Urban Minor Arterial Cross Section and the 2-Lane Rural Arterial Cross Section north of Poco Road.	Sections V4, V5, v6 to be constructed by <b>May 2024</b>	20,000	10,090	Sterling Ranch
V8	Improve Vollmer Road from Poco Road to Shoup Road to a Rural 2-Lane Arterial Cross Section <sup>(2)</sup>	Long-Term Future	10,000	11,790	El Paso County Project ID U-12

**Part 1/2 of this table (see Part 2 on next page)**

**Notes:**

(1) See Figure 14

(2) Adequate transition/redirect tapers would be needed between the various cross sections on Vollmer Road. Based on the criteria contained in Table 2-29 of the *El Paso Engineering Criteria Manual* an appropriate taper ratio for a roadway with a design speed of 40 mile per hour is 20:1

(3) Source: Table 20 Road Impact Fee Study Updated November 16, 2016

Source: LSC Transportation Consultants, Inc. (November, 2023)

## Appendix Table 2

### Roadway Segment Improvements

Sterling Ranch Filing 5

(Page 2 of 2)

Segment ID <sup>(1)</sup> (See Figure 14 for map)	Improvement Description	Timing	Design ADT (vpd)	Projected 2042 ADT (vpd)	Responsibility
SR1	Construct Sterling Ranch Road as an Urban Non-Residential Collector from Marksheffel Road to Dines Boulevard	<b>Completed</b>	20,000	14,840	Sterling Ranch
SR2	Construct Sterling Ranch Road as an Urban Non-Residential Collector from Dines Boulevard to Briargate Parkway	<b>Short-Term - with SRE Preliminary Plan 1</b>	20,000	10,275	Sterling Ranch
SR3	Construct Sterling Ranch Road as an Urban Collector from Briargate Parkway to Vancouver Street.	<b>Short-Term - with SRE Preliminary Plan 1</b>	10,000	9,300	Sterling Ranch
SR4	Construct Sterling Ranch Road from Vancouver Street north to Arroya (or ultimate north terminus)	Long-Term Future	10,000	4,260	Sterling Ranch
M1	Construct Marksheffel Road as an Urban Principal Arterial to City of Colorado Springs standards in 107' of right-of-way between Vollmer Road and Sterling Ranch Road	<b>Completed</b>	40,000	23,370	Sterling Ranch
M2	Construct Marksheffel Road as an Urban Principal Arterial to City of Colorado Springs standards in 107' of right-of-way between Sterling Ranch Road and the south boundary of the Sterling Ranch Master Plan Area. <b>NOTE: With the completion of this improvement the connection between Vollmer Road and Woodmen Road will be completed</b>	To be completed in 2024	40,000	29,600	Sterling Ranch
M3	Construct Marksheffel Road between the south boundary of the Sterling Ranch Master Plan Area and Woodmen Road (Note this segment is located within the City of Colorado Springs)	<b>Completed</b> (by Others)	40,000	24,525	Others (Completed)
M4	Construct Marksheffel Road between Black Forest Road and Vollmer Road	Long-Term Future	40,000	27,910	Others
B1	Construct the full section of Briargate Pkwy (4-Lane Principal Arterial) between Vollmer Road and Wheatland Drive	<b>Full section</b> to be completed in 2023 with Homestead at Sterling Ranch Filing No. 1	40,000	24,745	Sterling Ranch
B2	Construct Briargate Pkwy ( <b>full section</b> ) as a 4-Lane Principal Arterial between Wheatland Dr and Sterling Ranch Road	<b>Full section</b> to be completed in 2023 or Spring 2024	40,000	26,375	Sterling Ranch
B3	Construct Briargate Pkwy as a 4-Lane Principal Arterial between Sterling Ranch Road and Banning Lewis Parkway	Intermediate Term	40,000	22,365	Sterling Ranch
B4	Construct Stapleton Road as a 4-Lane Principal Arterial between Banning Lewis Parkway and Meridian Road (including upgrade of existing rural two-lane segment between Towner and Meridian)	Long-Term Future	40,000	17,945	Others
B5	Construct Briargate Pkwy as a 4-Lane Principal Arterial between its current terminus and Black Forest Road and between Black Forest Road and Vollmer Road	Long-Term Future	40,000	24,340	Others
BL1	Construct Banning Lewis Parkway as a 4-Lane Principal Arterial between the south Sterling Ranch boundary and Briargate Pkwy	Long-Term Future	40,000	20,320	Future- TBD with the future preliminary plan for that area-potentially, financial assurances for half-section, west-side half-section or full-section w/ cost recover may be required
BL2	Construct Banning Lewis Parkway as a 4-Lane Principal Arterial between Woodmen Road and the south Sterling Ranch boundary (Note this segment will be located within the City of Colorado Springs)	Long-Term Future	40,000	28,480	Others
W1	Widen Woodmen Road from 4-lane to 6-lane section from Powers Boulevard to US 24	Long-Term Future	72,000	66,690	Others

**Part 2/2 of this table**

**Notes:**

(1) See Figure 14

(2) Adequate transition/redirect tapers would be needed between the various cross sections on Vollmer Road. Based on the criteria contained in Table 2-29 of the *El Paso Engineering Criteria Manual* an appropriate taper ratio for a roadway with a design speed of 40 mile per hour is 20:1

(3) Source: Table 20 Road Impact Fee Study Updated November 16, 2016

Source: LSC Transportation Consultants, Inc. (November, 2023)