

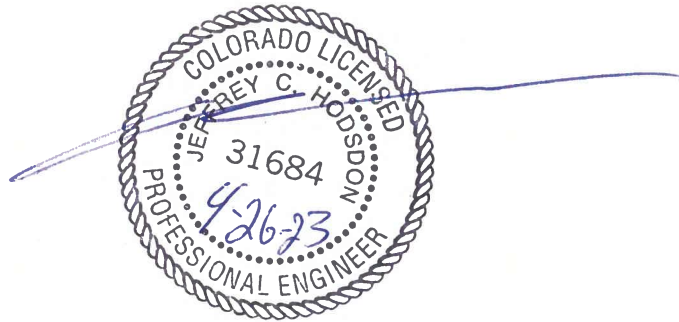


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Copper Chase at Sterling Ranch
Traffic Technical Memorandum
PUDSP-22-002
(LSC #184990)
April 26, 2023

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.

A handwritten signature in blue ink, appearing to be 'R. B. J.', written over a horizontal line.

4/28/23
Date

Copper Chase at Sterling Ranch

Traffic Impact Study

Prepared for:

Mr. Jim Byers
Challenger Homes
8605 Explorer Drive, Suite 250
Colorado Springs, CO 80920

APRIL 26, 2023

LSC Transportation Consultants
Prepared by: Kirstin D. Ferrin, P.E.
Reviewed by: Jeffrey C. Hodsdon, P.E.

LSC #184990
PUDSP-22-002



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April 26, 2023

Mr. Jim Byers
Challenger Homes
8605 Explorer Drive, Suite 250
Colorado Springs, CO 80920

RE: Copper Chase at Sterling Ranch
El Paso County, CO
Traffic Impact Study
PUDSP-22-002
LSC #184990

Dear Mr. Byers:

LSC Transportation Consultants, Inc. has prepared this traffic impact study (TIS) for the proposed Copper Chase at Sterling Ranch residential development. As shown in Figure 1, the site is located east of Vollmer Road and north of the future extension of Marksheffel Road in El Paso County, Colorado.

LSC prepared a traffic technical memorandum for this development dated May 26, 2022, however since completion of that memorandum LSC has updated the Sterling Ranch Master Traffic Impact Study and prepared multiple reports various for preliminary plans and filings within Sterling Ranch and the surrounding area which impact the recommendations and conclusions. This report replaces the May 2022 memorandum and is intended as site-specific, PUD Development/PUD Plan report for Copper Chase at Sterling Ranch.

REPORT CONTENTS

This report presents:

- A list of previous Sterling Ranch traffic reports and the context of this project;
- A summary of the proposed land use and access plan;
- 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;
- 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 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;
- 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 recommended street classifications
- The project's obligation to the County roadway improvement fee program.

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 Copper Chase at Sterling Ranch 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, and the planned FourSquare at Sterling Ranch East development. Trips projected from these other short-term developments outside of the currently proposed Copper Chase at Sterling Ranch 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 LSC February 10, 2023 Master TIS 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 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 Figure 1 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 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

Copper Chase at Sterling Ranch is planned to include 138 lots for single-family homes and is located east of Vollmer Road and north of the segment of Marksheffel Road currently under construction. Figure 3 shows the proposed site plan.

Access is proposed to Alzada Drive and Bynum Drive. Both of these existing “Urban Local” roadways are part of the approved Sterling Ranch Filing No. 2. The Copper Chase at Sterling Ranch access points are consistent with the access assumed in the TIS for that filing.

Copper Chase at Sterling Ranch was included in the Sterling Ranch Master TIS as Traffic Analysis Zone (TAZ) 5. Traffic projected to be generated by land uses within this zone was also included as part of the short-term background traffic volumes in the *Sterling Ranch East Rezoning and Preliminary Plan TIS*. The land use and access currently proposed are consistent with what was assumed in the *Master TIS and the Sterling Ranch East Rezoning and Preliminary Plan TIS*.

Intersection Sight Distance

Figure 4 shows a sight-distance analysis at the proposed intersections to Alzada Drive and Bynum Drive. Based on a design speed of 25 miles per hour (mph) and the criteria contained in Table 2-21 of the *Engineering Criteria Manual (ECM)*, the required intersection sight distance at the future intersections is 280 feet. Based on the criteria contained in Table 2-17 of the *ECM*, the required stopping sight distance approaching this intersection is 155 feet. As shown in Figure 3, both proposed intersections analyzed will meet the criteria.

Pedestrian and Bicycle Analysis

Figure 5 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), as shown in the attached map.

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 4. 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

Copper Chase at Sterling Ranch 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. The trip-generation estimate is consistent with the estimate assumed in the *Sterling Ranch Master TIS* and the *Sterling Ranch East Rezoning and Preliminary Plan TIS* for the same parcels.

Copper Chase at Sterling Ranch is expected to generate 1,301 vehicle trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 25 vehicles would enter and 71 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:15 and 6:15 p.m., about 82 vehicles would enter and 48 vehicles would exit the site.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of the site-generated traffic volumes on the street and roadway system serving the site is 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 6. 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 6) are applied to the new, external trip-generation estimates (from Table 1), the resulting site-generated traffic volumes can be determined. Figures 7 and 8 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 Copper Chase at Sterling Ranch.

Short-Term Scenario Background Conditions

Figure 9 shows the projected volumes for the short-term Background scenario. This scenario includes traffic to be traffic 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, and the planned FourSquare at Sterling Ranch East development.

Long-Term Scenario Background Conditions

Figure 10 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 11 shows the projected volumes for the short-term total scenario. These volumes are the sum of the short-term Background scenario (from Figure 9) plus the short-term site-generated traffic volumes (from Figure 7).

Long-Term Scenario Total Conditions

Figure 12 shows the projected volumes for the 2043 total scenario. These volumes are the sum of the 2043 Background scenario (from Figure 10) plus the long-term site-generated traffic volumes (from Figure 8).

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) ⁽¹⁾
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 D during the morning peak hour and LOS E during the afternoon peak hour.

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 D during the afternoon peak hour.

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.

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 one of the hours analyzed is 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 three 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 Copper Chase at Sterling Ranch should be classified as Urban Local. Figure 13 shows the recommended street classifications for the internal streets and the streets in the vicinity of the site.

DEVIATION REQUESTS

The following deviation requests to the criteria contained in the El Paso County *Engineering Criteria Manual (ECM)* have been included with this submittal:

- A deviation from the maximum mid-block ped ramp spacing
- A deviation from the number of ped ramps at a “T” intersection
- A deviation from the minimum center-line radius and minimum intersection-spacing standards. [Deviation request for tangent length between broken back curves & for K-values at stop conditions on a local road \(Refer to comment on CD's\).](#)

ROADWAY IMPROVEMENTS

Table 6 from the *Sterling Ranch East Rezoning and Preliminary Plan TIS* contained a summary of needed area improvements. Appendix Table 2 is a copy of this table with the improvements needed either prior to or with Copper Chase at Sterling Ranch highlighted. Please see Figure 14 for a map of the key street-segment locations. These recommendations are consistent with the LSC Sketch Plan TIS report.

The following auxiliary lanes shown will be required with Copper Chase at Sterling Ranch development 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/Bynum
 - A 155-foot northbound left-turn lane on Sterling Ranch Road approaching Bynum, plus a 90-foot reverse-curve taper

ROADWAY IMPROVEMENT FEE PROGRAM

This project will be required to participate in the El Paso County Road Improvement Fee Program. Copper Chase at Sterling Ranch 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 158 lots, the total building permit fee would be \$168,498. 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 1-14
Level of Service Reports
Appendix Tables 1-2

Tables 1, 3, and 4



Table 1
Sterling Ranch East Phase 1 Preliminary Plan
Copper Chase at Sterling Ranch

ITE Code	ITE Land Use	Quantity	Unit	Trip Generation Rates ⁽¹⁾					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
210	Single-Family Detached Housing	138	DU ⁽²⁾	9.43	0.18	0.52	0.59	0.35	1,301	25	71	82	48

Notes:

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

(2) DU = Dwelling Unit

Source: LSC Transportation Consultants, Inc.

Apr-23

Table 3
Traffic Signal Warrant Analysis
Marksheffel Road/Vollmer Road

Warrant Analysis ⁽¹⁾																		
Warrant 1: Eight Hour Vehicular Volume Evaluation														Warrant 2: Four Hour Vehicular Volume Evaluation				
Hour	Short-Term Background Traffic		Copper Chase at Sterling Ranch Generated Traffic		Short-Term Total Traffic		Warrant Thresholds				Warrant Threshold Met?				Short-Term Background		Short-Term Total	
	Major ⁽²⁾ Vollmer	Minor ⁽³⁾ Marksheffel	Major Vollmer	Minor Marksheffel	Major Vollmer	Minor Marksheffel	Condition A		Condition B		Short-Term Background		Short-Term Total		Warrant Threshold Minor Minimum	Warrant Threshold Met? WB	Warrant Threshold Minor Minimum	Warrant Threshold Met? WB
							Major	Minor	Major	Minor	Condition n A	Condition n B	Condition n A	Condition n B				
															Warrant Threshold Met?	Warrant Threshold Met?	Warrant Threshold Met?	Warrant Threshold Met?
Short-Term Total Traffic⁽⁴⁾																		
12-1 AM	45	2	1	1	46	3	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
1-2 AM	23	2	1	1	24	3	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
2-3 AM	16	0	1	0	17	0	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
3-4 AM	25	2	1	1	26	3	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
4-5 AM	40	8	1	2	41	10	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
5-6 AM	105	19	1	6	106	25	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
6-7 AM	312	57	7	17	319	74	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
7-8 AM	754	99	13	29	767	128	600	150	900	75	No	No	No	No	223	No	217	No
8-9 AM	841	83	14	24	855	107	600	150	900	75	No	No	No	No	190	No	186	No
9-10 AM	728	52	13	15	741	67	600	150	900	75	No	No	No	No	236	No	230	No
10-11 AM	843	52	18	15	861	67	600	150	900	75	No	No	No	No	189	No	185	No
11-12 PM	947	50	22	15	969	65	600	150	900	75	No	No	No	No	163	No	158	No
12-1 PM	791	49	22	15	813	64	600	150	900	75	No	No	No	No	205	No	197	No
1-2 PM	783	52	23	16	806	68	600	150	900	75	No	No	No	No	209	No	199	No
2-3 PM	901	55	26	17	927	72	600	150	900	75	No	No	No	No	175	No	168	No
3-4 PM	956	53	32	16	988	69	600	150	900	75	No	No	No	No	161	No	153	No
4-5 PM	992	66	40	20	1032	86	600	150	900	75	No	No	No	Yes	152	No	140	No
5-6 PM	829	65	40	20	869	85	600	150	900	75	No	No	No	No	193	No	183	No
6-7 PM	565	52	32	16	597	68	600	150	900	75	No	No	No	No	308	No	292	No
7-8 PM	353	38	23	11	376	49	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
8-9 PM	286	27	24	8	310	35	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
9-10 PM	183	21	17	6	200	27	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
10-11 PM	103	10	8	3	111	13	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
11-12 AM	54	6	5	2	59	8	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
Numbers of Hours the Warrant Thresholds Are Met											0	0	0	1				
Warrant Met?											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 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. Apr-23

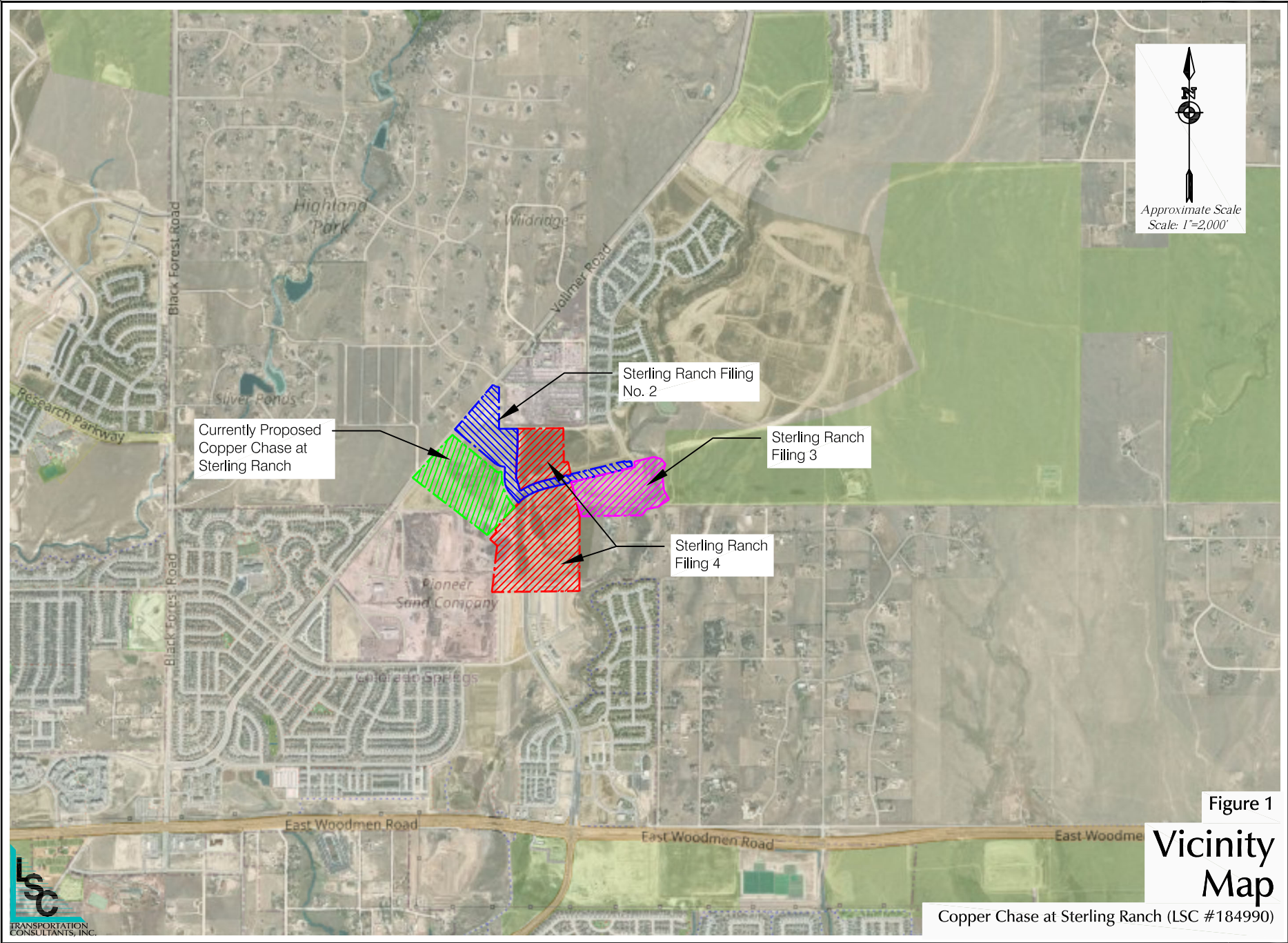
**Table 4
Traffic Signal Warrant Analysis
Marksheffel Road/Sterling Ranch Road**

Warrant Analysis ⁽³⁾																		
Warrant 1: Eight Hour Vehicular Volume Evaluation														Warrant 2: Four Hour Vehicular Volume Evaluation				
Hour	Short-Term Background Traffic		Copper Chase at Sterling Ranch Generated Traffic		Short-Term Total Traffic		Warrant Thresholds				Warrant Threshold Met?				Short-Term Background		Short-Term Total	
	Major ⁽²⁾ Marksheffel	Minor ⁽³⁾ Sterling Ranch	Major Marksheffel	Minor Sterling Ranch	Major Marksheffel	Minor Sterling Ranch	Condition A		Condition B		Conditio n A	Conditio n B	Conditio n A	Conditio n B	Warrant Threshold Minor Minimum	Warrant Threshold Met? WB	Warrant Threshold Minor Minimum	Warrant Threshold Met? WB
							Major	Minor	Major	Minor								
															Minimum	WB	Minimum	WB
														Minimum	WB	Minimum	WB	
Short-Term Total Traffic⁽⁴⁾																		
12-1 AM	28	6	3	1	31	7	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
1-2 AM	13	6	1	1	14	7	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
2-3 AM	11	0	1	0	12	0	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
3-4 AM	14	6	1	1	15	7	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
4-5 AM	21	23	1	3	22	26	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
5-6 AM	49	58	3	7	52	65	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
6-7 AM	147	171	8	21	155	192	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
7-8 AM	335	295	16	36	351	331	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
8-9 AM	377	249	19	30	396	279	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
9-10 AM	326	156	16	19	342	175	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
10-11 AM	389	156	21	19	410	175	600	150	900	75	No	No	No	No	Low Volume	No	385	No
11-12 PM	455	148	27	18	482	166	600	150	900	75	No	No	No	No	363	No	349	No
12-1 PM	460	148	28	19	488	167	600	150	900	75	No	No	No	No	360	No	346	No
1-2 PM	476	156	31	20	507	176	600	150	900	75	No	No	No	No	Low Volume	No	337	No
2-3 PM	550	164	36	21	586	185	600	150	900	75	No	No	No	No	315	No	297	No
3-4 PM	620	158	44	20	664	178	600	150	900	75	Yes	No	Yes	No	282	No	264	No
4-5 PM	702	198	55	25	757	223	600	150	900	75	Yes	No	Yes	No	249	No	222	Yes
5-6 PM	640	195	54	25	694	220	600	150	900	75	Yes	No	Yes	No	274	No	252	No
6-7 PM	490	156	45	20	535	176	600	150	900	75	No	No	No	No	Low Volume	No	323	No
7-8 PM	335	114	32	14	367	128	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
8-9 PM	316	82	33	10	349	92	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
9-10 PM	218	63	24	8	242	71	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
10-11 PM	112	29	12	4	124	33	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
11-12 AM	64	18	7	2	71	20	600	150	900	75	No	No	No	No	Low Volume	No	Low Volume	No
Numbers of Hours the Warrant Thresholds Are Met											3	0	3	0			0	
Warrant Met?											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

Figures 1-14





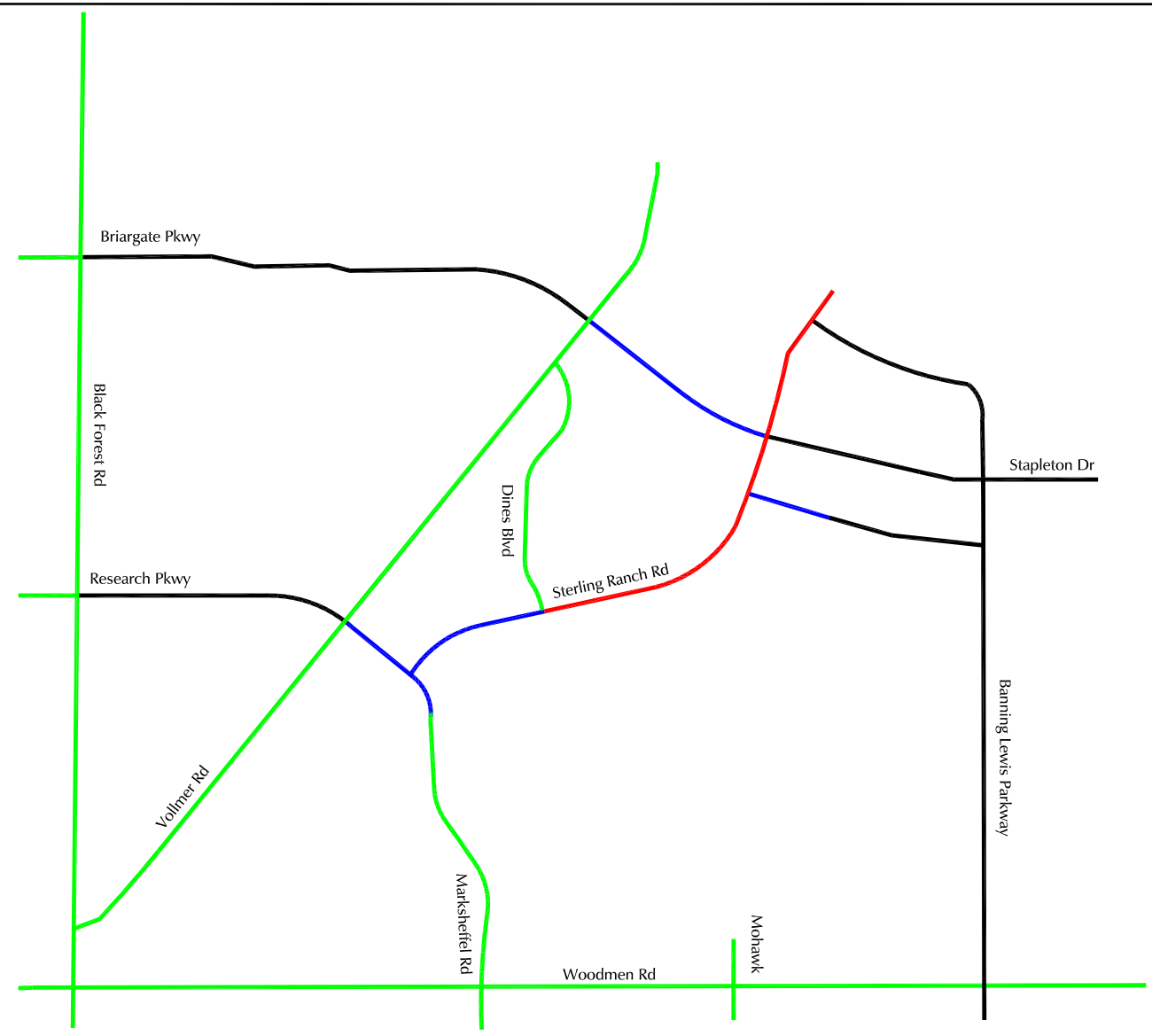
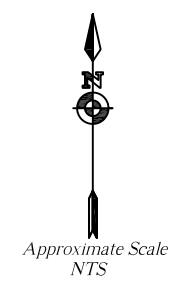
Approximate Scale
Scale: 1"=2,000'

Figure 1

Vicinity Map

Copper Chase at Sterling Ranch (LSC #184990)



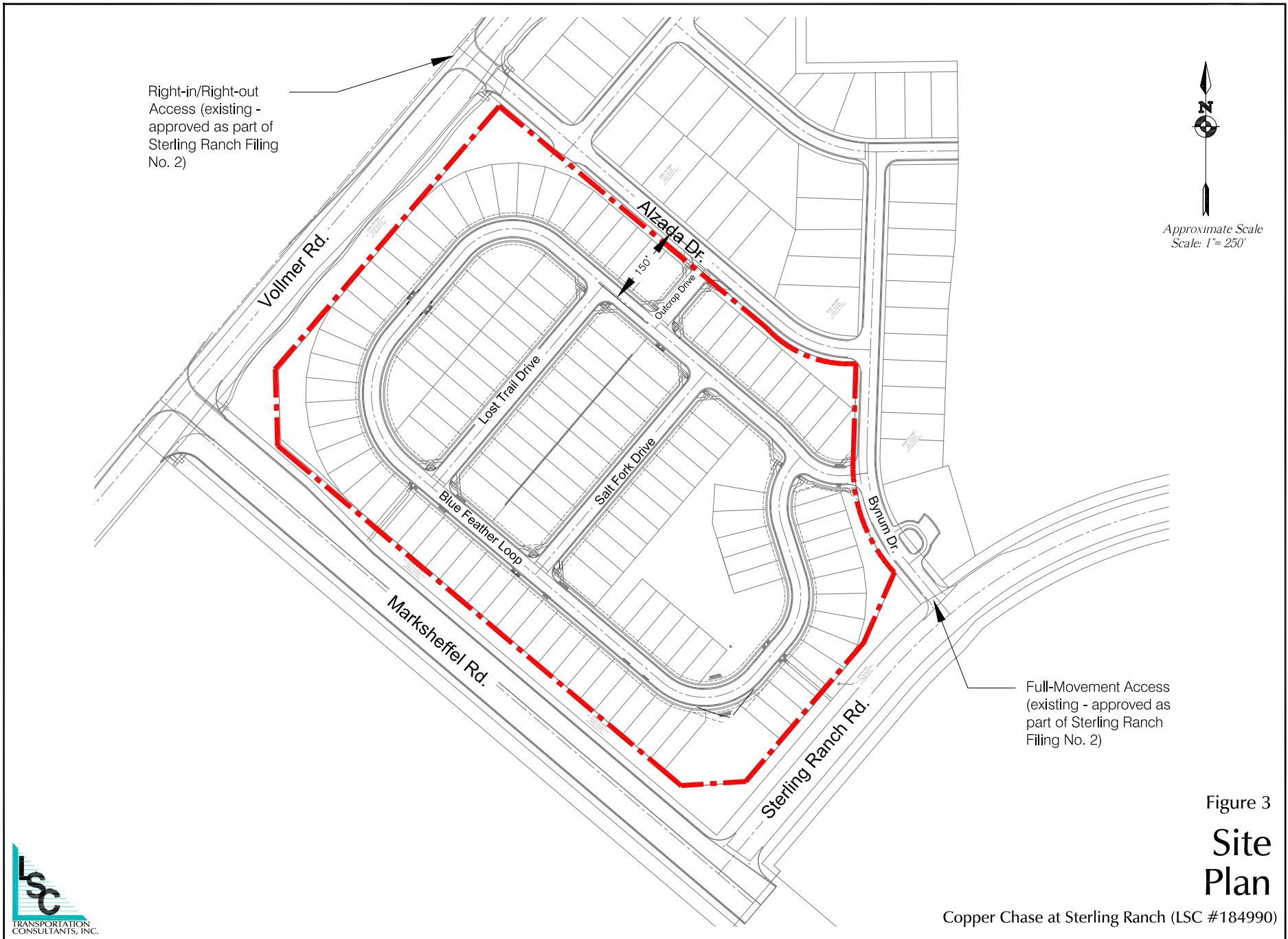


- LEGEND:**
- Roadway connection planned with Sterling Ranch East Preliminary Plan 1
 - Roadway connection planned to be completed by the end of 2023
 - Existing Roadway
 - Future Roadway

Short-Term Roadway Connections
Copper Chase at Sterling Ranch (LSC #184990)



Figure 2



Right-in/Right-out
Access (existing -
approved as part of
Sterling Ranch Filing
No. 2)

Approximate Scale
Scale: 1"= 250'

Full-Movement Access
(existing - approved as
part of Sterling Ranch
Filing No. 2)

Figure 3
Site Plan

Copper Chase at Sterling Ranch (LSC #184990)



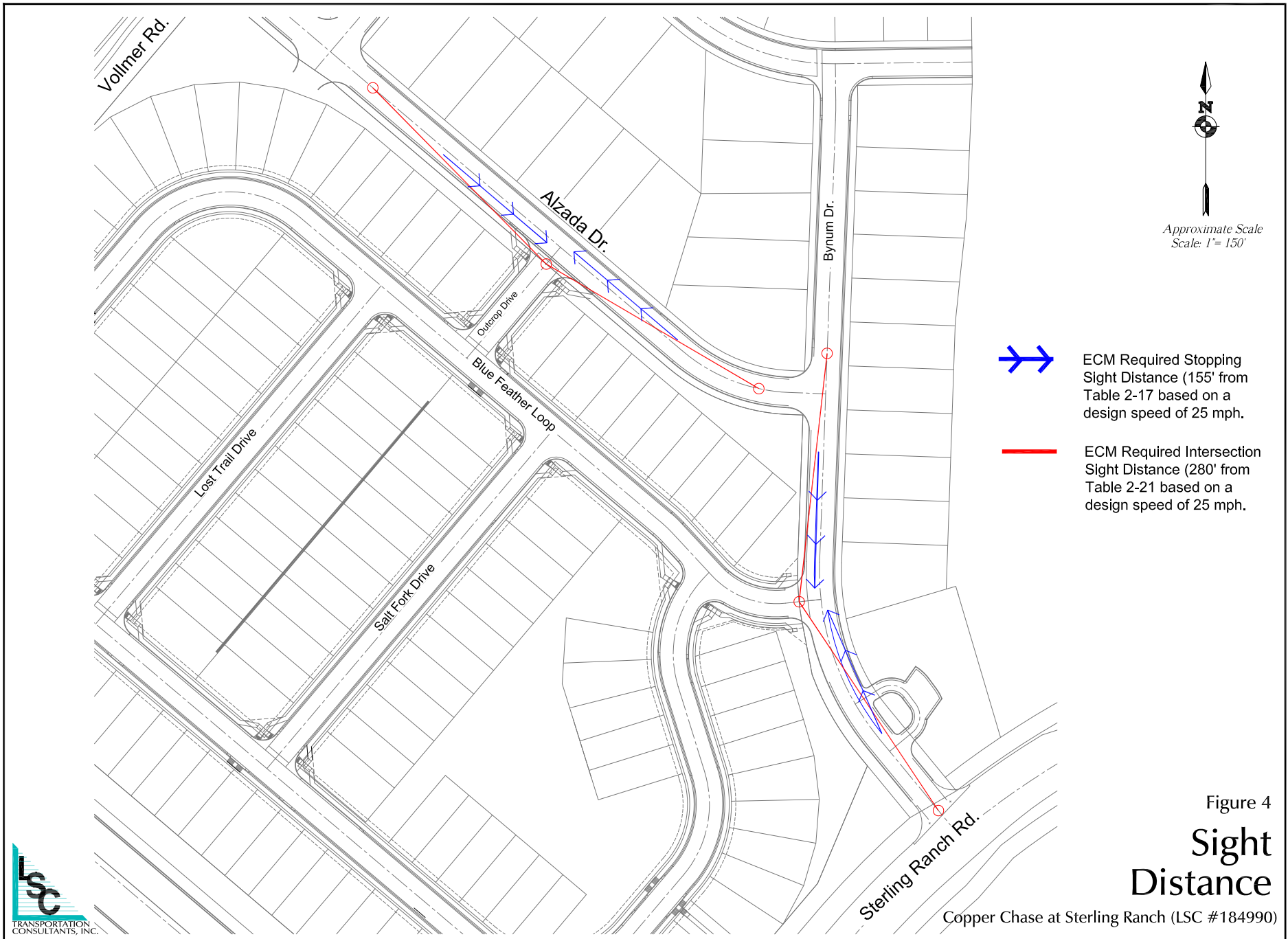


Figure 4
Sight Distance

Copper Chase at Sterling Ranch (LSC #184990)

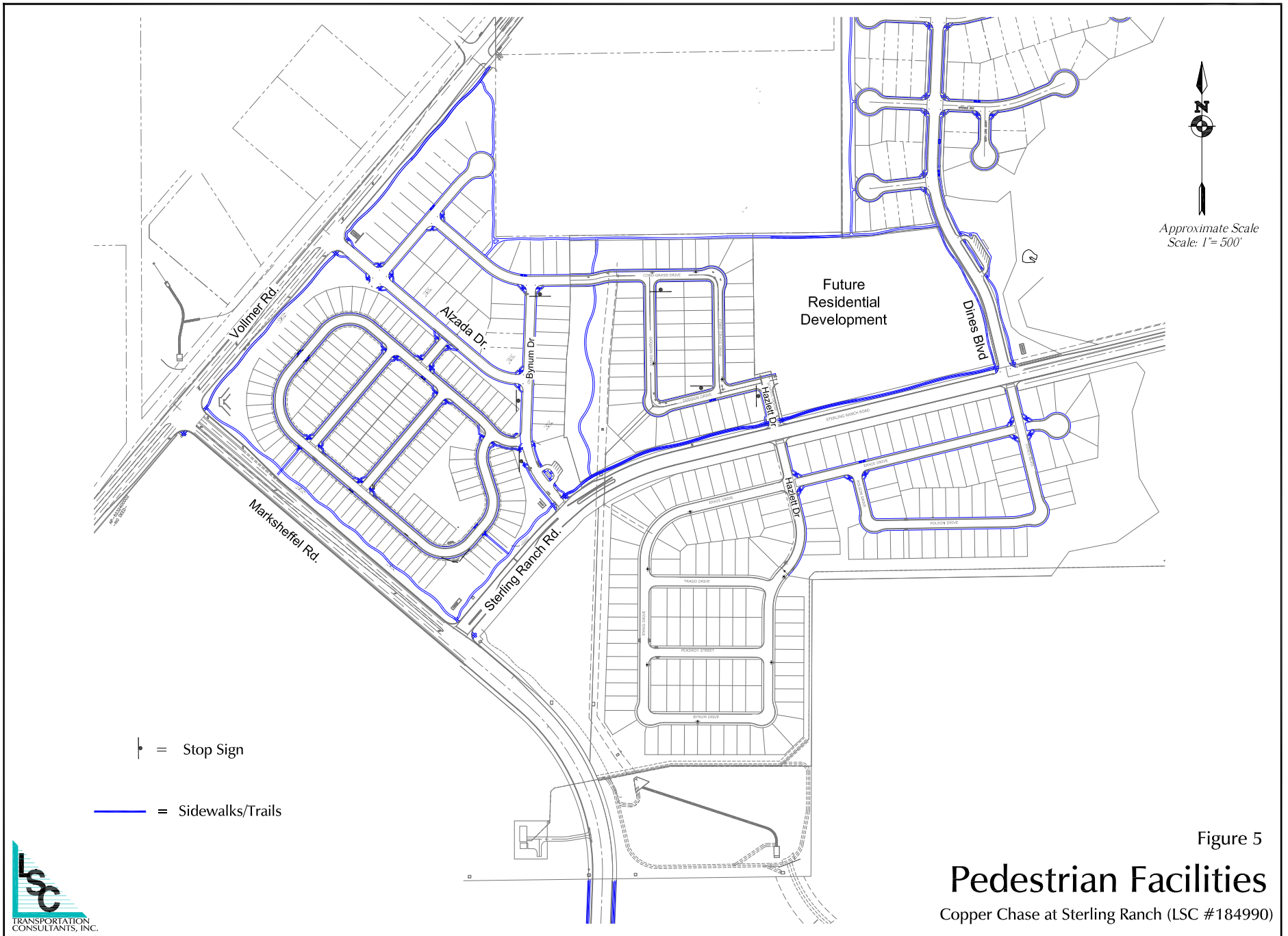
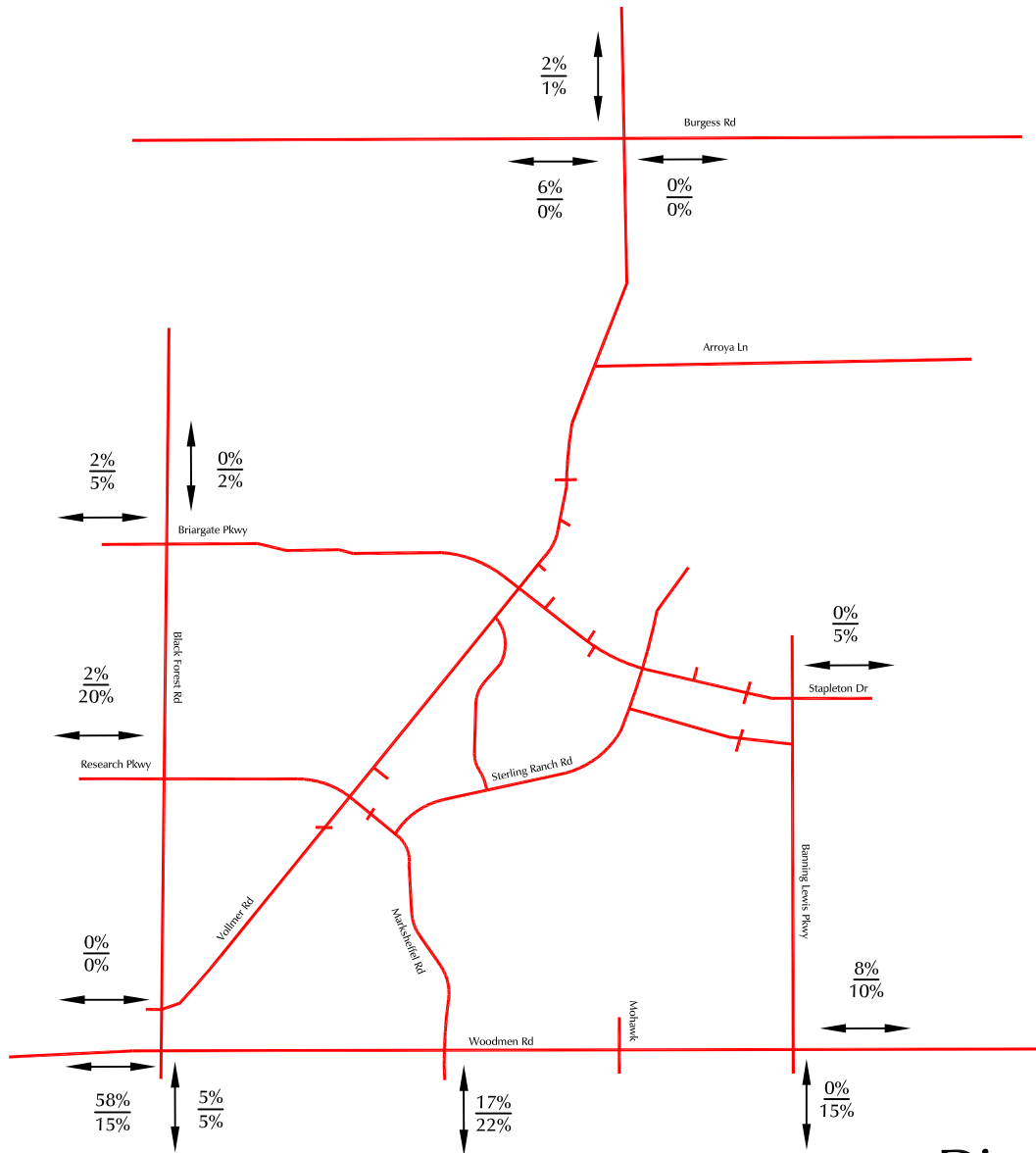
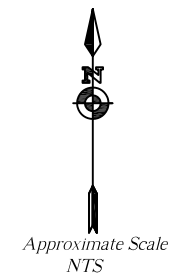


Figure 5
Pedestrian Facilities
 Copper Chase at Sterling Ranch (LSC #184990)

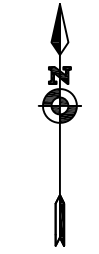




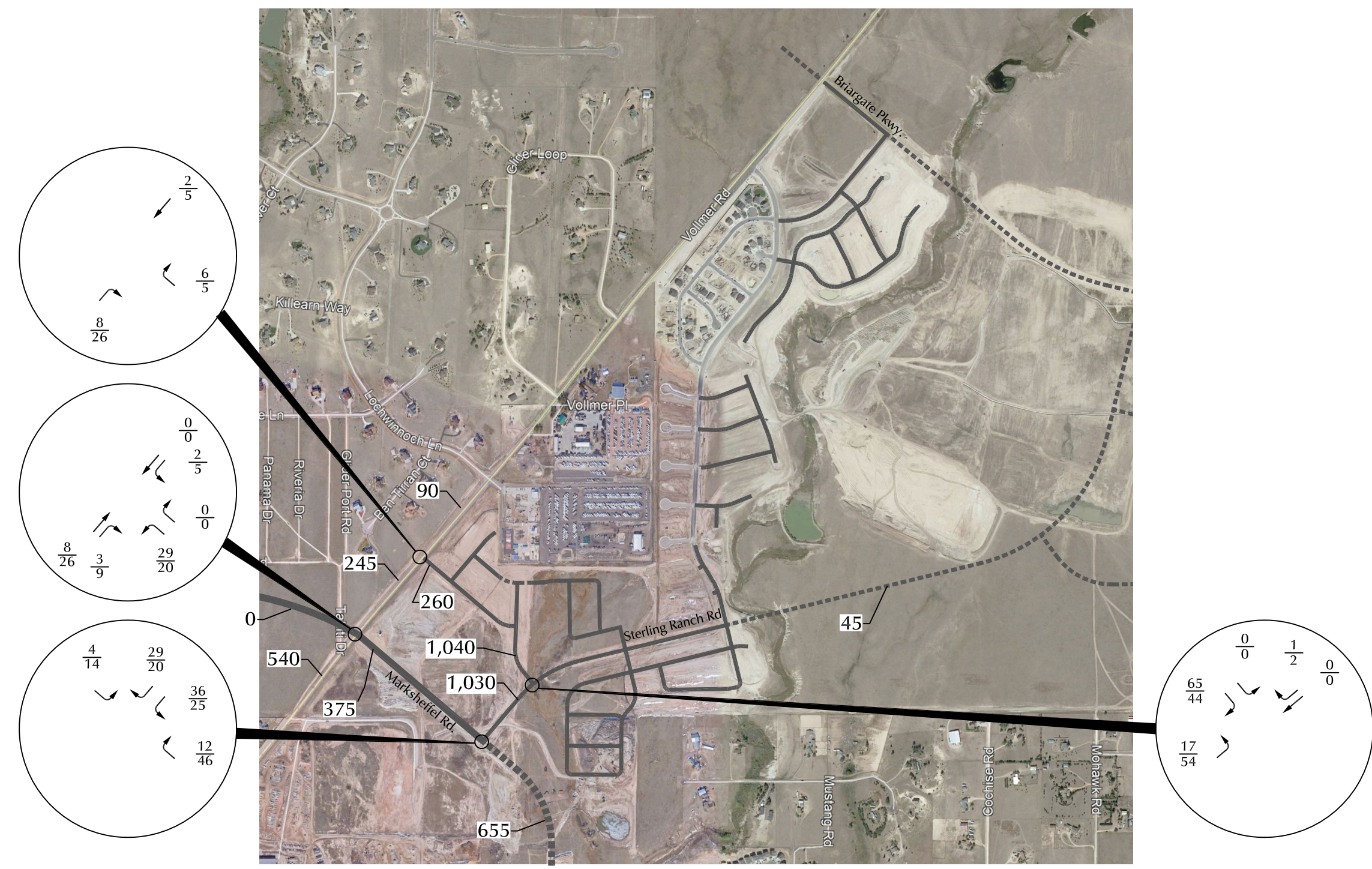
LEGEND:

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

Figure 6
Directional Distribution of Site-Generated Traffic
 Copper Chase at Sterling Ranch (LSC #184990)



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 7

Short-Term Assignment of Site-Generated Traffic

Copper Chase at Sterling Ranch (LSC #184990)



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)

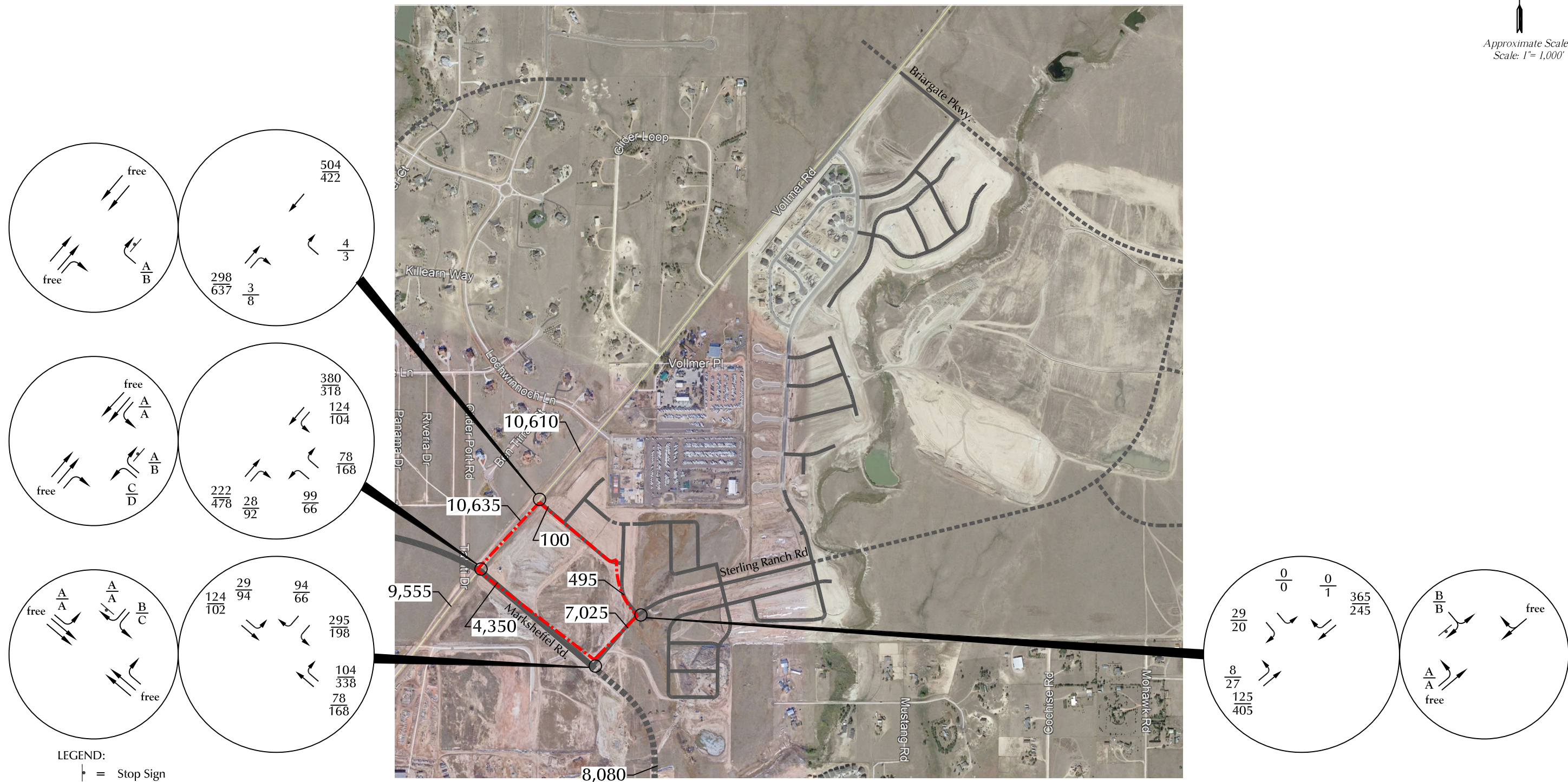
X,XXX = Average Daily Traffic (vehicles per day)



Figure 8

Long-Term Assignment of Site-Generated Traffic

Copper Chase at Sterling Ranch (LSC #184990)



LEGEND:

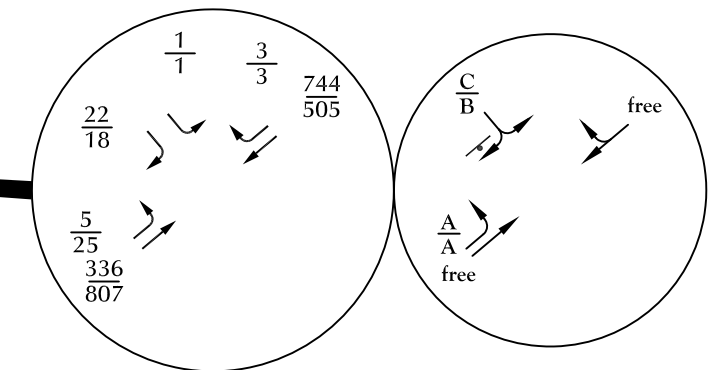
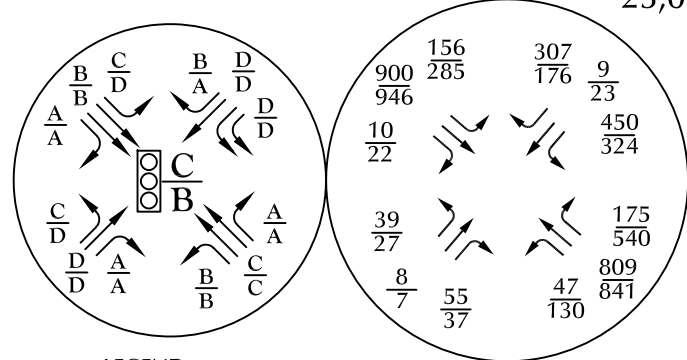
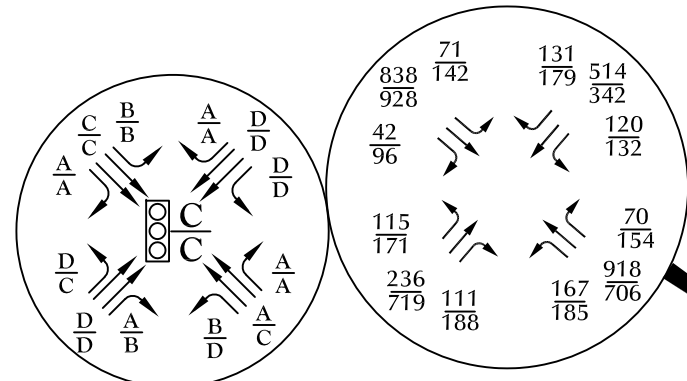
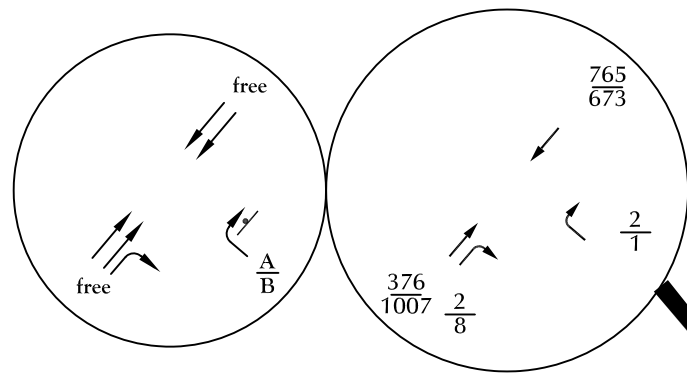
- = Stop Sign
- = Traffic Signal
- $\frac{XX}{XX}$ = AM Weekday Peak-Hour Traffic (vehicles per hour)
PM Weekday Peak-Hour Traffic (vehicles per hour)
- $\frac{A}{B}$ = AM Individual Movement Peak-Hour Level of Service
PM Individual Movement Peak-Hour Level of Service
- $\frac{C}{C}$ = AM Entire Intersection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



Figure 9
**Short-Term
Background Traffic, Lane Geometry,
Traffic Control and Level of Service**
Copper Chase at Sterling Ranch (LSC #184990)



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

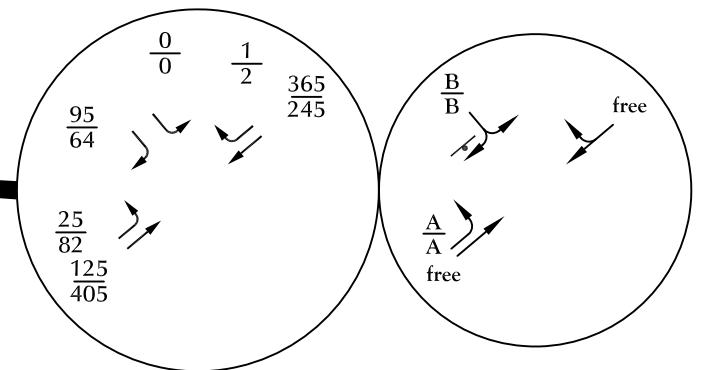
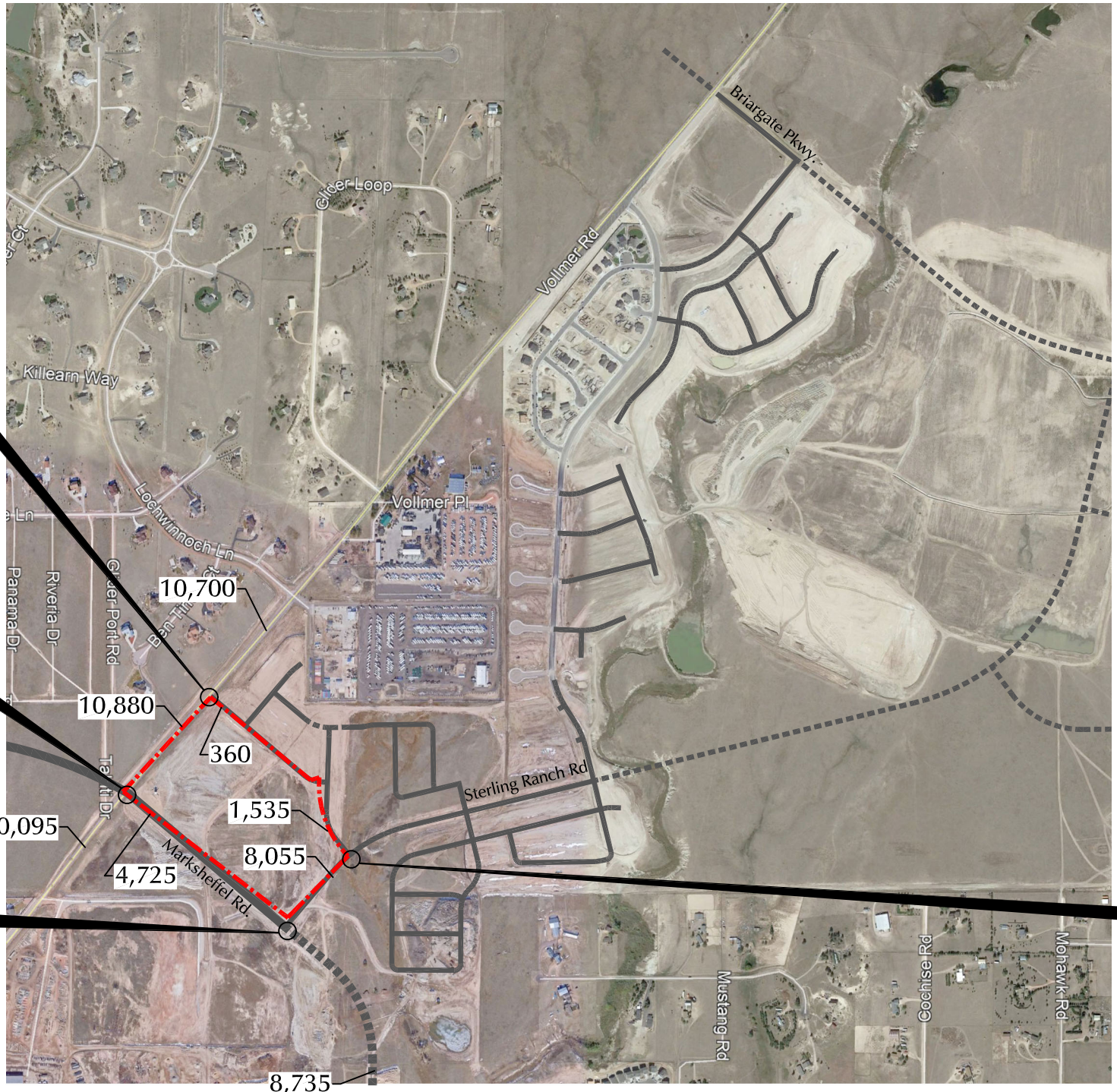
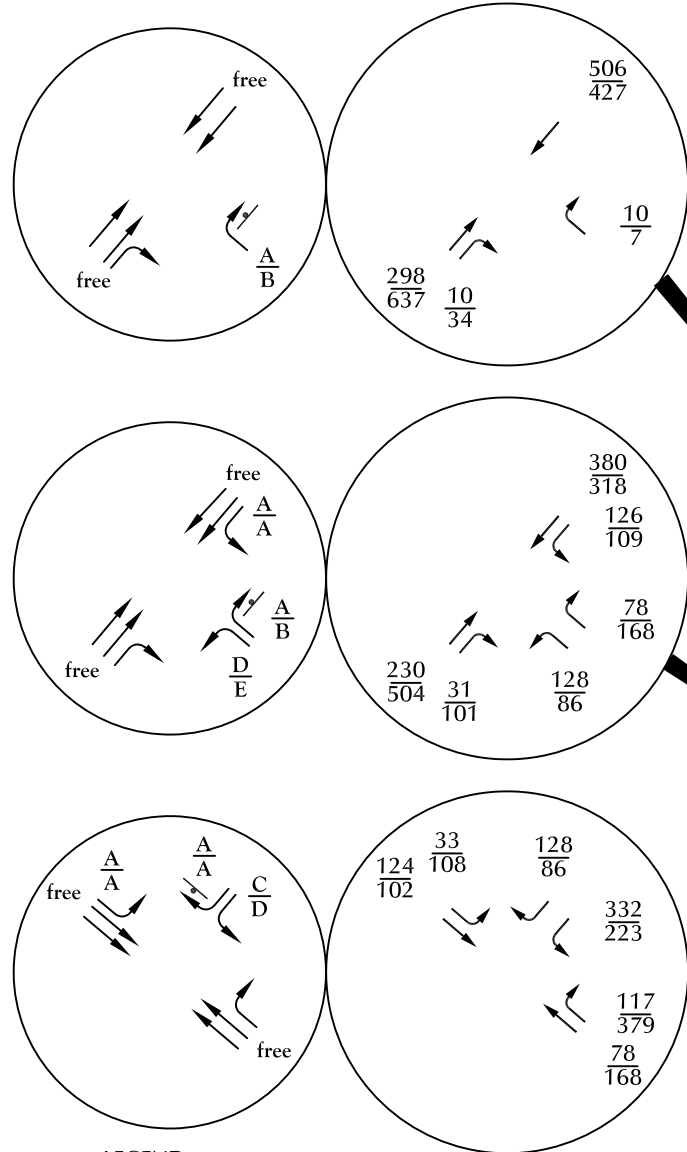
$\frac{C}{C}$ = AM Entire Intersection Peak-Hour Level of Service

$\frac{C}{C}$ = PM Entire Intersection Peak-Hour Level of Service

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



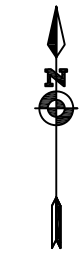
Figure 10
2043 Background Traffic, Lane Geometry,
Traffic Control and Level of Service
Copper Chase at Sterling Ranch (LSC #184990)



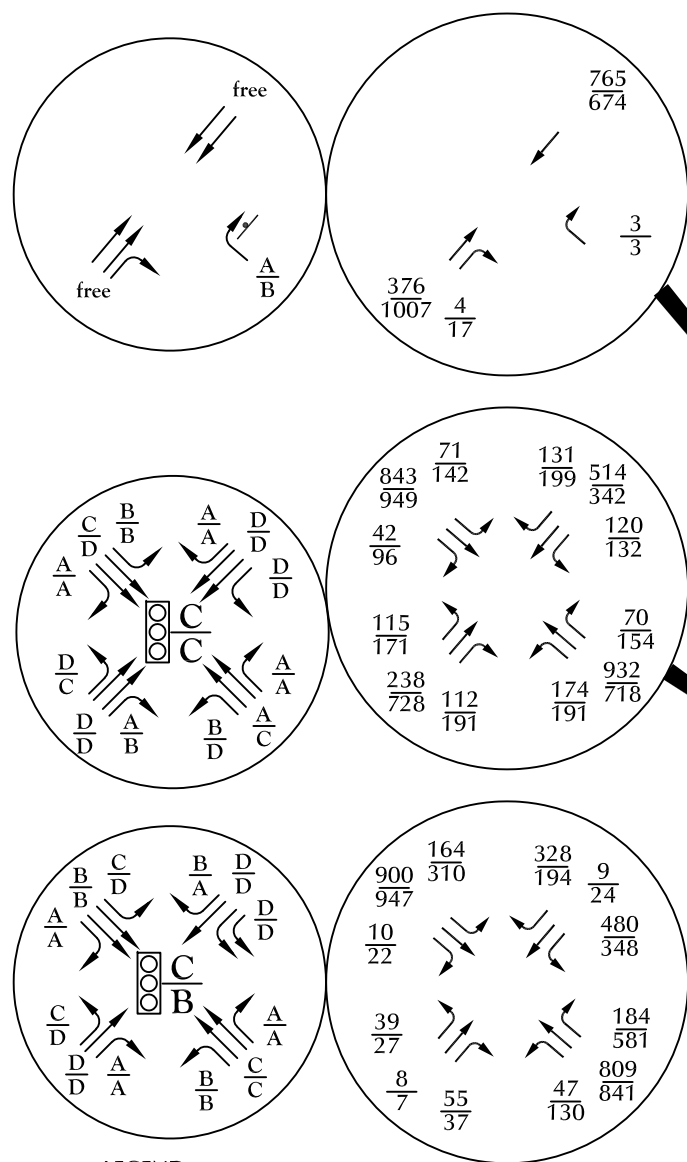
LEGEND:
 | = Stop Sign
 [] = Traffic Signal
 $\frac{XX}{XX}$ = AM Weekday Peak-Hour Traffic (vehicles per hour)
 $\frac{XX}{XX}$ = PM Weekday Peak-Hour Traffic (vehicles per hour)
 $\frac{A}{B}$ = AM Individual Movement Peak-Hour Level of Service
 $\frac{A}{B}$ = PM Individual Movement Peak-Hour Level 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 11
**Short-Term
 Total Traffic, Lane Geometry,
 Traffic Control and Level of Service**
 Copper Chase at Sterling Ranch (LSC #184990)



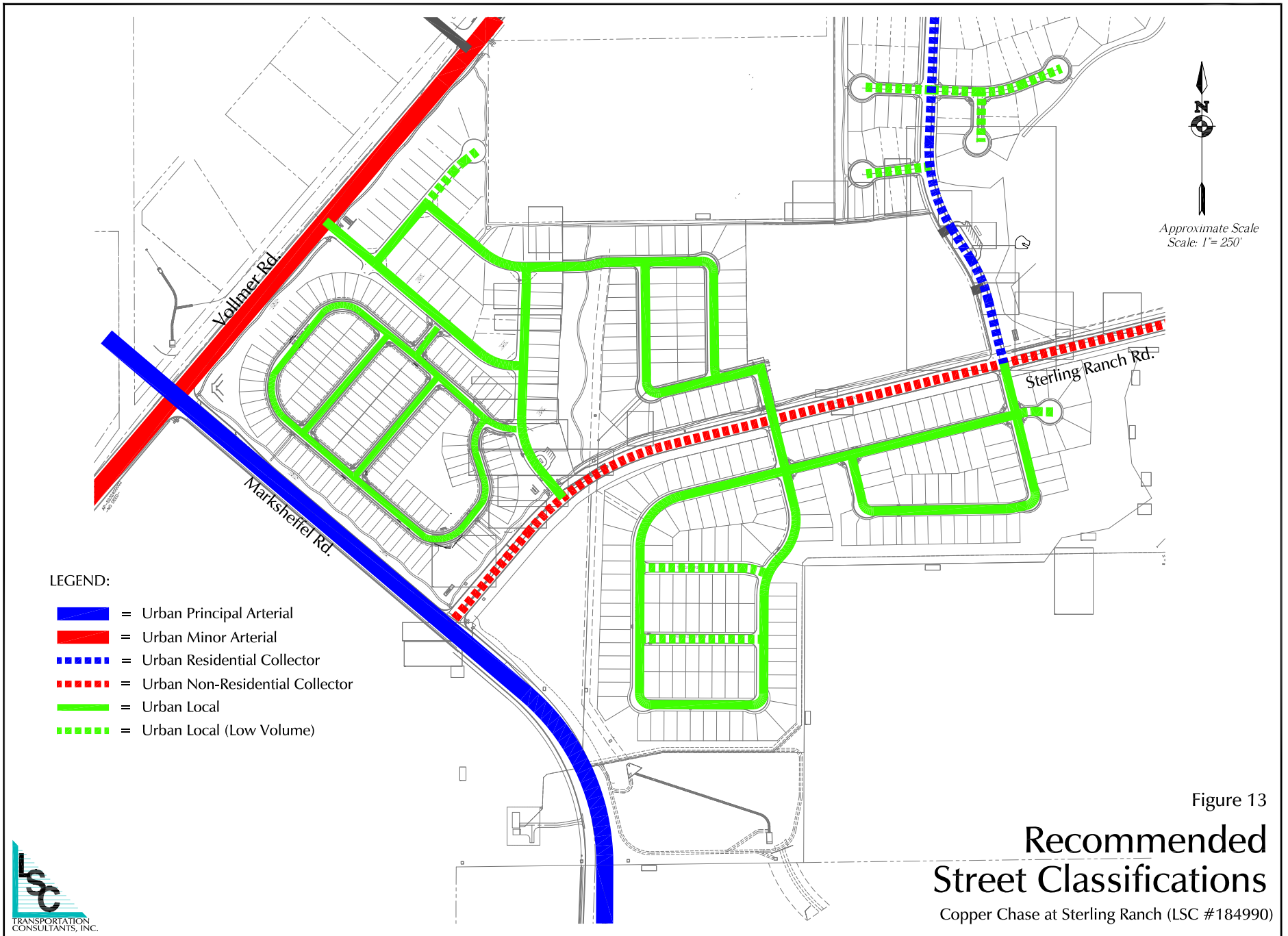
Approximate Scale
Scale: 1" = 1,000'

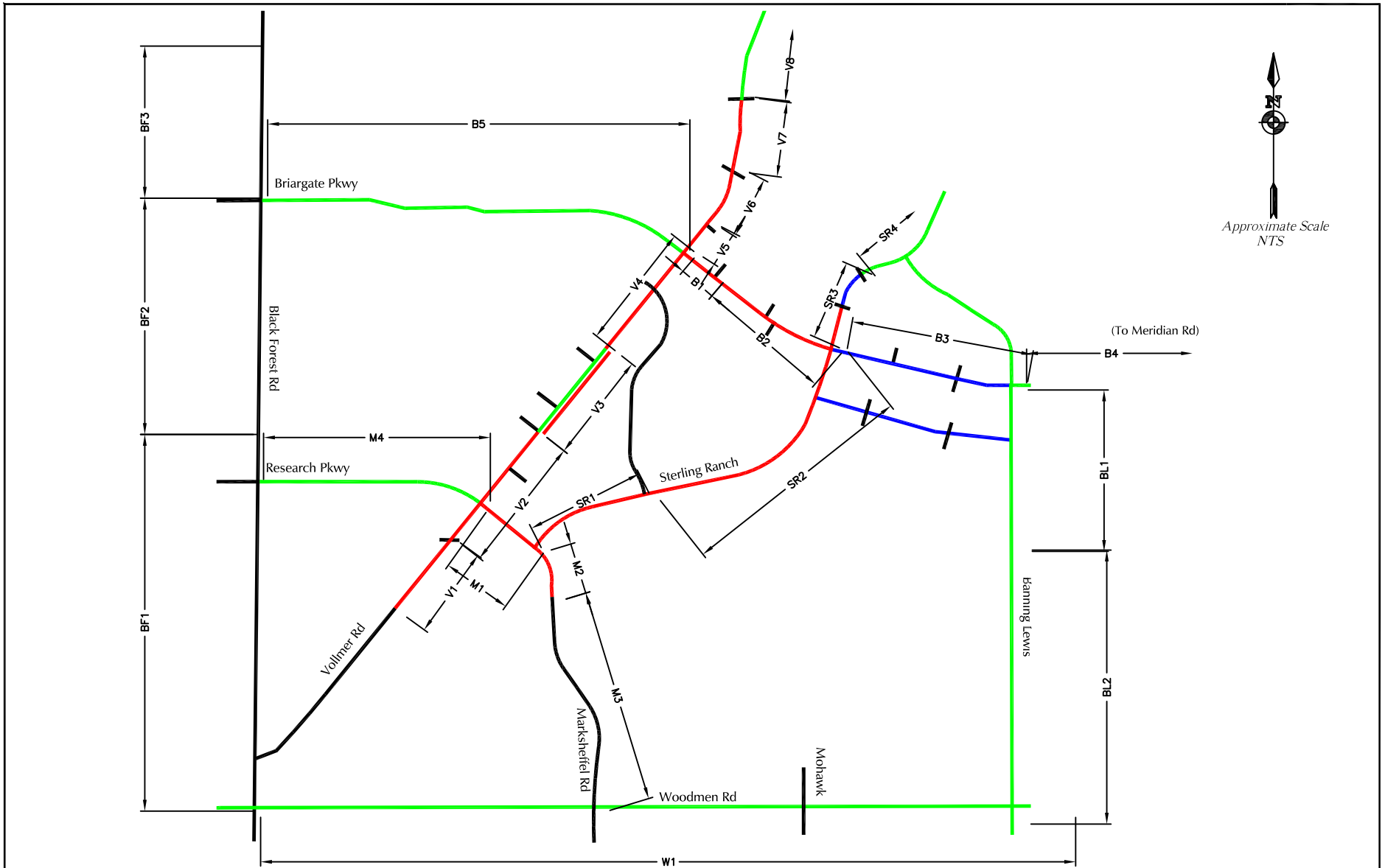


LEGEND:
 ┆ = Stop Sign
 ○○○ = Traffic Signal
 XX/XX = AM Weekday Peak-Hour Traffic (vehicles per hour)
 PM Weekday Peak-Hour Traffic (vehicles per hour)
 A/B = AM Individual Movement Peak-Hour Level of Service
 PM Individual Movement Peak-Hour Level of Service
 C/C = AM Entire Intersection Peak-Hour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



Figure 12
2043 Total Traffic, Lane Geometry, Traffic Control and Level of Service
 Copper Chase at Sterling Ranch (LSC #184990)





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*

Copper Chase at Sterling Ranch (LSC #184990)

Figure 14



Levels of Service



Intersection						
Int Delay, s/veh	4.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	99	78	222	28	124	380
Future Vol, veh/h	99	78	222	28	124	380
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	116	92	261	33	146	447

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	777	131	0	0	294
Stage 1	261	-	-	-	-
Stage 2	516	-	-	-	-
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	334	894	-	-	1264
Stage 1	759	-	-	-	-
Stage 2	564	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	295	894	-	-	1264
Mov Cap-2 Maneuver	295	-	-	-	-
Stage 1	759	-	-	-	-
Stage 2	499	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.1	0	2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	295	894	1264	-
HCM Lane V/C Ratio	-	-	0.395	0.103	0.115	-
HCM Control Delay (s)	-	-	24.9	9.5	8.2	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	1.8	0.3	0.4	-

Intersection						
Int Delay, s/veh	7.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	29	124	78	104	295	99
Future Vol, veh/h	29	124	78	104	295	99
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	34	146	92	122	347	116

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	214	0	-	0	233 46
Stage 1	-	-	-	-	92 -
Stage 2	-	-	-	-	141 -
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	1353	-	-	-	735 1014
Stage 1	-	-	-	-	921 -
Stage 2	-	-	-	-	871 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1353	-	-	-	717 1014
Mov Cap-2 Maneuver	-	-	-	-	717 -
Stage 1	-	-	-	-	898 -
Stage 2	-	-	-	-	871 -

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1353	-	-	-	717	1014
HCM Lane V/C Ratio	0.025	-	-	-	0.484	0.115
HCM Control Delay (s)	7.7	-	-	-	14.6	9
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.1	-	-	-	2.7	0.4

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	4	298	3	0	504
Future Vol, veh/h	0	4	298	3	0	504
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	-	200	-	-
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	0	5	351	4	0	593

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	176	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	837	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	837	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	837
HCM Lane V/C Ratio	-	-	0.006
HCM Control Delay (s)	-	-	9.3
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑	↗		↘	
Traffic Vol, veh/h	8	125	365	0	0	29
Future Vol, veh/h	8	125	365	0	0	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	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	9	147	429	0	0	34

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	429	0	-	0	594
Stage 1	-	-	-	-	429
Stage 2	-	-	-	-	165
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1130	-	-	-	468
Stage 1	-	-	-	-	657
Stage 2	-	-	-	-	864
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1130	-	-	-	464
Mov Cap-2 Maneuver	-	-	-	-	464
Stage 1	-	-	-	-	652
Stage 2	-	-	-	-	864

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	11.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1130	-	-	-	626
HCM Lane V/C Ratio	0.008	-	-	-	0.055
HCM Control Delay (s)	8.2	-	-	-	11.1
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection						
Int Delay, s/veh	4.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↕↕	↗	↘	↕↕
Traffic Vol, veh/h	66	168	478	92	104	318
Future Vol, veh/h	66	168	478	92	104	318
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	78	198	562	108	122	374

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	993	281	0	0	670
Stage 1	562	-	-	-	-
Stage 2	431	-	-	-	-
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	242	716	-	-	916
Stage 1	534	-	-	-	-
Stage 2	623	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	210	716	-	-	916
Mov Cap-2 Maneuver	210	-	-	-	-
Stage 1	534	-	-	-	-
Stage 2	540	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.5	0	2.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	210	716	916
HCM Lane V/C Ratio	-	-	0.37	0.276	0.134
HCM Control Delay (s)	-	-	31.9	11.9	9.5
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	1.6	1.1	0.5

Intersection						
Int Delay, s/veh	5.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	94	102	168	338	198	66
Future Vol, veh/h	94	102	168	338	198	66
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	111	120	198	398	233	78

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	596	0	-	0	480 99
Stage 1	-	-	-	-	198 -
Stage 2	-	-	-	-	282 -
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	976	-	-	-	515 937
Stage 1	-	-	-	-	816 -
Stage 2	-	-	-	-	741 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	976	-	-	-	456 937
Mov Cap-2 Maneuver	-	-	-	-	456 -
Stage 1	-	-	-	-	723 -
Stage 2	-	-	-	-	741 -

Approach	EB	WB	SB
HCM Control Delay, s	4.4	0	18
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	976	-	-	-	456	937
HCM Lane V/C Ratio	0.113	-	-	-	0.511	0.083
HCM Control Delay (s)	9.2	-	-	-	20.9	9.2
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.4	-	-	-	2.8	0.3

Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	3	637	8	0	422
Future Vol, veh/h	0	3	637	8	0	422
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	-	200	-	-
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	0	4	749	9	0	496

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	375	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	623	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	623	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	623
HCM Lane V/C Ratio	-	-	0.006
HCM Control Delay (s)	-	-	10.8
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑	↗		↘	
Traffic Vol, veh/h	27	405	245	1	0	20
Future Vol, veh/h	27	405	245	1	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	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	32	476	288	1	0	24

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	289	0	-	0	829 289
Stage 1	-	-	-	-	289 -
Stage 2	-	-	-	-	540 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1273	-	-	-	340 750
Stage 1	-	-	-	-	760 -
Stage 2	-	-	-	-	584 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1273	-	-	-	332 750
Mov Cap-2 Maneuver	-	-	-	-	332 -
Stage 1	-	-	-	-	741 -
Stage 2	-	-	-	-	584 -

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1273	-	-	-	750
HCM Lane V/C Ratio	0.025	-	-	-	0.031
HCM Control Delay (s)	7.9	-	-	-	10
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection						
Int Delay, s/veh	5.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↕	↕	↘	↗
Traffic Vol, veh/h	128	78	230	31	126	380
Future Vol, veh/h	128	78	230	31	126	380
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	151	92	271	36	148	447

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	791	136	0	0	307
Stage 1	271	-	-	-	-
Stage 2	520	-	-	-	-
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	327	888	-	-	1250
Stage 1	750	-	-	-	-
Stage 2	561	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	288	888	-	-	1250
Mov Cap-2 Maneuver	288	-	-	-	-
Stage 1	750	-	-	-	-
Stage 2	495	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.5	0	2.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	288	888	1250	-
HCM Lane V/C Ratio	-	-	0.523	0.103	0.119	-
HCM Control Delay (s)	-	-	30.4	9.5	8.3	-
HCM Lane LOS	-	-	D	A	A	-
HCM 95th %tile Q(veh)	-	-	2.8	0.3	0.4	-

Intersection						
Int Delay, s/veh	8.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	33	124	78	117	332	128
Future Vol, veh/h	33	124	78	117	332	128
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	39	146	92	138	391	151

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	230	0	-	0	243
Stage 1	-	-	-	-	92
Stage 2	-	-	-	-	151
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	1335	-	-	-	724
Stage 1	-	-	-	-	921
Stage 2	-	-	-	-	861
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1335	-	-	-	703
Mov Cap-2 Maneuver	-	-	-	-	703
Stage 1	-	-	-	-	894
Stage 2	-	-	-	-	861

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1335	-	-	-	703	1014
HCM Lane V/C Ratio	0.029	-	-	-	0.556	0.149
HCM Control Delay (s)	7.8	-	-	-	16.3	9.2
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.1	-	-	-	3.4	0.5

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	10	298	10	0	506
Future Vol, veh/h	0	10	298	10	0	506
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	-	200	-	-
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	0	12	351	12	0	595

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	176	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	837	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	837	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	837
HCM Lane V/C Ratio	-	-	0.014
HCM Control Delay (s)	-	-	9.4
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	125	365	1	0	95
Future Vol, veh/h	25	125	365	1	0	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	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	29	147	429	1	0	112

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	430	0	-	0	635 430
Stage 1	-	-	-	-	430 -
Stage 2	-	-	-	-	205 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1129	-	-	-	443 625
Stage 1	-	-	-	-	656 -
Stage 2	-	-	-	-	829 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1129	-	-	-	431 625
Mov Cap-2 Maneuver	-	-	-	-	431 -
Stage 1	-	-	-	-	639 -
Stage 2	-	-	-	-	829 -

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1129	-	-	-	625
HCM Lane V/C Ratio	0.026	-	-	-	0.179
HCM Control Delay (s)	8.3	-	-	-	12
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.6

Intersection						
Int Delay, s/veh	5.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↕↕	↗	↘	↕↕
Traffic Vol, veh/h	86	168	504	101	109	318
Future Vol, veh/h	86	168	504	101	109	318
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	198	593	119	128	374

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1036	297	0	0	712
Stage 1	593	-	-	-	-
Stage 2	443	-	-	-	-
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	227	699	-	-	884
Stage 1	515	-	-	-	-
Stage 2	614	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	194	699	-	-	884
Mov Cap-2 Maneuver	194	-	-	-	-
Stage 1	515	-	-	-	-
Stage 2	525	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22.4	0	2.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	194	699	884	-
HCM Lane V/C Ratio	-	-	0.522	0.283	0.145	-
HCM Control Delay (s)	-	-	42.2	12.2	9.8	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	2.7	1.2	0.5	-

Intersection						
Int Delay, s/veh	7.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	108	102	168	379	223	86
Future Vol, veh/h	108	102	168	379	223	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	120	198	446	262	101

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	644	0	-	0	512 99
Stage 1	-	-	-	-	198 -
Stage 2	-	-	-	-	314 -
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	937	-	-	-	491 937
Stage 1	-	-	-	-	816 -
Stage 2	-	-	-	-	714 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	937	-	-	-	424 937
Mov Cap-2 Maneuver	-	-	-	-	424 -
Stage 1	-	-	-	-	705 -
Stage 2	-	-	-	-	714 -

Approach	EB	WB	SB
HCM Control Delay, s	4.9	0	21.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	937	-	-	-	424	937
HCM Lane V/C Ratio	0.136	-	-	-	0.619	0.108
HCM Control Delay (s)	9.4	-	-	-	26.3	9.3
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0.5	-	-	-	4.1	0.4

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	7	637	34	0	427
Future Vol, veh/h	0	7	637	34	0	427
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	-	200	-	-
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	0	8	749	40	0	502

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	375	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	623	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	623	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	623
HCM Lane V/C Ratio	-	-	0.013
HCM Control Delay (s)	-	-	10.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	82	405	245	2	0	64
Future Vol, veh/h	82	405	245	2	0	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	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	96	476	288	2	0	75

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	290	0	-	0	957 289
Stage 1	-	-	-	-	289 -
Stage 2	-	-	-	-	668 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1272	-	-	-	286 750
Stage 1	-	-	-	-	760 -
Stage 2	-	-	-	-	510 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1272	-	-	-	265 750
Mov Cap-2 Maneuver	-	-	-	-	265 -
Stage 1	-	-	-	-	703 -
Stage 2	-	-	-	-	510 -

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1272	-	-	-	750
HCM Lane V/C Ratio	0.076	-	-	-	0.1
HCM Control Delay (s)	8.1	-	-	-	10.3
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.3

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	167	918	70	115	236	111	120	514	131
Future Volume (vph)	71	838	42	167	918	70	115	236	111	120	514	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	0.53	0.52	0.08	0.64	0.34	0.28	0.40	0.73	0.32
Control Delay	11.8	20.5	0.1	16.4	9.5	0.2	48.9	42.0	8.8	36.1	51.2	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	16.4	9.5	0.2	48.9	42.0	8.8	36.1	51.2	9.6
LOS	B	C	A	B	A	A	D	D	A	D	D	A
Approach Delay		18.9			10.0			35.7			41.7	
Approach LOS		B			A			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: 0.73
 Intersection Signal Delay: 23.4
 Intersection LOS: C
 Intersection Capacity Utilization 69.7%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd



Timings
13: Sterling Ranch Rd & Marksheffel Rd

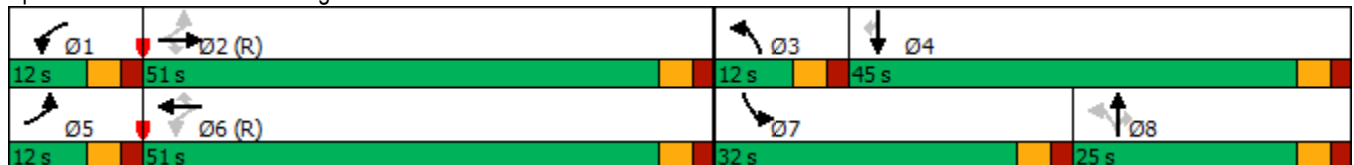
2042 Background Traffic
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	900	10	47	809	175	39	8	55	450	9	307
Future Volume (vph)	158	900	10	47	809	175	39	8	55	450	9	307
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)	74.8	65.7	65.7	66.7	59.8	59.8	14.6	10.0	10.0	22.5	25.0	25.0
Actuated g/C Ratio	0.62	0.55	0.55	0.56	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	0.21	0.05	0.21	0.74	0.02	0.60
Control Delay	20.0	15.2	0.0	12.0	22.8	3.7	32.9	51.6	1.8	53.2	35.8	13.3
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	20.0	15.2	0.0	12.0	22.8	3.7	32.9	51.6	1.8	53.2	35.8	13.3
LOS	C	B	A	B	C	A	C	D	A	D	D	B
Approach Delay		15.8			19.1			17.4			37.0	
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: 0.74
 Intersection Signal Delay: 22.5
 Intersection LOS: C
 Intersection Capacity Utilization 63.1%
 ICU Level of Service B
 Analysis Period (min) 15

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



Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	2	376	2	0	765
Future Vol, veh/h	0	2	376	2	0	765
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	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	396	2	0	805

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	198	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	810	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	810	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	810
HCM Lane V/C Ratio	-	-	0.003
HCM Control Delay (s)	-	-	9.5
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	336	744	3	6	22
Future Vol, veh/h	5	336	744	3	6	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	354	783	3	6	23

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	786	0	-	0	1149 785
Stage 1	-	-	-	-	785 -
Stage 2	-	-	-	-	364 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	833	-	-	-	219 393
Stage 1	-	-	-	-	449 -
Stage 2	-	-	-	-	703 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	833	-	-	-	218 393
Mov Cap-2 Maneuver	-	-	-	-	218 -
Stage 1	-	-	-	-	446 -
Stage 2	-	-	-	-	703 -

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	16.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	833	-	-	-	335
HCM Lane V/C Ratio	0.006	-	-	-	0.088
HCM Control Delay (s)	9.3	-	-	-	16.8
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Timings
12: Vollmer Rd & Marksheffel Rd

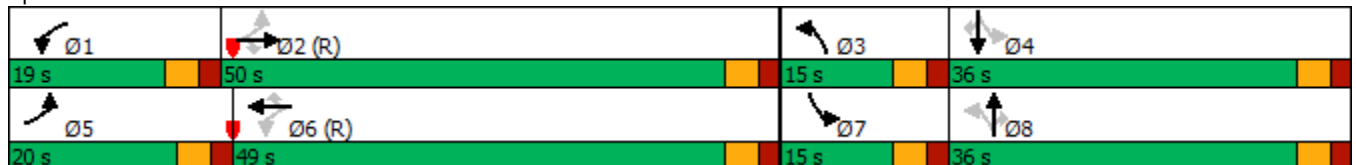
2042 Background Traffic
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	928	96	185	706	154	171	719	188	132	342	199
Future Volume (vph)	142	928	96	185	706	154	171	719	188	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)	57.7	47.0	47.0	60.3	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	0.70	0.15	0.70	0.52	0.22	0.50	0.82	0.38	0.68	0.39	0.37
Control Delay	18.5	34.4	4.5	49.4	22.3	5.3	31.4	50.1	13.4	42.7	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	18.5	34.4	4.5	49.4	22.3	5.3	31.4	50.1	13.4	42.7	38.2	6.7
LOS	B	C	A	D	C	A	C	D	B	D	D	A
Approach Delay		30.0			24.6			40.8			29.8	
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: 0.82
 Intersection Signal Delay: 31.5
 Intersection LOS: C
 Intersection Capacity Utilization 79.8%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd



Timings
13: Sterling Ranch Rd & Marksheffel Rd

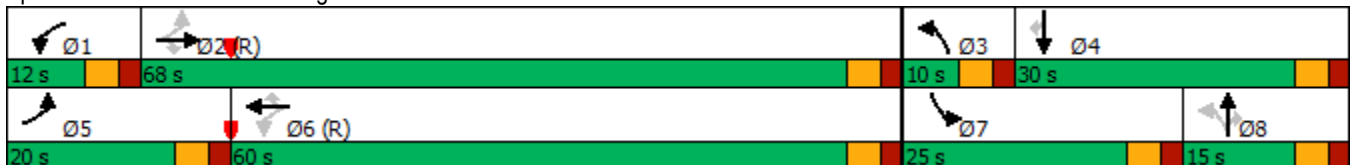
2042 Background Traffic
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	946	22	130	841	540	27	7	37	324	23	176
Future Volume (vph)	285	946	22	130	841	540	27	7	37	324	23	176
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)	80.2	69.1	69.1	70.0	63.1	63.1	11.0	10.0	10.0	20.0	23.0	23.0
Actuated g/C Ratio	0.67	0.58	0.58	0.58	0.53	0.53	0.09	0.08	0.08	0.17	0.19	0.19
v/c Ratio	0.71	0.49	0.02	0.41	0.48	0.52	0.20	0.05	0.12	0.60	0.07	0.41
Control Delay	36.2	10.4	0.0	12.9	20.7	3.4	37.8	51.4	0.8	51.2	39.1	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	36.2	10.4	0.0	12.9	20.7	3.4	37.8	51.4	0.8	51.2	39.1	8.5
LOS	D	B	A	B	C	A	D	D	A	D	D	A
Approach Delay		16.1			13.9			19.6			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: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.71
 Intersection Signal Delay: 18.3
 Intersection LOS: B
 Intersection Capacity Utilization 70.1%
 ICU Level of Service C
 Analysis Period (min) 15

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



Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	2	1007	8	0	673
Future Vol, veh/h	0	2	1007	8	0	673
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	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	2	1060	8	0	708

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	530	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	493	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	493	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	493
HCM Lane V/C Ratio	-	-	0.004
HCM Control Delay (s)	-	-	12.3
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	807	505	3	1	18
Future Vol, veh/h	25	807	505	3	1	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	849	532	3	1	19

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	535	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1033	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1033	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	12.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1033	-	-	-	475
HCM Lane V/C Ratio	0.025	-	-	-	0.042
HCM Control Delay (s)	8.6	-	-	-	12.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

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	843	42	174	932	70	115	238	112	120	514	131
Future Volume (vph)	71	843	42	174	932	70	115	238	112	120	514	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	0.64	0.34	0.28	0.41	0.73	0.32
Control Delay	11.9	20.5	0.1	17.8	9.9	0.2	48.9	42.0	8.8	36.2	51.2	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	17.8	9.9	0.2	48.9	42.0	8.8	36.2	51.2	9.6
LOS	B	C	A	B	A	A	D	D	A	D	D	A
Approach Delay		19.0			10.5			35.7			41.7	
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: 0.73
 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

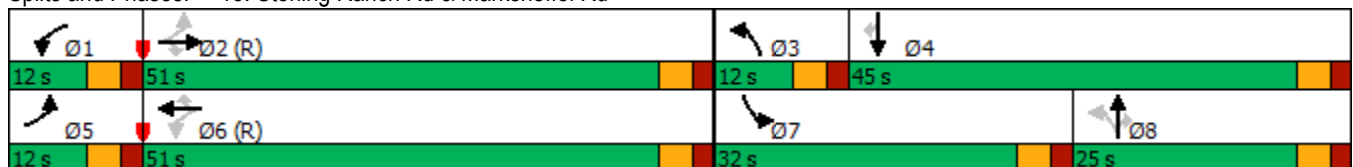
2042 Total Traffic
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	164	900	10	47	809	184	39	8	55	480	9	328
Future Volume (vph)	164	900	10	47	809	184	39	8	55	480	9	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)	74.5	65.1	65.1	65.7	58.8	58.8	14.6	10.0	10.0	23.1	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	0.45	0.49	0.01	0.15	0.49	0.22	0.21	0.05	0.21	0.77	0.02	0.63
Control Delay	21.9	15.6	0.0	12.3	23.6	3.7	32.6	51.6	1.8	54.0	35.2	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	21.9	15.6	0.0	12.3	23.6	3.7	32.6	51.6	1.8	54.0	35.2	15.6
LOS	C	B	A	B	C	A	C	D	A	D	D	B
Approach Delay		16.4			19.6			17.3			38.4	
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: 0.77
 Intersection Signal Delay: 23.4
 Intersection LOS: C
 Intersection Capacity Utilization 64.3%
 ICU Level of Service C
 Analysis Period (min) 15

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



Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	3	376	4	0	765
Future Vol, veh/h	0	3	376	4	0	765
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	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	396	4	0	805

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	198	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	810	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	810	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	810
HCM Lane V/C Ratio	-	-	0.004
HCM Control Delay (s)	-	-	9.5
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	1.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	21	336	744	11	25	73
Future Vol, veh/h	21	336	744	11	25	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	354	783	12	26	77

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	795	0	-	0	1187 789
Stage 1	-	-	-	-	789 -
Stage 2	-	-	-	-	398 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	826	-	-	-	208 391
Stage 1	-	-	-	-	448 -
Stage 2	-	-	-	-	678 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	826	-	-	-	202 391
Mov Cap-2 Maneuver	-	-	-	-	202 -
Stage 1	-	-	-	-	436 -
Stage 2	-	-	-	-	678 -

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	21.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	826	-	-	-	316
HCM Lane V/C Ratio	0.027	-	-	-	0.326
HCM Control Delay (s)	9.5	-	-	-	21.8
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.4

Timings
12: Vollmer Rd & Marksheffel Rd

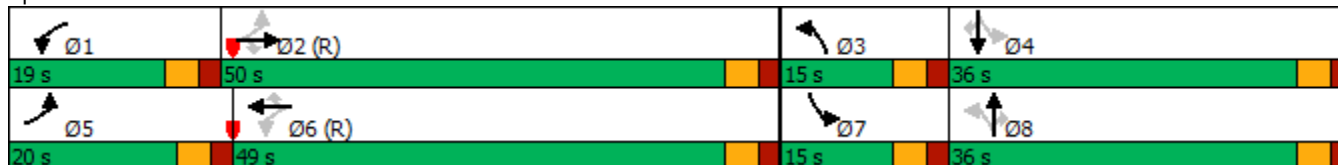
2042 Total Traffic
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	949	96	191	718	154	171	728	191	132	342	199
Future Volume (vph)	142	949	96	191	718	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	46.7	46.7	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	0.73	0.15	0.73	0.53	0.23	0.50	0.83	0.39	0.68	0.39	0.37
Control Delay	18.7	35.3	4.5	53.2	22.5	5.5	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	35.3	4.5	53.2	22.5	5.5	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		30.8			25.5			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: 32.1
 Intersection LOS: C
 Intersection Capacity Utilization 80.9%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 12: Vollmer Rd & Marksheffel Rd



Timings
13: Sterling Ranch Rd & Marksheffel Rd

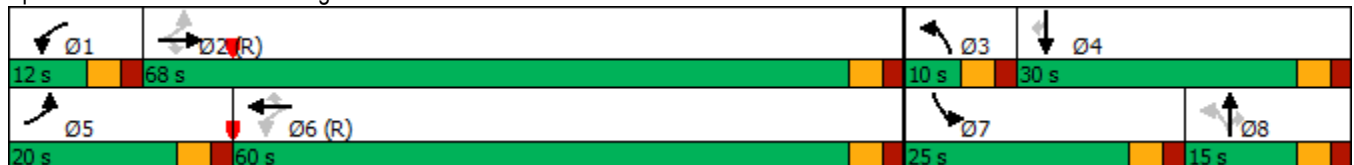
2042 Total Traffic
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	946	22	130	841	581	27	7	37	348	24	194
Future Volume (vph)	310	946	22	130	841	581	27	7	37	348	24	194
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)	80.7	69.1	69.1	69.5	62.6	62.6	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	0.76	0.49	0.02	0.41	0.48	0.55	0.20	0.05	0.12	0.64	0.07	0.44
Control Delay	40.3	10.5	0.0	12.9	20.9	3.6	37.8	51.4	0.8	52.4	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	40.3	10.5	0.0	12.9	20.9	3.6	37.8	51.4	0.8	52.4	39.2	8.5
LOS	D	B	A	B	C	A	D	D	A	D	D	A
Approach Delay		17.6			13.8			19.6			36.8	
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: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 19.0
 Intersection LOS: B
 Intersection Capacity Utilization 74.0%
 ICU Level of Service D
 Analysis Period (min) 15

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



Intersection						
Int Delay, s/veh	0					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↕	↗		↕
Traffic Vol, veh/h	0	3	1007	17	0	674
Future Vol, veh/h	0	3	1007	17	0	674
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	-	200	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	1060	18	0	709

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	530	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	493	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	493	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	493
HCM Lane V/C Ratio	-	-	0.006
HCM Control Delay (s)	-	-	12.3
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	90	807	505	12	6	61
Future Vol, veh/h	90	807	505	12	6	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	95	849	532	13	6	64

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	545	0	-	0	1578 539
Stage 1	-	-	-	-	539 -
Stage 2	-	-	-	-	1039 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1024	-	-	-	120 542
Stage 1	-	-	-	-	585 -
Stage 2	-	-	-	-	341 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1024	-	-	-	109 542
Mov Cap-2 Maneuver	-	-	-	-	109 -
Stage 1	-	-	-	-	531 -
Stage 2	-	-	-	-	341 -

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1024	-	-	-	400
HCM Lane V/C Ratio	0.093	-	-	-	0.176
HCM Control Delay (s)	8.9	-	-	-	15.9
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.3	-	-	-	0.6

Appendix Table 1



**Appendix Table 1
Area Traffic Impact Studies
Copper Chase Sterling Ranch**

Study	PCD File No⁽¹⁾	Consultant	Date
Sterling Ranch Reports			
Sterling Ranch Updated Traffic Impact Analysis	SKP07007	LSC Transportation Consultants, Inc	June 5, 2008
Sterling Ranch Phase 1 Traffic Impact Study	P151	LSC Transportation Consultants, Inc	March 16, 2015
Sterling Ranch Phases 1-3 Transportation Memorandum	SP1415	LSC Transportation Consultants, Inc	October 2, 2017
Branding Iron at Sterling Ranch Filing No. 1 and Homestead at Sterling Ranch Filing No. 1 Transportation	SF1724 SF1725	LSC Transportation Consultants, Inc	December 19, 2017
Sterling Ranch Filing No. 2 Transportation Memorandum	SF1820	LSC Transportation Consultants, Inc	April 3, 2018
Sterling Ranch Phase 2 Preliminary Plan Traffic Impact Study	SP203	LSC Transportation Consultants, Inc	December 20, 2018
Homestead at Sterling Ranch Filing No. 2 Transportation Memorandum	SF194	LSC Transportation Consultants, Inc	March 3, 2020
Branding Iron at Sterling Ranch Filing No. 2 Transportation Memorandum	SF1918	LSC Transportation Consultants, Inc	May 6, 2020
Sterling Ranch Filing No. 2 and Phase 2 Traffic Impact Study	SF2015 SP191	LSC Transportation Consultants, Inc	June 23, 2021
Sterling Ranch Filing No. 3 Transportation Memorandum	SF2132	LSC Transportation Consultants, Inc	April 19, 2022
Homestead North Phase 1 Updated Transportation Memorandum	SP208	LSC Transportation Consultants, Inc	January 11, 2022
Homestead North Filing No. 1 Traffic Technical Memorandum	SF2213	LSC Transportation Consultants, Inc	February 2, 2022
Homestead North Filing No. 2 Traffic Technical Memorandum	SF2218	LSC Transportation Consultants, Inc	April 15, 2022
Homestead North Filing 3 Traffic Impact Study	SF2229	LSC Transportation Consultants, Inc	June 17, 2022
The Villages at Sterling Ranch East Preliminary Plan/Traffic Generation Analysis	PUDSP226	SM Rocha, LLC	July 1, 2022
Sterling Ranch Sketch Plan Amendment Master Traffic Impact Study	SKP224	LSC Transportation Consultants, Inc	March 17, 2023
Sterling Ranch East - Rezoning & Preliminary Plan Traffic Impact Study	SP-22-004, P-22-012, P-22-013	LSC Transportation Consultants, Inc	March 17, 2023 ⁽²⁾
Sterling Ranch East Filing Nos 1 & 2 Traffic Technical Memorandum	SF2235 SF2237	LSC Transportation Consultants, Inc	February 10, 2023
Sterling Ranch Filing No. 4 Transportation Memorandum	SF2230	LSC Transportation Consultants, Inc	February 21, 2023
Foursquare at Sterling Ranch East Transportation Memorandum	SF2236	LSC Transportation Consultants, Inc	April 20, 2023
Retreat at TimberRidge Reports			
The Retreat at TimberRidge Traffic Impact Analysis	PUD173	LSC Transportation Consultants, Inc	January 25, 2018
The Retreat at TimberRidge Preliminary Plan Traffic Technical Memorandum	SP182	LSC Transportation Consultants, Inc	June 29, 2018
The Retreat at TimberRidge Filing No. 1 Traffic Technical Memorandum	SF199	LSC Transportation Consultants, Inc	April 3, 2020
The Retreat at TimberRidge Filing No. 2 Updated Traffic Technical Memorandum	SF2121	LSC Transportation Consultants, Inc	October 4, 2021
The Retreat at TimberRidge Filing No. 3 Traffic Technical Memorandum	SF2241	LSC Transportation Consultants, Inc	July 1, 2022
Other Area Reports			
Wolf Ranch School Site Traffic Impact Study	OAR1720	Matrix Design Group, Inc.	5-May-17
The Ranch Sketch Plan Traffic Impact Analysis	SKP186	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	OAR2177	LSC Transportation Consultants, Inc	July 16, 2021
Solace at Black Forest Traffic Impact and Access Analysis	OAR2134	LSC Transportation Consultants, Inc	August 13, 2021
Traffic Impact Study Addendum for Percheron	OAR2173	SM Rocha, LLC	October, 2021
Woodmen East Commercial Center Traffic Impact Analysis	OAR2191	LSC Transportation Consultants, Inc	December 8, 2021
Traffic Impact Study for Jaynes Property	SKP225	SM Rocha, LLC	May, 2022
Traffic Impact Study for Rhetoric Site	P2216	SM Rocha, LLC	June, 2022
Briargate-Stapleton Corridor Study (DRAFT)	briargate-stapleton.com	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⁽¹⁾

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Sterling Ranch

Roadway Segment Improvements

Segment ID ⁽²⁾ (See Figure 14 for map)	Improvement Description	Timing	Design ADT (vpd)	Projected 2042 ADT (vpd)	Responsibility
V1 northbound	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.	With Sterling Ranch Filing No. 4 but potentially complete concurrently with the construction of the right-turn lane at Pioneer Landscape Center access for the Sterling Ranch Recycling Facility (PCD No. PPR2241)	5,500 (Directional northbound)	16,275	Sterling Ranch
V1 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). ⁽³⁾	The need driven by anticipated traffic from each development impacting this section of Vollmer Road.	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. ⁽³⁾	Short-Term Future (With Sterling Ranch Fil No. 2 Or Sterling Ranch Phase 2)	20,000 (Note: Existing Capacity 8,000 ⁽³⁾)	17,475	Sterling Ranch
V3	Short Term: 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 plus a 6' paved, striped outside shoulder in each direction. ⁽³⁾	Short-Term Future (With Homestead North)	11,000 (Note: Existing Capacity 8,000)	17,380	Sterling Ranch
	Long Term: Improve Vollmer Road from Lochwinnoch Lane to Sterling Ranch boundary (northeast of Glider Loop) to a standard 4-Lane Urban Minor Arterial Cross Section. ⁽³⁾	Long-Term Future	20,000		Sterling Ranch with potential County assistance with ROW acquisition - 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. ⁽³⁾	Short-Term Future-- May 2024 Updated 10/15/2022 - Sections V4, V5, V6 to be constructed by May 2024 (prior note: With Homestead North Filing 1)	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. ⁽³⁾	Short-Term Future-- May 2024 Updated 10/15/2022 - Sections V4, V5, V6 to be constructed by May 2024 (prior note: prior note: With Homestead North Filing 1)	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. ⁽³⁾	Short-Term Future-- May 2024 Updated 10/15/2022 - Sections V4, V5, V6 to be constructed by May 2024 (prior note: prior note: With Homestead North Filing 2)	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.	Short-Term Future - May 2024 Updated 10/15/2022 - Sections V4, V5, V6 to be constructed by May 2024 (prior note: With Homestead North Filing 3)	20,000	10,030	Sterling Ranch
V8	Improve Vollmer Road from Poco Road to Shoup Road to a Rural 2-Lane Arterial Cross Section. ⁽³⁾	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) Source: This Appendix Table 2 is a copy of Table 6 from the Sterling Ranch East Phase 1 Rezoning and Preliminary Plan TIS, March 17, 2023 (with minor revisions April 3, 2023) with LSC notes regarding this Copper Chase project. Improvements needed prior to Copper Chase at Sterling Ranch have been highlighted in green.

(2) See Figure 14

(3) 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 miles per hour is 20:1

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

Source: LSC Transportation Consultants, Inc. (April 26, 2023)

Appendix Table 2⁽¹⁾

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Sterling Ranch

Roadway Segment Improvements

Segment ID ⁽²⁾ (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.	Short Term - with Sterling Ranch Fil No. 2	20,000	14,840	Sterling Ranch
SR2	Construct Sterling Ranch Road as an Urban Non-Residential Collector from Dines Boulevard to Briargate Parkway.	Short-Term	20,000	10,275	Sterling Ranch
SR3	Construct Sterling Ranch Road as an Urban Collector from Briargate Parkway to Vancouver Street.	Short Term	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.	Updated 10/15/2022: to be completed by the end of 2022 (prior note: With Sterling Ranch Fil No. 2)	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. 10/16/2022 NOTE: With the completion of M2 in 2023, the connection between Vollmer and Woodmen Road (via M3) will be completed.	Short Term Updated 10/15/2022: to be completed in 2023 (prior note: With Sterling Ranch Phase 2)	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). 10/16/2022 NOTE: With the completion of M2 in 2023, the connection between Vollmer and Woodmen Road (via M3) will be completed.	Updated 10/15/2022: Completed (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 south half section of Briargate Pkwy (4-Lane Principal Arterial) between Vollmer Road and Wheatland Drive [now full section by 2023].	Short-Term Future Updated 10/15/2022: Full section to be completed in 2023 with Homestead at Sterling Ranch Filing No. 1 (prior note: With Homestead at Sterling Ranch Fil 2)	20,000	24,745	Sterling Ranch
	Construct the north half section of Briargate Pkwy (4-Lane Principal Arterial) between Vollmer Road and Wheatland Drive [now full section by 2023].	Short-Term Future Updated 10/15/2022: Full section to be completed in 2023 with Homestead at Sterling Ranch Filing No. 1 (prior note: Long-Term Future)	40,000		Sterling Ranch
B2	Construct Briargate Pkwy (full section) as a 4-Lane Principal Arterial between Wheatland Dr and Sterling Ranch Road.	Short-Term Future Updated 10/15/2022: Full section to be completed in 2023 or Spring 2024 (prior note: Long-Term Future)	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 Black Forest Road and Vollmer Road.	Long-Term Future	40,000	24,340	Others; PPRTA A List Project
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	Financial assurances for half-section, Sterling Ranch half-section or full-section w/ cost recovery
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	PPRTA A-List Project; City of Colorado Springs ConnectCOS Index No.476
B1	Widen Black Forest Road between Woodmen Road to just north of Research Road to two northbound and southbound through lanes.	Black Forest Widening Project	40,000	28,420	City of Colorado Springs
B2	Widen Black Forest Road from just north of Research Road to Briargate Parkway.	Long-Term Future	40,000	25,145	Others/City of Colorado Springs
B3	Widen Black Forest Rd from Briargate Pkwy to Old Ranch Rd as a 4-lane Principal Arterial with bike and pedestrian facilities.	Long-Term Future	40,000	19,135	PPRTA B List Project ConnectCOS Index No. 479

Part 2/2 of this table

Notes:

(1) Source: This Appendix Table 2 is a copy of Table 6 from the Sterling Ranch East Phase 1 Rezoning and Preliminary Plan TIS, March 17, 2023 (with minor revisions April 3, 2023) with LSC notes regarding this Copper Chase project. Improvements needed prior to Copper Chase at Sterling Ranch have been highlighted in green.

(2) See Figure 14

Source: LSC Transportation Consultants, Inc. (April 26, 2023)


V_1 TIS.pdf Markup Summary

Text Box (1)

Visit us online and recommendations are automatically set for mobile devices and are not available on the site.

OBJECTIVE
Verify that the design is in the public interest in the City of Pease County Engineering Department and is in the public interest. The objective is to ensure that the design is in the public interest and that the design is in the public interest.

NOT RECOMMENDED
The design is not recommended for the City of Pease County Engineering Department. The design is not recommended for the City of Pease County Engineering Department. The design is not recommended for the City of Pease County Engineering Department.

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Deviation request for tangent length between broken back curves & for K-values at stop conditions on a local road (Refer to comment on CD's).