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EPC 7/24/18

Lorson Ranch East Filing No. 1
Transportation Memorandum

(LSC #184150)
PCD Ref. No. SF-18-8
May 2, 2018

Traffic Engineer's Statement

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

Developer's Statement

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

5/2/18
Date

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May 2, 2018
Mr. Jeff Mark
The Landhuis Company
212 North Wahsatch Avenue, Suite 301
Colorado Springs, CO 80903

RE: Lorson Ranch East
Filing No. 1
El Paso County, Colorado
Transportation Memorandum
LSC #184150

Dear Mr. Mark:

LSC Transportation Consultants, Inc. has prepared this updated transportation memorandum to accompany the Filing 1 submittal for the Lorson Ranch East residential development to be located within the Lorson Ranch development in El Paso County, Colorado. The site location is shown in Figure 1. LSC prepared a traffic impact study (TIS) for the entire Lorson Ranch East Preliminary Plan dated November 9, 2017 and revised January 8, 2018. The lot and street plan has not changed since completion of that report. This memorandum contains the following:

- The projected average weekday and peak-hour vehicle-trips to be generated by the Filing 1 land uses.
- Recommendations for a fair share contribution toward a future traffic signal at the intersection of Marksheffel Road and Lorson Boulevard.
- Recommendations for street functional classifications for streets within Filing 1.
- The required Countywide Road Impact Fees.

SITE DEVELOPMENT AND LAND USE

Land Use

Lorson Ranch East Filing 1 is planned to include 303 lots for single-family homes. This is 28 fewer lots than were included in Phase 1 of the Preliminary Plan TIS. Figure 2 shows the proposed site plan. The school site north of Fontaine Boulevard and east of Lamprey Drive is also planned to be developed in the short-term future. A separate traffic impact study is being submitted for the school site that will address the requirements for development of that site in more detail. The street infrastructure necessary to serve the school will be constructed by the developer as part

of Filing No. 1. There are no changes to the lot layout, street network, and access points from the plan shown in the Preliminary Plan TIS.

Figure 2 also shows the streets that are planned to be constructed with Lorson Ranch East Filing 1. Fontaine Boulevard is planned to be extended east from its current terminus at the intersection of Stingray Lane and Old Glory (east) to the east boundary of the school site. Lamprey Drive would be constructed north from Fontaine Boulevard to the future school access point (Shavers Drive) and south to Lorson Boulevard.

Lorson Ranch East Filing No. 1 would also include the construction of Lorson Boulevard between Stingray Lane and Lamprey Drive. The section of Lorson Boulevard from Carriage Meadows South across the main channel of Jimmy Camp Creek to Stingray would not be included with this filing. The streets planned to be constructed with this filing are generally consistent with the assumptions for Phase 1 in the Preliminary Plan TIS except that Lamprey Drive was previously not assumed to be constructed south of Fontaine Boulevard and Lorson Boulevard was assumed to only be constructed to the first access on the north side of Lorson Boulevard (Willapa Drive) with Phase 1.

TRIP GENERATION

Estimates of the traffic volumes expected to be generated by the site have been made using the nationally published trip generation rates found in *Trip Generation,10th Edition, 2017* by the Institute of Transportation Engineers (ITE). Table 1 shows the results of the trip generation estimates.

As shown in Table 1, Lorson Ranch East Filing 1 is projected to generate about 2,860 new vehicle-trips on the average weekday, with about one-half of the vehicles entering and one-half of the vehicles exiting in a 24-hour period. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 56 vehicles would enter and 168 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:30 and 6:30 p.m., about 189 vehicles would enter and 111 vehicles would exit the site.

SHORT-TERM AND 2040 TOTAL TRAFFIC

Please refer to Preliminary Plan TIS for the short-term and 2040 total traffic volumes, level of service analysis, and traffic signal warrant analysis.

TRAFFIC SIGNAL ESCROW AMOUNTS

The Lorson Ranch Preliminary Plan TIS estimated a fair share contribution towards a future signal at the intersection of Marksheffel/Lorson would be $93,950 for Lorson Ranch East Phase 1. Filing

1 is planned to contain 303 of the 331 lots assumed in Phase 1. Based on the proposed number of lots in Filing 1, the contribution for Filing 1 would be $86,003.

ROADWAY CLASSIFICATIONS

As shown on Figure 15 of the Lorson Ranch East Preliminary Plan TIS, all of the internal streets within Lorson Ranch East Filing 1 should be classified as Urban Local.

ROADWAY IMPROVEMENT FEE PROGRAM

This project will be required to participate in the El Paso County Road Improvement Fee Program. Lorson Ranch East Filing 1 will join the ten-mil PID. The ten-mil PID building permit fee portion associated with this option is $923 per single-family dwelling unit. Based on 303 lots, the total building permit fee would be $279,669.

* * * * *

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

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

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

JCH:KDF:bjwb

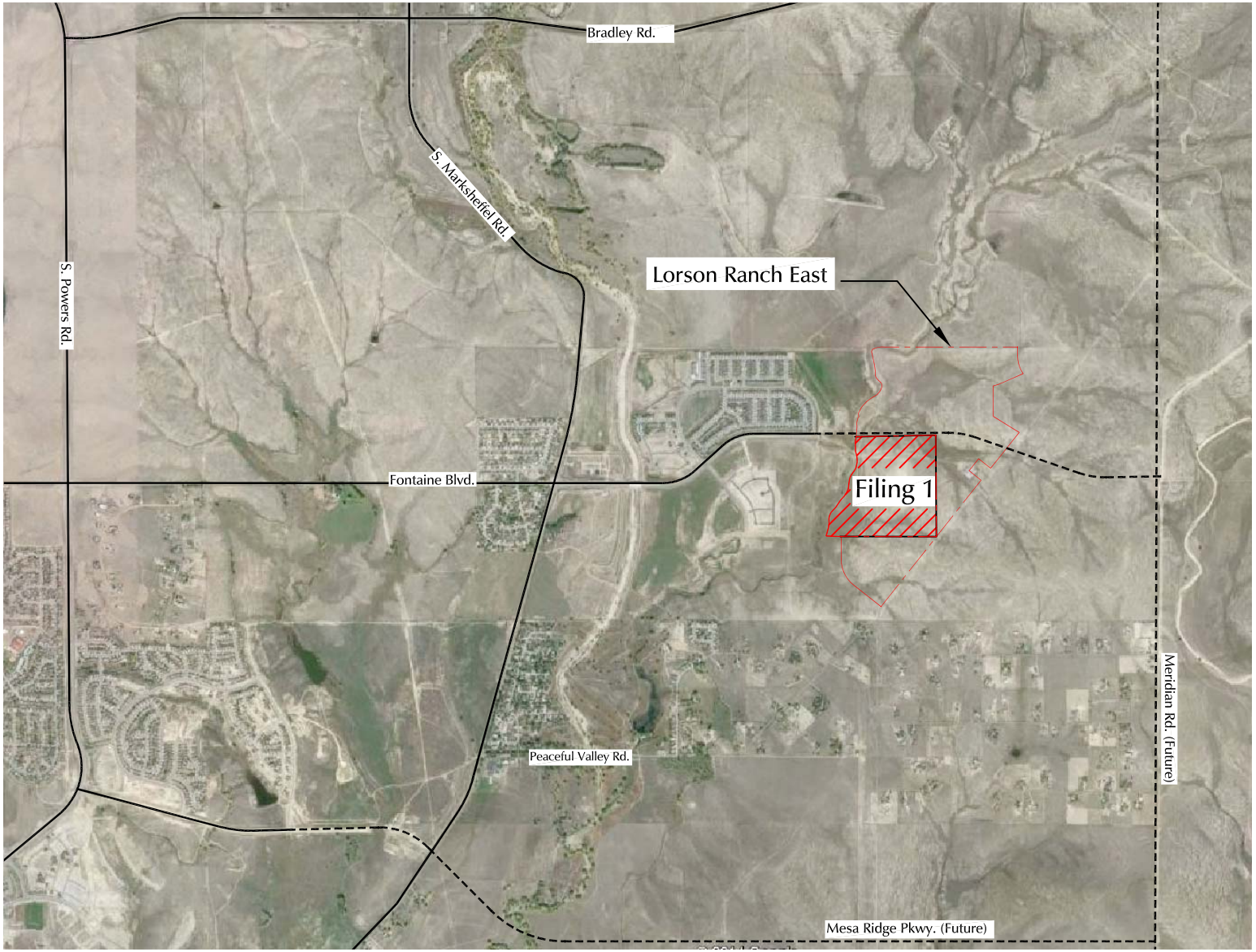
Enclosures: Table 1
Figures 1-2

Table 1
Trip Generation Estimate
Lorson Ranch East Filing 1

Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates [1] Average Weekday Traffic	Trip Generation Rates [1] Morning Peak Hour In	Trip Generation Rates [1] Morning Peak Hour Out	Trip Generation Rates [1] Afternoon Peak Hour In	Trip Generation Rates [1] Afternoon Peak Hour Out	Total Trips Generated Average Weekday Traffic	Total Trips Generated Morning Peak Hour In	Total Trips Generated Morning Peak Hour Out	Total Trips Generated Afternoon Peak Hour In	Total Trips Generated Afternoon Peak Hour Out
210	Single-Family Detached Housing	303 DU[2]	9.44	0.19	0.56	0.62	0.37	2,860	56	168	189	111

Notes:
(1) Source: "*Trip Generation, 10th Edition, 2017*" by the Institute of Transportation Engineers (ITE)
(2) DU = dwelling unit

Source: LSC Transportation Consultants, Inc.



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Approximate Scale
Scale: 1"= 3,000'

Figure 1

Vicinity Map

Lorson Ranch East Filing 1 (LSC #184150)

LSC TRANSPORTATION CONSULTANTS, INC.

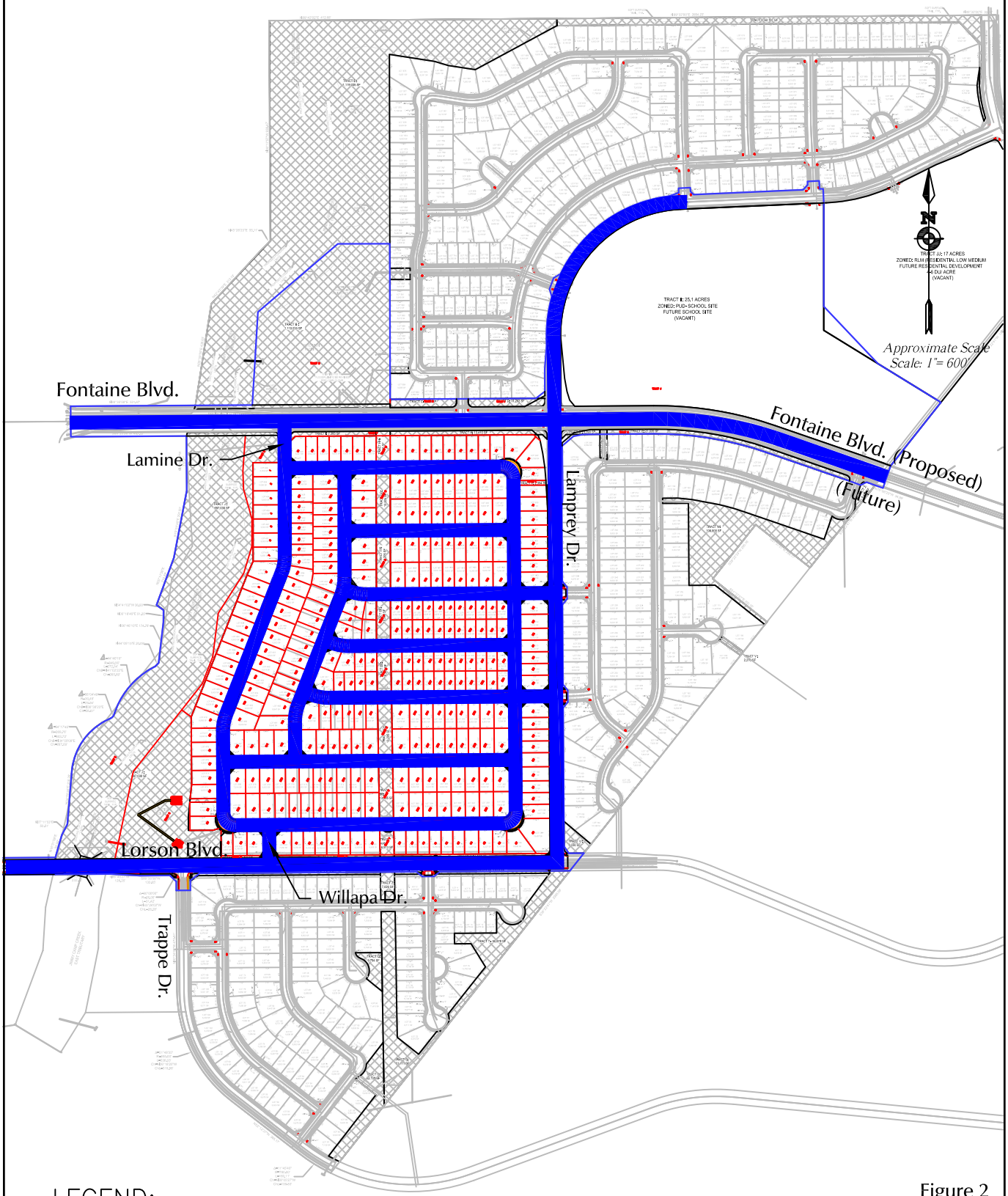

Figure 2

Site Plan

Lorson Ranch East Filing 1 (LSC #184150)

TRANSPORTATION CONSULTANTS, INC.

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Lorson Ranch East
Updated Traffic Impact and Access Analysis
(LSC #164360)
November 9, 2017

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.

Jeffrey C. Hodsdon, P.E., #31684

COLORADO LICENSED
JEFFREY C. HODSDON
31684
11-9-17
PROFESSIONAL ENGINEER

Date

Developer's Statement

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

11/9/17
Date

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November 9, 2017

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

RE: Lorson Ranch East
Preliminary Plan
El Paso County, Colorado
Updated Traffic Impact and Access Analysis
Revised January 8, 2018
LSC #164360

Dear Mr. Mark:

LSC Transportation Consultants, Inc. has prepared this traffic impact analysis update to accompany the Preliminary Plan submittal for the Lorson Ranch East residential development to be located within the Lorson Ranch development in El Paso County, Colorado. The site location is shown on Figure 1.

REPORT CONTENTS

The report contains the following:

- Recent/current street and traffic conditions in the vicinity of the site including the street widths, lane geometries, traffic controls, posted speed limits, street classification, etc.
- Existing traffic volumes at the key intersections in the vicinity of the site and estimates of short-term and 2040 background traffic volumes.
- The projected average weekday and peak-hour vehicle-trips to be generated by the land uses shown on the Preliminary Plan.
- The assignment of the projected trips to the existing and planned street system.
- The resulting short-term and 2040 total traffic volumes on the street system.
- The resulting traffic impacts. The traffic impacts have been quantified by determining the future levels of service at the intersections of Marksheffel Road/Lorson Boulevard, Marksheffel Road/Fontaine Boulevard and the proposed site access point intersections on Fontaine Boulevard and Lorson Boulevard.
- Recommendations for street functional classification, traffic controls, and auxiliary turn lanes.

SITE DEVELOPMENT AND LAND USE

Land Use

Phase 1 of Lorson Ranch East is planned to include 331 lots for single-family homes. This is the maximum number of homes that can be built prior to the construction of a second access for the Lorson Ranch Sketch Plan Area. At buildout Lorson Ranch East is planned to be developed with a total 826 lots for single-family homes and a Kindergarten through 8th grade school. The site plan is shown in Figure 2.

Access Points

Three full-movement access points are proposed to Fontaine Boulevard about 390 and 1,150 feet west of Lamprey Drive and 1,335 feet east of Lamprey Drive. The proposed access points do not meet the criteria for intersection spacing on a Principal Arterials. However, the street will function as a Collector street for the foreseeable future and will be constructed as an interim Urban Non-Residential Collector street. Please refer to the requested PUD modifications for access spacing justification details. Once Fontaine Boulevard is constructed as a Principal Arterial, all three access points would likely be restricted to right-in/right-out only. Access is also proposed to a Residential Collector (Lamprey Drive), which will extend north from Lorson Boulevard, and a Residential Collector (Trappe Drive), which will extend south from Lorson Boulevard about 1,595 feet west of Lamprey Drive.

Two full-movement access points are proposed to Lorson Boulevard about 550 feet west of Lamprey Drive and 367 feet east of Trappe Drive.

Street Connections

For Phase 1, Fontaine Boulevard is planned to be extended east from its current terminus at the intersection of Stingray Lane and Old Glory (east) about 1,335 feet east of Lamprey Drive. Lamprey Drive would be constructed north from Fontaine Boulevard to the future school access point (the location is currently under discussion). Phase 1 would also include the construction of Lorson Boulevard between Stingray Lane and the first access on the north side of Lorson Boulevard (Willapa Drive). The section of Lorson Boulevard from Carriage Meadows South across the main channel of Jimmy Camp Creek to Stingray would not be included with Phase 1. The phasing plan is shown in Figure 3.

With school development or with future development (whichever occurs first), Fontaine Boulevard is planned to be extended east from Lamprey Drive to provide access as needed. Ultimately it would extend to the east boundary of the site. Lorson Boulevard is planned to be constructed across the main channel of Jimmy Camp Creek and from Willapa Drive to the east boundary of the site following Phase 1.

Pedestrian and Bicycle Route Analysis

It is our understanding that a school access point to Fontaine Boulevard about 1,335 feet east of Lamprey Drive has been confirmed but any access to Lamprey Drive remains under discussion.

Figure 4 shows a pedestrian and bicycle route analysis for the school based on preliminary assumptions as no site plan is available.

Dwelling Unit Cap

Phase 1, at 331 dwelling units, would just meet the allowable 1,750 single-family equivalent dwelling units east of the main channel of Jimmy Camp Creek as per the amended development agreement. The development agreement states:

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

Table 1 shows the updated dwelling unit cap status table with the proposed Lorson East Phase 1 added. The development of any lots beyond the 331 lots included as part of Phase 1 will require Lorson Boulevard to be constructed from the Carriage Meadows South east boundary to Stingray Lane including a crossing of the main Jimmy Camp Creek channel.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

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

- **Marksheffel Road** extends north from the Link Road/C&S Road intersection in Fountain, Colorado to north of Woodmen Road. Marksheffel Road is shown as a future four-lane Expressway on the County *Major Transportation Corridors Plan (MTCP)*. The posted speed limit on Marksheffel Road at Fontaine Boulevard is 45 miles per hour (mph). The PPRTA has completed the Marksheffel Road upgrade between Mesa Ridge Parkway and Bradley Road. This included intersection improvements at the Fontaine Boulevard intersection.

- **Fontaine Boulevard** is designated as a four-lane Urban Principal Arterial east of Marksheffel Road and it has been constructed as such from Marksheffel Road east to Old Glory Drive. As part of this development Fontaine Boulevard will be extended east from Old Glory Drive adjacent to the site. In the interim, an Urban Non-Residential Collector Street will be constructed east of Stingray Lane as development progresses. The applicant will be dedicating 100 feet of right-of-way. The posted speed limit on Fontaine Boulevard is 35 mph just east of (and a short distance west of) Marksheffel Road. The speed limit increases to 45 mph just east of the bridge over Jimmy Camp Creek.

- **Lorson Boulevard** is a planned future roadway that will ultimately extend from Marksheffel Road about one-half mile south of Fontaine Boulevard. Initially, Lorson Boulevard is

planned to cross the east tributary of Jimmy Camp Creek, then as required by the development agreement, cross the main channel of Jimmy Camp Creek. The Phase 1 section of Lorson Boulevard will connect Stingray Lane and Willapa Drive (in Lorson East) via a bridge over the east tributary. Lorson Boulevard will be classified as an Urban Non-Residential Collector Street (modified for a 44-foot street width rather than the standard 52-foot street width) with an 80-foot-wide right-of-way. East of Stingray Lane, Lorson Boulevard will be classified as an Urban Non-Residential Collector Street (modified for a 44-foot street width rather than the standard 52-foot street width). The ROW will vary from 64 feet to 72 feet to accommodate anticipated future right-turn deceleration lanes. The ROW not adjacent to right turn lanes would be 64 feet. Also, tracts adjacent to the ROW will allow for future ROW expansion to 80 feet if ever needed. The proposed cross section includes two 14-foot "shared-use" travel lanes, a striped two-way left-turn lane and right-turn deceleration lanes where warranted. Approved deviation DEV17008 is attached for reference and additional detail.

Baseline Traffic Volumes

Figure 5 shows the recent traffic volumes at the intersection of Marksheffel Road/Fontaine Boulevard. These “baseline” traffic volumes were based on traffic counts conducted by LSC in March 2017. The traffic count reports are attached.

Baseline Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from “A” to “F.” LOS A represents control delay of less than 10 seconds for unsignalized and signalized intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections and more than 80 seconds for signalized intersections. Table 2 shows the level of service delay ranges.

Table 2
Intersection Levels of Service Delay Ranges

	Signalized Intersections		Unsignalized Intersections
Level of Service	Average Control Delay (seconds per vehicle)	V/C[1]	Average Control Delay (seconds per vehicle)[2]
A	10.0 sec or less	less than 0.60	10.0 sec or less
B	10.1-20.0 sec	0.60-0.69	10.1-15.0 sec
C	20.1-35.0 sec	0.70-0.79	15.1-25.0 sec
D	35.1-55.0 sec	0.80-0.89	25.1-35.0 sec
E	55.1-80.0 sec	0.90-0.99	35.1-50.0 sec
F	80.1 sec or more	1.00 and greater	50.1 sec or more

(1) Source: *Transportation Research Circular 212*
(2) For unsignalized intersections if V/C ratio is greater than 1.0 the level of service is LOS F regardless of the projected average control delay per vehicle.

The intersection of Marksheffel/Fontaine was analyzed to determine the baseline levels of service using Synchro. Figure 5 shows the level of service analysis results. As shown on the figure, all movements this intersection are level of service C or better during the peak hours. The level of service (LOS) reports are attached.

SHORT-TERM (YEAR 2020) BACKGROUND TRAFFIC

Background traffic is the traffic estimated to be on the roadways without the Lorson Ranch East traffic. Background traffic includes the baseline (from March 2017 counts) traffic and increases in through traffic on Marksheffel Road due to both regional growth and the recent extension of Mesa Ridge Parkway east to Marksheffel Road. The portion of the baseline traffic volumes were also assumed to be rerouted due to the extension of Mesa Ridge Parkway east to Marksheffel Road. A portion of the existing traffic that currently travels to and from the west on Fontaine Boulevard was assumed to shift to travel to and from the south on Marksheffel Road to this new connection. The short-term background traffic also includes traffic generated by buildout of the residential portion of Lorson Ranch subdivisions north of Lorson Boulevard between Jimmy Camp Creek and the east tributary and the Carriage Meadows North and Carriage Meadows South subdivisions located west of Jimmy Camp Creek, but assumes zero traffic generated by Lorson Ranch East. The short-term background volumes assume Lorson Boulevard has been constructed east of Marksheffel Road to serve the Carriage Meadows South subdivision (with a street connection north to Fontaine Boulevard) but does **not** cross Jimmy Camp Creek (main channel). The short-term background traffic volumes are shown in Figure 6.

2040 BACKGROUND TRAFFIC

Figure 7 shows the projected 2040 background traffic volumes. The 2040 background traffic volumes are based on estimates of traffic projected to be generated at buildout of the Lorson Ranch Sketch Plan (excluding the traffic projected to be generated by Lorson Ranch East) and traffic volumes shown in the *Marksheffel Road South Corridor Preservation Plan* dated July 2014. Appendix Table 1 shows the trip generation estimates for all existing and future land uses assumed to be built out by 2040 in the Lorson Ranch development. The 2040 background volumes also assume full buildout of the street network within Lorson Ranch but assume Meridian Road has not been extended south to Fontaine Boulevard.

TRIP GENERATION

Estimates of the traffic volumes expected to be generated by the site have been made using the nationally published trip generation rates found in *Trip Generation, 9th Edition, 2012* by the Institute of Transportation Engineers (ITE). Table 3 shows the results of the trip generation estimates.

As shown in Table 3, following Phase 1 the Lorson Ranch East site is projected to generate about 3,151 new vehicle-trips on the average weekday, with about one-half of the vehicles entering and one-half of the vehicles exiting in a 24-hour period. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 62 vehicles would enter and 186 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:30 and 6:30 p.m., about 209 vehicles would enter and 122 vehicles would exit the site.

At buildout, the Preliminary Plan land uses are projected to generate about 9,319 new vehicle-trips on the average weekday, with about one-half of the vehicles entering and one-half of the vehicles exiting in a 24-hour period. During the morning peak hour about 427 vehicles would enter and 687 vehicles would exit the site. During the afternoon peak hour about 596 vehicles would enter and 385 vehicles would exit the site.

Table 3 includes an additional alternate analysis using a trip generation rate consistent with actual data collected. This analysis assumes single-family detached housing generating trips using ITE fitted curve rates. These rates are closer to actual current trip generation rates for Lorson Ranch based on the recent counts shown in Figure 5. Based on the data, the ITE average rate of 9.52 trips per day per single-family dwelling unit are conservative. This information is provided for information only. The analysis in this report is based on the trip generation using the ITE average trip generation rates.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of the site-generated traffic volumes on the street and roadway system serving the site is one of the most important factors in determining the site's traffic impacts. Figure 8 shows the external trip distribution estimates (external to Lorson Ranch). The directional distribution estimates have been based on the location of the site with respect to the regional residential employment, commercial, and activity centers; the land use proposed; the access/roadway connections assumed; and the roadway network. The directional distribution estimate assumes Mesa Ridge Parkway has been extended east to Marksheffel Road.

When the external trip distribution percentages (from Figure 8) are applied to the trip generation estimates (from Table 3), the resulting site-generated traffic volumes can be determined. Figures 9 and 10 show the short-term (Phase 1 only) and long-term site-generated traffic volume estimates, respectively. The Phase 1 site-generated traffic volumes assume all trips generated by Lorson Ranch East have origins and destinations outside of Lorson Ranch. The long-term site-generated volumes assume a portion of the trips will travel within the Lorson Ranch Development to and from the planned commercial areas to be located near the intersection of Carriage Meadows Drive/ Fontaine Boulevard and the proposed school site located northeast of the intersection of Lamprey Drive/Fontaine Boulevard. The number of vehicle-trips assigned within the Lorson Ranch development were based on the internal trip estimates shown in Appendix Table 3. Internal trips from this site are shown in Table 3.

The short-term site-generated traffic volumes assume Lorson Boulevard has been constructed from Marksheffel Road to just west of Jimmy Camp Creek and from Stingray Lane east across the east tributary of Jimmy Camp Creek to Willapa Drive. The long-term site-generated traffic volumes assume full buildout of the street network within Lorson Ranch (including a crossing for Lorson Boulevard across the main Jimmy Camp Creek bed) but assume Meridian Road has not been extended south to Fontaine Boulevard.

As requested by County staff, the long-term trip assignment assumes half of the school trips using the Fontaine access and half of the school trips accessing the school site via Lamprey Drive (preliminary assumption as no site plan is available).

PROJECTED TOTAL TRAFFIC

Figure11a shows the short-term total traffic volumes. These volumes are the sum of the short-term background traffic volumes (from Figure 6) plus the short-term Phase 1 site-generated traffic volumes (from Figure 9).

Figure 12a shows the 2040 total traffic volumes. These volumes are the sum of the 2040 background traffic volumes (from Figure 7) plus the long-term site-generated traffic volumes (from Figure 10).

A "sensitivity analysis" was also conducted to estimate a hypothetical worst-case average daily traffic volume on Lorson Boulevard. This analysis assumes that all residential trips generated by the residential development areas (Lorson East and future) south of Fontaine Boulevard and east of the east tributary would use Lorson Boulevard (and zero traffic would use Fontaine Boulevard) to travel to/from the south on Marksheffel Road south of Lorson Ranch. A small percentage (two percent) of trips originating in areas north of Fontaine have also been assigned to Lorson Boulevard instead of Fontaine. The percentage is limited because under this worst-case scenario, the Fontaine volumes are shown being significantly reduced and the resulting westbound left-turn volume at the Marksheffel/Lorson intersection would be significantly higher than the corresponding left turn at Fontaine/Marksheffel. These factors would discourage use of Lorson Boulevard in lieu of Fontaine for development areas north of Fontaine.

The worst-case analysis for Lorson Boulevard also assumes trips generated in the south areas of the Lorson East Preliminary Plan and areas south and southwest of the Preliminary Plan area would also use Lorson Boulevard and the Old Glory connection to Fontaine to travel to/from the west on Fontaine (west of Marksheffel) and north on Marksheffel. Residential trips paired with the school in the areas south of and north of (and in close proximity to) Lorson Boulevard have also been assigned to Lorson Boulevard. The resulting average daily traffic volumes are shown on Figure 12a. Note, the hypothetical worst-case 13,000 average daily traffic volumes on Lorson Boulevard are for the section over the east tributary. East of Trappe Drive, the volume drops to 4,900 vehicles per day and west of Old Glory, the volume drops to 9,900 vehicles per day.

Table 3 also shows an estimate of the total average daily traffic volume on Lorson Boulevard just west of Trappe Drive using site-generated and background traffic volumes for homes east of the tributary estimated based on ITE fitted curve trip generation rates instead of average rates.

PROJECTED LEVELS OF SERVICE

The intersections of Marksheffel/Lorson, Marksheffel Road/Fontaine Boulevard, Fontaine/ Lamprey, Lorson/Lamprey and Lorson/Trappe and the site access points to Fontaine Boulevard and Lorson Boulevard have been analyzed to determine the projected levels of service for the short-term and 2040 background and total traffic volumes based on the signalized method of analysis from Synchro and the unsignalized method of analysis procedures outlined in the *Highway Capacity Manual, 2010 Edition* by the Transportation Research Board. The level of service reports are attached. The results of the analysis are shown in Figures 6, 7, 11b, and 12b.

Marksheffel/Fontaine

The signal-controlled Marksheffel Road/Fontaine Boulevard intersection is projected to continue to operate at a level of service D overall or better based on the short-term and 2040 background and total traffic conditions.

Marksheffel/Lorson

Based on the projected short-term total traffic volumes, all movements at the intersection of Marksheffel/Lorson are projected to operate at LOS C or better during the peak hours as a Stop-sign-controlled intersection (Stop-sign on the westbound approach). By 2040 it was assumed that this intersection would be signal controlled. As a signalized intersection, all movements are projected to operate at LOS D or better during the peak hours based on the projected 2040 background and total traffic volumes.

Fontaine/Lamprey

By 2040, the northbound and southbound left-turn and through movements at the intersection of Fontaine/Lamprey are projected to operate at LOS F during the peak hours if this intersection were to be Stop-sign controlled. All movements are projected to operate at a satisfactory level of service based on the projected 2040 peak-hour total traffic volumes if this intersection is either signal controlled or constructed as an interim one-lane modern roundabout (interim meaning the single-lane roundabout could remain in place until Fontaine is ultimately expanded to the full four-lane Principal Arterial cross section). A one-lane modern roundabout has been selected as the preferred traffic control for this intersection.

Lorson/Lamprey

Based on the projected 2040 total traffic volumes, all movements at the intersection of Lorson/ Lamprey are projected to operate at LOS B or better during the peak hours as a two-way Stop-sign-controlled intersection.

Lorson/Trappe

Based on the projected 2040 total traffic volumes, all movements at the intersection of Lorson/ Trappe are projected to operate at LOS C or better during the peak hours as a two-way Stop-sign-controlled intersection.

Fontaine Boulevard Site Access Points

The northbound approach at the westernmost access (Lamine Drive) is projected to operate at LOS F during the afternoon peak hour based on the projected 2040 total traffic volumes. Northbound left-turning traffic at the Chaplin Drive intersection would have the option to turn right and execute a U-turn using the roundabout at the intersection of Fontaine/Lamprey to travel west. Alternatively, residents would have the option to turn onto northbound Lamprey and make a left turn at the intersection of Fontaine/Lamprey instead. Once the four-lane Principal Arterial is ultimately

completed on Fontaine at some future time by the County (likely beyond 2040), the raised center median would restrict this intersection to a right-in/right-out.

The intersections of Fontaine Boulevard/Edisto Drive and Fontaine Boulevard/Tillamook Drive are projected to operate at level of service C or better as Stop-sign-controlled intersections based on the projected short-term and 2040 total traffic volumes.

Lorson Boulevard Site Access Points

All movements at the proposed site access points to Lorson Boulevard are projected to operate at level of service B or better as Stop-sign-controlled intersections based on the projected 2040 total traffic volumes.

TRAFFIC SIGNAL WARRANT ANALYSIS

Note: Although the intersection of Lamprey/Fontaine is proposed to be a modern roundabout, the following paragraph has been retained for completeness. The intersection of Fontaine/Lamprey was analyzed to determine if a Four-Hour Vehicular Volume Traffic Signal Warrant will be met or close to being met based on the projected 2040 total traffic volumes. The results of the analysis are shown in Figure 13. As shown in the figure, this intersection is projected to meet the thresholds for a Four-Hour Vehicular Volume Traffic Signal Warrant during the morning and afternoon peak hours. This analysis using the peak hours is intended to provide an indication that a warrant may be met or is close to being met. In order for a Four-Hour Traffic Signal Warrant to be satisfied, the volume threshold would need to be met for two additional hours of the day. For example, the four-hour warrant would be satisfied with the volume thresholds met for the one hour in the morning, two hours (instead of the one-hour peak) during the afternoon peak period, and an hour during the mid-afternoon. The satisfaction of warrants does not indicate that a signal must be installed. The decision to require a signal to be installed at this location rests with the El Paso County Department of Transportation. As noted, the applicant proposes to construct the intersection as a one-lane modern roundabout. This is the preferred option. The one-lane roundabout option would work with the interim Non-Residential Collector. Once Fontaine is ultimately upgraded to a four-lane Principal Arterial, the one-lane roundabout would need to be converted to a two-lane roundabout (or replaced with a signal). LSC has prepared a multi-lane roundabout design to accommodate future traffic demand as needed. Future right-of-way will be dedicated based on this design.

The intersection of Marksheffel/Lorson was analyzed to determine when the Four-Hour Vehicular Volume Traffic Signal Warrant thresholds would be reached or exceeded based on the projected morning and afternoon peak-hour total traffic volumes. The results of the analysis are shown in Figure 14. The minor approach volumes were assumed to include the westbound left-turn movements only.

As shown in the figure, the thresholds for a Four-Hour Vehicular Volume Traffic Signal Warrant are **not** projected to be exceeded during the morning and afternoon peak hours based on the projected short-term total traffic volumes. Figure 14 also shows the peak-hour volumes based on theoretical intermediate-term volumes. This intermediate-term scenario assumes Lorson Boulevard extended east across the Jimmy Camp Creek main bed and east tributary to serve the Lorson Ranch East development. The intermediate-term volumes are the sum of the short-term

total traffic volumes (from Figure 6) plus the **long-term** buildout site-generated traffic volumes from Figure 10 plus estimates of traffic from existing or approved developments within Lorson Ranch that may use this connection. As shown on Figure 14, the thresholds for a Four-Hour Vehicular Volume Traffic Signal Warrant are projected to be exceeded during both the morning and afternoon peak hours based on the projected intermediate-term total traffic volumes.

TRAFFIC SIGNAL ESCROW PERCENTAGES/AMOUNTS

As shown in Figure 14, the intersection of Marksheffel/Lorson is likely to meet a traffic signal warrant based on the intermediate-term total traffic volumes. Table 4 shows the projected number of westbound left-turning vehicles at the intersection of Lorson/Marksheffel estimated to be generated by **future** developments within Lorson Ranch. Estimates of westbound left-turning vehicles due to existing or approved developments were not included as they will not participate in funding of this signal. The specific developments included in the calculation are listed in the table. These volumes were used to calculate a fair share contribution toward a future signal at this intersection. Assuming a total signal cost of $300,000, a fair share contribution towards a future signal at this intersection would be $93,950 for Lorson Ranch East Phase 1 and $60,854 for the future Lorson Ranch East phases.

FONTAINE BOULEVARD CLASSIFICATION AND INTERIM CROSS SECTION

The ultimate classification of Fontaine Boulevard is Principal Arterial. Based on Lorson Ranch buildout only and assuming no through street connections to the east and north, the projected daily traffic volumes on the section of Fontaine east of Stingray Lane and the Jimmy Camp Creek east tributary are projected to be well below the thresholds for this classification. In the intermediate term this section of Fontaine Boulevard would be constructed as an interim three-lane Non-Residential Collector and a 100-foot right-of-way will be dedicated with a 15-foot right-of-way preservation on each side.

LORSON BOULEVARD RECOMMENDED FUNCTIONAL CLASSIFICATION CROSS SECTION

The projected average weekday traffic volume on Lorson Boulevard just west of Trappe Drive is about 9,555 vehicles per day. A sensitivity analysis showed a hypothetical maximum volume of 13,000 vehicles per day in the relatively short section over the east tributary (and 4,900 vehicles per day east of Trappe). The maximum daily traffic volume could be accommodated by the proposed enhanced Collector cross section and right-of-way. The standard Collector cross section is two lanes with no center turn lane and six-foot paved shoulders and no auxiliary turn lanes. The proposed section adds a continuous center left-turn lane, 14-foot “shared use” through lanes, and right-turn deceleration lanes where warranted. This cross section would fit within the proposed 64-foot right-of-way with 12-feet of additional right-of-way adjacent to and to accommodate right-turn deceleration lanes where warranted. This cross section was approved via deviation #DEV-17-008. This deviation contains the requirement for tracts adjacent to the right-of-way, which will allow for future right-of-way expansion to 80 feet if ever needed.

RECOMMENDED INTERNAL STREET CLASSIFICATIONS

Figure 15 shows the estimated average weekday traffic volumes and recommended street classifications for the Lorson Ranch East internal streets.

PUD MODIFICATIONS FOR INTERSECTION SPACING

Please refer to the PUD modifications submittal for justification for proposed intersection spacing shorter than ECM criteria.

ROUNDABOUT DESIGN

LSC has prepared a roundabout design report for the proposed single-lane modern roundabout at Fontaine/Lamprey. The roundabout design report is attached for reference. Also attached for reference are the design and analysis exhibits for a potential future multi-lane roundabout. This design has been completed to determine potential future right-of-way needs for a future multi-lane roundabout as a multi-lane roundabout would be needed with long-term future conversion of Fontaine Boulevard to a four-lane Principal Arterial.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

- At buildout, the Lorson Ranch East Preliminary Plan land uses are projected to generate about 9,320 new vehicle-trips on the average weekday, with about one-half of the vehicles entering and one-half of the vehicles exiting in a 24-hour period. During the morning peak hour about 427 vehicles would enter and 687 vehicles would exit the site. During the afternoon peak hour about 596 vehicles would enter and 385 vehicles would exit the site.

Projected Levels of Service

- The signal-controlled Marksheffel Road/Fontaine Boulevard intersection is projected to continue to operate at level of service D or better based on the short-term and 2040 background and total traffic conditions.

- Based on the projected short-term total traffic volumes all movements at the intersection of Marksheffel/Lorson are projected to operate at LOS D or better during the peak hours as a two-way Stop-sign-controlled intersection. By 2040, it was assumed that this intersection would be signal controlled. As a signalized intersection, all movements are projected to operate a LOS D or better during the peak hours based on the projected 2040 background and total traffic volumes. See the above.

- The intersection of Fontaine/Lamprey is planned to be constructed as a one-lane modern roundabout. The one-lane roundabout would work with the interim Non-Residential Collector cross-section and all approaches are projected to operate at a LOS C or better during peak hours based on the projected 2040 total traffic volumes. Once Fontaine is ultimately upgraded to a four-lane Principal Arterial (which may be well beyond 2040), the

one-lane roundabout would need to be converted to a multi-lane roundabout (or replaced with a signal). LSC has prepared a multi-lane roundabout design to accommodate future traffic demand as needed and future right-of-way will be dedicated based on this design.

- The intersections of Fontaine/Edisto, Fontaine/Tillamook, Lorson/Trappe, Lorson/Willapa, Lorson/Skuna, and Lorson/Lamprey are projected to operate at satisfactory levels of service as Stop-sign-controlled intersections based on the projected 2040 total traffic volumes.

- The northbound approach at the westernmost access to Fontaine Boulevard (Lamine Drive) is projected to operate at LOS F during the afternoon peak hour based on the projected 2040 total traffic volumes. Northbound left-turning traffic at the Lamine Drive intersection would have the option to turn right and execute a U-turn using the planned roundabout to travel west. Once Fontaine is upgraded to a four-lane Principal Arterial at some future time by the County (likely beyond 2040), the raised center median would restrict this intersection to a right-in/right-out.

Recommended Improvements

- Table 5 provides a summary of the recommended improvements in the vicinity of the site. The table includes estimated timing and responsibility for those improvements.

Traffic Signal Escrow Percentages/Amounts

- Assuming a total signal cost of $300,000, a fair share contribution towards a future signal at this intersection would be $93,950 for Lorson Ranch East Phase 1 and $60,854 for the future Lorson Ranch East phases. Please refer to the section in the report entitled Traffic Signal Escrow Percentages/Amounts.

Recommended Auxiliary Turn Lanes on Fontaine Boulevard

- Based on the projected long-term traffic volumes, an eastbound right-turn deceleration lane would be required on Fontaine Boulevard approaching Lamine Drive. No westbound right-turn deceleration lanes would be required.

- Based on the projected long-term traffic volumes, an eastbound left-turn lane would be required on Fontaine Boulevard approaching Edisto Drive. The Non-Residential Collector would provide one through lane in each direction plus a center two-way left-turn lane. This center painted median would accommodate left turns at this intersection.

Recommended Auxiliary Turn Lanes on Lorson Boulevard

- Based on the projected long-term traffic volumes, an eastbound right-turn deceleration lane would be required on Lorson Boulevard approaching Trappe Drive. This lane should be 155 feet long plus a 160-foot taper.

- A center striped two-way left-turn lane will be provided on Lorson Boulevard. This will provide left-turn lanes for the access points.

PUD Modifications

- Please refer to the PUD modifications submittal for justification for proposed intersection spacing shorter than ECM criteria.

Roundabout Design

- Roundabout designs for the Fontaine/Lamprey intersection are attached. Please refer to the report section for details.

* * * * *

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

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

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

JCH:KDF:bjwb

Enclosures: Tables 1, 3, 4, and 5
Appendix Tables 1-3
Figures 1-15
Traffic Count Reports
Level of Service Reports
Roundabout Design Report
Future Multi-Lane Design Exhibits

Table 1
Lorson Ranch Subdivision Status
Relative to Dwelling Unit Cap

Subdivision	Plats Already Recorded OR Planned for Recording in the Short Term	Recorded Plats	Number of Building Permits Issued
Townhomes	46	46	46
Pioneer Landing Filing #1	118	118	118
Ponderosa Filings #1 & #2	204	204	204
Allegiant	97	97	97
Meadows Filing #2	109	109	109
Meadows Filing #1	97	97	97
Meadows Filing #3	138	138	138
Meadows Filing #4	236	236	186
Buffalo Crossing	204	204	204
Pioneer Landing Filing #2	158	158	158
Pioneer Landing Filing #3	12	0	0
Subtotal	1,419	1,407	1,357
Phase 1 of Lorson Ranch East	331	0	0
Total	1,750	1,407	1,357
Current Dwelling Unit Cap			1,750

** Future - Lorson East plats have not been submitted. This is at the preliminary plan approval stage.

Table 3
Trip Generation Estimate
Lorson Ranch East

Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates [1] Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Total Trips Generated Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Internal Trips (%)	Internal Trips [3] (With Long-Term Buildout of Lorson Ranch) Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Total External Trips Generated Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out
Trip Generation Estimate Based on ITE Average Rates																							
Phase 1																							
210	Single-Family Detached Housing	331 DU[2]	9.52	0.19	0.56	0.63	0.37	3,151	62	186	209	122	0%	0	0	0	0	0	3,151	62	186	209	122
Buildout																							
210	Single-Family Detached Housing	826 DU	9.52	0.19	0.56	0.63	0.37	7,864	155	465	520	306	14%	1,090	22	46	52	26	6,774	133	419	468	280
520	Elementary School	500 Students	1.29	0.25	0.20	0.07	0.08	645	124	101	37	38	75%	484	93	51	19	29	161	31	50	18	9
522	Middle School/Junior High School	500 Students	1.62	0.30	0.24	0.08	0.08	810	149	122	39	41	75%	608	112	61	20	31	202	37	61	19	10
								9,319	**427**	**687**	**596**	**385**		**2,182**	**227**	**158**	**91**	**86**	**7,137**	**200**	**530**	**505**	**299**
Trip Generation Estimate Based on ITE Fitted Curve Rates [4]																							
210	Single-Family Detached Housing	826 DU	8.04	0.18	0.53	0.47	0.28	6,645	145	436	392	230	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

Notes:

(1) Source: "*Trip Generation, 9th Edition, 2012*" by the Institute of Transportation Engineers (ITE)

(2) DU = dwelling unit

(3) See Appendix Table 2 for details on the internal trip assumptions

(4) See Appendix Table 3 for details on the fitted curve rates used

Source: LSC Transportation Consultants, Inc.

Table 4
Lorson/Marksheffel Future Traffic Signal Contributions
Lorson Ranch East

Development	Westbound Left-Turn Volume			Signal Contribution	
	AM	PM	AM+PM	%	$
Carriage Meadows South at Lorson Ranch Filing No. 1	65	43	108	38.4%	$115,302
Future Townhomes SE Carriage Meadows/Fontaine (Tract O)	11	5	16	5.7%	$17,082
South Retail (Tract N)	3	9	12	4.3%	$12,811
Lorson Ranch East Phase 1	**53**	**35**	**88**	**31.3%**	**$93,950**
Lorson Ranch East Future Phases	**34**	**23**	**57**	**20.3%**	**$60,854**
	166	**115**	**281**		**$300,000**

Source: LSC Transportation Consultants, Inc.

Table 5
Lorson Ranch East
Roadway Improvements

Improvement	Timing	Responsibility
Fontaine Boulevard		
Extend Fontaine Boulevard from Old Glory/Stingray to the proposed access point for the school site (approximately 1,335 feet east of Lamprey Dr.) as an interim Urban Non-Residential Collector.	Phase 1 or as needed based on the future school site plan to provide access to the school	Lorson Ranch East
Extend Fontaine Boulevard from the school site access to the east border of Lorson Ranch East (Rockcastle Drive) as an interim Urban Non-Residential Collector.	Phase 2	Lorson Ranch East
Extend Fontaine Boulevard from Rockcastle Drive to the future east boundary of Lorson Ranch (location of future extension of Meridian Road).	Assumed by 2040	Future Lorson Ranch Development
Upgrade Fontaine Boulevard to a 4-Lane Principal Arterial.	Beyond 2040	By others – TBD – MTCP Master Planned 2060
Construct one-lane modern roundabout at the intersection of Fontaine/Lamprey	Phase 1	Lorson Ranch East
Replace one-lane roundabout at the intersection of Fontaine/ Lamprey with a traffic signal or expand to two-lane roundabout with upgrade of Fontaine Boulevard to a 4-Lane Principal Arterial.	Beyond 2040	By others – TBD – With the master-planned upgrade to a 4-lane Principal Arterial.
Provide a center two-way left-turn lane on Fontaine Boulevard to accommodate left-turn movements – width will be provided within the interim Non-Residential Collector cross section; incorporate eastbound right-turn deceleration lanes where indicated in this report into the design and construction of the Fontaine Boulevard interim Non-Residential Collector street.	Phase 1 from Old Glory/Stingray to Lamine Dr/ Phase 2 from Lamine Dr to Rockcastle Dr	Lorson Ranch East
Lorson Boulevard		
Construct Lorson Boulevard from Marksheffel Road to east boundary of Carriage Meadows South.	Short Term	Carriage Meadows South
Construct Lorson Boulevard as a modified Urban Non- Residential Collector (64- to 72-foot-wide right-of-way) from Stingray Lane to Willapa Drive.	Phase 1	Lorson Ranch East
Construct Lorson Boulevard as an Urban Non-Residential Collector Classification (80-foot-wide right-of-way) with modified street cross section per Deviation #DEV-17-008 from Carriage Meadows South to Stingray Lane.	Phase 2	Lorson Ranch East
Construct Lorson Boulevard as a modified Urban Non- Residential Collector (64- to 72-foot-wide right-of-way from Willapa Drive to Lamprey Drive.	Phase 2	Lorson Ranch East
Incorporate an eastbound right-turn deceleration lane into the design and construction of Lorson Boulevard on the approach to the Lorson Boulevard/Trappe Drive intersection.	Phase 2	Lorson Ranch East
Signalize the intersection of Marksheffel Road/Lorson Boulevard	Once signal warrants are met and the County decides a signal should be installed at the intersection.	See Table 4 for traffic signal escrow percentages/amounts
Lamprey Drive		
Construct Lamprey Drive as an Urban Residential Collector from Fontaine Boulevard to the school site access.	Phase 1	Lorson Ranch East
Construct Lamprey Drive as an Urban Residential Collector from Lorson Boulevard to Fontaine Boulevard	Phase 2	Lorson Ranch East
Construct Lamprey Drive as an Urban Residential Collector from the school site access to Yamhill Drive.	Phase 2	Lorson Ranch East

Source: LSC Transportation Consultants, Inc.

Appendix Table 1
Lorson Ranch Sketch Plan
Trip Generation Estimate

Traffix Zone	Name	ITE Land Use	ITE Code	Quantity	Unit	Trip Generation Rates[1] Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Raw ITE Trip Generation (Individual Driveway Trips) Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Internal Trips (%)	Internal Trips Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Pass-by[2] (%)	Pass-by Trips Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Total New External Trips Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out
RESIDENTIAL																																
All Residential North of Lorson Boulevard "Between the Creeks"																																
8	Ponderosa	Single-Family Detached Housing	210	102	DU[3]	9.52	0.19	0.56	0.63	0.37	971	19	57	64	38	(5)	135	3	6	6	3	0%	0	0	0	0	0	836	16	51	58	35
9	Ponderosa	Single-Family Detached Housing	210	102	DU	9.52	0.19	0.56	0.63	0.37	971	19	57	64	38	(5)	135	3	6	6	3	0%	0	0	0	0	0	836	16	51	58	35
10	Meadows Fil 1	Single-Family Detached Housing	210	97	DU	9.52	0.19	0.56	0.63	0.37	923	18	55	61	36	(5)	128	3	5	6	3	0%	0	0	0	0	0	795	15	50	55	33
11	Meadows Fil 3	Single-Family Detached Housing	210	51	DU	9.52	0.19	0.56	0.63	0.37	486	10	29	32	19	(5)	67	1	3	3	2	0%	0	0	0	0	0	419	9	26	29	17
12	Meadows Fil 3	Single-Family Detached Housing	210	87	DU	9.52	0.19	0.56	0.63	0.37	828	16	49	55	32	(5)	115	2	5	6	3	0%	0	0	0	0	0	713	14	44	49	29
3	The Meadows Fil 2	Single-Family Detached Housing	210	109	DU	9.52	0.19	0.56	0.63	0.37	1,038	20	61	69	40	(5)	144	3	6	7	3	0%	0	0	0	0	0	894	17	55	62	37
13	Allegiant Fil 1	Single-Family Detached Housing	210	97	DU	9.52	0.19	0.56	0.63	0.37	923	18	55	61	36	(5)	128	3	5	6	3	0%	0	0	0	0	0	795	15	50	55	33
5	Buffalo Crossing	Single-Family Detached Housing	210	204	DU	9.52	0.19	0.56	0.63	0.37	1,942	38	115	129	75	(5)	269	5	11	13	6	0%	0	0	0	0	0	1,673	33	104	116	69
	Townhomes at Lorson Ranch	Residential Condominium/Townhouse	210	46	DU	5.81	0.07	0.37	0.35	0.17	267	3	17	16	8	(5)	37	1	2	2	1	0%	0	0	0	0	0	230	2	15	14	7
6	Pioneer Landing	Single-Family Detached Housing	210	59	DU	9.52	0.19	0.56	0.63	0.37	562	11	33	37	22	(5)	78	2	3	4	2	0%	0	0	0	0	0	484	9	30	33	20
7	Pioneer Landing	Single-Family Detached Housing	210	59	DU	9.52	0.19	0.56	0.63	0.37	562	11	33	37	22	(5)	78	2	3	4	2	0%	0	0	0	0	0	484	9	30	33	20
15	Meadows Future Fil 4 West	Single-Family Detached Housing	210	110	DU	9.52	0.19	0.56	0.63	0.37	1,047	21	62	69	41	(5)	145	3	6	7	3	0%	0	0	0	0	0	902	18	56	62	38
16	Meadows Future Fil 4 East	Single-Family Detached Housing	210	126	DU	9.52	0.19	0.56	0.63	0.37	1,200	24	71	79	47	(5)	166	3	7	8	4	0%	0	0	0	0	0	1,034	21	64	71	43
18	Ponderosa Future Fil	Single-Family Detached Housing	210	31	DU	9.52	0.19	0.56	0.63	0.37	295	6	17	20	11	(5)	41	1	2	2	1	0%	0	0	0	0	0	254	5	15	18	10
39	Pioneer Landing Fil 2	Single-Family Detached Housing	210	170	DU	9.52	0.19	0.56	0.63	0.37	1,618	32	96	107	63	(5)	224	5	9	11	5	0%	0	0	0	0	0	1,394	27	87	96	58
	Total All Residential "Between the Creeks"			**1,450**	**DU**						**13,633**	**266**	**807**	**900**	**528**													**11,743**	**226**	**728**	**809**	**484**
Residential Adjacent to Marksheffel																																
1	Carriage Meadows North	Single-Family Detached Housing	210	159	DU	9.52	0.19	0.56	0.63	0.37	1,514	30	89	100	59	(5)	210	4	9	10	5	0%	0	0	0	0	0	1,304	26	80	90	54
147	Carriage Meadows South	Residential Condominium/Townhouse	210	72	DU	5.81	0.07	0.37	0.35	0.17	418	5	26	25	12	(5)	58	1	2	3	1	0%	0	0	0	0	0	360	4	24	22	11
47		Single-Family Detached Housing	210	86	DU	9.52	0.19	0.56	0.63	0.37	819	16	48	54	32	(5)	114	2	5	5	3	0%	0	0	0	0	0	705	14	43	49	29
247		Single-Family Detached Housing	210	51	DU	9.52	0.19	0.56	0.63	0.37	486	10	29	32	19	(5)	67	1	3	3	2	0%	0	0	0	0	0	419	9	26	29	17
347		Single-Family Detached Housing	210	97	DU	9.52	0.19	0.56	0.63	0.37	923	18	55	61	36	(5)	128	3	5	6	3	0%	0	0	0	0	0	795	15	50	55	33
	Total All Residential Adjacent to Marksheffel			**465**	**DU**						**4,160**	**79**	**247**	**272**	**158**													**3,583**	**68**	**223**	**245**	**144**
	Total All Residential "Between the Creeks" and Adjacent to Marksheffel			**1,915**	**DU**						**17,793**	**345**	**1,054**	**1,172**	**686**		309	6	13	15	7							**15,326**	**294**	**951**	**1,054**	**628**
Lorson Ranch East																																
42	North of Fontaine	Single-Family Detached Housing	210	277	DU	9.52	0.19	0.56	0.63	0.37	2,637	52	156	175	102	(5)	365	7	15	18	9	0%	0	0	0	0	0	2,272	45	141	157	93
37	East of Lamprey	Single-Family Detached Housing	210	122	DU	9.52	0.19	0.56	0.63	0.37	1,161	23	69	77	45	(5)	161	3	7	8	4	0%	0	0	0	0	0	1,000	20	62	69	41
27	West of Lamprey	Single-Family Detached Housing	210	303	DU	9.52	0.19	0.56	0.63	0.37	2,885	57	170	191	112	(5)	400	8	17	19	10	0%	0	0	0	0	0	2,485	49	153	172	102
127	South of Lorson (West)	Single-Family Detached Housing	210	76	DU	9.52	0.19	0.56	0.63	0.37	724	14	43	48	28	(5)	100	2	4	5	2	0%	0	0	0	0	0	624	12	39	43	26
227	South of Lorson (East)	Single-Family Detached Housing	210	48	DU	9.52	0.19	0.56	0.63	0.37	457	9	27	30	18	(5)	63	1	3	3	2	0%	0	0	0	0	0	394	8	24	27	16
	Total Lorson Ranch East			**826**	**DU**						**7,864**	**155**	**465**	**521**	**305**		**1,090**	**22**	**46**	**52**	**26**							**6,775**	**134**	**419**	**468**	**278**
	Total All Residential "Between the Creeks", Adjacent to Marksheffel & Lorson Ranch East			**2,741**	**DU**						**25,657**	**500**	**1,519**	**1,693**	**991**													**22,101**	**360**	**1,147**	**1,277**	**762**
All Other Future Residential West of the Power Line																																
26	South of Lorson Blvd "Between the Creeks"	Single-Family Detached Housing	210	226	DU	9.52	0.19	0.56	0.63	0.37	2,152	42	127	142	84	(5)	298	6	13	14	7	0%	0	0	0	0	0	1,854	36	114	128	77
126		Single-Family Detached Housing	210	223	DU	9.52	0.19	0.56	0.63	0.37	2,123	42	125	140	83	(5)	294	6	12	14	7	0%	0	0	0	0	0	1,829	36	113	126	76
43	North of Fontaine and South of Lamprey	Single-Family Detached Housing	210	73	DU	9.52	0.19	0.56	0.63	0.37	695	14	41	46	27	(5)	96	2	4	5	2	0%	0	0	0	0	0	599	12	37	41	25
45	North of Fontaine and NE Lamprey/Lorson	Single-Family Detached Housing	210	58	DU	9.52	0.19	0.56	0.63	0.37	552	11	33	37	21	(5)	77	2	3	4	2	0%	0	0	0	0	0	475	9	30	33	19
327	South of Lorson and west of Trappe	Single-Family Detached Housing	210	417	DU	9.52	0.19	0.56	0.63	0.37	3,970	78	235	263	154	(5)	550	11	23	26	13	0%	0	0	0	0	0	3,420	67	212	237	141
	Other Future Residential Between the Power Line			**997**	**DU**						**9,492**	**187**	**561**	**628**	**369**													**8,177**	**160**	**506**	**565**	**338**
	Total from Marksheffel to The Power Line			**3,738**	**DU**						**35,149**	**687**	**2,080**	**2,321**	**1,360**													**23,503**	**454**	**1,457**	**1,619**	**966**
Buildout of Residential Uses (East of the Power Line)																																
30	South of Trappe Dr	Single-Family Detached Housing	210	215	DU	9.52	0.19	0.56	0.63	0.37	2,047	40	121	135	80	(5)	284	6	12	14	7	0%	0	0	0	0	0	1,763	34	109	121	73
35	Southeast of Lorson/Fontaine	Single-Family Detached Housing	210	213	DU	9.52	0.19	0.56	0.63	0.37	2,028	40	120	134	79	(5)	281	6	12	13	7	0%	0	0	0	0	0	1,747	34	108	121	72
36	Southwest of Lorson/Fontaine	Single-Family Detached Housing	210	232	DU	9.52	0.19	0.56	0.63	0.37	2,209	44	131	146	86	(5)	306	6	13	15	7	0%	0	0	0	0	0	1,903	38	118	131	79
44	Northwest Lorson/Fontaine	Single-Family Detached Housing	210	77	DU	9.52	0.19	0.56	0.63	0.37	733	14	43	49	28	(5)	102	2	4	5	2	0%	0	0	0	0	0	631	12	39	44	26
46	Northeast Lorson/Fontaine	Single-Family Detached Housing	210	421	DU	9.52	0.19	0.56	0.63	0.37	4,008	79	237	265	156	(5)	556	11	23	27	13	0%	0	0	0	0	0	3,452	68	214	238	143
136	Between Trappe and Lorson	Single-Family Detached Housing	210	267	DU	9.52	0.19	0.56	0.63	0.37	2,542	50	150	168	99	(5)	352	7	15	17	8	0%	0	0	0	0	0	2,190	43	135	151	91
	Total East of the Power Line			**1,425**	**DU**						**13,567**	**267**	**802**	**897**	**528**													**11,686**	**229**	**723**	**806**	**484**
	Total Residential			**5,163**	**DU**						**48,716**	**954**	**2,882**	**3,218**	**1,888**													**41,964**	**817**	**2,599**	**2,893**	**1,728**
NON-RESIDENTIAL																																
34	K-8 School	Elementary School	520	500	Students	1.29	0.25	0.20	0.07	0.08	645	124	101	37	38	(5)	484	93	51	19	29	0%	0	0	0	0	0	161	31	50	18	9
		Middle School/Junior High School	522	500	Students	1.62	0.30	0.24	0.08	0.08	810	149	122	39	41	(5)	608	112	61	20	31	0%	0	0	0	0	0	202	37	61	19	10
20	North of Fontaine	Shopping Center	820	101	KSF[4]	51.58	0.71	0.44	2.22	2.40	5,209	72	44	224	243	(5)	2,605	36	11	56	121	25%	651	9	9	36	36	1,953	27	24	132	86
22	South of Fontaine	Shopping Center	820	118	KSF	51.58	0.71	0.44	2.22	2.40	6,111	84	52	263	285	(5)	3,055	42	13	66	143	25%	764	10	10	42	42	2,292	32	29	155	100
											12,775	**429**	**319**	**563**	**607**		**6,752**	**283**	**136**	**161**	**324**		**1,415**	**19**	**19**	**78**	**78**	**4,608**	**127**	**164**	**324**	**205**
											61,491	**1,383**	**3,201**	**3,781**	**2,495**													**46,572**	**944**	**2,763**	**3,217**	**1,933**

Notes:
(1) Source: "Trip Generation, 9th Edition, 2012" by the Institute of Transportation Engineers (ITE)
(2) Source: "Trip Generation Handbook - An ITE Proposed Recommended Practice 2nd Edition, June 2004" by ITE
(3) DU = dwelling Unit
(4) KSF = thousand square feet of floor area
(5) See Appendix Table 2 for Internal Trip Percentages

Appendix Table 2
Lorson Ranch Sketch Plan
Internal Trip Estimate

ITE Land Use	ITE Code	Quantity	Unit	Trip Generation Rates[1] Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Raw ITE Trip Generation (Individual Driveway Trips) Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out
Single-Family Detached Housing	210	5,045	DU[2]	9.52	0.19	0.56	0.63	0.37	48,028	946	2,838	3,178	1,867
Residential Condominium/Townhouse	210	118	DU	5.81	0.07	0.37	0.35	0.17	686	9	43	41	20
									48,714	**955**	**2,881**	**3,219**	**1,887**
Elementary School	520	500	Students	1.29	0.25	0.20	0.07	0.08	645	124	101	37	38
Middle School/Junior High School	522	500	Students	1.62	0.30	0.24	0.08	0.08	810	149	122	39	41
								Total School	**1,455**	**273**	**223**	**76**	**79**
Shopping Center	820	219	KSF[3]	51.58	0.71	0.44	2.22	2.40	11,320	156	96	487	528
								Total School and Retail	**12,775**	**429**	**319**	**563**	**607**

	Percent Internal Trips Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Total Internal Trips Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out	Total External Trips Daily	AM Peak Hour In	AM Peak Hour Out	PM Peak Hour In	PM Peak Hour Out
School	2%	12%	7%	2%	2%	1,092	112	205	60	39					
Retail	12%	3%	3%	8%	6%	5,660	24	78	264	122					
Total	14%	14%	10%	10%	9%	**6,752**	**136**	**283**	**324**	**161**	**41,962**	**819**	**2,598**	**2,895**	**1,726**
	75%	75%	50%	50%	75%	484	93	51	19	29	161	31	50	18	9
	75%	75%	50%	50%	75%	608	112	61	20	31	202	37	61	19	10
						1,092	**205**	**112**	**39**	**60**					
	50%	50%	25%	25%	50%	5,660	78	24	122	264	5,659	77	72	365	263
						6,752	**283**	**136**	**161**	**324**					
											47,984	**964**	**2,781**	**3,297**	**2,008**

Notes:
(1) Source: "Trip Generation, 9th Edition, 2012" by the Institute of Transportation Engineers (ITE)
(2) DU = dwelling Unit
(3) KSF = thousand square feet of floor area

Appendix Table 3
Alternate Trip Generation Estimate
Lorson Ranch

Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates [1] Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Total Trips Generated Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out
Trip Generation Estimates Based on Existing Homes within Lorson Ranch												
Based ITE Average Rates												
210	Single-Family Detached Housing	1,083 DU[2]	**9.52**	0.19	0.56	0.63	0.37	10,310	203	609	682	401
Based ITE Fitted Curve Rates												
210	Single-Family Detached Housing	1,083 DU	**8.68**	0.18	0.53	0.52	0.31	9,400	192	576	565	332
Existing Trip Generation Based on Actual Peak-Hour Counts[3]									**190**	**499**	**466**	**236**
Approximation of Current Trip Generation Rates Using ITE Fitted Curve Rates as a Template												
210	Single-Family Detached Housing	937 DU	**8.78**	0.18	0.53	0.53	0.31	8,228	166	499	496	291
Trip Generation for Buildout of the East Area (ITE Fitted Curve Rates)												
210	Single-Family Detached Housing	2,799 DU[4]	**8.04**	0.18	0.53	0.47	0.28	22,518	492	1,477	1,328	780

Notes:

(1) Source: "*Trip Generation, 9th Edition, 2012*" by the Institute of Transportation Engineers (ITE)

(2) DU = dwelling unit

(3) Based on manual turning movement counts at the intersection of Fontaine/Marksheffel by LSC in March 2017

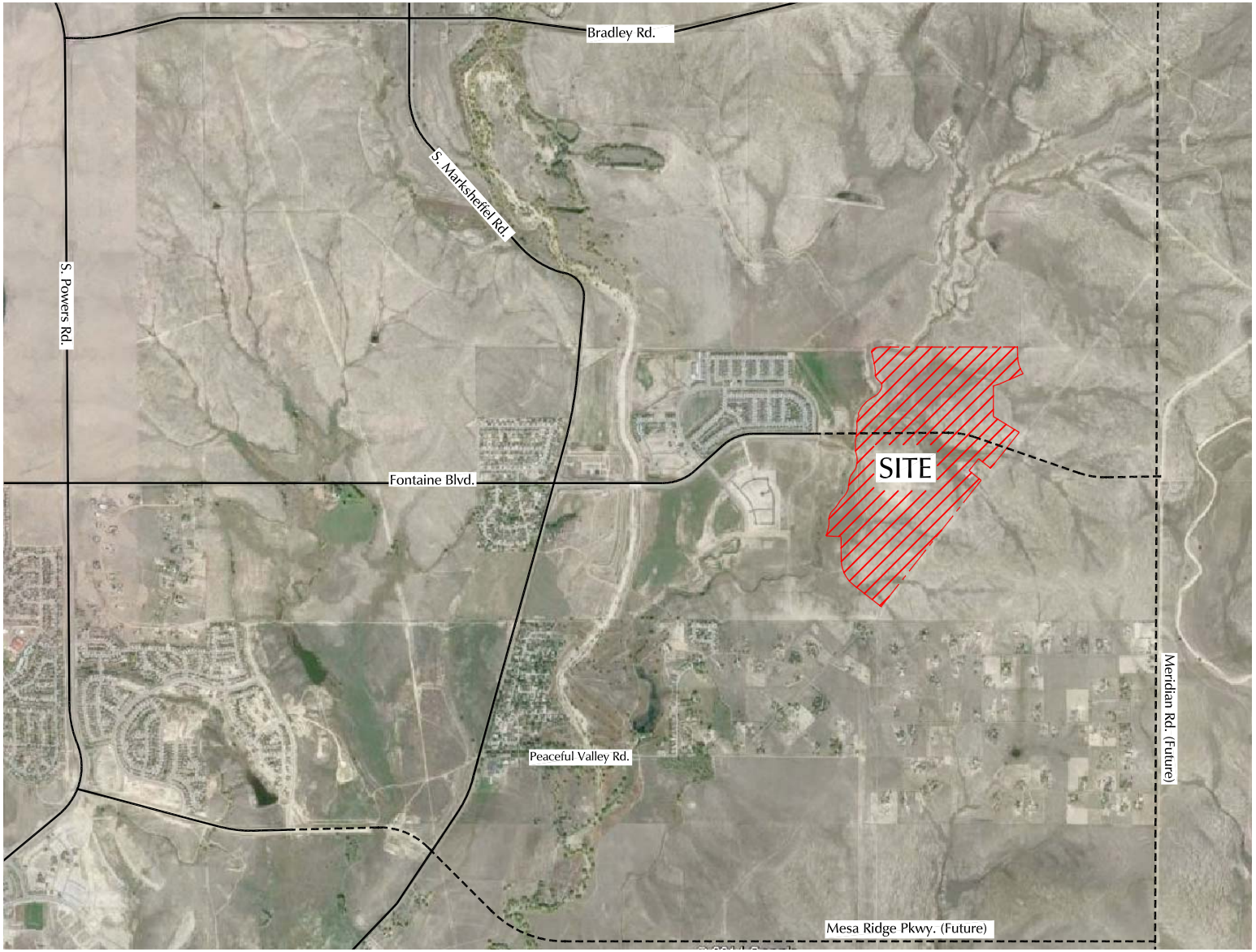
(4) The estimated number of dwelling units at buildout of Lorson Ranch in the area east of the East Tributory which includes the following Traffix Zones shown in Appendix Table 1:

Lorson Ranch East: 826 DU in Traffix Zones 42, 37, 27, 127 and 227

Other Future Residential West of the Power Line: 548 DUs in Traffix Zones 43, 45 and 327 (but **not** the 449 DUs in Traffix Zones 26 and 126 located south of Lorson Blvd "Between The Creeks")

Future Residential East of the Powers Line: 1,425 DUs in Traffix Zones 30, 35, 36, 44, 46 and 136

Source: LSC Transportation Consultants, Inc.



N

Approximate Scale
Scale: 1"= 3,000'

Figure 1

Vicinity Map

Lorson Ranch East (LSC #164360)

LSC TRANSPORTATION CONSULTANTS, INC.

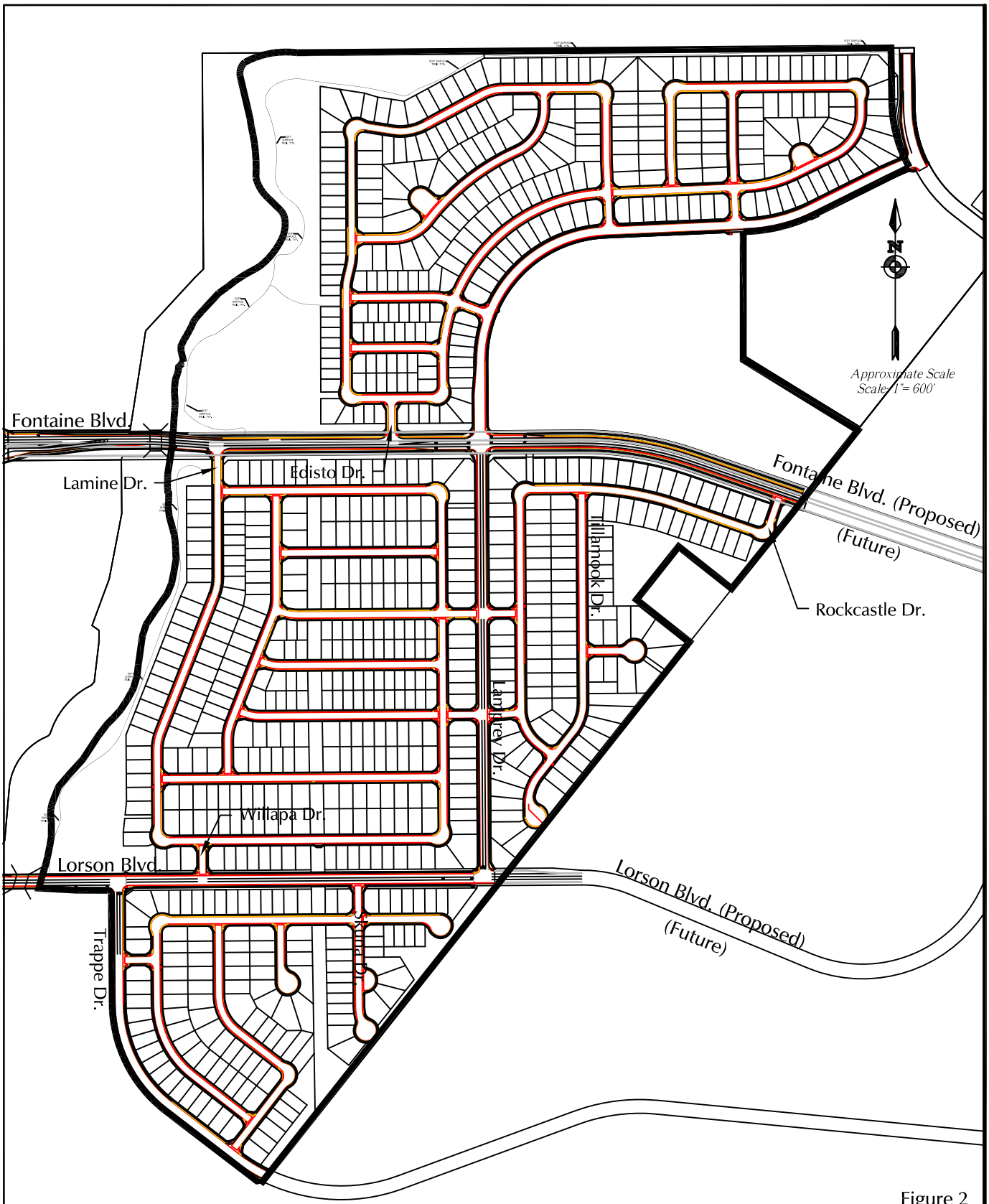


Figure 2

Site Plan

Lorson Ranch East (LSC #164360)

LSC TRANSPORTATION CONSULTANTS, INC.

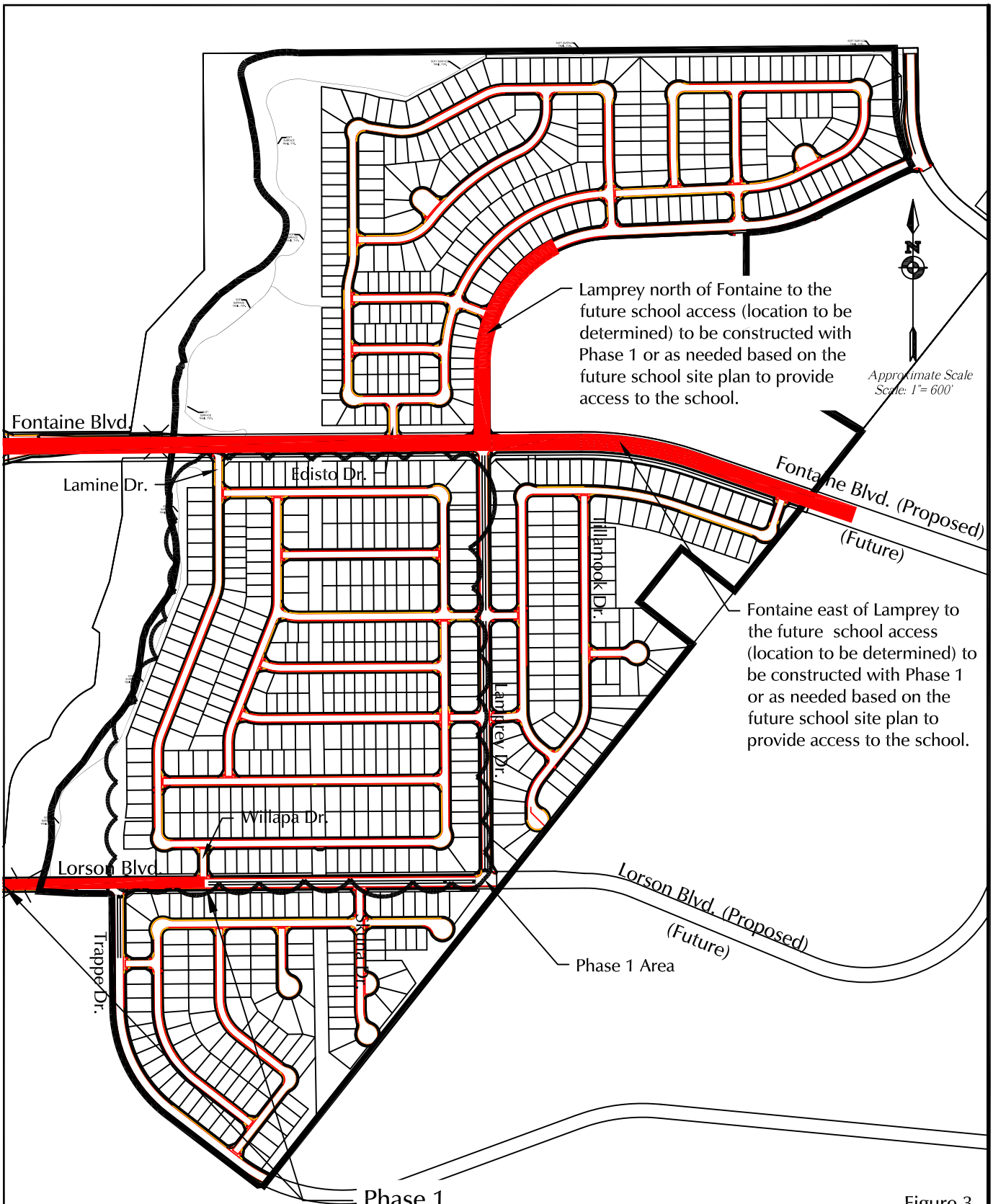


Figure 3

Phasing Plan for Phase 1

Lorson Ranch East (LSC #164360)

LSC TRANSPORTATION CONSULTANTS, INC.

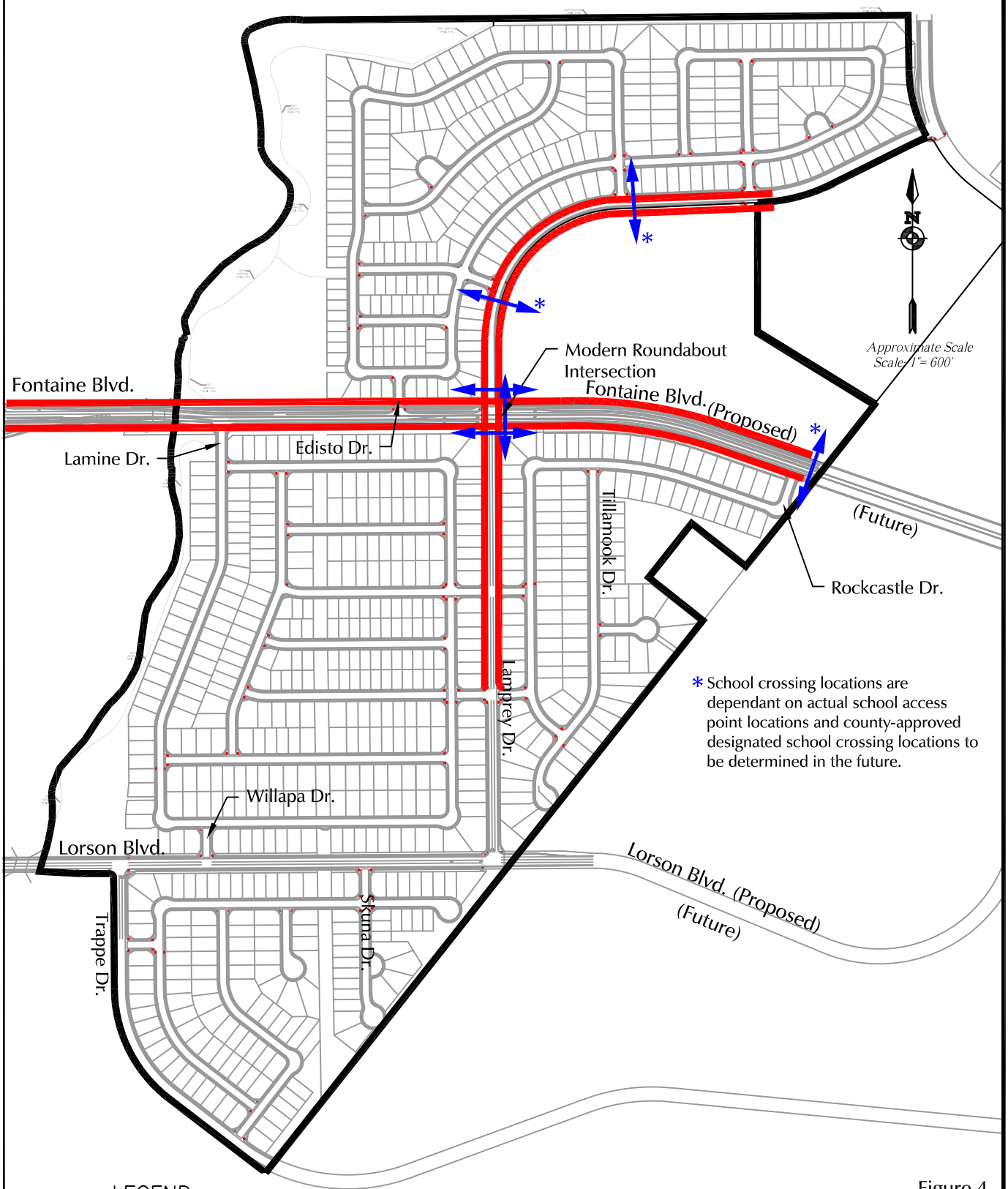
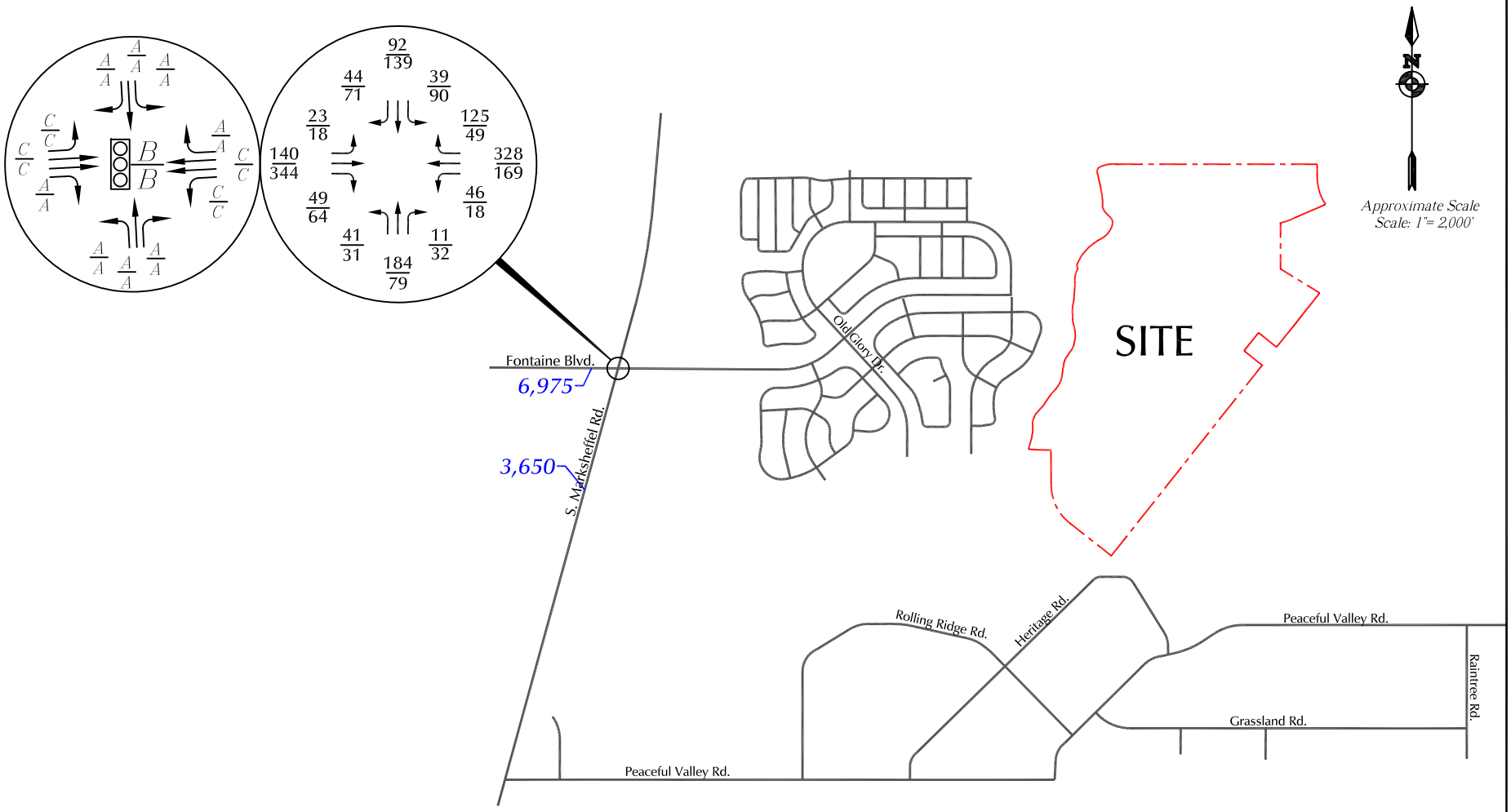


Figure 4

School Pedestrian Crossings

Lorson Ranch East (LSC #164360)

LSC TRANSPORTATION CONSULTANTS, INC.



LEGEND:

$\frac{XX}{XX}$ = $\frac{\text{AM Weekday Peak-Hour Traffic (vehicles per hour)}}{\text{PM Weekday Peak-Hour Traffic (vehicles per hour)}}$ Based on counts by LSC March 2017

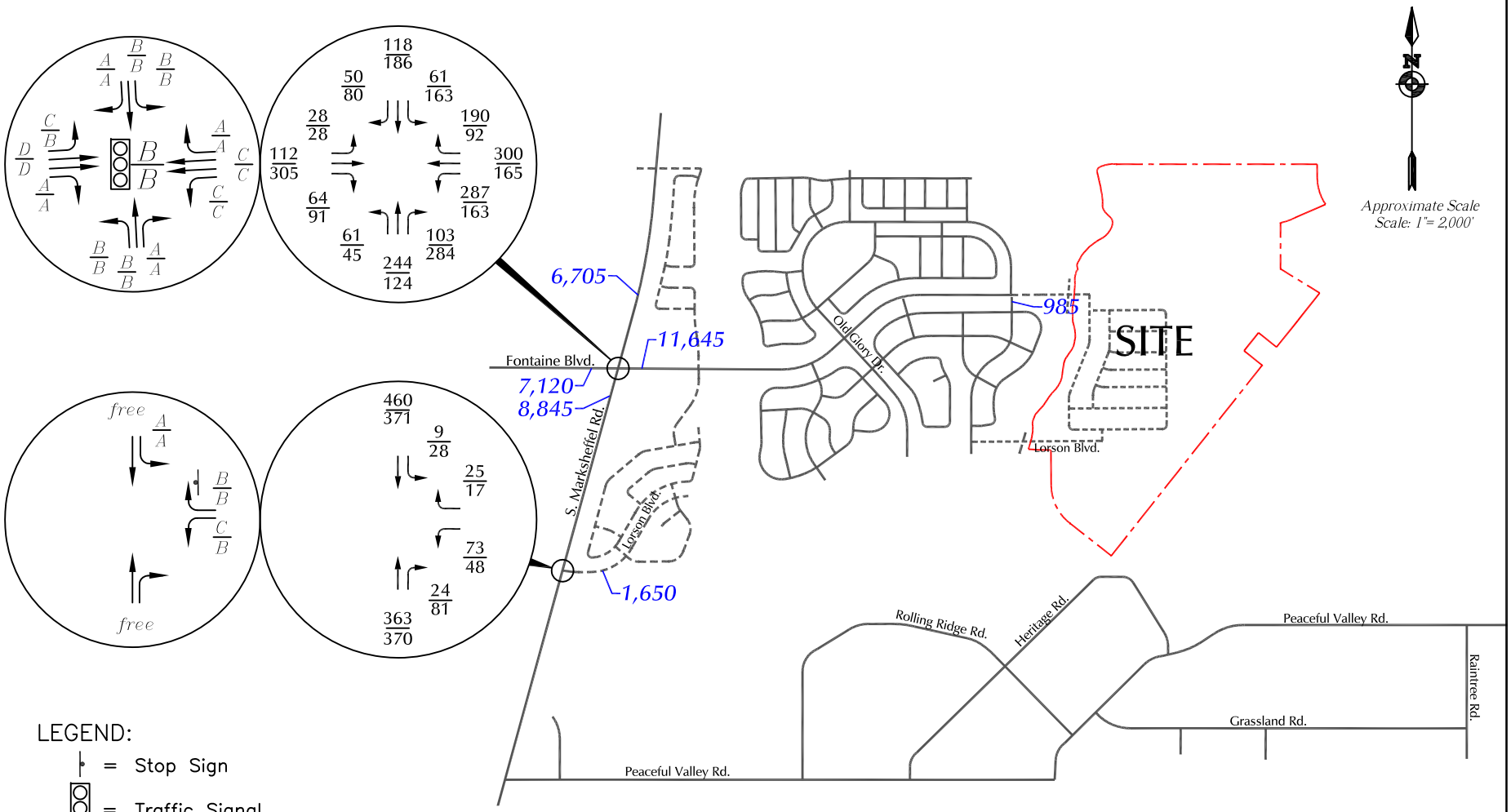
X,XXX = Average Weekday Traffic (vehicles per day)(Estimates by LSC)

TRANSPORTATION CONSULTANTS, INC.

Figure 5

Baseline Traffic Volumes

Lorson Ranch East (LSC #164360)



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

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

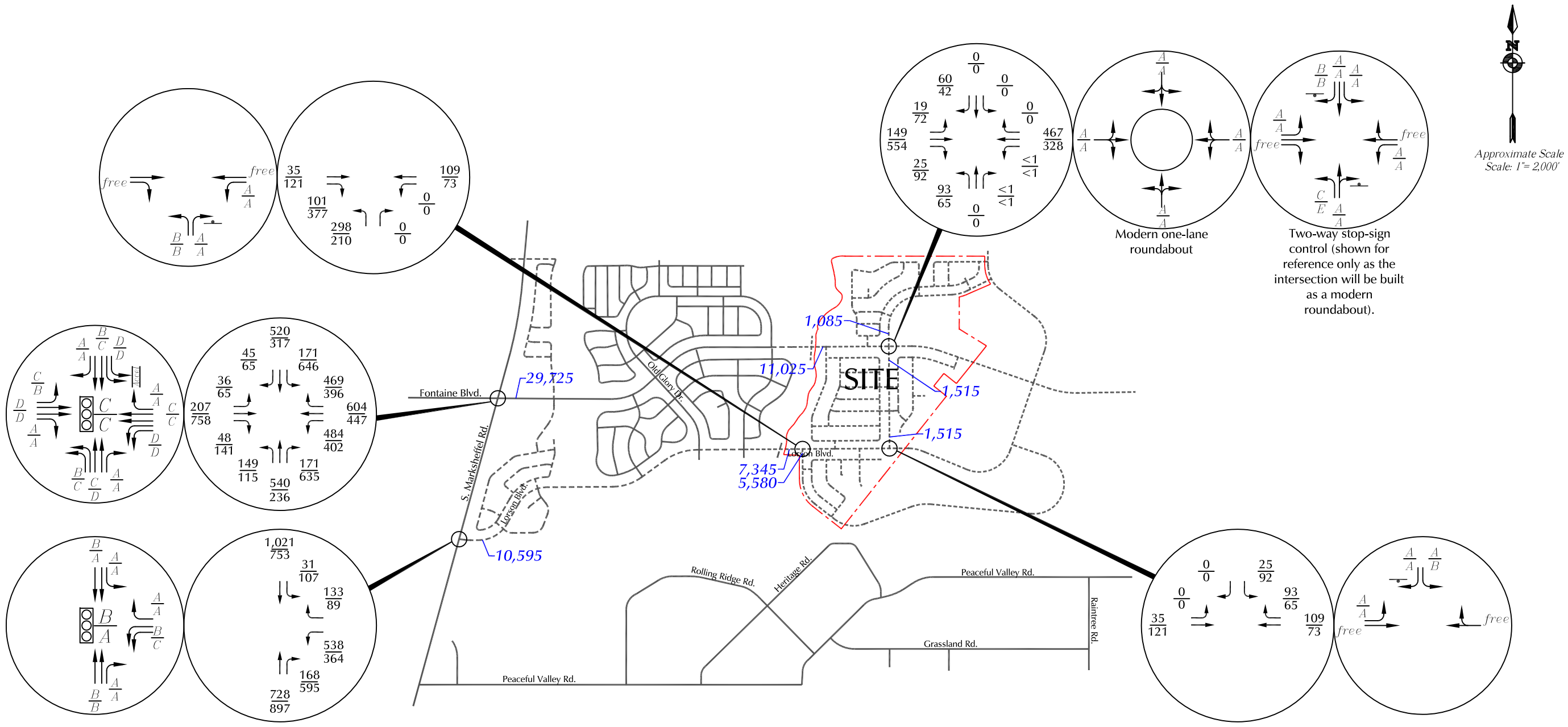
X,XXX = Average Weekday Traffic (vehicles per day)

TRANSPORTATION CONSULTANTS, INC.

Figure 6

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

Lorson Ranch East (LSC #164360)



LEGEND:

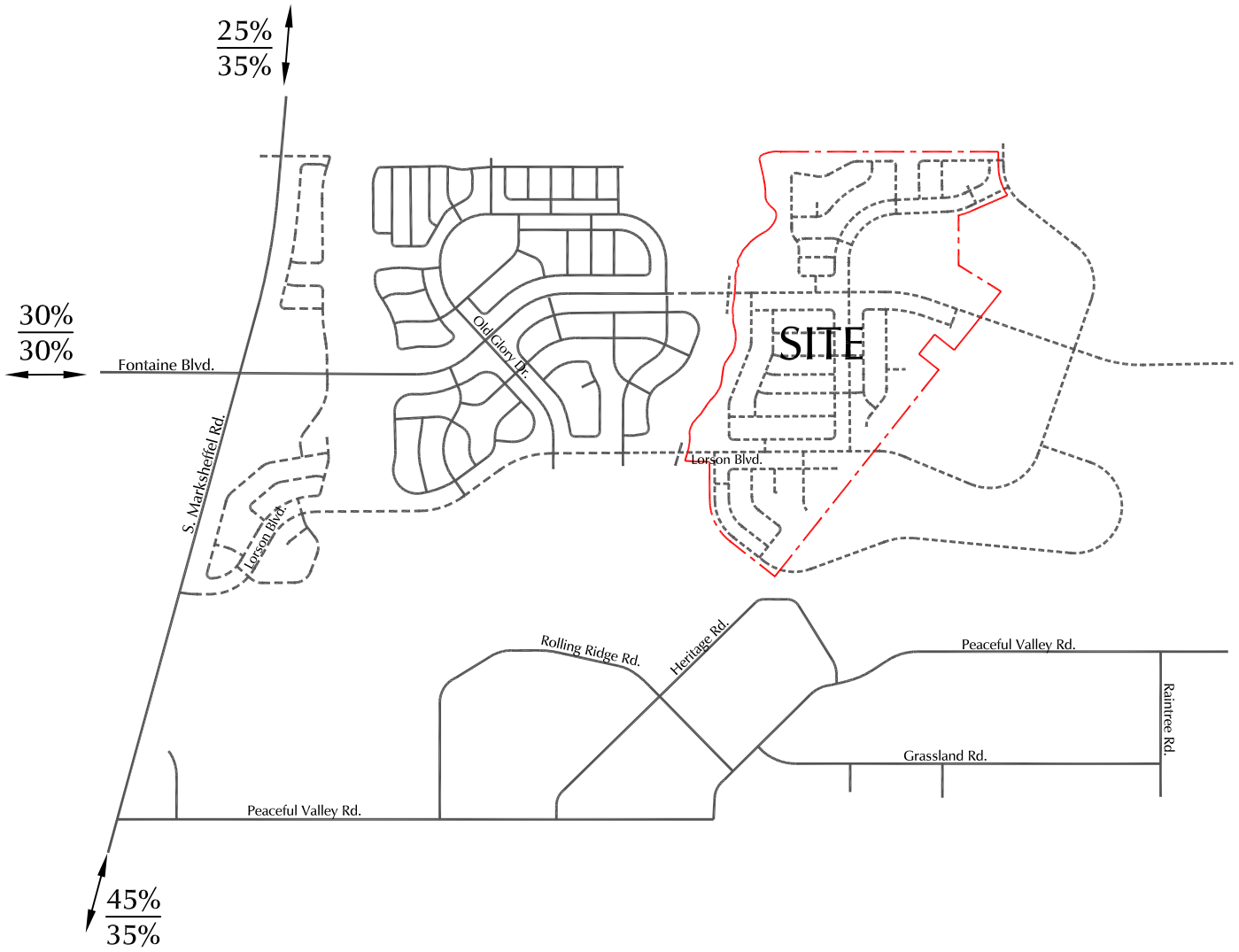
- = Stop Sign
- = Traffic Signal
- = Modern Roundabout
- XX/XX = AM Weekday Peak–Hour Traffic (vehicles per hour) / PM Weekday Peak–Hour Traffic (vehicles per hour)
- A/B = AM Individual Movement Peak–Hour Level of Service / PM Individual Movement Peak–Hour Level of Service
- C/D = AM Entire Intersection Peak–Hour Level of Service / PM Entire Intersection Peak–Hour Level of Service
- X,XXX = Average Weekday Traffic (vehicles per day)

TRANSPORTATION CONSULTANTS, INC.

Figure 7

Year 2040 Background Traffic, Lane Geometry, Traffic Control & Level of Service

Lorson Ranch East (LSC #164360)



LEGEND:

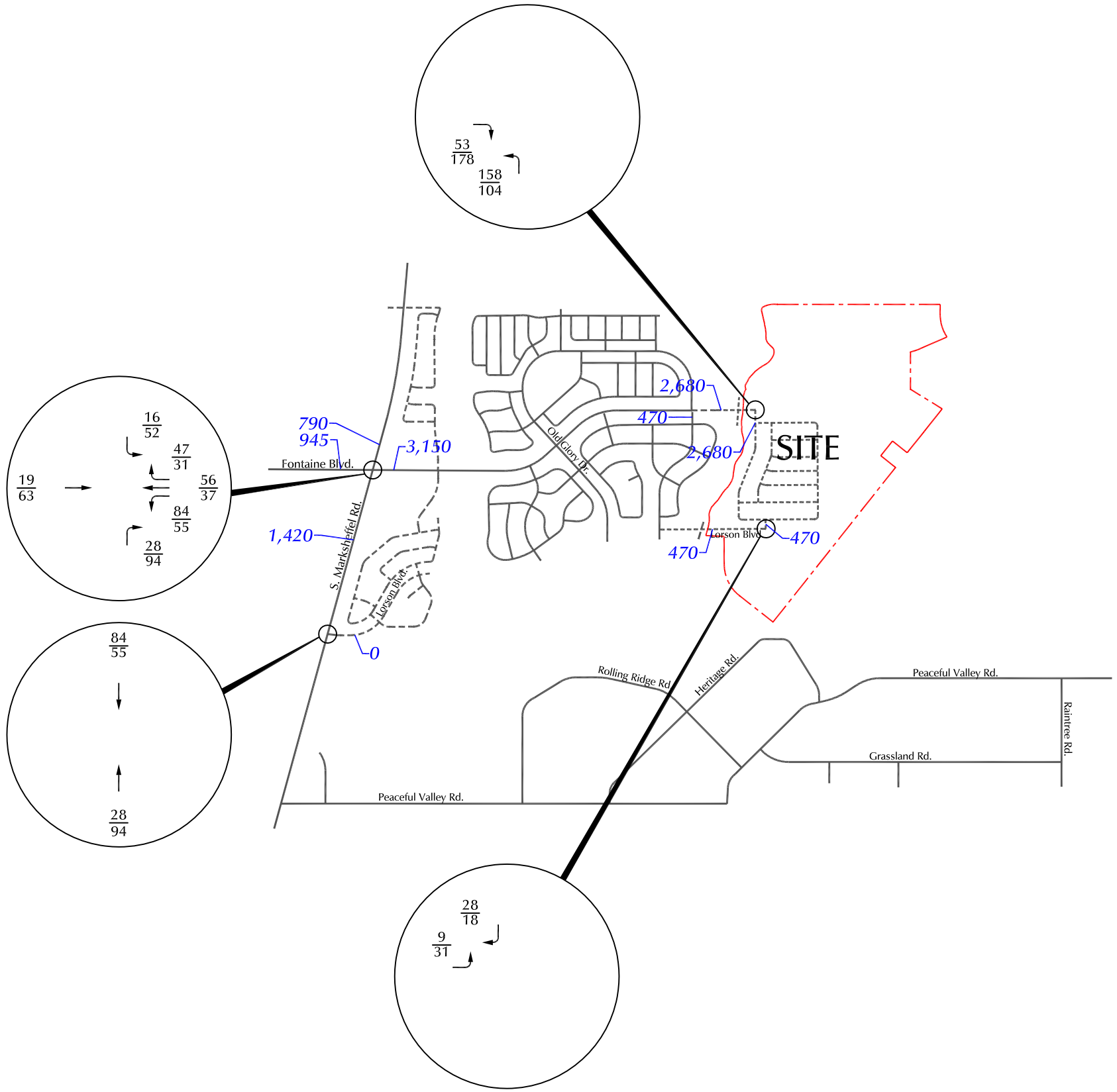
45% / 35% = Residential Percent Directional Distribution / School Percent Directional Distribution

TRANSPORTATION CONSULTANTS, INC.

Figure 8

Directional Distribution of Site-Generated Traffic

Lorson Ranch East (LSC #164360)



Approximate Scale
Scale: 1"= 2,000'

LEGEND:

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

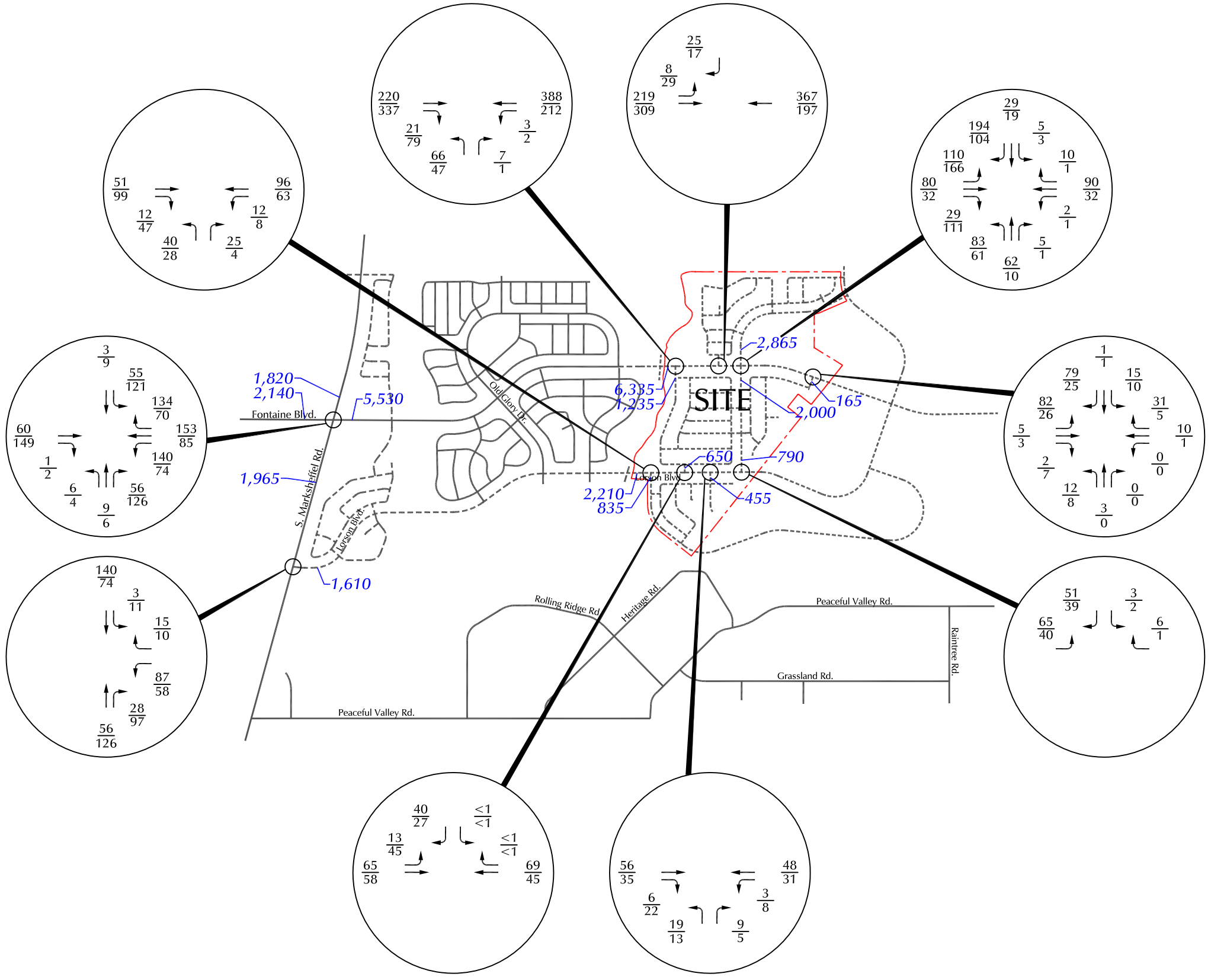
X,XXX = Average Weekday Traffic (vehicles per day)

TRANSPORTATION CONSULTANTS, INC.

Figure 9

Short-Term Assignment of Site-Generated Traffic

Lorson Ranch East (LSC #164360)



LEGEND:

XX/XX = AM Weekday Peak–Hour Traffic (vehicles per hour) / PM Weekday Peak–Hour Traffic (vehicles per hour)

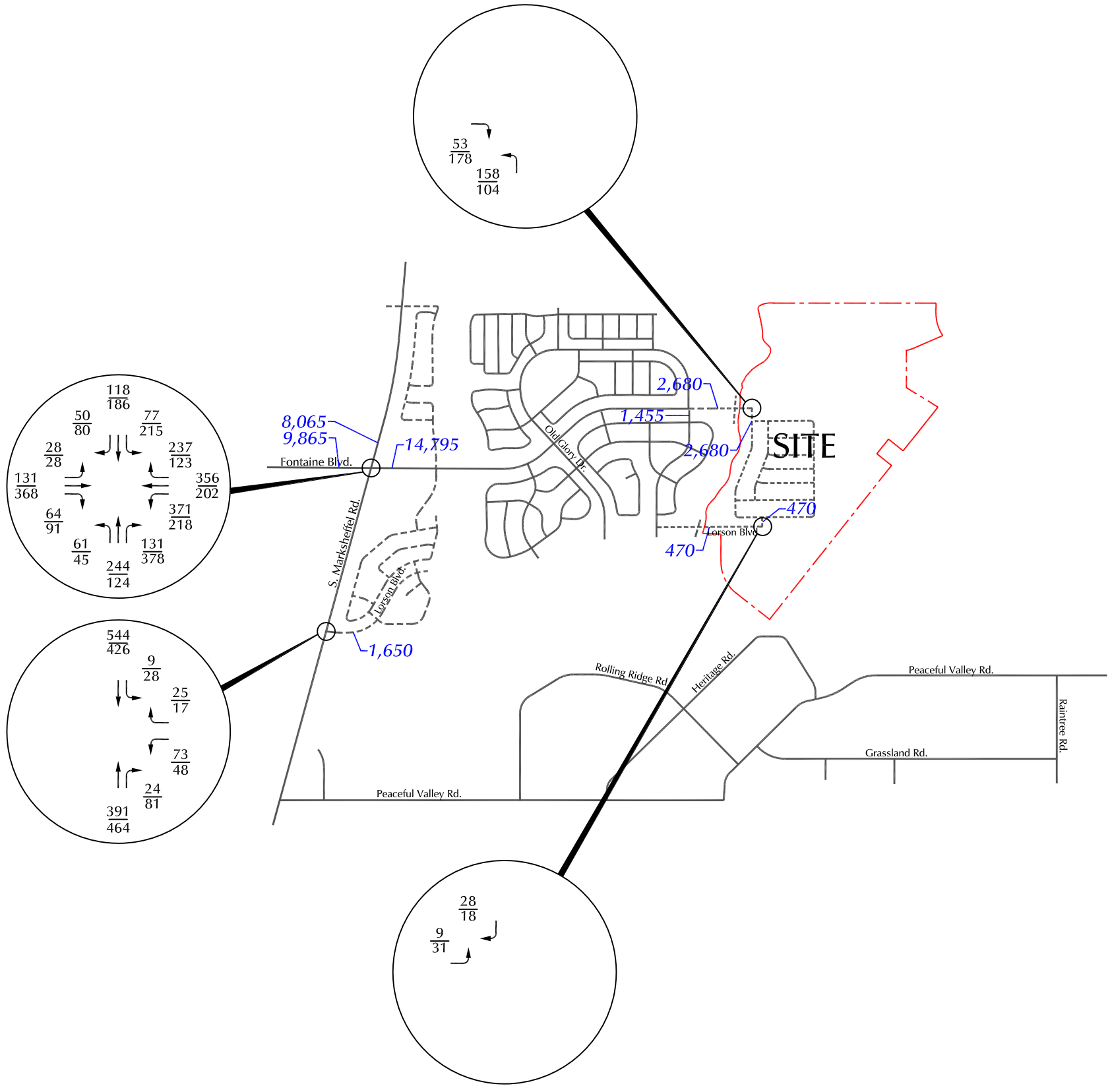
X,XXX = Average Weekday Traffic (vehicles per day)

TRANSPORTATION CONSULTANTS, INC.

Figure 10

Year 2040 Assignment of Site-Generated Traffic

Lorson Ranch East (LSC #164360)



N

Approximate Scale
Scale: 1"= 2,000'

LEGEND:

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

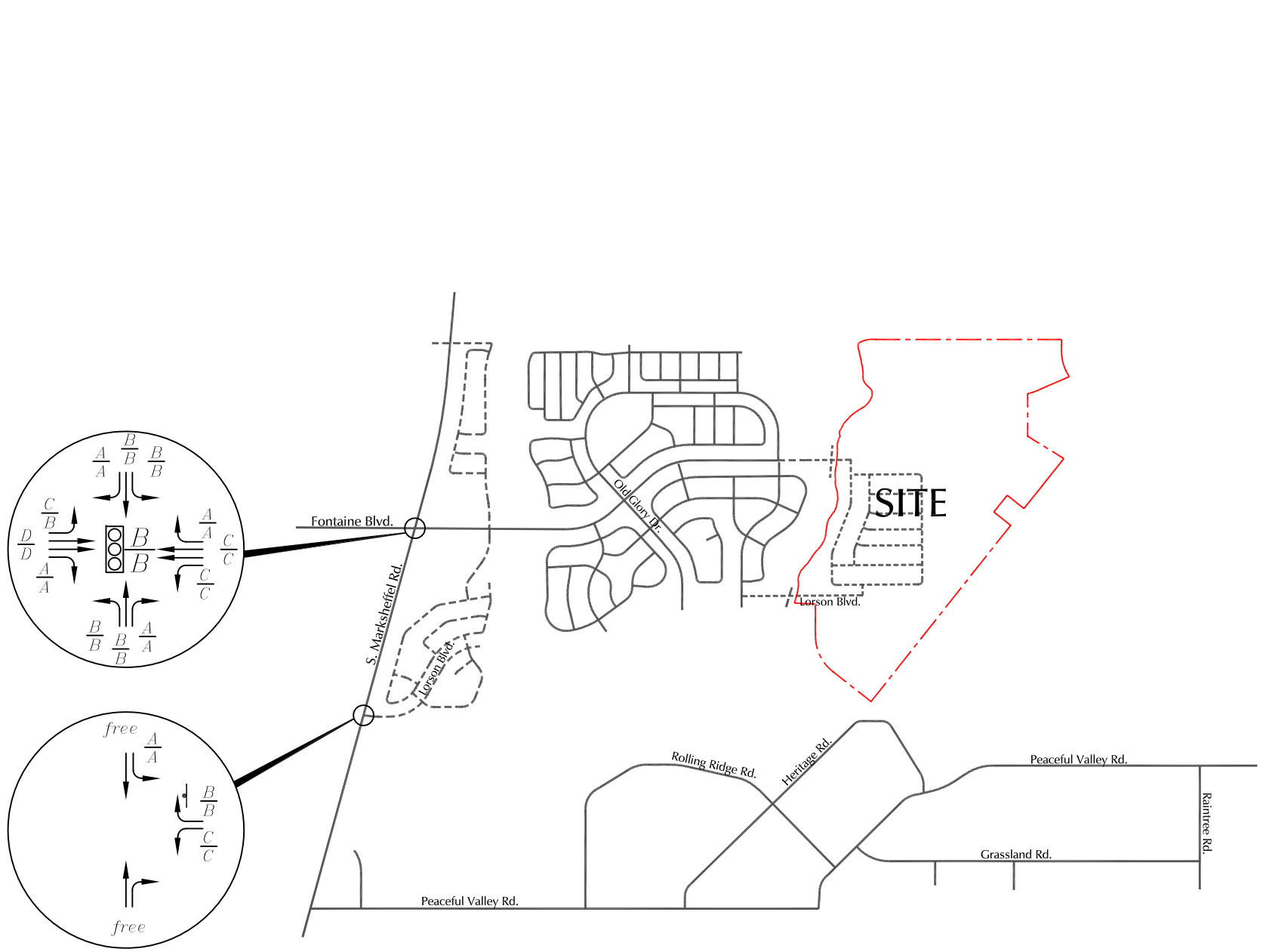
X,XXX = Average Weekday Traffic (vehicles per day)

TRANSPORTATION CONSULTANTS, INC.

Figure 11a

Short-Term Total Traffic

Lorson Ranch East (LSC #164360)



N

Approximate Scale
Scale: 1"= 2,000'

LEGEND:

= Stop Sign

= Traffic Signal

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

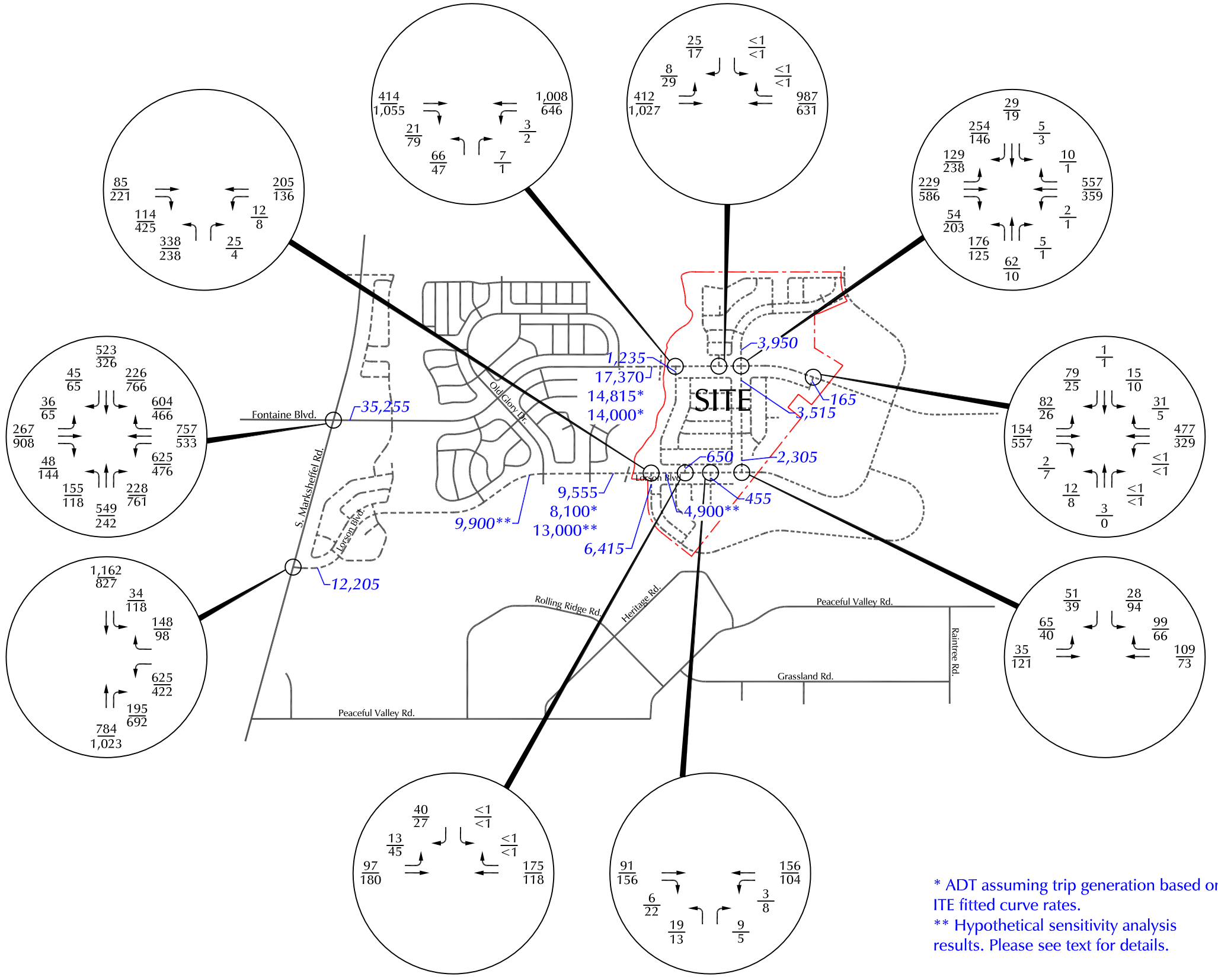
$\frac{C}{D}$ = AM Entire Intersection Peak–Hour Level of Service / PM Entire Intersection Peak–Hour Level of Service

TRANSPORTATION CONSULTANTS, INC.

Figure 11b

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

Lorson Ranch East (LSC #164360)



Approximate Scale
Scale: 1"= 2,000'

* ADT assuming trip generation based on ITE fitted curve rates.
** Hypothetical sensitivity analysis results. Please see text for details.

LEGEND:

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

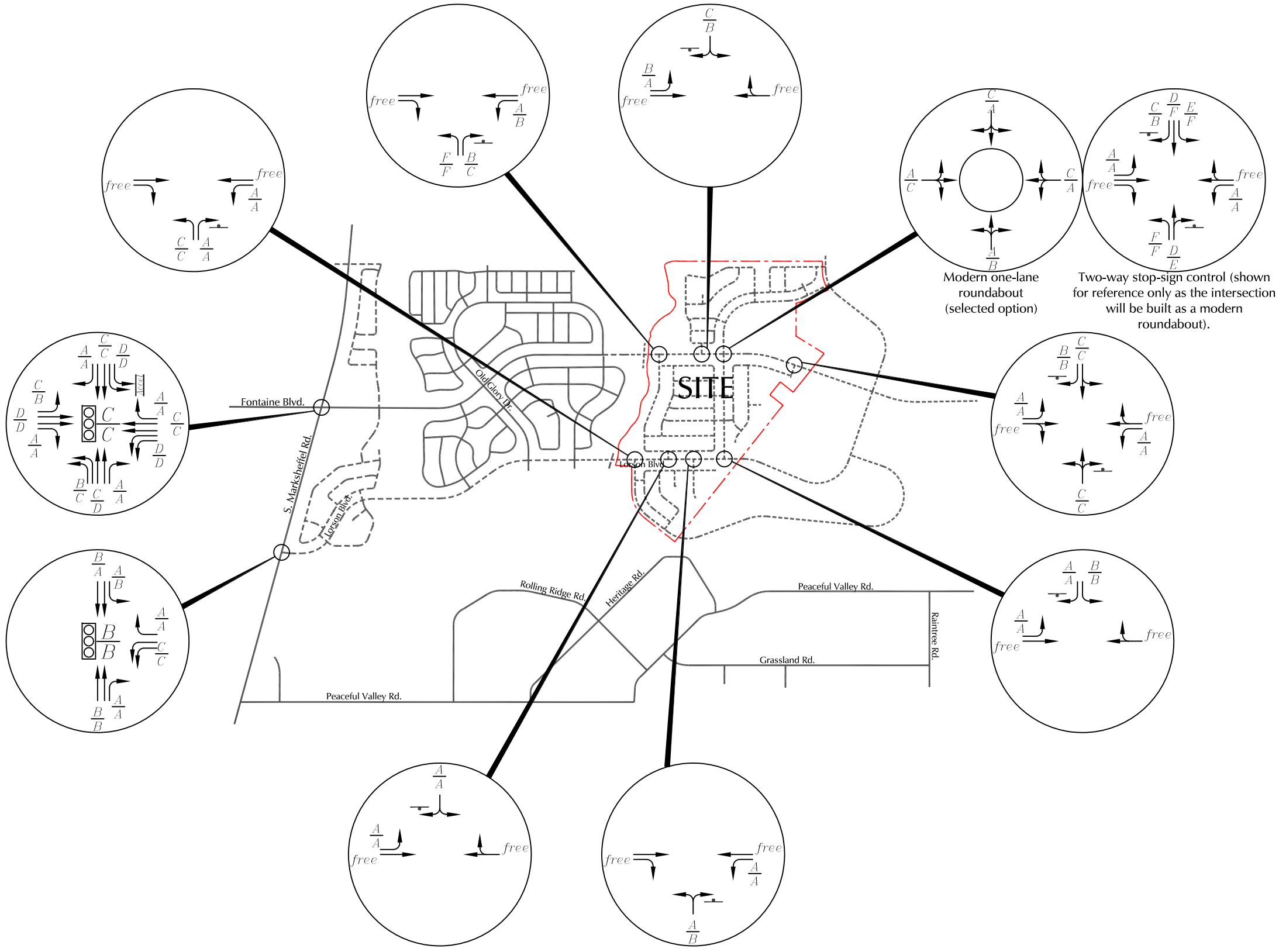
X,XXX = Average Weekday Traffic (vehicles per day)

TRANSPORTATION CONSULTANTS, INC.

Figure 12a

Year 2040 Total Traffic

Lorson Ranch East (LSC #164360)



LEGEND:

= Stop Sign

= Traffic Signal

= Roundabout

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

$\frac{C}{D}$ = AM Entire Intersection Peak–Hour Level of Service / PM Entire Intersection Peak–Hour Level of Service

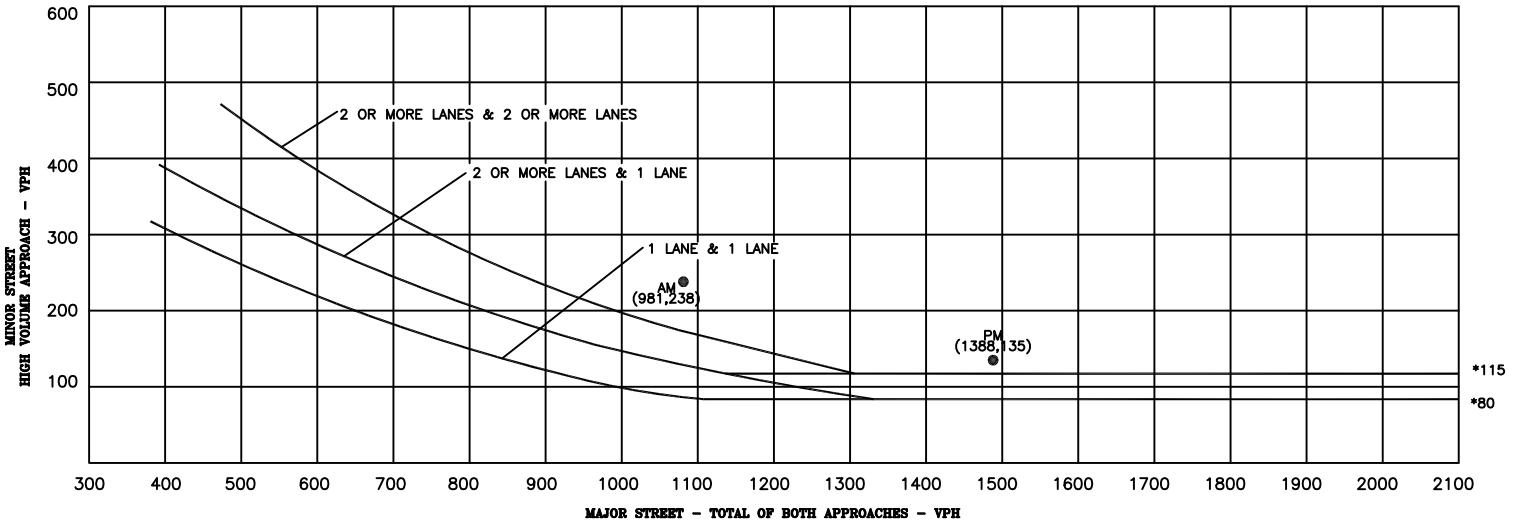
LSC TRANSPORTATION CONSULTANTS, INC.

Figure 12b

Year 2040 Total Lane Geometry, Traffic Control & Level of Service

Lorson Ranch East (LSC #164360)

Fontaine/Lamprey
Figure 4C-1. Warrant 2, Four Hour Vehicular Volume



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

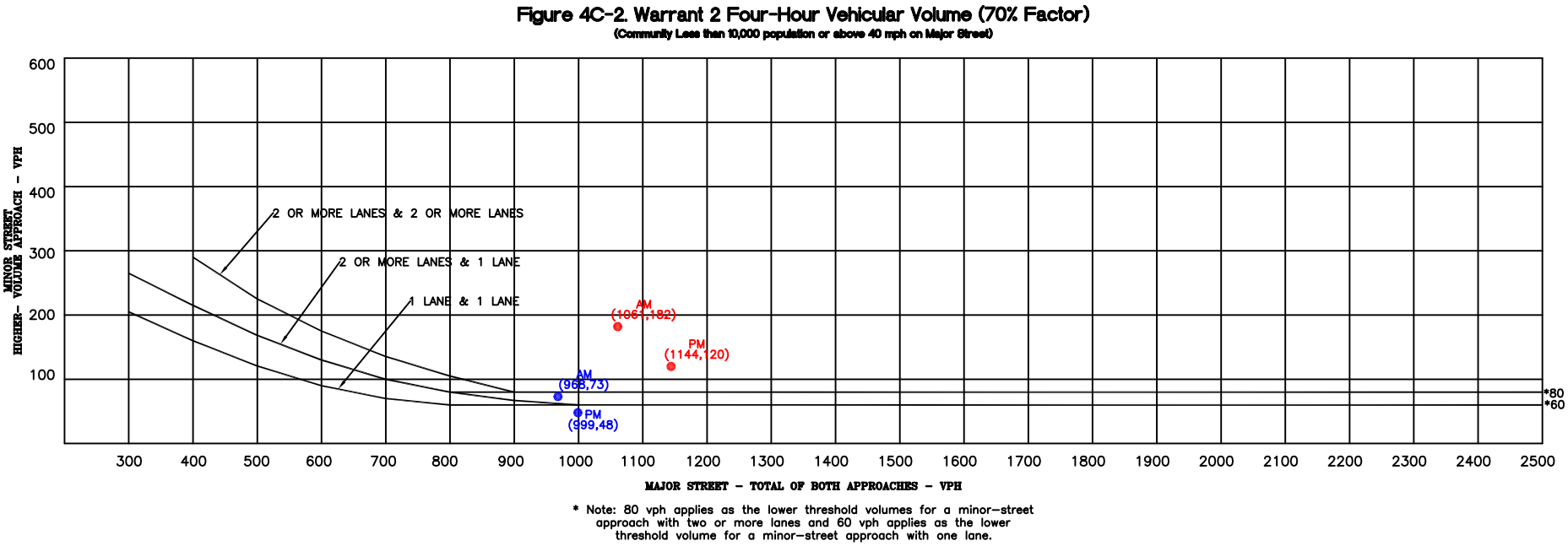
Note: Included for reference only as this intersection will be constructed as a modern roundabout.

Figure 13

Signal Warrant Analysis
Fontaine/Lamprey*

Lorson Ranch East (LSC #164360)

TRANSPORTATION CONSULTANTS, INC.



Short-Term Total Traffic

Intermediate Traffic Volume*

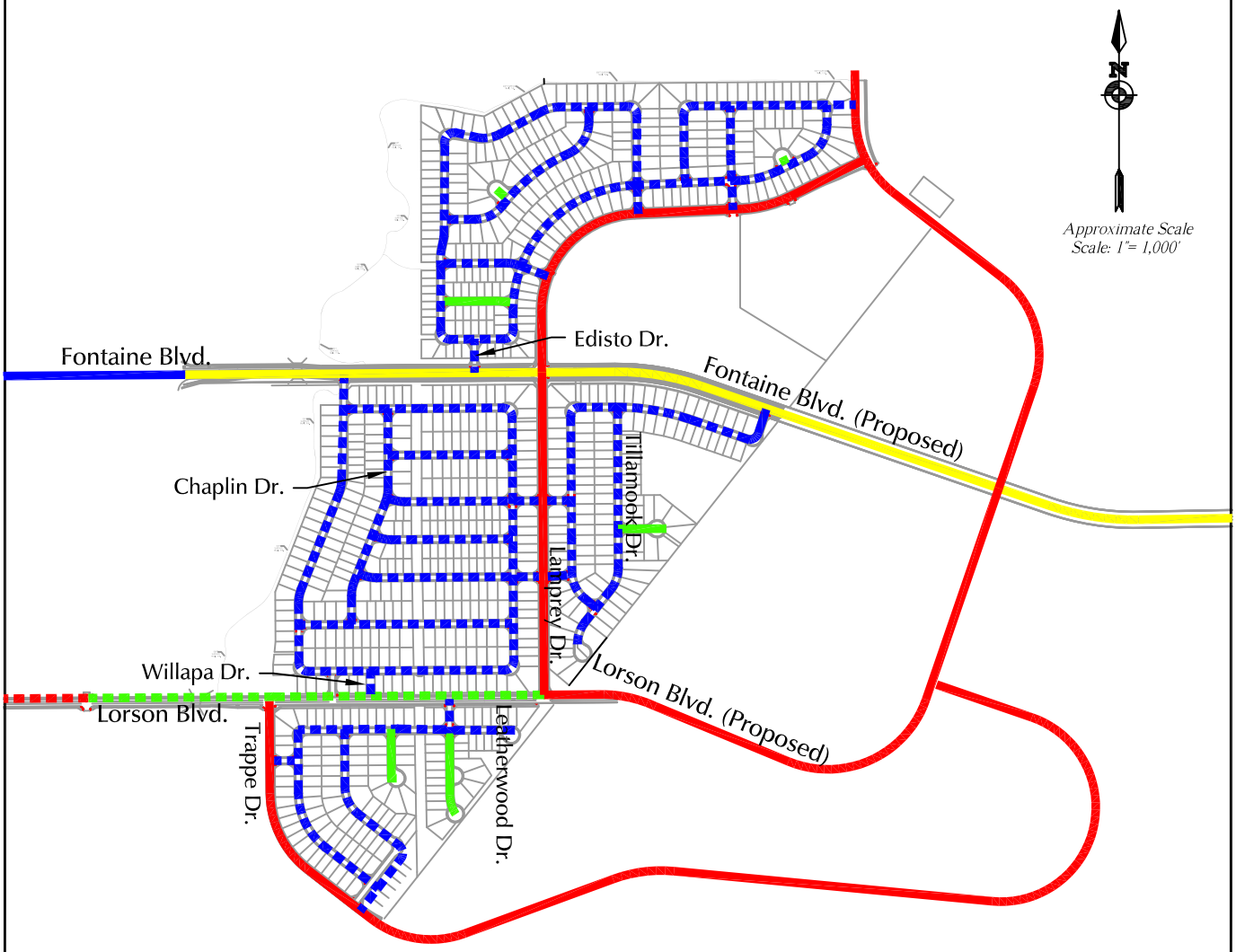
The intermediate traffic volumes are the sum of the short-term background volumes from Figure 6 plus the long term site generated traffic volumes from Figure 10. These volumes do not account for any traffic from existing or approved developments within Lorson Ranch that may use this intersection once Lorson Boulevard is constructed across the main Jimmy Camp Creek channel.

Figure 14

Signal Warrant Analysis Marksheffel/Lorson

Lorson Ranch East (LSC #164360)

TRANSPORTATION CONSULTANTS, INC.



LEGEND:

- = Four–Lane Principal Arterial
- = Four–Lane Principal Arterial (Ultimate Classification) Interim/Lorson Ranch Buildout 2–Lane Urban Non–Residential Collector Street in a 100–foot R.O.W.
- = Urban Local (Low Volume)
- = Urban Local
- = Urban Residential Collector (60' R.O.W.)
- = Urban Non–Residential Collector Classification (80–foot–wide R.O.W.) w/ Modified Street Cross Section per Deviation#DEV–17–008
- = Urban Residential Collector (64' to 72' R.O.W.)

TRANSPORTATION CONSULTANTS, INC.

Figure 15

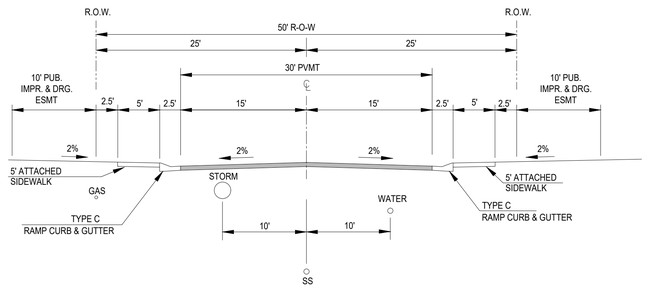
Recommended Classifications

Lorson Ranch East (LSC #164360)

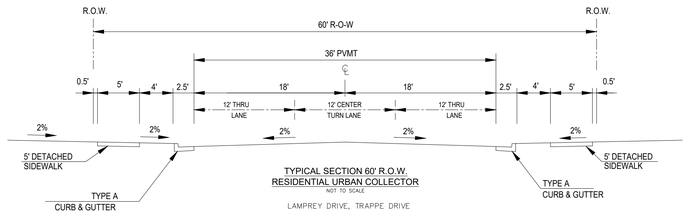
LORSON RANCH

Lorson Ranch East PUD Development & Preliminary Plan

A TRACT OF LAND LOCATED IN A PORTION OF THE SOUTHEAST ONE-QUARTER (SE1/4) OF SECTION 14 A PORTION OF THE SOUTH ONE-HALF (S1/2) OF SECTION 13 A PORTION OF THE NORTH ONE-HALF (N1/2) OF SECTION 24 AND A PORTION OF THE NORTH ONE-HALF (N1/2) OF SECTION 23, TOWNSHIP 15 SOUTH, RANGE 65 WEST OF THE 6TH P.M., EL PASO COUNTY, COLORADO

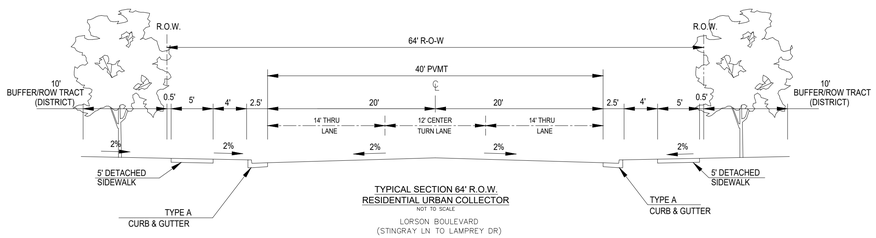


TYPICAL SECTION 50' R.O.W.
RESIDENTIAL URBAN LOCAL
NOT TO SCALE



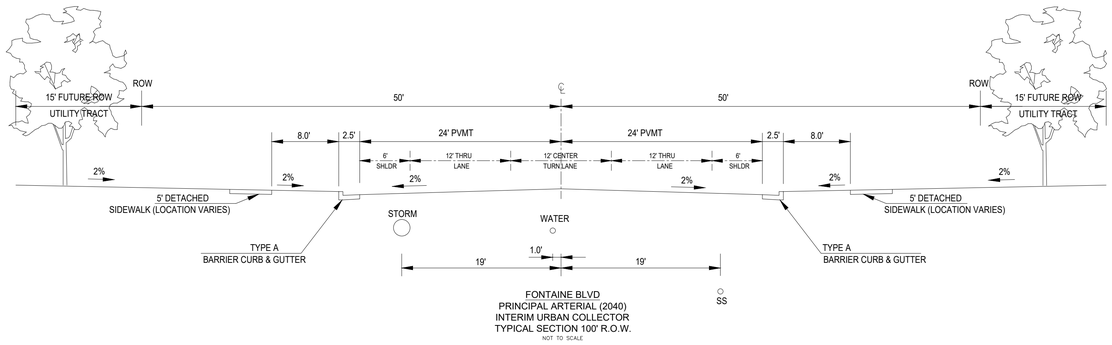
TYPICAL SECTION 60' R.O.W.
RESIDENTIAL URBAN COLLECTOR
NOT TO SCALE

LAMPREY DRIVE, TRAPPE DRIVE

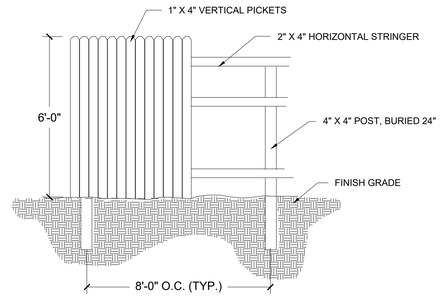


TYPICAL SECTION 64' R.O.W.
RESIDENTIAL URBAN COLLECTOR
NOT TO SCALE

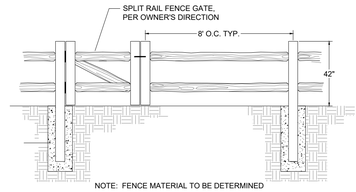
LORSON BOULEVARD
(STINGRAY LN TO LAMPREY DR)



FONTAINE BLVD
PRINCIPAL ARTERIAL (2040)
INTERIM URBAN COLLECTOR
TYPICAL SECTION 100' R.O.W.
NOT TO SCALE

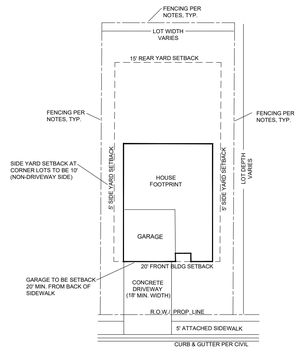


1 6' WOOD SCREEN FENCE
NTS



NOTE: FENCE MATERIAL TO BE DETERMINED

2 SPLIT RAIL FENCE DETAIL
N.T.S.



3 LOT LAYOUT DETAIL
N.T.S.

PCD FILE NO.: PUDSP-16-003

THOMAS THOMAS
Planning
Urban Design
Landscape Architecture
702 North Tejon
Colorado Springs, Colorado 80903
(719) 578-8777

REV #	REVISIONS	DATE	DRAWN	CHECKED	APPROVED
1	RESPONSE TO EPC COMMENTS REV1	7/10/17			
2	RESPONSE TO EPC COMMENTS REV2	11/14/17			
3					
4					
5					
6					

DESIGNED	JRA	10.10.16
DRAWN	JRA	10.10.16
CHECKED	JH	10.10.16
PROJECT NUMBER:		2816.13
SCALE:		AS NOTED

Lorson Ranch East

El Paso County, Colorado

PUD & PRELIMINARY PLAN

LSC Transportation Consultants, Inc.
545 E. Pikes Peak Ave., #210
Colorado Springs, CO 80903
(719) 633-2868

LSC Transportation Consultants, Inc.

File Name : Marksheffel - Fontaine Blvd AM
Site Code : 00164360
Start Date : 03/21/2017
Page No : 1

Groups Printed- Unshifted

	Marksheffel Rd From North				Fontaine Blvd From East				Marksheffel Rd From South				Fontain Blvd From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	8	17	6	0	28	87	8	0	4	63	8	0	10	22	5	0	266
06:45 AM	9	24	9	0	26	104	9	0	1	36	19	0	15	35	3	0	290
Total	17	41	15	0	54	191	17	0	5	99	27	0	25	57	8	0	556
07:00 AM	12	28	13	0	26	78	13	0	3	56	9	0	13	28	5	0	284
07:15 AM	9	16	5	0	43	78	11	0	5	58	7	0	6	36	7	0	281
07:30 AM	14	24	12	0	30	68	13	0	2	34	6	0	15	41	8	0	267
07:45 AM	9	23	13	0	18	48	7	0	2	47	7	0	25	54	3	0	256
Total	44	91	43	0	117	272	44	0	12	195	29	0	59	159	23	0	1088
08:00 AM	12	10	8	0	19	80	6	1	9	24	15	0	8	41	7	0	240
08:15 AM	14	22	5	0	20	80	3	0	1	21	14	0	12	31	3	0	226
Grand Total	87	164	71	0	210	623	70	1	27	339	85	0	104	288	41	0	2110
Apprch %	27.0	50.9	22.0	0.0	23.2	68.9	7.7	0.1	6.0	75.2	18.8	0.0	24.0	66.5	9.5	0.0	
Total %	4.1	7.8	3.4	0.0	10.0	29.5	3.3	0.0	1.3	16.1	4.0	0.0	4.9	13.6	1.9	0.0	

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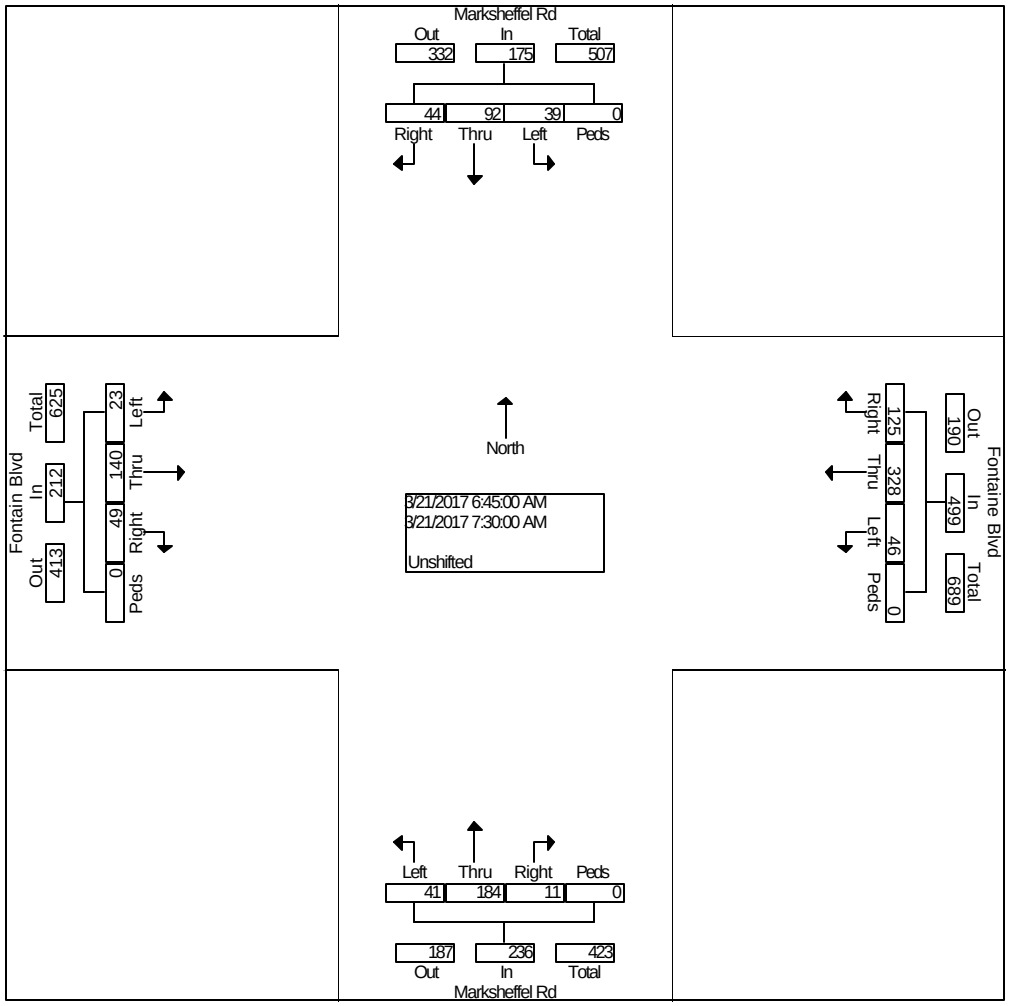
Site Code : 00164360
Start Date : 03/21/2017

	Marksheffel Rd From North					Fontaine Blvd From East					Marksheffel Rd From South					Fontain Blvd From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Intersection	06:45 AM																				
Volume	44	92	39	0	175	125	328	46	0	499	11	184	41	0	236	49	140	23	0	212	1122
Percent	25.1	52.6	22.3	0.0		25.1	65.7	9.2	0.0		4.7	78.0	17.4	0.0		23.1	66.0	10.8	0.0		
06:45 Volume	9	24	9	0	42	26	104	9	0	139	1	36	19	0	56	15	35	3	0	53	290
Peak Factor																					0.967
High Int.	07:00 AM					06:45 AM					07:15 AM					07:30 AM					
Volume	12	28	13	0	53	26	104	9	0	139	5	58	7	0	70	15	41	8	0	64	
Peak Factor					0.825					0.897					0.843					0.828	



LSC Transportation Consultants, Inc.
545 E. Pikes Peak Ave., #210
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(719) 633-2868

LSC Transportation Consultants, Inc.

Job Name : Marksheffel - Fontaine Blvd PM
Site Code : 00164360
Start Date : 03/20/2017
Page No : 1

Groups Printed- Unshifted

	Marksheffel Rd From North				Fontaine Blvd From East				Marksheffel Rd From South				Fontaine Blvd From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	18	25	8	0	6	53	5	0	5	31	5	0	8	61	0	0	225
04:15 PM	13	36	28	0	21	29	8	0	6	32	11	0	12	84	7	0	287
04:30 PM	21	35	14	0	17	38	3	0	8	21	12	0	12	69	6	0	256
04:45 PM	19	39	29	0	10	42	2	0	4	14	7	0	24	91	5	0	286
Total	71	135	79	0	54	162	18	0	23	98	35	0	56	305	18	0	1054
05:00 PM	16	24	19	0	14	38	5	0	8	19	5	0	10	81	5	0	244
05:15 PM	20	51	19	0	18	50	6	0	8	19	10	0	17	84	7	0	309
05:30 PM	16	25	23	0	7	39	5	0	12	27	9	0	13	88	1	0	265
05:45 PM	8	24	14	0	6	45	4	0	7	7	7	0	15	77	2	0	216
Total	60	124	75	0	45	172	20	0	35	72	31	0	55	330	15	0	1034
Grand Total	131	259	154	0	99	334	38	0	58	170	66	0	111	635	33	0	2088
Apprch %	24.1	47.6	28.3	0.0	21.0	70.9	8.1	0.0	19.7	57.8	22.4	0.0	14.2	81.5	4.2	0.0	
Total %	6.3	12.4	7.4	0.0	4.7	16.0	1.8	0.0	2.8	8.1	3.2	0.0	5.3	30.4	1.6	0.0	

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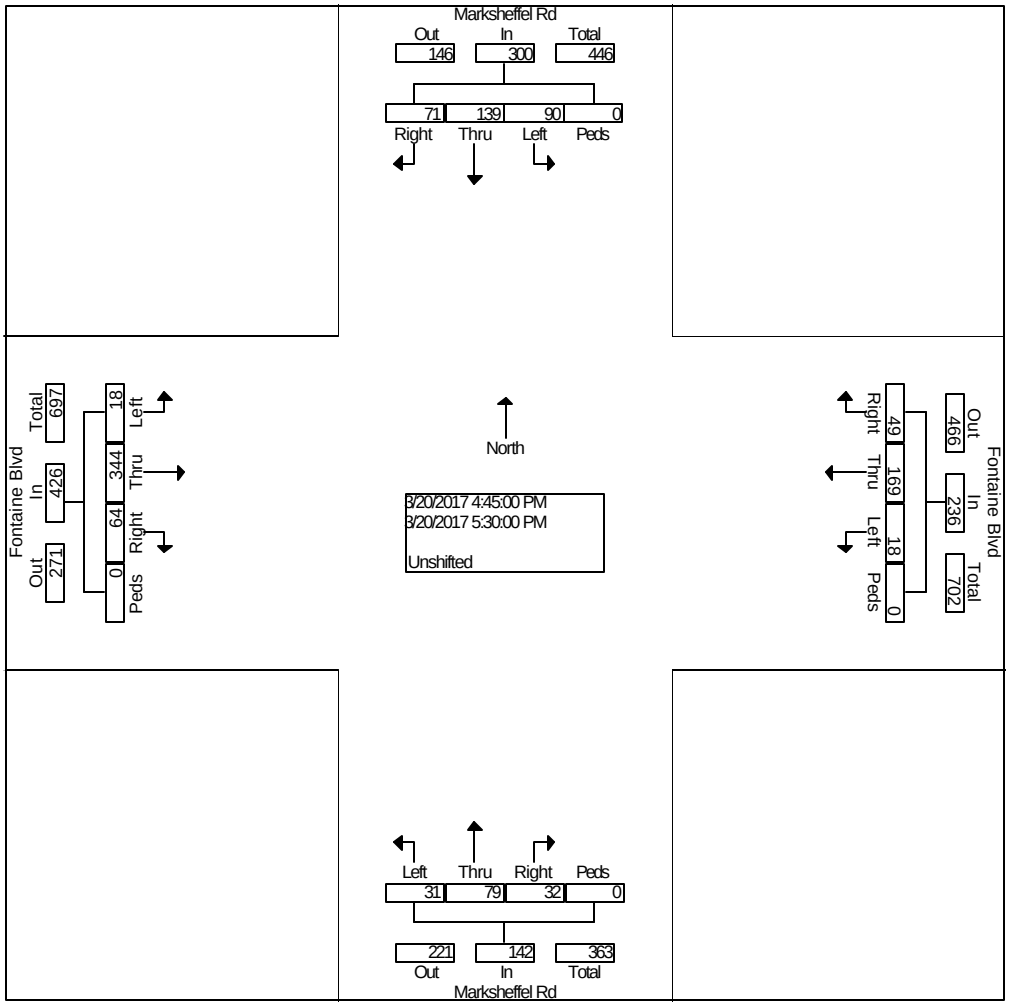
Study Name : Marksheffel - Fontaine Blvd PM
Site Code : 00164360
Start Date : 03/20/2017

	Marksheffel Rd From North					Fontaine Blvd From East					Marksheffel Rd From South					Fontaine Blvd From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:45 PM																				
Volume	71	139	90	0	300	49	169	18	0	236	32	79	31	0	142	64	344	18	0	426	1104
Percent	23.7	46.3	30.0	0.0		20.8	71.6	7.6	0.0		22.5	55.6	21.8	0.0		15.0	80.8	4.2	0.0		
05:15 Volume	20	51	19	0	90	18	50	6	0	74	8	19	10	0	37	17	84	7	0	108	309
Peak Factor																					0.893
High Int.	05:15 PM					05:15 PM					05:30 PM					04:45 PM					
Volume	20	51	19	0	90	18	50	6	0	74	12	27	9	0	48	24	91	5	0	120	
Peak Factor					0.833					0.797					0.740					0.888	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	140	49	46	328	125	41	184	11	39	92	44
Future Volume (vph)	23	140	49	46	328	125	41	184	11	39	92	44
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (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
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	60.0	60.0	60.0	60.0	60.0	60.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
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 Optimize?												
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	14.0	14.0	14.0	14.0	14.0	14.0	55.1	55.1	55.1	55.1	55.1	55.1
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18	0.18	0.70	0.70	0.70	0.70	0.70	0.70
v/c Ratio	0.16	0.22	0.15	0.23	0.58	0.35	0.05	0.14	0.01	0.05	0.07	0.04
Control Delay	29.9	28.4	9.7	30.3	33.7	8.0	4.7	4.9	1.1	4.7	4.6	1.8
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	29.9	28.4	9.7	30.3	33.7	8.0	4.7	4.9	1.1	4.7	4.6	1.8
LOS	C	C	A	C	C	A	A	A	A	A	A	A
Approach Delay		24.2			26.9			4.7			3.9	
Approach LOS		C			C			A			A	

Intersection Summary			
Cycle Length: 90			
Actuated Cycle Length: 79.1			
Natural Cycle: 40			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 18.5		Intersection LOS: B	
Intersection Capacity Utilization 43.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	344	64	18	169	49	31	79	32	90	139	71
Future Volume (vph)	18	344	64	18	169	49	31	79	32	90	139	71
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (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
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	60.0	60.0	60.0	60.0	60.0	60.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
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 Optimize?												
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	13.0	13.0	13.0	13.0	13.0	13.0	55.1	55.1	55.1	55.1	55.1	55.1
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17	0.17	0.71	0.71	0.71	0.71	0.71	0.71
v/c Ratio	0.09	0.59	0.21	0.17	0.36	0.19	0.04	0.06	0.03	0.12	0.13	0.08
Control Delay	28.1	34.3	9.4	30.4	30.4	9.5	4.3	4.3	1.8	4.6	4.4	1.3
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	28.1	34.3	9.4	30.4	30.4	9.5	4.3	4.3	1.8	4.6	4.4	1.3
LOS	C	C	A	C	C	A	A	A	A	A	A	A
Approach Delay		30.3			26.1			3.7			3.7	
Approach LOS		C			C			A			A	

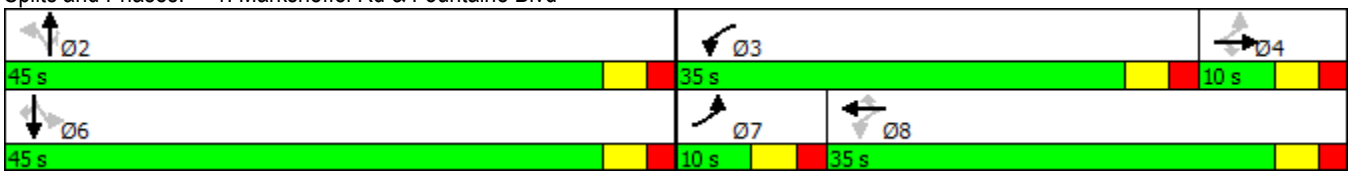
Intersection Summary		
Cycle Length: 90		
Actuated Cycle Length: 78.1		
Natural Cycle: 40		
Control Type: Semi Act-Uncoord		
Maximum v/c Ratio: 0.59		
Intersection Signal Delay: 18.3	Intersection LOS: B	
Intersection Capacity Utilization 38.9%	ICU Level of Service A	
Analysis Period (min) 15		

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	112	64	287	300	190	61	244	103	61	118	50
Future Volume (vph)	28	112	64	287	300	190	61	244	103	61	118	50
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.0	10.0	10.0	9.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	10.0	10.0	10.0	35.0	35.0	35.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	11.1%	11.1%	11.1%	38.9%	38.9%	38.9%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
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 Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	10.0	5.0	5.0	26.6	22.8	22.8	40.1	40.1	40.1	40.1	40.1	40.1
Actuated g/C Ratio	0.13	0.07	0.07	0.35	0.30	0.30	0.52	0.52	0.52	0.52	0.52	0.52
v/c Ratio	0.16	0.53	0.29	0.66	0.32	0.34	0.10	0.27	0.12	0.12	0.13	0.06
Control Delay	20.8	44.8	3.1	26.9	22.8	5.4	11.1	12.0	1.6	11.4	10.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.8	44.8	3.1	26.9	22.8	5.4	11.1	12.0	1.6	11.4	10.9	0.1
LOS	C	D	A	C	C	A	B	B	A	B	B	A
Approach Delay		28.4			20.1			9.2			8.7	
Approach LOS		C			C			A			A	

Intersection Summary		
Cycle Length: 90		
Actuated Cycle Length: 76.7		
Natural Cycle: 40		
Control Type: Semi Act-Uncoord		
Maximum v/c Ratio: 0.66		
Intersection Signal Delay: 16.8	Intersection LOS: B	
Intersection Capacity Utilization 52.8%	ICU Level of Service A	
Analysis Period (min) 15		

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	73	25	363	24	9	460
Future Vol, veh/h	73	25	363	24	9	460
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	79	27	395	26	10	500

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	915	395	0	0	395	0
Stage 1	395	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	303	654	-	-	1164	-
Stage 1	681	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	300	654	-	-	1164	-
Mov Cap-2 Maneuver	425	-	-	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	592	-	-	-	-	-

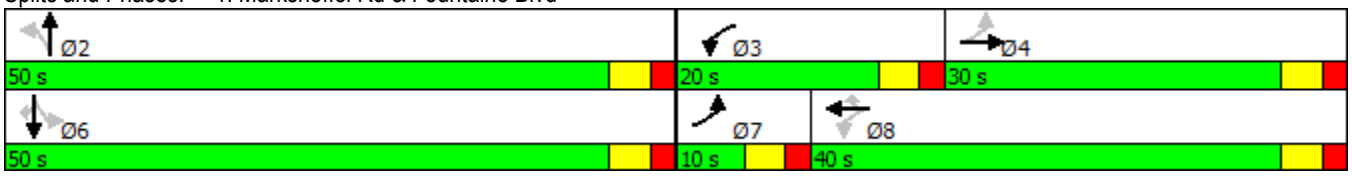
Approach	WB	NB	SB
HCM Control Delay, s	14.2	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	425	654	1164	-
HCM Lane V/C Ratio	-	-	0.187	0.042	0.008	-
HCM Control Delay (s)	-	-	15.4	10.7	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.1	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	305	91	163	165	92	45	124	284	163	186	80
Future Volume (vph)	28	305	91	163	165	92	45	124	284	163	186	80
Turn Type	pm+pt	NA	Free	pm+pt	NA	Perm	Perm	NA	Free	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		Free	8		8	2		Free	6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	5.0		4.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.0	10.0		9.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Total Split (s)	10.0	30.0		20.0	40.0	40.0	50.0	50.0		50.0	50.0	50.0
Total Split (%)	10.0%	30.0%		20.0%	40.0%	40.0%	50.0%	50.0%		50.0%	50.0%	50.0%
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	Max
Act Effct Green (s)	17.6	12.6	85.0	29.8	26.1	26.1	45.1	45.1	85.0	45.1	45.1	45.1
Actuated g/C Ratio	0.21	0.15	1.00	0.35	0.31	0.31	0.53	0.53	1.00	0.53	0.53	0.53
v/c Ratio	0.10	0.59	0.06	0.51	0.19	0.20	0.08	0.13	0.19	0.29	0.23	0.11
Control Delay	19.4	38.9	0.1	24.8	23.1	6.1	11.8	11.7	0.3	13.7	12.4	1.4
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	19.4	38.9	0.1	24.8	23.1	6.1	11.8	11.7	0.3	13.7	12.4	1.4
LOS	B	D	A	C	C	A	B	B	A	B	B	A
Approach Delay		29.2			20.0			4.5			10.8	
Approach LOS		C			C			A			B	

Intersection Summary		
Cycle Length: 100		
Actuated Cycle Length: 85		
Natural Cycle: 40		
Control Type: Semi Act-Uncoord		
Maximum v/c Ratio: 0.59		
Intersection Signal Delay: 15.9	Intersection LOS: B	
Intersection Capacity Utilization 49.7%	ICU Level of Service A	
Analysis Period (min) 15		

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	48	17	370	81	28	371
Future Vol, veh/h	48	17	370	81	28	371
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	96	92	92	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	18	385	88	30	447

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	893	385	0	0	385	0
Stage 1	385	-	-	-	-	-
Stage 2	508	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	312	663	-	-	1173	-
Stage 1	688	-	-	-	-	-
Stage 2	604	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	304	663	-	-	1173	-
Mov Cap-2 Maneuver	427	-	-	-	-	-
Stage 1	688	-	-	-	-	-
Stage 2	589	-	-	-	-	-

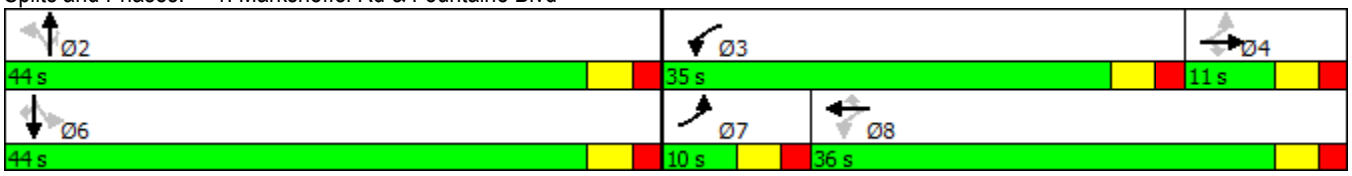
Approach	WB	NB	SB
HCM Control Delay, s	13.6	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	427	663	1173	-
HCM Lane V/C Ratio	-	-	0.122	0.028	0.026	-
HCM Control Delay (s)	-	-	14.6	10.6	8.2	-
HCM Lane LOS	-	-	B	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	131	64	371	356	237	61	244	131	77	118	50
Future Volume (vph)	28	131	64	371	356	237	61	244	131	77	118	50
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.0	10.0	10.0	9.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	10.0	11.0	11.0	35.0	36.0	36.0	44.0	44.0	44.0	44.0	44.0	44.0
Total Split (%)	11.1%	12.2%	12.2%	38.9%	40.0%	40.0%	48.9%	48.9%	48.9%	48.9%	48.9%	48.9%
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 Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	11.0	6.0	6.0	31.5	27.8	27.8	39.2	39.2	39.2	39.2	39.2	39.2
Actuated g/C Ratio	0.14	0.07	0.07	0.39	0.34	0.34	0.49	0.49	0.49	0.49	0.49	0.49
v/c Ratio	0.16	0.54	0.28	0.74	0.33	0.37	0.11	0.29	0.17	0.17	0.14	0.06
Control Delay	20.5	45.5	2.7	28.1	21.1	4.6	13.7	14.8	3.1	14.5	13.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.5	45.5	2.7	28.1	21.1	4.6	13.7	14.8	3.1	14.5	13.4	0.1
LOS	C	D	A	C	C	A	B	B	A	B	B	A
Approach Delay		30.0			19.7			11.1			11.1	
Approach LOS		C			B			B			B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 80.7	
Natural Cycle: 45	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 58.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	73	25	391	24	9	544
Future Vol, veh/h	73	25	391	24	9	544
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	79	27	425	26	10	591

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1036	425	0	0	425	0
Stage 1	425	-	-	-	-	-
Stage 2	611	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	256	629	-	-	1134	-
Stage 1	659	-	-	-	-	-
Stage 2	542	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	254	629	-	-	1134	-
Mov Cap-2 Maneuver	384	-	-	-	-	-
Stage 1	659	-	-	-	-	-
Stage 2	537	-	-	-	-	-

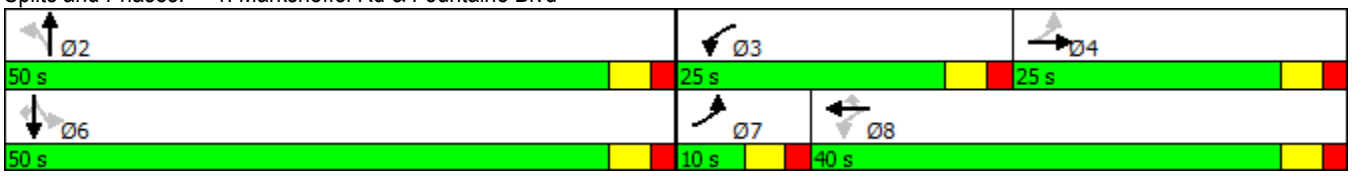
Approach	WB	NB	SB
HCM Control Delay, s	15.3	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	384	629	1134	-
HCM Lane V/C Ratio	-	-	0.207	0.043	0.009	-
HCM Control Delay (s)	-	-	16.8	11	8.2	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.8	0.1	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	368	91	218	202	123	45	124	378	215	186	80
Future Volume (vph)	28	368	91	218	202	123	45	124	378	215	186	80
Turn Type	pm+pt	NA	Free	pm+pt	NA	Perm	Perm	NA	Free	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		Free	8		8	2		Free	6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	5.0		4.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.0	10.0		9.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Total Split (s)	10.0	25.0		25.0	40.0	40.0	50.0	50.0		50.0	50.0	50.0
Total Split (%)	10.0%	25.0%		25.0%	40.0%	40.0%	50.0%	50.0%		50.0%	50.0%	50.0%
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	Max
Act Effct Green (s)	19.7	14.7	90.2	34.9	31.2	31.2	45.2	45.2	90.2	45.2	45.2	45.2
Actuated g/C Ratio	0.22	0.16	1.00	0.39	0.35	0.35	0.50	0.50	1.00	0.50	0.50	0.50
v/c Ratio	0.10	0.65	0.06	0.64	0.21	0.24	0.08	0.14	0.25	0.41	0.24	0.11
Control Delay	18.9	41.3	0.1	26.9	21.9	5.0	14.4	14.2	0.4	18.2	15.0	1.6
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	18.9	41.3	0.1	26.9	21.9	5.0	14.4	14.2	0.4	18.2	15.0	1.6
LOS	B	D	A	C	C	A	B	B	A	B	B	A
Approach Delay		32.3			20.1			4.7			14.2	
Approach LOS		C			C			A			B	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 90.2	
Natural Cycle: 45	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 17.4	Intersection LOS: B
Intersection Capacity Utilization 57.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	48	17	464	81	28	426
Future Vol, veh/h	48	17	464	81	28	426
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	250	250	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	15
Peak Hour Factor	92	92	96	92	92	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	52	18	483	88	30	513

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1057	483	0	0	483	0
Stage 1	483	-	-	-	-	-
Stage 2	574	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	249	584	-	-	1080	-
Stage 1	620	-	-	-	-	-
Stage 2	563	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	242	584	-	-	1080	-
Mov Cap-2 Maneuver	375	-	-	-	-	-
Stage 1	620	-	-	-	-	-
Stage 2	547	-	-	-	-	-

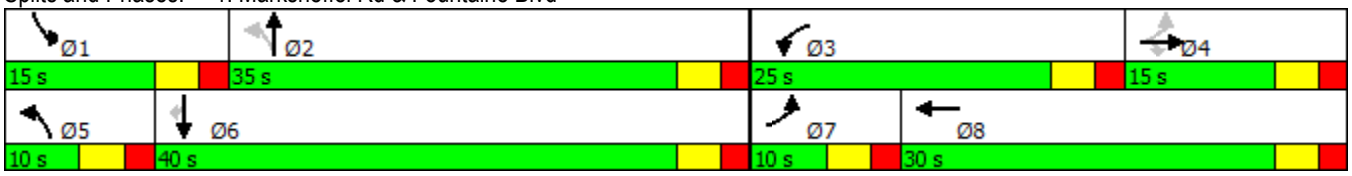
Approach	WB	NB	SB
HCM Control Delay, s	14.9	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	375	584	1080	-
HCM Lane V/C Ratio	-	-	0.139	0.032	0.028	-
HCM Control Delay (s)	-	-	16.1	11.4	8.4	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	207	48	484	604	469	149	540	171	171	520	45
Future Volume (vph)	36	207	48	484	604	469	149	540	171	171	520	45
Turn Type	pm+pt	NA	Perm	Prot	NA	Free	pm+pt	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			Free	2		Free			6
Detector Phase	7	4	4	3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	10.0	15.0	15.0	25.0	30.0		10.0	35.0		15.0	40.0	40.0
Total Split (%)	11.1%	16.7%	16.7%	27.8%	33.3%		11.1%	38.9%		16.7%	44.4%	44.4%
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	Max		None	Max	Max
Act Effct Green (s)	14.4	9.4	9.4	17.3	25.8	86.8	36.0	31.0	86.8	9.1	35.1	35.1
Actuated g/C Ratio	0.17	0.11	0.11	0.20	0.30	1.00	0.41	0.36	1.00	0.10	0.40	0.40
v/c Ratio	0.21	0.57	0.14	0.75	0.60	0.31	0.40	0.45	0.11	0.50	0.38	0.06
Control Delay	22.4	43.6	0.9	40.1	29.8	0.5	17.0	23.6	0.1	42.3	19.7	0.2
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	22.4	43.6	0.9	40.1	29.8	0.5	17.0	23.6	0.1	42.3	19.7	0.2
LOS	C	D	A	D	C	A	B	C	A	D	B	A
Approach Delay		33.9			24.2			17.8			23.8	
Approach LOS		C			C			B			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 86.8	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 23.3	Intersection LOS: C
Intersection Capacity Utilization 59.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	538	133	728	168	31	1021
Future Volume (vph)	538	133	728	168	31	1021
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	9.0	20.0
Total Split (s)	20.0	20.0	60.0	60.0	10.0	70.0
Total Split (%)	22.2%	22.2%	66.7%	66.7%	11.1%	77.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Min	Min	None	Min
Act Effct Green (s)	15.0	15.0	20.5	20.5	23.9	23.9
Actuated g/C Ratio	0.31	0.31	0.42	0.42	0.49	0.49
v/c Ratio	0.54	0.24	0.52	0.23	0.10	0.67
Control Delay	18.1	5.3	12.9	3.3	6.5	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	5.3	12.9	3.3	6.5	11.6
LOS	B	A	B	A	A	B
Approach Delay	15.5		11.1			11.5
Approach LOS	B		B			B

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 49.1	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 51.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd

Intersection	
Int Delay, s/veh	6.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	35	101	0	109	298	0
Future Vol, veh/h	35	101	0	109	298	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	275	-	0	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	37	106	0	115	314	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	37	0	152	37
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	115	-
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	-	-	1574	-	840	1035
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	910	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1574	-	840	1035
Mov Cap-2 Maneuver	-	-	-	-	840	-
Stage 1	-	-	-	-	985	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	840	-	-	-	1574	-
HCM Lane V/C Ratio	0.373	-	-	-	-	-
HCM Control Delay (s)	11.8	0	-	-	0	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	1.7	-	-	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	35	109	93	25	0
Future Vol, veh/h	0	35	109	93	25	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	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	0	37	115	98	26	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	213	0	-	0	201	164
Stage 1	-	-	-	-	164	-
Stage 2	-	-	-	-	37	-
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	1357	-	-	-	788	881
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	985	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1357	-	-	-	788	881
Mov Cap-2 Maneuver	-	-	-	-	788	-
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	985	-

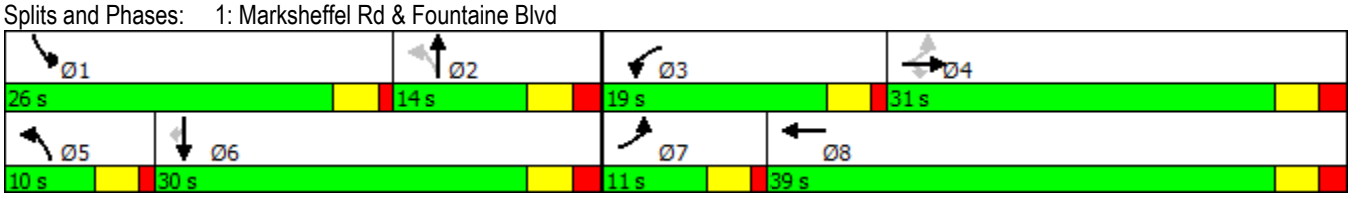
Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1357	-	-	-	788	-
HCM Lane V/C Ratio	-	-	-	-	0.033	-
HCM Control Delay (s)	0	-	-	-	9.7	0
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	758	141	402	447	396	115	236	635	646	317	65
Future Volume (vph)	65	758	141	402	447	396	115	236	635	646	317	65
Turn Type	pm+pt	NA	Perm	Prot	NA	Free	pm+pt	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			Free	2		Free			6
Detector Phase	7	4	4	3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	11.0	31.0	31.0	19.0	39.0		10.0	14.0		26.0	30.0	30.0
Total Split (%)	12.2%	34.4%	34.4%	21.1%	43.3%		11.1%	15.6%		28.9%	33.3%	33.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	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
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0		4.0	5.0		4.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	Max		None	Max	Max
Act Effct Green (s)	31.6	24.0	24.0	14.1	33.8	86.1	16.4	9.4	86.1	20.5	26.2	26.2
Actuated g/C Ratio	0.37	0.28	0.28	0.16	0.39	1.00	0.19	0.11	1.00	0.24	0.30	0.30
v/c Ratio	0.17	0.81	0.25	0.75	0.34	0.26	0.49	0.64	0.42	0.83	0.31	0.11
Control Delay	13.3	36.6	1.9	44.4	20.1	0.4	27.7	46.7	0.8	41.9	25.6	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	36.6	1.9	44.4	20.1	0.4	27.7	46.7	0.8	41.9	25.6	0.4
LOS	B	D	A	D	C	A	C	D	A	D	C	A
Approach Delay		29.9			21.7			14.9			34.2	
Approach LOS		C			C			B			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 86.1	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 25.1	Intersection LOS: C
Intersection Capacity Utilization 72.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	364	89	897	595	107	753
Future Volume (vph)	364	89	897	595	107	753
Turn Type	Prot	Perm	NA	Free	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		Free	6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.0	20.0	20.0		9.0	20.0
Total Split (s)	20.0	20.0	60.0		10.0	70.0
Total Split (%)	22.2%	22.2%	66.7%		11.1%	77.8%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None		None	None
Act Effct Green (s)	11.2	11.2	20.8	50.0	28.1	28.1
Actuated g/C Ratio	0.22	0.22	0.42	1.00	0.56	0.56
v/c Ratio	0.50	0.22	0.64	0.40	0.37	0.43
Control Delay	21.2	6.7	14.6	0.7	8.4	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.2	6.7	14.6	0.7	8.4	6.9
LOS	C	A	B	A	A	A
Approach Delay	18.4		9.1			7.0
Approach LOS	B		A			A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 50	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 9.9	Intersection LOS: A
Intersection Capacity Utilization 53.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	121	377	0	73	210	0
Future Vol, veh/h	121	377	0	73	210	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	275	-	0	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	127	397	0	77	221	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	127	0	204	127
Stage 1	-	-	-	-	127	-
Stage 2	-	-	-	-	77	-
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	-	-	1459	-	784	923
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	946	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1459	-	784	923
Mov Cap-2 Maneuver	-	-	-	-	784	-
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	946	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	784	-	-	-	1459	-
HCM Lane V/C Ratio	0.282	-	-	-	-	-
HCM Control Delay (s)	11.4	0	-	-	0	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	1.2	-	-	-	0	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	121	73	65	92	0
Future Vol, veh/h	0	121	73	65	92	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	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	0	127	77	68	97	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	145	0	-	0	238	111
Stage 1	-	-	-	-	111	-
Stage 2	-	-	-	-	127	-
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	1437	-	-	-	750	942
Stage 1	-	-	-	-	914	-
Stage 2	-	-	-	-	899	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1437	-	-	-	750	942
Mov Cap-2 Maneuver	-	-	-	-	750	-
Stage 1	-	-	-	-	914	-
Stage 2	-	-	-	-	899	-

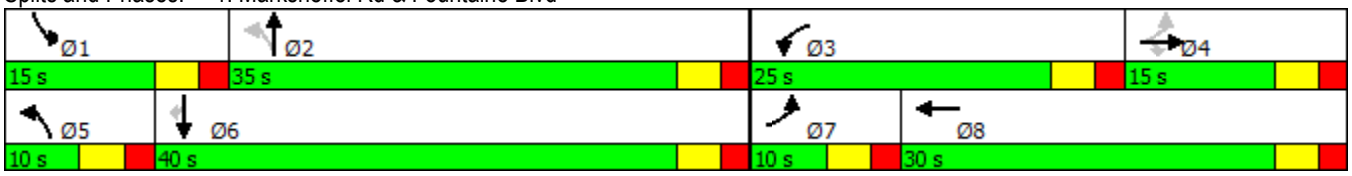
Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1437	-	-	-	750	-
HCM Lane V/C Ratio	-	-	-	-	0.129	-
HCM Control Delay (s)	0	-	-	-	10.5	0
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0	-	-	-	0.4	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	267	48	625	757	604	155	549	228	226	523	45
Future Volume (vph)	36	267	48	625	757	604	155	549	228	226	523	45
Turn Type	pm+pt	NA	Perm	Prot	NA	Free	pm+pt	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			Free	2		Free			6
Detector Phase	7	4	4	3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	10.0	15.0	15.0	25.0	30.0		10.0	35.0		15.0	40.0	40.0
Total Split (%)	11.1%	16.7%	16.7%	27.8%	33.3%		11.1%	38.9%		16.7%	44.4%	44.4%
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	Max		None	Max	Max
Act Effct Green (s)	14.8	9.8	9.8	19.4	28.2	89.2	35.4	30.4	89.2	9.6	35.0	35.0
Actuated g/C Ratio	0.17	0.11	0.11	0.22	0.32	1.00	0.40	0.34	1.00	0.11	0.39	0.39
v/c Ratio	0.22	0.72	0.14	0.88	0.71	0.40	0.44	0.48	0.15	0.64	0.40	0.06
Control Delay	22.9	50.3	0.8	48.9	32.2	0.8	18.4	25.1	0.2	46.9	20.7	0.2
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	22.9	50.3	0.8	48.9	32.2	0.8	18.4	25.1	0.2	46.9	20.7	0.2
LOS	C	D	A	D	C	A	B	C	A	D	C	A
Approach Delay		40.7			27.9			17.9			27.0	
Approach LOS		D			C			B			C	

Intersection Summary		
Cycle Length: 90		
Actuated Cycle Length: 89.2		
Natural Cycle: 60		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.88		
Intersection Signal Delay: 26.5	Intersection LOS: C	
Intersection Capacity Utilization 64.9%	ICU Level of Service C	
Analysis Period (min) 15		

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	625	148	784	195	34	1162
Future Volume (vph)	625	148	784	195	34	1162
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	9.0	20.0
Total Split (s)	20.0	20.0	60.0	60.0	10.0	70.0
Total Split (%)	22.2%	22.2%	66.7%	66.7%	11.1%	77.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Min	Min	None	Min
Act Effct Green (s)	15.2	15.2	23.3	23.3	26.8	26.8
Actuated g/C Ratio	0.29	0.29	0.45	0.45	0.51	0.51
v/c Ratio	0.66	0.27	0.52	0.25	0.11	0.73
Control Delay	22.0	5.4	12.6	3.0	6.4	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	5.4	12.6	3.0	6.4	12.4
LOS	C	A	B	A	A	B
Approach Delay	18.8		10.7			12.3
Approach LOS	B		B			B

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 52.2	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 13.5	Intersection LOS: B
Intersection Capacity Utilization 58.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	414	21	3	1008	66	7
Future Vol, veh/h	414	21	3	1008	66	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	275	-	0	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	436	22	3	1061	69	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	436	0	1503	436
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	1067	-
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	-	-	1124	-	134	620
Stage 1	-	-	-	-	652	-
Stage 2	-	-	-	-	331	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1124	-	134	620
Mov Cap-2 Maneuver	-	-	-	-	134	-
Stage 1	-	-	-	-	652	-
Stage 2	-	-	-	-	330	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	53.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	134	620	-	-	1124	-
HCM Lane V/C Ratio	0.518	0.012	-	-	0.003	-
HCM Control Delay (s)	57.7	10.9	-	-	8.2	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	2.5	0	-	-	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	82	154	2	0	477	31	12	3	0	15	1	79
Future Vol, veh/h	82	154	2	0	477	31	12	3	0	15	1	79
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	225	-	-	275	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	86	162	2	0	502	33	13	3	0	16	1	83

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	535	0	0	164	0	0	855	871	163	855	855	518
Stage 1	-	-	-	-	-	-	336	336	-	518	518	-
Stage 2	-	-	-	-	-	-	519	535	-	337	337	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1033	-	-	1414	-	-	278	289	882	278	296	558
Stage 1	-	-	-	-	-	-	678	642	-	541	533	-
Stage 2	-	-	-	-	-	-	540	524	-	677	641	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1033	-	-	1414	-	-	221	265	882	258	271	558
Mov Cap-2 Maneuver	-	-	-	-	-	-	221	265	-	258	271	-
Stage 1	-	-	-	-	-	-	622	589	-	496	533	-
Stage 2	-	-	-	-	-	-	459	524	-	617	588	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3	0	21.9	13.8
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	229	1033	-	-	1414	-	-	259	558
HCM Lane V/C Ratio	0.069	0.084	-	-	-	-	-	0.065	0.149
HCM Control Delay (s)	21.9	8.8	-	-	0	-	-	19.9	12.6
HCM Lane LOS	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.2	0.3	-	-	0	-	-	0.2	0.5

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	85	114	12	205	338	25
Future Vol, veh/h	85	114	12	205	338	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	100	-	0	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	89	120	13	216	356	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	89	0	330	89
Stage 1	-	-	-	-	89	-
Stage 2	-	-	-	-	241	-
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	-	-	1506	-	665	969
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	799	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1506	-	659	969
Mov Cap-2 Maneuver	-	-	-	-	659	-
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	792	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	16.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	659	969	-	-	1506	-
HCM Lane V/C Ratio	0.54	0.027	-	-	0.008	-
HCM Control Delay (s)	16.7	8.8	-	-	7.4	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	3.2	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	97	176	0	0	40
Future Vol, veh/h	13	97	176	0	0	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	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	14	102	185	0	0	42

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	185	0	-	0	314	185
Stage 1	-	-	-	-	185	-
Stage 2	-	-	-	-	129	-
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	1390	-	-	-	679	857
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	897	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1390	-	-	-	672	857
Mov Cap-2 Maneuver	-	-	-	-	672	-
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	888	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1390	-	-	-	857
HCM Lane V/C Ratio	0.01	-	-	-	0.049
HCM Control Delay (s)	7.6	-	-	-	9.4
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	91	6	3	156	19	9
Future Vol, veh/h	91	6	3	156	19	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	275	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	96	6	3	164	20	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	102	0	270	99
Stage 1	-	-	-	-	99	-
Stage 2	-	-	-	-	171	-
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	-	-	1490	-	719	957
Stage 1	-	-	-	-	925	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1490	-	718	957
Mov Cap-2 Maneuver	-	-	-	-	718	-
Stage 1	-	-	-	-	925	-
Stage 2	-	-	-	-	857	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	781	-	-	1490	-
HCM Lane V/C Ratio	0.038	-	-	0.002	-
HCM Control Delay (s)	9.8	-	-	7.4	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	65	35	109	99	28	51
Future Vol, veh/h	65	35	109	99	28	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	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	68	37	115	104	29	54

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	219	0	-	0	341	167
Stage 1	-	-	-	-	167	-
Stage 2	-	-	-	-	174	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1350	-	-	-	655	877
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	856	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1350	-	-	-	622	877
Mov Cap-2 Maneuver	-	-	-	-	622	-
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	813	-

Approach	EB	WB	SB
HCM Control Delay, s	5.1	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1350	-	-	-	622	877
HCM Lane V/C Ratio	0.051	-	-	-	0.047	0.061
HCM Control Delay (s)	7.8	-	-	-	11.1	9.4
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	412	987	0	0	25
Future Vol, veh/h	8	412	987	0	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	434	1039	0	0	26

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1039	0	-	0	1490	1039
Stage 1	-	-	-	-	1039	-
Stage 2	-	-	-	-	451	-
Critical Hdwy	4.12	-	-	-	7.12	6.22
Critical Hdwy Stg 1	-	-	-	-	6.12	-
Critical Hdwy Stg 2	-	-	-	-	6.12	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	669	-	-	-	102	280
Stage 1	-	-	-	-	279	-
Stage 2	-	-	-	-	588	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	669	-	-	-	101	280
Mov Cap-2 Maneuver	-	-	-	-	101	-
Stage 1	-	-	-	-	276	-
Stage 2	-	-	-	-	581	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	19.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	669	-	-	-	280
HCM Lane V/C Ratio	0.013	-	-	-	0.094
HCM Control Delay (s)	10.4	-	-	-	19.2
HCM Lane LOS	B	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	114.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	129	229	54	2	557	10	176	62	5	5	29	254
Future Vol, veh/h	129	229	54	2	557	10	176	62	5	5	29	254
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	275	-	225	275	-	-	0	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	136	241	57	2	586	11	185	65	5	5	31	267

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	597	0	0	241	0	0	1124	1114	241	1144	1109	592
Stage 1	-	-	-	-	-	-	513	513	-	596	596	-
Stage 2	-	-	-	-	-	-	611	601	-	548	513	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	980	-	-	1326	-	-	~ 183	208	798	177	210	506
Stage 1	-	-	-	-	-	-	544	536	-	490	492	-
Stage 2	-	-	-	-	-	-	481	489	-	521	536	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	980	-	-	1326	-	-	~ 67	179	798	113	181	506
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 67	179	-	113	181	-
Stage 1	-	-	-	-	-	-	469	462	-	422	491	-
Stage 2	-	-	-	-	-	-	212	488	-	383	462	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.9	0	$ 683	21
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	67	190	980	-	-	1326	-	-	113	181	506
HCM Lane V/C Ratio	2.765	0.371	0.139	-	-	0.002	-	-	0.047	0.169	0.528
HCM Control Delay (s)	$ 929.8	34.7	9.3	-	-	7.7	-	-	38.4	28.9	19.8
HCM Lane LOS	F	D	A	-	-	A	-	-	E	D	C
HCM 95th %tile Q(veh)	18.5	1.6	0.5	-	-	0	-	-	0.1	0.6	3

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	129	229	54	2	557	176	62	5	29	254
Future Volume (vph)	129	229	54	2	557	176	62	5	29	254
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4			8		2		6	
Permitted Phases	4		4	8		2		6		6
Detector Phase	4	4	4	8	8	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	80.0	80.0	80.0	80.0	80.0	10.0	10.0	10.0	10.0	10.0
Total Split (%)	88.9%	88.9%	88.9%	88.9%	88.9%	11.1%	11.1%	11.1%	11.1%	11.1%
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	14.6	14.6	14.6	14.6	14.6	5.1	5.1	5.1	5.1	5.1
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49	0.17	0.17	0.17	0.17	0.17
v/c Ratio	0.41	0.26	0.07	0.00	0.66	0.75	0.22	0.02	0.10	0.54
Control Delay	8.8	5.0	1.6	3.5	9.4	39.6	13.8	12.6	13.1	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	5.0	1.6	3.5	9.4	39.6	13.8	12.6	13.1	7.7
LOS	A	A	A	A	A	D	B	B	B	A
Approach Delay		5.7			9.4		32.5		8.4	
Approach LOS		A			A		C		A	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 29.8	
Natural Cycle: 40	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 11.9	Intersection LOS: B
Intersection Capacity Utilization 67.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 14: Lamprey Dr & Fontaine Blvd

HCS 2010 Roundabouts Report

General Information		Site Information	
Analyst	KDF	Intersection	Fontaine Blvd/Lamprey Dr
Agency or Co.	LSC	E/W Street Name	Fontaine Blvd
Date Performed	9/2/2016	N/S Street Name	Lamprey Dr
Analysis Year	2040 Total Traffic	Analysis Time Period (hrs)	0.25
Time Period	AM Peak	Peak Hour Factor	0.92
Project Description	164360	Jurisdiction	Colorado Springs, CO

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	129	229	54	0	2	557	10	0	176	62	5	0	5	29	254
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v_{PCE}), pc/h	0	143	254	60	0	2	618	11	0	195	69	6	0	6	32	282
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9900			4.9900			4.9900			4.9900	
Follow-Up Headway (s)		2.6090			2.6090			2.6090			2.6090	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		457			631			270			320	
Entry Volume veh/h		448			619			265			314	
Circulating Flow (v_c), pc/h	40			407			403			815		
Exiting Flow (v_{ex}), pc/h	266			1095			223			94		
Capacity (c_{pce}), pc/h		1324			910			913			599	
Capacity (c), veh/h		1299			892			895			587	
v/c Ratio (x)		0.35			0.69			0.30			0.53	

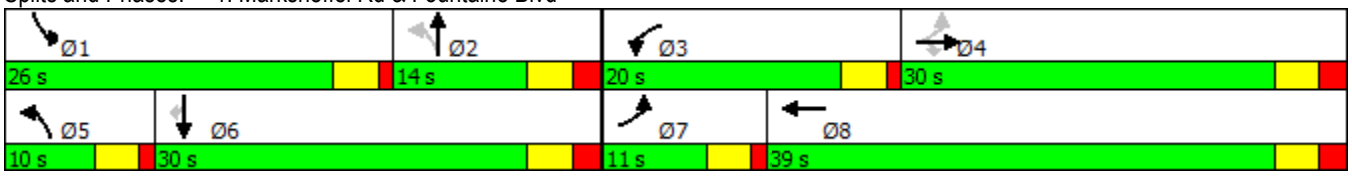
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.0			16.1			7.2			15.6	
Lane LOS		A			C			A			C	
95% Queue, veh		1.6			5.8			1.2			3.1	
Approach Delay, s/veh	6.0			16.1			7.2			15.6		
Approach LOS	A			C			A			C		
Intersection Delay, s/veh | LOS	11.8						B					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	908	144	476	533	466	118	242	761	766	326	65
Future Volume (vph)	65	908	144	476	533	466	118	242	761	766	326	65
Turn Type	pm+pt	NA	Perm	Prot	NA	Free	pm+pt	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			Free	2		Free			6
Detector Phase	7	4	4	3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	11.0	30.0	30.0	20.0	39.0		10.0	14.0		26.0	30.0	30.0
Total Split (%)	12.2%	33.3%	33.3%	22.2%	43.3%		11.1%	15.6%		28.9%	33.3%	33.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	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
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0		4.0	5.0		4.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None		None	Max		None	Max	Max
Act Effct Green (s)	32.6	25.0	25.0	15.6	35.9	89.6	16.0	9.0	89.6	22.0	25.0	25.0
Actuated g/C Ratio	0.36	0.28	0.28	0.17	0.40	1.00	0.18	0.10	1.00	0.25	0.28	0.28
v/c Ratio	0.18	0.96	0.25	0.84	0.40	0.31	0.53	0.72	0.51	0.95	0.35	0.12
Control Delay	13.6	53.1	2.1	50.0	20.9	0.5	29.9	51.8	1.2	54.9	27.1	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	53.1	2.1	50.0	20.9	0.5	29.9	51.8	1.2	54.9	27.1	0.4
LOS	B	D	A	D	C	A	C	D	A	D	C	A
Approach Delay		44.1			23.8			15.1			44.0	
Approach LOS		D			C			B			D	

Intersection Summary		
Cycle Length: 90		
Actuated Cycle Length: 89.6		
Natural Cycle: 90		
Control Type: Semi Act-Uncoord		
Maximum v/c Ratio: 0.96		
Intersection Signal Delay: 31.2	Intersection LOS: C	
Intersection Capacity Utilization 82.2%	ICU Level of Service E	
Analysis Period (min) 15		

Splits and Phases: 1: Marksheffel Rd & Fountaine Blvd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	422	98	1023	692	118	827
Future Volume (vph)	422	98	1023	692	118	827
Turn Type	Prot	Perm	NA	Free	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		Free	6	
Detector Phase	8	8	2		1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.0	20.0	20.0		9.0	20.0
Total Split (s)	20.0	20.0	60.0		10.0	70.0
Total Split (%)	22.2%	22.2%	66.7%		11.1%	77.8%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None		None	None
Act Effct Green (s)	12.7	12.7	25.2	55.8	32.7	32.7
Actuated g/C Ratio	0.23	0.23	0.45	1.00	0.59	0.59
v/c Ratio	0.57	0.23	0.67	0.46	0.46	0.45
Control Delay	24.1	6.9	15.2	1.0	10.6	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.1	6.9	15.2	1.0	10.6	7.2
LOS	C	A	B	A	B	A
Approach Delay	20.9		9.4			7.6
Approach LOS	C		A			A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 55.8	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 10.8	Intersection LOS: B
Intersection Capacity Utilization 59.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 5: Marksheffel Rd & Lorson Blvd

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	1055	79	2	646	47	1
Future Vol, veh/h	1055	79	2	646	47	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	275	-	0	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	1111	83	2	680	49	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1111	0	1795	1111
Stage 1	-	-	-	-	1111	-
Stage 2	-	-	-	-	684	-
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	-	-	629	-	88	254
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	501	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	629	-	88	254
Mov Cap-2 Maneuver	-	-	-	-	88	-
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	499	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	87.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	88	254	-	-	629	-
HCM Lane V/C Ratio	0.562	0.004	-	-	0.003	-
HCM Control Delay (s)	89	19.2	-	-	10.7	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	2.5	0	-	-	0	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	557	7	0	329	5	8	0	0	10	1	25
Future Vol, veh/h	26	557	7	0	329	5	8	0	0	10	1	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	225	-	-	275	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	586	7	0	346	5	8	0	0	11	1	26

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	352	0	0	594	0	0	994	997	590	994	997	349
Stage 1	-	-	-	-	-	-	645	645	-	349	349	-
Stage 2	-	-	-	-	-	-	349	352	-	645	648	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1207	-	-	982	-	-	224	244	508	224	244	694
Stage 1	-	-	-	-	-	-	461	467	-	667	633	-
Stage 2	-	-	-	-	-	-	667	632	-	461	466	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1207	-	-	982	-	-	211	239	508	220	239	694
Mov Cap-2 Maneuver	-	-	-	-	-	-	211	239	-	220	239	-
Stage 1	-	-	-	-	-	-	451	457	-	652	633	-
Stage 2	-	-	-	-	-	-	641	632	-	451	456	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	22.8	14
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	211	1207	-	-	982	-	-	222	694
HCM Lane V/C Ratio	0.04	0.023	-	-	-	-	-	0.052	0.038
HCM Control Delay (s)	22.8	8.1	-	-	0	-	-	22.1	10.4
HCM Lane LOS	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.2	0.1

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Vol, veh/h	221	425	8	136	238	4
Future Vol, veh/h	221	425	8	136	238	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	100	-	0	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	233	447	8	143	251	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	233	0	393	233
Stage 1	-	-	-	-	233	-
Stage 2	-	-	-	-	160	-
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	-	-	1335	-	611	806
Stage 1	-	-	-	-	806	-
Stage 2	-	-	-	-	869	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1335	-	607	806
Mov Cap-2 Maneuver	-	-	-	-	607	-
Stage 1	-	-	-	-	806	-
Stage 2	-	-	-	-	864	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	14.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	607	806	-	-	1335	-
HCM Lane V/C Ratio	0.413	0.005	-	-	0.006	-
HCM Control Delay (s)	15	9.5	-	-	7.7	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	2	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	45	180	118	0	0	27
Future Vol, veh/h	45	180	118	0	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	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	47	189	124	0	0	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	124	0	-	0	408	124
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	284	-
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	1463	-	-	-	599	927
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	764	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1463	-	-	-	580	927
Mov Cap-2 Maneuver	-	-	-	-	580	-
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	739	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1463	-	-	-	927
HCM Lane V/C Ratio	0.032	-	-	-	0.031
HCM Control Delay (s)	7.5	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	156	22	8	104	13	5
Future Vol, veh/h	156	22	8	104	13	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	275	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	164	23	8	109	14	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	187	0	302	176
Stage 1	-	-	-	-	176	-
Stage 2	-	-	-	-	126	-
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	-	-	1387	-	690	867
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	900	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1387	-	686	867
Mov Cap-2 Maneuver	-	-	-	-	686	-
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	895	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	728	-	-	1387	-
HCM Lane V/C Ratio	0.026	-	-	0.006	-
HCM Control Delay (s)	10.1	-	-	7.6	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	40	121	73	66	94	39
Future Vol, veh/h	40	121	73	66	94	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	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	42	127	77	69	99	41

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	146	0	-	0	324	112
Stage 1	-	-	-	-	112	-
Stage 2	-	-	-	-	212	-
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	1436	-	-	-	670	941
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1436	-	-	-	650	941
Mov Cap-2 Maneuver	-	-	-	-	650	-
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	799	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	10.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1436	-	-	-	650	941
HCM Lane V/C Ratio	0.029	-	-	-	0.152	0.044
HCM Control Delay (s)	7.6	-	-	-	11.5	9
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	1027	631	0	0	17
Future Vol, veh/h	29	1027	631	0	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	275	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	31	1081	664	0	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	664	0	-	0	1806	664
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	1142	-
Critical Hdwy	4.12	-	-	-	7.12	6.22
Critical Hdwy Stg 1	-	-	-	-	6.12	-
Critical Hdwy Stg 2	-	-	-	-	6.12	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	925	-	-	-	61	461
Stage 1	-	-	-	-	450	-
Stage 2	-	-	-	-	244	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	925	-	-	-	59	461
Mov Cap-2 Maneuver	-	-	-	-	59	-
Stage 1	-	-	-	-	435	-
Stage 2	-	-	-	-	236	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	13.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	925	-	-	-	461
HCM Lane V/C Ratio	0.033	-	-	-	0.039
HCM Control Delay (s)	9	-	-	-	13.1
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	63.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	238	586	203	1	359	1	125	10	1	3	19	146
Future Vol, veh/h	238	586	203	1	359	1	125	10	1	3	19	146
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	275	-	225	275	-	-	0	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	251	617	214	1	378	1	132	11	1	3	20	154

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	379	0	0	617	0	0	1509	1499	617	1505	1499	378
Stage 1	-	-	-	-	-	-	1118	1118	-	381	381	-
Stage 2	-	-	-	-	-	-	391	381	-	1124	1118	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1179	-	-	963	-	-	~ 99	122	490	100	122	669
Stage 1	-	-	-	-	-	-	251	282	-	641	613	-
Stage 2	-	-	-	-	-	-	633	613	-	249	282	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1179	-	-	963	-	-	~ 54	96	490	77	96	669
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 54	96	-	77	96	-
Stage 1	-	-	-	-	-	-	198	222	-	505	612	-
Stage 2	-	-	-	-	-	-	471	612	-	186	222	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	0	$ 753.8	17.3
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	54	104	1179	-	-	963	-	-	77	96	669
HCM Lane V/C Ratio	2.437	0.111	0.212	-	-	0.001	-	-	0.041	0.208	0.23
HCM Control Delay (s)	$ 816.3	43.9	8.9	-	-	8.7	-	-	53.7	52.1	12
HCM Lane LOS	F	E	A	-	-	A	-	-	F	F	B
HCM 95th %tile Q(veh)	13.4	0.4	0.8	-	-	0	-	-	0.1	0.7	0.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	238	586	203	1	359	125	10	3	19	146
Future Volume (vph)	238	586	203	1	359	125	10	3	19	146
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases		4			8		2		6	
Permitted Phases	4		4	8		2		6		6
Detector Phase	4	4	4	8	8	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	80.0	80.0	80.0	80.0	80.0	10.0	10.0	10.0	10.0	10.0
Total Split (%)	88.9%	88.9%	88.9%	88.9%	88.9%	11.1%	11.1%	11.1%	11.1%	11.1%
Yellow Time (s)	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
Lost Time Adjust (s)	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
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	18.0	18.0	18.0	18.0	18.0	5.1	5.1	5.1	5.1	5.1
Actuated g/C Ratio	0.54	0.54	0.54	0.54	0.54	0.15	0.15	0.15	0.15	0.15
v/c Ratio	0.47	0.61	0.22	0.00	0.38	0.59	0.04	0.01	0.07	0.41
Control Delay	7.5	8.0	1.3	3.0	5.3	32.6	15.0	15.3	15.7	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.5	8.0	1.3	3.0	5.3	32.6	15.0	15.3	15.7	8.0
LOS	A	A	A	A	A	C	B	B	B	A
Approach Delay		6.5			5.3		31.1		9.0	
Approach LOS		A			A		C		A	

Intersection Summary			
Cycle Length: 90			
Actuated Cycle Length: 33.4			
Natural Cycle: 40			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 8.5		Intersection LOS: A	
Intersection Capacity Utilization 60.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 14: Lamprey Dr & Fontaine Blvd

HCS 2010 Roundabouts Report

General Information		Site Information	
Analyst	KDF	Intersection	Fontaine Blvd/Lamprey Dr
Agency or Co.	LSC	E/W Street Name	Fontaine Blvd
Date Performed	9/2/2016	N/S Street Name	Lamprey Dr
Analysis Year	2040 Total Traffic	Analysis Time Period (hrs)	0.25
Time Period	PM Peak	Peak Hour Factor	0.92
Project Description	164360	Jurisdiction	Colorado Springs, CO

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	238	586	203	0	1	359	1	0	125	10	1	0	3	19	146
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v_{PCE}), pc/h	0	264	650	225	0	1	398	1	0	139	11	1	0	3	21	162
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9900			4.9900			4.9900			4.9900	
Follow-Up Headway (s)		2.6090			2.6090			2.6090			2.6090	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		1139			400			151			186	
Entry Volume veh/h		1117			392			148			182	
Circulating Flow (v_c), pc/h		25			414			917			538	
Exiting Flow (v_{ex}), pc/h		654			699			276			247	
Capacity (c_{pce}), pc/h		1345			903			540			795	
Capacity (c), veh/h		1319			885			529			780	
v/c Ratio (x)		0.85			0.44			0.28			0.23	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		19.7			9.5			10.8			7.2	
Lane LOS		C			A			B			A	
95% Queue, veh		11.4			2.3			1.1			0.9	
Approach Delay, s/veh	19.7			9.5			10.8			7.2		
Approach LOS	C			A			B			A		
Intersection Delay, s/veh | LOS	15.6						C					

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	149	25	0	457	0	93	0	0	0	0	60
Future Vol, veh/h	19	149	25	0	457	0	93	0	0	0	0	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	0	0	-	-	0	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	157	26	0	481	0	98	0	0	0	0	63

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	481	0	0	183	0	0	710	678	157	691	704	481
Stage 1	-	-	-	-	-	-	197	197	-	481	481	-
Stage 2	-	-	-	-	-	-	513	481	-	210	223	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1082	-	-	1392	-	-	348	374	889	359	361	585
Stage 1	-	-	-	-	-	-	805	738	-	566	554	-
Stage 2	-	-	-	-	-	-	544	554	-	792	719	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1082	-	-	1392	-	-	306	367	889	354	355	585
Mov Cap-2 Maneuver	-	-	-	-	-	-	306	367	-	354	355	-
Stage 1	-	-	-	-	-	-	791	725	-	556	554	-
Stage 2	-	-	-	-	-	-	485	554	-	777	706	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	22.2	11.9
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	306	-	1082	-	-	1392	-	-	-	-	585
HCM Lane V/C Ratio	0.32	-	0.018	-	-	-	-	-	-	-	0.108
HCM Control Delay (s)	22.2	0	8.4	-	-	0	-	-	0	0	11.9
HCM Lane LOS	C	A	A	-	-	A	-	-	A	A	B
HCM 95th %tile Q(veh)	1.3	-	0.1	-	-	0	-	-	-	-	0.4

HCS 2010 Roundabouts Report

General Information		Site Information	
Analyst	KDF	Intersection	Fontaine Blvd/Lamprey Dr
Agency or Co.	LSC	E/W Street Name	Fontaine Blvd
Date Performed	9/2/2016	N/S Street Name	Lamprey Dr
Analysis Year	2040 Background Traffic	Analysis Time Period (hrs)	0.25
Time Period	AM Peak	Peak Hour Factor	0.92
Project Description	164360	Jurisdiction	Colorado Springs, CO

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	19	149	25	0	0	467	0	0	93	0	0	0	0	0	60
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v_{PCE}), pc/h	0	21	165	28	0	0	518	0	0	103	0	0	0	0	0	67
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9900			4.9900			4.9900			4.9900	
Follow-Up Headway (s)		2.6090			2.6090			2.6090			2.6090	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		214			518			103			67	
Entry Volume veh/h		210			508			101			66	
Circulating Flow (v_c), pc/h	0			124			186			621		
Exiting Flow (v_{ex}), pc/h	165			688			21			28		
Capacity (c_{pce}), pc/h		1380			1215			1141			731	
Capacity (c), veh/h		1353			1192			1118			716	
v/c Ratio (x)		0.16			0.43			0.09			0.09	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9			7.4			4.0			6.0	
Lane LOS		A			A			A			A	
95% Queue, veh		0.5			2.2			0.3			0.3	
Approach Delay, s/veh	3.9			7.4			4.0			6.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	6.1						A					

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	756	345	68	44
Demand Flow Rate, veh/h	772	352	69	45
Vehicles Circulating, veh/h	0	147	673	421
Vehicles Exiting, veh/h	466	595	99	78
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.8	5.9	6.3	4.6
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	772	352	69	45
Cap Entry Lane, veh/h	1380	1188	695	898
Entry HV Adj Factor	0.980	0.980	0.986	0.978
Flow Entry, veh/h	756	345	68	44
Cap Entry, veh/h	1352	1164	685	878
V/C Ratio	0.559	0.296	0.099	0.050
Control Delay, s/veh	8.8	5.9	6.3	4.6
LOS	A	A	A	A
95th %tile Queue, veh	4	1	0	0

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	72	554	92	0	328	0	65	0	0	0	0	42
Future Vol, veh/h	72	554	92	0	328	0	65	0	0	0	0	42
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	0	0	-	-	0	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	76	583	97	0	345	0	68	0	0	0	0	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	345	0	0	680	0	0	1102	1080	583	1129	1177	345
Stage 1	-	-	-	-	-	-	735	735	-	345	345	-
Stage 2	-	-	-	-	-	-	367	345	-	784	832	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1214	-	-	912	-	-	189	218	512	181	191	698
Stage 1	-	-	-	-	-	-	411	425	-	671	636	-
Stage 2	-	-	-	-	-	-	653	636	-	386	384	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1214	-	-	912	-	-	169	204	512	172	179	698
Mov Cap-2 Maneuver	-	-	-	-	-	-	169	204	-	172	179	-
Stage 1	-	-	-	-	-	-	385	398	-	629	636	-
Stage 2	-	-	-	-	-	-	612	636	-	362	360	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	40.1	10.5
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	169	-	1214	-	-	912	-	-	-	-	698
HCM Lane V/C Ratio	0.405	-	0.062	-	-	-	-	-	-	-	0.063
HCM Control Delay (s)	40.1	0	8.2	-	-	0	-	-	0	0	10.5
HCM Lane LOS	E	A	A	-	-	A	-	-	A	A	B
HCM 95th %tile Q(veh)	1.8	-	0.2	-	-	0	-	-	-	-	0.2

HCS 2010 Roundabouts Report

General Information		Site Information	
Analyst	KDF	Intersection	Fontaine Blvd/Lamprey Dr
Agency or Co.	LSC	E/W Street Name	Fontaine Blvd
Date Performed	9/2/2016	N/S Street Name	Lamprey Dr
Analysis Year	2040 Background Traffic	Analysis Time Period (hrs)	0.25
Time Period	PM Peak	Peak Hour Factor	0.92
Project Description	164360	Jurisdiction	Colorado Springs, CO

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	72	554	92	0	0	328	0	0	65	0	0	0	0	0	42
Percent Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flow Rate (v_{PCE}), pc/h	0	80	614	102	0	0	364	0	0	72	0	0	0	0	0	47
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9900			4.9900			4.9900			4.9900	
Follow-Up Headway (s)		2.6090			2.6090			2.6090			2.6090	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		796			364			72			47	
Entry Volume veh/h		780			357			71			46	
Circulating Flow (v_c), pc/h	0			152			694			436		
Exiting Flow (v_{ex}), pc/h	614			483			80			102		
Capacity (c_{pce}), pc/h		1380			1181			678			883	
Capacity (c), veh/h		1353			1158			665			866	
v/c Ratio (x)		0.58			0.31			0.11			0.05	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		9.1			6.0			6.6			4.7	
Lane LOS		A			A			A			A	
95% Queue, veh		3.9			1.3			0.4			0.2	
Approach Delay, s/veh	9.1			6.0			6.6			4.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.9						A					

Roundabout Design Report

TRANSPORTATION
CONSULTANTS, INC.

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com

November 10, 2017

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

Re: Lorson Ranch East
Roundabout Report
El Paso County, CO
LSC #164360

Dear Mr. Mark:

We are pleased to submit this roundabout design report for the intersection of Fontaine Boulevard and Lamprey Drive in El Paso County, Colorado.

Roundabout Layout

Figure 1 shows the conceptual roundabout design parameters. The overall diameter is 150 feet and the entry angles are between 31 and 34 degrees on each of the approaches.

Design Vehicle

Figures 2 through 5 show WB-50 truck paths through the proposed roundabout for the various approaches. A minimum of one foot of clearance is maintained between all wheel paths and vertical curbs.

Figure 6 shows a WB-67 truck path through the proposed roundabout. Many movements will likely traverse over the outside curb or into the center or splitter islands. A larger truck apron should be considered to better accommodate the occasional WB-67.

Design Speeds

Figures 7 through 10 show the estimated fastest path radii for each of the approaches to the proposed roundabout. These paths are drawn in accordance with the methodology outlined in the *Roundabout Informational Guide* (NCHRP 672). The fastest entry path should generally be no more than about 25 mph for single-lane approaches and 30 mph for two-lane approaches. The fastest entry path for each of the four approaches meets this criteria.

Pedestrian Safety and Accessibility

Pedestrian crossings with pedestrian refuge areas on the splitter islands have been provided on all four approaches. The *Roundabout Informational Guide* (NCHRP 672) gives recommendations for placement and design of pedestrian crossings. The recommendations given in the *Roundabout Informational Guide* (NCHRP 672) were followed in the proposed design including the following:

- Pedestrian refuge widths are a minimum of 6 feet;
- Pedestrian refuge widths that will accommodate bicycles should be increased to a minimum of ten feet;
- Pedestrian crossings are generally set back 25 feet from the yield line.

In addition, detached sidewalks should be provided on the corners of the roundabout that provide pedestrian crossings. The following recommendations are given when designing the vertical aspects of the proposed roundabout:

- Pedestrian refuge areas should be designed at street level rather than elevated to the height of the splitter island;
- Ramps should be provided and designed in accordance with ADA standards on each end of the crosswalk;
- Detectable warning surfaces in accordance with ADA standards should be provided at ramps and the pedestrian refuge area of the splitter islands.
- The truck apron should be textured and raised above the circulating roadway. The specific design will be determined as part of the construction plans.

Sight Distance

Figure 11 shows the areas that should remain free of obstacles that would limit sight distance for vehicles, bicycles, and pedestrians.

Bike Lanes

There are on-street bike lanes proposed along Fontaine Boulevard. As on-street cyclists approach the roundabout, they will enter the vehicle lane and traverse the roundabout as a vehicle or use the bike lane ramps to exit the bike lane onto the adjacent multi-use path and traverse the roundabout as a pedestrian.

* * * * *

We trust that our findings and recommendations will assist in the planning and design of the proposed roundabout. Please call if we can be of further assistance.

Respectfully submitted,

LSC Transportation Consultants, Inc.

By:_____
Christopher S. McGranahan, P.E., PTOE
Principal

COLORADO LICENSED
CHRISTOPHER S. MCGRANAHAN
39018
PROFESSIONAL ENGINEER

11-10-17

CSM/wc

Enclosures: Figures 1 - 11

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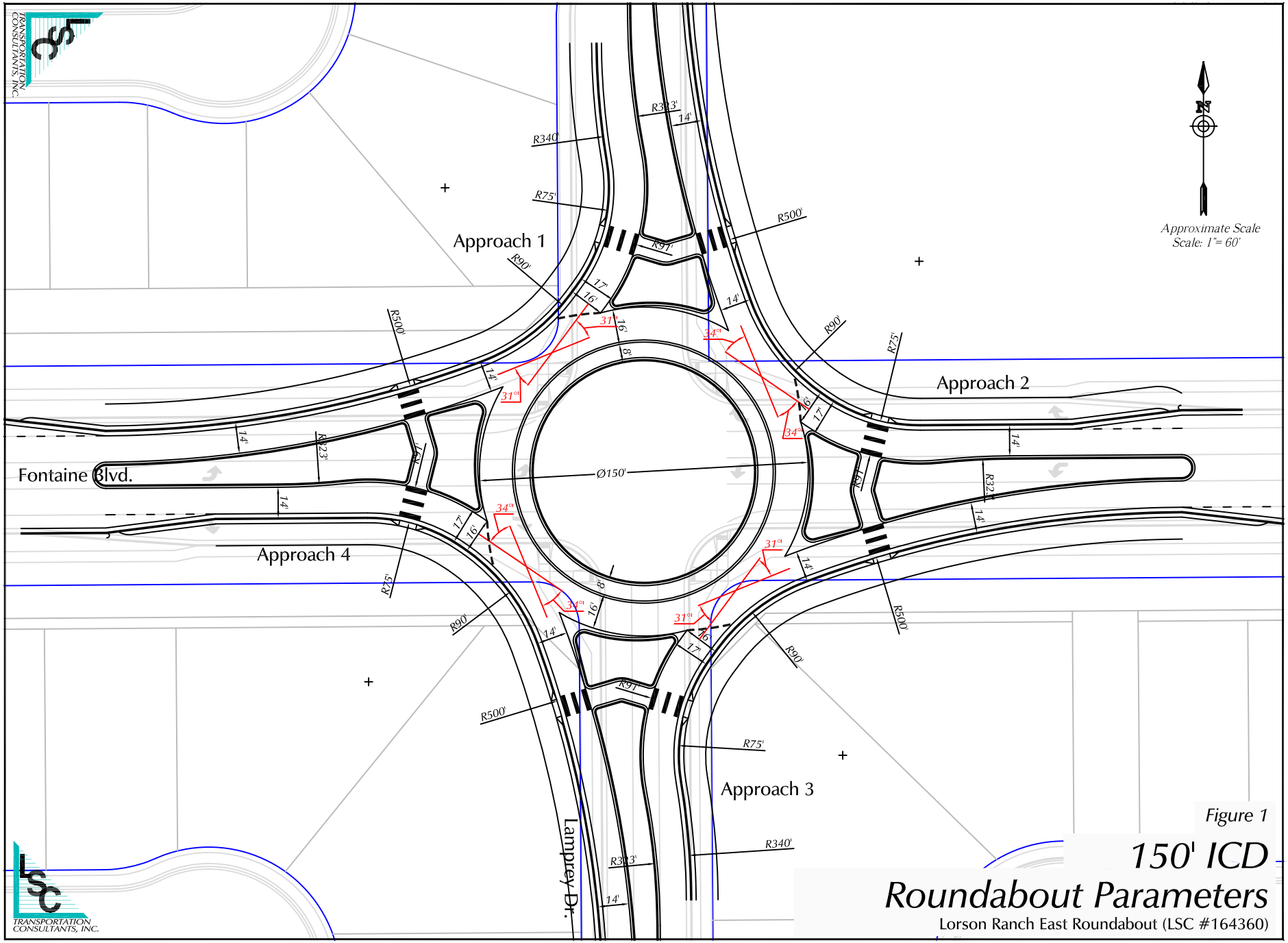

Figure 1

150' ICD Roundabout Parameters

Lorson Ranch East Roundabout (LSC #164360)

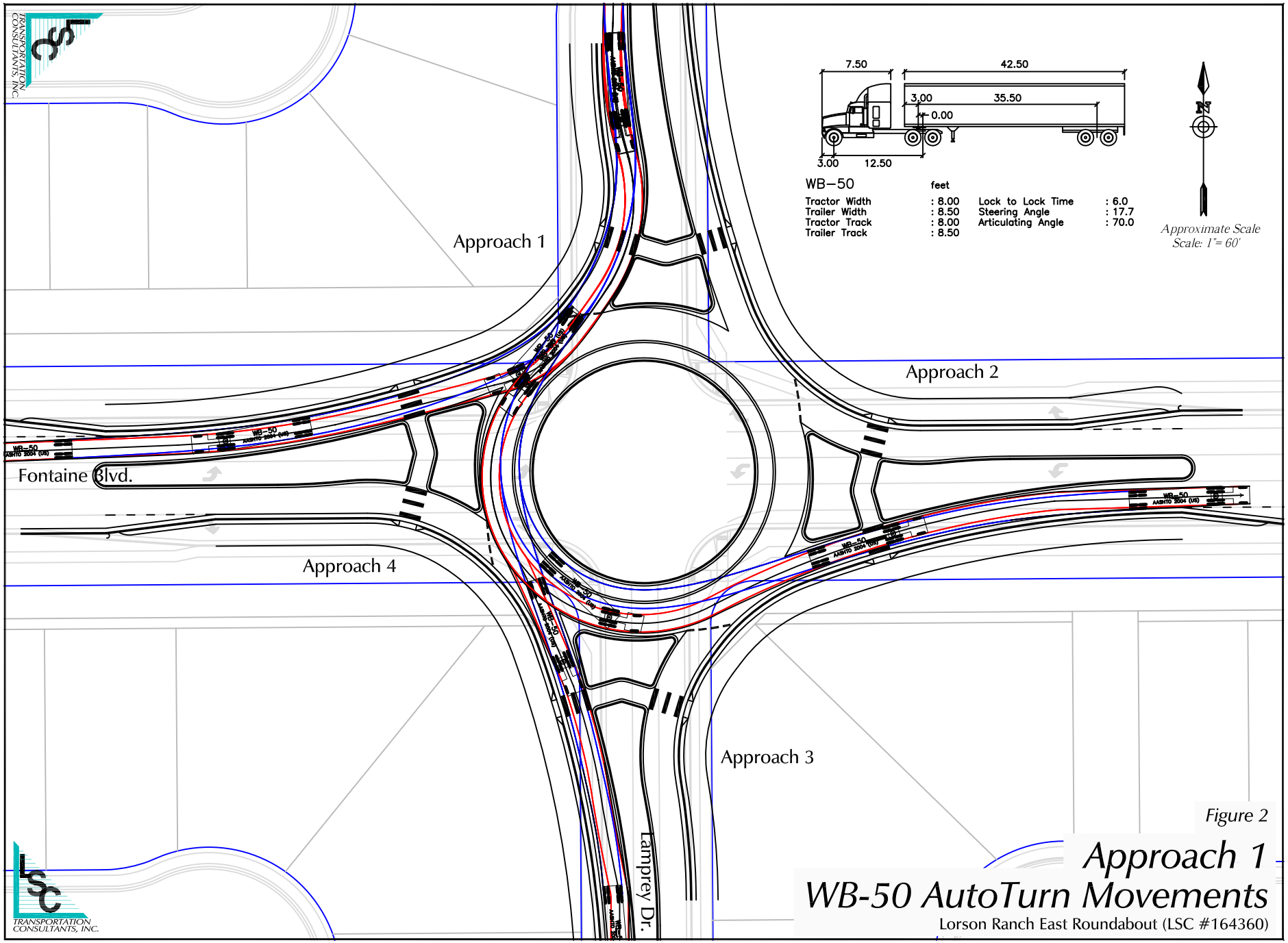

Figure 2

Approach 1
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

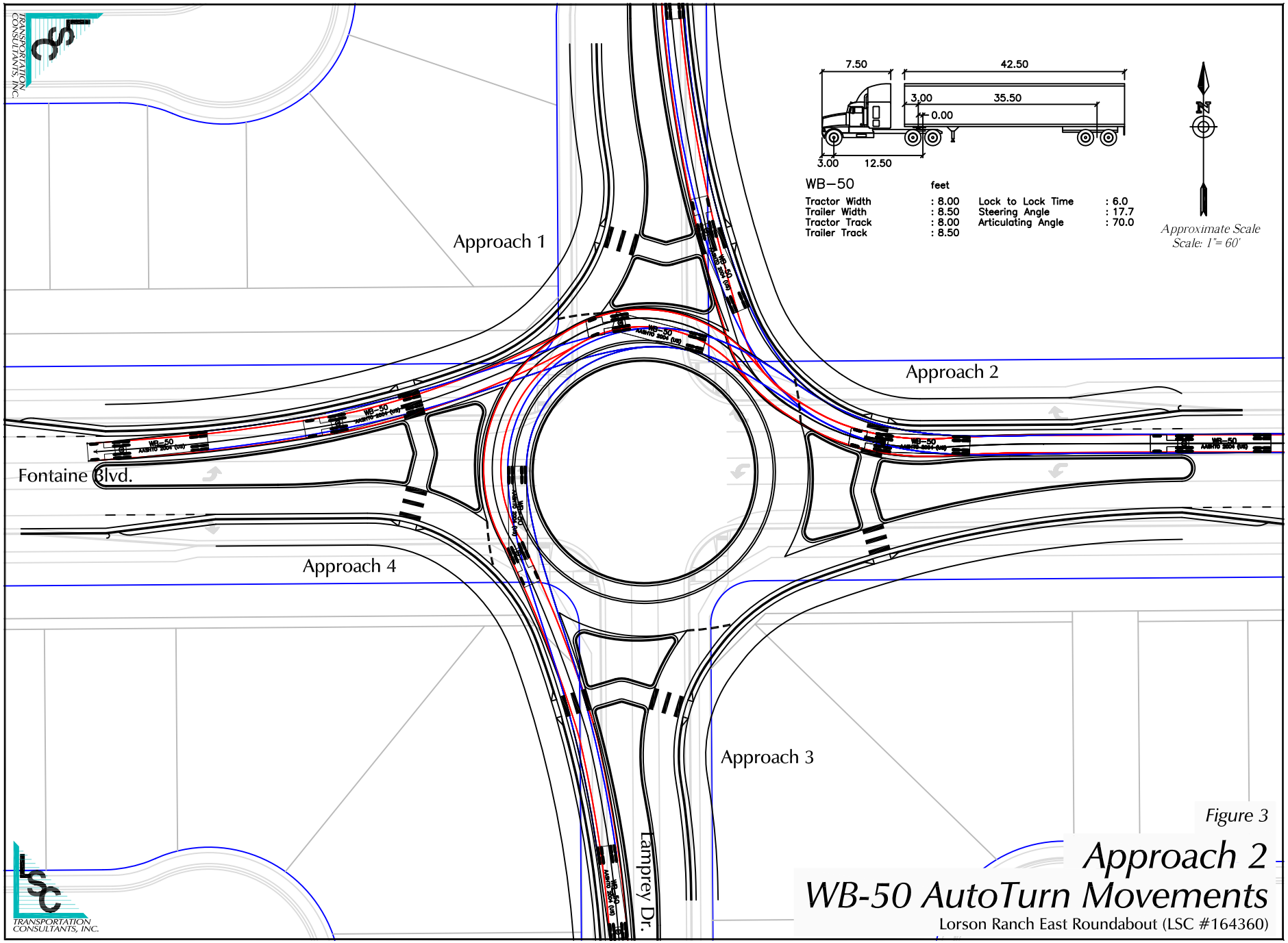

Figure 3

Approach 2
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

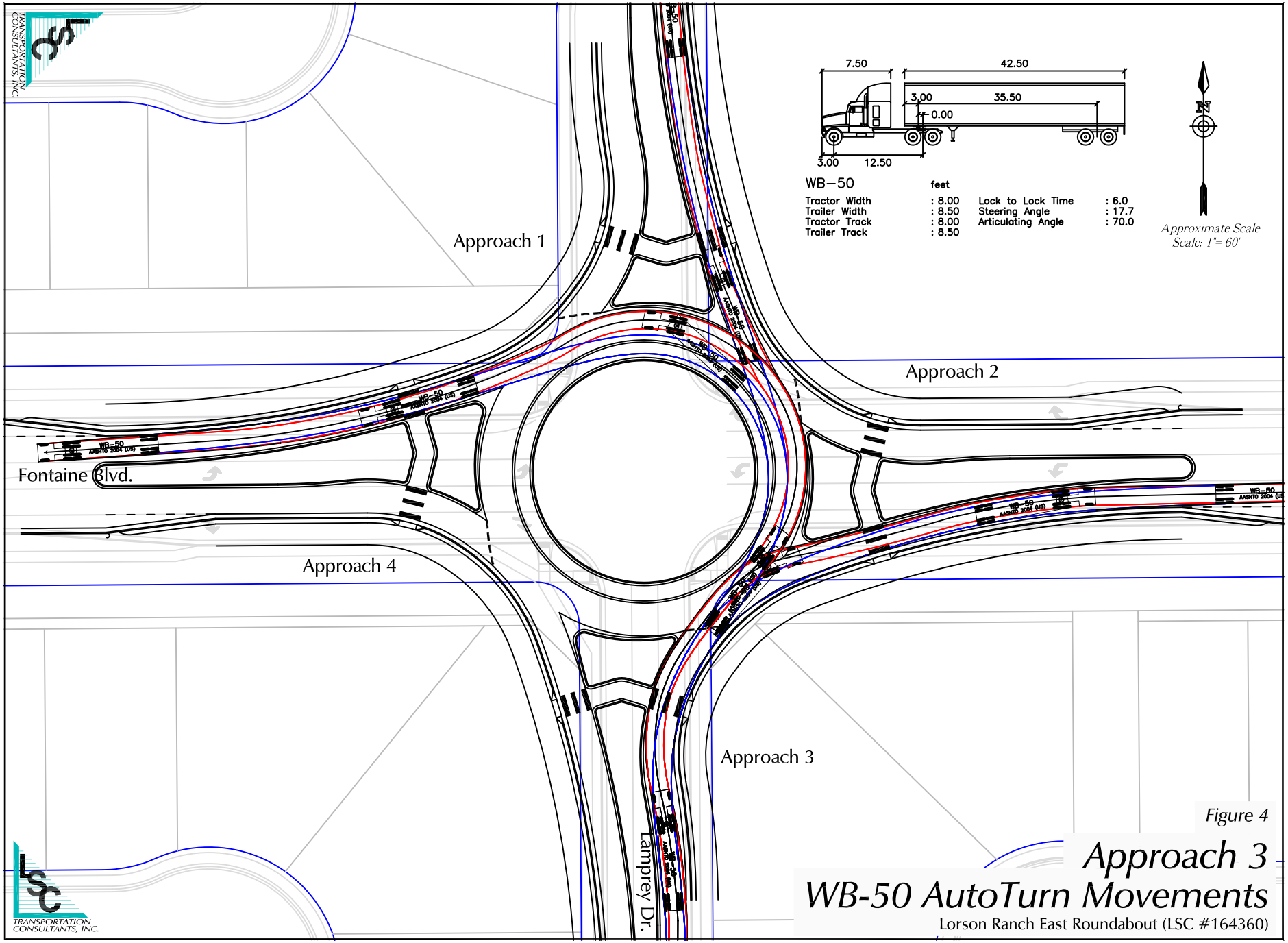

Figure 4

Approach 3
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

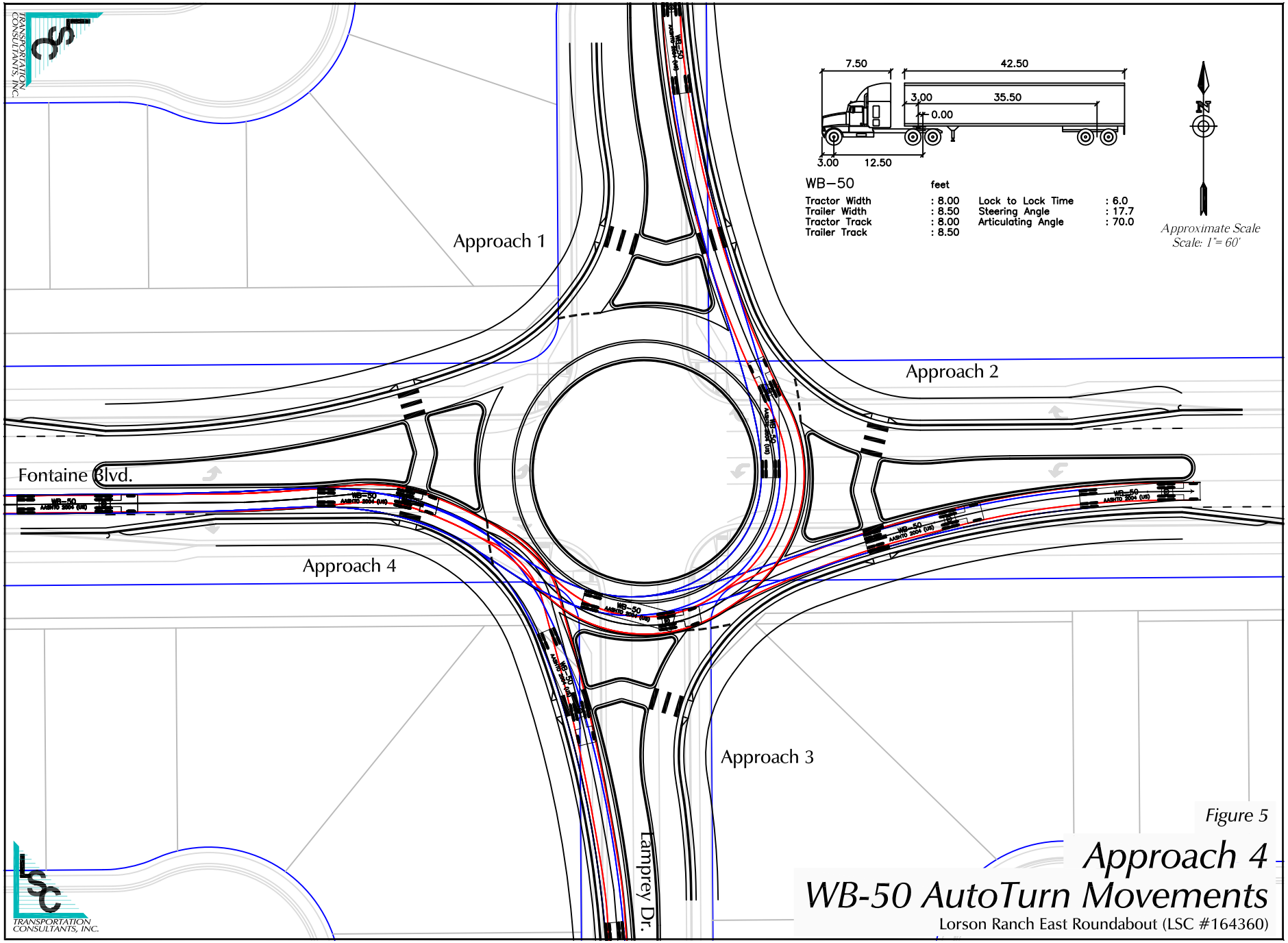

Figure 5

Approach 4
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

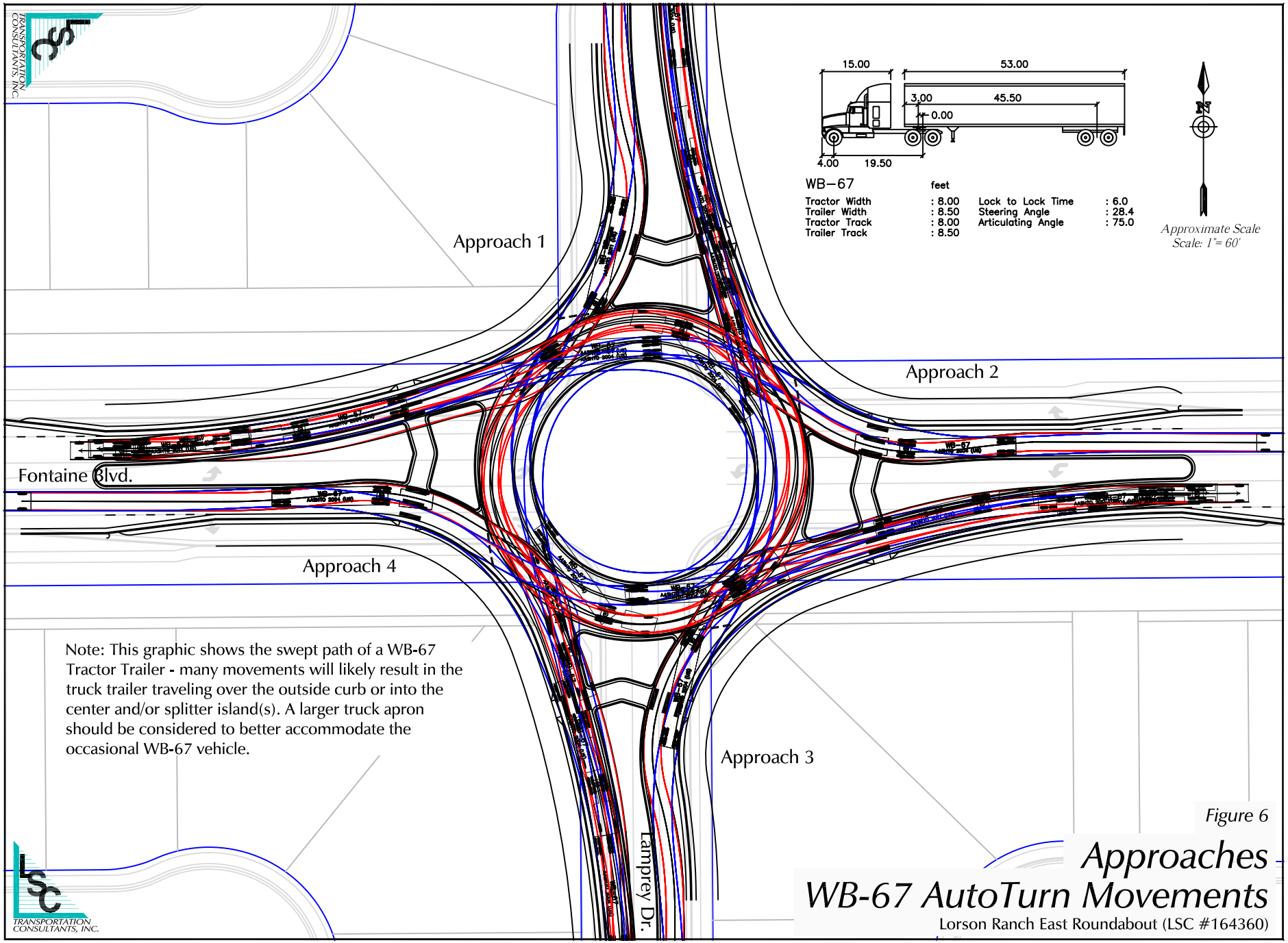

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Figure 6

Approaches
WB-67 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

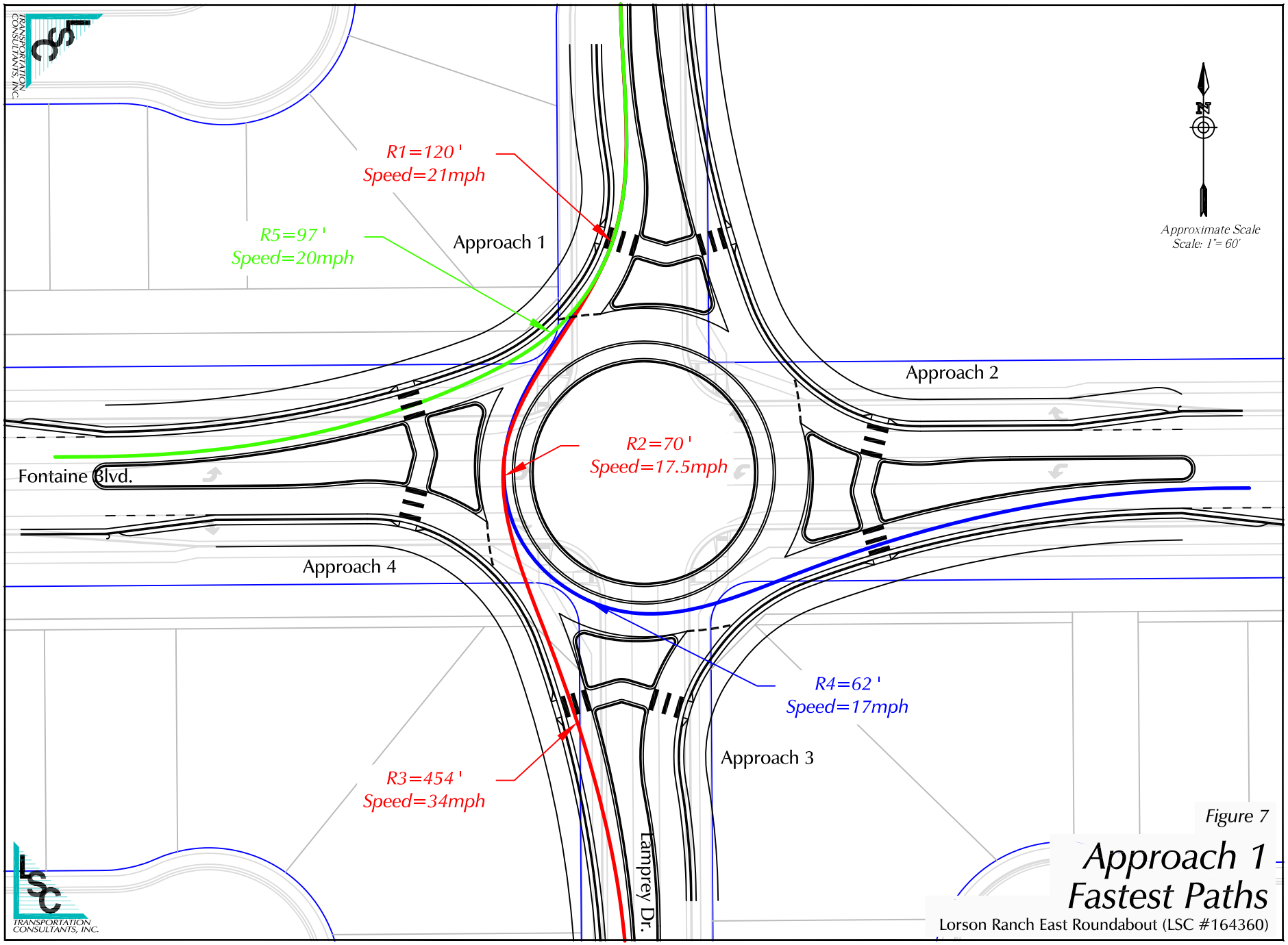

Figure 7

Approach 1 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

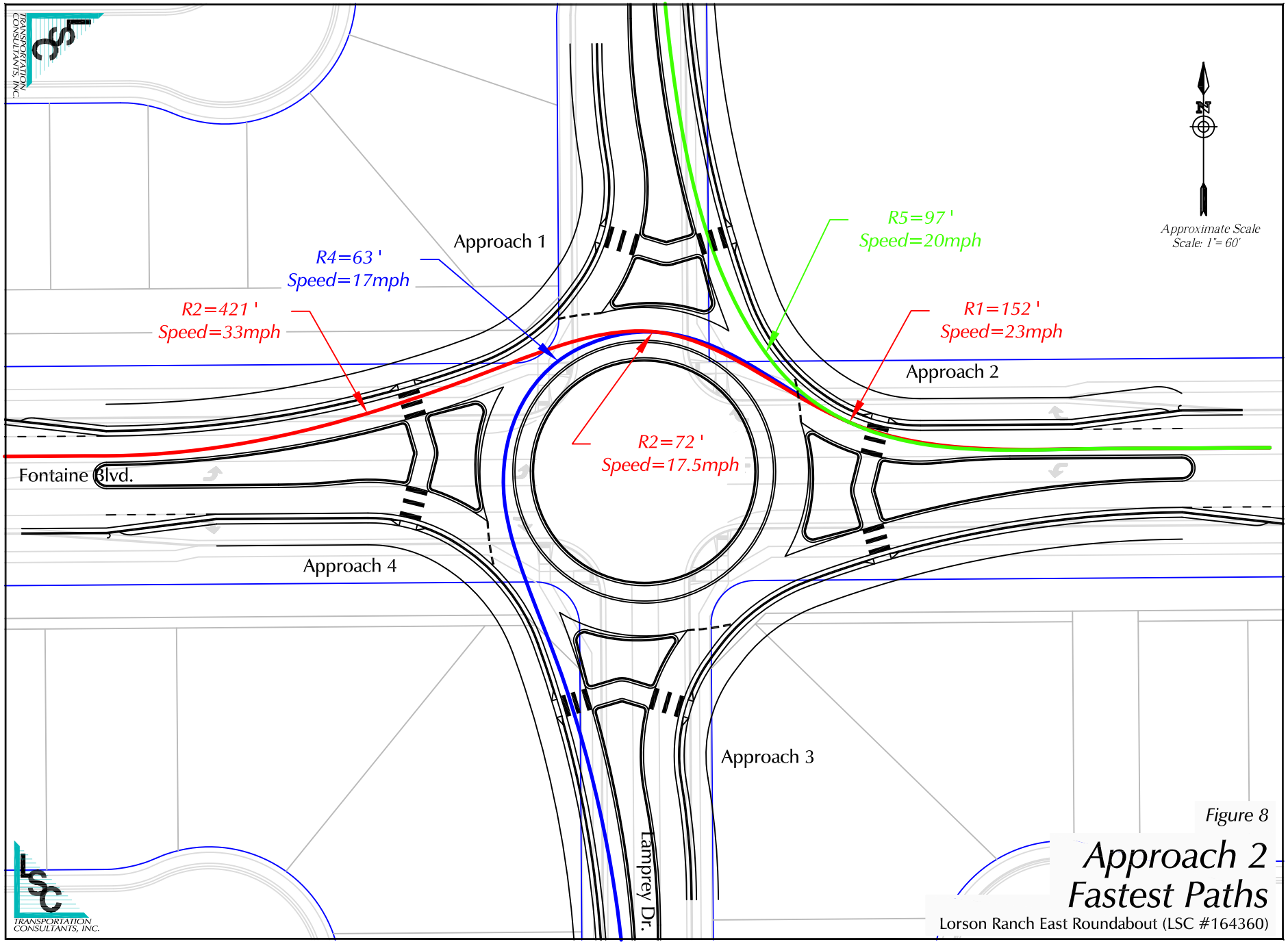

Figure 8

Approach 2 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

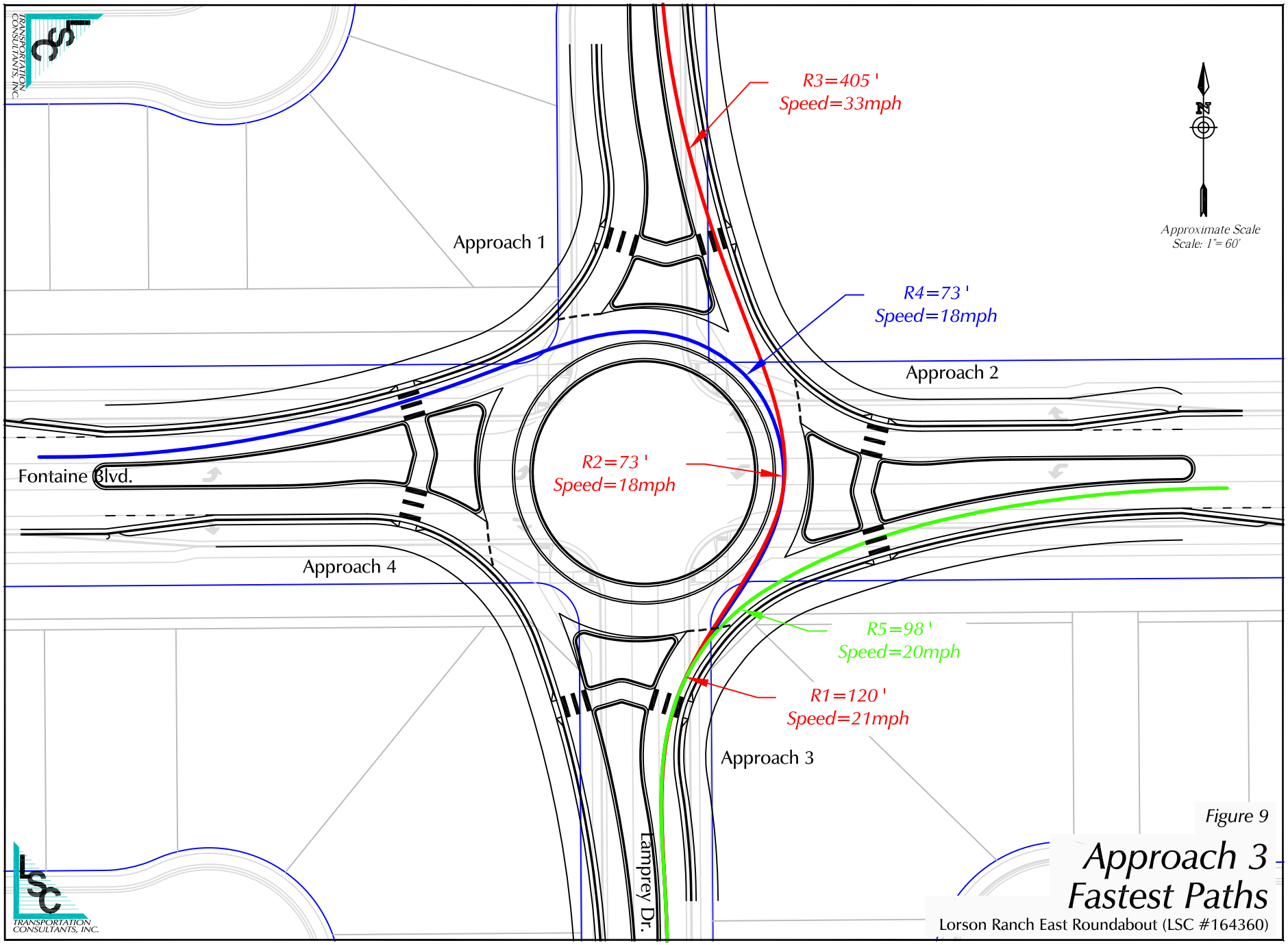

Figure 9

Approach 3 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

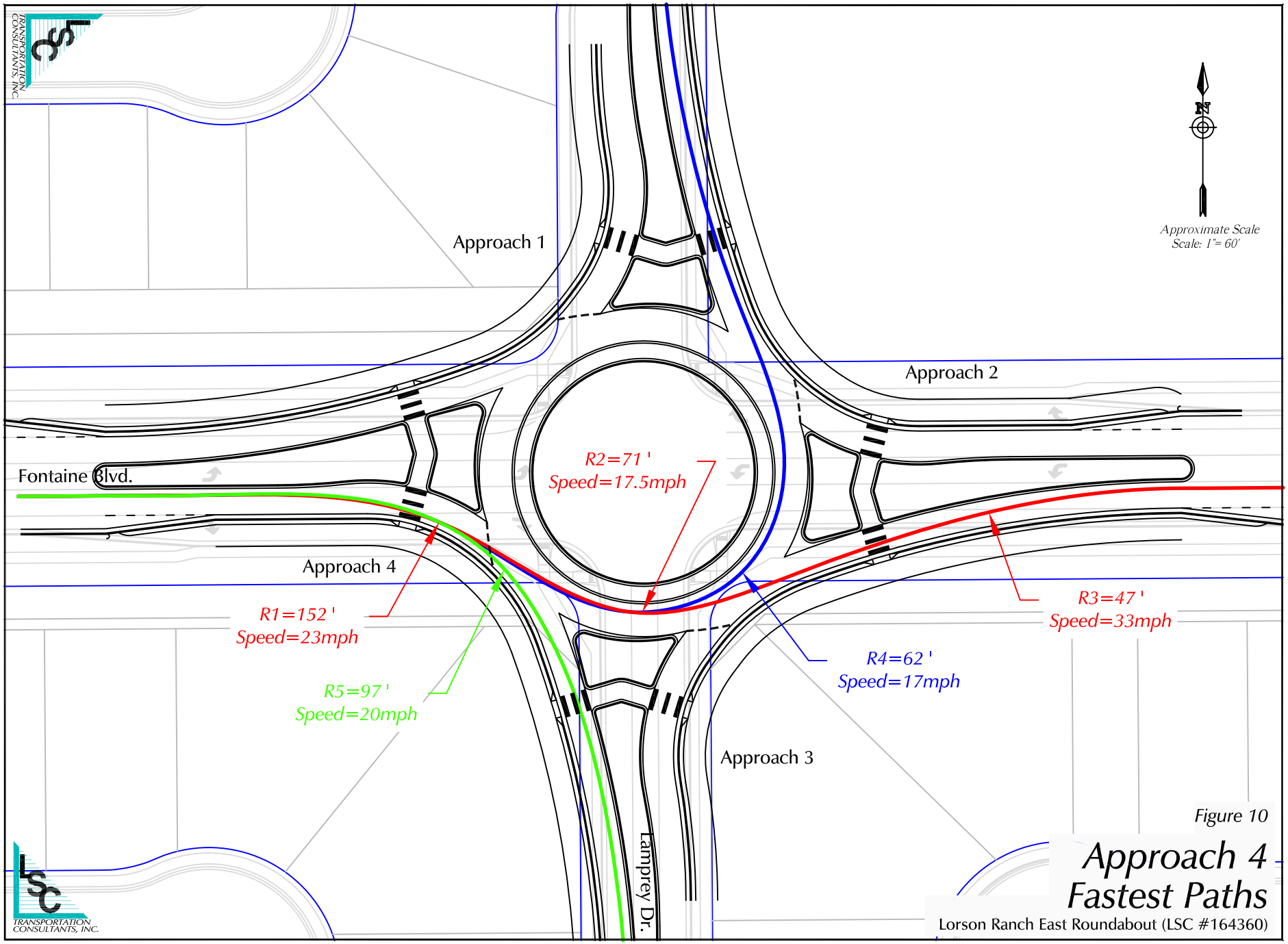

Figure 10

Approach 4 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

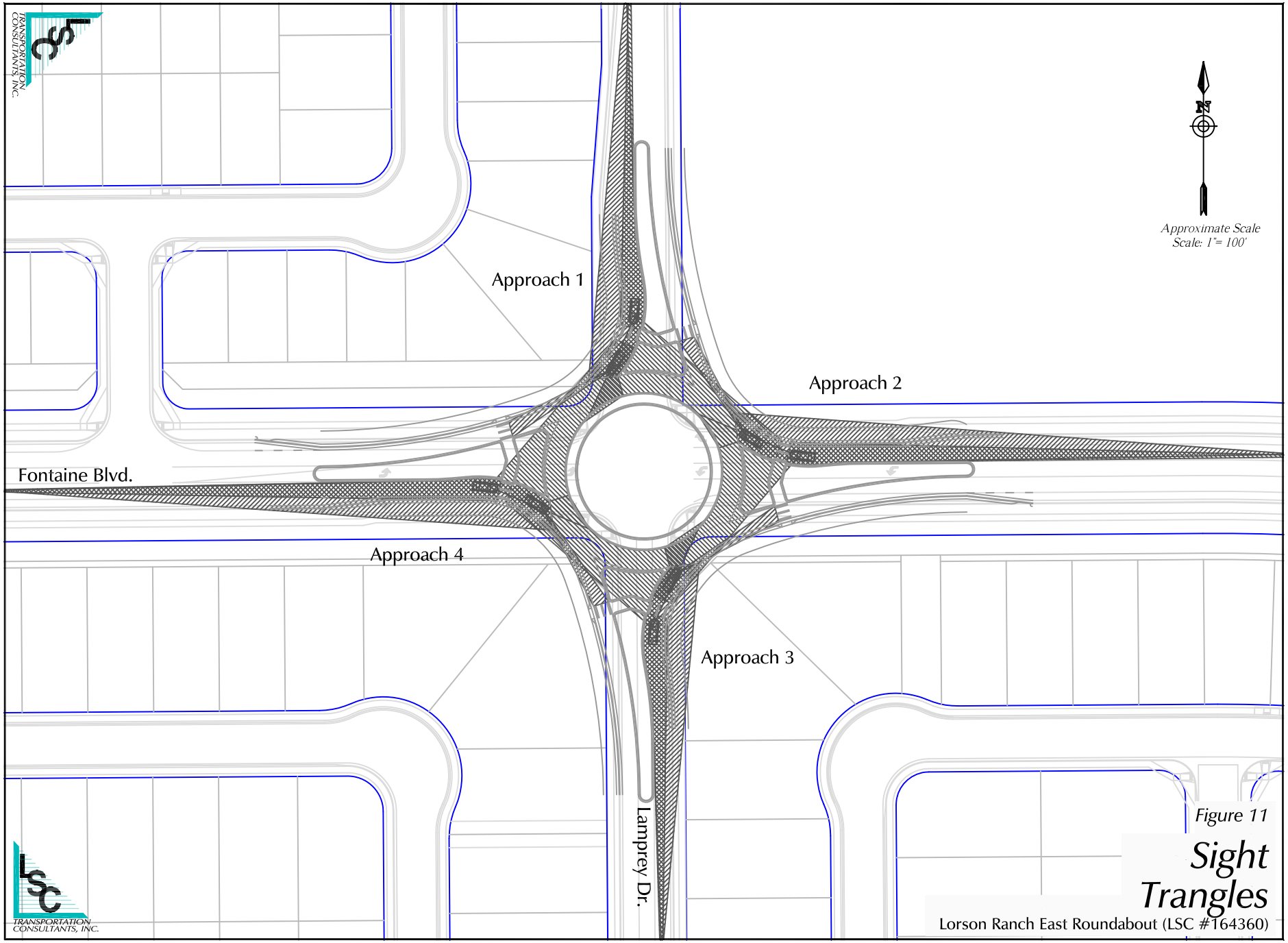

Figure 11

Sight Trangles

Lorson Ranch East Roundabout (LSC #164360)

Future Multi-Lane Design Exhibits

TRANSPORTATION
CONSULTANTS, INC.

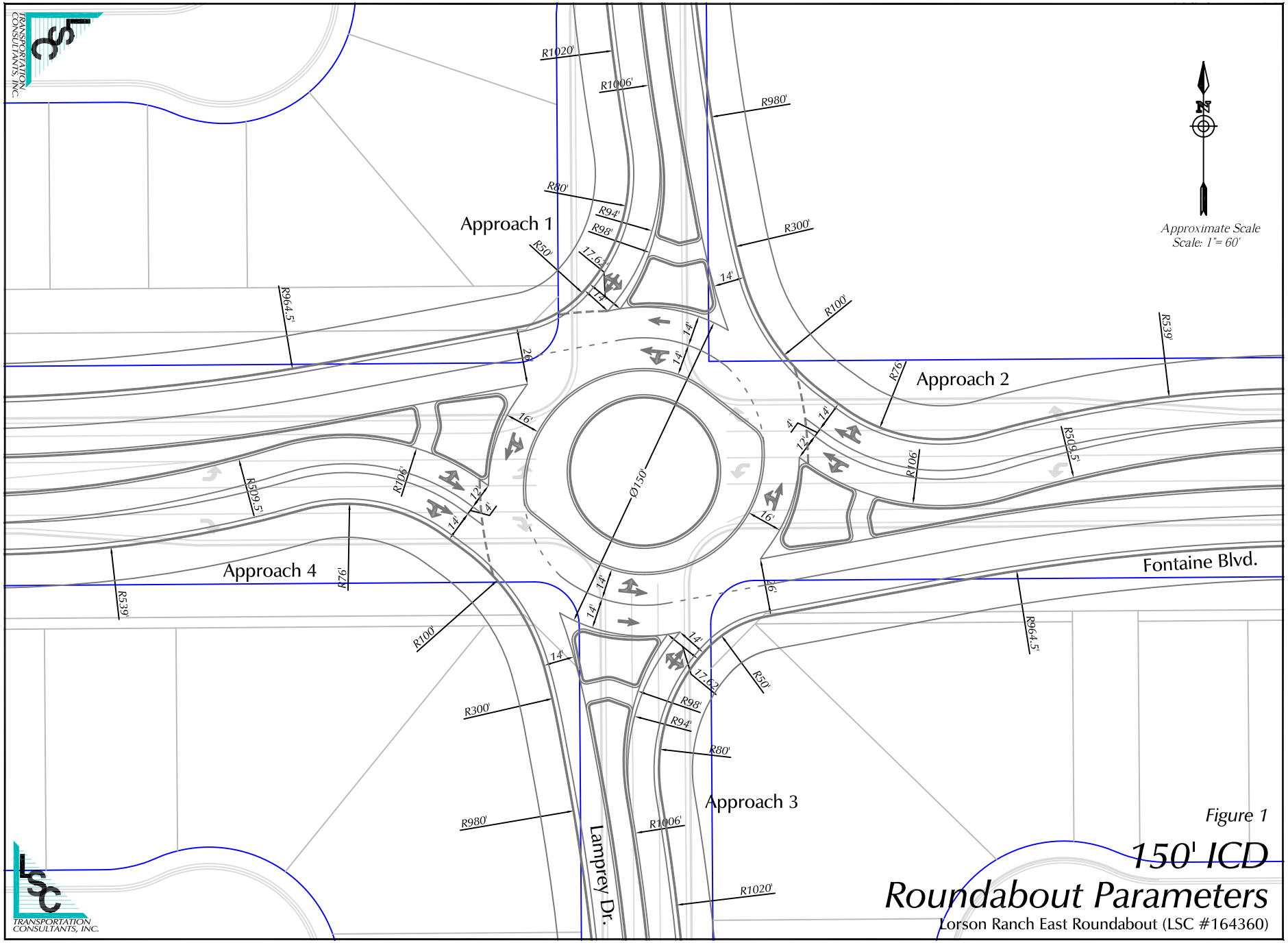

Figure 1

150' ICD

Roundabout Parameters

Lorson Ranch East Roundabout (LSC #164360)

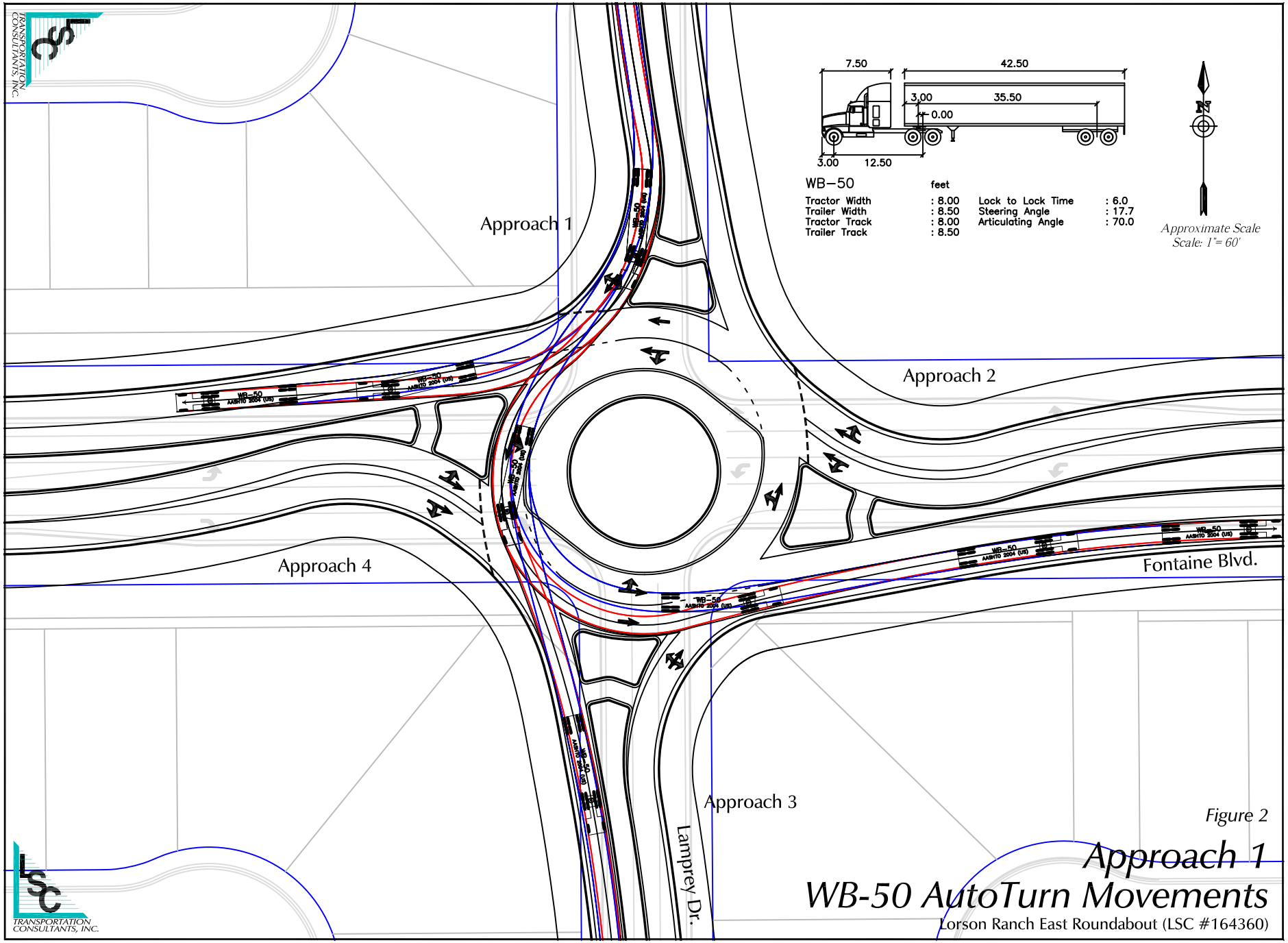

Figure 2

Approach 1
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

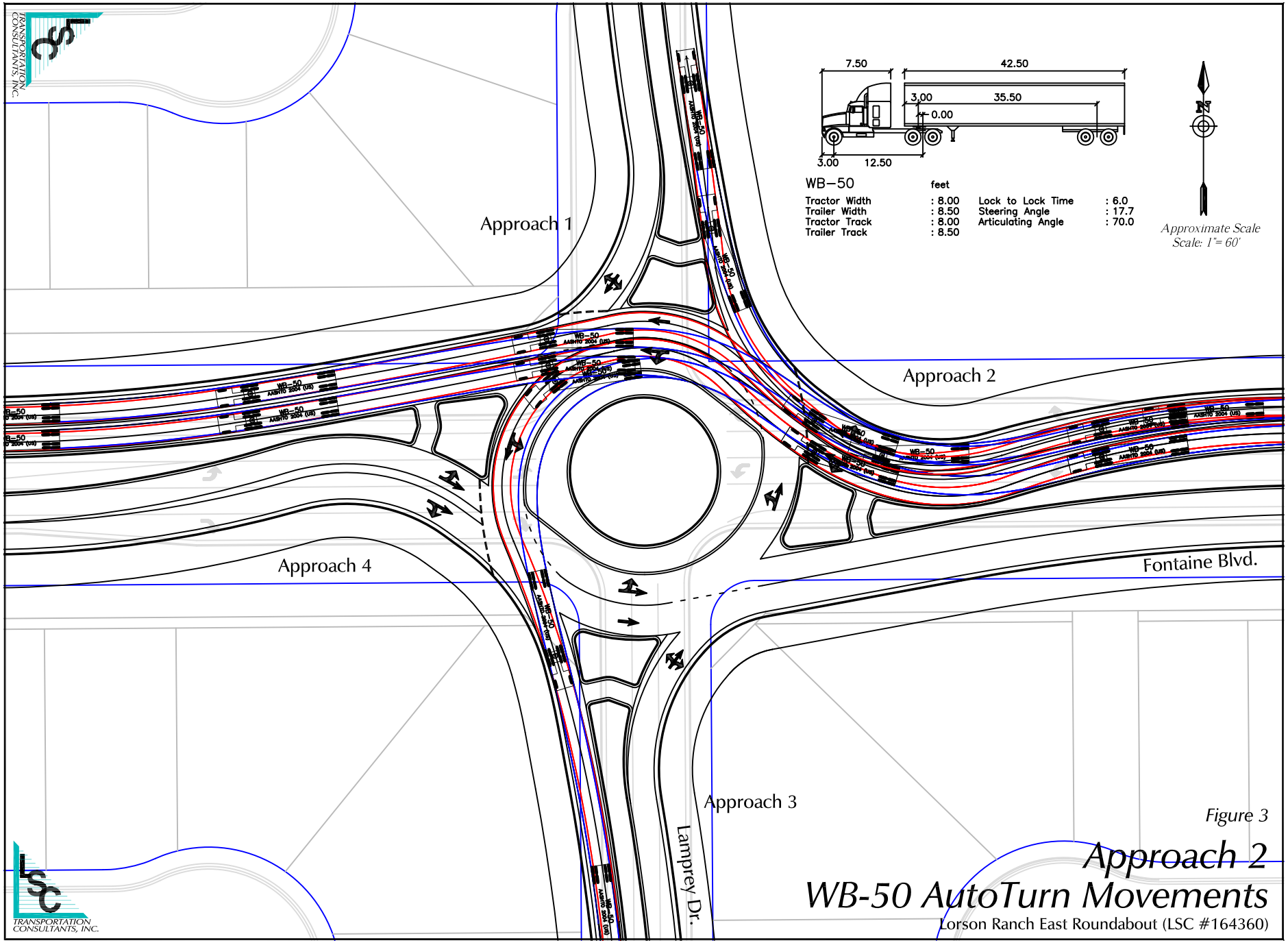

Figure 3

Approach 2
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

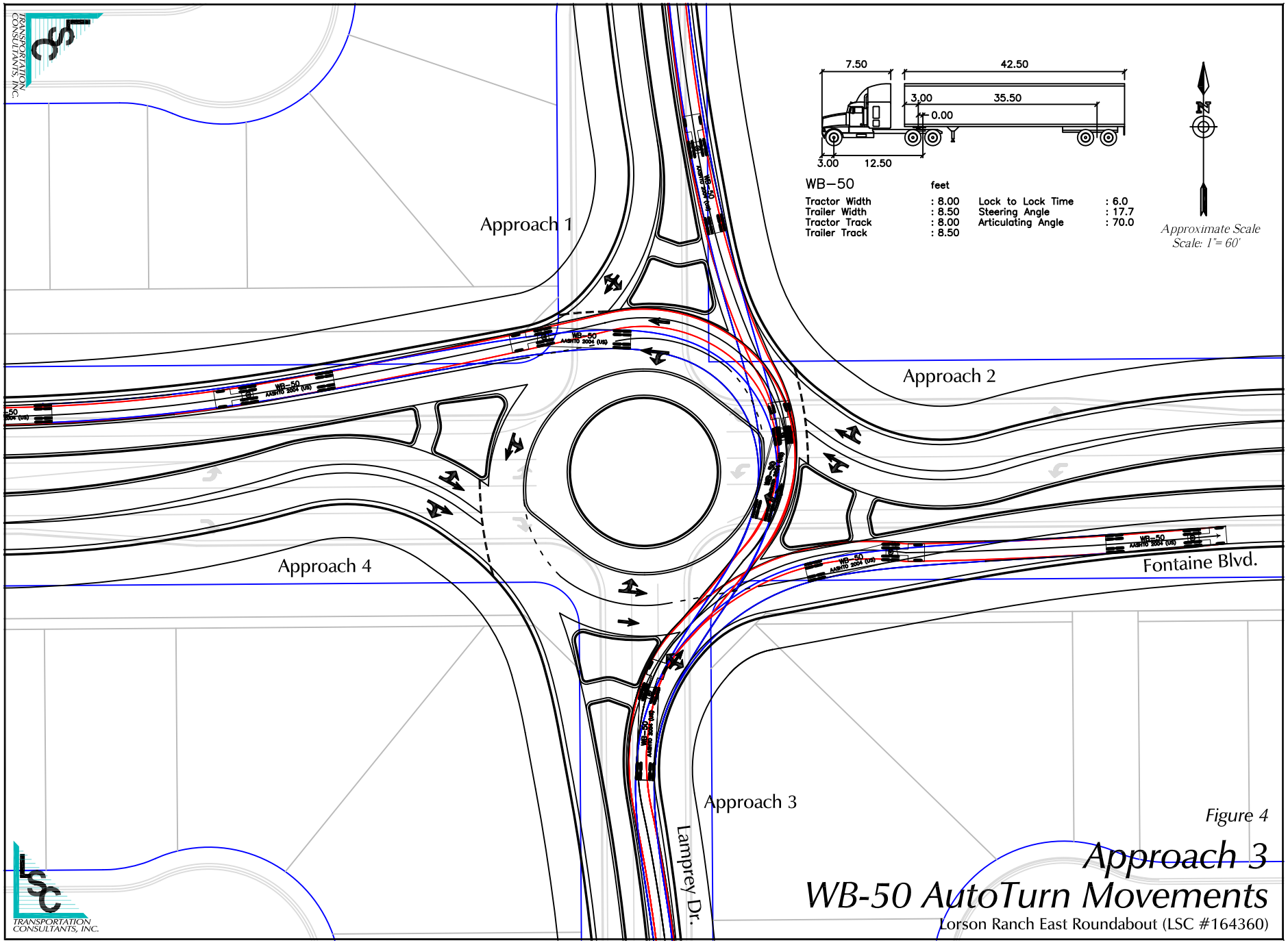

Figure 4

Approach 3
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

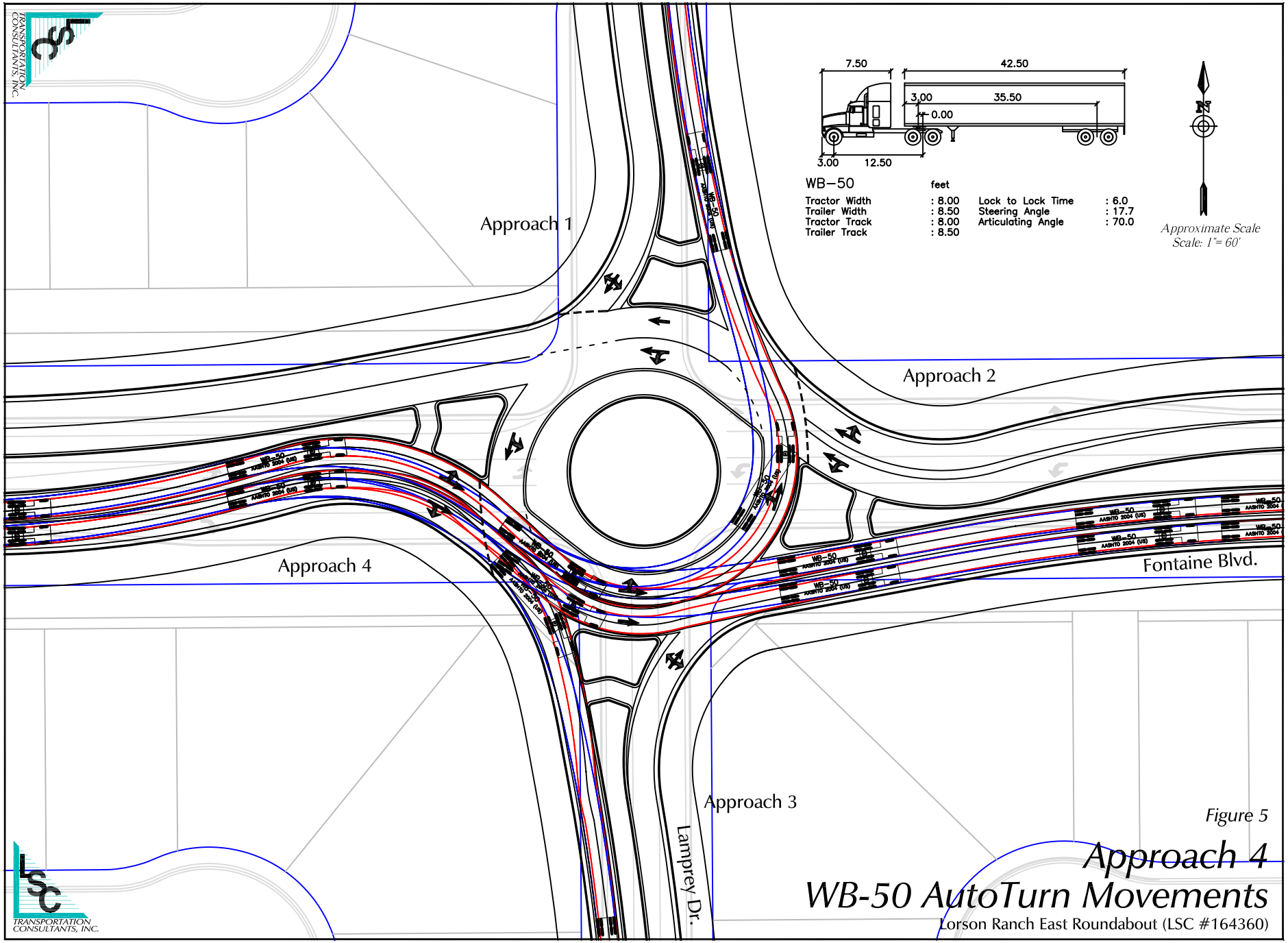

Figure 5

Approach 4
WB-50 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

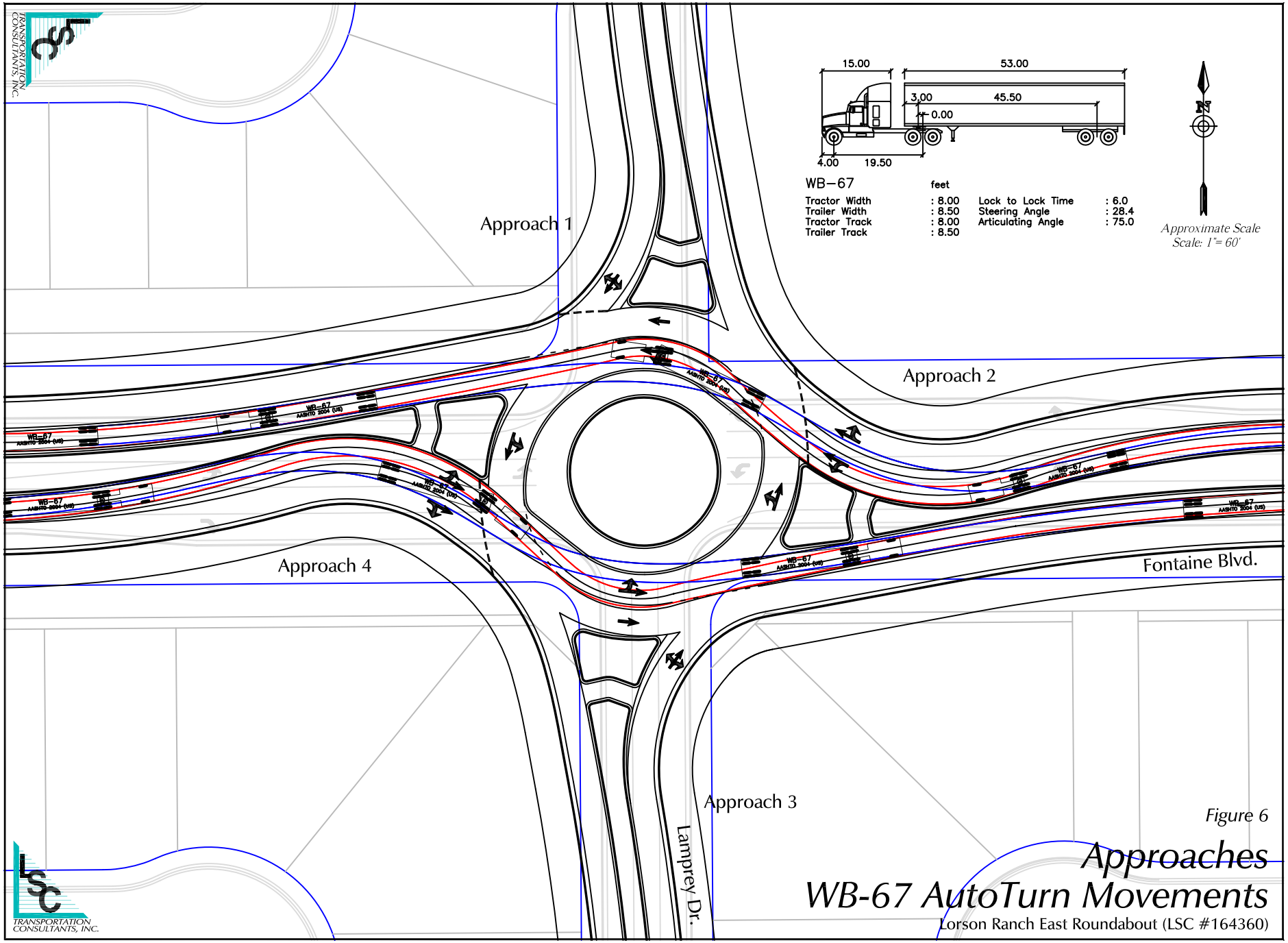

Figure 6

Approaches
WB-67 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

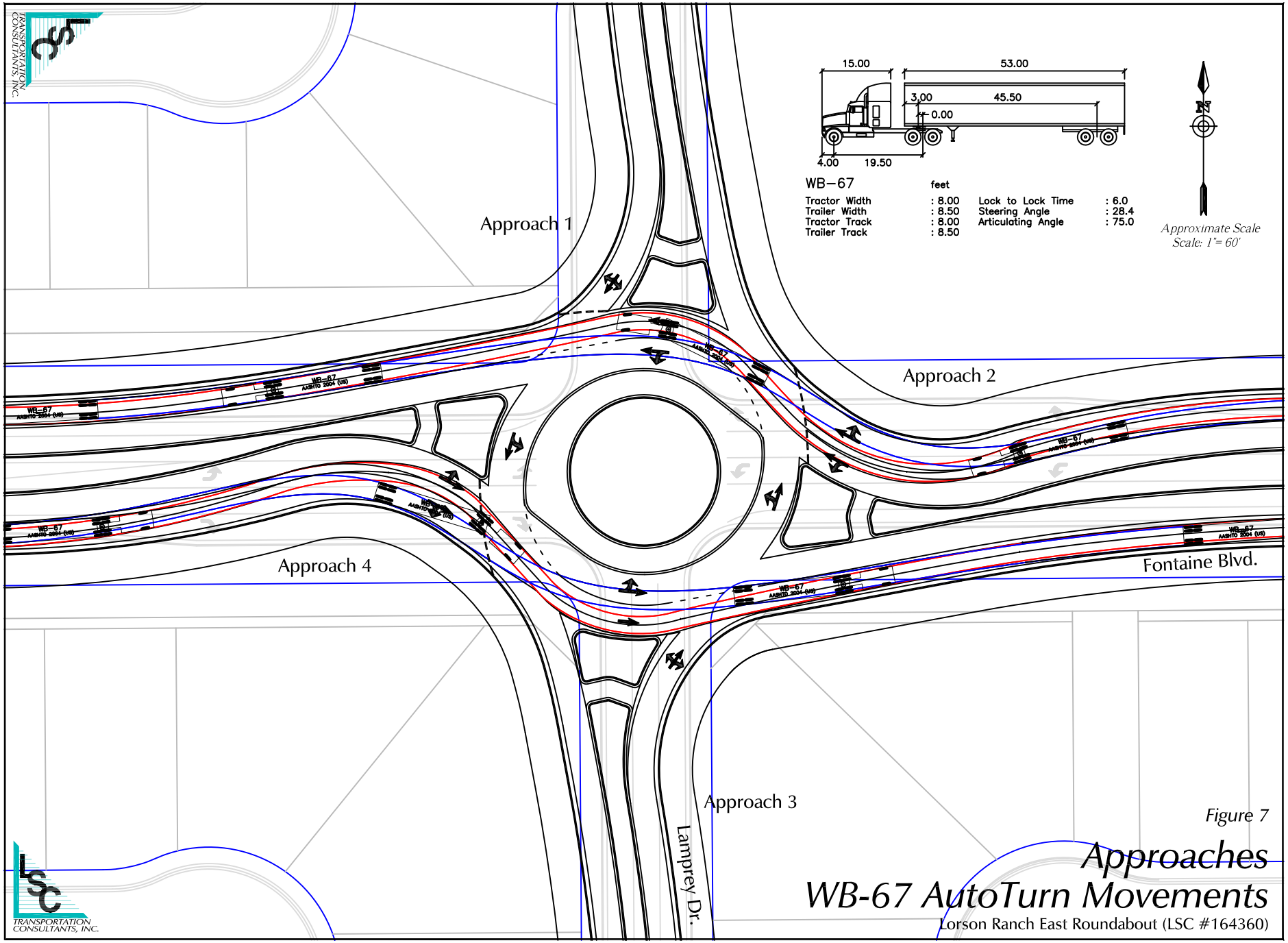

Figure 7

Approaches
WB-67 AutoTurn Movements

Lorson Ranch East Roundabout (LSC #164360)

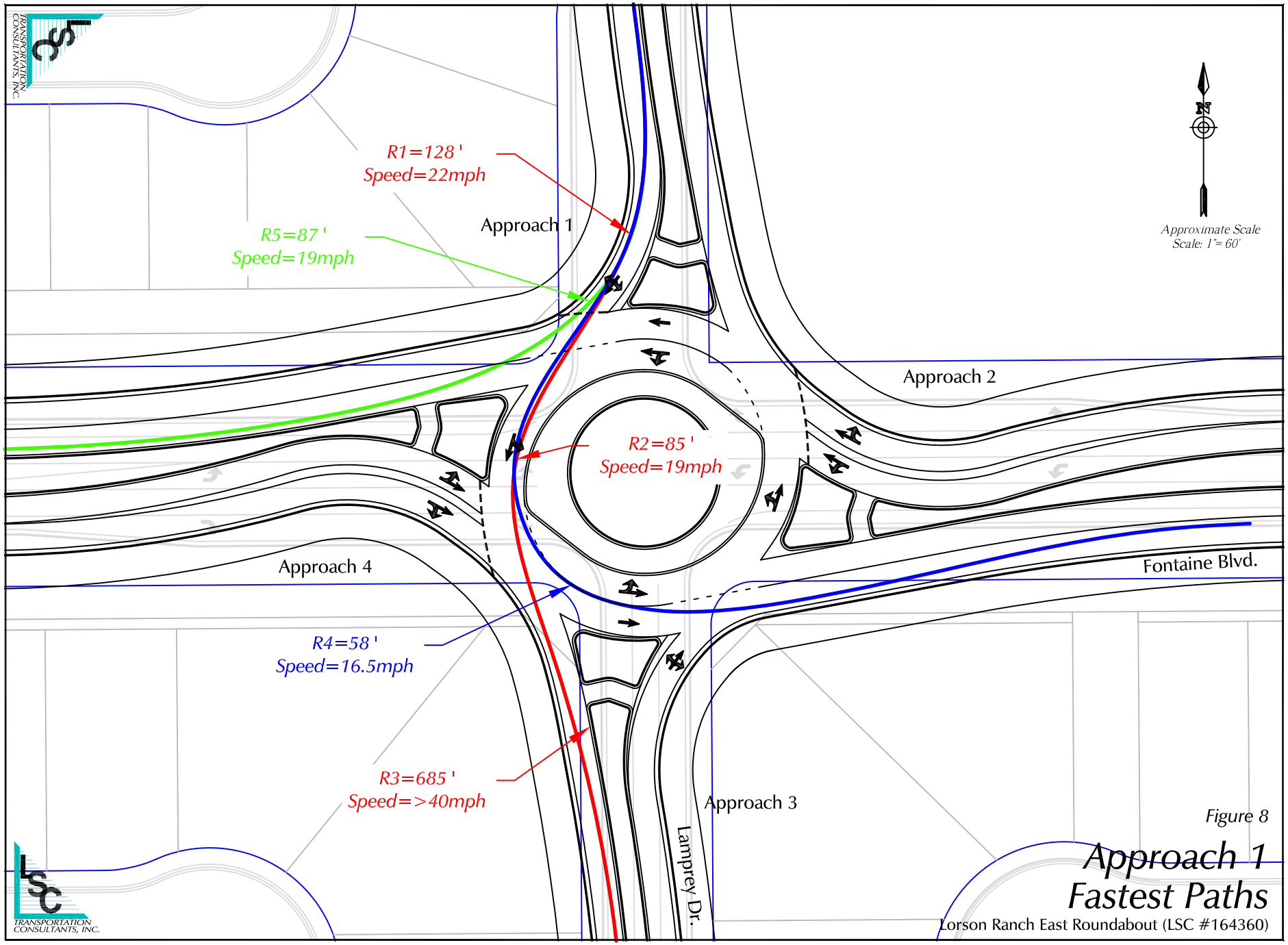

Figure 8

Approach 1 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

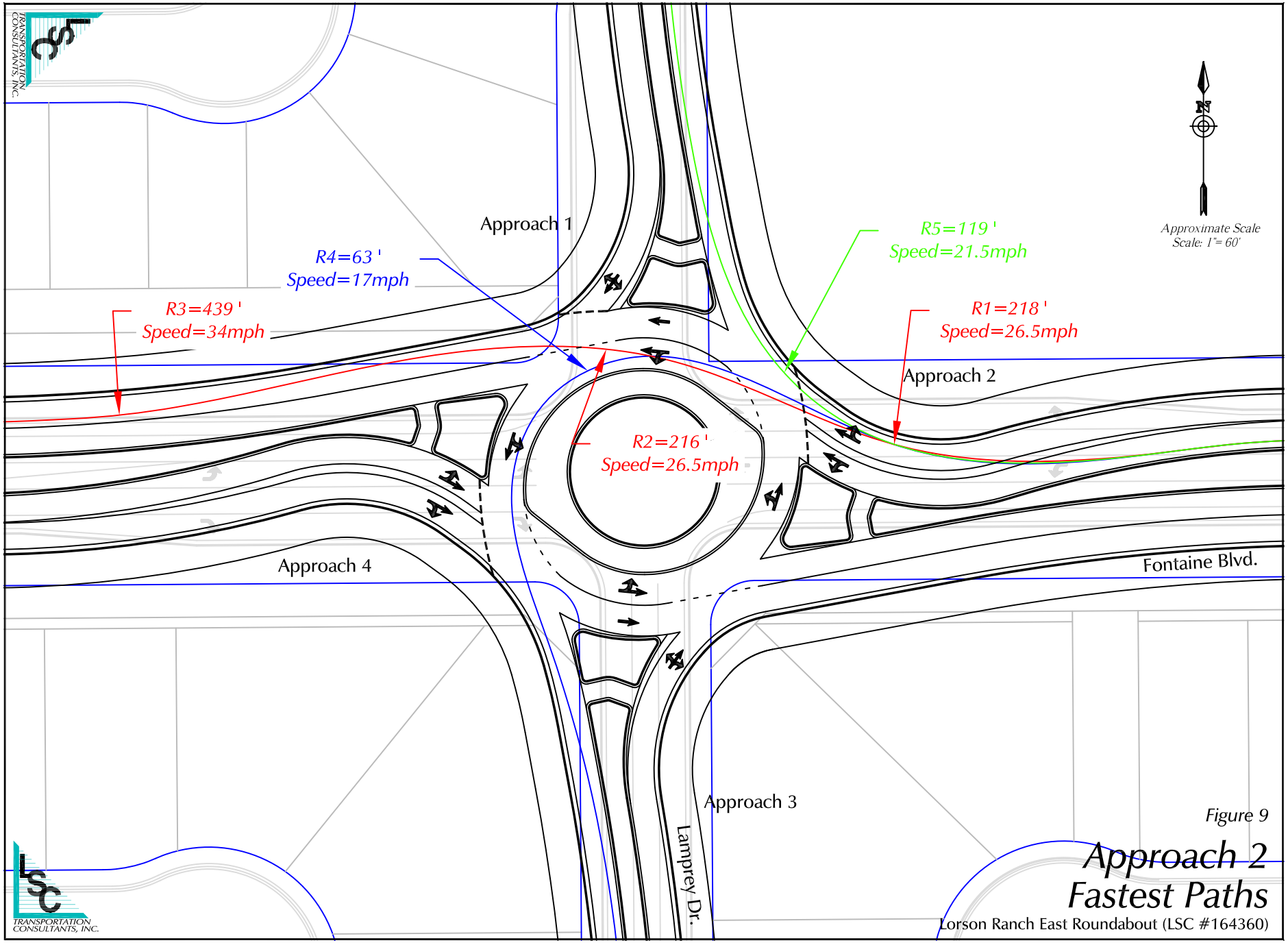

Figure 9

Approach 2 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

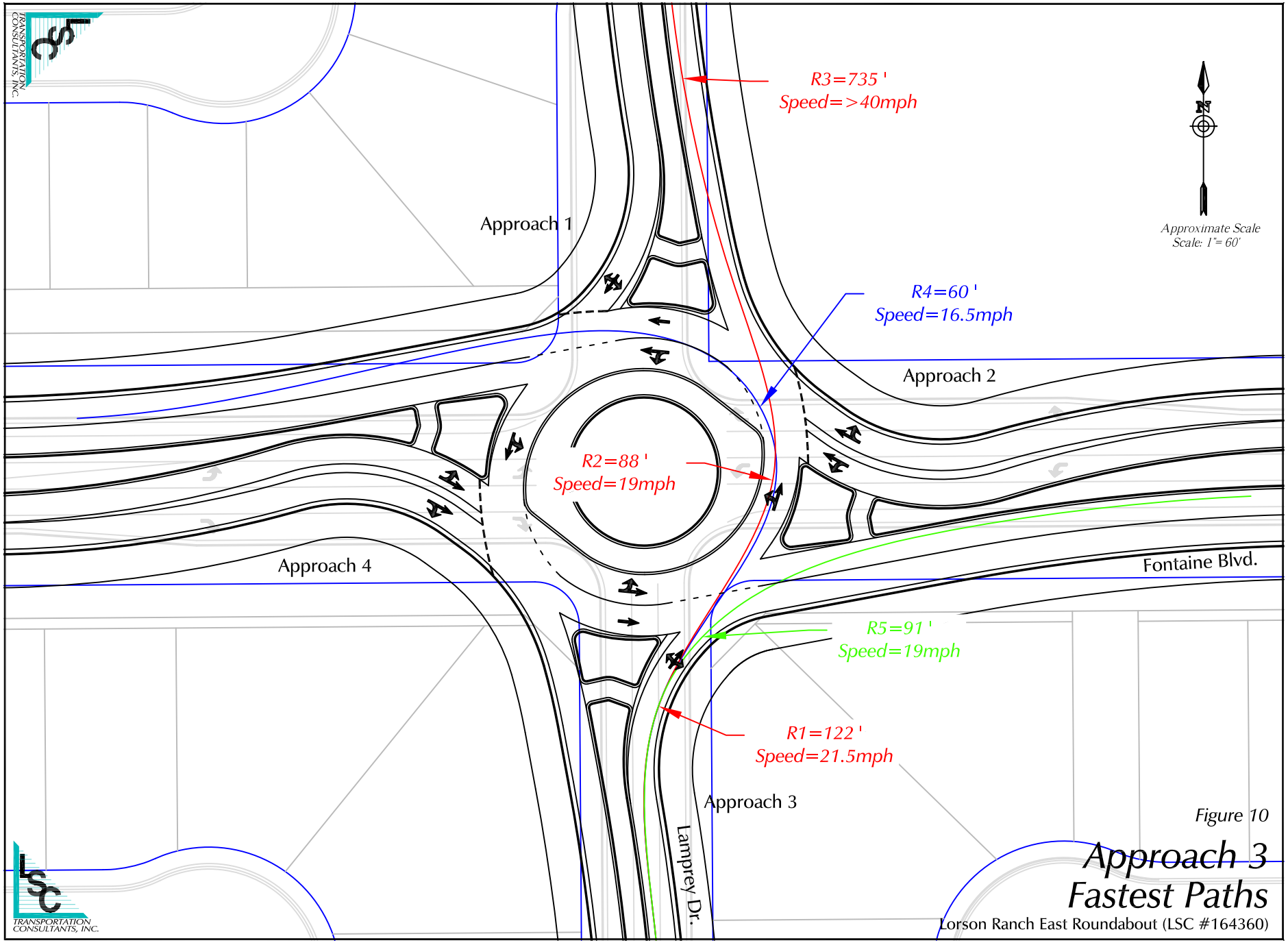

Figure 10

Approach 3 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

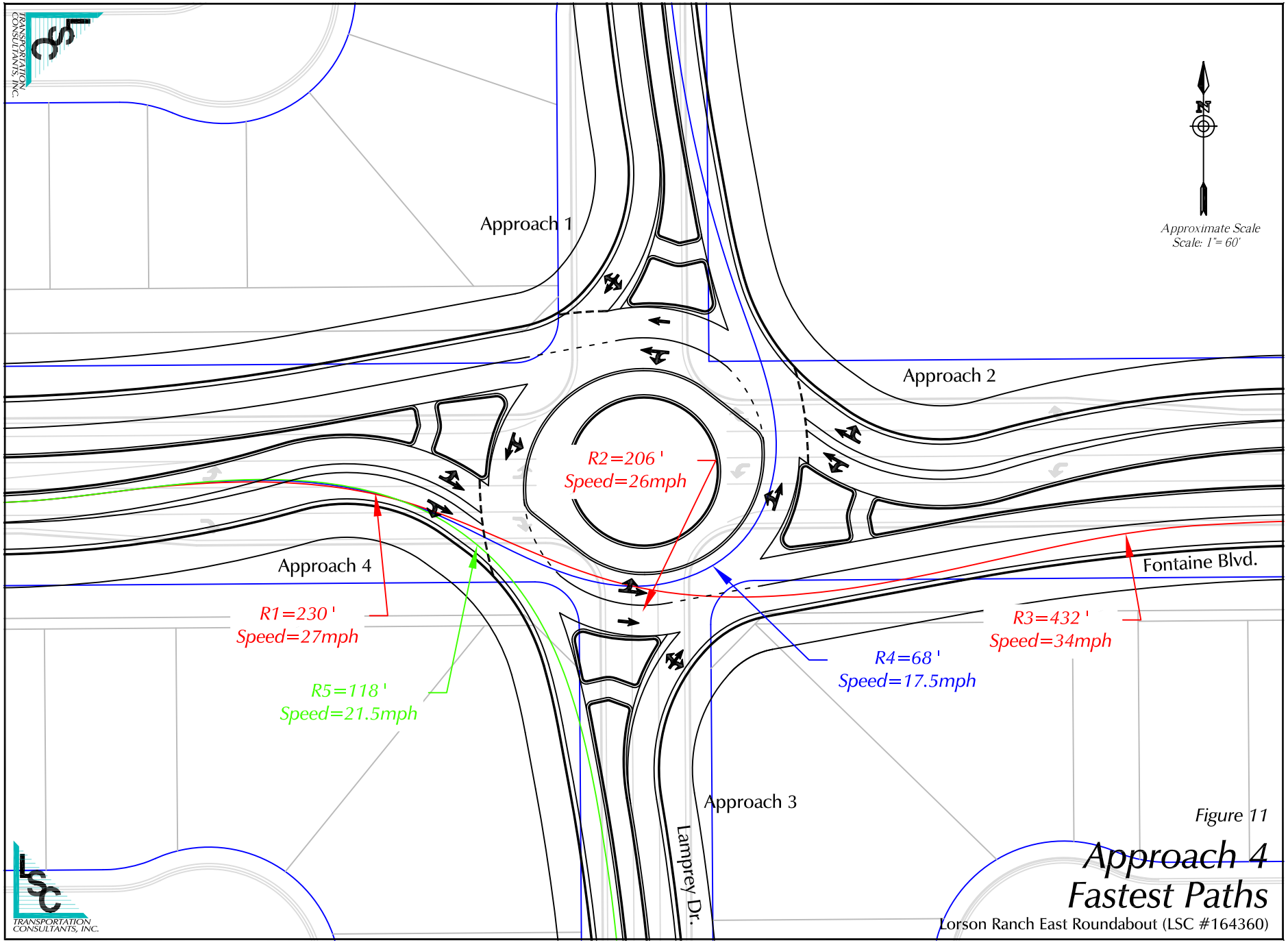

Figure 11

Approach 4 Fastest Paths

Lorson Ranch East Roundabout (LSC #164360)

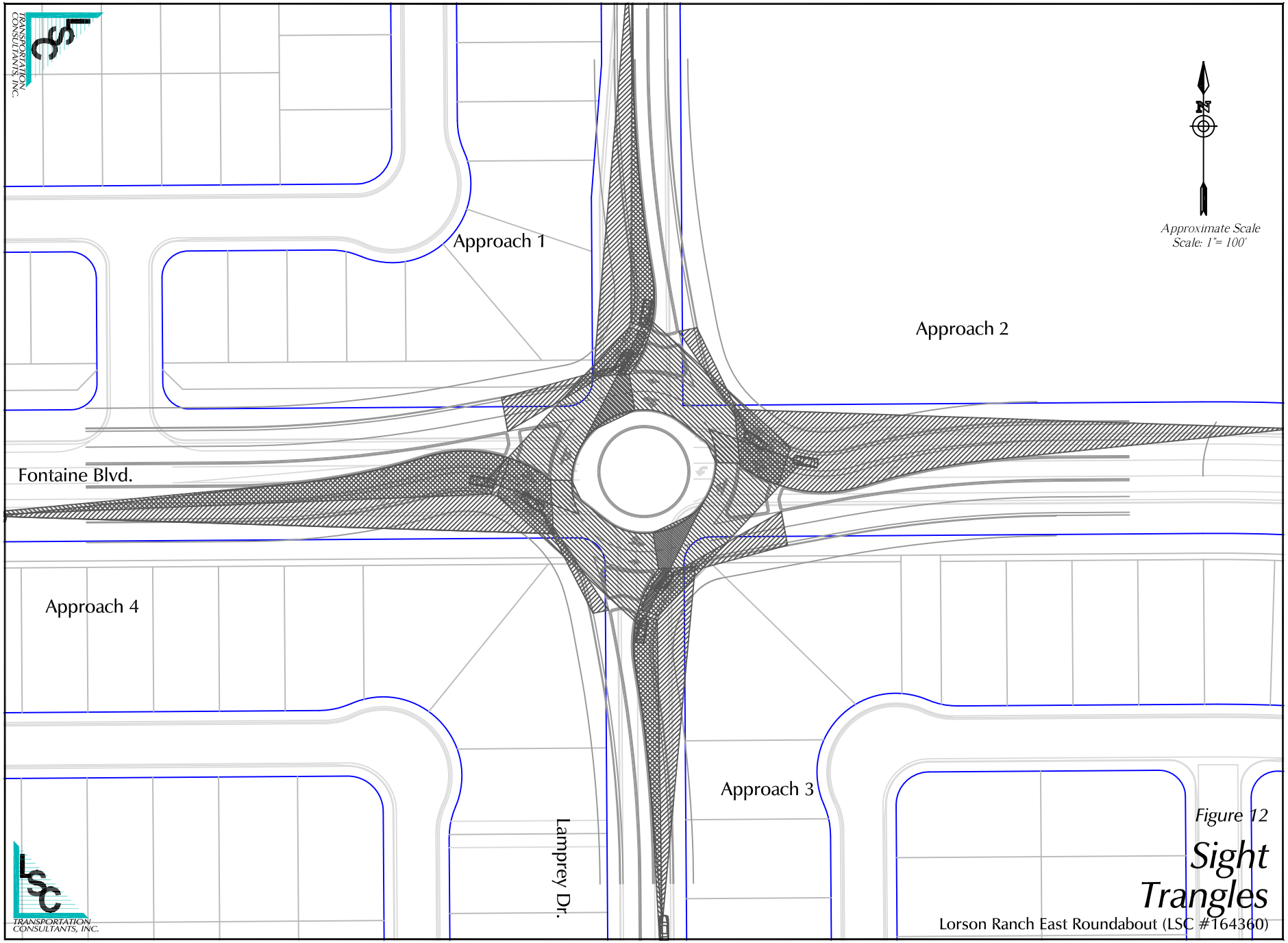

Figure 12

Sight Trangles

Lorson Ranch East Roundabout (LSC #164360)