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SH 94 / Curtis Road  
Traffic Impact Study  
PCD File No: CS203  
(LSC #204310)  
September 14, 2020

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.

*Curtis*

09-14-2020

Date

# **SH 94 / Curtis Road**

## **Master Traffic Impact Study**

### **PCD File No: CS203**

Prepared for:  
Ernesto Garcia Armendariz  
Land View LLC  
c/o Dan Kupferer, PLS  
Land Development Consultants, Inc  
3898 Maizeland Rd  
Colorado Springs, CO 80909

SEPTEMBER 14, 2020

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LSC Transportation Consultants  
Prepared by: Colleen Guillotte, P.E., PTOE, RSP  
Reviewed by: Jeffrey C. Hodsdon, P.E.

LSC #204310



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September 14, 2020

Ernesto Garcia Armendariz  
Land View LLC  
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3898 Maizeland Rd  
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RE: SH 94/Curtis Road  
Master Traffic Impact Study  
El Paso County, Colorado  
LSC #204310  
PCD File No. CS203

Dear Mr. Armendariz:

LSC Transportation Consultants, Inc. has prepared this master traffic impact study for the proposed development planned to be located southeast of the intersection of State Highway (SH) 94/Curtis Road in El Paso County, Colorado. The planned land use is for residential, commercial, and trucking. This report has been prepared for submittal to El Paso County and the Colorado Department of Transportation (CDOT). Subsequent traffic impact studies will be provided with each phase of development.

## REPORT CONTENTS

The preparation of this report included the following:

- Inventory of the existing adjacent and nearby roadway system. This includes functional classifications, street widths, lane configurations, intersection traffic control, posted speed limits, pavement markings, intersection and access spacing, roadway and intersection alignments, auxiliary left- and right-turn lanes, intersection sight distances, etc.;
- A review of the proposed site land use and access locations;
- Morning and evening peak-hour traffic volumes at the intersection of SH 94/Curtis Road;
- Estimates of short- and long-term background traffic volumes and total traffic (site traffic plus background traffic). Forecasts include buildout of adjacent proposed developments;

- Estimates of the daily and peak-hour trip generation for the proposed land use;
- The estimated directional distribution of site-generated vehicle trips on the study area roadway system;
- Projections of peak-hour site-generated turning-movement traffic volumes at the study area intersections;
- Level of service (LOS) analysis at the study area intersections;
- Evaluation of the short-term and long-term projected intersection volumes to determine the potential need for any new auxiliary right-/left-turn lanes and/or the adequacy of existing lanes at the site access-point intersections and the other study area intersections; and
- Findings and recommendations.

## **PREVIOUS TRAFFIC STUDIES**

In March 2018, a traffic study was completed by Gannett Fleming for Schriever Air Force Base: Traffic Study on Enoch and Irwin Road Entry Control Stations. LSC is not aware of any other recent traffic studies in the study area. In 2012 El Paso County completed the State Highway 94 Access Management Plan.

## **LAND USE AND ACCESS**

Figure 1 shows the site location relative to the adjacent and nearby roadways. The site plan is shown in Figure 2.

### **Site Land Uses Proposed with the Rezone Application**

The development is proposed to include 21 2.5-acre+ lots for single family homes, a 30-acre site to be zoned CS for **future** commercial use(s), and 5 acres of land for a trucking business.

#### Commercial Site (30 acres)

For purposes of this report, a conservative assumption (with respect to potential vehicle trip generation) of approximately 225,000 square feet of shopping center space for the 30-acre commercial site has been made by LSC. This could be considered the “highest and best use” for a CS-zoned parcel (assumes a floor area ratio [FAR] of about 0.18). However, it is more likely that only a minority portion would be developed as a shopping center with retail, restaurant/service businesses, or highway convenience uses. The majority of the 30-acres is likely to be developed with industrial, business park, or warehousing uses.

#### Trucking Business

The trucking business is relocating from another location. This location is anticipated to have up to 10 multi-unit trucks and 10 drivers. The facility will also have a small business office and a small maintenance facility that will employ five people. The trucks are used to support construction projects.

Truck drivers will travel to the site via their own passenger vehicles between 5:00 and 7:00 a.m. and depart in the company trucks to the job site(s). The employees return the company trucks to the site between 3:30 and 6:00 p.m. and then leave the site in their own vehicles.

Some hauling contracts are local with trucks parked at the site each night and dispatched to local job sites as needed during each work day. Other contracts are for projects out of the local area. With these “out-of-town” contracts, truck drivers travel out of the local area with the trucks for jobs that require them to remain away for several days (or longer) periods. The drivers and their trucks are often contracted for out-of-state or out-of-county jobs that require them to remain away for weeks or months at a time. This is most common during the summer construction season. During the winter, when there are fewer jobs, trucks may remain parked on site for several months. However, this analysis conservatively assumes all trucks leaving and returning to the site each day.

### **Development Phasing**

This development would be phased. The trucking business would be the first to be developed, followed by the single-family subdivision. The commercial site may be the last to be developed. But portions of the 30-acres may be developed in the short term as well.

### **Access & Circulation**

As shown in Figure 2, one access point to the adjacent Arterial roadway system is proposed: a full-movement access onto Curtis Road about 1,575 feet south of State Highway 94 (centerline spacing). This spacing meets the intersection spacing criteria in the ECM of a quarter mile required for Curtis Road’s current and future roadway classification.

A proposed public roadway extending east from this planned intersection would serve the trucking business, the 30-acre commercial site and the single-family lots. This public roadway is planned as a rural minor arterial with 100 feet of ROW. Three or four residential lots would have direct access to the section of this roadway frontage shared with the non-residential land uses on the north side of the roadway. The preliminary access location for the proposed trucking business would be approximately 250 feet east of Curtis Road (centerline spacing). The access point(s) to the commercial site have not yet been determined. Additionally, there will be an access easement to the property to the south between two of the single-family lots.

### **INTERSECTION SIGHT DISTANCE**

The required intersection sight distance for the site access on Curtis Road (proposed public road connection to Curtis Road) is per AASHTO criteria for a 60-mph design speed roadway (AASHTO criteria has been used as Table 2-21 in ECM Section 2.3.6 G only shows sight distance for roadways up to a 50-mph design speed. The required sight distance is 665 feet for passenger vehicles and 1,015 feet for combination trucks. This intersection would be able to meet this criterion, provided the intersection line of sight “triangles” are kept free of site improvements (that would limit the line of

sight needed to maintain ECM prescribed sight distance). Examples of site improvements include landscaping, monument signs, parking areas, berms, etc. Obstruction height to maintain passenger car line of sight is about 18 inches. Obstruction height to maintain truck line of sight is higher as the truck “driver’s eye” is significantly higher than the “driver’s eye” for a two-passenger vehicle.

## ROAD AND TRAFFIC CONDITIONS

### Area Roads

Figure 1 shows the streets in the vicinity of the site. The streets adjacent to the site are identified below, followed by a brief description of each:

- **State Highway 94** is a two-lane roadway that extends east from US Highway (US Hwy) 24 to US Hwy 40. SH 94 is classified as a Principal Arterial (NR-A) and has a speed limit of 55 miles per hour (mph) adjacent to the site. The El Paso County Major Transportation Corridors Plan (MTCP) shows SH 94 as a four-lane road in 2040 from the US 24 to Slocum Road. The intersection of Curtis Road/SH 94 is signalized with auxiliary lanes for all turning movements.
- **Curtis Road** is a two-lane roadway that extends from Bradley Road to Judge Orr Road. The roadway is classified as a Minor Arterial north of SH 94. To the south of SH 94, adjacent to the site, the roadway is classified as a Major Collector. The posted speed limit is 55 mph adjacent to the site. There is an access to Schriever Air Force Base, approximately two miles south of the site on Curtis Road. This results in the roadway having very directional travel during peak hours. The El Paso County Major Transportation Corridors Plan shows Curtis Road as having a classification of Minor Arterial adjacent to the site in the 2040 roadway plan. In the 2060 Corridor Preservation Plan, the Curtis Road is shown as a four-lane arterial roadway.

### Traffic Volumes

Due to the current COVID-19 pandemic, turning-movement counts could not be collected. Traffic counts were previously conducted in October 2017 in the *Traffic Study on Enoch and Irwin Road Entry Control Facilities*, March 2018 for Schriever Air Force. Figure 3 provides the 2017 traffic volumes at the intersection of SH 94/Curtis Road. Additionally, average daily traffic volumes for SH 94 and Curtis Road were available on CDOT’s Online Transportation Information System and MS2 websites.

### Crash History

Three years of crash data were collected at the intersection of SH 94/Curtis Road. There were ten crashes during the study period. All crashes were property damage only. No correctable crash patterns were identified in the crashes recorded.

## TRIP GENERATION

Estimates of the vehicle trips projected to be generated by the proposed development have been made using the nationally published trip-generation rates from *Trip Generation, 10<sup>th</sup> Edition, 2017* by the Institute of Transportation Engineers (ITE). There was no applicable ITE land use for the proposed trucking business. As a result, the trip generation for the trucking business was estimated, based on a count of the existing location, along with information provided regarding the usage of the site, including number of employees, number of trucks, and schedule. The trucking business will be moving from its existing location, where it currently employs five truck drivers and five additional office staff. Prior to the COVID-19 pandemic, the business employed five additional truck drivers. The new site is intended to employ up to 10 drivers and the five additional office staff. Table 4, attached, provides the calculated trip-generation rates for the existing location with five drivers. Those rates were then used to forecast trip generation for when the trucking business employs 10 drivers.

Table 1, below, presents a summary of the estimated site trip generation on a typical weekday. The detailed trip-generation estimate for the development, including ITE rates for the proposed land use, is presented in Table 5.

Approximately 10,674 total vehicle trips are projected to enter and exit the site at the access point (“driveway trips”) on the average weekday during a 24-hour period. During the morning peak hour, approximately 176 vehicles would enter and 120 vehicles would exit the site. During the evening peak hour, approximately 496 vehicles would enter and 531 vehicles would exit the site.

The proposed development is projected to generate approximately 7,126 (new/non-pass-by or diverted) vehicle trips on the average weekday during a 24-hour period.

**Table 1: Estimated External Site Vehicle-Trip Generation (Vehicles per Hour)**

Analysis Period	Total Trips			Pass-by Trips			New Trips		
	In	Out	Total	In	Out	Total	In	Out	Total
A.M. Peak Hour	176	122	298	45	45	90	131	77	208
P.M. Peak Hour	508	539	1,047	168	168	336	340	371	711
Daily/24-Hour	5,367	5,367	10,734	1,774	1,774	3,548	3,593	3,593	7,186

### Pass-by Trips

The trips generated by the site have also been aggregated by trip type to account for the pass-by phenomenon. A pass-by trip is one made by a motorist who would already be on an adjacent road regardless of the proposed development, but who stops in at the site while passing by. The pass-by motorist would then continue on his or her way to a final destination in the original direction. For purposes of this report, pass-by trips are trips by motorists already traveling

through the intersection of SH 94/Curtis Road. Pass-by trips are shown in Table 3 and are based on *Trip Generation Handbook - An ITE Proposed Recommended Practice*, 3rd Edition, 2014 by ITE.

## **BACKGROUND TRAFFIC**

Background traffic includes growth that is projected to occur on the study roadways, due to future development in the area. Background volumes do not include projected traffic to be generated by the proposed development.

Volumes have been projected based on CDOT growth projections on SH 94 near Curtis Road. The CDOT Online Transportation Information System (OTIS) showed a 1.12 percent/year growth rate west of the Curtis Road intersection on SH 94 and a 0.87 percent/year growth rate east of Curtis Road. However, in the 2019 CDOT study of SH 94 a 0.62 percent/year and 1.51 percent/year growth rates were used on SH 94 west and east of Curtis Road, respectively.

To be conservative, the higher of the two rates was applied on each leg. A 1.12 percent/year growth rate has been applied to the west leg of the intersection. A 1.51 percent/year growth rate was applied to the other three legs of the intersection.

Figure 4 shows the projected short-term background traffic volumes. Figure 5 shows the projected 20-year background traffic volumes for the year 2040.

## **TRIP DISTRIBUTION AND ASSIGNMENT**

### **Trip Directional Distribution**

Estimation of the directional distribution of site-generated vehicle trips to the study area roads and intersections is a necessary component in determining the site's traffic impacts. Figure 6 shows the directional distribution estimates for the proposed development. Estimates were based on the following factors: existing traffic counts, existing area development, the area roadway system, the site's proposed land use, and CDOT input. The Pikes Peak Area Council of Governments (PPACG) travel demand model was also used to project trip distribution.

### **Site-Generated Traffic**

Site-generated traffic volumes at the study intersections have been calculated by applying the directional-distribution percentages estimated by LSC (from Figure 6) to the trip-generation estimates (from Table 1). Because it is anticipated that the trucking business will be constructed first, two phases of development have been assumed. Phase 1 is just the development of the trucking business. The buildout phase includes the remainder of the site, including the commercial and residential land uses.

Figure 6 shows the projected site-generated traffic volumes for phase 1 of the proposed development. Figure 7 provides the site-generated traffic for the buildout of the site. In addition, Figure 7 shows the pass-by trips at the study intersections.

**Short-Term Total Traffic Volumes**

Figure 8 shows the sum of the short-term background traffic volumes (from Figure 4) and the site-generated peak-hour traffic volumes for phase 1 (shown in Figure 6). These volumes represent the projected short-term total traffic following construction of phase 1. Figure 9 provides the projected short-term total traffic following construction of the entire development.

**Long-Term Total Traffic Volumes**

Figure 10 shows the projected 2040 phase 1 total traffic volumes, which are the sum of 2040 background traffic volumes (from Figure 5) plus the site-generated traffic volumes (from Figure 6). Figure 11 provides the 2040 total traffic volumes with the buildout of the site.

**LEVEL OF SERVICE ANALYSIS**

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection and is indicated on a scale from “A” to “F.” LOS A is indicative of little congestion or delay. LOS F indicates a high level of congestion or delay. Table 2 shows the level of service delay ranges for signalized and unsignalized intersections.

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

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

(1) For unsignalized intersections if V/C ratio is greater than 1.0 the level of service is LOS F regardless of the projected average control delay per

The intersection of SH 94/Curtis Road and the site access point have been analyzed to determine the projected control delay and corresponding levels of service for turning movements. Figure 3 provides the existing levels of service. Figure 4 and Figure 5 provide the background levels of service for the short-term and long-term scenarios, respectively. Figure 8 through Figure 10

provide the levels of service of the short-term and long-term phase 1 and buildout total traffic scenarios.

### **SH 94/Curtis Road**

The signalized intersection of SH 94/Curtis Road currently operates at LOS C during both peak hours, with all movements operating at LOS D or better. In the short-term background, the intersection will continue to operate at LOS C with all movements at LOS D or better. In the long-term background, it has been assumed that SH 94 has been widened to four-lanes as shown in the 2016 El Paso County Major Transportation Corridors Plan. Additionally, dual left-turn lanes have been assumed on the northbound and southbound approaches. With these improvements, the intersection is projected to operate at LOS C, with all movements operating at LOS D or better.

In the short term, with the addition of both phase 1 and buildout of the proposed development, the intersection of SH 94/Curtis Road is expected to operate at LOS C or better, with all movements at LOS D or better. However, to maintain this level of service with the buildout of the site, the northbound left turn will need to be changed to protected/permissive.

In the long term, with the addition of the proposed development (both phase 1 and buildout), the intersection of SH 94/Curtis Road is expected to continue to operate at LOS C, with all movements at LOS D or better.

### **Site Accesses**

In the short term with phase 1 developed, all turning movements at the site are projected to operate at LOS B or better. In this scenario a shared westbound left/right lane is adequate for acceptable traffic operations. With the buildout of the site, there will need to be separate westbound left- and right-turn lanes. With separate outbound turn lanes, all turning movements are expected to operate at LOS C or better during the morning peak hour. During the evening peak hour, the outbound right turn is projected to operate at LOS D, while the outbound left turn would operate at LOS F. The left-turn movement is expected to be at capacity, but the intersection would not meet signal warrants. A channelized T may help to improve the level of service for the westbound left-turn movement.

Similar to the phase 1 short-term scenario, in long-term phase 1 scenario, all turning movements at the site are projected to operate at LOS B or better. In this scenario a shared westbound left/right lane is adequate for acceptable traffic operations.

In the long term with the full buildout of the site, during the evening peak hour both outbound movements are projected to operate at LOS F and be over capacity. However, the intersection is expected to meet the peak-hour warrant, as shown in Figure 12. The peak-hour warrant is typically used for unusual cases where minor-street traffic suffers undue delay entering or exiting the site. Due to the presence of Schriever Air Force Base, traffic on Curtis Road has peak-hour

factors between 12 and 15 percent and is highly directional, with approximately 85 percent of traffic in one direction during the peak hours. Due to the unusual traffic patterns, the peak-hour warrant for a traffic signal would apply and the intersection should be signalized in the long term. As a signalized intersection, the overall intersection would operate at LOS B or better during the peak hours.

### **AUXILIARY TURN LANES**

As mentioned previously, there are existing deceleration lanes for all movements at the intersection of SH 94/Curtis Road. The turn lanes on SH 94 meet the State Highway Access Code criteria. In the long term, when SH 94 is a four-lane roadway and the site is constructed, the right-turn deceleration lanes will need to be 600 feet on SH 94. To accommodate storage, the eastbound left-turn lane will need 600 feet for deceleration with 50 additional feet for storage. The westbound left-turn lane will need 600 feet for deceleration with 150 feet for storage. All of the auxiliary lanes on SH 94 will require a 225-foot taper.

The northbound right-turning movement at the intersection of SH 94/Curtis Road is currently very close to meeting the 50 vph threshold for requiring an acceleration lane. This movement was counted to have 46 vph during the peak hour in October 2017. New counts have not been conducted due to impacts to traffic by the COVID-19 pandemic. It is anticipated that background growth would cause this turn movement to hit the threshold. A northbound right-turn acceleration lane would be required to be 960 feet in length with a 225-foot taper within that distance.

At the site access, no auxiliary lanes are required in phase 1 or buildout, due to the classification of major collector. However, in the 2016 El Paso County Major Transportation Corridors Plan, the classification of Curtis Road is planned to be changed to Minor Arterial by 2040. Due to the low turning volumes, even with the minor arterial classification, no auxiliary lanes are required for phase 1. With the buildout of the site and the minor arterial classification, a southbound left-turn and northbound right-turn deceleration lane will be required per the ECM. Both the left- and right-turn lanes will be required to have a lane length of 290 feet with a 240-foot approach taper. Based on a queuing analysis, the southbound left turn will also require 250 feet in storage and the northbound right will require 40 feet in storage. The westbound left turn will require 100 feet of storage at this intersection.

Within the site, the peak-hour volume of the eastbound left-turning movement at the commercial access would exceed the threshold for requiring a left-turn lane, based on a minor arterial classification. However, due to the extremely low through volumes at this location, it is recommended that no left-turn lane be constructed. The Minor Arterial classification is indicated in this report solely based on daily volume estimates and not based on function or continuity of the roadway. Per the CDOT State Highway Access Code, a left-turn deceleration lane requirement may be dropped if the opposing traffic is predicted to be below 100 DHV, which is the case at this location. A deviation will be submitted during the development phase.

## **VEHICLE QUEUING**

At the intersection of SH 94/Curtis Road, there are adequate existing turn lanes for all projected queuing. At the site access, the westbound lanes are projected to have a 95<sup>th</sup> percentile queue length of 175 feet. The distance between Curtis Road and the truck business access is planned to be 250 feet, which is adequate for the projected queuing.

## **MTCP ROADWAY IMPROVEMENTS**

The 2016 El Paso County Major Transportation Corridor Plan shows planned improvements to Curtis Road and SH 94. State Highway 94 is planned to be widened to four-lanes through the study area. Curtis Road, south of SH 94, is planned to be improved to a minor arterial. These improvements have been included in the long-term analysis.

## **PEDESTRIAN AND BICYCLE ACCOMMODATION**

There are currently no sidewalks or multi-modal trails along SH 94 or Curtis Road adjacent to the site. In the 2016 El Paso County Major Transportation Corridors Plan, a bike route is planned along Curtis Road and a secondary regional trail is planned along SH 94.

## **COUNTY ROAD IMPROVEMENT FEE PROGRAM**

### **Transportation Impact Fees**

Per ECM Appendix B: *State what the current applicable Transportation Impact Fees are and what option the developer will be selecting for payment.*

The applicant intends to opt out of the PID options and will pay the full fee amount at the time of building permit. The current “full-fee” is \$3,830 per single family dwelling unit; \$4,958 per 1,000 square feet of commercial building floor area, and \$3,651 per 1,000 square feet of industrial building floor area. The total fee amount for the proposed development is \$1,239,792.

### **Reimbursable MTCP Improvements**

There are no apparent reimbursable improvements programmed in the MTCP in the general vicinity of this site.

## **FINDINGS AND CONCLUSIONS**

### **Trip Generation**

- Phase 1 of the development is expected to generate approximately 100 vehicle trips on the average weekday with approximately 18 trips occurring during the morning peak hour and 36

trips during the evening peak hour.

- The buildout of the site is projected to generate approximately 10,734 vehicle trips on the average weekday. Approximately a third of this traffic is expected to be pass-by traffic.
- With buildout, approximately 176 vehicles would enter and 122 vehicles would exit the site during the morning peak hour. During the evening peak hour, approximately 508 vehicles would enter and 539 vehicles would exit the site at the access point.

### Recommended Improvements

- In both the short-term and long-term scenarios with phase 1 of the development constructed, no additional improvements will be required in the study area. The site access can have a shared left/right outbound lane at Curtis Road.
- The northbound left-turning movement at the intersection of SH 94/Curtis Road will need to have protected/permissive phasing in the short-term and long-term buildout scenarios.
- It is projected that the site access will meet the peak-hour signal warrant in the long-term buildout scenario and will require signalization. A Channelized-T may help to improve intersection operations prior to the intersection meeting signal warrants.
- The 95<sup>th</sup> percentile queues at all study intersections are not projected to impact adjacent intersections.
- See Table 3 for a summary of recommended improvements.

### Auxiliary Lanes

- The intersection of SH 94/Curtis Road will require a northbound right-turn acceleration lane in the short-term future, both with and without the addition of the site-generated traffic.
- The site access will require a northbound right and southbound left auxiliary lane in the buildout scenarios.
- The westbound approach at the site access will be required to have separate left- and right-turn lanes in the buildout scenario.

**Table 3: Recommended Improvements**

Item #	Location	Improvement	Timing
1	SH 94/Curtis Road	Northbound Left Phasing - Protected/Permissive	With full buildout of the site
2	Curtis Road/Site Access	Auxiliary Lanes - Northbound Right - Southbound Left	With full buildout of the site
3	Curtis Road/Site Access	Signal	When Warranted (Long-term)

Source: LSC Transportation Consultants, Inc.

\* \* \* \* \*

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

Respectfully Submitted,

LSC TRANSPORTATION CONSULTANTS, INC.

By: Colleen Guillotte, P.E., PTOE, RSP  
Project Manager

CRG:JCH:jas

Enclosures:            Tables 4 and 5  
                             Figures 1-8  
                             Level of Service Reports  
                             Queuing Reports

# Tables and Figures

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**Table 4: Trucking Business Trip Generation Estimate**

Land Use Description	Trip Generation Units	Trip Generation Rates					Total Trips Generated					
		Average Weekday Traffic	Morning Peak Hour		Afternoon Peak Hour		Average Weekday Traffic	Morning Peak Hour		Afternoon Peak Hour		
			In	Out	In	Out		In	Out	In	Out	
<b>Existing</b> <sup>(1)</sup>												
Truck Business	5 Trucks	10.00	0.80	1.00	2.00	1.60	50	4	5	10	8	
<b>Future</b>												
Truck Business	10 Trucks	10.00	0.80	1.00	2.00	1.60	100	8	10	20	16	
Notes:												
(1) Source: LSC Traffic Counts, August 2020												
Source: LSC Transportation Consultants, Inc.												

**Table 5: Detailed Trip Generation Estimate**

Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates <sup>(1)</sup>				Total Trips Generated				Pass-By Trips <sup>(2)</sup>	New External Trips Generated Average Weekday Traffic		
			Average Weekday Traffic	Morning Peak Hour		Afternoon Peak Hour		Average Weekday Traffic	Morning Peak Hour				Afternoon Peak Hour	
820	Shopping Center	225 KSF <sup>(3)</sup>	46.38	0.73	0.45	2.11	2.29	10,435	164	100	475	515	34%	6,887
	Truck Business	10 Trucks	10.00	0.80	1.00	2.00	1.60	100	8	10	20	16	0%	100
210	Single Family	21 DU	9.44	0.19	0.56	0.62	0.37	198	4	12	13	8	0%	198
<b>Total Trip Generation Estimate</b>								<b>10,734</b>	<b>176</b>	<b>122</b>	<b>508</b>	<b>539</b>		<b>7,185</b>
Notes:														
(1) Source: "Trip Generation, 10th Edition, 2017" by the Institute of Transportation Engineers (ITE) and LSC Traffic Counts														
(2) Source: "Trip Generation Handbook - An ITE Proposed Recommended Practice, Third Edition September 2017" by ITE														
(3) KSF = one thousand square feet of floor space, DU = dwelling unit														
Source: LSC Transportation Consultants, Inc.														



NTS

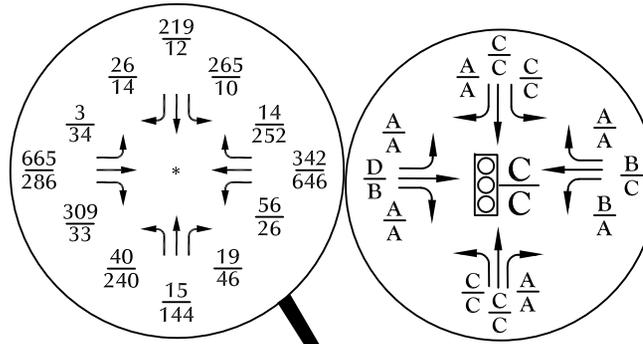
Figure 1

## Vicinity Map

Highway 94 and Curtis Road (LSC #204310)



\*Due to COVID-19 Pandemic, new turning counts were not recorded. Counts from Traffic Study on Enoch and Irwin Road Entry Control Facilities report. Counts were completed in October 2017.



NTS



LEGEND:



= Traffic Signal

$\frac{XX}{XX}$  =

AM Weekday Peak-Hour Traffic (vehicles per hour)

PM Weekday Peak-Hour Traffic (vehicles per hour)

XXX = Average Weekday Traffic (vehicles per day)

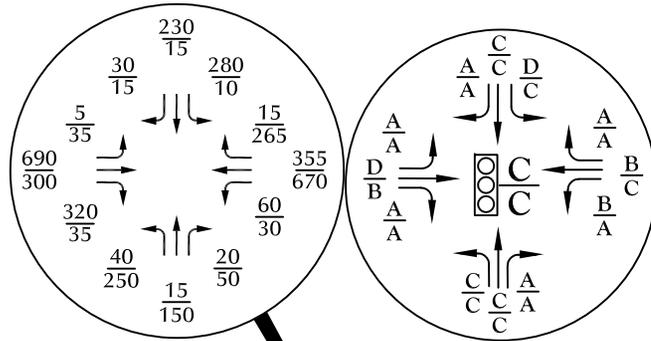
Yellow line - 45 mph

Magenta line - 55 mph

Blue line - 65 mph



Figure 3  
Existing Conditions  
Highway 94 and Curtis Road (LSC #204310)



NTS



LEGEND:

= Traffic Signal

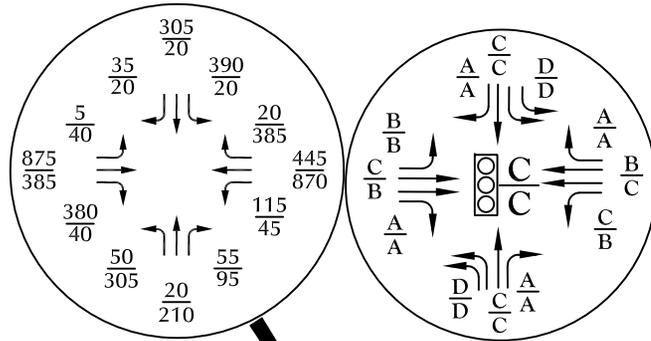
$\frac{XX}{XX}$  =  $\frac{\text{AM Weekday Peak-Hour Traffic (vehicles per hour)}}{\text{PM Weekday Peak-Hour Traffic (vehicles per hour)}}$

XXX = Average Weekday Traffic (vehicles per day)

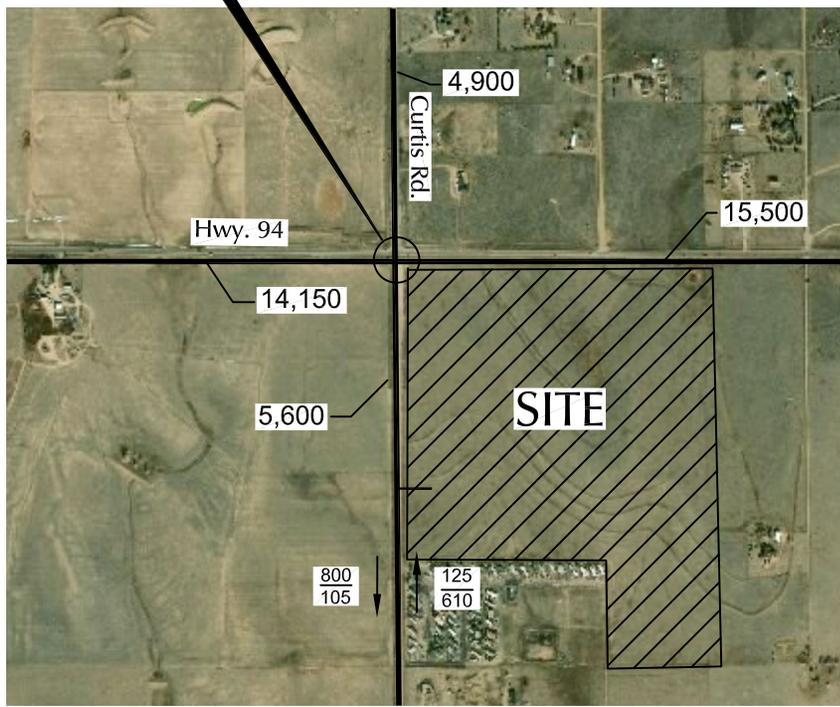


# Figure 4 Short-Term Background Conditions

Highway 94 and Curtis Road (LSC #204310)



NTS



LEGEND:



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

XXX = Average Weekday Traffic (vehicles per day)



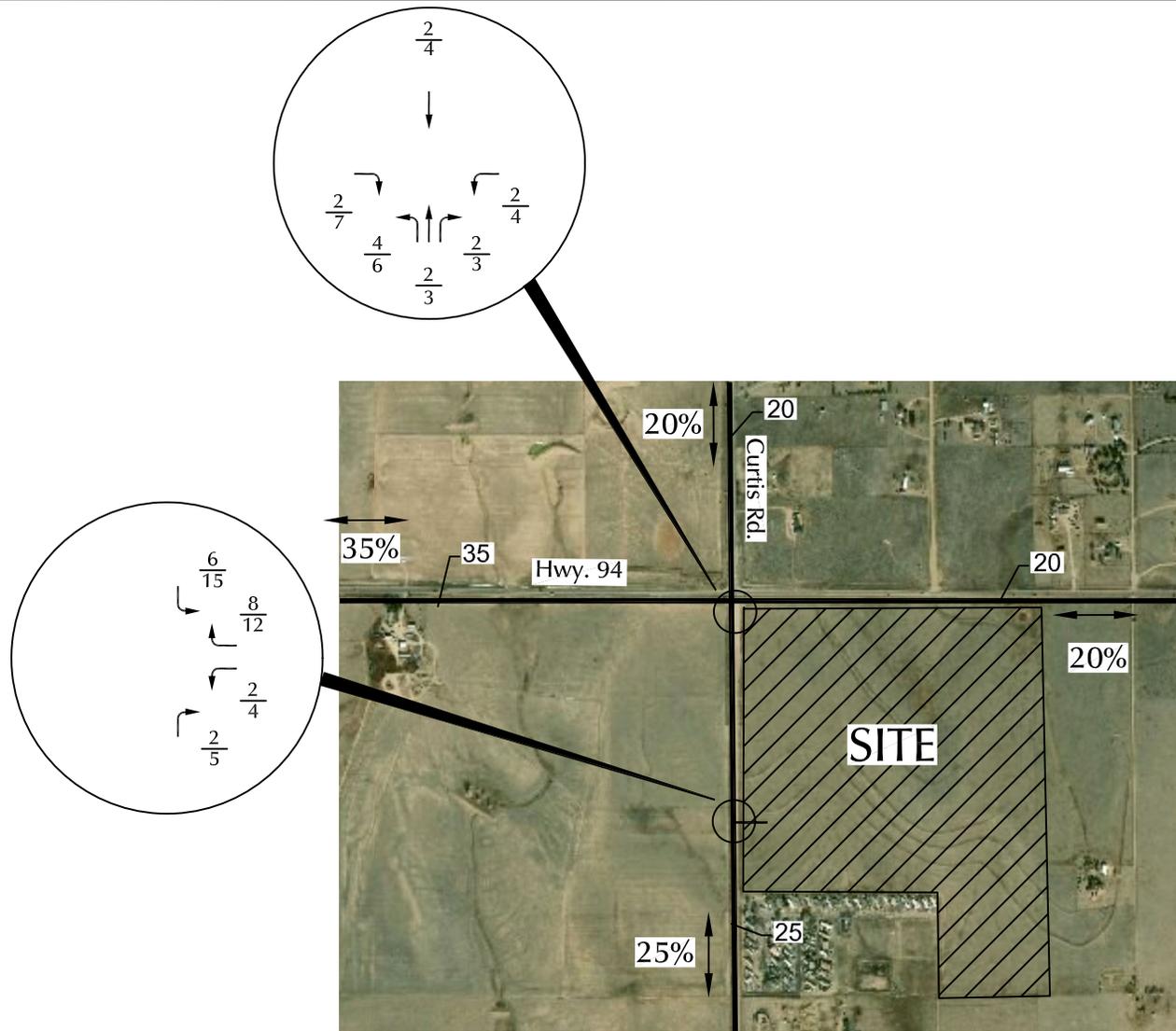
# Long-Term (2040) Background Conditions

Highway 94 and Curtis Road (LSC #204310)

Figure 5



NTS



LEGEND:

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

$\longleftrightarrow$  XX% = Percent Directional Distribution

XXX = Average Weekday Traffic (vehicles per day)



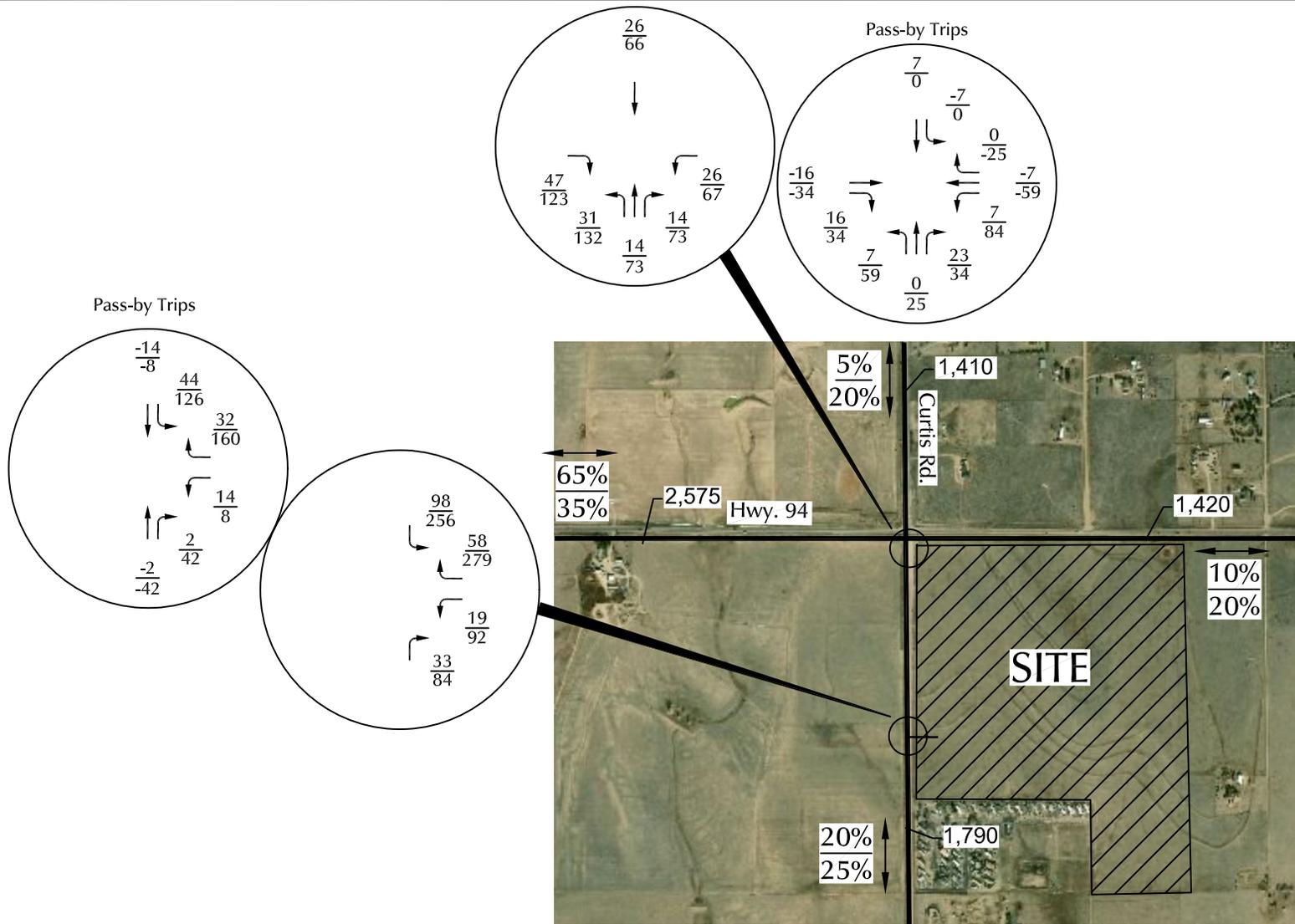
Figure 6

# Phase 1 Trip Distribution and Site-Generated Traffic

Highway 94 and Curtis Road (LSC #204310)



NTS



LEGEND:

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

$$\frac{XX\%}{XX\%} = \frac{\text{Residential Percent Directional Distribution}}{\text{Commercial Percent Directional Distribution}}$$

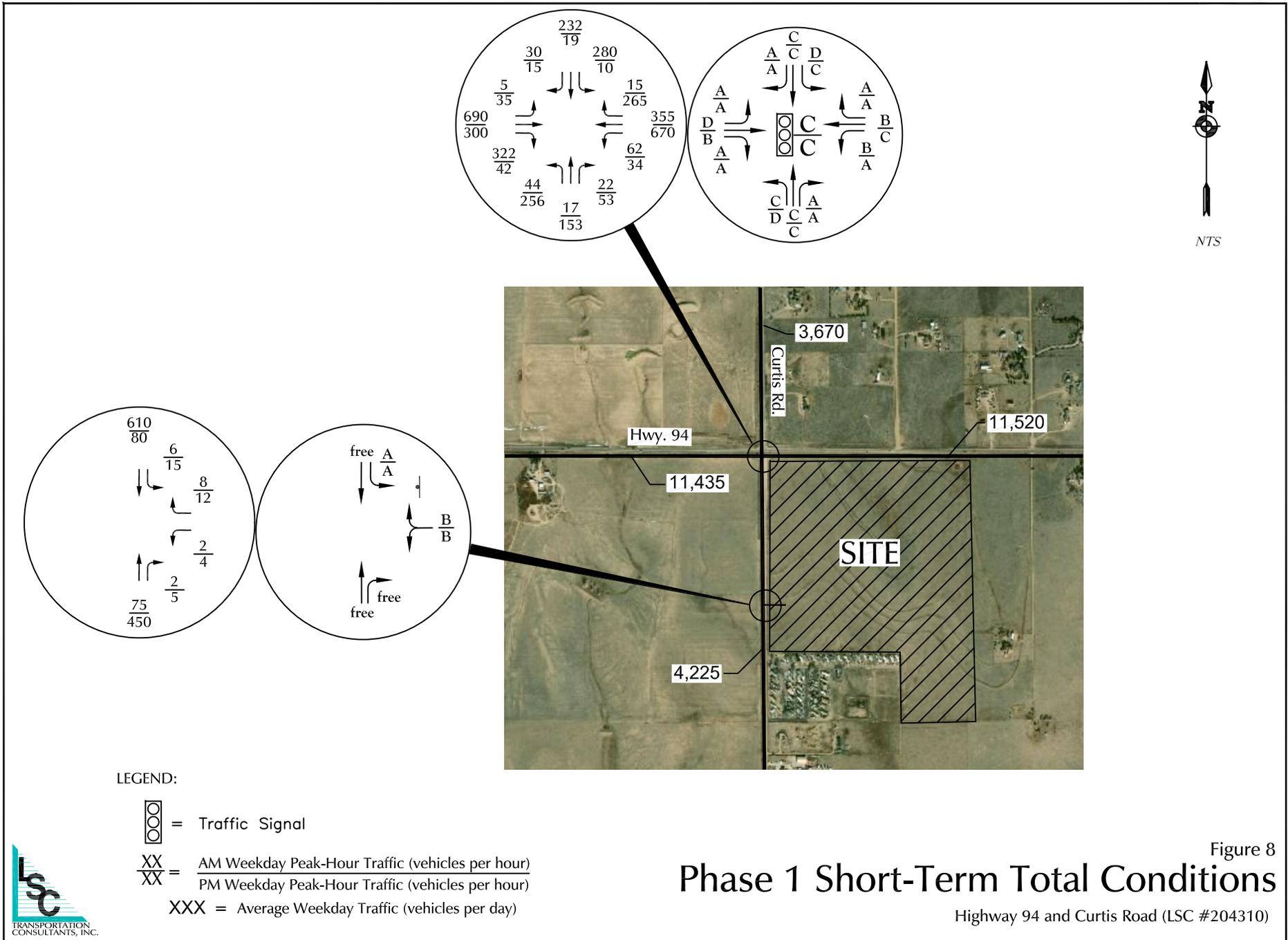
XXX = Average Weekday Traffic (vehicles per day)

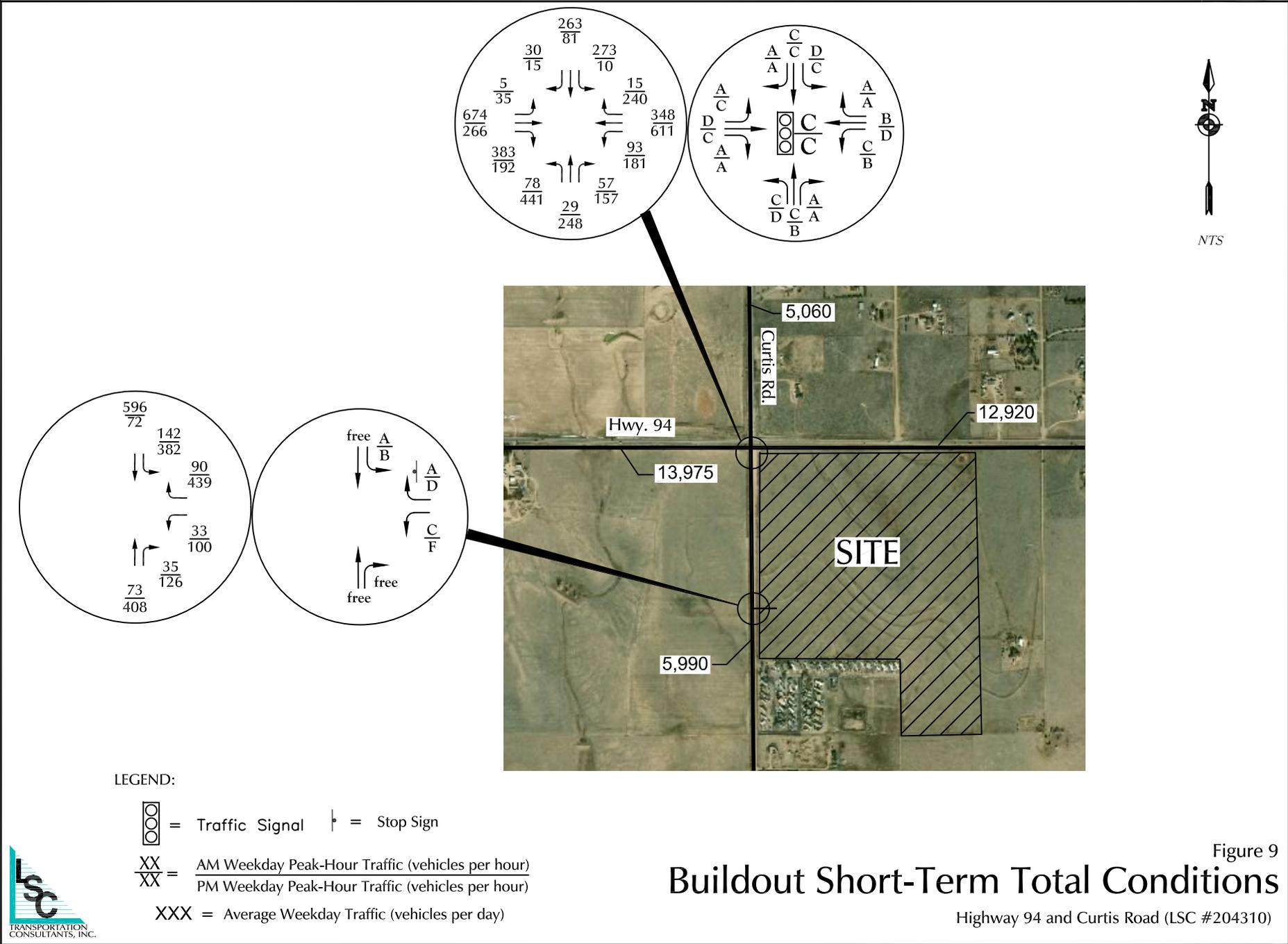


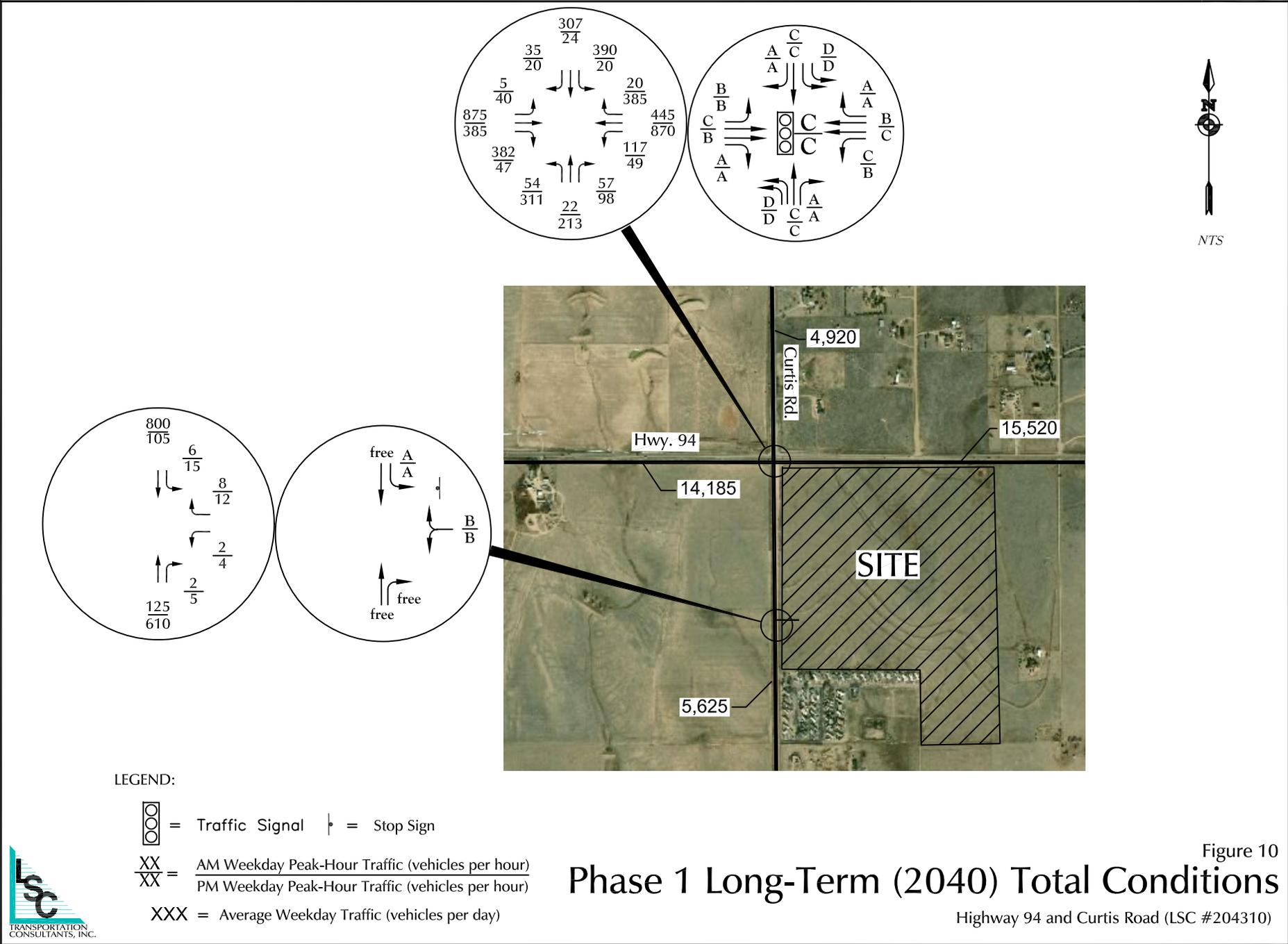
Figure 7

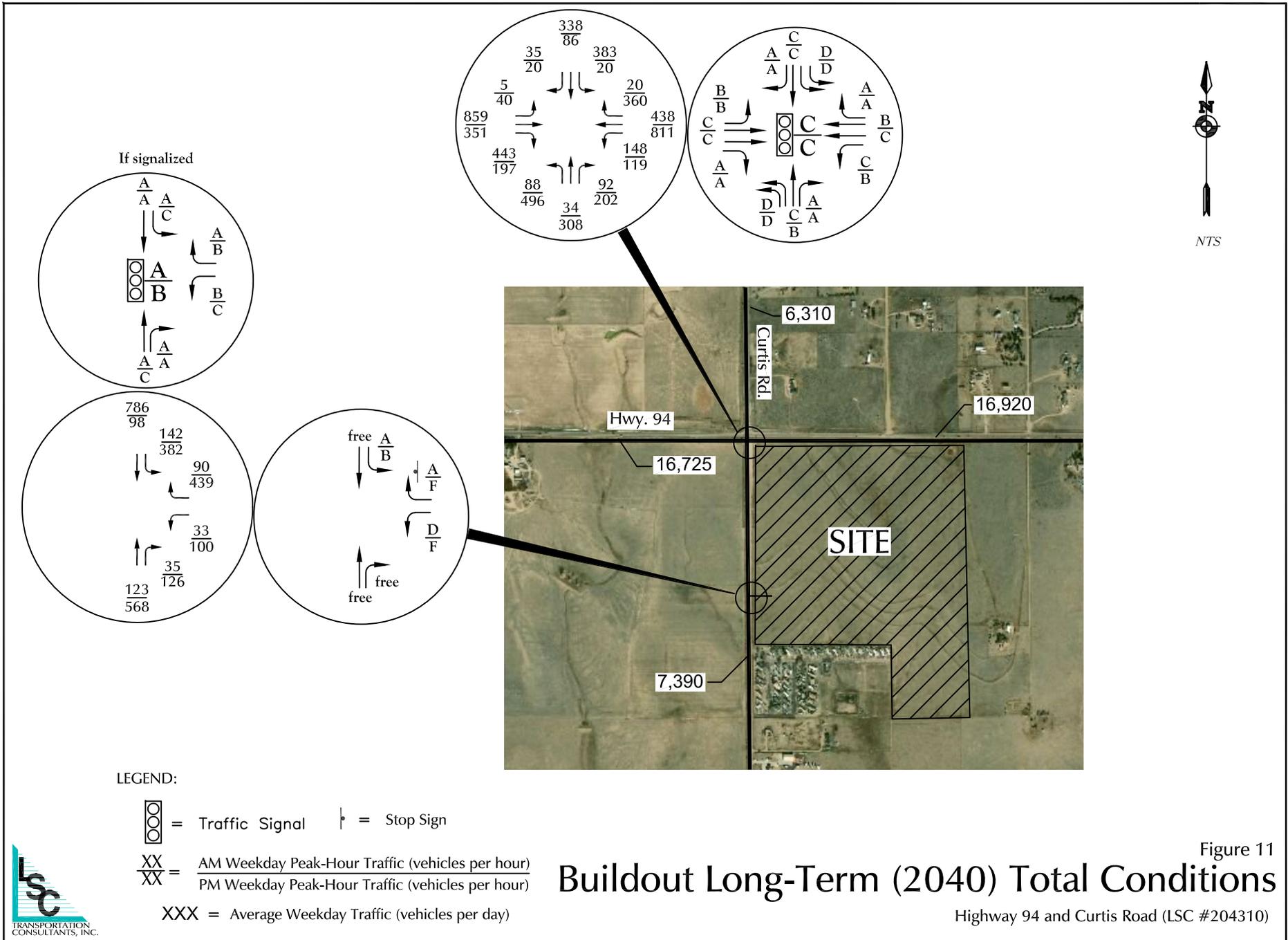
# Buildout Trip Distribution and Site-Generated Traffic

Highway 94 and Curtis Road (LSC #204310)

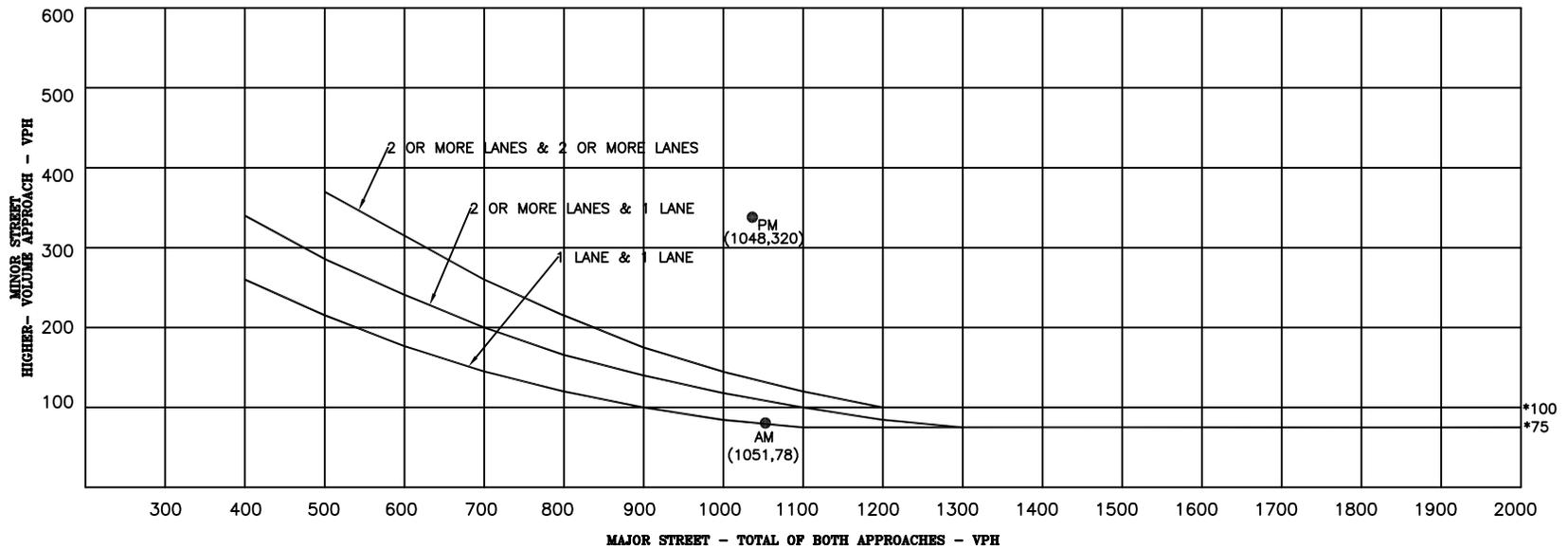








**Figure 4C-4. Warrant 3, Peak Hour (70% Factor)**  
 (Community Less than 10,000 population or above 40 mph on Major Street)



\*Note: 100 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 75 VPH applies as the lower threshold volume for a minor street approaching with one lane.

# Levels of Service

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Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

Existing  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	665	309	56	342	14	40	15	19	265	219	26
Future Volume (vph)	3	665	309	56	342	14	40	15	19	265	219	26
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.484			0.091			0.487			0.747		
Satd. Flow (perm)	902	1863	1583	170	1863	1583	907	1863	1583	1391	1863	1583
Satd. Flow (RTOR)			364			73			73			73
Peak Hour Factor	0.85	0.85	0.85	0.85	0.90	0.85	0.85	0.94	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	782	364	66	380	16	47	16	22	312	258	31
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
Total Split (s)	9.5	48.0	48.0	9.5	48.0	48.0	32.5	32.5	32.5	32.5	32.5	32.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	42.9	39.1	39.1	45.4	44.5	44.5	28.5	28.5	28.5	28.5	28.5	28.5
Actuated g/C Ratio	0.51	0.47	0.47	0.54	0.53	0.53	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.01	0.90	0.39	0.35	0.39	0.02	0.15	0.03	0.04	0.66	0.41	0.05
Control Delay	7.7	36.3	2.9	13.3	13.1	0.1	24.2	21.8	0.1	34.4	26.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.7	36.3	2.9	13.3	13.1	0.1	24.2	21.8	0.1	34.4	26.1	0.5
LOS	A	D	A	B	B	A	C	C	A	C	C	A
Approach Delay		25.6			12.7			17.5			29.1	
Approach LOS		C			B			B			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 84

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 23.6

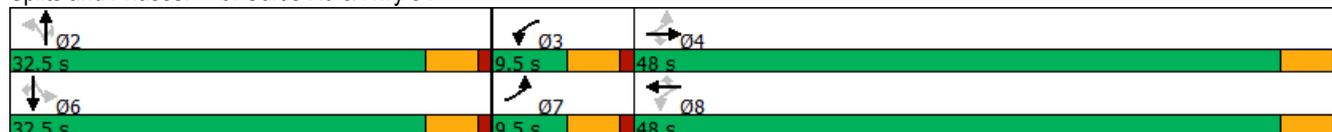
Intersection LOS: C

Intersection Capacity Utilization 73.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Curtis Rd & Hwy 94



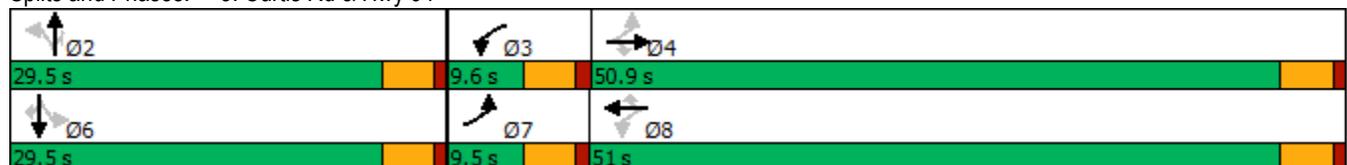
Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

Existing  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	286	33	26	646	252	240	144	46	10	12	14
Future Volume (vph)	34	286	33	26	646	252	240	144	46	10	12	14
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.110			0.503			0.748			0.625		
Satd. Flow (perm)	205	1863	1583	937	1863	1583	1393	1863	1583	1164	1863	1583
Satd. Flow (RTOR)			73			268			73			73
Peak Hour Factor	0.85	0.92	0.85	0.85	0.85	0.94	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	40	311	39	31	760	268	282	169	54	12	14	16
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
Total Split (s)	9.5	50.9	50.9	9.6	51.0	51.0	29.5	29.5	29.5	29.5	29.5	29.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	39.5	36.9	36.9	39.6	36.9	36.9	26.0	26.0	26.0	26.0	26.0	26.0
Actuated g/C Ratio	0.51	0.48	0.48	0.51	0.48	0.48	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.19	0.35	0.05	0.06	0.85	0.30	0.60	0.27	0.09	0.03	0.02	0.03
Control Delay	9.1	13.9	1.0	7.2	28.6	2.5	32.5	24.5	4.4	24.0	23.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	13.9	1.0	7.2	28.6	2.5	32.5	24.5	4.4	24.0	23.7	0.1
LOS	A	B	A	A	C	A	C	C	A	C	C	A
Approach Delay		12.1			21.4			26.8			14.8	
Approach LOS		B			C			C			B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 77.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 20.8	Intersection LOS: C
Intersection Capacity Utilization 62.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



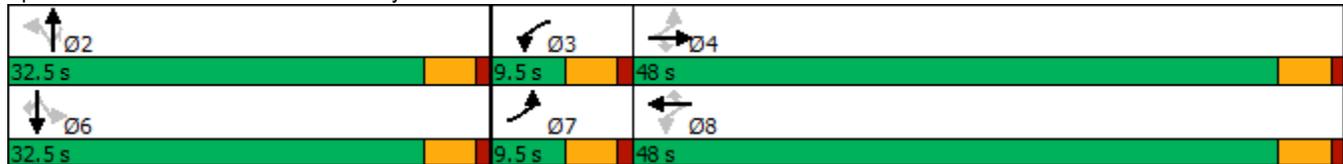
Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

Short-Term Background  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	690	320	60	355	15	40	15	20	280	230	30
Future Volume (vph)	5	690	320	60	355	15	40	15	20	280	230	30
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.473			0.087			0.463			0.747		
Satd. Flow (perm)	881	1863	1583	162	1863	1583	862	1863	1583	1391	1863	1583
Satd. Flow (RTOR)			365			73			73			73
Peak Hour Factor	0.85	0.85	0.85	0.85	0.90	0.85	0.85	0.94	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	812	376	71	394	18	47	16	24	329	271	35
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
Total Split (s)	9.5	48.0	48.0	9.5	48.0	48.0	32.5	32.5	32.5	32.5	32.5	32.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	44.5	40.7	40.7	47.0	46.1	46.1	28.4	28.4	28.4	28.4	28.4	28.4
Actuated g/C Ratio	0.52	0.48	0.48	0.55	0.54	0.54	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.01	0.92	0.40	0.39	0.39	0.02	0.16	0.03	0.04	0.71	0.44	0.06
Control Delay	7.8	38.0	3.1	14.4	13.2	0.1	24.6	21.8	0.1	37.3	26.9	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	7.8	38.0	3.1	14.4	13.2	0.1	24.6	21.8	0.1	37.3	26.9	1.3
LOS	A	D	A	B	B	A	C	C	A	D	C	A
Approach Delay		26.9			12.9			17.4			30.9	
Approach LOS		C			B			B			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 85.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 24.8	Intersection LOS: C
Intersection Capacity Utilization 75.2%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

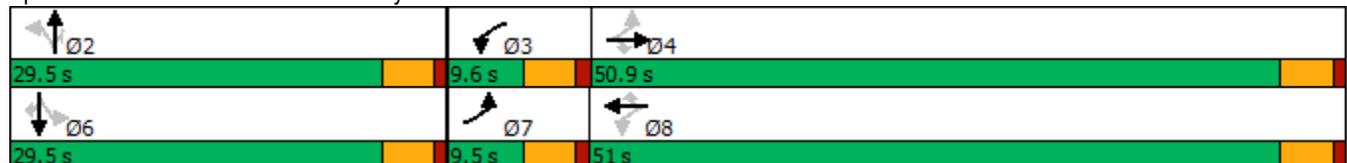
Short-Term Background  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	300	35	30	670	265	250	150	50	10	15	15
Future Volume (vph)	35	300	35	30	670	265	250	150	50	10	15	15
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.104			0.492			0.746			0.611		
Satd. Flow (perm)	194	1863	1583	916	1863	1583	1390	1863	1583	1138	1863	1583
Satd. Flow (RTOR)			73			282			73			73
Peak Hour Factor	0.85	0.92	0.85	0.85	0.85	0.94	0.86	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	326	41	35	788	282	291	176	59	12	18	18
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
Total Split (s)	9.5	50.9	50.9	9.6	51.0	51.0	29.5	29.5	29.5	29.5	29.5	29.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	41.0	38.4	38.4	41.1	38.4	38.4	25.9	25.9	25.9	25.9	25.9	25.9
Actuated g/C Ratio	0.52	0.49	0.49	0.52	0.49	0.49	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.20	0.36	0.05	0.07	0.87	0.31	0.64	0.29	0.10	0.03	0.03	0.03
Control Delay	9.2	13.8	1.1	7.1	29.5	2.5	34.3	25.1	5.3	24.2	23.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	13.8	1.1	7.1	29.5	2.5	34.3	25.1	5.3	24.2	23.7	0.1
LOS	A	B	A	A	C	A	C	C	A	C	C	A
Approach Delay		12.1			21.9			28.0			15.0	
Approach LOS		B			C			C			B	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 78.6	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 21.4	Intersection LOS: C
Intersection Capacity Utilization 64.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



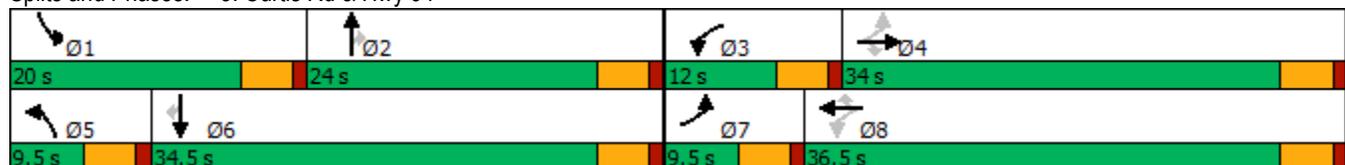
Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

Long-Term Background  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	875	380	115	445	20	50	20	55	390	305	35
Future Volume (vph)	5	875	380	115	445	20	50	20	55	390	305	35
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.483			0.117			0.950			0.950		
Satd. Flow (perm)	900	3539	1583	218	3539	1583	3433	1863	1583	3433	1863	1583
Satd. Flow (RTOR)			400			182			182			127
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	921	400	121	468	21	53	21	58	411	321	37
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Total Split (s)	9.5	34.0	34.0	12.0	36.5	36.5	9.5	24.0	24.0	20.0	34.5	34.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	32.1	28.3	28.3	37.0	35.6	35.6	5.1	19.8	19.8	14.3	33.2	33.2
Actuated g/C Ratio	0.38	0.33	0.33	0.43	0.42	0.42	0.06	0.23	0.23	0.17	0.39	0.39
v/c Ratio	0.01	0.78	0.51	0.53	0.32	0.03	0.26	0.05	0.11	0.71	0.44	0.05
Control Delay	13.6	32.0	4.9	23.3	17.7	0.1	44.1	28.4	0.5	42.1	24.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	32.0	4.9	23.3	17.7	0.1	44.1	28.4	0.5	42.1	24.3	0.1
LOS	B	C	A	C	B	A	D	C	A	D	C	A
Approach Delay		23.8			18.2			22.4			32.6	
Approach LOS		C			B			C			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 85.1	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 24.9	Intersection LOS: C
Intersection Capacity Utilization 63.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

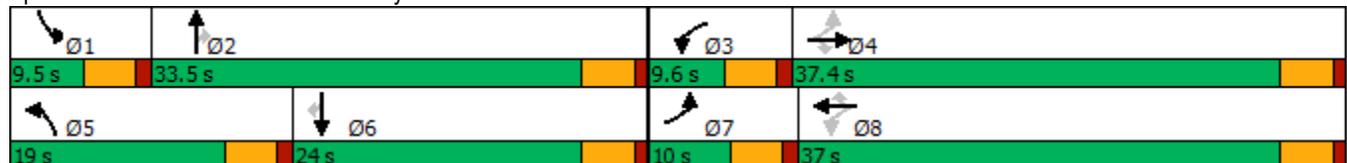
Long-Term Background  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	385	40	45	870	385	305	210	95	20	20	20
Future Volume (vph)	40	385	40	45	870	385	305	210	95	20	20	20
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.139			0.463			0.950			0.950		
Satd. Flow (perm)	259	3539	1583	862	3539	1583	3433	1863	1583	3433	1863	1583
Satd. Flow (RTOR)			182			405			127			182
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	405	42	47	916	405	321	221	100	21	21	21
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Total Split (s)	10.0	37.4	37.4	9.6	37.0	37.0	19.0	33.5	33.5	9.5	24.0	24.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	31.7	28.7	28.7	31.2	28.5	28.5	12.3	33.5	33.5	5.1	20.0	20.0
Actuated g/C Ratio	0.40	0.36	0.36	0.39	0.36	0.36	0.15	0.42	0.42	0.06	0.25	0.25
v/c Ratio	0.20	0.32	0.06	0.12	0.73	0.49	0.61	0.28	0.14	0.10	0.05	0.04
Control Delay	15.3	20.0	0.2	13.9	26.9	4.5	38.5	20.5	3.1	41.0	28.0	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	15.3	20.0	0.2	13.9	26.9	4.5	38.5	20.5	3.1	41.0	28.0	0.1
LOS	B	B	A	B	C	A	D	C	A	D	C	A
Approach Delay		17.9			19.8			26.8			23.1	
Approach LOS		B			B			C			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 21.3	Intersection LOS: C
Intersection Capacity Utilization 54.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

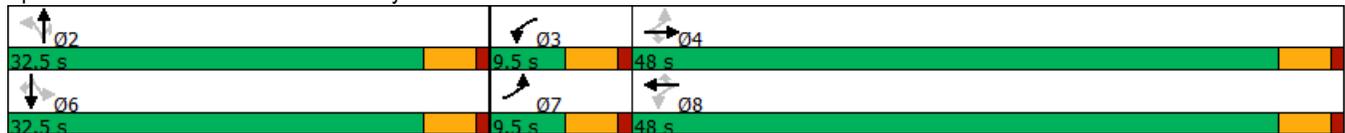
Short-Term Total - Phase 1  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	690	322	62	355	15	44	17	22	280	232	30
Future Volume (vph)	5	690	322	62	355	15	44	17	22	280	232	30
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.473			0.087			0.460			0.746		
Satd. Flow (perm)	881	1863	1583	162	1863	1583	857	1863	1583	1390	1863	1583
Satd. Flow (RTOR)			361			73			73			73
Peak Hour Factor	0.85	0.85	0.85	0.85	0.90	0.85	0.85	0.94	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	812	379	73	394	18	52	18	26	329	273	35
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
Total Split (s)	9.5	48.0	48.0	9.5	48.0	48.0	32.5	32.5	32.5	32.5	32.5	32.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	44.5	40.7	40.7	47.0	46.1	46.1	28.4	28.4	28.4	28.4	28.4	28.4
Actuated g/C Ratio	0.52	0.48	0.48	0.55	0.54	0.54	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.01	0.92	0.40	0.40	0.39	0.02	0.18	0.03	0.05	0.71	0.44	0.06
Control Delay	7.8	38.0	3.3	14.7	13.2	0.1	25.0	21.9	0.1	37.3	26.9	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	7.8	38.0	3.3	14.7	13.2	0.1	25.0	21.9	0.1	37.3	26.9	1.3
LOS	A	D	A	B	B	A	C	C	A	D	C	A
Approach Delay		26.9			12.9			17.7			30.9	
Approach LOS		C			B			B			C	

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 85.4  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.92  
 Intersection Signal Delay: 24.8  
 Intersection Capacity Utilization 75.2%  
 Analysis Period (min) 15  
 Intersection LOS: C  
 ICU Level of Service D

Splits and Phases: 3: Curtis Rd & Hwy 94



Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	T
Traffic Vol, veh/h	2	8	75	2	6	610
Future Vol, veh/h	2	8	75	2	6	610
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	50	2	50	50	2
Mvmt Flow	2	9	82	2	7	663

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	760	83	0	0	84
Stage 1	83	-	-	-	-
Stage 2	677	-	-	-	-
Critical Hdwy	6.9	6.7	-	-	4.6
Critical Hdwy Stg 1	5.9	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-
Follow-up Hdwy	3.95	3.75	-	-	2.65
Pot Cap-1 Maneuver	313	859	-	-	1258
Stage 1	832	-	-	-	-
Stage 2	426	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	310	859	-	-	1258
Mov Cap-2 Maneuver	310	-	-	-	-
Stage 1	832	-	-	-	-
Stage 2	422	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	634	1258
HCM Lane V/C Ratio	-	-	0.017	0.005
HCM Control Delay (s)	-	-	10.8	7.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

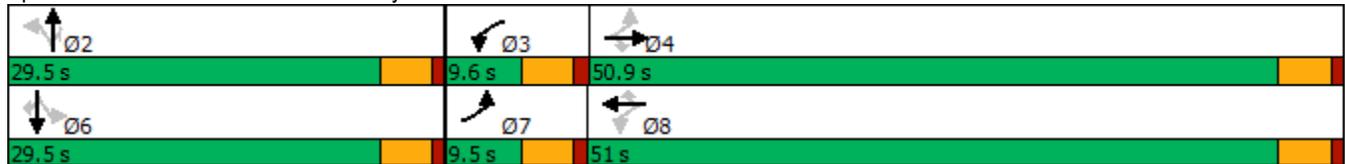
Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

Short-Term Total - Phase 1  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	300	42	34	670	265	256	153	53	10	19	15
Future Volume (vph)	35	300	42	34	670	265	256	153	53	10	19	15
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.104			0.492			0.743			0.605		
Satd. Flow (perm)	194	1863	1583	916	1863	1583	1384	1863	1583	1127	1863	1583
Satd. Flow (RTOR)			73			282			73			73
Peak Hour Factor	0.85	0.92	0.85	0.85	0.85	0.94	0.86	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	326	49	40	788	282	298	180	62	12	22	18
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
Total Split (s)	9.5	50.9	50.9	9.6	51.0	51.0	29.5	29.5	29.5	29.5	29.5	29.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	41.0	38.4	38.4	41.1	38.4	38.4	25.9	25.9	25.9	25.9	25.9	25.9
Actuated g/C Ratio	0.52	0.49	0.49	0.52	0.49	0.49	0.33	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.20	0.36	0.06	0.07	0.87	0.31	0.65	0.29	0.11	0.03	0.04	0.03
Control Delay	9.2	13.8	1.6	7.2	29.5	2.5	35.2	25.2	5.7	24.2	23.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	13.8	1.6	7.2	29.5	2.5	35.2	25.2	5.7	24.2	23.7	0.1
LOS	A	B	A	A	C	A	D	C	A	C	C	A
Approach Delay		11.9			21.8			28.5			15.7	
Approach LOS		B			C			C			B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 78.6	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 21.4	Intersection LOS: C
Intersection Capacity Utilization 64.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	4	12	450	5	15	80
Future Vol, veh/h	4	12	450	5	15	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	50	50	2	50	50	2
Mvmt Flow	4	13	489	5	16	87

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	611	492	0	0	494
Stage 1	492	-	-	-	-
Stage 2	119	-	-	-	-
Critical Hdwy	6.9	6.7	-	-	4.6
Critical Hdwy Stg 1	5.9	-	-	-	-
Critical Hdwy Stg 2	5.9	-	-	-	-
Follow-up Hdwy	3.95	3.75	-	-	2.65
Pot Cap-1 Maneuver	388	491	-	-	862
Stage 1	527	-	-	-	-
Stage 2	800	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	380	491	-	-	862
Mov Cap-2 Maneuver	380	-	-	-	-
Stage 1	527	-	-	-	-
Stage 2	784	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	458	862
HCM Lane V/C Ratio	-	-	0.038	0.019
HCM Control Delay (s)	-	-	13.2	9.3
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

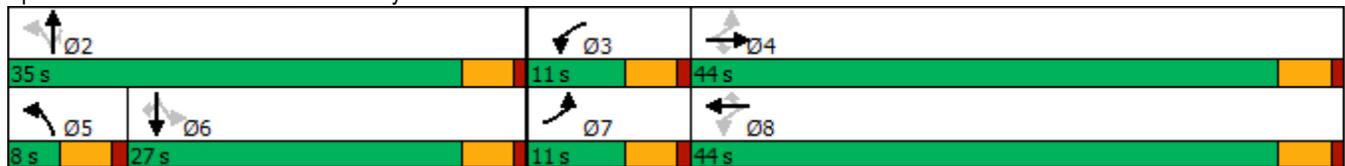
Short-Term Total  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	674	383	93	348	15	78	29	57	273	263	30
Future Volume (vph)	5	674	383	93	348	15	78	29	57	273	263	30
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.476			0.088			0.297			0.737		
Satd. Flow (perm)	887	1863	1583	164	1863	1583	553	1863	1583	1373	1863	1583
Satd. Flow (RTOR)			329			127			73			127
Peak Hour Factor	0.85	0.85	0.85	0.85	0.90	0.85	0.85	0.94	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	793	451	109	387	18	92	31	67	321	309	35
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Total Split (s)	11.0	44.0	44.0	11.0	44.0	44.0	8.0	35.0	35.0	27.0	27.0	27.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	43.3	38.9	38.9	46.6	45.4	45.4	30.7	30.7	30.7	24.5	24.5	24.5
Actuated g/C Ratio	0.50	0.45	0.45	0.54	0.52	0.52	0.35	0.35	0.35	0.28	0.28	0.28
v/c Ratio	0.01	0.95	0.51	0.53	0.40	0.02	0.38	0.05	0.11	0.83	0.59	0.07
Control Delay	9.0	47.5	7.1	21.9	14.8	0.1	26.0	20.4	5.3	52.6	34.6	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	9.0	47.5	7.1	21.9	14.8	0.1	26.0	20.4	5.3	52.6	34.6	0.2
LOS	A	D	A	C	B	A	C	C	A	D	C	A
Approach Delay		32.8			15.8			17.8			41.5	
Approach LOS		C			B			B			D	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 87.1	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 30.5	Intersection LOS: C
Intersection Capacity Utilization 74.9%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



HCM 6th TWSC  
6: Curtis Rd & Access

Short-Term Total  
AM Peak Hour

Intersection						
Int Delay, s/veh	2.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	33	90	73	35	142	596
Future Vol, veh/h	33	90	73	35	142	596
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	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	98	79	38	154	648

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1035	79	0	0	117
Stage 1	79	-	-	-	-
Stage 2	956	-	-	-	-
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	257	981	-	-	1471
Stage 1	944	-	-	-	-
Stage 2	373	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	230	981	-	-	1471
Mov Cap-2 Maneuver	230	-	-	-	-
Stage 1	944	-	-	-	-
Stage 2	334	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	230	981	1471
HCM Lane V/C Ratio	-	-	0.156	0.1	0.105
HCM Control Delay (s)	-	-	23.5	9.1	7.7
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.3	0.4

Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

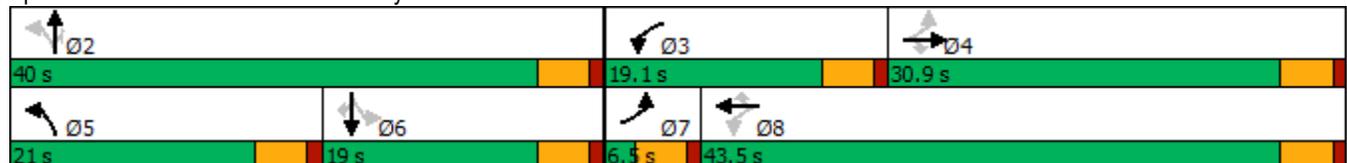
Short-Term Total  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	266	192	181	611	240	441	248	157	10	81	15
Future Volume (vph)	35	266	192	181	611	240	441	248	157	10	81	15
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.156			0.345			0.558			0.581		
Satd. Flow (perm)	291	1863	1583	643	1863	1583	1039	1863	1583	1082	1863	1583
Satd. Flow (RTOR)			226			255			185			182
Peak Hour Factor	0.85	0.92	0.85	0.85	0.85	0.94	0.86	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	289	226	213	719	255	513	292	185	12	95	18
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Total Split (s)	6.5	30.9	30.9	19.1	43.5	43.5	21.0	40.0	40.0	19.0	19.0	19.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	25.8	23.8	23.8	40.1	36.4	36.4	39.3	39.3	39.3	18.1	18.1	18.1
Actuated g/C Ratio	0.29	0.27	0.27	0.45	0.41	0.41	0.44	0.44	0.44	0.20	0.20	0.20
v/c Ratio	0.35	0.58	0.38	0.48	0.94	0.32	0.86	0.35	0.23	0.05	0.25	0.04
Control Delay	24.1	33.1	5.8	18.5	47.1	3.5	38.1	19.1	3.5	31.8	33.6	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	24.1	33.1	5.8	18.5	47.1	3.5	38.1	19.1	3.5	31.8	33.6	0.1
LOS	C	C	A	B	D	A	D	B	A	C	C	A
Approach Delay		21.3			32.6			26.0			28.6	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 88.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 28.0	Intersection LOS: C
Intersection Capacity Utilization 78.7%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Intersection						
Int Delay, s/veh	24.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	100	439	408	126	382	72
Future Vol, veh/h	100	439	408	126	382	72
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	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	109	477	443	137	415	78

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1351	443	0	0	580
Stage 1	443	-	-	-	-
Stage 2	908	-	-	-	-
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	166	615	-	-	994
Stage 1	647	-	-	-	-
Stage 2	393	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 97	615	-	-	994
Mov Cap-2 Maneuver	~ 97	-	-	-	-
Stage 1	647	-	-	-	-
Stage 2	229	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	61.7	0	9.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	97	615	994	-
HCM Lane V/C Ratio	-	-	1.121	0.776	0.418	-
HCM Control Delay (s)	-	-	208.7	28.2	11.2	-
HCM Lane LOS	-	-	F	D	B	-
HCM 95th %tile Q(veh)	-	-	7.2	7.3	2.1	-

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

Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

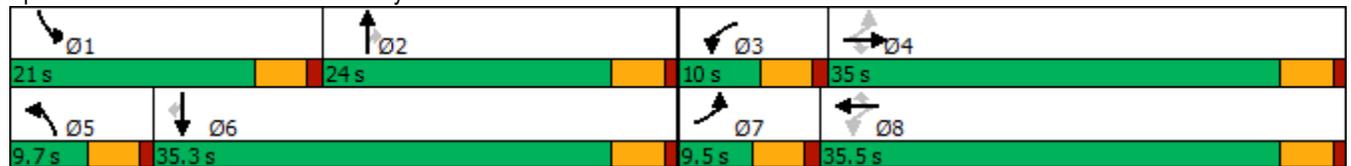
Short-Term Total - Phase 1  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	875	382	117	445	20	54	22	57	390	307	35
Future Volume (vph)	5	875	382	117	445	20	54	22	57	390	307	35
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.483			0.127			0.950			0.950		
Satd. Flow (perm)	900	3539	1583	237	3539	1583	3433	1863	1583	3433	1863	1583
Satd. Flow (RTOR)			402			182			182			127
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	921	402	123	468	21	57	23	60	411	323	37
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Total Split (s)	9.5	35.0	35.0	10.0	35.5	35.5	9.7	24.0	24.0	21.0	35.3	35.3
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	33.8	28.8	28.8	38.0	37.0	37.0	5.2	20.1	20.1	14.7	31.8	31.8
Actuated g/C Ratio	0.39	0.33	0.33	0.44	0.42	0.42	0.06	0.23	0.23	0.17	0.36	0.36
v/c Ratio	0.01	0.79	0.51	0.61	0.31	0.03	0.28	0.05	0.12	0.71	0.48	0.06
Control Delay	14.0	32.3	4.9	30.4	18.2	0.1	44.3	28.3	0.5	41.9	25.6	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	14.0	32.3	4.9	30.4	18.2	0.1	44.3	28.3	0.5	41.9	25.6	0.2
LOS	B	C	A	C	B	A	D	C	A	D	C	A
Approach Delay		23.9			20.0			22.9			33.1	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 87.2  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.79  
 Intersection Signal Delay: 25.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 65.0%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 3: Curtis Rd & Hwy 94



Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	T
Traffic Vol, veh/h	2	8	125	2	6	800
Future Vol, veh/h	2	8	125	2	6	800
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	8	132	2	6	842

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	987	133	0	0	134
Stage 1	133	-	-	-	-
Stage 2	854	-	-	-	-
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	274	916	-	-	1451
Stage 1	893	-	-	-	-
Stage 2	417	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	272	916	-	-	1451
Mov Cap-2 Maneuver	272	-	-	-	-
Stage 1	893	-	-	-	-
Stage 2	414	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	622	1451
HCM Lane V/C Ratio	-	-	0.017	0.004
HCM Control Delay (s)	-	-	10.9	7.5
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

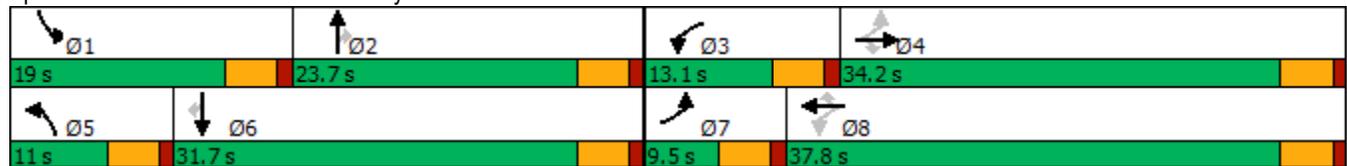
Long-Term Total  
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	859	443	148	438	20	88	34	92	383	338	35
Future Volume (vph)	5	859	443	148	438	20	88	34	92	383	338	35
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.487			0.128			0.950			0.950		
Satd. Flow (perm)	907	3539	1583	238	3539	1583	3433	1863	1583	3433	1863	1583
Satd. Flow (RTOR)			402			182			182			127
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	904	466	156	461	21	93	36	97	403	356	37
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Total Split (s)	9.5	34.2	34.2	13.1	37.8	37.8	11.0	23.7	23.7	19.0	31.7	31.7
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	33.2	28.2	28.2	40.8	39.1	39.1	6.4	19.3	19.3	13.6	28.9	28.9
Actuated g/C Ratio	0.38	0.32	0.32	0.47	0.45	0.45	0.07	0.22	0.22	0.16	0.33	0.33
v/c Ratio	0.01	0.79	0.60	0.61	0.29	0.03	0.37	0.09	0.20	0.75	0.58	0.06
Control Delay	13.0	33.1	7.9	25.3	16.7	0.1	44.3	29.2	0.9	45.6	30.5	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	13.0	33.1	7.9	25.3	16.7	0.1	44.3	29.2	0.9	45.6	30.5	0.2
LOS	B	C	A	C	B	A	D	C	A	D	C	A
Approach Delay		24.5			18.2			23.3			36.7	
Approach LOS		C			B			C			D	

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 87.5  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.79  
 Intersection Signal Delay: 26.3  
 Intersection LOS: C  
 Intersection Capacity Utilization 68.9%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 3: Curtis Rd & Hwy 94



HCM 6th TWSC  
6: Curtis Rd & Access

Long-Term Total  
AM Peak Hour

Intersection						
Int Delay, s/veh	2.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	33	90	123	35	142	786
Future Vol, veh/h	33	90	123	35	142	786
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	-	150	150	-
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	35	95	129	37	149	827

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1254	129	0	0	166
Stage 1	129	-	-	-	-
Stage 2	1125	-	-	-	-
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	190	921	-	-	1412
Stage 1	897	-	-	-	-
Stage 2	310	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	170	921	-	-	1412
Mov Cap-2 Maneuver	170	-	-	-	-
Stage 1	897	-	-	-	-
Stage 2	277	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.3	0	1.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	170	921	1412	-
HCM Lane V/C Ratio	-	-	0.204	0.103	0.106	-
HCM Control Delay (s)	-	-	31.5	9.4	7.9	-
HCM Lane LOS	-	-	D	A	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.3	0.4	-

Lanes, Volumes, Timings  
6: Curtis Rd & Access

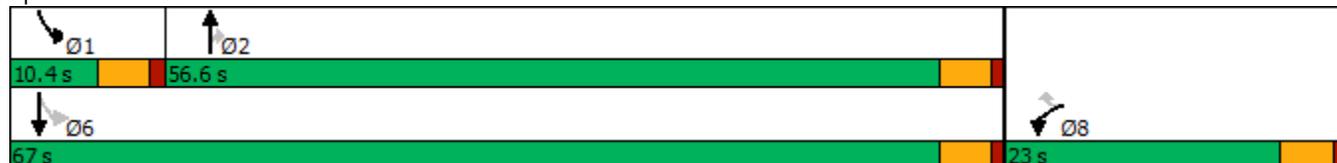
Long-Term Total - Signal  
AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	33	90	123	35	142	786
Future Volume (vph)	33	90	123	35	142	786
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.545	
Satd. Flow (perm)	1770	1583	1863	1583	1015	1863
Satd. Flow (RTOR)		95		37		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	95	129	37	149	827
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	23.0	23.0	56.6	56.6	10.4	67.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	6.8	6.8	20.1	20.1	27.0	28.2
Actuated g/C Ratio	0.17	0.17	0.50	0.50	0.67	0.70
v/c Ratio	0.12	0.28	0.14	0.05	0.19	0.64
Control Delay	18.8	8.0	9.1	3.4	3.9	7.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	8.0	9.1	3.4	3.9	7.8
LOS	B	A	A	A	A	A
Approach Delay	10.9		7.8			7.2
Approach LOS	B		A			A

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 40.5	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 53.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 6: Curtis Rd & Access



Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

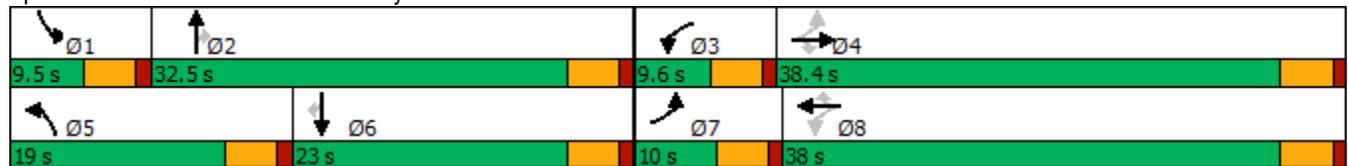
Long-Term Total - Phase 1  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	385	47	49	870	385	311	213	98	20	24	20
Future Volume (vph)	40	385	47	49	870	385	311	213	98	20	24	20
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.141			0.466			0.950			0.950		
Satd. Flow (perm)	263	3539	1583	868	3539	1583	3433	1863	1583	3433	1863	1583
Satd. Flow (RTOR)			182			405			127			182
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	405	49	52	916	405	327	224	103	21	25	21
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Total Split (s)	10.0	38.4	38.4	9.6	38.0	38.0	19.0	32.5	32.5	9.5	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	32.1	29.2	29.2	31.7	29.0	29.0	12.4	32.7	32.7	5.1	19.0	19.0
Actuated g/C Ratio	0.40	0.37	0.37	0.40	0.36	0.36	0.16	0.41	0.41	0.06	0.24	0.24
v/c Ratio	0.20	0.31	0.07	0.13	0.71	0.49	0.61	0.29	0.14	0.10	0.06	0.04
Control Delay	14.7	19.3	0.2	13.4	25.8	4.4	38.4	21.2	3.5	41.0	28.9	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	14.7	19.3	0.2	13.4	25.8	4.4	38.4	21.2	3.5	41.0	28.9	0.1
LOS	B	B	A	B	C	A	D	C	A	D	C	A
Approach Delay		17.0			19.0			27.0			23.7	
Approach LOS		B			B			C			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 79.6	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 20.8	Intersection LOS: C
Intersection Capacity Utilization 55.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↔			↔
Traffic Vol, veh/h	4	12	610	5	15	105
Future Vol, veh/h	4	12	610	5	15	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	13	642	5	16	111

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	788	645	0	0	647
Stage 1	645	-	-	-	-
Stage 2	143	-	-	-	-
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	360	472	-	-	939
Stage 1	522	-	-	-	-
Stage 2	884	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	354	472	-	-	939
Mov Cap-2 Maneuver	354	-	-	-	-
Stage 1	522	-	-	-	-
Stage 2	868	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.6	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	436	939
HCM Lane V/C Ratio	-	-	0.039	0.017
HCM Control Delay (s)	-	-	13.6	8.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Lanes, Volumes, Timings  
3: Curtis Rd & Hwy 94

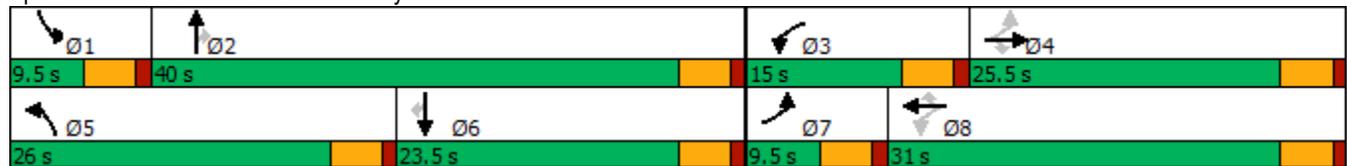
Long-Term Total  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	351	197	119	811	360	496	308	202	20	86	20
Future Volume (vph)	40	351	197	119	811	360	496	308	202	20	86	20
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	3433	1863	1583
Flt Permitted	0.198			0.363			0.950			0.950		
Satd. Flow (perm)	369	3539	1583	676	3539	1583	3433	1863	1583	3433	1863	1583
Satd. Flow (RTOR)			236			379			213			236
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	369	207	125	854	379	522	324	213	21	91	21
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Total Split (s)	9.5	25.5	25.5	15.0	31.0	31.0	26.0	40.0	40.0	9.5	23.5	23.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	23.0	19.2	19.2	29.9	24.7	24.7	17.1	37.9	37.9	5.1	19.6	19.6
Actuated g/C Ratio	0.29	0.24	0.24	0.37	0.31	0.31	0.21	0.47	0.47	0.06	0.24	0.24
v/c Ratio	0.22	0.44	0.37	0.34	0.78	0.51	0.71	0.37	0.25	0.10	0.20	0.04
Control Delay	19.7	29.4	4.9	19.8	32.7	5.5	36.1	17.8	3.5	40.9	29.3	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	19.7	29.4	4.9	19.8	32.7	5.5	36.1	17.8	3.5	40.9	29.3	0.1
LOS	B	C	A	B	C	A	D	B	A	D	C	A
Approach Delay		20.5			23.9			23.9			26.6	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 80.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 23.4	Intersection LOS: C
Intersection Capacity Utilization 58.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Intersection						
Int Delay, s/veh	37.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	100	439	568	126	382	98
Future Vol, veh/h	100	439	568	126	382	98
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	-	150	150	-
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	105	462	598	133	402	103

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1505	598	0	0	731	0
Stage 1	598	-	-	-	-	-
Stage 2	907	-	-	-	-	-
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	133	502	-	-	873	-
Stage 1	549	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 72	502	-	-	873	-
Mov Cap-2 Maneuver	~ 72	-	-	-	-	-
Stage 1	549	-	-	-	-	-
Stage 2	213	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	110.4	0	10
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	72	502	873	-
HCM Lane V/C Ratio	-	-	1.462	0.921	0.461	-
HCM Control Delay (s)	-	-	\$ 368	51.7	12.6	-
HCM Lane LOS	-	-	F	F	B	-
HCM 95th %tile Q(veh)	-	-	8.7	10.9	2.5	-

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

Lanes, Volumes, Timings  
6: Curtis Rd & Access

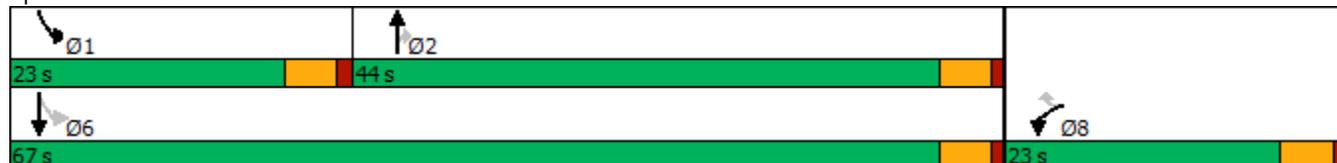
Long-Term Total - Signal  
PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	100	439	568	126	382	98
Future Volume (vph)	100	439	568	126	382	98
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.181	
Satd. Flow (perm)	1770	1583	1863	1583	337	1863
Satd. Flow (RTOR)		462		111		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	105	462	598	133	402	103
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	23.0	23.0	44.0	44.0	23.0	67.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	10.4	10.4	26.8	26.8	45.0	45.0
Actuated g/C Ratio	0.16	0.16	0.41	0.41	0.69	0.69
v/c Ratio	0.37	0.72	0.78	0.19	0.76	0.08
Control Delay	32.1	10.6	25.5	5.1	20.9	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.1	10.6	25.5	5.1	20.9	3.7
LOS	C	B	C	A	C	A
Approach Delay	14.6		21.8			17.4
Approach LOS	B		C			B

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 65.1	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 18.3	Intersection LOS: B
Intersection Capacity Utilization 67.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 6: Curtis Rd & Access



# Queuing Reports

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Queues  
6: Curtis Rd & Access

Long-Term Total - Signal  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	35	95	129	37	149	827
v/c Ratio	0.12	0.28	0.14	0.05	0.19	0.64
Control Delay	18.8	8.0	9.1	3.4	3.9	7.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	8.0	9.1	3.4	3.9	7.8
Queue Length 50th (ft)	6	0	19	0	11	97
Queue Length 95th (ft)	31	33	45	11	27	215
Internal Link Dist (ft)	193		143			1515
Turn Bay Length (ft)				150	150	
Base Capacity (vph)	849	809	1836	1560	791	1863
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.12	0.07	0.02	0.19	0.44
<b>Intersection Summary</b>						

Queues  
6: Curtis Rd & Access

Long-Term Total - Signal  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	105	462	598	133	402	103
v/c Ratio	0.37	0.72	0.78	0.19	0.76	0.08
Control Delay	32.1	10.6	25.5	5.1	20.9	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.1	10.6	25.5	5.1	20.9	3.7
Queue Length 50th (ft)	37	0	184	5	64	10
Queue Length 95th (ft)	97	84	403	39	#239	31
Internal Link Dist (ft)	193		143			1515
Turn Bay Length (ft)				150	150	
Base Capacity (vph)	541	805	1216	1072	671	1670
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.57	0.49	0.12	0.60	0.06

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.