

Clinch River Site
Traffic Assessment
FINAL
Technical Report

Prepared For:

Tennessee Valley Authority
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Chattanooga, SR 30736

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Executive Summary

At the request of Tennessee Valley Authority (TVA), AECOM performed an analysis of the future traffic conditions surrounding the construction and operation of a nuclear power generation plant at TVA's Clinch River Site (Site) in Oak Ridge, Tennessee. As shown in Figure 1, Bear Creek Road borders the Site to the north and the Clinch River arm of Watts Bar Reservoir borders the Site to the west and south. Access to / from the Site is planned via a single driveway from Bear Creek Road. This traffic analysis focuses primarily on the external intersections and major routes adjacent to the Site; it does not address internal circulation within the Site. Based on current projections, peak year of construction and operation activities will be in 2024.

Based on the available information, this traffic study provides recommendations for roadway improvements to allow for acceptable operations during the 2024 peak traffic year (largest number of on-Site construction and operations workers). These recommendations are also expected to satisfy traffic conditions once the nuclear power generation plant is completed and only operations staff is on Site. Due to the variation in workforce projections, AECOM conducted an analysis for two different scenarios and provided the recommendations needed to satisfy traffic operations for both.

AECOM analyzed Existing (2013), Background (2024), Background + Site Scenario 1 (2024), Background + Site Scenario 2 (2024), Future + Site Scenario 1 (2024), and Future + Site Scenario 2 (2024) traffic conditions for the weekday AM and PM peak hours.

The following roadway improvements are recommended to accommodate the 2024 peak traffic year for Scenario 1 (construction workforce of 2200 people and an operation workforce of 500 people) at the nuclear power generation plant. These improvements are illustrated in Figure 10.

SR 58 at Bear Creek Road Ramp

- Restripe northbound left-turn lane on SR 58 to provide 400 feet of storage.
- Construct an additional receiving lane on Bear Creek Road Ramp including channelization for the southbound right-turn movements onto Bear Creek Road Ramp providing free operation.
- Construct an additional eastbound left-turn lane (making dual left-turn lanes) on Bear Creek Road Ramp with 350 feet of storage.
- Extend existing eastbound right-turn lane storage on Bear Creek Road Ramp to the newly realigned US Government Property Road. This right-turn lane merge distance onto SR 58 should also be extended to provide at least 400 feet of acceleration distance.
- Construct a traffic signal.

Bear Creek Road at US Government Property Road

- Realign US Government Property Road with Bear Creek Road as a single lane approach under stop control. Due to the horizontal and vertical curvature, the US

Government Property Road should be realigned to allow adequate sight distance for all turning movements.

- Construct an exclusive northbound left-turn lane on Bear Creek Road with 150 feet of storage.
- Construct a southbound through / right-turn lane on Bear Creek Road channelized under yield control extend back to SR 58.

Bear Creek Road (SR 58 to Site)

- Construct a second southbound through lane on Bear Creek Road from SR 58 that turns into a left-turn lane onto W. Bear Creek Road at Site Entrance.
- Bear Creek Road should be designed to accommodate construction equipment transported by rail (100'L x 15'W x 16'H). The SR 58 overpass height is approximately 22 feet and should be noted when considering either rail or barge transportation for construction equipment.
- The proposed barge access is downstream of the SR 58 overpass along Bear Creek Road; therefore, Bear Creek Road (from Barge to Site) should be designed to accommodate large materials (100'L x 55'W x 60'H) for the nuclear power plant construction. Utilities poles, trees, and signs should be moved to accommodate the dimensions of the large equipment.

Bear Creek Road at Site Driveway

- Eliminate existing curve by realigning W. Bear Creek Road with Bear Creek Road / Site Driveway to a "T" intersection under stop control.
- Construct a southbound left-turn lane on Bear Creek Road that extends to SR 58
- Construct a northbound right-turn lane on Site Driveway with 150 feet of storage and channelize under yield control.
- Construct a westbound left-turn lane on W. Bear Creek Road with 150 feet of storage.
- Bollards should be installed on Bear Creek Road extending through the intersection to direct southbound vehicles to the outermost receiving lane into Site.

SR 95 at East Bear Creek Road / West Bear Creek Road

- Extend existing eastbound right-turn flare on W. Bear Creek Road to provide 125 feet of storage.

The difference in the number of workers between Scenario 1 and Scenario 2 is approximately 1,000. A failure analysis was conducted for Scenario 1 to determine the maximum of workers that can be accommodated by Scenario 1 improvements. It was determined that the maximum threshold is an increase in the number of Scenario 1 workers of approximately 10%. If the projected workforce is greater than 3,000, Scenario 2 improvements are recommended to provide acceptable operation during the peak 2024 year of construction.

The following roadway improvements are recommended to accommodate the 2024 peak traffic year for Scenario 2 (construction workforce of 3300 people and an operation workforce of 366 people) at the nuclear power generation plant. These improvements are illustrated in Figure 12.

SR 58 (North / South) at Bear Creek Southbound (SB) / Proposed Northbound (NB) Ramps

- Construct a new northbound loop ramp that mirrors the existing southbound loop.
- Construct a northbound free flow right-turn deceleration lane on SR 58 with 250 feet of storage connecting the new loop ramp to Bear Creek Road.
- Restripe pavement to remove existing northbound left-turn lane on SR 58 and prohibit all left-turns.
- Construct a westbound right-turn lane from the new NB ramp and provide a 225 foot acceleration lane onto SR 58 northbound.
- Restripe pavement to remove existing eastbound left-turn lane onto SR 58 from Bear Creek SB Ramp to prohibit all left-turns.

Bear Creek Road (North / South) at Bear Creek Proposed NB Ramp

- Construct a dual-lane roundabout with a mountable median.
- Construct a northbound right-turn lane on Bear Creek Road under yield control.
- Construct a southbound shared left- / through turn lane on Bear Creek Road with 250 feet of storage.
- Construct a westbound left-turn lane with 150 feet of storage and a shared left-turn / right-turn lane on the new Bear Creek NB Ramp.
- Widen Bear Creek Road from two to four lanes from the proposed NB Ramp to at least 500 feet south of the intersection.
- The proposed barge access is downstream of this intersection; therefore, large materials (100'L x 55'W x 60'H) for the nuclear power plant construction are not expected to enter the roundabout as they progress to the Site.

Bear Creek Road (North / South) Widening

- Construct a third lane on Bear Creek Road starting 500 feet south of the new Bear Creek Road NB Ramp intersection and continue internal to the Site property to minimize queuing on Bear Creek Road. This third lane will be reversible with two lanes southbound in the AM peak hour (entering the Site) and two lanes northbound (exiting the Site) during the PM peak hour.
- Design of the reversible lanes shall include gates, signs, and proper pavement markings at the transition points to direct vehicles into the proper lanes.

Bear Creek Road (North / South) at Site Driveway

- Eliminate existing curve by realigning W. Bear Creek Road with Bear Creek Road / Site Driveway to a "T" intersection.

- Construct a westbound left-turn lane on W. Bear Creek Road with 500 feet of storage. A temporary traffic signal is warranted for the AM and PM peak hours. The traffic signal should be designed to accommodate large loads delivered by barge (100'L x 55'W x 60'H). An alternative would be to employ a traffic officer to stop traffic on Bear Creek Road to provide gaps for the left-turn movement into the Site.
- During the AM peak hour, the reversible lane shall function as a southbound through / left-turn lane.
- During the PM peak hour, the reversible lane shall function as a northbound through lane.

SR 95 at East Bear Creek Road / West Bear Creek Road

- Extend existing eastbound right-turn flare on W. Bear Creek Road to provide 200 feet of storage.

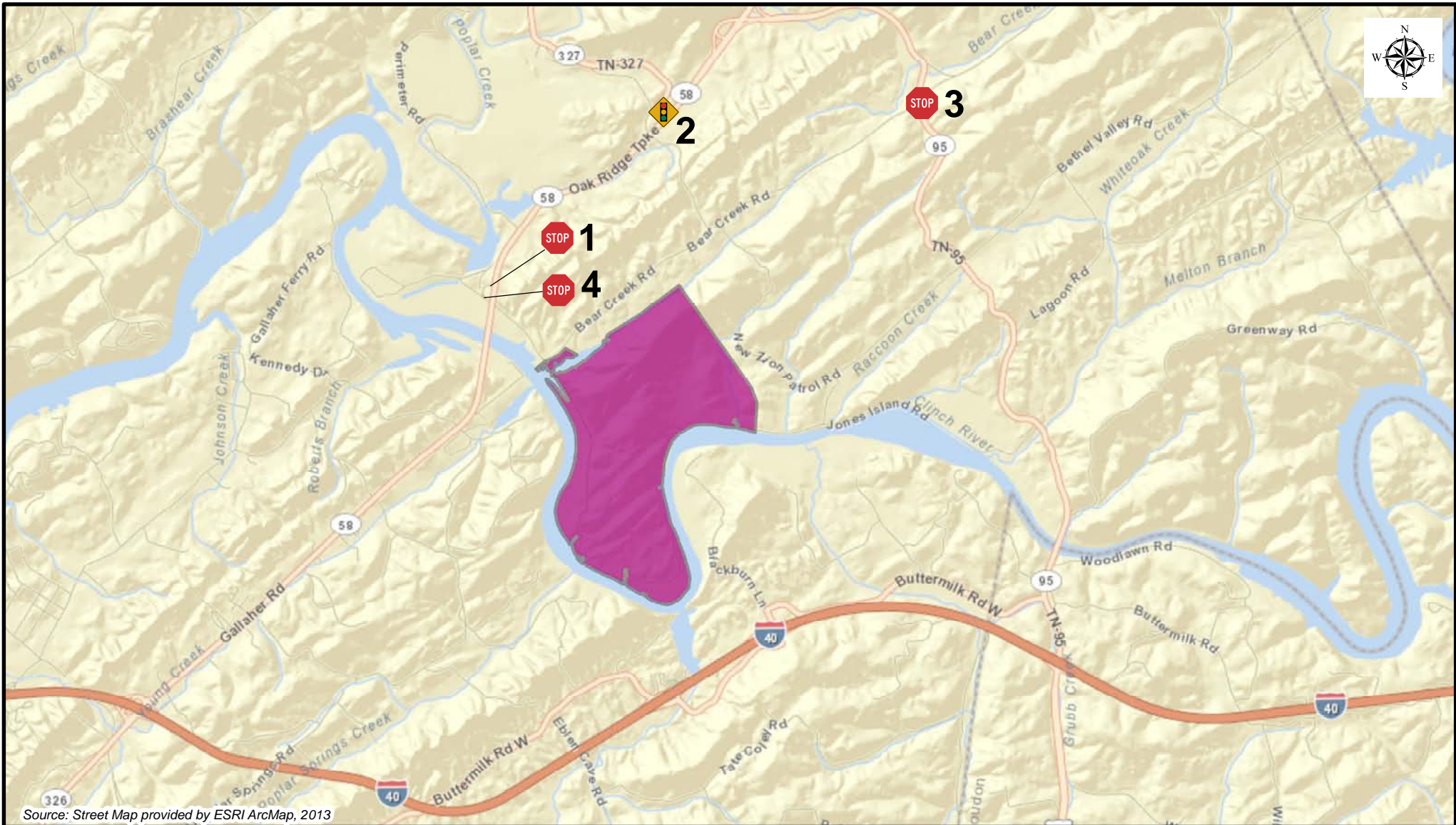
1.0 INTRODUCTION

At the request of Tennessee Valley Authority (TVA), AECOM assessed the traffic operations of a proposed nuclear power generation plant on the “Clinch River Site” (hereafter referred to as “the Site”), located in Oak Ridge, Tennessee. The Site is bordered to the north by Bear Creek Road and to the south and west by the Clinch River arm of Watts Bar Reservoir. Access to and from the Site will be provided by a single driveway on Bear Creek Road. Based on current projections, peak year construction and operation activities will be in 2024.

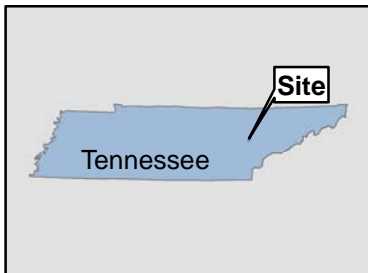
AECOM analyzed Existing (2013), Background (2024), Background + Site Scenario 1 (2024), Background + Site Scenario 2 (2024), Future + Site Scenario 1 (2024), and Future + Site Scenario 2 (2024) traffic conditions for the weekday AM and PM peak hours. Year 2024 was determined to be the peak year due to the largest number of on-Site construction and operations workers at the nuclear power generation plant. For the purposes of the report, the following abbreviations may be used describing directions of roadways: Northbound (NB), Southbound, (SB), Eastbound (EB), and Westbound (WB).

The study area, confirmed by the Tennessee Department of Transportation (TDOT) on June 24, 2013, includes the following intersections, which are shown in Figure 1:

1. State Route (SR) 58 at Bear Creek Road Ramp (Unsignalized)
2. SR 58 at SR 327 (Signalized)
3. SR 95 at Bear Creek Road (Unsignalized)
4. Bear Creek Road Ramp at Bear Creek Road / US Government Property Road (Unsignalized)



Source: Street Map provided by ESRI ArcMap, 2013



Legend

- Clinch River Site
- STOP Unsignalized
- ◻ Signalized

0 0.5 1 2 Miles

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Figure 1 Study Area Map

SMR Project

PROJECT NO.
60279942

DRAWN BY:
MLS

DATE:
6/19/2014

Figure 1

2.0 EXISTING CONDITIONS

SR 58 (Gallaher Road / Oak Ridge Turnpike), SR 95 (White Wing Road), and SR 327 (Blair Road) provide regional access to the Site. Local access to the Site is provided by Bear Creek Road. The following sections provide descriptions of each segment with intersection details; these segments are illustrated in Figure 2.

2.1 SR 58

SR 58 is a 5-lane northeast/southwest principal arterial north of the project Site that connects Interstate 40 (I-40) to SR 95 via an interchange carrying approximately 10,500 vehicles per day with 3 percent heavy vehicles (513 Tennessee Department of Transportation 2012). Posted speed limits along SR 58 vary between 45 and 55 miles per hour. Traveling northbound on SR 58, Bear Creek Road is the only grade-separated cross street, which is accessed shortly after crossing the Clinch River Bridge. Access to Bear Creek Road (direct access to proposed Site) includes a loop ramp that travels underneath SR 58.



Looking northbound on SR 58. The Bear Creek Road Ramp is visible on the left side of the photo.

2.2 SR 95



Looking northbound on SR 95 at Bear Creek Road.

SR 95 is a 2-lane north/south principal arterial approximately 2 miles east of the Site that connects I-40 to SR 58 (eventually to the City of Oak Ridge) via an interchange carrying approximately 6,600 vehicles per day with 3 percent heavy vehicles (513 Tennessee Department of Transportation 2012). Posted speed limits along SR 95 are primarily 55 miles per hour. Several locations along SR 95 contain 35 mile per hour advisory speed limits signs due to the horizontal (corners / bends) and vertical (hills / valleys) curvature.

2.3 SR 327



Looking eastbound along SR 327 at SR 58.

SR 327 (Blair Road) is a 2-lane north/south major collector that connects SR 58 to SR 61 carrying approximately 3,000 vehicles per day with 2 percent heavy vehicles (513 Tennessee Department of Transportation 2012). SR 61 connects the Towns of Oliver Springs and Harriman. Posted speed limits along SR 327 are primarily 35 miles per hour.



Looking southbound on Bear Creek Rd at Bear Creek Rd Ramp to SR 58.

2.4 BEAR CREEK ROAD

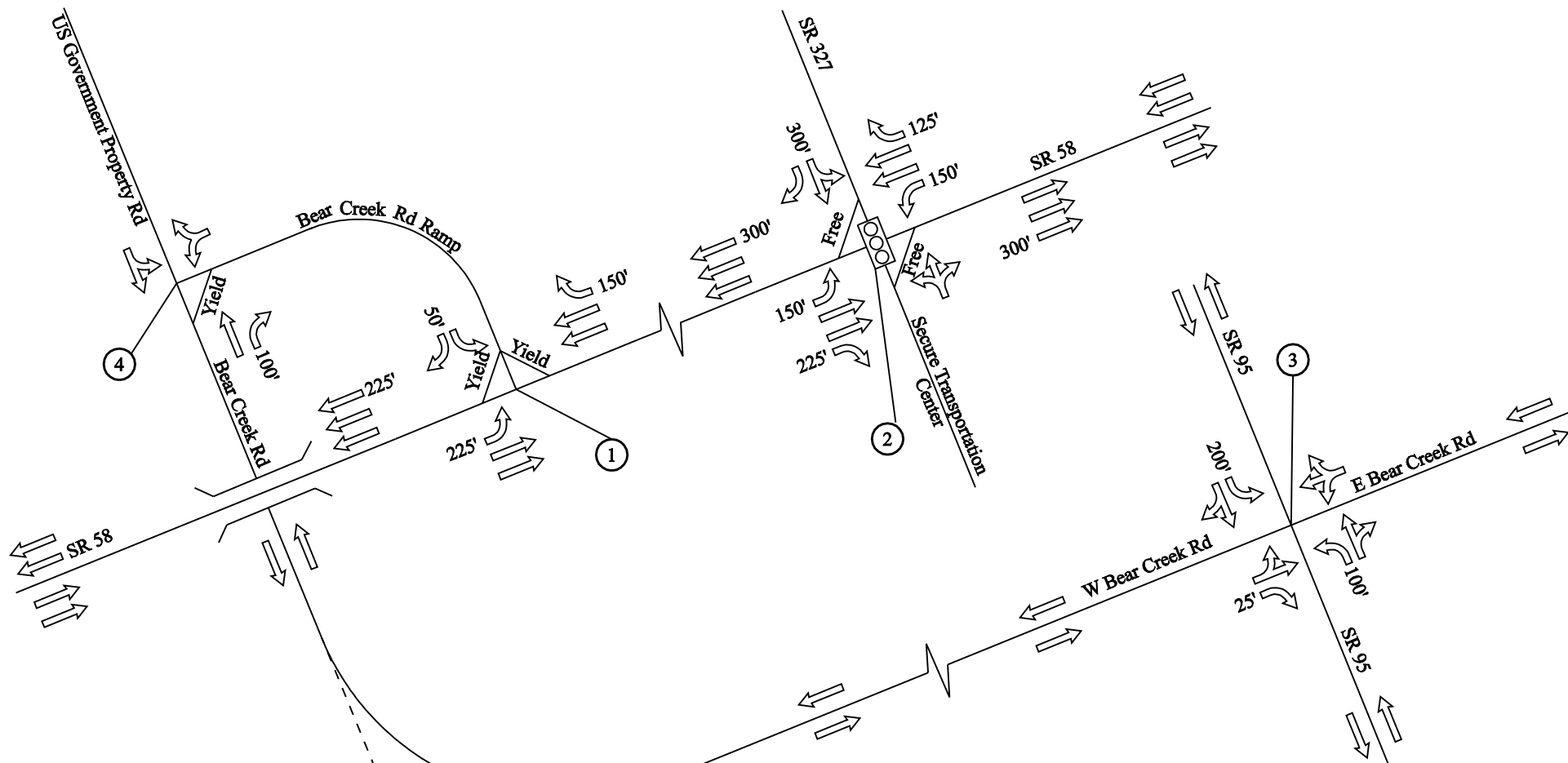
Bear Creek Road is a 2-lane northeast/southwest roadway that connects SR 58 to SR 95 carrying approximately 500 vehicles per day with up to 10 percent heavy vehicles (513 Tennessee Department of Transportation 2012). Posted speed limits along Bear Creek Road are primarily 45 miles per hour.

3.0 CRASH DATA REVIEW

3.1 CRASH ANALYSIS

TDOT provided crash data from February 2008 to November 2012 for the study area as shown in Appendix A. Table 1 summarizes the crash data for Bear Creek Road, SR 58, SR 327, and SR 95 respective log mile (L.M.). Based on the crash data provided, the majority of the crashes resulted in property damage, primarily due to vehicles leaving the roadway. Three fatalities also occurred on SR 95 during this time period, two of which were a result of collisions with trees. (514 Tennessee Department of Transportation 2013)

Property damage crashes at various intersections along these roads were primarily coded as rear-end or failure to yield the right-of-way. The location with the highest number of reported crashes (seven) was the intersection of SR 95 and Bethel Valley Road (not part of this study area). One of these crashes resulted in one incapacitating injury. The location with the second highest number of crashes (six) was the signalized intersection of SR 58 and SR 327. One of these crashes resulted in an incapacitating injury. (514 Tennessee Department of Transportation 2013)



EXISTING GEOMETRY FIGURE 2

- ← Existing Laneage
- ## Intersection Number
- Existing Signal
- #### Storage
- <####> Distance Between Intersections
- ⚡ Greater than 1 mile

AECOM



Drawing Not to Scale

Table 1 – Crash Analysis Summary (514 Tennessee Department of Transportation 2013)

Condition	Bear Creek Road		SR 58		SR 327		SR 95	
	(L.M. 0.00 to L.M. 4.17)		(L.M. 17.60 to L.M. 20.18)		(L.M. 0.00 to L.M. 2.20)		(L.M. 0.00 to L.M. 3.00)	
	Frequency	% of Total	Frequency	% of Total	Frequency	% of Total	Frequency	% of Total
<i>Daylight</i>	2	100.0%	16	57.1%	4	44.4%	17	45.8%
<i>Dark – Not Lighted</i>	0	0.0%	9	32.1%	2	22.2%	10	32.3%
<i>Dark- Lighted</i>	0	0.0%	3	10.7%	2	22.2%	0	0.0%
<i>Dusk / Dawn</i>	0	0.0%	0	0%	1	11.1%	4	12.9%
<i>Property Damage</i>	2	100.0%	19	67.9%	5	55.6%	21	67.7%
<i>Non Incap Injury</i>	0	0.0%	7	25.0%	3	33.3%	3	9.7%
<i>Incapacitating Injury</i>	0	0.0%	2	7.1%	1	11.1%	4	12.9%
<i>Fatality</i>	0	0.0%	0	0.0%	0	0.0%	3	9.7%
<i>Unknown</i>	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<i>Lane Departure</i>	0	0.0%	9	32.1%	5	55.6%	21	67.7%
<i>Rear-End</i>	0	0.0%	4	14.3%	0	0.0%	3	9.7%
<i>Rear to Rear</i>	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<i>Angle</i>	0	0.0%	4	14.3%	4	44.4%	5	16.1%
<i>Sideswipe</i>	0	0.0%	1	3.6%	0	0.0%	0	0.0%
<i>Head-On</i>	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<i>Animal Hit / Avoidance</i>	2	100.0%	10	35.7%	0	0.0%	2	6.5%
<i>Raining</i>	0	0.0%	5	17.9%	3	33.3%	8	25.8%
<i>Clear</i>	2	100.0%	22	78.6%	4	44.4%	21	67.7%
<i>Fog</i>	0	0.0%	1	3.6%	2	22.2%	2	6.5%
<i>Pedestrian / Cyclist Involved</i>	0	0.0%	0	0.0%	0	0.0%	0	0.0%

4.0 DATA COLLECTION AND ANALYSIS METHODS

4.1 DATA COLLECTION

AECOM conducted weekday peak hour (5:00 – 9:00 AM and 3:00 – 6:00 PM) turning movement counts at the following locations:

1. SR 58 at Bear Creek Road Ramp (Wednesday, July 17, 2013)
2. SR 58 at SR 327 (Tuesday, July 16, 2013)
3. SR 95 at Bear Creek Road (Tuesday, July 16, 2013)

Based on the results of these counts, AECOM determined the following single hour peaks within the AM and PM peak periods:

1. SR 58 at Bear Creek Road Ramp (6:15 - 7:15 AM / 4:30 – 5:30 PM)
2. SR 58 at SR 327 (6:00 - 7:00 AM / 4:30 – 5:30 PM)
3. SR 95 at Bear Creek Road (5:00 - 6:00 AM / 4:30 – 5:30 PM)

The intersection of Bear Creek Road / US Government Property Road with Bear Creek Road Ramp was monitored on Monday July 15, 2013 to determine if volumes were high enough to warrant a full traffic count. During the peak hours, fewer than five vehicles were observed traveling to / from the north leg of Bear Creek Road (Government Property). As a result, a traffic count was not conducted and traffic volumes from the SR 58 intersection were referenced and balanced at this intersection.

According to local law enforcement, several employment centers in the area follow a Monday through Thursday, 10-hour day work schedule.

Appendix B contains the raw turning movement counts.

4.2 ANALYSIS TOOLS

AECOM obtained available data from TDOT (i.e., counts, Synchro files, signal plans, etc.) for each project location and analyzed the data using Synchro and SimTraffic (Future 773, Rev 8). All existing condition signal timings (cycle lengths and splits) were optimized using Synchro software. SIDRA INTERSECTION 5.0 was used to analyze the feasibility of a roundabout where applicable. Highway Capacity Software (HCS) was used to conduct segment, merge / diverge, and the signal warrant analyses.

4.3 INTERSECTION ANALYSIS

The highway capacity analyses performed were based on methodologies from the *Highway Capacity Manual (HCM 2000)*, *Special Report 209* (515 Transportation Research Board National Research Council 2000). The traffic carrying ability of a roadway is described by levels

of service (LOS) that range from LOS A to LOS F. Table 2 defines the traffic flow conditions and approximate driver comfort level at each level of service (515 Transportation Research Board National Research Council 2000).

Table 2 - Level of Service (LOS) Index

LOS	Traffic Flow Conditions	Delay (seconds) Signalized Intersections	Delay (seconds) Unsignalized Intersections
A	Progression is extremely favorable and most vehicles do not stop at all	0-10	0-10
B	Good progression, some delay	10-20	10-15
C	Fair progression, higher delay	20-35	15-25
D	Unfavorable progression, congestion becomes apparent	35-55	25-35
E	Poor progression, significant delay	55-80	35-50
F	Poor progression, extreme delay	>80	>50

The delays associated with LOS for signalized intersections are different from those associated with unsignalized intersections. The Highway Capacity Manual explains that drivers perceive that a signalized intersection is designed to carry higher traffic volumes and therefore the driver expects to experience greater delays at signalized intersections. A signalized intersection is described by a single overall LOS.

Unsignalized intersections are assigned a LOS for each minor movement rather than for entire intersection. For example, at a two-way stop controlled intersection, traffic on the major street approaches do not have to stop; therefore, minimal delay (if any) is expected equating to a favorable LOS. For the minor street approach that is stop-controlled, delay will vary based on the number of vehicles on the major street approach. If the major street approach has a large number of vehicles, fewer gaps in traffic are available for side street traffic to proceed. This equates to long delays and poor LOS for the minor street approach regardless of the numbers of vehicles trying to complete this turning movement.

Typically and according to TDOT, LOS D is considered the minimum acceptable level of service at an intersection (signalized or unsignalized) in a rural setting. If the minor approach for an unsignalized intersection operates at LOS E or worse, a signal warrant analysis can be conducted to determine if a signal is warranted.

SimTraffic simulation runs were performed to identify the queuing and blocking problems at each study intersection. For the purpose of this analysis, if the average or maximum queues exceeded the storage length provided for the movement by less than 100 feet (ft), then the queuing was classified as “mild queuing”. If the average or maximum queue exceeded the storage length provided for the movement by 100 ft to 200 ft, then the queuing was classified as “moderate queuing”. If the average or maximum queue exceeded the storage length provided for the movement by greater than 200 ft, then the queuing was classified as “excessive queuing”.

4.4 SEGMENT ANALYSIS

Using Highway Capacity Manual (HCM 2000) methodologies and Highway Capacity Software (HCS), a two-lane and multi-lane segment analysis was conducted. Existing Bear Creek Road is a Class II highway with an assumed minimum base free flow speed of 45 mph. The HCM defines Class II highways as “highways on which motorist do not necessarily expect to travel at high speeds, including access routes, scenic and recreational routes that are not primarily arterials, and routes through rugged terrain.” For analyzing Class II highways, LOS is defined only in terms of percent time spent following (PTSF) without considering average travel speed. (515 Transportation Research Board National Research Council 2000). Table 3 defines the traffic flow conditions and approximate driver comfort level at each level of service.

Table 3 - Level of Service (LOS) Index for Class II Two-lane Highways

LOS	Traffic Flow Conditions	Percent Time Spent Following (PTSF)
A	Average speeds of 55 MPH, passing easily accomplished	< 40
B	Average speeds of 50 MPH, passing reaches capacity	40-55
C	Average speeds of 45 MPH, passing becomes difficult	55-70
D	Average speeds of 40 MPH, passing is very difficult	70-85
E	Average speeds of 25 MPH, passing impossible	> 85
F	Low variable speeds, heavily congested	Flow rate exceeds segment capacity

4.5 MERGE / DIVERGE ANALYSIS

A ramp is a length of roadway providing an exclusive connection between two highway facilities. On freeways, all entering and exiting maneuvers take place on ramps that are designed to facilitate smooth merging of on-ramp vehicles into the freeway traffic stream and smooth

diverging of off-ramp vehicles from the freeway traffic stream onto the ramp. (515 Transportation Research Board National Research Council 2000)

A ramp consists of three geometric elements of interest: the ramp-freeway junction, the ramp roadway, and the ramp-street junction. The ramp-freeway junction is typically designed to permit high-speed merging and diverging, with varying acceleration and deceleration lanes. Ramp roadways can vary between locations in terms of number of lanes, design speeds, grades, and horizontal curvature. The design of ramp roadways is seldom a source of operational difficulty unless a traffic incident causes disruption along the length of the ramp. Ramp-street terminal problems can cause queuing along the length of ramp, but this is generally not related to the design of the ramp roadway. Table 4 defines the traffic density conditions at each level of service. (515 Transportation Research Board National Research Council 2000)

Table 4 - Level of Service (LOS) Index for Basic Merge or Diverge Segment

LOS	Density Range (passenger cars / hour / lane - pc/hr/lane)
A	< 10
B	> 10 -20
C	> 20 -28
D	> 28-35
E	> 35
F	Demand Exceeds Capacity

Bear Creek Road as two lane section is expected to operate at an unacceptable LOS for the 2024 Future + Site Scenario 1 and Scenario 2 Conditions; therefore, a multi-lane analysis was conducted using HCS. Performance measures include density, speed, and volume to capacity ratio for a multi-lane highway. Density (vehicles per mile per lane) is assigned as the primary performance measure for estimating LOS. For free flow speeds (FFS) 60, 55, 50, and 45 miles per hour (mi/h), Table 5 defines average speed, the maximum volume to capacity value (v/c), the maximum density, and the corresponding maximum service flow rate for each LOS. (515 Transportation Research Board National Research Council 2000)

Table 5 - Level of Service (LOS) Index for Multi-lane Highways

Free Flow Speed	Criteria	LOS				
		A	B	C	D	E
60 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	40
	Average speed (mi/h)	60.0	60.0	59.4	56.7	55.0
	Maximum volume to capacity ratio (v/c)	0.30	0.49	0.70	0.90	1.00
	Maximum service flow rate (pc/h/ln)	660	1080	1550	1980	2200
55 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	41
	Average speed (mi/h)	55.0	55.0	54.9	52.9	51.2
	Maximum volume to capacity ratio (v/c)	0.29	0.47	0.68	0.88	1.00
	Maximum service flow rate (pc/h/ln)	600	990	1430	1850	2100
50 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	43
	Average speed (mi/h)	50.0	50.0	50.0	48.9	47.5
	Maximum volume to capacity ratio (v/c)	0.28	0.45	0.65	0.86	1.00
	Maximum service flow rate (pc/h/ln)	550	900	1300	1710	2000
45 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	45
	Average speed (mi/h)	45.0	45.0	45.0	44.4	42.2
	Maximum volume to capacity ratio (v/c)	0.26	0.43	0.62	0.82	1.00
	Maximum service flow rate (pc/h/ln)	490	810	1170	1550	1900

4.6 SIGNAL WARRANT ANALYSIS

As outlined in the Manual of Uniform Traffic Control Devices (MUTCD), a traffic signal should not be installed unless traffic volumes and intersection characteristics meet a set of warrants or requirements (959 U.S. Department of Transportation 2009). The MUTCD outlines nine warrants, which are listed below.

Warrant 1: Eight-Hour Traffic Volume

Warrant 2: Four-Hour Traffic Volume

Warrant 3: Peak Hour

Warrant 4: Pedestrian Volume

Warrant 5: School Crossing

Warrant 6: Coordinated Signal System

Warrant 7: Crash Experience

Warrant 8: Roadway Network

Warrant 9: Intersection Near Roadway Grade Crossing

HCS was used for the evaluation of signal warrants at unsignalized intersections that were projected to operate at LOS E or worse in the 2024 peak year of traffic.

5.0 TRAFFIC GENERATION

Site traffic potential of the proposed nuclear power generation plant was determined using the Bechtel anticipated schedule for construction and operation. During the peak year (2024) construction period, the estimated construction workforce of 2200 personnel and 500 operation workforce personnel was included in the traffic generation estimate for Scenario 1. An estimated construction workforce of 3300 personnel and 366 operation workforce personnel was included in the traffic generation estimate for Scenario 2.

The peak operations workforce at the completion of this project is well below the peak of construction personnel and operations personnel; therefore, the roadway improvements recommended to accommodate the peak year will also accommodate the operations staff traffic once the nuclear power generation plant is complete.

Bechtel also provided details for shift changes and carpooling to better generate traffic for the peak hours during the day. The following is a summary of the shift changes for the construction and operations staff with total traffic generation shown in Table 6 and Table 7 for Scenario 1 and Scenario 2, respectively:

Construction Staff

- 1st Shift (7:00 AM – 5:30 PM) - Approximately 70%
- 2nd Shift (6:00 PM – 4:00 AM) – Approximately 25%
- 3rd Shift (11:00 PM – 8:30 AM) – Approximately 5%
- A carpooling factor of 1.3 should be applied

Operation Staff

- 1st Shift (7:00 AM – 3:00 PM) - Approximately 75%
- 2nd Shift (3:00 PM – 11:00 PM) – Approximately 5%
- 3rd Shift (11:00 PM – 7:00 AM) – Approximately 5%
- The remaining 15% (5% training, 10% annual or sick leave)
- No carpooling factor should be applied

Table 6 – Trip Generation of Peak Construction Year (Scenario 1)

Peak Year	Worker Type (# of workers)	Shift	AM Peak (7-9)		PM Peak (4-6)	
			Enter	Exit	Enter	Exit
2024	Construction (2200)	1st	1185	-	-	1185
		2nd	-	-	423	-
		3rd	-	85	-	-
		Subtotal	1185	85	423	1185
	Operation (500)	1st	375	-	-	-
		2nd	-	25	-	-
		3rd	-	-	-	-
		Subtotal	375	25	0	0
	Total		1560	110	423	1185

Table 7 – Trip Generation of Peak Construction Year (Scenario 2)

Peak Year	Worker Type (# of workers)	Shift	AM Peak (7-9)		PM Peak (4-6)	
			Enter	Exit	Enter	Exit
2024	Construction (3300)	1st	1777	-	-	1777
		2nd	-	-	635	-
		3rd	-	127	-	-
		Subtotal	1777	127	635	1777
	Operation (366)	1st	275	-	-	-
		2nd	-	18	-	-
		3rd	-	-	-	-
		Subtotal	275	18	0	0
	Total		2052	145	635	1777

6.0 TRAFFIC DISTRIBUTION

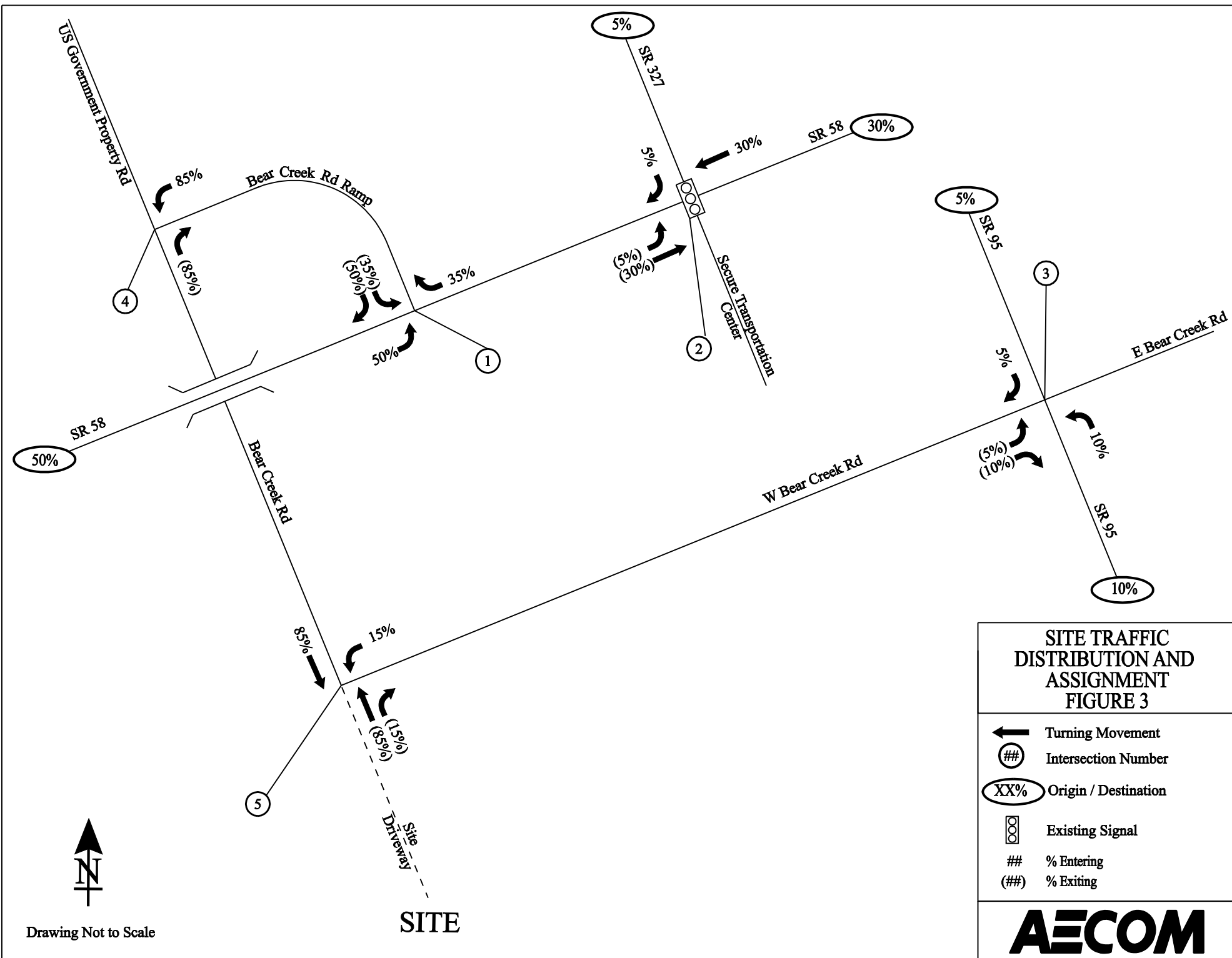
Access to the proposed nuclear power generation plant will be provided by one full-movement driveway on Bear Creek Road. Traffic distribution and assignment were based on land uses and population densities in the area, as well as the surrounding roadway network. The majority of the workers (either construction or operation) are expected to commute from within a 50-mile radius, which includes the greater Oak Ridge and Knoxville, Tennessee metropolitan population areas, with population centers of approximately 29,330 and 178,874, respectively.

Based on the information provided, the following directional distribution and assignment of Site traffic were assumed in this traffic analysis:

- 50% to and from the south on SR 58 (Kingston, Lenior City, Farrugut, and Knoxville)
- 30% to and from the north on SR 58 (Oak Ridge)
- 10% to and from the south on SR 95 (Lenior City, Farrugut, and Knoxville)
- 5% to and from the north on SR 95 (Oak Ridge)
- 5% to and from the west on SR 327 (Oliver Springs)

In summary, approximately 40% of the proposed Site traffic is expected to travel to / from Oak Ridge and Oliver Springs along SR 58, SR 95 and SR 327. The remaining 60% is expected to travel / from Kingston, Lenior City, Farrugut, and Knoxville along SR 58 and SR 95 from I-40.

The Site traffic distribution and assignments are summarized in Figure 3.



7.0 EXISTING CAPACITY ANALYSIS - 2013

7.1 CAPACITY ANALYSIS OVERVIEW

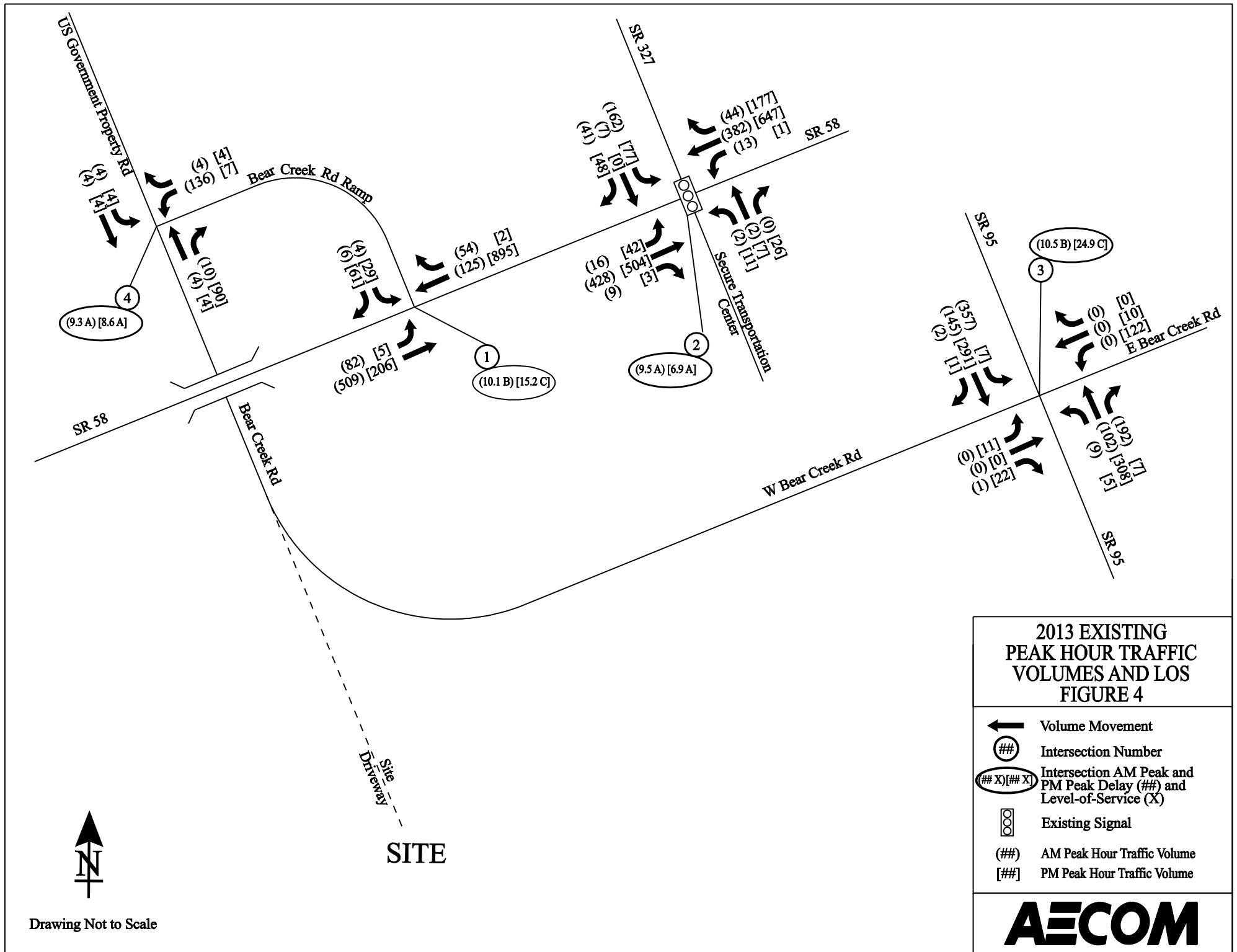
Capacity analyses were performed for 2013 AM and PM peak hours for all the study intersections. LOS and delays by approach are summarized in Table 8. Figure 4 illustrates the peak hour traffic volume, delay, and LOS for each intersection. Detailed Synchro, SimTraffic, and HCS Reports for 2013 existing conditions are provided in Appendix C.

Table 8 – Existing 2013 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
1. SR 58 at Bear Creek Road Ramp (Unsignalized)	B	10.1	C	15.2
Eastbound Approach	B	10.1	C	15.2
Northbound Approach	A	7.7	B	10.4
Southbound Approach	-	-	-	-
2. SR 58 at SR 327 (Signalized)	A	9.5	A	6.9
Eastbound Approach	B	14.0	B	12.9
Westbound Approach	B	12.8	B	12.4
Northbound Approach	A	7.2	A	4.0
Southbound Approach	A	9.7	A	7.6
3. SR 95 at Bear Creek Road (Unsignalized)	B	10.5	C	24.9
Eastbound Approach	B	10.5	B	12.2
Westbound Approach	A	0.0	C	24.9
Northbound Approach	A	7.6	A	8.0
Southbound Approach	A	9.4	A	8.0
4. Bear Creek Road at Bear Creek Road Ramp (Unsignalized)	A	9.3	A	8.6
Eastbound Approach	A	3.6	A	3.6
Westbound Approach	-	-	-	-
Southbound Approach	A	9.3	A	8.6

LOS – Level- of Service

Based on the 2013 existing capacity analysis, Bear Creek Road as a two-lane section (between Bear Creek Road Ramp and Proposed Site Entrance) is operating at LOS C in AM peak hour and LOS B during the PM peak hour.



7.2 INTERSECTION ANALYSIS (UNSIGNALIZED AND SIGNALIZED)

7.2.1 SR 58 at Bear Creek Rd Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection currently operates at a LOS B in the AM peak hour and a LOS C during the PM peak hour for minor street approach left-turn. The AM peak hour has minimal delay because the majority of vehicles are entering Bear Creek Road Ramp from SR 58. In the PM peak hour, more vehicles are exiting the Bear Creek Road Ramp onto SR 58; however, most of these vehicles are turning right and experience minimal conflict with SR 58 through traffic.

Queue Analysis: No significant queuing is present at this intersection.

7.2.2 SR 58 at SR 327 (Signalized)

Capacity Analysis: This signalized intersection currently operates at a LOS A in the AM and PM peak hours. Field observations confirm this LOS.

Queue Analysis: No significant queuing is present at this intersection.

7.2.3 SR 95 at Bear Creek Rd (Unsignalized)

Capacity Analysis: This unsignalized intersection currently operates at a LOS B in the AM peak hour (eastbound approach) and a LOS C during the PM peak hour (westbound approach). In the AM peak hour, the major turning movement is the southbound left-turn from SR 95 onto E. Bear Creek Road. During the morning peak hour from 5:00 – 6:00 AM, the through traffic on SR 95 is very low, resulting in minimal delay for the southbound left-turning traffic. In the PM Peak, most of the vehicles leaving E. Bear Creek Road use the designated right-out only exit, located approximately 1,000 feet north of this study intersection. Over 100 vehicles make left-turns from E. Bear Creek Road onto southbound SR 95 during the peak hour; however, due to the minimal traffic on SR 95, this movement results in minor delays. Traffic volumes on movements to and from W. Bear Creek Road (proposed access to the Site) are very low.

Queue Analysis: No significant queuing is present at this intersection.

7.2.4 Bear Creek Rd at Bear Creek Rd Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection currently operates at a LOS A in the AM and PM peak hours. In the AM peak hour, the major turning movement is the southbound left-turn from Bear Creek Road Ramp onto Bear Creek Road. This movement is stop-controlled; however, low volumes on Bear Creek Road allow this stop-controlled intersection to operate with minimal delay. In the afternoon, most of the vehicles turn right onto Bear Creek Road Ramp from Bear Creek Road. This movement operates under yield control with minimal delay. The west leg (Bear Creek Road) of this intersection carries minimal traffic because it is restricted to personnel entering the U.S. Department of Energy's Oak Ridge Reservation as indicated on a sign.

Queue Analysis: No significant queuing is present at this intersection.

8.0 BACKGROUND CAPACITY ANALYSIS - 2024

A 2024 Background Capacity analysis was performed during the AM and PM peak hours for all of the study intersections. A Background traffic analysis estimates the traffic at a future year without the proposed Site traffic. The Background traffic analysis incorporates any historic background growth rates, any approved development traffic, and any planned roadway improvements, independent of the project Site. The Knoxville Regional Transportation Planning Organization (TPO) provided average daily traffic volumes ranging from year 2014 to 2040 along the major routes within the study area; this information is provided in Appendix D. Based on the historic data, a 2% annual growth rate was applied to the existing traffic volumes for the 2024 analysis. No developments or future roadway improvements are planned within the study area prior to 2024.

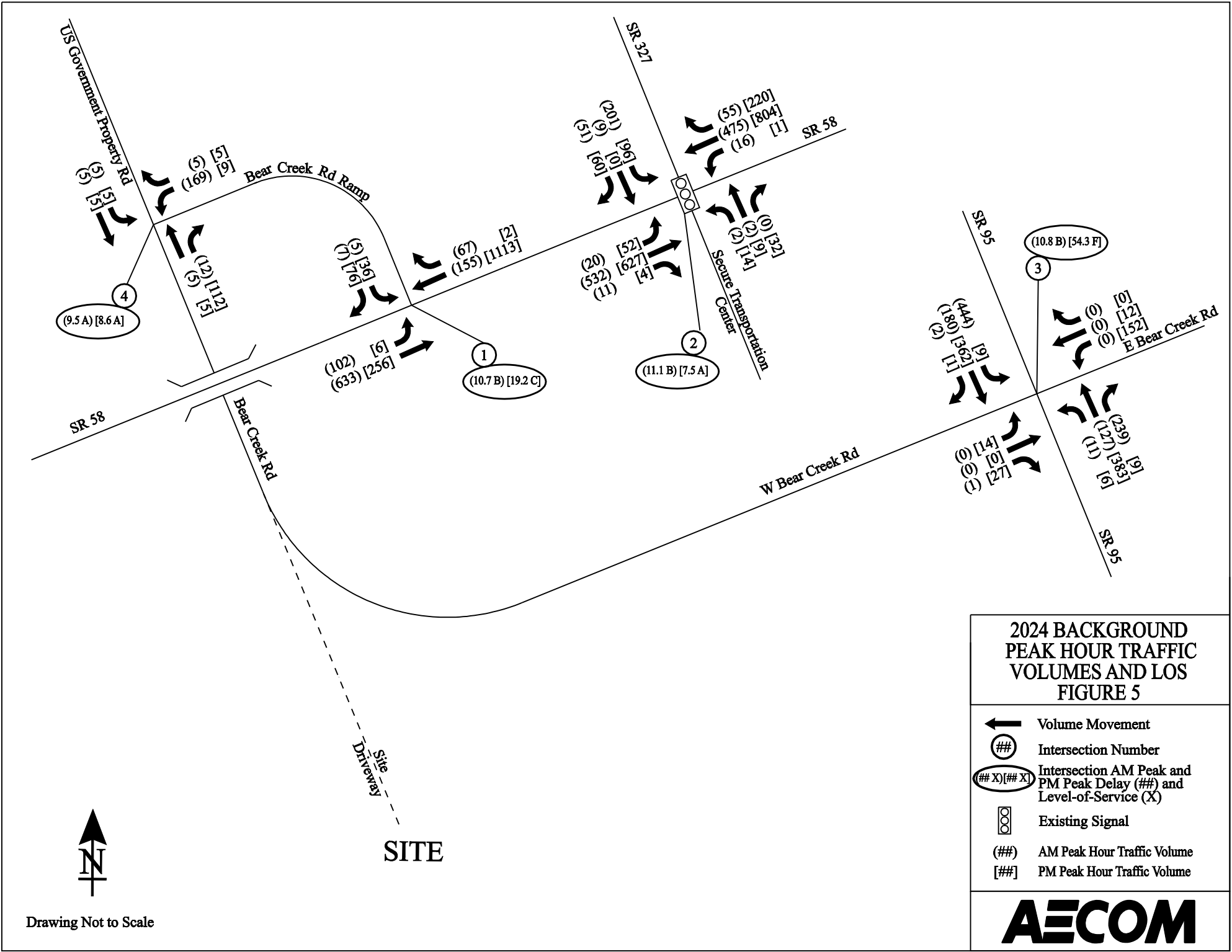
LOS and delays by approach are summarized in Table 9. The 2024 Background peak hour traffic volumes, delays, and LOS for the intersections are shown in Figure 5. Detailed Synchro, SimTraffic, and HCS Reports for the Background (No-Build) conditions are provided in Appendix E.

Table 9 – Background 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
1. SR 58 at Bear Creek Road Ramp (Unsignalized)	B	10.7	C	19.2
Eastbound Approach	B	10.7	C	19.2
Northbound Approach	A	7.8	B	11.7
Southbound Approach	-	-	-	-
2. SR 58 at SR 327 (Signalized)	B	11.1	A	7.5
Eastbound Approach	B	15.1	B	15.4
Westbound Approach	B	12.0	B	13.9
Northbound Approach	A	9.0	A	3.4
Southbound Approach	B	11.3	A	8.6
3. SR 95 at Bear Creek Road (Unsignalized)	B	10.8	F	54.3
Eastbound Approach	B	10.8	B	14.1
Westbound Approach	A	0.0	F	54.3
Northbound Approach	A	7.7	A	8.2
Southbound Approach	B	10.7	A	8.3
4. Bear Creek Road at Bear Creek Road Ramp (Unsignalized)	A	9.5	A	8.6
Eastbound Approach	A	3.6	A	3.6
Westbound Approach	-	-	-	-
Southbound Approach	A	9.5	A	8.6

LOS – Level- of Service

Based on the 2024 Background Capacity analysis, Bear Creek Road as a two-lane section (between Bear Creek Road Ramp and Proposed Site Entrance) is projected to continue to operate at LOS C in AM peak hour and LOS B during the PM peak hour.



Drawing Not to Scale



8.1 INTERSECTION ANALYSIS (UNSIGNALIZED AND SIGNALIZED)

8.1.1 SR 58 at Bear Creek Rd Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to continue operation at a LOS B in the AM peak hour and a LOS C during the PM peak hour for the minor street approach left-turn. The AM peak hour has minimal delay because the majority of vehicles are entering Bear Creek Road Ramp from SR 58. In the PM peak, more vehicles are exiting the Bear Creek Road Ramp onto SR 58; however, most vehicles are turning right with minimal conflict with SR 58 through traffic.

Queue Analysis: No significant queuing is present at this intersection.

8.1.2 SR 58 at SR 327 (Signalized)

Capacity Analysis: This signalized intersection is expected to operate at a LOS B in the AM peak hour and LOS A during the PM peak hour.

Queue Analysis: No significant queuing is present at this intersection.

8.1.3 SR 95 at Bear Creek Rd (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS B in the AM peak hour (eastbound approach) and a LOS F (westbound approach) during the PM peak hour. In the morning peak hour, the major turning movement is the southbound left-turn from SR 95 onto E. Bear Creek Road. During the morning peak hour from 5:00 – 6:00 AM, the through traffic on SR 95 is very low, resulting in minimal delay for the southbound left-turning traffic. In the afternoon, most of the vehicles leaving E. Bear Creek Road use the designated right-out only exit approximately 1000 ft north of this study intersection. With additional traffic along SR 95 and vehicles turning out of E Bear Creek Road, increased delay is shown with the LOS F. Turning movements to and from W. Bear Creek Road (proposed access to the Site) are very low, even with the additional 2% background growth.

Queue Analysis: No significant queuing is present at this intersection.

8.1.4 Bear Creek Rd at Bear Creek Rd Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to continue to operate at a LOS A in the AM and PM peak hours. In the AM peak hour, the major turning movement is the southbound left-turn from Bear Creek Road Ramp onto Bear Creek Road. This movement is stop-controlled; however, low volumes on Bear Creek Road allow this stop-controlled intersection to operate with minimal delay. In the afternoon, most of the vehicles are making right-turn onto Bear Creek Road Ramp from Bear Creek Road. This movement operates under yield control with minimal delay. The west leg (Bear Creek Road) of this intersection carries minimal traffic because it is restricted to personnel entering the U.S. Department of Energy's Oak Ridge Reservation as indicated on a sign.

Queue Analysis: No significant queuing is present at this intersection

9.0 BACKGROUND + SITE SCENARIO 1 CAPACITY ANALYSIS - 2024

9.1 CAPACITY ANALYSIS OVERVIEW

A 2024 Background Capacity + Site Scenario 1 Traffic analyses were performed during the AM and PM peak hours for all of the study intersections. A Background + Site traffic analysis estimates the traffic at a future year with proposed Site traffic on existing roadway conditions. By conducting this analysis, the effect of the Site traffic on the existing roadway network can be measured to identify intersections needing capacity improvements.

LOS and delays by approach are summarized in Table 10. The expected 2024 Site Scenario 1 traffic peak hour volumes are shown in Figure 6. The expected 2024 Background + Site Scenario 1 peak hour traffic volumes, delays, and LOS for the intersections are shown in Figure 7. Detailed Synchro, SimTraffic, and HCS Reports for the Background (No-Build) and Site Scenario 1 conditions are shown in Appendix F.

Table 10 – Background + Site Scenario 1 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
1. SR 58 at Bear Creek Road Ramp (Unsignalized)	F	900+	F	900+
Eastbound Approach	F	900+	F	900+
Northbound Approach	B	14.3	C	17.6
Southbound Approach	-	-	-	-
2. SR 58 at SR 327 (Signalized)	B	13.2	A	9.1
Eastbound Approach	B	19.9	B	15.8
Westbound Approach	B	18.0	B	14.2
Northbound Approach	A	6.6	A	5.0
Southbound Approach	B	14.8	B	11.6
3. SR 95 at Bear Creek Road (Unsignalized)	E	48.8	F	231
Eastbound Approach	E	48.8	C	19.5
Westbound Approach	A	0.0	F	231
Northbound Approach	A	8.4	A	8.4
Southbound Approach	B	10.7	A	8.3
4. Bear Creek Road at Bear Creek Road Ramp (Unsignalized)	F	348	B	11.4
Eastbound Approach	A	3.6	A	3.6
Westbound Approach	-	-	-	-
Southbound Approach	F	348	B	11.4

Table 10 (Con't) – Background + Site Scenario 1 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
5. <i>Bear Creek Road at Site Driveway (Unsignalized)</i>	F	900+	F	711
Eastbound Approach	-	-	-	-
Westbound Approach	E	36.3	A	3.4
Northbound Approach	F	900+	F	711

LOS – Level- of Service

Based on the 2024 Background + Site Scenario 1 HCS analysis, Bear Creek Road as a two-lane section (between Bear Creek Road Ramp and Proposed Site Entrance) is projected to operate at LOS F in AM peak hour and LOS E during the PM peak hour.

9.2 INTERSECTION ANALYSIS (UNSIGNALIZED AND SIGNALIZED)

9.2.1 SR 58 at Bear Creek Rd Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS F in the AM and PM peak hours for the minor street approach left-turn. In the AM peak hour, approximately 900 vehicles on northbound SR 58 are expected to turn left onto Bear Creek Ramp providing very few gaps for vehicles to turn left onto SR 58 from the stop-controlled Bear Creek Ramp. In the PM peak hour, over 450 vehicles are expected to turn left onto SR 58 from the stop-controlled Bear Creek Road Ramp; however, the southbound through traffic on SR 58 is heavy providing very few gaps to make this movement.

Queue Analysis: Excessive queuing is expected on northbound SR 58, as the existing left-turn storage bay cannot accommodate the 900 plus peak hour vehicles in AM peak hour. Excessive queuing is expected for eastbound Bear Creek Road Ramp in the AM and PM peak hours extending onto Bear Creek Road towards the Site.

9.2.2 SR 58 at SR 327 (Signalized)

Capacity Analysis: This signalized intersection is expected to operate at a LOS B in the AM peak hour and LOS A during the PM peak hour.

Queue Analysis: No significant queuing is present at this intersection.

9.2.3 SR 95 at Bear Creek Rd (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS E in the AM peak hour (eastbound approach) and a LOS F (westbound approach) during the PM peak hour. In the AM peak hour, the major turning movement is the southbound left-turn from SR 95 onto E. Bear Creek Road. During the AM peak hour from 5:00 – 6:00 AM, the through traffic on SR 95 is very low, resulting in some delay for the southbound left-turning traffic. In the PM peak, most of the vehicles leaving E. Bear Creek Road use the designated right-out only exit

approximately 1,000 ft north of this study intersection. With additional traffic along SR 95 and Site traffic turning out of W. Bear Creek Road, increased delay is shown with the LOS F for the westbound approach while the eastbound approach (Site traffic exit approach) is operating at LOS C. As indicated in Section 4.1, the peak hour for this intersection without the Site traffic is from 4:30 – 5:30 PM. As indicated in Section 5.0, the 1st shift of the construction workforce for the Site ends at 5:30 PM. It can be assumed that this intersection will actually operate better than indicated in this analysis because of the hour offset in peak traffic.

Queue Analysis: Moderate queuing (125 feet) is expected on the eastbound approach at this intersection during the PM peak hour.

9.2.4 Bear Creek Rd at Bear Creek Rd Ramp (Unsignalized)

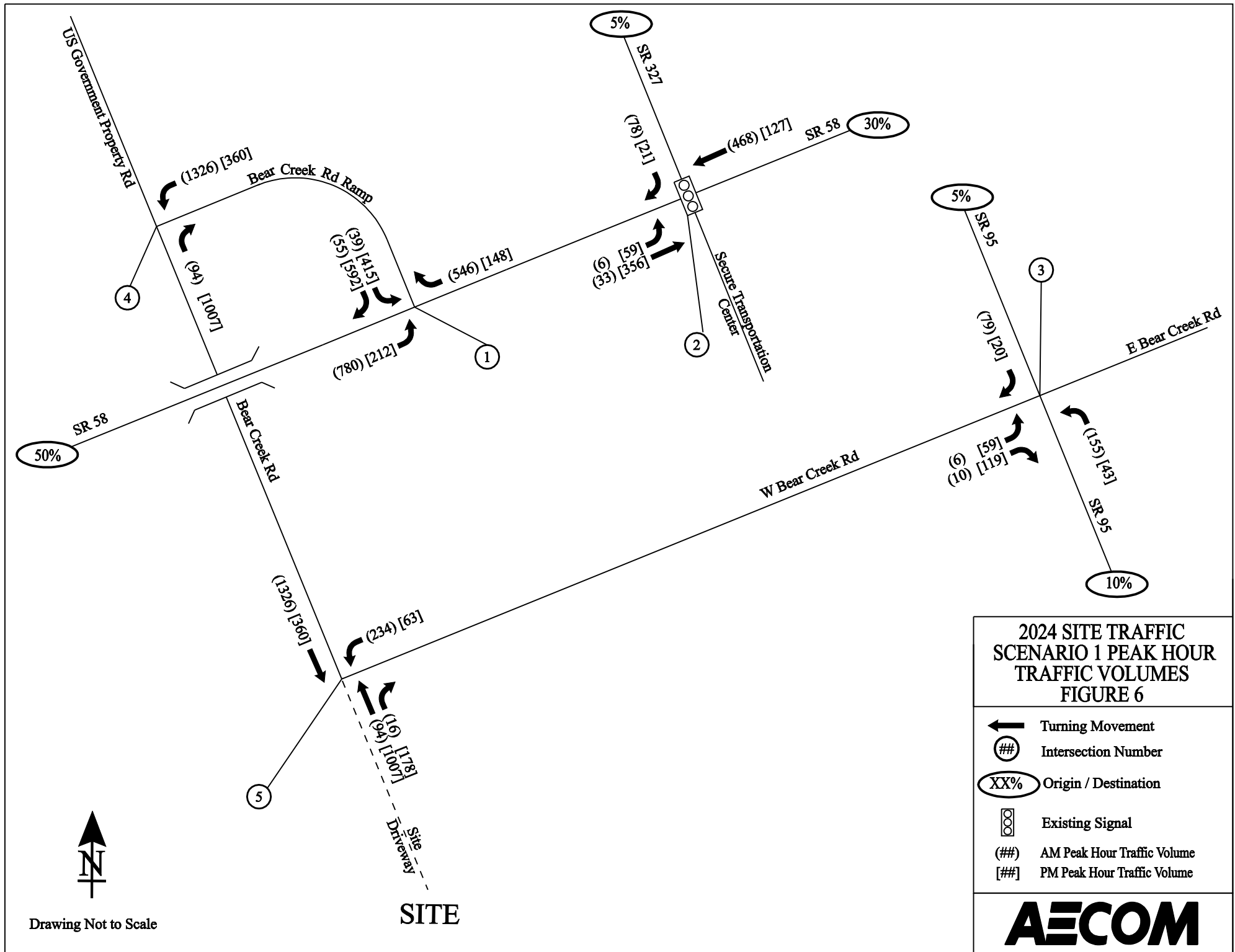
Capacity Analysis: This unsignalized intersection is expected to operate at a LOS F in the AM peak hour and LOS B during the PM peak hour for the stop-controlled approach. In the AM peak hour, the major turning movement is the southbound left-turn (approximately 1,500 vehicles) from Bear Creek Road Ramp onto Bear Creek Road towards the Site. In the PM peak hour most of the vehicles are turning right onto Bear Creek Road Ramp from Bear Creek Road. This movement operates under yield control with minimal delay. The west leg (Bear Creek Road) of this intersection carries minimal traffic because it is restricted to personnel entering the U.S. Department of Energy's Oak Ridge Reservation as indicated on a sign.

Queue Analysis: The Bear Creek Road Ramp at SR 58 stop-controlled intersection queue is expected to extend through this intersection creating gridlock during the AM and PM hours.

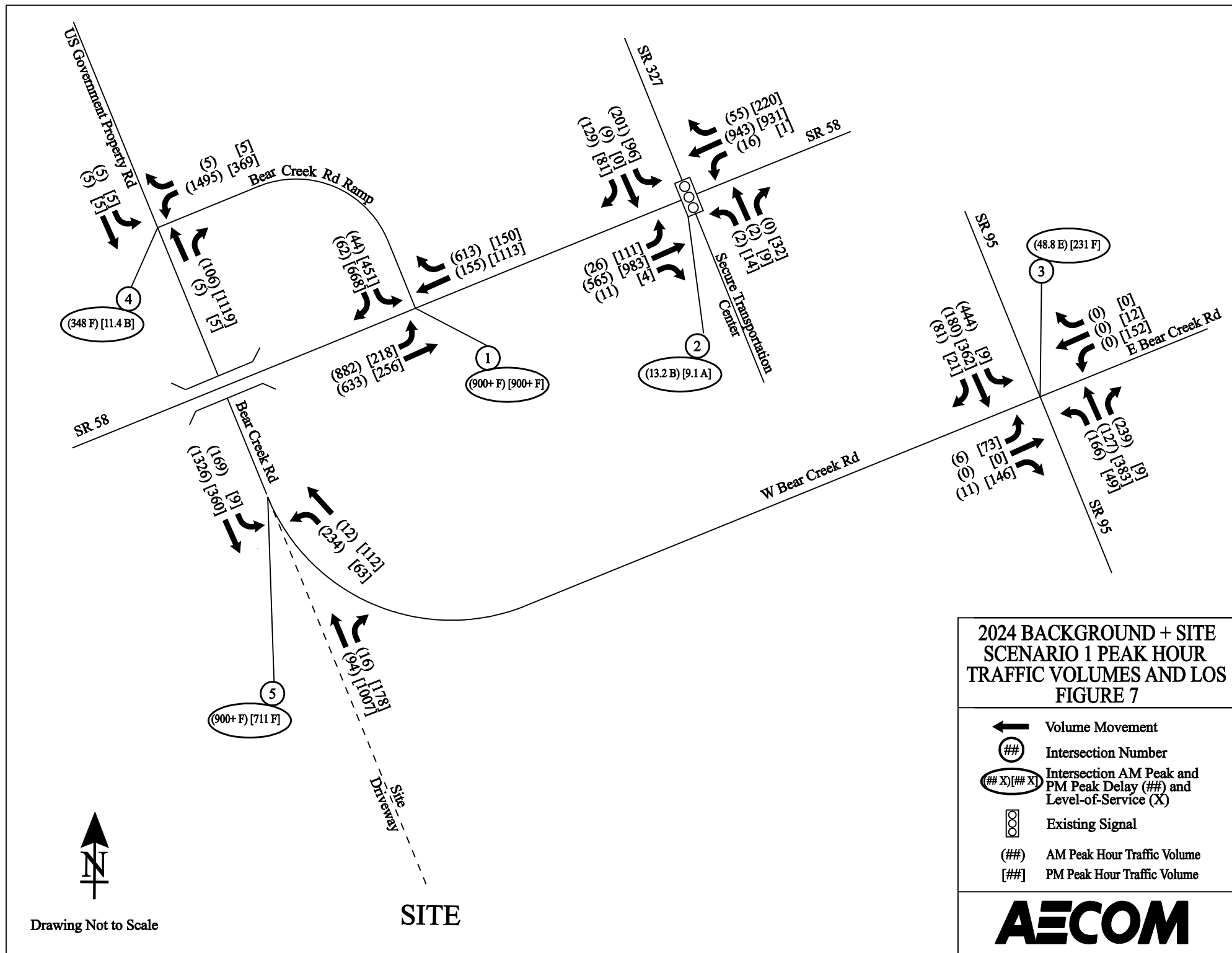
9.2.5 Bear Creek Rd at Site Driveway (Unsignalized)

Capacity Analysis: For purpose of this analysis, Bear Creek Road operates freely and the Site driveway is modeled as stop-controlled. This unsignalized intersection is expected to operate at a LOS F in the AM and PM peak hours. In the AM peak hour, the major turning movement is the westbound left-turn from Bear Creek Road into the Site. Few gaps are provided to make this turn with approximately 1,300 vehicles entering the Site on Bear Creek Road from SR 58. In the PM peak hour, approximately 1,200 vehicles are expected to exit the Site. Under stop control along with the existing two-lane Bear Creek Road, this approach is operates at LOS F with significant delays.

Queue Analysis: Excessive queuing is expected along southbound Bear Creek Road in the AM peak hour. Excessive queuing is also expected for the northbound approach Site Driveway during the PM peak hour extending well into the Site.



Drawing Not to Scale



10.0 BACKGROUND + SITE SCENARIO 2 CAPACITY ANALYSIS - 2024

10.1 CAPACITY ANALYSIS OVERVIEW

A 2024 Background Capacity + Site Scenario 2 Traffic analyses were performed during the AM and PM peak hours for all of the study intersections. A Background + Site traffic analysis estimates the traffic at a future year with proposed Site traffic on existing roadway conditions. By conducting this analysis, the effect of the Site traffic on the existing roadway network can be estimated to identify intersections needing capacity improvements.

LOS and delays by approach are summarized in Table 11. The expected 2024 Site Scenario 2 traffic peak hour volumes are shown in Figure 8. The expected 2024 Background + Site Scenario 2 peak hour traffic volumes, delays, and LOS for the intersections are shown in Figure 9. Detailed Synchro, SimTraffic, and HCS Reports for the Background (No-Build) and Site Scenario 2 conditions are shown in Appendix G.

Table 11 – Background + Site Scenario 2 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
1. SR 58 at Bear Creek Road SB Ramp (Unsignalized)	F	900+	F	900+
Eastbound Approach	F	900+	F	900+
Northbound Approach	D	28.8	D	25.9
Southbound Approach	-	-	-	-
2. SR 58 at SR 327 (Signalized)	B	14.2	A	8.9
Eastbound Approach	C	22.1	B	16.3
Westbound Approach	B	18.8	B	14.9
Northbound Approach	A	6.0	A	5.2
Southbound Approach	B	16.0	B	11.5
3. SR 95 at Bear Creek Road (Unsignalized)	F	57.9	F	435
Eastbound Approach	F	57.9	E	45.8
Westbound Approach	A	0.0	F	435
Northbound Approach	A	8.7	A	8.5
Southbound Approach	B	10.7	A	8.3
4. Bear Creek Road at Bear Creek Road SB Ramp (Unsignalized)	F	563	B	14.9
Eastbound Approach	A	3.6	A	3.6
Westbound Approach	-	-	-	-
Southbound Approach	F	563	B	14.9

Table 11 (Con't) – Background + Site Scenario 2 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
5. <i>Bear Creek Road at Site Driveway (Unsignalized)</i>	F	900+	F	900+
Eastbound Approach	-	-	-	-
Westbound Approach	F	269	A	4.9
Northbound Approach	F	900+	F	900+

LOS – Level- of Service

Based on the 2024 Background + Site Scenario 2 HCS analysis, Bear Creek Road as a two-lane section (between Bear Creek Road Ramp and Proposed Site Entrance) is projected to operate at LOS F in AM peak and the PM peak hours.

10.2 INTERSECTION ANALYSIS (UNSIGNALIZED AND SIGNALIZED)

10.2.1 SR 58 at Bear Creek Rd SB Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS F in the AM and PM peak hours for the minor street approach left-turn. In the AM peak hour, over 1,100 vehicles on northbound SR 58 are expected to turn left onto Bear Creek SB Ramp providing very few gaps for vehicles to turn left onto SR 58 from the stop-controlled Bear Creek SB Ramp. In the PM peak hour, over 650 vehicles are expected to turn left onto SR 58 from the stop-controlled Bear Creek Road SB Ramp; however, the southbound through traffic on SR 58 is heavy providing very few gaps to make this movement.

Queue Analysis: Excessive queuing is expected on northbound SR 58, as the existing left-turn storage bay cannot accommodate the 1,100 plus peak hour vehicles in AM peak hour. Excessive queuing is expected for eastbound Bear Creek Road SB Ramp in the AM and PM peak hours extending onto Bear Creek Road towards the Site.

10.2.2 SR 58 at SR 327 (Signalized)

Capacity Analysis: This signalized intersection is expected to operate at a LOS B in the AM peak hour and LOS A during the PM peak hour.

Queue Analysis: No significant queuing is present at this intersection.

10.2.3 SR 95 at Bear Creek Rd (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS F in the AM the PM peak hours for both of the minor street approaches. In the AM peak hour, the major turning movement is the southbound left-turn from SR 95 onto E. Bear Creek Road. During the AM peak hour from 5:00 – 6:00 AM, the through traffic on SR 95 is very low, creating some delay for the southbound left-turning traffic. In the PM peak, most of the vehicles leaving E. Bear Creek Road use the designated right-out only exit approximately 1,000 ft north of this

study intersection. As indicated in Section 4.1, the peak hour for this intersection without the Site traffic is from 4:30 – 5:30 PM. As indicated in Section 5.0, the 1st shift of the construction workforce for the Site ends at 5:30 PM. It can be assumed that this intersection will actually operate better than indicated in this analysis because of the hour offset in peak traffic.

Queue Analysis: Excessive queuing (300 feet) is expected on the eastbound approach at this intersection during the PM peak hour.

10.2.4 Bear Creek Rd at Bear Creek Rd SB Ramp (Unsignalized)

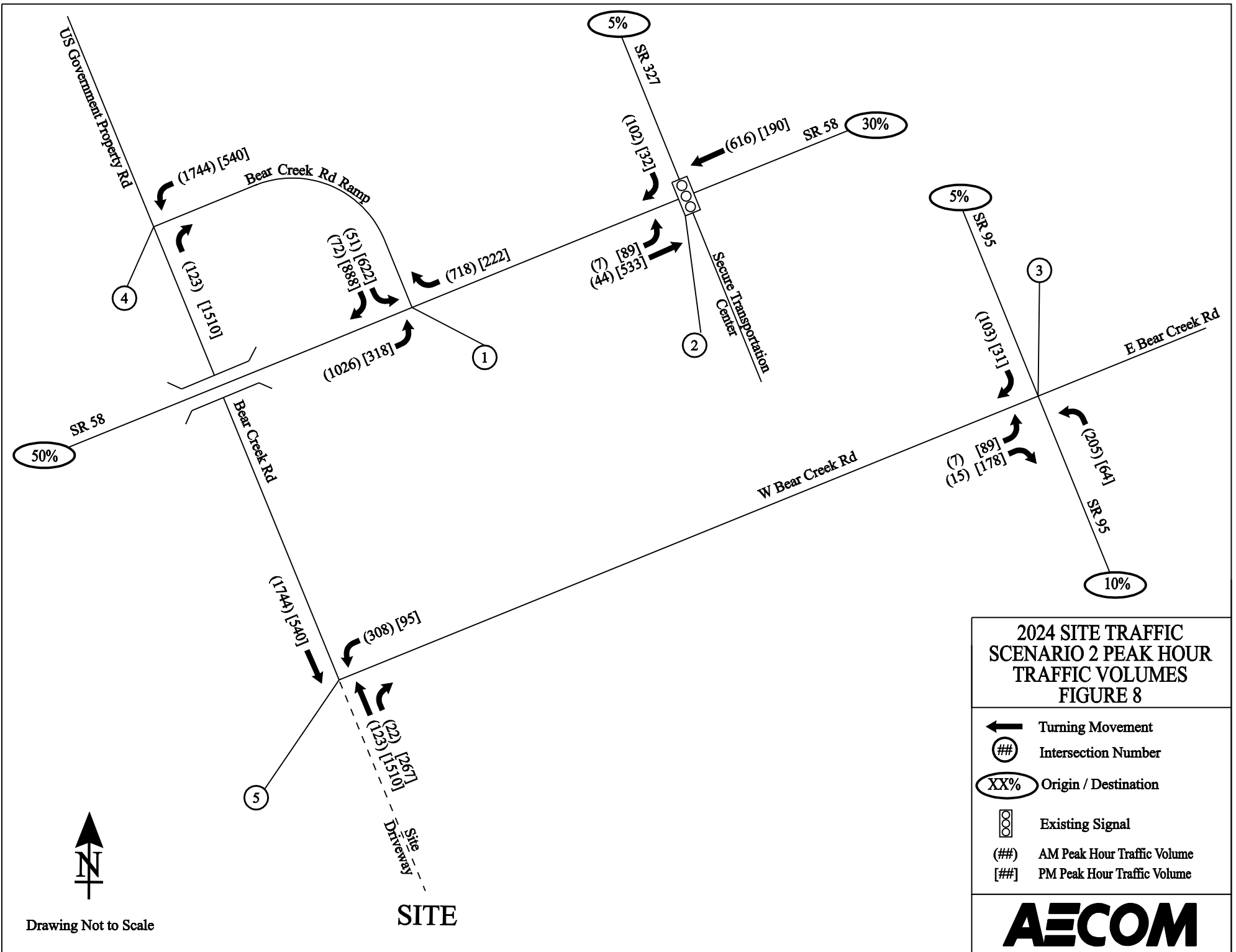
Capacity Analysis: This unsignalized intersection is expected to operate at a LOS F in the AM peak hour and LOS B during the PM peak hour for the stop-controlled approach. In the AM peak hour, the major turning movement is the southbound left-turn (approximately 1,900 vehicles) from Bear Creek Road SB Ramp onto Bear Creek Road towards the Site. In the PM peak hour most of the vehicles are turning right onto Bear Creek Road SB Ramp from Bear Creek Road. This movement operates under yield control with minimal delay. The west leg (Bear Creek Road) of this intersection carries minimal traffic because it is restricted to personnel entering the U.S. Department of Energy's Oak Ridge Reservation as indicated on a sign.

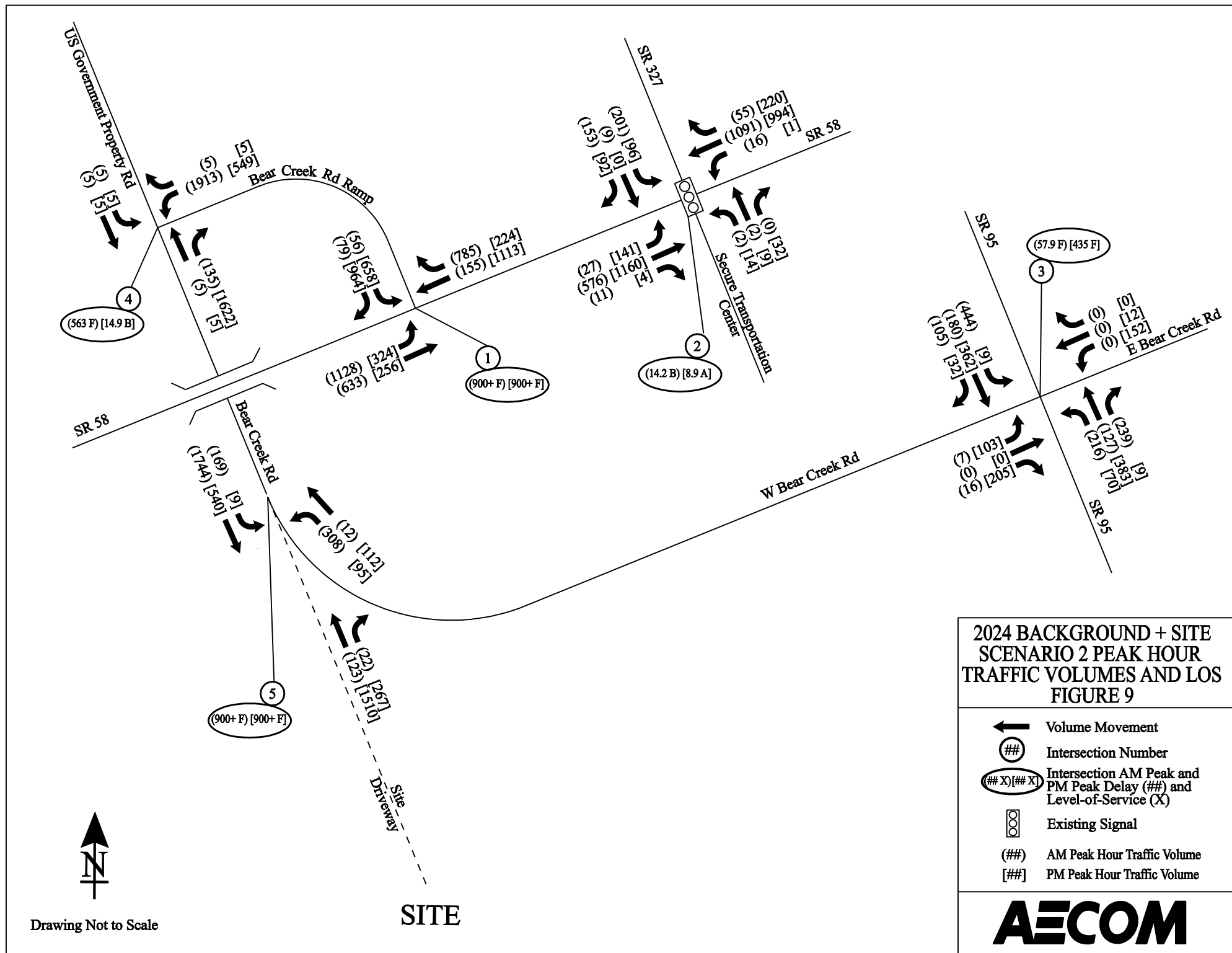
Queue Analysis: The Bear Creek Road SB Ramp at SR 58 stop-controlled intersection queue is expected to extend through this intersection creating gridlock during the AM and PM hours.

10.2.5 Bear Creek Rd at Site Driveway (Unsignalized)

Capacity Analysis: For purpose of this analysis, Bear Creek Road operates freely and the Site driveway is modeled as stop-controlled. This unsignalized intersection is expected to operate at a LOS F in the AM and PM peak hours. In the AM peak hour, the major turning movement is the westbound left-turn from Bear Creek Road into the Site. Few gaps are provided to make this turn with approximately 1,750 vehicles entering the Site on Bear Creek Road from SR 58. In the PM peak hour, approximately 1,800 vehicles are expected to exit the Site. Under stop control along with the existing two-lane Bear Creek Road, this approach is operates at LOS F with significant delays.

Queue Analysis: Excessive queuing is expected along southbound Bear Creek Road in the AM peak hour. Significant queuing is also expected for the northbound approach Site Driveway during the PM peak hour extending well into the Site.





11.0 FUTURE + SITE SCENARIO 1 CAPACITY ANALYSIS – 2024

11.1 CAPACITY ANALYSIS OVERVIEW

A 2024 Future + Site Scenario 1 Traffic Capacity analysis was performed during the AM and PM peak hours for all the study intersections. A Future + Site traffic analysis estimates the traffic at a future year with proposed Site traffic and recommended improvements. The roadway improvements listed below and shown in Figure 10 are recommended to accommodate 2024 traffic volumes during the peak year of construction with operation of the nuclear power generation plant.

SR 58 at Bear Creek Road Ramp

- Restripe northbound left-turn lane on SR 58 to provide 400 feet of storage.
- Construct an additional receiving lane on Bear Creek Road Ramp including channelization for the southbound right-turn movements onto Bear Creek Road Ramp providing free operation.
- Construct an additional eastbound left-turn lane (making dual left-turn lanes) on Bear Creek Road Ramp with 350 feet of storage.
- Extend existing eastbound right-turn lane storage on Bear Creek Road Ramp to the newly realigned US Government Property Road. This right-turn lane merge distance onto SR 58 should also be extended to provide at least 400 feet of acceleration distance.
- Construct a traffic signal.

Bear Creek Road at US Government Property Road

- Realign US Government Property Road with Bear Creek Road as a single lane approach under stop control. Due to the horizontal and vertical curvature, the US Government Property Road should be realigned to allow adequate sight distance for all turning movements.
- Construct an exclusive northbound left-turn lane on Bear Creek Road with 150 feet of storage.
- Construct a southbound through / right-turn lane on Bear Creek Road channelized under yield control extend back to SR 58.

Bear Creek Road (SR 58 to Site)

- Construct a second southbound through lane on Bear Creek Road from SR 58 that turns into a left-turn lane onto W. Bear Creek Road at Site Entrance.
- Bear Creek Road should be designed to accommodate construction equipment transported by rail (100'L x 15'W x 16'H). The SR 58 overpass height is approximately 22 feet and should be noted when considering either rail or barge transportation for construction equipment.

- The proposed barge access is downstream of the SR 58 overpass along Bear Creek Road; therefore, Bear Creek Road (from Barge to Site) should be designed to accommodate large materials (100'L x 55'W x 60'H) for the nuclear power plant construction. Utilities poles, trees, and signs should be moved to accommodate the dimensions of the large equipment.

Bear Creek Road at Site Driveway

- Eliminate existing curve by realigning W. Bear Creek Road with Bear Creek Road / Site Driveway to a "T" intersection under stop control.
- Construct a southbound left-turn lane on Bear Creek Road that extends to SR 58
- Construct a northbound right-turn lane on Site Driveway with 150 feet of storage and channelize under yield control.
- Construct a westbound left-turn lane on W. Bear Creek Road with 150 feet of storage.
- Bollards should be installed on Bear Creek Road extending through the intersection to direct southbound vehicles to the outermost receiving lane into Site.

SR 95 at East Bear Creek Road / West Bear Creek Road

- Extend existing eastbound right-turn flare on W. Bear Creek Road to provide 125 feet of storage.

LOS and delays by approach are summarized in Table 12 for the remaining study intersections. The 2024 Future + Site peak hour traffic volumes, delays, and LOS for the study intersections are shown in Figure 11. Detailed Synchro, SimTraffic, and HCS Reports for the Future (Build) and Site conditions are provided in Appendix H.

Table 12 – Future + Site Scenario 1 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
1. SR 58 at Bear Creek Road Ramp (Signalized)	A	7.9	C	20.9
Eastbound Approach	B	17.7	B	16.1
Northbound Approach	A	7.2	B	16.0
Southbound Approach	A	8.1	C	27.1
2. SR 58 at SR 327 (Signalized)	B	13.2	B	10.2
Eastbound Approach	B	19.9	B	13.5
Westbound Approach	B	18.0	B	12.3
Northbound Approach	A	6.6	A	6.2
Southbound Approach	B	14.8	B	13.5
3. SR 95 at Bear Creek Road (Unsignalized)	E	48.8	F	231
Eastbound Approach	E	48.8	C	19.8
Westbound Approach	A	0.0	F	231
Northbound Approach	A	8.4	A	8.4
Southbound Approach	B	10.7	A	8.3
4. Bear Creek Road at Bear Creek Road Ramp (Unsignalized)	E	43.1	D	32.1
Eastbound Approach	E	43.1	D	32.1
Northbound Approach	C	15.2	A	8.2
Southbound Approach	-	-	-	-
5. Bear Creek Road at Site Driveway (Unsignalized with Bollards)	C	22.2	E	35.8
Westbound Approach	C	22.2	E	35.8
Northbound Approach	-	-	-	-
Southbound Approach	A	7.8	B	11.1

LOS – Level- of Service

Based on the 2024 Future + Site Scenario 1 HCS analysis, Bear Creek Road as a three-lane section (2 southbound lanes, 1 northbound lane), between Bear Creek Road Ramp and W. Bear Creek Ramp, is projected to operate at LOS C in AM peak hour and LOS E during the PM peak hour. The volume to capacity ratio (northbound direction) for the PM peak hour is 0.75; therefore, it is not at capacity. Reversible lanes during the PM peak hour (two northbound lanes, one southbound lane) could be implemented closer to peak construction year if delay and queuing increases.

11.2 INTERSECTION ANALYSIS (UNSIGNALIZED AND SIGNALIZED)

11.2.1 SR 58 at Bear Creek Rd Ramp (Signalized)

Capacity Analysis: This proposed signalized intersection is expected to operate at a LOS A in the AM peak hour and LOS C during the PM peak hour.

Queue Analysis: No significant queuing is expected at the interchange.

11.2.2 SR 58 at SR 327 (Signalized)

Capacity Analysis: This signalized intersection is expected to operate at a LOS B in the AM and the PM peak hours.

Queue Analysis: No significant queuing is expected at this intersection.

11.2.3 SR 95 at Bear Creek Rd (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS E in the AM peak hour (eastbound approach) and a LOS F (westbound approach) during the PM peak hour. In the AM peak hour, the major turning movement is the southbound left-turn from SR 95 onto E. Bear Creek Road. During the AM peak hour from 5:00 – 6:00 AM, the through traffic on SR 95 is very low, resulting in some delay for the southbound left-turning traffic. In the PM peak, most of the vehicles leaving E. Bear Creek Road use the designated right-out only exit approximately 1,000 ft north of this study intersection. As indicated in Section 4.1, the peak hour for this intersection without the Site traffic is from 4:30 – 5:30 PM. As indicated in Section 5.0, the 1st shift of the construction workforce for the Site ends at 5:30 PM. It can be assumed that this intersection may actually operate better than indicated in this analysis because of the hour offset in peak traffic. A traffic signal is not warranted at this intersection despite the LOS E operation in the AM peak hour and LOS F operation during the PM peak hour. The recommended improvement at this intersection includes extending the existing eastbound right-turn flare on W. Bear Creek road to provide 125 feet of storage to accommodate queuing in the PM peak hour. Signal warrant HCS reports are shown in Appendix J.

Queue Analysis: No significant queuing is expected at this intersection.

11.2.4 Bear Creek Rd at US Government Property Rd (Unsignalized)

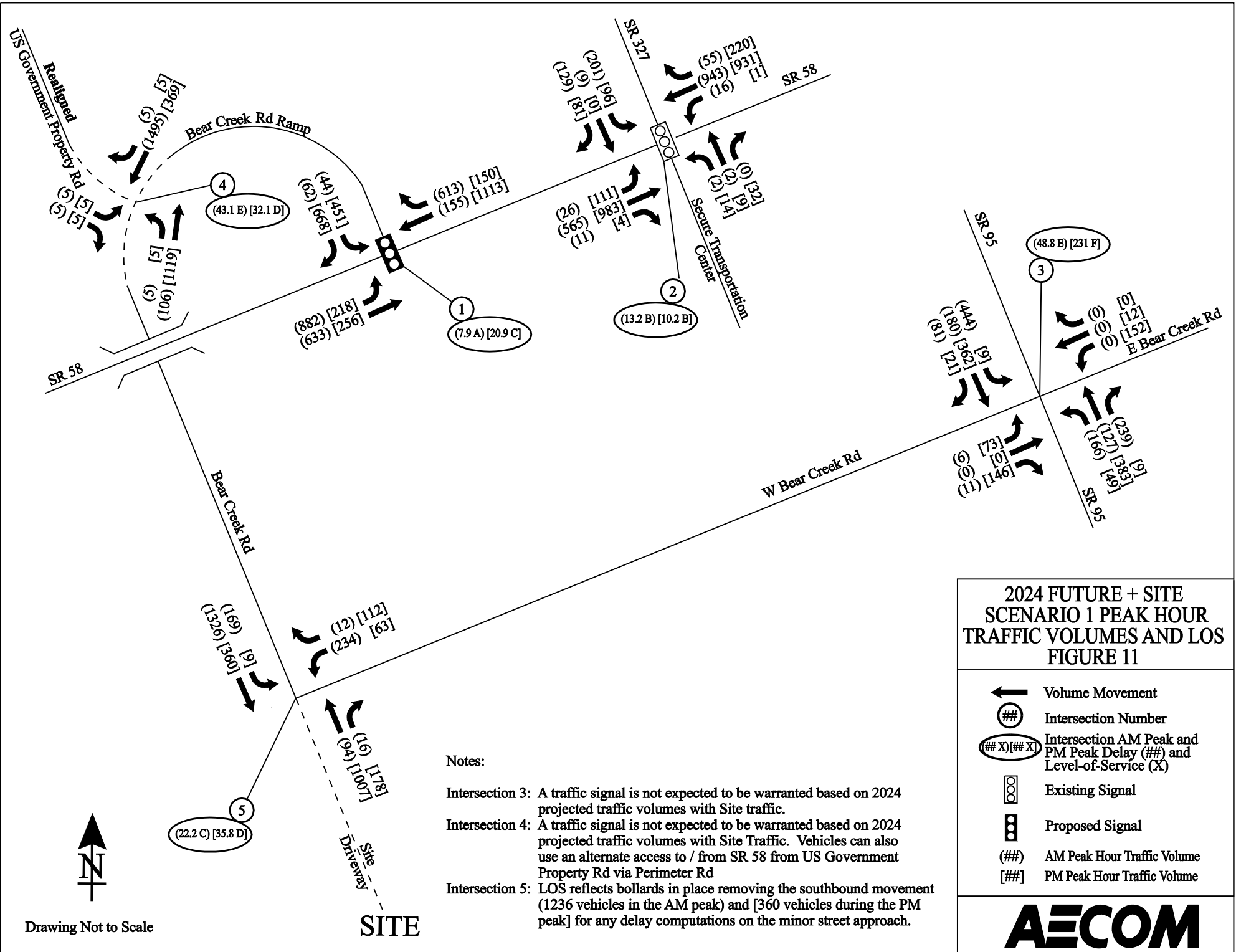
Capacity Analysis: This newly realigned unsignalized intersection is expected to operate at a LOS E in the AM peak hour and LOS D during the PM peak hour. The minor street approach leg (US Government Property Road) carries minimal traffic because it is restricted to personnel entering the U.S. Department of Energy's Oak Ridge Reservation as indicated on a sign. Access to / from SR 58 to this facility is provided along Perimeter Road too. A traffic signal is not warranted at this intersection.

Queue Analysis: No significant queuing is expected at this intersection.

11.2.5 Bear Creek Rd at Site Driveway (Unsignalized)

Capacity Analysis: For the Future + Site scenario, W. Bear Creek Road is realigned to a “T” unsignalized intersection under stop control. This unsignalized intersection should include raised bollards to separate ingress Site traffic from the southbound through movement on Bear Creek Road and westbound left-turn movement from W. Bear Creek Road. This unsignalized configuration is expected to operate at a LOS C in the AM peak hour and a LOS E during the PM peak hour. A peak hour signal warrant is expected to be met; however, a signal may not be needed for the remaining 22 hours of the day. A signal also may not be warranted at the completion of construction of the nuclear power generation plant when personnel on-Site are primarily operations staff. Signal warrant HCS reports are shown in Appendix J.

Queue Analysis: No significant queuing is expected at this intersection.



12.0 FUTURE + SITE SCENARIO 2 CAPACITY ANALYSIS - 2024

12.1 CAPACITY ANALYSIS OVERVIEW

A 2024 Future + Site Scenario 2 Traffic Capacity analysis was performed during the AM and PM peak hours for all the study intersections. A Future + Site traffic analysis estimates the traffic at a future year with proposed Site traffic and recommended improvements. The roadway improvements listed below and shown in Figure 12 are recommended to accommodate 2024 traffic volumes during the peak year of construction with operation of the nuclear power generation plant.

SR 58 (North / South) at Bear Creek Southbound / Proposed NB Ramps

- Construct a new northbound loop ramp that mirrors the existing southbound loop ramp.
- Construct a northbound free flow right-turn deceleration lane on SR 58 with 250 feet of storage connecting the new loop ramp to Bear Creek Road.
- Restripe pavement to remove existing northbound left-turn lane on SR 58 and prohibit all left-turns.
- Construct a westbound right-turn lane from the new NB ramp and provide a 225 ft acceleration lane onto SR 58 northbound.
- Restripe pavement to remove existing eastbound left-turn lane onto SR 58 from Bear Creek SB Ramp to prohibit all left-turns.

Bear Creek Road (North / South) at Bear Creek Proposed NB Ramp

- Construct a dual-lane roundabout with a mountable median.
- Construct a northbound right-turn lane on Bear Creek Road under yield control.
- Construct a southbound shared left- / through turn lane on Bear Creek Road with 250 feet of storage.
- Construct a westbound left-turn lane with 150 feet of storage and a shared left-turn / right-turn lane on the new Bear Creek NB Ramp.
- Widen Bear Creek Road from two to four lanes from the proposed NB Ramp to at least 500 feet south of the intersection.
- The proposed barge access is downstream of this intersection; therefore, large materials (100'L x 55'W x 60'H) for the nuclear power plant construction are not expected to enter the roundabout in transition to the Site.

Bear Creek Road (North / South) Widening

- Construct a third lane on Bear Creek Road starting 500 feet south of the new Bear Creek Road NB Ramp and continue internally into the Site property to minimize queuing on Bear Creek Road. This third lane will be reversible with two lanes southbound in the

AM peak hour (entering the Site) and two lanes northbound (exiting the Site) during the PM peak hour.

- Design the reversible lanes to include gates, signs, and proper pavement markings at the transition points to direct vehicles into the proper lanes during the AM and PM peak hours of the day.

Bear Creek Road (North / South) at Site Driveway

- Eliminate existing curve by realigning W. Bear Creek Road with Bear Creek Road / Site Driveway to a “T” intersection.
- Construct a westbound left-turn lane on W. Bear Creek Road with 500 feet of storage. A temporary traffic signal is warranted for the AM and PM peak hours. The traffic signal should be designed to accommodate large loads delivered by barge (100’L x 55’W x 60’H). An alternative would be to employ a traffic officer to stop traffic on Bear Creek Road to provide gaps for the left-turn movement into the Site.
- During the AM peak hour, the reversible lane shall function as a southbound through / left-turn lane.
- During the PM peak hour, the reversible lane shall function as a northbound through lane.

SR 95 at East Bear Creek Road / West Bear Creek Road

- Extend existing eastbound right-turn flare on W. Bear Creek Road to provide 200 feet of storage.

By removing the left-turn movements to / from SR 58 from the Bear Creek SB Ramp, this stop-controlled intersection becomes a continuous flow interchange; therefore, a merge / diverge analysis was conducted using HCS software. Table 13 summarizes the merges and diverges at this interchange. Detailed HCS Reports for the Future (Build) and Site conditions are provided in Appendix I.

Table 13 – Future + Site Scenario 2 2024 Merge / Diverge Summary of LOS and Density

Merge / Diverge	# of Ramp Lanes	AM Peak		PM Peak	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
Diverge SR 58 Northbound Off-Ramp to Bear Creek Road	1	C	20.5	A	8.1
Merge SR 58 Northbound On-Ramp from Bear Creek Road	1	B	10.4	B	12.3
Diverge SR 58 Southbound Off-Ramp to Bear Creek Road	1	B	12.8	B	16.9
Merge SR 58 Southbound On-Ramp from Bear Creek Road	1	A	6.1	C	23.2

LOS – Level- of Service

pc/mi/ln – passenger cars per hour per lane

By converting the stop-controlled intersection at SR 58 at Bear Creek Road SB Ramp into a continuous flow interchange, acceptable LOS is obtained with excess capacity if needed. As expected, the density is highest (23.2 pc/mi/l) in the PM peak hour for the merge onto SR 58 southbound heading towards I-40 as the 1st shift ends. In the AM peak hour the opposite is shown with second highest density (20.5 pc/mi/l) from vehicles from I-40 diverging from SR 58 northbound (proposed loop ramp) onto Bear Creek Road as the 1st shift begins.

Figure LOS and delays by approach are summarized in Table 14 for the remaining study intersections. The 2024 Future + Site peak hour traffic volumes, delays, and LOS for the study intersections are shown in Figure 13. Detailed Synchro and SimTraffic Reports for the Future (Build) and Site Scenario 2 conditions are provided in Appendix I, along with detailed SIDRA Reports summarizing the roundabout analysis for the Future (Build) and Site Scenario 2 conditions.

Table 14 – Future + Site Scenario 2 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
2. SR 58 at SR 327 (Signalized)	B	14.2	A	8.9
Eastbound Approach	C	22.1	B	16.3
Westbound Approach	B	18.8	B	14.9
Northbound Approach	A	6.0	A	5.2
Southbound Approach	B	16.0	B	11.5
3. SR 95 at Bear Creek Road (Unsignalized)	F	57.9	F	435
Eastbound Approach	F	57.9	D	27.3
Westbound Approach	A	0.0	F	435
Northbound Approach	A	8.7	A	8.5
Southbound Approach	B	10.7	A	8.3
4. Bear Creek Road at Bear Creek Road SB Ramp (Unsignalized)	D	31.9	A	10.0
Eastbound Approach	A	3.6	A	3.6
Westbound Approach	-	-	-	-
Southbound Approach	D	31.9	A	10.0
5A. Bear Creek Road at Site Driveway (Unsignalized)	F	900+	F	900+
Westbound Approach	F	900+	F	900+
Northbound Approach	-	-	-	-
Southbound Approach	A	3.2	A	1.4
5B. Bear Creek Road at Site Driveway (Signalized)	D	42.0	B	10.5
Westbound Approach	F	106	C	26.3
Northbound Approach	A	4.3	B	10.1
Southbound Approach	C	34.1	A	5.9

Table 14 (Con't) Future + Site Scenario 2 2024 Summary of LOS and Delay by Approach

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
6A. Bear Creek Road at Bear Creek Road NB Ramp (Signalized)	B	19.6	B	15.0
Westbound Approach	B	20.0	C	33.2
Northbound Approach	A	7.9	B	12.9
Southbound Approach	C	21.1	A	3.5
6B. Bear Creek Road at Bear Creek Road NB Ramp (Roundabout)	B	15.7	A	7.0
Westbound Approach	B	13.1	C	26.4
Northbound Approach	A	3.0	A	3.0
Southbound Approach	C	21.7	B	7.5

LOS – Level- of Service

Based on the 2024 Future + Site Scenario 2 HCS analysis, Bear Creek Road as a reversible 3-lane section (2 southbound lanes in AM peak and 2 northbound lane in PM peak), between Bear Creek Road Ramp and W. Bear Creek Ramp, is projected to operate at LOS C in AM and PM peak hours.

The Site driveway intersection with Bear Creek Road was analyzed both unsignalized and signalized (5A and 5B shown in Table 14). A peak hour signal warrant is expected to be met for the AM and PM peak hours; however, a signal may not be needed for the remaining 22 hours of the day. A signal also may not be warranted at the completion of construction of the nuclear power generation plant when personnel on-Site are primarily operations staff. Signal warrant HCS reports are shown in Appendix J.

Both a signal and roundabout were analyzed at the intersection of the proposed Bear Creek Road NB Ramp at Bear Creek Road (6A and 6B shown in Table 14), as a signal may not be warranted at the completion of construction of the nuclear power generation plant when personnel on-Site are primarily operations staff. In addition, a signal is only expected to be warranted for 2 hours a day during construction (AM and PM Peaks); a signal may not be needed for the remaining 22 hours of the day. A roundabout seems to be a long-term solution to the capacity constraints at this intersection; a signal seems to be a temporary solution. Other advantages of a roundabout include larger turning radii and minimal height restrictions for large trucks to traverse the intersection. Crashes at roundabouts (sideswipe) versus signals (right angle) are also typically less severe. Signal warrant HCS reports are shown in Appendix J.

12.2 INTERSECTION ANALYSIS (UNSIGNALIZED AND SIGNALIZED)

12.2.1 SR 58 at Bear Creek Rd SB Ramp (Interchange)

Capacity Analysis: This interchange configuration is expected to operate at LOS C in the AM and PM peak hours based on the merge / diverge analysis.

Queue Analysis: No significant queuing is expected at the interchange.

12.2.2 SR 58 at SR 327 (Signalized)

Capacity Analysis: This signalized intersection is expected to operate at a LOS B in the AM peak hour and LOS A during the PM peak hour.

Queue Analysis: No significant queuing is expected at this intersection.

12.2.3 SR 95 at Bear Creek Rd (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS F in the AM and PM peak hours for both minor street approaches. In the AM peak hour, the major turning movement is the southbound left-turn from SR 95 onto E. Bear Creek Road. During the AM peak hour from 5:00 – 6:00 AM, the through traffic on SR 95 is very low, resulting in some delay for the southbound left-turning traffic. In the PM peak, most of the vehicles leaving E. Bear Creek Road use the designated right-out only exit approximately 1,000 ft north of this study intersection. As indicated in Section 4.1, the peak hour for this intersection without the Site traffic is from 4:30 – 5:30 PM. As indicated in Section 5.0, the 1st shift of the construction workforce for the Site ends at 5:30 PM. It can be assumed that this intersection may actually operate better than indicated in this analysis because of the hour offset in peak traffic. A traffic signal is not warranted at this intersection despite the LOS F operation in the PM peak hour. The recommended improvement at this intersection includes extending the existing eastbound right-turn flare on W. Bear Creek road to provide 200 feet of storage to accommodate queuing in the PM peak hour.

Queue Analysis: No significant queuing is expected at this intersection.

12.2.4 Bear Creek Rd at Bear Creek Rd SB Ramp (Unsignalized)

Capacity Analysis: This unsignalized intersection is expected to operate at a LOS D in the AM peak hour and LOS A during the PM peak hour. In the AM peak hour, the major turning movement is the southbound left-turn (approximately 1,100 vehicles) from Bear Creek Road SB Ramp onto Bear Creek Road towards the Site, which is expected to operate well due to minor traffic on Bear Creek Road. In the PM peak hour most of the vehicles are making a westbound right-turn onto Bear Creek Road SB Ramp from Bear Creek Road. This movement operates under yield control with minimal delay. The west leg (Bear Creek Road) of this intersection carries minimal traffic because it is restricted to personnel entering the U.S. Department of Energy's Oak Ridge Reservation as indicated on a sign.

Queue Analysis: No significant queuing is expected at this intersection.

12.2.5 Bear Creek Rd at Site Driveway (Signalized)

Capacity Analysis: For the Future + Site Scenario 2, a temporary traffic signal is recommended. This signalized intersection is expected to operate at a LOS D in the AM peak hour and a LOS B during the PM peak hour. Without a traffic signal, few gaps are provided to complete the westbound left-turn into the Site with approximately 1,750 vehicles entering the Site on Bear Creek Road from SR 58 in the AM peak hour. During the PM peak hour, approximately 1,800 vehicles per hour are expected to leave the Site in this hour. The traffic signal would need to be

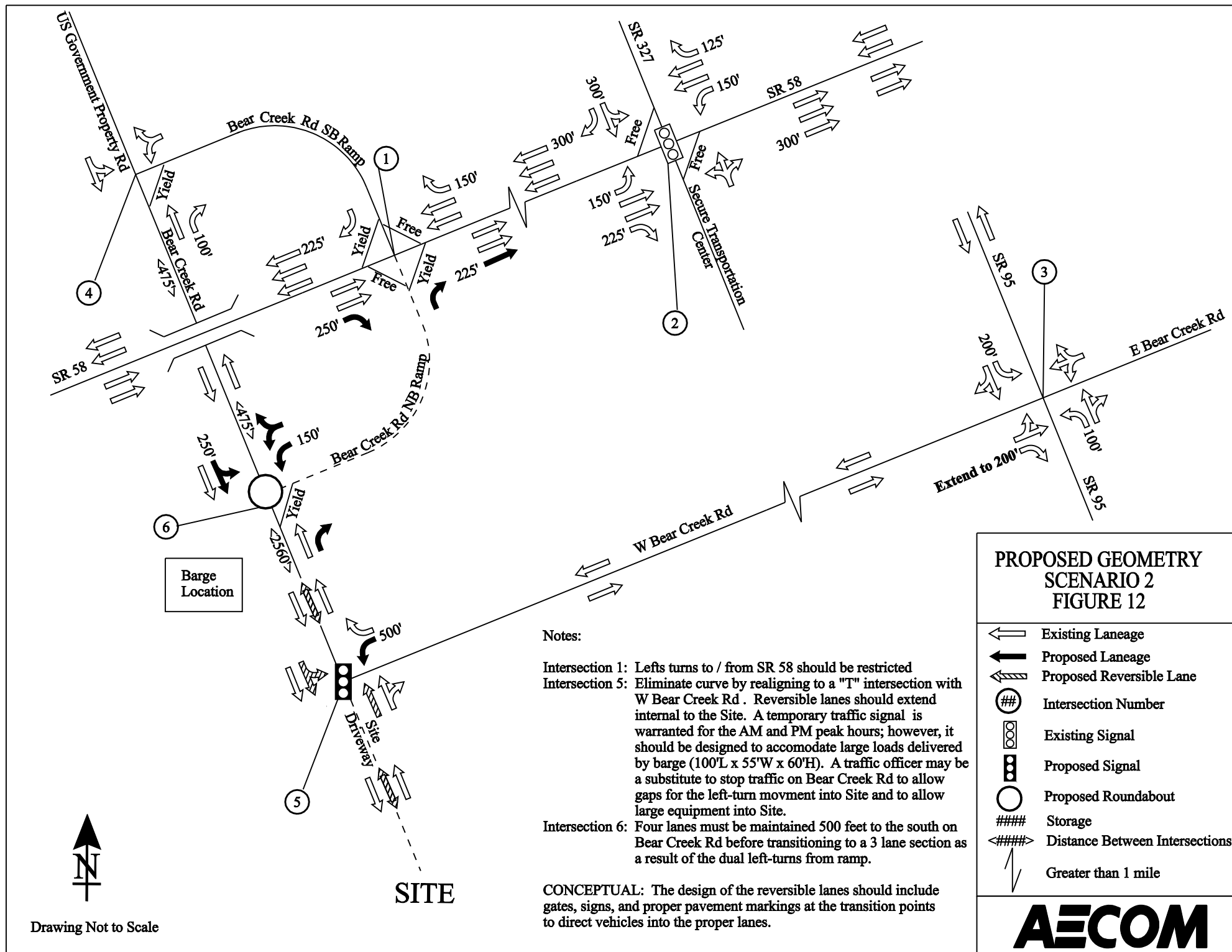
designed to accommodate large loads delivered by barge (100'L x 55'W x 60'H). If a traffic signal cannot be accommodated, a traffic officer may be needed to temporally stop traffic on Bear Creek Road providing gaps for this left-turn movement into Site during the AM and PM peak hours of the day.

Queue Analysis: Moderate queuing is expected along W. Bear Creek Road in the AM and PM peak hours if the intersection is signalized. Excessive queuing is expected entering the Site on Bear Creek Road; however, this queuing is not expected to extend to the Bear Creek Ramps if the reversible lanes are constructed internally within the Site.

12.2.6 Bear Creek Rd at Bear Creek NB Ramp (Roundabout)

Capacity Analysis: This intersection is expected to operate at a LOS B during the AM and PM peak hours as signalized intersection. As a roundabout, this intersection is expected to operate at LOS B in the AM peak hour and LOS A during the PM peak hour.

Queue Analysis: No significant queuing is expected at this intersection.



13.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this traffic analysis, the following roadway improvements, summarized in Figure 10, are expected to provide an acceptable operation for the peak year 2024 under Scenario 1. Roadway improvements for Scenario 2, which has the largest number of on-Site construction and operation workers at the nuclear power generation Site, are summarized in Figure 12. LOS and delay for each study intersection are shown in Table 15 for all analysis periods.

Table 15 – Summary of Overall LOS and Delay by Intersection

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
1. SR 58 at Bear Creek Road Ramp				
2013 Existing (Unsignalized)	B	10.1	C	15.2
2024 Background (Unsignalized)	B	10.7	C	19.2
2024 Background + Site Scenario 1 (Unsignalized)	F	900+	F	900+
2024 Background + Site Scenario 2 (Unsignalized)	F	900+	F	900+
2024 Future + Site Scenario 1 (Signalized)	A	7.9	C	20.9
2024 Future + Site Scenario 2 (Interchange)*	C	20.5	C	23.2
2. SR 58 at SR 327				
2013 Existing (Signalized)	A	9.5	A	6.9
2024 Background (Signalized)	B	11.1	A	7.5
2024 Background + Site Scenario 1 (Signalized)	B	13.2	A	9.1
2024 Background + Site Scenario 2 (Signalized)	B	14.2	A	8.9
2024 Future + Site Scenario 1 (Signalized)	B	13.2	B	10.2
2024 Future + Site Scenario 2 (Signalized)	B	14.2	A	8.9
3. SR 95 at Bear Creek Road				
2013 Existing (Unsignalized)	B	10.5	C	24.9
2024 Background (Unsignalized)	B	10.8	F	54.3
2024 Background + Site Scenario 1 (Unsignalized)	E	48.8	F	231
2024 Background + Site Scenario 2 (Unsignalized)	F	57.9	F	435
2024 Future + Site Scenario 1 (Unsignalized)	E	48.8	F	231
2024 Future + Site Scenario 2 (Unsignalized)	F	57.9	F	435
4. Bear Creek Road at US Government Property Road				
2013 Existing (Unsignalized)	A	9.3	A	8.6
2024 Background (Unsignalized)	A	9.5	A	8.6
2024 Background + Site Scenario 1 (Unsignalized)	F	348	B	11.4
2024 Background + Site Scenario 2 (Unsignalized)	F	563	B	14.9
2024 Future + Site Scenario 1 (Unsignalized)	E	43.1	D	32.1
2024 Future + Site Scenario 2 (Unsignalized)	D	31.9	A	10.0
5. Bear Creek Road at Site Driveway				
2024 Background + Site Scenario 1 (Unsignalized)	F	900+	F	711
2024 Background + Site Scenario 2 (Unsignalized)	F	900+	F	900+
2024 Future + Site Scenario 1 (Unsignalized + Bollards)	C	22.2	E	35.8
2024 Future + Site Scenario 2 (Signalized)	D	42.0	B	10.5

* AM Peak (NB Diverge), PM Peak (SB Merge), LOS – Level- of Service

Table 15 (Con't) – Summary of Overall LOS and Delay by Intersection

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec.)	LOS	Delay (sec.)
6. Bear Creek Road at Bear Creek Road NB Ramp (Proposed)				
2024 Future + Site Scenario 2 (Signalized)	B	19.6	B	15.0
2024 Future + Site Scenario 2 (Roundabout)	B	15.7	A	7.0

LOS – Level- of Service

A two-lane and multi-lane segment analysis was conducted for Bear Creek Road (between Bear Creek Road Ramp and Proposed Site Entrance) as shown in Table 16 for all analysis periods.

Table 16 – Bear Creek Road Segment Analysis Summary of LOS

Analysis Period	AM Peak		PM Peak	
	LOS	PTSF	LOS	PTSF
Existing 2013 (2-Lane)	C	59.7%	B	46.9%
Background 2024 (2-Lane)	C	63.8%	B	49.7%
Background + Site Scenario 1 2024 (2-Lane)	F	102.6%	E	91.5%
Background + Site Scenario 2 2024 (2-Lane)	F	102.9%	F	109.3%
Future + Site Scenario 1 2024 (2-Lane SB, 1-lane NB)	C*	19.4	E	(91.5%)
Future + Site Scenario 1 2024 (1-Lane SB, 2-lane NB)	F	(102.6%)	B*	14.5
Future + Site Scenario 2 2024 (Reversible Lanes) – 2 lanes SB in AM Peak, 2 lanes NB during PM Peak	C	24.8	C	21.0

*Indicates LOS as a 3 lane section for Scenario 1 if Reversible lanes are implemented

13.1 SCENARIO 1

Based on the Scenario 1 traffic analysis, the following roadway improvements summarized in Figure 10 are expected to provide an acceptable operation for the peak year 2024, including on-Site construction (2,200) and operations (500) workers at the nuclear power generation Site. The intersection of SR 58 at Bear Creek Road Ramp (Intersection 1) is projected to operate at LOS F with significant delays if no improvements are made. It is projected that 85% of the Site traffic will enter / exit this intersection. A signal warrant analysis was conducted and the peak hour warrant was met improving operation to LOS A in the AM peak hour and LOS C during the PM peak hour. It is to be noted that the existing SR 58 overpass is approximately 22 feet high; therefore, vehicles with equipment exceeding this height should access the Site via SR 95 or barge.

The intersection of SR 95 at Bear Creek Road (Intersection 3) is projected to operate at a LOS E in the AM peak hour and LOS F during the PM peak hour. A signal warrant analysis was conducted at this intersection, but was not warranted based on 2024 Future + Site Scenario 1 traffic volumes. An increase in the storage length for the eastbound right-turn lane on W. Bear Creek Road is recommended to accommodate traffic leaving the Site in the PM peak hour. This intersection should be monitored periodically during the peak construction year to determine if a signal is warranted.

The newly realigned US Government Property Road at Bear Creek Road and (Intersection 4) is projected to operate at LOS E in the AM peak hour and LOS D during the PM peak hour. A signal warrant analysis was conducted at this intersection, but was not warranted based on 2024 Future + Site traffic volumes. If delay increases for the US Government Property Road approach, it is assumed vehicle travel patterns will shift and access SR 58 using Perimeter Road.

The newly realigned W. Bear Creek Road at Bear Creek Road / Site Entrance is expected to operate at LOS F under stop control for W. Bear Creek Road approach. A signal warrant analysis was conducted and the peak hour warrant was met. Rather than recommending a signal to improve minor street delay, an alternative is recommended using bollards to separate the southbound vehicles on Bear Creek Road (use outermost receiving lane) and westbound left-turn from W. Bear Creek Road (use innermost receiving lane) entering the Site. Large loads (100'L x 55'W x 60'H) delivered by barge will traverse this intersection; therefore, if a signal were to be recommended, the poles and span wire would restrict large loads from entering the Site.

Two lanes in the southbound direction from SR 58 to the Site Driveway are recommended along Bear Creek Road because one lane does not provide enough capacity in the AM peak hour. It is critical to have these two lanes approaching the Site entrance from SR 58 to avoid any queuing onto this major roadway. Only one lane in the northbound direction is recommended from the Site Driveway to Bear Creek Road Ramp despite operating at LOS E during the PM peak hour. There may be some queuing on Bear Creek Road; however, this queuing would remain on Bear Creek Road. The proposed signal timing at SR 58 at Bear Creek Ramp should be monitored during the construction period to ensure adequate green time is provided to clear queues. It is also recommended that traffic is monitored along Bear Creek Road during the peak year of construction and if capacity is reached, the center lane may be converted to reversible (two NB lanes and 1 SB lane) during the PM peak hour with appropriate signage and pavement markings.

13.2 SCENARIO 2

Based on the Scenario 2 traffic analysis, the following roadway improvements summarized in Figure 12 are expected to provide an acceptable operation for the peak year 2024, which has the largest number of on-Site construction (3,300) and operations (366) workers at the nuclear power generation Site. As indicated in Table 15, the proposed additional northbound loop ramp between SR 58 and Bear Creek Road (Intersection 1) provides the added capacity for the 2024 peak traffic year surrounding construction and operation. Rather than all traffic entering / exiting the Site from one ramp, the traffic can be distributed between two ramps. With this new distribution, Bear Creek Road at Bear Creek Road SB Ramp (Intersection 4) is expected to operate with an acceptable LOS. Because the Bear Creek Road is grade separated (underpass) from SR 58, the height of the bridge could prohibit larger vehicles with equipment and/or materials from using this intersection; however, this new loop ramp bypasses this bridge and large vehicles can enter Site via SR 58. Another advantage of the ramp is that in the event of emergency, the ramp provides free flow movements to / from SR 58 for evacuation purposes.

The existing two-lane Bear Creek Road west of the proposed NB ramp is expected operate at an acceptable LOS; therefore, no widening is needed on Bear Creek Road underneath the overpass.

The addition of the new Bear Creek Road NB Ramps is expected to provide added capacity to / from SR 58; however, the connection onto Bear Creek Road needs to be improved too (Intersection 6). Both a traffic signal and roundabout, similar in operation, were analyzed. Due to the large volume of traffic shifting to the proposed NB Ramp in AM peak hour, dual left-turn lanes are needed (with a roundabout or a signal) requiring at least two receiving lanes onto Bear Creek Road. Two permanent receiving lanes approximately 500 feet to south of should be constructed to provide adequate merging distance during the PM peak hour when only one lane entering the Site is opened with the reversible lanes.

A roundabout instead of a signal (Intersection 6) is recommended for the following reasons:

- A roundabout provides a better LOS and delay and would be more efficient since a signal is only expected for two hours a day.
- Crashes are less severe at roundabouts (sideswipe) than at signalized intersections (right angle).
- A roundabout requires less maintenance.
- A roundabout may provide larger turning radii for trucks entering / exiting the Site.
- Spanwire or mast arms from a signal may be an obstacle if large vehicles (100'L x 55'W x 16'H) delivered by rail enter this intersection.

During 2024 peak year of construction, the existing two-lane Bear Creek Road is projected to be over capacity during the AM (entering) and PM (exiting) peaks. An additional lane (reversible) is recommended to accommodate the AM and PM peaks. It is recommended the reversible lanes start 500 feet south of the new NB ramp along Bear Creek Road and extend internally into the Site property. If the reversible lane ends at the Site Driveway, excessive queuing onto Bear Creek Road may extend back to SR 58.

The Bear Creek Road at Site Driveway (Intersection 5) should be realigned to a "T" intersection eliminating the existing curve. Significant delay for the left-turns into the Site is expected on W. Bear Creek Road under stop control due to the heavy free flow traffic on Bear Creek Road. A three-way stop was considered; however, significant queuing is expected on Bear Creek Road, potentially spilling back onto SR 58 with this option. A temporary traffic signal is recommended; however, a traffic signal should not have span wire, as this would be an obstacle for the large material (100'L x 55'W x 60'H) being delivered by barge. If this recommendation cannot be accommodated, a traffic officer may be needed to temporarily stop traffic on Bear Creek Road to allow vehicles to turn left into the Site from W. Bear Creek Road. It is encouraged that construction and operation workers enter the Site from SR 58 for traffic and safety reasons. SR 95, with the high speeds in conjunction with the horizontal (corners / bends) and vertical (hills / valleys) curvature, creates sight distance challenges along this route as highlighted the crash analysis section.

13.3 SCENARIO 1 AND SCENARIO 2 COMPARISON

This traffic analysis provides roadway improvements based on two different workforce projections. Scenario 1 (2,200 construction workers and 500 operation workers) improvements are expected to be the more affordable of the two options and may be the most feasible option considering the intensity of traffic is only expected to last a few years. The major costs associated with Scenario 2 include the following:

- A new loop ramp at SR 58
- Reversible lanes along Bear Creek Road
- A potential signal at the Site Entrance

Scenario 2 (3,300 construction workers and 366 operation workers) improvements are expected to be the more expensive of the two options; however, Scenario 2 improvements provide the following advantages:

- Provides an alternative path around the SR 58 overpass measuring 22 feet in height
- Continuous flow operation with interchange and roundabout
- Improved safety with less conflict points at the intersections (interchange and roundabout)
- Less obstructions (horizontal and vertical clearances) associated with a traffic signal
- A roadway infrastructure that should accommodate future development traffic

The difference in the number of workers between Scenario 1 and Scenario 2 is approximately 1,000. A failure analysis was conducted for Scenario 1 to determine the maximum number of workers that can be accommodated by Scenario 1 improvements. It was determined that the maximum threshold is an increase in the number of Scenario 1 workers of approximately 10%. If the projected workforce is greater than 3,000, Scenario 2 improvements are recommended to provide acceptable operation during the peak 2024 year of construction.

14.0 REFERENCES

513, Tennessee Department of Transportation, Oak Ridge 2012 Traffic Map, Roane County Tennessee, 2012.

514, Tennessee Department of Transportation, "Crash Data for Roane, TN," July 27, 2013.

515, Transportation Research Board National Research Council, "Highway Capacity Manual 2000," 2000.

959, U.S. Department of Transportation, Federal Highway Administration, 2009 Edition Chapter 4C. Traffic Control Signal Needs Studies, Website:
<http://mutcd.fhwa.dot.gov/htm/2009/part4/part4c.htm>, 2009.

APPENDIX A –Crash Data

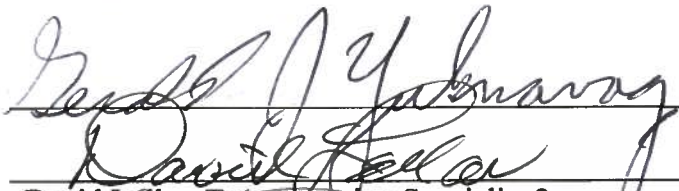
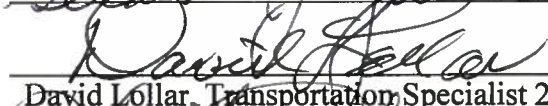
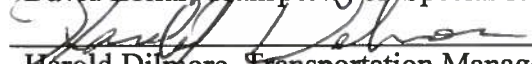
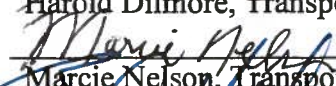

**TENNESSEE DEPARTMENT OF TRANSPORTATION
PROJECT PLANNING DIVISION
PROJECT SAFETY OFFICE
CRASH DATA REQUEST**

Requested by:	Name:	Brian Hurst for Matt Meservy, P.E. AECOM			Date:	6/27/2013
	Division:	Senior Transportation Planner				
	Address:	220 Athens Way, Suite 200, Nashville, Tn. 37228			Telephone No.:	615-244-8864
Project No.:						
Location:	Region:	1	County:	ROANE	City:	
Route:	4 Routes, SR58, SR95, E398 Bear Creek Rd., SR327 Blair Rd.					
Location on Route:	SR58 from 17.60 to 20.18 – SR95 from LM 0.000 to Bethel Valley Rd. 3.000					
E398 Bear Creek Rd from LM 0.000 to 4.166 – SR327 Blair Road from LM 0.000 to 2.197						
Investigated Log Mile:		Ending Log Mile:				
Project Log Mile		Ending Log Mile				

MAP SHOWING LOCATION MUST BE ATTACHED

TYPE OF CRASH DATA REQUESTED

	CHECK		TIME PERIOD OR YEARS REQUESTED			
	Yes	No	(3 Years or Specify)			
Crash Listing:	<input checked="" type="checkbox"/>	<input type="checkbox"/>		2008 to 2010	Check	11 /12
Collision Diagram:	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
Crash Rates:	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
High Hazard Rank:	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
Update Previous Request:	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
Special Request:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Describe Specifics: <u>See attached e-mail for additional information.</u>			

Request Analyzed By:		Date:	7-4-13
Reviewed By:		Date:	7-5-13
	David Lollar, Transportation Specialist 2		
		Date:	7/10/13
	Harold Dilmore, Transportation Manager 1		
		Date:	7/10/13
	Marcie Nelson, Transportation Manager 1		
		Date:	7/11/13
	Brian Hurst, Transportation Manager 2		

☐ Qualifies

Comments:

David Lollar

From: Marcie Nelson
Sent: Thursday, June 27, 2013 12:45 PM
To: David Lollar
Subject: FW: Crash Data Request

Crash Request.

Marcie Nelson
Project Planning Division
Transportation Manager
(615) 741-0970
(615) 532-0353 (Fax)
Marcie.Nelson@tn.gov



From: Brian Hurst
Sent: Thursday, June 27, 2013 11:54 AM
To: Meservy, Matt
Cc: Amanda Snowden; Eckenrode, Ryan; Marcie Nelson
Subject: Re: Crash Data Request

Not a problem, we will start gathering the requested information.

Thank you,
Brian Hurst
Tennessee DOT
Project Safety Office
Sent from my iPhone

On Jun 27, 2013, at 11:30 AM, "Meservy, Matt" <Matt.Meservy@aecom.com> wrote:

Brian-

AECOM has been hired by TVA to help produce a traffic impact assessment as part of the EIS document for a proposed site in Roane County.

We have already conducted an informal kick-off meeting with Amanda Snowden to discuss the size of the impacted area and some of the data needs.

At Amanda's direction, we would like to request crash history for the following roadway segments:

- SR-58 from LM 17.60 to 20.18
- SR-95 from LM 0.00 to Bethel Valley Road (approx. LM 3.00)
- Bear Creek Road from LM 0.00 to 4.166
- Blair Road from LM 0.00 to 2.197

If you need any more information, please advise.

Thanks.

Matt Meservy, P.E.
Senior Transportation Planner
D 615.313.0358 | C 615.495.3198
matt.meservy@aecom.com

AECOM

220 Athens Way, Suite 200, Nashville, TN 37228-1352

T 615.244.8864 F 615.244.8760

www.aecom.com



+ 100%

Local Intranet

Done



Done

ROUTE FEATURE DESCRIPTION LISTING

ROANE County - SR058

COUNTY: ROANE

COUNTY NO. 73

ROUTE: SR058

SPECIAL CASE: None

CTY SEQ: 1

LOG MILE	ITEM CODE	ROUTE FEATURE	DESC CODE
17.558	1	ENTER OAK RIDGE CITY LIMITS	130
17.558	0	BEGIN OAK RIDGE TURNPIKE	923
17.560	2	BRIDGE [73SR0580003]: CLINCH RIVER	241
17.590	1	ENTER OAK RIDGE URBAN BOUNDARY	140
17.690	9	END BRIDGE [73SR0580003]: CLINCH RIVER	983
17.850	2	OVERHEAD [73SR0580005]: E398 BEAR CREEK RD.	261
17.980	7	RAMP FROM E398 BEARCREEK RD. LT.	735
17.991	5	E398 BEAR CREEK RD. LT.	530
18.020	7	RAMP TO E398 BEARCREEK RD. LT.	732
18.220	9	WELCKER CEMETERY LT. 1600 FT.	913
18.230	9	SLAVE CEMETERY RT. 300 FT. / GALLAHER CEMETERY LT. 1500 FT.	913
18.300	9	BEGIN 45 MPH	932
18.462	5	E675 BURCHFIELD RD. LT.	530
18.750	9	CULVERT: BRANCH	980
18.810	9	FACTORY OAK RIDGE GASEOUS DIFFUSION PLANT LT.	964
19.260	9	BEGIN 55 MPH	932
19.680	2	UNDERPASS: U.S.D.O.E. RD.	205
19.820	9	TRAFFIC SIGNAL	905
19.820	3	SR-327 BLAIR RD. LT.	330
20.400	7	RAMP FROM SR-95 WHIPP RD. LT.	715
20.509	9	TRAFFIC COUNT STATION 60	959
20.610	9	CRAWFORD CEMETERY RT. 50 FT.	913

ROUTE FEATURE DESCRIPTION LISTING

ROANE County - SR095

COUNTY: ROANE

COUNTY NO. 73

ROUTE: SR095

SPECIAL CASE: None

CTY SEQ: 1

LOG MILE	ITEM CODE	ROUTE FEATURE	DESC CODE
0.000	1	LOUDON-ROANE COUNTY LINE	120
0.000	9	CENTER OF CLINCH RIVER BRIDGE	972
0.000	0	BEGIN WHIPP RD.	920
0.000	9	BEGIN 55 MPH	932
0.050	9	END OF BRIDGE	983
0.138	5	A030 MELTON HILL DAM RD. RT.	520
0.600	9	FLASHING YELLOW LIGHTS	907
0.810	9	FLASHING YELLOW LIGHTS	907
0.940	2	BRIDGE [73SR0950007]: WHITE OAK CREEK	251
2.490	5	E527 BETHEL VALLEY RD. RT.	520
3.450	9	BURNS CEMETERY RT.	913
4.005	5	E390 BEAR CREEK RD. LT.	530
4.190	2	BRIDGE [73SR0950001]: BEAR CREEK	221

ROUTE FEATURE DESCRIPTION LISTING

ROANE County - 0E398

COUNTY: ROANE

COUNTY NO. 73

ROUTE: 0E398

SPECIAL CASE: None

CTY SEQ: 1

LOG MILE	ITEM CODE	ROUTE FEATURE	DESC CODE
0.000	3	SR-58 OAK RIDGE TURNPIKE RT. & LT.	310
0.000	0	BEGIN BEAR CREEK RD.	920
0.000	9	1-WAY STOP	901
0.023	7	RAMP FROM SR-58 OAK RIDGE TURNPIKE RT. & RAMP TO SR-58 OAK RIDGE TURNPIKE LT.	711
0.133	9	1-WAY STOP	901
0.180	7	RAMP TO E398 BEAR CREEK RD. LT.	732
0.239	2	UNDERPASS [73SR0580005]: SR-58 OAK RIDGE TURNPIKE	242
1.628	9	GALLAHER CEMETERY RT. / 700 FT.	913
1.727	9	CEMETERY RT. / 620 FT.	913
1.875	9	NEW ZION CEMETERY RT. / 3100 FT.	913
3.849	9	TRAFFIC COUNT STATION 178	959
4.166	9	1-WAY STOP	901
4.166	3	SR-95 WHIPP RD. RT. & LT.	310
4.166	1	ROANE-ANDERSON COUNTY LINE	125

ROUTE FEATURE DESCRIPTION LISTING

ROANE County - SR327

COUNTY: ROANE

COUNTY NO. 73

ROUTE: SR327

SPECIAL CASE: None

CTY SEQ: 1

LOG MILE	ITEM CODE	ROUTE FEATURE	DESC CODE
0.000	3	SR-58 OAK RIDGE TURNPIKE RT. & LT.	310
0.000	0	BEGIN BLAIR RD.	920
0.000	9	BEGIN 35 MPH	932
0.000	9	TRAFFIC SIGNAL	905
0.300	9	GEORGE JONES MEMORIAL CEMETERY RT. 600 FT.	913
0.436	9	TRAFFIC COUNT STATION 174	959
0.810	9	MARTIN MARIETTA LT.	999
1.270	9	ELLIS CEMETERY LT.	913
1.330	6	GRADE CROSSING [731074K]: TOHX	610
1.390	2	BRIDGE [73E00230005]: EAST FORK POPLAR CREEK	251
1.980	6	GRADE CROSSING [731073D]: TOHX	610
2.197	1	LEAVE OAK RIDGE URBAN BOUNDARY	145
2.256	1	LEAVE OAK RIDGE CITY LIMITS	135
2.340	9	BEGIN 55 MPH	932
3.030	4	2374 POPLAR CREEK RD. RT. & LT.	510

County	Route	Log Mile	Date of Crash	Time of Crash	Location	Type of Crash	Total Killed	Total Incap	Total Other	Total Inj	Total Veh	Most Harmful Event	Manner of First Collision	Driver Actions	Relation to First Roadway	Weather Cond	Vehicle Going	Light Conditions	Case Number
ROANE	SR058	17.991	02/05/2008	1711	At an Intersection	Non-Incap Injury	0	0	1	1	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Clear	W	Daylight	50212455
ROANE	SR058	17.991	10/07/2008	1635	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	REAR-END	No Contributing Actions	On Roadway	Clear	S	Daylight	50249733
ROANE	SR058	17.991	09/30/2009	601	At an Intersection	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	E	Dark-Not Lighted	50277278
ROANE	SR058	17.991	04/23/2012	732	At an Intersection	Prop Damage (over)	0	0	0	0	1	Highway Traffic Sign Post	VO COLLISION W/ VEHICLE	Lane Departure	Shoulder	Clear	W	Daylight	900138395
ROANE	SR058	18.091	03/18/2012	1935	Along Roadway	Prop Damage (under)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	W	Daylight	900138157
ROANE	SR058	18.405	08/10/2010	1027	Along Roadway	Non-Incap Injury	0	0	1	1	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	E	Daylight	900115301
ROANE	SR058	18.424	09/13/2011	732	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Fog	N	Daylight	900135705
ROANE	SR058	18.462	03/28/2012	216	At an Intersection	Prop Damage (over)	0	0	0	0	1	Guardrail Face	VO COLLISION W/ VEHICLE	Other (Narrative)	Shoulder	Clear	W	Dark-Not Lighted	900138233
ROANE	SR058	18.810	12/17/2008	1314	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Rain	W	Daylight	50254433
ROANE	SR058	18.820	01/28/2009	1823	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	W	Dark-Not Lighted	50254498
ROANE	SR058	18.820	05/10/2012	832	Along Roadway	Prop Damage (over)	0	0	0	0	2	Parked Motor Vehicle	SIDESWIPE, SAME DIR	Improper Passing	On Roadway	Clear	N	Daylight	900138521
ROANE	SR058	18.962	05/21/2012	2050	Along Roadway	Non-Incap Injury	0	0	1	1	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	W	Dark-Not Lighted	900138593
ROANE	SR058	19.000	02/13/2010	430	Along Roadway	Prop Damage (under)	0			0	1	Ditch	VO COLLISION W/ VEHICLE		Outside Trafficway	Clear	E	Dark-Not Lighted	900082503
ROANE	SR058	19.100	09/11/2008	758	Along Roadway	Non-Incap Injury	0	0	1	1	1	Standing Tree	VO COLLISION W/ VEHICLE	No Contributing Actions	Off Roadway -- Location Unknown	Clear	N	Daylight	50235055
ROANE	SR058	19.220	05/03/2010	1613	Along Roadway	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	SIDESWIPE, SAME DIR	Lane Departure	On Roadway	Clear	W	Daylight	900097017
ROANE	SR058	19.400	11/14/2008	2000	Along Roadway	Prop Damage (over)	0	0	0	0	1	Standing Tree	VO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Right	Rain	E	Dark-Not Lighted	50249929
ROANE	SR058	19.420	12/07/2008	720	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	W	Daylight	50254442
ROANE	SR058	19.570	07/06/2008	1121	Along Roadway	Non-Incap Injury	0	0	1	1	1	Standing Tree	VO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Right	Clear	S	Daylight	50224044
ROANE	SR058	19.780	01/28/2008	545	Along Roadway	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	REAR-END	Following Improperly	On Roadway	Clear	E	Dark-Lighted	50212320
ROANE	SR058	19.820	09/08/2008	1756	At an Intersection	Prop Damage (under)	0	0	0	0	2	Vehicle in Transport	SIDESWIPE, SAME DIR	No Contributing Actions	On Roadway	Clear	E	Daylight	50234982
ROANE	SR058	19.820	12/28/2008	904	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	REAR-END	No Contributing Actions	On Roadway	Rain	E	Daylight	50254409
ROANE	SR058	19.820	10/05/2009	510	At an Intersection	Non-Incap Injury	0	0	1	1	2	Vehicle in Transport	ANGLE	Failure to Yield Right of Way	On Roadway	Rain	N	Dark-Lighted	50277182
ROANE	SR058	19.820	10/06/2011	529	At an Intersection	Incap Injury	0	1	0	1	2	Vehicle in Transport	ANGLE	Unknown Action	On Roadway	Clear	S	Dark-Not Lighted	900136257
ROANE	SR058	19.820	03/21/2012	411	At an Intersection	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	E	Dark-Lighted	900138189
ROANE	SR058	19.820	05/02/2012	932	At an Intersection	Non-Incap Injury	0	0	1	1	2	Vehicle in Transport	REAR-END	No Contributing Actions	On Roadway	Clear	N	Daylight	900138477
ROANE	SR058	19.858	08/06/2009	1040	Along Roadway	Incap Injury	0	1	0	1	1	Guardrail End	VO COLLISION W/ VEHICLE	Unknown Action	Roadside -- Left	Clear	E	Daylight	50275684
ROANE	SR058	19.880	02/21/2012	1900	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	W	Dark-Not Lighted	900138021
ROANE	SR058	19.990	11/21/2011	1820	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	VO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Rain	E	Dark-Not Lighted	900136929

County	Route	Log Mile	Date of Crash	Time of Crash	Location	Type of Crash	Total Killed	Total Incap	Total Other	Total Inj	Total Veh	Most Harmful Event	Manner of First Collision	Driver Actions	Relation to First Roadway	Weather Cond	Vehicle Going	Light Conditions	Case Number
ROANE	0E398	0.300	11/12/2010	735	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	NO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	E	Daylight	900124613
ROANE	0E398	2.166	11/08/2010	650	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	NO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	E	Daylight	900124284

County	Route	Log Mile	Date of Crash	Time of Crash	Location	Type of Crash	Total Killed	Total Incap	Total Other	Total Inj	Total Veh	Most Harmful Event	Manner of First Collision	Driver Actions	Relation to First Roadway	Weather Cond	Vehicle Going	Light Conditions	Case Number
ROANE	SR095	0.000	08/16/2008	1616	At an Intersection	Prop Damage (over)	0	0	0	0	1	Ditch	NO COLLISION W/ VEHICLE	Speed too Fast for Conditions	Roadside -- Left	Clear	S	Daylight	50235071
ROANE	SR095	0.020	04/24/2009	2040	Along Roadway	Incap Injury	0	1	0	1	1	Other Non-Collision	NO COLLISION W/ VEHICLE	Speed too Fast for Conditions	Shoulder	Clear	S	Dark-Not Lighted	50265690
ROANE	SR095	0.080	05/28/2009	859	Along Roadway	Prop Damage (over)	0	0	0	0	1	Ditch	NO COLLISION W/ VEHICLE	Inattentive (Eating, Reading, Talking, etc.)	Roadside -- Right	Clear	E	Daylight	50265590
ROANE	SR095	0.500	10/19/2008	1500	At an Intersection	Non-Incap Injury	0	0	1	1	1	Standing Tree	NO COLLISION W/ VEHICLE	Other (Narrative)	Roadside -- Right	Clear	N	Daylight	50249947
ROANE	SR095	1.181	06/22/2010	1548	Along Roadway	Incap Injury	0	1	0	1	2	Vehicle in Transport	ANGLE	Lane Departure	On Roadway	Clear	N	Daylight	900107196
ROANE	SR095	1.301	06/05/2012	238	Along Roadway	Prop Damage (over)	0	0	0	0	1	Earth Embankment	NO COLLISION W/ VEHICLE	No Contributing Actions	Roadside -- Right	Rain	S	Dark-Not Lighted	900138678
ROANE	SR095	1.490	04/21/2008	610	Along Roadway	Non-Incap Injury	0	0	1	1	1	Overtum	NO COLLISION W/ VEHICLE	Lane Departure	On Roadway	Clear	N	Dawn	50224293
ROANE	SR095	1.490	07/20/2009	727	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	NO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	N	Daylight	50275724
ROANE	SR095	1.500	02/20/2009	854	Along Roadway	Prop Damage (over)	0	0	0	0	1	Earth Embankment	NO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Right	Clear	S	Daylight	50265829
ROANE	SR095	1.990	12/16/2009	625	Along Roadway	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	SIDESWIPE, OPP DIR	Lane Departure	On Roadway	Cloudy	S	Dark-Not Lighted	900069694
ROANE	SR095	2.290	10/24/2010	1650	Along Roadway	Fatal	1	1	0	1	1	Other Non-Collision	NO COLLISION W/ VEHICLE	Unknown Action	Roadside -- Right	Clear	N	Daylight	900123087
ROANE	SR095	2.300	06/18/2008	722	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	REAR-END	No Contributing Actions	On Roadway	Clear	N	Daylight	50224086
ROANE	SR095	2.300	11/13/2012	1929	Along Roadway	Fatal	1	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Right	Clear	N	Dark-Not Lighted	900139709
ROANE	SR095	2.301	11/21/2011	1810	Along Roadway	Prop Damage (over)	0	0	0	0	1	Ditch	NO COLLISION W/ VEHICLE	Speed too Fast for Conditions	Roadside -- Right	Rain	S	Dark-Not Lighted	900136962
ROANE	SR095	2.331	06/11/2012	448	Along Roadway	Prop Damage (over)	0	0	0	0	1	Ditch	NO COLLISION W/ VEHICLE	Other (Narrative)	Roadside -- Right	Clear	N	Dark-Not Lighted	900138722
ROANE	SR095	2.390	09/21/2009	2328	Along Roadway	Prop Damage (over)	0	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	Unknown Action	Roadside -- Right	Rain	N	Dark-Not Lighted	50277243
ROANE	SR095	2.390	11/30/2009	600	Along Roadway	Prop Damage (over)	0	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	No Contributing Actions	Outside Trafficway	Rain	N	Dark-Not Lighted	50279789
ROANE	SR095	2.460	04/14/2009	910	Along Roadway	Prop Damage (over)	0	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	Lane Departure	Off Roadway -- Location Unknown	Rain	N	Daylight	50265651
ROANE	SR095	2.490	06/24/2008	1247	At an Intersection	Prop Damage (over)	0			0	1	Highway Traffic Sign Post	NO COLLISION W/ VEHICLE	Unknown Action	Median Barrier	Clear	9	Daylight	50224152
ROANE	SR095	2.490	08/31/2009	702	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Clear	N	Daylight	50275658
ROANE	SR095	2.490	01/25/2010	1740	At an Intersection	Incap Injury	0	1	3	4	2	Vehicle in Transport in other Roadway	ANGLE	Failure to Yield Right of Way	On Roadway	Rain	W	Dusk	900077898
ROANE	SR095	2.490	04/20/2010	1630	At an Intersection	Prop Damage (under)	0	0	0	0	2	Vehicle in Transport	REAR-END	No Contributing Actions	On Roadway	Rain	W	Daylight	900094092
ROANE	SR095	2.501	03/25/2010	700	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	ANGLE	Failure to Yield Right of Way	On Roadway	Cloudy	S	Dawn	900088925
ROANE	SR095	2.501	05/20/2010	1558	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	REAR-END	No Contributing Actions	On Roadway	Clear	W	Daylight	900101626
ROANE	SR095	2.501	11/17/2010	653	At an Intersection	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	ANGLE	Failure to Yield Right of Way	On Roadway	Clear	W	Dawn	900125049
ROANE	SR095	2.550	02/03/2010	1958	Along Roadway	Incap Injury	0	1	0	1	1	Overtum	NO COLLISION W/ VEHICLE	Other (Narrative)	Shoulder	Clear	S	Dark-Not Lighted	900079748
ROANE	SR095	2.590	01/16/2008	1529	Along Roadway	Prop Damage (over)	0	0	0	0	1	Highway Traffic Sign Post	NO COLLISION W/ VEHICLE	Speed too Fast for Conditions	Roadside -- Right	Clear	S	Daylight	50212463
ROANE	SR095	2.590	10/12/2009	702	Along Roadway	Prop Damage (over)	0	0	0	0	1	Deer (Animal)	NO COLLISION W/ VEHICLE	No Contributing Actions	On Roadway	Clear	S	Daylight	50277156
ROANE	SR095	2.990	12/08/2008	1305	Along Roadway	Fatal	1	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Right	Clear	S	Daylight	50254378
ROANE	SR095	3.000	01/14/2010	612	Along Roadway	Non-Incap Injury	0	0	1	1	1	Other Post, Pole, Supports	NO COLLISION W/ VEHICLE	No Contributing Actions	Shoulder	Clear	N	Dark-Not Lighted	900075288
ROANE	SR095	3.000	04/20/2010	1643	Along Roadway	Prop Damage (over)	0	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	Speed too Fast for Conditions	Roadside -- Right	Rain	S	Daylight	900094323

County	Route	Log Mile	Date of Crash	Time of Crash	Location	Type of Crash	Total Killed	Total Incap	Total Other	Total Inj	Total Veh	Most Harmful Event	Manner of First Collsion	Driver Actions	Relation to First Roadway	Weather Cond	Vehicle Going	Light Condtions	Case Number
ROANE	SR327	0.000	10/25/2010	1549	Along Roadway	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Rain	W	Daylight	10156433
ROANE	SR327	0.250	08/27/2008	552	Along Roadway	Incap Injury	0	1	1	2	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Rain	W	Dark-Lighted	50234969
ROANE	SR327	0.250	02/09/2009	653	Along Roadway	Prop Damage (over)	0	0	0	0	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Clear	N	Dark-Lighted	50265813
ROANE	SR327	0.250	04/22/2010	730	Along Roadway	Non-Incap Injury	0	0	1	1	1	Utility Pole	NO COLLISION W/ VEHICLE	Driving Left of Center	Roadside -- Right	Fog	N	Daylight	900094324
ROANE	SR327	1.390	01/22/2008	655	Bridge	Non-Incap Injury	0	0	2	2	2	Vehicle in Transport	ANGLE	No Contributing Actions	On Roadway	Sleet/Hail	S	Dark-Not Lighted	50212317
ROANE	SR327	1.530	03/12/2010	9999	Along Roadway	Prop Damage (over)	0	0	0	0	1	Highway Traffic Sign Post	UNKNOWN	Over Correcting	Roadside -- Right	Fog	E	Dawn	10156064
ROANE	SR327	1.790	08/09/2009	1924	Along Roadway	Prop Damage (over)	0	0	0	0	1	Earth Embankment	NO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Right	Clear	S	Daylight	900045241
ROANE	SR327	2.000	06/18/2008	2135	Along Roadway	Non-Incap Injury	0	0	1	1	1	Other Fixed Object	NO COLLISION W/ VEHICLE	Other (Narrative)	Roadside -- Right	Clear	N	Dark-Not Lighted	900001030
ROANE	SR327	2.000	03/10/2009	1815	Along Roadway	Prop Damage (over)	0	0	0	0	1	Standing Tree	NO COLLISION W/ VEHICLE	Lane Departure	Roadside -- Left	Clear	W	Daylight	900023886

APPENDIX B – Peak Hour Traffic Counts

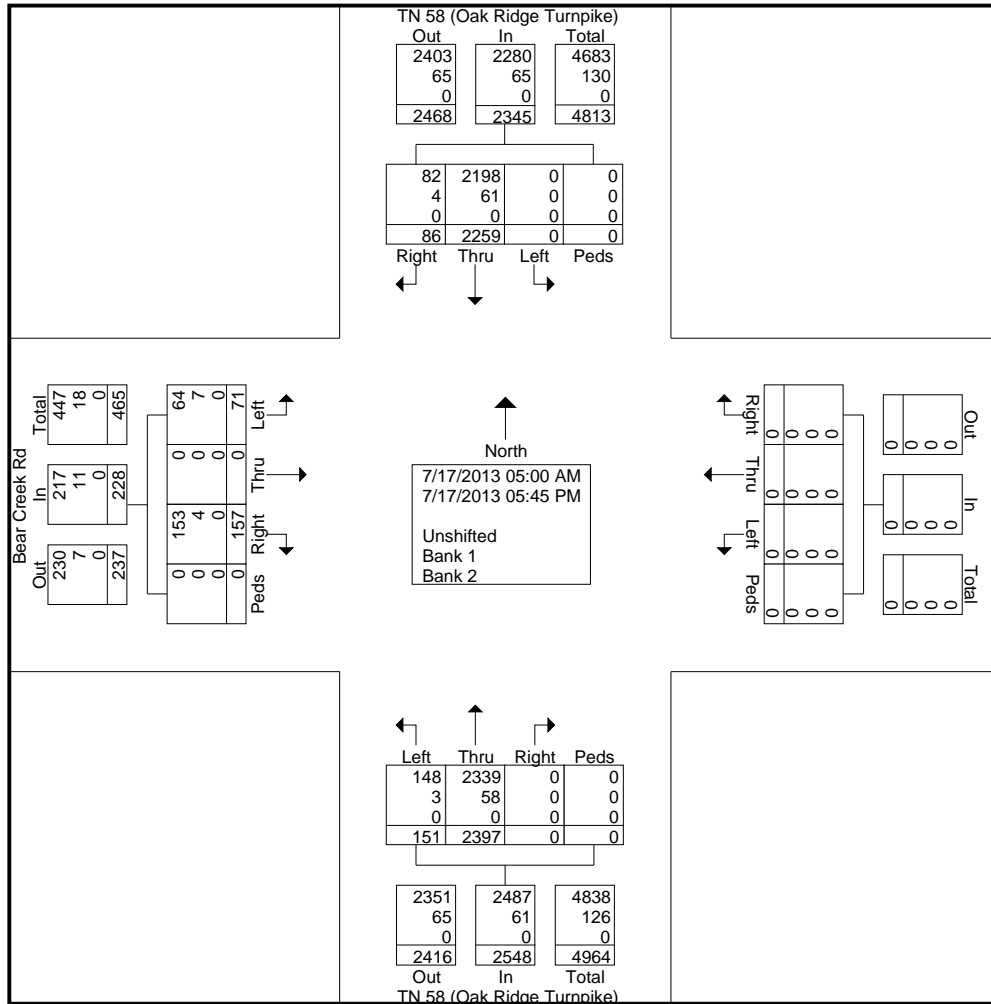
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Site Code : 00000000
Start Date : 7/17/2013
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	TN 58 (Oak Ridge Turnpike) From North					From East					TN 58 (Oak Ridge Turnpike) From South					Bear Creek Rd From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
05:00 AM	0	8	0	0	8	0	0	0	0	0	0	140	2	0	142	0	0	1	0	1	151
05:15 AM	0	8	0	0	8	0	0	0	0	0	0	158	0	0	158	0	0	0	0	0	166
05:30 AM	3	13	0	0	16	0	0	0	0	0	0	131	4	0	135	0	0	0	0	0	151
05:45 AM	4	17	0	0	21	0	0	0	0	0	0	133	11	0	144	0	0	0	0	0	165
Total	7	46	0	0	53	0	0	0	0	0	0	562	17	0	579	0	0	1	0	1	633
06:00 AM	1	16	0	0	17	0	0	0	0	0	0	118	5	0	123	0	0	0	0	0	140
06:15 AM	13	23	0	0	36	0	0	0	0	0	0	154	18	0	172	1	0	3	0	4	212
06:30 AM	10	32	0	0	42	0	0	0	0	0	0	148	33	0	181	0	0	1	0	1	224
06:45 AM	24	28	0	0	52	0	0	0	0	0	0	106	22	0	128	1	0	0	0	1	181
Total	48	99	0	0	147	0	0	0	0	0	0	526	78	0	604	2	0	4	0	6	757
07:00 AM	7	42	0	0	49	0	0	0	0	0	0	101	9	0	110	4	0	0	0	4	163
07:15 AM	3	46	0	0	49	0	0	0	0	0	0	112	5	0	117	1	0	0	0	1	167
07:30 AM	4	37	0	0	41	0	0	0	0	0	0	117	8	0	125	7	0	2	0	9	175
07:45 AM	5	34	0	0	39	0	0	0	0	0	0	109	8	0	117	1	0	0	0	1	157
Total	19	159	0	0	178	0	0	0	0	0	0	439	30	0	469	13	0	2	0	15	662
08:00 AM	2	30	0	0	32	0	0	0	0	0	0	76	9	0	85	1	0	2	0	3	120
08:15 AM	1	37	0	0	38	0	0	0	0	0	0	89	1	0	90	1	0	0	0	1	129
08:30 AM	2	36	0	0	38	0	0	0	0	0	0	76	2	0	78	0	0	1	0	1	117
08:45 AM	0	33	0	0	33	0	0	0	0	0	0	53	2	0	55	1	0	1	0	2	90
Total	5	136	0	0	141	0	0	0	0	0	0	294	14	0	308	3	0	4	0	7	456
*** BREAK ***																					
03:00 PM	0	66	0	0	66	0	0	0	0	0	0	32	1	0	33	0	0	1	0	1	100
03:15 PM	2	83	0	0	85	0	0	0	0	0	0	50	1	0	51	6	0	1	0	7	143
03:30 PM	0	123	0	0	123	0	0	0	0	0	0	50	2	0	52	9	0	4	0	13	188
03:45 PM	0	146	0	0	146	0	0	0	0	0	0	55	1	0	56	7	0	1	0	8	210
Total	2	418	0	0	420	0	0	0	0	0	0	187	5	0	192	22	0	7	0	29	641
04:00 PM	2	102	0	0	104	0	0	0	0	0	0	58	1	0	59	9	0	2	0	11	1

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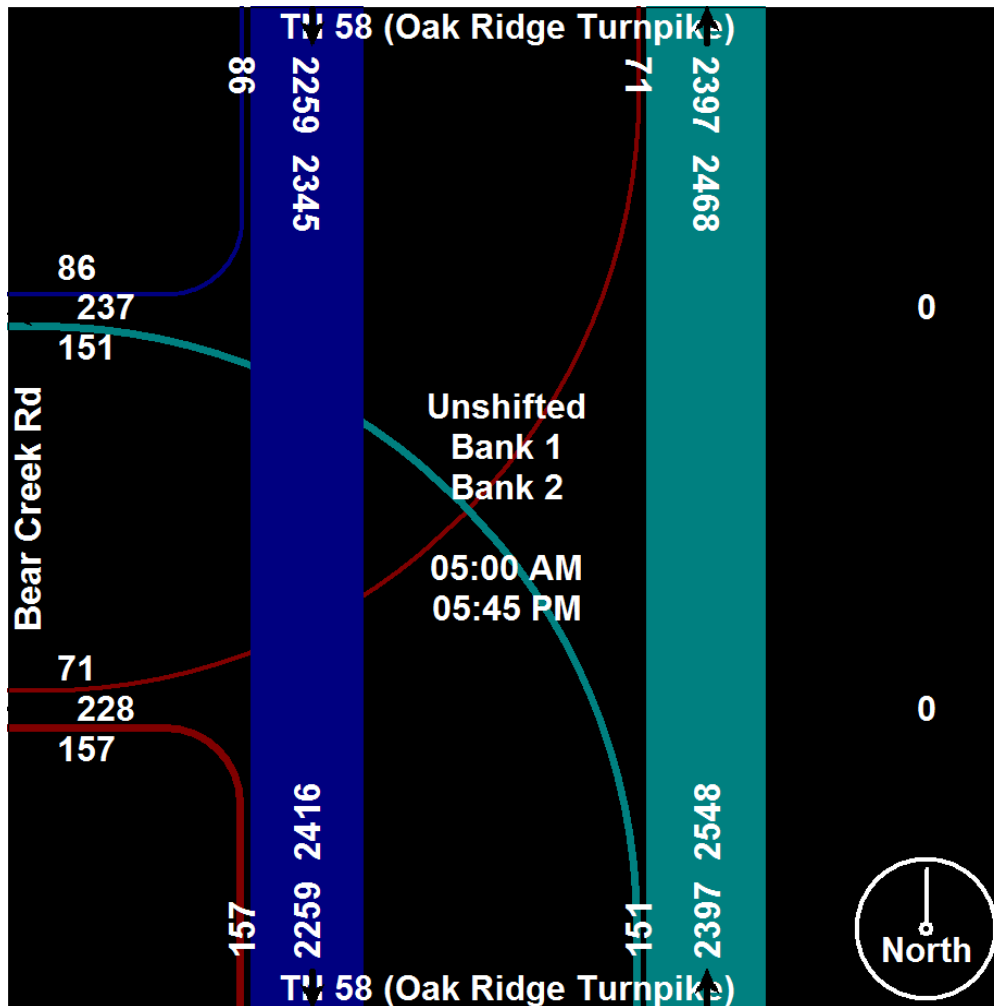
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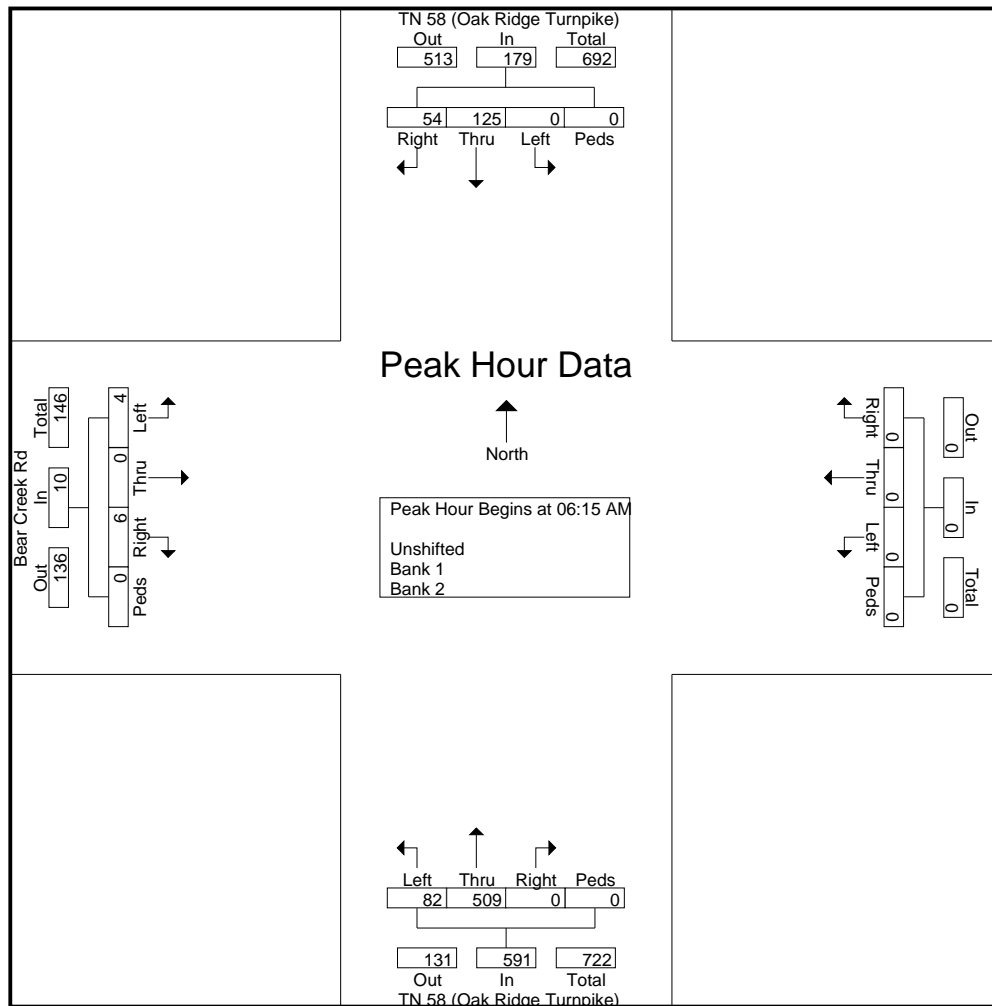


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	TN 58 (Oak Ridge Turnpike) From North					From East					TN 58 (Oak Ridge Turnpike) From South					Bear Creek Rd From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:15 AM																					
06:15 AM	13	23	0	0	36	0	0	0	0	0	0	154	18	0	172	1	0	3	0	4	212
06:30 AM	10	32	0	0	42	0	0	0	0	0	0	148	33	0	181	0	0	1	0	1	224
06:45 AM	24	28	0	0	52	0	0	0	0	0	0	106	22	0	128	1	0	0	0	1	181
07:00 AM	7	42	0	0	49	0	0	0	0	0	0	101	9	0	110	4	0	0	0	4	163
Total Volume	54	125	0	0	179	0	0	0	0	0	0	509	82	0	591	6	0	4	0	10	780
% App. Total	30.2	69.8	0	0		0	0	0	0		0	86.1	13.9	0		60	0	40	0		
PHF	.563	.744	.000	.000	.861	.000	.000	.000	.000	.000	.000	.826	.621	.000	.816	.375	.000	.333	.000	.625	.871

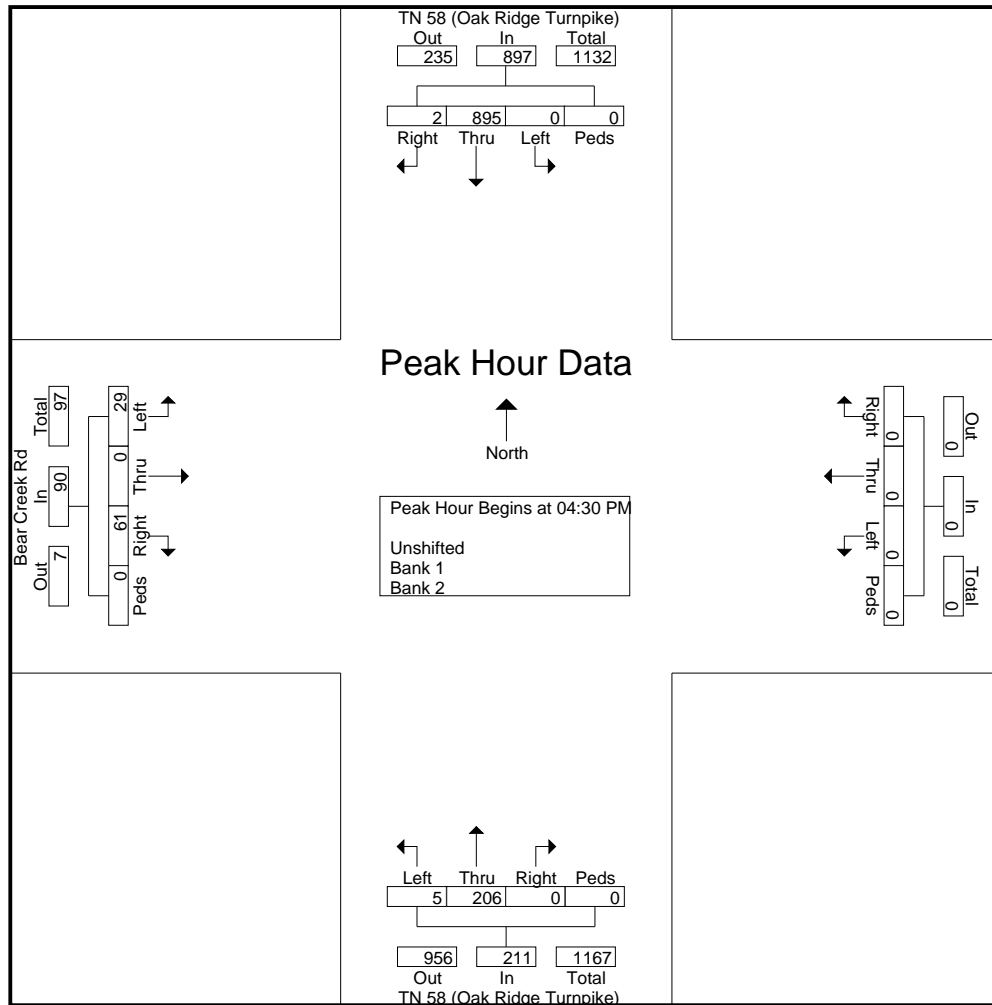


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	TN 58 (Oak Ridge Turnpike) From North					From East					TN 58 (Oak Ridge Turnpike) From South					Bear Creek Rd From West					
Start Time	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	1	226	0	0	227	0	0	0	0	0	0	49	0	0	49	22	0	11	0	33	309
04:45 PM	1	315	0	0	316	0	0	0	0	0	0	53	0	0	53	11	0	3	0	14	383
05:00 PM	0	181	0	0	181	0	0	0	0	0	0	59	3	0	62	7	0	6	0	13	256
05:15 PM	0	173	0	0	173	0	0	0	0	0	0	45	2	0	47	21	0	9	0	30	250
Total Volume	2	895	0	0	897	0	0	0	0	0	0	206	5	0	211	61	0	29	0	90	1198
% App. Total	0.2	99.8	0	0		0	0	0	0	0	0	97.6	2.4	0		67.8	0	32.2	0		
PHF	.500	.710	.000	.000	.710	.000	.000	.000	.000	.000	.000	.873	.417	.000	.851	.693	.000	.659	.000	.682	.782



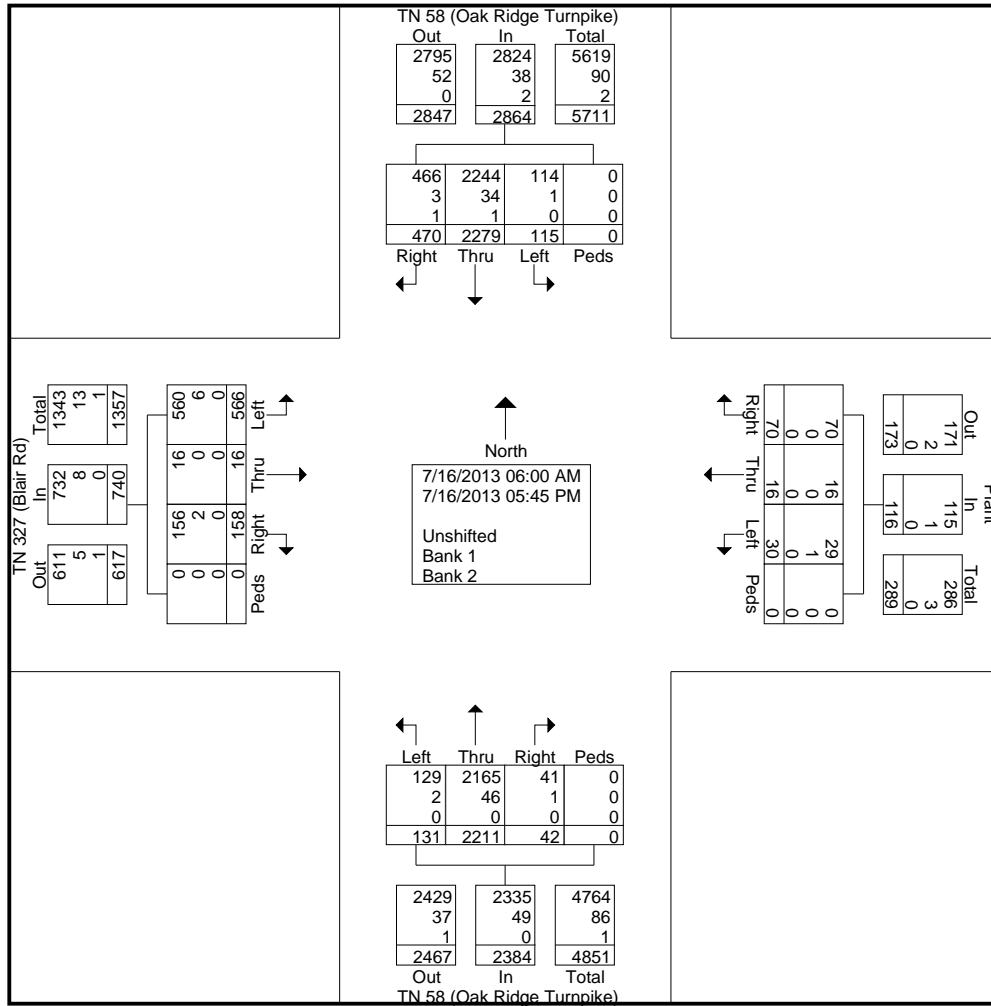
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Start Date : 7/16/2013
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	TN 58 (Oak Ridge Turnpike) From North					Plant From East					TN 58 (Oak Ridge Turnpike) From South					TN 327 (Blair Rd) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	22	93	1	0	116	0	0	0	0	0	0	100	6	0	106	8	0	27	0	35	257
06:15 AM	14	106	3	0	123	0	0	0	0	0	3	107	5	0	115	13	0	50	0	63	301
06:30 AM	3	106	7	0	116	0	0	0	0	0	4	122	4	0	130	10	4	44	0	58	304
06:45 AM	5	77	2	0	84	0	2	2	0	4	2	99	1	0	102	10	3	41	0	54	244
Total	44	382	13	0	439	0	2	2	0	4	9	428	16	0	453	41	7	162	0	210	1106
07:00 AM	8	52	9	0	69	1	1	0	0	2	2	97	6	0	105	4	0	28	0	32	208
07:15 AM	3	60	15	0	78	1	0	0	0	1	4	102	2	0	108	7	0	32	0	39	226
07:30 AM	10	55	18	0	83	0	0	0	0	0	3	103	5	0	111	3	1	39	0	43	237
07:45 AM	7	53	27	0	87	2	0	1	0	3	6	109	1	0	116	10	3	33	0	46	252
Total	28	220	69	0	317	4	1	1	0	6	15	411	14	0	440	24	4	132	0	160	923
08:00 AM	5	41	12	0	58	1	2	0	0	3	2	73	2	0	77	0	0	21	0	21	159
08:15 AM	3	38	7	0	48	4	1	0	0	5	4	79	4	0	87	8	0	20	0	28	168
08:30 AM	3	34	4	0	41	2	0	0	0	2	2	63	5	0	70	2	0	13	0	15	128
08:45 AM	9	41	1	0	51	0	1	4	0	5	0	55	4	0	59	4	1	19	0	24	139
Total	20	154	24	0	198	7	4	4	0	15	8	270	15	0	293	14	1	73	0	88	594
*** BREAK ***																					
03:00 PM	12	70	2	0	84	2	1	3	0	6	0	63	3	0	66	2	2	10	0	14	170
03:15 PM	16	88	1	0	105	2	0	1	0	3	2	56	1	0	59	2	1	15	0	18	185
03:30 PM	29	109	1	0	139	4	0	2	0	6	1	76	5	0	82	3	0	17	0	20	247
03:45 PM	28	126	1	0	155	3	0	1	0	4	2	85	2	0	89	5	1	14	0	20	268
Total	85	393	5	0	483	11	1	7	0	19	5	280	11	0	296	12	4	56	0	72	870
04:00 PM	29	117	3	0	149	9	0	3	0	12	0	57	9	0	66	5	0	10	0	15	242
04:15 PM	20	123	0	0	143	13	0	2	0	15	2	79	2	0	83	9	0	30	0	39	280
04:30 PM	47	186	0	0	233	9	4	4	0	17	2	127	15	0	144	12	0	16	0	28	422
04:45 PM	51	209	0	0	260	6	2	4	0	12	1	138	9	0	148	18	0	34	0	52	472
Total	147	635	3	0	785	37	6	13	0	56	5	401	35	0	441	44	0	90	0	134	1416
05:00 PM	43	105																			

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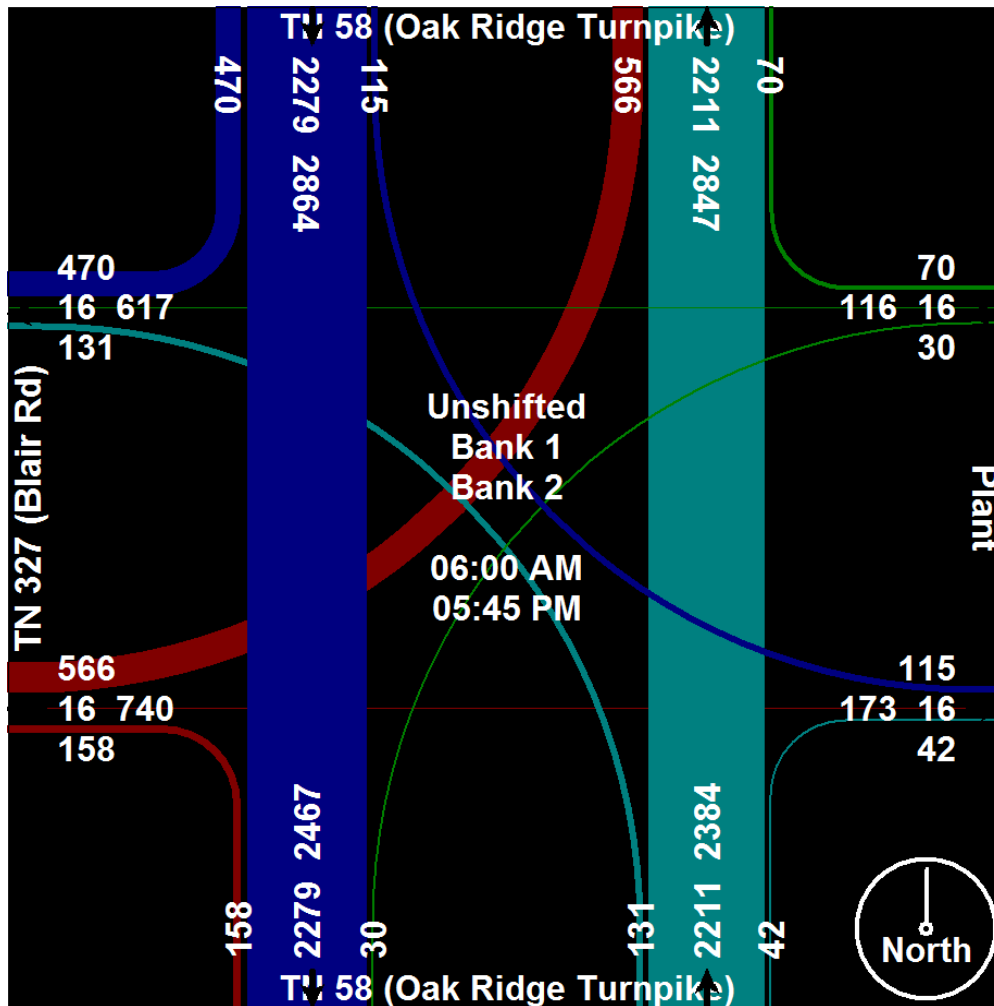
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File Name : TN58 & TN327
Site Code : 00000000
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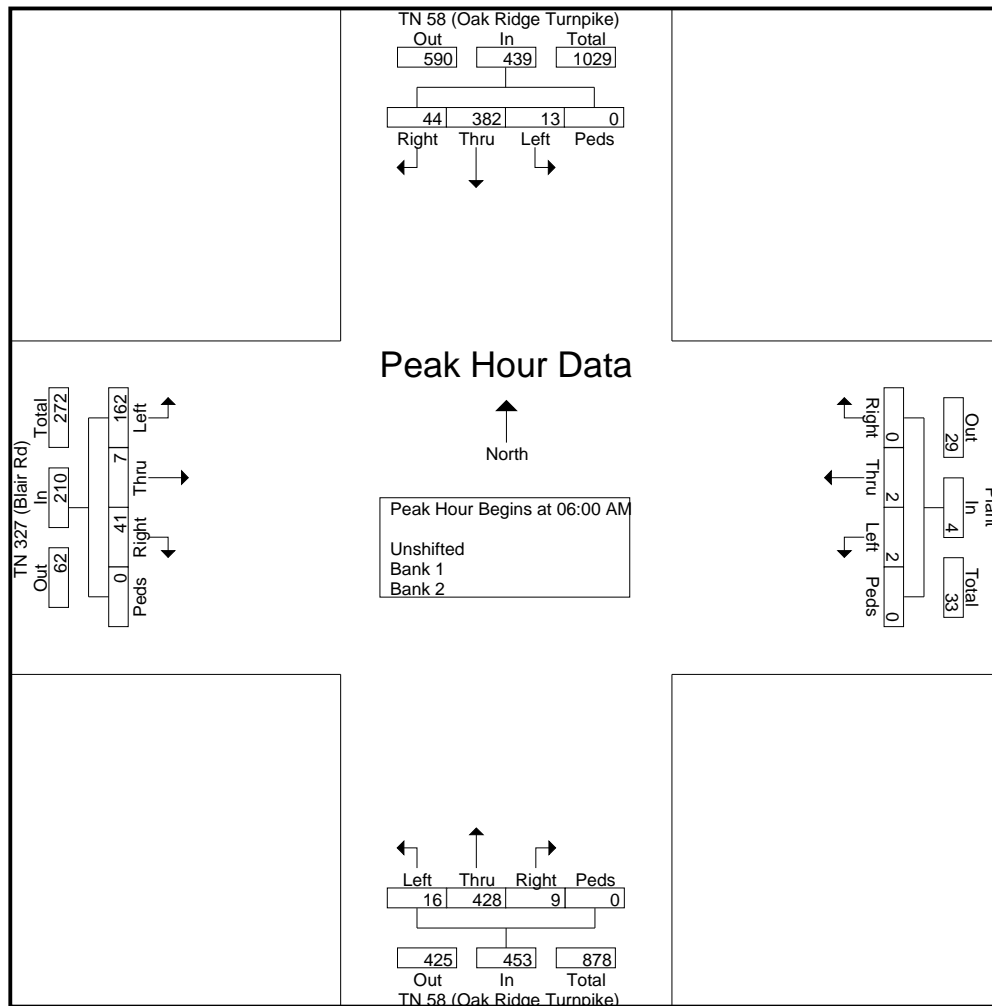


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Traffic Engineering

File Name : TN58 & TN327
Site Code : 00000000
Start Date : 7/16/2013
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	TN 58 (Oak Ridge Turnpike) From North					Plant From East					TN 58 (Oak Ridge Turnpike) From South					TN 327 (Blair Rd) 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 Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00 AM																					
06:00 AM	22	93	1	0	116	0	0	0	0	0	0	100	6	0	106	8	0	27	0	35	257
06:15 AM	14	106	3	0	123	0	0	0	0	0	3	107	5	0	115	13	0	50	0	63	301
06:30 AM	3	106	7	0	116	0	0	0	0	0	4	122	4	0	130	10	4	44	0	58	304
06:45 AM	5	77	2	0	84	0	2	2	0	4	2	99	1	0	102	10	3	41	0	54	244
Total Volume	44	382	13	0	439	0	2	2	0	4	9	428	16	0	453	41	7	162	0	210	1106
% App. Total	10	87	3	0		0	50	50	0		2	94.5	3.5	0		19.5	3.3	77.1	0		
PHF	.500	.901	.464	.000	.892	.000	.250	.250	.000	.250	.563	.877	.667	.000	.871	.788	.438	.810	.000	.833	.910

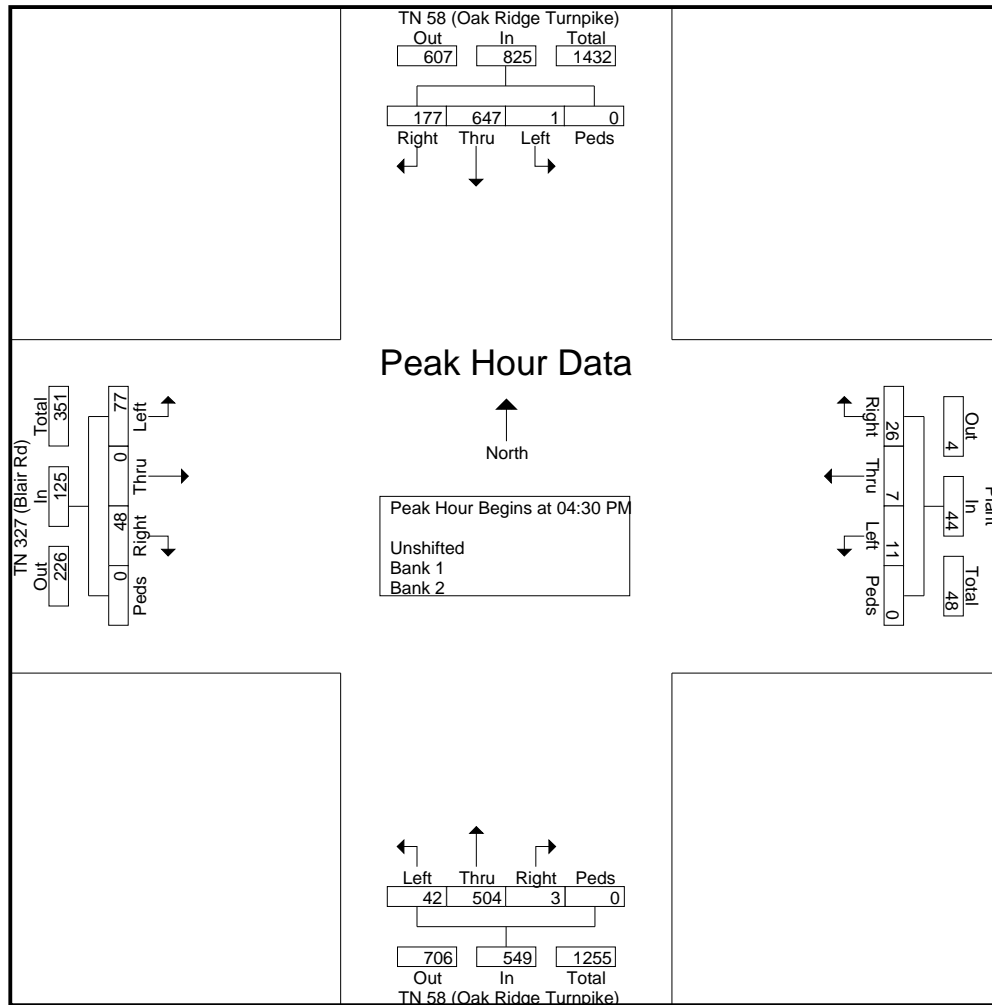


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File Name : TN58 & TN327
Site Code : 00000000
Start Date : 7/16/2013
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	TN 58 (Oak Ridge Turnpike) From North					Plant From East					TN 58 (Oak Ridge Turnpike) From South					TN 327 (Blair Rd) From West					
Start Time	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	47	186	0	0	233	9	4	4	0	17	2	127	15	0	144	12	0	16	0	28	422
04:45 PM	51	209	0	0	260	6	2	4	0	12	1	138	9	0	148	18	0	34	0	52	472
05:00 PM	43	105	1	0	149	8	1	3	0	12	0	145	10	0	155	11	0	15	0	26	342
05:15 PM	36	147	0	0	183	3	0	0	0	3	0	94	8	0	102	7	0	12	0	19	307
Total Volume	177	647	1	0	825	26	7	11	0	44	3	504	42	0	549	48	0	77	0	125	1543
% App. Total	21.5	78.4	0.1	0		59.1	15.9	25	0		0.5	91.8	7.7	0		38.4	0	61.6	0		
PHF	.868	.774	.250	.000	.793	.722	.438	.688	.000	.647	.375	.869	.700	.000	.885	.667	.000	.566	.000	.601	.817



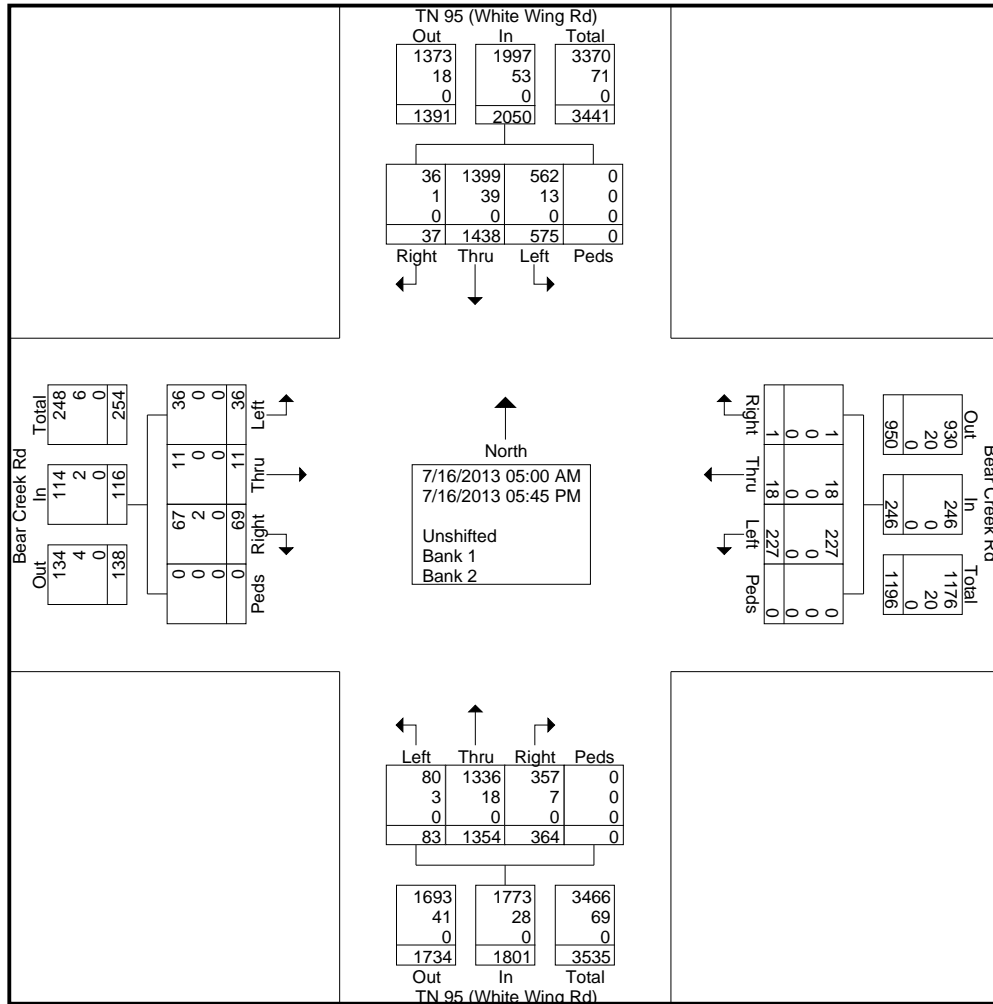
File Name : TN95 & Bear Creek
Site Code : 00000000
Start Date : 7/16/2013
Page No : 1

	TN 95 (White Wing Rd) From North					Bear Creek Rd From East					TN 95 (White Wing Rd) From South					Bear Creek Rd 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
05:00 AM	0	11	112	0	123	0	0	0	0	0	57	7	1	0	65	1	0	0	0	1	189
05:15 AM	1	25	142	0	168	0	0	0	0	0	64	15	2	0	81	0	0	0	0	0	249
05:30 AM	0	56	61	0	117	0	0	0	0	0	43	31	1	0	75	0	0	0	0	0	192
05:45 AM	1	53	42	0	96	0	0	0	0	0	28	49	5	0	82	0	0	0	0	0	178
Total	2	145	357	0	504	0	0	0	0	0	192	102	9	0	303	1	0	0	0	1	808
06:00 AM	2	34	49	0	85	0	1	2	0	3	29	51	5	0	85	0	0	0	0	0	173
06:15 AM	4	68	42	0	114	0	0	0	0	0	39	51	4	0	94	1	0	0	0	1	209
06:30 AM	5	89	33	0	127	0	0	1	0	1	25	39	11	0	75	2	2	0	0	4	207
06:45 AM	6	83	21	0	110	0	0	1	0	1	16	23	14	0	53	1	0	0	0	1	165
Total	17	274	145	0	436	0	1	4	0	5	109	164	34	0	307	4	2	0	0	6	754
07:00 AM	2	62	7	0	71	0	1	1	0	2	12	42	7	0	61	3	0	0	0	3	137
07:15 AM	2	55	12	0	69	0	0	1	0	1	11	37	2	0	50	2	2	1	0	5	125
07:30 AM	2	85	12	0	99	0	0	0	0	0	2	47	2	0	51	1	2	5	0	8	158
07:45 AM	0	76	4	0	80	0	1	0	0	1	6	56	6	0	68	2	1	0	0	3	152
Total	6	278	35	0	319	0	2	2	0	4	31	182	17	0	230	8	5	6	0	19	572
08:00 AM	4	51	3	0	58	0	0	1	0	1	7	33	3	0	43	1	1	0	0	2	104
08:15 AM	1	37	3	0	41	0	0	3	0	3	3	25	1	0	29	0	1	0	0	1	74
08:30 AM	0	42	2	0	44	0	0	1	0	1	0	18	2	0	20	1	0	1	0	2	67
08:45 AM	1	41	4	0	46	0	0	0	0	0	2	21	0	0	23	2	0	1	0	3	72
Total	6	171	12	0	189	0	0	5	0	5	12	97	6	0	115	4	2	2	0	8	317
*** BREAK ***																					
03:00 PM	0	20	4	0	24	0	0	2	0	2	0	36	0	0	36	3	0	1	0	4	66
03:15 PM	1	34	4	0	39	0	0	4	0	4	4	50	1	0	55	0	0	2	0	2	100
03:30 PM	0	38	0	0	38	0	4	3	0	7	4	90	5	0	99	1	0	2	0	3	147
03:45 PM	1	36	2	0	39	0	0	8	0	8	2	68	2	0	72	5	0	1	0	6	125
Total	2	128	10	0	140	0	4	17	0	21	10	244	8	0	262	9	0	6	0	15	438
04:00 PM	0	32	2	0	34	0	0	10	0	10	1	64	3	0	68	2	0	3	0		

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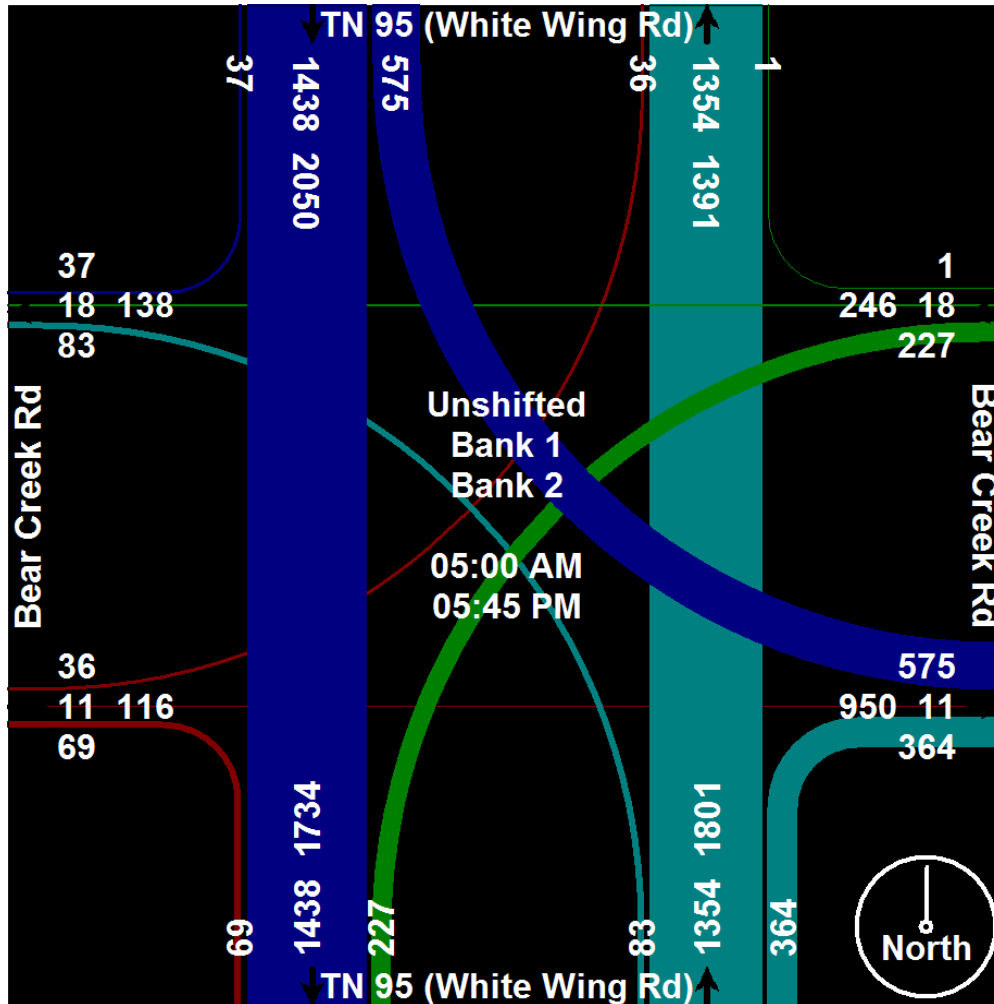
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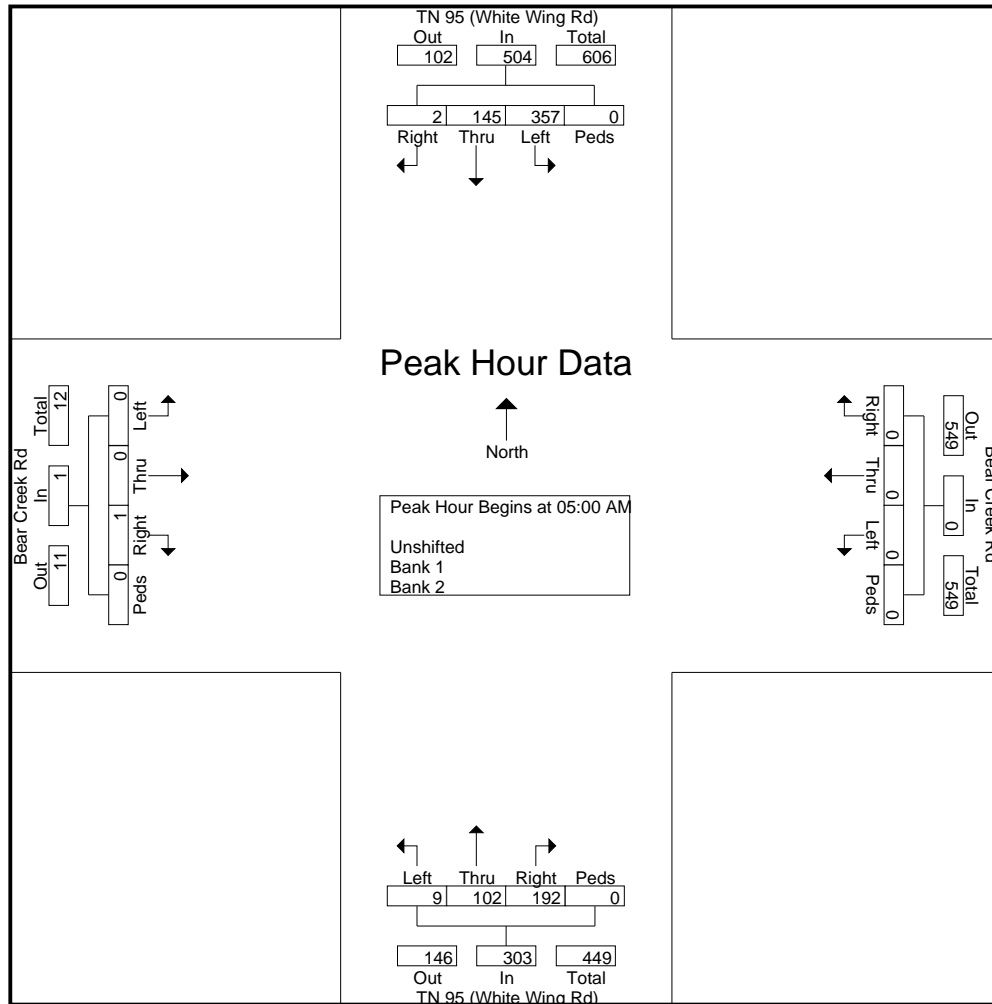


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File Name : TN95 & Bear Creek
Site Code : 00000000
Start Date : 7/16/2013
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	TN 95 (White Wing Rd) From North					Bear Creek Rd From East					TN 95 (White Wing Rd) From South					Bear Creek Rd From 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 Analysis From 05:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 AM																					
05:00 AM	0	11	112	0	123	0	0	0	0	0	57	7	1	0	65	1	0	0	0	1	189
05:15 AM	1	25	142	0	168	0	0	0	0	0	64	15	2	0	81	0	0	0	0	0	249
05:30 AM	0	56	61	0	117	0	0	0	0	0	43	31	1	0	75	0	0	0	0	0	192
05:45 AM	1	53	42	0	96	0	0	0	0	0	28	49	5	0	82	0	0	0	0	0	178
Total Volume	2	145	357	0	504	0	0	0	0	0	192	102	9	0	303	1	0	0	0	1	808
% App. Total	0.4	28.8	70.8	0		0	0	0	0		63.4	33.7	3	0		100	0	0	0		
PHF	.500	.647	.629	.000	.750	.000	.000	.000	.000	.000	.750	.520	.450	.000	.924	.250	.000	.000	.000	.250	.811

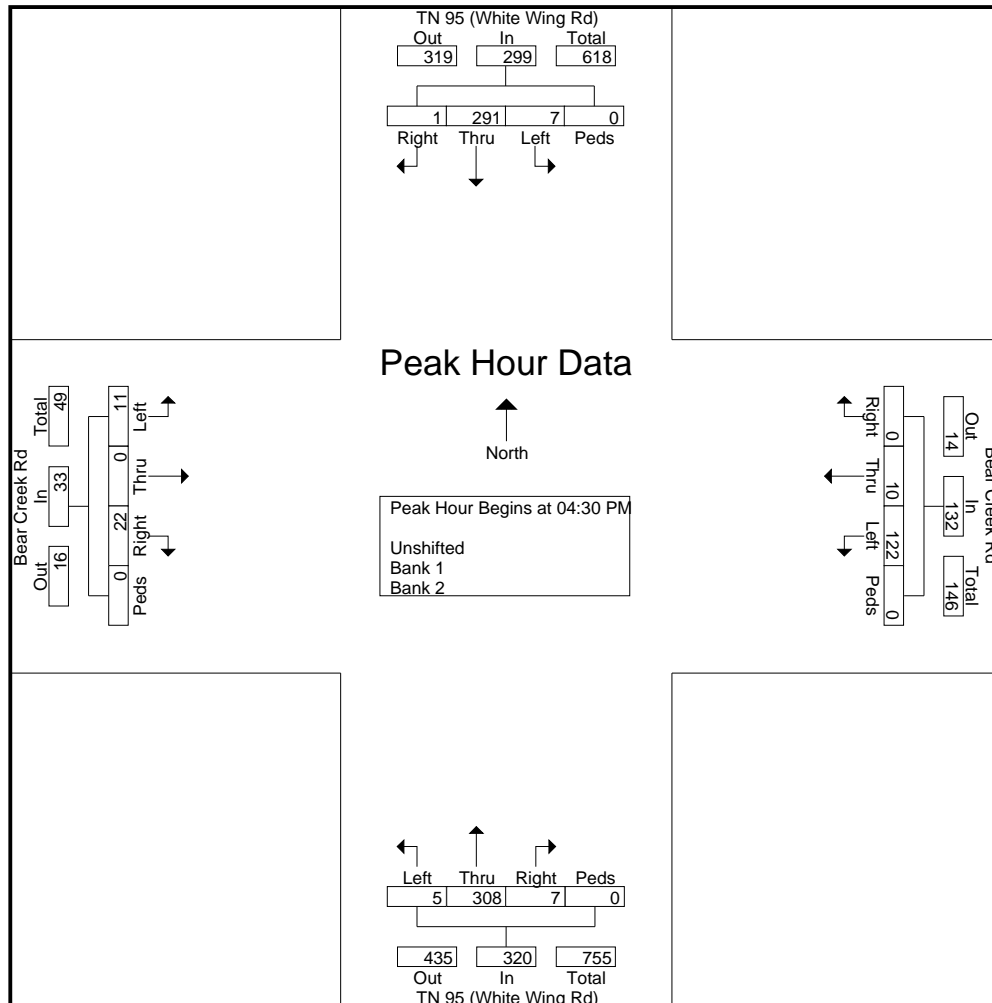


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Site Code : 00000000
Start Date : 7/16/2013
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	TN 95 (White Wing Rd) From North					Bear Creek Rd From East					TN 95 (White Wing Rd) From South					Bear Creek Rd From West					
Start Time	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Rig ht	Thr u	Left	Ped s	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	78	2	0	80	0	4	55	0	59	2	86	1	0	89	7	0	2	0	9	237
04:45 PM	0	85	4	0	89	0	3	31	0	34	3	63	3	0	69	2	0	2	0	4	196
05:00 PM	1	73	1	0	75	0	1	12	0	13	1	81	1	0	83	7	0	2	0	9	180
05:15 PM	0	55	0	0	55	0	2	24	0	26	1	78	0	0	79	6	0	5	0	11	171
Total Volume	1	291	7	0	299	0	10	122	0	132	7	308	5	0	320	22	0	11	0	33	784
% App. Total	0.3	97.3	2.3	0		0	7.6	92.4	0		2.2	96.2	1.6	0		66.7	0	33.3	0		
PHF	.250	.856	.438	.000	.840	.000	.625	.555	.000	.559	.583	.895	.417	.000	.899	.786	.000	.550	.000	.750	.827



Peak Year	Type of Worker	# of Workers	AM (7-9)		PM (4-6)	
			Enter	Exit	Enter	Exit
2024	Construction	2200	1185	85	423	1185
	Operation	500	375	25	0	0
	Total	2700	1560	110	423	1185

Notes

Construction Staff

Approximately 70% of Construction Staff work from 7AM - 5:30 PM (1st Shift)

Approximately 25% of Construction Staff work from 6PM - 4AM (2nd Shift)

Approximately 5% of Construction Staff work from 11:00 PM - 8:30 AM (3rd Shift)

Carpolling factor = 1.3

Operational Staff

Approximately 75% of Operational Staff work 7AM - 3:00 PM (Day Shift)

Approximately 5% of Operational Staff work 11PM - 7 AM (Evening Shift)

Approximately 5% of Operational Staff work 3:00 PM to 11:00 PM (Night Shift)

Approximately 5% assigned to training

Approximately 10% annual or sick leave

INTERSECTION VOLUME WORKSHEET

Intersection #1
Bear Creek Rd Ramp at SR 58

AM Peak Hour

Description	Bear Creek Rd Ramp <u>Eastbound</u>			- <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	4	0	6	0	0	0	82	509	0	0	125	54
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	4	0	6	0	0	0	82	509	0	0	125	54
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	1	0	1	0	0	0	20	124	0	0	30	13
2024 Background Peak Hour Volume	5	0	7	0	0	0	102	633	0	0	155	67
% Entering	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	35%
Entering Site Traffic	0	0	0	0	0	0	780	0	0	0	0	546
% Exiting	35%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	39	0	55	0	0	0	0	0	0	0	0	0
Total Site Traffic	39	0	55	0	0	0	780	0	0	0	0	546
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	44	0	62	0	0	0	882	633	0	0	155	613

PM Peak Hour

Description	Bear Creek Rd Ramp <u>Eastbound</u>			- <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	29	0	61	0	0	0	5	206	0	0	895	2
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	29	0	61	0	0	0	5	206	0	0	895	2
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	7	0	15	0	0	0	1	50	0	0	218	0
2024 Background Peak Hour Volume	36	0	76	0	0	0	6	256	0	0	1,113	2
% Entering	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	35%
Entering Site Traffic	0	0	0	0	0	0	212	0	0	0	0	148
% Exiting	35%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	415	0	592	0	0	0	0	0	0	0	0	0
Total Site Traffic	415	0	592	0	0	0	212	0	0	0	0	148
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	451	0	668	0	0	0	218	256	0	0	1,113	150

INTERSECTION VOLUME WORKSHEET

Intersection #2
SR 327 / Secure Transpo Center at SR 58

AM Peak Hour

Description	SR 327 <u>Eastbound</u>			Secure Transpo Center <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	162	7	41	2	2	0	16	428	9	13	382	44
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	162	7	41	2	2	0	16	428	9	13	382	44
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	39	2	10	0	0	0	4	104	2	3	93	11
2024 Background Peak Hour Volume	201	9	51	2	2	0	20	532	11	16	475	55
% Entering	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	30%	0%
Entering Site Traffic	0	0	78	0	0	0	0	0	0	0	468	0
% Exiting	0%	0%	0%	0%	0%	0%	5%	30%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	6	33	0	0	0	0
Total Site Traffic	0	0	78	0	0	0	6	33	0	0	468	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	201	9	129	2	2	0	26	565	11	16	943	55

PM Peak Hour

Description	SR 327 <u>Eastbound</u>			Secure Transpo Center <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	77	0	48	11	7	26	42	504	3	1	647	177
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	77	0	48	11	7	26	42	504	3	1	647	177
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	19	0	12	3	2	6	10	123	1	0	157	43
2024 Background Peak Hour Volume	96	0	60	14	9	32	52	627	4	1	804	220
% Entering	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	30%	0%
Entering Site Traffic	0	0	21	0	0	0	0	0	0	0	127	0
% Exiting	0%	0%	0%	0%	0%	0%	5%	30%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	59	356	0	0	0	0
Total Site Traffic	0	0	21	0	0	0	59	356	0	0	127	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	96	0	81	14	9	32	111	983	4	1	931	220

INTERSECTION VOLUME WORKSHEET

Intersection #3
E Bear Creek Rd / W Bear Creek Rd at SR 95

AM Peak Hour

Description	E Bear Creek Rd <u>Eastbound</u>			W Bear Creek Rd <u>Westbound</u>			SR 95 <u>Northbound</u>			SR 95 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	0	0	1	0	0	0	9	102	192	357	145	2
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	0	0	1	0	0	0	9	102	192	357	145	2
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	0	0	0	0	0	0	2	25	47	87	35	0
2024 Background Peak Hour Volume	0	0	1	0	0	0	11	127	239	444	180	2
% Entering	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	5%
Entering Site Traffic	0	0	0	0	0	0	155	0	0	0	0	79
% Exiting	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	6	0	10	0	0	0	0	0	0	0	0	0
Total Site Traffic	6	0	10	0	0	0	155	0	0	0	0	79
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	6	0	11	0	0	0	166	127	239	444	180	81

PM Peak Hour

Description	E Bear Creek Rd <u>Eastbound</u>			W Bear Creek Rd <u>Westbound</u>			SR 95 <u>Northbound</u>			SR 95 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	11	0	22	122	10	0	5	308	7	7	291	1
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	11	0	22	122	10	0	5	308	7	7	291	1
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	3	0	5	30	2	0	1	75	2	2	71	0
2024 Background Peak Hour Volume	14	0	27	152	12	0	6	383	9	9	362	1
% Entering	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	5%
Entering Site Traffic	0	0	0	0	0	0	43	0	0	0	0	20
% Exiting	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	59	0	119	0	0	0	0	0	0	0	0	0
Total Site Traffic	59	0	119	0	0	0	43	0	0	0	0	20
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	73	0	146	152	12	0	49	383	9	9	362	21

INTERSECTION VOLUME WORKSHEET

Intersection #4
US Gov't Property / E Bear Creek Rd at Bear Creek Rd Ramp

AM Peak Hour

Description	US Gov't Property <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			- <u>Northbound</u>			Bear Creek Rd Ramp <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	4	4	0	0	4	10	0	0	0	136	0	4
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	4	4	0	0	4	10	0	0	0	136	0	4
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	1	1	0	0	1	2	0	0	0	33	0	1
2024 Background Peak Hour Volume	5	5	0	0	5	12	0	0	0	169	0	5
% Entering	0%	0%	0%	0%	0%	0%	0%	0%	0%	85%	0%	0%
Entering Site Traffic	0	0	0	0	0	0	0	0	0	1,326	0	0
% Exiting	0%	0%	0%	0%	0%	85%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	94	0	0	0	0	0	0
Total Site Traffic	0	0	0	0	0	94	0	0	0	1,326	0	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	5	5	0	0	5	106	0	0	0	1,495	0	5

PM Peak Hour

Description	US Gov't Property <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			- <u>Northbound</u>			Bear Creek Rd Ramp <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	4	4	0	0	4	90	0	0	0	7	0	4
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	4	4	0	0	4	90	0	0	0	7	0	4
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	1	1	0	0	1	22	0	0	0	2	0	1
2024 Background Peak Hour Volume	5	5	0	0	5	112	0	0	0	9	0	5
% Entering	0%	0%	0%	0%	0%	0%	0%	0%	0%	85%	0%	0%
Entering Site Traffic	0	0	0	0	0	0	0	0	0	360	0	0
% Exiting	0%	0%	0%	0%	0%	85%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	1007	0	0	0	0	0	0
Total Site Traffic	0	0	0	0	0	1,007	0	0	0	360	0	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	5	5	0	0	5	1,119	0	0	0	369	0	5

INTERSECTION VOLUME WORKSHEET

Intersection #5
E Bear Creek Rd at Site Driveway / E Bear Creek Rd

AM Peak Hour

Description	- <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			Site Driveway <u>Northbound</u>			E Bear Creek Rd <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	0	0	0	0	0	10	0	0	0	136	0	0
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	0	0	0	0	0	10	0	0	0	136	0	0
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	0	0	0	0	0	2	0	0	0	33	0	0
2024 Background Peak Hour Volume	0	0	0	0	0	12	0	0	0	169	0	0
% Entering	0%	0%	0%	15%	0%	0%	0%	0%	0%	0%	85%	0%
Entering Site Traffic	0	0	0	234	0	0	0	0	0	0	1,326	0
% Exiting	0%	0%	0%	0%	0%	0%	0%	85%	15%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	0	94	16	0	0	0
Total Site Traffic	0	0	0	234	0	0	0	94	16	0	1,326	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	0	0	0	234	0	12	0	94	16	169	1,326	0

PM Peak Hour

Description	- <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			Site Driveway <u>Northbound</u>			E Bear Creek Rd <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	0	0	0	0	0	90	0	0	0	7	0	0
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	0	0	0	0	0	90	0	0	0	7	0	0
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	0	0	0	0	0	22	0	0	0	2	0	0
2024 Background Peak Hour Volume	0	0	0	0	0	112	0	0	0	9	0	0
% Entering	0%	0%	0%	15%	0%	0%	0%	0%	0%	0%	85%	0%
Entering Site Traffic	0	0	0	63	0	0	0	0	0	0	360	0
% Exiting	0%	0%	0%	0%	0%	0%	0%	85%	15%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	0	1007	178	0	0	0
Total Site Traffic	0	0	0	63	0	0	0	1,007	178	0	360	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 1 Peak Hour Volume	0	0	0	63	0	112	0	1,007	178	9	360	0

Peak Year	Type of Worker	# of Workers	AM (7-9)		PM (4-6)	
			Enter	Exit	Enter	Exit
2024	Construction	3300	1777	127	635	1777
	Operation	366	275	18	0	0
	Total	3666	2052	145	635	1777

Notes

Construction Staff

Approximately 70% of Construction Staff work from 7AM - 5:30 PM (1st Shift)

Approximately 25% of Construction Staff work from 6PM - 4AM (2nd Shift)

Approximately 5% of Construction Staff work from 11:00 PM - 8:30 AM (3rd Shift)

Carpolling factor = 1.3

Operational Staff

Approximately 75% of Operational Staff work 7AM - 3:00 PM (Day Shift)

Approximately 5% of Operational Staff work 11PM - 7 AM (Evening Shift)

Approximately 5% of Operational Staff work 3:00 PM to 11:00 PM (Night Shift)

Approximately 5% assigned to training

Approximately 10% annual or sick leave

INTERSECTION VOLUME WORKSHEET

Intersection #1
Bear Creek Rd Ramp at SR 58

AM Peak Hour

Description	Bear Creek Rd Ramp <u>Eastbound</u>			- <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	4	0	6	0	0	0	82	509	0	0	125	54
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	4	0	6	0	0	0	82	509	0	0	125	54
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	1	0	1	0	0	0	20	124	0	0	30	13
2024 Background Peak Hour Volume	5	0	7	0	0	0	102	633	0	0	155	67
% Entering	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	35%
Entering Site Traffic	0	0	0	0	0	0	1,026	0	0	0	0	718
% Exiting	35%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	51	0	72	0	0	0	0	0	0	0	0	0
Total Site Traffic	51	0	72	0	0	0	1,026	0	0	0	0	718
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	56	0	79	0	0	0	1,128	633	0	0	155	785

PM Peak Hour

Description	Bear Creek Rd Ramp <u>Eastbound</u>			- <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	29	0	61	0	0	0	5	206	0	0	895	2
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	29	0	61	0	0	0	5	206	0	0	895	2
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	7	0	15	0	0	0	1	50	0	0	218	0
2024 Background Peak Hour Volume	36	0	76	0	0	0	6	256	0	0	1,113	2
% Entering	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	35%
Entering Site Traffic	0	0	0	0	0	0	318	0	0	0	0	222
% Exiting	35%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	622	0	888	0	0	0	0	0	0	0	0	0
Total Site Traffic	622	0	888	0	0	0	318	0	0	0	0	222
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	658	0	964	0	0	0	324	256	0	0	1,113	224

INTERSECTION VOLUME WORKSHEET

Intersection #2
SR 327 / Secure Transpo Center at SR 58

AM Peak Hour

Description	SR 327 <u>Eastbound</u>			Secure Transpo Center <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	162	7	41	2	2	0	16	428	9	13	382	44
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	162	7	41	2	2	0	16	428	9	13	382	44
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	39	2	10	0	0	0	4	104	2	3	93	11
2024 Background Peak Hour Volume	201	9	51	2	2	0	20	532	11	16	475	55
% Entering	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	30%	0%
Entering Site Traffic	0	0	102	0	0	0	0	0	0	0	616	0
% Exiting	0%	0%	0%	0%	0%	0%	5%	30%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	7	44	0	0	0	0
Total Site Traffic	0	0	102	0	0	0	7	44	0	0	616	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	201	9	153	2	2	0	27	576	11	16	1,091	55

PM Peak Hour

Description	SR 327 <u>Eastbound</u>			Secure Transpo Center <u>Westbound</u>			SR 58 <u>Northbound</u>			SR 58 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	77	0	48	11	7	26	42	504	3	1	647	177
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	77	0	48	11	7	26	42	504	3	1	647	177
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	19	0	12	3	2	6	10	123	1	0	157	43
2024 Background Peak Hour Volume	96	0	60	14	9	32	52	627	4	1	804	220
% Entering	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	30%	0%
Entering Site Traffic	0	0	32	0	0	0	0	0	0	0	190	0
% Exiting	0%	0%	0%	0%	0%	0%	5%	30%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	89	533	0	0	0	0
Total Site Traffic	0	0	32	0	0	0	89	533	0	0	190	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	96	0	92	14	9	32	141	1,160	4	1	994	220

INTERSECTION VOLUME WORKSHEET

Intersection #3
E Bear Creek Rd / W Bear Creek Rd at SR 95

AM Peak Hour

Description	E Bear Creek Rd <u>Eastbound</u>			W Bear Creek Rd <u>Westbound</u>			SR 95 <u>Northbound</u>			SR 95 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	0	0	1	0	0	0	9	102	192	357	145	2
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	0	0	1	0	0	0	9	102	192	357	145	2
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	0	0	0	0	0	0	2	25	47	87	35	0
2024 Background Peak Hour Volume	0	0	1	0	0	0	11	127	239	444	180	2
% Entering	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	5%
Entering Site Traffic	0	0	0	0	0	0	205	0	0	0	0	103
% Exiting	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	7	0	15	0	0	0	0	0	0	0	0	0
Total Site Traffic	7	0	15	0	0	0	205	0	0	0	0	103
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	7	0	16	0	0	0	216	127	239	444	180	105

PM Peak Hour

Description	E Bear Creek Rd <u>Eastbound</u>			W Bear Creek Rd <u>Westbound</u>			SR 95 <u>Northbound</u>			SR 95 <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	11	0	22	122	10	0	5	308	7	7	291	1
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	11	0	22	122	10	0	5	308	7	7	291	1
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	3	0	5	30	2	0	1	75	2	2	71	0
2024 Background Peak Hour Volume	14	0	27	152	12	0	6	383	9	9	362	1
% Entering	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	5%
Entering Site Traffic	0	0	0	0	0	0	64	0	0	0	0	31
% Exiting	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	89	0	178	0	0	0	0	0	0	0	0	0
Total Site Traffic	89	0	178	0	0	0	64	0	0	0	0	31
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	103	0	205	152	12	0	70	383	9	9	362	32

INTERSECTION VOLUME WORKSHEET

Intersection #4
US Gov't Property / E Bear Creek Rd at Bear Creek Rd Ramp

AM Peak Hour

Description	US Gov't Property <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			- <u>Northbound</u>			Bear Creek Rd Ramp <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	4	4	0	0	4	10	0	0	0	136	0	4
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	4	4	0	0	4	10	0	0	0	136	0	4
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	1	1	0	0	1	2	0	0	0	33	0	1
2024 Background Peak Hour Volume	5	5	0	0	5	12	0	0	0	169	0	5
% Entering	0%	0%	0%	0%	0%	0%	0%	0%	0%	85%	0%	0%
Entering Site Traffic	0	0	0	0	0	0	0	0	0	1,744	0	0
% Exiting	0%	0%	0%	0%	0%	85%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	123	0	0	0	0	0	0
Total Site Traffic	0	0	0	0	0	123	0	0	0	1,744	0	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	5	5	0	0	5	135	0	0	0	1,913	0	5

PM Peak Hour

Description	US Gov't Property <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			- <u>Northbound</u>			Bear Creek Rd Ramp <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	4	4	0	0	4	90	0	0	0	7	0	4
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	4	4	0	0	4	90	0	0	0	7	0	4
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	1	1	0	0	1	22	0	0	0	2	0	1
2024 Background Peak Hour Volume	5	5	0	0	5	112	0	0	0	9	0	5
% Entering	0%	0%	0%	0%	0%	0%	0%	0%	0%	85%	0%	0%
Entering Site Traffic	0	0	0	0	0	0	0	0	0	540	0	0
% Exiting	0%	0%	0%	0%	0%	85%	0%	0%	0%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	1510	0	0	0	0	0	0
Total Site Traffic	0	0	0	0	0	1,510	0	0	0	540	0	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	5	5	0	0	5	1,622	0	0	0	549	0	5

INTERSECTION VOLUME WORKSHEET

Intersection #5
E Bear Creek Rd at Site Driveway / E Bear Creek Rd

AM Peak Hour

Description	- <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			Site Driveway <u>Northbound</u>			E Bear Creek Rd <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	0	0	0	0	0	10	0	0	0	136	0	0
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	0	0	0	0	0	10	0	0	0	136	0	0
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	0	0	0	0	0	2	0	0	0	33	0	0
2024 Background Peak Hour Volume	0	0	0	0	0	12	0	0	0	169	0	0
% Entering	0%	0%	0%	15%	0%	0%	0%	0%	0%	0%	85%	0%
Entering Site Traffic	0	0	0	308	0	0	0	0	0	0	1,744	0
% Exiting	0%	0%	0%	0%	0%	0%	0%	85%	15%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	0	123	22	0	0	0
Total Site Traffic	0	0	0	308	0	0	0	123	22	0	1,744	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	0	0	0	308	0	12	0	123	22	169	1,744	0

PM Peak Hour

Description	- <u>Eastbound</u>			E Bear Creek Rd <u>Westbound</u>			Site Driveway <u>Northbound</u>			E Bear Creek Rd <u>Southbound</u>		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
2013 Raw Traffic Count	0	0	0	0	0	90	0	0	0	7	0	0
Balancing Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
2013 Peak Hour Volume	0	0	0	0	0	90	0	0	0	7	0	0
Annual Growth Rate	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Background Growth	0	0	0	0	0	22	0	0	0	2	0	0
2024 Background Peak Hour Volume	0	0	0	0	0	112	0	0	0	9	0	0
% Entering	0%	0%	0%	15%	0%	0%	0%	0%	0%	0%	85%	0%
Entering Site Traffic	0	0	0	95	0	0	0	0	0	0	540	0
% Exiting	0%	0%	0%	0%	0%	0%	0%	85%	15%	0%	0%	0%
Exiting Site Traffic	0	0	0	0	0	0	0	1510	267	0	0	0
Total Site Traffic	0	0	0	95	0	0	0	1,510	267	0	540	0
Traffic Rerouting	0	0	0	0	0	0	0	0	0	0	0	0
2024 Future Scenario 2 Peak Hour Volume	0	0	0	95	0	112	0	1,510	267	9	540	0

APPENDIX C – 2013 Existing Conditions Synchro / Sim Traffic / HCS Reports

HCM Unsignalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field.

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Sign Control – Used to model two-way, three-way, and all-way stop or yield control unsignalized intersections.

Grade – Percent slope of the roadway approaching the intersection.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Hourly Flow Rate – The hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other traffic-way; computed as the number of vehicles, bicycles, or person passing a point divided by the time interval (usually less than 1 hour) in which they pass; expressed as vehicles, bicycles, or persons per hour.

Pedestrians – An individual traveling by foot.

Lane width – The arithmetic mean of the lane widths of roadway in on direction, expressed in feet.

Walking Speed – The speed of pedestrians which is established to be 3.5 ft/sec per the HCM.

Percent Blockage – Queuing penalty for a storage bay based on the percent time the lane is blocked.

Right Turn Flare – A shared turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Median Type – The type of divider between directional lanes such as Two Way Left Turn Lane, or Divided (Concrete or landscape median)

Median Storage – The number of vehicles that can be stored in the median is equal to the median width divided by vehicle length. For a Two Way Left Turn Lane median, 2 vehicles can stored.

Upstream Signal – Controls capacity efficiency and saturation flow rate at downstream signals **pX** – number of unlocked vehicles in platoon.

vC – total conflicting volumes for minor street approach.

vC1 – stage 1 movement conflicting volumes for minor street approach.

vC2 – stage 2 movement conflicting volumes for minor street approach.

vCu – Unblocked volumes for minor street approach.

tC, single – The critical gap time for single stage crossing.

tC, 2 stage – the critical gap time for each stage of a two stage crossing.

tF – Follow up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle.

pO – The probability of a queue free state for this movement.

cM – The capacity for the movement. This value considers the impacts of two state gap acceptance and platooned flows. However this capacity does not consider the influence of shared lanes or flared right turns.

Volume Total – total volume for an approach/movement.

Volume Left – Total volume turning left.

Volume right – Total volume turning right.

cSH – The capacity for each lane considering the affects of sharing and flared right runs. The capacity of free movements is assumed to be 1700 vehicles per hour per lane.

Volume to Capacity – the ratio of flow rate to capacity for transportation facility

Queue Length 95th – the maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during an analysis period.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Lane LOS – LOS for each lane.

Approach Delay – Is the weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach.

Average Delay – The average of Uniform delay (90th, 70th, 50th, 30th, and 10th percentile volumes).

Intersection Capacity Utilization – This method compares the current volume to the intersection ultimate capacity.

ICU LOS - Based upon the critical flow ratio (ICU) for the intersection. The critical flow ratio is the sum of green plus clearance times required to serve the critical movements at the intersection divided by a reference cycle length. The ICU LOS is designed to be insensitive to the actual signal timing for the intersection.

Analysis Period – Duration of the analysis.

HCM Signalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Ideal Flow – This is the Ideal Saturated Flow and 1900 vehicles per hour per lane by default.

Storage Length – Length of a storage bay for a turn lane.

Storage Lanes – Number of Lanes with storage.

Satd. Flow (prot) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to protected (prot) operation.

Taper Length – Length of a lane before the storage bay begins usually designated with mini-skip stripes.

Satd. Flow (perm) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to permissive (perm) operation.

Flt Permitted – The permitted left-turn factor may vary slightly from the left-turn factor showing in other Synchro reports because these are calculated based on actuated green times for HCM compatibility.

Right turn on Red – A way to indicated if right turn on red is allowed or restricted.

Satd Flow (RTOR) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to right-turn on red (RTOR) operation.

Link Speed – The driver speed on the particular link corresponding to the posted speed limit sign.

Link Distance – The distance from center point to center point of a link or distance between intersections.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Heavy Vehicles % - The percent vehicles in the traffic volumes that are heavy trucks or busses.

Shared Lane Traffic % - The percent of turning traffic assigned to a shared lane.

Lane Group Flow – Combines the adjusted flow and traffic in shared lane values to assign net volumes to each lane group.

Enter Blocked Intersection – Controls the simulation modeling gridlock avoidance.

Lane Alignment – This setting allows the user to specify how a lane aligns through an intersection.

Median Width – The width of a median.

Link Offset – Setting used to offset the roadway alignment to the right or left of the centerline.

Crosswalk Width – Width of a crosswalk.

Two Way Left Turn Lane – This setting visually displays a TWLTL median .

Headway Factor – Based on the Ideal Saturation Flow, lane width factor, the grade factor, the parking factor, the bus stops factor, and the area factor but is not used in the capacity calculations in Synchro.

Turning Speed – Speed used for vehicles turning and simulation in Sim Traffic.

Turn Type – Setting used to set the treatment (perm, prot, overlap, etc...) for left and right-turn movements.

Protected Phases – The movements at signalized intersection that are made with no opposing or conflicting vehicular flow allowed.

Permitted Phases – The movements at signalized intersection that is made against an opposing or conflicting vehicular flow.

Detector Phase – Primary detector that determines which phases each lane group's detector are connected to. Calls are placed for lane groups, regardless of the current active phases.

Switch Phase – A Secondary phase that extends the entered phase when it is green, but does not place a call.

Minimum Initial – The minimum Green time per phase in seconds.

Minimum Split – The shortest allowable amount of time allowed for a phase in seconds.

Total Split – Includes the green, yellow, and all-red intervals assigned to a phase.

Maximum Green – Parameter represents the maximum amount of time that a green signal indication can be displayed in the presence of conflicting demand.

Yellow Time – This is the time each phase displays yellow.

All-Red Time – This is the time each phase displays all red clearance before the next phase.

Lost time Adjust – Dependent on driver reaction time, length of yellow time, yellow deceleration rate, intersection width, and approach speeds.

Lead/Lag – Used to determine the phase order.

Lead-Lag Optimize – Setting allowing Synchro to optimize the phase order.

Vehicle Extension – Used with actuated phases. A vehicle passing over a detector will extend the gap counter by the amount of time specified by the vehicle extension time.

Recall Mode – A means to provide reoccurring vehicle or pedestrian demand so a phase is serviced, even if no real demand exists on the phase.

Act Effct Green – The value representing the average green time observed while the signal is operating in actuated mode.

Actuated g/C Ratio – The average actuated green time divided by the actuated cycle length.

v/c Ratio - the ratio of flow rate to capacity.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Queue Delay – An analysis of the effects of queues and blocking on short links and short turning bays. This delay includes the analysis of spillback, starvation, and storage blocking.

Total Delay – The lane group Control Delay plus the Queue Delay.

LOS – The letter from A-F based on the length of delay.

Approach Delay – A volume weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach based on Total Delay.

Queue Lengths 50th - The maximum back of queue with 50th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Queue Length 95th – The maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Internal Link Dist – The distance between two intersections.

Turn Bay Length – Length of a turn lane.

Base Capacity – The capacity of a lane group if unimpeded.

Starvation Cap Reductn – Reduction to the base capacity due to starvation. Starvation is the congested caused by short upstream link in conjunction with poor/no coordination.

Spillback Cap Reductn – Reduction to the base capacity caused by short downstream link becoming filled up.

Storage Cap Reductn – Reduction to the base capacity caused when turn pocked cannot accommodate queue lengths.

Reduced v/c Ratio – Modified volume to capacity ratio with the adjustments to the base capacity.

Area Type – A setting that allows the user to choose it surroundings such as a Central Business District.

Cycle Length – The total time for a signal to complete one cycle.

Actuated Cycle Length – The average cycle length for an actuated signal.

Natural Cycle – The shortest cycle length that will give acceptable capacity.

Control Type – Setting allowing the user to choose unsignalized or the type of signalization.

Maximum v/c Ratio – The highest individual movement or lane group v/c ratio.

Intersection Signal Delay – The total delay for the intersection by taking the volume weighted average of all the Total Delays.

Intersection LOS – The LOS for the entire intersection by taking total intersection delay and converting it to a level A-F.

Intersection Capacity Utilization (ICU) – The sum of the ratios of approach volume divided by approach capacity for each leg of intersection which controls overall traffic signal timing plus an allowance for clearance times.

ICU Level of Service – Numerical value that gives insight into how an intersection is functioning and how much extra capacity is available to handle fluctuations and incidents.

Analysis Period - Duration of the analysis.

SIM Traffic Summary & Queuing and Blocking Report Definitions – Synchro 7

Start Time – Time the network seeding begins.

End Time – The end of the recorded peak period.

Total Time – Seeding time plus recording time.

Time recorded – length of time of recording. Typically the peak hour.

of Intervals – There are 3 interval types

Interval 0, Seeding – Duration long enough for vehicle to traverse from one side of the network to another including stops.

Interval 1, Recording – Duration is closest to cycle length, volume is adjusted 95th

Interval 2, Recording and Recovery – Duration 15 minutes, no volume adjustment

of Recorded Intvls – The number of intervals which were recorded.

Vehs Entered – The total number of vehicles that entered the network.

Vehs Exited – The total number of vehicles that exited the network .

Starting Vehs – The number of vehicles at start of interval.

Ending Vehs – The number of vehicles at end of interval.

Denied Entry Before – Vehicles unable to enter a link due to congestion at the beginning of the period.

Denied Entry After – Vehicles unable to enter a link due to congestion at the end of the period.

Travel Distance – Summation of the vehicle distance traveled.

Travel Time – Total time each vehicle was present in this area. Travel Time includes time spent by vehicles denied entry.

Total Delay – The total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices.

Total Stops – A count of vehicle stops. Whenever a vehicles speed drops below 10 ft/sec a stop is added. A vehicle is considered going again when is speed reaches 15 ft/sec.

Fuel Used – Calculation using fuel consumption parameters .

Directions Served – Indicates the movement being served.

Maximum Queue – Maximum back of queue observed for the entire analysis interval.

Average Queue – Average back of queue observed for the entire analysis interval.

95th Queue – A calculation equal to the average queue plus 1.65 standard deviations.

Link Distance – Internal distance of the link from stop bar to stop bar.

Upstream Blk Time – Proportion of the time that the upstream end of the lane is blocked.

Queuing Penalty – A rough measure of how many vehicles are affected by the blocking.













Storage Bay Dist – Length of a turning bay.

Storage Blk Time – Proportion of time that a lane is queued at the top of the storage.

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2013 Existing AM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	4	6	82	509	125	54	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	5	7	93	578	142	61	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	618	71	142				
vC1, stage 1 conf vol	142						
vC2, stage 2 conf vol	476						
vCu, unblocked vol	618	71	142				
tC, single (s)	7.0	7.0	4.1				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	99	99	94				
cM capacity (veh/h)	508	974	1438				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	11	93	289	289	71	71	61
Volume Left	5	93	0	0	0	0	0
Volume Right	7	0	0	0	0	0	61
cSH	1270	1438	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.06	0.17	0.17	0.04	0.04	0.04
Queue Length 95th (ft)	1	5	0	0	0	0	0
Control Delay (s)	10.1	7.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	10.1	1.1			0.0		
Approach LOS	B						
Intersection Summary							
Average Delay			0.9				
Intersection Capacity Utilization			24.1%		ICU Level of Service		A
Analysis Period (min)			15				













Lanes, Volumes, Timings
2: TN 327 & TN 58

2013 Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	162	7	41	2	2	0	16	428	9	13	382	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1795	1599	0	1827	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.733			0.820		0.402			0.475		
Satd. Flow (perm)	0	1379	1599	0	1535	0	749	3539	1583	894	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			47						10			50
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	192	47	0	4	0	18	486	10	15	434	50
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	22.0	22.0	0.0	22.0	22.0	0.0	14.0	38.0	38.0	24.0	24.0	24.0
Total Split (%)	36.7%	36.7%	0.0%	36.7%	36.7%	0.0%	23.3%	63.3%	63.3%	40.0%	40.0%	40.0%
Maximum Green (s)	15.0	15.0		15.0	15.0		7.0	31.0	31.0	17.0	17.0	17.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		12.8	42.3		12.7		22.5	23.7	23.7	21.7	21.7	21.7
Actuated g/C Ratio		0.30	1.00		0.30		0.53	0.56	0.56	0.51	0.51	0.51
v/c Ratio		0.46	0.03		0.01		0.03	0.25	0.01	0.03	0.24	0.06
Control Delay		17.4	0.0		12.8		6.8	7.3	4.0	11.4	10.2	4.9
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2013 Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		17.4	0.0		12.8		6.8	7.3	4.0	11.4	10.2	4.9
LOS		B	A		B		A	A	A	B	B	A
Approach Delay		14.0			12.8			7.2			9.7	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		31	0		1		2	33	0	2	30	0
Queue Length 95th (ft)		109	0		7		10	64	5	15	95	19
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		574	1599		640		624	2862	1282	501	1982	918
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.33	0.03		0.01		0.03	0.17	0.01	0.03	0.22	0.05

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 42.3

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 9.5

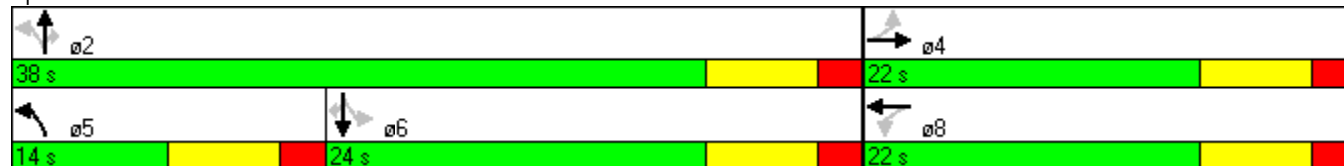
Intersection LOS: A

Intersection Capacity Utilization 45.2%

ICU Level of Service A

Analysis Period (min) 15




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

2013 Existing AM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	1	0	0	0	9	102	192	357	145	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	1	0	0	0	10	116	218	406	165	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1114	1332	166	1222	1224	225	167			334		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1114	1332	166	1222	1224	225	167			334		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	99			67		
cM capacity (veh/h)	138	103	878	115	119	814	1399			1220		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	1	0	10	334	406	167						
Volume Left	0	0	10	0	406	0						
Volume Right	1	0	0	218	0	2						
cSH	659	1700	1399	1700	1220	1700						
Volume to Capacity	0.00	0.00	0.01	0.20	0.33	0.10						
Queue Length 95th (ft)	0	0	1	0	37	0						
Control Delay (s)	10.5	0.0	7.6	0.0	9.4	0.0						
Lane LOS	B	A	A		A							
Approach Delay (s)	10.5	0.0	0.2		6.7							
Approach LOS	B	A										
Intersection Summary												
Average Delay			4.3									
Intersection Capacity Utilization			43.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp

2013 Existing AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	4	4	4	10	136	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	5	5	5	11	155	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5				18	5
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				18	5
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				84	100
cM capacity (veh/h)	1617				994	1076
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	9	5	11	159		
Volume Left	5	0	0	155		
Volume Right	0	0	11	5		
cSH	1617	1700	1700	996		
Volume to Capacity	0.00	0.00	0.01	0.16		
Queue Length 95th (ft)	0	0	0	14		
Control Delay (s)	3.6	0.0	0.0	9.3		
Lane LOS	A			A		
Approach Delay (s)	3.6	0.0		9.3		
Approach LOS				A		
Intersection Summary						
Average Delay			8.2			
Intersection Capacity Utilization			18.2%		ICU Level of Service	A
Analysis Period (min)			15			

SimTraffic Simulation Summary

2013 Existing AM

Summary of All Intervals

Start Time	6:20
End Time	7:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	2746
Vehs Exited	2750
Starting Vehs	30
Ending Vehs	26
Denied Entry Before	0
Denied Entry After	3
Travel Distance (mi)	842
Travel Time (hr)	26.2
Total Delay (hr)	5.4
Total Stops	739
Fuel Used (gal)	39.6

Interval #0 Information Seeding

Start Time	6:20
End Time	6:30
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	6:30
End Time	7:30
Total Time (min)	60

Volumes adjusted by Growth Factors.

Vehs Entered	2746
Vehs Exited	2750
Starting Vehs	30
Ending Vehs	26
Denied Entry Before	0
Denied Entry After	3
Travel Distance (mi)	842
Travel Time (hr)	26.2
Total Delay (hr)	5.4
Total Stops	739
Fuel Used (gal)	39.6

Queuing and Blocking Report

2013 Existing AM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	NB
Directions Served	L	L
Maximum Queue (ft)	30	31
Average Queue (ft)	4	10
95th Queue (ft)	21	33
Link Distance (ft)	660	178
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	102	26	43	93	106	28	16	105	134	51
Average Queue (ft)	55	3	9	27	41	3	3	23	35	9
95th Queue (ft)	88	16	27	60	83	16	11	62	74	32
Link Distance (ft)		295		232	232	232	191	191	191	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		150							125
Storage Blk Time (%)									0	
Queuing Penalty (veh)									0	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	NB	SB
Directions Served	R	L	L
Maximum Queue (ft)	17	7	94
Average Queue (ft)	1	0	28
95th Queue (ft)	8	3	63
Link Distance (ft)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	25	100	200
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Queuing and Blocking Report

2013 Existing AM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	62
Average Queue (ft)	31
95th Queue (ft)	49
Link Distance (ft)	660
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Existing AM 2013
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2013
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 140 veh/h
Opposing direction volume, Vo 14 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.7	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	0.966	0.966
Grade adj. factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	165 pc/h	16 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed volume,(note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access points,(note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSD	38.1	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.995	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	160 pc/h	16 pc/h
Base percent time-spent-following,(note-4) BPTSFd	17.7 %	
Adjustment for no-passing zones, fnp	46.1	
Percent time-spent-following, PTSFd	59.7 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.10	
Peak 15-min vehicle-miles of travel, VMT15	32	veh-mi
Peak-hour vehicle-miles of travel, VMT60	112	veh-mi
Peak 15-min total travel time, TT15	0.8	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	38.1	mi/h
Percent time-spent-following, PTSFd (from above)	59.7	
Level of service,(note-1) LOSd (from above)	C	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.08	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	13.00	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.58	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h













Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2013 Existing PM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	29	61	5	206	895	2	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	33	69	6	234	1017	2	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	1145	509	1017				
vC1, stage 1 conf vol	1017						
vC2, stage 2 conf vol	128						
vCu, unblocked vol	1145	509	1017				
tC, single (s)	7.0	7.0	4.1				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	88	86	99				
cM capacity (veh/h)	283	507	678				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	102	6	117	117	509	509	2
Volume Left	33	6	0	0	0	0	0
Volume Right	69	0	0	0	0	0	2
cSH	748	678	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.01	0.07	0.07	0.30	0.30	0.00
Queue Length 95th (ft)	12	1	0	0	0	0	0
Control Delay (s)	15.2	10.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	B					
Approach Delay (s)	15.2	0.2			0.0		
Approach LOS	C						
Intersection Summary							
Average Delay			1.2				
Intersection Capacity Utilization			35.2%		ICU Level of Service		A
Analysis Period (min)			15				













Lanes, Volumes, Timings
2: TN 327 & TN 58

2013 Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	0	48	11	7	26	42	504	3	1	647	177
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1787	1599	0	1713	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.724			0.891		0.290			0.436		
Satd. Flow (perm)	0	1362	1599	0	1545	0	540	3539	1583	820	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			55		30				3			201
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	88	55	0	50	0	48	573	3	1	735	201
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	16.0	16.0	0.0	16.0	16.0	0.0	14.0	44.0	44.0	30.0	30.0	30.0
Total Split (%)	26.7%	26.7%	0.0%	26.7%	26.7%	0.0%	23.3%	73.3%	73.3%	50.0%	50.0%	50.0%
Maximum Green (s)	9.0	9.0		9.0	9.0		7.0	37.0	37.0	23.0	23.0	23.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		10.6	45.3		10.6		31.5	34.2	34.2	29.9	29.9	29.9
Actuated g/C Ratio		0.23	1.00		0.23		0.70	0.75	0.75	0.66	0.66	0.66
v/c Ratio		0.28	0.03		0.13		0.08	0.21	0.00	0.00	0.31	0.18
Control Delay		20.9	0.0		12.4		4.3	4.0	2.7	10.0	9.0	2.7
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2013 Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		20.9	0.0		12.4		4.3	4.0	2.7	10.0	9.0	2.7
LOS		C	A		B		A	A	A	A	A	A
Approach Delay		12.9			12.4			4.0			7.6	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		16	0		3		5	37	0	0	50	0
Queue Length 95th (ft)		63	0		30		13	54	2	2	137	30
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		352	1599		422		636	3033	1357	568	2453	1170
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.25	0.03		0.12		0.08	0.19	0.00	0.00	0.30	0.17

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 45.3

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.31

Intersection Signal Delay: 6.9

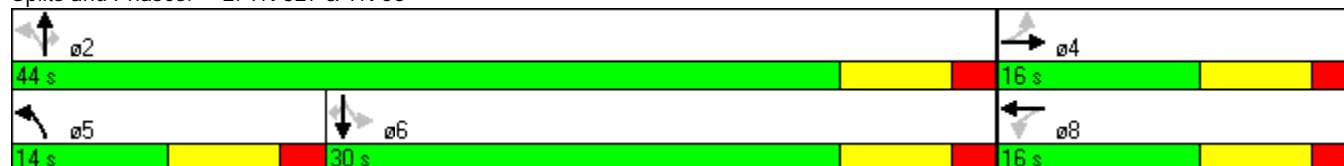
Intersection LOS: A

Intersection Capacity Utilization 49.0%

ICU Level of Service A

Analysis Period (min) 15




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

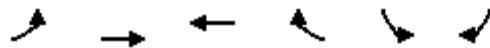
2013 Existing PM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	0	22	122	10	0	5	308	7	7	291	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	12	0	25	139	11	0	6	350	8	8	331	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	714	716	331	724	713	354	332			358		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	714	716	331	724	713	354	332			358		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	96	57	97	100	100			99		
cM capacity (veh/h)	337	354	710	326	353	690	1216			1195		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	38	150	6	358	8	332						
Volume Left	12	139	6	0	8	0						
Volume Right	25	0	0	8	0	1						
cSH	1012	328	1216	1700	1195	1700						
Volume to Capacity	0.04	0.46	0.00	0.21	0.01	0.20						
Queue Length 95th (ft)	3	57	0	0	1	0						
Control Delay (s)	12.2	24.9	8.0	0.0	8.0	0.0						
Lane LOS	B	C	A		A							
Approach Delay (s)	12.2	24.9	0.1		0.2							
Approach LOS	B	C										
Intersection Summary												
Average Delay			4.8									
Intersection Capacity Utilization			37.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp

2013 Existing PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	4	4	4	90	7	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	5	5	5	102	8	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5				18	5
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				18	5
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1617				994	1076
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	9	5	102	12		
Volume Left	5	0	0	8		
Volume Right	0	0	102	5		
cSH	1617	1700	1700	1022		
Volume to Capacity	0.00	0.00	0.06	0.01		
Queue Length 95th (ft)	0	0	0	1		
Control Delay (s)	3.6	0.0	0.0	8.6		
Lane LOS	A			A		
Approach Delay (s)	3.6	0.0		8.6		
Approach LOS				A		
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		15.6%		ICU Level of Service		A
Analysis Period (min)		15				

SimTraffic Simulation Summary

2013 Existing PM

Summary of All Intervals

Start Time	5:20
End Time	6:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	3561
Vehs Exited	3553
Starting Vehs	21
Ending Vehs	29
Denied Entry Before	0
Denied Entry After	1
Travel Distance (mi)	1064
Travel Time (hr)	28.6
Total Delay (hr)	5.0
Total Stops	656
Fuel Used (gal)	46.9

Interval #0 Information Seeding

Start Time	5:20
End Time	5:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:30
End Time	6:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	3561
Vehs Exited	3553
Starting Vehs	21
Ending Vehs	29
Denied Entry Before	0
Denied Entry After	1
Travel Distance (mi)	1064
Travel Time (hr)	28.6
Total Delay (hr)	5.0
Total Stops	656
Fuel Used (gal)	46.9

Queuing and Blocking Report

2013 Existing PM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	NB
Directions Served	L	L
Maximum Queue (ft)	52	31
Average Queue (ft)	17	4
95th Queue (ft)	45	19
Link Distance (ft)	660	178
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	T	T	R
Maximum Queue (ft)	56	52	64	68	68	63	113	53
Average Queue (ft)	25	24	13	19	27	31	54	27
95th Queue (ft)	51	49	35	48	60	67	101	47
Link Distance (ft)		295		232	232	191	191	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	300		150					125
Storage Blk Time (%)							0	
Queuing Penalty (veh)							0	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	WB	SB
Directions Served	LT	R	LTR	L
Maximum Queue (ft)	47	22	128	3
Average Queue (ft)	2	9	56	0
95th Queue (ft)	16	23	107	1
Link Distance (ft)	964		836	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25		200
Storage Blk Time (%)	1	4		
Queuing Penalty (veh)	0	0		

Queuing and Blocking Report

2013 Existing PM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	26
Average Queue (ft)	11
95th Queue (ft)	31
Link Distance (ft)	660
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 1

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Existing PM 2013
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2013
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 94 veh/h
Opposing direction volume, Vo 11 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.7	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.966	0.966
Grade adj. factor, (note-1) fG	1.00	1.00
Directional flow rate, (note-2) vi	111 pc/h	13 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	4.2	mi/h
Adj. for access points, (note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSD	38.5	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.995	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	107 pc/h	13 pc/h
Base percent time-spent-following,(note-4) BPTSFd	12.4 %	
Adjustment for no-passing zones, fnp	38.7	
Percent time-spent-following, PTSFd	46.9 %	

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	21	veh-mi
Peak-hour vehicle-miles of travel, VMT60	75	veh-mi
Peak 15-min total travel time, TT15	0.5	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	38.5	mi/h
Percent time-spent-following, PTSFd (from above)	46.9	
Level of service,(note-1) LOSd (from above)	B	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.08	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	13.00	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.58	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h

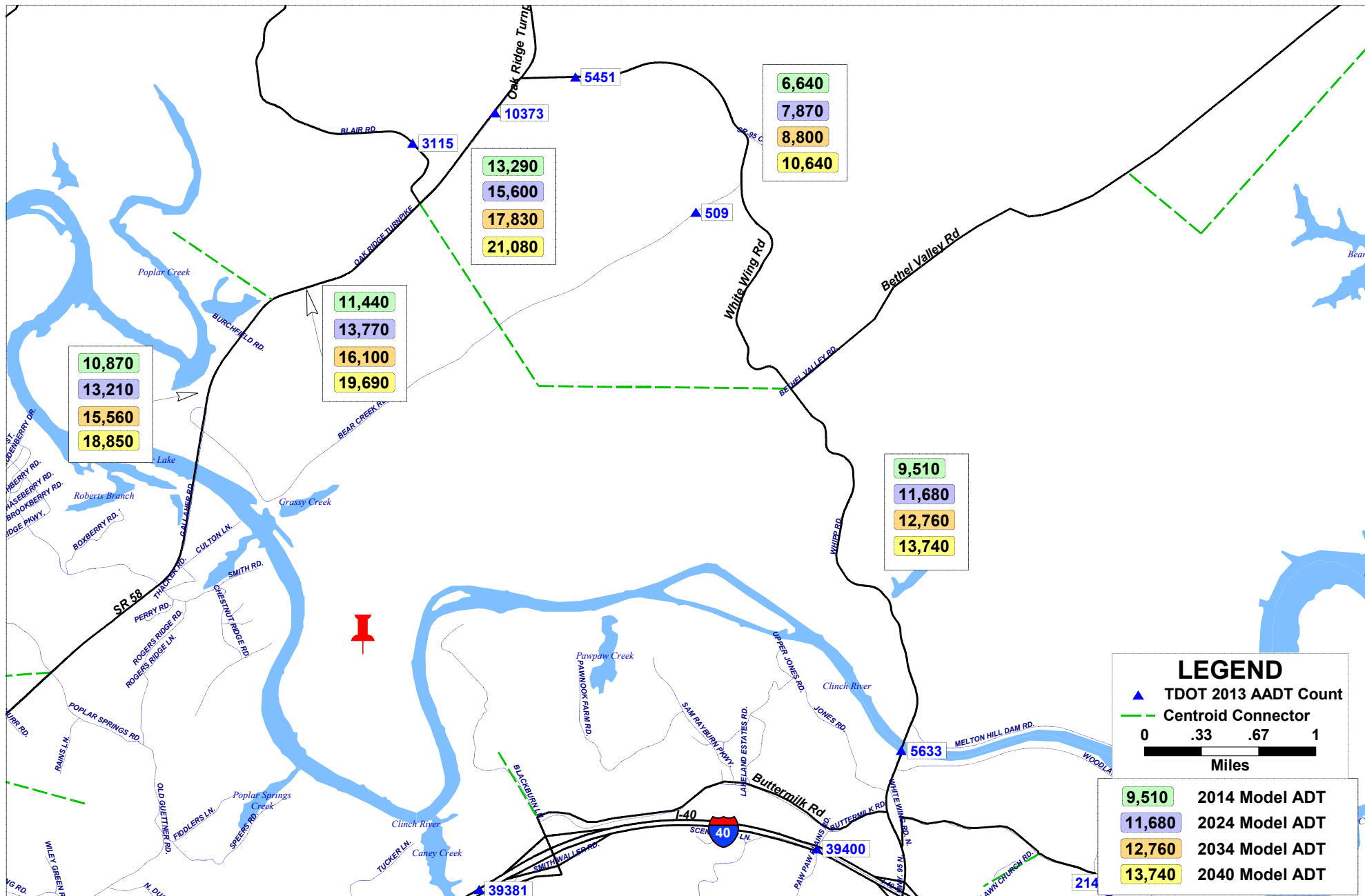
Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

APPENDIX D – Knoxville TPO Travel Demand Model Output

Knoxville TPO Travel Demand Model Output - Clinch River TVA Area

Prepared by TPO Staff 6/10/14



APPENDIX E – 2024 Background Conditions Synchro / Sim Traffic / HCS Reports

HCM Unsignalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field.

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Sign Control – Used to model two-way, three-way, and all-way stop or yield control unsignalized intersections.

Grade – Percent slope of the roadway approaching the intersection.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Hourly Flow Rate – The hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other traffic-way; computed as the number of vehicles, bicycles, or person passing a point divided by the time interval (usually less than 1 hour) in which they pass; expressed as vehicles, bicycles, or persons per hour.

Pedestrians – An individual traveling by foot.

Lane width – The arithmetic mean of the lane widths of roadway in on direction, expressed in feet.

Walking Speed – The speed of pedestrians which is established to be 3.5 ft/sec per the HCM.

Percent Blockage – Queuing penalty for a storage bay based on the percent time the lane is blocked.

Right Turn Flare – A shared turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Median Type – The type of divider between directional lanes such as Two Way Left Turn Lane, or Divided (Concrete or landscape median)

Median Storage – The number of vehicles that can be stored in the median is equal to the median width divided by vehicle length. For a Two Way Left Turn Lane median, 2 vehicles can stored.

Upstream Signal – Controls capacity efficiency and saturation flow rate at downstream signals **pX** – number of unlocked vehicles in platoon.

vC – total conflicting volumes for minor street approach.

vC1 – stage 1 movement conflicting volumes for minor street approach.

vC2 – stage 2 movement conflicting volumes for minor street approach.

vCu – Unblocked volumes for minor street approach.

tC, single – The critical gap time for single stage crossing.

tC, 2 stage – the critical gap time for each stage of a two stage crossing.

tF – Follow up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle.

pO – The probability of a queue free state for this movement.

cM – The capacity for the movement. This value considers the impacts of two state gap acceptance and platooned flows. However this capacity does not consider the influence of shared lanes or flared right turns.

Volume Total – total volume for an approach/movement.

Volume Left – Total volume turning left.

Volume right – Total volume turning right.

cSH – The capacity for each lane considering the affects of sharing and flared right runs. The capacity of free movements is assumed to be 1700 vehicles per hour per lane.

Volume to Capacity – the ratio of flow rate to capacity for transportation facility

Queue Length 95th – the maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during an analysis period.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Lane LOS – LOS for each lane.

Approach Delay – Is the weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach.

Average Delay – The average of Uniform delay (90th, 70th, 50th, 30th, and 10th percentile volumes).

Intersection Capacity Utilization – This method compares the current volume to the intersection ultimate capacity.

ICU LOS - Based upon the critical flow ratio (ICU) for the intersection. The critical flow ratio is the sum of green plus clearance times required to serve the critical movements at the intersection divided by a reference cycle length. The ICU LOS is designed to be insensitive to the actual signal timing for the intersection.

Analysis Period – Duration of the analysis.

HCM Signalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Ideal Flow – This is the Ideal Saturated Flow and 1900 vehicles per hour per lane by default.

Storage Length – Length of a storage bay for a turn lane.

Storage Lanes – Number of Lanes with storage.

Satd. Flow (prot) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to protected (prot) operation.

Taper Length – Length of a lane before the storage bay begins usually designated with mini-skip stripes.

Satd. Flow (perm) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to permissive (perm) operation.

Flt Permitted – The permitted left-turn factor may vary slightly from the left-turn factor showing in other Synchro reports because these are calculated based on actuated green times for HCM compatibility.

Right turn on Red – A way to indicated if right turn on red is allowed or restricted.

Satd Flow (RTOR) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to right-turn on red (RTOR) operation.

Link Speed – The driver speed on the particular link corresponding to the posted speed limit sign.

Link Distance – The distance from center point to center point of a link or distance between intersections.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Heavy Vehicles % - The percent vehicles in the traffic volumes that are heavy trucks or busses.

Shared Lane Traffic % - The percent of turning traffic assigned to a shared lane.

Lane Group Flow – Combines the adjusted flow and traffic in shared lane values to assign net volumes to each lane group.

Enter Blocked Intersection – Controls the simulation modeling gridlock avoidance.

Lane Alignment – This setting allows the user to specify how a lane aligns through an intersection.

Median Width – The width of a median.

Link Offset – Setting used to offset the roadway alignment to the right or left of the centerline.

Crosswalk Width – Width of a crosswalk.

Two Way Left Turn Lane – This setting visually displays a TWLTL median .

Headway Factor – Based on the Ideal Saturation Flow, lane width factor, the grade factor, the parking factor, the bus stops factor, and the area factor but is not used in the capacity calculations in Synchro.

Turning Speed – Speed used for vehicles turning and simulation in Sim Traffic.

Turn Type – Setting used to set the treatment (perm, prot, overlap, etc...) for left and right-turn movements.

Protected Phases – The movements at signalized intersection that are made with no opposing or conflicting vehicular flow allowed.

Permitted Phases – The movements at signalized intersection that is made against an opposing or conflicting vehicular flow.

Detector Phase – Primary detector that determines which phases each lane group's detector are connected to. Calls are placed for lane groups, regardless of the current active phases.

Switch Phase – A Secondary phase that extends the entered phase when it is green, but does not place a call.

Minimum Initial – The minimum Green time per phase in seconds.

Minimum Split – The shortest allowable amount of time allowed for a phase in seconds.

Total Split – Includes the green, yellow, and all-red intervals assigned to a phase.

Maximum Green – Parameter represents the maximum amount of time that a green signal indication can be displayed in the presence of conflicting demand.

Yellow Time – This is the time each phase displays yellow.

All-Red Time – This is the time each phase displays all red clearance before the next phase.

Lost time Adjust – Dependent on driver reaction time, length of yellow time, yellow deceleration rate, intersection width, and approach speeds.

Lead/Lag – Used to determine the phase order.

Lead-Lag Optimize – Setting allowing Synchro to optimize the phase order.

Vehicle Extension – Used with actuated phases. A vehicle passing over a detector will extend the gap counter by the amount of time specified by the vehicle extension time.

Recall Mode – A means to provide reoccurring vehicle or pedestrian demand so a phase is serviced, even if no real demand exists on the phase.

Act Effct Green – The value representing the average green time observed while the signal is operating in actuated mode.

Actuated g/C Ratio – The average actuated green time divided by the actuated cycle length.

v/c Ratio - the ratio of flow rate to capacity.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Queue Delay – An analysis of the effects of queues and blocking on short links and short turning bays. This delay includes the analysis of spillback, starvation, and storage blocking.

Total Delay – The lane group Control Delay plus the Queue Delay.

LOS – The letter from A-F based on the length of delay.

Approach Delay – A volume weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach based on Total Delay.

Queue Lengths 50th - The maximum back of queue with 50th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Queue Length 95th – The maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Internal Link Dist – The distance between two intersections.

Turn Bay Length – Length of a turn lane.

Base Capacity – The capacity of a lane group if unimpeded.

Starvation Cap Reductn – Reduction to the base capacity due to starvation. Starvation is the congested caused by short upstream link in conjunction with poor/no coordination.

Spillback Cap Reductn – Reduction to the base capacity caused by short downstream link becoming filled up.

Storage Cap Reductn – Reduction to the base capacity caused when turn pocked cannot accommodate queue lengths.

Reduced v/c Ratio – Modified volume to capacity ratio with the adjustments to the base capacity.

Area Type – A setting that allows the user to choose it surroundings such as a Central Business District.

Cycle Length – The total time for a signal to complete one cycle.

Actuated Cycle Length – The average cycle length for an actuated signal.

Natural Cycle – The shortest cycle length that will give acceptable capacity.

Control Type – Setting allowing the user to choose unsignalized or the type of signalization.

Maximum v/c Ratio – The highest individual movement or lane group v/c ratio.

Intersection Signal Delay – The total delay for the intersection by taking the volume weighted average of all the Total Delays.

Intersection LOS – The LOS for the entire intersection by taking total intersection delay and converting it to a level A-F.

Intersection Capacity Utilization (ICU) – The sum of the ratios of approach volume divided by approach capacity for each leg of intersection which controls overall traffic signal timing plus an allowance for clearance times.

ICU Level of Service – Numerical value that gives insight into how an intersection is functioning and how much extra capacity is available to handle fluctuations and incidents.

Analysis Period - Duration of the analysis.

SIM Traffic Summary & Queuing and Blocking Report Definitions – Synchro 7

Start Time – Time the network seeding begins.

End Time – The end of the recorded peak period.

Total Time – Seeding time plus recording time.

Time recorded – length of time of recording. Typically the peak hour.

of Intervals – There are 3 interval types

Interval 0, Seeding – Duration long enough for vehicle to traverse from one side of the network to another including stops.

Interval 1, Recording – Duration is closest to cycle length, volume is adjusted 95th

Interval 2, Recording and Recovery – Duration 15 minutes, no volume adjustment

of Recorded Intvls – The number of intervals which were recorded.

Vehs Entered – The total number of vehicles that entered the network.

Vehs Exited – The total number of vehicles that exited the network .

Starting Vehs – The number of vehicles at start of interval.

Ending Vehs – The number of vehicles at end of interval.

Denied Entry Before – Vehicles unable to enter a link due to congestion at the beginning of the period.

Denied Entry After – Vehicles unable to enter a link due to congestion at the end of the period.

Travel Distance – Summation of the vehicle distance traveled.

Travel Time – Total time each vehicle was present in this area. Travel Time includes time spent by vehicles denied entry.

Total Delay – The total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices.

Total Stops – A count of vehicle stops. Whenever a vehicles speed drops below 10 ft/sec a stop is added. A vehicle is considered going again when is speed reaches 15 ft/sec.

Fuel Used – Calculation using fuel consumption parameters .

Directions Served – Indicates the movement being served.

Maximum Queue – Maximum back of queue observed for the entire analysis interval.

Average Queue – Average back of queue observed for the entire analysis interval.

95th Queue – A calculation equal to the average queue plus 1.65 standard deviations.

Link Distance – Internal distance of the link from stop bar to stop bar.

Upstream Blk Time – Proportion of the time that the upstream end of the lane is blocked.

Queuing Penalty – A rough measure of how many vehicles are affected by the blocking.













Storage Bay Dist – Length of a turning bay.

Storage Blk Time – Proportion of time that a lane is queued at the top of the storage.

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2024 Background AM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	5	7	102	633	155	67	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	6	8	116	719	176	76	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLT		
Median storage (veh)					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	768	88	176				
vC1, stage 1 conf vol	176						
vC2, stage 2 conf vol	591						
vCu, unblocked vol	768	88	176				
tC, single (s)	7.0	7.0	4.1				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	99	99	92				
cM capacity (veh/h)	432	949	1398				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	14	116	360	360	88	88	76
Volume Left	6	116	0	0	0	0	0
Volume Right	8	0	0	0	0	0	76
cSH	1037	1398	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.08	0.21	0.21	0.05	0.05	0.04
Queue Length 95th (ft)	1	7	0	0	0	0	0
Control Delay (s)	10.7	7.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	10.7	1.1			0.0		
Approach LOS	B						
Intersection Summary							
Average Delay			1.0				
Intersection Capacity Utilization			27.5%		ICU Level of Service		A
Analysis Period (min)			15				













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	9	51	2	2	0	20	532	11	16	475	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1795	1599	0	1827	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.733			0.842		0.333			0.423		
Satd. Flow (perm)	0	1379	1599	0	1576	0	620	3539	1583	796	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			58						12			62
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	238	58	0	4	0	23	605	12	18	540	62
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	23.0	23.0	0.0	23.0	23.0	0.0	14.0	37.0	37.0	23.0	23.0	23.0
Total Split (%)	38.3%	38.3%	0.0%	38.3%	38.3%	0.0%	23.3%	61.7%	61.7%	38.3%	38.3%	38.3%
Maximum Green (s)	16.0	16.0		16.0	16.0		7.0	30.0	30.0	16.0	16.0	16.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		14.1	44.6		14.1		20.2	20.2	20.2	18.1	18.1	18.1
Actuated g/C Ratio		0.32	1.00		0.32		0.45	0.45	0.45	0.41	0.41	0.41
v/c Ratio		0.54	0.04		0.01		0.04	0.38	0.02	0.06	0.38	0.09
Control Delay		18.7	0.0		12.0		7.5	9.1	4.3	12.5	12.0	4.9
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings 2: TN 327 & TN 58

2024 Background AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		18.7	0.0		12.0		7.5	9.1	4.3	12.5	12.0	4.9
LOS		B	A		B		A	A	A	B	B	A
Approach Delay		15.1			12.0			9.0			11.3	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		40	0		1		3	47	0	2	42	0
Queue Length 95th (ft)		133	0		7		12	84	6	17	122	21
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		571	1599		652		519	2605	1168	346	1537	730
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.42	0.04		0.01		0.04	0.23	0.01	0.05	0.35	0.08

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 44.6

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 11.1

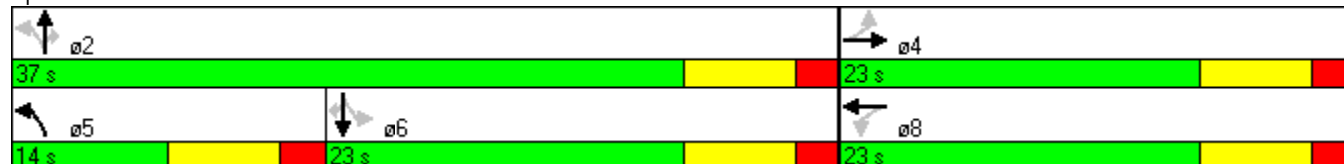
Intersection LOS: B

Intersection Capacity Utilization 47.4%

ICU Level of Service A

Analysis Period (min) 15




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

2024 Background AM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	1	0	0	0	11	127	239	444	180	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	1	0	0	0	12	144	272	505	205	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1384	1656	206	1519	1521	280	207			416		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1384	1656	206	1519	1521	280	207			416		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	99			56		
cM capacity (veh/h)	79	55	835	63	65	759	1352			1138		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	1	0	12	416	505	207						
Volume Left	0	0	12	0	505	0						
Volume Right	1	0	0	272	0	2						
cSH	626	1700	1352	1700	1138	1700						
Volume to Capacity	0.00	0.00	0.01	0.24	0.44	0.12						
Queue Length 95th (ft)	0	0	1	0	58	0						
Control Delay (s)	10.8	0.0	7.7	0.0	10.7	0.0						
Lane LOS	B	A	A		B							
Approach Delay (s)	10.8	0.0	0.2		7.6							
Approach LOS	B	A										
Intersection Summary												
Average Delay			4.8									
Intersection Capacity Utilization			52.6%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp

2024 Background AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	12	169	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	14	192	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				81	99
cM capacity (veh/h)	1615				988	1074
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	14	198		
Volume Left	6	0	0	192		
Volume Right	0	0	14	6		
cSH	1615	1700	1700	990		
Volume to Capacity	0.00	0.00	0.01	0.20		
Queue Length 95th (ft)	0	0	0	19		
Control Delay (s)	3.6	0.0	0.0	9.5		
Lane LOS	A			A		
Approach Delay (s)	3.6	0.0		9.5		
Approach LOS				A		
Intersection Summary						
Average Delay			8.4			
Intersection Capacity Utilization			21.1%		ICU Level of Service	A
Analysis Period (min)			15			

SimTraffic Simulation Summary
2024 Background AM

Summary of All Intervals

Start Time	6:20
End Time	7:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	3421
Vehs Exited	3429
Starting Vehs	36
Ending Vehs	28
Denied Entry Before	3
Denied Entry After	0
Travel Distance (mi)	1050
Travel Time (hr)	32.9
Total Delay (hr)	7.3
Total Stops	944
Fuel Used (gal)	49.4

Interval #0 Information Seeding

Start Time	6:20
End Time	6:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	6:30
End Time	7:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	3421
Vehs Exited	3429
Starting Vehs	36
Ending Vehs	28
Denied Entry Before	3
Denied Entry After	0
Travel Distance (mi)	1050
Travel Time (hr)	32.9
Total Delay (hr)	7.3
Total Stops	944
Fuel Used (gal)	49.4

Queuing and Blocking Report

2024 Background AM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	NB
Directions Served	L	L
Maximum Queue (ft)	30	52
Average Queue (ft)	2	13
95th Queue (ft)	14	40
Link Distance (ft)	660	178
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	140	26	21	127	126	25	12	96	106	54
Average Queue (ft)	63	3	5	44	45	2	2	29	38	15
95th Queue (ft)	114	16	20	88	83	12	10	68	75	44
Link Distance (ft)		295		232	232	232	191	191	191	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		150							125
Storage Blk Time (%)									0	
Queuing Penalty (veh)									0	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	NB	NB	SB
Directions Served	R	L	TR	L
Maximum Queue (ft)	16	1	13	113
Average Queue (ft)	1	0	1	36
95th Queue (ft)	5	0	7	79
Link Distance (ft)			1112	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	25	100		200
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Queuing and Blocking Report
2024 Background AM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	51
Average Queue (ft)	39
95th Queue (ft)	57
Link Distance (ft)	660
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Background AM 2024
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2024
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 174 veh/h
Opposing direction volume, Vo 17 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.7	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.966	0.966
Grade adj. factor, (note-1) fG	1.00	1.00
Directional flow rate, (note-2) vi	205 pc/h	20 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	4.2	mi/h
Adj. for access points, (note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSD	37.8	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.995	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	199 pc/h	19 pc/h
Base percent time-spent-following,(note-4) BPTSFd	21.5 %	
Adjustment for no-passing zones, fnp	46.4	
Percent time-spent-following, PTSFd	63.8 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.12	
Peak 15-min vehicle-miles of travel, VMT15	40	veh-mi
Peak-hour vehicle-miles of travel, VMT60	139	veh-mi
Peak 15-min total travel time, TT15	1.1	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	37.8	mi/h
Percent time-spent-following, PTSFd (from above)	63.8	
Level of service,(note-1) LOSd (from above)	C	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.08	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	13.00	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.58	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h













Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

HCM Unsignalized Intersection Capacity Analysis

1: Bear Creek Ramp & TN 58






















2024 Background PM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	36	76	6	256	1113	2	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	41	86	7	291	1265	2	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	1424	632	1265				
vC1, stage 1 conf vol	1265						
vC2, stage 2 conf vol	159						
vCu, unblocked vol	1424	632	1265				
tC, single (s)	7.0	7.0	4.1				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	80	79	99				
cM capacity (veh/h)	207	420	545				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	127	7	145	145	632	632	2
Volume Left	41	7	0	0	0	0	0
Volume Right	86	0	0	0	0	0	2
cSH	620	545	1700	1700	1700	1700	1700
Volume to Capacity	0.21	0.01	0.09	0.09	0.37	0.37	0.00
Queue Length 95th (ft)	19	1	0	0	0	0	0
Control Delay (s)	19.2	11.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	B					
Approach Delay (s)	19.2	0.3			0.0		
Approach LOS	C						
Intersection Summary							
Average Delay			1.5				
Intersection Capacity Utilization			42.1%		ICU Level of Service		A
Analysis Period (min)			15				

Lanes, Volumes, Timings













2: TN 327 & TN 58

2024 Background PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	60	14	9	32	52	627	4	1	804	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1787	1599	0	1716	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.717			0.877		0.222			0.381		
Satd. Flow (perm)	0	1349	1599	0	1525	0	414	3539	1583	717	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			68		36				5			250
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	68	0	62	0	59	712	5	1	914	250
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	15.0	15.0	0.0	15.0	15.0	0.0	14.0	45.0	45.0	31.0	31.0	31.0
Total Split (%)	25.0%	25.0%	0.0%	25.0%	25.0%	0.0%	23.3%	75.0%	75.0%	51.7%	51.7%	51.7%
Maximum Green (s)	8.0	8.0		8.0	8.0		7.0	38.0	38.0	24.0	24.0	24.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		10.8	48.0		10.7		35.1	38.3	38.3	31.6	31.6	31.6
Actuated g/C Ratio		0.22	1.00		0.22		0.73	0.80	0.80	0.66	0.66	0.66
v/c Ratio		0.36	0.04		0.17		0.10	0.25	0.00	0.00	0.39	0.22
Control Delay		25.0	0.1		13.9		3.7	3.4	2.2	10.0	10.3	2.4
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings 2: TN 327 & TN 58

2024 Background PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		25.0	0.1		13.9		3.7	3.4	2.2	10.0	10.3	2.4
LOS		C	A		B		A	A	A	A	B	A
Approach Delay		15.4			13.9			3.4			8.6	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)		35	0		8		6	45	0	0	126	0
Queue Length 95th (ft)		77	0		35		15	64	2	2	173	31
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		318	1599		387		590	2840	1271	475	2342	1143
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.34	0.04		0.16		0.10	0.25	0.00	0.00	0.39	0.22

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 48

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 7.5

Intersection LOS: A

Intersection Capacity Utilization 53.5%

ICU Level of Service A

Analysis Period (min) 15




















Splits and Phases: 2: TN 327 & TN 58

 ø2	 ø4
45 s	15 s
 ø5	 ø8
14 s	15 s
 ø6	
31 s	

HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

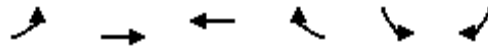
2024 Background PM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	14	0	27	152	12	0	6	383	9	9	362	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	16	0	31	173	14	0	7	435	10	10	411	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	888	891	412	901	887	440	412			445		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	888	891	412	901	887	440	412			445		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	95	29	95	100	99			99		
cM capacity (veh/h)	254	279	640	244	279	617	1136			1109		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	47	186	7	445	10	412						
Volume Left	16	173	7	0	10	0						
Volume Right	31	0	0	10	0	1						
cSH	743	246	1136	1700	1109	1700						
Volume to Capacity	0.06	0.76	0.01	0.26	0.01	0.24						
Queue Length 95th (ft)	5	136	0	0	1	0						
Control Delay (s)	14.1	54.3	8.2	0.0	8.3	0.0						
Lane LOS	B	F	A		A							
Approach Delay (s)	14.1	54.3	0.1		0.2							
Approach LOS	B	F										
Intersection Summary												
Average Delay			9.9									
Intersection Capacity Utilization			43.1%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp

2024 Background PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	112	9	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	127	10	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1615				988	1074
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	127	16		
Volume Left	6	0	0	10		
Volume Right	0	0	127	6		
cSH	1615	1700	1700	1017		
Volume to Capacity	0.00	0.00	0.07	0.02		
Queue Length 95th (ft)	0	0	0	1		
Control Delay (s)	3.6	0.0	0.0	8.6		
Lane LOS	A			A		
Approach Delay (s)	3.6	0.0		8.6		
Approach LOS				A		
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			16.9%		ICU Level of Service	A
Analysis Period (min)			15			

SimTraffic Simulation Summary

2024 Background PM

Summary of All Intervals

Start Time	5:20
End Time	6:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	4547
Vehs Exited	4535
Starting Vehs	35
Ending Vehs	47
Denied Entry Before	0
Denied Entry After	0
Travel Distance (mi)	1354
Travel Time (hr)	37.8
Total Delay (hr)	7.5
Total Stops	794
Fuel Used (gal)	60.5

Interval #0 Information Seeding

Start Time	5:20
End Time	5:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:30
End Time	6:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	4547
Vehs Exited	4535
Starting Vehs	35
Ending Vehs	47
Denied Entry Before	0
Denied Entry After	0
Travel Distance (mi)	1354
Travel Time (hr)	37.8
Total Delay (hr)	7.5
Total Stops	794
Fuel Used (gal)	60.5

Queuing and Blocking Report

2024 Background PM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	NB
Directions Served	L	L
Maximum Queue (ft)	118	31
Average Queue (ft)	34	3
95th Queue (ft)	76	18
Link Distance (ft)	660	178
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	4	
Queuing Penalty (veh)	3	

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	T	T	R
Maximum Queue (ft)	99	48	68	72	92	26	125	130	54
Average Queue (ft)	35	19	18	29	41	2	42	53	27
95th Queue (ft)	74	39	42	59	81	12	89	99	53
Link Distance (ft)		295		232	232	232	191	191	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	300		150						125
Storage Blk Time (%)								0	
Queuing Penalty (veh)								0	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	WB	SB
Directions Served	LT	R	LTR	L
Maximum Queue (ft)	7	39	196	5
Average Queue (ft)	1	14	74	0
95th Queue (ft)	4	29	148	2
Link Distance (ft)	964		836	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25		200
Storage Blk Time (%)	0	4		
Queuing Penalty (veh)	0	1		

Queuing and Blocking Report
2024 Background PM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	26
Average Queue (ft)	8
95th Queue (ft)	27
Link Distance (ft)	660
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 4

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Background PM 2024
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2024
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 117 veh/h
Opposing direction volume, Vo 14 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.7	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	0.966	0.966
Grade adj. factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	138 pc/h	16 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed volume,(note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access points,(note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.1	mi/h
Average travel speed, ATSD	38.3	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.995	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	134 pc/h	16 pc/h
Base percent time-spent-following,(note-4) BPTSFd	15.2 %	
Adjustment for no-passing zones, fnp	38.7	
Percent time-spent-following, PTSFd	49.7 %	

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.08	
Peak 15-min vehicle-miles of travel, VMT15	27	veh-mi
Peak-hour vehicle-miles of travel, VMT60	94	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	38.3	mi/h
Percent time-spent-following, PTSFd (from above)	49.7	
Level of service,(note-1) LOSd (from above)	B	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.08	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	13.00	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.58	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h

Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

***APPENDIX F – 2024 Background Conditions + SITE Scenario 1
Synchro / Sim Traffic / HCS Reports***

HCM Unsignalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field.

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Sign Control – Used to model two-way, three-way, and all-way stop or yield control unsignalized intersections.

Grade – Percent slope of the roadway approaching the intersection.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Hourly Flow Rate – The hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other traffic-way; computed as the number of vehicles, bicycles, or person passing a point divided by the time interval (usually less than 1 hour) in which they pass; expressed as vehicles, bicycles, or persons per hour.

Pedestrians – An individual traveling by foot.

Lane width – The arithmetic mean of the lane widths of roadway in on direction, expressed in feet.

Walking Speed – The speed of pedestrians which is established to be 3.5 ft/sec per the HCM.

Percent Blockage – Queuing penalty for a storage bay based on the percent time the lane is blocked.

Right Turn Flare – A shared turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Median Type – The type of divider between directional lanes such as Two Way Left Turn Lane, or Divided (Concrete or landscape median)

Median Storage – The number of vehicles that can be stored in the median is equal to the median width divided by vehicle length. For a Two Way Left Turn Lane median, 2 vehicles can stored.

Upstream Signal – Controls capacity efficiency and saturation flow rate at downstream signals **pX** – number of unlocked vehicles in platoon.

vC – total conflicting volumes for minor street approach.

vC1 – stage 1 movement conflicting volumes for minor street approach.

vC2 – stage 2 movement conflicting volumes for minor street approach.

vCu – Unblocked volumes for minor street approach.

tC, single– The critical gap time for single stage crossing.

tC, 2 stage – the critical gap time for each stage of a two stage crossing.

tF – Follow up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle.

pO – The probability of a queue free state for this movement.

cM – The capacity for the movement. This value considers the impacts of two state gap acceptance and platooned flows. However this capacity does not consider the influence of shared lanes or flared right turns.

Volume Total – total volume for an approach/movement.

Volume Left – Total volume turning left.

Volume right – Total volume turning right.

cSH – The capacity for each lane considering the affects of sharing and flared right runs. The capacity of free movements is assumed to be 1700 vehicles per hour per lane.

Volume to Capacity – the ratio of flow rate to capacity for transportation facility

Queue Length 95th – the maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during an analysis period.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Lane LOS – LOS for each lane.

Approach Delay – Is the weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach.

Average Delay – The average of Uniform delay (90th, 70th, 50th, 30th, and 10th percentile volumes).

Intersection Capacity Utilization – This method compares the current volume to the intersection ultimate capacity.

ICU LOS - Based upon the critical flow ratio (ICU) for the intersection. The critical flow ratio is the sum of green plus clearance times required to serve the critical movements at the intersection divided by a reference cycle length. The ICU LOS is designed to be insensitive to the actual signal timing for the intersection.

Analysis Period – Duration of the analysis.

HCM Signalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Ideal Flow – This is the Ideal Saturated Flow and 1900 vehicles per hour per lane by default.

Storage Length – Length of a storage bay for a turn lane.

Storage Lanes – Number of Lanes with storage.

Satd. Flow (prot) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to protected (prot) operation.

Taper Length – Length of a lane before the storage bay begins usually designated with mini-skip stripes.

Satd. Flow (perm) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to permissive (perm) operation.

Flt Permitted – The permitted left-turn factor may vary slightly from the left-turn factor showing in other Synchro reports because these are calculated based on actuated green times for HCM compatibility.

Right turn on Red – A way to indicated if right turn on red is allowed or restricted.

Satd Flow (RTOR) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to right-turn on red (RTOR) operation.

Link Speed – The driver speed on the particular link corresponding to the posted speed limit sign.

Link Distance – The distance from center point to center point of a link or distance between intersections.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Heavy Vehicles % - The percent vehicles in the traffic volumes that are heavy trucks or busses.

Shared Lane Traffic % - The percent of turning traffic assigned to a shared lane.

Lane Group Flow – Combines the adjusted flow and traffic in shared lane values to assign net volumes to each lane group.

Enter Blocked Intersection – Controls the simulation modeling gridlock avoidance.

Lane Alignment – This setting allows the user to specify how a lane aligns through an intersection.

Median Width – The width of a median.

Link Offset – Setting used to offset the roadway alignment to the right or left of the centerline.

Crosswalk Width – Width of a crosswalk.

Two Way Left Turn Lane – This setting visually displays a TWLTL median .

Headway Factor – Based on the Ideal Saturation Flow, lane width factor, the grade factor, the parking factor, the bus stops factor, and the area factor but is not used in the capacity calculations in Synchro.

Turning Speed – Speed used for vehicles turning and simulation in Sim Traffic.

Turn Type – Setting used to set the treatment (perm, prot, overlap, etc...) for left and right-turn movements.

Protected Phases – The movements at signalized intersection that are made with no opposing or conflicting vehicular flow allowed.

Permitted Phases – The movements at signalized intersection that is made against an opposing or conflicting vehicular flow.

Detector Phase – Primary detector that determines which phases each lane group's detector are connected to. Calls are placed for lane groups, regardless of the current active phases.

Switch Phase – A Secondary phase that extends the entered phase when it is green, but does not place a call.

Minimum Initial – The minimum Green time per phase in seconds.

Minimum Split – The shortest allowable amount of time allowed for a phase in seconds.

Total Split – Includes the green, yellow, and all-red intervals assigned to a phase.

Maximum Green – Parameter represents the maximum amount of time that a green signal indication can be displayed in the presence of conflicting demand.

Yellow Time – This is the time each phase displays yellow.

All-Red Time – This is the time each phase displays all red clearance before the next phase.

Lost time Adjust – Dependent on driver reaction time, length of yellow time, yellow deceleration rate, intersection width, and approach speeds.

Lead/Lag – Used to determine the phase order.

Lead-Lag Optimize – Setting allowing Synchro to optimize the phase order.

Vehicle Extension – Used with actuated phases. A vehicle passing over a detector will extend the gap counter by the amount of time specified by the vehicle extension time.

Recall Mode – A means to provide reoccurring vehicle or pedestrian demand so a phase is serviced, even if no real demand exists on the phase.

Act Effct Green – The value representing the average green time observed while the signal is operating in actuated mode.

Actuated g/C Ratio – The average actuated green time divided by the actuated cycle length.

v/c Ratio - the ratio of flow rate to capacity.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Queue Delay – An analysis of the effects of queues and blocking on short links and short turning bays. This delay includes the analysis of spillback, starvation, and storage blocking.

Total Delay – The lane group Control Delay plus the Queue Delay.

LOS – The letter from A-F based on the length of delay.

Approach Delay – A volume weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach based on Total Delay.

Queue Lengths 50th - The maximum back of queue with 50th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Queue Length 95th – The maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Internal Link Dist – The distance between two intersections.

Turn Bay Length – Length of a turn lane.

Base Capacity – The capacity of a lane group if unimpeded.

Starvation Cap Reductn – Reduction to the base capacity due to starvation. Starvation is the congested caused by short upstream link in conjunction with poor/no coordination.

Spillback Cap Reductn – Reduction to the base capacity caused by short downstream link becoming filled up.

Storage Cap Reductn – Reduction to the base capacity caused when turn pocked cannot accommodate queue lengths.

Reduced v/c Ratio – Modified volume to capacity ratio with the adjustments to the base capacity.

Area Type – A setting that allows the user to choose it surroundings such as a Central Business District.

Cycle Length – The total time for a signal to complete one cycle.

Actuated Cycle Length – The average cycle length for an actuated signal.

Natural Cycle – The shortest cycle length that will give acceptable capacity.

Control Type – Setting allowing the user to choose unsignalized or the type of signalization.

Maximum v/c Ratio – The highest individual movement or lane group v/c ratio.

Intersection Signal Delay – The total delay for the intersection by taking the volume weighted average of all the Total Delays.

Intersection LOS – The LOS for the entire intersection by taking total intersection delay and converting it to a level A-F.

Intersection Capacity Utilization (ICU) – The sum of the ratios of approach volume divided by approach capacity for each leg of intersection which controls overall traffic signal timing plus an allowance for clearance times.

ICU Level of Service – Numerical value that gives insight into how an intersection is functioning and how much extra capacity is available to handle fluctuations and incidents.

Analysis Period - Duration of the analysis.

SIM Traffic Summary & Queuing and Blocking Report Definitions – Synchro 7

Start Time – Time the network seeding begins.

End Time – The end of the recorded peak period.

Total Time – Seeding time plus recording time.

Time recorded – length of time of recording. Typically the peak hour.

of Intervals – There are 3 interval types

Interval 0, Seeding – Duration long enough for vehicle to traverse from one side of the network to another including stops.

Interval 1, Recording – Duration is closest to cycle length, volume is adjusted 95th

Interval 2, Recording and Recovery – Duration 15 minutes, no volume adjustment

of Recorded Intvls – The number of intervals which were recorded.

Vehs Entered – The total number of vehicles that entered the network.

Vehs Exited – The total number of vehicles that exited the network .

Starting Vehs – The number of vehicles at start of interval.

Ending Vehs – The number of vehicles at end of interval.

Denied Entry Before – Vehicles unable to enter a link due to congestion at the beginning of the period.

Denied Entry After – Vehicles unable to enter a link due to congestion at the end of the period.

Travel Distance – Summation of the vehicle distance traveled.

Travel Time – Total time each vehicle was present in this area. Travel Time includes time spent by vehicles denied entry.

Total Delay – The total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices.

Total Stops – A count of vehicle stops. Whenever a vehicles speed drops below 10 ft/sec a stop is added. A vehicle is considered going again when is speed reaches 15 ft/sec.

Fuel Used – Calculation using fuel consumption parameters .

Directions Served – Indicates the movement being served.

Maximum Queue – Maximum back of queue observed for the entire analysis interval.

Average Queue – Average back of queue observed for the entire analysis interval.

95th Queue – A calculation equal to the average queue plus 1.65 standard deviations.

Link Distance – Internal distance of the link from stop bar to stop bar.

Upstream Blk Time – Proportion of the time that the upstream end of the lane is blocked.

Queuing Penalty – A rough measure of how many vehicles are affected by the blocking.













Storage Bay Dist – Length of a turning bay.

Storage Blk Time – Proportion of time that a lane is queued at the top of the storage.

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2024 Background + Site Scenario 1 AM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	44	62	882	633	155	613	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	50	70	1002	719	176	697	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	2540	88	176				
vC1, stage 1 conf vol	176						
vC2, stage 2 conf vol	2364						
vCu, unblocked vol	2540	88	176				
tC, single (s)	7.0	7.0	4.2				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	0	93	27				
cM capacity (veh/h)	13	949	1376				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	120	1002	360	360	88	88	697
Volume Left	50	1002	0	0	0	0	0
Volume Right	70	0	0	0	0	0	697
cSH	32	1376	1700	1700	1700	1700	1700
Volume to Capacity	3.79	0.73	0.21	0.21	0.05	0.05	0.41
Queue Length 95th (ft)	Err	175	0	0	0	0	0
Control Delay (s)	Err	14.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	B					
Approach Delay (s)	Err	8.3			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay		448.9					
Intersection Capacity Utilization		93.5%		ICU Level of Service		F	
Analysis Period (min)		15					













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 1 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	9	129	2	2	0	26	565	11	16	943	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1795	1599	0	1827	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.733			0.828		0.145			0.408		
Satd. Flow (perm)	0	1379	1599	0	1550	0	270	3539	1583	768	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147						12			62
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	238	147	0	4	0	30	642	12	18	1072	62
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	14.0	42.0	42.0	28.0	28.0	28.0
Total Split (%)	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	23.3%	70.0%	70.0%	46.7%	46.7%	46.7%
Maximum Green (s)	11.0	11.0		11.0	11.0		7.0	35.0	35.0	21.0	21.0	21.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		13.0	50.5		13.0		27.3	27.3	27.3	22.6	22.6	22.6
Actuated g/C Ratio		0.26	1.00		0.26		0.54	0.54	0.54	0.45	0.45	0.45
v/c Ratio		0.67	0.09		0.01		0.07	0.34	0.01	0.05	0.68	0.08
Control Delay		32.0	0.1		18.0		5.2	6.7	2.5	11.5	15.5	4.3
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 1 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		32.0	0.1		18.0		5.2	6.7	2.5	11.5	15.5	4.3
LOS		C	A		B		A	A	A	B	B	A
Approach Delay		19.9			18.0			6.6			14.8	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		54	0		1		4	48	0	2	95	0
Queue Length 95th (ft)		#182	0		8		11	69	5	15	235	18
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		363	1599		408		420	2654	1190	358	1650	778
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.66	0.09		0.01		0.07	0.24	0.01	0.05	0.65	0.08

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 50.5

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 13.2

Intersection LOS: B

Intersection Capacity Utilization 52.7%

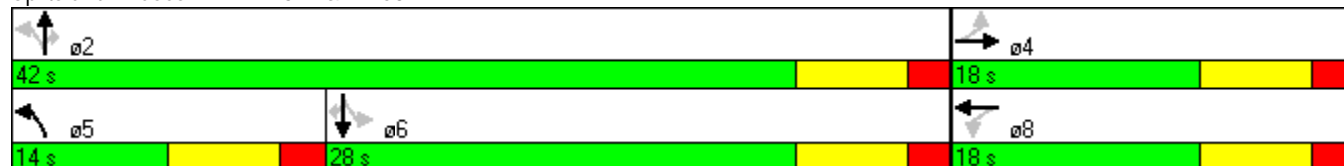
ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

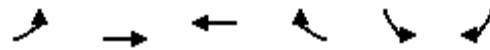
2024 Background + Site Scenario 1 AM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	0	11	0	0	0	166	127	239	444	180	81
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	7	0	12	0	0	0	189	144	272	505	205	92
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1781	2053	251	1877	1963	280	297			416		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1781	2053	251	1877	1963	280	297			416		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	82	100	98	100	100	100	85			56		
cM capacity (veh/h)	38	27	788	31	30	759	1253			1138		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	19	0	189	416	505	297						
Volume Left	7	0	189	0	505	0						
Volume Right	12	0	0	272	0	92						
cSH	107	1700	1253	1700	1138	1700						
Volume to Capacity	0.18	0.00	0.15	0.24	0.44	0.17						
Queue Length 95th (ft)	16	0	13	0	58	0						
Control Delay (s)	48.8	0.0	8.4	0.0	10.7	0.0						
Lane LOS	E	A	A		B							
Approach Delay (s)	48.8	0.0	2.6		6.7							
Approach LOS	E	A										
Intersection Summary												
Average Delay			5.5									
Intersection Capacity Utilization			59.3%		ICU Level of Service		B					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp










2024 Background + Site Scenario 1 AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	106	1495	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	120	1699	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				0	99
cM capacity (veh/h)	1596				982	1068
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	120	1705		
Volume Left	6	0	0	1699		
Volume Right	0	0	120	6		
cSH	1596	1700	1700	983		
Volume to Capacity	0.00	0.00	0.07	1.73		
Queue Length 95th (ft)	0	0	0	2421		
Control Delay (s)	3.6	0.0	0.0	347.6		
Lane LOS	A			F		
Approach Delay (s)	3.6	0.0		347.6		
Approach LOS				F		
Intersection Summary						
Average Delay		321.7				
Intersection Capacity Utilization		94.5%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis5: Bear Creek Rd & Site Entrance

2024 Background + Site Scenario 1 AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	169	1326	234	12	94	16
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	192	1507	266	14	107	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1699		1491	945
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1699		1491	945
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			28		0	94
cM capacity (veh/h)			367		37	313
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	1699	280	125			
Volume Left	0	266	107			
Volume Right	1507	0	18			
cSH	1700	367	42			
Volume to Capacity	1.00	0.72	2.96			
Queue Length 95th (ft)	0	138	344			
Control Delay (s)	0.0	36.3	1083.9			
Lane LOS		E	F			
Approach Delay (s)	0.0	36.3	1083.9			
Approach LOS			F			
Intersection Summary						
Average Delay			69.2			
Intersection Capacity Utilization			120.5%	ICU Level of Service		H
Analysis Period (min)			15			

SimTraffic Simulation Summary

2024 Background + Site Scenario 1 AM

Summary of All Intervals

Start Time	6:20
End Time	7:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	5278
Vehs Exited	5000
Starting Vehs	220
Ending Vehs	498
Denied Entry Before	4
Denied Entry After	628
Travel Distance (mi)	3495
Travel Time (hr)	675.2
Total Delay (hr)	580.3
Total Stops	7630
Fuel Used (gal)	251.2

Interval #0 Information Seeding

Start Time	6:20
End Time	6:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	6:30
End Time	7:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	5278
Vehs Exited	5000
Starting Vehs	220
Ending Vehs	498
Denied Entry Before	4
Denied Entry After	628
Travel Distance (mi)	3495
Travel Time (hr)	675.2
Total Delay (hr)	580.3
Total Stops	7630
Fuel Used (gal)	251.2

Queuing and Blocking Report

2024 Background + Site Scenario 1 AM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	NB	B20	B20	SB	SB	SB
Directions Served	L	L	T	T	T	T	R
Maximum Queue (ft)	53	299	3014	2990	3832	3832	250
Average Queue (ft)	24	268	1516	1004	3531	3567	228
95th Queue (ft)	56	297	2850	2835	4479	4467	330
Link Distance (ft)	647	179	2975	2975	3817	3817	
Upstream Blk Time (%)		75	8	7	41	71	
Queuing Penalty (veh)		0	0	0	0	0	
Storage Bay Dist (ft)							150
Storage Blk Time (%)	4						90
Queuing Penalty (veh)	2						69

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	121	26	41	47	92	29	16	105	156	53
Average Queue (ft)	70	4	9	26	45	4	4	56	80	14
95th Queue (ft)	113	19	29	52	75	18	14	93	127	38
Link Distance (ft)		295		232	232	232	191	191	191	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300		150							125
Storage Blk Time (%)									1	
Queuing Penalty (veh)									0	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	NB	NB	SB
Directions Served	LT	R	L	TR	L
Maximum Queue (ft)	27	22	64	32	141
Average Queue (ft)	2	4	8	2	60
95th Queue (ft)	11	17	30	12	122
Link Distance (ft)	964			1112	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25	100		200
Storage Blk Time (%)	4	0			
Queuing Penalty (veh)	0	0			

Queuing and Blocking Report

2024 Background + Site Scenario 1 AM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	756
Average Queue (ft)	730
95th Queue (ft)	751
Link Distance (ft)	647
Upstream Blk Time (%)	98
Queuing Penalty (veh)	1465
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Bear Creek Rd & Site Entrance

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	68	731	360
Average Queue (ft)	10	711	311
95th Queue (ft)	41	726	402
Link Distance (ft)	1176	692	321
Upstream Blk Time (%)		88	79
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			













Network Summary

Network wide Queuing Penalty: 1537

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2024 Background + Site Scenario 1 PM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	451	668	218	256	1113	150	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	512	759	248	291	1265	170	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	1906	632	1265				
vC1, stage 1 conf vol	1265						
vC2, stage 2 conf vol	641						
vCu, unblocked vol	1906	632	1265				
tC, single (s)	7.0	7.0	4.2				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	0	0	53				
cM capacity (veh/h)	159	420	529				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	1272	248	145	145	632	632	170
Volume Left	512	248	0	0	0	0	0
Volume Right	759	0	0	0	0	0	170
cSH	254	529	1700	1700	1700	1700	1700
Volume to Capacity	5.00	0.47	0.09	0.09	0.37	0.37	0.10
Queue Length 95th (ft)	Err	62	0	0	0	0	0
Control Delay (s)	Err	17.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	Err	8.1			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay		3919.0					
Intersection Capacity Utilization		78.8%		ICU Level of Service		D	
Analysis Period (min)		15					













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 1 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	81	14	9	32	111	983	4	1	931	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1787	1599	0	1716	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.717			0.877		0.161			0.255		
Satd. Flow (perm)	0	1349	1599	0	1525	0	300	3539	1583	480	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			92		36				5			250
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	92	0	62	0	126	1117	5	1	1058	250
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	15.0	15.0	0.0	15.0	15.0	0.0	14.0	45.0	45.0	31.0	31.0	31.0
Total Split (%)	25.0%	25.0%	0.0%	25.0%	25.0%	0.0%	23.3%	75.0%	75.0%	51.7%	51.7%	51.7%
Maximum Green (s)	8.0	8.0		8.0	8.0		7.0	38.0	38.0	24.0	24.0	24.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		10.1	54.8		10.1		38.5	40.1	40.1	29.8	29.8	29.8
Actuated g/C Ratio		0.18	1.00		0.18		0.70	0.73	0.73	0.54	0.54	0.54
v/c Ratio		0.44	0.06		0.20		0.27	0.43	0.00	0.00	0.55	0.25
Control Delay		29.0	0.1		14.2		5.2	5.0	2.2	10.0	13.8	2.6
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 1 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		29.0	0.1		14.2		5.2	5.0	2.2	10.0	13.8	2.6
LOS		C	A		B		A	A	A	A	B	A
Approach Delay		15.8			14.2			5.0			11.6	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		36	0		8		13	83	0	0	154	0
Queue Length 95th (ft)		77	0		35		27	113	2	2	209	31
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		256	1599		319		463	2610	1169	264	1945	992
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.43	0.06		0.19		0.27	0.43	0.00	0.00	0.54	0.25

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 54.8

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 9.1

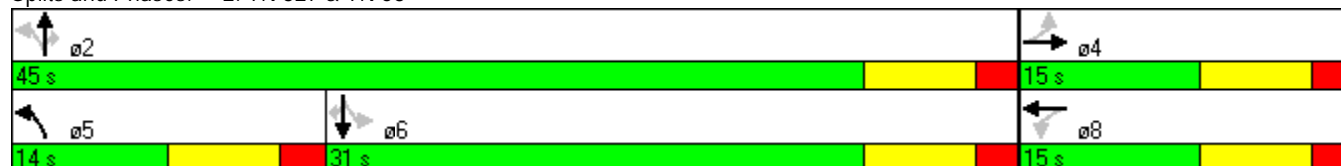
Intersection LOS: A

Intersection Capacity Utilization 63.3%

ICU Level of Service B

Analysis Period (min) 15




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

2024 Background + Site Scenario 1 PM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	73	0	146	152	12	0	49	383	9	9	362	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	83	0	166	173	14	0	56	435	10	10	411	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	997	1001	423	1066	1007	440	435			445		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	997	1001	423	1066	1007	440	435			445		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	60	100	74	0	94	100	95			99		
cM capacity (veh/h)	205	230	631	141	227	617	1114			1109		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	249	186	56	445	10	435						
Volume Left	83	173	56	0	10	0						
Volume Right	166	0	0	10	0	24						
cSH	494	145	1114	1700	1109	1700						
Volume to Capacity	0.50	1.29	0.05	0.26	0.01	0.26						
Queue Length 95th (ft)	70	284	4	0	1	0						
Control Delay (s)	19.5	231.1	8.4	0.0	8.3	0.0						
Lane LOS	C	F	A		A							
Approach Delay (s)	19.5	231.1	0.9		0.2							
Approach LOS	C	F										
Intersection Summary												
Average Delay			35.1									
Intersection Capacity Utilization			49.8%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp










2024 Background + Site Scenario 1 PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	1119	369	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	1272	419	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				57	99
cM capacity (veh/h)	1596				982	1068
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	1272	425		
Volume Left	6	0	0	419		
Volume Right	0	0	1272	6		
cSH	1596	1700	1700	983		
Volume to Capacity	0.00	0.00	0.75	0.43		
Queue Length 95th (ft)	0	0	0	55		
Control Delay (s)	3.6	0.0	0.0	11.4		
Lane LOS	A			B		
Approach Delay (s)	3.6	0.0		11.4		
Approach LOS				B		
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			79.3%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis5: Bear Creek Rd & Site Entrance

2024 Background + Site Scenario 1 PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	9	360	63	112	1007	178
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	10	409	72	127	1144	202
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			419		485	215
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			419		485	215
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		0	75
cM capacity (veh/h)			1124		501	818
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	419	199	1347			
Volume Left	0	72	1144			
Volume Right	409	0	202			
cSH	1700	1124	532			
Volume to Capacity	0.25	0.06	2.53			
Queue Length 95th (ft)	0	5	2663			
Control Delay (s)	0.0	3.4	711.1			
Lane LOS		A	F			
Approach Delay (s)	0.0	3.4	711.1			
Approach LOS			F			
Intersection Summary						
Average Delay			487.7			
Intersection Capacity Utilization			108.8%	ICU Level of Service		G
Analysis Period (min)			15			

SimTraffic Simulation Summary

2024 Background + Site Scenario 1 PM

Summary of All Intervals

Start Time	5:20
End Time	6:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	5840
Vehs Exited	5722
Starting Vehs	184
Ending Vehs	302
Denied Entry Before	67
Denied Entry After	1052
Travel Distance (mi)	2995
Travel Time (hr)	808.6
Total Delay (hr)	732.9
Total Stops	4667
Fuel Used (gal)	280.7

Interval #0 Information Seeding

Start Time	5:20
End Time	5:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:30
End Time	6:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	5840
Vehs Exited	5722
Starting Vehs	184
Ending Vehs	302
Denied Entry Before	67
Denied Entry After	1052
Travel Distance (mi)	2995
Travel Time (hr)	808.6
Total Delay (hr)	732.9
Total Stops	4667
Fuel Used (gal)	280.7

Queuing and Blocking Report

2024 Background + Site Scenario 1 PM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	EB	NB	SB
Directions Served	L	R	L	T
Maximum Queue (ft)	798	150	133	22
Average Queue (ft)	754	104	75	1
95th Queue (ft)	778	216	124	7
Link Distance (ft)	649		179	627
Upstream Blk Time (%)	90			
Queuing Penalty (veh)	1014			
Storage Bay Dist (ft)		50		
Storage Blk Time (%)	99			
Queuing Penalty (veh)	663			

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	T	T	R
Maximum Queue (ft)	76	91	64	111	114	191	176	89
Average Queue (ft)	33	28	32	44	68	66	75	34
95th Queue (ft)	62	64	61	93	121	132	128	66
Link Distance (ft)		295		232	232	191	191	
Upstream Blk Time (%)						0	0	
Queuing Penalty (veh)						0	0	
Storage Bay Dist (ft)	300		150					125
Storage Blk Time (%)							1	
Queuing Penalty (veh)							1	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	WB	NB	SB
Directions Served	LT	R	LTR	L	L
Maximum Queue (ft)	73	124	510	19	2
Average Queue (ft)	28	52	225	1	0
95th Queue (ft)	68	94	458	7	1
Link Distance (ft)	964		836		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	200
Storage Blk Time (%)	24	43			
Queuing Penalty (veh)	35	32			

Queuing and Blocking Report

2024 Background + Site Scenario 1 PM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	EB	WB	WB	B23	SB
Directions Served	LT	T	R	T	LR
Maximum Queue (ft)	83	2297	200	1193	549
Average Queue (ft)	4	2266	197	1047	81
95th Queue (ft)	31	2372	208	1597	234
Link Distance (ft)	433	2206		1176	649
Upstream Blk Time (%)		86		60	
Queuing Penalty (veh)		962		676	
Storage Bay Dist (ft)			100		
Storage Blk Time (%)			91		
Queuing Penalty (veh)			5		

Intersection: 5: Bear Creek Rd & Site Entrance

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	434	373
Average Queue (ft)	178	332
95th Queue (ft)	377	354
Link Distance (ft)	692	321
Upstream Blk Time (%)		96
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 3388

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Background + Site Scen 1 AM
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2024
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 1500 veh/h
Opposing direction volume, Vo 111 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor,(note-5) fHV	0.995	0.966
Grade adj. factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	1713 pc/h	131 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed volume,(note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access points,(note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.5	mi/h
Average travel speed, ATSD	24.8	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	1705 pc/h	127 pc/h
Base percent time-spent-following,(note-4) BPTSFd	85.8 %	
Adjustment for no-passing zones, fnp	18.0	
Percent time-spent-following, PTSFd	102.6 %	

Level of Service and Other Performance Measures

Level of service, LOS	F	
Volume to capacity ratio, v/c	1.01	
Peak 15-min vehicle-miles of travel, VMT15	341	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1200	veh-mi
Peak 15-min total travel time, TT15	13.8	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	24.8	mi/h
Percent time-spent-following, PTSFd (from above)	102.6	
Level of service,(note-1) LOSd (from above)	F	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.11	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	3.60	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.62	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h

Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Background + Site Scen 1 PM
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2024
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 1124 veh/h
Opposing direction volume, Vo 374 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.2
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.995	0.990
Grade adj. factor, (note-1) fG	1.00	1.00
Directional flow rate, (note-2) vi	1284 pc/h	429 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	4.2	mi/h
Adj. for access points, (note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATSD	26.1	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	1277 pc/h	427 pc/h
Base percent time-spent-following,(note-4) BPTSFd	80.7 %	
Adjustment for no-passing zones, fnp	14.4	
Percent time-spent-following, PTSFd	91.5 %	

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.76	
Peak 15-min vehicle-miles of travel, VMT15	255	veh-mi
Peak-hour vehicle-miles of travel, VMT60	899	veh-mi
Peak 15-min total travel time, TT15	9.8	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	26.1	mi/h
Percent time-spent-following, PTSFd (from above)	91.5	
Level of service,(note-1) LOSd (from above)	E	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.11	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	3.60	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.62	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h

Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

***APPENDIX G – 2024 Background Conditions + SITE Scenario 2
Synchro / Sim Traffic / HCS Reports***

HCM Unsignalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field.

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Sign Control – Used to model two-way, three-way, and all-way stop or yield control unsignalized intersections.

Grade – Percent slope of the roadway approaching the intersection.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Hourly Flow Rate – The hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other traffic-way; computed as the number of vehicles, bicycles, or person passing a point divided by the time interval (usually less than 1 hour) in which they pass; expressed as vehicles, bicycles, or persons per hour.

Pedestrians – An individual traveling by foot.

Lane width – The arithmetic mean of the lane widths of roadway in on direction, expressed in feet.

Walking Speed – The speed of pedestrians which is established to be 3.5 ft/sec per the HCM.

Percent Blockage – Queuing penalty for a storage bay based on the percent time the lane is blocked.

Right Turn Flare – A shared turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Median Type – The type of divider between directional lanes such as Two Way Left Turn Lane, or Divided (Concrete or landscape median)

Median Storage – The number of vehicles that can be stored in the median is equal to the median width divided by vehicle length. For a Two Way Left Turn Lane median, 2 vehicles can stored.

Upstream Signal – Controls capacity efficiency and saturation flow rate at downstream signals **pX** – number of unlocked vehicles in platoon.

vC – total conflicting volumes for minor street approach.

vC1 – stage 1 movement conflicting volumes for minor street approach.

vC2 – stage 2 movement conflicting volumes for minor street approach.

vCu – Unblocked volumes for minor street approach.

tC, single– The critical gap time for single stage crossing.

tC, 2 stage – the critical gap time for each stage of a two stage crossing.

tF – Follow up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle.

pO – The probability of a queue free state for this movement.

cM – The capacity for the movement. This value considers the impacts of two state gap acceptance and platooned flows. However this capacity does not consider the influence of shared lanes or flared right turns.

Volume Total – total volume for an approach/movement.

Volume Left – Total volume turning left.

Volume right – Total volume turning right.

cSH – The capacity for each lane considering the affects of sharing and flared right runs. The capacity of free movements is assumed to be 1700 vehicles per hour per lane.

Volume to Capacity – the ratio of flow rate to capacity for transportation facility

Queue Length 95th – the maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during an analysis period.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Lane LOS – LOS for each lane.

Approach Delay – Is the weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach.

Average Delay – The average of Uniform delay (90th, 70th, 50th, 30th, and 10th percentile volumes).

Intersection Capacity Utilization – This method compares the current volume to the intersection ultimate capacity.

ICU LOS - Based upon the critical flow ratio (ICU) for the intersection. The critical flow ratio is the sum of green plus clearance times required to serve the critical movements at the intersection divided by a reference cycle length. The ICU LOS is designed to be insensitive to the actual signal timing for the intersection.

Analysis Period – Duration of the analysis.

HCM Signalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Ideal Flow – This is the Ideal Saturated Flow and 1900 vehicles per hour per lane by default.

Storage Length – Length of a storage bay for a turn lane.

Storage Lanes – Number of Lanes with storage.

Satd. Flow (prot) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to protected (prot) operation.

Taper Length – Length of a lane before the storage bay begins usually designated with mini-skip stripes.

Satd. Flow (perm) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to permissive (perm) operation.

Flt Permitted – The permitted left-turn factor may vary slightly from the left-turn factor showing in other Synchro reports because these are calculated based on actuated green times for HCM compatibility.

Right turn on Red – A way to indicated if right turn on red is allowed or restricted.

Satd Flow (RTOR) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to right-turn on red (RTOR) operation.

Link Speed – The driver speed on the particular link corresponding to the posted speed limit sign.

Link Distance – The distance from center point to center point of a link or distance between intersections.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Heavy Vehicles % - The percent vehicles in the traffic volumes that are heavy trucks or busses.

Shared Lane Traffic % - The percent of turning traffic assigned to a shared lane.

Lane Group Flow – Combines the adjusted flow and traffic in shared lane values to assign net volumes to each lane group.

Enter Blocked Intersection – Controls the simulation modeling gridlock avoidance.

Lane Alignment – This setting allows the user to specify how a lane aligns through an intersection.

Median Width – The width of a median.

Link Offset – Setting used to offset the roadway alignment to the right or left of the centerline.

Crosswalk Width – Width of a crosswalk.

Two Way Left Turn Lane – This setting visually displays a TWLTL median .

Headway Factor – Based on the Ideal Saturation Flow, lane width factor, the grade factor, the parking factor, the bus stops factor, and the area factor but is not used in the capacity calculations in Synchro.

Turning Speed – Speed used for vehicles turning and simulation in Sim Traffic.

Turn Type – Setting used to set the treatment (perm, prot, overlap, etc...) for left and right-turn movements.

Protected Phases – The movements at signalized intersection that are made with no opposing or conflicting vehicular flow allowed.

Permitted Phases – The movements at signalized intersection that is made against an opposing or conflicting vehicular flow.

Detector Phase – Primary detector that determines which phases each lane group's detector are connected to. Calls are placed for lane groups, regardless of the current active phases.

Switch Phase – A Secondary phase that extends the entered phase when it is green, but does not place a call.

Minimum Initial – The minimum Green time per phase in seconds.

Minimum Split – The shortest allowable amount of time allowed for a phase in seconds.

Total Split – Includes the green, yellow, and all-red intervals assigned to a phase.

Maximum Green – Parameter represents the maximum amount of time that a green signal indication can be displayed in the presence of conflicting demand.

Yellow Time – This is the time each phase displays yellow.

All-Red Time – This is the time each phase displays all red clearance before the next phase.

Lost time Adjust – Dependent on driver reaction time, length of yellow time, yellow deceleration rate, intersection width, and approach speeds.

Lead/Lag – Used to determine the phase order.

Lead-Lag Optimize – Setting allowing Synchro to optimize the phase order.

Vehicle Extension – Used with actuated phases. A vehicle passing over a detector will extend the gap counter by the amount of time specified by the vehicle extension time.

Recall Mode – A means to provide reoccurring vehicle or pedestrian demand so a phase is serviced, even if no real demand exists on the phase.

Act Effct Green – The value representing the average green time observed while the signal is operating in actuated mode.

Actuated g/C Ratio – The average actuated green time divided by the actuated cycle length.

v/c Ratio - the ratio of flow rate to capacity.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Queue Delay – An analysis of the effects of queues and blocking on short links and short turning bays. This delay includes the analysis of spillback, starvation, and storage blocking.

Total Delay – The lane group Control Delay plus the Queue Delay.

LOS – The letter from A-F based on the length of delay.

Approach Delay – A volume weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach based on Total Delay.

Queue Lengths 50th - The maximum back of queue with 50th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Queue Length 95th – The maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Internal Link Dist – The distance between two intersections.

Turn Bay Length – Length of a turn lane.

Base Capacity – The capacity of a lane group if unimpeded.

Starvation Cap Reductn – Reduction to the base capacity due to starvation. Starvation is the congested caused by short upstream link in conjunction with poor/no coordination.

Spillback Cap Reductn – Reduction to the base capacity caused by short downstream link becoming filled up.

Storage Cap Reductn – Reduction to the base capacity caused when turn pocked cannot accommodate queue lengths.

Reduced v/c Ratio – Modified volume to capacity ratio with the adjustments to the base capacity.

Area Type – A setting that allows the user to choose it surroundings such as a Central Business District.

Cycle Length – The total time for a signal to complete one cycle.

Actuated Cycle Length – The average cycle length for an actuated signal.

Natural Cycle – The shortest cycle length that will give acceptable capacity.

Control Type – Setting allowing the user to choose unsignalized or the type of signalization.

Maximum v/c Ratio – The highest individual movement or lane group v/c ratio.

Intersection Signal Delay – The total delay for the intersection by taking the volume weighted average of all the Total Delays.

Intersection LOS – The LOS for the entire intersection by taking total intersection delay and converting it to a level A-F.

Intersection Capacity Utilization (ICU) – The sum of the ratios of approach volume divided by approach capacity for each leg of intersection which controls overall traffic signal timing plus an allowance for clearance times.

ICU Level of Service – Numerical value that gives insight into how an intersection is functioning and how much extra capacity is available to handle fluctuations and incidents.

Analysis Period - Duration of the analysis.

SIM Traffic Summary & Queuing and Blocking Report Definitions – Synchro 7

Start Time – Time the network seeding begins.

End Time – The end of the recorded peak period.

Total Time – Seeding time plus recording time.

Time recorded – length of time of recording. Typically the peak hour.

of Intervals – There are 3 interval types

Interval 0, Seeding – Duration long enough for vehicle to traverse from one side of the network to another including stops.

Interval 1, Recording – Duration is closest to cycle length, volume is adjusted 95th

Interval 2, Recording and Recovery – Duration 15 minutes, no volume adjustment

of Recorded Intvls – The number of intervals which were recorded.

Vehs Entered – The total number of vehicles that entered the network.

Vehs Exited – The total number of vehicles that exited the network .

Starting Vehs – The number of vehicles at start of interval.

Ending Vehs – The number of vehicles at end of interval.

Denied Entry Before – Vehicles unable to enter a link due to congestion at the beginning of the period.

Denied Entry After – Vehicles unable to enter a link due to congestion at the end of the period.

Travel Distance – Summation of the vehicle distance traveled.

Travel Time – Total time each vehicle was present in this area. Travel Time includes time spent by vehicles denied entry.

Total Delay – The total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices.

Total Stops – A count of vehicle stops. Whenever a vehicles speed drops below 10 ft/sec a stop is added. A vehicle is considered going again when is speed reaches 15 ft/sec.

Fuel Used – Calculation using fuel consumption parameters .

Directions Served – Indicates the movement being served.

Maximum Queue – Maximum back of queue observed for the entire analysis interval.

Average Queue – Average back of queue observed for the entire analysis interval.

95th Queue – A calculation equal to the average queue plus 1.65 standard deviations.

Link Distance – Internal distance of the link from stop bar to stop bar.

Upstream Blk Time – Proportion of the time that the upstream end of the lane is blocked.

Queuing Penalty – A rough measure of how many vehicles are affected by the blocking.













Storage Bay Dist – Length of a turning bay.

Storage Blk Time – Proportion of time that a lane is queued at the top of the storage.

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2024 Background + Site Scenario 2 AM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	56	79	1128	633	155	785	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	64	90	1282	719	176	892	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	3099	88	176				
vC1, stage 1 conf vol	176						
vC2, stage 2 conf vol	2923						
vCu, unblocked vol	3099	88	176				
tC, single (s)	7.0	7.0	4.2				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	0	91	7				
cM capacity (veh/h)	2	949	1376				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	153	1282	360	360	88	88	892
Volume Left	64	1282	0	0	0	0	0
Volume Right	90	0	0	0	0	0	892
cSH	4	1376	1700	1700	1700	1700	1700
Volume to Capacity	40.43	0.93	0.21	0.21	0.05	0.05	0.52
Queue Length 95th (ft)	Err	421	0	0	0	0	0
Control Delay (s)	Err	28.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	Err	18.4			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay		487.4					
Intersection Capacity Utilization		117.8%		ICU Level of Service		H	
Analysis Period (min)		15					













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 2 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	9	153	2	2	0	27	576	11	16	1091	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1795	1599	0	1827	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.733			0.820		0.135			0.403		
Satd. Flow (perm)	0	1379	1599	0	1535	0	251	3539	1583	758	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			174						12			57
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	238	174	0	4	0	31	655	12	18	1240	62
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	17.0	17.0	0.0	17.0	17.0	0.0	14.0	43.0	43.0	29.0	29.0	29.0
Total Split (%)	28.3%	28.3%	0.0%	28.3%	28.3%	0.0%	23.3%	71.7%	71.7%	48.3%	48.3%	48.3%
Maximum Green (s)	10.0	10.0		10.0	10.0		7.0	36.0	36.0	22.0	22.0	22.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		12.2	51.8		12.2		29.5	29.5	29.5	24.6	24.6	24.6
Actuated g/C Ratio		0.24	1.00		0.24		0.57	0.57	0.57	0.47	0.47	0.47
v/c Ratio		0.73	0.11		0.01		0.08	0.33	0.01	0.05	0.74	0.08
Control Delay		38.2	0.1		18.8		4.8	6.2	2.4	10.8	16.7	4.5
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 2 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		38.2	0.1		18.8		4.8	6.2	2.4	10.8	16.7	4.5
LOS		D	A		B		A	A	A	B	B	A
Approach Delay		22.1			18.8			6.0			16.0	
Approach LOS		C			B			A			B	
Queue Length 50th (ft)		56	0		1		4	46	0	2	111	1
Queue Length 95th (ft)		#191	0		8		11	66	4	14	#318	19
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		325	1599		361		411	2636	1182	362	1690	794
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.73	0.11		0.01		0.08	0.25	0.01	0.05	0.73	0.08

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 51.8

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 14.2

Intersection LOS: B

Intersection Capacity Utilization 56.8%










ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.




















Queue shown is maximum after two cycles.

Splits and Phases: 2: TN 327 & TN 58

											
ø2	ø4	ø5	ø6	ø8							
43 s	17 s	14 s	29 s	17 s							

HCM Unsignalized Intersection Capacity Analysis 3: W Bear Creek Rd & TN 95





2024 Background + Site Scenario 2 AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	0	16	0	0	0	216	127	239	444	180	105
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	0	18	0	0	0	245	144	272	505	205	119
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1909	2180	264	1994	2104	280	324			416		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1909	2180	264	1994	2104	280	324			416		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	73	100	98	100	100	100	80			56		
cM capacity (veh/h)	29	21	774	25	23	759	1225			1138		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	26	0	245	416	505	324						
Volume Left	8	0	245	0	505	0						
Volume Right	18	0	0	272	0	119						
cSH	97	1700	1225	1700	1138	1700						
Volume to Capacity	0.27	0.00	0.20	0.24	0.44	0.19						
Queue Length 95th (ft)	25	0	19	0	58	0						
Control Delay (s)	57.9	0.0	8.7	0.0	10.7	0.0						
Lane LOS	F	A	A		B							
Approach Delay (s)	57.9	0.0	3.2		6.5							
Approach LOS	F	A										
Intersection Summary												
Average Delay			6.0									
Intersection Capacity Utilization			59.3%	ICU Level of Service						B		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 4: US Government Property & Bear Creek Ramp










2024 Background + Site Scenario 2 AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	135	1913	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	153	2174	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				0	99
cM capacity (veh/h)	1596				982	1068
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	153	2180		
Volume Left	6	0	0	2174		
Volume Right	0	0	153	6		
cSH	1596	1700	1700	983		
Volume to Capacity	0.00	0.00	0.09	2.22		
Queue Length 95th (ft)	0	0	0	3872		
Control Delay (s)	3.6	0.0	0.0	563.4		
Lane LOS	A			F		
Approach Delay (s)	3.6	0.0		563.4		
Approach LOS				F		
Intersection Summary						
Average Delay		522.5				
Intersection Capacity Utilization		117.7%		ICU Level of Service		H
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis5: Bear Creek Rd & Site Entrance

2024 Background + Site Scenario 2 AM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	169	1744	308	12	123	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	192	1982	350	14	140	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			2174		1897	1183
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2174		1897	1183
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			0		0	89
cM capacity (veh/h)			239		0	228
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	2174	364	165			
Volume Left	0	350	140			
Volume Right	1982	0	25			
cSH	1700	239	0			
Volume to Capacity	1.28	1.46	Err			
Queue Length 95th (ft)	0	508	Err			
Control Delay (s)	0.0	269.0	Err			
Lane LOS		F	F			
Approach Delay (s)	0.0	269.0	Err			
Approach LOS			F			
Intersection Summary						
Average Delay			Err			
Intersection Capacity Utilization		152.5%		ICU Level of Service		H
Analysis Period (min)		15				

SimTraffic Simulation Summary

2024 Background + Site Scenario 2 AM

Summary of All Intervals

Start Time	6:20
End Time	7:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	5364
Vehs Exited	5195
Starting Vehs	300
Ending Vehs	469
Denied Entry Before	2
Denied Entry After	1364
Travel Distance (mi)	3338
Travel Time (hr)	1081.5
Total Delay (hr)	989.1
Total Stops	11129
Fuel Used (gal)	344.5

Interval #0 Information Seeding

Start Time	6:20
End Time	6:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	6:30
End Time	7:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	5364
Vehs Exited	5195
Starting Vehs	300
Ending Vehs	469
Denied Entry Before	2
Denied Entry After	1364
Travel Distance (mi)	3338
Travel Time (hr)	1081.5
Total Delay (hr)	989.1
Total Stops	11129
Fuel Used (gal)	344.5

Queuing and Blocking Report

2024 Background + Site Scenario 2 AM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	NB	B20	B20	SB	SB	SB
Directions Served	L	L	T	T	T	T	R
Maximum Queue (ft)	66	288	3024	3014	3832	3832	250
Average Queue (ft)	21	270	2808	2719	3698	3720	248
95th Queue (ft)	51	292	3507	3798	4202	4209	255
Link Distance (ft)	647	179	2975	2975	3817	3817	
Upstream Blk Time (%)		74	43	12	61	62	
Queuing Penalty (veh)		0	0	0	0	0	
Storage Bay Dist (ft)							150
Storage Blk Time (%)	2						99
Queuing Penalty (veh)	1						76

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB	B11
Directions Served	LT	LTR	L	T	T	R	L	T	T	R	T
Maximum Queue (ft)	229	26	31	66	107	26	37	189	263	29	34
Average Queue (ft)	80	3	16	30	47	3	6	94	119	12	1
95th Queue (ft)	160	15	29	55	82	15	20	162	203	35	11
Link Distance (ft)		295		232	232	232	191	191	191		529
Upstream Blk Time (%)								0	1		
Queuing Penalty (veh)								0	0		
Storage Bay Dist (ft)	300		150								125
Storage Blk Time (%)									4		
Queuing Penalty (veh)									2		

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	NB	NB	SB
Directions Served	LT	R	L	TR	L
Maximum Queue (ft)	30	23	51	13	165
Average Queue (ft)	1	9	13	1	58
95th Queue (ft)	10	23	37	7	116
Link Distance (ft)	964			1112	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25	100		200
Storage Blk Time (%)	2	1			
Queuing Penalty (veh)	0	0			

Queuing and Blocking Report

2024 Background + Site Scenario 2 AM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	770
Average Queue (ft)	734
95th Queue (ft)	757
Link Distance (ft)	647
Upstream Blk Time (%)	99
Queuing Penalty (veh)	1886
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Bear Creek Rd & Site Entrance

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	49	741	373
Average Queue (ft)	4	703	323
95th Queue (ft)	21	752	376
Link Distance (ft)	1176	692	321
Upstream Blk Time (%)		89	87
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			













Network Summary

Network wide Queuing Penalty: 1966

HCM Unsignalized Intersection Capacity Analysis






















1: Bear Creek Ramp & TN 58

2024 Background + Site Scenario 2 PM

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	658	964	324	256	1113	224	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	
Hourly flow rate (vph)	748	1095	368	291	1265	255	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)		2					
Median type				None	TWLTL		
Median storage veh					2		
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	2147	632	1265				
vC1, stage 1 conf vol	1265						
vC2, stage 2 conf vol	882						
vCu, unblocked vol	2147	632	1265				
tC, single (s)	7.0	7.0	4.2				
tC, 2 stage (s)	6.0						
tF (s)	3.6	3.3	2.2				
p0 queue free %	0	0	30				
cM capacity (veh/h)	91	420	529				
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	1843	368	145	145	632	632	255
Volume Left	748	368	0	0	0	0	0
Volume Right	1095	0	0	0	0	0	255
cSH	171	529	1700	1700	1700	1700	1700
Volume to Capacity	10.80	0.70	0.09	0.09	0.37	0.37	0.15
Queue Length 95th (ft)	Err	135	0	0	0	0	0
Control Delay (s)	Err	25.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	Err	14.5			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay		4585.1					
Intersection Capacity Utilization		97.1%		ICU Level of Service		F	
Analysis Period (min)		15					













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Background + Site Scenario 2 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	92	14	9	32	141	1160	4	1	994	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1787	1599	0	1716	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.717			0.877		0.145			0.208		
Satd. Flow (perm)	0	1349	1599	0	1525	0	270	3539	1583	391	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105		36				5			250
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	105	0	62	0	160	1318	5	1	1130	250
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	14.0	14.0	0.0	14.0	14.0	0.0	14.0	46.0	46.0	32.0	32.0	32.0
Total Split (%)	23.3%	23.3%	0.0%	23.3%	23.3%	0.0%	23.3%	76.7%	76.7%	53.3%	53.3%	53.3%
Maximum Green (s)	7.0	7.0		7.0	7.0		7.0	39.0	39.0	25.0	25.0	25.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		9.4	55.0		9.4		39.5	41.0	41.0	30.7	30.7	30.7
Actuated g/C Ratio		0.17	1.00		0.17		0.72	0.75	0.75	0.56	0.56	0.56
v/c Ratio		0.47	0.07		0.21		0.36	0.50	0.00	0.00	0.57	0.25
Control Delay		32.0	0.1		14.9		6.0	5.1	2.0	9.0	13.5	2.4
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings 2: TN 327 & TN 58

2024 Background + Site Scenario 2 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		32.0	0.1		14.9		6.0	5.1	2.0	9.0	13.5	2.4
LOS		C	A		B		A	A	A	A	B	A
Approach Delay		16.3			14.9			5.2			11.5	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		37	0		8		16	100	0	0	163	0
Queue Length 95th (ft)		#87	0		36		34	133	2	2	221	30
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		230	1599		290		450	2650	1186	220	1987	1007
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.47	0.07		0.21		0.36	0.50	0.00	0.00	0.57	0.25

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 55

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.9

Intersection LOS: A

Intersection Capacity Utilization 68.2%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

2024 Background + Site Scenario 2 PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	103	0	205	152	12	0	70	383	9	9	362	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	117	0	233	173	14	0	80	435	10	10	411	36
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1051	1055	430	1148	1068	440	448			445		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1051	1055	430	1148	1068	440	448			445		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	36	100	63	0	93	100	93			99		
cM capacity (veh/h)	184	209	626	104	204	617	1102			1109		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	350	186	80	445	10	448						
Volume Left	117	173	80	0	10	0						
Volume Right	233	0	0	10	0	36						
cSH	415	107	1102	1700	1109	1700						
Volume to Capacity	0.84	1.73	0.07	0.26	0.01	0.26						
Queue Length 95th (ft)	202	366	6	0	1	0						
Control Delay (s)	45.8	435.1	8.5	0.0	8.3	0.0						
Lane LOS	E	F	A		A							
Approach Delay (s)	45.8	435.1	1.3		0.2							
Approach LOS	E	F										
Intersection Summary												
Average Delay			64.4									
Intersection Capacity Utilization			52.7%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek Ramp










2024 Background + Site Scenario 2 PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↶	↶	↶	
Volume (veh/h)	5	5	5	1622	549	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	1843	624	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				36	99
cM capacity (veh/h)	1596				982	1068
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	1843	630		
Volume Left	6	0	0	624		
Volume Right	0	0	1843	6		
cSH	1596	1700	1700	983		
Volume to Capacity	0.00	0.00	1.08	0.64		
Queue Length 95th (ft)	0	0	0	120		
Control Delay (s)	3.6	0.0	0.0	14.9		
Lane LOS	A			B		
Approach Delay (s)	3.6	0.0		14.9		
Approach LOS				B		
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization			110.4%	ICU Level of Service		H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis5: Bear Creek Rd & Site Entrance

2024 Background + Site Scenario 2 PM

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	9	540	95	112	1510	267
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	10	614	108	127	1716	303
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			624		660	317
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			624		660	317
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		0	58
cM capacity (veh/h)			943		375	717
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	624	235	2019			
Volume Left	0	108	1716			
Volume Right	614	0	303			
cSH	1700	943	404			
Volume to Capacity	0.37	0.11	5.00			
Queue Length 95th (ft)	0	10	Err			
Control Delay (s)	0.0	4.9	Err			
Lane LOS		A	F			
Approach Delay (s)	0.0	4.9	Err			
Approach LOS			F			
Intersection Summary						
Average Delay		7015.1				
Intersection Capacity Utilization		155.0%	ICU Level of Service	H		
Analysis Period (min)		15				

SimTraffic Simulation Summary

2024 Background + Site Scenario 2 PM

Summary of All Intervals

Start Time	5:20
End Time	6:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	6245
Vehs Exited	6135
Starting Vehs	239
Ending Vehs	349
Denied Entry Before	158
Denied Entry After	1891
Travel Distance (mi)	3209
Travel Time (hr)	1279.8
Total Delay (hr)	1197.7
Total Stops	3761
Fuel Used (gal)	391.6

Interval #0 Information Seeding

Start Time	5:20
End Time	5:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:30
End Time	6:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	6245
Vehs Exited	6135
Starting Vehs	239
Ending Vehs	349
Denied Entry Before	158
Denied Entry After	1891
Travel Distance (mi)	3209
Travel Time (hr)	1279.8
Total Delay (hr)	1197.7
Total Stops	3761
Fuel Used (gal)	391.6

Queuing and Blocking Report

2024 Background + Site Scenario 2 PM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	EB	NB	B20	SB
Directions Served	L	R	L	T	T
Maximum Queue (ft)	769	150	287	136	22
Average Queue (ft)	746	45	144	16	1
95th Queue (ft)	765	158	257	81	7
Link Distance (ft)	649		179	3044	627
Upstream Blk Time (%)	79		15		
Queuing Penalty (veh)	1288		0		
Storage Bay Dist (ft)		50			
Storage Blk Time (%)	100				
Queuing Penalty (veh)	959				

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	T	T	R
Maximum Queue (ft)	141	70	114	99	132	189	245	176
Average Queue (ft)	50	29	46	40	61	75	93	41
95th Queue (ft)	111	63	85	77	115	148	181	89
Link Distance (ft)		295		232	232	191	191	
Upstream Blk Time (%)						0	1	0
Queuing Penalty (veh)						0	0	0
Storage Bay Dist (ft)	300		150					125
Storage Blk Time (%)							2	
Queuing Penalty (veh)							5	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	WB	NB	SB
Directions Served	LT	R	LTR	L	L
Maximum Queue (ft)	304	125	646	7	4
Average Queue (ft)	74	77	234	1	0
95th Queue (ft)	193	138	547	5	2
Link Distance (ft)	964		836		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	200
Storage Blk Time (%)	39	59			
Queuing Penalty (veh)	79	61			

Queuing and Blocking Report

2024 Background + Site Scenario 2 PM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	EB	WB	WB	B23	SB
Directions Served	LT	T	R	T	LR
Maximum Queue (ft)	31	2291	200	1198	167
Average Queue (ft)	2	2271	195	1096	79
95th Queue (ft)	12	2281	200	1530	127
Link Distance (ft)	433	2206		1176	649
Upstream Blk Time (%)		95		75	
Queuing Penalty (veh)		1543		1215	
Storage Bay Dist (ft)			100		
Storage Blk Time (%)			97		
Queuing Penalty (veh)			5		

Intersection: 5: Bear Creek Rd & Site Entrance

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	51	707	360
Average Queue (ft)	2	554	324
95th Queue (ft)	19	961	343
Link Distance (ft)	1176	692	321
Upstream Blk Time (%)		51	98
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 5156

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Background + Site Scen 2 AM
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2024
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 1913 veh/h
Opposing direction volume, Vo 135 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.7
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.995	0.966
Grade adj. factor, (note-1) fG	1.00	1.00
Directional flow rate, (note-2) vi	2185 pc/h	159 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	4.2	mi/h
Adj. for access points, (note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	1.8	mi/h
Average travel speed, ATSD	20.5	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.995
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	2174 pc/h	154 pc/h
Base percent time-spent-following,(note-4) BPTSFd	91.6 %	
Adjustment for no-passing zones, fnp	12.1	
Percent time-spent-following, PTSFd	102.9 %	

Level of Service and Other Performance Measures

Level of service, LOS	F	
Volume to capacity ratio, v/c	1.29	
Peak 15-min vehicle-miles of travel, VMT15	435	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1530	veh-mi
Peak 15-min total travel time, TT15	21.2	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	20.5	mi/h
Percent time-spent-following, PTSFd (from above)	102.9	
Level of service,(note-1) LOSd (from above)	F	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.11	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	3.60	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.62	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h

Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst AECOM
Agency/Co.
Date Performed 11/21/2014
Analysis Time Period Background + Site Scen 2 PM
Highway Bear Creek Rd
From/To SR 58 to W Bear Creek Rd
Jurisdiction
Analysis Year 2024
Description Clinch River TVA

Input Data

Highway class	Class 2	Peak-hour factor, PHF	0.88
Shoulder width	0.0 ft	% Trucks and buses	5 %
Lane width	12.0 ft	% Trucks crawling	0.0 %
Segment length	0.8 mi	Truck crawl speed	0.0 mi/hr
Terrain type	Level	% Recreational vehicles	0 %
Grade: Length	mi	% No-passing zones	50 %
Up/down	%	Access points/mi	1 /mi

Analysis direction volume, Vd 1622 veh/h
Opposing direction volume, Vo 549 veh/h

Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.995	0.995
Grade adj. factor, (note-1) fG	1.00	1.00
Directional flow rate, (note-2) vi	1852 pc/h	627 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed volume, (note-3) Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	45.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	4.2	mi/h
Adj. for access points, (note-3) fA	0.3	mi/h

Free-flow speed, FFSd	40.5	mi/h
-----------------------	------	------

Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATSD	20.5	mi/h

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.0
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	1.000
Grade adjustment factor,(note-1) fG	1.00	1.00
Directional flow rate,(note-2) vi	1843 pc/h	624 pc/h
Base percent time-spent-following,(note-4) BPTSFd	90.1 %	
Adjustment for no-passing zones, fnp	25.7	
Percent time-spent-following, PTSFd	109.3 %	

Level of Service and Other Performance Measures

Level of service, LOS	F	
Volume to capacity ratio, v/c	1.09	
Peak 15-min vehicle-miles of travel, VMT15	369	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1298	veh-mi
Peak 15-min total travel time, TT15	18.0	veh-h

Notes:

1. If the highway is extended segment (level) or rolling terrain, fG = 1.0
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Passing Lane Analysis

Total length of analysis segment, Lt	0.8	mi
Length of two-lane highway upstream of the passing lane, Lu		mi
Length of passing lane including tapers, Lpl		mi
Average travel speed, ATSD (from above)	20.5	mi/h
Percent time-spent-following, PTSFd (from above)	109.3	
Level of service,(note-1) LOSd (from above)	F	

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	1.70	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld		mi
Adj. factor for the effect of passing lane on average speed, fpl	1.11	
Average travel speed including passing lane,(note-2) ATSpl		

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	3.60	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld		mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	0.62	
Percent time-spent-following including passing lane,(note-3) PTSFpl		%

Level of Service and Other Performance Measures (note-4)

Level of service including passing lane, LOSpl

Peak 15-min total travel time, TT15

veh-h

Notes:

1. If LOSd = F, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT15, and VMT60 are calculated on Directional Two-Lane Highway Segment Worksheet.

***APPENDIX H – 2024 Future Conditions + SITE Scenario 1
Synchro / Sim Traffic / HCS Reports***

HCM Unsignalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field.

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Sign Control – Used to model two-way, three-way, and all-way stop or yield control unsignalized intersections.

Grade – Percent slope of the roadway approaching the intersection.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Hourly Flow Rate – The hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other traffic-way; computed as the number of vehicles, bicycles, or person passing a point divided by the time interval (usually less than 1 hour) in which they pass; expressed as vehicles, bicycles, or persons per hour.

Pedestrians – An individual traveling by foot.

Lane width – The arithmetic mean of the lane widths of roadway in on direction, expressed in feet.

Walking Speed – The speed of pedestrians which is established to be 3.5 ft/sec per the HCM.

Percent Blockage – Queuing penalty for a storage bay based on the percent time the lane is blocked.

Right Turn Flare – A shared turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Median Type – The type of divider between directional lanes such as Two Way Left Turn Lane, or Divided (Concrete or landscape median)

Median Storage – The number of vehicles that can be stored in the median is equal to the median width divided by vehicle length. For a Two Way Left Turn Lane median, 2 vehicles can stored.

Upstream Signal – Controls capacity efficiency and saturation flow rate at downstream signals **pX** – number of unlocked vehicles in platoon.

vC – total conflicting volumes for minor street approach.

vC1 – stage 1 movement conflicting volumes for minor street approach.

vC2 – stage 2 movement conflicting volumes for minor street approach.

vCu – Unblocked volumes for minor street approach.

tC, single– The critical gap time for single stage crossing.

tC, 2 stage – the critical gap time for each stage of a two stage crossing.

tF – Follow up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle.

pO – The probability of a queue free state for this movement.

cM – The capacity for the movement. This value considers the impacts of two state gap acceptance and platooned flows. However this capacity does not consider the influence of shared lanes or flared right turns.

Volume Total – total volume for an approach/movement.

Volume Left – Total volume turning left.

Volume right – Total volume turning right.

cSH – The capacity for each lane considering the affects of sharing and flared right runs. The capacity of free movements is assumed to be 1700 vehicles per hour per lane.

Volume to Capacity – the ratio of flow rate to capacity for transportation facility

Queue Length 95th – the maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during an analysis period.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Lane LOS – LOS for each lane.

Approach Delay – Is the weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach.

Average Delay – The average of Uniform delay (90th, 70th, 50th, 30th, and 10th percentile volumes).

Intersection Capacity Utilization – This method compares the current volume to the intersection ultimate capacity.

ICU LOS - Based upon the critical flow ratio (ICU) for the intersection. The critical flow ratio is the sum of green plus clearance times required to serve the critical movements at the intersection divided by a reference cycle length. The ICU LOS is designed to be insensitive to the actual signal timing for the intersection.

Analysis Period – Duration of the analysis.

HCM Signalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Ideal Flow – This is the Ideal Saturated Flow and 1900 vehicles per hour per lane by default.

Storage Length – Length of a storage bay for a turn lane.

Storage Lanes – Number of Lanes with storage.

Satd. Flow (prot) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to protected (prot) operation.

Taper Length – Length of a lane before the storage bay begins usually designated with mini-skip stripes.

Satd. Flow (perm) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to permissive (perm) operation.

Flt Permitted – The permitted left-turn factor may vary slightly from the left-turn factor showing in other Synchro reports because these are calculated based on actuated green times for HCM compatibility.

Right turn on Red – A way to indicated if right turn on red is allowed or restricted.

Satd Flow (RTOR) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to right-turn on red (RTOR) operation.

Link Speed – The driver speed on the particular link corresponding to the posted speed limit sign.

Link Distance – The distance from center point to center point of a link or distance between intersections.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Heavy Vehicles % - The percent vehicles in the traffic volumes that are heavy trucks or busses.

Shared Lane Traffic % - The percent of turning traffic assigned to a shared lane.

Lane Group Flow – Combines the adjusted flow and traffic in shared lane values to assign net volumes to each lane group.

Enter Blocked Intersection – Controls the simulation modeling gridlock avoidance.

Lane Alignment – This setting allows the user to specify how a lane aligns through an intersection.

Median Width – The width of a median.

Link Offset – Setting used to offset the roadway alignment to the right or left of the centerline.

Crosswalk Width – Width of a crosswalk.

Two Way Left Turn Lane – This setting visually displays a TWLTL median .

Headway Factor – Based on the Ideal Saturation Flow, lane width factor, the grade factor, the parking factor, the bus stops factor, and the area factor but is not used in the capacity calculations in Synchro.

Turning Speed – Speed used for vehicles turning and simulation in Sim Traffic.

Turn Type – Setting used to set the treatment (perm, prot, overlap, etc...) for left and right-turn movements.

Protected Phases – The movements at signalized intersection that are made with no opposing or conflicting vehicular flow allowed.

Permitted Phases – The movements at signalized intersection that is made against an opposing or conflicting vehicular flow.

Detector Phase – Primary detector that determines which phases each lane group's detector are connected to. Calls are placed for lane groups, regardless of the current active phases.

Switch Phase – A Secondary phase that extends the entered phase when it is green, but does not place a call.

Minimum Initial – The minimum Green time per phase in seconds.

Minimum Split – The shortest allowable amount of time allowed for a phase in seconds.

Total Split – Includes the green, yellow, and all-red intervals assigned to a phase.

Maximum Green – Parameter represents the maximum amount of time that a green signal indication can be displayed in the presence of conflicting demand.

Yellow Time – This is the time each phase displays yellow.

All-Red Time – This is the time each phase displays all red clearance before the next phase.

Lost time Adjust – Dependent on driver reaction time, length of yellow time, yellow deceleration rate, intersection width, and approach speeds.

Lead/Lag – Used to determine the phase order.

Lead-Lag Optimize – Setting allowing Synchro to optimize the phase order.

Vehicle Extension – Used with actuated phases. A vehicle passing over a detector will extend the gap counter by the amount of time specified by the vehicle extension time.

Recall Mode – A means to provide reoccurring vehicle or pedestrian demand so a phase is serviced, even if no real demand exists on the phase.

Act Effct Green – The value representing the average green time observed while the signal is operating in actuated mode.

Actuated g/C Ratio – The average actuated green time divided by the actuated cycle length.

v/c Ratio - the ratio of flow rate to capacity.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Queue Delay – An analysis of the effects of queues and blocking on short links and short turning bays. This delay includes the analysis of spillback, starvation, and storage blocking.

Total Delay – The lane group Control Delay plus the Queue Delay.

LOS – The letter from A-F based on the length of delay.

Approach Delay – A volume weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach based on Total Delay.

Queue Lengths 50th - The maximum back of queue with 50th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Queue Length 95th – The maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Internal Link Dist – The distance between two intersections.

Turn Bay Length – Length of a turn lane.

Base Capacity – The capacity of a lane group if unimpeded.

Starvation Cap Reductn – Reduction to the base capacity due to starvation. Starvation is the congested caused by short upstream link in conjunction with poor/no coordination.

Spillback Cap Reductn – Reduction to the base capacity caused by short downstream link becoming filled up.

Storage Cap Reductn – Reduction to the base capacity caused when turn pocked cannot accommodate queue lengths.

Reduced v/c Ratio – Modified volume to capacity ratio with the adjustments to the base capacity.

Area Type – A setting that allows the user to choose it surroundings such as a Central Business District.

Cycle Length – The total time for a signal to complete one cycle.

Actuated Cycle Length – The average cycle length for an actuated signal.

Natural Cycle – The shortest cycle length that will give acceptable capacity.

Control Type – Setting allowing the user to choose unsignalized or the type of signalization.

Maximum v/c Ratio – The highest individual movement or lane group v/c ratio.

Intersection Signal Delay – The total delay for the intersection by taking the volume weighted average of all the Total Delays.

Intersection LOS – The LOS for the entire intersection by taking total intersection delay and converting it to a level A-F.

Intersection Capacity Utilization (ICU) – The sum of the ratios of approach volume divided by approach capacity for each leg of intersection which controls overall traffic signal timing plus an allowance for clearance times.

ICU Level of Service – Numerical value that gives insight into how an intersection is functioning and how much extra capacity is available to handle fluctuations and incidents.

Analysis Period - Duration of the analysis.

SIM Traffic Summary & Queuing and Blocking Report Definitions – Synchro 7

Start Time – Time the network seeding begins.

End Time – The end of the recorded peak period.

Total Time – Seeding time plus recording time.

Time recorded – length of time of recording. Typically the peak hour.

of Intervals – There are 3 interval types

Interval 0, Seeding – Duration long enough for vehicle to traverse from one side of the network to another including stops.

Interval 1, Recording – Duration is closest to cycle length, volume is adjusted 95th

Interval 2, Recording and Recovery – Duration 15 minutes, no volume adjustment

of Recorded Intvls – The number of intervals which were recorded.

Vehs Entered – The total number of vehicles that entered the network.

Vehs Exited – The total number of vehicles that exited the network .

Starting Vehs – The number of vehicles at start of interval.

Ending Vehs – The number of vehicles at end of interval.

Denied Entry Before – Vehicles unable to enter a link due to congestion at the beginning of the period.

Denied Entry After – Vehicles unable to enter a link due to congestion at the end of the period.

Travel Distance – Summation of the vehicle distance traveled.

Travel Time – Total time each vehicle was present in this area. Travel Time includes time spent by vehicles denied entry.

Total Delay – The total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices.

Total Stops – A count of vehicle stops. Whenever a vehicles speed drops below 10 ft/sec a stop is added. A vehicle is considered going again when is speed reaches 15 ft/sec.

Fuel Used – Calculation using fuel consumption parameters .

Directions Served – Indicates the movement being served.

Maximum Queue – Maximum back of queue observed for the entire analysis interval.

Average Queue – Average back of queue observed for the entire analysis interval.

95th Queue – A calculation equal to the average queue plus 1.65 standard deviations.

Link Distance – Internal distance of the link from stop bar to stop bar.

Upstream Blk Time – Proportion of the time that the upstream end of the lane is blocked.
















Queuing Penalty – A rough measure of how many vehicles are affected by the blocking.

Storage Bay Dist – Length of a turning bay.

Storage Blk Time – Proportion of time that a lane is queued at the top of the storage.







Lanes, Volumes, Timings
1: Bear Creek Ramp & TN 58

2024 Future + Site Scenario 1 AM

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 			 	 	
Volume (vph)	44	62	882	633	155	613
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350	0	0			150
Storage Lanes	1	1	1			1
Taper Length (ft)	100	100	100			100
Satd. Flow (prot)	3183	1568	1719	3539	3505	1538
Flt Permitted	0.950		0.495			
Satd. Flow (perm)	3183	1568	896	3539	3505	1538
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		70				297
Link Speed (mph)	25			55	55	
Link Distance (ft)	669			409	3858	
Travel Time (s)	18.2			5.1	47.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	3%	5%	2%	3%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	50	70	1002	719	176	697
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type		Free	pm+pt			Free
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			Free
Detector Phase	4		5	2	6	
Switch Phase						
Minimum Initial (s)	7.0		7.0	14.0	14.0	
Minimum Split (s)	14.0		14.0	21.0	21.0	
Total Split (s)	14.0	0.0	65.0	86.0	21.0	0.0
Total Split (%)	14.0%	0.0%	65.0%	86.0%	21.0%	0.0%
Maximum Green (s)	7.0		58.0	79.0	14.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	1.0	-2.0	-2.0	-2.0	1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		None	Min	Min	
Act Effect Green (s)	9.4	88.5	75.8	78.4	16.7	88.5
Actuated g/C Ratio	0.11	1.00	0.86	0.89	0.19	1.00
v/c Ratio	0.15	0.04	0.79	0.23	0.27	0.45
Control Delay	42.5	0.0	11.0	1.8	36.3	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
1: Bear Creek Ramp & TN 58

2024 Future + Site Scenario 1 AM

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	42.5	0.0	11.0	1.8	36.3	1.0
LOS	D	A	B	A	D	A
Approach Delay	17.7			7.2	8.1	
Approach LOS	B			A	A	
Queue Length 50th (ft)	15	0	255	43	52	0
Queue Length 95th (ft)	33	0	436	54	83	0
Internal Link Dist (ft)	589			329	3778	
Turn Bay Length (ft)	350					150
Base Capacity (vph)	338	1568	1361	3107	662	1538
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	0.15	0.04	0.74	0.23	0.27	0.45






















Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 88.5	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 78.9%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Bear Creek Ramp & TN 58















Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 1 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	9	129	2	2	0	26	565	11	16	943	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1795	1599	0	1827	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.733			0.828		0.145			0.408		
Satd. Flow (perm)	0	1379	1599	0	1550	0	270	3539	1583	768	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147						12			62
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	238	147	0	4	0	30	642	12	18	1072	62
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	14.0	42.0	42.0	28.0	28.0	28.0
Total Split (%)	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	23.3%	70.0%	70.0%	46.7%	46.7%	46.7%
Maximum Green (s)	11.0	11.0		11.0	11.0		7.0	35.0	35.0	21.0	21.0	21.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		13.0	50.5		13.0		27.3	27.3	27.3	22.6	22.6	22.6
Actuated g/C Ratio		0.26	1.00		0.26		0.54	0.54	0.54	0.45	0.45	0.45
v/c Ratio		0.67	0.09		0.01		0.07	0.34	0.01	0.05	0.68	0.08
Control Delay		32.0	0.1		18.0		5.2	6.7	2.5	11.5	15.5	4.3
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 1 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		32.0	0.1		18.0		5.2	6.7	2.5	11.5	15.5	4.3
LOS		C	A		B		A	A	A	B	B	A
Approach Delay		19.9			18.0			6.6			14.8	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		54	0		1		4	48	0	2	95	0
Queue Length 95th (ft)		#182	0		8		11	69	5	15	235	18
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		363	1599		408		420	2654	1190	358	1650	778
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.66	0.09		0.01		0.07	0.24	0.01	0.05	0.65	0.08

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 50.5

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 13.2

Intersection LOS: B

Intersection Capacity Utilization 52.7%

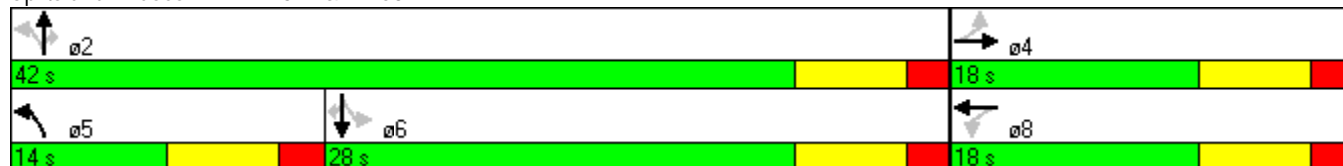
ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95











2024 Future + Site Scenario 1 AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	0	11	0	0	0	166	127	239	444	180	81
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	7	0	12	0	0	0	189	144	272	505	205	92
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			5									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1781	2053	251	1877	1963	280	297			416		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1781	2053	251	1877	1963	280	297			416		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	82	100	98	100	100	100	85			56		
cM capacity (veh/h)	38	27	788	31	30	759	1253			1138		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	19	0	189	416	505	297						
Volume Left	7	0	189	0	505	0						
Volume Right	12	0	0	272	0	92						
cSH	107	1700	1253	1700	1138	1700						
Volume to Capacity	0.18	0.00	0.15	0.24	0.44	0.17						
Queue Length 95th (ft)	16	0	13	0	58	0						
Control Delay (s)	48.8	0.0	8.4	0.0	10.7	0.0						
Lane LOS	E	A	A		B							
Approach Delay (s)	48.8	0.0	2.6		6.7							
Approach LOS	E	A										
Intersection Summary												
Average Delay			5.5									
Intersection Capacity Utilization			59.3%		ICU Level of Service		B					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis













4: US Government Property & Bear Creek Ramp

2024 Future + Site Scenario 1 AM













						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	106	1495	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	120	1699	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					669	
pX, platoon unblocked						
vC, conflicting volume	1834	852	1699			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1834	852	1699			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	98	98			
cM capacity (veh/h)	64	297	358			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	11	6	120	1133	572	
Volume Left	6	6	0	0	0	
Volume Right	6	0	0	0	6	
cSH	106	358	1700	1700	1700	
Volume to Capacity	0.11	0.02	0.07	0.67	0.34	
Queue Length 95th (ft)	9	1	0	0	0	
Control Delay (s)	43.1	15.2	0.0	0.0	0.0	
Lane LOS	E	C				
Approach Delay (s)	43.1	0.7		0.0		
Approach LOS	E					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			51.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 1 AM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	234	12	94	16	169	1326
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	266	14	107	18	192	1507
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1998	107			107	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1998	107			107	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	99			87	
cM capacity (veh/h)	56	939			1466	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	266	14	107	18	192	1507
Volume Left	266	0	0	0	192	0
Volume Right	0	14	0	18	0	0
cSH	56	939	1700	1700	1466	1700
Volume to Capacity	4.72	0.01	0.06	0.01	0.13	0.89
Queue Length 95th (ft)	Err	1	0	0	11	0
Control Delay (s)	Err	8.9	0.0	0.0	7.8	0.0
Lane LOS	F	A			A	
Approach Delay (s)	9511.7		0.0		0.9	
Approach LOS	F					
Intersection Summary						
Average Delay			1264.8			
Intersection Capacity Utilization			89.4%		ICU Level of Service	E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 2024 Future + Site Scenario 1 AM - Bollard 5: W Bear Creek Rd & Site Entrance

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	234	12	94	16	169	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	266	14	107	18	192	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	491	107			107	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	491	107			107	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	42	99			87	
cM capacity (veh/h)	462	939			1466	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	266	14	107	18	192	0
Volume Left	266	0	0	0	192	0
Volume Right	0	14	0	18	0	0
cSH	462	939	1700	1700	1466	1700
Volume to Capacity	0.58	0.01	0.06	0.01	0.13	0.00
Queue Length 95th (ft)	89	1	0	0	11	0
Control Delay (s)	22.8	8.9	0.0	0.0	7.8	0.0
Lane LOS	C	A			A	
Approach Delay (s)	22.2		0.0		7.8	
Approach LOS	C					
Intersection Summary						
Average Delay			12.9			
Intersection Capacity Utilization			35.7%		ICU Level of Service	A
Analysis Period (min)			15			

SimTraffic Simulation Summary

2024 Future + Site Scenario 1 AM

Summary of All Intervals

Start Time	6:20
End Time	7:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	6023
Vehs Exited	6082
Starting Vehs	233
Ending Vehs	174
Denied Entry Before	0
Denied Entry After	1
Travel Distance (mi)	5336
Travel Time (hr)	203.3
Total Delay (hr)	48.5
Total Stops	4742
Fuel Used (gal)	189.4

Interval #0 Information Seeding

Start Time	6:20
End Time	6:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	6:30
End Time	7:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	6023
Vehs Exited	6082
Starting Vehs	233
Ending Vehs	174
Denied Entry Before	0
Denied Entry After	1
Travel Distance (mi)	5336
Travel Time (hr)	203.3
Total Delay (hr)	48.5
Total Stops	4742
Fuel Used (gal)	189.4

Queuing and Blocking Report

2024 Future + Site Scenario 1 AM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	EB	NB	NB	NB	B20	SB	SB
Directions Served	L	L	L	T	T	T	T	T
Maximum Queue (ft)	51	74	448	54	74	210	111	96
Average Queue (ft)	10	31	256	21	24	21	36	51
95th Queue (ft)	34	60	422	53	58	112	83	89
Link Distance (ft)		587	351	351	351	2797	3818	3818
Upstream Blk Time (%)			3					
Queuing Penalty (veh)			0					
Storage Bay Dist (ft)	350							
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	140	26	43	70	85	27	16	165	236	50
Average Queue (ft)	70	4	15	43	46	2	3	74	96	12
95th Queue (ft)	125	19	36	76	79	12	12	134	171	36
Link Distance (ft)		295		232	232	232	191	191	191	
Upstream Blk Time (%)									0	
Queuing Penalty (veh)									0	
Storage Bay Dist (ft)	300		150							125
Storage Blk Time (%)									2	
Queuing Penalty (veh)									1	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	NB	NB	SB
Directions Served	LT	R	L	TR	L
Maximum Queue (ft)	4	21	29	15	158
Average Queue (ft)	0	7	7	2	50
95th Queue (ft)	2	21	21	9	112
Link Distance (ft)	964			1112	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		125	100		200
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report

2024 Future + Site Scenario 1 AM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	31	31
Average Queue (ft)	10	3
95th Queue (ft)	34	18
Link Distance (ft)	384	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: W Bear Creek Rd & Site Entrance

Movement	WB	WB	SB	SB
Directions Served	L	R	L	T
Maximum Queue (ft)	132	62	967	983
Average Queue (ft)	68	12	392	478
95th Queue (ft)	106	41	943	1063
Link Distance (ft)		1054	1447	1447
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150			
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 21: Bend
















Movement	SE	SE
Directions Served		T
Maximum Queue (ft)	447	480
Average Queue (ft)	218	301
95th Queue (ft)	522	570
Link Distance (ft)	447	447
Upstream Blk Time (%)	0	1
Queuing Penalty (veh)	0	6
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 7







Lanes, Volumes, Timings
1: Bear Creek Ramp & TN 58

2024 Future + Site Scenario 1 PM

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	 			 	 	
Volume (vph)	451	668	218	256	1113	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	350	0	0			150
Storage Lanes	1	1	1			1
Taper Length (ft)	100	100	100			100
Satd. Flow (prot)	3183	1568	1719	3539	3505	1538
Flt Permitted	0.950		0.091			
Satd. Flow (perm)	3183	1568	165	3539	3505	1538
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		535				64
Link Speed (mph)	25			55	55	
Link Distance (ft)	669			409	3858	
Travel Time (s)	18.2			5.1	47.8	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	3%	5%	2%	3%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	512	759	248	291	1265	170
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	R NA	Left	Left	Left	Right
Median Width(ft)	24			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type		Free	pm+pt			Free
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			Free
Detector Phase	4		5	2	6	
Switch Phase						
Minimum Initial (s)	7.0		7.0	14.0	14.0	
Minimum Split (s)	14.0		14.0	21.0	21.0	
Total Split (s)	30.0	0.0	22.0	70.0	48.0	0.0
Total Split (%)	30.0%	0.0%	22.0%	70.0%	48.0%	0.0%
Maximum Green (s)	23.0		15.0	63.0	41.0	
Yellow Time (s)	5.0		5.0	5.0	5.0	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-2.0	1.0	-2.0	-2.0	-2.0	1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	None		None	Min	Min	
Act Effect Green (s)	21.3	91.5	60.0	60.0	38.9	91.5
Actuated g/C Ratio	0.23	1.00	0.66	0.66	0.43	1.00
v/c Ratio	0.69	0.48	0.65	0.13	0.85	0.11
Control Delay	38.3	1.1	27.4	6.3	30.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
1: Bear Creek Ramp & TN 58

2024 Future + Site Scenario 1 PM

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Total Delay	38.3	1.1	27.4	6.3	30.7	0.1
LOS	D	A	C	A	C	A
Approach Delay	16.1			16.0	27.1	
Approach LOS	B			B	C	
Queue Length 50th (ft)	151	0	86	31	352	0
Queue Length 95th (ft)	200	0	170	48	446	0
Internal Link Dist (ft)	589			329	3778	
Turn Bay Length (ft)	350					150
Base Capacity (vph)	885	1568	402	2558	1676	1538
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	0.58	0.48	0.62	0.11	0.75	0.11






















Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 91.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 20.9	Intersection LOS: C
Intersection Capacity Utilization 68.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Bear Creek Ramp & TN 58















Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 1 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	81	14	9	32	111	983	4	1	931	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1787	1599	0	1716	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.717			0.879		0.148			0.255		
Satd. Flow (perm)	0	1349	1599	0	1528	0	276	3539	1583	480	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			92		36				5			250
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	92	0	62	0	126	1117	5	1	1058	250
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	18.0	18.0	0.0	18.0	18.0	0.0	14.0	42.0	42.0	28.0	28.0	28.0
Total Split (%)	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%	23.3%	70.0%	70.0%	46.7%	46.7%	46.7%
Maximum Green (s)	11.0	11.0		11.0	11.0		7.0	35.0	35.0	21.0	21.0	21.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		11.6	54.4		11.6		36.7	38.2	38.2	27.8	27.8	27.8
Actuated g/C Ratio		0.21	1.00		0.21		0.67	0.70	0.70	0.51	0.51	0.51
v/c Ratio		0.38	0.06		0.18		0.28	0.45	0.00	0.00	0.58	0.27
Control Delay		24.8	0.1		12.3		6.3	6.2	3.0	12.0	16.0	3.0
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 1 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		24.8	0.1		12.3		6.3	6.2	3.0	12.0	16.0	3.0
LOS		C	A		B		A	A	A	B	B	A
Approach Delay		13.5			12.3			6.2			13.5	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		34	0		8		15	95	0	0	165	0
Queue Length 95th (ft)		72	0		33		32	137	3	3	231	35
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		335	1599		407		443	2483	1112	246	1812	940
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.33	0.06		0.15		0.28	0.45	0.00	0.00	0.58	0.27

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 54.4

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 10.2

Intersection LOS: B

Intersection Capacity Utilization 63.3%

ICU Level of Service B

Analysis Period (min) 15




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis











3: W Bear Creek Rd & TN 95

2024 Future + Site Scenario 1 PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	73	0	146	152	12	0	49	383	9	9	362	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	83	0	166	173	14	0	56	435	10	10	411	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			5									
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	997	1001	423	1066	1007	440	435			445		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	997	1001	423	1066	1007	440	435			445		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	60	100	74	0	94	100	95			99		
cM capacity (veh/h)	205	230	631	141	227	617	1114			1109		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	249	186	56	445	10	435						
Volume Left	83	173	56	0	10	0						
Volume Right	166	0	0	10	0	24						
cSH	615	145	1114	1700	1109	1700						
Volume to Capacity	0.40	1.29	0.05	0.26	0.01	0.26						
Queue Length 95th (ft)	49	284	4	0	1	0						
Control Delay (s)	19.8	231.1	8.4	0.0	8.3	0.0						
Lane LOS	C	F	A		A							
Approach Delay (s)	19.8	231.1	0.9		0.2							
Approach LOS	C	F										
Intersection Summary												
Average Delay			35.1									
Intersection Capacity Utilization			49.8%		ICU Level of Service		A					
Analysis Period (min)			15									













HCM Unsignalized Intersection Capacity Analysis4: US Government Property & Bear Creek Ramp

2024 Future + Site Scenario 1 PM













						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	1119	369	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	1272	419	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					669	
pX, platoon unblocked						
vC, conflicting volume	1705	212	419			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1705	212	419			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	99	99			
cM capacity (veh/h)	79	784	1115			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	11	6	1272	280	145	
Volume Left	6	6	0	0	0	
Volume Right	6	0	0	0	6	
cSH	144	1115	1700	1700	1700	
Volume to Capacity	0.08	0.01	0.75	0.16	0.09	
Queue Length 95th (ft)	6	0	0	0	0	
Control Delay (s)	32.1	8.2	0.0	0.0	0.0	
Lane LOS	D	A				
Approach Delay (s)	32.1	0.0		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			68.9%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 1 PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	63	112	1007	178	9	360
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	72	127	1144	202	10	409
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1574	1144			1144	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1574	1144			1144	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	39	47			98	
cM capacity (veh/h)	117	240			600	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	72	127	1144	202	10	409
Volume Left	72	0	0	0	10	0
Volume Right	0	127	0	202	0	0
cSH	117	240	1700	1700	600	1700
Volume to Capacity	0.61	0.53	0.67	0.12	0.02	0.24
Queue Length 95th (ft)	77	71	0	0	1	0
Control Delay (s)	75.2	35.8	0.0	0.0	11.1	0.0
Lane LOS	F	E			B	
Approach Delay (s)	50.0		0.0		0.3	
Approach LOS	F					
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			66.6%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 2024 Future + Site Scenario 1 PM - Bollard 5: W Bear Creek Rd & Site Entrance

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	63	112	1007	178	9	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	72	127	1144	202	10	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1165	1144			1144	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1165	1144			1144	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	66	47			98	
cM capacity (veh/h)	208	240			600	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	72	127	1144	202	10	0
Volume Left	72	0	0	0	10	0
Volume Right	0	127	0	202	0	0
cSH	208	240	1700	1700	600	1700
Volume to Capacity	0.34	0.53	0.67	0.12	0.02	0.24
Queue Length 95th (ft)	36	71	0	0	1	0
Control Delay (s)	31.1	35.8	0.0	0.0	11.1	0.0
Lane LOS	D	E			B	
Approach Delay (s)	34.1		0.0		11.1	
Approach LOS	D					
Intersection Summary						
Average Delay			4.4			
Intersection Capacity Utilization			66.6%		ICU Level of Service	C
Analysis Period (min)			15			

SimTraffic Simulation Summary

2024 Future + Site Scenario 1 PM

Summary of All Intervals

Start Time	5:20
End Time	6:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	6896
Vehs Exited	6904
Starting Vehs	218
Ending Vehs	210
Denied Entry Before	1
Denied Entry After	0
Travel Distance (mi)	5990
Travel Time (hr)	220.6
Total Delay (hr)	58.0
Total Stops	4123
Fuel Used (gal)	225.3

Interval #0 Information Seeding

Start Time	5:20
End Time	5:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:30
End Time	6:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	6896
Vehs Exited	6904
Starting Vehs	218
Ending Vehs	210
Denied Entry Before	1
Denied Entry After	0
Travel Distance (mi)	5990
Travel Time (hr)	220.6
Total Delay (hr)	58.0
Total Stops	4123
Fuel Used (gal)	225.3

Queuing and Blocking Report

2024 Future + Site Scenario 1 PM

Intersection: 1: Bear Creek Ramp & TN 58

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	L	T	T	T	T	R
Maximum Queue (ft)	239	282	205	51	94	739	842	250
Average Queue (ft)	155	175	112	24	37	375	409	116
95th Queue (ft)	233	253	187	52	79	637	694	322
Link Distance (ft)		587	351	351	351	3818	3818	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	350							150
Storage Blk Time (%)							45	
Queuing Penalty (veh)							67	

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	T	T	R
Maximum Queue (ft)	97	88	104	110	114	148	154	177
Average Queue (ft)	42	34	44	61	79	76	78	39
95th Queue (ft)	88	65	84	104	119	137	135	90
Link Distance (ft)		295		232	232	191	191	
Upstream Blk Time (%)								0
Queuing Penalty (veh)								0
Storage Bay Dist (ft)	300		150					125
Storage Blk Time (%)							1	
Queuing Penalty (veh)							3	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	WB	NB	SB
Directions Served	LT	R	LTR	L	L
Maximum Queue (ft)	51	113	257	38	5
Average Queue (ft)	16	47	107	3	0
95th Queue (ft)	42	84	206	17	2
Link Distance (ft)	964		836		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		125		100	200
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Queuing and Blocking Report

2024 Future + Site Scenario 1 PM

Intersection: 4: US Government Property & Bear Creek Ramp

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	31	31	48
Average Queue (ft)	8	1	2
95th Queue (ft)	29	10	16
Link Distance (ft)	385		587
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: W Bear Creek Rd & Site Entrance

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	92	159	51
Average Queue (ft)	42	59	6
95th Queue (ft)	77	117	28
Link Distance (ft)		1054	1488
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	150		
Storage Blk Time (%)		1	
Queuing Penalty (veh)		1	

Intersection: 20: Bend

Movement	SB
Directions Served	T
Maximum Queue (ft)	435
Average Queue (ft)	366
95th Queue (ft)	605
Link Distance (ft)	351
Upstream Blk Time (%)	10
Queuing Penalty (veh)	60
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 131

Phone:
E-mail:

Fax:

OPERATIONAL ANALYSIS

Analyst: AECOM
 Agency/Co: AECOM
 Date: 11/21/2014
 Analysis Period: Future + Site Scen 1 AM 2024
 Highway: Bear Creek Rd
 From/To: SR 58 to W Bear Creek Rd
 Jurisdiction:
 Analysis Year: 2024
 Project ID: Clinch River TVA

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	45.0	mph	45.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	45.0	mph	45.0	mph

VOLUME

Direction	1		2	
Volume, V	1500	vph	111	vph
Peak-hour factor, PHF	0.88		0.88	
Peak 15-minute volume, v15	426		32	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.976		0.976	
Flow rate, vp	873	pcphpl	64	pcphpl

RESULTS

	Direction	1		2	
Flow rate, vp		873	pcphpl	64	pcphpl
Free-flow speed, FFS		45.0	mph	45.0	mph
Avg. passenger-car travel speed, S		45.0	mph	45.0	mph
Level of service, LOS		C		A	
Density, D		19.4	pc/mi/ln	1.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone:
E-mail:

Fax:

OPERATIONAL ANALYSIS

Analyst: AECOM
 Agency/Co: AECOM
 Date: 11/21/2014
 Analysis Period: Future + Site Scen 1 PM 2024
 Highway: Bear Creek Rd
 From/To: SR 58 to W Bear Creek Rd
 Jurisdiction:
 Analysis Year: 2024
 Project ID: Clinch River TVA

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	45.0	mph	45.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	45.0	mph	45.0	mph

VOLUME

Direction	1		2	
Volume, V	374	vph	1124	vph
Peak-hour factor, PHF	0.88		0.88	
Peak 15-minute volume, v15	106		319	
Trucks and buses	5	%	5	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.976		0.976	
Flow rate, vp	217	pcphpl	654	pcphpl

RESULTS

	Direction	1		2	
Flow rate, vp		217	pcphpl	654	pcphpl
Free-flow speed, FFS		45.0	mph	45.0	mph
Avg. passenger-car travel speed, S		45.0	mph	45.0	mph
Level of service, LOS		A		B	
Density, D		4.8	pc/mi/ln	14.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

***APPENDIX I – 2024 Future Conditions + SITE Scenario 2
Synchro / Sim Traffic / HCS / SIDRA Reports***

HCM Unsignalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field.

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Sign Control – Used to model two-way, three-way, and all-way stop or yield control unsignalized intersections.

Grade – Percent slope of the roadway approaching the intersection.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Hourly Flow Rate – The hourly rate at which vehicles, bicycles, or persons pass a point on a lane, roadway, or other traffic-way; computed as the number of vehicles, bicycles, or person passing a point divided by the time interval (usually less than 1 hour) in which they pass; expressed as vehicles, bicycles, or persons per hour.

Pedestrians – An individual traveling by foot.

Lane width – The arithmetic mean of the lane widths of roadway in on direction, expressed in feet.

Walking Speed – The speed of pedestrians which is established to be 3.5 ft/sec per the HCM.

Percent Blockage – Queuing penalty for a storage bay based on the percent time the lane is blocked.

Right Turn Flare – A shared turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Median Type – The type of divider between directional lanes such as Two Way Left Turn Lane, or Divided (Concrete or landscape median)

Median Storage – The number of vehicles that can be stored in the median is equal to the median width divided by vehicle length. For a Two Way Left Turn Lane median, 2 vehicles can stored.

Upstream Signal – Controls capacity efficiency and saturation flow rate at downstream signals **pX** – number of unlocked vehicles in platoon.

vC – total conflicting volumes for minor street approach.

vC1 – stage 1 movement conflicting volumes for minor street approach.

vC2 – stage 2 movement conflicting volumes for minor street approach.

vCu – Unblocked volumes for minor street approach.

tC, single – The critical gap time for single stage crossing.

tC, 2 stage – the critical gap time for each stage of a two stage crossing.

tF – Follow up time, or the time span between the departure of one vehicle from the minor street and the departure of the next vehicle.

pO – The probability of a queue free state for this movement.

cM – The capacity for the movement. This value considers the impacts of two state gap acceptance and platooned flows. However this capacity does not consider the influence of shared lanes or flared right turns.

Volume Total – total volume for an approach/movement.

Volume Left – Total volume turning left.

Volume right – Total volume turning right.

cSH – The capacity for each lane considering the affects of sharing and flared right runs. The capacity of free movements is assumed to be 1700 vehicles per hour per lane.

Volume to Capacity – the ratio of flow rate to capacity for transportation facility

Queue Length 95th – the maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during an analysis period.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Lane LOS – LOS for each lane.

Approach Delay – Is the weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach.

Average Delay – The average of Uniform delay (90th, 70th, 50th, 30th, and 10th percentile volumes).

Intersection Capacity Utilization – This method compares the current volume to the intersection ultimate capacity.

ICU LOS - Based upon the critical flow ratio (ICU) for the intersection. The critical flow ratio is the sum of green plus clearance times required to serve the critical movements at the intersection divided by a reference cycle length. The ICU LOS is designed to be insensitive to the actual signal timing for the intersection.

Analysis Period – Duration of the analysis.

HCM Signalized Report Definitions – Synchro 7

Lane Configurations – Representation of striped lanes in the field

Volume – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often 1 hr, expressed in vehicles, bicycles, or persons per hour.

Ideal Flow – This is the Ideal Saturated Flow and 1900 vehicles per hour per lane by default.

Storage Length – Length of a storage bay for a turn lane.

Storage Lanes – Number of Lanes with storage.

Satd. Flow (prot) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to protected (prot) operation.

Taper Length – Length of a lane before the storage bay begins usually designated with mini-skip stripes.

Satd. Flow (perm) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to permissive (perm) operation.

Flt Permitted – The permitted left-turn factor may vary slightly from the left-turn factor showing in other Synchro reports because these are calculated based on actuated green times for HCM compatibility.

Right turn on Red – A way to indicated if right turn on red is allowed or restricted.

Satd Flow (RTOR) – The equivalent hourly rate starting at 1900 passenger cars per hour per lane which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green signal is available at all times and no lost times are experienced, in vehicles per hour per hour per lane. This refers to right-turn on red (RTOR) operation.

Link Speed – The driver speed on the particular link corresponding to the posted speed limit sign.

Link Distance – The distance from center point to center point of a link or distance between intersections.

Peak Hour Factor – The hourly volume during the maximum-volume hour of the day divided by the peak 15-min flow rate within the peak hour; a measure of traffic demand fluctuation with the peak hour.

Heavy Vehicles % - The percent vehicles in the traffic volumes that are heavy trucks or busses.

Shared Lane Traffic % - The percent of turning traffic assigned to a shared lane.

Lane Group Flow – Combines the adjusted flow and traffic in shared lane values to assign net volumes to each lane group.

Enter Blocked Intersection – Controls the simulation modeling gridlock avoidance.

Lane Alignment – This setting allows the user to specify how a lane aligns through an intersection.

Median Width – The width of a median.

Link Offset – Setting used to offset the roadway alignment to the right or left of the centerline.

Crosswalk Width – Width of a crosswalk.

Two Way Left Turn Lane – This setting visually displays a TWLTL median .

Headway Factor – Based on the Ideal Saturation Flow, lane width factor, the grade factor, the parking factor, the bus stops factor, and the area factor but is not used in the capacity calculations in Synchro.

Turning Speed – Speed used for vehicles turning and simulation in Sim Traffic.

Turn Type – Setting used to set the treatment (perm, prot, overlap, etc...) for left and right-turn movements.

Protected Phases – The movements at signalized intersection that are made with no opposing or conflicting vehicular flow allowed.

Permitted Phases – The movements at signalized intersection that is made against an opposing or conflicting vehicular flow.

Detector Phase – Primary detector that determines which phases each lane group's detector are connected to. Calls are placed for lane groups, regardless of the current active phases.

Switch Phase – A Secondary phase that extends the entered phase when it is green, but does not place a call.

Minimum Initial – The minimum Green time per phase in seconds.

Minimum Split – The shortest allowable amount of time allowed for a phase in seconds.

Total Split – Includes the green, yellow, and all-red intervals assigned to a phase.

Maximum Green – Parameter represents the maximum amount of time that a green signal indication can be displayed in the presence of conflicting demand.

Yellow Time – This is the time each phase displays yellow.

All-Red Time – This is the time each phase displays all red clearance before the next phase.

Lost time Adjust – Dependent on driver reaction time, length of yellow time, yellow deceleration rate, intersection width, and approach speeds.

Lead/Lag – Used to determine the phase order.

Lead-Lag Optimize – Setting allowing Synchro to optimize the phase order.

Vehicle Extension – Used with actuated phases. A vehicle passing over a detector will extend the gap counter by the amount of time specified by the vehicle extension time.

Recall Mode – A means to provide reoccurring vehicle or pedestrian demand so a phase is serviced, even if no real demand exists on the phase.

Act Effct Green – The value representing the average green time observed while the signal is operating in actuated mode.

Actuated g/C Ratio – The average actuated green time divided by the actuated cycle length.

v/c Ratio - the ratio of flow rate to capacity.

Control Delay – The component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.

Queue Delay – An analysis of the effects of queues and blocking on short links and short turning bays. This delay includes the analysis of spillback, starvation, and storage blocking.

Total Delay – The lane group Control Delay plus the Queue Delay.

LOS – The letter from A-F based on the length of delay.

Approach Delay – A volume weighted average of the Total Delays for each lane group.

Approach LOS – LOS for each approach based on Total Delay.

Queue Lengths 50th - The maximum back of queue with 50th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Queue Length 95th – The maximum back of queue with 95th percentile traffic volumes or maximum back distance where vehicles stop during a cycle.

Internal Link Dist – The distance between two intersections.

Turn Bay Length – Length of a turn lane.

Base Capacity – The capacity of a lane group if unimpeded.

Starvation Cap Reductn – Reduction to the base capacity due to starvation. Starvation is the congested caused by short upstream link in conjunction with poor/no coordination.

Spillback Cap Reductn – Reduction to the base capacity caused by short downstream link becoming filled up.

Storage Cap Reductn – Reduction to the base capacity caused when turn pocked cannot accommodate queue lengths.

Reduced v/c Ratio – Modified volume to capacity ratio with the adjustments to the base capacity.

Area Type – A setting that allows the user to choose it surroundings such as a Central Business District.

Cycle Length – The total time for a signal to complete one cycle.

Actuated Cycle Length – The average cycle length for an actuated signal.

Natural Cycle – The shortest cycle length that will give acceptable capacity.

Control Type – Setting allowing the user to choose unsignalized or the type of signalization.

Maximum v/c Ratio – The highest individual movement or lane group v/c ratio.

Intersection Signal Delay – The total delay for the intersection by taking the volume weighted average of all the Total Delays.

Intersection LOS – The LOS for the entire intersection by taking total intersection delay and converting it to a level A-F.

Intersection Capacity Utilization (ICU) – The sum of the ratios of approach volume divided by approach capacity for each leg of intersection which controls overall traffic signal timing plus an allowance for clearance times.

ICU Level of Service – Numerical value that gives insight into how an intersection is functioning and how much extra capacity is available to handle fluctuations and incidents.

Analysis Period - Duration of the analysis.

SIM Traffic Summary & Queuing and Blocking Report Definitions – Synchro 7

Start Time – Time the network seeding begins.

End Time – The end of the recorded peak period.

Total Time – Seeding time plus recording time.

Time recorded – length of time of recording. Typically the peak hour.

of Intervals – There are 3 interval types

Interval 0, Seeding – Duration long enough for vehicle to traverse from one side of the network to another including stops.

Interval 1, Recording – Duration is closest to cycle length, volume is adjusted 95th

Interval 2, Recording and Recovery – Duration 15 minutes, no volume adjustment

of Recorded Intvls – The number of intervals which were recorded.

Vehs Entered – The total number of vehicles that entered the network.

Vehs Exited – The total number of vehicles that exited the network .

Starting Vehs – The number of vehicles at start of interval.

Ending Vehs – The number of vehicles at end of interval.

Denied Entry Before – Vehicles unable to enter a link due to congestion at the beginning of the period.

Denied Entry After – Vehicles unable to enter a link due to congestion at the end of the period.

Travel Distance – Summation of the vehicle distance traveled.

Travel Time – Total time each vehicle was present in this area. Travel Time includes time spent by vehicles denied entry.

Total Delay – The total travel time minus the travel time for the vehicle with no other vehicles or traffic control devices.

Total Stops – A count of vehicle stops. Whenever a vehicles speed drops below 10 ft/sec a stop is added. A vehicle is considered going again when is speed reaches 15 ft/sec.

Fuel Used – Calculation using fuel consumption parameters .

Directions Served – Indicates the movement being served.

Maximum Queue – Maximum back of queue observed for the entire analysis interval.

Average Queue – Average back of queue observed for the entire analysis interval.

95th Queue – A calculation equal to the average queue plus 1.65 standard deviations.

Link Distance – Internal distance of the link from stop bar to stop bar.

Upstream Blk Time – Proportion of the time that the upstream end of the lane is blocked.






















Queuing Penalty – A rough measure of how many vehicles are affected by the blocking.

Storage Bay Dist – Length of a turning bay.

Storage Blk Time – Proportion of time that a lane is queued at the top of the storage.













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 2 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	9	153	2	2	0	27	576	11	16	1091	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1795	1599	0	1827	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.733			0.820		0.135			0.403		
Satd. Flow (perm)	0	1379	1599	0	1535	0	251	3539	1583	758	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			174						12			57
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	238	174	0	4	0	31	655	12	18	1240	62
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	17.0	17.0	0.0	17.0	17.0	0.0	14.0	43.0	43.0	29.0	29.0	29.0
Total Split (%)	28.3%	28.3%	0.0%	28.3%	28.3%	0.0%	23.3%	71.7%	71.7%	48.3%	48.3%	48.3%
Maximum Green (s)	10.0	10.0		10.0	10.0		7.0	36.0	36.0	22.0	22.0	22.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		12.2	51.8		12.2		29.5	29.5	29.5	24.6	24.6	24.6
Actuated g/C Ratio		0.24	1.00		0.24		0.57	0.57	0.57	0.47	0.47	0.47
v/c Ratio		0.73	0.11		0.01		0.08	0.33	0.01	0.05	0.74	0.08
Control Delay		38.2	0.1		18.8		4.8	6.2	2.4	10.8	16.7	4.5
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 2 AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		38.2	0.1		18.8		4.8	6.2	2.4	10.8	16.7	4.5
LOS		D	A		B		A	A	A	B	B	A
Approach Delay		22.1			18.8			6.0			16.0	
Approach LOS		C			B			A			B	
Queue Length 50th (ft)		56	0		1		4	46	0	2	111	1
Queue Length 95th (ft)		#191	0		8		11	66	4	14	#318	19
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		325	1599		361		411	2636	1182	362	1690	794
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.73	0.11		0.01		0.08	0.25	0.01	0.05	0.73	0.08

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 51.8

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 14.2

Intersection LOS: B

Intersection Capacity Utilization 56.8%

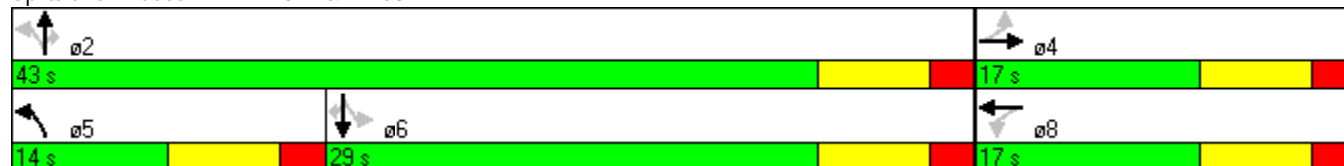
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.




















Queue shown is maximum after two cycles.

Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis 3: W Bear Creek Rd & TN 95

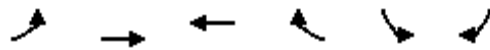
2024 Future + Site Scenario 2 AM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	0	16	0	0	0	216	127	239	444	180	105
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	0	18	0	0	0	245	144	272	505	205	119
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)	8											
Median type							None			None		
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1909	2180	264	1994	2104	280	324				416	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1909	2180	264	1994	2104	280	324				416	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	73	100	98	100	100	100	80				56	
cM capacity (veh/h)	29	21	774	25	23	759	1225				1138	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	26	0	245	416	505	324						
Volume Left	8	0	245	0	505	0						
Volume Right	18	0	0	272	0	119						
cSH	97	1700	1225	1700	1138	1700						
Volume to Capacity	0.27	0.00	0.20	0.24	0.44	0.19						
Queue Length 95th (ft)	25	0	19	0	58	0						
Control Delay (s)	57.9	0.0	8.7	0.0	10.7	0.0						
Lane LOS	F	A	A		B							
Approach Delay (s)	57.9	0.0	3.2		6.5							
Approach LOS	F	A										
Intersection Summary												
Average Delay	6.0											
Intersection Capacity Utilization	59.3%			ICU Level of Service			B					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek SB Ramp











2024 Future + Site Scenario 2 AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	79	781	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	90	888	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				10	99
cM capacity (veh/h)	1596				982	1068
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	90	893		
Volume Left	6	0	0	888		
Volume Right	0	0	90	6		
cSH	1596	1700	1700	983		
Volume to Capacity	0.00	0.00	0.05	0.91		
Queue Length 95th (ft)	0	0	0	338		
Control Delay (s)	3.6	0.0	0.0	31.9		
Lane LOS	A			D		
Approach Delay (s)	3.6	0.0		31.9		
Approach LOS				D		
Intersection Summary						
Average Delay		28.6				
Intersection Capacity Utilization		55.0%		ICU Level of Service		A
Analysis Period (min)		15				












HCM Unsignalized Intersection Capacity Analysis 5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 2 AM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	308	12	123	22	169	1744
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	350	14	140	25	192	1982
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1527	152			165	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1527	152			165	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	98			86	
cM capacity (veh/h)	91	857			1389	
Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2	
Volume Total	350	14	165	853	1321	
Volume Left	350	0	0	192	0	
Volume Right	0	14	25	0	0	
cSH	91	857	1700	1389	1700	
Volume to Capacity	3.87	0.02	0.10	0.14	0.78	
Queue Length 95th (ft)	Err	1	0	12	0	
Control Delay (s)	Err	9.3	0.0	3.2	0.0	
Lane LOS	F	A		A		
Approach Delay (s)	9624.4		0.0	1.3		
Approach LOS	F					
Intersection Summary						
Average Delay			1296.1			
Intersection Capacity Utilization			88.0%	ICU Level of Service		E
Analysis Period (min)			15			

Lanes, Volumes, Timings
5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 2 AM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Volume (vph)	308	12	123	22	169	1744
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500	0		100	0	
Storage Lanes	1	1		0	0	
Taper Length (ft)	100	100		100	100	
Satd. Flow (prot)	1719	1538	1773	0	0	3424
Flt Permitted	0.950					0.893
Satd. Flow (perm)	1719	1538	1773	0	0	3070
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		14	22			
Link Speed (mph)	45		45			45
Link Distance (ft)	1125		4060			1261
Travel Time (s)	17.0		61.5			19.1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	350	14	165	0	0	2174
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	L NA	Right	Left	Right	Left	R NA
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type		Perm			Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		12.0	12.0
Minimum Split (s)	14.0	14.0	19.0		19.0	19.0
Total Split (s)	24.0	24.0	76.0	0.0	76.0	76.0
Total Split (%)	24.0%	24.0%	76.0%	0.0%	76.0%	76.0%
Maximum Green (s)	17.0	17.0	69.0		69.0	69.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	1.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		Min	Min
Act Effect Green (s)	19.0	19.0	71.0			71.0
Actuated g/C Ratio	0.19	0.19	0.71			0.71
v/c Ratio	1.07	0.05	0.13			1.00
Control Delay	109.9	16.3	4.3			34.1
Queue Delay	0.0	0.0	0.0			0.0

Lanes, Volumes, Timings 5: W Bear Creek Rd & Site Entrance

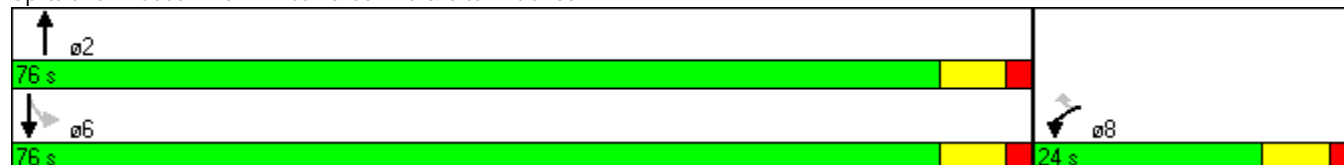
2024 Future + Site Scenario 2 AM

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	109.9	16.3	4.3			34.1
LOS	F	B	A			C
Approach Delay	106.3		4.3			34.1
Approach LOS	F		A			C
Queue Length 50th (ft)	~249	0	25			626
Queue Length 95th (ft)	#410	17	43			#862
Internal Link Dist (ft)	1045		3980			1181
Turn Bay Length (ft)	500					
Base Capacity (vph)	327	304	1265			2180
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	1.07	0.05	0.13			1.00

Intersection Summary













Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 42.0	Intersection LOS: D
Intersection Capacity Utilization 92.7%	ICU Level of Service F
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 5: W Bear Creek Rd & Site Entrance








Lanes, Volumes, Timings
6: Bear Creek NB Ramp & Bear Creek Rd

2024 Future + Site Scenario 2 AM - Signalized

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 					 
Volume (vph)	1128	5	79	56	5	781
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200	0		0	100	
Storage Lanes	1	0		1	1	
Taper Length (ft)	100	100		100	100	
Satd. Flow (prot)	3342	0	1810	1538	0	3438
Flt Permitted	0.953					0.953
Satd. Flow (perm)	3342	0	1810	1538	0	3277
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	1			64		
Link Speed (mph)	25		45			45
Link Distance (ft)	1142		516			947
Travel Time (s)	31.1		7.8			14.3
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1288	0	90	64	0	894
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	24		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type				Free	Perm	
Protected Phases	8		2			6
Permitted Phases				Free	6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	7.0		10.0		10.0	10.0
Minimum Split (s)	14.0		17.0		17.0	17.0
Total Split (s)	33.0	0.0	27.0	0.0	27.0	27.0
Total Split (%)	55.0%	0.0%	45.0%	0.0%	45.0%	45.0%
Maximum Green (s)	26.0		20.0		20.0	20.0
Yellow Time (s)	5.0		5.0		5.0	5.0
All-Red Time (s)	2.0		2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	1.0	-2.0	1.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Act Effect Green (s)	26.7		20.9	57.7		20.9
Actuated g/C Ratio	0.46		0.36	1.00		0.36
v/c Ratio	0.83		0.14	0.04		0.75
Control Delay	20.0		13.4	0.1		21.1
Queue Delay	0.0		0.0	0.0		0.0

6: Bear Creek NB Ramp & Bear Creek Rd

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	20.0		13.4	0.1		21.1
LOS	B		B	A		C
Approach Delay	20.0		7.9			21.1
Approach LOS	B		A			C
Queue Length 50th (ft)	195		21	0		144
Queue Length 95th (ft)	264		46	0		199
Internal Link Dist (ft)	1062		436			867
Turn Bay Length (ft)	200					
Base Capacity (vph)	1636		696	1538		1260
Starvation Cap Reductn	0		0	0		0
Spillback Cap Reductn	0		0	0		0
Storage Cap Reductn	0		0	0		0
Reduced v/c Ratio	0.79		0.13	0.04		0.71

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 57.7

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 19.6

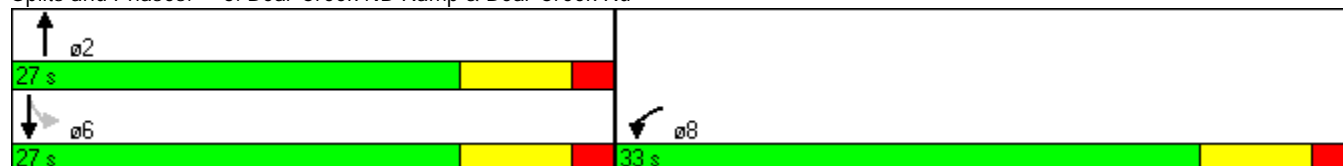
Intersection LOS: B

Intersection Capacity Utilization 65.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 6: Bear Creek NB Ramp & Bear Creek Rd



SimTraffic Simulation Summary
2024 Future + Site Scenario 2 AM

Summary of All Intervals

Start Time	6:20
End Time	7:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	6852
Vehs Exited	6781
Starting Vehs	165
Ending Vehs	236
Denied Entry Before	3
Denied Entry After	0
Travel Distance (mi)	5839
Travel Time (hr)	237.8
Total Delay (hr)	90.4
Total Stops	5831
Fuel Used (gal)	220.5

Interval #0 Information Seeding

Start Time	6:20
End Time	6:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	6:30
End Time	7:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	6852
Vehs Exited	6781
Starting Vehs	165
Ending Vehs	236
Denied Entry Before	3
Denied Entry After	0
Travel Distance (mi)	5839
Travel Time (hr)	237.8
Total Delay (hr)	90.4
Total Stops	5831
Fuel Used (gal)	220.5

Queuing and Blocking Report

2024 Future + Site Scenario 2 AM

Intersection: 1: Bear Creek SB Ramp & TN 58

Movement	SB
Directions Served	R
Maximum Queue (ft)	249
Average Queue (ft)	16
95th Queue (ft)	117
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	150
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	158	26	58	72	92	27	16	219	197	76
Average Queue (ft)	77	2	15	37	45	4	5	104	114	23
95th Queue (ft)	133	14	41	67	81	19	15	185	189	51
Link Distance (ft)		295		232	232	232	191	191	191	
Upstream Blk Time (%)								0	0	
Queuing Penalty (veh)								0	0	
Storage Bay Dist (ft)	300		150							125
Storage Blk Time (%)									4	
Queuing Penalty (veh)									2	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	NB	NB	SB
Directions Served	LT	R	L	TR	L
Maximum Queue (ft)	51	23	75	12	135
Average Queue (ft)	3	12	11	1	53
95th Queue (ft)	18	27	39	7	102
Link Distance (ft)	964			1112	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		200	100		200
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report

2024 Future + Site Scenario 2 AM

Intersection: 4: US Government Property & Bear Creek SB Ramp

Movement	SB
Directions Served	LR
Maximum Queue (ft)	748
Average Queue (ft)	292
95th Queue (ft)	612
Link Distance (ft)	642
Upstream Blk Time (%)	1
Queuing Penalty (veh)	12
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: W Bear Creek Rd & Site Entrance

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	LT	T
Maximum Queue (ft)	600	1049	138	353	439
Average Queue (ft)	453	397	31	219	287
95th Queue (ft)	728	1105	90	300	393
Link Distance (ft)		1082	3987	1201	1201
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	500				
Storage Blk Time (%)	39				
Queuing Penalty (veh)	5				

Intersection: 6: Bear Creek NB Ramp & Bear Creek Rd






















Movement	WB	WB	SB	SB
Directions Served	L	LR	LT	T
Maximum Queue (ft)	125	142	349	834
Average Queue (ft)	68	63	247	399
95th Queue (ft)	99	99	415	883
Link Distance (ft)		993		829
Upstream Blk Time (%)				1
Queuing Penalty (veh)				11
Storage Bay Dist (ft)	150		250	
Storage Blk Time (%)		0	39	37
Queuing Penalty (veh)		0	152	148

Network Summary

Network wide Queuing Penalty: 330













Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 2 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	0	92	14	9	32	141	1160	4	1	994	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	150		0	0		125
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Satd. Flow (prot)	0	1787	1599	0	1716	0	1770	3539	1583	1787	3539	1599
Flt Permitted		0.717			0.877		0.145			0.208		
Satd. Flow (perm)	0	1349	1599	0	1525	0	270	3539	1583	391	3539	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105		36				5			250
Link Speed (mph)		35			15			55			55	
Link Distance (ft)		574			359			298			269	
Travel Time (s)		11.2			16.3			3.7			3.3	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	0%	1%	3%	0%	0%	2%	2%	2%	1%	2%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	105	0	62	0	160	1318	5	1	1130	250
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	L NA	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm		Free	Perm			pm+pt		Perm	Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		Free	8			2		2	6		6
Detector Phase	4	4		8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	14.0	14.0	14.0	14.0	14.0
Minimum Split (s)	14.0	14.0		14.0	14.0		14.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	14.0	14.0	0.0	14.0	14.0	0.0	14.0	46.0	46.0	32.0	32.0	32.0
Total Split (%)	23.3%	23.3%	0.0%	23.3%	23.3%	0.0%	23.3%	76.7%	76.7%	53.3%	53.3%	53.3%
Maximum Green (s)	7.0	7.0		7.0	7.0		7.0	39.0	39.0	25.0	25.0	25.0
Yellow Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
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)	-2.0	-2.0	1.0	-2.0	-2.0	1.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
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	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min	Min	Min	Min	Min
Act Effect Green (s)		9.4	55.0		9.4		39.5	41.0	41.0	30.7	30.7	30.7
Actuated g/C Ratio		0.17	1.00		0.17		0.72	0.75	0.75	0.56	0.56	0.56
v/c Ratio		0.47	0.07		0.21		0.36	0.50	0.00	0.00	0.57	0.25
Control Delay		32.0	0.1		14.9		6.0	5.1	2.0	9.0	13.5	2.4
Queue Delay		0.0	0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lanes, Volumes, Timings
2: TN 327 & TN 58

2024 Future + Site Scenario 2 PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		32.0	0.1		14.9		6.0	5.1	2.0	9.0	13.5	2.4
LOS		C	A		B		A	A	A	A	B	A
Approach Delay		16.3			14.9			5.2			11.5	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)		37	0		8		16	100	0	0	163	0
Queue Length 95th (ft)		#87	0		36		34	133	2	2	221	30
Internal Link Dist (ft)		494			279			218			189	
Turn Bay Length (ft)							150					125
Base Capacity (vph)		230	1599		290		450	2650	1186	220	1987	1007
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.47	0.07		0.21		0.36	0.50	0.00	0.00	0.57	0.25

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 55

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 8.9

Intersection LOS: A

Intersection Capacity Utilization 68.2%

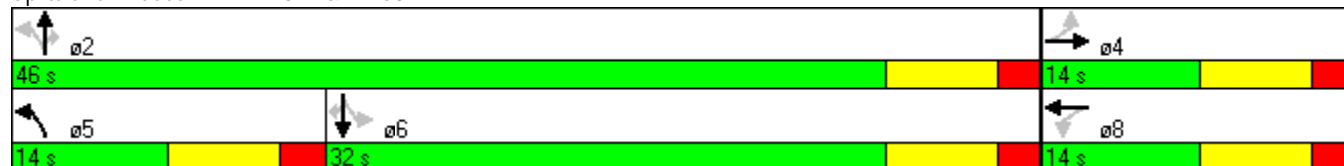
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.




















Splits and Phases: 2: TN 327 & TN 58



HCM Unsignalized Intersection Capacity Analysis

3: W Bear Creek Rd & TN 95

2024 Future + Site Scenario 2 PM





												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	103	0	205	152	12	0	70	383	9	9	362	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	117	0	233	173	14	0	80	435	10	10	411	36
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			8									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1051	1055	430	1148	1068	440	448			445		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1051	1055	430	1148	1068	440	448			445		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	36	100	63	0	93	100	93			99		
cM capacity (veh/h)	184	209	626	104	204	617	1102			1109		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	350	186	80	445	10	448						
Volume Left	117	173	80	0	10	0						
Volume Right	233	0	0	10	0	36						
cSH	550	107	1102	1700	1109	1700						
Volume to Capacity	0.64	1.73	0.07	0.26	0.01	0.26						
Queue Length 95th (ft)	111	366	6	0	1	0						
Control Delay (s)	27.3	435.1	8.5	0.0	8.3	0.0						
Lane LOS	D	F	A		A							
Approach Delay (s)	27.3	435.1	1.3		0.2							
Approach LOS	D	F										
Intersection Summary												
Average Delay			60.2									
Intersection Capacity Utilization			52.7%	ICU Level of Service					A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: US Government Property & Bear Creek SB Ramp












2024 Future + Site Scenario 2 PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	5	5	964	224	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	6	6	1095	255	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	6				23	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6				23	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				74	99
cM capacity (veh/h)	1596				982	1068
Direction, Lane #	EB 1	WB 1	WB 2	SB 1		
Volume Total	11	6	1095	260		
Volume Left	6	0	0	255		
Volume Right	0	0	1095	6		
cSH	1596	1700	1700	984		
Volume to Capacity	0.00	0.00	0.64	0.26		
Queue Length 95th (ft)	0	0	0	27		
Control Delay (s)	3.6	0.0	0.0	10.0		
Lane LOS	A			A		
Approach Delay (s)	3.6	0.0		10.0		
Approach LOS				A		
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			69.7%	ICU Level of Service		C
Analysis Period (min)			15			











HCM Unsignalized Intersection Capacity Analysis 5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 2 PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			
Volume (veh/h)	95	112	1510	267	9	540
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	108	127	1716	303	10	614
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2502	1010			2019	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2502	1010			2019	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	45			96	
cM capacity (veh/h)	22	233			267	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	
Volume Total	108	127	1144	875	624	
Volume Left	108	0	0	0	10	
Volume Right	0	127	0	303	0	
cSH	22	233	1700	1700	267	
Volume to Capacity	4.96	0.55	0.67	0.51	0.04	
Queue Length 95th (ft)	Err	74	0	0	3	
Control Delay (s)	Err	37.7	0.0	0.0	1.4	
Lane LOS	F	E			A	
Approach Delay (s)	4609.3		0.0		1.4	
Approach LOS	F					
Intersection Summary						
Average Delay			377.0			
Intersection Capacity Utilization			63.9%		ICU Level of Service	B
Analysis Period (min)			15			

Lanes, Volumes, Timings
5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 2 PM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	95	112	1510	267	9	540
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500	0		100	100	
Storage Lanes	1	1		0	0	
Taper Length (ft)	100	100		100	100	
Satd. Flow (prot)	1719	1538	3359	0	0	1808
Flt Permitted	0.950					0.946
Satd. Flow (perm)	1719	1538	3359	0	0	1712
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		37	76			
Link Speed (mph)	25		20			45
Link Distance (ft)	1125		3929			1261
Travel Time (s)	30.7		133.9			19.1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	108	127	2019	0	0	624
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type		Perm			Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	12.0		12.0	12.0
Minimum Split (s)	14.0	14.0	19.0		19.0	19.0
Total Split (s)	14.0	14.0	46.0	0.0	46.0	46.0
Total Split (%)	23.3%	23.3%	76.7%	0.0%	76.7%	76.7%
Maximum Green (s)	7.0	7.0	39.0		39.0	39.0
Yellow Time (s)	5.0	5.0	5.0		5.0	5.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	1.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Min		Min	Min
Act Effect Green (s)	9.0	9.0	44.9			44.9
Actuated g/C Ratio	0.15	0.15	0.75			0.75
v/c Ratio	0.42	0.49	0.80			0.49
Control Delay	28.8	24.2	10.1			5.9
Queue Delay	0.0	0.0	0.0			0.0

Lanes, Volumes, Timings
5: W Bear Creek Rd & Site Entrance

2024 Future + Site Scenario 2 PM

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	28.8	24.2	10.1			5.9
LOS	C	C	B			A
Approach Delay	26.3		10.1			5.9
Approach LOS	C		B			A
Queue Length 50th (ft)	36	30	228			89
Queue Length 95th (ft)	75	72	322			146
Internal Link Dist (ft)	1045		3849			1181
Turn Bay Length (ft)	500					
Base Capacity (vph)	257	261	2527			1278
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.42	0.49	0.80			0.49

Intersection Summary













Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 10.5	Intersection LOS: B
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 5: W Bear Creek Rd & Site Entrance









Lanes, Volumes, Timings
6: Bear Creek NB Ramp & Bear Creek Rd

2024 Future + Site Scenario 2 PM - Signalized

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 					 
Volume (vph)	324	5	964	658	5	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200	0		0	100	
Storage Lanes	1	0		1	1	
Taper Length (ft)	100	100		100	100	
Satd. Flow (prot)	3339	0	1810	1538	0	3435
Flt Permitted	0.953					0.933
Satd. Flow (perm)	3339	0	1810	1538	0	3208
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	2			451		
Link Speed (mph)	25		45			45
Link Distance (ft)	1142		516			947
Travel Time (s)	31.1		7.8			14.3
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	374	0	1095	748	0	261
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	24		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type				Free	Perm	
Protected Phases	8		2			6
Permitted Phases				Free	6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	7.0		10.0		10.0	10.0
Minimum Split (s)	14.0		17.0		17.0	17.0
Total Split (s)	14.0	0.0	46.0	0.0	46.0	46.0
Total Split (%)	23.3%	0.0%	76.7%	0.0%	76.7%	76.7%
Maximum Green (s)	7.0		39.0		39.0	39.0
Yellow Time (s)	5.0		5.0		5.0	5.0
All-Red Time (s)	2.0		2.0		2.0	2.0
Lost Time Adjust (s)	-2.0	1.0	-2.0	1.0	-2.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Act Effect Green (s)	9.1		38.7	57.8		38.7
Actuated g/C Ratio	0.16		0.67	1.00		0.67
v/c Ratio	0.71		0.90	0.49		0.12
Control Delay	33.2		20.9	1.1		3.5
Queue Delay	0.0		0.0	0.0		0.0

6: Bear Creek NB Ramp & Bear Creek Rd

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	33.2		20.9	1.1		3.5
LOS	C		C	A		A
Approach Delay	33.2		12.9			3.5
Approach LOS	C		B			A
Queue Length 50th (ft)	67		251	0		13
Queue Length 95th (ft)	#118		#558	0		22
Internal Link Dist (ft)	1062		436			867
Turn Bay Length (ft)	200					
Base Capacity (vph)	525		1292	1538		2289
Starvation Cap Reductn	0		0	0		0
Spillback Cap Reductn	0		0	0		0
Storage Cap Reductn	0		0	0		0
Reduced v/c Ratio	0.71		0.85	0.49		0.11

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 57.8

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 15.0

Intersection LOS: B

Intersection Capacity Utilization 68.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: Bear Creek NB Ramp & Bear Creek Rd



SimTraffic Simulation Summary
2024 Future + Site Scenario 2 PM

Summary of All Intervals

Start Time	4:20
End Time	5:30
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	2
# of Recorded Intvls	1
Vehs Entered	7972
Vehs Exited	7913
Starting Vehs	273
Ending Vehs	332
Denied Entry Before	2
Denied Entry After	3
Travel Distance (mi)	6268
Travel Time (hr)	307.3
Total Delay (hr)	86.4
Total Stops	4197
Fuel Used (gal)	264.7

Interval #0 Information Seeding

Start Time	4:20
End Time	4:30
Total Time (min)	10
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:30
End Time	5:30
Total Time (min)	60
Volumes adjusted by Growth Factors.	
Vehs Entered	7972
Vehs Exited	7913
Starting Vehs	273
Ending Vehs	332
Denied Entry Before	2
Denied Entry After	3
Travel Distance (mi)	6268
Travel Time (hr)	307.3
Total Delay (hr)	86.4
Total Stops	4197
Fuel Used (gal)	264.7

Queuing and Blocking Report

2024 Future + Site Scenario 2 PM

Intersection: 1: Bear Creek SB Ramp & TN 58

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	78	31
Average Queue (ft)	4	3
95th Queue (ft)	28	16
Link Distance (ft)	336	336
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 2: TN 327 & TN 58

Movement	EB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	LTR	L	T	T	R	T	T	R
Maximum Queue (ft)	117	67	107	79	151	29	151	210	73
Average Queue (ft)	35	28	53	44	64	2	76	93	37
95th Queue (ft)	79	60	96	77	115	13	129	147	67
Link Distance (ft)		295		232	232	232	191	191	
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)	300		150						125
Storage Blk Time (%)								1	
Queuing Penalty (veh)								3	

Intersection: 3: W Bear Creek Rd & TN 95

Movement	EB	EB	WB	NB	SB
Directions Served	LT	R	LTR	L	L
Maximum Queue (ft)	414	300	850	28	2
Average Queue (ft)	116	110	640	3	0
95th Queue (ft)	318	246	851	14	1
Link Distance (ft)	964		836		
Upstream Blk Time (%)			0		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)		200		100	200
Storage Blk Time (%)	21	0			
Queuing Penalty (veh)	42	0			

Queuing and Blocking Report
2024 Future + Site Scenario 2 PM

Intersection: 4: US Government Property & Bear Creek SB Ramp

Movement	EB	WB	SB
Directions Served	LT	R	LR
Maximum Queue (ft)	26	73	71
Average Queue (ft)	1	2	37
95th Queue (ft)	9	24	58
Link Distance (ft)	430		642
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: W Bear Creek Rd & Site Entrance

Movement	WB	WB	NB	NB	B23	SB
Directions Served	L	R	T	TR	T	LT
Maximum Queue (ft)	145	100	395	454	1154	224
Average Queue (ft)	63	38	190	197	38	92
95th Queue (ft)	119	78	373	408	380	177
Link Distance (ft)		1071	3853	3853	1141	1205
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	500					
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 6: Bear Creek NB Ramp & Bear Creek Rd

Movement	WB	WB	NB	SB
Directions Served	L	LR	T	LT
Maximum Queue (ft)	250	660	87	54
Average Queue (ft)	159	171	13	20
95th Queue (ft)	285	555	53	50
Link Distance (ft)		993	388	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150			250
Storage Blk Time (%)	36	1		
Queuing Penalty (veh)	60	2		

Queuing and Blocking Report
2024 Future + Site Scenario 2 PM

Intersection: 20: Bend

Movement	SB
Directions Served	T
Maximum Queue (ft)	397
Average Queue (ft)	76
95th Queue (ft)	329
Link Distance (ft)	330
Upstream Blk Time (%)	1
Queuing Penalty (veh)	7
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 114

Phone:
E-mail:

Fax:

OPERATIONAL ANALYSIS

Analyst: AECOM
 Agency/Co: AECOM
 Date: 11/21/2014
 Analysis Period: Future + Site Scen 2 AM 2024
 Highway: Bear Creek Rd
 From/To: SR 58 to W Bear Creek Rd
 Jurisdiction:
 Analysis Year: 2024
 Project ID: Clinch River TVA

FREE-FLOW SPEED

	Direction	1		2	
Lane width		12.0	ft	12.0	ft
Lateral clearance:					
Right edge		6.0	ft	6.0	ft
Left edge		6.0	ft	6.0	ft
Total lateral clearance		12.0	ft	12.0	ft
Access points per mile		0		0	
Median type					
Free-flow speed:		Measured		Measured	
FFS or BFFS		45.0	mph	45.0	mph
Lane width adjustment, FLW		0.0	mph	0.0	mph
Lateral clearance adjustment, FLC		0.0	mph	0.0	mph
Median type adjustment, FM		0.0	mph	0.0	mph
Access points adjustment, FA		0.0	mph	0.0	mph
Free-flow speed		45.0	mph	45.0	mph

VOLUME

	Direction	1		2	
Volume, V		1913	vph	135	vph
Peak-hour factor, PHF		0.88		0.88	
Peak 15-minute volume, v15		543		38	
Trucks and buses		5	%	5	%
Recreational vehicles		0	%	0	%
Terrain type		Level		Level	
Grade		0.00	%	0.00	%
Segment length		0.00	mi	0.00	mi
Number of lanes		2		2	
Driver population adjustment, fP		1.00		1.00	
Trucks and buses PCE, ET		1.5		1.5	
Recreational vehicles PCE, ER		1.2		1.2	
Heavy vehicle adjustment, fHV		0.976		0.976	
Flow rate, vp		1114	pcphpl	78	pcphpl

RESULTS

	Direction	1		2	
Flow rate, vp		1114	pcphpl	78	pcphpl
Free-flow speed, FFS		45.0	mph	45.0	mph
Avg. passenger-car travel speed, S		45.0	mph	45.0	mph
Level of service, LOS		C		A	
Density, D		24.8	pc/mi/ln	1.7	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone:
E-mail:

Fax:

OPERATIONAL ANALYSIS

Analyst: AECOM
 Agency/Co: AECOM
 Date: 11/21/2014
 Analysis Period: Future + Site Scen 2 PM 2024
 Highway: Bear Creek Rd
 From/To: SR 58 to W Bear Creek Rd
 Jurisdiction:
 Analysis Year: 2024
 Project ID: Clinch River TVA

FREE-FLOW SPEED

	Direction	1		2	
Lane width		12.0	ft	12.0	ft
Lateral clearance:					
Right edge		6.0	ft	6.0	ft
Left edge		6.0	ft	6.0	ft
Total lateral clearance		12.0	ft	12.0	ft
Access points per mile		0		0	
Median type					
Free-flow speed:		Measured		Measured	
FFS or BFFS		45.0	mph	45.0	mph
Lane width adjustment, FLW		0.0	mph	0.0	mph
Lateral clearance adjustment, FLC		0.0	mph	0.0	mph
Median type adjustment, FM		0.0	mph	0.0	mph
Access points adjustment, FA		0.0	mph	0.0	mph
Free-flow speed		45.0	mph	45.0	mph

VOLUME

	Direction	1		2	
Volume, V		549	vph	1622	vph
Peak-hour factor, PHF		0.88		0.88	
Peak 15-minute volume, v15		156		461	
Trucks and buses		5	%	5	%
Recreational vehicles		0	%	0	%
Terrain type		Level		Level	
Grade		0.00	%	0.00	%
Segment length		0.00	mi	0.00	mi
Number of lanes		2		2	
Driver population adjustment, fP		1.00		1.00	
Trucks and buses PCE, ET		1.5		1.5	
Recreational vehicles PCE, ER		1.2		1.2	
Heavy vehicle adjustment, fHV		0.976		0.976	
Flow rate, vp		319	pcphpl	944	pcphpl

RESULTS

	Direction	1		2	
Flow rate, vp		319	pcphpl	944	pcphpl
Free-flow speed, FFS		45.0	mph	45.0	mph
Avg. passenger-car travel speed, S		45.0	mph	45.0	mph
Level of service, LOS		A		C	
Density, D		7.1	pc/mi/ln	21.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 AM Peak
Freeway/Dir of Travel: SR 58 / NB
Junction: Bear Creek Rd NB Ramps
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1761	vph

-----Off Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	1128	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1761	1128		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	500	320		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2151	1378	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 2151 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2151	4500	No
$v_{FO} = v_F - v_R$	773	4500	No
v_R	1378	1900	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 2151$		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2151	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D = 20.5 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	$D_S = 0.682$	
Space mean speed in ramp influence area,	$S_R = 46.1$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 46.1$	mph

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 AM Peak
Freeway/Dir of Travel: SR 58 / NB
Junction: Bear Creek Rd NB Ramps
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	633	vph

-----On Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	56	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	633	56		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	180	16		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	773	68	pcph

-----Estimation of V12 Merge Areas-----

L = (Equation 25-2 or 25-3)
 EQ
 P = 1.000 Using Equation 0
 FM
 $v_{12} = v_F (P_{FM}) = 773 \text{ pc/h}$

-----Capacity Checks-----

		Actual	Maximum	LOS F?
v _{FO}		841	4500	No
v _{3 or av34}	v	0 pc/h	(Equation 25-4 or 25-5)	
Is v _{3 or av34}	v	> 2700 pc/h?	No	
Is v _{3 or av34}	v	> 1.5 v ₁₂ /2	No	
If yes, v _{12A}		= 773	(Equation 25-8)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v _{R12}	841	4600	No

-----Level of Service Determination (if not F)-----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 10.4 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence B

-----Speed Estimation-----

Intermediate speed variable,	M	= 0.318	
Space mean speed in ramp influence area,	S _R	= 50.9	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 50.9	mph

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 AM Peak
Freeway/Dir of Travel: SR 58 / SB
Junction: Bear Creek Rd SB Ramps
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	940	vph

-----Off Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	785	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	940	785		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	267	223		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1148	959	pcph

Estimation of V12 Diverge Areas

$L =$ (Equation 25-8 or 25-9)
 EQ
 $P = 1.000$ Using Equation 0
 FD
 $v_{12} = v_R + (v_F - v_R) P_{FD} = 1148 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_F = v_{Fi}$	1148	4500	No
$v_F = v_F - v_R$	189	4500	No
v_R	959	1900	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 1148$		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1148	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 12.8 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	$D_S = 0.644$	
Space mean speed in ramp influence area,	$S_R = 46.6$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 46.6$	mph

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 AM Peak
Freeway/Dir of Travel: SR 58 / SB
Junction: Bear Creek Rd SB Ramp
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	155	vph

-----On Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	79	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	155	79		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	44	22		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	189	97	pcph

-----Estimation of V12 Merge Areas-----

L = (Equation 25-2 or 25-3)
 EQ
 P = 1.000 Using Equation 0
 FM
 $v_{12} = v_F (P_{FM}) = 189 \text{ pc/h}$

-----Capacity Checks-----

		Actual	Maximum	LOS F?
v _{FO}		286	4500	No
v _{3 or av34}	v	0 pc/h	(Equation 25-4 or 25-5)	
Is v _{3 or av34}	v	> 2700 pc/h?	No	
Is v _{3 or av34}	v	> 1.5 v ₁₂ /2	No	
If yes, v _{12A}		= 189	(Equation 25-8)	

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v _{R12}	286	4600	No

-----Level of Service Determination (if not F)-----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 6.1 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence A

-----Speed Estimation-----

Intermediate speed variable,	M	= 0.314	
Space mean speed in ramp influence area,	S _R	= 50.9	mph
Space mean speed in outer lanes,	S ₀	= N/A	mph
Space mean speed for all vehicles,	S	= 50.9	mph

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 PM Peak
Freeway/Dir of Travel: SR 58 / NB
Junction: Bear Creek Rd NB Ramps
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	580	vph

-----Off Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	324	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	580	324		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	165	92		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	709	396	pcph

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)

EQ

P = 1.000 Using Equation 0

FD

$v_{12} = v_R + (v_F - v_R) P_{FD} = 709 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	709	4500	No
$v_{FO} = v_F - v_R$	313	4500	No
v_R	396	1900	No
$v_3 \text{ or } v_{av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_3 \text{ or } v_{av34} > 2700 \text{ pc/h?}$		No	
Is $v_3 \text{ or } v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 709$		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	709	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 8.1 \text{ pc/mi/ln}$

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	$D_S = 0.594$	
Space mean speed in ramp influence area,	$S_R = 47.3$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 47.3$	mph

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 PM Peak
Freeway/Dir of Travel: SR 58 / NB
Junction: Bear Creek Rd NB Ramps
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	256	vph

-----On Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	658	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	256	658		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	73	187		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	313	804	pcph

-----Estimation of V12 Merge Areas-----

$L =$ (Equation 25-2 or 25-3)
EQ
 $P = 1.000$ Using Equation 0
FM
 $v_{12} = v_F (P_{FM}) = 313$ pc/h

-----Capacity Checks-----

		Actual	Maximum	LOS F?
v		1117	4500	No
FO				
v	v	0	pc/h	(Equation 25-4 or 25-5)
3 or av34				
Is v	v	> 2700	pc/h?	No
3 or av34				
Is v	v	> 1.5 v	/2	No
3 or av34		12		
If yes, v	= 313		(Equation 25-8)	
12A				

-----Flow Entering Merge Influence Area-----

	Actual	Max Desirable	Violation?
v	1117	4600	No
R12			

-----Level of Service Determination (if not F)-----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 12.3$ pc/mi/ln
Level of service for ramp-freeway junction areas of influence B

-----Speed Estimation-----

Intermediate speed variable,	M	= 0.320	
	S		
Space mean speed in ramp influence area,	S	= 50.8	mph
	R		
Space mean speed in outer lanes,	S	= N/A	mph
	0		
Space mean speed for all vehicles,	S	= 50.8	mph

Phone: Fax:
E-mail:

-----Diverge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 PM Peak
Freeway/Dir of Travel: SR 58 / SB
Junction: Bear Creek Rd SB Ramps
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1337	vph

-----Off Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	25.0	mph
Volume on ramp	224	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1337	224		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	380	64		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1633	274	pcph

Estimation of V12 Diverge Areas

$L =$ (Equation 25-8 or 25-9)
 EQ
 $P = 1.000$ Using Equation 0
 FD
 $v_{12} = v_R + (v_F - v_R) P_{FD} = 1633 \text{ pc/h}$

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1633	4500	No
$v_{FO} = v_F - v_R$	1359	4500	No
v_R	274	1900	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or $v_{av34} > 2700 \text{ pc/h?}$		No	
Is v_3 or $v_{av34} > 1.5 v_{12} / 2$		No	
If yes, $v_{12A} = 1633$		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1633	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_{12} - 0.009 L_D = 16.9 \text{ pc/mi/ln}$
 Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	$D_S = 0.583$	
Space mean speed in ramp influence area,	$S_R = 47.4$	mph
Space mean speed in outer lanes,	$S_0 = \text{N/A}$	mph
Space mean speed for all vehicles,	$S = 47.4$	mph

Phone: Fax:
E-mail:

-----Merge Analysis-----

Analyst: AECOM
Agency/Co.: AECOM
Date performed: 6/18/2014
Analysis time period: Future + Site Scen 2 PM Peak
Freeway/Dir of Travel: SR 58 / SB
Junction: Bear Creek Rd SB Ramp
Jurisdiction:
Analysis Year: 2024
Description: Clinch River TVA

-----Freeway Data-----

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1113	vph

-----On Ramp Data-----

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	25.0	mph
Volume on ramp	964	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

-----Adjacent Ramp Data (if one exists)-----

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

-----Conversion to pc/h Under Base Conditions-----

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1113	964		vph
Peak-hour factor, PHF	0.88	0.88		
Peak 15-min volume, v15	316	274		v
Trucks and buses	5	5		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling		
Grade	%	%		%
Length	mi	mi		mi
Trucks and buses PCE, ET	2.5	2.5		
Recreational vehicle PCE, ER	2.0	2.0		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1360	1178	pcph

-----Estimation of V12 Merge Areas-----

$L =$ (Equation 25-2 or 25-3)
EQ
 $P = 1.000$ Using Equation 0
FM
 $v_{12} = v_F (P_{FM}) = 1360$ pc/h

-----Capacity Checks-----

		Actual	Maximum	LOS F?
v		2538	4500	No
FO				
v	v	0	pc/h	(Equation 25-4 or 25-5)
3 or av34				
Is v	v	> 2700	pc/h?	No
3 or av34				
Is v	v	> 1.5 v	/2	No
3 or av34		12		
If yes, v		= 1360		(Equation 25-8)
12A				

-----Flow Entering Merge Influence Area-----

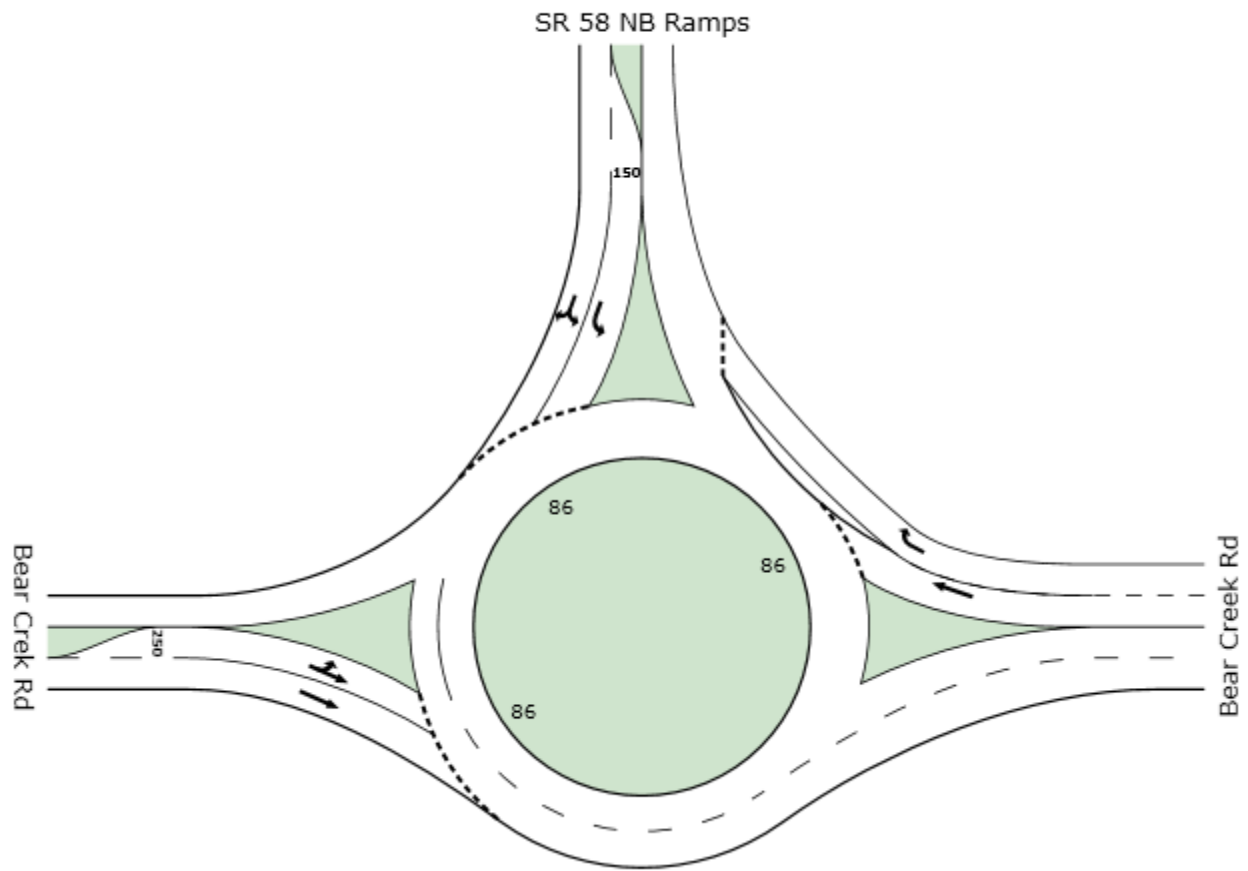
	Actual	Max Desirable	Violation?
v	2538	4600	No
R12			

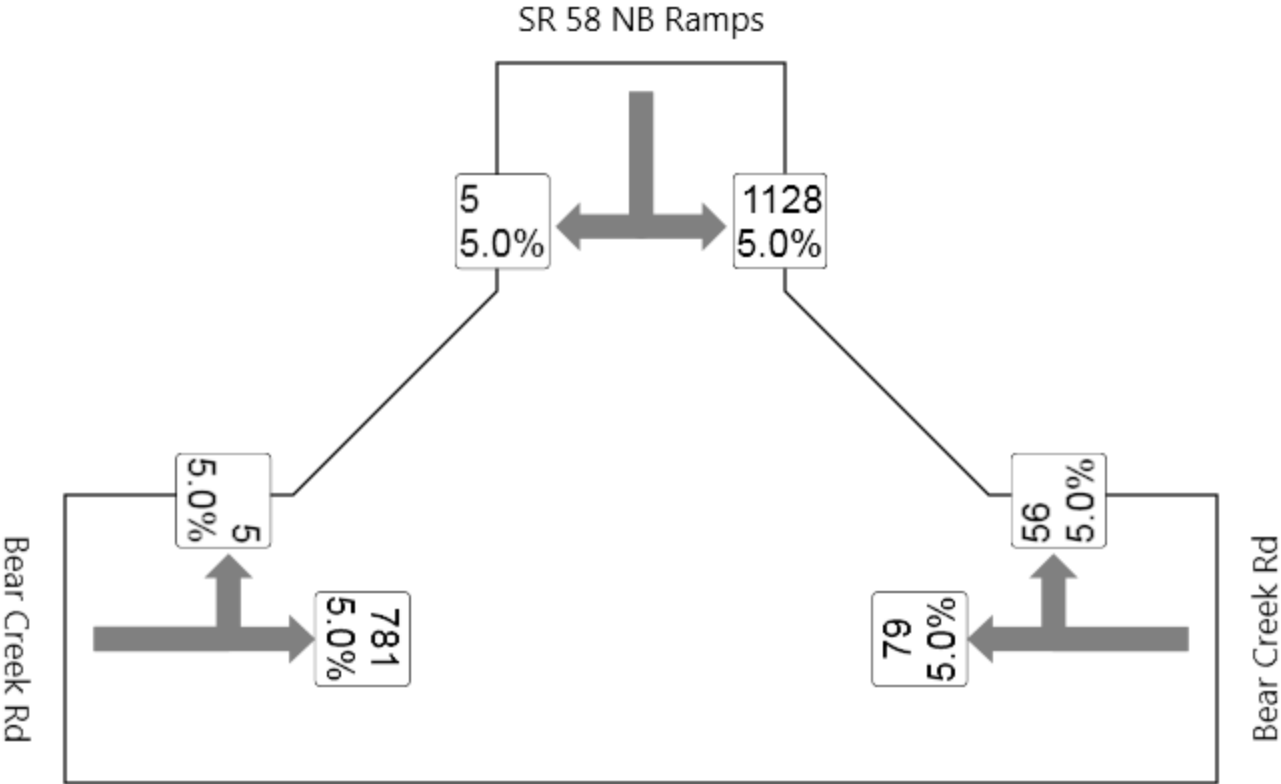
-----Level of Service Determination (if not F)-----

Density, $D = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A = 23.2$ pc/mi/ln
Level of service for ramp-freeway junction areas of influence C

-----Speed Estimation-----

Intermediate speed variable,	M	= 0.358	
	S		
Space mean speed in ramp influence area,	S	= 50.3	mph
	R		
Space mean speed in outer lanes,	S	= N/A	mph
	0		
Space mean speed for all vehicles,	S	= 50.3	mph





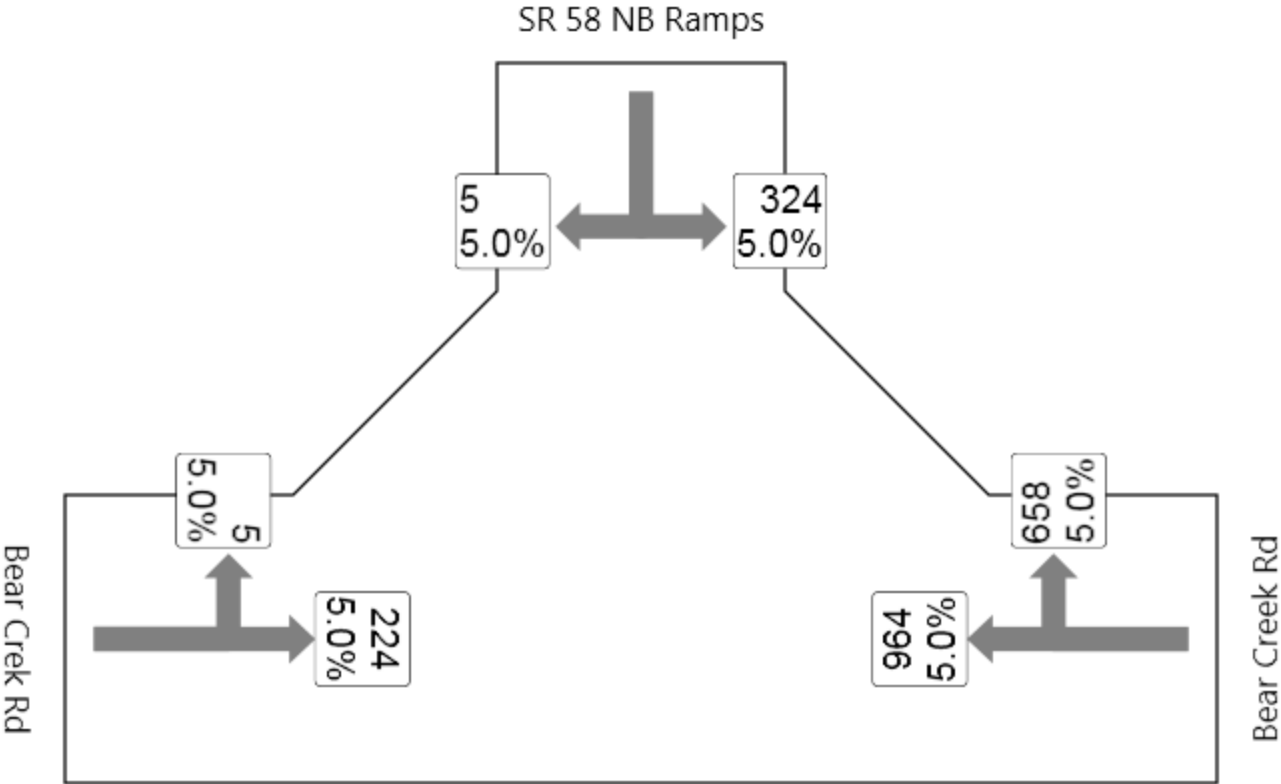
MOVEMENT SUMMARY

Site: 2024 Future Scenario 2 AM
Peak

Bear Creek Rd at SR 58 NB Ramps
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Bear Creek Rd											
6T	T	86	5.0	0.058	0.6	LOS A	0.4	11.2	0.05	0.08	24.5
6R	R	61	5.0	0.047	6.4	LOS A	0.3	8.8	0.06	0.49	33.5
Approach		147	5.0	0.058	3.0	LOS A	0.4	11.2	0.06	0.25	27.9
North: SR 58 NB Ramps											
7L	L	1226	5.0	0.531	13.1	LOS B	5.2	135.8	0.39	0.64	28.9
4R	R	5	5.0	0.543	7.9	LOS A	5.2	135.8	0.37	0.52	31.4
Approach		1232	5.0	0.532	13.1	LOS B	5.2	135.8	0.39	0.64	28.9
West: Bear Creek Rd											
5L	L	5	5.0	0.776	28.8	LOS C	8.3	216.7	0.91	1.25	23.1
2T	T	849	5.0	0.825	21.6	LOS C	8.6	224.1	0.90	1.20	24.6
Approach		854	5.0	0.825	21.7	LOS C	8.6	224.1	0.90	1.20	24.6
All Vehicles		2233	5.0	0.825	15.7	LOS B	8.6	224.1	0.57	0.83	27.1

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.



MOVEMENT SUMMARY

Site: 2024 Future Scenario 2 PM
Peak

Bear Creek at SR 58 NB Ramps
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: Bear Creek Rd											
6T	T	1048	5.0	0.644	0.6	LOS A	9.3	241.9	0.10	0.08	24.4
6R	R	715	5.0	0.554	6.5	LOS A	6.8	176.6	0.10	0.48	33.3
Approach		1763	5.0	0.644	3.0	LOS A	9.3	241.9	0.10	0.25	27.6
North: SR 58 NB Ramps											
7L	L	352	5.0	0.392	26.5	LOS C	3.4	89.4	0.91	1.02	23.2
4R	R	5	5.0	0.388	20.4	LOS C	3.4	89.4	0.91	1.00	24.7
Approach		358	5.0	0.392	26.4	LOS C	3.4	89.4	0.91	1.02	23.2
West: Bear Creek Rd											
5L	L	5	5.0	0.151	13.9	LOS B	0.9	22.3	0.50	0.89	29.7
2T	T	243	5.0	0.149	7.3	LOS A	0.9	22.3	0.50	0.60	31.8
Approach		249	5.0	0.149	7.5	LOS B	0.9	22.3	0.50	0.60	31.8
All Vehicles		2370	5.0	0.644	7.0	LOS A	9.3	241.9	0.26	0.40	27.2

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (HCM).
Approach LOS values are based on the worst delay for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

APPENDIX J – Signal Warrant Scenarios 1 & 2 HCS Reports

2.6 Right Turn Volume Adjustments

When a signal is being considered for capacity reasons, it is customary to adjust minor street right turn volumes to allow for the fact that a certain percentage of vehicles can make right turns without the aid of a traffic signal. High volumes of right turns on the minor streets can skew a signal warrant analysis and indicate a need for a signal where one does not exist.

The MUTCD states that a signal warrant analysis “*should consider the effects of the right turn vehicles from the minor street approach. Engineering judgment should be used to determine what, if any, portion of the right turn traffic is subtracted from the minor street traffic count*”¹. This provides justification for reducing right turn volumes but does not provide any guidance for doing so.

ALDOT requires justification for any right turn adjustments (or lack thereof). Right turn adjustments can be based on engineering judgment, field observation, or an accepted right turn adjustment methodology. As a minimum, the designer should observe existing intersections during the AM and PM peak hours and determine what portion of the right turning traffic is able to turn right without experiencing significant delays. The designer may then discount some or all of the right turning traffic as appropriate. If, however, queued vehicles prevent right turning traffic from flowing freely or if mainline volumes are high enough that even right turning vehicles experience significant delays, the designer may choose to use the full right turning volumes in the warrant analysis.

A formal right turn adjustment methodology has been developed by the Illinois Department of Transportation and can be used as a guide to estimate appropriate right turn adjustments. It is a two step methodology that uses 1) a Minor Street Reduction Factor and 2) a Mainline Congestion Factor to estimate the portion of right turn volumes should be discounted.

The Minor Street Reduction Factor reflects whether minor street geometry and traffic volumes permit the free movement of right turns and reduces right turning volumes accordingly. The Mainline Congestion Factor adjusts the Minor Street Reduction Factor to account for the amount of congestion on the mainline. In essence, the Minor Street Reduction Factor considers what portion of vehicles can get to the intersection to make a right turn while the Mainline Congestion Factor determines whether there are enough gaps in mainline traffic to permit them to actually make that right turn. The adjusted right turn volume is computed as follows:

$$R_{adj} = R \times [1 - (f_{minor} - f_{main})]$$

where:

R_{adj} = adjusted right turn volume (veh/hr)

R = raw right turn volume (veh/hr)

f_{minor} = minor street adjustment factor

f_{main} = mainline congestion factor

*note: if $(f_{minor} - f_{main}) \leq 0$ then $R_{adj} = R$

Values for f_{minor} and f_{main} are shown in Tables 2.2 and 2.3.

The mainline volume used in Table 2.3 is always the stream into which the right turning vehicles are entering. The factor f_{main} is computed for the thru movement associated with the minor street approach used to compute f_{minor} . For a standard intersection with the mainline running east-west, the eastbound thru movement would be associated with the northbound minor street movement and the westbound thru movement would be associated with the southbound minor street movement.

If there is no mainline right turn lane the mainline right turn volumes are added to the thru volumes for the lane volume calculations. If a right turn lane is present, mainline right turn volumes are excluded from the calculations in Table 2.3.

¹ Manual on Uniform Traffic Control Devices, 2003 Edition, page 4C-1.

Table 2.2 – Right Turn Adjustment Factors (Source: Illinois DOT)

Minor Street Adjustment Factor (f_{minor})			
Case	Lane Configuration	Volume Condition	f_{minor}
1		$R > 0.7V$	0.60
		$0.7V \geq R > 0.35V$	0.40
		$R \leq 0.35V$	0.20
2		$R > 3T$	0.60
		$3T \geq R > T/3$	0.40
		$R \leq T/3$	0.20
3		Any configuration with an exclusive right turn lane ≥ 500 ft. long. (See note* for shorter right turn lanes)	0.75
4		$R > (T+L)$	0.65
		$L > (T+R)$	Use Case 2
		$L \approx T \approx R (\pm 10 \text{ veh})$	0.40
		$L \approx T > 3R$	0.20
		$R \approx T > 3L$	0.50
		all other conditions	0.30
5		$R > T$	0.75
		$T \geq R > T/2$	0.50
		$T/2 \geq R > T/4$	0.30
		$R < T/4$	0.15

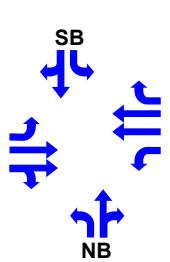
* Note: ALDOT will accept a minimum right turn lane length of 150 ft. Shorter right turn lanes should be considered 'exclusive' only if they permit right turn traffic to flow freely past queued traffic.

Table 2.3 – Mainline Congestion Factors (Source: Illinois DOT)

Mainline Congestion Factor (f_{main})			
Mainline volume per lane (veh/hr/lane)	f_{main}	Mainline volume per lane (veh/hr/lane)	f_{main}
0 - 399	0.0	1100 – 1199	0.40
400 – 499	0.05	1200 – 1299	0.45
500 – 599	0.10	1300 – 1399	0.50
600 – 699	0.15	1400 – 1499	0.55
700 – 799	0.20	1500 – 1599	0.60
800 – 899	0.25	1600 – 1699	0.65
900 – 999	0.30	1700 – 1799	0.70
1000 – 1099	0.35	1800 - 1899	0.75

Example: Right Turn Volume Adjustment

The following hourly traffic volumes were collected for the eastbound and northbound approaches at an intersection with the lane geometry shown. Compute the adjusted right turn volumes for the northbound minor street approach.

	EBL	EBT	EBR	NBL	NBT	NBR	f_{minor}	f_{main}	$1-(f_{minor}-f_{main})$	NBR_{adj}
	56	2156	141	41	15	88	0.60	0.40	0.80	70
	41	2405	166	58	9	106	0.60	0.45	0.85	90
	48	1881	101	38	11	74	0.60	0.30	0.70	52
	32	1156	87	41	15	44	0.40	0.15	0.75	33

The northbound minor street lane configuration corresponds to Case 2 in Table 2.1. For the first three hours $R > 3T$ so a value of 0.60 is used for f_{minor} . In the last hour, $3T \geq R > T/3$ so a value of 0.40 is used for f_{minor} . To compute f_{main} , the eastbound lane volumes are computed for each hour. Using the first hour:

Mainline volume = 2156 thrus + 141 rights = 2297 veh/hr
 Lane volume = (2297 veh/hr) / (2 thru lanes) = 1148 veh/hr/lane
 Mainline Congestion Factor (f_{main}) = 0.40 [from Table 2.2]

$1-(f_{minor} - f_{main}) = 1 - (0.60 - 0.40) = 1 - (0.20) = 0.80$
 $R_{adj} = 88 \text{ veh/hr} \times (0.80) = 70 \text{ veh/hr}$

If there was an eastbound right turn lane then the eastbound right turn volumes would not be included in the calculations.

It is recommended that right turn adjustments be determined for at least the AM and PM peak hours. If it is found that significant right turn volume reductions are necessary, the designer should consider adjusting the remaining count volumes to reflect this.

When performing a signal warrant analysis for a future intersection, it is difficult to estimate the effects of right turning vehicles on minor street traffic flow. In these cases, engineering judgment should be used.

2.7 ALDOT Policy Regarding Warrants

Satisfying one or more of the MUTCD signal warrants does not imply that a traffic signal

should be installed at a given location or that ALDOT is in any way obligated to approve a traffic signal. Satisfying one or more signal warrants simply means that a traffic signal can be given consideration along with other design alternatives.

2.8 Alternative Treatments

Traffic signals are most often installed to address one of two conditions: 1) capacity deficiencies, particularly those which cause excessive side street delays, and/or 2) safety deficiencies, often related to poor sight distances or high mainline speeds.

2.6 Right Turn Volume Adjustments

When a signal is being considered for capacity reasons, it is customary to adjust minor street right turn volumes to allow for the fact that a certain percentage of vehicles can make right turns without the aid of a traffic signal. High volumes of right turns on the minor streets can skew a signal warrant analysis and indicate a need for a signal where one does not exist.

The MUTCD states that a signal warrant analysis “*should consider the effects of the right turn vehicles from the minor street approach. Engineering judgment should be used to determine what, if any, portion of the right turn traffic is subtracted from the minor street traffic count*”¹. This provides justification for reducing right turn volumes but does not provide any guidance for doing so.

ALDOT requires justification for any right turn adjustments (or lack thereof). Right turn adjustments can be based on engineering judgment, field observation, or an accepted right turn adjustment methodology. As a minimum, the designer should observe existing intersections during the AM and PM peak hours and determine what portion of the right turning traffic is able to turn right without experiencing significant delays. The designer may then discount some or all of the right turning traffic as appropriate. If, however, queued vehicles prevent right turning traffic from flowing freely or if mainline volumes are high enough that even right turning vehicles experience significant delays, the designer may choose to use the full right turning volumes in the warrant analysis.

A formal right turn adjustment methodology has been developed by the Illinois Department of Transportation and can be used as a guide to estimate appropriate right turn adjustments. It is a two step methodology that uses 1) a Minor Street Reduction Factor and 2) a Mainline Congestion Factor to estimate the portion of right turn volumes should be discounted.

The Minor Street Reduction Factor reflects whether minor street geometry and traffic volumes permit the free movement of right turns and reduces right turning volumes accordingly. The Mainline Congestion Factor adjusts the Minor Street Reduction Factor to account for the amount of congestion on the mainline. In essence, the Minor Street Reduction Factor considers what portion of vehicles can get to the intersection to make a right turn while the Mainline Congestion Factor determines whether there are enough gaps in mainline traffic to permit them to actually make that right turn. The adjusted right turn volume is computed as follows:

$$R_{adj} = R \times [1 - (f_{minor} - f_{main})]$$

where:

R_{adj} = adjusted right turn volume (veh/hr)

R = raw right turn volume (veh/hr)

f_{minor} = minor street adjustment factor

f_{main} = mainline congestion factor

*note: if $(f_{minor} - f_{main}) \leq 0$ then $R_{adj} = R$

Values for f_{minor} and f_{main} are shown in Tables 2.2 and 2.3.

The mainline volume used in Table 2.3 is always the stream into which the right turning vehicles are entering. The factor f_{main} is computed for the thru movement associated with the minor street approach used to compute f_{minor} . For a standard intersection with the mainline running east-west, the eastbound thru movement would be associated with the northbound minor street movement and the westbound thru movement would be associated with the southbound minor street movement.

If there is no mainline right turn lane the mainline right turn volumes are added to the thru volumes for the lane volume calculations. If a right turn lane is present, mainline right turn volumes are excluded from the calculations in Table 2.3.

¹ Manual on Uniform Traffic Control Devices, 2003 Edition, page 4C-1.

Table 2.2 – Right Turn Adjustment Factors (Source: Illinois DOT)

Minor Street Adjustment Factor (f_{minor})			
Case	Lane Configuration	Volume Condition	f_{minor}
1		$R > 0.7V$	0.60
		$0.7V \geq R > 0.35V$	0.40
		$R \leq 0.35V$	0.20
2		$R > 3T$	0.60
		$3T \geq R > T/3$	0.40
		$R \leq T/3$	0.20
3		Any configuration with an exclusive right turn lane ≥ 500 ft. long. (See note* for shorter right turn lanes)	0.75
4		$R > (T+L)$	0.65
		$L > (T+R)$	Use Case 2
		$L \approx T \approx R (\pm 10 \text{ veh})$	0.40
		$L \approx T > 3R$	0.20
		$R \approx T > 3L$	0.50
		all other conditions	0.30
5		$R > T$	0.75
		$T \geq R > T/2$	0.50
		$T/2 \geq R > T/4$	0.30
		$R < T/4$	0.15

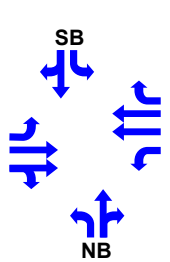
* Note: ALDOT will accept a minimum right turn lane length of 150 ft. Shorter right turn lanes should be considered 'exclusive' only if they permit right turn traffic to flow freely past queued traffic.

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Mainline volume per lane (veh/hr/lane)	f_{main}	Mainline volume per lane (veh/hr/lane)	f_{main}
0 - 399	0.0	1100 – 1199	0.40
400 – 499	0.05	1200 – 1299	0.45
500 – 599	0.10	1300 – 1399	0.50
600 – 699	0.15	1400 – 1499	0.55
700 – 799	0.20	1500 – 1599	0.60
800 – 899	0.25	1600 – 1699	0.65
900 – 999	0.30	1700 – 1799	0.70
1000 – 1099	0.35	1800 - 1899	0.75

Example: Right Turn Volume Adjustment

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	56	2156	141	41	15	88	0.60	0.40	0.80	70
	41	2405	166	58	9	106	0.60	0.45	0.85	90
	48	1881	101	38	11	74	0.60	0.30	0.70	52
	32	1156	87	41	15	44	0.40	0.15	0.75	33

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Mainline volume = 2156 thrus + 141 rights = 2297 veh/hr

Lane volume = (2297 veh/hr) / (2 thru lanes) = 1148 veh/hr/lane

Mainline Congestion Factor (f_{main}) = 0.40 [from Table 2.2]

$1-(f_{minor} - f_{main}) = 1 - (0.60 - 0.40) = 1 - (0.20) = 0.80$

$R_{adj} = 88 \text{ veh/hr} \times (0.80) = 70 \text{ veh/hr}$

If there was an eastbound right turn lane then the eastbound right turn volumes would not be included in the calculations.

It is recommended that right turn adjustments be determined for at least the AM and PM peak hours. If it is found that significant right turn volume reductions are necessary, the designer should consider adjusting the remaining count volumes to reflect this.

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should be installed at a given location or that ALDOT is in any way obligated to approve a traffic signal. Satisfying one or more signal warrants simply means that a traffic signal can be given consideration along with other design alternatives.

2.8 Alternative Treatments

Traffic signals are most often installed to address one of two conditions: 1) capacity deficiencies, particularly those which cause excessive side street delays, and/or 2) safety deficiencies, often related to poor sight distances or high mainline speeds.

Intesection #1
W Bear Creek Ramp at SR 58

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[illegible]

Intesection #3
E Bear Creek Rd / W Bear Creek Rd at SR 95

2024 Scenario 1 Peak Hour Projections

[illegible]

Intesection #5
W Bear Creek Rd at Bear Creek Rd / Site Driveway

Time	-							W Bear Creek Rd							Site Driveway							Bear Creek Rd						
	Eastbound							Westbound							Northbound							Southbound						
	Left	Through	Right	t_{minor}	t_{main}	Right Adj	Approach	Left	Through	Right	t_{minor}	t_{main}	Right Adj	Approach	Left	Through	Right	t_{minor}	t_{main}	Right Adj	Approach	Left	Through	Right	t_{minor}	t_{main}	Right Adj	Approach
7:00 to 8:00 AM								234	0	12	0.75	0.00	3	237	0	94	16	0.00	0.00	16	110	169	1326	0	0.00	0.00	0	1495
8:00 to 9:00 AM																											0	0
9:00 to 10:00 AM																											0	0
10:00 to 11:00 AM																											0	0
11:00 to 12:00 PM																											0	0
12:00 to 1:00 PM																											0	0
1:00 to 2:00 PM																											0	0
2:00 to 3:00 PM																											0	0
3:00 to 4:00 PM																											0	0
4:00 to 5:00 PM																											0	0
5:00 to 6:00 PM								63	0	112	0.75	0.35	67	130	0	1007	178	0.00	0.00	178	1185	9	360	0	0.00	0.00	0	369
6:00 to 7:00 PM																											0	0

Intesection #3
E Bear Creek Rd / W Bear Creek Rd at SR 95

2024 Scenario 2 Peak Hour Projections

[illegible]

Intesection #5
W Bear Creek Rd at Bear Creek Rd / Site Driveway

[illegible]

Intesection #6
SR 58 NB Off Ramp at Bear Creek Rd

[illegible]

Analyst: AECOM	Intersection: Bear Creek Rd Ramp at SR 58
Agency: AECOM	Jurisdiction:
Date: 11/18/2014	Units: U.S. Customary
Project ID: Clinch River Site	Analysis Year: 2024 Future Scenario 1
EW Street: Bear Creek Road Ramps	NS Street: SR 58

General Information

Major St. Speed (mph): 55	Population: Less than 10000
Nearest Signal (ft): 0	Coordinated Signal System: N
Crashes per Yr: 0	

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 0
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	0	1	0	0	0	1	2	0	0	2	1
LaneUsage	L		R				L	T			T	R

Results

Warrant 1: Eight-Hour Vehicular Volume	[]
1 A. Minimum Vehicular Volumes	[]
1 B. Interruption of Continuous Traffic	[]
1 80% Vehicular --and-- Interruption Volumes	[]

Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[]

Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]

Warrant 4: Pedestrian Volume	[]
4 A. Pedestrian Volumes	[]
4 B. Gaps Same Period	[]

Warrant 5: School Crossing	[]
5 A. Student Volumes	[]
5 B. Gaps Same Period	[]

Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[]

Warrant 7: Crash Experience	[]
7 A. Adequate trials of alternatives	[]

7 B. Reported crashes []

7 80% Volumes for Warrants 1A, 1B --or-- 4 []

Warrant 8: Roadway Network []

8 A. Weekday Volume []

8 B. Weekend Volume []

Summary											
	Major	Minor	Total	Delay	1A	1A	1B	1B	2	3A	3B
Hours	Volume	Volume	Volume	(Veh-hr)	70%	56%	70%	56%	70%	70%	70%
07-08	2283	60	2343	0.0	No	No	No	Yes	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	1737	1119	2856	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	4020	1179	5199		1	1	1	2	1	0	1

Traffic Volumes (vph)

[illegible]

Pedestrian Volumes and Gaps (Per Hour)

[illegible][illegible]

[illegible]

Analyst: AECOM	Intersection: Bear Creek Rd at SR 95
Agency: AECOM	Jurisdiction:
Date: 11/18/2014	Units: U.S. Customary
Project ID: Clinch River Site	Analysis Year: 2024 Future Scenario 1
EW Street: W Bear Creek Road	NS Street: SR 95

General Information

Major St. Speed (mph): 55	Population: Less than 10000
Nearest Signal (ft): 0	Coordinated Signal System: N
Crashes per Yr: 0	

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 0
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	1	0	1	0	1	1	0	1	1	0
LaneUsage		LT	R		LTR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[]
1 A. Minimum Vehicular Volumes	[]
1 B. Interruption of Continuous Traffic	[]
1 80% Vehicular --and-- Interruption Volumes	[]

Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[]

Warrant 3: Peak Hour	[]
3 A. Peak-Hour Conditions	[]
3 B. Peak-Hour Vehicular Volume Hours Met	[]

Warrant 4: Pedestrian Volume	[]
4 A. Pedestrian Volumes	[]
4 B. Gaps Same Period	[]

Warrant 5: School Crossing	[]
5 A. Student Volumes	[]
5 B. Gaps Same Period	[]

Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[]

Warrant 7: Crash Experience	[]
7 A. Adequate trials of alternatives	[]

7 B. Reported crashes []

7 80% Volumes for Warrants 1A, 1B --or-- 4 []

Warrant 8: Roadway Network []

8 A. Weekday Volume []

8 B. Weekend Volume []

Summary											
	Major	Minor	Total	Delay	1A	1A	1B	1B	2	3A	3B
Hours	Volume	Volume	Volume	(Veh-hr)	70%	56%	70%	56%	70%	70%	70%
07-08	1237	9	1246	0.0	No	No	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	833	164	1107	0.0	Yes	Yes	Yes	Yes	Yes	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2070	173	2353		1	1	1	1	1	0	0

Traffic Volumes (vph)

[illegible]

Pedestrian Volumes and Gaps (Per Hour)

[illegible][illegible]

[illegible]

Analyst: AECOM	Intersection: Bear Creek Rd at Site Drive
Agency: AECOM	Jurisdiction:
Date: 11/18/2014	Units: U.S. Customary
Project ID: Clinch River Site	Analysis Year: 2024 Future Scenario 1
EW Street: W Bear Creek Road	NS Street: Site Driveway

General Information

Major St. Speed (mph): 25	Population: Less than 10000
Nearest Signal (ft): 0	Coordinated Signal System: N
Crashes per Yr: 0	

School Crossing

Students in Highest Hour: 0
 Adequate Gaps in Period: 0
 Minutes in Period: 0

Roadway Network

Two Major Routes: 0
 Weekend Count: 0
 5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	1	1	1	1	0
LaneUsage				L		R		T	R	L	T	

Results

Warrant 1: Eight-Hour Vehicular Volume	[]
1 A. Minimum Vehicular Volumes	[]
1 B. Interruption of Continuous Traffic	[]
1 80% Vehicular --and-- Interruption Volumes	[]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[]
4 A. Pedestrian Volumes	[]
4 B. Gaps Same Period	[]
Warrant 5: School Crossing	[]
5 A. Student Volumes	[]
5 B. Gaps Same Period	[]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[]
Warrant 7: Crash Experience	[]
7 A. Adequate trials of alternatives	[]

7 B. Reported crashes []

7 80% Volumes for Warrants 1A, 1B --or-- 4 []

Warrant 8: Roadway Network []

8 A. Weekday Volume []

8 B. Weekend Volume []

	Summary										
	Major	Minor	Total	Delay	1A	1A	1B	1B	2	3A	3B
Hours	Volume	Volume	Volume	(Veh-hr)	70%	56%	70%	56%	70%	70%	70%
07-08	279	237	516	0.0	No	No	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	1194	130	1324	0.0	No	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	1473	367	1840		0	1	1	1	1	0	1

Traffic Volumes (vph)

[illegible]

Pedestrian Volumes and Gaps (Per Hour)

[illegible][illegible]

[illegible]

Analyst: AECOM
Date: 6/26/2014
Project ID: Clinch River Site
EW Street: SR 58 NB Off Ramp

Intersection: Bear Creek Rd at SR58 NB Ramp
Units: U.S. Customary
Analysis Year: 2024 Future Scenario 2 AM
NS Street: Bear Creek Rd

Agency: AECOM
Jurisdiction:

General Information

Major St. Speed (mph): 45
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 0
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic												
No. Lanes LaneUsage	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
	0	0	0	1	0	0	0	1	1	0	2	0
				L		LR		T	R		LT	

Results

Warrant 1: Eight-Hour Vehicular Volume

1 A. Minimum Vehicular Volumes

1 B. Interruption of Continuous Traffic

1 80% Vehicular --and-- Interruption Volumes

Warrant 2: Four-Hour Vehicular Volume

2 A. Four-Hour Vehicular Volumes

Warrant 3: Peak Hour

3 A. Peak-Hour Conditions

3 B. Peak-Hour Vehicular Volume Hours Met

Warrant 4: Pedestrian Volume

4 A. Pedestrian Volumes

4 B. Gaps Same Period

Warrant 5: School Crossing

5 A. Student Volumes

5 B. Gaps Same Period

Warrant 6: Coordinated Signal System

6 Degree of Platooning

Warrant 7: Crash Experience

7 A. Adequate trials of alternatives

7 B. Reported crashes

[]

[]

Hours	Summary										
	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 70%	1A 56%	1B 70%	1B 56%	2 70%	3A 70%	3B 70%
07-08	921	1132	2053	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	1851	330	2181	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2772	1462	4234		2	2	2	2	2	0	2

[illegible][illegible][illegible]

	0.0	0.0		0.0	0.0		0.0	0.0	
	0.0	0.0		0.0	0.0		0.0	0.0	
	0.0	0.0		0.0	0.0		0.0	0.0	
	0.0	0.0		0.0	0.0		0.0	0.0	
	0.0	0.0		0.0	0.0		0.0	0.0	

Analyst: AECOM	Intersection: Bear Creek Rd at Site Drive
Agency: AECOM	Jurisdiction:
Date: 6/26/2014	Units: U.S. Customary
Project ID: Clinch River Site	Analysis Year: 2024 Future Scenario 2 AM
EW Street: W Bear Creek Road	NS Street: Site Driveway

General Information

Major St. Speed (mph): 45	Population: Less than 10000
Nearest Signal (ft): 0	Coordinated Signal System: N
Crashes per Yr: 0	

School Crossing

Students in Highest Hour: 0
 Adequate Gaps in Period: 0
 Minutes in Period: 0

Roadway Network

Two Major Routes: 0
 Weekend Count: 0
 5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	1	0	0	2	0
LaneUsage				L		R		TR			LT	

Results

Warrant 1: Eight-Hour Vehicular Volume	[]
1 A. Minimum Vehicular Volumes	[]
1 B. Interruption of Continuous Traffic	[]
1 80% Vehicular --and-- Interruption Volumes	[]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[]
4 A. Pedestrian Volumes	[]
4 B. Gaps Same Period	[]
Warrant 5: School Crossing	[]
5 A. Student Volumes	[]
5 B. Gaps Same Period	[]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[]
Warrant 7: Crash Experience	[]
7 A. Adequate trials of alternatives	[]

7 B. Reported crashes []

7 80% Volumes for Warrants 1A, 1B --or-- 4 []

Warrant 8: Roadway Network []

8 A. Weekday Volume []

8 B. Weekend Volume []

	Summary										
	Major	Minor	Total	Delay	1A	1A	1B	1B	2	3A	3B
Hours	Volume	Volume	Volume	(Veh-hr)	70%	56%	70%	56%	70%	70%	70%
07-08	2058	311	2369	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2058	311	2369		1	1	1	1	1	0	1

Traffic Volumes (vph)

[illegible]

Pedestrian Volumes and Gaps (Per Hour)

[illegible][illegible]

[illegible]

Analyst: AECOM	Intersection: Bear Creek Rd at Site Drive
Agency: AECOM	Jurisdiction:
Date: 6/26/2014	Units: U.S. Customary
Project ID: Clinch River Site	Analysis Year: 2024 Future Scenario 2 PM
EW Street: W Bear Creek Road	NS Street: Site Driveway

General Information

Major St. Speed (mph): 45	Population: Less than 10000
Nearest Signal (ft): 0	Coordinated Signal System: N
Crashes per Yr: 0	

School Crossing

Students in Highest Hour: 0
 Adequate Gaps in Period: 0
 Minutes in Period: 0

Roadway Network

Two Major Routes: 0
 Weekend Count: 0
 5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	1	0	2	0	0	1	0
LaneUsage				L		R		TR			LT	

Results

Warrant 1: Eight-Hour Vehicular Volume	[]
1 A. Minimum Vehicular Volumes	[]
1 B. Interruption of Continuous Traffic	[]
1 80% Vehicular --and-- Interruption Volumes	[]

Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[]

Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]

Warrant 4: Pedestrian Volume	[]
4 A. Pedestrian Volumes	[]
4 B. Gaps Same Period	[]

Warrant 5: School Crossing	[]
5 A. Student Volumes	[]
5 B. Gaps Same Period	[]

Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[]

Warrant 7: Crash Experience	[]
7 A. Adequate trials of alternatives	[]

7 B. Reported crashes []

7 80% Volumes for Warrants 1A, 1B --or-- 4 []

Warrant 8: Roadway Network []

8 A. Weekday Volume []

8 B. Weekend Volume []

	Summary										
	Major	Minor	Total	Delay	1A	1A	1B	1B	2	3A	3B
Hours	Volume	Volume	Volume	(Veh-hr)	70%	56%	70%	56%	70%	70%	70%
07-08	0	0	0	0.0	No	No	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	2326	151	2477	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2326	151	2477		1	1	1	1	1	0	1

Traffic Volumes (vph)

[illegible]

Pedestrian Volumes and Gaps (Per Hour)

[illegible][illegible]

[illegible]

Major St. Speed (mph): 45	Population: Less than 10000
Nearest Signal (ft): 0	Coordinated Signal System: N
Crashes per Yr: 0	

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Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0
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Two Major Routes: 0
Weekend Count: 0
5-yr Growth Factor: 0

	Geometry and Traffic											
	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	1	0	0	0	1	1	0	2	0
LaneUsage				L	LR			T	R		LT	

Warrant 1: Eight-Hour Vehicular Volume	[]
1 A. Minimum Vehicular Volumes	[]
1 B. Interruption of Continuous Traffic	[]
1 80% Vehicular --and-- Interruption Volumes	[]
Warrant 2: Four-Hour Vehicular Volume	[]
2 A. Four-Hour Vehicular Volumes	[]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[X]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[]
4 A. Pedestrian Volumes	[]
4 B. Gaps Same Period	[]
Warrant 5: School Crossing	[]
5 A. Student Volumes	[]
5 B. Gaps Same Period	[]
Warrant 6: Coordinated Signal System	[]
6 Degree of Platooning	[]
Warrant 7: Crash Experience	[]
7 A. Adequate trials of alternatives	[]
7 B. Reported crashes	[]

Warrant 8: Roadway Network	[]
8 A. Weekday Volume	[]
8 B. Weekend Volume	[]

	Summary										
	Major	Minor	Total	Delay	1A	1A	1B	1B	2	3A	3B
Hours	Volume	Volume	Volume	(Veh-hr)	70%	56%	70%	56%	70%	70%	70%
07-08	921	1132	2053	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	1851	330	2181	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2772	1462	4234		2	2	2	2	2	0	2

Traffic Volumes (vph)											
Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
0	0	0	1128	0	4	0	79	56	5	781	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	324	0	6	0	964	658	5	224	0
0	0	0	0	0	0	0	0	0	0	0	0

[illegible][illegible]

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0