

# Traffic Impact Study

*Prepared for submittal to:*



*for the project:*

## Barber Farm Subdivision

*on behalf of:*

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# 1 INTRODUCTION

This report documents the Traffic Impact Study (TIS) conducted for the Barber Farm subdivision project in northwest Billings. This is a working title for the project. Some parts of the site could be marketed under a different name before final occupancy. The study was conducted by and under the direction of a Professional Traffic Operations Engineer and Montana-licensed PE with expertise and experience in traffic engineering.

This TIS builds on findings from the recent TIS conducted for the similar subdivision located due south across Central Avenue, Clearwater/44 West (406 Traffic for Performance Engineering, August 2025) because the two subdivisions will share two new intersections to Central as their primary access points—Barber from the north and Clearwater/44 West from the south. The relationship and timing of these two subdivisions is important for traffic impact analysis and will be described in that context at various points in this report.

## 1.1 PROJECT SITE AND STUDY AREA

The overall Barber Farm subdivision site location is shown in **Exhibit 1** along with the intersections studied. The following study intersections were identified during preapplication review with City of Billings staff, along with the two access points the Clearwater/44 West subdivision proponent is in the process of constructing:

1. Broadwater Avenue at S. 48<sup>th</sup> Street West
2. Broadwater Avenue at Shiloh Road
3. Central Avenue at S. 48<sup>th</sup> Street West
4. Central Avenue at Sundance Ridge Road
5. Central Avenue at Double Haul Lane
6. Central Avenue at S. 44<sup>th</sup> Street West (called Road A in some application materials)
7. Central Avenue at Shiloh Road

From here forward in this report, existing intersections are generally referred to only by their distinguishing street names (e.g., “Shiloh at Central”) for the sake of brevity. The subdivision’s two new access points on Central Avenue, Double Haul Lane and S. 44<sup>th</sup> Street West, have only been analyzed for future scenarios because they are not constructed yet. The site’s third access will be to a future extension of Broadwater Avenue, which is expected to be extended east into the site area to serve the second phase. The Broadwater extension will provide access to 48<sup>th</sup> Street West. Because Broadwater will not be connected to the north or east of the Barber site in the timeline of this project, its connection with the internal collector (Road C) will not function as an intersection and was therefore not analyzed in this study.

## 1.2 PROPOSED LAND USE AND PHASING

The site is currently agricultural land. The subdivision’s proposed land uses will be a combination of residential and commercial, with 370 single-family attached homes three commercial uses: a 35,000 square-foot (SF) recreational community center (or similar), an 8,500 SF restaurant, and an 8,500 SF building for small office use. These areas are for planning/estimating purposes and could vary slightly as project definition is finalized. The project is divided into two logical phases. Phase 1 contains only residential use—one half (185) of the single-family homes indicated. Broadwater Avenue access was only assumed to be available when Phase 2 opens. Phase 2 contains the remainder of the proposed land uses.

Because the site is generally rural, the types and locations of specific pathways or other facilities and connections for pedestrians and bicycles have not yet been identified. A brief examination of potential traffic calming needs indicated that no local streets have long enough blocks uninterrupted by traffic control devices that the need for such measures could arise. On-street parking is expected to be allowed throughout the site wherever street width and sight distance allow for it and such parking does not interfere with operations at the Central Avenue access intersections.

**Exhibit 2** shows the Barber Farm site plan on which the analysis here is based. It indicates land uses and phasing (red = Phase 1), with Central Avenue at the bottom of the page. This site plan drawing is provided for illustrative purposes only. The full high-resolution drawing is submitted separately by the applicant.

Exhibit 1. Overall Site Location and Study Intersections



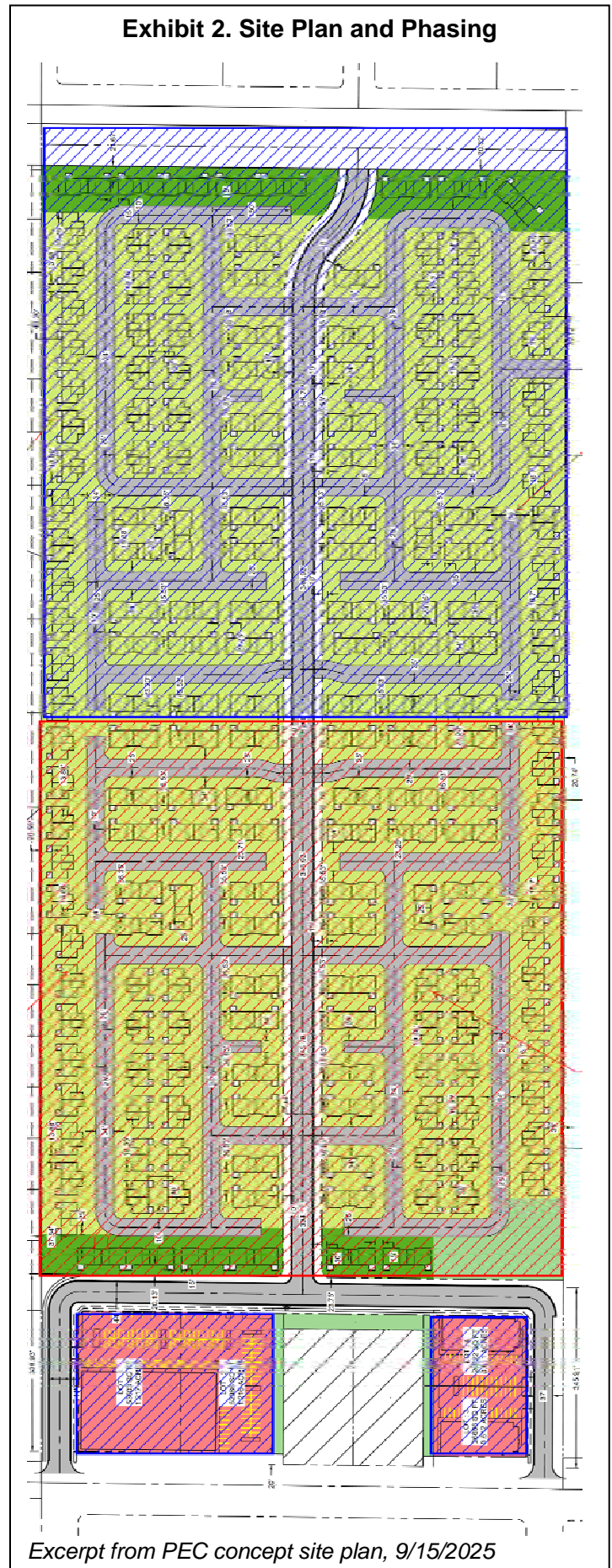
For analysis purposes, both Double Haul Lane and S. 44<sup>th</sup> Street West were initially assumed to have one northbound lane and one southbound lane at their intersections with Central, such that vehicles leaving the site wait in a single shared lane regardless of their eventual turning movement.

### 1.3 ANALYSIS METHODS AND REFERENCES

Raw field traffic counts were gathered from other recent traffic study work in the area by Sanbell and provided to this project’s applicant team, along with new intersection counts at Intersections 1 and 4. These raw counts were then adjusted slightly for this TIS based on both (a) recent traffic growth and (b) 2024 City of Billings annualization factors prior to their use in impact analysis.

Trip generation rates, or equations as applicable, are from the Institute of Transportation Engineers (ITE) Trip Generation suite’s 11<sup>th</sup> edition, which was the most current available at the onset of this study. While the 12<sup>th</sup> edition became available, the project team used the 11<sup>th</sup> edition in order to maintain consistency with the Clearwater/44 West TIS. ITE trip generation data, when aggregated across enough varied sites, produce both simple average rates and best-fit equations, either linear or logarithmic, to help the analyst derive proper estimates for their situation. Equations are generally preferred over rates, especially for larger sites where trip generation per unit of land use can diminish with increasing project size. General ITE guidance calls for the use of the fitted curve equation when the data set for the land use type in question is comprised of studies from 20 or more separate sites and when the equation produces a correlation coefficient ( $R^2$ ) of 0.75 or higher, with 1.0 being the best possible fit.

Operational performance was analyzed at the study intersections through the use of the industry-standard methods presented in the USDOT’s Highway Capacity Manual (HCM), published in its modern form as Transportation Research Board Special Report 209. Synchro Studio 12 was employed as both a data repository and a capacity analysis tool, with reports for each intersection generated using Synchro’s application of the assumptions of the HCM’s 7<sup>th</sup> edition, the most recent available at the time of this study.



The HCM methodology for intersection capacity analysis produces delay estimates for each turning movement (or “lane group”, when multiple turning movements operate from the same lane). These delay estimates are assigned Level of Service (LOS) grades that range from A (best) to F (worst), as indicated in **Exhibit 3**. It’s also important to note that for unsignalized intersections with only side-street Stop sign control, LOS for the intersection is represented by the LOS for the worst lane group. “T” intersections with side-street stop control also fall under this category. All stop-controlled intersections in this study area, including the two new proposed accesses to Central, are “T” intersections, where the approach on the stem of the T, rather than a main street turning movement, contains the worst lane group.

Operations impacts are determined by how peak hour LOS relates to acceptability standards. Billings employs a LOS standard of C or better. When LOS without the project is D or worse, an operations impact is usually defined when the project would increase delay.

**Exhibit 3. LOS Definitions**

LOS	Delay, seconds per vehicle
A	0 - 10.0
B	10.1 - 15.0
C	15.1 - 25.0
D	25.1 - 35.0
E	35.1 - 50.0
F	50.1 or more

Source: HCM 7<sup>th</sup> Edition

In addition to intersection operations analysis, the need for auxiliary left- and right-turn lanes was examined as part of this study effort. These movements on arterial roadways at stop-controlled site access points with volumes that meet MDT criteria with respect to the department’s guidelines indicated in Chapter 28 of its Traffic Engineering Manual. These auxiliary lanes would serve traffic entering the project site. Only locations with free-flowing traffic on the primary street are considered in this auxiliary lane analysis.

Potential mitigation of traffic impacts at the Central/44<sup>th</sup> intersection included the examination of traffic signal warrants according to the guidance in the Manual on Uniform Traffic Control Devices (MUTCD).

## 2 EXISTING AND BACKGROUND CONDITIONS

### 2.1 STREETS AND INTERSECTIONS

**Shiloh Road**, which also carries the designation of MT-302, is a north-south urban principal arterial according to the Montana Department of Transportation (MDT), and a principal arterial according to the 2023 Billings Long Range Transportation Plan (LRTP). It has two travel lanes in each direction and a speed limit of 45 mph in the study area. Shiloh Road has been a key facilitator of the city’s westward expansion, with substantial residential and commercial growth having occurred adjacent to it in recent years. It is characterized by a series of roundabouts at intersections with several of western Billings’ east-west arterials and collectors. It also provides access to Interstate 90 via Zoo Drive to the south. A raised median prevents left turns at many two-way stop-controlled intersections. Exclusive left-turn lanes exist at some accesses and local streets. A sidewalk runs along the east side of the road, and a shared-use path called Shiloh Road Trail runs along the west side, much of it separated from the road by a large ditch. There are also two MET Transit bus stops on its east side between the Broadwater and Central roundabouts. These are not considered to be close enough to the project to site to provide meaningful transit access.

**Central Avenue** is an east-west road that is classified by the MDT as an urban collector to the west of Shiloh Road and as an urban principal arterial to the east of it. It has one travel lane in each direction to the west of Shiloh, and two travel lanes in each direction to the east of it. Its entire length from 64<sup>th</sup> St W to Montana Avenue is classified as a principal arterial in the 2023 Billings LRTP. It has a speed limit of 45 mph on both sides of Shiloh Road, but it becomes 50 mph to the west of 48<sup>th</sup> St W. It connects residential neighborhoods to many of western Billings’ commercial centers. Central currently has no exclusive turning lanes or connecting multimodal facilities to the west of Shiloh Road. However, the 2023 Billings LRTP shows that a shared-use path and/or trail are planned to be installed on this segment of Central Avenue and the Clearwater/44 West project has completed construction on such a path on the south side of the road along its frontage. There are

also plans to expand Central Avenue to a three-lane cross-section to the west of Shiloh Road: one travel lane in each direction and a center left-turn lane.

**48<sup>th</sup> Street W** is a north-south local road according to the MDT, and a principal arterial according to the 2023 Billings LRTP. It has one travel lane in each direction, and its speed limit is 45 mph to the north of Central Avenue and 50 mph to the south of it. It links residences and agricultural properties on the western edges of Billings to the east-west routes that lead into the city, such as Central Avenue and King Avenue. No exclusive turning lanes or multimodal facilities currently exist on 48<sup>th</sup> in the study area.

East of Shiloh Road, **Broadwater Avenue** is an east-west urban principal arterial according to the MDT, and a principal arterial according to the 2023 Billings LRTP. It has one travel lane in each direction and a speed limit of 35 mph in the study area. It serves as a link between residential neighborhoods in western Billings, some small commercial centers, and downtown Billings. Its eastern terminus is at its intersection with Division Street, 1<sup>st</sup> Ave N, and N 36<sup>th</sup> Street near downtown. Its western terminus is currently at a roundabout intersection with Shiloh Road. Currently, the roundabout's west leg only connects to two agricultural lots in active use, but the roundabout's infrastructure here has been built out in preparation for a future westward extension of the road. The arterial Broadwater Avenue has an exclusive westbound right-turn lane at the Shiloh roundabout. There is a shared-use path on the road's north side, and there is a sidewalk on Broadwater's south side extending east.

West of Shiloh Road, Broadwater is a local road segment is currently disconnected from the rest of the arterial network and only accessible via 48<sup>th</sup> Street W.

Intersection traffic control currently comes in only three forms at the five existing study intersections: two-way stop control (TWSC), all-way stop control (AWSC), and roundabouts. Each leg of the three roundabouts has a crosswalk with a pedestrian refuge in the splitter island. Most of these crosswalks have solar-powered rectangular rapid flashing beacons. The intersection of 48<sup>th</sup> Street and Central Avenue is all-way stop-controlled and is augmented with flashing red beacons facing all four directions, but it is projected to be upgraded to signalized control in 2026. **Exhibit 4** shows schematically the existing traffic control and lane arrangements at each existing intersection as well as posted speed limits on selected road segments as of the start of this study effort.

## 2.2 EXISTING TRAFFIC VOLUMES

Existing (2025) annualized volumes were estimated from raw field counts collected in 2024 and 2025 as described earlier in subsection 1.3 and are shown in **Exhibit 5**. These raw counts are provided in Appendix A.

## 2.3 HISTORIC GROWTH AND BACKGROUND CONDITION TRAFFIC

The "Background Condition" described here is represented by the volumes and intersection performance after multiple years of traffic growth assumed to occur during the permitting, construction, sales, and occupancy of the project. These steps are expected to be complete for Phase 1 in 2029. The resulting volumes and operating conditions form the basis for evaluating marginal intersection delay effects of traffic generated by this first phase of the Barber Farm subdivision. Full buildout (Phase 2) is scheduled for completion and occupancy in 2031. In order to estimate traffic growth without the project, average daily traffic volumes were gathered from selected MDT periodic data collection locations in the study area. The best and most logical data set available was represented by the four legs of the Shiloh intersection at Central. Data were recorded or estimated by MDT annually on each leg dating back at least 20 years. This historical traffic information is shown in the graph in **Exhibit 6**.

Exhibit 4. Existing Road and Intersection Basics

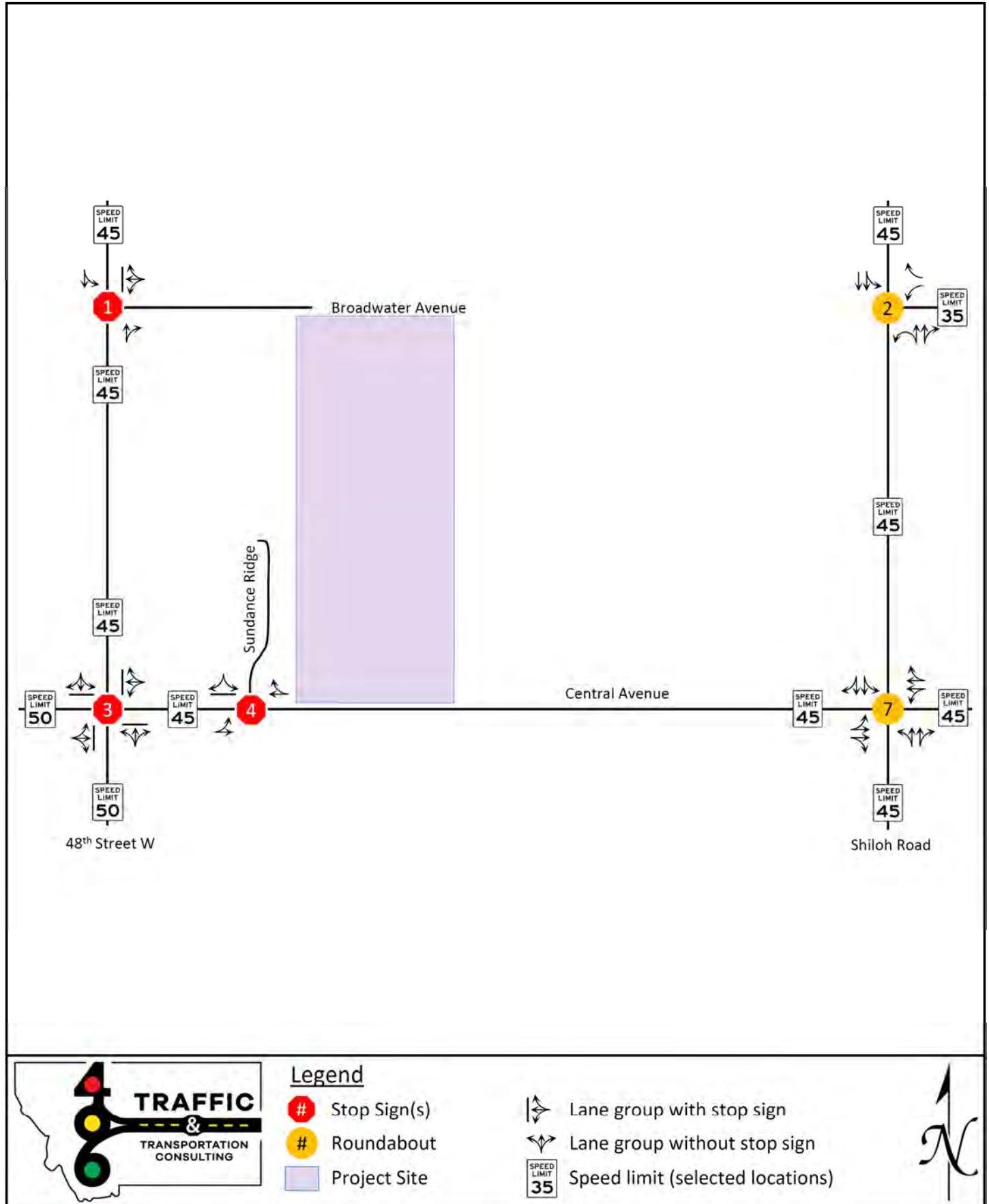
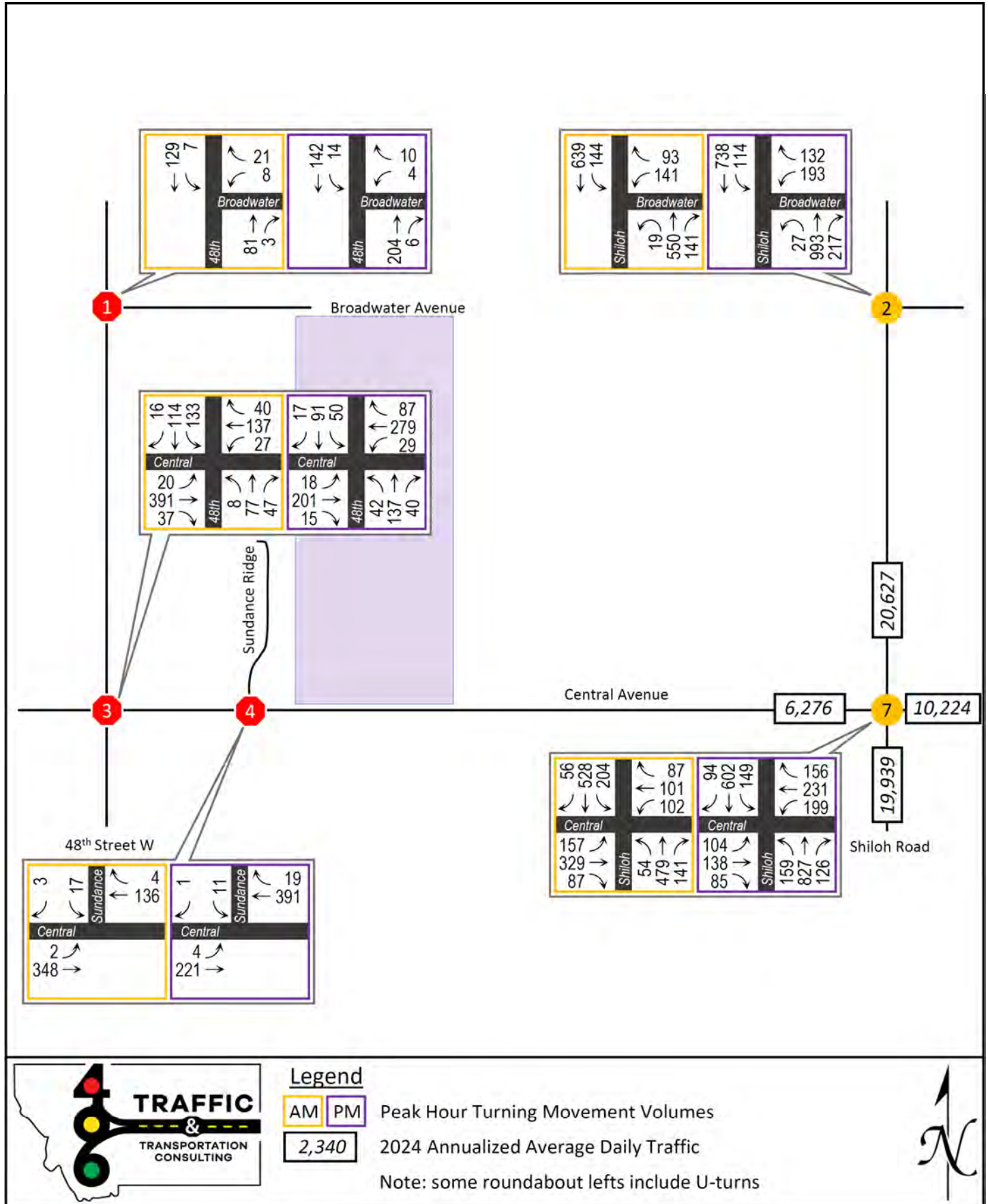
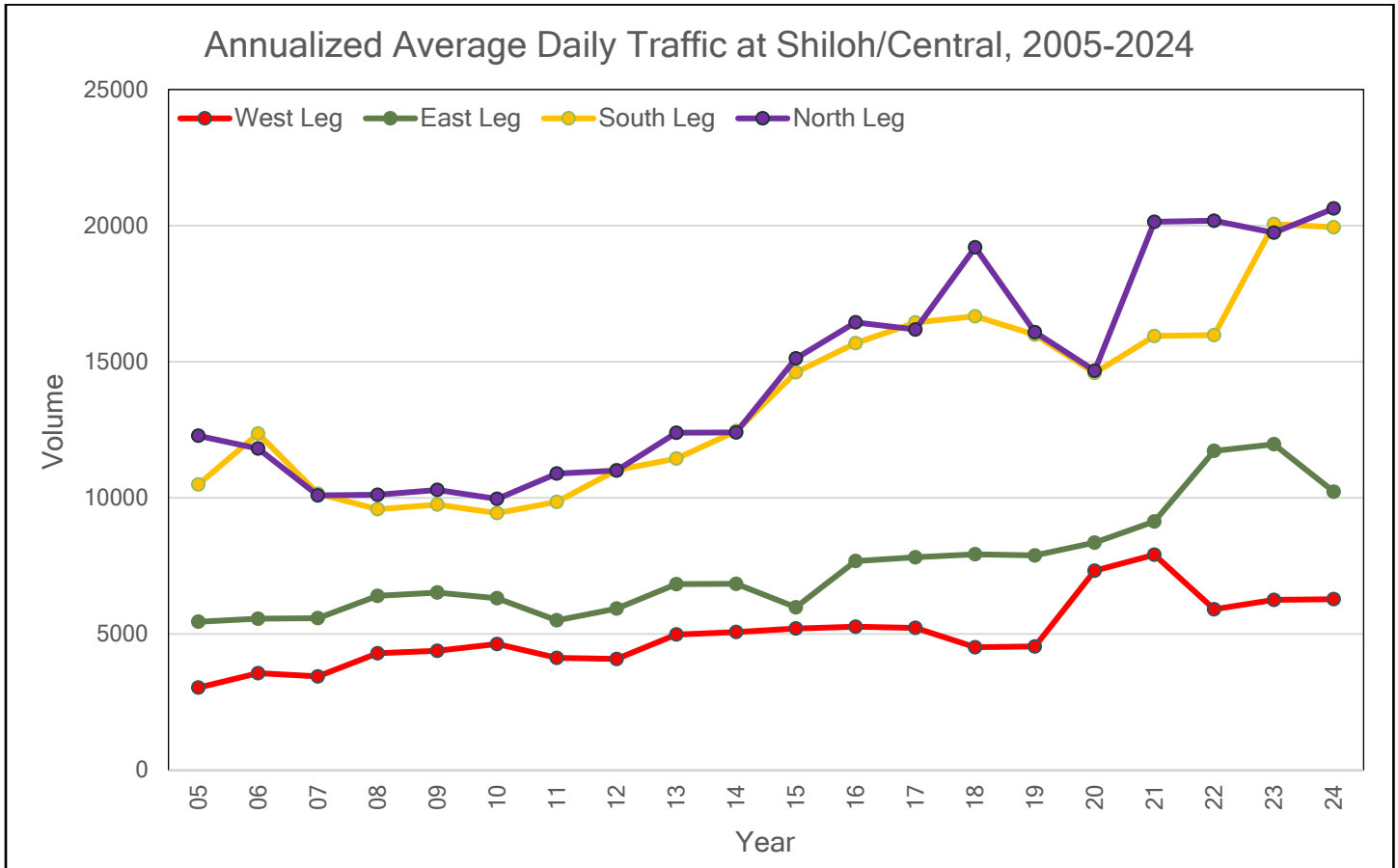


Exhibit 5. Existing Traffic Volumes

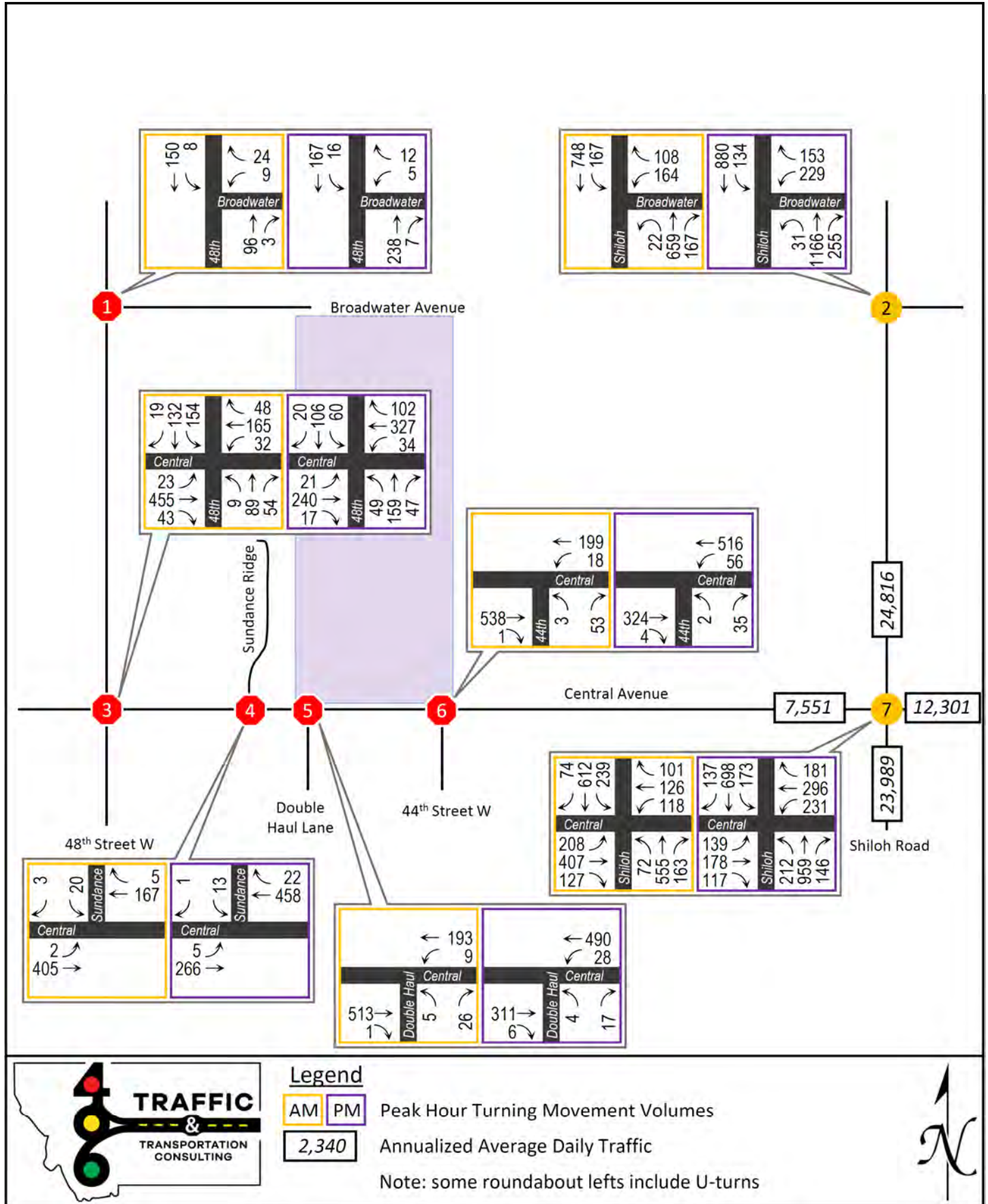


**Exhibit 6. Historical Daily Traffic Volumes**



Counts from the most recent ten of these years were used to calculate the average annual growth rate in daily traffic for these four locations in aggregate, which was approximately 3.8% per year. This rate was then applied to the annualized peak hour intersection counts for each study year. Because the two phases of this project will be constructed sequentially and were not considered independent 'all-or-nothing' conditions at each two-year interval, the second phase's traffic builds on that generated by Phase 1 and each phase's traffic impacts were analyzed incrementally. 2029 Background traffic is shown in **Exhibit 7**.

Exhibit 7. 2029 Background Traffic Volumes



## 2.4 INTERSECTION TRAFFIC OPERATIONS WITHOUT THE PROJECT

The existing and 2029 background peak hour intersection Level of Service (LOS) and delay results are shown in **Exhibit 8**. Analysis software results are provided in Appendix B, and as described earlier, no separate 2031 background scenario was examined.

**Exhibit 8. Existing and 2029 Background Intersection LOS and Delay**

	Intersection	Traffic Control	Peak Hour LOS (delay, in seconds/vehicle)	
			Existing	2029 Background
AM Peak Hour	1. Broadwater at 48 <sup>th</sup>	TWSC*	A ( 9.2)	A ( 9.4)
	2. Broadwater at Shiloh	Roundabout	A ( 6.1)	A ( 7.1)
	3. Central at 48 <sup>th</sup>	AWSC, then Signal	C (25.0)	A ( 9.9)
	4. Central at Sundance Ridge	TWSC*	B (12.4)	B (13.7)
	5. Central at Double Haul	TWSC*	-	B (13.0)
	6. Central at 44 <sup>th</sup>	TWSC*	-	B (13.4)
	7. Central at Shiloh	Roundabout	B (12.1)	C (22.3)
PM Peak Hour	1. Broadwater at 48 <sup>th</sup>	TWSC*	B (10.1)	B (10.5)
	2. Broadwater at Shiloh	Roundabout	A ( 9.3)	B (12.5)
	3. Central at 48 <sup>th</sup>	AWSC, then Signal	C (18.9)	A ( 8.5)
	4. Central at Sundance Ridge	TWSC*	B (14.0)	C (15.9)
	5. Central at Double Haul	TWSC*	-	B (11.9)
	6. Central at 44 <sup>th</sup>	TWSC*	-	B (11.2)
	7. Central at Shiloh	Roundabout	B (14.9)	D (33.7)

\* Intersections 1 and 4 – 6 are all T intersections, so the worst lane group that determines LOS is the minor approach.

The results in the table indicate that with 2025 annualized average traffic volume, all intersections operate at LOS B or better except the AWSC at Central/48<sup>th</sup>. For the 2029 scenario without Barber traffic, signalization of the intersection by Yellowstone County would result in LOS A there in both peaks. For the busiest intersection in the study area, Central at Shiloh, addition of early-phase Clearwater/44 West trips and four years of background growth would result in LOS D in the PM peak hour.

## 3 PROJECT TRIP GENERATION AND DISTRIBUTION

### 3.1 TRIP GENERATION

Trip generation rates, or equations as applicable, are from the Institute of Transportation Engineers (ITE) Trip Generation package's 11<sup>th</sup> edition. ITE trip generation data, when aggregated across enough varied sites, produce both simple average rates and best-fit equations, either linear or logarithmic, to help the analyst derive proper estimates for their situation. Equations are generally preferred over rates, especially for larger sites where trip generation per unit of land use can diminish with increasing project size.

Barber Farm will consist of mostly residential land uses. Small parkland areas within the subdivision are designed and intended for use by residents and their guests, and will be similar to park spaces located in other residential areas around Billings. For that reason, they will not generate external traffic. The commercial space in Phase 2 has had fairly certain sub-types of commercial use identified, and no drive-through activity is expected.

Three types of adjustments to trip generation were evaluated for this project. First, a discount is sometimes taken to reflect internal capture where multiple uses are present in a single project site. Second, a modal adjustment can be taken if a facility is clearly served by robust high-capacity transit and serves a clientele inclined to use transit to get there, or if the potential land use mix and walk/bike network are likely to lead to nonmotorized trips, either internal or external. Finally, some land uses such as gas stations or coffee shops attract trips that were already using the adjacent or nearby road network by virtue of improved convenience over a similar site that could have been used before. These are called "pass-by" and "diverted-linked" trips.

Pass-by trips are those on streets bordering the site, while diverted-linked trips are those that might go slightly out of their way to stop at the establishment on their way to their destination.

The Phase 2 commercial element is the only part of the site considered for these discounts. Due to the retail site's location, small size, and expected general similarity to other sites along the Central Avenue corridor, only a small aggregate discount of the first two types was assumed here; it is not expected to support a use special enough or large enough to generate offsite multimodal or pass-by/diverted-linked trip activity. The estimated reduction in vehicle trip use for the on-site retail due to residents' use applied here is 10%. This reduction in retail vehicle trip use could take the form of subdivision residents (a) stopping at the on-site retail on their way to/from home, (b) choosing to drive to and from the on-site retail rather than a site farther away due to its proximity and convenience, or (c) choosing to walk or bike to and from the on-site retail for the same reason.

To arrive at phase-specific residential trip generation totals, the land use totals for the entire project (370 attached-home lots) were first estimated, then the resulting trip totals were proportioned according to the amount of each home type in each phase. **Exhibit 9** shows the subdivision's trip generation details by phase and land use. Commercial trips are listed first in Phase 2 for clearer accounting of the internal capture effect.

### Exhibit 9. Trip Generation

	Daily	AM Peak Hour	PM Peak Hour
<b>Phase 1</b>			
ITE Land Use 215 – Single Family Attached Housing: X = 185 dwelling units			
Equation/Rate	T = 7.62(X) - 50.48	T = 0.52(X) - 5.70	T = 0.60(X) - 3.93
Peak hour in/out split	-	25% / 75%	59% / 41%
Trips	1,384	93 (23 in / 70 out)	109 (64 in / 45 out)
ITE Land Use 495 – Recreational Community Center: X = 35 ksf (thousands of square feet)			
Equation/Rate	T = 28.82(X)	T = 1.91(X)	T = 2.50(X)
Peak hour in/out split	-	66% / 34%	47% / 53%
Trips	1,009	67 (44 / 23)	88 (41 / 46)
ITE Land Use 712 – Small Office Building: X = 8.5 ksf			
Equation/Rate	T = 14.39(X)	T = 1.67(X)	T = 2.16(X)
Peak hour in/out split	-	82% / 18%	34% / 66%
Trips	122	14 (12 in / 3 out)	18 (6 in / 12 out)
<b>Phase 2</b>			
ITE Land Use 931 – Fine Dining Restaurant: X = 8.5 ksf			
Equation/Rate	T = 83.84(X)	T = 0.73(X)	T = 7.80(X)
Peak hour in/out split	-	50% / 50%	67% / 33%
Trips	713	6 (3 in / 3 out)	66 (44 in / 22 out)
Full gross Phase 2 Commercial trips, all uses	1,844	87 (59 in / 28 out)	172 (92 in / 80 out)
Less 10% internal and walk/bike	-184	- 9 (-6 in / -3 out)	- 17 (-9 in / -8 out)
Net Phase 2 Commercial Trips	1,659	79 (53 in / 26 out)	155 (83 in / 72 out)
ITE Land Use 215 – Single Family Attached Housing: X = 185 dwelling units			
Phase 2 Residential Trips	1,384	93 (23 in / 70 out)	109 (64 in / 45 out)
Phase 2 Total Net Trips	3,044	172 (76 in / 96 out)	264 (147 in, 117 out)
<b>Combined net trips, both phases:</b>	<b>4,428</b>	<b>265 (100 in / 166 out)</b>	<b>373 (211 in / 162 out)</b>

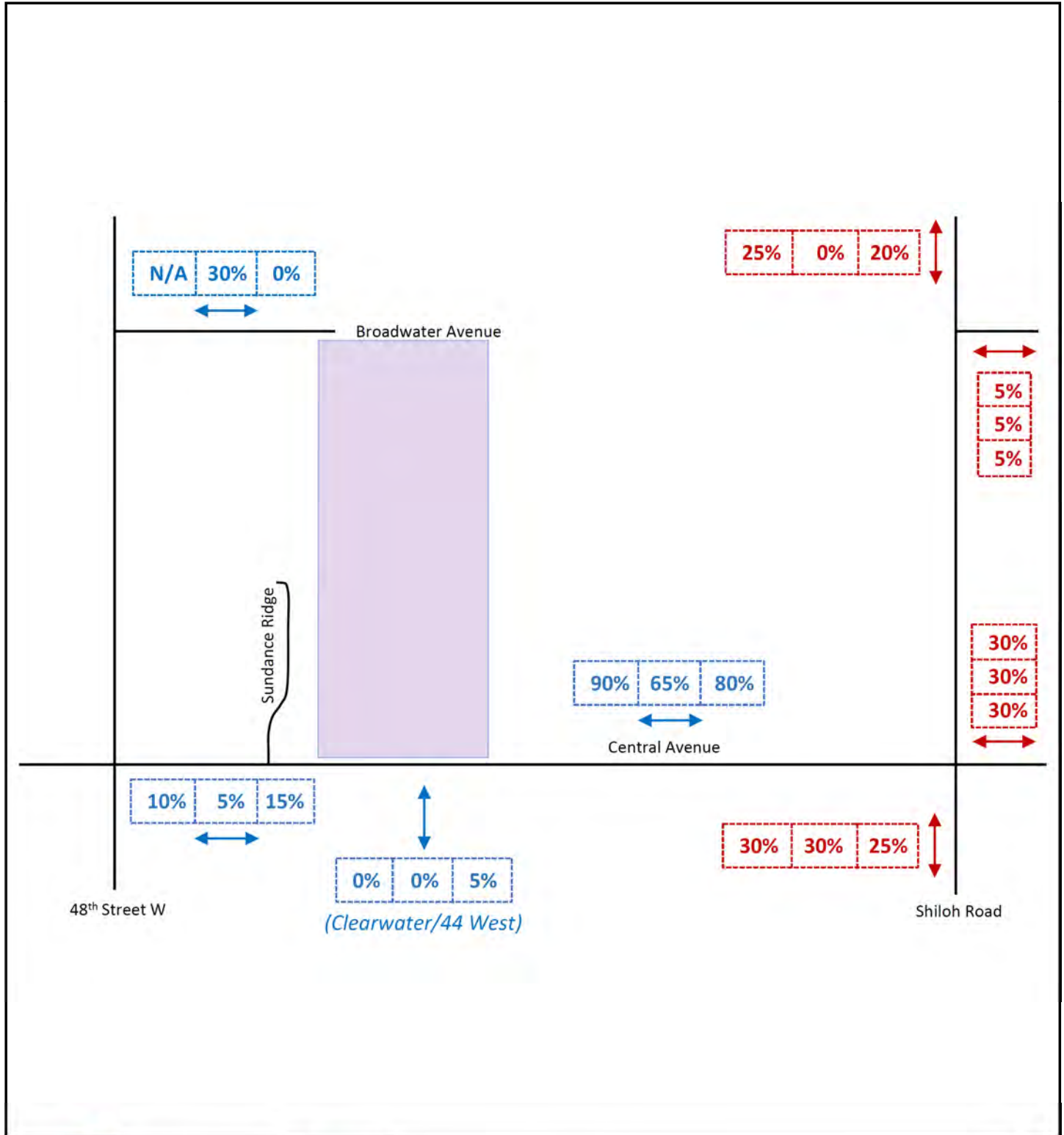
Source: Equations/rates from ITE Trip Generation, 11<sup>th</sup> Edition.

Note: Some totals may be reported +/- one vehicle due to rounding.

## 3.2 TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution has been estimated for the streets surrounding the project site in percentages that add to 100%. Farther from the site, traffic eventually disperses in smaller percentages to/from other routes. Because there is no new information regarding a future developer's plan to connect Broadwater Avenue and/or the similar connection in Phase 2 to the east, no Barber Farm traffic was assumed to use such a connection. Trip distribution and large-scale assignment percentages are shown in **Exhibit 10**. Phase 1 Project Trips are shown in **Exhibit 11**. Future traffic volumes for the 2029 Total Traffic scenario and 2031 scenario without Phase 2 are shown in **Exhibits 12** and **13**, respectively. Phase 2 Project Trips are shown in **Exhibit 14** and 2031 Total Traffic volumes are shown in **Exhibit 15**.

Exhibit 10. Trip Distribution Percentages



Legend

- 30% Primary Distribution (100%) } of New Vehicle Trips to Project Site
- 10% Secondary Assignment

Phase 1	Phase 2 Residential	Phase 2 Commercial
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Exhibit 11. Phase 1 Project Trips

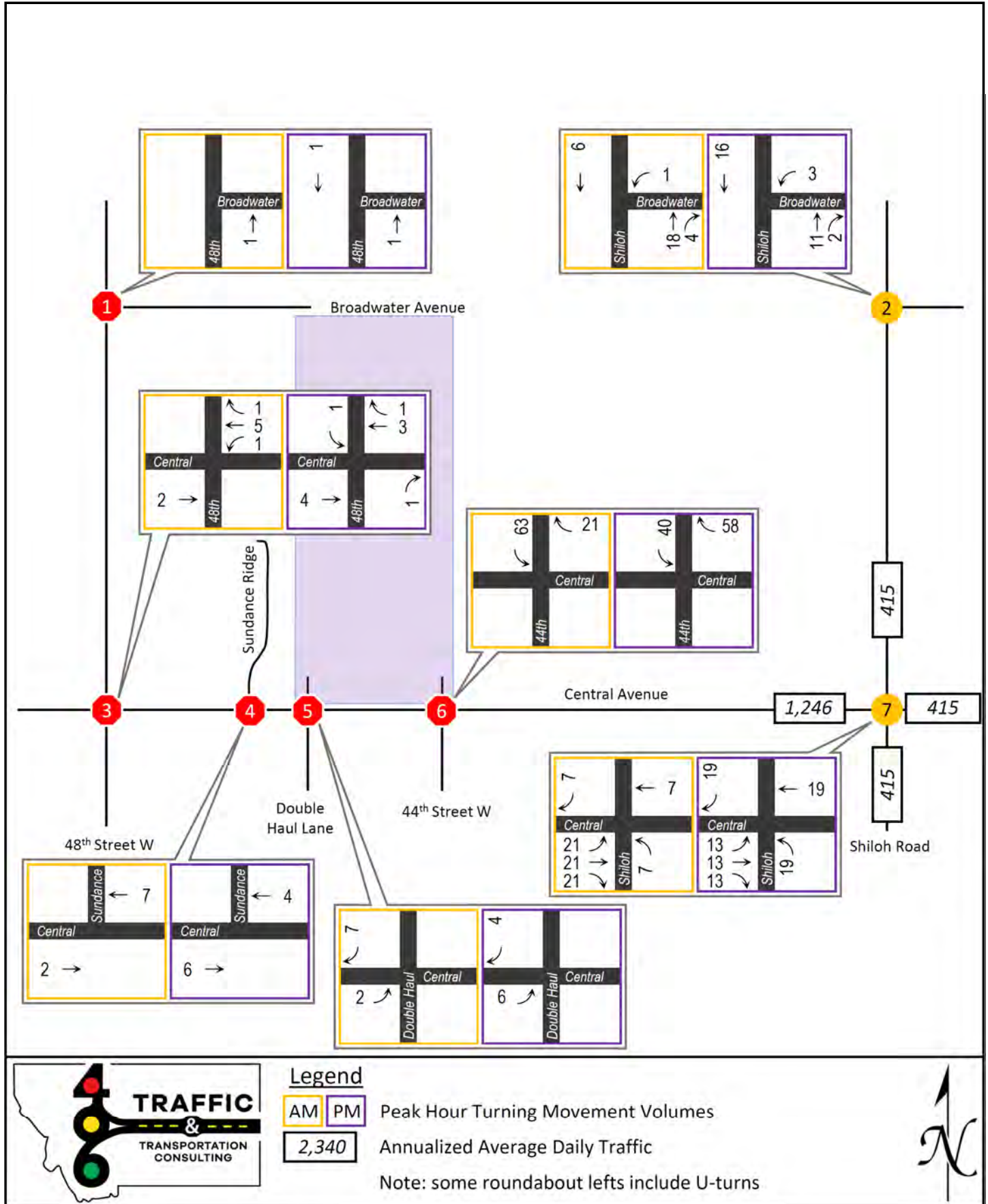


Exhibit 12. 2029 Total Traffic

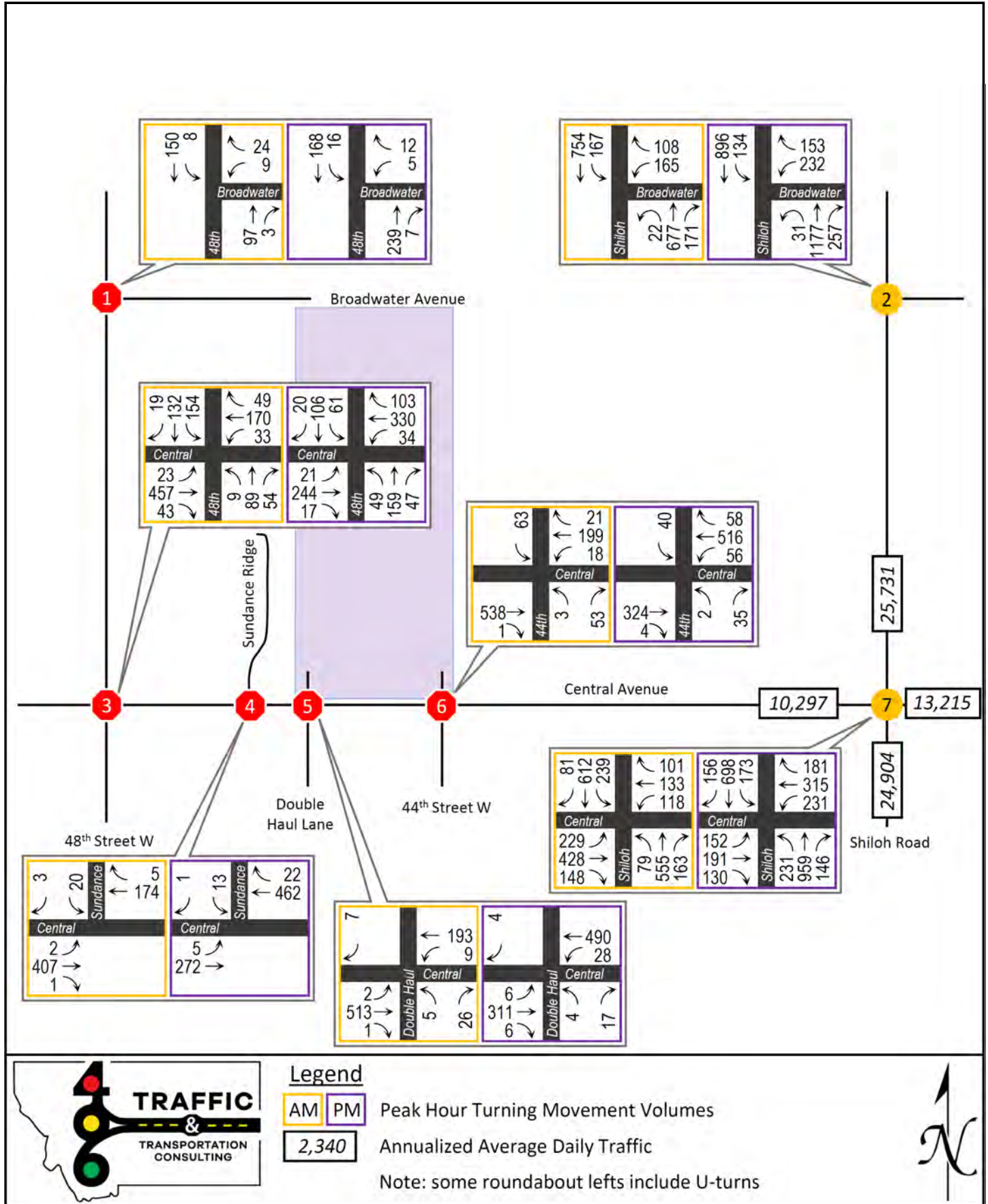


Exhibit 13. 2031 Traffic without Phase 2

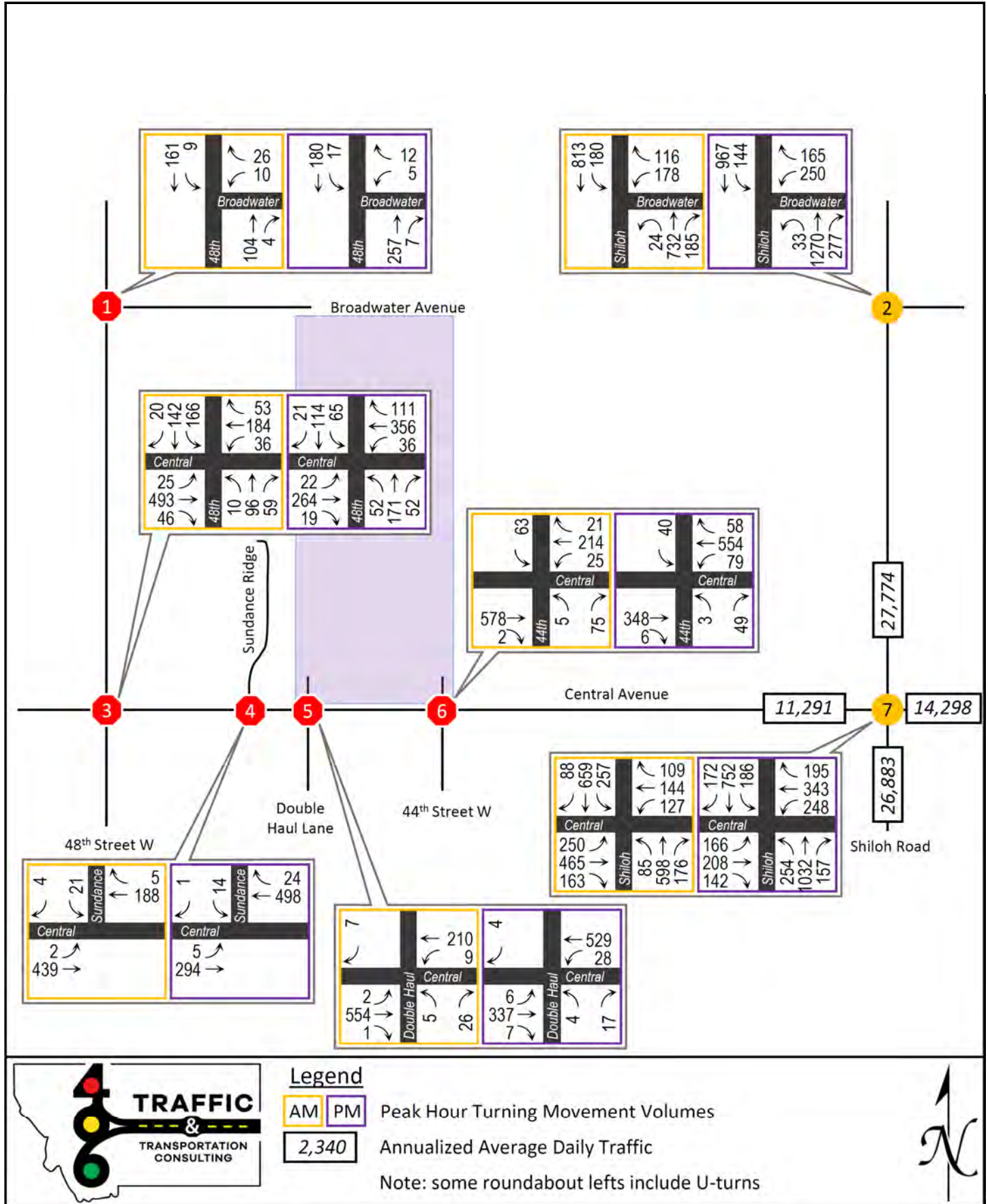


Exhibit 14. Phase 2 Project Trips

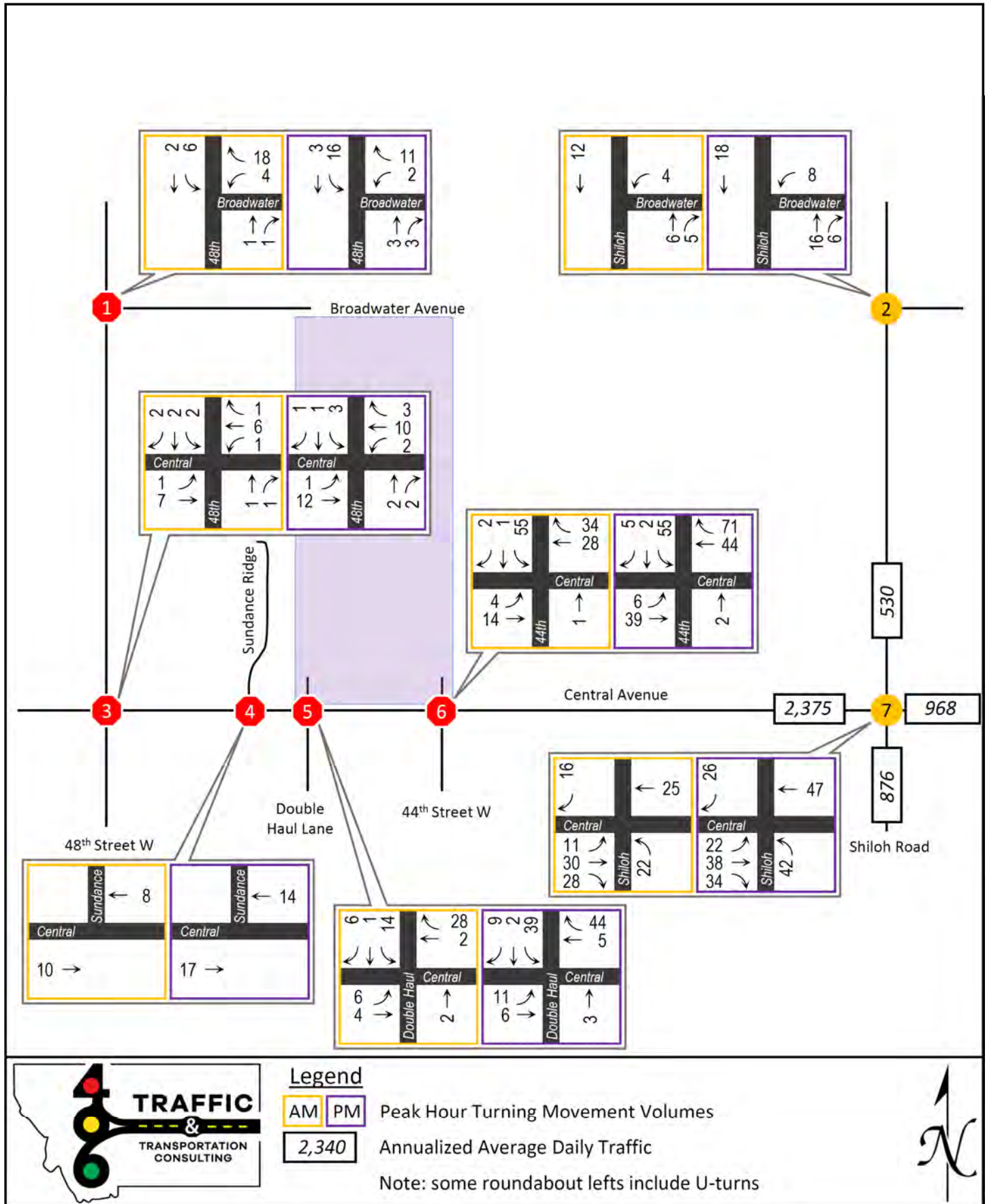
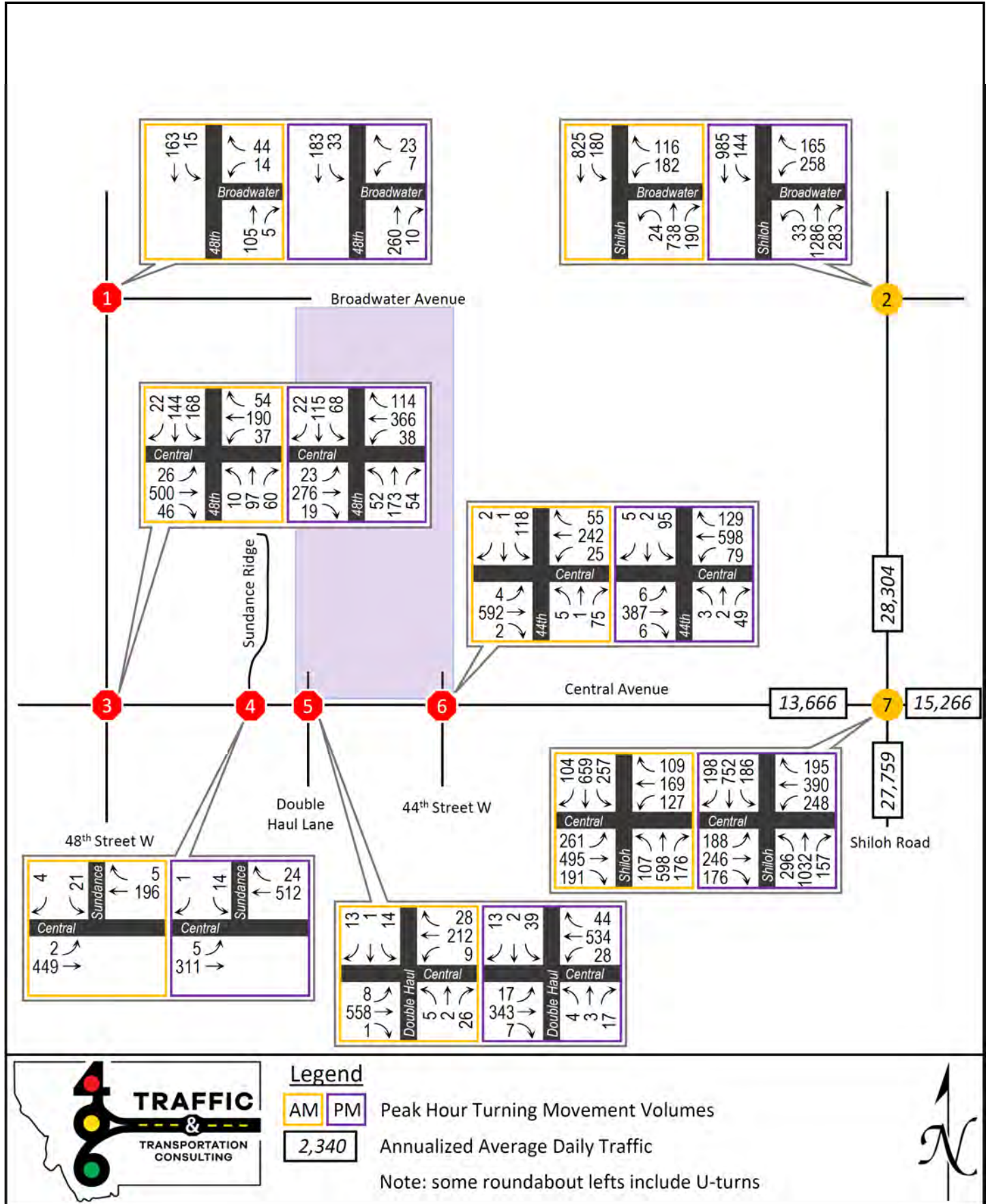


Exhibit 15. 2031 Total Traffic



## 4 CAPACITY ANALYSIS

The analysis results described in this section are organized by project phase order. Project traffic by phase is additive such that the Phase 2 scenario includes Phase 1 traffic. Summaries of intersection capacity and auxiliary turn lane analysis results are provided for each phase in the study area when it's projected to be fully open. As with the existing condition, intersection capacity analysis software output results for the future conditions analyzed are provided in Appendix B. Turn lane warrant summaries for applicable situations are provided in Appendix C and summaries of MUTCD signal warrant analysis for Intersection 6 (44<sup>th</sup> Avenue W) are provided by phase in Appendix D.

### 4.1 INTERSECTION DELAY

The peak hour intersection Level of Service (LOS) and delay results with and without Clearwater/ 44 West subdivision Phase 1 traffic are shown in **Exhibit 16**. Bold results indicate LOS cases that are projected to be worse than the LOS C standard.

**Exhibit 16. Future Intersection LOS and Delay**

Intersection	Traffic Control	LOS (delay, in seconds/vehicle)				
		2029 Background	2029 Total	2031, No Phase 2	2031 Total	
AM Peak Hour	1. Broadwater at 48 <sup>th</sup>	TWSC*	A ( 9.4)	A ( 9.4)	A ( 9.5)	A ( 9.7)
	2. Broadwater at Shiloh	Roundabout	A ( 7.1)	A ( 7.2)	A ( 7.8)	A ( 7.9)
	3. Central at 48 <sup>th</sup>	Signal	A ( 9.9)	A (10.0)	B (11.4)	B (11.7)
	4. Central at Sundance Ridge	TWSC*	B (13.7)	B (13.8)	B (14.4)	B (14.5)
	5. Central at Double Haul	TWSC*	B (13.0)	B (13.3)	B (14.0)	C (16.2)
	6. Central at 44 <sup>th</sup>	TWSC*	B (13.4)	<b>D (26.5)</b>	<b>D (33.8)</b>	<b>F (75.9)</b>
	7. Central at Shiloh	Roundabout	C (22.3)	<b>D (26.7)</b>	<b>E (44.4)</b>	<b>F (57.8)</b>
PM Peak Hour	1. Broadwater at 48 <sup>th</sup>	TWSC*	B (10.5)	B (10.6)	B (10.8)	B (10.9)
	2. Broadwater at Shiloh	Roundabout	B (12.5)	B (12.8)	C (15.5)	C (16.3)
	3. Central at 48 <sup>th</sup>	Signal	A ( 8.5)	A ( 8.5)	A ( 9.2)	A ( 9.4)
	4. Central at Sundance Ridge	TWSC*	C (15.9)	C (16.0)	C (17.2)	C (17.8)
	5. Central at Double Haul	TWSC*	B (11.9)	B (12.6)	B (13.2)	<b>D (29.9)</b>
	6. Central at 44 <sup>th</sup>	TWSC*	B (11.2)	<b>D (33.9)</b>	<b>E (47.2)</b>	<b>F (204.1)</b>
	7. Central at Shiloh	Roundabout	<b>D (33.7)</b>	<b>E (40.2)</b>	<b>F (69.9)</b>	<b>F (102.6)</b>

\* Intersections 1 and 4 – 6 are all TWSC intersections; worst lane group that determines LOS is a minor approach.

Intersections 1 through 4 would all operate at LOS C or better in all scenarios, and Intersection 5, Central Avenue at Double Haul Lane, would only exceed the LOS C standard in the 2031 PM peak hour. Signalization of Intersection 3, Central at 48<sup>th</sup>, is indicated here to provide clear benefits to peak hour traffic operations. The east site access to Central Avenue would operate beyond the LOS C standard in both phases, including LOS F conditions in the 2031 PM peak hour under standard two-way stop control. The need for evaluation of additional capacity and control is clearly indicated for this location. Initial testing of signalization with PM peak hour traffic assumptions here shows that LOS could be expected to be well within acceptable limits (LOS A). While this also means that AM peak LOS would also be expected to improve and be within the LOS C standard, additional engineering study is recommended before a signal is formally considered.

The Central/Shiloh roundabout would operate beyond the LOS C standard in at least one peak hour in all scenarios, as has been demonstrated in multiple recent traffic impact analyses. Mitigation of future delay problems at the Central/Shiloh roundabout is recommended with or without the Barber Farm subdivision, in the form of the eventual addition of a westbound right turn bypass lane, subject to additional evaluation by City staff. Preliminary testing with 2031 Phase 2 PM peak hour volumes indicates that addition of a westbound bypass lane would reduce overall intersection delay considerably, while it would still be in the LOS F range. Synchro's estimate of the 95<sup>th</sup> percentile westbound queue would be reduced by about 46%, from 24 vehicles per lane to 13.

## 4.2 TURN LANE WARRANTS

Auxiliary turn lanes were evaluated using the methods and tools in MDT Traffic Engineering Manual, Chapter 28 for the three locations where project-generated traffic accesses the surrounding highway network at qualifying locations: Intersections 1, 5, and 6. Both AM and PM conditions were evaluated for both right-turn and left-turn lanes, and condition could provide justification for considering a turn lane. Intersection 1 was only evaluated for 2031 conditions because Broadwater is not projected to be extended east from 48<sup>th</sup> to serve the project site before that time. This analysis indicates that three such lanes could be justified by the MDT method: westbound right on Central at 44<sup>th</sup> in 2029, and eastbound left on Central at both Double Haul Lane and 44<sup>th</sup> in 2031. Despite the low eastbound turning volume (single-digits in both 2031 peaks), the MDT methodology still considers a lane justified due to the very heavy east-west through volumes projected on Central. Note that the LOS results shown in Exhibit 16 above do not reflect the addition of any auxiliary lanes.

Growth in background traffic on Central is a strong part of the future need for left turn lanes. The project team believes strongly that, especially in concert with other side-street turning activity in the corridor, proportionate share cost contributions (discussed in the next chapter) for the Double Haul and 44<sup>th</sup> intersections from both subdivisions should be used to help the City and County construct the LRTP project that would create a 3-lane section on Central between Shiloh and 48<sup>th</sup>.

## 4.3 SIGNAL WARRANTS AT 44<sup>TH</sup> AVENUE W

At Intersection 6, only the volume warrants are meaningful and relevant. With 2029 Phase 1 conditions none of them would be met, although the intersection is projected to operate at LOS D in both peaks with projected stop control, in which the highest-delay movement's (southbound left turn) delay is the basis for LOS reporting. In contrast, when Phase 2 and two years of additional background traffic growth are added, 2031 full-project traffic there results in all three signal warrants being met. With respect to the Clearwater/44 West subdivision under the City's consideration across Central Avenue to the south, the 2031 Barber horizon year corresponds to the completion of all residential units in the northern half of the project, but no commercial development activity. A traffic signal is expected to be warranted by 2031 based on the analysis indicated in this study.

## 5 COST PARTICIPATION

The net new trips identified in this report were subject to examination under the City's arterial intersection cost participation program to the extent that they would travel through studied intersections. City staff also requested that the two project access intersections on Central be included even though they are effectively local streets (low-speed with parking and driveways, not connected to other major routes) rather than arterials. Critical traffic shares that drive intersection cost participation can be excluded if they are below 2%, but project trips from all phases are considered together when evaluating such a possibility. Phase-specific project trips used in this calculation were shown previously in Exhibits 11 and 14.

**Exhibit 17** shows the incremental intersection cost participation for the new trips associated with each project phase. Exempted shares for Phase 1 traffic would be deferred until the cost participation contribution is due for the second phase. These are shown in brackets and excluded from the Phase 1 total.

**Exhibit 17. Intersection Cost Participation by Phase**

Intersection	Phase		Project Total
	1	2	
1. Broadwater at 48 <sup>th</sup>	[0.1%]	[1.8%]	1.9%-exempt
2. Broadwater at Shiloh	[1.0%]	[1.5%]	2.5%
3. Central at 48 <sup>th</sup>	[0.4%]	2.0%	2.4%
4. Central at Sundance Ridge	[0.6%]	[1.5%]	2.1%
7. Central at Shiloh	4.0%	9.8%	13.8%
<b>Arterial Intersection Subtotal:</b>	<b>4.0%</b>		<b>20.8%</b>
5. Central at Double Haul (Local)	[0.5%]	4.8%	5.3%
6. Central at 44 <sup>th</sup> (Local)	5.3%	8.9%	14.2%
<b>Total Participation:</b>	<b>9.3%</b>		<b>40.3%</b>

*Note: each % represents the highest project critical-volume share of the two peak hours (AM or PM) for that location.*

As shown in the table, only Intersection 1 qualifies for the “sub-2%” exemption when both phases are considered. A total of 9.3% is due with Phase 1 and the remaining 31.0% is due with Phase 2. The details of these cost participation calculations are provided in Appendix E.

This concludes the Barber Farm Subdivision TIS.

## Appendix A: Original Raw Traffic Count Data for Intersections

Note: Intersections 5 and 6 were not yet built at the time of this study.

Intersection 1. Broadwater Ave & 48th St. W.

Start Date Wednesday, August 20, 2025

Start Time 7:00 AM, 4:00 PM

Start Time	48th Street West Southbound				Broadwater Avenue Westbound				48th Street West Northbound				n/a Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM		23	2	0	2		1	0	1	8		0				
7:15 AM		29	3	0	2		1	0	0	17		0				
7:30 AM		35	1	0	8		2	0	0	28		0				
7:45 AM		43	2	0	5		3	0	0	21		0				
8:00 AM		29	0	0	5		0	0	0	20		0				
8:15 AM		26	4	0	4		3	0	3	14		0				
8:30 AM		36	0	0	4		0	0	1	25		0				
8:45 AM		30	1	0	3		1	0	0	24		0				
4:00 PM		27	4	0	4		0	0	5	45		0				
4:15 PM		37	5	0	6		1	0	2	27		0				
4:30 PM		34	1	0	4		0	0	2	52		0				
4:45 PM		33	2	0	5		2	0	0	50		0				
5:00 PM		30	2	0	0		0	0	2	54		0				
5:15 PM		39	6	0	4		1	0	4	59		0				
5:30 PM		44	4	0	1		1	0	0	47		0				
5:45 PM		35	7	0	3		0	0	1	31		0				

Intersection 2. Shiloh & Broadwater  
 Start Date Thursday, March 7th, 2024  
 Start Time 7:00 AM, 4:00 PM

	Shiloh Road Southbound				Broadwater Avenue Westbound				Shiloh Road Northbound				Eastbound Approach Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	0	111	22	0	17	0	8	0	23	52	0	0	0	1	0	0
7:15 AM	0	147	52	0	21	0	25	0	35	102	0	6	0	3	0	0
7:30 AM	0	182	63	0	18	0	33	0	28	122	0	2	0	4	0	0
7:45 AM	0	170	34	0	23	0	39	0	38	140	0	4	0	4	0	0
8:00 AM	0	131	22	0	26	0	29	0	39	143	0	6	0	6	0	0
8:15 AM	0	139	21	0	24	0	36	0	32	130	0	6	0	4	0	0
8:30 AM	0	133	23	0	18	0	28	0	42	137	0	5	0	3	0	0
8:45 AM	0	150	49	0	18	0	28	0	34	124	0	3	0	4	0	0
4:00 PM	0	143	17	0	33	0	42	0	27	244	0	5	0	2	0	0
4:15 PM	0	151	25	0	20	0	46	0	36	226	0	2	0	0	1	0
4:30 PM	0	151	31	0	21	0	38	0	50	238	2	2	0	0	0	0
4:45 PM	0	177	21	0	24	0	37	0	35	201	1	3	0	0	0	0
5:00 PM	0	169	23	0	40	0	56	0	56	281	0	8	0	3	0	0
5:15 PM	0	193	32	1	44	0	52	0	63	283	4	8	0	0	0	0
5:30 PM	0	179	35	1	20	0	43	0	57	202	1	1	0	0	0	0
5:45 PM	0	160	33	2	20	1	35	0	43	200	0	0	0	0	0	0

Intersection 3. 48th & Central  
 Start Date Tuesday, September 10, 2024  
 Start Time 12:00 AM

	48th Street Southbound				Central Avenue Westbound				48th Street Northbound				Central Avenue Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	3	19	14	0	8	11	3	0	5	10	1	0	6	48	3	0
7:15 AM	4	13	33	0	7	31	1	0	11	23	1	0	8	94	4	0
7:30 AM	3	35	34	0	11	35	7	0	19	17	4	0	8	104	5	0
7:45 AM	6	41	35	0	15	42	11	0	14	19	1	0	15	103	3	0
8:00 AM	3	26	31	0	8	29	8	0	3	18	2	0	6	92	8	0
8:15 AM	2	20	22	0	5	49	7	0	12	18	2	0	6	61	5	0
8:30 AM	6	10	20	0	11	29	4	0	20	12	3	0	5	54	5	0
8:45 AM	1	16	16	0	7	19	4	0	8	17	1	0	6	34	1	0
4:00 PM	4	17	10	0	14	46	10	0	11	31	12	0	2	37	6	0
4:15 PM	2	23	10	0	15	68	9	0	7	29	8	0	4	35	7	0
4:30 PM	8	17	17	0	25	53	9	0	10	37	7	0	13	43	4	0
4:45 PM	3	17	11	0	15	56	8	0	10	32	10	0	3	40	3	0
5:00 PM	2	15	15	0	19	71	10	0	7	35	14	0	4	55	7	0
5:15 PM	8	29	10	0	26	95	4	0	14	43	9	0	3	55	2	0
5:30 PM	4	31	14	0	27	58	7	0	10	28	9	0	5	52	6	0
5:45 PM	4	18	19	0	18	46	9	0	5	26	10	0	8	39	4	0

Intersection 4. Central Ave & Sundance Ridge Rd

Start Date Wednesday, August 20, 2025

Start Time 7:00 AM, 4:00 PM

	Sundance Ridge Road Southbound				Central Avenue Westbound				Northbound Approach Northbound				Central Avenue Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	1	0	1	0	0	22	0	0	0	0	0	0	0	57	1	0
7:15 AM	0	0	7	0	1	32	0	0	0	0	0	0	0	79	1	0
7:30 AM	2	0	3	0	1	39	0	0	0	0	0	0	0	76	0	0
7:45 AM	1	0	6	0	1	37	0	0	1	0	0	0	1	111	0	0
8:00 AM	1	0	4	0	1	33	0	0	0	0	0	0	0	85	0	0
8:15 AM	1	0	3	0	0	30	0	0	0	0	0	0	0	76	2	0
8:30 AM	0	0	5	0	2	40	0	0	0	0	0	0	0	87	0	0
8:45 AM	2	0	4	0	2	42	0	0	0	0	0	0	0	67	0	0
4:00 PM	1	0	4	0	4	75	0	0	0	0	0	0	0	58	1	0
4:15 PM	0	0	2	0	2	72	0	0	0	0	0	0	0	45	1	0
4:30 PM	0	0	2	0	3	81	0	0	0	0	0	0	0	55	3	0
4:45 PM	0	0	2	0	2	93	0	0	0	0	0	0	0	62	0	0
5:00 PM	1	0	3	0	2	99	0	0	0	0	0	0	0	58	2	0
5:15 PM	0	0	3	0	9	114	0	0	0	0	0	0	0	61	1	0
5:30 PM	0	0	3	0	7	97	0	0	0	0	0	0	0	47	1	0
5:45 PM	0	0	5	0	2	71	1	0	0	0	1	0	0	36	0	0

Intersection 7. Shiloh & Central

Start Date Thursday, March 21st, 2024

Start Time 7:00 AM

	Shiloh Road Southbound				Central Avenue Westbound				Shiloh Road Northbound				Central Avenue Eastbound			
Start Time	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	6	74	22	0	7	13	15	0	19	66	9	1	19	51	15	0
7:15 AM	8	118	48	0	7	18	28	0	32	84	14	0	25	90	17	0
7:30 AM	16	128	69	1	18	25	29	0	41	96	15	0	22	112	36	0
7:45 AM	17	135	67	0	26	19	34	0	36	130	19	0	20	91	42	0
8:00 AM	7	116	32	0	29	25	17	0	33	114	10	0	21	76	37	0
8:15 AM	15	135	31	1	12	29	19	0	27	127	9	0	22	41	38	0
8:30 AM	9	98	29	0	15	30	21	0	26	146	10	0	16	30	31	0
8:45 AM	10	102	31	1	20	22	24	0	17	119	20	0	22	40	30	0
4:00 PM	19	127	37	0	23	51	45	0	35	168	24	0	21	29	27	0
4:15 PM	20	100	34	0	35	41	58	0	26	156	45	0	20	39	25	0
4:30 PM	23	127	35	0	38	50	62	0	30	163	47	0	21	26	27	0
4:45 PM	19	153	33	0	41	45	49	0	26	174	41	0	15	36	23	0
5:00 PM	26	152	34	0	38	63	48	0	31	235	32	0	21	46	23	0
5:15 PM	24	154	43	0	35	67	35	0	35	233	35	0	26	26	28	0
5:30 PM	17	142	35	0	40	74	46	0	32	148	35	0	14	32	27	0
5:45 PM	21	148	30	0	31	46	41	0	32	162	26	0	24	22	30	0

## **Appendix B: Intersection Analysis Software Output**

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	8	21	81	3	7	129
Future Vol, veh/h	8	21	81	3	7	129
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	9	24	94	3	8	150

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	262	96	0	0	98
Stage 1	96	-	-	-	-
Stage 2	166	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	731	966	-	-	1508
Stage 1	933	-	-	-	-
Stage 2	868	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	727	966	-	-	1508
Mov Cap-2 Maneuver	727	-	-	-	-
Stage 1	933	-	-	-	-
Stage 2	863	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.23	0	0.38
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	886	93
HCM Lane V/C Ratio	-	-	0.038	0.005
HCM Ctrl Dly (s/v)	-	-	9.2	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	6.1					
Intersection LOS	A					
Approach	WB	NB			SB	
Entry Lanes	1	2			2	
Conflicting Circle Lanes	2	1			1	
Adj Approach Flow, veh/h	249	756			833	
Demand Flow Rate, veh/h	252	771			842	
Vehicles Circulating, veh/h	618	155			173	
Vehicles Exiting, veh/h	308	860			597	
Ped Vol Crossing Leg, #/h	0	0			0	
Ped Cap Adj	1.000	1.000			1.000	
Approach Delay, s/veh	5.9	5.9			6.3	
Approach LOS	A	A			A	
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	152	100	362	409	396	446
Cap Entry Lane, veh/h	840	855	1233	1233	1213	1213
Entry HV Adj Factor	0.987	0.990	0.981	0.980	0.989	0.990
Flow Entry, veh/h	150	99	355	401	392	442
Cap Entry, veh/h	829	847	1210	1208	1200	1201
V/C Ratio	0.181	0.117	0.294	0.332	0.326	0.368
Control Delay, s/veh	6.2	5.4	5.7	6.1	6.1	6.6
LOS	A	A	A	A	A	A
95th %tile Queue, veh	1	0	1	1	1	2

Intersection												
Intersection Delay, s/veh	25											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	20	391	37	27	137	40	8	77	47	133	114	16
Future Vol, veh/h	20	391	37	27	137	40	8	77	47	133	114	16
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles, %	2	2	2	5	5	5	5	5	5	2	2	2
Mvmt Flow	23	455	43	31	159	47	9	90	55	155	133	19
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	37	14.7	13.1	18.6
HCM LOS	E	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	4%	13%	51%
Vol Thru, %	58%	87%	67%	43%
Vol Right, %	36%	8%	20%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	132	448	204	263
LT Vol	8	20	27	133
Through Vol	77	391	137	114
RT Vol	47	37	40	16
Lane Flow Rate	153	521	237	306
Geometry Grp	1	1	1	1
Degree of Util (X)	0.299	0.872	0.435	0.574
Departure Headway (Hd)	7.004	6.023	6.606	6.756
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	510	599	541	532
Service Time	5.094	4.085	4.688	4.829
HCM Lane V/C Ratio	0.3	0.87	0.438	0.575
HCM Control Delay, s/veh	13.1	37	14.7	18.6
HCM Lane LOS	B	E	B	C
HCM 95th-tile Q	1.2	10	2.2	3.6

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	2	348	136	4	17	3
Future Vol, veh/h	2	348	136	4	17	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	2	414	162	5	20	4

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	167	0	-	0	583
Stage 1	-	-	-	-	164
Stage 2	-	-	-	-	419
Critical Hdwy	4.11	-	-	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	2.209	-	-	-	3.5
Pot Cap-1 Maneuver	1417	-	-	-	478
Stage 1	-	-	-	-	870
Stage 2	-	-	-	-	668
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1417	-	-	-	477
Mov Cap-2 Maneuver	-	-	-	-	477
Stage 1	-	-	-	-	868
Stage 2	-	-	-	-	668

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.04	0	12.37
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	10	-	-	-	512
HCM Lane V/C Ratio	0.002	-	-	-	0.046
HCM Ctrl Dly (s/v)	7.5	0	-	-	12.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection									
Intersection Delay, s/veh	12.1								
Intersection LOS	B								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	644		326		757		887		
Demand Flow Rate, veh/h	657		335		780		896		
Vehicles Circulating, veh/h	950		797		790		297		
Vehicles Exiting, veh/h	243		773		817		835		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	16.1		8.4		15.0		8.0		
Approach LOS	C		A		B		A		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.469	0.531	0.471	0.529	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	309	348	157	178	367	413	421	475	
Cap Entry Lane, veh/h	563	633	648	721	653	726	1027	1103	
Entry HV Adj Factor	0.979	0.980	0.975	0.970	0.969	0.971	0.990	0.990	
Flow Entry, veh/h	302	341	153	173	356	401	417	470	
Cap Entry, veh/h	551	621	632	699	633	705	1017	1092	
V/C Ratio	0.549	0.550	0.242	0.247	0.562	0.569	0.410	0.431	
Control Delay, s/veh	16.9	15.4	8.7	8.1	15.6	14.5	8.0	7.9	
LOS	C	C	A	A	C	B	A	A	
95th %tile Queue, veh	3	3	1	1	4	4	2	2	

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	4	10	204	6	14	142
Future Vol, veh/h	4	10	204	6	14	142
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	5	12	237	7	16	165

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	438	241	0	0	244	0
Stage 1	241	-	-	-	-	-
Stage 2	198	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	579	803	-	-	1334	-
Stage 1	804	-	-	-	-	-
Stage 2	840	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	572	803	-	-	1334	-
Mov Cap-2 Maneuver	572	-	-	-	-	-
Stage 1	804	-	-	-	-	-
Stage 2	829	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.12	0	0.69
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	720	162
HCM Lane V/C Ratio	-	-	0.023	0.012
HCM Ctrl Dly (s/v)	-	-	10.1	7.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	9.3					
Intersection LOS	A					
Approach	WB	NB			SB	
Entry Lanes	1	2			2	
Conflicting Circle Lanes	2	1			1	
Adj Approach Flow, veh/h	374	1420			981	
Demand Flow Rate, veh/h	374	1420			990	
Vehicles Circulating, veh/h	1171	134			252	
Vehicles Exiting, veh/h	383	1108			1141	
Ped Vol Crossing Leg, #/h	0	0			0	
Ped Cap Adj	1.000	1.000			1.000	
Approach Delay, s/veh	12.6	9.4			7.9	
Approach LOS	B	A			A	
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	222	152	667	753	465	525
Cap Entry Lane, veh/h	525	539	1257	1257	1129	1129
Entry HV Adj Factor	1.000	1.000	1.001	0.999	0.991	0.990
Flow Entry, veh/h	222	152	667	753	461	520
Cap Entry, veh/h	525	539	1258	1256	1119	1118
V/C Ratio	0.423	0.282	0.531	0.599	0.412	0.465
Control Delay, s/veh	13.9	10.7	8.7	10.0	7.5	8.3
LOS	B	B	A	B	A	A
95th %tile Queue, veh	2	1	3	4	2	3

<b>Intersection</b>												
Intersection Delay, s/veh	18.9											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	201	15	29	279	87	42	137	40	50	91	17
Future Vol, veh/h	18	201	15	29	279	87	42	137	40	50	91	17
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	21	236	18	34	328	102	49	161	47	59	107	20
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	5.2	25.1	15.3	13.6
HCM LOS	C	D	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	8%	7%	32%
Vol Thru, %	63%	86%	71%	58%
Vol Right, %	18%	6%	22%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	219	234	395	158
LT Vol	42	18	29	50
Through Vol	137	201	279	91
RT Vol	40	15	87	17
Lane Flow Rate	258	275	465	186
Geometry Grp	1	1	1	1
Degree of Util (X)	0.469	0.484	0.758	0.352
Departure Headway (Hd)	6.547	6.327	5.871	6.814
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	549	567	613	526
Service Time	4.616	4.394	3.928	4.889
HCM Lane V/C Ratio	0.47	0.485	0.759	0.354
HCM Control Delay, s/veh	15.3	15.2	25.1	13.6
HCM Lane LOS	C	C	D	B
HCM 95th-tile Q	2.5	2.6	6.8	1.6

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	4	221	391	19	11	1
Future Vol, veh/h	4	221	391	19	11	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	4	248	439	21	12	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	461	0	-	0	707
Stage 1	-	-	-	-	450
Stage 2	-	-	-	-	257
Critical Hdwy	4.11	-	-	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	2.209	-	-	-	3.5
Pot Cap-1 Maneuver	1106	-	-	-	405
Stage 1	-	-	-	-	647
Stage 2	-	-	-	-	790
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1106	-	-	-	403
Mov Cap-2 Maneuver	-	-	-	-	403
Stage 1	-	-	-	-	644
Stage 2	-	-	-	-	790

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.15	0	13.98
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	32	-	-	-	414
HCM Lane V/C Ratio	0.004	-	-	-	0.033
HCM Ctrl Dly (s/v)	8.3	0	-	-	14
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection									
Intersection Delay, s/veh	14.9								
Intersection LOS	B								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	351		630		1195		908		
Demand Flow Rate, veh/h	351		630		1195		917		
Vehicles Circulating, veh/h	1029		1172		422		633		
Vehicles Exiting, veh/h	521		445		958		1169		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	11.0		22.7		13.0		13.6		
Approach LOS	B		C		B		B		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.470	0.530	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	165	186	296	334	562	633	431	486	
Cap Entry Lane, veh/h	524	592	459	524	916	992	754	829	
Entry HV Adj Factor	1.000	1.000	1.000	1.000	0.999	1.001	0.990	0.990	
Flow Entry, veh/h	165	186	296	334	562	633	427	481	
Cap Entry, veh/h	524	592	459	524	915	993	746	821	
V/C Ratio	0.315	0.314	0.644	0.637	0.614	0.638	0.572	0.586	
Control Delay, s/veh	11.6	10.4	24.2	21.3	13.0	13.0	13.9	13.3	
LOS	B	B	C	C	B	B	B	B	
95th %tile Queue, veh	1	1	4	4	4	5	4	4	

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	9	24	96	3	8	150
Future Vol, veh/h	9	24	96	3	8	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	10	28	112	3	9	174

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	306	113	0	0	115	0
Stage 1	113	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	690	945	-	-	1486	-
Stage 1	916	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	685	945	-	-	1486	-
Mov Cap-2 Maneuver	685	-	-	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	839	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.4	0	0.38
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	856	91
HCM Lane V/C Ratio	-	-	0.045	0.006
HCM Ctrl Dly (s/v)	-	-	9.4	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	7.1					
Intersection LOS	A					
Approach	WB	NB		SB		
Entry Lanes	1	2		2		
Conflicting Circle Lanes	2	1		1		
Adj Approach Flow, veh/h	289	904		974		
Demand Flow Rate, veh/h	292	923		984		
Vehicles Circulating, veh/h	741	180		202		
Vehicles Exiting, veh/h	362	1006		715		
Ped Vol Crossing Leg, #/h	0	0		0		
Ped Cap Adj	1.000	1.000		1.000		
Approach Delay, s/veh	7.0	6.9		7.4		
Approach LOS	A	A		A		
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	176	116	434	489	462	522
Cap Entry Lane, veh/h	756	773	1206	1206	1182	1182
Entry HV Adj Factor	0.989	0.990	0.979	0.980	0.991	0.989
Flow Entry, veh/h	174	115	425	479	458	516
Cap Entry, veh/h	748	766	1181	1182	1171	1169
V/C Ratio	0.233	0.150	0.360	0.406	0.391	0.442
Control Delay, s/veh	7.4	6.3	6.6	7.1	7.0	7.7
LOS	A	A	A	A	A	A
95th %tile Queue, veh	1	1	2	2	2	2

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
10/13/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	23	455	43	32	165	48	9	89	54	154	132	19
Future Volume (veh/h)	23	455	43	32	165	48	9	89	54	154	132	19
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1723	1723	1682	1682	1682	1682	1682	1682	1723	1723	1723
Adj Flow Rate, veh/h	27	529	50	37	192	56	10	103	63	179	153	22
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	5	5	5	5	5	5	2	2	2
Cap, veh/h	117	669	61	154	518	137	114	304	175	353	230	29
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	33	1509	139	98	1169	310	32	977	562	658	738	93
Grp Volume(v), veh/h	606	0	0	285	0	0	176	0	0	354	0	0
Grp Sat Flow(s),veh/h/ln	1681	0	0	1577	0	0	1571	0	0	1489	0	0
Q Serve(g_s), s	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
Cycle Q Clear(g_c), s	11.4	0.0	0.0	4.3	0.0	0.0	3.2	0.0	0.0	7.6	0.0	0.0
Prop In Lane	0.04		0.08	0.13		0.20	0.06		0.36	0.51		0.06
Lane Grp Cap(c), veh/h	847	0	0	810	0	0	593	0	0	612	0	0
V/C Ratio(X)	0.72	0.00	0.00	0.35	0.00	0.00	0.30	0.00	0.00	0.58	0.00	0.00
Avail Cap(c_a), veh/h	1266	0	0	1171	0	0	1186	0	0	1154	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.8	0.0	0.0	6.9	0.0	0.0	9.8	0.0	0.0	11.2	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.9	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	0.0	0.8	0.0	0.0	0.7	0.0	0.0	1.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	10.0	0.0	0.0	7.2	0.0	0.0	10.1	0.0	0.0	12.0	0.0	0.0
LnGrp LOS	A			A			B			B		
Approach Vol, veh/h		606			285			176			354	
Approach Delay, s/veh		10.0			7.2			10.1			12.0	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.9		20.8		15.9		20.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		5.2		13.4		9.6		6.3				
Green Ext Time (p_c), s		0.8		2.8		1.8		1.5				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh					9.9							
HCM 7th LOS					A							

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	2	405	167	5	20	3
Future Vol, veh/h	2	405	167	5	20	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	2	482	199	6	24	4

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	205	0	0	689	202
Stage 1	-	-	-	202	-
Stage 2	-	-	-	487	-
Critical Hdwy	4.11	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	3.5	3.3
Pot Cap-1 Maneuver	1373	-	-	415	844
Stage 1	-	-	-	837	-
Stage 2	-	-	-	622	-
Platoon blocked, %		-	-		
Mov Cap-1 Maneuver	1373	-	-	414	844
Mov Cap-2 Maneuver	-	-	-	414	-
Stage 1	-	-	-	835	-
Stage 2	-	-	-	622	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.04	0	13.66
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	9	-	-	-	443
HCM Lane V/C Ratio	0.002	-	-	-	0.062
HCM Ctrl Dly (s/v)	7.6	0	-	-	13.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	514	1	9	193	5	26
Future Vol, veh/h	514	1	9	193	5	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	571	1	10	214	6	29

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	572	0	806
Stage 1	-	-	-	-	572
Stage 2	-	-	-	-	234
Critical Hdwy	-	-	4.12	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.218	-	3.5
Pot Cap-1 Maneuver	-	-	1001	-	354
Stage 1	-	-	-	-	569
Stage 2	-	-	-	-	809
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1001	-	350
Mov Cap-2 Maneuver	-	-	-	-	350
Stage 1	-	-	-	-	569
Stage 2	-	-	-	-	800

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.38	12.99
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	485	-	-	80	-
HCM Lane V/C Ratio	0.071	-	-	0.01	-
HCM Ctrl Dly (s/v)	13	-	-	8.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	539	1	18	199	3	53
Future Vol, veh/h	539	1	18	199	3	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	599	1	20	221	3	59

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	600	0	861
Stage 1	-	-	-	-	599
Stage 2	-	-	-	-	261
Critical Hdwy	-	-	4.12	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.218	-	3.5
Pot Cap-1 Maneuver	-	-	977	-	329
Stage 1	-	-	-	-	552
Stage 2	-	-	-	-	787
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	977	-	321
Mov Cap-2 Maneuver	-	-	-	-	321
Stage 1	-	-	-	-	552
Stage 2	-	-	-	-	769

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.73	13.41
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	490	-	-	149	-
HCM Lane V/C Ratio	0.127	-	-	0.02	-
HCM Ctrl Dly (s/v)	13.4	-	-	8.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection									
Intersection Delay, s/veh	22.3								
Intersection LOS	C								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	834		388		889		1040		
Demand Flow Rate, veh/h	851		399		915		1051		
Vehicles Circulating, veh/h	1104		966		977		366		
Vehicles Exiting, veh/h	313		926		978		999		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	35.1		11.1		29.4		10.2		
Approach LOS	E		B		D		B		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.471	0.529	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	400	451	188	211	430	485	494	557	
Cap Entry Lane, veh/h	489	556	555	625	550	619	964	1040	
Entry HV Adj Factor	0.980	0.980	0.969	0.974	0.972	0.972	0.990	0.990	
Flow Entry, veh/h	392	442	182	206	418	471	489	551	
Cap Entry, veh/h	479	544	538	608	534	601	954	1030	
V/C Ratio	0.818	0.812	0.339	0.338	0.783	0.784	0.512	0.535	
Control Delay, s/veh	37.3	33.2	11.8	10.6	30.8	28.2	10.2	10.1	
LOS	E	D	B	B	D	D	B	B	
95th %tile Queue, veh	8	8	1	1	7	7	3	3	

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		B			A
Traffic Vol, veh/h	5	12	238	7	16	167
Future Vol, veh/h	5	12	238	7	16	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	14	277	8	19	194

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	512	281	0	0	285	0
Stage 1	281	-	-	-	-	-
Stage 2	231	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	525	763	-	-	1289	-
Stage 1	771	-	-	-	-	-
Stage 2	812	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	517	763	-	-	1289	-
Mov Cap-2 Maneuver	517	-	-	-	-	-
Stage 1	771	-	-	-	-	-
Stage 2	799	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.54	0	0.68
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	669	157
HCM Lane V/C Ratio	-	-	0.03	0.014
HCM Ctrl Dly (s/v)	-	-	10.5	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	12.5					
Intersection LOS	B					
Approach	WB	NB		SB		
Entry Lanes	1	2		2		
Conflicting Circle Lanes	2	1		1		
Adj Approach Flow, veh/h	439	1668		1165		
Demand Flow Rate, veh/h	439	1668		1177		
Vehicles Circulating, veh/h	1375	156		298		
Vehicles Exiting, veh/h	449	1319		1340		
Ped Vol Crossing Leg, #/h	0	0		0		
Ped Cap Adj	1.000	1.000		1.000		
Approach Delay, s/veh	19.4	12.4		10.1		
Approach LOS	C	B		B		
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	263	176	784	884	553	624
Cap Entry Lane, veh/h	441	455	1232	1232	1083	1083
Entry HV Adj Factor	1.000	1.000	1.000	1.000	0.990	0.989
Flow Entry, veh/h	263	176	784	884	547	617
Cap Entry, veh/h	441	455	1232	1232	1072	1071
V/C Ratio	0.596	0.387	0.636	0.717	0.511	0.576
Control Delay, s/veh	22.5	14.8	11.1	13.5	9.4	10.7
LOS	C	B	B	B	A	B
95th %tile Queue, veh	4	2	5	7	3	4

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
10/13/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	21	240	17	34	327	102	49	159	47	60	106	20
Future Volume (veh/h)	21	240	17	34	327	102	49	159	47	60	106	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Adj Flow Rate, veh/h	25	282	20	40	385	120	58	187	55	71	125	24
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	149	666	45	152	533	158	195	307	81	253	296	48
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	53	1533	103	60	1226	363	204	1124	298	359	1084	177
Grp Volume(v), veh/h	327	0	0	545	0	0	300	0	0	220	0	0
Grp Sat Flow(s),veh/h/ln1690	0	0	0	1649	0	0	1626	0	0	1619	0	0
Q Serve(g_s), s	0.0	0.0	0.0	1.8	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.0	0.0	0.0	8.4	0.0	0.0	4.9	0.0	0.0	3.3	0.0	0.0
Prop In Lane	0.08		0.06	0.07		0.22	0.19		0.18	0.32		0.11
Lane Grp Cap(c), veh/h	860	0	0	842	0	0	583	0	0	597	0	0
V/C Ratio(X)	0.38	0.00	0.00	0.65	0.00	0.00	0.51	0.00	0.00	0.37	0.00	0.00
Avail Cap(c_a), veh/h	1499	0	0	1480	0	0	1462	0	0	1419	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.1	0.0	0.0	7.3	0.0	0.0	9.9	0.0	0.0	9.3	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.8	0.0	0.0	0.7	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/lr0.5	0.0	0.0	0.0	1.2	0.0	0.0	1.0	0.0	0.0	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.3	0.0	0.0	8.1	0.0	0.0	10.6	0.0	0.0	9.7	0.0	0.0
LnGrp LOS	A			A			B			A		
Approach Vol, veh/h		327			545			300			220	
Approach Delay, s/veh		6.3			8.1			10.6			9.7	
Approach LOS		A			A			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		12.9		17.9		12.9		17.9				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		6.9		6.0		5.3		10.4				
Green Ext Time (p_c), s		1.5		1.6		1.1		2.9				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh				8.5								
HCM 7th LOS				A								

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	5	266	458	22	13	1
Future Vol, veh/h	5	266	458	22	13	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	6	299	515	25	15	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	539	0	-	0	837
Stage 1	-	-	-	-	527
Stage 2	-	-	-	-	310
Critical Hdwy	4.11	-	-	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	2.209	-	-	-	3.5
Pot Cap-1 Maneuver	1034	-	-	-	339
Stage 1	-	-	-	-	596
Stage 2	-	-	-	-	748
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1034	-	-	-	337
Mov Cap-2 Maneuver	-	-	-	-	337
Stage 1	-	-	-	-	592
Stage 2	-	-	-	-	748

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.16	0	15.87
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	33	-	-	-	347
HCM Lane V/C Ratio	0.005	-	-	-	0.045
HCM Ctrl Dly (s/v)	8.5	0	-	-	15.9
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	311	6	28	490	4	17
Future Vol, veh/h	311	6	28	490	4	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	346	7	31	544	4	19

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	352	0	956 349
Stage 1	-	-	-	-	349 -
Stage 2	-	-	-	-	607 -
Critical Hdwy	-	-	4.11	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.209	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	1212	-	289 699
Stage 1	-	-	-	-	719 -
Stage 2	-	-	-	-	548 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1212	-	278 699
Mov Cap-2 Maneuver	-	-	-	-	278 -
Stage 1	-	-	-	-	719 -
Stage 2	-	-	-	-	528 -

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.44	11.93
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	543	-	-	97	-
HCM Lane V/C Ratio	0.043	-	-	0.026	-
HCM Ctrl Dly (s/v)	11.9	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Traffic Vol, veh/h	324	4	56	516	2	35
Future Vol, veh/h	324	4	56	516	2	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	360	4	62	573	2	39

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	364	0	1060
Stage 1	-	-	-	-	362
Stage 2	-	-	-	-	698
Critical Hdwy	-	-	4.11	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.209	-	3.5
Pot Cap-1 Maneuver	-	-	1200	-	250
Stage 1	-	-	-	-	709
Stage 2	-	-	-	-	497
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1200	-	231
Mov Cap-2 Maneuver	-	-	-	-	231
Stage 1	-	-	-	-	709
Stage 2	-	-	-	-	460

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.8	11.21
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	621	-	-	176	-
HCM Lane V/C Ratio	0.066	-	-	0.052	-
HCM Ctrl Dly (s/v)	11.2	-	-	8.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.2	-

Intersection									
Intersection Delay, s/veh	33.7								
Intersection LOS	D								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	465		776		1416		1084		
Demand Flow Rate, veh/h	465		776		1416		1095		
Vehicles Circulating, veh/h	1195		1407		527		809		
Vehicles Exiting, veh/h	709		536		1133		1374		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	16.7		70.5		23.6		28.0		
Approach LOS	C		F		C		D		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.471	0.529	0.470	0.530	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	219	246	365	411	666	750	515	580	
Cap Entry Lane, veh/h	450	514	370	429	831	907	641	714	
Entry HV Adj Factor	0.998	1.002	0.999	1.001	0.999	1.001	0.990	0.991	
Flow Entry, veh/h	219	246	365	411	666	750	510	575	
Cap Entry, veh/h	449	515	370	430	831	908	635	707	
V/C Ratio	0.487	0.478	0.986	0.957	0.801	0.827	0.803	0.812	
Control Delay, s/veh	17.8	15.6	77.4	64.4	23.3	23.8	28.7	27.3	
LOS	C	C	F	F	C	C	D	D	
95th %tile Queue, veh	3	3	11	11	9	10	8	9	

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	9	24	97	3	8	150
Future Vol, veh/h	9	24	97	3	8	150
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	10	28	113	3	9	174

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	308	115	0	0	116	0
Stage 1	115	-	-	-	-	-
Stage 2	193	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	689	943	-	-	1485	-
Stage 1	915	-	-	-	-	-
Stage 2	845	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	684	943	-	-	1485	-
Mov Cap-2 Maneuver	684	-	-	-	-	-
Stage 1	915	-	-	-	-	-
Stage 2	839	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.41	0	0.38
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	855	91
HCM Lane V/C Ratio	-	-	0.045	0.006
HCM Ctrl Dly (s/v)	-	-	9.4	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	7.2					
Intersection LOS	A					
Approach	WB	NB			SB	
Entry Lanes	1	2			2	
Conflicting Circle Lanes	2	1			1	
Adj Approach Flow, veh/h	291	927			980	
Demand Flow Rate, veh/h	294	946			990	
Vehicles Circulating, veh/h	760	180			204	
Vehicles Exiting, veh/h	366	1014			734	
Ped Vol Crossing Leg, #/h	0	0			0	
Ped Cap Adj	1.000	1.000			1.000	
Approach Delay, s/veh	7.1	7.0			7.4	
Approach LOS	A	A			A	
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized		Yield				
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	178	116	445	501	465	525
Cap Entry Lane, veh/h	744	761	1206	1206	1179	1179
Entry HV Adj Factor	0.989	0.990	0.979	0.981	0.991	0.989
Flow Entry, veh/h	176	115	436	491	461	519
Cap Entry, veh/h	736	754	1180	1182	1168	1167
V/C Ratio	0.239	0.153	0.369	0.416	0.394	0.445
Control Delay, s/veh	7.6	6.4	6.7	7.3	7.0	7.8
LOS	A	A	A	A	A	A
95th %tile Queue, veh	1	1	2	2	2	2

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
10/19/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	23	457	43	33	170	49	9	89	54	154	132	19
Future Volume (veh/h)	23	457	43	33	170	49	9	89	54	154	132	19
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1723	1723	1682	1682	1682	1682	1682	1682	1723	1723	1723
Adj Flow Rate, veh/h	27	531	50	38	198	57	10	103	63	179	153	22
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	5	5	5	5	5	5	2	2	2
Cap, veh/h	117	671	61	155	520	136	113	304	175	352	230	29
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	32	1510	138	99	1171	307	32	977	562	658	738	93
Grp Volume(v), veh/h	608	0	0	293	0	0	176	0	0	354	0	0
Grp Sat Flow(s),veh/h/ln	1681	0	0	1577	0	0	1571	0	0	1489	0	0
Q Serve(g_s), s	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
Cycle Q Clear(g_c), s	11.5	0.0	0.0	4.5	0.0	0.0	3.2	0.0	0.0	7.6	0.0	0.0
Prop In Lane	0.04		0.08	0.13		0.19	0.06		0.36	0.51		0.06
Lane Grp Cap(c), veh/h	849	0	0	811	0	0	592	0	0	611	0	0
V/C Ratio(X)	0.72	0.00	0.00	0.36	0.00	0.00	0.30	0.00	0.00	0.58	0.00	0.00
Avail Cap(c_a), veh/h	1262	0	0	1168	0	0	1183	0	0	1150	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.9	0.0	0.0	6.9	0.0	0.0	9.8	0.0	0.0	11.2	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.9	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	0.0	0.8	0.0	0.0	0.7	0.0	0.0	1.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	10.0	0.0	0.0	7.2	0.0	0.0	10.1	0.0	0.0	12.1	0.0	0.0
LnGrp LOS	B			A			B			B		
Approach Vol, veh/h		608			293			176			354	
Approach Delay, s/veh		10.0			7.2			10.1			12.1	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.9		20.8		15.9		20.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		5.2		13.5		9.6		6.5				
Green Ext Time (p_c), s		0.8		2.8		1.8		1.6				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh				10.0								
HCM 7th LOS				A								

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	2	407	174	5	20	3
Future Vol, veh/h	2	407	174	5	20	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	2	485	207	6	24	4

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	213	0	-	0	699 210
Stage 1	-	-	-	-	210 -
Stage 2	-	-	-	-	489 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1363	-	-	-	409 835
Stage 1	-	-	-	-	830 -
Stage 2	-	-	-	-	620 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1363	-	-	-	408 835
Mov Cap-2 Maneuver	-	-	-	-	408 -
Stage 1	-	-	-	-	828 -
Stage 2	-	-	-	-	620 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.04	0	13.79
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	9	-	-	-	437
HCM Lane V/C Ratio	0.002	-	-	-	0.063
HCM Ctrl Dly (s/v)	7.6	0	-	-	13.8
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	513	1	9	193	0	5	0	26	0	0	7
Future Vol, veh/h	2	513	1	9	193	0	5	0	26	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	2	570	1	10	214	0	6	0	29	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	214	0	0	571	0	0	809	809	571	809	810	214
Stage 1	-	-	-	-	-	-	575	575	-	234	234	-
Stage 2	-	-	-	-	-	-	234	234	-	574	576	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1362	-	-	1002	-	-	301	316	524	301	316	831
Stage 1	-	-	-	-	-	-	507	506	-	773	715	-
Stage 2	-	-	-	-	-	-	773	715	-	507	506	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1362	-	-	1002	-	-	294	312	524	281	312	831
Mov Cap-2 Maneuver	-	-	-	-	-	-	294	312	-	281	312	-
Stage 1	-	-	-	-	-	-	506	505	-	764	706	-
Stage 2	-	-	-	-	-	-	757	706	-	478	504	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.03			0.38			13.35			9.38		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	466	7	-	-	80	-	-	831
HCM Lane V/C Ratio	0.074	0.002	-	-	0.01	-	-	0.009
HCM Ctrl Dly (s/v)	13.3	7.6	0	-	8.6	0	-	9.4
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	538	1	18	199	21	3	0	53	63	0	0
Future Vol, veh/h	0	538	1	18	199	21	3	0	53	63	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	0	598	1	20	221	23	3	0	59	70	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	244	0	0	599	0	0	859	883	598	871	872	233
Stage 1	-	-	-	-	-	-	598	598	-	273	273	-
Stage 2	-	-	-	-	-	-	261	284	-	598	599	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1328	-	-	978	-	-	279	287	506	274	291	811
Stage 1	-	-	-	-	-	-	492	494	-	738	688	-
Stage 2	-	-	-	-	-	-	748	680	-	493	494	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	1328	-	-	978	-	-	272	280	506	236	284	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	272	280	-	236	284	-
Stage 1	-	-	-	-	-	-	492	494	-	720	671	-
Stage 2	-	-	-	-	-	-	730	664	-	435	494	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0			0.66			13.54			26.54		
HCM LOS							B			D		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	483	1328	-	-	134	-	-	236
HCM Lane V/C Ratio	0.129	-	-	-	0.02	-	-	0.296
HCM Ctrl Dly (s/v)	13.5	0	-	-	8.8	0	-	26.5
HCM Lane LOS	B	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	1.2

Intersection									
Intersection Delay, s/veh	26.7								
Intersection LOS	D								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	904		395		896		1048		
Demand Flow Rate, veh/h	922		406		923		1059		
Vehicles Circulating, veh/h	1104		997		1025		382		
Vehicles Exiting, veh/h	337		951		1001		1021		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	44.1		11.7		34.6		10.5		
Approach LOS	E		B		D		B		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.470	0.530	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	433	489	191	215	434	489	498	561	
Cap Entry Lane, veh/h	489	556	539	608	526	594	950	1026	
Entry HV Adj Factor	0.982	0.980	0.971	0.973	0.971	0.971	0.989	0.990	
Flow Entry, veh/h	425	479	185	209	421	475	493	556	
Cap Entry, veh/h	480	545	524	592	510	577	940	1016	
V/C Ratio	0.886	0.880	0.354	0.353	0.825	0.823	0.524	0.547	
Control Delay, s/veh	46.6	41.9	12.4	11.1	36.4	33.0	10.6	10.5	
LOS	E	E	B	B	E	D	B	B	
95th %tile Queue, veh	10	10	2	2	8	8	3	3	

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	5	12	239	7	16	168
Future Vol, veh/h	5	12	239	7	16	168
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	14	278	8	19	195

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	515	282	0	0	286	0
Stage 1	282	-	-	-	-	-
Stage 2	233	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	524	762	-	-	1288	-
Stage 1	770	-	-	-	-	-
Stage 2	811	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	515	762	-	-	1288	-
Mov Cap-2 Maneuver	515	-	-	-	-	-
Stage 1	770	-	-	-	-	-
Stage 2	798	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.56	0	0.68
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	668	157
HCM Lane V/C Ratio	-	-	0.03	0.014
HCM Ctrl Dly (s/v)	-	-	10.6	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	12.8					
Intersection LOS	B					
Approach	WB	NB		SB		
Entry Lanes	1	2		2		
Conflicting Circle Lanes	2	1		1		
Adj Approach Flow, veh/h	443	1683		1184		
Demand Flow Rate, veh/h	443	1683		1196		
Vehicles Circulating, veh/h	1388	156		302		
Vehicles Exiting, veh/h	451	1342		1353		
Ped Vol Crossing Leg, #/h	0	0		0		
Ped Cap Adj	1.000	1.000		1.000		
Approach Delay, s/veh	20.1	12.6		10.3		
Approach LOS	C	B		B		
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	267	176	791	892	562	634
Cap Entry Lane, veh/h	436	450	1232	1232	1079	1079
Entry HV Adj Factor	1.000	1.000	1.000	1.000	0.990	0.990
Flow Entry, veh/h	267	176	791	892	556	627
Cap Entry, veh/h	436	450	1232	1232	1068	1068
V/C Ratio	0.612	0.391	0.642	0.724	0.521	0.588
Control Delay, s/veh	23.5	15.0	11.2	13.8	9.6	11.0
LOS	C	C	B	B	A	B
95th %tile Queue, veh	4	2	5	7	3	4

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
10/18/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	21	244	17	34	330	103	49	159	48	61	106	20
Future Volume (veh/h)	21	244	17	34	330	103	49	159	48	61	106	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Adj Flow Rate, veh/h	25	287	20	40	388	121	58	187	56	72	125	24
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	148	670	44	151	535	158	194	306	83	254	295	48
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	53	1536	102	59	1226	363	203	1120	302	364	1079	176
Grp Volume(v), veh/h	332	0	0	549	0	0	301	0	0	221	0	0
Grp Sat Flow(s),veh/h/ln1691	0	0	0	1649	0	0	1626	0	0	1619	0	0
Q Serve(g_s), s	0.0	0.0	0.0	1.9	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.1	0.0	0.0	8.6	0.0	0.0	5.0	0.0	0.0	3.3	0.0	0.0
Prop In Lane	0.08		0.06	0.07		0.22	0.19		0.19	0.33		0.11
Lane Grp Cap(c), veh/h	863	0	0	844	0	0	583	0	0	596	0	0
V/C Ratio(X)	0.38	0.00	0.00	0.65	0.00	0.00	0.52	0.00	0.00	0.37	0.00	0.00
Avail Cap(c_a), veh/h	1491	0	0	1470	0	0	1453	0	0	1409	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.1	0.0	0.0	7.3	0.0	0.0	10.0	0.0	0.0	9.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.9	0.0	0.0	0.7	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln0.5	0.0	0.0	0.0	1.2	0.0	0.0	1.0	0.0	0.0	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.4	0.0	0.0	8.2	0.0	0.0	10.7	0.0	0.0	9.8	0.0	0.0
LnGrp LOS	A			A			B			A		
Approach Vol, veh/h		332			549			301			221	
Approach Delay, s/veh		6.4			8.2			10.7			9.8	
Approach LOS		A			A			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		12.9		18.0		12.9		18.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		7.0		6.1		5.3		10.6				
Green Ext Time (p_c), s		1.5		1.7		1.1		2.9				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh				8.5								
HCM 7th LOS				A								

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	5	272	462	22	13	1
Future Vol, veh/h	5	272	462	22	13	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	6	306	519	25	15	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	544	0	-	0	848 531
Stage 1	-	-	-	-	531 -
Stage 2	-	-	-	-	317 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1030	-	-	-	334 552
Stage 1	-	-	-	-	593 -
Stage 2	-	-	-	-	743 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1030	-	-	-	332 552
Mov Cap-2 Maneuver	-	-	-	-	332 -
Stage 1	-	-	-	-	590 -
Stage 2	-	-	-	-	743 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.15	0	16.04
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	32	-	-	-	342
HCM Lane V/C Ratio	0.005	-	-	-	0.046
HCM Ctrl Dly (s/v)	8.5	0	-	-	16
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	311	6	28	490	0	4	0	17	0	0	4
Future Vol, veh/h	6	311	6	28	490	0	4	0	17	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	0	0	0
Mvmt Flow	7	346	7	31	544	0	4	0	19	0	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	544	0	0	352	0	0	969	969	349	966	972	544
Stage 1	-	-	-	-	-	-	362	362	-	607	607	-
Stage 2	-	-	-	-	-	-	607	607	-	359	366	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1025	-	-	1212	-	-	235	256	699	236	254	543
Stage 1	-	-	-	-	-	-	661	629	-	487	490	-
Stage 2	-	-	-	-	-	-	487	490	-	663	626	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1025	-	-	1212	-	-	223	244	699	220	243	543
Mov Cap-2 Maneuver	-	-	-	-	-	-	223	244	-	220	243	-
Stage 1	-	-	-	-	-	-	655	624	-	469	472	-
Stage 2	-	-	-	-	-	-	465	472	-	640	621	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.16			0.44			12.61			11.69		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	497	33	-	-	97	-	-	543
HCM Lane V/C Ratio	0.047	0.007	-	-	0.026	-	-	0.008
HCM Ctrl Dly (s/v)	12.6	8.5	0	-	8	0	-	11.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	324	4	56	516	58	2	0	35	40	0	0
Future Vol, veh/h	0	324	4	56	516	58	2	0	35	40	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	0	0	0
Mvmt Flow	0	360	4	62	573	64	2	0	39	44	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	638	0	0	364	0	0	1060	1124	362	1090	1094	606
Stage 1	-	-	-	-	-	-	362	362	-	730	730	-
Stage 2	-	-	-	-	-	-	698	762	-	360	364	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	946	-	-	1200	-	-	204	207	687	194	216	501
Stage 1	-	-	-	-	-	-	661	629	-	417	431	-
Stage 2	-	-	-	-	-	-	434	416	-	662	627	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	946	-	-	1200	-	-	187	190	687	168	198	501
Mov Cap-2 Maneuver	-	-	-	-	-	-	187	190	-	168	198	-
Stage 1	-	-	-	-	-	-	661	629	-	383	396	-
Stage 2	-	-	-	-	-	-	399	383	-	625	627	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0	0.73	11.44	33.86
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	600	946	-	-	157	-	-	168
HCM Lane V/C Ratio	0.068	-	-	-	0.052	-	-	0.264
HCM Ctrl Dly (s/v)	11.4	0	-	-	8.2	0	-	33.9
HCM Lane LOS	B	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-	1

Intersection									
Intersection Delay, s/veh	40.2								
Intersection LOS	E								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	508		797		1436		1105		
Demand Flow Rate, veh/h	508		797		1436		1117		
Vehicles Circulating, veh/h	1195		1442		556		850		
Vehicles Exiting, veh/h	772		550		1147		1389		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	18.1		86.7		27.1		33.8		
Approach LOS	C		F		D		D		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.471	0.529	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	239	269	375	422	675	761	525	592	
Cap Entry Lane, veh/h	450	514	358	417	809	885	618	689	
Entry HV Adj Factor	0.999	1.001	0.999	1.001	1.000	1.000	0.990	0.990	
Flow Entry, veh/h	239	269	375	422	675	761	520	586	
Cap Entry, veh/h	449	515	358	417	809	885	611	682	
V/C Ratio	0.532	0.523	1.047	1.012	0.834	0.860	0.850	0.859	
Control Delay, s/veh	19.4	17.0	95.2	79.2	26.6	27.5	34.6	33.0	
LOS	C	C	F	F	D	D	D	D	
95th %tile Queue, veh	3	3	13	13	10	11	9	10	

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	10	26	104	4	9	161
Future Vol, veh/h	10	26	104	4	9	161
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	12	30	121	5	10	187

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	331	123	0	0	126
Stage 1	123	-	-	-	-
Stage 2	208	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	668	933	-	-	1473
Stage 1	907	-	-	-	-
Stage 2	831	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	662	933	-	-	1473
Mov Cap-2 Maneuver	662	-	-	-	-
Stage 1	907	-	-	-	-
Stage 2	825	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.52	0	0.39
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	838	95
HCM Lane V/C Ratio	-	-	0.05	0.007
HCM Ctrl Dly (s/v)	-	-	9.5	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Intersection Delay, s/veh	7.8					
Intersection LOS	A					
Approach	WB	NB			SB	
Entry Lanes	1	2			2	
Conflicting Circle Lanes	2	1			1	
Adj Approach Flow, veh/h	312	1003			1056	
Demand Flow Rate, veh/h	315	1024			1067	
Vehicles Circulating, veh/h	823	193			219	
Vehicles Exiting, veh/h	394	1093			795	
Ped Vol Crossing Leg, #/h	0	0			0	
Ped Cap Adj	1.000	1.000			1.000	
Approach Delay, s/veh	7.8	7.6			8.1	
Approach LOS	A	A			A	
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	191	124	481	543	501	566
Cap Entry Lane, veh/h	705	723	1191	1191	1163	1163
Entry HV Adj Factor	0.990	0.990	0.981	0.980	0.991	0.989
Flow Entry, veh/h	189	123	472	532	496	560
Cap Entry, veh/h	698	715	1169	1167	1153	1151
V/C Ratio	0.271	0.172	0.404	0.456	0.431	0.486
Control Delay, s/veh	8.4	6.9	7.2	7.9	7.6	8.5
LOS	A	A	A	A	A	A
95th %tile Queue, veh	1	1	2	2	2	3

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	25	493	46	36	184	53	10	96	59	166	142	20
Future Volume (veh/h)	25	493	46	36	184	53	10	96	59	166	142	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1723	1723	1723	1682	1682	1682	1682	1682	1682	1723	1723	1723
Adj Flow Rate, veh/h	29	573	53	42	214	62	12	112	69	193	165	23
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	5	5	5	5	5	5	2	2	2
Cap, veh/h	107	693	62	147	530	140	105	314	181	349	233	29
Arrive On Green	0.46	0.46	0.46	0.46	0.46	0.46	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	33	1510	136	104	1155	305	36	976	563	673	723	90
Grp Volume(v), veh/h	655	0	0	318	0	0	193	0	0	381	0	0
Grp Sat Flow(s),veh/h/ln	1679	0	0	1564	0	0	1576	0	0	1485	0	0
Q Serve(g_s), s	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	0.0	0.0
Cycle Q Clear(g_c), s	14.1	0.0	0.0	5.4	0.0	0.0	3.9	0.0	0.0	9.3	0.0	0.0
Prop In Lane	0.04		0.08	0.13		0.19	0.06		0.36	0.51		0.06
Lane Grp Cap(c), veh/h	862	0	0	817	0	0	600	0	0	610	0	0
V/C Ratio(X)	0.76	0.00	0.00	0.39	0.00	0.00	0.32	0.00	0.00	0.62	0.00	0.00
Avail Cap(c_a), veh/h	1132	0	0	1048	0	0	1062	0	0	1030	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.8	0.0	0.0	7.5	0.0	0.0	10.7	0.0	0.0	12.4	0.0	0.0
Incr Delay (d2), s/veh	2.2	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	1.1	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.1	0.0	0.0	1.1	0.0	0.0	0.9	0.0	0.0	2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.0	0.0	0.0	7.8	0.0	0.0	11.1	0.0	0.0	13.4	0.0	0.0
LnGrp LOS	B			A			B			B		
Approach Vol, veh/h		655			318			193			381	
Approach Delay, s/veh		12.0			7.8			11.1			13.4	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		17.7		23.3		17.7		23.3				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		5.9		16.1		11.3		7.4				
Green Ext Time (p_c), s		0.9		2.7		1.9		1.7				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh											11.4	
HCM 7th LOS											B	

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	2	439	188	5	21	4
Future Vol, veh/h	2	439	188	5	21	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	2	523	224	6	25	5

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	230	0	-	0	754 227
Stage 1	-	-	-	-	227 -
Stage 2	-	-	-	-	527 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1344	-	-	-	380 818
Stage 1	-	-	-	-	816 -
Stage 2	-	-	-	-	596 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1344	-	-	-	379 818
Mov Cap-2 Maneuver	-	-	-	-	379 -
Stage 1	-	-	-	-	814 -
Stage 2	-	-	-	-	596 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.03	0	14.36
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	8	-	-	-	414
HCM Lane V/C Ratio	0.002	-	-	-	0.072
HCM Ctrl Dly (s/v)	7.7	0	-	-	14.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	554	1	9	210	0	5	0	26	0	0	7
Future Vol, veh/h	2	554	1	9	210	0	5	0	26	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	2	616	1	10	233	0	6	0	29	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	233	0	0	617	0	0	874	874	616	873	874	233
Stage 1	-	-	-	-	-	-	621	621	-	253	253	-
Stage 2	-	-	-	-	-	-	253	253	-	620	621	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1340	-	-	963	-	-	272	290	494	273	290	811
Stage 1	-	-	-	-	-	-	479	483	-	755	701	-
Stage 2	-	-	-	-	-	-	755	701	-	479	482	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1340	-	-	963	-	-	266	286	494	253	286	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	266	286	-	253	286	-
Stage 1	-	-	-	-	-	-	477	481	-	746	693	-
Stage 2	-	-	-	-	-	-	739	693	-	450	481	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.03			0.36			14.01			9.48		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	434	6	-	-	74	-	-	811
HCM Lane V/C Ratio	0.079	0.002	-	-	0.01	-	-	0.01
HCM Ctrl Dly (s/v)	14	7.7	0	-	8.8	0	-	9.5
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	3.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	578	2	25	214	21	5	0	75	63	0	0
Future Vol, veh/h	0	578	2	25	214	21	5	0	75	63	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	0	642	2	28	238	23	6	0	83	70	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	261	0	0	644	0	0	937	960	643	947	949	249
Stage 1	-	-	-	-	-	-	643	643	-	305	305	-
Stage 2	-	-	-	-	-	-	293	317	-	642	644	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1309	-	-	941	-	-	247	259	477	243	262	794
Stage 1	-	-	-	-	-	-	465	471	-	709	666	-
Stage 2	-	-	-	-	-	-	719	658	-	466	471	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1309	-	-	941	-	-	238	250	477	194	253	794
Mov Cap-2 Maneuver	-	-	-	-	-	-	238	250	-	194	253	-
Stage 1	-	-	-	-	-	-	465	471	-	684	643	-
Stage 2	-	-	-	-	-	-	694	635	-	384	471	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0	0.86	14.99	33.76
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	449	1309	-	-	170	-	-	194
HCM Lane V/C Ratio	0.198	-	-	-	0.03	-	-	0.362
HCM Ctrl Dly (s/v)	15	0	-	-	8.9	0	-	33.8
HCM Lane LOS	B	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	0.7	0	-	-	0.1	-	-	1.5

Intersection									
Intersection Delay, s/veh	44.4								
Intersection LOS	E								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	986		427		966		1128		
Demand Flow Rate, veh/h	1006		440		995		1139		
Vehicles Circulating, veh/h	1186		1078		1111		413		
Vehicles Exiting, veh/h	366		1028		1081		1105		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	80.5		13.8		58.9		12.1		
Approach LOS	F		B		F		B		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.470	0.530	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	473	533	207	233	468	527	535	604	
Cap Entry Lane, veh/h	453	518	501	568	486	552	923	1000	
Entry HV Adj Factor	0.979	0.980	0.970	0.972	0.970	0.971	0.991	0.989	
Flow Entry, veh/h	463	522	201	226	454	512	530	598	
Cap Entry, veh/h	444	508	486	552	471	536	915	989	
V/C Ratio	1.043	1.029	0.413	0.410	0.963	0.954	0.580	0.604	
Control Delay, s/veh	85.3	76.2	14.6	13.0	62.4	55.9	12.1	12.1	
LOS	F	F	B	B	F	F	B	B	
95th %tile Queue, veh	14	15	2	2	12	12	4	4	

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	5	12	257	7	17	180
Future Vol, veh/h	5	12	257	7	17	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	6	14	299	8	20	209

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	552	303	0	0	307	0
Stage 1	303	-	-	-	-	-
Stage 2	249	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	498	742	-	-	1265	-
Stage 1	754	-	-	-	-	-
Stage 2	797	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	490	742	-	-	1265	-
Mov Cap-2 Maneuver	490	-	-	-	-	-
Stage 1	754	-	-	-	-	-
Stage 2	783	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.77	0	0.68
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	644	155
HCM Lane V/C Ratio	-	-	0.031	0.016
HCM Ctrl Dly (s/v)	-	-	10.8	7.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Intersection Delay, s/veh	15.5					
Intersection LOS	C					
Approach	WB	NB		SB		
Entry Lanes	1	2		2		
Conflicting Circle Lanes	2	1		1		
Adj Approach Flow, veh/h	477	1815		1277		
Demand Flow Rate, veh/h	477	1815		1290		
Vehicles Circulating, veh/h	1497	168		324		
Vehicles Exiting, veh/h	486	1446		1460		
Ped Vol Crossing Leg, #/h	0	0		0		
Ped Cap Adj	1.000	1.000		1.000		
Approach Delay, s/veh	27.1	15.1		11.8		
Approach LOS	D	C		B		
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	287	190	853	962	606	684
Cap Entry Lane, veh/h	398	411	1219	1219	1057	1057
Entry HV Adj Factor	1.000	1.000	1.000	1.000	0.990	0.989
Flow Entry, veh/h	287	190	853	962	600	677
Cap Entry, veh/h	398	411	1219	1219	1047	1046
V/C Ratio	0.722	0.463	0.700	0.789	0.573	0.647
Control Delay, s/veh	32.9	18.4	13.0	16.9	10.8	12.7
LOS	D	C	B	C	B	B
95th %tile Queue, veh	6	2	6	9	4	5

HCM 7th Signalized Intersection Summary  
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Barber Farm TIS  
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	22	264	19	36	356	111	52	171	52	65	114	21
Future Volume (veh/h)	22	264	19	36	356	111	52	171	52	65	114	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Adj Flow Rate, veh/h	26	311	22	42	419	131	61	201	61	76	134	25
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	138	697	47	141	554	165	183	313	86	244	304	48
Arrive On Green	0.45	0.45	0.45	0.45	0.45	0.45	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	51	1539	104	58	1224	364	200	1119	307	365	1086	173
Grp Volume(v), veh/h	359	0	0	592	0	0	323	0	0	235	0	0
Grp Sat Flow(s),veh/h/ln1693	0	0	0	1647	0	0	1627	0	0	1624	0	0
Q Serve(g_s), s	0.0	0.0	0.0	2.7	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.8	0.0	0.0	10.2	0.0	0.0	5.9	0.0	0.0	3.8	0.0	0.0
Prop In Lane	0.07		0.06	0.07		0.22	0.19		0.19	0.32		0.11
Lane Grp Cap(c), veh/h	881	0	0	860	0	0	583	0	0	596	0	0
V/C Ratio(X)	0.41	0.00	0.00	0.69	0.00	0.00	0.55	0.00	0.00	0.39	0.00	0.00
Avail Cap(c_a), veh/h	1372	0	0	1350	0	0	1334	0	0	1295	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.4	0.0	0.0	7.8	0.0	0.0	10.8	0.0	0.0	10.1	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	1.0	0.0	0.0	0.8	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln0.7	0.0	0.0	0.0	1.7	0.0	0.0	1.3	0.0	0.0	0.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.7	0.0	0.0	8.8	0.0	0.0	11.6	0.0	0.0	10.5	0.0	0.0
LnGrp LOS	A			A			B			B		
Approach Vol, veh/h		359			592			323			235	
Approach Delay, s/veh		6.7			8.8			11.6			10.5	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		13.9		19.8		13.9		19.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		7.9		6.8		5.8		12.2				
Green Ext Time (p_c), s		1.6		1.8		1.2		3.1				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh				9.2								
HCM 7th LOS				A								

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	5	294	498	24	14	1
Future Vol, veh/h	5	294	498	24	14	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	6	330	560	27	16	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	587	0	-	0	915
Stage 1	-	-	-	-	573
Stage 2	-	-	-	-	342
Critical Hdwy	4.11	-	-	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	2.209	-	-	-	3.5
Pot Cap-1 Maneuver	993	-	-	-	305
Stage 1	-	-	-	-	568
Stage 2	-	-	-	-	724
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	993	-	-	-	303
Mov Cap-2 Maneuver	-	-	-	-	303
Stage 1	-	-	-	-	564
Stage 2	-	-	-	-	724

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.14	0	17.19
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	30	-	-	-	312
HCM Lane V/C Ratio	0.006	-	-	-	0.054
HCM Ctrl Dly (s/v)	8.6	0	-	-	17.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	337	7	28	529	0	4	0	17	0	0	4
Future Vol, veh/h	6	337	7	28	529	0	4	0	17	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	0	0	0
Mvmt Flow	7	374	8	31	588	0	4	0	19	0	0	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	588	0	0	382	0	0	1042	1042	378	1038	1046	588
Stage 1	-	-	-	-	-	-	392	392	-	650	650	-
Stage 2	-	-	-	-	-	-	650	650	-	388	396	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	987	-	-	1182	-	-	210	232	673	211	230	513
Stage 1	-	-	-	-	-	-	637	610	-	461	468	-
Stage 2	-	-	-	-	-	-	461	468	-	640	608	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	987	-	-	1182	-	-	198	221	673	195	219	513
Mov Cap-2 Maneuver	-	-	-	-	-	-	198	221	-	195	219	-
Stage 1	-	-	-	-	-	-	631	605	-	443	450	-
Stage 2	-	-	-	-	-	-	439	450	-	617	603	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.15			0.41			13.21			12.08		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	462	31	-	-	90	-	-	513
HCM Lane V/C Ratio	0.051	0.007	-	-	0.026	-	-	0.009
HCM Ctrl Dly (s/v)	13.2	8.7	0	-	8.1	0	-	12.1
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	348	6	79	554	58	3	0	49	40	0	0
Future Vol, veh/h	0	348	6	79	554	58	3	0	49	40	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	1	1	2	0	2	0	2	2	2
Mvmt Flow	0	387	7	88	616	64	3	0	54	44	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	680	0	0	393	0	0	1181	1246	390	1210	1217	648
Stage 1	-	-	-	-	-	-	390	390	-	823	823	-
Stage 2	-	-	-	-	-	-	791	856	-	387	393	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	912	-	-	1171	-	-	168	174	663	159	181	471
Stage 1	-	-	-	-	-	-	638	608	-	367	388	-
Stage 2	-	-	-	-	-	-	386	375	-	637	606	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	912	-	-	1171	-	-	148	153	663	128	159	471
Mov Cap-2 Maneuver	-	-	-	-	-	-	148	153	-	128	159	-
Stage 1	-	-	-	-	-	-	638	608	-	323	340	-
Stage 2	-	-	-	-	-	-	339	329	-	584	606	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0			0.95			12.28			47.17		
HCM LOS							B			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	552	912	-	-	202	-	-	128
HCM Lane V/C Ratio	0.105	-	-	-	0.075	-	-	0.346
HCM Ctrl Dly (s/v)	12.3	0	-	-	8.3	0	-	47.2
HCM Lane LOS	B	A	-	-	A	A	-	E
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-	1.4

Intersection									
Intersection Delay, s/veh	69.9								
Intersection LOS	F								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	555		862		1552		1194		
Demand Flow Rate, veh/h	555		862		1552		1206		
Vehicles Circulating, veh/h	1286		1561		604		925		
Vehicles Exiting, veh/h	845		595		1237		1498		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	23.8		160.9		44.1		59.1		
Approach LOS	C		F		E		F		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.470	0.530	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	261	294	405	457	729	823	567	639	
Cap Entry Lane, veh/h	414	476	321	377	774	850	576	647	
Entry HV Adj Factor	0.999	1.001	1.000	1.000	1.001	0.999	0.990	0.990	
Flow Entry, veh/h	261	294	405	457	729	823	561	633	
Cap Entry, veh/h	413	476	321	377	775	849	570	641	
V/C Ratio	0.631	0.618	1.261	1.213	0.941	0.968	0.984	0.988	
Control Delay, s/veh	25.6	22.1	174.0	149.2	42.4	45.5	60.5	57.9	
LOS	D	C	F	F	E	E	F	F	
95th %tile Queue, veh	4	4	19	19	14	16	14	15	

Intersection						
Int Delay, s/veh	1.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	14	44	105	5	15	163
Future Vol, veh/h	14	44	105	5	15	163
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	16	51	122	6	17	190

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	349	125	0	0	128	0
Stage 1	125	-	-	-	-	-
Stage 2	224	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	652	931	-	-	1471	-
Stage 1	906	-	-	-	-	-
Stage 2	818	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	643	931	-	-	1471	-
Mov Cap-2 Maneuver	643	-	-	-	-	-
Stage 1	906	-	-	-	-	-
Stage 2	807	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.66	0	0.63
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	840	152
HCM Lane V/C Ratio	-	-	0.08	0.012
HCM Ctrl Dly (s/v)	-	-	9.7	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0

Intersection						
Intersection Delay, s/veh	7.9					
Intersection LOS	A					
Approach	WB	NB		SB		
Entry Lanes	1	2		2		
Conflicting Circle Lanes	2	1		1		
Adj Approach Flow, veh/h	317	1014		1069		
Demand Flow Rate, veh/h	320	1035		1080		
Vehicles Circulating, veh/h	829	193		224		
Vehicles Exiting, veh/h	399	1111		801		
Ped Vol Crossing Leg, #/h	0	0		0		
Ped Cap Adj	1.000	1.000		1.000		
Approach Delay, s/veh	8.0	7.6		8.2		
Approach LOS	A	A		A		
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	196	124	486	549	508	572
Cap Entry Lane, veh/h	702	719	1191	1191	1158	1158
Entry HV Adj Factor	0.990	0.990	0.981	0.980	0.989	0.991
Flow Entry, veh/h	194	123	477	538	503	567
Cap Entry, veh/h	695	712	1169	1167	1146	1147
V/C Ratio	0.279	0.173	0.408	0.461	0.439	0.494
Control Delay, s/veh	8.6	7.0	7.2	8.0	7.8	8.6
LOS	A	A	A	A	A	A
95th %tile Queue, veh	1	1	2	2	2	3

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
10/19/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	26	500	46	37	190	54	10	97	60	168	144	22
Future Volume (veh/h)	26	500	46	37	190	54	10	97	60	168	144	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1723	1723	1723	1682	1682	1682	1682	1682	1682	1723	1723	1723
Adj Flow Rate, veh/h	30	581	53	43	221	63	12	113	70	195	167	26
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	5	5	5	5	5	5	2	2	2
Cap, veh/h	105	696	62	145	532	138	102	317	184	346	232	32
Arrive On Green	0.46	0.46	0.46	0.46	0.46	0.46	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	35	1510	134	105	1154	300	36	975	566	669	716	99
Grp Volume(v), veh/h	664	0	0	327	0	0	195	0	0	388	0	0
Grp Sat Flow(s),veh/h/ln	1679	0	0	1559	0	0	1576	0	0	1484	0	0
Q Serve(g_s), s	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0
Cycle Q Clear(g_c), s	14.7	0.0	0.0	5.7	0.0	0.0	4.0	0.0	0.0	9.7	0.0	0.0
Prop In Lane	0.05		0.08	0.13		0.19	0.06		0.36	0.50		0.07
Lane Grp Cap(c), veh/h	863	0	0	815	0	0	603	0	0	611	0	0
V/C Ratio(X)	0.77	0.00	0.00	0.40	0.00	0.00	0.32	0.00	0.00	0.64	0.00	0.00
Avail Cap(c_a), veh/h	1105	0	0	1021	0	0	1037	0	0	1005	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.0	0.0	0.0	7.6	0.0	0.0	10.9	0.0	0.0	12.7	0.0	0.0
Incr Delay (d2), s/veh	2.5	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	1.1	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.3	0.0	0.0	1.2	0.0	0.0	1.0	0.0	0.0	2.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.6	0.0	0.0	8.0	0.0	0.0	11.2	0.0	0.0	13.8	0.0	0.0
LnGrp LOS	B			A			B			B		
Approach Vol, veh/h		664			327			195			388	
Approach Delay, s/veh		12.6			8.0			11.2			13.8	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		18.2		23.9		18.2		23.9				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		6.0		16.7		11.7		7.7				
Green Ext Time (p_c), s		0.9		2.7		1.9		1.8				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh				11.7								
HCM 7th LOS				B								

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	2	439	196	5	21	4
Future Vol, veh/h	2	439	196	5	21	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	2	523	233	6	25	5

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	239	0	0	764	236
Stage 1	-	-	-	236	-
Stage 2	-	-	-	527	-
Critical Hdwy	4.11	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	3.5	3.3
Pot Cap-1 Maneuver	1333	-	-	375	808
Stage 1	-	-	-	808	-
Stage 2	-	-	-	596	-
Platoon blocked, %		-	-		
Mov Cap-1 Maneuver	1333	-	-	374	808
Mov Cap-2 Maneuver	-	-	-	374	-
Stage 1	-	-	-	806	-
Stage 2	-	-	-	596	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.03	0	14.49
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	8	-	-	-	409
HCM Lane V/C Ratio	0.002	-	-	-	0.073
HCM Ctrl Dly (s/v)	7.7	0	-	-	14.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	558	1	9	212	28	5	2	26	14	1	13
Future Vol, veh/h	8	558	1	9	212	28	5	2	26	14	1	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	9	620	1	10	236	31	6	2	29	16	1	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	267	0	0	621	0	0	894	925	621	910	910	251
Stage 1	-	-	-	-	-	-	638	638	-	271	271	-
Stage 2	-	-	-	-	-	-	256	287	-	639	639	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1303	-	-	960	-	-	264	271	491	258	277	792
Stage 1	-	-	-	-	-	-	468	474	-	739	689	-
Stage 2	-	-	-	-	-	-	753	678	-	468	474	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1303	-	-	960	-	-	252	265	491	235	270	792
Mov Cap-2 Maneuver	-	-	-	-	-	-	252	265	-	235	270	-
Stage 1	-	-	-	-	-	-	463	469	-	730	680	-
Stage 2	-	-	-	-	-	-	729	670	-	434	469	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.11			0.32			14.62			16.24		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	411	25	-	-	64	-	-	351
HCM Lane V/C Ratio	0.089	0.007	-	-	0.01	-	-	0.089
HCM Ctrl Dly (s/v)	14.6	7.8	0	-	8.8	0	-	16.2
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.3

Intersection												
Int Delay, s/veh	9.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	592	2	25	242	55	5	1	75	118	1	2
Future Vol, veh/h	4	592	2	25	242	55	5	1	75	118	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	4	658	2	28	269	61	6	1	83	131	1	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	330	0	0	660	0	0	993	1053	659	1022	1024	299
Stage 1	-	-	-	-	-	-	668	668	-	355	355	-
Stage 2	-	-	-	-	-	-	325	386	-	667	669	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1235	-	-	928	-	-	226	228	467	216	237	745
Stage 1	-	-	-	-	-	-	451	460	-	666	633	-
Stage 2	-	-	-	-	-	-	692	614	-	451	459	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1235	-	-	928	-	-	215	218	467	169	227	745
Mov Cap-2 Maneuver	-	-	-	-	-	-	215	218	-	169	227	-
Stage 1	-	-	-	-	-	-	448	457	-	642	610	-
Stage 2	-	-	-	-	-	-	663	591	-	368	456	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.05			0.7			15.57			75.9		
HCM LOS							C			F		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	430	12	-	-	135	-	-	172
HCM Lane V/C Ratio	0.209	0.004	-	-	0.03	-	-	0.783
HCM Ctrl Dly (s/v)	15.6	7.9	0	-	9	0	-	75.9
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.8	0	-	-	0.1	-	-	5.1

Intersection									
Intersection Delay, s/veh	57.8								
Intersection LOS	F								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	1064		455		990		1146		
Demand Flow Rate, veh/h	1085		469		1020		1157		
Vehicles Circulating, veh/h	1186		1115		1158		467		
Vehicles Exiting, veh/h	438		1063		1113		1117		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	105.8		15.3		76.8		13.6		
Approach LOS	F		C		F		B		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.469	0.531	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	510	575	220	249	479	541	544	613	
Cap Entry Lane, veh/h	453	518	484	550	465	531	878	955	
Entry HV Adj Factor	0.980	0.981	0.973	0.969	0.971	0.970	0.990	0.990	
Flow Entry, veh/h	500	564	214	241	465	525	538	607	
Cap Entry, veh/h	445	508	471	533	452	515	869	946	
V/C Ratio	1.125	1.110	0.455	0.452	1.030	1.020	0.619	0.642	
Control Delay, s/veh	111.1	101.2	16.1	14.5	80.7	73.2	13.7	13.6	
LOS	F	F	C	B	F	F	B	B	
95th %tile Queue, veh	18	18	2	2	14	15	4	5	

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	7	23	260	10	33	183
Future Vol, veh/h	7	23	260	10	33	183
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	27	302	12	38	213

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	598	308	0	0	314	0
Stage 1	308	-	-	-	-	-
Stage 2	290	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	469	737	-	-	1258	-
Stage 1	750	-	-	-	-	-
Stage 2	764	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	452	737	-	-	1258	-
Mov Cap-2 Maneuver	452	-	-	-	-	-
Stage 1	750	-	-	-	-	-
Stage 2	738	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.93	0	1.21
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	642	275
HCM Lane V/C Ratio	-	-	0.054	0.031
HCM Ctrl Dly (s/v)	-	-	10.9	8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1

Intersection						
Intersection Delay, s/veh	16.3					
Intersection LOS	C					
Approach	WB	NB		SB		
Entry Lanes	1	2		2		
Conflicting Circle Lanes	2	1		1		
Adj Approach Flow, veh/h	487	1840		1298		
Demand Flow Rate, veh/h	487	1840		1311		
Vehicles Circulating, veh/h	1515	168		334		
Vehicles Exiting, veh/h	493	1477		1478		
Ped Vol Crossing Leg, #/h	0	0		0		
Ped Cap Adj	1.000	1.000		1.000		
Approach Delay, s/veh	29.7	15.6		12.4		
Approach LOS	D	C		B		
Lane	Left	Bypass	Left	Right	Left	Right
Designated Moves	L	R	LT	TR	LT	TR
Assumed Moves	L		LT	TR	LT	TR
RT Channelized	Yield					
Lane Util	1.000		0.470	0.530	0.470	0.530
Follow-Up Headway, s	2.535	2.535	2.535	2.535	2.535	2.535
Critical Headway, s	4.328	4.327	4.544	4.544	4.544	4.544
A (Intercept)	1420	1420	1420	1420	1420	1420
B (Slope)	8.501e-4	8.499e-4	9.101e-4	9.101e-4	9.101e-4	9.101e-4
Entry Flow, veh/h	297	190	865	975	616	695
Cap Entry Lane, veh/h	392	404	1219	1219	1048	1048
Entry HV Adj Factor	1.000	1.000	1.000	1.000	0.990	0.990
Flow Entry, veh/h	297	190	865	975	610	688
Cap Entry, veh/h	392	404	1218	1219	1038	1037
V/C Ratio	0.758	0.470	0.710	0.800	0.588	0.663
Control Delay, s/veh	36.7	18.9	13.4	17.5	11.2	13.3
LOS	E	C	B	C	B	B
95th %tile Queue, veh	6	2	6	9	4	5

HCM 7th Signalized Intersection Summary  
3: 48th & Central

Barber Farm TIS  
10/18/2025



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	23	276	19	38	366	114	52	173	54	68	115	22
Future Volume (veh/h)	23	276	19	38	366	114	52	173	54	68	115	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Adj Flow Rate, veh/h	27	325	22	45	431	134	61	204	64	80	135	26
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	135	711	46	140	562	166	178	313	89	245	300	49
Arrive On Green	0.46	0.46	0.46	0.46	0.46	0.46	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	52	1544	100	62	1220	361	197	1114	317	381	1067	175
Grp Volume(v), veh/h	374	0	0	610	0	0	329	0	0	241	0	0
Grp Sat Flow(s),veh/h/ln1695	0	0	0	1644	0	0	1627	0	0	1623	0	0
Q Serve(g_s), s	0.0	0.0	0.0	3.3	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.2	0.0	0.0	10.9	0.0	0.0	6.2	0.0	0.0	4.1	0.0	0.0
Prop In Lane	0.07		0.06	0.07		0.22	0.19		0.19	0.33		0.11
Lane Grp Cap(c), veh/h	891	0	0	868	0	0	580	0	0	594	0	0
V/C Ratio(X)	0.42	0.00	0.00	0.70	0.00	0.00	0.57	0.00	0.00	0.41	0.00	0.00
Avail Cap(c_a), veh/h	1330	0	0	1305	0	0	1292	0	0	1251	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.5	0.0	0.0	8.0	0.0	0.0	11.2	0.0	0.0	10.5	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	1.1	0.0	0.0	0.9	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln0.8	0.0	0.0	0.0	1.8	0.0	0.0	1.4	0.0	0.0	1.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.8	0.0	0.0	9.0	0.0	0.0	12.1	0.0	0.0	10.9	0.0	0.0
LnGrp LOS	A			A			B			B		
Approach Vol, veh/h		374			610			329			241	
Approach Delay, s/veh		6.8			9.0			12.1			10.9	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		14.3		20.5		14.3		20.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		25.5		25.5		25.5				
Max Q Clear Time (g_c+I1), s		8.2		7.2		6.1		12.9				
Green Ext Time (p_c), s		1.6		1.9		1.2		3.1				
<b>Intersection Summary</b>												
HCM 7th Control Delay, s/veh				9.4								
HCM 7th LOS				A								

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	5	311	512	24	14	1
Future Vol, veh/h	5	311	512	24	14	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	6	349	575	27	16	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	602	0	-	0	949 589
Stage 1	-	-	-	-	589 -
Stage 2	-	-	-	-	361 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	980	-	-	-	291 512
Stage 1	-	-	-	-	559 -
Stage 2	-	-	-	-	710 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	980	-	-	-	289 512
Mov Cap-2 Maneuver	-	-	-	-	289 -
Stage 1	-	-	-	-	555 -
Stage 2	-	-	-	-	710 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.14	0	17.81
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	28	-	-	-	298
HCM Lane V/C Ratio	0.006	-	-	-	0.057
HCM Ctrl Dly (s/v)	8.7	0	-	-	17.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	343	7	28	534	44	4	3	17	39	2	13
Future Vol, veh/h	17	343	7	28	534	44	4	3	17	39	2	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	0	0	0
Mvmt Flow	19	381	8	31	593	49	4	3	19	43	2	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	642	0	0	389	0	0	1079	1127	385	1101	1107	618
Stage 1	-	-	-	-	-	-	423	423	-	680	680	-
Stage 2	-	-	-	-	-	-	657	704	-	421	427	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	942	-	-	1175	-	-	198	206	667	191	212	493
Stage 1	-	-	-	-	-	-	613	591	-	444	454	-
Stage 2	-	-	-	-	-	-	457	442	-	614	589	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	942	-	-	1175	-	-	177	193	667	171	198	493
Mov Cap-2 Maneuver	-	-	-	-	-	-	177	193	-	171	198	-
Stage 1	-	-	-	-	-	-	597	576	-	426	435	-
Stage 2	-	-	-	-	-	-	423	424	-	578	574	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.41			0.38			15.27			29.87		
HCM LOS							C			D		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	377	83	-	-	82	-	-	204
HCM Lane V/C Ratio	0.071	0.02	-	-	0.026	-	-	0.294
HCM Ctrl Dly (s/v)	15.3	8.9	0	-	8.1	0	-	29.9
HCM Lane LOS	C	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0.1	-	-	1.2

Intersection												
Int Delay, s/veh	16.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	387	6	79	598	129	3	2	49	95	2	5
Future Vol, veh/h	6	387	6	79	598	129	3	2	49	95	2	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	0	0	0
Mvmt Flow	7	430	7	88	664	143	3	2	54	106	2	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	808	0	0	437	0	0	1288	1430	433	1356	1362	736
Stage 1	-	-	-	-	-	-	447	447	-	912	912	-
Stage 2	-	-	-	-	-	-	841	983	-	444	450	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	817	-	-	1128	-	-	142	136	627	128	149	422
Stage 1	-	-	-	-	-	-	595	577	-	331	356	-
Stage 2	-	-	-	-	-	-	362	329	-	597	575	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	817	-	-	1128	-	-	117	115	627	~ 97	126	422
Mov Cap-2 Maneuver	-	-	-	-	-	-	117	115	-	~ 97	126	-
Stage 1	-	-	-	-	-	-	588	571	-	283	304	-
Stage 2	-	-	-	-	-	-	303	281	-	537	569	-

Approach	EB			WB			NB			SB		
HCM Ctrl Dly, s/v	0.14			0.83			14.34			204.1		
HCM LOS							B			F		

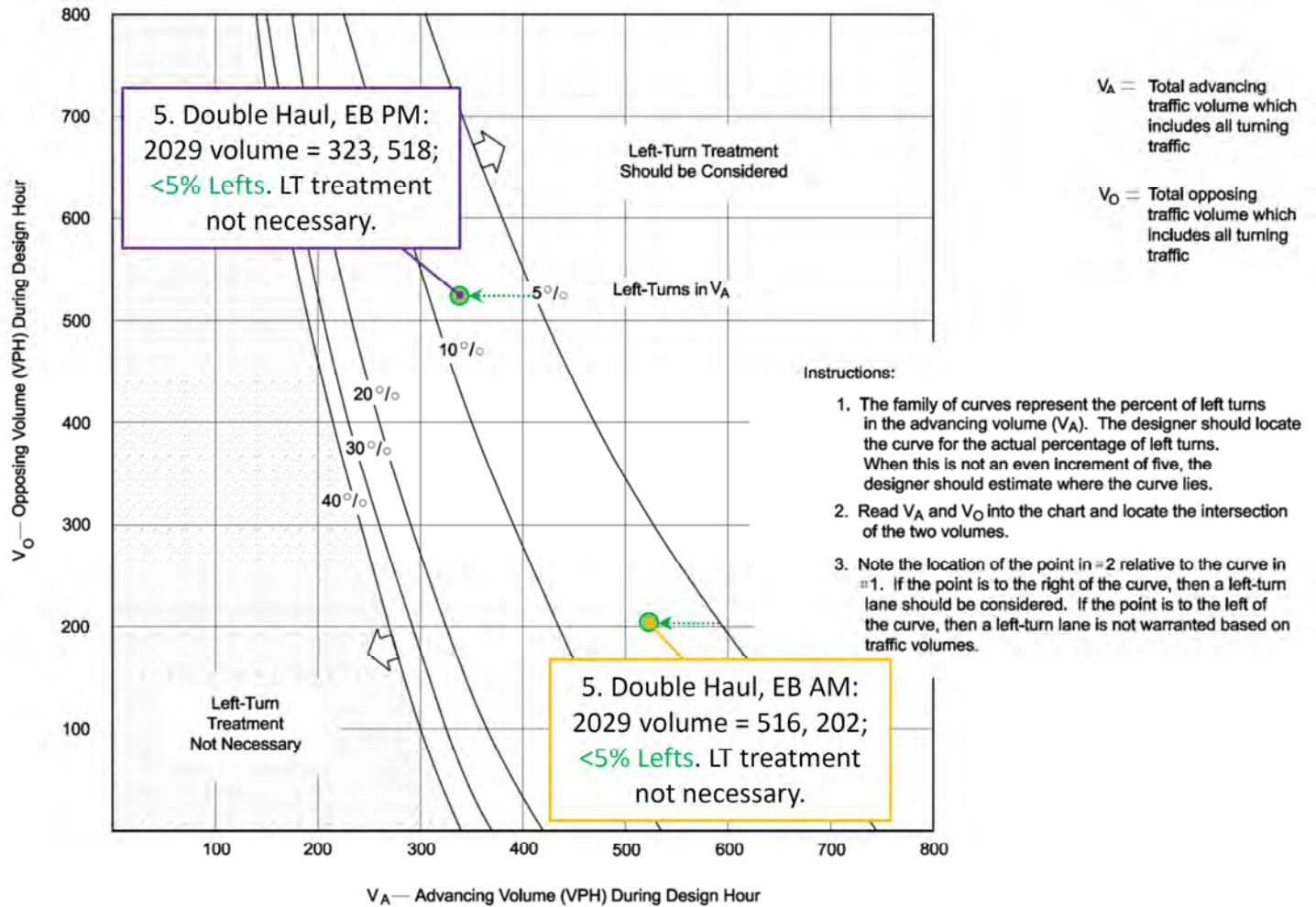
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	445	27	-	-	170	-	-	101
HCM Lane V/C Ratio	0.135	0.008	-	-	0.078	-	-	1.12
HCM Ctrl Dly (s/v)	14.3	9.4	0	-	8.5	0	-	204.1
HCM Lane LOS	B	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.5	0	-	-	0.3	-	-	7.3

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

Intersection									
Intersection Delay, s/veh	102.6								
Intersection LOS	F								
Approach	EB		WB		NB		SB		
Entry Lanes	2		2		2		2		
Conflicting Circle Lanes	2		2		2		2		
Adj Approach Flow, veh/h	656		915		1597		1222		
Demand Flow Rate, veh/h	656		915		1597		1234		
Vehicles Circulating, veh/h	1286		1630		669		1023		
Vehicles Exiting, veh/h	971		636		1273		1522		
Ped Vol Crossing Leg, #/h	0		0		0		0		
Ped Cap Adj	1.000		1.000		1.000		1.000		
Approach Delay, s/veh	31.3		226.2		66.9		94.9		
Approach LOS	D		F		F		F		
Lane	Left	Right	Left	Right	Left	Right	Left	Right	
Designated Moves	LT	TR	LT	TR	LT	TR	LT	TR	
Assumed Moves	LT	TR	LT	TR	LT	TR	LT	TR	
RT Channelized									
Lane Util	0.470	0.530	0.470	0.530	0.470	0.530	0.470	0.530	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.667	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.645	4.328	4.645	4.328	
A (Intercept)	1350	1420	1350	1420	1350	1420	1350	1420	
B (Slope)	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	9.199e-4	8.501e-4	
Entry Flow, veh/h	308	348	430	485	751	846	580	654	
Cap Entry Lane, veh/h	414	476	301	355	729	804	527	595	
Entry HV Adj Factor	1.001	0.999	1.000	1.000	0.999	1.000	0.990	0.990	
Flow Entry, veh/h	308	348	430	485	751	846	574	648	
Cap Entry, veh/h	414	475	301	355	729	805	522	589	
V/C Ratio	0.745	0.731	1.427	1.365	1.029	1.052	1.101	1.099	
Control Delay, s/veh	33.8	29.2	242.9	211.3	64.9	68.7	97.4	92.7	
LOS	D	D	F	F	F	F	F	F	
95th %tile Queue, veh	6	6	23	24	18	21	18	20	

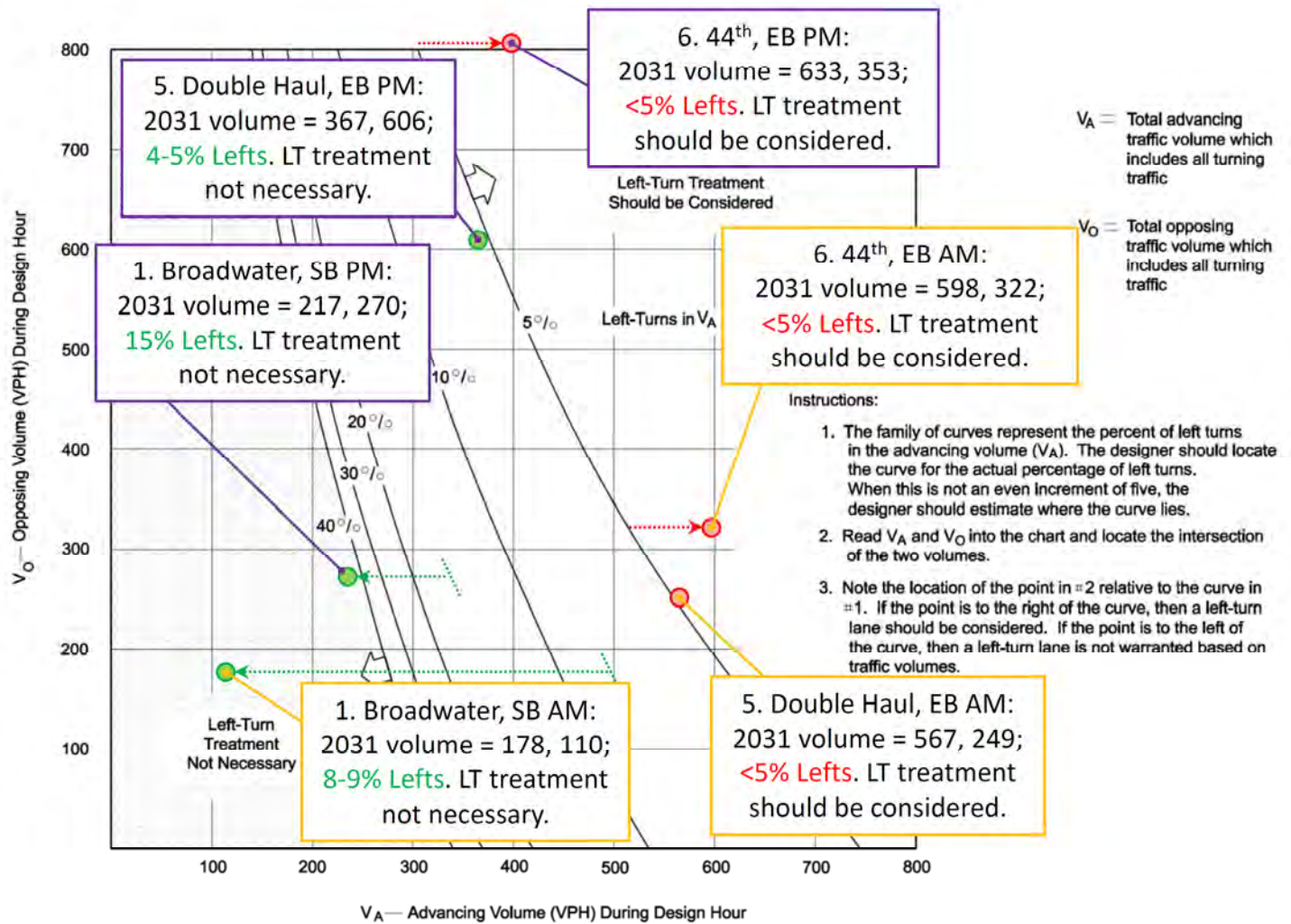
## Appendix C: Auxiliary Turn Lane Analysis Charts

Exhibit C-1: 2029 Left Turns



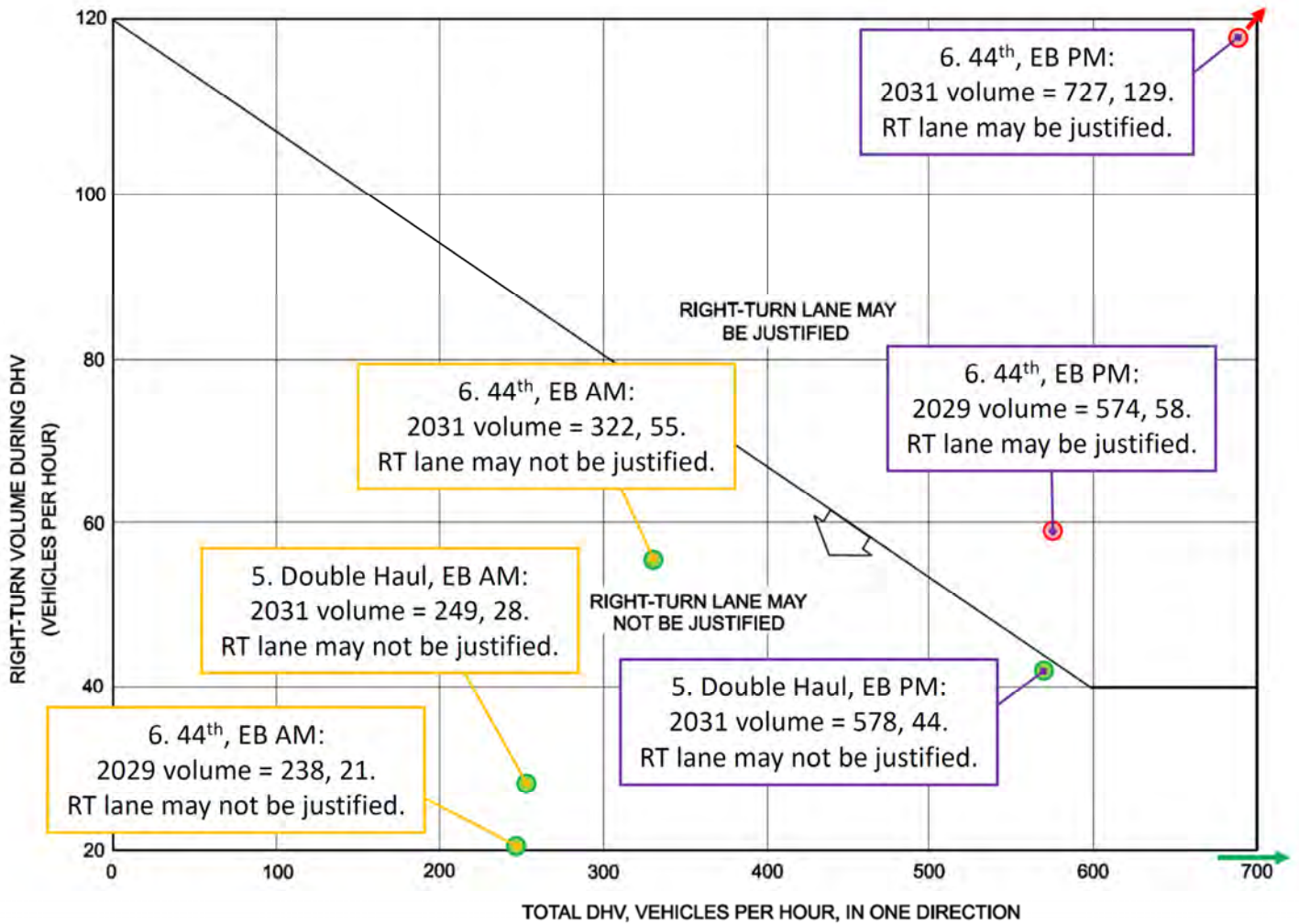
### VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (45 MPH)

Exhibit C-2: 2031 Left Turns



**VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (45 MPH)**

Exhibit C-3: Right Turns



*Note: For highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.*

Note that while northbound right turns on 48<sup>th</sup> at Broadwater were examined, total right turn volume is too low for the data point to appear on the graph (20 vph), so no right turn treatment is justified.

## **Appendix D: Central Avenue at 44<sup>th</sup> Intersection Signal Warrant Summaries**

**Traffic Signal Needs Analysis Summary: 44th St W at Central Ave**

Scenario: <b>Completion of Barber Subdivision Phase 1 in 2029</b>	
Analysis Date: 10/17/2025	Conducted by: 406 Traffic & Transportation Consulting
Major Street: Central Ave (E/W), 1 moving lane per direction	Minor Street: 44th St W (N/S), 1 moving lane per direction
Speed Limit: 45 mph	Number of Approaches: 4

**Traffic Volumes**

Hour:	1	2	3	4	5	6	7	8	9	10	11	12
Start Time:	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Central Ave Eastbound:	506	486	425	381	399	401	336	283	296	275	328	223
Central Ave Westbound:	216	224	240	266	334	394	381	388	491	541	642	453
44th St W Northbound:	62	48	34	27	29	29	29	33	30	34	38	33
44th St W Southbound:	82	58	43	27	35	32	30	38	30	32	42	41
Total Entering Volume:	866	816	742	701	797	856	776	742	847	882	1050	750
TEV Rank:	3	6	10	12	7	4	8	10	5	2	1	9
Use for:						Warrant 2			Warrant 1		Warrant 3	
Major, Both Directions:	722	710	665	647	733	795	717	671	787	816	970	676
Minor, Higher Direction:	82	58	43	27	35	32	30	38	30	34	42	41

**Warrants**

Warrant	Condition	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	Met?	
1 Eight-Hour Vehicular Volume (either condition)	Condition A: Large Volume of Intersecting Traffic Major (Both Dir.) Minor (Higher Dir.) Value Minimum Value Minimum Met?	717	350 <sup>c</sup>	30	105 <sup>c</sup>	No	717	525 <sup>c</sup>	30	53 <sup>c</sup>	No	No	
2 Four-Hour Vehicular Volume	MUTCD Figure 4C-2 for speed over 40 mph Major (Both Dir.) Minor (Higher Dir.) Value Minimum Value Minimum Met?	795	-	32	60	No						No	
3 Peak Hour* (either condition)	Condition A (must meet all three subconditions) Value Minimum Met?	1. Veh-Hrs of Delay	0.4	4	No	2. Minor Volume	42	100	No	3. Total Ent. Volume	1050	800	Yes
	or Condition B (MUTCD Figure 4C-4) Major (Both Dir.) Minor (Higher Dir.) Value Minimum Value Minimum Met?	970	N/A	42	75	No						No	
4 Pedestrian Volume (either criterion)	Criterion A: Four-hour (MUTCD Figure 4C-7) Major (Both Dir.) Pedestrians Value Minimum Value Minimum Met?	795	n/a	n/a	n/a	n/a	970	n/a	n/a	n/a	n/a	Not Evaluated	
	or Criterion B: One Hour (MUTCD Figure 4C-8) Major (Both Dir.) Pedestrians Value Minimum Value Minimum Met?	970	n/a	n/a	n/a	n/a	970	n/a	n/a	n/a	n/a	Not Evaluated	
5 School Crossing	No students projected to cross the major street at this location.											No	
6 Coordinated Signal System	Only one signal in the roadway network nearby.											No	
7 Crash Experience ** Condition A not evaluated (all conditions)	Condition B, 1-year Period (Table 4C-4) Angle+Ped Crashes or Fatal+Injury Angle+Ped Value Minimum Value Minimum Met?	n/a	4	n/a	3	n/a	717	30	n/a	n/a	n/a	Not Evaluated	
	or Condition B, 3-year Period (Table 4C-5) Angle+Ped Crashes or Fatal+Injury Angle+Ped Value Minimum Value Minimum Met?	n/a	6	n/a	4	n/a	717	30	n/a	n/a			
	and Condition C, 80% of Warrant 1 [Condition A] Major (Both Dir.) Minor (Higher Dir.) Value Minimum Value Minimum Met?	717	30	n/a	n/a	n/a	n/a	n/a	n/a	n/a			
	or Condition C, 80% of Warrant 1 [Condition B] Major (Both Dir.) Minor (Higher Dir.) Value Minimum Value Minimum Met?	717	30	n/a	n/a	n/a	n/a	n/a	n/a	n/a			
	or Condition C, 80% of Warrant 4 Four Hour Ped One Hour Ped Value Minimum Value Minimum Met?										n/a	Not Evaluated	
8 Roadway Network	Not an intersection of two or more major routes.											No	
9 Intersection Near Grade Xing	No railroad grade crossing nearby.											No	

**Notes:**

- c: Warrant 1 minimum values used for "70%" to account to reflect major-street speed over 40 mph
- \* Warrant 3, Peak Hour, is indicated by the MUTCD as follows: "This signal warrant should be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time."
- \*\* No trial of alternatives with observance and enforcement has been attempted for crash reduction at this location.

Warrants Met: **0**  
**Recommendation: No Signal**

**Traffic Signal Needs Analysis Summary: 44th St W at Central Ave**

Scenario: <b>Completion of Barber Subdivision Phase 2 in 2031</b>	
Analysis Date: 10/17/2025	Conducted by: 406 Traffic & Transportation Consulting
Major Street: Central Ave (E/W), 1 moving lane per direction	Minor Street: 44th St W (N/S), 1 moving lane per direction
Speed Limit: 45 mph	Number of Approaches: 4

**Traffic Volumes**

Hour:	1	2	3	4	5	6	7	8	9	10	11	12
Start Time:	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Central Ave Eastbound:	554	544	485	442	460	462	396	335	356	336	393	280
Central Ave Westbound:	280	319	345	382	464	533	516	529	680	757	891	661
44th St W Northbound:	88	69	49	39	42	42	43	47	44	50	55	49
44th St W Southbound:	232	175	139	97	119	109	107	125	109	117	145	141
Total Entering Volume:	1154	1107	1018	960	1085	1146	1062	1036	1189	1260	1484	1131
TEV Rank:	4	7	11	12	8	5	9	10	3	2	1	6
Use for:	Warrant 2				Warrant 1				Warrant 3			
Major, Both Directions:	834	863	830	824	924	995	912	864	1036	1093	1284	941
Minor, Higher Direction:	232	175	139	97	119	109	107	125	109	117	145	141

**Warrants**

												Met?		
1 Eight-Hour Vehicular Volume (either condition)	<i>Condition A: Large Volume of Intersecting Traffic</i>				<i>or Condition B: Interruption of Continuous Traffic</i>								Yes	
	Major (Both Dir.)	Minor (Higher Dir.)	Value	Minimum	Value	Minimum	Value	Minimum	Value	Minimum	Value	Minimum		
2 Four-Hour Vehicular Volume	<i>MUTCD Figure 4C-2 for speed over 40 mph</i>												Yes	
3 Peak Hour* (either condition)	<i>Condition A (must meet all three subconditions)</i>				<i>or Condition B (MUTCD Figure 4C-4)</i>								Yes*	
	Value Minimum Value Minimum Met?				Value Minimum Value Minimum Met?									
	1. Veh-Hrs of Delay 5.8 4 Yes				1284 N/A 145 280 No									
	2. Minor Volume 102 100 Yes													
4 Pedestrian Volume (either criterion)	<i>Criterion A: Four-hour (MUTCD Figure 4C-7)</i>				<i>or Criterion B: One Hour (MUTCD Figure 4C-8)</i>								Not Evaluated	
	Major (Both Dir.)	Pedestrians	Value	Minimum	Value	Minimum	Value	Minimum	Value	Minimum	Value	Minimum		
5 School Crossing	No students projected to cross the major street at this location.											No		
6 Coordinated Signal System	Only one signal in the roadway network nearby.											No		
7 Crash Experience ** Condition A not evaluated (all conditions)	<i>Condition B, 1-year Period (Table 4C-4)</i>				<i>and Condition C, 80% of Warrant 1 [Condition A]</i>								Not Evaluated	
	Angle+Ped Crashes	or Fatal+Injury	Angle+Ped	Value	Minimum	Value	Minimum	Value	Minimum	Value	Minimum	Value		Minimum
	n/a	4	n/a	3	n/a	924	119	n/a	n/a	n/a	n/a	n/a		
	<i>or Condition B, 3-year Period (Table 4C-5)</i>				<i>or Condition C, 80% of Warrant 1 [Condition B]</i>									
	Angle+Ped Crashes	or Fatal+Injury	Angle+Ped	Value	Minimum	Value	Minimum	Value	Minimum	Value	Minimum	Value		Minimum
n/a	6	n/a	4	n/a	924	119	n/a	n/a	n/a	n/a	n/a			
				<i>or Condition C, 80% of Warrant 4</i>										
				Four Hour Ped One Hour Ped										
				Value Minimum Value Minimum Met?										
				n/a										
8 Roadway Network	Not an intersection of two or more major routes.											No		
9 Intersection Near Grade Xing	No railroad grade crossing nearby.											No		

**Notes:**

- c: Warrant 1 minimum values used for "70%" to account to reflect major-street speed over 40 mph
- \* Warrant 3, Peak Hour, is indicated by the MUTCD as follows: "This signal warrant should be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time."
- \*\* No trial of alternatives with observance and enforcement has been attempted for crash reduction at this location.

Warrants Met: 3\*  
**Recommendation: Signal**

## **Appendix E: Intersection Cost Participation Calculations**

City of Billings Intersection Cost Participation Worksheet: Barber Farm Phase 1

Shading Key: **No such movement** **Movement has no project traffic in this phase**

**1: Broadwater at 48th**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	0				
WB L	1				
WB T	0				
EB L	0				
NB T	1	1	1	1	1
SB L	1				
SB T	1	0	0	1	1
NB L	0				
Project Critical Lane Volume		1		1	
Critical Lane Capacity		1140		1140	
% Increase		0.1%		0.1%	
Max % Increase		0.1%		0.1%	

**2: Broadwater at Shiloh**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	0				
WB L	1	1	1	3	3
WB T	0				
EB L	0				
NB T	2	18	9	11	6
SB L	1				
SB T	2	6	3	16	8
NB L	1				
Project Critical Lane Volume		10		11	
Critical Lane Capacity		1140		1140	
% Increase		0.9%		1.0%	
Max % Increase		1.0%		1.0%	

**3: 48th at Central**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	2	2	4	4
WB L	1	1	1	0	0
WB T	1	5	5	3	3
EB L	1				
NB T	1				
SB L	1	0	0	1	1
SB T	1				
NB L	1				
Project Critical Lane Volume		5		5	
Critical Lane Capacity		1200		1200	
% Increase		0.4%		0.4%	
Max % Increase		0.4%		0.4%	

**4: Sundance Ridge at Central**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	2	2	6	6
WB L	0				
WB T	1	7	7	4	4
EB L	1				
NB T	0				
SB L	1				
SB T	0				
NB L	0				
Project Critical Lane Volume		7		6	
Critical Lane Capacity		1140		1140	
% Increase		0.6%		0.5%	
Max % Increase		0.6%		0.6%	

**5: Double Haul Lane at Central**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1				
WB L	1				
WB T	1				
EB L	1	2	2	6	6
NB T	1				
SB L	1				
SB T	1				
NB L	1				
Project Critical Lane Volume		2		6	
Critical Lane Capacity		1200		1200	
% Increase		0.2%		0.5%	
Max % Increase		0.5%		0.5%	

**6: Central at 44th**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1				
WB L	1				
WB T	1				
EB L	1				
NB T	1				
SB L	1	63	63	40	40
SB T	1				
NB L	1				
Project Critical Lane Volume		63		40	
Critical Lane Capacity		1200		1200	
% Increase		5.3%		3.3%	
Max % Increase		5.3%		5.3%	

**7: Central at Shiloh**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	2	21	11	13	7
WB L	1				
WB T	2	7	4	19	10
EB L	1	7	7	19	19
NB T	2				
SB L	1				
SB T	2				
NB L	1	7	7	19	19
Project Critical Lane Volume		18		48	
Critical Lane Capacity		1200		1200	
% Increase		1.5%		4.0%	
Max % Increase		4.0%		4.0%	

City of Billings Intersection Cost Participation Worksheet: Barber Farm Phase 2

Shading Key: **No such movement** **Movement has no project traffic in this phase**

**1: Broadwater at 48th**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	0				
WB L	1	4	4	2	2
WB T	0				
EB L	0				
NB T	1	1	1	3	3
SB L	1	6	6	16	16
SB T	1	2	2	3	3
NB L	0				
Project Critical Lane Volume		11		21	
Critical Lane Capacity		1140		1140	
% Increase		1.0%		1.8%	
Max % Increase		1.8%			

**2: Broadwater at Shiloh**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	0				
WB L	1	4	4	8	8
WB T	0				
EB L	0				
NB T	2	6	3	16	8
SB L	1				
SB T	2	12	6	18	9
NB L	1				
Project Critical Lane Volume		10		17	
Critical Lane Capacity		1140		1140	
% Increase		0.9%		1.5%	
Max % Increase		1.5%			

**3: 48th at Central**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	7	7	12	12
WB L	1	1	1	2	2
WB T	1	6	6	10	10
EB L	1				
NB T	1				
SB L	1	6	6	10	10
SB T	1				
NB L	1				
Project Critical Lane Volume		14		24	
Critical Lane Capacity		1200		1200	
% Increase		1.2%		2.0%	
Max % Increase		2.0%			

**4: Sundance Ridge at Central**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	10	10	17	17
WB L	0				
WB T	1	8	8	14	14
EB L	1				
NB T	0				
SB L	1				
SB T	0				
NB L	0				
Project Critical Lane Volume		10		17	
Critical Lane Capacity		1140		1140	
% Increase		0.9%		1.5%	
Max % Increase		1.5%			

**5: Double Haul Lane at Central**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	4	4	6	6
WB L	1				
WB T	1	2	2	5	5
EB L	1	6	6	11	11
NB T	1	2	2	3	3
SB L	1	14	14	39	39
SB T	1	1	1	2	2
NB L	1				
Project Critical Lane Volume		24		58	
Critical Lane Capacity		1200		1200	
% Increase		2.0%		4.8%	
Max % Increase		4.8%			

**6: Central at 44th**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	14	14	39	39
WB L	1				
WB T	1	28	28	44	44
EB L	1	4	4	6	6
NB T	1	1	1	2	2
SB L	1	55	55	55	55
SB T	1	1	1	2	2
NB L	1				
Project Critical Lane Volume		88		107	
Critical Lane Capacity		1200		1200	
% Increase		7.3%		8.9%	
Max % Increase		8.9%			

**7: Central at Shiloh**

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	2	30	15	38	19
WB L	1				
WB T	2	25	13	47	24
EB L	1	25	25	47	47
NB T	2				
SB L	1				
SB T	2				
NB L	1	25	25	47	47
Project Critical Lane Volume		63		118	
Critical Lane Capacity		1200		1200	
% Increase		5.2%		9.8%	
Max % Increase		9.8%			