

Traffic Impact Study

Mountain Bluffs

Colorado Springs, Colorado

Prepared for:

AMH Development, LLC

Kimley»Horn

T R A F F I C I M P A C T S T U D Y

Mountain Bluffs

Colorado Springs, Colorado

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1.0 EXECUTIVE SUMMARY

Mountain Bluffs residential neighborhood is proposed to be located along the east side of Marksheffel Road between Graphite Drive and Zircon Drive in Colorado Springs, Colorado. The project is proposed include 104 single-family residential homes. It is expected that Mountain Bluffs will be completed in the next few years. Therefore, analysis was conducted for the 2025 short-term buildout horizon as well as the 2045 long-term twenty-year planning horizon.

The purpose of this traffic study is to identify project traffic generation characteristics to determine potential project traffic related impacts on the local street system and to develop the necessary mitigation measures required for the identified traffic impacts. The following intersections were incorporated into this traffic study based on the City of Colorado Springs requested scope:

- Barnes Road and Marksheffel Road
- Graphite Drive and Marksheffel Road
- Zircon Drive and Marksheffel Road
- Carefree Circle and Marksheffel Road

In addition, the proposed full movement accesses along Zircon Drive and Graphite Drive were evaluated.

Regional access to Mountain Bluffs will be provided by US-24, I-25, and Powers Boulevard (SH-21). Primary access will be provided by Marksheffel Road. Direct access will be provided by an access along Zircon Drive and an access along Graphite Drive.

Mountain Bluffs is expected to generate approximately 1,046 weekday daily trips, with 78 of these trips occurring during the morning peak hour and 103 of these trips occurring during the afternoon peak hour.

Based on the analysis presented in this report, Kimley-Horn believes the Mountain Bluffs residential neighborhood will be successfully incorporated into the existing and future roadway network. Analysis of the existing street network, the proposed project development, and expected traffic volumes resulted in the following recommendations:

2025 Recommendations

- With completion of the Mountain Bluffs project, an access along Graphite Drive and an access along Zircon Drive are proposed. Single lane approaches will be sufficient at these two access intersections. It is recommended that the exiting project approaches operate with stop-control with R1-1 “STOP” signs installed on each approach exiting the development.

2045 Recommendations

- By the 2045 horizon, Marksheffel Road is anticipated to be improved to be a four-lane roadway by the City of Colorado Springs providing two through lanes in each direction. The ultimate configuration for the Barnes Road and Marksheffel Road intersection will be constructed by other developments occurring in the area. The Carefree Circle and Marksheffel Road intersection is anticipated to warrant signalization by the long-term horizon. Dual northbound left turn lanes were found to be needed, which can be provided within the existing pavement that is presently striped out.

General Recommendations

- Any onsite or offsite improvements should be incorporated into the Civil Drawings and conform to standards of the City of Colorado Springs and the Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition.

2.0 INTRODUCTION

Kimley-Horn and Associates, Inc. has prepared this report to document the results of a Traffic Impact Study for the Mountain Bluffs residential neighborhood proposed to be located along the east side of Marksheffel Road between Graphite Drive and Zircon Drive in Colorado Springs, Colorado. A vicinity map illustrating the Mountain Bluffs development location is shown in **Figure 1**. Mountain Bluffs is proposed to include 104 single-family residential homes. A conceptual site plan is attached in **Appendix H**. It is expected that Mountain Bluffs will be completed in the next few years; therefore, analysis was conducted for the 2025 short-term buildout horizon as well as the 2045 long-term twenty-year planning horizon.

The purpose of this traffic study is to identify project traffic generation characteristics to determine potential project traffic related impacts on the local street system and to develop the necessary mitigation measures required for the identified traffic impacts. The following intersections were incorporated into this traffic study based on the City of Colorado Springs requested scope:

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- Zircon Drive and Marksheffel Road
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In addition, the proposed full movement accesses along Zircon Drive and Graphite Drive were evaluated.

Regional access to Mountain Bluffs will be provided by US-24, I-25, and Powers Boulevard (SH-21). Primary access will be provided by Marksheffel Road. Direct access will be provided by an access along Zircon Drive and an access along Graphite Drive.

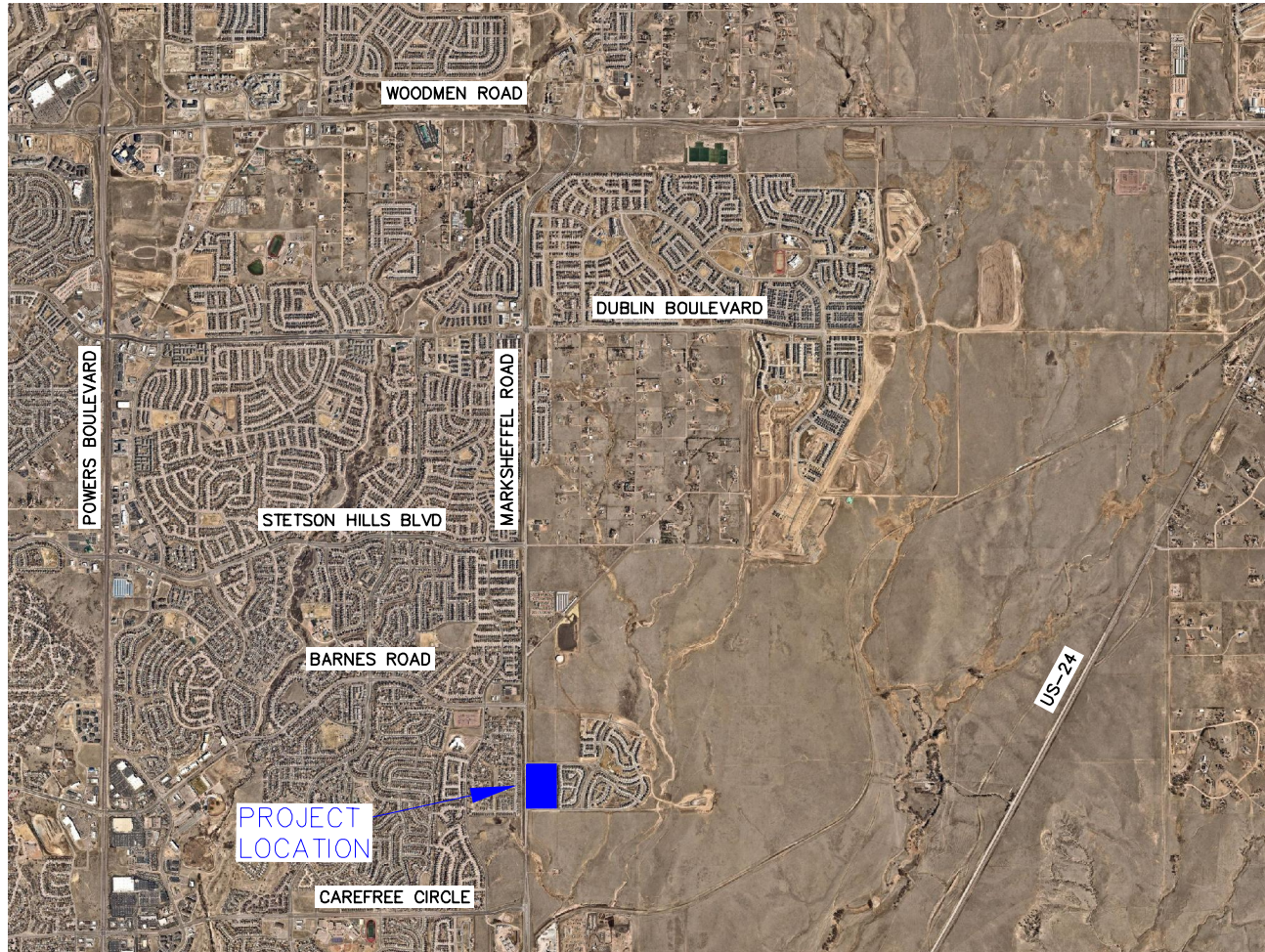


FIGURE 1
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
VICINITY MAP

3.0 EXISTING AND FUTURE CONDITIONS

3.1 Existing Study Area

The existing site is comprised of vacant land. The area to the west is residential housing and to the east is comprised of additional residential housing, specifically Filings 2, 3, 4, 5, and 6 of the Enclaves at Mountain Vista. Surrounding the site to the north and south is vacant land. Extending to the north and northeast of the site is the proposed Banning Lewis Ranch Village A-D and to the north is Banning Lewis Ranch Freestyle, both are currently being developed which includes single-family homes, schools, and neighborhood retail.

3.2 Existing Roadway Network

Marksheffel Road extends north/south with one through lane in each direction with some sections providing two through lanes in each direction in the study area. The roadway has a posted speed limit ranging from 45 miles per hour to 55 miles per hour. Marksheffel Road is classified as a “Principal Arterial” roadway.

Barnes Road extends east/west, west of Marksheffel Road, with three through lanes in each direction and a posted speed limit of 45 miles per hour. Barnes Road is classified as a “Principal Arterial” roadway.

Carefree Circle extends east/west, west of Marksheffel Road, with three through lanes in each direction and a posted speed limit of 35 miles per hour. Carefree Circle is classified as a “Principal Arterial” roadway.

Zircon Drive extends east/west, east of Marksheffel Road, with one through lane in each direction and a posted speed limit of 30 miles per hour. Likewise, Graphite Drive also extends east/west with one through lane in each direction and a posted speed limit of 30 miles per hour. The City of Colorado Springs does not provide a classification for these two roadways. It can be assumed they follow the characteristics of a “Local Residential” roadway.

The signalized 'T'-intersection of Barnes Road and Marksheffel Road operates with permissive-only northbound left turn phasing. The northbound Marksheffel Road approach provides a left turn lane and a through lane while the southbound Marksheffel Road approach provides a through lane and a right turn lane. The eastbound Barnes Road approach provides separate left turn and right turn lanes. There is additional pavement on the eastbound approach for designation of through lanes when the east leg is constructed. An aerial photo of the existing intersection configuration is provided as follows (north is up – typical).



Barnes Road & Marksheffel Road

The unsignalized 'T'-intersection of Graphite Drive and Marksheffel Road operates with stop control on the westbound Graphite Drive approach. The northbound approach provides a through lane and a right turn lane while the southbound approach provide provides a left turn lane and a through lane. The westbound approach provides a single lane for shared left and right movements. An aerial photo of the existing intersection configuration is below.



Graphite Drive & Marksheffel Road

The unsignalized 'T'-intersection of Zircon Drive and Marksheffel Road operates with stop control on the westbound Zircon Drive approach. The northbound approach provides a through lane and a right turn lane while the southbound approach provide provides a left turn lane and a through lane. The westbound approach provides separate left and right turn lanes. An aerial photo of the existing intersection configuration is below.



Zircon Drive & Marksheffel Road

The unsignalized 'T'-intersection of Carefree Circle and Marksheffel Road operates with stop control on the eastbound Carefree Circle approach. The northbound approach provides a left turn lane and two through lanes while the southbound approach provide provides two through lanes and a right turn lane. The eastbound approach provides separate left and right turn lanes. The eastbound right movements operated under FREE conditions. There is additional pavement on the eastbound approach for designation of through lanes when the east leg is constructed. An aerial photo of the existing intersection configuration is below.



Carefree Circle & Marksheffel Road

The intersection lane configuration and control for the study area intersections are shown in **Figure 2**.

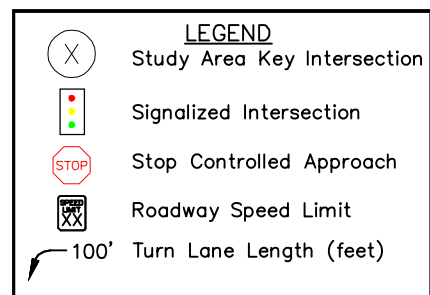
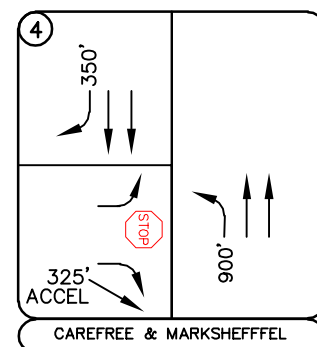
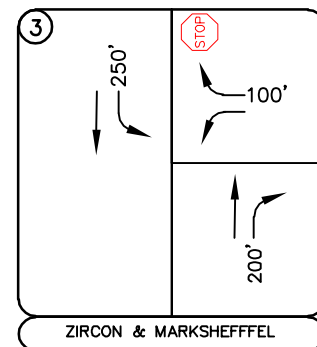
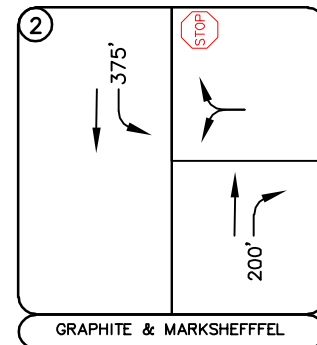
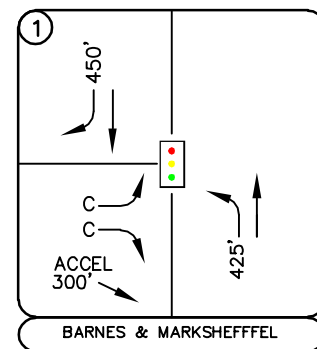
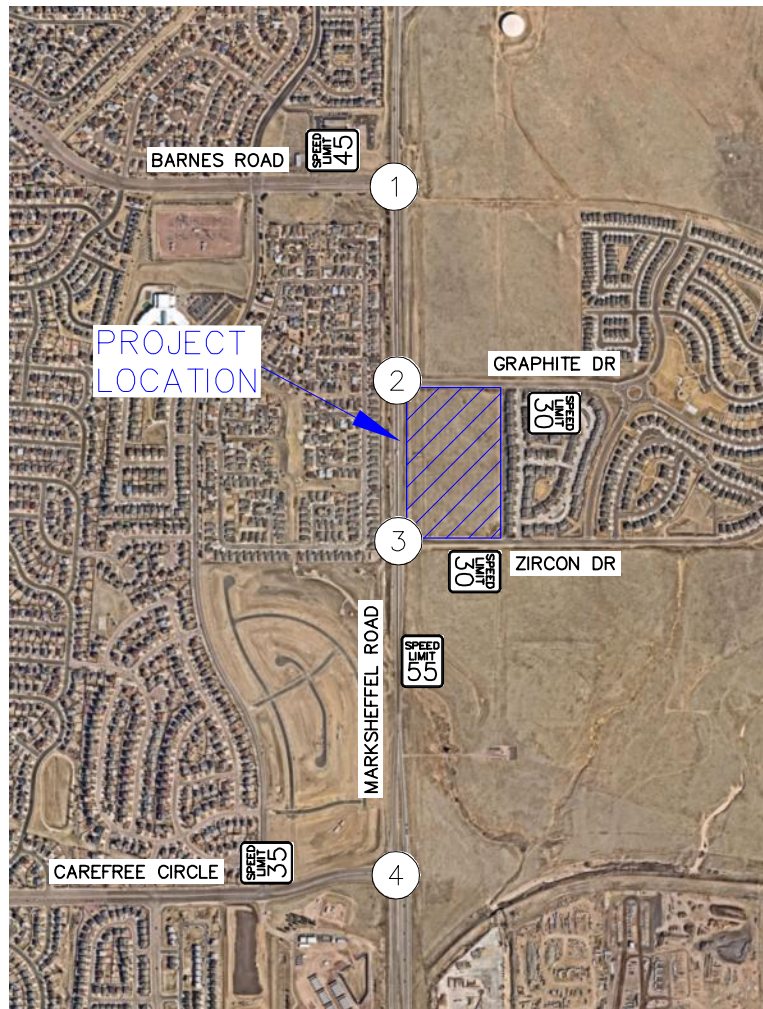


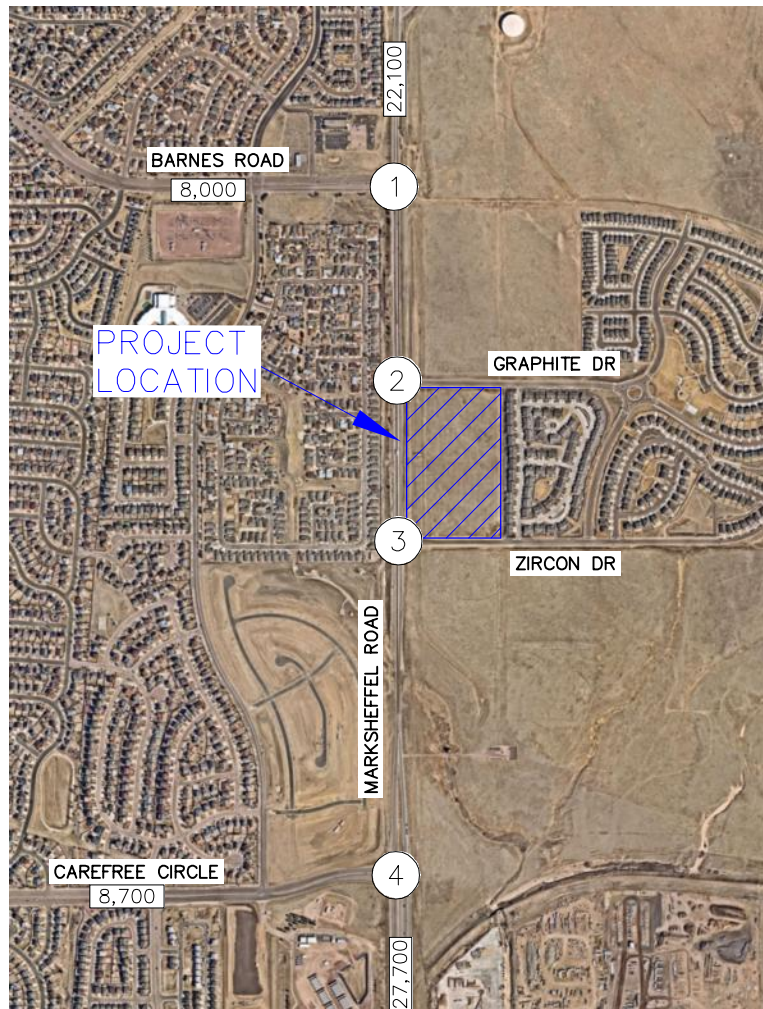
FIGURE 2
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
EXISTING GEOMETRY AND CONTROL

3.3 Existing Traffic Volumes

Existing weekday morning and afternoon turning movement counts were conducted at the Barnes Road/Marksheffel Road intersection on Thursday July 29, 2021 and at the Carefree Circle/Marksheffel Road intersection on Tuesday, August 17, 2021. Turning movement counts were conducted at the Graphite Drive/Marksheffel Road and Zircon Drive/Marksheffel Road intersections on Thursday, April 7, 2022. The counts were conducted during the morning and afternoon peak hours of adjacent street traffic in 15-minute intervals from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM on these count dates. Of note, the 2021 volumes were balanced with the 2022 counts. The existing intersection traffic volumes are shown in **Figure 3** with count sheets provided in **Appendix A**.

3.4 Unspecified Development Traffic Growth

According to traffic projections from the Pikes Peak Area Council of Governments (PPACG) traffic model, the area surrounding the site is expected to have an average 25-year growth factor of 1.33. This growth factor equates to an annual growth rate of 1.1 percent. Of note, the City of Colorado Springs requested a two (2) percent growth rate along Marksheffel Road to be conservative. Therefore, the 1.1 percent annual growth rate was applied to the turning movements and to the east/west roadways while a two (2) percent annual growth rate was applied to Marksheffel Road to forecast 2025 background traffic volumes. Additionally, the Filing 7 and 8 residential homes were included as background traffic. **Figure 4** illustrates the 2025 background traffic volumes at the study intersections.



Thursday, July 29, 2021
7:00 to 8:00AM (4:15 to 5:15PM)

1	<div> <div>110(160)</div> <div>978(780)</div> </div> <div> <div>74(226)</div> <div>211(145)</div> </div> <div> <div>160(271)</div> <div>790(1041)</div> </div>
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BARNES & MARKSHEFFEL

Thursday, April 7, 2022
7:00 to 8:00AM (4:30 to 5:30PM)

2	<div> <div>1184(887)</div> <div>21(61)</div> </div> <div> <div>75(54)</div> <div>23(15)</div> </div> <div> <div>885(1192)</div> <div>4(14)</div> </div>
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GRAPHITE & MARKSHEFFEL

Thursday, April 7, 2022
7:00 to 8:00AM (4:30 to 5:30PM)

3	<div> <div>1201(874)</div> <div>9(26)</div> </div> <div> <div>33(22)</div> <div>66(31)</div> </div> <div> <div>873(1200)</div> <div>27(78)</div> </div>
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ZIRCON & MARKSHEFFEL

Tuesday, August 17, 2021
7:00 to 8:00AM (4:30 to 5:30PM)

4	<div> <div>68(111)</div> <div>1172(776)</div> </div> <div> <div>32(34)</div> <div>457(220)</div> </div> <div> <div>285(506)</div> <div>933(1269)</div> </div>
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CAREFREE & MARKSHEFFEL

LEGEND



Study Area Key Intersection

xxx(xxx)

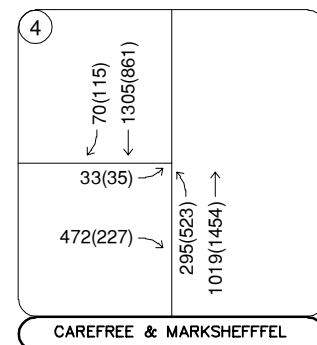
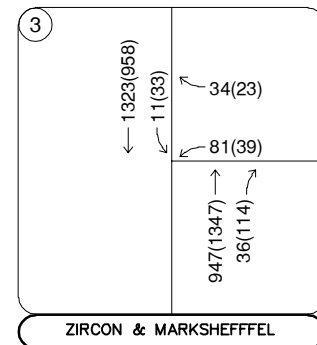
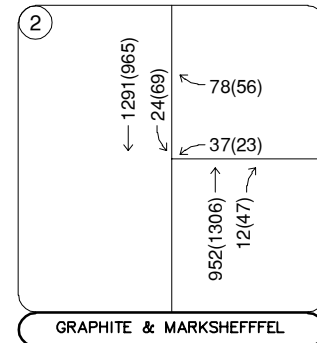
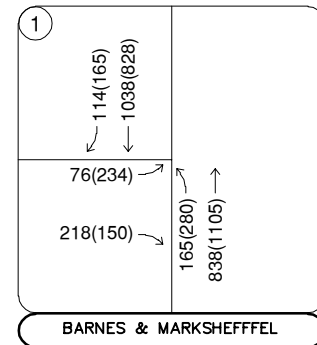
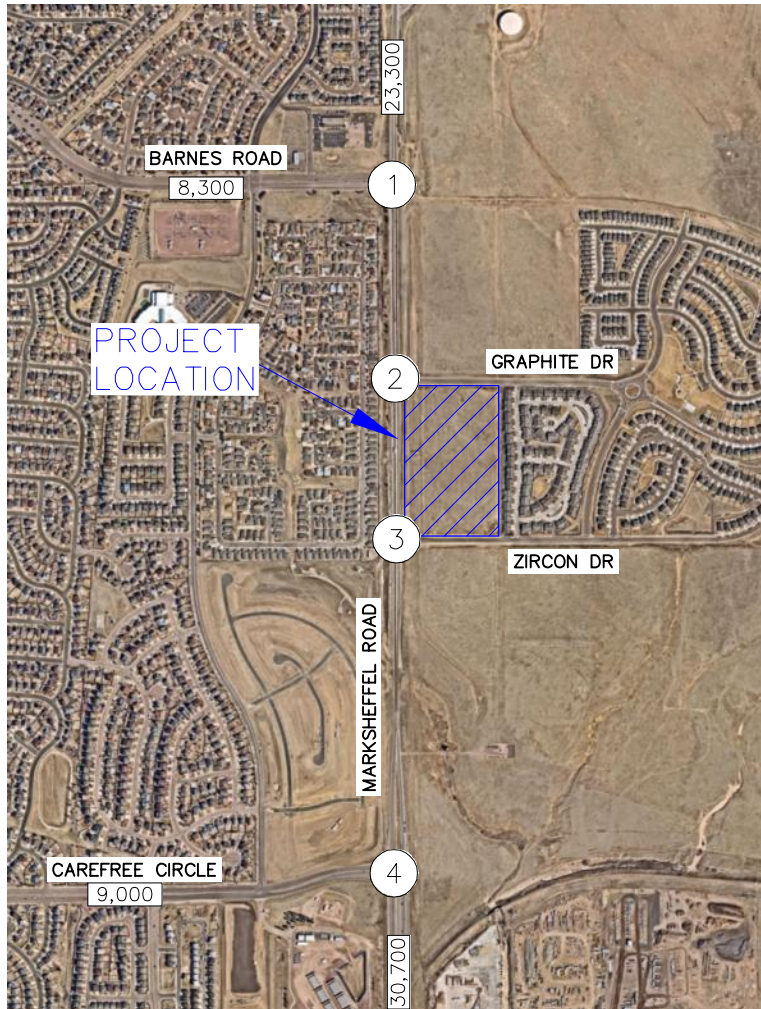
Weekday AM(PM)

Peak Hour Traffic Volumes

xx,x00

Estimated Daily Traffic Volume

FIGURE 3
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
EXISTING TRAFFIC VOLUMES

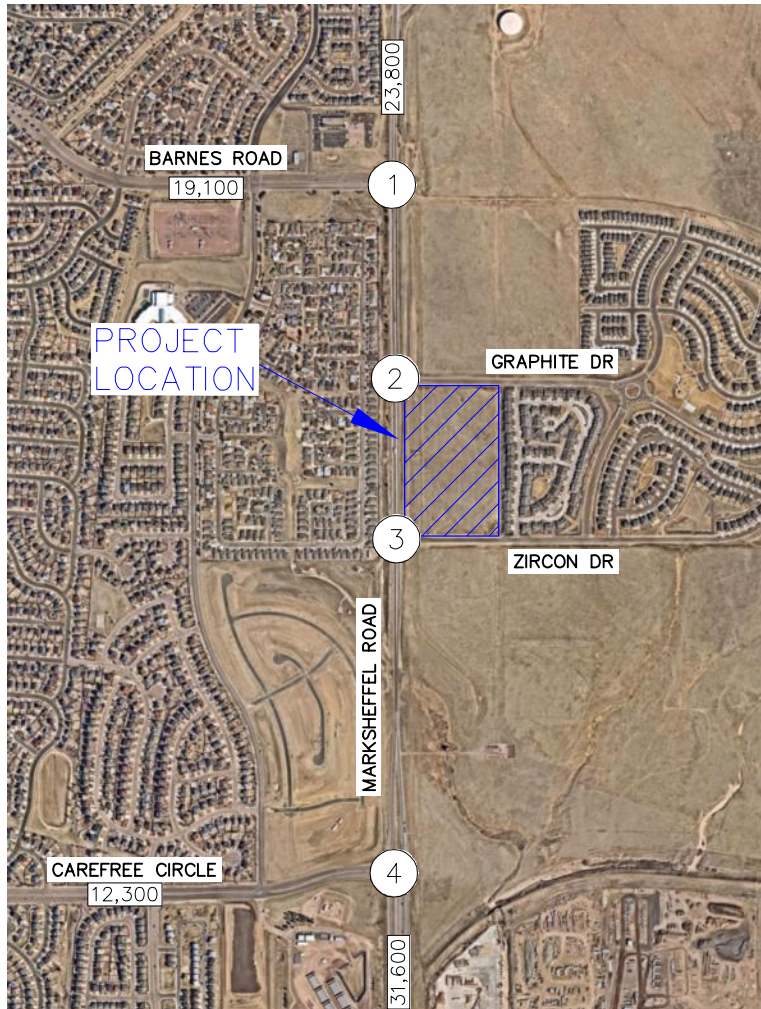


LEGEND

- (X) Study Area Key Intersection
- xxx(xxx) Weekday AM(PM)
Peak Hour Traffic Volumes
- xx,x00 Estimated Daily Traffic Volume

FIGURE 4
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
2025 BACKGROUND TRAFFIC VOLUMES

Future total traffic volumes from the “Enclaves at Mountain Vista East Traffic Study” completed in April 2022 by Kimley-Horn and Associates was used for background 2045 traffic volumes for this project. The Enclaves at Mountain Vista East’s 2030 total volumes included the Freestyle Master Plan development and included volumes from the Pikes Peak Area Council of Governments (PPACG) traffic model to derive turning movements at the study intersections. These traffic volumes from the previous traffic study are also provided in **Appendix B**. Per direction of City of Colorado Springs staff, Banning Lewis Parkway and the east/west roadways provide connection to US-24 by 2045. Therefore, some of the Marksheffel Road volumes were diverted to Banning Lewis Parkway. The volumes generated along Marksheffel Road are significantly higher than those in the El Paso County MTCP traffic model. Therefore, the future volumes are believed to be long-range volumes and were used for the 2045 background traffic volumes. The calculated background traffic volumes for 2045 are shown in **Figure 5**.



1	<div> <div> 135(145) 580(350) 290(660) </div> <div> 645(460) 425(310) 490(400) </div> </div> <div> <div> 155(330) 225(525) 360(425) </div> <div> 210(175) 275(435) 225(510) </div> </div>
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BARNES & MARKSHEFFEL

2	<div> <div> 1430(1175) 24(69) </div> <div> 78(56) 37(23) </div> </div> <div> <div> 710(1120) 12(47) </div> </div>
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GRAPHITE & MARKSHEFFEL

3	<div> <div> 1467(1198) 11(33) </div> <div> 34(23) 81(39) </div> </div> <div> <div> 722(1167) 36(114) </div> </div>
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ZIRCON & MARKSHEFFEL

4	<div> <div> 162(186) 1386(1051) </div> <div> 75(111) 588(283) </div> </div> <div> <div> 367(651) 683(1170) </div> </div>
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CAREFREE & MARKSHEFFEL

LEGEND



Study Area Key Intersection

xxx(xxx)

Weekday AM(PM)
Peak Hour Traffic Volumes

xx,x00

Estimated Daily Traffic Volume

FIGURE 5
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
2045 BACKGROUND TRAFFIC VOLUMES

4.0 PROJECT TRAFFIC CHARACTERISTICS

4.1 Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Manual*¹ published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. For this study, Kimley-Horn used the ITE Trip Generation Report fitted curve equations that applies to Single Family Detached Housing (ITE Land Use Code 210), for traffic associated with the development.

Mountain Bluffs is expected to generate approximately 1,046 weekday daily trips, with 78 of these trips occurring during the morning peak hour and 103 of these trips occurring during the afternoon peak hour. Calculations were based on the procedure and information provided in the ITE *Trip Generation Manual, 11th Edition – Volume 1: User's Guide and Handbook, 2022*. **Table 1** summarizes the estimated trip generation for the Mountain Bluffs. The trip generation worksheets are included in **Appendix C**.

Table 1 – Mountain Bluffs Traffic Generation

Land Use and Size	Weekday Vehicle Trips						
	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Detached (ITE 210) – 104 Dwelling Units	1,046	20	58	78	65	38	103

4.2 Trip Distribution

Distribution of site traffic on the street system was based on the area street system characteristics, existing traffic patterns, existing and anticipated surrounding demographic information, and the proposed access system for the project. The directional distribution of traffic is a means to quantify the percentage of site-generated traffic that approaches the site from a given direction and departs the site back to the original source. The project trip distribution for the proposed development is illustrated in **Figure 6**.

¹ Institute of Transportation Engineers, *Trip Generation Manual*, Eleventh Edition, Washington DC, 2022.

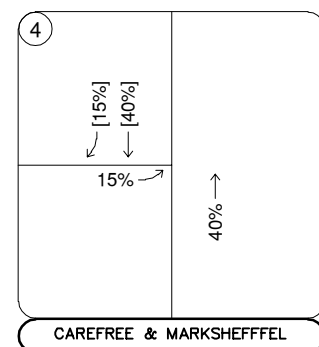
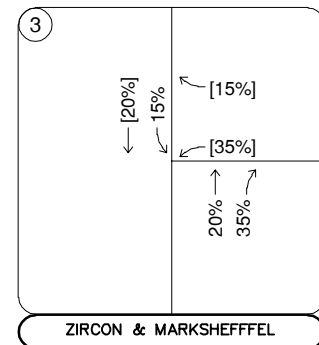
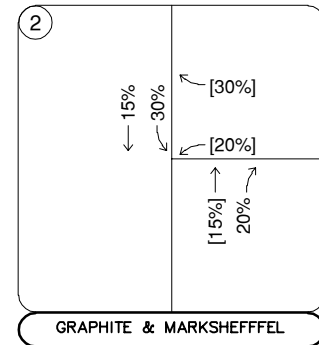
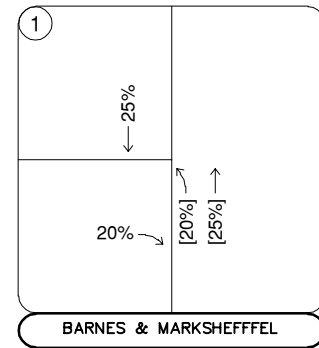
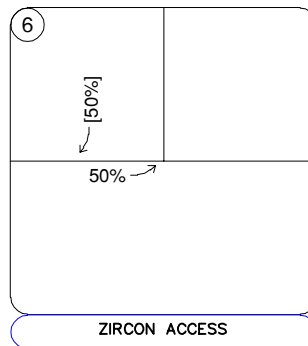
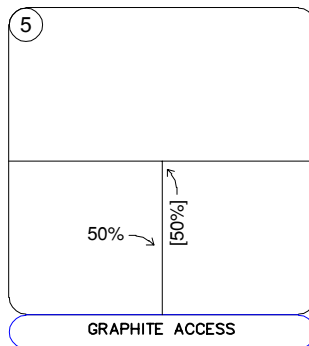
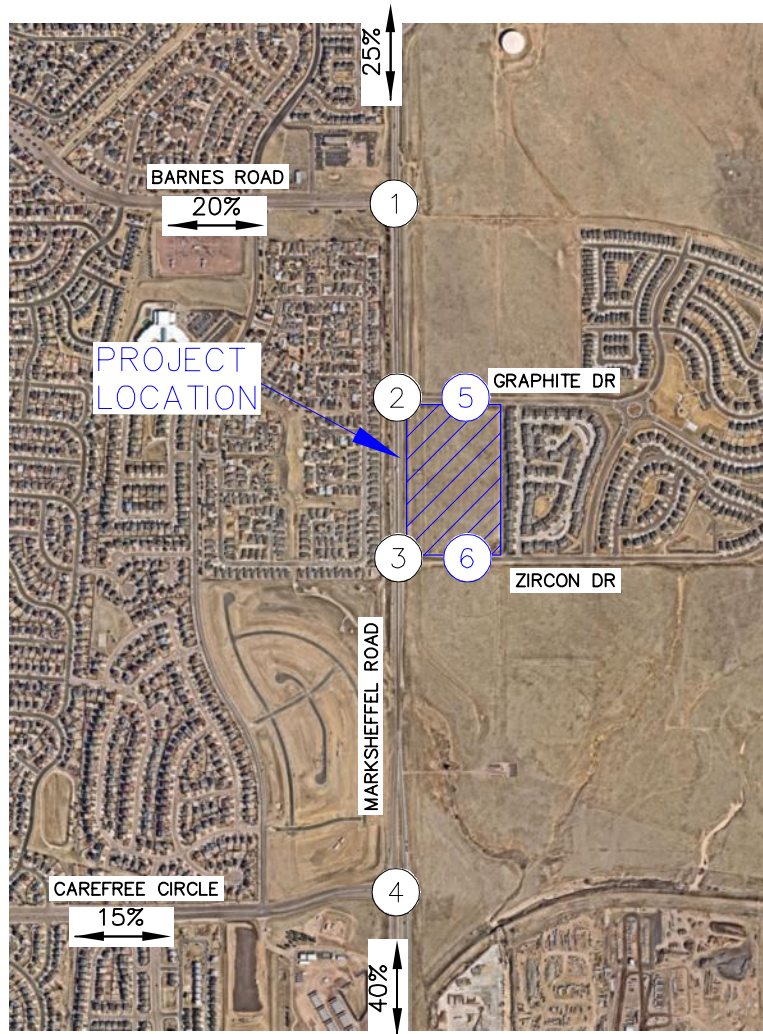


FIGURE 6
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
PROJECT TRIP DISTRIBUTION

LEGEND

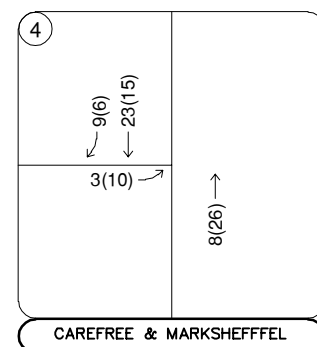
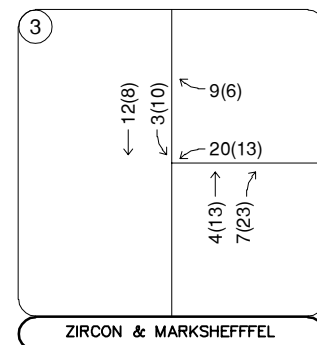
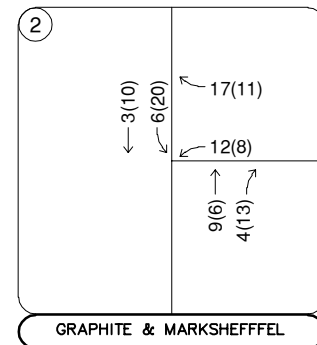
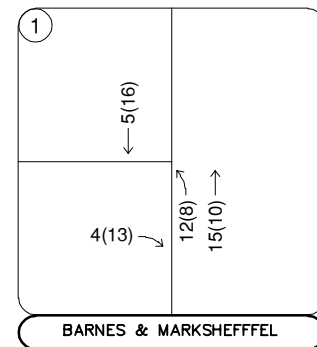
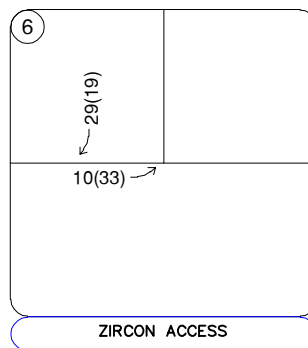
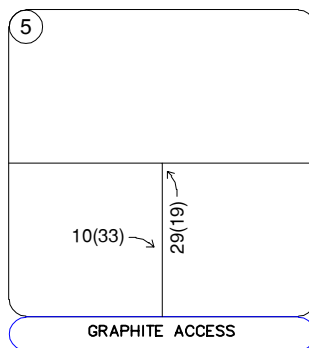
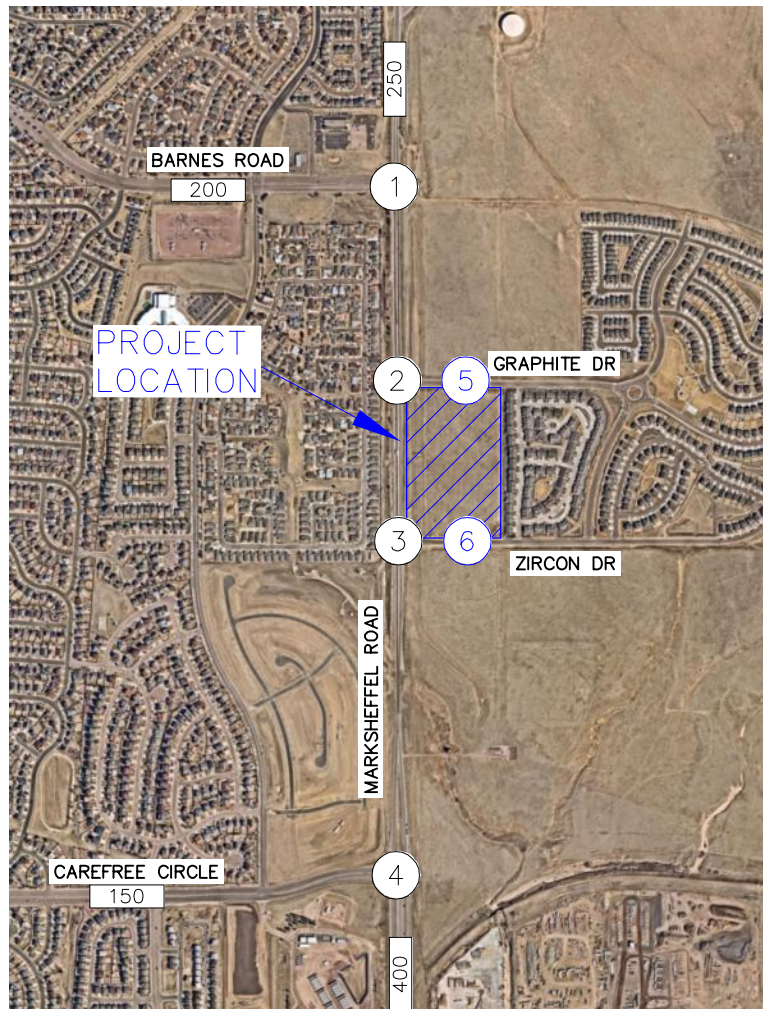
- (X) Study Area Key Intersection
- (X) Project Access Intersection
- XX% External Trip Distribution Percentage
- XX%[XX%] Entering[Exiting] Trip Distribution Percentage

4.3 Traffic Assignment

Mountain Bluffs traffic assignment was obtained by applying the project trip distribution to the estimated traffic generation of the development shown in **Table 1**. Traffic assignment is shown in **Figure 7**.

4.4 Total (Background Plus Project) Traffic

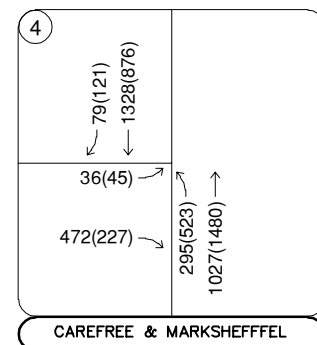
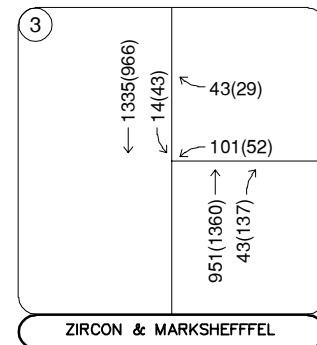
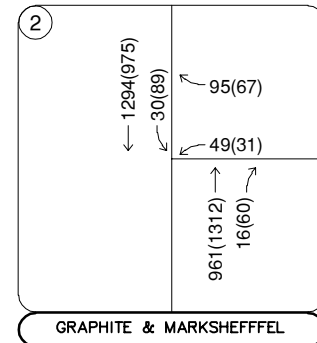
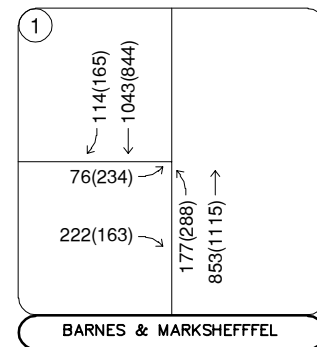
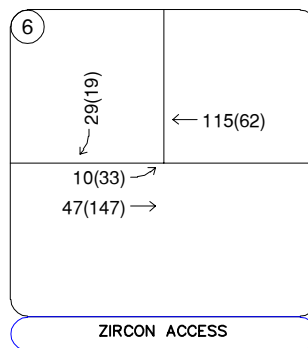
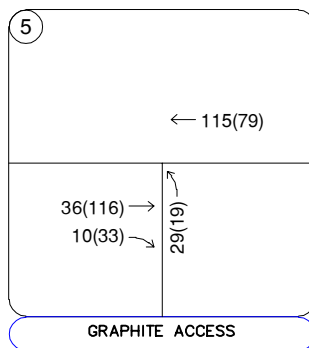
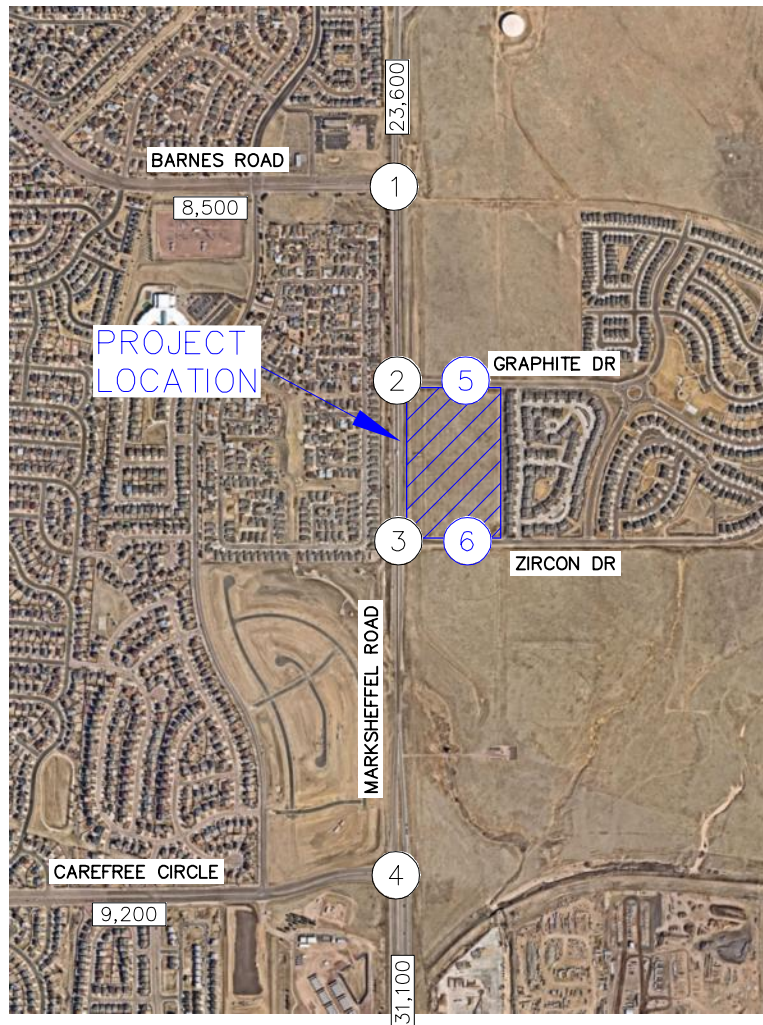
Site traffic volumes were added to the background volumes to represent estimated traffic conditions for the short-term 2025 buildout horizon and long-term 2045 twenty-year planning horizon. These total traffic volumes for the study area are illustrated for the 2025 and 2045 horizon years in **Figures 8** and **9**, respectively.



LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- xxx(xxx) Weekday AM(PM)
Peak Hour Traffic Volumes
- xx,x00 Estimated Daily Traffic Volume

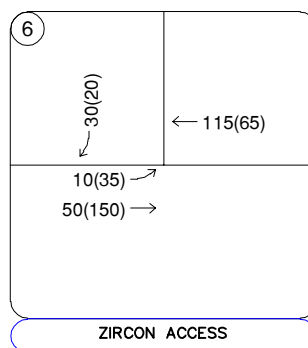
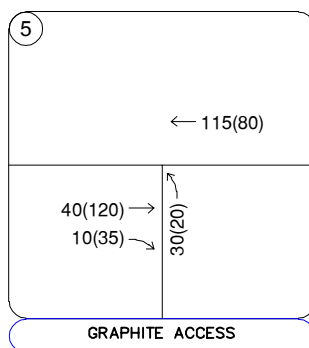
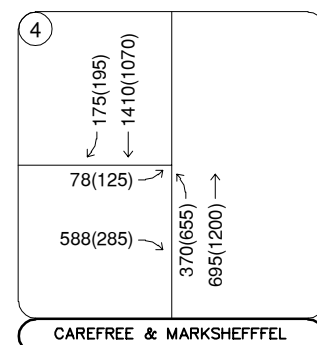
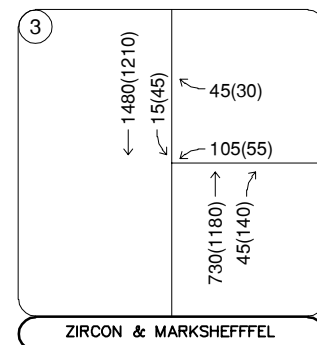
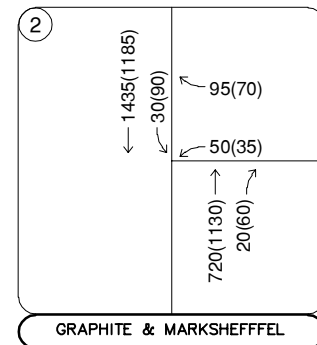
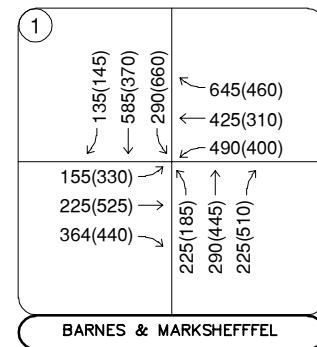
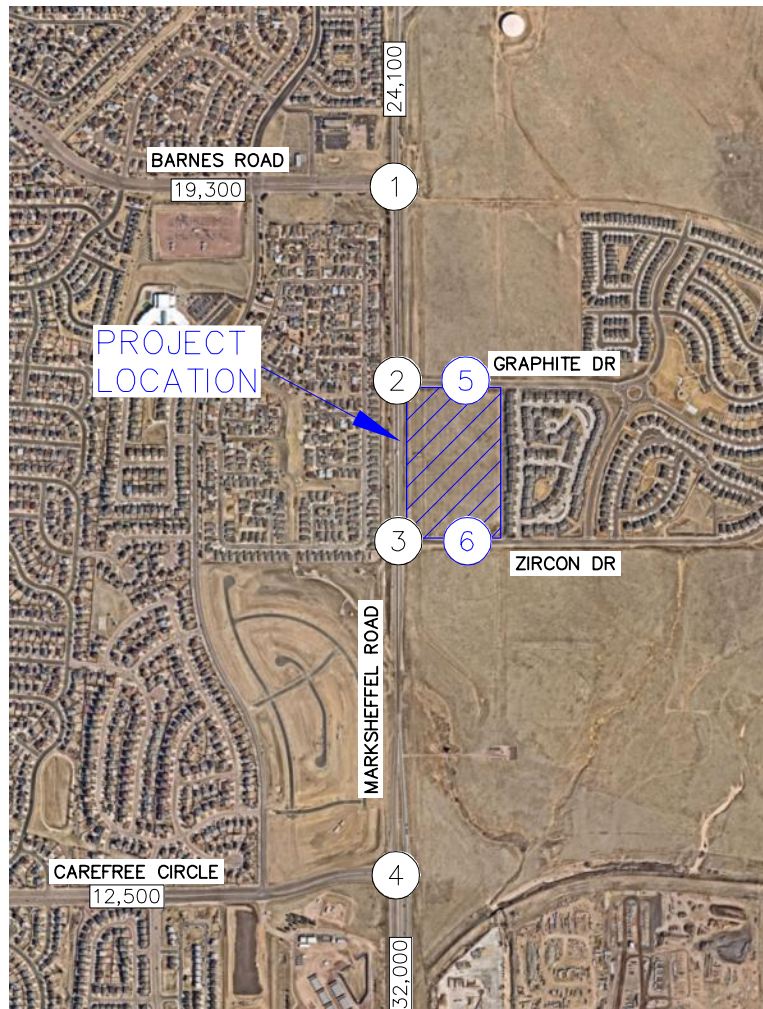
FIGURE 7
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
PROJECT TRAFFIC ASSIGNMENT



LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- XXX(XXX) Weekday AM(PM)
Peak Hour Traffic Volumes
- XX,X00 Estimated Daily Traffic Volume

FIGURE 8
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
2025 TOTAL TRAFFIC VOLUMES



LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- xxx(xxx) Weekday AM(PM)
Peak Hour Traffic Volumes
- xx,x00 Estimated Daily Traffic Volume

FIGURE 9
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
2045 TOTAL TRAFFIC VOLUMES

5.0 TRAFFIC OPERATIONS ANALYSIS

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies in the 2025 and 2045 development horizons at the identified key intersections. The acknowledged source for determining overall capacity is the current edition of the *Highway Capacity Manual (HCM)*².

5.1 Analysis Methodology

Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). For intersections and roadways in this study area, standard traffic engineering practice recommends overall intersection LOS D and movement/approach LOS E as the minimum desirable thresholds for acceptable operations. **Table 2** shows the definition of level of service for signalized and unsignalized intersections.

Table 2 – Level of Service Definitions

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Definitions provided from the Highway Capacity Manual, Sixth Edition, Transportation Research Board, 2016.

Study area intersections were analyzed based on average total delay analysis for signalized and unsignalized intersections. Under the unsignalized analysis, the LOS for a two-way stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. LOS for a two-way stop-controlled intersection is not defined for the intersection as a whole. LOS for signalized, roundabout, and all-way stop controlled intersections are defined for each approach and for the overall intersection.

² Transportation Research Board, *Highway Capacity Manual*, Sixth Edition, Washington DC, 2016.

5.2 Key Intersection Operational Analysis

Calculations for the operational level of service at the key intersections for the study area are provided in **Appendix E**. The existing year analysis is based on the lane geometry and intersection control shown in **Figure 2**. Existing peak hour factors were utilized in the analysis. The City of Colorado Springs provided the existing signal timing for the Barnes Road/Marksheffel Road intersection (timing sheet attached in **Appendix D**). Synchro traffic analysis software was used to analyze the signalized, and unsignalized key intersections for HCM level of service.

Barnes Road and Marksheffel Road

The signalized 'T'-intersection of Barnes Road and Marksheffel Road operates with permissive-only northbound left turn phasing. The intersection currently operates at LOS B during the morning peak hour and LOS C during the afternoon peak hour. With project traffic, the intersection is anticipated to continue operating at an acceptable level of service throughout the short-term 2025 horizon. Therefore, no improvements or modifications are needed to the control or lane configurations as result of this project.

By the 2045 horizon, Marksheffel Road is anticipated to be improved to be a four-lane roadway by the City of Colorado Springs with two through lanes in each direction. In addition, the east leg will be constructed with buildout of Freestyle Master Plan and Enclaves at Mountain Vista East projects. Barnes Road is also anticipated to provide two through lanes in each direction in the future. The projected ADT is anticipated to be between 24,100 to 32,000 vehicles per day within the site area. The four-lane roadway is proposed to be carried through all the study intersection along Marksheffel Road. It is understood that ultimately, with the roadway connections from Banning Lewis Parkway to US-24 and the buildout of Banning Lewis Parkway, less vehicles may utilize Marksheffel Road. Therefore, the following lane geometry has been recommended within previous studies at this intersection to accommodate future traffic volumes:

- Eastbound: Dual Left Turn Lanes, Two Through Lanes, and a Right Turn Lane
- Northbound: Left Turn Lane, Two Through Lanes, and a Right Turn Lane
- Westbound: Dual Left Turn Lanes, Two Through Lanes, and a Right Turn Lane
- Southbound: Dual Left Turn Lanes, Two Through Lanes, and a Right Turn Lane

With these 2045 recommendations, the intersection is anticipated to operate with LOS D during the morning and afternoon peak hours. **Table 3** provides the results of the LOS analysis at this intersection.

Table 3 – Barnes Road & Marksheffel Road LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing	11.1	B	21.1	C
2025 Background	12.3	B	24.4	C
2025 Background Plus Project	12.7	B	25.6	C
2045 Background #	46.6	D	48.3	D
2045 Background Plus Project #	46.2	D	48.6	D

= Ultimate Intersection Configuration

Graphite Drive and Marksheffel Road

The unsignalized 'T'-intersection of Graphite Drive and Marksheffel Road operates with stop control on the westbound Graphite Drive approach. The intersection movements operate acceptably at LOS D or better during both peak hours under existing conditions. With project traffic, all movements are anticipated to continue operating at an acceptable level of service E or better throughout the short-term 2025 horizon. As the delay levels are within reasonable and expected limits, no improvements or modifications are proposed at this intersection.

By 2045, Marksheffel Road is anticipated to be improved to be a four-lane roadway with two through lanes in each direction by the City of Colorado Springs. With two through lanes in each direction along Marksheffel Road, the intersection is anticipated to operate with LOS C or better during both peak hours. **Table 4** provides the results of the LOS analysis conducted at this intersection.

Table 4 – Graphite Drive & Marksheffel Road LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing				
Westbound Approach	23.3	C	29.5	D
Southbound Left	9.9	A	12.1	B
2025 Background				
Westbound Approach	30.8	D	39.3	E
Southbound Left	10.3	B	13.5	B
2025 Background Plus Project				
Westbound Approach	39.2	E	48.4	E
Southbound Left	10.4	B	14.1	B
2045 Background #				
Westbound Approach	15.3	C	18.6	C
Southbound Left	9.3	A	12.0	B
2045 Background Plus Project #				
Westbound Approach	16.8	C	21.7	C
Southbound Left	9.4	A	12.5	B

= Two NB/SB Through Lanes

Zircon Drive and Marksheffel Road

The unsignalized 'T'-intersection of Zircon Drive and Marksheffel Road operates with stop control on the westbound Zircon Drive approach. The intersection movements operate acceptably during both peak hours under existing conditions. With project traffic, all movements are anticipated to continue operating at an acceptable level of service E or better throughout short-term 2025 horizon. As these delay levels are within reasonable and expected limits, no improvements or modifications are proposed at this intersection.

By 2045, Marksheffel Road is anticipated to be improved to be a four-lane roadway with two through lanes in each direction by the City of Colorado Springs. With two through lanes in each direction along Marksheffel Road, the intersection is anticipated to operate with LOS C or better during both peak hours. **Table 5** provides the results of the LOS analysis conducted at this intersection.

Table 5 – Zircon Drive & Marksheffel Road LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing				
Westbound Left	38.3	E	25.3	D
Westbound Right	16.5	C	23.7	C
Southbound Left	9.9	A	12.2	B
2025 Background				
Westbound Left	37.6	E	31.6	D
Westbound Right	17.9	C	28.8	D
Southbound Left	10.3	B	13.8	B
2025 Background Plus Project				
Westbound Left	45.6	E	44.1	E
Westbound Right	18.4	C	30.5	D
Southbound Left	10.3	B	14.3	B
2045 Background #				
Westbound Left	21.0	C	26.4	D
Westbound Right	11.0	B	13.6	B
Southbound Left	9.3	A	12.4	B
2045 Background Plus Project #				
Westbound Left	23.5	C	29.6	D
Westbound Right	11.2	B	13.8	B
Southbound Left	9.4	A	21.9	B

= Two NB/SB Through Lanes

Carefree Circle and Marksheffel Road

The unsignalized 'T'-intersection of Carefree Circle and Marksheffel Road operates with stop control on the eastbound Carefree Circle approach. The eastbound left turn movement operates with LOS F during both peak hours under existing conditions. An MUTCD four-hour signal warrant was performed at the intersection. The short-term horizon is not anticipated to meet warrants for any of the four hours; however, all four hours are anticipated to meet the Four-Hour Warrant for signalized for the long-term 2045 horizon. The signal warrant worksheet is attached in **Appendix G**. Therefore, the eastbound left movement may operate with higher delays until a traffic signal is warranted and constructed at this intersection. Drivers coming from the west can reroute on the street network and use the signalized intersections of Constitution Avenue or Barnes Road along Marksheffel Road to access their destination instead as delay values increase.

By 2045, signalization of the intersection is anticipated. In addition, dual northbound left turn lanes were found to be needed, which can be provided within the existing pavement that is presently striped out. Therefore, with signalization and dual northbound left turn lanes, the intersection is anticipated to operate with LOS B during both peak hours. **Table 6** provides the results of the LOS analysis conducted at this intersection.

Table 6 – Carefree Circle & Marksheffel Road LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing				
Northbound Left	18.1	C	16.4	C
Eastbound Left	57.3	F	64.2	F
Eastbound Right	0.0	A	0.0	A
2025 Background				
Northbound Left	22.8	C	19.9	C
Eastbound Left	96.2	F	94.5	F
Eastbound Right	0.0	A	0.0	A
2025 Background Plus Project				
Northbound Left	23.8	C	20.4	C
Eastbound Left	112.5	F	121.4	F
Eastbound Right	0.0	A	0.0	A
2045 Background #	16.4	B	19.4	B
2045 Background Plus Project #	16.6	B	19.8	B

= Signalized, Dual NB Left Turn Lanes

Project Accesses

With completion of the Mountain Bluffs project, an access along Graphite Drive and an access along Zircon Drive are proposed. Single lane approaches will be sufficient at these two access intersections. It is recommended that R1-1 “STOP” signs be installed on the approach exiting the development at both locations. **Table 7** provides the results of the level of service for the project street accesses. As shown in the table, the project street access intersections are both anticipated to have all movements operating with acceptable LOS A during the peak hours in both the buildout year 2025 and the long term 2045 horizons.

Table 7 – Project Access Level of Service Results

Intersection	2025 Total				2045 Total			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Graphite Drive Northbound Approach	9.6	A	9.9	A	9.6	A	9.9	A
Zircon Drive Eastbound Left Southbound Approach	7.5 9.0	A A	7.4 8.7	A A	7.5 9.0	A A	7.4 8.7	A A

5.3 Turn Bay Length Analysis

Auxiliary turn lanes and turn lane lengths are based on the guidelines outlined in the City of Colorado Springs Traffic Criteria Manual. A left turn lane is provided for movements with volumes greater than 10 vehicles per hour whereas right turn lanes were provided for movement with volumes greater than 25 vehicles per hour. In addition, dual left turn lanes are usually needed when 300 or more vehicles per hour are utilizing the turn lane. Marksheffel Road, Barnes Road, and Carefree Circle are classified as principal arterial roadways. By 2045, all roadways will most likely provide a 45 mile per hour speed limit based functional classification from *Section 16.0: Table of Traffic Engineering Design Standards* within the Traffic Criteria Manual. Because most intersections along Marksheffel Road are not built out and currently provide additional pavement for future lanes for future developments, the turn lane lengths that are recommended will follow the City of Colorado Springs turn lane standards.

5.4 Vehicle Queuing Analysis

A vehicle queuing analysis was conducted for the study area intersections. The queuing analysis was performed using Synchro presenting the results of the 95th percentile queue lengths. Results are shown in the following **Table 8** with calculations provided within the level of service operational sheets of **Appendix E** for unsignalized intersections and **Appendix F** for signalized intersections.

Table 8 – Turn Lane Queuing Analysis Results

Intersection Turn Lane	Existing Turn Lane Length (feet)	2025 Calculated Queue (feet)	2025 Recommended Length (feet)	2045 Calculated Queue (feet)	2045 Recommended Length (feet)
Barens & Marksheffel					
Eastbound Left	C	261'	C	182' DL	380'+180'T DL
Eastbound Right	C	75'	C	310'	310'+180'T
Westbound Left	DNE	-	DNE	274' DL	475'+180'T DL
Westbound Right	DNE	-	DNE	446'	450'+180'T
Northbound Left	425'	359'	425'	156'	350'+180'T
Northbound Right	DNE	-	DNE	497'	500'+180'T
Southbound Left	DNE	-	DNE	347' DL	550'+180'T DL
Southbound Right	450'	38'	450'	51'	200'+180'T
Graphite & Marksheffel					
Southbound Left	375'	25'	375'	25'	375'
Northbound Right	200'	25'	200'	25'	200'
Zircon & Marksheffel					
Westbound Left	C	75'	C	50'	C
Westbound Right	100'	25'	100'	25'	100'
Southbound Left	250'	25'	250'	25'	250'
Northbound Right	200'	25'	200'	25'	200'
Carefree & Marksheffel					
Eastbound Left	C	75'	C	156'	C
Eastbound Right	C	25'	C	0'	C
Northbound Left	900'	150'	900'	295' DL	900' DL
Southbound Right	350'	25'	350'	16'	350'

DNE = Does Not Exist; C = Continuous; **Red** Text = Storage Deficiency; **Blue** Text = Recommendation

As shown in the results presented within the queuing table, all vehicle queues are anticipated to be accommodated within the existing turn bay lengths in the 2025 buildout horizon. With most intersections needing additional widening or reconfiguration by 2045, all auxiliary turn lanes should be constructed with the storage lengths as provided in **Table 8** above. The turn lane lengths were based on the City of Colorado Springs Traffic Criteria Manual. With a 45 mile per hour speed limit on most roadways, a lane length of 200 feet and a taper length of 180 feet were used. The left turn lane storage length at the signalized intersection is based on the 95th percentile queue.

5.5 Improvement Summary

Based on the results of the intersection operational and vehicle queuing analysis, the key intersection recommended improvements and control are shown in **Figure 10** for the short-term 2025 horizon and **Figure 11** for the long-term 2045 horizon.

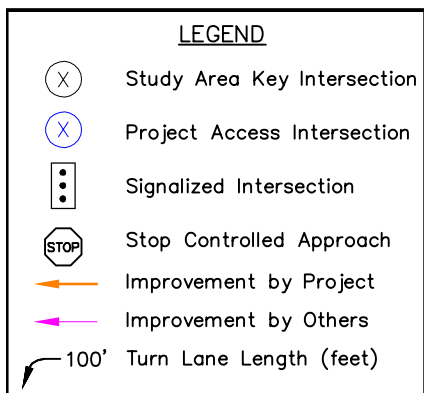
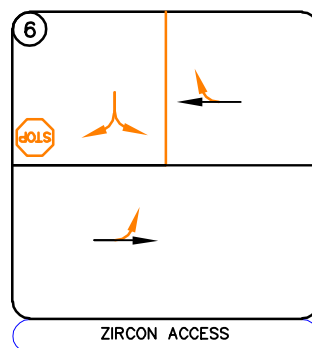
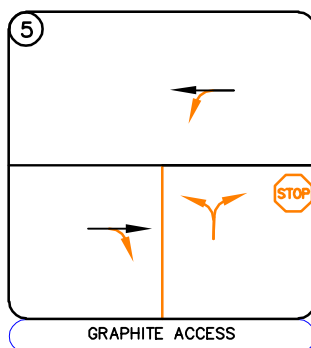
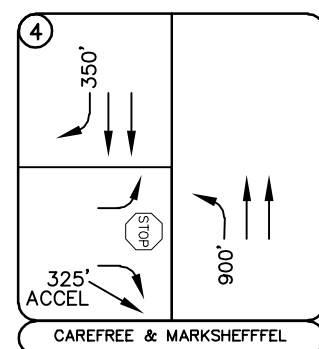
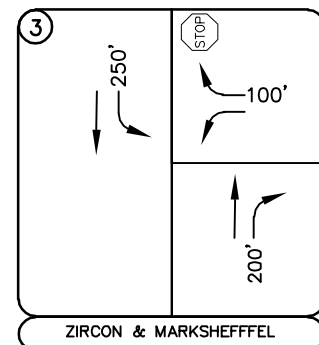
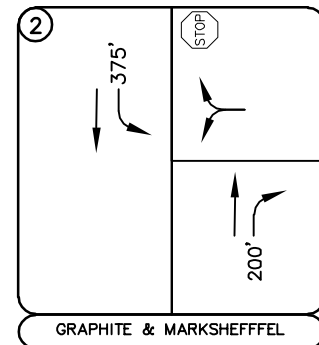
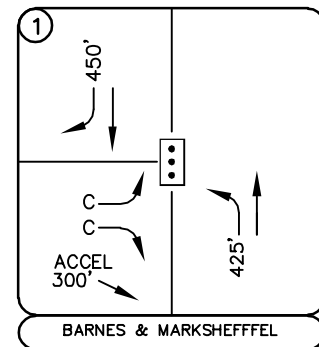
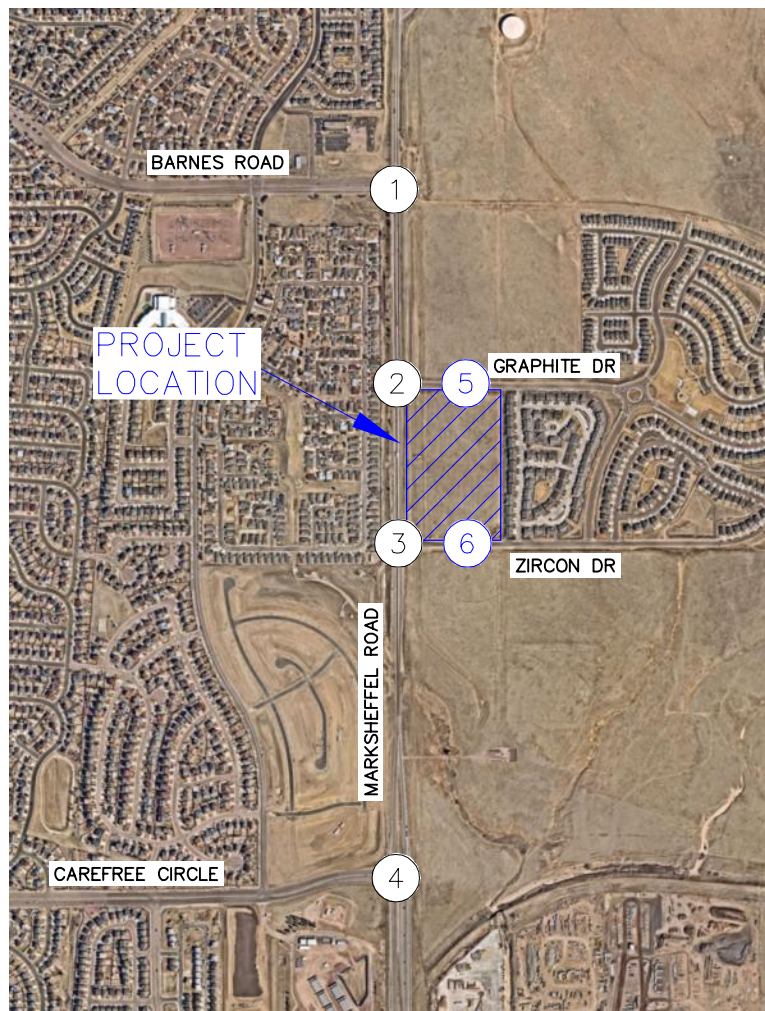


FIGURE 10
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
2025 RECOMMENDED
GEOMETRY AND CONTROL



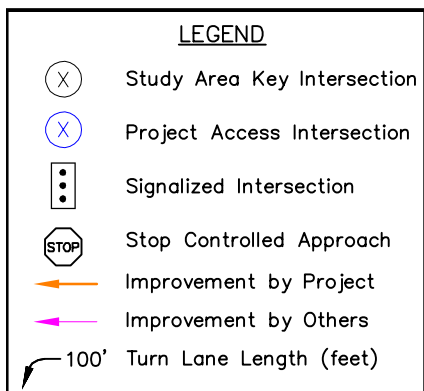
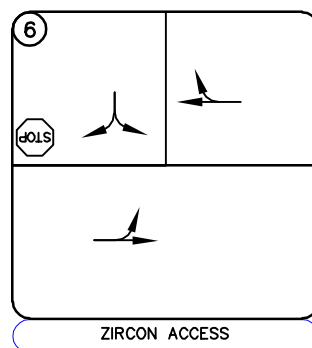
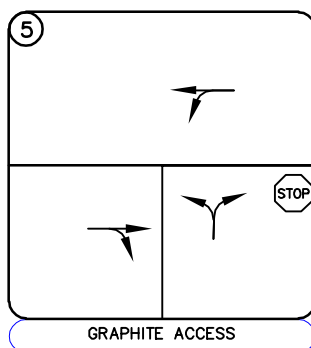
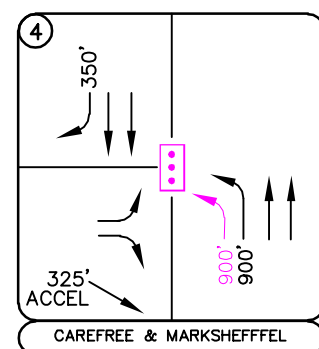
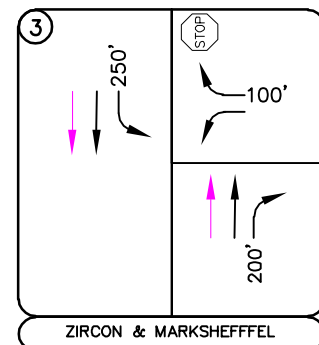
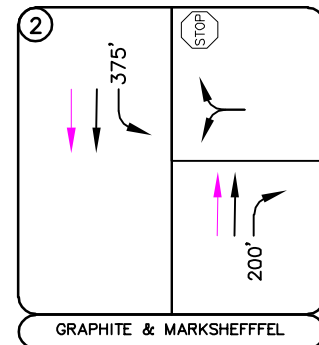
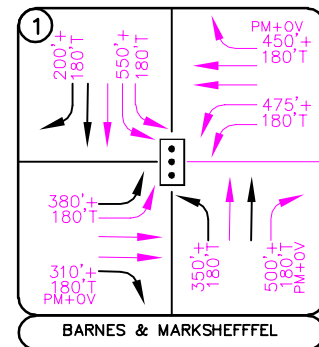
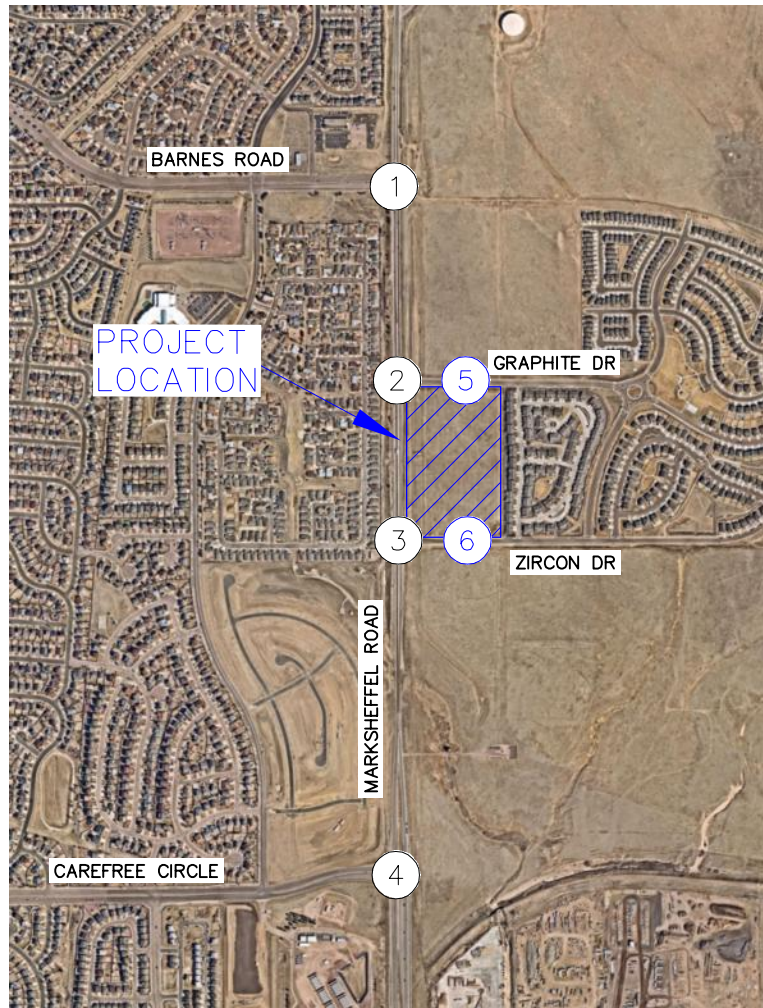


FIGURE 11
MOUNTAIN BLUFFS
COLORADO SPRINGS, COLORADO
2045 RECOMMENDED
GEOMETRY AND CONTROL



6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis presented in this report, Kimley-Horn believes the Mountain Bluffs residential neighborhood will be successfully incorporated into the existing and future roadway network. Analysis of the existing street network, the proposed project development, and expected traffic volumes resulted in the following recommendations:

2025 Recommendations

- With completion of the Mountain Bluffs project, an access along Graphite Drive and an access along Zircon Drive are proposed. Single lane approaches will be sufficient at these two access intersections. It is recommended that the exiting project approaches operate with stop-control with R1-1 “STOP” signs installed on each approach exiting the development.

2045 Recommendations

- By the 2045 horizon, Marksheffel Road is anticipated to be improved to be a four-lane roadway by the City of Colorado Springs providing two through lanes in each direction. The ultimate configuration for the Barnes Road and Marksheffel Road intersection will be constructed by other developments occurring in the area. The Carefree Circle and Marksheffel Road intersection is anticipated to warrant signalization by the long-term horizon. Dual northbound left turn lanes were found to be needed, which can be provided within the existing pavement that is presently striped out.

General Recommendations

- Any onsite or offsite improvements should be incorporated into the Civil Drawings and conform to standards of the City of Colorado Springs and the Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition.

APPENDICES

APPENDIX A

Intersection Count Sheets

Colorado Springs, CO
BLR Barnes - Freestyle
AM Peak
Barnes Rd and Marksheffel Rd

File Name : Barnes and Marksheffel AM
Site Code : IPO 563
Start Date : 7/29/2021
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

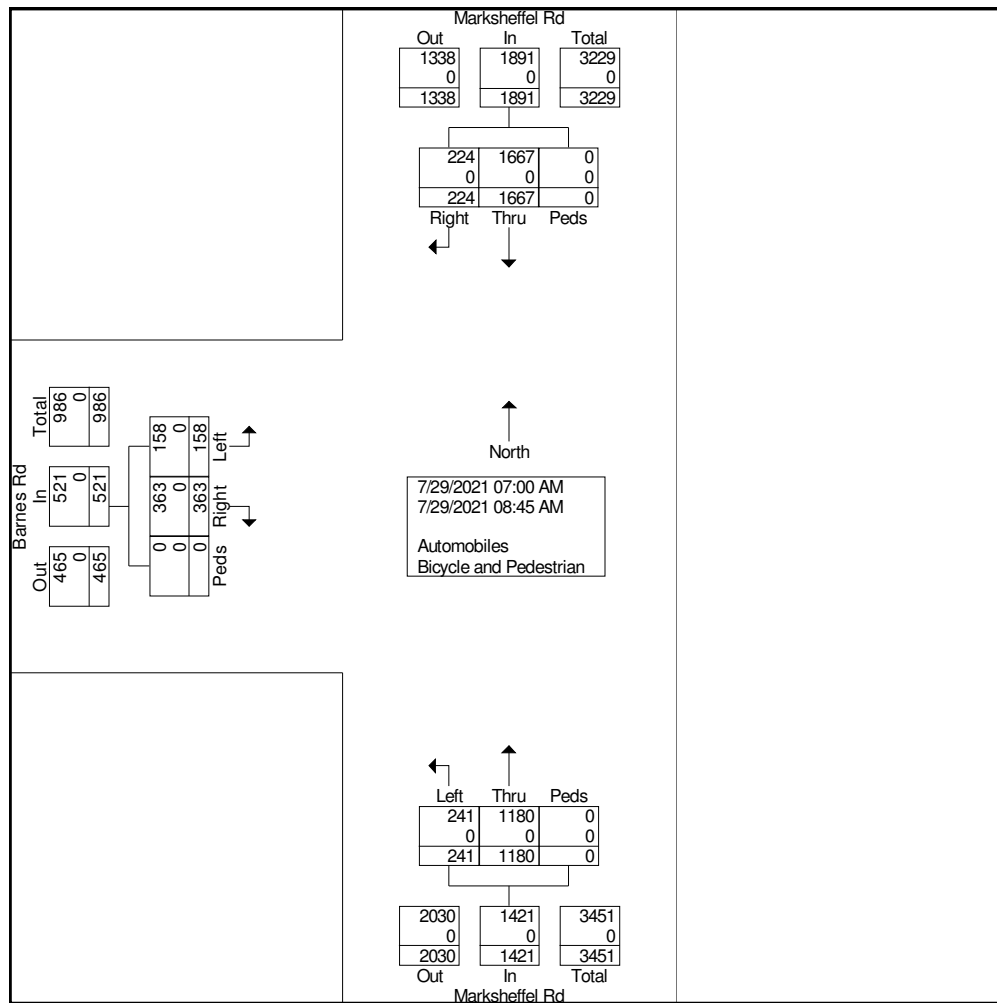
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Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
AM Peak
Barnes Rd and Marksheffel Rd

File Name : Barnes and Marksheffel AM
Site Code : IPO 563
Start Date : 7/29/2021
Page No : 2



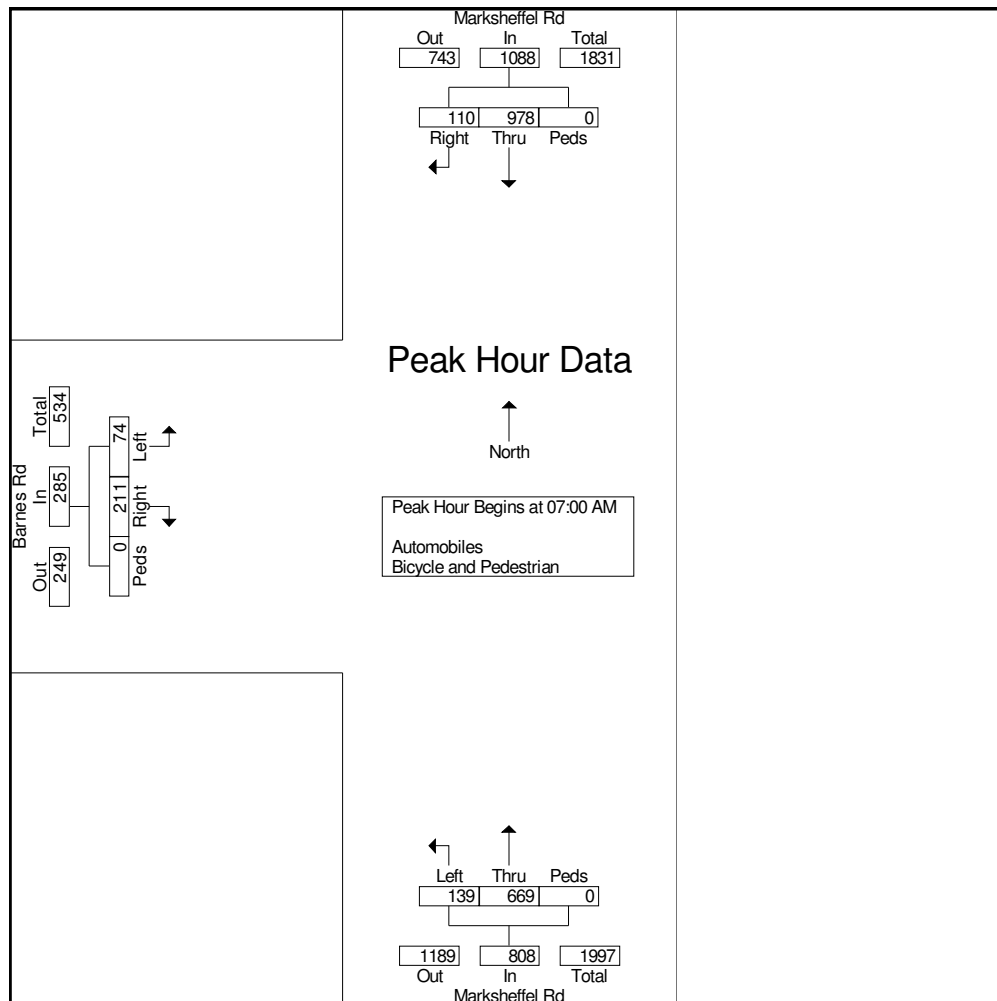


Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
AM Peak
Barnes Rd and Marksheffel Rd

File Name : Barnes and Marksheffel AM
Site Code : IPO 563
Start Date : 7/29/2021
Page No : 3

	Barnes Rd Eastbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	12	53	0	65	18	174	0	192	248	21	0	269	526
07:15 AM	18	51	0	69	37	167	0	204	242	25	0	267	540
07:30 AM	15	57	0	72	37	149	0	186	263	29	0	292	550
07:45 AM	29	50	0	79	47	179	0	226	225	35	0	260	565
Total Volume	74	211	0	285	139	669	0	808	978	110	0	1088	2181
% App. Total	26	74	0		17.2	82.8	0		89.9	10.1	0		
PHF	.638	.925	.000	.902	.739	.934	.000	.894	.930	.786	.000	.932	.965



Colorado Springs, CO
BLR Barnes - Freestyle
PM Peak
Barnes Rd and Marksheffel Rd

File Name : Barnes and Marksheffel PM
Site Code : IPO 563
Start Date : 7/29/2021
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

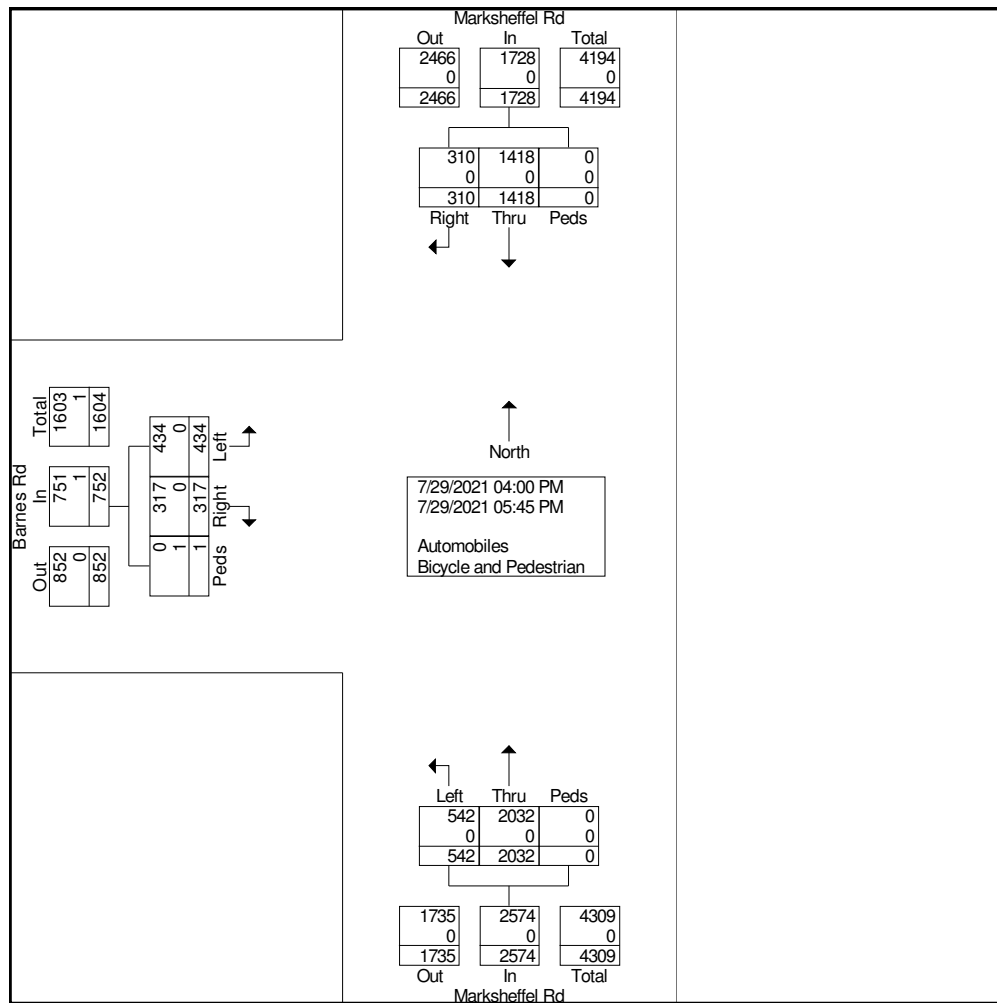
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Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
PM Peak
Barnes Rd and Marksheffel Rd

File Name : Barnes and Marksheffel PM
Site Code : IPO 563
Start Date : 7/29/2021
Page No : 2



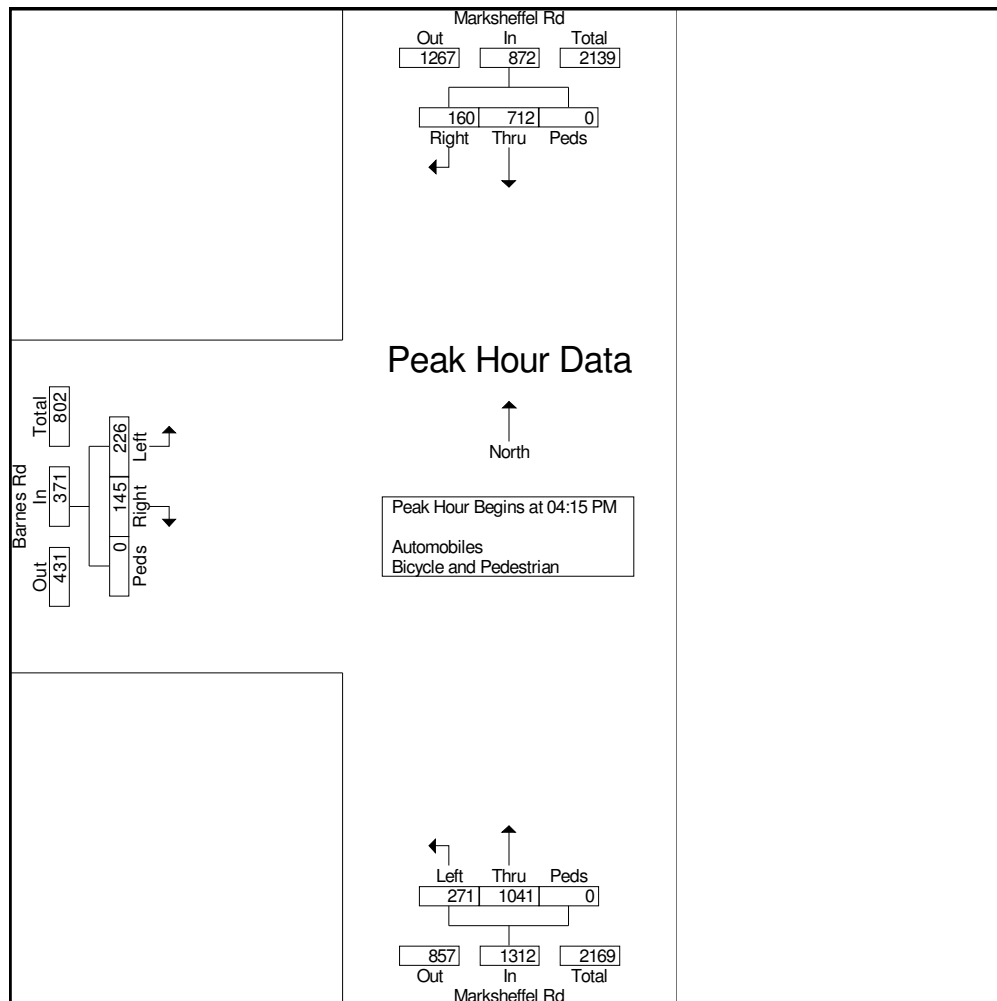


Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
PM Peak
Barnes Rd and Marksheffel Rd

File Name : Barnes and Marksheffel PM
Site Code : IPO 563
Start Date : 7/29/2021
Page No : 3

	Barnes Rd Eastbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	64	33	0	97	74	250	0	324	173	40	0	213	634
04:30 PM	52	34	0	86	63	277	0	340	186	41	0	227	653
04:45 PM	48	32	0	80	73	255	0	328	154	40	0	194	602
05:00 PM	62	46	0	108	61	259	0	320	199	39	0	238	666
Total Volume	226	145	0	371	271	1041	0	1312	712	160	0	872	2555
% App. Total	60.9	39.1	0		20.7	79.3	0		81.7	18.3	0		
PHF	.883	.788	.000	.859	.916	.940	.000	.965	.894	.976	.000	.916	.959



Colorado Springs, CO
AMH Enclaves at Mountain Vista
AM Peak
Graphite Dr and Marksheffel Rd

File Name : Graphite and Marksheffel AM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

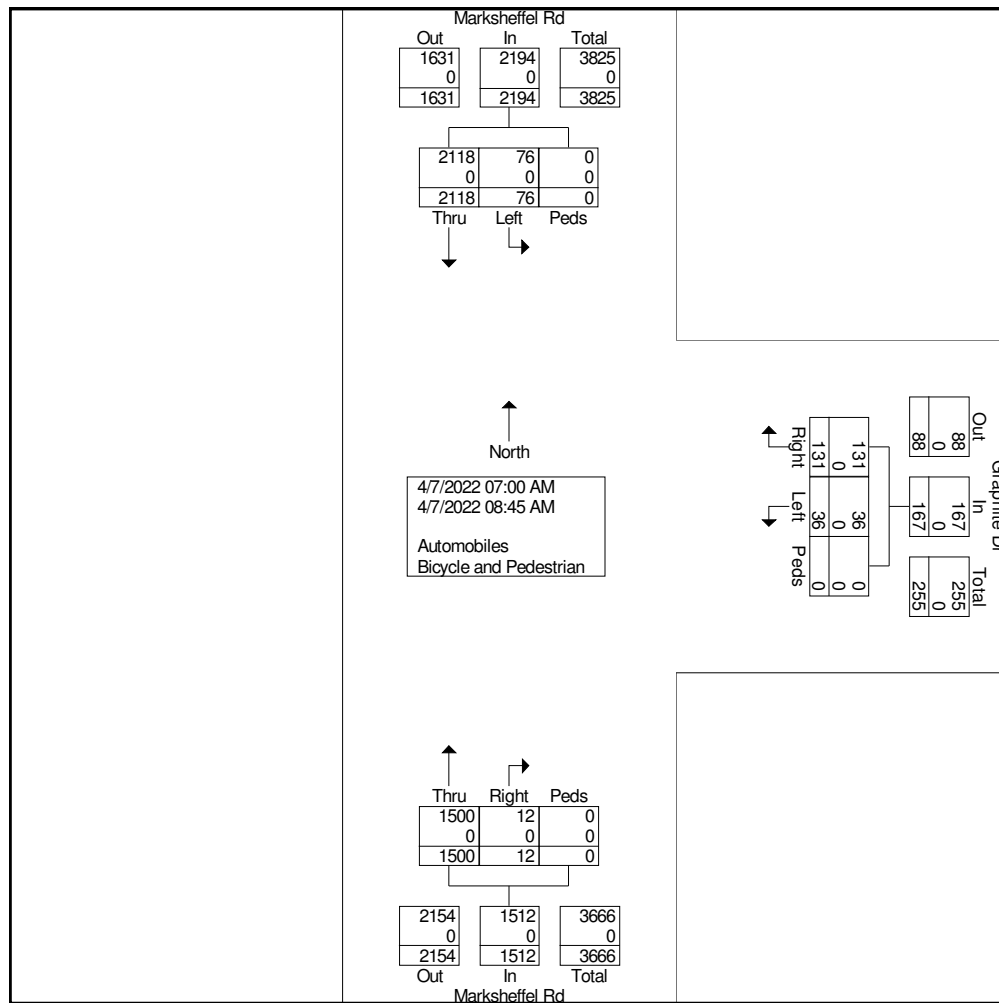
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Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
AM Peak
Graphite Dr and Marksheffel Rd

File Name : Graphite and Marksheffel AM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 2



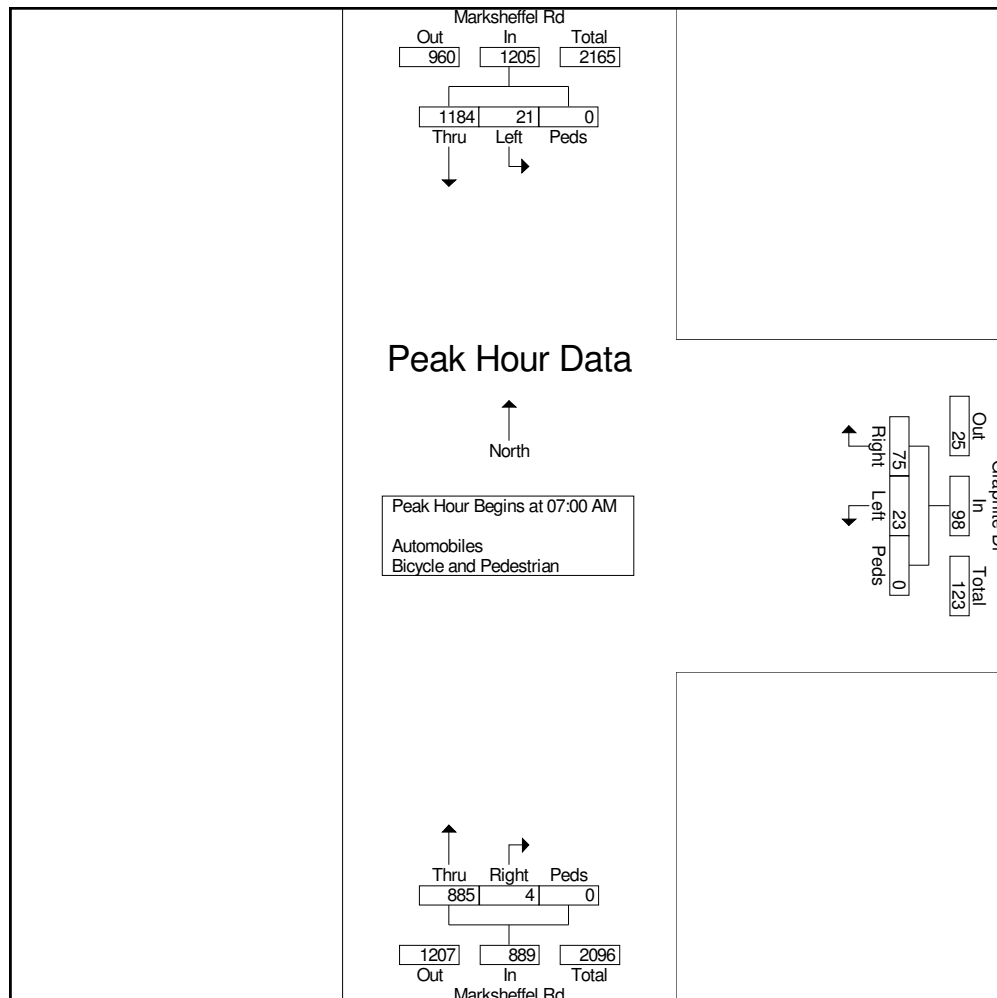


Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
AM Peak
Graphite Dr and Marksheffel Rd

File Name : Graphite and Marksheffel AM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 3

	Graphite Dr Westbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	8	13	0	21	206	2	0	208	3	297	0	300	529
07:15 AM	7	25	0	32	233	2	0	235	5	288	0	293	560
07:30 AM	3	26	0	29	205	0	0	205	5	317	0	322	556
07:45 AM	5	11	0	16	241	0	0	241	8	282	0	290	547
Total Volume	23	75	0	98	885	4	0	889	21	1184	0	1205	2192
% App. Total	23.5	76.5	0		99.6	0.4	0		1.7	98.3	0		
PHF	.719	.721	.000	.766	.918	.500	.000	.922	.656	.934	.000	.936	.979



Colorado Springs, CO
AMH Enclaves at Mountain Vista
PM Peak
Graphite Dr and Marksheffel Rd

File Name : Graphite and Marksheffel PM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

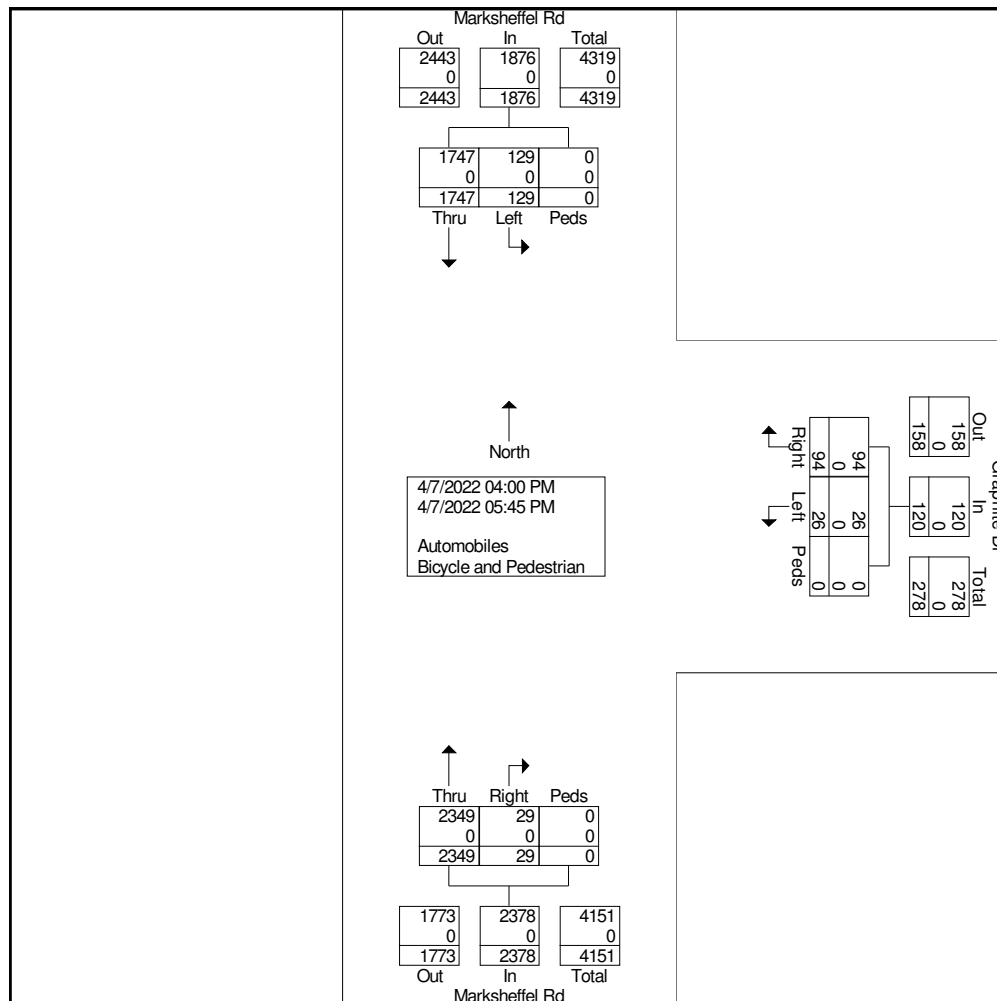
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Ridgeview Data
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Colorado Springs, CO
AMH Enclaves at Mountain Vista
PM Peak
Graphite Dr and Marksheffel Rd

File Name : Graphite and Marksheffel PM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 2



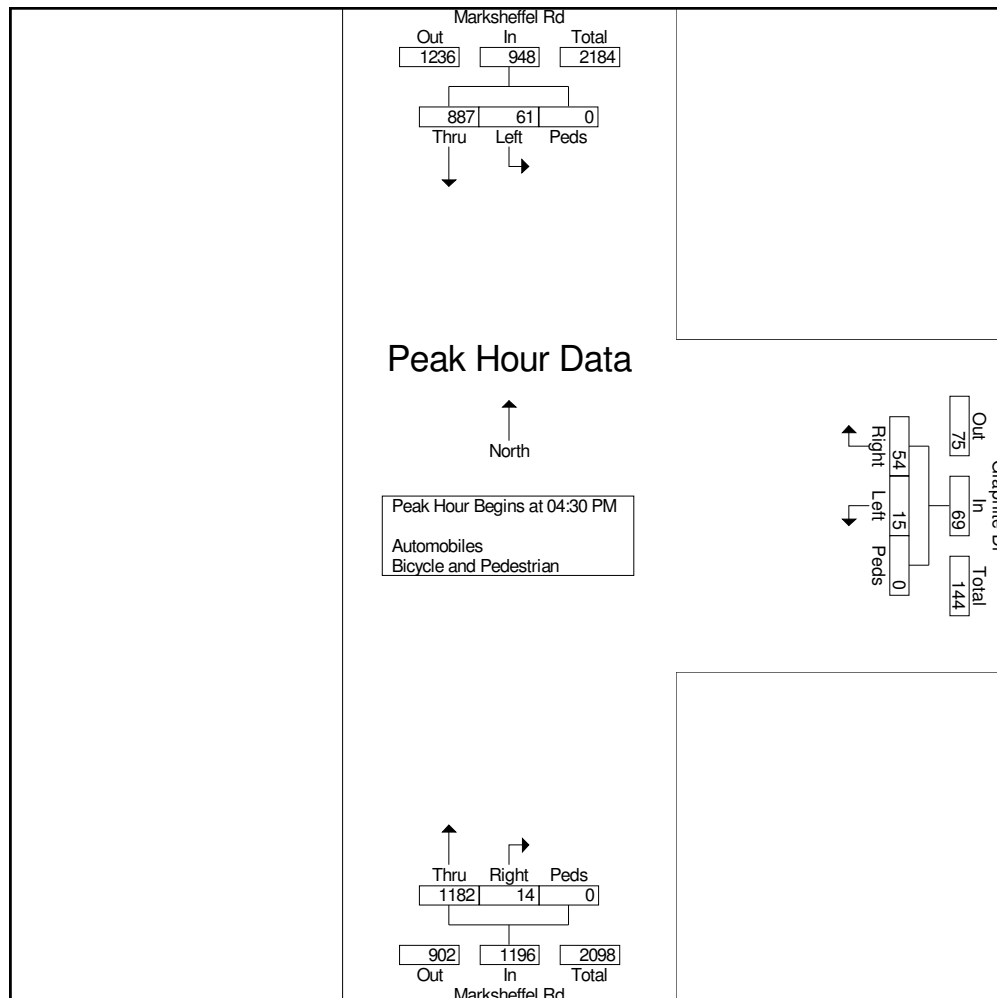


Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
PM Peak
Graphite Dr and Marksheffel Rd

File Name : Graphite and Marksheffel PM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 3

	Graphite Dr Westbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	3	11	0	14	295	3	0	298	14	238	0	252	564
04:45 PM	3	22	0	25	315	1	0	316	15	203	0	218	559
05:00 PM	3	6	0	9	290	6	0	296	11	225	0	236	541
05:15 PM	6	15	0	21	282	4	0	286	21	221	0	242	549
Total Volume	15	54	0	69	1182	14	0	1196	61	887	0	948	2213
% App. Total	21.7	78.3	0		98.8	1.2	0		6.4	93.6	0		
PHF	.625	.614	.000	.690	.938	.583	.000	.946	.726	.932	.000	.940	.981



Colorado Springs, CO
AMH Enclaves at Mountain Vista
AM Peak
Zircon Dr and Marksheffel Rd

File Name : Zircon and Marksheffel AM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

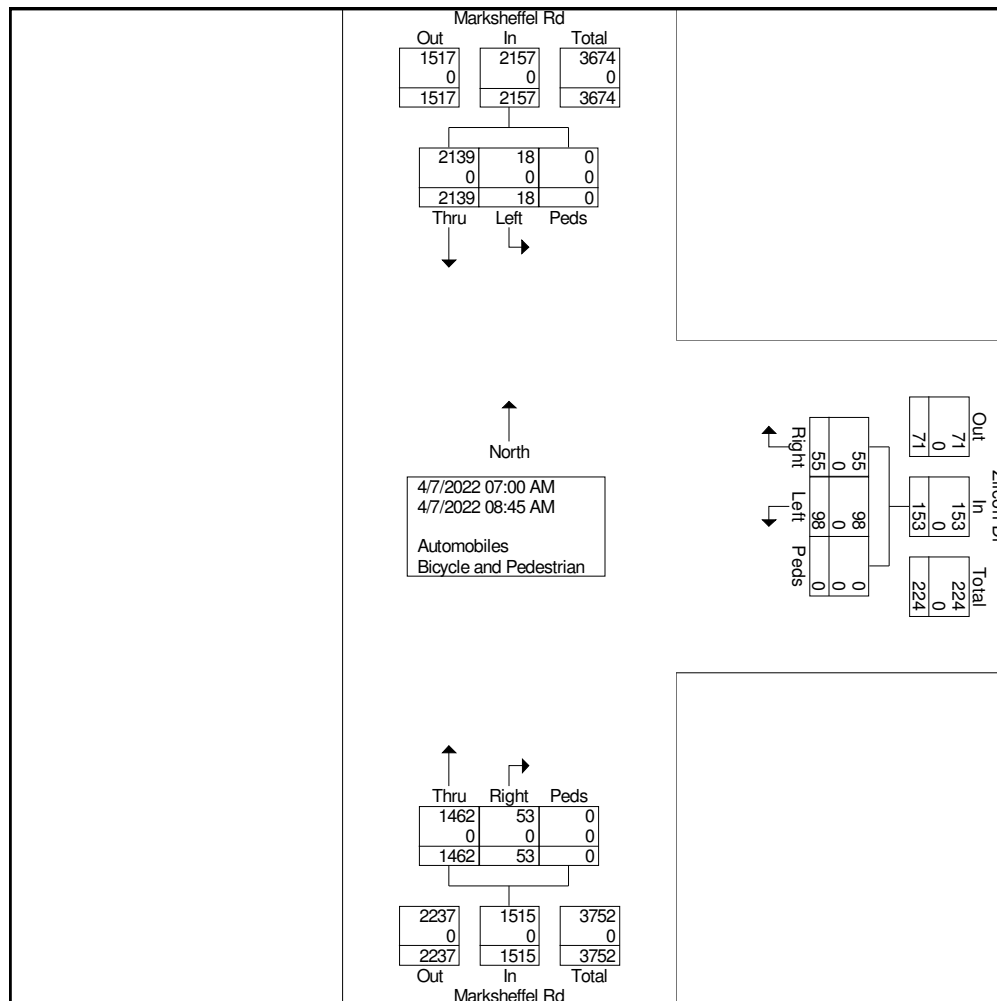
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Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
AM Peak
Zircon Dr and Marksheffel Rd

File Name : Zircon and Marksheffel AM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 2



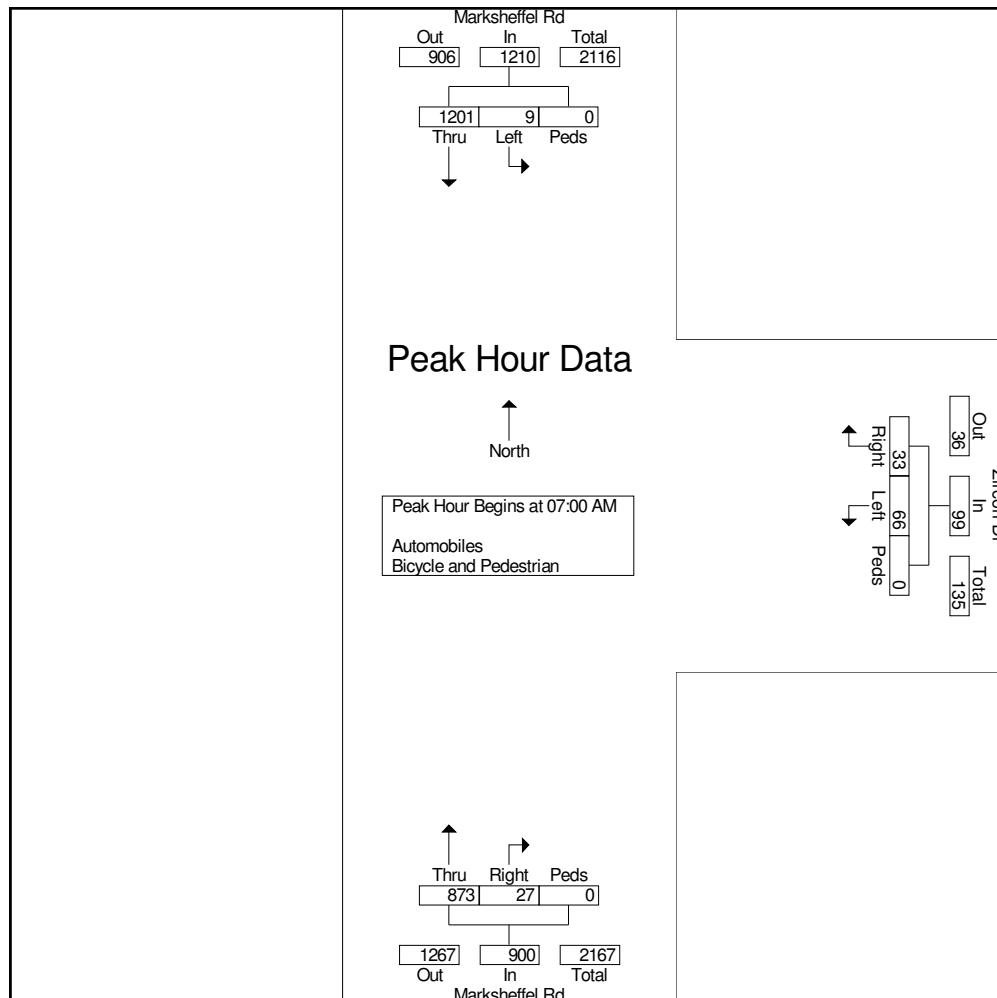


Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
AM Peak
Zircon Dr and Marksheffel Rd

File Name : Zircon and Marksheffel AM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 3

	Zircon Dr Westbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	21	8	0	29	206	5	0	211	3	298	0	301	541
07:15 AM	18	12	0	30	222	4	0	226	1	302	0	303	559
07:30 AM	19	7	0	26	217	4	0	221	2	311	0	313	560
07:45 AM	8	6	0	14	228	14	0	242	3	290	0	293	549
Total Volume	66	33	0	99	873	27	0	900	9	1201	0	1210	2209
% App. Total	66.7	33.3	0		97	3	0		0.7	99.3	0		
PHF	.786	.688	.000	.825	.957	.482	.000	.930	.750	.965	.000	.966	.986



Colorado Springs, CO
AMH Enclaves at Mountain Vista
PM Peak
Zircon Dr and Marksheffel Rd

File Name : Zircon and Marksheffel PM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

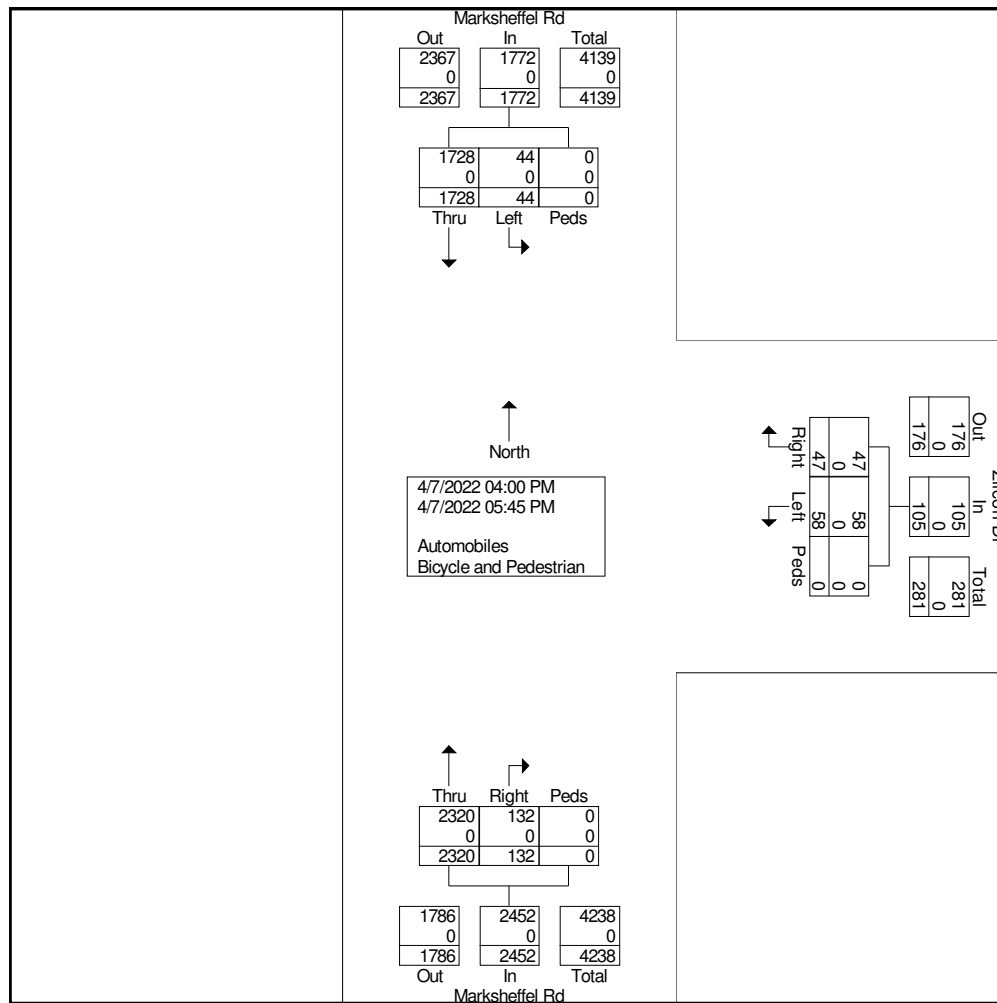
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Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
PM Peak
Zircon Dr and Marksheffel Rd

File Name : Zircon and Marksheffel PM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 2



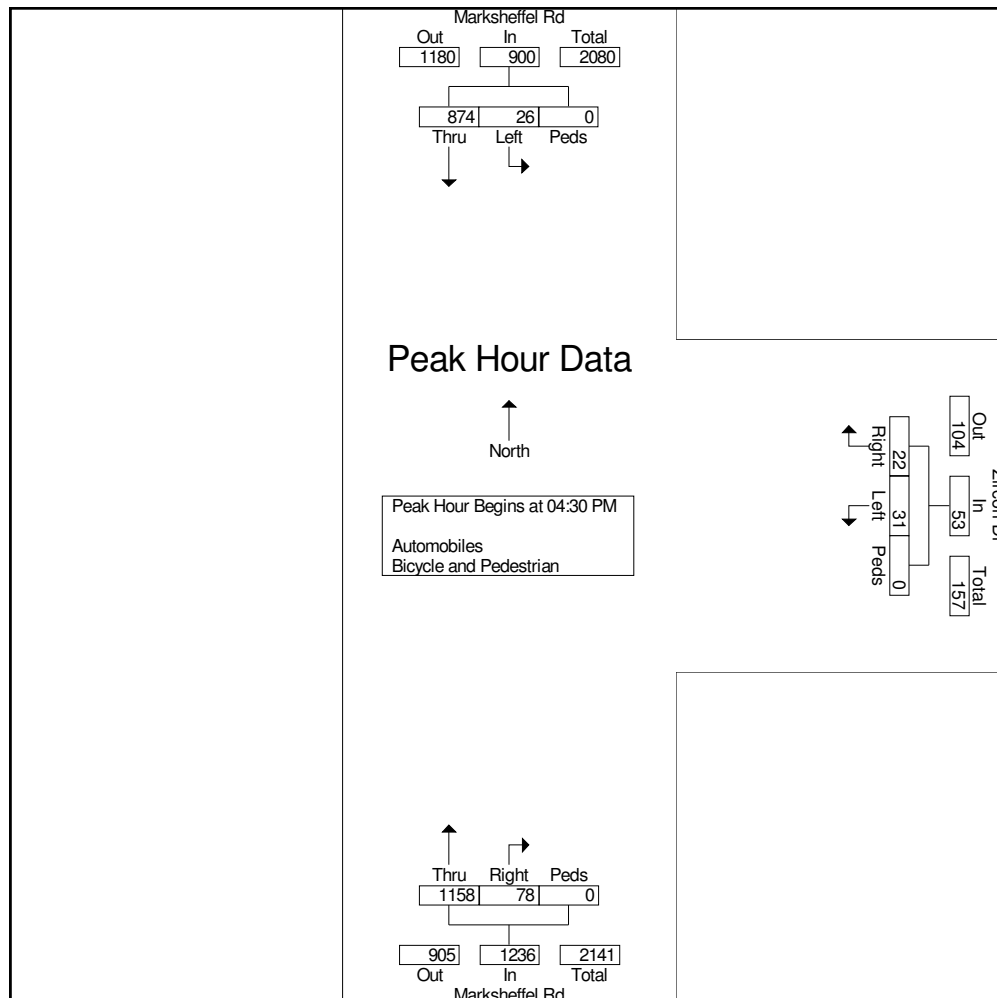


Ridgeview Data
Collection

Colorado Springs, CO
AMH Enclaves at Mountain Vista
PM Peak
Zircon Dr and Marksheffel Rd

File Name : Zircon and Marksheffel PM
Site Code : IPO 600
Start Date : 4/7/2022
Page No : 3

	Zircon Dr Westbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	12	5	0	17	288	25	0	313	7	230	0	237	567
04:45 PM	6	9	0	15	301	25	0	326	8	200	0	208	549
05:00 PM	7	4	0	11	296	13	0	309	4	220	0	224	544
05:15 PM	6	4	0	10	273	15	0	288	7	224	0	231	529
Total Volume	31	22	0	53	1158	78	0	1236	26	874	0	900	2189
% App. Total	58.5	41.5	0		93.7	6.3	0		2.9	97.1	0		
PHF	.646	.611	.000	.779	.962	.780	.000	.948	.813	.950	.000	.949	.965





Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
AM Peak
Carefree Cir and Marksheffel Rd

File Name : Carefree and Marksheffel AM
Site Code : IPO 567
Start Date : 8/17/2021
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

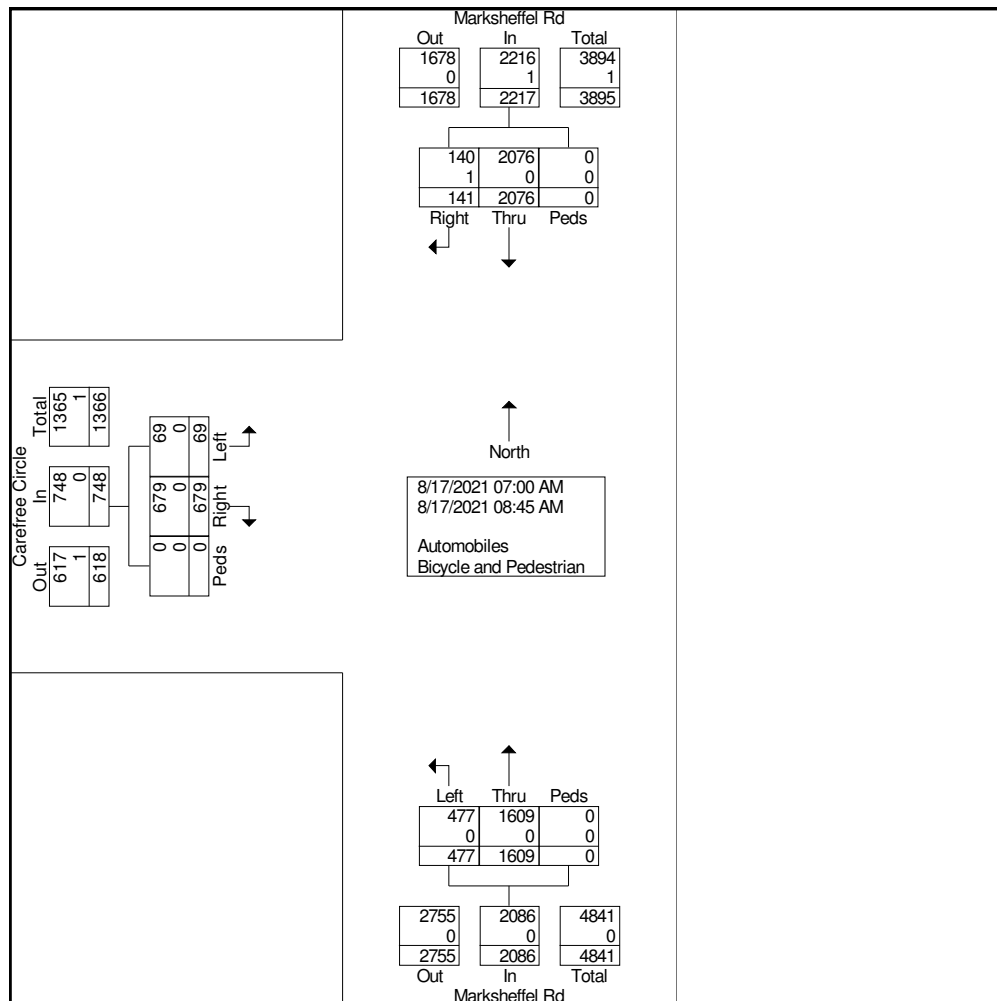
Start Time	Carefree Circle Eastbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				Int. Total
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	
07:00 AM	3	101	0	104	51	214	0	265	307	16	0	323	692
07:15 AM	6	126	0	132	73	245	0	318	306	12	0	318	768
07:30 AM	11	128	0	139	84	240	0	324	279	16	0	295	758
07:45 AM	12	102	0	114	77	234	0	311	280	24	0	304	729
Total	32	457	0	489	285	933	0	1218	1172	68	0	1240	2947
08:00 AM	13	84	0	97	77	209	0	286	270	12	0	282	665
08:15 AM	9	50	0	59	45	167	0	212	242	14	0	256	527
08:30 AM	5	49	0	54	37	159	0	196	242	25	0	267	517
08:45 AM	10	39	0	49	33	141	0	174	150	22	0	172	395
Total	37	222	0	259	192	676	0	868	904	73	0	977	2104
Grand Total	69	679	0	748	477	1609	0	2086	2076	141	0	2217	5051
Apprch %	9.2	90.8	0		22.9	77.1	0		93.6	6.4	0		
Total %	1.4	13.4	0	14.8	9.4	31.9	0	41.3	41.1	2.8	0	43.9	
Automobiles	69	679	0	748	477	1609	0	2086	2076	140	0	2216	5050
% Automobiles	100	100	0	100	100	100	0	100	100	99.3	0	100	100
Bicycle and Pedestrian	0	0	0	0	0	0	0	0	0	1	0	1	1
% Bicycle and Pedestrian	0	0	0	0	0	0	0	0	0	0.7	0	0	0



Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
AM Peak
Carefree Cir and Marksheffel Rd

File Name : Carefree and Marksheffel AM
Site Code : IPO 567
Start Date : 8/17/2021
Page No : 2



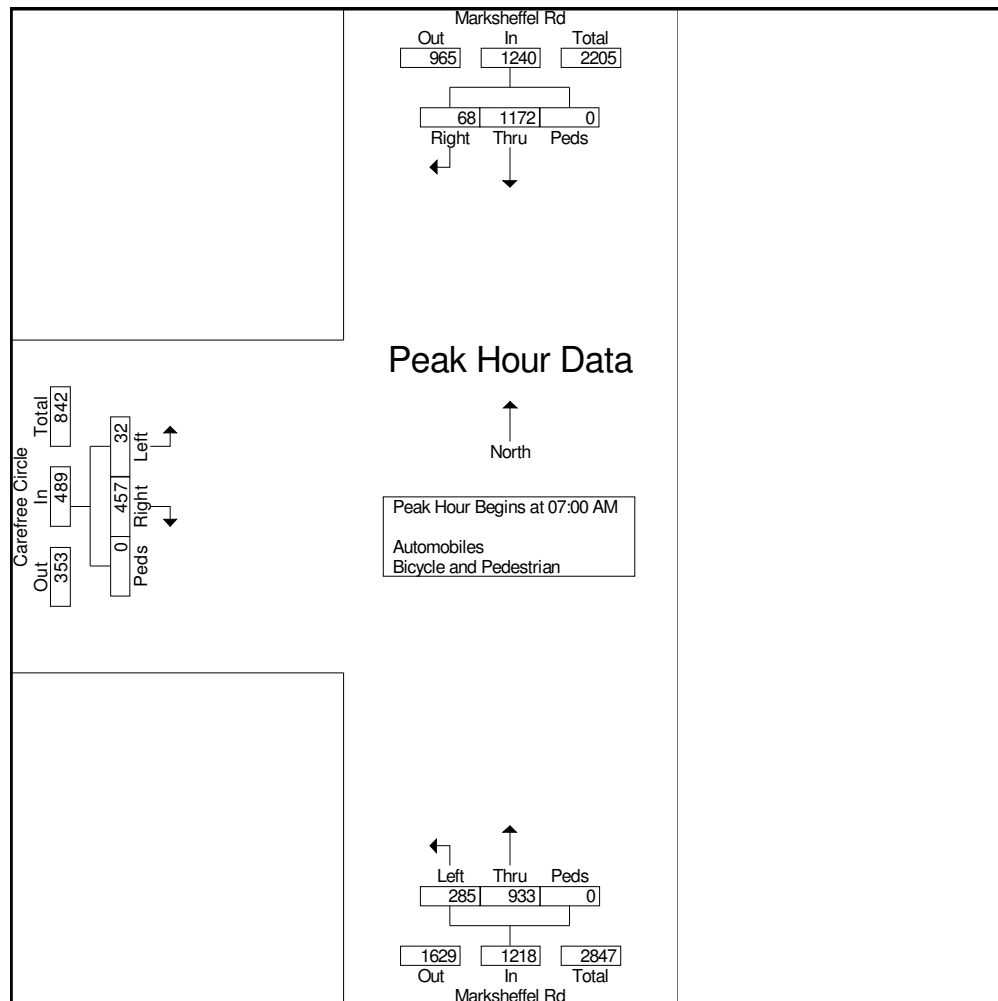


Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
AM Peak
Carefree Cir and Marksheffel Rd

File Name : Carefree and Marksheffel AM
Site Code : IPO 567
Start Date : 8/17/2021
Page No : 3

	Carefree Circle Eastbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	3	101	0	104	51	214	0	265	307	16	0	323	692
07:15 AM	6	126	0	132	73	245	0	318	306	12	0	318	768
07:30 AM	11	128	0	139	84	240	0	324	279	16	0	295	758
07:45 AM	12	102	0	114	77	234	0	311	280	24	0	304	729
Total Volume	32	457	0	489	285	933	0	1218	1172	68	0	1240	2947
% App. Total	6.5	93.5	0		23.4	76.6	0		94.5	5.5	0		
PHF	.667	.893	.000	.879	.848	.952	.000	.940	.954	.708	.000	.960	.959



Colorado Springs, CO
BLR Barnes - Freestyle
PM Peak
Carefree Cir and Marksheffel Rd

File Name : Carefree and Marksheffel PM
Site Code : IPO 567
Start Date : 8/17/2021
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

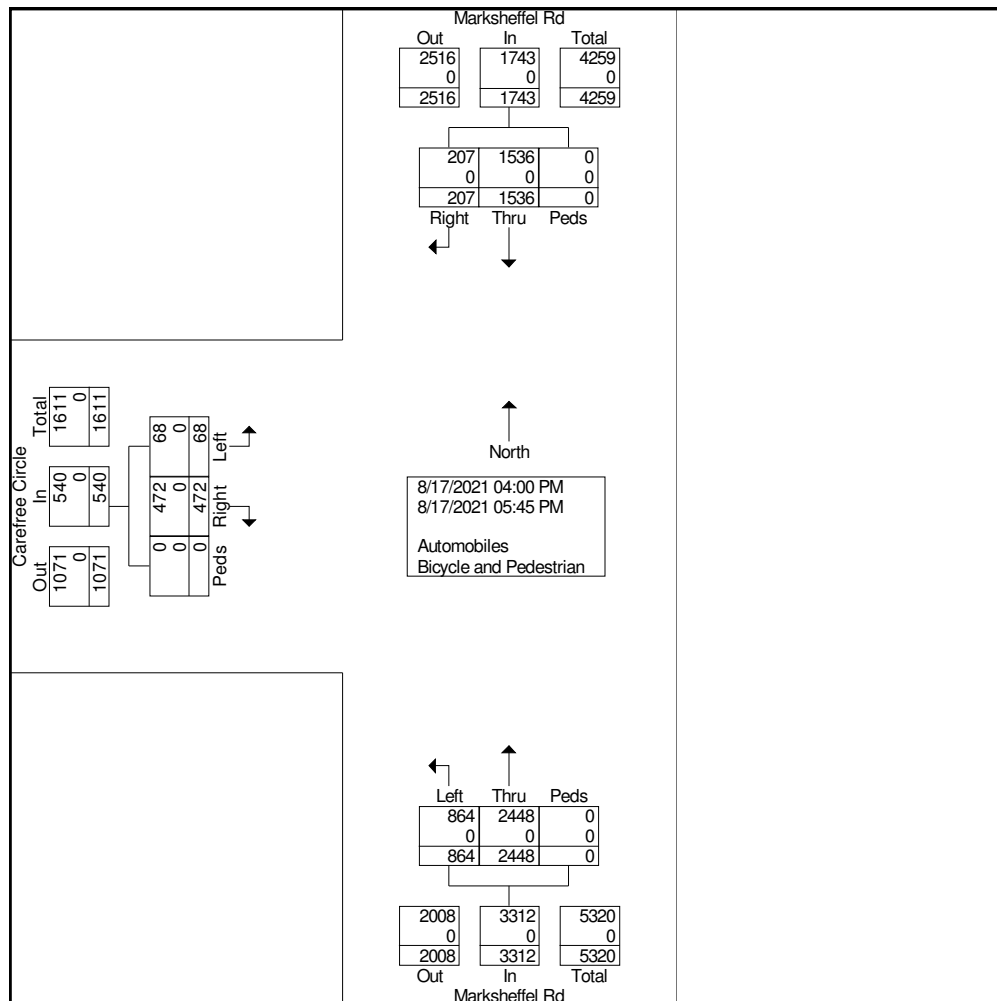
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Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
PM Peak
Carefree Cir and Marksheffel Rd

File Name : Carefree and Marksheffel PM
Site Code : IPO 567
Start Date : 8/17/2021
Page No : 2



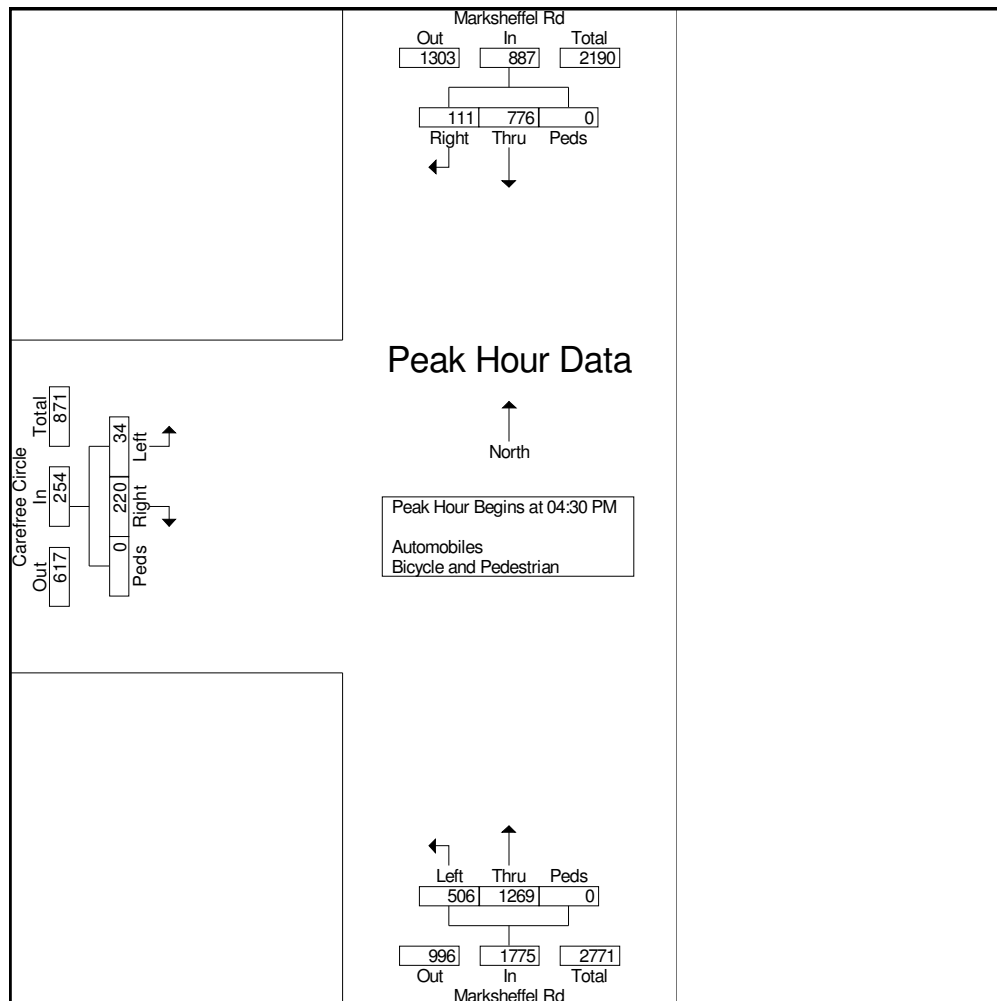


Ridgeview Data
Collection

Colorado Springs, CO
BLR Barnes - Freestyle
PM Peak
Carefree Cir and Marksheffel Rd

File Name : Carefree and Marksheffel PM
Site Code : IPO 567
Start Date : 8/17/2021
Page No : 3

	Carefree Circle Eastbound				Marksheffel Rd Northbound				Marksheffel Rd Southbound				
Start Time	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	8	56	0	64	131	306	0	437	211	32	0	243	744
04:45 PM	10	48	0	58	120	334	0	454	183	25	0	208	720
05:00 PM	6	50	0	56	140	314	0	454	196	24	0	220	730
05:15 PM	10	66	0	76	115	315	0	430	186	30	0	216	722
Total Volume	34	220	0	254	506	1269	0	1775	776	111	0	887	2916
% App. Total	13.4	86.6	0		28.5	71.5	0		87.5	12.5	0		
PHF	.850	.833	.000	.836	.904	.950	.000	.977	.919	.867	.000	.913	.980



APPENDIX B

Future Traffic Projections

Traffic Projections: Mountain Bluffs

Location	Daily Volumes			
	2015	2040	Growth Factor	Annual Growth
Marksheffel Btwn Dublin and Barnes	8,950	12,028	1.34	1.2%
Marksheffel Btwn Barnes and Carefree	8,390	10,381	1.24	0.9%
Marksheffel Bwtm Carefree and SH-24	8,840	12,336	1.40	1.3%
Total (Average)	26,180	34,745	1.33	1.1%

Traffic Impact Study

Enclaves at Mountain Vista East

Colorado Springs, Colorado

Prepared for:

Challenger Homes

Kimley»Horn

T R A F F I C I M P A C T S T U D Y

Enclaves at Mountain Vista East

Colorado Springs, Colorado

**Prepared for
Challenger Homes**

619 North Cascade Avenue
Suite 200
Colorado Springs, CO 80903

**Prepared by
Kimley-Horn and Associates, Inc.**

2 North Nevada Avenue
Suite 300
Colorado Springs, Colorado 80903
(719) 453-0180



April 2022

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FIGURE 7
ENCLAVES AT MOUNTAIN VISTA EAST
COLORADO SPRINGS, COLORADO
2030 TOTAL TRAFFIC VOLUMES

1	<div> <div>220(200)</div> <div>170(120)</div> <div>220(250)</div> </div> <div> <div>130(305)</div> <div>320(1000)</div> <div>435(757)</div> </div> <div> <div>80(120)</div> <div>900(700)</div> <div>270(295)</div> </div> <div> <div>616(516)</div> <div>185(250)</div> <div>155(415)</div> </div>
WOODMEN & MARKSHEFFEL	

5	<div> <div>800(600)</div> <div>189(287)</div> </div> <div> <div>400(860)</div> <div>205(315)</div> </div> <div> <div>305(280)</div> <div>181(224)</div> </div>
WOODMEN & BANNING LEWIS	

2	<div> <div>80(100)</div> <div>510(597)</div> <div>35(55)</div> </div> <div> <div>55(145)</div> <div>75(155)</div> <div>119(172)</div> </div> <div> <div>55(40)</div> <div>160(130)</div> <div>165(135)</div> </div> <div> <div>186(166)</div> <div>551(606)</div> <div>100(220)</div> </div>
DUBLIN & MARKSHEFFEL	

6	<div> <div>60(120)</div> <div>314(462)</div> <div>20(20)</div> </div> <div> <div>10(15)</div> <div>80(50)</div> <div>20(15)</div> </div> <div> <div>35(65)</div> <div>80(50)</div> <div>25(45)</div> </div> <div> <div>15(45)</div> <div>441(424)</div> <div>30(35)</div> </div>
DUBLIN & BANNING LEWIS	

3	<div> <div>125(100)</div> <div>667(778)</div> <div>10(30)</div> </div> <div> <div>85(175)</div> <div>35(80)</div> <div>286(340)</div> </div> <div> <div>50(25)</div> <div>15(35)</div> <div>50(25)</div> </div> <div> <div>336(375)</div> <div>730(795)</div> <div>10(15)</div> </div>
STETSON HILLS & MARKSHEFFEL	

7	<div> <div>14(43)</div> <div>301(414)</div> <div>40(40)</div> </div> <div> <div>27(18)</div> <div>27(23)</div> <div>5(5)</div> </div> <div> <div>25(10)</div> <div>9(38)</div> <div>42(78)</div> </div> <div> <div>5(5)</div> <div>269(337)</div> <div>73(60)</div> </div>
STETSON HILLS & BANNING LEWIS	

4	<div> <div>135(145)</div> <div>580(350)</div> <div>287(660)</div> </div> <div> <div>155(330)</div> <div>224(523)</div> <div>360(425)</div> </div> <div> <div>645(456)</div> <div>422(307)</div> <div>486(397)</div> </div> <div> <div>210(175)</div> <div>275(435)</div> <div>225(510)</div> </div>
BARNES & MARKSHEFFEL	

8	<div> <div>47(110)</div> <div>486(367)</div> <div>67(58)</div> </div> <div> <div>62(66)</div> <div>112(75)</div> <div>283(182)</div> </div> <div> <div>24(43)</div> <div>61(109)</div> <div>10(30)</div> </div> <div> <div>154(297)</div> <div>271(578)</div> <div>30(20)</div> </div>
BARNES & BANNING LEWIS	

9	<div> <div>424(270)</div> <div>5(5)</div> <div>87(56)</div> </div> <div> <div>127(448)</div> <div>666(729)</div> <div>35(156)</div> </div> <div> <div>26(92)</div> <div>696(730)</div> <div>8(14)</div> </div> <div> <div>100(190)</div> <div>5(5)</div> <div>13(10)</div> </div>
WEST ACCESS & BARNES	

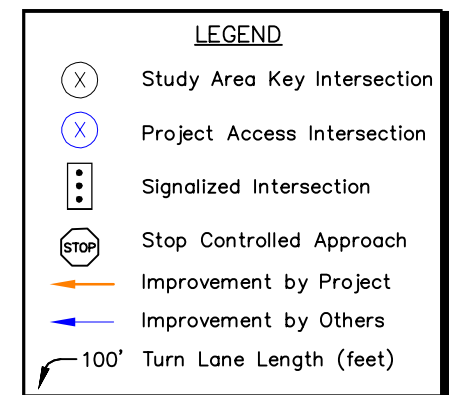
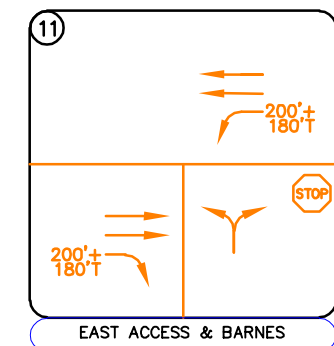
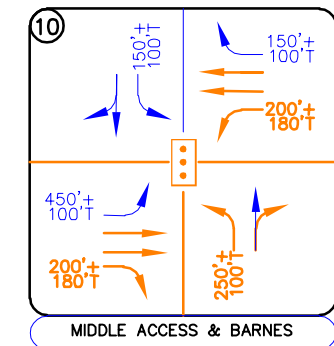
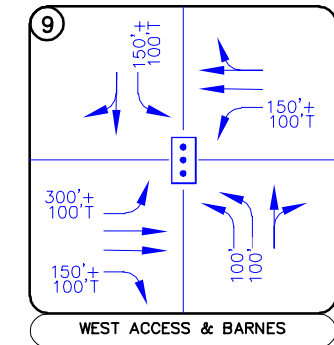
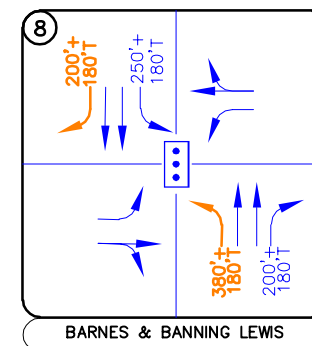
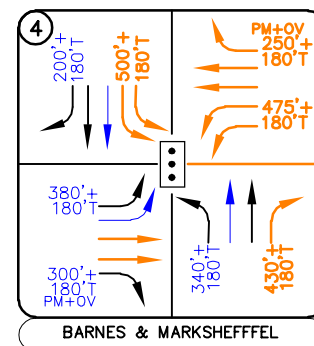
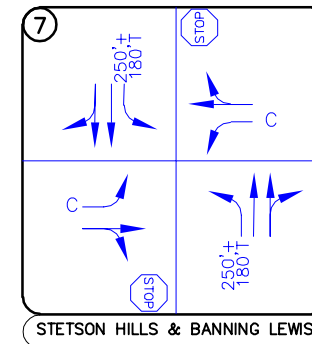
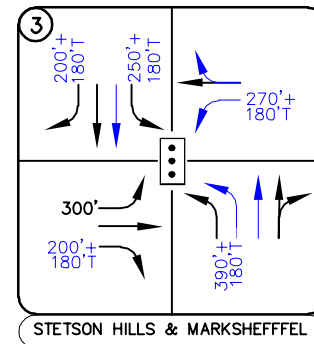
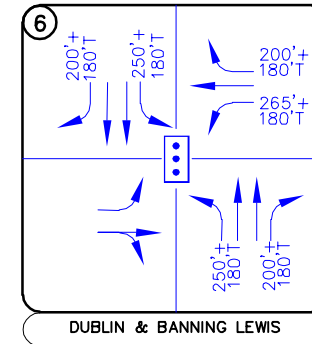
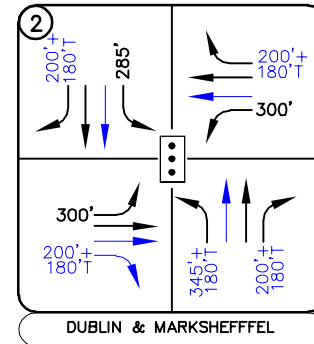
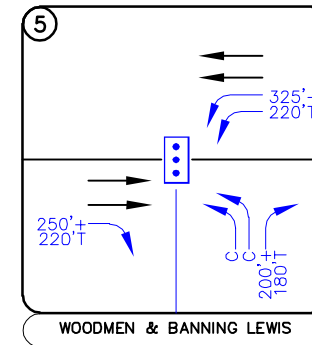
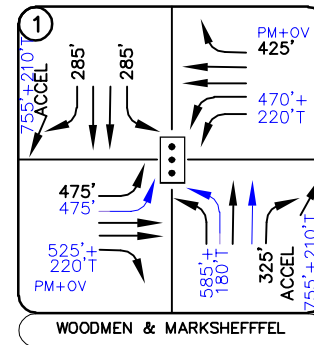
10	<div> <div>557(280)</div> <div>15(20)</div> <div>132(69)</div> </div> <div> <div>337(430)</div> <div>183(286)</div> <div>66(212)</div> </div> <div> <div>101(82)</div> <div>189(266)</div> <div>19(61)</div> </div> <div> <div>153(142)</div> <div>15(20)</div> <div>44(41)</div> </div>
MIDDLE ACCESS & BARNES	

11	<div> <div>156(267)</div> <div>38(121)</div> </div> <div> <div>293(174)</div> <div>66(212)</div> </div> <div> <div>153(142)</div> <div>87(81)</div> </div>
EAST ACCESS & BARNES	

LEGEND	
(X)	Study Area Key Intersection
(X)	Project Access Intersection
XXX(XXX)	Weekday AM(PM) Peak Hour Traffic Volumes
XX,X00	Estimated Daily Traffic Volume



FIGURE 8
MOUNTAIN VISTA EAST
COLORADO SPRINGS, COLORADO
2030 RECOMMENDED GEOMETRY AND CONTROL



APPENDIX C

Trip Generation Worksheets

Project Mountain Bluffs
 Subject Trip Generation for Single-Family Detached Housing
 Designed by MAG Date April 14, 2022 Job No. 196465000
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 11th Edition, Fitted Curve Equations

Land Use Code - Single-Family Detached Housing (210)

Independent Variable - Dwelling Units (X)

$$X = 104$$

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (200 Series Page 220)

$$\begin{aligned} \ln(T) &= 0.91 \ln(X) + 0.12 \\ \ln(T) &= 0.91 * \ln(104) + 0.12 \end{aligned}$$

Directional Distribution: 26% ent. 74% exit.
 T = 78 Average Vehicle Trip Ends
 20 entering 58 exiting

$$20 + 58 = 78$$

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (200 Series Page 221)

$$\begin{aligned} \ln(T) &= 0.94 \ln(X) + 0.27 \\ \ln(T) &= 0.94 * \ln(104) + 0.27 \end{aligned}$$

Directional Distribution: 63% ent. 37% exit.
 T = 103 Average Vehicle Trip Ends
 65 entering 38 exiting

$$65 + 38 = 103$$

Weekday (200 Series Page 219)

$$\begin{aligned} \ln(T) &= 0.92 \ln(X) + 2.68 \\ \ln(T) &= 0.92 * \ln(104) + 2.68 \end{aligned}$$

Directional Distribution: 50% entering, 50% exiting
 T = 1046 Average Vehicle Trip Ends
 523 entering 523 exiting

$$523 + 523 = 1046$$

APPENDIX D

Signal Timing Worksheets

Intersection 558 at Marksheffel Rd and Barnes Rd - Coordination plan 1

4/14/2022 1:17:06 PM

Plan
1

Length
120

Offset 1
40

Offset 2
0

Page
1

Offset 3
0

Offset 4
0

Done modifying

Ring 1 coordinated phase and splits

☒ Phase 2 88

North, through

Green time = 80

☐ Phase 4 32

East, through

Green time = 27

Ring 2 coordinated phase and splits

☐ Phase 5 25

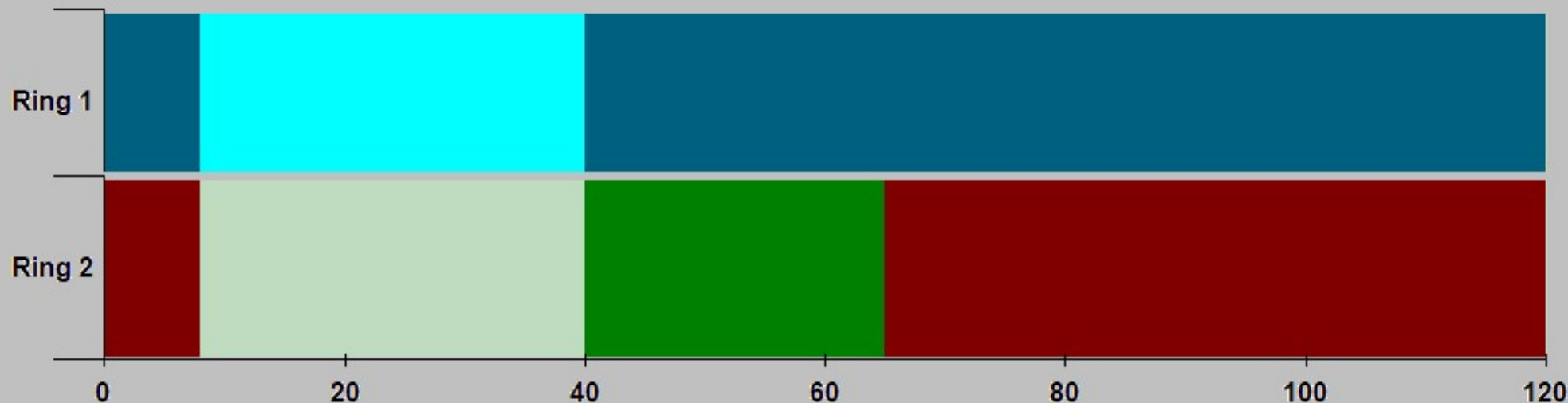
North, left

Green time = 20

☒ Phase 6 63

South, through

Green time = 55



Intersection 558 at Marksheffel Rd and Barnes Rd - Plans schedule

4/14/2022 1:17:20 PM

• Plan Changes

• Page Changes

Week of

4/11/2022

	Mon 04/11	Tue 04/12	Wed 04/13	Thu 04/14	Fri 04/15
12:00am	Free	Free	Free	Free	Free
Cycle len,offset					
6:30am	Plan1,Ofst1	Plan1,Ofst1	Plan1,Ofst1	Plan1,Ofst1	Plan1,Ofst1
Cycle len,offset	120, 40	120, 40	120, 40	120, 40	120, 40
6:30pm	Free	Free	Free	Free	Free
Cycle len,offset					

	Sat 04/16	Sun 04/17
12:00am	Free	Free
Cycle len,offset		
6:30am	Plan1,Ofst1	Plan1,Ofst1
Cycle len,offset	120, 40	120, 40
6:30pm	Free	Free
Cycle len,offset		

Intersection 558 at Marksheffel Rd and Barnes Rd - Timing table

Page 1	Phases											
	1	2	3	4	5	6	7	8	9	10	11	12
Min Green	0	20	0	4	4	20	0	0	0	0	0	0
Passage Time I	0.0	1.0	0.0	3.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Passage Time II	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Green I	0	30	0	20	15	30	0	0	0	0	0	0
Max Green II	0	0	0	0	0	0	0	0	0	0	0	0
Yellow Clearance	0.0	5.5	0.0	3.0	3.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0
Red Clearance	0.0	2.0	0.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Added Initial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Added Initial	0	0	0	0	0	0	0	0	0	0	0	0
Time Before Reduction	0	0	0	0	0	0	0	0	0	0	0	0
Cars Before Reduction	0	0	0	0	0	0	0	0	0	0	0	0
Time To Reduce	0	0	0	0	0	0	0	0	0	0	0	0
Min Passage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Green Time	0	0	0	0	0	0	0	0	0	0	0	0
Red Revert Time	0.0	5.0	0.0	5.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Walk Time	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Clearance	0	0	0	0	0	0	0	0	0	0	0	0
Handicap Walk	0	0	0	0	0	0	0	0	0	0	0	0
Handicap Ped Clearance	0	0	0	0	0	0	0	0	0	0	0	0
Marksheffel Rd		X			X	X						
Barnes Rd				X								
Compass Direction		N		E	N	S						
Through, Turn or XPed		Thru		Thru	Left,prt	Thru						

APPENDIX E













Intersection Analysis Worksheets

Timings

1: Marksheffel Road & Barnes Road

2022 Existing AM

04/26/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	74	211	160	790	978	110
Future Volume (vph)	74	211	160	790	978	110
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	20.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	27.5	27.5	27.5
Total Split (s)	32.0	32.0	25.0	88.0	63.0	63.0
Total Split (%)	26.7%	26.7%	20.8%	73.3%	52.5%	52.5%
Yellow Time (s)	3.0	3.0	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	7.5	7.5	7.5	7.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	10.6	10.6	96.9	96.9	78.3	78.3
Actuated g/C Ratio	0.09	0.09	0.81	0.81	0.65	0.65
v/c Ratio	0.49	0.65	0.54	0.55	0.84	0.11
Control Delay	62.2	15.9	12.8	5.9	25.7	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.2	15.9	12.8	5.9	25.7	2.2
LOS	E	B	B	A	C	A
Approach Delay	27.9			7.1	23.3	
Approach LOS	C			A	C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 17.2

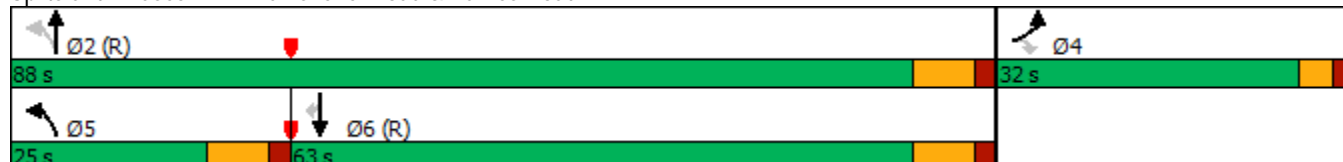
Intersection LOS: B

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



HCM 6th Signalized Intersection Summary

1: Marksheffel Road & Barnes Road

2022 Existing AM

04/26/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	74	211	160	790	978	110
Future Volume (veh/h)	74	211	160	790	978	110
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	77	0	167	823	1019	115
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	100		342	1571	1378	1168
Arrive On Green	0.06	0.00	0.04	0.84	0.74	0.74
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	77	0	167	823	1019	115
Grp Sat Flow(s), veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	5.1	0.0	2.6	15.1	37.8	2.5
Cycle Q Clear(g_c), s	5.1	0.0	2.6	15.1	37.8	2.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	100		342	1571	1378	1168
V/C Ratio(X)	0.77		0.49	0.52	0.74	0.10
Avail Cap(c_a), veh/h	401		529	1571	1378	1168
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.9	0.0	12.8	2.7	9.1	4.5
Incr Delay (d2), s/veh	11.9	0.0	1.1	1.3	3.6	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	2.6	0.0	2.2	4.2	14.5	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	67.8	0.0	13.8	4.0	12.7	4.7
LnGrp LOS	E		B	A	B	A
Approach Vol, veh/h	77	A		990	1134	
Approach Delay, s/veh	67.8			5.7	11.9	
Approach LOS	E			A	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		108.3		11.7	12.4	95.9
Change Period (Y+Rc), s		7.5		5.0	7.5	7.5
Max Green Setting (Gmax), s		80.5		27.0	17.5	55.5
Max Q Clear Time (g_c+l1), s		17.1		7.1	4.6	39.8
Green Ext Time (p_c), s		7.9		0.2	0.3	7.9

Intersection Summary

HCM 6th Ctrl Delay	11.1
HCM 6th LOS	B

Notes













Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Timings

1: Marksheffel Road & Barnes Road

2022 Existing PM

04/26/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	226	145	271	1041	780	160
Future Volume (vph)	226	145	271	1041	780	160
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	20.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	27.5	27.5	27.5
Total Split (s)	32.0	32.0	25.0	88.0	63.0	63.0
Total Split (%)	26.7%	26.7%	20.8%	73.3%	52.5%	52.5%
Yellow Time (s)	3.0	3.0	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	7.5	7.5	7.5	7.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	20.8	20.8	86.7	86.7	61.0	61.0
Actuated g/C Ratio	0.17	0.17	0.72	0.72	0.51	0.51
v/c Ratio	0.77	0.38	0.74	0.81	0.86	0.19
Control Delay	63.1	8.9	32.8	18.4	38.2	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.1	8.9	32.8	18.4	38.2	3.3
LOS	E	A	C	B	D	A
Approach Delay	41.9			21.4	32.2	
Approach LOS	D			C	C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 28.2

Intersection LOS: C

Intersection Capacity Utilization 85.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



HCM 6th Signalized Intersection Summary

1: Marksheffel Road & Barnes Road

2022 Existing PM

04/26/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	226	145	271	1041	780	160
Future Volume (veh/h)	226	145	271	1041	780	160
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	235	0	282	1084	812	167
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	267		373	1396	1133	961
Arrive On Green	0.15	0.00	0.08	0.75	0.61	0.61
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	235	0	282	1084	812	167
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	15.5	0.0	6.8	42.0	36.3	5.6
Cycle Q Clear(g_c), s	15.5	0.0	6.8	42.0	36.3	5.6
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	267		373	1396	1133	961
V/C Ratio(X)	0.88		0.76	0.78	0.72	0.17
Avail Cap(c_a), veh/h	401		494	1396	1133	961
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.0	0.0	18.4	9.2	16.5	10.4
Incr Delay (d2), s/veh	14.0	0.0	4.7	4.3	3.9	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.9	0.0	4.8	16.1	15.9	2.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	64.0	0.0	23.1	13.5	20.4	10.8
LnGrp LOS	E		C	B	C	B
Approach Vol, veh/h	235	A		1366	979	
Approach Delay, s/veh	64.0			15.5	18.7	
Approach LOS	E			B	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		97.0		23.0	16.8	80.2
Change Period (Y+Rc), s		7.5		5.0	7.5	7.5
Max Green Setting (Gmax), s		80.5		27.0	17.5	55.5
Max Q Clear Time (g_c+l1), s		44.0		17.5	8.8	38.3
Green Ext Time (p_c), s		12.6		0.5	0.6	6.3

Intersection Summary

HCM 6th Ctrl Delay	21.1
HCM 6th LOS	C

Notes













Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Timings

1: Marksheffel Road & Barnes Road

2025 Background AM

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	76	218	165	838	1038	114
Future Volume (vph)	76	218	165	838	1038	114
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	20.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	27.5	27.5	27.5
Total Split (s)	32.0	32.0	25.0	88.0	63.0	63.0
Total Split (%)	26.7%	26.7%	20.8%	73.3%	52.5%	52.5%
Yellow Time (s)	3.0	3.0	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	7.5	7.5	7.5	7.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	10.7	10.7	96.8	96.8	77.8	77.8
Actuated g/C Ratio	0.09	0.09	0.81	0.81	0.65	0.65
v/c Ratio	0.50	0.65	0.65	0.58	0.89	0.11
Control Delay	62.2	15.7	28.0	6.5	30.7	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.2	15.7	28.0	6.5	30.7	2.4
LOS	E	B	C	A	C	A
Approach Delay	27.7			10.0	27.9	
Approach LOS	C			B	C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 20.6

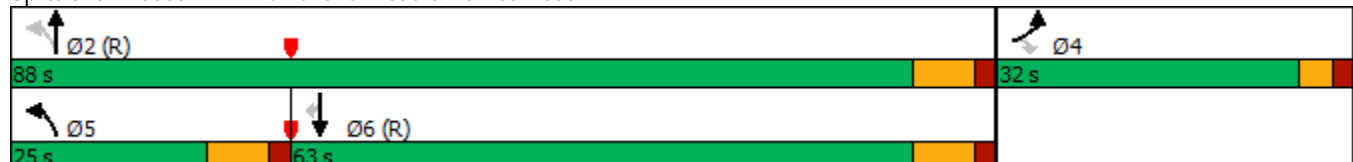
Intersection LOS: C

Intersection Capacity Utilization 84.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



HCM 6th Signalized Intersection Summary

1: Marksheffel Road & Barnes Road

2025 Background AM

04/27/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	76	218	165	838	1038	114
Future Volume (veh/h)	76	218	165	838	1038	114
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	79	0	172	873	1081	119
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	102		307	1568	1374	1164
Arrive On Green	0.06	0.00	0.04	0.84	0.73	0.73
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	79	0	172	873	1081	119
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	5.2	0.0	2.7	17.0	43.7	2.6
Cycle Q Clear(g_c), s	5.2	0.0	2.7	17.0	43.7	2.6
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	102		307	1568	1374	1164
V/C Ratio(X)	0.77		0.56	0.56	0.79	0.10
Avail Cap(c_a), veh/h	401		493	1568	1374	1164
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.8	0.0	16.6	2.9	10.0	4.6
Incr Delay (d2), s/veh	11.7	0.0	1.6	1.4	4.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	2.8	4.7	17.0	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	67.5	0.0	18.2	4.4	14.7	4.8
LnGrp LOS	E		B	A	B	A
Approach Vol, veh/h	79	A		1045	1200	
Approach Delay, s/veh	67.5			6.6	13.7	
Approach LOS	E			A	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		108.1		11.9	12.5	95.6
Change Period (Y+Rc), s		7.5		5.0	7.5	7.5
Max Green Setting (Gmax), s		80.5		27.0	17.5	55.5
Max Q Clear Time (g_c+l1), s		19.0		7.2	4.7	45.7
Green Ext Time (p_c), s		8.8		0.2	0.4	6.1
Intersection Summary						
HCM 6th Ctrl Delay			12.3			
HCM 6th LOS			B			

Notes













Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Timings

1: Marksheffel Road & Barnes Road

2025 Background PM

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	234	150	280	1105	828	165
Future Volume (vph)	234	150	280	1105	828	165
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	20.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	27.5	27.5	27.5
Total Split (s)	32.0	32.0	25.0	88.0	63.0	63.0
Total Split (%)	26.7%	26.7%	20.8%	73.3%	52.5%	52.5%
Yellow Time (s)	3.0	3.0	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	7.5	7.5	7.5	7.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	21.3	21.3	86.2	86.2	59.8	59.8
Actuated g/C Ratio	0.18	0.18	0.72	0.72	0.50	0.50
v/c Ratio	0.78	0.38	0.86	0.86	0.93	0.20
Control Delay	63.5	8.8	56.6	22.2	46.9	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.5	8.8	56.6	22.2	46.9	3.3
LOS	E	A	E	C	D	A
Approach Delay	42.2			29.1	39.7	
Approach LOS	D			C	D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 34.7

Intersection LOS: C

Intersection Capacity Utilization 88.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



HCM 6th Signalized Intersection Summary

1: Marksheffel Road & Barnes Road

2025 Background PM

04/27/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	234	150	280	1105	828	165
Future Volume (veh/h)	234	150	280	1105	828	165
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	244	0	292	1151	862	172
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	275		343	1386	1118	947
Arrive On Green	0.15	0.00	0.08	0.74	0.60	0.60
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	244	0	292	1151	862	172
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	16.1	0.0	7.2	49.7	41.3	5.9
Cycle Q Clear(g_c), s	16.1	0.0	7.2	49.7	41.3	5.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	275		343	1386	1118	947
V/C Ratio(X)	0.89		0.85	0.83	0.77	0.18
Avail Cap(c_a), veh/h	401		458	1386	1118	947
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.7	0.0	22.1	10.5	18.0	10.9
Incr Delay (d2), s/veh	15.1	0.0	11.2	5.9	5.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.3	0.0	6.2	19.5	18.4	2.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	64.8	0.0	33.2	16.3	23.2	11.3
LnGrp LOS	E		C	B	C	B
Approach Vol, veh/h	244	A		1443	1034	
Approach Delay, s/veh	64.8			19.8	21.2	
Approach LOS	E			B	C	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		96.4		23.6	17.2	79.2
Change Period (Y+Rc), s		7.5		5.0	7.5	7.5
Max Green Setting (Gmax), s		80.5		27.0	17.5	55.5
Max Q Clear Time (g_c+l1), s		51.7		18.1	9.2	43.3
Green Ext Time (p_c), s		12.9		0.5	0.6	5.6
Intersection Summary						
HCM 6th Ctrl Delay			24.4			
HCM 6th LOS			C			

Notes













Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Timings

1: Marksheffel Road & Barnes Road

2025 Total AM

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	76	222	177	853	1043	114
Future Volume (vph)	76	222	177	853	1043	114
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	20.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	27.5	27.5	27.5
Total Split (s)	32.0	32.0	25.0	88.0	63.0	63.0
Total Split (%)	26.7%	26.7%	20.8%	73.3%	52.5%	52.5%
Yellow Time (s)	3.0	3.0	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	7.5	7.5	7.5	7.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	10.7	10.7	96.8	96.8	77.1	77.1
Actuated g/C Ratio	0.09	0.09	0.81	0.81	0.64	0.64
v/c Ratio	0.50	0.66	0.70	0.59	0.91	0.11
Control Delay	62.2	15.8	35.4	6.6	32.6	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.2	15.8	35.4	6.6	32.6	2.5
LOS	E	B	D	A	C	A
Approach Delay	27.6			11.6	29.6	
Approach LOS	C			B	C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 21.9

Intersection LOS: C

Intersection Capacity Utilization 85.6%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



HCM 6th Signalized Intersection Summary

2025 Total AM

04/27/2022

1: Marksheffel Road & Barnes Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	76	222	177	853	1043	114
Future Volume (veh/h)	76	222	177	853	1043	114
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	79	0	184	889	1086	119
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	102		306	1568	1370	1161
Arrive On Green	0.06	0.00	0.04	0.84	0.73	0.73
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	79	0	184	889	1086	119
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	5.2	0.0	2.9	17.6	44.5	2.6
Cycle Q Clear(g_c), s	5.2	0.0	2.9	17.6	44.5	2.6
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	102		306	1568	1370	1161
V/C Ratio(X)	0.77		0.60	0.57	0.79	0.10
Avail Cap(c_a), veh/h	401		488	1568	1370	1161
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.8	0.0	17.8	3.0	10.2	4.6
Incr Delay (d2), s/veh	11.7	0.0	1.9	1.5	4.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	3.2	4.9	17.5	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	67.5	0.0	19.7	4.5	15.0	4.8
LnGrp LOS	E		B	A	B	A
Approach Vol, veh/h	79	A		1073	1205	
Approach Delay, s/veh	67.5			7.1	14.0	
Approach LOS	E			A	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		108.1		11.9	12.7	95.4
Change Period (Y+Rc), s		7.5		5.0	7.5	7.5
Max Green Setting (Gmax), s		80.5		27.0	17.5	55.5
Max Q Clear Time (g_c+l1), s		19.6		7.2	4.9	46.5
Green Ext Time (p_c), s		9.1		0.2	0.4	5.8

Intersection Summary

HCM 6th Ctrl Delay	12.7
HCM 6th LOS	B

Notes













Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Timings

1: Marksheffel Road & Barnes Road

2025 Total PM

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	234	163	288	1115	844	165
Future Volume (vph)	234	163	288	1115	844	165
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	20.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	27.5	27.5	27.5
Total Split (s)	32.0	32.0	25.0	88.0	63.0	63.0
Total Split (%)	26.7%	26.7%	20.8%	73.3%	52.5%	52.5%
Yellow Time (s)	3.0	3.0	5.5	5.5	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	7.5	7.5	7.5	7.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	21.3	21.3	86.2	86.2	59.2	59.2
Actuated g/C Ratio	0.18	0.18	0.72	0.72	0.49	0.49
v/c Ratio	0.78	0.40	0.86	0.87	0.96	0.20
Control Delay	63.5	8.7	57.0	22.7	51.7	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.5	8.7	57.0	22.7	51.7	3.3
LOS	E	A	E	C	D	A
Approach Delay	41.0			29.8	43.8	
Approach LOS	D			C	D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 36.4

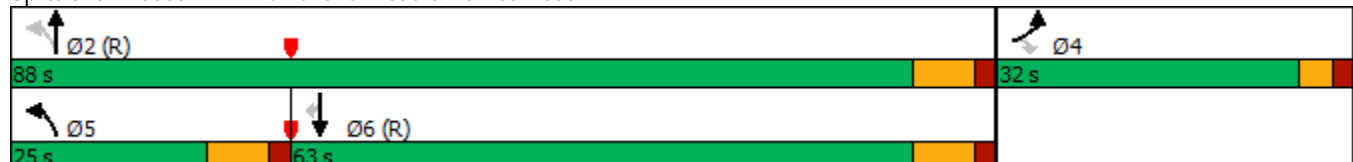
Intersection LOS: D

Intersection Capacity Utilization 90.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



HCM 6th Signalized Intersection Summary

2025 Total PM

04/27/2022

1: Marksheffel Road & Barnes Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	234	163	288	1115	844	165
Future Volume (veh/h)	234	163	288	1115	844	165
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	244	0	300	1161	879	172
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	275		335	1386	1114	944
Arrive On Green	0.15	0.00	0.08	0.74	0.60	0.60
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	244	0	300	1161	879	172
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	16.1	0.0	7.4	50.8	43.0	5.9
Cycle Q Clear(g_c), s	16.1	0.0	7.4	50.8	43.0	5.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	275		335	1386	1114	944
V/C Ratio(X)	0.89		0.89	0.84	0.79	0.18
Avail Cap(c_a), veh/h	401		447	1386	1114	944
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.7	0.0	23.2	10.6	18.5	11.0
Incr Delay (d2), s/veh	15.1	0.0	16.4	6.2	5.7	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.3	0.0	6.8	20.0	19.3	2.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	64.8	0.0	39.6	16.8	24.2	11.4
LnGrp LOS	E		D	B	C	B
Approach Vol, veh/h	244	A		1461	1051	
Approach Delay, s/veh	64.8			21.5	22.1	
Approach LOS	E			C	C	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		96.4		23.6	17.5	79.0
Change Period (Y+Rc), s		7.5		5.0	7.5	7.5
Max Green Setting (Gmax), s		80.5		27.0	17.5	55.5
Max Q Clear Time (g_c+l1), s		52.8		18.1	9.4	45.0
Green Ext Time (p_c), s		12.8		0.5	0.6	5.2

Intersection Summary

HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

























Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Timings

2045 Background AM

1: Marksheffel Road & Barnes Road

04/27/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	225	360	490	425	645	210	275	225	290	580	135
Future Volume (vph)	155	225	360	490	425	645	210	275	225	290	580	135
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	Perm
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8	2		2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	5.0	5.0	5.0	4.0	20.0	5.0	5.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	10.0	23.0	10.0	12.5	27.5	10.0	10.0	27.5	27.5
Total Split (s)	23.0	23.0	26.0	28.0	28.0	40.0	26.0	29.0	28.0	40.0	43.0	43.0
Total Split (%)	19.2%	19.2%	21.7%	23.3%	23.3%	33.3%	21.7%	24.2%	23.3%	33.3%	35.8%	35.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.0	3.0	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.5	5.0	5.0	7.5	7.5
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	C-Max
Act Effect Green (s)	11.0	13.6	31.9	21.8	24.5	53.6	53.7	37.9	67.3	24.1	48.8	48.8
Actuated g/C Ratio	0.09	0.11	0.27	0.18	0.20	0.45	0.45	0.32	0.56	0.20	0.41	0.41
v/c Ratio	0.51	0.61	0.73	0.85	0.64	0.86	0.48	0.26	0.25	0.46	0.42	0.19
Control Delay	57.5	57.0	33.2	61.5	48.0	31.5	18.6	34.8	4.3	42.8	28.2	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	57.0	33.2	61.5	48.0	31.5	18.6	34.8	4.3	42.8	28.2	5.3
LOS	E	E	C	E	D	C	B	C	A	D	C	A
Approach Delay		45.7			45.4			20.1			29.5	
Approach LOS		D			D			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 37.1

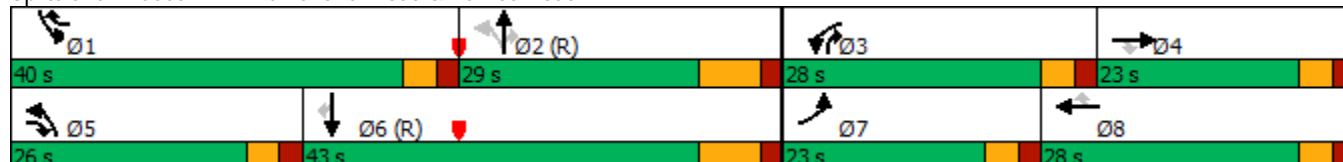
Intersection LOS: D

Intersection Capacity Utilization 75.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



























HCM 6th Signalized Intersection Summary

1: Marksheffel Road & Barnes Road

2045 Background AM

04/27/2022

























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	225	360	490	425	645	210	275	225	290	580	135
Future Volume (veh/h)	155	225	360	490	425	645	210	275	225	290	580	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	161	245	375	533	462	571	219	286	245	315	604	141
Peak Hour Factor	0.96	0.92	0.96	0.92	0.92	0.92	0.96	0.96	0.92	0.92	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	225	533	388	597	916	590	422	1333	869	395	1404	626
Arrive On Green	0.07	0.15	0.15	0.17	0.26	0.26	0.09	0.38	0.38	0.11	0.40	0.40
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	161	245	375	533	462	571	219	286	245	315	604	141
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	5.5	7.6	18.0	18.1	13.3	30.9	8.9	6.6	9.9	10.7	14.9	7.1
Cycle Q Clear(g_c), s	5.5	7.6	18.0	18.1	13.3	30.9	8.9	6.6	9.9	10.7	14.9	7.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	225	533	388	597	916	590	422	1333	869	395	1404	626
V/C Ratio(X)	0.71	0.46	0.97	0.89	0.50	0.97	0.52	0.21	0.28	0.80	0.43	0.23
Avail Cap(c_a), veh/h	518	533	388	662	916	590	566	1333	869	1008	1404	626
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.0	46.6	44.9	48.5	38.0	37.0	20.2	25.5	14.5	51.8	26.4	24.1
Incr Delay (d2), s/veh	4.2	0.6	37.1	13.5	0.4	29.1	1.0	0.4	0.8	3.7	1.0	0.8
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	2.5	3.4	14.9	8.9	5.9	20.9	3.8	2.9	3.7	4.8	6.5	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.2	47.2	82.0	62.1	38.5	66.1	21.2	25.8	15.3	55.5	27.4	24.9
LnGrp LOS	E	D	F	E	D	E	C	C	B	E	C	C
Approach Vol, veh/h	781		1566				750		1060			
Approach Delay, s/veh	66.3		56.6				21.0		35.4			
Approach LOS	E		E				C		D			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.7	52.5	25.7	23.0	16.3	54.9	12.8	35.9				
Change Period (Y+Rc), s	5.0	7.5	5.0	5.0	5.0	7.5	5.0	5.0				
Max Green Setting (Gmax), s	35.0	21.5	23.0	18.0	21.0	35.5	18.0	23.0				
Max Q Clear Time (g_c+l1), s	12.7	11.9	20.1	20.0	10.9	16.9	7.5	32.9				
Green Ext Time (p_c), s	1.1	1.9	0.6	0.0	0.4	4.4	0.3	0.0				
Intersection Summary												
HCM 6th Ctrl Delay	46.6											
HCM 6th LOS	D											
Notes												

Timings

2045 Background PM

1: Marksheffel Road & Barnes Road

04/27/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	525	425	400	310	460	175	435	510	660	350	145
Future Volume (vph)	330	525	425	400	310	460	175	435	510	660	350	145
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	Perm
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8	2		2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	5.0	5.0	5.0	4.0	20.0	5.0	5.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	10.5	23.5	10.5	12.5	27.5	10.5	10.5	27.5	27.5
Total Split (s)	23.0	27.0	31.0	29.0	33.0	35.0	31.0	29.0	29.0	35.0	33.0	33.0
Total Split (%)	19.2%	22.5%	25.8%	24.2%	27.5%	29.2%	25.8%	24.2%	24.2%	29.2%	27.5%	27.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.0	3.0	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.5	5.0	5.0	7.5	7.5
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	C-Max
Act Effect Green (s)	16.3	22.3	41.0	20.9	27.0	60.8	41.6	25.4	53.9	28.8	40.6	40.6
Actuated g/C Ratio	0.14	0.19	0.34	0.17	0.22	0.51	0.35	0.21	0.45	0.24	0.34	0.34
v/c Ratio	0.74	0.87	0.71	0.73	0.42	0.59	0.42	0.60	0.74	0.87	0.30	0.24
Control Delay	59.8	62.3	29.5	54.0	41.4	19.8	20.6	47.8	36.5	55.9	32.2	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.8	62.3	29.5	54.0	41.4	19.8	20.6	47.8	36.5	55.9	32.2	6.0
LOS	E	E	C	D	D	B	C	D	D	E	C	A
Approach Delay		51.0			37.2			38.3			42.8	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 42.5









Intersection LOS: D

Intersection Capacity Utilization 80.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road

























			
Ø1	Ø2 (R)	Ø3	Ø4
35 s	29 s	29 s	27 s
			
Ø5	Ø6 (R)	Ø7	Ø8
31 s	33 s	23 s	33 s

HCM 6th Signalized Intersection Summary

2045 Background PM

1: Marksheffel Road & Barnes Road

04/27/2022

























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	330	525	425	400	310	460	175	435	510	660	350	145
Future Volume (veh/h)	330	525	425	400	310	460	175	435	510	660	350	145
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	344	571	443	435	337	500	182	453	554	717	365	151
Peak Hour Factor	0.96	0.92	0.96	0.92	0.92	0.92	0.96	0.96	0.92	0.92	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	409	725	476	510	829	731	437	827	603	788	1296	578
Arrive On Green	0.12	0.20	0.20	0.15	0.23	0.23	0.10	0.23	0.23	0.23	0.36	0.36
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	344	571	443	435	337	500	182	453	554	717	365	151
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	11.7	18.3	24.5	14.7	9.6	28.0	9.2	13.5	27.9	24.3	8.7	8.0
Cycle Q Clear(g_c), s	11.7	18.3	24.5	14.7	9.6	28.0	9.2	13.5	27.9	24.3	8.7	8.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	409	725	476	510	829	731	437	827	603	788	1296	578
V/C Ratio(X)	0.84	0.79	0.93	0.85	0.41	0.68	0.42	0.55	0.92	0.91	0.28	0.26
Avail Cap(c_a), veh/h	518	725	476	691	829	731	652	827	603	864	1296	578
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.8	45.3	40.8	49.9	39.0	25.4	30.1	40.5	35.4	45.1	27.0	26.8
Incr Delay (d2), s/veh	9.7	5.8	25.1	7.7	0.3	2.6	0.6	2.6	21.3	12.8	0.5	1.1
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	5.6	8.6	15.9	6.9	4.3	11.5	4.0	6.2	18.7	11.7	3.8	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.5	51.1	65.8	57.6	39.3	28.1	30.7	43.1	56.8	57.9	27.5	27.9
LnGrp LOS	E	D	E	E	D	C	C	D	E	E	C	C
Approach Vol, veh/h	1358			1272			1189			1233		
Approach Delay, s/veh	58.5			41.1			47.6			45.3		
Approach LOS	E			D			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	32.4	35.4	22.7	29.5	16.5	51.2	19.2	33.0				
Change Period (Y+Rc), s	5.0	7.5	5.0	5.0	5.0	7.5	5.0	5.0				
Max Green Setting (Gmax), s	30.0	21.5	24.0	22.0	26.0	25.5	18.0	28.0				
Max Q Clear Time (g_c+l1), s	26.3	29.9	16.7	26.5	11.2	10.7	13.7	30.0				
Green Ext Time (p_c), s	1.1	0.0	1.0	0.0	0.4	2.5	0.5	0.0				
Intersection Summary												
HCM 6th Ctrl Delay	48.3											
HCM 6th LOS	D											

Timings

1: Marksheffel Road & Barnes Road

2045 Total AM

04/27/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	225	364	490	425	645	225	290	225	290	585	135
Future Volume (vph)	155	225	364	490	425	645	225	290	225	290	585	135
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	Perm
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8	2		2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	5.0	5.0	5.0	4.0	20.0	5.0	5.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	10.0	23.0	10.0	12.5	27.5	10.0	10.0	27.5	27.5
Total Split (s)	23.0	23.0	26.0	28.0	28.0	40.0	26.0	29.0	28.0	40.0	43.0	43.0
Total Split (%)	19.2%	19.2%	21.7%	23.3%	23.3%	33.3%	21.7%	24.2%	23.3%	33.3%	35.8%	35.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.0	3.0	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.5	5.0	5.0	7.5	7.5
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	C-Max
Act Effect Green (s)	11.0	13.6	32.5	21.8	24.5	53.9	54.0	37.6	67.0	24.4	48.2	48.2
Actuated g/C Ratio	0.09	0.11	0.27	0.18	0.20	0.45	0.45	0.31	0.56	0.20	0.40	0.40
v/c Ratio	0.51	0.61	0.72	0.85	0.64	0.86	0.50	0.27	0.25	0.45	0.43	0.20
Control Delay	57.5	57.0	32.8	61.5	48.0	31.9	18.3	35.4	7.6	42.6	28.8	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	57.0	32.8	61.5	48.0	31.9	18.3	35.4	7.6	42.6	28.8	5.4
LOS	E	E	C	E	D	C	B	D	A	D	C	A
Approach Delay		45.4			45.6			21.6			29.8	
Approach LOS		D			D			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 37.3

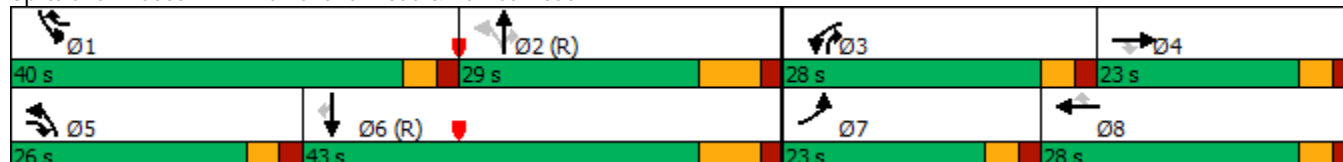
Intersection LOS: D

Intersection Capacity Utilization 75.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



























HCM 6th Signalized Intersection Summary

2045 Total AM

1: Marksheffel Road & Barnes Road

04/27/2022

























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	225	364	490	425	645	225	290	225	290	585	135
Future Volume (veh/h)	155	225	364	490	425	645	225	290	225	290	585	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	161	245	379	533	462	571	234	302	245	315	609	141
Peak Hour Factor	0.96	0.92	0.96	0.92	0.92	0.92	0.96	0.96	0.92	0.92	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	225	533	396	597	916	590	426	1333	869	395	1385	618
Arrive On Green	0.07	0.15	0.15	0.17	0.26	0.26	0.10	0.38	0.38	0.11	0.39	0.39
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	161	245	379	533	462	571	234	302	245	315	609	141
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	5.5	7.6	18.0	18.1	13.3	30.9	9.5	7.0	9.9	10.7	15.1	7.1
Cycle Q Clear(g_c), s	5.5	7.6	18.0	18.1	13.3	30.9	9.5	7.0	9.9	10.7	15.1	7.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	225	533	396	597	916	590	426	1333	869	395	1385	618
V/C Ratio(X)	0.71	0.46	0.96	0.89	0.50	0.97	0.55	0.23	0.28	0.80	0.44	0.23
Avail Cap(c_a), veh/h	518	533	396	662	916	590	559	1333	869	1008	1385	618
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.0	46.6	44.4	48.5	38.0	37.0	20.1	25.6	14.5	51.8	27.0	24.5
Incr Delay (d2), s/veh	4.2	0.6	34.2	13.5	0.4	29.1	1.1	0.4	0.8	3.7	1.0	0.9
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	2.5	3.4	14.8	8.9	5.9	20.9	4.1	3.0	3.7	4.8	6.6	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.2	47.2	78.5	62.1	38.5	66.1	21.3	26.0	15.3	55.5	28.0	25.4
LnGrp LOS	E	D	E	E	D	E	C	C	B	E	C	C
Approach Vol, veh/h	785				1566				781			
Approach Delay, s/veh	64.8				56.6				21.2			
Approach LOS	E				E				C			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.7	52.5	25.7	23.0	17.0	54.3	12.8	35.9				
Change Period (Y+Rc), s	5.0	7.5	5.0	5.0	5.0	7.5	5.0	5.0				
Max Green Setting (Gmax), s	35.0	21.5	23.0	18.0	21.0	35.5	18.0	23.0				
Max Q Clear Time (g_c+l1), s	12.7	11.9	20.1	20.0	11.5	17.1	7.5	32.9				
Green Ext Time (p_c), s	1.1	2.0	0.6	0.0	0.5	4.5	0.3	0.0				
Intersection Summary												
HCM 6th Ctrl Delay	46.2											
HCM 6th LOS	D											
Notes												

Timings

1: Marksheffel Road & Barnes Road

2045 Total PM

04/27/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	525	440	400	310	460	185	445	510	660	370	145
Future Volume (vph)	330	525	440	400	310	460	185	445	510	660	370	145
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	Perm
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8	2		2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	5.0	5.0	5.0	4.0	20.0	5.0	5.0	20.0	20.0
Minimum Split (s)	23.0	23.0	12.5	10.5	23.5	10.5	12.5	27.5	10.5	10.5	27.5	27.5
Total Split (s)	23.0	27.0	31.0	29.0	33.0	35.0	31.0	29.0	29.0	35.0	33.0	33.0
Total Split (%)	19.2%	22.5%	25.8%	24.2%	27.5%	29.2%	25.8%	24.2%	24.2%	29.2%	27.5%	27.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.0	3.0	5.5	5.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.5	5.0	5.0	7.5	7.5
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	C-Max
Act Effect Green (s)	16.3	22.3	41.5	20.9	27.0	60.8	42.2	25.4	53.9	28.8	40.0	40.0
Actuated g/C Ratio	0.14	0.19	0.35	0.17	0.22	0.51	0.35	0.21	0.45	0.24	0.33	0.33
v/c Ratio	0.74	0.87	0.72	0.73	0.42	0.59	0.44	0.62	0.74	0.87	0.33	0.24
Control Delay	59.8	62.3	30.2	54.0	41.4	19.8	20.7	48.1	36.0	55.9	33.0	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.8	62.3	30.2	54.0	41.4	19.8	20.7	48.1	36.0	55.9	33.0	6.2
LOS	E	E	C	D	D	B	C	D	D	E	C	A
Approach Delay		51.0			37.2			38.2			42.9	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 42.5

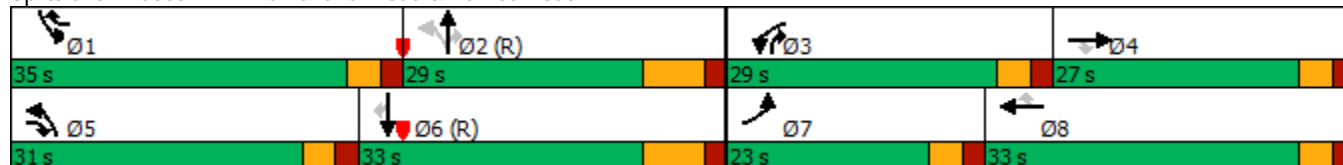
Intersection LOS: D

Intersection Capacity Utilization 80.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Marksheffel Road & Barnes Road



























HCM 6th Signalized Intersection Summary

2045 Total PM

1: Marksheffel Road & Barnes Road

04/27/2022






												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	330	525	440	400	310	460	185	445	510	660	370	145
Future Volume (veh/h)	330	525	440	400	310	460	185	445	510	660	370	145
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	344	571	458	435	337	500	193	464	554	717	385	151
Peak Hour Factor	0.96	0.92	0.96	0.92	0.92	0.92	0.96	0.96	0.92	0.92	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	409	725	484	510	829	731	442	827	603	788	1278	570
Arrive On Green	0.12	0.20	0.20	0.15	0.23	0.23	0.10	0.23	0.23	0.23	0.36	0.36
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	1781	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	344	571	458	435	337	500	193	464	554	717	385	151
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1781	1777	1585	1728	1777	1585
Q Serve(g_s), s	11.7	18.3	24.5	14.7	9.6	28.0	9.7	13.8	27.9	24.3	9.3	8.1
Cycle Q Clear(g_c), s	11.7	18.3	24.5	14.7	9.6	28.0	9.7	13.8	27.9	24.3	9.3	8.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	409	725	484	510	829	731	442	827	603	788	1278	570
V/C Ratio(X)	0.84	0.79	0.95	0.85	0.41	0.68	0.44	0.56	0.92	0.91	0.30	0.26
Avail Cap(c_a), veh/h	518	725	484	691	829	731	648	827	603	864	1278	570
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.8	45.3	40.7	49.9	39.0	25.4	29.9	40.6	35.4	45.1	27.6	27.2
Incr Delay (d2), s/veh	9.7	5.8	28.0	7.7	0.3	2.6	0.7	2.7	21.3	12.8	0.6	1.1
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	5.6	8.6	16.8	6.9	4.3	11.5	4.3	6.4	18.7	11.7	4.1	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.5	51.1	68.7	57.6	39.3	28.1	30.5	43.4	56.8	57.9	28.2	28.3
LnGrp LOS	E	D	E	E	D	C	C	D	E	E	C	C
Approach Vol, veh/h	1373			1272			1211			1253		
Approach Delay, s/veh	59.6			41.1			47.5			45.2		
Approach LOS	E			D			D			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	32.4	35.4	22.7	29.5	17.1	50.7	19.2	33.0				
Change Period (Y+Rc), s	5.0	7.5	5.0	5.0	5.0	7.5	5.0	5.0				
Max Green Setting (Gmax), s	30.0	21.5	24.0	22.0	26.0	25.5	18.0	28.0				
Max Q Clear Time (g_c+l1), s	26.3	29.9	16.7	26.5	11.7	11.3	13.7	30.0				
Green Ext Time (p_c), s	1.1	0.0	1.0	0.0	0.4	2.6	0.5	0.0				
Intersection Summary												
HCM 6th Ctrl Delay	48.6											
HCM 6th LOS	D											

HCM 6th TWSC
2: Marksheffel Road & Graphite Drive

2022 Existing AM
04/27/2022

Intersection

Int Delay, s/veh 1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	23	75	885	4	21	1184
Future Vol, veh/h	23	75	885	4	21	1184
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	77	903	4	21	1208






Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	2153	903	0
Stage 1	903	-	-
Stage 2	1250	-	-
Critical Hdwy	6.42	6.22	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	-
Pot Cap-1 Maneuver	53	336	-
Stage 1	396	-	-
Stage 2	270	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	52	336	-
Mov Cap-2 Maneuver	211	-	-
Stage 1	396	-	-
Stage 2	262	-	-






Approach	WB	NB	SB
HCM Control Delay, s	23.3	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	295	750
HCM Lane V/C Ratio	-	-	0.339	0.029
HCM Control Delay (s)	-	-	23.3	9.9
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	1.5	0.1

HCM 6th TWSC
2: Marksheffel Road & Graphite Drive

2022 Existing PM
04/27/2022






Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	54	1192	14	61	887
Future Vol, veh/h	15	54	1192	14	61	887
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	55	1216	14	62	905
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	2245	1216	0	0	1230	0
Stage 1	1216	-	-	-	-	-
Stage 2	1029	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	46	221	-	-	567	-
Stage 1	280	-	-	-	-	-
Stage 2	345	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	41	221	-	-	567	-
Mov Cap-2 Maneuver	198	-	-	-	-	-
Stage 1	280	-	-	-	-	-
Stage 2	307	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	29.5	0	0.8			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	216	567	-	
HCM Lane V/C Ratio	-	-	0.326	0.11	-	
HCM Control Delay (s)	-	-	29.5	12.1	-	
HCM Lane LOS	-	-	D	B	-	
HCM 95th %tile Q(veh)	-	-	1.4	0.4	-	

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	37	78	952	12	24	1291
Future Vol, veh/h	37	78	952	12	24	1291
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	80	971	12	24	1317
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	2336	971	0	0	983	0
Stage 1	971	-	-	-	-	-
Stage 2	1365	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	40	307	-	-	703	-
Stage 1	367	-	-	-	-	-
Stage 2	237	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	39	307	-	-	703	-
Mov Cap-2 Maneuver	186	-	-	-	-	-
Stage 1	367	-	-	-	-	-
Stage 2	229	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	30.8	0	0.2			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	254	703	-	
HCM Lane V/C Ratio	-	-	0.462	0.035	-	
HCM Control Delay (s)	-	-	30.8	10.3	-	
HCM Lane LOS	-	-	D	B	-	
HCM 95th %tile Q(veh)	-	-	2.3	0.1	-	

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑	↑	↔	↑
Traffic Vol, veh/h	23	56	1306	47	69	965
Future Vol, veh/h	23	56	1306	47	69	965
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	57	1333	48	70	985
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	2458	1333	0	0	1381	0
Stage 1	1333	-	-	-	-	-
Stage 2	1125	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	34	188	-	-	496	-
Stage 1	246	-	-	-	-	-
Stage 2	310	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	29	188	-	-	496	-
Mov Cap-2 Maneuver	171	-	-	-	-	-
Stage 1	246	-	-	-	-	-
Stage 2	266	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	39.3	0	0.9			
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	183	496	-	
HCM Lane V/C Ratio	-	-	0.441	0.142	-	
HCM Control Delay (s)	-	-	39.3	13.5	-	
HCM Lane LOS	-	-	E	B	-	
HCM 95th %tile Q(veh)	-	-	2	0.5	-	






HCM 6th TWSC
2: Marksheffel Road & Graphite Drive






2025 Total AM
04/27/2022






Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	49	95	961	16	30	1294
Future Vol, veh/h	49	95	961	16	30	1294
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	97	981	16	31	1320
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2363	981	0	0	997	0
Stage 1	981	-	-	-	-	-
Stage 2	1382	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 39	303	-	-	694	-
Stage 1	363	-	-	-	-	-
Stage 2	233	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 37	303	-	-	694	-
Mov Cap-2 Maneuver	181	-	-	-	-	-
Stage 1	363	-	-	-	-	-
Stage 2	223	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	39.2	0		0.2		
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	
Capacity (veh/h)	-	-	246	694	-	
HCM Lane V/C Ratio	-	-	0.597	0.044	-	
HCM Control Delay (s)	-	-	39.2	10.4	-	
HCM Lane LOS	-	-	E	B	-	
HCM 95th %tile Q(veh)	-	-	3.5	0.1	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

HCM 6th TWSC
2: Marksheffel Road & Graphite Drive

2025 Total PM
04/27/2022

Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	67	1312	60	89	975
Future Vol, veh/h	31	67	1312	60	89	975
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	68	1339	61	91	995
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2516	1339	0	0	1400	0
Stage 1	1339	-	-	-	-	-
Stage 2	1177	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 31	187	-	-	488	-
Stage 1	244	-	-	-	-	-
Stage 2	293	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 25	187	-	-	488	-
Mov Cap-2 Maneuver	161	-	-	-	-	-
Stage 1	244	-	-	-	-	-
Stage 2	239	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	48.4	0		1.2		
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	
Capacity (veh/h)	-	-	178	488	-	
HCM Lane V/C Ratio	-	-	0.562	0.186	-	
HCM Control Delay (s)	-	-	48.4	14.1	-	
HCM Lane LOS	-	-	E	B	-	
HCM 95th %tile Q(veh)	-	-	3	0.7	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	37	78	710	12	24	1430
Future Vol, veh/h	37	78	710	12	24	1430
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	80	724	12	24	1459
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1502	362	0	0	736	0
Stage 1	724	-	-	-	-	-
Stage 2	778	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	112	635	-	-	865	-
Stage 1	441	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	109	635	-	-	865	-
Mov Cap-2 Maneuver	300	-	-	-	-	-
Stage 1	441	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	15.3	0	0.2			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	467	865	-	
HCM Lane V/C Ratio	-	-	0.251	0.028	-	
HCM Control Delay (s)	-	-	15.3	9.3	-	
HCM Lane LOS	-	-	C	A	-	
HCM 95th %tile Q(veh)	-	-	1	0.1	-	






Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	23	56	1120	47	69	1175
Future Vol, veh/h	23	56	1120	47	69	1175
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	57	1143	48	70	1199
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1883	572	0	0	1191	0
Stage 1	1143	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	63	463	-	-	582	-
Stage 1	266	-	-	-	-	-
Stage 2	433	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	55	463	-	-	582	-
Mov Cap-2 Maneuver	212	-	-	-	-	-
Stage 1	266	-	-	-	-	-
Stage 2	381	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	18.6	0		0.7		
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	
Capacity (veh/h)	-	-	344	582	-	
HCM Lane V/C Ratio	-	-	0.234	0.121	-	
HCM Control Delay (s)	-	-	18.6	12	-	
HCM Lane LOS	-	-	C	B	-	
HCM 95th %tile Q(veh)	-	-	0.9	0.4	-	

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Intersection

Int Delay, s/veh 1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	50	95	720	20	30	1435
Future Vol, veh/h	50	95	720	20	30	1435
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	51	97	735	20	31	1464






Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1529	368	0	0	755
Stage 1	735	-	-	-	-
Stage 2	794	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14
Critical Hdwy Stg 1	5.84	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22
Pot Cap-1 Maneuver	108	629	-	-	851
Stage 1	435	-	-	-	-
Stage 2	406	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	104	629	-	-	851
Mov Cap-2 Maneuver	293	-	-	-	-
Stage 1	435	-	-	-	-
Stage 2	391	-	-	-	-







Approach	WB	NB	SB
HCM Control Delay, s	16.8	0	0.2
HCM LOS	C		







Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	451	851
HCM Lane V/C Ratio	-	-	0.328	0.036
HCM Control Delay (s)	-	-	16.8	9.4
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	1.4	0.1







HCM 6th TWSC
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Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	70	1130	60	90	1185
Future Vol, veh/h	35	70	1130	60	90	1185
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	200	375	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	71	1153	61	92	1209
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1942	577	0	0	1214	0
Stage 1	1153	-	-	-	-	-
Stage 2	789	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	57	460	-	-	570	-
Stage 1	263	-	-	-	-	-
Stage 2	408	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	48	460	-	-	570	-
Mov Cap-2 Maneuver	201	-	-	-	-	-
Stage 1	263	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	21.7	0	0.9			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	322	570	-	
HCM Lane V/C Ratio	-	-	0.333	0.161	-	
HCM Control Delay (s)	-	-	21.7	12.5	-	
HCM Lane LOS	-	-	C	B	-	
HCM 95th %tile Q(veh)	-	-	1.4	0.6	-	

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	66	33	873	27	9	1201
Future Vol, veh/h	66	33	873	27	9	1201
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	100	-	200	200	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	33	882	27	9	1213
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2113	882	0	0	909	0
Stage 1	882	-	-	-	-	-
Stage 2	1231	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 56	345	-	-	749	-
Stage 1	405	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 55	345	-	-	749	-
Mov Cap-2 Maneuver	173	-	-	-	-	-
Stage 1	405	-	-	-	-	-
Stage 2	273	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	31	0		0.1		
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	173	345	749	-
HCM Lane V/C Ratio	-	-	0.385	0.097	0.012	-
HCM Control Delay (s)	-	-	38.3	16.5	9.9	-
HCM Lane LOS	-	-	E	C	A	-
HCM 95th %tile Q(veh)	-	-	1.7	0.3	0	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon







Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	31	22	1200	78	26	874
Future Vol, veh/h	31	22	1200	78	26	874
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	23	1237	80	27	901
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	2192	1237	0	0	1317	0
Stage 1	1237	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	50	215	-	-	525	-
Stage 1	274	-	-	-	-	-
Stage 2	374	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	47	215	-	-	525	-
Mov Cap-2 Maneuver	209	-	-	-	-	-
Stage 1	274	-	-	-	-	-
Stage 2	355	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	24.6	0	0.4			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 209 215	525	-		
HCM Lane V/C Ratio	-	- 0.153 0.105	0.051	-		
HCM Control Delay (s)	-	- 25.3 23.7	12.2	-		
HCM Lane LOS	-	- D C	B	-		
HCM 95th %tile Q(veh)	-	- 0.5 0.3	0.2	-		

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	81	34	947	36	11	1323
Future Vol, veh/h	81	34	947	36	11	1323
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	34	957	36	11	1336
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2315	957	0	0	993	0
Stage 1	957	-	-	-	-	-
Stage 2	1358	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 42	313	-	-	696	-
Stage 1	373	-	-	-	-	-
Stage 2	239	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 41	313	-	-	696	-
Mov Cap-2 Maneuver	190	-	-	-	-	-
Stage 1	373	-	-	-	-	-
Stage 2	235	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	31.8	0		0.1		
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	190	313	696	-
HCM Lane V/C Ratio	-	-	0.431	0.11	0.016	-
HCM Control Delay (s)	-	-	37.6	17.9	10.3	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	2	0.4	0	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	23	1347	114	33	958
Future Vol, veh/h	39	23	1347	114	33	958
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	24	1389	118	34	988
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2445	1389	0	0	1507	0
Stage 1	1389	-	-	-	-	-
Stage 2	1056	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 34	175	-	-	444	-
Stage 1	231	-	-	-	-	-
Stage 2	335	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 31	175	-	-	444	-
Mov Cap-2 Maneuver	175	-	-	-	-	-
Stage 1	231	-	-	-	-	-
Stage 2	309	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	30.6	0		0.5		
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	175	175	444	-
HCM Lane V/C Ratio	-	-	0.23	0.135	0.077	-
HCM Control Delay (s)	-	-	31.6	28.8	13.8	-
HCM Lane LOS	-	-	D	D	B	-
HCM 95th %tile Q(veh)	-	-	0.9	0.5	0.2	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon







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Intersection						
Int Delay, s/veh	2.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	101	43	951	43	14	1335
Future Vol, veh/h	101	43	951	43	14	1335
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	102	43	961	43	14	1348
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2337	961	0	0	1004	0
Stage 1	961	-	-	-	-	-
Stage 2	1376	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 40	311	-	-	690	-
Stage 1	371	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 39	311	-	-	690	-
Mov Cap-2 Maneuver	186	-	-	-	-	-
Stage 1	371	-	-	-	-	-
Stage 2	229	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	37.5	0		0.1		
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	186	311	690	-
HCM Lane V/C Ratio	-	-	0.548	0.14	0.02	-
HCM Control Delay (s)	-	-	45.6	18.4	10.3	-
HCM Lane LOS	-	-	E	C	B	-
HCM 95th %tile Q(veh)	-	-	2.9	0.5	0.1	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

HCM 6th TWSC
3: Marksheffel Road & Zircon Drive

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Intersection						
Int Delay, s/veh	1.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	52	29	1360	137	43	966
Future Vol, veh/h	52	29	1360	137	43	966
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	30	1402	141	44	996
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2486	1402	0	0	1543	0
Stage 1	1402	-	-	-	-	-
Stage 2	1084	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	*0	171	-	-	430	-
Stage 1	*228	-	-	-	-	-
Stage 2	*253	-	-	-	-	-
Platoon blocked, %	1	-	-	-	-	-
Mov Cap-1 Maneuver	*0	171	-	-	430	-
Mov Cap-2 Maneuver	*144	-	-	-	-	-
Stage 1	*228	-	-	-	-	-
Stage 2	*227	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	39.2	0		0.6		
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT	
Capacity (veh/h)	-	-	144	171	430	-
HCM Lane V/C Ratio	-	-	0.372	0.175	0.103	-
HCM Control Delay (s)	-	-	44.1	30.5	14.3	-
HCM Lane LOS	-	-	E	D	B	-
HCM 95th %tile Q(veh)	-	-	1.6	0.6	0.3	-
Notes						
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	81	34	722	36	11	1467
Future Vol, veh/h	81	34	722	36	11	1467
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	34	729	36	11	1482
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1492	365	0	0	765	0
Stage 1	729	-	-	-	-	-
Stage 2	763	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	114	632	-	-	844	-
Stage 1	438	-	-	-	-	-
Stage 2	421	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	113	632	-	-	844	-
Mov Cap-2 Maneuver	306	-	-	-	-	-
Stage 1	438	-	-	-	-	-
Stage 2	416	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	18	0	0.1			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 306 632	844	-		
HCM Lane V/C Ratio	-	- 0.267 0.054	0.013	-		
HCM Control Delay (s)	-	- 21 11	9.3	-		
HCM Lane LOS	-	- C B	A	-		
HCM 95th %tile Q(veh)	-	- 1.1 0.2	0	-		







Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	23	1167	114	33	1198
Future Vol, veh/h	39	23	1167	114	33	1198
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	24	1203	118	34	1235
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1889	602	0	0	1321	0
Stage 1	1203	-	-	-	-	-
Stage 2	686	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	62	443	-	-	519	-
Stage 1	247	-	-	-	-	-
Stage 2	461	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	58	443	-	-	519	-
Mov Cap-2 Maneuver	208	-	-	-	-	-
Stage 1	247	-	-	-	-	-
Stage 2	431	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	21.7	0		0.3		
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	208	443	519	-
HCM Lane V/C Ratio	-	-	0.193	0.054	0.066	-
HCM Control Delay (s)	-	-	26.4	13.6	12.4	-
HCM Lane LOS	-	-	D	B	B	-
HCM 95th %tile Q(veh)	-	-	0.7	0.2	0.2	-

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Intersection

Int Delay, s/veh 1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	105	45	730	45	15	1480
Future Vol, veh/h	105	45	730	45	15	1480
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	106	45	737	45	15	1495







Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1515	369	0
Stage 1	737	-	-
Stage 2	778	-	-
Critical Hdwy	6.84	6.94	-
Critical Hdwy Stg 1	5.84	-	-
Critical Hdwy Stg 2	5.84	-	-
Follow-up Hdwy	3.52	3.32	-
Pot Cap-1 Maneuver	110	628	-
Stage 1	434	-	-
Stage 2	413	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	108	628	-
Mov Cap-2 Maneuver	299	-	-
Stage 1	434	-	-
Stage 2	406	-	-







Approach	WB	NB	SB
HCM Control Delay, s	19.8	0	0.1
HCM LOS	C		







Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	299	628
HCM Lane V/C Ratio	-	-	0.355	0.072
HCM Control Delay (s)	-	-	23.5	11.2
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	1.6	0.2







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Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	55	30	1180	140	45	1210
Future Vol, veh/h	55	30	1180	140	45	1210
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	100	-	200	200	-
Veh in Median Storage, #	2	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	31	1216	144	46	1247
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1932	608	0	0	1360	0
Stage 1	1216	-	-	-	-	-
Stage 2	716	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	58	439	-	-	501	-
Stage 1	243	-	-	-	-	-
Stage 2	445	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 53	439	-	-	501	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	243	-	-	-	-	-
Stage 2	404	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	24	0		0.5		
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	202	439	501	-
HCM Lane V/C Ratio	-	-	0.281	0.07	0.093	-
HCM Control Delay (s)	-	-	29.6	13.8	12.9	-
HCM Lane LOS	-	-	D	B	B	-
HCM 95th %tile Q(veh)	-	-	1.1	0.2	0.3	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	32	457	285	933	1172	68
Future Vol, veh/h	32	457	285	933	1172	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Free
Storage Length	0	0	900	-	-	350
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	476	297	972	1221	71
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2301	-	1221	0	-	0
Stage 1	1221	-	-	-	-	-
Stage 2	1080	-	-	-	-	-
Critical Hdwy	6.84	-	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	-	2.22	-	-	-
Pot Cap-1 Maneuver	~ 32	0	567	-	-	0
Stage 1	242	0	-	-	-	0
Stage 2	287	0	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 15	-	567	-	-	-
Mov Cap-2 Maneuver	101	-	-	-	-	-
Stage 1	115	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	57.3	4.2		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	567	-	101	-	-	
HCM Lane V/C Ratio	0.524	-	0.33	-	-	
HCM Control Delay (s)	18.1	-	57.3	0	-	
HCM Lane LOS	C	-	F	A	-	
HCM 95th %tile Q(veh)	3	-	1.3	-	-	
Notes						
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						







Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	34	220	506	1269	776	111
Future Vol, veh/h	34	220	506	1269	776	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Free
Storage Length	0	0	900	-	-	350
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	224	516	1295	792	113
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2472	-	792	0	-	0
Stage 1	792	-	-	-	-	-
Stage 2	1680	-	-	-	-	-
Critical Hdwy	6.84	-	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	-	2.22	-	-	-
Pot Cap-1 Maneuver	~ 25	0	824	-	-	0
Stage 1	407	0	-	-	-	0
Stage 2	136	0	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 9	-	824	-	-	-
Mov Cap-2 Maneuver	94	-	-	-	-	-
Stage 1	152	-	-	-	-	-
Stage 2	136	-	-	-	-	-
Approach	EB		NB		SB	
HCM Control Delay, s	64.2		4.7		0	
HCM LOS	F					
Minor Lane/Major Mvmt	NBL		NBT	EBLn1	EBLn2	SBT
Capacity (veh/h)	824		-	94	-	-
HCM Lane V/C Ratio	0.627		-	0.369	-	-
HCM Control Delay (s)	16.4		-	64.2	0	-
HCM Lane LOS	C		-	F	A	-
HCM 95th %tile Q(veh)	4.5		-	1.5	-	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	3.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	33	472	295	1019	1305	70
Future Vol, veh/h	33	472	295	1019	1305	70
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Free
Storage Length	0	0	900	-	-	350
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	492	307	1061	1359	73
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2504	-	1359	0	-	0
Stage 1	1359	-	-	-	-	-
Stage 2	1145	-	-	-	-	-
Critical Hdwy	6.84	-	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	-	2.22	-	-	-
Pot Cap-1 Maneuver	~ 24	0	502	-	-	0
Stage 1	204	0	-	-	-	0
Stage 2	265	0	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 9	-	502	-	-	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	79	-	-	-	-	-
Stage 2	265	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	96.2	5.1		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	502	-	71	-	-	
HCM Lane V/C Ratio	0.612	-	0.484	-	-	
HCM Control Delay (s)	22.8	-	96.2	0	-	
HCM Lane LOS	C	-	F	A	-	
HCM 95th %tile Q(veh)	4.1	-	2	-	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	4.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	227	523	1454	861	115
Future Vol, veh/h	35	227	523	1454	861	115
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Free
Storage Length	0	0	900	-	-	350
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	232	534	1484	879	117
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2689	-	879	0	-	0
Stage 1	879	-	-	-	-	-
Stage 2	1810	-	-	-	-	-
Critical Hdwy	6.84	-	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	-	2.22	-	-	-
Pot Cap-1 Maneuver	~ 18	0	764	-	-	0
Stage 1	366	0	-	-	-	0
Stage 2	116	0	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 5	-	764	-	-	-
Mov Cap-2 Maneuver	73	-	-	-	-	-
Stage 1	110	-	-	-	-	-
Stage 2	116	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	94.5	5.3		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	764	-	73	-	-	
HCM Lane V/C Ratio	0.699	-	0.489	-	-	
HCM Control Delay (s)	19.9	-	94.5	0	-	
HCM Lane LOS	C	-	F	A	-	
HCM 95th %tile Q(veh)	5.8	-	2	-	-	
Notes						
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						







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Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	36	472	295	1027	1328	79
Future Vol, veh/h	36	472	295	1027	1328	79
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Free
Storage Length	0	0	900	-	-	350
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	492	307	1070	1383	82
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2532	-	1383	0	-	0
Stage 1	1383	-	-	-	-	-
Stage 2	1149	-	-	-	-	-
Critical Hdwy	6.84	-	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	-	2.22	-	-	-
Pot Cap-1 Maneuver	~ 23	0	491	-	-	0
Stage 1	198	0	-	-	-	0
Stage 2	264	0	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 9	-	491	-	-	-
Mov Cap-2 Maneuver	67	-	-	-	-	-
Stage 1	74	-	-	-	-	-
Stage 2	264	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	112.5	5.3		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	491	-	67	-	-	
HCM Lane V/C Ratio	0.626	-	0.56	-	-	
HCM Control Delay (s)	23.8	-	112.5	0	-	
HCM Lane LOS	C	-	F	A	-	
HCM 95th %tile Q(veh)	4.2	-	2.3	-	-	
Notes						
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						

HCM 6th TWSC
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Intersection						
Int Delay, s/veh	5.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	45	227	523	1480	876	121
Future Vol, veh/h	45	227	523	1480	876	121
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	Free
Storage Length	0	0	900	-	-	350
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	232	534	1510	894	123
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2717	-	894	0	-	0
Stage 1	894	-	-	-	-	-
Stage 2	1823	-	-	-	-	-
Critical Hdwy	6.84	-	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	-	2.22	-	-	-
Pot Cap-1 Maneuver	~ 17	0	755	-	-	0
Stage 1	360	0	-	-	-	0
Stage 2	114	0	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 5	-	755	-	-	-
Mov Cap-2 Maneuver	71	-	-	-	-	-
Stage 1	105	-	-	-	-	-
Stage 2	114	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	121.4	5.3		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	755	-	71	-	-	
HCM Lane V/C Ratio	0.707	-	0.647	-	-	
HCM Control Delay (s)	20.4	-	121.4	0	-	
HCM Lane LOS	C	-	F	A	-	
HCM 95th %tile Q(veh)	6	-	2.9	-	-	
Notes						
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						

Timings 4: Marksheffel Road & Carefree Circle

2045 Background AM

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	75	588	367	683	1386	162
Future Volume (vph)	75	588	367	683	1386	162
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	36.0		27.0	84.0	57.0	57.0
Total Split (%)	30.0%		22.5%	70.0%	47.5%	47.5%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None		None	C-Max	C-Max	C-Max
Act Effect Green (s)	10.7	120.0	18.5	103.4	79.5	79.5
Actuated g/C Ratio	0.09	1.00	0.15	0.86	0.66	0.66
v/c Ratio	0.50	0.39	0.72	0.23	0.62	0.15
Control Delay	62.2	0.7	56.2	2.2	12.2	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.2	0.7	56.2	2.2	12.2	0.8
LOS	E	A	E	A	B	A
Approach Delay	7.7			21.1	11.0	
Approach LOS	A			C	B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 13.6

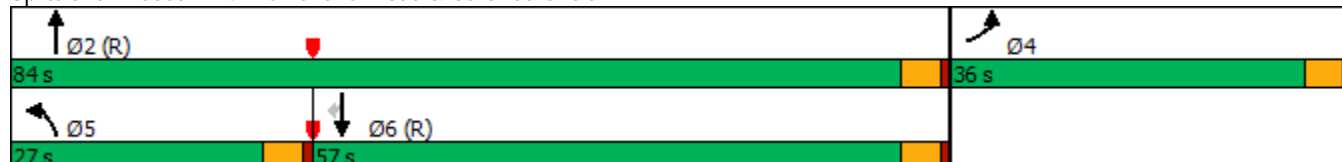
Intersection LOS: B

Intersection Capacity Utilization 64.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Marksheffel Road & Carefree Circle



HCM 6th Signalized Intersection Summary 4: Marksheffel Road & Carefree Circle

2045 Background AM

04/27/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	75	588	367	683	1386	162
Future Volume (veh/h)	75	588	367	683	1386	162
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	78	0	382	711	1444	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	101		455	3086	2484	
Arrive On Green	0.06	0.00	0.13	0.87	0.70	0.00
Sat Flow, veh/h	1781	1585	3456	3647	3647	1585
Grp Volume(v), veh/h	78	0	382	711	1444	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1728	1777	1777	1585
Q Serve(g_s), s	5.2	0.0	12.9	4.0	24.7	0.0
Cycle Q Clear(g_c), s	5.2	0.0	12.9	4.0	24.7	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	101		455	3086	2484	
V/C Ratio(X)	0.77		0.84	0.23	0.58	
Avail Cap(c_a), veh/h	468		648	3086	2484	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	55.8	0.0	50.9	1.3	9.2	0.0
Incr Delay (d2), s/veh	11.7	0.0	6.7	0.2	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	6.0	0.7	9.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	67.5	0.0	57.6	1.5	10.2	0.0
LnGrp LOS	E		E	A	B	
Approach Vol, veh/h	78	A		1093	1444	A
Approach Delay, s/veh	67.5			21.1	10.2	
Approach LOS	E			C	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		108.7		11.3	20.3	88.4
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		79.5		31.5	22.5	52.5
Max Q Clear Time (g_c+l1), s		6.0		7.2	14.9	26.7
Green Ext Time (p_c), s		6.0		0.2	0.9	13.0

Intersection Summary

HCM 6th Ctrl Delay	16.4
HCM 6th LOS	B

Notes













Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Timings

2045 Background PM

4: Marksheffel Road & Carefree Circle

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	111	283	651	1170	1051	186
Future Volume (vph)	111	283	651	1170	1051	186
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	23.0		51.0	97.0	46.0	46.0
Total Split (%)	19.2%		42.5%	80.8%	38.3%	38.3%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None		None	C-Max	C-Max	C-Max
Act Effect Green (s)	13.0	120.0	29.4	98.0	64.2	64.2
Actuated g/C Ratio	0.11	1.00	0.24	0.82	0.54	0.54
v/c Ratio	0.59	0.18	0.79	0.41	0.57	0.20
Control Delay	63.0	0.3	49.4	3.8	17.7	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.0	0.3	49.4	3.8	17.7	1.9
LOS	E	A	D	A	B	A
Approach Delay	17.9			20.1	15.3	
Approach LOS	B			C	B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.1

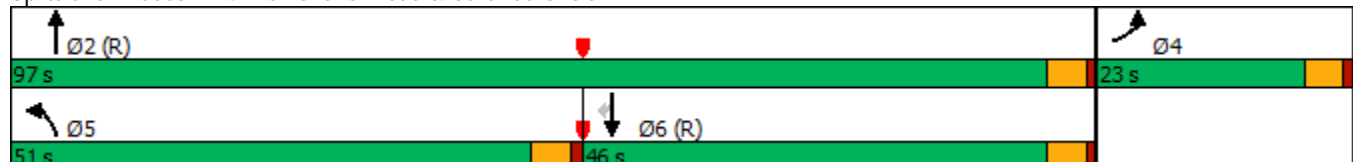
Intersection LOS: B

Intersection Capacity Utilization 65.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Marksheffel Road & Carefree Circle



HCM 6th Signalized Intersection Summary

4: Marksheffel Road & Carefree Circle

2045 Background PM

04/27/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	111	283	651	1170	1051	186
Future Volume (veh/h)	111	283	651	1170	1051	186
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	113	0	664	1194	1072	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	140		769	3008	2084	
Arrive On Green	0.08	0.00	0.22	0.85	0.59	0.00
Sat Flow, veh/h	1781	1585	3456	3647	3647	1585
Grp Volume(v), veh/h	113	0	664	1194	1072	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1728	1777	1777	1585
Q Serve(g_s), s	7.5	0.0	22.2	9.3	21.4	0.0
Cycle Q Clear(g_c), s	7.5	0.0	22.2	9.3	21.4	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	140		769	3008	2084	
V/C Ratio(X)	0.81		0.86	0.40	0.51	
Avail Cap(c_a), veh/h	275		1339	3008	2084	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	54.4	0.0	44.9	2.1	14.7	0.0
Incr Delay (d2), s/veh	10.4	0.0	3.0	0.4	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	0.0	9.8	2.2	8.6	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	64.8	0.0	47.9	2.5	15.6	0.0
LnGrp LOS	E		D	A	B	
Approach Vol, veh/h	113	A		1858	1072	A
Approach Delay, s/veh	64.8			18.8	15.6	
Approach LOS	E			B	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		106.1		13.9	31.2	74.9
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		92.5		18.5	46.5	41.5
Max Q Clear Time (g_c+l1), s		11.3		9.5	24.2	23.4
Green Ext Time (p_c), s		12.9		0.2	2.5	7.5

Intersection Summary

HCM 6th Ctrl Delay	19.4
HCM 6th LOS	B

Notes













Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Timings

4: Marksheffel Road & Carefree Circle

2045 Total AM

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	78	588	370	695	1410	175
Future Volume (vph)	78	588	370	695	1410	175
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	36.0		27.0	84.0	57.0	57.0
Total Split (%)	30.0%		22.5%	70.0%	47.5%	47.5%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None		None	C-Max	C-Max	C-Max
Act Effct Green (s)	10.9	120.0	18.6	103.3	79.3	79.3
Actuated g/C Ratio	0.09	1.00	0.16	0.86	0.66	0.66
v/c Ratio	0.51	0.39	0.72	0.24	0.63	0.16
Control Delay	62.3	0.7	56.2	2.3	12.5	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.3	0.7	56.2	2.3	12.5	0.7
LOS	E	A	E	A	B	A
Approach Delay	7.9			21.0	11.2	
Approach LOS	A			C	B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 13.7

Intersection LOS: B

Intersection Capacity Utilization 65.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Marksheffel Road & Carefree Circle



HCM 6th Signalized Intersection Summary

4: Marksheffel Road & Carefree Circle

2045 Total AM
04/27/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	78	588	370	695	1410	175
Future Volume (veh/h)	78	588	370	695	1410	175
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	81	0	385	724	1469	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	105		458	3078	2474	
Arrive On Green	0.06	0.00	0.13	0.87	0.70	0.00
Sat Flow, veh/h	1781	1585	3456	3647	3647	1585
Grp Volume(v), veh/h	81	0	385	724	1469	0
Grp Sat Flow(s), veh/h/ln	1781	1585	1728	1777	1777	1585
Q Serve(g_s), s	5.4	0.0	13.1	4.1	25.7	0.0
Cycle Q Clear(g_c), s	5.4	0.0	13.1	4.1	25.7	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	105		458	3078	2474	
V/C Ratio(X)	0.77		0.84	0.24	0.59	
Avail Cap(c_a), veh/h	468		648	3078	2474	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	55.7	0.0	50.8	1.3	9.4	0.0
Incr Delay (d2), s/veh	11.4	0.0	6.9	0.2	1.1	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	2.7	0.0	6.1	0.8	9.4	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	67.1	0.0	57.7	1.5	10.5	0.0
LnGrp LOS	E		E	A	B	
Approach Vol, veh/h	81	A		1109	1469	A
Approach Delay, s/veh	67.1			21.0	10.5	
Approach LOS	E			C	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		108.4		11.6	20.4	88.0
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		79.5		31.5	22.5	52.5
Max Q Clear Time (g_c+l1), s		6.1		7.4	15.1	27.7
Green Ext Time (p_c), s		6.1		0.2	0.9	13.0

Intersection Summary

HCM 6th Ctrl Delay	16.6
HCM 6th LOS	B

Notes








Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Timings

2045 Total PM

4: Marksheffel Road & Carefree Circle

04/27/2022

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	125	285	655	1200	1070	195
Future Volume (vph)	125	285	655	1200	1070	195
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	23.0		51.0	97.0	46.0	46.0
Total Split (%)	19.2%		42.5%	80.8%	38.3%	38.3%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	None		None	C-Max	C-Max	C-Max
Act Effect Green (s)	13.8	120.0	29.5	97.2	63.2	63.2
Actuated g/C Ratio	0.12	1.00	0.25	0.81	0.53	0.53
v/c Ratio	0.63	0.18	0.79	0.43	0.59	0.21
Control Delay	63.9	0.3	49.3	4.1	18.5	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.9	0.3	49.3	4.1	18.5	1.8
LOS	E	A	D	A	B	A
Approach Delay	19.7			20.1	16.0	
Approach LOS	B			C	B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.6

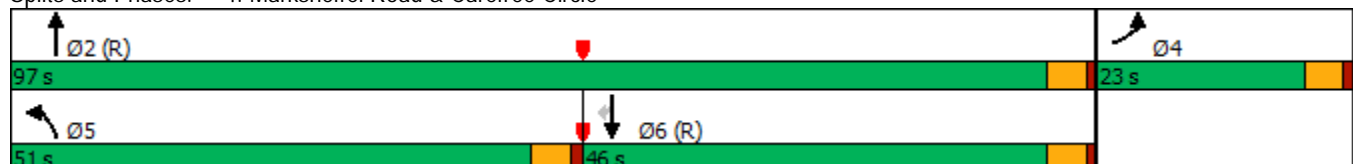
Intersection LOS: B

Intersection Capacity Utilization 66.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: Marksheffel Road & Carefree Circle



HCM 6th Signalized Intersection Summary

4: Marksheffel Road & Carefree Circle

2045 Total PM

04/27/2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	125	285	655	1200	1070	195
Future Volume (veh/h)	125	285	655	1200	1070	195
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	128	0	668	1224	1092	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	156		773	2976	2048	
Arrive On Green	0.09	0.00	0.22	0.84	0.58	0.00
Sat Flow, veh/h	1781	1585	3456	3647	3647	1585
Grp Volume(v), veh/h	128	0	668	1224	1092	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1728	1777	1777	1585
Q Serve(g_s), s	8.5	0.0	22.3	10.2	22.6	0.0
Cycle Q Clear(g_c), s	8.5	0.0	22.3	10.2	22.6	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	156		773	2976	2048	
V/C Ratio(X)	0.82		0.86	0.41	0.53	
Avail Cap(c_a), veh/h	275		1339	2976	2048	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	53.8	0.0	44.8	2.4	15.6	0.0
Incr Delay (d2), s/veh	10.1	0.0	3.0	0.4	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	0.0	9.8	2.6	9.1	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	64.0	0.0	47.9	2.8	16.6	0.0
LnGrp LOS	E		D	A	B	
Approach Vol, veh/h	128	A		1892	1092	A
Approach Delay, s/veh	64.0			18.7	16.6	
Approach LOS	E			B	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		105.0		15.0	31.4	73.6
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		92.5		18.5	46.5	41.5
Max Q Clear Time (g_c+l1), s		12.2		10.5	24.3	24.6
Green Ext Time (p_c), s		13.5		0.2	2.5	7.4

Intersection Summary

HCM 6th Ctrl Delay	19.8
HCM 6th LOS	B

Notes




Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC
5: Access & Graphite Drive

2025 Total AM
04/27/2022

Intersection




Int Delay, s/veh 1.5




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	36	10	0	115	29	0
Future Vol, veh/h	36	10	0	115	29	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	39	11	0	125	32	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	50
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1557
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1557
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	820	-	-	1557	-
HCM Lane V/C Ratio	0.038	-	-	-	-
HCM Control Delay (s)	9.6	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	0.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	116	33	0	79	19	0
Future Vol, veh/h	116	33	0	79	19	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	126	36	0	86	21	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	162	0	230	144
Stage 1	-	-	-	-	144	-
Stage 2	-	-	-	-	86	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1417	-	758	903
Stage 1	-	-	-	-	883	-
Stage 2	-	-	-	-	937	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1417	-	758	903
Mov Cap-2 Maneuver	-	-	-	-	758	-
Stage 1	-	-	-	-	883	-
Stage 2	-	-	-	-	937	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9.9	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	758	-	-	1417	-	
HCM Lane V/C Ratio	0.027	-	-	-	-	
HCM Control Delay (s)	9.9	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	




Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	40	10	0	115	30	0
Future Vol, veh/h	40	10	0	115	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	11	0	125	33	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	174	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	125	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1551	-	816	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	901	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1551	-	816	1020
Mov Cap-2 Maneuver	-	-	-	-	816	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	901	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		9.6	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	816	-	-	1551	-	
HCM Lane V/C Ratio	0.04	-	-	-	-	
HCM Control Delay (s)	9.6	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	

HCM 6th TWSC
5: Access & Graphite Drive

2045 Total PM
04/27/2022

Intersection




Int Delay, s/veh 0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	35	0	80	20	0
Future Vol, veh/h	120	35	0	80	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	38	0	87	22	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	168
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1410
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1410
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	752	-	-	1410	-
HCM Lane V/C Ratio	0.029	-	-	-	-
HCM Control Delay (s)	9.9	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	47	115	0	0	29
Future Vol, veh/h	10	47	115	0	0	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	51	125	0	0	32
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	125	0	-	0	198	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	73	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1462	-	-	-	791	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1462	-	-	-	785	926
Mov Cap-2 Maneuver	-	-	-	-	785	-
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	950	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.3	0		9		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1462	-	-	-	926	
HCM Lane V/C Ratio	0.007	-	-	-	0.034	
HCM Control Delay (s)	7.5	0	-	-	9	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

Intersection




Int Delay, s/veh 1.6




Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	33	147	62	0	0	19
Future Vol, veh/h	33	147	62	0	0	19
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	160	67	0	0	21

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	67	0	0 299 67
Stage 1	-	-	- 67 -
Stage 2	-	-	- 232 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	1535	-	- 692 997
Stage 1	-	-	- 956 -
Stage 2	-	-	- 807 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1535	-	- 674 997
Mov Cap-2 Maneuver	-	-	- 674 -
Stage 1	-	-	- 931 -
Stage 2	-	-	- 807 -

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1535	-	-	-	997
HCM Lane V/C Ratio	0.023	-	-	-	0.021
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	50	115	0	0	30
Future Vol, veh/h	10	50	115	0	0	30
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	54	125	0	0	33
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	125	0	-	0	201	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	76	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1462	-	-	-	788	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	947	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1462	-	-	-	782	926
Mov Cap-2 Maneuver	-	-	-	-	782	-
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	947	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.2	0		9		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1462	-	-	-	926	
HCM Lane V/C Ratio	0.007	-	-	-	0.035	
HCM Control Delay (s)	7.5	0	-	-	9	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0.1	

Intersection						
Int Delay, s/veh	1.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	150	65	0	0	20
Future Vol, veh/h	35	150	65	0	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	163	71	0	0	22
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	71	0	-	0	310	71
Stage 1	-	-	-	-	71	-
Stage 2	-	-	-	-	239	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1529	-	-	-	682	991
Stage 1	-	-	-	-	952	-
Stage 2	-	-	-	-	801	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1529	-	-	-	664	991
Mov Cap-2 Maneuver	-	-	-	-	664	-
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	801	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.4	0		8.7		
HCM LOS				A		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1529	-	-	-	991	
HCM Lane V/C Ratio	0.025	-	-	-	0.022	
HCM Control Delay (s)	7.4	0	-	-	8.7	
HCM Lane LOS	A	A	-	-	A	
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	

APPENDIX F

Queues Analysis Worksheets

Queues

2025 Total AM

1: Marksheffel Road & Barnes Road

04/27/2022



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	79	231	184	889	1086	119
v/c Ratio	0.50	0.66	0.70	0.59	0.91	0.11
Control Delay	62.2	15.8	35.4	6.6	32.6	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.2	15.8	35.4	6.6	32.6	2.5
Queue Length 50th (ft)	59	0	67	203	661	1
Queue Length 95th (ft)	107	75	143	352	#1178	28
Internal Link Dist (ft)	2060			1409	6051	
Turn Bay Length (ft)			425			450
Base Capacity (vph)	398	535	340	1502	1196	1058
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.43	0.54	0.59	0.91	0.11

Intersection Summary

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

Queues

2025 Total PM

1: Marksheffel Road & Barnes Road

04/27/2022



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	244	170	300	1161	879	172
v/c Ratio	0.78	0.40	0.86	0.87	0.96	0.20
Control Delay	63.5	8.7	57.0	22.7	51.7	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.5	8.7	57.0	22.7	51.7	3.3
Queue Length 50th (ft)	182	0	170	603	~722	0
Queue Length 95th (ft)	261	56	#359	#1122	#967	38
Internal Link Dist (ft)	2060			1409	6051	
Turn Bay Length (ft)			425			450
Base Capacity (vph)	398	487	353	1338	919	868
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.35	0.85	0.87	0.96	0.20

Intersection Summary













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

Queues

2045 Total AM

1: Marksheffel Road & Barnes Road

04/27/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	161	245	379	533	462	701	234	302	245	315	609	141
v/c Ratio	0.51	0.61	0.72	0.85	0.64	0.86	0.50	0.27	0.25	0.45	0.43	0.20
Control Delay	57.5	57.0	32.8	61.5	48.0	31.9	18.3	35.4	7.6	42.6	28.8	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	57.0	32.8	61.5	48.0	31.9	18.3	35.4	7.6	42.6	28.8	5.4
Queue Length 50th (ft)	62	96	178	205	171	357	96	98	28	109	178	0
Queue Length 95th (ft)	95	135	260	#274	226	446	156	160	85	137	265	46
Internal Link Dist (ft)	2060				605			1409			6051	
Turn Bay Length (ft)							425			450		
Base Capacity (vph)	514	530	610	657	737	938	567	1110	991	1004	1420	719
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.46	0.62	0.81	0.63	0.75	0.41	0.27	0.25	0.31	0.43	0.20

Intersection Summary

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













Queue shown is maximum after two cycles.

Queues

2045 Total PM

1: Marksheffel Road & Barnes Road

04/27/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	344	571	458	435	337	500	193	464	554	717	385	151
v/c Ratio	0.74	0.87	0.72	0.73	0.42	0.59	0.44	0.62	0.74	0.87	0.33	0.24
Control Delay	59.8	62.3	30.2	54.0	41.4	19.8	20.7	48.1	36.0	55.9	33.0	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.8	62.3	30.2	54.0	41.4	19.8	20.7	48.1	36.0	55.9	33.0	6.2
Queue Length 50th (ft)	132	224	222	163	115	206	91	182	350	272	118	0
Queue Length 95th (ft)	182	#324	310	215	162	315	142	241	497	#347	185	51
Internal Link Dist (ft)	2060				605				1409		6051	
Turn Bay Length (ft)							425				450	
Base Capacity (vph)	514	670	776	686	830	858	610	749	784	858	1180	631
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.85	0.59	0.63	0.41	0.58	0.32	0.62	0.71	0.84	0.33	0.24

Intersection Summary

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

Queues

2045 Total AM

4: Marksheffel Road & Carefree Circle

04/27/2022



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	81	613	385	724	1469	182
v/c Ratio	0.51	0.39	0.72	0.24	0.63	0.16
Control Delay	62.3	0.7	56.2	2.3	12.5	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.3	0.7	56.2	2.3	12.5	0.7
Queue Length 50th (ft)	61	0	148	46	345	1
Queue Length 95th (ft)	109	0	192	76	444	m4
Internal Link Dist (ft)	501			2110	2279	
Turn Bay Length (ft)			900			350
Base Capacity (vph)	464	1583	648	3045	2337	1107
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.39	0.59	0.24	0.63	0.16

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues

2045 Total PM

4: Marksheffel Road & Carefree Circle

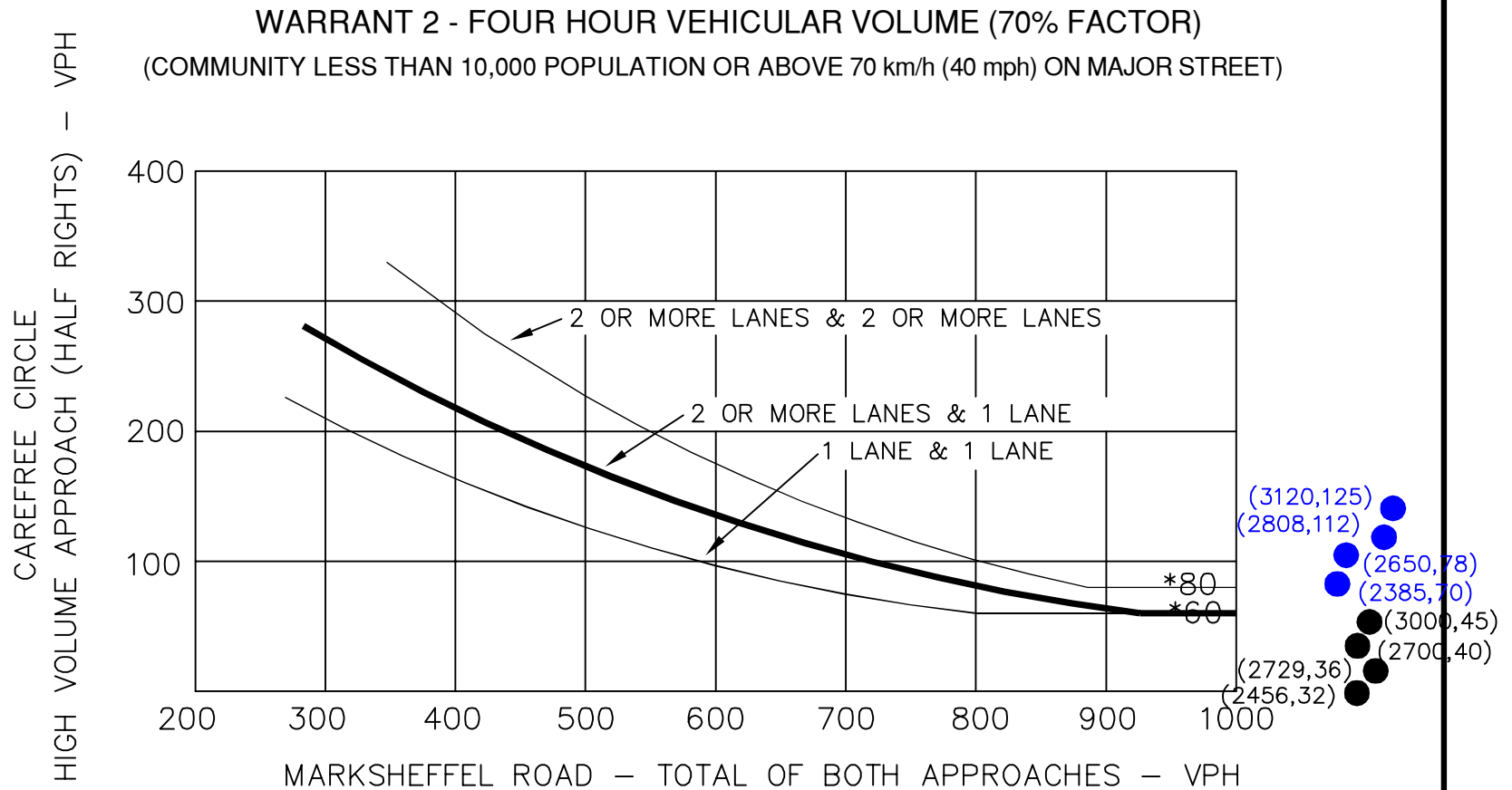
04/27/2022



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	128	291	668	1224	1092	199
v/c Ratio	0.63	0.18	0.79	0.43	0.59	0.21
Control Delay	63.9	0.3	49.3	4.1	18.5	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.9	0.3	49.3	4.1	18.5	1.8
Queue Length 50th (ft)	96	0	251	116	276	5
Queue Length 95th (ft)	156	0	295	178	377	16
Internal Link Dist (ft)	501			2110	2279	
Turn Bay Length (ft)			900			350
Base Capacity (vph)	272	1583	1330	2866	1862	927
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.18	0.50	0.43	0.59	0.21
Intersection Summary						

APPENDIX G

Signal Warrant Worksheets



* NOTE: 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 60 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

CAREFREE CIR & MARKSHEFFEL RD
SIGNAL WARRANT ANALYSIS
FOUR HOUR VOLUME WARRANT

● 2026 TOTAL TRAFFIC DATA POINT
● 2040 TOTAL TRAFFIC DATA POINT

FIGURE 1

Source: Manual of Uniform Traffic Control Devices 2009

APPENDIX H

Conceptual Site Plan



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IN ASSOCIATION WITH

AMERICAN HOMES 4 RENT

ENCLAVES AT MOUNTAIN VISTA
PROJECT ADDRESS

OTHER INFO

DATE: 03.09.22
PROJECT MGR: J. ROMERO
PREPARED BY: T. KNAB

CONCEPT LAYOUT

DATE: BY: DESCRIPTION:

CONCEPT LAYOUT

S#

OF

CPC #