

Traffic Impact Study

# The Ridge at Spring Creek

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

**The Ridge at Spring Creek**

Colorado Springs, Colorado

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## 1.0 EXECUTIVE SUMMARY

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The Ridge at Spring Creek is proposed to be located on the northeast corner of Circle Drive Ramp and Union Boulevard/Hancock Expressway intersection in Colorado Spring, Colorado. The project is proposed to include 194 attached single-family homes. It is expected that the Ridge at Spring Creek will be completed in the next couple of years; therefore, analysis was conducted for the 2026 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 in accordance with the City of Colorado Spring standards and requirements:

- Circle Drive Ramp and Union Boulevard/Hancock Expressway
- Circle Drive Ramp Full Movement Access
- Circle Drive Right-In/Right-Out (RIRO) Access

Regional access to the Ridge at Spring Creek will be provided by Interstate 25 (I-25) and US-24. Primary access will be provided by Union Boulevard/Hancock Expressway and Circle Drive. Direct access will be provided along Circle Drive Ramp, aligning with an existing driveway that serves a car wash and a storage facility along the south side of the roadway. In addition, a proposed right-in/right-out access will be located along Circle Drive, at the northeast portion of the property.

The Ridge at Spring Creek is expected to generate approximately 1,428 weekday daily trips, with 95 of these trips occurring during the morning peak hour and 112 of these trips occurring during the afternoon peak hour.

Based on the analysis presented in this report, Kimley-Horn believes the Ridge at Spring Creek 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 conclusions and recommendations:

- With buildout of the project, a north leg will be constructed along Circle Drive Ramp aligning with the existing storage facility and car wash access. This north leg will be constructed to provide full movement access to the site. The southbound approach out of the development is recommended to operate with stop-control with an R1-1 “STOP” sign installed.
- For safety purposes, turn lanes are recommended along Circle Drive Ramp for traffic turning into the full movement project access as well as the existing driveway on the south side of the roadway. Turn lanes with a length of 120 feet plus 140-foot taper are recommended to be designated for the westbound left turn and westbound right turn lanes at the Circle Drive Ramp Access intersection. Based on the posted 25 mile per hour speed limit along Circle Drive Ramp west of the access, a 115-foot plus 120-foot taper eastbound left turn lane is recommended at the access to be back-to-back with the inside westbound left turn lane of the dual left turn lanes for the Circle Drive and Union Boulevard/Hancock Expressway intersection to the west.
- An additional right-in/right-out access is proposed along the west side of Circle Drive at the northeast portion of the site. It is recommended that a R1-1 “STOP” sign be installed on the eastbound approach, exiting the Ridge at Spring Creek. This access will be restrict to right turn egress movements only; therefore, a R3-2 No Left Turn Lane is recommended to be provided below the “STOP” sign as well as a possible R6-1 (R) “ONE WAY” sign installed within the existing raised median of Circle Drive, directly in an exiting driver’s view. The southbound Circle Drive approach to the right-in/right-out access should be restriped so that the outside lane is converted to standard 10-foot stripe 30-foot gap through lane striping instead of the existing short skip dashed striping denoting the upcoming right turn lane for the off ramp.

- Any on-site 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

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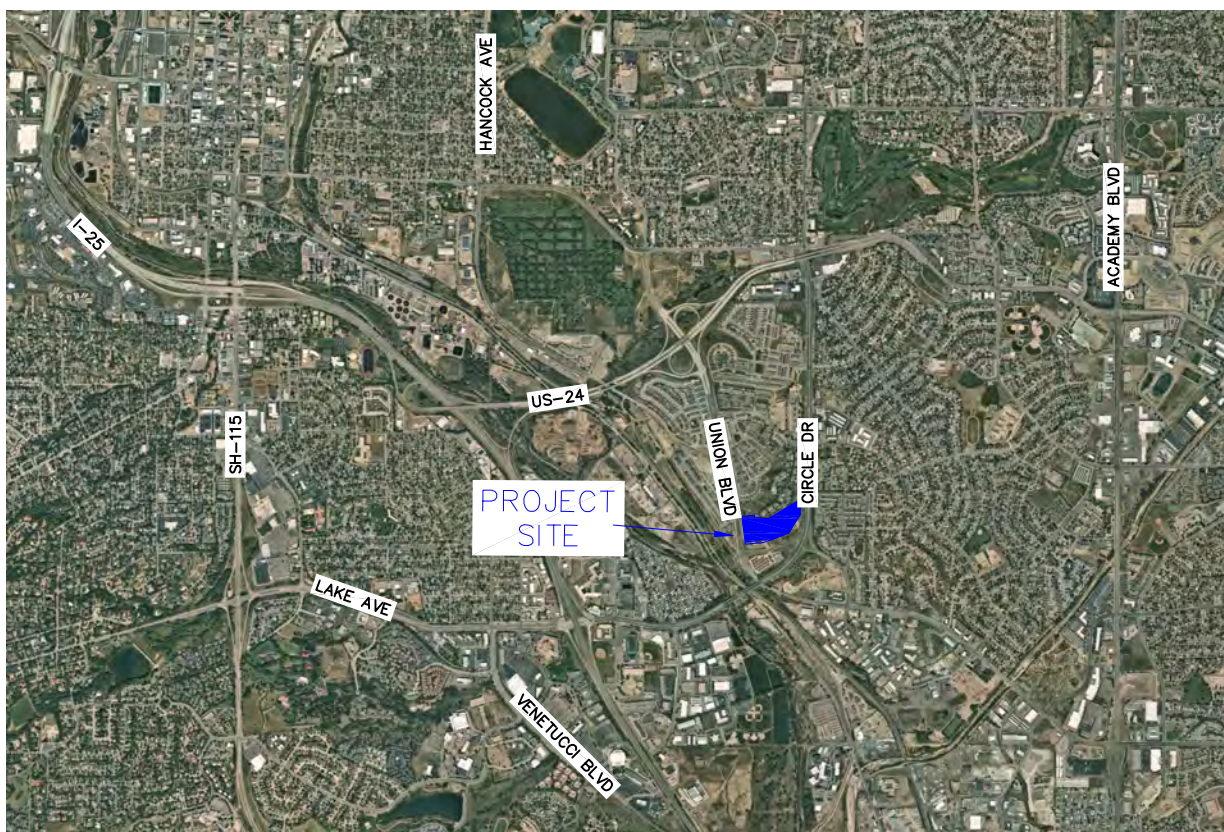
Kimley-Horn and Associates, Inc. has prepared this report to document the results of a Traffic Impact Study for the Ridge at Spring Creek proposed to be located on the northeast corner of Circle Drive Ramp and Union Boulevard/Hancock Expressway intersection in Colorado Spring, Colorado. A vicinity map illustrating the Ridge at Spring Creek development location is shown in **Figure 1**. The Ridge at Spring Creek is proposed to include 194 attached single-family homes. A conceptual site plan is attached in **Appendix A**. It is expected that the Ridge at Spring Creek will be completed in the next couple of years; therefore, analysis was conducted for the 2026 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 in accordance with the City of Colorado Spring standards and requirements:

- Circle Drive Ramp and Union Boulevard/Hancock Expressway
- Circle Drive Ramp Full Movement Access
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Regional access to the Ridge at Spring Creek will be provided by Interstate 25 (I-25) and US-24. Primary access will be provided by Union Boulevard/Hancock Expressway and Circle Drive. Direct access will be provided along Circle Drive Ramp, aligning with an existing driveway that serves a car wash and a storage facility along the south side of the roadway. In addition, a proposed Right-In/Right-Out access will be located along Circle Drive, at the northeast portion of the property.





THE RIDGE AT SPRING CREEK  
COLORADO SPRING, COLORADO  
VICINITY MAP

FIGURE 1

## 3.0 EXISTING AND FUTURE CONDITIONS

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### 3.1 Existing Study Area

The existing site is vacant land. Surrounding the site are newly constructed homes with a mix of multifamily and single-family. Extending to the west are a mix of industrial, retail, and Harrison High School.

### 3.2 Existing Roadway Network

Union Boulevard extends north of Circle Drive while Hancock Expressway extends south of Circle Drive in the north-south direction. Union Boulevard/Hancock Expressway provides two through lanes in each direction and bicycle lanes on either side of the roadway. The posted speed limit is 40 miles per hour. The City of Colorado Springs classifies Union Boulevard/Hancock Expressway as a Principal Arterial roadway.

Circle Drive Ramp is an on and off ramp for south westbound traffic along Circle Drive accessing Union Boulevard/Hancock Expressway. The Circle Drive Ramp provides one through lane in each direction off and onto Circle Drive. The City of Colorado Springs classifies Union Boulevard/Hancock Expressway as a Principal Arterial roadway.

The signalized intersection Circle Drive Ramp and Union Boulevard/Hancock Expressway operates with permissive-only left turn phasing southbound approach of Union Boulevard. The southbound approach provides a left turn lane and two through lanes while the northbound approach provides two through lanes and a right turn lane. The westbound approach provides dual left turn lanes and a right turn lane. An aerial photo of the existing intersection configuration is below.



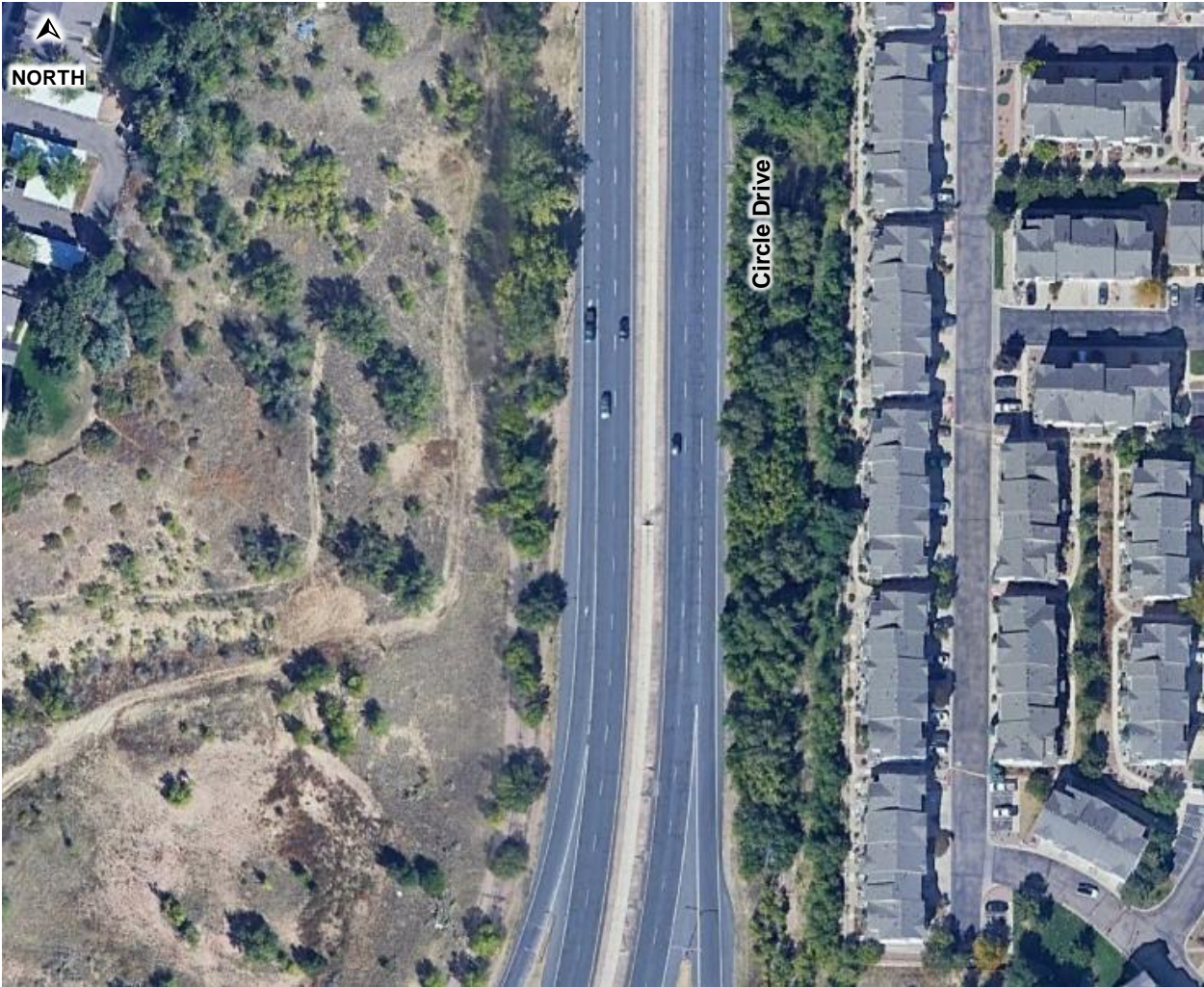
*Circle Drive Ramp & Union Boulevard/Hancock Expressway*

The unsignalized intersection of Circle Drive Ramp and Driveway operates with stop control on the northbound approach of the storage facility and car wash driveway. The north leg is proposed to be constructed as an access to the project site. All three approaches provide a single lane shared for all movements. An aerial photo of the existing intersection configuration is below.



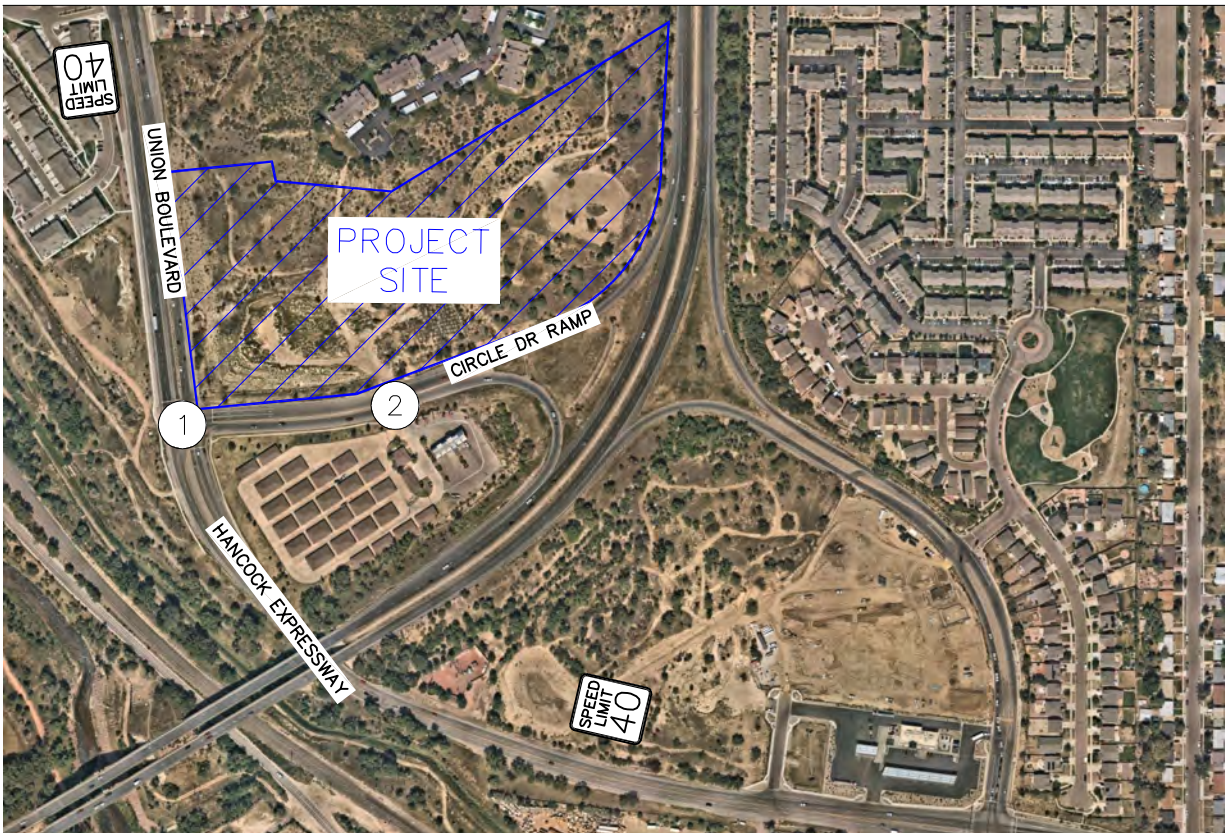
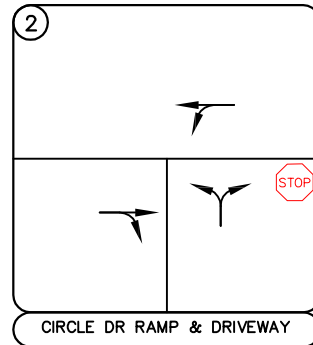
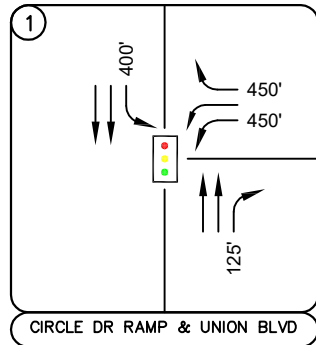
*Circle Drive Ramp Full Movement Access*

The proposed right-in/right-out access along Circle Drive is located approximately where the outside third southbound lane transitions from the short skip dash striping to solid striping for the upcoming right turn lane and offramp. At this location, Circle Drive provides three through lanes in each direction, northbound and southbound. An aerial photo of the existing roadway at the proposed right-in/right-out access intersection is below.



*Circle Drive Right-In/Right-Out Access Location*

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



**LEGEND**

- (X) Study Area Key Intersection
- Signalized Intersection
- STOP Stop Controlled Approach
- SPEED LIMIT XX Roadway Speed Limit
- 100' Turn Lane Length (feet)

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 EXISTING GEOMETRY AND CONTROL

FIGURE 2

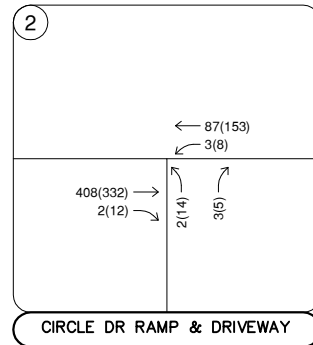
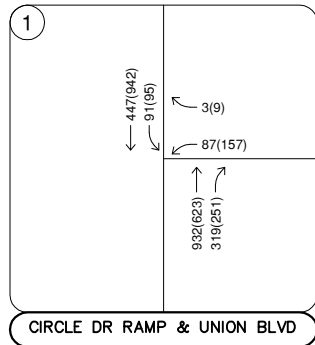
### 3.3 Existing Traffic Volumes

Existing turning movement counts were conducted at the study intersections on Tuesday, February 8, 2022, during the morning and afternoon peak hours. Existing counts were also collected at the proposed Right-In/Right-Out access location along Circle Drive on Tuesday August 27, 2024. 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. Count sheets are provided in **Appendix B**.

To adjust the counts collected in 2022 to current conditions, a one (1) percent annual growth rate was applied to the traffic volumes to determine 2024 adjusted traffic volumes. These volumes are illustrated in **Figure 3**.

### 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 1.19. This growth factor equates to an annual growth rate of 0.7 percent. Future traffic volume projections and growth rate calculations are provided in **Appendix C**. To be conservative, a one (1) percent annual growth rate was used to calculate future traffic volumes at the study area intersections. This annual growth rate was used to estimate short-term 2026 and long-term 2045 traffic volume projections at the key intersections. Of note, the driveway volumes into and out of the car wash and self-storage facility were not grown as this is an existing development with anticipated steady traffic volumes into the future. The calculated background traffic volumes for 2026 and 2045 are shown in **Figure 4** and **Figure 5**, respectively.



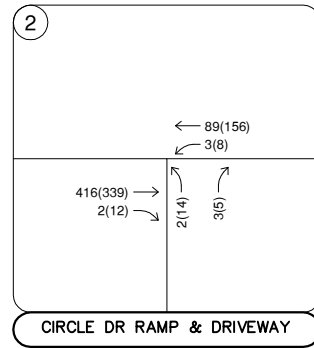
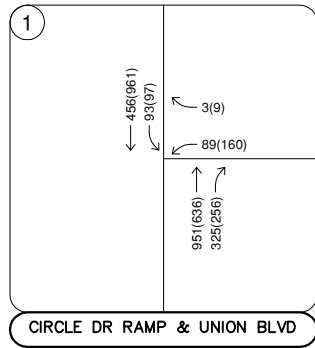
**LEGEND**

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

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 2024 ADJUSTED TRAFFIC VOLUMES

FIGURE 3





**LEGEND**

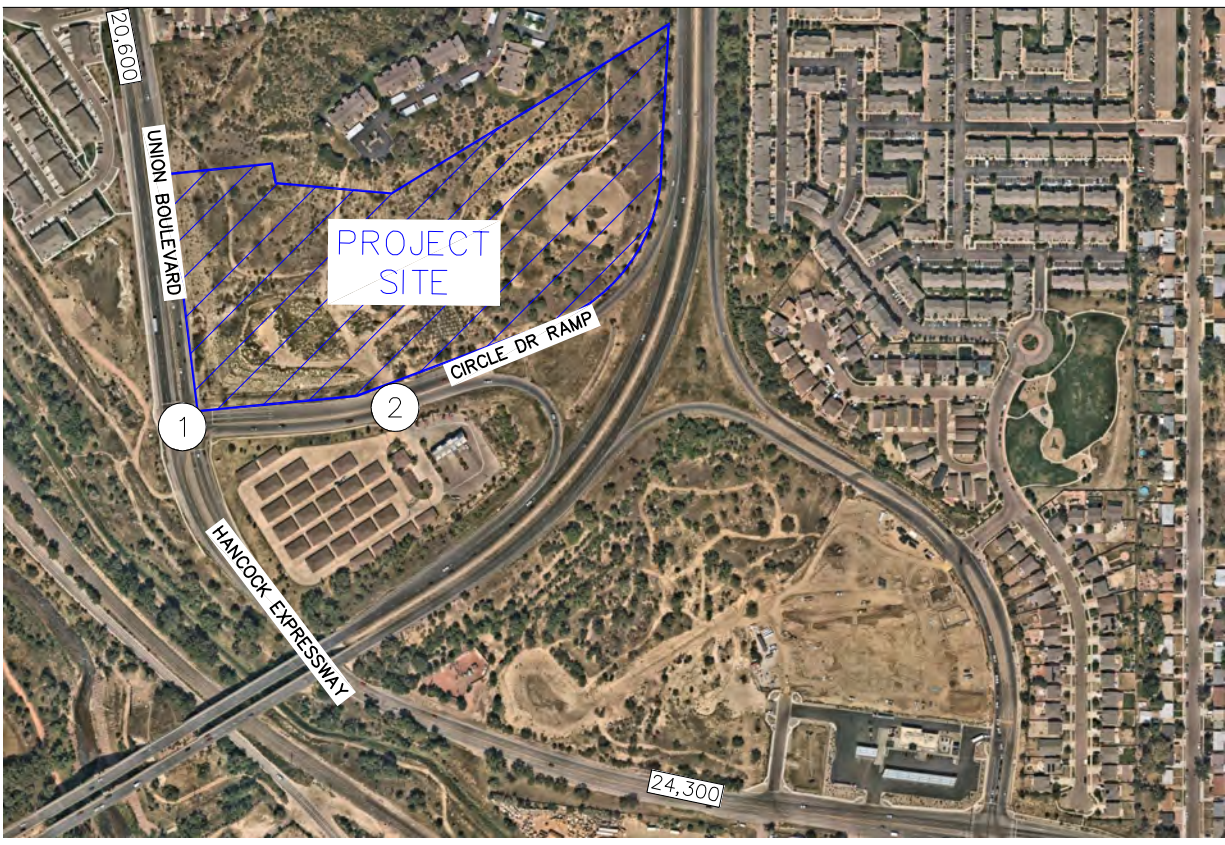
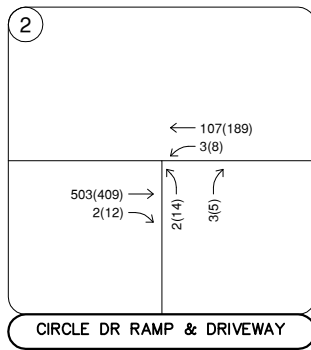
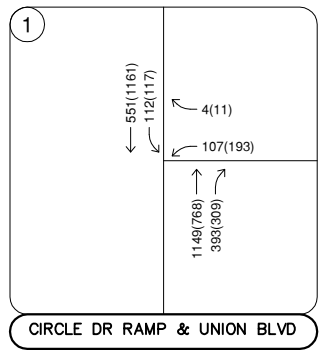
⊗ Study Area Key Intersection

XXX(XXX) Weekday AM(PM)  
 Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 2026 BACKGROUND TRAFFIC VOLUMES

FIGURE 4



**LEGEND**

(X) Study Area Key Intersection

XXX(XXX) Weekday AM(PM)  
Peak Hour Traffic Volumes

[XX,X00] Estimated Daily Traffic Volume

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 2045 BACKGROUND TRAFFIC VOLUMES

FIGURE 5

## 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*<sup>1</sup> 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 Attached Housing (ITE Land Use Code 215), for traffic associated with the development.

The Ridge at Spring Creek is expected to generate approximately 1,428 weekday daily trips, with 95 of these trips occurring during the morning peak hour and 112 of these trips occurring during the afternoon peak hour. Calculations were based on the procedure and information provided in the ITE *Trip Generation Manual, 11<sup>th</sup> Edition – Volume 1: User's Guide and Handbook, 2021*.

**Table 1** summarizes the estimated trip generation for the Ridge at Spring Creek. The trip generation worksheets are included in **Appendix D**.

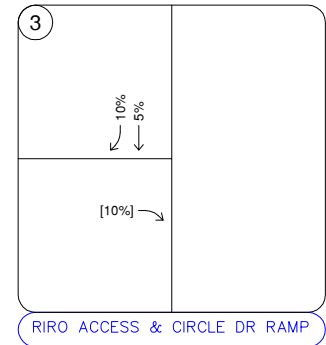
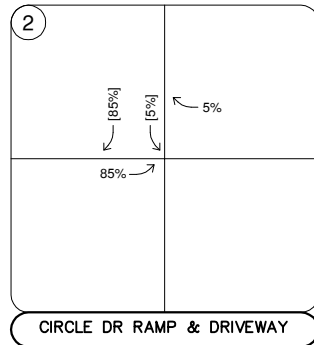
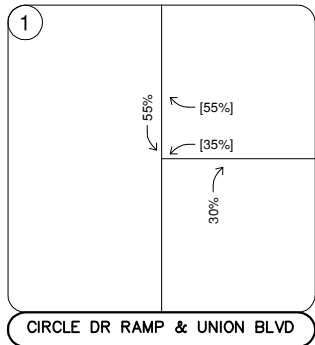
**Table 1 – The Ridge at Spring Creek Traffic Generation**

Land Use and Size	Weekday Vehicle Trips						
	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Attached Housing (ITE 215) – 194 Dwelling Units	1,428	29	66	95	66	46	112

### 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**.

<sup>1</sup> Institute of Transportation Engineers, *Trip Generation Manual*, Eleventh Edition, Washington DC, 2021.



**LEGEND**

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

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 PROJECT TRIP DISTRIBUTION

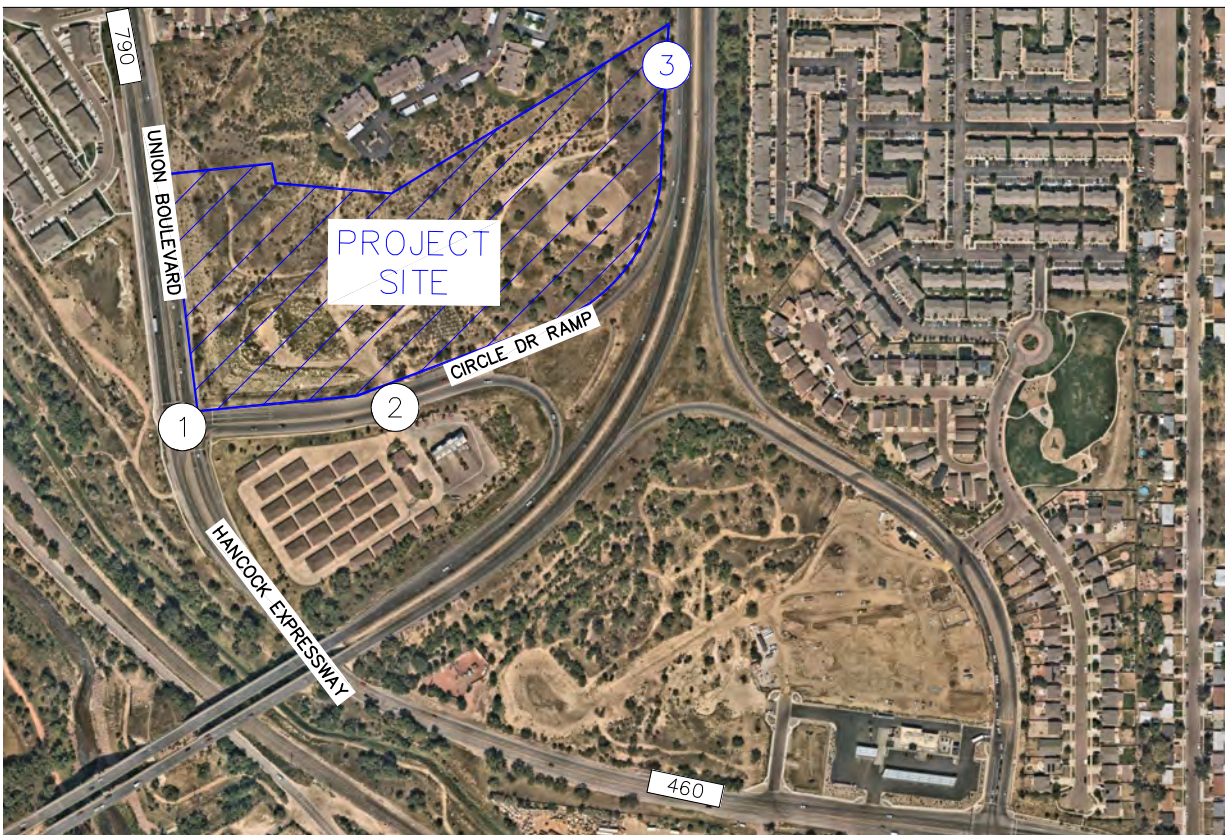
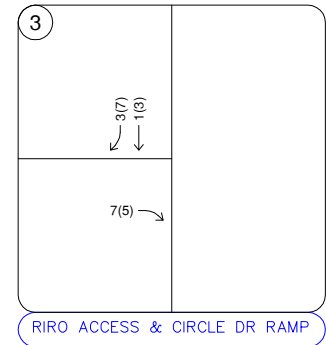
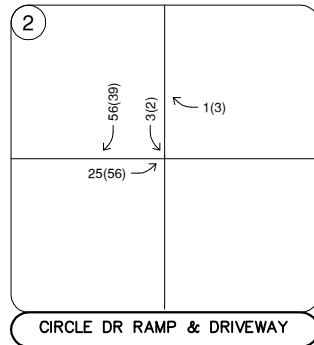
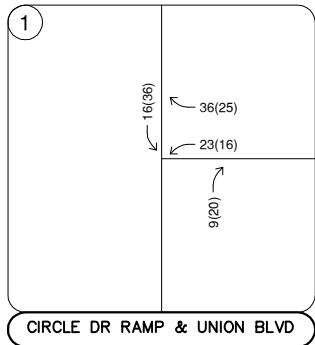
FIGURE 6

### 4.3 Traffic Assignment

The Ridge at Spring Creek 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 2026 buildout horizon and long-term 2045 twenty-year planning horizon. These total traffic volumes for the study area are illustrated for the 2026 and 2045 horizon years in **Figures 8** and **9**, respectively.

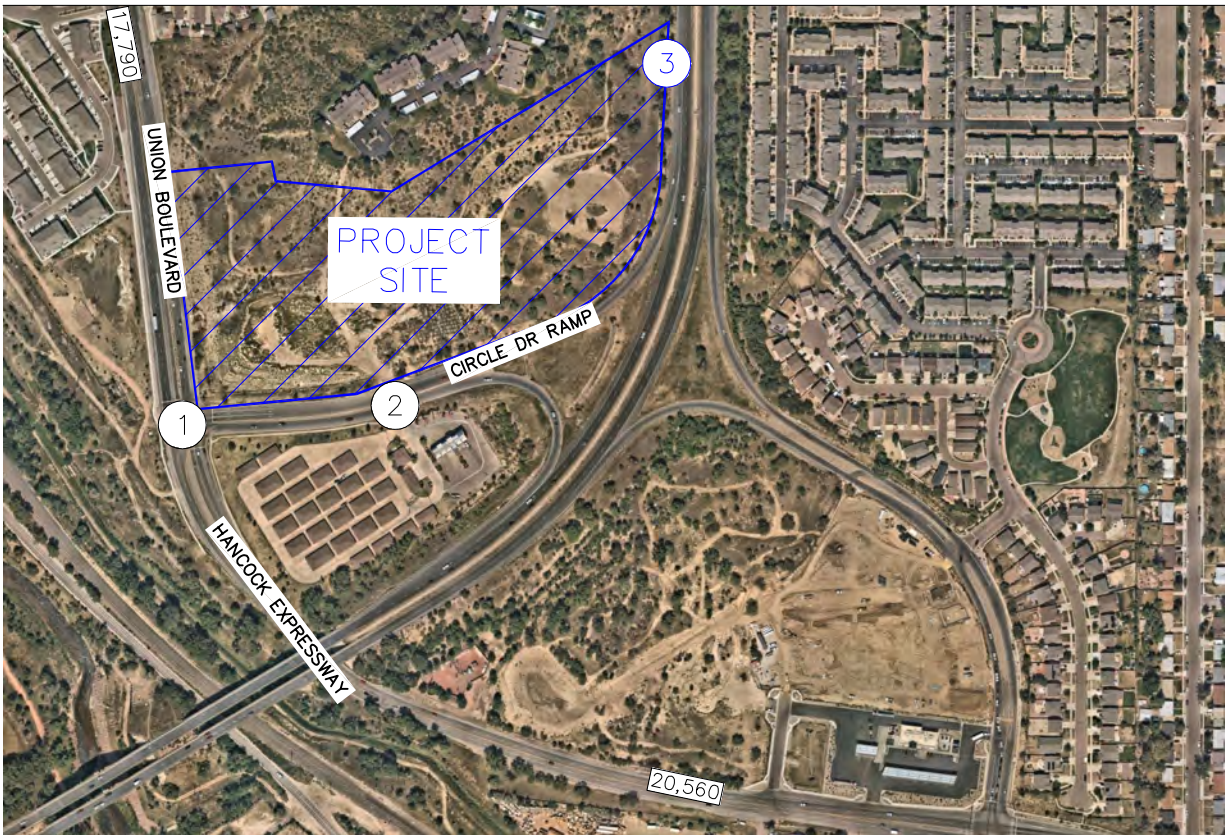
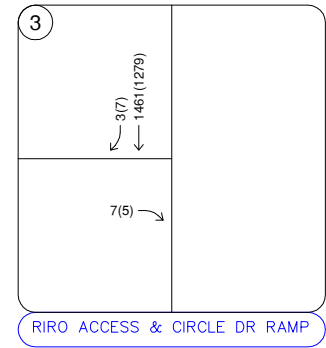
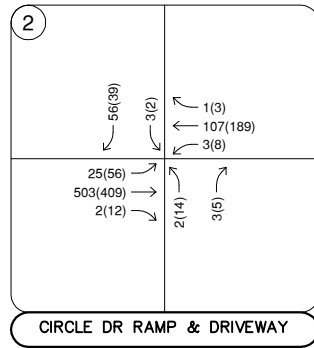
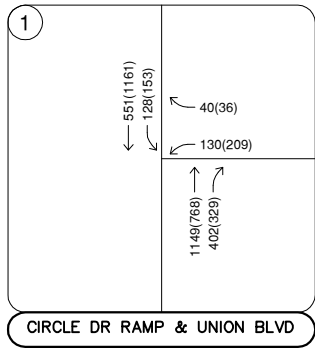


**LEGEND**

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

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 PROJECT TRAFFIC ASSIGNMENT

FIGURE 7

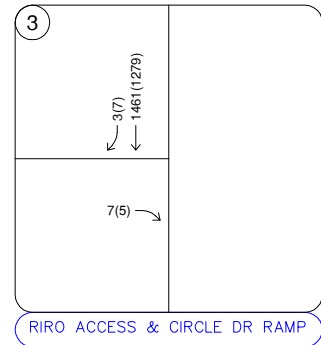
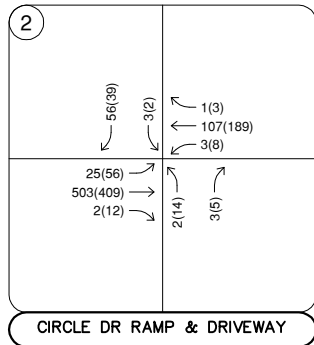
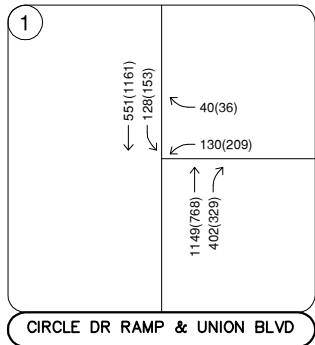


**LEGEND**

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

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 2026 TOTAL TRAFFIC VOLUMES

FIGURE 8



**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

THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 2045 TOTAL TRAFFIC VOLUMES

FIGURE 9



## 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 2026 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)*<sup>2</sup>.

### 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, Seventh Edition, Transportation Research Board, 2022.

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.

<sup>2</sup> Transportation Research Board, *Highway Capacity Manual*, Seventh Edition, Washington DC, 2022.

## 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 increase in yellow and all red time sacrifices intersection capacity for improved safety. Synchro traffic analysis software was used to analyze the signalized, and unsignalized key intersections for HCM level of service.

### Circle Drive Ramp and Union Boulevard/Hancock Expressway

The signalized intersection Circle Drive Ramp and Union Boulevard/Hancock Expressway operates with permissive-only left turn phasing on the southbound approach of Union Boulevard. The intersection operates acceptably at LOS A during both peak hours under existing conditions. With project traffic, all movements are anticipated to continue operating LOS A throughout the 2045 horizon. Therefore, no recommendations to the existing control or lane configurations are proposed at this intersection. **Table 3** provides the results of the LOS analysis conducted at this intersection.

**Table 3 – Circle Dr Ramp and Union Blvd/Hancock Expwy LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
<b>2024 Existing</b>	3.8	A	5.4	A
<b>2026 Background</b>	3.9	A	5.4	A
<b>2026 Background Plus Project</b>	5.2	A	6.1	A
<b>2045 Background</b>	4.4	A	5.9	A
<b>2045 Background Plus Project</b>	5.7	A	6.6	A

### Circle Drive Ramp Full Movement Access

The unsignalized access intersection along Circle Drive Ramp operates with stop control on the northbound approach of the driveway. The intersection movements operate acceptably at LOS B or better during both peak hours under existing conditions. With buildout of the project, a north leg will be constructed along Circle Drive Ramp aligning with the existing storage facility and car wash access. This north leg will be constructed to provide access to the site. The southbound approach out of the development is recommended to operate with stop-control with an R1-1 “STOP” sign installed. All movements are anticipated to continue operating at an acceptable level of service throughout the 2045 horizon, with or without project traffic. For safety purposes, turn lanes are recommended along Circle Drive Ramp for traffic turning into the project access and existing driveway on the south side of the roadway. Turn lanes are recommended to be designated for the eastbound left turn, westbound left turn, and westbound right turn lanes at the Circle Drive Ramp Access. The eastbound left turn lane at the access will be back-to-back with the inside westbound left turn lane of the dual left turn lanes for the Circle Drive and Union Boulevard/Hancock Expressway intersection to the west. **Table 4** provides the results of the LOS analysis conducted at this intersection.

**Table 4 – Circle Drive Ramp Full Movement Access LOS Results**

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
<b>2021 Existing</b>				
Northbound Approach	11.9	B	11.8	B
Westbound Left	8.4	A	8.0	A
<b>2024 Background</b>				
Northbound Approach	12.0	B	11.9	B
Westbound Left	8.4	A	8.0	A
<b>2024 Background Plus Project #</b>				
Northbound Approach	13.1	B	14.6	B
Eastbound Left	7.5	A	7.7	A
Westbound Left	8.4	A	8.0	A
Southbound Approach	9.4	A	9.6	A
<b>2045 Background</b>				
Northbound Approach	13.2	B	13.1	B
Westbound Left	8.7	A	8.2	A
<b>2045 Background Plus Project #</b>				
Northbound Approach	14.6	B	16.3	C
Eastbound Left	7.5	A	7.7	A
Westbound Left	8.7	A	8.2	A
Southbound Approach	9.7	A	9.9	A

# = Addition of North Leg

### Circle Drive Right-In/Right-Out Access

With completion of the Ridge at Spring Creek project, a right-in/right-out access is proposed along the west side of Circle Drive, at the northeast corner of the property. It is recommended that a R1-1 “STOP” sign be installed on the eastbound approach, exiting the Ridge at Spring Creek. This access will be restricted to right turn egress movements only; therefore, a R3-2 No Left Turn Lane is recommended to be provided below the “STOP” sign as well as a possible R6-1 (R) “ONE WAY” sign installed within the existing raised median of Circle Drive, directly in an exiting driver’s view. The southbound Circle Drive approach to the right-in/right-out access should be restriped so that the outside lane is converted to standard 10-foot stripe 30-foot gap through lane striping instead of the existing short skip dashed striping denoting the upcoming right turn lane for the off ramp. **Table 5** provides the results of the level of service for this project access. As shown in the table, the eastbound right turn exiting the Circle Drive Right-In/Right-Out Access is anticipated to operate with acceptable LOS C during the morning peak hour and LOS B during the afternoon peak hour in the buildout year of 2026. The eastbound right turn at the access is projected to continue operating acceptably at LOS C during both peak hours in the 2045 long-term horizon.

**Table 5 – Circle Drive Right-In/Right-Out Access LOS Results**

Movement	2026 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
Eastbound Right Turn	15.6	C	14.3	B	18.1	C	16.2	C

### 5.3 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 95<sup>th</sup> percentile queue lengths. Results are shown in the following **Table 6** with calculations provided within the level of service operational sheets of **Appendix E** for unsignalized intersections and **Appendix F** for signalized intersections.

**Table 6 – Turn Lane Queuing Analysis Results**

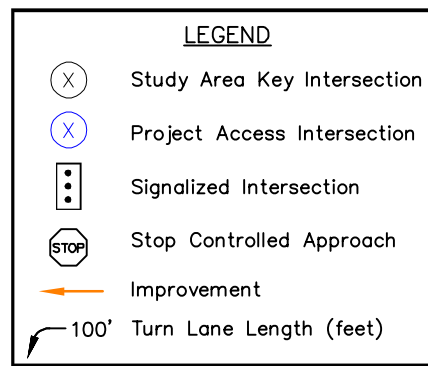
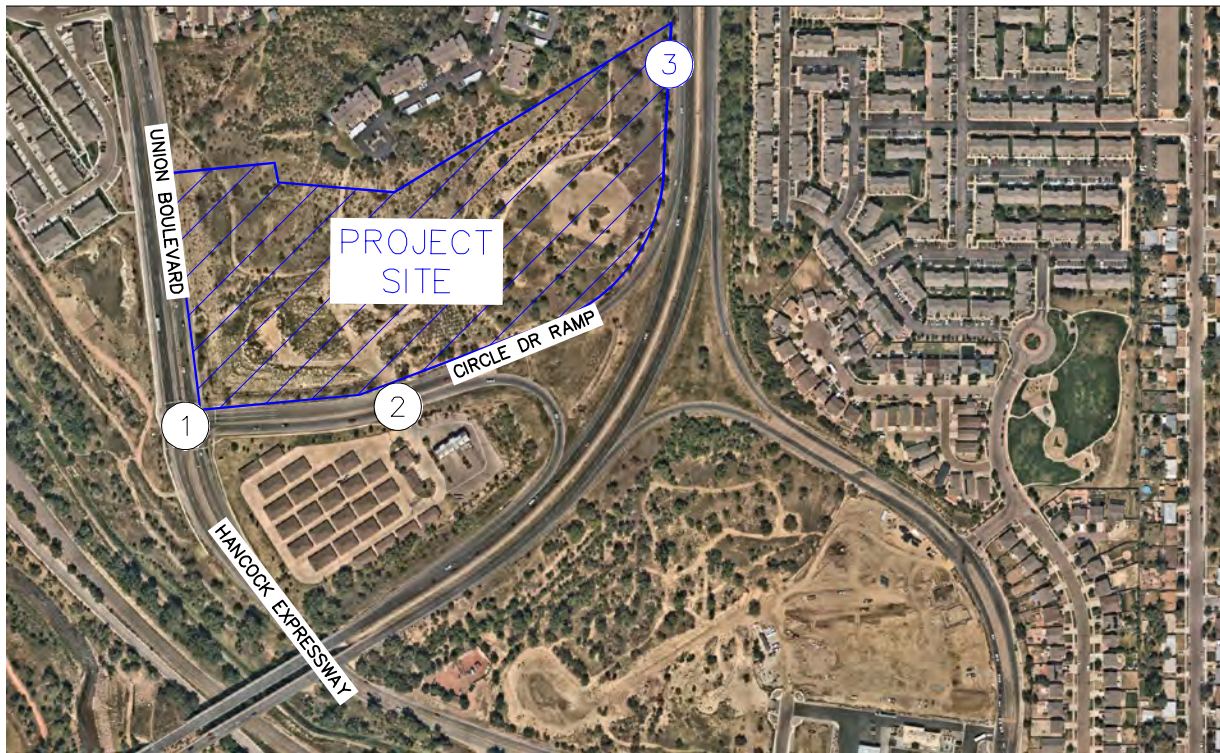
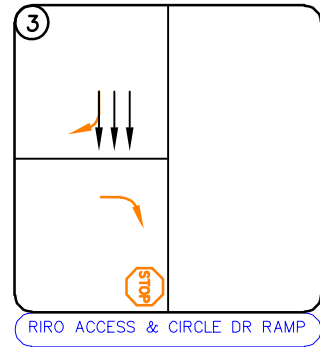
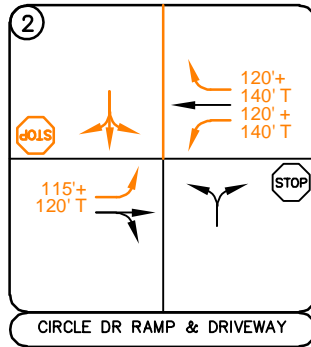
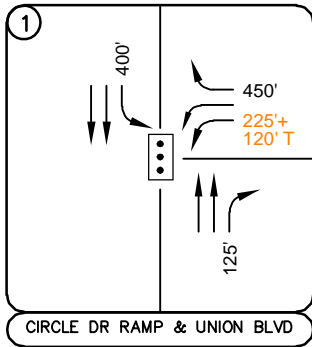
Intersection Turn Lane	Existing Turn Lane Length (feet)	2024 Calculated Queue (feet)	2024 Recommended Length (feet)	2025 Calculated Queue (feet)	2025 Recommended Length (feet)
<b>Circle Dr Ramp &amp; Union Blvd</b>					
Westbound Left	450'/C	81' DL	<b>225'/C</b>	93' DL	<b>225'/C</b>
Westbound Right	450'	27'	450'	30'	450'
Northbound Right	125'	16'	125'	18'	125'
Southbound Left	400'	39'	400'	69'	400'
<b>Circle Drive Ramp Access</b>					
Eastbound Left	DNE	25'	<b>115'+120'T</b>	25'	<b>115'+120'T</b>
Westbound Left	DNE	25'	<b>120'+140'T</b>	25'	<b>120'+140'T</b>

DNE = Does Not Exist; C = Continuous; T=Taper; **Blue** Text = Recommendation

As shown in the vehicle queuing table, all turn lane vehicle queues are expected to be contained within the existing turn lane lengths. However, turn lanes into and out of the project access and existing driveway on the south leg are recommended to be striped for safety purposes along the ramp. The westbound turn lanes at Circle Drive and Union Boulevard/Hancock Expressway intersection will need to be modified to accommodate an eastbound left turn lane into the project site. The Circle Drive On-Ramp was identified as having a posted speed limit of 25 miles per hour, matching the ramp posted speed. A lane length of 115 feet plus a 120-foot taper is required at this speed for the eastbound left turn lane into the access. The 120-foot taper will be shared with the inside westbound left turn lane at the Circle Drive and Union Boulevard/Hancock Expressway intersection to the west. Assuming Circle Drive Off-Ramp has a speed of 35 miles per hour based on the approximate 500-foot curve radius, the westbound left turn and right turn lanes at the Circle Drive Ramp Access intersection should be designated with a length of 120 feet plus a 140-foot taper based on City of Colorado Springs Engineering Criteria Manual (ECM).

#### 5.4 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**. In addition, an improvement exhibit for the restriping of turn lanes at the Circle Drive Ramp Access intersection is shown in **Figure 11**.



THE RIDGE AT SPRING CREEK  
 COLORADO SPRING, COLORADO  
 RECOMMENDED GEOMETRY  
 AND CONTROL

FIGURE 10



THE RIDGE AT SPRING CREEK  
COLORADO SPRING, COLORADO  
TURN LANE EXHIBIT

FIGURE 11



## 6.0 CONCLUSIONS AND RECOMMENDATIONS

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Based on the analysis presented in this report, Kimley-Horn believes the Ridge at Spring Creek 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 conclusions and recommendations:

- With buildout of the project, a north leg will be constructed along Circle Drive Ramp aligning with the existing storage facility and car wash access. This north leg will be constructed to provide full movement access to the site. The southbound approach out of the development is recommended to operate with stop-control with an R1-1 “STOP” sign installed.
- For safety purposes, turn lanes are recommended along Circle Drive Ramp for traffic turning into the full movement project access as well as the existing driveway on the south side of the roadway. Turn lanes with a length of 120 feet plus 140-foot taper are recommended to be designated for the westbound left turn and westbound right turn lanes at the Circle Drive Ramp Access intersection. Based on the posted 25 mile per hour speed limit along Circle Drive Ramp west of the access, a 115-foot plus 120-foot taper eastbound left turn lane is recommended at the access to be back-to-back with the inside westbound left turn lane of the dual left turn lanes for the Circle Drive and Union Boulevard/Hancock Expressway intersection to the west.
- An additional right-in/right-out access is proposed along the west side of Circle Drive at the northeast portion of the site. It is recommended that a R1-1 “STOP” sign be installed on the eastbound approach, exiting the Ridge at Spring Creek. This access will be restricted to right turn egress movements only; therefore, a R3-2 No Left Turn Lane is recommended to be provided below the “STOP” sign as well as a possible R6-1 (R) “ONE WAY” sign installed within the existing raised median of Circle Drive, directly in an exiting driver’s view. The southbound Circle Drive approach to the right-in/right-out access should be restriped so that the outside lane is converted to standard 10-foot stripe 30-foot gap through lane striping instead of the existing short skip dashed striping denoting the upcoming right turn lane for the off ramp.

- Any on-site 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

## Conceptual Site Plan

DISCLAIMER:  
THE INFORMATION, IDEAS,  
DESIGNS, AND DETAILS  
SHOWN ON THIS SHEET ARE  
FOR THE EXPRESS USE OF  
THE CLIENT AND PROJECT  
LISTED ON THIS SHEET ONLY.  
ANY RE-USE WITHOUT THE  
EXPRESS, WRITTEN CONSENT  
OF NAMED PARTIES OR ITS  
SUB-CONTRACTORS IS  
EXPRESSLY FORBIDDEN.  
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SHEET NAME  
**Cottage Concept**

PROJECT NAME  
**Covenant Presbyterian**

PROJECT ADDRESS  
PROJECT ADDRESS  
PROJECT ADDRESS

STAMPS/ENDORSEMENTS

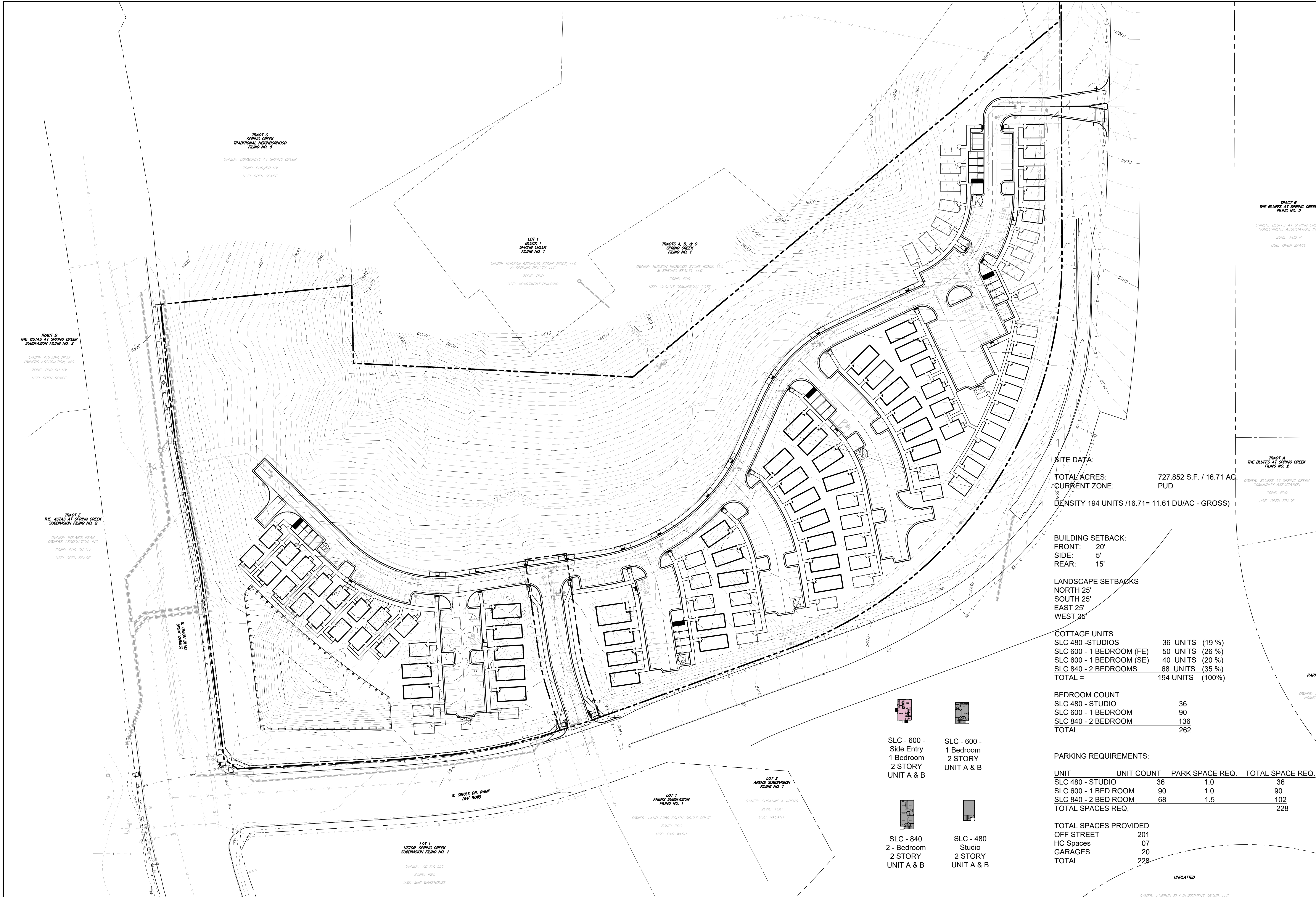
DRAWN BY:  
XXX

DATE:  
XX/XX/XXXX

DATE	BY	TYPE	REVISIONS
10/1/2015	JBS	IF CITY REVIEW	

DATE	BY	TYPE	REVISIONS
10/1/2015	JBS	IF CITY REVIEW	

SHEET NUMBER  
**X**  
x OF x SHEETS  
CITY FILE NUMBER:



**SITE DATA:**  
TOTAL ACRES: 727,852 S.F. / 16.71 AC.  
CURRENT ZONE: PUD  
DENSITY 194 UNITS / 16.71 = 11.61 DU/AC - GROSS

**BUILDING SETBACK:**  
FRONT: 20'  
SIDE: 5'  
REAR: 15'

**LANDSCAPE SETBACKS**  
NORTH 25'  
SOUTH 25'  
EAST 25'  
WEST 25'

**COTTAGE UNITS**

SLC 480 - STUDIOS	36 UNITS	(19 %)
SLC 600 - 1 BEDROOM (FE)	50 UNITS	(26 %)
SLC 600 - 1 BEDROOM (SE)	40 UNITS	(20 %)
SLC 840 - 2 BEDROOMS	68 UNITS	(35 %)
<b>TOTAL =</b>	<b>194 UNITS</b>	<b>(100%)</b>

**BEDROOM COUNT**

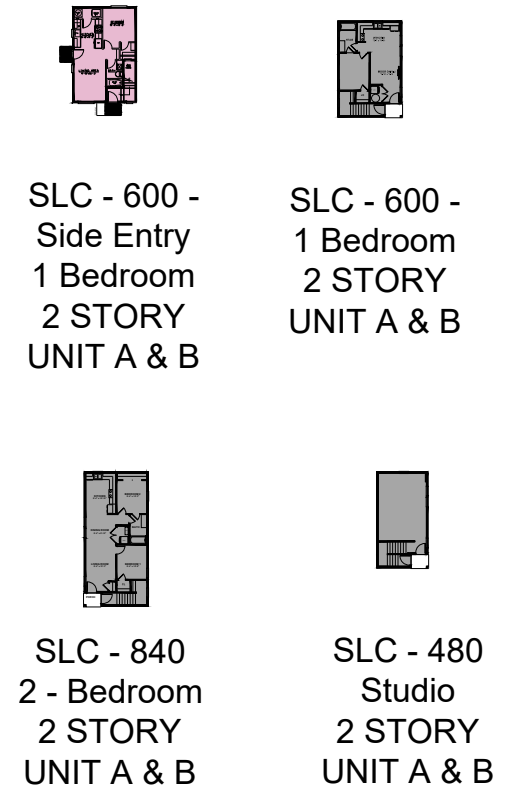
SLC 480 - STUDIO	36
SLC 600 - 1 BEDROOM	90
SLC 840 - 2 BEDROOM	136
<b>TOTAL</b>	<b>262</b>

**PARKING REQUIREMENTS:**

UNIT	UNIT COUNT	PARK SPACE REQ.	TOTAL SPACE REQ.
SLC 480 - STUDIO	36	1.0	36
SLC 600 - 1 BED ROOM	90	1.0	90
SLC 840 - 2 BED ROOM	68	1.5	102
<b>TOTAL SPACES REQ.,</b>			<b>228</b>

**TOTAL SPACES PROVIDED**

OFF STREET	201
HC SPACES	07
GARAGES	20
<b>TOTAL</b>	<b>228</b>



UNPLATTED

# APPENDIX B

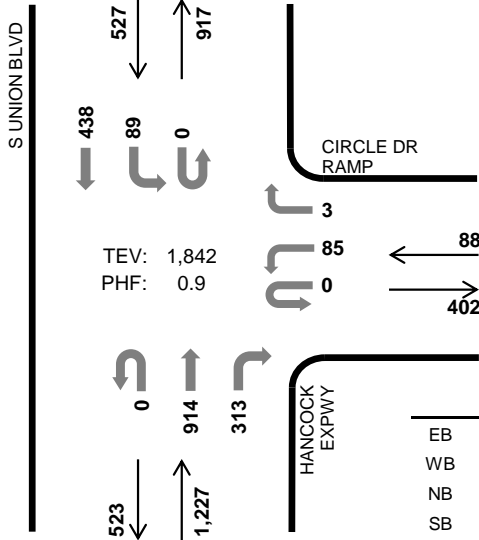
## Intersection Count Sheets

# HANCOCK EXPWY CIRCLE DR RAMP



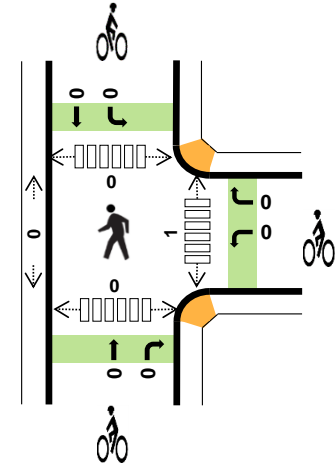
Peak Hour

Date: 02/08/2022  
Count Period: 7:00 AM to 9:00 AM  
Peak Hour: 7:15 AM to 8:15 AM



TEV: 1,842  
PHF: 0.9

	HV %:	PHF
EB	-	-
WB	1.1%	0.71
NB	5.6%	0.82
SB	3.8%	0.93
TOTAL	4.9%	0.90



## Two-Hour Count Summaries

Interval Start	n/a				CIRCLE DR RAMP				HANCOCK EXPWY				S UNION BLVD				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM	0	0	0	0	0	23	0	2	0	0	161	50	0	13	99	0	348	0	
7:15 AM	0	0	0	0	0	14	0	0	0	0	216	82	0	23	118	0	453	0	
7:30 AM	0	0	0	0	0	13	0	1	0	0	285	90	0	22	97	0	508	0	
7:45 AM	0	0	0	0	0	29	0	2	0	0	243	96	0	19	120	0	509	1,818	
8:00 AM	0	0	0	0	0	29	0	0	0	0	170	45	0	25	103	0	372	1,842	
8:15 AM	0	0	0	0	0	28	0	0	0	0	142	52	0	26	91	0	339	1,728	
8:30 AM	0	0	0	0	0	16	0	1	0	0	180	56	0	28	82	0	363	1,583	
8:45 AM	0	0	0	0	0	18	0	1	0	0	138	67	0	21	73	0	318	1,392	
Count Total	0	0	0	0	0	170	0	7	0	0	1,535	538	0	177	783	0	3,210	0	
Peak Hour	All	0	0	0	0	0	85	0	3	0	0	914	313	0	89	438	0	1,842	0
	HV	0	0	0	0	0	1	0	0	0	0	50	19	0	3	17	0	90	0
	HV%	-	-	-	-	-	1%	-	0%	-	-	5%	6%	-	3%	4%	-	5%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	1	18	7	26	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	20	5	25	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	26	5	31	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	12	3	15	0	0	0	0	0	1	0	0	0	1
8:00 AM	0	1	11	7	19	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	2	17	7	26	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	1	12	11	24	0	0	0	1	1	0	0	0	0	0
8:45 AM	0	0	12	9	21	0	0	0	0	0	0	0	0	0	0
Count Total	0	5	128	54	187	0	0	0	1	1	1	0	0	0	1
Peak Hr	0	1	69	20	90	0	0	0	0	0	1	0	0	0	1

<b>Two-Hour Count Summaries - Heavy Vehicles</b>																			
Interval Start	n/a				CIRCLE DR RAMP				HANCOCK EXPWY				S UNION BLVD				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM	0	0	0	0	0	1	0	0	0	0	0	15	3	0	1	6	0	26	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	14	6	0	0	5	0	25	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	21	5	0	0	5	0	31	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	6	6	0	1	2	0	15	97
8:00 AM	0	0	0	0	0	1	0	0	0	0	0	9	2	0	2	5	0	19	90
8:15 AM	0	0	0	0	0	2	0	0	0	0	0	12	5	0	0	7	0	26	91
8:30 AM	0	0	0	0	0	1	0	0	0	0	0	8	4	0	2	9	0	24	84
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	10	2	0	0	9	0	21	90
Count Total	0	0	0	0	0	5	0	0	0	0	0	95	33	0	6	48	0	187	0
Peak Hour	0	0	0	0	0	1	0	0	0	0	0	50	19	0	3	17	0	90	0

<b>Two-Hour Count Summaries - Bikes</b>																			
Interval Start	n/a			CIRCLE DR RAMP			HANCOCK EXPWY			S UNION BLVD			15-min Total	Rolling One Hour					
	Eastbound			Westbound			Northbound			Southbound									
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT							
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

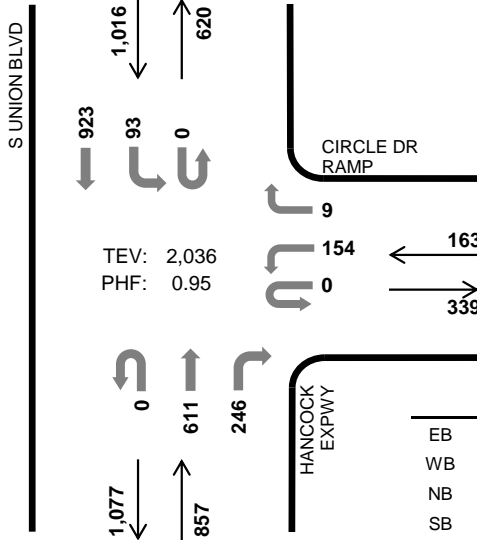


# HANCOCK EXPWY CIRCLE DR RAMP

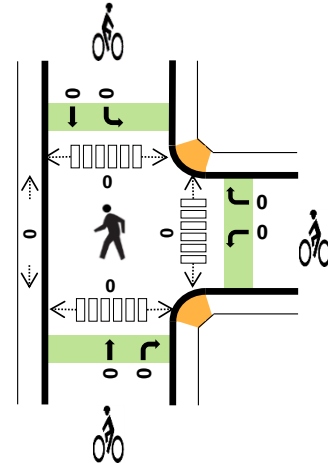


Peak Hour

Date: 02/08/2022  
Count Period: 4:00 PM to 6:00 PM  
Peak Hour: 4:30 PM to 5:30 PM



TEV: 2,036  
PHF: 0.95



	HV %:	PHF
EB	-	-
WB	0.0%	0.85
NB	2.2%	0.87
SB	3.5%	0.99
TOTAL	2.7%	0.95

## Two-Hour Count Summaries

Interval Start	n/a				CIRCLE DR RAMP				HANCOCK EXPWY				S UNION BLVD				15-min Total	Rolling One Hour	
	Eastbound				Westbound				Northbound				Southbound						
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT			
4:00 PM	0	0	0	0	0	40	0	4	0	0	155	64	0	18	206	0	487	0	
4:15 PM	0	0	0	0	0	32	0	2	0	0	125	60	0	26	194	0	439	0	
<b>4:30 PM</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>36</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>181</b>	<b>66</b>	<b>0</b>	<b>21</b>	<b>230</b>	<b>0</b>	<b>537</b>	<b>0</b>	
4:45 PM	0	0	0	0	0	36	0	2	0	0	137	51	0	37	219	0	482	1,945	
5:00 PM	0	0	0	0	0	44	0	4	0	0	159	60	0	19	236	0	522	1,980	
5:15 PM	0	0	0	0	0	38	0	0	0	0	134	69	0	16	238	0	495	2,036	
5:30 PM	0	0	0	0	0	39	0	5	0	0	135	63	0	19	191	0	452	1,951	
5:45 PM	0	0	0	0	0	34	0	1	0	0	121	30	0	16	145	0	347	1,816	
Count Total	0	0	0	0	0	299	0	21	0	0	1,147	463	0	172	1,659	0	3,761	0	
Peak Hour	All	0	0	0	0	0	154	0	9	0	0	611	246	0	93	923	0	2,036	0
	HV	0	0	0	0	0	0	0	0	0	0	14	5	0	3	33	0	55	0
	HV%	-	-	-	-	-	0%	-	0%	-	-	2%	2%	-	3%	4%	-	3%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	1	7	4	12	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	1	9	7	17	0	0	0	0	0	0	0	0	0	0
<b>4:30 PM</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>7</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
4:45 PM	0	0	5	9	14	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	3	13	16	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	3	7	10	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	7	6	14	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	1	4	6	11	0	0	0	0	0	0	0	0	0	0
Count Total	0	4	46	59	109	0	0	0	0	0	0	0	0	0	0
Peak Hr	0	0	19	36	55	0	0	0	0	0	0	0	0	0	0

<b>Two-Hour Count Summaries - Heavy Vehicles</b>																		
Interval Start	n/a				CIRCLE DR RAMP				HANCOCK EXPWY				S UNION BLVD				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	1	0	0	0	0	4	3	0	0	4	0	12	0
4:15 PM	0	0	0	0	0	1	0	0	0	0	5	4	0	0	7	0	17	0
<b>4:30 PM</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>15</b>	<b>0</b>
4:45 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	1	8	0	14	58
5:00 PM	0	0	0	0	0	0	0	0	0	0	2	1	0	1	12	0	16	62
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	2	0	0	7	0	10	55
5:30 PM	0	0	0	0	0	1	0	0	0	0	3	4	0	0	6	0	14	54
5:45 PM	0	0	0	0	0	1	0	0	0	0	1	3	0	0	6	0	11	51
Count Total	0	0	0	0	0	4	0	0	0	0	27	19	0	3	56	0	109	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	14	5	0	3	33	0	55	0

<b>Two-Hour Count Summaries - Bikes</b>																		
Interval Start	n/a			CIRCLE DR RAMP			HANCOCK EXPWY			S UNION BLVD			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>4:30 PM</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

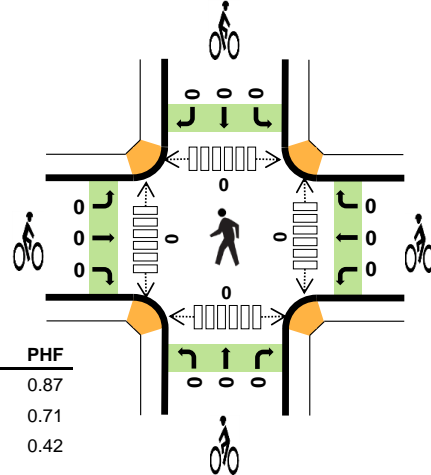
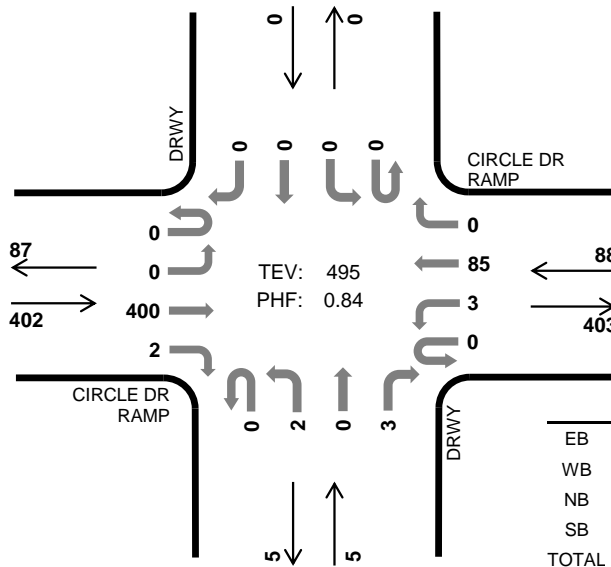
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

# DRWY CIRCLE DR RAMP



Peak Hour

Date: 02/08/2022  
Count Period: 7:00 AM to 9:00 AM  
Peak Hour: 7:15 AM to 8:15 AM



	HV %:	PHF
EB	5.2%	0.87
WB	1.1%	0.71
NB	0.0%	0.42
SB	-	-
TOTAL	4.4%	0.84

### Two-Hour Count Summaries

Interval Start	CIRCLE DR RAMP				CIRCLE DR RAMP				DRWY				DRWY				15-min Total	Rolling One Hour	
	Eastbound		Westbound		Northbound		Southbound		UT	LT	TH	RT	UT	LT	TH	RT			
7:00 AM	0	0	62	1	0	1	23	0	0	0	0	1	0	0	0	1	89	0	
7:15 AM	0	0	105	0	0	0	14	0	0	0	0	1	0	0	0	0	120	0	
7:30 AM	0	0	110	2	0	1	14	0	0	0	0	0	0	0	0	0	127	0	
7:45 AM	0	0	116	0	0	1	27	0	0	1	0	2	0	0	0	0	147	483	
8:00 AM	0	0	69	0	0	1	30	0	0	1	0	0	0	0	0	0	101	495	
8:15 AM	0	0	77	2	0	0	27	0	0	0	0	0	0	0	0	0	106	481	
8:30 AM	0	0	83	1	0	0	14	0	0	1	0	1	0	0	0	0	100	454	
8:45 AM	1	0	85	2	0	0	18	0	0	1	0	0	0	0	0	0	107	414	
Count Total	1	0	707	8	0	4	167	0	0	4	0	5	0	0	0	1	897	0	
Peak Hour	All	0	0	400	2	0	3	85	0	0	2	0	3	0	0	0	0	495	0
	HV	0	0	21	0	0	0	1	0	0	0	0	0	0	0	0	0	22	0
	HV%	-	-	5%	0%	-	0%	1%	-	-	0%	-	0%	-	-	-	-	4%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	4	1	0	0	5	0	0	0	0	0	0	0	0	0	0
7:15 AM	6	0	0	0	6	0	0	0	0	0	0	0	0	0	0
7:30 AM	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0
7:45 AM	7	0	0	0	7	0	0	0	0	0	0	0	0	0	0
8:00 AM	4	1	0	0	5	0	0	0	0	0	0	0	0	0	0
8:15 AM	5	3	0	0	8	0	0	0	0	0	0	0	0	0	0
8:30 AM	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0
8:45 AM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Count Total	38	5	0	0	43	0	0	0	0	0	0	0	0	0	0
Peak Hour	21	1	0	0	22	0	0	0	0	0	0	0	0	0	0

<b>Two-Hour Count Summaries - Heavy Vehicles</b>																		
Interval Start	CIRCLE DR RAMP				CIRCLE DR RAMP				DRWY				DRWY				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0
7:15 AM	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
7:30 AM	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
7:45 AM	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7	22
8:00 AM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	22
8:15 AM	0	0	4	1	0	0	3	0	0	0	0	0	0	0	0	0	8	24
8:30 AM	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	25
8:45 AM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	21
Count Total	0	0	37	1	0	0	5	0	0	0	0	0	0	0	0	0	43	0
Peak Hour	0	0	21	0	0	0	1	0	0	0	0	0	0	0	0	0	22	0
<b>Two-Hour Count Summaries - Bikes</b>																		
Interval Start	CIRCLE DR RAMP			CIRCLE DR RAMP			DRWY			DRWY			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Note: U-Turn volumes for bikes are included in Left-Turn, if any.</i>																		

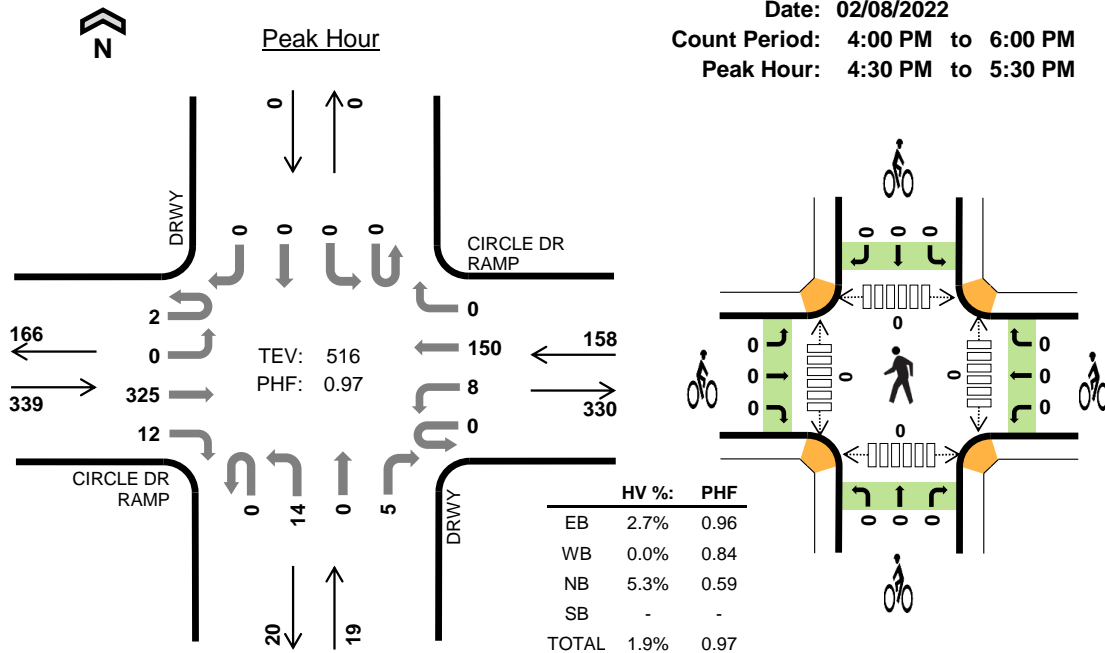
# DRWY CIRCLE DR RAMP



Date: 02/08/2022

Count Period: 4:00 PM to 6:00 PM

Peak Hour: 4:30 PM to 5:30 PM



### Two-Hour Count Summaries

Interval Start	CIRCLE DR RAMP				CIRCLE DR RAMP				DRWY				DRWY				15-min Total	Rolling One Hour	
	Eastbound		Westbound		Northbound		Southbound		UT	LT	TH	RT	UT	LT	TH	RT			
4:00 PM	0	0	82	3	0	0	43	0	0	3	0	0	0	0	0	0	131	0	
4:15 PM	0	0	78	4	0	0	29	0	0	3	0	1	0	0	0	0	115	0	
4:30 PM	0	0	88	0	0	1	42	0	0	1	0	0	0	0	0	0	132	0	
4:45 PM	1	0	83	3	0	4	30	0	0	3	0	2	0	0	0	0	126	504	
5:00 PM	1	0	73	4	0	3	44	0	0	5	0	3	0	0	0	0	133	506	
5:15 PM	0	0	81	5	0	0	34	0	0	5	0	0	0	0	0	0	125	516	
5:30 PM	0	0	78	3	0	0	41	0	0	5	0	0	0	0	0	0	127	511	
5:45 PM	0	0	46	2	0	1	29	0	0	2	0	2	0	0	0	0	82	467	
Count Total	2	0	609	24	0	9	292	0	0	27	0	8	0	0	0	0	971	0	
Peak Hour	All	2	0	325	12	0	8	150	0	0	14	0	5	0	0	0	0	516	0
	HV	0	0	8	1	0	0	0	0	0	1	0	0	0	0	0	0	10	0
	HV%	0%	-	2%	8%	-	0%	0%	-	-	7%	-	0%	-	-	-	-	2%	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0
4:15 PM	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0
4:30 PM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
4:45 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
5:00 PM	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
5:15 PM	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0
5:30 PM	4	1	0	0	5	0	0	0	0	0	0	0	0	0	0
5:45 PM	4	1	0	0	5	0	0	0	0	0	0	0	0	0	0
Count Total	23	4	1	0	28	0	0	0	0	0	0	0	0	0	0
Peak Hour	9	0	1	0	10	0	0	0	0	0	0	0	0	0	0

<b>Two-Hour Count Summaries - Heavy Vehicles</b>																		
Interval Start	CIRCLE DR RAMP				CIRCLE DR RAMP				DRWY				DRWY				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
4:15 PM	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
4:30 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
4:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12
5:00 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	11
5:15 PM	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	3	10
5:30 PM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	12
5:45 PM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	16
Count Total	0	0	22	1	0	0	4	0	0	1	0	0	0	0	0	0	28	0
Peak Hour	0	0	8	1	0	0	0	0	0	1	0	0	0	0	0	0	10	0
<b>Two-Hour Count Summaries - Bikes</b>																		
Interval Start	CIRCLE DR RAMP			CIRCLE DR RAMP			DRWY			DRWY			15-min Total	Rolling One Hour				
	Eastbound			Westbound			Northbound			Southbound								
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Note: U-Turn volumes for bikes are included in Left-Turn, if any.</i>																		

**All Traffic Data Services**  
 12200 W 52nd Ave  
 Wheat Ridge, CO 80033  
 www.alltrafficdata.net

Site Code: 1  
 Station ID: 1  
 SB CIRCLE LANE N.O. HANCOCK RAMPS

Start Time	27-Aug-24 Tue	RAMP LANE	LANE 1	LANE 2						Total
12:00 AM		0	0	0						0
01:00		0	0	0						0
02:00		0	0	0						0
03:00		0	0	0						0
04:00		0	0	0						0
05:00		0	0	0						0
06:00		0	0	0						0
07:00		52	587	546						1185
08:00		70	502	521						1093
09:00		0	0	0						0
10:00		0	0	0						0
11:00		0	0	0						0
12:00 PM		0	0	0						0
01:00		0	0	0						0
02:00		0	0	0						0
03:00		0	0	0						0
04:00		121	422	492						1035
05:00		117	419	462						998
06:00		0	0	0						0
07:00		0	0	0						0
08:00		0	0	0						0
09:00		0	0	0						0
10:00		0	0	0						0
11:00		0	0	0						0
Total		360	1930	2021						4311
Percent		8.4%	44.8%	46.9%						
AM Peak	-	08:00	07:00	07:00	-	-	-	-	-	07:00
Vol.	-	70	587	546	-	-	-	-	-	1185
PM Peak	-	16:00	16:00	16:00	-	-	-	-	-	16:00
Vol.	-	121	422	492	-	-	-	-	-	1035
Grand Total		360	1930	2021						4311
Percent		8.4%	44.8%	46.9%						
ADT		ADT 4,311		AADT 4,311						

# APPENDIX C

## Future Traffic Projections



PPACG Traffic Projections: The Ridge at Spring Creek

Location	Daily Volumes			
	2015	2040	Growth Factor	Annual Growth
Union Blvd N/O Circle Dr Ramp	9,341	11,191	1.20	0.7%
Hancock Expwy S/O Circle Dr Ramp	9,474	11,191	1.18	0.7%
Total (Average)	18,815	22,382	1.19	0.7%

# APPENDIX D

## Trip Generation Worksheets

Project The Ridge at Spring Creek  
 Subject Trip Generation for Single-Family Attached Housing  
 Designed by PAC Date September 30, 2024 Job No. 296062000  
 Checked by \_\_\_\_\_ Date \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_

## **TRIP GENERATION MANUAL TECHNIQUES**

ITE Trip Generation Manual 11th Edition, Fitted Curve Equations

Land Use Code - Single-Family Attached Housing (215)

Independent Variable - Dwelling Units (X)

$$X = 194$$

T = Average Vehicle Trip Ends

### **Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (200 Series Page 239)**

(T) = 0.52 (X) - 5.70	Directional Distribution:	31% ent.	69% exit.
(T) = 0.52 * (194) - 5.70	T = 95	Average Vehicle Trip Ends	
	29 entering	66	exiting
	29 + 66 = 95		

### **Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (200 Series Page 240)**

(T) = 0.60 (X) - 3.93	Directional Distribution:	59% ent.	41% exit.
(T) = 0.60 * (194) - 3.93	T = 112	Average Vehicle Trip Ends	
	66 entering	46	exiting
	66 + 46 = 112		

### **Weekday (200 Series Page 238)**

(T) = 7.62 (X) - 50.48	Directional Distribution:	50% entering, 50% exiting	
(T) = 7.62 * (194) - 50.48	T = 1428	Average Vehicle Trip Ends	
	714 entering	714	exiting
	714 + 714 = 1428		

# APPENDIX E

## Intersection Analysis Worksheets

Timings  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2024 Existing AM  
 10/01/2024

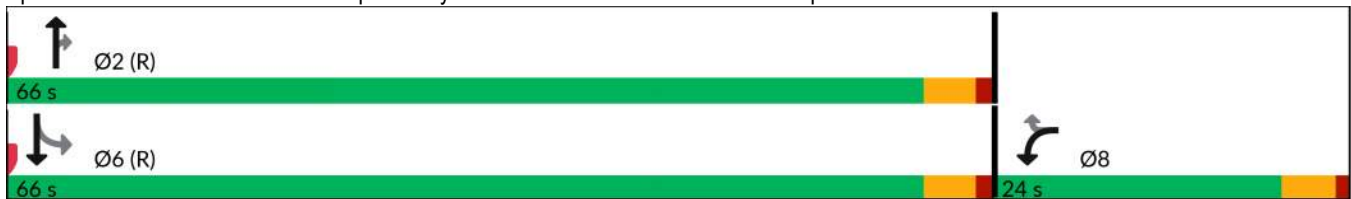


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↗↘	↗	↗↗	↗	↘	↗↗
Traffic Volume (vph)	87	3	932	319	91	447
Future Volume (vph)	87	3	932	319	91	447
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	24.0	24.0	66.0	66.0	66.0	66.0
Total Split (%)	26.7%	26.7%	73.3%	73.3%	73.3%	73.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	7.9	7.9	76.0	76.0	76.0	76.0
Actuated g/C Ratio	0.09	0.09	0.84	0.84	0.84	0.84
v/c Ratio	0.32	0.02	0.35	0.25	0.24	0.17
Control Delay (s/veh)	40.9	25.3	2.5	0.7	3.7	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	40.9	25.3	2.5	0.7	3.7	1.9
LOS	D	C	A	A	A	A
Approach Delay (s/veh)	40.4		2.0			2.2
Approach LOS	D		A			A

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.35  
 Intersection Signal Delay (s/veh): 3.9  
 Intersection LOS: A  
 Intersection Capacity Utilization 46.2%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2024 Existing AM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	87	3	932	319	91	447
Future Volume (veh/h)	87	3	932	319	91	447
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	97	3	1036	354	101	497
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	176	81	3017	1346	386	3017
Arrive On Green	0.05	0.05	0.85	0.85	0.85	0.85
Sat Flow, veh/h	3456	1585	3647	1585	389	3647
Grp Volume(v), veh/h	97	3	1036	354	101	497
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	389	1777
Q Serve(g_s), s	2.5	0.2	5.6	3.9	6.7	2.2
Cycle Q Clear(g_c), s	2.5	0.2	5.6	3.9	12.3	2.2
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	176	81	3017	1346	386	3017
V/C Ratio(X)	0.55	0.04	0.34	0.26	0.26	0.16
Avail Cap(c_a), veh/h	749	343	3017	1346	386	3017
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	41.7	40.6	1.4	1.3	2.8	1.2
Incr Delay (d2), s/veh	2.7	0.2	0.3	0.5	1.6	0.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.1	0.8	0.6	0.5	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	44.4	40.8	1.8	1.8	4.4	1.3
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	100		1390			598
Approach Delay, s/veh	44.3		1.8			1.8
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		80.9			80.9	9.1
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		61.5			61.5	19.5
Max Q Clear Time (g_c+11), s		7.6			14.3	4.5
Green Ext Time (p_c), s		12.3			6.3	0.2
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			3.8			
HCM 7th LOS			A			

Timings

1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

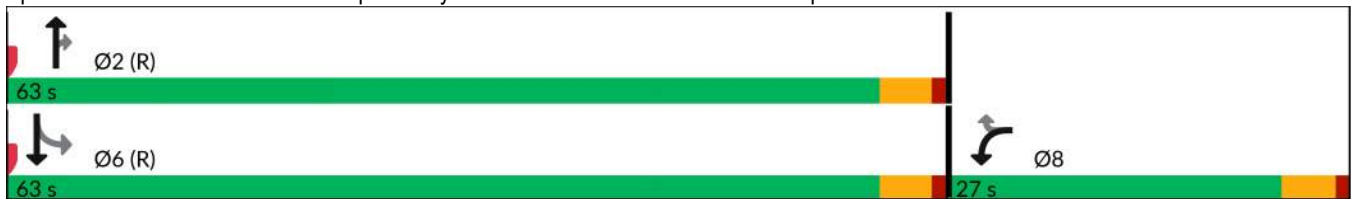


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑↑	↑	↑↑	↑	↑	↑↑
Traffic Volume (vph)	157	9	623	251	95	942
Future Volume (vph)	157	9	623	251	95	942
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.0	27.0	63.0	63.0	63.0	63.0
Total Split (%)	30.0%	30.0%	70.0%	70.0%	70.0%	70.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effect Green (s)	9.7	9.7	71.3	71.3	71.3	71.3
Actuated g/C Ratio	0.11	0.11	0.79	0.79	0.79	0.79
v/c Ratio	0.45	0.05	0.23	0.20	0.17	0.35
Control Delay (s/veh)	41.1	19.7	2.7	0.7	3.3	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.1	19.7	2.7	0.7	3.3	3.2
LOS	D	B	A	A	A	A
Approach Delay (s/veh)	40.0		2.2			3.2
Approach LOS	D		A			A

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 45  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.45  
 Intersection Signal Delay (s/veh): 5.7    Intersection LOS: A  
 Intersection Capacity Utilization 38.2%    ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2024 Existing PM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	157	9	623	251	95	942
Future Volume (veh/h)	157	9	623	251	95	942
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	165	9	656	264	100	992
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	252	116	2939	1311	558	2939
Arrive On Green	0.07	0.07	0.83	0.83	0.83	0.83
Sat Flow, veh/h	3456	1585	3647	1585	607	3647
Grp Volume(v), veh/h	165	9	656	264	100	992
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	607	1777
Q Serve(g_s), s	4.2	0.5	3.5	3.1	3.8	6.0
Cycle Q Clear(g_c), s	4.2	0.5	3.5	3.1	7.3	6.0
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	252	116	2939	1311	558	2939
V/C Ratio(X)	0.65	0.08	0.22	0.20	0.18	0.34
Avail Cap(c_a), veh/h	864	396	2939	1311	558	2939
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	40.6	38.9	1.7	1.6	2.4	1.9
Incr Delay (d2), s/veh	2.9	0.3	0.2	0.3	0.7	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.2	0.6	0.6	0.4	1.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	43.5	39.2	1.8	2.0	3.1	2.2
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	174		920			1092
Approach Delay, s/veh	43.2		1.9			2.3
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		78.9			78.9	11.1
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		58.5			58.5	22.5
Max Q Clear Time (g_c+I1), s		5.5			9.3	6.2
Green Ext Time (p_c), s		6.5			11.0	0.5
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			5.4			
HCM 7th LOS			A			



Timings  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

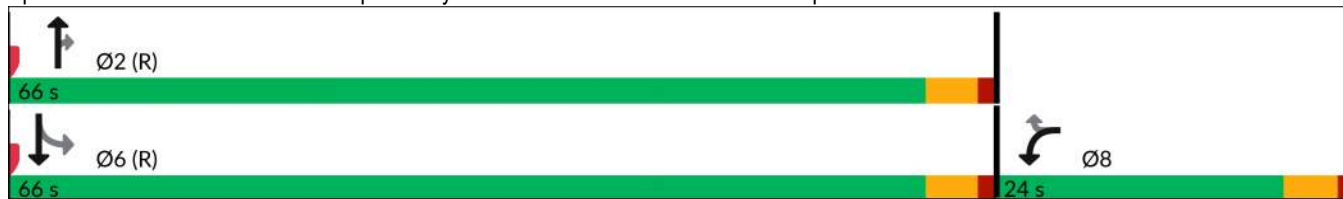


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	89	3	951	325	93	456
Future Volume (vph)	89	3	951	325	93	456
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	24.0	24.0	66.0	66.0	66.0	66.0
Total Split (%)	26.7%	26.7%	73.3%	73.3%	73.3%	73.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	8.0	8.0	76.0	76.0	76.0	76.0
Actuated g/C Ratio	0.09	0.09	0.84	0.84	0.84	0.84
v/c Ratio	0.33	0.02	0.35	0.26	0.25	0.17
Control Delay (s/veh)	41.0	25.3	2.5	0.7	3.9	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.0	25.3	2.5	0.7	3.9	1.9
LOS	D	C	A	A	A	A
Approach Delay (s/veh)	40.5		2.1			2.3
Approach LOS	D		A			A

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.35  
 Intersection Signal Delay (s/veh): 4.0      Intersection LOS: A  
 Intersection Capacity Utilization 46.9%      ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2026 Background AM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	89	3	951	325	93	456
Future Volume (veh/h)	89	3	951	325	93	456
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	99	3	1057	361	103	507
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	177	81	3016	1345	377	3016
Arrive On Green	0.05	0.05	0.85	0.85	0.85	0.85
Sat Flow, veh/h	3456	1585	3647	1585	379	3647
Grp Volume(v), veh/h	99	3	1057	361	103	507
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	379	1777
Q Serve(g_s), s	2.5	0.2	5.8	4.0	7.2	2.3
Cycle Q Clear(g_c), s	2.5	0.2	5.8	4.0	13.0	2.3
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	177	81	3016	1345	377	3016
V/C Ratio(X)	0.56	0.04	0.35	0.27	0.27	0.17
Avail Cap(c_a), veh/h	749	343	3016	1345	377	3016
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	41.7	40.6	1.5	1.3	2.9	1.2
Incr Delay (d2), s/veh	2.8	0.2	0.3	0.5	1.8	0.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.1	0.8	0.6	0.5	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	44.5	40.8	1.8	1.8	4.6	1.3
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	102		1418			610
Approach Delay, s/veh	44.3		1.8			1.9
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		80.9			80.9	9.1
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		61.5			61.5	19.5
Max Q Clear Time (g_c+I1), s		7.8			15.0	4.5
Green Ext Time (p_c), s		12.7			6.5	0.2
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			3.9			
HCM 7th LOS			A			



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	160	9	636	256	97	961
Future Volume (vph)	160	9	636	256	97	961
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.0	27.0	63.0	63.0	63.0	63.0
Total Split (%)	30.0%	30.0%	70.0%	70.0%	70.0%	70.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effect Green (s)	9.7	9.7	71.3	71.3	71.3	71.3
Actuated g/C Ratio	0.11	0.11	0.79	0.79	0.79	0.79
v/c Ratio	0.45	0.05	0.24	0.21	0.17	0.36
Control Delay (s/veh)	41.2	19.7	2.8	0.7	3.3	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.2	19.7	2.8	0.7	3.3	3.3
LOS	D	B	A	A	A	A
Approach Delay (s/veh)	40.1		2.2			3.3
Approach LOS	D		A			A

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
 Natural Cycle: 45  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.45  
 Intersection Signal Delay (s/veh): 5.8      Intersection LOS: A  
 Intersection Capacity Utilization 38.8%      ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2026 Background PM

10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	160	9	636	256	97	961
Future Volume (veh/h)	160	9	636	256	97	961
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	168	9	669	269	102	1012
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	256	117	2935	1309	549	2935
Arrive On Green	0.07	0.07	0.83	0.83	0.83	0.83
Sat Flow, veh/h	3456	1585	3647	1585	597	3647
Grp Volume(v), veh/h	168	9	669	269	102	1012
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	597	1777
Q Serve(g_s), s	4.3	0.5	3.6	3.2	4.0	6.2
Cycle Q Clear(g_c), s	4.3	0.5	3.6	3.2	7.6	6.2
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	256	117	2935	1309	549	2935
V/C Ratio(X)	0.66	0.08	0.23	0.21	0.19	0.34
Avail Cap(c_a), veh/h	864	396	2935	1309	549	2935
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	40.6	38.8	1.7	1.6	2.5	1.9
Incr Delay (d2), s/veh	2.9	0.3	0.2	0.4	0.7	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.2	0.7	0.6	0.4	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	43.4	39.1	1.9	2.0	3.2	2.2
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	177		938			1114
Approach Delay, s/veh	43.2		1.9			2.3
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		78.8			78.8	11.2
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		58.5			58.5	22.5
Max Q Clear Time (g_c+I1), s		5.6			9.6	6.3
Green Ext Time (p_c), s		6.7			11.4	0.5
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			5.4			
HCM 7th LOS			A			

Timings

2026 Total AM

1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

10/01/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↗↗	↗	↑↑	↗	↘	↑↑
Traffic Volume (vph)	112	39	951	334	109	456
Future Volume (vph)	112	39	951	334	109	456
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	24.0	24.0	66.0	66.0	66.0	66.0
Total Split (%)	26.7%	26.7%	73.3%	73.3%	73.3%	73.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	8.6	8.6	72.4	72.4	72.4	72.4
Actuated g/C Ratio	0.10	0.10	0.80	0.80	0.80	0.80
v/c Ratio	0.38	0.23	0.37	0.28	0.31	0.18
Control Delay (s/veh)	41.1	14.8	3.0	0.8	5.0	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.1	14.8	3.0	0.8	5.0	2.3
LOS	D	B	A	A	A	A
Approach Delay (s/veh)	34.3		2.4			2.8
Approach LOS	C		A			A

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

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

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.38

Intersection Signal Delay (s/veh): 4.9

Intersection LOS: A

Intersection Capacity Utilization 47.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2026 Total AM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	112	39	951	334	109	456
Future Volume (veh/h)	112	39	951	334	109	456
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	124	43	1057	371	121	507
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	210	97	2982	1330	369	2982
Arrive On Green	0.06	0.06	0.84	0.84	0.84	0.84
Sat Flow, veh/h	3456	1585	3647	1585	375	3647
Grp Volume(v), veh/h	124	43	1057	371	121	507
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	375	1777
Q Serve(g_s), s	3.1	2.4	6.1	4.4	9.8	2.4
Cycle Q Clear(g_c), s	3.1	2.4	6.1	4.4	16.0	2.4
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	210	97	2982	1330	369	2982
V/C Ratio(X)	0.59	0.45	0.35	0.28	0.33	0.17
Avail Cap(c_a), veh/h	749	343	2982	1330	369	2982
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	41.2	40.8	1.7	1.5	3.5	1.4
Incr Delay (d2), s/veh	2.6	3.2	0.3	0.5	2.4	0.1
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	1.0	1.0	0.7	0.8	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	43.8	44.0	2.0	2.0	5.8	1.5
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	167		1428			628
Approach Delay, s/veh	43.8		2.0			2.3
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		80.0			80.0	10.0
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		61.5			61.5	19.5
Max Q Clear Time (g_c+I1), s		8.1			18.0	5.1
Green Ext Time (p_c), s		12.8			7.0	0.4
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			5.2			
HCM 7th LOS			A			



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	176	34	636	276	133	961
Future Volume (vph)	176	34	636	276	133	961
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.0	27.0	63.0	63.0	63.0	63.0
Total Split (%)	30.0%	30.0%	70.0%	70.0%	70.0%	70.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	10.2	10.2	70.8	70.8	70.8	70.8
Actuated g/C Ratio	0.11	0.11	0.79	0.79	0.79	0.79
v/c Ratio	0.48	0.17	0.24	0.22	0.24	0.36
Control Delay (s/veh)	41.2	14.0	2.9	0.8	4.0	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.2	14.0	2.9	0.8	4.0	3.4
LOS	D	B	A	A	A	A
Approach Delay (s/veh)	36.7		2.3			3.5
Approach LOS	D		A			A

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay (s/veh): 6.1	Intersection LOS: A
Intersection Capacity Utilization 41.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2026 Total PM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶↶	↷	↕↕	↷	↶	↕↕
Traffic Volume (veh/h)	176	34	636	276	133	961
Future Volume (veh/h)	176	34	636	276	133	961
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	185	36	669	291	140	1012
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	279	128	2911	1298	535	2911
Arrive On Green	0.08	0.08	0.82	0.82	0.82	0.82
Sat Flow, veh/h	3456	1585	3647	1585	585	3647
Grp Volume(v), veh/h	185	36	669	291	140	1012
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	585	1777
Q Serve(g_s), s	4.7	1.9	3.8	3.7	6.3	6.5
Cycle Q Clear(g_c), s	4.7	1.9	3.8	3.7	10.1	6.5
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	279	128	2911	1298	535	2911
V/C Ratio(X)	0.66	0.28	0.23	0.22	0.26	0.35
Avail Cap(c_a), veh/h	864	396	2911	1298	535	2911
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	40.2	38.9	1.8	1.8	2.9	2.1
Incr Delay (d2), s/veh	2.7	1.2	0.2	0.4	1.2	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.8	0.7	0.7	0.7	1.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	42.8	40.1	2.0	2.2	4.1	2.4
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	221		960			1152
Approach Delay, s/veh	42.4		2.1			2.6
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		78.2			78.2	11.8
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		58.5			58.5	22.5
Max Q Clear Time (g_c+1), s		5.8			12.1	6.7
Green Ext Time (p_c), s		6.8			12.0	0.6
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			6.1			
HCM 7th LOS			A			





HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2045 Background AM

10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	107	4	1149	393	112	551
Future Volume (veh/h)	107	4	1149	393	112	551
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	119	4	1277	437	124	612
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	194	89	2999	1338	295	2999
Arrive On Green	0.06	0.06	0.84	0.84	0.84	0.84
Sat Flow, veh/h	3456	1585	3647	1585	285	3647
Grp Volume(v), veh/h	119	4	1277	437	124	612
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	285	1777
Q Serve(g_s), s	3.0	0.2	7.9	5.4	16.9	2.9
Cycle Q Clear(g_c), s	3.0	0.2	7.9	5.4	24.8	2.9
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	194	89	2999	1338	295	2999
V/C Ratio(X)	0.61	0.04	0.43	0.33	0.42	0.20
Avail Cap(c_a), veh/h	691	317	2999	1338	295	2999
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	41.5	40.2	1.7	1.5	4.7	1.3
Incr Delay (d2), s/veh	3.1	0.2	0.4	0.7	4.3	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	1.4	0.1	1.2	0.9	1.1	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	44.6	40.4	2.2	2.2	9.1	1.5
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	123		1714			736
Approach Delay, s/veh	44.5		2.2			2.8
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		80.4			80.4	9.6
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		63.0			63.0	18.0
Max Q Clear Time (g_c+I1), s		9.9			26.8	5.0
Green Ext Time (p_c), s		17.6			9.3	0.3
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			4.4			
HCM 7th LOS			A			



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2045 Background PM

10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	194	11	768	309	117	1160
Future Volume (veh/h)	194	11	768	309	117	1160
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	204	12	808	325	123	1221
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	296	136	2894	1291	457	2894
Arrive On Green	0.09	0.09	0.81	0.81	0.81	0.81
Sat Flow, veh/h	3456	1585	3647	1585	497	3647
Grp Volume(v), veh/h	204	12	808	325	123	1221
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	497	1777
Q Serve(g_s), s	5.2	0.6	4.9	4.3	7.1	8.8
Cycle Q Clear(g_c), s	5.2	0.6	4.9	4.3	12.0	8.8
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	296	136	2894	1291	457	2894
V/C Ratio(X)	0.69	0.09	0.28	0.25	0.27	0.42
Avail Cap(c_a), veh/h	826	379	2894	1291	457	2894
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	40.0	37.9	2.0	2.0	3.5	2.4
Incr Delay (d2), s/veh	2.8	0.3	0.2	0.5	1.4	0.5
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.3	1.0	0.9	0.7	1.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	42.8	38.2	2.3	2.4	4.9	2.8
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	216		1133			1344
Approach Delay, s/veh	42.6		2.3			3.0
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		77.8			77.8	12.2
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		59.5			59.5	21.5
Max Q Clear Time (g_c+I1), s		6.9			14.0	7.2
Green Ext Time (p_c), s		8.7			15.6	0.6
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			5.9			
HCM 7th LOS			A			



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2045 Total AM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔	↕↕	↔	↔	↕↕
Traffic Volume (veh/h)	130	40	1149	402	128	551
Future Volume (veh/h)	130	40	1149	402	128	551
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	144	44	1277	447	142	612
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	232	107	2959	1320	288	2959
Arrive On Green	0.07	0.07	0.83	0.83	0.83	0.83
Sat Flow, veh/h	3456	1585	3647	1585	282	3647
Grp Volume(v), veh/h	144	44	1277	447	142	612
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	282	1777
Q Serve(g_s), s	3.7	2.4	8.4	5.9	23.9	3.1
Cycle Q Clear(g_c), s	3.7	2.4	8.4	5.9	32.3	3.1
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	232	107	2959	1320	288	2959
V/C Ratio(X)	0.62	0.41	0.43	0.34	0.49	0.21
Avail Cap(c_a), veh/h	691	317	2959	1320	288	2959
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	40.9	40.3	2.0	1.8	6.2	1.5
Incr Delay (d2), s/veh	2.7	2.5	0.5	0.7	5.9	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	1.6	1.0	1.5	1.1	1.5	0.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	43.5	42.8	2.4	2.4	12.1	1.7
LnGrp LOS	D	D	A	A	B	A
Approach Vol, veh/h	188		1724			754
Approach Delay, s/veh	43.4		2.4			3.6
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		79.5			79.5	10.5
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		63.0			63.0	18.0
Max Q Clear Time (g_c+I1), s		10.4			34.3	5.7
Green Ext Time (p_c), s		17.6			9.3	0.5
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			5.7			
HCM 7th LOS			A			

Timings

2045 Total PM

1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

10/01/2024

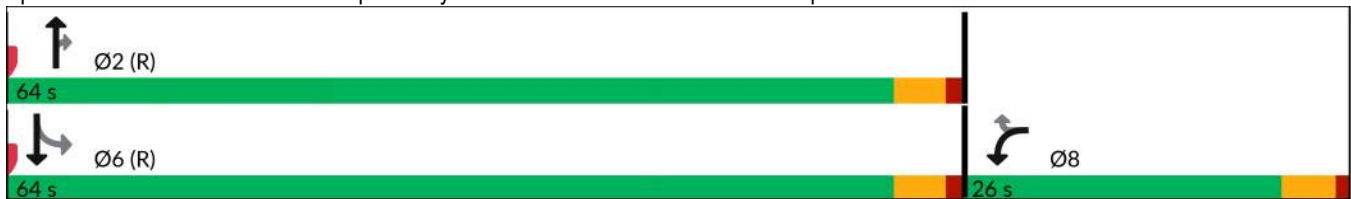


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	209	36	768	329	153	1161
Future Volume (vph)	209	36	768	329	153	1161
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	26.0	26.0	64.0	64.0	64.0	64.0
Total Split (%)	28.9%	28.9%	71.1%	71.1%	71.1%	71.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	11.1	11.1	69.9	69.9	69.9	69.9
Actuated g/C Ratio	0.12	0.12	0.78	0.78	0.78	0.78
v/c Ratio	0.52	0.17	0.29	0.26	0.33	0.44
Control Delay (s/veh)	41.1	13.1	3.4	0.9	5.5	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.1	13.1	3.4	0.9	5.5	4.2
LOS	D	B	A	A	A	A
Approach Delay (s/veh)	37.0		2.6			4.4
Approach LOS	D		A			A

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.52	
Intersection Signal Delay (s/veh): 6.7	Intersection LOS: A
Intersection Capacity Utilization 46.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp



HCM 7th Signalized Intersection Summary  
 1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

2045 Total PM  
 10/01/2024



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	209	36	768	329	153	1161
Future Volume (veh/h)	209	36	768	329	153	1161
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
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	220	38	808	346	161	1222
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	317	146	2872	1281	446	2872
Arrive On Green	0.09	0.09	0.81	0.81	0.81	0.81
Sat Flow, veh/h	3456	1585	3647	1585	487	3647
Grp Volume(v), veh/h	220	38	808	346	161	1222
Grp Sat Flow(s),veh/h/ln	1728	1585	1777	1585	487	1777
Q Serve(g_s), s	5.6	2.0	5.1	4.8	11.0	9.0
Cycle Q Clear(g_c), s	5.6	2.0	5.1	4.8	16.1	9.0
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	317	146	2872	1281	446	2872
V/C Ratio(X)	0.69	0.26	0.28	0.27	0.36	0.43
Avail Cap(c_a), veh/h	826	379	2872	1281	446	2872
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	39.6	38.0	2.1	2.1	4.1	2.5
Incr Delay (d2), s/veh	2.7	0.9	0.2	0.5	2.3	0.5
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.8	1.1	1.0	1.1	2.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	42.4	39.0	2.4	2.6	6.4	3.0
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	258		1154			1383
Approach Delay, s/veh	41.9		2.5			3.4
Approach LOS	D		A			A
Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		77.2			77.2	12.8
Change Period (Y+Rc), s		4.5			4.5	4.5
Max Green Setting (Gmax), s		59.5			59.5	21.5
Max Q Clear Time (g_c+I1), s		7.1			18.1	7.6
Green Ext Time (p_c), s		8.8			16.2	0.7
<b>Intersection Summary</b>						
HCM 7th Control Delay, s/veh			6.6			
HCM 7th LOS			A			



Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	408	2	3	87	2	3
Future Vol, veh/h	408	2	3	87	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	486	2	4	104	2	4

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	488	0	598
Stage 1	-	-	-	-	487
Stage 2	-	-	-	-	111
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1075	-	465
Stage 1	-	-	-	-	618
Stage 2	-	-	-	-	914
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1075	-	464
Mov Cap-2 Maneuver	-	-	-	-	464
Stage 1	-	-	-	-	618
Stage 2	-	-	-	-	911

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.28	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	527	-	-	60	-
HCM Lane V/C Ratio	0.011	-	-	0.003	-
HCM Control Delay (s/veh)	11.9	-	-	8.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	332	12	8	153	14	5
Future Vol, veh/h	332	12	8	153	14	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	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	342	12	8	158	14	5

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	355	0	523 348
Stage 1	-	-	-	-	348 -
Stage 2	-	-	-	-	174 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1204	-	515 695
Stage 1	-	-	-	-	715 -
Stage 2	-	-	-	-	856 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1204	-	511 695
Mov Cap-2 Maneuver	-	-	-	-	511 -
Stage 1	-	-	-	-	715 -
Stage 2	-	-	-	-	850 -

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.4	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	549	-	-	89	-
HCM Lane V/C Ratio	0.036	-	-	0.007	-
HCM Control Delay (s/veh)	11.8	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	416	2	3	89	2	3
Future Vol, veh/h	416	2	3	89	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	495	2	4	106	2	4

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	498	0	610
Stage 1	-	-	-	-	496
Stage 2	-	-	-	-	113
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1066	-	458
Stage 1	-	-	-	-	612
Stage 2	-	-	-	-	912
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1066	-	456
Mov Cap-2 Maneuver	-	-	-	-	456
Stage 1	-	-	-	-	612
Stage 2	-	-	-	-	908

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.27	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	520	-	-	59	-
HCM Lane V/C Ratio	0.011	-	-	0.003	-
HCM Control Delay (s/veh)	12	-	-	8.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	339	12	8	156	14	5
Future Vol, veh/h	339	12	8	156	14	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	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	349	12	8	161	14	5

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	362	0	533 356
Stage 1	-	-	-	-	356 -
Stage 2	-	-	-	-	177 -
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	-	-	1197	-	507 688
Stage 1	-	-	-	-	709 -
Stage 2	-	-	-	-	853 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1197	-	504 688
Mov Cap-2 Maneuver	-	-	-	-	504 -
Stage 1	-	-	-	-	709 -
Stage 2	-	-	-	-	847 -

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.39	11.89
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	542	-	-	88	-
HCM Lane V/C Ratio	0.036	-	-	0.007	-
HCM Control Delay (s/veh)	11.9	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	416	2	3	89	1	2	0	3	3	0	56
Future Vol, veh/h	25	416	2	3	89	1	2	0	3	3	0	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	84	84	84	84	92	84	92	84	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	495	2	4	106	1	2	0	4	3	0	61

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	107	0	0	498	0	0	664	665	496	663	665	106
Stage 1	-	-	-	-	-	-	551	551	-	113	113	-
Stage 2	-	-	-	-	-	-	113	114	-	550	552	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1484	-	-	1066	-	-	374	381	573	375	381	948
Stage 1	-	-	-	-	-	-	519	515	-	892	802	-
Stage 2	-	-	-	-	-	-	892	801	-	520	515	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1484	-	-	1066	-	-	343	372	573	364	372	948
Mov Cap-2 Maneuver	-	-	-	-	-	-	343	372	-	364	372	-
Stage 1	-	-	-	-	-	-	509	506	-	889	799	-
Stage 2	-	-	-	-	-	-	832	798	-	507	505	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s/v	0.39			0.27			13.08			9.43		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	452	1484	-	-	1066	-	-	877
HCM Lane V/C Ratio	0.013	0.018	-	-	0.003	-	-	0.073
HCM Control Delay (s/veh)	13.1	7.5	-	-	8.4	-	-	9.4
HCM Lane LOS		B	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.2

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	56	339	12	8	156	3	14	0	5	2	0	39
Future Vol, veh/h	56	339	12	8	156	3	14	0	5	2	0	39
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	97	97	97	97	92	97	92	97	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	61	349	12	8	161	3	14	0	5	2	0	42

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	164	0	0	362	0	0	655	658	356	649	661	161
Stage 1	-	-	-	-	-	-	477	477	-	177	177	-
Stage 2	-	-	-	-	-	-	177	181	-	471	484	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1414	-	-	1197	-	-	379	384	688	383	383	884
Stage 1	-	-	-	-	-	-	569	556	-	824	752	-
Stage 2	-	-	-	-	-	-	824	750	-	573	552	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1414	-	-	1197	-	-	343	365	688	361	364	884
Mov Cap-2 Maneuver	-	-	-	-	-	-	343	365	-	361	364	-
Stage 1	-	-	-	-	-	-	544	532	-	819	747	-
Stage 2	-	-	-	-	-	-	780	745	-	544	529	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s/v	1.1			0.38			14.58			9.61		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	396	1414	-	-	1197	-	-	826
HCM Lane V/C Ratio	0.05	0.043	-	-	0.007	-	-	0.054
HCM Control Delay (s/veh)	14.6	7.7	-	-	8	-	-	9.6
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.2

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	503	2	3	107	2	3
Future Vol, veh/h	503	2	3	107	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	599	2	4	127	2	4

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	601	0	735 600
Stage 1	-	-	-	-	600 -
Stage 2	-	-	-	-	135 -
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	-	-	976	-	387 501
Stage 1	-	-	-	-	548 -
Stage 2	-	-	-	-	892 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	976	-	385 501
Mov Cap-2 Maneuver	-	-	-	-	385 -
Stage 1	-	-	-	-	548 -
Stage 2	-	-	-	-	888 -

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.24	13.16
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	447	-	-	49	-
HCM Lane V/C Ratio	0.013	-	-	0.004	-
HCM Control Delay (s/veh)	13.2	-	-	8.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	409	15	10	189	18	6
Future Vol, veh/h	409	15	10	189	18	6
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	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	422	15	10	195	19	6

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	437	0	645	429
Stage 1	-	-	-	-	429	-
Stage 2	-	-	-	-	215	-
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	-	-	1123	-	437	626
Stage 1	-	-	-	-	656	-
Stage 2	-	-	-	-	820	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1123	-	432	626
Mov Cap-2 Maneuver	-	-	-	-	432	-
Stage 1	-	-	-	-	656	-
Stage 2	-	-	-	-	812	-

Approach	EB	WB	NB
HCM Control Delay, s/v	0	0.41	13.11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	468	-	-	90	-
HCM Lane V/C Ratio	0.053	-	-	0.009	-
HCM Control Delay (s/veh)	13.1	-	-	8.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-



Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	503	2	3	107	1	2	0	3	3	0	56
Future Vol, veh/h	25	503	2	3	107	1	2	0	3	3	0	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	84	84	84	84	92	84	92	84	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	599	2	4	127	1	2	0	4	3	0	61

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	128	0	0	601	0	0	789	790	600	788	790	127
Stage 1	-	-	-	-	-	-	654	654	-	135	135	-
Stage 2	-	-	-	-	-	-	135	136	-	653	656	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1457	-	-	976	-	-	308	322	501	309	322	923
Stage 1	-	-	-	-	-	-	455	463	-	869	785	-
Stage 2	-	-	-	-	-	-	869	784	-	456	462	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1457	-	-	976	-	-	282	315	501	300	315	923
Mov Cap-2 Maneuver	-	-	-	-	-	-	282	315	-	300	315	-
Stage 1	-	-	-	-	-	-	447	454	-	866	782	-
Stage 2	-	-	-	-	-	-	809	781	-	444	454	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s/v	0.33			0.24			14.57			9.67		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	382	1457	-	-	976	-	-	835
HCM Lane V/C Ratio	0.016	0.019	-	-	0.004	-	-	0.077
HCM Control Delay (s/veh)	14.6	7.5	-	-	8.7	-	-	9.7
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.2

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	56	409	12	8	189	3	14	0	5	2	0	39
Future Vol, veh/h	56	409	12	8	189	3	14	0	5	2	0	39
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	97	97	97	97	92	97	92	97	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	61	422	12	8	195	3	14	0	5	2	0	42

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	198	0	0	434	0	0	761	764	428	755	767	195
Stage 1	-	-	-	-	-	-	550	550	-	211	211	-
Stage 2	-	-	-	-	-	-	211	215	-	543	556	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1374	-	-	1126	-	-	322	334	627	325	332	847
Stage 1	-	-	-	-	-	-	520	516	-	791	727	-
Stage 2	-	-	-	-	-	-	791	725	-	524	513	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1374	-	-	1126	-	-	290	317	627	306	315	847
Mov Cap-2 Maneuver	-	-	-	-	-	-	290	317	-	306	315	-
Stage 1	-	-	-	-	-	-	497	493	-	785	722	-
Stage 2	-	-	-	-	-	-	746	720	-	496	490	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s/v	0.95			0.33			16.3			9.9		
HCM LOS							C			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	338	1374	-	-	1126	-	-	779
HCM Lane V/C Ratio	0.058	0.044	-	-	0.007	-	-	0.057
HCM Control Delay (s/veh)	16.3	7.7	-	-	8.2	-	-	9.9
HCM Lane LOS	C	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.2

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↖↖↖	
Traffic Vol, veh/h	0	7	0	0	1210	3
Future Vol, veh/h	0	7	0	0	1210	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	8	0	0	1315	3

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	659	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.14	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.92	-	-
Pot Cap-1 Maneuver	0	348	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	348	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s/v15.57		0
HCM LOS	C	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	348	-	-
HCM Lane V/C Ratio	0.022	-	-
HCM Control Delay (s/veh)	15.6	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↑↑↑	
Traffic Vol, veh/h	0	5	0	0	1059	7
Future Vol, veh/h	0	5	0	0	1059	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	5	0	0	1151	8

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	579	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.14	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.92	-	-
Pot Cap-1 Maneuver	0	392	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	392	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s/v	14.3	0
HCM LOS	B	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	392	-	-
HCM Lane V/C Ratio	0.014	-	-
HCM Control Delay (s/veh)	14.3	-	-
HCM Lane LOS	B	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↑↑↑	
Traffic Vol, veh/h	0	7	0	0	1461	3
Future Vol, veh/h	0	7	0	0	1461	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	8	0	0	1588	3

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	796	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.14	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.92	-	-
Pot Cap-1 Maneuver	0	283	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	283	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s/v18.06		0
HCM LOS	C	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	283	-	-
HCM Lane V/C Ratio	0.027	-	-
HCM Control Delay (s/veh)	18.1	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↑↑↑	
Traffic Vol, veh/h	0	5	0	0	1279	7
Future Vol, veh/h	0	5	0	0	1279	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	5	0	0	1390	8

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	699	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.14	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.92	-	-
Pot Cap-1 Maneuver	0	328	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	328	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s/v16.16		0
HCM LOS	C	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	328	-	-
HCM Lane V/C Ratio	0.017	-	-
HCM Control Delay (s/veh)	16.2	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-

# APPENDIX F

## Queues Analysis Worksheets

## 1: Hancock Expressway/Union Boulevard &amp; Circle Drive Ramp

10/01/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	124	43	1057	371	121	507
v/c Ratio	0.38	0.23	0.37	0.28	0.31	0.18
Control Delay (s/veh)	41.1	14.8	3.0	0.8	5.0	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.1	14.8	3.0	0.8	5.0	2.3
Queue Length 50th (ft)	34	0	63	0	13	25
Queue Length 95th (ft)	60	30	98	15	37	41
Internal Link Dist (ft)	500		256			355
Turn Bay Length (ft)	450	450		125	400	
Base Capacity (vph)	743	376	2846	1345	386	2846
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	0.11	0.37	0.28	0.31	0.18

## Intersection Summary



Queues

2026 Total PM

1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

10/01/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	185	36	669	291	140	1012
v/c Ratio	0.48	0.17	0.24	0.22	0.24	0.36
Control Delay (s/veh)	41.2	14.0	2.9	0.8	4.0	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.2	14.0	2.9	0.8	4.0	3.4
Queue Length 50th (ft)	51	0	40	0	16	68
Queue Length 95th (ft)	81	27	64	16	39	107
Internal Link Dist (ft)	500		256			355
Turn Bay Length (ft)	450	450		125	400	
Base Capacity (vph)	858	422	2784	1307	580	2784
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	0.22	0.09	0.24	0.22	0.24	0.36

Intersection Summary

Queues

2045 Total AM

1: Hancock Expressway/Union Boulevard & Circle Drive Ramp

10/01/2024



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	144	44	1277	447	142	612
v/c Ratio	0.41	0.22	0.45	0.33	0.48	0.22
Control Delay (s/veh)	41.2	14.3	3.6	0.9	9.9	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.2	14.3	3.6	0.9	9.9	2.5
Queue Length 50th (ft)	40	0	88	0	19	32
Queue Length 95th (ft)	67	30	136	17	69	53
Internal Link Dist (ft)	500		256			355
Turn Bay Length (ft)	450	450		125	400	
Base Capacity (vph)	686	351	2827	1354	294	2827
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	0.21	0.13	0.45	0.33	0.48	0.22

Intersection Summary

## 1: Hancock Expressway/Union Boulevard &amp; Circle Drive Ramp



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	220	38	808	346	161	1222
v/c Ratio	0.52	0.17	0.29	0.26	0.33	0.44
Control Delay (s/veh)	41.1	13.1	3.4	0.9	5.5	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	41.1	13.1	3.4	0.9	5.5	4.2
Queue Length 50th (ft)	61	0	54	0	21	96
Queue Length 95th (ft)	93	27	86	18	54	150
Internal Link Dist (ft)	500		256			355
Turn Bay Length (ft)	450	450		125	400	
Base Capacity (vph)	820	407	2749	1307	489	2749
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	0.27	0.09	0.29	0.26	0.33	0.44

## Intersection Summary