TRAFFIC & PARKING IMPACT LETTER - DRAFT

Anoka Ramsey Athletic Association Dome
Ramsey, MN

January 10, 2023

Project No. 21-26051

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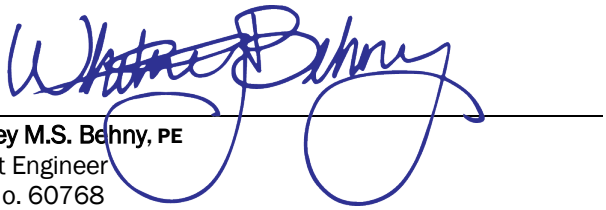

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Anoka Ramsey Athletic Association Dome Traffic & Parking Impact Letter

Anoka Ramsey Athletic Association Dome
Ramsey, MN

Engineer's Project Number: 21-26051

Dated this 10th day of January 2023

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EXECUTIVE SUMMARY

Studied Intersection Description and Location

This study has been prepared in anticipation of the proposed Anoka Ramsey Athletic Association Dome (ARAA). The site is located in the City limits of Ramsey, Minnesota and northwest of the intersection of US-10 / US-169 and Armstrong Boulevard Northwest / Riverdale Drive Northwest / County State Aide Highway (CSAH) 83. The property is planned on two (2) separate parcels (PID: 29-32-14-0005 and 29-32-25-14-0015).

The site is anticipated to develop to a multi-use athletic facility for the Anoka Ramsey Athletic Association (ARAA) that will contain one and a half (1.5) multipurpose synthetic turf field and eight (8) sport (basketball / volleyball) courts. The project is anticipated to be open to the public in late 2023 or early 2024. Three (3) years after opening of the athletic center, it is anticipated that a separate sports clinic and restaurant will be established on the property. A copy of the current proposed site plan is provided in **Appendix A**. The site will maintain access from Ferret Street Northwest. Ferret Street Northwest provides connection to the surrounding roadway network. Additional growth is anticipated within the neighboring area and surrounding roadways. Discussion on surrounding growth can be found in the **Existing Traffic Volumes and Analysis Assumptions** section of this report.

This Traffic and Parking Impact Letter studied current, projected, and future traffic conditions at four (4) locations in the City of Ramsey, Carver County, Minnesota. These locations included:

- Intersection 1 – The intersection of 147th Avenue Northwest and Armstrong Boulevard Northwest (CSAH 83).
- Intersection 2 – The intersection of 147th Avenue Northwest and Ferret Street Northwest.
- Intersection 3 – The intersection of Ferret Street Northwest and Access A.
- Intersection 4 – The intersection of Ferret Street Northwest and Access B.

EXISTING CONDITIONS

Area Roadway System

Through and adjacent to the study area:

- Armstrong Boulevard Northwest (CSAH 83) is a north-south minor expander.
- Ferret Street Northwest is a north-south local roadway.

MINOR ARTERIAL ROADWAYS AND CONNECTIONS TO THE STUDY AREA

Armstrong Boulevard Northwest (CSAH 83) is functionally classified as an "A-Minor Expander" within the Anoka County roadway network. Minor arterials with regional importance are labeled with the letter grade due to their ability to relieve, expand, or complement the principal arterial system. The minor arterials connect urban service area with cities and towns outside the Twin Cities region and serve medium to long distance trips.

The roadway infrastructure was intentionally sized for future development within the vicinity of the proposed development in concurrence with the City's plan for "The COR". The COR is a downtown development that spans 300+ acres and is focused on transit oriented and walkable urban development.

The minor expander is currently four (4)-lane divided asphalt roadway. Armstrong Boulevard Northwest (CSAH 83) has a posted speed limit of 55 miles-per-hour (MPH). Where local roadways connect with the minor expander, turn lanes are generally provided at the intersecting road feature. At the time of this study, the intersection of Armstrong Boulevard Northwest (CSAH 83) and 147th Ave Northwest (Intersection 1) is a signalized intersection. The intersection has designated pedestrian crossings across the southbound and westbound approaches. Landings are provided in the northwest and southwest quadrant to allow for future pedestrian crossing. It was noted that a recent access was constructed within the eastbound right-turn lane taper. Access is provided to an existing daycare facility. The report will evaluate queue lengths within all approaches and will note any concern of stacking limiting movement to the existing facilities. The previously completed report should be consulted.

It is assumed that Intersection 1 is actuated and coordinated with additional signal(s) along the Armstrong Boulevard Northwest (CSAH 83) corridor within proximity. Additionally, it is presumed that the traffic signal system utilizes near-stop-bar detectors in all lanes with additional advance detectors within the thru lanes. The cycle and split times are optimized per future scenario (2024 Opening No Build, 2027 Full Build No Build, 2034 Future No Build). Existing signal timing has not been provided and is currently optimized for current traffic volumes. Additional discussion on the scenarios can be found within the **Existing Traffic Volumes and Analysis Assumptions of this Report.**

LOCAL ROADWAYS AND CONNECTIONS TO THE STUDY AREA

Ferret Street Northwest is a local roadway that currently serves and connects to existing industrial and retail facilities. The roadway's primary outlet to the surrounding roadway network is via Intersection 1. The roadways are part of the public street network and are understood to have a speed limit of 30 MPH per City Comments on

December 20th, 2022. At the time of the traffic study, speed limit signs were not observed adjacent to the development.

The intersection of Ferret Street Northwest and 147th Avenue Northwest (Intersection 2) is an uncontrolled t-intersection. There are no sidewalk crossings or connections provided along Ferret Street Northwest.

At the time of this study, there are preliminary discussions on extending Ferret Street Northwest to the north and connecting to Bunker Lake Boulevard. There is no definitive plan on this extension, for the purpose of this report, it is assumed that current and future circulation will not be served through the potential new intersection created by Ferret Street Northwest and Bunker Lake Boulevard.

Existing Traffic Volumes and Analysis Assumptions

Traffic count data was not collected for this report and historical annual average daily traffic (AADT) within The COR was provided by the City of Ramsey. Historical data contained counts within The COR at nineteen (19) locations from 2017 to 2022. A copy of the PDF is provided in **Appendix B** to refer to the corresponding intersection. **Figure 1** below illustrates the collected traffic counts across The COR for reference.

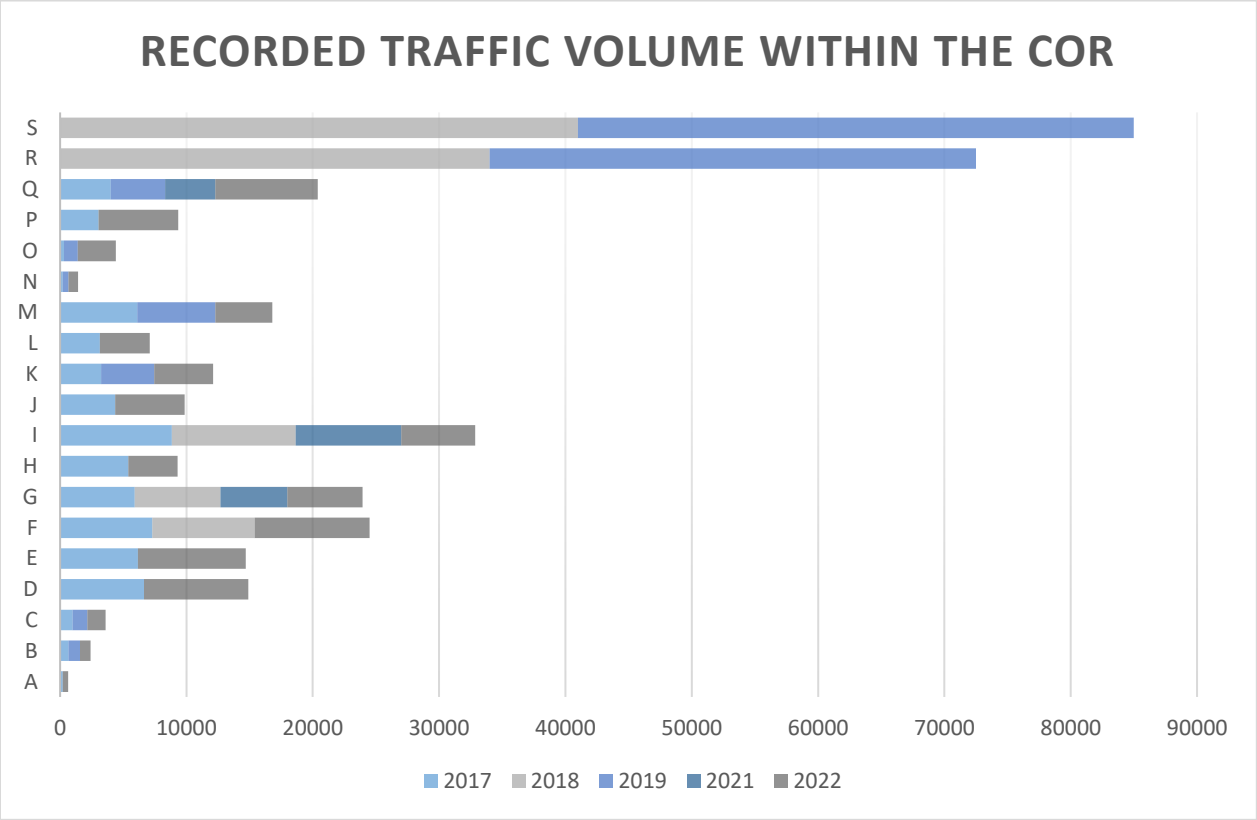


Figure 1: Historical AADT within th City of Ramsey's The COR.

The historical AADT volumes were analyzed per location for annualized growth trends with the overall average growth rate of 11% over the past five (5) years throughout The COR. The proposed development is planned to impact the roadway network of Intersections 1 and 2 of this study. An overall analyzed growth of 11% is unlikely sustainable in the vicinity of the proposed development due to the amount of developable area. The locations of E, F, and K were selected to evaluate growth adjacent to of the proposed development. Locations E, F, and K correspond to the following locations:

- Location E – the northern approach of Intersection 1.
- Location F – the southern approach of Intersection 1.
- Location K – the eastern approach of Intersection 1.

Figure 2: Locations within The COR historical AADT volumes analyzed to determined annualized average growth. From the City of Ramsey, 2022.

The three locations were assessed and determined to have an average annualized growth rate of 7%. This growth rate may occur within the future years and will likely decrease once the surrounding area is developed. The 7% annualized growth rate was utilized for this study and applied to the background traffic in all conditions and scenarios. Scenarios that are provided within this report are the following:

- Existing 2022 **|** Utilized as a base model to evaluate current conditions for comparison.
- Opening 2024 **|** Characterized by the anticipated completion of the ARAA facility and supporting infrastructure.
- Full Build 2027 **|** Characterized by the anticipated opening of the onsite clinic and restaurant adjacent to the ARAA facility.
- Future 2034 **|** Provided 10-years after facility opening.

Existing Trip Generation Along Ferret Street Northwest

Existing trip generation has not been collected in the past for the western approaches of Intersections 1 and 2. The existing facility sizes were approximated, and utilizing the ITE Trip Generation manual, 11th Edition current trip generated was estimated and shown within **Table 1**.

Day Care Facility											
ITE Code	565	Day Care Facility					14.7	1000 SF GFA			
	Average Rate / Fitted Curve Equation	# of Generated Trips	% Entering	% Exiting	# of Generated Trips Entering	# of Generated Trips Exiting	% New Trips	# of New Trips Entering	# of New Trips Exiting	R^2	# of Studies
Weekday	4.09	60	50%	50%	30	30	100%	30	30	--	27
Saturday	0.00	0	50%	50%	0	0	100%	0	0	--	5
Note: Sums may not add as expected due to rounding. Utilized Trip Generation Manual, 11th Edition.											
Industrial Users											
ITE Code	110	General Light Industrial					16.5	1000 SF GFA			
	Average Rate / Fitted Curve Equation	# of Generated Trips	% Entering	% Exiting	# of Generated Trips Entering	# of Generated Trips Exiting	% New Trips	# of New Trips Entering	# of New Trips Exiting	R^2	# of Studies
Weekday	T=3.76(X)+50.47	113	50%	50%	57	57	100%	57	57	0.61	37
Saturday	0.67	11	50%	50%	6	6	100%	6	6	--	1
Note: Sums may not add as expected due to rounding. Utilized Trip Generation Manual, 11th Edition.											

Table 1: Existing ITE Trip Generation along Ferret Street Northwest.

A summary of the total existing trips is shown within **Table 2**.

2022 EXISTING SUMMARY			
	# of Generated Trips	# of Generated Trips Entering	# of Generated Trips Exiting
Weekday	173	87	87
Saturday	11	6	6

Table 2: Summary of 2022 Existing ITE Trip Generation.

Existing Intersection Turning Movements

Intersection turning movements were modeled utilizing the following equation for Intersection 1:

$$DDHV = (K)(D)(AADT)$$

Directional Design-Hour Volume (DDHV) is the proportion of AADT in the peak-hour (design hour) in the predominant direction of traffic flow. DDHV is determined from field measurements on the facility under consideration. The Florida DOT's TURNS5 Turning Movement Analysis Tool utilizes this equation assist with trip distribution within an intersection and was utilized for Intersection 1. Intersection 2 was determined based on a 50/50 split in westbound left- and right-turning movements and a 50/50 split for southbound left-turns and northbound right-turns. The turning movements were assigned using the TURNS5 Turning Movement Analysis Tool. A copy of the work completed can be found in **Appendix C.**

To analyze the traffic conditions within the study area, Synchro version 11's Synchro Control Delay (Percentile Method) and the Highway Capacity Manual 6th Edition delay methods were utilized for this report. Intersections 1 and 2 were modeled. The resulting Synchro analysis worksheets were prepared for the existing and No Build conditions (Intersections 3 and 4 are not included within the tables as they will be a result of the proposed development) and are provided in **Appendix D**. **Table 3** displays the No Build and Existing intersection level of service (LOS), delay, and utilization for Intersection 1 and 2 for the assumed PM Peak Hour period.

No Build Scenarios

Year of Analysis	Intersection 1 147th Avenue Northwest and Armstrong Boulevard Northwest (CSAH 83)			Intersection 2 147th Avenue Northwest and Ferret Street Northwest		
	Intersection LOS	Intersection Delay (seconds)	Intersection Utilization (%)	Intersection LOS	Intersection Delay (seconds)	Intersection Utilization (%)
2022 Existing	B	13.1	34.6	A	0.0	13.3
2024 Opening	B	13.4	36.7	A	0.0	13.3
2027 Full Build	B	14.1	39.9	A	0.0	13.3
2034 Future	B	15.7	46.7	A	0.0	13.3

Table 3: Intersections 1 and 2 Existing (2022), Opening (2024), Full Build (2027), Future (2034) LOS, Delay, and Utilization.

Using Synchro version 11, multiple delay computation methods are available, including the Percentile Delay Method, the Highway Capacity Manual 6th Edition methodology, Highway Capacity Manual 2010 Edition methodology, and Highway Capacity Manual 2000 Edition methodology. Synchro's core delay calculation, the Percentile Delay Method is recommended by Synchro when evaluating actuated signals.

LEVEL OF SERVICE AND DELAY

For this report the Level of Service (LOS) will be analyzed. For signalized intersections, the LOS is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria is stated in terms of average delay per vehicle during a specified time period (peak hour). Vehicle delay is a complex measure based on variables including signal phasing, signal cycle length, and traffic volumes with respect to intersection capacity. **Figure 3** shows the LOS table for signalized intersections.

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Figure 3 Highway Capacity Manual (HCM) 6th Edition, 2016 Signalized Intersection LOS.

For unsignalized intersections LOS criteria can be further reduced into two (2) intersection types: all-way-stop-controlled and two-way-stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way-stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its terms of its individual movements. **Figure 4** shows the LOS table for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Figure 4 Highway Capacity Manual (HCM) 6th Edition, 2016 Unsignalized Intersection LOS.

The studied intersections currently operate at a high LOS with the lowest LOS rating of B at Intersection 1. Delays experienced are approximately 15.7 seconds within the intersection.

PROPOSED CONDITIONS

Existing background traffic was projected to create a two (2)-year (2024) Opening, (2027) Full Build, and a 10-year (2034) Full Build traffic for the weekday PM peak hour. The method for determining these traffic projections included trip generation and distribution analyses based on estimates from the ITE Trip Generation Manual, 11th Edition and existing traffic data.

Site Traffic

TRIP GENERATION FOR OPENING 2024

The proposed ARAA dome facility is anticipated to start construction in the spring of 2023 with an opening date in 2024. It is expected that by 2024 the facility will be completed and operating at full capacity, conservatively. The additional traffic created as a result of the proposed development will be composed of new trips generally created by the recreational teams they attract. For this study, a trip is defined as a one-way movement between an origin and a destination. The expected number of trips the proposed development will generate was estimated using the ITE Trip Generation Manual, 11th Edition.

For the Sports Dome, ITE Code 488 (Soccer Complex) was utilized for the multipurpose field and court facility. The facility will hold one and a half (1.5) high school level fields which can be converted into three (3) fields for youth sports or softball fields. In addition, the dome will hold eight (8) courts that can be used for basketball or volleyball. The facility will be used for practice similar to the already established TCO Dome at Lakeville North or West St. Paul Regional Athletics Center. Other land use codes were evaluated and determined to be unrealistic for the use of this facility or had an insufficient amount of data. Additional discussion on evaluation can be provided upon request.

2024 OPENING | TRIP GENERATION SUMMARY			
	# of Generated Trips	# of New Trips Entering	# of New Trips Exiting
Weekday AM (AM Peak Hour of Generator)	9	5	4
Weekday PM (PM Peak Hour of Generator)	85	40	45

Table 4 Trip Generation of the Proposed Facility in 2024 Opening Condition.

The anticipated Trip Generation is summarized in **Table 4**. Peak facility activity is expected to be from November 1st through April 30th. The facility's peak hour is typically during the 7:00 PM to 9:00 PM timeframe on weekdays. This is supported based on rental rates of similar facilities. In general, the facility's peaking hour will not be during standard peaking hours of the surrounding roadway network. For the purpose of this study, the PM peak hour of the proposed facility is modeled to occur during the adjacent network's PM peak hour.

TRIP GENERATION FOR FULL BUILD 2027

Three (3) years after the opening of the ARRA dome, there is potential for a sports clinic and restaurant to be established on the property. The additional traffic is represented within the "Full Build" scenario of this report where the clinic, restaurant, and dome are operating in full capacity. Following ITE Trip Generation, Codes 630 (Clinic) and 930 (Fast Casual Restaurant) were utilized to project the number of generated trips. **Table 5** summarizes the combined peak hour generated trips.

2027 FULL BUILD | TRIP GENERATION SUMMARY			
	# of Generated Trips	# of New Trips Entering	# of New Trips Exiting
Weekday AM (AM Peak Hour of Generator)	47	28	19
Weekday PM (PM Peak Hour of Generator)	154	78	76

Table 5: Trip Generation of the Proposed Facilities in 2027 Full Build Condition.

TRIP GENERATION FOR FUTURE 2034

No additional construction beyond the future clinic and fast casual restaurant is planned on site 10-years after opening the dome. The scenario is provided to evaluate how increased background traffic and the site's generated traffic impacts the surrounding roadway network. The traffic generated from the facility is not likely to increase overtime as the use is not anticipated to change. Trip generation for the proposed facility will follow volumes listed within **Table 5**.

Total Future Traffic

TRIP DISTRIBUTION AND ASSIGNMENT

It is assumed that the facility's new trips would follow similar existing traffic patterns within the study area. Based on distance and Existing (2022) Level of Service (LOS) ratings, it is anticipated that internal traffic on the local roadways will continue to access the minor arterial roadways via the quickest route. A copy of the Trip Distribution and Assignment is provided within **Appendix E**. It is assumed that no other route is provided within this study. As formerly mentioned, there is discussion on Ferret Street Northwest being improved and extended to the north. The modification to the surrounding roadway network would redistribute traffic to the facility and surrounding roadway network. It is advised the impacts are considered with the public improvements reporting. **Table 6** summarize the Build Scenarios, 2024 Opening, 2027 Full Build, and 2034 Future, during the weekday PM peak hour for Intersections 1, 2, 3, and 4.

Build Scenarios

Year of Analysis	Intersection 1 147th Avenue Northwest and Armstrong Boulevard Northwest (CSAH 83)			Intersection 2 147th Avenue Northwest and Ferret Street Northwest		
	Intersection LOS	Intersection Delay (seconds)	Intersection Utilization (%)	Intersection LOS	Intersection Delay (seconds)	Intersection Utilization (%)
2024 Opening	B	14.9	36.7	A	4.7	13.3
2027 Full Build	B	11.0	39.9	A	5.0	13.3
2034 Future	B	12.1	46.7	A	5.1	13.3
Year of Analysis	**Intersection 3** Ferret Street Northwest and Access A			**Intersection 4** Ferret Street Northwest and Access B		
	Intersection LOS	Intersection Delay (seconds)	Intersection Utilization (%)	Intersection LOS	Intersection Delay (seconds)	Intersection Utilization (%)
2024 Opening	A	0.0	13.3	A	7.3	13.3
2027 Full Build	A	0.0	13.3	A	7.7	13.3
2034 Future	A	0.0	13.3	A	7.4	13.3

Table 6: Intersection 1, 2, 3, and 4 Opening (2024, Full Build (2027), Future (2034) LOS, Delay, and Utilization.

Appendices F, G, and **H** shows the corresponding Synchro analysis worksheets for 2024 Opening, 2027 Full Build, and 2034 Future conditions.

INTERSECTION ANALYSIS AND RECOMMENDATIONS

According to the completed traffic modeling, the new traffic generated as a result of the proposed facility will increase vehicle traffic volumes to varying degrees at the studied intersections:

INTERSECTION 1

- Will operate at a LOS B for all No Build and Build scenarios.
- The proposed traffic will increase the intersection delay in 2024 Opening by 1.5 seconds compared to the No Build scenario without modifying the signal timing. Cycle length is estimated to be 70 seconds.
- The intersection signal timing was optimized for the 2027 Full Build and 2034 Future scenarios from the No Build scenarios. This resulted in a reduction of the intersection delay of 3.1-3.6 seconds from the No Build scenarios. A 70-second cycle length.
- It is recommended to evaluate the existing access within the eastbound left-turn-lane taper of Intersection 1 to reduce conflict and delay. The potential improvements to Ferret Street Northwest are recommended to explore circulation improvements within The COR.
- Intersection utilization is not changed from No Build to Build scenarios.

INTERSECTION 2

- Will operate at a LOS A for all No Build and Build scenarios.
- Currently the intersection is not signed with all approaches moving freely. With the low traffic volumes, the intersection is anticipated to minorly be impacted as traffic continues to grow. Per MUTCD, unsignalized intersections in a signalized area should not be uncontrolled. It is recommended that with future improvements, the westbound approach equipped with a stop sign. All build scenarios are modeled with this modification. Note that if improvements are made to Ferret Street Northwest, the operations of this intersection will be impacted.
- Delay increases for the overall intersection by 4.7 to 5.1 seconds compared to the No Build scenarios.
- Intersection utilization is not changed from No Build to Build scenarios.

INTERSECTION 3

- Intersection 3 is the intersection of Ferret Street Northwest and the proposed facility's entrance driveway. It is currently designed as a one-lane approach accommodating inbound movements only. Intersection 3 is located 27.5 feet from Intersection 2, measured center-to-center. The close proximity of Intersections 2 and 3 will create a skewed alignment with additional conflict points and minimum queuing length. Navigation through Intersection 2 and 3 may be difficult for drivers. It is recommended that with future improvements of Ferret Street Northwest, that Intersections 2 and 3 are aligned.
- Overall the approach will operate at a LOS A during peak time and delay will likely be due to driver error from the intersection proximity.

INTERSECTION 4

- Intersection 4 is created as the exit for the proposed facility and is currently designed as a one-lane outbound movement only which turns onto a single lane for northbound and southbound traffic. It is recommended that the eastbound lane is signed with a stop sign at the intersection.
- Overall the approach will operate at a LOS A during peak time and delay will likely be due to driver error.

It is unlikely that the proposed facility and the surrounding roadway network will experience their PM peak hour concurrently. The provided analysis shows that the current infrastructure can support this occurrence with the increase in background traffic and optimization of the split times at Intersection 1. Additional improvements to Intersections 1, 2, 3, and 4 are related to geometric and signing needs to reduce conflict points and increase safety. With the potential improvements to Ferret Street Northwest it is recommended to address alignment and circulation concerns for this portion of The COR.

The addition of the proposed traffic as a result of the Anoka Ramsey Athletic Association Dome development, potential clinic, and potential restaurant will have minimal effect on level of service and delay currently experienced and projected to be experienced within the PM peak hour.

PARKING ANALYSIS

Reviewing the proposed use of sports dome, an analysis was completed based on the courts and fields within the facility. The dome is proposed to hold one and half (1.5) multi-purpose fields and eight (8) courts that can be used for high school or youth sports. It is common that youth practices are earlier in the evening and high school level sports later in the evening. The site plan in **Appendix A** has 135 parking stalls.

YOUTH SPORTS

For youth sports it is assumed that guardians will drop-off and pick-up their players within a varying time before and after scheduled practice times. Primary parking needs for youth sports would be for the coaches. To support this assumption, seating for viewing is limited within the facility. The multi-purpose field can support three (3) youth size fields and eight (8) courts, the maximum and average use of the facility was analyzed. **Tables 7** and **8** list the maximum and average use of the space for youth sports.

Total No. of Youth Courts	No. of Players per Court	No. of Coaches per Court	Total No. of Users per Courts	Percentage of Users Parking	No. of Vehicles Parking
8	10	3	104	15%	**16**
Total No. of Youth Fields	**No. of Players per Field**	**No. of Coaches per Field**	**Total No. of Users per Fields**	**Percentage of Users Parking**	**No. of Vehicles Parking**
3	15	3	54	15%	**9**
Maximum No. of Parking Stalls Utilized During Practice for Youth Level Sports Only					**25**

Table 7: Maximum parking needs of ARAA for youth sports.

Average No. of Youth Courts in Use	Average No. of Players per Court	Average No. of Coaches per Court	Percentage of Users Parking	No. of Vehicles Parking
5	59	3	15%	**10**
Average No. of Youth Fields in Use	**Average No. of Users Youth Fields in Use**	**Average No. of Coaches per Field**	**Percentage of Users Parking**	**No. of Vehicles Parking**
2	36	3	15%	**6**
Average No. of Parking Stalls Utilized During Practice for Youth Level Sports Only				**16**

Table 8: Average parking needs of ARAA for youth sports.

The parking needs for youth sports at maximum capacity is around 19% of the total parking provided. It is likely that within the practice time for youth rated sports the pick-up / drop-off will be utilized more than the general parking lot. Queuing may be experienced within the parking lot at the beginning and end of practice times but will likely be cleared with minimum impact to the surrounding roadway network. Note this is assuming that bus shuttles are not being provided for teams.

HIGH SCHOOL LEVEL SPORTS

For high school level sports there is a higher demand of parking needs due to the fact that the players are around the age where they can drive themselves to practice. If it is assumed that 80% of the players and coaches drive themselves independently the following volumes are generated (**Table 9** and **10**).

Total No. of High School Courts	No. of Players per Court	No. of Coaches per Court	Total No. of Users per Courts	Percentage of Users Parking	No. of Vehicles Parking
8	10	2	96	80%	**77**
Total No. of High School Fields	**Average No. of Players per Field**	**Average No. of Coaches per Field**	**Total No. of Users per Fields**	**Percentage of Users Parking**	**No. of Vehicles Parking**
1.5	15	2	26	80%	**21**
Maximum No. of Parking Stalls Utilized During Practice for High School Level Sports Only					**98**

Table 9: Maximum parking needs of ARAA for high school level sports.

Average No. of High School Courts in Use	Average No. of Players per Court	Average No. of Coaches per Court	Percentage of Users Parking	No. of Vehicles Parking
5	60	2	80%	**50**
Average No. of Youth Fields in Use	**Average No. of Users Youth Fields in Use**	**Average No. of Coaches per Field**	**Percentage of Users Parking**	**No. of Vehicles Parking**
1	17	2	80%	**16**
Average No. of Parking Stalls Utilized During Practice for High School Level Sports Only				**66**

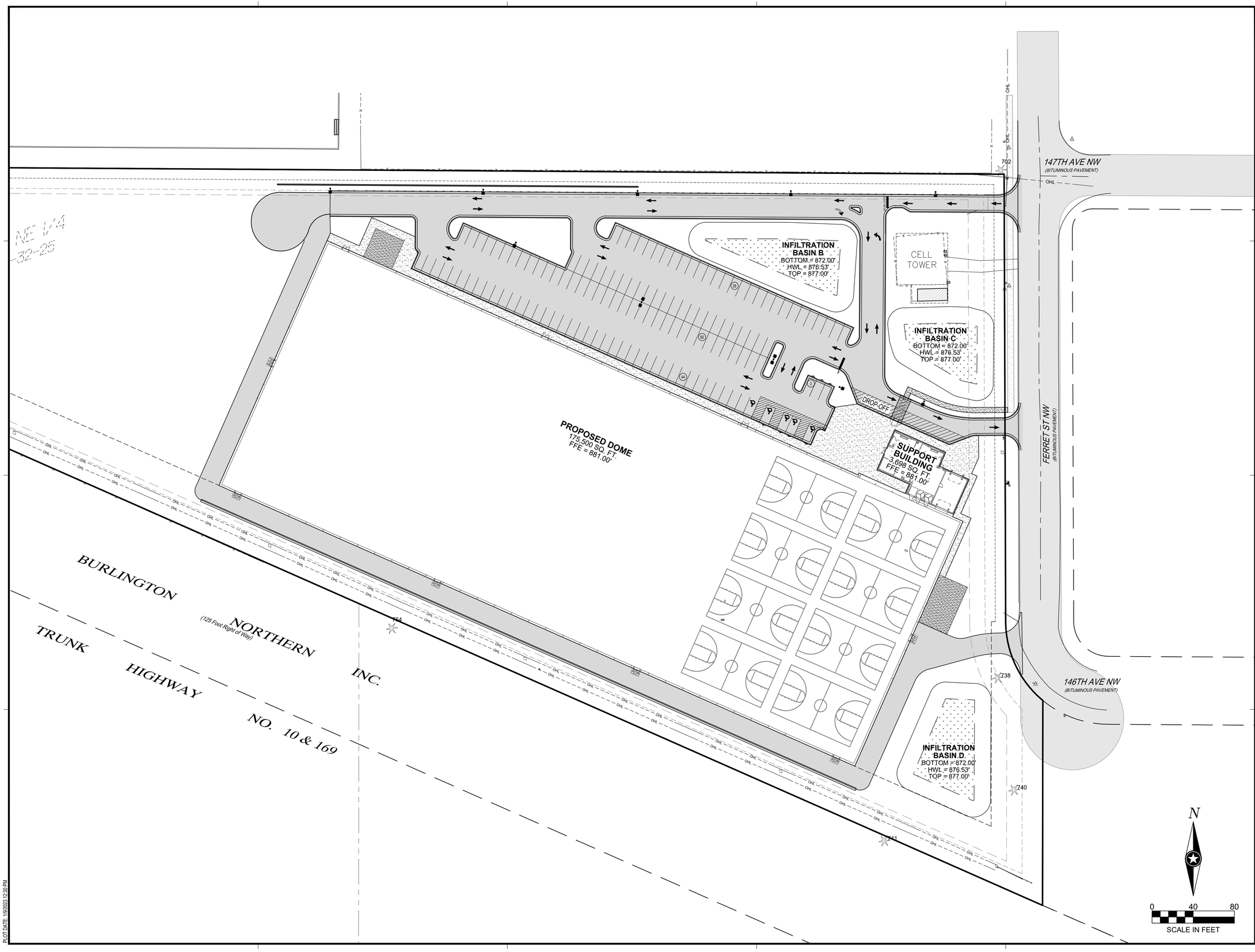
Table 10: Average parking needs of ARAA for high school level sports.

The parking needs for high school level sports at maximum capacity is around 73% of the total parking provided. It is likely that within the practice times the parking lot will be utilized more than the pick-up / drop-off lane. Note this is assuming that bus shuttles are not being provided for teams.

SUMMARY

The proposed facility as shown within **Appendix A** provides ample parking for day-to-day operations ranging from 12% to 73% utilization of the overall parking lot. With the potential improvements to Ferret Street Northwest, it is recommended that signing and roadway width are evaluated. The roadway is currently wide enough for on-street parking.

Appendix A: Proposed Site Concept



PLOT DATE: 1/9/2023 12:30 PM

PRELIMINARY NOT FOR CONSTRUCTION

ISG

ANOKA RAMSEY ATHLETIC ASSOCIATION

NOTE:
THE CLARITY OF THESE PLANS DEPEND UPON COLOR COPIES. IF THIS TEXT DOES NOT APPEAR IN COLOR, THIS IS NOT AN ORIGINAL PLAN SET AND MAY RESULT IN MISINTERPRETATION.

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

REESE A. SUDTELGTE

DATE 12/15/2022 LIC. NO. 54243

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

MITCHELL R. WORKMON

DATE 12/15/2022 LIC. NO. 53748

PROJECT

ANOKA RAMSEY ATHLETIC ASSOCIATION NEW DOME

RAMSEY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-26051
FILE NAME	26051 C3-SITE
DRAWN BY	---
DESIGNED BY	---
REVIEWED BY	---
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

SITE PLAN

SHEET

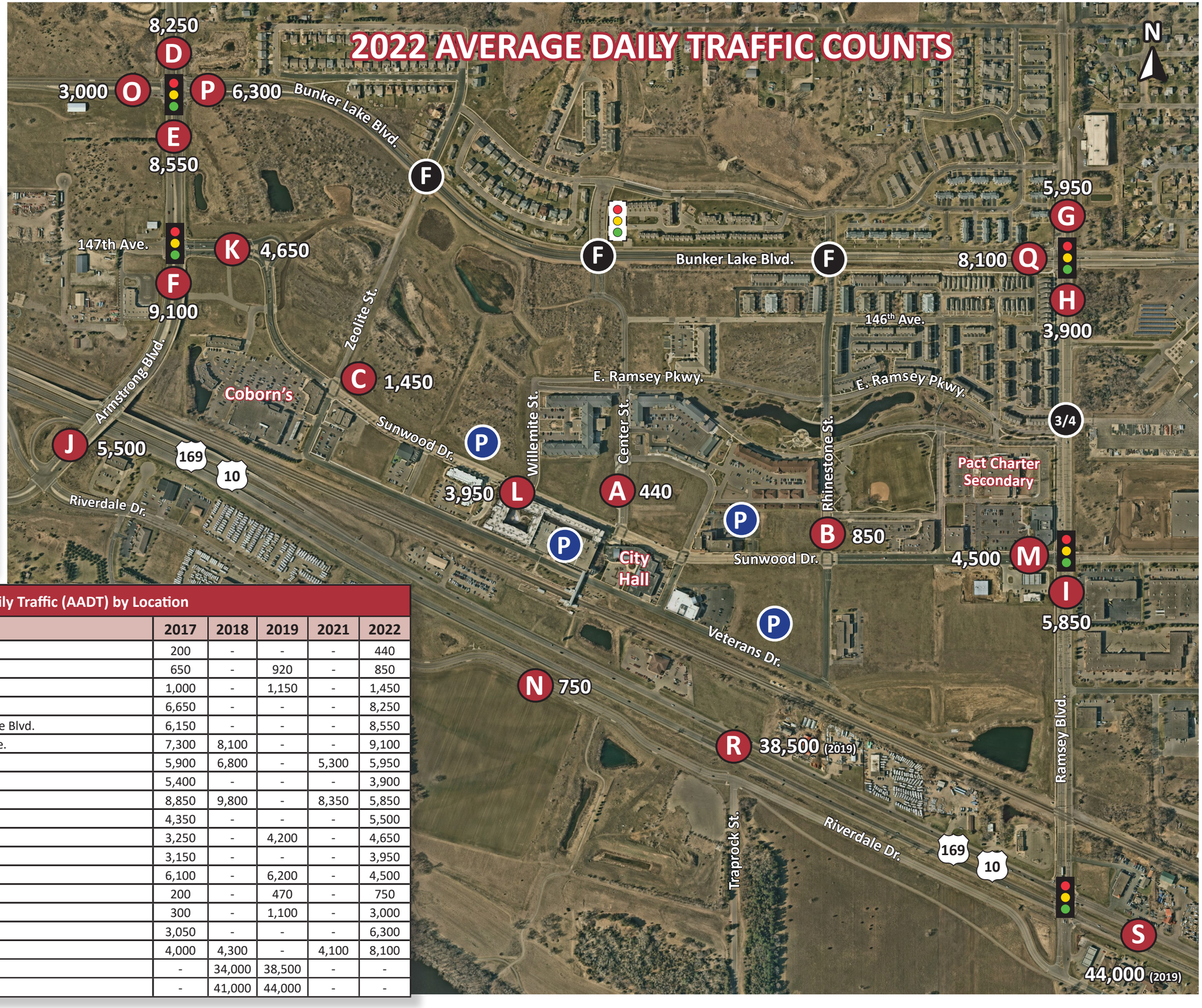
C3-10

Appendix B: Historical AADT Volumes of The COR

THE COR AT RAMSEY

LEGEND

- 1,000 — Annual Average Daily Traffic (AADT)
- Existing Signalized Intersection
- Future Signalized Intersection
- A — Location Marker
- P — Parking Ramp
- F — Full Intersection
- 3/4 — No Left Outbound Movements



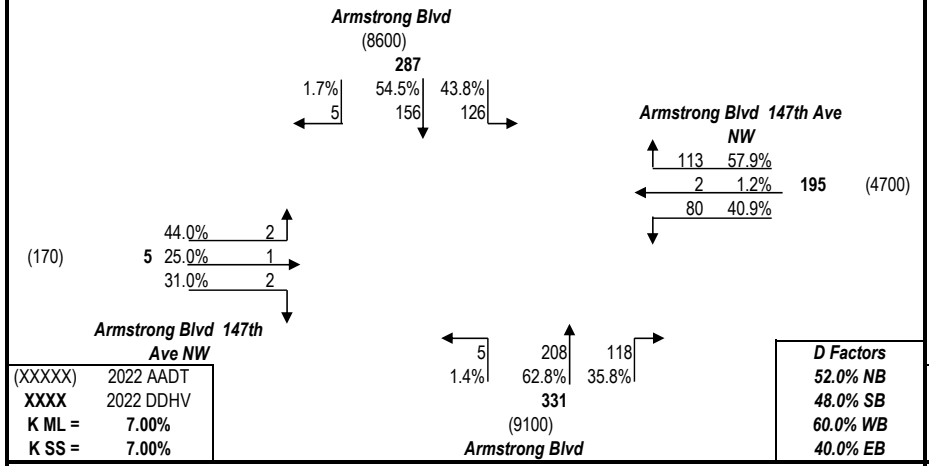
Annual Average Daily Traffic (AADT) by Location

	Location	2017	2018	2019	2021	2022
A	Center St.	200	-	-	-	440
B	Rhinestone St.	650	-	920	-	850
C	Zeolite St.	1,000	-	1,150	-	1,450
D	Armstrong Blvd. - North of Bunker Lake Blvd.	6,650	-	-	-	8,250
E	Armstrong Blvd. - Sunwood Dr./147th Ave. to Bunker Lake Blvd.	6,150	-	-	-	8,550
F	Armstrong Blvd. - Hwy. 10/169 to Sunwood Dr./147th Ave.	7,300	8,100	-	-	9,100
G	Ramsey Blvd. - North of Bunker Lake Blvd.	5,900	6,800	-	5,300	5,950
H	Ramsey Blvd. - Sunwood Dr. to Bunker Lake Blvd.	5,400	-	-	-	3,900
I	Ramsey Blvd. - Hwy. 10/169 to Sunwood Dr.	8,850	9,800	-	8,350	5,850
J	Armstrong Blvd. - Between Hwy. 10/169 Ramps	4,350	-	-	-	5,500
K	Sunwood Dr. - East of Armstrong Blvd.	3,250	-	4,200	-	4,650
L	Sunwood Dr. - City Hall	3,150	-	-	-	3,950
M	Sunwood Dr. - West of Ramsey Blvd.	6,100	-	6,200	-	4,500
N	Riverdale Dr. - West of Traprock St.	200	-	470	-	750
O	Bunker Lake Blvd. - West of Armstrong Blvd.	300	-	1,100	-	3,000
P	Bunker Lake Blvd. - East of Armstrong Blvd.	3,050	-	-	-	6,300
Q	Bunker Lake Blvd. - West of Ramsey Blvd.	4,000	4,300	-	4,100	8,100
R	Hwy. 10/169 - Armstrong Blvd. to Ramsey Blvd.	-	34,000	38,500	-	-
S	Hwy. 10/169 - Ramsey Blvd. to Sunfish Lake Blvd.	-	41,000	44,000	-	-

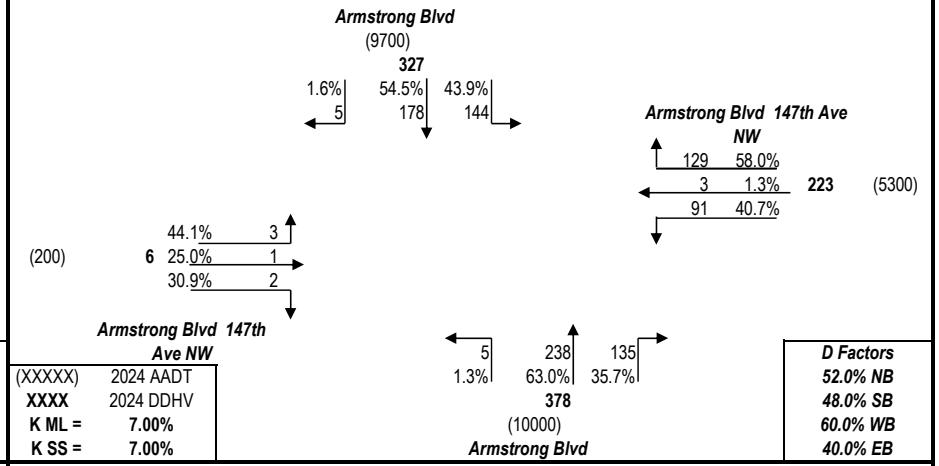
Appendix C: Intersection 1 Turning Movement Analysis

PROJECT TRAFFIC FOR Armstrong Blvd AT Armstrong Blvd 147th Ave NW

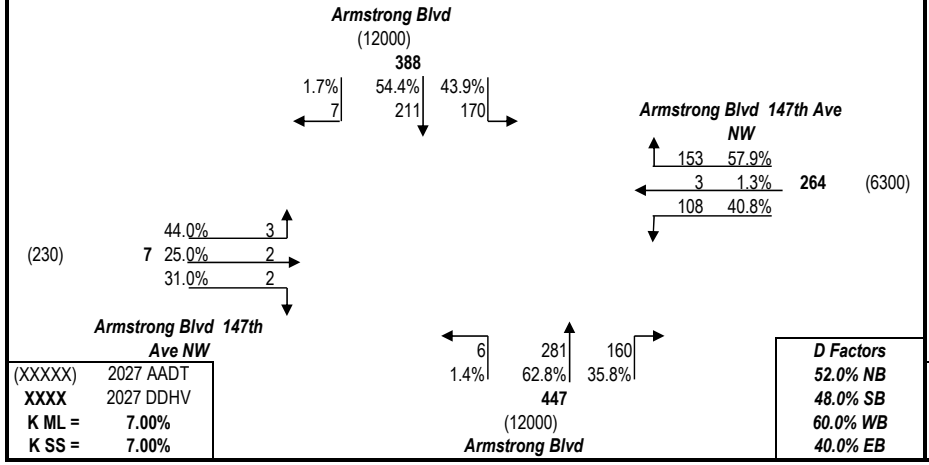
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2022



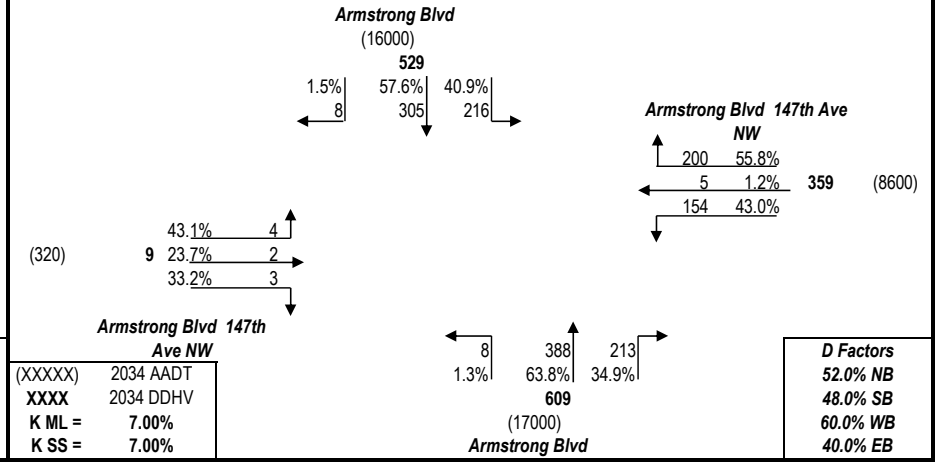
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2024



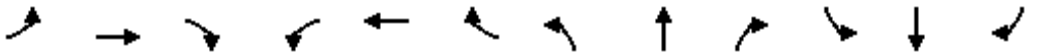
DESIGN HOUR TURNING MOVEMENTS IN YEAR 2027



DESIGN HOUR TURNING MOVEMENTS IN YEAR 2034



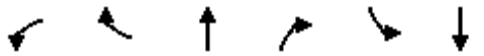
Appendix D: Existing and No Build Synchro Analysis Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1	2	80	2	113	5	208	118	126	156	5
Future Volume (veh/h)	2	1	2	80	2	113	5	208	118	126	156	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	2	1	2	87	2	123	5	226	128	137	170	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	194	123	104	586	227	192	748	1862	830	726	2074	925
Arrive On Green	0.00	0.07	0.07	0.06	0.12	0.12	0.01	0.52	0.52	0.07	0.58	0.58
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	2	1	2	87	2	123	5	226	128	137	170	5
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.1	0.0	0.1	1.5	0.1	5.2	0.1	2.3	2.9	2.2	1.5	0.1
Cycle Q Clear(g_c), s	0.1	0.0	0.1	1.5	0.1	5.2	0.1	2.3	2.9	2.2	1.5	0.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	194	123	104	586	227	192	748	1862	830	726	2074	925
V/C Ratio(X)	0.01	0.01	0.02	0.15	0.01	0.64	0.01	0.12	0.15	0.19	0.08	0.01
Avail Cap(c_a), veh/h	335	494	419	656	494	419	876	1862	830	748	2074	925
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.4	30.6	30.6	26.3	27.1	29.3	7.7	8.5	8.6	5.8	6.4	6.1
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.1	0.0	3.5	0.0	0.1	0.4	0.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.6	0.0	2.1	0.0	0.7	1.0	0.5	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.4	30.6	30.7	26.4	27.1	32.8	7.7	8.6	9.0	5.9	6.4	6.1
LnGrp LOS	C	C	C	C	C	C	A	A	A	A	A	A
Approach Vol, veh/h		5			212			359			312	
Approach Delay, s/veh		30.6			30.2			8.7			6.2	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.2	42.2	8.6	10.1	5.0	46.4	4.7	14.0
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	20.5	5.5	18.5	5.5	20.5	5.5	18.5
Max Q Clear Time (g_c+I1), s	4.2	4.9	3.5	2.1	2.1	3.5	2.1	7.2
Green Ext Time (p_c), s	0.0	1.4	0.0	0.0	0.0	0.7	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	13.1
HCM 6th LOS	B



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	6	6	0	3	2	0
Future Volume (vph)	6	6	0	3	2	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	12	12	12	12	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.932		0.865			
Flt Protected	0.976					0.950
Satd. Flow (prot)	1920	0	1611	0	0	1770
Flt Permitted	0.976					0.950
Satd. Flow (perm)	1920	0	1611	0	0	1770
Link Speed (mph)	30		30			30
Link Distance (ft)	279		420			382
Travel Time (s)	6.3		9.5			8.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	7	0	3	2	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	3	0	0	2
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	16		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	0.85	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Free		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

Movement	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	L	R	L	T	T	R	L	T	T
Maximum Queue (ft)	25	26	86	63	24	90	23	62	68	22	15
Average Queue (ft)	5	10	63	30	5	51	9	37	39	13	3
95th Queue (ft)	22	31	90	59	21	94	27	77	68	31	13
Link Distance (ft)						231	231			509	509
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200	280	280	280	300			300	350		
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 2: Ferret St N & 147th Ave NW

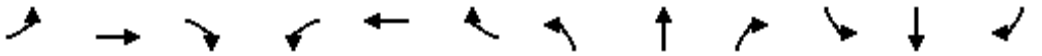
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

HCM 6th Signalized Intersection Summary
1: Armstrong Blvd NW & 147th Ave NW

12/07/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1	2	91	2	129	5	238	135	144	178	5
Future Volume (veh/h)	3	1	2	91	2	129	5	238	135	144	178	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	1	2	99	2	140	5	259	147	157	193	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	126	107	600	233	197	728	1840	821	694	2058	918
Arrive On Green	0.00	0.07	0.07	0.06	0.12	0.12	0.01	0.52	0.52	0.07	0.58	0.58
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	3	1	2	99	2	140	5	259	147	157	193	5
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.1	0.0	0.1	1.8	0.1	5.9	0.1	2.7	3.5	2.6	1.7	0.1
Cycle Q Clear(g_c), s	0.1	0.0	0.1	1.8	0.1	5.9	0.1	2.7	3.5	2.6	1.7	0.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	198	126	107	600	233	197	728	1840	821	694	2058	918
V/C Ratio(X)	0.02	0.01	0.02	0.16	0.01	0.71	0.01	0.14	0.18	0.23	0.09	0.01
Avail Cap(c_a), veh/h	336	494	419	661	494	419	856	1840	821	713	2058	918
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.2	30.5	30.5	26.1	26.9	29.4	7.9	8.8	9.0	6.0	6.6	6.2
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.1	0.0	4.7	0.0	0.2	0.5	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.7	0.0	2.4	0.0	0.8	1.2	0.6	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	30.5	30.5	26.2	26.9	34.1	7.9	8.9	9.4	6.1	6.6	6.2
LnGrp LOS	C	C	C	C	C	C	A	A	A	A	A	A
Approach Vol, veh/h		6			241			411			355	
Approach Delay, s/veh		30.4			30.8			9.1			6.4	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.3	41.7	8.8	10.2	5.0	46.0	4.8	14.2
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	20.5	5.5	18.5	5.5	20.5	5.5	18.5
Max Q Clear Time (g_c+I1), s	4.6	5.5	3.8	2.1	2.1	3.7	2.1	7.9
Green Ext Time (p_c), s	0.0	1.6	0.0	0.0	0.0	0.8	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	13.4
HCM 6th LOS	B

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	6	6	0	3	3	0
Future Volume (vph)	6	6	0	3	3	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	12	12	12	12	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.932		0.865			
Flt Protected	0.976					0.950
Satd. Flow (prot)	1920	0	1611	0	0	1770
Flt Permitted	0.976					0.950
Satd. Flow (perm)	1920	0	1611	0	0	1770
Link Speed (mph)	30		30			30
Link Distance (ft)	279		420			382
Travel Time (s)	6.3		9.5			8.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	7	0	3	3	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	3	0	0	3
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	16		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	0.85	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Free		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

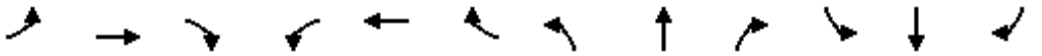
Movement	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	L	R	L	T	T	R	L	T	T
Maximum Queue (ft)	25	26	86	63	24	90	23	62	68	22	15
Average Queue (ft)	5	10	63	30	5	51	9	37	39	13	3
95th Queue (ft)	22	31	90	59	21	94	27	77	68	31	13
Link Distance (ft)						231	231			509	509
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200	280	280	280	300			300	350		
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 2: Ferret St N & 147th Ave NW

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

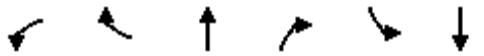
Network wide Queuing Penalty: 0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	2	2	108	3	153	6	281	160	170	211	7
Future Volume (veh/h)	3	2	2	108	3	153	6	281	160	170	211	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	2	2	117	3	166	7	305	174	185	229	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	204	138	117	627	251	212	693	1784	796	652	2015	899
Arrive On Green	0.00	0.07	0.07	0.06	0.13	0.13	0.01	0.50	0.50	0.07	0.57	0.57
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	3	2	2	117	3	166	7	305	174	185	229	8
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.1	0.1	0.1	2.1	0.1	7.1	0.1	3.3	4.3	3.2	2.1	0.2
Cycle Q Clear(g_c), s	0.1	0.1	0.1	2.1	0.1	7.1	0.1	3.3	4.3	3.2	2.1	0.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	204	138	117	627	251	212	693	1784	796	652	2015	899
V/C Ratio(X)	0.01	0.01	0.02	0.19	0.01	0.78	0.01	0.17	0.22	0.28	0.11	0.01
Avail Cap(c_a), veh/h	329	481	408	653	481	408	804	1784	796	741	2015	899
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.8	30.0	30.1	25.4	26.3	29.3	8.4	9.5	9.8	6.3	7.0	6.6
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.1	0.0	6.2	0.0	0.2	0.6	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.8	0.0	2.9	0.0	1.0	1.5	0.8	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.8	30.1	30.1	25.6	26.3	35.5	8.4	9.7	10.4	6.6	7.1	6.6
LnGrp LOS	C	C	C	C	C	D	A	A	B	A	A	A
Approach Vol, veh/h		7			286			486			422	
Approach Delay, s/veh		30.0			31.3			9.9			6.9	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.7	40.6	9.0	10.7	5.1	45.2	4.8	14.9
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	8.7	18.3	5.0	18.0	5.0	22.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	5.2	6.3	4.1	2.1	2.1	4.1	2.1	9.1
Green Ext Time (p_c), s	0.1	1.7	0.0	0.0	0.0	1.1	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	14.1
HCM 6th LOS	B



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	8	8	0	4	3	0
Future Volume (vph)	8	8	0	4	3	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	12	12	12	12	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.932		0.865			
Flt Protected	0.976					0.950
Satd. Flow (prot)	1920	0	1611	0	0	1770
Flt Permitted	0.976					0.950
Satd. Flow (perm)	1920	0	1611	0	0	1770
Link Speed (mph)	30		30			30
Link Distance (ft)	279		420			382
Travel Time (s)	6.3		9.5			8.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	9	0	4	3	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	0	4	0	0	3
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	16		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	0.85	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Free		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	R	L	T	T
Maximum Queue (ft)	26	108	82	25	90	76	40	65	22	61
Average Queue (ft)	12	70	41	12	60	29	12	49	9	12
95th Queue (ft)	31	111	81	31	98	70	38	76	27	53
Link Distance (ft)					231	231			509	509
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	200	280	280	300			300	350		
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 2: Ferret St N & 147th Ave NW

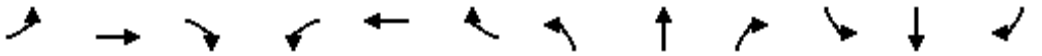
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

HCM 6th Signalized Intersection Summary
1: Armstrong Blvd NW & 147th Ave NW

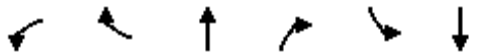
12/07/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	3	154	5	200	8	388	213	216	305	8
Future Volume (veh/h)	4	2	3	154	5	200	8	388	213	216	305	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	4	2	3	167	5	217	9	422	232	235	332	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	237	193	163	722	311	264	589	1592	710	562	1888	842
Arrive On Green	0.01	0.10	0.10	0.07	0.17	0.17	0.01	0.45	0.45	0.09	0.53	0.53
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	4	2	3	167	5	217	9	422	232	235	332	9
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.1	0.1	0.1	2.8	0.2	9.3	0.2	5.2	6.6	4.6	3.4	0.2
Cycle Q Clear(g_c), s	0.1	0.1	0.1	2.8	0.2	9.3	0.2	5.2	6.6	4.6	3.4	0.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	237	193	163	722	311	264	589	1592	710	562	1888	842
V/C Ratio(X)	0.02	0.01	0.02	0.23	0.02	0.82	0.02	0.26	0.33	0.42	0.18	0.01
Avail Cap(c_a), veh/h	359	481	408	732	481	408	696	1592	710	610	1888	842
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.9	28.2	28.2	23.6	24.4	28.2	10.3	12.1	12.5	7.9	8.5	7.7
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	7.7	0.0	0.4	1.2	0.5	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	1.1	0.1	3.9	0.1	1.7	2.4	1.2	1.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.9	28.2	28.3	23.8	24.4	35.9	10.3	12.5	13.7	8.4	8.7	7.8
LnGrp LOS	C	C	C	C	C	D	B	B	B	A	A	A
Approach Vol, veh/h		9			389			663			576	
Approach Delay, s/veh		28.1			30.6			12.9			8.6	
Approach LOS		C			C			B			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.1	36.9	9.3	12.7	5.3	42.7	4.9	17.1
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	8.5	18.5	5.0	18.0	5.0	22.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	6.6	8.6	4.8	2.1	2.2	5.4	2.1	11.3
Green Ext Time (p_c), s	0.1	2.3	0.0	0.0	0.0	1.6	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	15.7
HCM 6th LOS	B



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	11	10	0	5	4	0
Future Volume (vph)	11	10	0	5	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	12	12	12	12	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.935		0.865			
Flt Protected	0.975					0.950
Satd. Flow (prot)	1925	0	1611	0	0	1770
Flt Permitted	0.975					0.950
Satd. Flow (perm)	1925	0	1611	0	0	1770
Link Speed (mph)	30		30			30
Link Distance (ft)	279		420			382
Travel Time (s)	6.3		9.5			8.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	11	0	5	4	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	0	5	0	0	4
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	16		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	0.85	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Free		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	L	R	L	T	T	R	L	T	T
Maximum Queue (ft)	26	24	155	104	18	109	98	61	109	22	20
Average Queue (ft)	13	5	121	65	4	73	40	30	57	16	8
95th Queue (ft)	31	20	170	129	16	119	90	66	115	25	24
Link Distance (ft)		283				231	231			509	509
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200		280	280	300			300	350		
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 2: Ferret St N & 147th Ave NW

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

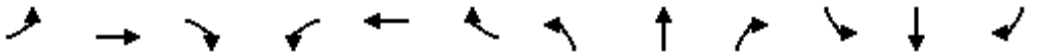
Network wide Queuing Penalty: 0

Appendix E: Proposed Development Trip Distribution and Assignment

Trip Distribution and Assignment | Opening 2024				
			PM Peak Hour	
			Entering	Exiting
		ARAA FACILITY (SPORTS DOME)	40	45
		POTENTIAL CLINIC + RESTAURANT	0	0
	Access A & Ferret St N		100%	0%
	Access B & Ferret St N		0%	100%
Origin	Origin 1 (N)		35%	44%
	Origin 2 (S)		41%	31%
	Origin 3 (E)		24%	25%
Route Distribution By Value	Access A & Ferret St N	Origin 1 (N)	14	0
	Access B & Ferret St N	Origin 1 (N)	0	20
	Access A & Ferret St N	Origin 2 (S)	16	0
	Access B & Ferret St N	Origin 2 (S)	0	14
	Access A & Ferret St N	Origin 3 (E)	10	0
	Access B & Ferret St N	Origin 3 (E)	0	11
Route Distribution By Percent	Access A & Ferret St N	Origin 1 (N)	35.00%	0.00%
	Access B & Ferret St N	Origin 1 (N)	0.00%	44.44%
	Access A & Ferret St N	Origin 2 (S)	40.00%	0.00%
	Access B & Ferret St N	Origin 2 (S)	0.00%	31.11%
	Access A & Ferret St N	Origin 3 (E)	25.00%	0.00%
	Access B & Ferret St N	Origin 3 (E)	0.00%	24.44%

Trip Distribution and Assignment | Full Build 2027 + Future 2034				
			PM Peak Hour	
			Entering	Exiting
		ARAA FACILITY (SPORTS DOME)	40	45
		POTENTIAL CLINIC + RESTAURANT	38	31
	Access A & Ferret St N		100%	0%
	Access B & Ferret St N		0%	100%
Origin	Origin 1 (N)		35%	44%
	Origin 2 (S)		41%	31%
	Origin 3 (E)		24%	25%
Route Distribution By Value	Access A & Ferret St N	Origin 1 (N)	27	0
	Access B & Ferret St N	Origin 1 (N)	0	33
	Access A & Ferret St N	Origin 2 (S)	32	0
	Access B & Ferret St N	Origin 2 (S)	0	24
	Access A & Ferret St N	Origin 3 (E)	19	0
	Access B & Ferret St N	Origin 3 (E)	0	19
Route Distribution By Percent	Access A & Ferret St N	Origin 1 (N)	34.62%	0.00%
	Access B & Ferret St N	Origin 1 (N)	0.00%	43.42%
	Access A & Ferret St N	Origin 2 (S)	41.03%	0.00%
	Access B & Ferret St N	Origin 2 (S)	0.00%	31.58%
	Access A & Ferret St N	Origin 3 (E)	24.36%	0.00%
	Access B & Ferret St N	Origin 3 (E)	0.00%	25.00%

Appendix F: 2024 Opening Synchro Analysis Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1	2	91	2	129	5	238	135	144	178	5
Future Volume (veh/h)	23	12	16	91	12	129	21	238	135	144	178	19
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	25	13	17	99	13	140	23	259	147	157	193	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	262	158	134	626	221	187	733	1779	793	676	1929	861
Arrive On Green	0.03	0.08	0.08	0.06	0.12	0.12	0.03	0.50	0.50	0.07	0.54	0.54
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	25	13	17	99	13	140	23	259	147	157	193	21
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.9	0.4	0.7	1.8	0.4	6.0	0.4	2.7	3.6	2.9	1.8	0.4
Cycle Q Clear(g_c), s	0.9	0.4	0.7	1.8	0.4	6.0	0.4	2.7	3.6	2.9	1.8	0.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	262	158	134	626	221	187	733	1779	793	676	1929	861
V/C Ratio(X)	0.10	0.08	0.13	0.16	0.06	0.75	0.03	0.15	0.19	0.23	0.10	0.02
Avail Cap(c_a), veh/h	357	494	419	687	494	419	827	1779	793	695	1929	861
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.0	29.5	29.6	26.3	27.4	29.9	8.0	9.4	9.6	7.0	7.7	7.4
Incr Delay (d2), s/veh	0.2	0.2	0.4	0.1	0.1	5.9	0.0	0.2	0.5	0.2	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.2	0.3	0.7	0.2	2.5	0.1	0.8	1.2	0.8	0.5	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.1	29.8	30.1	26.4	27.5	35.7	8.0	9.6	10.1	7.2	7.8	7.5
LnGrp LOS	C	C	C	C	C	D	A	A	B	A	A	A
Approach Vol, veh/h		55			252			429			371	
Approach Delay, s/veh		29.1			31.6			9.7			7.5	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.3	40.5	8.8	11.4	6.3	43.5	6.4	13.8
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	5.5	20.5	5.5	18.5	5.5	20.5	5.5	18.5
Max Q Clear Time (g_c+I1), s	4.9	5.6	3.8	2.7	2.4	3.8	2.9	8.0
Green Ext Time (p_c), s	0.0	1.6	0.0	0.0	0.0	0.9	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	14.9
HCM 6th LOS	B

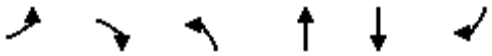
Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	6	0	3	3	0
Future Vol, veh/h	46	6	0	48	3	0
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	50	7	0	52	3	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	32	26	0	0	52	0
Stage 1	26	-	-	-	-	-
Stage 2	6	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	982	1050	-	-	1554	-
Stage 1	997	-	-	-	-	-
Stage 2	1017	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	980	1050	-	-	1554	-
Mov Cap-2 Maneuver	980	-	-	-	-	-
Stage 1	997	-	-	-	-	-
Stage 2	1015	-	-	-	-	-

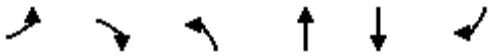
Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	7.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	988	1554	-
HCM Lane V/C Ratio	-	-	0.057	0.002	-
HCM Control Delay (s)	-	-	8.9	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	3	6	0
Future Volume (vph)	0	0	0	48	6	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.884	
Flt Protected						
Satd. Flow (prot)	0	0	0	1863	1647	0
Flt Permitted						
Satd. Flow (perm)	0	0	0	1863	1647	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	245			155	91	
Travel Time (s)	5.6			3.5	2.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	52	7	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	52	50	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	15			15
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	3	6	0
Future Volume (vph)	45	0	0	3	6	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	1863	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	225			171	155	
Travel Time (s)	5.1			3.9	3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	0	0	3	7	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	49	0	0	3	7	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	15			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

Movement	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	L	R	L	T	T	R	L	T	T
Maximum Queue (ft)	25	26	86	63	24	90	23	62	68	63	15
Average Queue (ft)	8	10	63	30	5	51	9	37	43	22	3
95th Queue (ft)	24	32	90	59	21	94	27	77	77	60	13
Link Distance (ft)						231	231			509	509
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200	280	280	280	300			300	350		
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 2: Ferret St N & 147th Ave NW

Movement	WB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	6
95th Queue (ft)	26
Link Distance (ft)	220
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Ferret St N & Access A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 4: Ferret St N & Access B

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

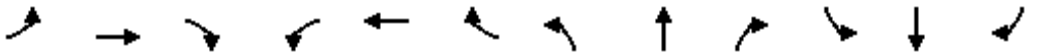
Network Summary

Network wide Queuing Penalty: 0

Appendix G: 2027 Full Build Synchro Analysis Worksheets

HCM 6th Signalized Intersection Summary
1: Armstrong Blvd NW & 147th Ave NW

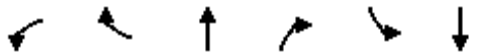
12/07/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	2	2	108	3	153	6	281	160	170	211	7
Future Volume (veh/h)	36	21	26	108	22	153	38	281	160	170	211	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	39	23	28	117	24	166	41	305	174	185	229	37
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	309	204	173	685	253	214	685	1636	730	622	1783	795
Arrive On Green	0.04	0.11	0.11	0.06	0.14	0.14	0.04	0.46	0.46	0.08	0.50	0.50
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	39	23	28	117	24	166	41	305	174	185	229	37
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	1.3	0.8	1.1	2.0	0.8	7.1	0.8	3.5	4.7	3.7	2.4	0.8
Cycle Q Clear(g_c), s	1.3	0.8	1.1	2.0	0.8	7.1	0.8	3.5	4.7	3.7	2.4	0.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	309	204	173	685	253	214	685	1636	730	622	1783	795
V/C Ratio(X)	0.13	0.11	0.16	0.17	0.09	0.77	0.06	0.19	0.24	0.30	0.13	0.05
Avail Cap(c_a), veh/h	371	481	408	710	481	408	743	1636	730	694	1783	795
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.0	28.1	28.3	24.8	26.5	29.2	9.0	11.1	11.4	8.2	9.3	8.9
Incr Delay (d2), s/veh	0.2	0.2	0.4	0.1	0.2	5.9	0.0	0.3	0.8	0.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.3	0.4	0.8	0.3	2.9	0.2	1.1	1.6	1.0	0.7	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	28.4	28.7	24.9	26.7	35.1	9.0	11.4	12.2	8.4	9.4	9.0
LnGrp LOS	C	C	C	C	C	D	A	B	B	A	A	A
Approach Vol, veh/h		90			307			520			451	
Approach Delay, s/veh		27.5			30.5			11.5			9.0	
Approach LOS		C			C			B			A	

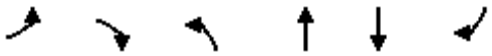
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.1	37.7	9.0	13.1	7.2	40.6	7.2	15.0
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	8.5	18.5	5.0	18.0	5.0	22.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	5.7	6.7	4.0	3.1	2.8	4.4	3.3	9.1
Green Ext Time (p_c), s	0.1	1.7	0.0	0.1	0.0	1.2	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	16.0
HCM 6th LOS	B



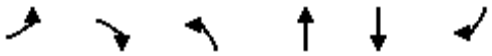
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	8	8	0	4	3	0
Future Volume (vph)	86	8	0	80	3	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	12	12	12	12	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.988		0.865			
Flt Protected	0.956					0.950
Satd. Flow (prot)	1994	0	1611	0	0	1770
Flt Permitted	0.956					0.950
Satd. Flow (perm)	1994	0	1611	0	0	1770
Link Speed (mph)	30		30			30
Link Distance (ft)	279		91			382
Travel Time (s)	6.3		2.1			8.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	93	9	0	87	3	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	102	0	87	0	0	3
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	16		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	0.85	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	4	8	0
Future Volume (vph)	0	0	0	80	8	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.878	
Flt Protected						
Satd. Flow (prot)	0	0	0	1863	1635	0
Flt Permitted						
Satd. Flow (perm)	0	0	0	1863	1635	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	245			155	91	
Travel Time (s)	5.6			3.5	2.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	87	9	85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	87	94	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	15			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	4	8	0
Future Volume (vph)	76	0	0	4	8	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	1863	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	225			171	155	
Travel Time (s)	5.1			3.9	3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	0	0	4	9	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	0	0	4	9	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	15			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	T	R	L	R	L	T	R	L	T	T	R
Maximum Queue (ft)	45	24	21	109	19	26	87	43	46	44	20	16
Average Queue (ft)	17	11	15	73	19	20	58	15	36	26	4	6
95th Queue (ft)	45	28	28	109	20	37	98	42	55	53	17	17
Link Distance (ft)		283					231			509	509	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200		200	280	280	300		300	350			160
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 2: Ferret St N & 147th Ave NW

Movement	WB
Directions Served	LR
Maximum Queue (ft)	54
Average Queue (ft)	35
95th Queue (ft)	51
Link Distance (ft)	220
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Ferret St N & Access A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

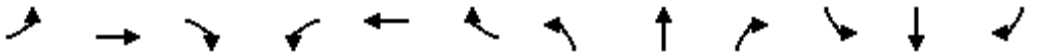
Intersection: 4: Ferret St N & Access B

Movement	EB
Directions Served	L
Maximum Queue (ft)	30
Average Queue (ft)	23
95th Queue (ft)	43
Link Distance (ft)	195
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

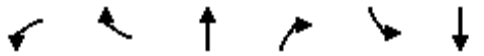
Appendix H: 2034 Future Synchro Analysis Worksheets



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	3	154	5	200	8	388	213	216	305	8
Future Volume (veh/h)	37	21	27	154	24	200	40	388	213	216	305	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1945	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	40	23	29	167	26	217	43	422	232	235	332	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	337	257	217	775	313	265	588	1452	647	537	1663	742
Arrive On Green	0.04	0.14	0.14	0.07	0.17	0.17	0.04	0.41	0.41	0.10	0.47	0.47
Sat Flow, veh/h	1853	1870	1585	3456	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	40	23	29	167	26	217	43	422	232	235	332	38
Grp Sat Flow(s),veh/h/ln	1853	1870	1585	1728	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	1.3	0.8	1.1	2.8	0.8	9.2	1.0	5.6	7.1	5.0	3.8	0.9
Cycle Q Clear(g_c), s	1.3	0.8	1.1	2.8	0.8	9.2	1.0	5.6	7.1	5.0	3.8	0.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	337	257	217	775	313	265	588	1452	647	537	1663	742
V/C Ratio(X)	0.12	0.09	0.13	0.22	0.08	0.82	0.07	0.29	0.36	0.44	0.20	0.05
Avail Cap(c_a), veh/h	397	481	408	784	481	408	644	1452	647	575	1663	742
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.3	26.4	26.5	23.2	24.6	28.1	10.9	13.9	14.3	9.4	10.9	10.1
Incr Delay (d2), s/veh	0.2	0.1	0.3	0.1	0.1	7.5	0.1	0.5	1.5	0.6	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.3	0.4	1.1	0.4	3.9	0.3	1.9	2.6	1.4	1.2	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.5	26.5	26.8	23.3	24.7	35.6	10.9	14.4	15.9	9.9	11.2	10.3
LnGrp LOS	C	C	C	C	C	D	B	B	B	A	B	B
Approach Vol, veh/h		92			410			697			605	
Approach Delay, s/veh		25.7			29.9			14.7			10.6	
Approach LOS		C			C			B			B	

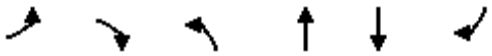
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.5	34.1	9.3	15.1	7.3	38.3	7.2	17.2
Change Period (Y+Rc), s	4.5	5.5	4.5	5.5	4.5	5.5	4.5	5.5
Max Green Setting (Gmax), s	8.5	18.5	5.0	18.0	5.0	22.0	5.0	18.0
Max Q Clear Time (g_c+I1), s	7.0	9.1	4.8	3.1	3.0	5.8	3.3	11.2
Green Ext Time (p_c), s	0.1	2.2	0.0	0.1	0.0	1.7	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	17.4
HCM 6th LOS	B



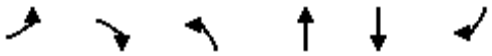
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	11	10	0	5	4	0
Future Volume (vph)	89	10	0	81	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	12	12	12	12	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.986		0.865			
Flt Protected	0.957					0.950
Satd. Flow (prot)	1992	0	1611	0	0	1770
Flt Permitted	0.957					0.950
Satd. Flow (perm)	1992	0	1611	0	0	1770
Link Speed (mph)	30		30			30
Link Distance (ft)	279		91			382
Travel Time (s)	6.3		2.1			8.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	11	0	88	4	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	108	0	88	0	0	4
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	16		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	0.85	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	5	11	0
Future Volume (vph)	0	0	0	81	11	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.882	
Flt Protected						
Satd. Flow (prot)	0	0	0	1863	1643	0
Flt Permitted						
Satd. Flow (perm)	0	0	0	1863	1643	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	245			155	91	
Travel Time (s)	5.6			3.5	2.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	88	12	85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	88	97	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	15			15
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	5	11	0
Future Volume (vph)	76	0	0	5	11	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	0	0	1863	1863	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	0	0	1863	1863	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	225			171	155	
Travel Time (s)	5.1			3.9	3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	0	0	5	12	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	0	0	5	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	15	15			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection: 1: Armstrong Blvd NW & 147th Ave NW

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	T	R	L	R	L	T	R	L	T	T	R
Maximum Queue (ft)	45	24	21	109	19	26	87	43	46	44	20	16
Average Queue (ft)	17	11	15	73	19	20	58	15	36	26	4	6
95th Queue (ft)	45	28	28	109	20	37	98	42	55	53	17	17
Link Distance (ft)		283					231			509	509	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200		200	280	280	300		300	350			160
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 2: Ferret St N & 147th Ave NW

Movement	WB
Directions Served	LR
Maximum Queue (ft)	54
Average Queue (ft)	35
95th Queue (ft)	51
Link Distance (ft)	220
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Ferret St N & Access A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 4: Ferret St N & Access B

Movement	EB
Directions Served	L
Maximum Queue (ft)	30
Average Queue (ft)	23
95th Queue (ft)	43
Link Distance (ft)	195
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0