

COUNTERPOINT
LAND DEVELOPMENT BY

DILLON
CONSULTING

ASTORIA INC.

TRANSPORTATION IMPACT STUDY

**Residential Development at
3771, 3783, 3793 Howard Avenue, Windsor, Ontario**

March 2025 – 24-8888

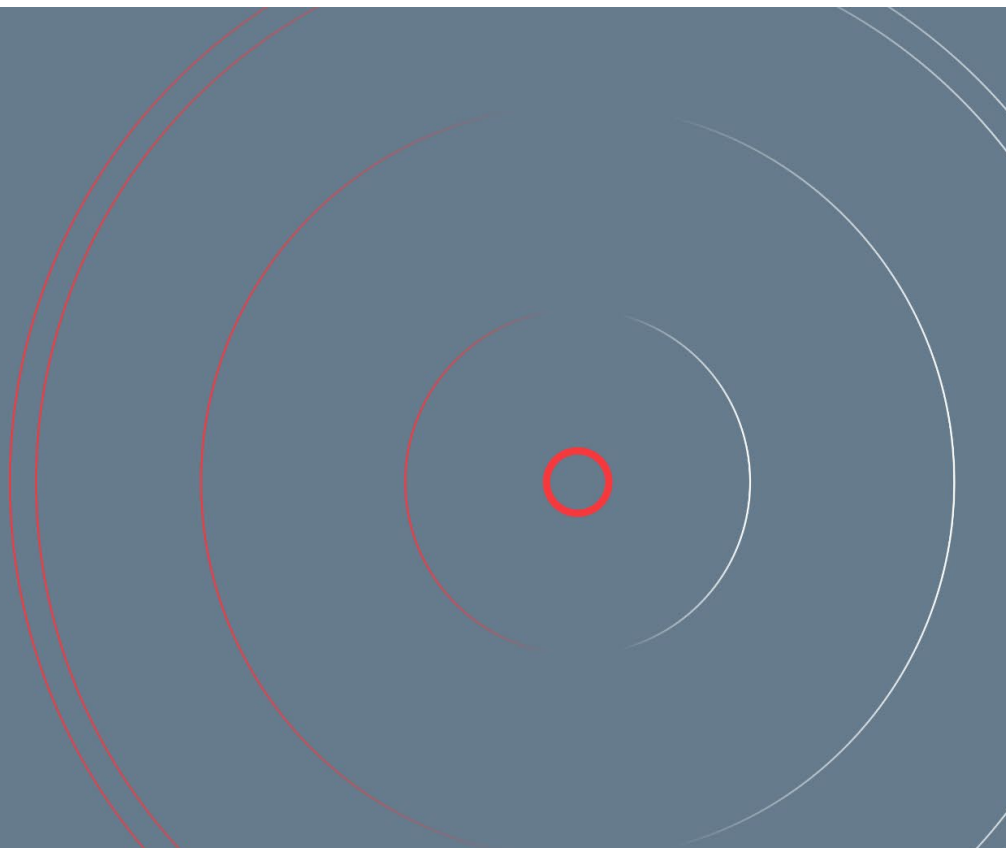


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1.0 INTRODUCTION

1.1 PURPOSE

Dillon Consulting Limited (Dillon) has been retained by Astoria Inc. to undertake a transportation impact study (TIS) to review the impact of a proposed residential development in the city of Windsor. The proposed residential development would be located at 3771, 3783, and 3793 Howard Avenue. The site is located on the west side of Howard Avenue immediately south of Lily Mac Boulevard. Three single-family residential dwelling units currently occupy the site and will be demolished before the construction of the development. The site location is illustrated in **Figure 1** and the existing local context is illustrated in **Figure 2**.

Figure 1: Site Location



Figure 2: Local Context

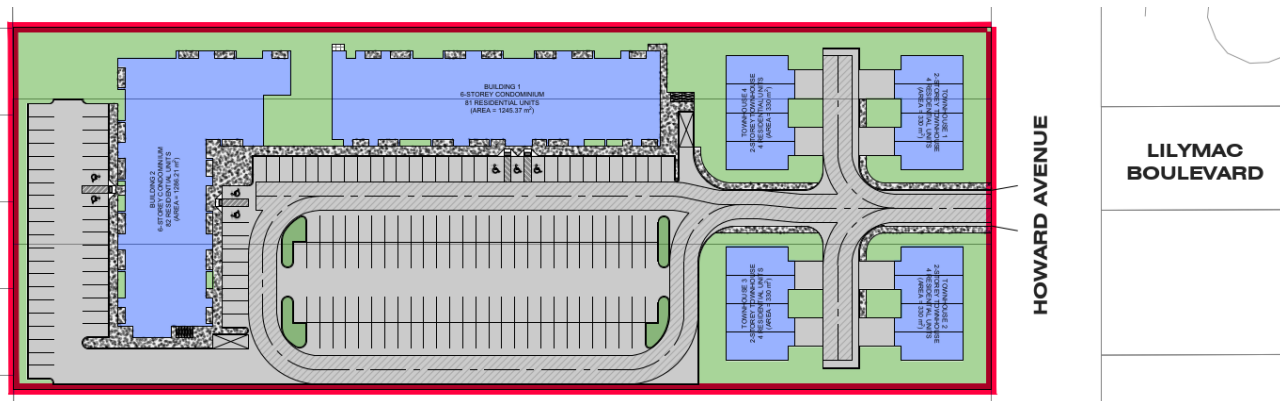


1.2 PROPOSED DEVELOPMENT

The development is proposed to have two apartment buildings, one with 81 dwelling units and the other with 82 dwelling units, as well as four townhouse buildings with four dwelling units each. One site access is proposed via Howard Avenue.

Figure 3 illustrates the concept plan for the development. A detailed version can be found in **Appendix A**.

Figure 3: Development Concept Plan



1.3 SCOPE OF ANALYSES

Based on discussions with City of Windsor staff, the study area includes the following intersections:

- Division Road at Howard Avenue / mall driveway;
- Howard Avenue at Lily Mac Boulevard; and
- Howard Avenue at Cabana Road East.

The proposed site access on Howard Avenue was assessed in the total future analyses only.

Traffic analyses have been completed for the weekday AM and PM peak hours, as well as a Saturday mid-day peak hour. Two horizon years have been assessed:

- 2025, corresponding to the anticipated build-out year; and
- 2030, corresponding to five years after the anticipated build-out year.

2.0 EXISTING CONDITIONS

2.1 EXISTING ROAD NETWORK

The following describes the roadways within the study area.

Division Road is a Class II Arterial road that is under the jurisdiction of the City of Windsor. The road begins at Cabana Road East and extends northwest until it turns north and becomes Howard Avenue. The road provides access to multiple commercial units, including the Devonshire Mall, and residential properties. Within the study area, the road features a four-lane cross-section, with no sidewalks on either side. The posted speed limit is 60 km/h.

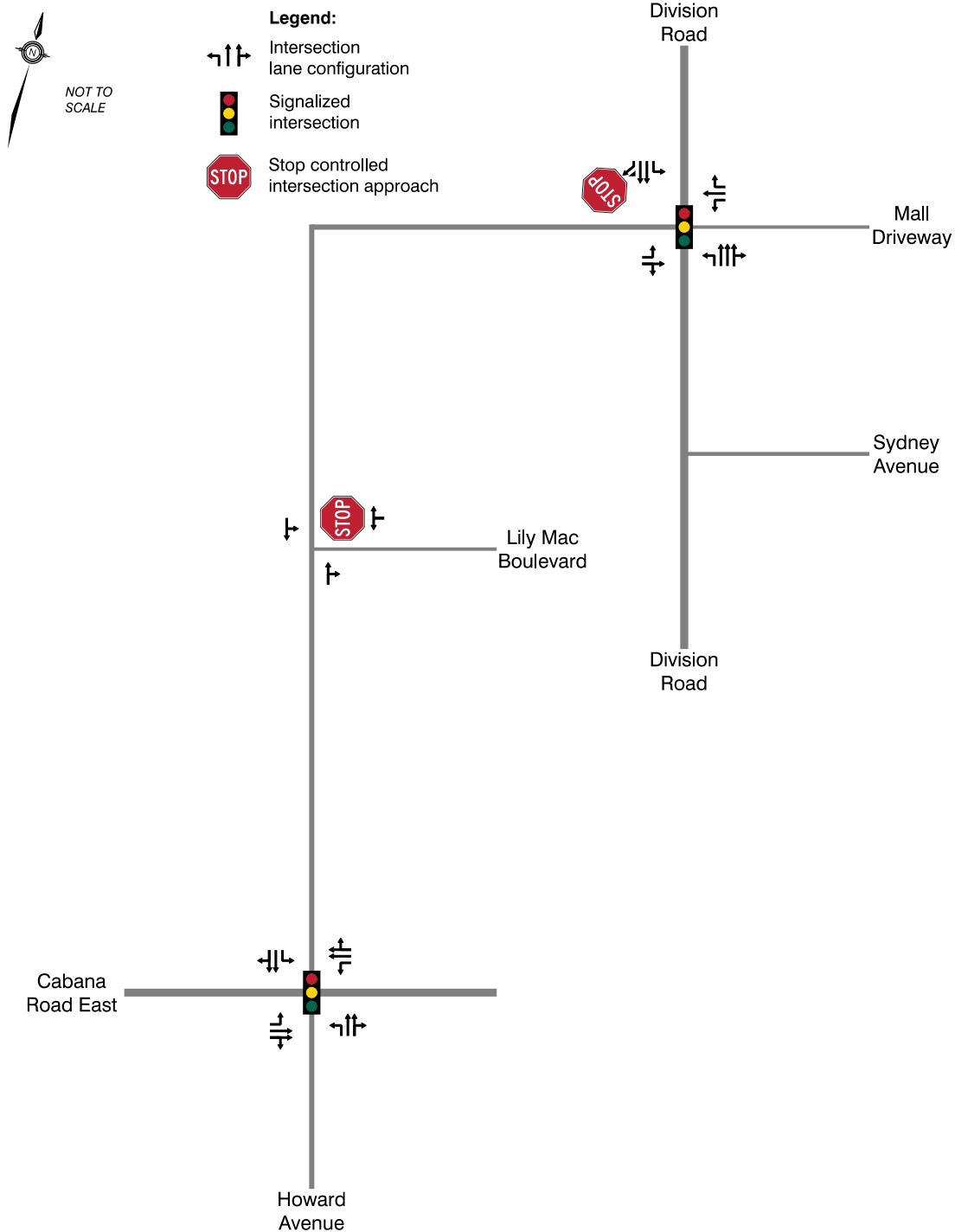
Cabana Road East is an east-west Class II Arterial road that is under the jurisdiction of the City of Windsor. The road provides access to multiple commercial units and residential properties. Within the study area, the road has a four-lane cross-section with sidewalks and separated bike lanes on either side. The speed limit within the study area is 50 km/h.

Howard Avenue is a north-south Class II Arterial road that is under the jurisdiction of the City of Windsor. The road provides a connection to surrounding residential properties. Within the study area, the road features a two-lane cross-section with a sidewalk on the east side of the road. The posted speed limit is 50 km/h.

Lily Mac Boulevard is an east-west private residential street. The road extends from Howard Avenue to Clara Avenue, providing access to a residential subdivision. The road features a two-lane cross-section with no sidewalks on either side of the road. There is no posted speed limit; therefore, a 50 km/h statutory speed limit applies under the *Highway Traffic Act*.

Figure 4 illustrates the existing traffic control and lane configuration at the study area intersections.

Figure 4: Existing Intersection Geometry and Traffic Control



2.2 EXISTING TRANSIT NETWORK

Transit service in the study area is operated by Transit Windsor. One route passes through the study area:

South Windsor 7 runs from St. Clair College towards Devonshire Mall along Howard Avenue. The route operates at 30-minute headways during weekdays and 45-minute headways during Saturdays. The closest stop to the subject site is approximately 240 metres south of the site, located at the northeast corner of Howard Avenue and Cabana Road East.

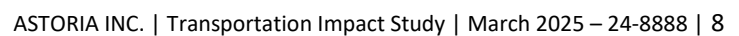
2.3 EXISTING TRAFFIC VOLUMES

Weekday AM and PM peak hour and Saturday mid-day peak hour intersection turning movement counts (TMCs) were collected at the study area intersections by Horizon Data Services Limited (HDSL). Division Road and Howard Avenue was surveyed on Thursday, December 19, 2024, and Saturday, December 21, 2024. All other intersections were surveyed on Tuesday, December 10, 2024, and Saturday, December 7, 2024.

The existing AM, PM, and Saturday peak hour traffic volumes are presented in **Figure 5**. The detailed turning movement count data are provided in **Appendix B**.

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 123 (123) [123] → } peak hour turning
 123 (123) [123] ↘ } movement volumes



2.4 EXISTING PEDESTRIAN AND CYCLING ACTIVITY

Pedestrians and cyclist volumes were recorded as part of the traffic surveys undertaken by HDSL. **Table 1** and **Table 2** document the number of pedestrian crossings at each intersection during the weekday and Saturday peak hours, respectively.

Table 3 and **Table 4** document the number of cyclists crossings at each intersection during the weekday and Saturday peak hours, respectively.

Table 1: Existing Weekday Pedestrian Activity

INTERSECTION	AM PEAK HOUR					PM PEAK HOUR				
	North leg	South leg	West leg	East leg	Total	North leg	South leg	West leg	East leg	Total
Division Road and Howard Avenue/mall driveway	0	3	0	1	4	0	9	2	0	11
Howard Avenue and Lily Mac Boulevard	2	0	0	6	8	1	0	0	7	8
Howard Avenue and Cabana Road East	6	3	4	4	17	6	6	6	1	19

Table 2: Existing Saturday Pedestrian Activity

INTERSECTION	SATURDAY PEAK HOUR				
	North leg	South leg	West leg	East leg	Total
Division Road and Howard Avenue/mall driveway	0	4	0	0	4
Howard Avenue and Lily Mac Boulevard	3	0	0	6	9
Howard Avenue and Cabana Road East	1	8	1	0	10

Table 3: Existing Weekday Cyclist Activity

INTERSECTION	AM PEAK HOUR					PM PEAK HOUR				
	North leg	South leg	West leg	East leg	Total	North leg	South leg	West leg	East leg	Total
Division Road and Howard Avenue/mall driveway	0	0	1	0	1	1	0	1	0	2
Howard Avenue and Lily Mac Boulevard	0	0	0	0	0	0	0	1	0	1
Howard Avenue and Cabana Road East	1	0	0	0	1	0	0	0	0	0

Table 4: Existing Saturday Cyclist Activity

INTERSECTION	SATURDAY PEAK HOUR				
	North leg	South leg	West leg	East leg	Total
Division Road and Howard Avenue/mall driveway	0	0	0	0	0
Howard Avenue and Lily Mac Boulevard	0	0	0	0	0
Howard Avenue and Cabana Road East	2	0	0	0	2

Minimal pedestrian and cyclist volumes were observed at the three study area intersections during the three peak hours. This is not unexpected as the counts were collected during the wintertime.

3.0 FUTURE BACKGROUND CONDITIONS

This section establishes the magnitude of traffic growth under future background conditions (i.e., traffic volumes that are forecasted without the proposed development in place).

Two horizon years have been assessed:

- 2025, corresponding to the anticipated build-out year; and
- 2030, corresponding to five years after the anticipated build-out year.

3.1 PLANNED ROADWAY MODIFICATIONS

The City of Windsor is planning to realign the Howard Avenue and Division Road intersection to Sydney Avenue in 2025. The west leg of the existing intersection will be closed, and it will become a T-intersection. The existing T-intersection at Division Road and Sydney Avenue will become a four-legged intersection with the addition of the west leg (which will connect to Howard Avenue). Both intersections will remain signalized with adjustments to the phasing and green times to account for the reconfigurations.

Existing traffic currently travelling to and from the west leg of the Howard Avenue and Division Road intersection has been re-assigned to the west leg of the future Division Road and Sydney Avenue intersection for assessing future operations.

The Division Road and Sydney Avenue intersection was not analyzed as the intersection was not identified by the City as being within the scope of this study.

3.2 BACKGROUND TRAFFIC GROWTH

As discussed with City staff, a growth rate of 1.5% per annum was applied to the existing traffic volumes. The background growth rate was applied to all movements at the study area intersections, except for those turning into or out of the mall driveway and Lily Mac Boulevard, as these roads are not expected to have any through traffic that would be subject to growth.

3.3 BACKGROUND DEVELOPMENT TRAFFIC

The City of Windsor identified three developments to consider for background development traffic with the following details:

- 3623, 3631, and 3637 Howard Avenue:
 - Located on the west side of Howard Avenue, between Maguire Street and Holburn Street.
 - The development is proposed to have 64 single-family detached dwelling units.
- 3756, 3762, 3780, and 3786 Howard Avenue:
 - Located on the east side of Howard Avenue, south of Lily Mac Boulevard.
 - The development is partially constructed, with 36 semi-detached dwelling units currently built.
 - The remaining development to be constructed consists of two four-storey apartment buildings, with a total of 108 residential dwelling units.

- 521, 523, and 525 Sandison Street:
 - Located southeast of the Howard Avenue and Sandison Street intersection.
 - The development is proposed to have 34 single-family detached dwelling units.

It is assumed that the three background developments would be built-out by 2025.

Trips generated by the proposed single-family detached dwelling units and the two four-storey apartment buildings were estimated based on trip generation rates published by ITE in the *Trip Generation Manual*, 11th edition. The trips generated by the two four-storey apartment buildings were based on ITE land use code 221 (“Multifamily Housing (Mid-Rise)”) and the trips generated by the single-family detached dwelling units are based on ITE land use code 210 (“Single-Family Detached Housing”). The fitted curve equation was used in the trip generation calculations.

Table 5 summarizes the number of vehicle trips that are projected to be generated by the three background developments.

Table 5: Trip Generation – Background Developments

	AM PEAK HOUR			PM PEAK HOUR			SATURDAY PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
3623, 3631, and 3637 Howard Avenue – 64 dwelling units									
In/Out/Rate	25%	75%	[1]	63%	37%	[1]	54%	46%	[1]
Vehicle trips	12	38	50	41	24	65	35	30	65
3756, 3762, 3780, and 3786 Howard Avenue – 108 dwelling units									
In/Out/Rate	23%	77%	[2]	61%	39%	[2]	51%	49%	[2]
Vehicle trips	8	28	36	26	16	42	22	21	43
521, 523, and 525 Sandison Street – 34 dwelling units									
In/Out/Rate	25%	75%	[1]	63%	37%	[1]	54%	46%	[1]
Vehicle trips	7	21	28	23	13	36	21	18	39
Total Vehicle trips	27	87	114	90	53	143	78	69	147

[1] AM: $\ln(T) = 0.91 (X) + 0.12$; PM: $\ln(T) = 0.94 (X) + 0.27$; SAT: $T = 0.86 (X) + 9.72$

[2] AM: $T = 0.44 (X) - 11.61$; PM: $T = 0.39 (X) + 0.34$; SAT: $\ln(T) = 1.0 (X) - 0.91$

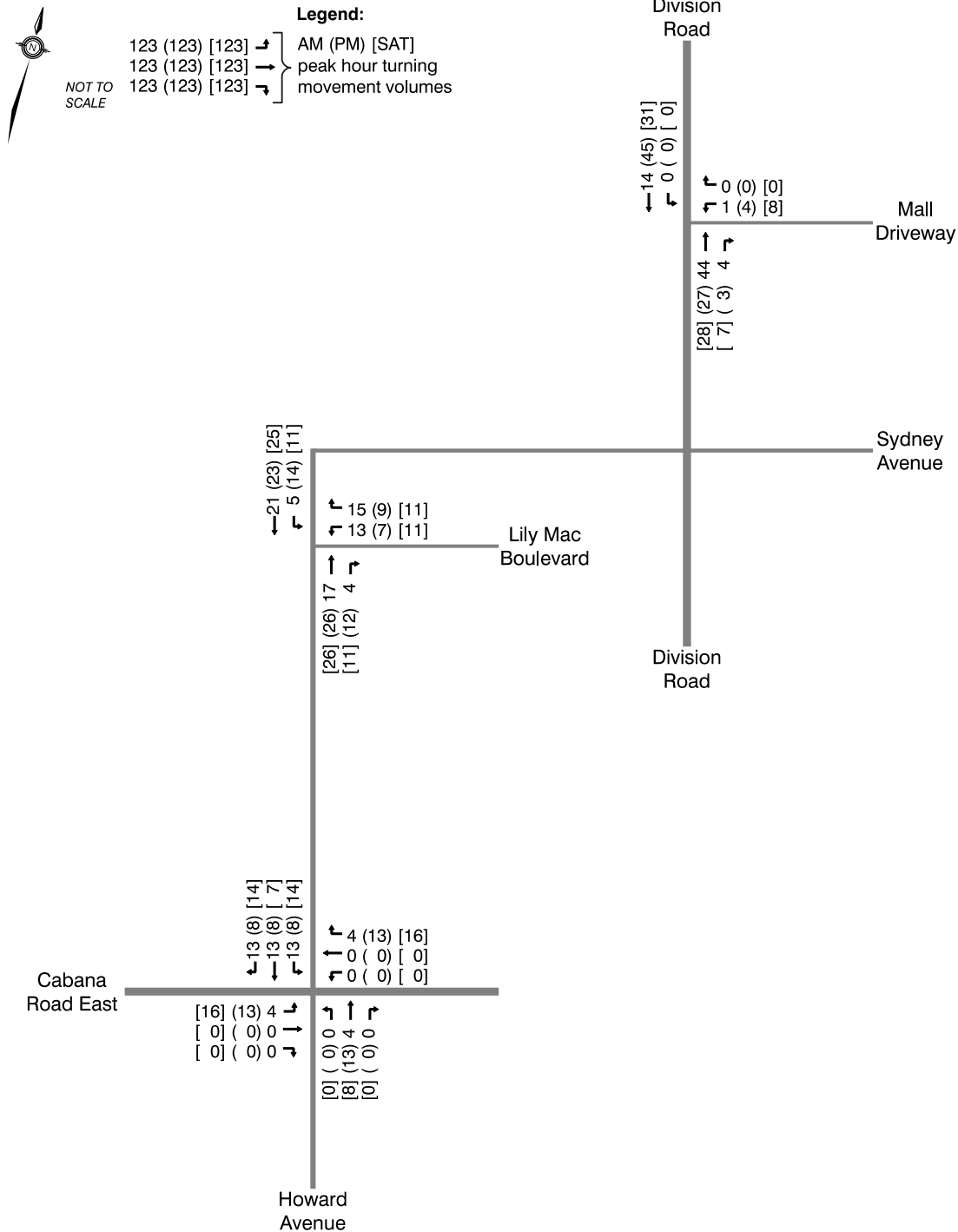
The three background developments are anticipated to generate 114 vehicle trips (27 inbound, 87 outbound) during the AM peak hour, 143 vehicle trips (90 inbound, 53 outbound) during the PM peak hour, and 147 vehicle trips (78 inbound, 69 outbound) during the Saturday peak hour.

The trips that would be generated by each of the background developments were included within the future background traffic volumes for both horizon years.

The same trip distribution used for the site trips identified in **Section 4.3** was also applied to distribute the trips associated with the background developments.

Figure 6 illustrates the background development traffic volumes.

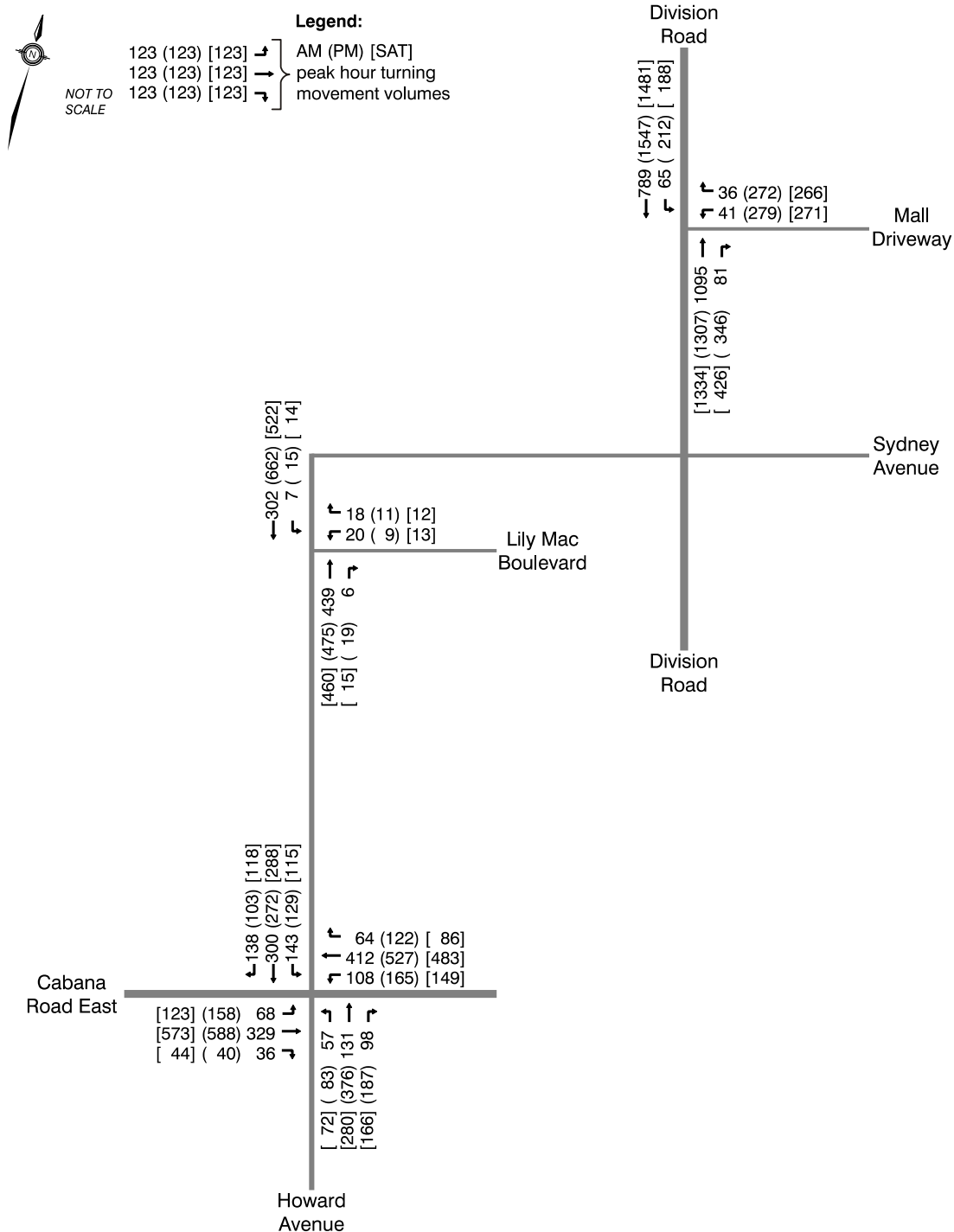
Figure 6: Background Developments Traffic Volumes



3.4 FUTURE BACKGROUND TRAFFIC VOLUMES

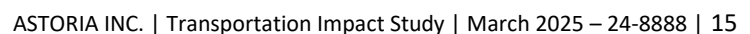
The future background traffic volumes during 2025 and 2030 are presented in **Figure 7** and **Figure 8**, respectively.

Figure 7: Future Background Traffic Volumes (2025)



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4.0 TOTAL FUTURE CONDITIONS

4.1 PROPOSED DEVELOPMENT

The development is proposed to have two apartment buildings, one with 81 dwelling units and the other with 82 dwelling units, as well as four townhouse buildings with four dwelling units each. One site access is proposed via Howard Avenue.

4.2 SITE TRIP GENERATION

Trips generated by the proposed residential development were estimated based on trip generation rates published by ITE in the *Trip Generation Manual*, 11th edition. The trips generated by the two apartment buildings are based on ITE land use code 221 (“Multifamily Housing (Mid-Rise)”) and the trips generated by the four townhouse blocks are based on ITE land use code 215 (“Single-Family Attached Housing”). The referenced ITE pages are provided in **Appendix C**; however, some of these values are slightly different from the values in the ITE trip generation web-based app, which was used in the analysis.

To estimate existing modal splits in the Windsor area, the 2019 Active Transportation Master Plan was reviewed. The 2041 target mode shares for various areas within the city of Windsor are outlined in the plan. For newer communities, the target non-auto mode share was identified as 14%.

Given the location of the development and the land use proposed, the non-auto mode share (14%) was broken down as follows:

- 5% for transit;
- 5% for walking; and
- 4% for cycling.

The non-auto trips were added to the vehicle trips.

Table 6 summarizes the assumed modal split for the subject development. The fitted curve equation was used in the calculations.

Table 6: Trip Generation

	AM PEAK HOUR			PM PEAK HOUR			SATURDAY PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
Six-storey apartment building – 81 dwelling units									
In/Out/Rate	23%	77%	[1]	61%	39%	[1]	51%	49%	[1]
Vehicle trips	6	18	24	20	12	32	17	16	33
Six-storey apartment building – 82 dwelling units									
In/Out/Rate	23%	77%	[1]	61%	39%	[1]	51%	49%	[1]
Vehicle trips	6	18	24	20	12	32	17	16	33
Four townhouse buildings – 16 dwelling units									
In/Out/Rate	25%	75%	[2]	59%	41%	[2]	48%	52%	[2]
Vehicle trips	1	2	3	4	2	6	7	8	15
Total vehicle trips	13	38	51	44	26	70	41	40	81
Non-auto trips (14%)	2	5	7	6	4	10	6	6	12
Total person trips	15	43	58	50	30	80	47	46	93

[1] AM: $T = 0.44 (X) - 11.61$; PM: $T = 0.39 (X) + 0.34$; SAT: $\ln(T) = 1.0 (X) - 0.91$

[2] AM: $T = 0.52 (X) - 5.7$; PM: $T = 0.6 (X) - 3.93$; SAT: $\ln(T) = 0.82 (X) + 0.43$

The proposed residential development is anticipated to generate 51 vehicle trips (13 inbound, 38 outbound) during the AM peak hour, 70 vehicle trips (44 inbound, 26 outbound) during the PM peak hour, and 81 vehicle trips (41 inbound, 40 outbound) during the Saturday peak hour.

When considering a 14% non-auto mode share, the proposed residential development is projected to generate 58 total trips (i.e., person trips) during the AM peak hour, 80 total trips during the PM peak hour, and 93 total trips during the Saturday peak hour.

4.3 SITE TRIP DISTRIBUTION

The vehicles generated by the proposed development were distributed to the road network based on existing travel patterns and attractiveness of various travel routes.

For the purpose of this analysis, Howard Avenue is considered as a north-south road except at the Division Road and Howard Avenue/mall driveway intersection where Division Road is considered as north-south, while Howard Avenue and the mall driveway are considered as east-west.

Table 7 lists the trip distribution applied to the site trips. The same trip distribution was used for the AM and PM peak hours, while the Saturday peak hour distribution was slightly adjusted to reflect travel patterns specific to Saturdays.

Table 7: Trip Distribution

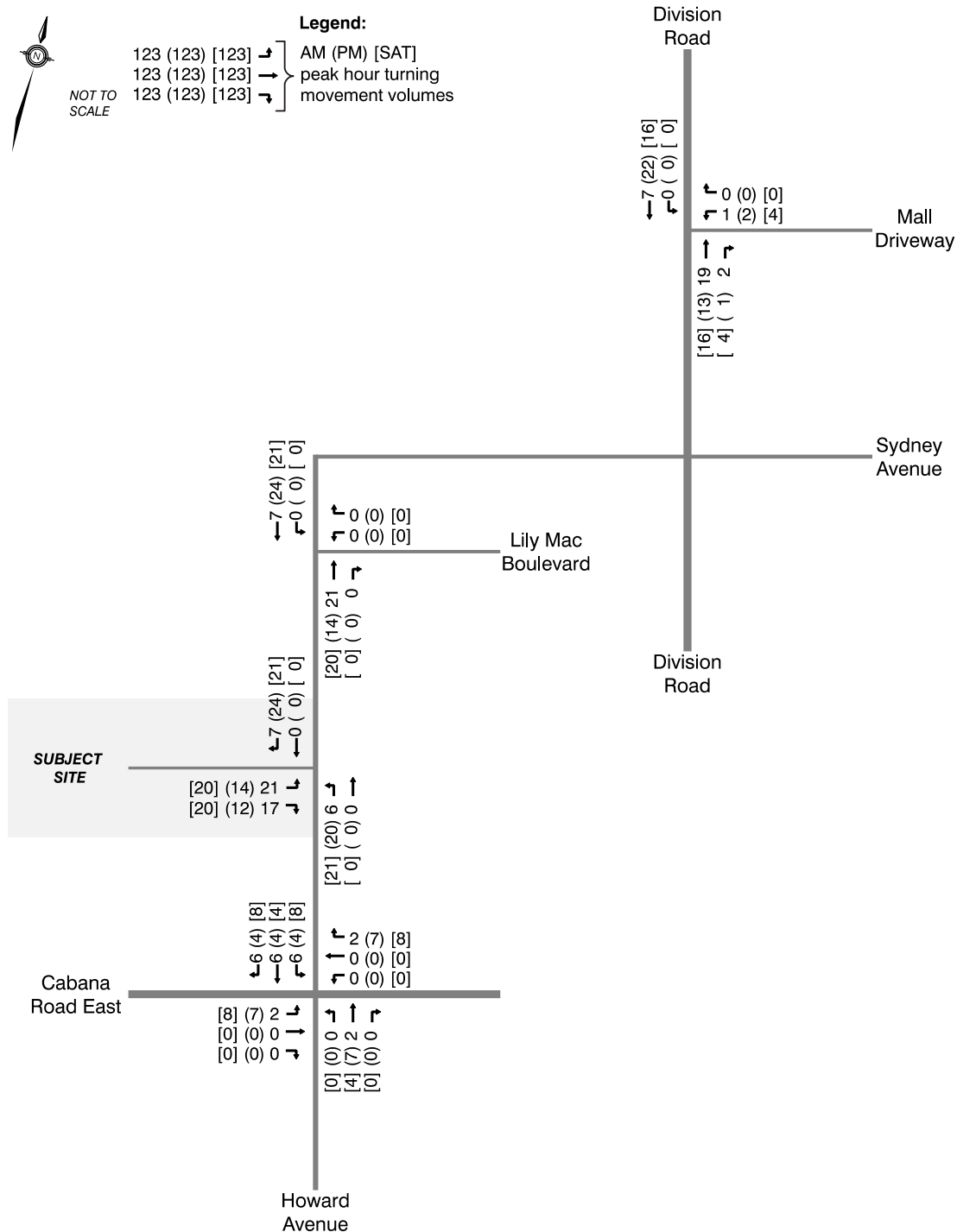
TO/FROM	VIA	TRIP DISTRIBUTION %	
		AM AND PM PEAK HOUR	SATURDAY PEAK HOUR
North	Division Road	50%	40%
South	Division Road	0%	0%
	Howard Avenue	15%	10%
East	Mall driveway	5%	10%
	Lily Mac Boulevard	0%	0%
	Cabana Road East	15%	20%
West	Cabana Road East	15%	20%
TOTAL		100%	100%

Trips were not distributed south via Division Road as those would be grouped with trips travelling to/from the east via Cabana Road East.

4.4 SITE TRIP ASSIGNMENT

Figure 9 illustrates how the vehicle trips generated by the development were distributed and assigned through the study area intersections. Some movements do not balance due to rounding.

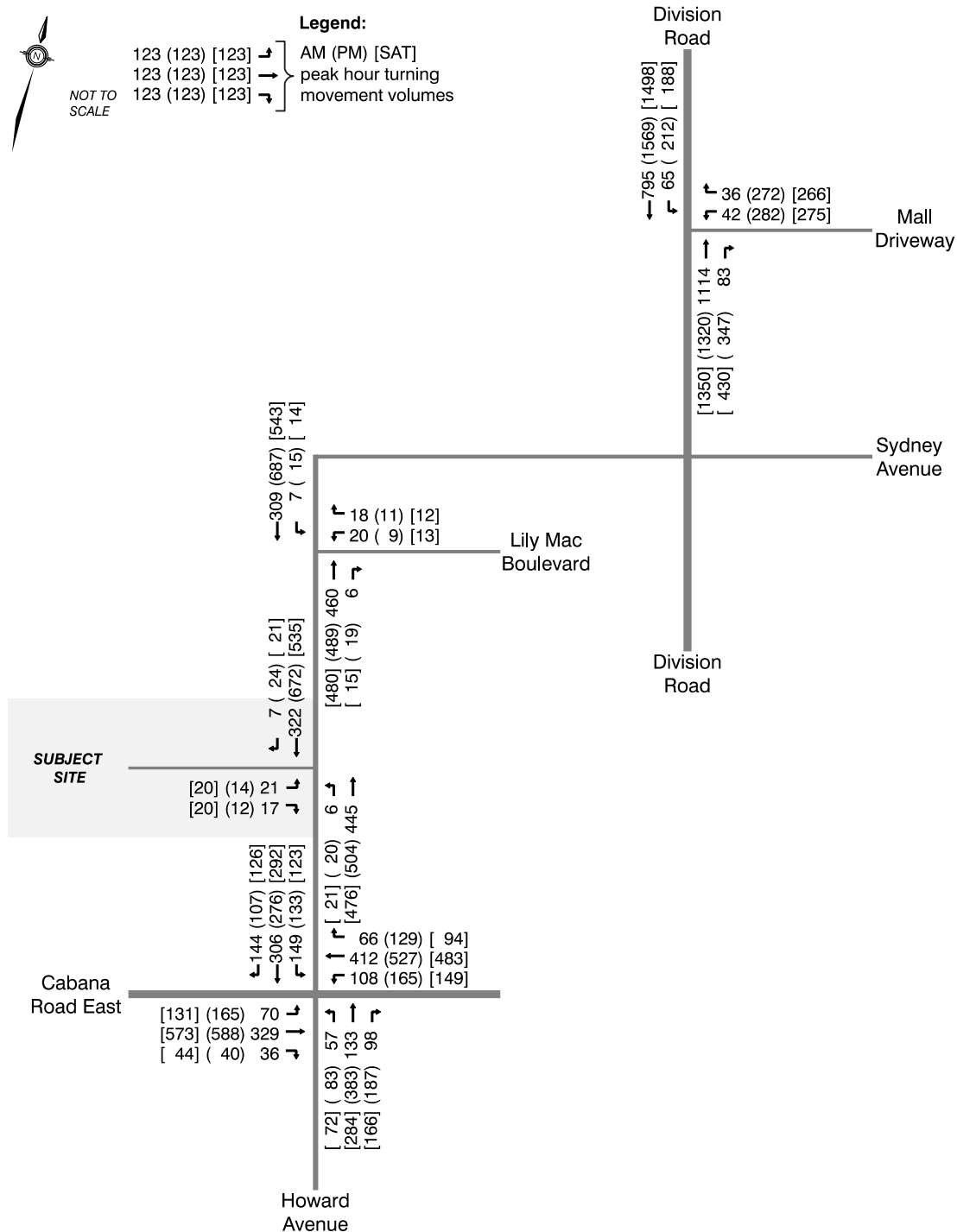
Figure 9: Site-Generated Trips



4.5 TOTAL FUTURE TRAFFIC VOLUMES

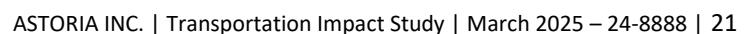
The total future traffic volumes were calculated by adding the site trips to the future background traffic volumes. **Figure 10** and **Figure 11** illustrate the total future traffic volumes for 2025 and 2030, respectively.

Figure 10: Total Future Traffic Volumes (2025)



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 123 (123) [123] → } peak hour turning
 123 (123) [123] ↘ } movement volumes



5.0 INTERSECTION OPERATIONS

Intersection operational analyses were completed for the study area intersections using Trafficware's Synchro software (version 11). At the study area intersections, the volume-to-capacity (v/c) ratio, delay, level of service and 95th percentile queue were noted for any stop-controlled movements or for any movements where an exclusive left-turn lane is present. Level of service (LOS) definitions are provided in **Appendix D**. The Synchro analysis worksheets reports are provided in **Appendix E**.

At each intersection, critical movements were identified. Critical movements are defined by the City of Windsor as:

- Any individual movement at a signalized intersection operating at a v/c ratio of 0.85 or greater;
- An exclusive turning movement at a signalized intersection operating at a v/c ratio of 1.0 or greater;
- Any individual movement at a signalized intersection operating at LOS F;
- Any individual movement at an unsignalized intersection operating at LOS E or worse; and
- Any turning movement where the calculated 95th percentile queue exceeds the available storage length.

The analyses reflect the existing lane configurations and traffic signal timings obtained from the City of Windsor. However, the future analyses at Howard Avenue at Division Road intersection reflect the planned realignment in 2025. The existing cycle lengths for each time period were used, while the splits were adjusted to optimize operations.

5.1 DIVISION ROAD AT HOWARD AVENUE/MALL DRIVEWAY

For the purpose of this analysis, Division Road is considered as north-south, while Howard Avenue and the mall driveway are considered as east-west at the Division Road and Howard Avenue/mall driveway intersection.

Using the methodology found in the Synchro Studio 11 User Guide shown in **Appendix F**, a lane utilization factor of 0.75 was calculated and applied to the shared northbound through/right-turn movement. This factor was used to better represent the existing northbound capacity.

During the future reconstruction of the intersection, the east leg will be reconfigured to have dual left-turn lanes and a single right-turn lane. The east-west crosswalk on the south leg of the intersection is planned to be relocated to the north leg. This will allow the westbound left-turn to operate with a protected phase.

There are no planned future signal timings for the reconfiguration. Therefore, signal timing plans were created based on optimizing the future background conditions for each peak hour. The existing cycle lengths were used and the splits were adjusted to reallocate green time from the westbound phase to the northbound/southbound phases.

Table 8 summarizes the existing and future operations for the Division Road and Howard Avenue/mall driveway intersection.

Table 8: Intersection Operations, Division Road and Howard Avenue/Mall Driveway

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Existing												
EBL	0.77	D	44.0	91	0.79	D	51.4	112	0.77	D	44.0	95
EBTR	0.23	B	17.1	25	0.68	D	43.1	93	0.79	D	42.8	99
WBL	0.03	D	42.2	5	0.47	D	50.6	42	0.52	D	53.4	42
WBT	0.25	D	47.0	18	0.74	E	63.9	#73	0.77	E	67.9	#71
WBR	0.16	A	1.4	0	0.69	B	18.1	39	0.72	C	21.9	#42
NBL	0.09	B	15.3	10	0.72	D	39.8	#59	0.78	D	44.9	#70
NBTR	0.45	C	24.2	77	0.92	D	50.1	#152	0.88	D	41.9	#155
SBL	0.24	B	16.8	17	0.78	D	46.1	#93	0.79	D	46.7	#78
SBT	0.39	C	22.4	74	0.88	D	46.3	#169	0.85	D	41.9	#159
SBR	0.25	A	4.3	16	0.67	A	7.8	41	0.58	A	5.8	28

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Overall	—	C	24.3	—	—	D	40.9	—	—	D	38.4	—
Future background (2025)												
WBL	0.16	D	43.6	10	0.59	D	47.6	47	0.59	D	47.5	45
WBR	0.23	B	17.0	10	0.64	B	14.1	33	0.67	B	18.3	40
NBTR	0.41	A	6.0	57	0.73	B	18.4	157	0.75	B	17.2	157
SBL	0.24	A	3.6	4	0.79	D	46.2	61	0.77	D	43.5	#57
SBT	0.30	A	2.3	24	0.63	A	7.6	101	0.59	A	6.9	88
Overall	—	A	5.5	—	—	B	17.4	—	—	B	16.7	—
Total future (2025)												
WBL	0.17	D	43.6	10	0.59	D	47.8	48	0.60	D	47.6	46
WBR	0.23	B	17.0	10	0.64	B	14.2	34	0.67	B	18.7	41
NBTR	0.42	A	6.0	59	0.74	B	18.6	160	0.76	B	17.5	160
SBL	0.25	A	3.7	4	0.79	D	46.2	61	0.77	D	43.5	#57
SBT	0.30	A	2.3	24	0.64	A	7.7	104	0.60	A	7.0	90
Overall	—	A	5.5	—	—	B	17.6	—	—	B	16.9	—
Future background (2030)												
WBL	0.16	D	43.6	10	0.59	D	47.6	47	0.59	D	47.5	45
WBR	0.23	B	17.0	10	0.64	B	15.0	35	0.68	B	19.8	42
NBTR	0.44	A	6.2	63	0.78	B	19.9	176	0.80	B	18.8	176
SBL	0.26	A	4.0	4	0.79	D	46.2	61	0.77	D	43.5	#57
SBT	0.32	A	2.4	27	0.67	A	8.3	117	0.64	A	7.5	101
Overall	—	A	5.6	—	—	B	18.2	—	—	B	17.5	—
Total future (2030)												
WBL	0.17	D	43.6	10	0.59	D	47.8	48	0.65	D	50.5	46
WBR	0.23	B	17.0	10	0.64	B	15.1	35	0.70	C	21.5	43
NBTR	0.45	A	6.3	65	0.78	C	20.1	178	0.79	B	17.9	179
SBL	0.27	A	4.1	4	0.79	D	46.2	61	0.77	D	44.2	#58
SBT	0.32	A	2.4	27	0.68	A	8.5	120	0.63	A	7.0	103
Overall	—	A	5.6	—	—	B	18.3	—	—	B	17.3	—

Note, '#' means that the 95th %ile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

The intersection is currently operating at an overall LOS C during the AM peak hour and LOS D during the PM and Saturday peak hours. The northbound shared through/right and the southbound through movements are operating critically with v/c ratios slightly above 0.85 during the PM and Saturday peak hours.

Under 2025 and 2030 future background conditions, with the future configuration, the intersection is anticipated to operate at a good overall level of service (LOS A–B) during all peak hours. No critical movements are expected, with all movements operating with v/c ratios less than 0.85 and at LOS D or better. Queues are not expected to exceed the available storage lengths. Similar operations are anticipated with the addition of site traffic.

5.2 HOWARD AVENUE AT LILY MAC BOULEVARD

Table 9 summarizes the existing and future operations for the westbound stop-controlled approach at the Howard Avenue and Lily Mac Boulevard intersection.

Table 9: Intersection Operations, Howard Avenue and Lily Mac Boulevard

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Existing												
WB approach	0.03	B	13.9	1	0.01	C	17.3	0	0.01	C	16.5	0
Future background (2025)												
WB approach	0.10	B	14.5	3	0.08	C	19.8	2	0.09	C	17.8	2
Total future (2025)												
WB approach	0.10	B	14.9	3	0.09	C	20.8	2	0.09	C	18.7	2
Future background (2030)												
WB approach	0.11	C	15.2	3	0.10	C	22.3	3	0.10	C	19.5	3
Total future (2030)												
WB approach	0.11	C	15.7	3	0.10	C	23.4	3	0.10	C	20.5	3

The westbound approach is currently operating acceptably at LOS C or better during all peak hours. Similar operations are anticipated to continue through to 2030. Minimal queueing and delay are anticipated. The addition of site traffic is not expected to significantly affect operations.

5.3 HOWARD AVENUE AT CABANA ROAD EAST

Table 10 summarizes the existing and future operations for the Howard Avenue and Cabana Road East intersection.

Table 10: Intersection Operations, Howard Avenue and Cabana Road East

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Existing												
EBL	0.14	B	10.6	14	0.39	B	16.0	32	0.24	B	11.0	20
EBTR	0.25	B	17.3	42	0.47	C	26.3	89	0.40	C	20.1	75
WBL	0.20	B	10.6	21	0.44	B	16.6	36	0.36	B	12.0	28
WBTR	0.30	B	16.5	53	0.47	C	25.1	87	0.35	B	18.2	63
NBL	0.26	C	25.9	17	0.27	C	24.2	22	0.30	C	28.7	22
NBTR	0.40	C	21.8	22	0.75	D	40.1	71	0.70	D	36.7	53
SBL	0.45	C	30.0	30	0.53	C	29.5	m25	0.49	C	27.0	m24
SBTR	0.61	D	35.2	52	0.44	C	31.4	m39	0.58	C	30.6	m52
Overall	—	C	22.2	—	—	C	28.5	—	—	C	24.0	—
Future background (2025)												
EBL	0.16	B	11.0	15	0.45	B	17.6	35	0.29	B	11.7	23
EBTR	0.25	B	17.9	43	0.49	C	27.4	91	0.41	C	20.7	77
WBL	0.21	B	11.0	21	0.46	B	17.7	37	0.37	B	12.5	28
WBTR	0.31	B	17.2	54	0.51	C	26.8	93	0.38	B	19.2	67
NBL	0.26	C	25.6	17	0.27	C	23.5	22	0.31	C	28.5	22
NBTR	0.39	C	21.7	23	0.75	D	40.1	74	0.72	D	38.0	56
SBL	0.49	C	30.8	37	0.56	C	31.4	32	0.55	D	36.0	33
SBTR	0.64	D	35.2	55	0.45	C	31.2	49	0.60	D	37.6	56
Overall	—	C	22.8	—	—	C	29.3	—	—	C	26.2	—
Total future (2025)												
EBL	0.16	B	11.1	15	0.47	B	18.3	37	0.31	B	11.9	25
EBTR	0.26	B	18.1	43	0.49	C	27.6	91	0.41	C	20.8	77
WBL	0.21	B	11.1	21	0.46	B	18.0	37	0.37	B	12.6	28

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
WBTR	0.31	B	17.4	54	0.52	C	27.3	94	0.38	B	19.5	69
NBL	0.27	C	25.5	17	0.27	C	23.3	22	0.31	C	28.5	22
NBTR	0.39	C	21.8	23	0.75	D	40.2	75	0.72	D	38.3	57
SBL	0.51	C	31.3	38	0.58	C	31.8	33	0.59	D	37.7	35
SBTR	0.65	D	35.1	56	0.45	C	30.9	49	0.61	D	37.4	57
Overall	—	C	23.0	—	—	C	29.5	—	—	C	26.4	—
Future background (2030)												
EBL	0.18	B	11.5	16	0.52	C	20.2	39	0.33	B	12.7	26
EBTR	0.28	B	18.9	47	0.55	C	29.7	99	0.46	C	22.6	87
WBL	0.24	B	11.6	23	0.54	C	20.6	41	0.43	B	14.0	31
WBTR	0.34	B	18.2	59	0.57	C	29.2	101	0.42	C	20.7	75
NBL	0.28	C	25.4	18	0.31	C	23.0	23	0.33	C	28.3	23
NBTR	0.40	C	21.4	24	0.76	D	39.7	79	0.73	D	38.3	60
SBL	0.53	C	31.3	39	0.61	C	32.3	33	0.60	D	37.3	34
SBTR	0.66	D	35.7	59	0.49	C	32.0	52	0.62	D	37.5	60
Overall	—	C	23.4	—	—	C	30.8	—	—	C	27.2	—
Total future (2030)												
EBL	0.19	B	11.8	16	0.55	C	21.1	40	0.35	B	13.2	27
EBTR	0.28	B	19.3	47	0.56	C	30.0	99	0.46	C	22.9	87
WBL	0.24	B	11.8	23	0.54	C	20.8	41	0.43	B	14.2	31
WBTR	0.34	B	18.6	60	0.59	C	29.7	103	0.43	C	21.2	77
NBL	0.29	C	25.1	18	0.31	C	22.9	23	0.34	C	28.1	23
NBTR	0.40	C	21.3	25	0.77	D	40.0	81	0.73	D	38.4	61
SBL	0.54	C	31.5	40	0.62	C	32.8	34	0.63	D	38.5	36
SBTR	0.66	D	35.5	60	0.50	C	31.8	53	0.62	D	37.2	61
Overall	—	C	23.6	—	—	C	31.1	—	—	C	—	—

Note, "The m footnote indicates that volume for the 95th percentile queue is metered by an upstream signal." Sourced from the Synchro Manual

The intersection is currently operating at a reasonable overall level of service (LOS C) during all peak hours. No critical movements have been identified and queues do not exceed the available storage lengths. This is expected to continue through to the 2030 horizon year. The addition of site traffic is anticipated to have a minimal effect on the intersection operations.

5.4 SITE ACCESS TO HOWARD AVENUE

Table 11 summarizes the future operations for the eastbound stop-controlled movement at the Howard Avenue site access.

Table 11: Intersection Operations, Site Access to Howard Avenue

MOVEMENT	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Total future (2025)												
EB approach	0.10	B	14.3	3	0.13	C	24.9	4	0.15	C	19.9	4
Total future (2030)												
EB approach	0.10	C	15.1	3	0.16	D	28.8	4	0.17	C	22.2	5

The eastbound approach is anticipated to operate at LOS C or better during the three peak hours upon full build out. Queues are not expected to exceed one vehicle. Similar operations are anticipated in 2030.

As requested by the City of Windsor, the alignment of the proposed site driveway in relation to the nearby Lily Mac Boulevard intersection was reviewed. Given the low outbound left-turn volumes from both the site access and from Lily Mac Boulevard, the offset alignment is not expected to be an issue as it would be unlikely for the westbound left-turn from Lily Mac Boulevard and the eastbound left-turn from the site access to occur at the same time. Further, since the proposed site driveway is located to the south of Lily Mac Boulevard, left-turning motorists on Howard Avenue will not “interlock”.

6.0 ACTIVE TRANSPORTATION AND TRANSIT CONNECTIVITY

The proposed site plan, provided in **Appendix A**, shows pathways connecting each building throughout the site. These pathways extend to the east end of the site, providing a connection to Howard Avenue. The sidewalk on the west side of Howard Avenue currently extends from Cabana Road East to Sandison Street, immediately south of the proposed development. The west sidewalk is planned to be extended along the frontage of the site to provide the development with connectivity to active transportation facilities and the nearby transit stops. The nearest bus stops located along Howard Avenue and Cabana Avenue would be easily accessible from the site with this connection in place.

7.0 SUMMARY

Dillon Consulting Limited (Dillon) has been retained by Astoria Inc. to undertake a transportation impact study to review the impact of a proposed residential development in the city of Windsor. The proposed residential development is located at 3771, 3783, 3793 Howard Avenue.

The development is proposed to have two apartment buildings, one with 81 dwelling units and the other with 82 dwelling units, as well as four townhouse buildings with four dwelling units each. One site access is proposed via Howard Avenue.

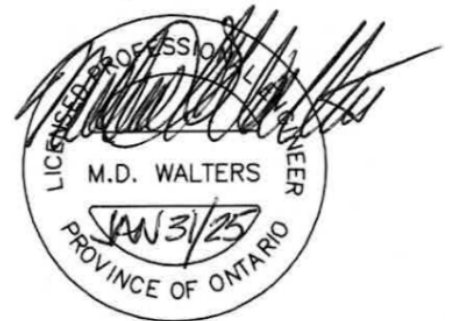
The development is projected to generate 51 new vehicle trips (13 inbound, 38 outbound) during the AM peak hour, 70 vehicle trips (44 inbound, 26 outbound) during the PM peak hour, and 81 vehicle trips (41 inbound, 40 outbound) during the Saturday mid-day peak hour.

The Division Road and Howard Avenue / mall driveway intersection currently has few movements operating critically during the weekday PM and Saturday mid-day peak hours. In 2025, Howard Avenue will be realigned to connect to Division Road opposite Sydney Avenue. The future T-intersection configuration of Division Road and the mall driveway is expected to operate at a good overall level of service (LOS A–B) during all peak hours, with no critical movements.

The remaining two study area intersections on Howard Avenue at Lily Mac Boulevard and at Cabana Road East both currently operate at an overall LOS D or better, and similar operations are anticipated to continue through to the 2030 horizon year. The addition of site traffic is expected to have a minimal effect on the intersection operations at each study area intersection.

The eastbound approach at the site access to Howard Avenue is projected to operate at LOS D or better with minimal queues.

The development is proposed to have pathways throughout the site that connect to Howard Avenue, providing connectivity to the active transportation and transit facilities nearby. The sidewalk on the west side of Howard Avenue is planned to be extended north of Sandison Street along the frontage of the site boundary.



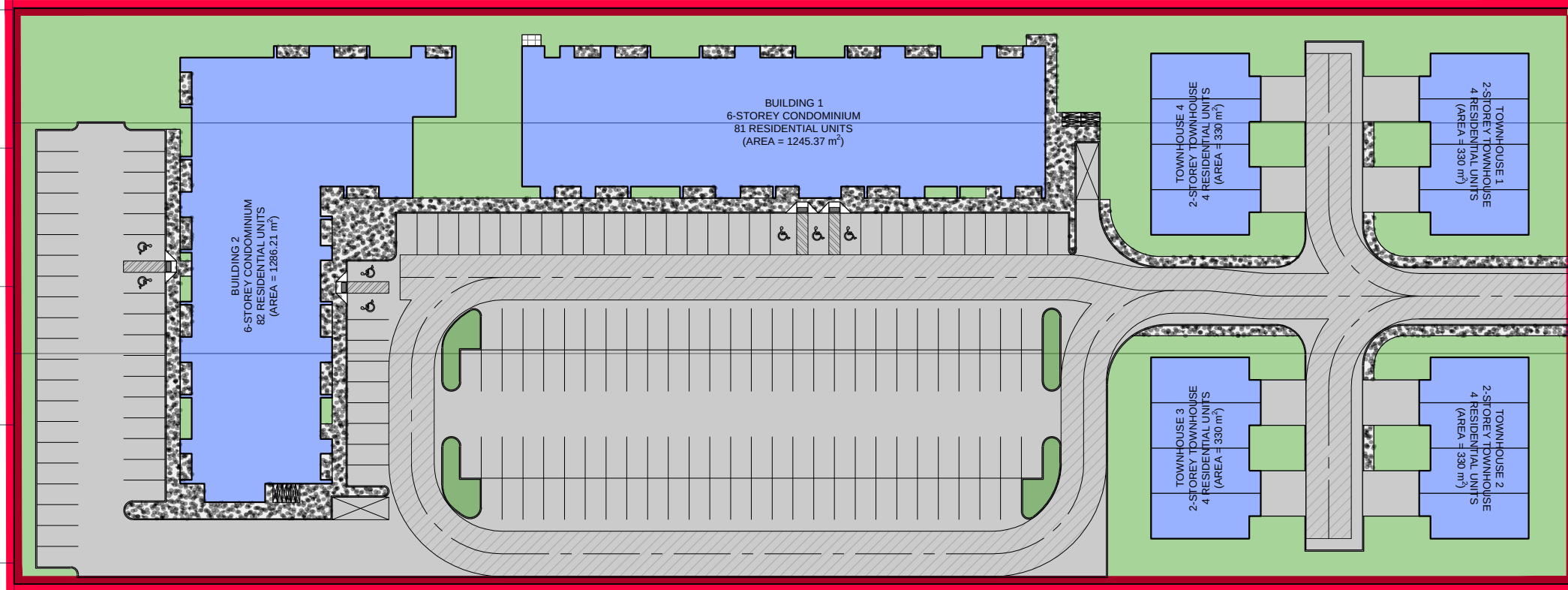
Mike Walters, P.Eng.
Transportation Engineer

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APPENDIX A

Development Concept Plan

INGLEWOOD AVENUE



HOWARD AVENUE

LILYMAC
BOULEVARD

ASTORIA INC.
ASTORIA DEVELOPMENT
3771 - 3793 HOWARD AVENUE, WINDSOR, ON N9E3N8

CONCEPTUAL PLAN

 SUBJECT AREA
($\pm 1.57\text{ha} / 3.88\text{ac}$)

 PROPOSED BUILDING

 PROPOSED PAVEMENT

 PROPOSED LANDSCAPING

 FIRE ROUTE

 PROPOSED SIDEWALK/
PATIO AREA

SOURCE: THE COUNTY OF ESSEX INTERACTIVE MAPPING (2023)

MAP/DRAWING INFORMATION
THIS DRAWING IS FOR INFORMATION PURPOSES ONLY. ALL
DIMENSIONS AND BOUNDARY INFORMATION SHOULD BE
VERIFIED BY AN O.L.S PRIOR TO CONSTRUCTION.
CREATED BY: DM
CHECKED BY: KDT/KNE
DESIGNED BY: DM

SCALE: 1:750 (11X17)



PROJECT: 24-8888
STATUS: DRAFT
DATE: 09/12/2024

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APPENDIX B

Traffic Volume Data

	Howard Ave From North					Mall Access From East					Division Rd From South					Howard Ave From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	36	81	5	0	122	6	4	0	0	10	1	89	4	1	95	3	6	34	0	43	270
07:15 AM	42	98	8	0	148	6	3	0	0	9	0	107	6	0	113	9	4	53	0	66	336
07:30 AM	37	110	6	0	153	8	3	1	0	12	0	138	10	0	148	7	3	81	0	91	404
07:45 AM	46	155	11	0	212	10	2	0	0	12	4	160	6	1	171	8	14	81	0	103	498
Total	161	444	30	0	635	30	12	1	0	43	5	494	26	2	527	27	27	249	0	303	1508
08:00 AM	44	126	11	0	181	13	7	1	0	21	4	166	5	0	175	6	13	70	0	89	466
08:15 AM	51	142	21	0	214	9	7	1	0	17	5	165	11	0	181	10	7	103	0	120	532
08:30 AM	50	132	11	0	193	7	10	2	1	20	3	181	8	2	194	9	15	72	0	96	503
08:45 AM	51	168	22	0	241	7	11	1	0	19	8	189	10	1	208	21	22	89	0	132	600
Total	196	568	65	0	829	36	35	5	1	77	20	701	34	3	758	46	57	334	0	437	2101
04:00 PM	138	246	55	0	439	77	44	26	0	147	36	270	49	5	360	25	49	83	2	159	1105
04:15 PM	139	225	53	0	417	65	57	25	0	147	26	218	41	0	285	25	49	90	0	164	1013
04:30 PM	143	228	51	0	422	65	35	28	0	128	38	212	27	3	280	16	52	94	0	162	992
04:45 PM	138	223	53	0	414	65	37	23	0	125	30	218	44	1	293	25	63	76	0	164	996
Total	558	922	212	0	1692	272	173	102	0	547	130	918	161	9	1218	91	213	343	2	649	4106
05:00 PM	121	232	54	0	407	85	52	24	2	163	42	241	44	3	330	15	54	80	0	149	1049
05:15 PM	160	254	57	0	471	55	38	21	2	116	35	236	37	2	310	18	45	90	0	153	1050
05:30 PM	133	224	50	0	407	53	42	19	0	114	31	211	39	0	281	21	45	84	0	150	952
05:45 PM	134	206	52	0	392	74	41	35	0	150	34	206	40	1	281	25	48	67	0	140	963
Total	548	916	213	0	1677	267	173	99	4	543	142	894	160	6	1202	79	192	321	0	592	4014
Grand Total	1463	2850	520	0	4833	605	393	207	5	1210	297	3007	381	20	3705	243	489	1247	2	1981	11729
Apprch %	30.3	59	10.8	0		50	32.5	17.1	0.4		8	81.2	10.3	0.5		12.3	24.7	62.9	0.1		
Total %	12.5	24.3	4.4	0	41.2	5.2	3.4	1.8	0	10.3	2.5	25.6	3.2	0.2	31.6	2.1	4.2	10.6	0	16.9	
Cars	1451	2733	508	0	4692	593	379	206	5	1183	294	2867	379	20	3560	239	483	1237	2	1961	11396
% Cars	99.2	95.9	97.7	0	97.1	98	96.4	99.5	100	97.8	99	95.3	99.5	100	96.1	98.4	98.8	99.2	100	99	97.2
Trucks	5	34	3	0	42	3	0	0	0	3	1	33	1	0	35	3	0	5	0	8	88
% Trucks	0.3	1.2	0.6	0	0.9	0.5	0	0	0	0.2	0.3	1.1	0.3	0	0.9	1.2	0	0.4	0	0.4	0.8
Heavies	6	82	9	0	97	9	12	1	0	22	2	106	1	0	109	1	6	5	0	12	240
% Heavies	0.4	2.9	1.7	0	2	1.5	3.1	0.5	0	1.8	0.7	3.5	0.3	0	2.9	0.4	1.2	0.4	0	0.6	2
Cyclists	1	1	0	0	2	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	5
% Cyclists	0.1	0	0	0	0	0	0.5	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0

Horizon Data Services Ltd

(416) 840-6619

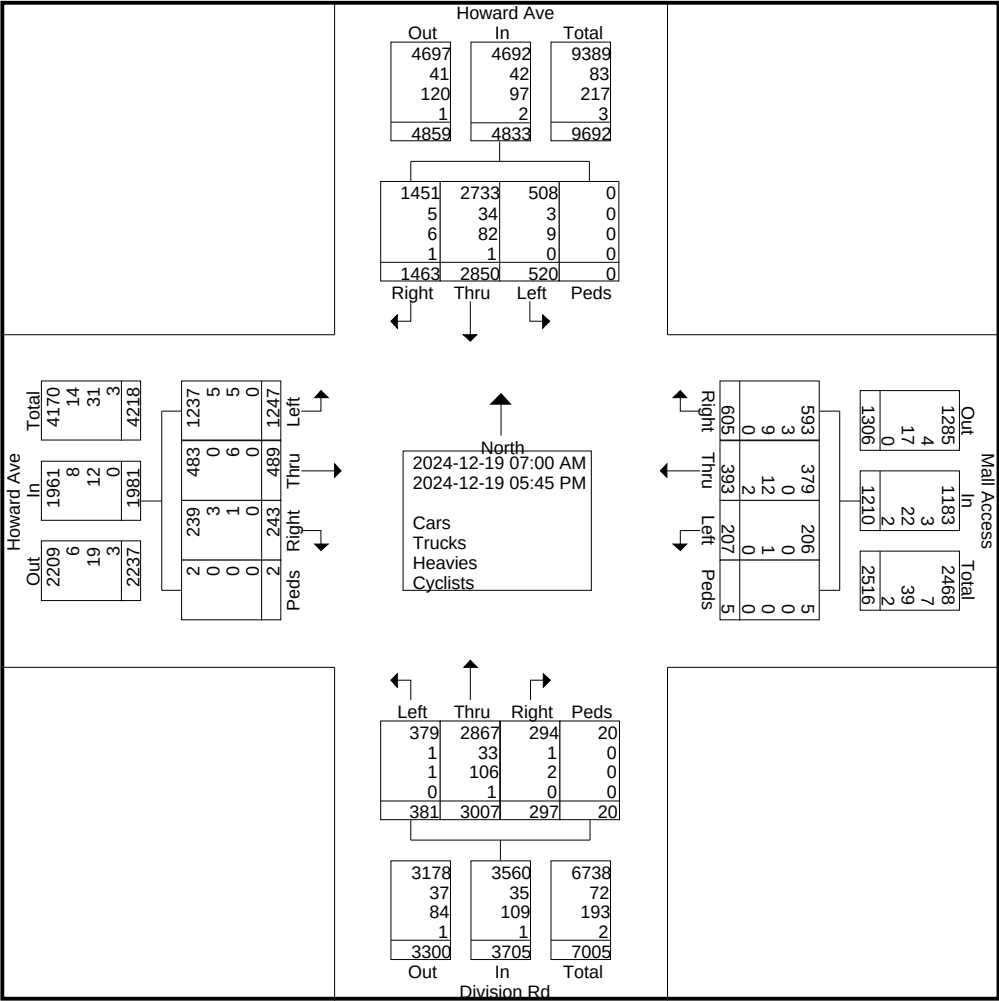
Your Traffic Count Specialist

File Name : Howard Avenue at Division Road

Site Code : Loc 3

Start Date : 2024-12-19

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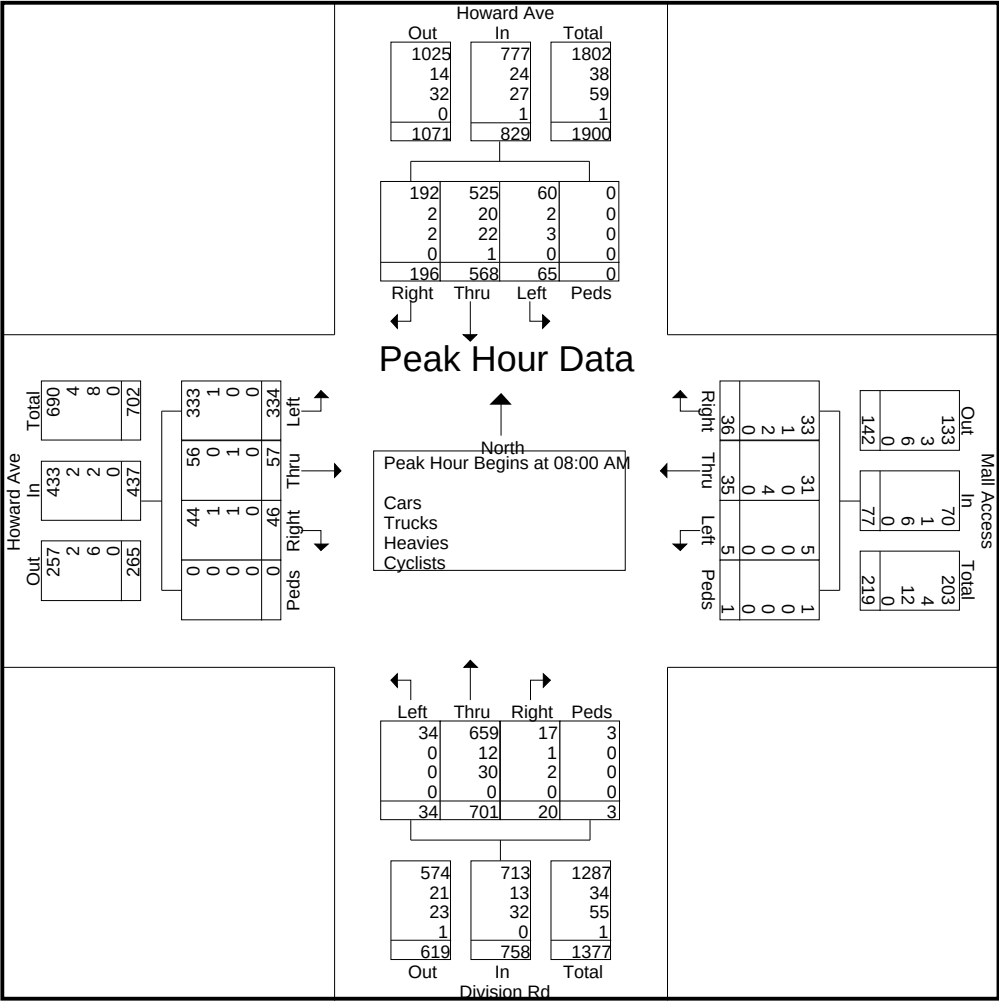
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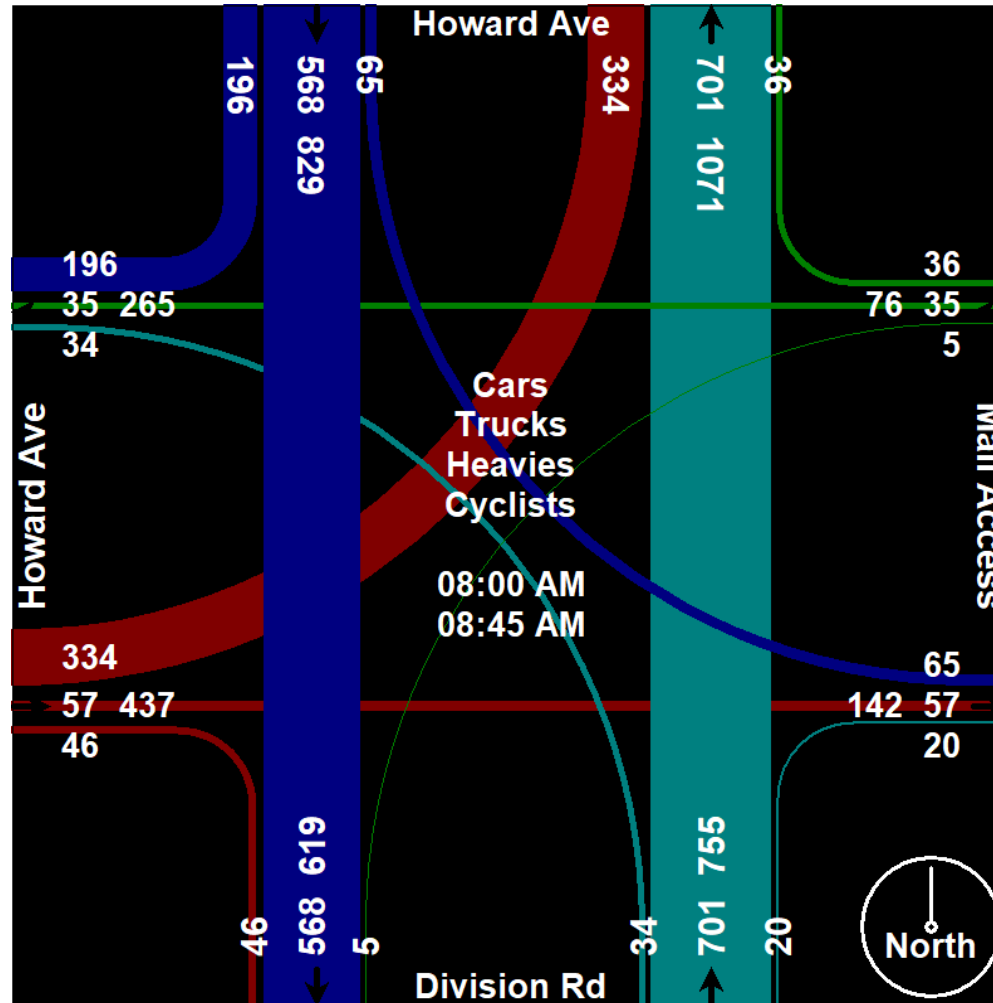
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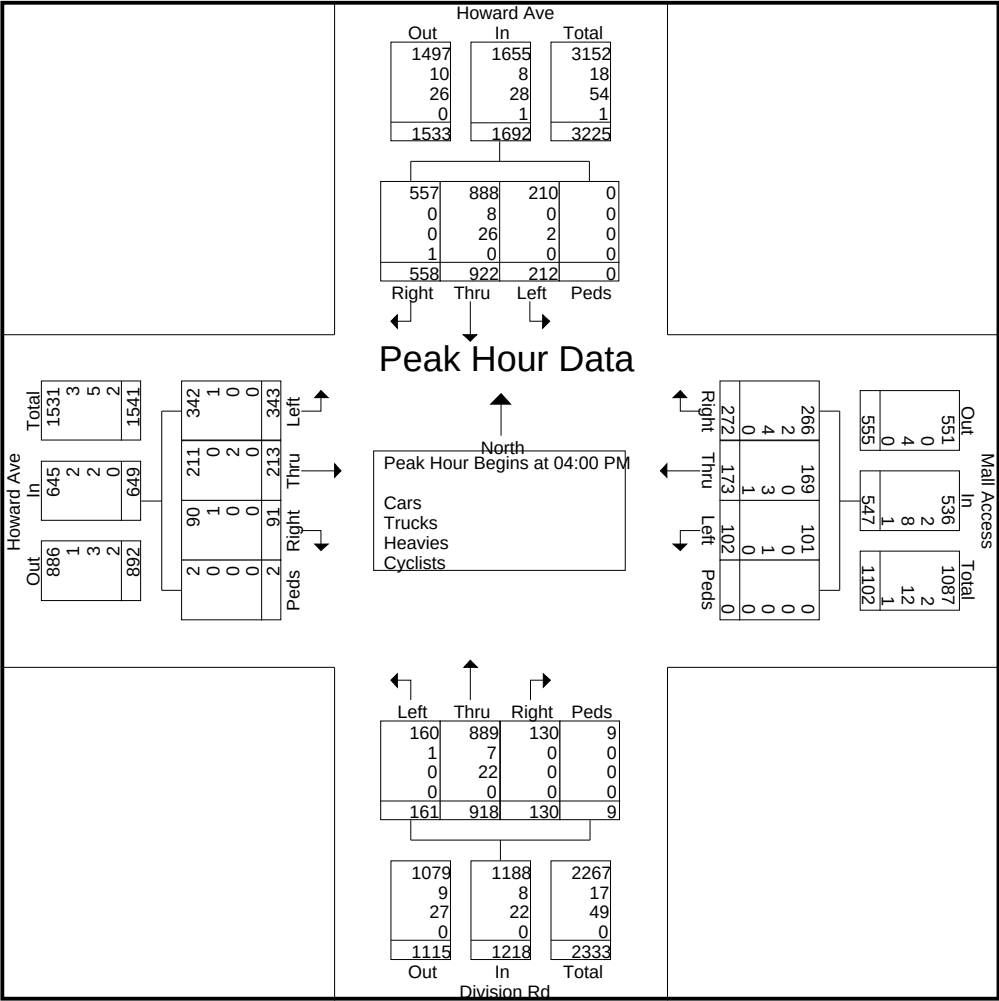
Your Traffic Count Specialist

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Site Code : Loc 3

Start Date : 2024-12-19

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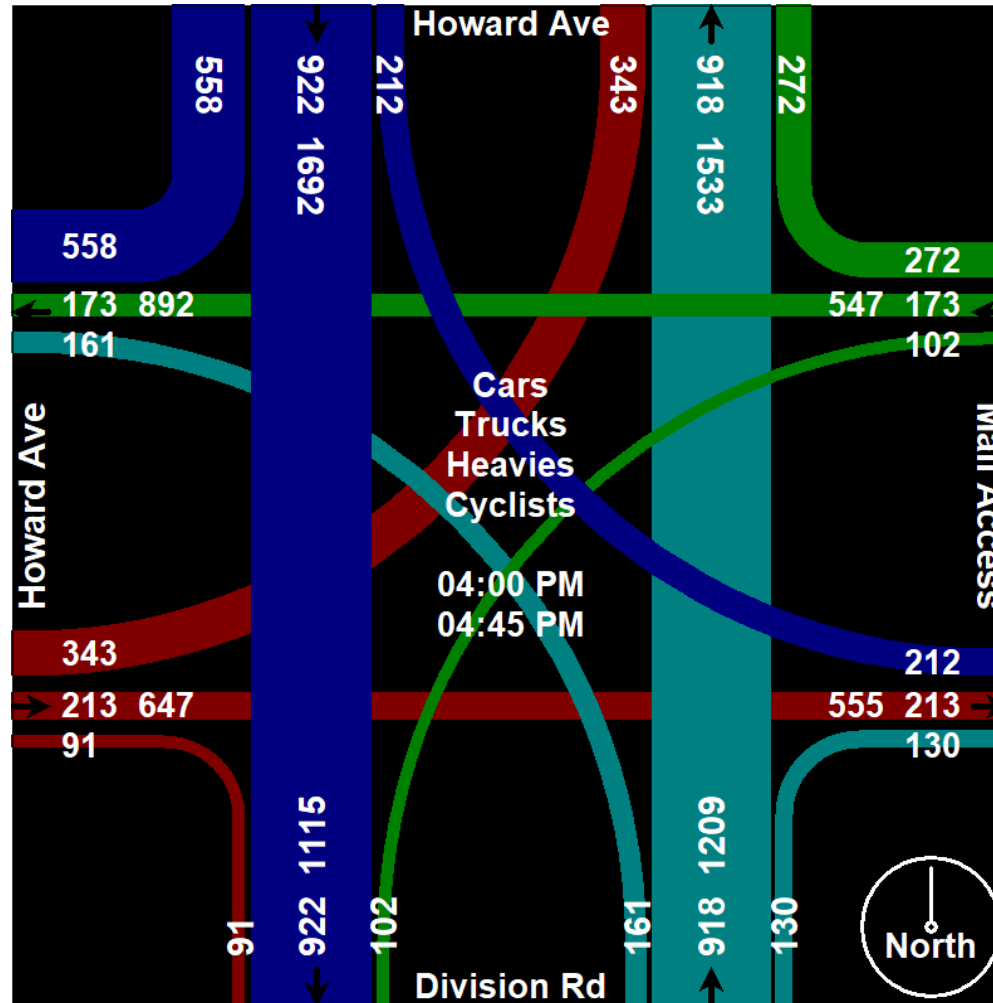
Your Traffic Count Specialist

File Name : Howard Avenue at Division Road

Site Code : Loc 3

Start Date : 2024-12-19

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	Howard Ave From North					Mall Access From East					Division Rd From South					Howard Ave From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
11:00 AM	78	194	56	0	328	48	29	21	0	98	36	209	38	1	284	14	67	77	0	158	868
11:15 AM	99	201	50	0	350	54	32	23	0	109	61	224	33	1	319	21	64	70	0	155	933
11:30 AM	115	209	46	0	370	75	49	33	0	157	52	194	34	0	280	20	56	84	0	160	967
11:45 AM	109	236	60	0	405	75	41	26	0	142	40	202	33	1	276	28	65	95	0	188	1011
Total	401	840	212	0	1453	252	151	103	0	506	189	829	138	3	1159	83	252	326	0	661	3779
12:00 PM	122	239	51	0	412	69	40	21	0	130	41	240	43	1	325	29	55	80	0	164	1031
12:15 PM	111	227	52	0	390	58	42	35	0	135	51	220	35	3	309	31	71	75	0	177	1011
12:30 PM	128	226	40	0	394	79	38	22	0	139	49	206	51	0	306	28	69	93	0	190	1029
12:45 PM	110	266	45	0	421	60	40	25	0	125	44	294	47	0	385	22	39	79	0	140	1071
Total	471	958	188	0	1617	266	160	103	0	529	185	960	176	4	1325	110	234	327	0	671	4142
01:00 PM	118	216	48	2	384	83	43	24	0	150	40	218	47	0	305	19	65	84	0	168	1007
01:15 PM	118	212	51	1	382	83	43	31	0	157	46	226	54	2	328	18	55	85	1	159	1026
01:30 PM	126	237	37	0	400	67	32	28	0	127	51	253	42	1	347	35	49	65	0	149	1023
01:45 PM	105	223	41	0	369	76	37	37	0	150	44	231	43	4	322	25	56	81	0	162	1003
Total	467	888	177	3	1535	309	155	120	0	584	181	928	186	7	1302	97	225	315	1	638	4059
Grand Total	1339	2686	577	3	4605	827	466	326	0	1619	555	2717	500	14	3786	290	711	968	1	1970	11980
Apprch %	29.1	58.3	12.5	0.1		51.1	28.8	20.1	0		14.7	71.8	13.2	0.4		14.7	36.1	49.1	0.1		
Total %	11.2	22.4	4.8	0	38.4	6.9	3.9	2.7	0	13.5	4.6	22.7	4.2	0.1	31.6	2.4	5.9	8.1	0	16.4	
Cars	1338	2635	573	3	4549	816	456	326	0	1598	553	2688	497	14	3752	289	707	968	1	1965	11864
% Cars	99.9	98.1	99.3	100	98.8	98.7	97.9	100	0	98.7	99.6	98.9	99.4	100	99.1	99.7	99.4	100	100	99.7	99
Trucks	0	10	0	0	10	1	0	0	0	1	1	7	3	0	11	1	0	0	0	1	23
% Trucks	0	0.4	0	0	0.2	0.1	0	0	0	0.1	0.2	0.3	0.6	0	0.3	0.3	0	0	0	0.1	0.2
Heavies	1	41	4	0	46	10	10	0	0	20	1	22	0	0	23	0	4	0	0	4	93
% Heavies	0.1	1.5	0.7	0	1	1.2	2.1	0	0	1.2	0.2	0.8	0	0	0.6	0	0.6	0	0	0.2	0.8
Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Cyclists	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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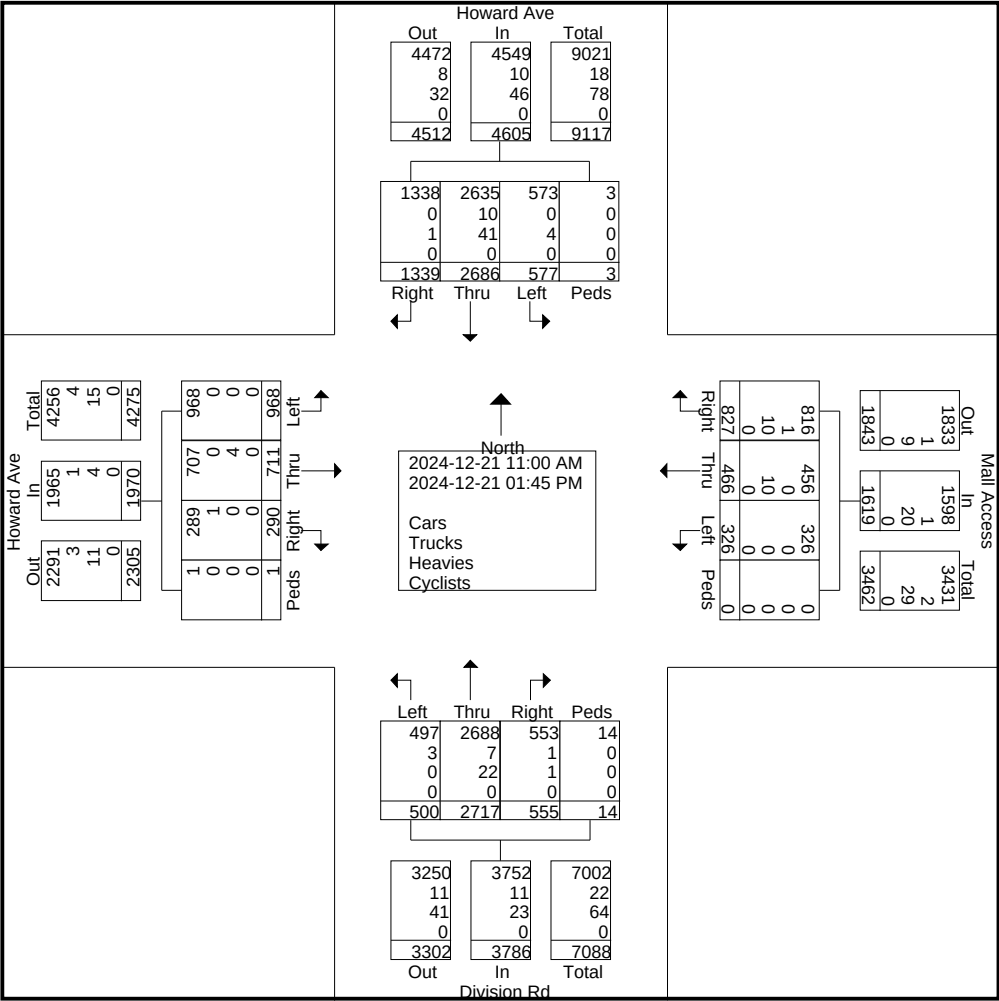
Your Traffic Count Specialist

File Name : Howard Avenue at Division Road-SAT

Site Code : Loc 3

Start Date : 2024-12-21

Page No : 2



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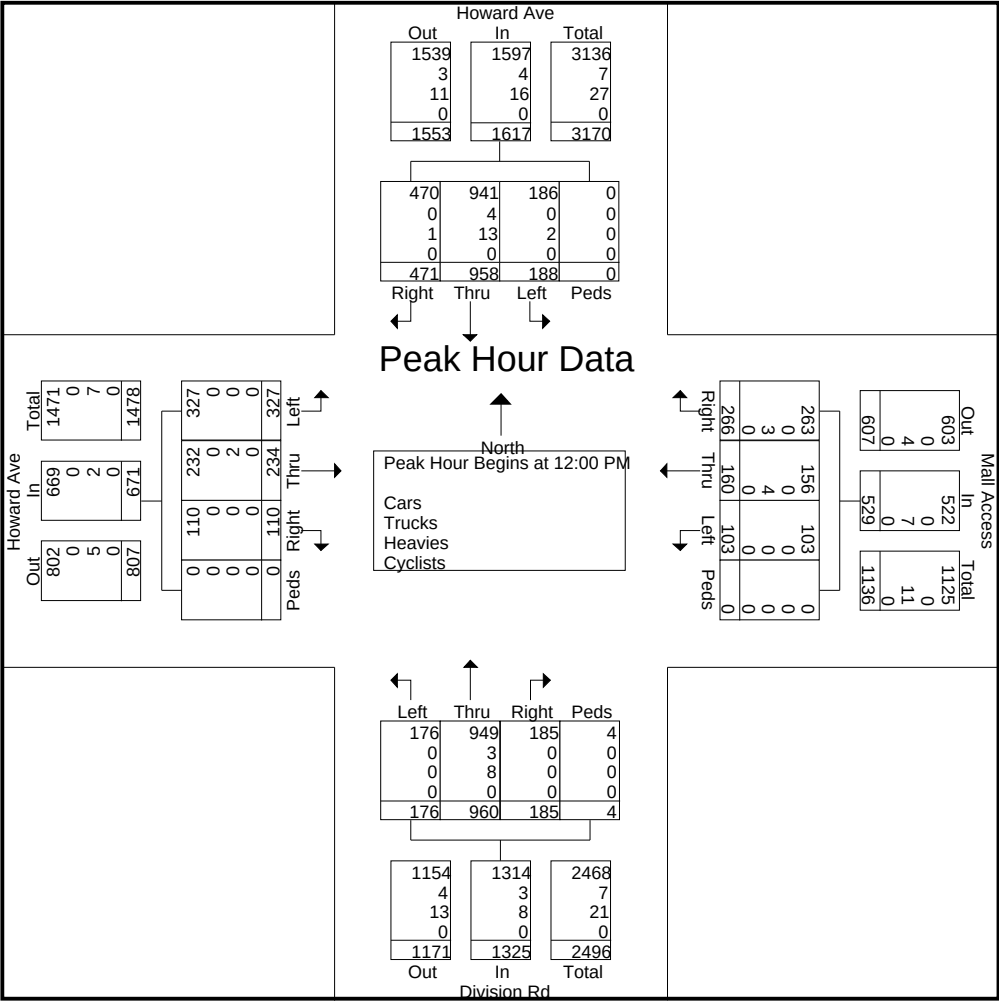
Your Traffic Count Specialist

File Name : Howard Avenue at Division Road-SAT

Site Code : Loc 3

Start Date : 2024-12-21

Page No : 4



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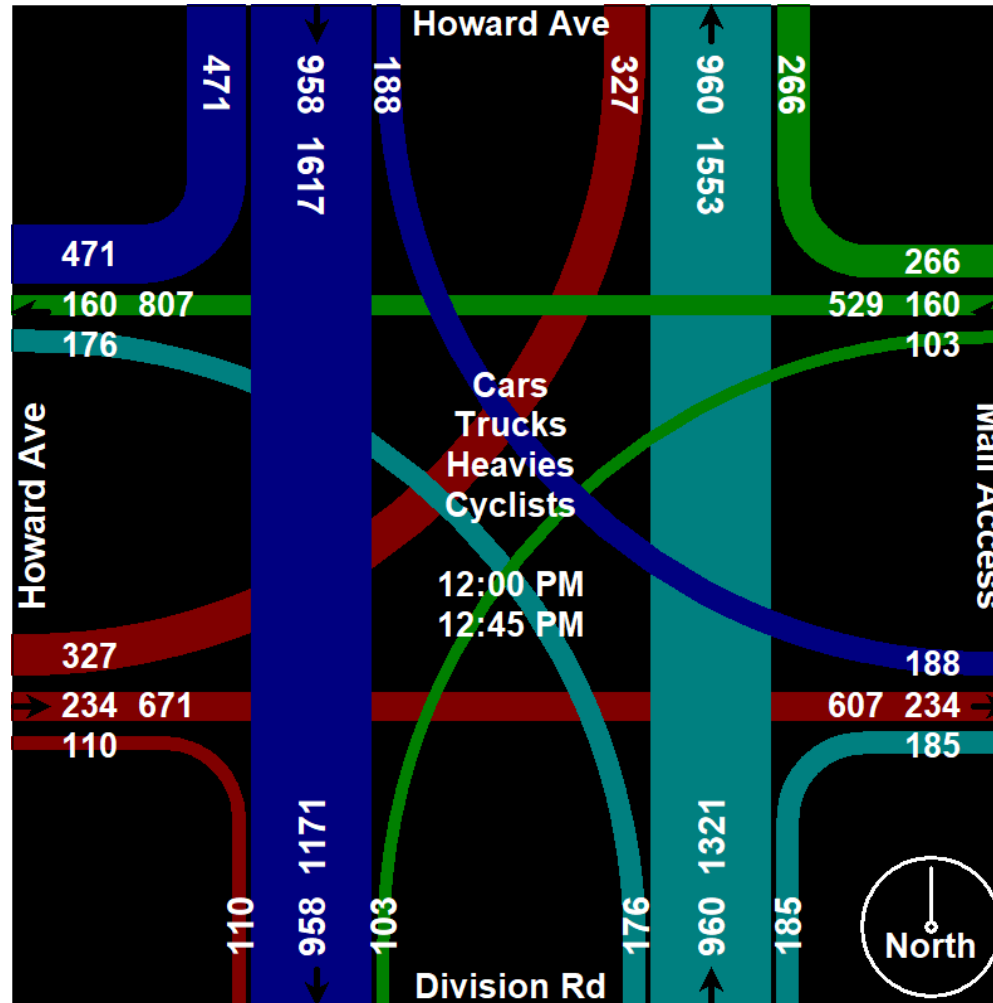
Your Traffic Count Specialist

File Name : Howard Avenue at Division Road-SAT

Site Code : Loc 3

Start Date : 2024-12-21

Page No : 5



	Howard Ave From North					Lilymac Boulevard From East					Howard Ave From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	39	0	0	39	0	0	0	0	0	0	55	0	0	55	0	0	0	0	0	94
07:15 AM	0	33	0	0	33	0	0	0	0	0	0	40	0	0	40	0	0	0	0	0	73
07:30 AM	0	51	1	0	52	1	0	2	5	8	1	82	0	0	83	0	0	0	0	0	143
07:45 AM	0	75	1	0	76	1	0	1	2	4	0	80	0	0	80	0	0	0	0	0	160
Total	0	198	2	0	200	2	0	3	7	12	1	257	0	0	258	0	0	0	0	0	470
08:00 AM	0	84	0	0	84	1	0	1	3	5	0	97	0	0	97	0	0	0	0	0	186
08:15 AM	0	61	0	0	61	0	0	3	1	4	1	123	0	0	124	0	0	0	0	0	189
08:30 AM	0	55	1	1	57	0	0	1	1	2	0	111	0	0	111	0	0	0	0	0	170
08:45 AM	0	77	1	1	79	2	0	2	1	5	1	85	0	0	86	0	0	0	0	0	170
Total	0	277	2	2	281	3	0	7	6	16	2	416	0	0	418	0	0	0	0	0	715
04:00 PM	0	163	1	0	164	0	0	0	0	0	1	113	0	0	114	0	0	0	0	0	278
04:15 PM	0	151	1	0	152	2	0	1	1	4	1	111	0	0	112	0	0	0	0	0	268
04:30 PM	0	160	1	1	162	0	0	1	1	2	0	117	0	0	117	0	0	0	0	0	281
04:45 PM	0	125	0	0	125	0	0	0	1	1	2	111	0	0	113	0	0	0	0	0	239
Total	0	599	3	1	603	2	0	2	3	7	4	452	0	0	456	0	0	0	0	0	1066
05:00 PM	0	180	0	0	180	1	0	1	4	6	2	105	0	0	107	0	0	0	0	0	293
05:15 PM	0	165	0	0	165	1	0	0	1	2	3	109	0	0	112	0	0	0	0	0	279
05:30 PM	0	110	0	0	110	1	0	1	0	2	0	107	0	0	107	0	0	0	0	0	219
05:45 PM	0	107	1	0	108	1	0	1	2	4	0	115	0	0	115	0	0	0	0	0	227
Total	0	562	1	0	563	4	0	3	7	14	5	436	0	0	441	0	0	0	0	0	1018
Grand Total	0	1636	8	3	1647	11	0	15	23	49	12	1561	0	0	1573	0	0	0	0	0	3269
Apprch %	0	99.3	0.5	0.2		22.4	0	30.6	46.9		0.8	99.2	0	0		0	0	0	0		
Total %	0	50	0.2	0.1	50.4	0.3	0	0.5	0.7	1.5	0.4	47.8	0	0	48.1	0	0	0	0	0	
Cars	0	1608	8	3	1619	11	0	15	23	49	12	1538	0	0	1550	0	0	0	0	0	3218
% Cars	0	98.3	100	100	98.3	100	0	100	100	100	100	98.5	0	0	98.5	0	0	0	0	0	98.4
Trucks	0	9	0	0	9	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	15
% Trucks	0	0.6	0	0	0.5	0	0	0	0	0	0	0.4	0	0	0.4	0	0	0	0	0	0.5
Heavies	0	18	0	0	18	0	0	0	0	0	0	17	0	0	17	0	0	0	0	0	35
% Heavies	0	1.1	0	0	1.1	0	0	0	0	0	0	1.1	0	0	1.1	0	0	0	0	0	1.1
Cyclists	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Cyclists	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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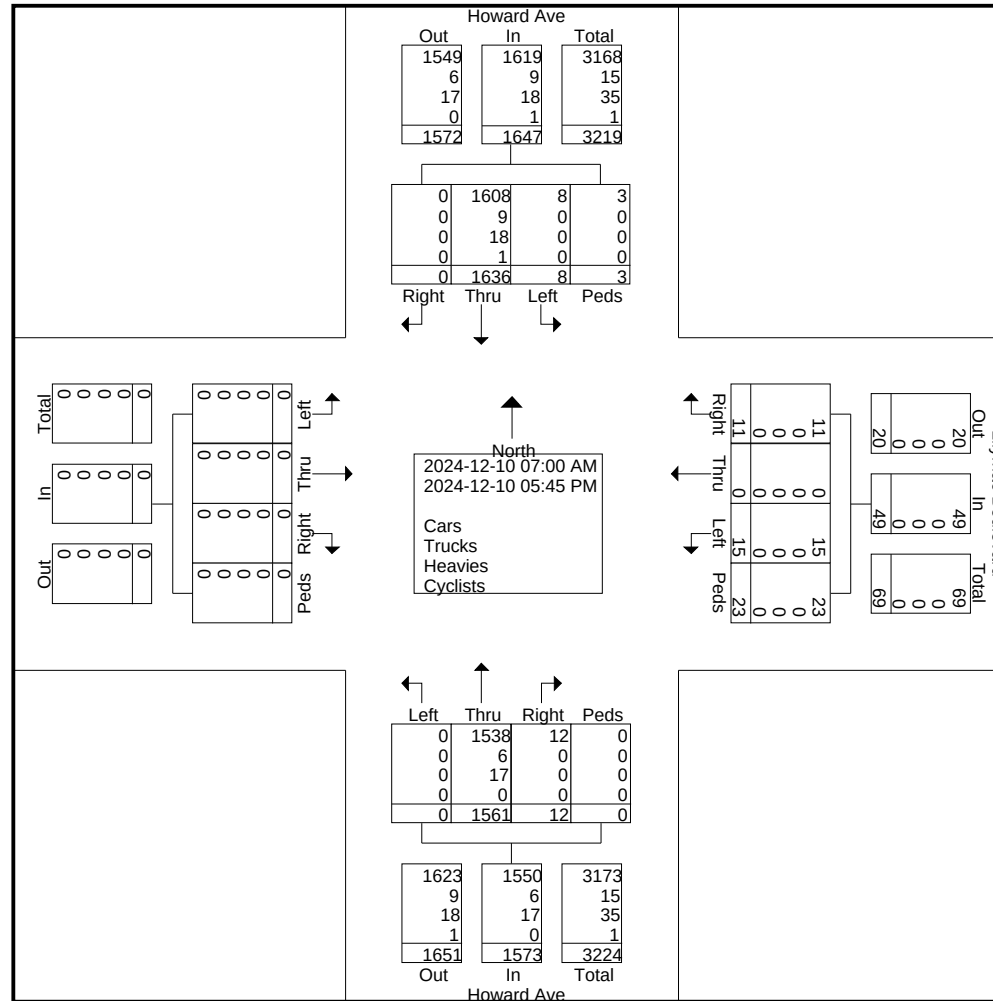
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard

Site Code : Loc 1

Start Date : 2024-12-10

Page No : 2



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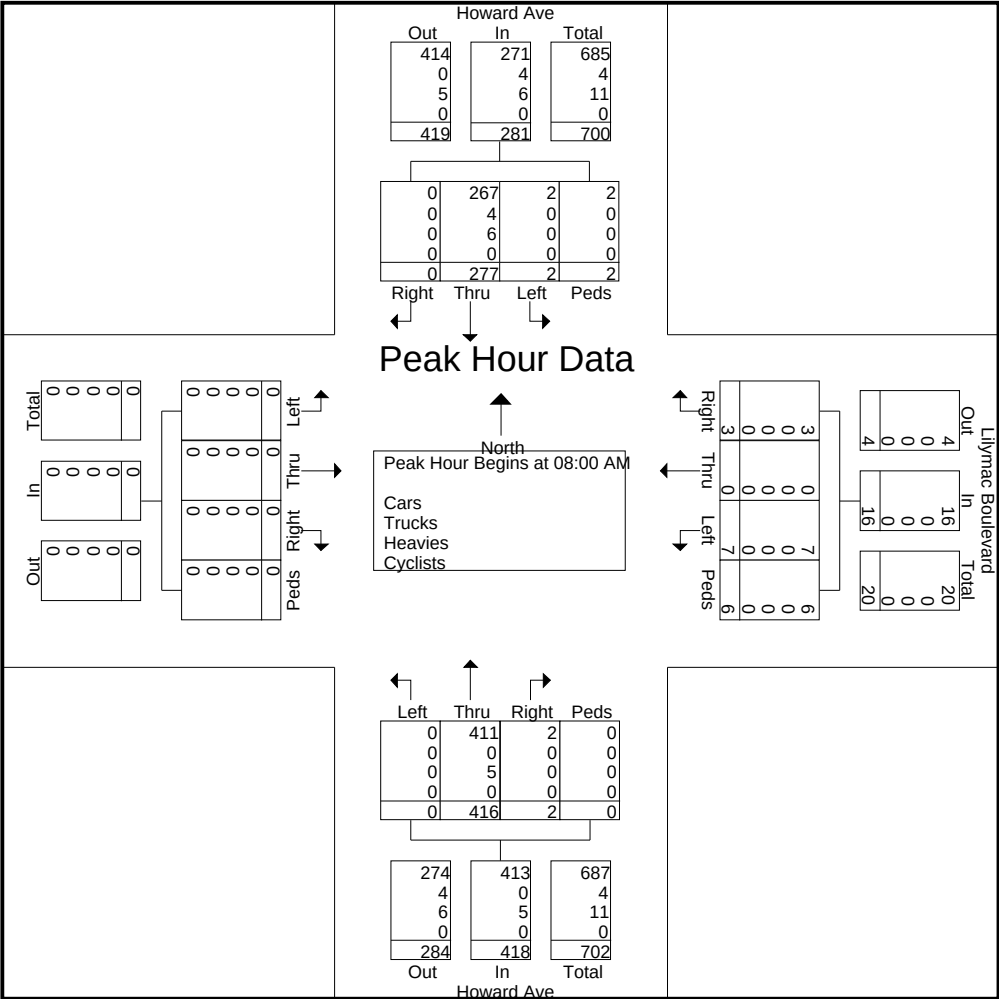
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard

Site Code : Loc 1

Start Date : 2024-12-10

Page No : 4



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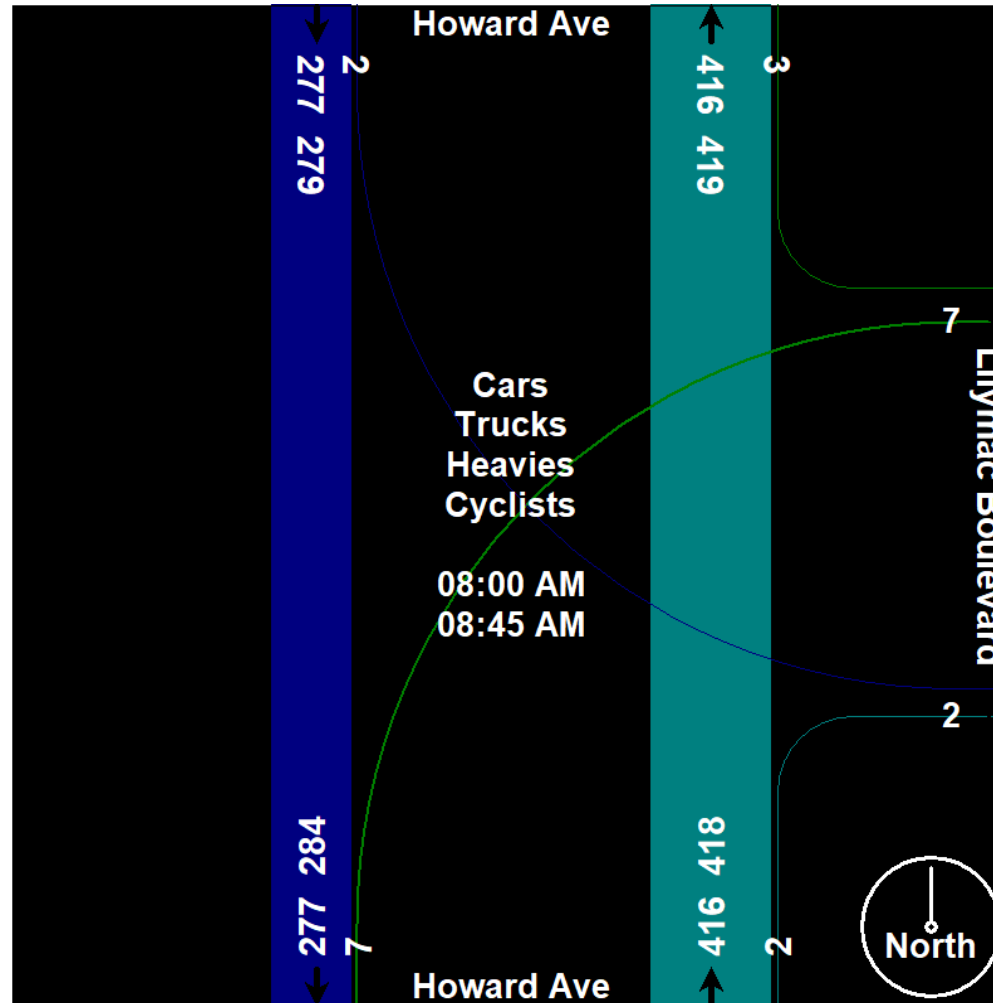
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard

Site Code : Loc 1

Start Date : 2024-12-10

Page No : 5



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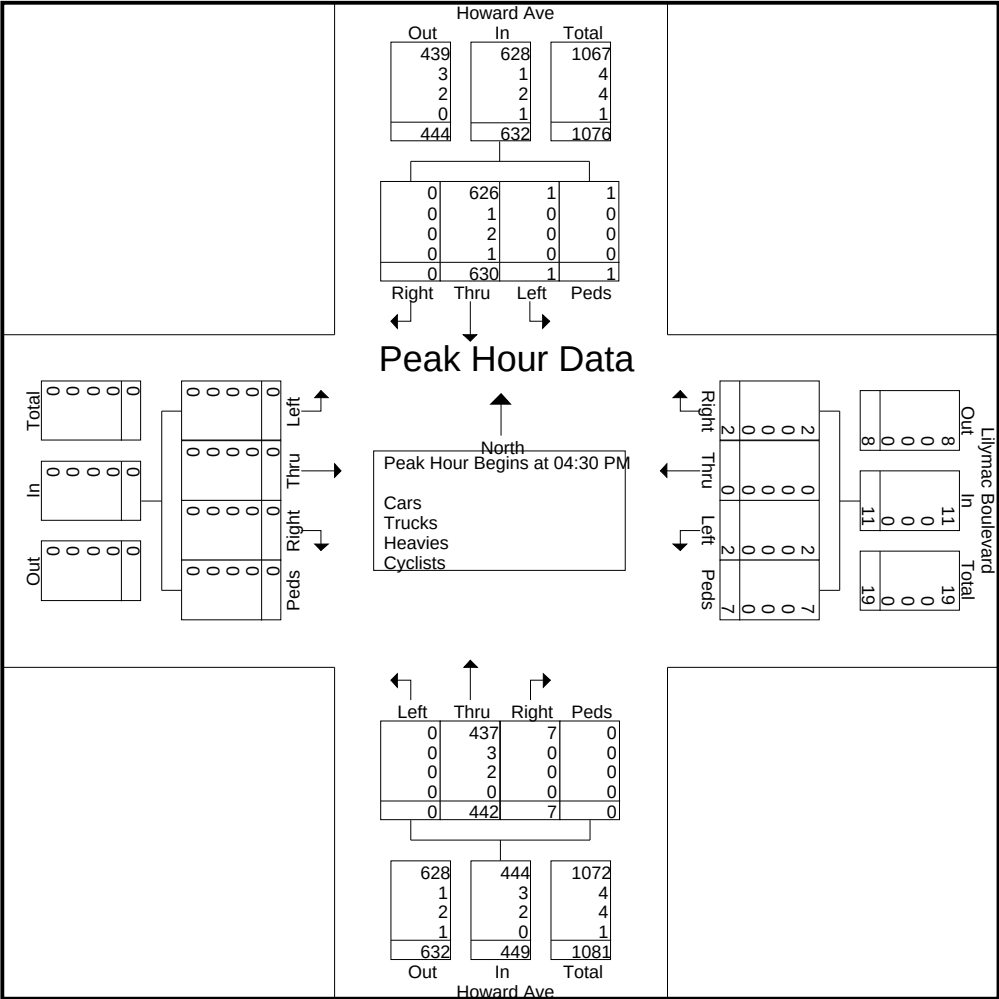
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard

Site Code : Loc 1

Start Date : 2024-12-10

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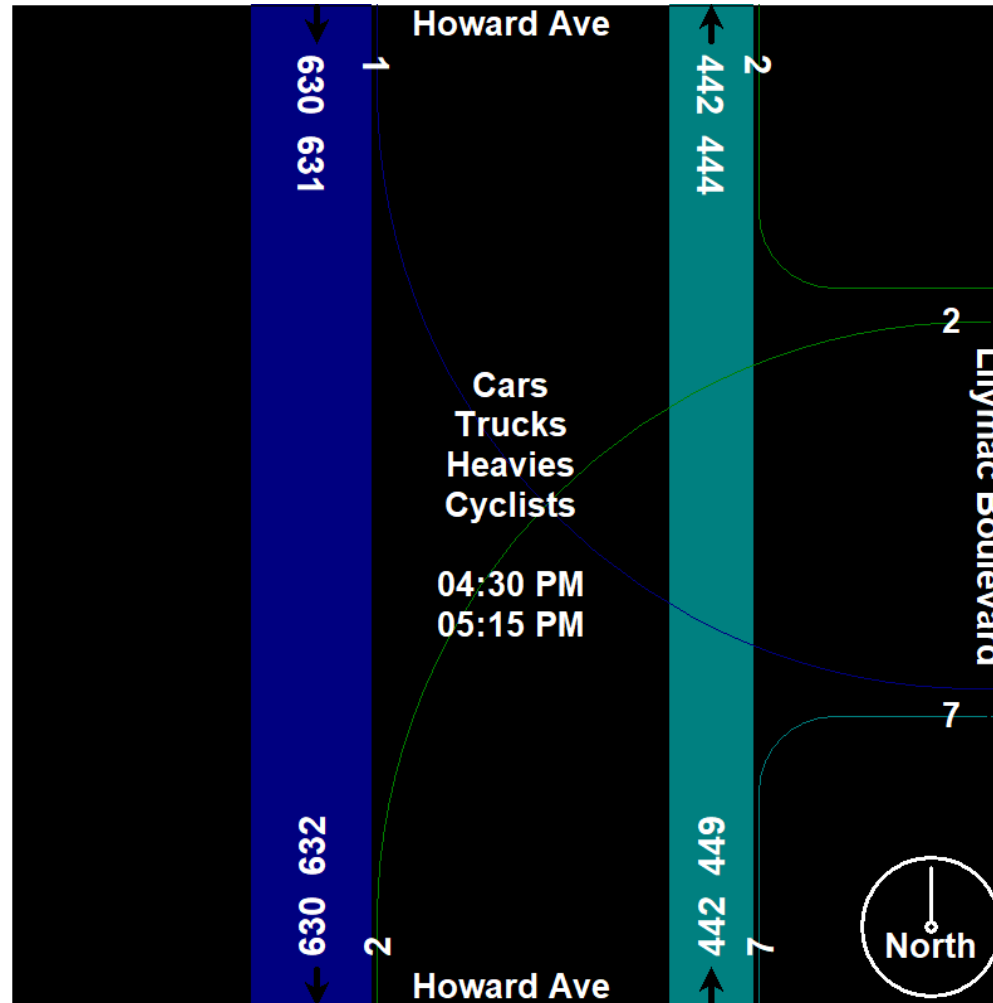
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard

Site Code : Loc 1

Start Date : 2024-12-10

Page No : 8



	Groups Printed- Cars - Trucks - Heavies - Cyclists																					
	Howard Ave From North					Lilymac Boulevard From East					Howard Ave From South					From West						
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total	
11:00 AM	0	84	1	0	85	3	0	0	1	4	2	94	0	0	96	0	0	0	0	0	185	
11:15 AM	0	105	0	0	105	1	0	0	1	2	1	84	0	0	85	0	0	0	0	0	192	
11:30 AM	0	106	0	0	106	2	0	0	0	2	0	108	0	0	108	0	0	0	0	0	216	
11:45 AM	0	108	1	0	109	1	0	2	0	3	0	117	0	0	117	0	0	0	0	0	229	
Total	0	403	2	0	405	7	0	2	2	11	3	403	0	0	406	0	0	0	0	0	822	
12:00 PM	0	118	1	0	119	0	0	2	0	2	2	119	0	0	121	0	0	0	0	0	242	
12:15 PM	0	113	1	0	114	3	0	0	0	3	2	112	0	0	114	0	0	0	0	0	231	
12:30 PM	0	113	1	0	114	1	0	1	0	2	1	96	0	0	97	0	0	0	0	0	213	
12:45 PM	0	99	0	0	99	0	0	0	0	0	1	97	0	0	98	0	0	0	0	0	197	
Total	0	443	3	0	446	4	0	3	0	7	6	424	0	0	430	0	0	0	0	0	883	
01:00 PM	0	130	1	0	131	0	0	1	1	2	1	81	0	0	82	0	0	0	0	0	215	
01:15 PM	0	118	0	1	119	1	0	0	3	4	2	110	0	0	112	0	0	0	0	0	235	
01:30 PM	0	122	0	2	124	0	0	0	1	1	0	120	0	0	120	0	0	0	0	0	245	
01:45 PM	0	120	2	0	122	0	0	1	1	2	1	117	0	0	118	0	0	0	0	0	242	
Total	0	490	3	3	496	1	0	2	6	9	4	428	0	0	432	0	0	0	0	0	937	
Grand Total	0	1336	8	3	1347	12	0	7	8	27	13	1255	0	0	1268	0	0	0	0	0	2642	
Apprch %	0	99.2	0.6	0.2		44.4	0	25.9	29.6		1	99	0	0		0	0	0	0			
Total %	0	50.6	0.3	0.1	51	0.5	0	0.3	0.3	1	0.5	47.5	0	0	48	0	0	0	0	0		
Cars	0	1327	8	3	1338	12	0	7	8	27	13	1252	0	0	1265	0	0	0	0	0	2630	
% Cars	0	99.3	100	100	99.3	100	0	100	100	100	100	99.8	0	0	99.8	0	0	0	0	0	99.5	
Trucks	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	
% Trucks	0	0.4	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	
Heavies	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6	
% Heavies	0	0.2	0	0	0.2	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	0.2	
Cyclists	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
% Cyclists	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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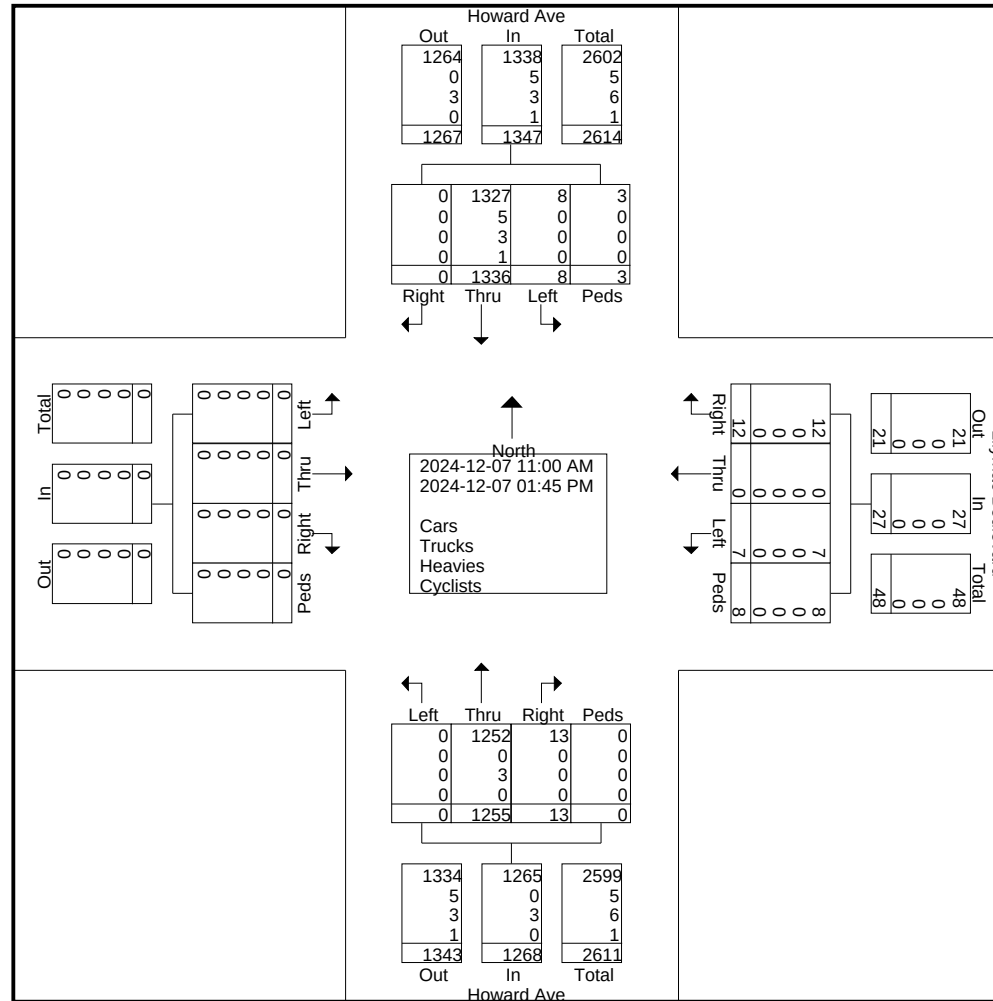
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard-SAT

Site Code : Loc 1

Start Date : 2024-12-07

Page No : 2



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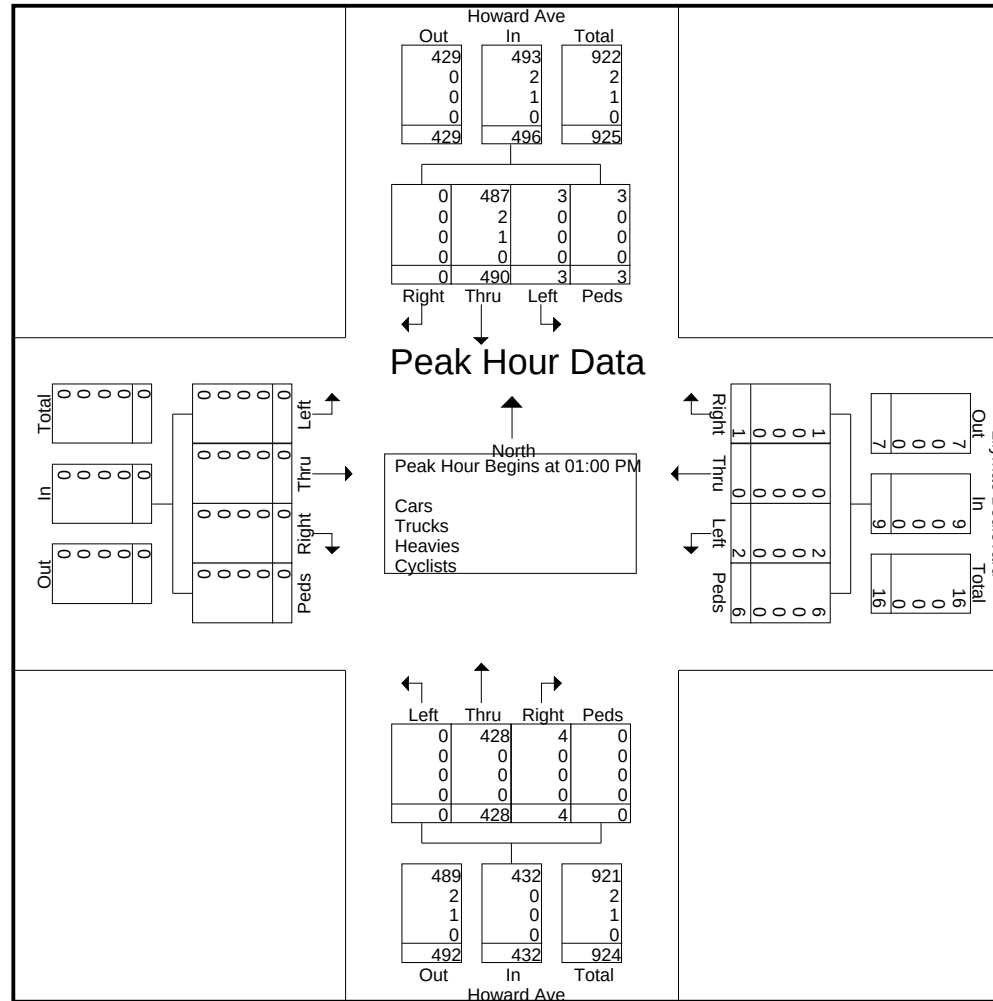
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard-SAT

Site Code : Loc 1

Start Date : 2024-12-07

Page No : 4



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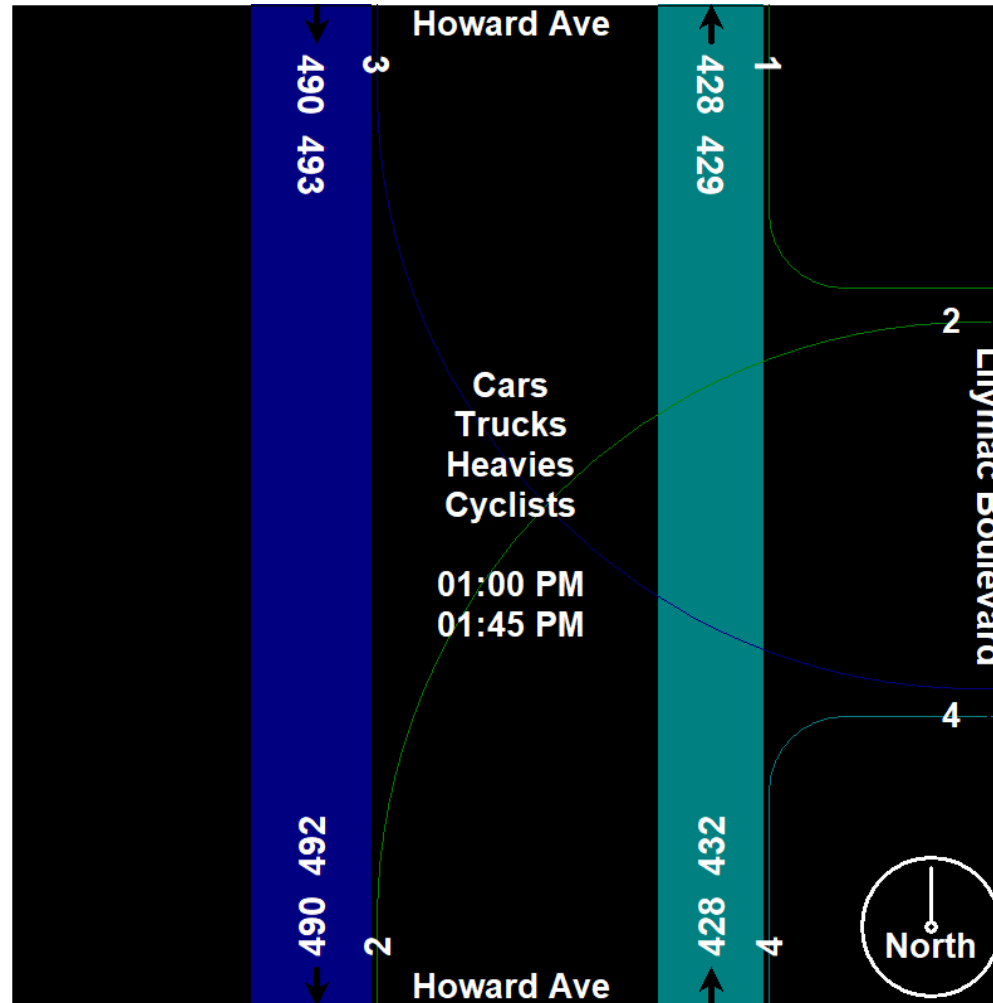
Your Traffic Count Specialist

File Name : Howard Avenue at Lilymac Boulevard-SAT

Site Code : Loc 1

Start Date : 2024-12-07

Page No : 5



	Howard Ave From North					Cabana Road E From East					Howard Ave From South					Cabana Road E From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	16	42	8	0	66	7	30	7	0	44	6	34	3	0	43	3	36	4	0	43	196
07:15 AM	19	31	9	0	59	7	40	6	0	53	10	17	6	5	38	1	39	13	0	53	203
07:30 AM	33	63	35	1	132	4	58	11	0	73	14	29	6	0	49	2	84	9	1	96	350
07:45 AM	32	63	40	0	135	9	86	12	1	108	25	42	13	5	85	7	58	16	0	81	409
Total	100	199	92	1	392	27	214	36	1	278	55	122	28	10	215	13	217	42	1	273	1158
08:00 AM	32	70	36	2	140	16	93	23	4	136	17	45	18	1	81	13	65	17	1	96	453
08:15 AM	38	84	32	1	155	20	92	22	0	134	22	37	12	2	73	15	96	22	2	135	497
08:30 AM	24	74	32	1	131	15	95	29	0	139	26	17	9	0	52	5	97	16	0	118	440
08:45 AM	29	55	28	2	114	8	126	32	0	166	32	26	17	0	75	2	66	8	1	77	432
Total	123	283	128	6	540	59	406	106	4	575	97	125	56	3	281	35	324	63	4	426	1822
04:00 PM	17	69	31	1	118	25	119	36	3	183	63	86	16	1	166	12	131	31	0	174	641
04:15 PM	20	67	33	2	122	30	130	38	0	198	41	104	18	2	165	9	131	28	0	168	653
04:30 PM	16	66	35	1	118	31	112	40	0	183	43	90	23	0	156	11	139	36	2	188	645
04:45 PM	33	60	25	2	120	26	140	45	0	211	42	66	18	0	126	13	153	34	2	202	659
Total	86	262	124	6	478	112	501	159	3	775	189	346	75	3	613	45	554	129	4	732	2598
05:00 PM	25	67	26	1	119	20	137	40	1	198	58	98	23	4	183	6	156	45	2	209	709
05:15 PM	18	61	32	0	111	27	111	37	1	176	54	85	17	1	157	15	157	34	1	207	651
05:30 PM	21	67	20	1	109	26	93	34	3	156	39	73	14	0	126	11	131	44	0	186	577
05:45 PM	25	66	28	0	119	21	117	36	0	174	27	69	10	3	109	16	118	18	1	153	555
Total	89	261	106	2	458	94	458	147	5	704	178	325	64	8	575	48	562	141	4	755	2492
Grand Total	398	1005	450	15	1868	292	1579	448	13	2332	519	918	223	24	1684	141	1657	375	13	2186	8070
Apprch %	21.3	53.8	24.1	0.8		12.5	67.7	19.2	0.6		30.8	54.5	13.2	1.4		6.5	75.8	17.2	0.6		
Total %	4.9	12.5	5.6	0.2	23.1	3.6	19.6	5.6	0.2	28.9	6.4	11.4	2.8	0.3	20.9	1.7	20.5	4.6	0.2	27.1	
Cars	387	993	429	15	1824	282	1553	439	13	2287	507	911	216	24	1658	135	1625	364	13	2137	7906
% Cars	97.2	98.8	95.3	100	97.6	96.6	98.4	98	100	98.1	97.7	99.2	96.9	100	98.5	95.7	98.1	97.1	100	97.8	98
Trucks	7	6	5	0	18	1	15	0	0	16	0	5	3	0	8	1	13	4	0	18	60
% Trucks	1.8	0.6	1.1	0	1	0.3	0.9	0	0	0.7	0	0.5	1.3	0	0.5	0.7	0.8	1.1	0	0.8	0.7
Heavies	3	6	16	0	25	9	10	9	0	28	12	2	4	0	18	5	19	7	0	31	102
% Heavies	0.8	0.6	3.6	0	1.3	3.1	0.6	2	0	1.2	2.3	0.2	1.8	0	1.1	3.5	1.1	1.9	0	1.4	1.3
Cyclists	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% Cyclists	0.3	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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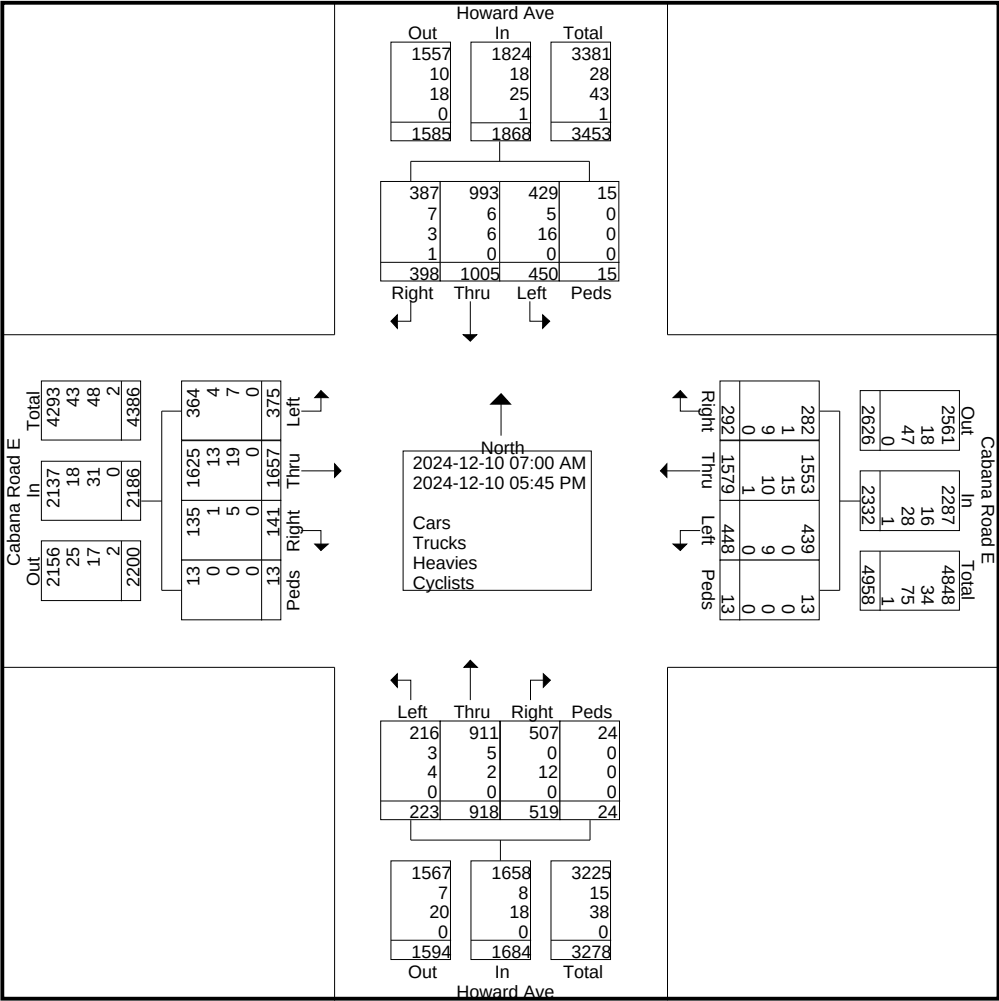
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East

Site Code : Loc 2

Start Date : 2024-12-10

Page No : 2



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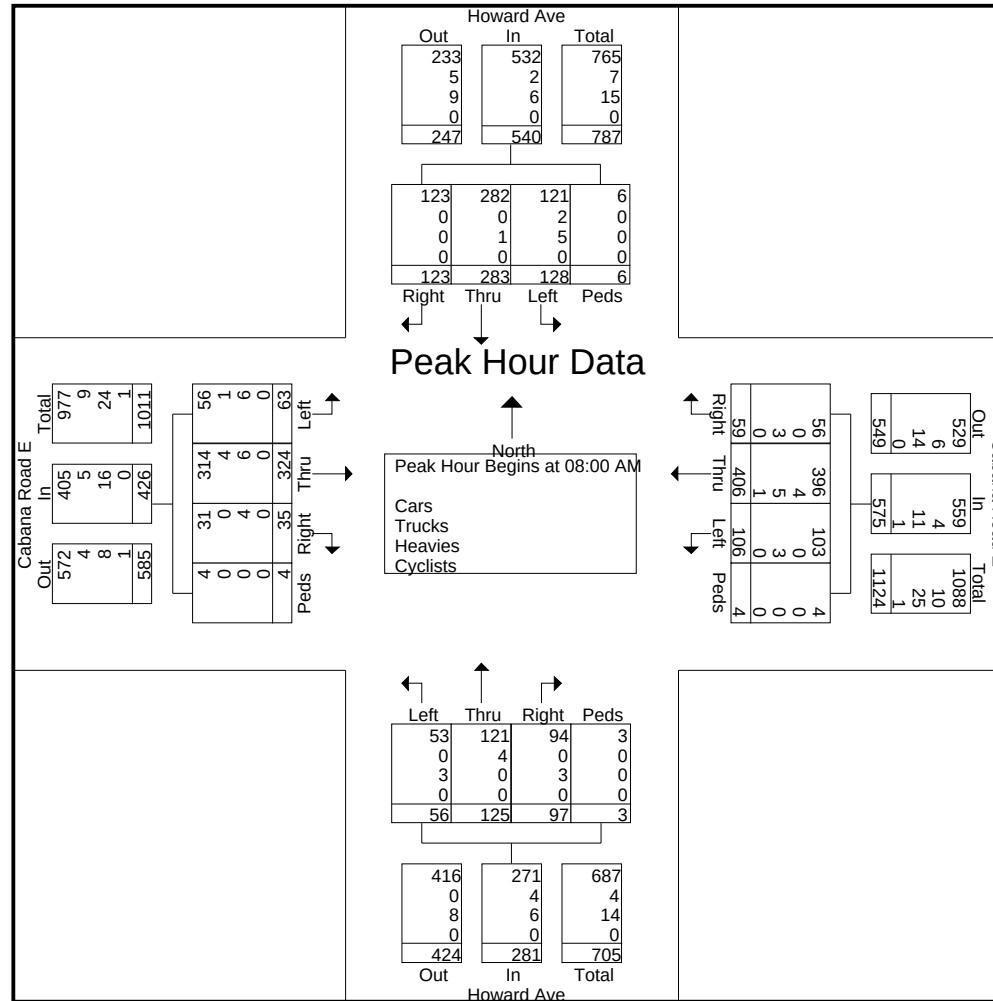
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East

Site Code : Loc 2

Start Date : 2024-12-10

Page No : 4



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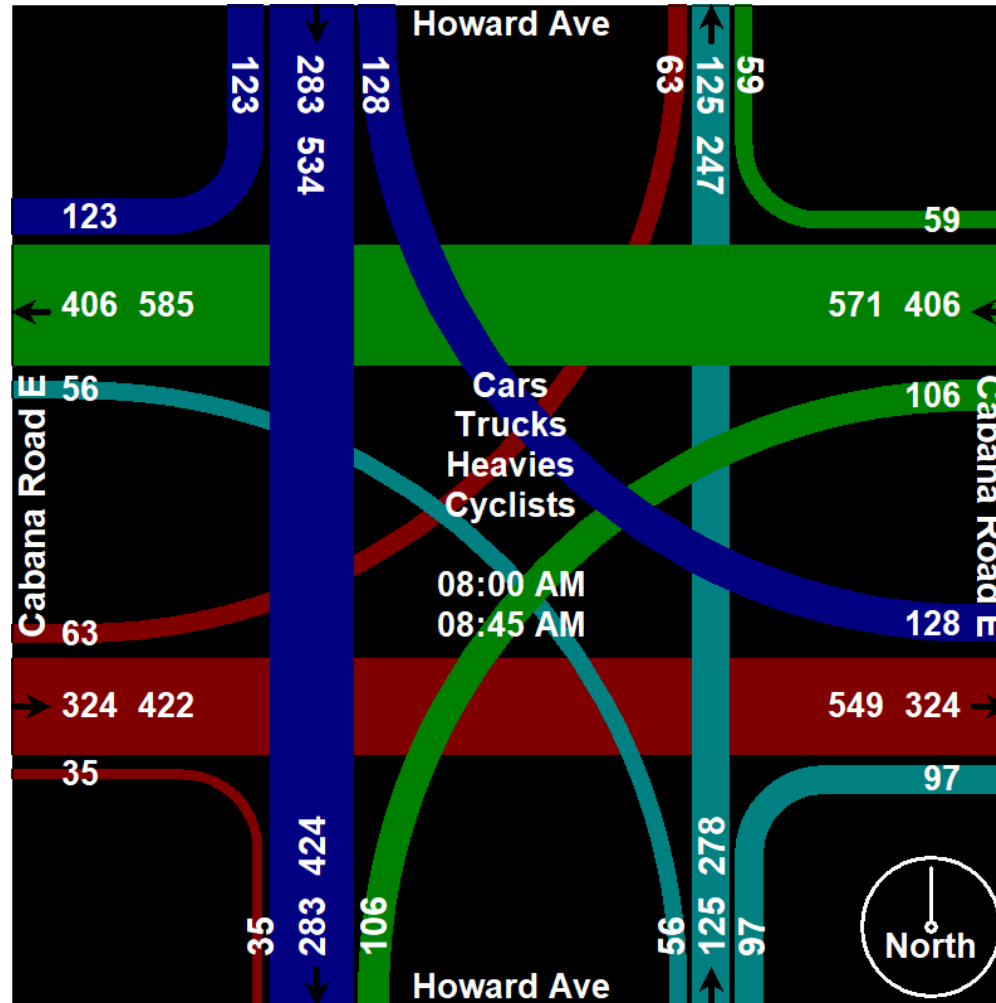
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East

Site Code : Loc 2

Start Date : 2024-12-10

Page No : 5



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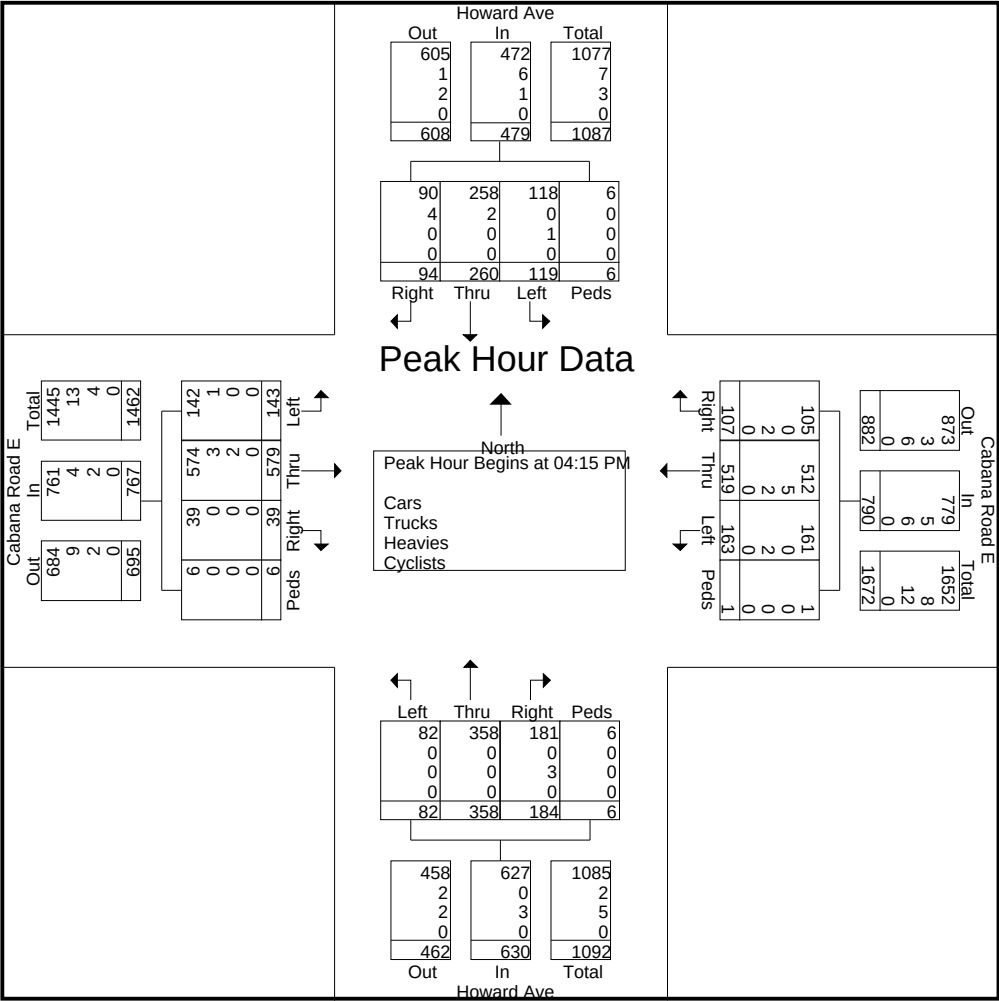
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East

Site Code : Loc 2

Start Date : 2024-12-10

Page No : 7



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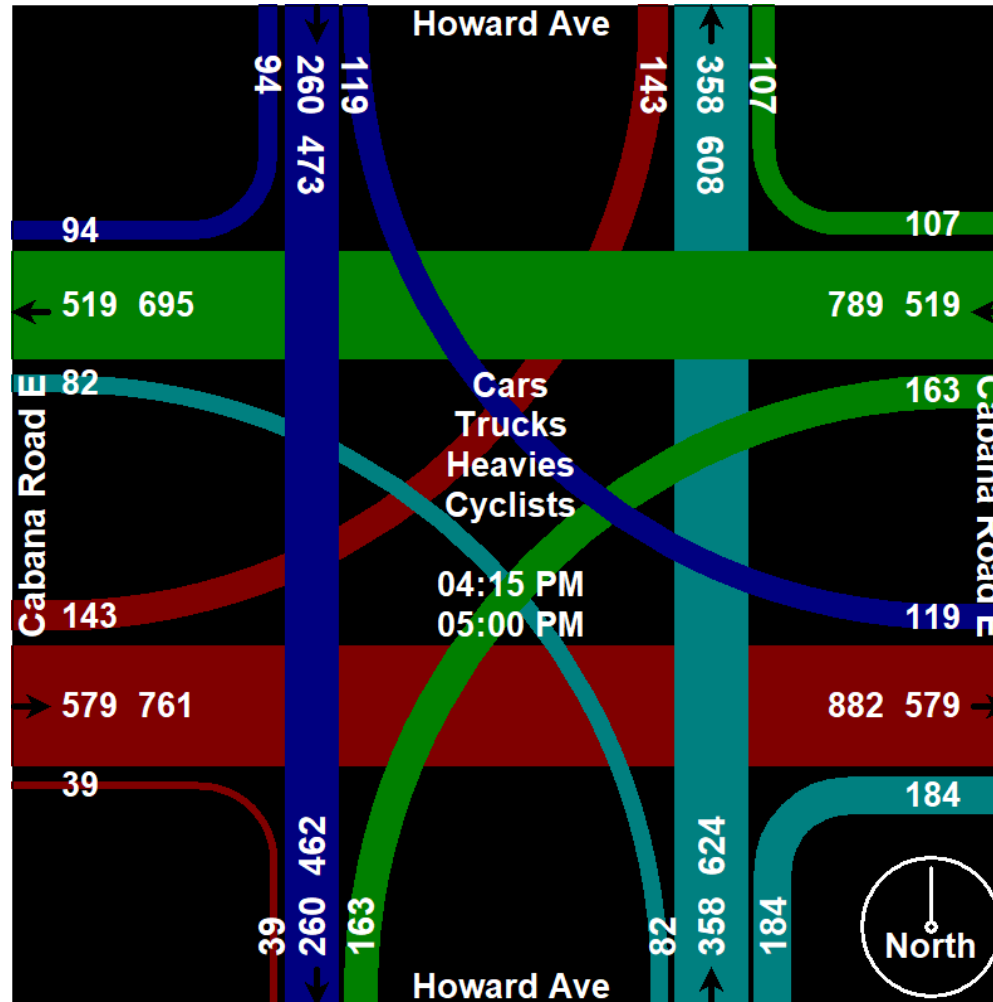
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East

Site Code : Loc 2

Start Date : 2024-12-10

Page No : 8



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Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East-SAT

Site Code : Loc 2

Start Date : 2024-12-07

Page No : 1

Groups Printed- Cars - Trucks - Heavies - Cyclists																						
	Howard Ave From North					Cabana Road E From East					Howard Ave From South					Cabana Road E From West						
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total	
11:00 AM	28	66	20	1	115	18	91	32	0	141	34	42	13	0	89	3	109	22	1	135	480	
11:15 AM	25	56	25	0	106	22	132	24	0	178	35	49	6	1	91	5	119	22	0	146	521	
11:30 AM	18	60	14	1	93	17	134	44	2	197	54	40	21	2	117	9	134	11	1	155	562	
11:45 AM	22	75	22	0	119	15	109	44	0	168	38	72	18	1	129	9	124	20	0	153	569	
Total	93	257	81	2	433	72	466	144	2	684	161	203	58	4	426	26	486	75	2	589	2132	
12:00 PM	25	73	27	0	125	20	135	40	0	195	24	74	12	1	111	7	135	20	0	162	593	
12:15 PM	22	60	24	1	107	13	147	36	0	196	34	61	10	2	107	8	147	26	0	181	591	
12:30 PM	23	64	24	1	112	10	95	34	0	139	41	68	14	2	125	6	116	27	0	149	525	
12:45 PM	14	44	17	1	76	15	127	36	0	178	37	55	12	0	104	18	120	92	0	230	588	
Total	84	241	92	3	420	58	504	146	0	708	136	258	48	5	447	39	518	165	0	722	2297	
01:00 PM	21	52	21	0	94	23	113	31	0	167	34	73	20	6	133	12	159	23	0	194	588	
01:15 PM	26	70	38	0	134	18	122	37	0	177	39	68	22	0	129	13	119	29	0	161	601	
01:30 PM	26	80	19	1	126	13	131	40	0	184	53	59	12	1	125	7	133	26	1	167	602	
01:45 PM	29	75	22	0	126	15	110	39	0	164	38	68	17	1	124	11	154	27	0	192	606	
Total	102	277	100	1	480	69	476	147	0	692	164	268	71	8	511	43	565	105	1	714	2397	
Grand Total	279	775	273	6	1333	199	1446	437	2	2084	461	729	177	17	1384	108	1569	345	3	2025	6826	
Apprch %	20.9	58.1	20.5	0.5		9.5	69.4	21	0.1		33.3	52.7	12.8	1.2		5.3	77.5	17	0.1			
Total %	4.1	11.4	4	0.1	19.5	2.9	21.2	6.4	0	30.5	6.8	10.7	2.6	0.2	20.3	1.6	23	5.1	0	29.7		
Cars	278	773	268	6	1325	194	1441	433	2	2070	453	726	177	17	1373	107	1563	344	3	2017	6785	
% Cars	99.6	99.7	98.2	100	99.4	97.5	99.7	99.1	100	99.3	98.3	99.6	100	100	99.2	99.1	99.6	99.7	100	99.6	99.4	
Trucks	1	1	0	0	2	1	2	0	0	3	4	3	0	0	7	1	5	1	0	7	19	
% Trucks	0.4	0.1	0	0	0.2	0.5	0.1	0	0	0.1	0.9	0.4	0	0	0.5	0.9	0.3	0.3	0	0.3	0.3	
Heavies	0	1	5	0	6	4	0	4	0	8	3	0	0	0	3	0	0	0	0	0	17	
% Heavies	0	0.1	1.8	0	0.5	2	0	0.9	0	0.4	0.7	0	0	0	0.2	0	0	0	0	0	0.2	
Cyclists	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	0	1	0	0	1	5	
% Cyclists	0	0	0	0	0	0	0.2	0	0	0.1	0.2	0	0	0	0.1	0	0.1	0	0	0	0.1	

Horizon Data Services Ltd

(416) 840-6619

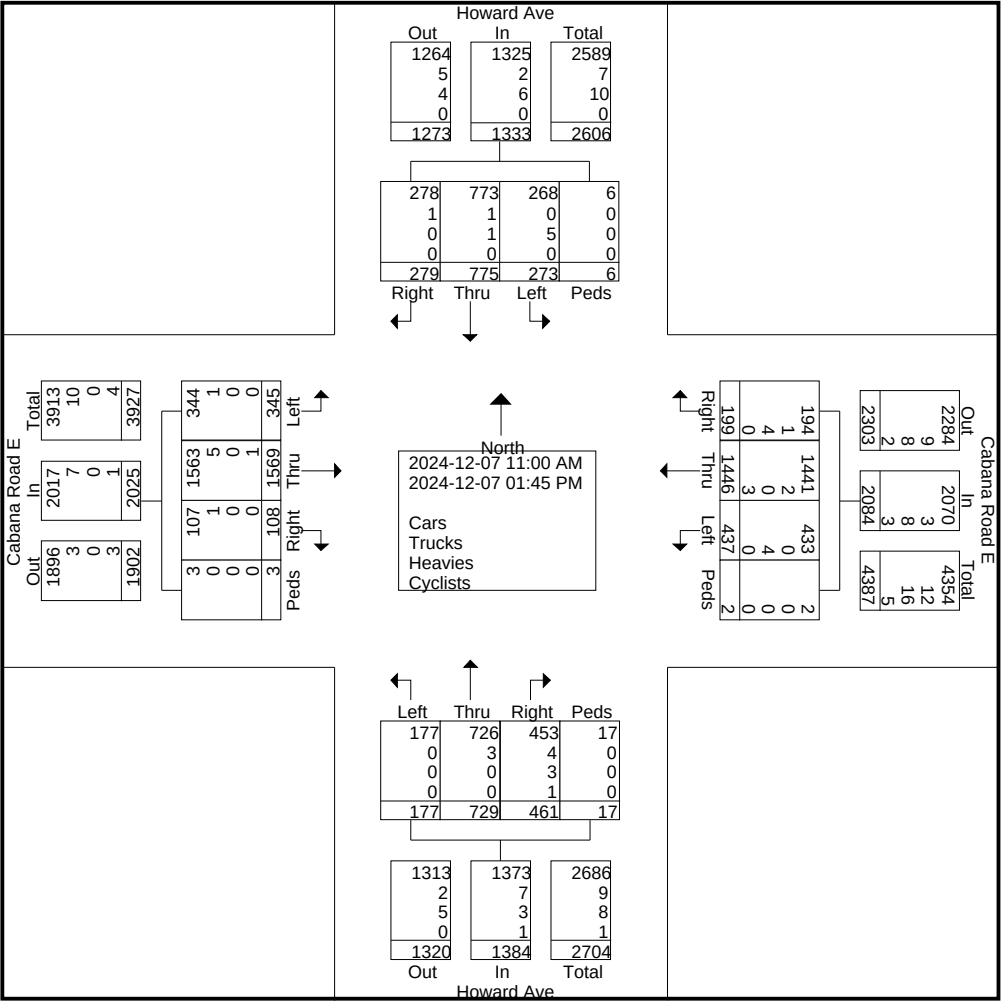
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East-SAT

Site Code : Loc 2

Start Date : 2024-12-07

Page No : 2



[illegible]

Horizon Data Services Ltd

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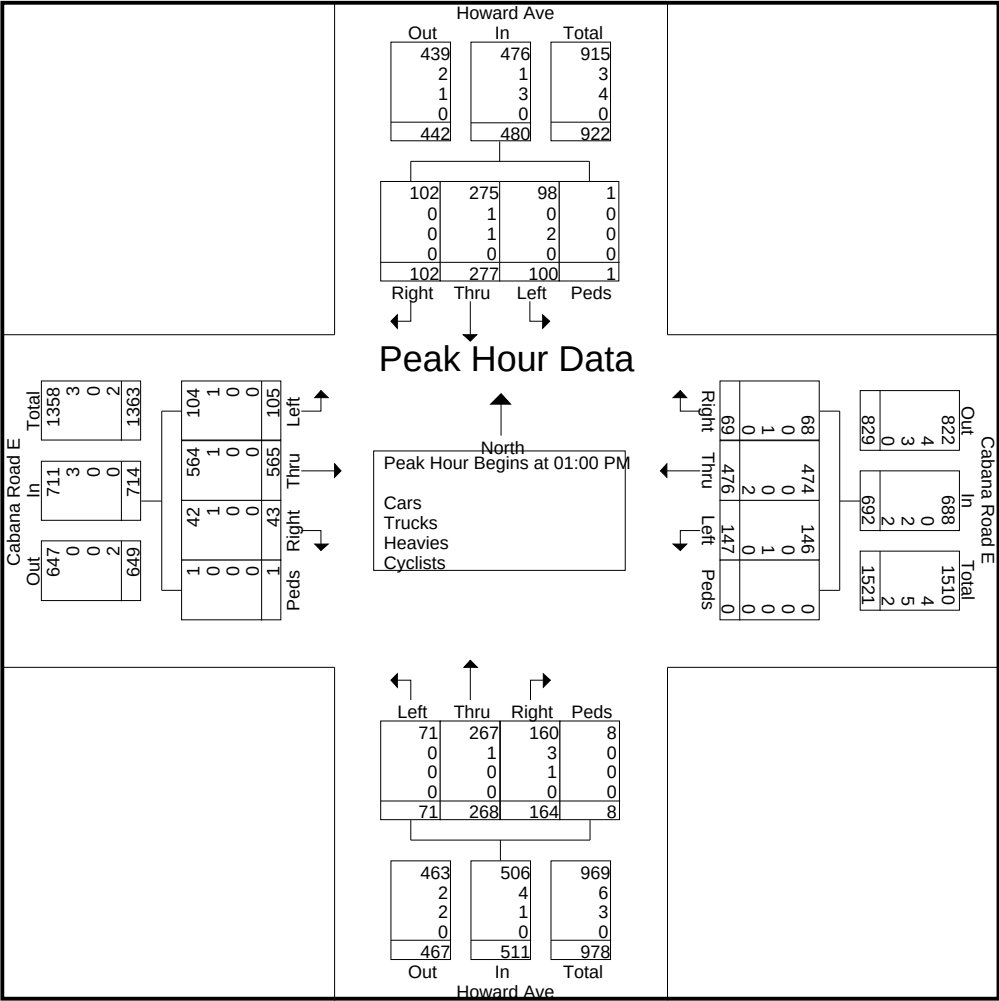
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East-SAT

Site Code : Loc 2

Start Date : 2024-12-07

Page No : 4



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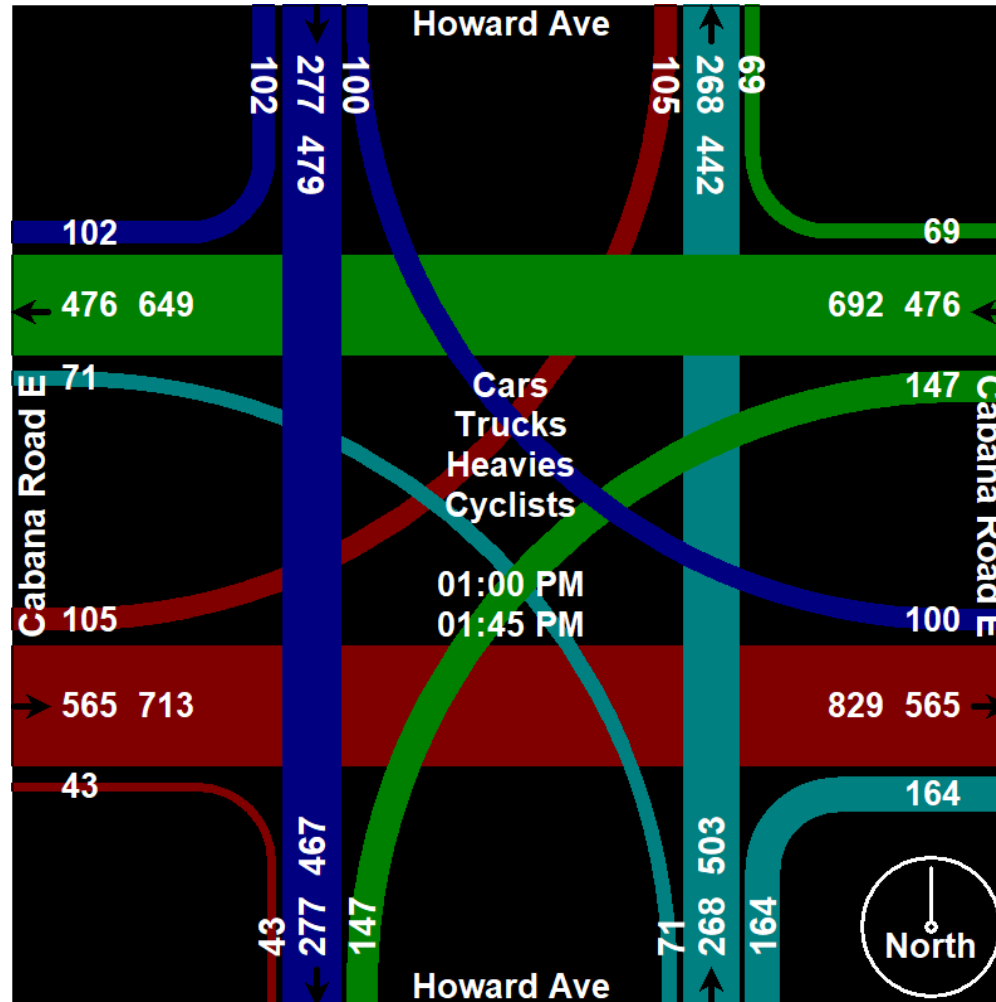
Your Traffic Count Specialist

File Name : Howard Avenue at Cabana Road East-SAT

Site Code : Loc 2

Start Date : 2024-12-07

Page No : 5



APPENDIX C

ITE Page References

Land Use: 210

Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077, 1078, 1079

Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 192

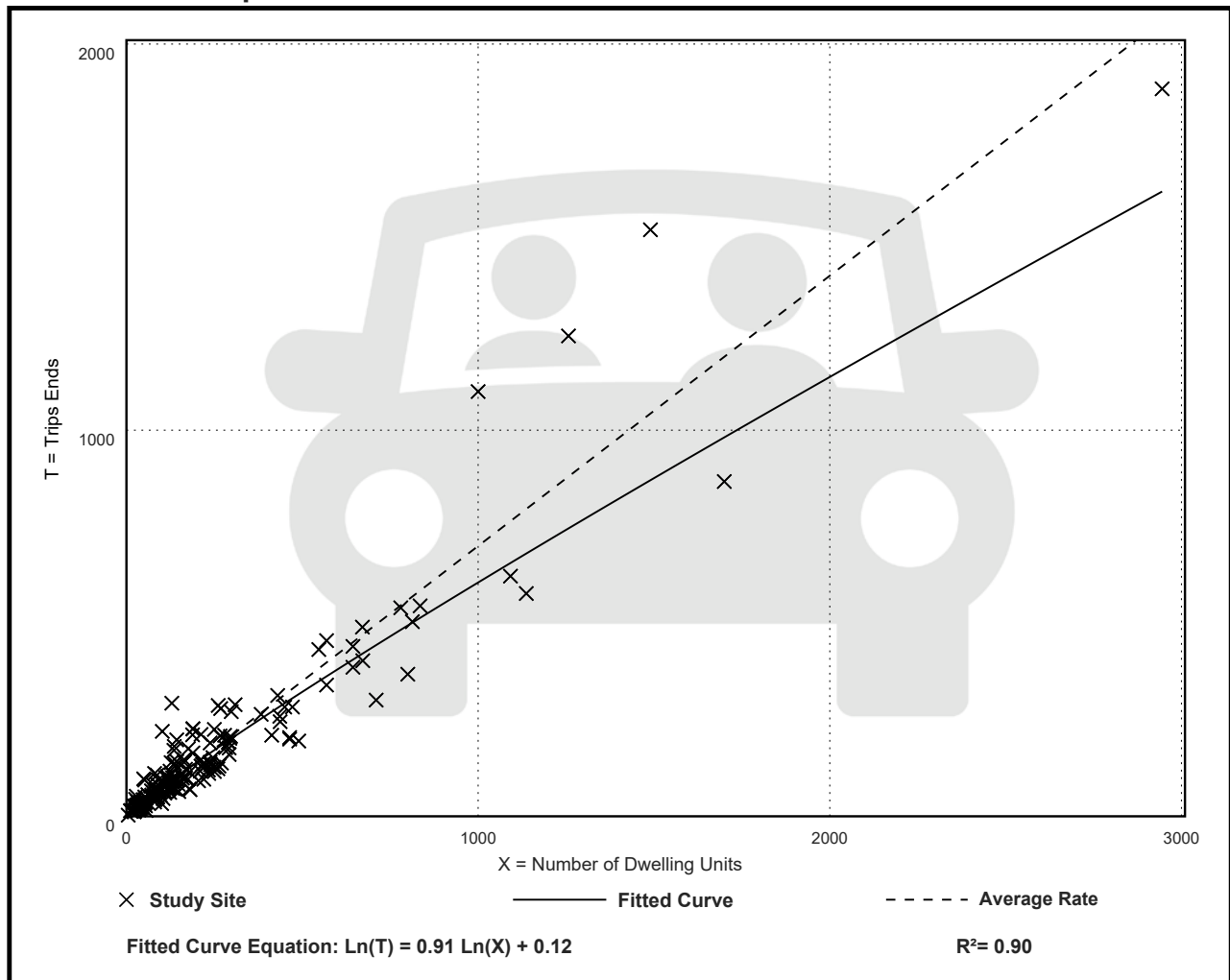
Avg. Num. of Dwelling Units: 226

Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 208

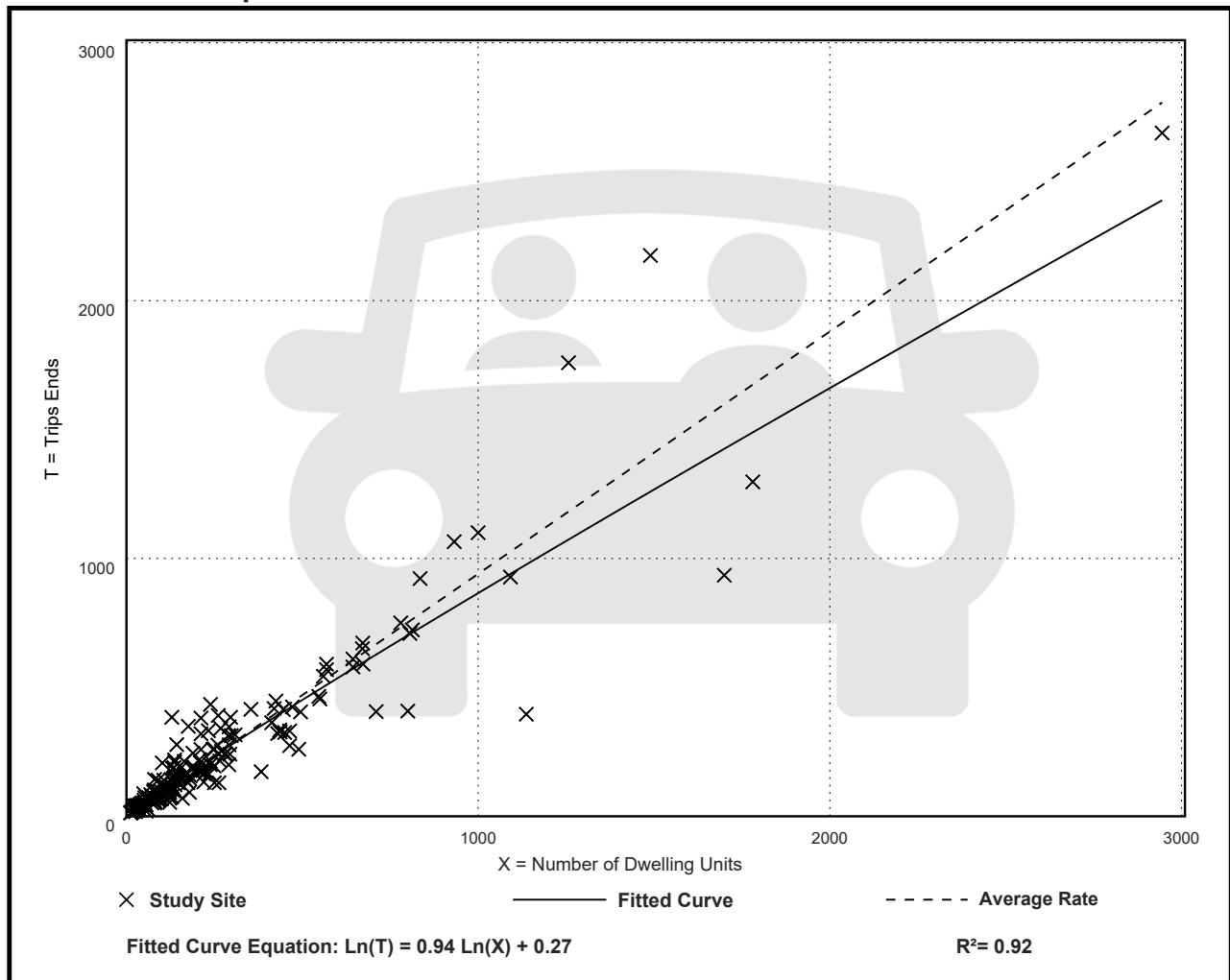
Avg. Num. of Dwelling Units: 248

Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 42

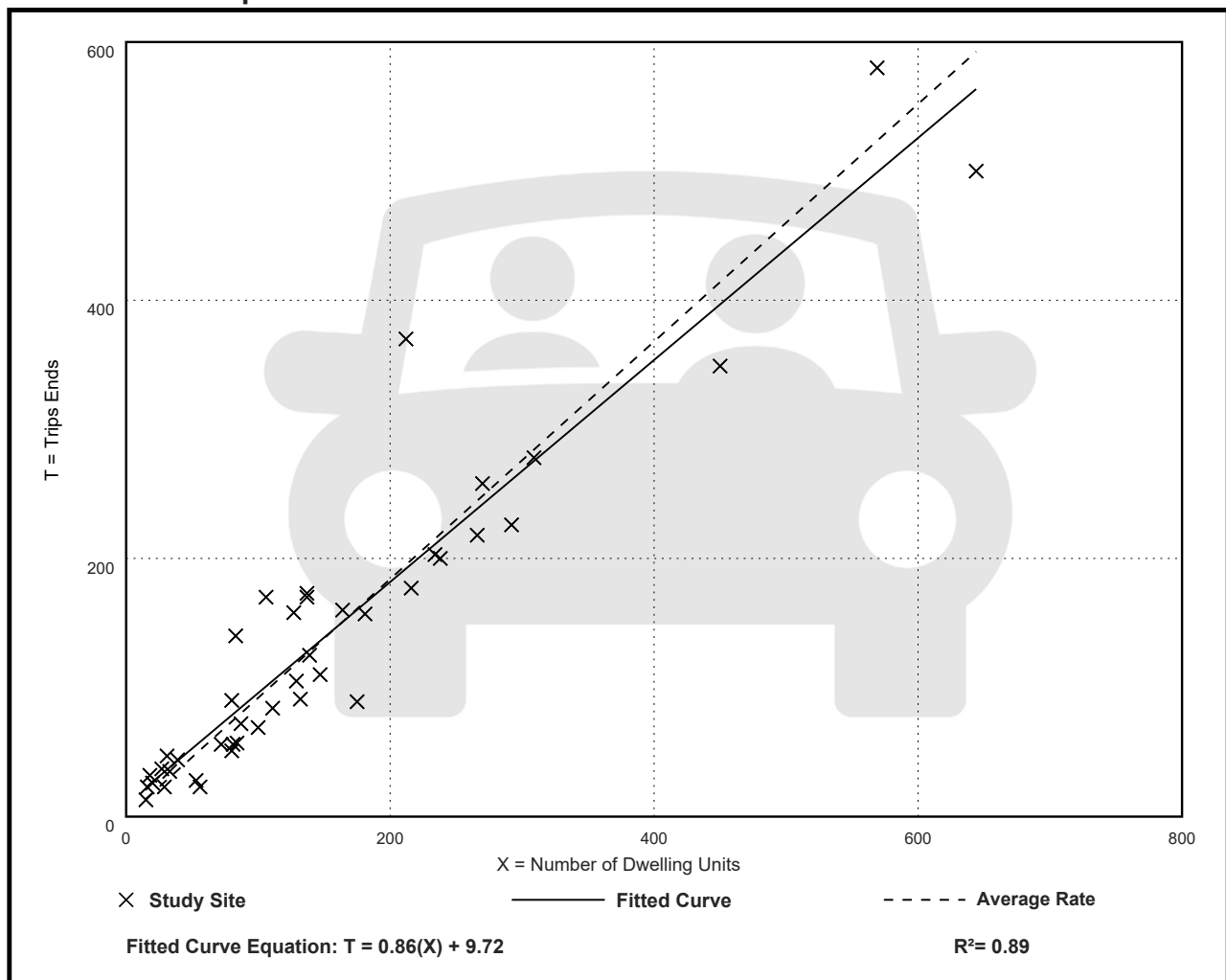
Avg. Num. of Dwelling Units: 152

Directional Distribution: 54% entering, 46% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.92	0.41 - 1.78	0.27

Data Plot and Equation



Land Use: 215

Single-Family Attached Housing

Description

Single-family attached housing includes any single-family housing unit that shares a wall with an adjoining dwelling unit, whether the walls are for living space, a vehicle garage, or storage space.

Additional Data

The database for this land use includes duplexes (defined as a single structure with two distinct dwelling units, typically joined side-by-side and each with at least one outside entrance) and townhouses/rowhouses (defined as a single structure with three or more distinct dwelling units, joined side-by-side in a row and each with an outside entrance).

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, Georgia, Illinois, Maryland, Massachusetts, Minnesota, New Jersey, Ontario (CAN), Oregon, Pennsylvania, South Dakota, Utah, Virginia, and Wisconsin.

Source Numbers

168, 204, 211, 237, 305, 306, 319, 321, 357, 390, 418, 525, 571, 583, 638, 735, 868, 869, 870, 896, 912, 959, 1009, 1046, 1056, 1058, 1077

Single-Family Attached Housing (215)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 46

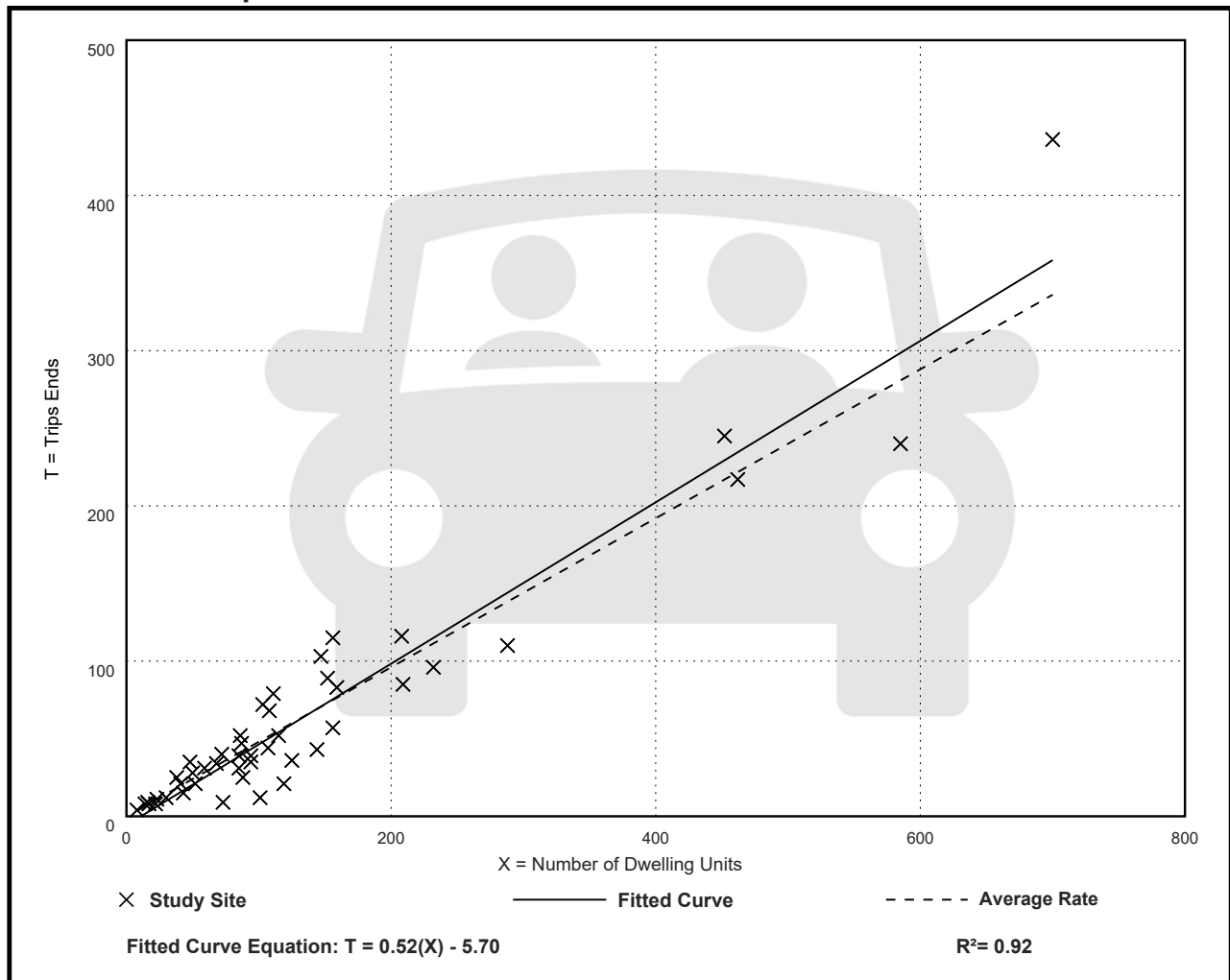
Avg. Num. of Dwelling Units: 135

Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.48	0.12 - 0.74	0.14

Data Plot and Equation



Single-Family Attached Housing (215)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 51

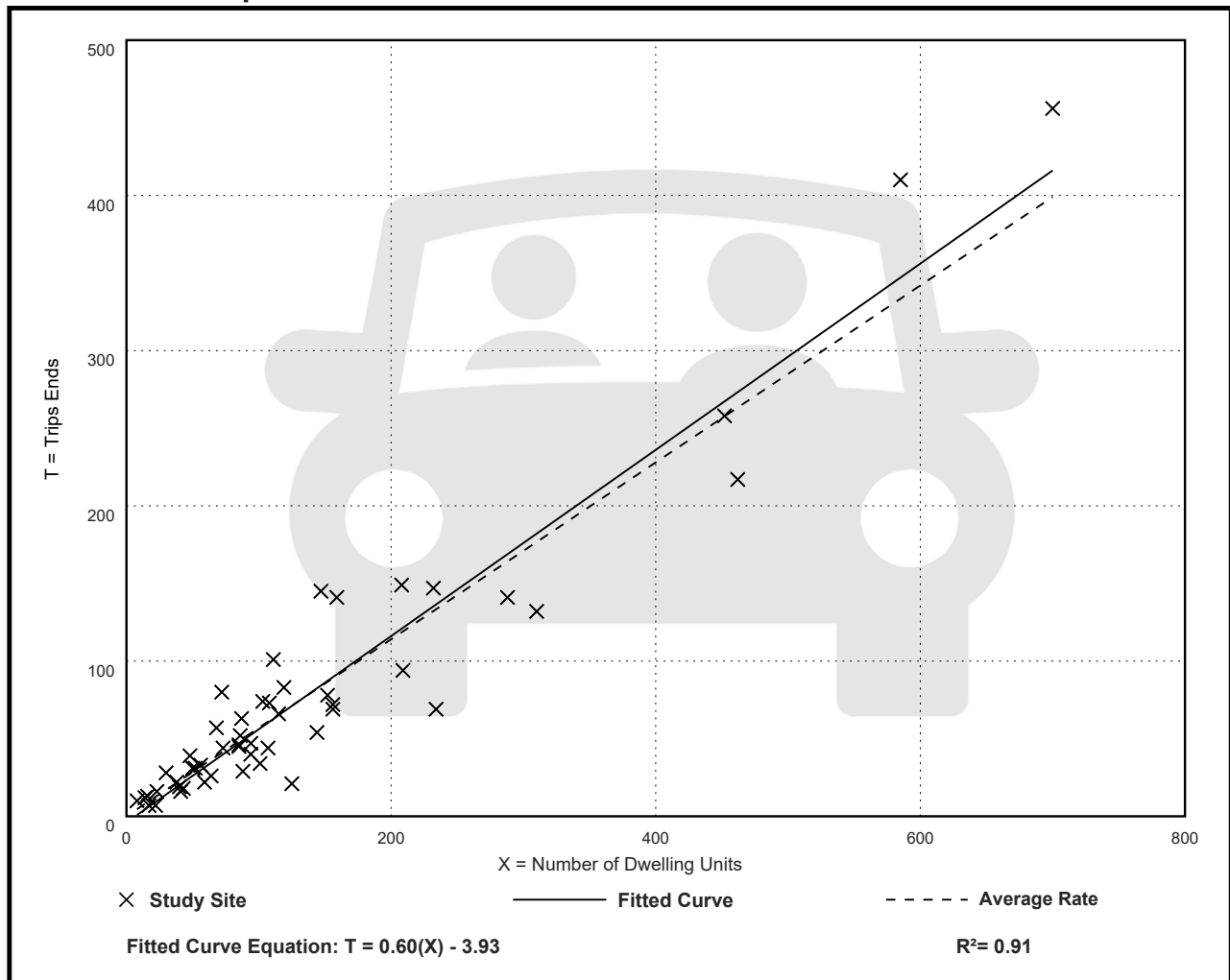
Avg. Num. of Dwelling Units: 136

Directional Distribution: 57% entering, 43% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.57	0.17 - 1.25	0.18

Data Plot and Equation



Single-Family Attached Housing (215)

Vehicle Trip Ends vs: Dwelling Units

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 7

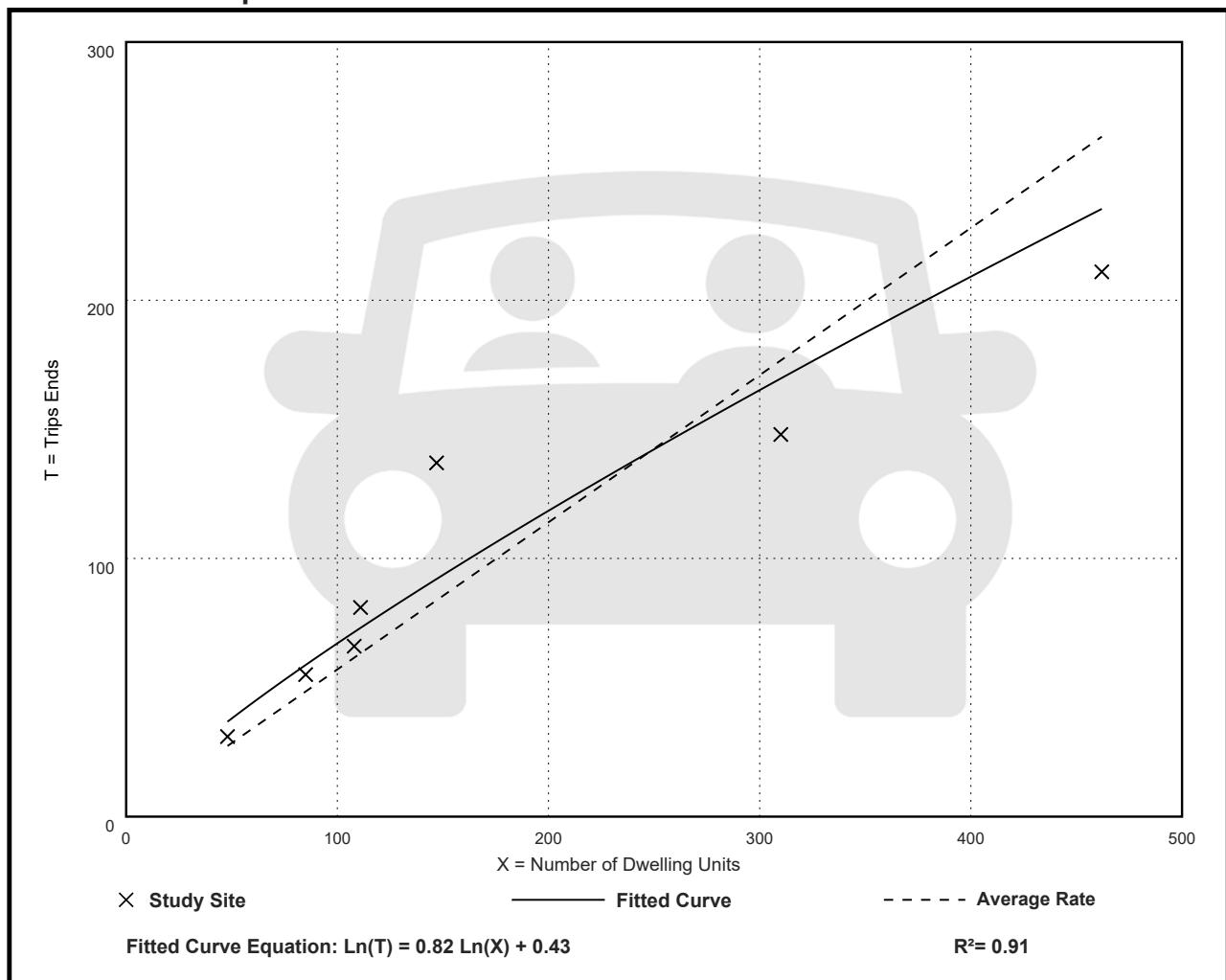
Avg. Num. of Dwelling Units: 182

Directional Distribution: 48% entering, 52% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.57	0.46 - 0.93	0.17

Data Plot and Equation



Land Use: 221

Multifamily Housing (Mid-Rise)

Description

Mid-rise multifamily housing includes apartments and condominiums located in a building that has between four and 10 floors of living space. Access to individual dwelling units is through an outside building entrance, a lobby, elevator, and a set of hallways.

Multifamily housing (low-rise) (Land Use 220), multifamily housing (high-rise) (Land Use 222), off-campus student apartment (mid-rise) (Land Use 226), and mid-rise residential with ground-floor commercial (Land Use 231) are related land uses.

Land Use Subcategory

Data are presented for two subcategories for this land use: (1) not close to rail transit and (2) close to rail transit. A site is considered close to rail transit if the walking distance between the residential site entrance and the closest rail transit station entrance is ½ mile or less.

Additional Data

For the six sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.5 residents per occupied dwelling unit.

For the five sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96 percent of the total dwelling units were occupied.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 1990s, the 2000s, the 2010s, and the 2020s in Alberta (CAN), California, District of Columbia, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, Montana, New Jersey, New York, Ontario (CAN), Oregon, Utah, and Virginia.

Source Numbers

168, 188, 204, 305, 306, 321, 818, 857, 862, 866, 901, 904, 910, 949, 951, 959, 963, 964, 966, 967, 969, 970, 1004, 1014, 1022, 1023, 1025, 1031, 1032, 1035, 1047, 1056, 1057, 1058, 1071, 1076

Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 30

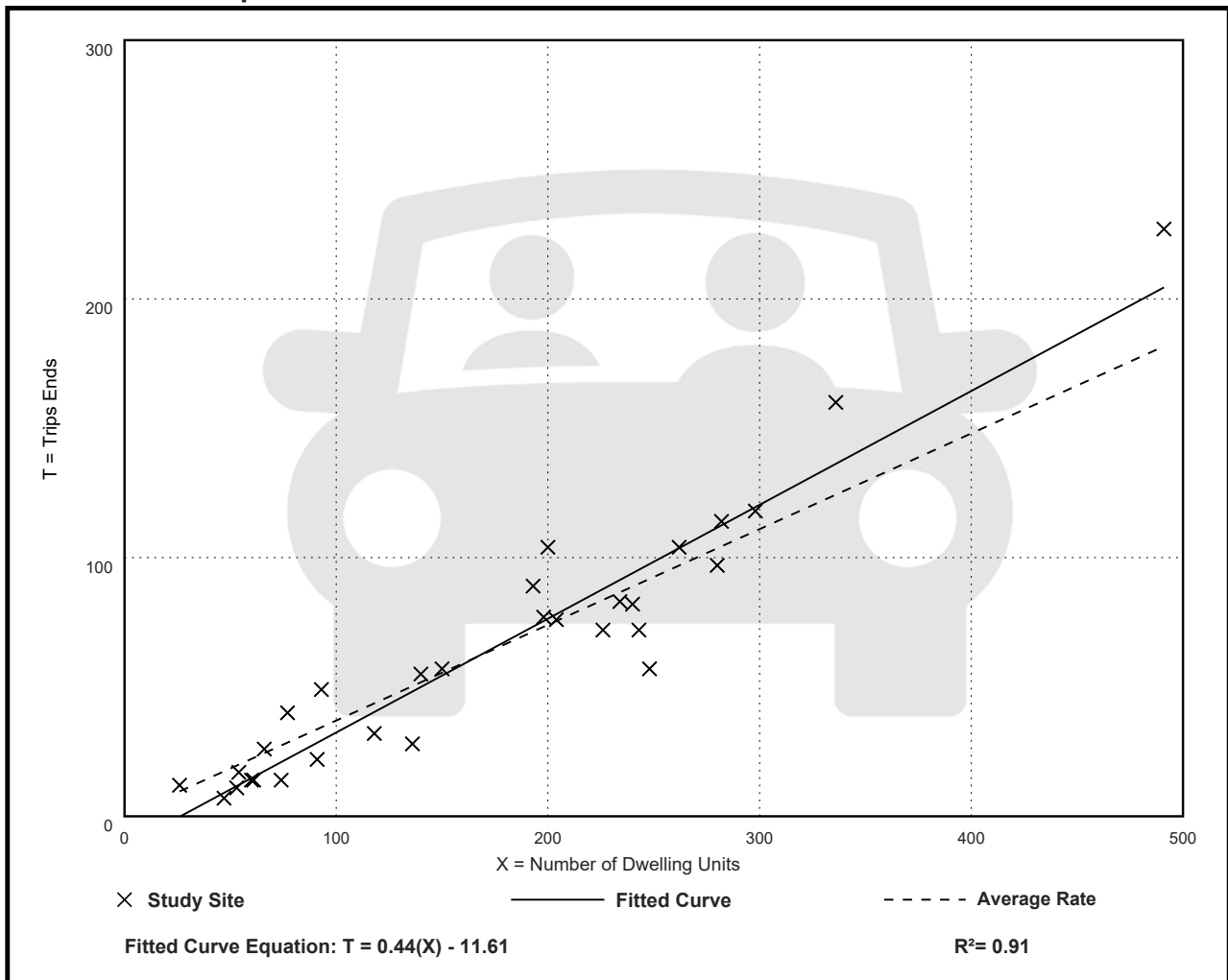
Avg. Num. of Dwelling Units: 173

Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.37	0.15 - 0.53	0.09

Data Plot and Equation



Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 31

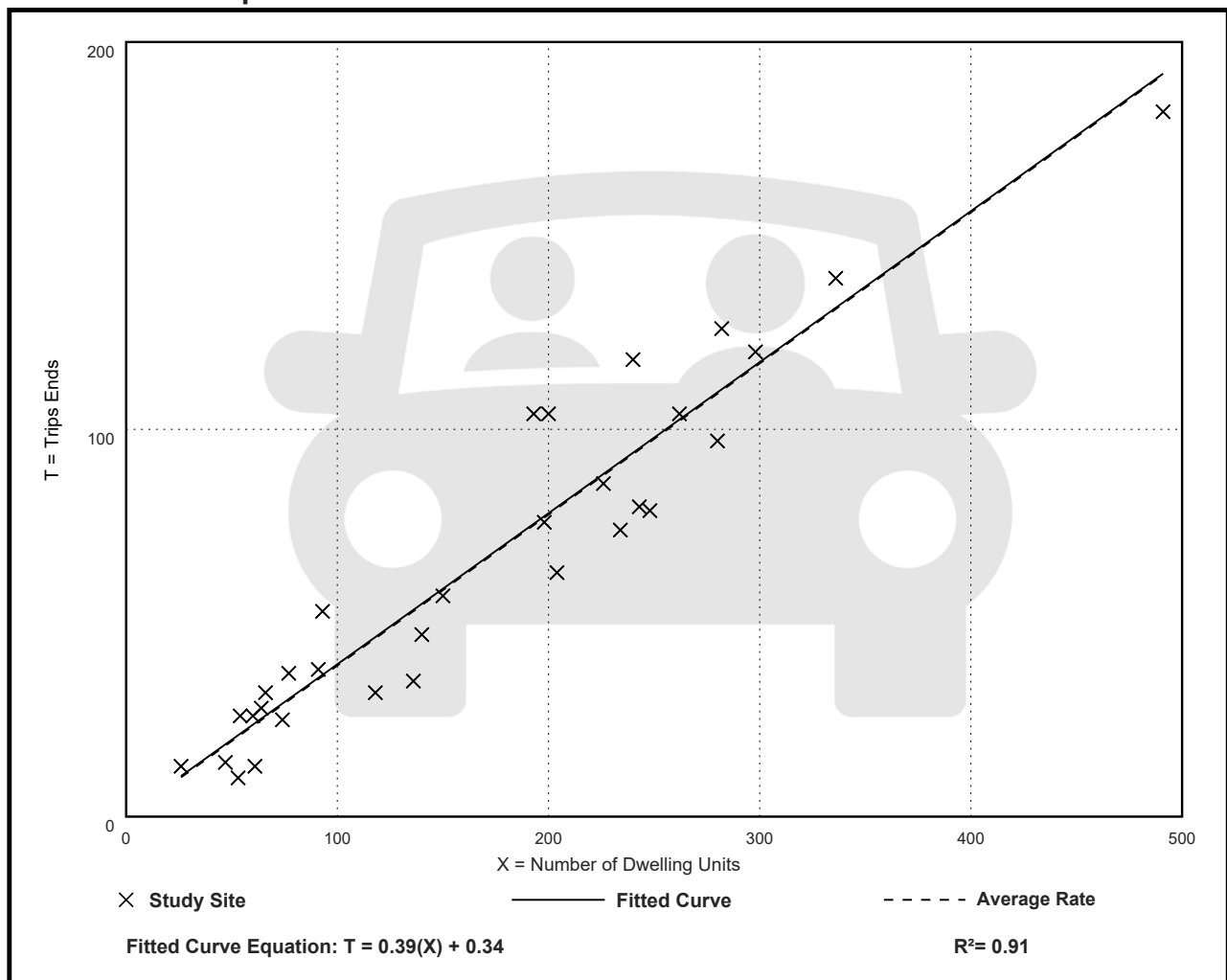
Avg. Num. of Dwelling Units: 169

Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.39	0.19 - 0.57	0.08

Data Plot and Equation



Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

Vehicle Trip Ends vs: Dwelling Units

On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 5

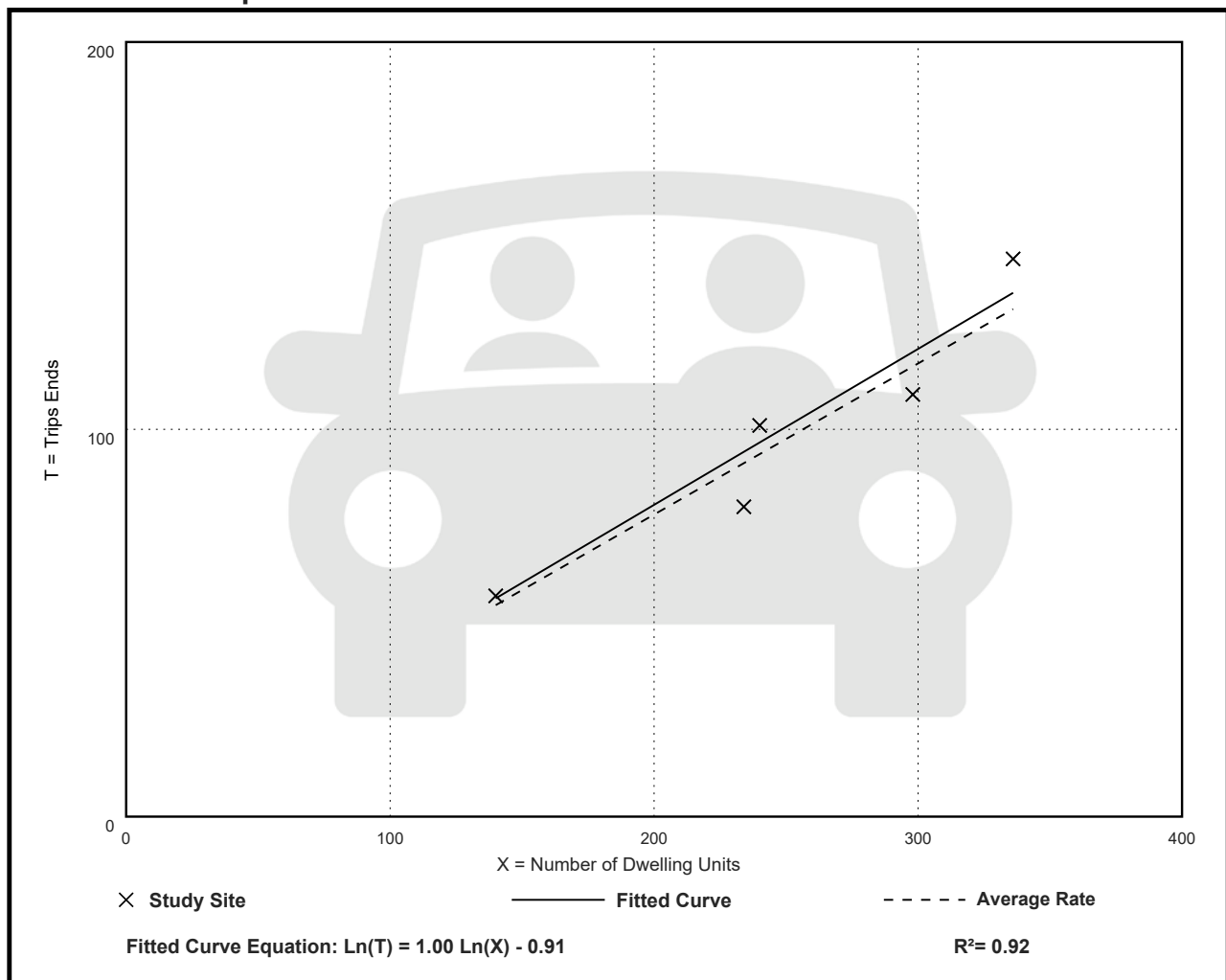
Avg. Num. of Dwelling Units: 250

Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.39	0.34 - 0.43	0.04

Data Plot and Equation



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APPENDIX D

Level of Service Definitions

LEVEL OF SERVICE¹

Level of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. This concept was introduced in the 1965 *Highway Capacity Manual* as a criteria for interrupted flow conditions. The 2000 *Highway Capacity Manual* changed the basis for measuring Level of Service at intersections to control delay².

Six Levels of Service are defined with LOS A representing the best operating conditions, and LOS F the worst (briefly described below). It should be noted that there is often significant variability in the amount of delay experienced by individual drivers.

- LOS A:** This Level of Service describes the highest quality of traffic flow and is referred to as free flow. The approach appears open, turning movements are easily made and drivers have freedom of operation. Control delay is less than 10 seconds/vehicle.
- LOS B:** This Level of Service is referred to as a stable flow. Drivers feel somewhat restricted and occasionally may have to wait to complete the minor movement. Control delay is 10-15 seconds/vehicle for unsignalized intersections and 10-20 seconds/vehicle for signalized intersections.
- LOS C:** At this level, the operation is stable. Drivers feel more restricted and may have to wait, with queues developing for short periods. Control delay is 15-25 seconds/vehicle at unsignalized intersections and 20-35 seconds/vehicle at signalized intersections.
- LOS D:** At this level, traffic is approaching unstable flow. The motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough gaps to lower demand to permit occasional clearance of developing queues and prevent excessive back-ups. Control delay is 25-35 seconds/vehicle at unsignalized intersections and 35-55 seconds/vehicle at signalized intersections.
- LOS E:** At this level capacity occurs. Long queues of vehicles exist and delays to vehicles may extend. Control delay is 35-50 seconds/vehicle at unsignalized intersections and 55-80 seconds/vehicle at signalized intersections.
- LOS F:** At this Level of Service, the intersection has failed. Capacity of the intersection has been exceeded. Control delay exceeds 50 seconds/vehicle at unsignalized intersections and exceeds 80 seconds/vehicle at signalized intersections.

¹

Transportation Research Board: Highway Capacity Manual 1965, 2000

²

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

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APPENDIX E

Synchro Analysis Worksheets

Lanes, Volumes, Timings
100: Division Road & Howard Avenue/Mall driveway

AM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	334	57	46	5	35	36	34	701	20	65	568	196
Future Volume (vph)	334	57	46	5	35	36	34	701	20	65	568	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.6	3.0	3.3	3.3	3.4	3.6	3.6	3.5	3.6	3.6
Storage Length (m)	0.0		80.0	65.0		0.0	60.0		45.0	65.0		0.0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.91	1.00	0.95	1.00
Ped Bike Factor		0.99		1.00				1.00		1.00		
Frt		0.933				0.850		0.996				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1845	1749	0	1685	1655	1446	1765	4005	0	1653	3374	1583
Flt Permitted	0.950			0.950			0.363			0.216		
Satd. Flow (perm)	1845	1749	0	1680	1655	1446	674	4005	0	376	3374	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				118		4				213
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		277.4			128.2			209.1			190.6	
Travel Time (s)		20.0			9.2			12.5			11.4	
Confl. Peds. (#/hr)			3	3					1	1		
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
Heavy Vehicles (%)	0%	2%	4%	0%	11%	8%	0%	6%	15%	8%	7%	2%
Adj. Flow (vph)	363	62	50	5	38	39	37	762	22	71	617	213
Shared Lane Traffic (%)												
Lane Group Flow (vph)	363	112	0	5	38	39	37	784	0	71	617	213
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.8			3.8			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	0.97	0.97	1.00	1.09	1.04	1.04	1.03	1.00	1.00	1.01	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2			6		6
Detector Phase	4	4		3	3	3	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	7.0	7.0	7.0	10.0		7.0	10.0	10.0
Minimum Split (s)	31.0	31.0		12.0	12.0	12.0	11.0	30.0		11.0	30.0	30.0
Total Split (s)	38.0	38.0		15.0	15.0	15.0	11.0	38.0		11.0	38.0	38.0
Total Split (%)	37.3%	37.3%		14.7%	14.7%	14.7%	10.8%	37.3%		10.8%	37.3%	37.3%
Maximum Green (s)	33.0	33.0		10.0	10.0	10.0	7.0	33.0		7.0	33.0	33.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	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	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag		Lead	Lag	Lag

Lanes, Volumes, Timings
100: Division Road & Howard Avenue/Mall driveway

AM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		5.5	5.5	5.5	3.5	4.0		3.5	4.0	4.0
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)	7.0	7.0						7.0			7.0	7.0
Flash Dont Walk (s)	19.0	19.0						18.0			18.0	18.0
Pedestrian Calls (#/hr)	3	3						1			0	0
Act Effect Green (s)	26.1	26.1		9.4	9.4	9.4	51.3	44.6		53.3	47.4	47.4
Actuated g/C Ratio	0.26	0.26		0.09	0.09	0.09	0.50	0.44		0.52	0.46	0.46
v/c Ratio	0.77	0.23		0.03	0.25	0.16	0.09	0.45		0.24	0.39	0.25
Control Delay	44.0	17.1		42.2	47.0	1.4	15.3	24.2		16.8	22.4	4.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	44.0	17.1		42.2	47.0	1.4	15.3	24.2		16.8	22.4	4.3
LOS	D	B		D	D	A	B	C		B	C	A
Approach Delay		37.6			25.1			23.8			17.7	
Approach LOS		D			C			C			B	
Queue Length 50th (m)	68.0	10.5		1.0	7.5	0.0	3.7	54.9		7.3	49.6	0.0
Queue Length 95th (m)	90.8	24.6		4.7	17.8	0.0	10.3	77.4		17.1	74.0	16.1
Internal Link Dist (m)		253.4			104.2			185.1			166.6	
Turn Bay Length (m)				65.0			60.0			65.0		
Base Capacity (vph)	596	594		165	162	248	415	1751		293	1566	849
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.61	0.19		0.03	0.23	0.16	0.09	0.45		0.24	0.39	0.25

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

Offset: 32 (31%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 24.3

Intersection LOS: C

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Howard Avenue/Mall driveway

 Ø1	 Ø2 (R)	 Ø3	 Ø4
11 s	38 s	15 s	38 s
 Ø5	 Ø6 (R)		
11 s	38 s		

HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

AM Peak Hour
2024 Existing Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	7	3	416	2	2	277			
Future Volume (Veh/h)	7	3	416	2	2	277			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	8	3	452	2	2	301			
Pedestrians	6					2			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.97	0.97			0.97				
vC, conflicting volume	764	461			460				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	742	430			429				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	98	100			100				
cM capacity (veh/h)	372	607			1103				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	11	454	303						
Volume Left	8	0	2						
Volume Right	3	2	0						
cSH	416	1700	1103						
Volume to Capacity	0.03	0.27	0.00						
Queue Length 95th (m)	0.7	0.0	0.0						
Control Delay (s)	13.9	0.0	0.1						
Lane LOS	B		A						
Approach Delay (s)	13.9	0.0	0.1						
Approach LOS	B								
Intersection Summary									
Average Delay		0.2							
Intersection Capacity Utilization		32.7%	ICU Level of Service	A					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	324	35	106	406	59	56	125	97	128	283	123
Future Volume (vph)	63	324	35	106	406	59	56	125	97	128	283	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Frt		0.985			0.981			0.935			0.955	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3307	0	1655	3336	0	1604	3181	0	1624	3392	0
Flt Permitted	0.450			0.478			0.363			0.484		
Satd. Flow (perm)	734	3307	0	831	3336	0	612	3181	0	824	3392	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			17			105			68	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		3	3		6	4		4	4		4
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
Heavy Vehicles (%)	11%	3%	11%	3%	2%	5%	5%	3%	3%	5%	0%	0%
Adj. Flow (vph)	68	352	38	115	441	64	61	136	105	139	308	134
Shared Lane Traffic (%)												
Lane Group Flow (vph)	68	390	0	115	505	0	61	241	0	139	442	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	14.0	39.0		14.0	39.0		14.0	35.0		14.0	35.0	
Total Split (%)	13.7%	38.2%		13.7%	38.2%		13.7%	34.3%		13.7%	34.3%	
Maximum Green (s)	10.0	34.0		10.0	34.0		10.0	30.0		10.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		3			6			4			4	
Act Effect Green (s)	57.7	48.9		60.5	52.1		26.2	16.7		29.0	20.0	
Actuated g/C Ratio	0.57	0.48		0.59	0.51		0.26	0.16		0.28	0.20	
v/c Ratio	0.14	0.25		0.20	0.30		0.26	0.40		0.45	0.61	
Control Delay	10.6	17.3		10.6	16.5		25.9	21.8		30.1	35.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.6	17.3		10.6	16.5		25.9	21.8		30.1	35.3	
LOS	B	B		B	B		C	C		C	D	
Approach Delay		16.3			15.4			22.7			34.1	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	5.2	23.2		9.1	30.3		9.1	13.2		22.7	39.4	
Queue Length 95th (m)	13.7	41.8		21.0	52.5		16.6	22.4		29.5	52.0	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	511	1590		584	1711		263	1009		312	1045	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.13	0.25		0.20	0.30		0.23	0.24		0.45	0.42	

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 22.3

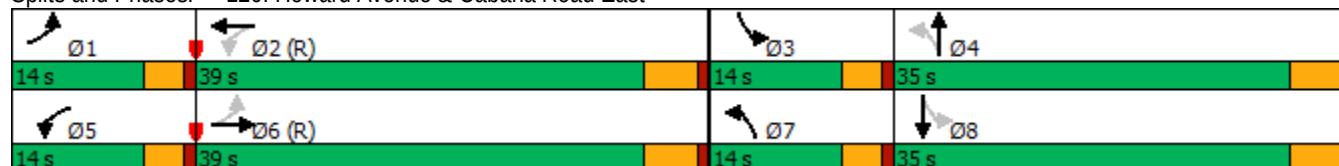
Intersection LOS: C

Intersection Capacity Utilization 63.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Howard Avenue/Mall driveway

PM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	343	213	91	102	173	272	161	918	130	212	922	558
Future Volume (vph)	343	213	91	102	173	272	161	918	130	212	922	558
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.6	3.0	3.3	3.3	3.4	3.6	3.6	3.5	3.6	3.6
Storage Length (m)	0.0		80.0	65.0		0.0	60.0		45.0	65.0		0.0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.91	1.00	0.95	1.00
Ped Bike Factor		0.99		0.99								0.98
Frt		0.955				0.850		0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1845	1824	0	1668	1801	1531	1747	4086	0	1767	3471	1615
Flt Permitted	0.950			0.950			0.121			0.110		
Satd. Flow (perm)	1845	1824	0	1656	1801	1531	223	4086	0	205	3471	1576
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20				251		18				577
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		277.4			128.2			209.1			190.6	
Travel Time (s)		20.0			9.2			12.5			11.4	
Confl. Peds. (#/hr)			9	9			2					2
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
Heavy Vehicles (%)	0%	1%	1%	1%	2%	2%	1%	3%	0%	1%	4%	0%
Adj. Flow (vph)	373	232	99	111	188	296	175	998	141	230	1002	607
Shared Lane Traffic (%)												
Lane Group Flow (vph)	373	331	0	111	188	296	175	1139	0	230	1002	607
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.8			3.8			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	0.97	0.97	1.00	1.09	1.04	1.04	1.03	1.00	1.00	1.01	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2			6		6
Detector Phase	4	4		3	3	3	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	7.0	7.0	7.0	10.0		7.0	10.0	10.0
Minimum Split (s)	31.0	31.0		12.0	12.0	12.0	11.0	30.0		11.0	30.0	30.0
Total Split (s)	39.0	39.0		21.0	21.0	21.0	14.0	36.0		14.0	36.0	36.0
Total Split (%)	35.5%	35.5%		19.1%	19.1%	19.1%	12.7%	32.7%		12.7%	32.7%	32.7%
Maximum Green (s)	34.0	34.0		16.0	16.0	16.0	10.0	31.0		10.0	31.0	31.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	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	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag		Lead	Lag	Lag

Lanes, Volumes, Timings
100: Division Road & Howard Avenue/Mall driveway

PM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		5.5	5.5	5.5	3.5	4.0		3.5	4.0	4.0
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)	7.0	7.0						7.0			7.0	7.0
Flash Dont Walk (s)	19.0	19.0						18.0			18.0	18.0
Pedestrian Calls (#/hr)	9	9						0			2	2
Act Effect Green (s)	28.3	28.3		15.5	15.5	15.5	45.0	33.0		50.1	36.2	36.2
Actuated g/C Ratio	0.26	0.26		0.14	0.14	0.14	0.41	0.30		0.46	0.33	0.33
v/c Ratio	0.79	0.68		0.47	0.74	0.69	0.72	0.92		0.78	0.88	0.67
Control Delay	51.4	43.1		50.6	63.9	18.1	39.8	50.1		46.1	46.3	7.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	51.4	43.1		50.6	63.9	18.1	39.8	50.1		46.1	46.3	7.8
LOS	D	D		D	E	B	D	D		D	D	A
Approach Delay		47.5			38.6			48.7			33.5	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	83.3	68.5		23.3	41.0	9.1	22.9	111.9		34.7	117.4	4.9
Queue Length 95th (m)	111.5	93.1		41.7	#72.6	38.5	#58.6	#151.8		#92.9	#168.9	40.7
Internal Link Dist (m)		253.4			104.2			185.1			166.6	
Turn Bay Length (m)				65.0			60.0			65.0		
Base Capacity (vph)	570	577		242	261	437	246	1239		294	1143	906
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.65	0.57		0.46	0.72	0.68	0.71	0.92		0.78	0.88	0.67

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 62 (56%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 40.9

Intersection LOS: D

Intersection Capacity Utilization 78.3%

ICU Level of Service D

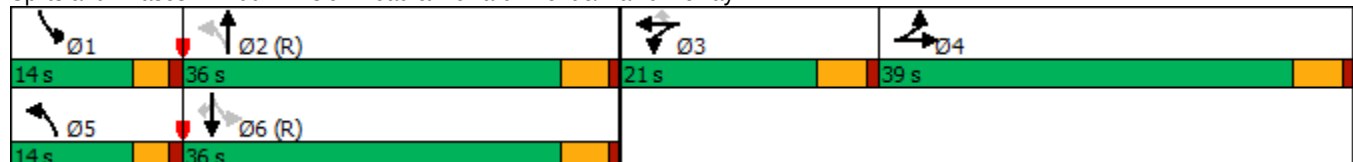
Analysis Period (min) 15

* User Entered Value

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

Queue shown is maximum after two cycles.

Splits and Phases: 100: Division Road & Howard Avenue/Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

PM Peak Hour
2024 Existing Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	2	2	442	7	1	630			
Future Volume (Veh/h)	2	2	442	7	1	630			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	2	2	480	8	1	685			
Pedestrians	7					1			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage veh									
Upstream signal (m)			288						
pX, platoon unblocked	0.86	0.86			0.86				
vC, conflicting volume	1178	492			495				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1124	323			326				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	99	100			100				
cM capacity (veh/h)	195	615			1060				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	4	488	686						
Volume Left	2	0	1						
Volume Right	2	8	0						
cSH	296	1700	1060						
Volume to Capacity	0.01	0.29	0.00						
Queue Length 95th (m)	0.3	0.0	0.0						
Control Delay (s)	17.3	0.0	0.0						
Lane LOS	C		A						
Approach Delay (s)	17.3	0.0	0.0						
Approach LOS	C								
Intersection Summary									
Average Delay		0.1							
Intersection Capacity Utilization		44.3%	ICU Level of Service	A					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	579	39	163	519	107	82	358	184	119	260	94
Future Volume (vph)	143	579	39	163	519	107	82	358	184	119	260	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Frt		0.991			0.974			0.949			0.960	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3422	0	1688	3349	0	1685	3312	0	1688	3349	0
Flt Permitted	0.305			0.296			0.465			0.187		
Satd. Flow (perm)	547	3422	0	525	3349	0	821	3312	0	332	3349	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			22			85			47	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		6	6		6	6		1	1		6
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
Heavy Vehicles (%)	1%	1%	0%	1%	1%	2%	0%	0%	2%	1%	1%	4%
Adj. Flow (vph)	155	629	42	177	564	116	89	389	200	129	283	102
Shared Lane Traffic (%)												
Lane Group Flow (vph)	155	671	0	177	680	0	89	589	0	129	385	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	18.0	38.0		18.0	38.0		16.0	38.0		16.0	38.0	
Total Split (%)	16.4%	34.5%		16.4%	34.5%		14.5%	34.5%		14.5%	34.5%	
Maximum Green (s)	14.0	33.0		14.0	33.0		12.0	33.0		12.0	33.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		6			6			1			6	
Act Effect Green (s)	57.6	46.0		59.3	46.9		34.3	23.9		37.5	27.4	
Actuated g/C Ratio	0.52	0.42		0.54	0.43		0.31	0.22		0.34	0.25	
v/c Ratio	0.39	0.47		0.44	0.47		0.27	0.75		0.53	0.44	
Control Delay	16.0	26.3		16.6	25.1		24.2	40.1		29.9	31.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.0	26.3		16.6	25.1		24.2	40.1		29.9	31.8	
LOS	B	C		B	C		C	D		C	C	
Approach Delay		24.4			23.4			38.0			31.3	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	16.1	56.7		18.7	55.7		13.3	56.4		19.6	30.9	
Queue Length 95th (m)	31.6	89.3		35.8	87.4		22.2	71.0		m26.0	38.6	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	450	1434		446	1439		369	1053		262	1037	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.34	0.47		0.40	0.47		0.24	0.56		0.49	0.37	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 28.5

Intersection LOS: C

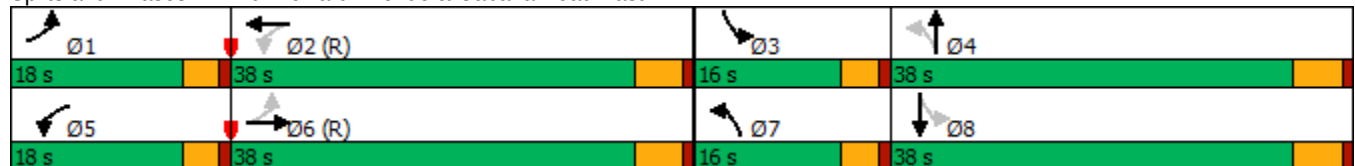
Intersection Capacity Utilization 69.9%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Howard Avenue/Mall driveway

Saturday Mid-Day Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	327	234	110	103	160	266	176	960	185	188	958	471
Future Volume (vph)	327	234	110	103	160	266	176	960	185	188	958	471
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.6	3.0	3.3	3.3	3.4	3.6	3.6	3.5	3.6	3.6
Storage Length (m)	0.0		80.0	65.0		0.0	60.0		45.0	65.0		0.0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	*0.75	0.91	1.00	0.95	1.00
Ped Bike Factor		0.99		1.00								
Frt		0.952				0.850		0.976				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1845	1827	0	1685	1783	1546	1765	4138	0	1767	3539	1615
Flt Permitted	0.950			0.950			0.109			0.107		
Satd. Flow (perm)	1845	1827	0	1680	1783	1546	202	4138	0	199	3539	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22				233		28				500
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		277.4			128.2			209.1			190.6	
Travel Time (s)		20.0			9.2			12.5			11.4	
Confl. Peds. (#/hr)			4	4								
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
Heavy Vehicles (%)	0%	1%	0%	0%	3%	1%	0%	1%	0%	1%	2%	0%
Adj. Flow (vph)	355	254	120	112	174	289	191	1043	201	204	1041	512
Shared Lane Traffic (%)												
Lane Group Flow (vph)	355	374	0	112	174	289	191	1244	0	204	1041	512
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.8			3.8			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	0.97	0.97	1.00	1.09	1.04	1.04	1.03	1.00	1.00	1.01	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases						3	2			6		6
Detector Phase	4	4		3	3	3	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		7.0	7.0	7.0	7.0	10.0		7.0	10.0	10.0
Minimum Split (s)	31.0	31.0		12.0	12.0	12.0	11.0	30.0		11.0	30.0	30.0
Total Split (s)	37.0	37.0		19.0	19.0	19.0	13.0	39.0		13.0	39.0	39.0
Total Split (%)	34.3%	34.3%		17.6%	17.6%	17.6%	12.0%	36.1%		12.0%	36.1%	36.1%
Maximum Green (s)	32.0	32.0		14.0	14.0	14.0	9.0	34.0		9.0	34.0	34.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	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	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lead	Lag		Lead	Lag	Lag

Lanes, Volumes, Timings
100: Division Road & Howard Avenue/Mall driveway

Saturday Mid-Day Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	4.0	4.0		5.5	5.5	5.5	3.5	4.0		3.5	4.0	4.0
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)	7.0	7.0						7.0			7.0	7.0
Flash Dont Walk (s)	19.0	19.0						18.0			18.0	18.0
Pedestrian Calls (#/hr)	4	4						0			0	0
Act Effect Green (s)	27.1	27.1		13.8	13.8	13.8	48.4	36.6		49.8	37.3	37.3
Actuated g/C Ratio	0.25	0.25		0.13	0.13	0.13	0.45	0.34		0.46	0.35	0.35
v/c Ratio	0.77	0.79		0.52	0.77	0.72	0.78	0.88		0.79	0.85	0.58
Control Delay	44.0	42.8		53.4	67.9	21.9	44.9	41.9		46.7	41.9	5.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	44.0	42.8		53.4	67.9	21.9	44.9	41.9		46.7	41.9	5.8
LOS	D	D		D	E	C	D	D		D	D	A
Approach Delay		43.4			42.0			42.3			32.0	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	55.1	53.1		23.5	37.7	11.4	25.0	116.4		28.4	117.3	1.8
Queue Length 95th (m)	94.8	98.6		42.4	#71.0	#42.0	#69.9	#154.5		#77.9	#159.4	28.0
Internal Link Dist (m)		253.4			104.2			185.1			166.6	
Turn Bay Length (m)				65.0			60.0			65.0		
Base Capacity (vph)	546	556		218	231	403	246	1419		259	1221	885
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.65	0.67		0.51	0.75	0.72	0.78	0.88		0.79	0.85	0.58

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

Offset: 5 (5%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 38.4

Intersection LOS: D

Intersection Capacity Utilization 78.6%

ICU Level of Service D

Analysis Period (min) 15

* User Entered Value

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

Queue shown is maximum after two cycles.

Splits and Phases: 100: Division Road & Howard Avenue/Mall driveway

 Ø1	 Ø2 (R)	 Ø3	 Ø4
13 s	39 s	19 s	37 s
 Ø5	 Ø6 (R)		
13 s	39 s		

HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

Saturday Mid-Day Peak Hour
2024 Existing Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	2	1	428	4	3	490			
Future Volume (Veh/h)	2	1	428	4	3	490			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	2	1	465	4	3	533			
Pedestrians	6					3			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage (veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.86	0.86			0.86				
vC, conflicting volume	1012	476			475				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	933	311			309				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	99	100			100				
cM capacity (veh/h)	254	627			1082				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	3	469	536						
Volume Left	2	0	3						
Volume Right	1	4	0						
cSH	317	1700	1082						
Volume to Capacity	0.01	0.28	0.00						
Queue Length 95th (m)	0.2	0.0	0.1						
Control Delay (s)	16.5	0.0	0.1						
Lane LOS	C		A						
Approach Delay (s)	16.5	0.0	0.1						
Approach LOS	C								
Intersection Summary									
Average Delay		0.1							
Intersection Capacity Utilization		39.1%	ICU Level of Service	A					
Analysis Period (min)		15							

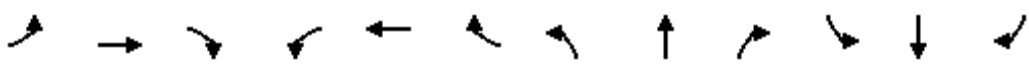
Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	565	43	147	476	69	71	268	164	100	277	102
Future Volume (vph)	105	565	43	147	476	69	71	268	164	100	277	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00				1.00	
Frt		0.989			0.981			0.943			0.960	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3441	0	1688	3413	0	1685	3304	0	1671	3390	0
Flt Permitted	0.384			0.325			0.380			0.234		
Satd. Flow (perm)	690	3441	0	576	3413	0	673	3304	0	412	3390	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			16			118			48	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	1		8	8		1	1					1
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
Heavy Vehicles (%)	1%	0%	2%	1%	0%	1%	0%	0%	2%	2%	1%	0%
Adj. Flow (vph)	114	614	47	160	517	75	77	291	178	109	301	111
Shared Lane Traffic (%)												
Lane Group Flow (vph)	114	661	0	160	592	0	77	469	0	109	412	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	17.0	43.0		17.0	43.0		14.0	34.0		14.0	34.0	
Total Split (%)	15.7%	39.8%		15.7%	39.8%		13.0%	31.5%		13.0%	31.5%	
Maximum Green (s)	13.0	38.0		13.0	38.0		10.0	29.0		10.0	29.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2024 Existing Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		8			1			0			1	
Act Effect Green (s)	61.8	52.0		64.4	53.3		28.3	18.6		30.2	21.3	
Actuated g/C Ratio	0.57	0.48		0.60	0.49		0.26	0.17		0.28	0.20	
v/c Ratio	0.24	0.40		0.36	0.35		0.30	0.70		0.49	0.58	
Control Delay	11.0	20.1		12.0	18.2		28.7	36.7		27.6	31.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.0	20.1		12.0	18.2		28.7	36.7		27.6	31.2	
LOS	B	C		B	B		C	D		C	C	
Approach Delay		18.8			16.9			35.6			30.5	
Approach LOS		B			B			D			C	
Queue Length 50th (m)	9.5	47.1		13.8	39.4		12.3	39.2		15.5	34.6	
Queue Length 95th (m)	20.4	75.4		27.7	63.4		21.7	53.1		m25.3	m53.3	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	541	1662		491	1693		278	973		232	945	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.21	0.40		0.33	0.35		0.28	0.48		0.47	0.44	

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 24.1

Intersection LOS: C

Intersection Capacity Utilization 65.0%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 120: Howard Avenue & Cabana Road East

			
Ø1	Ø2 (R)	Ø3	Ø4
17 s	43 s	14 s	34 s
			
Ø5	Ø6 (R)	Ø7	Ø8
17 s	43 s	14 s	34 s

Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2025 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	41	36	1095	81	65	789
Future Volume (vph)	41	36	1095	81	65	789
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Ped Bike Factor			1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	2971	1446	4061	0	1653	3406
Flt Permitted	0.950				0.132	
Satd. Flow (perm)	2971	1446	4061	0	230	3406
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		39	19			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	8%	4%	5%	8%	6%
Adj. Flow (vph)	45	39	1190	88	71	858
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	39	1278	0	71	858
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	15.0	15.0	72.0		15.0	87.0
Total Split (%)	14.7%	14.7%	70.6%		14.7%	85.3%
Maximum Green (s)	11.0	11.0	67.0		11.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	

Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2025 Future Background Conditions

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			1			0
Act Effect Green (s)	9.4	9.4	78.0		87.0	87.0
Actuated g/C Ratio	0.09	0.09	0.76		0.85	0.85
v/c Ratio	0.16	0.23	0.41		0.24	0.30
Control Delay	43.6	17.0	6.0		3.6	2.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	43.6	17.0	6.0		3.6	2.3
LOS	D	B	A		A	A
Approach Delay	31.2		6.0			2.4
Approach LOS	C		A			A
Queue Length 50th (m)	4.5	0.0	42.4		1.9	16.6
Queue Length 95th (m)	10.1	10.0	57.0		4.4	24.1
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	320	190	3110		349	2903
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.14	0.21	0.41		0.20	0.30

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.41

Intersection Signal Delay: 5.5

Intersection LOS: A

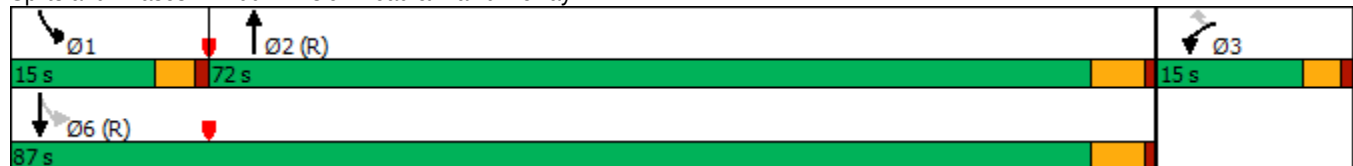
Intersection Capacity Utilization 45.5%

ICU Level of Service A

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

AM Peak Hour
2025 Future Background Conditions

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	18	439	6	7	302
Future Volume (Veh/h)	20	18	439	6	7	302
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	20	477	7	8	328
Pedestrians	6					2
Lane Width (m)	3.6					3.6
Walking Speed (m/s)	1.2					1.2
Percent Blockage	1					0
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)			288			
pX, platoon unblocked	0.97	0.97			0.97	
vC, conflicting volume	830	488			490	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	807	453			455	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	97			99	
cM capacity (veh/h)	337	586			1074	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	42	484	336			
Volume Left	22	0	8			
Volume Right	20	7	0			
cSH	423	1700	1074			
Volume to Capacity	0.10	0.28	0.01			
Queue Length 95th (m)	2.6	0.0	0.2			
Control Delay (s)	14.5	0.0	0.3			
Lane LOS	B		A			
Approach Delay (s)	14.5	0.0	0.3			
Approach LOS	B					
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		34.1%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2025 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	329	36	108	412	64	57	131	98	143	300	138
Future Volume (vph)	68	329	36	108	412	64	57	131	98	143	300	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Frt		0.985			0.980			0.936			0.953	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3307	0	1655	3331	0	1604	3184	0	1624	3384	0
Flt Permitted	0.441			0.470			0.334			0.477		
Satd. Flow (perm)	719	3307	0	817	3331	0	563	3184	0	812	3384	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			18			107			74	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		3	3		6	4		4	4		4
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
Heavy Vehicles (%)	11%	3%	11%	3%	2%	5%	5%	3%	3%	5%	0%	0%
Adj. Flow (vph)	74	358	39	117	448	70	62	142	107	155	326	150
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	397	0	117	518	0	62	249	0	155	476	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	14.0	39.0		14.0	39.0		14.0	35.0		14.0	35.0	
Total Split (%)	13.7%	38.2%		13.7%	38.2%		13.7%	34.3%		13.7%	34.3%	
Maximum Green (s)	10.0	34.0		10.0	34.0		10.0	30.0		10.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2025 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		3			6			4			4	
Act Effect Green (s)	57.0	47.9		59.6	51.0		26.9	17.4		29.8	20.8	
Actuated g/C Ratio	0.56	0.47		0.58	0.50		0.26	0.17		0.29	0.20	
v/c Ratio	0.16	0.25		0.21	0.31		0.26	0.39		0.49	0.64	
Control Delay	11.0	17.9		11.0	17.2		25.6	21.7		30.8	35.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.0	17.9		11.0	17.2		25.6	21.7		30.8	35.2	
LOS	B	B		B	B		C	C		C	D	
Approach Delay		16.8			16.1			22.4			34.1	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	5.9	24.2		9.6	32.1		9.2	13.7		24.3	41.7	
Queue Length 95th (m)	14.6	42.8		21.4	54.0		16.9	23.1		36.6	54.9	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	497	1559		569	1675		258	1012		317	1047	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.25		0.21	0.31		0.24	0.25		0.49	0.45	

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 22.8

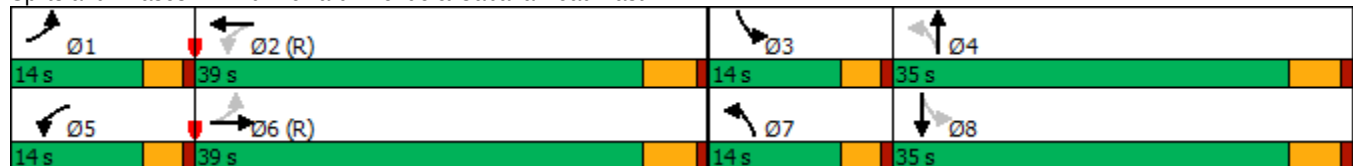
Intersection LOS: C

Intersection Capacity Utilization 64.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2025 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	279	272	1307	346	212	1547
Future Volume (vph)	279	272	1307	346	212	1547
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.969			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3236	1531	4070	0	1767	3539
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3236	1531	4070	0	106	3539
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		265	65			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	2%	1%	1%	2%
Adj. Flow (vph)	303	296	1421	376	230	1682
Shared Lane Traffic (%)						
Lane Group Flow (vph)	303	296	1797	0	230	1682
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	23.0	23.0	66.0		21.0	87.0
Total Split (%)	20.9%	20.9%	60.0%		19.1%	79.1%
Maximum Green (s)	19.0	19.0	61.0		17.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2025 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			2
Act Effect Green (s)	17.5	17.5	65.6		84.5	83.5
Actuated g/C Ratio	0.16	0.16	0.60		0.77	0.76
v/c Ratio	0.59	0.64	0.73		0.79	0.63
Control Delay	47.6	14.1	18.4		46.2	7.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.6	14.1	18.4		46.2	7.6
LOS	D	B	B		D	A
Approach Delay	31.1		18.4			12.2
Approach LOS	C		B			B
Queue Length 50th (m)	32.5	6.0	125.9		33.8	82.5
Queue Length 95th (m)	47.0	33.2	157.2		61.0	101.1
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	558	483	2454		337	2685
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.54	0.61	0.73		0.68	0.63

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 17.4

Intersection LOS: B

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

PM Peak Hour
2025 Future Background Conditions

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	9	11	475	19	15	662
Future Volume (Veh/h)	9	11	475	19	15	662
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	12	516	21	16	720
Pedestrians	7					1
Lane Width (m)	3.6					3.6
Walking Speed (m/s)	1.2					1.2
Percent Blockage	1					0
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			288			
pX, platoon unblocked	0.84	0.84			0.84	
vC, conflicting volume	1286	534			544	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1246	357			368	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	98			98	
cM capacity (veh/h)	160	580			1009	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	22	537	736			
Volume Left	10	0	16			
Volume Right	12	21	0			
cSH	265	1700	1009			
Volume to Capacity	0.08	0.32	0.02			
Queue Length 95th (m)	2.2	0.0	0.4			
Control Delay (s)	19.8	0.0	0.4			
Lane LOS	C		A			
Approach Delay (s)	19.8	0.0	0.4			
Approach LOS	C					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			57.2%	ICU Level of Service		B
Analysis Period (min)			15			

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2025 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	588	40	165	527	122	83	376	187	129	272	103
Future Volume (vph)	158	588	40	165	527	122	83	376	187	129	272	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Frt		0.991			0.972			0.950			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3422	0	1688	3340	0	1685	3317	0	1688	3344	0
Flt Permitted	0.279			0.289			0.451			0.182		
Satd. Flow (perm)	501	3422	0	512	3340	0	797	3317	0	323	3344	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			26			80			51	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		6	6		6	6		1	1		6
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
Heavy Vehicles (%)	1%	1%	0%	1%	1%	2%	0%	0%	2%	1%	1%	4%
Adj. Flow (vph)	172	639	43	179	573	133	90	409	203	140	296	112
Shared Lane Traffic (%)												
Lane Group Flow (vph)	172	682	0	179	706	0	90	612	0	140	408	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	18.0	38.0		18.0	38.0		16.0	38.0		16.0	38.0	
Total Split (%)	16.4%	34.5%		16.4%	34.5%		14.5%	34.5%		14.5%	34.5%	
Maximum Green (s)	14.0	33.0		14.0	33.0		12.0	33.0		12.0	33.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2025 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		6			6			1			6	
Act Effect Green (s)	56.9	44.7		57.4	45.0		35.3	24.9		38.9	28.7	
Actuated g/C Ratio	0.52	0.41		0.52	0.41		0.32	0.23		0.35	0.26	
v/c Ratio	0.45	0.49		0.46	0.51		0.27	0.75		0.56	0.45	
Control Delay	17.6	27.4		17.7	26.8		23.5	40.1		31.4	31.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.6	27.4		17.7	26.8		23.5	40.1		31.4	31.2	
LOS	B	C		B	C		C	D		C	C	
Approach Delay		25.4			25.0			38.0			31.3	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	18.6	59.4		19.6	60.2		13.1	59.6		21.1	35.9	
Queue Length 95th (m)	35.4	91.0		36.9	93.0		22.0	74.2		32.2	48.7	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	427	1395		430	1381		371	1051		264	1038	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.40	0.49		0.42	0.51		0.24	0.58		0.53	0.39	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 29.3

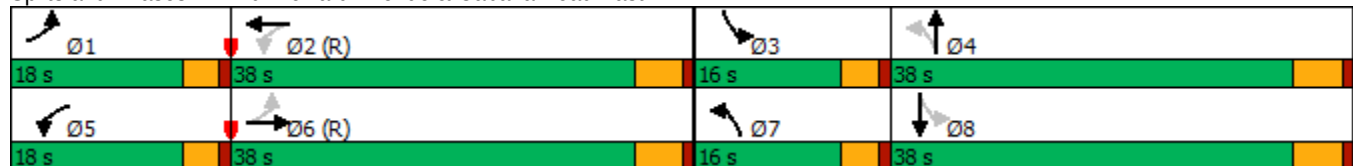
Intersection LOS: C

Intersection Capacity Utilization 71.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2025 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	271	266	1334	426	188	1481
Future Volume (vph)	271	266	1334	426	188	1481
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.964			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1546	4090	0	1767	3574
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3204	1546	4090	0	106	3574
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		230	96			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	1%	1%	0%	1%	1%
Adj. Flow (vph)	295	289	1450	463	204	1610
Shared Lane Traffic (%)						
Lane Group Flow (vph)	295	289	1913	0	204	1610
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	6.0	6.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	22.0	22.0	68.0		18.0	86.0
Total Split (%)	20.4%	20.4%	63.0%		16.7%	79.6%
Maximum Green (s)	18.0	18.0	63.0		14.0	81.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2025 Future Background Conditions

												
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT						
Recall Mode	None	None	C-Max		None	C-Max						
Walk Time (s)			7.0			7.0						
Flash Dont Walk (s)			18.0			18.0						
Pedestrian Calls (#/hr)			0			0						
Act Effect Green (s)	16.8	16.8	66.2		83.2	82.2						
Actuated g/C Ratio	0.16	0.16	0.61		0.77	0.76						
v/c Ratio	0.59	0.67	0.75		0.77	0.59						
Control Delay	47.5	18.3	17.2		43.5	6.9						
Queue Delay	0.0	0.0	0.0		0.0	0.0						
Total Delay	47.5	18.3	17.2		43.5	6.9						
LOS	D	B	B		D	A						
Approach Delay	33.1		17.2			11.0						
Approach LOS	C		B			B						
Queue Length 50th (m)	31.2	11.5	129.6		27.1	72.0						
Queue Length 95th (m)	45.4	40.2	156.6		#57.2	88.3						
Internal Link Dist (m)	104.2		176.7			166.6						
Turn Bay Length (m)	65.0				65.0							
Base Capacity (vph)	534	449	2543		296	2720						
Starvation Cap Reductn	0	0	0		0	0						
Spillback Cap Reductn	0	0	0		0	0						
Storage Cap Reductn	0	0	0		0	0						
Reduced v/c Ratio	0.55	0.64	0.75		0.69	0.59						

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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: 0.77

Intersection Signal Delay: 16.7

Intersection LOS: B

Intersection Capacity Utilization 64.3%

ICU Level of Service C

Analysis Period (min) 15

* User Entered Value

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

Queue shown is maximum after two cycles.

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

Saturday Mid-Day Peak Hour
2025 Future Background Conditions

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	13	12	460	15	14	522
Future Volume (Veh/h)	13	12	460	15	14	522
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	13	500	16	15	567
Pedestrians	6					3
Lane Width (m)	3.6					3.6
Walking Speed (m/s)	1.2					1.2
Percent Blockage	1					0
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			288			
pX, platoon unblocked	0.85	0.85			0.85	
vC, conflicting volume	1111	517			522	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1045	350			356	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	98			99	
cM capacity (veh/h)	214	592			1033	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	27	516	582			
Volume Left	14	0	15			
Volume Right	13	16	0			
cSH	309	1700	1033			
Volume to Capacity	0.09	0.30	0.01			
Queue Length 95th (m)	2.3	0.0	0.4			
Control Delay (s)	17.8	0.0	0.4			
Lane LOS	C		A			
Approach Delay (s)	17.8	0.0	0.4			
Approach LOS	C					
Intersection Summary						
Average Delay		0.6				
Intersection Capacity Utilization		49.7%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2025 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	123	573	44	149	483	86	72	280	166	115	288	118
Future Volume (vph)	123	573	44	149	483	86	72	280	166	115	288	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00				1.00	
Frt		0.989			0.977			0.944			0.956	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3441	0	1688	3398	0	1685	3308	0	1671	3376	0
Flt Permitted	0.362			0.320			0.357			0.226		
Satd. Flow (perm)	650	3441	0	567	3398	0	633	3308	0	398	3376	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			21			109			56	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	1		8	8		1	1					1
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
Heavy Vehicles (%)	1%	0%	2%	1%	0%	1%	0%	0%	2%	2%	1%	0%
Adj. Flow (vph)	134	623	48	162	525	93	78	304	180	125	313	128
Shared Lane Traffic (%)												
Lane Group Flow (vph)	134	671	0	162	618	0	78	484	0	125	441	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	17.0	43.0		17.0	43.0		14.0	34.0		14.0	34.0	
Total Split (%)	15.7%	39.8%		15.7%	39.8%		13.0%	31.5%		13.0%	31.5%	
Maximum Green (s)	13.0	38.0		13.0	38.0		10.0	29.0		10.0	29.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2025 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		8			1			0			1	
Act Effect Green (s)	61.5	51.1		63.2	52.0		28.9	19.1		31.1	22.1	
Actuated g/C Ratio	0.57	0.47		0.59	0.48		0.27	0.18		0.29	0.20	
v/c Ratio	0.29	0.41		0.37	0.38		0.31	0.72		0.55	0.60	
Control Delay	11.7	20.7		12.5	19.2		28.5	38.0		36.0	37.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.7	20.7		12.5	19.2		28.5	38.0		36.0	37.6	
LOS	B	C		B	B		C	D		D	D	
Approach Delay		19.2			17.8			36.7			37.3	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	11.6	48.7		14.3	42.3		12.4	41.8		20.5	42.1	
Queue Length 95th (m)	23.6	76.6		28.0	67.1		22.0	56.2		32.8	56.0	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	516	1633		481	1646		274	967		232	947	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.26	0.41		0.34	0.38		0.28	0.50		0.54	0.47	

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 26.2

Intersection LOS: C

Intersection Capacity Utilization 66.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2025 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	42	36	1114	83	65	795
Future Volume (vph)	42	36	1114	83	65	795
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Ped Bike Factor			1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	2971	1446	4061	0	1653	3406
Flt Permitted	0.950				0.127	
Satd. Flow (perm)	2971	1446	4061	0	221	3406
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		39	19			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	8%	4%	5%	8%	6%
Adj. Flow (vph)	46	39	1211	90	71	864
Shared Lane Traffic (%)						
Lane Group Flow (vph)	46	39	1301	0	71	864
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	15.0	15.0	72.0		15.0	87.0
Total Split (%)	14.7%	14.7%	70.6%		14.7%	85.3%
Maximum Green (s)	11.0	11.0	67.0		11.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	

Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2025 Total Future Conditions

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			1			0
Act Effect Green (s)	9.5	9.5	78.0		86.9	86.9
Actuated g/C Ratio	0.09	0.09	0.76		0.85	0.85
v/c Ratio	0.17	0.23	0.42		0.25	0.30
Control Delay	43.6	17.0	6.0		3.7	2.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	43.6	17.0	6.0		3.7	2.3
LOS	D	B	A		A	A
Approach Delay	31.4		6.0			2.4
Approach LOS	C		A			A
Queue Length 50th (m)	4.6	0.0	43.4		1.9	16.8
Queue Length 95th (m)	10.2	10.0	58.5		4.4	24.4
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	320	190	3109		342	2903
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.14	0.21	0.42		0.21	0.30

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 5.5

Intersection LOS: A

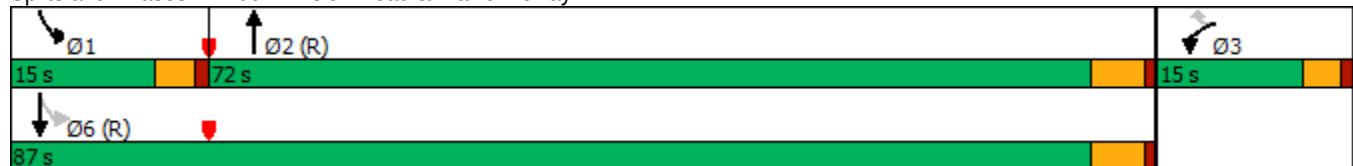
Intersection Capacity Utilization 45.9%

ICU Level of Service A

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

AM Peak Hour
2025 Total Future Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	20	18	460	6	7	309			
Future Volume (Veh/h)	20	18	460	6	7	309			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	22	20	500	7	8	336			
Pedestrians	6					2			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.97	0.97			0.97				
vC, conflicting volume	862	512			513				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	839	477			478				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	93	96			99				
cM capacity (veh/h)	323	569			1052				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	42	507	344						
Volume Left	22	0	8						
Volume Right	20	7	0						
cSH	407	1700	1052						
Volume to Capacity	0.10	0.30	0.01						
Queue Length 95th (m)	2.7	0.0	0.2						
Control Delay (s)	14.9	0.0	0.3						
Lane LOS	B		A						
Approach Delay (s)	14.9	0.0	0.3						
Approach LOS	B								
Intersection Summary									
Average Delay		0.8							
Intersection Capacity Utilization		35.2%	ICU Level of Service	A					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2025 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	329	36	108	412	66	57	133	98	149	306	144
Future Volume (vph)	70	329	36	108	412	66	57	133	98	149	306	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Frt		0.985			0.979			0.936			0.952	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3307	0	1655	3327	0	1604	3185	0	1624	3380	0
Flt Permitted	0.438			0.470			0.323			0.473		
Satd. Flow (perm)	714	3307	0	817	3327	0	544	3185	0	806	3380	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			19			107			78	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		3	3		6	4		4	4		4
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
Heavy Vehicles (%)	11%	3%	11%	3%	2%	5%	5%	3%	3%	5%	0%	0%
Adj. Flow (vph)	76	358	39	117	448	72	62	145	107	162	333	157
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	397	0	117	520	0	62	252	0	162	490	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	14.0	39.0		14.0	39.0		14.0	35.0		14.0	35.0	
Total Split (%)	13.7%	38.2%		13.7%	38.2%		13.7%	34.3%		13.7%	34.3%	
Maximum Green (s)	10.0	34.0		10.0	34.0		10.0	30.0		10.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2025 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		3			6			4			4	
Act Effect Green (s)	56.8	47.7		59.3	50.8		27.1	17.6		30.1	21.1	
Actuated g/C Ratio	0.56	0.47		0.58	0.50		0.27	0.17		0.30	0.21	
v/c Ratio	0.16	0.26		0.21	0.31		0.27	0.39		0.51	0.65	
Control Delay	11.1	18.1		11.1	17.4		25.5	21.8		31.3	35.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.1	18.1		11.1	17.4		25.5	21.8		31.3	35.1	
LOS	B	B		B	B		C	C		C	D	
Approach Delay		16.9			16.2			22.5			34.2	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	6.1	24.4		9.6	32.4		9.1	14.0		25.4	42.8	
Queue Length 95th (m)	15.0	42.8		21.4	54.3		16.9	23.4		38.0	56.3	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	493	1552		567	1665		256	1012		317	1049	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.26		0.21	0.31		0.24	0.25		0.51	0.47	

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 23.0

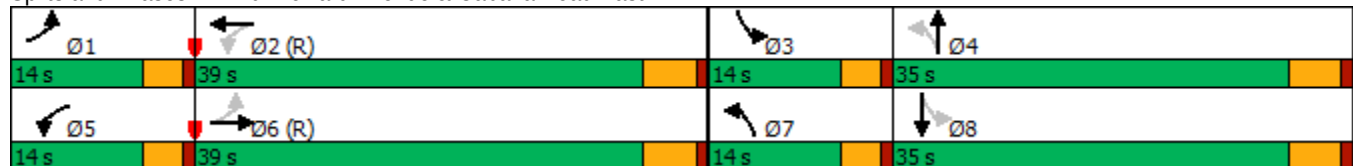
Intersection LOS: C

Intersection Capacity Utilization 64.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



HCM Unsignalized Intersection Capacity Analysis

200: Howard Avenue & Site Access

AM Peak Hour
2025 Total Future Conditions

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	17	6	445	322	7
Future Volume (Veh/h)	21	17	6	445	322	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	18	7	484	350	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				262		
pX, platoon unblocked	0.96					
vC, conflicting volume	852	354	358			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	823	354	358			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	97	99			
cM capacity (veh/h)	329	694	1212			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	41	491	358			
Volume Left	23	7	0			
Volume Right	18	0	8			
cSH	428	1212	1700			
Volume to Capacity	0.10	0.01	0.21			
Queue Length 95th (m)	2.5	0.1	0.0			
Control Delay (s)	14.3	0.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.3	0.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		38.2%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2025 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	282	272	1320	347	212	1569
Future Volume (vph)	282	272	1320	347	212	1569
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.969			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3236	1531	4070	0	1767	3539
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3236	1531	4070	0	106	3539
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		264	65			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	2%	1%	1%	2%
Adj. Flow (vph)	307	296	1435	377	230	1705
Shared Lane Traffic (%)						
Lane Group Flow (vph)	307	296	1812	0	230	1705
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	23.0	23.0	66.0		21.0	87.0
Total Split (%)	20.9%	20.9%	60.0%		19.1%	79.1%
Maximum Green (s)	19.0	19.0	61.0		17.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2025 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			2
Act Effect Green (s)	17.6	17.6	65.6		84.4	83.4
Actuated g/C Ratio	0.16	0.16	0.60		0.77	0.76
v/c Ratio	0.59	0.64	0.74		0.79	0.64
Control Delay	47.8	14.2	18.6		46.2	7.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.8	14.2	18.6		46.2	7.7
LOS	D	B	B		D	A
Approach Delay	31.3		18.6			12.3
Approach LOS	C		B			B
Queue Length 50th (m)	33.0	6.2	127.6		33.8	84.8
Queue Length 95th (m)	47.6	33.5	159.6		61.0	103.9
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	558	482	2453		337	2684
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.55	0.61	0.74		0.68	0.64

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 17.6

Intersection LOS: B

Intersection Capacity Utilization 63.9%

ICU Level of Service B

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

PM Peak Hour
2025 Total Future Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	9	11	489	19	15	687			
Future Volume (Veh/h)	9	11	489	19	15	687			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	10	12	532	21	16	747			
Pedestrians	7					1			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage veh									
Upstream signal (m)			288						
pX, platoon unblocked	0.85	0.85			0.85				
vC, conflicting volume	1328	550			560				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1297	378			389				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	93	98			98				
cM capacity (veh/h)	149	566			993				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	22	553	763						
Volume Left	10	0	16						
Volume Right	12	21	0						
cSH	249	1700	993						
Volume to Capacity	0.09	0.33	0.02						
Queue Length 95th (m)	2.3	0.0	0.4						
Control Delay (s)	20.8	0.0	0.4						
Lane LOS	C		A						
Approach Delay (s)	20.8	0.0	0.4						
Approach LOS	C								
Intersection Summary									
Average Delay		0.6							
Intersection Capacity Utilization		58.5%	ICU Level of Service	B					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2025 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	588	40	165	527	129	83	383	187	133	276	107
Future Volume (vph)	165	588	40	165	527	129	83	383	187	133	276	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Frt		0.991			0.971			0.951			0.958	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3422	0	1688	3336	0	1685	3320	0	1688	3340	0
Flt Permitted	0.272			0.287			0.446			0.180		
Satd. Flow (perm)	488	3422	0	509	3336	0	788	3320	0	320	3340	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			28			77			53	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		6	6		6	6		1	1		6
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
Heavy Vehicles (%)	1%	1%	0%	1%	1%	2%	0%	0%	2%	1%	1%	4%
Adj. Flow (vph)	179	639	43	179	573	140	90	416	203	145	300	116
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	682	0	179	713	0	90	619	0	145	416	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	18.0	38.0		18.0	38.0		16.0	38.0		16.0	38.0	
Total Split (%)	16.4%	34.5%		16.4%	34.5%		14.5%	34.5%		14.5%	34.5%	
Maximum Green (s)	14.0	33.0		14.0	33.0		12.0	33.0		12.0	33.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2025 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		6			6			1			6	
Act Effect Green (s)	56.7	44.4		56.8	44.4		35.6	25.3		39.4	29.1	
Actuated g/C Ratio	0.52	0.40		0.52	0.40		0.32	0.23		0.36	0.26	
v/c Ratio	0.47	0.49		0.46	0.52		0.27	0.75		0.58	0.45	
Control Delay	18.3	27.6		18.0	27.3		23.3	40.2		31.8	30.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.3	27.6		18.0	27.3		23.3	40.2		31.8	30.9	
LOS	B	C		B	C		C	D		C	C	
Approach Delay		25.7			25.4			38.0			31.1	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	19.7	59.8		19.7	61.4		13.1	60.6		21.8	36.4	
Queue Length 95th (m)	37.1	91.0		37.1	94.1		21.9	75.2		33.0	49.3	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	419	1383		425	1363		372	1049		264	1039	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.43	0.49		0.42	0.52		0.24	0.59		0.55	0.40	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 29.5

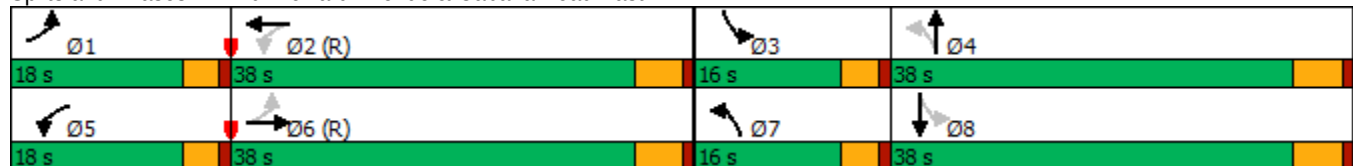
Intersection LOS: C

Intersection Capacity Utilization 71.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



HCM Unsignalized Intersection Capacity Analysis

200: Howard Avenue & Site Access

PM Peak Hour
2025 Total Future Conditions

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	14	12	20	504	672	24
Future Volume (Veh/h)	14	12	20	504	672	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	13	22	548	730	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				262		
pX, platoon unblocked	0.83					
vC, conflicting volume	1335	743	756			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1302	743	756			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	97	97			
cM capacity (veh/h)	146	418	864			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	28	570	756			
Volume Left	15	22	0			
Volume Right	13	0	26			
cSH	209	864	1700			
Volume to Capacity	0.13	0.03	0.44			
Queue Length 95th (m)	3.6	0.6	0.0			
Control Delay (s)	24.9	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	24.9	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		52.7%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2025 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	275	266	1350	430	188	1498
Future Volume (vph)	275	266	1350	430	188	1498
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.964			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1546	4090	0	1767	3574
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3204	1546	4090	0	106	3574
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		228	95			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	1%	1%	0%	1%	1%
Adj. Flow (vph)	299	289	1467	467	204	1628
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	289	1934	0	204	1628
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	22.0	22.0	68.0		18.0	86.0
Total Split (%)	20.4%	20.4%	63.0%		16.7%	79.6%
Maximum Green (s)	18.0	18.0	63.0		14.0	81.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2025 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			0
Act Efect Green (s)	16.8	16.8	66.2		83.2	82.2
Actuated g/C Ratio	0.16	0.16	0.61		0.77	0.76
v/c Ratio	0.60	0.67	0.76		0.77	0.60
Control Delay	47.6	18.7	17.5		43.5	7.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.6	18.7	17.5		43.5	7.0
LOS	D	B	B		D	A
Approach Delay	33.4		17.5			11.0
Approach LOS	C		B			B
Queue Length 50th (m)	31.7	11.9	132.4		27.1	73.4
Queue Length 95th (m)	46.1	40.7	160.4		#57.2	90.2
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	534	447	2542		296	2718
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.56	0.65	0.76		0.69	0.60

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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: 0.77

Intersection Signal Delay: 16.9

Intersection LOS: B

Intersection Capacity Utilization 64.8%

ICU Level of Service C

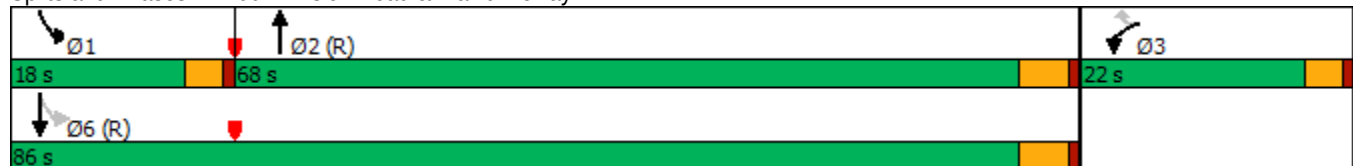
Analysis Period (min) 15

* User Entered Value

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

Queue shown is maximum after two cycles.

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

Saturday Mid-Day Peak Hour
2025 Total Future Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	13	12	480	15	14	543			
Future Volume (Veh/h)	13	12	480	15	14	543			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	14	13	522	16	15	590			
Pedestrians	6					3			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage veh									
Upstream signal (m)			288						
pX, platoon unblocked	0.86	0.86			0.86				
vC, conflicting volume	1156	539			544				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1099	380			386				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	93	98			99				
cM capacity (veh/h)	200	572			1011				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	27	538	605						
Volume Left	14	0	15						
Volume Right	13	16	0						
cSH	291	1700	1011						
Volume to Capacity	0.09	0.32	0.01						
Queue Length 95th (m)	2.4	0.0	0.4						
Control Delay (s)	18.7	0.0	0.4						
Lane LOS	C		A						
Approach Delay (s)	18.7	0.0	0.4						
Approach LOS	C								
Intersection Summary									
Average Delay		0.6							
Intersection Capacity Utilization		50.8%	ICU Level of Service	A					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2025 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	573	44	149	483	94	72	284	166	123	292	126
Future Volume (vph)	131	573	44	149	483	94	72	284	166	123	292	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00				1.00	
Frt		0.989			0.976			0.945			0.955	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3441	0	1688	3393	0	1685	3311	0	1671	3372	0
Flt Permitted	0.354			0.320			0.346			0.222		
Satd. Flow (perm)	636	3441	0	567	3393	0	613	3311	0	391	3372	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			23			107			61	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	1		8	8		1	1					1
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
Heavy Vehicles (%)	1%	0%	2%	1%	0%	1%	0%	0%	2%	2%	1%	0%
Adj. Flow (vph)	142	623	48	162	525	102	78	309	180	134	317	137
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	671	0	162	627	0	78	489	0	134	454	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	17.0	43.0		17.0	43.0		14.0	34.0		14.0	34.0	
Total Split (%)	15.7%	39.8%		15.7%	39.8%		13.0%	31.5%		13.0%	31.5%	
Maximum Green (s)	13.0	38.0		13.0	38.0		10.0	29.0		10.0	29.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2025 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		8			1			0			1	
Act Effect Green (s)	61.5	50.9		62.7	51.5		29.1	19.3		31.3	22.3	
Actuated g/C Ratio	0.57	0.47		0.58	0.48		0.27	0.18		0.29	0.21	
v/c Ratio	0.31	0.41		0.37	0.38		0.31	0.72		0.59	0.61	
Control Delay	11.9	20.8		12.6	19.5		28.5	38.3		37.7	37.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.9	20.8		12.6	19.5		28.5	38.3		37.7	37.4	
LOS	B	C		B	B		C	D		D	D	
Approach Delay		19.3			18.1			37.0			37.5	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	12.4	49.0		14.3	43.4		12.4	42.6		22.0	43.1	
Queue Length 95th (m)	24.8	76.6		28.0	68.5		22.0	57.1		34.9	57.2	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	508	1626		478	1630		271	967		231	950	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.28	0.41		0.34	0.38		0.29	0.51		0.58	0.48	

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 26.4

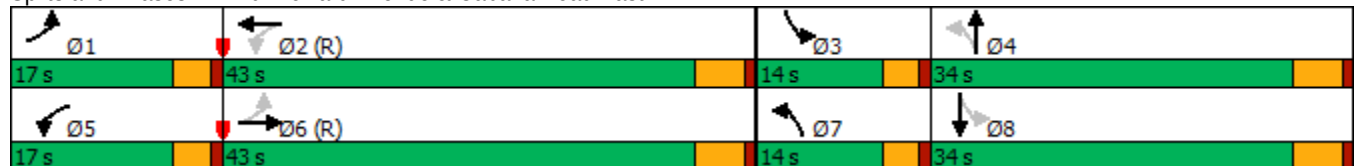
Intersection LOS: C

Intersection Capacity Utilization 66.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



HCM Unsignalized Intersection Capacity Analysis

200: Howard Avenue & Site Access

Saturday Mid-Day Peak Hour
2025 Total Future Conditions

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	20	21	476	535	21
Future Volume (Veh/h)	20	20	21	476	535	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	22	23	517	582	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				262		
pX, platoon unblocked	0.85					
vC, conflicting volume	1156	594	605			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1096	594	605			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	96	98			
cM capacity (veh/h)	198	509	983			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	44	540	605			
Volume Left	22	23	0			
Volume Right	22	0	23			
cSH	285	983	1700			
Volume to Capacity	0.15	0.02	0.36			
Queue Length 95th (m)	4.3	0.6	0.0			
Control Delay (s)	19.9	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.9	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.0				
Intersection Capacity Utilization		52.1%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2030 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	41	36	1176	81	65	849
Future Volume (vph)	41	36	1176	81	65	849
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Ped Bike Factor			1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	2971	1446	4061	0	1653	3406
Flt Permitted	0.950				0.116	
Satd. Flow (perm)	2971	1446	4061	0	202	3406
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		39	17			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	8%	4%	5%	8%	6%
Adj. Flow (vph)	45	39	1278	88	71	923
Shared Lane Traffic (%)						
Lane Group Flow (vph)	45	39	1366	0	71	923
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	15.0	15.0	72.0		15.0	87.0
Total Split (%)	14.7%	14.7%	70.6%		14.7%	85.3%
Maximum Green (s)	11.0	11.0	67.0		11.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	

Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2030 Future Background Conditions

	↖	↗	↑	↘	↙	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			1			0
Act Effect Green (s)	9.4	9.4	78.0		87.0	87.0
Actuated g/C Ratio	0.09	0.09	0.76		0.85	0.85
v/c Ratio	0.16	0.23	0.44		0.26	0.32
Control Delay	43.6	17.0	6.2		4.0	2.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	43.6	17.0	6.2		4.0	2.4
LOS	D	B	A		A	A
Approach Delay	31.2		6.2			2.5
Approach LOS	C		A			A
Queue Length 50th (m)	4.5	0.0	46.9		1.9	18.4
Queue Length 95th (m)	10.1	10.0	62.9		4.4	26.6
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	320	190	3110		328	2903
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.14	0.21	0.44		0.22	0.32

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 5.6

Intersection LOS: A

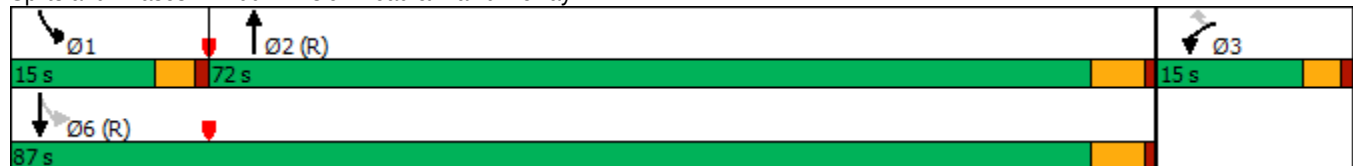
Intersection Capacity Utilization 47.0%

ICU Level of Service A

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

AM Peak Hour
2030 Future Background Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	20	18	472	6	7	324			
Future Volume (Veh/h)	20	18	472	6	7	324			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	22	20	513	7	8	352			
Pedestrians	6					2			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.96	0.96			0.96				
vC, conflicting volume	890	524			526				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	864	482			484				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	93	96			99				
cM capacity (veh/h)	310	560			1039				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	42	520	360						
Volume Left	22	0	8						
Volume Right	20	7	0						
cSH	393	1700	1039						
Volume to Capacity	0.11	0.31	0.01						
Queue Length 95th (m)	2.8	0.0	0.2						
Control Delay (s)	15.2	0.0	0.3						
Lane LOS	C		A						
Approach Delay (s)	15.2	0.0	0.3						
Approach LOS	C								
Intersection Summary									
Average Delay		0.8							
Intersection Capacity Utilization		35.9%	ICU Level of Service	A					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2030 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	354	38	116	444	69	61	141	106	153	322	147
Future Volume (vph)	73	354	38	116	444	69	61	141	106	153	322	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Frt		0.986			0.980			0.936			0.953	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3311	0	1655	3331	0	1604	3185	0	1624	3384	0
Flt Permitted	0.414			0.447			0.306			0.460		
Satd. Flow (perm)	675	3311	0	777	3331	0	516	3185	0	784	3384	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			18			115			74	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		3	3		6	4		4	4		4
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
Heavy Vehicles (%)	11%	3%	11%	3%	2%	5%	5%	3%	3%	5%	0%	0%
Adj. Flow (vph)	79	385	41	126	483	75	66	153	115	166	350	160
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	426	0	126	558	0	66	268	0	166	510	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	14.0	39.0		14.0	39.0		14.0	35.0		14.0	35.0	
Total Split (%)	13.7%	38.2%		13.7%	38.2%		13.7%	34.3%		13.7%	34.3%	
Maximum Green (s)	10.0	34.0		10.0	34.0		10.0	30.0		10.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2030 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		3			6			4			4	
Act Effect Green (s)	55.9	46.7		58.9	50.0		27.8	18.2		30.6	21.6	
Actuated g/C Ratio	0.55	0.46		0.58	0.49		0.27	0.18		0.30	0.21	
v/c Ratio	0.18	0.28		0.24	0.34		0.28	0.40		0.53	0.66	
Control Delay	11.5	18.9		11.6	18.2		25.4	21.4		31.3	35.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.5	18.9		11.6	18.2		25.4	21.4		31.3	35.7	
LOS	B	B		B	B		C	C		C	D	
Approach Delay		17.8			17.0			22.2			34.6	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	6.5	27.2		10.7	36.3		9.6	14.5		25.8	45.3	
Queue Length 95th (m)	15.5	46.5		22.8	59.3		17.7	24.4		38.9	59.3	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	469	1523		544	1642		254	1017		317	1047	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.17	0.28		0.23	0.34		0.26	0.26		0.52	0.49	

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 23.4

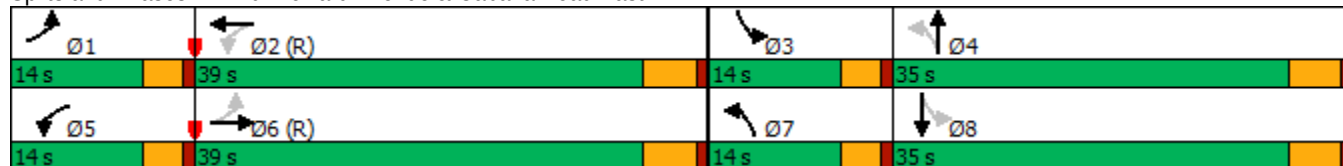
Intersection LOS: C

Intersection Capacity Utilization 65.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2030 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	279	272	1406	346	212	1663
Future Volume (vph)	279	272	1406	346	212	1663
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.970			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3236	1531	4073	0	1767	3539
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3236	1531	4073	0	106	3539
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		258	59			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	2%	1%	1%	2%
Adj. Flow (vph)	303	296	1528	376	230	1808
Shared Lane Traffic (%)						
Lane Group Flow (vph)	303	296	1904	0	230	1808
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	23.0	23.0	66.0		21.0	87.0
Total Split (%)	20.9%	20.9%	60.0%		19.1%	79.1%
Maximum Green (s)	19.0	19.0	61.0		17.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2030 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			2
Act Effect Green (s)	17.5	17.5	65.6		84.5	83.5
Actuated g/C Ratio	0.16	0.16	0.60		0.77	0.76
v/c Ratio	0.59	0.64	0.78		0.79	0.67
Control Delay	47.6	15.0	19.9		46.2	8.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.6	15.0	19.9		46.2	8.3
LOS	D	B	B		D	A
Approach Delay	31.5		19.9			12.6
Approach LOS	C		B			B
Queue Length 50th (m)	32.5	7.4	140.6		33.8	95.2
Queue Length 95th (m)	47.0	35.1	175.5		61.0	116.7
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	558	477	2454		337	2685
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.54	0.62	0.78		0.68	0.67

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.2

Intersection LOS: B

Intersection Capacity Utilization 65.4%

ICU Level of Service C

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

PM Peak Hour
2030 Future Background Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	9	11	509	19	15	712			
Future Volume (Veh/h)	9	11	509	19	15	712			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	10	12	553	21	16	774			
Pedestrians	7					1			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage (veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.83	0.83			0.83				
vC, conflicting volume	1376	572			581				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1351	380			391				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	93	98			98				
cM capacity (veh/h)	136	553			971				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	22	574	790						
Volume Left	10	0	16						
Volume Right	12	21	0						
cSH	230	1700	971						
Volume to Capacity	0.10	0.34	0.02						
Queue Length 95th (m)	2.5	0.0	0.4						
Control Delay (s)	22.3	0.0	0.4						
Lane LOS	C		A						
Approach Delay (s)	22.3	0.0	0.4						
Approach LOS	C								
Intersection Summary									
Average Delay		0.6							
Intersection Capacity Utilization		59.8%	ICU Level of Service	B					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2030 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	633	43	178	567	130	90	404	201	138	292	111
Future Volume (vph)	169	633	43	178	567	130	90	404	201	138	292	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Frt		0.990			0.972			0.950			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3419	0	1688	3340	0	1685	3316	0	1688	3344	0
Flt Permitted	0.248			0.254			0.394			0.167		
Satd. Flow (perm)	445	3419	0	450	3340	0	696	3316	0	297	3344	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			26			80			51	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		6	6		6	6		1	1		6
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
Heavy Vehicles (%)	1%	1%	0%	1%	1%	2%	0%	0%	2%	1%	1%	4%
Adj. Flow (vph)	184	688	47	193	616	141	98	439	218	150	317	121
Shared Lane Traffic (%)												
Lane Group Flow (vph)	184	735	0	193	757	0	98	657	0	150	438	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	18.0	38.0		18.0	38.0		16.0	38.0		16.0	38.0	
Total Split (%)	16.4%	34.5%		16.4%	34.5%		14.5%	34.5%		14.5%	34.5%	
Maximum Green (s)	14.0	33.0		14.0	33.0		12.0	33.0		12.0	33.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2030 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		6			6			1			6	
Act Effect Green (s)	55.1	42.8		55.7	43.1		37.1	26.5		40.0	28.0	
Actuated g/C Ratio	0.50	0.39		0.51	0.39		0.34	0.24		0.36	0.25	
v/c Ratio	0.52	0.55		0.54	0.57		0.31	0.76		0.61	0.49	
Control Delay	20.2	29.7		20.6	29.2		23.0	39.7		32.3	32.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.2	29.7		20.6	29.2		23.0	39.7		32.3	32.0	
LOS	C	C		C	C		C	D		C	C	
Approach Delay		27.8			27.4			37.6			32.1	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	20.9	68.0		22.0	68.6		14.0	64.5		22.1	38.7	
Queue Length 95th (m)	38.9	99.3		40.9	101.3		23.0	79.2		33.4	51.7	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	392	1333		393	1324		358	1050		261	1038	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.47	0.55		0.49	0.57		0.27	0.63		0.57	0.42	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 30.8

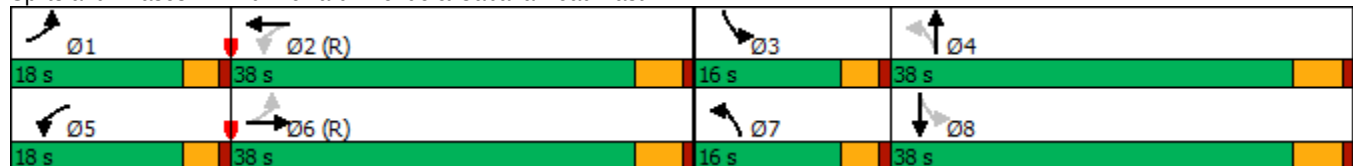
Intersection LOS: C

Intersection Capacity Utilization 73.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2030 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	271	266	1435	426	188	1594
Future Volume (vph)	271	266	1435	426	188	1594
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.966			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1546	4098	0	1767	3574
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3204	1546	4098	0	106	3574
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		222	85			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	1%	1%	0%	1%	1%
Adj. Flow (vph)	295	289	1560	463	204	1733
Shared Lane Traffic (%)						
Lane Group Flow (vph)	295	289	2023	0	204	1733
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	22.0	22.0	68.0		18.0	86.0
Total Split (%)	20.4%	20.4%	63.0%		16.7%	79.6%
Maximum Green (s)	18.0	18.0	63.0		14.0	81.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2030 Future Background Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			0
Act Effect Green (s)	16.8	16.8	66.2		83.2	82.2
Actuated g/C Ratio	0.16	0.16	0.61		0.77	0.76
v/c Ratio	0.59	0.68	0.80		0.77	0.64
Control Delay	47.5	19.8	18.8		43.5	7.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.5	19.8	18.8		43.5	7.5
LOS	D	B	B		D	A
Approach Delay	33.8		18.8			11.3
Approach LOS	C		B			B
Queue Length 50th (m)	31.2	13.1	145.3		27.1	82.7
Queue Length 95th (m)	45.4	42.3	175.7		#57.2	101.3
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	534	442	2544		296	2720
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.55	0.65	0.80		0.69	0.64

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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: 0.80

Intersection Signal Delay: 17.5

Intersection LOS: B

Intersection Capacity Utilization 66.2%

ICU Level of Service C

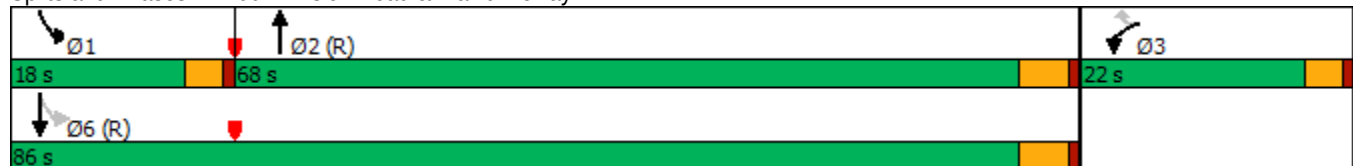
Analysis Period (min) 15

* User Entered Value

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

Queue shown is maximum after two cycles.

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

Saturday Mid-Day Peak Hour
2030 Future Background Conditions

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	13	12	494	15	14	561
Future Volume (Veh/h)	13	12	494	15	14	561
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	13	537	16	15	610
Pedestrians	6					3
Lane Width (m)	3.6					3.6
Walking Speed (m/s)	1.2					1.2
Percent Blockage	1					0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)			288			
pX, platoon unblocked	0.84	0.84			0.84	
vC, conflicting volume	1191	554			559	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1133	377			383	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	98			98	
cM capacity (veh/h)	187	563			995	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	27	553	625			
Volume Left	14	0	15			
Volume Right	13	16	0			
cSH	276	1700	995			
Volume to Capacity	0.10	0.33	0.02			
Queue Length 95th (m)	2.6	0.0	0.4			
Control Delay (s)	19.5	0.0	0.4			
Lane LOS	C		A			
Approach Delay (s)	19.5	0.0	0.4			
Approach LOS	C					
Intersection Summary						
Average Delay		0.6				
Intersection Capacity Utilization		51.7%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2030 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	618	47	161	520	91	78	301	179	123	310	126
Future Volume (vph)	131	618	47	161	520	91	78	301	179	123	310	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00				1.00	
Frt		0.989			0.978			0.944			0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3441	0	1688	3401	0	1685	3307	0	1671	3379	0
Flt Permitted	0.333			0.286			0.332			0.207		
Satd. Flow (perm)	598	3441	0	507	3401	0	588	3307	0	364	3379	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			20			111			56	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	1		8	8		1	1					1
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
Heavy Vehicles (%)	1%	0%	2%	1%	0%	1%	0%	0%	2%	2%	1%	0%
Adj. Flow (vph)	142	672	51	175	565	99	85	327	195	134	337	137
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	723	0	175	664	0	85	522	0	134	474	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	17.0	43.0		17.0	43.0		14.0	34.0		14.0	34.0	
Total Split (%)	15.7%	39.8%		15.7%	39.8%		13.0%	31.5%		13.0%	31.5%	
Maximum Green (s)	13.0	38.0		13.0	38.0		10.0	29.0		10.0	29.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2030 Future Background Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		8			1			0			1	
Act Effect Green (s)	60.0	49.4		62.2	50.4		30.2	20.3		32.2	23.2	
Actuated g/C Ratio	0.56	0.46		0.58	0.47		0.28	0.19		0.30	0.21	
v/c Ratio	0.33	0.46		0.43	0.42		0.33	0.73		0.60	0.62	
Control Delay	12.7	22.6		14.0	20.7		28.3	38.3		37.3	37.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	12.7	22.6		14.0	20.7		28.3	38.3		37.3	37.5	
LOS	B	C		B	C		C	D		D	D	
Approach Delay		21.0			19.3			36.9			37.5	
Approach LOS		C			B			D			D	
Queue Length 50th (m)	12.7	55.4		16.0	47.8		13.3	45.8		21.7	45.7	
Queue Length 95th (m)	25.6	86.6		31.1	75.3		23.2	60.4		34.2	59.7	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	482	1577		448	1599		272	969		229	948	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.29	0.46		0.39	0.42		0.31	0.54		0.59	0.50	

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 27.2

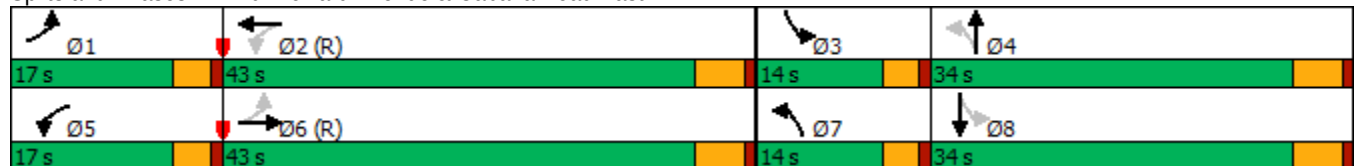
Intersection LOS: C

Intersection Capacity Utilization 68.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2030 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	42	36	1195	83	65	855
Future Volume (vph)	42	36	1195	83	65	855
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Ped Bike Factor			1.00		1.00	
Frt		0.850	0.990			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	2971	1446	4061	0	1653	3406
Flt Permitted	0.950				0.111	
Satd. Flow (perm)	2971	1446	4061	0	193	3406
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		39	18			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Confl. Peds. (#/hr)				1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	8%	4%	5%	8%	6%
Adj. Flow (vph)	46	39	1299	90	71	929
Shared Lane Traffic (%)						
Lane Group Flow (vph)	46	39	1389	0	71	929
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	15.0	15.0	72.0		15.0	87.0
Total Split (%)	14.7%	14.7%	70.6%		14.7%	85.3%
Maximum Green (s)	11.0	11.0	67.0		11.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	

Lanes, Volumes, Timings
100: Division Road & Mall driveway

AM Peak Hour
2030 Total Future Conditions

												
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT						
Lead-Lag Optimize?			Yes		Yes							
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0						
Recall Mode	None	None	C-Max		None	C-Max						
Walk Time (s)			7.0			7.0						
Flash Dont Walk (s)			18.0			18.0						
Pedestrian Calls (#/hr)			1			0						
Act Effect Green (s)	9.5	9.5	78.0		86.9	86.9						
Actuated g/C Ratio	0.09	0.09	0.76		0.85	0.85						
v/c Ratio	0.17	0.23	0.45		0.27	0.32						
Control Delay	43.6	17.0	6.3		4.1	2.4						
Queue Delay	0.0	0.0	0.0		0.0	0.0						
Total Delay	43.6	17.0	6.3		4.1	2.4						
LOS	D	B	A		A	A						
Approach Delay	31.4		6.3			2.5						
Approach LOS	C		A			A						
Queue Length 50th (m)	4.6	0.0	47.9		1.9	18.6						
Queue Length 95th (m)	10.2	10.0	64.5		4.4	26.7						
Internal Link Dist (m)	104.2		176.7			166.6						
Turn Bay Length (m)	65.0				65.0							
Base Capacity (vph)	320	190	3109		321	2903						
Starvation Cap Reductn	0	0	0		0	0						
Spillback Cap Reductn	0	0	0		0	0						
Storage Cap Reductn	0	0	0		0	0						
Reduced v/c Ratio	0.14	0.21	0.45		0.22	0.32						

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 5.6

Intersection LOS: A

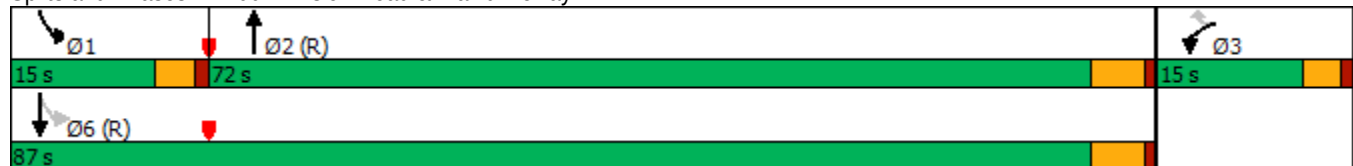
Intersection Capacity Utilization 47.4%

ICU Level of Service A

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

AM Peak Hour
2030 Total Future Conditions

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	18	493	6	7	331
Future Volume (Veh/h)	20	18	493	6	7	331
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	20	536	7	8	360
Pedestrians	6					2
Lane Width (m)	3.6					3.6
Walking Speed (m/s)	1.2					1.2
Percent Blockage	1					0
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			288			
pX, platoon unblocked	0.96	0.96			0.96	
vC, conflicting volume	922	548			549	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	897	507			508	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	96			99	
cM capacity (veh/h)	296	543			1018	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	42	543	368			
Volume Left	22	0	8			
Volume Right	20	7	0			
cSH	378	1700	1018			
Volume to Capacity	0.11	0.32	0.01			
Queue Length 95th (m)	3.0	0.0	0.2			
Control Delay (s)	15.7	0.0	0.3			
Lane LOS	C		A			
Approach Delay (s)	15.7	0.0	0.3			
Approach LOS	C					
Intersection Summary						
Average Delay		0.8				
Intersection Capacity Utilization		37.0%	ICU Level of Service	A		
Analysis Period (min)		15				

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2030 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	354	38	116	444	71	61	143	106	159	328	153
Future Volume (vph)	75	354	38	116	444	71	61	143	106	159	328	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Frt		0.986			0.979			0.936			0.952	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	3311	0	1655	3327	0	1604	3185	0	1624	3380	0
Flt Permitted	0.411			0.446			0.297			0.461		
Satd. Flow (perm)	671	3311	0	776	3327	0	501	3185	0	785	3380	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			19			115			76	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		3	3		6	4		4	4		4
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
Heavy Vehicles (%)	11%	3%	11%	3%	2%	5%	5%	3%	3%	5%	0%	0%
Adj. Flow (vph)	82	385	41	126	483	77	66	155	115	173	357	166
Shared Lane Traffic (%)												
Lane Group Flow (vph)	82	426	0	126	560	0	66	270	0	173	523	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	14.0	39.0		14.0	39.0		14.0	35.0		14.0	35.0	
Total Split (%)	13.7%	38.2%		13.7%	38.2%		13.7%	34.3%		13.7%	34.3%	
Maximum Green (s)	10.0	34.0		10.0	34.0		10.0	30.0		10.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

AM Peak Hour
2030 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		3			6			4			4	
Act Effect Green (s)	55.6	46.3		58.5	49.5		28.2	18.5		31.0	22.0	
Actuated g/C Ratio	0.55	0.45		0.57	0.49		0.28	0.18		0.30	0.22	
v/c Ratio	0.19	0.28		0.24	0.34		0.29	0.40		0.54	0.66	
Control Delay	11.8	19.3		11.8	18.6		25.1	21.3		31.5	35.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.8	19.3		11.8	18.6		25.1	21.3		31.5	35.5	
LOS	B	B		B	B		C	C		C	D	
Approach Delay		18.1			17.3			22.0			34.5	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	6.9	27.4		10.8	36.7		9.5	14.7		26.8	46.4	
Queue Length 95th (m)	16.2	47.1		23.2	60.3		17.5	24.5		40.1	60.2	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	465	1509		541	1625		253	1017		320	1047	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.18	0.28		0.23	0.34		0.26	0.27		0.54	0.50	

Intersection Summary

Area Type: Other

Cycle Length: 102

Actuated Cycle Length: 102

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 23.6

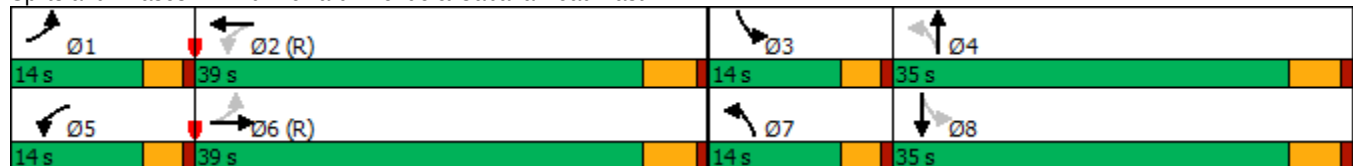
Intersection LOS: C

Intersection Capacity Utilization 65.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



HCM Unsignalized Intersection Capacity Analysis

200: Howard Avenue & Site Access

AM Peak Hour
2030 Total Future Conditions

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	17	6	478	345	7
Future Volume (Veh/h)	21	17	6	478	345	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	18	7	520	375	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				262		
pX, platoon unblocked	0.95					
vC, conflicting volume	913	379	383			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	883	379	383			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	97	99			
cM capacity (veh/h)	302	672	1187			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	41	527	383			
Volume Left	23	7	0			
Volume Right	18	0	8			
cSH	398	1187	1700			
Volume to Capacity	0.10	0.01	0.23			
Queue Length 95th (m)	2.7	0.1	0.0			
Control Delay (s)	15.1	0.2	0.0			
Lane LOS	C	A				
Approach Delay (s)	15.1	0.2	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization		39.9%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2030 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	282	272	1419	347	212	1685
Future Volume (vph)	282	272	1419	347	212	1685
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.971			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3236	1531	4077	0	1767	3539
Flt Permitted	0.950				0.057	
Satd. Flow (perm)	3236	1531	4077	0	106	3539
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		257	58			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	2%	1%	1%	2%
Adj. Flow (vph)	307	296	1542	377	230	1832
Shared Lane Traffic (%)						
Lane Group Flow (vph)	307	296	1919	0	230	1832
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	23.0	23.0	66.0		21.0	87.0
Total Split (%)	20.9%	20.9%	60.0%		19.1%	79.1%
Maximum Green (s)	19.0	19.0	61.0		17.0	82.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	5.5	5.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

PM Peak Hour
2030 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			2
Act Effect Green (s)	17.6	17.6	65.6		84.4	83.4
Actuated g/C Ratio	0.16	0.16	0.60		0.77	0.76
v/c Ratio	0.59	0.64	0.78		0.79	0.68
Control Delay	47.8	15.1	20.1		46.2	8.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	47.8	15.1	20.1		46.2	8.5
LOS	D	B	C		D	A
Approach Delay	31.7		20.1			12.7
Approach LOS	C		C			B
Queue Length 50th (m)	33.0	7.6	142.9		33.8	97.8
Queue Length 95th (m)	47.6	35.4	178.0		61.0	120.1
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	558	477	2454		337	2684
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.55	0.62	0.78		0.68	0.68

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 18.3

Intersection LOS: B

Intersection Capacity Utilization 65.8%

ICU Level of Service C

Analysis Period (min) 15

* User Entered Value

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis

110: Howard Avenue & Lily Mac Boulevard

PM Peak Hour
2030 Total Future Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	9	11	523	19	15	737			
Future Volume (Veh/h)	9	11	523	19	15	737			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	10	12	568	21	16	801			
Pedestrians	7					1			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage (veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.83	0.83			0.83				
vC, conflicting volume	1418	586			596				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1402	400			411				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	92	98			98				
cM capacity (veh/h)	127	540			956				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	22	589	817						
Volume Left	10	0	16						
Volume Right	12	21	0						
cSH	217	1700	956						
Volume to Capacity	0.10	0.35	0.02						
Queue Length 95th (m)	2.7	0.0	0.4						
Control Delay (s)	23.4	0.0	0.4						
Lane LOS	C		A						
Approach Delay (s)	23.4	0.0	0.4						
Approach LOS	C								
Intersection Summary									
Average Delay		0.6							
Intersection Capacity Utilization		61.1%	ICU Level of Service	B					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2030 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	633	43	178	567	137	90	411	201	142	296	115
Future Volume (vph)	176	633	43	178	567	137	90	411	201	142	296	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Frt		0.990			0.971			0.951			0.958	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3419	0	1688	3336	0	1685	3320	0	1688	3340	0
Flt Permitted	0.239			0.253			0.389			0.165		
Satd. Flow (perm)	429	3419	0	449	3336	0	687	3320	0	293	3340	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			27			77			53	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	6		6	6		6	6		1	1		6
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
Heavy Vehicles (%)	1%	1%	0%	1%	1%	2%	0%	0%	2%	1%	1%	4%
Adj. Flow (vph)	191	688	47	193	616	149	98	447	218	154	322	125
Shared Lane Traffic (%)												
Lane Group Flow (vph)	191	735	0	193	765	0	98	665	0	154	447	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	18.0	38.0		18.0	38.0		16.0	38.0		16.0	38.0	
Total Split (%)	16.4%	34.5%		16.4%	34.5%		14.5%	34.5%		14.5%	34.5%	
Maximum Green (s)	14.0	33.0		14.0	33.0		12.0	33.0		12.0	33.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

PM Peak Hour
2030 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		6			6			1			6	
Act Effect Green (s)	55.0	42.5		55.2	42.6		37.3	26.8		40.4	28.4	
Actuated g/C Ratio	0.50	0.39		0.50	0.39		0.34	0.24		0.37	0.26	
v/c Ratio	0.55	0.56		0.54	0.59		0.31	0.77		0.62	0.50	
Control Delay	21.1	30.0		20.8	29.7		22.9	40.0		32.8	31.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.1	30.0		20.8	29.7		22.9	40.0		32.8	31.8	
LOS	C	C		C	C		C	D		C	C	
Approach Delay		28.1			27.9			37.8			32.0	
Approach LOS		C			C			D			C	
Queue Length 50th (m)	21.9	68.3		22.2	70.1		13.9	65.7		22.7	39.3	
Queue Length 95th (m)	40.2	99.3		40.9	102.5		23.0	80.8		34.3	52.6	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	385	1323		391	1307		357	1049		261	1039	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.50	0.56		0.49	0.59		0.27	0.63		0.59	0.43	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 31.1

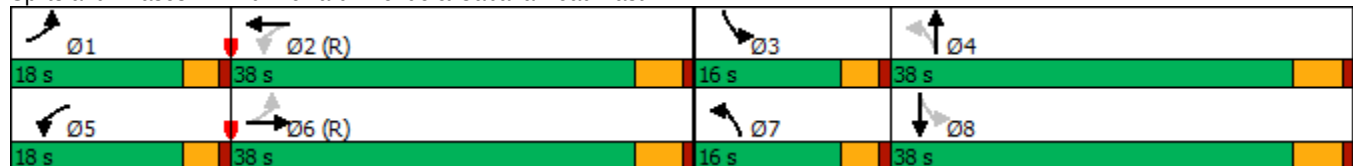
Intersection LOS: C

Intersection Capacity Utilization 74.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



HCM Unsignalized Intersection Capacity Analysis

200: Howard Avenue & Site Access

PM Peak Hour
2030 Total Future Conditions

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	14	12	20	539	722	24
Future Volume (Veh/h)	14	12	20	539	722	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	13	22	586	785	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				262		
pX, platoon unblocked	0.82					
vC, conflicting volume	1428	798	811			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1412	798	811			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	97	97			
cM capacity (veh/h)	122	389	824			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	28	608	811			
Volume Left	15	22	0			
Volume Right	13	0	26			
cSH	179	824	1700			
Volume to Capacity	0.16	0.03	0.48			
Queue Length 95th (m)	4.3	0.7	0.0			
Control Delay (s)	28.8	0.7	0.0			
Lane LOS	D	A				
Approach Delay (s)	28.8	0.7	0.0			
Approach LOS	D					
Intersection Summary						
Average Delay		0.9				
Intersection Capacity Utilization		54.6%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2030 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  			 
Traffic Volume (vph)	275	266	1451	430	188	1611
Future Volume (vph)	275	266	1451	430	188	1611
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.3	3.6	3.6	3.5	3.6
Storage Length (m)	65.0	0.0		45.0	65.0	
Storage Lanes	2	1		0	1	
Taper Length (m)	7.5				7.5	
Lane Util. Factor	0.97	1.00	*0.75	0.91	1.00	0.95
Frt		0.850	0.966			
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3204	1546	4098	0	1767	3574
Flt Permitted	0.950				0.056	
Satd. Flow (perm)	3204	1546	4098	0	104	3574
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		221	85			
Link Speed (k/h)	50		60			60
Link Distance (m)	128.2		200.7			190.6
Travel Time (s)	9.2		12.0			11.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	1%	1%	0%	1%	1%
Adj. Flow (vph)	299	289	1577	467	204	1751
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	289	2044	0	204	1751
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	6.0		3.5			3.5
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	4.8		4.8			4.8
Two way Left Turn Lane						
Headway Factor	1.09	1.04	1.00	1.00	1.01	1.00
Turning Speed (k/h)	25	15		15	25	
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases		3			6	
Detector Phase	3	3	2		1	6
Switch Phase						
Minimum Initial (s)	7.0	7.0	10.0		7.0	10.0
Minimum Split (s)	11.0	11.0	30.0		11.0	30.0
Total Split (s)	22.0	22.0	68.0		18.0	86.0
Total Split (%)	20.4%	20.4%	63.0%		16.7%	79.6%
Maximum Green (s)	18.0	18.0	63.0		14.0	81.0
Yellow Time (s)	3.0	3.0	4.0		3.0	4.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	5.0		4.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.5	3.5	4.0		3.5	4.0

Lanes, Volumes, Timings
100: Division Road & Mall driveway

Saturday Mid-Day Peak Hour
2030 Total Future Conditions

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Recall Mode	None	None	C-Max		None	C-Max
Walk Time (s)			7.0			7.0
Flash Dont Walk (s)			18.0			18.0
Pedestrian Calls (#/hr)			0			0
Act Efect Green (s)	15.4	15.4	67.7		84.6	83.6
Actuated g/C Ratio	0.14	0.14	0.63		0.78	0.77
v/c Ratio	0.65	0.70	0.79		0.77	0.63
Control Delay	50.5	21.5	17.9		44.2	7.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	50.5	21.5	17.9		44.2	7.0
LOS	D	C	B		D	A
Approach Delay	36.3		17.9			10.9
Approach LOS	D		B			B
Queue Length 50th (m)	32.5	13.6	138.6		26.9	75.2
Queue Length 95th (m)	46.1	42.6	179.4		#57.8	103.4
Internal Link Dist (m)	104.2		176.7			166.6
Turn Bay Length (m)	65.0				65.0	
Base Capacity (vph)	534	441	2598		296	2765
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.56	0.66	0.79		0.69	0.63

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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: 0.79

Intersection Signal Delay: 17.3

Intersection LOS: B

Intersection Capacity Utilization 66.7%

ICU Level of Service C

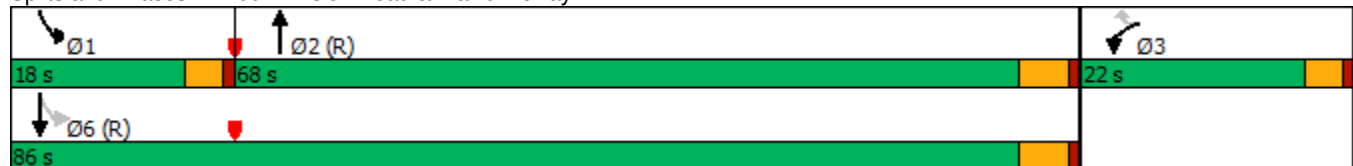
Analysis Period (min) 15

* User Entered Value

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

Queue shown is maximum after two cycles.

Splits and Phases: 100: Division Road & Mall driveway



HCM Unsignalized Intersection Capacity Analysis 110: Howard Avenue & Lily Mac Boulevard

Saturday Mid-Day Peak Hour
2030 Total Future Conditions

									
Movement	WBL	WBR	NBT	NBR	SBL	SBT			
Lane Configurations									
Traffic Volume (veh/h)	13	12	514	15	14	582			
Future Volume (Veh/h)	13	12	514	15	14	582			
Sign Control	Stop		Free			Free			
Grade	0%		0%			0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92			
Hourly flow rate (vph)	14	13	559	16	15	633			
Pedestrians	6					3			
Lane Width (m)	3.6					3.6			
Walking Speed (m/s)	1.2					1.2			
Percent Blockage	1					0			
Right turn flare (veh)									
Median type			None			None			
Median storage (veh)									
Upstream signal (m)			288						
pX, platoon unblocked	0.85	0.85			0.85				
vC, conflicting volume	1236	576			581				
vC1, stage 1 conf vol									
vC2, stage 2 conf vol									
vCu, unblocked vol	1188	407			413				
tC, single (s)	6.4	6.2			4.1				
tC, 2 stage (s)									
tF (s)	3.5	3.3			2.2				
p0 queue free %	92	98			98				
cM capacity (veh/h)	174	544			973				
Direction, Lane #	WB 1	NB 1	SB 1						
Volume Total	27	575	648						
Volume Left	14	0	15						
Volume Right	13	16	0						
cSH	259	1700	973						
Volume to Capacity	0.10	0.34	0.02						
Queue Length 95th (m)	2.8	0.0	0.4						
Control Delay (s)	20.5	0.0	0.4						
Lane LOS	C		A						
Approach Delay (s)	20.5	0.0	0.4						
Approach LOS	C								
Intersection Summary									
Average Delay		0.7							
Intersection Capacity Utilization		52.8%	ICU Level of Service	A					
Analysis Period (min)		15							

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2030 Total Future Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	139	618	47	161	520	99	78	305	179	131	314	134
Future Volume (vph)	139	618	47	161	520	99	78	305	179	131	314	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.2	3.3	3.6	3.1	3.3	3.6	3.0	3.4	3.6	3.1	3.5	3.6
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00				1.00	
Frt		0.989			0.976			0.944			0.955	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1708	3441	0	1688	3393	0	1685	3308	0	1671	3372	0
Flt Permitted	0.324			0.285			0.322			0.208		
Satd. Flow (perm)	582	3441	0	505	3393	0	571	3308	0	366	3372	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			23			108			60	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		338.8			262.0			119.8			78.0	
Travel Time (s)		24.4			18.9			8.6			5.6	
Confl. Peds. (#/hr)	1		8	8		1	1					1
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
Heavy Vehicles (%)	1%	0%	2%	1%	0%	1%	0%	0%	2%	2%	1%	0%
Adj. Flow (vph)	151	672	51	175	565	108	85	332	195	142	341	146
Shared Lane Traffic (%)												
Lane Group Flow (vph)	151	723	0	175	673	0	85	527	0	142	487	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.2			3.2			3.1			3.1	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.06	1.04	1.00	1.08	1.04	1.00	1.09	1.03	1.00	1.08	1.01	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Detector Phase	1	6		5	2		7	4		3	8	
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	33.0		11.0	33.0		11.0	30.0		11.0	30.0	
Total Split (s)	17.0	43.0		17.0	43.0		14.0	34.0		14.0	34.0	
Total Split (%)	15.7%	39.8%		15.7%	39.8%		13.0%	31.5%		13.0%	31.5%	
Maximum Green (s)	13.0	38.0		13.0	38.0		10.0	29.0		10.0	29.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0		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		0.0	0.0	
Total Lost Time (s)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lanes, Volumes, Timings
120: Howard Avenue & Cabana Road East

Saturday Mid-Day Peak Hour
2030 Total Future Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		21.0			21.0			18.0			18.0	
Pedestrian Calls (#/hr)		8			1			0			1	
Act Effect Green (s)	59.9	49.0		61.6	49.8		30.5	20.6		32.6	23.6	
Actuated g/C Ratio	0.55	0.45		0.57	0.46		0.28	0.19		0.30	0.22	
v/c Ratio	0.35	0.46		0.43	0.43		0.34	0.73		0.63	0.62	
Control Delay	13.2	22.9		14.2	21.2		28.1	38.4		38.5	37.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.2	22.9		14.2	21.2		28.1	38.4		38.5	37.2	
LOS	B	C		B	C		C	D		D	D	
Approach Delay		21.2			19.8			37.0			37.5	
Approach LOS		C			B			D			D	
Queue Length 50th (m)	13.7	55.8		16.2	49.0		13.3	46.7		23.0	46.7	
Queue Length 95th (m)	27.2	87.1		31.3	77.1		23.1	61.3		35.9	60.8	
Internal Link Dist (m)		314.8			238.0			95.8			54.0	
Turn Bay Length (m)	40.0			40.0			40.0			40.0		
Base Capacity (vph)	475	1564		444	1576		270	967		231	949	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.46		0.39	0.43		0.31	0.54		0.61	0.51	

Intersection Summary

Area Type: Other

Cycle Length: 108

Actuated Cycle Length: 108

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

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 27.5

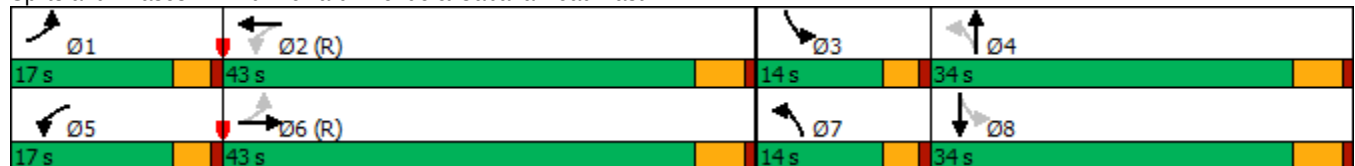
Intersection LOS: C

Intersection Capacity Utilization 68.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 120: Howard Avenue & Cabana Road East



HCM Unsignalized Intersection Capacity Analysis

200: Howard Avenue & Site Access

Saturday Mid-Day Peak Hour
2030 Total Future Conditions

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	20	21	510	574	21
Future Volume (Veh/h)	20	20	21	510	574	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	22	23	554	624	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				262		
pX, platoon unblocked	0.83					
vC, conflicting volume	1236	636	647			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1182	636	647			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	95	98			
cM capacity (veh/h)	172	482	948			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	44	577	647			
Volume Left	22	23	0			
Volume Right	22	0	23			
cSH	253	948	1700			
Volume to Capacity	0.17	0.02	0.38			
Queue Length 95th (m)	4.9	0.6	0.0			
Control Delay (s)	22.2	0.7	0.0			
Lane LOS	C	A				
Approach Delay (s)	22.2	0.7	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		53.9%		ICU Level of Service		A
Analysis Period (min)		15				

APPENDIX F

Synchro Studio 11 User Guide Lane Utilization

Slip Lanes for Roundabouts

To code a right turn slip lane at a roundabout for HCM or SimTraffic analysis, set the Right Turn Channelized to Stop, Yield, or Free. Additional right turn lane(s) will be added to the roundabout, outside of the **Outside Radius**. The width of the slip lane is determined by the width of the incoming right turn lane group.

The input fields below have the following effect:

- ✓ Right Turn Channelized = Yield or Stop: Vehicles in slip lane will yield at end of slip lane if there is a merge.
- ✓ Right Turn Channelized = Free: Vehicles in slip lane will merge at end of slip lane if there is a merge.
- ✓ Right Turn Channelized = None: No slip lane.
- ✓ Lanes and Sharing: Controls number of lanes in right turn slip lane, and number of lanes to enter main circle.
- ✓ Curb Radius (in the **SIGNING** settings): Has no effect; slip lane controlled by Outside Radius.
- ✓ Add Lanes: Slip lane will be add lane(s), provided enough lanes exist downstream.

With a small circle or with tight angles between links, the slip lanes will directly connect to the roundabout. With a larger circle or angle, the slip lanes will be additional lanes on the outside of the roundabout with an additional radius.

Alternate Method

It is also possible to create a slip lane by coding a multilane roundabout with a two-lane exit (see page 11-13). To get a direct slip lane it is necessary to code two lane exits at both the entry and the exit links. This method works best for creating a slip lane in all directions.

Combining a slip lane with a two-lane Exit may give a three-lane exit or other strange results. It is usually best to use one or the other.

Lane Utilization Factor

The Lane Utilization Factor determines how the traffic volumes assigned to a lane group are distributed across each lane. A value of one (1) indicates equal distribution across all lanes. Values less than one lower the saturation flow rate because all lanes are not working at full capacity. The Lane Utilization Factor is selected from the values in Table 9-2.

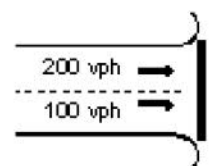


If there is an exclusive turning lane plus a shared turning lane, then all of the lanes will be placed in the through lane group to calculate this factor.

Table 9-2 Lane Utilization Factors

Lane Group Movements	# of Lanes	Lane Utilization Factor
Thru or shared	1	1.00
Thru or shared	2	0.95
Thru or shared	3	0.91
Thru or shared	4+	0.86
Left	1	1.00
Left	2	0.97
Left	3+	0.94
Right	1	1.00
Right	2	0.88
Right	3	0.76

This field can be overridden. If, for example, there is a busy shopping center entrance just after this intersection on the right side, most of the vehicles will be using the right lane and cause a lower lane utilization factor. If the actual per lane volumes are known, the lane utilization factor can be calculated as follows:



$$f_{LU} = \frac{\text{Total App. Vol.}}{(\text{No. of Lanes}) \times (\text{High Lane Vol.})} = \frac{(100 + 200)}{(2 \times 200)} = 0.75$$

f_{LU} = Lane Utilization Factor



The f_{LU} is a macroscopic adjustment and will only affect the saturation flow rates. Changes to this value have no impact on the simulated results in SimTraffic. To account for unbalanced flow in SimTraffic, be sure to code in the geometric condition that is causing condition, such as a downstream lane taper.

Right Turn Factors

The **Right Turn Factor** is used to reduce the Saturation Flow Rate based on the proportion of right-turns in the lane group and the type of lane servicing the right-turn. The default calculations from HCM 2000 can be overridden by the user.

Exclusive Lane: $f_{RT} = 0.85$

Shared Lane: $f_{RT} = 1.0 - (0.15) P_{RT}$

Single Lane: $f_{RT} = 1.0 - (0.135) P_{RT}$

P_{RT} = Proportion of right turn traffic in lane group

The permitted right turn factor is used during the through phase for this approach. The protected right-turn factor is used if an exclusive right-turn lane is provided and a Protected Phase is assigned from a concurrent left-turn (right-turn overlap signal).