

REGENCY LINKS TRAFFIC IMPACT STUDY

REVISED REPORT



PREPARED FOR:
QUAD-RAM CONSTRUCTION LIMITED

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1 INTRODUCTION

Background

Plans are being prepared for a multi-use development consisting of about 3,830 residential units and 155,665 square feet of commercial space on vacant land north of the Bayers Lake Business Park in Halifax, Nova Scotia, see Figure 1. Buildout of the development is expected by 2034. The Halifax Regional Municipality (HRM) has requested that a Traffic Impact Study (TIS) be completed to review the impacts to the adjacent transportation network. WSP Canada Inc. has been retained to complete this TIS.

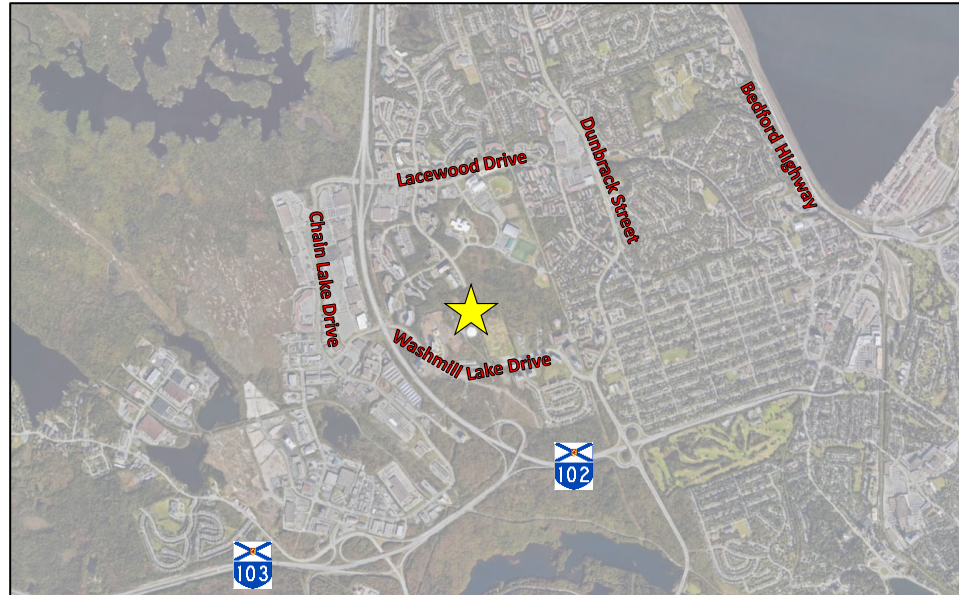


Figure 1 – Development Location

A Traffic Impact Study Usually Considers Four Questions

A TIS usually consists of determining answers to the following questions:

1. **What is the existing transportation situation** adjacent to the study site? How have volumes changed historically?
2. **What transportation changes are expected** at key Study Area locations? How many vehicle trips are expected to be generated by the proposed development during weekday peak hours? What routes are the trips expected to use to travel within and through the Study Area?
3. **What transportation impacts will occur** on Study Area roads, sidewalks, and intersections?
4. **What transportation improvements are required** to mitigate project impacts on Study Area travel? Are there transportation modifications that should be made to improve the travel experience for all users?

Study Objectives

The objectives of the traffic impact study are to:

1. Develop projected 2039 background weekday AM and PM peak hourly traffic volumes for Study Intersections. This includes connection of Regency Park Drive and diverted traffic but does not include site development.
2. Estimate the number of weekday AM and PM peak hour vehicle trips that will be generated by the proposed development.
3. Distribute and assign site generated trips to Study Intersections to project 2039 peak hourly volumes that include site generated trips.
4. Evaluate impacts of site generated traffic on the performance of Study Intersections.
5. Complete warrant analyses, as necessary, for Study Intersections and recommend improvements that may be needed at Study Intersections to mitigate the impacts of site development.

2 STUDY AREA DESCRIPTIONS

Description of Existing Development

The proposed development area is on the vacant land bounded by Washmill Lake Drive and Thomas Raddall Drive.

Description of Proposed Development

The proposed development is planned to include 3,830 high-rise residential units and 155,665 square feet of ground floor retail space. The study will consider the build out development scenario with a study horizon year of 2039.

A concept of the proposed development is shown in Figure 2. The proposed development consists of 18 residential towers, of which ten are expected to have commercial space.



Figure 2 - Site Concept

Existing Study Road Descriptions

Washmill Lake Drive is a four-lane major collector through Clayton Park, running from Chain Lake Drive in the west to Dunbrack Street in the east with a speed limit of 60 km/h in this area. There are sidewalks and dedicated bicycle lanes on both sides of Washmill Lake Drive.

Regency Park Drive is a two-lane major collector with a speed limit of 50 km/h that runs south from Lacewood Drive about 850m to its current terminus. There are sidewalks on both sides of the road and no existing dedicated bicycle lanes.

Parkland Drive is a two-lane major collector with a speed limit of 50 km/h. Parkland Drive is a continuation of Regency Park Drive north of Lacewood Drive. There are sidewalks on both sides of the road and no dedicated bicycle lanes.

Lacewood Drive is a four-lane arterial with a posted speed limit of 60 km/h at the study intersections. There are sidewalks on both sides of the road and no dedicated bicycle lanes.

Dunbrack Street is a four-lane arterial with a posted speed limit of 60 km/h. There is a multi-use path on the east side of the street.

The traffic study includes review of one existing intersection north of the site as well as two proposed intersections. These intersections are shown in Figure 3 and a description of each is provided below.

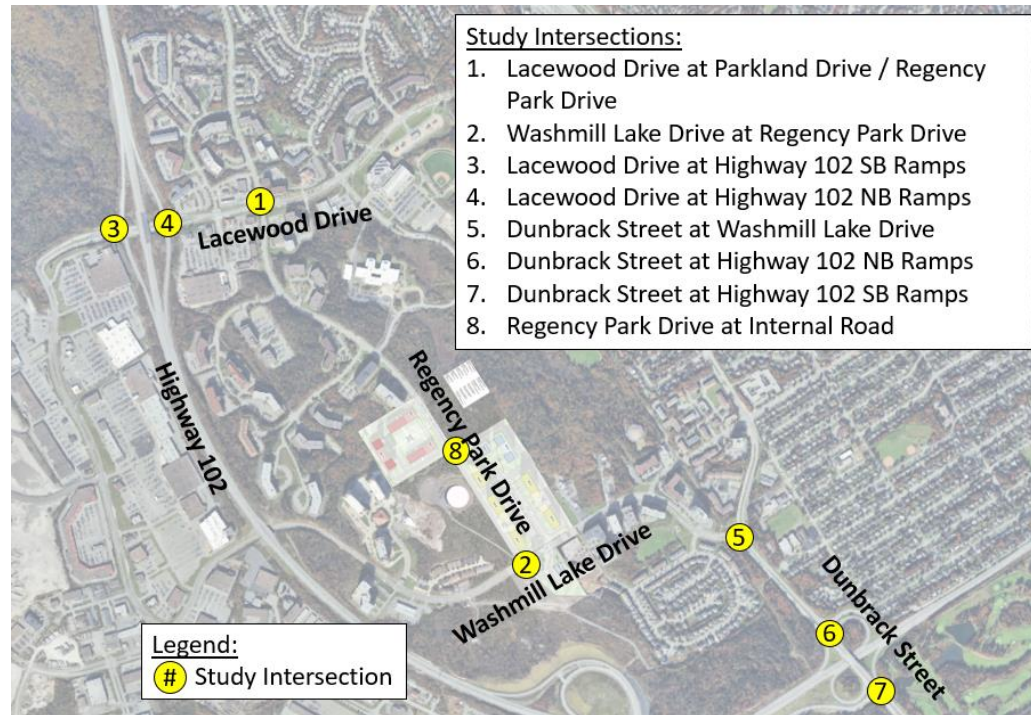


Figure 3 - Study Intersections

Intersection #1 – Lacewood Drive at Parkland Drive/Regency Park Drive is a 4-leg signalized intersection with a left-turn lane, two through lanes, and a right-turn channelized lane in the eastbound and westbound directions (Lacewood Drive approaches); and a left-turn lane, a through lane, and a right-turn channelized lane in the northbound and southbound directions. All approaches have marked pedestrian crossings.

Intersection #2 – Washmill Lake Drive at Regency Park Drive is a proposed 4-leg intersection. Washmill Lake Drive is a four-lane roadway running east-west with a proposed street connection (Regency Park Drive) as the southbound approach and a driveway for the proposed development forming the northbound approach.

Intersection #3&4 – Lacewood Drive at the Highway 102 Ramps are 4-leg signalized multi-lane intersections. The northbound approaches have marked pedestrian crossings.

Intersection #5 – Dunbrack Street at Washmill Lake Drive is a 3-leg signalized intersection with a left-turn lane and two through lanes in the northbound direction, two through lanes and a channelized right-turn lane in the southbound direction, and a shared through/left-turn lane and a right-turn channelized lane in the eastbound direction. All approaches have marked pedestrian crossings.

Intersection #6&7 – Dunbrack Street at the Highway 102 Ramps are 4-leg unsignalized multi-lane intersections. These intersections are not accessible by pedestrians.

Intersection #8 – Regency Park Drive at Internal Road is a proposed 4-leg intersection. Regency Park Drive is a proposed two-lane roadway running north-south with a proposed street connection (Internal Road) as the eastbound and westbound approaches.

3 BACKGROUND TRAFFIC

Turning Movement Counts

Turning movement counts were collected at the Lacewood Drive at Regency Park Drive / Parkland Drive and Washmill Lake Drive at Bently Drive intersections on Wednesday, June 21, 2023 for the PM peak period and on Thursday, June 22, 2023 for the AM peak period. The counts at the Bently Drive intersection were used to estimate the two-way volumes along Washmill Lake Drive fronting the site and project the future volumes at the Washmill Lake Drive at Regency Park Drive intersection.

Additional turning movement counts were collected at the Lacewood Drive intersections (study intersection 1, 3, and 4) on Tuesday, April 23, 2024 for the PM peak period and on Wednesday, April 24, 2024 for the AM peak period.

Further turning movement counts were collected at the Dunbrack Street intersections (study intersection 5, 6, and 7) on Tuesday, November 19, 2024 for the AM and PM peak periods.

Intersection counts have been tabulated in 15-minute intervals with peak hours indicated by shaded areas. Pedestrian volumes are summarized in hourly increments. Turning movement counts are summarized in Tables A-1 to A-8, Appendix A. No Seasonal adjustment factor has been applied since the HRM factors for each of the counted days are below 1.0 and would result in a reduction from the observed volumes.

Traffic Growth Rate

An annual growth rate of 0.5% was applied to project the 2039 Future Background Volumes (see Figure A-2, Appendix A). This is expected to account for continuing development in the area in additional vehicle trips generated by population increases in the area and coincides with the HRM 0.5% annual traffic growth target.

Redistribution of Background Traffic to the Extended Regency Park Drive

With the proposed extension of Regency Park Drive, it is anticipated that some background traffic in the current roadway network will redistribute their trips to the extended roadway. The projected 2039 Future Background Volumes with the Extension of Regency Park Drive are shown in Figure A-3, Appendix A.

Background Development Trips

Trip Generation Study, Bayers Lake Expansion Lands (WSP, April 2022) estimates the generated trips for the new Community Outpatient Centre in the Bayers Lake area. It was estimated that that development will generate:

- 246 two-way trips (165 entering and 81 exiting) during the AM peak hour; and,
- 234 two-way trips (82 entering and 152 exiting) during the PM peak hour.

The Community Outpatient Centre trips were applied to the 2039 future background volumes along Lacewood Drive and Washmill Lake Drive without site generated trips to provide a realistic estimate of traffic during this period.

4 ACTIVE TRANSPORTATION AND TRANSIT

Active Transportation

Sidewalk facilities and / or multi-use paths are available along each of the study roads and sidewalk is planned for both sides along the extended Regency Park Drive. Bicycle facilities are also planned for the extended Regency Park Drive and the developer intends to work with HRM to ensure the desired bicycle facility type is put in place with the road extension. It is understood that HRM has recently completed a project to review and recommend the type of bicycle facilities on Parkland Drive up to Lacewood Drive and includes options for providing bicycle facilities crossing at the Lacewood Drive intersection. While the exact bicycle facility type proposed for Parkland Drive is not yet finalized and the design has not been completed, it is recommended that HRM consider extending the preferred bicycle facility type along the current and extended Regency Park Drive to connect to the existing bicycle lanes along Washmill Lake Drive. Figure 4 shows the existing and candidate bicycle facility routes within the surrounding area.

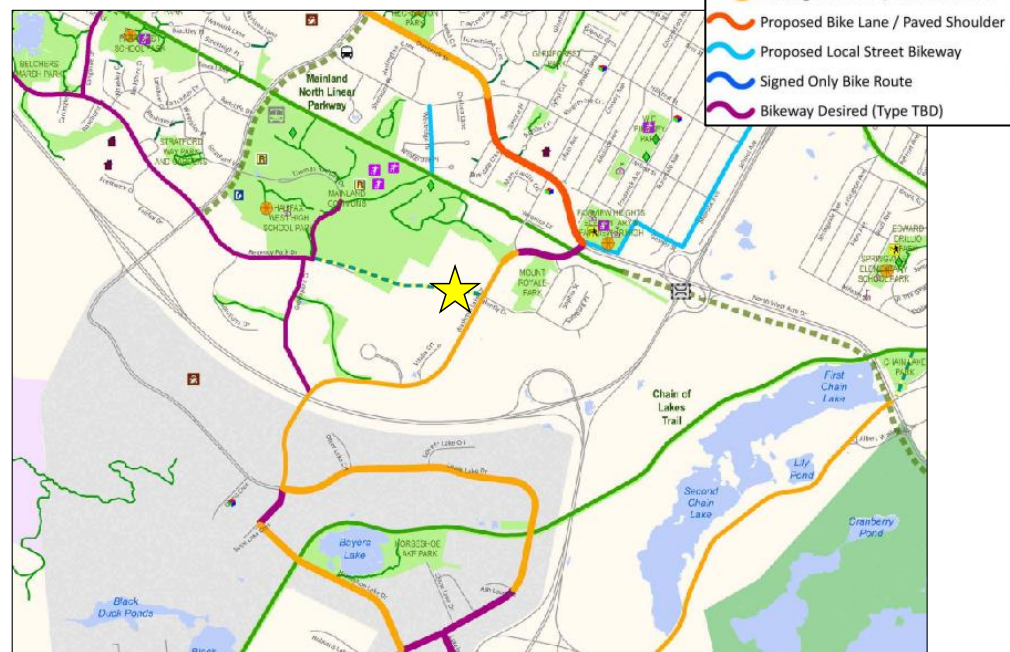


Figure 4 – Candidate Bicycle Facilities
Extracted from Map 2C, Making Connections, Halifax

Transit

There are many transit stops in the area. Transit stops #6719 and #7446 are along Washmill Lake Drive near Bently Drive just to the east of the site, and there are several transit stops and routes along the existing portion of Regency Park Drive and Thomas Raddall Drive. The site is about 1.3km from the Lacewood Terminal, which is serviced by Halifax Transit routes #2, #3, #4, #21, #28, #30, #39, #135, #136, #137, #138, and #433. The existing transit network in the area is shown in Figure 5.

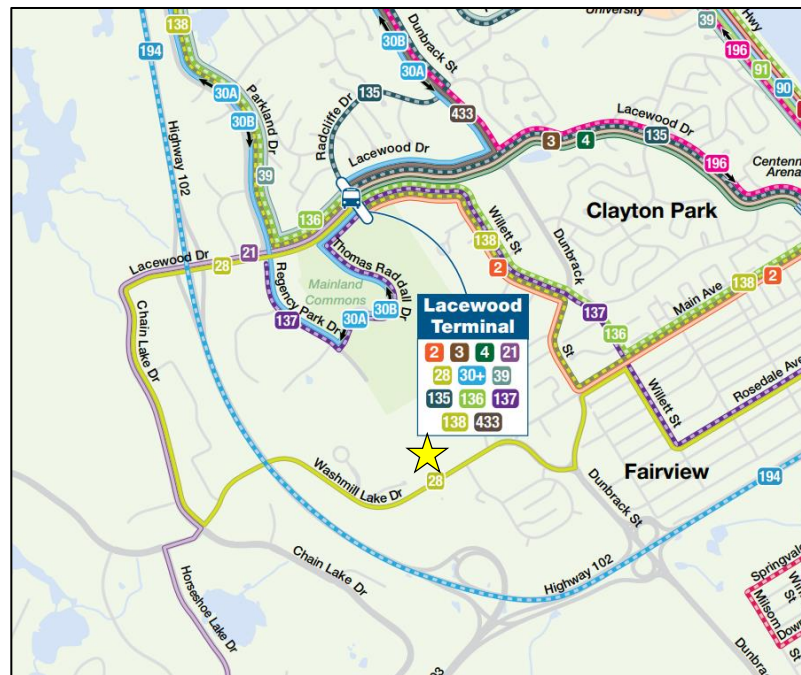


Figure 5 – Existing Halifax Transit Routes

A transit route (#137, Regency Park Express) running along the extended Regency Park Drive fronting the site and connecting to Scotia Square (AM) and Lacewood Terminal (PM) was proposed in Map 1 of the Council Approved Halifax Transit Moving Forward Together Plan (See Figure 6). It is anticipated that the extended street will include routing of transit fronting the site given the current routing along Regency Park Drive and Washmill Lake Drive (See Figure 5) and the proximity to the Lacewood Terminal.



Figure 6 – Proposed Transit Routes in the project area
Extracted from Map 1, Halifax Transit Moving Forward Together Plan

HRM has completed a rapid transit strategy that would see the implementation of four Bus Rapid Transit (BRT) lines and three new ferry routes which will “promote the creation of more compact and walkable communities and increase mobility options alternative to private vehicles”. The proposed green line is planned to travel between the Lacwood Terminal and SMU and would provide frequent and reliable transit service between the study area and Peninsular Halifax.



Figure 7 – HRM Rapid Transit Strategy – Proposed Routes

5 TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT

Prepared Trip Generation Estimates

When using the published trip generation rates in the Trip Generation Manual, the transportation engineer's objective should be to provide a realistic estimate of the number of trips that will be generated by the proposed development.

Proposed Development

The proposed development is expected to include 3,830 high-rise residential units and 155,665 square feet of ground floor retail space.

Anticipated Land Use for the Proposed Development

Trip generation estimates for the proposed development were prepared using published rates and equations from *Trip Generation Manual, 11th Edition* (Institute of Transportation Engineers, Washington, 2021). Trip generation estimates for the AM and PM peak hours of adjacent streets have been prepared based on the number of units for residential developments and 1,000 square feet of leasable area for the retail space.

Based on the proposed development's proximity to numerous amenities and that the site lies within an area of HRM with high active transportation and transit usage, many of the trips generated by the proposed development are anticipated to be non-auto trips. Using the methodology provided in *Trip Generation Handbook, 3rd Edition* (Institute of Transportation Engineers, Washington, 2017), estimates of the total person trips generated by the development were prepared (See Table 1).

With residential and retail land uses planned for this development, many of the trips generated by the site are expected to be internal trips, those that are made between complementary land uses within the development, such as a resident visiting a store on the ground level who never leaves the site. The National Cooperative Highway Research Program (NCHRP) Report 684 – *Enhancing Internal Trip Capture for Mixed-Use Developments* provides an estimation tool for considering internal trips. Output worksheets from this estimation tool are included in Appendix B.

Appendix B of the ITE Trip Generation Handbook, 3rd Edition (2017) includes baseline modal share data for a variety of land use types including apartments and shopping centers.

Appendix B of the Handbook indicates that the modal share of the sample trip data for apartment and shopping center land uses was 96%-100% vehicle trips.

For this development, it is expected that significantly more than 0-4% of the person trips will be by transit and active modes and the multimodal trip generation methodology identified in Figure 3.1 of the Handbook has been applied to the trip generation estimates for this development.

Trips Generated by the Proposed Development – Total Trips Generated

Trip generation estimates for the proposed development are summarized in Table 1. It is estimated that the development will generate:

- 1,415 two-way external person trips (516 entering and 899 exiting) during the AM peak hour; and,
- 2,116 two-way external person trips (1,204 entering and 912 exiting) during the PM peak hour.

Table 1 – Trip Generation Estimates for the Proposed Development

Land Use ¹	Units ²	Trip Generation Rates ³				Trip Generation Estimates ³			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Multifamily Housing (High Rise) 222 MU1, MU2, MU3, MU5, MU6, MU9	1372	Equations from Page 307 & 308				83	237	236	144
Multifamily Housing (High Rise) 222 MU4, MU7, MU8, MU10	946					59	168	167	102
Multifamily Housing (High Rise) 222 MU11, MU12	420					29	82	82	50
Multifamily Housing (High Rise) 222 MU13, MU14, MU15, MU16, MU17, MU18	1092					67	192	190	117
Strip Retail Plaza (<40k GLA) 822 MU1, MU2, MU3, MU5, MU6, MU9	88.1 KGLA	Rates from Pages 230 & 231				125	83	290	290
Strip Retail Plaza (<40k GLA) 822 MU4, MU7, MU8, MU10	67.6 KGLA					96	64	223	223
Baseline Vehicle Trip Estimate for the Proposed Development						459	826	1188	926
Total Person Trips ⁴						528	911	1397	1105
Internal Person Trips ⁵						12	12	193	193
External Person Trips ⁵						516	899	1204	912
NOTES: 1. Rates and equations are from <i>Trip Generation, 11th Edition</i> , Institute of Transportation Engineers, 2021. Directional splits were corrected using the Errata released by ITE. 2. KGLA is 'Gross Leasable Area x 1000 SF'. 3. Rates are 'vehicles per hour per unit'; trips generated are 'vehicles per hour for peak hours'. 4. Baseline vehicle trips using historical trip generation dara from Trip Generation, 11th Edition have been converted to person trips using methodology and conversion factors provided in Trip Generation Handbook, 3rd Edition (Institute of Transportation Engineers, 2017). 5. Internal and external person trip estimates are based on methodology from National Cooperative Highway Research Program (NCHRP) 684 with associated worksheets provided in Appendix B.									

Estimated Modal Shares of Development Trips

The site is located near the Lacewood Transit Terminal and several transit routes and there are existing or planned bicycle facilities along Washmill Lake Drive, Regency Park Drive, and Parkland Drive with existing or planned active transportation connections to the Mainland North Trail, the Bayers Lake Business Park, and the Chain of Lakes Trail (See Section 4). HRM's Integrated Mobility Plan (IMP) sets a modal share target that by 2031 at least 26% of all person trips in the Inner Suburban Area will be made by transit or active transportation. The horizon year for this TIS is 2039 and this site is located within a five-minute bike ride of a major transit terminal (Lacewood) as well as near several existing and planned active transportation facilities. While it is expected that the non-auto modal share of site trips will exceed the HRM targets for this area, a conservative 25% modal share of transit and active transportation has been applied to site generated person trips. The non-auto modal share for this area in 2016 was about 25%.

It is estimated that the development will generate:

- 919 two-way vehicle trips (335 entering and 584 exiting) during the AM peak hour; and,
- 1,376 two-way vehicle trips (783 entering and 593 exiting) during the PM peak hour.

Table 2 –Total Trip Generation Estimates for the Proposed Development

Travel Mode	Modal Share	AM Peak		PM Peak	
		In	Out	In	Out
External Person Trips		516	899	1204	912
Auto Driver	65%	335	584	783	593
Auto Passenger	10%	52	90	120	91
Transit	20%	103	180	241	182
Active Modes	5%	26	45	60	46



**Rationalization
of Estimated
Modal Share**

The projected transit modal share for the proposed development considers the proximity of the Lacewood terminal, the existing transit routes along Washmill Lake Drive fronting the site, and the planned transit route along the extended Regency Park Drive.

The projected active transportation modal share for the proposed development considers the existing bicycle lanes and sidewalk along Washmill Lake Drive, the sidewalk and bicycle facilities planned for the extended Regency Park Drive, and the proximity of the site to the Bayers Lake business park, and several nearby facilities such as Halifax West High School, Canada Games Center, and the Lacewood Square retail development.

**Trip
Distribution and
Assignment**

The proposed development generated trips were distributed to the Study Intersections based on counted volumes and review of travel origin and destinations around the site. For retail development attraction, regional residential development has been considered. For new residential development, employment densities and retail draws have been considered. The estimated directional distributions are provided below.

Direction	Residential	Commercial
North on Parkland Drive	5%	5%
South/West on Washmill Lake Drive	25%	30%
North/East to Lacewood Drive	15%	15%
East on Washmill Lake Drive	30%	25%
North/West to Lacewood Drive	25%	25%

**Volume
Figures**

Weekday AM and PM peak hourly estimated site generated vehicle volumes (See Table 2) were distributed and assigned to external streets and intersections in the study area using the above assumptions. Assigned AM and PM peak hourly site generated volumes are illustrated diagrammatically in Figure A-4, Appendix A. Assigned site development trips were added to background volumes with redistribution for the extended Regency Park Drive (Figure A-3) to provide estimates of the AM and PM peak hour volumes at study area intersections for development build-out which are illustrated diagrammatically on Figure A-5, Appendix A.

6 INTERSECTION OPERATIONAL ANALYSIS

Intersection Operational Analysis was completed to estimate how intersections may be expected to operate into the future without and with site generated trips. This section of the report addresses how left-turn lane warrants and traffic signal warrants were conducted and how each intersection was evaluated. The following subsections identify each study intersection and summarize the results of the operational analysis.

Left-Turn Lane Warrant Analysis

Left-turn movements on a street may cause both operational and safety problems. Operational problems result as a vehicle stopped waiting for an opportunity to turn across 'heavy' opposing traffic causes a queue of stopped vehicles to form. Safety problems result from rear end collisions when a stopped left-turning vehicle is struck by an advancing vehicle, or from head-on or right-angle collisions when a left-turning vehicle is struck by an opposing vehicle.

The *Geometric Design Standards for Ontario Highways Manual* contains a nomograph for left-turn lane analysis for four-lane undivided streets at unsignalized intersections. The analysis method, which is normally used by WSP Atlantic to evaluate the warrant for left-turn lanes along four lane roadways, uses a nomograph that considers left-turning volume and opposing volume. A point, based on left turning and 'opposing' volumes, plotted to the right of the 'warrant line' indicates that a left-turn lane is warranted for the conditions used in the analysis. Similarly, a point that is plotted to the left of the warrant line indicates that a left-turn lane is not warranted.

Evaluation of left turn lane warrants were completed for the Washmill Lake Drive at Regency Park Drive intersection using 2039 traffic volumes with redistribution of existing traffic onto the extended Regency Park Drive without and with the proposed development and for the Regency Park Drive at Internal Road intersection. **A left-turn lane is warranted** in the eastbound direction on Washmill Lake Drive at Regency Park Drive without and with the addition of site generated trips. A westbound left turn lane is found to be warranted at that intersection with the addition of site generated trips. **A left-turn lane is warranted** in the northbound and southbound directions at the Regency Park Drive and Internal Road intersection (Study Intersection #8).

The addition of a warranted left-turn lane has been identified based on safety of left turning vehicles but are at the discretion of HRM based on operational needs and right-of-way limitations. Left-turn lane warrant results are available in Figure B-1 and Figure B-2, Appendix B.

A signal warrant analysis is completed to determine if the installation of traffic signals at an intersection will provide a positive impact on total intersection operation. That is, the benefits in time saved and improved safety that will accrue to vehicles entering from a side street will exceed the impact that signals will have in time lost and potential additional collisions for vehicles approaching the intersection on the main street.

The *Canadian Traffic Signal Warrant Matrix Analysis (Transportation Association of Canada (TAC), 2005)* considers 100 warrant points as an indication that traffic signals will provide a positive impact. Signal warrant analysis uses vehicular and pedestrian volumes, and intersection, roadway and study area characteristics to calculate a warrant point value.

Evaluation of traffic signal warrants were completed for the Washmill Lake Drive at Regency Park Drive intersection using 2039 traffic volumes with the proposed development and **traffic signals are warranted** (277 vehicle warrant points) with the addition of site generated trips. Evaluation of traffic signal warrants were completed for the Regency Park Drive at Internal Road intersection using 2039 traffic volumes with the proposed development and **traffic signals are not warranted** (79 vehicle warrant points). Signal warrant results are available in Tables B-1, B-2, and B-3, Appendix B.

Evaluation of traffic signal warrants were completed for the Dunbrack Street at Highway 102 Ramp intersections using 2039 traffic volumes without and with the proposed development and **traffic signals are warranted** without and with the addition of site generated trips. Signal warrant results are available in Tables B-4, B-5, B-6, and B-7, Appendix B.

- Dunbrack Street @ 102 NB Ramps – Future Background **(142 warrant points)**
- Dunbrack Street @ 102 NB Ramps – Site Trips **(186 warrant points)**
- Dunbrack Street @ 102 SB Ramps – Future Background **(316 warrant points)**
- Dunbrack Street @ 102 SB Ramps – Site Trips **(350 warrant points)**

**Intersection
Capacity
Analysis
Results**

Synchro 11 software has been used for performance evaluation of the Study Intersections. Summaries of the results are provided in the following sub-sections and detailed results of the analyses are included in Appendix C.

While Synchro is used to determine macro level delays and LOS at intersections, SimTraffic is a microscopic model that simulates real world conditions. Each vehicle in a traffic system is individually tracked through a SimTraffic model and comprehensive measures of effectiveness are collected on every vehicle during each 0.1 second of the simulation. SimTraffic analysis has been completed for ten 1-hour runs with results for the PM peak hour for scenario 2 and reported for select intersections.

It should be noted that all signalized intersections were analyzed using optimized signal timings.

6.1 ANALYSIS SCENARIOS

**Summary
Analysis
Scenarios
Considered**

Scenario 1A - Future 2039 without Site: Represents future 2039 traffic volumes on the existing road network, including the existing traffic control and lane configurations of the Study Intersections.

Scenario 1B - Future 2039 without Site – Diverted Trips: Represents future 2039 traffic volumes with future diverted trips onto the Regency Park Drive connection. The study intersections have been modified to accommodate an eastbound left-turn lane on Washmill Lake Drive at Regency Park Drive based on the warrants summarized in Appendix B.

Scenario 2 - Future 2039 with Site: Represents future 2039 traffic volumes on the existing road network, including the existing traffic control and lane configurations of the Study Intersections with buildout of the proposed development. The study intersections have been modified to accommodate left-turn lanes and traffic signalization at the Washmill Lake Drive at Regency Park Drive intersection based on the warrants summarized in Appendix B.

6.2 INT #1: LACEWOOD DRIVE AT REGENCY PARK DRIVE

Operational performance results for this intersection are provided in Table 3 for both the AM and PM peak hours for each of the analysis scenarios.

The intersection is expected to operate within HRM acceptable limits laid out in HRM's current TIS Guidelines during the AM and PM peak hours without and with site generated trips. The maximum v/c ratio is projected to be 0.75 for the westbound left-turn movement. Some changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 3 - Intersection Capacity Analysis: Lacewood Drive at Regency Park Drive

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement												Overall Intersection	
	Lacewood Drive						Regency Park Drive			Parkland Drive				
	EB-L	EB-TT	EB-R	WB-L	WB-TT	WB-R	NB-L	NB-T	NB-R	SB-L	SB-T	SB-R	Delay	Control
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-1)														
Delay	7.8	18.3	9.7	7.7	16.4	7.1	19.9	15.8	5.2	23.5	16.1	5.1	14.2	
v/c	0.18	0.49	0.28	0.18	0.33	0.20	0.38	0.11	0.28	0.54	0.15	0.31		
Queue	13.0	42.0	18.1	12.5	28.1	11.9	25.4	12.0	11.0	36.3	14.7	11.6		
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-17)														
Delay	7.5	18.0	8.6	7.9	14.6	6.5	19.2	16.1	5.1	23.2	16.9	5.2	13.6	
v/c	0.14	0.46	0.24	0.23	0.26	0.17	0.34	0.17	0.34	0.53	0.24	0.26		
Queue	10.6	37.2	14.6	15.1	25.2	11.0	21.7	15.6	12.2	33.8	20.8	10.3		
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-31)														
Delay	10.2	22.5	15.5	11.8	18.8	7.3	28.1	16.0	4.3	20.8	16.3	5.0	16.5	
v/c	0.16	0.53	0.45	0.37	0.31	0.18	0.69	0.20	0.42	0.46	0.23	0.24		
Queue	14.4	47.3	33.8	28.1	34.5	12.2	54.1	21.3	14.3	35.5	24.7	11.1		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-9)														
Delay	12.6	20.4	10.8	9.1	21.9	11.4	29.7	21.0	6.4	27.3	20.6	6.0	17.6	
v/c	0.62	0.60	0.31	0.37	0.61	0.32	0.58	0.24	0.23	0.50	0.20	0.37		
Queue	39.1	60.6	23.6	21.7	56.6	22.7	41.8	23.8	10.7	35.8	20.8	14.3		
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-24)														
Delay	9.8	21.4	10.4	9.1	19.6	10.4	28.6	23.5	11.5	28.9	22.0	8.3	17.5	
v/c	0.47	0.60	0.29	0.43	0.53	0.30	0.54	0.42	0.38	0.54	0.32	0.33		
Queue	30.6	57.6	20.2	27.5	50.4	21.1	36.9	39.1	21.6	35.7	30.2	16.0		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-39)														
Delay	15.4	30.3	27.2	23.3	24.6	12.3	43.9	22.9	12.7	25.4	22.1	9.9	24.5	
v/c	0.55	0.69	0.72	0.75	0.53	0.31	0.31	0.32	0.32	0.32	0.32	0.32		
Queue	39.1	71.0	70.3	74.1	60.8	23.9	92.4	46.8	36.1	36.6	39.4	20.1		

6.3 INT #2: WASHMILL LAKE DRIVE AT REGENCY PARK DRIVE

Operational performance results for this intersection are provided in Table 4 for both the AM and PM peak hours for each of the analysis scenarios. Left-turn lanes and signals are included as warranted.

With added left turn lanes as warranted and with signalization in Scenario 2, the intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours without and with site generated trips. The maximum v/c ratio is projected to be 0.82 in the westbound direction during the PM peak hour. While the operations at this intersection are expected to meet HRM thresholds, consideration could be given to the construction of a westbound right turn lane (recommended 60 metre storage) to improve the delay and queueing on this approach. This lane would be particularly advantageous if transit vehicles are expected to complete this right turn movement during the PM peak period to travel to the Lacewood Terminal.

Table 4 - Intersection Capacity Analysis: Washmill Lake Drive at Regency Park Drive

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement						Overall Intersection		
	Washmill Lake Drive			Access	Regency Park Drive				
	EB-L	EB-TT	WB-TTR			SB-LR		Delay	Control
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-23)									
Delay	9.0	0.0	0.0		-	14.4		1.9	
v/c	0.09	0.12	0.22		-	0.20			
Queue	1.6	0.0	0.0		-	6.1			
	EB-L	EB-TT	WB-L	WB-TTR	NB-LTR	SB-L	SB-TR	Delay	Control
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-32)									
Delay	19.4	10.0	9.4	11.5	9.6	21.6	5.5	12.5	
v/c	0.52	0.31	0.04	0.52	0.18	0.60	0.23		
Queue	27.4	27.0	3.8	46.4	14.6	46.7	11.8		
	EB-L	EB-TT	WB-TTR			SB-LR		Delay	Control
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-30)									
Delay	10.3	0.0	0.0		-	25.9		2.5	
v/c	0.18	0.28	0.30		-	0.44			
Queue	5.3	0.0	0.0		-	17.3			
	EB-L	EB-TT	WB-L	WB-TTR	NB-LTR	SB-L	SB-TR	Delay	Control
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-40)									
Delay	24.4	10.4	22.2	29.5	18.8	48.3	10.4	22.4	
v/c	0.66	0.48	0.19	0.82	0.13	0.78	0.37		
Queue	56.8	69.4	12.3	119.0	14.5	83.0	23.7		

6.4 INT #3: LACEWOOD DRIVE AT HIGHWAY 102 NB RAMPS

Operational performance results for this intersection are provided in Table 5 for both the AM and PM peak hours for each of the analysis scenarios.

The intersection is expected to operate within NSPW guidelines during the AM and PM peak hours without and with site generated trips, with the exception of the northbound right movement during PM peak hour with the addition of site generated trips. The maximum v/c ratio is projected to be 0.98 for the northbound right-turn movement. Some changes in the operational performance of this intersection are expected with the addition of the proposed development.

SimTraffic analysis (11 one-hour runs) was completed to supplement the assessment of this intersection due to the high delay and queuing on the northbound right turn movement. This additional analysis indicates that during the PM peak hour of Scenario 2, the northbound right turning movement may operate with an average delay of about 35 seconds with a 95th percentile queue of 80.4m (See Page C-47, Appendix C).

Table 5 - Intersection Capacity Analysis: Lacewood Drive at Highway 102 NB Ramps

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement							Overall Intersection	
	Lacewood Drive				Highway 102 NB Ramps				
	EB-LL	EB-TT	WB-TTT	WB-R	NB-L	NB-LT	NB-R	Delay	Control
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-2)									
Delay	0.4	0.5	40.7	7.9	29.1	29.1	33.3	20.5	
v/c	0.14	0.25	0.66	0.51	0.18	0.18	0.84		
Queue	0.0	0.0	53.4	19.7	19.8	19.8	70.6		
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-18)									
Delay	0.3	0.3	41.9	8.9	32.6	32.6	29.7	20.4	
v/c	0.12	0.20	0.63	0.53	0.21	0.21	0.85		
Queue	0.5	0.0	47.7	20.5	20.9	20.9	60.3		
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-33)									
Delay	2.0	1.0	38.9	7.6	25.2	25.2	33.7	20.6	
v/c	0.17	0.27	0.66	0.60	0.15	0.15	0.86		
Queue	0.0	0.0	58.4	22.6	18.3	18.3	83.3		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-10)									
Delay	13.2	5.5	52.5	11.3	36.9	36.8	51.6	27.5	
v/c	0.71	0.47	0.87	0.55	0.38	0.37	0.88		
Queue	138.5	4.5	114.7	38.3	52.5	52.4	115.1		
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-25)									
Delay	12.4	3.8	48.8	8.5	38.4	38.2	48.1	25.4	
v/c	0.67	0.41	0.80	0.54	0.40	0.39	0.87		
Queue	139.6	3.2	99.4	28.3	52.5	52.4	106.3		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-41)									
Delay	28.6	9.2	50.7	11.0	31.4	31.3	65.5	32.7	
v/c	0.88	0.52	0.84	0.65	0.30	0.30	0.98		
Queue	139.7	0.0	108.3	43.4	52.5	52.4	203.0		

6.5 INT #4: LACEWOOD DRIVE AT HIGHWAY 102 SB RAMPS

Operational performance results for this intersection are provided in Table 6 for both the AM and PM peak hours for each of the analysis scenarios.

The intersection is expected to operate within NSPW guidelines during the AM and PM peak hours without and with site generated trips. The maximum v/c ratio is projected to be 0.77 for the eastbound through movement. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 6 - Intersection Capacity Analysis: Lacewood Drive at Highway 102 SB Ramps

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement							Overall Intersection	
	Lacewood Drive				Highway 102 SB Ramps				
	EB-TTTT	EB-R	WB-L	WB-TT	SB-L	SB-LT	SB-R	Delay	Control
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-3)									
Delay	43.6	10.9	1.4	0.3	50.6	50.6	0.6	17.8	
v/c	0.58	0.26	0.24	0.20	0.64	0.64	0.35		
Queue	34.8	11.4	9.3	0.0	52.4	52.4	0.0		
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-19)									
Delay	44.0	11.7	2.1	0.3	50.6	50.6	0.6	17.5	
v/c	0.52	0.29	0.24	0.17	0.64	0.64	0.35		
Queue	29.1	11.6	17.4	0.0	52.4	52.4	0.0		
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-34)									
Delay	43.8	11.1	1.9	0.4	50.2	50.4	0.6	17.3	
v/c	0.57	0.27	0.28	0.22	0.65	0.66	0.35		
Queue	33.2	11.4	0.0	0.8	54.9	55.2	0.0		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-11)									
Delay	38.5	7.1	6.8	3.1	64.1	64.1	0.6	21.5	
v/c	0.77	0.45	0.54	0.39	0.68	0.68	0.36		
Queue	118.5	28.7	117.9	115.6	60.3	60.3	0.0		
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-26)									
Delay	39.4	5.5	6.2	1.8	64.1	64.1	0.6	21.3	
v/c	0.74	0.46	0.51	0.34	0.68	0.68	0.36		
Queue	103.8	21.0	132.3	96.1	60.3	60.3	0.0		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-42)									
Delay	40.1	6.2	9.6	2.7	66.0	66.3	0.6	22.6	
v/c	0.76	0.46	0.58	0.36	0.73	0.74	0.36		
Queue	111.8	24.3	134.9	100.3	69.5	69.8	0.0		

6.6 INT #5: DUNBRACK STREET AT WASHMILL LAKE DRIVE

Operational performance results for this intersection are provided in Table 5 for both the AM and PM peak hours for each of the analysis scenarios.

The intersection is expected to operate within HRM acceptable limits laid out in HRM's current TIS Guidelines during the AM and PM peak hours without and with site generated trips. The maximum v/c ratio is projected to be 0.94 for the eastbound right-turn movement. Some changes in the operational performance of this intersection are expected with the addition of the proposed development. The northbound left turn lane at the intersection currently has about 120m of storage. Consideration should be given to lengthening this left turn lane or providing dual northbound left turn lanes at this intersection to accommodate background traffic and site generated trips.

Table 7 - Intersection Capacity Analysis: Dunbrack Street at Washmill Lake Drive

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement						Overall Intersection	
	Washmill Lake Drive		Dunbrack Street					
	EB-L	EB-R	NB-L	NB-TT	SB-TT	SB-R	Delay	Control
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-4)								
Delay	27.0	11.0	7.1	5.3	23.5	14.7	12.1	
v/c	0.16	0.68	0.52	0.36	0.66	0.12		
Queue	13.8	23.3	34.3	34.8	63.9	12.8		
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-20)								
Delay	26.9	11.0	7.3	5.3	23.7	14.8	12.2	
v/c	0.15	0.70	0.52	0.36	0.66	0.12		
Queue	13.8	24.2	35.5	35.7	64.5	13.0		
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-35)								
Delay	33.0	9.8	12.4	6.5	28.4	15.1	15.2	
v/c	0.49	0.72	0.63	0.37	0.70	0.31		
Queue	40.7	26.8	68.2	43.9	70.1	24.4		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-12)								
Delay	41.7	13.8	22.7	5.1	34.5	21.8	20.0	
v/c	0.31	0.81	0.71	0.33	0.80	0.17		
Queue	27.8	34.5	128.9	50.8	130.4	25.3		
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-27)								
Delay	40.9	15.5	23.8	5.4	35.2	22.3	20.8	
v/c	0.30	0.84	0.72	0.34	0.80	0.17		
Queue	27.6	41.2	133.8	54.2	133.8	25.8		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-43)								
Delay	48.2	30.3	49.7	7.6	45.2	26.0	33.0	
v/c	0.59	0.94	0.93	0.34	0.85	0.46		
Queue	67.3	119.4	230.2	54.2	133.8	57.8		

6.7 INT #6: DUNBRACK STREET AT HIGHWAY 102 NB RAMPS

Operational performance results for this intersection are provided in Table 8 for both the AM and PM peak hours for each of the analysis scenarios. Signals are warranted for to accommodate background traffic and the intersection is expected to operate poorly as a STOP controlled intersection, as shown below.

The signalized intersection is expected to operate within NSW guidelines during the AM and PM peak hours without and with site generated trips. The maximum v/c ratio is projected to be 0.64 for the southbound through movement in the PM peak hour. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 8 - Intersection Capacity Analysis: Dunbrack Street at Highway 102 NB Ramps

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement						Overall Intersection	
	Highway 102 NB Ramps		Dunbrack Street					
	WB-LT	WB-R	NB-TT	NB-R	SB-TT	SB-R	Delay	Control
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-7)								
Delay	134.8	0.0	0.0	0.0	0.0	0.0	15.4	
v/c	1.13	-	0.30	0.26	0.20	0.17		
Queue	106.2	-	0.0	0.0	0.0	0.0		
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-5)								
Delay	21.2	0.2	6.7	1.8	5.8	2.4	5.4	
v/c	0.36	0.12	0.43	0.36	0.29	0.26		
Queue	22.4	0.0	42.6	9.6	26.3	11.3		
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-21)								
Delay	21.2	0.2	6.7	1.8	5.8	2.5	5.4	
v/c	0.36	0.12	0.43	0.36	0.30	0.27		
Queue	22.4	0.0	42.6	9.6	26.9	12.0		
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-36)								
Delay	22.1	0.2	6.7	1.7	5.8	0.3	5.1	
v/c	0.36	0.14	0.45	0.36	0.32	0.22		
Queue	23.0	0.0	45.9	9.6	30.2	0.0		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-15)								
Delay	Err	0.0	0.0	0.0	0.0	0.0	Err	
v/c	3.81	-	0.28	0.27	0.32	0.23		
Queue	Err	-	0.0	0.0	0.0	0.0		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-13)								
Delay	22.1	0.5	11.0	2.6	12.0	7.6	9.3	
v/c	0.55	0.29	0.54	0.45	0.62	0.47		
Queue	50.9	0.0	57.2	12.7	68.6	37.4		
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-28)								
Delay	22.5	0.5	10.9	2.6	12.0	7.7	9.3	
v/c	0.56	0.29	0.54	0.45	0.62	0.47		
Queue	51.3	0.0	57.4	12.6	69.7	38.8		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-44)								
Delay	24.1	0.6	11.2	2.5	12.3	8.4	9.6	
v/c	0.57	0.33	0.57	0.44	0.64	0.52		
Queue	55.4	0.0	67.0	12.6	79.4	47.5		

6.8 INT #7: DUNBRACK STREET AT HIGHWAY 102 SB RAMPS

Operational performance results for this intersection are provided in Table 9 for both the AM and PM peak hours for each of the analysis scenarios. Signals are warranted to accommodate background traffic and the intersection is expected to operate poorly as a STOP controlled intersection, as shown below.

The signalized intersection is expected to operate within NSW guidelines during the AM and PM peak hours without and with site generated trips. The maximum v/c ratio is projected to be 0.75 for the eastbound left-turn/through movement in the AM peak period. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 9 - Intersection Capacity Analysis: Dunbrack Street at Highway 102 SB Ramps

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement						Overall Intersection	
	Highway 102 SB Ramps		Dunbrack Street					
	EB-LT	EB-R	NB-TT	NB-R	SB-TT	SB-R	Delay	Control
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-8)								
Delay	544.3	75.7	0.0	0.0	0.0	0.0	92.0	
v/c	2.09	1.07	0.31	0.33	0.12	0.02		
Queue	271.7	178.0	0.0	0.0	0.0	0.0		
Scenario 1A - 2039 Future without Site AM Peak Hour - without diversions (Page C-6)								
Delay	26.9	1.4	16.3	6.2	11.9	0.0	11.5	
v/c	0.72	0.55	0.65	0.59	0.25	0.02		
Queue	102.0	0.0	94.1	39.5	31.7	0.0		
Scenario 1B - 2039 Future without Site AM Peak Hour (Page C-22)								
Delay	26.9	1.4	16.3	6.2	11.9	0.0	11.4	
v/c	0.72	0.55	0.65	0.59	0.25	0.03		
Queue	102.0	0.0	94.1	39.5	31.7	0.0		
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-37)								
Delay	28.7	1.4	17.4	6.6	12.6	0.1	12.1	
v/c	0.75	0.55	0.66	0.59	0.26	0.06		
Queue	113.3	0.0	100.9	42.6	35.2	0.0		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-16)								
Delay	Err	342.5	0.0	0.0	0.0	0.0	Err	
v/c	4.58	1.69	0.33	0.07	0.33	0.02		
Queue	Err	378.0	0.0	0.0	0.0	0.0		
Scenario 1A - 2039 Future without Site PM Peak Hour - without diversions (Page C-14)								
Delay	23.1	1.2	12.5	3.9	12.5	0.0	10.3	
v/c	0.58	0.50	0.64	0.15	0.64	0.02		
Queue	55.6	0.0	73.4	9.5	73.4	0.0		
Scenario 1B - 2039 Future without Site PM Peak Hour (Page C-29)								
Delay	23.1	1.2	12.5	3.9	12.5	0.0	10.3	
v/c	0.58	0.50	0.64	0.15	0.64	0.03		
Queue	55.6	0.0	73.4	9.5	73.4	0.0		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-45)								
Delay	23.4	1.2	15.2	4.7	15.2	0.1	12.1	
v/c	0.62	0.50	0.70	0.15	0.70	0.06		
Queue	70.2	0.0	90.5	11.1	89.9	0.0		

6.9 INT #8: REGENCY PARK DRIVE AT INTERNAL ROAD

Operational performance results for this intersection are provided in Table 10 for both the AM and PM peak hours for each of the analysis scenarios. Northbound and southbound left-turn lanes are included as warranted. Left turn lanes have been added to the internal street approaches (eastbound and westbound) based on intersection operations.

With STOP control on the side streets only, the intersection is expected to operate within HRM acceptable limits with site generated trips. The maximum v/c ratio is projected to be 0.94 in the westbound left-turning direction during the PM peak hour with a delay of 122.1 seconds per vehicle.

Table 10 - Intersection Capacity Analysis: Regency Park Drive at Internal Road

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement								Overall Intersection	
	Internal Street (EW)				Regency Park Drive					
	EB-L	EB-TR	WB-L	WB-TR	NB-L	NB-TR	SB-L	SB-TR	Delay	Control
Scenario 2 - 2039 Future with Site AM Peak Hour (Page C-38)										
Delay	21.7	9.8	21.7	9.9	7.8	0.0	7.8	0.0	6.8	
v/c	0.25	0.09	0.32	0.12	0.02	0.13	0.05	0.15		
Queue	7.6	2.2	10.9	3.3	0.6	0.0	1.4	0.0		
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-46)										
Delay	104.6	10.4	122.1	11.2	8.1	0.0	8.5	0.0	21.7	
v/c	0.81	0.13	0.94	0.19	0.06	0.22	0.14	0.20		
Queue	38.0	3.5	51.6	5.4	1.5	0.0	3.8	0.0		

While the analysis summarized in Table 10 has been completed as a stand-alone intersection, the proposed traffic signals on Washmill Lake Drive with the nearby development may provide additional gaps on Regency Park Drive and assist the left-turn movement from the Internal Streets. The intersection performance of eleven 1-hour runs using *SimTraffic* software for the 2039 PM peak hour with site development is summarized in Table 11 with results included in Appendix C.

Table 11 – SimTraffic Analysis: Regency Park Drive at Internal Road

LOS Criteria	Control Delay (sec/veh) and 95 th %ile Queue (m) by Intersection Movement								Overall Intersection	
	Internal Street (EW)				Regency Park Drive					
	EB-L	EB-TR	WB-L	WB-TR	NB-L	NB-TR	SB-L	SB-TR	Delay	Control
Scenario 2 - 2039 Future with Site PM Peak Hour (Page C-48)										
Delay	19.4	5.4	20.2	6.3	4.7	2.5	7.5	3.1	6.5	
Queue	23.0	17.7	24.9	20.7	13.4	3.2	17.5	1.6		

7 SUMMARY & RECOMMENDATIONS

7.1 SUMMARY

Background	1. Plans are being prepared for a multi-use development consisting of 3,830 high-rise residential units and 155,665 square feet of ground floor retail space on vacant land north of the Bayers Lake Business Park in Halifax, Nova Scotia. Buildout of the development is expected by 2034.
Description of Existing Development	2. The proposed development area is on the vacant land bounded by Washmill Lake Drive and Thomas Raddall Drive.
Description of Proposed Development	3. The proposed development is expected to include 3,830 high-rise residential units and 155,665 square feet of ground floor retail space.
Proposed Site Access	4. The proposed development is along an extension of Regency Park Drive through to Washmill Lake Drive with several small accesses along the extended Regency Park Drive and Washmill Lake Drive.
Study Area Roads	5. The study considers Washmill Lake Drive, Regency Park Drive, Lacewood Drive, Dunbrack Street, and Parkland Drive.
Turning Movement Counts	6. Turning movement counts were collected by WSP on Wednesday, June 21, 2023 (PM peak period), and on Thursday, June 22, 2023 (AM peak period) for the Lacewood Drive at Parkland Drive/Regency Park Drive intersection. 7. Additional turning movement counts were collected at the Lacewood Drive intersections (study intersection 1, 3, and 4) on Tuesday, April 23, 2024 for the PM peak period and on Wednesday, April 24, 2024 for the AM peak period. 8. Further turning movement counts were collected at the Dunbrack Street intersections (study intersection 5, 6, and 7) on Tuesday, November 19, 2024 for the AM and PM peak periods.
Background Traffic Volumes	9. Projected 2039 peak hour future background volumes include an annual growth of 0.5% between 2023 and 2039. Projected 2039 traffic volumes consider trips generated by the new Bayers Lake Community Outpatient Centre separately. 10. Some background traffic in the current roadway network will be redistributed to the extension of Regency Park Drive. A separate volume scenario has been prepared that considers these redistributed background trips.
Estimation of Existing & Proposed Development Trips	11. Trip generation estimates for the proposed development were prepared using rates and equations published in <i>Trip Generation, 11th Edition</i> (Institute of Transportation Engineers, Washington, 2021). 12. Based on the proposed development's proximity to numerous amenities including planned transit routes and active transportation connections, many of the trips generated by the proposed development are anticipated to be non-auto trips. The methodology provided in <i>Trip Generation Handbook, 3rd Edition</i> (Institute of Transportation Engineers, Washington, 2017), for estimating total person trips generated by a development was applied with consideration of onsite synergies – trips that are made between complementary land uses within a single site, such as residential and retail uses.

	13. Using the trip generation methodology outlined in <i>Trip Generation, 11th Edition</i>, and <i>Trip Generation Handbook, 3rd Edition</i>, it is estimated that the development will generate: • 1,415 two-way external person trips (516 entering and 899 exiting) during the AM peak hour; and, • 2,116 two-way external person trips (1,204 entering and 912 exiting) during the PM peak hour.
Estimation of Existing & Proposed Development Trips (Cont)	14. Person trips were assigned by travel mode considering existing and planned transit and active transportation corridors for this area as well as HRM's target non-auto modal split for the Inner Suburban area. The following modal splits for the site generated trips have been applied: • 65% auto driver; • 10% auto passenger; • 20% transit; and, • 5% active modes. 15. Based on the above, it is estimated that the development will generate: • 919 two-way vehicle trips (335 entering and 584 exiting) during the AM peak hour; and, • 1,376 two-way vehicle trips (783 entering and 593 exiting) during the PM peak hour.
Trip Distribution and Assignment	16. Proposed development generated trips were distributed to the Study Intersections based on counted volumes considering major trip origins and destinations in the region. Retail trips have been assigned considering regional residential development, while residential trips have been assigned considering employment densities and retail draws.
Warrant Analysis Summary	17. Warrant reviews were completed for left-turn lanes and traffic signals with the projected traffic volumes without and with site generated trips. 18. It was determined that: • An eastbound left turn lane will be warranted along Washmill Lake Drive at Regency Park Drive without and with site generated trips. • A westbound left turn lane will be warranted along Washmill Lake Drive at Regency Park Drive with site generated trips. • Northbound and southbound left turn lanes will be warranted along Regency Park Drive at Internal Road intersection with site generated trips. • Traffic signals will be warranted at Washmill Lake Drive at Regency Park Drive with site generated trips. • Traffic signals will be warranted at Dunbrack Street at Highway 102 Northbound Ramps without and with site generated trips. • Traffic signals will be warranted at Dunbrack Street at Highway 102 Southbound Ramps without and with site generated trips.
Summary – Intersection Capacity Analysis	19. Intersection performance analysis was completed using <i>Synchro 11</i> at the Study Intersections. 20. The Lacewood Drive at Regency Park Drive/Parkland Drive intersection is expected to operate well and within HRM acceptable limits during the AM and PM peak periods in all scenarios. 21. The Washmill Lake Drive at Regency Park Drive intersection is expected to operate well and within HRM acceptable limits with added turn lanes and traffic signalization, as warranted, during both the AM and PM peak periods. 22. The Lacewood Drive at Highway 102 NB Ramps intersection is expected to operate well and within NSPW guidelines during the AM and PM peak periods in all scenarios, apart from the northbound right turn movement whose v/c ratio is expected to reach 0.98 during the PM

peak hour with the addition of site generated trips. Site generated trips are expected to have some impact to operations at this intersection.

23. The **Lacewood Drive at Highway 102 SB Ramps intersection** is expected to operate well and within NSPW guidelines during the AM and PM peak periods in all scenarios. Site generated trips are expected to have a negligible impact to operations.
24. The **Dunbrack Street at Washmill Lake Drive intersection** is expected to operate well and within HRM acceptable limits during the AM and PM peak periods in all scenarios. Site generated trips are expected to have some impact to operations.
25. The **Dunbrack Street at Highway 102 NB Ramps intersection** is expected to operate well and within NSPW guidelines during the AM and PM peak periods in all scenarios with traffic signalization, as warranted. Site generated trips are expected to have a negligible impact to operations.
26. The **Dunbrack Street at Highway 102 SB Ramps intersection** is expected to operate well and within NSPW guidelines during the AM and PM peak periods in all scenarios with traffic signalization, as warranted. Site generated trips are expected to have a negligible impact to operations.
27. The **Regency Park Drive at Internal Road intersection** is expected to operate within HRM guidelines with added left turn lanes on each approach.

7.2 RECOMMENDATIONS

Recommendations

28. It is recommended that at the new Washmill Lake Drive at Regency Park Drive intersection:
 - a) Install eastbound and westbound left turn lanes on Washmill Lake Drive when connection to Regency Park Drive is completed.
 - b) Install traffic signals at the Washmill Lake Drive at Regency Park Drive intersection (warranted with site development).
29. It is recommended that at the new Regency Park Drive and Internal Road intersection:
 - a) Install separate left turn lanes on each approach.
30. It is recommended that at both of the Dunbrack Street at Highway 102 Ramps intersections:
 - a) Install traffic signals (warranted without and with site development).
31. HRM should consider the type of bicycle connections appropriate for the existing and new portions of Regency Park Drive. It is likely that the bicycle facilities along Regency Park Drive will extend what is selected for Parkland Drive and connect to the existing bicycle lanes along Washmill Lake Drive at the proposed signalized intersection.
32. Halifax Transit should continue to plan for transit routing along Regency Park Drive between Washmill Lake Drive and Lacewood Drive.

APPENDIX

A

TRAFFIC VOLUME DATA



Table A-1 Lacewood Drive @ Parkland Drive / Regency Park Drive Halifax, NS PM Peak: Wednesday, June 21, 2023 AM Peak: Thursday, June 22, 2023					<									
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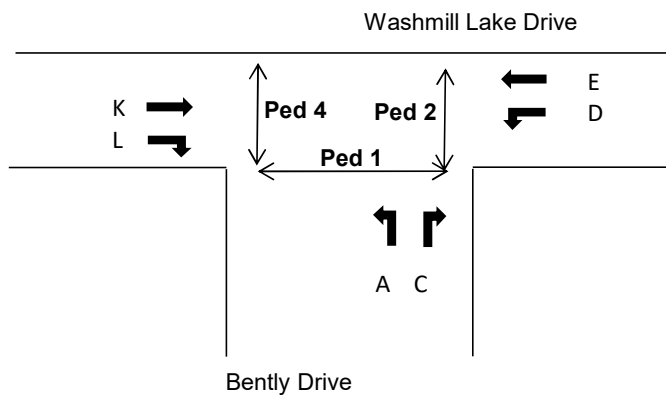
Table A-2

**Washmill Lake Drive
@
Bently Drive**

Halifax, NS

PM Peak: Wednesday, June 21, 2023

AM Peak: Thursday, June 22, 2023



AM Peak Period Volume Data

Time	Bently Drive Northbound Approach		Washmill Lake Drive Westbound Approach		Washmill Lake Drive Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
07:00 07:15	3	20	3	65	63	2	156
07:15 07:30	2	14	4	89	58	2	169
07:30 07:45	2	25	6	79	55	0	167
07:45 08:00	4	15	8	122	80	2	231
08:00 08:15	5	27	8	102	86	2	230
08:15 08:30	7	18	11	112	80	6	234
08:30 08:45	4	25	5	118	88	3	243
08:45 09:00	3	8	8	126	64	3	212
AM Peak Hour	20	85	32	454	334	13	938
07:00 08:00	11	74	21	355	256	6	723
08:00 09:00	19	78	32	458	318	14	919
	Ped 1		Ped 2		Ped 4		Total Peds
07:00 08:00	7		4		0		11
08:00 09:00	6		5		0		11

PM Peak Period Volume Data

Time	Bently Drive Northbound Approach		Washmill Lake Drive Westbound Approach		Washmill Lake Drive Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
16:00 16:15	4	11	15	158	174	8	370
16:15 16:30	3	7	16	161	150	5	342
16:30 16:45	4	16	10	161	181	6	378
16:45 17:00	3	8	20	174	199	9	413
17:00 17:15	4	10	21	153	219	9	416
17:15 17:30	4	13	19	147	169	7	359
17:30 17:45	3	13	17	144	163	13	353
17:45 18:00	5	18	14	170	147	8	362
PM Peak Hour	15	47	70	635	768	31	1566
16:00 17:00	14	42	61	654	704	28	1503
17:00 18:00	16	54	71	614	698	37	1490
	Ped 1		Ped 2		Ped 4		Total Peds
16:00 17:00	5		1		0		6
17:00 18:00	2		3		0		5

Table A-3 Lacewood Drive @ Parkland Drive/Regency Park Drive Halifax, NS PM Peak: Tuesday, April 23, 2024 AM Peak: Wednesday, April 24, 2024														Parkland Drive I H G J K L Lacewood Drive Ped 3 Ped 4 Ped 2 Ped 1 A B C Regency Park Drive Lacewood Drive									
AM Peak Period Volume Data																							
Time		Regency Park Drive Northbound Approach			Lacewood Drive Westbound Approach			Parkland Drive Southbound Approach			Lacewood Drive Eastbound Approach			Total Vehicles									
		A	B	C	D	E	F	G	H	I	J	K	L										
07:00	07:15	14	5	31	6	40	14	33	5	39	15	48	16	266									
07:15	07:30	19	3	21	8	51	22	26	12	31	19	60	16	288									
07:30	07:45	17	11	20	18	63	22	31	6	37	24	91	15	355									
07:45	08:00	20	11	33	23	76	25	45	18	36	19	107	20	433									
08:00	08:15	33	12	33	13	63	29	52	16	47	24	108	29	459									
08:15	08:30	34	10	33	24	89	20	44	8	29	26	116	33	466									
08:30	08:45	26	12	24	25	68	17	19	20	30	21	105	43	410									
08:45	09:00	18	21	6	26	83	18	28	24	38	67	76	9	414									
AM Peak Hour		113	45	123	85	296	91	160	62	142	90	436	125	1768									
07:00	08:00	70	30	105	55	230	83	135	41	143	77	306	67	1342									
08:00	09:00	111	55	96	88	303	84	143	68	144	138	405	114	1749									
		Ped 1			Ped 2			Ped 3			Ped 4			Total Peds									
07:00	08:00	8			5			9			7			29									
08:00	09:00	11			6			12			7			36									
Midday Peak Period Volume Data																							
Time		Regency Park Drive Northbound Approach			Lacewood Drive Westbound Approach			Parkland Drive Southbound Approach			Lacewood Drive Eastbound Approach			Total Vehicles									
		A	B	C	D	E	F	G	H	I	J	K	L										
11:30	11:45													0									
11:45	12:00													0									
12:00	12:15													0									
12:15	12:30													0									
12:30	12:45													0									
12:45	13:00													0									
13:00	13:15													0									
13:15	13:30													0									
Midday Peak Hour		0	0	0	0	0	0	0	0	0	0	0	0	0									
11:30	12:30	0	0	0	0	0	0	0	0	0	0	0	0	0									
12:30	13:30	0	0	0	0	0	0	0	0	0	0	0	0	0									
		Ped 1			Ped 2			Ped 3			Ped 4			Total Peds									
11:30	12:30													0									
12:30	13:30													0									
PM Peak Period Volume Data																							
Time		Regency Park Drive Northbound Approach			Lacewood Drive Westbound Approach			Parkland Drive Southbound Approach			Lacewood Drive Eastbound Approach			Total Vehicles									
		A	B	C	D	E	F	G	H	I	J	K	L										
16:00	16:15	49	22	24	41	134	32	28	16	38	77	131	36	628									
16:15	16:30	46	28	30	36	130	49	30	15	52	65	146	47	674									
16:30	16:45	33	22	27	39	121	39	35	17	34	69	139	41	616									
16:45	17:00	26	16	8	42	146	24	37	26	39	70	152	25	611									
17:00	17:15	26	17	29	26	150	43	29	19	48	62	120	38	607									
17:15	17:30	27	16	16	50	134	41	28	19	41	69	169	45	655									
17:30	17:45	32	14	30	28	106	28	35	13	51	64	161	53	615									
17:45	18:00	41	23	19	42	131	38	37	18	45	36	151	58	639									
PM Peak Hour		154	88	89	158	531	144	130	74	163	281	568	149	2529									
16:00	17:00	154	88	89	158	531	144	130	74	163	281	568	149	2529									
17:00	18:00	126	70	94	146	521	150	129	69	185	231	601	194	2516									
		Ped 1			Ped 2			Ped 3			Ped 4			Total Peds									
16:00	17:00	7			12			22			12			53									
17:00	18:00	8			15			22			16			61									

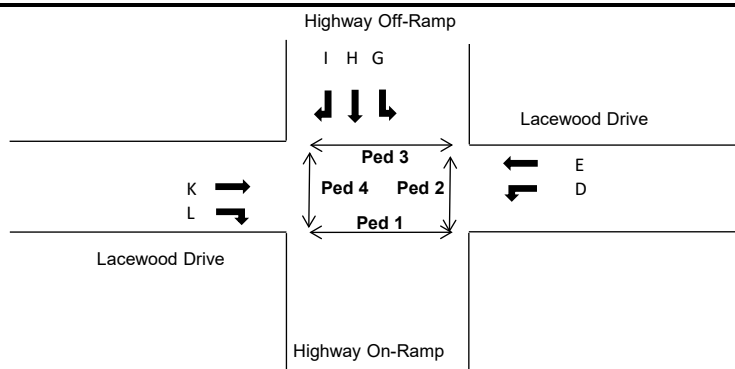
Table A-4 Lacewood Drive @ Highway 102 NB Ramps				Highway On-Ramp Lacewood Drive J K Ped 3 Ped 4 Ped 1 Lacewood Drive Highway Off-Ramp F E A B C						
Halifax, NS PM Peak: Tuesday, April 23, 2024 AM Peak: Wednesday, April 24, 2024										
AM Peak Period Volume Data										
Time		Highway Off-Ramp Northbound Approach			Lacewood Drive Westbound Approach		Highway On-Ramp Southbound Approach	Lacewood Drive Eastbound Approach		Total Vehicles
		A	B	C	E	F		J	K	
07:00	07:15	10	0	48	90	26		17	50	241
07:15	07:30	14	0	47	106	39		26	71	303
07:30	07:45	17	0	78	102	47		26	98	368
07:45	08:00	15	0	72	130	47		29	117	410
08:00	08:15	14	0	75	129	54		23	114	409
08:15	08:30	22	0	79	119	60		50	135	465
08:30	08:45	29	0	98	123	51		45	130	476
08:45	09:00	46	1	108	166	54		58	124	557
AM Peak Hour		111	1	360	537	219	0	176	503	1907
07:00	08:00	56	0	245	428	159	0	98	336	1322
08:00	09:00	111	1	360	537	219	0	176	503	1907
		Ped 1			Ped 2		Ped 3	Ped 4		Total Peds
07:00	08:00	8			0		0	0		8
08:00	09:00	3			0		0	0		3
Midday Peak Period Volume Data										
Time		Highway Off-Ramp Northbound Approach			Lacewood Drive Westbound Approach		Highway On-Ramp Southbound Approach	Lacewood Drive Eastbound Approach		Total Vehicles
		A	B	C	E	F		J	K	
11:30	11:45									0
11:45	12:00									0
12:00	12:15									0
12:15	12:30									0
12:30	12:45									0
12:45	13:00									0
13:00	13:15									0
13:15	13:30									0
Midday Peak Hour		0	0	0	0	0	0	0	0	0
11:30	12:30	0	0	0	0	0	0	0	0	0
12:30	13:30	0	0	0	0	0	0	0	0	0
		Ped 1			Ped 2		Ped 3	Ped 4		Total Peds
11:30	12:30									0
12:30	13:30									0
PM Peak Period Volume Data										
Time		Highway Off-Ramp Northbound Approach			Lacewood Drive Westbound Approach		Highway On-Ramp Southbound Approach	Lacewood Drive Eastbound Approach		Total Vehicles
		A	B	C	E	F		J	K	
16:00	16:15	69	1	89	239	89		210	216	913
16:15	16:30	73	1	107	250	56		216	226	929
16:30	16:45	63	0	97	230	69		153	239	851
16:45	17:00	78	1	74	223	68		152	217	813
17:00	17:15	68	0	82	209	66		170	214	809
17:15	17:30	53	1	102	210	59		205	274	904
17:30	17:45	62	0	88	184	77		133	252	796
17:45	18:00	48	1	102	231	64		111	228	785
PM Peak Hour		283	3	367	942	282	0	731	898	3506
16:00	17:00	283	3	367	942	282	0	731	898	3506
17:00	18:00	231	2	374	834	266	0	619	968	3294
		Ped 1			Ped 2		Ped 3	Ped 4		Total Peds
16:00	17:00	12			0		0	0		12
17:00	18:00	17			0		1	0		18

Table A-5
Lacewood Drive
@
Highway 102 SB Ramps

Halifax, NS

Midday, PM Peaks: Tuesday, April 23, 2024

AM Peak: Wednesday, April 24, 2024



AM Peak Period Volume Data

Time	Highway On-Ramp Northbound Approach	Lacewood Drive Westbound Approach		Highway Off-Ramp Southbound Approach			Lacewood Drive Eastbound Approach		Total Vehicles
		D	E	G	H	I	K	L	
07:00 07:15		60	48	28	0	70	50	2	258
07:15 07:30		56	57	40	0	85	54	6	298
07:30 07:45		44	75	64	0	91	87	2	363
07:45 08:00		41	125	64	1	152	77	14	474
08:00 08:15		52	93	67	0	114	74	18	418
08:15 08:30		49	96	77	0	96	117	9	444
08:30 08:45		44	106	74	0	123	117	18	482
08:45 09:00		57	144	59	0	141	101	15	517
AM Peak Hour	0	202	439	277	0	474	409	60	1861
07:00 08:00	0	201	305	196	1	398	268	24	1393
08:00 09:00	0	202	439	277	0	474	409	60	1861
	Ped 1	Ped 2		Ped 3			Ped 4		Total Peds
07:00 08:00	5	1		0			0		6
08:00 09:00	3	0		0			0		3

Midday Peak Period Volume Data

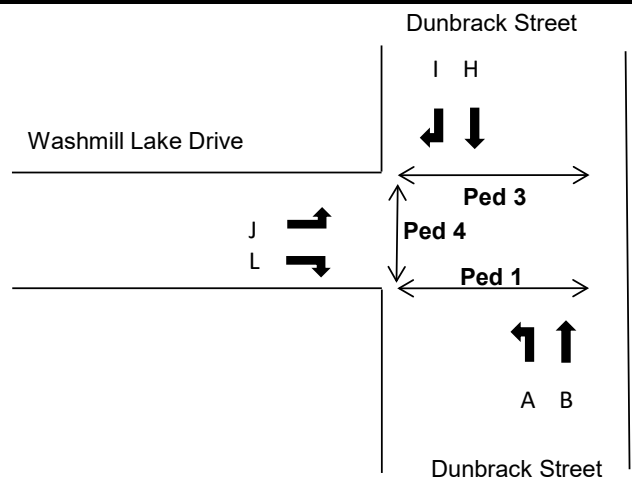
Time	Highway On-Ramp Northbound Approach	Lacewood Drive Westbound Approach		Highway Off-Ramp Southbound Approach			Lacewood Drive Eastbound Approach		Total Vehicles
		D	E	G	H	I	K	L	
11:30 11:45		68	236	42	0	151	288	77	862
11:45 12:00		87	266	51	0	120	231	70	825
12:00 12:15		106	278	39	0	144	248	76	891
12:15 12:30		70	246	72	1	154	272	74	889
12:30 12:45		70	219	52	0	143	316	103	903
12:45 13:00		65	230	33	0	131	289	84	832
13:00 13:15		65	231	49	0	128	265	88	826
13:15 13:30		68	242	37	1	115	315	71	849
Midday Peak Hour	0	311	973	196	1	572	1125	337	3515
11:30 12:30	0	331	1026	204	1	569	1039	297	3467
12:30 13:30	0	268	922	171	1	517	1185	346	3410
	Ped 1	Ped 2		Ped 3			Ped 4		Total Peds
11:30 12:30	15	0		0			0		15
12:30 13:30	11	0		0			0		11

PM Peak Period Volume Data

Time	Highway On-Ramp Northbound Approach	Lacewood Drive Westbound Approach		Highway Off-Ramp Southbound Approach			Lacewood Drive Eastbound Approach		Total Vehicles
		D	E	G	H	I	K	L	
16:00 16:15		67	234	65	0	108	401	62	937
16:15 16:30		94	220	69	0	129	345	72	929
16:30 16:45		88	246	64	0	122	308	69	897
16:45 17:00		75	190	64	0	134	347	74	884
17:00 17:15		69	214	73	0	87	304	77	824
17:15 17:30		94	167	100	0	136	371	87	955
17:30 17:45		56	189	79	0	115	297	82	818
17:45 18:00		85	220	72	0	102	251	59	789
PM Peak Hour	0	324	890	262	0	493	1401	277	3647
16:00 17:00	0	324	890	262	0	493	1401	277	3647
17:00 18:00	0	304	790	324	0	440	1223	305	3386
	Ped 1	Ped 2		Ped 3			Ped 4		Total Peds
16:00 17:00	12	0		0			0		12
17:00 18:00	9	0		0			0		9

Table A-6
Dunbrack Street
@
Washmill Lake Drive

Halifax, NS
Tuesday, November 19, 2024



AM Peak Period Volume Data

Time	Dunbrack Street Northbound Approach		Dunbrack Street Southbound Approach		Washmill Lake Drive Eastbound Approach		Total Vehicles
	A	B	H	I	J	L	
07:00 07:15	30	165	93	6	9	51	354
07:15 07:30	59	204	99	4	6	87	459
07:30 07:45	42	173	112	6	7	79	419
07:45 08:00	100	216	136	6	6	93	557
08:00 08:15	77	180	117	11	8	75	468
08:15 08:30	72	161	146	17	13	77	486
08:30 08:45	67	140	139	12	7	60	425
08:45 09:00	85	151	106	6	9	64	421
AM Peak Hour	316	697	538	46	34	305	1936
07:00 08:00	231	758	440	22	28	310	1789
08:00 09:00	301	632	508	46	37	276	1800
	Ped 1		Ped 3		Ped 4		Total Peds
07:00 08:00	26		16		3		45
08:00 09:00	59		40		1		100

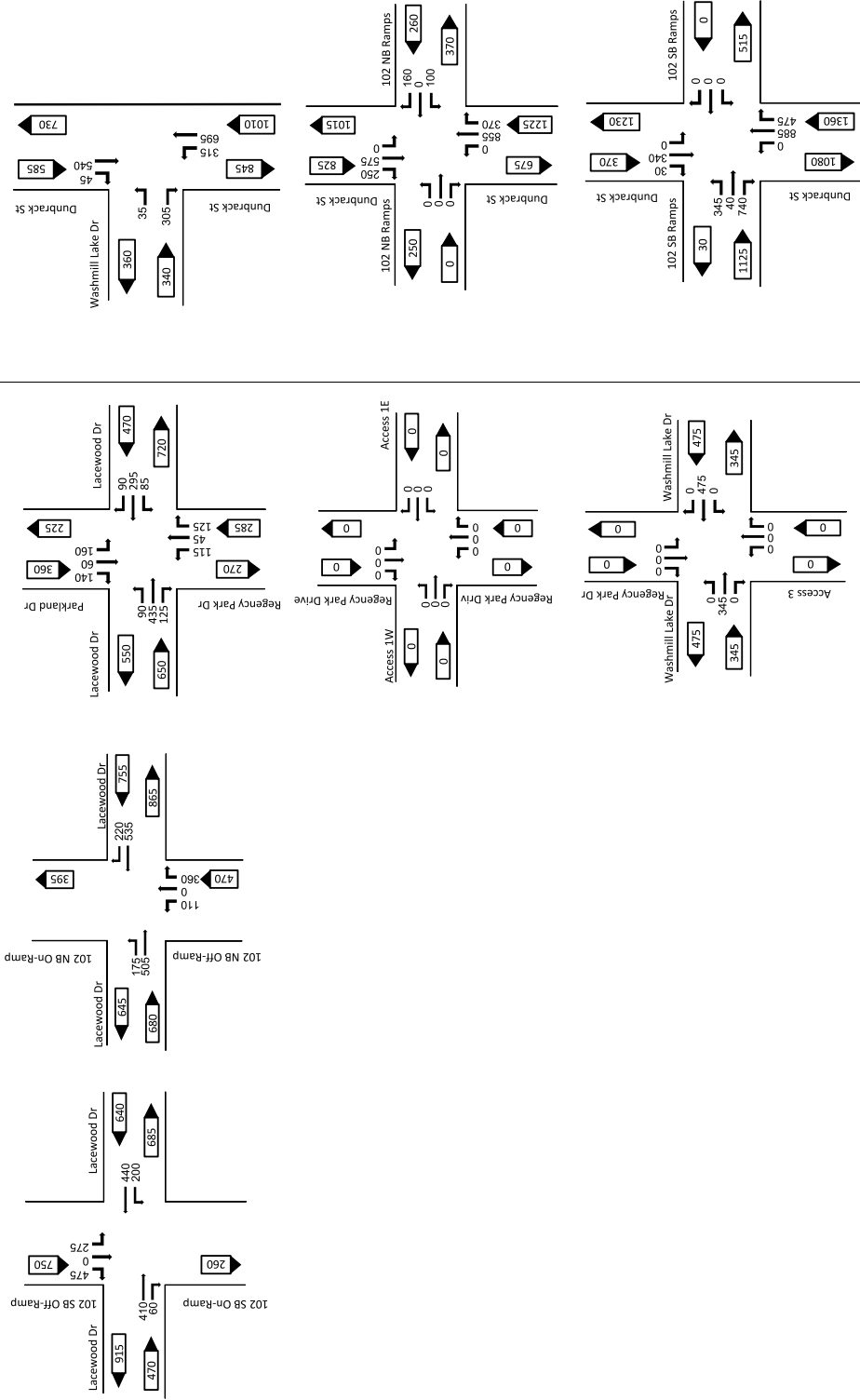
PM Peak Period Volume Data

Time	Dunbrack Street Northbound Approach		Dunbrack Street Southbound Approach		Washmill Lake Drive Eastbound Approach		Total Vehicles
	A	B	H	I	J	L	
16:00 16:15	99	191	176	17	15	127	625
16:15 16:30	102	187	188	15	19	126	637
16:30 16:45	103	171	235	24	10	127	670
16:45 17:00	138	180	171	19	15	99	622
17:00 17:15	116	166	178	16	15	123	614
17:15 17:30	121	181	169	17	13	115	616
17:30 17:45	107	177	159	15	4	85	547
17:45 18:00	120	179	114	12	14	79	518
PM Peak Hour	442	729	770	75	59	479	2554
16:00 17:00	442	729	770	75	59	479	2554
17:00 18:00	464	703	620	60	46	402	2295
	Ped 1		Ped 3		Ped 4		Total Peds
16:00 17:00	0		8		0		8
17:00 18:00	0		5		0		5

Table A-7 Dunbrack Street @ Highway 102 NB Ramps (Toward Bedford) Halifax, NS Tuesday, November 19, 2024				Dunbrack Street I H ↓ ↓ Highway 102 Ramps ↖ F ↗ D Hwy 102 Onramp ↑ B Dunbrack Street										
				AM Peak Period Volume Data										
				Time		Dunbrack Street Northbound Approach	Highway 102 Ramps Westbound Approach		Dunbrack Street Southbound Approach		Hwy 102 Onramp Eastbound Approach			Total Vehicles
						B	D	F	H	I				
07:00	07:15	176	17	26	99	49				367				
07:15	07:30	227	20	26	136	57				466				
07:30	07:45	195	19	33	137	67				451				
07:45	08:00	267	19	38	146	66				536				
08:00	08:15	206	30	43	138	49				466				
08:15	08:30	189	34	46	156	66				491				
08:30	08:45	174	22	42	140	54				432				
08:45	09:00	177	33	52	127	44				433				
AM Peak Hour		857	102	160	577	248	0	0	0	1944				
07:00	08:00	865	75	123	518	239	0	0	0	1820				
08:00	09:00	746	119	183	561	213	0	0	0	1822				
Midday Peak Period Volume Data														
Time		Dunbrack Street Northbound Approach	Highway 102 Ramps Westbound Approach		Dunbrack Street Southbound Approach		Hwy 102 Onramp Eastbound Approach			Total Vehicles				
		B	D	F	H	I								
11:30	11:45	122	37	90	157	44				450				
11:45	12:00	149	31	84	157	42				463				
12:00	12:15	154	30	80	148	45				457				
12:15	12:30	141	42	76	162	53				474				
12:30	12:45	124	26	72	174	41				437				
12:45	13:00	152	33	86	154	48				473				
13:00	13:15	140	27	78	169	54				468				
13:15	13:30	126	30	58	152	51				417				
Midday Peak Hour		557	128	312	659	196	0	0	0	1852				
11:30	12:30	566	140	330	624	184	0	0	0	1844				
12:30	13:30	542	116	294	649	194	0	0	0	1795				
PM Peak Period Volume Data														
Time		Dunbrack Street Northbound Approach	Highway 102 Ramps Westbound Approach		Dunbrack Street Southbound Approach		Hwy 102 Onramp Eastbound Approach			Total Vehicles				
		B	D	F	H	I	J	K	L					
16:00	16:15	185	53	100	225	88				651				
16:15	16:30	212	62	79	240	80				673				
16:30	16:45	187	66	108	255	94				710				
16:45	17:00	219	47	108	195	76				645				
17:00	17:15	178	67	99	234	66				644				
17:15	17:30	195	40	107	213	68				623				
17:30	17:45	176	47	100	177	54				554				
17:45	18:00	179	32	120	159	42				532				
PM Peak Hour		803	228	395	915	338	0	0	0	2679				
16:00	17:00	803	228	395	915	338	0	0	0	2679				
17:00	18:00	728	186	426	783	230	0	0	0	2353				

Table A-8 Dunbrack Street @ Highway 102 SB Ramps (From Bedford) Halifax, NS Tuesday, November 19, 2024				Dunbrack Street I H J K L Hwy 102 SB Ramps B C Dunbrack Street Hwy 102 SB Onramp												
				AM Peak Period Volume Data												
				Time		Dunbrack Street Northbound Approach		Hwy 102 SB Onramp Westbound Approach			Dunbrack Street Southbound Approach		Hwy 102 SB Ramps Eastbound Approach			Total Vehicles
						B	C				H	I	J	K	L	
07:00	07:15	152	124				54	25	86	21	124	586				
07:15	07:30	195	134				63	10	86	16	219	723				
07:30	07:45	208	136				79	6	75	11	194	709				
07:45	08:00	246	96				98	8	82	6	173	709				
08:00	08:15	234	109				98	7	101	6	153	708				
08:15	08:30	230	72				123	6	67	3	143	644				
08:30	08:45	208	69				114	2	67	3	113	576				
08:45	09:00	240	48				109	3	53	0	89	542				
AM Peak Hour		883	475	0	0	0	338	31	344	39	739	2849				
07:00	08:00	801	490	0	0	0	294	49	329	54	710	2727				
08:00	09:00	912	298	0	0	0	444	18	288	12	498	2470				
Midday Peak Period Volume Data																
Time		Dunbrack Street Northbound Approach		Hwy 102 SB Onramp Westbound Approach			Dunbrack Street Southbound Approach		Hwy 102 SB Ramps Eastbound Approach			Total Vehicles				
		B	C				H	I	J	K	L					
11:30	11:45	170	18				153	2	25	0	71	439				
11:45	12:00	146	42				135	2	45	0	70	440				
12:00	12:15	186	26				128	2	38	1	76	457				
12:15	12:30	168	23				156	2	32	1	74	456				
12:30	12:45	156	41				143	2	37	0	73	452				
12:45	13:00	178	27				128	1	41	1	85	461				
13:00	13:15	186	18				132	0	22	0	60	418				
13:15	13:30	155	28				129	3	39	0	70	424				
Midday Peak Hour		688	117	0	0	0	555	7	148	3	308	1826				
11:30	12:30	670	109	0	0	0	572	8	140	2	291	1792				
12:30	13:30	675	114	0	0	0	532	6	139	1	288	1755				
PM Peak Period Volume Data																
Time		Dunbrack Street Northbound Approach		Hwy 102 SB Onramp Westbound Approach			Dunbrack Street Southbound Approach		Hwy 102 SB Ramps Eastbound Approach			Total Vehicles				
		B	C				H	I	J	K	L					
16:00	16:15	276	23				205	0	51	0	151	706				
16:15	16:30	255	32				253	0	63	0	165	768				
16:30	16:45	232	27				257	0	66	0	150	732				
16:45	17:00	251	20				190	0	72	1	204	738				
17:00	17:15	214	22				252	30	38	1	161	718				
17:15	17:30	217	21				206	39	53	0	155	691				
17:30	17:45	206	14				178	30	46	0	147	621				
17:45	18:00	191	14				149	29	41	0	118	542				
PM Peak Hour		952	101	0	0	0	952	30	239	2	680	2956				
16:00	17:00	1014	102	0	0	0	905	0	252	1	670	2944				
17:00	18:00	828	71	0	0	0	785	128	178	1	581	2572				

Weekday AM Peak Hour
2024 Existing Traffic Volumes



Regency Links
Halifax, NS
Weekday AM Peak Hour
2024 Existing Traffic Volumes

Figure A-1A

February 2025



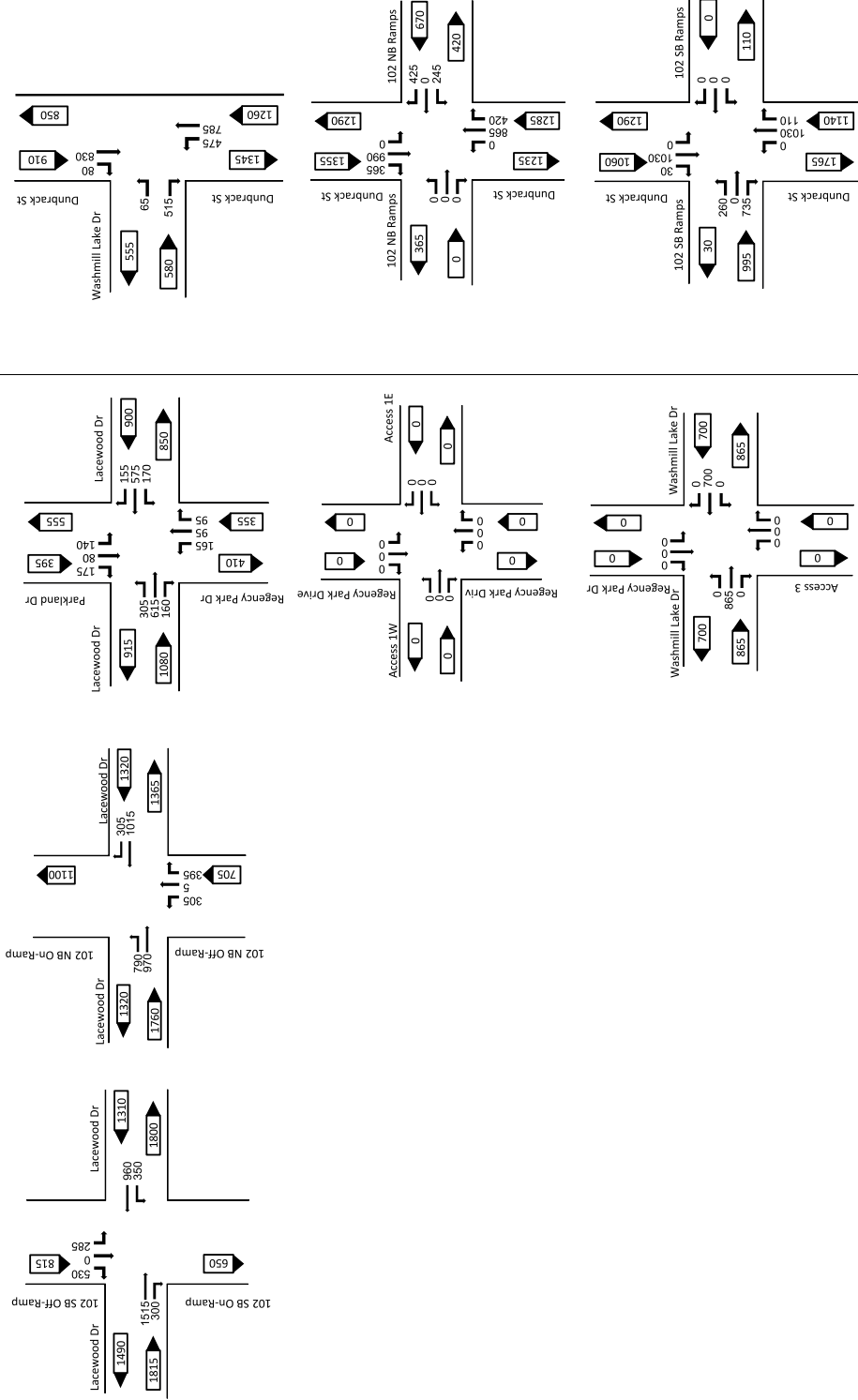


Figure A-2A

Weekday AM Peak Hour
2039 Future Background Traffic Volumes

February 2025

Weekday PM Peak Hour
2039 Future Background Traffic
Volumes



Regency Links
Halifax, NS
Weekday PM Peak Hour
2039 Future Background Traffic Volumes

Figure A-2B

February 2025



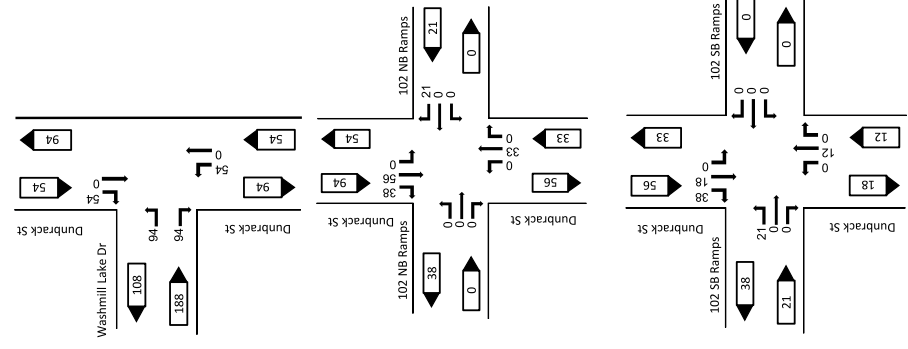
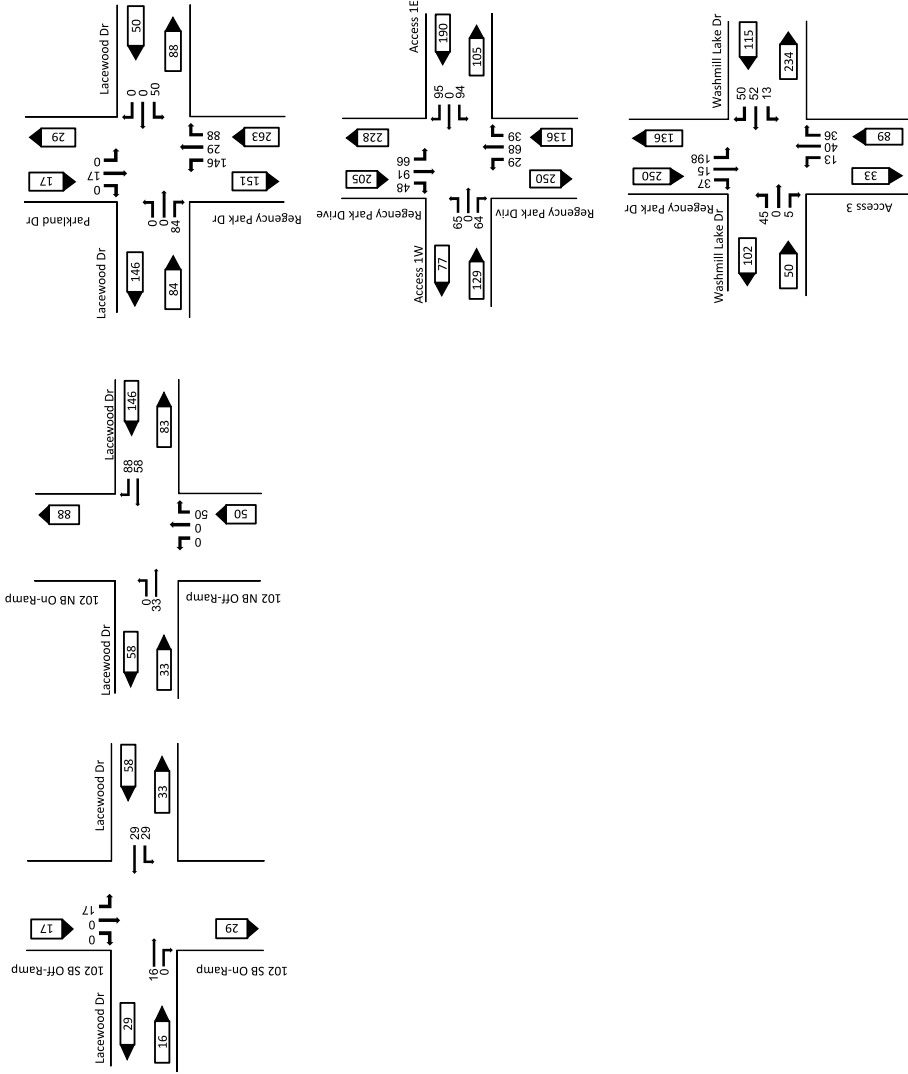


Figure A-3B

Weekday PM Peak Hour
2039 Future Background Traffic Volumes - Diverted Trips

February 2025

Weekday AM Peak Hour
Trip Assignment

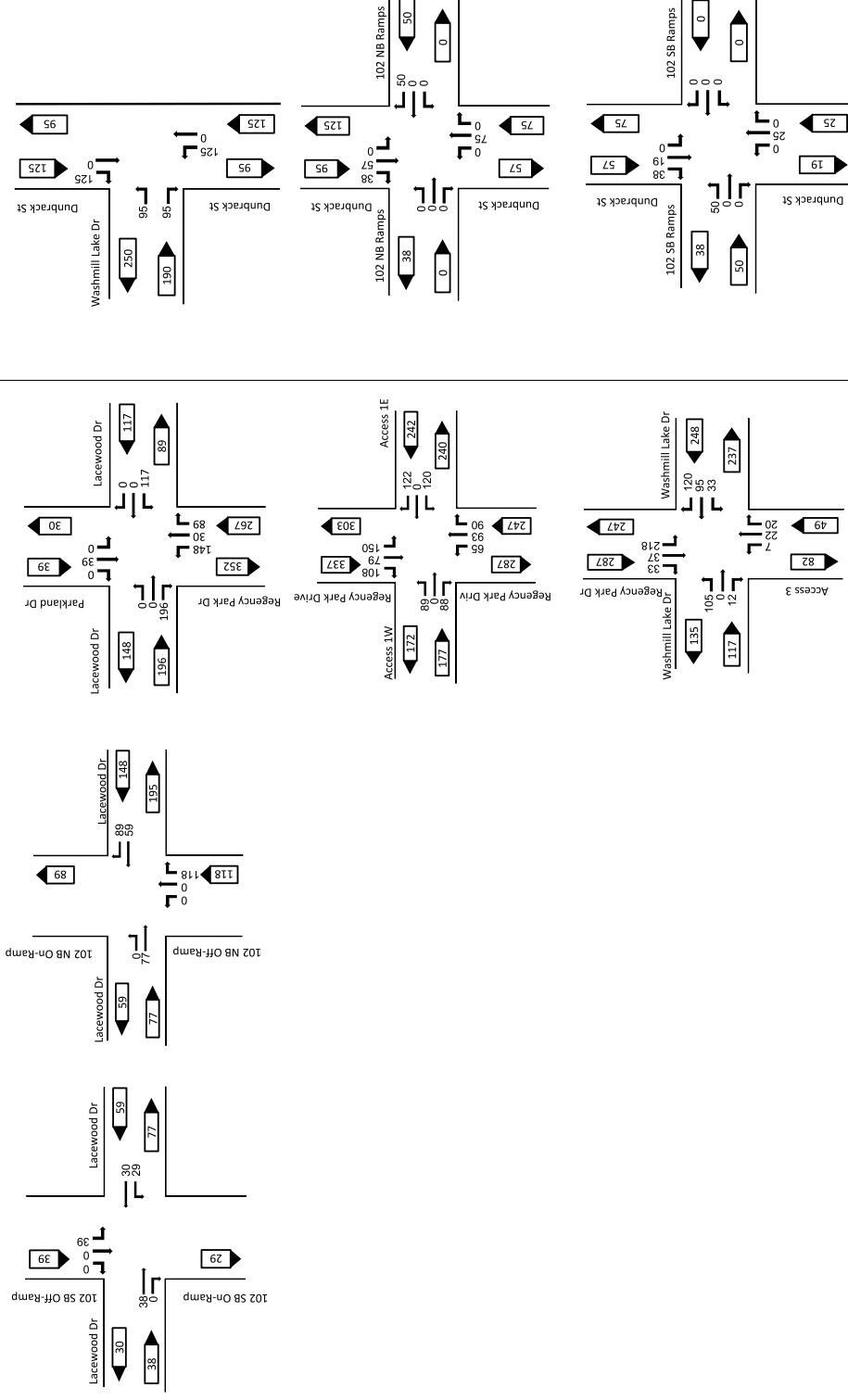


Regency Links
Halifax, NS
Weekday AM Peak Hour
Trip Assignment

Figure A-4A

February 2025

Weekday PM Peak Hour
Trip Assignment



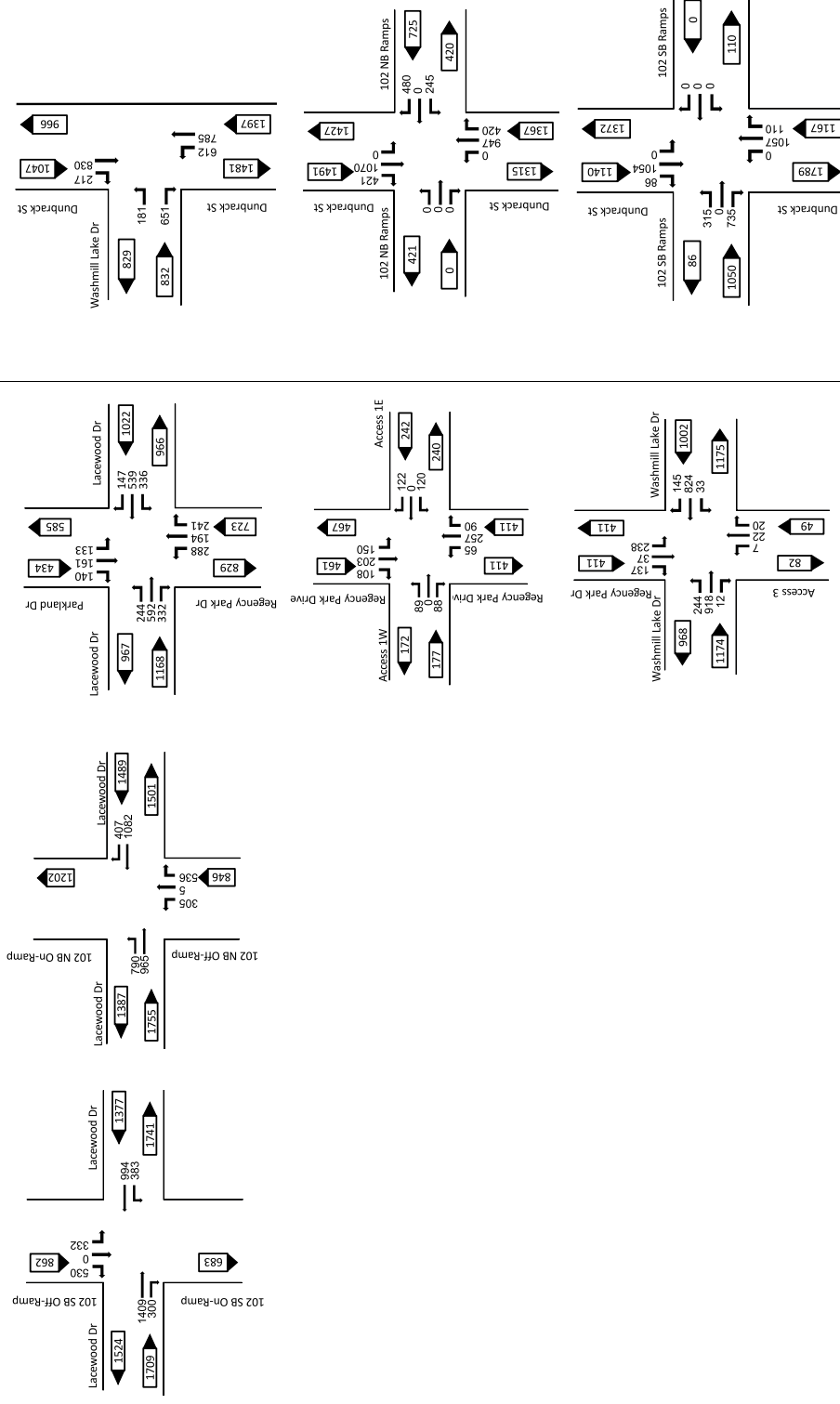
Regency Links
Halifax, NS
Weekday PM Peak Hour
Trip Assignment

Figure A-4B
February 2025

Regency Links
Halifax, NS

Weekday AM Peak Hour
2039 Total Traffic with Site Generated Trips

Weekday PM Peak Hour
2039 Total Traffic with Site
Generated Trips



Regency Links
Halifax, NS
Weekday PM Peak Hour
2039 Total Traffic with Site Generated Trips

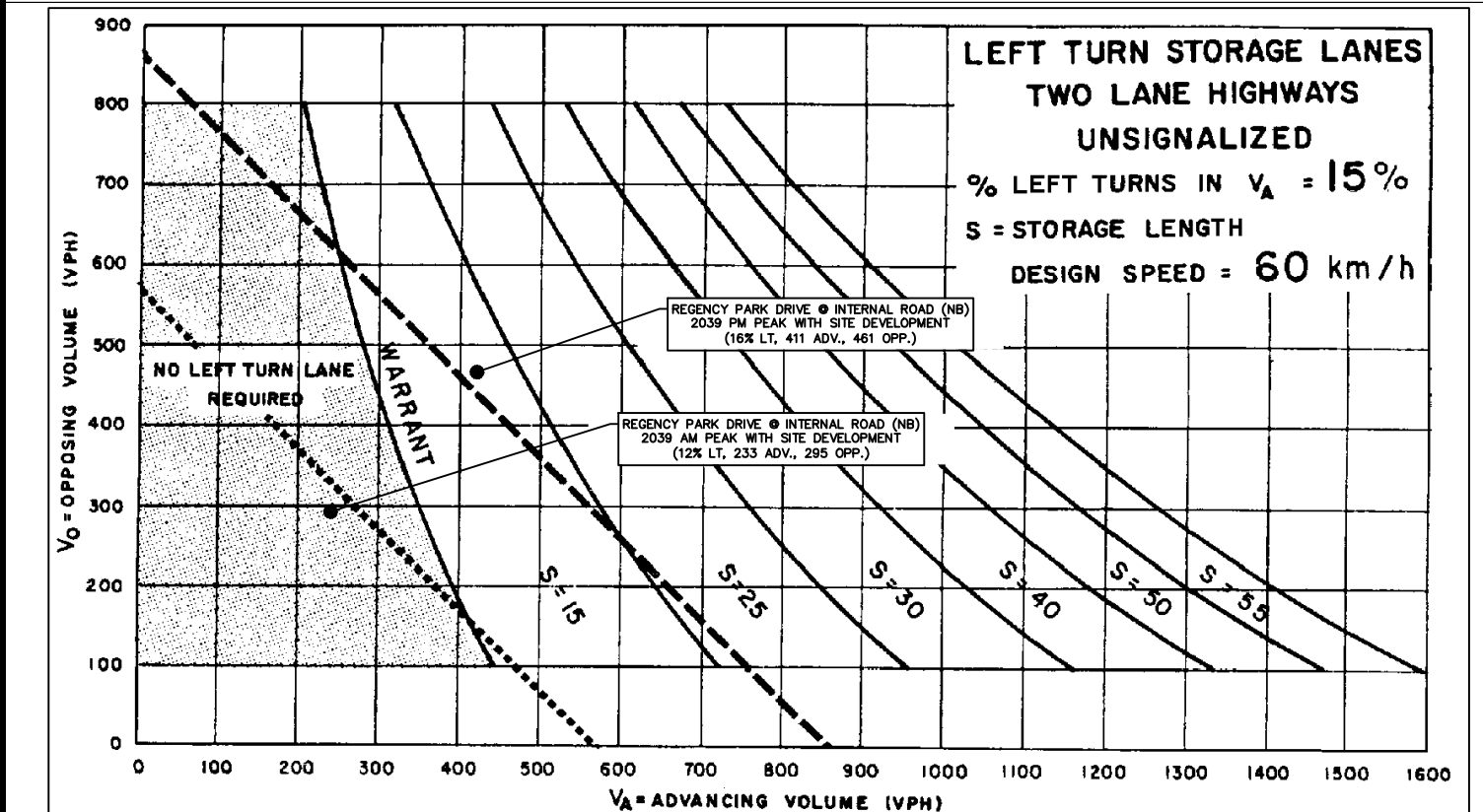
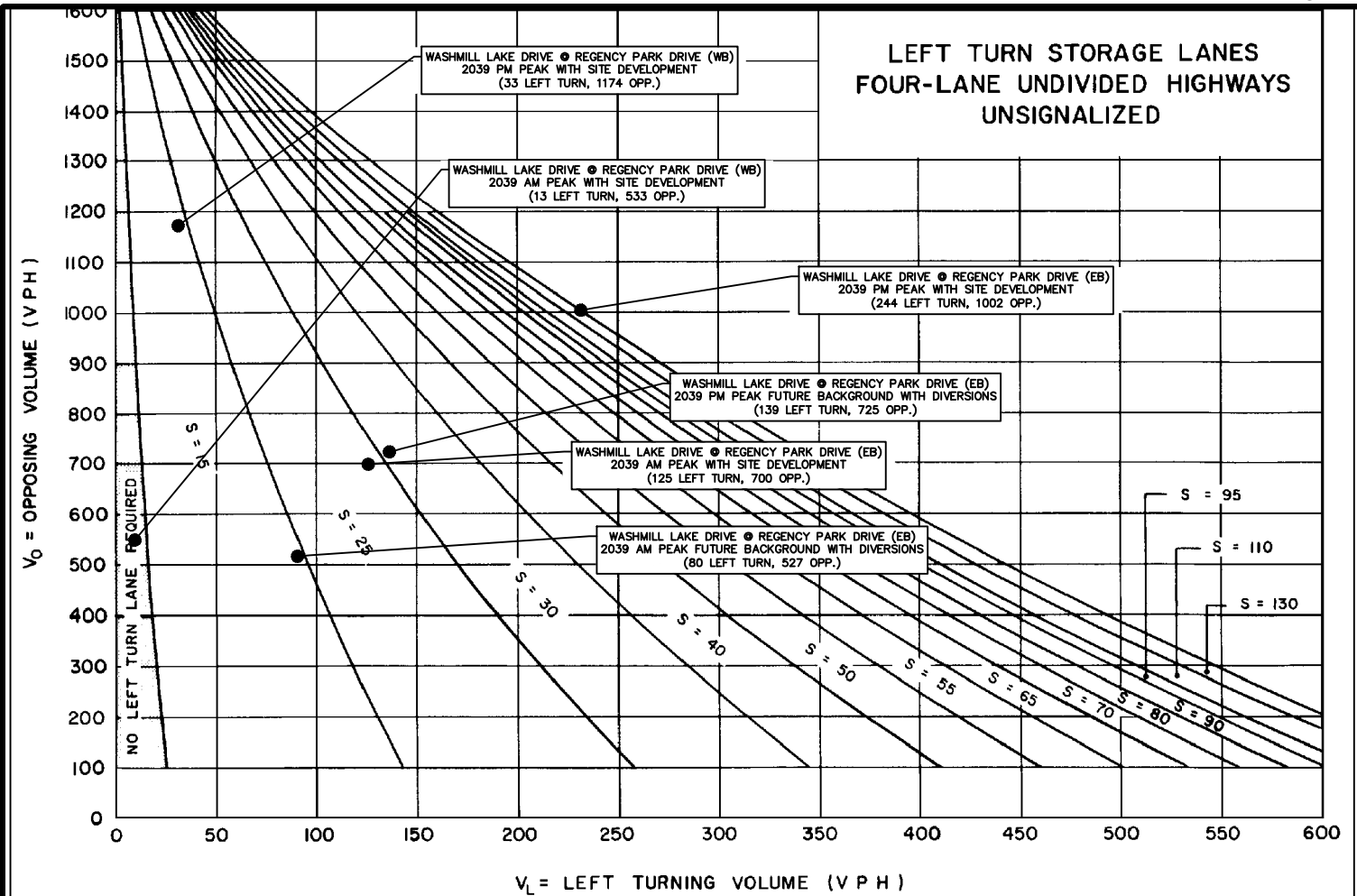
Figure A-5B
February 2025

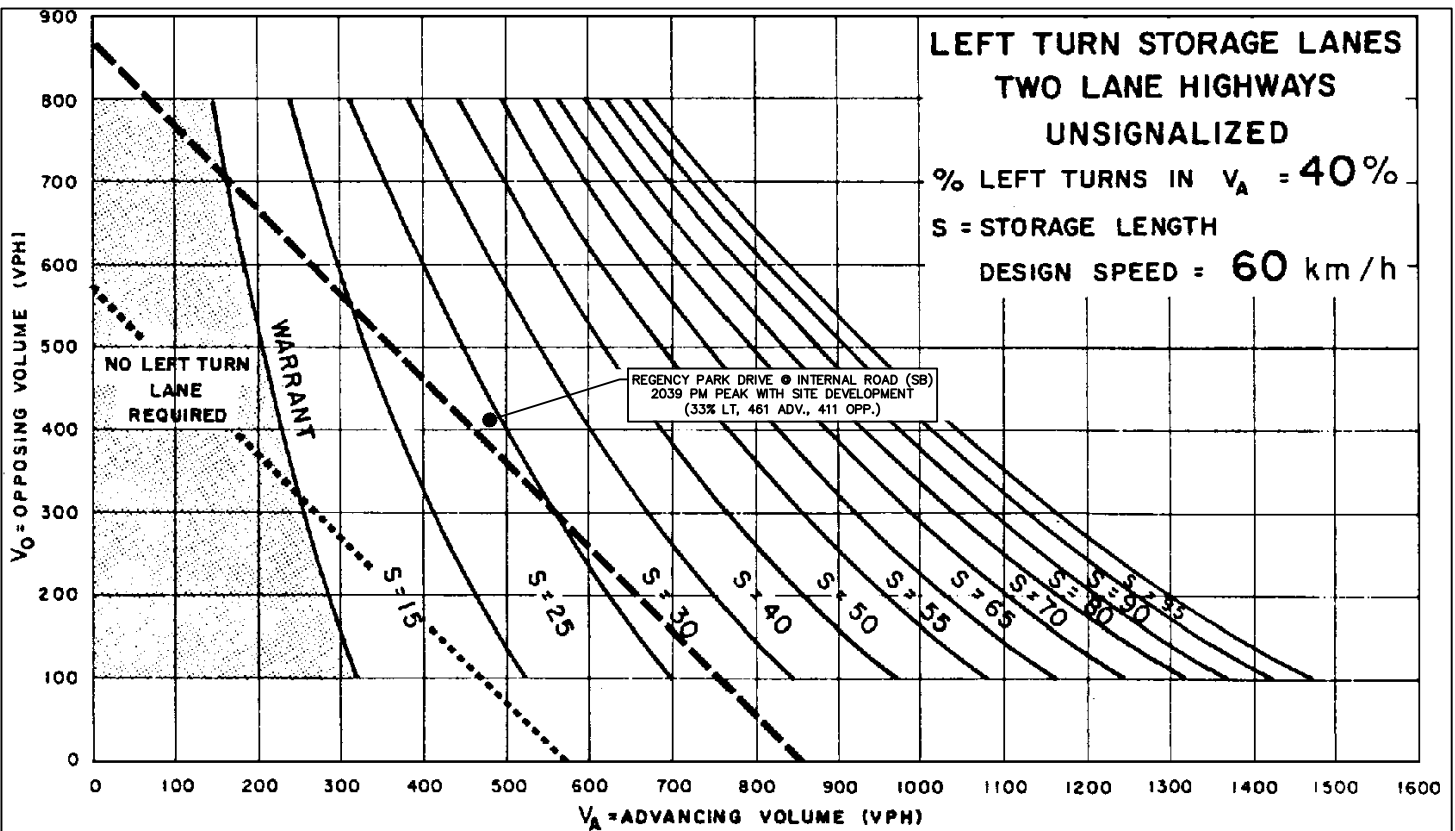
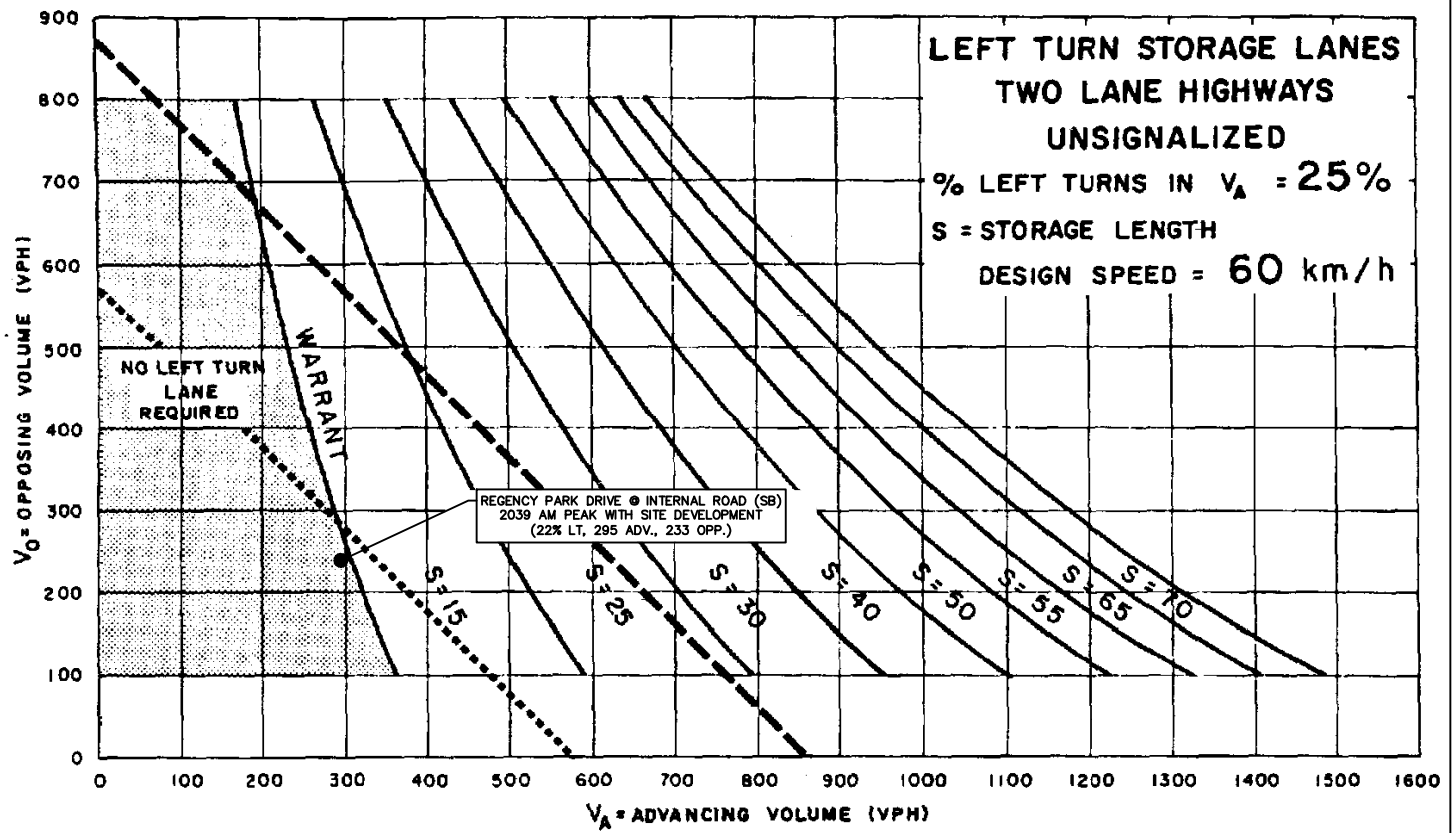
APPENDIX

B

WARRANT ANALYSIS







2005 Canadian Traffic Signal Warrant Matrix Analysis

**Table: B-1 - Washmill Lake Drive @ Regency Park Drive
2039 Future with Site Generated Trips**

Main Street (name)	Washmill Lake Drive		Direction (EW or NS)	EW	Date:	February 2025
Side Street (name)	Regency Park Drive		Direction (EW or NS)	NS	City:	Halifax, NS

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Washmill Lake Drive	WB		1		1				
Washmill Lake Drive	EB		1		1				
Site Access #3	NB			1					
Regency Park Drive	SB			1					

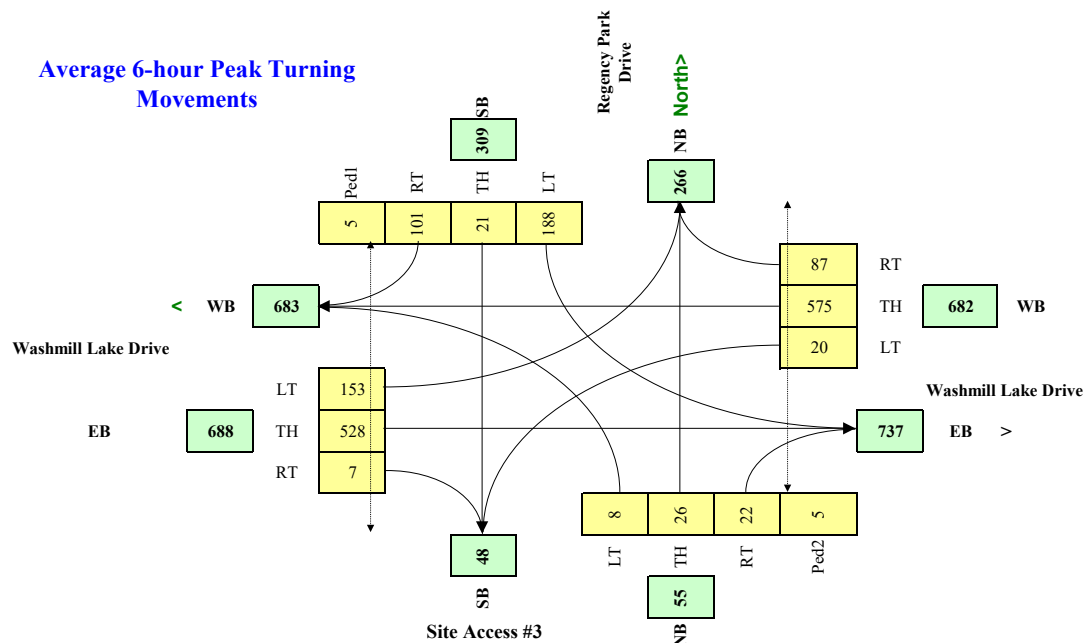
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Washmill Lake Drive	EW	50	2.0%	y	0.0
Regency Park Drive	NS	50	2.0%	y	

	Ped1 NS	Ped2 NS	Ped3 EW	Ped4 EW
	W Side	E Side	N Side	S side
7:00 - 8:00	5	5	5	5
8:00 - 9:00	5	5	5	5
11:30 - 12:30	5	5	5	5
12:30 - 13:30	5	5	5	5
16:00 - 17:00	5	5	5	5
17:00 - 18:00	5	5	5	5
Total (6-hour peak)	30	30	30	30
Average (6-hour peak)	5	5	5	5

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population	(#)	500,000
Central Business District	(y/n)	y

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	10	35	30	185	15	90	10	480	55	105	320	5
8:00 - 9:00	15	40	35	220	15	105	15	560	65	125	375	5
11:30 - 12:30	5	20	15	140	15	80	15	470	65	120	435	5
12:30 - 13:30	5	20	15	140	15	80	15	470	65	120	435	5
16:00 - 17:00	5	20	20	240	35	135	35	795	145	245	865	10
17:00 - 18:00	5	20	15	200	30	115	30	675	125	205	735	10
Total (6-hour peak)	45	155	130	1,125	125	605	120	3,450	520	920	3,165	40
Average (6-hour peak)	8	26	22	188	21	101	20	575	87	153	528	7

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

W =	277	259	18
		<i>Veh</i>	<i>Ped</i>
Warranted			

2005 Canadian Traffic Signal Warrant Matrix Analysis

**Table: B-2 - Washmill Lake Drive @ Regency Park Drive
2039 Future Background with Trips Diverted**

Main Street (name)	Washmill Lake Drive		Direction (EW or NS)	EW	Date:	February 2025
Side Street (name)	Regency Park Drive		Direction (EW or NS)	NS	City:	Halifax, NS

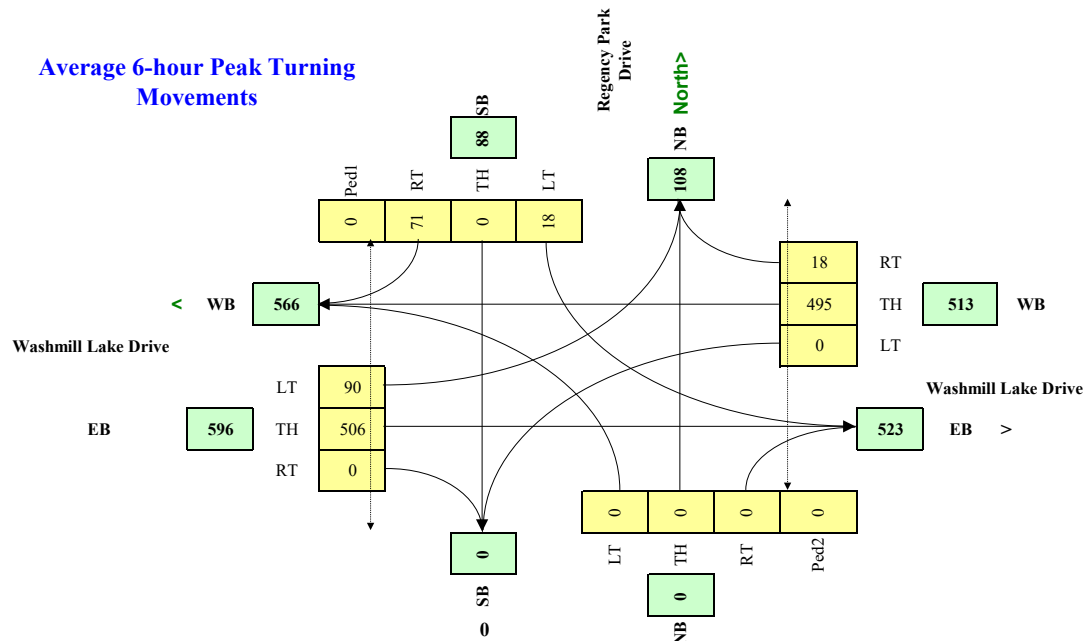
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Washmill Lake Drive	WB			1	1				
Washmill Lake Drive	EB		1	1					
	NB								
Regency Park Drive	SB			1					

Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Washmill Lake Drive	EW	50	2.0%	y	0.0
Regency Park Drive	NS	50	2.0%	y	

	Ped1 NS W Side	Ped2 NS E Side	Ped3 EW N Side	Ped4 EW S side
7:00 - 8:00				
8:00 - 9:00				
11:30 - 12:30				
12:30 - 13:30				
15:30 - 16:30				
16:30 - 17:30				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population	(#)	500,000
Central Business District	(y/n)	y

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	0	0	20	0	60	0	435	15	70	320	0
8:00 - 9:00	0	0	0	20	0	70	0	510	15	80	375	0
11:30 - 12:30	0	0	0	15	0	50	0	365	15	65	370	0
12:30 - 13:30	0	0	0	15	0	50	0	365	15	65	370	0
15:30 - 16:30	0	0	0	20	0	105	0	700	25	140	865	0
16:30 - 17:30	0	0	0	15	0	90	0	595	20	120	735	0
Total (6-hour peak)	0	0	0	105	0	425	0	2,970	105	540	3,035	0
Average (6-hour peak)	0	0	0	18	0	71	0	495	18	90	506	0



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

W = 45 45 0
 Veh Ped
NOT Warranted

2005 Canadian Traffic Signal Warrant Matrix Analysis

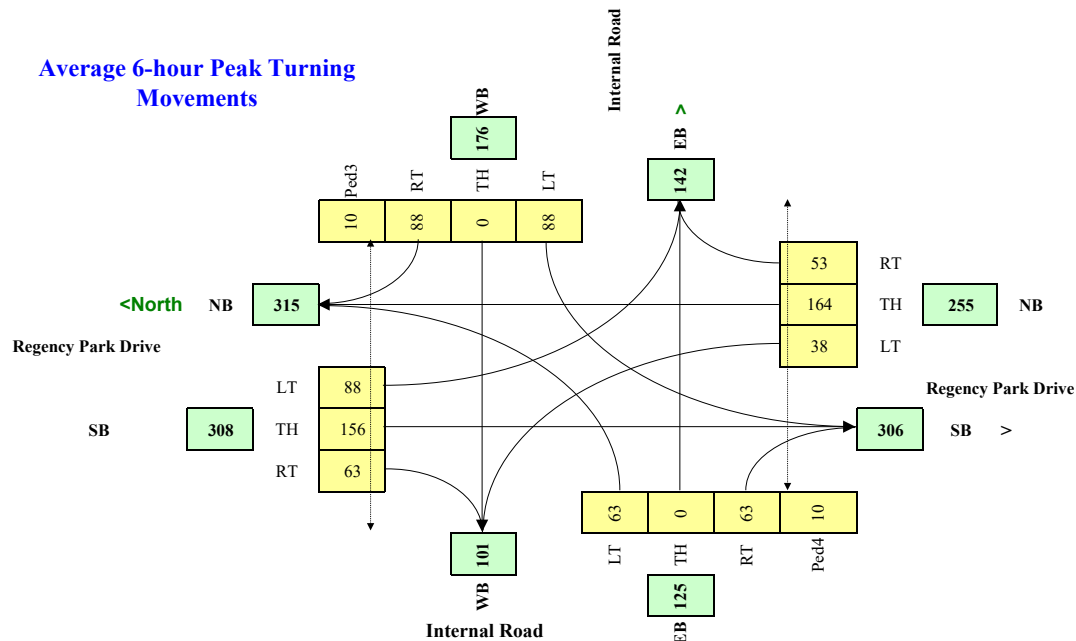
Table: B-3 - Regency Park Drive @ Internal Intersection (EW)
2039 Future with Site Generated Trips

Main Street (name)	Regency Park Drive		Direction (EW or NS)	NS	Date:	February 2025
Side Street (name)	Internal Road		Direction (EW or NS)	EW	City:	Halifax, NS
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT
Regency Park Drive	NB	1			1	
Regency Park Drive	SB	1			1	
Internal Road	WB		1			
Internal Road	EB		1			
UpStream Signal (m)						
# of Thru Lanes						
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)	
Regency Park Drive	NS	50	2.0%	y	0.0	
Internal Road	EW	50	2.0%	y		

Ped1	Ped2	Ped3	Ped4
NS	NS	EW	EW
W Side	E Side	N Side	S side
7:00 - 8:00	10	10	10
8:00 - 9:00	10	10	10
11:30 - 12:30	10	10	10
12:30 - 13:30	10	10	10
15:30 - 16:30	10	10	10
16:30 - 17:30	10	10	10
Total (6-hour peak)	60	60	60
Average (6-hour peak)	10	10	10

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population	(#)	500,000
Central Business District	(y/n)	y

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	25	130	35	55	150	40	80	0	80	55	0	55
8:00 - 9:00	30	150	40	65	175	50	95	0	95	65	0	65
11:30 - 12:30	25	120	40	65	115	45	65	0	65	45	0	45
12:30 - 13:30	25	120	40	65	115	45	65	0	65	45	0	45
15:30 - 16:30	65	250	90	150	205	110	120	0	120	90	0	90
16:30 - 17:30	55	215	75	130	175	90	100	0	105	75	0	75
Total (6-hour peak)	225	985	320	530	935	380	525	0	530	375	0	375
Average (6-hour peak)	38	164	53	88	156	63	88	0	88	63	0	63



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

$$W = 79 \quad 64 \quad 15$$

Veh Ped

NOT Warranted

2005 Canadian Traffic Signal Warrant Matrix Analysis

**Table: B-4 - Dunbrack Street @ 102 NB Ramps
2039 Future with Background Development**

Main Street (name)	Dunbrack Street		Direction (EW or NS)	NS	Date:	February 2025	
Side Street (name)	Highway 102 NB		Direction (EW or NS)	EW	City:	Halifax, NS	

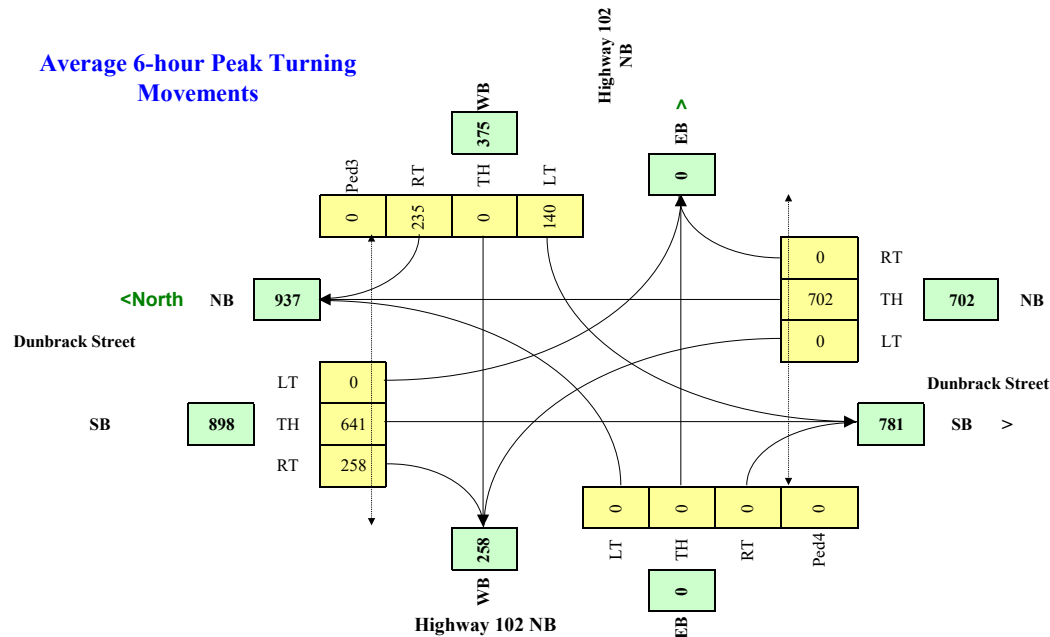
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Dunbrack Street	NB			2		1		2	
Dunbrack Street	SB			2		1		2	
Highway 102 NB	WB	1				1			
Highway 102 NB	EB								

Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Dunbrack Street	NS	60	2.0%	y	6.0
Highway 102 NB	EW	60	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
NS	NS	NS	EW	EW
W Side	E Side	N Side	S Side	
7:00 - 8:00				
8:00 - 9:00				
11:30 - 12:30				
12:30 - 13:30				
15:30 - 16:30				
16:30 - 17:30				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	925	0	0	635	280	110	0	175	0	0	0
8:00 - 9:00	0	785	0	0	540	240	95	0	150	0	0	0
11:30 - 12:30	0	450	0	0	410	165	90	0	150	0	0	0
12:30 - 13:30	0	450	0	0	410	165	90	0	150	0	0	0
15:30 - 16:30	0	735	0	0	850	320	210	0	360	0	0	0
16:30 - 17:30	0	865	0	0	1000	375	245	0	425	0	0	0
Total (6-hour peak)	0	4,210	0	0	3,845	1,545	840	0	1,410	0	0	0
Average (6-hour peak)	0	702	0	0	641	258	140	0	235	0	0	0



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

W =	142	142	0
		Veh	Ped
Warranted			

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table: B-5 - Dunbrack Street @ 102 NB Ramps
2039 Future with Site Trips

Main Street (name)	Dunbrack Street		Direction (EW or NS)		NS	Date:		January 2025	
Side Street (name)	Highway 102 NB		Direction (EW or NS)		EW	City:		Halifax, NS	

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Dunbrack Street	NB			2		1		2	
Dunbrack Street	SB			2		1		2	
Highway 102 NB	WB	1				1			
Highway 102 NB	EB								

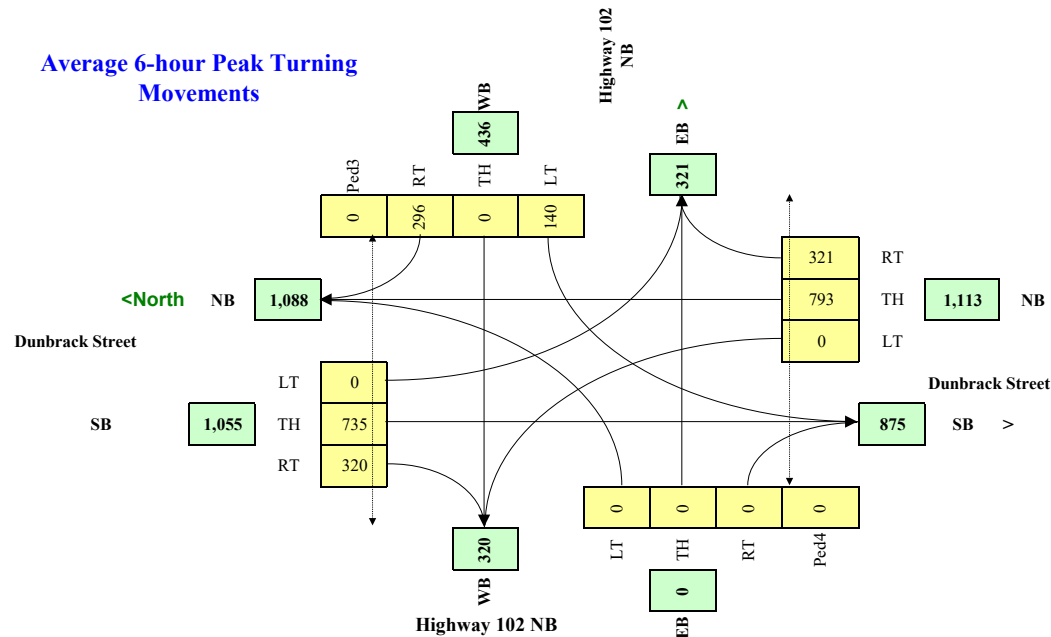
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Dunbrack Street	NS	60	2.0%	y	6.0
Highway 102 NB	EW	60	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00				
8:00 - 9:00				
11:30 - 12:30				
12:30 - 13:30				
15:30 - 16:30				
16:30 - 17:30				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	1005	400	0	755	360	110	0	225	0	0	0
8:00 - 9:00	0	850	340	0	635	300	95	0	190	0	0	0
11:30 - 12:30	0	505	205	0	470	205	90	0	190	0	0	0
12:30 - 13:30	0	505	205	0	470	205	90	0	190	0	0	0
15:30 - 16:30	0	870	355	0	955	390	210	0	450	0	0	0
16:30 - 17:30	0	1020	420	0	1125	460	245	0	530	0	0	0
Total (6-hour peak)	0	4,755	1,925	0	4,410	1,920	840	0	1,775	0	0	0
Average (6-hour peak)	0	793	321	0	735	320	140	0	296	0	0	0



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

W =	186	186	0
		Veh	Ped
Warranted			

2005 Canadian Traffic Signal Warrant Matrix Analysis

**Table: B-6 - Dunbrack Street @ 102 SB Ramps
2039 Future with Background Development**

Main Street (name)	Dunbrack Street		Direction (EW or NS)		NS	Date:	February 2025	
Side Street (name)	Highway 102 SB		Direction (EW or NS)		EW	City:	Halifax, NS	

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Dunbrack Street	NB			2		1		2	
Dunbrack Street	SB			2		1		2	
Highway 102 SB	WB								
Highway 102 SB	EB	1				1			

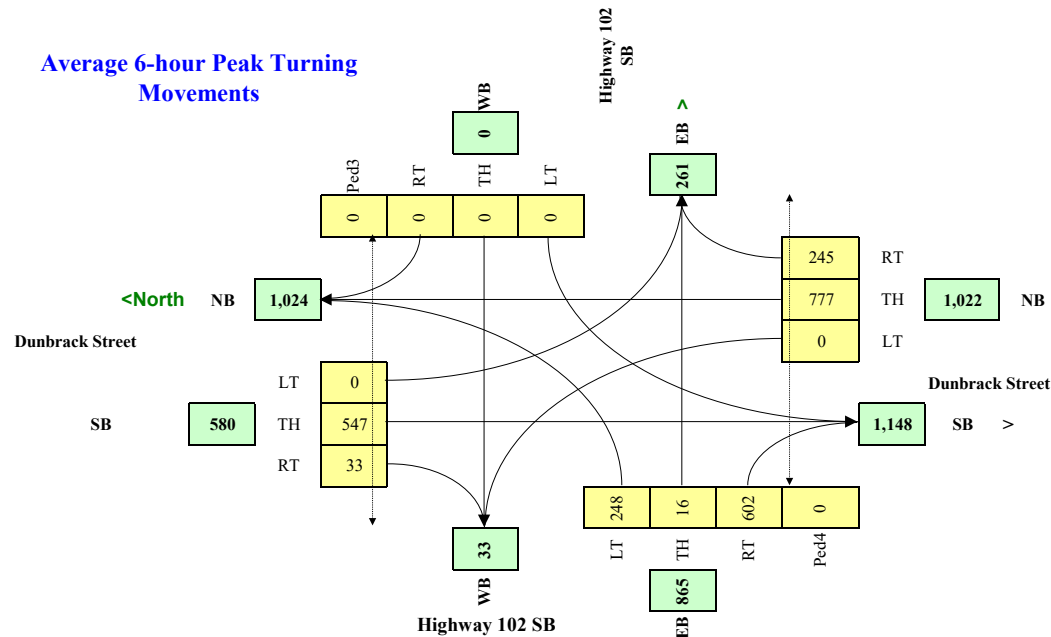
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Dunbrack Street	NS	60	2.0%	y	6.0
Highway 102 SB	EW	60	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00				
8:00 - 9:00				
11:30 - 12:30				
12:30 - 13:30				
15:30 - 16:30				
16:30 - 17:30				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	955	515	0	365	45	0	0	0	370	40	800
8:00 - 9:00	0	810	440	0	310	40	0	0	0	315	35	680
11:30 - 12:30	0	495	155	0	350	20	0	0	0	160	10	385
12:30 - 13:30	0	495	155	0	350	20	0	0	0	160	10	385
15:30 - 16:30	0	875	95	0	875	35	0	0	0	220	0	625
16:30 - 17:30	0	1030	110	0	1030	40	0	0	0	260	0	735
Total (6-hour peak)	0	4,660	1,470	0	3,280	200	0	0	0	1,485	95	3,610
Average (6-hour peak)	0	777	245	0	547	33	0	0	0	248	16	602



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

W =	316	316	0
	Veh	Ped	
Warranted			

2005 Canadian Traffic Signal Warrant Matrix Analysis

**Table: B-7 - Dunbrack Street @ 102 SB Ramps
2039 Future with Background Development**

Main Street (name)	Dunbrack Street		Direction (EW or NS)		NS		Date:		February 2025	
Side Street (name)	Highway 102 SB		Direction (EW or NS)		EW		City:		Halifax, NS	

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Dunbrack Street	NB			2		1		2	
Dunbrack Street	SB			2		1		2	
Highway 102 SB	WB								
Highway 102 SB	EB	1				1			

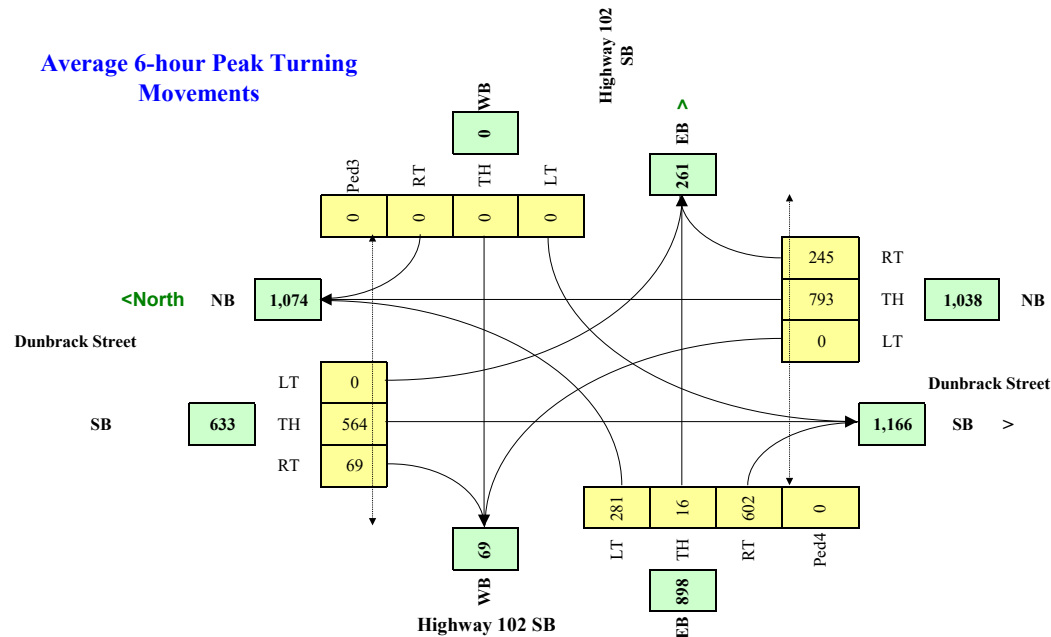
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Dunbrack Street	NS	60	2.0%	y	6.0
Highway 102 SB	EW	60	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00				
8:00 - 9:00				
11:30 - 12:30				
12:30 - 13:30				
15:30 - 16:30				
16:30 - 17:30				
Total (6-hour peak)	0	0	0	0
Average (6-hour peak)	0	0	0	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	970	515	0	385	90	0	0	0	400	40	800
8:00 - 9:00	0	825	440	0	330	75	0	0	0	340	35	680
11:30 - 12:30	0	505	155	0	360	45	0	0	0	180	10	385
12:30 - 13:30	0	505	155	0	360	45	0	0	0	180	10	385
15:30 - 16:30	0	900	95	0	895	75	0	0	0	270	0	625
16:30 - 17:30	0	1055	110	0	1055	85	0	0	0	315	0	735
Total (6-hour peak)	0	4,760	1,470	0	3,385	415	0	0	0	1,685	95	3,610
Average (6-hour peak)	0	793	245	0	564	69	0	0	0	281	16	602



$$W = [C_{bt}(X_{v,v}) / K_1 + (F(X_{v,p}) L) / K_2] \times C_i$$

W =	350	350	0
	Veh	Ped	
Warranted			

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Regency Links			Organization:	WSP
Project Location:	Regency Park Drive			Performed By:	Brianna Rietzel
Scenario Description:	AM Peak Hour			Date:	2025-02-20
Analysis Year:	2039			Checked By:	Patrick Hatton
Analysis Period:	AM Street Peak Hour			Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)							
Land Use	Development Data (For Information Only)				Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units		Total	Entering	Exiting
Office					0		
Retail					368	221	147
Restaurant					0		
Cinema/Entertainment					0		
Residential					917	238	679
Hotel					0		
All Other Land Uses ²					0		
					1,285	459	826

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail	1.17			1.16		
Restaurant						
Cinema/Entertainment						
Residential	1.13			1.09		
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	5	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	7	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,439	528	911
Internal Capture Percentage	2%	2%	1%
External Vehicle-Trips ⁵	1,264	449	815
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	3%	3%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	Regency Links			Organization:	WSP
Project Location:	Regency Park Drive			Performed By:	Brianna Rietzel
Scenario Description:	PM Peak Hour			Date:	2025-02-20
Analysis Year:	2039			Checked By:	Patrick Hatton
Analysis Period:	PM Street Peak Hour			Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				1,026	513	513
Restaurant				0		
Cinema/Entertainment				0		
Residential				1,088	675	413
Hotel				0		
All Other Land Uses ²				0		
				2,114	1,188	926

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail	1.21			1.18		
Restaurant						
Cinema/Entertainment						
Residential	1.15			1.21		
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail					1000	
Restaurant						
Cinema/Entertainment						
Residential		1000				
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	146	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	47	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,502	1,397	1,105
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ⁵	1,785	1,022	763
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	8%	24%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	19%	9%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

APPENDIX

C

INTERSECTION PERFORMANCE ANALYSIS



Appendix C - Intersection Performance Analysis

1: Regency Park Drive/Parkland Drive & Lacewood Drive

Page C - 1
2039 AM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Traffic Volume (vph)	95	470	135	90	320	100	120	50	135	175	65	155
Future Volume (vph)	95	470	135	90	320	100	120	50	135	175	65	155
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.543			0.454			0.711			0.722		
Satd. Flow (perm)	1011	3539	1583	846	3539	1583	1324	1863	1583	1345	1863	1583
Satd. Flow (RTOR)			88			88			147			168
Lane Group Flow (vph)	103	511	147	98	348	109	130	54	147	190	71	168
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Total Split (s)	12.0	35.0	35.0	13.0	36.0	36.0	42.0	42.0	42.0	42.0	42.0	42.0
Total Lost Time (s)	4.0	6.3	6.3	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Act Effect Green (s)	22.5	14.5	14.5	23.0	14.8	14.8	12.9	12.9	12.9	12.9	12.9	12.9
Actuated g/C Ratio	0.45	0.29	0.29	0.46	0.30	0.30	0.26	0.26	0.26	0.26	0.26	0.26
v/c Ratio	0.18	0.49	0.28	0.18	0.33	0.20	0.38	0.11	0.28	0.54	0.15	0.31
Control Delay	7.8	18.3	9.7	7.7	16.4	7.1	19.9	15.8	5.2	23.5	16.1	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	18.3	9.7	7.7	16.4	7.1	19.9	15.8	5.2	23.5	16.1	5.1
LOS	A	B	A	A	B	A	B	B	A	C	B	A
Approach Delay		15.2			13.0			12.7			15.1	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	4.1	21.2	4.1	3.9	13.6	1.4	9.7	3.7	0.0	14.9	5.0	0.0
Queue Length 95th (m)	13.0	42.0	18.1	12.5	28.1	11.9	25.4	12.0	11.0	36.3	14.7	11.6
Internal Link Dist (m)		122.8			242.6			314.2			320.2	
Turn Bay Length (m)	55.0		7.0	50.0		7.0	35.0		7.0	35.0		7.0
Base Capacity (vph)	597	2172	1005	586	2247	1037	977	1375	1207	993	1375	1212
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.24	0.15	0.17	0.15	0.11	0.13	0.04	0.12	0.19	0.05	0.14

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 49.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 14.2

Intersection Capacity Utilization 49.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 1: Regency Park Drive/Parkland Drive & Lacewood Drive

 Ø1	 Ø2	 Ø4
12 s	36 s	42 s
 Ø5	 Ø6	 Ø8
13 s	35 s	42 s

4: Hwy 102 NB Ramps & Lacewood Drive

2039 AM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (vph)	190	545	0	0	580	235	120	0	390	0	0	0
Future Volume (vph)	190	545	0	0	580	235	120	0	390	0	0	0
Satd. Flow (prot)	3433	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Flt Permitted	0.950						0.950	0.950				
Satd. Flow (perm)	3433	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Satd. Flow (RTOR)						255			202			
Lane Group Flow (vph)	207	592	0	0	630	255	65	65	424	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Total Split (s)	19.0	52.0			33.0	33.0	48.0	48.0	48.0			
Total Lost Time (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Act Effct Green (s)	43.2	66.1			18.8	18.8	21.9	21.9	21.9			
Actuated g/C Ratio	0.43	0.66			0.19	0.19	0.22	0.22	0.22			
v/c Ratio	0.14	0.25			0.66	0.51	0.18	0.18	0.84			
Control Delay	0.4	0.5			40.7	7.9	29.1	29.1	33.3			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	0.4	0.5			40.7	7.9	29.1	29.1	33.3			
LOS	A	A			D	A	C	C	C			
Approach Delay		0.5			31.3			32.3				
Approach LOS		A			C			C				
Queue Length 50th (m)	0.0	0.1			44.2	0.0	11.4	11.4	44.9			
Queue Length 95th (m)	0.0	0.0			53.4	19.7	19.8	19.8	70.6			
Internal Link Dist (m)		118.1			149.0			197.6			197.9	
Turn Bay Length (m)						60.0			60.0			
Base Capacity (vph)	1484	2337			1372	613	706	706	782			
Starvation Cap Reductn	0	0			0	0	0	0	0			
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.14	0.25			0.46	0.42	0.09	0.09	0.54			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 95 (95%), Referenced to phase 4:EBT and 7:EBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 20.5

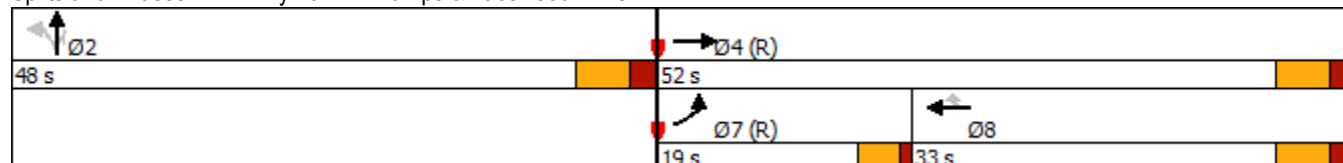
Intersection Capacity Utilization 49.2%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service A

Splits and Phases: 4: Hwy 102 NB Ramps & Lacewood Drive



5: Lacewood Drive & Hwy 102 SB Ramps

2039 AM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	440	65	220	475	0	0	0	0	300	0	510
Future Volume (vph)	0	440	65	220	475	0	0	0	0	300	0	510
Satd. Flow (prot)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Satd. Flow (RTOR)			76									554
Lane Group Flow (vph)	0	478	71	239	516	0	0	0	0	163	163	554
Turn Type		NA	Perm	Prot	NA					Perm	NA	Free
Protected Phases		4		3	8						6	
Permitted Phases			4							6		Free
Total Split (s)		24.0	24.0	29.0	53.0					47.0	47.0	
Total Lost Time (s)		6.0	6.0	4.0	6.0					6.0	6.0	
Act Effct Green (s)		12.9	12.9	55.9	72.8					15.2	15.2	100.0
Actuated g/C Ratio		0.13	0.13	0.56	0.73					0.15	0.15	1.00
v/c Ratio		0.58	0.26	0.24	0.20					0.64	0.64	0.35
Control Delay		43.6	10.9	1.4	0.3					50.6	50.6	0.6
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		43.6	10.9	1.4	0.3					50.6	50.6	0.6
LOS		D	B	A	A					D	D	A
Approach Delay		39.4			0.6						19.1	
Approach LOS		D			A						B	
Queue Length 50th (m)		27.1	0.0	2.0	0.0					33.3	33.3	0.0
Queue Length 95th (m)		34.8	11.4	9.3	0.0					52.4	52.4	0.0
Internal Link Dist (m)		108.2			118.1			188.6			191.5	
Turn Bay Length (m)			70.0									90.0
Base Capacity (vph)		1153	347	988	2576					689	689	1583
Starvation Cap Reductn		0	0	0	0					0	0	0
Spillback Cap Reductn		0	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.41	0.20	0.24	0.20					0.24	0.24	0.35

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 3:WBL and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 17.8

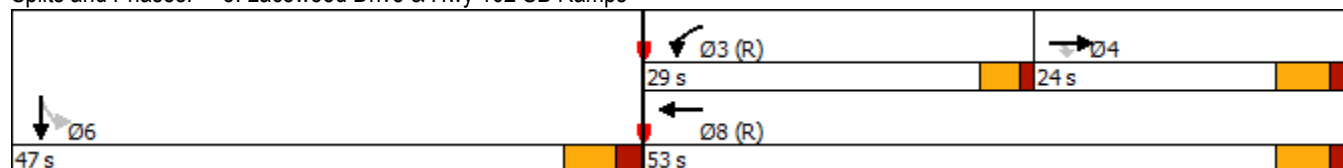
Intersection LOS: B

Intersection Capacity Utilization 49.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: Lacewood Drive & Hwy 102 SB Ramps



Appendix C - Intersection Performance Analysis

6: Dunbrack Street & Washmill Lake Drive

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2039 AM without Site - no diversions

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	35	330	340	755	580	50
Future Volume (vph)	35	330	340	755	580	50
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.261			
Satd. Flow (perm)	1770	1583	486	3539	3539	1583
Satd. Flow (RTOR)		359				17
Lane Group Flow (vph)	38	359	370	821	630	54
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	
Permitted Phases	4	4	2			6
Total Split (s)	28.0	28.0	31.0	62.0	31.0	31.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0
Act Effect Green (s)	8.0	8.0	39.3	37.2	15.6	15.6
Actuated g/C Ratio	0.14	0.14	0.68	0.64	0.27	0.27
v/c Ratio	0.16	0.68	0.52	0.36	0.66	0.12
Control Delay	27.0	11.0	7.1	5.3	23.5	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	11.0	7.1	5.3	23.5	14.7
LOS	C	B	A	A	C	B
Approach Delay	12.5			5.8	22.8	
Approach LOS	B			A	C	
Queue Length 50th (m)	3.6	0.0	11.1	15.7	29.9	2.8
Queue Length 95th (m)	13.8	23.3	34.3	34.8	63.9	12.8
Internal Link Dist (m)	384.9			213.8	199.1	
Turn Bay Length (m)			120.0			7.0
Base Capacity (vph)	711	850	964	3232	1615	731
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.42	0.38	0.25	0.39	0.07

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 57.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 12.1

Intersection Capacity Utilization 52.4%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 6: Dunbrack Street & Washmill Lake Drive

	
Ø2	Ø4
62 s	28 s
	
Ø5	Ø6
31 s	31 s

7: Dunbrack Street & 102 NB Ramps

2039 AM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	110	0	175	0	925	400	0	625	270
Future Volume (vph)	0	0	0	110	0	175	0	925	400	0	625	270
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)						190			435			230
Lane Group Flow (vph)	0	0	0	0	120	190	0	1005	435	0	679	293
Turn Type				Perm	NA	Free		NA	Perm		NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		Free			2			6
Total Split (s)				31.0	31.0			69.0	69.0		69.0	69.0
Total Lost Time (s)					6.0			6.0	6.0		6.0	6.0
Act Effect Green (s)					9.1	47.8		31.5	31.5		31.5	31.5
Actuated g/C Ratio					0.19	1.00		0.66	0.66		0.66	0.66
v/c Ratio					0.36	0.12		0.43	0.36		0.29	0.26
Control Delay					21.2	0.2		6.7	1.8		5.8	2.4
Queue Delay					0.0	0.0		0.0	0.0		0.0	0.0
Total Delay					21.2	0.2		6.7	1.8		5.8	2.4
LOS					C	A		A	A		A	A
Approach Delay					8.3			5.2			4.7	
Approach LOS					A			A			A	
Queue Length 50th (m)					9.9	0.0		24.7	0.0		14.7	2.2
Queue Length 95th (m)					22.4	0.0		42.6	9.6		26.3	11.3
Internal Link Dist (m)		132.3			134.0			231.5			155.9	
Turn Bay Length (m)						50.0			50.0			15.0
Base Capacity (vph)					950	1583		3539	1583		3539	1583
Starvation Cap Reductn					0	0		0	0		0	0
Spillback Cap Reductn					0	0		0	0		0	0
Storage Cap Reductn					0	0		0	0		0	0
Reduced v/c Ratio					0.13	0.12		0.28	0.27		0.19	0.19

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 47.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 5.4

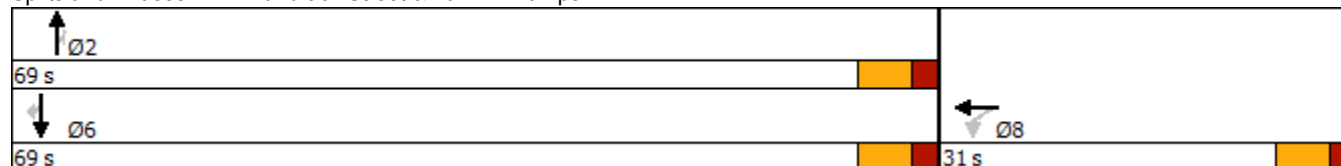
Intersection Capacity Utilization 41.7%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 7: Dunbrack Street & 102 NB Ramps



8: Dunbrack Street & 102 SB Ramps

2039 AM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	370	40	800	0	0	0	0	955	515	0	365	35
Future Volume (vph)	370	40	800	0	0	0	0	955	515	0	365	35
Satd. Flow (prot)	0	1783	1583	0	0	0	0	3539	1583	0	3539	1583
Flt Permitted		0.957										
Satd. Flow (perm)	0	1783	1583	0	0	0	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)			697						434			98
Lane Group Flow (vph)	0	445	870	0	0	0	0	1038	560	0	397	38
Turn Type	Perm	NA	Free					NA	Perm		NA	Free
Protected Phases		4						2			6	
Permitted Phases	4		Free						2			Free
Total Split (s)	45.0	45.0						55.0	55.0		55.0	
Total Lost Time (s)		6.0						6.0	6.0		6.0	
Act Effct Green (s)		22.3	64.3					29.1	29.1		29.1	64.3
Actuated g/C Ratio		0.35	1.00					0.45	0.45		0.45	1.00
v/c Ratio		0.72	0.55					0.65	0.59		0.25	0.02
Control Delay		26.9	1.4					16.3	6.2		11.9	0.0
Queue Delay		0.0	0.0					0.0	0.0		0.0	0.0
Total Delay		26.9	1.4					16.3	6.2		11.9	0.0
LOS		C	A					B	A		B	A
Approach Delay		10.0						12.8			10.9	
Approach LOS		B						B			B	
Queue Length 50th (m)		44.2	0.0					46.5	8.3		14.2	0.0
Queue Length 95th (m)		102.0	0.0					94.1	39.5		31.7	0.0
Internal Link Dist (m)		153.7			159.2			222.4			231.5	
Turn Bay Length (m)									40.0			55.0
Base Capacity (vph)		1165	1583					2794	1341		2794	1583
Starvation Cap Reductn		0	0					0	0		0	0
Spillback Cap Reductn		0	0					0	0		0	0
Storage Cap Reductn		0	0					0	0		0	0
Reduced v/c Ratio		0.38	0.55					0.37	0.42		0.14	0.02

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 64.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 11.5

Intersection Capacity Utilization 64.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 8: Dunbrack Street & 102 SB Ramps

 02	 04
55 s	45 s
 06	
55 s	

7: Dunbrack Street & 102 NB Ramps

2039 AM without Site - no diversions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	110	0	175	0	925	400	0	625	270
Future Volume (Veh/h)	0	0	0	110	0	175	0	925	400	0	625	270
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	0	120	0	190	0	1005	435	0	679	293
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)						6						
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1182	1684	340	1344	1684	502	679			1005		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1182	1684	340	1344	1684	502	679			1005		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	63	100			100		
cM capacity (veh/h)	92	93	656	110	93	514	909			685		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3					
Volume Total	310	502	502	435	340	340	293					
Volume Left	120	0	0	0	0	0	0					
Volume Right	190	0	0	435	0	0	293					
cSH	274	1700	1700	1700	1700	1700	1700					
Volume to Capacity	1.13	0.30	0.30	0.26	0.20	0.20	0.17					
Queue Length 95th (m)	106.2	0.0	0.0	0.0	0.0	0.0	0.0					
Control Delay (s)	134.8	0.0	0.0	0.0	0.0	0.0	0.0					
Lane LOS	F											
Approach Delay (s)	134.8	0.0			0.0							
Approach LOS	F											
Intersection Summary												
Average Delay			15.4									
Intersection Capacity Utilization			43.1%		ICU Level of Service					A		
Analysis Period (min)			15									

8: Dunbrack Street & 102 SB Ramps

2039 AM without Site - no diversions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	370	40	800	0	0	0	0	955	515	0	365	35
Future Volume (Veh/h)	370	40	800	0	0	0	0	955	515	0	365	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	402	43	870	0	0	0	0	1038	560	0	397	38
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	916	1435	198	1258	1435	519	397			1038		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	916	1435	198	1258	1435	519	397			1038		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	68	0	0	100	100	100			100		
cM capacity (veh/h)	227	133	809	0	133	502	1158			665		
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	445	870	519	519	560	198	198	38				
Volume Left	402	0	0	0	0	0	0	0				
Volume Right	0	870	0	0	560	0	0	38				
cSH	213	809	1700	1700	1700	1700	1700	1700				
Volume to Capacity	2.09	1.07	0.31	0.31	0.33	0.12	0.12	0.02				
Queue Length 95th (m)	271.7	178.0	0.0	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	544.3	75.7	0.0	0.0	0.0	0.0	0.0	0.0				
Lane LOS	F	F										
Approach Delay (s)	234.2		0.0			0.0						
Approach LOS	F											
Intersection Summary												
Average Delay			92.0									
Intersection Capacity Utilization			66.3%			ICU Level of Service				C		
Analysis Period (min)			15									

Appendix C - Intersection Performance Analysis

1: Regency Park Drive/Parkland Drive & Lacewood Drive

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2039 PM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	305	615	160	170	575	155	165	95	95	140	80	175
Future Volume (vph)	305	615	160	170	575	155	165	95	95	140	80	175
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.311			0.358			0.701			0.690		
Satd. Flow (perm)	579	3539	1583	667	3539	1583	1306	1863	1583	1285	1863	1583
Satd. Flow (RTOR)			88			88			103			190
Lane Group Flow (vph)	332	668	174	185	625	168	179	103	103	152	87	190
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Total Split (s)	17.0	33.0	33.0	20.0	36.0	36.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Lost Time (s)	4.0	6.3	6.3	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Act Effect Green (s)	32.3	18.8	18.8	28.9	17.1	17.1	14.0	14.0	14.0	14.0	14.0	14.0
Actuated g/C Ratio	0.54	0.32	0.32	0.49	0.29	0.29	0.24	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.62	0.60	0.31	0.37	0.61	0.32	0.58	0.24	0.23	0.50	0.20	0.37
Control Delay	12.6	20.4	10.8	9.1	21.9	11.4	29.7	21.0	6.4	27.3	20.6	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	20.4	10.8	9.1	21.9	11.4	29.7	21.0	6.4	27.3	20.6	6.0
LOS	B	C	B	A	C	B	C	C	A	C	C	A
Approach Delay		16.8			17.7			21.1			16.5	
Approach LOS		B			B			C			B	
Queue Length 50th (m)	16.3	32.1	6.7	8.3	31.8	6.7	17.9	9.4	0.0	14.9	7.9	0.0
Queue Length 95th (m)	39.1	60.6	23.6	21.7	56.6	22.7	41.8	23.8	10.7	35.8	20.8	14.3
Internal Link Dist (m)		122.8			242.6			314.2			320.2	
Turn Bay Length (m)	55.0		7.0	50.0		7.0	35.0		7.0	35.0		7.0
Base Capacity (vph)	600	1650	785	694	1836	863	700	999	896	689	999	937
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.40	0.22	0.27	0.34	0.19	0.26	0.10	0.11	0.22	0.09	0.20

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 59.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 17.6

Intersection Capacity Utilization 62.4%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 1: Regency Park Drive/Parkland Drive & Lacewood Drive

		
Ø1	Ø2	Ø4
17 s	36 s	37 s
		
Ø5	Ø6	Ø8
20 s	33 s	37 s

4: Hwy 102 NB Ramps & Lacewood Drive

2039 PM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (vph)	790	970	0	0	1015	305	305	5	395	0	0	0
Future Volume (vph)	790	970	0	0	1015	305	305	5	395	0	0	0
Satd. Flow (prot)	3433	3539	0	0	5085	1583	1681	1688	1583	0	0	0
Flt Permitted	0.950						0.950	0.954				
Satd. Flow (perm)	3433	3539	0	0	5085	1583	1681	1688	1583	0	0	0
Satd. Flow (RTOR)						279			92			
Lane Group Flow (vph)	859	1054	0	0	1103	332	169	168	429	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Total Split (s)	38.0	74.0			36.0	36.0	46.0	46.0	46.0			
Total Lost Time (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Act Effct Green (s)	42.2	76.0			29.8	29.8	32.0	32.0	32.0			
Actuated g/C Ratio	0.35	0.63			0.25	0.25	0.27	0.27	0.27			
v/c Ratio	0.71	0.47			0.87	0.55	0.38	0.37	0.88			
Control Delay	11.0	4.7			52.1	11.3	36.9	36.7	51.6			
Queue Delay	2.2	0.8			0.4	0.0	0.0	0.0	0.0			
Total Delay	13.2	5.5			52.5	11.3	36.9	36.8	51.6			
LOS	B	A			D	B	D	D	D			
Approach Delay		8.9			43.0			45.1				
Approach LOS		A			D			D				
Queue Length 50th (m)	112.0	96.6			96.2	10.2	35.4	35.1	81.3			
Queue Length 95th (m)	#138.5	4.5			114.7	38.3	52.5	52.4	115.1			
Internal Link Dist (m)		118.1			149.0			197.6			197.9	
Turn Bay Length (m)						60.0			60.0			
Base Capacity (vph)	1207	2242			1283	608	560	562	589			
Starvation Cap Reductn	213	792			0	0	0	0	0			
Spillback Cap Reductn	0	0			26	0	9	10	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.86	0.73			0.88	0.55	0.31	0.30	0.73			

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 61 (51%), Referenced to phase 4:EBT and 7:EBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 27.5

Intersection LOS: C

Intersection Capacity Utilization 64.1%

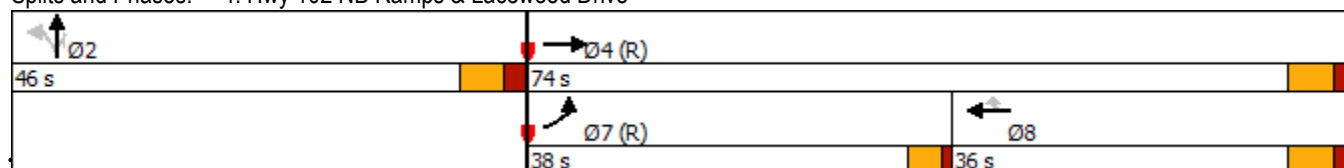
ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: Hwy 102 NB Ramps & Lacewood Drive



5: Lacewood Drive & Hwy 102 SB Ramps

2039 PM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1515	300	350	960	0	0	0	0	285	0	530
Future Volume (vph)	0	1515	300	350	960	0	0	0	0	285	0	530
Satd. Flow (prot)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Satd. Flow (RTOR)			288									358
Lane Group Flow (vph)	0	1647	326	380	1043	0	0	0	0	155	155	576
Turn Type		NA	Perm	Prot	NA					Perm	NA	Free
Protected Phases		4		3	8						6	
Permitted Phases			4							6		Free
Total Split (s)		43.0	43.0	49.0	92.0					28.0	28.0	
Total Lost Time (s)		6.0	6.0	4.0	6.0					6.0	6.0	
Act Effct Green (s)		40.1	40.1	47.7	91.8					16.2	16.2	120.0
Actuated g/C Ratio		0.33	0.33	0.40	0.76					0.14	0.14	1.00
v/c Ratio		0.77	0.45	0.54	0.39					0.68	0.68	0.36
Control Delay		38.5	7.1	6.0	2.7					64.1	64.1	0.6
Queue Delay		0.3	0.0	0.8	0.4					0.0	0.0	0.0
Total Delay		38.7	7.1	6.8	3.1					64.1	64.1	0.6
LOS		D	A	A	A					E	E	A
Approach Delay		33.5			4.1						22.9	
Approach LOS		C			A						C	
Queue Length 50th (m)		103.6	6.3	0.0	0.0					39.0	39.0	0.0
Queue Length 95th (m)		118.5	28.7	m117.9	115.6					60.3	60.3	0.0
Internal Link Dist (m)		108.2			118.1			188.6			191.5	
Turn Bay Length (m)			70.0									90.0
Base Capacity (vph)		2166	725	728	2706					308	308	1583
Starvation Cap Reductn		0	0	134	1029					0	0	0
Spillback Cap Reductn		108	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.80	0.45	0.64	0.62					0.50	0.50	0.36

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 3:WBL and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 21.5

Intersection LOS: C

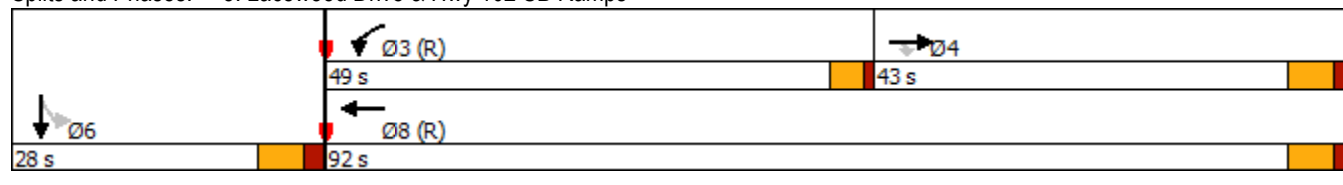
Intersection Capacity Utilization 64.1%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 5: Lacewood Drive & Hwy 102 SB Ramps



Appendix C - Intersection Performance Analysis

6: Dunbrack Street & Washmill Lake Drive

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2039 PM without Site - no diversions

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	65	515	475	785	830	80
Future Volume (vph)	65	515	475	785	830	80
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.131			
Satd. Flow (perm)	1770	1583	244	3539	3539	1583
Satd. Flow (RTOR)		560				15
Lane Group Flow (vph)	71	560	516	853	902	87
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	
Permitted Phases	4	4	2			6
Total Split (s)	33.0	33.0	43.0	87.0	44.0	44.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0
Act Effect Green (s)	11.2	11.2	65.3	63.1	27.9	27.9
Actuated g/C Ratio	0.13	0.13	0.75	0.72	0.32	0.32
v/c Ratio	0.31	0.81	0.71	0.33	0.80	0.17
Control Delay	41.7	13.8	22.7	5.1	34.5	21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	13.8	22.7	5.1	34.5	21.8
LOS	D	B	C	A	C	C
Approach Delay	17.0			11.7	33.4	
Approach LOS	B			B	C	
Queue Length 50th (m)	11.6	0.0	50.4	19.8	73.1	8.7
Queue Length 95th (m)	27.8	34.5	128.9	50.8	130.4	25.3
Internal Link Dist (m)	384.9			213.8	199.1	
Turn Bay Length (m)			120.0			7.0
Base Capacity (vph)	583	896	908	3134	1640	742
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.63	0.57	0.27	0.55	0.12

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 87.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 20.0

Intersection Capacity Utilization 66.8%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 6: Dunbrack Street & Washmill Lake Drive

	
Ø2	Ø4
87 s	33 s
	
Ø5	Ø6
43 s	44 s

7: Dunbrack Street & 102 NB Ramps

2039 PM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	245	0	425	0	865	420	0	990	365
Future Volume (vph)	0	0	0	245	0	425	0	865	420	0	990	365
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)						453			457			151
Lane Group Flow (vph)	0	0	0	0	266	462	0	940	457	0	1076	397
Turn Type				Perm	NA	Free		NA	Perm		NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		Free			2			6
Total Split (s)				42.0	42.0			58.0	58.0		58.0	58.0
Total Lost Time (s)					6.0			6.0	6.0		6.0	6.0
Act Effct Green (s)					14.3	52.4		25.7	25.7		25.7	25.7
Actuated g/C Ratio					0.27	1.00		0.49	0.49		0.49	0.49
v/c Ratio					0.55	0.29		0.54	0.45		0.62	0.47
Control Delay					22.1	0.5		11.0	2.6		12.0	7.6
Queue Delay					0.0	0.0		0.0	0.0		0.0	0.0
Total Delay					22.1	0.5		11.0	2.6		12.0	7.6
LOS					C	A		B	A		B	A
Approach Delay					8.4			8.2			10.8	
Approach LOS					A			A			B	
Queue Length 50th (m)					20.4	0.0		29.4	0.0		35.4	12.7
Queue Length 95th (m)					50.9	0.0		57.2	12.7		68.6	37.4
Internal Link Dist (m)		132.3			134.0			231.5			155.9	
Turn Bay Length (m)						50.0			50.0			15.0
Base Capacity (vph)					1262	1583		3285	1502		3285	1480
Starvation Cap Reductn					0	0		0	0		0	0
Spillback Cap Reductn					0	0		0	0		0	0
Storage Cap Reductn					0	0		0	0		0	0
Reduced v/c Ratio					0.21	0.29		0.29	0.30		0.33	0.27

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 52.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 9.3

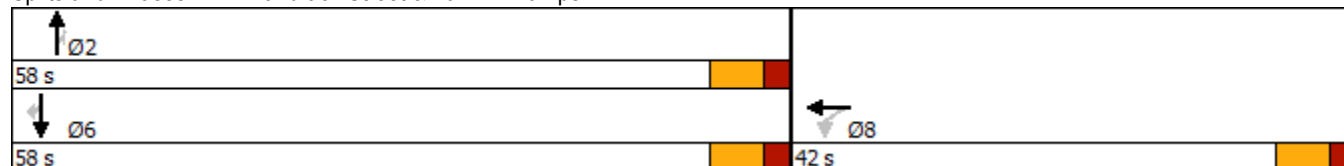
Intersection Capacity Utilization 50.9%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 7: Dunbrack Street & 102 NB Ramps



8: Dunbrack Street & 102 SB Ramps

2039 PM without Site - no diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	260	0	735	0	0	0	0	1030	110	0	1030	30
Future Volume (vph)	260	0	735	0	0	0	0	1030	110	0	1030	30
Satd. Flow (prot)	0	1770	1583	0	0	0	0	3539	1583	0	3539	1583
Flt Permitted		0.950										
Satd. Flow (perm)	0	1770	1583	0	0	0	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)			446						86			82
Lane Group Flow (vph)	0	283	799	0	0	0	0	1120	120	0	1120	33
Turn Type	Perm	NA	Free					NA	Perm		NA	Free
Protected Phases		4						2			6	
Permitted Phases	4		Free						2			Free
Total Split (s)	45.0	45.0						75.0	75.0		75.0	
Total Lost Time (s)		6.0						6.0	6.0		6.0	
Act Effct Green (s)		15.0	54.1					26.6	26.6		26.6	54.1
Actuated g/C Ratio		0.28	1.00					0.49	0.49		0.49	1.00
v/c Ratio		0.58	0.50					0.64	0.15		0.64	0.02
Control Delay		23.1	1.2					12.5	3.9		12.5	0.0
Queue Delay		0.0	0.0					0.0	0.0		0.0	0.0
Total Delay		23.1	1.2					12.5	3.9		12.5	0.0
LOS		C	A					B	A		B	A
Approach Delay		6.9						11.7			12.2	
Approach LOS		A						B			B	
Queue Length 50th (m)		23.2	0.0					39.2	1.6		39.2	0.0
Queue Length 95th (m)		55.6	0.0					73.4	9.5		73.4	0.0
Internal Link Dist (m)		153.7			159.2			222.4			231.5	
Turn Bay Length (m)									40.0			55.0
Base Capacity (vph)		1325	1583					3505	1568		3505	1583
Starvation Cap Reductn		0	0					0	0		0	0
Spillback Cap Reductn		0	0					0	0		0	0
Storage Cap Reductn		0	0					0	0		0	0
Reduced v/c Ratio		0.21	0.50					0.32	0.08		0.32	0.02

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 54.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 10.3

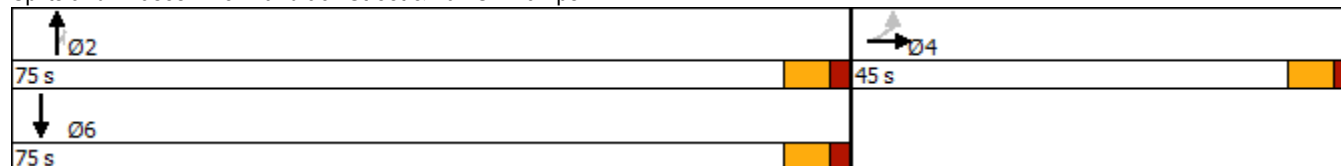
Intersection Capacity Utilization 52.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 8: Dunbrack Street & 102 SB Ramps



7: Dunbrack Street & 102 NB Ramps

2039 PM without Site - no diversions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	245	0	425	0	865	420	0	990	365
Future Volume (Veh/h)	0	0	0	245	0	425	0	865	420	0	990	365
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	0	266	0	462	0	940	457	0	1076	397
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)						6						
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1546	2016	538	1478	2016	470	1076			940		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1546	2016	538	1478	2016	470	1076			940		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	14	100			100		
cM capacity (veh/h)	11	58	488	88	58	540	644			725		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3					
Volume Total	728	470	470	457	538	538	397					
Volume Left	266	0	0	0	0	0	0					
Volume Right	462	0	0	457	0	0	397					
cSH	191	1700	1700	1700	1700	1700	1700					
Volume to Capacity	3.81	0.28	0.28	0.27	0.32	0.32	0.23					
Queue Length 95th (m)	Err	0.0	0.0	0.0	0.0	0.0	0.0					
Control Delay (s)	Err	0.0	0.0	0.0	0.0	0.0	0.0					
Lane LOS	F											
Approach Delay (s)	Err	0.0			0.0							
Approach LOS	F											
Intersection Summary												
Average Delay			2023.1									
Intersection Capacity Utilization			56.9%		ICU Level of Service					B		
Analysis Period (min)			15									

8: Dunbrack Street & 102 SB Ramps

2039 PM without Site - no diversions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	0	735	0	0	0	0	1030	110	0	1030	30
Future Volume (Veh/h)	260	0	735	0	0	0	0	1030	110	0	1030	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	283	0	799	0	0	0	0	1120	120	0	1120	33
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1680	2240	560	1680	2240	560	1120			1120		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1680	2240	560	1680	2240	560	1120			1120		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	0	0	100	100	100			100		
cM capacity (veh/h)	62	42	472	0	42	472	619			619		
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	283	799	560	560	120	560	560	33				
Volume Left	283	0	0	0	0	0	0	0				
Volume Right	0	799	0	0	120	0	0	33				
cSH	62	472	1700	1700	1700	1700	1700	1700				
Volume to Capacity	4.58	1.69	0.33	0.33	0.07	0.33	0.33	0.02				
Queue Length 95th (m)	Err	378.0	0.0	0.0	0.0	0.0	0.0	0.0				
Control Delay (s)	Err	342.5	0.0	0.0	0.0	0.0	0.0	0.0				
Lane LOS	F	F										
Approach Delay (s)	2868.2		0.0			0.0						
Approach LOS	F											
Intersection Summary												
Average Delay			893.1									
Intersection Capacity Utilization			80.6%			ICU Level of Service				D		
Analysis Period (min)			15									

Appendix C - Intersection Performance Analysis
1: Regency Park Drive/Parkland Drive & Lacewood Drive

Page C - 17
2039 AM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	423	115	117	288	95	102	74	175	166	105	124
Future Volume (vph)	76	423	115	117	288	95	102	74	175	166	105	124
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.562			0.427			0.684			0.705		
Satd. Flow (perm)	1047	3539	1583	795	3539	1583	1274	1863	1583	1313	1863	1583
Satd. Flow (RTOR)			88			88			190			135
Lane Group Flow (vph)	83	460	125	127	313	103	111	80	190	180	114	135
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Total Split (s)	12.0	35.0	35.0	13.0	36.0	36.0	42.0	42.0	42.0	42.0	42.0	42.0
Total Lost Time (s)	4.0	6.3	6.3	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Act Effct Green (s)	21.8	13.9	13.9	23.9	16.9	16.9	12.7	12.7	12.7	12.7	12.7	12.7
Actuated g/C Ratio	0.44	0.28	0.28	0.49	0.34	0.34	0.26	0.26	0.26	0.26	0.26	0.26
v/c Ratio	0.14	0.46	0.24	0.23	0.26	0.17	0.34	0.17	0.34	0.53	0.24	0.26
Control Delay	7.5	18.0	8.6	7.9	14.6	6.5	19.2	16.1	5.1	23.2	16.9	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.5	18.0	8.6	7.9	14.6	6.5	19.2	16.1	5.1	23.2	16.9	5.2
LOS	A	B	A	A	B	A	B	B	A	C	B	A
Approach Delay		15.0			11.5			11.5			15.8	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	3.2	18.9	2.6	5.1	12.0	1.0	8.2	5.6	0.0	14.1	8.2	0.0
Queue Length 95th (m)	10.6	37.2	14.6	15.1	25.2	11.0	21.7	15.6	12.2	33.8	20.8	10.3
Internal Link Dist (m)		122.8			242.6			314.2			320.2	
Turn Bay Length (m)	55.0		7.0	50.0		7.0	35.0		7.0	35.0		7.0
Base Capacity (vph)	600	2180	1008	580	2256	1040	948	1387	1227	977	1387	1213
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.21	0.12	0.22	0.14	0.10	0.12	0.06	0.15	0.18	0.08	0.11

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 49

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 13.6

Intersection Capacity Utilization 47.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 1: Regency Park Drive/Parkland Drive & Lacewood Drive

 Ø1	 Ø2	 Ø4
12 s	36 s	42 s
 Ø5	 Ø6	 Ø8
13 s	35 s	42 s

4: Hwy 102 NB Ramps & Lacewood Drive

2039 AM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (vph)	190	464	0	0	499	235	120	0	390	0	0	0
Future Volume (vph)	190	464	0	0	499	235	120	0	390	0	0	0
Satd. Flow (prot)	3433	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Flt Permitted	0.950						0.950	0.950				
Satd. Flow (perm)	3433	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Satd. Flow (RTOR)						255			262			
Lane Group Flow (vph)	207	504	0	0	542	255	65	65	424	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Total Split (s)	19.0	52.0			33.0	33.0	48.0	48.0	48.0			
Total Lost Time (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Act Effct Green (s)	49.1	69.9			16.8	16.8	18.1	18.1	18.1			
Actuated g/C Ratio	0.49	0.70			0.17	0.17	0.18	0.18	0.18			
v/c Ratio	0.12	0.20			0.63	0.53	0.21	0.21	0.85			
Control Delay	0.3	0.3			41.9	8.9	32.6	32.6	29.7			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	0.3	0.3			41.9	8.9	32.6	32.6	29.7			
LOS	A	A			D	A	C	C	C			
Approach Delay		0.3			31.4			30.3				
Approach LOS		A			C			C				
Queue Length 50th (m)	0.1	0.0			38.1	0.0	12.1	12.1	32.7			
Queue Length 95th (m)	0.5	0.0			47.7	20.5	20.9	20.9	60.3			
Internal Link Dist (m)		118.1			149.0			197.6			197.9	
Turn Bay Length (m)						60.0			60.0			
Base Capacity (vph)	1686	2475			1372	613	706	706	816			
Starvation Cap Reductn	0	0			0	0	0	0	0			
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.12	0.20			0.40	0.42	0.09	0.09	0.52			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 94 (94%), Referenced to phase 4:EBT and 7:EBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 20.4

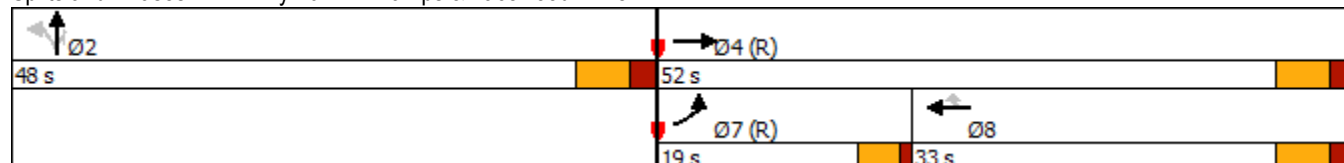
Intersection Capacity Utilization 47.0%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service A

Splits and Phases: 4: Hwy 102 NB Ramps & Lacewood Drive



5: Lacewood Drive & Hwy 102 SB Ramps

2039 AM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	354	65	220	399	0	0	0	0	300	0	510
Future Volume (vph)	0	354	65	220	399	0	0	0	0	300	0	510
Satd. Flow (prot)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Satd. Flow (RTOR)			76									554
Lane Group Flow (vph)	0	385	71	239	434	0	0	0	0	163	163	554
Turn Type		NA	Perm	Prot	NA					Perm	NA	Free
Protected Phases		4		3	8						6	
Permitted Phases			4							6		Free
Total Split (s)		24.0	24.0	29.0	53.0					47.0	47.0	
Total Lost Time (s)		6.0	6.0	4.0	6.0					6.0	6.0	
Act Effect Green (s)		11.5	11.5	57.3	72.8					15.2	15.2	100.0
Actuated g/C Ratio		0.12	0.12	0.57	0.73					0.15	0.15	1.00
v/c Ratio		0.52	0.29	0.24	0.17					0.64	0.64	0.35
Control Delay		44.0	11.7	2.1	0.3					50.6	50.6	0.6
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		44.0	11.7	2.1	0.3					50.6	50.6	0.6
LOS		D	B	A	A					D	D	A
Approach Delay		39.0			0.9						19.1	
Approach LOS		D			A						B	
Queue Length 50th (m)		21.8	0.0	5.5	0.0					33.3	33.3	0.0
Queue Length 95th (m)		29.1	11.6	17.4	0.0					52.4	52.4	0.0
Internal Link Dist (m)		108.2			118.1			188.6			191.5	
Turn Bay Length (m)			70.0									90.0
Base Capacity (vph)		1153	347	1013	2576					689	689	1583
Starvation Cap Reductn		0	0	0	0					0	0	0
Spillback Cap Reductn		0	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.33	0.20	0.24	0.17					0.24	0.24	0.35

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 3:WBL and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 17.5

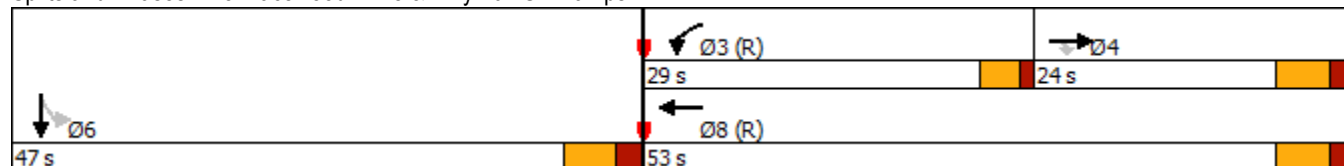
Intersection LOS: B

Intersection Capacity Utilization 47.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: Lacewood Drive & Hwy 102 SB Ramps



Appendix C - Intersection Performance Analysis 6: Dunbrack Street & Washmill Lake Drive

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2039 AM without Site - diversions

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	35	352	340	755	580	50
Future Volume (vph)	35	352	340	755	580	50
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.259			
Satd. Flow (perm)	1770	1583	482	3539	3539	1583
Satd. Flow (RTOR)		383				17
Lane Group Flow (vph)	38	383	370	821	630	54
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	
Permitted Phases	4	4	2			6
Total Split (s)	28.0	28.0	31.0	62.0	31.0	31.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0
Act Effect Green (s)	8.1	8.1	39.4	37.3	15.7	15.7
Actuated g/C Ratio	0.14	0.14	0.68	0.64	0.27	0.27
v/c Ratio	0.15	0.70	0.52	0.36	0.66	0.12
Control Delay	26.9	11.0	7.3	5.3	23.7	14.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.9	11.0	7.3	5.3	23.7	14.8
LOS	C	B	A	A	C	B
Approach Delay	12.5			5.9	23.0	
Approach LOS	B			A	C	
Queue Length 50th (m)	3.6	0.0	11.1	15.7	29.9	2.8
Queue Length 95th (m)	13.8	24.2	35.5	35.7	64.5	13.0
Internal Link Dist (m)	384.9			204.0	199.1	
Turn Bay Length (m)			120.0			7.0
Base Capacity (vph)	709	864	961	3225	1612	730
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.44	0.39	0.25	0.39	0.07

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 58.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 12.2

Intersection Capacity Utilization 52.4%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 6: Dunbrack Street & Washmill Lake Drive

	
Ø2	Ø4
62 s	28 s
	
Ø5	Ø6
31 s	31 s

7: Dunbrack Street & 102 NB Ramps

2039 AM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	110	0	175	0	925	400	0	636	281
Future Volume (vph)	0	0	0	110	0	175	0	925	400	0	636	281
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)						190			435			234
Lane Group Flow (vph)	0	0	0	0	120	190	0	1005	435	0	691	305
Turn Type				Perm	NA	Free		NA	Perm		NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		Free			2			6
Total Split (s)				31.0	31.0			69.0	69.0		69.0	69.0
Total Lost Time (s)					6.0			6.0	6.0		6.0	6.0
Act Effect Green (s)					9.1	47.8		31.5	31.5		31.5	31.5
Actuated g/C Ratio					0.19	1.00		0.66	0.66		0.66	0.66
v/c Ratio					0.36	0.12		0.43	0.36		0.30	0.27
Control Delay					21.2	0.2		6.7	1.8		5.8	2.5
Queue Delay					0.0	0.0		0.0	0.0		0.0	0.0
Total Delay					21.2	0.2		6.7	1.8		5.8	2.5
LOS					C	A		A	A		A	A
Approach Delay					8.3			5.2			4.8	
Approach LOS					A			A			A	
Queue Length 50th (m)					9.9	0.0		24.7	0.0		15.1	2.5
Queue Length 95th (m)					22.4	0.0		42.6	9.6		26.9	12.0
Internal Link Dist (m)		132.3			134.0			231.5			165.7	
Turn Bay Length (m)						60.0			50.0			15.0
Base Capacity (vph)					950	1583		3539	1583		3539	1583
Starvation Cap Reductn					0	0		0	0		0	0
Spillback Cap Reductn					0	0		0	0		0	0
Storage Cap Reductn					0	0		0	0		0	0
Reduced v/c Ratio					0.13	0.12		0.28	0.27		0.20	0.19

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 47.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 5.4

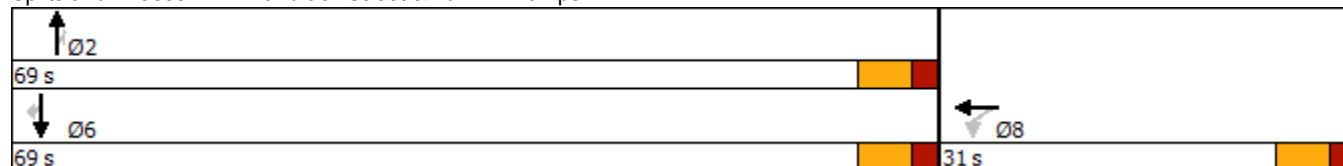
Intersection Capacity Utilization 41.7%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 7: Dunbrack Street & 102 NB Ramps



8: Dunbrack Street & 102 SB Ramps

2039 AM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	370	40	800	0	0	0	0	955	515	0	365	46
Future Volume (vph)	370	40	800	0	0	0	0	955	515	0	365	46
Satd. Flow (prot)	0	1783	1583	0	0	0	0	3539	1583	0	3539	1583
Flt Permitted		0.957										
Satd. Flow (perm)	0	1783	1583	0	0	0	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)			697						434			98
Lane Group Flow (vph)	0	445	870	0	0	0	0	1038	560	0	397	50
Turn Type	Perm	NA	Free					NA	Perm		NA	Free
Protected Phases		4						2			6	
Permitted Phases	4		Free						2			Free
Total Split (s)	45.0	45.0						55.0	55.0		55.0	
Total Lost Time (s)		6.0						6.0	6.0		6.0	
Act Effct Green (s)		22.3	64.3					29.1	29.1		29.1	64.3
Actuated g/C Ratio		0.35	1.00					0.45	0.45		0.45	1.00
v/c Ratio		0.72	0.55					0.65	0.59		0.25	0.03
Control Delay		26.9	1.4					16.3	6.2		11.9	0.0
Queue Delay		0.0	0.0					0.0	0.0		0.0	0.0
Total Delay		26.9	1.4					16.3	6.2		11.9	0.0
LOS		C	A					B	A		B	A
Approach Delay		10.0						12.8			10.6	
Approach LOS		B						B			B	
Queue Length 50th (m)		44.2	0.0					46.5	8.3		14.2	0.0
Queue Length 95th (m)		102.0	0.0					94.1	39.5		31.7	0.0
Internal Link Dist (m)		153.7			159.2			222.4			231.5	
Turn Bay Length (m)									40.0			55.0
Base Capacity (vph)		1165	1583					2794	1341		2794	1583
Starvation Cap Reductn		0	0					0	0		0	0
Spillback Cap Reductn		0	0					0	0		0	0
Storage Cap Reductn		0	0					0	0		0	0
Reduced v/c Ratio		0.38	0.55					0.37	0.42		0.14	0.03

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 64.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 11.4

Intersection Capacity Utilization 64.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 8: Dunbrack Street & 102 SB Ramps

 02	 04
55 s	45 s
 06	
55 s	

Appendix C - Intersection Performance Analysis

2: Washmill Lake Drive & Regency Park Drive

Page C - 23
2039 AM without Site - diversions

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		 	 		 	
Traffic Volume (veh/h)	80	375	510	17	22	68
Future Volume (Veh/h)	80	375	510	17	22	68
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	408	554	18	24	74
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	572				941	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	572				941	286
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				90	90
cM capacity (veh/h)	997				239	711
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	87	204	204	369	203	98
Volume Left	87	0	0	0	0	24
Volume Right	0	0	0	0	18	74
cSH	997	1700	1700	1700	1700	479
Volume to Capacity	0.09	0.12	0.12	0.22	0.12	0.20
Queue Length 95th (m)	2.3	0.0	0.0	0.0	0.0	6.1
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	14.4
Lane LOS	A					B
Approach Delay (s)	1.6			0.0		14.4
Approach LOS						B
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			34.5%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Performance Analysis

1: Regency Park Drive/Parkland Drive & Lacewood Drive

Page C - 24
2039 PM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Traffic Volume (vph)	244	554	136	219	518	147	140	164	152	133	122	140
Future Volume (vph)	244	554	136	219	518	147	140	164	152	133	122	140
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.422			0.348			0.672			0.645		
Satd. Flow (perm)	786	3539	1583	648	3539	1583	1252	1863	1583	1201	1863	1583
Satd. Flow (RTOR)			88			88			106			130
Lane Group Flow (vph)	265	602	148	238	563	160	152	178	165	145	133	152
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Total Split (s)	17.0	33.0	33.0	20.0	36.0	36.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Lost Time (s)	4.0	6.3	6.3	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Act Effct Green (s)	28.7	16.4	16.4	30.2	17.1	17.1	13.0	13.0	13.0	13.0	13.0	13.0
Actuated g/C Ratio	0.50	0.29	0.29	0.53	0.30	0.30	0.23	0.23	0.23	0.23	0.23	0.23
v/c Ratio	0.47	0.60	0.29	0.43	0.53	0.30	0.54	0.42	0.38	0.54	0.32	0.33
Control Delay	9.8	21.4	10.4	9.1	19.6	10.4	28.6	23.5	11.5	28.9	22.0	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	21.4	10.4	9.1	19.6	10.4	28.6	23.5	11.5	28.9	22.0	8.3
LOS	A	C	B	A	B	B	C	C	B	C	C	A
Approach Delay		16.8			15.4			21.1			19.5	
Approach LOS		B			B			C			B	
Queue Length 50th (m)	11.7	28.3	4.6	10.3	25.7	5.5	14.1	16.0	5.0	13.4	11.7	1.8
Queue Length 95th (m)	30.6	57.6	20.2	27.5	50.4	21.1	36.9	39.1	21.6	35.7	30.2	16.0
Internal Link Dist (m)		122.8			242.6			314.2			320.2	
Turn Bay Length (m)	55.0		7.0	50.0		7.0	35.0		7.0	35.0		7.0
Base Capacity (vph)	668	1721	815	705	1915	897	700	1042	932	671	1042	943
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.35	0.18	0.34	0.29	0.18	0.22	0.17	0.18	0.22	0.13	0.16

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 57.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 17.5

Intersection Capacity Utilization 62.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 1: Regency Park Drive/Parkland Drive & Lacewood Drive

 Ø1	 Ø2	 Ø4
17 s	36 s	37 s
 Ø5	 Ø6	 Ø8
20 s	33 s	37 s

4: Hwy 102 NB Ramps & Lacewood Drive

2039 PM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (vph)	790	859	0	0	898	305	305	5	395	0	0	0
Future Volume (vph)	790	859	0	0	898	305	305	5	395	0	0	0
Satd. Flow (prot)	3433	3539	0	0	5085	1583	1681	1688	1583	0	0	0
Flt Permitted	0.950						0.950	0.954				
Satd. Flow (perm)	3433	3539	0	0	5085	1583	1681	1688	1583	0	0	0
Satd. Flow (RTOR)						315			124			
Lane Group Flow (vph)	859	934	0	0	976	332	169	168	429	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Total Split (s)	38.0	74.0			36.0	36.0	46.0	46.0	46.0			
Total Lost Time (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Act Effct Green (s)	45.0	77.7			28.7	28.7	30.3	30.3	30.3			
Actuated g/C Ratio	0.38	0.65			0.24	0.24	0.25	0.25	0.25			
v/c Ratio	0.67	0.41			0.80	0.54	0.40	0.39	0.87			
Control Delay	10.8	3.4			48.6	8.5	38.4	38.2	48.1			
Queue Delay	1.6	0.5			0.2	0.0	0.0	0.0	0.0			
Total Delay	12.4	3.8			48.8	8.5	38.4	38.2	48.1			
LOS	B	A			D	A	D	D	D			
Approach Delay		7.9			38.6			43.8				
Approach LOS		A			D			D				
Queue Length 50th (m)	116.4	78.7			82.1	3.2	36.3	36.1	74.7			
Queue Length 95th (m)	#139.6	3.2			99.4	28.3	52.5	52.4	106.3			
Internal Link Dist (m)		118.1			149.0			197.6			197.9	
Turn Bay Length (m)						60.0			60.0			
Base Capacity (vph)	1286	2291			1274	633	560	562	610			
Starvation Cap Reductn	246	818			0	0	0	0	0			
Spillback Cap Reductn	0	0			33	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.83	0.63			0.79	0.52	0.30	0.30	0.70			

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 61 (51%), Referenced to phase 4:EBT and 7:EBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 25.4

Intersection LOS: C

Intersection Capacity Utilization 63.3%

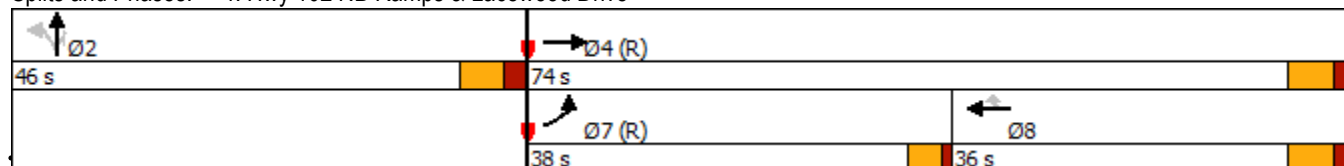
ICU Level of Service B

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: Hwy 102 NB Ramps & Lacewood Drive



5: Lacewood Drive & Hwy 102 SB Ramps

2039 PM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1364	300	350	853	0	0	0	0	285	0	530
Future Volume (vph)	0	1364	300	350	853	0	0	0	0	285	0	530
Satd. Flow (prot)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Satd. Flow (RTOR)			320									389
Lane Group Flow (vph)	0	1483	326	380	927	0	0	0	0	155	155	576
Turn Type		NA	Perm	Prot	NA					Perm	NA	Free
Protected Phases		4		3	8						6	
Permitted Phases			4							6		Free
Total Split (s)		43.0	43.0	49.0	92.0					28.0	28.0	
Total Lost Time (s)		6.0	6.0	4.0	6.0					6.0	6.0	
Act Effect Green (s)		37.3	37.3	50.5	91.8					16.2	16.2	120.0
Actuated g/C Ratio		0.31	0.31	0.42	0.76					0.14	0.14	1.00
v/c Ratio		0.74	0.46	0.51	0.34					0.68	0.68	0.36
Control Delay		39.4	5.5	6.2	1.8					64.1	64.1	0.6
Queue Delay		0.3	0.0	0.5	0.2					0.0	0.0	0.0
Total Delay		39.6	5.5	6.8	2.1					64.1	64.1	0.6
LOS		D	A	A	A					E	E	A
Approach Delay		33.5			3.4						22.9	
Approach LOS		C			A						C	
Queue Length 50th (m)		95.0	1.0	8.3	0.0					39.0	39.0	0.0
Queue Length 95th (m)		103.8	21.0	m132.3	96.1					60.3	60.3	0.0
Internal Link Dist (m)		108.2			118.1			188.6			191.5	
Turn Bay Length (m)			70.0									90.0
Base Capacity (vph)		2071	728	759	2706					308	308	1583
Starvation Cap Reductn		0	0	122	946					0	0	0
Spillback Cap Reductn		137	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.77	0.45	0.60	0.53					0.50	0.50	0.36

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 3:WBL and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 21.3

Intersection LOS: C

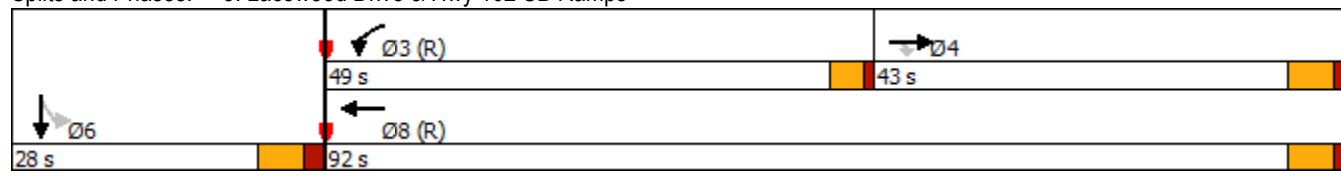
Intersection Capacity Utilization 63.3%

ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 5: Lacewood Drive & Hwy 102 SB Ramps



Appendix C - Intersection Performance Analysis

6: Dunbrack Street & Washmill Lake Drive

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2039 PM without Site - diversions

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	65	535	475	785	830	80
Future Volume (vph)	65	535	475	785	830	80
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.129			
Satd. Flow (perm)	1770	1583	240	3539	3539	1583
Satd. Flow (RTOR)		564				15
Lane Group Flow (vph)	71	582	516	853	902	87
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	
Permitted Phases	4	4	2			6
Total Split (s)	33.0	33.0	43.0	87.0	44.0	44.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0
Act Effct Green (s)	11.9	11.9	65.6	63.5	28.1	28.1
Actuated g/C Ratio	0.13	0.13	0.74	0.72	0.32	0.32
v/c Ratio	0.30	0.83	0.72	0.34	0.80	0.17
Control Delay	40.9	15.5	23.8	5.4	35.2	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.9	15.5	23.8	5.4	35.2	22.3
LOS	D	B	C	A	D	C
Approach Delay	18.3			12.4	34.1	
Approach LOS	B			B	C	
Queue Length 50th (m)	11.6	2.9	50.9	19.8	73.1	8.7
Queue Length 95th (m)	27.6	41.2	133.8	54.2	133.8	25.8
Internal Link Dist (m)	384.9			204.0	199.1	
Turn Bay Length (m)			120.0			7.0
Base Capacity (vph)	578	897	901	3109	1629	736
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.65	0.57	0.27	0.55	0.12

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 88.2
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.83
 Intersection Signal Delay: 20.8
 Intersection Capacity Utilization 66.8%
 Analysis Period (min) 15

Intersection LOS: C
ICU Level of Service C

Splits and Phases: 6: Dunbrack Street & Washmill Lake Drive

	
Ø2	Ø4
87 s	33 s
	
Ø5	Ø6
43 s	44 s

7: Dunbrack Street & 102 NB Ramps

2039 PM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	245	0	425	0	865	420	0	1000	375
Future Volume (vph)	0	0	0	245	0	425	0	865	420	0	1000	375
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)						462			457			154
Lane Group Flow (vph)	0	0	0	0	266	462	0	940	457	0	1087	408
Turn Type				Perm	NA	Free		NA	Perm		NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		Free			2			6
Total Split (s)				42.0	42.0			58.0	58.0		58.0	58.0
Total Lost Time (s)					6.0			6.0	6.0		6.0	6.0
Act Effct Green (s)					14.4	53.1		26.3	26.3		26.3	26.3
Actuated g/C Ratio					0.27	1.00		0.50	0.50		0.50	0.50
v/c Ratio					0.56	0.29		0.54	0.45		0.62	0.47
Control Delay					22.5	0.5		10.9	2.6		12.0	7.7
Queue Delay					0.0	0.0		0.0	0.0		0.0	0.0
Total Delay					22.5	0.5		10.9	2.6		12.0	7.7
LOS					C	A		B	A		B	A
Approach Delay					8.5			8.2			10.8	
Approach LOS					A			A			B	
Queue Length 50th (m)					21.3	0.0		29.7	0.0		36.3	13.3
Queue Length 95th (m)					51.3	0.0		57.4	12.6		69.7	38.8
Internal Link Dist (m)		132.3			134.0			231.5			165.7	
Turn Bay Length (m)						60.0			50.0			15.0
Base Capacity (vph)					1242	1583		3279	1500		3279	1478
Starvation Cap Reductn					0	0		0	0		0	0
Spillback Cap Reductn					0	0		0	0		0	0
Storage Cap Reductn					0	0		0	0		0	0
Reduced v/c Ratio					0.21	0.29		0.29	0.30		0.33	0.28

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 53.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 9.3

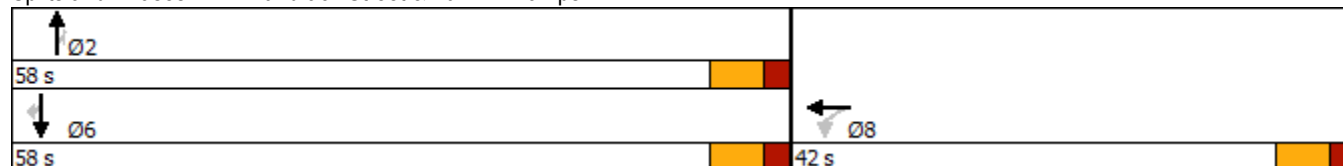
Intersection Capacity Utilization 51.2%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 7: Dunbrack Street & 102 NB Ramps



8: Dunbrack Street & 102 SB Ramps

2039 PM without Site - diversions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	260	0	735	0	0	0	0	1030	110	0	1030	40
Future Volume (vph)	260	0	735	0	0	0	0	1030	110	0	1030	40
Satd. Flow (prot)	0	1770	1583	0	0	0	0	3539	1583	0	3539	1583
Flt Permitted		0.950										
Satd. Flow (perm)	0	1770	1583	0	0	0	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)			446						86			82
Lane Group Flow (vph)	0	283	799	0	0	0	0	1120	120	0	1120	43
Turn Type	Perm	NA	Free					NA	Perm		NA	Free
Protected Phases		4						2			6	
Permitted Phases	4		Free						2			Free
Total Split (s)	45.0	45.0						75.0	75.0		75.0	
Total Lost Time (s)		6.0						6.0	6.0		6.0	
Act Effct Green (s)		15.0	54.1					26.6	26.6		26.6	54.1
Actuated g/C Ratio		0.28	1.00					0.49	0.49		0.49	1.00
v/c Ratio		0.58	0.50					0.64	0.15		0.64	0.03
Control Delay		23.1	1.2					12.5	3.9		12.5	0.0
Queue Delay		0.0	0.0					0.0	0.0		0.0	0.0
Total Delay		23.1	1.2					12.5	3.9		12.5	0.0
LOS		C	A					B	A		B	A
Approach Delay		6.9						11.7			12.1	
Approach LOS		A						B			B	
Queue Length 50th (m)		23.2	0.0					39.2	1.6		39.2	0.0
Queue Length 95th (m)		55.6	0.0					73.4	9.5		73.4	0.0
Internal Link Dist (m)		153.7			159.2			222.4			231.5	
Turn Bay Length (m)									40.0			55.0
Base Capacity (vph)		1325	1583					3505	1568		3505	1583
Starvation Cap Reductn		0	0					0	0		0	0
Spillback Cap Reductn		0	0					0	0		0	0
Storage Cap Reductn		0	0					0	0		0	0
Reduced v/c Ratio		0.21	0.50					0.32	0.08		0.32	0.03

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 54.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 10.3

Intersection Capacity Utilization 52.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 8: Dunbrack Street & 102 SB Ramps

	
Ø2	Ø4
75 s	45 s
	
Ø6	
75 s	

Appendix C - Intersection Performance Analysis

2: Washmill Lake Drive & Regency Park Drive

Page C - 30
2039 PM without Site - diversions

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	139	865	700	25	20	104
Future Volume (Veh/h)	139	865	700	25	20	104
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	151	940	761	27	22	113
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	788				1546	394
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	788				1546	394
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				74	81
cM capacity (veh/h)	827				86	605
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	151	470	470	507	281	135
Volume Left	151	0	0	0	0	22
Volume Right	0	0	0	0	27	113
cSH	827	1700	1700	1700	1700	305
Volume to Capacity	0.18	0.28	0.28	0.30	0.17	0.44
Queue Length 95th (m)	5.3	0.0	0.0	0.0	0.0	17.3
Control Delay (s)	10.3	0.0	0.0	0.0	0.0	25.9
Lane LOS	B					D
Approach Delay (s)	1.4			0.0		25.9
Approach LOS						D
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			45.4%		ICU Level of Service	A
Analysis Period (min)			15			

Appendix C - Intersection Performance Analysis
1: Regency Park Drive/Parkland Drive & Lacewood Drive

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2039 AM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Traffic Volume (vph)	76	443	199	167	329	93	243	103	263	166	122	124
Future Volume (vph)	76	443	199	167	329	93	243	103	263	166	122	124
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.538			0.386			0.672			0.685		
Satd. Flow (perm)	1002	3539	1583	719	3539	1583	1252	1863	1583	1276	1863	1583
Satd. Flow (RTOR)			94			88			286			126
Lane Group Flow (vph)	83	482	216	182	358	101	264	112	286	180	133	135
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Total Split (s)	12.0	35.0	35.0	13.0	36.0	36.0	42.0	42.0	42.0	42.0	42.0	42.0
Total Lost Time (s)	4.0	6.3	6.3	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Act Effct Green (s)	25.1	15.1	15.1	28.2	19.0	19.0	18.2	18.2	18.2	18.2	18.2	18.2
Actuated g/C Ratio	0.42	0.26	0.26	0.48	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31
v/c Ratio	0.16	0.53	0.45	0.37	0.31	0.18	0.69	0.20	0.42	0.46	0.23	0.24
Control Delay	10.2	22.5	15.5	11.8	18.8	7.3	28.1	16.0	4.3	20.8	16.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	22.5	15.5	11.8	18.8	7.3	28.1	16.0	4.3	20.8	16.3	5.0
LOS	B	C	B	B	B	A	C	B	A	C	B	A
Approach Delay		19.2			15.0			15.8			14.7	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	4.2	24.1	10.9	9.8	16.3	1.0	25.1	8.9	0.0	15.7	10.8	0.7
Queue Length 95th (m)	14.4	47.3	33.8	28.1	34.5	12.2	54.1	21.3	14.3	35.5	24.7	11.1
Internal Link Dist (m)		122.8			242.6			314.2			320.2	
Turn Bay Length (m)	55.0		7.0	50.0		7.0	35.0		7.0	35.0		7.0
Base Capacity (vph)	545	1779	842	511	1841	865	783	1165	1097	797	1165	1036
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.27	0.26	0.36	0.19	0.12	0.34	0.10	0.26	0.23	0.11	0.13

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 59.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 16.5

Intersection Capacity Utilization 60.5%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 1: Regency Park Drive/Parkland Drive & Lacewood Drive

 Ø1	 Ø2	 Ø4
12 s	36 s	42 s
 Ø5	 Ø6	 Ø8
13 s	35 s	42 s

Appendix C - Intersection Performance Analysis
2: Access #3/Regency Park Drive & Washmill Lake Drive

Page C - 32
2039 AM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	403	5	13	620	67	13	40	36	220	15	105
Future Volume (vph)	125	403	5	13	620	67	13	40	36	220	15	105
Satd. Flow (prot)	1770	3532	0	1770	3486	0	0	1748	0	1770	1617	0
Flt Permitted	0.343			0.495				0.947		0.695		
Satd. Flow (perm)	639	3532	0	922	3486	0	0	1667	0	1295	1617	0
Satd. Flow (RTOR)		2			21			39			114	
Lane Group Flow (vph)	136	443	0	14	747	0	0	96	0	239	130	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	47.0	47.0		47.0	47.0		33.0	33.0		33.0	33.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0		6.0	6.0	
Act Effect Green (s)	18.8	18.8		18.8	18.8			14.1		14.1	14.1	
Actuated g/C Ratio	0.41	0.41		0.41	0.41			0.31		0.31	0.31	
v/c Ratio	0.52	0.31		0.04	0.52			0.18		0.60	0.23	
Control Delay	19.4	10.0		9.4	11.5			9.6		21.6	5.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	19.4	10.0		9.4	11.5			9.6		21.6	5.5	
LOS	B	B		A	B			A		C	A	
Approach Delay		12.2			11.5			9.6			15.9	
Approach LOS		B			B			A			B	
Queue Length 50th (m)	7.2	11.0		0.6	20.1			2.8		13.8	0.8	
Queue Length 95th (m)	27.4	27.0		3.8	46.4			14.6		46.7	11.8	
Internal Link Dist (m)		518.2			383.0			43.2			228.7	
Turn Bay Length (m)	20.0			15.0						25.0		
Base Capacity (vph)	563	3113		812	3075			1069		819	1065	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.24	0.14		0.02	0.24			0.09		0.29	0.12	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 45.8

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 12.5

Intersection Capacity Utilization 60.1%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 2: Access #3/Regency Park Drive & Washmill Lake Drive

 Ø2	 Ø4
47 s	33 s
 Ø6	 Ø8
47 s	33 s

4: Hwy 102 NB Ramps & Lacewood Drive

2039 AM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (vph)	190	532	0	0	654	348	120	0	452	0	0	0
Future Volume (vph)	190	532	0	0	654	348	120	0	452	0	0	0
Satd. Flow (prot)	3433	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Flt Permitted	0.950						0.950	0.950				
Satd. Flow (perm)	3433	3539	0	0	5085	1583	1681	1681	1583	0	0	0
Satd. Flow (RTOR)						378			211			
Lane Group Flow (vph)	207	578	0	0	711	378	65	65	491	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Total Split (s)	19.0	52.0			33.0	33.0	48.0	48.0	48.0			
Total Lost Time (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Act Effct Green (s)	36.4	61.6			21.2	21.2	26.4	26.4	26.4			
Actuated g/C Ratio	0.36	0.62			0.21	0.21	0.26	0.26	0.26			
v/c Ratio	0.17	0.27			0.66	0.60	0.15	0.15	0.86			
Control Delay	2.0	1.0			38.9	7.6	25.2	25.2	33.7			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	2.0	1.0			38.9	7.6	25.2	25.2	33.7			
LOS	A	A			D	A	C	C	C			
Approach Delay		1.2			28.0			31.9				
Approach LOS		A			C			C				
Queue Length 50th (m)	0.0	0.0			49.1	0.0	10.7	10.7	57.1			
Queue Length 95th (m)	0.0	0.0			58.4	22.6	18.3	18.3	83.3			
Internal Link Dist (m)		118.1			149.0			197.6			197.9	
Turn Bay Length (m)						60.0			60.0			
Base Capacity (vph)	1251	2180			1372	703	706	706	787			
Starvation Cap Reductn	0	0			0	0	0	0	0			
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.17	0.27			0.52	0.54	0.09	0.09	0.62			

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 94 (94%), Referenced to phase 4:EBT and 7:EBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 20.6

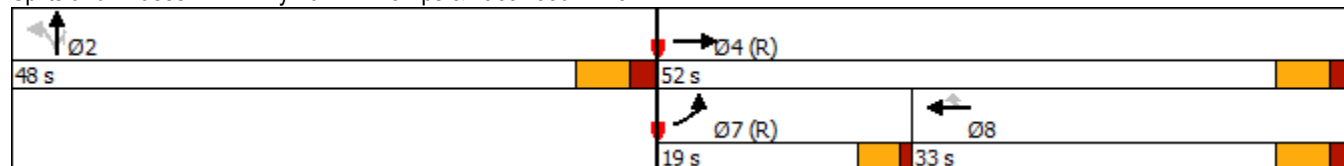
Intersection Capacity Utilization 52.7%

Analysis Period (min) 15

Intersection LOS: C

ICU Level of Service A

Splits and Phases: 4: Hwy 102 NB Ramps & Lacewood Drive



5: Lacewood Drive & Hwy 102 SB Ramps

2039 AM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	416	65	257	512	0	0	0	0	321	0	510
Future Volume (vph)	0	416	65	257	512	0	0	0	0	321	0	510
Satd. Flow (prot)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Satd. Flow (RTOR)			76									554
Lane Group Flow (vph)	0	452	71	279	557	0	0	0	0	174	175	554
Turn Type		NA	Perm	Prot	NA					Perm	NA	Free
Protected Phases		4		3	8						6	
Permitted Phases			4							6		Free
Total Split (s)		24.0	24.0	29.0	53.0					47.0	47.0	
Total Lost Time (s)		6.0	6.0	4.0	6.0					6.0	6.0	
Act Effct Green (s)		12.5	12.5	55.6	72.1					15.9	15.9	100.0
Actuated g/C Ratio		0.12	0.12	0.56	0.72					0.16	0.16	1.00
v/c Ratio		0.57	0.27	0.28	0.22					0.65	0.66	0.35
Control Delay		43.8	11.1	1.9	0.4					50.2	50.4	0.6
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		43.8	11.1	1.9	0.4					50.2	50.4	0.6
LOS		D	B	A	A					D	D	A
Approach Delay		39.4			0.9						19.8	
Approach LOS		D			A						B	
Queue Length 50th (m)		25.6	0.0	3.8	0.0					35.4	35.6	0.0
Queue Length 95th (m)		33.2	11.4	0.0	0.8					54.9	55.2	0.0
Internal Link Dist (m)		108.2			118.1			188.6			191.5	
Turn Bay Length (m)			70.0									90.0
Base Capacity (vph)		1153	347	983	2550					689	689	1583
Starvation Cap Reductn		0	0	0	0					0	0	0
Spillback Cap Reductn		0	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.39	0.20	0.28	0.22					0.25	0.25	0.35

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 3:WBL and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 17.3

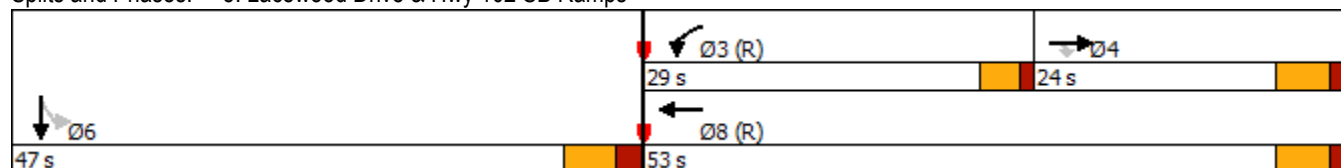
Intersection LOS: B

Intersection Capacity Utilization 52.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: Lacewood Drive & Hwy 102 SB Ramps



Appendix C - Intersection Performance Analysis

6: Dunbrack Street & Washmill Lake Drive

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2039 AM with Site Trips

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	140	457	417	755	580	127
Future Volume (vph)	140	457	417	755	580	127
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.237			
Satd. Flow (perm)	1770	1583	441	3539	3539	1583
Satd. Flow (RTOR)		497				66
Lane Group Flow (vph)	152	497	453	821	630	138
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	
Permitted Phases	4	4	2			6
Total Split (s)	28.0	28.0	31.0	62.0	31.0	31.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0
Act Effect Green (s)	11.6	11.6	44.3	42.2	16.9	16.9
Actuated g/C Ratio	0.17	0.17	0.67	0.63	0.25	0.25
v/c Ratio	0.49	0.72	0.63	0.37	0.70	0.31
Control Delay	33.0	9.8	12.4	6.5	28.4	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	9.8	12.4	6.5	28.4	15.1
LOS	C	A	B	A	C	B
Approach Delay	15.3			8.6	26.0	
Approach LOS	B			A	C	
Queue Length 50th (m)	18.3	0.0	20.9	21.0	38.8	7.3
Queue Length 95th (m)	40.7	26.8	68.2	43.9	70.1	24.4
Internal Link Dist (m)	384.9			268.2	197.4	
Turn Bay Length (m)			120.0			15.0
Base Capacity (vph)	617	875	862	2981	1402	667
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.57	0.53	0.28	0.45	0.21

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 66.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 15.2

Intersection Capacity Utilization 60.2%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 6: Dunbrack Street & Washmill Lake Drive

 Ø2		 Ø4
62 s		28 s
 Ø5	 Ø6	
31 s	31 s	

7: Dunbrack Street & 102 NB Ramps

2039 AM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	110	0	205	0	972	400	0	699	323
Future Volume (vph)	0	0	0	110	0	205	0	972	400	0	699	323
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)						223			435			98
Lane Group Flow (vph)	0	0	0	0	120	223	0	1057	435	0	760	351
Turn Type				Perm	NA	Free		NA	Perm		NA	Free
Protected Phases					8			2			6	
Permitted Phases				8		Free			2			Free
Total Split (s)				31.0	31.0			69.0	69.0		69.0	
Total Lost Time (s)					6.0			6.0	6.0		6.0	
Act Effect Green (s)					9.2	49.3		33.0	33.0		33.0	49.3
Actuated g/C Ratio					0.19	1.00		0.67	0.67		0.67	1.00
v/c Ratio					0.36	0.14		0.45	0.36		0.32	0.22
Control Delay					22.1	0.2		6.7	1.7		5.8	0.3
Queue Delay					0.0	0.0		0.0	0.0		0.0	0.0
Total Delay					22.1	0.2		6.7	1.7		5.8	0.3
LOS					C	A		A	A		A	A
Approach Delay					7.9			5.3			4.1	
Approach LOS					A			A			A	
Queue Length 50th (m)					10.4	0.0		26.6	0.0		17.1	0.0
Queue Length 95th (m)					23.0	0.0		45.9	9.6		30.2	0.0
Internal Link Dist (m)		132.3			115.3			212.7			106.8	
Turn Bay Length (m)						50.0			50.0			15.0
Base Capacity (vph)					923	1583		3539	1583		3539	1583
Starvation Cap Reductn					0	0		0	0		0	0
Spillback Cap Reductn					0	0		0	0		0	0
Storage Cap Reductn					0	0		0	0		0	0
Reduced v/c Ratio					0.13	0.14		0.30	0.27		0.21	0.22

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 49.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 5.1

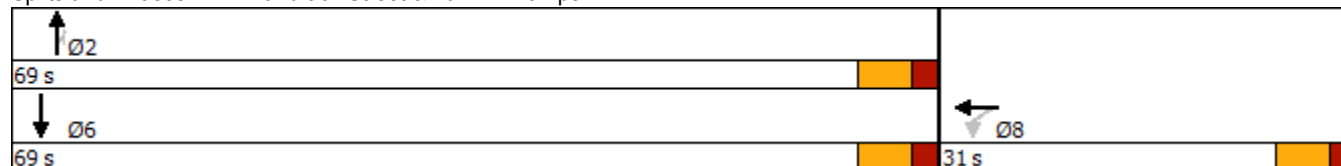
Intersection Capacity Utilization 43.0%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 7: Dunbrack Street & 102 NB Ramps



8: Dunbrack Street & 102 SB Ramps

2039 AM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	400	40	800	0	0	0	0	972	515	0	386	88
Future Volume (vph)	400	40	800	0	0	0	0	972	515	0	386	88
Satd. Flow (prot)	0	1781	1583	0	0	0	0	3539	1583	0	3539	1583
Flt Permitted		0.956										
Satd. Flow (perm)	0	1781	1583	0	0	0	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)			684						427			98
Lane Group Flow (vph)	0	478	870	0	0	0	0	1057	560	0	420	96
Turn Type	Perm	NA	Free					NA	Perm		NA	Free
Protected Phases		4						2			6	
Permitted Phases	4		Free						2			Free
Total Split (s)	45.0	45.0						55.0	55.0		55.0	
Total Lost Time (s)		6.0						6.0	6.0		6.0	
Act Effect Green (s)		24.1	67.6					30.5	30.5		30.5	67.6
Actuated g/C Ratio		0.36	1.00					0.45	0.45		0.45	1.00
v/c Ratio		0.75	0.55					0.66	0.59		0.26	0.06
Control Delay		28.7	1.4					17.4	6.6		12.6	0.1
Queue Delay		0.0	0.0					0.0	0.0		0.0	0.0
Total Delay		28.7	1.4					17.4	6.6		12.6	0.1
LOS		C	A					B	A		B	A
Approach Delay		11.1						13.6			10.3	
Approach LOS		B						B			B	
Queue Length 50th (m)		52.0	0.0					51.7	9.5		16.3	0.0
Queue Length 95th (m)		113.3	0.0					100.9	42.6		35.2	0.0
Internal Link Dist (m)		147.9			159.2			130.1			212.7	
Turn Bay Length (m)									40.0			55.0
Base Capacity (vph)		1108	1583					2685	1304		2685	1583
Starvation Cap Reductn		0	0					0	0		0	0
Spillback Cap Reductn		0	0					0	0		0	0
Storage Cap Reductn		0	0					0	0		0	0
Reduced v/c Ratio		0.43	0.55					0.39	0.43		0.16	0.06

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 67.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 12.1

Intersection Capacity Utilization 66.1%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service C

Splits and Phases: 8: Dunbrack Street & 102 SB Ramps

 02	 04
55 s	45 s
 06	
55 s	

Appendix C - Intersection Performance Analysis

3: Regency Park Drive & Internal Road

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2039 AM with Site Trips

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	0	64	94	0	95	29	165	39	66	181	48
Future Volume (Veh/h)	65	0	64	94	0	95	29	165	39	66	181	48
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	71	0	70	102	0	103	32	179	42	72	197	52
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)								253				
pX, platoon unblocked												
vC, conflicting volume	713	652	223	675	657	200	249			221		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	713	652	223	675	657	200	249			221		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	75	100	91	68	100	88	98			95		
cM capacity (veh/h)	287	358	817	317	355	841	1317			1348		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total	71	70	102	103	32	221	72	249				
Volume Left	71	0	102	0	32	0	72	0				
Volume Right	0	70	0	103	0	42	0	52				
cSH	287	817	317	841	1317	1700	1348	1700				
Volume to Capacity	0.25	0.09	0.32	0.12	0.02	0.13	0.05	0.15				
Queue Length 95th (m)	7.6	2.2	10.9	3.3	0.6	0.0	1.4	0.0				
Control Delay (s)	21.7	9.8	21.7	9.9	7.8	0.0	7.8	0.0				
Lane LOS	C	A	C	A	A		A					
Approach Delay (s)	15.8		15.8		1.0		1.8					
Approach LOS	C		C									
Intersection Summary												
Average Delay			6.8									
Intersection Capacity Utilization			37.7%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix C - Intersection Performance Analysis

1: Regency Park Drive/Parkland Drive & Lacewood Drive

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2039 PM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	244	592	332	336	539	147	288	194	241	133	161	140
Future Volume (vph)	244	592	332	336	539	147	288	194	241	133	161	140
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.412			0.233			0.647			0.612		
Satd. Flow (perm)	767	3539	1583	434	3539	1583	1205	1863	1583	1140	1863	1583
Satd. Flow (RTOR)			114			88			141			99
Lane Group Flow (vph)	265	643	361	365	586	160	313	211	262	145	175	152
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Total Split (s)	17.0	33.0	33.0	20.0	36.0	36.0	37.0	37.0	37.0	37.0	37.0	37.0
Total Lost Time (s)	4.0	6.3	6.3	4.0	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Act Effct Green (s)	33.8	20.2	20.2	40.8	23.8	23.8	24.3	24.3	24.3	24.3	24.3	24.3
Actuated g/C Ratio	0.44	0.26	0.26	0.53	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32
v/c Ratio	0.55	0.69	0.72	0.75	0.53	0.29	0.82	0.36	0.44	0.40	0.30	0.27
Control Delay	15.4	30.3	27.2	23.3	24.6	12.3	43.9	22.9	12.7	25.4	22.1	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	30.3	27.2	23.3	24.6	12.3	43.9	22.9	12.7	25.4	22.1	9.9
LOS	B	C	C	C	C	B	D	C	B	C	C	A
Approach Delay		26.3			22.4			27.9			19.2	
Approach LOS		C			C			C			B	
Queue Length 50th (m)	22.3	50.0	36.8	32.8	41.7	8.5	45.5	25.6	14.1	17.9	20.8	5.9
Queue Length 95th (m)	39.1	71.0	70.3	#74.1	60.8	23.9	#92.4	46.8	36.1	36.6	39.4	20.1
Internal Link Dist (m)		122.8			242.6			314.2			320.2	
Turn Bay Length (m)	55.0		7.0	50.0		7.0	35.0		7.0	35.0		7.0
Base Capacity (vph)	538	1283	646	523	1427	691	502	776	742	475	776	717
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.50	0.56	0.70	0.41	0.23	0.62	0.27	0.35	0.31	0.23	0.21

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 76.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 24.5

Intersection LOS: C

Intersection Capacity Utilization 78.5%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Regency Park Drive/Parkland Drive & Lacewood Drive

		
Ø1	Ø2	Ø4
17 s	36 s	37 s
		
Ø5	Ø6	Ø8
20 s	33 s	37 s

Appendix C - Intersection Performance Analysis

2: Access #3/Regency Park Drive & Washmill Lake Drive

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2039 PM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	244	918	12	33	824	145	7	22	20	238	37	137
Future Volume (vph)	244	918	12	33	824	145	7	22	20	238	37	137
Satd. Flow (prot)	1770	3532	0	1770	3461	0	0	1748	0	1770	1643	0
Flt Permitted	0.113			0.283				0.950		0.722		
Satd. Flow (perm)	210	3532	0	527	3461	0	0	1672	0	1345	1643	0
Satd. Flow (RTOR)		2			24			22			149	
Lane Group Flow (vph)	265	1011	0	36	1054	0	0	54	0	259	189	0
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	21.0	67.0		46.0	46.0		33.0	33.0		33.0	33.0	
Total Lost Time (s)	4.5	6.0		6.0	6.0			6.0		6.0	6.0	
Act Effect Green (s)	51.4	49.9		30.6	30.6			20.5		20.5	20.5	
Actuated g/C Ratio	0.62	0.60		0.37	0.37			0.25		0.25	0.25	
v/c Ratio	0.66	0.48		0.19	0.82			0.13		0.78	0.37	
Control Delay	24.4	10.4		22.2	29.5			18.8		48.3	10.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	24.4	10.4		22.2	29.5			18.8		48.3	10.4	
LOS	C	B		C	C			B		D	B	
Approach Delay		13.3			29.2			18.8			32.3	
Approach LOS		B			C			B			C	
Queue Length 50th (m)	23.6	46.0		4.2	84.3			4.3		41.8	5.3	
Queue Length 95th (m)	56.8	69.4		12.3	119.0			14.5		#83.0	23.7	
Internal Link Dist (m)		518.2			383.0			43.2			228.7	
Turn Bay Length (m)	20.0			15.0						25.0		
Base Capacity (vph)	455	2665		265	1759			584		458	658	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.58	0.38		0.14	0.60			0.09		0.57	0.29	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 82.9

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 22.4

Intersection LOS: C

Intersection Capacity Utilization 74.5%

ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 2: Access #3/Regency Park Drive & Washmill Lake Drive

											
67 s									33 s		
											
21 s			46 s						33 s		

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (vph)	790	951	0	0	965	407	305	5	536	0	0	0
Future Volume (vph)	790	951	0	0	965	407	305	5	536	0	0	0
Satd. Flow (prot)	3433	3539	0	0	5085	1583	1681	1688	1583	0	0	0
Flt Permitted	0.950						0.950	0.954				
Satd. Flow (perm)	3433	3539	0	0	5085	1583	1681	1688	1583	0	0	0
Satd. Flow (RTOR)						391			97			
Lane Group Flow (vph)	859	1034	0	0	1049	442	169	168	583	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	7	4			8			2				
Permitted Phases						8	2		2			
Total Split (s)	38.0	74.0			36.0	36.0	46.0	46.0	46.0			
Total Lost Time (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Act Effct Green (s)	34.3	67.7			29.4	29.4	40.3	40.3	40.3			
Actuated g/C Ratio	0.29	0.56			0.24	0.24	0.34	0.34	0.34			
v/c Ratio	0.88	0.52			0.84	0.65	0.30	0.30	0.98			
Control Delay	23.2	8.3			50.3	11.0	31.4	31.3	65.5			
Queue Delay	5.3	0.9			0.4	0.0	0.0	0.0	0.0			
Total Delay	28.6	9.2			50.7	11.0	31.4	31.3	65.5			
LOS	C	A			D	B	C	C	E			
Approach Delay		18.0			38.9			53.0				
Approach LOS		B			D			D				
Queue Length 50th (m)	118.1	90.2			90.4	9.9	32.5	32.3	124.4			
Queue Length 95th (m)	#139.7	0.0			108.3	43.4	52.5	52.4	#203.0			
Internal Link Dist (m)		118.1			149.0			197.6			197.9	
Turn Bay Length (m)						60.0			60.0			
Base Capacity (vph)	987	2005			1277	690	564	567	596			
Starvation Cap Reductn	87	629			0	0	0	0	0			
Spillback Cap Reductn	0	0			35	0	1	1	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.95	0.75			0.84	0.64	0.30	0.30	0.98			

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 61 (51%), Referenced to phase 4:EBT and 7:EBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 32.7

Intersection LOS: C

Intersection Capacity Utilization 69.7%

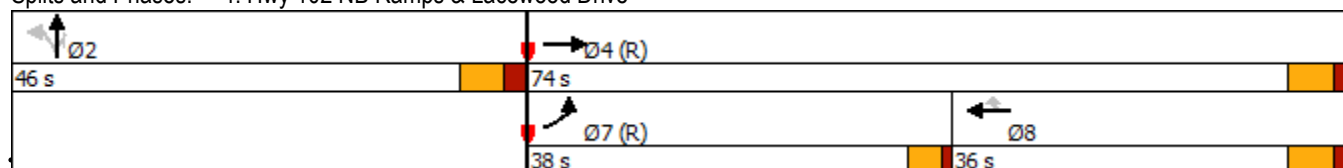
ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 4: Hwy 102 NB Ramps & Lacewood Drive



5: Lacewood Drive & Hwy 102 SB Ramps

2039 PM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑					↖	↗	↗
Traffic Volume (vph)	0	1409	300	383	887	0	0	0	0	332	0	530
Future Volume (vph)	0	1409	300	383	887	0	0	0	0	332	0	530
Satd. Flow (prot)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	6408	1583	1770	3539	0	0	0	0	1681	1681	1583
Satd. Flow (RTOR)			310									378
Lane Group Flow (vph)	0	1532	326	416	964	0	0	0	0	180	181	576
Turn Type		NA	Perm	Prot	NA					Perm	NA	Free
Protected Phases		4		3	8						6	
Permitted Phases			4							6		Free
Total Split (s)		43.0	43.0	49.0	92.0					28.0	28.0	
Total Lost Time (s)		6.0	6.0	4.0	6.0					6.0	6.0	
Act Effct Green (s)		37.6	37.6	48.9	90.4					17.6	17.6	120.0
Actuated g/C Ratio		0.31	0.31	0.41	0.75					0.15	0.15	1.00
v/c Ratio		0.76	0.46	0.58	0.36					0.73	0.74	0.36
Control Delay		39.9	6.2	8.0	2.4					66.0	66.3	0.6
Queue Delay		0.2	0.0	1.6	0.4					0.0	0.0	0.0
Total Delay		40.1	6.2	9.6	2.7					66.0	66.3	0.6
LOS		D	A	A	A					E	E	A
Approach Delay		34.2			4.8						25.9	
Approach LOS		C			A						C	
Queue Length 50th (m)		97.1	2.7	11.4	0.0					45.2	45.4	0.0
Queue Length 95th (m)		111.8	24.3	m134.9	100.3					69.5	69.8	0.0
Internal Link Dist (m)		108.2			118.1			188.6			191.5	
Turn Bay Length (m)			70.0									90.0
Base Capacity (vph)		2070	721	736	2667					308	308	1583
Starvation Cap Reductn		0	0	166	1027					0	0	0
Spillback Cap Reductn		109	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.78	0.45	0.73	0.59					0.58	0.59	0.36

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 3:WBL and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 22.6

Intersection LOS: C

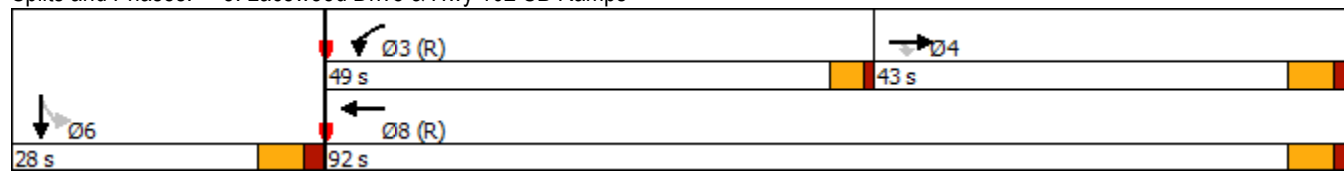
Intersection Capacity Utilization 69.7%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 5: Lacewood Drive & Hwy 102 SB Ramps



Appendix C - Intersection Performance Analysis

6: Dunbrack Street & Washmill Lake Drive

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2039 PM with Site Trips

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	181	651	612	785	830	217
Future Volume (vph)	181	651	612	785	830	217
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.109			
Satd. Flow (perm)	1770	1583	203	3539	3539	1583
Satd. Flow (RTOR)		564				63
Lane Group Flow (vph)	197	708	665	853	902	236
Turn Type	Perm	Perm	pm+pt	NA	NA	Perm
Protected Phases			5	2	6	
Permitted Phases	4	4	2			6
Total Split (s)	33.0	33.0	43.0	87.0	44.0	44.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0
Act Effct Green (s)	20.7	20.7	78.3	76.3	32.7	32.7
Actuated g/C Ratio	0.19	0.19	0.72	0.70	0.30	0.30
v/c Ratio	0.59	0.94	0.93	0.34	0.85	0.46
Control Delay	48.2	30.3	49.7	7.6	45.2	26.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.2	30.3	49.7	7.6	45.2	26.0
LOS	D	C	D	A	D	C
Approach Delay	34.2			26.0	41.3	
Approach LOS	C			C	D	
Queue Length 50th (m)	42.0	35.9	~142.7	42.3	106.4	33.0
Queue Length 95th (m)	67.3	#119.4	#230.2	54.2	133.8	57.8
Internal Link Dist (m)	384.9			268.2	197.4	
Turn Bay Length (m)			120.0			15.0
Base Capacity (vph)	444	819	713	2663	1249	599
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.86	0.93	0.32	0.72	0.39

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 109.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 33.0

Intersection LOS: C

Intersection Capacity Utilization 80.2%

ICU Level of Service D

Analysis Period (min) 15

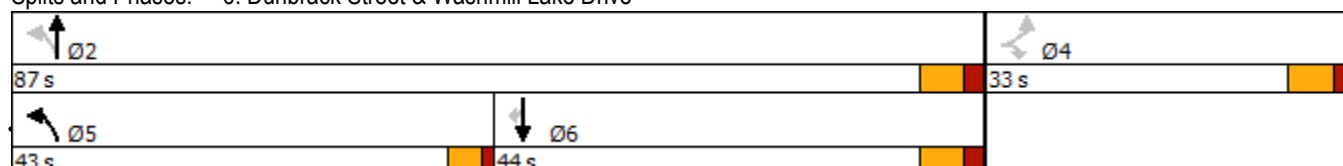
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 6: Dunbrack Street & Washmill Lake Drive



7: Dunbrack Street & 102 NB Ramps

2039 PM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	245	0	480	0	947	420	0	1070	421
Future Volume (vph)	0	0	0	245	0	480	0	947	420	0	1070	421
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)						493			457			161
Lane Group Flow (vph)	0	0	0	0	266	522	0	1029	457	0	1163	458
Turn Type				Perm	NA	Free		NA	Perm		NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		Free			2			6
Total Split (s)				42.0	42.0			58.0	58.0		58.0	58.0
Total Lost Time (s)					6.0			6.0	6.0		6.0	6.0
Act Effect Green (s)					15.0	56.4		28.9	28.9		28.9	28.9
Actuated g/C Ratio					0.27	1.00		0.51	0.51		0.51	0.51
v/c Ratio					0.57	0.33		0.57	0.44		0.64	0.52
Control Delay					24.1	0.6		11.2	2.5		12.3	8.4
Queue Delay					0.0	0.0		0.0	0.0		0.0	0.0
Total Delay					24.1	0.6		11.2	2.5		12.3	8.4
LOS					C	A		B	A		B	A
Approach Delay					8.5			8.6			11.2	
Approach LOS					A			A			B	
Queue Length 50th (m)					23.0	0.0		34.7	0.0		41.4	16.6
Queue Length 95th (m)					55.4	0.0		67.0	12.6		79.4	47.5
Internal Link Dist (m)		132.3			115.3			212.7			106.8	
Turn Bay Length (m)						50.0			50.0			15.0
Base Capacity (vph)					1178	1583		3182	1469		3182	1439
Starvation Cap Reductn					0	0		0	0		0	0
Spillback Cap Reductn					0	0		0	0		0	0
Storage Cap Reductn					0	0		0	0		0	0
Reduced v/c Ratio					0.23	0.33		0.32	0.31		0.37	0.32

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 56.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 9.6

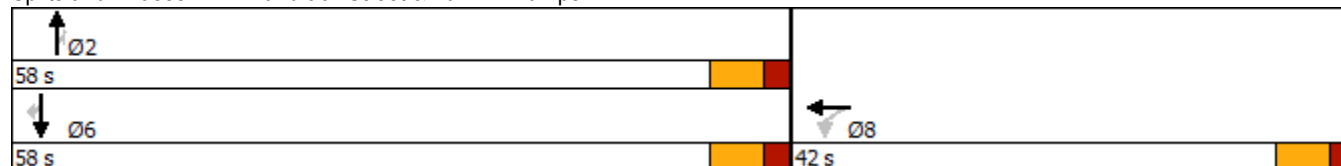
Intersection Capacity Utilization 53.2%

Analysis Period (min) 15

Intersection LOS: A

ICU Level of Service A

Splits and Phases: 7: Dunbrack Street & 102 NB Ramps



Appendix C - Intersection Performance Analysis

8: Dunbrack Street & 102 SB Ramps

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2039 PM with Site Trips

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	315	0	735	0	0	0	0	1057	110	0	1054	86
Future Volume (vph)	315	0	735	0	0	0	0	1057	110	0	1054	86
Satd. Flow (prot)	0	1770	1583	0	0	0	0	3539	1583	0	3539	1583
Flt Permitted		0.950										
Satd. Flow (perm)	0	1770	1583	0	0	0	0	3539	1583	0	3539	1583
Satd. Flow (RTOR)			510						84			98
Lane Group Flow (vph)	0	342	799	0	0	0	0	1149	120	0	1146	93
Turn Type	Perm	NA	Free					NA	Perm		NA	Free
Protected Phases		4						2			6	
Permitted Phases	4		Free						2			Free
Total Split (s)	45.0	45.0						55.0	55.0		55.0	
Total Lost Time (s)		6.0						6.0	6.0		6.0	
Act Effect Green (s)		17.8	57.0					26.4	26.4		26.4	57.0
Actuated g/C Ratio		0.31	1.00					0.46	0.46		0.46	1.00
v/c Ratio		0.62	0.50					0.70	0.15		0.70	0.06
Control Delay		23.4	1.2					15.2	4.7		15.2	0.1
Queue Delay		0.0	0.0					0.0	0.0		0.0	0.0
Total Delay		23.4	1.2					15.2	4.7		15.2	0.1
LOS		C	A					B	A		B	A
Approach Delay		7.8						14.2			14.0	
Approach LOS		A						B			B	
Queue Length 50th (m)		29.6	0.0					46.0	1.9		45.8	0.0
Queue Length 95th (m)		70.2	0.0					90.5	11.1		89.9	0.0
Internal Link Dist (m)		147.9			159.2			130.1			212.7	
Turn Bay Length (m)									40.0			55.0
Base Capacity (vph)		1290	1583					3025	1365		3025	1583
Starvation Cap Reductn		0	0					0	0		0	0
Spillback Cap Reductn		0	0					0	0		0	0
Storage Cap Reductn		0	0					0	0		0	0
Reduced v/c Ratio		0.27	0.50					0.38	0.09		0.38	0.06

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 57
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 12.1
Intersection Capacity Utilization 56.7%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service B

Splits and Phases: 8: Dunbrack Street & 102 SB Ramps

 02	 04
55 s	45 s
 06	
55 s	

3: Regency Park Drive & Internal Road

2039 PM with Site Trips

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	89	0	88	120	0	122	65	257	90	150	203	108
Future Volume (Veh/h)	89	0	88	120	0	122	65	257	90	150	203	108
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	97	0	96	130	0	133	71	279	98	163	221	117
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)								253				
pX, platoon unblocked												
vC, conflicting volume	1160	1124	280	1113	1134	328	338			377		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1160	1124	280	1113	1134	328	338			377		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	19	100	87	6	100	81	94			86		
cM capacity (veh/h)	120	167	759	139	164	713	1221			1181		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total	97	96	130	133	71	377	163	338				
Volume Left	97	0	130	0	71	0	163	0				
Volume Right	0	96	0	133	0	98	0	117				
cSH	120	759	139	713	1221	1700	1181	1700				
Volume to Capacity	0.81	0.13	0.94	0.19	0.06	0.22	0.14	0.20				
Queue Length 95th (m)	38.0	3.5	51.6	5.4	1.5	0.0	3.8	0.0				
Control Delay (s)	104.6	10.4	122.1	11.2	8.1	0.0	8.5	0.0				
Lane LOS	F	B	F	B	A		A					
Approach Delay (s)	57.8		66.0		1.3		2.8					
Approach LOS	F		F									
Intersection Summary												
Average Delay			21.7									
Intersection Capacity Utilization			53.1%		ICU Level of Service				A			
Analysis Period (min)			15									

4: Hwy 102 NB Ramps & Lacewood Drive Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.4	1.5	1.1	1.3	3.1	0.8
Total Del/Veh (s)	16.2	7.6	42.7	19.7	44.8	39.0	30.4	25.2

Intersection: 4: Hwy 102 NB Ramps & Lacewood Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	B11	B11	NB	NB
Directions Served	L	L	T	T	T	T	T	R	T	T	L	LT
Maximum Queue (m)	99.9	105.1	75.3	77.7	100.4	89.3	96.4	67.5	0.7	69.2	127.0	176.7
Average Queue (m)	38.1	41.1	26.2	30.1	68.7	57.1	55.7	44.9	0.0	2.0	20.2	83.8
95th Queue (m)	82.2	86.6	62.6	67.2	98.5	85.7	89.0	75.6	0.0	28.9	85.0	148.2
Link Distance (m)	126.0	126.0	126.0	126.0	149.5	149.5	149.5		127.1	127.1	204.9	204.9
Upstream Blk Time (%)		0								0		0
Queuing Penalty (veh)		0								0		0
Storage Bay Dist (m)								60.0				
Storage Blk Time (%)							5	3				7
Queuing Penalty (veh)							18	8				36

Intersection: 4: Hwy 102 NB Ramps & Lacewood Drive

Movement	NB
Directions Served	R
Maximum Queue (m)	67.5
Average Queue (m)	60.0
95th Queue (m)	80.4
Link Distance (m)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	60.0
Storage Blk Time (%)	16
Queuing Penalty (veh)	25

3: Regency Park Drive & Internal Road Performance by movement

Movement	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	3.8	0.4	3.7	0.5	0.0	0.0	0.0	2.8	0.6	0.6	1.1
Total Del/Veh (s)	15.6	5.0	16.5	5.8	4.7	2.5	1.6	4.7	2.5	1.4	5.4

Intersection: 3: Regency Park Drive & Internal Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	27.8	21.7	27.2	26.1	15.8	6.7	20.3	6.3
Average Queue (m)	12.7	10.4	14.4	12.1	5.1	0.4	8.8	0.1
95th Queue (m)	23.0	17.7	24.9	20.7	13.4	3.2	17.5	1.6
Link Distance (m)	70.0		125.7		228.6		332.9	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	25.0		25.0		25.0		25.0	
Storage Blk Time (%)	1	0	2	0			0	
Queuing Penalty (veh)	1	0	2	0			0	