2829 Dumaurier Ave

TIA Final Report

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TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering ☑ or transportation planning ☐.

[1,2] **License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

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TIA Final Report

Parsons has been retained by Brigil to prepare a Transportation Impact Assessment (TIA) in support of a Zoning By-Law Amendment (ZBLA) and Site Plan Application (SPA) for a residential development located at 2829 Dumaurier Avenue in Bayshore/Cedarview district. This document follows the new TIA process, as outlined in the City Transportation Impact Assessment (TIA) Guidelines (2017). The following report represents a revised Step 5 – Final Report.

Summary of Changes

Since the previous TIA Step 5 (July 2021) submission, the client has made further refinements to the Site Plan, triggering this refresh to the TIA Step 5. **Table 1** compares the 2021 site plan statistics to the latest site plan prepared by RLA Architecture, illustrated in **Figure 1**. Overall, the new Site Plan proposes an increase in the number of floors and residential units, but a reduction in vehicular and bike parking quantities. The building footprint has also been reduced along with the proposed commercial space.

Notable changes include a change in the onsite circulation layout. The ramp to the underground parking garage has shifted south and the downgrade begins on the straightaway rather than on the bend, which is preferred. Due to the shifting of the underground parking garage ramp, four surface parking spots were relocated indoors, and the garbage pickup location has shifted to the southwest quadrant of the site.

Table 1: Comparison of Site Statistics 2021 versus 2023 Site Plan

Independent Variable	November 2021	April 2023	Net Difference
Residential Units Proposed	330	422	+92 units
Commercial Floor Space (m^2)	440	300	-140 m^2
Floors proposed	30	40	+10 floors
Building Footprint (m^2)	1,654.7	1,212.0	-442.7 m^2
Residential parking spaces proposed	220	174	-46 spaces
Visitor parking spaces proposed	30	30	0
Bicycle parking spaces proposed	314	310	- 4 spaces

1. Screening Form

The screening form confirmed the need for a TIA Report based on the Trip Generation trigger, given that the proposed development consists of a 40-storey building with approximately 422 residential apartment units and 3,230 ft^2 of commercial space; the Location trigger, given that the development is located within a Transit Oriented Development Zone (TOD) and within 600 meters of the future Pinecrest LRT Station; and Safety trigger given that the proposed driveway is within the influence of a horizontal curvature. The Screening Form and City comment correspondence has been provided in **Appendix A**.

2. Scoping Report

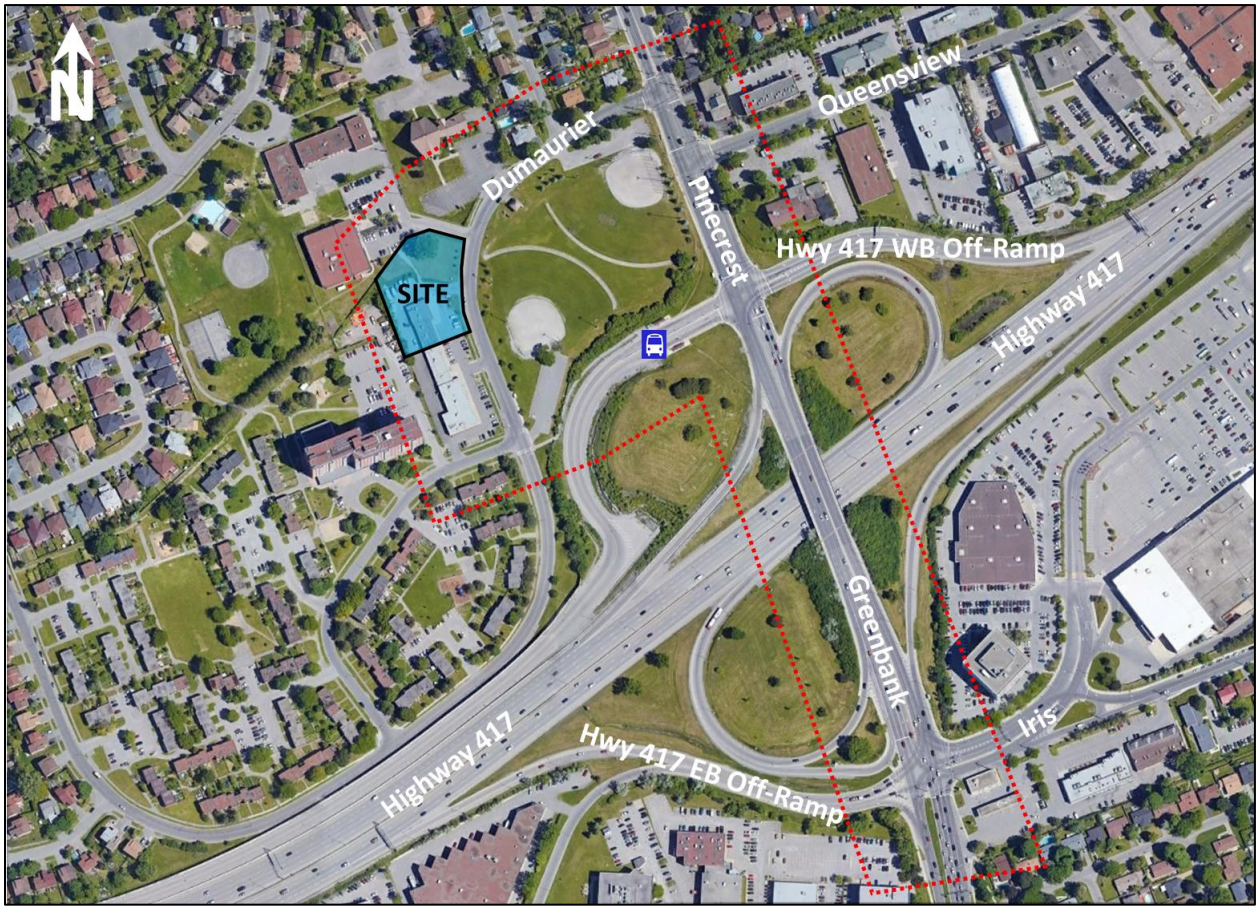
2.1. Existing and Planned Conditions

2.1.1. PROPOSED DEVELOPMENT

The proposed development is located at the municipal addresses of 2829 Dumaurier Avenue on the west side of Dumaurier, approximately 230m west of the Dumaurier/Pinecrest intersection. The existing site is partially

vacant, the southern half is occupied by a small shopping plaza that extends beyond the south property boundary, and includes a U-Haul, Al Waha Grocery, Musalla As-Sahaba and Barney's Pizza. The proposed study area includes the intersections of Dumaurier/Pinecrest, Queensview/Pinecrest, Hwy 417/Pinecrest, Iris/Greenbank and roadway segments adjacent to site or between intersections as shown in **Figure 1**. More details regarding the study area can be found in **Section 2.1.2**.

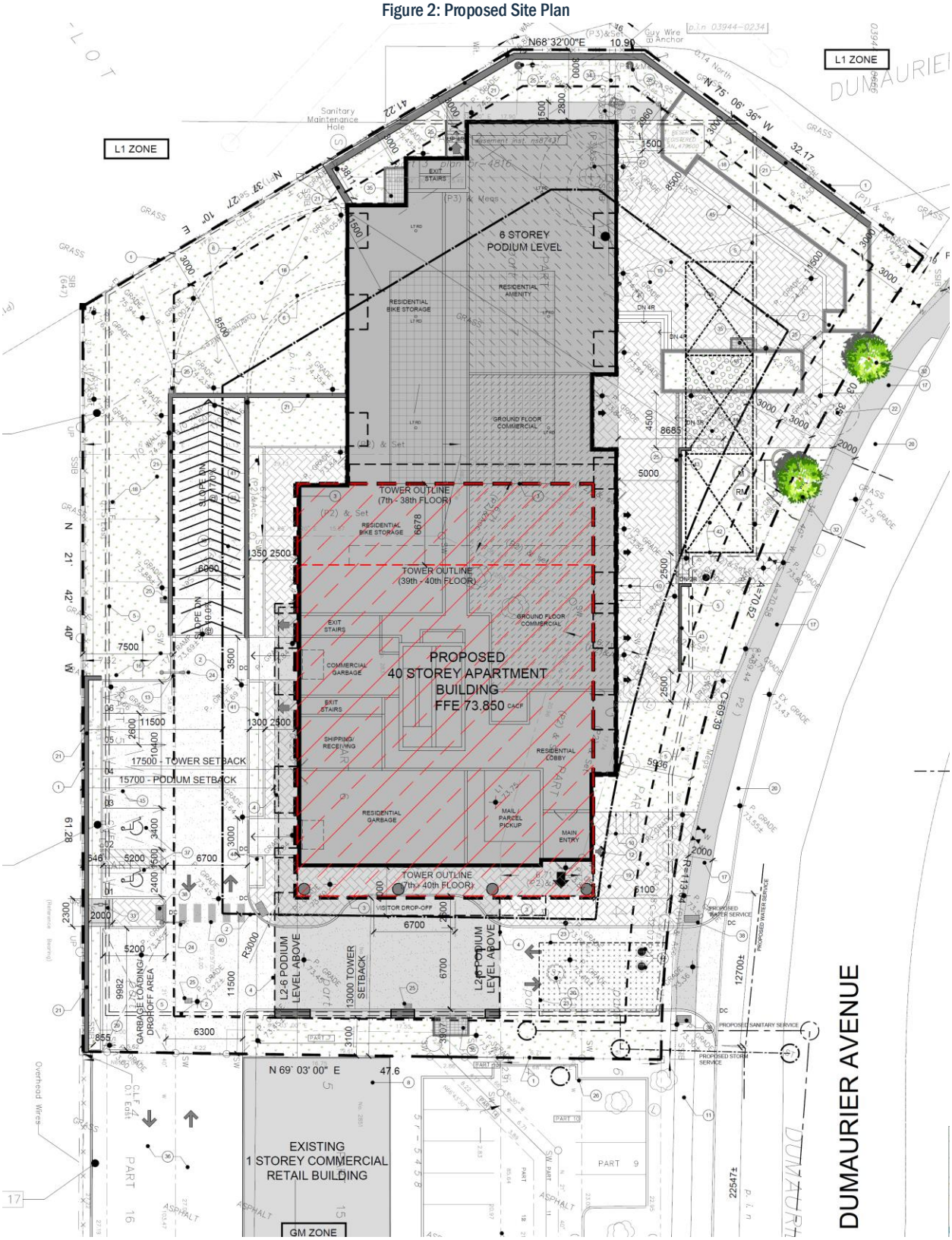
Figure 1: Local Context



The property is currently zoned as GM[62] F(0.25) which means general mixed use and has a maximum of 325 m^2 of retail stores permitted. Under general GM zoning, building heights of up to 18 meters are allowed, which triggers the re-zoning application to allow a higher maximum building height forecasted at 126 meters. The owners intend to develop a 40-storey apartment building containing approximately 422 residential apartment units and 3,230 ft^2 of commercial space.

Full buildout of the site is expected by 2025. A new driveway access on the south side of the property parcel will provide a connection to Dumaurier Avenue for both the subject site and the adjacent property to the south. Access to an underground parking structure will be provided from this driveway connection. A total of 198 underground and 6 above grade parking spaces are proposed for the development. The latest site plan concept is shown in **Figure 2**.

Figure 2: Proposed Site Plan



2.1.2. EXISTING CONDITIONS

Area Road Network

Highway 417 Queensway (HWY 417) is an east-west provincially owned freeway, which extends from the border with Quebec Highway 20 near Rigaud in the east to Arnprior in the west, where it continues as Highway 17. Within the study area, HWY 417 has a six-lane cross section and auxiliary turn lanes are provided at its intersection with Greenbank. The posted speed limit within the study area is 100 km/h.

Pinecrest Road is north-south arterial roadway which extends from Carling Avenue in the north to Hwy 417 in the south, where it continues as Greenbank Road. Within the study area, Pinecrest Road has a four-lane cross section. The posted speed limit is 50 km/h.

Greenbank Road is north-south arterial roadway which extends from Prince of Wales Drive in the south to Hwy 417 in the north, where it continues as Pinecrest Road. Within the study area, Greenbank Road has a four-lane cross section. The posted speed limit is 50 km/h.

Iris Street is a major east-west collector roadway which extends from Greenbank Road in the west to Navaho Drive in the east. Within the study area, Iris Street has a two-lane cross section. The posted speed limit is 50 km/h.

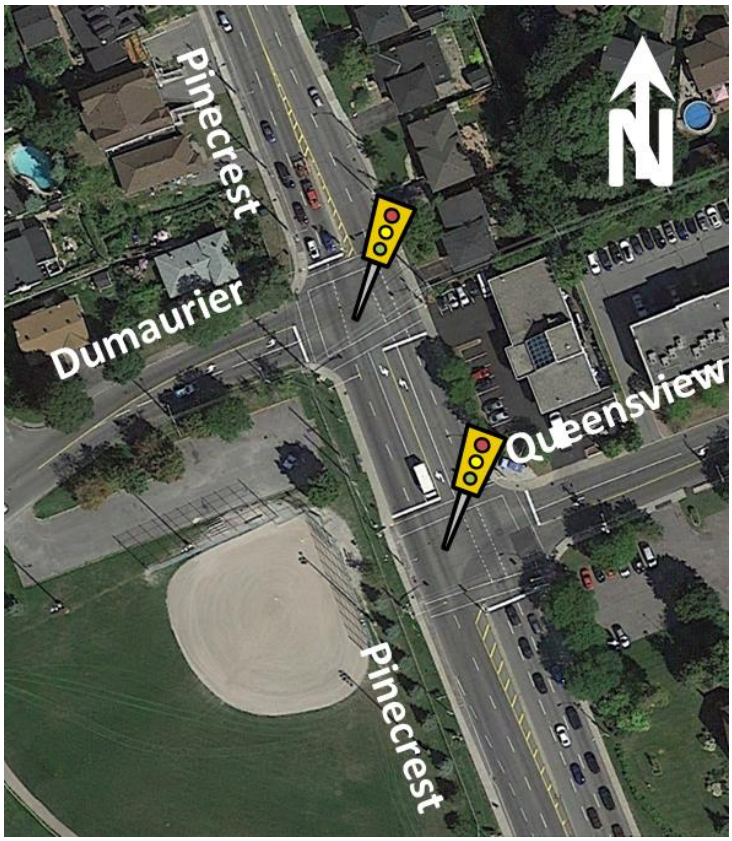
Dumaurier Avenue is an east-west collector roadway which extends from Pinecrest Road in the east to Richmond Road in the west. Within the study area, Dumaurier Avenue has a two-lane cross section. The unposted speed limit is assumed 50 km/h.

Queensview Drive is an east-west local roadway which extends from Pinecrest Road in the west to an OC Transpo bus hub in the east. Within the study area, Queensview Drive has a two-lane cross section. The unposted speed limit is assumed 50 km/h.

Existing Study Area Intersections

Dumaurier/Pinecrest

The Dumaurier/Pinecrest intersection is a signalized three-legged intersection. The eastbound approach consists of a single left-turn lane and a through-right turn lane. The northbound approach consists of a left-turn lane and a double through lane. The southbound approach consists of a shared through-right turn lane and a single through lane. All movements are permitted at this location.

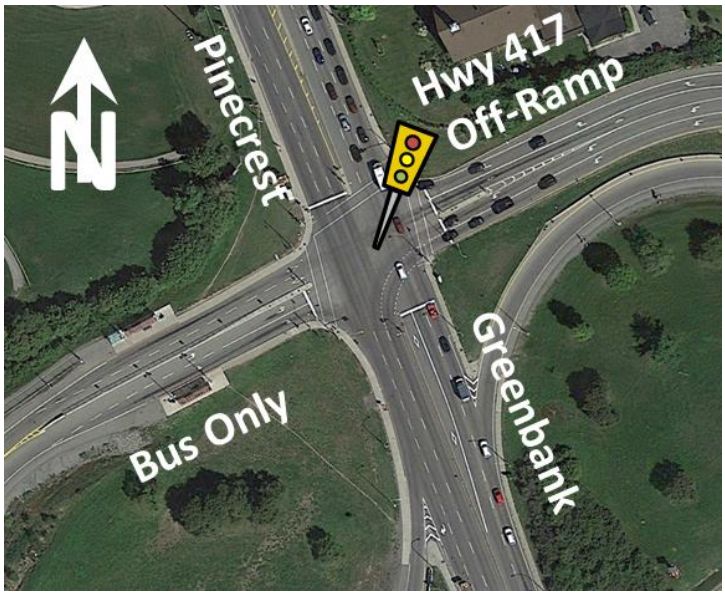


Queensview/Pinecrest

The Queensview/Pinecrest intersection is a signalized three-legged intersection. The westbound approach consists of a single left-turn lane and a through-right turn lane. The northbound approach consists of a shared through-right turn lane and a double through lane, with the innermost lane feeding directly into the left-turn lane at Dumaurier/Pinecrest. The southbound approach consists of a left-turn lane and a double through lane. All movements are permitted at this location.

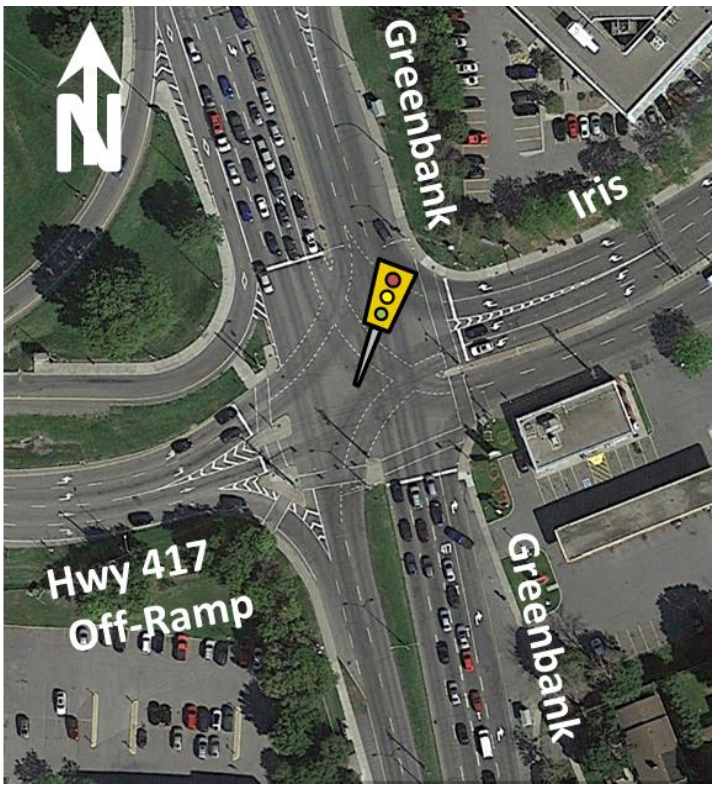
Hwy 417/Pinecrest-Greenbank

The Hwy 417/Pinecrest intersection is a signalized four-legged intersection. The eastbound approach is a bus only leg. The westbound approach consists of a double left-turn lane, a right-turn lane and a bus only through lane. The northbound approach consists of a left-through bus only lane, a double through lane and a channelized right-turn. The southbound approach consists of a triple through lane. The west leg is accessible to permitted vehicles only and the east leg is a one way only leg with vehicles exiting the Hwy 417 on to Pinecrest Road.



Iris-Hwy 417/Greenbank

The Iris/Greenbank intersection is a signalized four-legged intersection. The eastbound approach is a highway exit only, consisting of a double left-turn lane, a channelized right-turn lane and a single through lane. The westbound approach consists of a double left-turn lane and a double right-turn lane. The northbound approach consists of a right-turn lane and a triple through lane, with the rightmost through-lane feeding directly into the eastbound on-ramp for Highway 417. The southbound approach consists of a double left-turn lane and a double through lane. All movements are permitted at this location. Westbound right turns are not allowed on red. The west leg is a one way only leg with vehicles exiting Hwy 417 on to Greenbank Road.

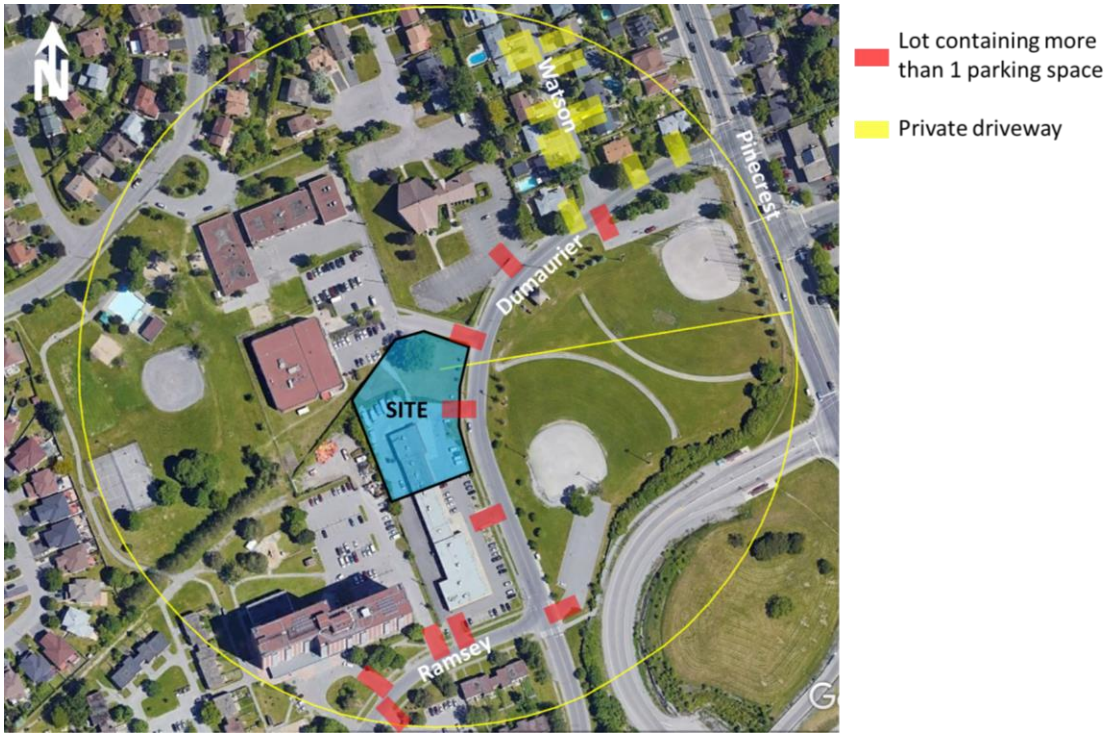


Existing Driveways to Adjacent Developments

Within 200m of the proposed site, there are 3 roads with existing driveways. The existing driveways as shown in **Figure 3** include:

- Access Driveways to Dumaurier Avenue:
  - 2793 Dumaurier – private driveway to a single detached home (160m north of site)
  - 2799 Dumaurier – private driveway to a single detached home (130m north of site)
  - 2809 Dumaurier – private driveway to a single detached home (85m north of site)
  - 2821 Dumaurier – approximate 60 spot parking lot for Paroisse St. Remi (50m north of site)
  - 1085 Grenon Ave – approximate 50 spot parking lot for Boys and Girls Club of Ottawa and Abraar Secondary School (borders site to the north)
  - 2829 Dumaurier north access – existing driveway, to be relocated
  - 2829 Dumaurier south access – approximate 35 spot parking lot for the shopping center south of the site (access driveway located approximately 25m south of the proposed property limits)
  - 2850 Dumaurier – parking for the baseball fields, approximately 40 parking spots on the north lot access and 40 on the south (north access located 90m north of the site and the south access is located approximately 90m south of the site.
- Access Driveways to Watson Street (located approximate 90 meters north of the proposed site):
  - 9 private driveways to single detached homes
- Access Driveways to Ramsey Crescent (located approximate 90 meters south of the proposed site):
  - 2829 Dumaurier – a secondary access to the shopping center south of the site which has approximately 35 parking spots
  - Foster Farm Family House – access to a surface parking lot, possible underground and 2 driveways which function as a drop off loop
  - Access to a 26-space parking lot on southern side of Ramsey Cr

Figure 3: Existing Driveways Adjacent to Development



Existing Area Traffic Management Measures

Below are the existing area traffic management measures within the study area:

- Sidewalk facilities with some crosswalks including high-visibility zebra stripes at the intersection of Dumaurier/Ramsey (further details in following section);
- On-street parking;
- Children at play signage;

Pedestrian/Cycling Network

Pedestrian sidewalk facilities are provided on both sides of Dumaurier Avenue, Pinecrest Road, Greenbank Road and Iris Street. Queensview Drive has sidewalk facilities on the south side of the road only. A separated multi-use pathway (MUP) provides direct and convenient access from Dumaurier Avenue to existing Pinecrest BRT Station. Additional internal pathways and alleyways provide connectivity to Grenon Avenue and the surrounding neighborhood via Abraar Secondary School.

With regards to cycling, there are scattered pathways and suggested bike routes, such as Iris Street and Morrison Drive.

Transit Network

There has been substantial construction work along the west Transitway near the site, which is currently in the process of being converted from a BRT to an LRT corridor. Works included the grade separation of the transit corridor, which required bridge modifications on Pinecrest Road as described in **Section 2.1.3** below. Construction of the Pinecrest LRT Station, bridge modifications and active transportation connections are still in progress.

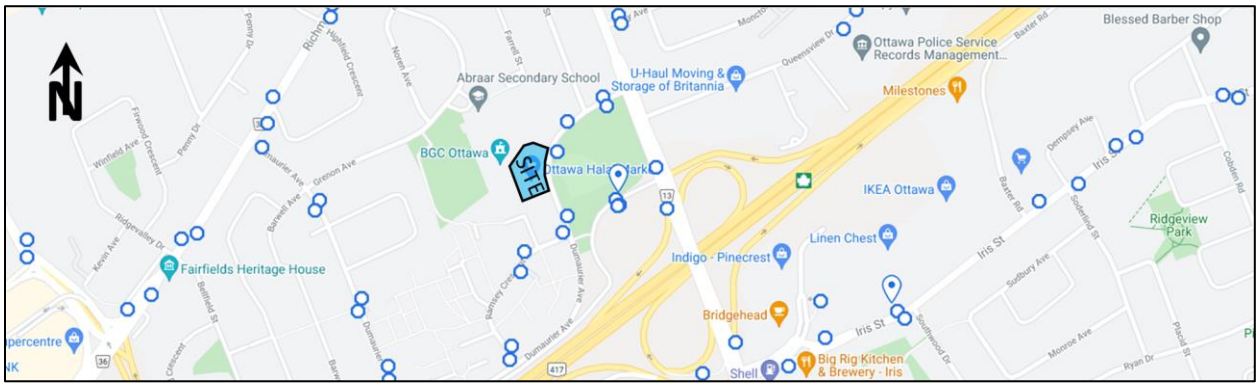
The transit routes described below are all still up to date, however it is noteworthy that routes using Pinecrest Station such as routes #63, #64, #66 and #67 are currently using a partial detoured route since the former station is closed for construction purposes.

The transit network for the study area is illustrated in **Figure 4** with nearby transit stops shows in **Figure 5**. The following OC Transpo routes currently operate within 600m walking distance to the site:

- **Rapid Transit Routes**: identified by OC Transpo as operating in all time periods and operates 7 days a week. Routes #61, #62 and #63 operate on the major east-west BRT with fast connection to Confederation LRT Line 1 and destinations in the west including Stittsville, Terry Fox and Briarbrook. The nearest bus stops for these routes are available on the BRT transitway, approximately 300 meters walking from the site.
- **Frequent Transit Routes**: identified by OC Transpo as operating at a frequency of every 15 minutes or less on weekdays and operates 7 days a week. Route #11 operates from Parliament to Bayshore predominantly via Richmond Road, Wellington and Somerset. The nearest bus stops for this route are available on both sides of Richmond Road, approximately 550 meters walking from the site.
- **Local Transit Routes**: identified by OC Transpo as operating on custom routing and hours. Routes #82, #173 and #691 operate on Dumaurier Avenue and have bus stops located less than 100 meters from the site. Additional local routes operating from Pinecrest Station at the BRT Transitway (approximately 300-meter walk) include routes #55, #64, #66, #155, #301, #303 and #660.
- **Connexion Transit Routes**: identified by OC Transpo as operating during peak periods only on weekdays. Route #258 provides fast connection to Confederation LRT Line 1. The nearest bus stops for this route is available on the BRT transitway, approximately 300 meters walking from the site.

Figure 4: Area Transit Network

Figure 5: Nearby Transit Stops



Peak Hour Travel Demands

The existing peak hour traffic vehicle and active travel volumes within the study area, as illustrated in **Figure 6** and **Figure 7** respectively, were obtained from the City of Ottawa. The peak hour traffic volume count data has been provided in **Appendix B**.

Figure 6: Existing Peak Hour Traffic Volumes

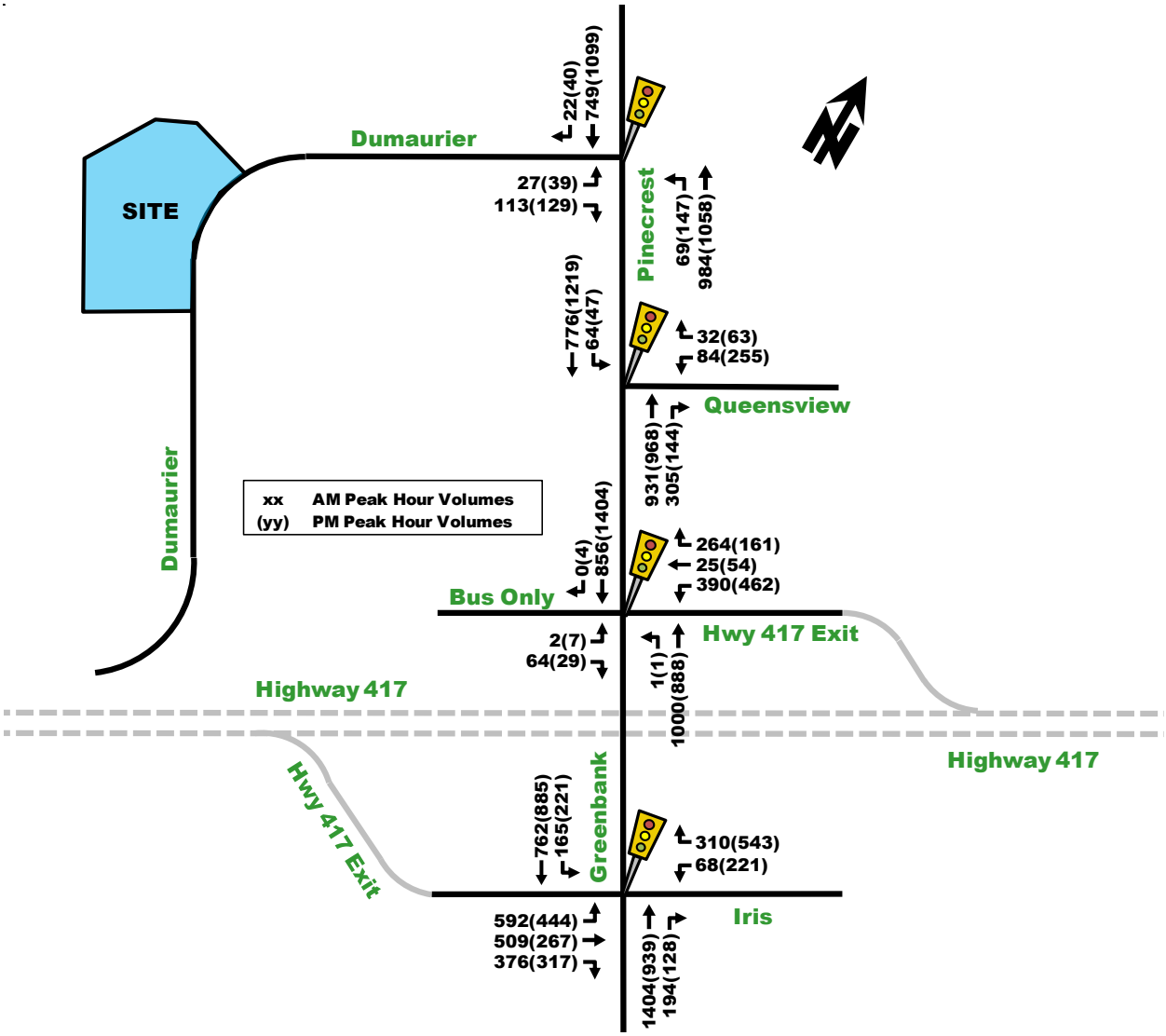
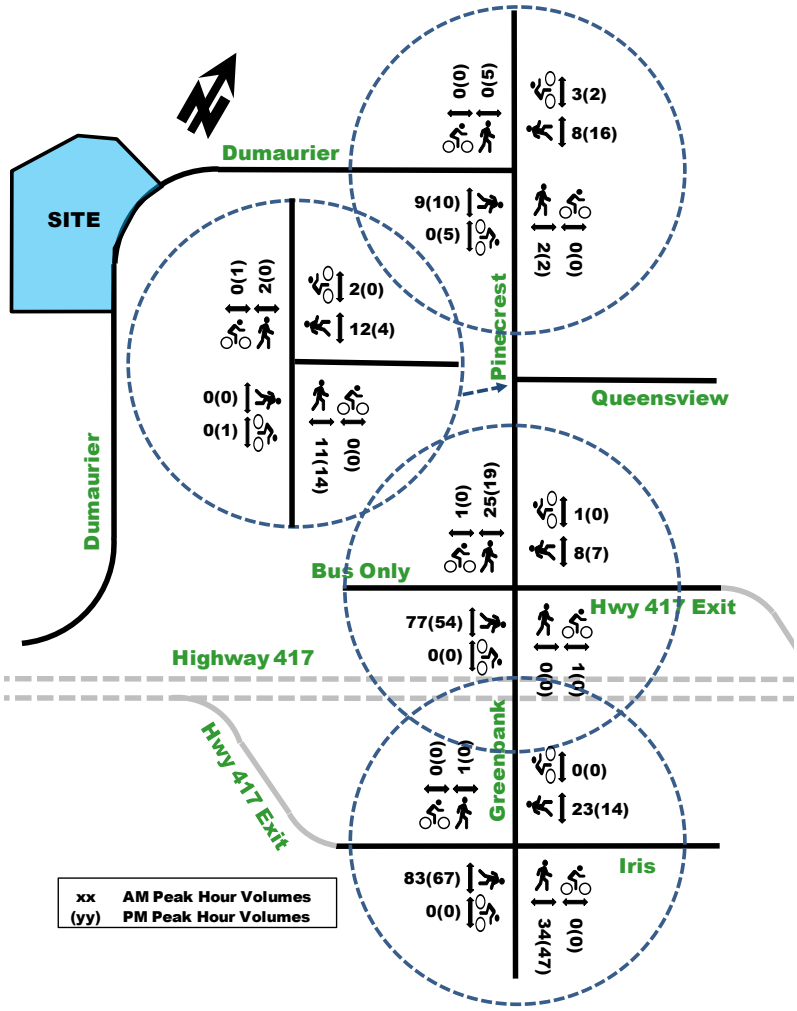


Figure 7: Existing Peak Hour Pedestrian/Cycling Volumes



Existing Road Safety Conditions

A five-year collision history data (2014-2018, inclusive) was requested and obtained from the City of Ottawa for all intersections and road segments within the study area. Upon analyzing the collision data, the total number of collisions observed within the study area was determined to be 194 collisions within the past five-years. Within the study area, the quantity of collisions at each location has occurred at a rate of:

- Dumaurier/Ramsey: 1
- Dumaurier/Pinecrest: 25
- Queensview/Pinecrest: 15
- Hwy 174/Pinecrest: 23
- Iris/Greenbank: 99
- Mid-block Dumaurier: 4
- Mid-block Pinecrest: 13
- Mid-block Greenbank: 12

To help quantify the relative safety risk at intersections within the study area, an industry standard unit of measure for assessing collisions at an intersection was used based on the number collisions per million entering vehicles (MEV). An MEV value greater than 1.00 indicates a relatively high frequency of collisions; however, it does not explain the type or severity of collision. A secondary analysis is done to determine the severity of collision by representing the number of personal injuries as a percentage of the total number of collisions at a given intersection.

A high propensity (MEV > 1.00 or %PIR > 30%) would signal a potential intersection design deficiency or other contributing factor, such as poor intersection geometry, blind spots, poor lighting, excessive speeds, high amount of entry/exit driveways etc.

Intersections that met the MEV or PIR threshold include:

- Iris/Greenbank – 1.02 Collisions/MEV with 10% causing injury. Total of 99 collisions with 58 (58%) of all collisions involving rear end, 25 (25%) of all collisions involving sideswipes, 9 (9%) involving angle, 4 (4%) involving turning movement, 2 (2%) other and 1 (1%) single vehicle. The large quantity of sideswipes is likely due to the high number of vehicles turning to and from the shopping center and Ikea located to the east of the intersection. None of the sideswipes resulted in personal injury; however, 7 of the 12 collisions resulting in personal injury occurred during rear end collision type, possibly from vehicles colliding at fast rates of speed or colliding with vehicles that might be stopped at the intersection waiting to turn or stopped at a red light. A possible factor which results in higher likeliness of collisions (MEV) can be attributed to horizontal curvatures from the highway underpass, the non-symmetrical shape of the intersection and the high number of vehicles using the intersection. Additional trends noted include 39 of the 58 (57%) rear end collisions involved vehicles following too closely or travelling too fast. Of the 58 rear end collisions, 22 (38%) involved the first vehicle attempting to turn left or right. Rear-end incidents were fairly balanced among three approaches, with the east leg having 22, north 14, south 20 and the west only 2 rear end type collisions.

Intersections that did not meet the MEV or PIR threshold and do not warrant further analysis include:

- Dumaurier/Pinecrest – 0.50 Collisions/MEV with 12% causing injury. Total of 25 collisions with 12 (48%) of all collisions involving rear end (5 at the north leg, 5 at the south leg and 2 at the west leg).
- Hwy 417/Pinecrest – 0.30 Collisions/MEV with 23% causing injury. Total of 22 collisions with 11 (50%) of all collisions involving rear end (5 at the north leg, 5 at the south leg and 1 at the east leg) and 9 (39%) involving angled collisions (no particular trend).
- Queensview/Pinecrest – 0.28 Collisions/MEV with 7% causing injury. Total of 15 collisions with 7 (47%) of all collisions involving rear end (4 at the north leg, 3 at the south leg).

Other collisions within the study area include:

- There was a total of 29 collisions between intersections (mid-block segments), with the majority, 25 (86%) of them occurring on Pinecrest Road or Greenbank Road
- Out of all collisions, only 3 (2%) involved cyclists and they all occurred at different locations
- There were no registered collisions with pedestrians

The source collision data as provided by the City of Ottawa and related analysis is provided as **Appendix C**.

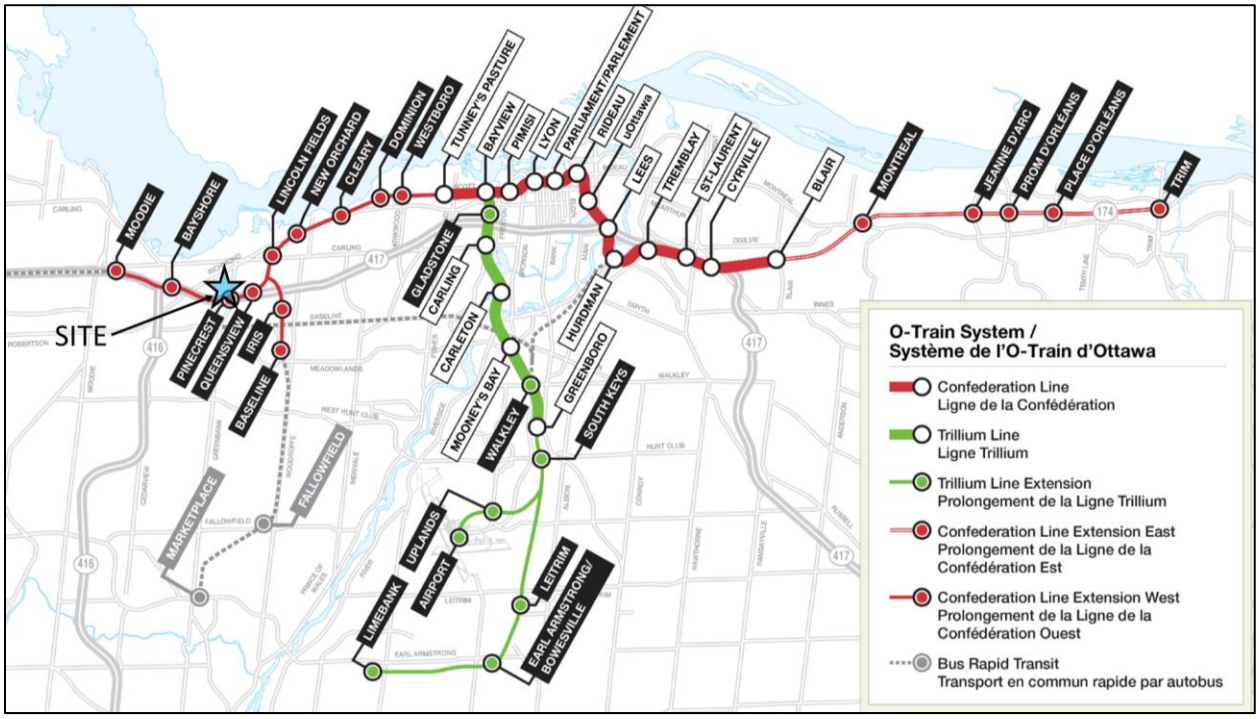
2.1.3. PLANNED CONDITIONS

Planned Study Area Transportation Network Changes

Stage 2 LRT and Pedestrian Enhancements

Stage 2 of the City of Ottawa LRT system is currently under construction. Stage 2, as shown in **Figure 8,** is a package of three extensions – south, east and west – totaling 44 km of new rail and 24 new LRT stations. The subject site will be located within 300m of Pinecrest Station on the Confederation Line 1.

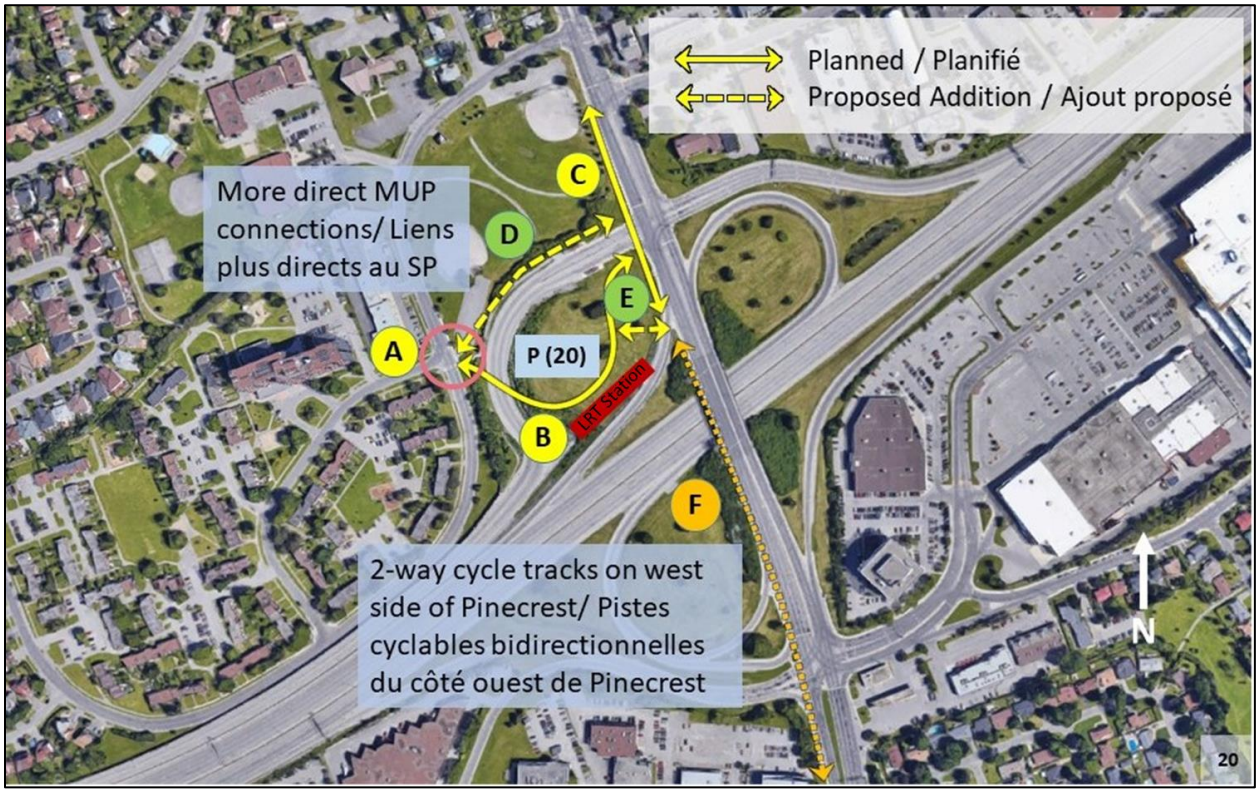
Figure 8: Stage 2 LRT System Map



Within the Stage 2 LRT Connectivity and Enhancement Study, there are multiple improvements from existing conditions to the future station as follows and referenced to **Figure 9**:

A) Planned – Pedestrian crossover at Dumaurier Avenue and 3 passenger pick up and drop off spaces.
B) Planned – Station entrance plaza with multi-use pathway to Dumaurier Avenue and Pinecrest Road, and bike parking for 20 bikes with space allocated to double in future when required.
C) Planned – Bidirectional cycle tracks along west side of Pinecrest Road, from station entrance north to Queensview Drive.
D) Proposed – Multi-use pathway from Dumaurier Avenue to Pinecrest Road north of the bus loop.
E) Proposed – Add multi-use pathway from Pinecrest bridge directly to station.
F) Feasibility Assessment – Bi-directional cycle track along west side of Pinecrest Highway 417 Bridge from station to Morrison Drive subject to MTO Approval.

Figure 9: Confederation Line West Extension – Pinecrest LRT Station



Source: https://ottawa.ca/en/city-hall/public-engagement/projects/stage-2-lrt-station-connectivity-enhancement-study

Figure 10: Rendering of Potential Pinecrest Station

Source: https://ottawa.ca/en/planning-development-and-construction/major-projects/stage-2-light-rail-transit-project/confederation-line-west-extension

Cycling Network

Within the Ottawa Ultimate Cycling Network, Dumaurier, Queensview, Iris and Morrison are suggested local routes. Pinecrest and Greenbank are suggested future spine routes. A 2-way cycle track on the west side of Pinecrest and Greenbank is proposed within a feasibility assessment for the Stage 2 LRT Connectivity Enhancement Study. **Figure 11** depicts the existing and future network.

Figure 11: Existing and Future 'Ultimate Cycling Network"

Other Area Developments

The following section outlines adjacent developments in the general area that were considered in the TIA. The criteria for inclusion of other area developments are either approved developments or developments that have an active planning application that are generally within a 1-km radius of the subject site. The development applications numbered 1, 2, 3, and 4 in the figure below remain unchanged from the November 2021 TIA (shaded yellow), while new developments 5, 6, 7 have recently been added and accounted for in future conditions. **Figure 12** illustrates the location and relative size of relevant other area developments.

Figure 12: Other Area Developments

1 – 2720 Richmond

JL Richards Grant School is proposing an expansion to their current site, including 12,000 ft² of community center and 20,000 ft² of community college. A TIA prepared by McIntosh Perry projects approximately 40 to 50 new two-way trips. Approximately 11 AM trips and 6 PM trips are anticipated to use Pinecrest Road, which we be layered on to our background volumes.

2 – 826 High Street

A 15-unit low rise building is proposed for this site. Given the low number of units and the distance from the site, it is not anticipated to have any effect on the study road network.

3 – 841 Grenon Avenue

A 30-unit 4-storey building is proposed for this site. Given the low number of units and the distance from the site, it is not anticipated to have any effect on the study road network.

4 – 100 Bayshore Drive

Ivanhoe Cambridge is proposing the construction of two towers consisting of a 27- and 30-storey residential buildings with 234 residential units and 266 residential units respectively. A TIA prepared by IBI Group projects

approximately 50 new two-way trips for the AM and PM peaks. Given the close proximity to Highway 417/416 and major arterials, it is not anticipated that any vehicles will be added to our immediate study area.

5 – 1300 McWaters Road

Proposed 25-storey 235-unit residential development. The TIA by GHD Limited projects 36 two-way trips in the AM peak and 37 two-way trips in the PM peak. Of these trips, less than 20 new trips two-way per peak hour are anticipated to use Pinecrest Road within our study area intersections. These volumes will be layered on to future background conditions.

6 – 817 Roseview Avenue

Proposed 20-unit residential development. Given the low number of units count and the fact that it will replace existing units, a negligible increase in traffic is forecasted.

7 – 3055 Richmond Road

Proposed 16-unit residential development. Given the low number of units count and the fact that it will replace existing units, a negligible increase in traffic is forecasted.

2.2. Study Area and Time Periods

Full buildout of the proposed residential development is planned by 2025. As such, the horizon years being analyzed in this report are the 2025 and 2030 (five years after full buildout) horizon years, using the weekday morning and afternoon peak hour time periods.

Proposed study area intersections and boundary roads are outlined below and highlighted in **Figure 13**.

- Dumaurier/Pinecrest intersection;
- Queensview/Pinecrest intersection;
- Hwy 417/Pinecrest intersection;
- Iris/Greenbank intersection;
- Site Access/Dumaurier intersection; and,
- Along Dumaurier Ave adjacent to the site.

Figure 13: Study Area Boundaries and Intersections

2.3. Exemption Review

The following modules/elements of the TIA process recommended to be exempt in the subsequent steps of the TIA process, based on the City's TIA guidelines and the subject site:

Table 2: Exemptions Review Summary

Module	Element	Exemption Consideration
4.1 Development Design	4.1.3 New Streets Networks	Only required for plans of subdivision
4.2 Parking	4.2.2. Spillover	Parking is expected to meet By-Law requirements, will be confirmed in **Section 4.2.1.**

3. Forecasting Report

3.1. Development Generated Travel Demand

3.1.1. TRIP GENERATION AND MODE SHARES

As part of the proposed development, a fragment of the existing shopping strip will be demolished and replaced by the tower. As such, the vehicle trips currently being generated by this portion of the strip mall should be reduced from the site. The strip mall has a total gross floor area of 17,700 ft^2 and the existing portion that will be demolished is approximately 4,900 ft^2 (or approximately 28% of the total GFA). The ITE Trip Generation Manual was used to estimate a rate of how many vehicles currently use the site, as seen in **Table 3**.

Table 3: Existing Land Use

Land Use	Size	Data Source	Trip Rates	
			AM Peak	PM Peak
Shopping Center[1]	15,500 ft^2	ITE 820	T = 0.94(x)	T = 3.81(x)
Note: T = Average Vehicle Trip Ends, x = 1,000 sq. ft commercial *1). Trip rates for Shopping Center are based on an average rate and not the fitted curve due to site size vs average study size*				

Based on the vehicle trip generation rates shown above, the existing trips to and from the portion of the existing shopping center to be demolished can be calculated as seen in **Table 4**.

Table 4: Projected Trips to Reduce

Land Use	'New' Trips	AM Peak (veh/h)			PM Peak (veh/h)		
		In	Out	Total	In	Out	Total
Shopping Center	Auto Trips Generated	10	7	17	32	35	67
	Less Pass-By (-35% PM)	*0*	*0*	*0*	*-11*	*-12*	*-23*
	Total for Whole Shopping Center	10	7	17	21	23	44
	Less 72% of Building to Remain[1]	*-7*	*-5*	*-12*	*-15*	*-17*	*-32*
Total Auto Trips to be Removed		**3**	**2**	**5**	**6**	**6**	**12**
1.) 72% was derived from subtracting totality of the shopping center (100%) by the portion to be demolished (28%)							

Based on the very low number of vehicles projected to be removed from the site and the even smaller number of vehicles anticipated to be added from the 3,230 ft^2 of commercial space, they were assumed to cancel out.

Trip generation rates for the 422 residential units were obtained from the City's 2020 TRANS Trip Generation Manual Report for residential uses. These rates have been summarized in **Table 5**.

Table 5: 2020 TRANS Residential Trip Generation Rates

Land Use	Data Source	Size	Trip Rates	
			AM Peak	PM Peak
High-Rise Apartments	TRANS 2020	422 units	T = 0.80(du)	T = 0.90(du)
Note: T = Average Vehicle Trip Ends; du = dwelling units				

The total number of person trips generated by the development during the morning and afternoon peak periods can be found in **Table 6**.

Table 6: Residential Unit Peak Period Person Trip Generation

Land Use	Dwelling Units	AM Peak Period Person Trips	PM Peak Period Person Trips
Residential Building	422	338	380

The projected site peak period person trips were then divided based on the mode shares for Bayshore/Cedarview according to TRANS 2020 table 5, as summarized in **Table 7**.

Table 7: Residential Peak Period Trips using TRANS 2020 Mode Shares

Travel Mode	AM Peak Period		PM Peak Period	
	Mode Share	Person Trip	Mode Share	Person Trips
Auto Driver	40%	134	40%	152
Auto Passenger	12%	42	15%	57
Transit	38%	130	33%	123
Cycling	2%	5	1%	4
Walking	8%	27	11%	43
Total Person Trips	100%	338	100%	380

Standard traffic analysis is usually conducted using the morning and afternoon peak hour trips as they represent a worst-case scenario. The 2020 TRANS Manual uses peak periods which can exceed the peak hours. Table 4 within the 2020 TRANS Manual includes factors for converting peak periods into peak hour traffic volumes as seen in **Table 8**. Note that conversion factors for passenger trips are assumed to be the same as auto driver.

Table 8: Peak Period to Peak Hour Conversion Factor (2020 TRANS Manual)

Travel Mode	Peak Period to Peak Hour Conversion Factors	
	AM	PM
Auto Driver	0.48	0.44
Passenger	0.48	0.44
Transit	0.55	0.47
Bike	0.58	0.48
Walk	0.58	0.52

Using the peak period to peak hour conversion rates from **Table 8**, the derived peak period trips by mode shares from **Table 7**, and the inbound and outbound splits from table 9 within the TRANS 2020 Manual, then the residential peak hour trips generated by the site for TRANS 2020 Bayshore/Cedarview mode share can be calculated, as seen summarized in **Table 9**.

Table 9: Peak Hour Trips Generated using TRANS 2020 Mode Shares

Travel Mode	Mode Share	AM Peak (Person Trips/h)			Mode Share	PM Peak (Person Trips/h)		
		In	Out	Total		In	Out	Total
Auto Driver	40%	20	44	64	40%	39	28	67
Auto Passenger	12%	6	14	20	15%	14	10	25
Transit	38%	22	49	71	33%	34	24	58
Cycling	2%	1	2	3	1%	1	1	2
Walking	8%	5	11	16	11%	13	9	23
Total Person Trips	**100%**	**54**	**120**	**174**	**100%**	**101**	**73**	**174**
Total 'New' Residential Auto Trips		**20**	**44**	**64**	-	**39**	**28**	**67**

As shown in **Table 9**, based on the 2020 TRANS Trip Generation Manual, the proposed site is projected to generate approximately 65 new auto-trips per hour during the weekday commuter peak hours if the proposed residential buildings comprised of 422 units was constructed. The increase in two-way transit trips is estimated to be approximately 70 to 60 persons per hour, and the increase in walk/bike trips is approximately 20 to 25 persons per hour.

Mode Share Assumptions

The TRANS OD Mode share for Bayshore/Cedarview includes a large portion of homes located far from rapid transit and thus, the mode shares reflected in **Table 9** show a large percentage of drivers and low percentage of transit/active users. This development is within 300 meters from the Pineview Rapid Transit Station and is therefore considered a Transit Oriented Development (TOD). The mode share assumptions for the proposed development were adjusted to reflect TOD mode shares with lower auto-driver mode share, and higher transit mode share targets for residential uses compared to the TRANS model mode share assumptions as shown in **Table 10**.

Table 10: Residential Mode Share Comparison – TRANS and Target Mode Share

Travel Mode	TRANS Residential Mode Shares		Target Residential Mode Share (AM & PM)	Target Rationale
	AM	PM		
Auto Driver	40%	40%	15%	This is consistent with TOD targets.
Auto Passenger	12%	15%	5%	
Transit	38%	33%	65%	Development is located within 300m walk of a future LRT station and is within 300m of existing BRT Transitway Corridor, making it a Transit-Oriented Development (TOD) which have transit targets of 65%.
Cycling	2%	1%	5%	This is consistent with TOD targets.
Walking	8%	11%	10%	

Using the adjusted mode shares as shown in **Table 10** and the same number of person trips generated (but taking different modes of transportation compared to TRANS 2020), then the target mode share trip generation can be derived as summarized in **Table 11**.

Table 11: Residential Peak Hour Trips Generated using Target Mode Shares

Travel Mode	Mode Share	AM Peak (Person Trips/h)			Mode Share	PM Peak (Person Trips/h)		
		In	Out	Total		In	Out	Total
Auto Driver	15%	8	18	26	15%	15	11	26
Auto Passenger	5%	3	6	9	5%	5	4	9
Transit	65%	35	78	113	65%	66	48	113
Cycling	5%	3	6	9	5%	5	4	9
Walking	10%	5	12	17	10%	10	7	17
Total Person Trips	**100%**	**54**	**120**	**174**	**100%**	**101**	**73**	**174**
Total 'New' Residential Auto Trips		**8**	**18**	**26**	**-**	**15**	**11**	**26**

As shown in **Table 11**, the development is expected to generate approximately 175 morning and afternoon peak hour total person trips.

Roughly 25 new vehicle trips are expected in the peak hours, with approximately 115 new transit trips and approximately 30 new active mode trips.

3.1.2. TRIP DISTRIBUTION

Based on the OD Mode Share Survey, existing traffic volume counts and the location of adjacent arterial roadways and neighborhoods, the distribution of site-generated traffic volumes is as follows:

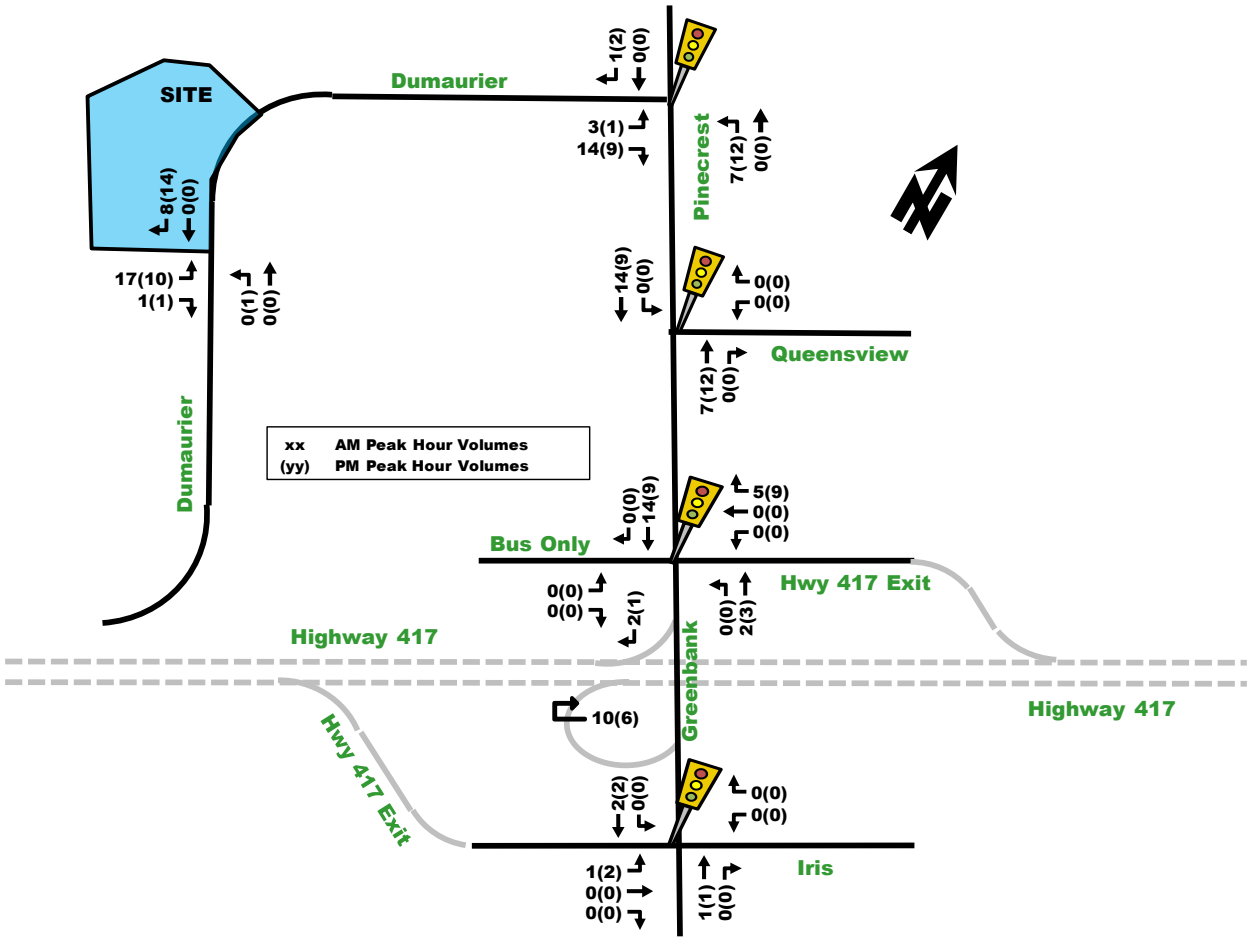
- (From/To) the North: 5%;
- (From/To) the East: 65%;
- (From/To) the South: 15%; and,
- (From/To) the West: 15%.

3.1.3. TRIP ASSIGNMENT

A full movement driveway onto Dumaurier Avenue has been proposed. The latest site plan suggests that the existing driveway on the north end of the strip mall will be relocated approximately 30 meters south of its existing

location. The new driveway will be approximately 90 meters north of the intersection of Dumaurier/Ramsey and its nearest neighboring driveway will be approximately 25 meters south which provides access to the strip mall. The 'new' site-generated vehicle trips outlined in **Table 11** were assigned to the study area network and are illustrated as **Figure 14**.

Figure 14: 'New' Site-Generated Traffic



3.2. Background Network Travel Demands

3.2.1. TRANSPORTATION NETWORK PLANS

Refer to section 2.1.3 Planned Conditions – Planned Study Area Transportation Network Changes.

3.2.2. BACKGROUND GROWTH

The background traffic growth through the immediate study area, summarized in **Table 12,** was calculated based on historical traffic count data (2011, 2015-April, 2015-July and 2019) provided by the City of Ottawa at the Iris/Greenbank intersection. Detailed analysis of the background growth is included in **Appendix D**.

Table 12: Iris/Greenbank Historical Background Growth (2011 – 2019)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	-2.04%	-1.89%	-1.43%	0.27%	**-1.59%**
AM Peak	-1.18%	-1.50%	1.52%	0.61%	**-0.63%**
PM Peak	-2.19%	-2.73%	-3.67%	0.47%	**-2.23%**

As shown in **Table 12,** Iris/Greenbank has generally experienced negative annual growth in recent years. Overall, growth was observed on the west leg of the intersection for all 3 time periods, suggesting that there has been gradual increase in traffic coming from Hwy 417 to the west, but a sizeable reduction elsewhere. These findings are consistent with City of Ottawa AM background traffic growth results, showing negative trends along Greenbank near Hwy 417 from 1995-2013 (excerpt provided in **Appendix D**). For the subsequent analysis of future conditions, a conservative 0% annual growth rate will be used, in addition to other area developments-generated traffic will be layered on to future analysis.

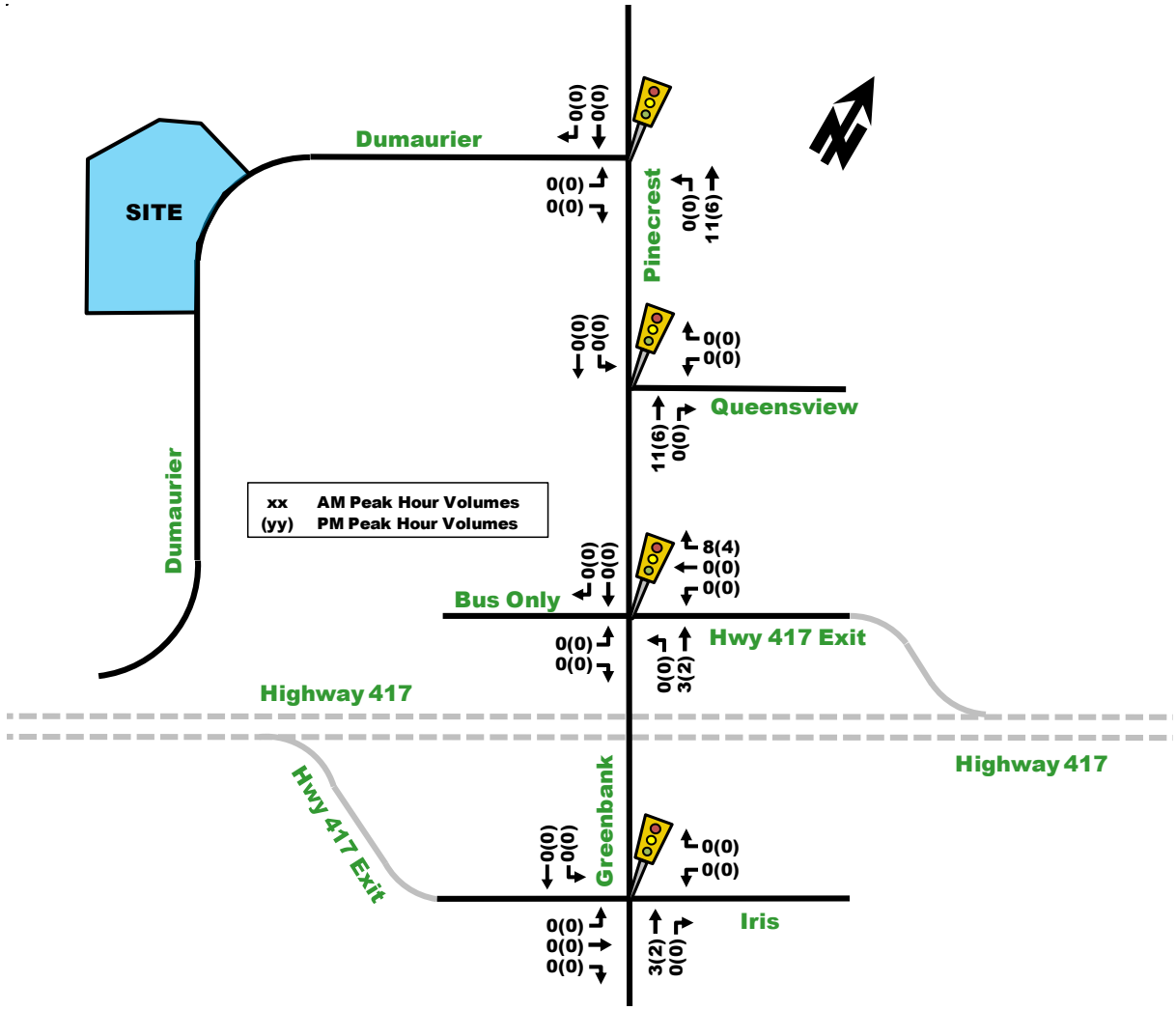
3.2.3. OTHER AREA DEVELOPMENTS

Other area developments were outlined in **Section 2.1.3**. It was determined that only the development at 2720 Richmond and 1300 McWaters would generate vehicle trips within the study area.

2720 Richmond Road

Figure 15 illustrates the projected traffic volumes for 2720 Richmond Road at full buildout, obtained from the TIA Report completed by McIntosh Perry. This school extension was proposed to be complete for the year 2018 according to the TIA, however, it is unclear if it has been built yet or not.

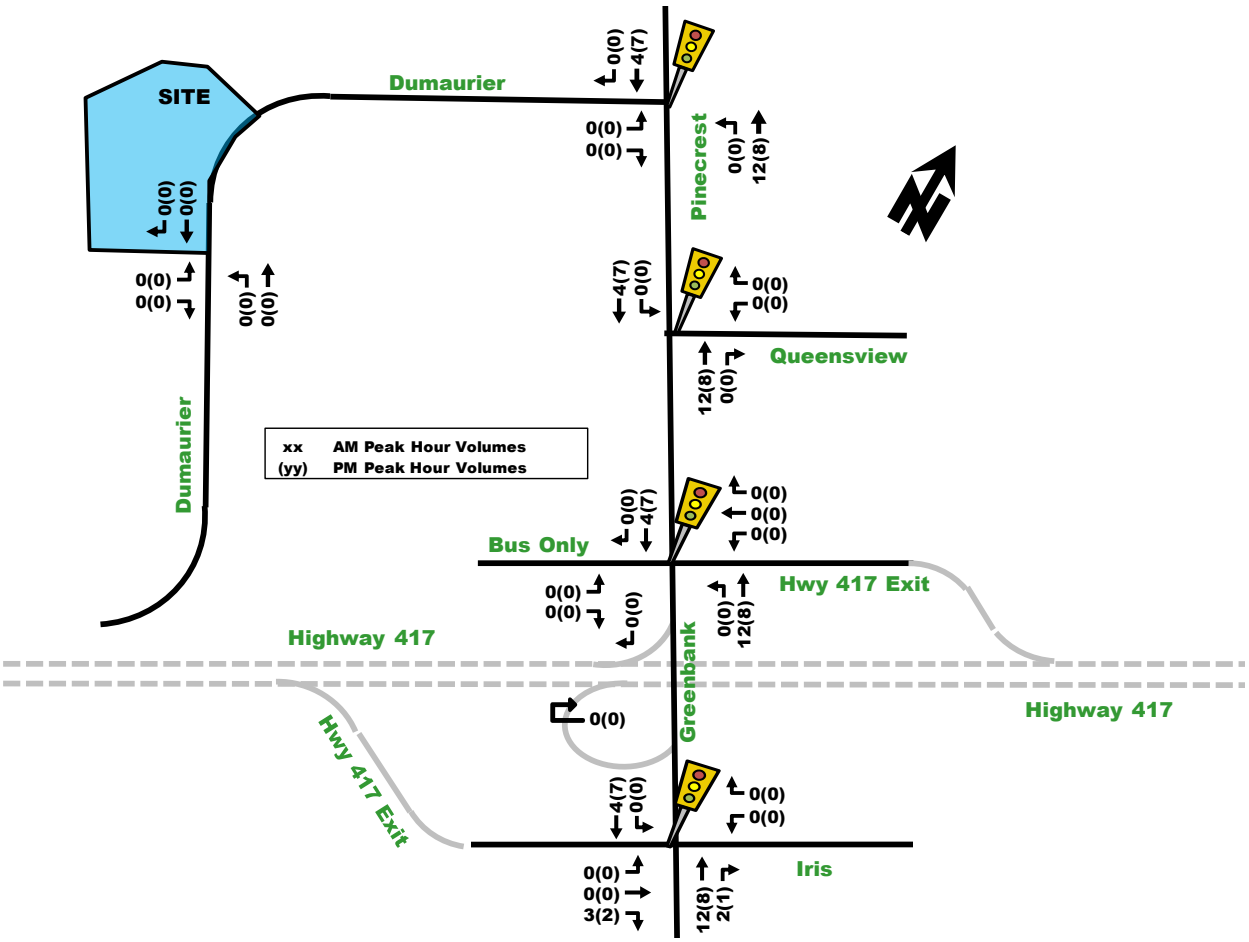
Figure 15: 2720 Richmond Road Projected Traffic Volumes – Full Buildout



1300 McWaters Road

Figure 16 illustrates the projected traffic volumes for 1300 McWaters Road at full buildout, obtained from the TIA Report completed by GHD. This residential development is anticipated to be built by 2024.

Figure 16: 1300 McWatters Road Projected Traffic Volumes – Full Buildout



3.3. Demand Rationalization

The following **Table 13** provides a summary of the existing traffic operations at the study area intersection based on the Synchro (V10) traffic analysis software. The volumes from **Figure 6** were used. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The Synchro model outputs of existing conditions are provided within **Appendix E**.

Table 13: Existing Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Dumaurier/Pinecrest	A(C)	0.48(0.76)	NBT(SBT)	7.9(17.1)	A(B)	0.47(0.70)
Queensview/Pinecrest	A(D)	0.44(0.81)	NBT(SBT)	4.6(12.4)	A(C)	0.43(0.80)
Hwy 417/Pinecrest	B(C)	0.67(0.80)	WBL(SBT)	17.7(21.9)	B(B)	0.63(0.70)
Iris/Greenbank	F(F)	1.31(1.15)	EBL(EBL)	74.7(49.5)	F(C)	1.11(0.80)
Note: Analysis of signalized intersections assumes a PHF of 0.90 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 13, all intersections were shown to operate at an overall LoS 'C' or better with the exception of Iris/Greenbank which was expected to be overcapacity in the AM peak hour. All critical movements operated at a LoS 'D' or better with the exception of Iris/Greenbank in the AM and PM peak hours, including the eastbound left and northbound through movements.

The Synchro analysis confirms that the overall network is expected to operate well, with the exception of the Iris/Greenbank intersection. The convergence of commuter traffic on Greenbank with Hwy 417 EB off-ramp traffic at Iris, which also provides access to the popular Ikea retail complex, creates significant congestion in the morning peak hour. However, the intersection as constructed is near its maximum buildout and to further increase capacity would require significant investment. This approach would not be cost-effective in this context. Modifications to signal timings alone may be sufficient to address the operational constraints.

However, the City's TMP does have a long-term plan to reduce auto-usage, which includes the Stage 2 LRT expansion that is currently under construction. These and other transit and active transportation initiatives will have a City-wide effect, gradually improving long-term operational performance.

The proposed development is expected to have negligible impact on this intersection given the anticipated low auto usage during the peak hours from being located in close proximity to the future Pinecrest LRT station.

4. Strategy Report

4.1. Development Design

4.1.1. DESIGN FOR SUSTAINABLE MODES

Location of Transit Facilities

As shown in Figure 9, connectivity enhancements to the future Pinecrest LRT Station, including improvements to active travel and transit connections are proposed. The existing BRT station at Pinecrest which will be converted to an LRT station is proposed to be shifted approximately 100 meters south and will operate below ground level through a trench. At surface level, a local bus transfer loop will be built.

The subject site is located approximately 300m walking distance to the future Pinecrest LRT Station via a new station entrance plaza with a multi-use pathway to Dumaurier Avenue and Pinecrest Road.

Pedestrian/Cycling Routes and Facilities

The proposed building will have direct pedestrian and cycling access to Dumaurier Avenue. As of recent, Dumaurier Avenue has sidewalk facilities on both sides of the road. Within the connectivity enhancement study, a pedestrian crossover on Dumaurier Avenue is planned, along with a proposed multi-use pathway from Dumaurier Avenue to Pinecrest Road north of the bus loop and a multi-use pathway from Pinecrest bridge directly to the LRT station. A by-directional cycle track along the west side of Pinecrest Road from the station entrance north to Queensview Drive is planned and a by-directional cycle track along the west side of Pinecrest Highway 417 Bridge from the LRT Station to Morrison Drive is considered subject to MTO approval.

The intersections of Queensview/Pinecrest and Hwy 417/Pinecrest will be realigned to improve pedestrian and cycling infrastructure, including pavement marking and curb treatments. Appendix F illustrates the proposed geometric and intersection treatments.

Bicycle Parking

Bicycle parking exceeds the minimum City By-Law requirements as discussed in Section 4.2. The majority of bicycle parking, 304 stalls, will be provided below grade within the parking garage, located indoors in a secure, well-lit area located. An additional 6 spaces will be located outdoors at ground level.

4.1.2. CIRCULATION AND ACCESS

The proposed development driveway will provide two-way vehicular access protected by curbs on both sides to prevent vehicles crossing from the existing strip mall to access this new access, eliminating a conflict point. The driveway will be 6.7m wide, which adheres to City By-Law requirements.

Access to the visitor parking and the underground parking garage is provided on the west side of the lot, along the west side of the proposed laneway. The laneway going to the underground parking garage also connects to the laneway at the rear of the existing strip mall to the south.

The ramp slope to the underground parking garage has been shifted from the previous Site Plan and now occurs on a straightaway alignment rather than the bend, which is generally preferred.

A heated, textured ramp with a grade of 10% to 17% transition is proposed to access the underground parking garage. The relocated ramp triggered the relocation of the garbage loading area. The latest proposed location is at the southwestern corner of the site. Truck turning templates were prepared and confirmed there is adequate space for garbage truck operations to occur. The truck turning templates have been provided in **Appendix I.**

No other major circulation changes for vehicles, pedestrians or cyclists have been noted.

4.1.3. NEW STREETS NETWORK

Exempt. See **Table 2**.

4.2. Parking

4.2.1. PARKING SUPPLY

According to the City of Ottawa Zoning By-Law, the proposed development is located in Area C in Schedule 1 and Area C in Schedule 1A, however, it is within 600m walk to Pinecrest Rapid Transit Station within Schedule 2A. The entirety of residential parking is proposed underground. **Table 14** summarizes the vehicle parking minimum and maximums allowed within the parking by-law.

Table 15 summarizes the bicycle parking requirements as per City of Ottawa Zoning By-Law-Part 4, sections 100-114.

Table 14: Vehicle Parking Space Supply

Land Use		Rate per Unit		Required Vehicle Spaces				Proposed Spaces
		Base	Visitor	Base	Visitors	Min	Max[3]	
Residential Tower	422 units	0.5 per unit[1]	0.1 per unit[2]	185	30	219	754	204 (174 Res/ 30 Vis/com)
Commercial	300 m²	-	1.25 per 100 m²	-	4			
1) no off-street motor vehicle parking is required for the first 12 dwelling units; Claus 6(c)ii states that where all parking spaces provided for a permitted land use located below grade in the same building as the land use, additional 20 parking spaces may be reduced. 2) visitor at a rate of 0.1 with a maximum of 30 spaces per building 3) maximum parking allowed is at a rate of 1.75 parking stalls per unit (combined base and visitor) plus 5.0 per 100 m² of commercial								

Table 15: Bicycle Parking Requirements

Land Use		Rate	Required Bicycle Spaces	Proposed Spaces
			Required	
Residential Tower	422 units	0.5 per unit	211	310
Commercial	300 m²	1 per 250 m²	1	

The proposed number of base residential vehicle parking spaces is below the recommended City By-law requirements by less than 10%. The site will provide 174 parking spaces for residents that will be located within a 2-storey underground parking structure and the remaining 30 blended commercial and visitor parking stalls will be split with 6 on ground level and 24 below grade parking spaces. An additional visitor drop-offs space has been proposed on the south side of the tower.

Regarding bicycle parking, the development will provide approximately 50% more than the minimum by-law for bike parking requires, offsetting the slightly below vehicle parking proposed. Of the 310 proposed bike parking spaces, 304 of them will be located within the parking garage, near the main elevators and with access to the main lobby at ground floor. Bike parking will be provided in a secure, well-lit parking area. An additional 6 bike parking spots are proposed outdoors at ground level for visitors.

4.2.2. SPILLOVER PARKING

Though the residential parking spaces proposed are slightly below the minimum by-law, it is important to note the context of the development, located within 300 meters of rapid LRT transit facilities. The upcoming Transportation Master Plan (TMP) suggests that buildings located near rapid transit stations and TOD areas could be completely exempt minimum parking requirements. Additionally, exceeding the bike parking minimums and being located so close to rapid LRT transit, this development makes it convenient for tenants to use active mode shares over driving. As such, the slightly below parking spaces proposed for vehicles compared to the existing by-law requirement is acceptable.

Although the by-law suggests a minimum of 30 visitor car parking spaces and 4 commercial spaces be provided, a total of 30 blended commercial and visitor parking spaces are proposed which was considered suitable for both uses considering the location in proximity to LRT and the ancillary nature of proposed commercial uses. The primary customer catchment area for the commercial uses will be local residents and surrounding community, who would walk to this destination. Within the TDM checklist, a blended visitor and commercial rate is recommended, as the times of usage normally differ, with commercial activity normally happening during business hours and the visitor parking normally in the afternoon or overnight hours.

In the unlikely event of spillover parking, there is on-street parking available on Dumaurier Street fronting the site, which does not have any on-street parking restrictions.

The proposed bike parking supply exceeds the minimum City By-Law requirements in order to encourage sustainable travel modes.

4.3. Boundary Street Design

4.3.1. EXISTING CONDITIONS

The boundary street for the development is Dumaurier Avenue. There are no anticipated roadway or active facility changes for Dumaurier Avenue fronting the site. Pedestrian improvements are proposed on the segments between Dumaurier Avenue and the LRT Station and Pinecrest and the LRT Station. The existing and future roadway geometries consist of the following features:

- *Dumaurier Avenue:*
    - 1 vehicle travel lane in each direction;
    - 1.8m sidewalk on northwest side with 0.5 to 2m boulevard, 1.8m sidewalk on southeast side of roadway with no boulevard;
    - Less than 3,000 vehicles per day;
    - Assumed unposted speed 50km/h (used 60km/h) with parking on northwest side of road;
    - Classified as collector roadway;
    - Not a bike route, but proposed local route in future; and,
    - Not identified as a Truck Route.

The proposed site is located within 600m of a rapid bus station/future LRT station at Pinecrest. Multi-modal Level of Service analysis for the subject road segments adjacent to the site is summarized in **Table 16** with detail analysis provided in **Appendix G**.

Table 16: MMLOS – Boundary Street Segment Existing

Road Segment	Level of Service							
	Pedestrian		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Dumaurier Avenue Northwest side between Ramsey Crescent and Watson Street	B	A	F	D	D	D	-	N/A
Dumaurier Avenue Southeast side between Ramsey Crescent and Watson Street	C	A	F	D	D	D	-	N/A

Pedestrian

- ***Dumaurier Avenue*** does not meet pedestrian PLoS on either side of the road due to the widths of the boulevard separation and sidewalk being less than 2 meters wide each on both sides of the road.

Bicycle

- ***Dumaurier Avenue*** does not meet the BLoS targets at the posted speed limit +10km/h. If a speed test confirmed the driving speed as 50km/h, the bike BLoS target would improve to BLoS 'D' and would meet the minimum desired target for existing conditions. However, in the future, Dumaurier Avenue is planned as a local route which would increase the desirable target to BLoS 'B', in which case, a reduction in road speeds and confirmed speed limit of 40km/h would be required to meet the desired minimum target of 'B'.

Transit

- ***Dumaurier Avenue*** meets transit TLoS targets.

Truck

- ***Dumaurier Avenue*** is not a truck route.

4.4. Access Intersection Design

4.4.1. LOCATION AND DESIGN OF ACCESS

The proposed vehicular access to the site relies on a single two-way driveway off Dumaurier Avenue. The driveway will be located on the southern-most edge of the site, bordering the neighboring lot. As part of this development, the northern access for the existing shopping strip mall will be relocated further south. The new site driveway will be located approximately 25m north of the adjacent driveway to the south, which services the existing strip mall. This separation distance adheres to the private approach by-law (No. 2003-447) Section 24(g), which suggests a minimum of 9m separation to the nearest approach.

Furthermore, the nearest intersecting street is Ramsey Crescent, which is located approximately 85m south of the site access. This distance adheres to the By-law (No. 2003-447) Section 24(m)(ii), which suggests a separation between the site access and nearest intersection of 60m for a site with 200 to 299 parking spaces.

The proposed driveway is located within the horizontal curve on Dumaurier Avenue, but sufficient sightlines are available in both directions. There are no vertical sight line concerns.

4.4.2. INTERSECTION CONTROL

A traffic signal warrant and an all-way stop control warrant was completed at Site Access/Dumaurier and neither were warranted due to the very low traffic volumes. All warrant analysis has been provided in **Appendix H**.

The proposed stop control on the side street was acceptable. The access driveway is proposed as a full-movement intersection.

4.4.3. INTERSECTION DESIGN

The proposed driveway will provide two-way vehicular access protected by curbs on both sides to prevent vehicular access for the existing strip mall users to the south. There is approximately 35m throat length that meets the 25m minimum By-law requirement off a collector roadway.

The internal lane then splits to provide access to parking onsite to the north and the rear of the adjacent strip mall to the south. The slope of the driveway does not exceed 2% gradient within the first 6 meters from Dumaurier Avenue.

Auxiliary turn lanes were not warranted at the access driveway based on queue lengths from Synchro (V10).

Garbage trucks will enter the site via the site access off Dumaurier Avenue to access the loading area at the south-western corner of the property. The trucks are expected to reverse and exit the site via the drive aisle behind the existing strip mall. A reverse maneuver with garbage trucks coming from the south aisle and leaving the site via the Dumaurier Avenue access is also possible without conflicts. The truck turning templates have been provided in **Appendix I**.

4.5. Transportation Demand Management

4.5.1. CONTEXT FOR TDM

Based on the type of development, it is assumed that most trips generated by the proposed site will be residents leaving the site in the AM peak to go to work and returning from work to the proposed site in the PM peak. Sections 3.1.1 and 3.1.2 describe how many trips are anticipated per travel mode and anticipates the likely locations that they will travel to and from based on the OD-Survey 2011 for Ottawa. The site is located in a Transit-Oriented Development (TOD) zone according to the Official Plan.

4.5.2. NEED AND OPPORTUNITY

Developments located in a Transit-Oriented Development (TOD) zone such as the proposed site are expected to utilize measures to provide sustainable active mode shares. Such measures are described in more detail in Section 4.5.3 below, but can include reduced parking (as discussed **Section 4.2**), more aggressive Multi-Modal Levels of Service (MMLOS) as described in **Section 4.3** and **4.9** and safe and efficient connectivity to public transit as described in **Section 4.7**, to name a few.

4.5.3. TDM PROGRAM

The TDM infrastructure and measures checklist has been provided in **Appendix J**. Some of the TDM measures proposed, but not definite (proponent still investigating some measures) include:

- Offer Presto cards pre-loaded for a free monthly transit pass to new tenants
- Exceeding minimum bike parking by approximately 50% more than required
- Proponent investigating potential for on-site bikeshare program
- Proponent investigating potential for on-site carshare program
- Unbundled car parking spot from monthly rent
- Personalized trip planning to new residents
- A drop off/pick up space has been proposed on the south side of the tower
- Easy and direct connection to Pinecrest LRT Station via sidewalks and a MUP

4.6. Neighborhood Traffic Management

4.6.1. ADJACENT NEIGHBORHOODS

The future projected 2030 two-way traffic volumes along Dumaurier Avenue are anticipated to be approximately 270 to 390 vehicles during the AM and PM peak hours respectively, which is consistent with a collector road. Collector roadways have a two-way capacity threshold between 300 to 600 vehicles per hour (with the upper limit of this range being more aligned with major collectors), based on City of Ottawa TIA Guidelines. Given that this development will add approximately 25 'new' vehicle trips two-way per peak hour, it is not anticipated that this development will affect the roadway classification for Dumaurier Avenue.

4.7. Transit

4.7.1. ROUTE CAPACITY

It is projected that approximately 115 'new' two-way transit passenger trips per hour will be generated for the AM and PM peak hours. Considering the envisioned LRT West extension line is projected to begin operation in 2024 and assuming a similar capacity to that of the Confederation Line (OC Transpo site suggests 600 passengers per train and 12 trains per hour during peak), it is anticipated that the future transit network will have sufficient capacity to accommodate the subject development transit demand. Additionally, added capacity is available on local bus routes departing at surface level of Pinecrest Station, on Dumaurier Avenue and Richmond Road.

4.7.2. TRANSIT PRIORITY

Since the Confederation LRT Line is grade separated, the development's driveways will not impact transit travel times. On average, the LRT stations are approximately 90m long, providing enough station distance to efficiently load and off-load the passengers without creating delays.

4.8. Review of Network Concept

The proposed site is currently zoned as GM[62] F(0.25) which allow buildings up to 6-storeys or 18 meters high. The residential tower is proposed to be 40-storeys high or 126 meters tall which is 34-storeys or 108 meters above permissible zoning. However, the City of Ottawa New Official Plan encompasses a goal for intensification within Section 3.2 of their report, particularly near rapid transit corridors such as this development. Within their intensification goal, the City has upped the definition of a standard 'high-rise building' to 41-storeys, which is within the proposed height of this development.

Furthermore, as shown in Section 3.1 of this report, the total person trips for the entirety of the building, including that proposed within and above the permissible existing zoning is 174 people trips per peak hour, which is lower than 200 people trips above permissible zoning as defined the trigger quantity of trips above zoning by the Tia Guidelines.

Given the two clauses above, the remainder of this step can be exempt.

4.9. Intersection Design

4.9.1. INTERSECTION CONTROL

See Section 4.4.2.

4.9.2. INTERSECTION DESIGN

Multi-Modal Level of Service

As stated in the MMLOS Guidelines, only signalized intersections are considered for the intersection Level of Service measures. The Dumaurier/Pinecrest, Queensview/Pinecrest, Hwy 417/Pinecrest and Iris/Greenbank intersections are signalized intersections within the study area. The MMLOS analysis is summarized in **Table 17**, with detailed analyses provided in **Appendix K**.

Table 17: MMLOS – Existing and Future Intersections

Intersection	Level of Service							
	Pedestrian		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Existing								
Dumaurier/Pinecrest	E	A	E	D	C	D	n/a	D
Queensview/Pinecrest	F	A	E	D	B	D	n/a	n/a
Hwy 417/Pinecrest	F	A	D	D	F	D	B	D
Iris/Greenbank	F	A	F	D	F	D	A	D
Future (if different from existing)								
Queensview/Pinecrest	E	A	C	C	B	D	n/a	n/a
Hwy 417/Pinecrest	E	A	C	C	F	D	B	D

Pedestrian

- No intersection met the pedestrian minimum desirable target of PLoS 'A'. All intersections had a PLoS of 'E' or worse predominantly based on the number of lanes that would need to be crossed for pedestrians crossing Pinecrest Road or Greenbank Road (on average 6 lanes). No mitigation would lower the PLoS to a level close to the desired MMLOS target without significantly reducing the vehicle capacity or without adding grade separated crossings at an expensive price-tag
- Future conditions on Queensview and Hwy 417 with Pinecrest will see a slight improvement but due to the number of lanes required to cross, the target PLoS is not met

Bicycle

- Only Hwy 417/Pinecrest met the BLoS target as bikes were assumed to only pass through the intersection without any turning movements (as the east leg is a highway off-ramp and the west leg is a bus only lane). Bicycle facilities and 2-stage left-turn boxes would improve cycling BLoS
- Future conditions on Queensview and Hwy 417 with Pinecrest will improve BLoS to achieve target goals with the addition of a bi-directional cycle track on the west side of Pinecrest Road

Transit

- Transit TLoS targets were met at Dumaurier/Pinecrest and Queensview/Pinecrest due to modest intersection delays. Hwy 417/Pinecrest and Iris/Greenbank had certain movements used by buses which surpassed 40 second delays and triggers the TLoS of 'F'. Future conditions anticipated to be similar to existing

Truck

- Truck target level of service was met for Hwy 417/Pinecrest and Iris/Greenbank which have truck routes that turn from one roadway to the other. The other intersections did not have receiving truck routes and trucks were assumed to only travel through. Future conditions anticipated to be similar to existing

Background Conditions

Given that a 0% annual growth on network roads was assumed (based on negative vehicular growth annually as discussed in **Section 3.2.2**) and the limited amount of other area developments, it was assumed that 2025 background volumes will be similar to the 2030 background volumes.

Figure 17 shows the projected background volumes which are anticipated to be the same throughout all study horizon years. The projected operation outputs are displayed in **Table 18**. The detailed Synchro results can be found in **Appendix L**.

Figure 17: Future Background Projected Volumes

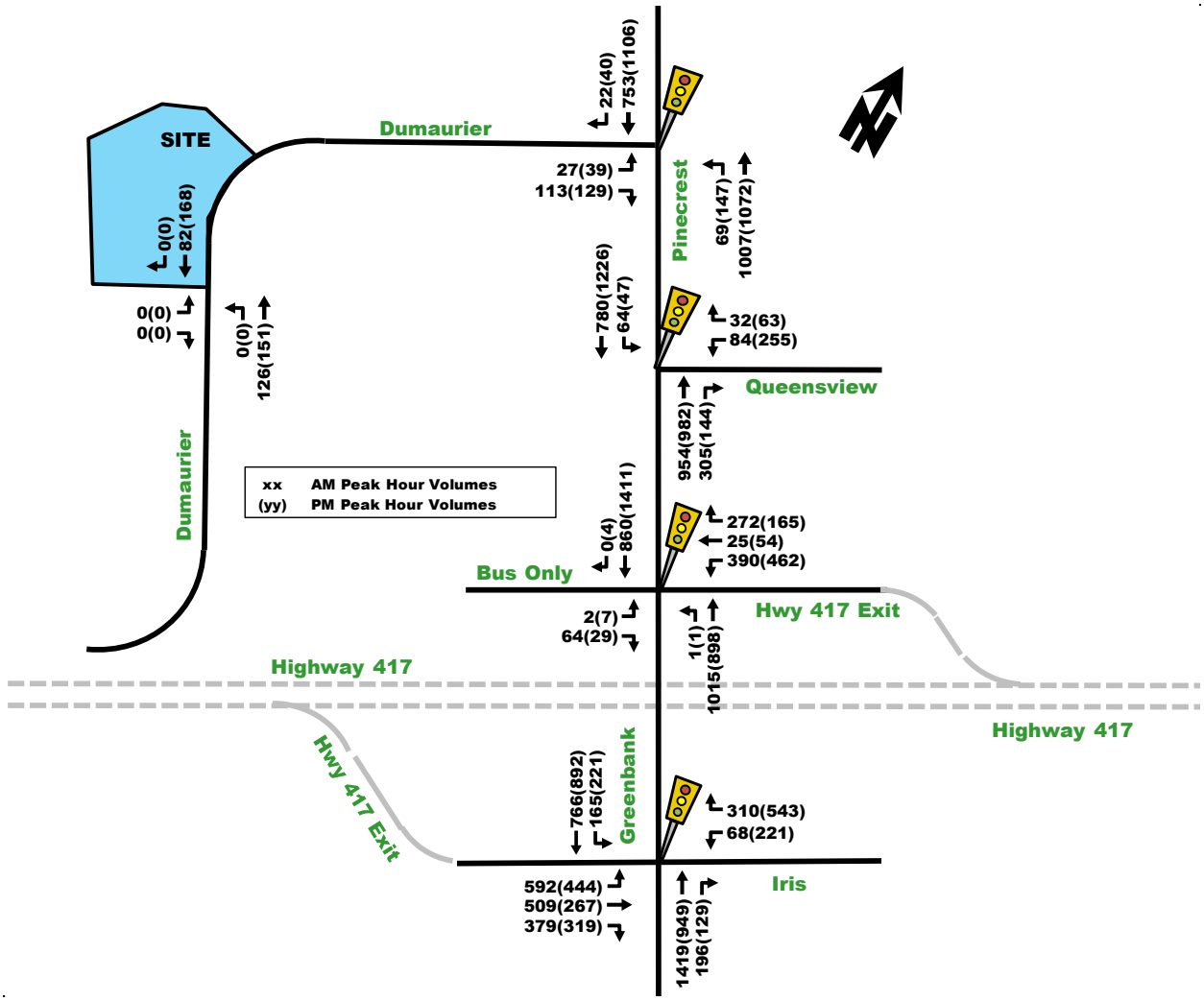


Table 18: Future Background Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Dumaurier/Pinecrest	A(B)	0.44(0.66)	NBT(SBT)	7.6(14.0)	A(B)	0.43(0.61)
Queensview/Pinecrest	A(C)	0.40(0.75)	NBT(WBL)	4.4(10.5)	A(C)	0.39(0.72)
Hwy 417/Pinecrest	B(C)	0.63(0.71)	WBL(SBT)	16.7(19.6)	A(B)	0.57(0.63)
Iris/Greenbank	F(F)	1.18(1.04)	EBL(EBL)	55.7(43.5)	E(B)	0.98(0.70)
Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane.						

As shown in **Table 18**, all intersections operate overall at good LoS 'C' or better with critical movements operating at LoS 'C' or better during the future background volumes, with the exception of Iris/Greenbank which operated overall close to capacity for the AM peak hour and at LoS 'F' for some critical movements in both peak hours. Operations are slightly better than existing intersection performance given that a peak hour factor of 1.00 is used for future operations compared to 0.90 for existing performance, as per the TIA guidelines and minimal background growth.

Future Conditions Post Full-Buildout

Given that a conservative 0% annual growth on network roads was assumed (based on negative vehicular growth annually as discussed in **Section 3.2.2**), the limited amount of other area developments, and that the building will be complete in a single phase, it is assumed that 2025 future projected volumes will be more or less the same as 2030 future projected volumes. The future projected full-buildout volumes up to year 2030 are illustrated in **Figure 18** with projected operation outputs in **Table 19** The detailed Synchro results can be found in **Appendix M**.

Figure 18: Full-Buildout Total Projected Volumes

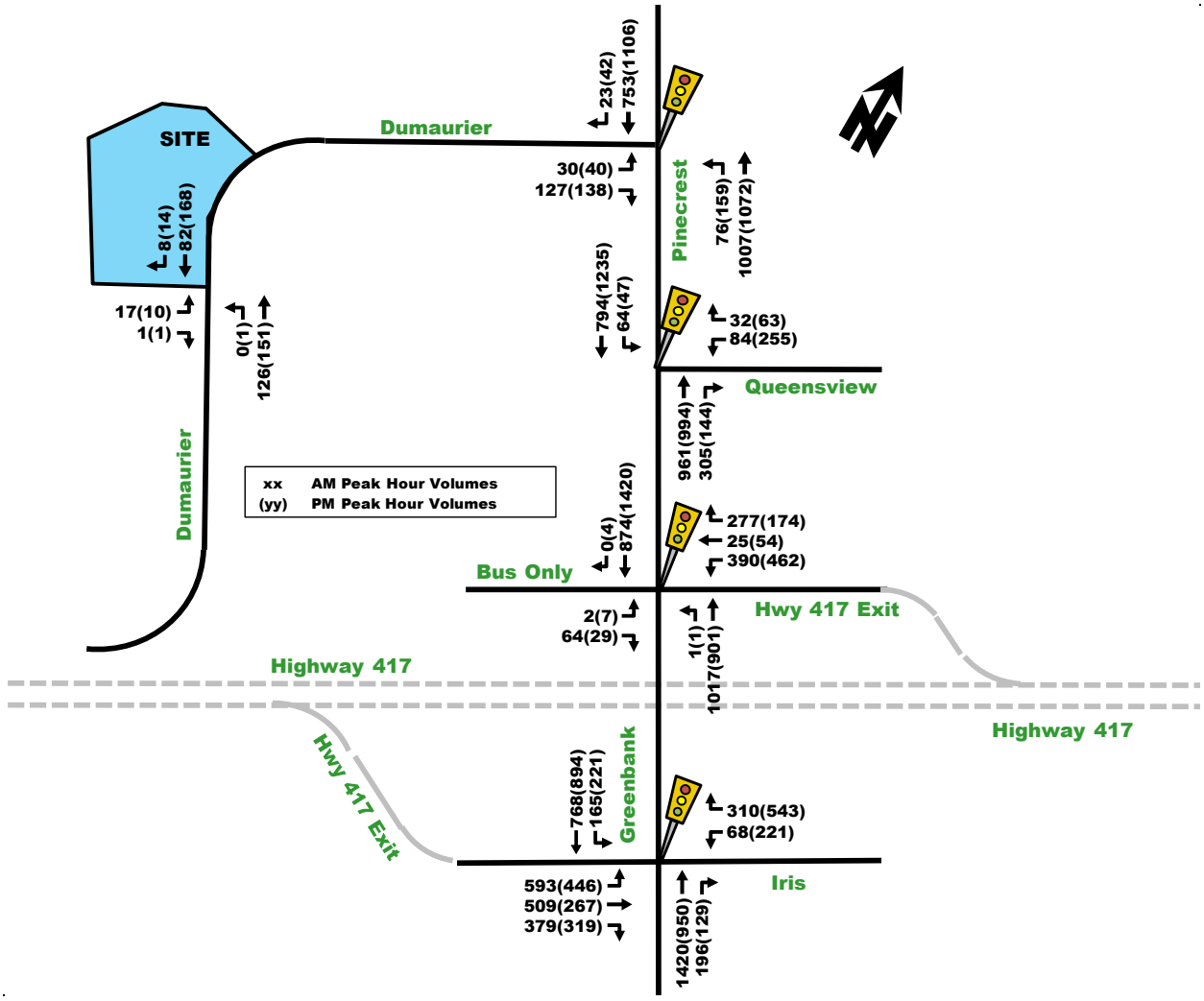


Table 19: Full-Buildout Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Dumaurier/Pinecrest	A(B)	0.49(0.69)	NBT(SBT)	8.9(15.1)	A(B)	0.47(0.63)
Queensview/Pinecrest	A(B)	0.49(0.69)	NBT(WBL)	5.1(8.7)	A(B)	0.46(0.67)
Hwy 417/Pinecrest	A(C)	0.59(0.76)	NBT(SBT)	17.8(22.0)	A(B)	0.57(0.65)
Iris/Greenbank[1]	D(C)	0.90(0.80)	EBT(EBL)	41.5(38.6)	D(B)	0.81(0.65)
Site/Dumaurier (unsig.)	B(B)	12(13)	EB(EB)	1(1)	A(A)	-

Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane. 1.) Iris/Greenbank timing plan was optimized to increase capacity while maintaining the same cycle length.

As seen in **Table 19**, all study area intersections are expected to operate better than existing conditions with minor delays. Note that the timing plan for Iris/Greenbank was optimized to improve performance while maintaining the same cycle length and protected phasing. Other factors that lead to an improved intersection performance includes the use of 1.0 PHF for future instead of 0.90 used for existing, as suggested per TIA guidelines.

Future Conditions if Custom Mode Share not Met

The trips generated based on TRANS Bayshore/Cedarview mode share are shown in **Figure 19** in the event that the TOD mode shares are not met. The projected intersection performance is shown in **Table 20** with detailed output in **Appendix N**.

Figure 19: TOD Mode Share not Met Projected Volumes

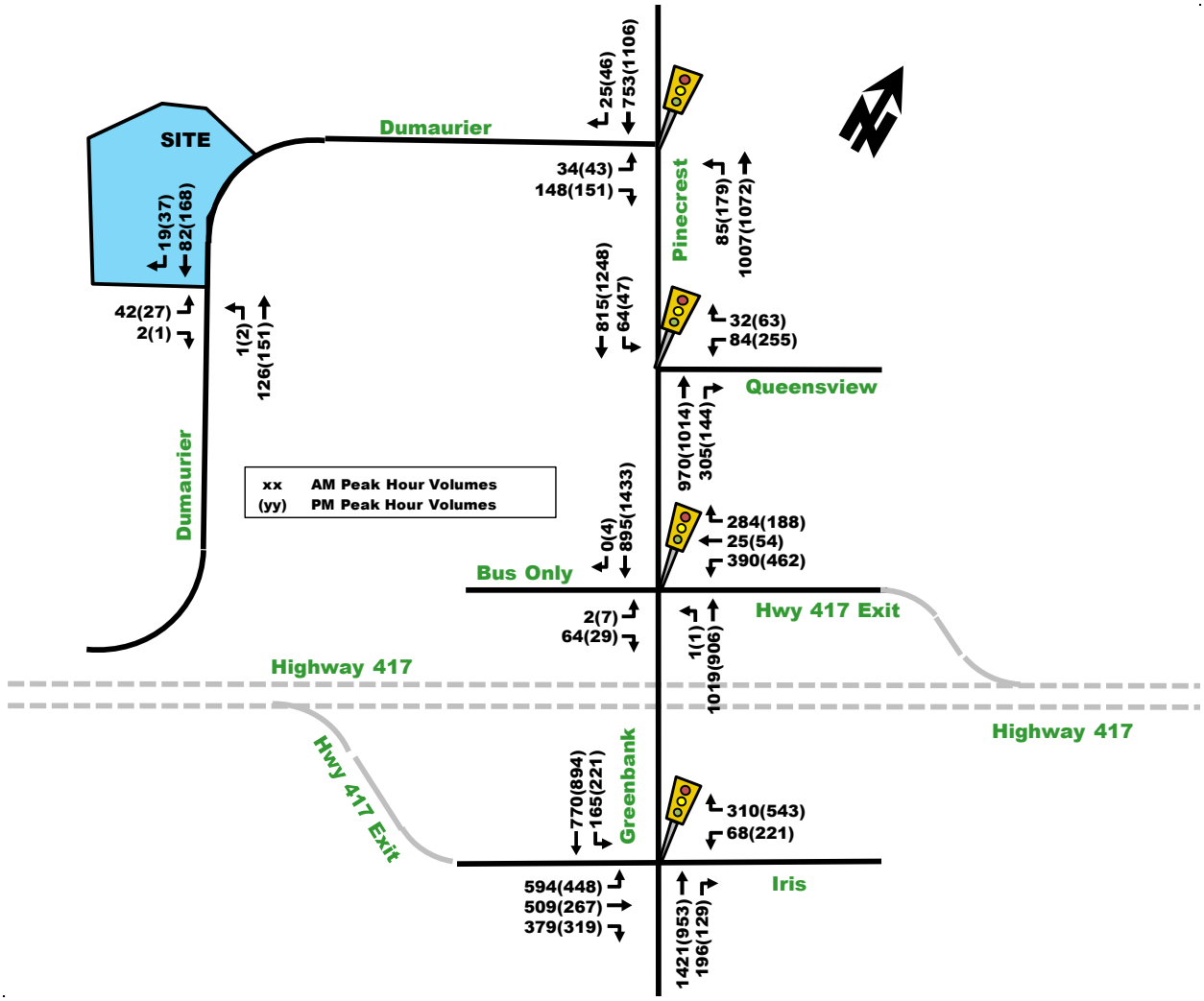


Table 20: Intersection Performance if TOD Mode Shares Not Met

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Dumaurier/Pinecrest	A(B)	0.46(0.69)	NBT(SBT)	8.7(15.2)	A(B)	0.45(0.64)
Queensview/Pinecrest	A(C)	0.42(0.74)	NBT(SBT)	4.8(10.8)	A(C)	0.40(0.74)
Hwy 417/Pinecrest	A(C)	0.58(0.74)	WBL(SBT)	16.8(20.6)	A(B)	0.57(0.64)
Iris/Greenbank1	D(C)	0.90(0.79)	EBT(EBL)	41.5(38.4)	D(B)	0.81(0.64)
Site/Dumaurier (unsig.)	B(B)	12(13)	EB(EB)	2(2)	A(A)	-
Note: Analysis of signalized intersections assumes a PHF of 1.0 and a saturation flow rate of 1800 veh/h/lane. 1.) Iris/Greenbank timing plan was optimized to increase capacity while maintaining the same cycle length.						

As shown in Table 20, the traffic impacts from the proposed development were minimal, even without TOD mode share assumptions met. Therefore, there are no traffic impact concerns to the study area network if TOD mode shares are not met.

5. Findings and Recommendations

Based on the results summarized herein the following findings and recommendations are provided:

Existing Conditions

- Pinecrest BRT Station will be realigned further south as part of the Confederation LRT Line Extension with the addition of Pinecrest LRT Station to be build less than 300m walking distance from the proposed site.
- The site is currently vacant on the north half and occupied by a strip mall on the south. Approximately 1/3 of the strip mall will be replaced by the proposed residential building.
- An existing driveway within the proposed site parcel servicing the strip mall will be relocated further south to the edge of the site.
- Overall, there are no existing safety concerns along the proposed development frontage and study area intersections. Therefore, no mitigation measures were considered.
- Existing intersections operate at good overall LoS 'C' or better with critical movements of 'D' or better during the weekday peak hours with the exception of Iris/Greenbank which operates at capacity for the AM peak and critical movements at capacity for AM and PM peaks.

Proposed Development

- The proposed development will comprise of approximately 422 apartment units and 3,230 ft^2 of commercial space in a 40-storey building.
- The proposed development is projected to generate 'new' vehicle volumes of approximately 25 veh/h two-way total during the weekday morning and afternoon peak hours.
- The proposed development is projected to generate approximately 115 'new' transit trips during the AM and PM peak hour periods, which can be accommodated by the future nearby high-capacity Confederation LRT Line expansion. Additional transit capacity is also available on local bus routes departing Pinecrest Station. Transit demand was modeled as pedestrians travelling between the LRT station and proposed development.
- The minimum residential vehicle parking by-law requirements have not been met by a small margin; however, the New Official Plan suggests guidance to removing the minimum parking requirements for developments near rapid transit such as this one. Various TDM measures have been proposed to leverage the site's proximity to rapid transit. The bike parking minimums were also exceeded to encourage active travel versus vehicle travel. The proposed number of parking stalls has been considered adequate for this development.
- The proposed bike parking supply exceeds the City's minimum requirement.
- A combined 30 visitor and commercial parking spaces has been proposed. Visitor parking requirements did not meet the by-law minimum but was considered sufficient considering the proximity to the Pinecrest LRT Station. Commercial visitor and residential visitor parking demands are also anticipated to occur at different times of the day. The TDM checklists recommend providing a shared visitor parking provision to reduce the cumulative number of parking spaces. In the unlikely event that parking spillover occurs, on-street parking is available along Dumaurier Avenue directly adjacent to the subject site.
- The access to the site proposes a new full movement driveway off Dumaurier Avenue with free-flow operations on Dumaurier Avenue and stop-control on the minor.

Future Conditions

- The proposed development is expected to be a single-phase development with a 2025 buildout year. Due to low background growth, the 2030 (buildout year +5) is expected to operate similarly to 2025 horizon.
- Peak hour traffic volumes from nearby adjacent developments were incorporated into the future traffic volume projections. A background growth rate was not applied given that historical growth within the study area did not support this assumption.
- Future road network conditions performed at an overall LoS 'D' or better and with critical movement of 'D' or better.
- If the TOD mode shares assumptions are not met, all study area intersections were still shown to operate within City standards.
- Pedestrian and cycling facilities are proposed between Dumaurier Avenue and the new Pinecrest LRT Station as part of the Stage 2 LRT project, which is located approximately 300m from the subject site.
- The MMLOS road segment analysis confirmed boundary streets conditions did not meet MMLOS area targets for pedestrians due to lack of wider boulevard separation and wider sidewalks on both sides of Dumaurier Avenue. Bike BLoS targets were not met in existing conditions given that there was no speed test to confirm actual driving speeds. If confirmed at posted speed limit of 50km/h, BLoS targets would be met for existing, but would require a further reduction in driving speeds to 40km/h to meet the BLoS target 'B' for its future local route classification. A physically separated or curbside bike lane with 50km/h would also satisfy the target goal. All other MMLOS targets including transit TLoS and truck TkLoS were met or were not applicable.
- The MMLOS intersection analysis showed that only truck target goals were met at all intersections. Transit TLoS was met in some intersections but not all due to vehicle delays on some movements.
- Due to the number of lanes required to cross on Pinecrest/Greenbank (6 or more for east west), it was not possible to meet pedestrian and cyclist target goals without grade separating the crossing or lane reductions that would greatly impact traffic operations on Pinecrest.
- Overall, all study area intersections were expected to operate within City standards in all future conditions. The Iris/Greenbank intersection will require signal timing modifications to ensure green time is allocated to the movements that are most critical and improve overall intersection operations.

Based on the foregoing findings, the proposed development located at 2829 Dumaurier Avenue is recommended from a transportation perspective.

Prepared By:

Juan Lavin, P.Eng
Transportation Engineer

Reviewed By:

Austin Shih, M.A.Sc., P.Eng.
Senior Transportation Engineer

APPENDIX A

SCREENING FORM & RESPONSE TO CITY COMMENTS

PARSONS

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City of Ottawa 2017 TIA Guidelines

TIA Screening Form

Date	17/11/2020
Project	1922-2829 Dumaurier Ave
Project Number	477580 - 01000

Results of Screening	Yes/No
Development Satisfies the Trip Generation Trigger	Yes
Development Satisfies the Location Trigger	Yes
Development Satisfies the Safety Trigger	Yes

Module 1.1 - Description of Proposed Development	
Municipal Address	1922-2829 Dumaurier Ave
Description of location	West side of Dumaurier Street, between Pinecrest Rd and Ramsey Cr
Land Use	Residential
Development Size	422 residential units
Number of Accesses and Locations	Single access to Dumaurier Ave
Development Phasing	Single phase
Buildout Year	2025
Sketch Plan / Site Plan	See attached

Module 1.2 - Trip Generation Trigger		
Land Use Type	Townhomes or Apartments	
Development Size	422	Units
Trip Generation Trigger Met?	Yes	

Module 1.3 - Location Triggers		
Development Proposes a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit, or Spine Bicycle Networks (See Sheet 3)	Yes	Located within 600m of future Pincrest LRT Station. Suggested local cycling route in ultimate cycling plan
Development is in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone. (See Sheet 3)	Yes	TOD with future Pinecrest LRT Station within 600m
Location Trigger Met?	Yes	

Module 1.4 - Safety Triggers		
Posted Speed Limit on any boundary road	<80	km/h
Horizontal / Vertical Curvature on a boundary street limits sight lines at a proposed driveway	Yes	Horizontal curve on Dumaurier Ave
A proposed driveway is within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions) or within auxiliary lanes of an intersection;	No	
A proposed driveway makes use of an existing median break that serves an existing site	No	
There is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development	No	
The development includes a drive-thru facility	No	
Safety Trigger Met?	Yes	

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26 November 2020

City of Ottawa
Development Review Services
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Attention: Josiane Gervais, P.Eng.

Dear Josiane:

Re: 2829 Dumaurier TIA
Step 2 – Response to City Comments

The following response form has been prepared to address City of Ottawa comments received on November 26, 2020. City comments are noted in black with the corresponding responses from Parsons in Green.

Transportation Engineering Services

- Please update the circulation list, I will be the TPM on the file. Noted
- Element 2.1.2 - Existing Conditions
    - Queensview/Pinecrest: Note that the west-most NB-TH lane feeds directly into the NB LT lane at the Dumaurier intersection. Noted, description modified.
    - Listing of existing driveways is nicely done.
    - Correct referencing error within Transit Network section. Noted, reference updated.
    - Identification of relevant collision patterns required. For example, are all 12 rear-end collisions at Dumaurier/Pinecrest in the same direction of travel? Noted, additional analysis has been provided.
- Element 2.2.1 - Study Area: Richmond/Pinecrest also falls within the 1km driving distance from the site. If you wish to omit this intersection, provide justification as to why. This will be further reviewed as part of the Forecasting report. Given the proximity of the subject site to Highway 417 and the Pinecrest LRT Station (less than 300m walking distance), the potential draw north on Pinecrest was considered minimal and the corresponding traffic impacts to the Richmond/Pinecrest intersection negligible. Therefore, this intersection was not included in the TIA.
- Element 2.2.3 - Horizon Years: The 5-years beyond build-out should be 2030. Noted, TIA has updated.
- Module 2.3 - Exemptions Review: Should the applicant choose to provide less than required parking at the time of SPA. The requirement for this module will be reviewed. Noted.

Please address the above comments within the next submission and proceed to Step 3: Forecasting.

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17 February 2021

City of Ottawa
Development Review Services
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Attention: Josiane Gervais, P.Eng.

Dear Josiane:

Re: 2829 Dumaurier TIA
Step 3 – Response to City Comments

The following response has been prepared in response to City of Ottawa comments received on December 24, 2020. City comments have been noted in black with the corresponding responses from Parsons in Green.

Transportation Engineering Services

1. Section 2.1.1 Proposed Development:
    a. Note that the provision of less than 30 visitor parking spaces will trigger the need for a by-law exemption. Noted.
    b. Correct the mention of Trim Road and Inlet Private in/around Figure 2. Noted, figure corrected.
2. Section 2.1.2 Existing Conditions:
    a. Note the channelized northbound right-turn at the Pinecrest/Highway 417 intersection. Noted, description updated.
    b. Note that the rightmost northbound through lane at Greenbank/Iris/Highway 417 feeds directly into the eastbound on-ramp for Highway 417. Also indicate the southbound transit lane on the southbound approach. Noted, description updated.
3. Section 2.1.3 Planned Conditions: Mention the pedestrian project planned for the south/east side of Dumaurier. Noted, discussed in Section 2.1.3 under "Stage 2 LRT and Pedestrian Enhancements"
4. Section 3.1.4 Trip Assignment: Consider assigning a few more trips north/east along Pinecrest. Noted, the distribution has been adapted.
5. Section 3.2.2 Background Growth: In the future, contact Tim Wei at tim.wei@ottawa.ca in order to obtain a snapshot of the Long-Range Transportation Model to inform the chosen background growth rates. Noted.

Traffic Signal Operations

6. Synchro model of Pinecrest/Dumaurier and Queensview operates with a single controller. Please model appropriately. Noted, the Synchro analysis has been modified.
7. The Pinecrest corridor in this segment will be undergoing some geometric modifications with proposed cycling facilities as part of Stage 2 LRT. Please include in your model and analysis. Noted, discussion has been added in Section 4.1.1. and Table 15: MMLOS.

Development Review - Transportation

8. If the above comments can be incorporated within the next submission, please proceed to Step 4: Strategy. Noted.
9. Please submit digital copies of the Strategy Report and digital files of ICA outputs (Synchro/Sidra/Rodel, if applicable) for circulation. Noted.

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22 July 2021

City of Ottawa
Development Review Services
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Attention: Josiane Gervais, P.Eng.

Dear Josiane:

Re: 2829 Dumaurier TIA
Step 4 – Response to City Comments

The following response has been prepared in response to City of Ottawa comments received on June 9, 2021. City comments have been noted in black with the corresponding responses from Parsons in Green.

Transportation Engineering Services

1. Element 4.2
    a. An exemption to the bylaw is required for the reduced number of visitor parking spaces. Noted
    b. Consider additional bike parking both for residents in the underground parking garage and on the surface. Consider providing a covered shelter for surface parking. Provide details on how residents will access and egress the bike parking. Ensure that access is safe and accessible. Development increased their bike parking from 167 to 314, almost doubling the minimum required. Majority of bike parking provided indoors in a secured area
2. Element 4.3.1:
    a. Please confirm what operational speed was actually used to calculate the segment BLOS along Dumaurier Avenue. An operational speed of 60 km/h as suggested in page 23 of the report would yield a BLOS of F. Noted, text updated
    b. The desired BLOS target is D is only applicable for existing conditions. Dumaurier is planned to be a Local Route according to the ultimate cycling plan, which would then require a future BLOS target of B. Noted, text updated
3. Element 4.9.2 Intersection Design
    a. Clarify how the VLOS improves in the PM peak from B to A if mode share targets are not met. Noted, slight error which has been fixed
    b. Consider what lane reductions could be considered to improve the pedestrian LOS at intersections on Pinecrest (Dumaurier and Queensview) to better balance the target level of service for motorists and pedestrians. Given Traffic Signal Operations comments confirm that the analysis is correct but continue to review the possibility of balancing needs of all users. The current maximum number of lanes needed to cross on Dumaurier/Pinecrest and Queensview/Dumaurier is currently 6. Reducing the number of lanes from 6 to 5 or 4 lanes yields the same PLoS, improving it from PLoS F to D. Modifying the existing cycle length, effective walk time and reducing to 3 lanes would be required to improve it further than PLoS D, which would cause significant reductions in intersection performance.
4. General comments
    a. The transportation impact from the proposed development are minimal and the road capacity seems more than adequate to accommodate additional vehicles. However, the site should be integrating as many TOD initiatives as possible both to meet TOD mode share targets as well as address climate change initiatives. Exceeding bylaw requirements for cycling facilities and other TOD infrastructure enhancements should be encouraged. Ensure that these initiatives are incorporated into the site plan agreement. The developer upped their bike parking stalls from 167 spaces to 314. The developer will try to meet as many TDM measures as possible; to be confirmed over the approval process

b. Cycling facilities on Dumaurier Ave along the site frontage would be of benefit. Site frontage limited to less than 100 meters, which would have limited benefits to cyclists. AT facilities have been provided as required
c. Ensure that the developer connects with the LRT connectivity group (Meagan Whitehead) to discuss potential improvements and contributions. During site plan development, optimize the pedestrian and cycling connections to the LRT Station. Noted

Traffic Signal Operations

5. In the Synchro model, the number of pedestrian actuations and forecasted pedestrian crossings at intersections are low. It would be expected that the other users of the intersections (i.e. pedestrians/cyclists) will increase and side street green times would max out more often, which would render less extra time for other phases. The conflicting interactions between motorists and pedestrians/cyclists will increase at intersections. The results in the report are optimistic. Queueing may also be an issue. Noted, more ped calls and AT volumes were added, however, it is anticipated that the majority of pedestrians headed to transit will cross Dumaurier at Ramsay Cr. And use the internal pathways to the Pinecrest LRT Station
6. Pinecrest/Queensview/Dumaurier:
    a. For accuracy, the lane configuration for NB at Queensview should show 2 NBT lanes and 1 NBTR. Acknowledged that the leftmost NBT continues past Queensview to become a NBR lane, however, it operates as a through lane and not a turn lane south of Queensview/Pinecrest intersection. A NBL cannot be added to Queensview without adding a 4th leg which does not exist. The outermost lane lines up with a through lane north of Queensview/Pinecrest and functions as a through-right lane
    b. The NBLT queue to turn into Dumaurier may spill back to Queensview and cause operational concerns. Noted, approximately 36m + 78m (=114m) of storage is available for the NBL turning lane if the segment from Dumaurier to Hwy 417 WB off ramp is considered as one block. Given that the intersections of Dumaurier/Pinecrest and Queensview/Pinecrest function under the same controller, it is anticipated that they will flush traffic as one. The longest NBL queue is anticipated as 42 meters which is shorter than the 114 meters available

Traffic Signal Design

7. No comments to this TIA for this circulation. Traffic Signal Design and Specification reserves the right to make future comments based on subsequent submissions. Noted

Street Lighting

8. No comments. Noted

Transit Services

9. Comments were provided below:
    - Section 2.1.2 Existing Conditions: include a figure showing the location of nearby bus stops in relation to the site. Figure added
    - Section 4.2.1 Parking: the rate of resident parking should be reduced to align with TOD objectives and to align with minimum parking rates for TOD zones: 0.5 spaces per unit or about 159 spaces. Suggested reduction in resident parking to rate of 0.5/unit. The minimum parking required for the development as a whole is 231 parking spaces. At 250 parking spaces, the development is in the lower end of parking. Further bike parking was added to increase active transportation attractiveness for the development
    - TDM Measures Checklist: note that item 3.3 Enhanced Public Transit Service would not be applicable in this case as it applies to subdivisions only. Noted

Development Review - Transportation

10. Site Plan provided in the report is blurry, please update using the Site Plan that is to be included with the first submission. Figure in report updated
11. Providing bike parking at a rate of 1 stall per unit is encouraged as a TDM measure. Bike parking proposed is approaching 1 stall per unit. Recent site plan update increased bike parking from 167 stalls to 314
12. Note that the visitor parking provisions identified in Table 12 do not represent the bylaw requirements for developments within Area C. Please correct table to represent requirements as per the bylaw. As per text below Table 12, the rate of 0.2 visitor parking stalls/unit applies within Area C (i.e. 66 visitor parking spaces required). Table and text corrected
13. Section 4.3.1 – note that Dumaurier Avenue is identified on the City's Ultimate Cycling Network as a local route, therefore the statement that Dumaurier Avenue is "Not a bike route" is incorrect when referring to the future roadway. Noted, text updated
14. Section 4.5.3 should specify which TDM measures will be provided for the site versus those that are not definite. Noted, the TDM measures will all be considered and defined over the approval process
15. Please address the above comments and re-submit the TIA. Noted

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14 April 2023

City of Ottawa
Development Review Services
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Attention: Josiane Gervais, P.Eng.

Dear Josiane:

Re: 2829 Dumaurier TIA
Step 5 – Response to City Comments

The following response has been prepared in response to City of Ottawa comments received on February, 2023. City comments have been noted in black with the corresponding responses from Parsons in Green.

Transportation Engineering Services

Section 5 Recommendations indicates that the BLOS is met for the future boundary street (Dumaurier) design however, Section 4.3 indicates that the existing Dumaurier Street cross section does not meet the target BLOS. It does not appear that the applicant has provided a recommended cross section for Dumaurier Avenue and should review the site frontage to determine if there is sufficient space to provide this future collector road cross section (likely to include cycle track).
The updated TIA reflects that Dumaurier does not meet the target BLOS in the future. Two options would enable this target to be achieved based on the MMLOS guidelines: 1. reduce the posted speed limit to 40kph or 2. introduce a segregated cycling facility. The latter is less feasible since only 20m ROW is available on Dumaurier and it is a transit route, which requires compromises in the design to optimally accommodate these new facilities. An alternative approach is for the City to reduce the posted speed and enact targeted measures along the corridor to support the speed reduction (e.g. intersection narrowings and /or speed humps).

The significant increase in bicycle parking is appreciated. We also recommend that the applicant consider adding a bicycle repair station and bike wash station to the development.
Noted, client to consider this addition.

Resubmission should include an update of the new existing sidewalk on Dumaurier Avenue (east side).
Noted.

Development Review – Transportation

Commercial parking requirements in the TIA and Site Plan contradict themselves. Ensure consistency and update as appropriate.
Noted, parking numbers revised in TIA.

The TDM Measures outlined in the TIA as being “proposed, but not definite” are encouraged. The applicant should confirm which TDM measures will be included for this site.
Noted, a refinement to TDM measures was completed based on the latest. Some elements such as bikeshare and carshare are currently still being investigated.

Please revise the TIA as per above comments. Noted.

APPENDIX B

TRAFFIC COUNT DATA

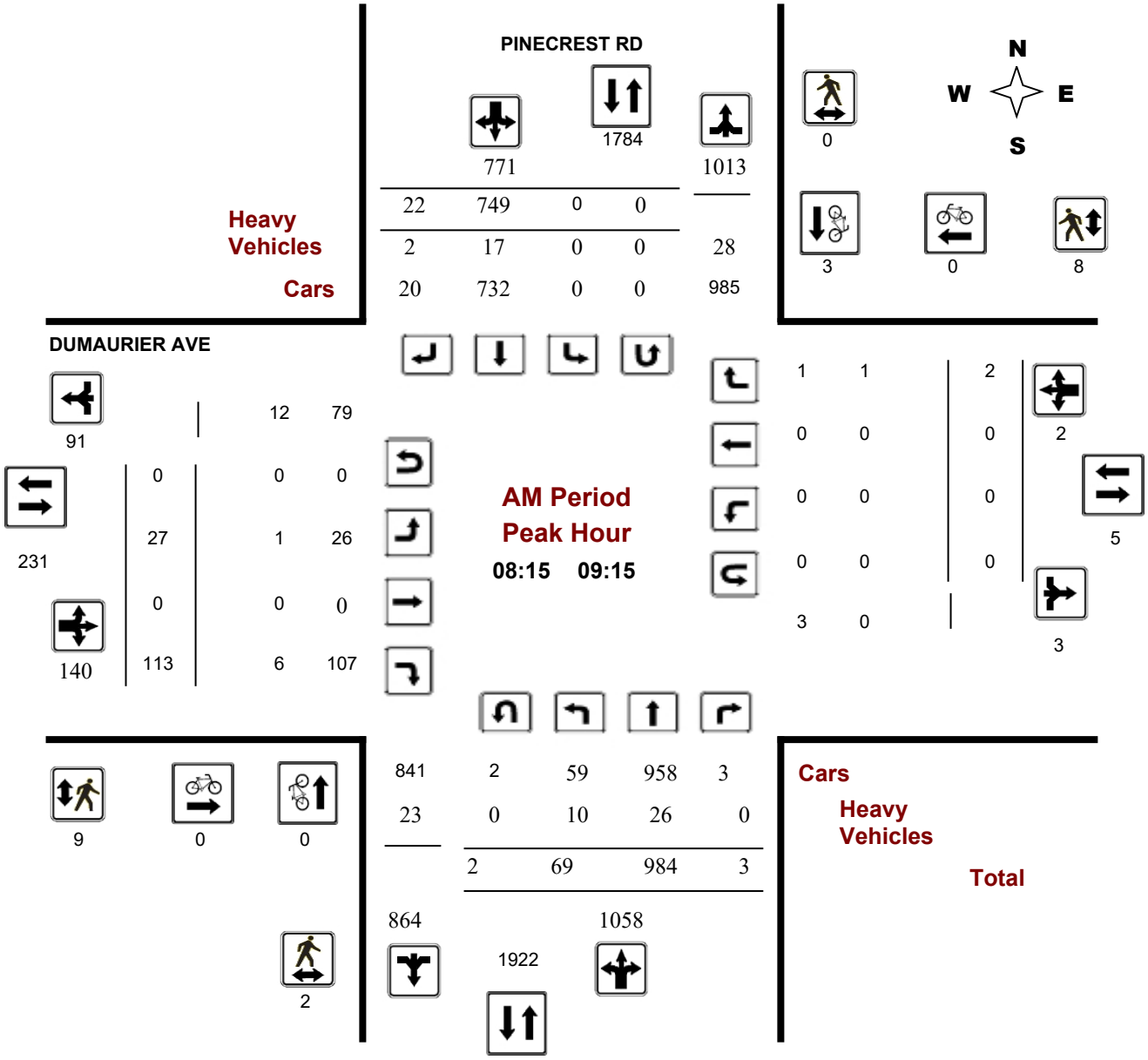
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

DUMAURIER AVE @ PINECREST RD

Survey Date: Thursday, August 25, 2016 **WO No:** 36164

Start Time: 07:00 **Device:** Miovision



Comments

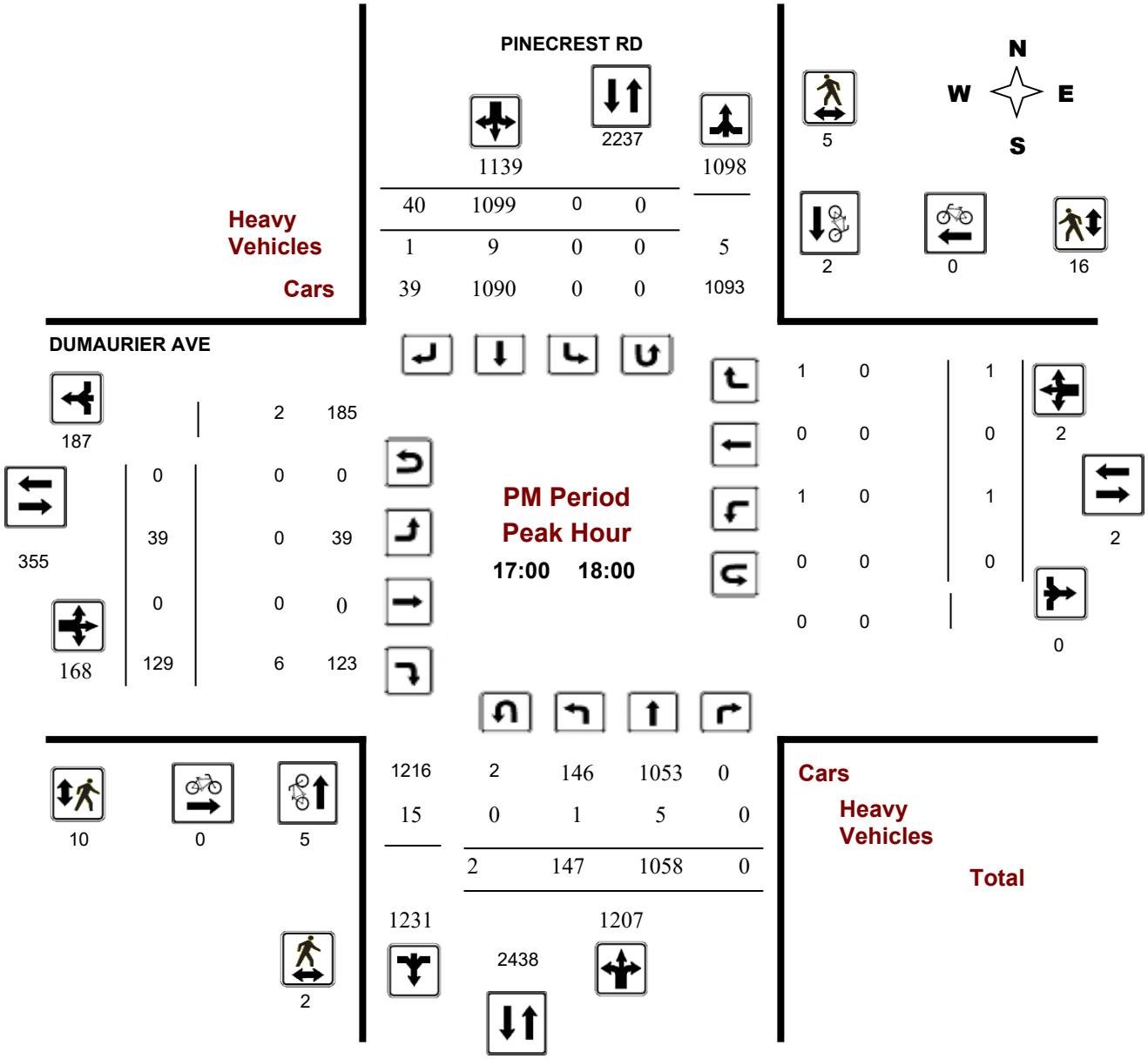
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

DUMAURIER AVE @ PINECREST RD

Survey Date: Thursday, August 25, 2016 **WO No:** 36164

Start Time: 07:00 **Device:** Miovision



Comments

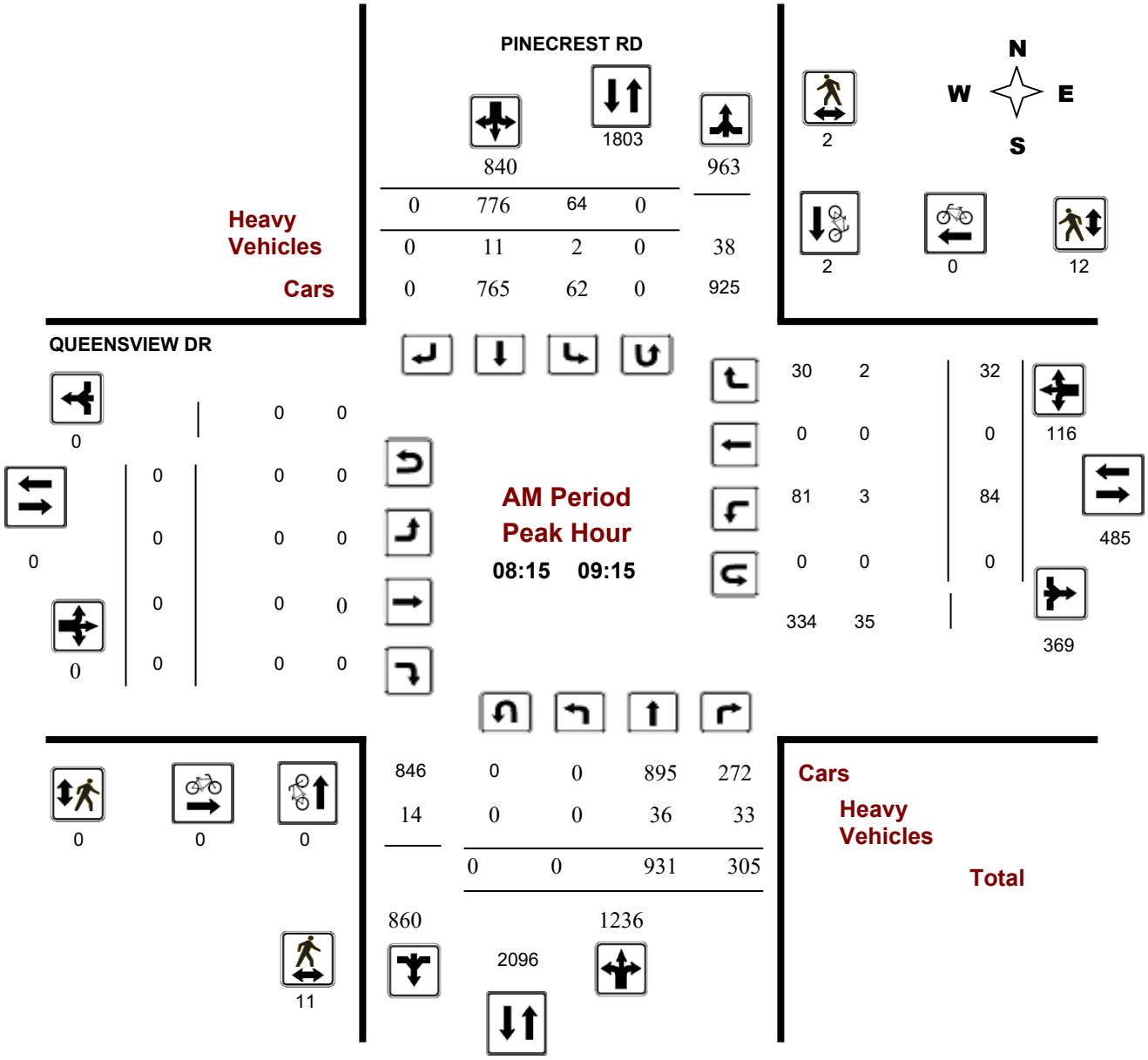
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

PINECREST RD @ QUEENSVIEW DR

Survey Date: Thursday, August 11, 2016 **WO No:** 36166

Start Time: 07:00 **Device:** Miovision



Comments

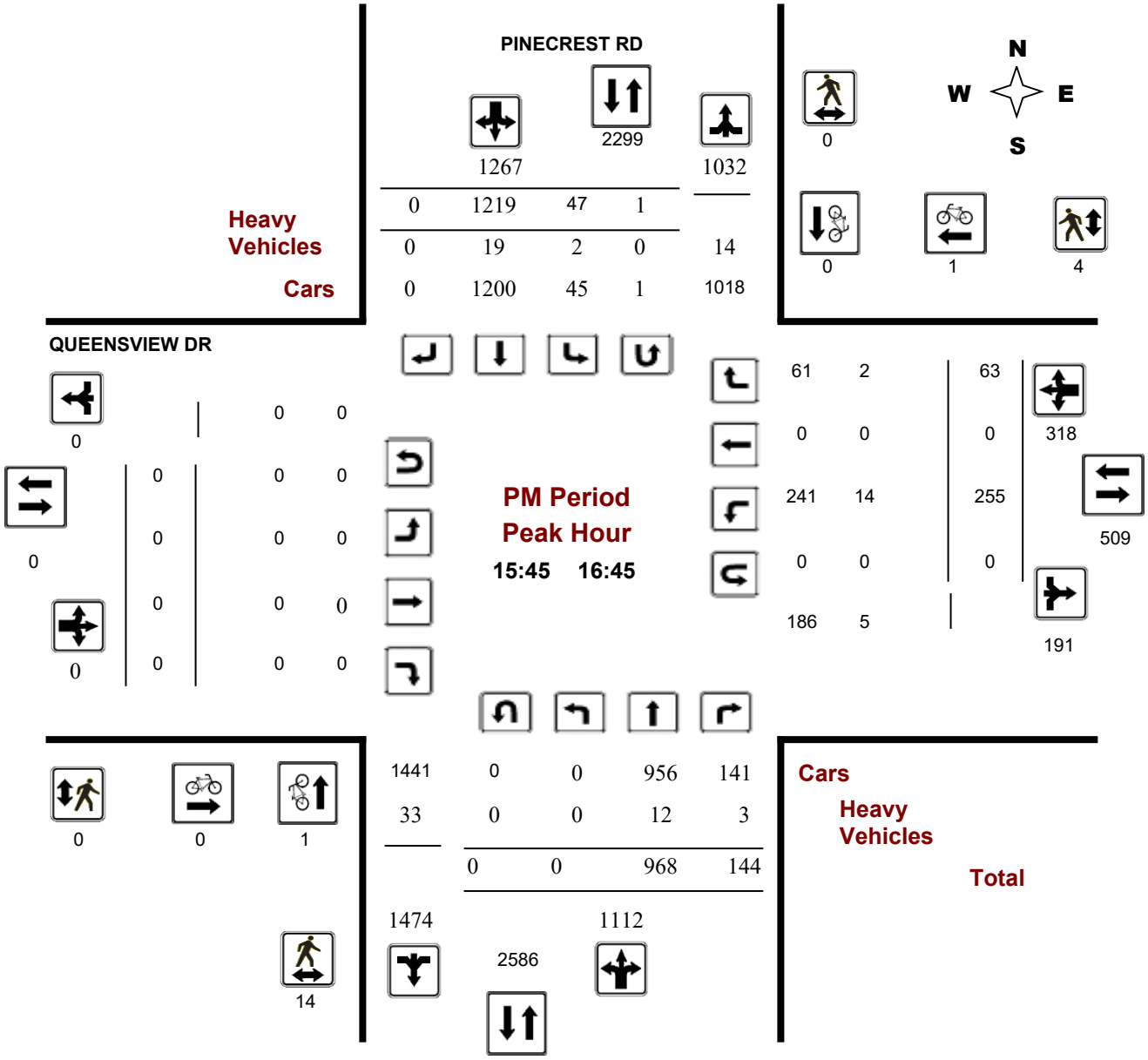
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

PINECREST RD @ QUEENSVIEW DR

Survey Date: Thursday, August 11, 2016 **WO No:** 36166

Start Time: 07:00 **Device:** Miovision



Comments

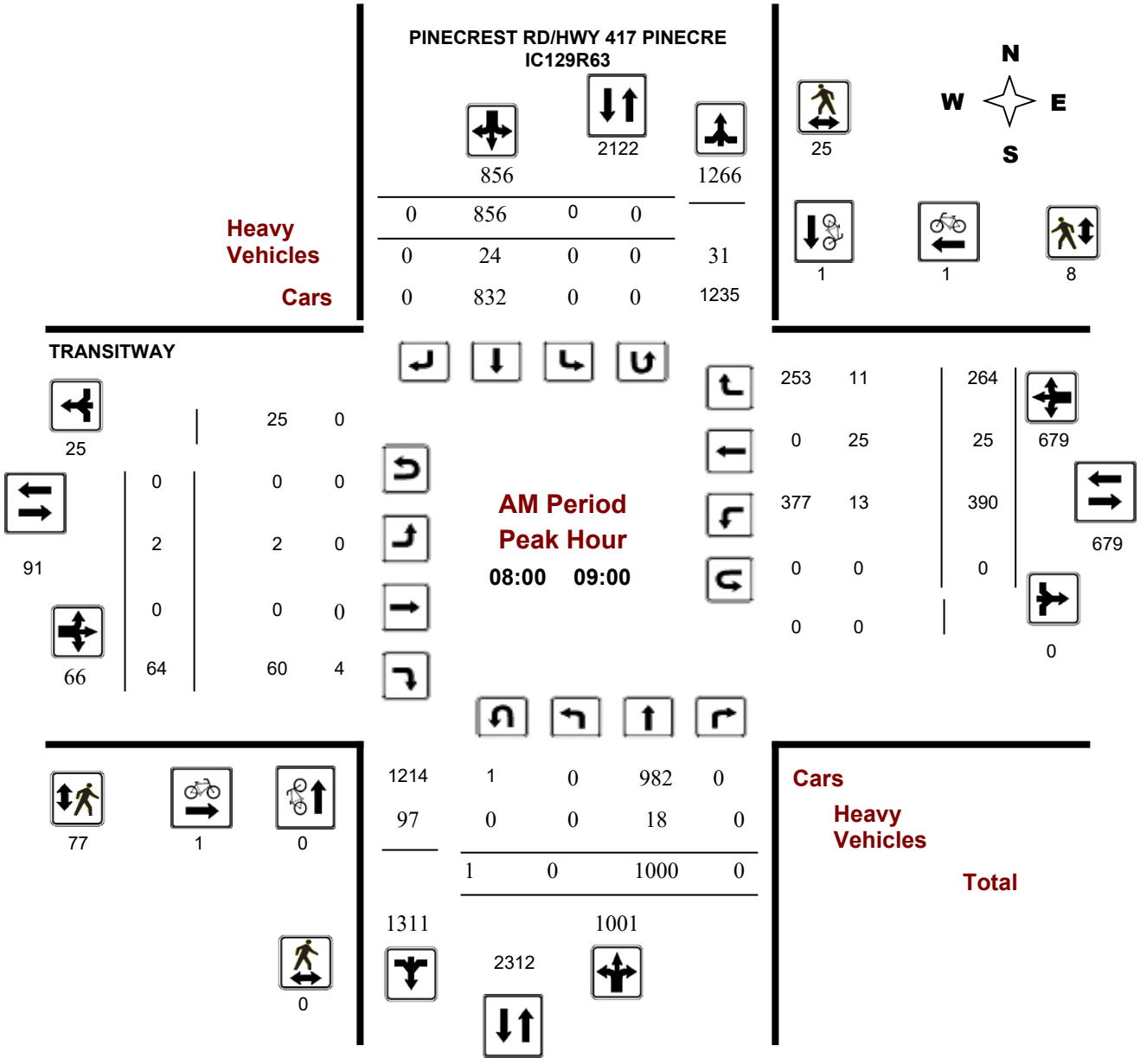
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

PINECREST RD/HWY 417 PINECRE IC129R63 @ TRANSI

Survey Date: Tuesday, January 22, 2019 **WO No:** 38298

Start Time: 07:00 **Device:** Miovision



Comments

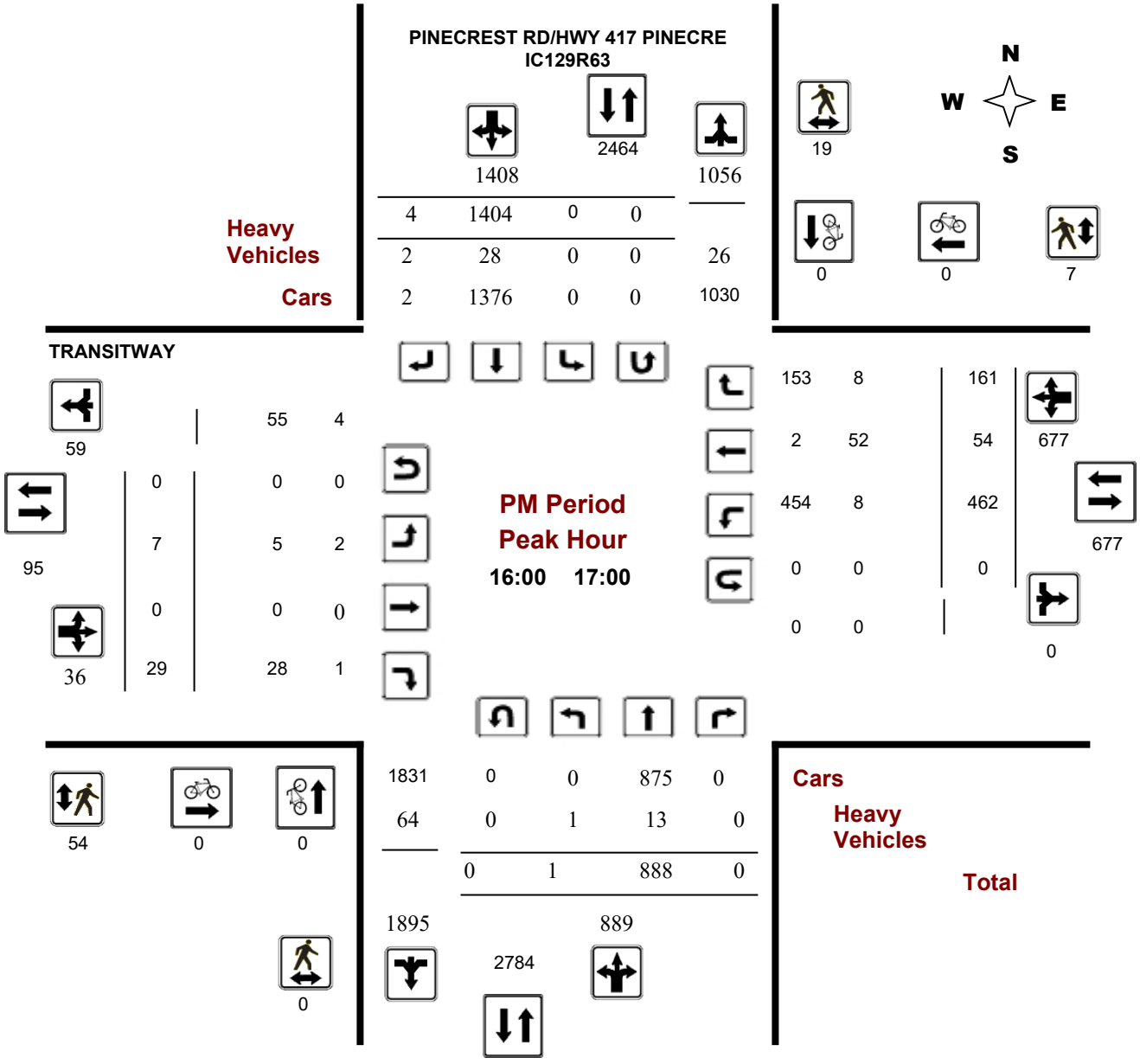
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

PINECREST RD/HWY 417 PINECRE IC129R63 @ TRANSI

Survey Date: Tuesday, January 22, 2019 **WO No:** 38298

Start Time: 07:00 **Device:** Miovision



Comments

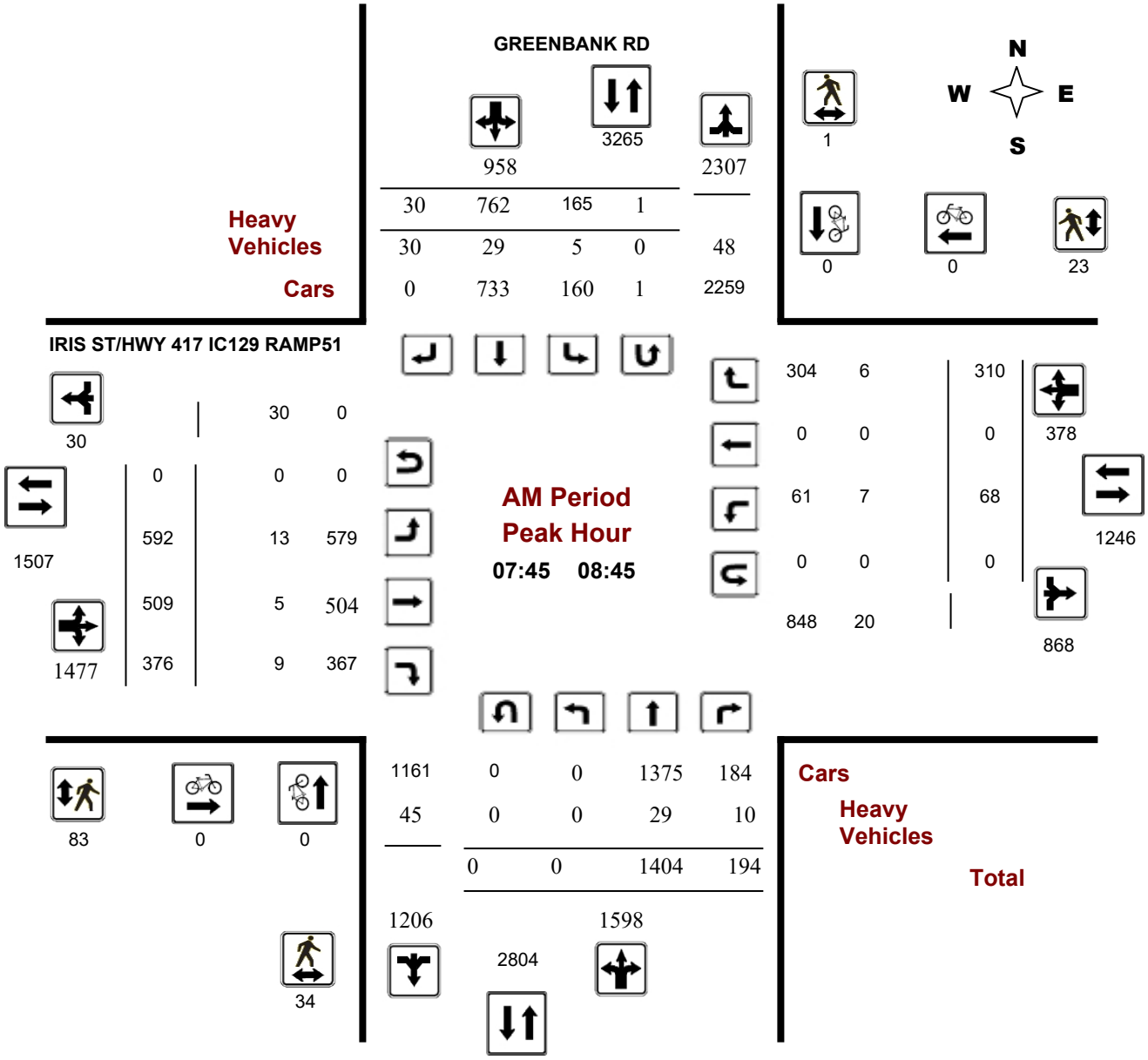
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ IRIS ST/HWY 417 IC129 RAMP51

Survey Date: Wednesday, January 16, 2019 **WO No:** 38263

Start Time: 07:00 **Device:** Miovision



Comments

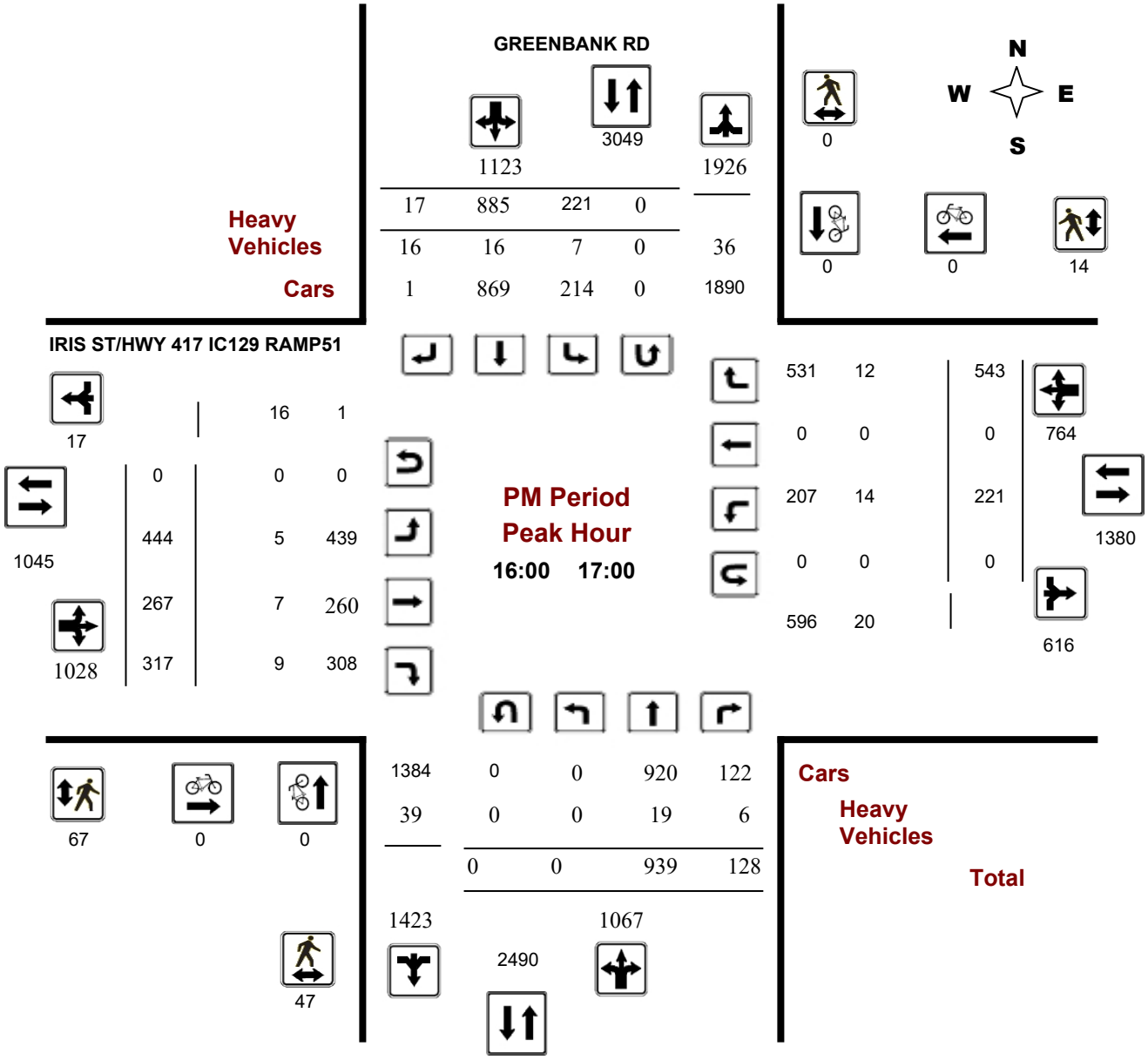
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

GREENBANK RD @ IRIS ST/HWY 417 IC129 RAMP51

Survey Date: Wednesday, January 16, 2019 **WO No:** 38263

Start Time: 07:00 **Device:** Miovision



Comments

APPENDIX C

COLLISION DATA

Total Area

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	89	6	41	22	3	4	1	3	169	87%
Non-fatal injury	14	1	0	6	0	4	0	0	25	13%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**103**	**7**	**41**	**28**	**3**	**8**	**1**	**3**	**194**	100%
	#1 or 53%	#5 or 4%	#2 or 21%	#3 or 14%	#6 or 2%	#4 or 4%	#8 or 1%	#6 or 2%		

DUMAURIER AVE / RAMSEY CRES S (0002804)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	1	n/a	1825	**n/a**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	0	0	0	1	0	0	0	0	1	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	100%
	0%	0%	0%	100%	0%	0%	0%	0%		

DUMAURIER AVE / PINECREST RD (0002743)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	25	27,271	1825	**0.50**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	12	1	2	2	1	2	1	1	22	88%
Non-fatal injury	0	1	0	2	0	0	0	0	3	12%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**12**	**2**	**2**	**4**	**1**	**2**	**1**	**1**	**25**	100%
	48%	8%	8%	16%	4%	8%	4%	4%		

PINECREST RD / QUEENSVIEW DR (0002739)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	15	29,767	1825	**0.28**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	7	1	1	4	1	0	0	0	14	93%
Non-fatal injury	0	0	0	1	0	0	0	0	1	7%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**7**	**1**	**1**	**5**	**1**	**0**	**0**	**0**	**15**	100%
	47%	7%	7%	33%	7%	0%	0%	0%		

PINECREST RD/HWY 417 PINECRE IC129R63 / TRANSI (0008264)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	22	40,855	1825	**0.30**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	7	0	2	8	0	0	0	0	17	77%
Non-fatal injury	3	0	0	1	0	1	0	0	5	23%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**10**	**0**	**2**	**9**	**0**	**1**	**0**	**0**	**22**	100%
	45%	0%	9%	41%	0%	5%	0%	0%		

HWY 417 PINECRE IC129R26 / PINECREST RD (0011469)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	1	n/a	1825	**n/a**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	0	0	0	0	0	0	0	0	0	0%
Non-fatal injury	0	0	0	0	0	1	0	0	1	100%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	100%
	0%	0%	0%	0%	0%	100%	0%	0%		

GREENBANK RD / IRIS ST/HWY 417 IC129 RAMP51 (0009073)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	97	51,947	1825	**1.02**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	49	4	25	7	0	0	0	2	87	90%
Non-fatal injury	7	0	0	2	0	1	0	0	10	10%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**56**	**4**	**25**	**9**	**0**	**1**	**0**	**2**	**97**	100%
	58%	4%	26%	9%	0%	1%	0%	2%		

GREENBANK RD / HWY 417 GREENBA IC126R35 (0008878)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	2	n/a	1825	**n/a**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	2	0	0	0	0	0	0	0	2	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	100%
	100%	0%	0%	0%	0%	0%	0%	0%		

SECTIONS

Dumaurier between Ramsey and Watson

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	4	n/a	1825	**n/a**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	1	0	0	0	1	2	0	0	4	100%
Non-fatal injury	0	0	0	0	0	0	0	0	0	0%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**1**	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**4**	100%
	25%	0%	0%	0%	25%	50%	0%	0%		

Pinecrest between Dumaurier and 417 (beginning of Greenbank)

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	13	n/a	1825	**n/a**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	6	0	4	0	0	0	0	0	10	77%
Non-fatal injury	2	0	0	0	0	1	0	0	3	23%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**8**	**0**	**4**	**0**	**0**	**1**	**0**	**0**	**13**	100%
	62%	0%	31%	0%	0%	8%	0%	0%		

Greenbank between 417 (edge with Pinecrest) to Iris

Years	*Total # Collisions*	*24 Hr AADT Veh Volume*	*Days*	*Collisions/MEV*
2014-2018	12	n/a	1825	**n/a**

Classification of Accident	*Rear End*	*Turning Movement*	*Sideswipe*	*Angle*	*Approaching*	*Single Vehicle (other)*	*Single vehicle (Unattended vehicle)*	*Other*	*Total*	
P.D. only	4	0	7	0	0	0	0	0	11	92%
Non-fatal injury	1	0	0	0	0	0	0	0	1	8%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**5**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**12**	100%
	42%	0%	58%	0%	0%	0%	0%	0%		

APPENDIX D

PROJECTED BACKGROUND GROWTH

Road/Road
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2012	11-Jan	9643	15469	10477	10760	4637	5489	7085	124	63684
2015	1-Apr	9476	15342	10394	10778	4343	5339	7360	114	63146
2015	2-Jul	10732	14835	9928	10270	4883	5254	6531	1715	64148
2019	22-Jan	8255	13578	9033	9593	3954	5216	7287	142	57058

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2012	15469	9643	25112	63684				
2015	15342	9476	24818	63146	-0.8%	-1.7%	-1.2%	-0.8%
2015	14835	10732	25567	64148	-3.3%	13.3%	3.0%	1.6%
2019	13578	8255	21833	57058	-8.5%	-23.1%	-14.6%	-11.1%

Regression Estimate	2012	15712	10240	25952
Regression Estimate	2019	13760	8703	22463
Average Annual Change		**-1.88%**	**-2.30%**	**-2.04%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2012	7085	124	7209	63684				
2015	7360	114	7474	63146	3.9%	-8.1%	3.7%	-0.8%
2015	6531	1715	8246	64148	-11.3%	1404.4%	10.3%	1.6%
2019	7287	142	7429	57058	11.6%	-91.7%	-9.9%	-11.1%

Regression Estimate	2012	6957	567	7524
Regression Estimate	2019	7191	474	7665
Average Annual Change		**0.47%**	**-2.52%**	**0.27%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2012	5489	4637	10126	63684				
2015	5339	4343	9682	63146	-2.7%	-6.3%	-4.4%	-0.8%
2015	5254	4883	10137	64148	-1.6%	12.4%	4.7%	1.6%
2019	5216	3954	9170	57058	-0.7%	-19.0%	-9.5%	-11.1%

Regression Estimate	2012	5446	4789	10235
Regression Estimate	2019	5184	4068	9252
Average Annual Change		**-0.70%**	**-2.30%**	**-1.43%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2012	10477	10760	21237	63684				
2015	10394	10778	21172	63146	-0.8%	0.2%	-0.3%	-0.8%
2015	9928	10270	20198	64148	-4.5%	-4.7%	-4.6%	1.6%
2019	9033	9593	18626	57058	-9.0%	-6.6%	-7.8%	-11.1%

Regression Estimate	2012	10648	10909	21558
Regression Estimate	2019	9161	9705	18867
Average Annual Change		**-2.13%**	**-1.66%**	**-1.89%**

Road/Road
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2012	43841	1099	2479	1831	1307	302	875	1461	32	9386
2015	43922	1059	2414	1710	1310	350	758	1379	16	8996
2015	44014	1067	1760	1411	1120	231	468	817	178	7052
2019	43852	958	2307	1598	1206	378	868	1477	30	8822

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2012	2479	1099	3578	9386				
2015	2414	1059	3473	8996	-2.6%	-3.6%	-2.9%	-4.2%
2015	1760	1067	2827	7052	-27.1%	0.8%	-18.6%	-21.6%
2019	2307	958	3265	8822	31.1%	-10.2%	15.5%	25.1%

Regression Estimate	2012	2299	1113	3412
Regression Estimate	2019	2172	968	3140
Average Annual Change		**-0.81%**	**-1.97%**	**-1.18%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2012	1461	32	1493	9386				
2015	1379	16	1395	8996	-5.6%	-50.0%	-6.6%	-4.2%
2015	817	178	995	7052	-40.8%	1012.5%	-28.7%	-21.6%
2019	1477	30	1507	8822	80.8%	-83.1%	51.5%	25.1%

Regression Estimate	2012	1252	69	1321
Regression Estimate	2019	1320	58	1378
Average Annual Change		**0.76%**	**-2.52%**	**0.61%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2012	875	302	1177	9386				
2015	758	350	1108	8996	-13.4%	15.9%	-5.9%	-4.2%
2015	468	231	699	7052	-38.3%	-34.0%	-36.9%	-21.6%
2019	868	378	1246	8822	85.5%	63.6%	78.3%	25.1%

Regression Estimate	2012	728	277	1006
Regression Estimate	2019	758	359	1117
Average Annual Change		**0.57%**	**3.78%**	**1.52%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2012	1831	1307	3138	9386				
2015	1710	1310	3020	8996	-6.6%	0.2%	-3.8%	-4.2%
2015	1411	1120	2531	7052	-17.5%	-14.5%	-16.2%	-21.6%
2019	1598	1206	2804	8822	13.3%	7.7%	10.8%	25.1%

Regression Estimate	2012	1734	1279	3014
Regression Estimate	2019	1526	1185	2711
Average Annual Change		**-1.82%**	**-1.09%**	**-1.50%**

Road/Road
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2012	43841	1478	2066	1213	1806	851	652	992	10	9068
2015	43922	1364	2027	1187	1597	812	652	926	13	8578
2015	44014	1660	2083	1291	1659	835	727	952	269	9476
2019	43852	1123	1926	1067	1423	543	616	1028	17	7743

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2012	2066	1478	3544	9068				
2015	2027	1364	3391	8578	-1.9%	-7.7%	-4.3%	-5.4%
2015	2083	1660	3743	9476	2.8%	21.7%	10.4%	10.5%
2019	1926	1123	3049	7743	-7.5%	-32.3%	-18.5%	-18.3%

Regression Estimate	2012	2094	1583	3677
Regression Estimate	2019	1947	1202	3149
Average Annual Change		**-1.03%**	**-3.86%**	**-2.19%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2012	992	10	1002	9068				
2015	926	13	939	8578	-6.7%	30.0%	-6.3%	-5.4%
2015	952	269	1221	9476	2.8%	1969.2%	30.0%	10.5%
2019	1028	17	1045	7743	8.0%	-93.7%	-14.4%	-18.3%

Regression Estimate	2012	953	82	1036
Regression Estimate	2019	999	71	1070
Average Annual Change		**0.67%**	**-2.05%**	**0.47%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2012	652	851	1503	9068				
2015	652	812	1464	8578	0.0%	-4.6%	-2.6%	-5.4%
2015	727	835	1562	9476	11.5%	2.8%	6.7%	10.5%
2019	616	543	1159	7743	-15.3%	-35.0%	-25.8%	-18.3%

Regression Estimate	2012	682	910	1592
Regression Estimate	2019	638	587	1226
Average Annual Change		**-0.94%**	**-6.07%**	**-3.67%**

South Leg

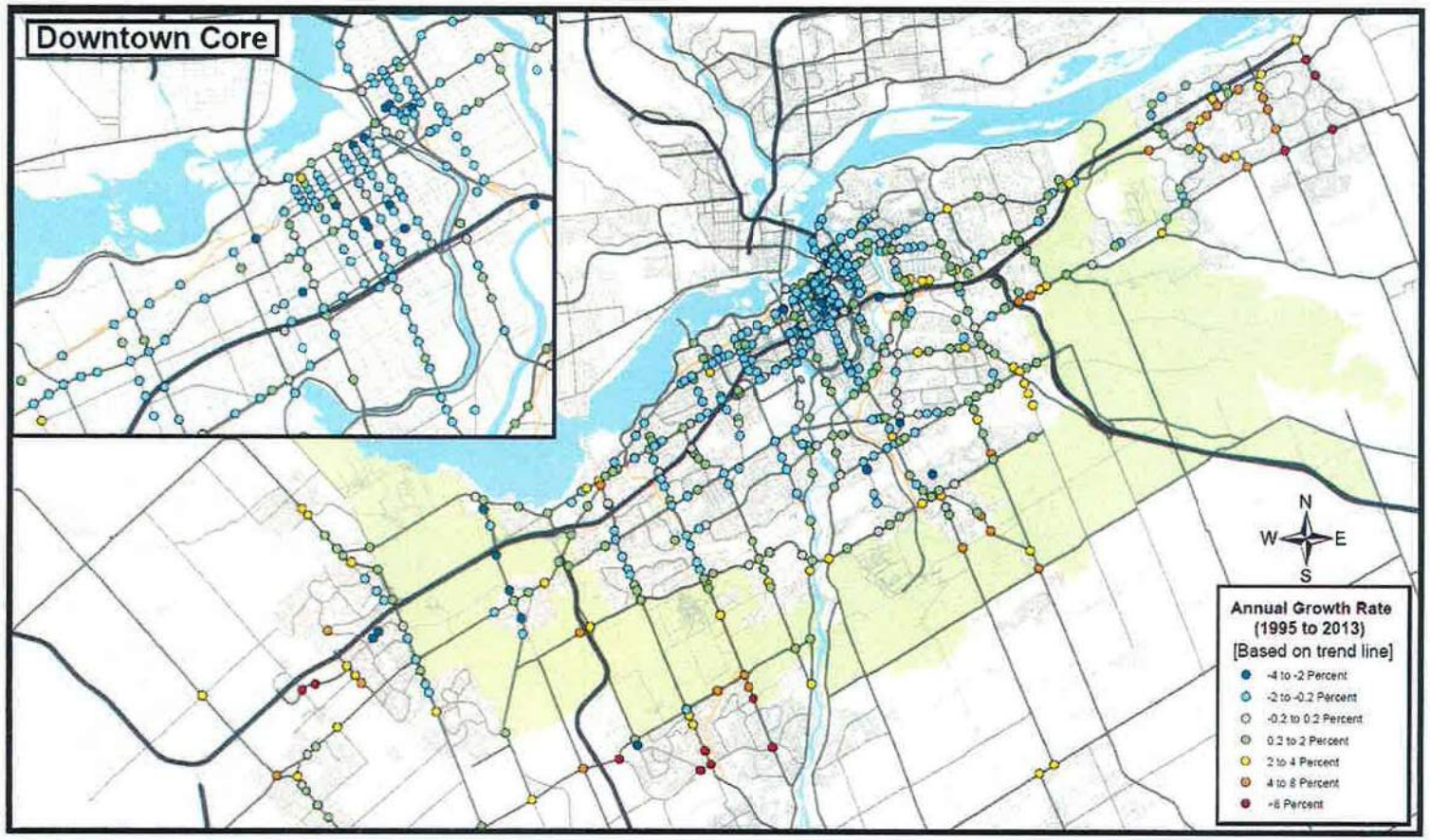
Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2012	1213	1806	3019	9068				
2015	1187	1597	2784	8578	-2.1%	-11.6%	-7.8%	-5.4%
2015	1291	1659	2950	9476	8.8%	3.9%	6.0%	10.5%
2019	1067	1423	2490	7743	-17.4%	-14.2%	-15.6%	-18.3%

Regression Estimate	2012	1263	1798	3061
Regression Estimate	2019	1105	1417	2522
Average Annual Change		**-1.90%**	**-3.34%**	**-2.73%**

3.2 Background Traffic:
Background Growth

INTERSECTION TRAFFIC GROWTH RATES, AM PEAK PERIOD (0700 to 0900)

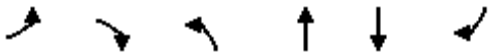
Total Vehicular Volume Entering the Intersection, 1995 to 2013, Scenario F AM 2



- Growth rates vary by location
- In some areas, traffic has been declining
- Growth rate must be justified

APPENDIX E

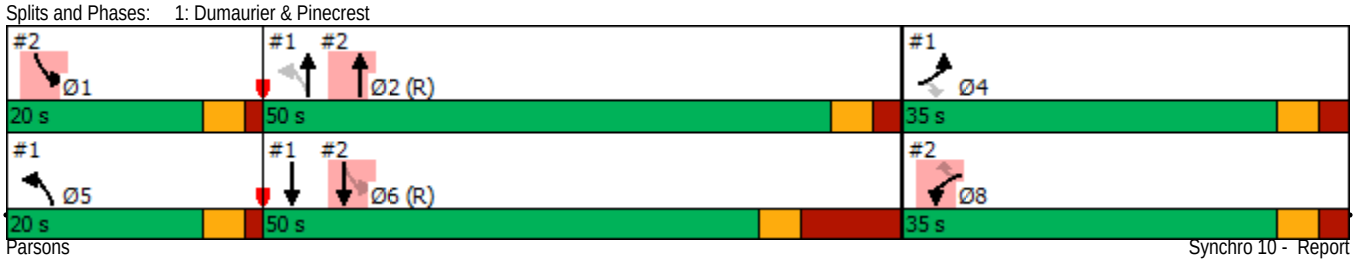
SYNCHRO ANALYSIS: EXISTING INTERSECTION PERFORMANCE



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	27	113	69	984	749	22		
Future Volume (vph)	27	113	69	984	749	22		
Satd. Flow (prot)	1695	1517	1695	3390	3373	0		
Flt Permitted	0.950		0.318					
Satd. Flow (perm)	1695	1495	564	3390	3373	0		
Satd. Flow (RTOR)		126			3			
Lane Group Flow (vph)	30	126	77	1093	856	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	35.0	35.0	20.0	50.0	50.0		20.0	35.0
Total Split (%)	33.3%	33.3%	19.0%	47.6%	47.6%		19%	33%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	14.2	14.2	76.6	70.0	64.2			
Actuated g/C Ratio	0.14	0.14	0.73	0.67	0.61			
v/c Ratio	0.13	0.41	0.16	0.48	0.41			
Control Delay	38.1	10.3	2.0	3.1	13.2			
Queue Delay	0.0	0.0	0.1	0.1	0.0			
Total Delay	38.1	10.3	2.1	3.2	13.2			
LOS	D	B	A	A	B			
Approach Delay	15.6			3.1	13.2			
Approach LOS	B			A	B			
Queue Length 50th (m)	5.7	0.0	0.9	10.9	42.4			
Queue Length 95th (m)	11.9	13.7	2.5	16.2	84.1			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	471	506	595	2260	2064			
Starvation Cap Reductn	0	0	127	188	0			
Spillback Cap Reductn	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.06	0.25	0.16	0.53	0.41			

Intersection Summary	
Cycle Length: 105	
Actuated Cycle Length: 105	
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 54.2%	ICU Level of Service A
Analysis Period (min) 15	

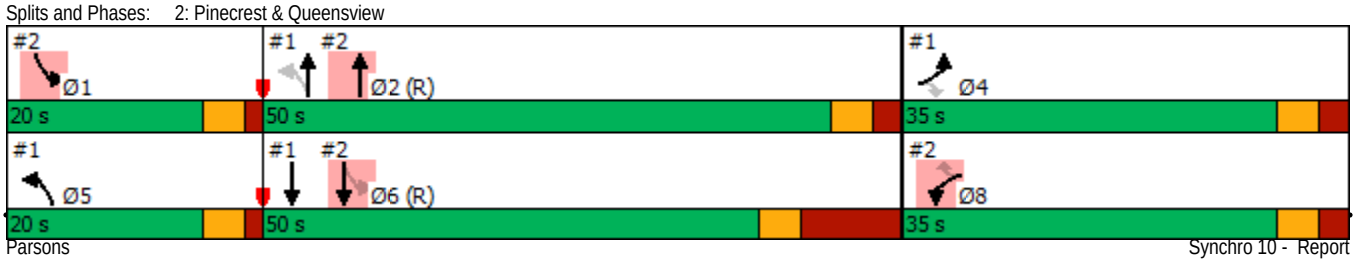
Splits and Phases: 1: Dumaurier & Pinecrest



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	84	32	931	305	64	776		
Future Volume (vph)	84	32	931	305	64	776		
Satd. Flow (prot)	1695	1517	4630	0	1695	3390		
Flt Permitted	0.950				0.161			
Satd. Flow (perm)	1673	1495	4630	0	287	3390		
Satd. Flow (RTOR)		36	98					
Lane Group Flow (vph)	93	36	1373	0	71	862		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	35.0	35.0	50.0		20.0	50.0	35.0	20.0
Total Split (%)	33.3%	33.3%	47.6%		19.0%	47.6%	33%	19%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.8	5.8	5.6		4.7	11.3		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	14.2	14.2	70.0		76.4	64.2		
Actuated g/C Ratio	0.14	0.14	0.67		0.73	0.61		
v/c Ratio	0.41	0.15	0.44		0.24	0.42		
Control Delay	45.0	12.4	2.0		4.2	3.8		
Queue Delay	0.0	0.0	0.1		0.0	0.1		
Total Delay	45.0	12.4	2.1		4.2	3.9		
LOS	D	B	A		A	A		
Approach Delay	35.9		2.1			3.9		
Approach LOS	D		A			A		
Queue Length 50th (m)	18.3	0.0	5.9		0.3	8.1		
Queue Length 95th (m)	28.2	7.7	12.9		4.6	15.8		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	471	441	3120		424	2073		
Starvation Cap Reductn	0	0	474		18	371		
Spillback Cap Reductn	0	0	6		0	0		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.20	0.08	0.52		0.17	0.51		

Intersection Summary	
Cycle Length: 105	
Actuated Cycle Length: 105	
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 4.6	Intersection LOS: A
Intersection Capacity Utilization 53.3%	ICU Level of Service A
Analysis Period (min) 15	

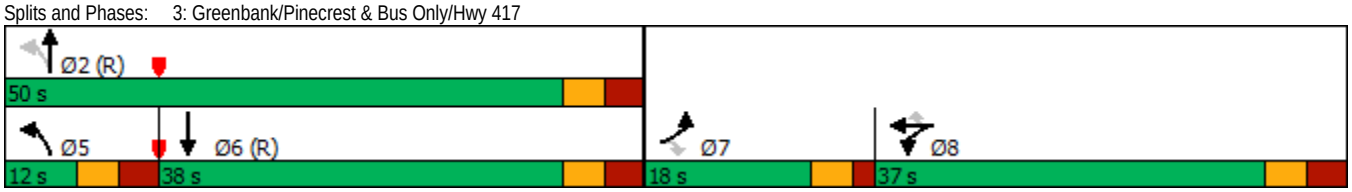
Splits and Phases: 2: Pinecrest & Queensview



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	64	390	25	264	1	1000	0	0	856	0
Future Volume (vph)	2	0	64	390	25	264	1	1000	0	0	856	0
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3390	0
Flt Permitted	0.950			0.950				0.955				
Satd. Flow (perm)	1652	0	1496	3288	1784	1458	0	3238	0	0	3390	0
Satd. Flow (RTOR)			170			293						
Lane Group Flow (vph)	2	0	71	433	28	293	0	1112	0	0	951	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	20.7	20.7	20.7		59.3			59.3	
Actuated g/C Ratio	0.10		0.10	0.20	0.20	0.20		0.56			0.56	
v/c Ratio	0.01		0.24	0.67	0.08	0.56		0.61			0.50	
Control Delay	43.5		1.9	43.6	32.0	8.2		19.1			7.7	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.1	
Total Delay	43.5		1.9	43.6	32.0	8.2		19.1			7.8	
LOS	D		A	D	C	A		B			A	
Approach Delay		3.0			29.4			19.1			7.8	
Approach LOS		A			C			B			A	
Queue Length 50th (m)	0.4		0.0	42.8	4.8	0.0		79.1			18.7	
Queue Length 95th (m)	2.7		0.0	51.8	10.8	19.1		123.8			25.7	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		334	951	516	630		1830			1915	
Starvation Cap Reductn	0		0	0	0	0		0			140	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.01		0.21	0.46	0.05	0.47		0.61			0.54	

Intersection Summary	
Cycle Length: 105	
Actuated Cycle Length: 105	
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 17.7	Intersection LOS: B
Intersection Capacity Utilization 69.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Greenbank/Pinecrest & Bus Only/Hwy 417

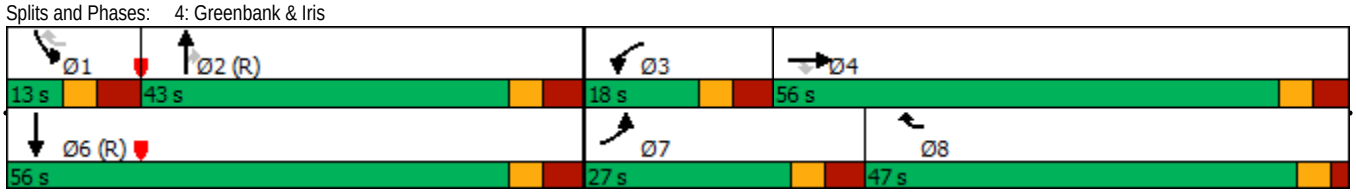


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	592	509	376	68	0	310	0	1404	194	165	762	30
Future Volume (vph)	592	509	376	68	0	310	0	1404	194	165	762	30
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3348	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3277	1784	1449	3239	0	2607	0	4871	1460	3272	3348	0
Satd. Flow (RTOR)			161			157			217		3	
Lane Group Flow (vph)	658	566	418	76	0	344	0	1560	216	183	880	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	25.1	47.0	47.0	12.1		24.0		42.5	42.5	12.6	42.5	
Total Split (s)	27.0	56.0	56.0	18.0		47.0		43.0	43.0	13.0	56.0	
Total Split (%)	20.8%	43.1%	43.1%	13.8%		36.2%		33.1%	33.1%	10.0%	43.1%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	19.9	45.6	45.6	8.4		46.2		38.7	38.7	10.7	57.0	
Actuated g/C Ratio	0.15	0.35	0.35	0.06		0.36		0.30	0.30	0.08	0.44	
v/c Ratio	1.31	0.90	0.68	0.36		0.33		1.08	0.37	0.68	0.60	
Control Delay	195.4	58.9	27.0	62.5		14.3		90.2	6.5	71.4	31.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	195.4	58.9	27.0	62.5		14.3		90.2	6.5	71.4	31.9	
LOS	F	E	C	E		B		F	A	E	C	
Approach Delay		105.5			23.0			80.0			38.7	
Approach LOS		F			C			E			D	
Queue Length 50th (m)	~111.4	132.6	54.9	9.7		16.7		~174.4	0.0	24.3	95.6	
Queue Length 95th (m)	#148.2	#190.2	90.7	17.4		28.5		#204.1	18.3	#55.3	123.2	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	503	677	650	275		1110		1451	587	270	1469	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	1.31	0.84	0.64	0.28		0.31		1.08	0.37	0.68	0.60	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.31	
Intersection Signal Delay: 74.7	Intersection LOS: E
Intersection Capacity Utilization 84.3%	ICU Level of Service E
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: 4: Greenbank & Iris

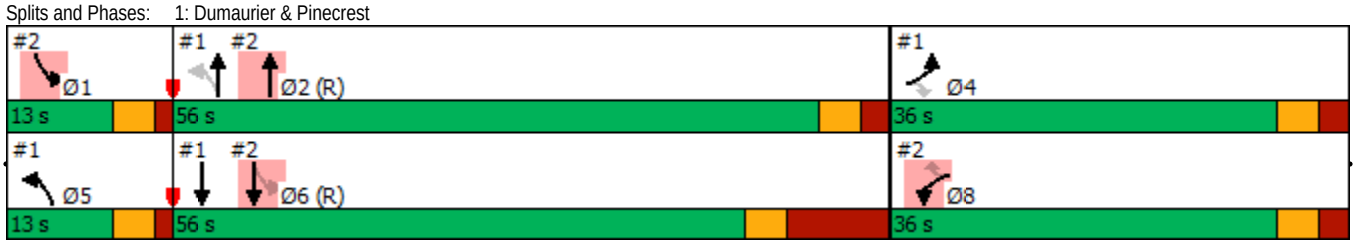


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	39	129	147	1058	1099	40		
Future Volume (vph)	39	129	147	1058	1099	40		
Satd. Flow (prot)	1695	1517	1695	3390	3366	0		
Flt Permitted	0.950		0.136					
Satd. Flow (perm)	1685	1495	243	3390	3366	0		
Satd. Flow (RTOR)		143			4			
Lane Group Flow (vph)	43	143	163	1176	1265	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	36.0	36.0	13.0	56.0	56.0		13.0	36.0
Total Split (%)	34.3%	34.3%	12.4%	53.3%	53.3%		12%	34%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	22.7	22.7	69.9	61.6	51.7			
Actuated g/C Ratio	0.22	0.22	0.67	0.59	0.49			
v/c Ratio	0.12	0.33	0.58	0.59	0.76			
Control Delay	31.3	7.2	30.9	5.4	26.8			
Queue Delay	0.0	0.0	0.3	0.0	0.1			
Total Delay	31.3	7.2	31.1	5.4	26.9			
LOS	C	A	C	A	C			
Approach Delay	12.8			8.5	26.9			
Approach LOS	B			A	C			
Queue Length 50th (m)	7.1	0.0	9.5	13.1	107.7			
Queue Length 95th (m)	14.6	13.8	#31.8	20.0	#155.2			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	487	531	287	1988	1659			
Starvation Cap Reductn	0	0	9	0	0			
Spillback Cap Reductn	0	5	0	0	32			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.09	0.27	0.59	0.59	0.78			

Intersection Summary

Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 17.1 — Intersection LOS: B
Intersection Capacity Utilization 69.5% — 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: 1: Dumaurier & Pinecrest

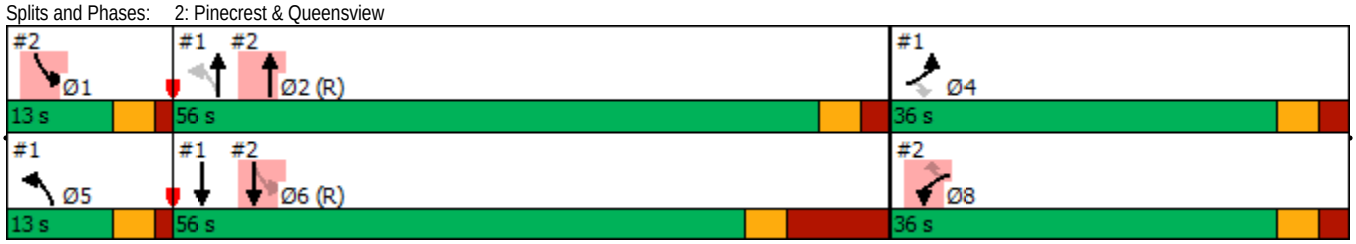


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	255	63	968	144	47	1219		
Future Volume (vph)	255	63	968	144	47	1219		
Satd. Flow (prot)	1695	1517	4759	0	1695	3390		
Flt Permitted	0.950				0.189			
Satd. Flow (perm)	1667	1497	4759	0	337	3390		
Satd. Flow (RTOR)		70	36					
Lane Group Flow (vph)	283	70	1236	0	52	1354		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	36.0	36.0	56.0		13.0	56.0	36.0	13.0
Total Split (%)	34.3%	34.3%	53.3%		12.4%	53.3%	34%	12%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.8	5.8	5.6		4.7	11.3		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	22.7	22.7	61.6		65.0	51.7		
Actuated g/C Ratio	0.22	0.22	0.59		0.62	0.49		
v/c Ratio	0.77	0.19	0.44		0.18	0.81		
Control Delay	52.6	8.3	5.1		2.2	10.1		
Queue Delay	2.5	0.0	0.2		0.1	0.3		
Total Delay	55.1	8.4	5.3		2.3	10.5		
LOS	E	A	A		A	B		
Approach Delay	45.8		5.3			10.2		
Approach LOS	D		A			B		
Queue Length 50th (m)	54.6	0.0	6.8		0.4	16.2		
Queue Length 95th (m)	76.5	10.1	25.7		m1.1	#176.0		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	487	480	2806		320	1669		
Starvation Cap Reductn	0	0	642		26	55		
Spillback Cap Reductn	107	11	21		0	32		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.74	0.15	0.57		0.18	0.84		

Intersection Summary

Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 12.4 — Intersection LOS: B
Intersection Capacity Utilization 64.7% — 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.
m Volume for 95th percentile queue is metered by upstream signal.

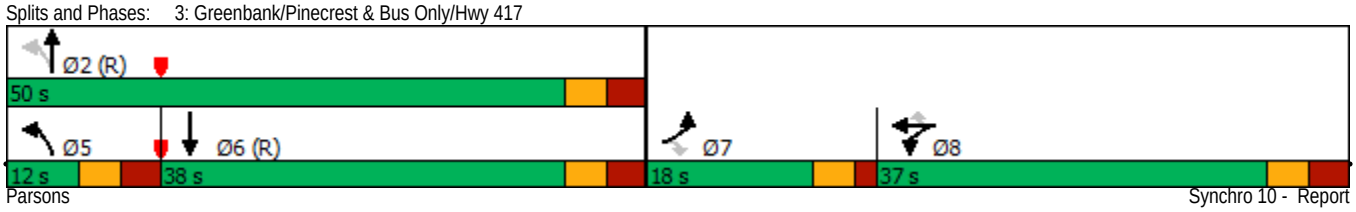
Splits and Phases: 2: Pinecrest & Queensview



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	0	29	462	54	161	1	888	0	0	1404	4
Future Volume (vph)	7	0	29	462	54	161	1	888	0	0	1404	4
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3389	0
Flt Permitted	0.950			0.950				0.954				
Satd. Flow (perm)	1664	0	1517	3288	1784	1469	0	3234	0	0	3389	0
Satd. Flow (RTOR)			170			179						
Lane Group Flow (vph)	8	0	32	513	60	179	0	988	0	0	1564	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	22.6	22.6	22.6		60.4			60.4	
Actuated g/C Ratio	0.10		0.10	0.22	0.22	0.22		0.58			0.58	
v/c Ratio	0.05		0.11	0.73	0.16	0.39		0.53			0.80	
Control Delay	44.1		0.7	44.1	32.4	7.2		17.4			19.0	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.2	
Total Delay	44.1		0.7	44.1	32.4	7.2		17.4			19.1	
LOS	D		A	D	C	A		B			B	
Approach Delay		9.4			34.4			17.4			19.1	
Approach LOS		A			C			B			B	
Queue Length 50th (m)	1.5		0.0	50.6	10.0	0.0		70.4			65.5	
Queue Length 95th (m)	6.1		0.0	61.7	19.1	15.3		104.8			#216.7	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		336	951	516	552		1860			1950	
Starvation Cap Reductn	0		0	0	0	0		0			43	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.04		0.10	0.54	0.12	0.32		0.53			0.82	

Intersection Summary	
Cycle Length: 105	
Actuated Cycle Length: 105	
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 21.9	Intersection LOS: C
Intersection Capacity Utilization 78.4%	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: 3: Greenbank/Pinecrest & Bus Only/Hwy 417

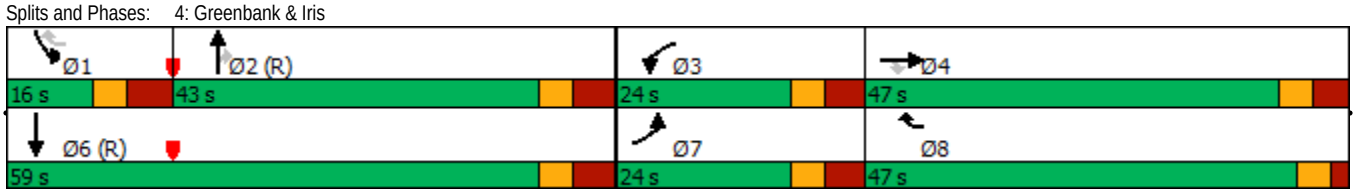


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	444	267	317	221	0	543	0	939	128	221	885	17
Future Volume (vph)	444	267	317	221	0	543	0	939	128	221	885	17
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3371	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3288	1784	1430	3189	0	2669	0	4871	1475	3268	3371	0
Satd. Flow (RTOR)			161			97			157		2	
Lane Group Flow (vph)	493	297	352	246	0	603	0	1043	142	246	1002	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	47.0	47.0	12.1		23.3		42.5	42.5	12.6	42.5	
Total Split (s)	24.0	47.0	47.0	24.0		47.0		43.0	43.0	16.0	59.0	
Total Split (%)	18.5%	36.2%	36.2%	18.5%		36.2%		33.1%	33.1%	12.3%	45.4%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	16.9	29.1	29.1	14.5		52.5		40.7	40.7	16.4	64.7	
Actuated g/C Ratio	0.13	0.22	0.22	0.11		0.40		0.31	0.31	0.13	0.50	
v/c Ratio	1.15	0.74	0.79	0.67		0.53		0.68	0.25	0.59	0.60	
Control Delay	142.3	58.1	38.0	64.5		25.6		42.6	5.2	60.4	26.7	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	142.3	58.1	38.0	64.5		25.6		42.6	5.2	60.4	26.7	
LOS	F	E	D	E		C		D	A	E	C	
Approach Delay		88.3			36.9			38.1			33.4	
Approach LOS		F			D			D			C	
Queue Length 50th (m)	~76.5	72.9	49.2	31.5		55.3		85.3	0.0	30.7	91.2	
Queue Length 95th (m)	#110.6	91.7	76.3	44.7		69.0		107.9	12.5	#65.2	139.9	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	427	548	551	427		1135		1525	569	415	1679	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	1.15	0.54	0.64	0.58		0.53		0.68	0.25	0.59	0.60	

Intersection Summary

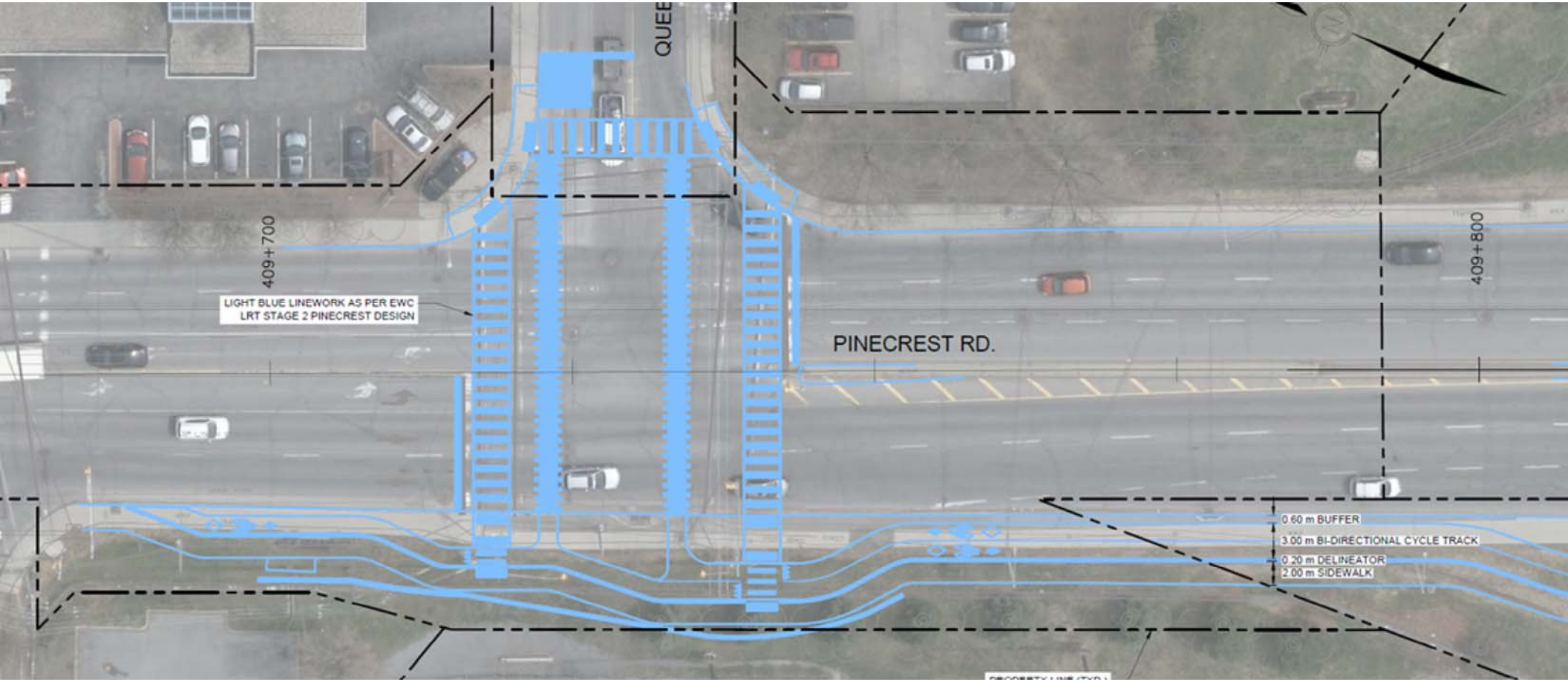
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 49.5 Intersection LOS: D
Intersection Capacity Utilization 93.7% ICU Level of Service F
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.

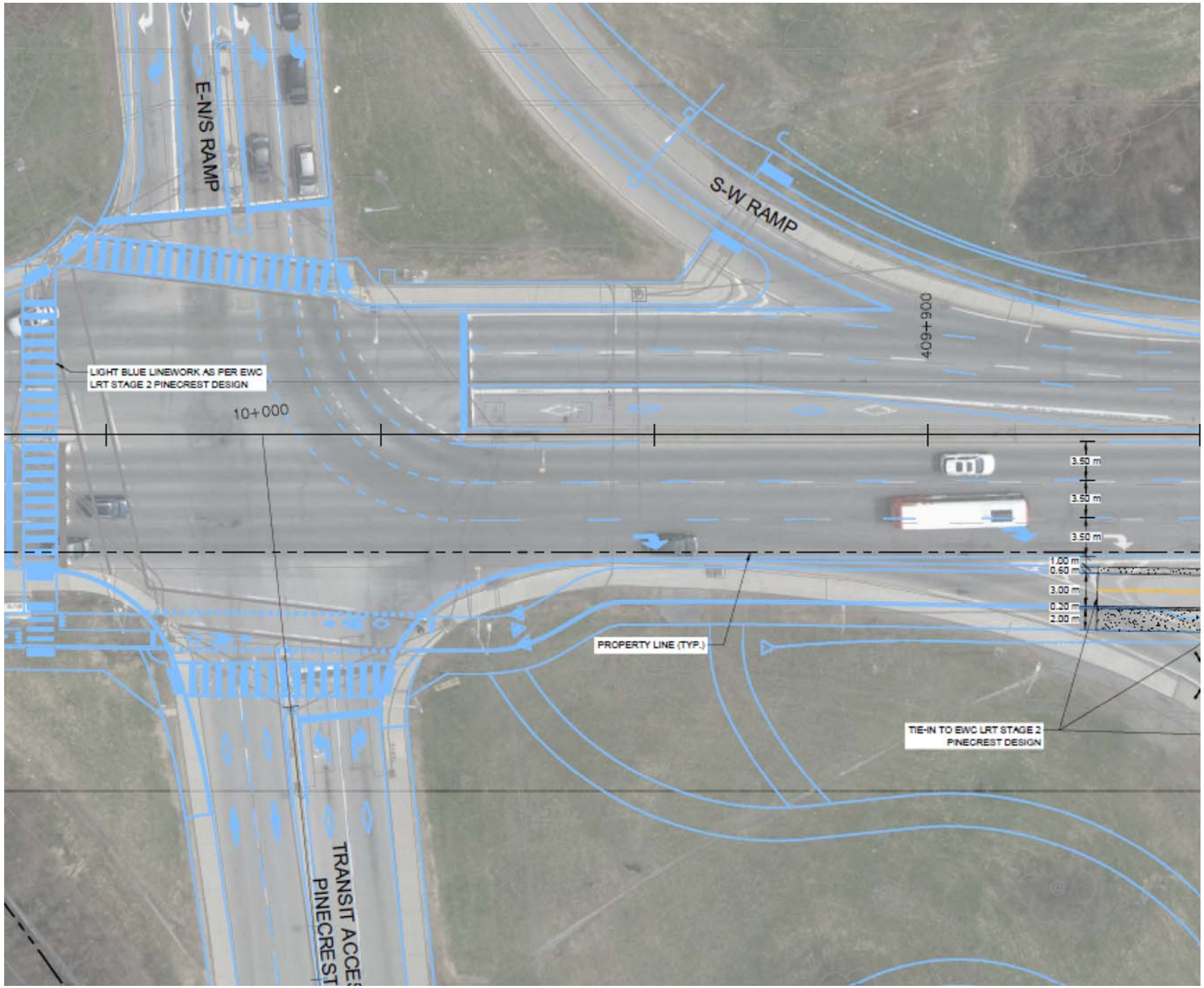
Splits and Phases: 4: Greenbank & Iris



APPENDIX F

PINECREST ROAD GEOMETRIC MODIFICATIONS


QUEE
409+700
409+800
LIGHT BLUE LINEWORK AS PER EWC
LRT STAGE 2 PINECREST DESIGN
PINECREST RD.
0.60 m BUFFER
3.00 m BI-DIRECTIONAL CYCLE TRACK
0.20 m DELINEATOR
2.00 m SIDEWALK


E-N/S RAMP
S-W RAMP
409+900
LIGHT BLUE LINEWORK AS PER EWC
LRT STAGE 2 PINECREST DESIGN
10+000
3.50 m
3.50 m
3.50 m
1.00 m
0.60 m
3.00 m
0.20 m
2.00 m
PROPERTY LINE (TYP.)
TIE-IN TO EWC LRT STAGE 2
PINECREST DESIGN
TRANSIT ACCES
PINECREST

APPENDIX G

MMLOS: BOUNDARY STREETS ROAD SEGMENTS

Multi-Modal Level of Service - Segments Form

Consultant	Parsons	**Project**	477580
Scenario	2829 Dumaurier	**Date**	#########
Comments			

SEGMENTS		Street A	Dumaurier Northwest	Dumaurier Southeast	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Section 9
Pedestrian	Sidewalk Width Boulevard Width	B	1.8 m 0.5 - 2 m	no sidewalk n/a							
	Avg Daily Curb Lane Traffic Volume		≤ 3000	≤ 3000							
	Operating Speed On-Street Parking		> 50 to 60 km/h yes	> 50 to 60 km/h no							
	Exposure to Traffic PLoS		**B**	**F**	-	-	-	-	-	-	-
	Effective Sidewalk Width		1.5 m								
	Pedestrian Volume		250 ped/hr								
	Crowding PLoS		**B**	-	-	-	-	-	-	-	-
	Level of Service		**B**	-	-	-	-	-	-	-	-
Bicycle	Type of Cycling Facility	F	Mixed Traffic	Mixed Traffic							
	Number of Travel Lanes		≤ 2 (no centreline)	≤ 2 (no centreline)							
	Operating Speed		≥ 60 km/h	≥ 60 km/h							
	# of Lanes & Operating Speed LoS		**F**	**F**	-	-	-	-	-	-	-
	Bike Lane (+ Parking Lane) Width										
	Bike Lane Width LoS		-	-	-	-	-	-	-	-	-
	Bike Lane Blockages										
	Blockage LoS		-	-	-	-	-	-	-	-	-
	Median Refuge Width (no median = < 1.8 m)		≥ 1.8 m refuge	≥ 1.8 m refuge							
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes							
	Sidestreet Operating Speed		≤ 40 km/h	≤ 40 km/h							
	Unsignalized Crossing - Lowest LoS		**A**	**A**	-	-	-	-	-	-	-
	Level of Service		**F**	**F**	-	-	-	-	-	-	-
Transit	Facility Type	D	Mixed Traffic	Mixed Traffic							
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8							
	Level of Service		**D**	**D**	-	-	-	-	-	-	-
Truck	Truck Lane Width	B	> 3.7 m	> 3.7 m							
	Travel Lanes per Direction		1	1							
	Level of Service		**B**	**B**	-	-	-	-	-	-	-

APPENDIX H

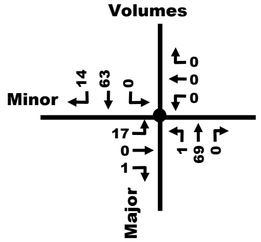
WARRANT ANALYSIS

Site/Dumaurier - Future

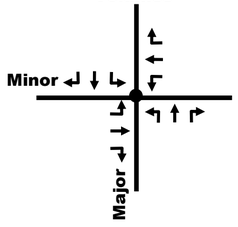
AWSC Warrant			Description	Minimum Requirement for a 'T' intersection	Compliance		
					Sectional %	Entire %	Warrant
Intersection	1. Minimum Volume Criterion	A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of on Average Day, or	200	83%	23%	**No**
		B	Vehicle Volume, All Approaches for the Heaviest Peak Hour, and	350	0%		
		C	Vehicle and pedestrian Volume, Along Minor Streets for Each of the Same 8 Hours, and	80	23%		
		D	The volume split between the major and minor streets	75/25	37%		
	2. Minimum Collision Criterion	A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	9		0%	

Note: ***n/a*** *preventable by AWSC collisions (i.e. right angle and turning movement collisions) were reported during a 3 year time period*

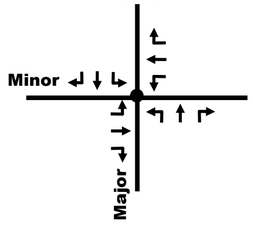
Average 8 Hour Volumes



AM Peak Hour Volumes



PM Peak Hour Volumes



		Major Dumaurier						**Minor** Site					
	Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing	8 hr												
	AM												
	PM												
Site Generated	AM	1	126			82	19	42		2			
	PM	2	151			168	37	27		1			
	Avg. 8 hr	1	69	0	0	63	14	17	0	1	0	0	0

Dumaurier/Site - (peak hour signal warrant)

Signal Warrant		Description		Minimum Requirement for Two-Lane Roadways	Compliance		
				Restricted Flow - Operating Speed Less Than 70 km/h	Sectional %	Entire %	Warrant
Intersection	1. Minimum Vehicular Volume	(1) A	Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of on Average Day, and	720	23%	7%	**20% No**
		(4) B	Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	255	7%		
	2. Delay to Cross Traffic	(1) A	Vehicle Volume, Along Major Street for Each of the Heaviest 8 Hours of an Average Day, and	720	20%	20%	
		(2) B	Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours	75	23%		

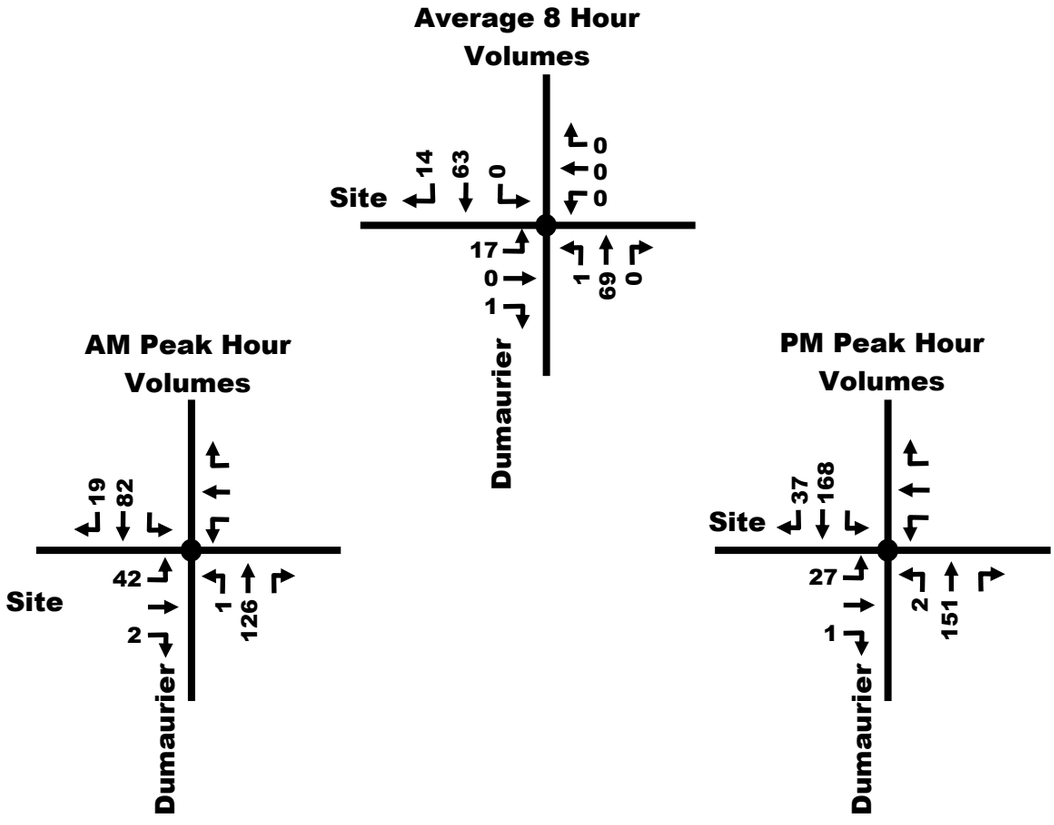
Notes

1 *Vehicle Volume Warrants (1A), (2A) and (5B) for Roadways Having Two or More Moving Lanes in one Direction Should Be 25% Higher Than Values Given Above* — **No**

2 *For Definition of Crossing Volume Refer to Note 4 on the Signal Warrant Analysis Form B2.03.08*

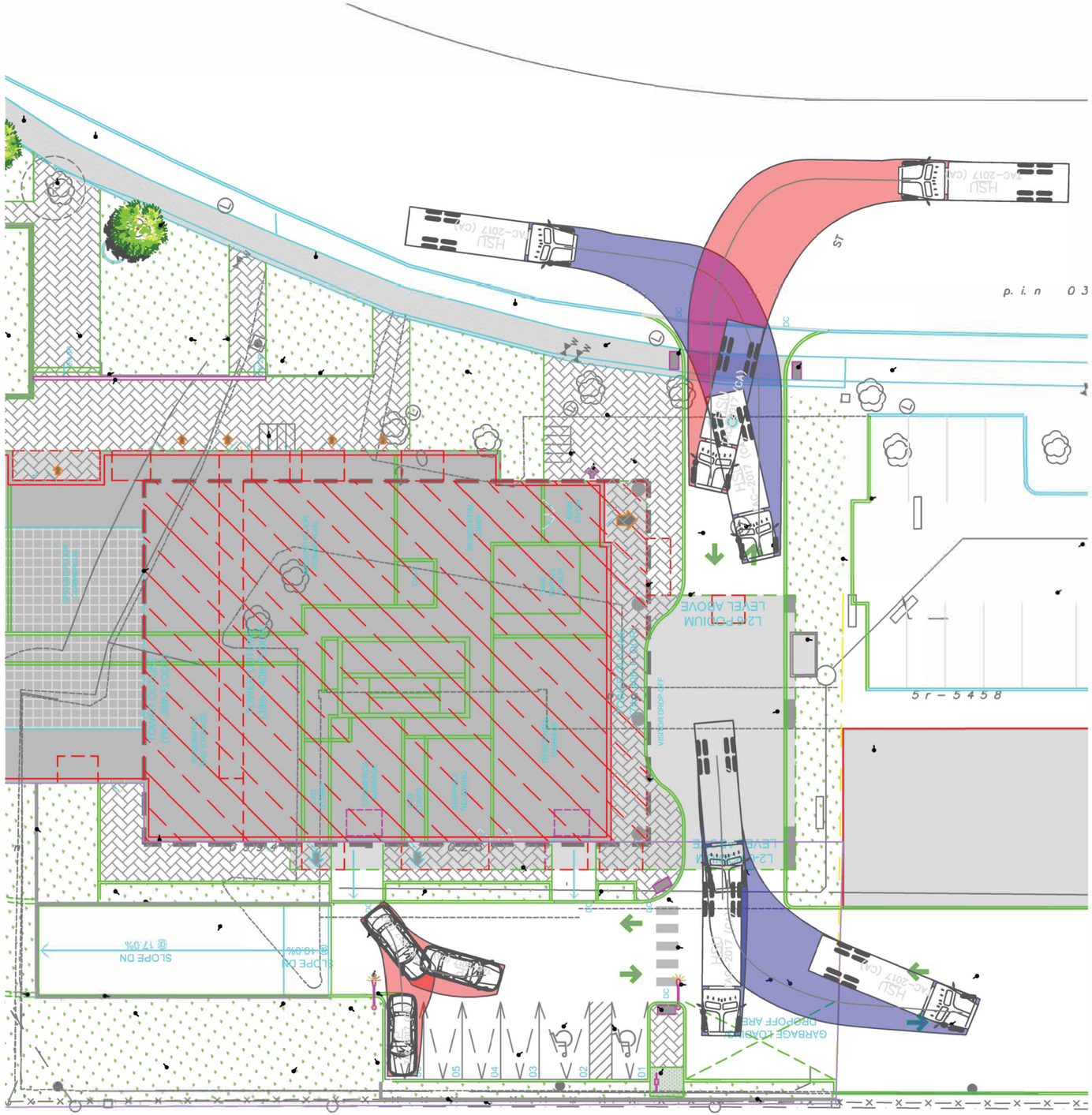
3 *The Lowest Sectional Percentage Governs the Entire Warrant*

4 *For "T" Intersections the Warrant Values for Minor Street Should be Increased by 50% (Warrant 1B only)* — **Yes**



APPENDIX I

TRUCK TURNING TEMPLATES



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NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

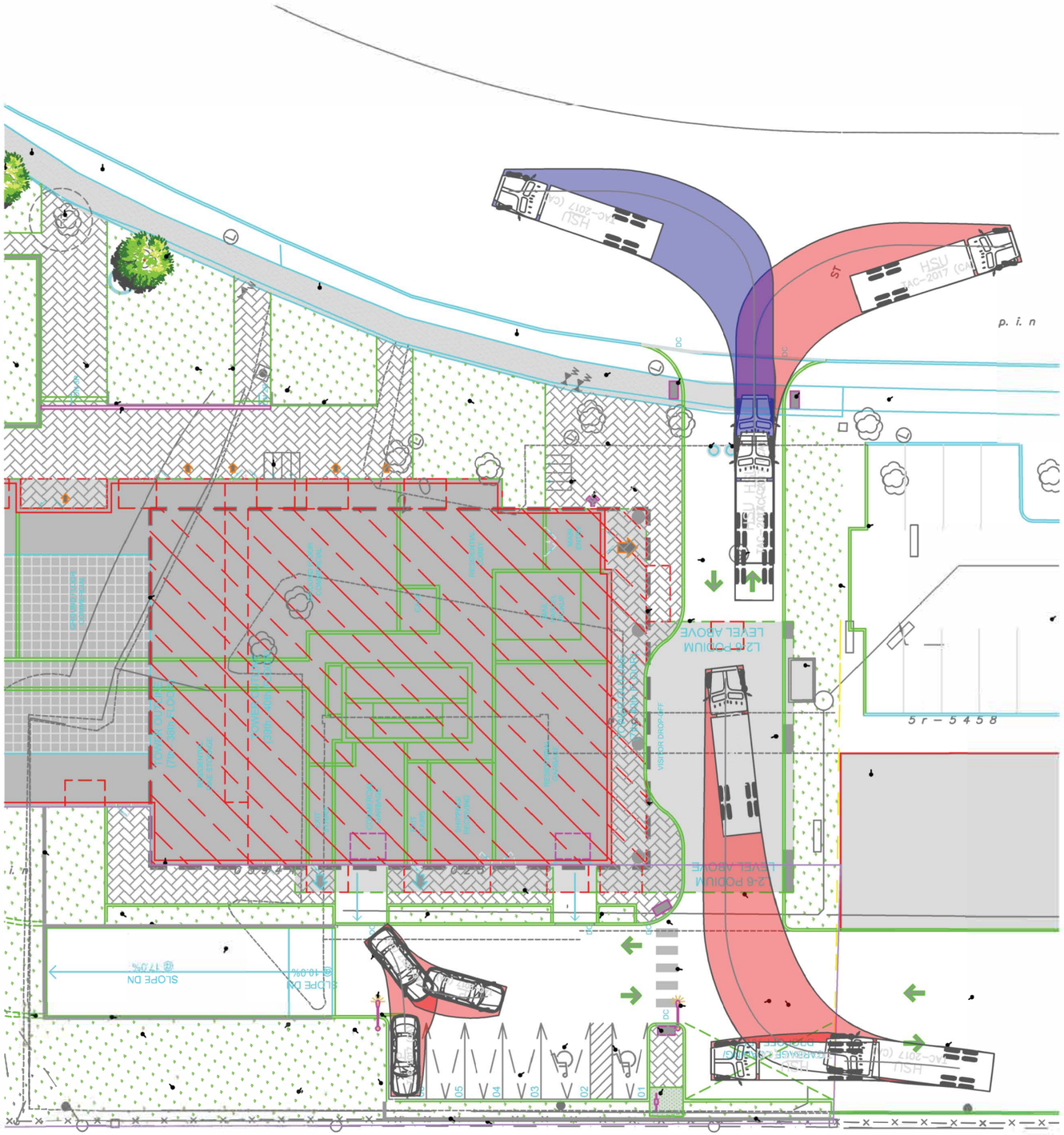
N

Legend

HSU

Not to Scale

Drawing Description: HSU Garbage Collection with Front Loading		
Client: Brigil	Date: April 2023	Figure Number: 1
Project Number: 2829 Dumaurier Avenue	Project Description:	



PARSONS

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

N

Legend

HSU

Not to Scale

Drawing Description	HSU Garbage Collection with Front Loading
Client: Brigil	Date: April 2023
Figure Number: 2	
Project Number: 2829 Dumaurier Avenue	Project Description

APPENDIX J

TDM CHECKLIST

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☑ *Parking on back side and underground*
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑ *Main entrance faces Dumaurier*
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑ *Modern design building with many windows*
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☑ *Main entrance connects to sidewalk on Dumaurier Avenue which has connectivity to the MUP that goes to the future proposed LRT Pinecrest Station*
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑ *Refer to comment 1.2.1.*

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑ *New sidewalks to be built to City Standards. Dumaurier existing*
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑ *New sidewalks to be built to City Standards. Dumaurier existing*
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☑ *Main entrance connects to sidewalk on Dumaurier Avenue which has connectivity to the MUP that goes to the future proposed LRT Pinecrest Station*
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑ *refer to comment 1.2.5*
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☑ *Street lighting already available on Dumaurier*
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☑ *walking, cycling and transit maps to be displayed*

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑ *Majority located indoors*
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑ *exceeds minimum*
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☑ *Most located indoors*
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☑ *a drop off/pick up space has been proposed on the south side of the tower.*
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses *(see Zoning By-law Section 94)*	☑ *the proponent is investigating potential contract with carshare provider*
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☑ *the proponent is investigating potential contract with bikeshare provider*
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☐ *minimum parking not met. Refer to Section 4.2 of report.*
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☑ *a low parking ratio has been proposed to promote active travel such as transit, walk, bike.*
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☑ *visitor and commercial parking blended use proposed. Refer to Section 4.2 of report.*
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	☑ *visitor parking located on surface level and additional below grade. Long-term resident parking below grade only.*

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☑
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☑
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☑
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☑
BETTER		3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
		3.2	**Transit fare incentives**	
BASIC	★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☑
BETTER		3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		3.3	**Enhanced public transit service**	
BETTER	★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐
		3.4	**Private transit service**	
BETTER		3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
		4.	**CARSHARING & BIKESHARING**	
		4.1	**Bikeshare stations & memberships**	
BETTER		4.1.1	Contract with provider to install on-site bikeshare station (*multi-family)*	☑ *the proponent is investigating potential contract with bikeshare provider*
BETTER		4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☑ *the proponent is investigating potential contract with bikeshare provider*
		4.2	**Carshare vehicles & memberships**	
BETTER		4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☑ *the proponent is investigating potential contract with carshare provider*
BETTER		4.2.2	Provide residents with carshare memberships, either free or subsidized	☑ *the proponent is investigating potential contract with carshare provider*
		5.	**PARKING**	
		5.1	**Priced parking**	
BASIC	★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐
BASIC	★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☑

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☑

APPENDIX K

MMLOS: INTERSECTION ANALYSIS

Multi-Modal Level of Service - Intersections Form

Consultant	Parsons	**Project**	477580
Scenario	2829 Dumaurier Ave	**Date**	25-Nov
Comments			

Unlocked Rows for Replicating

INTERSECTIONS		Dumaurier/Pinecrest				Hwy 417/Pinecrest				Iris/Greenbank				Queensview/Pinecrest			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	4	6		3	6	6	4	4	9	8	7	6	6	6	3	
	Median	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	
	Conflicting Left Turns	No left turn / Prohib.	Protected/ Permissive		Permissive	No left turn / Prohib.	Protected/ Permissive	Protected	Protected	Protected	No left turn / Prohib.	Protected	Protected	Protected/ Permissive	No left turn / Prohib.	Permissive	
	Conflicting Right Turns	Permissive or yield control	No right turn		Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Protected	Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control	
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR prohibited		RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed	
	Ped Signal Leading Interval?	No	No		No	No	No	No	No	No	No	No	No	No	No	No	
	Right Turn Channel	No Channel	No Right Turn		No Channel	No Channel	No Right Turn	No Channel	No Channel	Conventional with Receiving Lane	No Channel	No Channel	Conv'tl without Receiving Lane	No Right Turn	No Channel	No Channel	
	Corner Radius	5-10m	No Right Turn		5-10m	10-15m	No Right Turn	10-15m	10-15m	15-25m	15-25m	10-15m	15-25m	No Right Turn	5-10m	5-10m	
	Crosswalk Type	Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	
	PETSI Score	**62**	**38**		**71**	**28**		**61**	**61**		**1**	**20**	**35**	**38**	**29**	**71**	
	Ped. Exposure to Traffic LoS	**C**	**E**	**-**	**C**	**F**	**-**	**C**	**C**	**-**	**F**	**F**	**E**	**E**	**F**	**C**	**-**
	Cycle Length	105	105		105	105	105	105	105	130	130	130	130	105	105	105	
	Effective Walk Time	27	27		20	30	30	24	24		40	35	35	20	20	27	
	Average Pedestrian Delay	**29**	**29**		**34**	**27**	**27**	**31**	**31**		**31**	**35**	**35**	**34**	**34**	**29**	
	Pedestrian Delay LoS	**C**	**C**	**-**	**D**	**C**	**C**	**D**	**D**	**-**	**D**	**D**	**D**	**D**	**D**	**C**	**-**
	Level of Service	**C**	**E**	**-**	**D**	**F**	**C**	**D**	**D**	**-**	**F**	**F**	**E**	**E**	**F**	**C**	**-**
		E				**F**				**F**				**F**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic		Mixed Traffic	Mixed Traffic	Mixed Traffic			Mixed Traffic	Mixed Traffic	Mixed Traffic		Mixed Traffic	Mixed Traffic	Mixed Traffic	
	Right Turn Lane Configuration	≤ 50 m			≤ 50 m	≤ 50 m	≤ 50 m			> 50 m	> 50 m	Dual RT-lanes			≤ 50 m	≤ 50 m	
	Right Turning Speed	≤ 25 km/h			≤ 25 km/h	≤ 25 km/h	≤ 25 km/h			≤ 25 km/h	≤ 25 km/h	≤ 25 km/h			≤ 25 km/h	≤ 25 km/h	
	Cyclist relative to RT motorists	**D**	**#N/A**	**-**	**D**	**D**	**D**	**-**	**-**	**F**	**F**	**F**	**-**	**#N/A**	**D**	**D**	**-**
	Separated or Mixed Traffic	**Mixed Traffic**	**Mixed Traffic**	**-**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**-**	**-**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**-**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**-**
	Left Turn Approach		≥ 2 lanes crossed		One lane crossed					Other LT config		Other LT config		≥ 2 lanes crossed		One lane crossed	
	Operating Speed		> 40 to ≤ 50 km/h		> 40 to ≤ 50 km/h					> 40 to ≤ 50 km/h		> 40 to ≤ 50 km/h		> 40 to ≤ 50 km/h		> 40 to ≤ 50 km/h	
	Left Turning Cyclist	**-**	**E**	**-**	**D**	**-**	**-**	**-**	**-**	**F**	**-**	**F**	**-**	**E**	**-**	**D**	**-**
	Level of Service	**-**	**#N/A**	**-**	**D**	**-**	**-**	**-**	**-**	**F**	**-**	**F**	**-**	**#N/A**	**-**	**D**	**-**
		#N/A				**-**				**F**				**#N/A**			
Transit	Average Signal Delay	≤ 20 sec	≤ 20 sec		≤ 20 sec	≤ 20 sec	≤ 20 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 10 sec	≤ 10 sec		
	Level of Service	**C**	**C**	**-**	**C**	**C**	**C**	**F**	**F**	**F**	**F**	**F**	**F**	**B**	**B**	**-**	**-**
		C				**F**				**F**				**B**			
Truck	Effective Corner Radius							10 - 15 m					> 15 m				
	Number of Receiving Lanes on Departure from Intersection							≥ 2					≥ 2				
	Level of Service	**-**	**-**	**-**	**-**	**-**	**-**	**B**	**-**	**-**	**-**	**-**	**A**	**-**	**-**	**-**	**-**
		-				**B**				**A**				**-**			
Auto	Volume to Capacity Ratio																
	Level of Service	**-**				**-**				**-**				**-**			

Multi-Modal Level of Service - Intersections Form

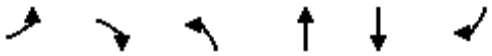
Consultant	**Parsons**	**Project**	**477580**
Scenario	**2829 Dumaurier Ave**	**Date**	**25-Nov**
Comments			

Unlocked Rows for Replicating

INTERSECTIONS		FUTURE Queensview/Pinecrest				FUTURE Hwy 417/Pinecrest							
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes	6	6	3		6	6	4	4				
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m				
	Conflicting Left Turns	Protected/ Permissive	No left turn / Prohib.	Permissive		No left turn / Prohib.	Protected/ Permissive	Protected	Protected				
	Conflicting Right Turns	No right turn	Permissive or yield control	Permissive or yield control		Permissive or yield control	No right turn	Permissive or yield control	Permissive or yield control				
	Right Turns on Red (RToR) ?	RTOR prohibited	RTOR allowed	RTOR allowed		RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed				
	Ped Signal Leading Interval?	No	No	No		No	No	No	No				
	Right Turn Channel	No Right Turn	No Channel	No Channel		No Channel	No Right Turn	No Channel	No Channel				
	Corner Radius	No Right Turn	5-10m	5-10m		10-15m	No Right Turn	10-15m	10-15m				
	Crosswalk Type	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings		Zebra stripe hi-vis markings		Zebra stripe hi-vis markings	Zebra stripe hi-vis markings				
	PETSI Score	**41**	**32**	**74**		**31**		**64**	**64**				
	Ped. Exposure to Traffic LoS	**E**	**E**	**C**	**-**	**E**	**-**	**C**	**C**	**-**	**-**	**-**	**-**
	Cycle Length	105	105		105	105	105	105	105				
	Effective Walk Time	27	27		20	30	30	24	24				
	Average Pedestrian Delay	**29**	**29**		**34**	**27**	**27**	**31**	**31**				
	Pedestrian Delay LoS	**C**	**C**	**-**	**D**	**C**	**C**	**D**	**D**	**-**	**-**	**-**	**-**
	Level of Service	**E**	**E**	**C**	**D**	**E**	**C**	**D**	**D**	**-**	**-**	**-**	**-**
		E				**E**				**-**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach				Curb Bike Lane, Cycletrack or MUP				Curb Bike Lane, Cycletrack or MUP				
	Right Turn Lane Configuration				Not Applicable				Not Applicable				
	Right Turning Speed				Not Applicable				Not Applicable				
	Cyclist relative to RT motorists	**-**	**-**	**-**	**Not Applicable**	**-**	**-**	**-**	**Not Applicable**	**-**	**-**	**-**	**-**
	Separated or Mixed Traffic	**-**	**-**	**-**	**Separated**	**-**	**-**	**-**	**Separated**	**-**	**-**	**-**	**-**
	Left Turn Approach				No lane crossed				No lane crossed				
	Operating Speed				> 50 to < 60 km/h				> 50 to < 60 km/h				
	Left Turning Cyclist	**-**	**-**	**-**	**C**	**-**	**-**	**-**	**C**	**-**	**-**	**-**	**-**
	Level of Service	**-**	**-**	**-**	**C**	**-**	**-**	**-**	**C**	**-**	**-**	**-**	**-**
		C				**C**				**-**			
Transit	Average Signal Delay	≤ 10 sec	≤ 10 sec			≤ 20 sec	≤ 20 sec	> 40 sec	> 40 sec				
	Level of Service	**B**	**B**	**-**	**-**	**C**	**C**	**F**	**F**	**-**	**-**	**-**	**-**
		B				**F**				**-**			
Truck	Effective Corner Radius							10 - 15 m					
	Number of Receiving Lanes on Departure from Intersection							≥ 2					
	Level of Service	**-**	**-**	**-**	**-**	**-**	**-**	**B**	**-**	**-**	**-**	**-**	**-**
		-				**B**				**-**			
Auto	Volume to Capacity Ratio												
	Level of Service	**-**				**-**				**-**			

APPENDIX L

SYNCHRO ANALYSIS: BACKGROUND INTERSECTION PERFORMANCE



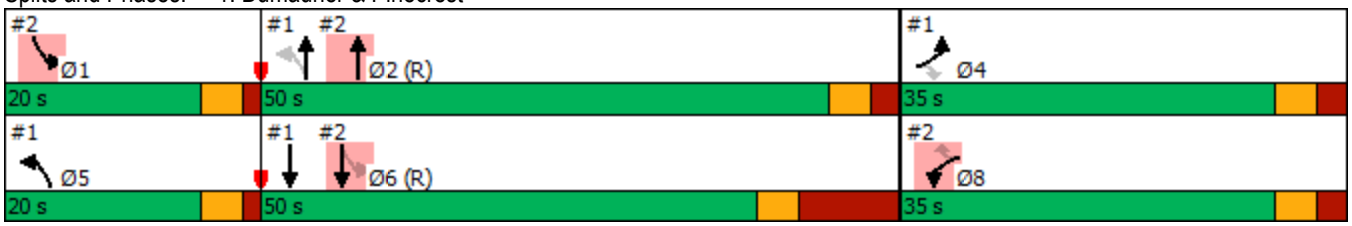
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	27	113	69	1007	753	22		
Future Volume (vph)	27	113	69	1007	753	22		
Satd. Flow (prot)	1695	1517	1695	3390	3372	0		
Flt Permitted	0.950		0.354					
Satd. Flow (perm)	1695	1495	628	3390	3372	0		
Satd. Flow (RTOR)		113			3			
Lane Group Flow (vph)	27	113	69	1007	775	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	35.0	35.0	20.0	50.0	50.0		20.0	35.0
Total Split (%)	33.3%	33.3%	19.0%	47.6%	47.6%		19%	33%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	14.0	14.0	76.9	70.4	64.6			
Actuated g/C Ratio	0.13	0.13	0.73	0.67	0.62			
v/c Ratio	0.12	0.38	0.13	0.44	0.37			
Control Delay	38.1	10.5	1.8	3.0	12.4			
Queue Delay	0.0	0.0	0.1	0.1	0.0			
Total Delay	38.1	10.5	1.9	3.1	12.4			
LOS	D	B	A	A	B			
Approach Delay	15.8			3.0	12.4			
Approach LOS	B			A	B			
Queue Length 50th (m)	5.1	0.0	0.8	9.8	36.2			
Queue Length 95th (m)	10.9	13.0	2.2	14.9	74.0			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	471	497	637	2273	2077			
Starvation Cap Reductn	0	0	168	290	0			
Spillback Cap Reductn	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.06	0.23	0.15	0.51	0.37			

Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 54.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Dumaurier & Pinecrest



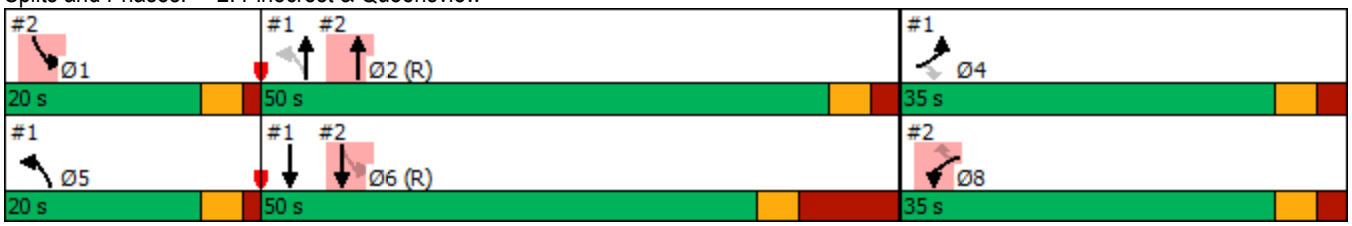
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	84	32	954	305	64	780		
Future Volume (vph)	84	32	954	305	64	780		
Satd. Flow (prot)	1695	1517	4636	0	1695	3390		
Flt Permitted	0.950				0.187			
Satd. Flow (perm)	1673	1495	4636	0	333	3390		
Satd. Flow (RTOR)		32	95					
Lane Group Flow (vph)	84	32	1259	0	64	780		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	35.0	35.0	50.0		20.0	50.0	35.0	20.0
Total Split (%)	33.3%	33.3%	47.6%		19.0%	47.6%	33%	19%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.8	5.8	5.6		4.7	11.3		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	14.0	14.0	70.4		76.7	64.6		
Actuated g/C Ratio	0.13	0.13	0.67		0.73	0.62		
v/c Ratio	0.37	0.14	0.40		0.20	0.37		
Control Delay	44.4	12.8	1.8		2.7	3.6		
Queue Delay	0.0	0.0	0.1		0.0	0.2		
Total Delay	44.4	12.8	1.9		2.8	3.8		
LOS	D	B	A		A	A		
Approach Delay	35.7		1.9			3.7		
Approach LOS	D		A			A		
Queue Length 50th (m)	16.5	0.0	4.5		0.4	7.2		
Queue Length 95th (m)	25.9	7.1	12.0		2.2	14.5		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	471	438	3140		453	2086		
Starvation Cap Reductn	0	0	493		33	474		
Spillback Cap Reductn	0	0	0		0	0		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.18	0.07	0.48		0.15	0.48		

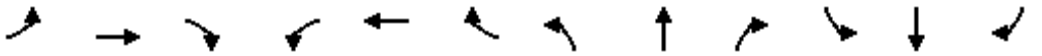
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 4.4	Intersection LOS: A
Intersection Capacity Utilization 53.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Pinecrest & Queensview





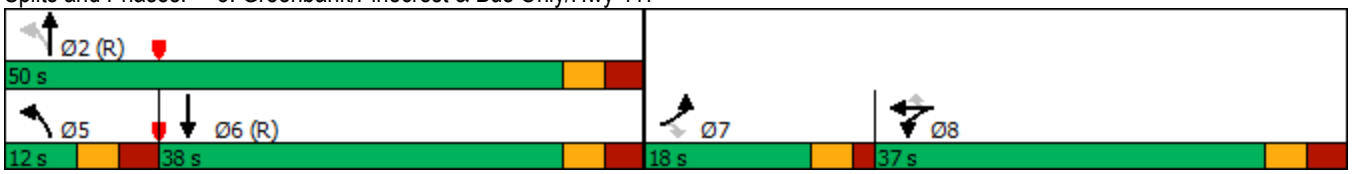
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	64	390	25	272	1	1015	0	0	860	0
Future Volume (vph)	2	0	64	390	25	272	1	1015	0	0	860	0
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3390	0
Flt Permitted	0.950			0.950				0.955				
Satd. Flow (perm)	1652	0	1496	3288	1784	1458	0	3238	0	0	3390	0
Satd. Flow (RTOR)			170			272						
Lane Group Flow (vph)	2	0	64	390	25	272	0	1016	0	0	860	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	19.6	19.6	19.6		60.4			60.4	
Actuated g/C Ratio	0.10		0.10	0.19	0.19	0.19		0.58			0.58	
v/c Ratio	0.01		0.22	0.63	0.08	0.55		0.55			0.44	
Control Delay	43.5		1.7	43.4	32.4	8.4		17.4			7.0	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.1	
Total Delay	43.5		1.7	43.4	32.4	8.4		17.4			7.1	
LOS	D		A	D	C	A		B			A	
Approach Delay		2.9			29.2			17.4			7.1	
Approach LOS		A			C			B			A	
Queue Length 50th (m)	0.4		0.0	38.7	4.3	0.0		67.0			17.8	
Queue Length 95th (m)	2.7		0.0	46.5	10.0	18.4		108.8			23.5	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		334	951	516	615		1861			1948	
Starvation Cap Reductn	0		0	0	0	0		0			210	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.01		0.19	0.41	0.05	0.44		0.55			0.49	

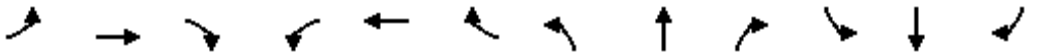
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 16.7	Intersection LOS: B
Intersection Capacity Utilization 70.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Greenbank/Pinecrest & Bus Only/Hwy 417





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	592	509	379	68	0	310	0	1419	196	165	766	30
Future Volume (vph)	592	509	379	68	0	310	0	1419	196	165	766	30
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3348	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3277	1784	1449	3235	0	2607	0	4871	1460	3269	3348	0
Satd. Flow (RTOR)			161			157			217		3	
Lane Group Flow (vph)	592	509	379	68	0	310	0	1419	196	165	796	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	25.1	47.0	47.0	12.1		24.0		42.5	42.5	12.6	42.5	
Total Split (s)	27.0	56.0	56.0	18.0		47.0		43.0	43.0	13.0	56.0	
Total Split (%)	20.8%	43.1%	43.1%	13.8%		36.2%		33.1%	33.1%	10.0%	43.1%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	19.9	43.1	43.1	8.1		44.4		40.5	40.5	11.7	59.8	
Actuated g/C Ratio	0.15	0.33	0.33	0.06		0.34		0.31	0.31	0.09	0.46	
v/c Ratio	1.18	0.86	0.65	0.33		0.31		0.94	0.32	0.56	0.52	
Control Delay	146.1	55.6	25.2	62.3		13.0		56.5	4.8	64.8	28.4	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	146.1	55.6	25.2	62.3		13.0		56.5	4.8	64.8	28.4	
LOS	F	E	C	E		B		E	A	E	C	
Approach Delay		84.0			21.9			50.2			34.6	
Approach LOS		F			C			D			C	
Queue Length 50th (m)	~93.4	121.0	47.5	8.7		13.5		~146.9	0.0	20.8	77.7	
Queue Length 95th (m)	#129.3	154.3	75.8	16.0		24.1		#176.6	13.3	#49.3	108.6	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	503	674	647	275		1114		1517	604	296	1542	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	1.18	0.76	0.59	0.25		0.28		0.94	0.32	0.56	0.52	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

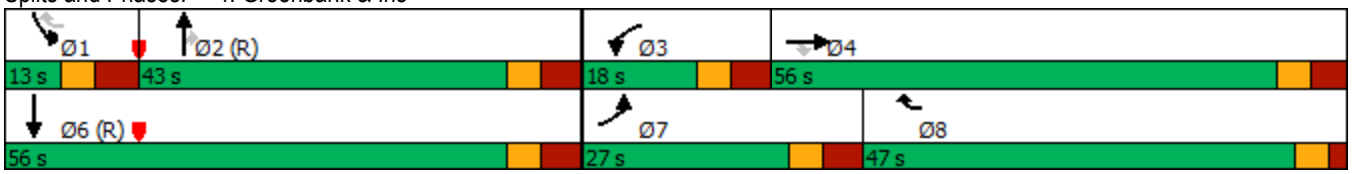
Maximum v/c Ratio: 1.18

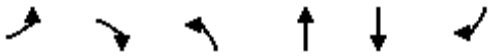
Intersection Signal Delay: 55.7	Intersection LOS: E
Intersection Capacity Utilization 84.3%	ICU Level of Service E
Analysis Period (min) 15	

~ 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: 4: Greenbank & Iris





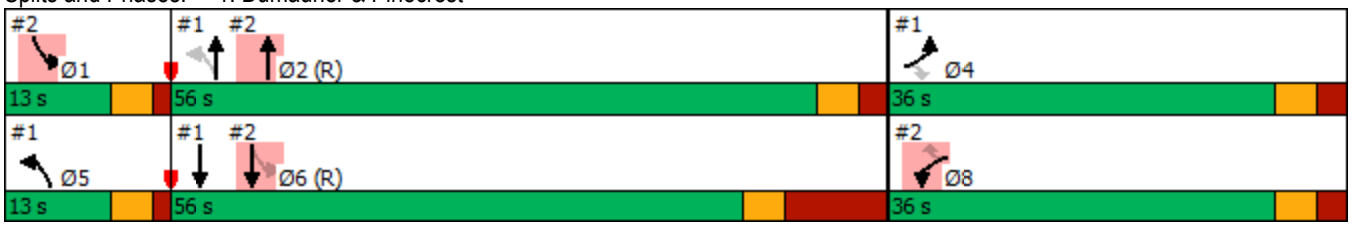
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	39	129	147	1072	1106	40		
Future Volume (vph)	39	129	147	1072	1106	40		
Satd. Flow (prot)	1695	1517	1695	3390	3366	0		
Flt Permitted	0.950		0.178					
Satd. Flow (perm)	1685	1495	317	3390	3366	0		
Satd. Flow (RTOR)		129			4			
Lane Group Flow (vph)	39	129	147	1072	1146	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	36.0	36.0	13.0	56.0	56.0		13.0	36.0
Total Split (%)	34.3%	34.3%	12.4%	53.3%	53.3%		12%	34%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	21.0	21.0	71.5	63.4	53.7			
Actuated g/C Ratio	0.20	0.20	0.68	0.60	0.51			
v/c Ratio	0.12	0.32	0.45	0.52	0.66			
Control Delay	32.6	7.8	16.0	4.4	22.7			
Queue Delay	0.0	0.0	0.1	0.0	0.0			
Total Delay	32.6	7.8	16.1	4.5	22.7			
LOS	C	A	B	A	C			
Approach Delay	13.5			5.9	22.7			
Approach LOS	B			A	C			
Queue Length 50th (m)	6.6	0.0	5.3	11.3	87.3			
Queue Length 95th (m)	14.1	13.5	18.0	17.6	131.4			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	487	521	334	2046	1724			
Starvation Cap Reductn	0	0	9	93	0			
Spillback Cap Reductn	0	0	0	0	22			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.08	0.25	0.45	0.55	0.67			

Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 14.0	Intersection LOS: B
Intersection Capacity Utilization 69.7%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Dumaurier & Pinecrest



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	255	63	982	144	47	1226		
Future Volume (vph)	255	63	982	144	47	1226		
Satd. Flow (prot)	1695	1517	4759	0	1695	3390		
Flt Permitted	0.950				0.223			
Satd. Flow (perm)	1667	1497	4759	0	397	3390		
Satd. Flow (RTOR)		63	35					
Lane Group Flow (vph)	255	63	1126	0	47	1226		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	36.0	36.0	56.0		13.0	56.0	36.0	13.0
Total Split (%)	34.3%	34.3%	53.3%		12.4%	53.3%	34%	12%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.8	5.8	5.6		4.7	11.3		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	21.0	21.0	63.4		66.8	53.7		
Actuated g/C Ratio	0.20	0.20	0.60		0.64	0.51		
v/c Ratio	0.75	0.18	0.39		0.14	0.71		
Control Delay	52.9	9.1	4.3		1.9	7.3		
Queue Delay	1.0	0.0	0.1		0.0	0.1		
Total Delay	54.0	9.1	4.4		1.9	7.4		
LOS	D	A	A		A	A		
Approach Delay	45.1		4.4			7.2		
Approach LOS	D		A			A		
Queue Length 50th (m)	49.4	0.0	5.8		0.3	14.1		
Queue Length 95th (m)	70.3	9.7	11.7		m1.1	25.9		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	487	475	2887		361	1734		
Starvation Cap Reductn	0	0	675		0	63		
Spillback Cap Reductn	83	0	15		0	32		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.63	0.13	0.51		0.13	0.73		

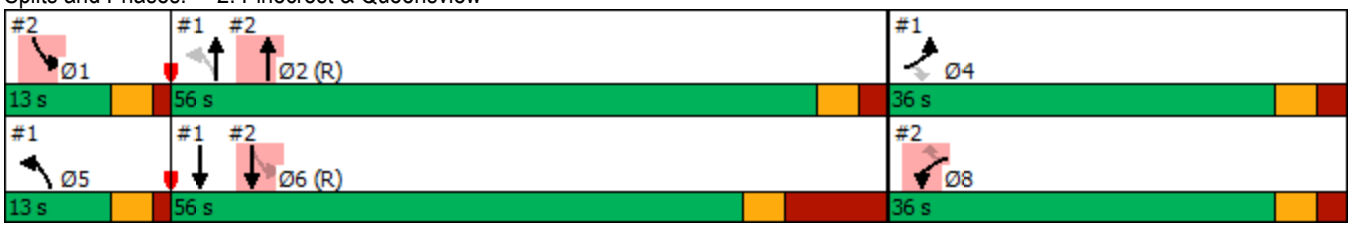
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

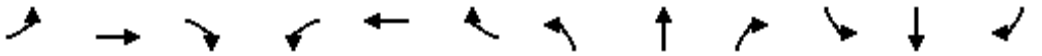
Maximum v/c Ratio: 0.75

Intersection Signal Delay: 10.5	Intersection LOS: B
Intersection Capacity Utilization 64.9%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Pinecrest & Queensview





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	0	29	462	54	165	1	898	0	0	1411	4
Future Volume (vph)	7	0	29	462	54	165	1	898	0	0	1411	4
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3389	0
Flt Permitted	0.950			0.950				0.954				
Satd. Flow (perm)	1664	0	1517	3288	1784	1469	0	3234	0	0	3389	0
Satd. Flow (RTOR)			170			165						
Lane Group Flow (vph)	7	0	29	462	54	165	0	899	0	0	1415	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	21.4	21.4	21.4		61.6			61.6	
Actuated g/C Ratio	0.10		0.10	0.20	0.20	0.20		0.59			0.59	
v/c Ratio	0.04		0.10	0.69	0.15	0.38		0.47			0.71	
Control Delay	44.0		0.7	43.8	32.9	7.5		15.9			15.1	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.1	
Total Delay	44.0		0.7	43.8	32.9	7.5		15.9			15.2	
LOS	D		A	D	C	A		B			B	
Approach Delay		9.1			34.1			15.9			15.2	
Approach LOS		A			C			B			B	
Queue Length 50th (m)	1.3		0.0	45.6	9.2	0.0		59.3			52.0	
Queue Length 95th (m)	5.6		0.0	55.4	17.6	14.8		92.3			#182.8	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		336	951	516	542		1897			1988	
Starvation Cap Reductn	0		0	0	0	0		0			45	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.03		0.09	0.49	0.10	0.30		0.47			0.73	

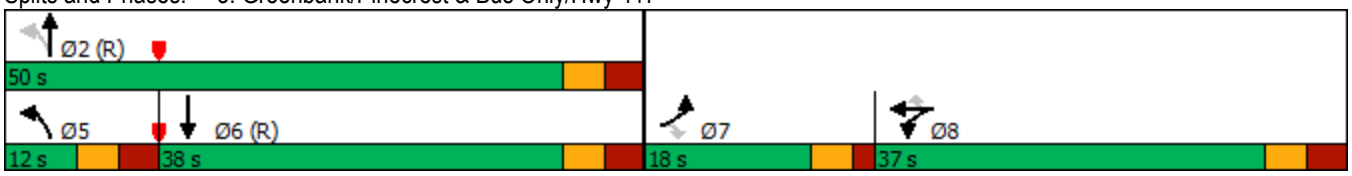
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

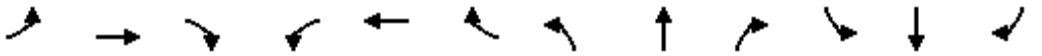
Maximum v/c Ratio: 0.71

Intersection Signal Delay: 19.6	Intersection LOS: B
Intersection Capacity Utilization 78.6%	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: 3: Greenbank/Pinecrest & Bus Only/Hwy 417





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	444	267	319	221	0	543	0	949	129	221	892	17
Future Volume (vph)	444	267	319	221	0	543	0	949	129	221	892	17
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3371	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3288	1784	1430	3184	0	2669	0	4871	1475	3266	3371	0
Satd. Flow (RTOR)			161			97			157		2	
Lane Group Flow (vph)	444	267	319	221	0	543	0	949	129	221	909	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	47.0	47.0	12.1		23.3		42.5	42.5	12.6	42.5	
Total Split (s)	24.0	47.0	47.0	24.0		47.0		43.0	43.0	16.0	59.0	
Total Split (%)	18.5%	36.2%	36.2%	18.5%		36.2%		33.1%	33.1%	12.3%	45.4%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	16.9	27.9	27.9	13.8		48.6		44.6	44.6	14.4	66.7	
Actuated g/C Ratio	0.13	0.21	0.21	0.11		0.37		0.34	0.34	0.11	0.51	
v/c Ratio	1.04	0.70	0.74	0.63		0.51		0.57	0.21	0.61	0.53	
Control Delay	108.5	56.4	32.8	63.8		26.5		37.6	3.7	62.7	24.1	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	108.5	56.4	32.8	63.8		26.5		37.6	3.7	62.7	24.1	
LOS	F	E	C	E		C		D	A	E	C	
Approach Delay		71.6			37.3			33.5			31.6	
Approach LOS		E			D			C			C	
Queue Length 50th (m)	~63.1	65.7	39.9	28.3		50.6		71.2	0.0	27.8	75.1	
Queue Length 95th (m)	#95.8	82.0	64.4	40.6		60.0		96.5	9.1	#57.2	123.1	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	427	548	551	427		1064		1671	609	365	1729	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	1.04	0.49	0.58	0.52		0.51		0.57	0.21	0.61	0.53	

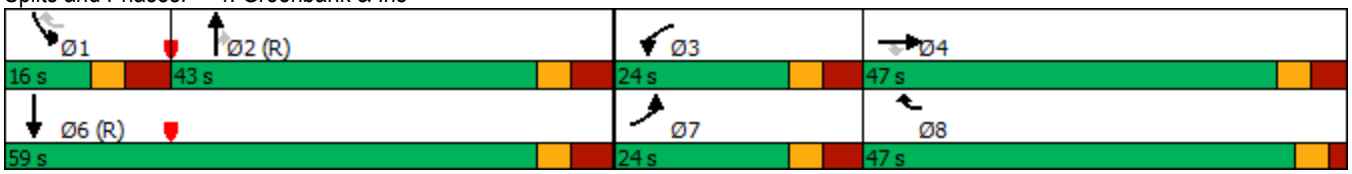
Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 43.5	Intersection LOS: D
Intersection Capacity Utilization 93.7%	ICU Level of Service F
Analysis Period (min) 15	

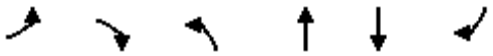
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Greenbank & Iris



APPENDIX M

SYNCHRO ANALYSIS: FUTURE INTERSECTION PERFORMANCE



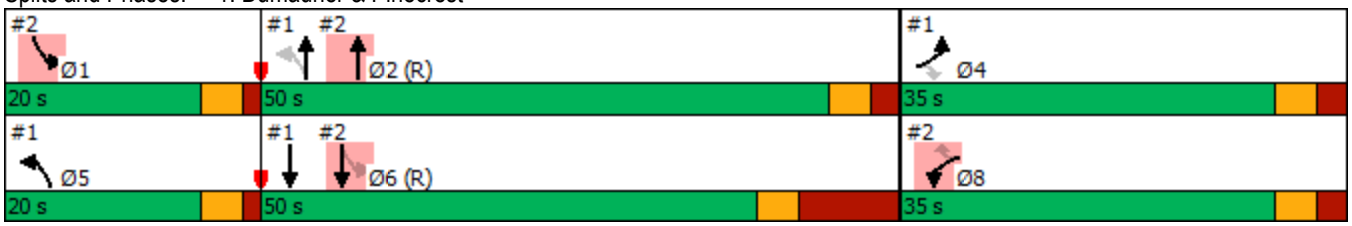
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	30	127	76	1007	753	23		
Future Volume (vph)	30	127	76	1007	753	23		
Satd. Flow (prot)	1695	1517	1695	3390	3370	0		
Flt Permitted	0.950		0.340					
Satd. Flow (perm)	1695	1481	600	3390	3370	0		
Satd. Flow (RTOR)		127			3			
Lane Group Flow (vph)	30	127	76	1007	776	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	35.0	35.0	20.0	50.0	50.0		20.0	35.0
Total Split (%)	33.3%	33.3%	19.0%	47.6%	47.6%		19%	33%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	20.2	20.2	70.8	63.9	57.9			
Actuated g/C Ratio	0.19	0.19	0.67	0.61	0.55			
v/c Ratio	0.09	0.33	0.16	0.49	0.42			
Control Delay	31.6	8.0	1.9	2.6	16.9			
Queue Delay	0.0	0.0	0.1	0.0	0.0			
Total Delay	31.6	8.0	1.9	2.6	16.9			
LOS	C	A	A	A	B			
Approach Delay	12.5			2.6	16.9			
Approach LOS	B			A	B			
Queue Length 50th (m)	4.6	0.0	0.9	9.0	55.7			
Queue Length 95th (m)	11.9	13.7	1.9	11.6	74.6			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	471	503	584	2063	1860			
Starvation Cap Reductn	0	0	99	53	0			
Spillback Cap Reductn	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.06	0.25	0.16	0.50	0.42			

Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 8.9	Intersection LOS: A
Intersection Capacity Utilization 57.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Dumaurier & Pinecrest



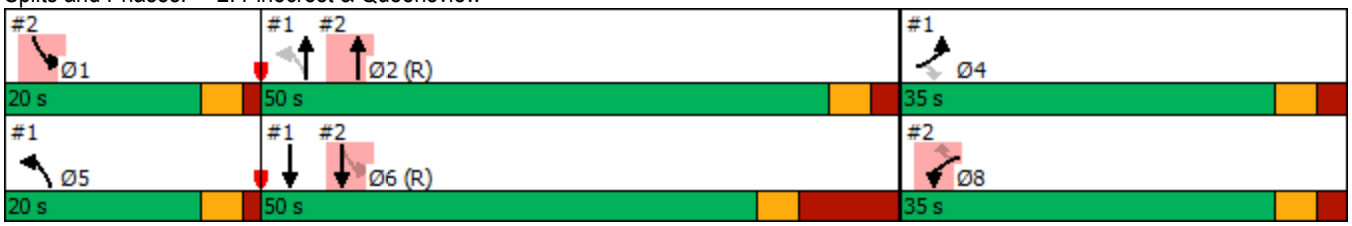
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	84	32	961	305	64	794		
Future Volume (vph)	84	32	961	305	64	794		
Satd. Flow (prot)	1695	1517	4624	0	1695	3390		
Flt Permitted	0.950				0.190			
Satd. Flow (perm)	1665	1481	4624	0	337	3390		
Satd. Flow (RTOR)		32	86					
Lane Group Flow (vph)	84	32	1266	0	64	794		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	35.0	35.0	50.0		20.0	50.0	35.0	20.0
Total Split (%)	33.3%	33.3%	47.6%		19.0%	47.6%	33%	19%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	5.7		0.0	-5.7		
Total Lost Time (s)	5.8	5.8	11.3		4.7	5.6		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	20.2	20.2	58.2		70.3	63.6		
Actuated g/C Ratio	0.19	0.19	0.55		0.67	0.61		
v/c Ratio	0.26	0.10	0.49		0.20	0.39		
Control Delay	35.3	11.0	4.5		3.2	2.5		
Queue Delay	0.0	0.0	0.1		0.0	0.1		
Total Delay	35.3	11.0	4.6		3.2	2.6		
LOS	D	B	A		A	A		
Approach Delay	28.6		4.6			2.6		
Approach LOS	C		A			A		
Queue Length 50th (m)	13.4	0.0	11.0		0.6	6.0		
Queue Length 95th (m)	25.9	7.1	16.8		2.3	11.1		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	471	434	2601		436	2054		
Starvation Cap Reductn	0	0	274		13	218		
Spillback Cap Reductn	0	0	0		0	0		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.18	0.07	0.54		0.15	0.43		

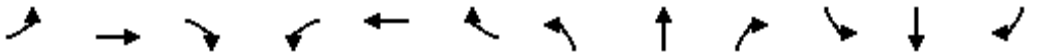
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 5.1	Intersection LOS: A
Intersection Capacity Utilization 61.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Pinecrest & Queensview





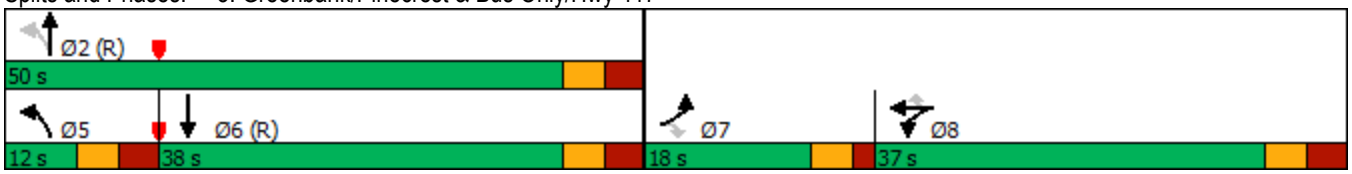
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	64	390	25	277	1	1017	0	0	874	0
Future Volume (vph)	2	0	64	390	25	277	1	1017	0	0	874	0
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3390	0
Flt Permitted	0.950			0.950				0.955				
Satd. Flow (perm)	1644	0	1496	3288	1784	1451	0	3238	0	0	3390	0
Satd. Flow (RTOR)			170			277						
Lane Group Flow (vph)	2	0	64	390	25	277	0	1018	0	0	874	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	23.8	23.8	23.8		56.2			56.2	
Actuated g/C Ratio	0.10		0.10	0.23	0.23	0.23		0.54			0.54	
v/c Ratio	0.01		0.22	0.52	0.06	0.51		0.59			0.48	
Control Delay	43.5		1.7	37.2	28.6	7.1		20.9			9.6	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	43.5		1.7	37.2	28.6	7.1		20.9			9.6	
LOS	D		A	D	C	A		C			A	
Approach Delay		2.9			24.9			20.9			9.6	
Approach LOS		A			C			C			A	
Queue Length 50th (m)	0.4		0.0	33.1	3.7	0.0		85.7			24.0	
Queue Length 95th (m)	2.7		0.0	46.5	10.0	18.4		109.1			28.0	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		334	951	516	616		1733			1815	
Starvation Cap Reductn	0		0	0	0	0		0			75	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.01		0.19	0.41	0.05	0.45		0.59			0.50	

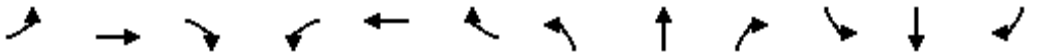
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 70.7%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Greenbank/Pinecrest & Bus Only/Hwy 417





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	593	509	379	68	0	310	0	1420	196	165	768	30
Future Volume (vph)	593	509	379	68	0	310	0	1420	196	165	768	30
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3346	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3277	1784	1440	3225	0	2607	0	4871	1456	3269	3346	0
Satd. Flow (RTOR)			161			157			217		4	
Lane Group Flow (vph)	593	509	379	68	0	310	0	1420	196	165	798	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	25.1	47.0	47.0	12.1		24.0		42.5	42.5	12.6	42.5	
Total Split (s)	35.0	50.0	50.0	12.1		27.1		51.1	51.1	16.8	67.9	
Total Split (%)	26.9%	38.5%	38.5%	9.3%		20.8%		39.3%	39.3%	12.9%	52.2%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	26.5	41.4	41.4	5.0		30.8		47.5	47.5	9.4	64.5	
Actuated g/C Ratio	0.20	0.32	0.32	0.04		0.24		0.37	0.37	0.07	0.50	
v/c Ratio	0.88	0.90	0.67	0.54		0.42		0.80	0.29	0.70	0.48	
Control Delay	65.9	62.0	27.5	77.3		19.2		42.1	3.9	74.8	23.7	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	65.9	62.0	27.5	77.3		19.2		42.1	3.9	74.8	23.7	
LOS	E	E	C	E		B		D	A	E	C	
Approach Delay		54.8			29.6			37.5			32.4	
Approach LOS		D			C			D			C	
Queue Length 50th (m)	75.6	121.8	47.8	9.0		16.6		124.6	0.0	21.7	73.6	
Queue Length 95th (m)	#101.8	#180.4	83.3	16.8		30.1		144.2	12.1	#36.1	91.8	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	705	590	584	126		774		1778	669	240	1660	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.84	0.86	0.65	0.54		0.40		0.80	0.29	0.69	0.48	

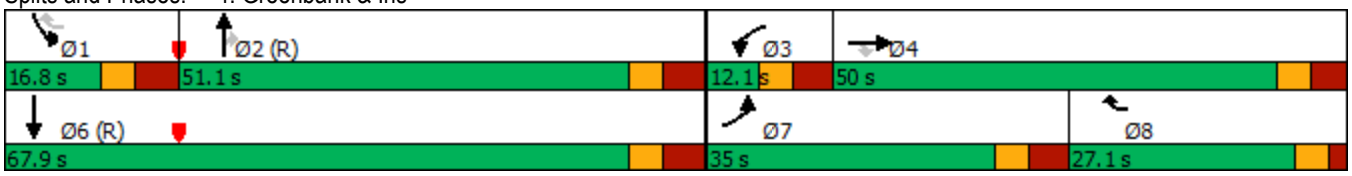
Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 41.5	Intersection LOS: D
Intersection Capacity Utilization 84.6%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 4: Greenbank & Iris



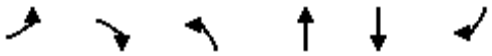
Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	17	1	0	126	82	8
Future Vol, veh/h	17	1	0	126	82	8
Conflicting Peds, #/hr	0	0	120	0	0	120
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	1	0	126	82	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	332	206	210	0	-	0
Stage 1	206	-	-	-	-	-
Stage 2	126	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	663	835	1361	-	-	-
Stage 1	829	-	-	-	-	-
Stage 2	900	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	534	750	1223	-	-	-
Mov Cap-2 Maneuver	534	-	-	-	-	-
Stage 1	744	-	-	-	-	-
Stage 2	808	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1223	-	543	-	-
HCM Lane V/C Ratio	-	-	0.033	-	-
HCM Control Delay (s)	0	-	11.9	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-



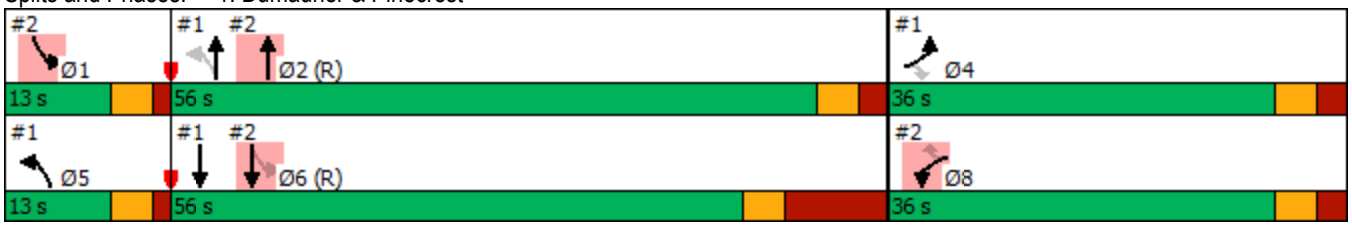
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	40	138	159	1072	1106	42		
Future Volume (vph)	40	138	159	1072	1106	42		
Satd. Flow (prot)	1695	1517	1695	3390	3364	0		
Flt Permitted	0.950		0.170					
Satd. Flow (perm)	1675	1481	302	3390	3364	0		
Satd. Flow (RTOR)		138			4			
Lane Group Flow (vph)	40	138	159	1072	1148	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	36.0	36.0	13.0	56.0	56.0		13.0	36.0
Total Split (%)	34.3%	34.3%	12.4%	53.3%	53.3%		12%	34%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	22.8	22.8	70.0	61.6	51.6			
Actuated g/C Ratio	0.22	0.22	0.67	0.59	0.49			
v/c Ratio	0.11	0.32	0.50	0.54	0.69			
Control Delay	31.0	7.4	21.2	4.1	24.8			
Queue Delay	0.0	0.0	0.4	0.0	0.0			
Total Delay	31.0	7.4	21.6	4.1	24.8			
LOS	C	A	C	A	C			
Approach Delay	12.7			6.4	24.8			
Approach LOS	B			A	C			
Queue Length 50th (m)	6.2	0.0	7.1	11.9	100.4			
Queue Length 95th (m)	14.4	14.0	22.9	16.5	131.7			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	487	524	325	1988	1655			
Starvation Cap Reductn	0	0	24	42	0			
Spillback Cap Reductn	0	0	0	0	0			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.08	0.26	0.53	0.55	0.69			

Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 73.6%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Dumaurier & Pinecrest



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	255	63	994	144	47	1235		
Future Volume (vph)	255	63	994	144	47	1235		
Satd. Flow (prot)	1695	1517	4748	0	1695	3390		
Flt Permitted	0.950				0.236			
Satd. Flow (perm)	1665	1489	4748	0	419	3390		
Satd. Flow (RTOR)		63	31					
Lane Group Flow (vph)	255	63	1138	0	47	1235		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	36.0	36.0	56.0		13.0	56.0	36.0	13.0
Total Split (%)	34.3%	34.3%	53.3%		12.4%	53.3%	34%	12%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	5.7		0.0	-5.7		
Total Lost Time (s)	5.8	5.8	11.3		4.7	5.6		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	22.8	22.8	55.9		64.7	57.3		
Actuated g/C Ratio	0.22	0.22	0.53		0.62	0.55		
v/c Ratio	0.69	0.17	0.45		0.14	0.67		
Control Delay	47.3	8.8	5.1		2.0	3.6		
Queue Delay	1.7	0.0	0.1		0.0	0.2		
Total Delay	49.0	8.8	5.2		2.0	3.8		
LOS	D	A	A		A	A		
Approach Delay	41.0		5.2			3.7		
Approach LOS	D		A			A		
Queue Length 50th (m)	45.7	0.0	8.2		0.4	9.4		
Queue Length 95th (m)	70.3	9.7	13.2		m1.1	15.0		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	487	473	2542		366	1850		
Starvation Cap Reductn	0	0	375		0	109		
Spillback Cap Reductn	108	0	12		0	32		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.67	0.13	0.53		0.13	0.71		

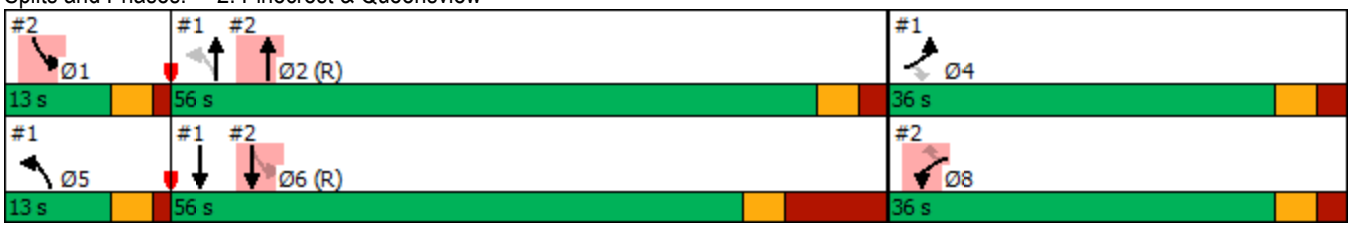
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

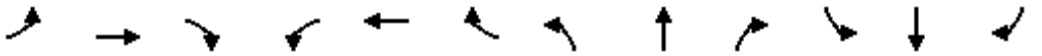
Maximum v/c Ratio: 0.69

Intersection Signal Delay: 8.7	Intersection LOS: A
Intersection Capacity Utilization 62.2%	ICU Level of Service B
Analysis Period (min) 15	

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

Splits and Phases: 2: Pinecrest & Queensview





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	0	29	462	54	174	1	901	0	0	1420	4
Future Volume (vph)	7	0	29	462	54	174	1	901	0	0	1420	4
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3389	0
Flt Permitted	0.950			0.950				0.954				
Satd. Flow (perm)	1654	0	1517	3288	1784	1459	0	3234	0	0	3389	0
Satd. Flow (RTOR)			170			174						
Lane Group Flow (vph)	7	0	29	462	54	174	0	902	0	0	1424	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	24.6	24.6	24.6		58.4			58.4	
Actuated g/C Ratio	0.10		0.10	0.23	0.23	0.23		0.56			0.56	
v/c Ratio	0.04		0.10	0.60	0.13	0.37		0.50			0.76	
Control Delay	44.0		0.7	38.4	29.7	6.8		18.5			20.7	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.1	
Total Delay	44.0		0.7	38.4	29.7	6.8		18.5			20.8	
LOS	D		A	D	C	A		B			C	
Approach Delay		9.1			29.8			18.5			20.8	
Approach LOS		A			C			B			C	
Queue Length 50th (m)	1.3		0.0	40.3	8.1	0.0		72.3			70.0	
Queue Length 95th (m)	5.6		0.0	55.4	17.6	15.2		92.7			#185.6	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		336	951	516	546		1798			1884	
Starvation Cap Reductn	0		0	0	0	0		0			36	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.03		0.09	0.49	0.10	0.32		0.50			0.77	

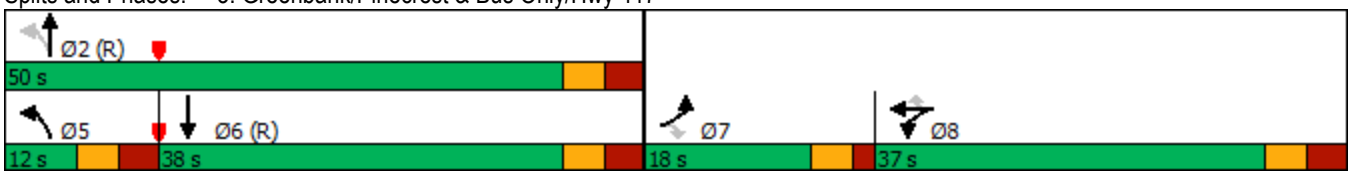
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 78.8%	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: 3: Greenbank/Pinecrest & Bus Only/Hwy 417



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	446	267	319	221	0	543	0	950	129	221	894	17
Future Volume (vph)	446	267	319	221	0	543	0	950	129	221	894	17
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3370	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3288	1784	1426	3178	0	2669	0	4871	1469	3266	3370	0
Satd. Flow (RTOR)			161			157			217		2	
Lane Group Flow (vph)	446	267	319	221	0	543	0	950	129	221	911	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	47.0	47.0	12.1		23.3		42.5	42.5	12.6	42.5	
Total Split (s)	32.7	47.0	47.0	19.0		33.3		44.0	44.0	20.0	64.0	
Total Split (%)	25.2%	36.2%	36.2%	14.6%		25.6%		33.8%	33.8%	15.4%	49.2%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	22.2	31.6	31.6	11.6		42.5		45.3	45.3	12.3	65.3	
Actuated g/C Ratio	0.17	0.24	0.24	0.09		0.33		0.35	0.35	0.09	0.50	
v/c Ratio	0.80	0.62	0.68	0.76		0.55		0.56	0.20	0.71	0.54	
Control Delay	62.5	49.1	28.1	74.6		26.5		37.4	0.7	70.2	24.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	62.5	49.1	28.1	74.6		26.5		37.4	0.7	70.2	24.9	
LOS	E	D	C	E		C		D	A	E	C	
Approach Delay		48.4			40.4			33.0			33.8	
Approach LOS		D			D			C			C	
Queue Length 50th (m)	56.8	61.8	37.5	28.9		45.5		73.0	0.0	28.3	80.6	
Queue Length 95th (m)	73.2	82.0	64.4	#45.1		61.0		95.6	0.0	#42.5	115.0	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	647	548	550	300		979		1698	653	322	1692	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.69	0.49	0.58	0.74		0.55		0.56	0.20	0.69	0.54	

Intersection Summary

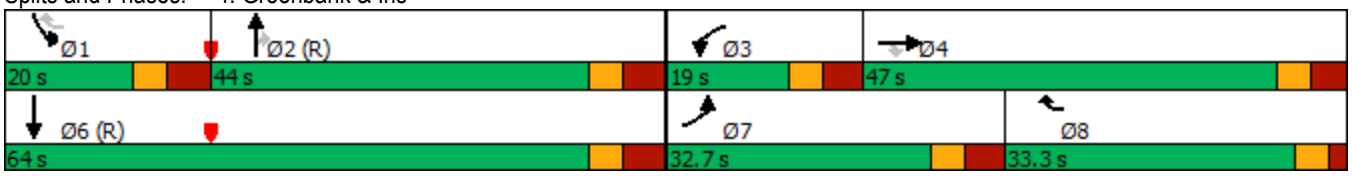
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 38.6	Intersection LOS: D
Intersection Capacity Utilization 94.1%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 4: Greenbank & Iris



Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	1	1	151	168	14
Future Vol, veh/h	10	1	1	151	168	14
Conflicting Peds, #/hr	0	0	120	0	0	120
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	1	1	151	168	14

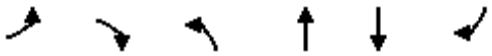
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	448	295	302	0	-	0
Stage 1	295	-	-	-	-	-
Stage 2	153	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	568	744	1259	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	875	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	458	668	1131	-	-	-
Mov Cap-2 Maneuver	458	-	-	-	-	-
Stage 1	677	-	-	-	-	-
Stage 2	786	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.8	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1131	-	471	-	-
HCM Lane V/C Ratio	0.001	-	0.023	-	-
HCM Control Delay (s)	8.2	0	12.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX N

SYNCHRO ANALYSIS: TOD MODE SHARES NOT MET INTERSECTION PERFORMANCE



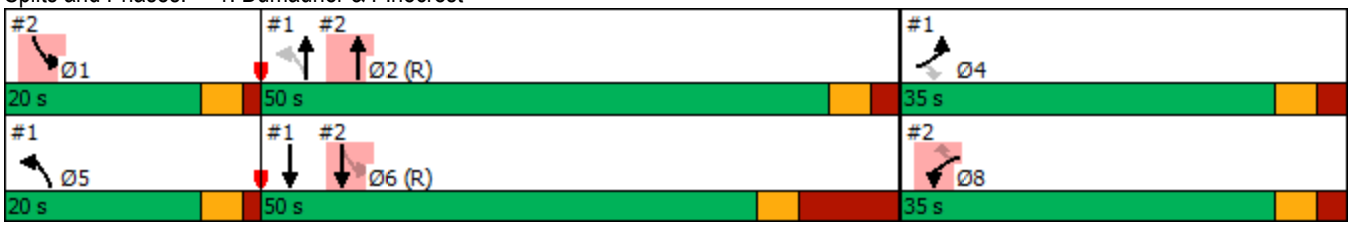
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	34	148	85	1007	753	25		
Future Volume (vph)	34	148	85	1007	753	25		
Satd. Flow (prot)	1695	1517	1695	3390	3367	0		
Flt Permitted	0.950		0.345					
Satd. Flow (perm)	1695	1490	609	3390	3367	0		
Satd. Flow (RTOR)		148			4			
Lane Group Flow (vph)	34	148	85	1007	778	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	35.0	35.0	20.0	50.0	50.0		20.0	35.0
Total Split (%)	33.3%	33.3%	19.0%	47.6%	47.6%		19%	33%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	16.9	16.9	74.2	67.3	61.2			
Actuated g/C Ratio	0.16	0.16	0.71	0.64	0.58			
v/c Ratio	0.12	0.41	0.17	0.46	0.40			
Control Delay	34.8	8.7	2.3	3.5	14.9			
Queue Delay	0.0	0.0	0.1	0.1	0.0			
Total Delay	34.8	8.7	2.4	3.6	14.9			
LOS	C	A	A	A	B			
Approach Delay	13.5			3.5	14.9			
Approach LOS	B			A	B			
Queue Length 50th (m)	6.5	0.0	1.0	9.8	36.7			
Queue Length 95th (m)	12.9	14.7	2.6	14.6	75.2			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	471	521	608	2173	1964			
Starvation Cap Reductn	0	0	141	288	0			
Spillback Cap Reductn	0	0	0	0	2			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.07	0.28	0.18	0.53	0.40			

Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 8.7	Intersection LOS: A
Intersection Capacity Utilization 56.5%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Dumaurier & Pinecrest



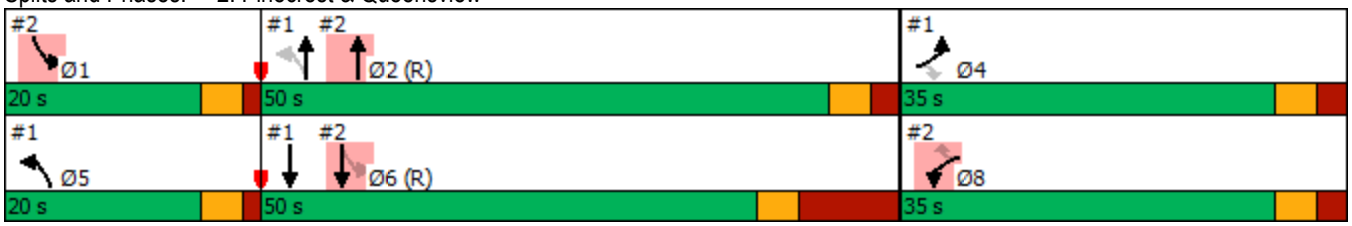
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	84	32	970	305	64	815		
Future Volume (vph)	84	32	970	305	64	815		
Satd. Flow (prot)	1695	1517	4627	0	1695	3390		
Flt Permitted	0.950				0.180			
Satd. Flow (perm)	1665	1490	4627	0	320	3390		
Satd. Flow (RTOR)		32	93					
Lane Group Flow (vph)	84	32	1275	0	64	815		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	35.0	35.0	50.0		20.0	50.0	35.0	20.0
Total Split (%)	33.3%	33.3%	47.6%		19.0%	47.6%	33%	19%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.8	5.8	5.6		4.7	11.3		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	16.9	16.9	67.3		73.4	61.2		
Actuated g/C Ratio	0.16	0.16	0.64		0.70	0.58		
v/c Ratio	0.31	0.12	0.42		0.21	0.41		
Control Delay	39.2	11.2	2.3		3.3	4.6		
Queue Delay	0.0	0.0	0.1		0.0	0.2		
Total Delay	39.2	11.2	2.4		3.4	4.8		
LOS	D	B	A		A	A		
Approach Delay	31.5		2.4			4.7		
Approach LOS	C		A			A		
Queue Length 50th (m)	16.5	0.0	5.8		0.4	8.6		
Queue Length 95th (m)	25.9	7.1	12.7		2.6	17.5		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	471	437	3000		436	1976		
Starvation Cap Reductn	0	0	483		29	448		
Spillback Cap Reductn	0	0	0		0	0		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.18	0.07	0.51		0.16	0.53		

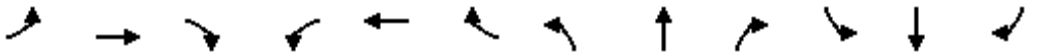
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 4.8	Intersection LOS: A
Intersection Capacity Utilization 55.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Pinecrest & Queensview





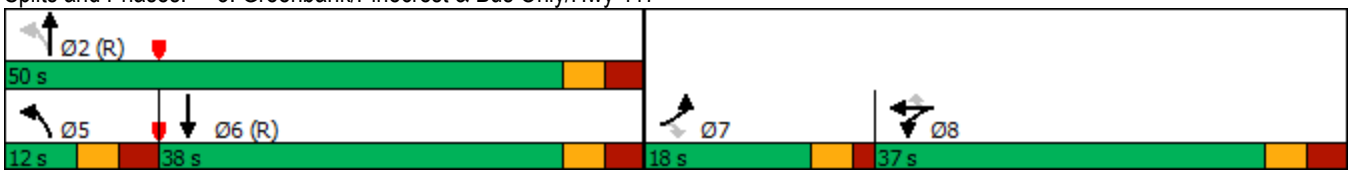
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	0	64	390	25	284	1	1019	0	0	895	0
Future Volume (vph)	2	0	64	390	25	284	1	1019	0	0	895	0
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3390	0
Flt Permitted	0.950			0.950				0.955				
Satd. Flow (perm)	1644	0	1496	3288	1784	1451	0	3238	0	0	3390	0
Satd. Flow (RTOR)			170			284						
Lane Group Flow (vph)	2	0	64	390	25	284	0	1020	0	0	895	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	21.5	21.5	21.5		58.5			58.5	
Actuated g/C Ratio	0.10		0.10	0.20	0.20	0.20		0.56			0.56	
v/c Ratio	0.01		0.22	0.58	0.07	0.54		0.57			0.47	
Control Delay	43.5		1.7	40.2	30.2	7.7		19.1			7.3	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.1	
Total Delay	43.5		1.7	40.2	30.2	7.7		19.1			7.4	
LOS	D		A	D	C	A		B			A	
Approach Delay		2.9			26.6			19.1			7.4	
Approach LOS		A			C			B			A	
Queue Length 50th (m)	0.4		0.0	38.7	4.3	0.0		67.3			17.0	
Queue Length 95th (m)	2.7		0.0	46.5	10.0	18.6		109.4			23.8	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		334	951	516	621		1803			1888	
Starvation Cap Reductn	0		0	0	0	0		0			183	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.01		0.19	0.41	0.05	0.46		0.57			0.52	

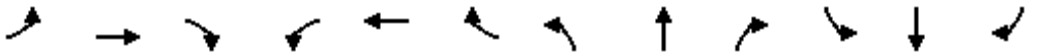
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 16.8	Intersection LOS: B
Intersection Capacity Utilization 70.9%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 3: Greenbank/Pinecrest & Bus Only/Hwy 417





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	594	509	379	68	0	310	0	1421	196	165	770	30
Future Volume (vph)	594	509	379	68	0	310	0	1421	196	165	770	30
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3348	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3277	1784	1448	3233	0	2607	0	4871	1457	3269	3348	0
Satd. Flow (RTOR)			161			157			217		4	
Lane Group Flow (vph)	594	509	379	68	0	310	0	1421	196	165	800	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	25.1	47.0	47.0	12.1		24.0		42.5	42.5	12.6	42.5	
Total Split (s)	35.0	50.0	50.0	12.1		27.1		51.2	51.2	16.7	67.9	
Total Split (%)	26.9%	38.5%	38.5%	9.3%		20.8%		39.4%	39.4%	12.8%	52.2%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	26.6	41.4	41.4	5.0		30.7		47.5	47.5	9.3	64.5	
Actuated g/C Ratio	0.20	0.32	0.32	0.04		0.24		0.37	0.37	0.07	0.50	
v/c Ratio	0.89	0.90	0.66	0.54		0.42		0.80	0.29	0.70	0.48	
Control Delay	66.0	62.0	27.4	77.3		19.2		42.1	3.9	75.1	23.7	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	66.0	62.0	27.4	77.3		19.2		42.1	3.9	75.1	23.7	
LOS	E	E	C	E		B		D	A	E	C	
Approach Delay		54.8			29.7			37.4			32.5	
Approach LOS		D			C			D			C	
Queue Length 50th (m)	75.8	121.8	47.8	9.0		16.6		124.5	0.0	21.7	73.8	
Queue Length 95th (m)	#102.1	#180.4	83.0	16.8		30.1		144.2	12.1	#36.4	92.0	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	705	590	586	126		773		1780	670	238	1661	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.84	0.86	0.65	0.54		0.40		0.80	0.29	0.69	0.48	

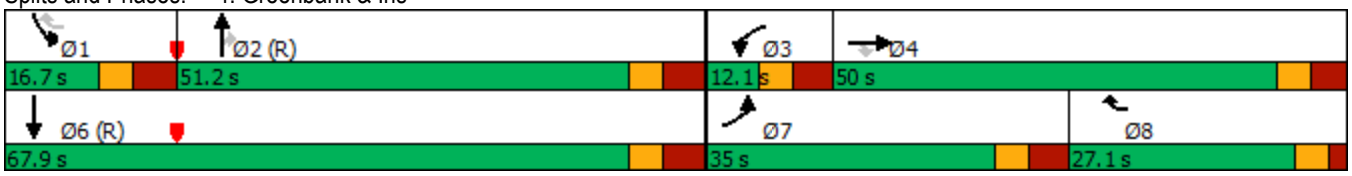
Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 41.5	Intersection LOS: D
Intersection Capacity Utilization 84.3%	ICU Level of Service E
Analysis Period (min) 15	

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

Splits and Phases: 4: Greenbank & Iris



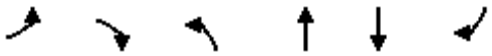
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	42	2	1	126	82	19
Future Vol, veh/h	42	2	1	126	82	19
Conflicting Peds, #/hr	0	0	100	0	0	100
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	2	1	126	82	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	320	192	201	0	-	0
Stage 1	192	-	-	-	-	-
Stage 2	128	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	673	850	1371	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	898	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	563	778	1255	-	-	-
Mov Cap-2 Maneuver	563	-	-	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	822	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1255	-	570	-	-
HCM Lane V/C Ratio	0.001	-	0.077	-	-
HCM Control Delay (s)	7.9	0	11.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-



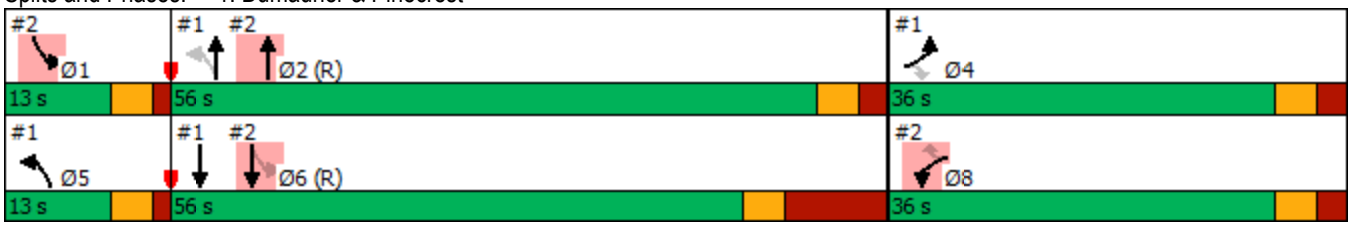
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø1	Ø8
Lane Configurations								
Traffic Volume (vph)	43	151	179	1072	1106	46		
Future Volume (vph)	43	151	179	1072	1106	46		
Satd. Flow (prot)	1695	1517	1695	3390	3361	0		
Flt Permitted	0.950		0.170					
Satd. Flow (perm)	1685	1490	302	3390	3361	0		
Satd. Flow (RTOR)		151			5			
Lane Group Flow (vph)	43	151	179	1072	1152	0		
Turn Type	Prot	Perm	pm+pt	NA	NA			
Protected Phases	4		5	2	6		1	8
Permitted Phases		4	2					
Detector Phase	4	4	5	2	6			
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0		5.0	10.0
Minimum Split (s)	32.8	32.8	11.0	25.6	31.3		9.7	32.8
Total Split (s)	36.0	36.0	13.0	56.0	56.0		13.0	36.0
Total Split (%)	34.3%	34.3%	12.4%	53.3%	53.3%		12%	34%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		3.3	3.3
All-Red Time (s)	2.5	2.5	1.4	2.3	8.0		1.4	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.8	5.8	4.7	5.6	11.3			
Lead/Lag			Lead	Lag	Lag		Lead	
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	
Recall Mode	None	None	None	C-Min	C-Min		None	None
Act Effct Green (s)	21.6	21.6	71.5	62.8	52.4			
Actuated g/C Ratio	0.21	0.21	0.68	0.60	0.50			
v/c Ratio	0.12	0.35	0.55	0.53	0.69			
Control Delay	32.1	7.5	24.6	4.3	24.1			
Queue Delay	0.0	0.0	0.4	0.0	0.1			
Total Delay	32.1	7.5	24.9	4.3	24.2			
LOS	C	A	C	A	C			
Approach Delay	12.9			7.3	24.2			
Approach LOS	B			A	C			
Queue Length 50th (m)	7.3	0.0	9.1	11.1	89.7			
Queue Length 95th (m)	15.1	14.5	28.5	17.2	132.3			
Internal Link Dist (m)	231.3			36.0	182.5			
Turn Bay Length (m)	25.0							
Base Capacity (vph)	487	536	332	2027	1678			
Starvation Cap Reductn	0	0	18	88	0			
Spillback Cap Reductn	0	1	0	0	29			
Storage Cap Reductn	0	0	0	0	0			
Reduced v/c Ratio	0.09	0.28	0.57	0.55	0.70			

Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 15.2	Intersection LOS: B
Intersection Capacity Utilization 73.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Dumaurier & Pinecrest



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø4	Ø5
Lane Configurations								
Traffic Volume (vph)	255	63	1014	144	47	1248		
Future Volume (vph)	255	63	1014	144	47	1248		
Satd. Flow (prot)	1695	1517	4758	0	1695	3390		
Flt Permitted	0.950				0.215			
Satd. Flow (perm)	1665	1497	4758	0	383	3390		
Satd. Flow (RTOR)		63	34					
Lane Group Flow (vph)	255	63	1158	0	47	1248		
Turn Type	Prot	Perm	NA		pm+pt	NA		
Protected Phases	8		2		1	6	4	5
Permitted Phases		8			6			
Detector Phase	8	8	2		1	6		
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0		5.0	10.0	10.0	5.0
Minimum Split (s)	32.8	32.8	25.6		9.7	31.3	32.8	11.0
Total Split (s)	36.0	36.0	56.0		13.0	56.0	36.0	13.0
Total Split (%)	34.3%	34.3%	53.3%		12.4%	53.3%	34%	12%
Yellow Time (s)	3.3	3.3	3.3		3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.3		1.4	8.0	2.5	1.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.8	5.8	5.6		4.7	11.3		
Lead/Lag			Lag		Lead	Lag		Lead
Lead-Lag Optimize?			Yes		Yes	Yes		Yes
Recall Mode	None	None	C-Min		None	C-Min	None	None
Act Effct Green (s)	21.6	21.6	62.8		65.5	52.4		
Actuated g/C Ratio	0.21	0.21	0.60		0.62	0.50		
v/c Ratio	0.73	0.18	0.41		0.15	0.74		
Control Delay	50.8	8.9	4.4		2.1	8.4		
Queue Delay	1.1	0.0	0.1		0.0	0.2		
Total Delay	51.9	8.9	4.6		2.1	8.6		
LOS	D	A	A		A	A		
Approach Delay	43.4		4.6			8.3		
Approach LOS	D		A			A		
Queue Length 50th (m)	49.4	0.0	6.6		0.3	15.6		
Queue Length 95th (m)	70.3	9.7	13.1		m1.2	28.7		
Internal Link Dist (m)	293.1		87.5			36.0		
Turn Bay Length (m)	40.0							
Base Capacity (vph)	487	475	2859		349	1690		
Starvation Cap Reductn	0	0	665		0	61		
Spillback Cap Reductn	87	0	13		0	32		
Storage Cap Reductn	0	0	0		0	0		
Reduced v/c Ratio	0.64	0.13	0.53		0.13	0.77		

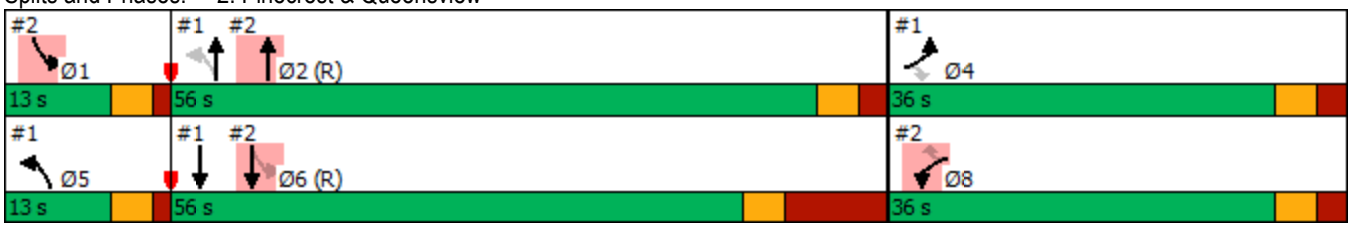
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 90 (86%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

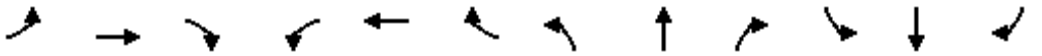
Maximum v/c Ratio: 0.74

Intersection Signal Delay: 10.8	Intersection LOS: B
Intersection Capacity Utilization 65.6%	ICU Level of Service C
Analysis Period (min) 15	

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

Splits and Phases: 2: Pinecrest & Queensview





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	0	29	462	54	188	1	906	0	0	1433	4
Future Volume (vph)	7	0	29	462	54	188	1	906	0	0	1433	4
Satd. Flow (prot)	1695	0	1517	3288	1784	1517	0	3390	0	0	3389	0
Flt Permitted	0.950			0.950				0.954				
Satd. Flow (perm)	1662	0	1517	3288	1784	1467	0	3234	0	0	3389	0
Satd. Flow (RTOR)			170			188						
Lane Group Flow (vph)	7	0	29	462	54	188	0	907	0	0	1437	0
Turn Type	Prot		Perm	Split	NA	Perm	pm+pt	NA			NA	
Protected Phases	7			8	8		5	2			6	
Permitted Phases			7			8	2					
Detector Phase	7		7	8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)	10.0		10.0	10.0	10.0	10.0	5.0	10.0			10.0	
Minimum Split (s)	17.0		17.0	36.6	36.6	36.6	11.4	30.4			30.4	
Total Split (s)	18.0		18.0	37.0	37.0	37.0	12.0	50.0			38.0	
Total Split (%)	17.1%		17.1%	35.2%	35.2%	35.2%	11.4%	47.6%			36.2%	
Yellow Time (s)	3.3		3.3	3.3	3.3	3.3	3.3	3.3			3.3	
All-Red Time (s)	1.7		1.7	3.3	3.3	3.3	3.1	3.1			3.1	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	5.0		5.0	6.6	6.6	6.6		6.4			6.4	
Lead/Lag	Lead		Lead	Lag	Lag	Lag	Lead				Lag	
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes				Yes	
Recall Mode	None		None	None	None	None	None	C-Min			C-Min	
Act Effct Green (s)	10.0		10.0	22.8	22.8	22.8		60.2			60.2	
Actuated g/C Ratio	0.10		0.10	0.22	0.22	0.22		0.57			0.57	
v/c Ratio	0.04		0.10	0.65	0.14	0.40		0.49			0.74	
Control Delay	44.0		0.7	41.1	31.3	7.0		17.2			17.7	
Queue Delay	0.0		0.0	0.0	0.0	0.0		0.0			0.1	
Total Delay	44.0		0.7	41.1	31.3	7.0		17.2			17.8	
LOS	D		A	D	C	A		B			B	
Approach Delay		9.1			31.3			17.2			17.8	
Approach LOS		A			C			B			B	
Queue Length 50th (m)	1.3		0.0	45.6	9.2	0.0		60.1			52.5	
Queue Length 95th (m)	5.6		0.0	55.4	17.6	15.7		93.3			#187.8	
Internal Link Dist (m)		171.9			276.3			363.7			87.5	
Turn Bay Length (m)			55.0	180.0		145.0						
Base Capacity (vph)	209		336	951	516	558		1854			1943	
Starvation Cap Reductn	0		0	0	0	0		0			44	
Spillback Cap Reductn	0		0	0	0	0		0			0	
Storage Cap Reductn	0		0	0	0	0		0			0	
Reduced v/c Ratio	0.03		0.09	0.49	0.10	0.34		0.49			0.76	

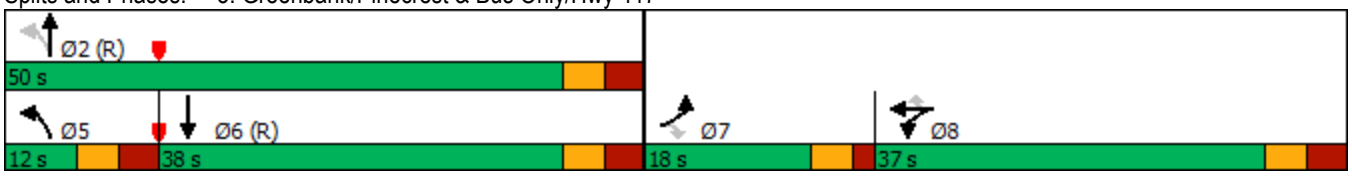
Intersection Summary
Cycle Length: 105
Actuated Cycle Length: 105
Offset: 93 (89%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 20.6	Intersection LOS: C
Intersection Capacity Utilization 79.2%	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: 3: Greenbank/Pinecrest & Bus Only/Hwy 417



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	267	319	221	0	543	0	953	129	221	894	17
Future Volume (vph)	448	267	319	221	0	543	0	953	129	221	894	17
Satd. Flow (prot)	3288	1784	1517	3288	0	2669	0	4871	1517	3288	3371	0
Flt Permitted	0.950			0.950						0.950		
Satd. Flow (perm)	3288	1784	1426	3178	0	2669	0	4871	1472	3266	3371	0
Satd. Flow (RTOR)			161			157			217		2	
Lane Group Flow (vph)	448	267	319	221	0	543	0	953	129	221	911	0
Turn Type	Prot	NA	Perm	Prot		custom		NA	Perm	Prot	NA	
Protected Phases	7	4		3		8		2		1	6	
Permitted Phases			4			1			2			
Detector Phase	7	4	4	3		8		2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0		10.0		10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	47.0	47.0	12.1		23.3		42.5	42.5	12.6	42.5	
Total Split (s)	33.0	47.0	47.0	19.0		33.0		44.0	44.0	20.0	64.0	
Total Split (%)	25.4%	36.2%	36.2%	14.6%		25.4%		33.8%	33.8%	15.4%	49.2%	
Yellow Time (s)	3.3	3.3	3.3	3.3		3.3		3.3	3.3	3.3	3.3	
All-Red Time (s)	3.8	3.7	3.7	3.8		2.0		4.2	4.2	4.3	4.2	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	7.1	7.0	7.0	7.1		5.3		7.5	7.5	7.6	7.5	
Lead/Lag	Lead	Lag	Lag	Lead		Lag		Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes		
Recall Mode	None	None	None	None		None		C-Min	C-Min	None	C-Max	
Act Effct Green (s)	22.3	30.6	30.6	11.6		42.1		45.7	45.7	13.0	66.2	
Actuated g/C Ratio	0.17	0.24	0.24	0.09		0.32		0.35	0.35	0.10	0.51	
v/c Ratio	0.79	0.64	0.70	0.76		0.56		0.56	0.20	0.68	0.53	
Control Delay	62.4	50.8	29.3	74.6		26.8		37.1	0.7	67.2	24.1	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	62.4	50.8	29.3	74.6		26.8		37.1	0.7	67.2	24.1	
LOS	E	D	C	E		C		D	A	E	C	
Approach Delay		49.2			40.6			32.7			32.5	
Approach LOS		D			D			C			C	
Queue Length 50th (m)	57.1	61.8	37.5	28.9		45.5		73.3	0.0	28.3	80.6	
Queue Length 95th (m)	73.3	82.0	64.4	#45.1		61.3		96.0	0.0	#42.5	115.0	
Internal Link Dist (m)		249.5			237.7			174.0			363.7	
Turn Bay Length (m)	50.0					60.0			110.0	100.0		
Base Capacity (vph)	655	548	550	300		965		1710	657	338	1718	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.68	0.49	0.58	0.74		0.56		0.56	0.20	0.65	0.53	

Intersection Summary

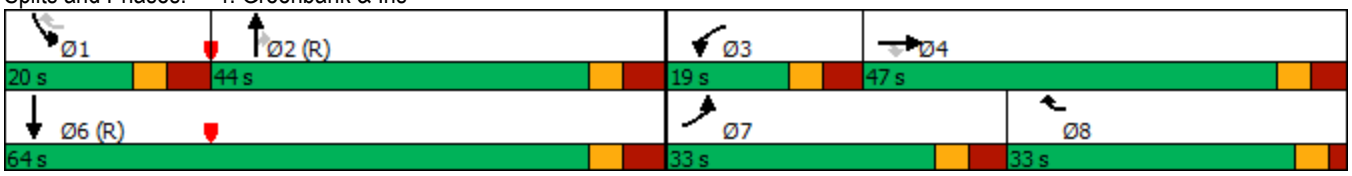
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 70 (54%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 38.4	Intersection LOS: D
Intersection Capacity Utilization 94.1%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 4: Greenbank & Iris



Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	42	2	2	151	168	37
Future Vol, veh/h	42	2	2	151	168	37
Conflicting Peds, #/hr	0	0	100	0	0	100
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	2	2	151	168	37

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	442	287	305	0	-	0
Stage 1	287	-	-	-	-	-
Stage 2	155	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	573	752	1256	-	-	-
Stage 1	762	-	-	-	-	-
Stage 2	873	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	479	688	1150	-	-	-
Mov Cap-2 Maneuver	479	-	-	-	-	-
Stage 1	696	-	-	-	-	-
Stage 2	799	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1150	-	486	-	-
HCM Lane V/C Ratio	0.002	-	0.091	-	-
HCM Control Delay (s)	8.1	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-