

1451 – 1445 Wellington Street West

Transportation Brief

prepared for:



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DEVELOPMENTS

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November 5, 2013

TO3131TOH

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1. INTRODUCTION

From the information provided, a 12 storey high-rise condominium development, consisting of approximately 114 dwelling units, 2,740 ft² of ground floor retail and a 2,472 ft² restaurant is being proposed on the northeast corner of the Wellington/Island Park intersection. The site is currently occupied by a hand car wash (Proshine Car Wash, which is no longer operational as of June 2013) and a sit-down quality restaurant (Bella's Bistro Italiano), which will be reconstructed and incorporated into the ground floor of the proposed condo building. The site will be accessed by a single full-movement driveway connection to Wellington Street located approximately 60 m from the signalized Wellington/Island Park intersection. The site's local context is depicted as Figure 1 and the Site Plan is depicted as Figure 2.

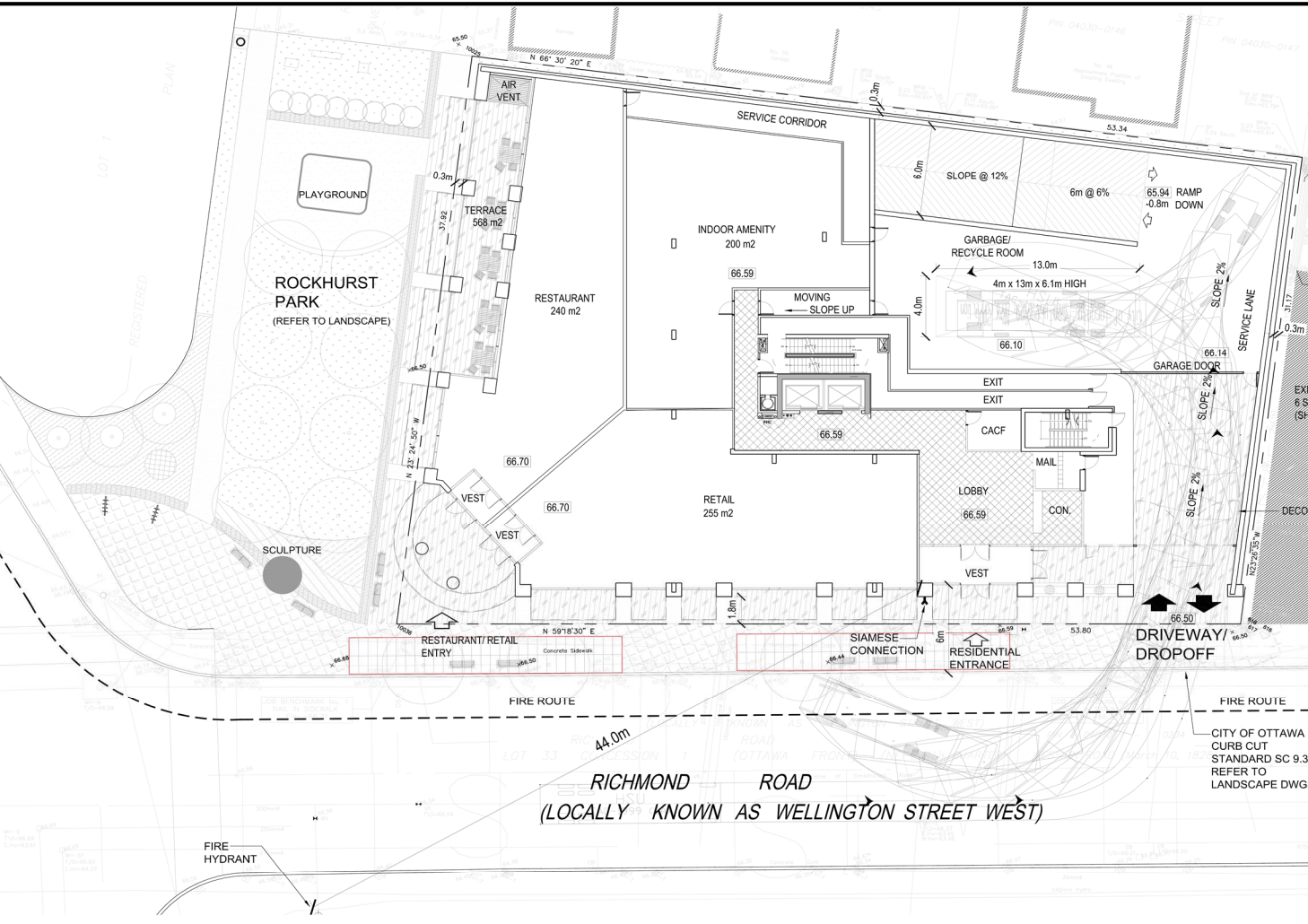
Figure 1: Local Context



Based on the ensuing trip generation and our review of the City's Transportation Impact Assessment Guidelines (TIA), the proposed development is projected to generate less than the City's 75 veh/h TIA threshold for requiring any traffic assessment. As such, no further traffic analysis is required. However, to assist in the application/review process, we have prepared this report that captures only the relevant transportation issues, which are as follows:

- Existing operational conditions at the adjacent Wellington/Island Park intersection;
- Peak hour site traffic generation and assignment;
- The requirements (if any) of the site traffic superimposed onto existing traffic; and
- Site Plan issues, including proposed parking supply and garage access/egress.

By default, this report is being called a Transportation Brief. However, it does not contain all the requirements of a Transportation Brief, as one is not required for this application.



CONTEXT PLAN
SITE STATISTICS

Proposed Use: Residential Building with Retail/Restaurant Use at Grade
Site Area: 1,843 sm (4.55 acre)
Proposed GFA: 11,675 sm*
 Residential: 11,180 sm
 Non-Residential: 495 sm
 FS: 6.3

SURVEY INFORMATION:
 BOUNDARY AND TOPOGRAPHIC SURVEY OF
 ALL OF LOT 1.2.3 AND PART OF LOT 4
 NORTH11 RICHMOND ROAD
 REGISTERED PLAN 145
 CITY OF OTTAWA
 PREPARED BY ANNIS, O'SULLIVAN, VOLLEBECK LTD.
 APRIL 12, 2013

Proposed Residential Units: 114
 1B - 70, 2B - 44 (Subject to Market)
Indoor/ Outdoor Amenity Required: 114 units x 6sm/unit = 684 sm
Indoor/ Outdoor Amenity Provided: 1950 sm

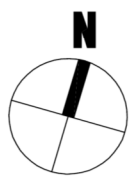
Total Parking Required: 90 Spaces
 114 Units @0.5 spaces/unit = 57 resident
 Residential Visitor Parking Required (@0.2 spaces/unit): 23
 2 Accessible Spaces
 7 spaces for 240sm of Restaurant
 3 spaces for 255sm of Retail

Total Parking Provided: 147 Spaces
 114 residential,
 23 residential visitor.
 2 accessible spaces
 7 restaurant spaces, 3 retail spaces
 provided within 3.5 levels of underground parking

Proposed Height: As Shown*
 * Excludes Parapets & Mech.

Bike Parking Spaces Required: 59
 114 units @0.5 Bike Parking Spaces/unit = 57 spaces
 1 per 250sm Retail/Restaurant = 2 spaces
Bike Spaces Provided: 59

Setbacks:
 North: 0.3 m
 South: 1.8 m
 East: 0.3 m
 West: 0.3 m



**1451 WELLINGTON AVE,
 OTTAWA, ONTARIO
 GROUND FLOOR PLAN**
 ISSUED FOR REZONING/SITEPLAN APPROVAL NOV 01- 2013

PROJECT NO. 31643



Figure 2: Proposed Site Plan

2. EXISTING CONDITIONS

2.1 Area Road Network

Richmond Road/ Wellington Street is an east-west arterial roadway that extends from Robertson Road in the west (as Richmond Road) to Island Park Drive in the east, where it continues east into Ottawa’s downtown area as Wellington Street and then Somerset Street. Within the study area, its cross-section consists of two travel lanes in each direction with on-street parking permitted outside peak hours. Auxiliary turn lanes are not provided on Wellington Street in the eastbound and westbound directions within the study area and the posted speed limit is 50 km/h.

Island Park Drive is a federally owned arterial roadway, which extends from the Sir John A. Macdonald Parkway in the north (providing a connection to the City of Gatineau, Quebec via the Champlain Bridge) to Carling Avenue in the south. Within the study area, its cross-section consists of a single travel lane in each direction, with dedicated on-street cycling lanes. The posted speed limit within the study area is 40 km/h and northbound and southbound left-turn lanes are provided at the signalized Wellington/Island Park intersection.

2.2 Existing Intersection Operations

Illustrated as Figure 3, are the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa for the adjacent Wellington/Island Park intersection. These peak hour traffic volumes are also included as Appendix A.

Figure 3: Existing Peak Hour Traffic Volumes

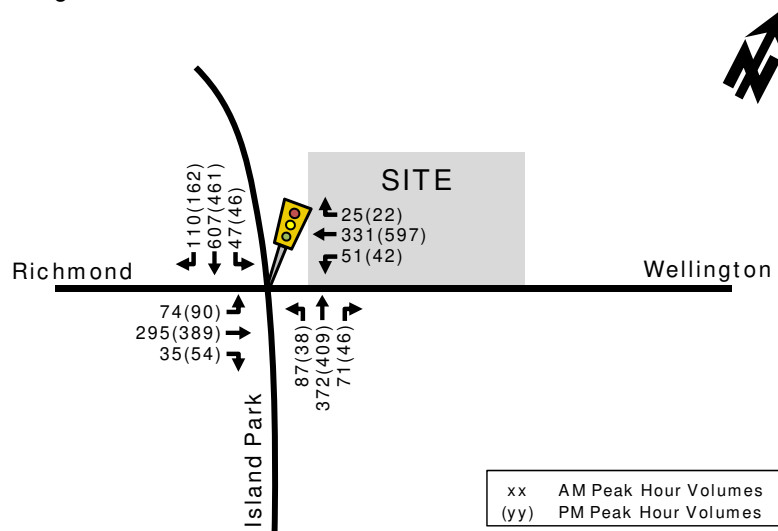


Table 1 provides a summary of existing traffic operations at the Wellington/Island Park intersection, based on the Synchro (V8) traffic analysis software. The subject intersection was assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the ‘critical movement(s)’. The intersection ‘as a whole’ was assessed

based on a weighted v/c ratio. The Synchro model output of existing conditions is provided within Appendix B.

Table 1: Existing Performance at the Wellington/ Island Park Intersection

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/ c or avg. delay (s)	Movement	Delay (s)	LoS	v/ c
Wellington/Island Park	D(D)	0.84(0.81)	SBT(SBT)	26.8(23.9)	C(B)	0.72(0.67)
<i>Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.</i>						

As shown in Table 1, the Wellington/Island Park intersection 'as a whole' is currently operating at an acceptable LoS 'C' or better during the weekday morning and afternoon peak hours, with respect to the City of Ottawa operating standards of LoS 'D' or better ($0.90 > v/c > 0.00$).

With regard to 'critical movements' the southbound through movement at the subject intersection is operating at a LoS 'D' during both the weekday morning and afternoon peak hours.

However, field observations at this location revealed high traffic volumes and long queues in the northbound and southbound directions along Island Park Drive. The Wellington/Island Park intersection was also observed as having difficulty processing approach volumes during peak hours (i.e. vehicles requiring more than one signal cycle to proceed through the intersection). This can be attributed to downstream network performance issues related to the Scott Street, the Ottawa River Parkway and the Champlain Bridge.

Based on these field observations and the above Synchro analysis, it is reasonable to conclude that the traffic count data obtained from the City does not accurately reflect the actual demand at the Wellington/Island Park intersection. For example, if vehicles are present at an intersection but not moving due to congestion, they are not counted. Only vehicles that complete a movement through an intersection are counted. This will result in traffic counts at congested intersections being lower than the observed number of vehicles on the road caught in traffic. This is also evident in the data, with peak volumes spread out over several hours.

The observed northbound and southbound delays at the Wellington/Island Park intersection are a result of the traffic congestion at the Island Park/Sir John A. Macdonald and Island Park/Scott intersections. This congestion is caused by high volumes to/from the Champlain Bridge and to/from the downtown core.

Based on the foregoing, the Wellington/Island Park intersection is currently considered to be failing during peak hours due to high vehicle volumes along Island Park Drive.

3. DEMAND FORECASTING

3.1 Site Vehicle Trip Generation

Table 2 summarizes the appropriate vehicle trip generation rates for the proposed land uses obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. As the existing sit-down quality restaurant (Bella’s Bistro Italiano) will be incorporated into the ground floor of the proposed condo building and will not generate ‘new’ person trips, the 2,472 ft² of restaurant identified on the proposed Site Plan (Figure 2) will not be included in the ensuing trip generation.

Table 2: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
High-Rise Condominium	ITE 232	T = 0.34(du); T = 0.29(du) + 28.86	T = 0.38(du); T = 0.34(du) + 15.47
Specialty Retail Centre	ITE 826	T = 1.36(X); T = 1.20(X) + 10.74	T = 2.71(X); T = 2.40(X) + 21.48
Notes: T = Average Vehicle Trip Ends X = 1,000 ft ² Gross Floor Area du = dwelling units Specialty Retail AM Peak is assumed to be 50% of the PM Peak			

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development. This approach is considered appropriate within the industry for urban infill developments.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. As such, the person trip generation for the proposed site is summarized in Table 3.

Table 3: Modified Person Trip Generation

Land Use	Data Source	Area/ Unit Count	AM Peak (persons)			PM Peak (persons)		
			In	Out	Total	In	Out	Total
High-Rise Condominium	ITE 232	114 Units	15	65	80	43	27	70
Specialty Retail	ITE 826	2,740 ft ²	10	8	18	15	21	36
Total Person Trips			25	73	98	58	48	106

Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%

The person trips shown in Table 3 for the proposed site were then reduced by modal share values based on the 2011 TRANS O-D survey to reflect the site's location and proximity to employment, shopping uses and transit availability. Modal share values for the proposed uses are summarized in Table 4.

Table 4: Total Site Modal Trip Generation

Travel Mode	Mode Share	AM Peak (Persons/ hr)			PM Peak (Persons/ hr)		
		In	Out	Total	In	Out	Total
Auto Driver	50%	13	37	50	29	24	53
Auto Passenger	10%	2	8	10	6	5	11
Transit	20%	5	14	19	12	10	22
Non-motorized	20%	5	14	19	11	9	20
Total Person Trips	100%	25	73	98	58	48	106
Less Retail 'Pass-by' (30%)		-1	-1	-2	-3	-3	-6
Total 'New' Auto Trips		12	36	48	27	22	49

As shown in Table 4, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 50 veh/h during both the weekday morning and afternoon peak hours. These volumes equate to approximately 1 new vehicle a minute during peak hours, which is considered to be a negligible increase in traffic.

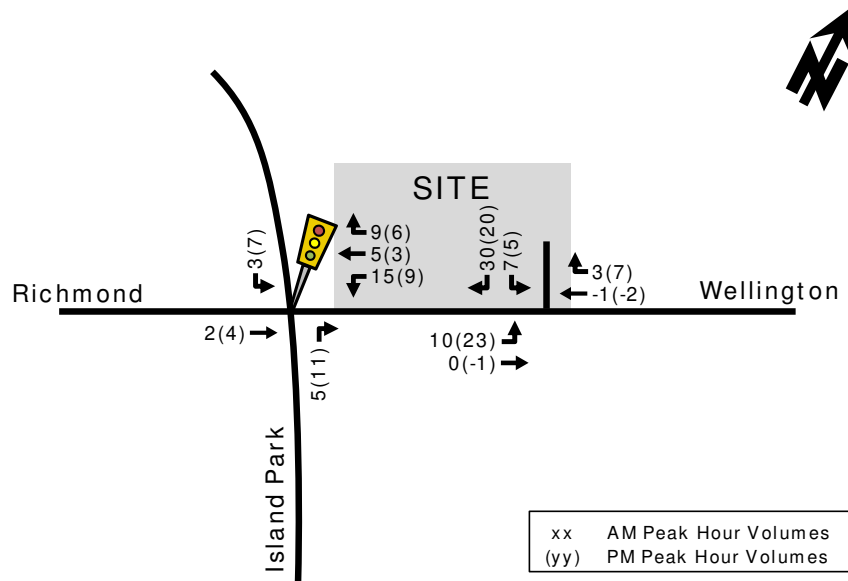
3.2 Vehicle Traffic Distribution and Assignment

Traffic distribution was based on the existing road network and our knowledge of the surrounding area. The resultant distribution is outlined as follows:

- 40% to/from south towards HWY 417;
- 25% to/from north towards Sir John A. Macdonald Parkway and Champlain Bridge;
- 15% to/from west; and
- 20% to/from east.

Based on these distributions, 'new' and 'pass-by' site-generated trips were assigned to the study area, which is illustrated as Figure 4.

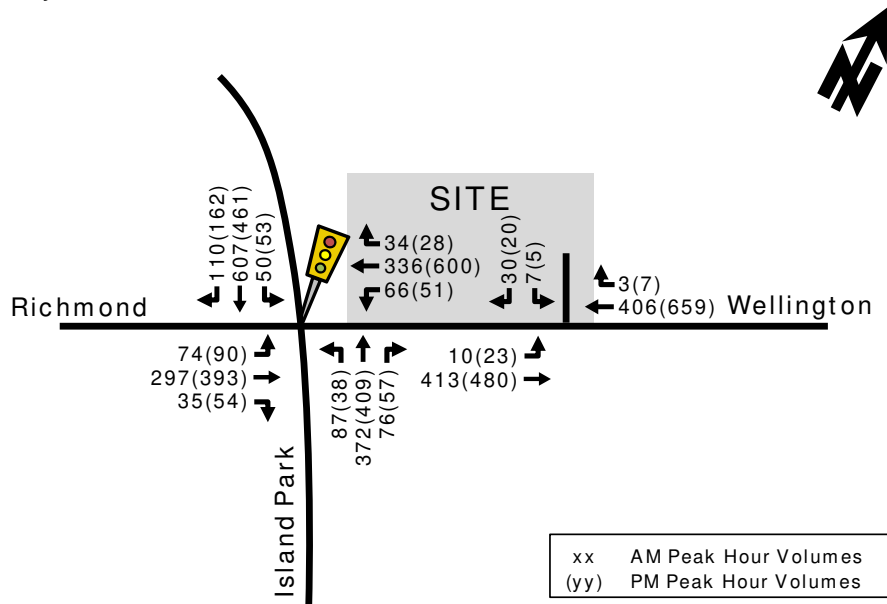
Figure 4: 'New' and 'Pass-by' Site-Generated Traffic Volumes



4. FUTURE TRAFFIC OPERATIONS

For the purpose of this study, the total projected traffic volumes were derived by superimposing 'new' and 'pass-by' site-generated traffic (Figure 4) onto existing volumes (Figure 3). As previously mentioned, the size of the proposed development does not require any traffic analysis. As such, background traffic growth is not included in the total projected performance of study area intersections. The resulting total projected traffic volumes used in the subsequent analysis are illustrated as Figure 5.

Figure 5: Projected Traffic Volumes



The following Table 5 provides a summary of projected performance of the study area intersections and the associated Synchro model output of projected conditions (without roadway or signal modifications) are provided within Appendix C.

Table 5: Projected Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/ c or avg. delay (s)	Movement	Delay (s)	LoS	v/ c
Wellington/Island Park	D(D)	0.84(0.81)	SBT(SBT)	27.7(24.2)	C(B)	0.74(0.68)
Wellington/Site	B(B)	12.2(12.5)	SBL(SBL)	0.6(0.5)	-	-

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

As shown in Table 5, with no signal timing plan or roadway modifications, the Wellington/Island Park intersection is projected to operate similar to existing conditions summarized previously in Table 1.

The proposed site driveway connection to Wellington Street is projected to operate with acceptable delays of approximately 13 seconds during peak hours with 95th percentile queues of approximately 2 metres (no more than 1 vehicle in queue) on site.

As previously mentioned, it is reasonable to conclude that the traffic count data at the Wellington/Island Park intersection does not accurately reflect the actual demand during peak hours. Therefore, the proposed site generated traffic is projected to only contribute a maximum increase of 2% in volumes at this location (i.e. less than 1 new vehicle a minute). Nevertheless, as shown in Tables 1 and 5, the impact of the projected additional traffic at this location will be negligible and the Wellington/Island Park intersection will continue to operate similar to existing conditions.

Given the observed failing conditions at the Wellington/Island Park intersection is an existing issue and a result of the traffic congestion at the Island Park/Sir John A. Macdonald and Island Park/Scott intersections, which are beyond the study area limits, roadway modifications/intersection improvements should not be a condition of Application Approval for the subject site. It should also be noted that intersection improvements at the Wellington/Island Park intersection will provide minimal benefit and may not be feasible due to right-of-way/geometric constraints or signal timing coordination and therefore, will require further investigation by/with the City of Ottawa.

5. SITE PLAN REVIEW

This section provides an overview of site access, parking requirements, pedestrian circulation and transit accessibility. The proposed Site Plan was previously illustrated in Figure 2.

Parking

A total of 147 vehicle parking spaces are proposed to serve the subject development. This amount of parking meets the City's Zoning By-Law minimum requirements of 57 residential parking spaces, 23 visitor parking spaces, 7 restaurant parking spaces, and 3 ground floor retail parking spaces for a Traditional Main Street (TM) zone in Area B (identified in Schedule 1 of the City's Zoning By-Law).

The proposed dimensioning for the provided underground parking is also noted as being acceptable with respect to the City's By-law requirements of 2.6 m in width and 5.2 m in length for perpendicular parking.

Site Circulation

With regard to on-site circulation, sufficient turning radii on-site and at the site driveway connection will be provided for garbage and delivery trucks. The proposed lower level parking garage is laid out effectively such that two-way traffic can be accommodated. It should be noted that the lower level parking garage aisle widths (including the access ramp) are indicated as approximately 6.0 m in width, which according to the City's By-Law requirements, is not sufficient, as a minimum 6.7 m is required for two-way traffic. However, given the low projected vehicle volumes accessing/egressing the parking garage, the proposed 6.0 m aisle widths will be sufficient for safe and effective two-way operations.

Regarding the design of the proposed ramps, the grades leading to/from the parking garage and to/from the lower parking levels are identified on the attached Site Plan as 12% with 6% transition grades.

Access Requirements

Based on projected volumes and proximity to adjacent intersections, additional traffic control/auxiliary turn lanes are not warranted or required at the proposed driveway connection.

With regard to the proposed location of the site driveway, it is noted as being less than 3.0 metres from the adjacent property line, which does not meet the City's Private Approach By-Law requirements. However, given there is currently no driveway connection to Wellington Street serving the adjacent property, there will be no vehicular conflicts as a result of driveways being too close in proximity. Therefore, the proposed location of the site driveway is considered to be both safe and acceptable. It should also be noted that given the adjacent site is a relatively new development with access to/from Carleton Avenue, there will be no conflict with driveways being too close in proximity in the foreseeable future.

Furthermore to the proposed location of the site driveway, it is noted as being located approximately 60 m from the nearest intersecting street line (Island Park Drive). This satisfies the City's Private Approach By-Law requirements.

Pedestrians/Transit

Sidewalks are currently provided along both sides of Wellington Street and Island Park Drive, connecting pedestrians to transit service and other adjacent development. Bus stops are currently provided along Wellington Street, approximately 80 m walking distance east and west of the site. OC Transpo service along Wellington Street is currently provided by regular (Black) Routes # 2 and 16.

Bicycles

A total of 59 bicycle parking spaces are identified on the attached Site Plan, which is sufficient with respect to the City's By-Law requirements, provided that a minimum of 2 bicycle parking spaces are accessible to restaurant/retail patrons as well.

According to the City's 2008 Official Cycling Plan (OCP), Wellington Street is classified as a "Spine or City-wide" cycling route and Island Park Drive is classified as a cycling route on a NCC-owned Capital pathway. Bicycle lanes are currently provided along Island Park Drive and shared use lanes are proposed for Wellington Street by 2018.

6. FINDINGS AND RECOMMENDATIONS

Based on the foregoing analysis of the proposed site, the following transportation-related findings and recommendations are offered:

- The Wellington/Island Park intersection is currently failing during the weekday morning and afternoon peak hours, based on observed queuing along Island Park Drive. It should also be noted that intersection improvements at this location may not be feasible due to right-of-way/geometric constraints or signal timing coordination and therefore, will require further investigation by/with the City of Ottawa;
- The proposed development is projected to generate approximately 50 veh/h during both the weekday morning and afternoon peak hours. This equates to approximately 1 new vehicle a minute during peak hours, which is considered to be a negligible increase in traffic;
- Future traffic conditions within the study area are projected to operate similar to existing conditions. Based on the amount of projected site generated traffic, the impacts on the operations of the Wellington/Island Park intersection will be negligible;
- The proposed garage access ramp and aisle widths of the lower level parking are noted as 6.0 m, which does not meet By-Law requirements. However, based on the low projected site traffic, the 6.0 m garage access ramp and aisle widths are considered acceptable and will operate in a safe and effective manner;
- The proposed location of the site driveway is noted as being less than 3.0 m from the adjacent property line, which does not meet the City's minimum requirements.

However, as there are no adjacent driveways and there will be no driveways in the foreseeable future, there will be no vehicular conflicts as a result of adjacent driveways being too close in proximity. Therefore, the proposed site driveway location is acceptable;

- The proposed amount of vehicle and bicycle parking supply is sufficient with respect to By-Law requirements; and
- The proposed parking garage access/egress ramp and ramps leading to/from the lower parking levels are noted as being at an acceptable grade of 12%.

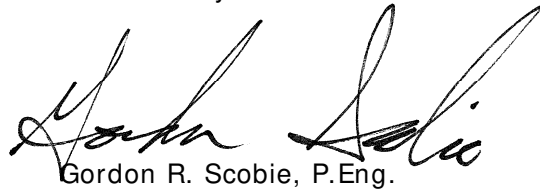
Therefore, based on the foregoing, approval of the proposed 1451-1445 Wellington Street West residential development is recommended from a transportation perspective.

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Appendix A

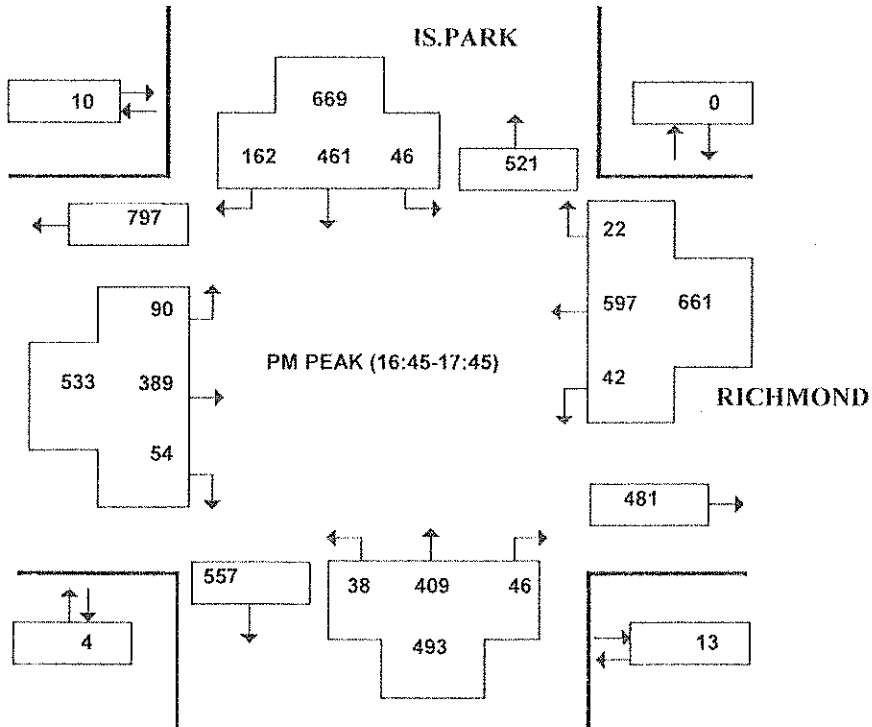
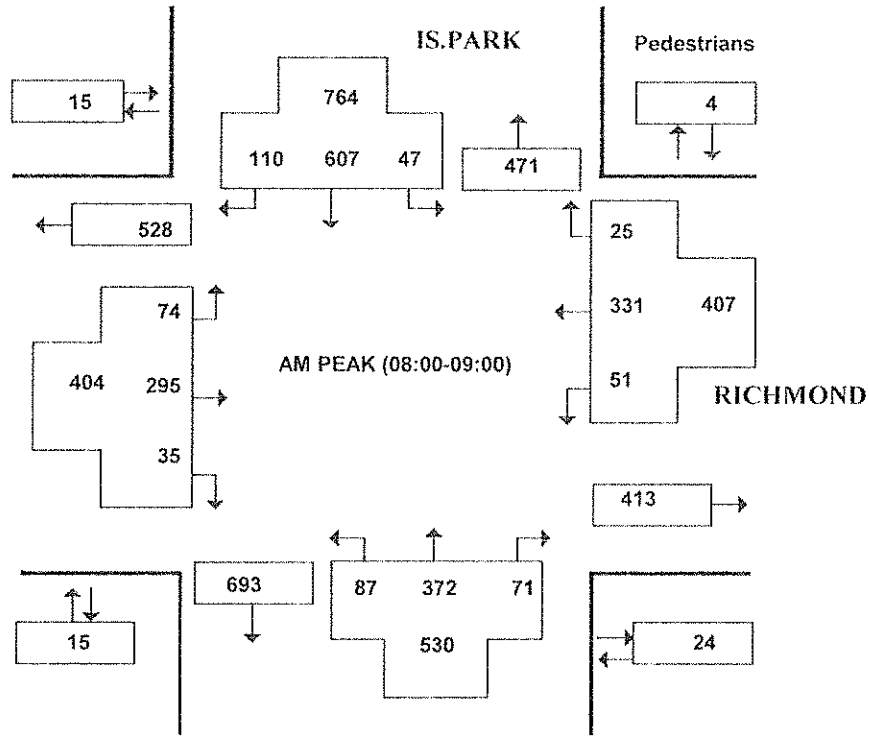
Existing Peak Hour Traffic Counts

ISLAND PARK DR and RICHMOND RD
(ULRS Listing IS.PARK & RICHMOND)

Survey Date: Wednesday 13 July 2011
 Conditions: dry
 Start Time: 0700

Total Observed U-Turns
 Northbound: 0 Southbound: 0
 Eastbound: 0 Westbound: 0

AADT Factor
 Wednesday in July is
 9



Appendix B

Existing SYNCHRO Model Output

Existing AM

1: Island Park & Richmond/Wellington

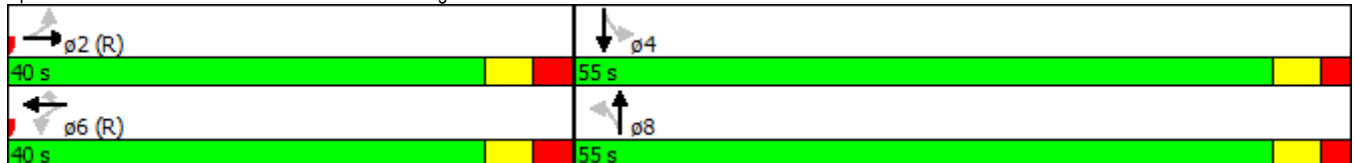


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	74	295	51	331	25	87	372	47	607
Lane Group Flow (vph)	0	426	0	402	26	92	467	49	755
Turn Type	Perm	NA	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2		6			8		4
Permitted Phases	2		6		6	8		4	
Minimum Split (s)	26.3	26.3	26.3	26.3	26.3	21.6	21.6	21.6	21.6
Total Split (s)	40.0	40.0	40.0	40.0	40.0	55.0	55.0	55.0	55.0
Total Split (%)	42.1%	42.1%	42.1%	42.1%	42.1%	57.9%	57.9%	57.9%	57.9%
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)	3.0	3.0	3.0	3.0	3.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.3	6.3	5.6	5.6	5.6	5.6
Lead/Lag									
Lead-Lag Optimize?									
Act Effct Green (s)		33.7		33.7	33.7	49.4	49.4	49.4	49.4
Actuated g/C Ratio		0.35		0.35	0.35	0.52	0.52	0.52	0.52
v/c Ratio		0.53		0.72	0.05	0.59	0.51	0.14	0.84
Control Delay		26.5		35.4	6.9	34.5	16.9	13.1	29.1
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		26.5		35.4	6.9	34.5	16.9	13.1	29.1
LOS		C		D	A	C	B	B	C
Approach Delay		26.5		33.6			19.8		28.2
Approach LOS		C		C			B		C
Queue Length 50th (m)		31.2		63.1	0.0	11.1	51.5	4.4	109.8
Queue Length 95th (m)		46.0		97.5	4.8	#35.2	77.8	10.7	#182.6
Internal Link Dist (m)		1322.4		1557.6			960.9		1299.8
Turn Bay Length (m)					20.0	20.0		20.0	
Base Capacity (vph)		809		557	527	157	909	361	904
Starvation Cap Reductn		0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0	0
Reduced v/c Ratio		0.53		0.72	0.05	0.59	0.51	0.14	0.84

Intersection Summary

Cycle Length: 95	
Actuated Cycle Length: 95	
Offset: 28 (29%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 70	
Control Type: Pretimed	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 26.8	Intersection LOS: C
Intersection Capacity Utilization 107.2%	ICU Level of Service G
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 1: Island Park & Richmond/Wellington



Existing PM

1: Island Park & Richmond/Wellington

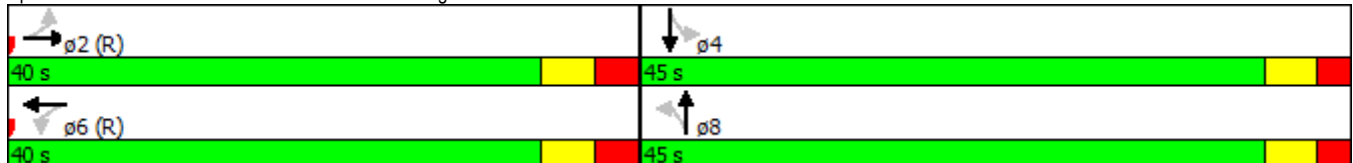


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	90	389	42	597	38	409	46	461
Lane Group Flow (vph)	0	561	0	695	40	479	48	656
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Minimum Split (s)	26.3	26.3	26.3	26.3	21.6	21.6	21.6	21.6
Total Split (s)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0
Total Split (%)	47.1%	47.1%	47.1%	47.1%	52.9%	52.9%	52.9%	52.9%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	3.0	3.0	3.0	3.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.3	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Act Effct Green (s)		33.7		33.7	39.4	39.4	39.4	39.4
Actuated g/C Ratio		0.40		0.40	0.46	0.46	0.46	0.46
v/c Ratio		0.64		0.59	0.24	0.58	0.16	0.81
Control Delay		24.2		22.6	18.7	20.0	15.2	28.8
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		24.2		22.6	18.7	20.0	15.2	28.8
LOS		C		C	B	C	B	C
Approach Delay		24.2		22.6		19.9		27.9
Approach LOS		C		C		B		C
Queue Length 50th (m)		36.6		45.4	3.8	53.9	4.4	84.8
Queue Length 95th (m)		54.2		62.5	11.2	83.2	11.2	#146.0
Internal Link Dist (m)		1322.4		1557.6		960.9		1299.8
Turn Bay Length (m)					20.0		20.0	
Base Capacity (vph)		876		1176	164	819	292	806
Starvation Cap Reductn		0		0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.64		0.59	0.24	0.58	0.16	0.81

Intersection Summary

Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 53 (62%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Pretimed
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 23.9
 Intersection LOS: C
 Intersection Capacity Utilization 91.7%
 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: 1: Island Park & Richmond/Wellington



Appendix C

Projected SYNCHRO Model Output

Projected AM
1: Island Park & Richmond/Wellington

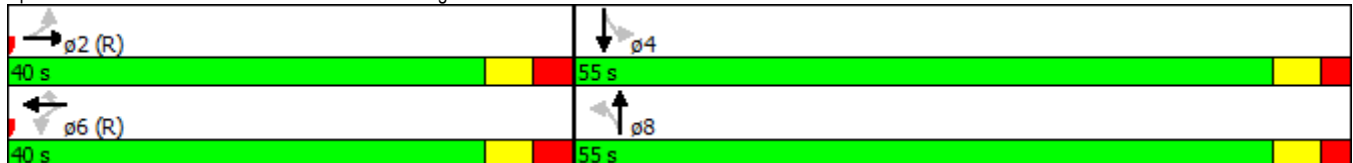


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	74	297	66	336	34	87	372	50	607
Lane Group Flow (vph)	0	428	0	423	36	92	472	53	755
Turn Type	Perm	NA	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2		6			8		4
Permitted Phases	2		6		6	8		4	
Minimum Split (s)	26.3	26.3	26.3	26.3	26.3	24.0	24.0	24.0	24.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	55.0	55.0	55.0	55.0
Total Split (%)	42.1%	42.1%	42.1%	42.1%	42.1%	57.9%	57.9%	57.9%	57.9%
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)	3.0	3.0	3.0	3.0	3.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.3	6.3	5.6	5.6	5.6	5.6
Lead/Lag									
Lead-Lag Optimize?									
Act Effct Green (s)		33.7		33.7	33.7	49.4	49.4	49.4	49.4
Actuated g/C Ratio		0.35		0.35	0.35	0.52	0.52	0.52	0.52
v/c Ratio		0.54		0.79	0.07	0.59	0.52	0.15	0.84
Control Delay		26.9		39.8	9.2	34.5	17.0	13.3	29.1
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		26.9		39.8	9.2	34.5	17.0	13.3	29.1
LOS		C		D	A	C	B	B	C
Approach Delay		26.9		37.4			19.8		28.1
Approach LOS		C		D			B		C
Queue Length 50th (m)		31.6		68.6	0.7	11.1	52.1	4.8	109.8
Queue Length 95th (m)		46.4		#115.0	6.9	#35.2	79.0	11.4	#182.6
Internal Link Dist (m)		1322.4		88.2			960.9		1299.8
Turn Bay Length (m)					20.0	20.0		20.0	
Base Capacity (vph)		789		537	527	157	909	358	904
Starvation Cap Reductn		0		0	0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0	0
Reduced v/c Ratio		0.54		0.79	0.07	0.59	0.52	0.15	0.84

Intersection Summary

Cycle Length: 95
 Actuated Cycle Length: 95
 Offset: 28 (29%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Pretimed
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 27.7 Intersection LOS: C
 Intersection Capacity Utilization 108.4% ICU Level of Service G
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Island Park & Richmond/Wellington

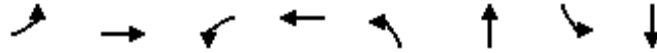


Projected AM
2: Wellington & Site



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	10	413	406	3	7	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	435	427	3	7	32
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		112				
pX, platoon unblocked					0.96	
vC, conflicting volume	431				667	429
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	431				565	429
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	95
cM capacity (veh/h)	1125				432	574
Direction, Lane #						
	EB 1	EB 2	WB 1	SB 1		
Volume Total	155	290	431	39		
Volume Left	11	0	0	7		
Volume Right	0	0	3	32		
cSH	1125	1700	1700	541		
Volume to Capacity	0.01	0.17	0.25	0.07		
Queue Length 95th (m)	0.2	0.0	0.0	1.8		
Control Delay (s)	0.6	0.0	0.0	12.2		
Lane LOS	A			B		
Approach Delay (s)	0.2		0.0	12.2		
Approach LOS				B		
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			32.7%		ICU Level of Service	A
Analysis Period (min)			15			

Projected PM
1: Island Park & Richmond/Wellington

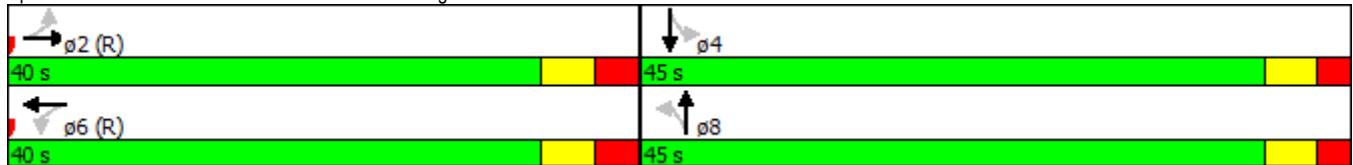


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	90	393	51	600	38	409	53	461
Lane Group Flow (vph)	0	566	0	715	40	491	56	656
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Minimum Split (s)	26.3	26.3	26.3	26.3	24.0	24.0	24.0	24.0
Total Split (s)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0
Total Split (%)	47.1%	47.1%	47.1%	47.1%	52.9%	52.9%	52.9%	52.9%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	3.0	3.0	3.0	3.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.3	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Act Effct Green (s)		33.7		33.7	39.4	39.4	39.4	39.4
Actuated g/C Ratio		0.40		0.40	0.46	0.46	0.46	0.46
v/c Ratio		0.65		0.62	0.24	0.60	0.20	0.81
Control Delay		24.6		23.3	18.7	20.3	15.8	28.8
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		24.6		23.3	18.7	20.3	15.8	28.8
LOS		C		C	B	C	B	C
Approach Delay		24.6		23.3		20.2		27.8
Approach LOS		C		C		C		C
Queue Length 50th (m)		37.3		47.3	3.8	55.6	5.2	84.8
Queue Length 95th (m)		55.1		65.4	11.2	85.9	12.8	#146.0
Internal Link Dist (m)		1322.4		76.0		960.9		1299.8
Turn Bay Length (m)					20.0		20.0	
Base Capacity (vph)		865		1147	164	818	283	806
Starvation Cap Reductn		0		0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.65		0.62	0.24	0.60	0.20	0.81

Intersection Summary

Cycle Length: 85
 Actuated Cycle Length: 85
 Offset: 53 (62%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Pretimed
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 24.2
 Intersection LOS: C
 Intersection Capacity Utilization 98.4%
 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: 1: Island Park & Richmond/Wellington



Projected PM
2: Wellington & Site



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	23	480	659	7	5	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	24	505	694	7	5	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		100				
pX, platoon unblocked					0.93	
vC, conflicting volume	701				998	351
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	701				844	351
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	97
cM capacity (veh/h)	892				273	646
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	193	337	462	239	26	
Volume Left	24	0	0	0	5	
Volume Right	0	0	0	7	21	
cSH	892	1700	1700	1700	507	
Volume to Capacity	0.03	0.20	0.27	0.14	0.05	
Queue Length 95th (m)	0.6	0.0	0.0	0.0	1.2	
Control Delay (s)	1.4	0.0	0.0	0.0	12.5	
Lane LOS	A				B	
Approach Delay (s)	0.5		0.0		12.5	
Approach LOS					B	
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			41.9%		ICU Level of Service	A
Analysis Period (min)			15			