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October 15, 2012 **File:** 5012210-001

Polygon Development 266 Ltd.
Suite 900-1333 West Broadway
Vancouver, BC V6H 4C2

Attention: Mr. Hugh Ker

Dear Mr. Ker,

Reference: Parking Study
2635-2691 Mountain Highway – North Vancouver, BC

Polygon Development 266 Ltd. (Polygon) proposes to construct 108 dwelling units in two wood-frame apartment buildings located at 2635-2691 Mountain Highway in North Vancouver, BC. The project would include a 162-space underground parkade, equivalent to a parking ratio of 1.50 parking spaces per dwelling unit. MMM was retained to assist Polygon in documenting the appropriate amount of off-street parking that should be provided for this multi-family development.

SUMMARY

- Application of the *District of North Vancouver Zoning Bylaw, 1965* to the proposed form of development yields a requirement for 197 parking spaces for residents and visitors; equivalent to a parking supply of 1.81 stalls per dwelling unit.
- Parking utilization surveys at comparable condominium developments in Lynn Valley and Vancouver suggest that a parking ratio of 1.06 parking spaces per dwelling unit would be appropriate for the proposed form of development. Consequently, at least 115 parking spaces should be provided for residents and visitors at the proposed residential condominium development.
- Although the proposed parking supply (162 spaces) is less than that the minimum required by the District's by-law (197 spaces) and the peak demand based on data published by the Institute of Transportation Engineers (ITE) (174 spaces), the proposed supply would exceed the anticipated peak demand (115 spaces).

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Polygon Development 266 Ltd.
Mr. Hugh Ker

METHODOLOGY

In order to quantify the off-street parking demand for the proposed development, MMM Group completed the following work program:

- Reviewed site statistics for the proposed development.
- Confirmed the District of North Vancouver's (District) off-street parking requirements for the proposed development per *District of North Vancouver Zoning Bylaw, 1965.*
- Conducted a parking utilization survey at the nearby Branches development – located at 2601 Whiteley Court – on Tuesday, May 8, 2012 between 11:00 p.m. and 2:00 a.m. to quantify the number of occupied underground parking spaces. This time period ensured that the maximum number of residents would be home at the time of the survey.
- Determined an appropriate parking ratio for the proposed development based on parking utilization data for comparable condominium developments. Data sources include:
  - Parking utilization survey at the Branches development
  - Parking utilization surveys (2004) at three comparable condominium developments within the Arbutus neighbourhood in Vancouver:
    - **Tropez** (2263 Redbud Lane) one 4-storey low rise residential building
    - **Carlings** (2161 & 2181 W12th Ave) two 4-storey low-rise residential buildings
    - **Zydeco** (2768 Cranberry Drive) one 4-storey low-rise with ground floor retail

FINDINGS

District of North Vancouver Parking Requirements

As shown in **Table 1**, application of the District's off-street parking requirements to this development yields a requirement for 197 parking spaces and represents a parking ratio of 1.81 spaces per dwelling unit (DU).

Table 1: By-Law Parking Requirements

Component	No. of DU	Gross Residential Floor Area (m²)	By-Law Parking Ratio	Parking Requirement (Spaces)
Residential (Apartment)	108	8,904	1 space per unit plus 1 space per 100m² of gross residential floor area (to a maximum of 2 spaces per unit inclusive of 0.25 per dwelling unit designated for visitor parking)	197

Notes: DU – dwelling unit
Gross Residential Floor Area - sum of the floor areas of all dwelling units including the areas occupied by walls and partitions, but excluding the floor areas of balconies.

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The key finding of **Table 1** is that the proposed form of development is required to provide at least 197 parking spaces.

Parking Demand

Building statistics for the various comparable residential developments, including the proposed development, are compared in **Table 2**. Key findings of **Table 2** include:

- The comparable developments have similar characteristics including:
  - a mix of 1-bedroom, 2-bedroom, and 3-bedroom dwelling units
  - the proximity to grocery stores and transit (i.e. less than five minutes walking distance)
  - the limited availability of nearby on-street parking

The parking demand, percent utilization and parking ratios for the comparable developments are summarized in **Table 3**. Key findings of **Table 3** include:

- The parking ratio at four comparable developments ranges from a low of 0.80 spaces per dwelling unit to a high of 1.22 spaces per dwelling unit
- The average parking ratio is 1.06 spaces per dwelling unit
- The average parking ratio is lower than the ratio measured at residential condominium developments by ITE

The future demand was estimated by applying the average parking ratio to the proposed number of dwelling units at the proposed development. Based on this methodology, the future peak parking demand would be 115 spaces (=1.06 spaces per dwelling unit x 108 dwelling units). If the peak parking demand was calculated using data published by the Institute of Transportation Engineers then the peak parking demand would be 174 spaces (=1.61 spaces per dwelling unit x 108 dwelling units).

RECOMMENDATIONS

In light of the findings, the following recommendations are offered for consideration.

- A minimum parking ratio of 1.06 spaces per dwelling unit would be appropriate at the proposed residential condominium development.

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Mr. Hugh Ker

Table 2: Comparison of Building Statistics

Variable	Tropez	Carlings	Zydeco	Branches	Average	Proposed Development
Number of Dwelling Units (DU)						
Studio	--	--	--	--	--	--
One Bedroom	--	19	9	3	8	--
One Bedroom + Den	28	22	31(1)	--	20	9
Two Bedroom	39	43	28	115	56	90
Two Bedroom + Den	20	--	--	3	6	--
Three Bedroom	--	16	2	46	16	9
Total	87	100	70	167	106	108
Average Area (m^2)						
Studio	--	--	--	--	--	--
One Bedroom	--	64.85	60.57	64.47	47.47	--
One Bedroom + Den	68.56	73.77	64.75(2)	--	51.77	60.02
Two Bedroom	96.34	85.43	85.65	86.77	88.55	82.22
Two Bedroom + Den	110.65	--	--	82.50	48.29	--
Three Bedroom	--	109.81	121.05	96.94	81.95	104.33
Net Area (m2)						
Residential Area (m^2)	7,892.31	8,281.29	5,265.47	14,878.88	9,079.49	8,878.93
Common Area (m^2)	913.89	1,050.36	505.21	2,218.24	1,171.93	1,428.29
Gross Building Area (m^2)	8,805.90	9,331.62	5,770.48	17,097.12	10,251.28	10,307.22
Parking Supply (stalls)						
Residential	118	152	89	259	155	135
Visitor	13	11	16	33	18	27
Total	131	163	105	292	173	162
Parking Rate (stalls / DU)	1.51	1.63	1.50	1.75	1.63	1.50
Other Variables						
Distance to Transit	250m(3)	100m(3)	50m(3)	250m(4)	160m	<100m(5)
Distance to Grocery Stores	600m(6)	500m(6)	450m(6)	200m(7)	440m	350m(7)
Availability of On-Street Parking	Limited	Limited	Limited	Limited	--	Limited

Notes:
1. Sum of 25 One Bedroom + Den and 6 One Bedroom + Computer Room.
2. Weighted average of 25 One Bedroom + Den and 6 One Bedroom + Computer Room.
3. Nearest bus stop is located at 12th and Arbutus
4. Nearest bus stop is located at Lynn Valley and 27th
5. Nearest bus stop is located at Mountain and 27th
6. IGA at Maple and Broadway
7. Safeway at 12th and Ash
8. Safeway at Lynn Valley Centre

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Table 3: Parking Utilization

Venue	Variable (Dwelling Units)	Parking Supply			Parking Demand			Parking Utilization	Parking Ratio
		Resident	Visitor	Total	Resident	Visitor	Total		
Branches	167	260	32	292	169	13	182	62%	1.09
Tropez	87	118	13	131	82	9	91	69%	1.05
The Carlings	100	152	11	163	115	7	122	75%	1.22
Zydeco	70	89	16	105	51	5	56	53%	0.80
Average	**106**	**155**	**18**	**173**	**104**	**9**	**113**	**65%**	**1.06**
ITE*	--	--	--	--	--	--	--	--	1.61

Notes: ITE – Land Use 221 Low/Mid-Rise Apartment (Urban Weekday) as described in *Parking Generation, 4th Edition* (Washington, DC: Institute of Transportation Engineers, 2010)

CONCLUSIONS

- Application of the *District of North Vancouver Zoning Bylaw, 1965* to the proposed form of development yields a requirement for 197 parking spaces for residents and visitors; equivalent to a parking supply of 1.81 stalls per dwelling unit.
- Parking utilization surveys at comparable condominium developments in Lynn Valley and Vancouver suggest that a parking ratio of 1.06 parking spaces per dwelling unit would be appropriate for the proposed form of development. Consequently, at least 115 parking spaces should be provided for residents and visitors at the proposed residential condominium development.
- Although the proposed parking supply (162 spaces) is less than that the minimum required by the District's by-law (197 spaces) and the peak demand based on data published by the Institute of Transportation Engineers (174 spaces), the proposed supply would exceed the anticipated peak demand (115 spaces).

* * * * *

If you have any questions about our findings, recommendations or conclusions, please call me at (604) 685-9381 or e-mail me at vanweelderenf@mmm.ca.

Yours truly,

MMM Group Limited

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Floris van Weelderen, P.Eng. PTOE
Manager, Transportation Planning
Associate Partner
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May 16, 2012 **File:** 5012210-001

Polygon Development 266 Ltd.
Suite 900-1333 West Broadway
Vancouver, BC V6H 4C2

Attention: Mr. Brandon Hohenwarter

Dear Mr. Hohenwarter

Reference: Traffic Study
2691-2635 Mountain Highway – North Vancouver, BC

Polygon Development 266 Ltd. (Polygon) proposes to construct 108 dwelling units in two wood-frame apartment buildings located at 2691-2635Mountain Highway in North Vancouver, BC. Notable aspects of the site include:

- The site's 173-space underground parkade would be accessed from a new local street at the south end of the site.
- The site is located within walking distance to Lynn Valley Centre, which provides a range of retail services including banks and grocery stores.

As part of the rezoning application, the District of North Vancouver (District) requires submission of a traffic review which documents traffic impacts associated with the site. This letter report presents the methodology, findings and conclusions regarding this traffic review.

METHODOLOGY

MMM Group completed the following work program in support of the traffic review:

- Visited the site on Thursday, May 10, 2012 to clearly understand the site development in terms of street laning, traffic control measures, and on-street parking regulations.
- Obtained the most recent traffic counts and signal timings from the District for the signalized intersection of Mountain Highway / E 27th Street.
- Estimated trip generation of the proposed development based on data in the Institute of Transportation Engineers' (ITE) *Trip Generation, 8th Edition.*
- Estimated growth in through traffic based on historical traffic volumes.

- Estimated the directional distribution of site traffic using the analogy method and assigned project traffic.
- Used Synchro 8 software (2010 HCM Methodology) to assess traffic operations at study area intersections for the Existing (2012) and Future Total (2017) scenarios. Reported operational parameters include level of service (LOS), delay, volume to capacity ratio (v/c ratio), and queuing patterns (95th percentile queues).
- Formulated mitigation alternatives if and when the operating parameters identify LOS, v/c ratio, or queue deficiencies.

FINDINGS

Existing Conditions

As illustrated in **Figure 1,** the proposed development is located on the southwest corner of Mountain Highway and E 27th Street, within the Lynn Valley neighbourhood of North Vancouver. The existing land use consists of seven single-family homes. Surrounding land uses are primarily residential, including single-family homes, multi-family townhouse and low-rise apartments. The site is within walking distance of Lynn Valley Centre, which provides a range of retail services.

Mountain Highway is a north-south major arterial that has a two-lane cross-section north of E 27th Street and a three-lane cross-section (two northbound lanes + one southbound lane) south of E 27th Street, i.e. adjacent to the site. The posted speed limit is 50 km/h with sidewalk provided on both sides of the street. Bicycle lanes are also provided in both directions north of E 27th Street.

E 27th Street is a local street with a two-lane cross-section. The posted speed is 50 km/h, and sidewalks are provided on both sides of the street. E 27th Street intersects Mountain Highway at a signalized intersection.

The existing lane configurations, intersection controls and traffic volumes at the intersection of Mountain Highway and E 27th Street are shown in **Figure 2**.

Proposed Development

The project would construct 108 dwelling units in two wood-frame apartment buildings, with a 173-stall underground parkade accessed via a newly dedicated local street located approximately 150m south of the intersection of Mountain / E 27th. The site plan is illustrated in **Figure 3**. Note that the existing restricted parking zone in the northbound direction (no Parking 3-6pm, Mon-Sat) terminates just north of the proposed driveway location.

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Mr. Brandon Hohenwarter

Figure 1 – Site Location

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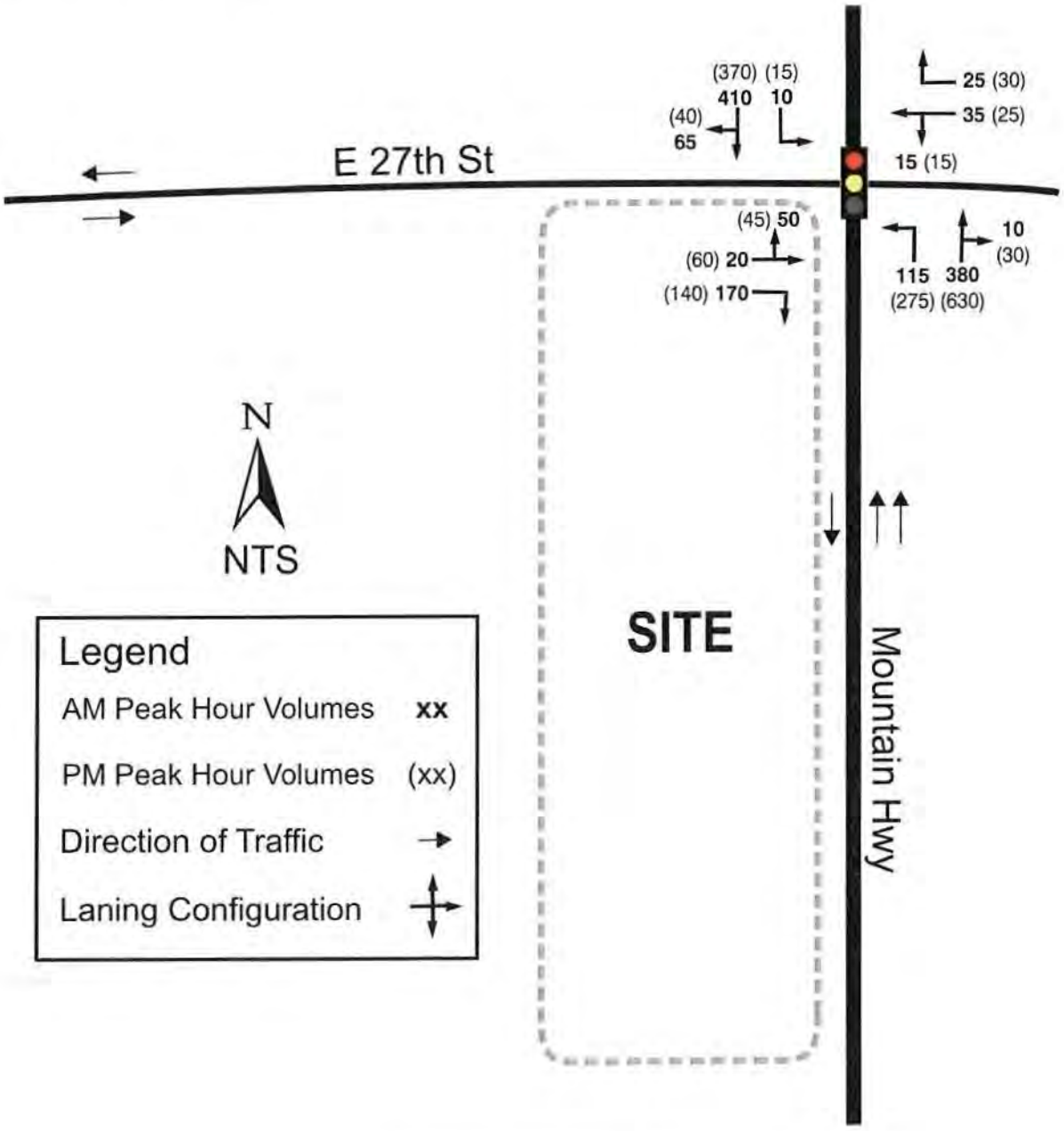

Note: Volumes rounded to nearest 5 vehicle trips

Figure 2 – Existing (2011) Traffic Volumes
Source: District of North Vancouver

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Mr. Brandon Hohenwarter

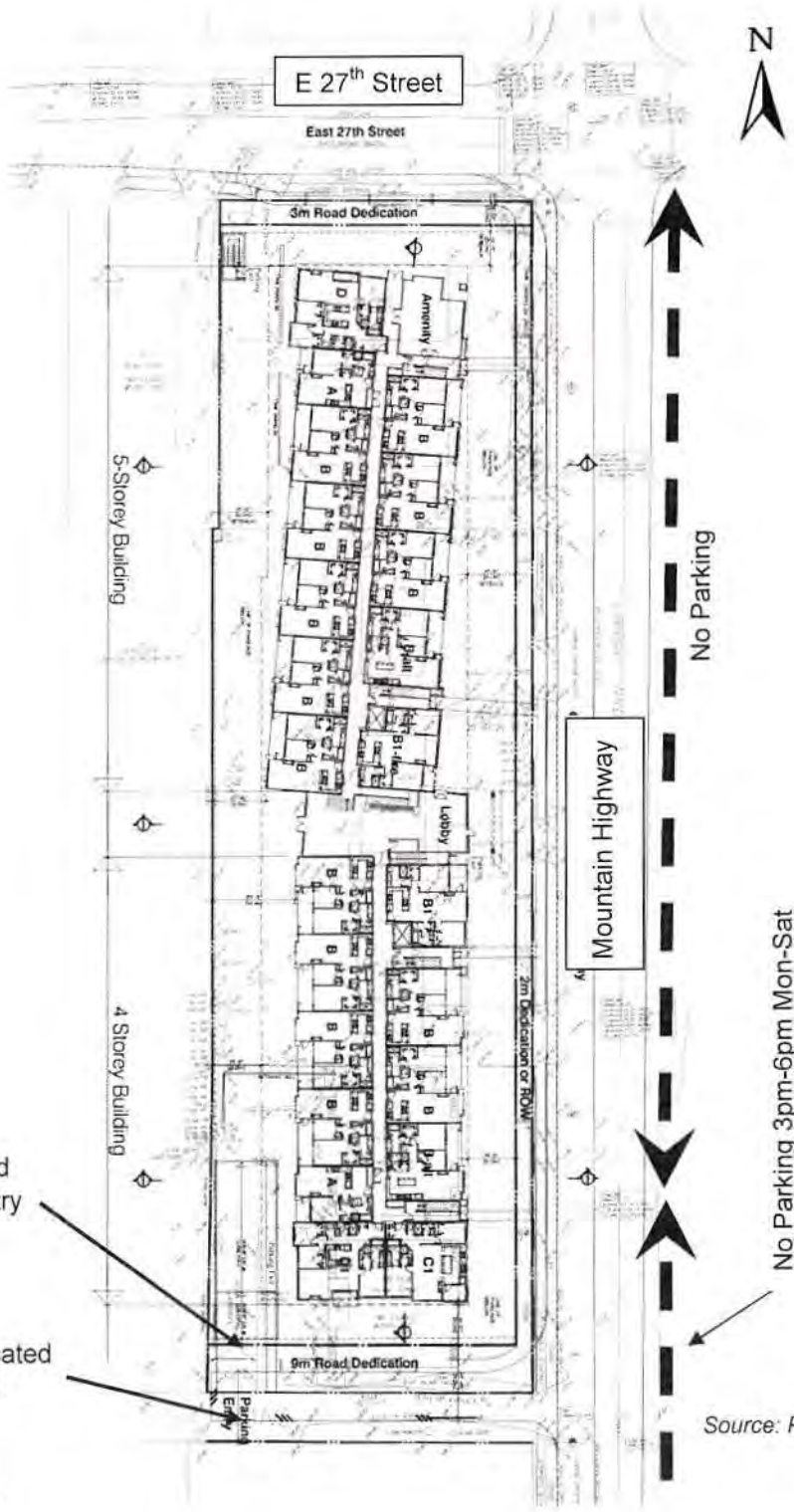

Figure 3 – Site Plan
Source: Polygon Development 266 Ltd.

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Mr. Brandon Hohenwarter

Trip Generation, Distribution & Assignment

As shown in **Table 1**, the development is anticipated to generate up to 59 trips (12 inbound + 47 outbound) in the AM peak hour and 72 trips (47 inbound + 25 outbound) in the PM peak hour. For the purpose of analysis, traffic generated by existing uses on the proposed site (i.e. seven single-family homes) was not deducted; hence, the trip generation estimate is considered conservative, i.e. high.

Table 1 – Trip Generation

Time of Day	Independent Variable	Directional Distribution		Trip Rate (veh trips per unit)	Trip Generation (vph)		
		IN	OUT		IN	OUT	Total
Weekday AM Peak Hour	108 DU(s)	21%	79%	0.55	12	47	59
Weekday PM Peak Hour	108 DU(s)	65%	35%	0.67	47	25	72

Notes: Rates based on ITE *Trip Generation, 8th Edition*, Land Use (221) Low-Rise Apartment
DU = Dwelling Unit
vph = vehicles per hour

Table 2 summarizes the directional distribution of traffic based on existing traffic patterns. The assignment of site-generated traffic onto the adjacent road network is illustrated in **Figure 4**.

Table 2 – Trip Distribution

Direction	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
North	37%	35%	25%	42%
South	39%	46%	56%	32%
East	6%	3%	4%	6%
West	18%	16%	15%	20%
Total	100%	100%	100%	100%

Future Total Traffic

A review of historical volumes suggests that there were negligible growth in traffic volumes in the past five years along Mountain Highway and E 27th Street. As a result, Future Total (2017) traffic was determined by adding the site generated traffic volumes to the Existing (2011) volumes. The future Total (2017) traffic volumes are illustrated in **Figure 5**.

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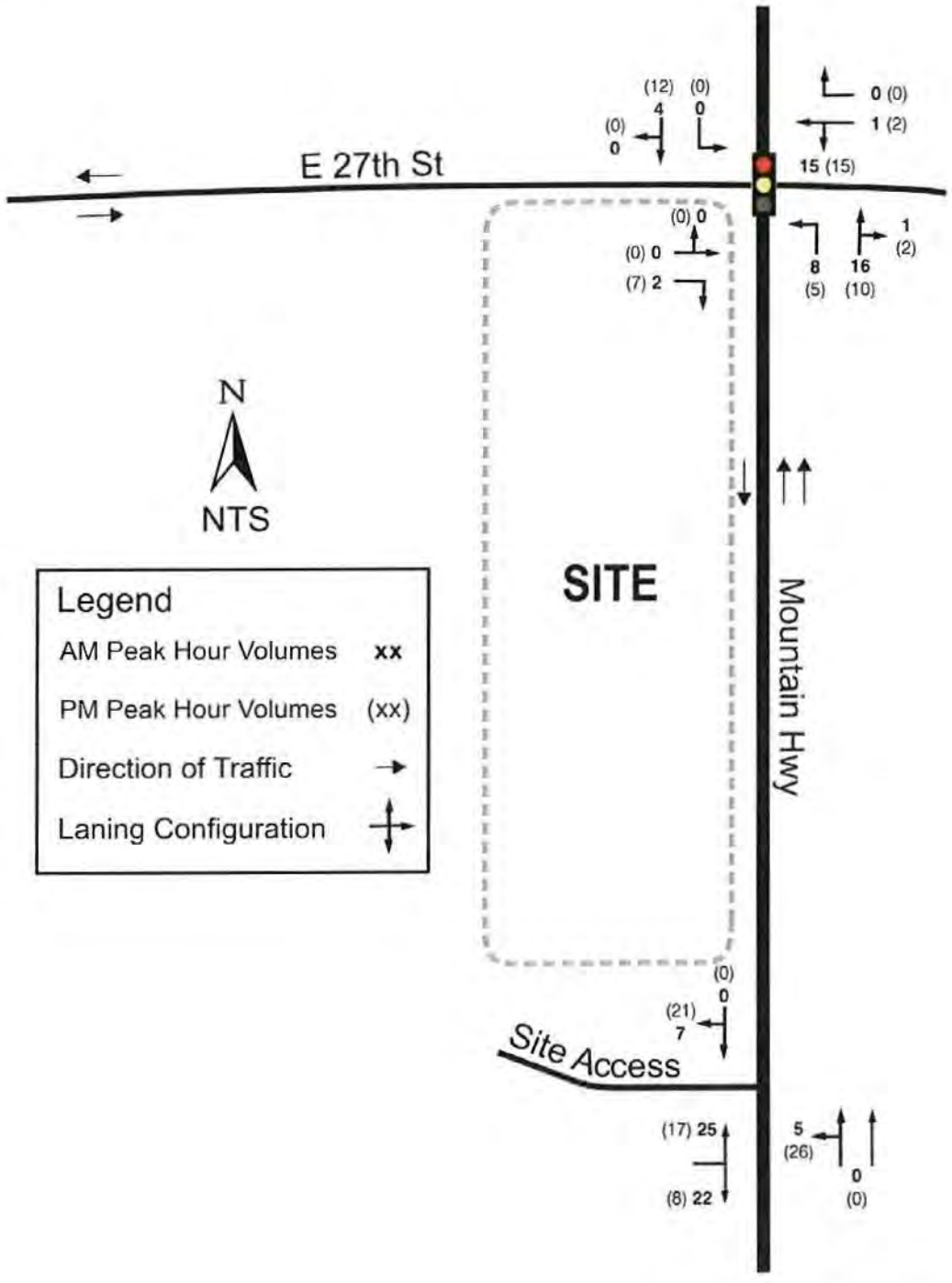
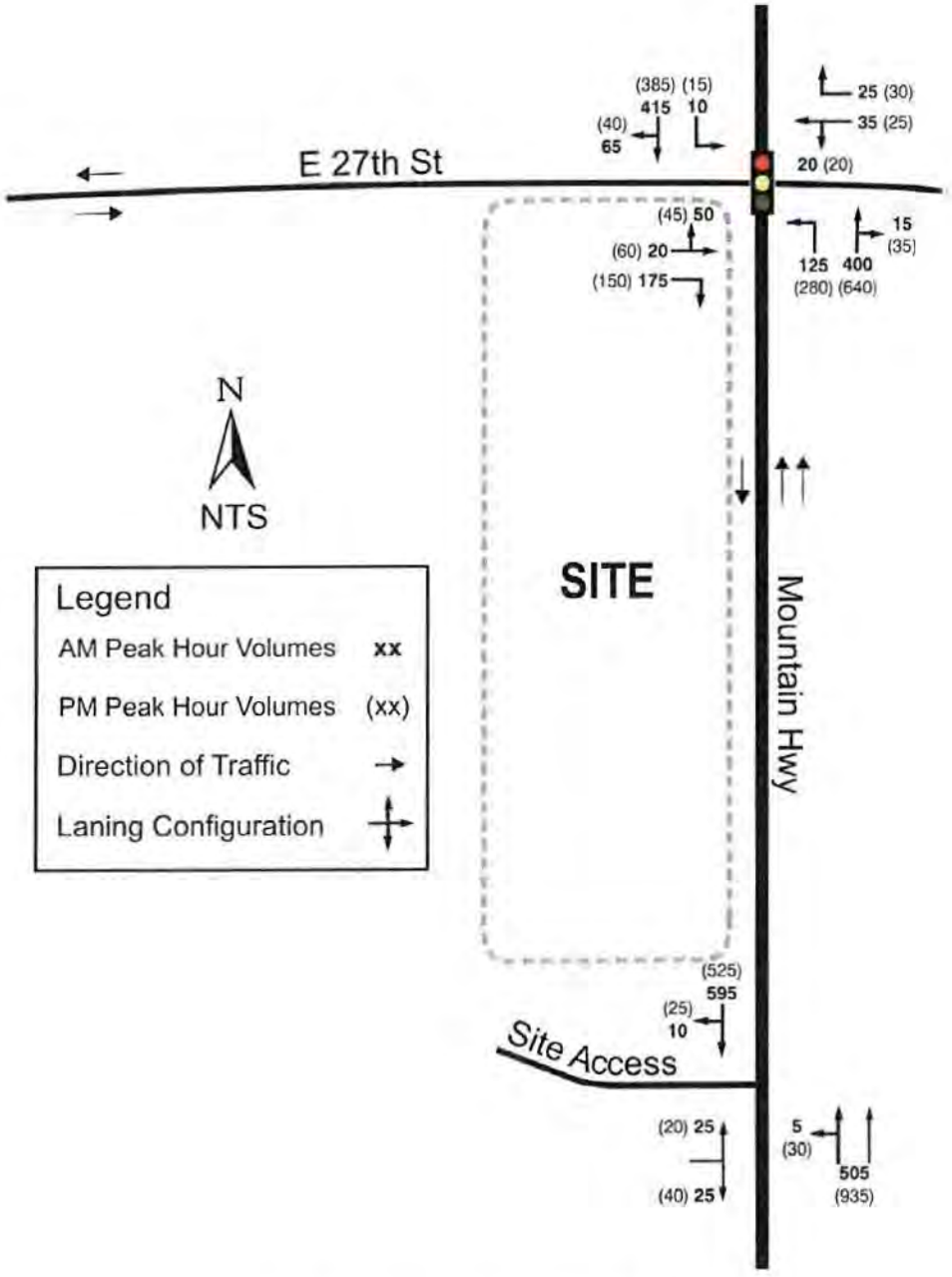


Figure 4 – Site-Generated Traffic



Note: Volumes rounded to nearest 5 vehicle trips

Figure 5 – Future (2017) Total Volumes

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Traffic Analysis

Results of the operational analysis for Existing (2012) and Future Total (2017) are tabulated and compared in **Table 3.** Reported measures of traffic performance include volume to capacity (v/c) ratio and a delay-based traffic Level of Service (LOS) indicator ranging from LOS A (ideal) to LOS F (over-saturated) conditions. As a target or design parameter, LOS D and a v/c lower than 0.90 for individual movements is considered appropriate. Note that existing timings provided by the District were used for the analysis. Synchro outputs can be found in **Appendix A**.

Key findings from Table 3 include:

- Under Existing (2012) conditions, both study area intersections appear to operate at acceptable levels.
- Under Future Total (2017) conditions, both study area intersections are anticipated to continue operating at acceptable levels. There were only marginal increases in delay and v/c ratios compared to existing conditions.
- With the addition of project traffic, the northbound queue at the intersection of Mountain Highway / E 27th Street is expected to reach approximately 80m during the PM peak hour. As there is 150m of storage space between the new local street and E 27th Street, queues are not anticipated to impede motorists turning into and out of the new local street.

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Table 3 – Level of Service Analysis (AM Peak Hour)

Intersection	Control	Movement	Existing (2012) LOS (Delay)	V/C	Queue (m)	Future Total (2017) LOS (Delay)	V/C	Queue (m)
AM Peak Hour								
Mountain Highway / E 27th Street	Signalized	**Intersection**	**B (15)**	--	--	**B (15)**	--	--
		EB-L	C (35)	0.38	20	C (35)	0.38	50
		EB-R	B (15)	0.36	10	B (15)	0.37	10
		WB-L	B (20)	0.32	15	B (19)	0.33	15
		WB-R	B (15)	0.15	5	B (15)	0.15	5
		NB-L	B (10)	0.25	10	B (10)	0.28	10
		NB-R	A (10)	0.33	35	A (10)	0.35	35
		SB-L	B (10)	0.03	5	B (10)	0.03	5
		SB-R	C (20)	0.71	85	C (20)	0.72	90
Mountain Highway / Local Street	Stop Controlled	**Intersection**	Not Analysed			**A (1)**	--	--
		EB-LR				C (18.2)	0.16	5
		NB-TL				A (0.3)	0.01	0
		NB-T				A (0)	0.22	0
		SB-TR				A (0)	0.38	0
PM Peak Hour								
Mountain Highway / E 27th Street	Signalized	**Intersection**	**B (15)**	--	--	**B (15)**	--	--
		EB-L	C (30)	0.44	30	C (30)	0.44	30
		EB-R	B (10)	0.26	10	B (10)	0.26	10
		WB-L	B (20)	0.25	10	C (20)	0.25	15
		WB-R	B (20)	0.15	5	B (20)	0.15	5
		NB-L	B (15)	0.50	25	B (15)	0.50	25
		NB-R	A (10)	0.53	5	B (10)	0.53	80
		SB-L	B (15)	0.06	5	B (15)	0.06	5
		SB-R	C (25)	0.69	80	C (25)	0.69	85
Mountain Highway / Local Street	Stop Controlled	**Intersection**	Not Analysed			**A (1)**	--	--
		EB-LR				C (25)	0.13	5
		NB-TL				A (1)	0.03	1
		NB-T				A (0)	0.40	0
		SB-TR				A (0)	0.35	0

Notes:
Delay = measured in seconds
V/C = volume to capacity ratio
Queue = 95th percentile queue length

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Polygon Development 266 Ltd.
Mr. Brandon Hohenwarter

RECOMMENDATIONS

In light of the findings, the following recommendations are offered for consideration:

- Intersection of Mountain Highway / E 27th Street
  - No improvements recommended.
- Intersection of Mountain Highway / Newly Dedicated Local Street
  - An all-movement intersection is recommended. Design of the local street should ensure that adequate sight distance to and from the new local street is incorporated.
  - The existing northbound "No Parking" zone should be extended to south of the local street so that two northbound lanes are maintained at all times through the intersection.

CONCLUSIONS

Polygon Development 266 Ltd. is proposing a residential development consisting of 108 apartment units. Based on this study, we offer the following:

- The proposed development is anticipated to generate 59 trips (12 inbound + 47 outbound) in the AM peak hour and 72 trips (47 inbound + 25 outbound) in the PM peak hour.
- Under Future Total (2017) traffic conditions, all study area intersections operate at LOS B or better. Overall, the traffic generated by the proposed development is not anticipated to significantly impact the operation of the roadway network.
- Northbound queuing at the intersection of Mountain Highway / E 27th Avenue is not anticipated to conflict with turning movements in and from the newly dedicated local street.

* * * * *

If you have any questions about our findings, recommendations or conclusions, please call me at (604) 685-9381 or e-mail me at youngs@mmm.ca.

Yours truly,

MMM Group Limited

<original signed by>

Sam Young, P.Eng
Transportation Engineer

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Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	210	86	43	131	443	12	572
v/c Ratio	0.38	0.36	0.32	0.15	0.25	0.33	0.03	0.71
Control Delay	27.4	5.7	25.3	9.4	5.1	5.0	11.7	20.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.4	5.7	25.3	9.4	5.1	5.0	11.7	20.6
Queue Length 50th (m)	8.3	3.0	8.1	0.0	4.1	16.5	0.7	47.3
Queue Length 95th (m)	19.2	11.2	12.9	3.0	10.3	34.2	3.6	87.2
Internal Link Dist (m)	141.5		88.0			129.3		48.4
Turn Bay Length (m)		30.0		15.0			15.0	
Base Capacity (vph)	401	766	475	482	695	1578	475	935
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.27	0.18	0.09	0.19	0.28	0.03	0.61

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	20	170	15	35	25	115	380	10	10	410	65
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		0.98	1.00		0.99	1.00		0.99	0.99		0.97
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881
Lanes	0	1	1	0	1	1	1	1	0	1	1	0
Lane Assignment												
Capacity, veh/h	110	27	543	83	145	420	362	1014	27	493	612	97
Proportion Arriving On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.08	0.56	0.56	0.39	0.39	0.39
Movement Delay, s/veh	32.8	0.0	14.4	17.9	0.0	15.7	11.4	0.0	7.5	10.7	0.0	20.4
Movement LOS	C		B	B		B	B		A	B		C
Approach Volume, veh/h		296			129			574			584	
Approach Delay, s/veh		19.8			17.2			8.4			20.2	
Approach LOS		B			B			A			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4	5	6		8
Case No		4.0		7.0	1.2	6.3		7.0
Phase Duration (G+Y+Rc), s		36.30		20.00	9.49	26.81		20.00
Change Period (Y+Rc), s		5.00		5.00	5.00	5.00		5.00
Max. Allowable Headway (MAH), s		9.75		9.10	8.31	9.75		9.10
Maximum Green Setting (Gmax), s		26.00		15.00	15.00	26.00		15.00
Max. Queue Clearance Time (g_c+I1), s		9.75		17.00	4.20	17.70		17.00
Green Extension Time (g_e), s		13.10		0.00	0.95	4.11		0.00
Probability of Phase Call (p_c)		1.000		0.999	0.870	1.000		0.999
Probability of Max Out (p_x)		0.897		1.000	0.450	1.000		1.000

Left-Turn Movement Data								
Assigned Movement				7	5	1		3
Mvmt. Sat Flow, veh/h				71.66	1791.61	943.22		163.48

Through Movement Data								
Assigned Movement		2		4		6		8
Mvmt. Sat Flow, veh/h		1824.05		28.66		1578.90		381.45

Right-Turn Movement Data								
Assigned Movement		12		14		16		18
Mvmt. Sat Flow, veh/h		48.00		1560.00		250.31		1578.00

Left Lane Group Data								
Assigned Movement	0	0	0	7	5	1	0	3
Lane Assignment				L+TL (Pr/Pm)		L		L+T
Lanes in Group	0	0	0	1	1	1	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	86.4	130.7	12.0	0.0	86.2
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	100.3	1791.6	943.2	0.0	544.9
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	2.2	0.4	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	15.0	2.2	0.4	0.0	15.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	757.7	844.9	943.2	0.0	757.6
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	15.0	23.8	21.8	0.0	15.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	6.1	21.8	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	3.2	0.4	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.8	0.0	0.0	0.0	4.3
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.8	0.0	0.0	0.0	2.0
Proportion LT Inside Lane (P_L)	0.000	0.000	0.000	0.714	1.000	1.000	0.000	0.300
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	136.3	362.4	493.3	0.0	228.3
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.634	0.361	0.024	0.000	0.378
Available Capacity (c_a), veh/h	0.0	0.0	0.0	136.3	696.9	563.5	0.0	228.3
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	23.6	10.8	10.7	0.0	16.9
Incremental Delay (d2), s/veh	0.0	0.0	0.0	9.2	0.6	0.0	0.0	1.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	32.8	11.4	10.7	0.0	17.9
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	1.2	0.8	0.1	0.0	0.9
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	1.5	0.9	0.1	0.0	0.9
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.08	0.05	0.05	0.00	0.07
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	6	0	8
Lane Assignment								
Lanes in Group	0	0	0	0	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	18
Lane Assignment		T+R		R		T+R		R
Lanes in Group	0	1	0	1	0	1	0	1
Group Volume (v), veh/h	0.0	443.2	0.0	209.9	0.0	572.3	0.0	43.1
Group Sat. Flow (s), veh/h/ln	0.0	1872.0	0.0	1560.0	0.0	1829.2	0.0	1578.0
Queue Serve Time (g_s), s	0.0	7.8	0.0	5.7	0.0	15.7	0.0	1.2
Cycle Queue Clear Time (g_c), s	0.0	7.8	0.0	5.7	0.0	15.7	0.0	1.2
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	1599.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.026	0.000	1.000	0.000	0.137	0.000	1.000
Lane Group Capacity (c), veh/h	0.0	1040.8	0.0	543.1	0.0	708.7	0.0	420.4
Volume-to-Capacity Ratio (X)	0.000	0.426	0.000	0.386	0.000	0.808	0.000	0.103
Available Capacity (c_a), veh/h	0.0	1040.8	0.0	543.1	0.0	844.8	0.0	420.4
Upstream Filter Factor (I)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	7.3	0.0	13.9	0.0	15.4	0.0	15.6
Incremental Delay (d2), s/veh	0.0	0.3	0.0	0.5	0.0	5.0	0.0	0.1
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.5	0.0	14.4	0.0	20.4	0.0	15.7
First-Term Queue (Q1), veh/ln	0.0	2.9	0.0	2.0	0.0	6.3	0.0	0.4
Second-Term Queue (Q2), veh/ln	0.0	0.1	0.0	0.1	0.0	1.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	3.0	0.0	2.1	0.0	7.3	0.0	0.4
Percentile Storage Ratio (RQ%)	0.00	0.18	0.00	0.56	0.00	0.99	0.00	0.23
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	15.6
HCM Level of Service	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					153	
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1084	1622			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	0	0	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.0	0.0		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	115	154	56	42	296	709	18	500
Act Effct Green (s)	9.7	19.8	9.7	9.7	40.0	41.6	22.8	22.8
Actuated g/C Ratio	0.17	0.35	0.17	0.17	0.70	0.73	0.40	0.40
v/c Ratio	0.44	0.24	0.21	0.15	0.49	0.52	0.06	0.67
Control Delay	29.2	3.1	24.9	9.7	7.1	7.1	14.7	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	3.1	24.9	9.7	7.1	7.1	14.7	22.0
LOS	C	A	C	A	A	A	B	C
Approach Delay	14.3		18.4			7.1		21.8
Approach LOS	B		B			A		C
Queue Length 50th (m)	11.6	0.0	5.5	0.0	10.6	34.0	1.3	47.2
Queue Length 95th (m)	28.1	8.3	12.2	4.8	24.7	74.5	5.2	80.2
Internal Link Dist (m)	141.5		88.0			129.3		48.4
Turn Bay Length (m)		30.0		15.0			15.0	
Base Capacity (vph)	428	738	425	442	697	1494	348	890
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.21	0.13	0.10	0.42	0.47	0.05	0.56

Intersection Summary

Cycle Length: 71
Actuated Cycle Length: 56.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 12.7 — Intersection LOS: B
Intersection Capacity Utilization 76.7% — ICU Level of Service D
Analysis Period (min) 15

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	60	140	15	25	30	275	630	30	15	370	40
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		0.95	1.00		0.95	1.00		0.97	0.98		0.96
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881
Lanes	0	1	1	0	1	1	1	1	0	1	1	0
Lane Assignment												
Capacity, veh/h	86	83	635	83	102	384	488	1033	49	357	562	61
Proportion Arriving On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.16	0.58	0.58	0.34	0.34	0.34
Movement Delay, s/veh	30.7	0.0	11.7	19.3	0.0	17.3	12.5	0.0	9.9	14.1	0.0	22.5
Movement LOS	C		B	B		B	B		A	B		C
Approach Volume, veh/h		269			99			1005			518	
Approach Delay, s/veh		19.8			18.4			10.7			22.2	
Approach LOS		B			B			B			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4	5	6		8
Case No		4.0		7.0	1.2	6.3		7.0
Phase Duration (G+Y+Rc), s		39.63		20.00	14.47	25.16		20.00
Change Period (Y+Rc), s		5.00		5.00	5.00	5.00		5.00
Max. Allowable Headway (MAH), s		9.76		9.20	8.31	9.76		9.20
Maximum Green Setting (Gmax), s		26.00		15.00	15.00	26.00		15.00
Max. Queue Clearance Time (g_c+I1), s		17.38		17.00	7.53	16.71		17.00
Green Extension Time (g_e), s		7.92		0.00	2.00	3.45		0.00
Probability of Phase Call (p_c)		1.000		0.999	0.993	1.000		0.999
Probability of Max Out (p_x)		1.000		1.000	1.000	1.000		1.000

Left-Turn Movement Data								
Assigned Movement				7	5	1		3
Mvmt. Sat Flow, veh/h				141.17	1791.61	731.28		152.15

Through Movement Data								
Assigned Movement		2		4		6		8
Mvmt. Sat Flow, veh/h		1778.72		188.23		1661.43		253.58

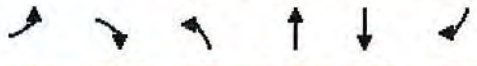
Right-Turn Movement Data								
Assigned Movement		12		14		16		18
Mvmt. Sat Flow, veh/h		84.70		1516.38		179.61		1525.91

Left Lane Group Data								
Assigned Movement	0	0	0	7	5	1	0	3
Lane Assignment				L+TL (Pr/Pm)		L		L+T
Lanes in Group	0	0	0	1	1	1	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	115.4	295.7	18.3	0.0	56.3
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	329.4	1791.6	731.3	0.0	405.7
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	5.5	1.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	15.0	5.5	1.9	0.0	15.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	772.2	903.3	731.3	0.0	743.7
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	15.0	22.2	20.2	0.0	15.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	5.4	19.3	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	5.4	1.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	2.6	0.0	0.0	0.0	3.2
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	2.6	0.0	0.0	0.0	1.4
Proportion LT Inside Lane (P_L)	0.000	0.000	0.000	0.429	1.000	1.000	0.000	0.375
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	169.1	487.7	356.8	0.0	185.1
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.682	0.606	0.051	0.000	0.304
Available Capacity (c_a), veh/h	0.0	0.0	0.0	169.1	654.0	428.4	0.0	185.1
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	20.0	11.2	14.0	0.0	18.4
Incremental Delay (d2), s/veh	0.0	0.0	0.0	10.7	1.2	0.1	0.0	0.9
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	30.7	12.5	14.1	0.0	19.3
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	1.3	2.1	0.2	0.0	0.6
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	1.8	2.2	0.2	0.0	0.7
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.09	0.14	0.10	0.00	0.05
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	6	0	8
Lane Assignment								
Lanes in Group	0	0	0	0	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	18
Lane Assignment		T+R		R		T+R		R
Lanes in Group	0	1	0	1	0	1	0	1
Group Volume (v), veh/h	0.0	709.7	0.0	153.8	0.0	500.0	0.0	42.3
Group Sat. Flow (s), veh/h/ln	0.0	1863.4	0.0	1516.4	0.0	1841.0	0.0	1525.9
Queue Serve Time (g_s), s	0.0	15.4	0.0	4.0	0.0	14.7	0.0	1.3
Cycle Queue Clear Time (g_c), s	0.0	15.4	0.0	4.0	0.0	14.7	0.0	1.3
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	1599.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.045	0.000	1.000	0.000	0.098	0.000	1.000
Lane Group Capacity (c), veh/h	0.0	1082.2	0.0	635.3	0.0	622.5	0.0	383.9
Volume-to-Capacity Ratio (X)	0.000	0.656	0.000	0.242	0.000	0.803	0.000	0.110
Available Capacity (c_a), veh/h	0.0	1082.2	0.0	635.3	0.0	802.8	0.0	383.9
Upstream Filter Factor (I)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	8.5	0.0	11.5	0.0	17.9	0.0	17.2
Incremental Delay (d2), s/veh	0.0	1.4	0.0	0.2	0.0	4.6	0.0	0.1
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.9	0.0	11.7	0.0	22.5	0.0	17.3
First-Term Queue (Q1), veh/ln	0.0	5.7	0.0	1.3	0.0	6.2	0.0	0.5
Second-Term Queue (Q2), veh/ln	0.0	0.4	0.0	0.0	0.0	0.8	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	6.1	0.0	1.4	0.0	7.0	0.0	0.5
Percentile Storage Ratio (RQ%)	0.00	0.38	0.00	0.37	0.00	0.94	0.00	0.25
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	15.5
HCM Level of Service	B



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					153	
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1084	1622			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	0	0	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.0	0.0		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	216	89	43	142	472	12	578
v/c Ratio	0.38	0.37	0.33	0.15	0.28	0.35	0.03	0.72
Control Delay	27.7	6.0	25.9	9.5	5.3	5.2	11.9	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.7	6.0	25.9	9.5	5.3	5.2	11.9	21.4
Queue Length 50th (m)	8.4	3.7	8.6	0.0	4.4	17.9	0.7	48.8
Queue Length 95th (m)	19.5	12.1	13.5	3.0	11.1	37.1	3.7	#90.8
Internal Link Dist (m)	141.5		88.0			129.3		48.4
Turn Bay Length (m)		30.0		15.0			15.0	
Base Capacity (vph)	397	759	465	479	686	1564	460	926
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.28	0.19	0.09	0.21	0.30	0.03	0.62

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	20	175	17	35	25	125	400	15	10	415	65
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		0.98	1.00		0.99	1.00		0.99	0.99		0.97
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881
Lanes	0	1	1	0	1	1	1	1	0	1	1	0
Lane Assignment												
Capacity, veh/h	109	26	549	84	129	416	367	1009	38	482	612	96
Proportion Arriving On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.09	0.56	0.56	0.39	0.39	0.39
Movement Delay, s/veh	33.7	0.0	14.4	18.6	0.0	16.0	11.6	0.0	7.7	10.9	0.0	21.1
Movement LOS	C		B	B		B	B		A	B		C
Approach Volume, veh/h		302			133			614			590	
Approach Delay, s/veh		19.9			17.7			8.6			20.9	
Approach LOS		B			B			A			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4	5	6		8
Case No		4.0		7.0	1.2	6.3		7.0
Phase Duration (G+Y+Rc), s		36.87		20.00	9.88	26.99		20.00
Change Period (Y+Rc), s		5.00		5.00	5.00	5.00		5.00
Max. Allowable Headway (MAH), s		9.75		9.10	8.31	9.75		9.10
Maximum Green Setting (Gmax), s		26.00		15.00	15.00	26.00		15.00
Max. Queue Clearance Time (g_c+I1), s		10.44		17.00	4.41	18.12		17.00
Green Extension Time (g_e), s		12.85		0.00	1.05	3.87		0.00
Probability of Phase Call (p_c)		1.000		0.999	0.894	1.000		0.999
Probability of Max Out (p_x)		0.915		1.000	0.498	1.000		1.000

Left-Turn Movement Data								
Assigned Movement				7	5	1		3
Mvmt. Sat Flow, veh/h				71.66	1791.61	919.17		160.16

Through Movement Data								
Assigned Movement		2		4		6		8
Mvmt. Sat Flow, veh/h		1800.81		28.66		1581.95		329.73

Right-Turn Movement Data								
Assigned Movement		12		14		16		18
Mvmt. Sat Flow, veh/h		67.53		1559.60		247.78		1577.79

Left Lane Group Data								
Assigned Movement	0	0	0	7	5	1	0	3
Lane Assignment				L+TL (Pr/Pm)		L		L+T
Lanes in Group	0	0	0	1	1	1	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	86.4	142.0	12.0	0.0	89.7
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	100.3	1791.6	919.2	0.0	489.9
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	2.4	0.5	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	15.0	2.4	0.5	0.0	15.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	756.0	840.2	919.2	0.0	757.6
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	15.0	24.0	22.0	0.0	15.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	5.9	22.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	3.7	0.5	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.8	0.0	0.0	0.0	3.9
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.8	0.0	0.0	0.0	2.1
Proportion LT Inside Lane (P_L)	0.000	0.000	0.000	0.714	1.000	1.000	0.000	0.327
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	135.0	367.1	482.0	0.0	213.2
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.640	0.387	0.025	0.000	0.421
Available Capacity (c_a), veh/h	0.0	0.0	0.0	135.0	685.9	546.8	0.0	213.2
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	24.0	11.0	10.8	0.0	17.3
Incremental Delay (d2), s/veh	0.0	0.0	0.0	9.8	0.7	0.0	0.0	1.3
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	33.7	11.6	10.9	0.0	18.6
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	1.2	0.9	0.1	0.0	0.9
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.4	0.1	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	1.6	1.0	0.1	0.0	1.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.08	0.06	0.05	0.00	0.08
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	6	0	8
Lane Assignment								
Lanes in Group	0	0	0	0	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	18
Lane Assignment		T+R		R		T+R		R
Lanes in Group	0	1	0	1	0	1	0	1
Group Volume (v), veh/h	0.0	471.6	0.0	216.0	0.0	578.3	0.0	43.1
Group Sat. Flow (s), veh/h/ln	0.0	1868.3	0.0	1559.6	0.0	1829.7	0.0	1577.8
Queue Serve Time (g_s), s	0.0	8.4	0.0	5.9	0.0	16.1	0.0	1.2
Cycle Queue Clear Time (g_c), s	0.0	8.4	0.0	5.9	0.0	16.1	0.0	1.2
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	1599.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	4.9	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.036	0.000	1.000	0.000	0.135	0.000	1.000
Lane Group Capacity (c), veh/h	0.0	1047.0	0.0	548.5	0.0	707.6	0.0	416.1
Volume-to-Capacity Ratio (X)	0.000	0.450	0.000	0.394	0.000	0.817	0.000	0.104
Available Capacity (c_a), veh/h	0.0	1047.0	0.0	548.5	0.0	836.5	0.0	416.1
Upstream Filter Factor (I)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	7.4	0.0	14.0	0.0	15.6	0.0	15.8
Incremental Delay (d2), s/veh	0.0	0.3	0.0	0.5	0.0	5.5	0.0	0.1
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.7	0.0	14.4	0.0	21.1	0.0	16.0
First-Term Queue (Q1), veh/ln	0.0	3.1	0.0	2.1	0.0	6.5	0.0	0.4
Second-Term Queue (Q2), veh/ln	0.0	0.1	0.0	0.1	0.0	1.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	3.2	0.0	2.2	0.0	7.6	0.0	0.4
Percentile Storage Ratio (RQ%)	0.00	0.20	0.00	0.58	0.00	1.03	0.00	0.24
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	15.9
HCM Level of Service	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	22	5	505	595	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	24	5	549	647	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					153	
pX, platoon unblocked	0.80	0.80	0.80			
vC, conflicting volume	936	651	654			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	792	434	438			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	95	99			
cM capacity (veh/h)	258	454	890			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	51	188	366	654
Volume Left	27	5	0	0
Volume Right	24	0	0	8
cSH	324	890	1700	1700
Volume to Capacity	0.16	0.01	0.22	0.38
Queue Length 95th (m)	4.4	0.1	0.0	0.0
Control Delay (s)	18.2	0.3	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	18.2	0.1		0.0
Approach LOS	C			

Intersection Summary				
Average Delay		0.8		
Intersection Capacity Utilization		41.7%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	115	165	63	42	301	726	18	519
v/c Ratio	0.44	0.26	0.25	0.15	0.50	0.53	0.06	0.69
Control Delay	29.7	3.1	25.9	9.8	7.5	7.2	14.7	22.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.7	3.1	25.9	9.8	7.5	7.2	14.7	22.9
Queue Length 50th (m)	11.9	0.0	6.3	0.0	10.9	35.6	1.3	50.5
Queue Length 95th (m)	28.1	8.6	13.3	4.8	25.9	78.0	5.2	84.3
Internal Link Dist (m)	141.5		88.0			129.3		48.4
Turn Bay Length (m)		30.0		15.0			15.0	
Base Capacity (vph)	422	739	406	438	686	1478	339	882
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.22	0.16	0.10	0.44	0.49	0.05	0.59

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	60	150	20	25	30	280	640	35	15	385	40
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		0.95	1.00		0.95	1.00		0.97	0.98		0.96
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881
Lanes	0	1	1	0	1	1	1	1	0	1	1	0
Lane Assignment												
Capacity, veh/h	85	82	632	86	77	379	482	1033	57	351	573	60
Proportion Arriving On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.16	0.59	0.59	0.34	0.34	0.34
Movement Delay, s/veh	31.9	0.0	12.1	20.4	0.0	17.6	12.8	0.0	10.0	14.3	0.0	23.6
Movement LOS	C		B	C		B	B		B	B		C
Approach Volume, veh/h		280			106			1027			537	
Approach Delay, s/veh		20.2			19.3			10.8			23.3	
Approach LOS		C			B			B			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4	5	6		8
Case No		4.0		7.0	1.2	6.3		7.0
Phase Duration (G+Y+Rc), s		40.33		20.00	14.61	25.72		20.00
Change Period (Y+Rc), s		5.00		5.00	5.00	5.00		5.00
Max. Allowable Headway (MAH), s		9.76		9.20	8.31	9.76		9.20
Maximum Green Setting (Gmax), s		26.00		15.00	15.00	26.00		15.00
Max. Queue Clearance Time (g_c+I1), s		17.98		17.00	7.66	17.50		17.00
Green Extension Time (g_e), s		7.44		0.00	2.02	3.22		0.00
Probability of Phase Call (p_c)		1.000		0.999	0.994	1.000		0.999
Probability of Max Out (p_x)		1.000		1.000	1.000	1.000		1.000

Left-Turn Movement Data								
Assigned Movement				7	5	1		3
Mvmt. Sat Flow, veh/h				141.17	1791.61	721.19		137.65

Through Movement Data								
Assigned Movement		2		4		6		8
Mvmt. Sat Flow, veh/h		1764.48		188.23		1669.14		172.06

Right-Turn Movement Data								
Assigned Movement		12		14		16		18
Mvmt. Sat Flow, veh/h		96.49		1515.40		173.42		1525.05

Left Lane Group Data								
Assigned Movement	0	0	0	7	5	1	0	3
Lane Assignment				L+TL (Pr/Pm)		L		L+T
Lanes in Group	0	0	0	1	1	1	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	115.4	301.1	18.3	0.0	63.4
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	329.4	1791.6	721.2	0.0	309.7
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	5.7	1.1	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	15.0	5.7	2.4	0.0	15.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	768.7	888.2	721.2	0.0	743.7
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	15.0	22.7	20.7	0.0	15.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	5.2	19.3	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	5.2	1.1	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	2.6	0.0	0.0	0.0	2.5
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	2.6	0.0	0.0	0.0	1.6
Proportion LT Inside Lane (P_L)	0.000	0.000	0.000	0.429	1.000	1.000	0.000	0.444
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	167.1	481.6	350.6	0.0	163.2
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.690	0.625	0.052	0.000	0.388
Available Capacity (c_a), veh/h	0.0	0.0	0.0	167.1	641.6	413.7	0.0	163.2
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	20.5	11.4	14.3	0.0	18.9
Incremental Delay (d2), s/veh	0.0	0.0	0.0	11.4	1.3	0.1	0.0	1.5
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	31.9	12.8	14.3	0.0	20.4
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	1.3	2.1	0.2	0.0	0.7
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	0.000	1.000	1.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	1.8	2.3	0.2	0.0	0.8
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.10	0.14	0.10	0.00	0.06
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	6	0	8
Lane Assignment								
Lanes in Group	0	0	0	0	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	18
Lane Assignment		T+R		R		T+R		R
Lanes in Group	0	1	0	1	0	1	0	1
Group Volume (v), veh/h	0.0	725.8	0.0	164.8	0.0	518.3	0.0	42.3
Group Sat. Flow (s), veh/h/ln	0.0	1861.0	0.0	1515.4	0.0	1842.6	0.0	1525.0
Queue Serve Time (g_s), s	0.0	16.0	0.0	4.4	0.0	15.5	0.0	1.3
Cycle Queue Clear Time (g_c), s	0.0	16.0	0.0	4.4	0.0	15.5	0.0	1.3
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	1599.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	9.6	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.052	0.000	1.000	0.000	0.094	0.000	1.000
Lane Group Capacity (c), veh/h	0.0	1089.8	0.0	631.5	0.0	632.8	0.0	379.2
Volume-to-Capacity Ratio (X)	0.000	0.666	0.000	0.261	0.000	0.819	0.000	0.111
Available Capacity (c_a), veh/h	0.0	1089.8	0.0	631.5	0.0	794.1	0.0	379.2
Upstream Filter Factor (I)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	8.5	0.0	11.9	0.0	18.1	0.0	17.5
Incremental Delay (d2), s/veh	0.0	1.6	0.0	0.2	0.0	5.5	0.0	0.1
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.0	0.0	12.1	0.0	23.6	0.0	17.6
First-Term Queue (Q1), veh/ln	0.0	5.9	0.0	1.5	0.0	6.5	0.0	0.5
Second-Term Queue (Q2), veh/ln	0.0	0.5	0.0	0.0	0.0	1.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	6.4	0.0	1.5	0.0	7.5	0.0	0.5
Percentile Storage Ratio (RQ%)	0.00	0.39	0.00	0.41	0.00	1.01	0.00	0.26
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	16.1
HCM Level of Service	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	17	8	26	935	525	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	9	28	1016	571	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					153	
pX, platoon unblocked	0.80	0.80	0.80			
vC, conflicting volume	1147	582	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1061	359	373			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	98	97			
cM capacity (veh/h)	171	513	951			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	27	367	678	593
Volume Left	18	28	0	0
Volume Right	9	0	0	23
cSH	217	951	1700	1700
Volume to Capacity	0.13	0.03	0.40	0.35
Queue Length 95th (m)	3.4	0.7	0.0	0.0
Control Delay (s)	23.9	1.0	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	23.9	0.3		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

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The Metro Vancouver Apartment Parking Study

Municipal TDM Network| June 15, 2012

#: 20120615

metrovancouver

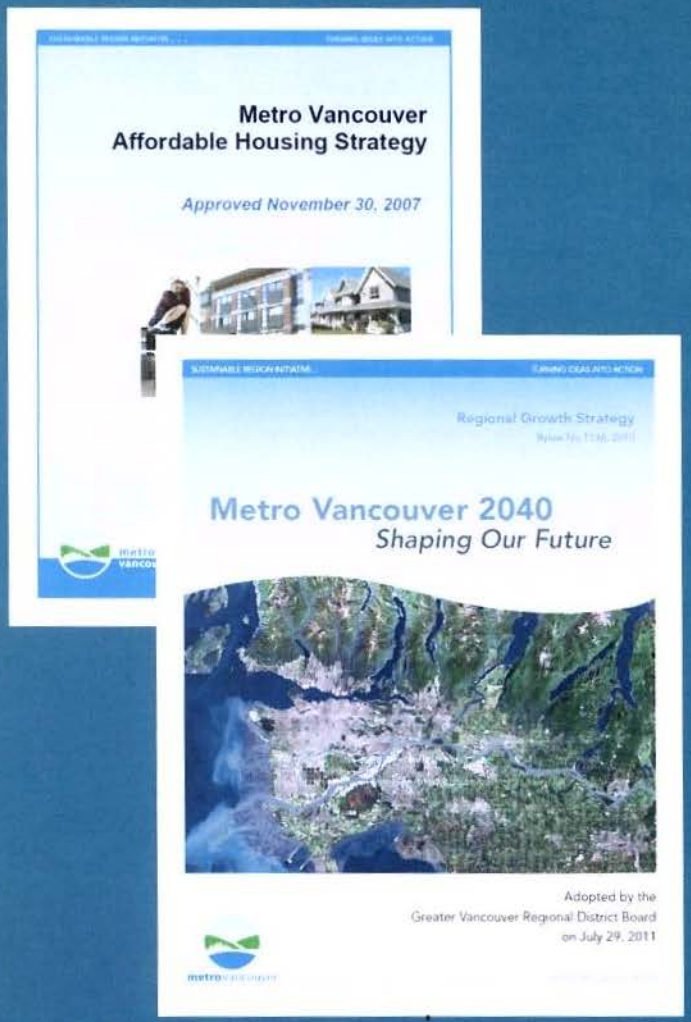
Outline

- Study context and objectives
- Study findings
- Recommendations / guidelines
- Next steps
- Discussion questions

Regional Planning Committee (June 8, 2012)

- Appreciated technical work and encouraged staff to continue research to support regional objectives
- Concerned about recommended guidelines, in particular for reduced minimum parking requirements
- Want 'guidelines' to be reframed (e.g. 'considerations' / 'findings')
- Revised report and illustrated booklet expected to Committee and Board – Fall 2012

Why Metro Vancouver?



- Improve housing affordability
- Focus growth in Urban Centres and Frequent Transit Development Areas
- Support sustainable transportation choices
- Parking is at the nexus

Regional Context Statements

Action 1.2.6: Role of municipalities is to adopt regional context statements which include policies for Urban Centres which:

iv) in coordination with the provision of transit service, establish or maintain reduced residential and commercial parking requirements in Urban Centres, where appropriate;

...for Frequent Transit Development Areas which:

iii) in coordination with the provision of transit service, establish or maintain reduced residential and commercial parking requirements within Frequent Transit Development Areas, where appropriate;

Study Objectives

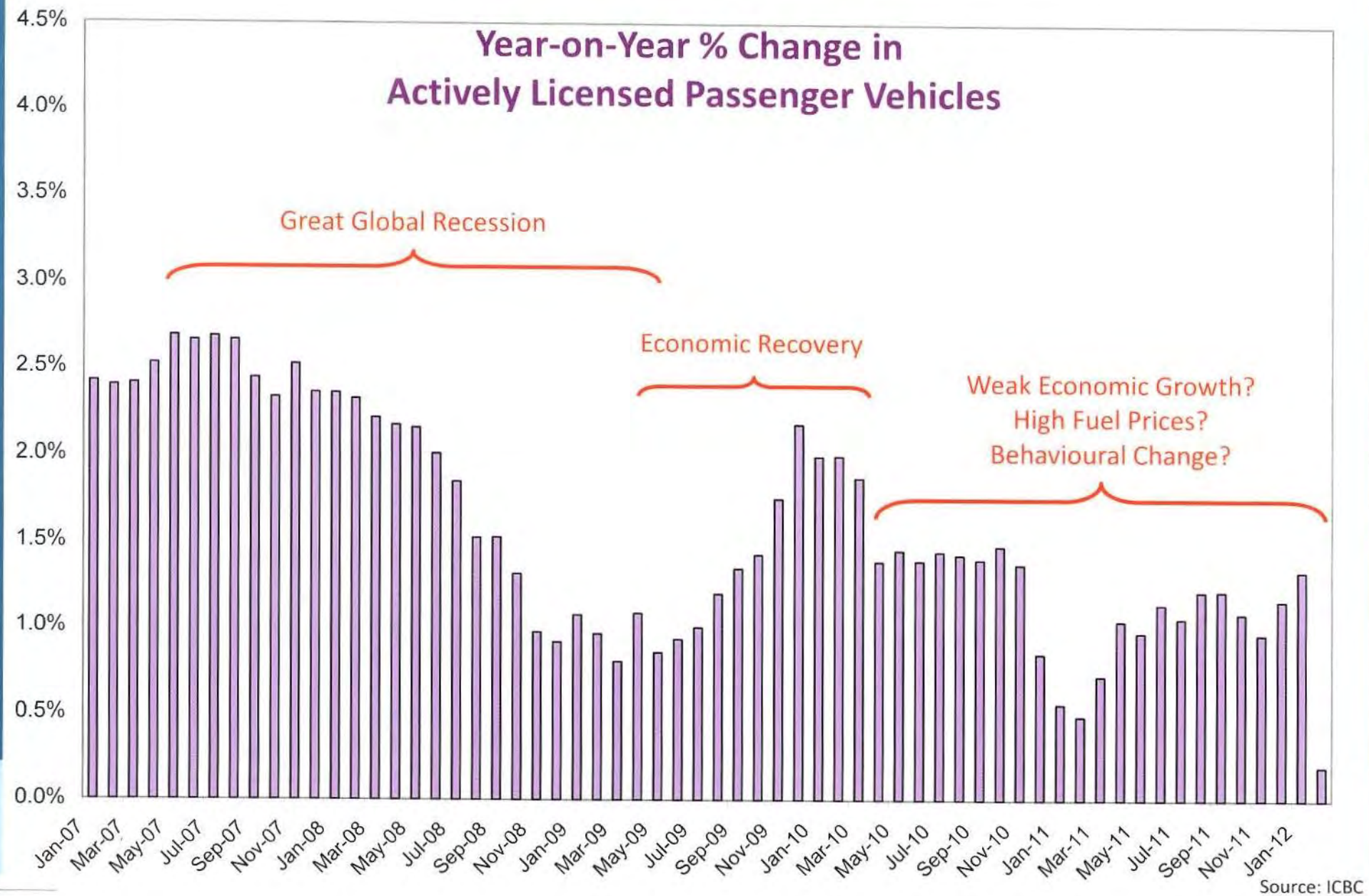
1. Establish a reliable evidence base

2. Provide appropriate guidance on parking regulations

Emergence of *Frequent Transit Network*

http://www.translink.ca/en/Be-Part-of-the-Plan/Frequent-Transit-Network.aspx

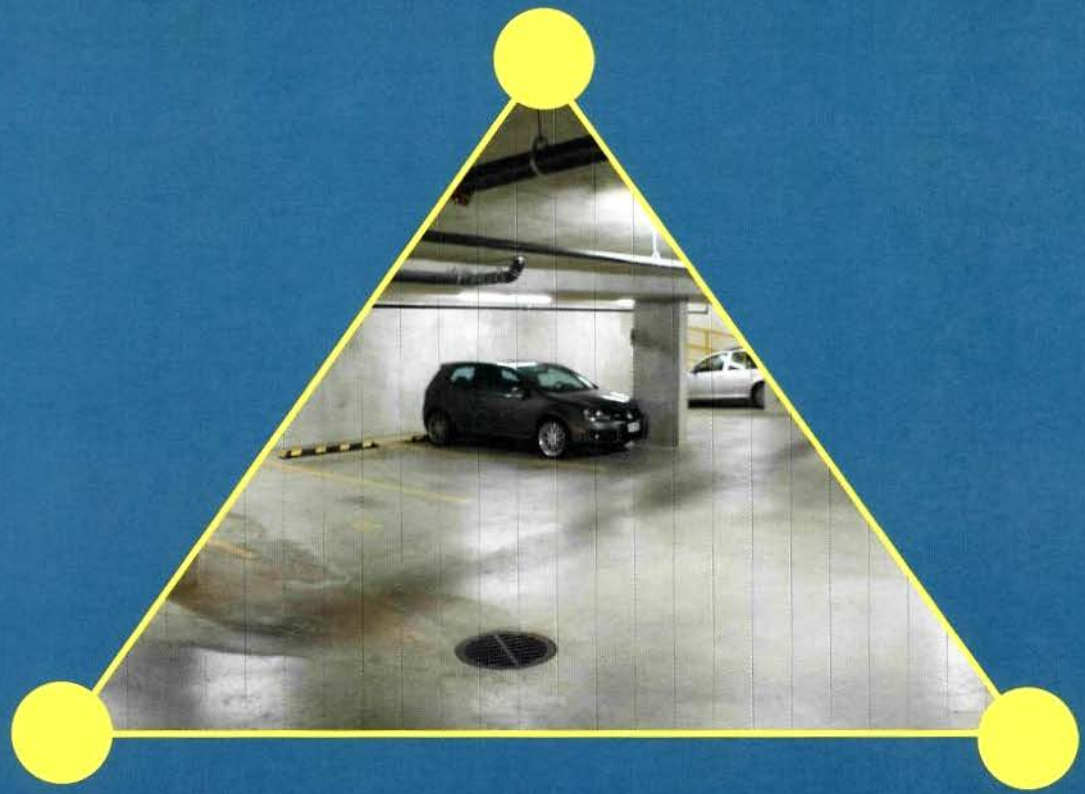
Emerging Patterns and Trends



Source: ICBC

An Evidence-Based Approach

Review current practices

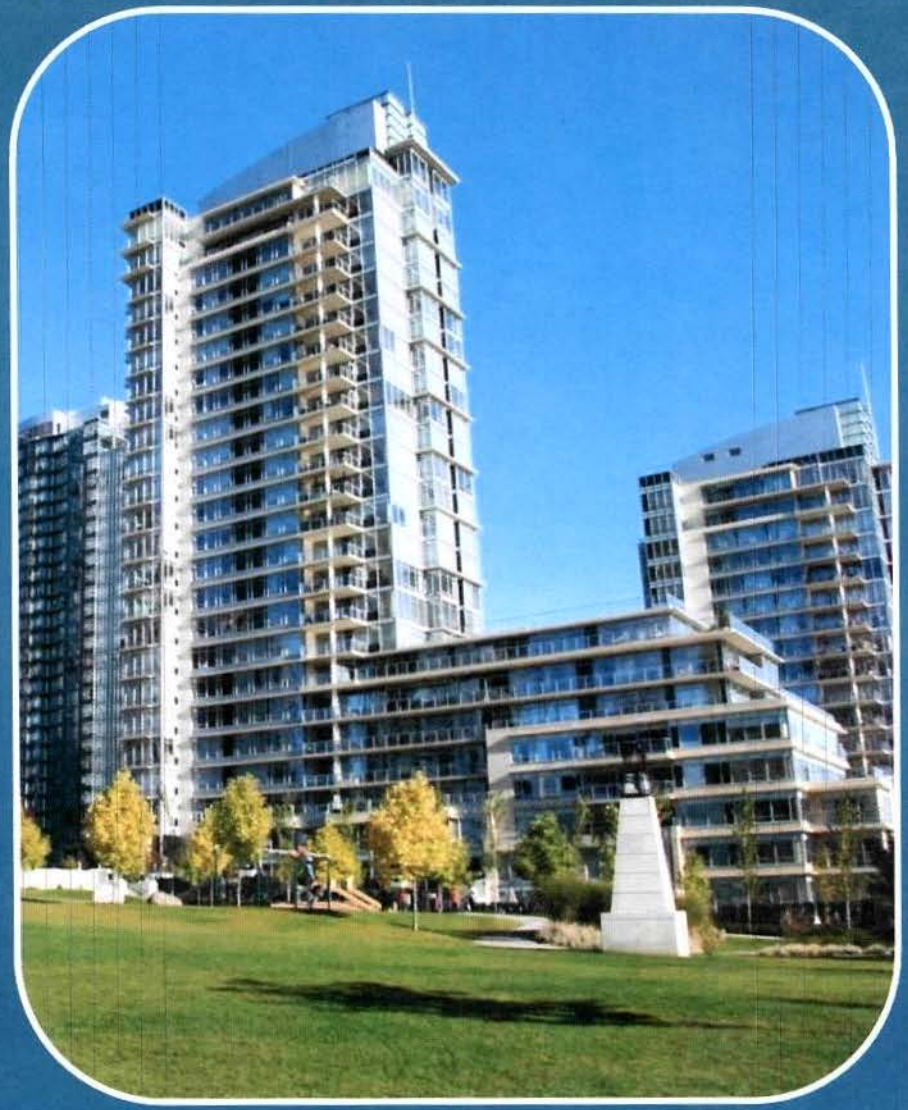


Key Informant Interviews

Surveys

Lessons from Current Municipal Practices

- Min 1 stall/unit
- Reductions for seniors/affordable rental apartments
- Few outright parking reductions near transit



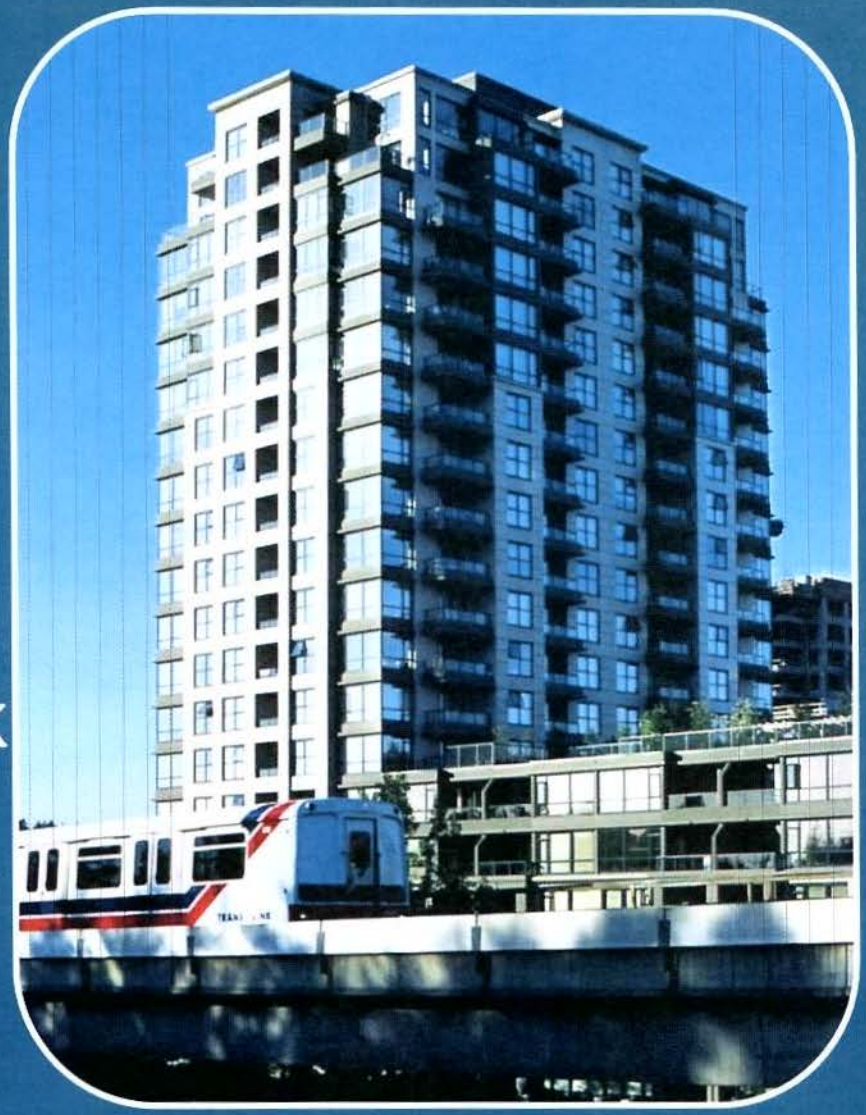
Lessons from Other Cities

(Calgary, Toronto, Montreal, Seattle, Bellevue, Portland, Denver)

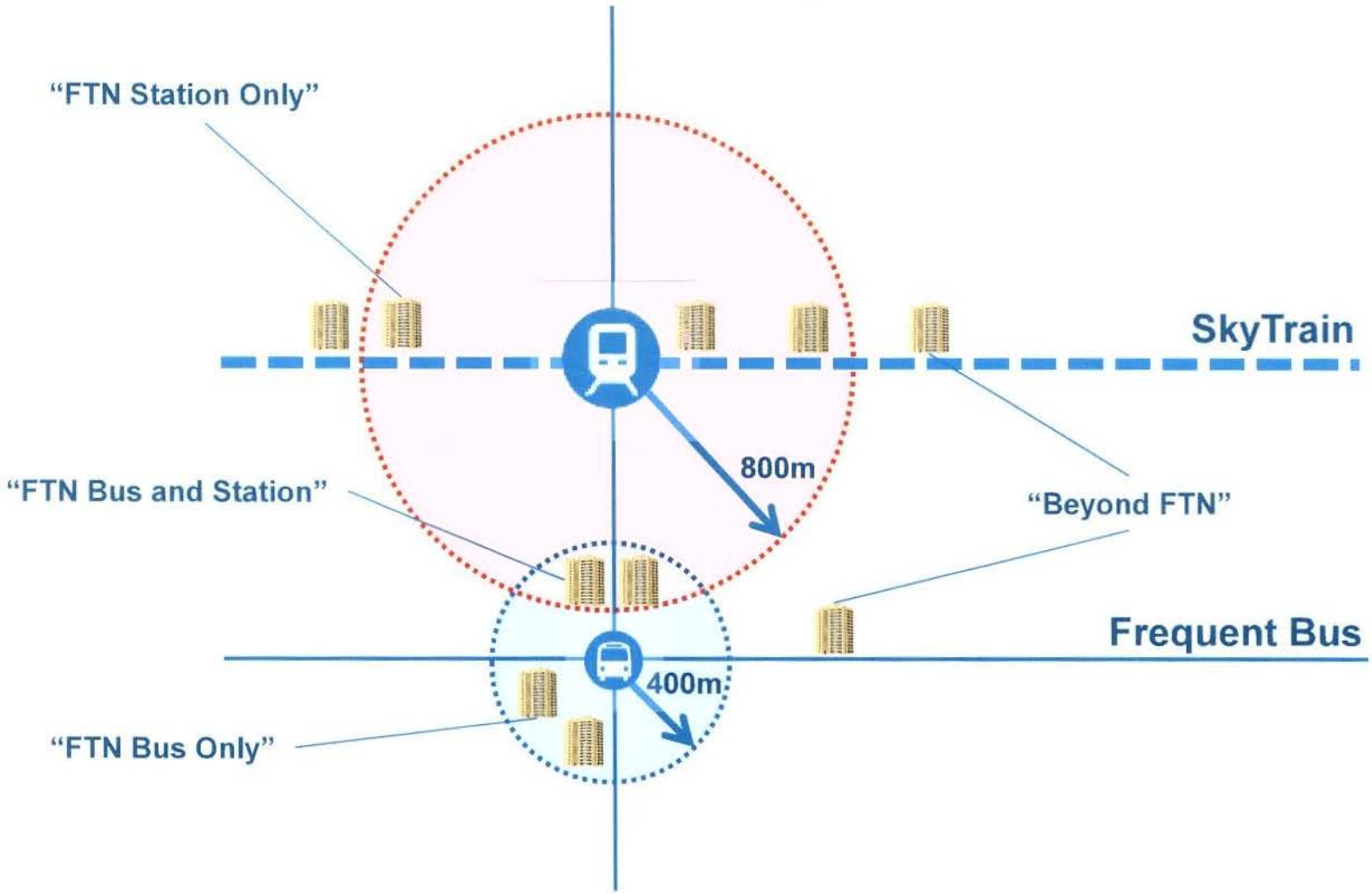
- Min < 1 stall/unit
- Reductions near transit
- 0 minimum near frequent transit in Seattle and Portland
- Unbundling parking is the norm in Seattle and Toronto

Lessons from Developer Interviews

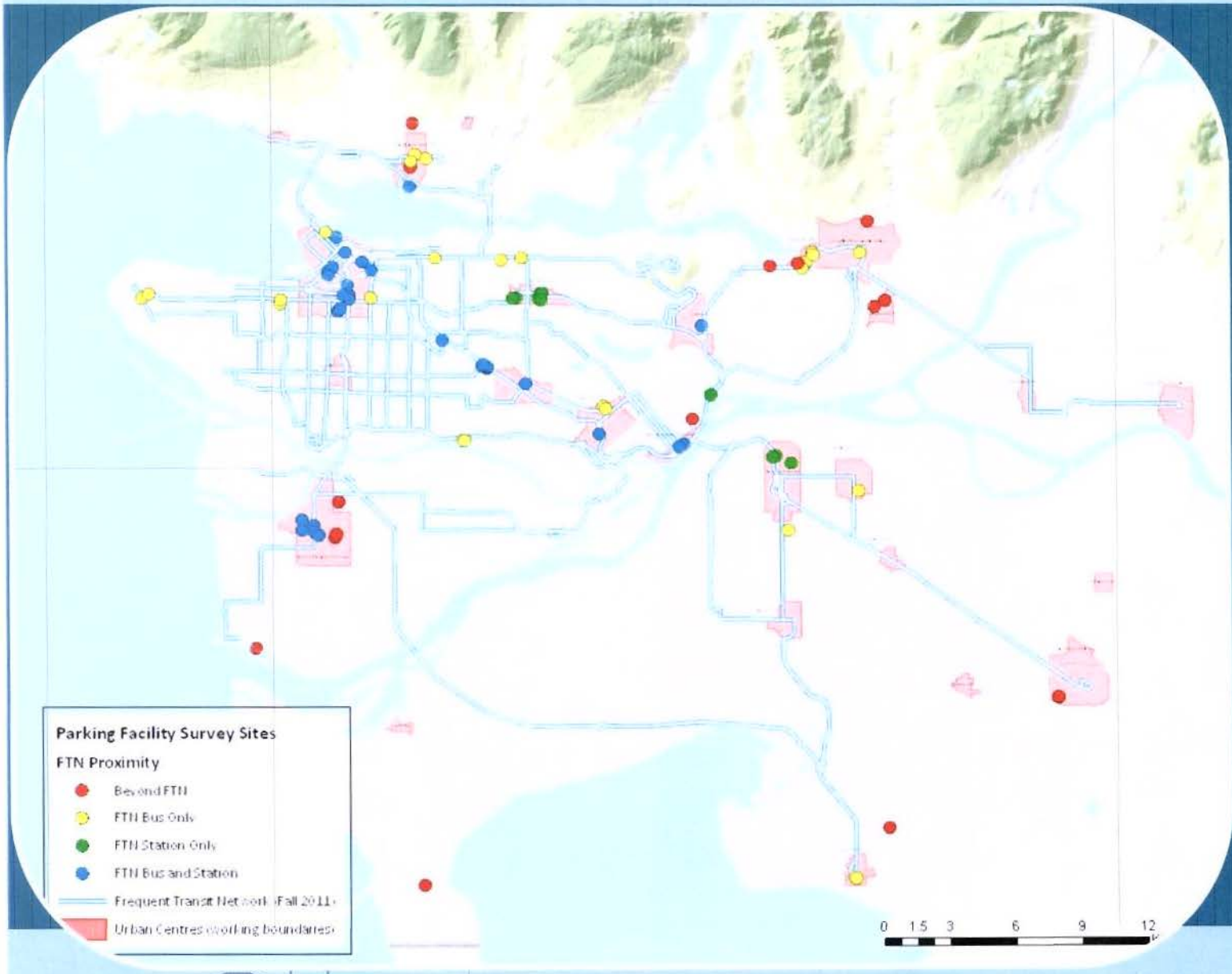
- Open to flexibility
- SkyTrain considered in parking decisions, but not frequent bus
- Infrequent requests for parking variances due to risk
- Parking demand surveys seldom conducted



Survey Sites



Parking Facility Survey (80 sites)



Apartment Type

- 67 Strata
- 9 Market Rental
- 4 Non-Market

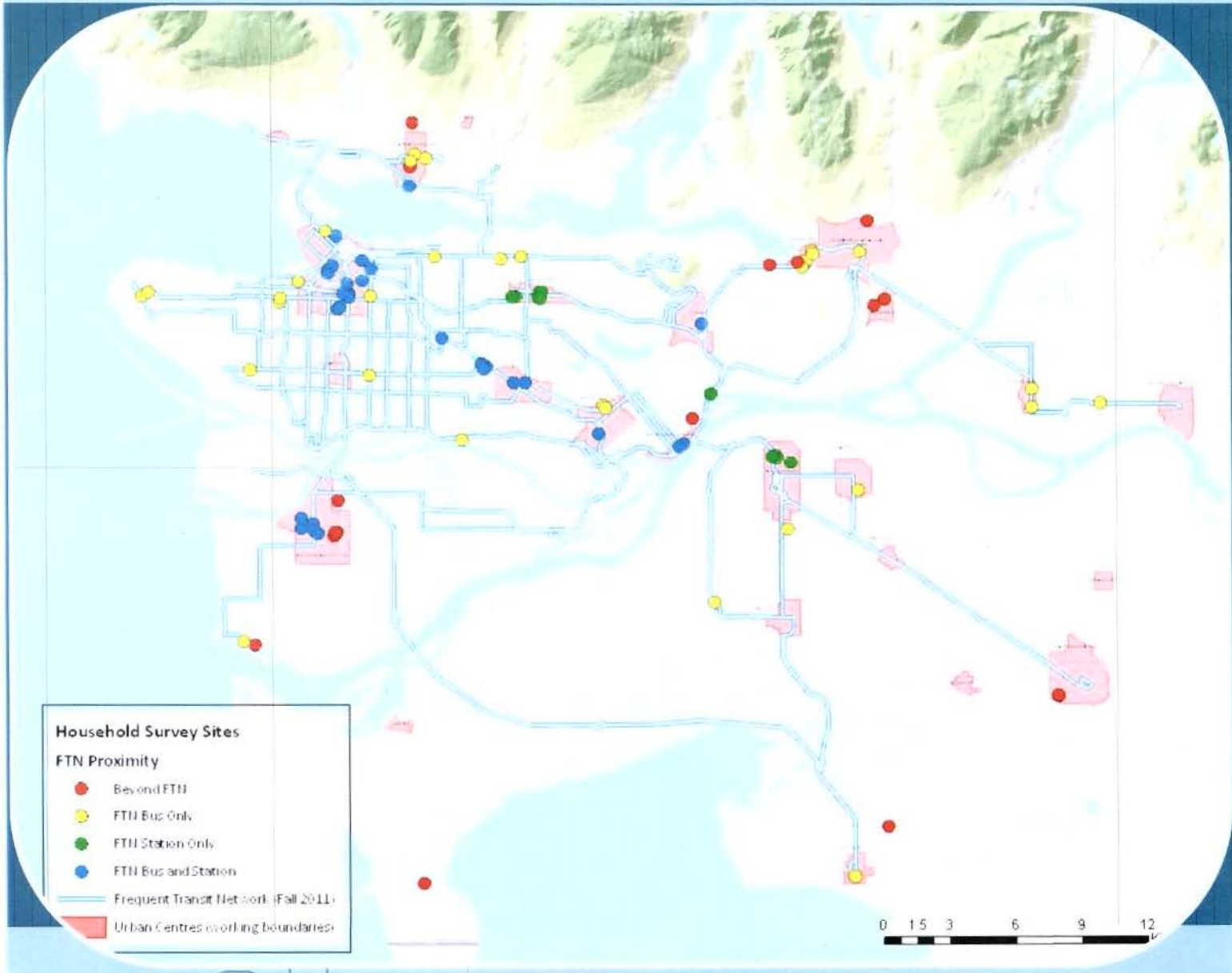
Survey Period

- Sept – Nov 2011
- 10PM or later
- 17,000 stalls

Data Adjustments

- Time of survey
- Vacant units

Household Survey (90 sites)



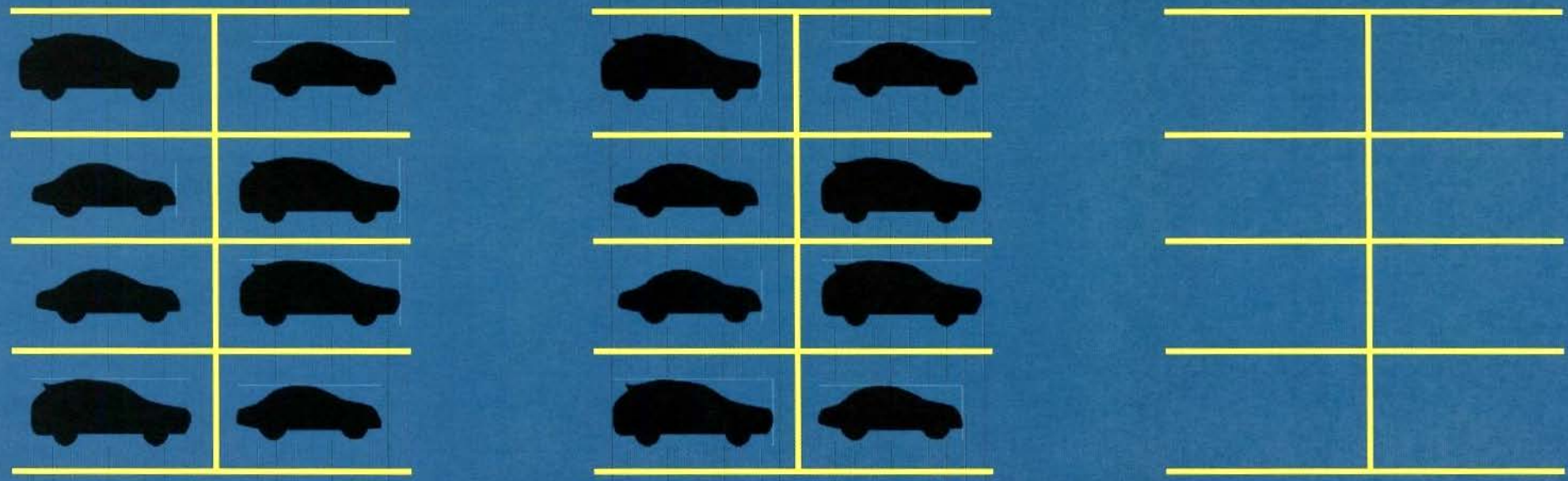
Apartment Type

- 76 Strata
- 8 Market Rental
- 6 Non-Market

Survey Period

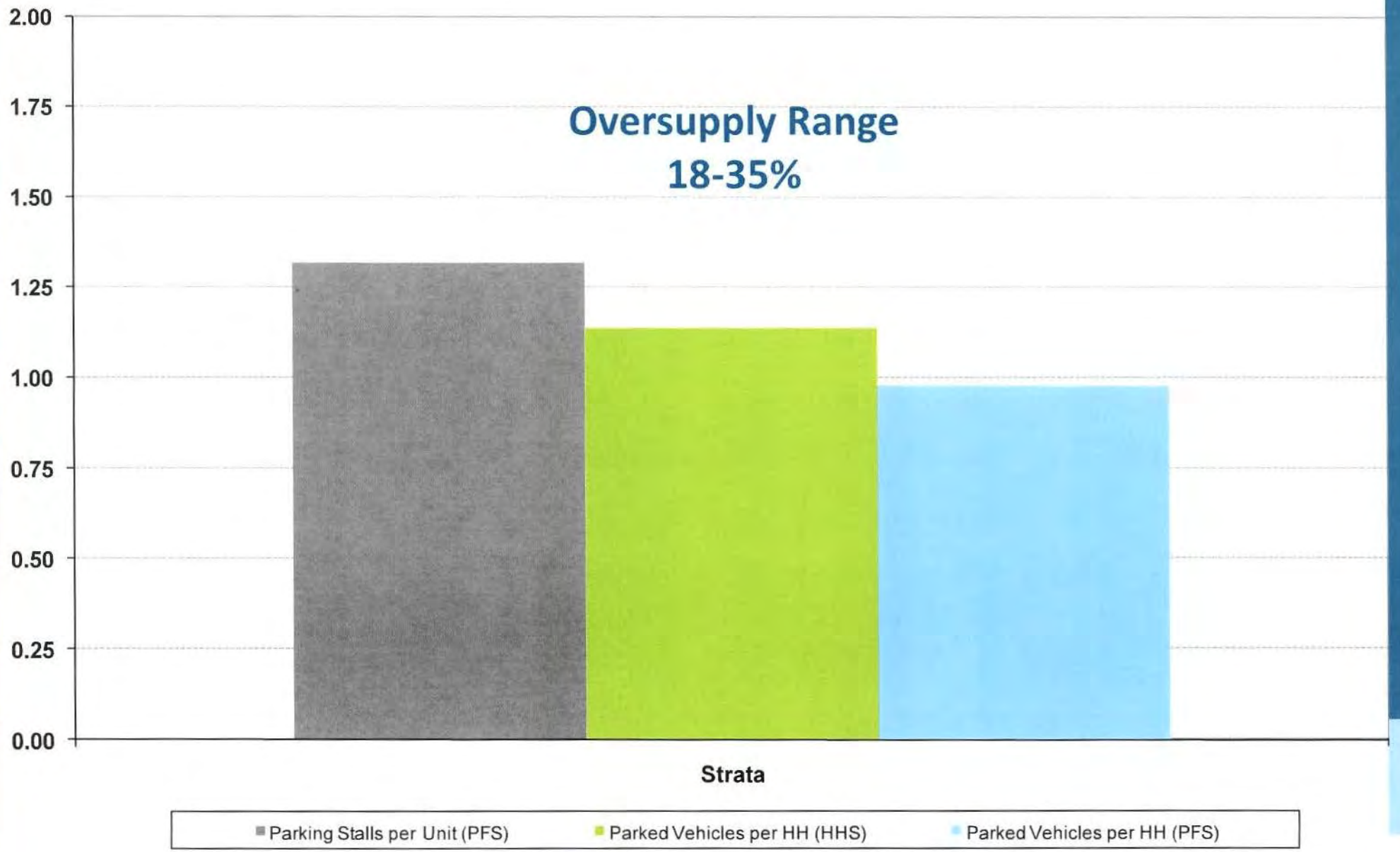
- Oct – Nov 2011
- Online and mail
- 1,500 responses
- 13% response rate

Key Survey Findings

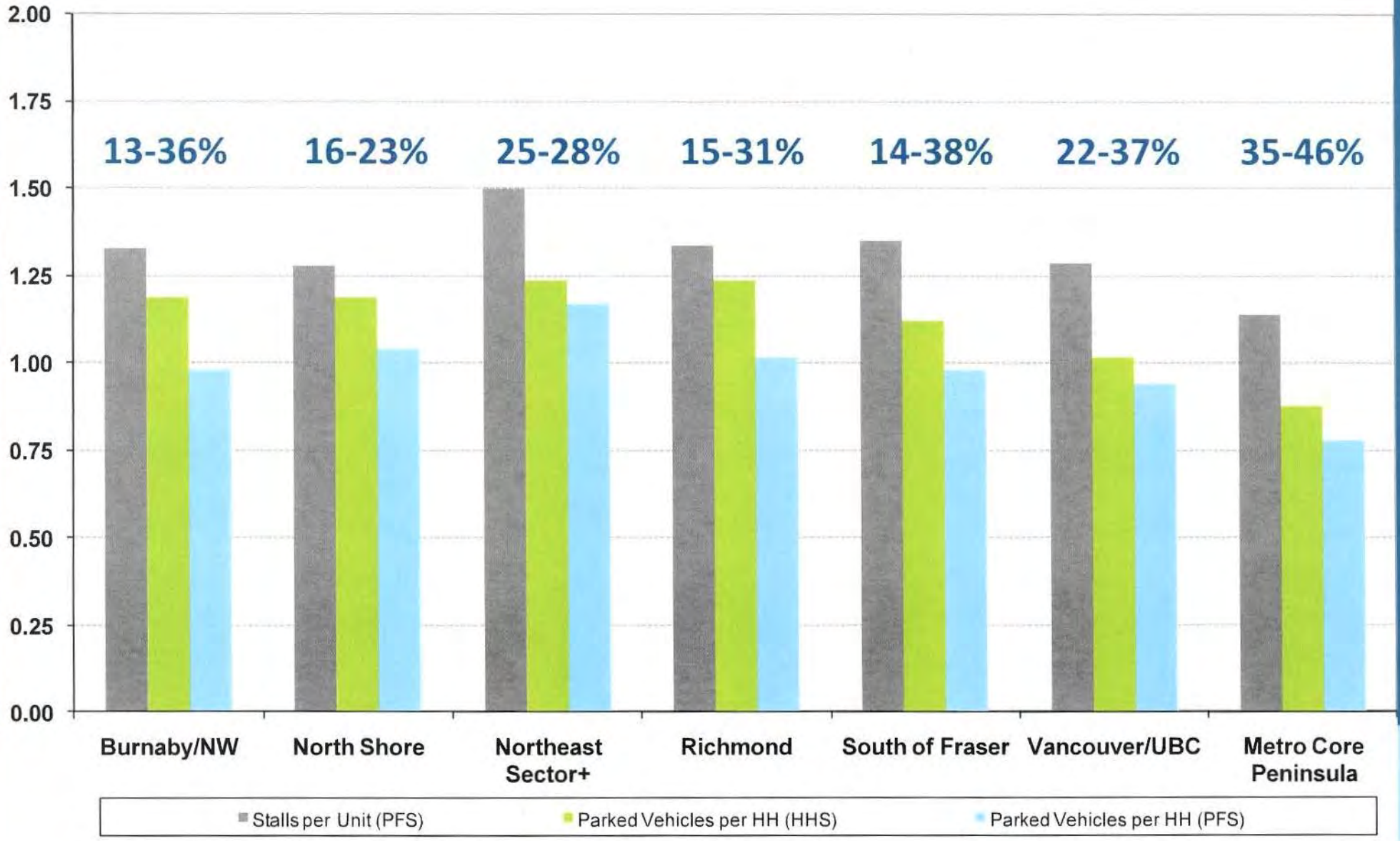


Parking is oversupplied
by 18 - 35% in strata sites

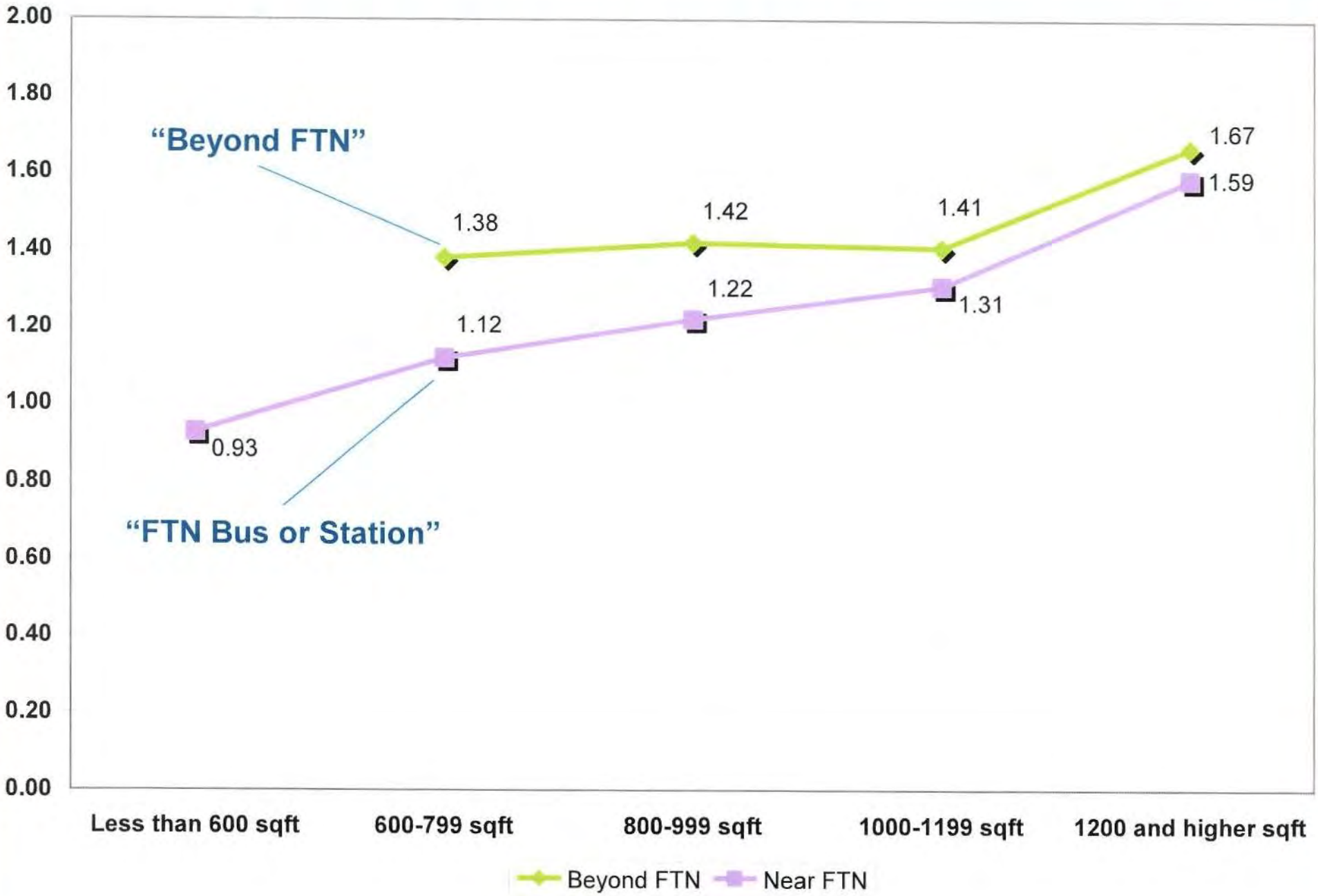
Parking Supply & Demand (Strata)



Parking Supply & Demand (Strata)

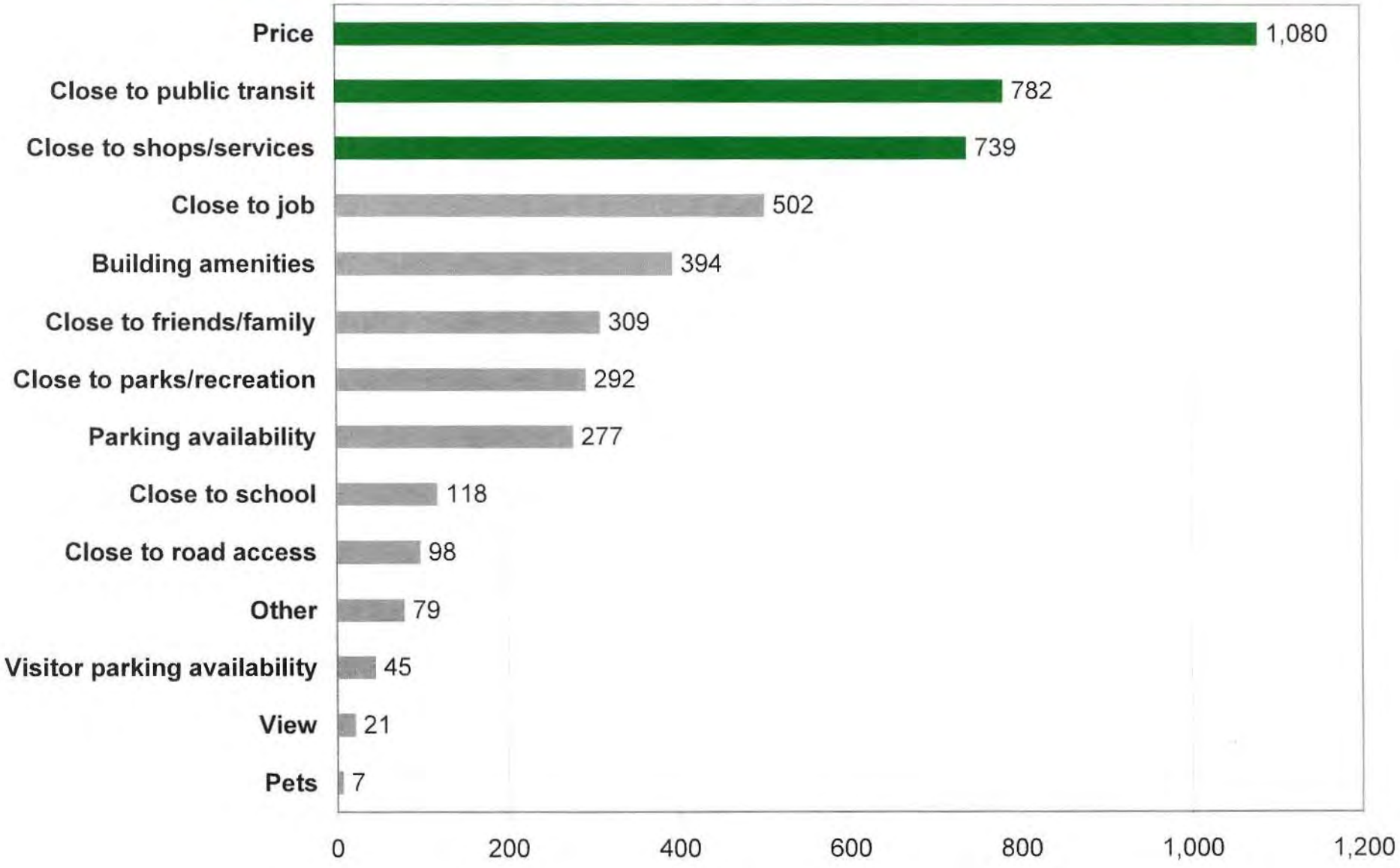


Vehicles per Household



Proximity to Transit Matters

Which features were most important to you when you chose your current apartment/townhouse? (select top 3)



Apartment Parking Guidelines

Refine Min/Max Parking Requirements

Geography	Bachelor Suite		One Bedroom		Two Bedrooms		Three or More Bedrooms		Visitor Parking
	Min	Max	Min	Max	Min	Max	Min	Max	Min
Apartments *not near TransLink's Frequent Transit Network*	0.50	-	0.50	-	0.75	-	1.00	-	0.10
Strata Apartments *near TransLink's Frequent Transit Network*	0.50	1.00	0.50	1.25	0.50	1.50	1.00	1.75	0.10
Market Rental Apartments *near TransLink's Frequent Transit Network*	0.25	1.00	0.25	1.00	0.50	1.00	1.00	1.50	0.10

Other Apartment Parking Guidelines

- Allow parking unbundling/opt-out
- Allow amendment after pre-sales
- Expand carshare programs
- Conduct regular post-occupancy surveys
- Encourage rental apartments near FTN
- Coordinate development with FTN expansion

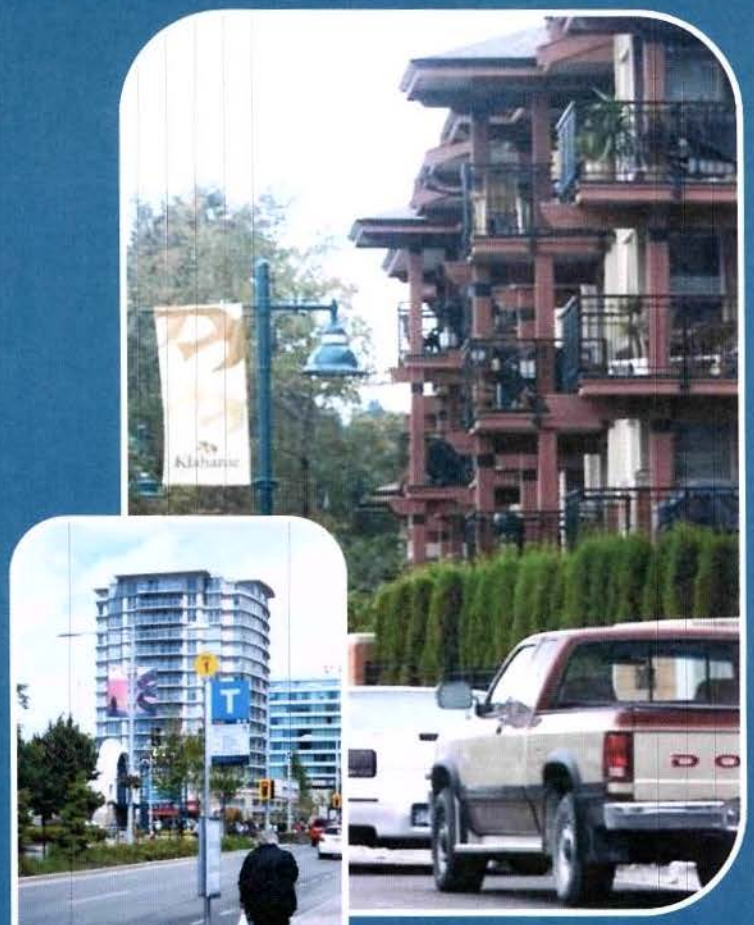
Benefits

- Support efficient and livable neighbourhoods in Urban Centres and Frequent Transit Development Areas
- Contributes to improved housing affordability
- Improved choices for consumers
- Encourage sustainable transportation choices

Potential Future Studies

(as suggested by municipal planners and engineers, and the development community)

1. Visitor and street parking
2. Mixed-use development
3. Townhouses
4. Families and older adult households
5. Additional surveys in south of Fraser and Northeast Sector+



Next Steps

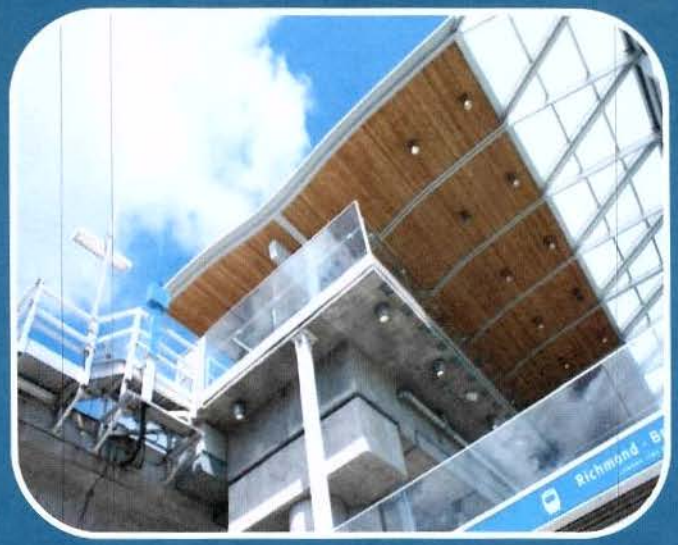
- Respond to RPA directions
  - Additional consultation with municipalities
    - Municipal TDM Network (June 15)
    - RPAC Housing Subcommittee (July 5)
    - MRTAC (July 19)
    - RPAC (July 20)
  - Review recommendations
  - Return to RPA in Fall 2012 with revised technical report and illustrated booklet

Discussion Questions

1. How can Metro Vancouver characterize the 'guidelines' without being prescriptive?

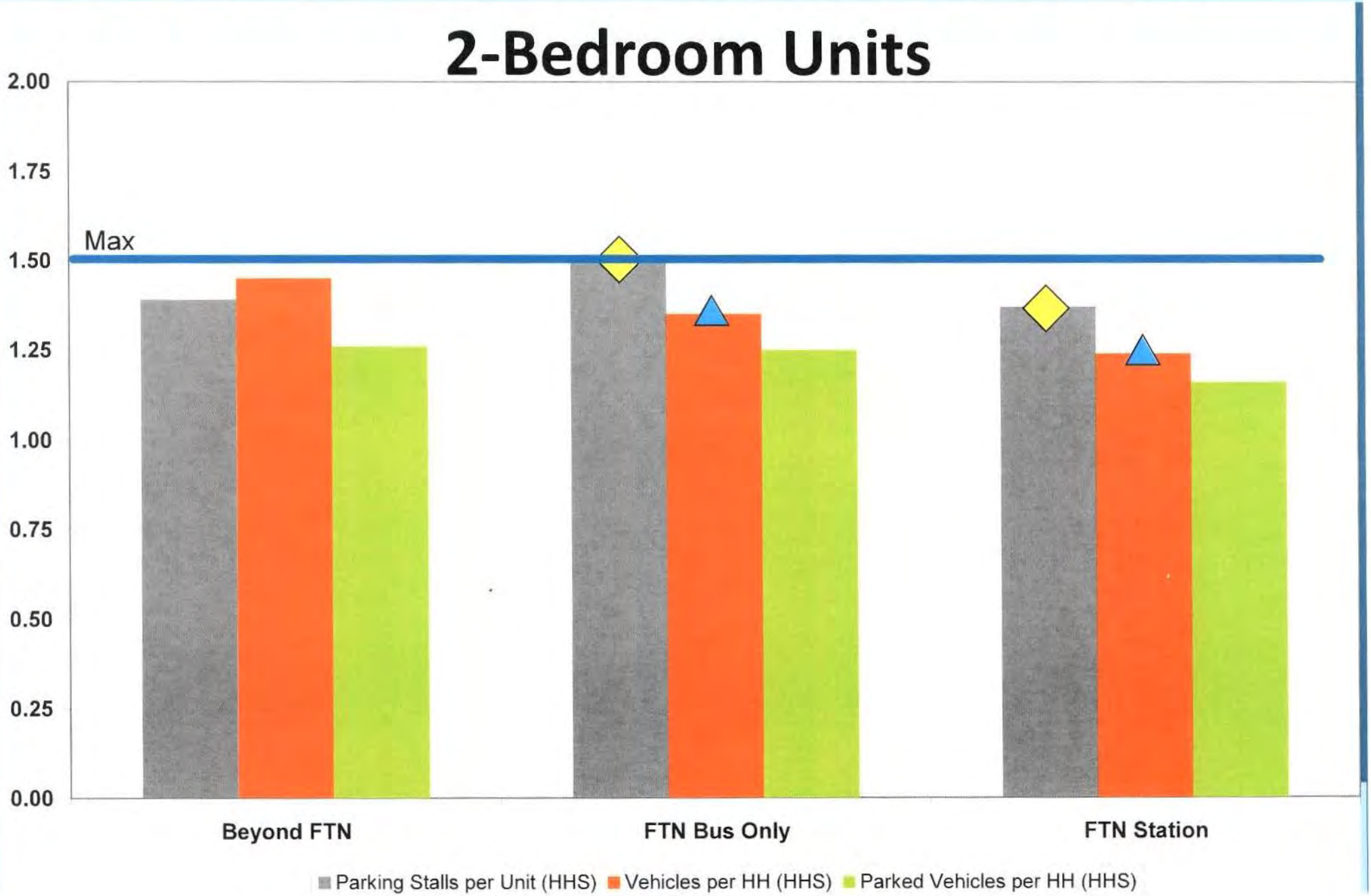
2. How can the findings/guidelines inform municipal TDM efforts?

3. What other priority research areas could the region pursue (e.g. parking or other TDMs)?

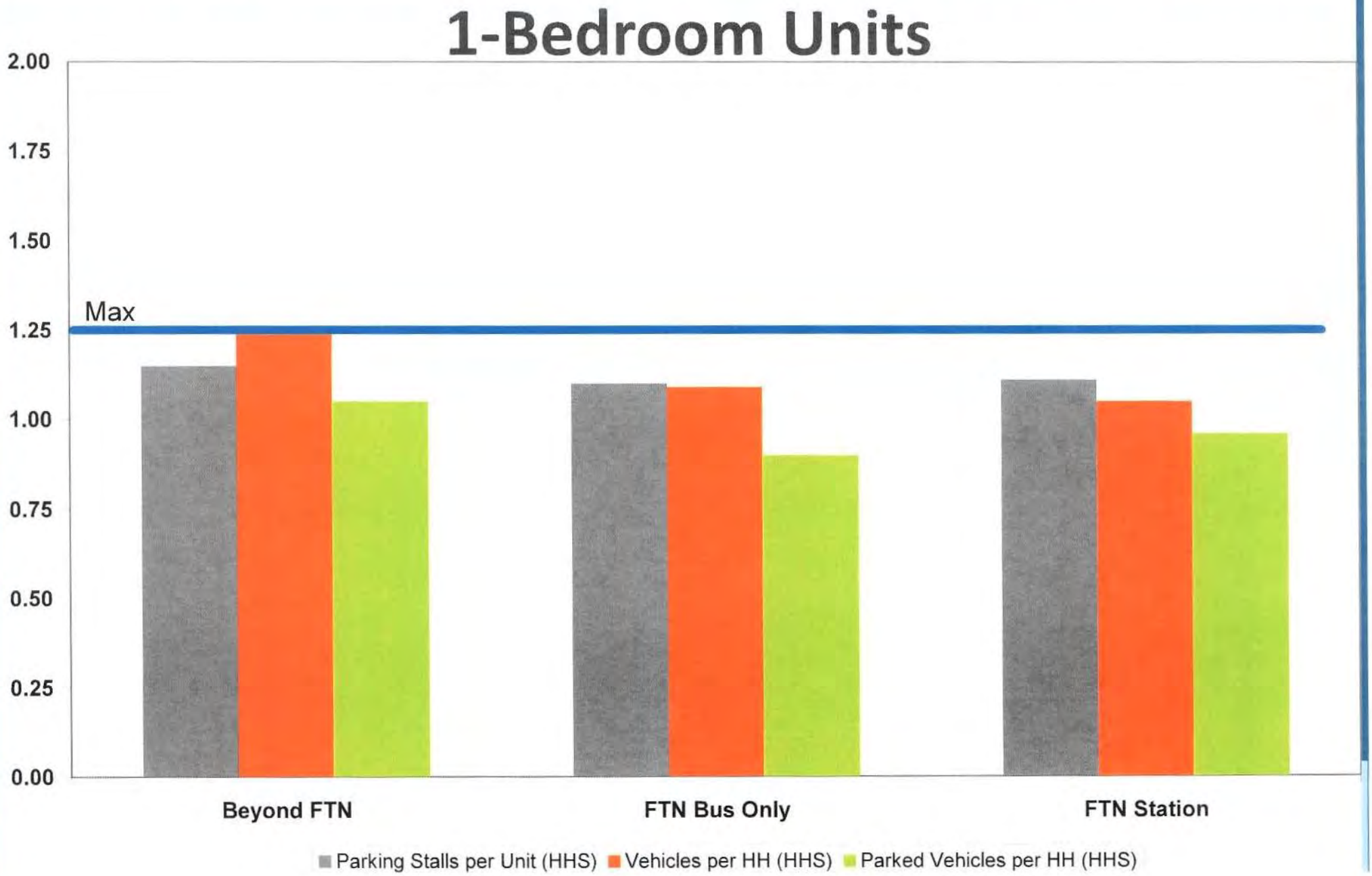



Questions

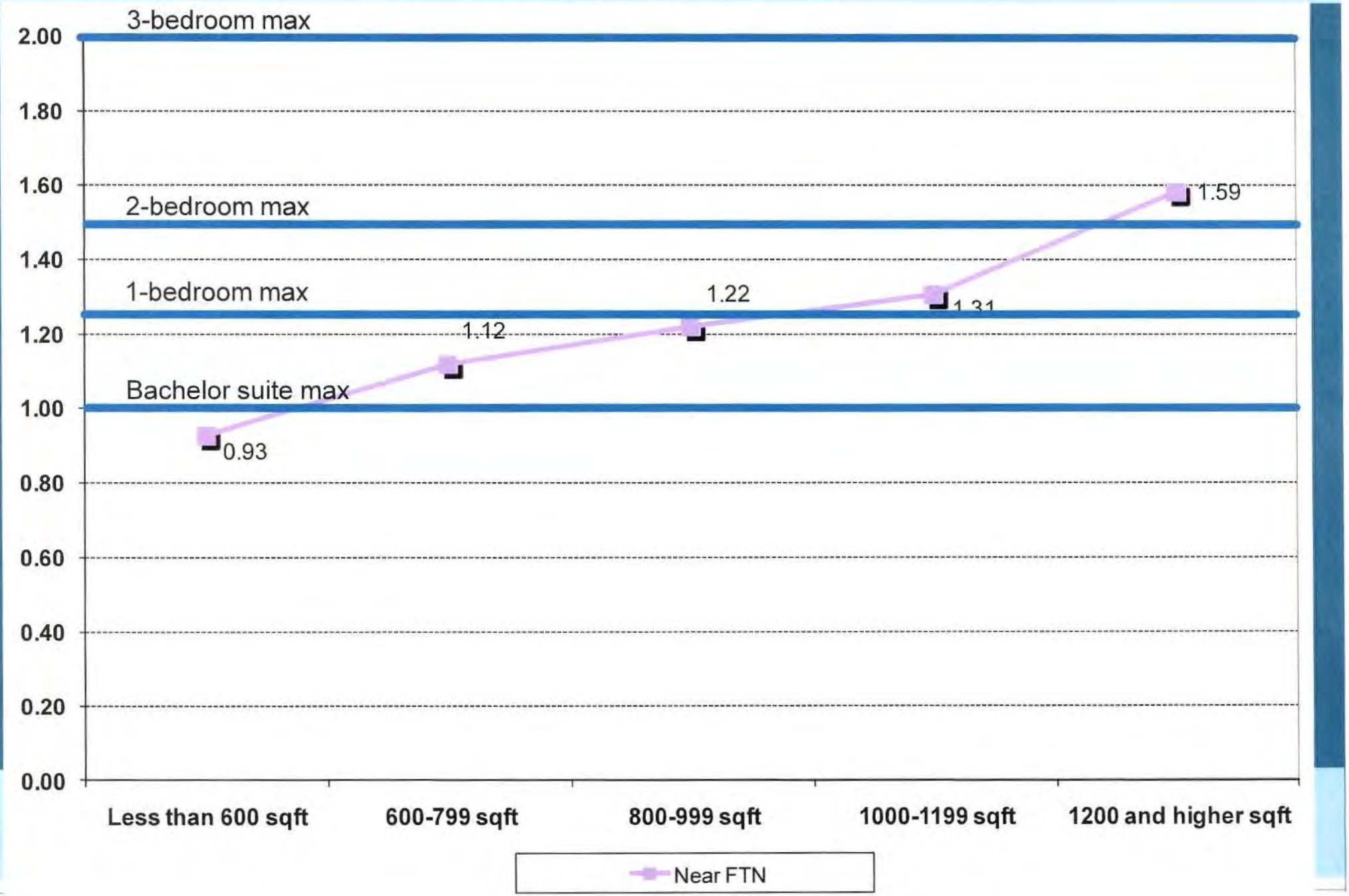
Supply & Demand by FTN (Strata)



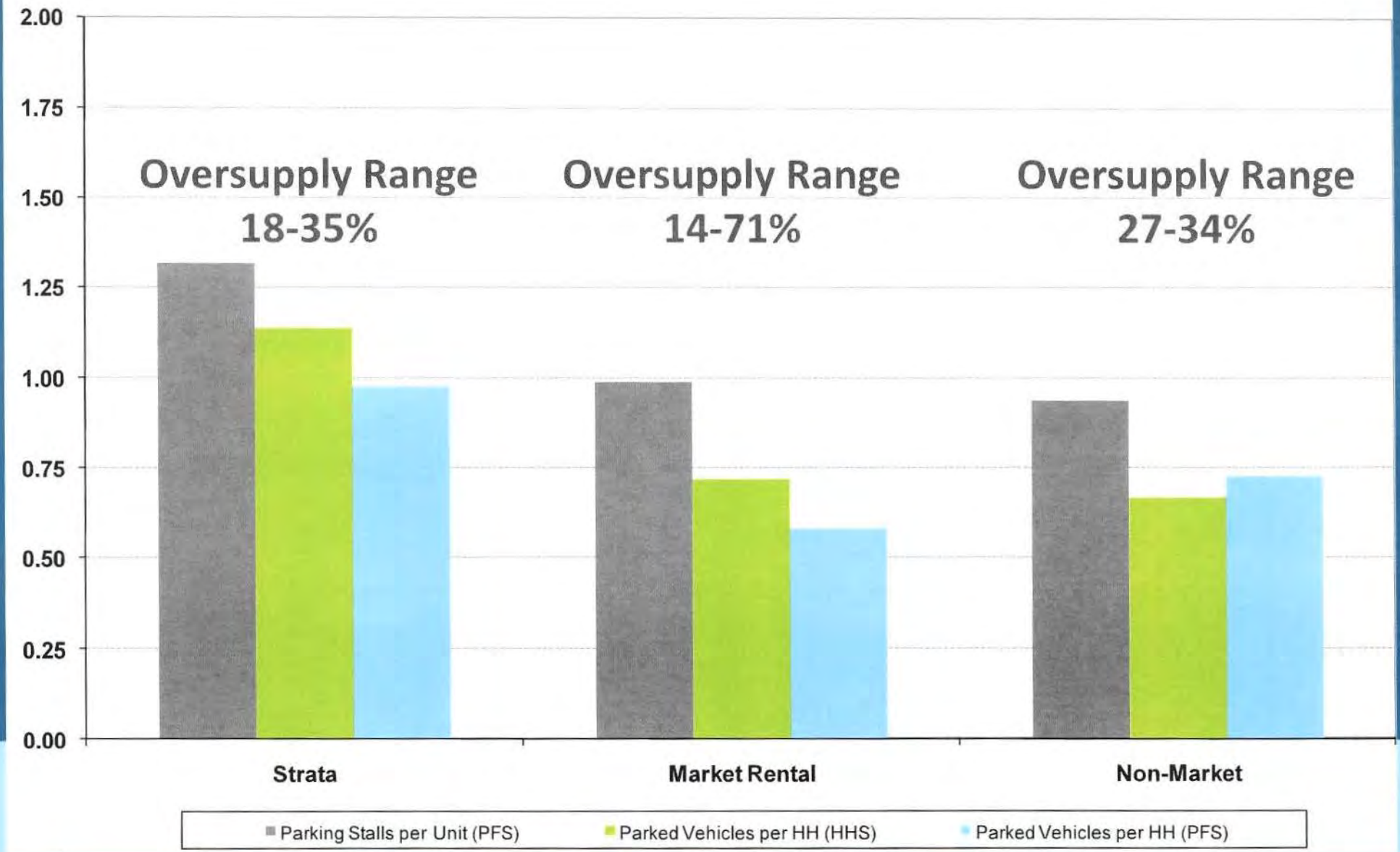
Supply & Demand by FTN (Strata)



Vehicles per Household



Supply & Demand by Apartment Type



Building Type (Tenure)

Tenure	Household Survey Sites	Parking Facility Survey Sites
Strata	76	67
Market Rental	8	9
Non-Market Rental	6	4
Total	90	80

Building Age

Age	Household Survey Sites	Parking Facility Survey Sites
Pre-2000 (1982-1999)	14	15
2000-2006	22	19
2007-2010	53	46
Total	90	80

Estimates of Supply and Demand

	Parking Facility Survey	Household Survey
Parking Supply Rate (#stalls/unit)	✓	✓
Parking Demand Rate (#parked vehicles/unit)	✓	✓
Vehicle "Ownership" (#vehicles/unit)	✗	✓

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