



Ref. No. 171-06694 Phase 2

November 23, 2017

Mr. David Quilichini, Vice President  
Fares & Co. Developments Inc.  
31 Kings Wharf Place  
Keelson Sales Centre  
DARTMOUTH NS B2Y 0C1

Sent Via Email to [David@faresinc.com](mailto:David@faresinc.com)

**RE: Traffic Impact Analysis, Evaluation of Alderney Drive / King Street / Kings Wharf Place Intersection, Trips Generated by Kings Wharf Development Site Build-out**

Dear Mr. Quilichini:

This is the Traffic Impact Analysis (TIA) that you have requested to determine if the Alderney Drive/ King Street / Kings Wharf Place intersection will be able to accommodate the estimated peak hourly trips that will be generated by the proposed build-out of the Kings Wharf Development.

**Background** - Planning for the Kings Wharf development has been on-going for more than 10 years with proposed land uses being revised from time to time as the development evolves based on market trends. The existing occupied land use (November 2017) and the proposed land use at site build-out are included in Table 1.

Table 1 - Land Use Comparisons - Proposed King's Wharf Development					
Study	Land Use				
	Residential (Units)	Office (SF)	Retail (SF)	Hotel (Rooms)	Marina (Slips)
Existing Occupied Land Uses <sup>1</sup>	354	6,000	10,900	-	-
Proposed Build-Out Land Uses	1,500	50,148	180,000	200	100

NOTE: 1. Information provided by David Quilichini, Vice President, Fares & Co. Developments Inc.. November 7, 2017.

**Estimation of 2027 Background Volumes** - AM and PM peak period turning movement counts at the Alderney Drive / King Street / Kings Wharf Place intersection, obtained on Wednesday, October 25, 2017, are tabulated with peak hours shown as shaded areas in Table A-1, Appendix A. Tabulated peak hourly volumes at the intersection with existing Kings Wharf trips removed are included in Table A-2.

The following peak hourly volumes are illustrated diagrammatically on Figure A-1, Appendix A:

- Boxes A and B - 2017 AM and PM peak hourly volumes.
- Boxes C and D - 2017 AM and PM peak hourly volumes, with existing Kings Wharf trips removed.
- Boxes E and F - Projected 2027 background volumes based on a 0.5% annual increase in through volumes on Alderney Drive for an assumed 10 year build-out for the site.

**Trip Generation Proposed Build-Out Land Uses** - AM and PM peak hour trip generation, prepared using published data from *Trip Generation, 9<sup>th</sup> Edition*, are included in Table 2. Trip generation equations are considered to be appropriate for residential and commercial land uses, while average trip generation rates have been used for hotel, office and marina land uses.

Discussions with Paul Burgess, MEng., P. Eng., concerning the appropriate percentage of non-vehicle trips for the Dartmouth Cove area, concluded that a large percentage of site trips would be made by transit, bicycle, walking, or other non-auto modes so that 50% of site generated trips estimated using ITE published trip generation rates for this area would be considered non-auto trips. The 2011 Census data revealed that 50% of trips made in the Regional Centre are non-auto trips, and the HRM Integrated Mobility Plan (IMP) has set a target of 60% non-auto trips by 2031.

Since the large mixed use Kings Wharf development will have significant on-site synergies, synergistic relations with other existing and planned developments in the Dartmouth core area near the site, as well as having excellent accessibility to transit and the Halifax Harbour Ferry, 50% of site generated trips have been assumed to be non-auto trips. A sensitivity analysis has also been completed for 40% non-auto trips.

Land Use <sup>1</sup>	Number Units <sup>3</sup>	Trip Generation Rates <sup>1</sup>				Estimate of Trips Generated <sup>2</sup>			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
High Rise Apt (Land Use 222)	1100 Units	Equations from Pages 376 and 377				82	246	222	142
Mid-Rise Apt (Land Use 223)	400 Units	Equations from Pages 387 and 388				47	104	105	76
Hotel (Land Use 310)	200 Rooms	0.31	0.22	0.31	0.29	62	44	62	58
Marina (Land Use 420)	100 Slips	0.03	0.05	0.11	0.08	3	5	11	8
Office <sup>4</sup> (Land Use 710)	50.148 KGFA	1.37	0.19	0.25	1.24	69	10	13	62
Commercial <sup>5</sup> (Land Use 820)	180.0 KGLA	Equations from Pages 1562 and 1563				138	85	426	462
<b>Total Estimated Trips for Full Site Development</b>						401	494	839	808
<b>50% Trip Reduction for Non-Auto Trips <sup>6</sup></b>						201	247	420	404
<b>Adjusted Trip Generation Estimates with 50% Non-Auto Trip Reduction</b>						200	247	419	404
<b>40% Trip Reduction for Non-Auto Trips <sup>7</sup></b>						160	198	336	323
<b>Adjusted Trip Generation Estimates with 40% Non-Auto Trip Reduction</b>						241	296	503	485
NOTES: 1. Trip generation rates are 'vehicles per hour per unit' for AM and PM peak hours per unit. Rates and equations are for indicated Land Use Codes, <i>Trip Generation, 9<sup>th</sup> Edition</i> , Institute of Transportation Engineers, 2012. 2. Vehicles per hour for peak hours. 3. Units are as indicated; KGFA is '1000 square feet gross floor area'; KGLA is '1000 square feet gross leasable area'. 4. Since the proposed office space is significantly less than the average sized facility published in <i>Trip Generation, 9<sup>th</sup> Edition</i> (215,000 SF and 222,000 SF) and the regression curves would produce illogical trip-end estimates, average published AM and PM peak hour rates have been used. 5. Shopping centre trip generation equations have been used for commercial (retail, restaurants, etc.) land use. Since a large percentage of trips to / from a shopping center are usually made by vehicle, the equations would probably over estimate trips to the Kings Wharf location during the peak hours, however, the reduction for non-vehicle trips (Note 6) should result in reasonable trip estimates for this land use. 6. It has been recognized that additional synergies between King Wharf and other Downtown Dartmouth developments, as well as increased walking, transit and ferry trips by residents of Kings Wharf over the project build-out during the next 10 to 15 years, justify a 50% reduction from trip generation estimates prepared using published rates 7. A sensitivity analysis has been completed to evaluate the impacts with a 40% non-vehicle trip reduction.									

When 50% of site generated trips are considered to be non-auto trips, it is estimated that the development will generate 447 two-way vehicle trips (200 entering and 247 exiting) during the AM peak hour and 823 two-way vehicle trips (419 entering and 404 exiting) during the PM peak hour.

When 40% of site generated trips are considered to be non-auto trips, it is estimated that the development will generate 537 two-way vehicle trips (241 entering and 296 exiting) during the AM peak hour and 988 two-way vehicle trips (503 entering and 485 exiting) during the PM peak hour.

**Trip Distribution** - The following trip distribution has been used throughout the analyses:

- Alderney Drive north of the site - 40%
- King Street west of the site - 20%
- Alderney Drive south of the site - 40%,

**Assignment 50% Non-Auto Mode** - Assigned peak hourly site generated trips for 50% non-auto analysis are illustrated diagrammatically on Figure A-2, Boxes C and D, with projected 2027 volumes that include 50% of site generated trips illustrated diagrammatically on Figure A-2, Boxes E and F.

**Assignment 40% Non-Auto Mode** - Assigned peak hourly site generated trips for the sensitivity analysis with 40% non-auto mode are illustrated diagrammatically on Figure A-3, Boxes C and D, with projected 2027 volumes that include 60% of site generated trips illustrated diagrammatically on Figure A-3, Boxes E and F.

**Level of Service Analysis** - The level or quality of performance of an intersection in terms of traffic movement is determined by a level of service (LOS) analysis. LOS for intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time. LOS criteria are stated in terms of average control delay per vehicle which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

LOS	Signalized Intersections Control Delay (seconds per vehicle)	LOS Description
A	less than 10.0	Very low delay; most vehicles do not stop ( <b>Excellent</b> )
B	between 10.0 and 20.0	Higher delay; more vehicles stop ( <b>Very Good</b> )
C	between 20.0 and 35.0	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping ( <b>Good</b> )
D	between 35.0 and 55.0	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop ( <b>Satisfactory</b> )
E	between 55.0 and 80.0	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of <b>acceptable</b> delay
F	greater than 80.0	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection ( <b>Unacceptable</b> )

The HRM *Guidelines for Preparation of Transportation Impact Studies* indicates the following critical limits for intersection evaluation:

1. the v/c ratio of an intersection exceeds 0.85;
2. the v/c ratio of a through movement or shared through / turning movement exceeds 0.85;
3. the v/c ratio of an exclusive turning movement exceeds 1.0;
4. an exclusive turning movement generates queues which exceed the available turning lane storage space.

Synchro 9.0 software has been used for performance evaluation of AM and PM peak hourly volumes for the Alderney Drive / King Street / Kings Wharf Place intersection. LOS analysis sheets are included in Appendix A and results are summarized in Table 4.

The following intersection and traffic signal conditions were used in the analyses:

- Existing intersection configuration;
- 90 second actuated cycle, except 100 seconds during PM peak with 40% non-auto trips;
- Existing signal phasing, except a left turn phase has been added for Alderney Drive southbound during PM peak with 40% non-auto trips:

The following analyses have been completed:

- Existing 2017 volumes including existing site development (Pages A-6 and A-7)
- Projected 2027 volumes; full site development; 50% non-auto trips (Pages A-8 and A-9)
- Projected 2027 volumes; full site development ; 40% non-auto trips (Pages A-10 and A-11).

Table 4 - LOS for Alderney Drive/ King Street / Kings Wharf Place Intersection							
LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95% Queue (m) by Intersection Movement						Intersection LOS
	EB-LTR	WB-LT	WB-R	NB-LTR	SB-L	SB-TR	
<b>AM Peak Hour - Existing 2017 Volumes - Existing Intersection (Page A-6)</b>							
Delay	10.7	13.9	5.8	6.4	6.7	6.7	7.0
v/c	0.07	0.21	0.12	0.24	0.07	0.31	-
Queue	4.2	9.9	4.7	15.6	4.6	21.5	-
<b>AM Peak Hour - Projected 2027 Volumes with Site - 50% Non-Auto Trips (Page A-8)</b>							
Delay	11.5	16.6	4.7	8.8	10.7	9.6	9.8
v/c	0.14	0.44	0.22	0.39	0.26	0.44	-
Queue	9.4	23.1	7.9	23.9	12.2	29.7	-
<b>AM Peak Hour - Projected 2027 Volumes with Site - Sensitivity Analysis - 40% Non-Auto Trips (Page A-10)</b>							
Delay	11.7	17.3	4.4	9.6	12.6	10.5	10.7
v/c	0.14	0.49	0.24	0.42	0.33	0.46	-
Queue	11.0	28.6	8.6	27.5	16.2	33.5	-
<b>PM Peak Hour - Existing 2017 Volumes - Existing Intersection (Page A-7)</b>							
Delay	12.5	15.0	6.8	7.2	6.8	5.8	7.4
v/c	0.28	0.14	0.09	0.43	0.09	0.18	-
Queue	12.6	7.9	4.6	33.1	4.5	13.3	-
<b>PM Peak Hour - Projected 2027 Volumes with Site - 50% Non-Auto Trips (Page A-9)</b>							
Delay	22.8	38.6	12.0	12.7	44.1	9.5	18.4
v/c	0.38	0.74	0.36	0.55	0.79	0.19	-
Queue	32.1	59.7	22.9	84.6	68.8	27.6	-
<b>PM Peak Hour - Projected 2027 Volumes with Site - Sensitivity Analysis - 40% Non-Auto Trips (Page A-11)</b>							
Delay	26.5	48.9	12.4	31.8	30.6	10.9	28.4
v/c	0.40	0.83	0.38	0.84	0.70	0.20	-
Queue	42.7	94.3	28.9	123.0	57.0	27.6	-

**Summary Level of Service Analyses** - Level of service (LOS) analysis (Table 4) for the Alderney Drive / King Street / Kings Wharf Place intersection indicate the following:

- The intersection will be in compliance with HRM v/c ratio limits for both the 50% non-auto and 40% non-auto sensitivity analyses;
- The intersection is expected to provide good overall performance for projected 2027 volumes with added trips for both the 50% non-auto analysis and the 40% non-auto sensitivity analysis.

**Summary -**

1. The proposed build-out of Kings Wharf will included 1500 residential units, 50,148 SF of office, 180,000 SF of retail, a 200 room hotel and 100 marine slips.
2. When 50% of site generated trips are considered to be non-auto trips, it is estimated that the development will generate 447 two-way vehicle trips (200 entering and 247 exiting) during the AM peak hour and 823 two-way vehicle trips (419 entering and 404 exiting) during the PM peak hour.
3. For the sensitivity analysis when 40% of site generated trips are considered to be non-auto trips, it is estimated that the development will generate 537 two-way vehicle trips (241 entering and 296 exiting) during the AM peak hour and 988 two-way vehicle trips (503 entering and 485 exiting) during the PM peak hour.
4. Level of service (LOS) analyses for the Alderney Drive / King Street / Kings Wharf Place intersection indicate the intersection will be within HRM acceptable limits for both the 50% non-auto analysis and the 40% non-auto sensitivity analysis. The intersection is expected to provide good overall performance for projected 2027 volumes with added trips for both the 50% non-auto analysis and the 40% non-auto sensitivity analysis.

**Conclusion -**

5. Trip generation, trip assignment, and level of service analyses indicate that the Alderney Drive/ King Street / Kings Wharf Place intersection will operate within HRM guidelines and will continue to provide good overall performance during 2027 while accommodating the estimated peak hourly trips that will be generated by the proposed build-out of the Kings Wharf Development.

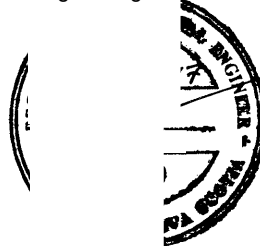
If you have any questions, please contact me by Email to [ken.obrien@wsp.com](mailto:ken.obrien@wsp.com) or telephone 902-452-7747.

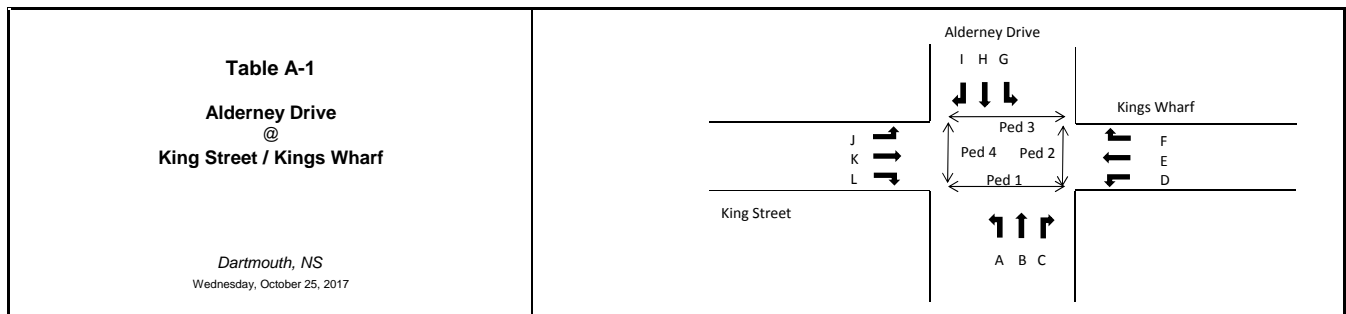
Sincerely,

Original Signed

Ken O'Brien, P. Eng.  
Senior Traffic Engineer  
WSP Canada Inc.

Original Signed

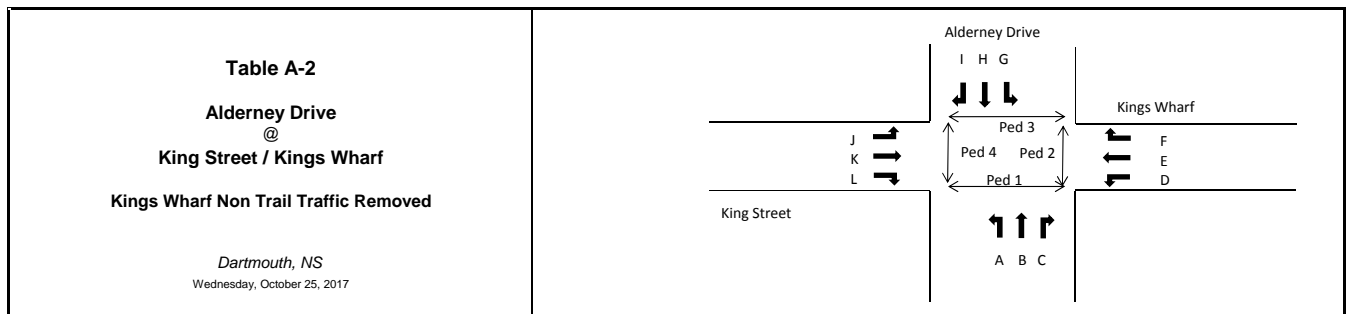




<b>AM Peak Period Volume Data</b>														
Time	Alderney Drive Northbound Approach			Kings Wharf Westbound Approach			Alderney Drive Southbound Approach			King Street Eastbound Approach			Total Vehicles	
	A	B	C	D	E	F	G	H	I	J	K	L		
07:00 - 07:15	2	85	0	4	1	6	3	150	1	1	1	0	254	
07:15 - 07:30	0	88	3	8	3	4	2	148	0	1	1	1	259	
07:30 - 07:45	2	96	4	5	1	5	4	140	1	2	0	1	261	
07:45 - 08:00	0	104	1	6	4	10	6	141	2	1	0	1	276	
08:00 - 08:15	2	116	2	16	4	8	5	123	5	4	0	2	287	
08:15 - 08:30	0	91	3	11	5	13	13	153	5	3	2	2	301	
08:30 - 08:45	2	100	6	8	7	9	10	148	6	4	2	1	303	
08:45 - 09:00	0	87	9	9	4	8	9	94	4	4	1	5	234	
<b>AM Peak Hour</b>	<b>4</b>	<b>411</b>	<b>12</b>	<b>41</b>	<b>20</b>	<b>40</b>	<b>34</b>	<b>565</b>	<b>18</b>	<b>12</b>	<b>4</b>	<b>6</b>	<b>1167</b>	
<b>07:00 - 08:00</b>	<b>4</b>	<b>373</b>	<b>8</b>	<b>23</b>	<b>9</b>	<b>25</b>	<b>15</b>	<b>579</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>1050</b>	
<b>08:00 - 09:00</b>	<b>4</b>	<b>394</b>	<b>20</b>	<b>44</b>	<b>20</b>	<b>38</b>	<b>37</b>	<b>518</b>	<b>20</b>	<b>15</b>	<b>5</b>	<b>10</b>	<b>1125</b>	
	<b>Ped 1</b>			<b>Ped 2</b>			<b>Ped 3</b>			<b>Ped 4</b>			<b>Total Peds</b>	
<b>07:00 - 08:00</b>	7			7			16			2			32	
<b>08:00 - 09:00</b>	10			7			10			0			27	

<b>PM Peak Period Volume Data</b>														
Time	Alderney Drive Northbound Approach			Kings Wharf Westbound Approach			Alderney Drive Southbound Approach			King Street Eastbound Approach			Total Vehicles	
	A	B	C	D	E	F	G	H	I	J	K	L		
16:00 - 16:15	2	213	12	2	1	5	5	88	1	10	3	4	346	
16:15 - 16:30	0	188	11	6	5	12	7	81	5	11	2	7	335	
16:30 - 16:45	2	170	6	7	2	11	7	87	1	10	4	3	310	
16:45 - 17:00	1	180	6	7	2	9	3	81	2	3	5	7	306	
17:00 - 17:15	2	209	11	8	2	4	5	94	2	14	6	12	369	
17:15 - 17:30	1	201	12	3	5	7	15	83	2	8	6	7	350	
17:30 - 17:45	1	149	5	5	4	7	6	62	3	5	4	2	253	
17:45 - 18:00	0	114	6	2	3	2	7	54	2	3	1	2	196	
<b>PM Peak Hour</b>	<b>6</b>	<b>760</b>	<b>35</b>	<b>25</b>	<b>11</b>	<b>31</b>	<b>30</b>	<b>345</b>	<b>7</b>	<b>35</b>	<b>21</b>	<b>29</b>	<b>1335</b>	
<b>16:00 - 17:00</b>	<b>5</b>	<b>751</b>	<b>35</b>	<b>22</b>	<b>10</b>	<b>37</b>	<b>22</b>	<b>337</b>	<b>9</b>	<b>34</b>	<b>14</b>	<b>21</b>	<b>1297</b>	
<b>17:00 - 18:00</b>	<b>4</b>	<b>673</b>	<b>34</b>	<b>18</b>	<b>14</b>	<b>20</b>	<b>33</b>	<b>293</b>	<b>9</b>	<b>30</b>	<b>17</b>	<b>23</b>	<b>1168</b>	
	<b>Ped 1</b>			<b>Ped 2</b>			<b>Ped 3</b>			<b>Ped 4</b>			<b>Total Peds</b>	
<b>16:00 - 17:00</b>	7			28			29			1			65	
<b>17:00 - 18:00</b>	9			6			16			0			31	

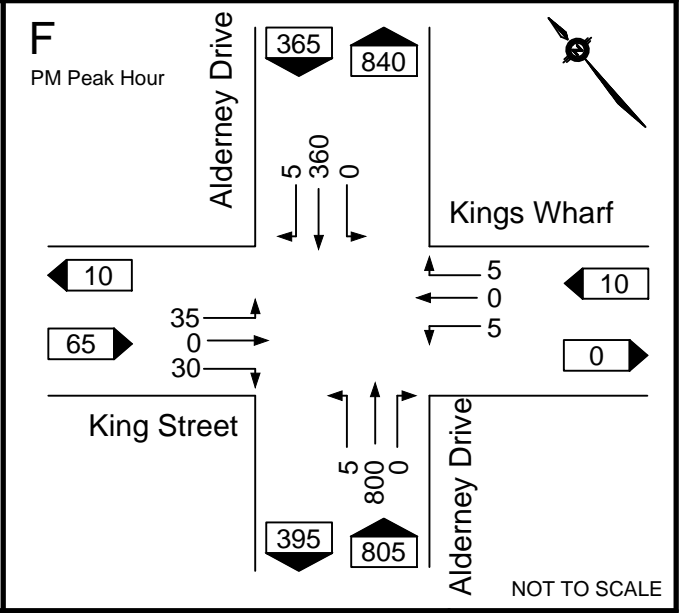
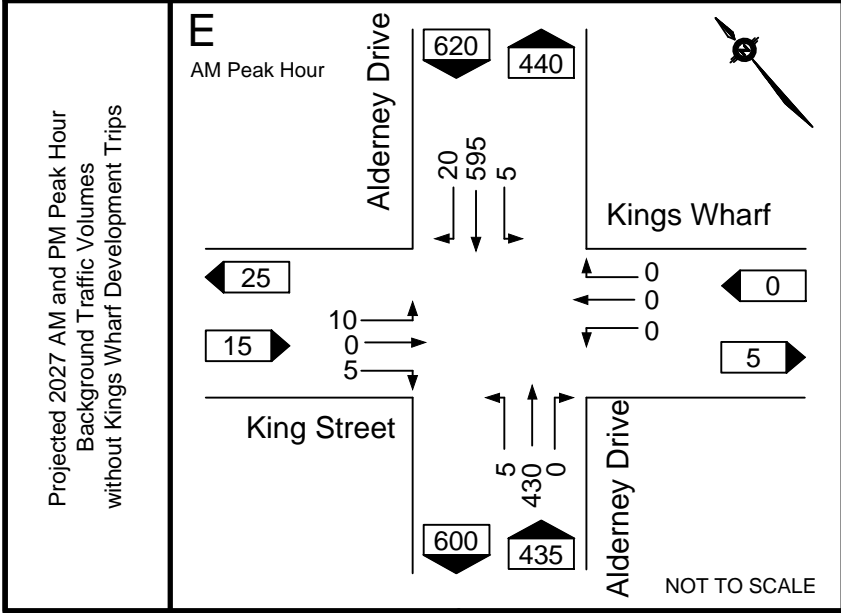
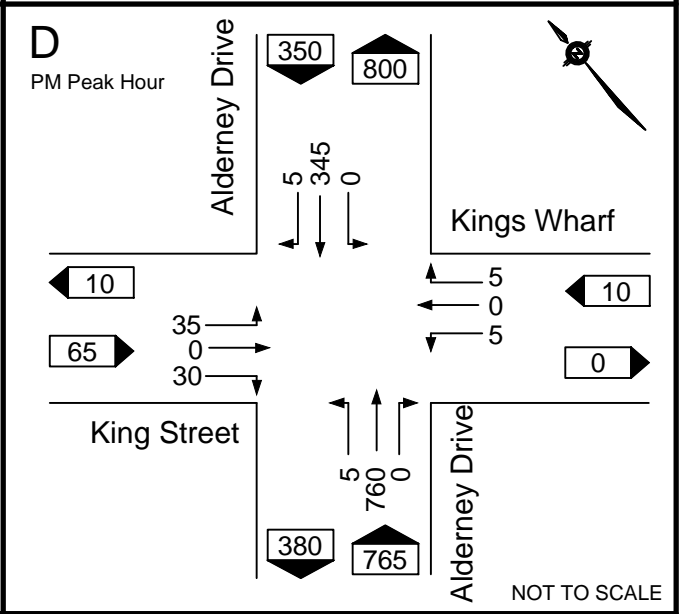
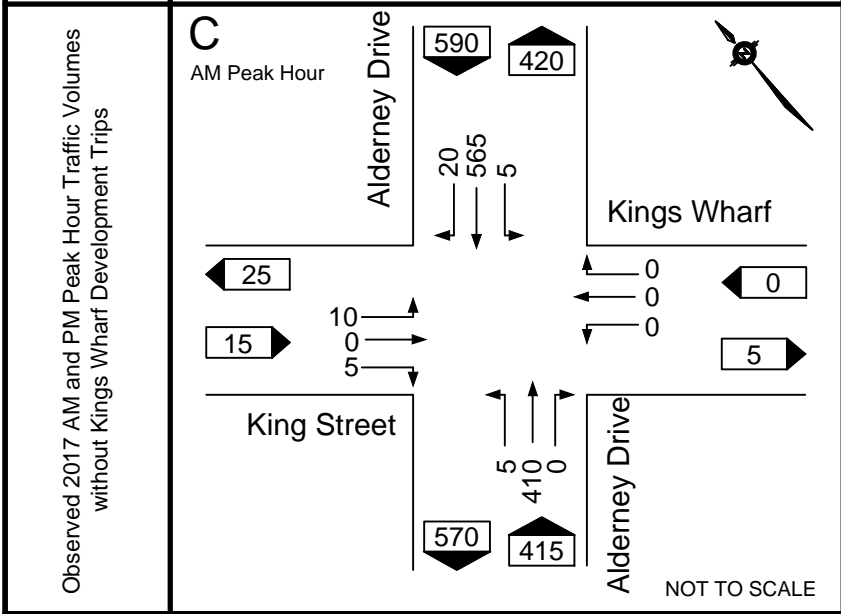
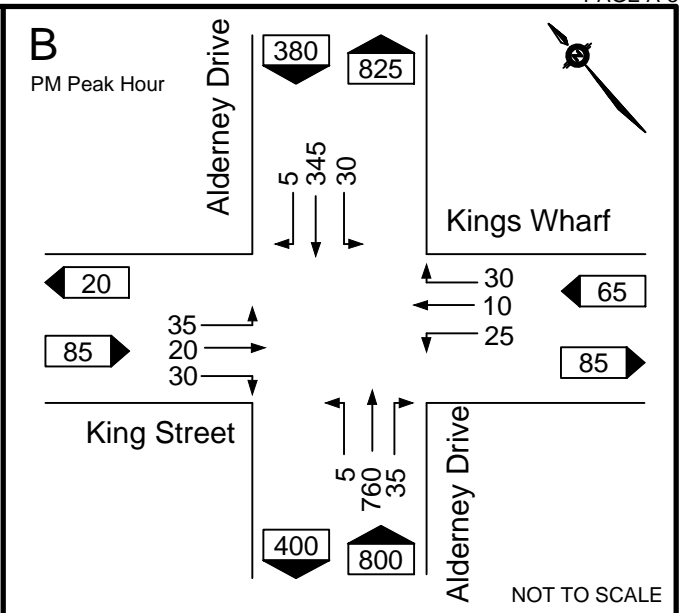
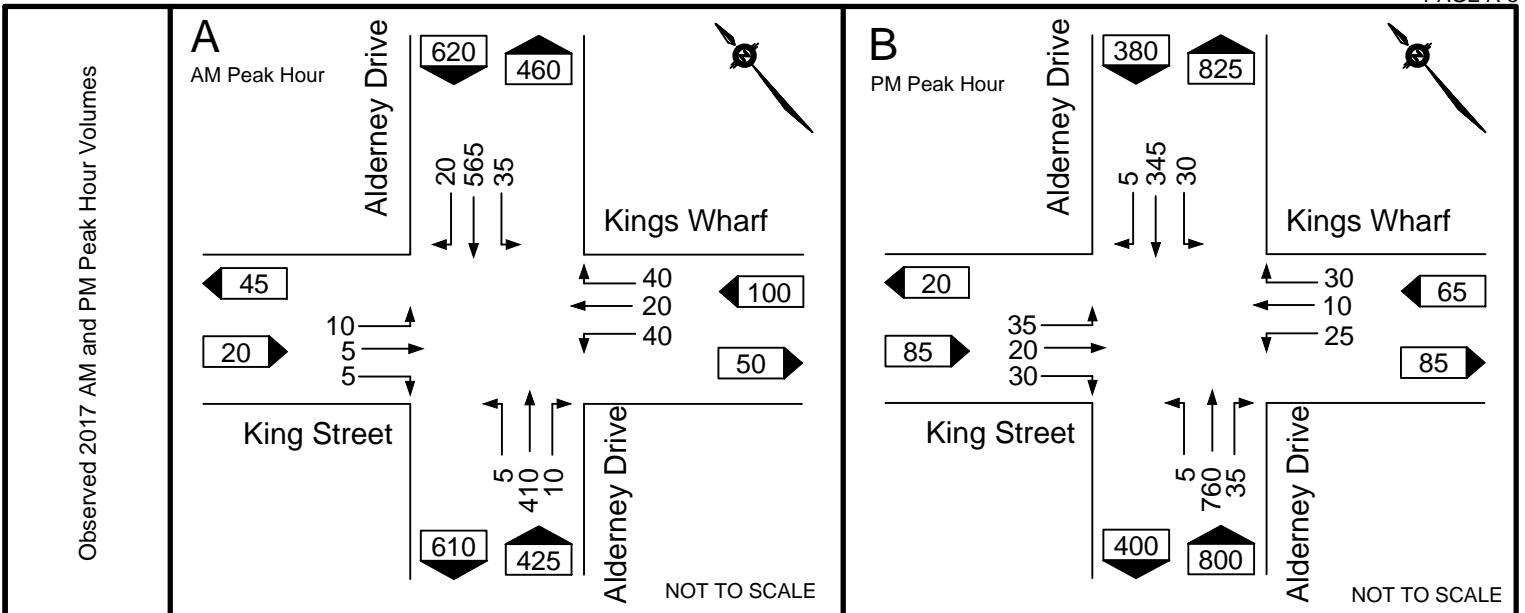
\* Count completed by WSP



AM Peak Period Volume Data														
Time		Alderney Drive Northbound Approach			Kings Wharf Westbound Approach			Alderney Drive Southbound Approach			King Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
07:00	07:15	2	85	0	0	0	0	0	150	1	1	0	0	239
07:15	07:30	0	88	2	0	0	0	0	148	0	1	0	1	240
07:30	07:45	2	96	1	0	0	0	1	140	1	2	0	1	244
07:45	08:00	0	104	0	0	0	0	2	141	2	1	0	1	251
08:00	08:15	2	116	1	0	0	0	0	123	5	4	0	2	253
08:15	08:30	0	91	0	0	0	0	2	153	5	3	1	2	257
08:30	08:45	2	100	0	1	1	0	1	148	6	4	0	1	264
08:45	09:00	0	87	1	0	0	0	0	94	4	4	0	5	195
<b>AM Peak Hour</b>		<b>4</b>	<b>411</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>5</b>	<b>565</b>	<b>18</b>	<b>12</b>	<b>1</b>	<b>6</b>	<b>1025</b>
<b>07:00</b>	<b>08:00</b>	<b>4</b>	<b>373</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>579</b>	<b>4</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>974</b>
<b>08:00</b>	<b>09:00</b>	<b>4</b>	<b>394</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>518</b>	<b>20</b>	<b>15</b>	<b>1</b>	<b>10</b>	<b>969</b>
		<b>Ped 1</b>			<b>Ped 2</b>			<b>Ped 3</b>			<b>Ped 4</b>			<b>Total Peds</b>
<b>07:00</b>	<b>08:00</b>	<b>7</b>			<b>7</b>			<b>16</b>			<b>2</b>			<b>32</b>
<b>08:00</b>	<b>09:00</b>	<b>10</b>			<b>7</b>			<b>10</b>			<b>0</b>			<b>27</b>

PM Peak Period Volume Data														
Time		Alderney Drive Northbound Approach			Kings Wharf Westbound Approach			Alderney Drive Southbound Approach			King Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
16:00	16:15	2	213	0	0	0	0	0	88	1	10	0	4	318
16:15	16:30	0	188	0	0	0	1	0	81	5	11	0	7	293
16:30	16:45	2	170	0	4	0	2	0	87	1	10	0	3	279
16:45	17:00	1	180	0	1	0	1	0	81	2	3	0	7	276
17:00	17:15	2	209	0	1	0	2	0	94	2	14	0	12	336
17:15	17:30	1	201	0	0	0	1	0	83	2	8	0	7	303
17:30	17:45	1	149	0	0	0	1	0	62	3	5	0	2	223
17:45	18:00	0	114	0	0	0	0	0	54	2	3	0	2	175
<b>PM Peak Hour</b>		<b>6</b>	<b>760</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>345</b>	<b>7</b>	<b>35</b>	<b>0</b>	<b>29</b>	<b>1194</b>
<b>16:00</b>	<b>17:00</b>	<b>5</b>	<b>751</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>337</b>	<b>9</b>	<b>34</b>	<b>0</b>	<b>21</b>	<b>1166</b>
<b>17:00</b>	<b>18:00</b>	<b>4</b>	<b>673</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>293</b>	<b>9</b>	<b>30</b>	<b>0</b>	<b>23</b>	<b>1037</b>
		<b>Ped 1</b>			<b>Ped 2</b>			<b>Ped 3</b>			<b>Ped 4</b>			<b>Total Peds</b>
<b>16:00</b>	<b>17:00</b>	<b>7</b>			<b>28</b>			<b>29</b>			<b>1</b>			<b>65</b>
<b>17:00</b>	<b>18:00</b>	<b>9</b>			<b>6</b>			<b>16</b>			<b>0</b>			<b>31</b>

\* Count completed by WSP



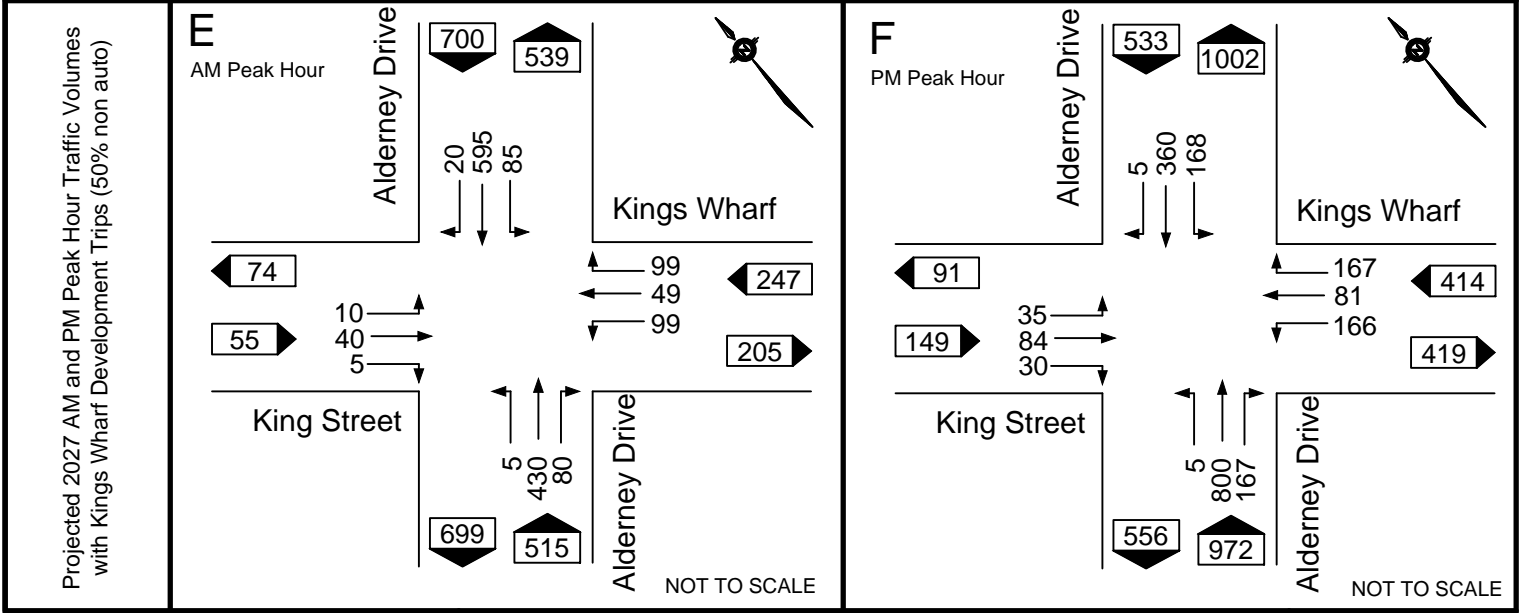
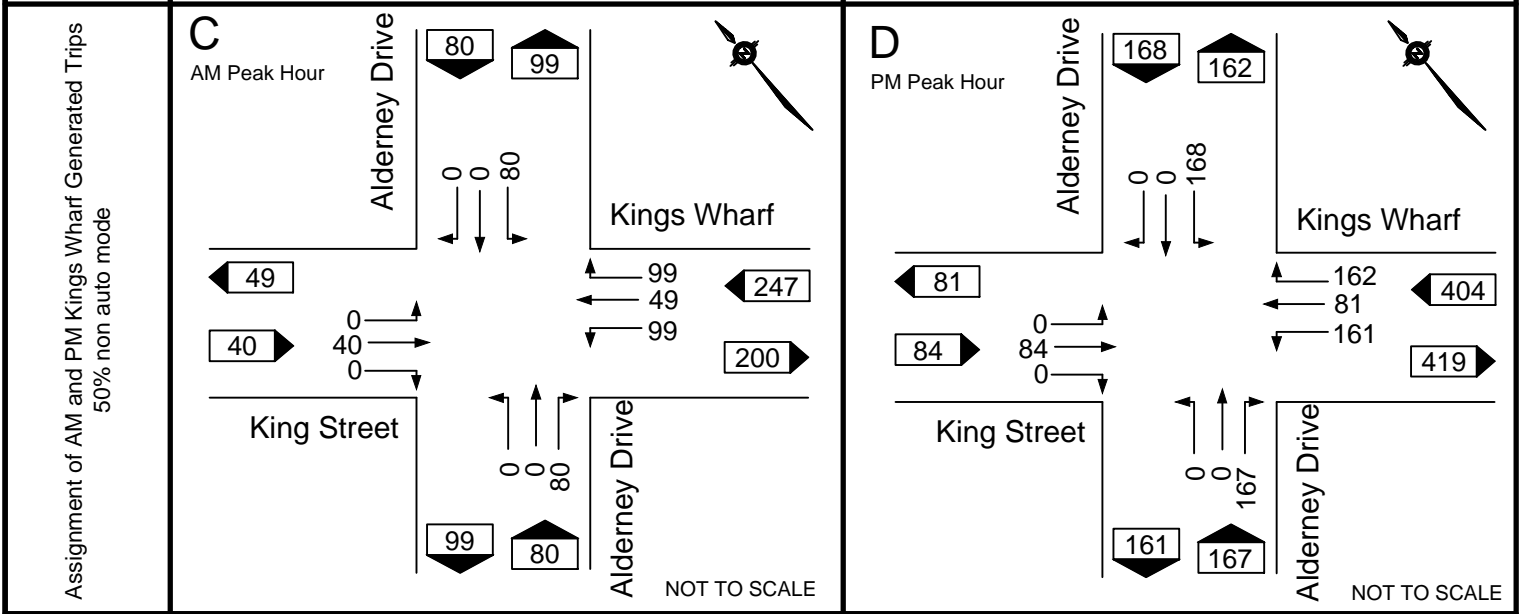
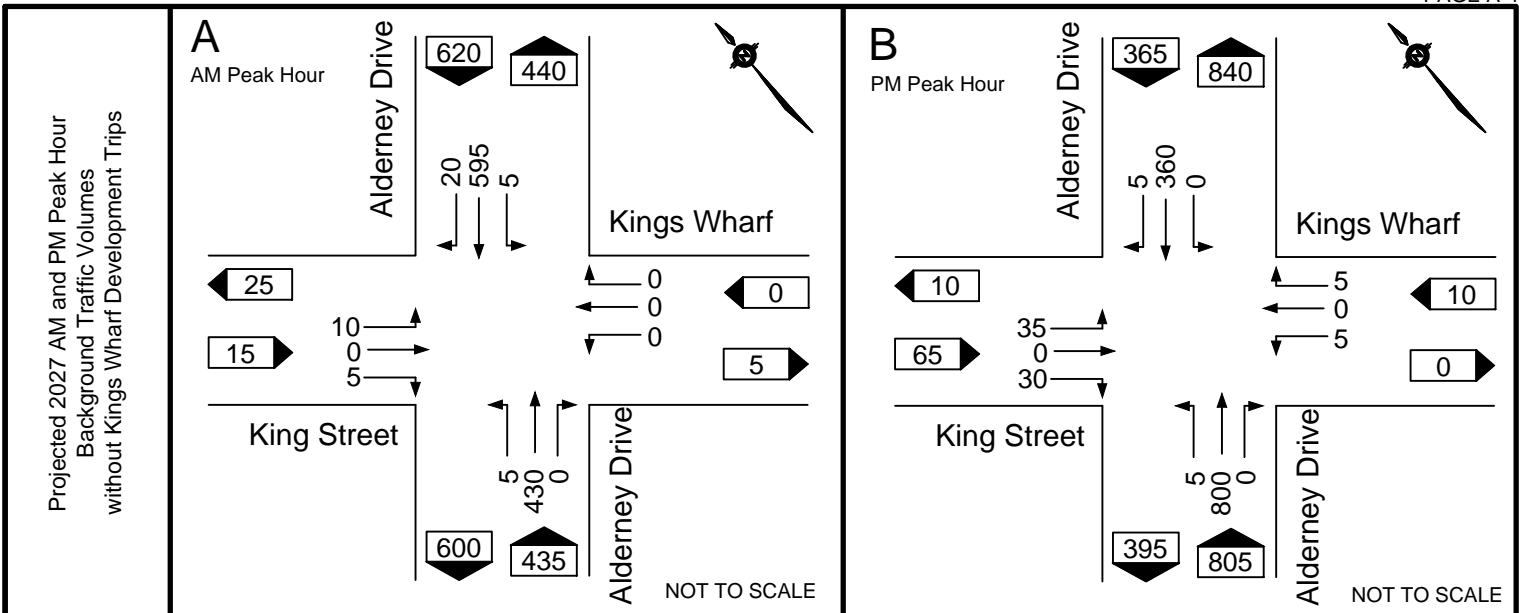
Kings Wharf Traffic Impact Analysis

Figure A-1

Observed 2017 Weekday AM and PM Peak Hour Traffic Volumes;  
2017 AM and PM Peak Hour Volumes without Kings Wharf Development; and,  
Background 2027 AM and PM Peak Hour Traffic Volumes without Kings Wharf Development

November 2017



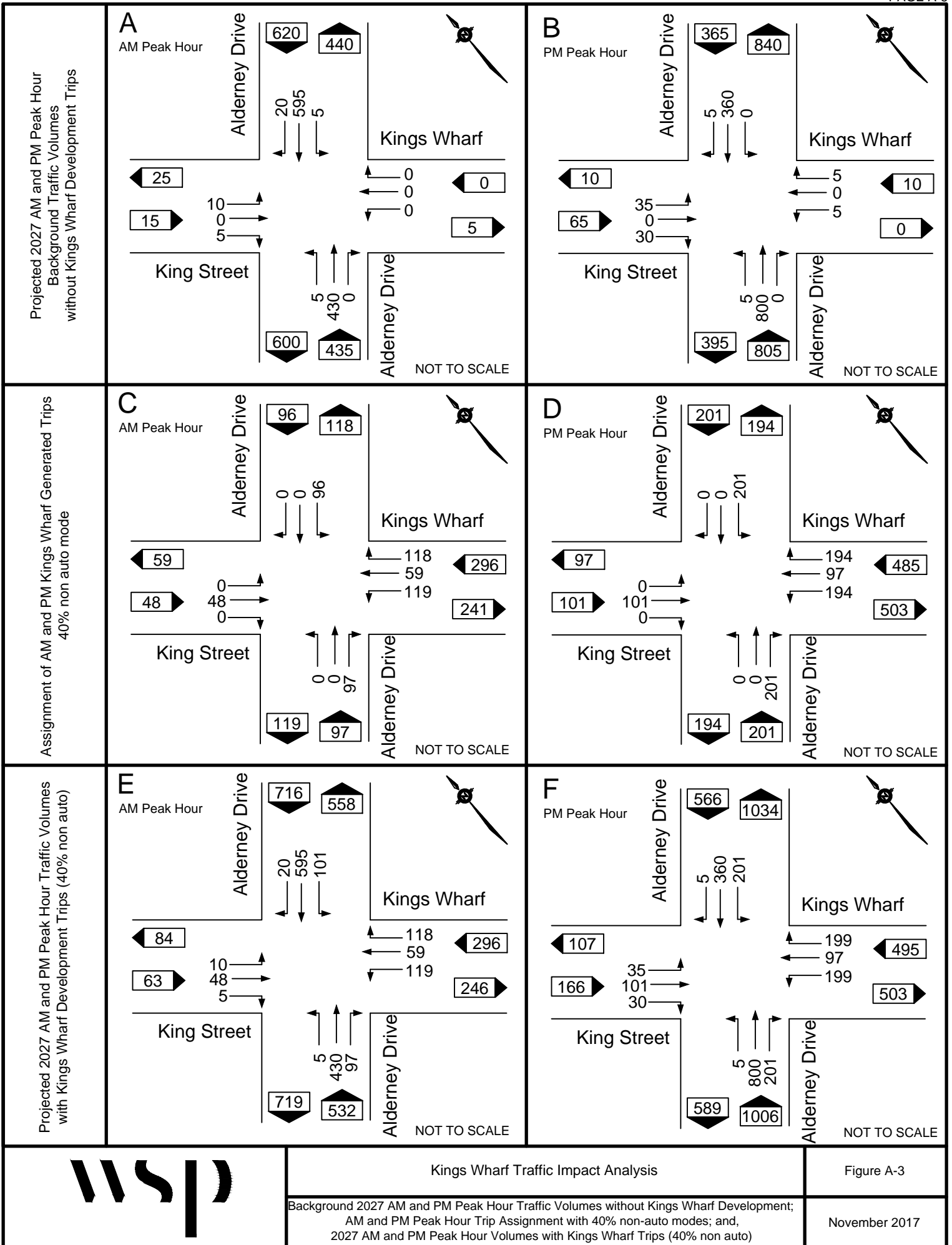


Kings Wharf Traffic Impact Analysis

Figure A-2

Background 2027 AM and PM Peak Hour Traffic Volumes without Kings Wharf Development; AM and PM Peak Hour Trip Assignment with 50% non-auto modes; and, 2027 AM and PM Peak Hour Volumes with Kings Wharf Trips (50% non auto)

November 2017



Kings Wharf Traffic Impact Analysis

Figure A-3

Background 2027 AM and PM Peak Hour Traffic Volumes without Kings Wharf Development; AM and PM Peak Hour Trip Assignment with 40% non-auto modes; and, 2027 AM and PM Peak Hour Volumes with Kings Wharf Trips (40% non auto)

November 2017

# Kings Wharf Traffic Impact Analysis

## 1: Alderney Drive & King Street/Kings Wharf

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	5	5	40	20	40	5	410	10	35	565	20
Future Volume (vph)	10	5	5	40	20	40	5	410	10	35	565	20
Satd. Flow (prot)	0	1776	0	0	1823	1601	0	3561	0	1789	3561	0
Flt Permitted		0.801			0.788			0.948		0.486		
Satd. Flow (perm)	0	1460	0	0	1484	1601	0	3379	0	915	3561	0
Satd. Flow (RTOR)		5				43		4			6	
Lane Group Flow (vph)	0	21	0	0	65	43	0	462	0	38	636	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Total Split (s)	40.0	40.0		40.0	40.0	40.0	50.0	50.0		50.0	50.0	
Total Lost Time (s)		6.7			6.7	6.7		5.9		5.9	5.9	
Act Effct Green (s)		7.7			7.7	7.7		20.8		20.8	20.8	
Actuated g/C Ratio		0.21			0.21	0.21		0.57		0.57	0.57	
v/c Ratio		0.07			0.21	0.12		0.24		0.07	0.31	
Control Delay		10.7			13.9	5.8		6.4		6.7	6.7	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		10.7			13.9	5.8		6.4		6.7	6.7	
LOS		B			B	A		A		A	A	
Approach Delay		10.7			10.7			6.4			6.7	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		0.8			3.3	0.0		8.0		1.1	11.5	
Queue Length 95th (m)		4.2			9.9	4.7		15.6		4.6	21.5	
Internal Link Dist (m)		118.5			234.4			124.5			184.9	
Turn Bay Length (m)						20.0				25.0		
Base Capacity (vph)		1316			1338	1447		3364		911	3545	
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		0.02			0.05	0.03		0.14		0.04	0.18	

### Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 36.3  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.31  
 Intersection Signal Delay: 7.0  
 Intersection Capacity Utilization 47.4%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 1: Alderney Drive & King Street/Kings Wharf

	Ø2			Ø4
50 s			40 s	
	Ø6			Ø8
50 s			40 s	

# Kings Wharf Traffic Impact Analysis

## 1: Alderney Drive & King Street/Kings Wharf

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	20	30	25	10	30	5	760	35	30	345	5
Future Volume (vph)	35	20	30	25	10	30	5	760	35	30	345	5
Satd. Flow (prot)	0	1757	0	0	1819	1601	0	3553	0	1789	3571	0
Flt Permitted		0.850			0.731			0.953		0.319		
Satd. Flow (perm)	0	1524	0	0	1377	1601	0	3386	0	601	3571	0
Satd. Flow (RTOR)		33				35		7			2	
Lane Group Flow (vph)	0	93	0	0	38	33	0	869	0	33	380	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Total Split (s)	40.0	40.0		40.0	40.0	40.0	50.0	50.0		50.0	50.0	
Total Lost Time (s)		6.7			6.7	6.7		5.9		5.9	5.9	
Act Effct Green (s)		8.0			8.0	8.0		23.5		23.5	23.5	
Actuated g/C Ratio		0.20			0.20	0.20		0.60		0.60	0.60	
v/c Ratio		0.28			0.14	0.09		0.43		0.09	0.18	
Control Delay		12.5			15.0	6.8		7.2		6.8	5.8	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		12.5			15.0	6.8		7.2		6.8	5.8	
LOS		B			B	A		A		A	A	
Approach Delay		12.5			11.2			7.2			5.9	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		3.0			1.9	0.0		17.6		1.0	6.4	
Queue Length 95th (m)		12.6			7.9	4.6		33.1		4.5	13.3	
Internal Link Dist (m)		118.5			234.4			124.5			184.9	
Turn Bay Length (m)						20.0				25.0		
Base Capacity (vph)		1295			1165	1360		3352		595	3535	
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		0.07			0.03	0.02		0.26		0.06	0.11	

### Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 39.2  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.43  
 Intersection Signal Delay: 7.4  
 Intersection Capacity Utilization 50.0%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

### Splits and Phases: 1: Alderney Drive & King Street/Kings Wharf

	Ø2			Ø4
50 s			40 s	
	Ø6			Ø8
50 s			40 s	

# Kings Wharf Traffic Impact Analysis

## 1: Alderney Drive & King Street/Kings Wharf

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	40	5	99	49	99	5	430	80	85	595	20
Future Volume (vph)	10	40	5	99	49	99	5	430	80	85	595	20
Satd. Flow (prot)	0	1846	0	0	1823	1601	0	3496	0	1789	3561	0
Flt Permitted		0.910			0.762			0.948		0.442		
Satd. Flow (perm)	0	1695	0	0	1435	1601	0	3314	0	832	3561	0
Satd. Flow (RTOR)		5				108		33			5	
Lane Group Flow (vph)	0	59	0	0	161	108	0	559	0	92	669	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Total Split (s)	40.0	40.0		40.0	40.0	40.0	50.0	50.0		50.0	50.0	
Total Lost Time (s)		6.7			6.7	6.7		5.9		5.9	5.9	
Act Effct Green (s)		10.3			10.3	10.3		17.2		17.2	17.2	
Actuated g/C Ratio		0.26			0.26	0.26		0.43		0.43	0.43	
v/c Ratio		0.14			0.44	0.22		0.39		0.26	0.44	
Control Delay		11.5			16.6	4.7		8.8		10.7	9.6	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		11.5			16.6	4.7		8.8		10.7	9.6	
LOS		B			B	A		A		B	A	
Approach Delay		11.5			11.8			8.8			9.7	
Approach LOS		B			B			A			A	
Queue Length 50th (m)		2.4			7.9	0.0		11.3		3.6	14.7	
Queue Length 95th (m)		9.4			23.1	7.9		23.9		12.2	29.7	
Internal Link Dist (m)		118.5			234.4			124.5			184.9	
Turn Bay Length (m)						20.0				25.0		
Base Capacity (vph)		1420			1201	1358		3249		816	3491	
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		0.04			0.13	0.08		0.17		0.11	0.19	

### Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 40.3  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.44  
 Intersection Signal Delay: 9.8  
 Intersection Capacity Utilization 61.8%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service B

### Splits and Phases: 1: Alderney Drive & King Street/Kings Wharf

	Ø2			Ø4
50 s			40 s	
	Ø6			Ø8
50 s			40 s	

# Kings Wharf Traffic Impact Analysis

## 1: Alderney Drive & King Street/Kings Wharf

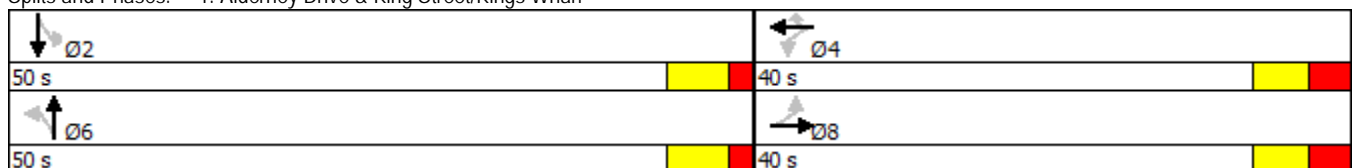
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	84	30	166	81	167	5	800	167	168	360	5
Future Volume (vph)	35	84	30	166	81	167	5	800	167	168	360	5
Satd. Flow (prot)	0	1809	0	0	1823	1601	0	3485	0	1789	3571	0
Flt Permitted		0.849			0.722			0.953		0.216		
Satd. Flow (perm)	0	1554	0	0	1360	1601	0	3322	0	407	3571	0
Satd. Flow (RTOR)		16				104		38			2	
Lane Group Flow (vph)	0	162	0	0	268	182	0	1057	0	183	396	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Total Split (s)	40.0	40.0		40.0	40.0	40.0	50.0	50.0		50.0	50.0	
Total Lost Time (s)		6.7			6.7	6.7		5.9		5.9	5.9	
Act Effct Green (s)		20.7			20.7	20.7		44.5		44.5	44.5	
Actuated g/C Ratio		0.27			0.27	0.27		0.57		0.57	0.57	
v/c Ratio		0.38			0.74	0.36		0.55		0.79	0.19	
Control Delay		22.8			38.6	12.0		12.7		44.1	9.5	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		22.8			38.6	12.0		12.7		44.1	9.5	
LOS		C			D	B		B		D	A	
Approach Delay		22.8			27.9			12.7			20.4	
Approach LOS		C			C			B			C	
Queue Length 50th (m)		17.3			35.8	8.8		44.0		18.8	13.1	
Queue Length 95th (m)		32.1			59.7	22.9		84.6		#68.8	27.6	
Internal Link Dist (m)		118.5			234.4			124.5			184.9	
Turn Bay Length (m)						20.0				25.0		
Base Capacity (vph)		678			586	749		1911		232	2038	
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		0.24			0.46	0.24		0.55		0.79	0.19	

### Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 77.9  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.79  
 Intersection Signal Delay: 18.4  
 Intersection Capacity Utilization 73.2%  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Intersection LOS: B  
 ICU Level of Service D

### Splits and Phases: 1: Alderney Drive & King Street/Kings Wharf



# Kings Wharf Traffic Impact Analysis

## 1: Alderney Drive & King Street/Kings Wharf

2027 AM Peak Hour with development and 40% non-auto modes

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	48	5	119	59	118	5	430	97	101	595	20
Future Volume (vph)	10	48	5	119	59	118	5	430	97	101	595	20
Satd. Flow (prot)	0	1850	0	0	1823	1601	0	3482	0	1789	3561	0
Flt Permitted		0.921			0.758			0.948		0.435		
Satd. Flow (perm)	0	1717	0	0	1428	1601	0	3301	0	819	3561	0
Satd. Flow (RTOR)		5				128		41			5	
Lane Group Flow (vph)	0	68	0	0	193	128	0	577	0	110	669	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		8			4			6			2	
Permitted Phases	8			4		4	6			2		
Total Split (s)	40.0	40.0		40.0	40.0	40.0	50.0	50.0		50.0	50.0	
Total Lost Time (s)		6.7			6.7	6.7		5.9		5.9	5.9	
Act Effct Green (s)		11.4			11.4	11.4		16.6		16.6	16.6	
Actuated g/C Ratio		0.28			0.28	0.28		0.41		0.41	0.41	
v/c Ratio		0.14			0.49	0.24		0.42		0.33	0.46	
Control Delay		11.7			17.3	4.4		9.6		12.6	10.5	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		11.7			17.3	4.4		9.6		12.6	10.5	
LOS		B			B	A		A		B	B	
Approach Delay		11.7			12.2			9.6			10.8	
Approach LOS		B			B			A			B	
Queue Length 50th (m)		2.9			9.9	0.0		12.3		4.7	15.6	
Queue Length 95th (m)		11.0			28.6	8.6		27.5		16.2	33.5	
Internal Link Dist (m)		118.5			234.4			124.5			184.9	
Turn Bay Length (m)						20.0				25.0		
Base Capacity (vph)		1436			1193	1359		3179		788	3428	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.05			0.16	0.09		0.18		0.14	0.20	

### Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 40.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 10.7

Intersection Capacity Utilization 64.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 1: Alderney Drive & King Street/Kings Wharf

	Ø2			Ø4
50 s			40 s	
	Ø6			Ø8
50 s			40 s	

# Kings Wharf Traffic Impact Analysis

## 1: Alderney Drive & King Street/Kings Wharf

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	101	30	199	97	199	5	800	201	201	360	5
Future Volume (vph)	35	101	30	199	97	199	5	800	201	201	360	5
Satd. Flow (prot)	0	1818	0	0	1821	1601	0	3471	0	1789	3571	0
Flt Permitted		0.811			0.687			0.953		0.104		
Satd. Flow (perm)	0	1489	0	0	1294	1601	0	3308	0	196	3571	0
Satd. Flow (RTOR)		12				132		36			2	
Lane Group Flow (vph)	0	181	0	0	321	216	0	1093	0	218	396	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4		4	6			2		
Total Split (s)	40.0	40.0		40.0	40.0	40.0	45.0	45.0		15.0	60.0	
Total Lost Time (s)		6.7			6.7	6.7		5.9		4.0	5.9	
Act Effct Green (s)		26.7			26.7	26.7		34.4		51.5	49.6	
Actuated g/C Ratio		0.30			0.30	0.30		0.39		0.58	0.56	
v/c Ratio		0.40			0.83	0.38		0.84		0.70	0.20	
Control Delay		26.5			48.9	12.4		31.8		30.6	10.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		26.5			48.9	12.4		31.8		30.6	10.9	
LOS		C			D	B		C		C	B	
Approach Delay		26.5			34.2			31.8			17.9	
Approach LOS		C			C			C			B	
Queue Length 50th (m)		24.5			54.7	11.4		90.7		20.8	18.2	
Queue Length 95th (m)		42.7			#94.3	28.9		123.0		#57.0	27.6	
Internal Link Dist (m)		118.5			234.4			124.5			184.9	
Turn Bay Length (m)						20.0				25.0		
Base Capacity (vph)		577			495	694		1507		314	2222	
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		0.31			0.65	0.31		0.73		0.69	0.18	

### Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 89.2  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.84  
 Intersection Signal Delay: 28.4  
 Intersection Capacity Utilization 86.0%  
 Analysis Period (min) 15

Intersection LOS: C  
 ICU Level of Service E

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

### Splits and Phases: 1: Alderney Drive & King Street/Kings Wharf

