Ref. No. 151-11929

November 24, 2015

Mr. Hugh Morrison, P. Eng., Development Engineer
HRM Community Development - Alderney Gate
PO Box 1749
HALIFAX NS B3J 3A5

Sent via Email to morrish@halifax.ca

RE: Addendum Traffic Impact Analysis for the Revised 2015 Land Uses, Former Halifax West Site Development, Dutch Village Road, Halifax

Dear Hugh:

United Gulf Developments Ltd. is proceeding with construction of a mixed use residential and commercial development on the former Halifax West High School site on Dutch Village Road. This Traffic Impact Analysis (TIA) has been prepared as an Addendum to the *Traffic Impact Study - Proposed Mixed Use Development, Former Halifax West High School Site* (WSP Canada Inc., December 2010) to account for proposed land use changes and to evaluate possible traffic impacts using current traffic volumes.

Background - The Addendum TIA has been completed to include the following:

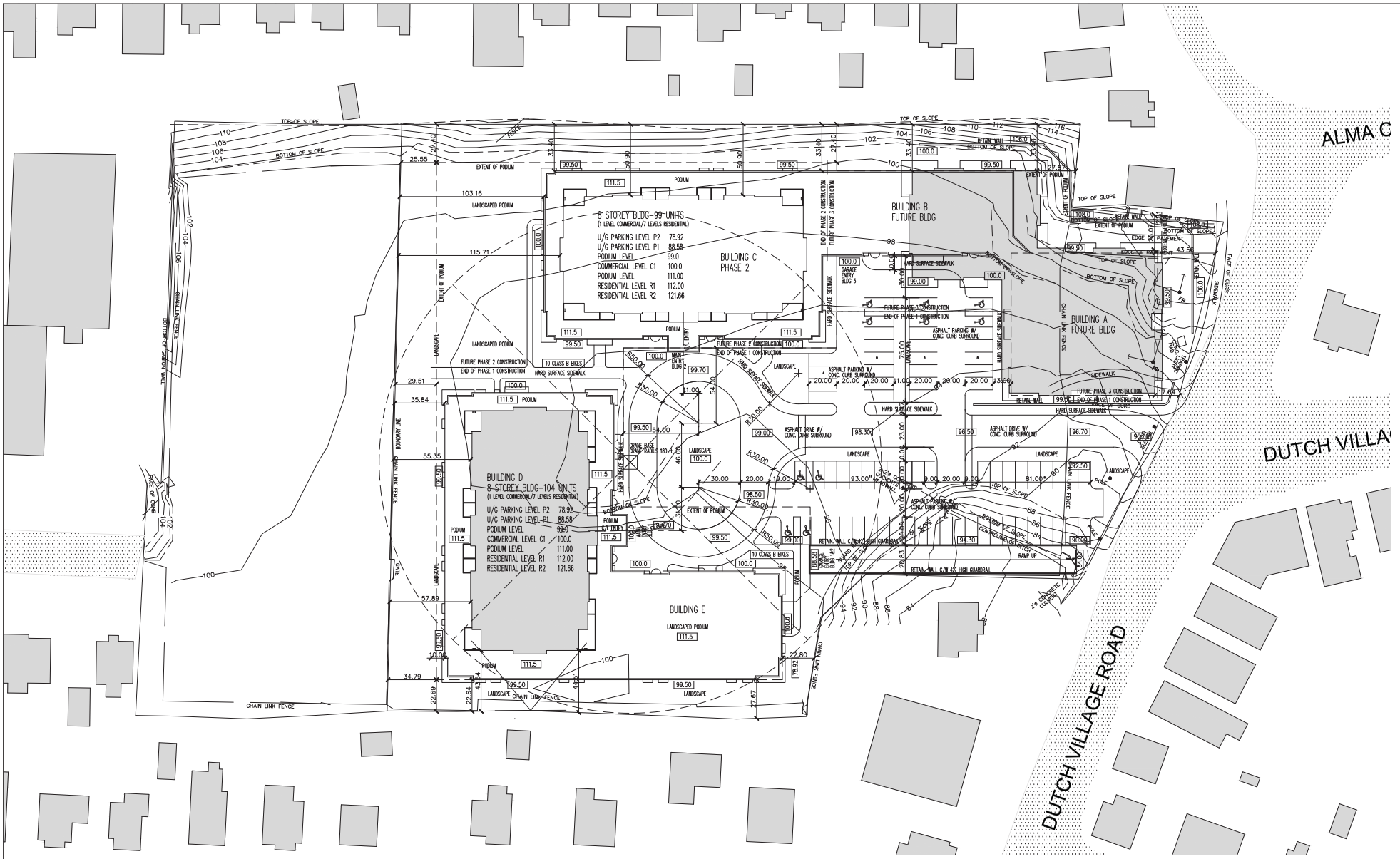
- While the 2010 Report included a possible significant street reconstruction considered by HRM at the Dutch Village Road / Alma Crescent intersection by 2016, it has been assumed that it is unlikely that street changes will occur before this project is competed. The TIA includes performance evaluation of the intersection for 2015 without the site, and 2020 for projected volumes, both without and with added site volumes.
- While the 2010 Report was prepared using 2007 volumes, this TIA has used intersection volumes obtained by HRM during mid-September, 2014.
- The proposed 2015 land use includes a significant reduction in General Office space and approximately twice as many apartment units as were included in the 2010 Report. Land uses for 2010 and the current 2015 proposed development are compared in Table 1.

Table 1 - Land Use Comparisons - 2010 and Current 2015 Development Concepts

Land Use	Proposed 2010 Land Use Units	Proposed Current 2015 Land Use Units	Land Use Changes (2015 - 2010 Uses)
Multi-Unit Residential (Land Use 223)	150	296	146
General Office (Land Use 710)	63,200 SF	12,300 SF	(50,900)
Medical Office (Land Use 720)	16,300 SF	0 SF	(16,300)
Specialty Retail (Land Use 826)	36,100 SF	45,800 SF	9,700

Site Access - The site access (Figure 1) is unchanged from the 2010 Report and includes a full movement driveway at the signalized Dutch Village Road / Alma Crescent intersection, and a right-in / right-out parking garage driveway at the south edge of the site.

1 Spectacle Lake Drive, Dartmouth, Nova Scotia, Canada B3B 1X7
Telephone: 902-835-9955 ~ Fax: 902-835-1645 ~ www.wspgroup.com



NOTES:

1) THE CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL DIMENSIONS ON SITE & REPORTING ANY DISCREPANCY TO THE ARCHITECT BEFORE PROCEEDING.
2) DO NOT SCALE FROM DRAWINGS, USE FIGURED DIMENSIONS.
3) DRAWING REPRESENTATIONS MAYBE IN VARIANCE W/ DETAILED SPECS. & SCHEDULES, IN WHICH CASE SPECS. & SCHEDULES OVERRIDE THE DRAWINGS.
4) CHANGES FROM THESE PLANS & SPECS. MUST BE AGEED TO IN WRITING, & APPROVED BY THE ARCHITECT & OWNER, BEFORE PROCEEDING.
5) ONLY THOSE DRAWINGS MARKED APPROVED FOR CONSTRUCTION, SIGNED & DATED BY THE ARCHITECT ARE TO BE USED FOR CONSTRUCTION.
6) THESE DRAWINGS ARE TO BE READ IN CONJUNCTION W/ THE SPECS.

REGISTERED MEMBER N.S. ASSOCIATION OF ARCHITECTS PAUL F. SKERRY

No.	DESCRIPTION	Date	No.	DESCRIPTION	Date

REVISIONS

Paul Skerry Associates Ltd.
ARCHITECTS
5514 LIVINGSTONE PLACE
HALIFAX N.S. B3K 2B9
PHONE: 902-455-4361
FAX: 902-455-7778
EMAIL: pskerry@pskerry.ca

PROJECT
PHASE 3
RESIDENTIAL & COMMERCIAL
DEVELOPMENT
OLD HFX. WEST SITE
DUTCH VILLAGE RD.
HALIFAX, N.S.

TITLE:
Figure 1
SITE PLAN

drawn by: STAFF	checked: P.S.
date: OCT.14/15	approved: P.S.
scale: 1"=30'	dwg #: A1
project #: 2848	

Traffic Volumes - A turning movement count which HRM obtained at the Dutch Village Road / Alma Crescent intersection during mid-September, 2014, has been used to estimate future volumes at the intersection. Tabulated 2014 hourly volumes (Table A-1) have been increased using a 1.0% annual growth rate, which is considered appropriate for this area to provide 2015 AM and PM peak hourly background volumes. The 2015 AM and PM peak hourly background volumes are shown diagrammatically in Figure A-1, Boxes A and B, and 2020 background volumes are shown in Figure A-1, Boxes C and D.

Trip Generation - Trip generation estimates for the proposed and existing land uses, prepared using published trip generation rates from *Trip Generation,9th Edition,* are included in Table 2.

After adjustment for 10% non-vehicle trips, it is estimated that the proposed 2015 land uses will generate 153 two-way vehicle trips (71 entering and 82 exiting) during the AM peak hour and 232 two-way vehicle trips (113 entering and 119 exiting) during the PM peak hour. The proposed 2015 land uses are estimated to generate 55 fewer two-way vehicle trips (70 fewer entering and 15 more exiting) during the AM peak hour, and 44 fewer two-way vehicle trips (15 more entering and 59 fewer exiting) during the PM peak hour than trip estimates for the 2010 land uses.

Table 2 - Trip Generation Comparisons 2010 and 2015 Proposed Land Uses

Land Use [1]	Number Units [2]	Trip Generation Rates [1]				Trips Generated [3]			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Trip Generation Estimates for the Land Uses for the 2010 Study (Extracted from Table 1, Traffic Impact Study, WSP Canada Inc., Dec. 2010)						141	67	98	178
Trip Generation Estimates for the Proposed 2015 Land Uses									
Mid Rise Apt (Land Use 223)	296 units	0.09	0.21	0.23	0.16	27	62	68	47
General Office (Land Use 710)	12.3 KGFA	1.37	0.19	0.25	1.24	17	2	3	15
Retail [4] (Land Use 826)	45.8 KGLA	0.76	0.60	1.19	1.52	35	27	55	70
Total Estimated Trips for Full Site Development						79	91	126	132
10% Reduction to Account for Non-vehicle Trips and On-Site Synergies [5]						8	9	13	13
Adjusted Trip Generation Estimate for 2015 Land Uses						71	82	113	119
Assume 20% Pass-By Trips to Retail Land Uses						6	6	13	13
Estimated Number of Primary Trips Generated by the Site						65	76	100	106
Comparison of Trip Generation Estimates for 2015 and 2010 Lands Uses (2015 Adjusted Trip Estimate minus 2010 Estimate)						(70)	15	15	(59)

NOTES:
1. Trip generation rates are for indicated Land Uses and Land Use Codes, *Trip Generation*, *9th Edition*, Institute of Transportation Engineers, 2012.
2. KGLA is 'Gross Leasable Area x 1000 square feet'. KGFA is 'Gross Floor Area x 1000 square feet'.
3. Rates are 'vehicles per hour per unit'; trips generated are 'vehicles per hour for peak hours'.
4. The Speciality Retail (Land Use 826) rate for 'Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 PM' has been used. Since there is no published rate for the AM peak hour of adjacent street for this Land Use, and since AM peak hour trips to Speciality Retail are generally low, AM trip rates have been assumed to be 50% of the PM rate with reversal of the directional split.
5. It is assumed that total vehicle trips generated by the site will be reduced by higher than average non-vehicle trips (walking and transit) as well as on-site synergies, or cross-shopping, between the various land uses. A 10% reduction has been used to estimate external trip generation for full build-out of the site.

Trip Distribution and Assignment - The following distribution has been used for primary trips generated by the mixed use development:

- South on Dutch Village Road - 40%
- East on Dutch Village Road / Alma Crescent - 30%
- North / West on Alma Crescent / Titus Street - 30%.

Pass-by trips, those which are made as 'intervening opportunity' stops to retail land uses, have been assumed to account for 20% of the site generated retail trips. Pass-by trips are estimated to account for 12 trips (6 entering and 6 exiting) during the AM peak hour and 26 trips (13 entering and 13 exiting) during the PM peak hour.

Site generated trips have been assigned in accordance with the above distribution percentages; 50% of primary trips entering the site from the north and east, and 50% of exiting trips to the south, have been assigned to the right-in / right-out driveway.

Site generated trips to the site entrances and existing intersection are illustrated diagrammatically in Figure A-2, Boxes A and B. Site generated trips have been added to projected 2020 background volumes (Figure A-1, Boxes C and D) to provide projected 2020 AM and PM peak hour volumes that include site generated trips, shown diagrammatically in Figure A-2, Boxes C and D.

Description of Pedestrian Facilities - There are sidewalks on both sides of Dutch Village Road and Alma Crescent and there are pedestrian heads at the Dutch Village Road / Alma Crescent signalized intersection.

Description of Transit Service - The proposed development site is well served by Halifax Transit with many bus route on Dutch Village Road and Alma Crescent, as well as on Main Avenue just north of the site.

Intersection Level of Service Analysis - Synchro 9.0 software has been used for performance evaluation of the Dutch Village Road / Alma Crescent / Supreme Court intersection for projected 2015 AM and PM peak hour volumes without the site and projected 2020 volumes, both without and with addition of site trips. Analysis results are included on Appendix A, Pages A-4 to A-9, and results are summarized in Table 4.

Table 3 - Level of Service (LOS) Criteria for Intersections

LOS	Signalized Intersections Control Delay (seconds per vehicle)	LOS Description
A	less than 10.0	Very low delay; most vehicles do not stop **(Excellent)**
B	between 10.0 and 20.0	Higher delay; more vehicles stop **(Very Good)**
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 **(Good)**
D	between 35.0 and 55.0	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop **(Satisfactory)**
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 **acceptable** 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 **(Unacceptable)**

HRM Critical Limits for Intersection Performance Evaluation - The HRM *Guidelines for Preparation of Transportation Impact Studies* indicate critical limits for intersection evaluation:

1. the v/c ratio of an intersection exceeds 0.85;
2. the v/c ratio of an individual though 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.

Table 4 - LOS Summary for Dutch Village Road / Alma Crescent / Supreme Court intersection

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95th% Queue (m) by Intersection Movement						Intersection LOS
	EB-LTR	WB-LT	WB-R	NB-LTR	SB-L	SB-TR	
AM Peak Hour - Projected 2015 Background Volumes without Site (Page A-4)							
Delay		28.7	0.0	11.7	9.4	12.8	12.5
v/c		0.22	0.01	0.21	0.56	0.65	-
Queue		25.1	0.0	21.1	47.1	126.4	-
AM Peak Hour - Projected 2020 Background Volumes without Site (Page A-6)							
Delay		29.4	0.0	12.0	9.8	13.7	13.1
v/c		0.24	0.01	0.22	0.58	0.68	-
Queue		26.6	0.0	22.4	49.7	139.0	-
AM Peak Hour - Projected 2020 Volumes with Site (Page A-8)							
Delay	22.3	31.1	0.0	13.0	9.9	14.2	14.2
v/c	0.17	0.32	0.01	0.28	0.59	0.70	-
Queue	18.7	32.4	0.0	25.7	49.5	147.5	-
PM Peak Hour - Projected 2015 Background Volumes without Site (Page A-5)							
Delay		43.8	7.0	17.9	13.4	8.1	16.4
v/c		0.68	0.51	0.46	0.68	0.32	-
Queue		65.7	19.7	59.3	35.2	40.0	-
PM Peak Hour - Projected 2020 Background Volumes without Site (Page A-7)							
Delay		46.1	7.0	18.3	15.7	8.3	17.3
v/c		0.72	0.53	0.48	0.73	0.34	-
Queue		70.8	20.3	62.3	39.5	42.8	-
PM Peak Hour - Projected 2020 Volumes with Site (Page A-9)							
Delay	23.3	45.4	5.9	24.1	23.3	10.6	21.3
v/c	0.28	0.77	0.49	0.64	0.79	0.39	-
Queue	24.9	76.5	18.5	77.9	64.5	55.9	-

Summary Level of Service Analyses - Existing signal timings with a 90 second cycle were used for all analyses except the 2020 PM peak hour volumes with the added site trips where time for Dutch Village Road WB was increased by 5 seconds and the NB and SB through movement time was reduced by 5 seconds. With the relatively minor signal timing change for 2020 PM peak hour, all intersection approaches are expected to operate within HRM critical limits.

Summary -

1. This Addendum Traffic Impact Analysis has been completed to consider land use changes and to update traffic volumes from those used in the *Traffic Impact Study - Proposed Mixed Use Development, Former Halifax West High School Site* (WSP Canada Inc., December 2010).

2. After adjustment for 10% non-vehicle trips, it is estimated that the proposed 2015 land uses will generate 153 two-way vehicle trips (71 entering and 82 exiting) during the AM peak hour and 232 two-way vehicle trips (113 entering and 119 exiting) during the PM peak hour.

3. Pass-by trips, those which are made as 'intervening opportunity' stops to retail land uses, have been assumed to account for 20% of the site generated retail trips. Primary trips generated by the mixed use development have been distributed as follows:
    - South on Dutch Village Road - 40%
    - East on Dutch Village Road / Alma Crescent - 30%
    - North / West on Alma Crescent / Titus Street - 30%.

4. Performance evaluations of the Dutch Village Road / Alma Crescent / Supreme Court intersection were completed for projected 2015 AM and PM peak hour volumes without the site and projected 2020 volumes, both without and with addition of site trips. Level of service analyses were completed using existing signal timings with a 90 second cycle for all analyses except the 2020 PM peak hour volumes with the added site trips where time for Dutch Village Road WB was increased by 5 seconds and the NB and SB through movement time was reduced by 5 seconds.

Recommendation -

5. HRM should monitor signal timing and make necessary adjustments to provide acceptable performance on intersection approaches. The analysis used for the 2020 PM peak hour intersection evaluation in this Addendum TIA maintained the existing 90 second signal cycle and included an additional 5 seconds to the Dutch Village Road WB approach and reduction of 5 seconds from the NB and SB through movement.

Conclusions -

6. With relatively minor signal timing changes for the 2020 PM peak hour used in the performance evaluation, all intersection approaches are expected to operate well within HRM critical limits.

If you have any questions or comments, please contact me by Email to ken.obrien@wspgroup.com or telephone 902-443-7747.

Sincerely:
Original Signed

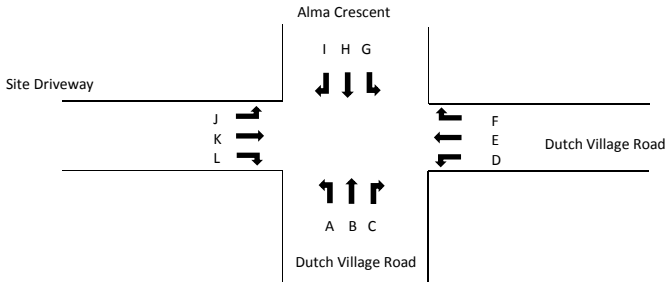
Ken O'Brien, P. Eng.
Senior Traffic Engineer
WSP Canada Inc.

Original Signed

Table A-1

Dutch Village Road
@
Alma Crescent

Halifax, NS
Wednesday, September 17, 2014



AM Peak Period Volume Data

Time		Dutch Village Road Northbound Approach			Dutch Village Road Westbound Approach			Alma Crescent Southbound Approach			Site Driveway Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
07:00	07:15	0	14	34	15	0	0	133	173	0	0	0	0	369
07:15	07:30	0	22	22	10	0	0	88	212	0	0	0	0	354
07:30	07:45	0	35	21	21	0	0	74	251	0	0	0	0	402
07:45	08:00	0	36	26	13	0	0	51	170	0	0	0	0	296
08:00	08:15	0	32	23	18	0	2	81	198	0	0	0	0	354
08:15	08:30	0	43	30	25	0	1	78	204	0	0	0	0	381
08:30	08:45	0	42	29	18	0	1	138	208	0	0	0	0	436
08:45	09:00	0	60	25	19	0	1	120	163	0	0	0	0	388
AM Peak Hour		**0**	**177**	**107**	**80**	**0**	**5**	**417**	**773**	**0**	**0**	**0**	**0**	**1559**
07:00	**08:00**	**0**	**107**	**103**	**59**	**0**	**0**	**346**	**806**	**0**	**0**	**0**	**0**	**1421**
08:00	**09:00**	**0**	**177**	**107**	**80**	**0**	**5**	**417**	**773**	**0**	**0**	**0**	**0**	**1559**

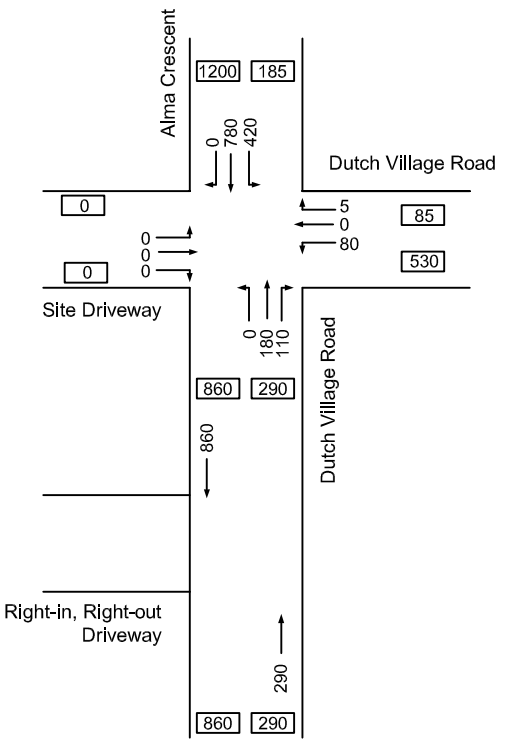
PM Peak Period Volume Data

Time		Dutch Village Road Northbound Approach			Dutch Village Road Westbound Approach			Alma Crescent Southbound Approach			Site Driveway Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
16:00	16:15	0	108	21	53	0	54	74	75	0	0	0	0	385
16:15	16:30	0	120	16	81	0	59	74	75	0	0	0	0	425
16:30	16:45	0	130	21	59	0	102	76	82	0	0	0	0	470
16:45	17:00	0	148	13	62	0	63	75	78	0	0	0	0	439
17:00	17:15	0	154	17	42	0	55	82	95	0	0	0	0	445
17:15	17:30	0	149	24	42	0	64	94	91	0	0	0	0	464
17:30	17:45	0	112	23	36	0	25	90	81	0	0	0	0	367
17:45	18:00	0	113	32	31	0	14	77	85	0	0	0	0	352
PM Peak Hour		**0**	**581**	**75**	**205**	**0**	**284**	**327**	**346**	**0**	**0**	**0**	**0**	**1818**
16:00	**17:00**	**0**	**506**	**71**	**255**	**0**	**278**	**299**	**310**	**0**	**0**	**0**	**0**	**1719**
17:00	**18:00**	**0**	**528**	**96**	**151**	**0**	**158**	**343**	**352**	**0**	**0**	**0**	**0**	**1628**

* Count completed by HRM Traffic Management

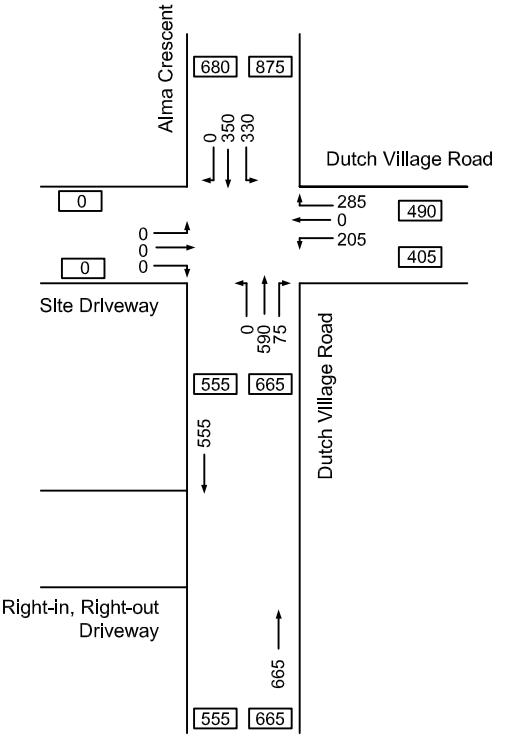
2015 AM and PM Peak Hour
Background Volumes Without Site Development

A
AM Peak Hour



NOT TO SCALE

B
PM Peak Hour



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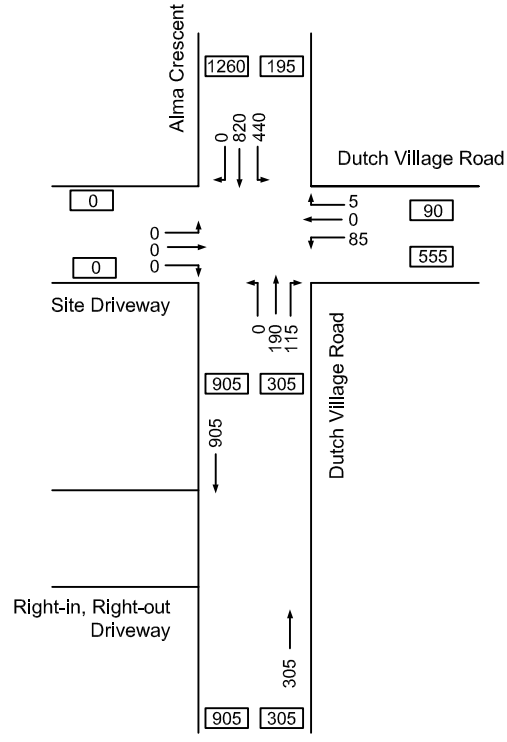
2020 AM and PM Peak Hour
Background Volumes Without Site Development

C
AM Peak Hour



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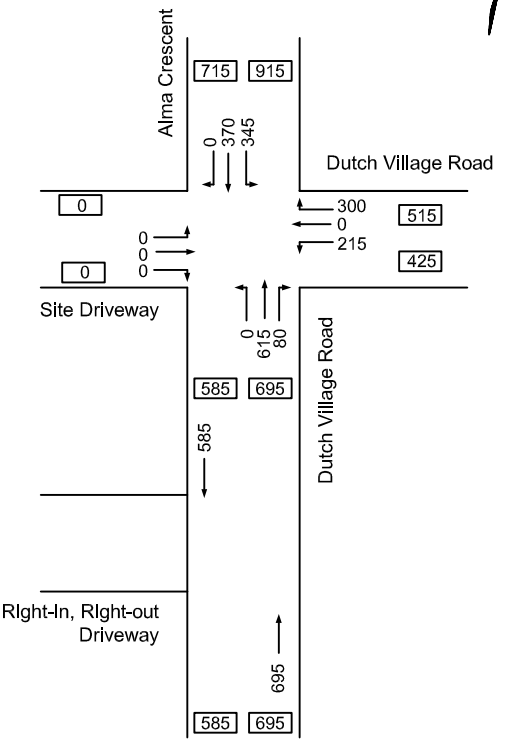
D
PM Peak Hour



NOT TO SCALE

WSP
1 SPECTACLE LAKE DRIVE
DARTMOUTH, NOVA SCOTIA
CANADA, B3B 1X7
PHONE: 902 835-9955 ~ FAX: 902 835-1645
WWW.WSPGROUP.COM

Traffic Impact Analysis - Proposed Multi-use Development
Former Halifax West Site Development, Halifax, NS

Figure A-1

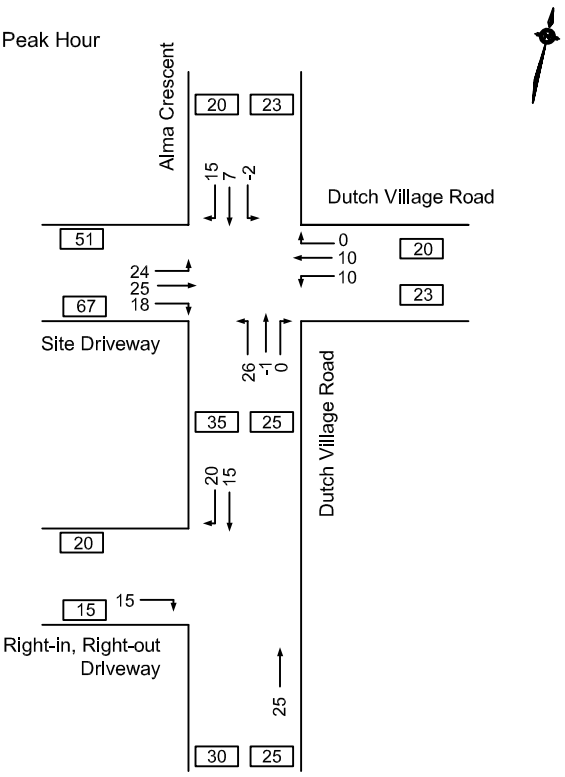
Projected 2015 and 2020 Weekday AM and PM Peak Hour
Background Traffic Without Site Development

November 2015

Estimated Site Generated Trips

A

AM Peak Hour



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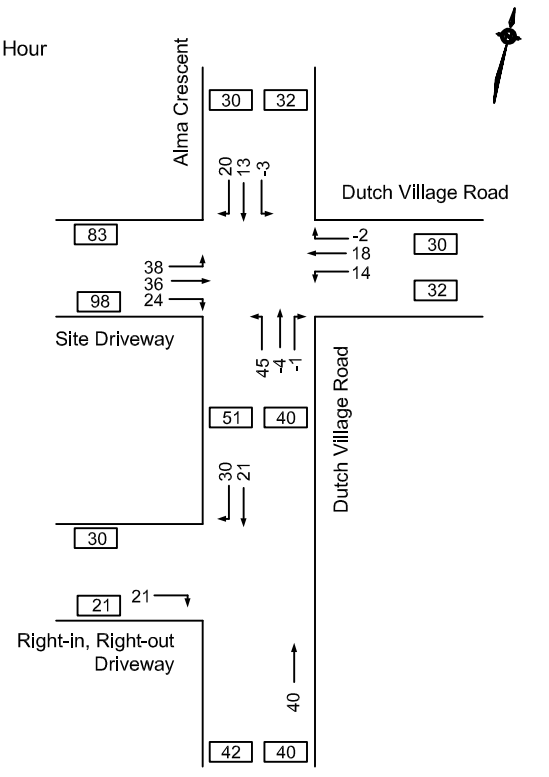
B

PM Peak Hour



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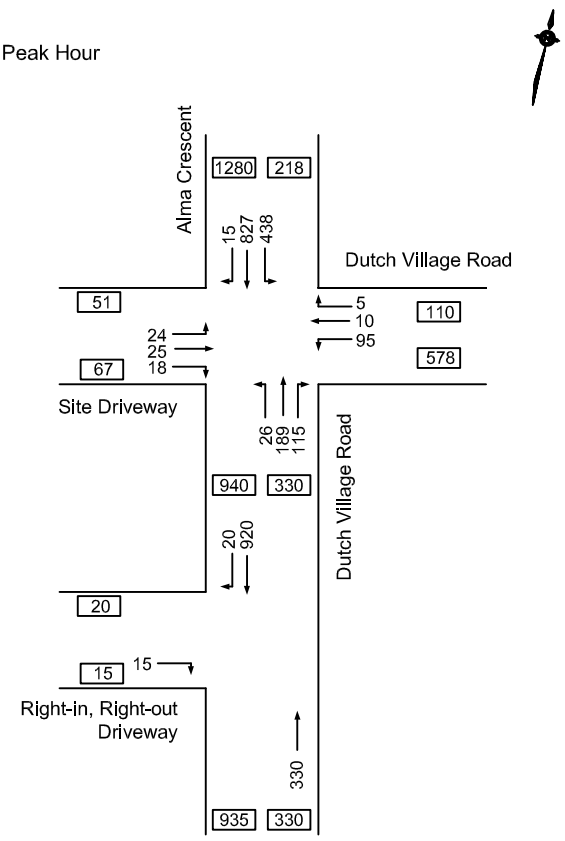
2020 AM and PM Peak Hour
Background Volumes With Site Development

C

AM Peak Hour



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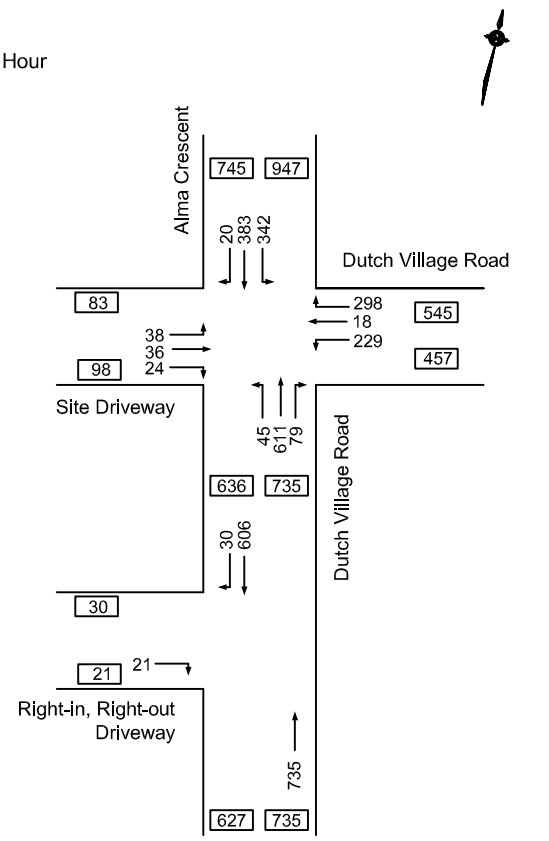
D

PM Peak Hour



NOT TO SCALE

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CANADA, B3B 1X7
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Traffic Impact Analysis - Proposed Multi-use Development
Former Halifax West Site Development, Halifax, NS

Figure A-2

Estimated Site Generated Trips and Projected 2020 Weekday
AM and PM Peak Hour Volumes With Site Development

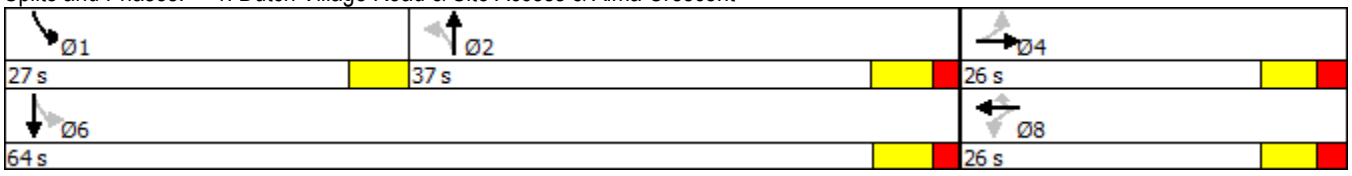
November 2015

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	80	0	5	0	180	110	420	780	0
Future Volume (vph)	0	0	0	80	0	5	0	180	110	420	780	0
Satd. Flow (prot)	0	1883	0	0	1789	1601	0	3375	0	1789	1883	0
Flt Permitted					0.757					0.500		
Satd. Flow (perm)	0	1883	0	0	1426	1601	0	3375	0	942	1883	0
Satd. Flow (RTOR)						85		120				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	87	5	0	316	0	457	848	0
Turn Type				Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Total Split (s)	26.0	26.0		26.0	26.0	26.0	37.0	37.0		27.0	64.0	
Total Lost Time (s)		5.9			5.9	5.9		6.0		4.0	5.9	
Act Effct Green (s)					21.1	21.1		32.7		53.8	53.7	
Actuated g/C Ratio					0.27	0.27		0.42		0.70	0.70	
v/c Ratio					0.22	0.01		0.21		0.56	0.65	
Control Delay					28.7	0.0		11.7		9.4	12.8	
Queue Delay					0.0	0.0		0.0		0.0	0.0	
Total Delay					28.7	0.0		11.7		9.4	12.8	
LOS					C	A		B		A	B	
Approach Delay					27.2			11.7			11.7	
Approach LOS					C			B			B	
Queue Length 50th (m)					11.1	0.0		10.5		31.0	84.1	
Queue Length 95th (m)					25.1	0.0		21.1		47.1	126.4	
Internal Link Dist (m)		56.9			107.9			90.1			90.6	
Turn Bay Length (m)												
Base Capacity (vph)					392	501		1501		924	1417	
Starvation Cap Reductn					0	0		0		0	0	
Spillback Cap Reductn					0	0		0		0	0	
Storage Cap Reductn					0	0		0		0	0	
Reduced v/c Ratio					0.22	0.01		0.21		0.49	0.60	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 77
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 12.5
Intersection LOS: B
Intersection Capacity Utilization 98.4%
ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Dutch Village Road & Site Access & Alma Crescent

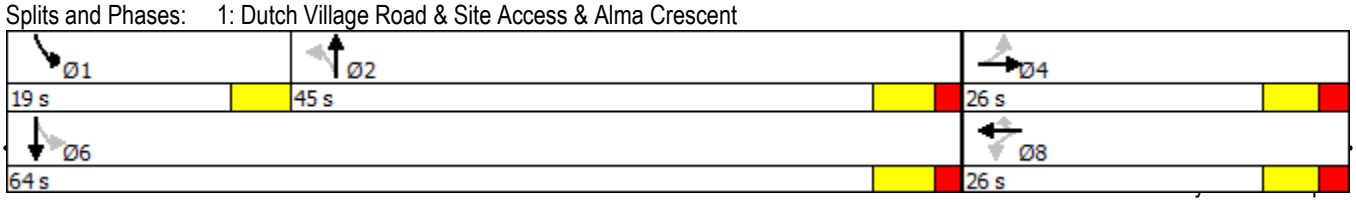


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	205	0	285	0	590	75	330	350	0
Future Volume (vph)	0	0	0	205	0	285	0	590	75	330	350	0
Satd. Flow (prot)	0	1883	0	0	1789	1601	0	3518	0	1789	1883	0
Flt Permitted					0.757					0.280		
Satd. Flow (perm)	0	1883	0	0	1426	1601	0	3518	0	527	1883	0
Satd. Flow (RTOR)						310		19				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	223	310	0	723	0	359	380	0
Turn Type				Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Total Split (s)	26.0	26.0		26.0	26.0	26.0	45.0	45.0		19.0	64.0	
Total Lost Time (s)		5.9			5.9	5.9		6.0		4.0	6.0	
Act Effct Green (s)					20.0	20.0		39.0		57.6	55.6	
Actuated g/C Ratio					0.23	0.23		0.45		0.66	0.63	
v/c Ratio					0.68	0.51		0.46		0.68	0.32	
Control Delay					43.8	7.0		17.9		13.4	8.1	
Queue Delay					0.0	0.0		0.0		0.0	0.0	
Total Delay					43.8	7.0		17.9		13.4	8.1	
LOS					D	A		B		B	A	
Approach Delay					22.4			17.9			10.7	
Approach LOS					C			B			B	
Queue Length 50th (m)					34.5	0.0		42.1		22.7	26.0	
Queue Length 95th (m)					#65.7	19.7		59.3		35.2	40.0	
Internal Link Dist (m)		56.9			107.9			90.1			90.6	
Turn Bay Length (m)												
Base Capacity (vph)					327	606		1577		562	1247	
Starvation Cap Reductn					0	0		0		0	0	
Spillback Cap Reductn					0	0		0		0	0	
Storage Cap Reductn					0	0		0		0	0	
Reduced v/c Ratio					0.68	0.51		0.46		0.64	0.30	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 87.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 16.4 Intersection LOS: B
Intersection Capacity Utilization 96.6% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Dutch Village Road & Site Access & Alma Crescent

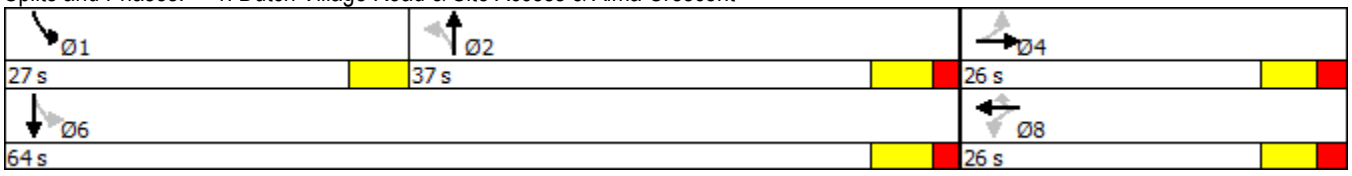


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	85	0	5	0	190	115	440	820	0
Future Volume (vph)	0	0	0	85	0	5	0	190	115	440	820	0
Satd. Flow (prot)	0	1883	0	0	1789	1601	0	3378	0	1789	1883	0
Flt Permitted					0.757					0.492		
Satd. Flow (perm)	0	1883	0	0	1426	1601	0	3378	0	927	1883	0
Satd. Flow (RTOR)						85		125				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	92	5	0	332	0	478	891	0
Turn Type				Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Total Split (s)	26.0	26.0		26.0	26.0	26.0	37.0	37.0		27.0	64.0	
Total Lost Time (s)		5.9			5.9	5.9		6.0		4.0	6.0	
Act Effct Green (s)					21.1	21.1		32.7		54.4	54.3	
Actuated g/C Ratio					0.27	0.27		0.42		0.70	0.70	
v/c Ratio					0.24	0.01		0.22		0.58	0.68	
Control Delay					29.4	0.0		12.0		9.8	13.7	
Queue Delay					0.0	0.0		0.0		0.0	0.0	
Total Delay					29.4	0.0		12.0		9.8	13.7	
LOS					C	A		B		A	B	
Approach Delay					27.9			12.0			12.3	
Approach LOS					C			B			B	
Queue Length 50th (m)					11.9	0.0		11.3		33.0	92.6	
Queue Length 95th (m)					26.6	0.0		22.4		49.7	139.0	
Internal Link Dist (m)		56.9			107.9			90.1			90.6	
Turn Bay Length (m)												
Base Capacity (vph)					389	498		1497		919	1406	
Starvation Cap Reductn					0	0		0		0	0	
Spillback Cap Reductn					0	0		0		0	0	
Storage Cap Reductn					0	0		0		0	0	
Reduced v/c Ratio					0.24	0.01		0.22		0.52	0.63	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 77.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.1
Intersection LOS: B
Intersection Capacity Utilization 100.6%
ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 1: Dutch Village Road & Site Access & Alma Crescent

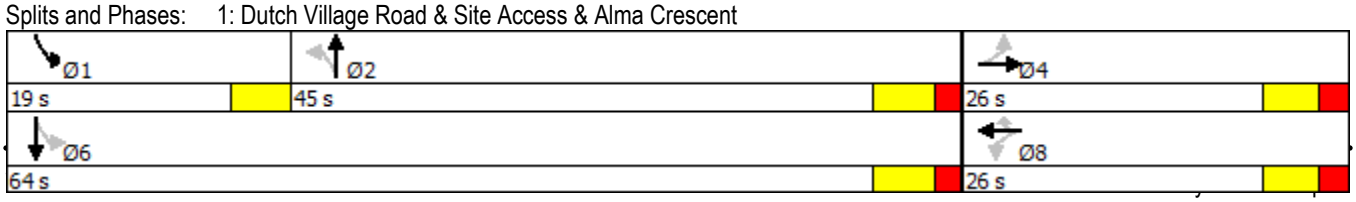


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	215	0	300	0	615	80	345	370	0
Future Volume (vph)	0	0	0	215	0	300	0	615	80	345	370	0
Satd. Flow (prot)	0	1883	0	0	1789	1601	0	3518	0	1789	1883	0
Flt Permitted					0.757					0.265		
Satd. Flow (perm)	0	1883	0	0	1426	1601	0	3518	0	499	1883	0
Satd. Flow (RTOR)						326		20				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	234	326	0	755	0	375	402	0
Turn Type				Perm	NA	Perm		NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Total Split (s)	26.0	26.0		26.0	26.0	26.0	45.0	45.0		19.0	64.0	
Total Lost Time (s)		5.9			5.9	5.9		6.0		4.0	6.0	
Act Effct Green (s)					20.1	20.1		39.0		57.9	55.9	
Actuated g/C Ratio					0.23	0.23		0.44		0.66	0.64	
v/c Ratio					0.72	0.53		0.48		0.73	0.34	
Control Delay					46.1	7.0		18.3		15.7	8.3	
Queue Delay					0.0	0.0		0.0		0.0	0.0	
Total Delay					46.1	7.0		18.3		15.7	8.3	
LOS					D	A		B		B	A	
Approach Delay					23.4			18.3			11.9	
Approach LOS					C			B			B	
Queue Length 50th (m)					36.8	0.0		45.0		24.0	28.1	
Queue Length 95th (m)					#70.8	20.3		62.3		39.5	42.8	
Internal Link Dist (m)		56.9			107.9			90.1			90.6	
Turn Bay Length (m)												
Base Capacity (vph)					326	617		1572		549	1243	
Starvation Cap Reductn					0	0		0		0	0	
Spillback Cap Reductn					0	0		0		0	0	
Storage Cap Reductn					0	0		0		0	0	
Reduced v/c Ratio					0.72	0.53		0.48		0.68	0.32	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 87.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 17.3 Intersection LOS: B
Intersection Capacity Utilization 96.6% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Dutch Village Road & Site Access & Alma Crescent

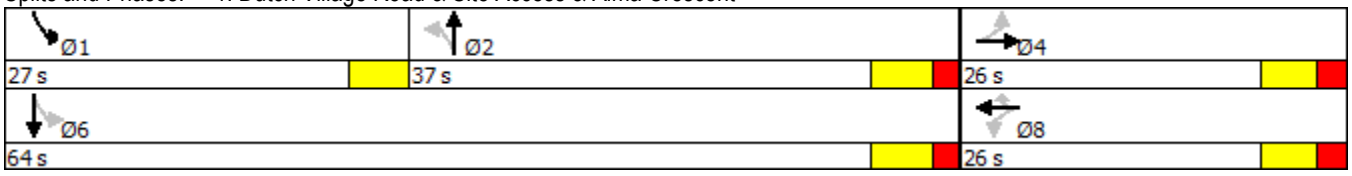


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	25	18	95	10	5	26	189	115	438	827	15
Future Volume (vph)	24	25	18	95	10	5	26	189	115	438	827	15
Satd. Flow (prot)	0	1783	0	0	1802	1601	0	3379	0	1789	1878	0
Flt Permitted		0.859			0.695			0.851		0.480		
Satd. Flow (perm)	0	1558	0	0	1309	1601	0	2887	0	904	1878	0
Satd. Flow (RTOR)		19				85		121			2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	73	0	0	114	5	0	358	0	476	915	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Total Split (s)	26.0	26.0		26.0	26.0	26.0	37.0	37.0		27.0	64.0	
Total Lost Time (s)		5.9			5.9	5.9		6.0		4.0	6.0	
Act Effct Green (s)		21.1			21.1	21.1		32.8		54.4	54.3	
Actuated g/C Ratio		0.27			0.27	0.27		0.42		0.70	0.70	
v/c Ratio		0.17			0.32	0.01		0.28		0.59	0.70	
Control Delay		22.3			31.1	0.0		13.0		9.9	14.2	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		22.3			31.1	0.0		13.0		9.9	14.2	
LOS		C			C	A		B		A	B	
Approach Delay		22.3			29.8			13.0			12.8	
Approach LOS		C			C			B			B	
Queue Length 50th (m)		6.8			15.1	0.0		13.2		32.8	97.5	
Queue Length 95th (m)		18.7			32.4	0.0		25.7		49.5	147.5	
Internal Link Dist (m)		56.9			107.9			29.0			90.6	
Turn Bay Length (m)												
Base Capacity (vph)		439			357	499		1289		910	1403	
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		0.17			0.32	0.01		0.28		0.52	0.65	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 77.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 14.2
Intersection LOS: B
Intersection Capacity Utilization 101.9%
ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 1: Dutch Village Road & Site Access & Alma Crescent



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	36	24	229	18	298	45	611	79	342	383	20
Future Volume (vph)	38	36	24	229	18	298	45	611	79	342	383	20
Satd. Flow (prot)	0	1787	0	0	1801	1601	0	3511	0	1789	1868	0
Flt Permitted		0.754			0.706			0.895		0.222		
Satd. Flow (perm)	0	1373	0	0	1330	1601	0	3152	0	418	1868	0
Satd. Flow (RTOR)		18				324		17			5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	106	0	0	269	324	0	799	0	372	438	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Total Split (s)	31.0	31.0		31.0	31.0	31.0	40.0	40.0		19.0	59.0	
Total Lost Time (s)		5.9			5.9	5.9		6.0		4.0	6.0	
Act Effct Green (s)		22.9			22.9	22.9		34.1		53.6	51.6	
Actuated g/C Ratio		0.27			0.27	0.27		0.39		0.62	0.60	
v/c Ratio		0.28			0.77	0.49		0.64		0.79	0.39	
Control Delay		23.3			45.4	5.9		24.1		23.3	10.6	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		23.3			45.4	5.9		24.1		23.3	10.6	
LOS		C			D	A		C		C	B	
Approach Delay		23.3			23.8			24.1			16.4	
Approach LOS		C			C			C			B	
Queue Length 50th (m)		11.7			41.9	0.0		57.2		28.1	36.1	
Queue Length 95th (m)		24.9			#76.5	18.5		77.9		#64.5	55.9	
Internal Link Dist (m)		56.9			107.9			29.0			90.6	
Turn Bay Length (m)												
Base Capacity (vph)		412			387	695		1254		497	1151	
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		0.26			0.70	0.47		0.64		0.75	0.38	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 86.4
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 21.3 Intersection LOS: C
Intersection Capacity Utilization 96.0% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Dutch Village Road & Site Access & Alma Crescent