

MEMO

TO: Scott MacCallum, P.Eng. – Clayton Developments
FROM: Patrick Hatton, P.Eng. – WSP Canada Inc.
SUBJECT: **Opal Ridge – Traffic Review with Revised Units**
DATE: **January 9, 2025**

BACKGROUND

Plans are being prepared for a residential development adjacent to the existing Penhorn Plaza site in Dartmouth, Nova Scotia. A Traffic Impact Study (TIS) was prepared (WSP, April 2022) to assess the transportation impacts with the proposed development based on a combination of mid-rise and high-rise apartment buildings, totalling 860 apartment units, as well as 45 townhome units. Full occupancy of the development was anticipated by 2030.

Since the approval of the 2022 TIS, additional density is being considered to provide a total of 1,522 apartment units as well as 45 townhome units. This Memorandum has been prepared to review the transportation impacts with the proposed additional units for this development.

EXISTING AND PLANNED TRANSPORTATION NETWORK

Portland Street, otherwise known as NS Route 207, is an arterial road that runs east-west approximately 5.7 km between Alderney Drive (Downtown Dartmouth) and Caldwell Road. In the Study Area, Portland Street consists of a changing cross section with alternating turning lanes, divided by a median. The posted speed limit is 50 km/h in the Study Area.

The proposed site has good accessibility for pedestrians. The site is connected to sidewalks along Portland Street and marked crosswalks at the Study Intersections, therefore, pedestrians can easily access the site from the south. In addition, there are walking trails throughout the Manor Park neighbourhood and near Penhorn Lake and Brownlow Park, which pedestrians may use to access the site from the north.

The Penhorn Transit Terminal is currently located on the Penhorn Plaza site, fronting Portland Street. Halifax Transit currently operates Routes #5, #58, #62, #63, #67, #158, #159, #161, #165, and #168 through the Penhorn Transit Terminal.

The HRM Integrated Mobility Plan (IMP) has identified Portland Street as a Transit Priority Corridor. It is expected that physical or policy-related interventions will be implemented in an effort to reduce the impact of traffic congestion on transit vehicles and it is understood that HRM is currently undertaking that project to provide opportunities for transit and active transportation improvements in this area.

BACKGROUND TRAFFIC VOLUMES

2030 Future Background Traffic Volumes for the AM and PM peak hour at the site connections to Portland Street were projected in the 2022 Traffic Impact Study. These volume projections have been extracted and are shown in Figure 1.

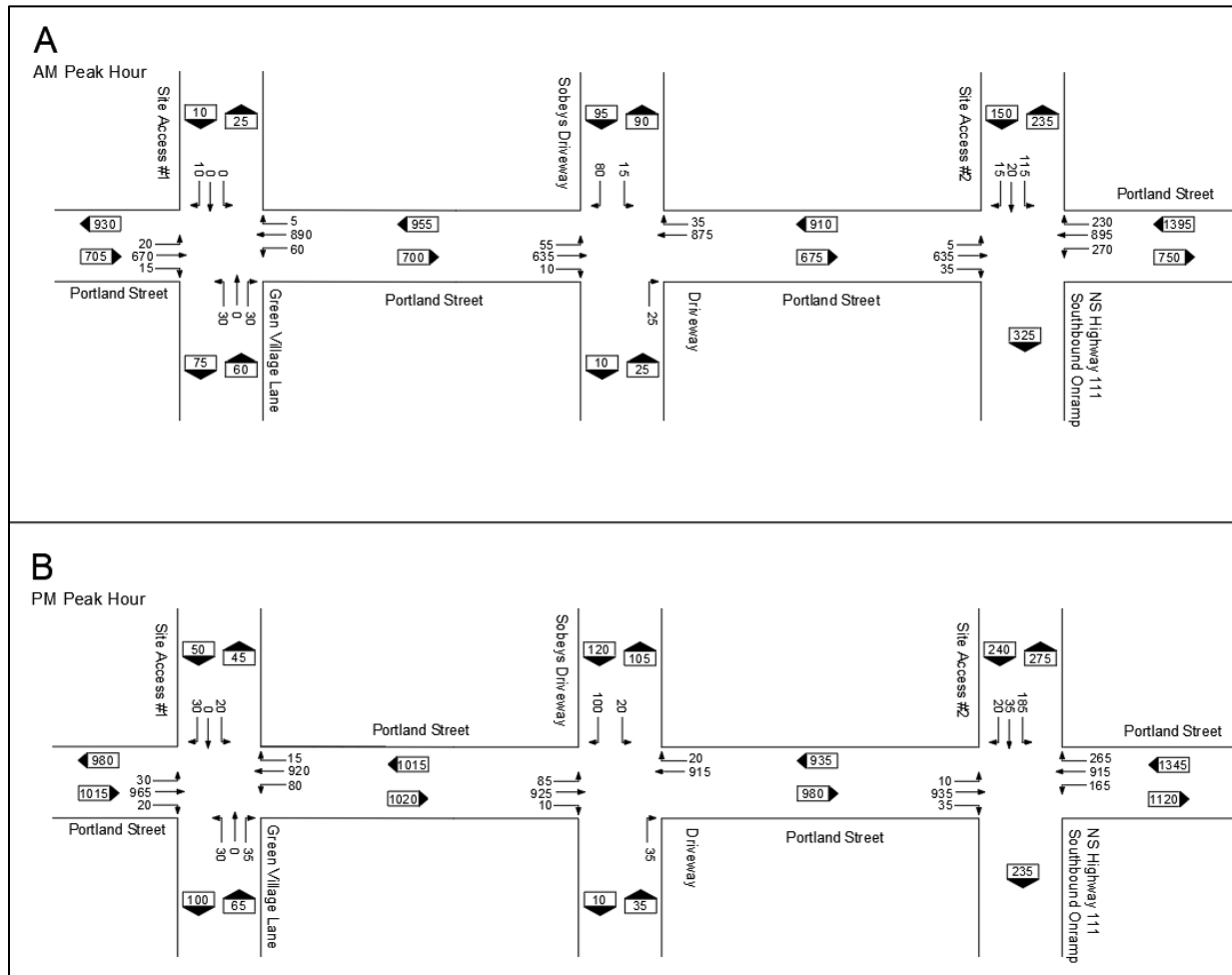


Figure 1 – 2030 Weekday AM and PM Peak Hour Traffic Volumes without Site Development (Extracted from 2022 TIS)

REVISED TRIP GENERATION ESTIMATES

The 2022 Traffic Impact Study included trip generation estimates for this development was based on the following:

- Use of published rates and equations from *Trip Generation, 11th Edition* (Institute of Transportation Engineers, Washington, 2021).
- A reduction of 10% for non-auto modes to account for transit, cycling and walking trips, as well as on-site synergies.

The above factors have been applied to estimate the trips generated by the revised development plan with trip generation estimates for the revised site included in Table 1.

Table 1 – Trip Generation Estimates for the Proposed Development

Table 1 – Trip Generation Estimates for the Proposed Development									
Land Use ¹	Units ²	Trip Generation Rates ³				Trip Generation Estimates ⁴			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Penhorn Residential Development									
Single Family Housing (Land Use 210)	45 Units	0.18	0.52	0.59	0.35	8	23	27	16
Mid-Rise Apartments (Land Use 221)	466 Units	AM: T = 0.44 (X) -11.81 PM: T = 0.39 (X) +0.34				44	149	111	71
High-Rise Apartments (Land Use 222)	1056 Units	AM: T = 0.22 (X) + 18.85 PM: T = 0.26 (X) + 23.12				65	186	185	113
Trip Generation Estimate for Proposed Site						117	358	323	200
10% Reduction for Non-Auto Trips ⁵						12	36	32	20
Revised Total Primary Trip Estimate for Proposed Site						105	322	291	180
Previous Trip Estimate for Proposed Site (2022 TIS)						80	218	188	129
Net Increase in Trip Generation Estimate						25	104	103	51
NOTES:									
1. Trip generation rates and equations are from Trip Generation, 11th Edition, (Institute of Transportation Engineers, Washington, 2021). Directional Distribution has been corrected using the Errata.									
2. 'Number of Residential Units' for Single Family Housing and Mid-Rise and High-Rise Apartment Buildings.									
3. Trip generation rates are 'vehicles per hour per unit'.									
4. Trips generated are 'vehicles per hour' for AM and PM peak hours.									
5. A 10% reduction for non-auto trips has been used to account for transit, cycling and walking trips as well as on-site synergies.									

Vehicular site generated trips have been distributed and assigned to roadway network using the trip distribution accepted in the 2022 TIS (below).

North	45%	(Burnside, Dartmouth Crossing, Bayers Lake, Bedford, Airport)
East	15%	(Adjacent Shopping Centers, Cole Harbour)
South	10%	(Woodside Industrial Park, Woodside Ferry Terminal, Shearwater)
West	30%	(Downtown Dartmouth, Downtown Halifax, Alderney Ferry Terminal)

The assignment of the revised site generated trips are shown in Figure 2.

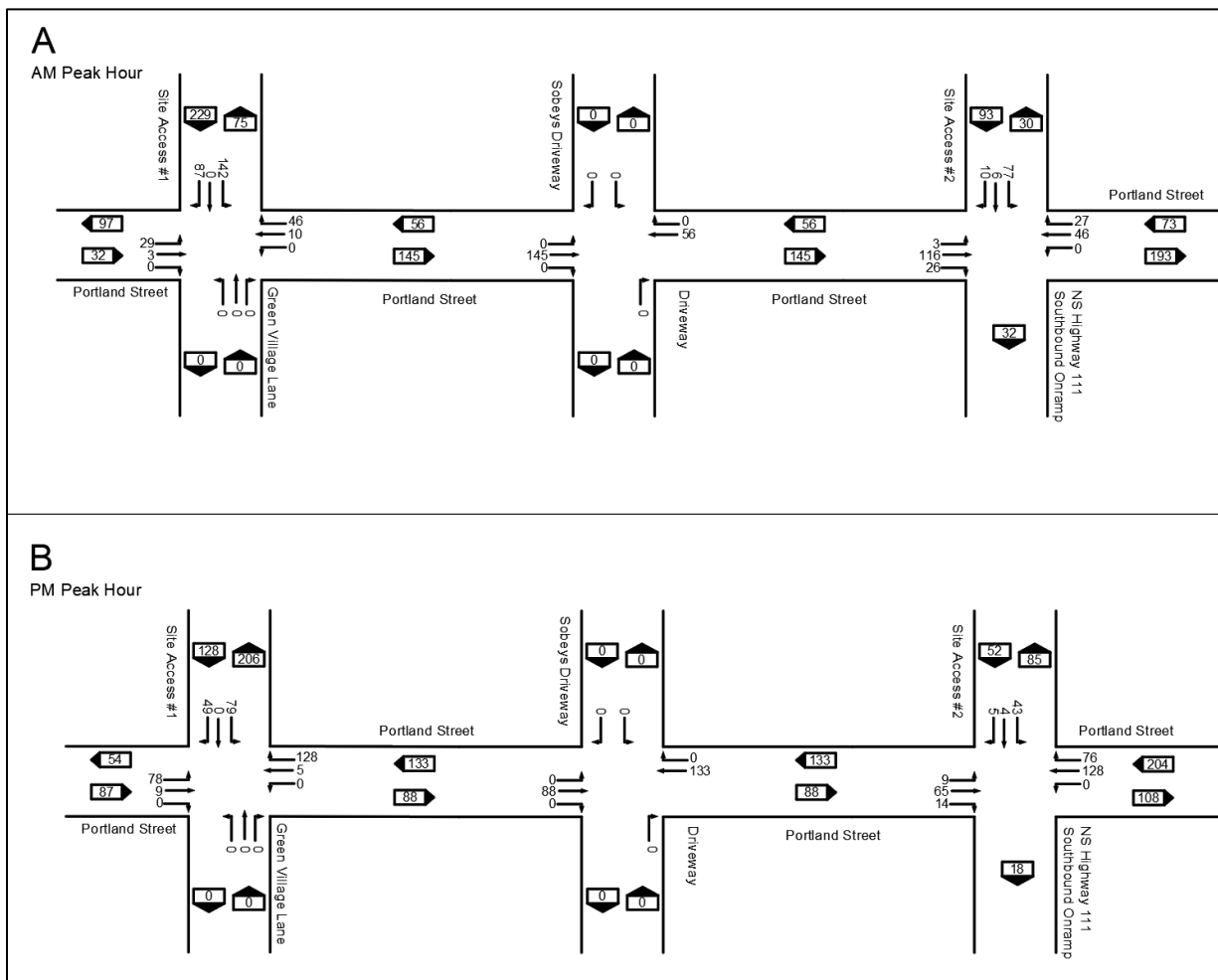


Figure 2 – Assignment of Generated Trips by the Revised Development Site

2030 TOTAL TRAFFIC VOLUMES WITH SITE GENERATED TRIPS

The 2030 Total Traffic Volumes that include site generated trips are shown in Figure 3 and have been projected by adding the 2030 Future Background Traffic Volumes (See Figure 1) to the Assigned Trips generated by the revised site (See Figure 2).

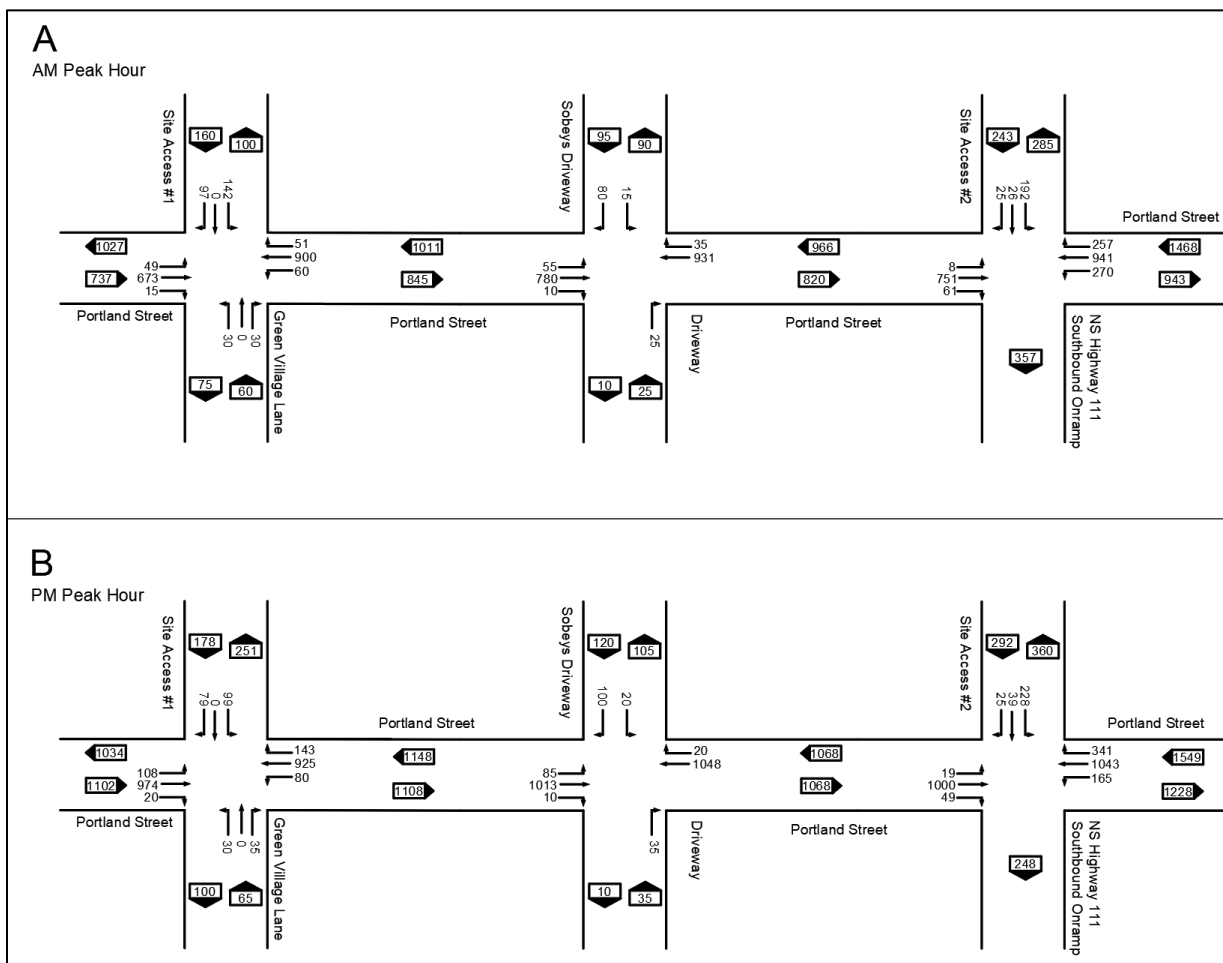


Figure 3 – 2030 Total Traffic Volumes with Trips Generated by the Revised Development Site

INTERSECTION CAPACITY ANALYSIS

A **volume to capacity (v/c) ratio** is a measure of the peak hour volume on an approach to an intersection compared to the capacity of that intersection approach. The capacity of an intersection approach at a signalized intersection depends on the number of lanes and the amount of green time. Approaches with volumes less than 50% of capacity (v/c ratios less than 0.50) usually have low or no congestion, and a v/c ratio up to 0.75 is usually associated with moderate congestion, while a v/c ratio of 0.85 suggests that the approach has 15% residual capacity available, it is also an indication that mitigative measures must be considered if higher volumes are to be accommodated in future years.

The **95th queue** is the estimated length in meters of a line of vehicles stopped on an intersection approach that is only exceeded 5% of the time. Since a stopped vehicle occupies about six meters of queue length, a 95th queue of 12 meters indicates that there are two vehicles queued on the approach less than 5 times out of 100.

Intersection Capacity Analysis (*Synchro 11*) has been completed to evaluate the operations of the intersections with the 2030 Total Traffic Volumes with Trips Generated by the Revised Site (See Figure 3). Analysis results are included in the Appendix and summarized in Tables 2 and 3.

Table 2 – Intersection Capacity Analysis: Portland Street at Site Access #1 / Green Village Lane

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement									Overall Intersection
	Portland Street				Green Village Lane		Site Access #1			
	EB-L	EB-TR	WB-L	WB-TR	NB-LT	NB-R	SB-L	SB-T	SB-R	Delay
2030 AM Peak Hour with Proposed Site (Page A-1)										
Delay	17.8	14.9	6.4	9.8	18.1	1.4	24.0	17.0	6.2	12.4
v/c	0.25	0.51	0.14	0.55	0.10	0.08	0.48	0.00	0.23	
Queue	13.6	57.2	8.0	57.6	9.7	1.6	32.7	1.2	10.3	
2030 PM Peak Hour with Proposed Site (Page A-3)										
Delay	21.8	13.7	5.3	6.6	24.5	2.6	30.1	23.0	8.2	11.2
v/c	0.46	0.54	0.21	0.47	0.14	0.11	0.43	0.00	0.24	
Queue	35.0	81.7	8.4	56.8	11.2	2.7	27.5	1.4	10.7	

Table 3 – Intersection Capacity Analysis: Portland Street at Site Access #2 / Highway 111 Southbound Ramp

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement							Overall Intersection
	Portland Street				Site Access #2			
	EB-L	EB-TR	WB-L	WB-TR	SB-L	SB-T	SB-R	Delay
2030 AM Peak Hour with Proposed Site (Page A-2)								
Delay	14.6	18.4	10.7	6.0	27.8	27.8	4.3	12.4
v/c	0.06	0.67	0.59	0.43	0.38	0.39	0.08	
Queue	3.9	75.1	31.1	35.9	32.8	33.4	3.5	
2030 PM Peak Hour with Proposed Site (Page A-4)								
Delay	15.3	18.3	10.5	6.6	31.3	31.1	4.2	13.3
v/c	0.16	0.73	0.49	0.49	0.46	0.46	0.08	
Queue	6.8	99.6	21.4	48.2	42.0	42.5	3.4	

CONCLUSION

All movements at these access intersections are expected to continue to operate within HRM guidelines (v/c ratios of 0.85 or less for through movements and v/c ratios of 1.0 or less for turning lanes) with the addition of trips generated by the revised site plan.

Since the access intersections for this redevelopment with the revised unit counts are expected to continue to operate within HRM guidelines with the addition of trips generated by the revised site, the conclusions from the 2022 TIS remain valid when considering the trips generated by the revised plan.



APPENDIX

Opal Ridge - Traffic Review with Revised Units
1: Green Village Lane/Site Access #1 & Portland Street

Page A-1
Future Background with Site (2030) - AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	673	15	60	900	51	30	1	30	142	1	97
Future Volume (vph)	49	673	15	60	900	51	30	1	30	142	1	97
Satd. Flow (prot)	1770	3529	0	1770	3511	0	0	1777	1583	1770	1863	1583
Flt Permitted	0.277			0.268				0.756		0.735		
Satd. Flow (perm)	516	3529	0	499	3511	0	0	1408	1583	1369	1863	1583
Satd. Flow (RTOR)		2			9				76			105
Lane Group Flow (vph)	53	748	0	65	1033	0	0	34	33	154	1	105
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	6			4			5	
Permitted Phases	2			6			4		4	5		5
Total Split (s)	39.0	39.0		24.0	63.0		37.0	37.0	37.0	37.0	37.0	37.0
Total Lost Time (s)	6.0	6.0		4.0	6.0			6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	21.9	21.9		30.1	28.0			12.3	12.3	12.3	12.3	12.3
Actuated g/C Ratio	0.41	0.41		0.57	0.53			0.23	0.23	0.23	0.23	0.23
v/c Ratio	0.25	0.51		0.14	0.55			0.10	0.08	0.48	0.00	0.23
Control Delay	17.8	14.9		6.4	9.8			18.1	1.4	24.0	17.0	6.2
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	14.9		6.4	9.8			18.1	1.4	24.0	17.0	6.2
LOS	B	B		A	A			B	A	C	B	A
Approach Delay		15.1			9.6			9.9			16.8	
Approach LOS		B			A			A			B	
Queue Length 50th (m)	3.8	32.0		2.4	30.2			2.7	0.0	13.2	0.1	0.0
Queue Length 95th (m)	13.6	57.2		8.0	57.6			9.7	1.6	32.7	1.2	10.3
Internal Link Dist (m)		186.0			98.3			168.8			141.4	
Turn Bay Length (m)	35.0			50.0					35.0	20.0		
Base Capacity (vph)	334	2286		786	3395			856	993	833	1133	1004
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.16	0.33		0.08	0.30			0.04	0.03	0.18	0.00	0.10

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 52.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 12.4

Intersection Capacity Utilization 61.9%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 1: Green Village Lane/Site Access #1 & Portland Street

		
Ø1	Ø2	Ø4
24 s	39 s	37 s
		
Ø6		Ø5
63 s		37 s

2: Highway 102 SB Ramp/Site Access #2 & Portland Street

Future Background with Site (2030) - AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	751	61	270	941	257	0	0	0	192	26	25
Future Volume (vph)	8	751	61	270	941	257	0	0	0	192	26	25
Satd. Flow (prot)	1770	3500	0	1770	4923	0	0	0	0	1681	1704	1583
Flt Permitted	0.200			0.200						0.950	0.963	
Satd. Flow (perm)	373	3500	0	373	4923	0	0	0	0	1681	1704	1583
Satd. Flow (RTOR)		8			109							50
Lane Group Flow (vph)	9	882	0	293	1302	0	0	0	0	117	120	27
Turn Type	Perm	NA		pm+pt	NA					Split	NA	Prot
Protected Phases		2		1	6					4	4	4
Permitted Phases	2			6								
Total Split (s)	59.0	59.0		32.0	91.0					39.0	39.0	39.0
Total Lost Time (s)	6.0	6.0		3.0	6.0					6.0	6.0	6.0
Act Effct Green (s)	22.2	22.2		39.0	35.8					10.7	10.7	10.7
Actuated g/C Ratio	0.38	0.38		0.66	0.61					0.18	0.18	0.18
v/c Ratio	0.06	0.67		0.59	0.43					0.38	0.39	0.08
Control Delay	14.6	18.4		10.7	6.0					27.8	27.8	4.3
Queue Delay	0.0	0.0		0.0	0.0					0.0	0.0	0.0
Total Delay	14.6	18.4		10.7	6.0					27.8	27.8	4.3
LOS	B	B		B	A					C	C	A
Approach Delay		18.3			6.9						25.4	
Approach LOS		B			A						C	
Queue Length 50th (m)	0.6	39.7		10.4	20.9					11.7	12.1	0.0
Queue Length 95th (m)	3.9	75.1		31.1	35.9					32.8	33.4	3.5
Internal Link Dist (m)		93.0			32.2			87.6			105.5	
Turn Bay Length (m)	75.0			30.0						70.0		70.0
Base Capacity (vph)	331	3107		961	4923					978	991	941
Starvation Cap Reductn	0	0		0	0					0	0	0
Spillback Cap Reductn	0	0		0	0					0	0	0
Storage Cap Reductn	0	0		0	0					0	0	0
Reduced v/c Ratio	0.03	0.28		0.30	0.26					0.12	0.12	0.03

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 59

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 12.4

Intersection Capacity Utilization 57.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 2: Highway 102 SB Ramp/Site Access #2 & Portland Street

		
Ø1	Ø2	Ø4
32 s	59 s	39 s
		
Ø6		
91 s		

Opal Ridge - Traffic Review with Revised Units
1: Green Village Lane/Site Access #1 & Portland Street

Page A-3
Future Background with Site (2030) - PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	974	20	80	925	143	30	1	35	99	1	79
Future Volume (vph)	108	974	20	80	925	143	30	1	35	99	1	79
Satd. Flow (prot)	1770	3529	0	1770	3468	0	0	1777	1583	1770	1863	1583
Flt Permitted	0.244			0.175				0.732		0.735		
Satd. Flow (perm)	455	3529	0	326	3468	0	0	1364	1583	1369	1863	1583
Satd. Flow (RTOR)		2			28				76			86
Lane Group Flow (vph)	117	1081	0	87	1160	0	0	34	38	108	1	86
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	6			4			5	
Permitted Phases	2			6			4		4	5		5
Total Split (s)	39.0	39.0		24.0	63.0		37.0	37.0	37.0	37.0	37.0	37.0
Total Lost Time (s)	6.0	6.0		4.0	6.0			6.0	6.0	6.0	6.0	6.0
Act Effct Green (s)	33.0	33.0		41.5	41.4			10.7	10.7	10.7	10.7	10.7
Actuated g/C Ratio	0.56	0.56		0.71	0.71			0.18	0.18	0.18	0.18	0.18
v/c Ratio	0.46	0.54		0.21	0.47			0.14	0.11	0.43	0.00	0.24
Control Delay	21.8	13.7		5.3	6.6			24.5	2.6	30.1	23.0	8.2
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	13.7		5.3	6.6			24.5	2.6	30.1	23.0	8.2
LOS	C	B		A	A			C	A	C	C	A
Approach Delay		14.5			6.5			12.9			20.4	
Approach LOS		B			A			B			C	
Queue Length 50th (m)	9.7	50.0		3.0	32.5			3.5	0.0	11.6	0.1	0.0
Queue Length 95th (m)	#35.0	81.7		8.4	56.8			11.2	2.7	27.5	1.4	10.7
Internal Link Dist (m)		186.0			98.3			168.8			141.4	
Turn Bay Length (m)	35.0			50.0					35.0	20.0		
Base Capacity (vph)	271	2107		752	3161			764	920	767	1044	925
Starvation Cap Reductn	0	0		0	0			0	0	0	0	0
Spillback Cap Reductn	0	0		0	0			0	0	0	0	0
Storage Cap Reductn	0	0		0	0			0	0	0	0	0
Reduced v/c Ratio	0.43	0.51		0.12	0.37			0.04	0.04	0.14	0.00	0.09

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 58.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 11.2

Intersection LOS: B

Intersection Capacity Utilization 63.3%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Green Village Lane/Site Access #1 & Portland Street

		
Ø1	Ø2	Ø4
24 s	39 s	37 s
		
Ø6		Ø5
63 s		37 s

2: Highway 102 SB Ramp/Site Access #2 & Portland Street

Future Background with Site (2030) - PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	1000	49	165	1043	341	0	0	0	228	39	25
Future Volume (vph)	19	1000	49	165	1043	341	0	0	0	228	39	25
Satd. Flow (prot)	1770	3514	0	1770	4897	0	0	0	0	1681	1709	1583
Flt Permitted	0.161			0.134						0.950	0.966	
Satd. Flow (perm)	300	3514	0	250	4897	0	0	0	0	1681	1709	1583
Satd. Flow (RTOR)		5			131							50
Lane Group Flow (vph)	21	1140	0	179	1505	0	0	0	0	144	146	27
Turn Type	Perm	NA		pm+pt	NA					Split	NA	Prot
Protected Phases		2		1	6					4	4	4
Permitted Phases	2			6								
Total Split (s)	69.0	69.0		22.0	91.0					39.0	39.0	39.0
Total Lost Time (s)	6.0	6.0		3.0	6.0					6.0	6.0	6.0
Act Effct Green (s)	29.0	29.0		43.8	40.6					12.2	12.2	12.2
Actuated g/C Ratio	0.44	0.44		0.67	0.62					0.19	0.19	0.19
v/c Ratio	0.16	0.73		0.49	0.49					0.46	0.46	0.08
Control Delay	15.3	18.3		10.5	6.6					31.3	31.1	4.2
Queue Delay	0.0	0.0		0.0	0.0					0.0	0.0	0.0
Total Delay	15.3	18.3		10.5	6.6					31.3	31.1	4.2
LOS	B	B		B	A					C	C	A
Approach Delay		18.2			7.0						28.9	
Approach LOS		B			A						C	
Queue Length 50th (m)	1.5	57.2		6.6	28.1					16.9	17.1	0.0
Queue Length 95th (m)	6.8	99.6		21.4	48.2					42.0	42.5	3.4
Internal Link Dist (m)		93.0			44.1			87.6			105.5	
Turn Bay Length (m)	75.0			30.0						70.0		70.0
Base Capacity (vph)	275	3222		628	4867					886	900	858
Starvation Cap Reductn	0	0		0	0					0	0	0
Spillback Cap Reductn	0	0		0	0					0	0	0
Storage Cap Reductn	0	0		0	0					0	0	0
Reduced v/c Ratio	0.08	0.35		0.29	0.31					0.16	0.16	0.03

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 65.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 13.3

Intersection Capacity Utilization 59.0%

Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service B

Splits and Phases: 2: Highway 102 SB Ramp/Site Access #2 & Portland Street

		
Ø1	Ø2	Ø4
22 s	69 s	39 s
		
Ø6		
91 s		