Stantec

Technical Note

To:	Department of Transport and Planning	Attention:	Patricia Ocampo
Project Name	Bannockburn South East PSP	Project/File:	300305980
From:	Renuka Janga Reece Humphreys	Date:	5 February 2026

Reference: Bannockburn South East PSP

1 Background

The Department of Transport and Planning (DTP) is currently in the planning process stage of the Bannockburn South East Precinct Structure Plan (PSP) and is developing a list of DCP Transport Infrastructure Items. One location that requires additional transport infrastructure, due to the projected population growth and associated increase in traffic movements stemming from the Bannockburn South East Precinct, is the Hamilton Highway and Burnside Road intersection. Before proceeding to the detailed design and construction cost estimates stages of the process, DTP requires further transport assessment, guided by strategic modelling, to determine the most appropriate treatment for the intersection.

2 Methodology

The strategic modelling has been undertaken in VITM, using a version (VITM22v2_04_RC22v1_09) which was obtained from DTP. The model version used as a reference case for this project was the latest available at the time to assess the various land use options and network impact associated with the PSP on to the surrounding network. Based on discussions with DTP, the adopted Scenario 2 incorporates the short- and medium-term priority precincts identified in the Bannockburn Growth Plan namely the North West, South West, and South East growth areas. This scenario does not include the proposed east-west link road. Model outputs from Scenario 2 were extracted and processed to derive the turning movement volumes for the Burnside Road / Hamilton Highway study intersection.

3 Existing Conditions

The Burnside Road / Hamilton Highway intersection is currently stop-controlled on the Burnside Road Hamilton Highway, managed by the Department of Transport and Planning (DTP), operates as a rural highway consisting of a single lane in each direction with no central median, and is subject to a posted speed limit of 100 km/h. Burnside Road is a major council road, providing a single lane in each direction, with a posted speed limit of 80 km/h. The existing configuration of the intersection is illustrated in Figure 3.1.

Figure 3.1 - Aerial view of the subject site from Nearmap (December 2024)



Source: Nearmap

4 Traffic Assessment

The future year 2051 AM and PM peak-hour traffic volumes for Scenario 2 were extracted from the VITM strategic model, as described earlier. The modelled one-hour peak period volumes for both the AM and PM peaks are presented in Figure 4.1. The Y2051 model outputs indicates very large tidal flows of traffic between the east and north approaches with 813 left turning vehicles from Burnside Road to Hamilton Highway in the AM peak and a similar magnitude of demand in the PM peak for the right turn from Hamilton Highway into Burnside Road (812 veh/hr). This equates to one vehicle every 4-5 seconds. Heavy vehicles represent between 4% to 5% of the total traffic in the strategic model outputs. For conservatism, 5% heavy vehicles has been adopted in the SIDRA modelling.

Figure 4.1 – AM and PM peak volumes



5 Modelling Results

The performance of the Hamilton Highway/Burnside Road intersection has been assessed using SIDRA INTERSECTION 9.1, a computer-based modelling package which calculates intersection performance for the future year 2051. The commonly used measures of intersection performance are referred to as

the Degree of Saturation (DOS) and Level of Service (LOS). The DOS represents the flow-to-capacity ratio for the most critical movement on each leg of the intersection. For unsignalised intersections, the DTP Intersection Modelling guidelines details intersection utilisation targets with a desirable DOS of 0.8 and a maximum DOS of 0.85. Beyond these limits, queues and delays increase disproportionately.

Analysis of the existing intersection geometry was undertaken and identified that the intersection would fail to accommodate the future demands in both peak periods, with a DOS of approximately 1.5 in each peak and with a queue length of 1.4km expected on Burnside Road in the AM peak as shown in Table 5.1.

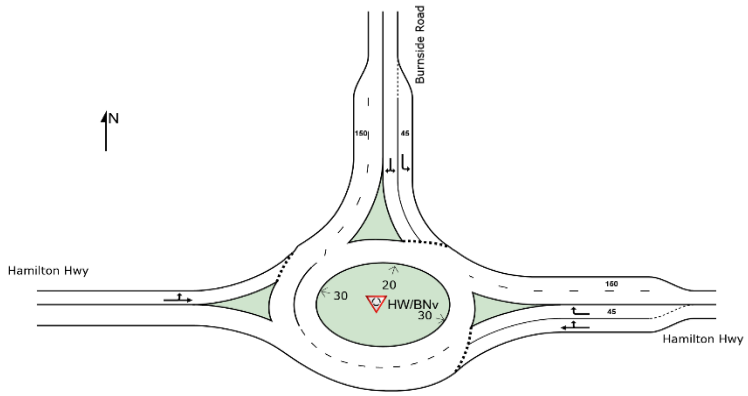
Table 5.1 – 2051 SIDRA Results: Existing Layout with Future 2051 demand

Peak Hour	Approach	DOS	Average Delay (sec)	95th percentile Queue (m)
AM Peak Hour	Hamilton Highway (E)	0.26	4s	8m
	Burnside Road (N)	1.51	486s	1431m
	Hamilton Highway (W)	0.25	0s	0m
	Intersection	**1.51**	**231**	**1431m**
PM Peak Hour	Hamilton Highway (E)	0.91	13s	174m
	Burnside Road (N)	1.47	458s	541m
	Hamilton Highway (W)	0.18	6s	0m
	Intersection	**1.47**	**82s**	**541m**

Various mitigation measures have been assessed in SIDRA to determine the optimal layout to accommodate the large tidal flows between the east and north approaches. The testing included scenarios which provided a new and separate left turn lane on the north approach or upgraded the intersection to a single lane roundabout. The single lane roundabout provided some improvements, however the operation in the AM peak period was still failing with a DOS over 1.0 and 575m queues on Burnside Road. A further roundabout scenario was modelled which provided separate though and right turn lanes on the east approach and a separate left and right turn lane on the north approach, however this still exceed DTP's maximum utilisation Target DOS of 0.85, with a DOS of 0.87 in the AM peak and a 143m queue on Burnside Road.

The preferred mitigation option provides for double right turn lanes from the east approach and double left turn lanes on the north approach, plus an additional departure lane on the north and east legs . This is illustrated in Figure 5.1.

Figure 5.1 – Mitigated Option



The results for Mitigated Option are presented in indicate that the proposed layout performs satisfactorily under the 2051 forecast traffic demands. The intersection operates well within capacity, with a Degree of Saturation (DoS) of 0.53, and 95th percentile queue lengths of less than 40 metres during both the AM and PM peak periods. This demonstrates that the proposed mitigated layout is expected to provide adequate capacity and good performance in the design year.

Table 5.2 and indicate that the proposed layout performs satisfactorily under the 2051 forecast traffic demands. The intersection operates well within capacity, with a Degree of Saturation (DoS) of 0.53, and 95th percentile queue lengths of less than 40 metres during both the AM and PM peak periods. This demonstrates that the proposed mitigated layout is expected to provide adequate capacity and good performance in the design year.

Table 5.2 – 2051 SIDRA Results: Mitigated Option

Peak Hour	Approach	DOS	Average Delay (sec)	95th percentile Queue (m)
AM Peak Hour	Hamilton Highway (E)	0.15	6s	9m
	Burnside Road (N)	0.53	9s	36m
	Hamilton Highway (W)	0.45	6s	23m
	Intersection	**0.53**	**7s**	**36m**
PM Peak Hour	Hamilton Highway (E)	0.44	7s	31m
	Burnside Road (N)	0.19	7s	10m
	Hamilton Highway (W)	0.53	11s	26m
	Intersection	**0.53**	**8s**	**31m**

6 Summary

The assessment indicates that the existing Burnside Road / Hamilton Highway intersection would fail to operate satisfactorily under the 2051 forecast AM and PM peak-hour traffic demands. The heavily tidal movements between the east and north approaches are approximately 800vph in each peak period, or one vehicle every 4-5 seconds. The high demands are impacted significantly by opposing traffic flows, which reduce the availability of gaps, and result in excessive queues and delays.

Analysis of various mitigations shows that the preferred Mitigated Option, has two approach and departure lanes on the north and east approaches of the roundabout. Double turn movements are proposed to meet the high demands, and the analysis shows that this configuration would operate well with small queue lengths on each approach, a DOS of 0.53 in each peak and would meet DTP's desirable DOS target for roundabouts.

USER REPORT FOR SITE

Project: burnsiderd_hamilton_hwy

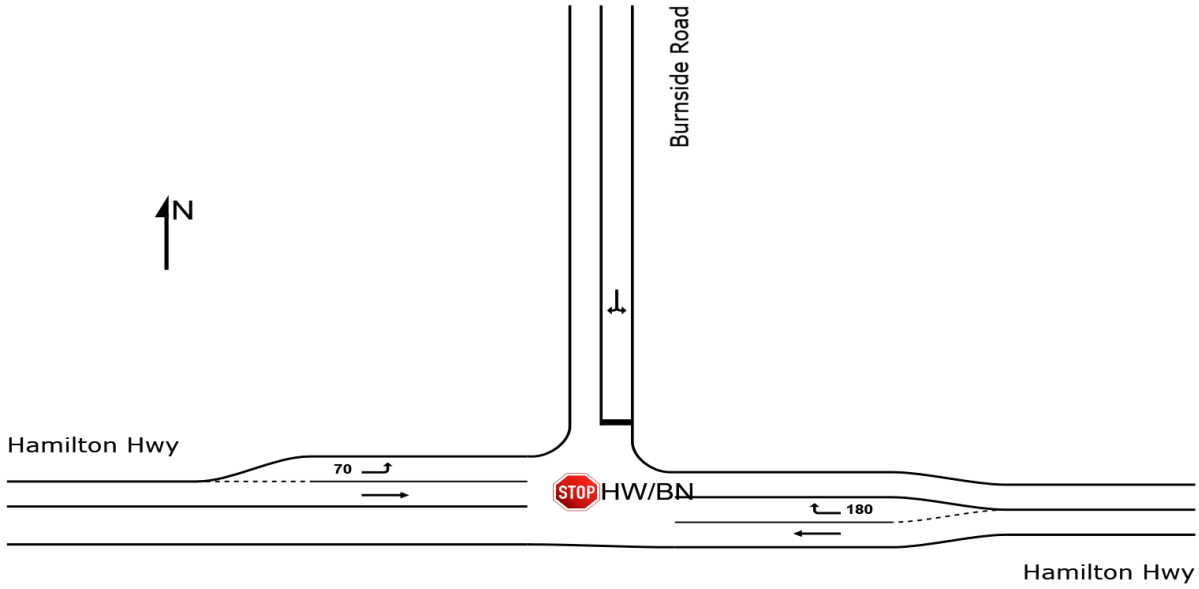
Output produced by SIDRA INTERSECTION Version: 9.1.6.228 **Template: Stantec User Report**

Site: HW/BN [AM Peak_Existing Layout (Site Folder: Future volume 2051)]

New Site
Site Category: (None)
Stop (Two-Way)

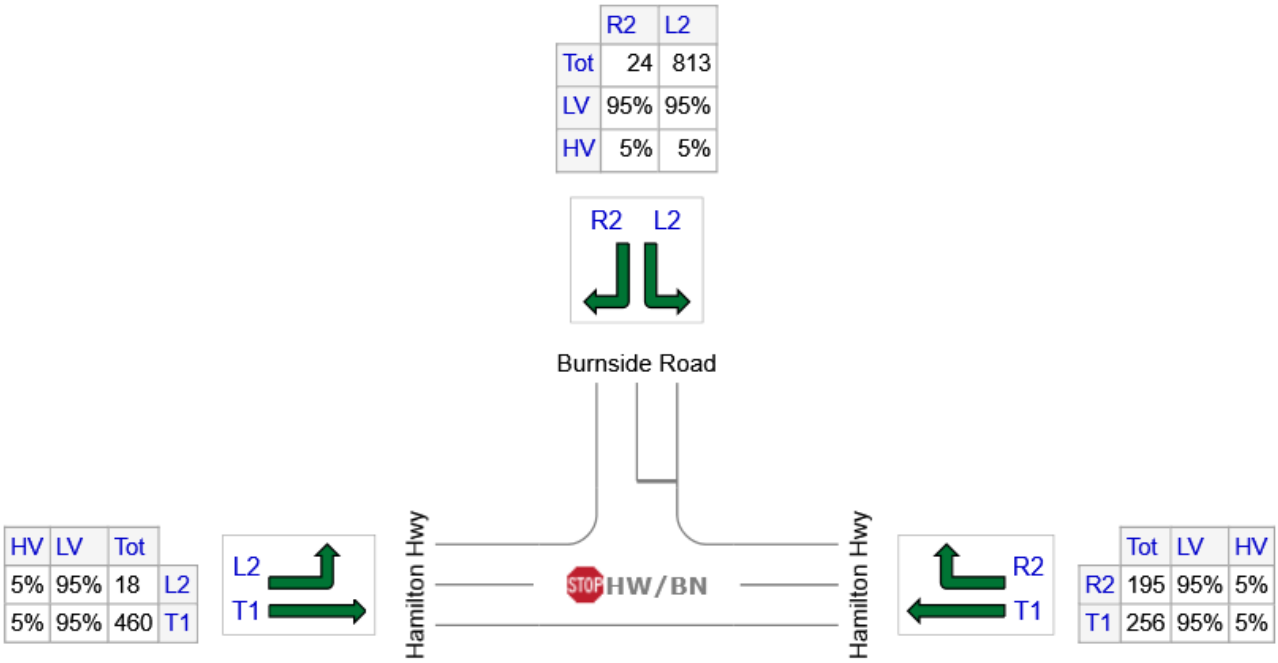
Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: Hamilton Hwy	451	428	23
N: Burnside Road	837	795	42
W: Hamilton Hwy	478	454	24
Total	1766	1678	88

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Hamilton Hwy															
Lane 1	269	5.0	269	5.0	1889	0.143	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	205	5.0	205	5.0	776	0.265	100	9.0	LOS A	1.1	8.3	Short	180	0.0	NA
Approach	475	5.0	475	5.0		0.265		3.9	NA	1.1	8.3				
North: Burnside Road															
Lane 1	881	5.0	881	5.0	580	1.518	100	485.9	LOS F	196.0	1430.6	Full	500	0.0	80.2
Approach	881	5.0	881	5.0		1.518		485.9	LOS F	196.0	1430.6				
West: Hamilton Hwy															
Lane 1	19	5.0	19	5.0	1793	0.011	100	5.6	LOS A	0.0	0.0	Short	70	0.0	NA
Lane 2	484	5.0	484	5.0	1889	0.256	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	503	5.0	503	5.0		0.256		0.3	NA	0.0	0.0				
All Vehicles	1859	5.0	1859	5.0		1.518		231.4	NA	196.0	1430.6				

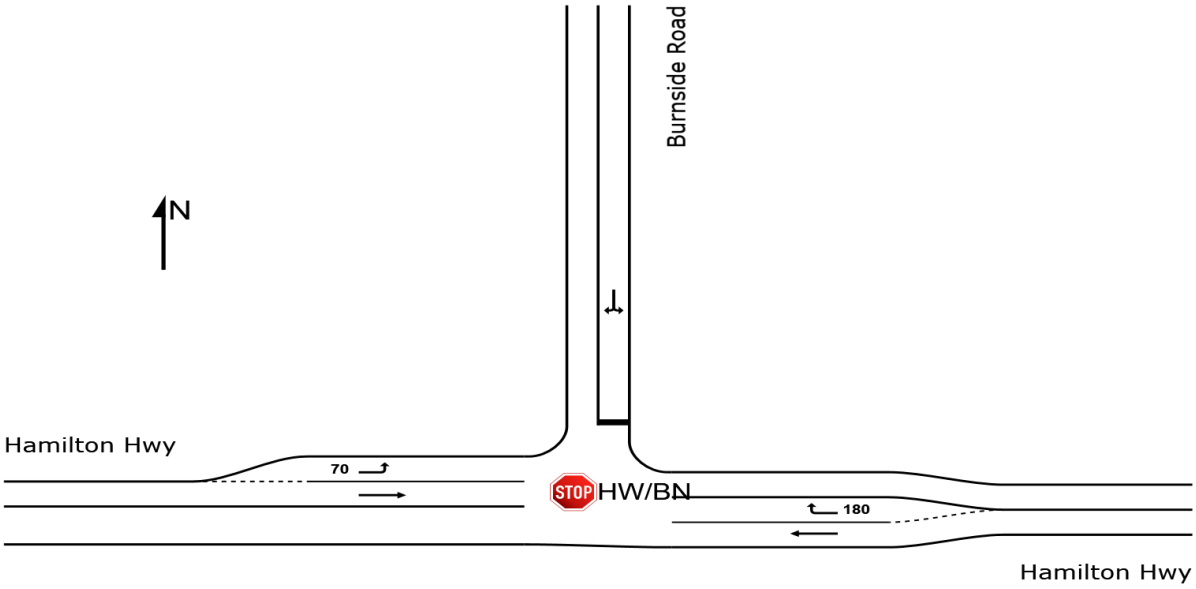
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Site: HW/BN [PM Peak_Existing Layout (Site Folder: Future volume 2051)]

New Site
Site Category: (None)
Stop (Two-Way)

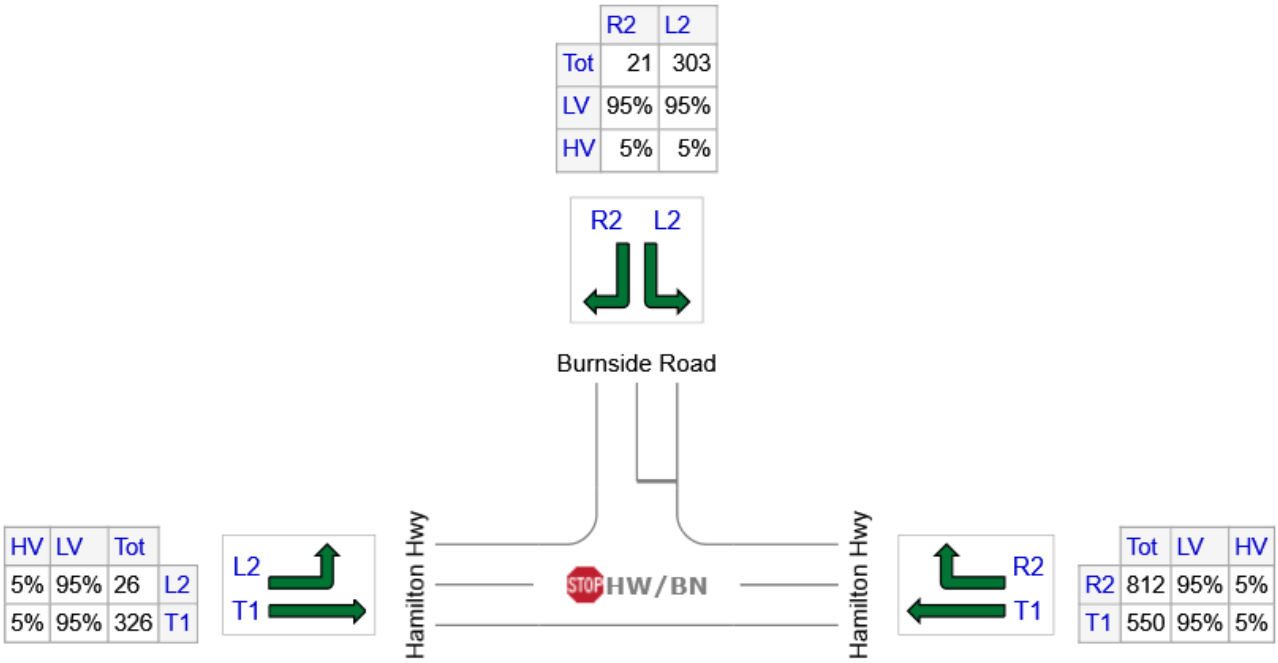
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Input Volumes

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: Hamilton Hwy	1362	1294	68
N: Burnside Road	324	308	16
W: Hamilton Hwy	352	334	18
Total	2038	1936	102

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Hamilton Hwy															
Lane 1	579	5.0	579	5.0	1421[15]	0.407	100	0.7	LOS A	2.4	17.2	Full	500	0.0	0.0
Lane 2	855	5.0	855	5.0	932	0.917	100	21.7	LOS C	23.8	173.5	Short	180	0.0	NA
Approach	1434	5.0	1434	5.0		0.917		13.2	NA	23.8	173.5				
North: Burnside Road															
Lane 1	341	5.0	341	5.0	232	1.473	100	457.9	LOS F	74.1	541.1	Full	500	0.0	7.4
Approach	341	5.0	341	5.0		1.473		457.9	LOS F	74.1	541.1				
West: Hamilton Hwy															
Lane 1	27	5.0	27	5.0	1793	0.015	100	5.6	LOS A	0.0	0.0	Short	70	0.0	NA
Lane 2	343	5.0	343	5.0	1889	0.182	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	371	5.0	371	5.0		0.182		0.5	NA	0.0	0.0				
All Vehicles	2145	5.0	2145	5.0		1.473		81.7	NA	74.1	541.1				

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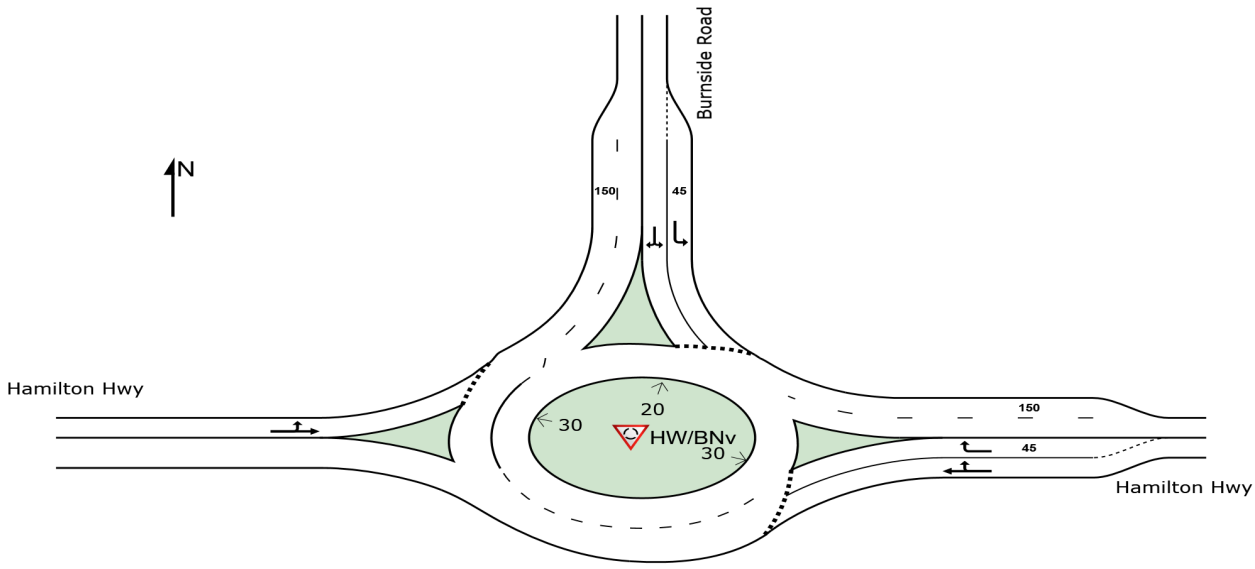
15 Continuous lane capacity reduced due to overflow of an opposed movement in an adjacent short lane.

Site: HW/BNv [AM Peak_Mitigated Option - preferred (Site Folder: Future volume 2051)]

New Site
Site Category: (None)
Roundabout

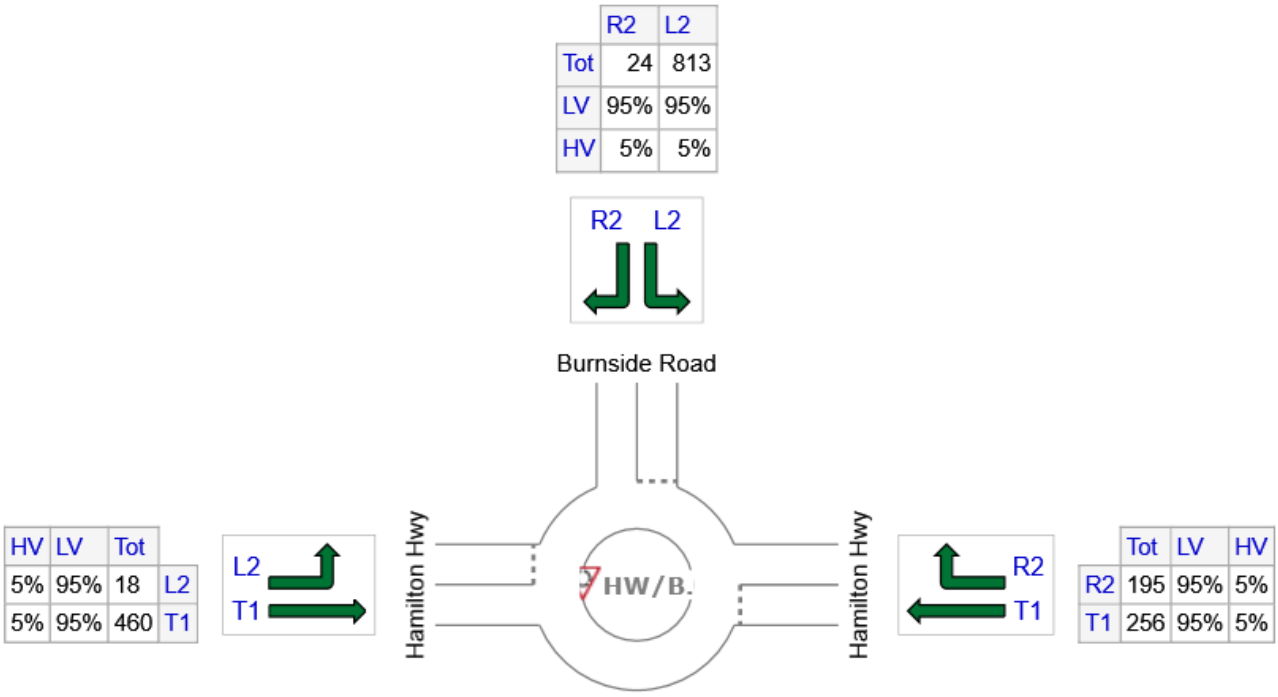
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East: Hamilton Hwy															
Lane 1[d]	269	5.0	269	5.0	1759	0.153	100	3.7	LOS A	1.2	8.5	Full	500	0.0	0.0
Lane 2	205	5.0	205	5.0	1465	0.140	91[5]	9.4	LOS A	1.0	7.4	Short	45	0.0	NA
Approach	475	5.0	475	5.0		0.153		6.1	LOS A	1.2	8.5				
North: Burnside Road															
Lane 1	340	5.0	340	5.0	807	0.421	80[6]	8.7	LOS A	3.1	22.7	Short	45	0.0	NA
Lane 2[d]	541	5.0	541	5.0	1023	0.529	100	9.4	LOS A	4.9	35.6	Full	500	0.0	0.0
Approach	881	5.0	881	5.0		0.529		9.1	LOS A	4.9	35.6				
West: Hamilton Hwy															
Lane 1[d]	503	5.0	503	5.0	1109	0.454	100	5.7	LOS A	3.1	22.6	Full	500	0.0	0.0
Approach	503	5.0	503	5.0		0.454		5.7	LOS A	3.1	22.6				
All Vehicles	1859	5.0	1859	5.0		0.529		7.4	LOS A	4.9	35.6				

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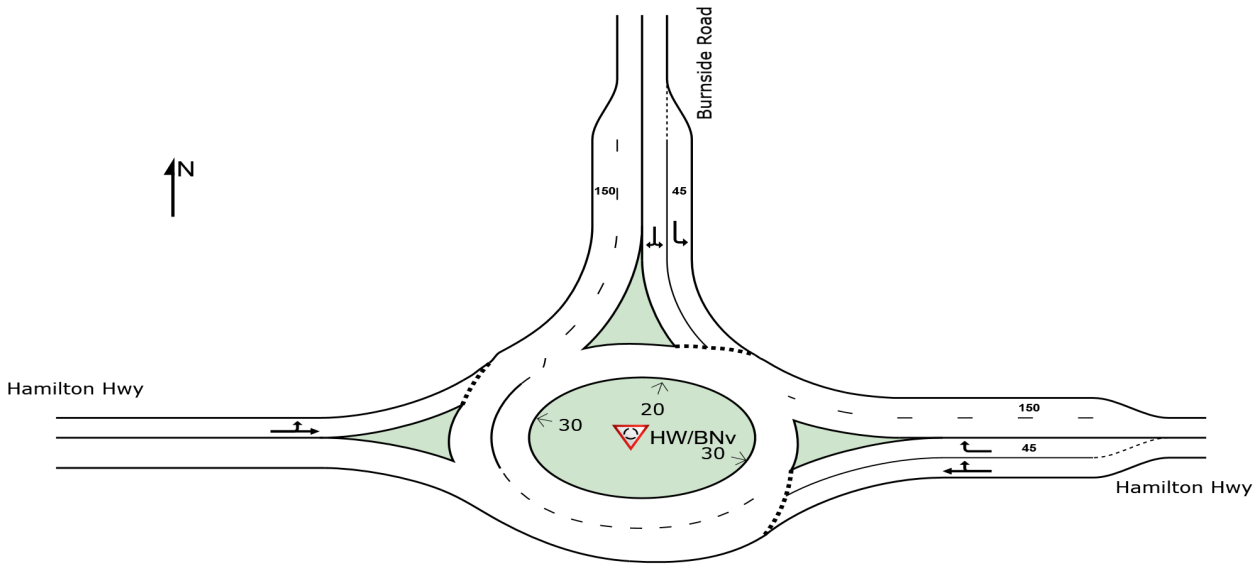
5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Site: HW/BNv [PM Peak_Mitigated Option - preferred (Site Folder: Future volume 2051)]

New Site
Site Category: (None)
Roundabout

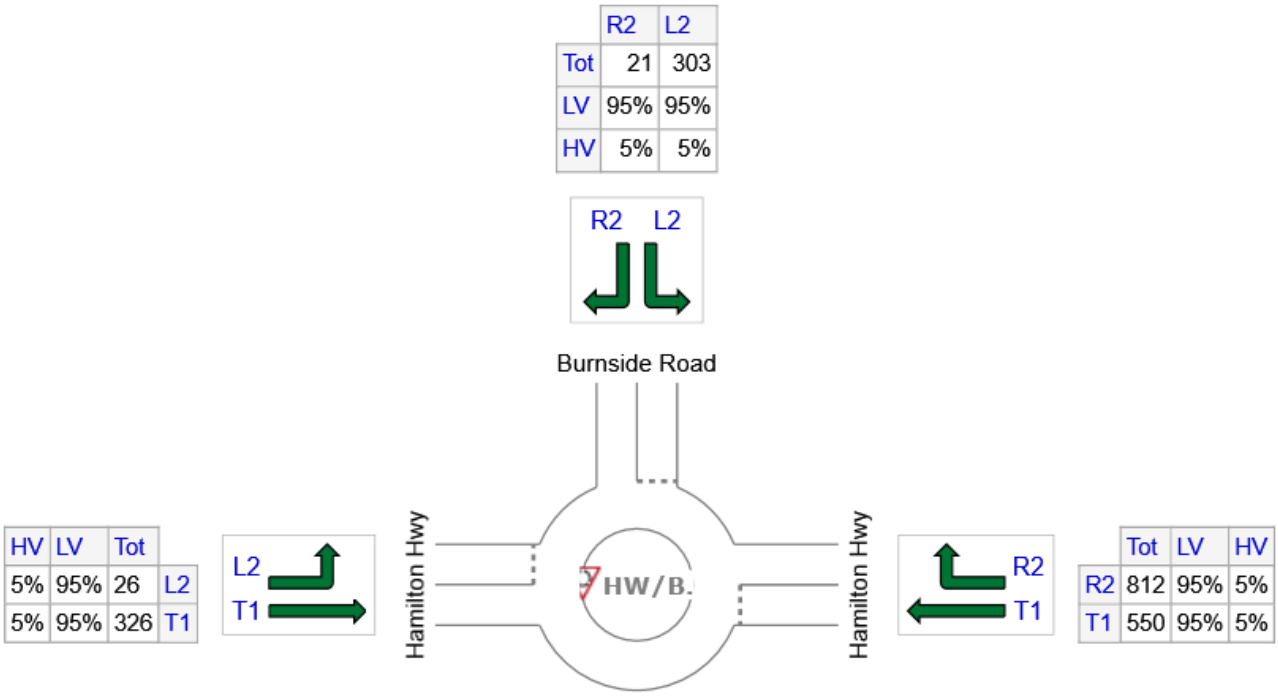
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East: Hamilton Hwy															
Lane 1[d]	782	5.0	782	5.0	1800	0.435	100	5.3	LOS A	4.3	31.4	Full	500	0.0	0.0
Lane 2	651	5.0	651	5.0	1499	0.435	100	9.5	LOS A	4.2	30.9	Short	45	0.0	NA
Approach	1434	5.0	1434	5.0		0.435		7.2	LOS A	4.3	31.4				
North: Burnside Road															
Lane 1	134	5.0	134	5.0	910	0.147	80[6]	6.5	LOS A	1.0	7.0	Short	45	0.0	NA
Lane 2[d]	207	5.0	207	5.0	1122	0.185	100	6.6	LOS A	1.3	9.5	Full	500	0.0	0.0
Approach	341	5.0	341	5.0		0.185		6.5	LOS A	1.3	9.5				
West: Hamilton Hwy															
Lane 1[d]	371	5.0	371	5.0	698	0.531	100	11.0	LOS B	3.6	26.4	Full	500	0.0	0.0
Approach	371	5.0	371	5.0		0.531		11.0	LOS B	3.6	26.4				
All Vehicles	2145	5.0	2145	5.0		0.531		7.7	LOS A	4.3	31.4				

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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Stantec

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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