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5431 Eighth Line Residential Development Traffic Impact Brief

Home in the Hills Inc.

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April 2019
300039324.0000

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0	Yes	Yes	Home in the Hills Inc.
1	Yes	Yes	J.L. Cox Planning Consultants

Record of Revisions

Revision	Date	Description
0	March 14, 2019	Initial Draft Submission to Planner
1	March 18, 2019	Second Draft Submission to Planner
2	March 21, 2019	Third Draft Submission to Client
3	April 1, 2019	Final Submission to Client

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Executive Summary

Home in the Hills Inc. (“Client”) is proposing to develop 33 single detached residential lots at 5431 Eighth Line in the Town of Erin (“Town”). R.J. Burnside & Associates Limited (“Burnside”) has been retained to undertake a Traffic Impact Brief (“TIB”) which reviews the traffic impacts associated with the proposed development, to assist the Client in the development approval process.

It is assumed that the development will be fully built-out and occupied by 2026. Access to the development will be provided via Forest Ridge Road off Delarmbro Drive.

The Highway 124 / 8th Line and Highway 124 / Delarmbro Drive intersections (“Study Area”) were analyzed in this TIB. Transportation impacts were assessed under existing, 2031 background, and 2031 total traffic conditions.

Based on the analysis completed, the following primary conclusions and recommendations are made in this TIB:

- It is forecast that the proposed development will generate 28 and 35 vehicles in the weekday AM and PM peak hours, respectively.
- Under existing conditions, all movements at both intersections in the Study Area operate with excess capacity and a LOS C or better.
- Under 2031 background conditions, all movements at both intersections in the Study Area are forecast to operate with excess capacity and a LOS C or better.
- Under 2031 total conditions, all movements at both intersections in the Study Area are forecast to operate with excess capacity and a LOS C or better.
- The intersections of Highway 124 / 8th Line and Highway 124 / Delarmbro Drive are forecast to operate acceptably through horizon year 2031.
- Forest Ridge Road is forecast to operate well within its capacity through horizon year 2031.
- The existing stop-control on the Forest Ridge Road approach to Delarmbro Drive is considered acceptable through horizon year 2031.
- The minimum stopping sight distance on Forest Ridge Road is acceptable (in both directions on Delarmbro Drive).
- Access to the development will be provided via Forest Ridge Road. A 6-metre-wide dedicated emergency access Block is provided at the easternmost cul-de-sac in the southeast corner of the development, for potential future connection through the lands to the east. Also, an existing laneway is proposed to connect 8th Line to the westernmost cul-de-sac. These measures are considered to adequately meet emergency access requirements.
- An eastbound left-turn lane with a 15-metre storage length is warranted under existing conditions at the Highway 124 and 8th Line intersection.

- Under 2031 background conditions, at the Highway 124 and 8th Line intersection, the warrant criteria are forecasted to be met for an eastbound left-turn lane (25-metre storage length) and for a westbound left-turn lane (15-metre storage length). **The turn-lanes are warranted due to background (i.e., not development) traffic.** It is recommended that the County monitor this intersection to confirm if, or when, left-turn lanes are implemented.
- The warrant criteria are not met for an eastbound left-turn lane at the intersection of Highway 124 and Delarmbro Drive under 2031 total traffic conditions.
- The existing right-turn tapers at the intersections in the Study Area are considered sufficient through horizon year 2031.

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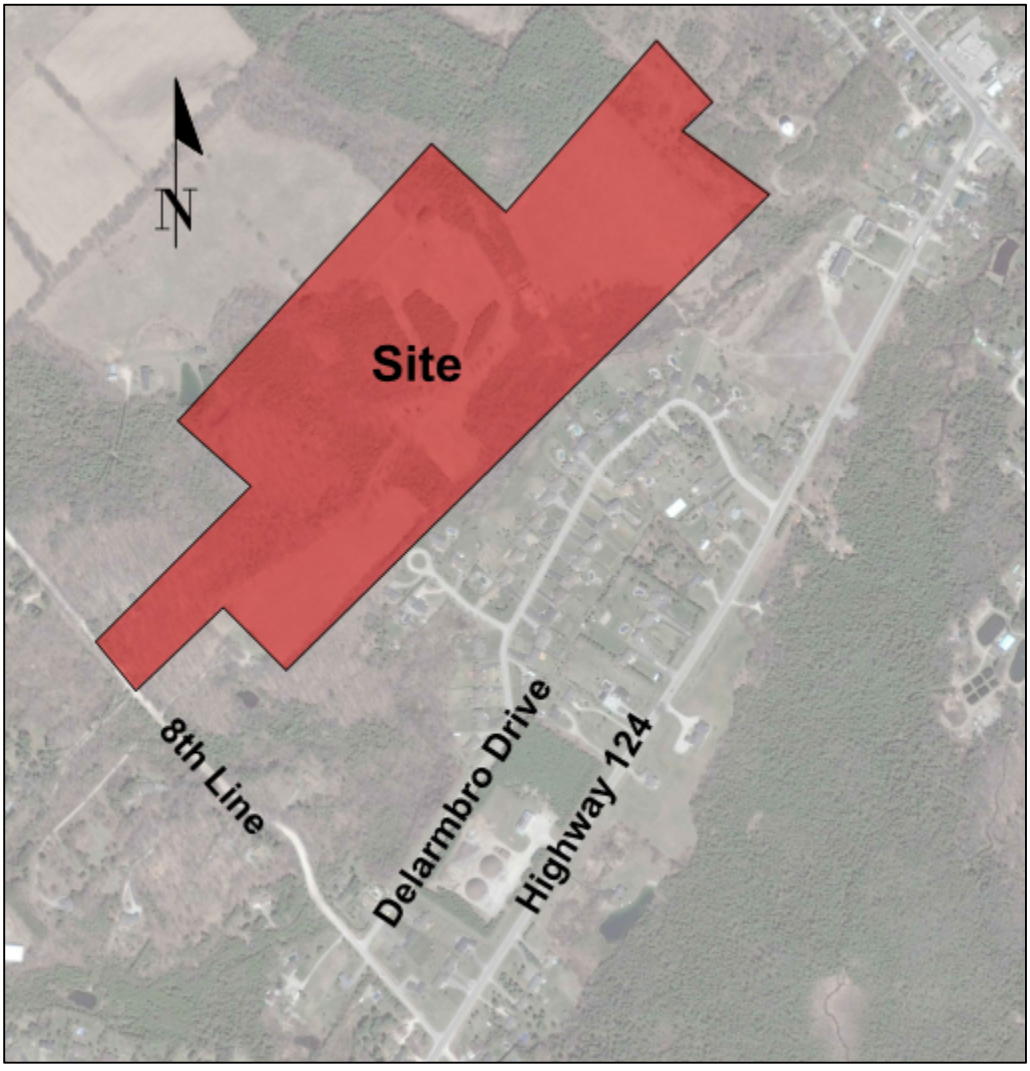
1.0 Introduction

1.1 Background

Home in the Hills Inc. (“Client”) is proposing to develop 33 single detached residential lots at 5431 Eighth Line in the Town of Erin (“Town”). R.J. Burnside & Associates Limited (“Burnside”) has been retained to undertake a Traffic Impact Brief (“TIB”) which reviews the traffic impacts associated with the proposed development, to assist the Client in the development approval process.

It is assumed that the development will be fully built-out and occupied by 2026. Access to the development will be provided via Forest Ridge Road off Delarmbro Drive. The location of the proposed development is illustrated in Figure 1.

Figure 1: Site Location



1.2 Scope of Work

The study scope of work is summarized as the following:

Analysis Scenarios	• Existing (2019) traffic conditions • 2031 background traffic conditions (i.e., 5-year horizon post build-out) • 2031 total traffic conditions (i.e., 2031 background traffic plus development traffic)
Analysis Time Periods	• Weekday AM peak hour • Weekday PM peak hour
Analysis Intersections ("Study Area")	• Highway 124 and 8th Line • Highway 124 and Delarmbro Drive

1.3 Intersection Analysis Methodology

Intersection operations were assessed for intersections in the study area using the software program Synchro 9, which employs methodology from the *Highway Capacity Manual (HCM2000 and HCM2010)*, published by the Transportation Research Board National Research Council. Synchro 9 can analyze both signalized and unsignalized intersections in a road corridor or network, taking into account the spacing, interaction, queues, and operations between intersections. This analysis has utilized the HCM2000 methodology.

The two-way and all-way unsignalized intersection analysis considers two separate measures of performance:

- The capacity of the intersection's critical movements, which is based on a volume-to-capacity ratio ("v/c ratio").
- The level of service ("LOS") for the critical movements, which is based on the average control delay per vehicle for the various critical movements within the intersection. The relationship between LOS and delay (in seconds) for unsignalized intersections is summarized in Table 1.

Table 1: Level of Service Criteria for Unsignalized Intersections

Level of Service	Control Delay per Vehicle (seconds)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

2.0 Existing Conditions

2.1 Site Context

The Town of Erin had a population of 11,439 as of 2016, an increase of approximately 6.2% between 2011 and 2016 (Statistics Canada).

To the north, the property is bounded by environmental protection and agricultural lands. To the west, the property is bounded by 8th Line. To the east, the property is bounded by agricultural lands. To the south, the property is bounded by a residential subdivision consisting of single detached residential lots along Delarmbro Drive and Forest Ridge Road.

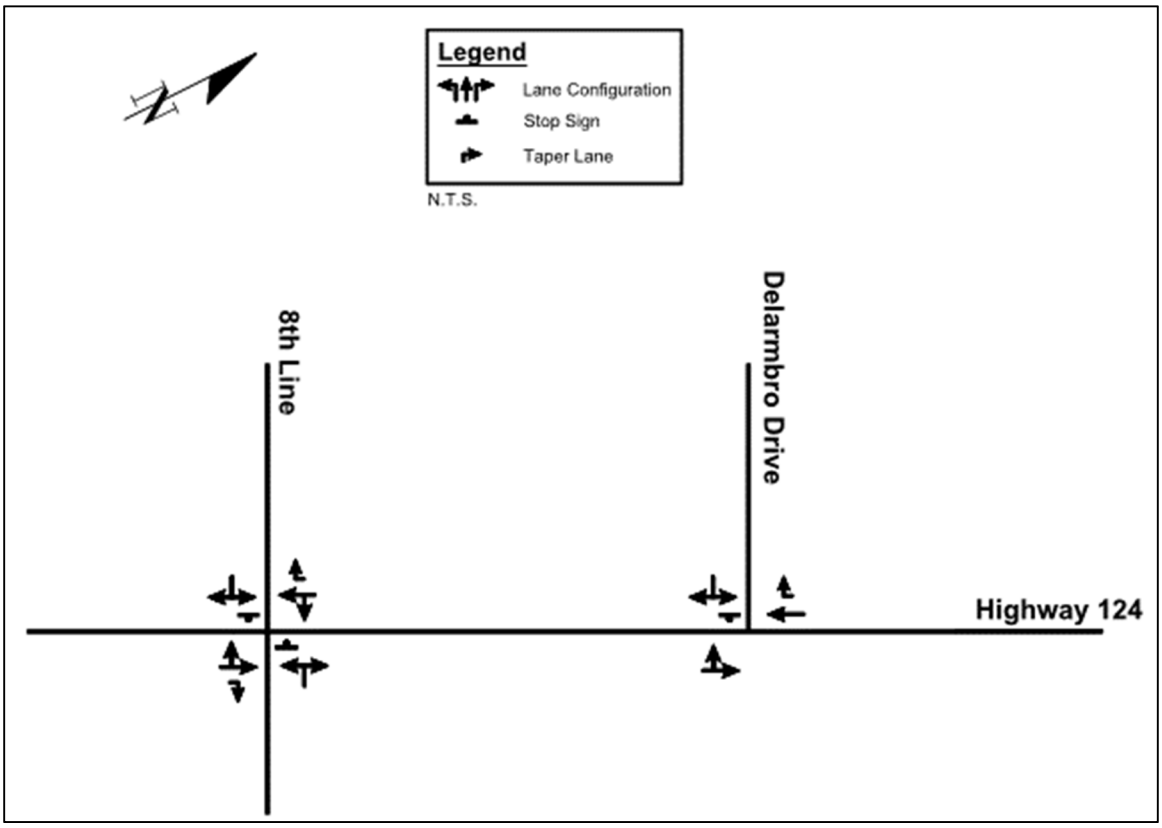
2.2 Existing Road Network

The existing road network ("Study Area") is described below.

Highway 124	Highway 124 is a County road under the jurisdiction of the County of Wellington. The road has a posted speed limit of 60 km/h and consists of a two-lane rural cross section. The posted speed increases to 80 km/h just east of 8th Line. Neither sidewalks nor bicycle lanes exist. For the purposes of this TIB, Highway 124 is considered to run east-west.
8th Line	8th Line is a local road under the jurisdiction of the Town. The road has a posted speed limit of 40 km/h and consists of a two-lane rural cross section. Neither sidewalks nor bicycles exist. For the purposes of this TIB, 8th Line is considered to run north-south.
Delarmbro Drive	Delarmbro Drive is a local road under the jurisdiction of the Town. The road has a posted speed limit of 40 km/h and consists of a two-lane urban cross section. Neither sidewalks nor bicycles exist. For the purposes of this TIB, Delarmbro Drive is considered to run north-south.

Delarmbro Drive forms an unsignalized T-intersection with Highway 124. Highway 124 forms a four-leg unsignalized intersection with 8th Line. Figure 2 depicts the existing lane configurations and traffic controls in the Study Area.

Figure 2: Existing Study Area Lane Configurations and Traffic Controls



2.3 Existing Transit Services

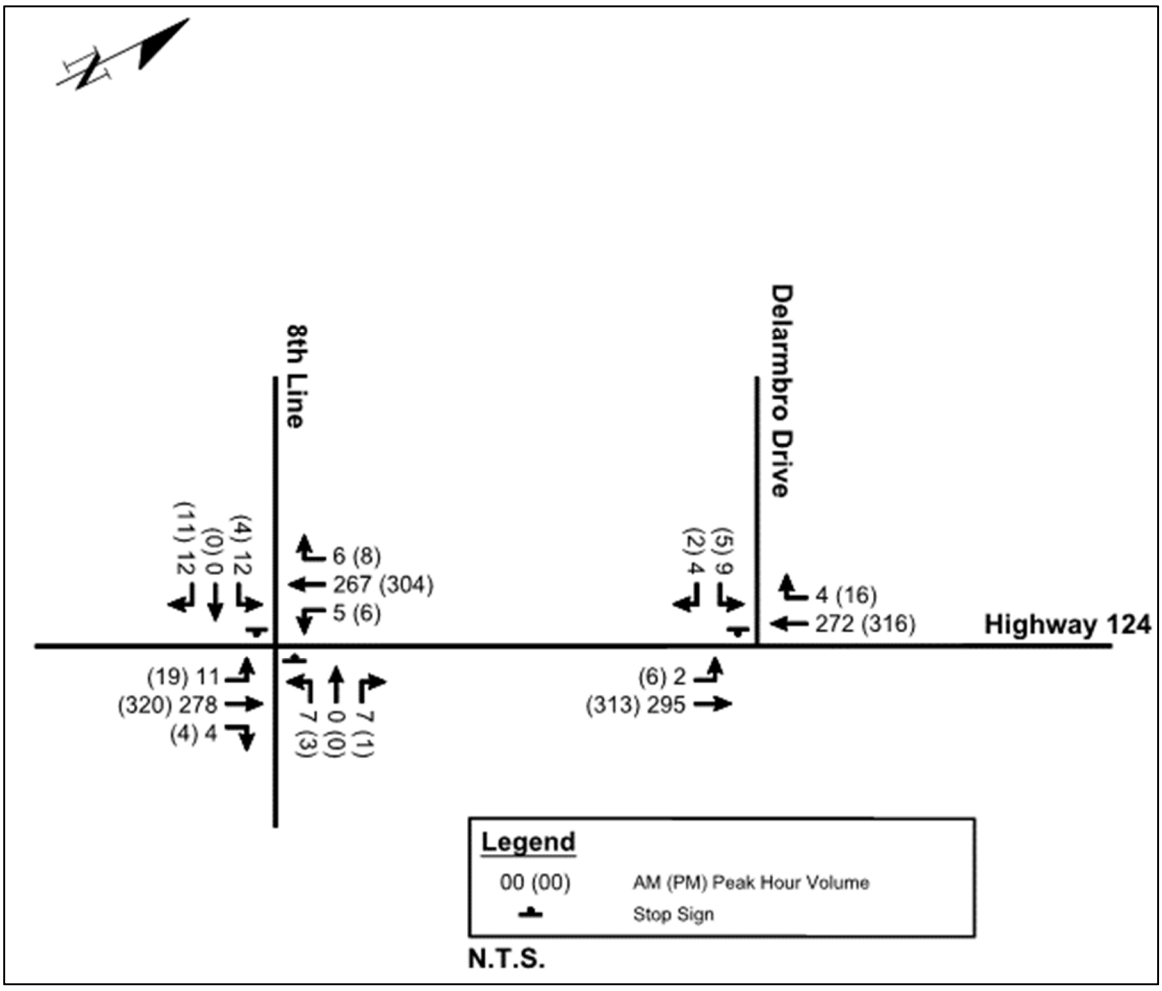
A municipal-operated transit service does not exist within the Town. However, Denny Bus Lines Ltd. provides transit service on Thursdays to and from the Town of Erin, City of Guelph, and Town of Orangeville.

2.4 Existing Traffic Volumes

Burnside's sub-consultant Ontario Traffic Inc. conducted Turning Movement Counts ("TMCs") at the Study Area intersections on Tuesday, March 5, 2019. The TMCs were conducted during the morning peak period (7:00 AM to 9:00 AM) and the afternoon peak period (3:00 PM to 6:00 PM). The weekday morning and afternoon peak periods were selected as these are the typical peak traffic periods for residential developments.

The existing traffic volumes during the weekday AM and PM peak hours are illustrated in Figure 3. The traffic count data collected by Ontario Traffic Inc. is provided in Appendix A.

Figure 3: Existing Traffic Volumes



3.0 Future Background Conditions

Future background traffic consists of existing traffic, background traffic growth, and traffic from other developments within the vicinity of the proposed development (if any). For the purposes of this study, it is assumed that the proposed development will be fully built-out and occupied by 2026. Based on that assumption, a five-year horizon year after build-out (i.e., 2031) was selected for future traffic projections and analysis.

3.1 Background Developments

No proposed background developments were identified within the immediate Study Area.

3.2 Background Traffic Growth

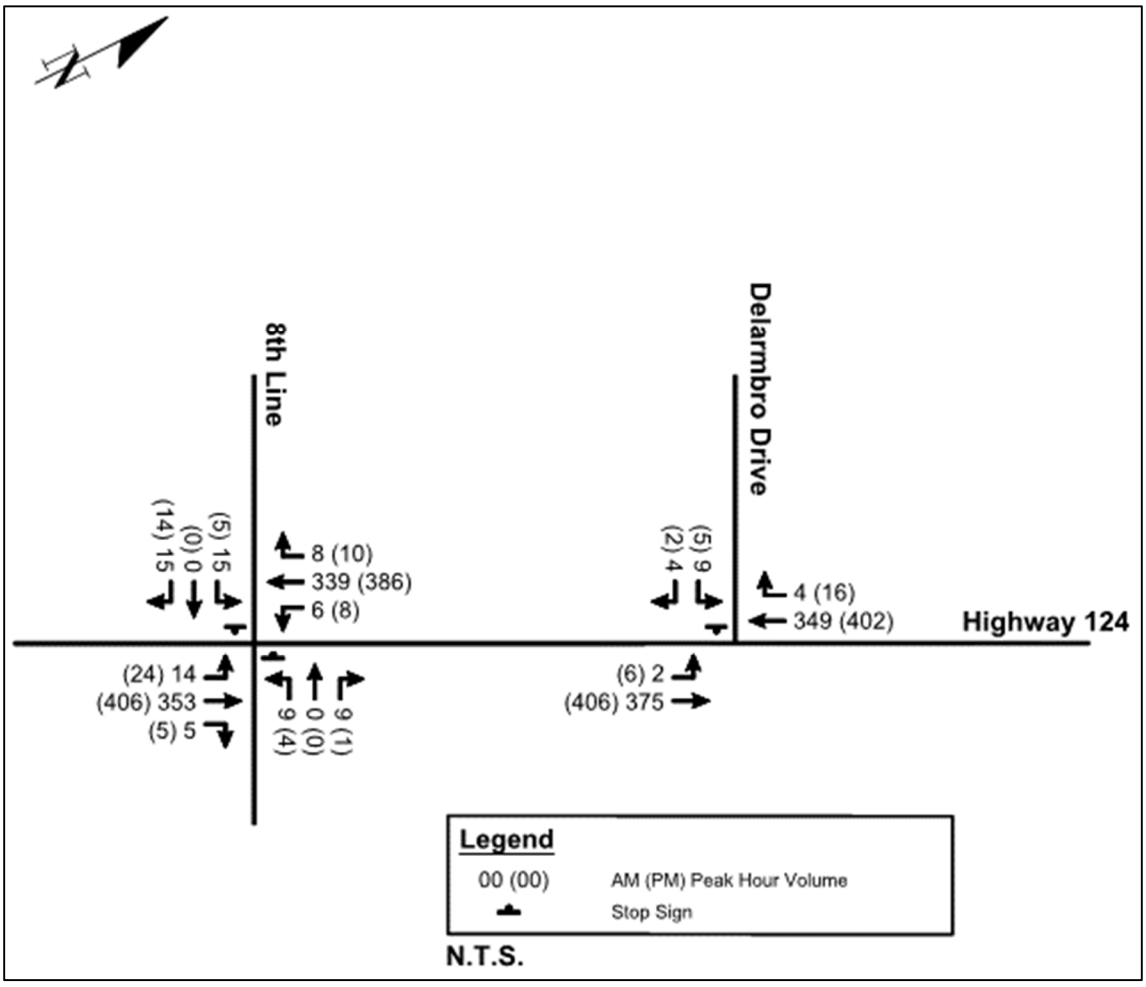
Burnside has applied a 2.0% Compound Annual Growth Rate (CAGR) to traffic volumes on Highway 124 and 8th Line.

Based on traffic data supplied by the County of Wellington, traffic volumes on Highway 124 (at a location 1.0 km southwest of Wellington Road 52) increased from 7,455 vehicles per day (vpd) in 2008 to 8,768 vpd in 2017. This represents a CAGR of approximately 1.8% between 2008 and 2017. Therefore, the application of a 2.0% CAGR to the traffic volumes on Highway 124 is considered conservative.

3.3 Future Background Traffic Volumes

Background traffic volumes consist of the application of traffic growth per annum (up to horizon year 2031) to the existing traffic volumes. The resulting traffic volumes are illustrated in Figure 4.

Figure 4: 2031 Background Traffic Volumes



3.4 Future Road Network

No road network improvements in the Study Area have been identified through horizon year 2031. Staff at the County of Wellington have confirmed that in the 10-year capital program there are no proposed changes to Highway 124 (in the Study Area).

4.0 Proposed Development

4.1 Draft Plan

The proposed development will consist of 33 single detached residential lots. The Draft Plan of Subdivision is illustrated in Figure 5.

As shown in Figure 5, access to the development will be provided via Forest Ridge Road.

4.2 Development Traffic Generation

Site generated traffic volumes from the proposed development have been estimated based on trip rate information contained in the *Trip Generation Manual 10th Edition* (Institute of Transportation Engineers [ITE], September 2017). The "Single-Family Detached Housing" (Land Use Code 210) was utilized and the resulting trips are summarized in Table 2.

Table 2: Forecast Trip Generation from Proposed Development

ITE Land Use Code	Proposed Number of Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
210	33	7	21	28	22	13	35

As shown in Table 2, the total new trip generation (two-way) for the proposed development is forecast to be 28 and 35 vehicles in the weekday AM and PM peak hours, respectively.

4.3 Trip Distribution and Assignment

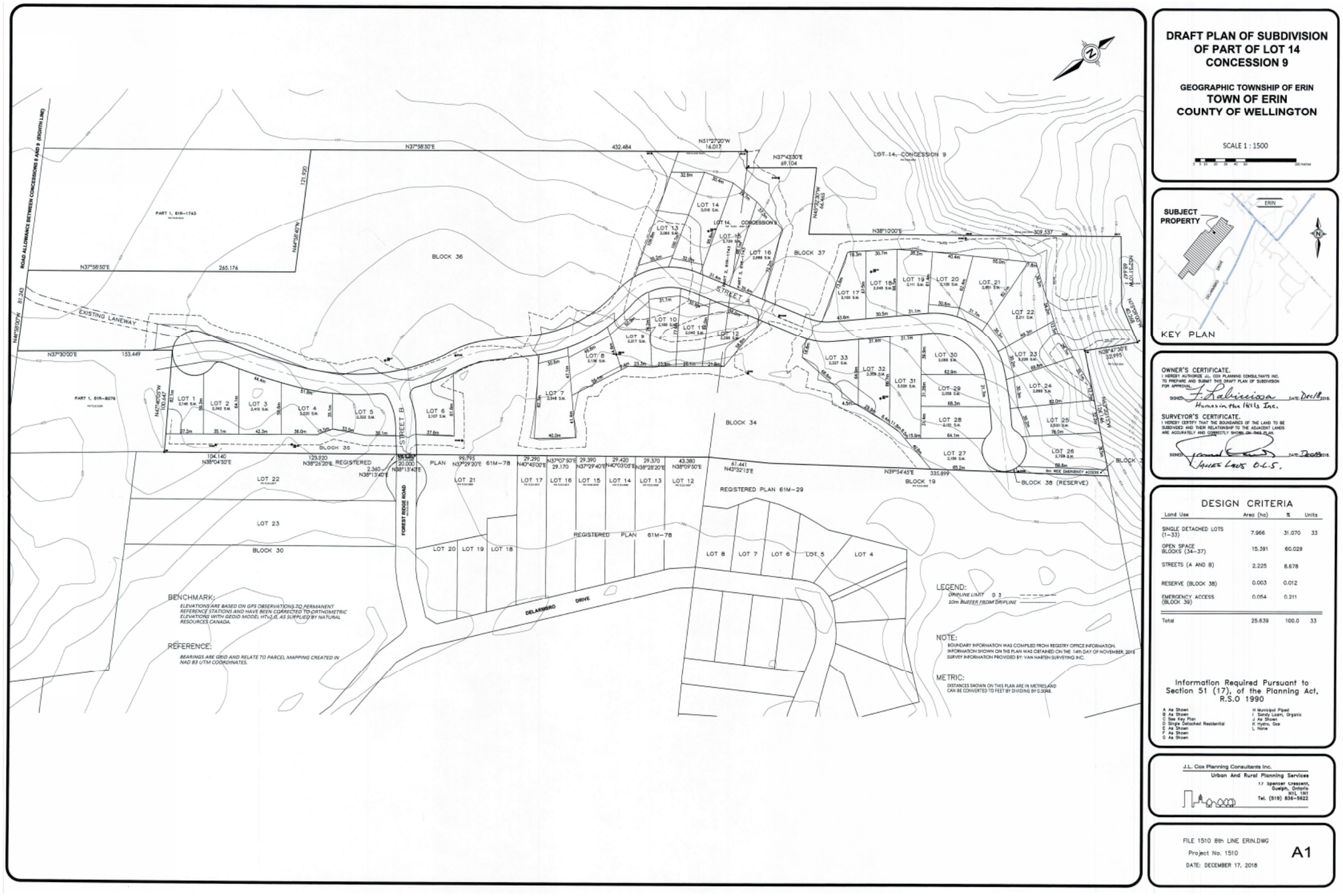
The forecast development traffic has been distributed over the road network according to the logical routing of traffic to/from the development and the existing turning movement data, as shown in Figure 3.

Table 3 summarizes the trip distribution applied in this study.

Table 3: Trip Distribution of Development Traffic

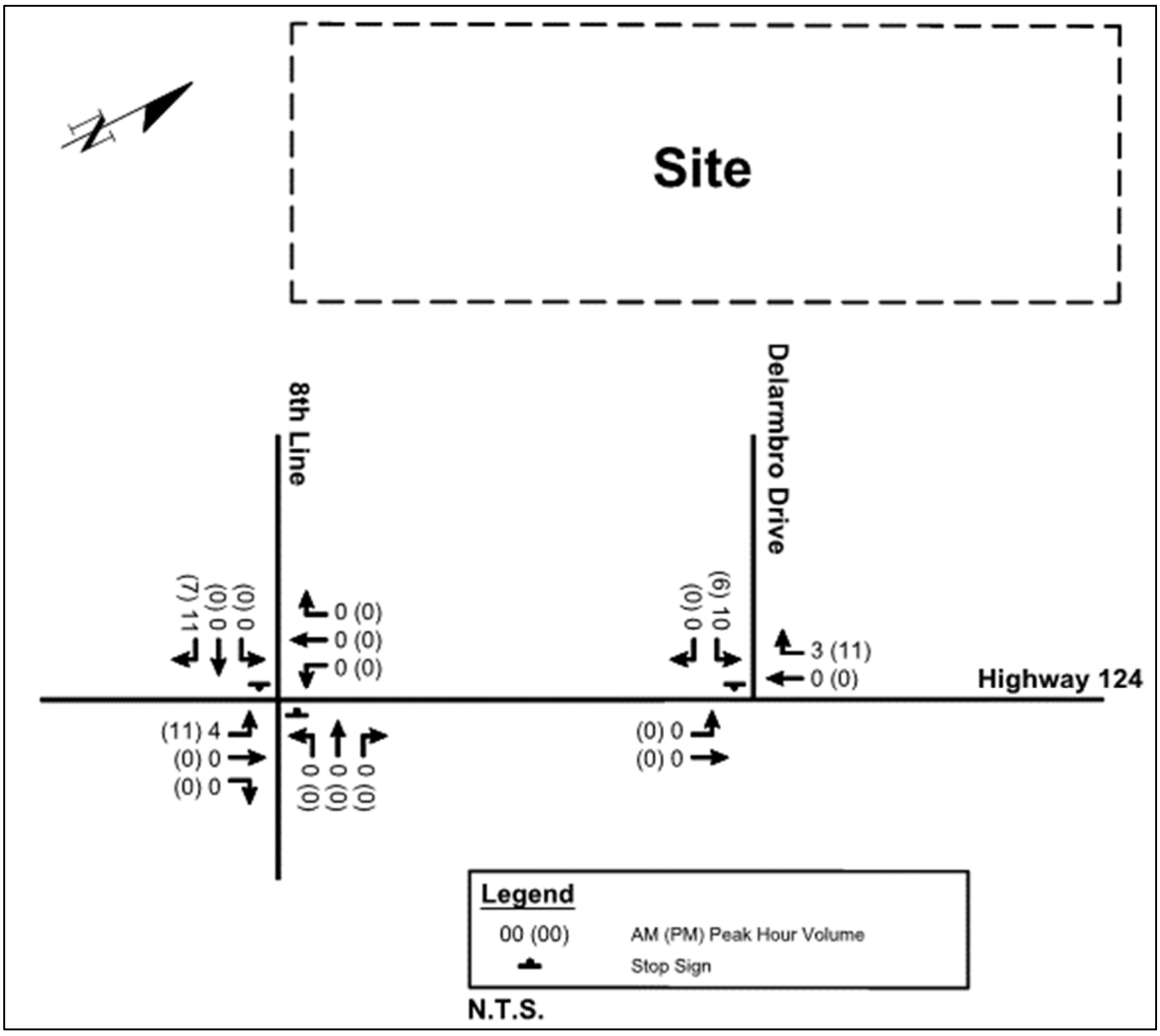
Direction	Via	Weekday AM Peak Hour		Weekday PM Peak Hour	
		In	Out	In	Out
West	Highway 124	50%	50%	50%	50%
East		50%	50%	50%	50%
Total		100%	100%	100%	100%

Figure 5: Draft Plan of Subdivision



The forecast turning movement volumes from the proposed development are illustrated in Figure 6.

Figure 6: Forecast Development Traffic Volumes

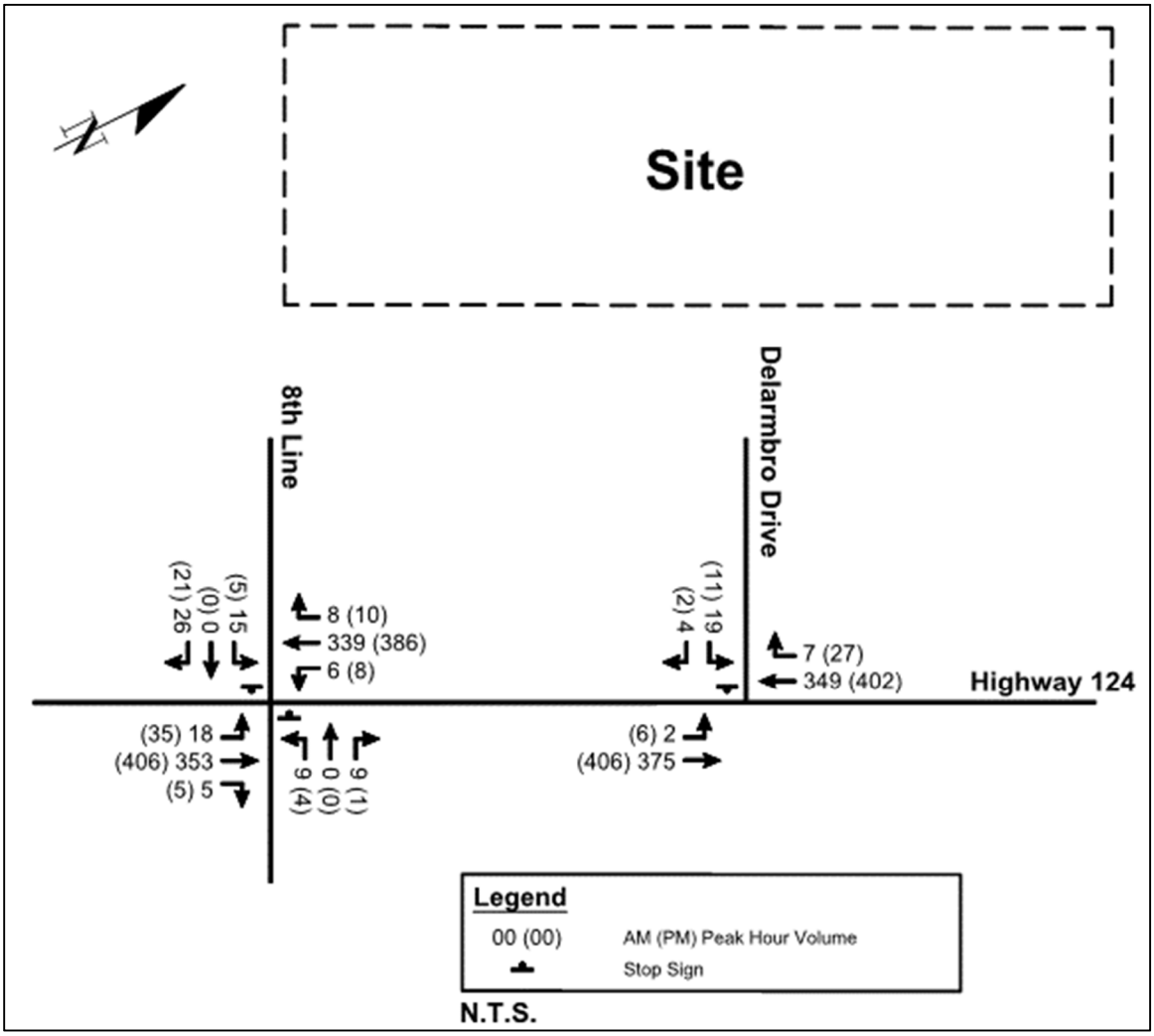


5.0 Future Total Conditions

5.1 2031 Total Traffic Volumes

The development traffic is added to the background traffic to obtain the forecasted total turning movement volumes. The forecast 2031 total traffic volumes (weekday AM and PM peak hours) are summarized in Figure 7.

Figure 7: 2031 Total Traffic Volumes



6.0 Traffic Operations Analysis

6.1 Existing Traffic Operations

Existing traffic operations were assessed at both intersections in the Study Area, based on the lane configurations shown in Figure 2 and the traffic volumes shown in Figure 3. The existing Synchro analyses are included in Appendix B, and the results are summarized in Table 4.

Table 4: Existing Traffic Operations

Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
	v/c	LOS	v/c	LOS
Highway 124 & 8th Line				
Eastbound Left-Through	0.01	A	0.02	A
Eastbound Right	0.00	A	0.00	A
Westbound Left-Through	0.01	A	0.01	A
Westbound Right	0.00	A	0.01	A
Northbound Left-Through-Right	0.04	B	0.01	C
Southbound Left-Through-Right	0.06	B	0.03	B
Highway 124 & Delarmbro Drive				
Eastbound Through-Left	0.00	A	0.01	A
Westbound Through	0.20	A	0.21	A
Westbound Right	0.00	A	0.01	A
Southbound Left-Right	0.04	B	0.02	B

Note: v/c = volume to capacity ratio, LOS = Level of Service

As shown in Table 4, all movements at both intersections in the Study Area are operating with excess capacity and a LOS C or better. Therefore, existing traffic operations in the Study Area are considered acceptable.

6.2 Background Traffic Operations

Based on the 2031 background traffic volumes shown in Figure 4, operations were assessed and are summarized below in Table 5. Detailed Synchro reports for the 2031 background traffic conditions are provided in Appendix C.

Table 5: 2031 Background Traffic Operations

Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
	v/c	LOS	v/c	LOS
Highway 124 & 8th Line				
Eastbound Left-Through	0.02	A	0.02	A
Eastbound Right	0.00	A	0.00	A
Westbound Left-Through	0.01	A	0.01	A
Westbound Right	0.01	A	0.01	A
Northbound Left-Through-Right	0.07	C	0.02	C
Southbound Left-Through-Right	0.10	C	0.04	B
Highway 124 & Delarmbro Drive				
Eastbound Through-Left	0.00	A	0.01	A
Westbound Through	0.26	A	0.27	A
Westbound Right	0.00	A	0.01	A
Southbound Left-Right	0.05	C	0.02	C

As shown in Table 5, all movements at both intersections in the Study Area are operating with excess capacity and a LOS C or better. Therefore, 2031 background traffic operations in the Study Area are considered acceptable.

6.3 Total Traffic Operations

Based on the 2031 total traffic volumes shown in Figure 7, intersection operations were assessed and are summarized in Table 6. Detailed Synchro reports for the 2031 total traffic conditions are provided in Appendix D.

Table 6: 2031 Total Traffic Operations

Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
	v/c	LOS	v/c	LOS
Highway 124 & 8th Line				
Eastbound Left-Through	0.02	A	0.03	A
Eastbound Right	0.00	A	0.00	A
Westbound Left-Through	0.01	A	0.01	A
Westbound Right	0.01	A	0.01	A
Northbound Left-Through-Right	0.07	C	0.02	C
Southbound Left-Through-Right	0.13	C	0.06	B
Highway 124 & Delarmbro Drive				
Eastbound Through-Left	0.00	A	0.01	A
Westbound Through	0.26	A	0.27	A
Westbound Right	0.01	A	0.02	A
Southbound Left-Right	0.09	C	0.05	C

As shown in Table 6, all movements at both intersections in the Study Area are operating with excess capacity and a LOS C or better. Therefore, 2031 total traffic operations in the Study Area are considered acceptable.

7.0 Traffic Impacts at Intersection of Delarmbro Drive and Forest Ridge Road

7.1 Traffic Volumes and Intersection Control

As outlined in Section 4.2, the proposed development is forecast to generate only 28 and 35 vehicles (two-way) during the AM and PM peak hours, respectively. The five existing homes with driveways on Forest Ridge Road generate 4 and 6 during the AM and PM peak hours, respectively, according to trip generation rates in the *Trip Generation Manual 10th Edition* (ITE, September 2017). The only access (excluding emergency) to the proposed development is via Forest Ridge Road. Therefore, it is forecast that the maximum two-way traffic driving on Forest Ridge Road during the AM and PM peak hours is 32 and 41, respectively.

The theoretical capacity of a two-lane local road is 500 vehicles per hour per lane (vphpl), thus suggesting that the theoretical capacity on Forest Ridge Road is approximately 1,000 vph (i.e., accounting for two lanes). Based on the forecasted traffic volumes outlined above, the traffic volumes on Forest Ridge Road will only be approximately 3% and 4% of the road's theoretical capacity during the AM and PM peak hours, respectively. Therefore, the traffic being added to Forest Ridge Road is minimal and well within the roads capacity.

Forest Ridge Road is currently stop-controlled at its intersection with Delarmbro Drive. Given the very low volumes forecasted on Forest Ridge Road, the existing stop-control configuration is considered acceptable from a traffic operations perspective.

7.2 Sightlines

The posted speed limit on Delarmbro Drive is 40 km/h. Thus, a design speed of 50 km/h has been assumed for this sightline analysis.

The *Geometric Design Guide for Canadian Road* (Transportation Association of Canada, June 2017) specifies a minimum stopping sight distance requirement of 65 metres for a road with a 50 km/h design speed. This sight distance requirement is met at Forest Ridge Road (in both directions on Delarmbro Drive).

8.0 Geometric Considerations

8.1 Site Plan Review

Access to the proposed development will be provided via Forest Ridge Road. The internal roads will have a 20-metre right-of-way width.

An existing laneway to the east of 8th Line will connect to the westernmost cul-de-sac within the proposed development. Also, a 6-metre-wide dedicated emergency access Block is also provided for a future connection to the easternmost cul-de-sac in the southeast corner of the development.

8.2 Turn Lane Requirements

8.2.1 Left-Turn Lane Review

The warrant for left-turn lanes at the Study Area intersections have been assessed based on Ministry of Transportation Ontario ("MTO") nomographs contained in the *Geometric Design Standards for Ontario Highways ("GDSOH")* (MTO, 1991). The analysis at the intersection of Highway 124 & 8th Line is based on a 100 km/h design speed on Highway 124, since an 80 km/h posted speed commences just east of the intersection. The analysis at the intersection of Highway 124 & Delarmbro Drive is based on an 80 km/h design speed since the posted speed in this area is 60 km/h.

The results of the left-turn lane analysis under existing, 2031 background, and 2031 total traffic conditions are summarized below in Table 7, Table 8, and Table 9, respectively. The left-turn lane warrants are also depicted visually in the nomographs contained in Appendix E.

Table 7: Left-Turn Lane Warrants Under Existing Conditions

Location: Highway 124 & 8th Line				
Design Speed = 100 km/h	**Time Period = 2019 Existing Traffic**			
Approach Direction	**Eastbound**		**Westbound**	
Peak Hours	Morning	Afternoon	Morning	Afternoon
Advancing Traffic	293	343	278	318
Opposing Traffic	278	318	293	343
Left Turning Traffic	11	19	5	6
Percentage of Left Turning Traffic	3.8%	5.5%	1.8%	1.9%
Figure Used from *GDSOH* (MTO, 1991)	EA-22	EA-22	EA-22	EA-22
Storage Length Required	**15 metres**		**0 metres**	

Location: Highway 124 & Delarmbro Drive		
Design Speed = 80 km/h	**Time Period = 2019 Existing Traffic**	
Approach Direction	**Eastbound**	
Peak Hours	Morning	Afternoon
Advancing Traffic	297	319
Opposing Traffic	276	332
Left Turning Traffic	2	6
Percentage of Left Turning Traffic	0.7%	1.9%
Figure Used from *GDSOH* (MTO, 1991)	EA-14	EA-14
Storage Length Required	**0 metres**	**0 metres**

Based on the above analysis, an eastbound left-turn lane with a 15-metre storage length is warranted under existing conditions at the Highway 124 and 8th Line intersection. No other left-turn lanes are warranted under existing conditions.

Table 8: Left-Turn Lane Warrants Under 2031 Background Traffic Conditions

Location: Highway 124 & 8th Line				
Design Speed = 100 km/h	**Time Period = 2031 Background Traffic**			
Approach Direction	**Eastbound**		**Westbound**	
Peak Hours	Morning	Afternoon	Morning	Afternoon
Advancing Traffic	372	435	353	404
Opposing Traffic	353	404	372	435
Left Turning Traffic	14	24	6	8
Percentage of Left Turning Traffic	3.8%	5.5%	1.7%	2.0%
Figure Used from *GDSOH* (MTO, 1991)	EA-22	EA-22	EA-22	EA-22
Storage Length Required	**25 metres**		**15 metres**	

Location: Highway 124 & Delarmbro Drive		
Design Speed = 80 km/h	**Time Period = 2031 Background Traffic**	
Approach Direction	**Eastbound**	
Peak Hours	Morning	Afternoon
Advancing Traffic	377	412
Opposing Traffic	353	418
Left Turning Traffic	2	6
Percentage of Left Turning Traffic	0.5%	1.5%
Figure Used from *GDSOH* (MTO, 1991)	EA-14	EA-14
Storage Length Required	**0 metres**	**0 metres**

Table 9: Left-Turn Lane Warrants Under 2031 Total Traffic Conditions

Location: Highway 124 & 8th Line				
Design Speed = 100 km/h	**Time Period = 2031 Total Traffic**			
Approach Direction	**Eastbound**		**Westbound**	
Peak Hours	Morning	Afternoon	Morning	Afternoon
Advancing Traffic	376	446	353	404
Opposing Traffic	353	404	376	446
Left Turning Traffic	18	35	6	8
Percentage of Left Turning Traffic	4.8%	7.8%	1.7%	2.0%
Figure Used from *GDSOH* (MTO, 1991)	EA-22	EA-22	EA-22	EA-22
Storage Length Required	**25 metres**		**15 metres**	

Location: Highway 124 & Delarmbro Drive		
Design Speed = 80 km/h	**Time Period = 2031 Total Traffic**	
Approach Direction	**Eastbound**	
Peak Hours	Morning	Afternoon
Advancing Traffic	377	412
Opposing Traffic	356	429
Left Turning Traffic	2	6
Percentage of Left Turning Traffic	0.5%	1.5%
Figure Used from *GDSOH* (MTO, 1991)	EA-14	EA-14
Storage Length Required	**0 metres**	**0 metres**

Under existing (2019) background traffic conditions the warrants are met for an eastbound left-turn lane (15 metres storage) at the intersection of Highway 124 and 8th Line. The storage requirement for this left-turn lane increases to 25 metres under 2031 background traffic conditions. Also under 2031 background traffic conditions the warrants are met for a westbound left-turn lane (15 metres storage). The addition of the traffic from the proposed development does not change these requirements.

Under 2031 total traffic conditions the warrants are not met for an eastbound left-turn lane at the intersection of Highway 124 and Delarmbro Drive.

Traffic generation from the proposed 33 residential units is forecast to be minimal and the need for left-turn lanes at the intersection of Highway 124 and 8th Line primarily results from the existing background traffic and assumed growth of this background traffic, rather than from development traffic. Since the traffic growth assumptions made in this TIB may not be realized, it is recommended that the County of Wellington monitor traffic volumes and operations at the intersection of Highway 124 / 8th Line to confirm if, or when, left-turn lanes are implemented.

8.2.2 Right-Turn Lane Review

It is noted in the Geometric Design Standards for Ontario Highways that right-turn lanes or tapers may be considered where right-turn volumes exceed 60 vehicles per hour ("vph") and where right-turning vehicles create a hazard or reduce capacity at an intersection.

Right-turn tapers exist on the eastbound and westbound approaches to the 8th Line/Highway 124 intersection and on the westbound approach to the Delarmbro Drive/Highway 124 intersection. Based on the 2031 total right-turning volumes, the existing right-turn tapers at the Study Area intersections are considered sufficient through horizon year 2031.

9.0 Active Transportation Considerations

Neither sidewalks nor bicycle lanes exist on any roads in the Study Area. As indicated in the traffic data contained in Appendix A, pedestrian volumes at the Study Area intersections are minimal (i.e., only one pedestrian is observed at the Highway 124 and Delarmbro Drive intersection during the PM peak hour).

In the Wellington County Active Transportation Plan (MMM Group, September 2012), Highway 124, 8th Line, and Delarmbro Drive do not have any existing or proposed pedestrian facilities or bicycle routes (in the Study Area). Given the rural location of this subdivision it is expected that external pedestrian/cyclist travel will be minimal.

10.0 Conclusions and Recommendations

Based on the analysis completed, the following primary conclusions and recommendations are made in this TIB:

- It is forecast that the proposed development will generate 28 and 35 vehicles in the weekday AM and PM peak hours, respectively.
- Under existing conditions, all movements at both intersections in the Study Area operate with excess capacity and a LOS C or better.
- Under 2031 background conditions, all movements at both intersections in the Study Area are forecast to operate with excess capacity and a LOS C or better.
- Under 2031 total conditions, all movements at both intersections in the Study Area are forecast to operate with excess capacity and a LOS C or better.
- The intersections of Highway 124 / 8th Line and Highway 124 / Delarmbro Drive are forecast to operate acceptably through horizon year 2031.
- Forest Ridge Road is forecast to operate well within its capacity through horizon year 2031.
- The existing stop-control on the Forest Ridge Road approach to Delarmbro Drive is considered acceptable through horizon year 2031.
- The minimum stopping sight distance on Forest Ridge Road is acceptable (in both directions on Delarmbro Drive).
- Access to the development will be provided via Forest Ridge Road. A 6-metre-wide dedicated emergency access Block is provided at the easternmost cul-de-sac in the southeast corner of the development, for potential future connection through the lands to the east. Also, an existing laneway is proposed to connect 8th Line to the westernmost cul-de-sac. These measures are considered to adequately meet emergency access requirements.
- An eastbound left-turn lane with a 15-metre storage length is warranted under existing conditions at the Highway 124 and 8th Line intersection.
- Under 2031 background conditions, at the Highway 124 and 8th Line intersection, the warrant criteria are forecasted to be met for an eastbound left-turn lane (25-metre storage length) and for a westbound left-turn lane (15-metre storage length). **The turn-lanes are warranted due to background (i.e., not development) traffic.** It is recommended that the County monitor this intersection to confirm if, or when, left-turn lanes are implemented.
- The warrant criteria are not met for an eastbound left-turn lane at the intersection of Highway 124 and Delarmbro Drive under 2031 total traffic conditions.
- The existing right-turn tapers at the intersections in the Study Area are considered sufficient through horizon year 2031.

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Appendix A

Turning Movement Count (TMC) Data

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

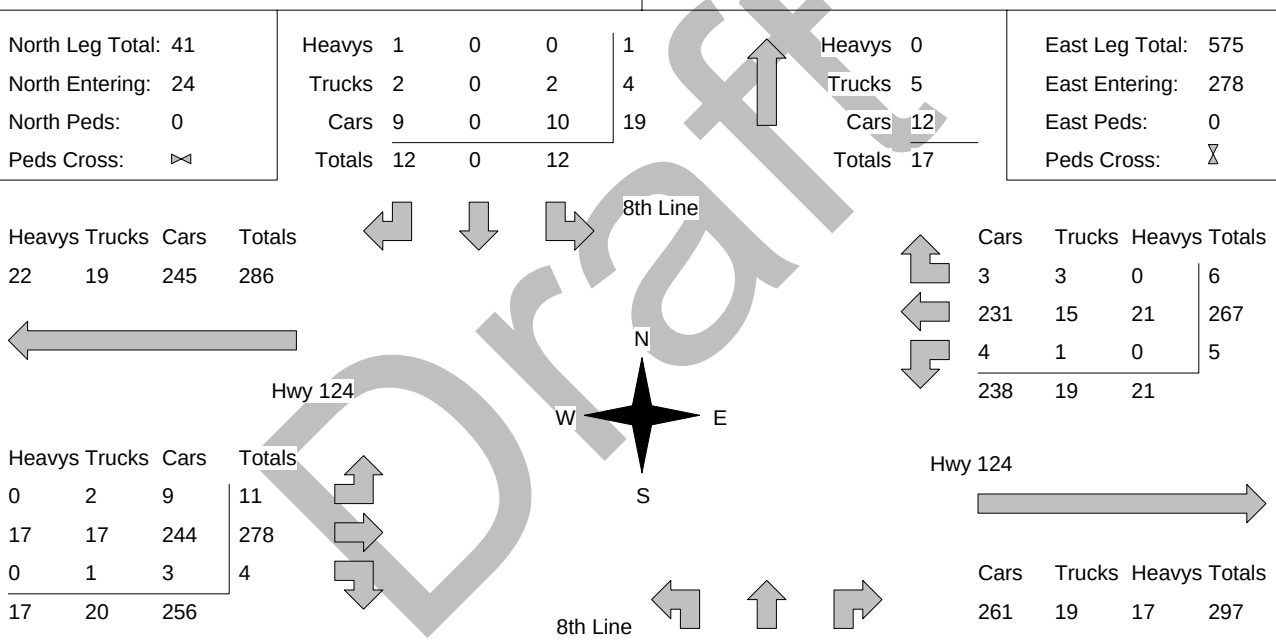
Municipality: Erin
Site #: 1905900001
Intersection: Hwy 124 & 8th Line
TFR File #: 1
Count date: 5-Mar-19

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Hwy 124 runs W/E



Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

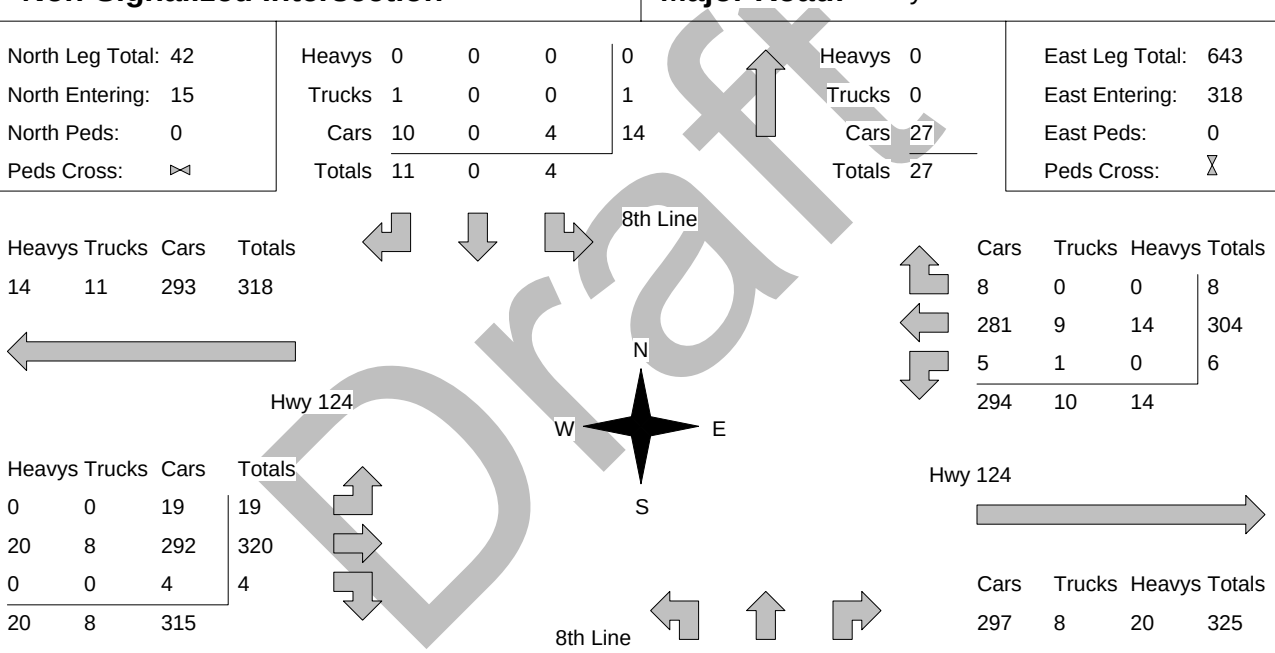
Municipality: Erin
Site #: 1905900001
Intersection: Hwy 124 & 8th Line
TFR File #: 1
Count date: 5-Mar-19

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Hwy 124 runs W/E



Comments

Ontario Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Erin
Site #: 1905900002
Intersection: Hwy 124 & Delarmbro Dr
TFR File #: 13
Count date: 5-Mar-19

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

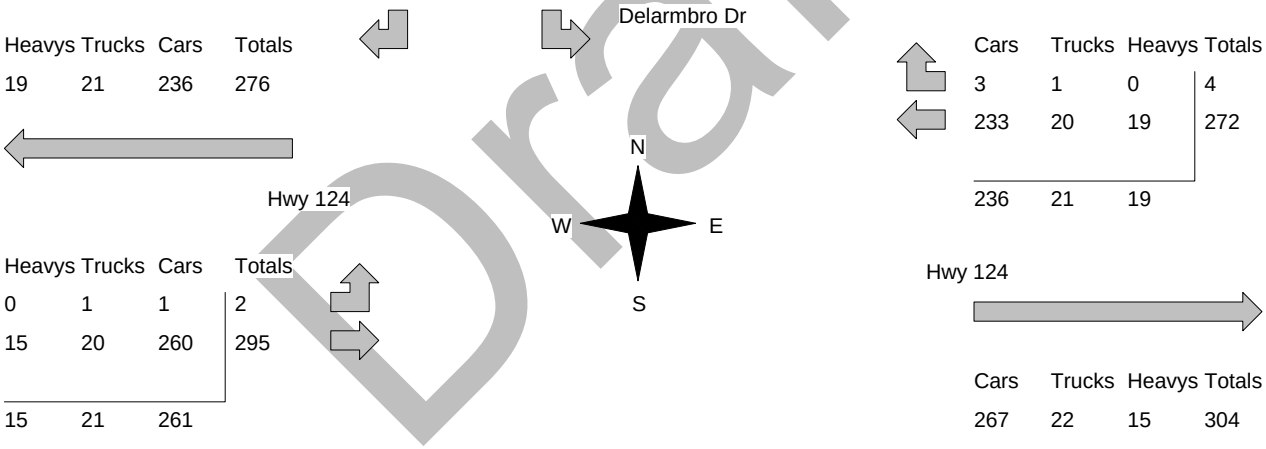
Major Road: Hwy 124 runs W/E

North Leg Total: 19
North Entering: 13
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	1	2	3
Cars	3	7	10
Totals	4	9	

Heavys	0
Trucks	2
Cars	4
Totals	6

East Leg Total: 580
East Entering: 276
East Peds: 0
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 297
West Leg Total: 573

Comments

Ontario Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

Municipality: Erin
Site #: 1905900002
Intersection: Hwy 124 & Delarmbro Dr
TFR File #: 13
Count date: 5-Mar-19

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

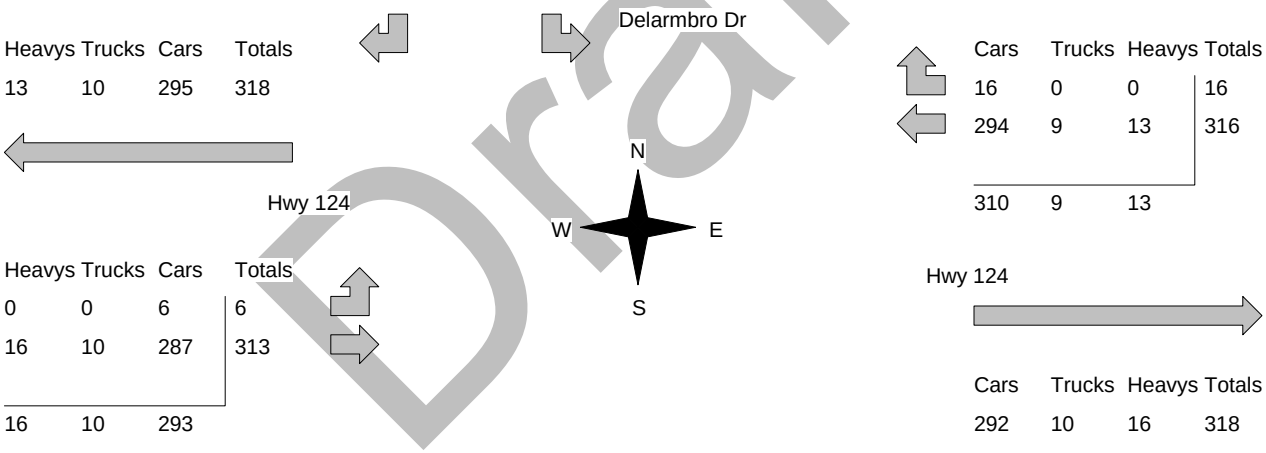
Major Road: Hwy 124 runs W/E

North Leg Total: 29
North Entering: 7
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	1	0	1
Cars	1	5	6
Totals	2	5	

Heavys 0
Trucks 0
Cars 22
Totals 22

East Leg Total: 650
East Entering: 332
East Peds: 1
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 0
West Entering: 319
West Leg Total: 637

Comments

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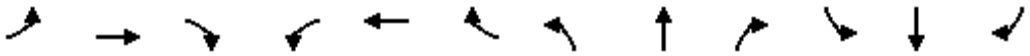
Appendix B

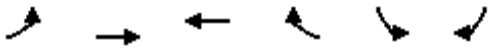
Existing Traffic Operations (Synchro Reports)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	278	4	5	267	6	7	0	7	12	0	12
Future Volume (Veh/h)	11	278	4	5	267	6	7	0	7	12	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	13	331	5	6	318	7	8	0	8	14	0	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	325			336			701	694	331	695	692	318
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	325			336			701	694	331	695	692	318
tC, single (s)	4.3			4.3			7.4	6.5	6.2	7.3	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.8	4.0	3.3	3.7	4.0	3.5
p0 queue free %	99			99			97	100	99	96	100	98
cM capacity (veh/h)	1150			1129			310	360	715	330	361	672

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	344	5	324	7	16	28
Volume Left	13	0	6	0	8	14
Volume Right	0	5	0	7	8	14
cSH	1150	1700	1129	1700	432	442
Volume to Capacity	0.01	0.00	0.01	0.00	0.04	0.06
Queue Length 95th (m)	0.3	0.0	0.1	0.0	0.9	1.5
Control Delay (s)	0.4	0.0	0.2	0.0	13.7	13.7
Lane LOS	A		A		B	B
Approach Delay (s)	0.4		0.2		13.7	13.7
Approach LOS					B	B

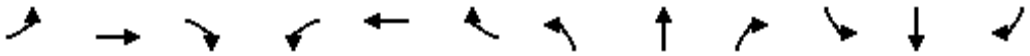
Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	33.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	295	272	4	9	4
Future Volume (Veh/h)	2	295	272	4	9	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	3	369	340	5	11	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	345				715	340
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	345				715	340
tC, single (s)	4.6				6.6	6.5
tC, 2 stage (s)						
tF (s)	2.7				3.7	3.5
p0 queue free %	100				97	99
cM capacity (veh/h)	990				368	653

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	372	340	5	16
Volume Left	3	0	0	11
Volume Right	0	0	5	5
cSH	990	1700	1700	426
Volume to Capacity	0.00	0.20	0.00	0.04
Queue Length 95th (m)	0.1	0.0	0.0	0.9
Control Delay (s)	0.1	0.0	0.0	13.8
Lane LOS	A			B
Approach Delay (s)	0.1	0.0		13.8
Approach LOS				B

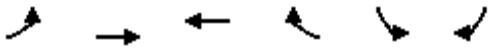
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	320	4	6	304	8	3	0	1	4	0	11
Future Volume (Veh/h)	19	320	4	6	304	8	3	0	1	4	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	20	344	4	6	327	9	3	0	1	4	0	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	336			348			735	732	344	724	727	327
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	336			348			735	732	344	724	727	327
tC, single (s)	4.1			4.3			7.4	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.8	4.0	3.3	3.5	4.0	3.4
p0 queue free %	98			99			99	100	100	99	100	98
cM capacity (veh/h)	1235			1132			289	343	703	337	345	698

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	364	4	333	9	4	16
Volume Left	20	0	6	0	3	4
Volume Right	0	4	0	9	1	12
cSH	1235	1700	1132	1700	339	551
Volume to Capacity	0.02	0.00	0.01	0.01	0.01	0.03
Queue Length 95th (m)	0.4	0.0	0.1	0.0	0.3	0.7
Control Delay (s)	0.6	0.0	0.2	0.0	15.7	11.7
Lane LOS	A		A		C	B
Approach Delay (s)	0.6		0.2		15.7	11.7
Approach LOS					C	B

Intersection Summary				
Average Delay	0.7			
Intersection Capacity Utilization	42.4%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	313	316	16	5	2
Future Volume (Veh/h)	6	313	316	16	5	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	7	360	363	18	6	2
Pedestrians			1			
Lane Width (m)			3.7			
Walking Speed (m/s)			1.1			
Percent Blockage			0			
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	381				738	363
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	381				738	363
tC, single (s)	4.1				6.4	6.7
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.8
p0 queue free %	99				98	100
cM capacity (veh/h)	1189				385	587

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	367	363	18	8
Volume Left	7	0	0	6
Volume Right	0	0	18	2
cSH	1189	1700	1700	422
Volume to Capacity	0.01	0.21	0.01	0.02
Queue Length 95th (m)	0.1	0.0	0.0	0.4
Control Delay (s)	0.2	0.0	0.0	13.7
Lane LOS	A			B
Approach Delay (s)	0.2	0.0		13.7
Approach LOS				B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		

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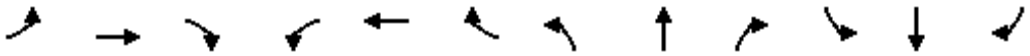
Appendix C

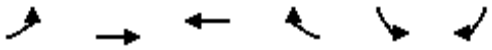
2031 Background Traffic Operations (Synchro Reports)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	353	5	6	339	8	9	0	9	15	0	15
Future Volume (Veh/h)	14	353	5	6	339	8	9	0	9	15	0	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	420	6	7	404	10	11	0	11	18	0	18
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	414			426			890	882	420	883	878	404
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	414			426			890	882	420	883	878	404
tC, single (s)	4.3			4.3			7.4	6.5	6.2	7.3	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.8	4.0	3.3	3.7	4.0	3.5
p0 queue free %	98			99			95	100	98	93	100	97
cM capacity (veh/h)	1064			1043			225	279	638	242	280	600

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	437	6	411	10	22	36
Volume Left	17	0	7	0	11	18
Volume Right	0	6	0	10	11	18
cSH	1064	1700	1043	1700	333	345
Volume to Capacity	0.02	0.00	0.01	0.01	0.07	0.10
Queue Length 95th (m)	0.4	0.0	0.2	0.0	1.6	2.6
Control Delay (s)	0.5	0.0	0.2	0.0	16.6	16.6
Lane LOS	A		A		C	C
Approach Delay (s)	0.5		0.2		16.6	16.6
Approach LOS					C	C

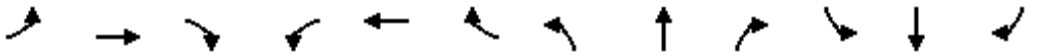
Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	39.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	375	349	4	9	4
Future Volume (Veh/h)	2	375	349	4	9	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	3	469	436	5	11	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	441				911	436
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	441				911	436
tC, single (s)	4.6				6.6	6.5
tC, 2 stage (s)						
tF (s)	2.7				3.7	3.5
p0 queue free %	100				96	99
cM capacity (veh/h)	906				280	575

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	472	436	5	16
Volume Left	3	0	0	11
Volume Right	0	0	5	5
cSH	906	1700	1700	333
Volume to Capacity	0.00	0.26	0.00	0.05
Queue Length 95th (m)	0.1	0.0	0.0	1.1
Control Delay (s)	0.1	0.0	0.0	16.3
Lane LOS	A			C
Approach Delay (s)	0.1	0.0		16.3
Approach LOS				C

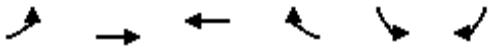
Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	406	5	8	386	10	4	0	1	5	0	14
Future Volume (Veh/h)	24	406	5	8	386	10	4	0	1	5	0	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	26	437	5	9	415	11	4	0	1	5	0	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	426			442			937	933	437	923	927	415
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	426			442			937	933	437	923	927	415
tC, single (s)	4.1			4.3			7.4	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.8	4.0	3.3	3.5	4.0	3.4
p0 queue free %	98			99			98	100	100	98	100	98
cM capacity (veh/h)	1144			1043			206	260	624	246	262	623

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	463	5	424	11	5	20
Volume Left	26	0	9	0	4	5
Volume Right	0	5	0	11	1	15
cSH	1144	1700	1043	1700	237	450
Volume to Capacity	0.02	0.00	0.01	0.01	0.02	0.04
Queue Length 95th (m)	0.5	0.0	0.2	0.0	0.5	1.1
Control Delay (s)	0.7	0.0	0.3	0.0	20.5	13.4
Lane LOS	A		A		C	B
Approach Delay (s)	0.7		0.3		20.5	13.4
Approach LOS					C	B

Intersection Summary				
Average Delay	0.9			
Intersection Capacity Utilization	51.0%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	406	402	16	5	2
Future Volume (Veh/h)	6	406	402	16	5	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	7	467	462	18	6	2
Pedestrians			1			
Lane Width (m)			3.7			
Walking Speed (m/s)			1.1			
Percent Blockage			0			
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	480				944	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	480				944	462
tC, single (s)	4.1				6.4	6.7
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.8
p0 queue free %	99				98	100
cM capacity (veh/h)	1093				291	512

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	474	462	18	8
Volume Left	7	0	0	6
Volume Right	0	0	18	2
cSH	1093	1700	1700	326
Volume to Capacity	0.01	0.27	0.01	0.02
Queue Length 95th (m)	0.1	0.0	0.0	0.6
Control Delay (s)	0.2	0.0	0.0	16.3
Lane LOS	A			C
Approach Delay (s)	0.2	0.0		16.3
Approach LOS				C

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

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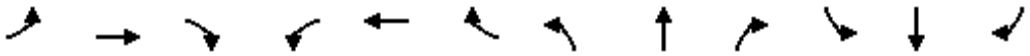
Appendix D

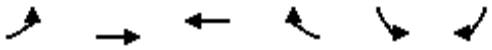
2031 Total Traffic Operations (Synchro Reports)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	353	5	6	339	8	9	0	9	15	0	26
Future Volume (Veh/h)	18	353	5	6	339	8	9	0	9	15	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	21	420	6	7	404	10	11	0	11	18	0	31
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	414			426			911	890	420	891	886	404
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	414			426			911	890	420	891	886	404
tC, single (s)	4.3			4.3			7.4	6.5	6.2	7.3	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.8	4.0	3.3	3.7	4.0	3.5
p0 queue free %	98			99			95	100	98	92	100	95
cM capacity (veh/h)	1064			1043			213	275	638	238	276	600

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	441	6	411	10	22	49
Volume Left	21	0	7	0	11	18
Volume Right	0	6	0	10	11	31
cSH	1064	1700	1043	1700	319	385
Volume to Capacity	0.02	0.00	0.01	0.01	0.07	0.13
Queue Length 95th (m)	0.5	0.0	0.2	0.0	1.7	3.3
Control Delay (s)	0.6	0.0	0.2	0.0	17.1	15.7
Lane LOS	A		A		C	C
Approach Delay (s)	0.6		0.2		17.1	15.7
Approach LOS					C	C

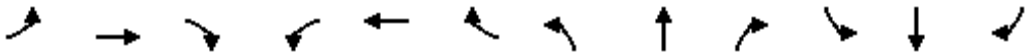
Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	43.2%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	375	349	7	19	4
Future Volume (Veh/h)	2	375	349	7	19	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	3	469	436	9	24	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	445				911	436
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	445				911	436
tC, single (s)	4.6				6.6	6.5
tC, 2 stage (s)						
tF (s)	2.7				3.7	3.5
p0 queue free %	100				91	99
cM capacity (veh/h)	902				280	575

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	472	436	9	29
Volume Left	3	0	0	24
Volume Right	0	0	9	5
cSH	902	1700	1700	307
Volume to Capacity	0.00	0.26	0.01	0.09
Queue Length 95th (m)	0.1	0.0	0.0	2.4
Control Delay (s)	0.1	0.0	0.0	17.9
Lane LOS	A			C
Approach Delay (s)	0.1	0.0		17.9
Approach LOS				C

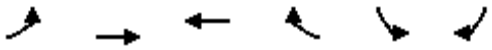
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	406	5	8	386	10	4	0	1	5	0	21
Future Volume (Veh/h)	35	406	5	8	386	10	4	0	1	5	0	21
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	38	437	5	9	415	11	4	0	1	5	0	23
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	426			442			969	957	437	947	951	415
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	426			442			969	957	437	947	951	415
tC, single (s)	4.1			4.3			7.4	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.8	4.0	3.3	3.5	4.0	3.4
p0 queue free %	97			99			98	100	100	98	100	96
cM capacity (veh/h)	1144			1043			191	249	624	235	251	623

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	475	5	424	11	5	28
Volume Left	38	0	9	0	4	5
Volume Right	0	5	0	11	1	23
cSH	1144	1700	1043	1700	222	481
Volume to Capacity	0.03	0.00	0.01	0.01	0.02	0.06
Queue Length 95th (m)	0.8	0.0	0.2	0.0	0.5	1.4
Control Delay (s)	1.0	0.0	0.3	0.0	21.6	12.9
Lane LOS	A		A		C	B
Approach Delay (s)	1.0		0.3		21.6	12.9
Approach LOS					C	B

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	57.4%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	406	402	27	11	2
Future Volume (Veh/h)	6	406	402	27	11	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	7	467	462	31	13	2
Pedestrians			1			
Lane Width (m)			3.7			
Walking Speed (m/s)			1.1			
Percent Blockage			0			
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	493				944	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	493				944	462
tC, single (s)	4.1				6.4	6.7
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.8
p0 queue free %	99				96	100
cM capacity (veh/h)	1081				291	512

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	474	462	31	15
Volume Left	7	0	0	13
Volume Right	0	0	31	2
cSH	1081	1700	1700	309
Volume to Capacity	0.01	0.27	0.02	0.05
Queue Length 95th (m)	0.1	0.0	0.0	1.2
Control Delay (s)	0.2	0.0	0.0	17.2
Lane LOS	A			C
Approach Delay (s)	0.2	0.0		17.2
Approach LOS				C

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

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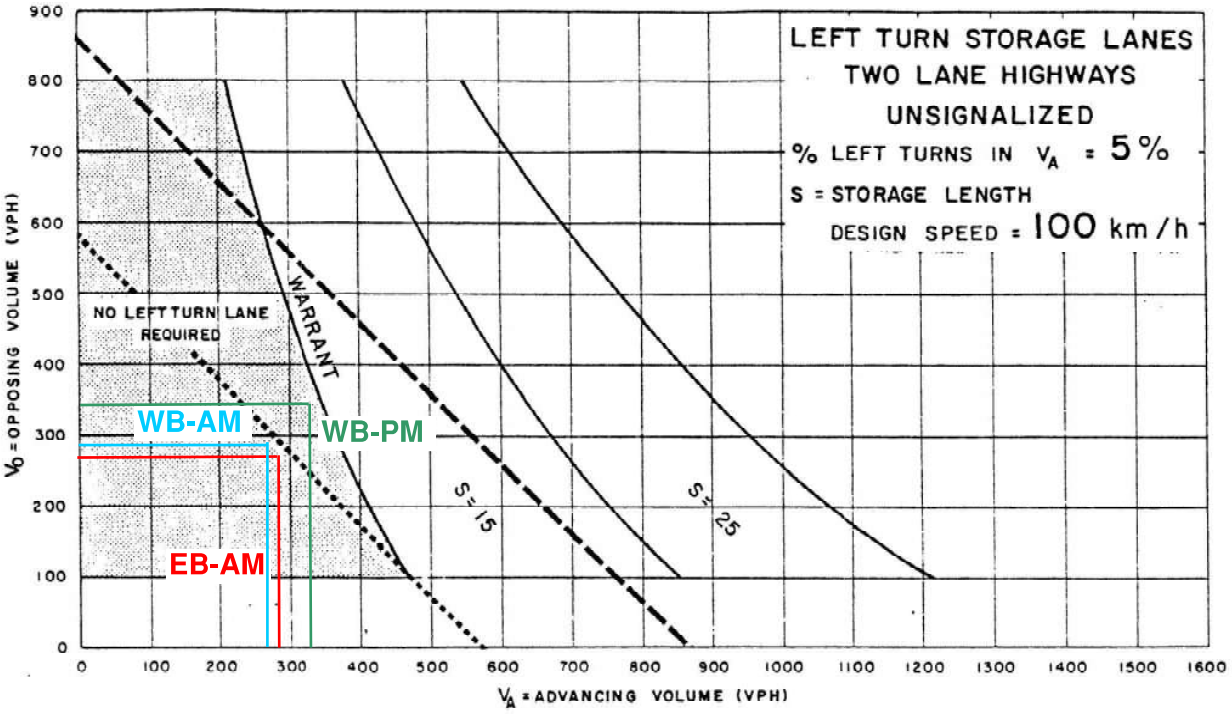
Appendix E

Left-Turn Lane Warrant Nomographs

2019 Existing Traffic - Highway 124 & 8th Line



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

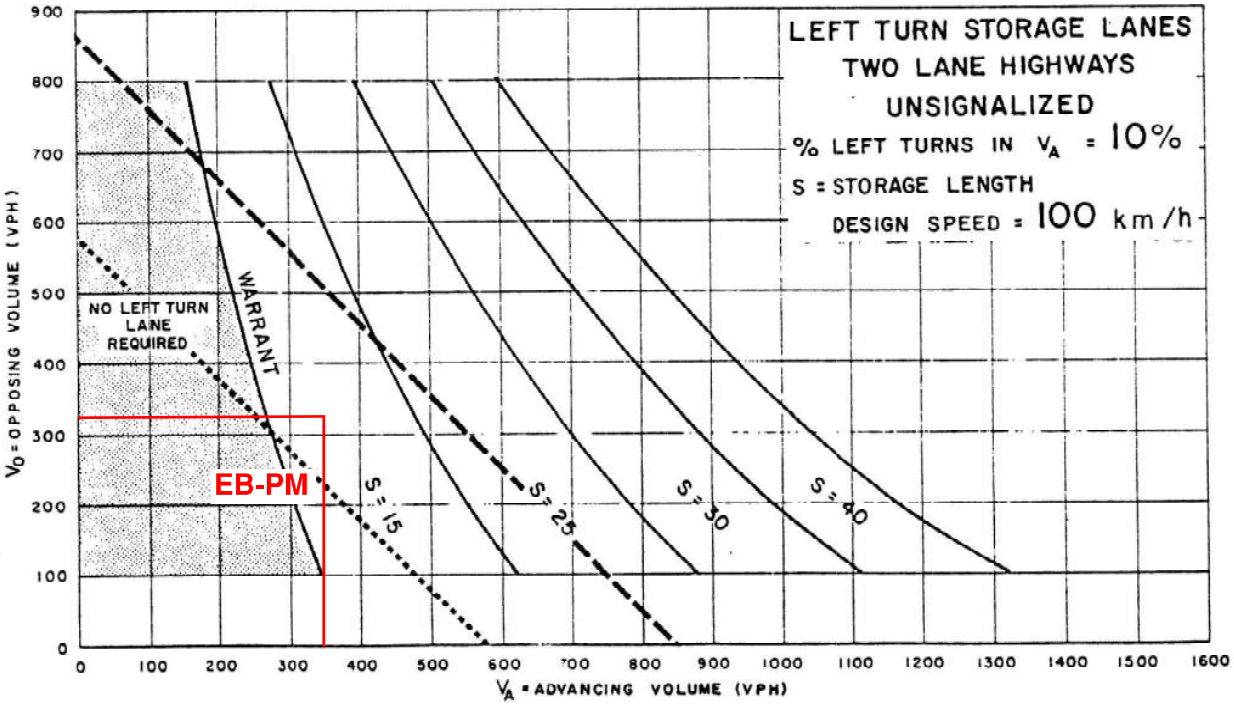
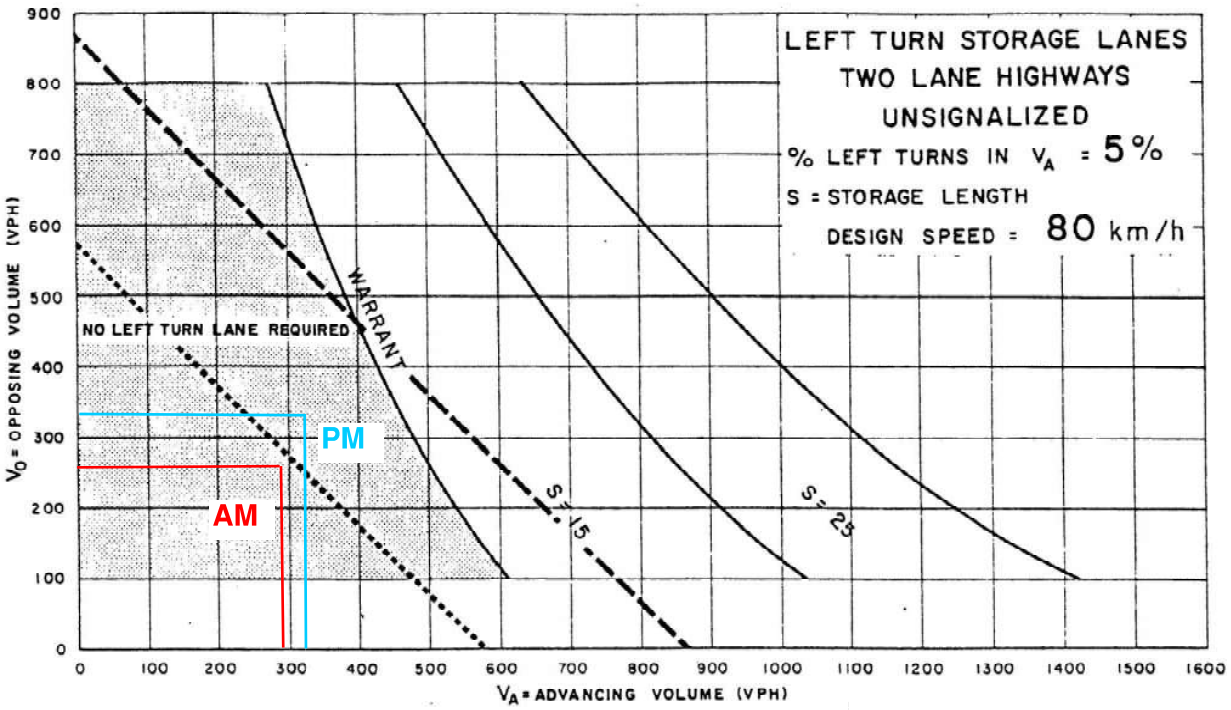


Figure EA-22

2019 Existing Traffic - Highway 124 & Delarmbro Drive



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

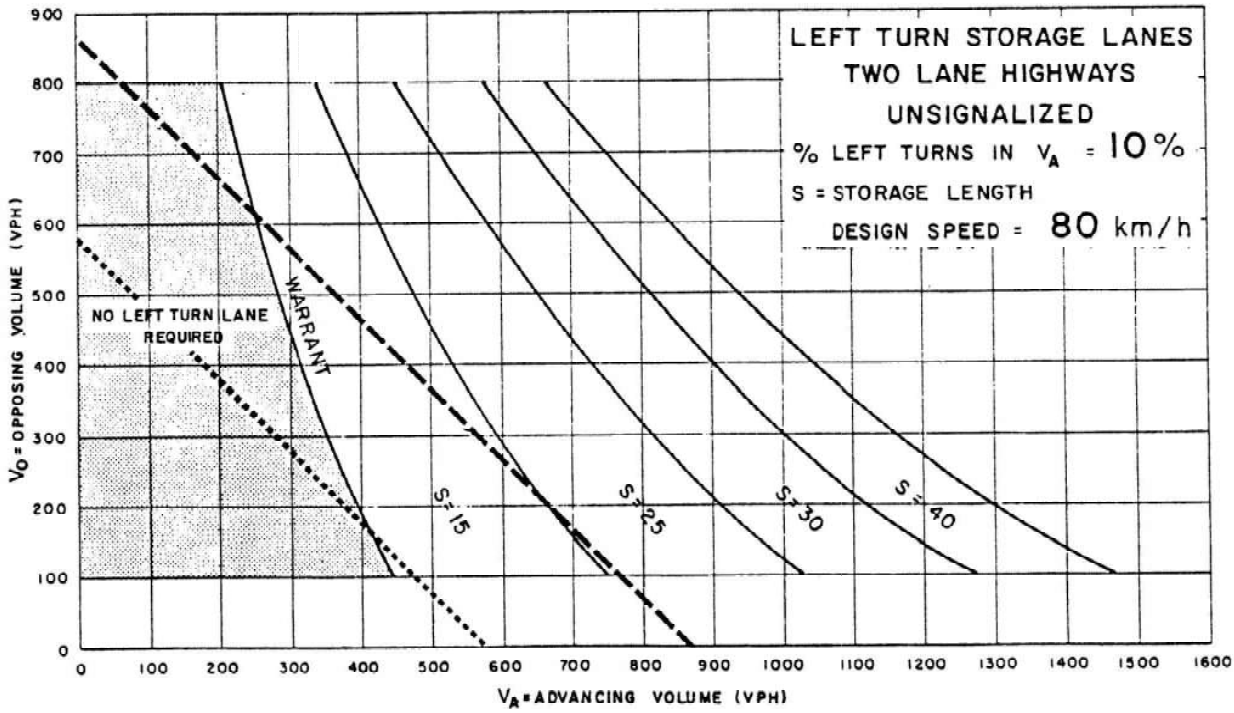
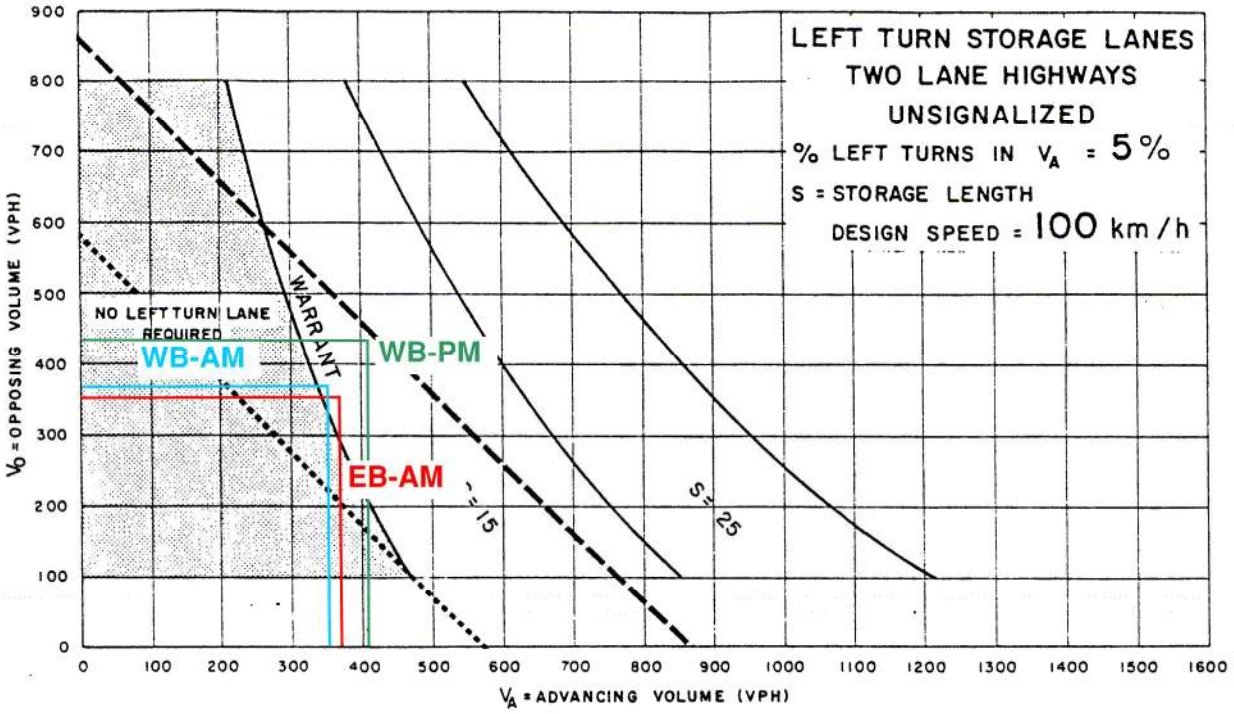


Figure EA-14



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

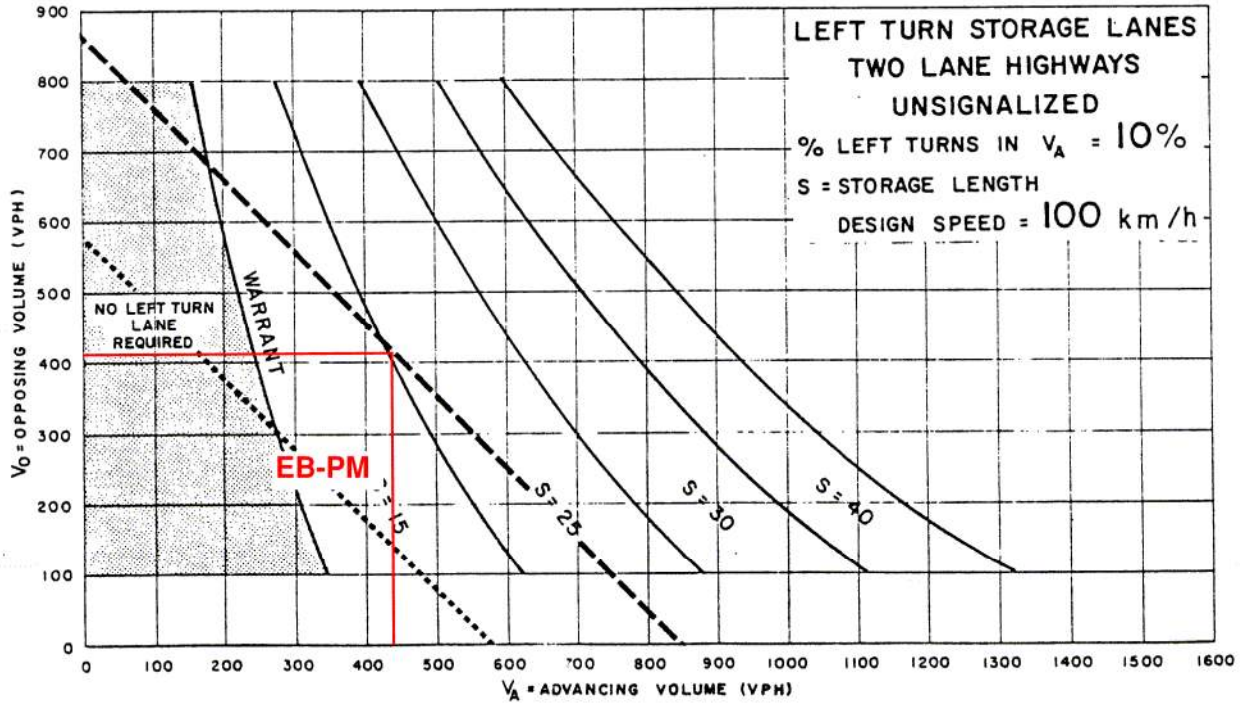
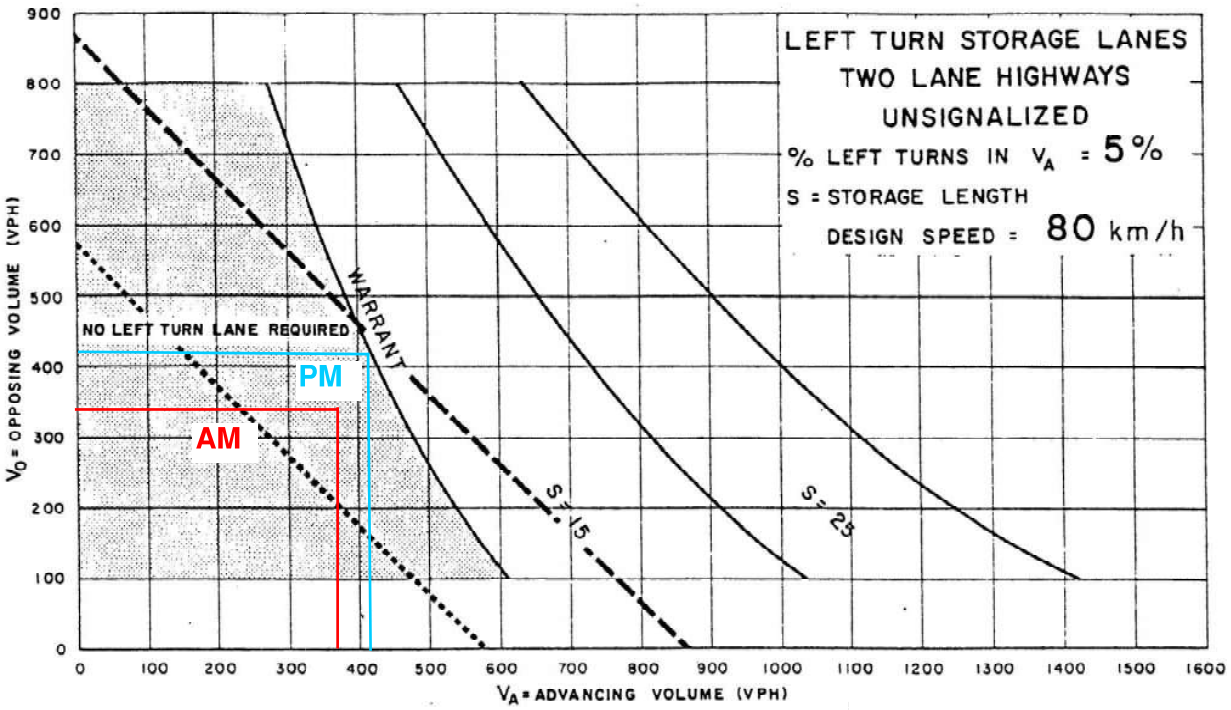


Figure EA-22

2031 Background Traffic - Highway 124 & Delarmbro Drive



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

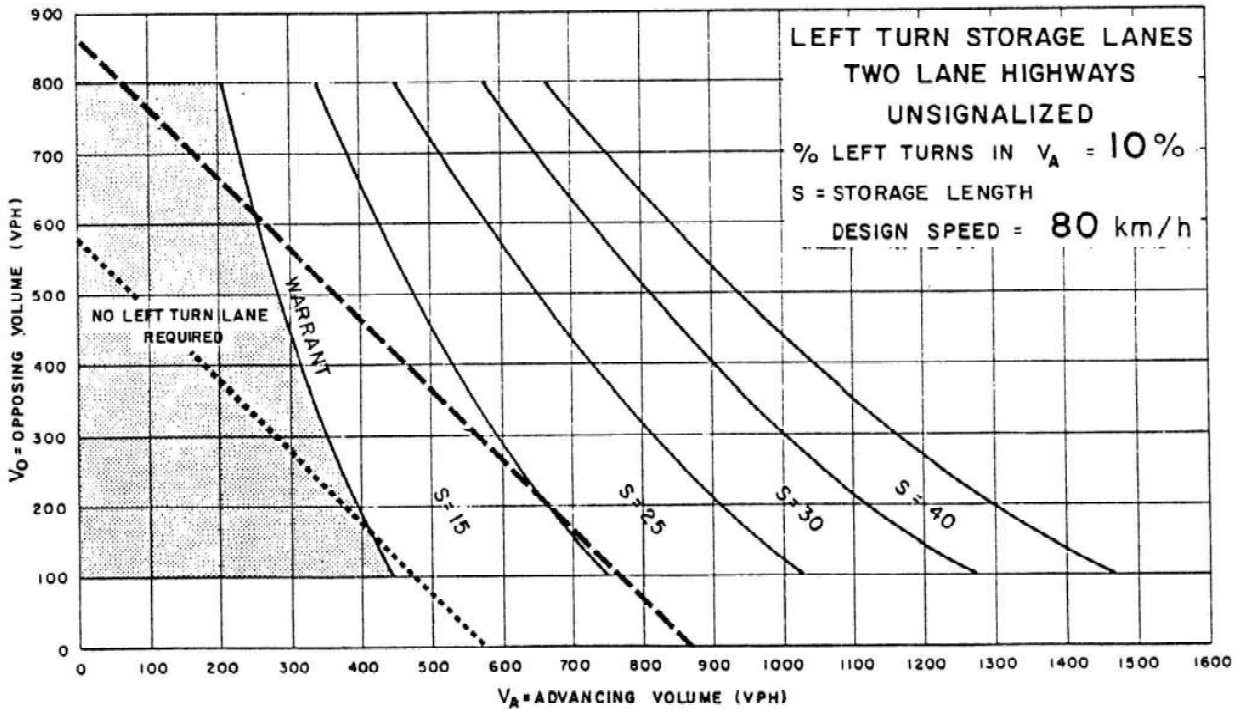
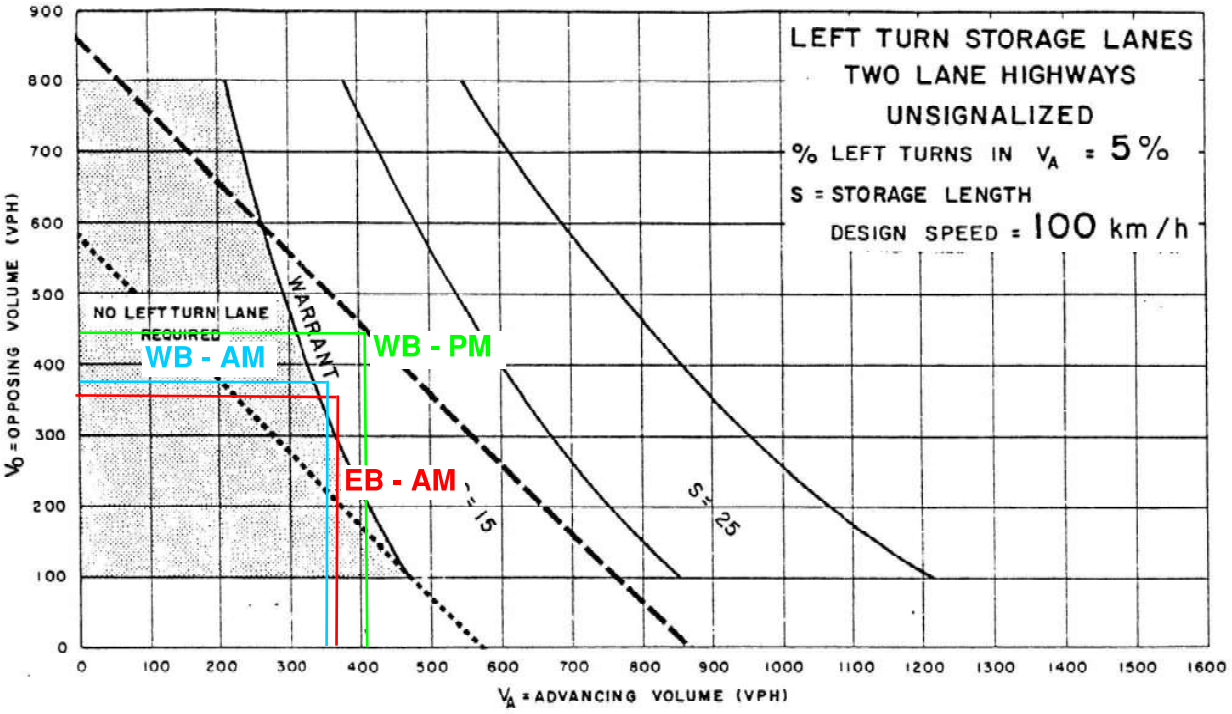


Figure EA-14



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

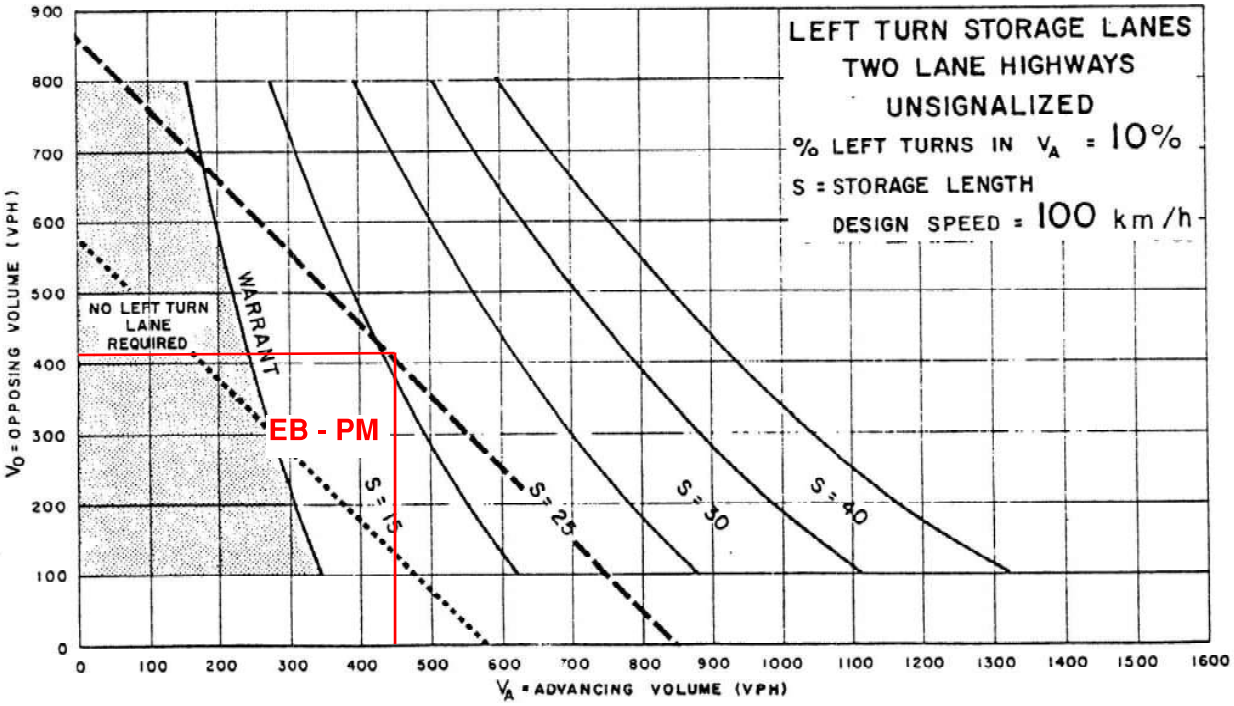
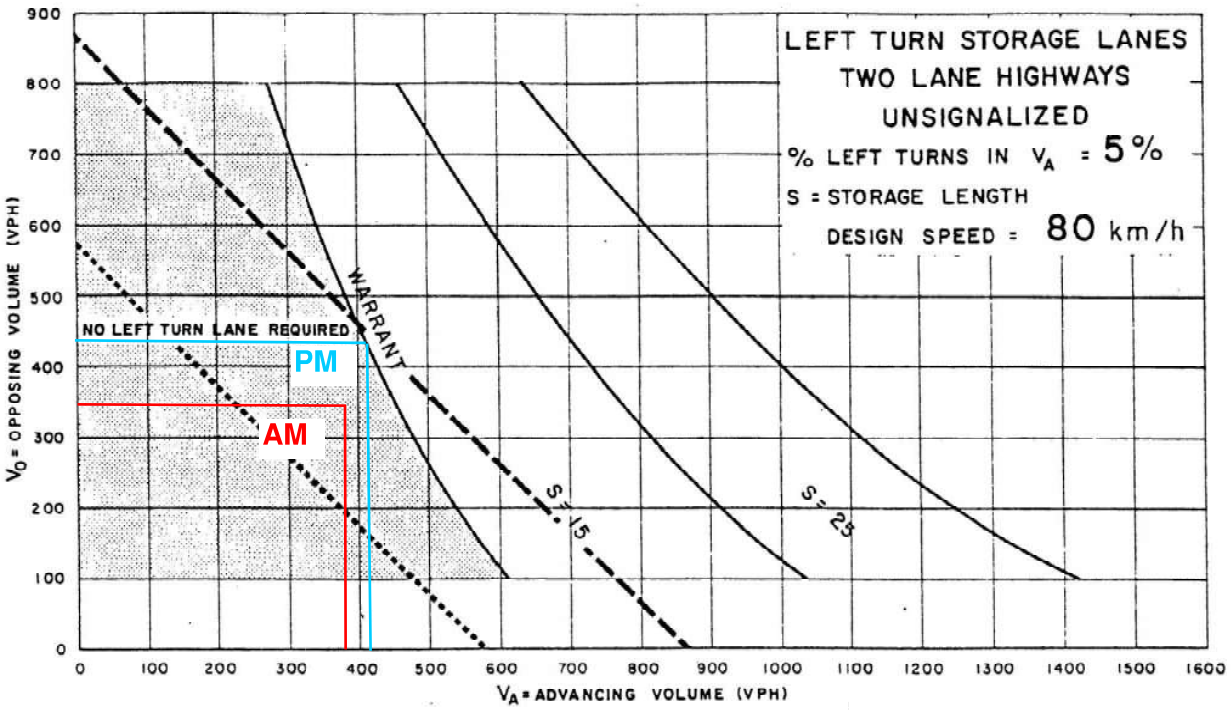


Figure EA-22

2031 Total Traffic - Highway 124 & Delarmbro Drive



TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

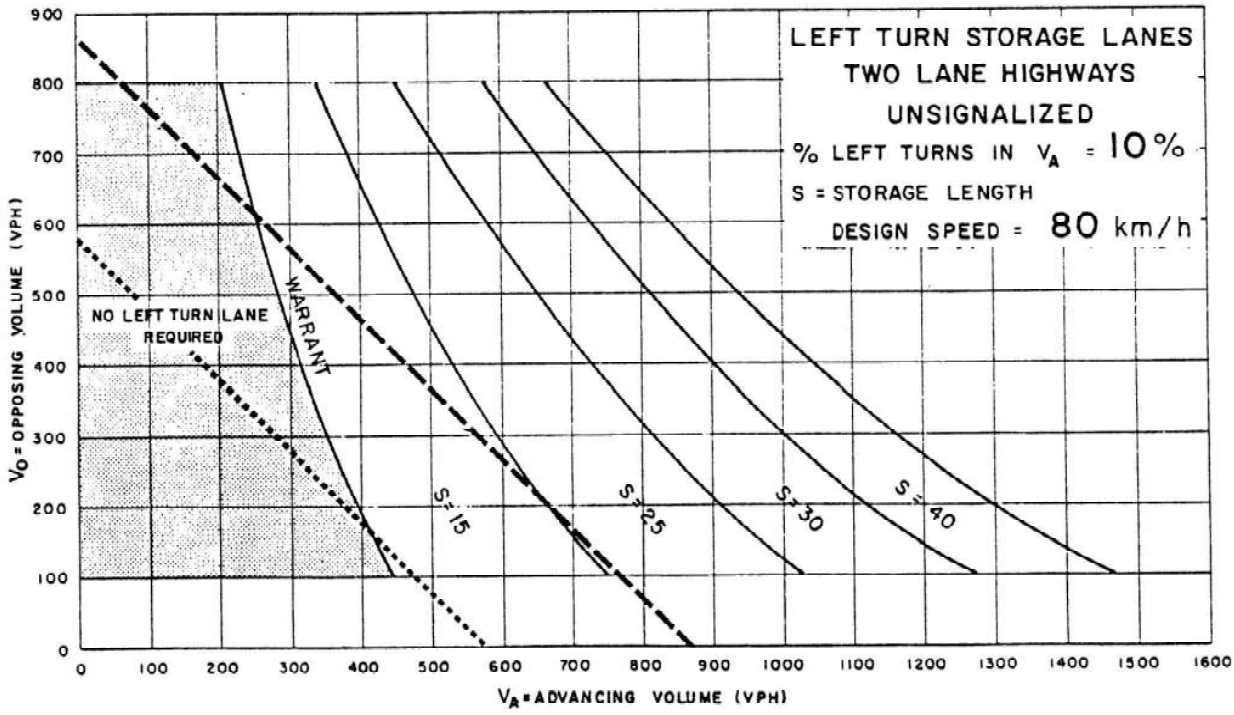


Figure EA-14

R.J. Burnside & Associates Limited