Corseed Residential Subdivision

Town of Grand Valley
County of Dufferin

Traffic Impact Study for

Corseed Inc.

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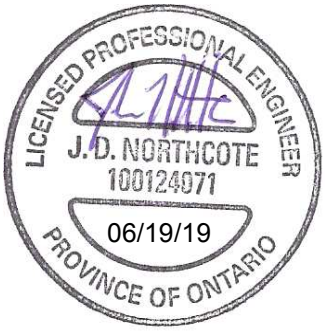

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Executive Summary

This report summarizes the traffic impact study prepared for the proposed 14.9 hectare Corseed Subdivision, located west of County Road 25, across from Industrial Drive. The report assesses the impact of traffic related to the development on the adjacent roadways and provides recommendations to accommodate this traffic in a safe and efficient manner.

The proposed Corseed Subdivision will include the following:

- Single Detached 85 units
- Townhouses 29 units
- Future Mixed-Use blocks
    - Townhomes TBD
    - Commercial Development TBD

A concept plan for the future mixed-use blocks in the Corseed Subdivision is not available at this time. Consequently, for the purpose of this analysis, it is assumed that the traffic generated by the future mixed-use blocks in the Corseed Subdivision will be proportionate to the traffic generated by the future mixed-use blocks in the Moco Subdivision, as calculated in the previous version of this report. This traffic generation estimate was completed using the previous breakdown for the mixed-use blocks presented for the Moco Subdivision, which was based on a concept plan prepared by IPS Consulting Inc., intended for future planning purposes.

Access to the Corseed Subdivision is provided via a connection to County Road 25 [Corseed Access] directly across from Industrial Drive.

The scope of this analysis includes a review of the existing intersections of County Road 25 / Melody Lane, County Road 25 / County Road 109 and proposed intersection of Corseed Access / County Road 25 / Industrial Drive.

Conclusions

1. The proposed residential development [Phase 1] in the Corseed Subdivision is expected to generate a total of 85 AM and 111 PM peak hour trips.
2. The proposed ultimate development of the Corseed Subdivision, including the future mixed-use development, is expected to generate a total of 148 AM and 246 PM primary peak hour trips.
3. Background traffic and pedestrian counts were completed for the existing intersections of County Road 25 / Melody Lane and County Road 25 / County Road 109 on Tuesday August 19th, 2014.
4. Level-of-service [LOS] analysis was completed at the study area intersections, using the existing (2016) and background (2021 & 2026) traffic volumes without the proposed development. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. Based on the background 2021 traffic volume, a northbound left turn lane is warranted at the intersection of Melody Lane / County Road 25; however, based on our discussions with the Town, widening the road at this intersection is not feasible.
5. The following improvements are recommended as a result of the background 2026 traffic volume:

Future Collector & Industrial Drive / Country Road 25

- A northbound left turn lane is recommended at the intersection of Future Collector & Industrial Drive / County Road 25 with 25 metre storage, 40 metre parallel and 115 metre taper length.
- A southbound left turn lane is recommended at the intersection of Future Collector & Industrial Drive / County Road 25 with 15 metre storage, 40 metre parallel and 115 metre taper length.

6. No other geometric or traffic signage improvements were recommended at the intersections in the study area as a result of the existing (2016) or background (2021 & 2026) traffic volumes without the proposed development.
7. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
8. LOS analysis was completed under total (2021, 2026 & 2031) traffic volumes with the proposed development operational at the study area intersections.
9. No geometric or traffic signage improvements are recommended at the existing Melody Lane / County Road 25 or County Road 25 / County Road 109 intersections as a result of the total (2021, 2026 & 2031) traffic volumes with the proposed development. As noted above, a northbound left turn lane is warranted at the intersection of Melody Lane / County Road 25; however, based on our discussions with the Town, widening the road at this intersection is not feasible.
10. The following improvements are recommended as a result of the Phase 1 Corseed Development:

    - The proposed **Corseed Access** & Industrial Drive / County Road 25 intersection will operate efficiently using unsignalized control with two-way stop control for westbound and eastbound traffic at County Road 25. One lane for egress traffic and one lane for ingress traffic for the west leg of the intersection will provide the necessary capacity for the proposed development.

11. The following improvements are recommended as a result of the ultimate Corseed Development (2031). These recommendations should be confirmed once the specifics for the future mixed-use blocks are known:

    Corseed Access & Industrial Drive / Country Road 25

    Total (2031) Traffic Volume

    - Installation of traffic signals to improve the eastbound control delay

12. The road structure for the internal streets within the proposed development will meet Town standards for local and collector roadways.
13. The sight distance available south of the Corseed Access is greater than the County's minimum sight distance requirements. The sight distance available north of the Corseed Access is marginally below the County's minimum sight distance requirements; however, since it is marginally under the County's minimum sight distance requirements no improvements are recommended.

In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

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1 Introduction

1.1 Background

Corseed Inc. [The Developer] is proposing to develop a 14.9 hectare site [Corseed Subdivision] located west of Dufferin County Road 25 [County Road 25], south of the Upper Grand Trailway, in the Town of Grand Valley [Town], County of Dufferin [County].

The proposed Corseed Subdivision will include 85 single detached residential units, 29 townhouse units and two future mixed-use blocks (combined area of 1.35 hectares).

Corseed Inc. has retained **JD Northcote Engineering Inc.** [JD Engineering] to prepare this traffic impact study in support of the Draft Plan Application.

1.2 Study Area

Figure 1 shows the location of the subject site and study area intersections in relation to the surrounding area. The Draft Plan of Subdivision (by IPS Consulting Inc.) for the proposed development is shown in **Appendix A**.

The Corseed Subdivision is bound by existing residential lands to the north, County Road 25 to the east, and existing agricultural lands to the west and south. The subject site includes a single access [Corseed Access] connection with County Road 25, across from Industrial Drive.

Through consultation with the Town and County, the following intersections are included in the Study:

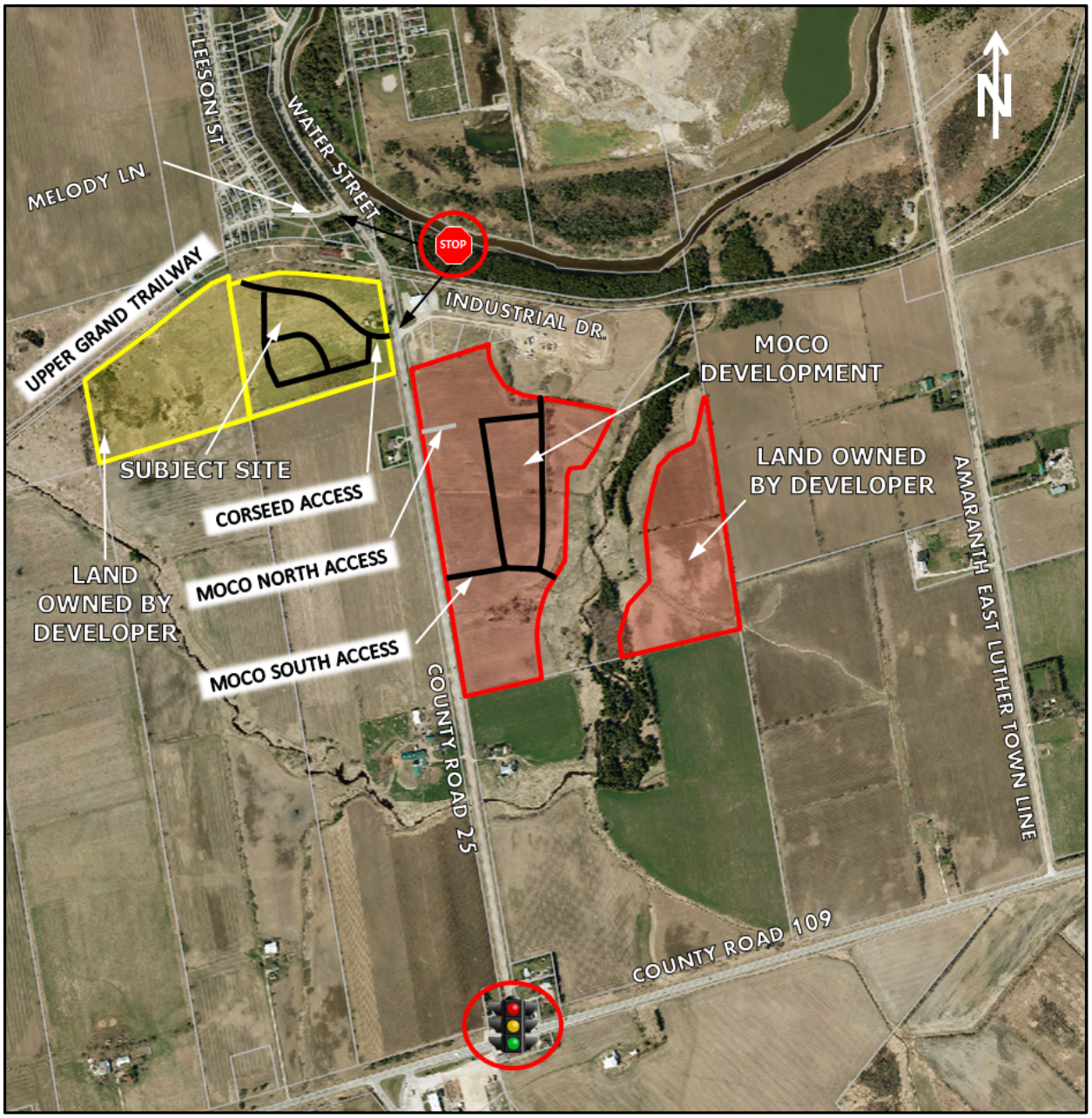
- Corseed Access / County Road 25 / Industrial Drive;
- County Road 25 / Melody Lane; and
- County Road 25 / County Road 109.

1.3 Study Scope and Objectives

The purpose of this study is to identify the potential impacts to traffic flow at the site access and on the surrounding roadway network. The study analysis includes the following tasks:

- Consult with the Town and County to address any transportation-related issues or concerns they have with the proposed development;
- Determine existing traffic volumes and circulation patterns;
- Estimate future traffic volumes if the proposed development was not constructed, including the impact of additional proposed developments in the area;
- Complete level-of-service [LOS] analysis of horizon year traffic conditions and identify operational deficiencies;
- Estimate the amount of traffic that would be generated by the proposed development and assign to the roadway network;
- Complete LOS analysis of horizon year traffic conditions and identify additional operational deficiencies;
- Identify improvement options to address operational deficiencies; and
- Document findings and recommendations in a final report.

Figure 1 – Proposed Site Location and Study Area



1.4 Horizon Year and Analysis Periods

It has been assumed that, should all approvals be granted, the residential units [Phase 1] within the proposed development will be built-out by 2021. The existing year traffic (2016), Phase 1 build-out year (2021), as well as 5-year post Phase 1 build-out year (2026) scenarios were selected for analysis of traffic operations in the study area. The weekday morning [AM] and afternoon [PM] peak hour have been selected as the analysis periods for this study.

Development plans for the Phase 2 (mixed-use blocks) for the proposed development have not been finalized at this time. It is anticipated that development of the mixed-use blocks will not commence within 10 years of the current proposed development. Based on our correspondence with the Town and County, although the development of the mixed-use blocks are not anticipated to develop in the short term, a longer-term preliminary review of the anticipated mixed-use development for the year 2031 is required.

2 Information Gathering

2.1 Street and Intersection Characteristics

County Road 109 is a two-lane county road with a posted speed limit of 80km/h in the study area. County Road 109 has a rural cross-section with shoulders and ditch on both sides of the road. County Road 109 includes a westbound right turn lane and an eastbound left turn lane at County Road 25. County Road 109 and is under the jurisdiction of the County.

County Road 25 (Water Street): County Road 25 is a two-lane road with a rural cross-section and no sidewalk. From the north limit of the study area to approximately 80 metres north of Industrial Drive, County Road 25 has a posted speed limit of 40km/h. The posted speed limit on County Road 25 is 60 km/h from 80 metres north of Industrial Drive to approximately 190 metres south of Industrial Drive. The posted speed limit on County Road 25 is 80 km/h from 190 metres south of Industrial Drive to County Road 109. County Road is under the jurisdiction of the County. North of the Upper Grand Trailway, County Road 25 becomes Water Street, which is a two-lane primary road. Water Street has a rural cross-section with a sidewalk on the west side of the street, starting just south of Melody Lane. Water Street is under jurisdiction of the Town.

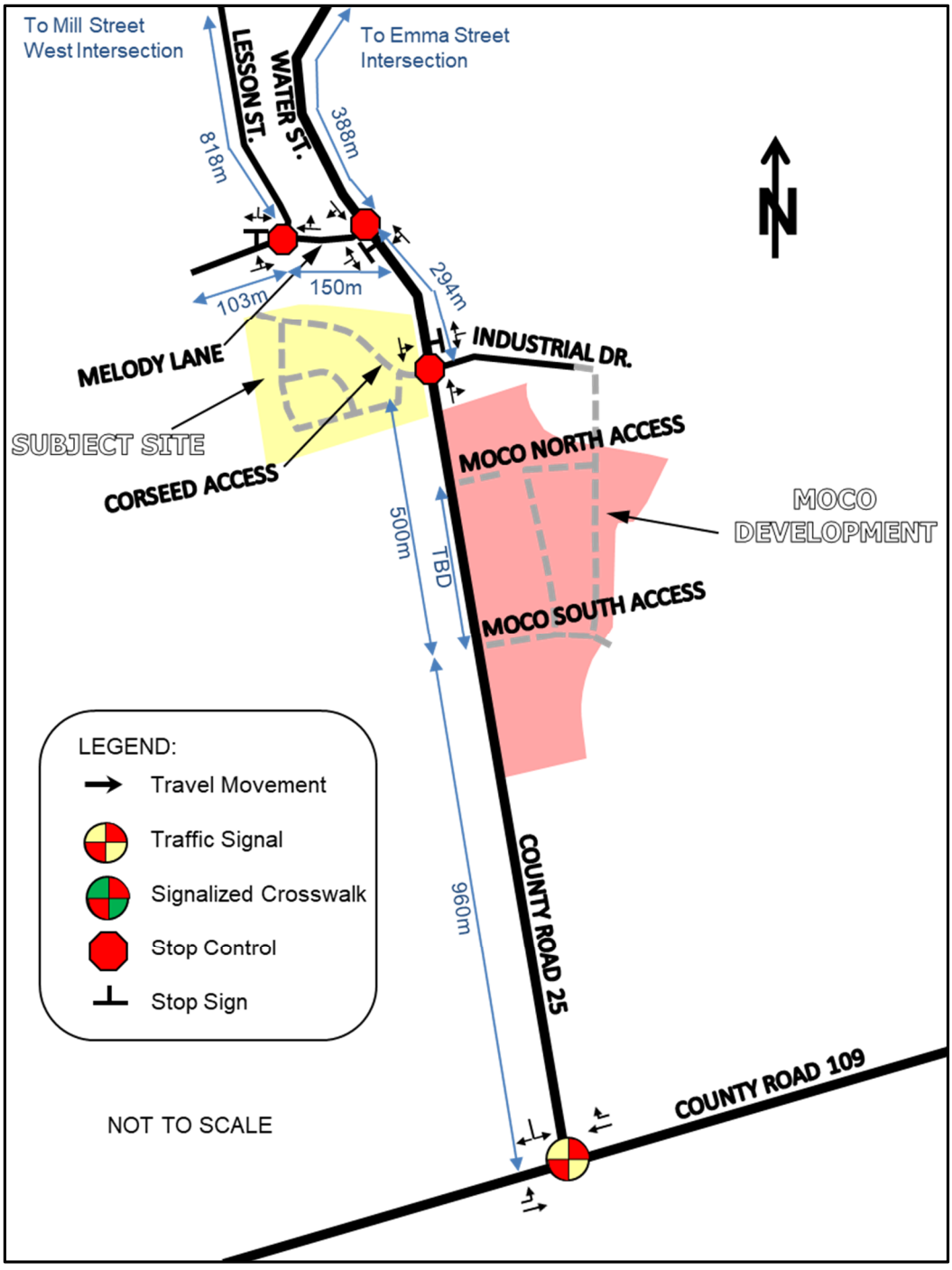
Melody Lane is a two-lane primary road with unsigned (assumed) speed limit of 40km/h in the study area. Melody Lane has an urban cross-section with a sidewalk on the north side of the street. Melody Lane is under jurisdiction of the Town.

Leeson Street is a two-lane primary road with unsigned (assumed) speed limit of 40km/h in the study area. Leeson Street has an urban cross-section with a sidewalk on the west side of the street. Leeson Street is under jurisdiction of the Town.

Industrial Drive is a two-lane road primary road with a rural cross-section with an unsigned (assumed) speed limit of 40km/h in the study area. Industrial Drive is under the jurisdiction of the Town.

The existing lane configuration for all study area intersections can be seen in **Figure 2**.

Figure 2 – Existing Lane Configuration for Study Area Intersections



2.2 Transit Access

There is currently no public transit available, or planned for in the study area.

2.3 Local Road Improvements

Based on the Town's Transportation Master Plan (dated March 2017) [Town TMP], the recommended alternative includes a future collector road [Future Collector] southwest of the Corseed Subdivision with a connection to County Road 25, south of the Corseed Access (excerpt provided in **Appendix I**). However, based on our correspondence with the Town, in conjunction with the proposed Corseed Subdivision, the location of the Future Collector has been revised to extend through the northwest side of the Corseed Subdivision, via Street A and will connect to County Road 25 at Industrial Drive. The Future Collector will bypass the Town and reconnect to County Road 25 north of Fife Road and continue around the existing built boundary of the Village east of County Road 25 and connect with Scott Street at Bielby Street. For the purpose of our analysis, we have assumed that the Future Collector will be constructed by the 2026 horizon year scenario.

The above noted improvement will have a notable impact on the distribution of the local traffic volumes, when it is completed in 2026. For the purpose of this report, it is assumed that the majority of the existing traffic that would pass through the Village and continue northbound or southbound on County Road 25 will be redistributed to the Future Collector. Based on our review of the local traffic volumes, it is assumed that 30% of the existing traffic currently travelling along Water Street through the Village will use the Future Collector.

The recommended alternative in the Town TMP also includes upgrading Amaranth Townline to a collector road with a collector road connection to County Road 25, through the Moco Subdivision mentioned in Section 2.4. Upgrading Amaranth Townline is anticipated to redirect some existing and future background traffic on County Road 25; however, in order to be conservative, we have not specifically accounted for this redistribution in our analysis.

No other geometric or road capacity improvements are currently planned within the study area.

2.4 Other Developments within the Study Area

The Moco Subdivision and the Thomasfield Subdivision are the only planned developments that will have a significant impact on local traffic volumes in the study area.

The Developer is moving ahead with plans to develop a 34.4 hectare site [Moco Subdivision] located southeast of the proposed development, bound by County Road 25 to the west, existing employment land to the north, and existing agricultural lands to the south and east. The proposed Moco Subdivision will include 54 single-family detached residential units, future mixed-use blocks (combined area of 9.17 hectares) and 6.9 hectares of future development lands. It is anticipated the Phase 1 of the Moco Subdivision will be built-out by 2021. The build-out date for Phase 2 of this development is not anticipated within 10 years of the proposed development; however, as noted in Section 1.4, a longer-term preliminary review of the anticipated mixed-use development for the 2031 horizon is included in the scope of this study. The previous submission of this report, prepared by JD Engineering (dated December 2016) [2016 TIS], included the analysis with an estimate of the traffic generation by the conceptual development plan for the future mixed-use block in the Moco Subdivision.

The Moco Subdivision includes a proposed t-intersection with County Road 25 on the south half of the property [Moco South Access]. A second right-in right-out access onto County Road 25 [Moco North Access] with an internal connection via Street A is anticipated to service the mixed-use block at

the northwest corner of the property. Although the exact location of the Moco North Access is not known at this time, we have provided a conceptual access as part of our review to allow for a preliminary review of the mixed-use block. An internal connection to Industrial Drive is anticipated to be constructed as well. The Moco South Access and the internal connection to Industrial Drive is expected to be constructed along with Phase 1 and the Moco North Access is expected to be constructed along with Phase 2 for the Moco Subdivision.

Thomasfield Homes Ltd. Is moving ahead with the proposed Thomasfield Subdivision. The location of this development is illustrated in **Figure 3**[1]. Phase 1 of this development is currently under construction. Phase 1 includes a connection with Amaranth Street West at the north end and Melody Lane at the south end. The developer of the Thomasfield Subdivision also owns lands located west of the Phase 1 lands; however, there are currently no plans for the development of these lands. Paradigm Transportation Solutions Ltd. prepared a traffic impact study (dated April 2011) for the Thomasfield Subdivision [Thomasfield TIS].

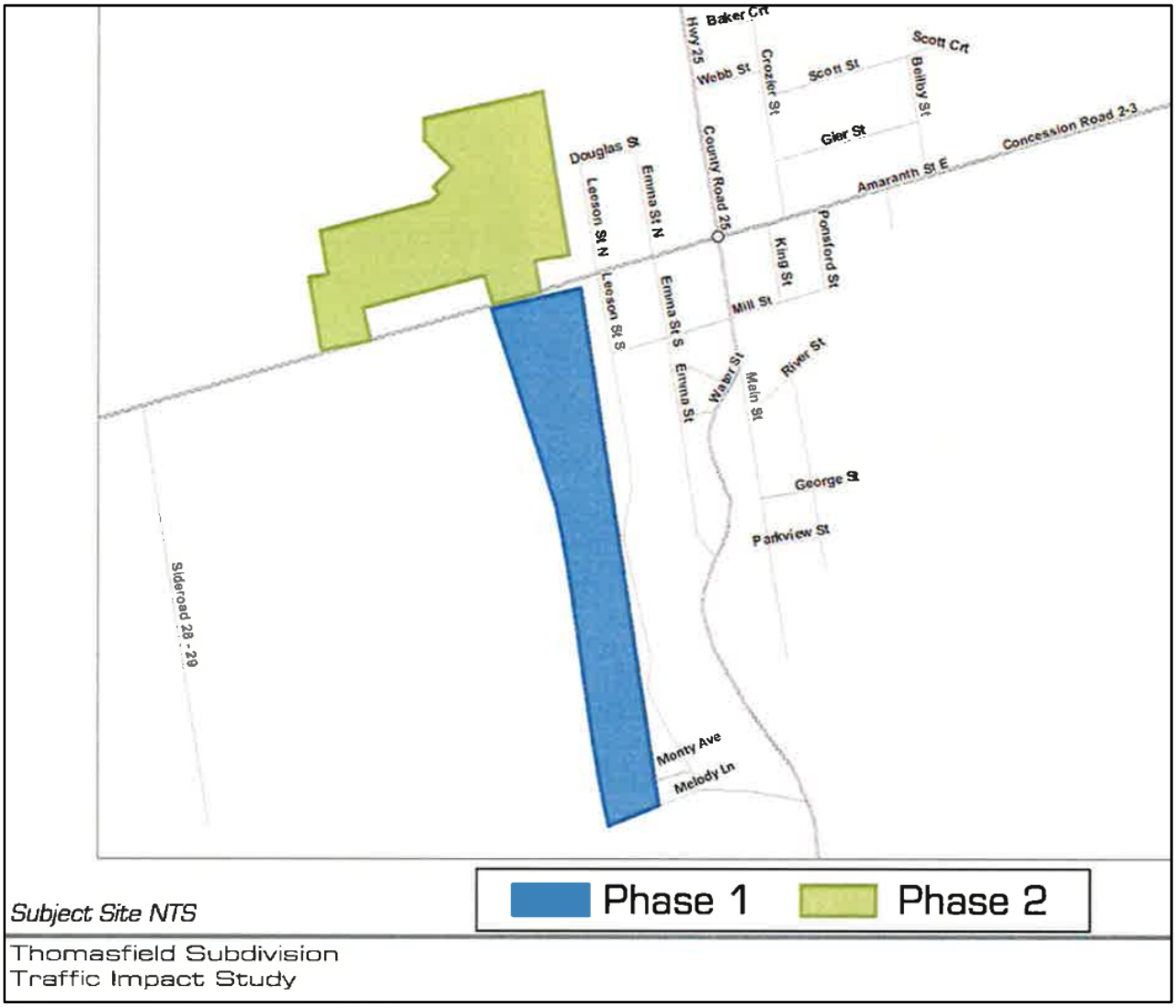
Industrial lands along Industrial Drive [Industrial Drive Development] are anticipated to be developed within the proposed developments horizon years. The development density on Industrial Drive has been estimated based on the 2021 and 2031 employment projections provided in the Draft Transportation Master Plan for Grand Valley (excerpts included in **Appendix I**). Based on a comparison between the employment population projections and the developable areas east of County Road 25 and south of the Grand River, we have estimated that the employment population for the Industrial Drive Development will be 185 employees by 2031.

There are a number of other developments in the village of Grand Valley at various stages of the planning process. The majority of these developments are located north of the existing built boundary of the village.

Section 2.4.2 to 2.4.7 outline the methodology applied to account for the additional traffic in the study area, as a result of the Moco Subdivision, Thomasfield Subdivision and the Industrial Drive Development.

[1] Excerpt from the Thomasfield TIS (Fig. 1.1).

Figure 3 – Thomasfield Subdivision Location



2.4.1 Background Traffic Growth

Through our discussions with the Town and County, a background traffic growth rate of 2.2% has been applied to the traffic volumes on County Road 25 and 109. This background traffic growth will account for increased traffic volumes as a result of small infill developments close to the study area, or larger developments beyond the study area

2.4.2 Traffic Generation for the Moco Subdivision

An updated conceptual site plan (dated October 2017) for the Moco Subdivision was prepared by IPS Consulting Inc. (attached in **Appendix J**).

The traffic generation for Phase 1 of the Moco Subdivision has been based on the Institute of Transportation Engineers [ITE] *Trip Generation* data. The following ITE land uses have been applied to estimate the traffic from the proposed development:

- ITE land use 210 (Single-Family Detached Housing); and
- ITE land use 230 (Residential Condominium / Townhouse).

As noted in Section 1.4, it is anticipated that development of the mixed-use blocks will not commence within the next 10 years. Based on our correspondence with the Town and County, although the development of the mixed-use blocks are not anticipated to develop in the short term, a longer-term preliminary review of the anticipated mixed-use development for the year 2031 is required.

The traffic generated by the future mixed-use block in the Moco Subdivision has been calculated based on the traffic projections completed in the 2016 TIS for the future mixed-use block in the Moco Subdivision. The traffic generated by the Moco Subdivision in the 2016 TIS was based off the conceptual development plan (dated November 2016) by IPS Consulting Inc. Excerpts from this study have been included in **Appendix K.**

The estimated trip generation of the Moco Subdivision is illustrated below in **Table 1**. The AM and PM peak traffic generation for the subject site generally aligns with the AM and PM peak hour in the traffic counts.

Table 1 – Estimated Traffic Generation from Proposed Moco Subdivision

Phase	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
1	Single-Family Detached Housing ITE Land Use: 210	54 units	12	36	48	38	22	60
	Residential Condominium/Townhouse ITE Land Use: 230	7 units	1	5	6	5	2	7
PHASE 1 TOTAL TRIPS			**13**	**41**	**54**	**43**	**24**	**67**
2	Residential Condominium/Townhouse ITE Land Use: 230	141% of Moco Traffic Volumes in 2016 TIS*	10	50	60	47	23	70
	Shopping Center ITE Land Use: 820		126	77	203	371	402	773
	Internal Capture (10%)[2]		-13	-7	-20	-37	-40	-77
	Pass-by Trips (Shopping Center)		0	0	0	-119	-119	-238
PHASE 2 TOTAL PRIMARY TRIPS			**126**	**111**	**237**	**258**	**267**	**525**

*Excerpts for the traffic generation of the residential townhouse and mixed-use land in the Moco Subdivision are outlined in **Table 9** of the 2016 TIS (excerpts provided in **Appendix L**).

In order to be conservative, no transportation modal split has been applied to the above-noted traffic generation calculation.

2.4.3 Traffic Distribution for the Moco Subdivision

The distribution of traffic for the Moco Subdivision has been taken directly from the 2016 TIS (excerpts provided in **Appendix K**). The internal distribution of traffic in the Moco Subdivision has been adjusted to reflect the updated conceptual site plan and the relocation of the Future Collector on the west side of County Road 25, as noted in Section 2.3. It is assumed that 30% of vehicles travelling north on County Road 25 will use the Future Collector connection once constructed.

[2] The internal capture rate (10%) was estimated based on a conservative application of the values provided in Table 7.1 and 7.2 of the ITE *Trip Generation Handbook*.

Figures A and **B** in **Appendix M** illustrate the traffic distribution pattern for the residential component of the Moco in the 2021 horizon year and the 2026/2031 horizon years respectively.

Figures C in **Appendix M** illustrates the traffic distribution pattern for the commercial component of the Moco Subdivision.

Figure 4, 5 and **6** illustrates the traffic assignment by the Moco Subdivision for the Phase 1 build-out (2021), 5-year post Phase 1 build-out (2026) and Phase 2 build-out (2031) scenarios respectively, in the AM and PM peak hour.

2.4.4 Traffic Generation for the Thomasfield Subdivision

The traffic generation for the Thomasfield Subdivision has been included in addition to the background traffic growth outlined above. **Table 2**[3] summarizes the estimated trip generation for each phase of the development. Phase 1 was approximately 75% built-out in 2014 at the time the traffic counts were completed for this report. In order to avoid double counting this traffic, we have reduced the overall traffic generation by 37.5%[4]. It is anticipated that the remaining units will be built-out prior to the 2021 horizon year.

Table 2 – Estimated Traffic Generation from Adjacent Thomasfield Subdivision

Development Phase	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
Phase 1	Single-Family Detached	98 units	18	55	73	62	37	99
	Low-Rise Condominium / Townhouse	52 units	9	26	35	24	17	41
	PHASE 1 TOTAL TRIPS		27	81	108	86	54	140
Phase 2	Single-Family Detached	142 units	27	80	107	90	53	143
	Low-Rise Condominium / Townhouse	29 units	5	15	20	13	10	23
	PHASE 2 TOTAL TRIPS		32	95	127	103	63	166

2.4.5 Traffic Distribution for the Thomasfield Subdivision

The distribution of traffic for the Thomasfield Subdivisions has been taken directly from the Thomasfield TIS.

The construction of the Future Collector is anticipated to impact the distribution of traffic generated by the Thomasfield Subdivision. Based on our review of future road network, in conjunction with our estimate of the origin / destination of the trips from the Thomasfield Subdivision, we have estimated that 40% of the traffic south of the Thomasfield Subdivision will use the Future Collector in the 2026 and 2031 scenarios. This assumption is fundamentally based on our estimates of the travel time through the future road network and the assumption that people will select the route with the shortest travel time.

Figures 7 and **8** illustrate the additional 2021 and 2026/2031 traffic volumes in the study area generated by the Thomasfield Subdivision respectively, during the AM and PM peak hour.

[3] Excerpt from the Thomasfield TIS (Table 4.3)
[4] Since the traffic generated by Phase 1 and 2 is relatively equal, we have taken 75% of Phase 1 to be equal to 37.5% of the total traffic generation.

2.4.6 Traffic Generation for the Industrial Drive Development

The lands along Industrial Drive were partially built-out on the date the traffic counts used in this report were completed (October 2014). Development included the Grand Valley and District Fire Department, the Water Pollution Control Plant and a mini-storage facility (16 units[5]). The traffic generation for the three above-noted existing land-uses is relatively low during the AM and PM peak hour analyzed in this report. Consequently we have ignored the traffic on this approach for the existing (2016) and future 2021 scenarios. For the future 2026 and 2031 scenarios we have estimated the traffic generation for the Industrial Drive Development based on the Institute of Transportation Engineers [ITE] *Trip Generation* data. The Industrial Park (ITE #130) land use has been applied to represent the development in the area.

The estimated trip generation from the future development on Industrial Drive is illustrated below in **Table 3**. The AM and PM peak traffic generation for industrial properties generally aligns with the AM and PM peak hour in the traffic counts.

Table 3 – Estimated Traffic Generation from the Industrial Drive Development

Location	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
Industrial Drive	Industrial Park ITE Land Use: 130	185 Employees	70	10	80	17	66	83

In order to be conservative, no transportation modal split has been applied to the above-noted traffic generation calculation.

2.4.7 Traffic Distribution for the Industrial Drive Development

For the purposes of this study, it has been assumed that all traffic generated by Industrial Drive Development will be new traffic and would not be in the study area if the development was not constructed.

The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. Beyond the local area the distribution of traffic from the developments on Industrial Drive have been estimated based on the 2011 Transportation Tomorrow Survey [TTS] data for the area (excerpt attached as **Appendix M**). TTS data provides historical data for work trip origins with a destination in the Grand Valley zone (2006 GTA Zone – 8416).

The above-noted methodology provides an estimate of the distribution of ingress trips. We have assumed that the distribution of egress trips will follow the inverse of the ingress traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

The construction of the Future Collector is anticipated to impact the distribution of traffic generated by the Industrial Drive Development. It is assumed that 30% of vehicles travelling north on County Road 25 will use the Future Collector connection once constructed.

Table 4 summarizes the trip distribution for the Industrial Drive Development.

[5] A second mini-storage building with 24 storage units was constructed in 2016.

Table 4 – Traffic Distribution Summary

Travel Direction (to/from)	Percent of Total Traffic Generation
North (via County Road 25)	49%
North (via Future Collector)	21%
Southwest	6%
Southeast	24%
Total	**100%**

Figure 9 illustrates the additional (2026 and 2031) traffic volumes in the study area generated by the Industrial Drive Development during the AM and PM peak hour.

Figure 4 – Moco Subdivision Phase 1 Build-out (2021) Peak Hour Traffic Volumes

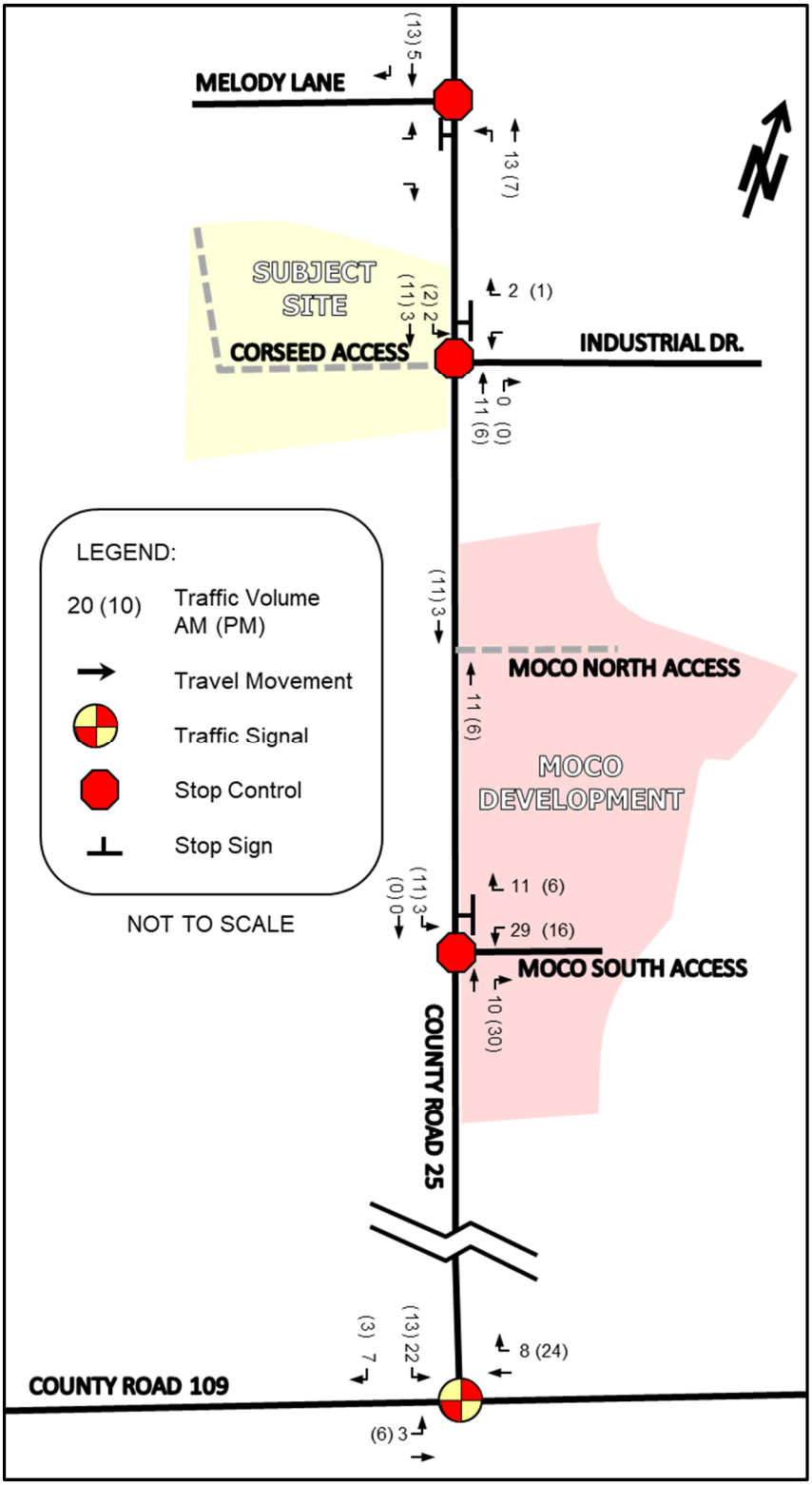


Figure 5 – Moco Subdivision 5-year Post Phase 1 Build-out (2026) Peak Hour Traffic Volumes

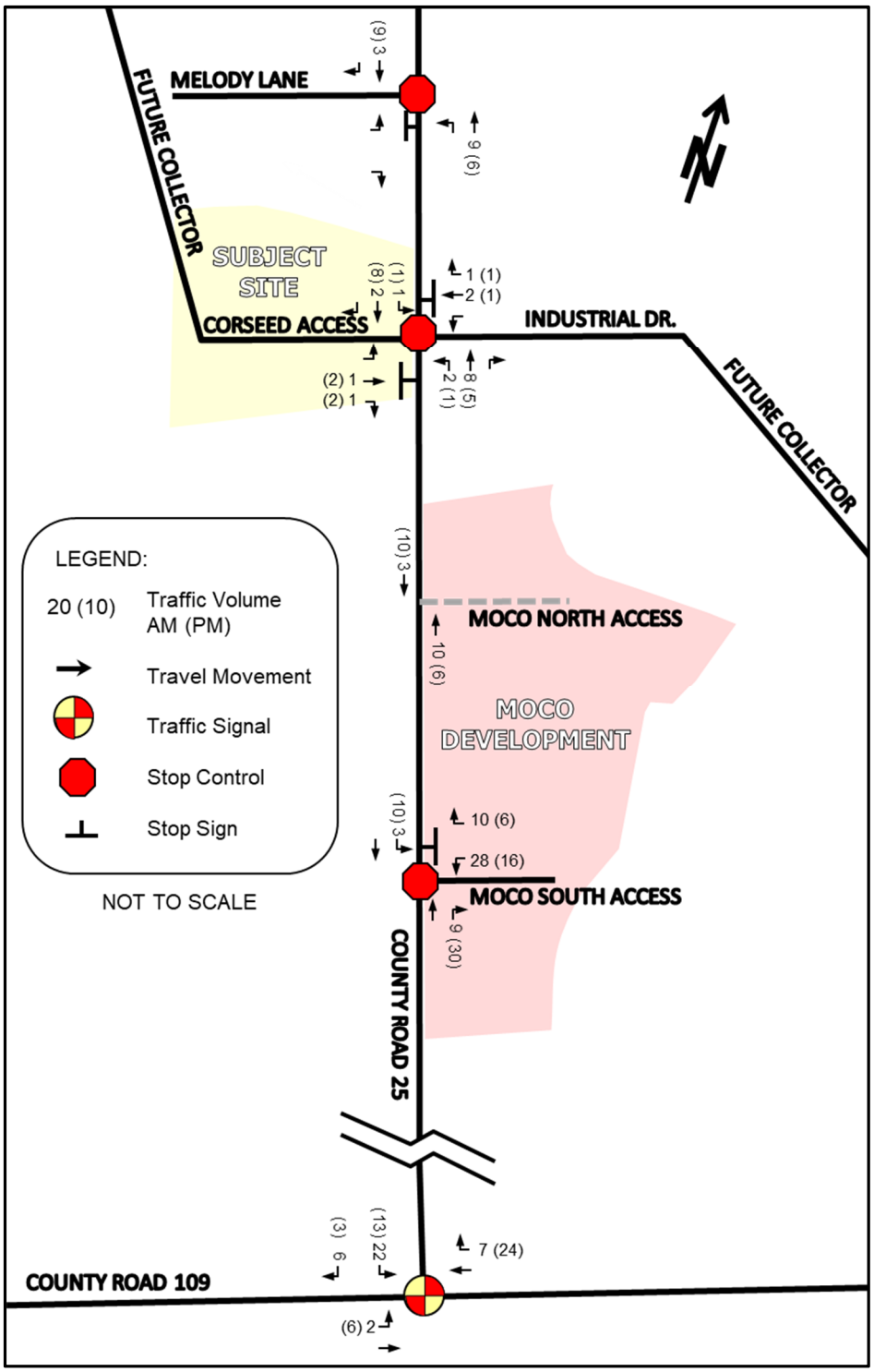


Figure 6 – Moco Subdivision Phase 2 Build-out (2031) Peak Hour Traffic Volumes

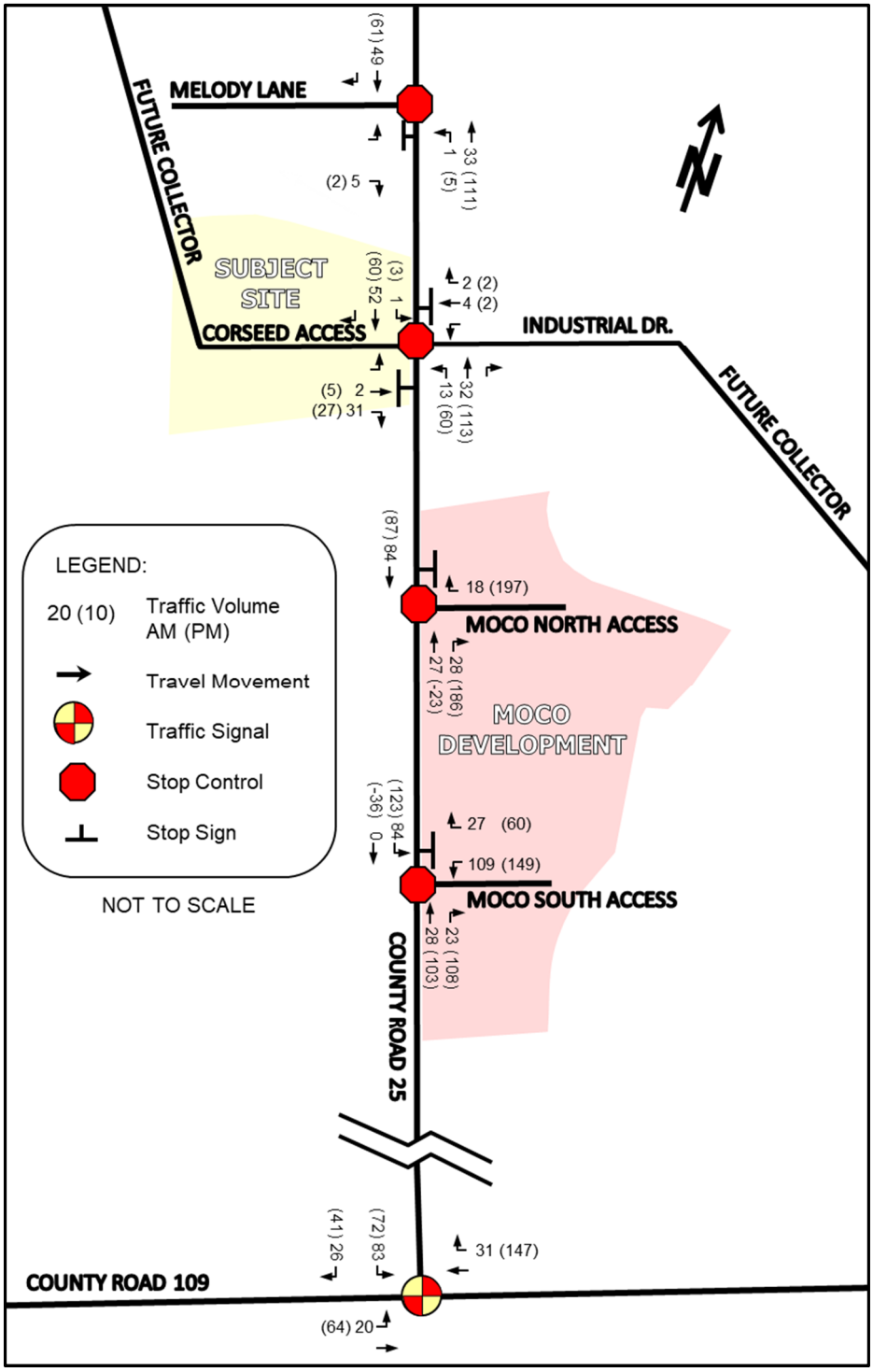


Figure 7 – Additional Thomasfield Subdivision (2021) Peak Hour Traffic Volumes

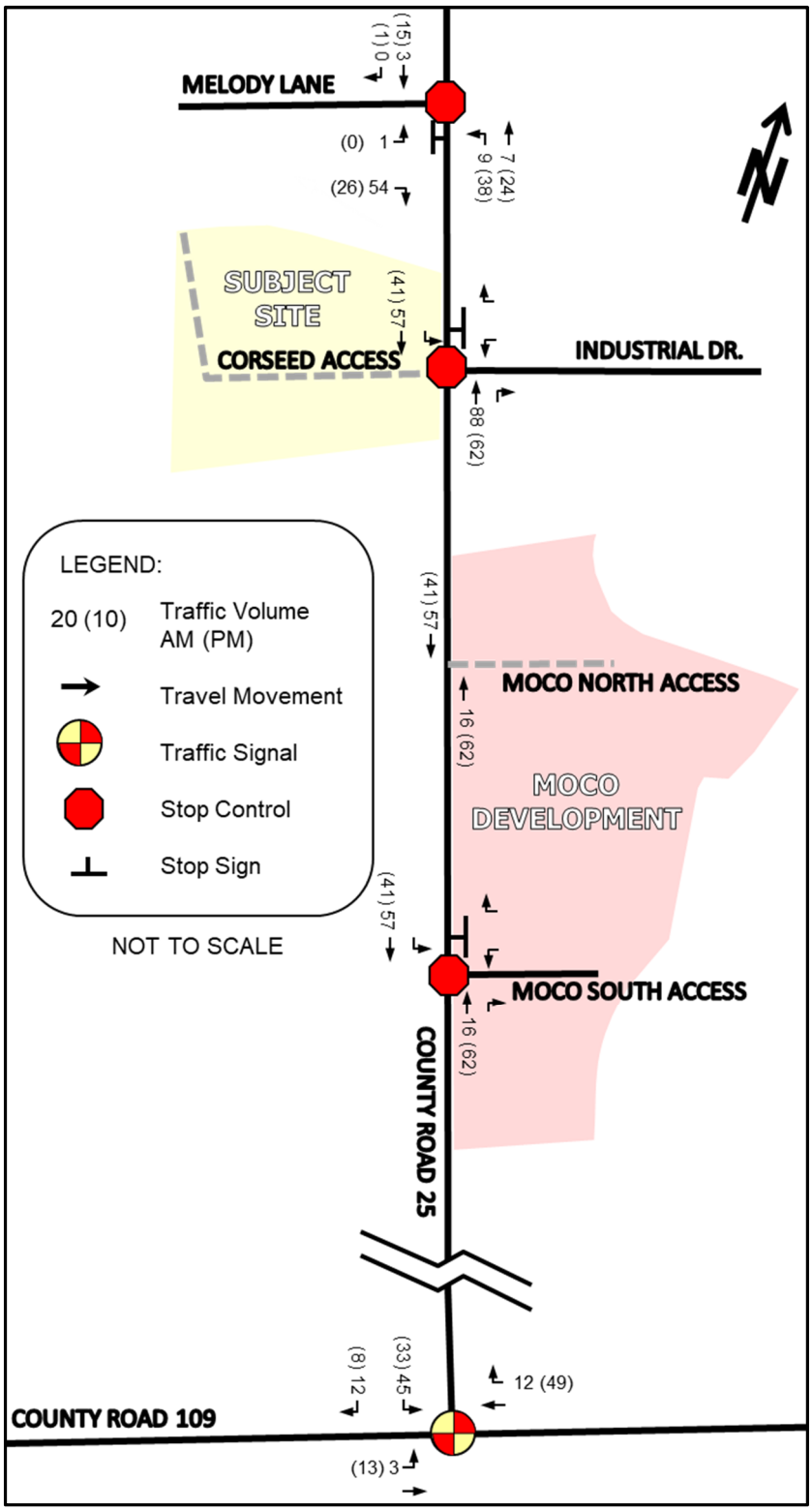


Figure 8 – Additional Thomasfield Subdivision (2026 and 2031) Peak Hour Traffic Volumes

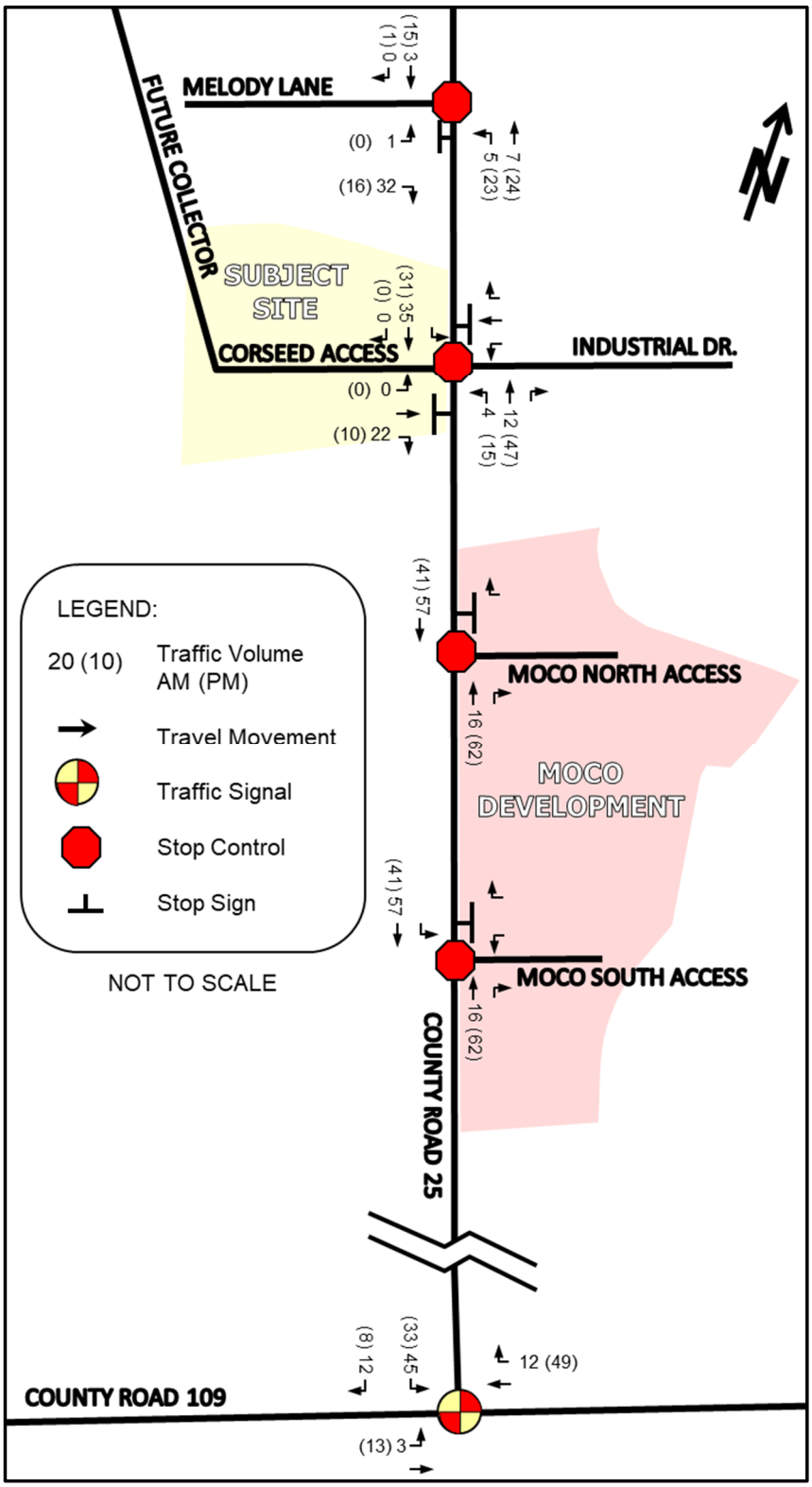
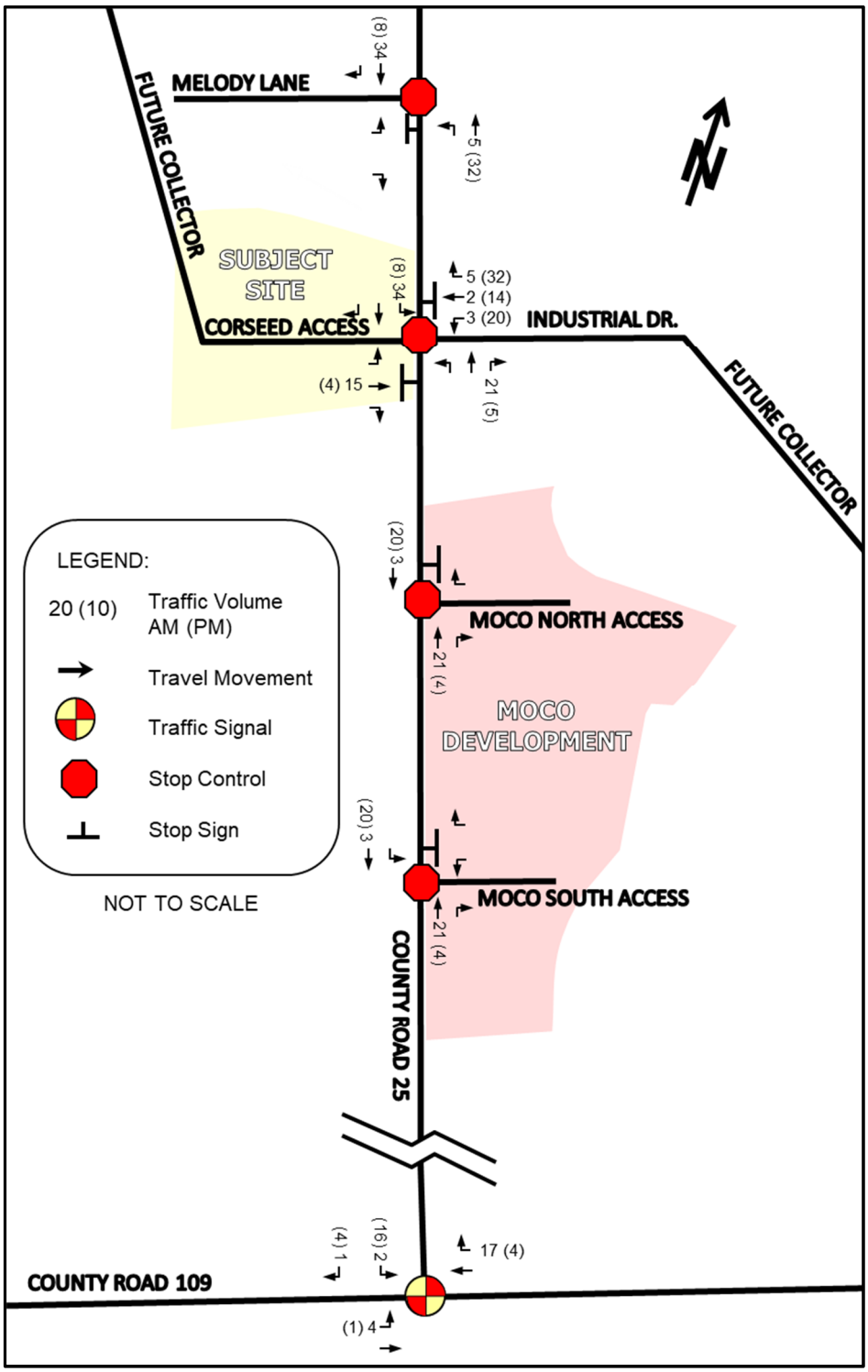


Figure 9 – Industrial Drive Development (2026 and 2031) Peak Hour Traffic Volumes



2.5 Traffic Counts

Detailed turning movement traffic and pedestrian counts were completed at the two existing intersections within the study area. **Table 5** summarizes the traffic count data collection information.

Table 5 – Traffic Count Data Collection Information

Intersection	Count Date	AM Peak Hour	PM Peak Hour	Source
County Road 25 / Melody Lane	Thursday October 9th, 2014	07:45 – 08:45	17:15 – 18:15	JD Eng.
County Road 25 / County Road 109	Wednesday October 9th, 2014	07:30 – 08:30	16:45 – 17:45	JD Eng.

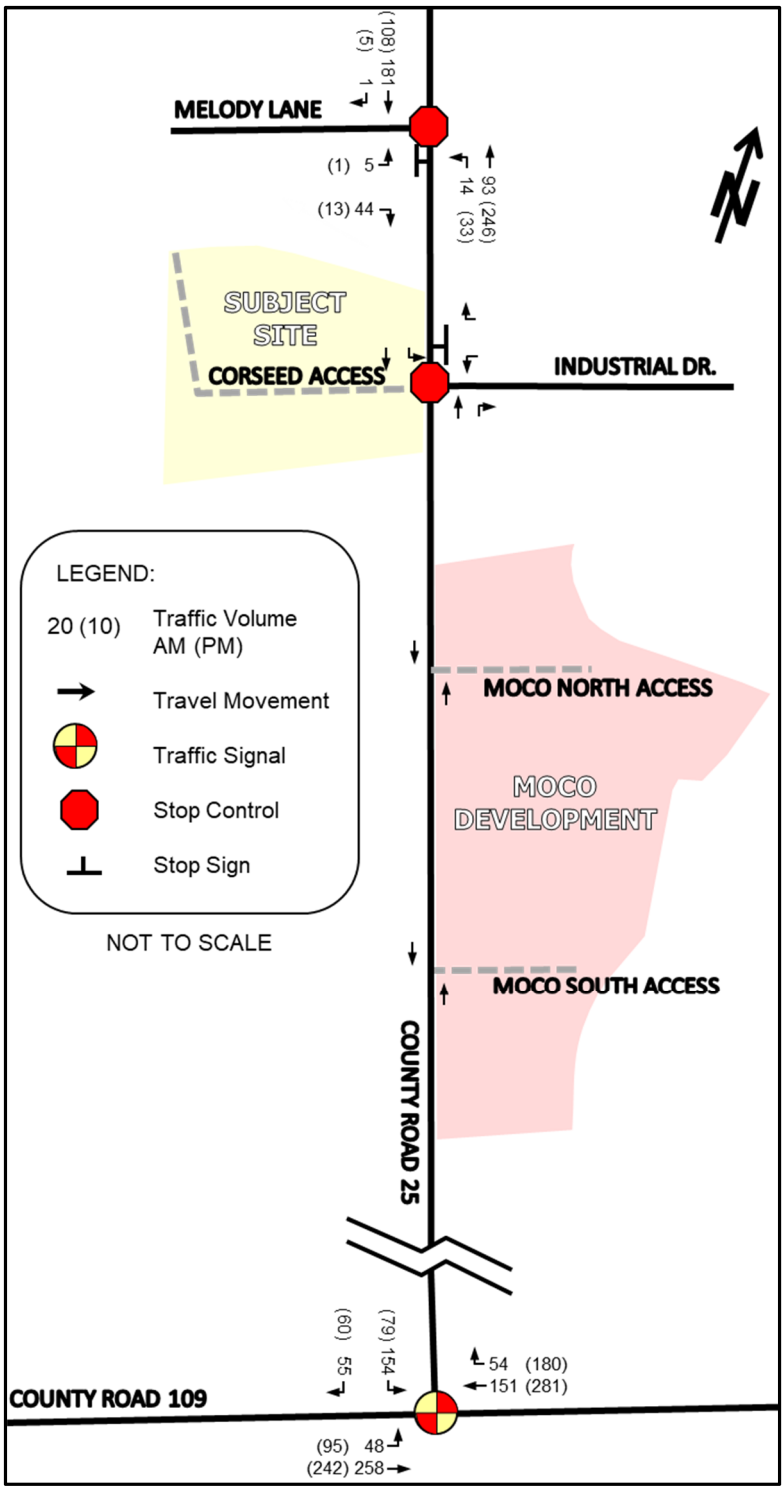
Detailed traffic count data can be found in **Appendix B**. These peaks hours generally aligned with the anticipated peak hour of traffic generation by the proposed development. Although the AM and PM peak periods at the two intersections did not exactly align, for the purpose of this report, we have assumed that the AM and PM peak hours are concurrent.

Heavy vehicle percentages and pedestrian crossings from the traffic count data have also been included in the Synchro analysis.

The traffic counts have been factored by the annual background traffic growth rate (2.2% - as calculated in Section 2.4.1) to estimate the existing (2016) traffic volumes.

Figure 10 illustrates the existing (2016) AM and PM peak hour traffic volumes at the site access and study area intersections.

Figure 10 – Existing (2016) Peak Hour Traffic Volumes



2.6 Horizon Year Traffic Volumes

Future horizon year traffic volumes without the proposed development were estimated to provide base case scenarios to compare to horizon year traffic scenarios with the proposed development operational.

The background traffic growth rate and the adjacent development traffic volumes calculated in Section 2.4 have been applied to the existing traffic counts to estimate the total background traffic volume within the study area.

Figure 11, 12 and **13** illustrate the 2021, 2026 and 2031 total background AM and PM peak hour traffic volumes in the study area, respectively.

Figure 11 – Total Background (2021) Peak Hour Traffic Volumes

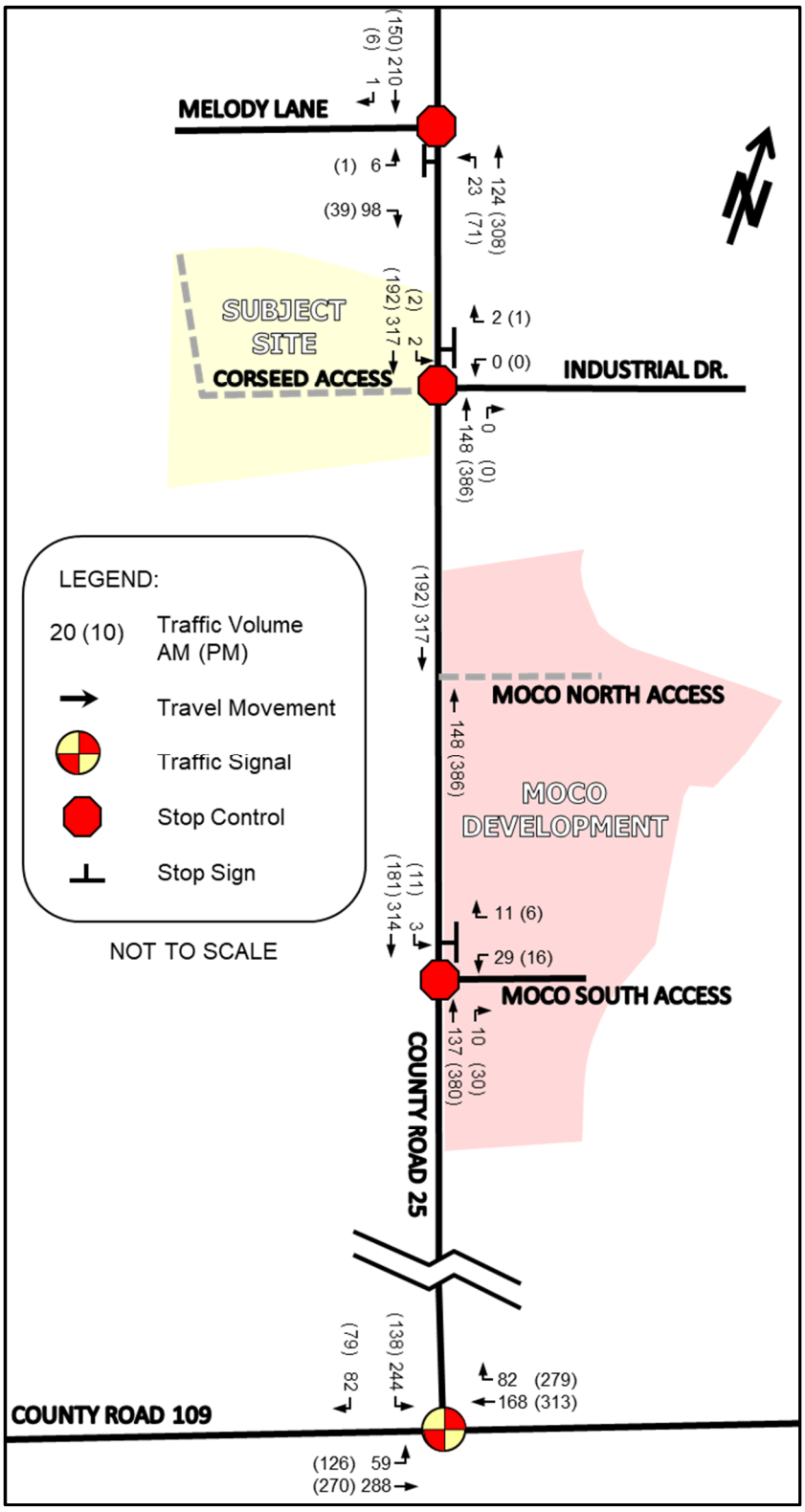


Figure 12 – Total Background (2026) Peak Hour Traffic Volumes

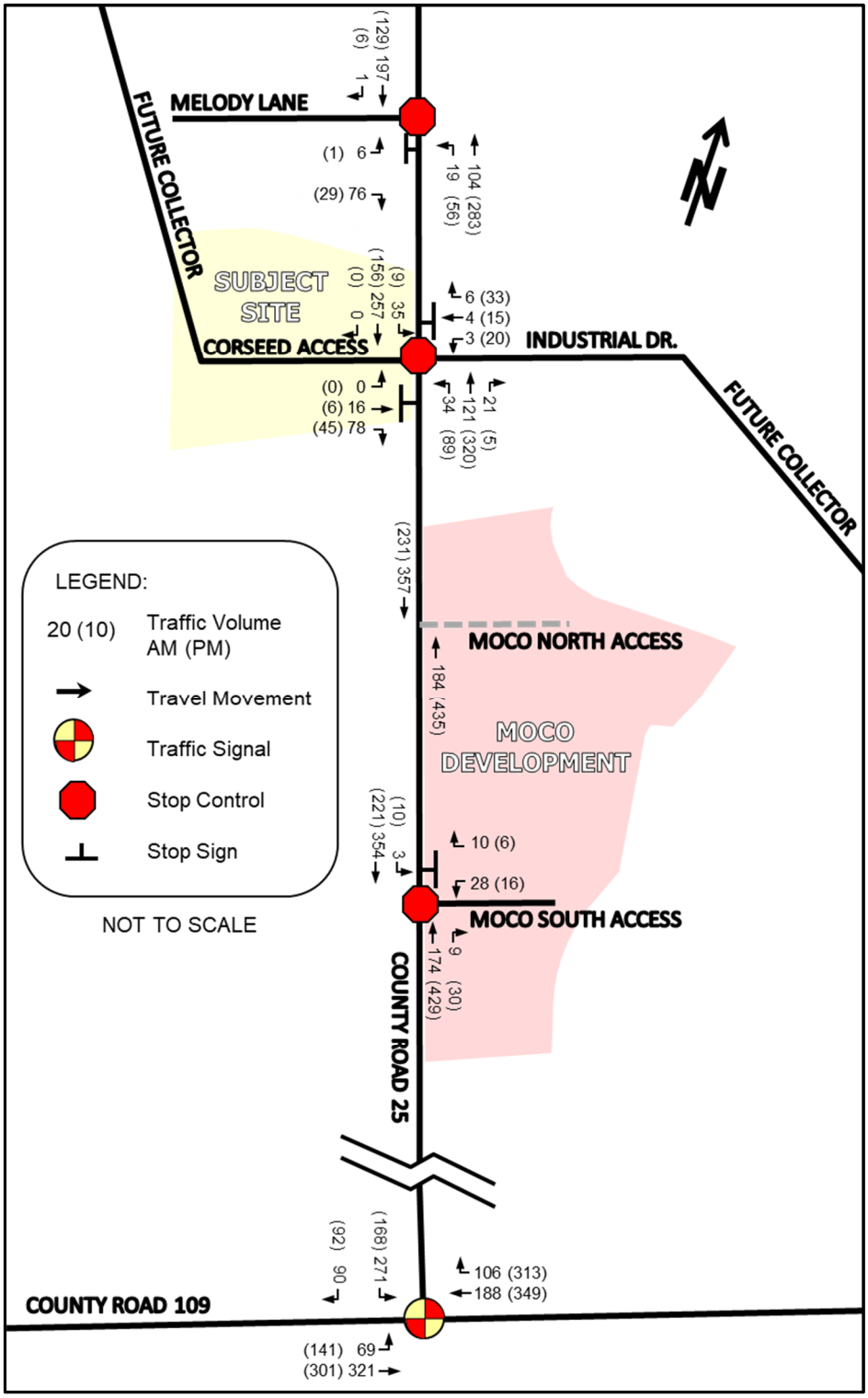
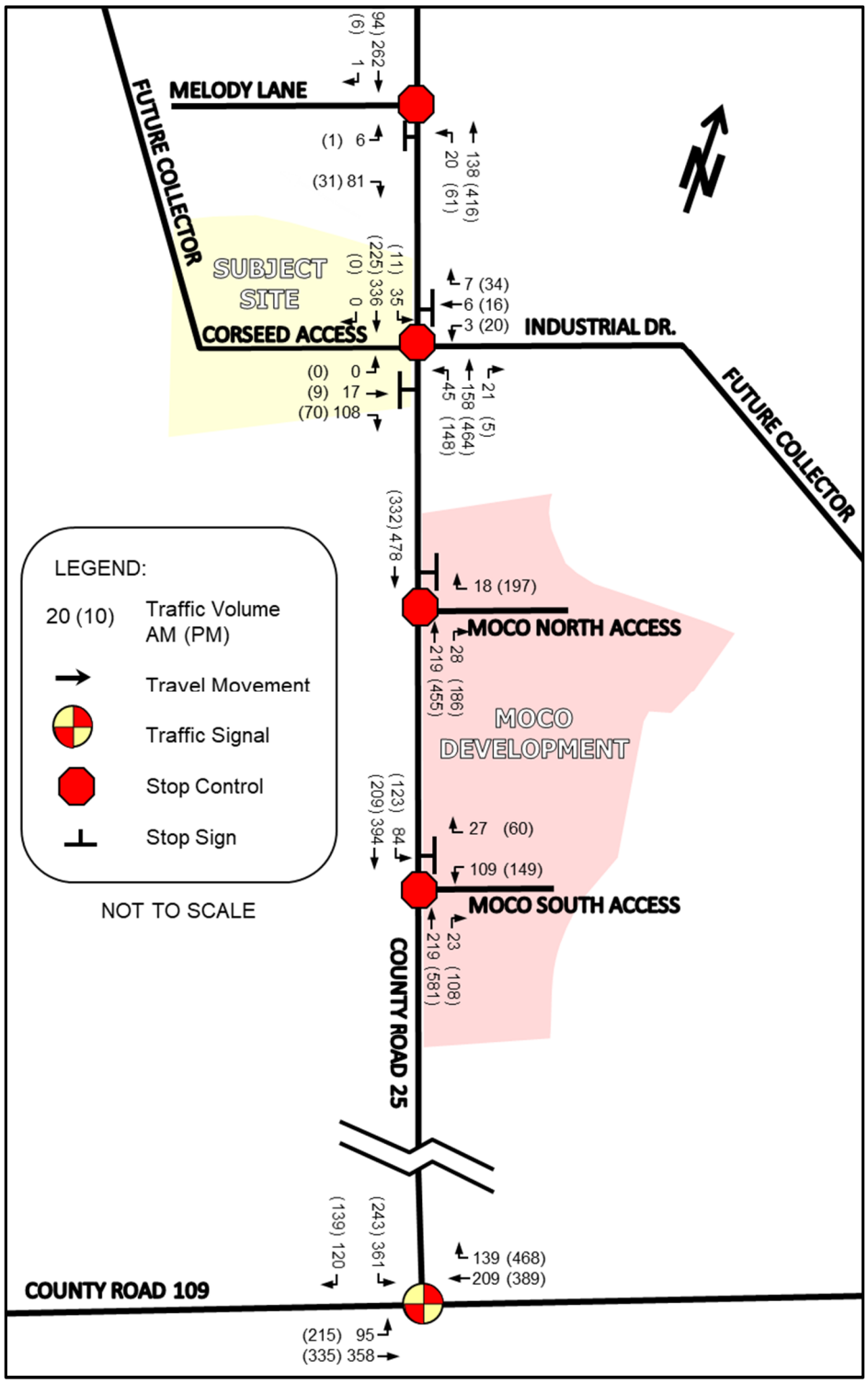


Figure 13 – Total Background (2031) Peak Hour Traffic Volumes



3 Existing Year LOS without Proposed Development

3.1 Introduction

Existing year operational conditions were established to determine how the street network within the study area is currently functioning without the proposed development. This provides a base case scenario to compare with future development scenarios. Traffic operations within the study area were evaluated using the 2015 traffic volumes with the existing road configuration and traffic control. The intersection performance was measured using the traffic analysis software, Synchro 9, a deterministic model that employs Highway Capacity Manual and Intersection Capacity Utilization methodologies for analyzing intersection operations. These procedures are accepted by provincial and municipal agencies throughout North America.

Synchro 9 enables the study area to be graphically defined in terms of streets and intersections, along with their geometric and traffic control characteristics. The user is able to evaluate both signalized and unsignalized intersections in relation to each other, thus not only providing level of service for the individual intersections, but also enabling an assessment of the impact the various intersections in a network have on each other in terms of spacing, traffic congestion, delay, and queuing.

Individual turning movements with a volume-to-capacity [V/C] ratio of 0.85 or greater are considered to be critical movements. Turning movements with a V/C ratio approaching this threshold and have been highlighted in the LOS tables.

The intersection operations were also evaluated in terms of the LOS. LOS is a common measure of the quality of performance at an intersection and is defined in terms of vehicular delay. This delay includes deceleration delay, queue move-up time, stopped delay, and acceleration delay. LOS is expressed on a scale of A through F, where LOS A represents very little delay (i.e. less than 10 seconds per vehicle) and LOS F represents very high delay (i.e. greater than 50 seconds per vehicle for a stop sign controlled intersection and greater than 80 seconds per vehicle for a signalized intersection).

The LOS criteria for signalized and stop sign controlled intersections are shown in **Table 6**. A description of traffic performance characteristics is included for each LOS.

Table 6 – Level of Service Criteria for Intersections

LOS	LOS Description	Control Delay (seconds per vehicle)	
		Signalized Intersections	**Stop Controlled Intersections**
A	Very low delay; most vehicles do not stop (**Excellent**)	less than 10.0	less than 10.0
B	Higher delay; more vehicles stop (**Very Good**)	between 10.0 and 20.0	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping **(Good**)	between 20.0 and 35.0	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (**Satisfactory**)	between 35.0 and 55.0	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of **acceptable** delay	between 55.0 and 80.0	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (**Unacceptable**)	greater than 80.0	greater than 50.0

3.2 Existing (2016) LOS

The results of the LOS analysis under existing (2016) traffic volumes during the AM and PM peak hour can be found below in **Table 7**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix C**.

Table 7 – Existing (2016) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Melody Lane / County Road 25 (unsignalized)	-	1.8	A	-	-	-	1.0	A	-	-
EB	0.07	10.0	A	-	-	0.02	9.1	A	-	-
County Road 109 / County Road 25 (signalized)	0.36	15.2	B	-	-	0.31	13.4	B	-	-
EBL	0.10	10.6	B	10	75	0.21	11.6	B	18	75
EBT	0.33	12.4	B	-	-	0.32	12.3	B	-	-
WBT	0.21	11.4	B	-	-	0.36	12.7	B	-	-
WBR	0.04	10.2	B	6	95	0.12	10.7	B	10	95
SB	0.40	23.8	C	-	-	0.23	21.4	C	-	-

The results of the LOS analysis indicate that the study area intersections are operating within the typical design standards noted in Section 3.1.

The anticipated queue length does not exceed the existing storage length and will not queue back to adjacent intersections. Consequently, there are no issues with the queuing in the study area.

An analysis was completed for the northbound left turn movement on County Road 25 at Melody Lane. Based on the criteria outlined in Appendix 9A of the MTO Design Supplement for TAC

Geometric Design Guide for Canadian Roads [MTO DS] left turn lanes are not warranted[6]. MTO GDSOH left turn warrant graphs are provided in **Appendix G**.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the intersection of Melody Lane / County Road 25 (results are provided in **Appendix H**).

No improvements are required at the within the study area.

3.3 Background (2021) LOS without Proposed Development

The results of the LOS analysis for the background (2021) traffic volumes during the AM and PM peak hour can be found below in **Table 8**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 8 – Background (2021) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Melody Lane / County Road 25 (unsignalized)	-	2.8	A	-	-	-	1.9	A	-	-
EB	0.16	10.6	B	-	-	0.05	9.4	A	-	-
Industrial Drive / County Road 25 (unsignalized)	-	0.1	A	-	-	-	0.0	A	-	-
WB	0.00	9.1	A	-	-	0.00	10.7	B	-	-
County Road 109 / County Road 25 (signalized)	0.47	18.1	B	-	-	0.40	14.5	B	-	-
EBL	0.12	10.8	B	11	75	0.30	12.5	B	23	75
EBT	0.37	12.8	B	-	-	0.35	12.6	B	-	-
WBT	0.24	11.6	B	-	-	0.40	13.1	B	-	-
WBR	0.06	10.3	B	7	95	0.19	11.2	B	12	95
SB	0.63	29.3	C	-	-	0.41	24.0	C	-	-

The results of the LOS analysis indicate that the study area intersections are operating within the typical design standards noted in Section 3.1.

The anticipated queue length does not exceed the existing storage length and will not queue back to adjacent intersections. Consequently, there are no issues with the anticipated queuing in the study area.

An analysis was completed for the left turn movements at all unsignalized intersections within the study area based on the criteria outlined in Appendix 9A of the MTO DS[7], a northbound left turn lane is warranted at the Melody Lane / County Road with a 15 metre storage length; however, based on our discussions with the Town, widening the road at this intersection is not feasible. Consequently,

[6] North of Industrial Drive, a design speed of 50km/h is assumed for County Road 25.
South of Industrial Drive, a design speed of 70km/h is assumed for County Road 25.

we have proceeded with our analysis without the warranted northbound left turn lane. No additional left turn lanes are warranted. MTO GDSOH left turn warrant graphs are provided in **Appendix G**.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the intersection of Melody Lane / County Road 25 (results are provided in **Appendix H**).

No improvements are required at the within the study area.

3.4 Background (2026) LOS without Proposed Development

The results of the LOS analysis for the background (2026) traffic volumes during the AM and PM peak hour can be found below in **Table 9**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 9 – Background (2026) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Melody Lane / County Road 25 (unsignalized)	-	2.5	A	-	-	-	1.6	A	-	-
EB	0.12	10.3	B	-	-	0.03	9.2	A	-	-
Future Collector & Industrial Drive / County Road 25 (unsignalized)	-	3.2	A	-	-	-	3.7	A	-	-
EB	0.15	11.4	B	-	-	0.08	10.4	B	-	-
WB	0.03	12.2	B	-	-	0.18	15.8	C	-	-
County Road 109 / County Road 25 (signalized)	0.52	19.0	B	-	-	0.47	15.3	B	-	-
EBL	0.14	11.0	B	13	75	0.36	13.2	B	27	75
EBT	0.41	13.2	B	-	-	0.39	13.0	B	-	-
WBT	0.27	11.9	B	-	-	0.45	13.6	B	-	-
WBR	0.08	10.4	B	8	95	0.22	11.4	B	12	95
SB	0.71	32.0	C	-	-	0.50	25.9	C	-	-

The results of the LOS analysis indicate that the study area intersections are operating within the typical design standards noted in Section 3.1.

The anticipated queue length does not exceed the existing storage length and will not queue back to adjacent intersections. Consequently, there are no issues with the anticipated queuing in the study area.

An analysis was completed for left turn movements at all unsignalized intersections within the study area based on the criteria outlined in Appendix 9A of the MTO DS.

Based on the above noted warrants, a northbound left turn lane is recommended on County Road 25 at the Future Collector with a 25 metre storage length[8], 40 metre parallel length and a 115 metre taper length.

Based on the above noted warrants a southbound left turn lane is not warranted on County Road 25 at Industrial Drive; however, a southbound left turn lane is recommended to avoid piecemeal reconstruction of County Road 25 in the study area. The traffic volumes in this scenario are approaching the warrant for a southbound left turn lane and are anticipated to pass the warrant likely a short time after the construction of the mixed-use blocks in the 2031 horizon year. Consequently, a southbound left turn lane is recommended on County Road 25 at Industrial Drive with a 15 metre storage length, 40 metre parallel length and a 115 metre taper length.

No other left turn lanes are warranted in the study area. MTO DS left turn warrant graphs are provided in **Appendix G**.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the intersection of Melody Lane / County Road 25 or Future Collector / County Road 25 (results are provided in **Appendix H**).

No improvements are required at the within the study area.

4 Proposed Development Traffic Generation and Assignment

4.1 Traffic Generation

The proposed site plan for the Corseed Subdivision is shown in **Appendix A**.

The traffic generation for Phase 1 of the proposed development has been based on the ITE *Trip Generation* data. The following ITE land uses have been applied to estimate the traffic from the proposed development:

- ITE land use 210 (Single-Family Detached Housing)
- ITE land use 220 (Multifamily Housing (Low-Rise))

As noted in Section 1.4, development plans for the future mixed-use blocks (Phase 2) in the proposed development have not been finalized at this time. It is anticipated that development of the mixed-use blocks will not commence within 10 years of the current proposed development. Based on our correspondence with the Town and County, although the development of the mixed-use blocks are not anticipated to develop in the short term, a longer-term preliminary review of the anticipated mixed-use development for the year 2031 is required.

The traffic generated by the future mixed-use block in the Corseed Subdivision has been calculated based on the traffic projections completed in the 2016 TIS for the future mixed-use block in the Moco Subdivision. The traffic generated by the Moco Subdivision in the 2016 TIS was based off the

[8] Storage length requirement based on the anticipated queue in the Total (2031) scenario.

conceptual development plan (dated November 2016) by IPS Consulting Inc. Excerpts from this study have been included in **Appendix K.**

The estimated trip generation of the proposed development is illustrated below in **Table 10**. The AM and PM peak traffic generation for the subject site generally aligns with the AM and PM peak hour in the traffic counts.

Table 10 – Estimated Traffic Generation from Proposed Development

Phase	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
1	Single-Family Detached Housing ITE Land Use: 210	85 units	18	52	70	57	34	91
	Multifamily Housing (Low-Rise) ITE Land Use: 220	29 units	3	12	15	13	7	20
PHASE 1 TOTAL TRIPS			21	64	85	70	41	111
2	Residential Condominium/Townhouse	25% of Moco*	3	12	15	12	6	18
	Shopping Centre		31	20	51	93	100	193
	Internal Capture		-3	-2	-5	-10	-10	-20
	Pass-by		0	0	0	-30	-30	-60
PHASE 2 TOTAL PRIMARY TRIPS			**52**	**94**	**146**	**135**	**107**	**242**

*Traffic generated by the residential townhouse and commercial area for the proposed Moco Subdivision is provided in **Table 1.**

In order to be conservative, no transportation modal split has been applied to the above-noted traffic generation calculation.

4.2 Traffic Assignment

For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed. The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. Beyond the local area the distribution of traffic from the proposed development has been estimated based on the 2011 TTS data (excerpt attached as **Appendix M**). TTS data provides historical origin and destination work trip percentages for specific areas within the County and the Greater Toronto and Hamilton Area [GTHA].

The egress distribution of the residential trips generated by the proposed development was based on TTS data for trips originating in Zone 8614 between 07:00 and 09:00. Logically, the distribution of ingress traffic will follow the inverse of the exiting traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

Trips generated by the mixed-use developable areas in the proposed development has been distributed proportionately with the existing traffic volumes on the roads in the study area.

It is anticipated that some traffic generated by the proposed development travelling north on County Road 25 would ultimately take the Future Collector (once constructed) to bypass main intersections within the Town during peak hours; however, for the purposes of analysis we have conservatively assumed all traffic generated by the proposed development to be assigned to the existing local network.

For site traffic travelling southeast on County Road 109 we anticipate some traffic to take an alternative route and use the Future Collector (once constructed) onto the Amaranth Townline to

access County Road 109. It is assumed that 30% of site traffic travelling southeast on County Road 109 would use the Future Collector. For the purposes of this report we have assigned all this traffic at the Country Road 25 / Industrial Drive intersection where there will be a connection to the Future Collector via the internal network of the Moco Subdivision. This assumption is based on the recommendations in the GVTMP regarding the future collector.

Table 11 summarizes the residential trip distribution for the Moco Subdivision and Corseed Subdivision.

Table 11 – Traffic Distribution Summary

Travel Direction (to/from)	Percent of Total Traffic Generation (Phase 1)
North (via County Road 25)	32%
Southwest	14%
Southeast	54%
Total	**100%**

Figure C and **E** in **Appendix L** illustrates the traffic distribution pattern for the residential and commercial component of the proposed development respectively.

It is assumed that the residential component will be constructed and completely occupied by 2021 and the mixed-use residential and commercial component to be operational by 2031.

Using the traffic distribution patterns and timing assumptions noted above, the 2021/2026 and 2031 development traffic assignment during the AM and PM peak hour for the Corseed Subdivision is illustrated in **Figure 14** and **15** respectively.

Figure 14 – Traffic Assignment for the Proposed Development (2021 & 2026)

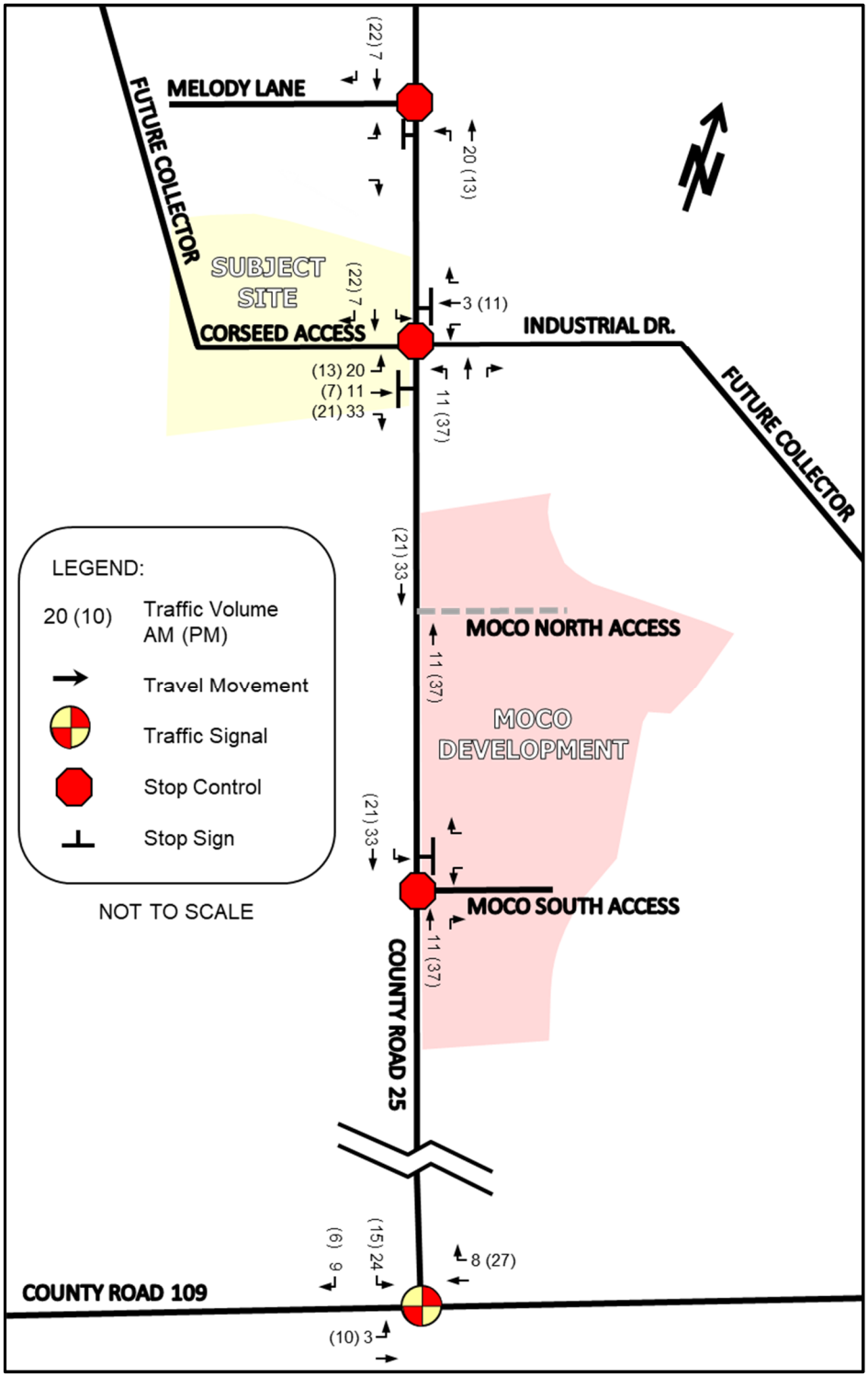
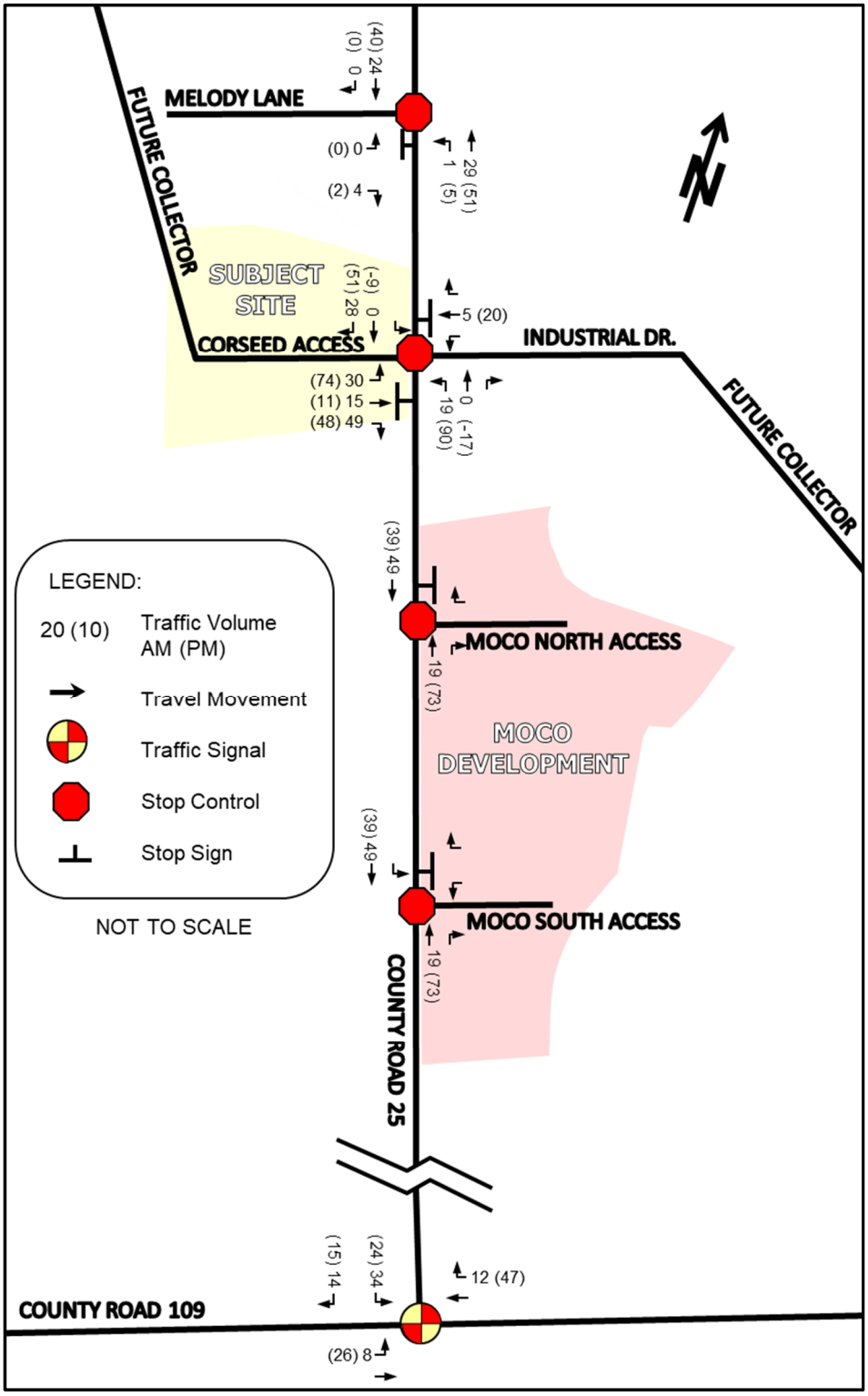


Figure 15 – Traffic Assignment for the Proposed Development (2031)



4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2021, 2026 and 2031) horizon year traffic volumes, the proposed development traffic was added to the background (2021, 2026 and 2031) traffic volumes. The resulting total (2021, 2026 and 2031) horizon year total traffic volume for the AM and PM peak hour can be found in **Figure 16, 17** and **18**.

Figure 16 – Total (2021) Peak Hour Traffic Volumes with Proposed Development

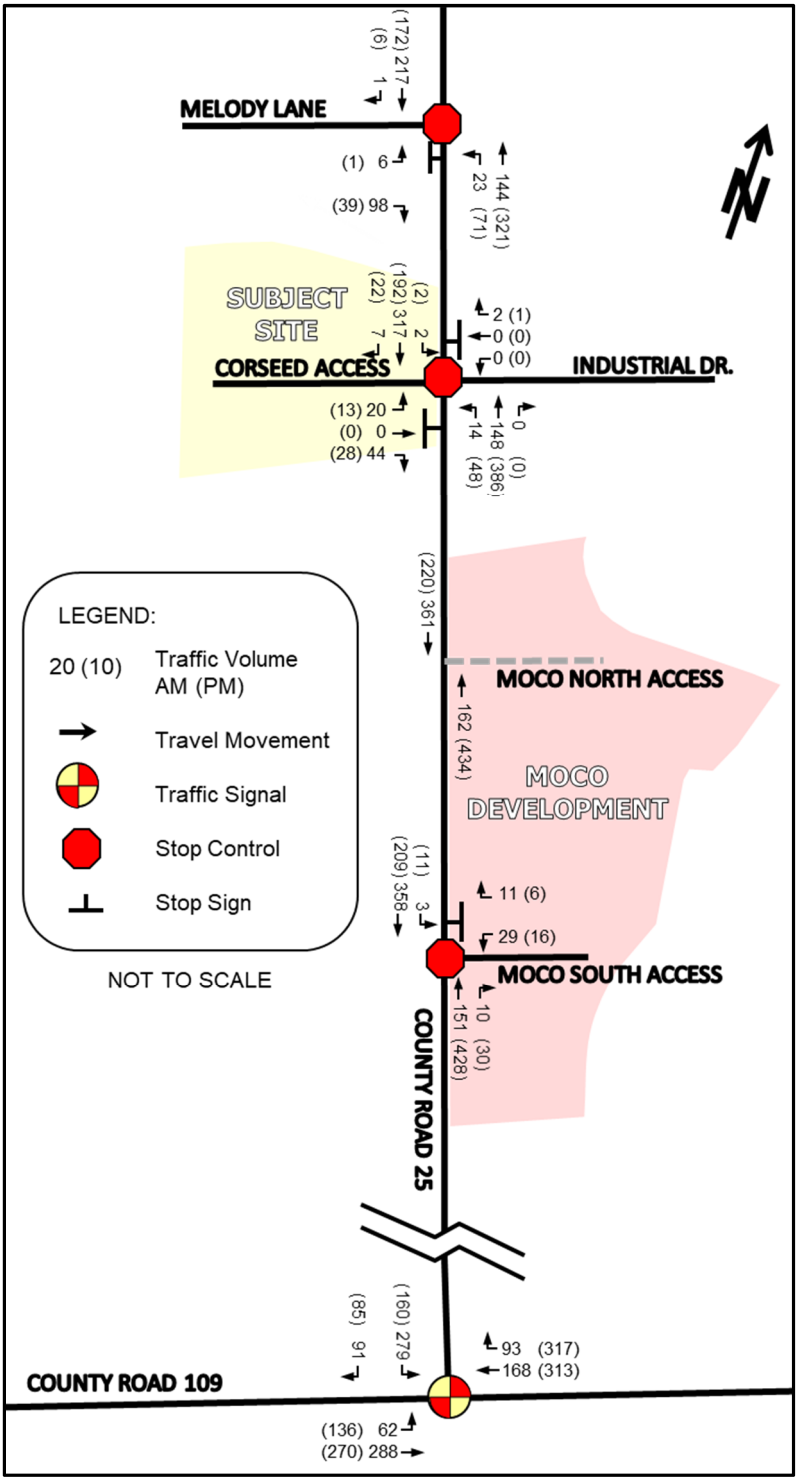


Figure 17 – Total (2026) Peak Hour Traffic Volumes with Proposed Development

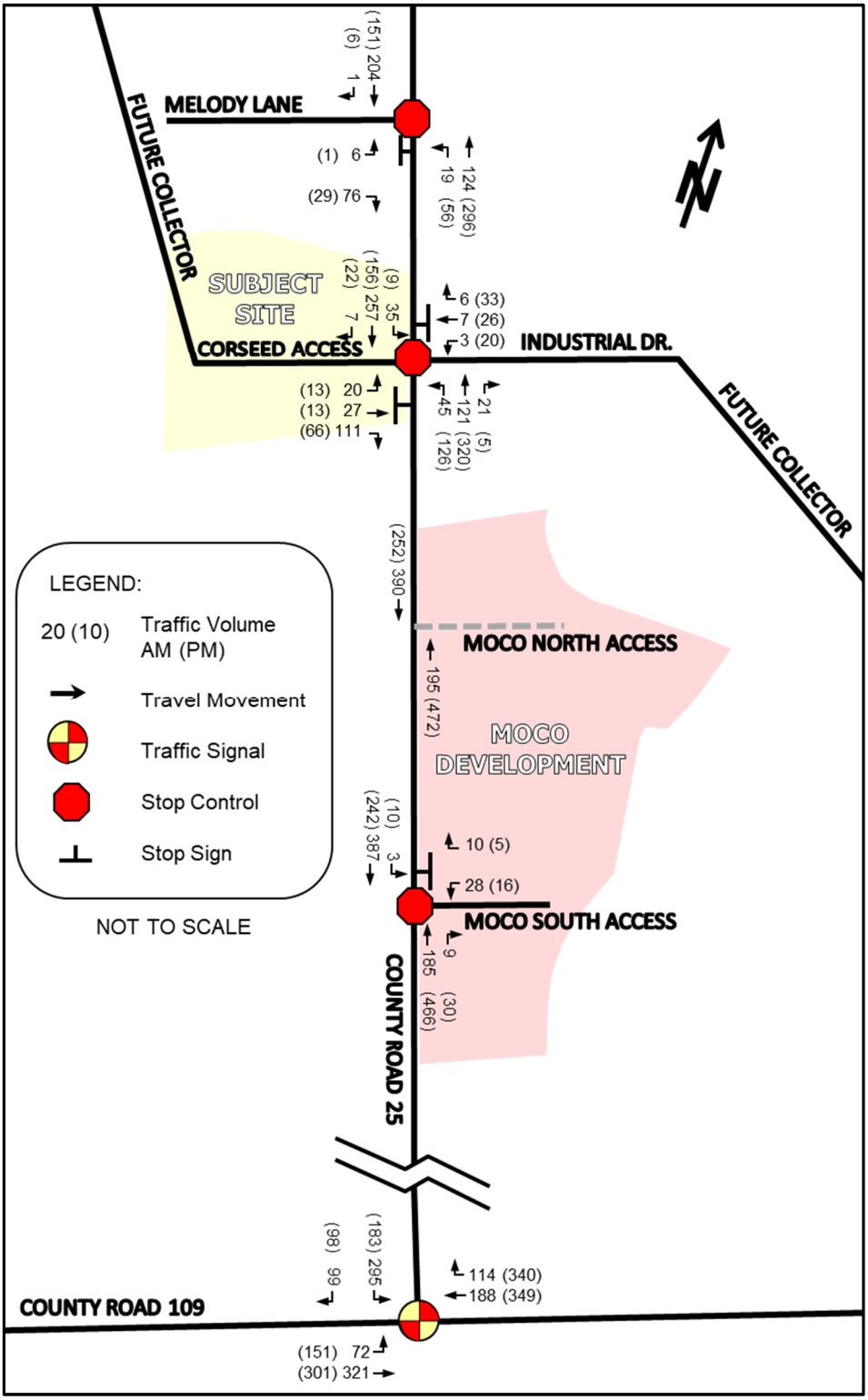
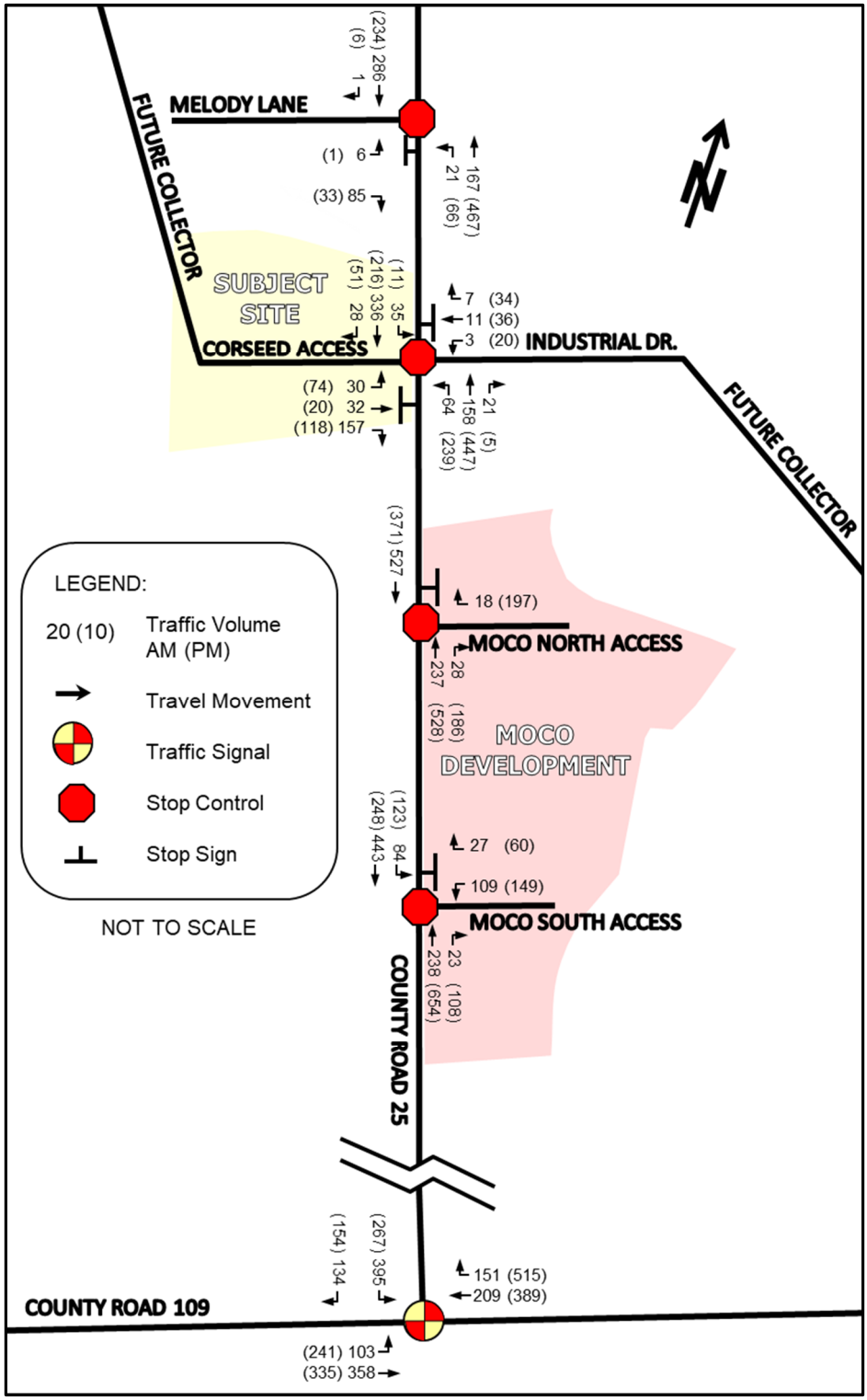


Figure 18 – Total (2031) Peak Hour Traffic Volumes with Proposed Development



5 Intersection Operation with Proposed Development

5.1 2021 Horizon Year LOS with Full Development

The 2021 horizon year was evaluated to determine how the study area would function at build-out of Phase 1 of the Corseed Subdivision. In this scenario, existing intersection geometry and traffic control have been utilized for this scenario. The proposed intersection of Corseed Access & Industrial Drive / Country Road 25 is assumed to be unsignalized with two-way stop control for eastbound and westbound movements.

The results of the LOS analysis under total (2021) traffic volumes during the AM and PM peak hour can be found below in **Table 12**. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 12 – Total (2021) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Melody Lane / County Road 25 (unsignalized)	-	2.7	A	-	-	-	1.8	A	-	-
EB	0.16	10.7	B	-	-	0.05	9.5	A	-	-
Corseed Access & Industrial Drive / County Road 25 (unsignalized)	-	1.6	A	-	-	-	1.5	A	-	-
EB	0.12	12.2	B	-	-	0.08	12.1	B	-	-
NB	0.01	0.8	A	-	-	0.04	1.2	A	-	-
WB	0.00	9.1	A	-	-	0.00	10.7	B	-	-
County Road 109 / County Road 25 (signalized)	0.51	19.8	B	-	-	0.43	14.8	B	-	-
EBL	0.13	10.8	B	12	75	0.32	12.7	B	25	75
EBT	0.37	12.8	B	-	-	0.35	12.6	B	-	-
WBT	0.24	11.6	B	-	-	0.40	13.1	B	-	-
WBR	0.07	10.4	B	7	95	0.22	11.5	B	12	95
SB	0.72	32.8	C	-	-	0.47	25.2	C	-	-

The results of the LOS analysis indicate that the study area intersections are operating within the typical design standards noted in Section 3.1.

The anticipated queue length does not exceed the existing storage length and will not queue back to adjacent intersections. Consequently, there are no issues with the anticipated queuing in the study area.

An analysis was completed for left turn movements at all unsignalized intersections within the study area based on the criteria outlined in Appendix 9A of the MTO DS.

A northbound left turn lane on County Road 25 at Melody Lane is warranted with a 15 metre storage length; however, widening the road at this intersection is not feasible. Consequently, for the purpose of this analysis, it is assumed that a northbound left turn lane will not be constructed on County Road 25 at Melody Lane.

A northbound left turn lane is marginally over the warrant based on the above-noted criteria for the Corseed Access & Industrial Drive / County Road 25 intersection; however, since the control delay and V/C ratio for this movement are very low, a northbound left turn lane is not recommended for this horizon year.

No additional left turn lanes are warranted in the study area. MTO DS left turn warrant graphs are provided in **Appendix G**.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the unsignalized intersections (results are provided in **Appendix H**).

No improvements are required at the within the study area.

5.2 2026 Horizon Year LOS with Full Development

The 2026 horizon year was evaluated to determine how the study area would function five years following Phase 1 build-out of the Corseed Development. Existing traffic control have been utilized for this scenario.

The results of the LOS analysis under Total (2026) traffic volumes during the AM and PM peak hour can be found below in **Table 13**. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 13 – Total (2026) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Melody Lane / County Road 25 (unsignalized)	-	2.4	A	-	-	-	1.5	A	-	-
EB	0.12	10.3	B	-	-	0.04	9.3	A	-	-
Corseed Access & Industrial Drive / County Road 25 (unsignalized)	-	4.5	A	-	-	-	4.8	A	-	-
EB	0.30	14.0	B	-	-	0.20	13.9	B	-	-
WB	0.04	13.7	B	-	-	0.26	19.5	C	-	-
County Road 109 / County Road 25 (signalized)	0.55	20.6	C	-	-	0.48	13.5	B	-	-
EBL	0.15	11.0	B	13	75	0.39	13.5	B	29	75
EBT	0.41	13.2	B	-	-	0.39	13.0	B	-	-
WBT	0.27	11.9	B	-	-	0.45	13.6	B	-	-
WBR	0.09	10.5	B	8	95	0.24	11.6	B	13	95
SB	0.77	35.5	D	-	-	0.55	26.9	C	-	-

The results of the LOS analysis indicate that the study area intersections are operating within the typical design standards noted in Section 3.1.

The anticipated queue length does not exceed the existing storage length and will not queue back to adjacent intersections. Consequently, there are no issues with the anticipated queuing in the study area.

An analysis was completed for left turn movements at all unsignalized intersections within the study area based on the criteria outlined in Appendix 9A of the MTO DS. No left turn lanes are warranted. MTO DS left turn warrant graphs are provided in **Appendix G**.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the unsignalized intersections (results are provided in **Appendix H**).

No improvements are required at the within the study area.

5.3 2031 Horizon Year LOS with Full Development

The 2031 horizon year was evaluated for long-term right-of-way planning purposes. Traffic signal timing has been optimized at the County Road 109 / County Road 25 intersection to maximize the operational capacity of the existing intersection geometry.

The results of the LOS analysis under total (2031) traffic volumes during the AM and PM peak hour can be found below in **Table 14**. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 14 – Total (2031) LOS

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Melody Lane / County Road 25 (unsignalized)	-	2.2	A	-	-	-	1.4	B	-	-
EB	0.16	11.3	B	-	-	0.05	10.0	A	-	-
Corseed Access & Industrial Drive / County Road 25 (unsignalized)	-	6.2	A	-	-	-	48.1	B	-	-
EB	0.51	20.5	C	22	-	1.36	248.2	F	106	-
WB	0.07	17.4	C	-	-	0.68	71.2	F	-	-
County Road 109 / County Road 25 (signalized)	0.67	24.1	C	-	-	0.73	21.1	C	-	-
EBL	0.26	17.8	B	24	75	0.72	26.2	C	71	75
EBT	0.55	21.5	C	-	-	0.46	15.8	B	-	-
WBT	0.36	18.7	B	-	-	0.52	15.5	B	-	-
WBR	0.11	16.2	B	11	95	0.36	14.1	B	16	95
SB	0.79	31.4	C	-	-	0.76	25.1	C	-	-

The results of the LOS analysis indicate that all intersection in the study area will operate at an acceptable LOS for all turning movements. However, the eastbound movement at the Corseed Access & Industrial Drive / County Road 25 intersection is operating outside the typical design limits noted in Section 3.1 during the PM peak hour. Based on the Ontario Traffic Manual Book 12 *Signal Justification,* traffic signals are not warranted at any of the study area intersections (results are provided in **Appendix H**); however, due to the anticipated control delay for the eastbound movement at this intersection, it is recommended that the Town plan to install traffic signals at this intersection before 2031.

The results of the Synchro analysis with the above-noted improvements can be found below in **Table 15.** Detailed output of the Synchro analysis can be found in **Appendix F**. It is recommended that the Town review the traffic volumes at this intersection closer to the anticipated construction date to assess the recommendation for signalization at this intersection.

Table 15 – Total (2031) LOS with Improvements

Location (E-W Street / N-S Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95% Queue (m)		V/C	Delay (s)	LOS	95% Queue (m)	
				Model	Actual				Model	Actual
Corseed Access & Industrial Drive / County Road 25 (signalized)	0.35	10.0	B	-	-	0.45	11.1	B	-	-
EB	0.40	24.6	C	24	-	0.59	27.4	C	33	-
WB	0.07	22.4	C	-	-	0.25	22.8	C	-	-
NBL	0.11	4.2	A	9	65	0.37	7.1	A	31	65
NBTR	0.17	4.3	A	-	-	0.41	6.8	A	-	-
SBL	0.05	3.8	A	5	55	0.02	4.4	A	3	55
SBTR	0.34	5.4	A	-	-	0.24	5.5	A	-	-

The results of the LOS analysis indicate that the study area intersections are operating within the typical design standards noted in Section 3.1.

It is recommended that the County continue to monitor the County Road 109 / County Road 25 intersection operation. Ultimately, a protected eastbound left turn phase may be warranted and / an auxiliary southbound right turn lane on County Road 25.

An analysis was completed for the northbound left turn movement on County Road 25 at Melody Lane is warranted with a 25 metre storage length; however, as noted in Section 3.4, widening the road at this intersection is not feasible. Consequently, for the purpose of this analysis, it is assumed that a northbound left turn lane will not be constructed on County Road 25 at Melody Lane. MTO DS left turn warrant graphs are provided in **Appendix G**.

A review of the need for additional auxiliary right turn lanes at all unsignalized intersections was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, additional auxiliary right turn lanes are not recommended.

No other improvements are recommended within the study area.

5.4 Site Access and Intersection Spacing Review

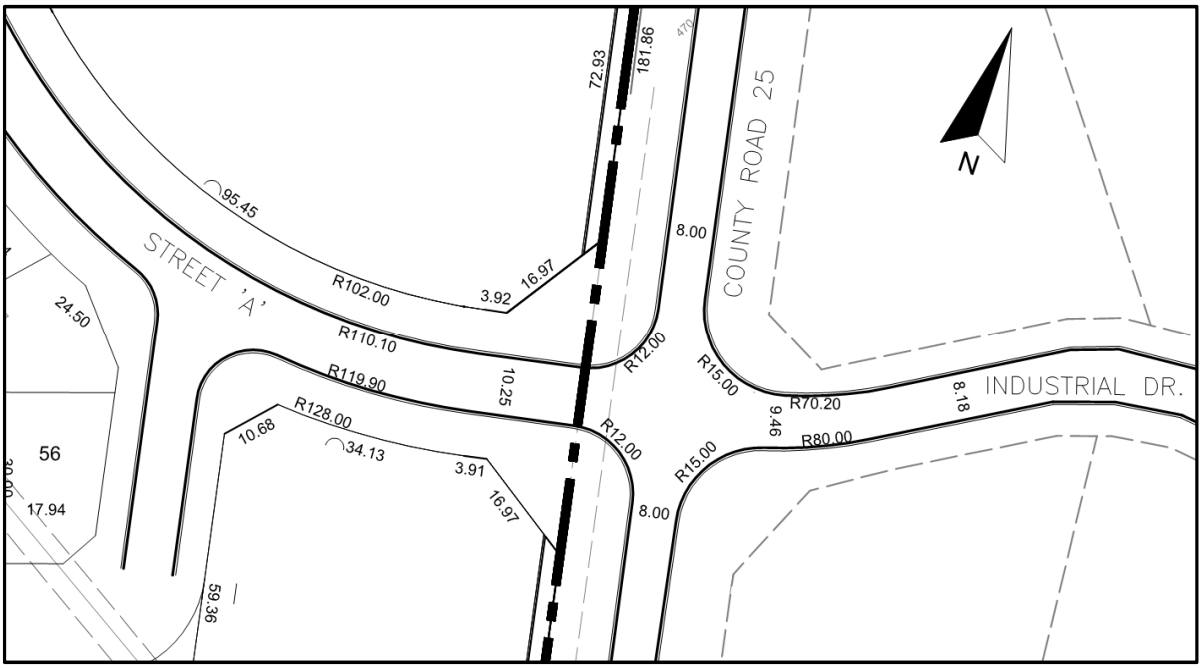
Prior to the development of the future mixed-use block, the proposed Corseed Access & Industrial Drive / County Road 25 intersection will operate efficiently using unsignalized control with two-way stop control for westbound and eastbound traffic at County Road 25. One lane for egress traffic and one lane for ingress traffic for the west leg of the intersection will provide the necessary capacity for Phase 1 of the proposed development.

As noted in Section 5.3, it is anticipated that this intersection may require traffic signalization by 2031 to reduce the anticipated eastbound delay at this intersection.

Figure 19 has been provided to provide a preliminary intersection alignment concept for the proposed intersection of the Corseed Site Access & Industrial Road / County Road 25. The sight distance for vehicles approaching the intersection is greater than 120 metres in all cases, which exceeds the sight stopping distance requirement. The proposed Corseed Access is constrained by a number of factors;

however, the proposed preliminary alignment would not result in any operational or traffic safety issues. Consequently, the proposed alignment is acceptable for the intended use.

Figure 19 – Preliminary Intersection Layout



A review of the proposed site access configuration for the proposed development was completed as part of our analysis. The existing and proposed intersection spacing dimensions are illustrated in Figure 2. The proposed spacing between the Corseed Access and the Moco South Access exceeds the County's Entrance Policy minimum intersection spacing – for County Roads with a posted speed limit greater than 80 km/h (365 metres).

The Corseed Access is located 294 metres south of the existing Melody Lane / County Road 25 intersection, which is less than the minimum intersection – for County Roads with a posted speed limit less than 80 km/h (300 metres); however, the access is aligned with the existing Industrial Drive intersection. Traffic movements and queuing at the adjacent intersections are not anticipated to result in any operational issues, consequently, no change to the proposed intersection spacing is recommended.

The specific location of the access driveway(s) for Block 5 [Mixed-Use Block] and Block 6 [Commercial Block] are not known at this time. Access to the Commercial Block directly across from Street 'B' would provide the necessary sight stopping distance (85 metres) and driveway spacing (55 metre) as identified in the TAC Guidelines. Sight triangles will need to be reviewed during the Site Plan approval stage of development. A right-in, right-out [RIRO] access to the Mixed-Use Block could be provided via Street 'A' and a secondary access could be provided via Street 'B'.

The specific location of the Moco North Access is not known at this time. A review of the proposed intersection spacing for this access will be completed at a later date, when more information is known about the proposed access configuration.

5.5 Pedestrian Movements Review

In order to facilitate pedestrian movements, the following pedestrian infrastructure is proposed:

1) Sidewalks will be constructed on both sides along of Street A and along one side of all other internal roads in the proposed development;
2) A connection can be provided from the parkland block in the proposed development to the Upper Grand Trailway; and
3) A sidewalk will be constructed within the 3.0 metre block proposed across the frontage of the subject site, west of the County Road 25 right-of-way [ROW]. The sidewalk will transition into the Town's existing ROW for Water Street (County Road 25), starting at the south edge of the Upper Grand Trailway. A sidewalk will be constructed on the west side of Water Street (County Road 25) from the Upper Grand Trailway to Melody, within the Town's existing ROW.

5.6 Sight Distance Review

A review of the available sight distance for the proposed Corseed Access was completed as part of this analysis.

The available sight distance south of the proposed Corseed Access for egress movements is significantly greater than the County's minimum sight distance requirements for a commercial entrance with a posted speed limit of 60km/h (180 metres). The available sight distance north of the proposed Corseed Access was determined based on field measurements obtained during a site visit. The egress sight distance north of the proposed Corseed Access (139 metres) is marginally below the commercial entrance sight distance requirements for a posted speed limit of 40km/h (140 metres); however, since the variation in sight distance is relatively minor (1 metre) and the sight distance meet the requirement for a residential entrance for a posted speed limit of 50km/h, the sight distance is acceptable for the intended use. No additional improvements are recommended.

An additional review of the sight distance for the future Street B was completed as part of our analysis. The sight distance east and west of Street B is greater than the minimum stopping sight distance requirements as identified in the Transportation Association of Canada Design Guide for Canadian Roads (2017) [TAC Guidelines] for a design speed of 60km/h (85 metres). Furthermore, vehicles turning into the Corseed Access will turning at much slower speeds consequently, there are no issues with the sightlines at Street B.

A relocation of the proposed Corseed Access north or south would result in a skewed intersection alignment with the existing location of Industrial Drive, which is not preferred; consequently, the relocation of the Corseed Access is not recommended. It is recommended that the existing 60km/h speed limit zone is converted to a 50km/h zone, to ensure that the intersection of County Road 25 / Industrial Drive / Corseed Access meets the County's residential sight distance requirements.

5.7 Road Design

The road structure for the roads within the proposed development will meet the Town standards for local and collector roadways. Street A will have a 26 metre ROW and be classified as a collector road to match the Future Collector road connection. Street B & Street C will have a 20 metre ROW and be classified as local roads.

6 Summary

Corseed Inc. has retained **JD Engineering** to prepare this traffic impact study in support of the Draft Plan Application for the Corseed Subdivision in the Town of Grand Valley, County of Dufferin. The proposed site plan is shown in **Appendix A**.

The proposed Corseed Subdivision will include the following:

- Single Detached 85 units
- Townhouses 29 units
- Future Mixed-Use blocks (assumed from the ratio of developable area between Moco and Corseed)
    - Townhomes TBD
    - Commercial Development TBD

Development plans for the mixed-use blocks for the proposed development have not been finalized at this time. A concept plan for the future mixed-use blocks in the proposed development is not available at this time, consequently, for the purpose of this analysis, it is assumed that the traffic generated by the future mixed-use blocks in the proposed development will be proportionate to the traffic generated by the future mixed-use blocks in the proposed Moco Subdivision based on the relative developable areas.

This chapter summarizes the conclusions and recommendations from the study.

1. The proposed residential development [Phase 1] in the Corseed Subdivision is expected to generate a total of 85 AM and 111 PM peak hour trips.
2. The proposed ultimate development of the Corseed Subdivision, including the future mixed-use development, is expected to generate a total of 148 AM and 246 PM primary peak hour trips.
3. Background traffic and pedestrian counts were completed for the existing intersections of County Road 25 / Melody Lane and County Road 25 / County Road 109 on Tuesday August 19th, 2014.
4. Level-of-service [LOS] analysis was completed at the study area intersections, using the existing (2016) and background (2021 & 2026) traffic volumes without the proposed development. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. Based on the background 2021 traffic volume, a northbound left turn lane is warranted at the intersection of Melody Lane / County Road 25; however, based on our discussions with the Town, widening the road at this intersection is not feasible.
5. The following improvements are recommended as a result of the background 2026 traffic volume:

    Future Collector & Industrial Drive / Country Road 25

    - A northbound left turn lane is recommended at the intersection of Future Collector & Industrial Drive / County Road 25 with 25 metre storage, 40 metre parallel and 115 metre taper length.
    - A southbound left turn lane is recommended at the intersection of Future Collector & Industrial Drive / County Road 25 with 15 metre storage, 40 metre parallel and 115 metre taper length.

6. No other geometric or traffic signage improvements were recommended at the intersections in the study area as a result of the existing (2016) or background (2021 & 2026) traffic volumes without the proposed development.
7. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
8. LOS analysis was completed under total (2021, 2026 & 2031) traffic volumes with the proposed development operational at the study area intersections.
9. No geometric or traffic signage improvements are recommended at the existing Melody Lane / County Road 25 or County Road 25 / County Road 109 intersections as a result of the total (2021, 2026 & 2031) traffic volumes with the proposed development. As noted above, a northbound left turn lane is warranted at the intersection of Melody Lane / County Road 25; however, based on our discussions with the Town, widening the road at this intersection is not feasible.
10. The following improvements are recommended as a result of the Phase 1 Corseed Development:

    - The proposed **Corseed Access** & Industrial Drive / County Road 25 intersection will operate efficiently using unsignalized control with two-way stop control for westbound and eastbound traffic at County Road 25. One lane for egress traffic and one lane for ingress traffic for the west leg of the intersection will provide the necessary capacity for the proposed development.

11. The following improvements are recommended as a result of the ultimate Corseed Development (2031). These recommendations should be confirmed once the specifics for the future mixed-use blocks are known:

    Corseed Access & Industrial Drive / Country Road 25

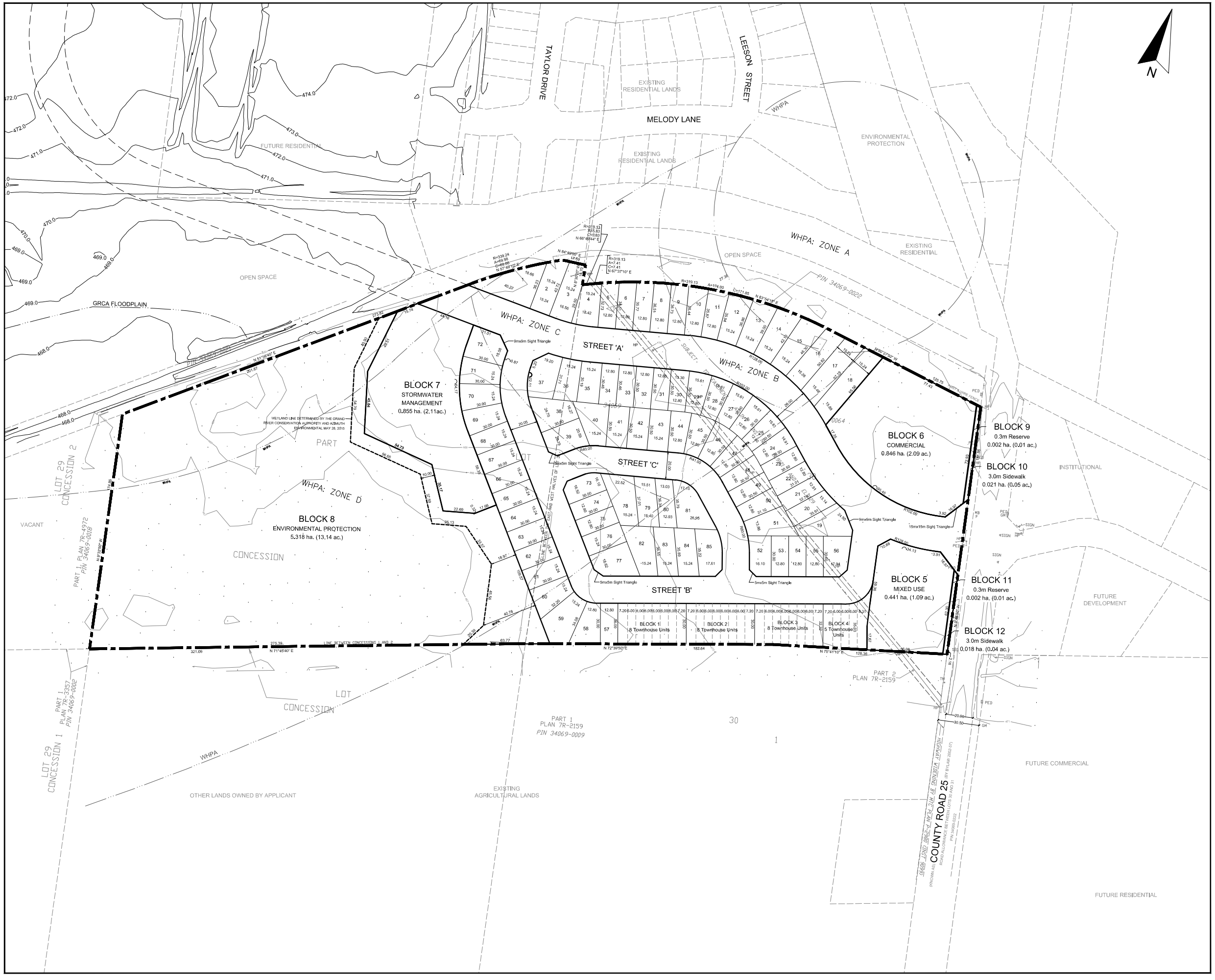
    Total (2031) Traffic Volume

    - Installation of traffic signals to improve the eastbound control delay

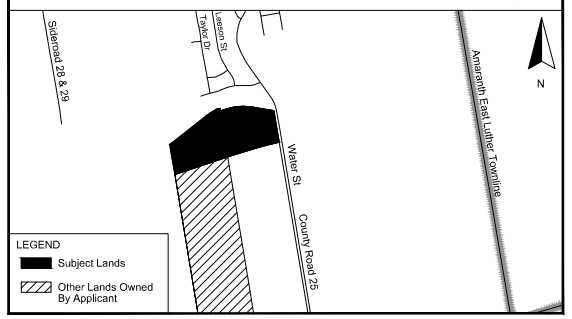
12. The road structure for the internal streets within the proposed development will meet Town standards for local and collector roadways.
13. It is recommended that the existing 60km/h speed limit zone is converted to a 50km/h zone, to ensure that the intersection of County Road 25 / Industrial Drive / Corseed Access meets the County's residential sight distance requirements.

In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

Appendix A –
Draft Plan of Subdivision



KEY MAP — Scale 1:20,000



DRAFT PLAN OF SUBDIVISION

CORSEED FARM

PART OF LOT 30, CONCESSION 2
FORMERLY IN THE TOWNSHIP OF EAST LUTHER
NOW IN THE
TOWNSHIP OF EAST EAST LUTHER - GRAND VALLEY
COUNTY OF DUFFERIN

Scale 1:1,250

0 25 50 75 100 125 150m

LAND USE SCHEDULE

	LOTS/BLOCKS	UNITS	ha	ac	%
RESIDENTIAL LOTS (50')	1-4, 12-18, 35-43, 59-72, 76-79, 82-84	41	2.395	5.918	16.07
RESIDENTIAL LOTS (42')	5-11, 19-34, 44-58, 73-75, 80-81, 85	44	1.986	4.907	13.32
RESIDENTIAL UNITS (19.7')	Blocks 1-4	29	0.571	1.411	3.83
MIXED USE	Block 5	10	0.441	1.09	2.95
COMMERCIAL	Block 6		0.846	2.09	5.68
STORMWATER MANAGEMENT	Block 7		0.855	2.11	5.74
ENVIRONMENTAL PROTECTION	Block 8		5.318	13.14	35.68
0.3m RESERVE	Blocks 9 & 11		0.004	0.01	0.03
3.0m SIDEWALK	Blocks 11 & 12		0.039	0.09	0.26
STREETS			2.451	6.06	16.45
TOTAL		124	14.906	36.83	100

ADDITIONAL INFORMATION REQUIRED UNDER **SECTION 51(17)** OF THE PLANNING ACT

a) SHOWN ON PLAN
b) SHOWN ON PLAN
c) SHOWN ON PLAN
d) SHOWN ON LAND USE SCHEDULE
e) SHOWN ON PLAN
f) SHOWN ON PLAN
f1) NONE
g) SHOWN ON PLAN
h) MUNICIPAL WATER
i) GUELPH LOAM
j) SHOWN ON PLAN
k) ALL MUNICIPAL SERVICES
l) NONE

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE INNOVATIVE PLANNING SOLUTIONS TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE _____ CORSEED INC.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE _____ PIER DE ROSA, O.L.S

SCHEDULE OF REVISIONS

No.	Date	Description	By

INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
150 DUNLOP STREET EAST, SUITE 201, BARRIE, ONTARIO L4M 1B1
tel: 705 • 812 • 3281 fax: 705 • 812 • 3438 e: info@ipsconsultinginc.com www.ipsconsultinginc.com

Date:	April 8, 2019	Drawn By:	AS
File:	10-301 - Cortel Grand Valley	Checked By:	CS

Appendix B – Traffic Counts

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 7:30:00
To: 8:30:00

Municipality: Grand Valley
Site #: 1422800001
Intersection: County Rd 109 & Water St (CR 25)
TFR File #: 21
Count date: 9-Oct-14

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

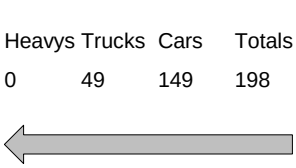
Major Road: County Rd 109 runs W/E

North Leg Total: 298
North Entering: 200
North Peds: 2
Peds Cross: ⋈

Heavys	0	0	0
Trucks	10	2	12
Cars	43	145	188
Totals	53	147	

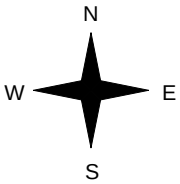
Heavys	0
Trucks	16
Cars	82
Totals	98

East Leg Total: 591
East Entering: 197
East Peds: 0
Peds Cross: ⧖

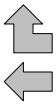


Heavys	Trucks	Cars	Totals
0	49	149	198

County Rd 109

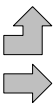


Water St (CR 25)



Cars	Trucks	Heavys	Totals
44	8	0	52
106	39	0	145
150	47	0	

Heavys	Trucks	Cars	Totals
0	8	38	46
0	37	210	247
0	45	248	



County Rd 109

Cars	Trucks	Heavys	Totals
355	39	0	394

Peds Cross: ⧖
West Peds: 0
West Entering: 293
West Leg Total: 491

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 19:00:00

One Hour Peak
From: 16:45:00
To: 17:45:00

Municipality: Grand Valley
Site #: 1422800001
Intersection: County Rd 109 & Water St (CR 25)
TFR File #: 21
Count date: 9-Oct-14

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: County Rd 109 runs W/E

North Leg Total: 396
North Entering: 133
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	6	4	10
Cars	51	72	123
Totals	57	76	

Heavys	0
Trucks	19
Cars	244
Totals	263

East Leg Total: 749
East Entering: 441
East Peds: 0
Peds Cross: ⧖

Water St (CR 25)

Heavys	Trucks	Cars	Totals
0	41	285	326

Cars	Trucks	Heavys	Totals
165	7	0	172
234	35	0	269
399	42	0	

County Rd 109

N
W E
S

Heavys	Trucks	Cars	Totals
0	12	79	91
0	36	196	232
0	48	275	

County Rd 109

Cars	Trucks	Heavys	Totals
268	40	0	308

Peds Cross: ⧖
West Peds: 0
West Entering: 323
West Leg Total: 649

Comments

Ontario Traffic Inc

Total Count Diagram

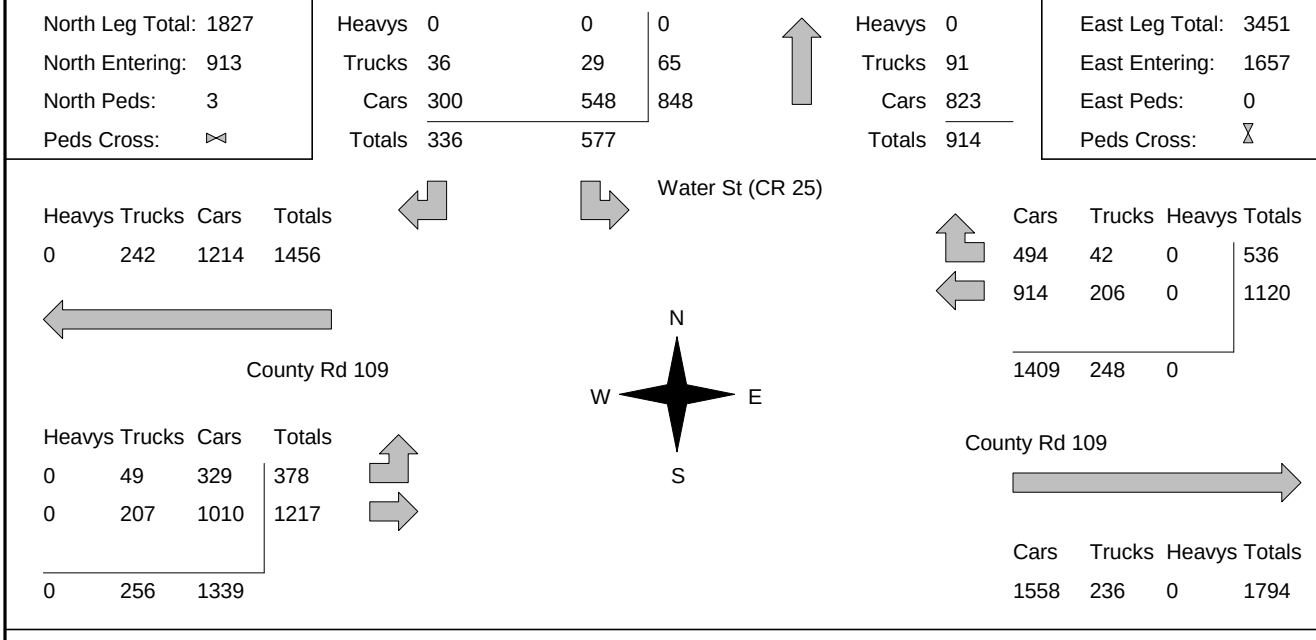
Municipality: Grand Valley
Site #: 1422800001
Intersection: County Rd 109 & Water St (CR 25)
TFR File #: 21
Count date: 9-Oct-14

Weather conditions:

Person(s) who counted:

**** Signalized Intersection ****

Major Road: County Rd 109 runs W/E



Comments

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

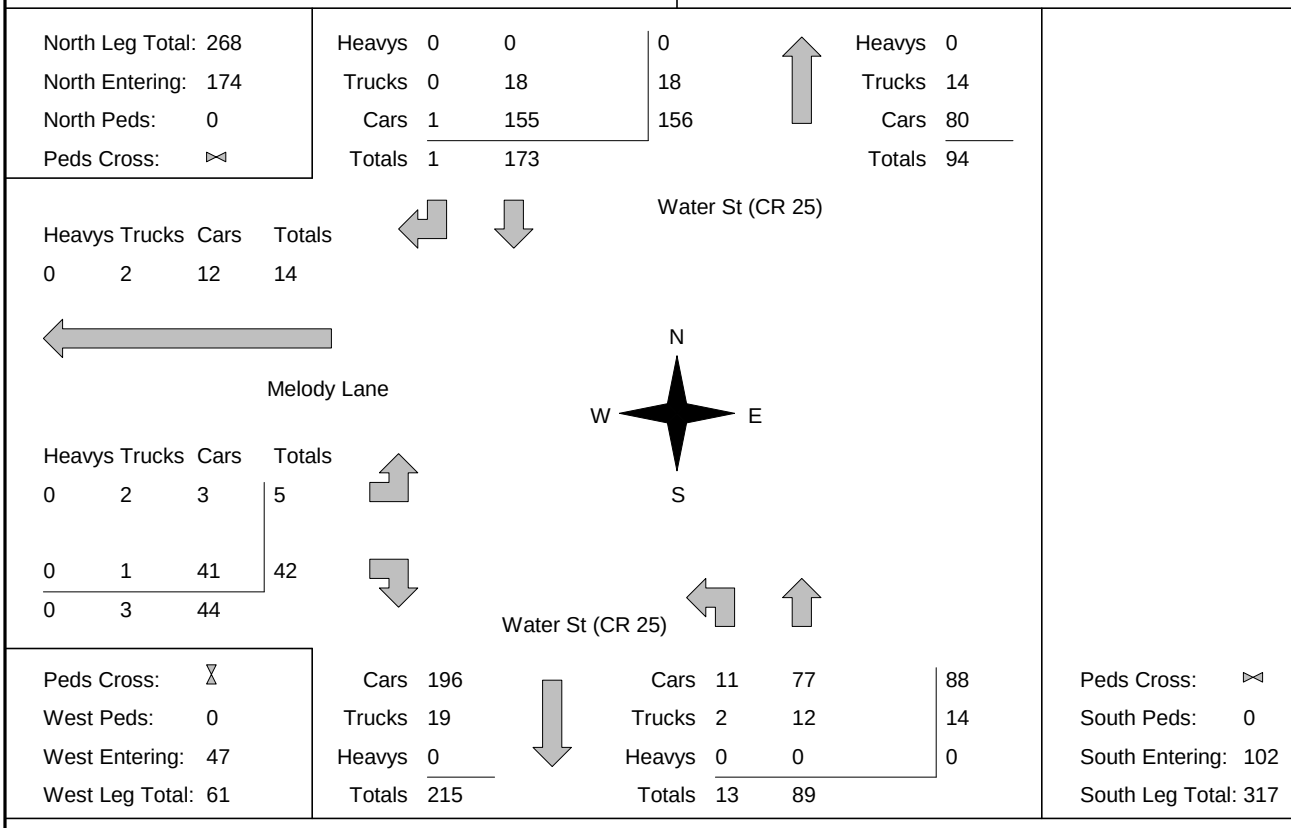
Municipality: Grand Valley
Site #: 1422800002
Intersection: Water St (CR 25) & Melody Lane
TFR File #: 5
Count date: 9-Oct-14

Weather conditions:

Person(s) who counted:

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

Major Road: Water St (CR 25) runs N/S



Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 19:00:00

One Hour Peak
From: 17:15:00
To: 18:15:00

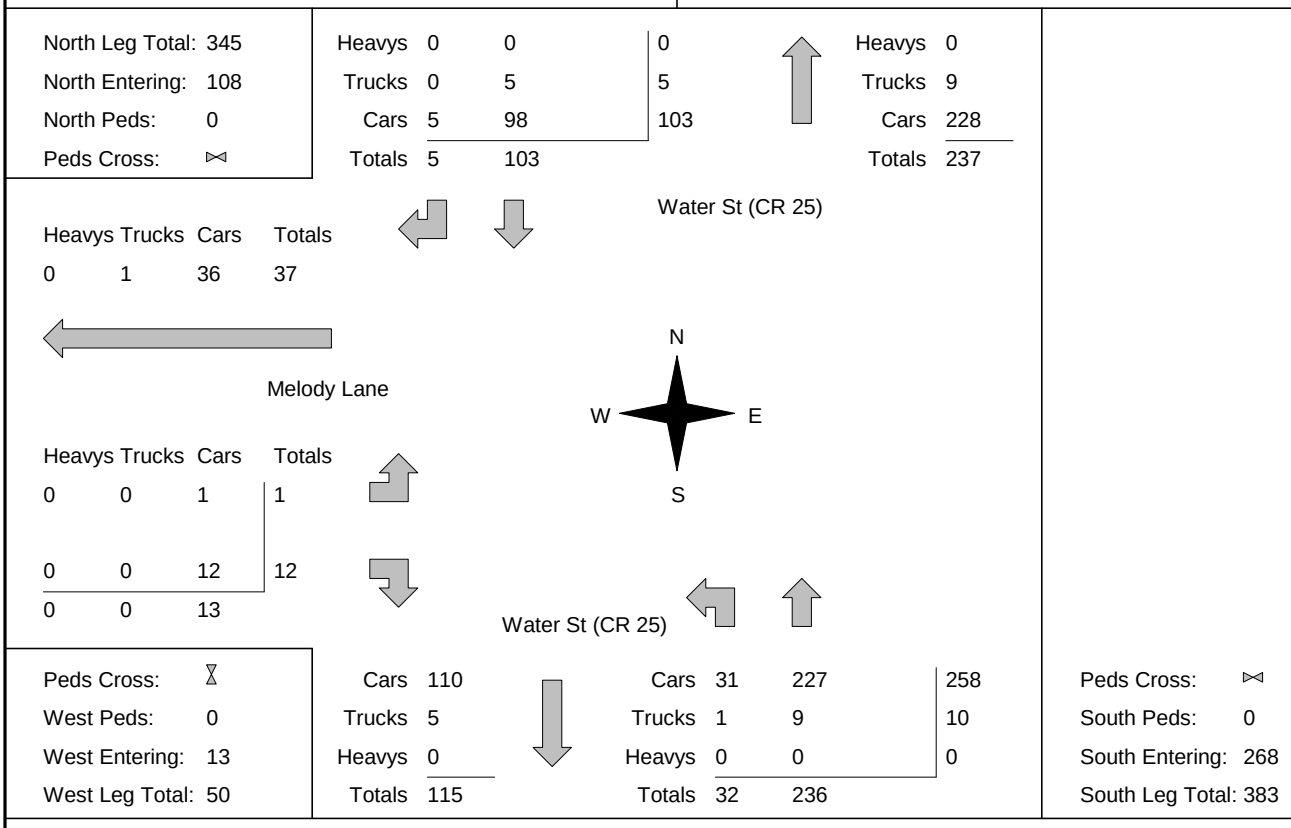
Municipality: Grand Valley
Site #: 1422800002
Intersection: Water St (CR 25) & Melody Lane
TFR File #: 5
Count date: 9-Oct-14

Weather conditions:

Person(s) who counted:

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

Major Road: Water St (CR 25) runs N/S



Comments

Ontario Traffic Inc

Total Count Diagram

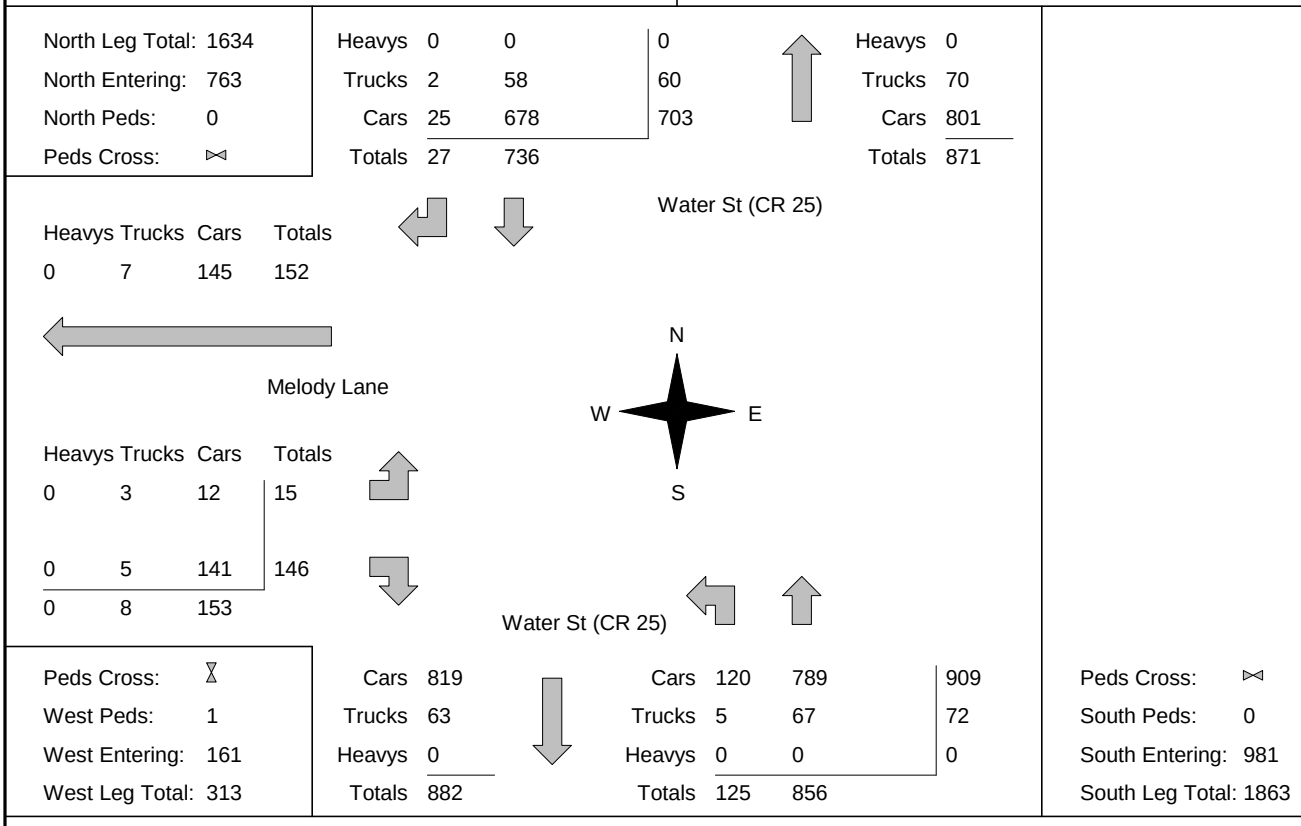
Municipality: Grand Valley
Site #: 1422800002
Intersection: Water St (CR 25) & Melody Lane
TFR File #: 5
Count date: 9-Oct-14

Weather conditions:

Person(s) who counted:

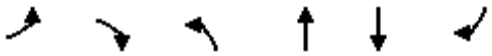
**** Non-Signalized Intersection ****

Major Road: Water St (CR 25) runs N/S



Comments

Appendix C – Synchro Analysis Output – Existing Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	44	14	93	188	1
Future Volume (Veh/h)	5	44	14	93	188	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	6	51	16	108	219	1
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	360	220	220			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	360	220	220			
tC, single (s)	6.8	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.9	3.3	2.3			
p0 queue free %	99	94	99			
cM capacity (veh/h)	563	820	1276			

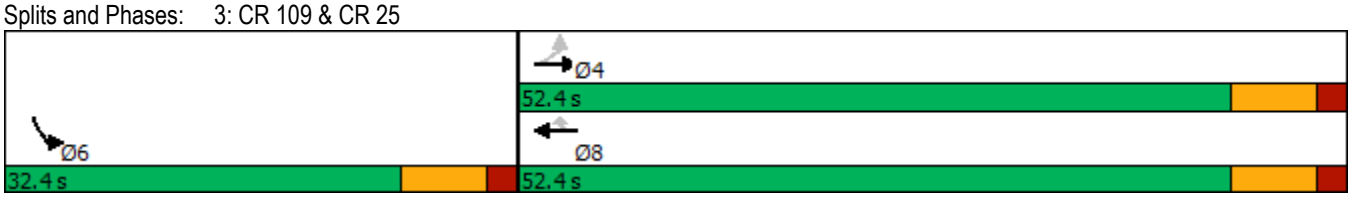
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	57	124	220
Volume Left	6	16	0
Volume Right	51	0	1
cSH	783	1276	1700
Volume to Capacity	0.07	0.01	0.13
Queue Length 95th (m)	1.8	0.3	0.0
Control Delay (s)	10.0	1.1	0.0
Lane LOS	A	A	
Approach Delay (s)	10.0	1.1	0.0
Approach LOS	A		

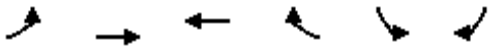
Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	48	258	151	54	154
Future Volume (vph)	48	258	151	54	154
Lane Group Flow (vph)	51	272	159	57	220
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.10	0.33	0.21	0.08	0.41
Control Delay	11.1	13.3	12.1	3.5	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	11.1	13.3	12.1	3.5	22.2
Queue Length 50th (m)	3.8	23.3	12.7	0.0	23.2
Queue Length 95th (m)	9.4	38.9	23.4	5.2	41.9
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	593	921	834	808	532
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.09	0.30	0.19	0.07	0.41

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

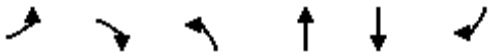
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	48	258	151	54	154	55
Future Volume (vph)	48	258	151	54	154	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.96	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1526	1634	1479	1389	1653	
Flt Permitted	0.66	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	1054	1634	1479	1389	1653	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	51	272	159	57	162	58
RTOR Reduction (vph)	0	0	0	28	15	0
Lane Group Flow (vph)	51	272	159	29	205	0
Heavy Vehicles (%)	17%	15%	27%	15%	1%	19%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	528	819	741	696	517	
v/s Ratio Prot		c0.17	0.11		c0.12	
v/s Ratio Perm	0.05			0.02		
v/c Ratio	0.10	0.33	0.21	0.04	0.40	
Uniform Delay, d1	10.4	11.9	11.1	10.1	21.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.5	0.3	0.1	2.3	
Delay (s)	10.6	12.4	11.4	10.2	23.8	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.1	11.1		23.8	
Approach LOS		B	B		C	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	13	33	246	108	5
Future Volume (Veh/h)	1	13	33	246	108	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1	14	34	256	113	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	440	116	118			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	440	116	118			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	98			
cM capacity (veh/h)	565	942	1464			

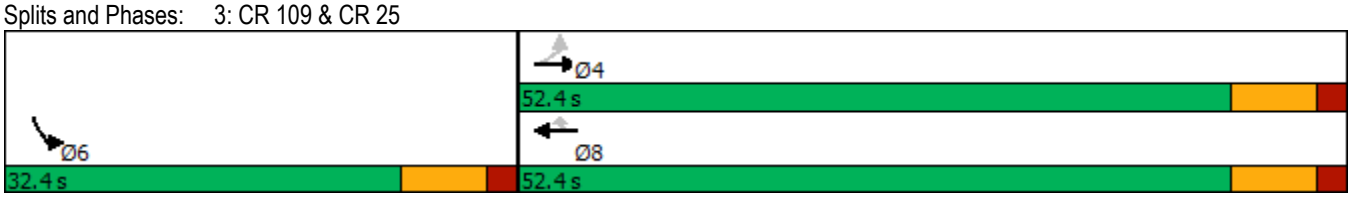
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	15	290	118
Volume Left	1	34	0
Volume Right	14	0	5
cSH	902	1464	1700
Volume to Capacity	0.02	0.02	0.07
Queue Length 95th (m)	0.4	0.5	0.0
Control Delay (s)	9.1	1.1	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	1.1	0.0
Approach LOS	A		

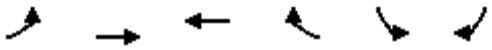
Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	95	242	281	180	79
Future Volume (vph)	95	242	281	180	79
Lane Group Flow (vph)	101	257	299	191	148
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.21	0.32	0.36	0.22	0.28
Control Delay	12.6	13.2	13.7	2.5	15.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	13.2	13.7	2.5	15.8
Queue Length 50th (m)	8.1	21.8	26.1	0.0	11.2
Queue Length 95th (m)	17.1	36.8	42.9	9.2	24.8
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	534	913	937	949	532
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.19	0.28	0.32	0.20	0.28

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

Splits and Phases: 3: CR 109 & CR 25

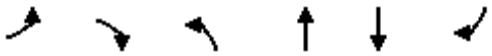




Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	242	281	180	79	60
Future Volume (vph)	95	242	281	180	79	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.94	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1580	1620	1663	1536	1599	
Flt Permitted	0.57	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	948	1620	1663	1536	1599	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	101	257	299	191	84	64
RTOR Reduction (vph)	0	0	0	95	32	0
Lane Group Flow (vph)	101	257	299	96	116	0
Heavy Vehicles (%)	13%	16%	13%	4%	5%	11%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	475	812	833	769	500	
v/s Ratio Prot		0.16	c0.18		c0.07	
v/s Ratio Perm	0.11			0.06		
v/c Ratio	0.21	0.32	0.36	0.12	0.23	
Uniform Delay, d1	11.1	11.8	12.1	10.6	20.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.5	0.6	0.2	1.1	
Delay (s)	11.6	12.3	12.7	10.7	21.4	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.1	11.9		21.4	
Approach LOS		B	B		C	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Appendix D –
Synchro Analysis Output –
Background Traffic Volumes



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	98	23	124	210	1
Future Volume (Veh/h)	6	98	23	124	210	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	7	114	27	144	244	1
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	442	244	245			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	442	244	245			
tC, single (s)	6.8	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.9	3.3	2.3			
p0 queue free %	99	86	98			
cM capacity (veh/h)	497	794	1249			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	121	171	245
Volume Left	7	27	0
Volume Right	114	0	1
cSH	768	1249	1700
Volume to Capacity	0.16	0.02	0.14
Queue Length 95th (m)	4.2	0.5	0.0
Control Delay (s)	10.6	1.4	0.0
Lane LOS	B	A	
Approach Delay (s)	10.6	1.4	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	2	148	0	2	317
Future Volume (Veh/h)	0	2	148	0	2	317
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	161	0	2	345
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	510	161			161	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	510	161			161	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	526	889			1430	

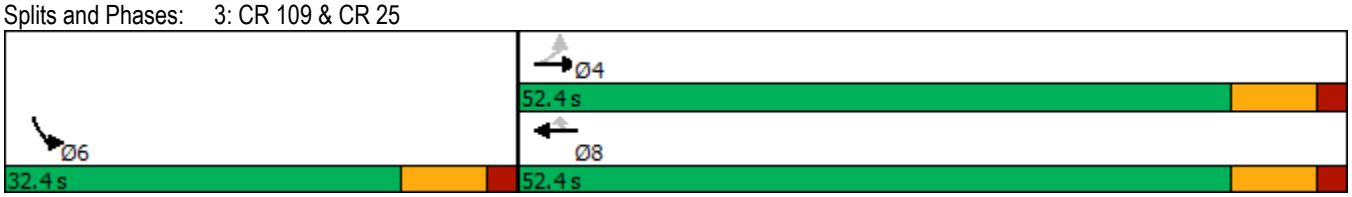
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	2	161	347
Volume Left	0	0	2
Volume Right	2	0	0
cSH	889	1700	1430
Volume to Capacity	0.00	0.09	0.00
Queue Length 95th (m)	0.1	0.0	0.0
Control Delay (s)	9.1	0.0	0.1
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	0.1
Approach LOS	A		

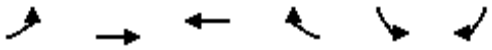
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	28.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	59	288	168	82	244
Future Volume (vph)	59	288	168	82	244
Lane Group Flow (vph)	62	303	177	86	343
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.12	0.37	0.24	0.12	0.64
Control Delay	11.4	13.9	12.4	3.1	28.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	11.4	13.9	12.4	3.1	28.7
Queue Length 50th (m)	4.7	26.6	14.4	0.0	41.7
Queue Length 95th (m)	11.0	43.8	26.0	6.3	69.0
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	584	921	834	820	533
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.11	0.33	0.21	0.10	0.64

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

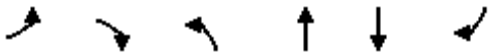
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	59	288	168	82	244	82
Future Volume (vph)	59	288	168	82	244	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1526	1634	1479	1389	1658	
Flt Permitted	0.65	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	1037	1634	1479	1389	1658	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	62	303	177	86	257	86
RTOR Reduction (vph)	0	0	0	43	14	0
Lane Group Flow (vph)	62	303	177	43	329	0
Heavy Vehicles (%)	17%	15%	27%	15%	1%	19%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	519	819	741	696	519	
v/s Ratio Prot		c0.19	0.12		c0.20	
v/s Ratio Perm	0.06			0.03		
v/c Ratio	0.12	0.37	0.24	0.06	0.63	
Uniform Delay, d1	10.6	12.2	11.3	10.2	23.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.6	0.4	0.1	5.8	
Delay (s)	10.8	12.8	11.6	10.3	29.3	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.4	11.2		29.3	
Approach LOS		B	B		C	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	39	71	308	150	6
Future Volume (Veh/h)	1	39	71	308	150	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1	41	74	321	156	6
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	628	159	162			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	628	159	162			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	95			
cM capacity (veh/h)	426	892	1411			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	42	395	162
Volume Left	1	74	0
Volume Right	41	0	6
cSH	869	1411	1700
Volume to Capacity	0.05	0.05	0.10
Queue Length 95th (m)	1.2	1.3	0.0
Control Delay (s)	9.4	1.8	0.0
Lane LOS	A	A	
Approach Delay (s)	9.4	1.8	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	1	386	0	2	192
Future Volume (Veh/h)	0	1	386	0	2	192
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1	420	0	2	209
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	633	420			420	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	633	420			420	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	446	638			1150	

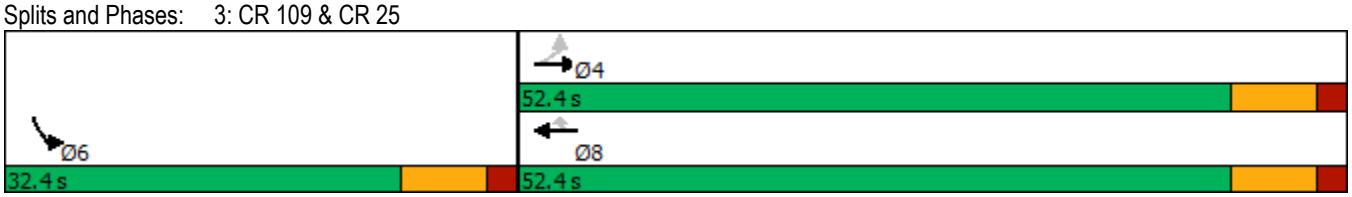
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	1	420	211
Volume Left	0	0	2
Volume Right	1	0	0
cSH	638	1700	1150
Volume to Capacity	0.00	0.25	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	10.7	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	10.7	0.0	0.1
Approach LOS	B		

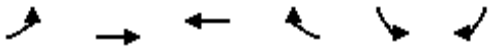
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	126	270	313	279	138
Future Volume (vph)	126	270	313	279	138
Lane Group Flow (vph)	134	287	333	297	231
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.30	0.35	0.40	0.32	0.44
Control Delay	14.0	13.6	14.2	2.5	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	13.6	14.2	2.5	21.6
Queue Length 50th (m)	11.3	24.9	29.7	0.0	23.2
Queue Length 95th (m)	22.9	41.4	48.5	11.1	42.5
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	503	913	937	995	529
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.27	0.31	0.36	0.30	0.44

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

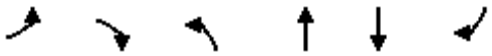
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	126	270	313	279	138	79
Future Volume (vph)	126	270	313	279	138	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.95	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1580	1620	1663	1536	1616	
Flt Permitted	0.54	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	893	1620	1663	1536	1616	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	134	287	333	297	147	84
RTOR Reduction (vph)	0	0	0	148	23	0
Lane Group Flow (vph)	134	287	333	149	208	0
Heavy Vehicles (%)	13%	16%	13%	4%	5%	11%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	447	812	833	769	506	
v/s Ratio Prot		0.18	c0.20		c0.13	
v/s Ratio Perm	0.15			0.10		
v/c Ratio	0.30	0.35	0.40	0.19	0.41	
Uniform Delay, d1	11.7	12.1	12.4	11.0	21.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.8	0.6	0.7	0.3	2.5	
Delay (s)	12.5	12.6	13.1	11.2	24.0	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.6	12.2		24.0	
Approach LOS		B	B		C	

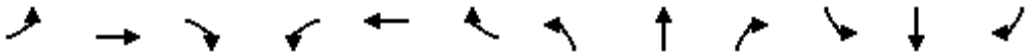
Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	97.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	76	19	104	197	1
Future Volume (Veh/h)	6	76	19	104	197	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	7	88	22	121	229	1
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	394	230	230			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	394	230	230			
tC, single (s)	6.8	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.9	3.3	2.3			
p0 queue free %	99	89	98			
cM capacity (veh/h)	533	810	1265			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	95	143	230
Volume Left	7	22	0
Volume Right	88	0	1
cSH	780	1265	1700
Volume to Capacity	0.12	0.02	0.14
Queue Length 95th (m)	3.1	0.4	0.0
Control Delay (s)	10.3	1.3	0.0
Lane LOS	B	A	
Approach Delay (s)	10.3	1.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	32.0%	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)	0	16	78	3	4	6	34	121	21	35	257	0
Future Volume (Veh/h)	0	16	78	3	4	6	34	121	21	35	257	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	17	85	3	4	7	37	132	23	38	279	0
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	582	584	279	666	572	144	279			155		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	582	584	279	666	572	144	279			155		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	96	89	99	99	99	97			97		
cM capacity (veh/h)	404	403	765	310	409	909	1295			1438		

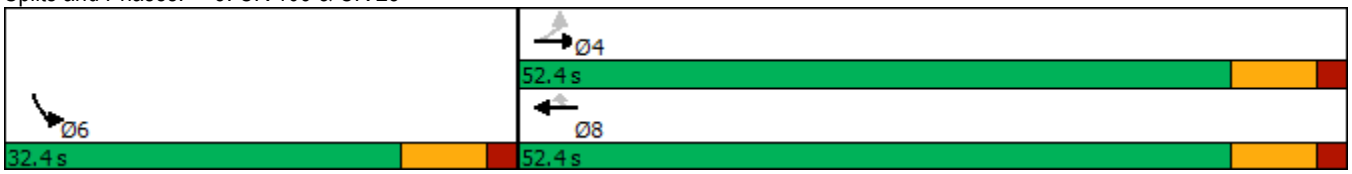
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	102	14	192	317
Volume Left	0	3	37	38
Volume Right	85	7	23	0
cSH	665	516	1295	1438
Volume to Capacity	0.15	0.03	0.03	0.03
Queue Length 95th (m)	4.1	0.6	0.7	0.6
Control Delay (s)	11.4	12.2	1.7	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.4	12.2	1.7	1.1
Approach LOS	B	B		

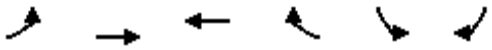
Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	30.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	69	321	188	106	271
Future Volume (vph)	69	321	188	106	271
Lane Group Flow (vph)	73	338	198	112	380
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.14	0.41	0.27	0.15	0.71
Control Delay	11.7	14.5	12.7	2.8	31.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	14.5	12.7	2.8	31.7
Queue Length 50th (m)	5.6	30.4	16.3	0.0	47.8
Queue Length 95th (m)	12.6	49.5	29.0	7.2	#79.0
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	573	921	834	832	533
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.13	0.37	0.24	0.13	0.71

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

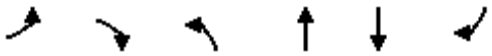
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	69	321	188	106	271	90
Future Volume (vph)	69	321	188	106	271	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1526	1634	1479	1389	1659	
Flt Permitted	0.63	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	1017	1634	1479	1389	1659	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	73	338	198	112	285	95
RTOR Reduction (vph)	0	0	0	56	14	0
Lane Group Flow (vph)	73	338	198	56	366	0
Heavy Vehicles (%)	17%	15%	27%	15%	1%	19%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	509	819	741	696	519	
v/s Ratio Prot		c0.21	0.13		c0.22	
v/s Ratio Perm	0.07			0.04		
v/c Ratio	0.14	0.41	0.27	0.08	0.71	
Uniform Delay, d1	10.7	12.5	11.5	10.3	24.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.7	0.4	0.1	7.9	
Delay (s)	11.0	13.2	11.9	10.4	32.0	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.8	11.4		32.0	
Approach LOS		B	B		C	

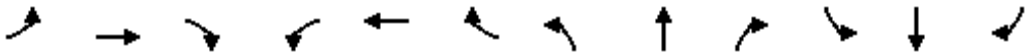
Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	29	56	283	129	6
Future Volume (Veh/h)	1	29	56	283	129	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1	30	58	295	134	6
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	548	137	140			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	548	137	140			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	96			
cM capacity (veh/h)	481	917	1437			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	31	353	140
Volume Left	1	58	0
Volume Right	30	0	6
cSH	891	1437	1700
Volume to Capacity	0.03	0.04	0.08
Queue Length 95th (m)	0.8	1.0	0.0
Control Delay (s)	9.2	1.6	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	1.6	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	38.5%	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)	0	6	45	20	15	33	89	320	5	9	156	0
Future Volume (Veh/h)	0	6	45	20	15	33	89	320	5	9	156	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	49	22	16	36	97	348	5	10	170	0
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	778	737	170	787	734	350	170			353		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	778	737	170	787	734	350	170			353		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	94	92	95	95	93			99		
cM capacity (veh/h)	272	322	879	273	323	697	1420			1217		

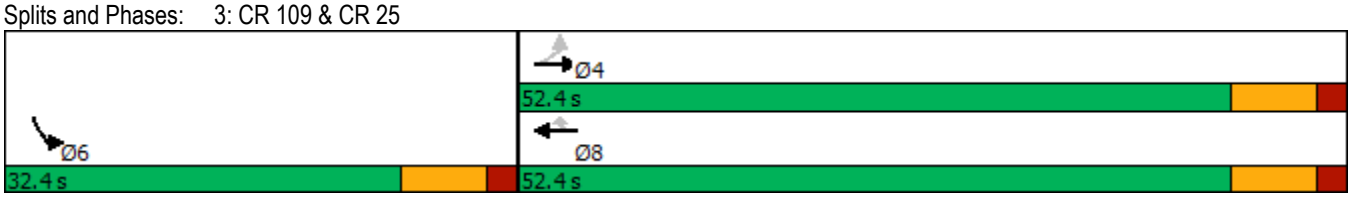
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	56	74	450	180
Volume Left	0	22	97	10
Volume Right	49	36	5	0
cSH	723	407	1420	1217
Volume to Capacity	0.08	0.18	0.07	0.01
Queue Length 95th (m)	1.9	5.0	1.7	0.2
Control Delay (s)	10.4	15.8	2.2	0.5
Lane LOS	B	C	A	A
Approach Delay (s)	10.4	15.8	2.2	0.5
Approach LOS	B	C		

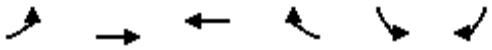
Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	51.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	141	301	349	313	168
Future Volume (vph)	141	301	349	313	168
Lane Group Flow (vph)	150	320	371	333	277
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.36	0.39	0.45	0.36	0.52
Control Delay	15.3	14.2	14.9	2.5	23.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.3	14.2	14.9	2.5	23.9
Queue Length 50th (m)	13.1	28.5	34.1	0.0	29.8
Queue Length 95th (m)	26.6	46.7	54.9	11.8	52.5
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	469	913	937	1011	529
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.32	0.35	0.40	0.33	0.52

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

Splits and Phases: 3: CR 109 & CR 25

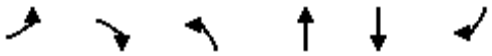




Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	141	301	349	313	168	92
Future Volume (vph)	141	301	349	313	168	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.95	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1580	1620	1663	1536	1618	
Flt Permitted	0.50	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	833	1620	1663	1536	1618	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	150	320	371	333	179	98
RTOR Reduction (vph)	0	0	0	166	23	0
Lane Group Flow (vph)	150	320	371	167	254	0
Heavy Vehicles (%)	13%	16%	13%	4%	5%	11%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	417	812	833	769	506	
v/s Ratio Prot		0.20	c0.22		c0.16	
v/s Ratio Perm	0.18			0.11		
v/c Ratio	0.36	0.39	0.45	0.22	0.50	
Uniform Delay, d1	12.1	12.4	12.8	11.1	22.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.1	0.7	0.8	0.3	3.5	
Delay (s)	13.2	13.0	13.6	11.4	25.9	
Level of Service	B	B	B	B	C	
Approach Delay (s)		13.1	12.6		25.9	
Approach LOS		B	B		C	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

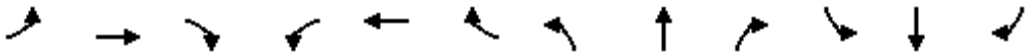
Appendix E –
Synchro Analysis Output –
Total Traffic Volumes



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	98	23	144	217	1
Future Volume (Veh/h)	6	98	23	144	217	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	7	114	27	167	252	1
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	474	252	253			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	474	252	253			
tC, single (s)	6.8	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.9	3.3	2.3			
p0 queue free %	99	85	98			
cM capacity (veh/h)	476	786	1240			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	121	194	253
Volume Left	7	27	0
Volume Right	114	0	1
cSH	758	1240	1700
Volume to Capacity	0.16	0.02	0.15
Queue Length 95th (m)	4.3	0.5	0.0
Control Delay (s)	10.7	1.3	0.0
Lane LOS	B	A	
Approach Delay (s)	10.7	1.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	36.7%	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)	20	0	44	0	0	2	14	148	0	2	317	7
Future Volume (Veh/h)	20	0	44	0	0	2	14	148	0	2	317	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.86	0.92
Hourly flow rate (vph)	22	0	48	0	0	2	15	172	0	2	369	8
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	581	579	373	627	583	172	377			172		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	581	579	373	627	583	172	377			172		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	93	100	100	100	99			100		
cM capacity (veh/h)	423	423	678	367	421	877	1193			1417		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	70	2	187	379
Volume Left	22	0	15	2
Volume Right	48	2	0	8
cSH	570	877	1193	1417
Volume to Capacity	0.12	0.00	0.01	0.00
Queue Length 95th (m)	3.2	0.1	0.3	0.0
Control Delay (s)	12.2	9.1	0.8	0.1
Lane LOS	B	A	A	A
Approach Delay (s)	12.2	9.1	0.8	0.1
Approach LOS	B	A		

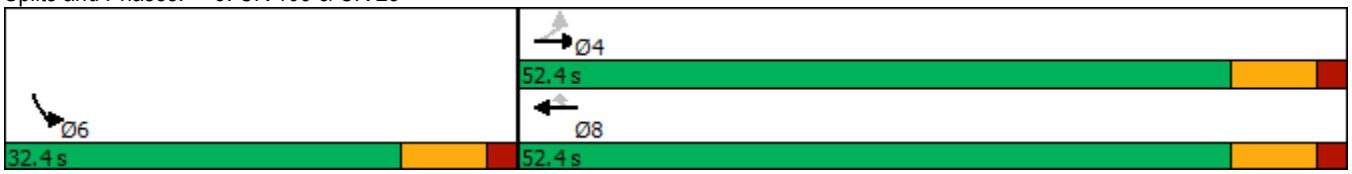
Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	34.9%	ICU Level of Service	A	
Analysis Period (min)	15			

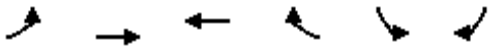
Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	62	288	168	93	279
Future Volume (vph)	62	288	168	93	279
Lane Group Flow (vph)	65	303	177	98	390
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.13	0.37	0.24	0.13	0.73
Control Delay	11.5	13.9	12.4	2.9	32.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	11.5	13.9	12.4	2.9	32.7
Queue Length 50th (m)	5.0	26.6	14.4	0.0	49.5
Queue Length 95th (m)	11.5	43.8	26.0	6.7	#83.9
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	584	921	834	826	534
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.11	0.33	0.21	0.12	0.73

Intersection Summary

Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

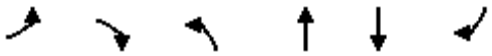
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	62	288	168	93	279	91
Future Volume (vph)	62	288	168	93	279	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1526	1634	1479	1389	1660	
Flt Permitted	0.65	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	1037	1634	1479	1389	1660	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	65	303	177	98	294	96
RTOR Reduction (vph)	0	0	0	49	14	0
Lane Group Flow (vph)	65	303	177	49	376	0
Heavy Vehicles (%)	17%	15%	27%	15%	1%	19%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	519	819	741	696	520	
v/s Ratio Prot		c0.19	0.12		c0.23	
v/s Ratio Perm	0.06			0.04		
v/c Ratio	0.13	0.37	0.24	0.07	0.72	
Uniform Delay, d1	10.6	12.2	11.3	10.3	24.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.6	0.4	0.1	8.5	
Delay (s)	10.8	12.8	11.6	10.4	32.8	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.4	11.2		32.8	
Approach LOS		B	B		C	

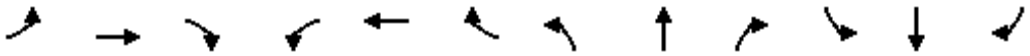
Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	39	71	321	172	6
Future Volume (Veh/h)	1	39	71	321	172	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1	41	74	334	179	6
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	664	182	185			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	664	182	185			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	95			
cM capacity (veh/h)	406	866	1384			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	42	408	185
Volume Left	1	74	0
Volume Right	41	0	6
cSH	843	1384	1700
Volume to Capacity	0.05	0.05	0.11
Queue Length 95th (m)	1.2	1.3	0.0
Control Delay (s)	9.5	1.8	0.0
Lane LOS	A	A	
Approach Delay (s)	9.5	1.8	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	43.6%	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)	13	0	28	0	0	1	48	386	0	2	192	22
Future Volume (Veh/h)	13	0	28	0	0	1	48	386	0	2	192	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	0	30	0	0	1	52	420	0	2	209	24
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	750	749	221	779	761	420	233			420		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	750	749	221	779	761	420	233			420		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	96	100	100	100	96			100		
cM capacity (veh/h)	319	329	824	295	324	638	1346			1150		

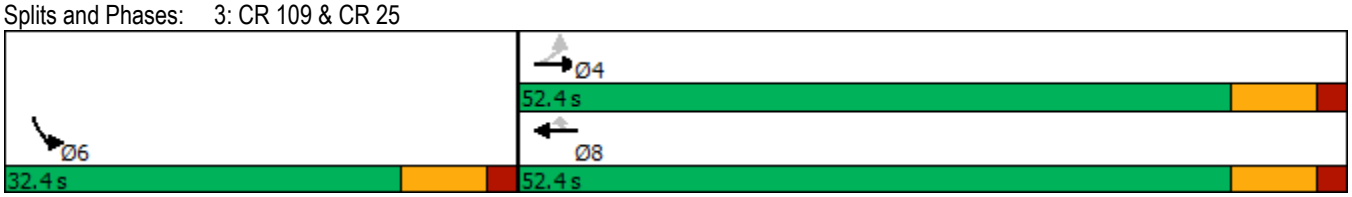
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	44	1	472	235
Volume Left	14	0	52	2
Volume Right	30	1	0	24
cSH	548	638	1346	1150
Volume to Capacity	0.08	0.00	0.04	0.00
Queue Length 95th (m)	2.0	0.0	0.9	0.0
Control Delay (s)	12.1	10.7	1.2	0.1
Lane LOS	B	B	A	A
Approach Delay (s)	12.1	10.7	1.2	0.1
Approach LOS	B	B		

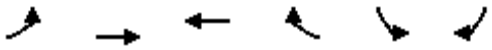
Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	53.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	136	270	313	317	160
Future Volume (vph)	136	270	313	317	160
Lane Group Flow (vph)	145	287	333	337	260
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.32	0.35	0.40	0.36	0.49
Control Delay	14.4	13.6	14.2	2.5	23.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	13.6	14.2	2.5	23.1
Queue Length 50th (m)	12.4	24.9	29.7	0.0	27.5
Queue Length 95th (m)	24.8	41.4	48.5	11.8	48.7
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	503	913	937	1013	529
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.29	0.31	0.36	0.33	0.49

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

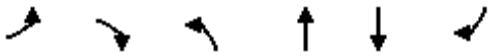
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	136	270	313	317	160	85
Future Volume (vph)	136	270	313	317	160	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.95	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1580	1620	1663	1536	1620	
Flt Permitted	0.54	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	893	1620	1663	1536	1620	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	145	287	333	337	170	90
RTOR Reduction (vph)	0	0	0	168	22	0
Lane Group Flow (vph)	145	287	333	169	238	0
Heavy Vehicles (%)	13%	16%	13%	4%	5%	11%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	447	812	833	769	507	
v/s Ratio Prot		0.18	c0.20		c0.15	
v/s Ratio Perm	0.16			0.11		
v/c Ratio	0.32	0.35	0.40	0.22	0.47	
Uniform Delay, d1	11.9	12.1	12.4	11.2	22.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.9	0.6	0.7	0.3	3.1	
Delay (s)	12.7	12.6	13.1	11.5	25.2	
Level of Service	B	B	B	B	C	
Approach Delay (s)		12.7	12.3		25.2	
Approach LOS		B	B		C	

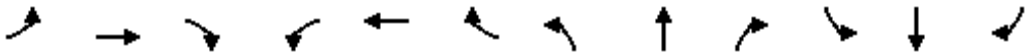
Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	76	19	124	204	1
Future Volume (Veh/h)	6	76	19	124	204	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	7	88	22	144	237	1
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	238	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	426	238	238			
tC, single (s)	6.8	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.9	3.3	2.3			
p0 queue free %	99	89	98			
cM capacity (veh/h)	511	801	1256			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	95	166	238
Volume Left	7	22	0
Volume Right	88	0	1
cSH	769	1256	1700
Volume to Capacity	0.12	0.02	0.14
Queue Length 95th (m)	3.2	0.4	0.0
Control Delay (s)	10.3	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	10.3	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	33.4%	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)	20	27	111	3	7	6	45	121	21	35	257	7
Future Volume (Veh/h)	20	27	111	3	7	6	45	121	21	35	257	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.86	0.92
Hourly flow rate (vph)	22	29	121	3	8	7	49	141	23	38	299	8
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	629	641	303	761	634	152	307			164		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	629	641	303	761	634	152	307			164		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	92	84	99	98	99	96			97		
cM capacity (veh/h)	369	370	741	243	374	899	1265			1427		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	172	18	49	164	38	307
Volume Left	22	3	49	0	38	0
Volume Right	121	7	0	23	0	8
cSH	571	433	1265	1700	1427	1700
Volume to Capacity	0.30	0.04	0.04	0.10	0.03	0.18
Queue Length 95th (m)	9.6	1.0	0.9	0.0	0.6	0.0
Control Delay (s)	14.0	13.7	8.0	0.0	7.6	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	14.0	13.7	1.8		0.8	
Approach LOS	B	B				

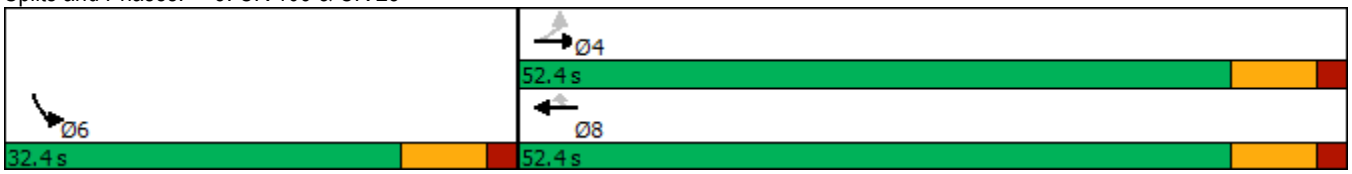
Intersection Summary				
Average Delay	4.5			
Intersection Capacity Utilization	38.6%	ICU Level of Service		A
Analysis Period (min)	15			

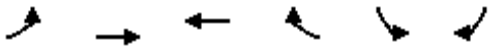
Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	72	321	188	114	295
Future Volume (vph)	72	321	188	114	295
Lane Group Flow (vph)	76	338	198	120	415
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.15	0.41	0.27	0.16	0.78
Control Delay	11.8	14.5	12.7	2.8	35.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	14.5	12.7	2.8	35.7
Queue Length 50th (m)	5.9	30.4	16.3	0.0	54.0
Queue Length 95th (m)	13.0	49.5	29.0	7.5	#97.1
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	573	921	834	835	533
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.13	0.37	0.24	0.14	0.78

Intersection Summary

Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

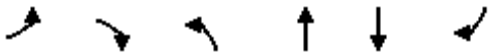
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	72	321	188	114	295	99
Future Volume (vph)	72	321	188	114	295	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1526	1634	1479	1389	1658	
Flt Permitted	0.63	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	1017	1634	1479	1389	1658	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	76	338	198	120	311	104
RTOR Reduction (vph)	0	0	0	60	14	0
Lane Group Flow (vph)	76	338	198	60	401	0
Heavy Vehicles (%)	17%	15%	27%	15%	1%	19%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	509	819	741	696	519	
v/s Ratio Prot		c0.21	0.13		c0.24	
v/s Ratio Perm	0.07			0.04		
v/c Ratio	0.15	0.41	0.27	0.09	0.77	
Uniform Delay, d1	10.7	12.5	11.5	10.4	24.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.7	0.4	0.1	10.7	
Delay (s)	11.0	13.2	11.9	10.5	35.5	
Level of Service	B	B	B	B	D	
Approach Delay (s)		12.8	11.3		35.5	
Approach LOS		B	B		D	

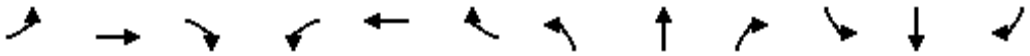
Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	29	56	296	151	6
Future Volume (Veh/h)	1	29	56	296	151	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1	30	58	308	157	6
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	584	160	163			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	584	160	163			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	96			
cM capacity (veh/h)	458	890	1410			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	31	366	163
Volume Left	1	58	0
Volume Right	30	0	6
cSH	864	1410	1700
Volume to Capacity	0.04	0.04	0.10
Queue Length 95th (m)	0.8	1.0	0.0
Control Delay (s)	9.3	1.5	0.0
Lane LOS	A	A	
Approach Delay (s)	9.3	1.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	40.3%	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)	13	13	66	20	26	33	126	320	5	9	156	22
Future Volume (Veh/h)	13	13	66	20	26	33	126	320	5	9	156	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	14	72	22	28	36	137	348	5	10	170	24
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	874	829	182	894	838	350	194			353		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	874	829	182	894	838	350	194			353		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	95	92	90	90	95	90			99		
cM capacity (veh/h)	219	276	866	214	272	697	1391			1217		

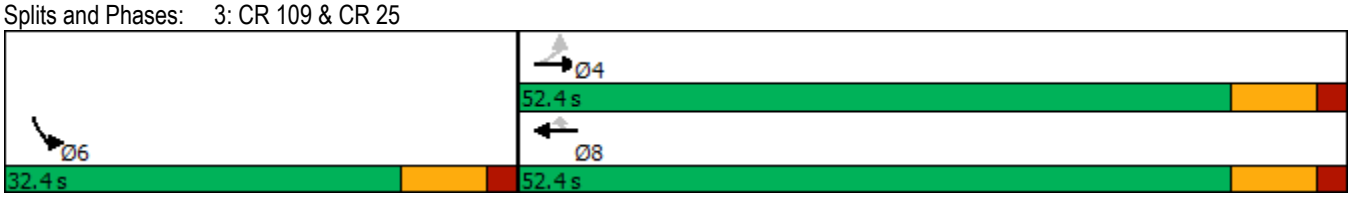
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	100	86	137	353	10	194
Volume Left	14	22	137	0	10	0
Volume Right	72	36	0	5	0	24
cSH	505	334	1391	1700	1217	1700
Volume to Capacity	0.20	0.26	0.10	0.21	0.01	0.11
Queue Length 95th (m)	5.5	7.6	2.5	0.0	0.2	0.0
Control Delay (s)	13.9	19.5	7.9	0.0	8.0	0.0
Lane LOS	B	C	A		A	
Approach Delay (s)	13.9	19.5	2.2		0.4	
Approach LOS	B	C				

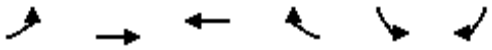
Intersection Summary				
Average Delay	4.8			
Intersection Capacity Utilization	38.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	151	301	349	340	183
Future Volume (vph)	151	301	349	340	183
Lane Group Flow (vph)	161	320	371	362	299
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	32.4
Total Split (%)	61.8%	61.8%	61.8%	61.8%	38.2%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.39	0.39	0.45	0.38	0.57
Control Delay	15.8	14.2	14.9	2.6	25.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.8	14.2	14.9	2.6	25.2
Queue Length 50th (m)	14.3	28.5	34.1	0.0	33.3
Queue Length 95th (m)	28.7	46.7	54.9	12.1	57.4
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	469	913	937	1024	529
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.34	0.35	0.40	0.35	0.57

Intersection Summary
Cycle Length: 84.8
Actuated Cycle Length: 79.8
Natural Cycle: 75
Control Type: Semi Act-Uncoord

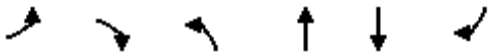
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	151	301	349	340	183	98
Future Volume (vph)	151	301	349	340	183	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.95	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1580	1620	1663	1536	1619	
Flt Permitted	0.50	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	833	1620	1663	1536	1619	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	161	320	371	362	195	104
RTOR Reduction (vph)	0	0	0	181	22	0
Lane Group Flow (vph)	161	320	371	181	277	0
Heavy Vehicles (%)	13%	16%	13%	4%	5%	11%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	40.0	40.0	40.0	40.0	25.0	
Effective Green, g (s)	40.0	40.0	40.0	40.0	25.0	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.31	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	417	812	833	769	507	
v/s Ratio Prot		0.20	c0.22		c0.17	
v/s Ratio Perm	0.19			0.12		
v/c Ratio	0.39	0.39	0.45	0.24	0.55	
Uniform Delay, d1	12.3	12.4	12.8	11.3	22.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	0.7	0.8	0.3	4.2	
Delay (s)	13.5	13.0	13.6	11.6	26.9	
Level of Service	B	B	B	B	C	
Approach Delay (s)		13.2	12.6		26.9	
Approach LOS		B	B		C	

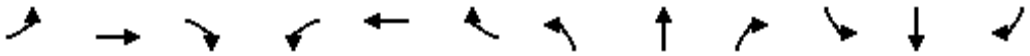
Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	79.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	108	25	189	334	1
Future Volume (Veh/h)	6	108	25	189	334	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	7	126	29	220	388	1
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	666	388	389			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	666	388	389			
tC, single (s)	6.8	6.2	4.2			
tC, 2 stage (s)						
tF (s)	3.9	3.3	2.3			
p0 queue free %	98	81	97			
cM capacity (veh/h)	361	660	1102			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	133	249	389
Volume Left	7	29	0
Volume Right	126	0	1
cSH	632	1102	1700
Volume to Capacity	0.21	0.03	0.23
Queue Length 95th (m)	6.0	0.6	0.0
Control Delay (s)	12.2	1.2	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	1.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	44.6%	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)	30	0	123	3	2	10	50	182	21	50	392	29
Future Volume (Veh/h)	30	0	123	3	2	10	50	182	21	50	392	29
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.86	0.92
Hourly flow rate (vph)	33	0	134	3	2	11	54	212	23	54	456	32
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	912	923	472	1030	928	224	488			235		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	912	923	472	1030	928	224	488			235		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	100	78	98	99	99	95			96		
cM capacity (veh/h)	235	248	596	155	246	821	1086			1344		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	167	16	54	235	54	488
Volume Left	33	3	54	0	54	0
Volume Right	134	11	0	23	0	32
cSH	457	391	1086	1700	1344	1700
Volume to Capacity	0.37	0.04	0.05	0.14	0.04	0.29
Queue Length 95th (m)	12.6	1.0	1.2	0.0	1.0	0.0
Control Delay (s)	17.3	14.6	8.5	0.0	7.8	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	17.3	14.6	1.6		0.8	
Approach LOS	C	B				

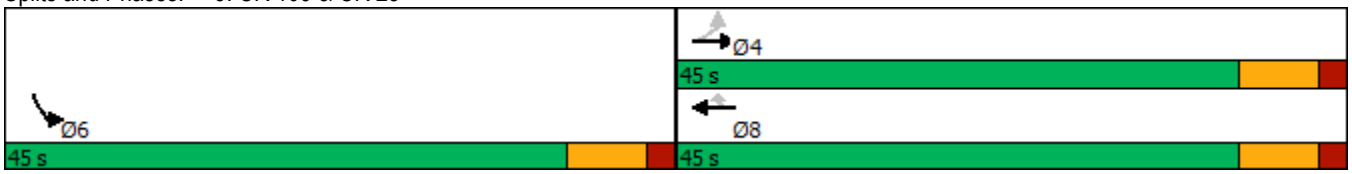
Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	48.0%	ICU Level of Service		A
Analysis Period (min)	15			

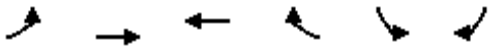
Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	104	358	209	156	411
Future Volume (vph)	104	358	209	156	411
Lane Group Flow (vph)	109	377	220	164	576
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	37.6	37.6	37.6	37.6	17.6
Minimum Split (s)	45.0	45.0	45.0	45.0	25.0
Total Split (s)	45.0	45.0	45.0	45.0	45.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.26	0.55	0.36	0.24	0.82
Control Delay	19.3	23.7	20.0	3.8	33.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	23.7	20.0	3.8	33.5
Queue Length 50th (m)	12.0	48.0	25.4	0.0	82.5
Queue Length 95th (m)	23.9	75.0	42.7	10.9	#139.4
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	416	682	617	675	706
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.26	0.55	0.36	0.24	0.82

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Natural Cycle: 80
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

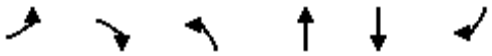
Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	104	358	209	156	411	136
Future Volume (vph)	104	358	209	156	411	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1526	1634	1479	1389	1659	
Flt Permitted	0.62	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	997	1634	1479	1389	1659	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	109	377	220	164	433	143
RTOR Reduction (vph)	0	0	0	95	13	0
Lane Group Flow (vph)	109	377	220	69	563	0
Heavy Vehicles (%)	17%	15%	27%	15%	1%	19%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	37.6	37.6	37.6	37.6	37.6	
Effective Green, g (s)	37.6	37.6	37.6	37.6	37.6	
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	416	682	617	580	693	
v/s Ratio Prot		c0.23	0.15		c0.34	
v/s Ratio Perm	0.11			0.05		
v/c Ratio	0.26	0.55	0.36	0.12	0.81	
Uniform Delay, d1	17.1	19.8	17.9	16.0	23.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	1.7	0.7	0.2	10.0	
Delay (s)	17.8	21.5	18.7	16.2	33.1	
Level of Service	B	C	B	B	C	
Approach Delay (s)		20.7	17.6		33.1	
Approach LOS		C	B		C	

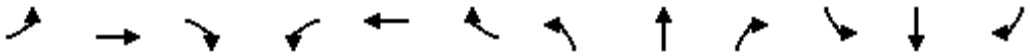
Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.8
Intersection Capacity Utilization	112.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	33	66	467	234	6
Future Volume (Veh/h)	1	33	66	467	234	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1	34	69	486	244	6
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	871	247	250			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	871	247	250			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	95			
cM capacity (veh/h)	307	797	1310			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	35	555	250
Volume Left	1	69	0
Volume Right	34	0	6
cSH	762	1310	1700
Volume to Capacity	0.05	0.05	0.15
Queue Length 95th (m)	1.1	1.3	0.0
Control Delay (s)	10.0	1.5	0.0
Lane LOS	A	A	
Approach Delay (s)	10.0	1.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	54.2%	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)	74	20	118	20	36	34	238	447	5	11	216	51
Future Volume (Veh/h)	74	20	118	20	36	34	238	447	5	11	216	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	80	22	128	22	39	37	259	486	5	12	235	55
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	1347	1296	262	1404	1320	488	290			491		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1347	1296	262	1404	1320	488	290			491		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	83	84	70	69	94	80			99		
cM capacity (veh/h)	78	129	781	72	125	583	1283			1083		

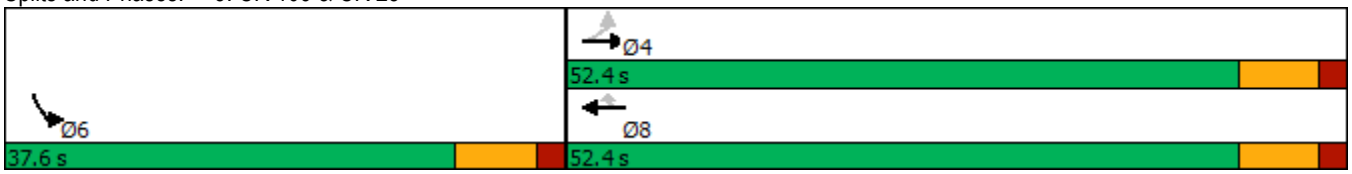
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	230	98	259	491	12	290
Volume Left	80	22	259	0	12	0
Volume Right	128	37	0	5	0	55
cSH	169	144	1283	1700	1083	1700
Volume to Capacity	1.36	0.68	0.20	0.29	0.01	0.17
Queue Length 95th (m)	105.4	29.1	5.7	0.0	0.3	0.0
Control Delay (s)	248.2	71.2	8.5	0.0	8.4	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	248.2	71.2	2.9		0.3	
Approach LOS	F	F				

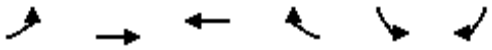
Intersection Summary				
Average Delay	48.1			
Intersection Capacity Utilization	56.7%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL
Lane Configurations					
Traffic Volume (vph)	241	335	389	515	267
Future Volume (vph)	241	335	389	515	267
Lane Group Flow (vph)	256	356	414	548	448
Turn Type	Perm	NA	NA	Perm	Prot
Protected Phases		4	8		6
Permitted Phases	4			8	
Detector Phase	4	4	8	8	6
Switch Phase					
Minimum Initial (s)	40.0	40.0	40.0	40.0	10.0
Minimum Split (s)	47.4	47.4	47.4	47.4	24.4
Total Split (s)	52.4	52.4	52.4	52.4	37.6
Total Split (%)	58.2%	58.2%	58.2%	58.2%	41.8%
Yellow Time (s)	5.4	5.4	5.4	5.4	5.4
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.4	7.4	7.4	7.4	7.4
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	None	None	Max
v/c Ratio	0.72	0.46	0.52	0.54	0.77
Control Delay	31.4	17.2	18.3	3.3	34.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	31.4	17.2	18.3	3.3	34.0
Queue Length 50th (m)	32.3	37.5	45.4	0.0	58.2
Queue Length 95th (m)	#70.8	59.1	70.2	15.2	#111.6
Internal Link Dist (m)		1152.8	1187.2		708.3
Turn Bay Length (m)	75.0			95.0	
Base Capacity (vph)	383	839	861	1060	584
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.67	0.42	0.48	0.52	0.77

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 86.9
Natural Cycle: 80
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: CR 109 & CR 25





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	241	335	389	515	267	154
Future Volume (vph)	241	335	389	515	267	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.95	
Flt Protected	0.95	1.00	1.00	1.00	0.97	
Satd. Flow (prot)	1580	1620	1663	1536	1615	
Flt Permitted	0.44	1.00	1.00	1.00	0.97	
Satd. Flow (perm)	740	1620	1663	1536	1615	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	256	356	414	548	284	164
RTOR Reduction (vph)	0	0	0	284	23	0
Lane Group Flow (vph)	256	356	414	264	425	0
Heavy Vehicles (%)	13%	16%	13%	4%	5%	11%
Turn Type	Perm	NA	NA	Perm	Prot	
Protected Phases		4	8		6	
Permitted Phases	4			8		
Actuated Green, G (s)	41.9	41.9	41.9	41.9	30.2	
Effective Green, g (s)	41.9	41.9	41.9	41.9	30.2	
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.35	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	4.0	
Lane Grp Cap (vph)	356	781	801	740	561	
v/s Ratio Prot		0.22	0.25		c0.26	
v/s Ratio Perm	c0.35			0.17		
v/c Ratio	0.72	0.46	0.52	0.36	0.76	
Uniform Delay, d1	17.8	14.9	15.5	14.1	25.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.4	0.9	1.1	0.6	9.3	
Delay (s)	26.2	15.8	16.6	14.7	34.4	
Level of Service	C	B	B	B	C	
Approach Delay (s)		20.2	15.5		34.4	
Approach LOS		C	B		C	

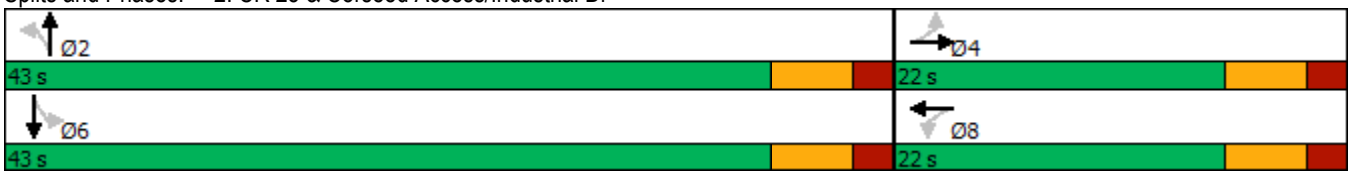
Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	86.9	Sum of lost time (s)	14.8
Intersection Capacity Utilization	109.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

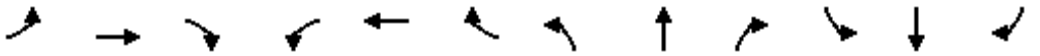
Appendix F –
Synchro Analysis Output –
Total Traffic Volumes with Improvements

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	30	32	3	11	64	158	35	336
Future Volume (vph)	30	32	3	11	64	158	35	336
Lane Group Flow (vph)	0	239	0	23	70	207	38	421
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	43.0	43.0	43.0	43.0
Total Split (%)	33.8%	33.8%	33.8%	33.8%	66.2%	66.2%	66.2%	66.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0		6.0	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio		0.63		0.09	0.11	0.17	0.05	0.34
Control Delay		15.5		17.0	5.5	4.8	5.0	6.2
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		15.5		17.0	5.5	4.8	5.0	6.2
Queue Length 50th (m)		6.5		1.4	2.2	6.3	1.2	15.7
Queue Length 95th (m)		23.2		6.3	8.1	16.3	4.9	35.7
Internal Link Dist (m)		413.4		408.0		194.7		271.4
Turn Bay Length (m)					65.0		55.0	
Base Capacity (vph)		551		440	630	1216	773	1221
Starvation Cap Reductn		0		0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.43		0.05	0.11	0.17	0.05	0.34

Intersection Summary
Cycle Length: 65
Actuated Cycle Length: 60.6
Natural Cycle: 45
Control Type: Semi Act-Uncoord

Splits and Phases: 2: CR 25 & Corseed Access/Industrial Dr





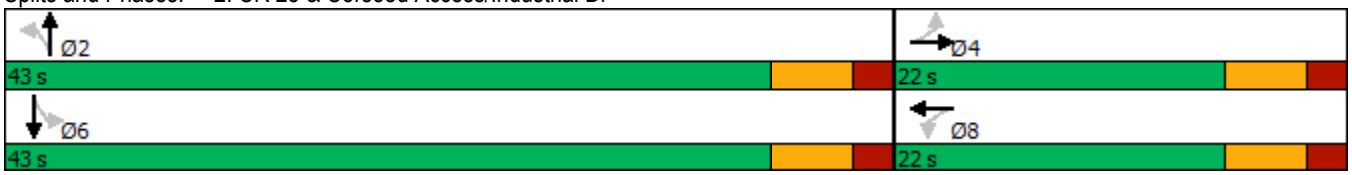
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	32	157	3	11	7	64	158	21	35	336	28
Future Volume (vph)	30	32	157	3	11	7	64	158	21	35	336	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.90			0.95		1.00	0.98		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1686			1779		1785	1848		1785	1859	
Flt Permitted		0.95			0.91		0.51	1.00		0.63	1.00	
Satd. Flow (perm)		1607			1638		962	1848		1180	1859	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.86	0.92	0.92	0.86	0.92
Adj. Flow (vph)	33	35	171	3	12	8	70	184	23	38	391	30
RTOR Reduction (vph)	0	146	0	0	7	0	0	6	0	0	3	0
Lane Group Flow (vph)	0	93	0	0	16	0	70	201	0	38	418	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.8			8.8		39.7	39.7		39.7	39.7	
Effective Green, g (s)		8.8			8.8		39.7	39.7		39.7	39.7	
Actuated g/C Ratio		0.15			0.15		0.66	0.66		0.66	0.66	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		233			238		631	1212		774	1219	
v/s Ratio Prot								0.11			c0.22	
v/s Ratio Perm		c0.06			0.01		0.07			0.03		
v/c Ratio		0.40			0.07		0.11	0.17		0.05	0.34	
Uniform Delay, d1		23.4			22.3		3.9	4.0		3.7	4.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			0.1		0.4	0.3		0.1	0.8	
Delay (s)		24.6			22.4		4.2	4.3		3.8	5.4	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		24.6			22.4			4.3			5.3	
Approach LOS		C			C			A			A	

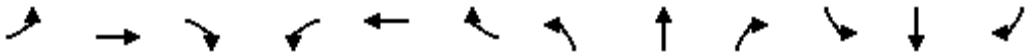
Intersection Summary			
HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	60.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	74	20	20	36	238	447	11	216
Future Volume (vph)	74	20	20	36	238	447	11	216
Lane Group Flow (vph)	0	230	0	98	259	491	12	290
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	22.0	22.0	43.0	43.0	43.0	43.0
Total Split (%)	33.8%	33.8%	33.8%	33.8%	66.2%	66.2%	66.2%	66.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0		6.0	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio		0.68		0.32	0.37	0.41	0.02	0.25
Control Delay		24.4		17.0	8.6	7.9	5.9	5.9
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		24.4		17.0	8.6	7.9	5.9	5.9
Queue Length 50th (m)		13.8		5.8	12.3	24.2	0.4	11.0
Queue Length 95th (m)		32.8		16.2	30.4	50.3	2.4	25.2
Internal Link Dist (m)		413.4		408.0		194.7		271.4
Turn Bay Length (m)					65.0		55.0	
Base Capacity (vph)		444		420	691	1185	536	1165
Starvation Cap Reductn		0		0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.52		0.23	0.37	0.41	0.02	0.25

Intersection Summary
Cycle Length: 65
Actuated Cycle Length: 63
Natural Cycle: 45
Control Type: Semi Act-Uncoord

Splits and Phases: 2: CR 25 & Corseed Access/Industrial Dr





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	20	118	20	36	34	238	447	5	11	216	51
Future Volume (vph)	74	20	118	20	36	34	238	447	5	11	216	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.92			0.95		1.00	1.00		1.00	0.97	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1708			1763		1785	1876		1785	1825	
Flt Permitted		0.85			0.86		0.58	1.00		0.45	1.00	
Satd. Flow (perm)		1475			1539		1094	1876		849	1825	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	22	128	22	39	37	259	486	5	12	235	55
RTOR Reduction (vph)	0	76	0	0	30	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	154	0	0	68	0	259	491	0	12	279	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.1			11.1		39.8	39.8		39.8	39.8	
Effective Green, g (s)		11.1			11.1		39.8	39.8		39.8	39.8	
Actuated g/C Ratio		0.18			0.18		0.63	0.63		0.63	0.63	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		260			271		692	1187		537	1154	
v/s Ratio Prot								c0.26			0.15	
v/s Ratio Perm		c0.10			0.04		0.24			0.01		
v/c Ratio		0.59			0.25		0.37	0.41		0.02	0.24	
Uniform Delay, d1		23.8			22.3		5.6	5.7		4.3	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.6			0.5		1.5	1.1		0.1	0.5	
Delay (s)		27.4			22.8		7.1	6.8		4.4	5.5	
Level of Service		C			C		A	A		A	A	
Approach Delay (s)		27.4			22.8			6.9			5.5	
Approach LOS		C			C			A			A	

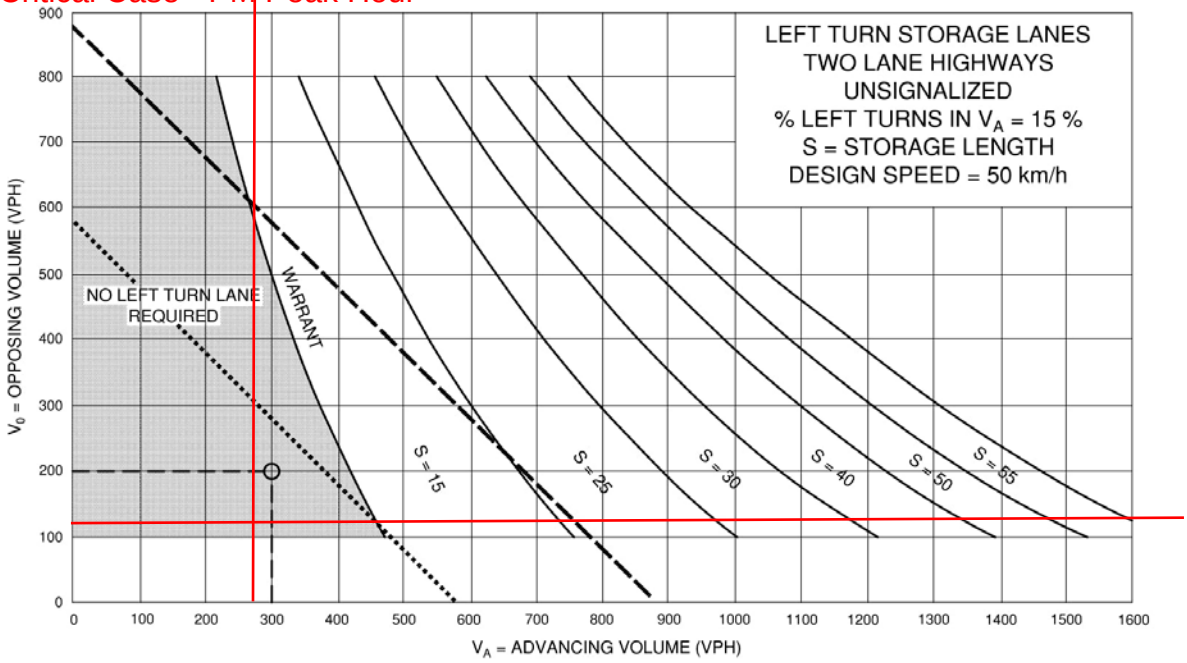
Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	62.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Appendix G –
MTO DS Left Turn Lane Warrant Graphs

Melody Lane / County Road 25

2016 Existing Traffic - Northbound **Exhibit 9A-3**

Critical Case - PM Peak Hour



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

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

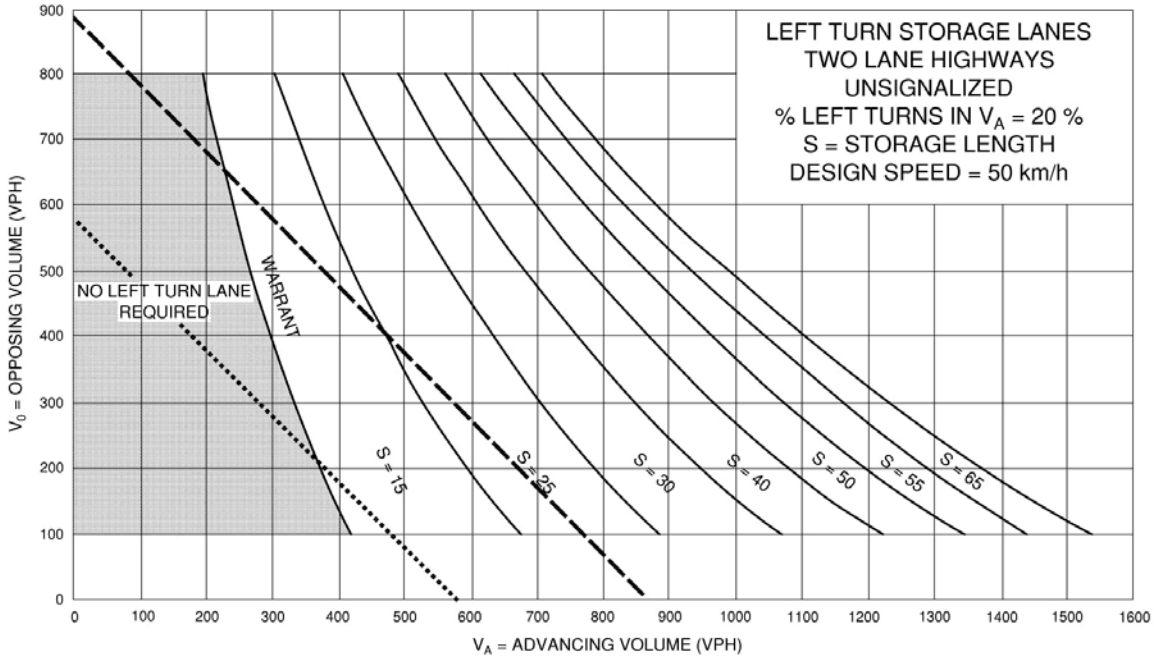
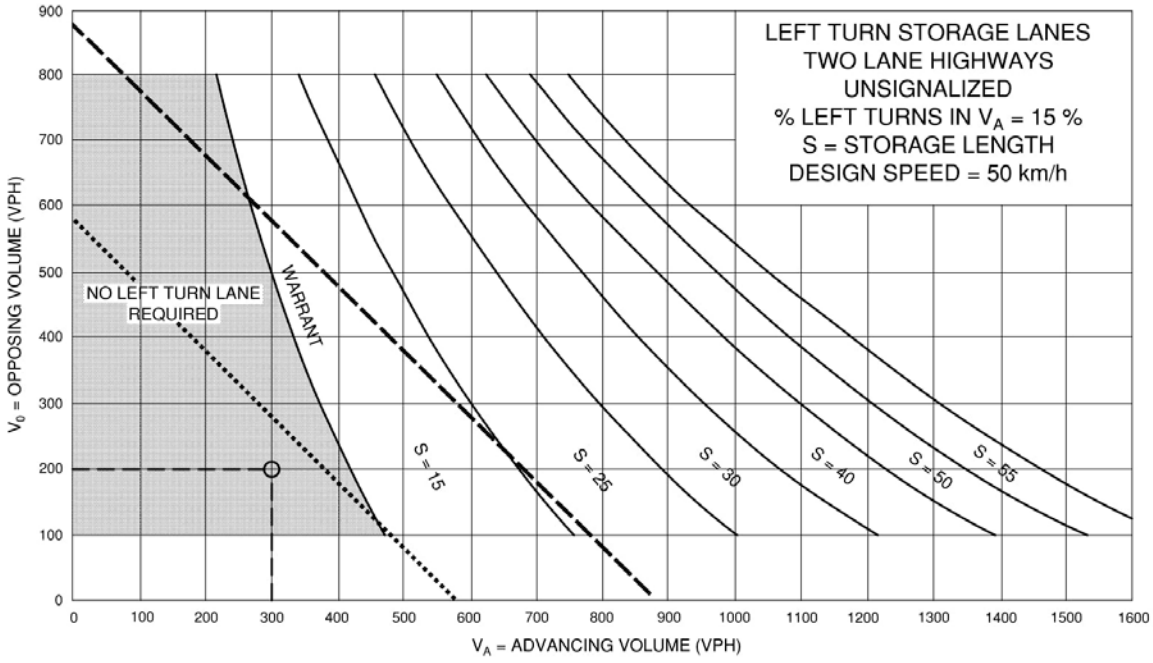


Exhibit 9A-3



Melody Lane / County Road 25
2021 Background Traffic - Northbound
Critical Case - PM Peak Hour

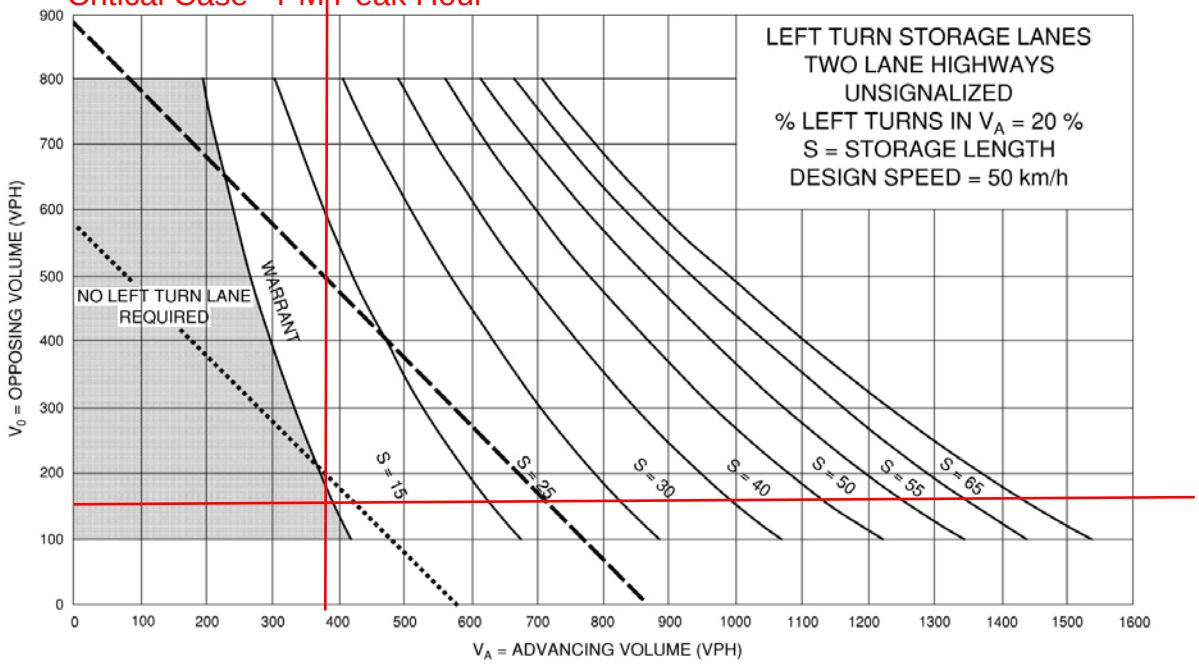
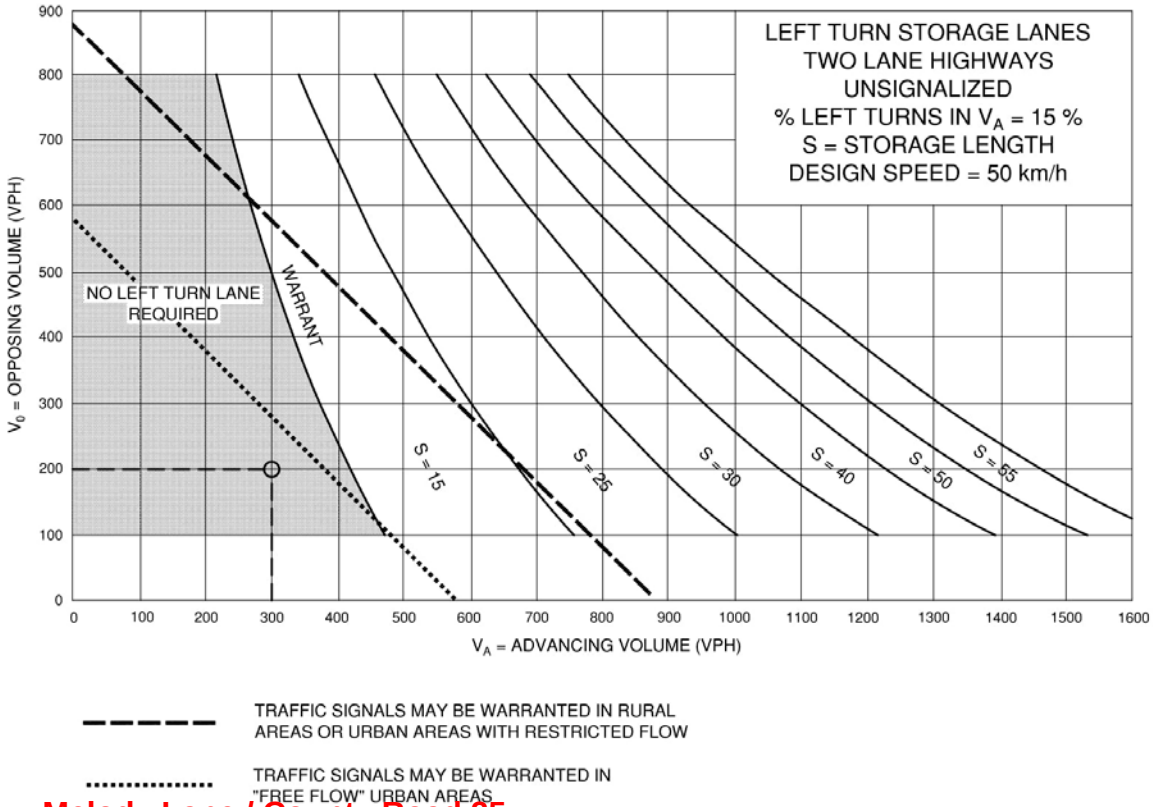


Exhibit 9A-3



Melody Lane / County Road 25
2026 Background Traffic - Northbound
Critical Case - PM Peak Hour

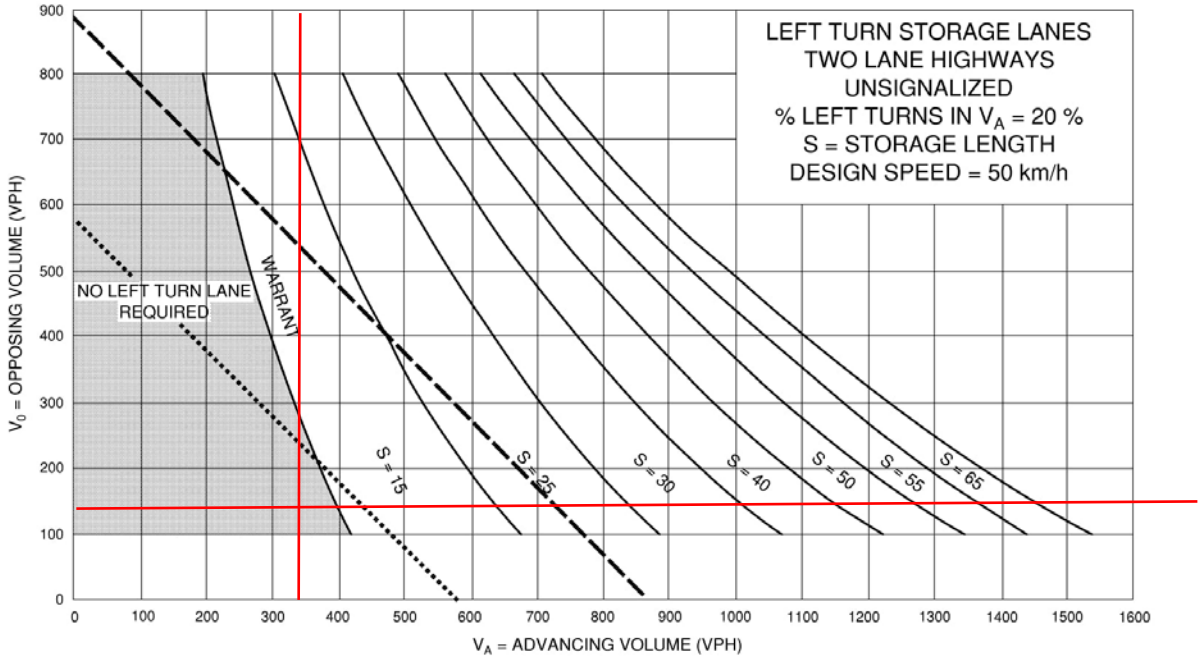
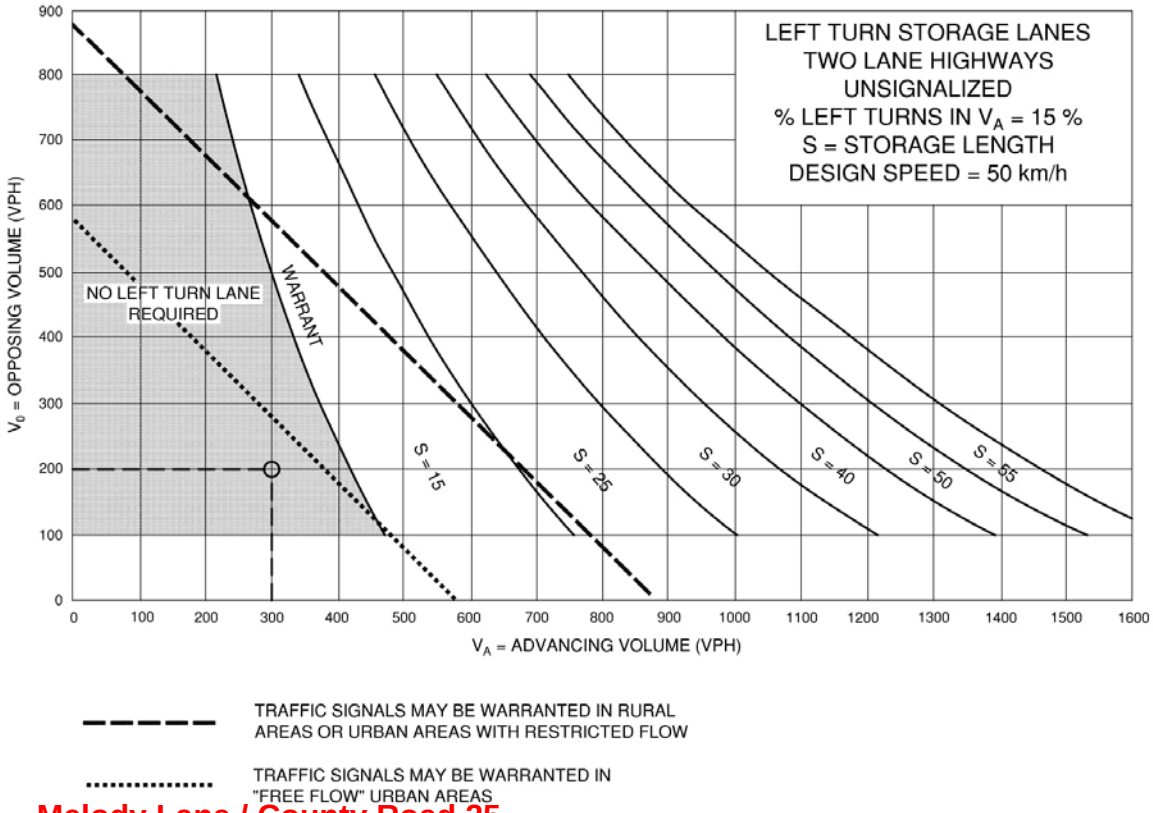
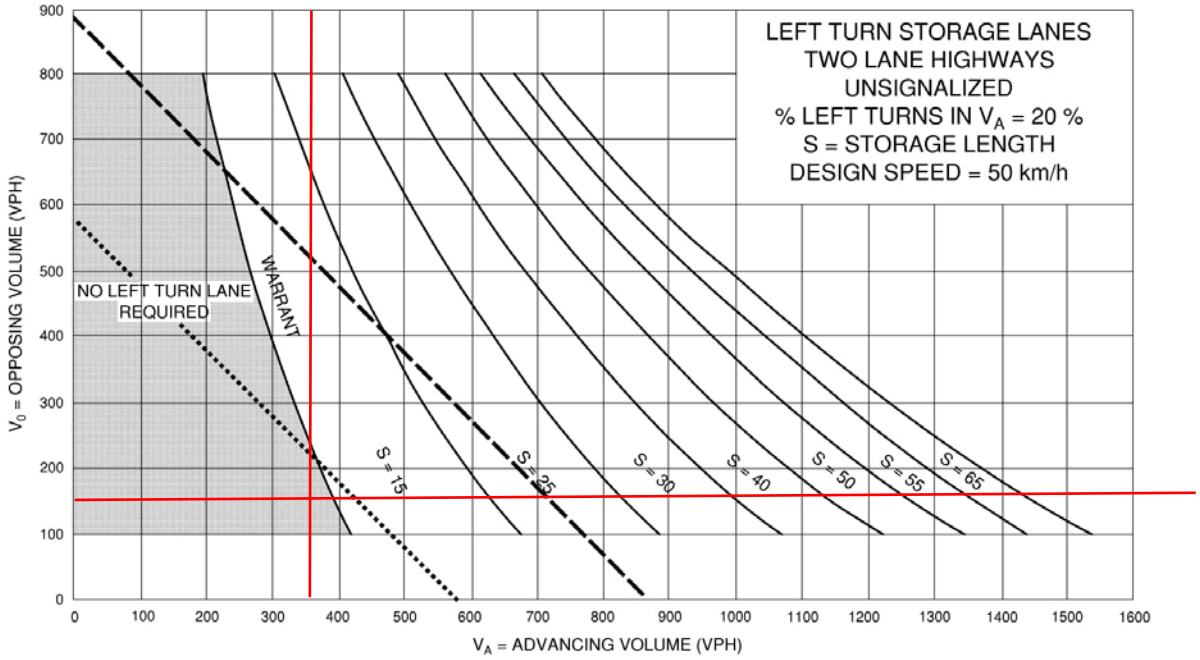


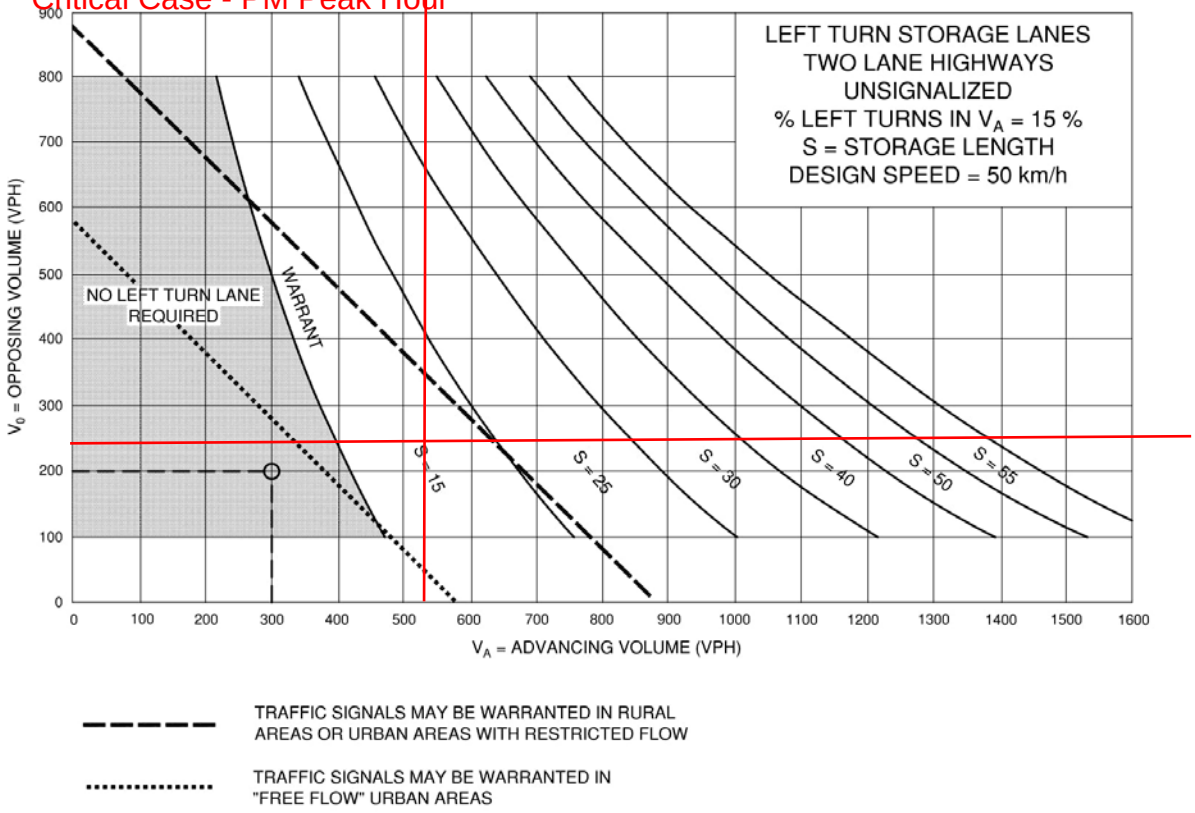
Exhibit 9A-3

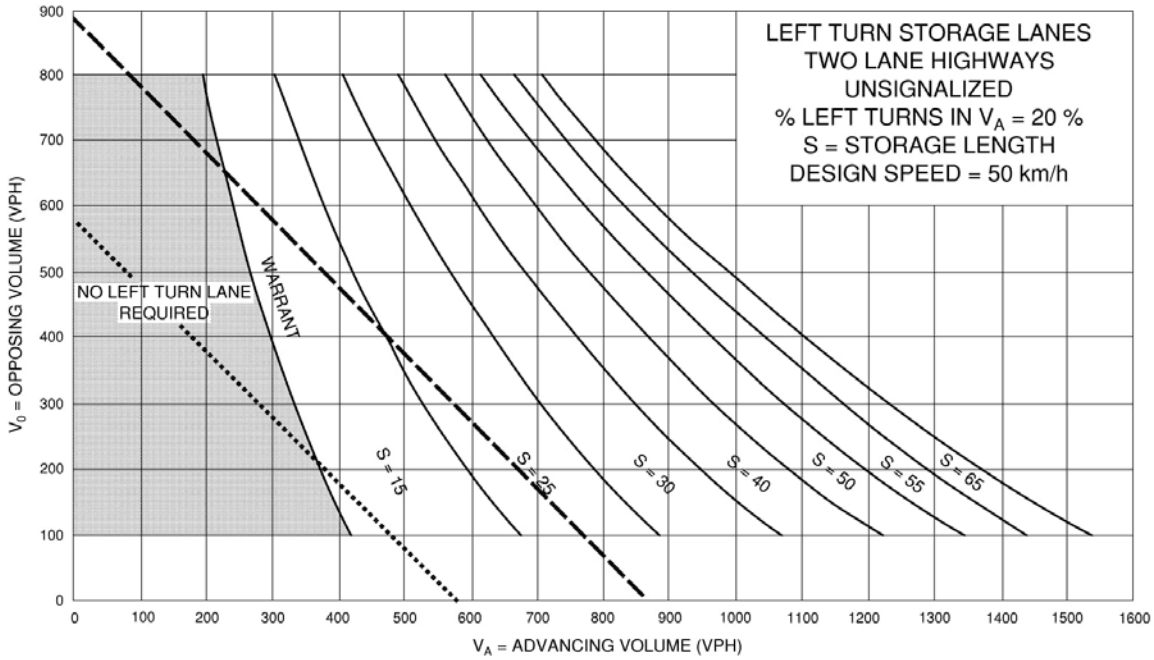


Melody Lane / County Road 25
2026 Total Traffic - Northbound
Critical Case - PM Peak Hour



Melody Lane / County Road 25
2031 Total Traffic - Northbound **Exhibit 9A-3**
Critical Case - PM Peak Hour



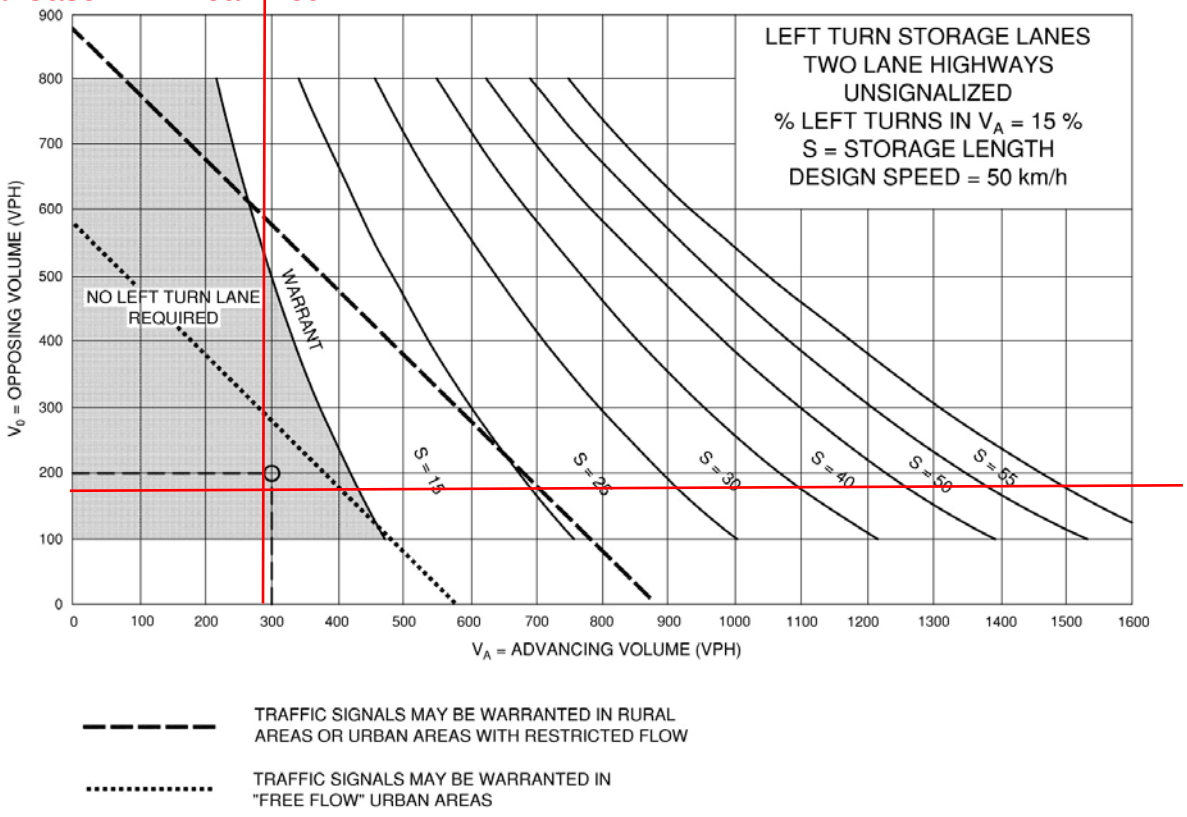


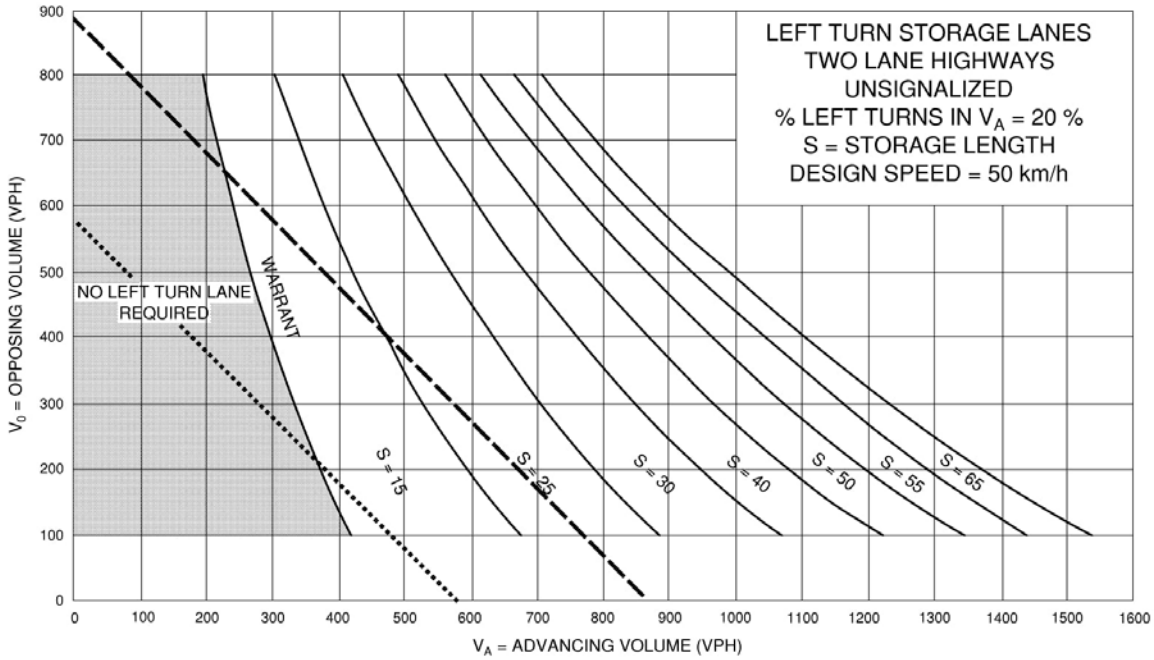
Future Collector & Industrial Drive / County Road 25

2026 Background Traffic - Southbound

Critical Case - AM Peak Hour

Exhibit 9A-3



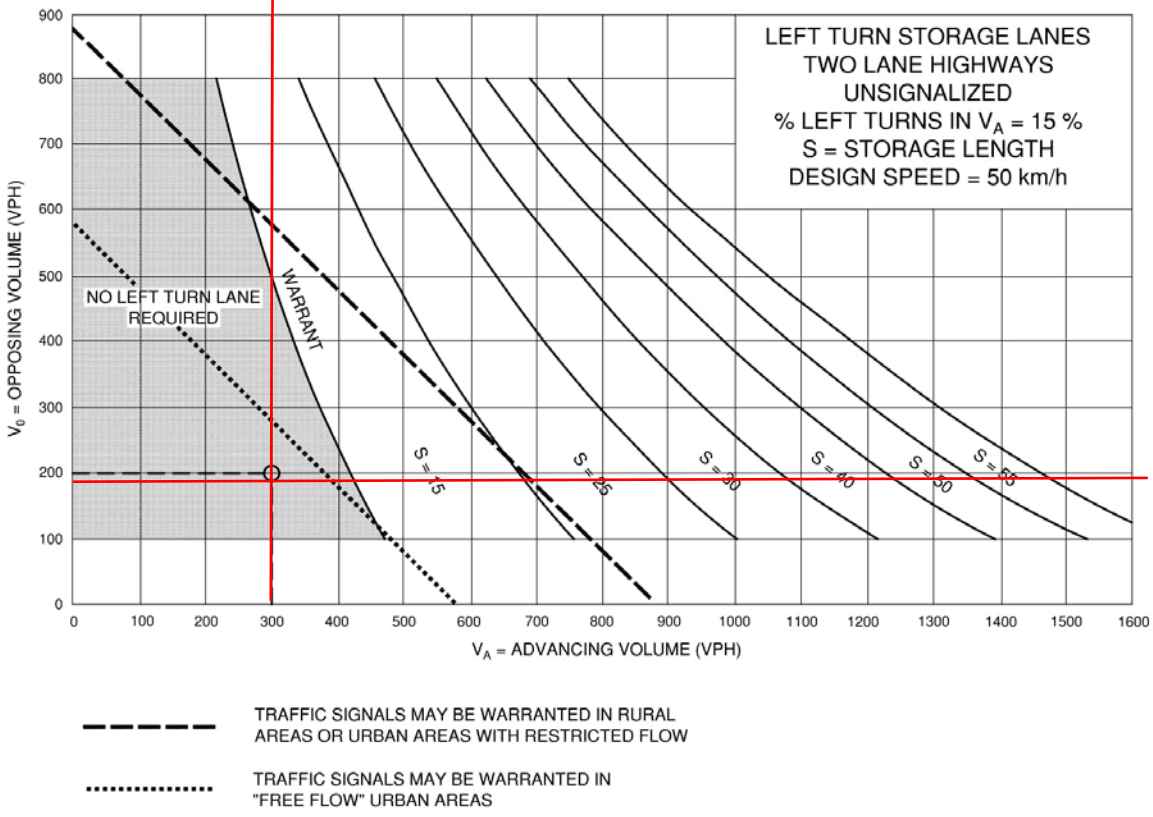


Corseed Access & Industrial Drive / County Road 25

2026 Total Traffic - Southbound

Critical Case - AM Peak Hour

Exhibit 9A-3



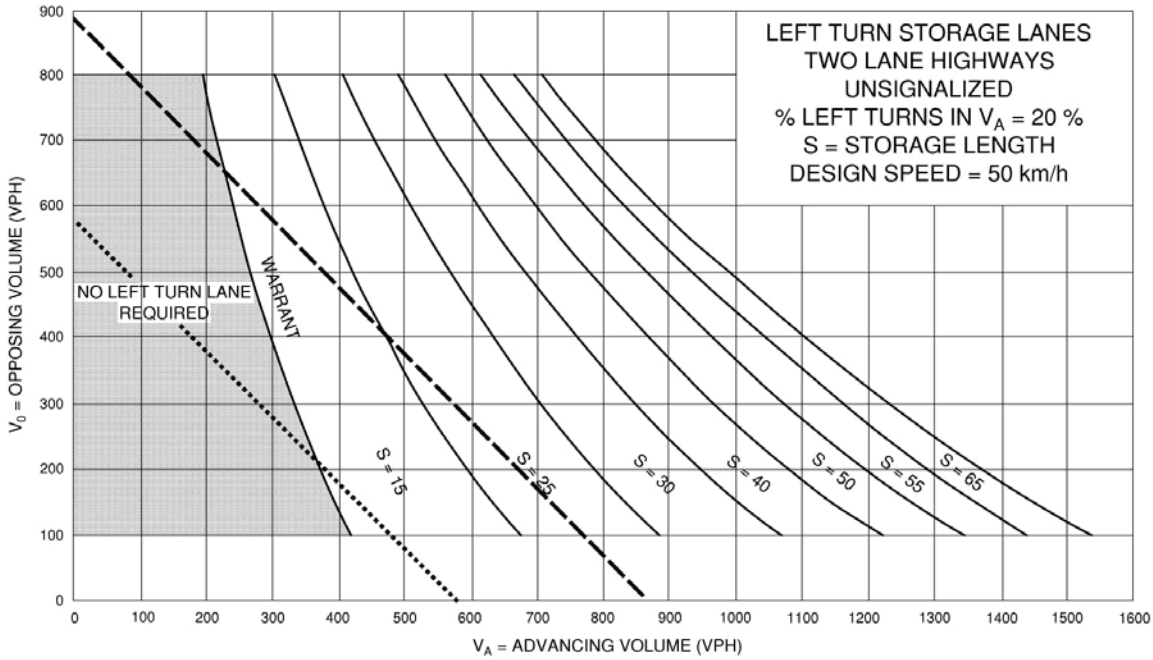
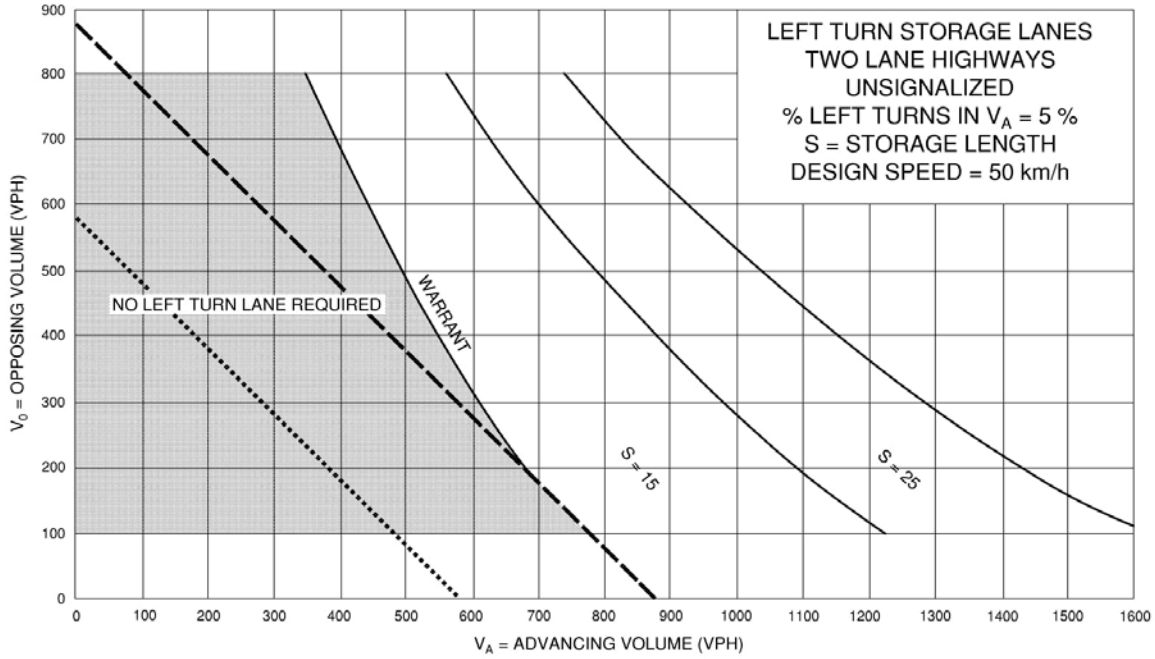


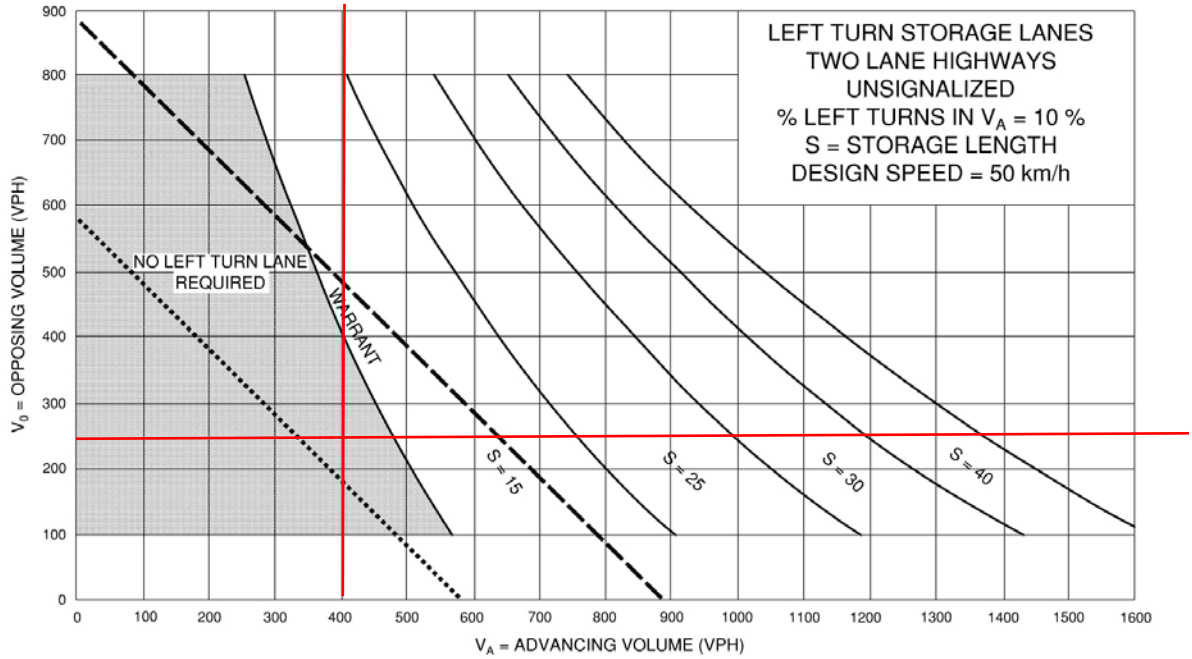
Exhibit 9A-2



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

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

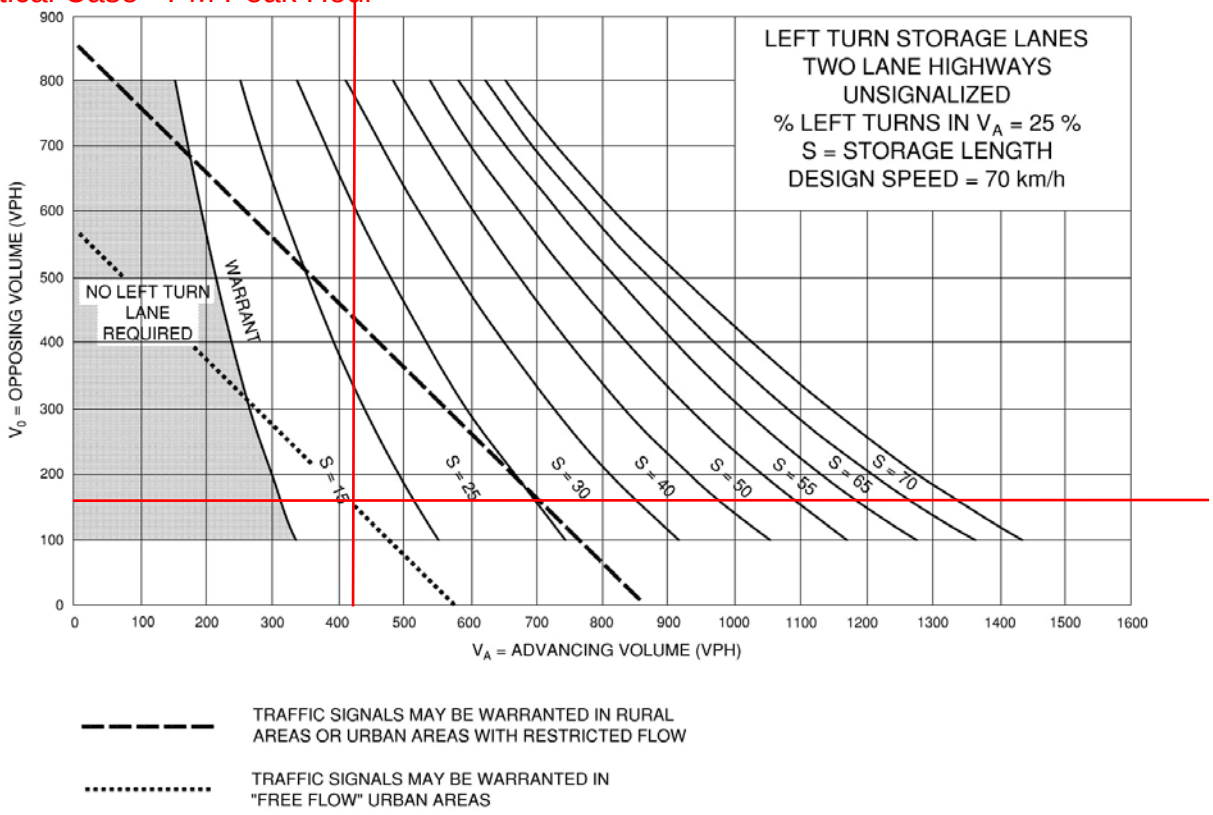
Corseed Access & Industrial Drive / County Road 25
2031 Total Traffic - Southbound
Critical Case - AM Peak Hour



Future Collector & Industrial Drive / County Road 25

2026 Background Traffic - Northbound **Exhibit 9A-12**

Critical Case - PM Peak Hour



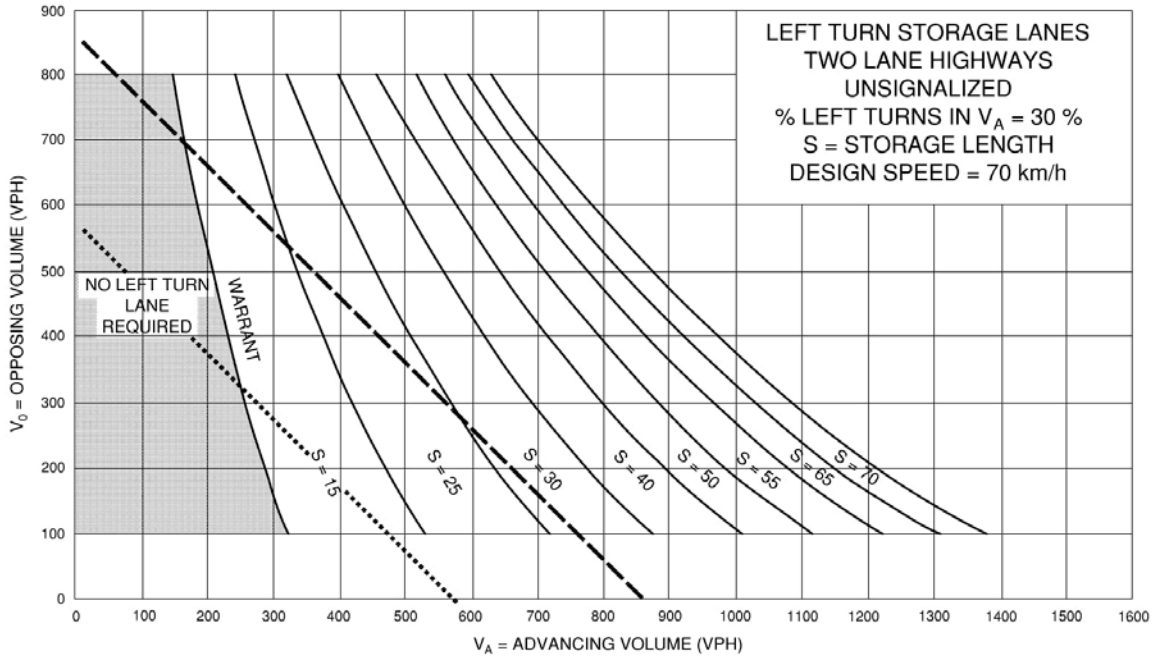
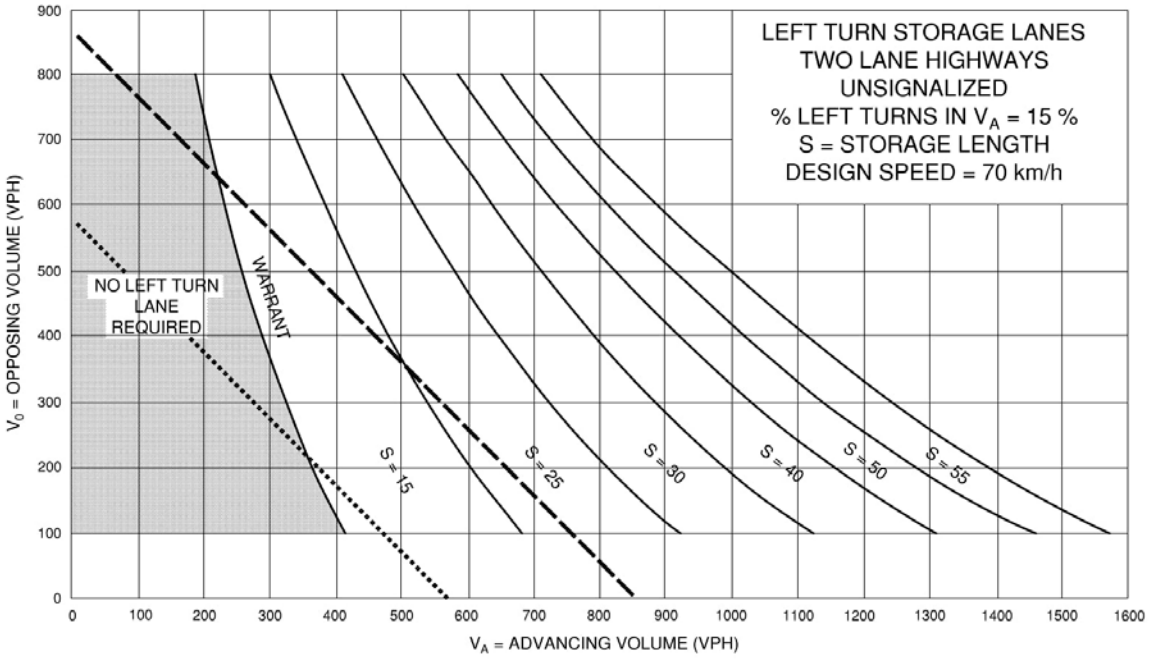


Exhibit 9A-11



Corseed Access & Industrial Drive / County Road 25
2021 Total Traffic - Northbound
Critical Case - PM Peak Hour

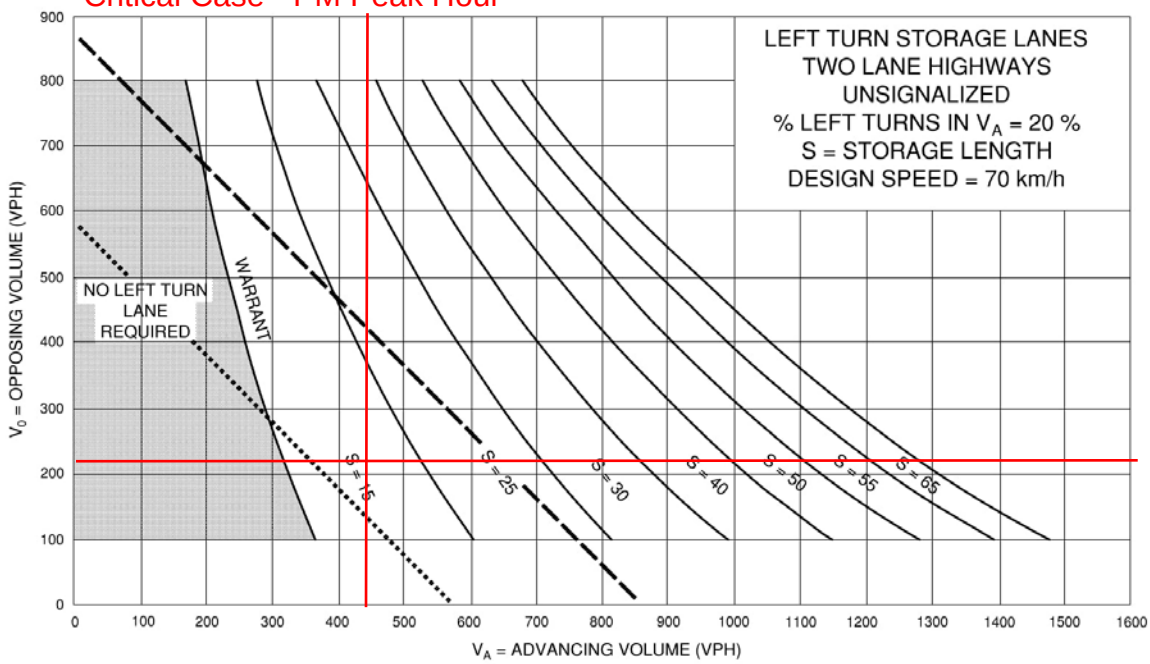
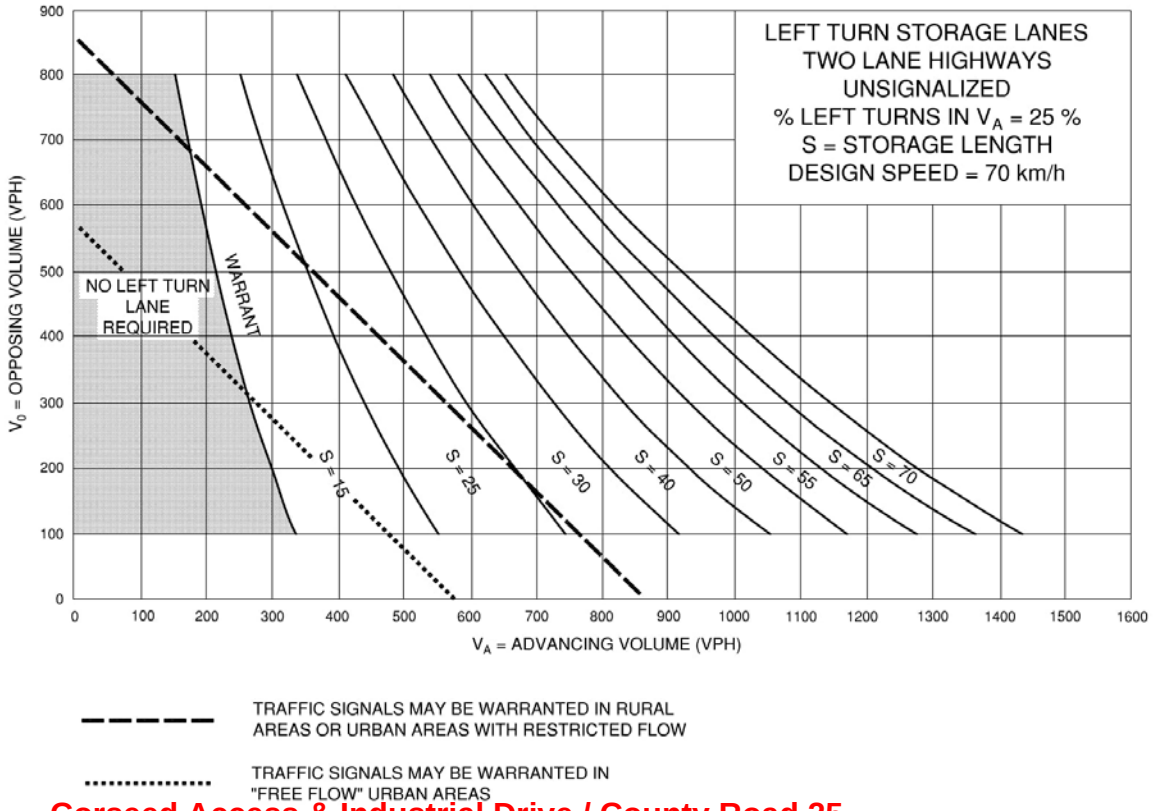
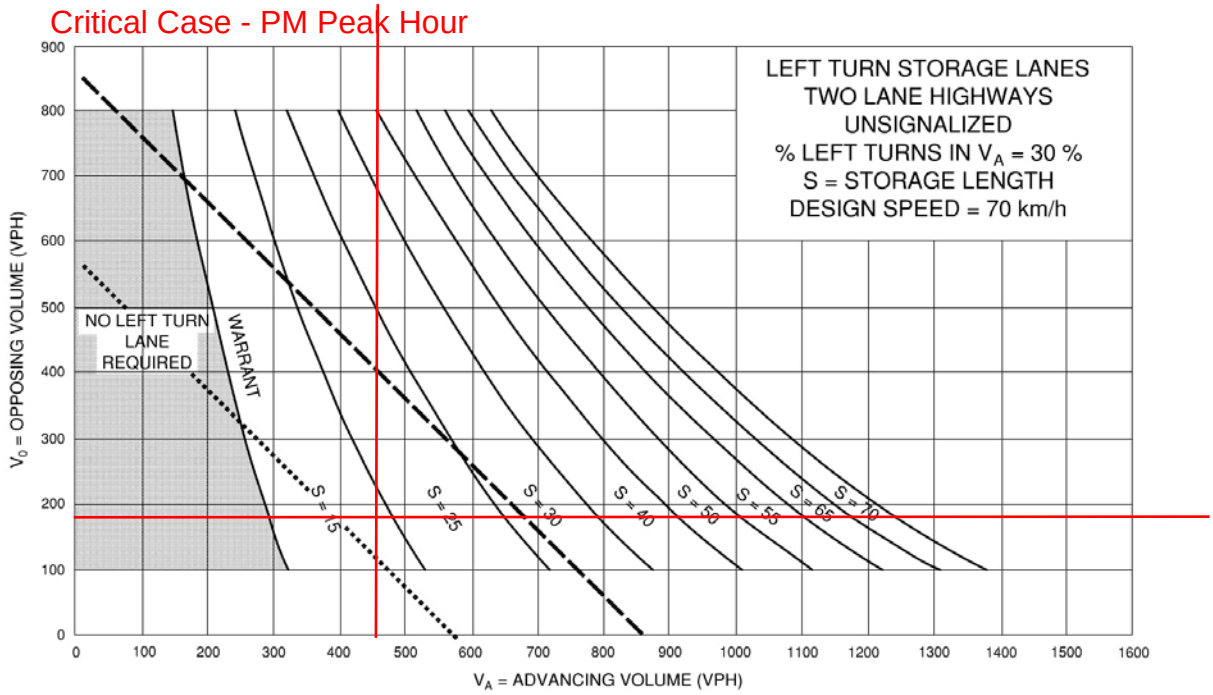


Exhibit 9A-12



Corseed Access & Industrial Drive / County Road 25
2026 Total Traffic - Northbound
Critical Case - PM Peak Hour



Appendix H –
OTM Book 12 – Traffic Signal Justification Sheets

Justification No. 7 - 2031 Total Traffic

Melody Lane / CR 25

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
		Rest. Flow	Numerical	%			
1. Minimum Vehicluar Volume	A. Vehicle volume, all aproaches (average hour)	720	343	48%	8%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	31	12%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	310	43%	2%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	2	2%		NO	NO

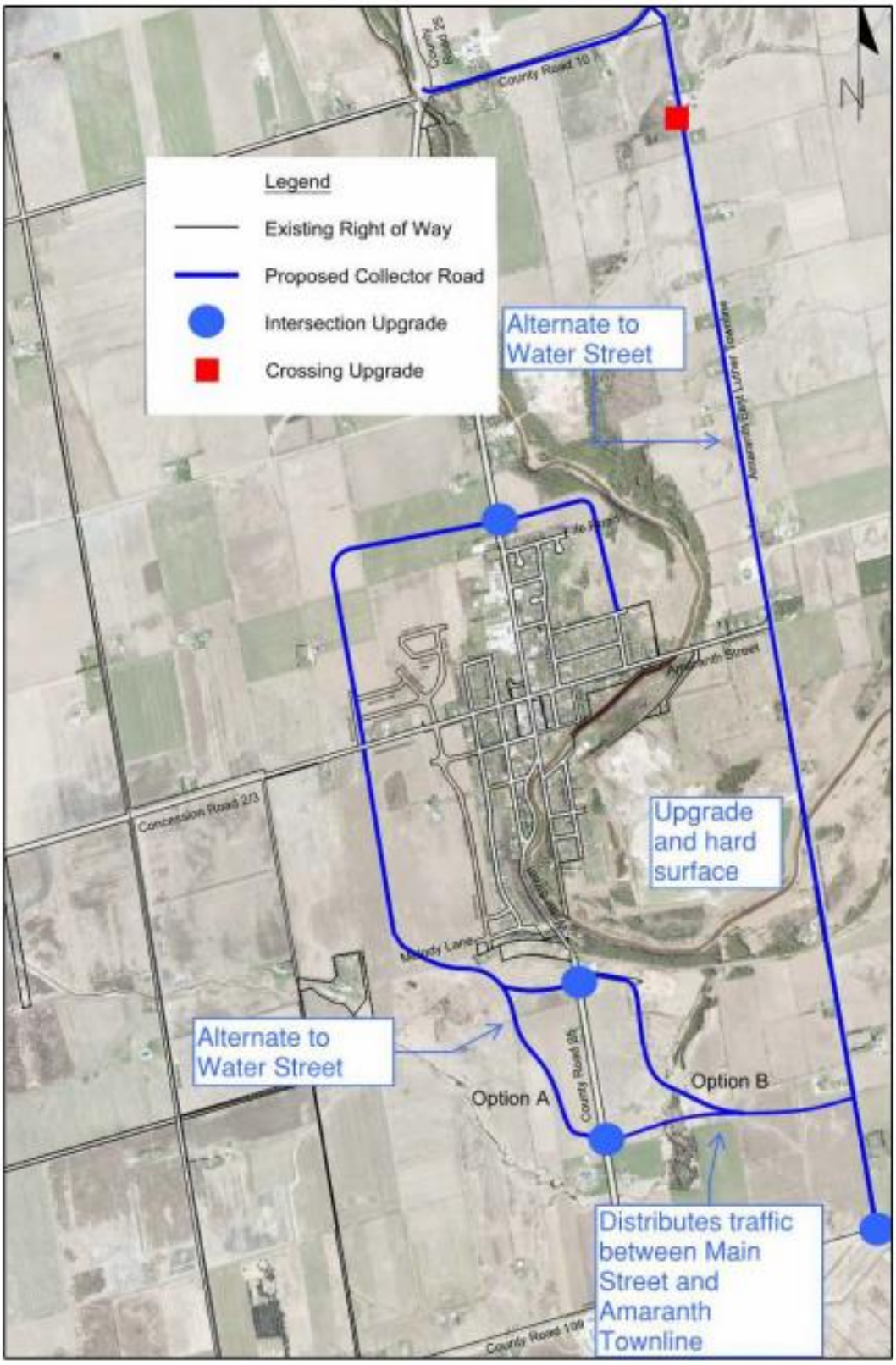
Justification No. 7 - 2031 Total Traffic

Corseed Access & Industrial Drive / CR 25

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
		Rest. Flow	Numerical	%			
1. Minimum Vehicluar Volume	A. Vehicle volume, all aproaches (average hour)	720	538	75%	50%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	170	136	80%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	376	52%	35%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	45	60%		NO	NO

Appendix I –
Grand Valley TMP Excerpts

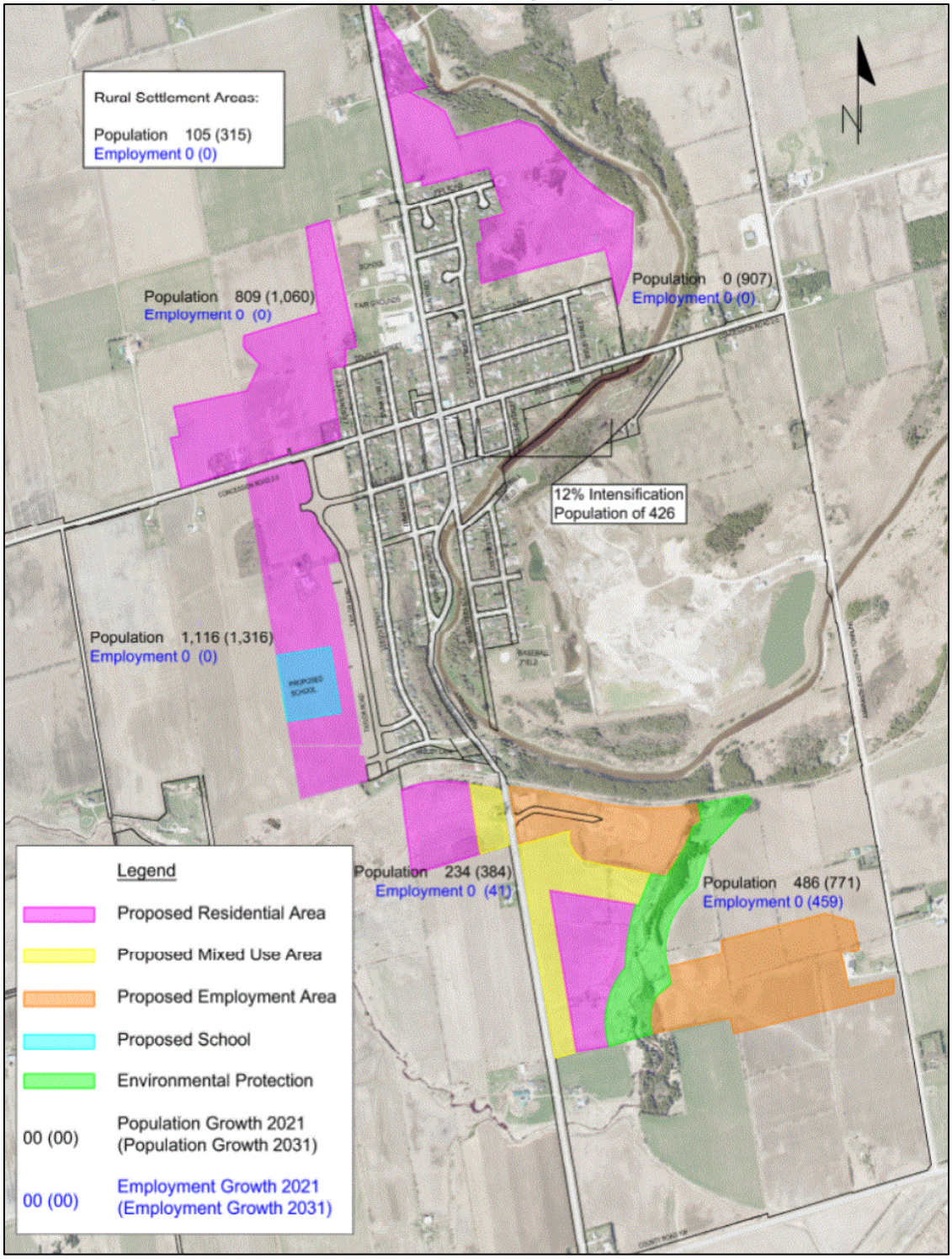
Executive Figure 2: Preferred Transportation Road Network



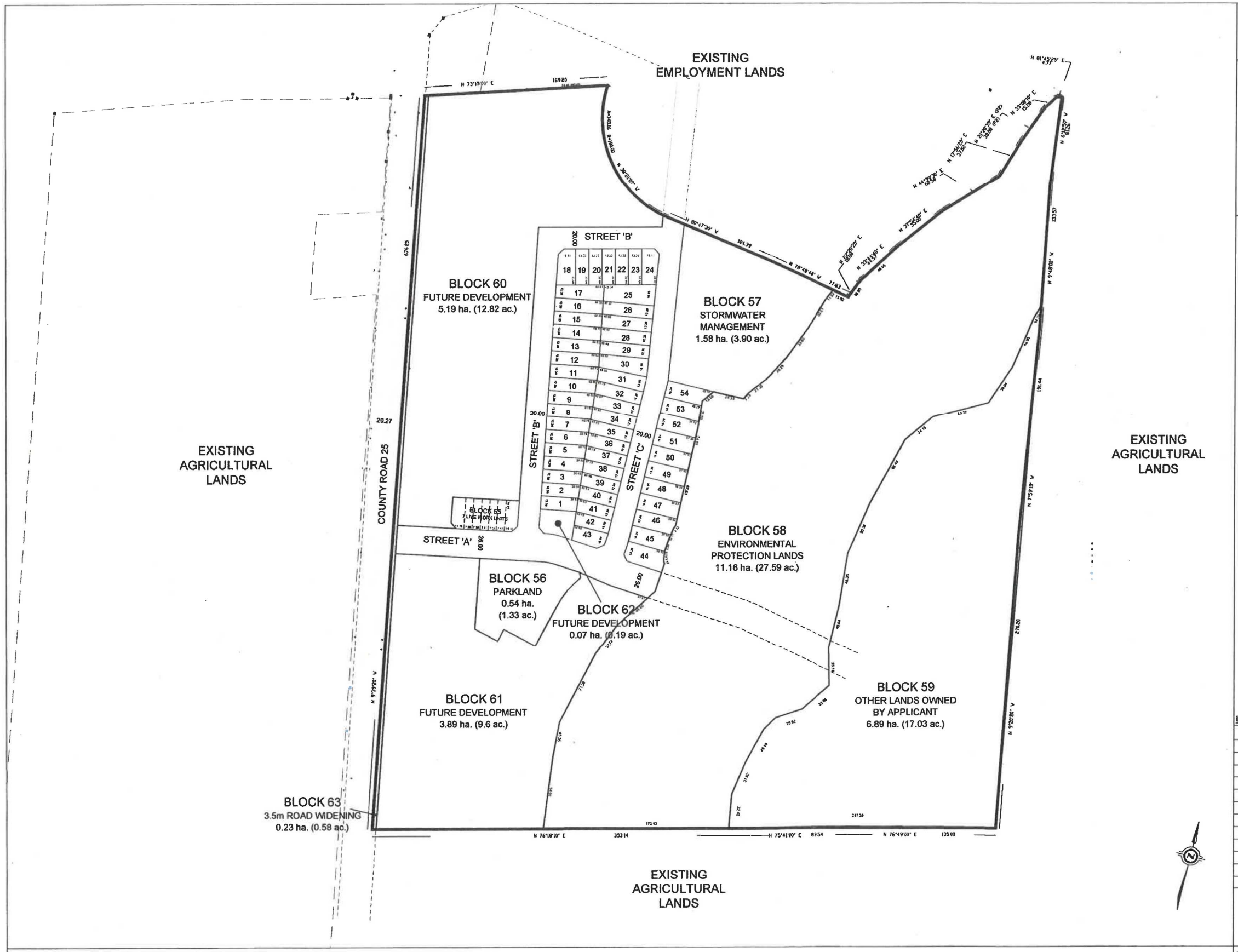
GRAND VALLEY

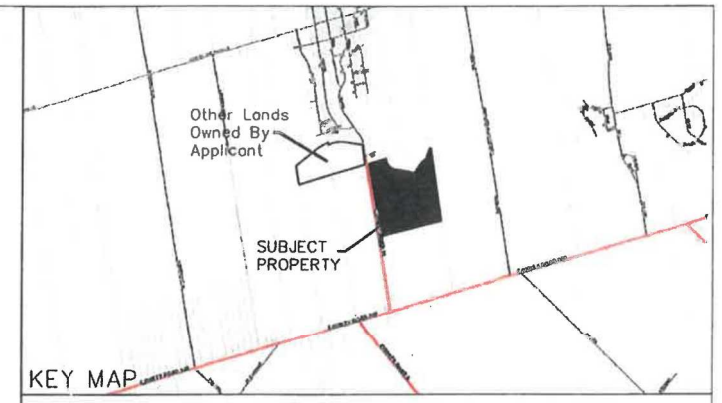
BURNSIDE

Future Population and Employment Distribution



Appendix J –
Moco Subdivision Draft Plan





DRAFT PLAN OF SUBDIVISION

PART OF NORTH HALF OF LOT 31,
CONCESSION 1
FORMERLY IN THE TOWNSHIP OF EAST LUTHER
NOW IN THE
TOWNSHIP OF EAST LUTHER - GRAND VALLEY
COUNTY OF DUFFERIN
2017

0 m 150 m

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE INNOVATIVE PLANNING SOLUTIONS TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

Oct 31, 2017 — DATE
MOCO FARMS LTD.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

OCT 31, 2017 — DATE
PIER DEROSA, O.L.S

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a) SHOWN ON PLAN
b) SHOWN ON PLAN
c) SEE KEY PLAN
d) RESIDENTIAL, MIXED USE, PARKLAND, ENVIRONMENTAL PROTECTION, STORMWATER MANAGEMENT
e) SHOWN ON PLAN
f) SHOWN ON PLAN
g) SHOWN ON PLAN
h) MUNICIPAL WATER
i) GUELPH LOAM
j) SHOWN ON PLAN
k) ALL MUNICIPAL SERVICES
l) NONE

LAND USE STATISTICS

Land Use	Lot / Block No.	Area (ha.)	Units
RESIDENTIAL UNITS (40')	1-43	2.14	43
RESIDENTIAL UNITS (50')	44-54	0.64	11
LIVE WORK UNITS (24.6')	55	0.17	7
FUTURE DEVELOPMENT	60-62	9.15	
PARKLAND	56	0.54	
STORMWATER MANAGEMENT	57	1.58	
ENVIRONMENTAL PROTECTION LANDS	58	11.16	
OTHER LANDS OWNED BY APPLICANT	59	6.89	
20.0 m R.O.W	'B', 'C'	1.38	
26.0 m R.O.W	'A'	0.64	
3.5m ROAD WIDENING	63	0.23	
TOTAL		34.5	61

MOCO FARMS- DRAFT PLAN OF SUBDIVISION
TOWN OF GRAND VALLEY

INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
150 Dunlop Street East, Suite 201, Barrie, ON L4M 1B1
P: 705 • 812 • 3281 F: 705 • 812 • 3438 www.ipsconsultinginc.com

FILE NAME: 10-301 MOCO - 010815.dwg	DATE: OCTOBER 31, 2017
PROJECT: 10-301 CORTEL GRAND VALLEY	DRAWN BY: V.L.

Appendix L –
2016 TIS Excerpts

Corseed & Moco Residential Subdivision

Town of Grand Valley
County of Dufferin

Traffic Impact Study for

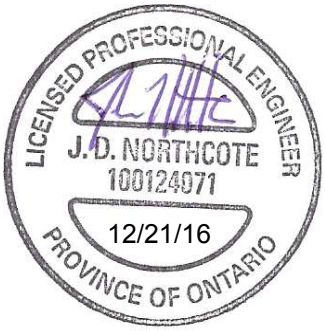
Moco Farms Ltd., Corseed Inc.

Type of Document:
Final Report

Project Number:
JDE – 1417

Date Submitted:
July 22nd, 2015

Date Revised
December 21st, 2016



John Northcote, P.Eng.
Professional License #: 100124071

ENGINEERING

JD Northcote Engineering Inc.
86 Cumberland Street
Barrie, ON
705.725.4035
www.JDEngineering.ca

The results of the LOS analysis indicate that the study area intersections are operating at a good LOS for all turning movements.

For right turn movements, the criteria outlined in Section E.7 of the MTO GDSOH were applied. Based on the above-noted criteria, right turn lanes are not warranted at all study area intersections.

An analysis was completed for left turn movements at all unsignalized intersections within the study area. Based on the criteria outlined in Section E.B.1 of the MTO GDSOH, a northbound left turn lane is warranted on County Road 25 at Melody Lane with a 15 meter storage length; however, based on our discussions with the Town, widening the road at this intersection is not feasible. Consequently, for the purpose of this analysis, it is assumed that a northbound left turn lane will not be constructed on County Road 25 at Melody Lane. A northbound left turn lane on County Road 25 at the Future Collector is warranted with a 15 meter storage length. MTO GDSOH left turn warrant graphs are provided in **Appendix G**.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at the intersection of Melody Lane / County Road 25 or Future Collector / County Road 25 (results are provided in **Appendix H**).

No additional improvements are required at the existing intersections.

4 Proposed Development Traffic Generation and Assignment

4.1 Traffic Generation

As noted in Section 1.4, development plans for the mixed-use blocks for the Moco Subdivision and Corseed Subdivision have not been finalized at this time. It is anticipated that development of the mixed-use blocks will not commence within 10 years of the current proposed development. Based on our correspondence with the Town and County, although the development of the mixed-use blocks are not anticipated to develop in the short term, a longer-term preliminary review of the anticipated mixed-use development for the year 2031 is required.

A conceptual plan showing a potential configuration of the future mixed-use block in the Moco Subdivision was prepared by IPS Consulting Inc. for the purpose of this analysis (attached in **Appendix A**). A similar conceptual development plan for the mixed-use block in the Corseed Subdivision is not available, consequently, for the purpose of this report, we have assumed that the traffic generated by the Corseed Subdivision would be proportionate to the ratio of the mixed-use developable areas within the Moco and Corseed Subdivisions.

The traffic generation for the Corseed and Moco Subdivisions has been based on the ITE *Trip Generation* data. The following ITE land uses have been applied to estimate the traffic from the proposed development:

- ITE land use 210 (Single-Family Detached Housing)
- ITE land use 230 (Residential Condominium / Townhouse)
- ITE land use 820 (Shopping Center)

The estimated trip generation of the proposed development is illustrated below in **Table 9** and **10**. The AM and PM peak traffic generation for the subject site generally aligns with the AM and PM peak hour in the traffic counts.

Table 9 – Estimated Traffic Generation from Proposed Moco Development

Phase	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
1	Single-Family Detached Housing ITE Land Use: 210	108 units	22	65	86	71	42	113
2	Residential Condominium/Townhouse ITE Land Use: 230	79 units	7	36	43	34	17	50
	Shopping Center ITE Land Use:820	8,177 sq.m. 88,018 sq.ft.	89	55	144	264	286	550
	Internal Capture (10%)[6]		-9	-5	-14	-26	-29	-55
	Pass-by Trips (Shopping Center)		0	0	0	-81	-87	-168
TOTAL PRIMARY TRIPS			**109**	**151**	**259**	**262**	**229**	**490**

Table 10 – Estimated Traffic Generation from Proposed Corseed Development

Phase	Land Use	Size	AM Peak Hour			PM Peak Hour		
			IN	OUT	TOTAL	IN	OUT	TOTAL
1	Single-Family Detached Housing ITE Land Use: 210	75 units	16	47	62	50	30	80
2	Net Mixed Use	25% of Moco	22	22	44	69	69	138
	Pass-by (Mixed Use)		0	0	0	20	22	42
TOTAL PRIMARY TRIPS			**37**	**112**	**149**	**122**	**72**	**194**

In order to be conservative, no transportation modal split has been applied to the above-noted traffic generation calculation.

4.2 Traffic Assignment

For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed. The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. Beyond the local area the distribution of traffic from the Moco Subdivision and Corseed Subdivision have been estimated based on the 2011 Transportation Tomorrow Survey [TTS] data (excerpt attached as **Appendix E**). TTS data provides historical origin and destination work trip percentages for specific areas within the County and the Greater Toronto and Hamilton Area [GTHA].

The egress distribution of the residential trips generated by the Moco Subdivision and Corseed Subdivision were based on TTS data for trips originating in Zone 8614 between 07:00 and 09:00. Logically, the distribution of ingress traffic will follow the inverse of the exiting traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

Commercial trips generated by the Moco and Corseed Subdivisions have been distributed proportionately with the existing traffic volumes on the roads in the study area.

For the Moco Subdivision, it is assumed that all residential trips will access the site via the Moco South Access and all commercial trips will access the site via the Moco North Access.

[6] The internal capture rate (10%) was estimated based on a conservative application of the values provided in Table 7.1 and 7.2 of the ITE *Trip Generation Handbook*.

Appendix L –
Proposed Traffic Distribution Figures

Figure A – Residential Traffic Distribution for the Proposed Moco Development (2021)

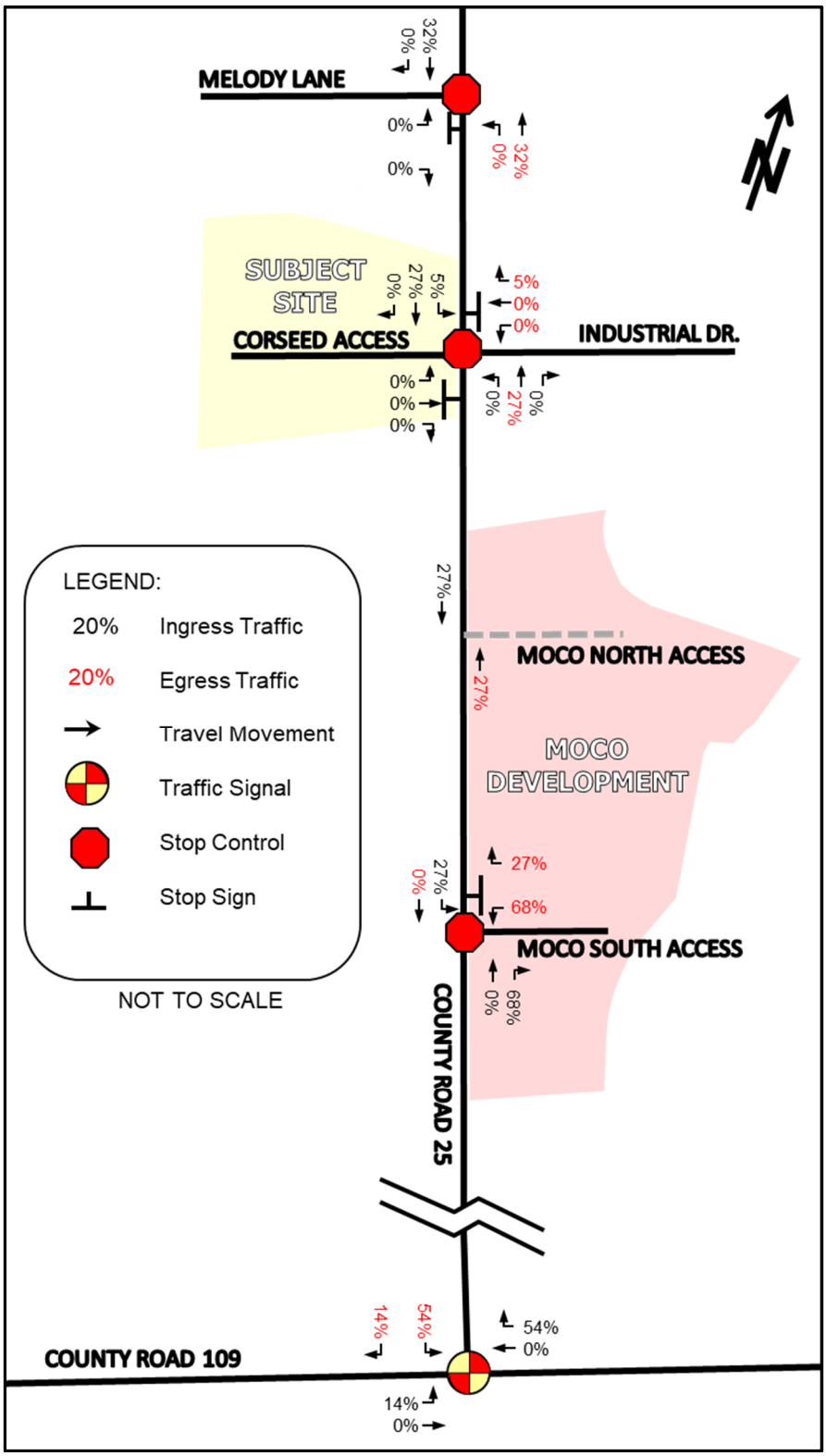


Figure B – Residential Traffic Distribution for the Proposed Moco Development (2026 & 2031)

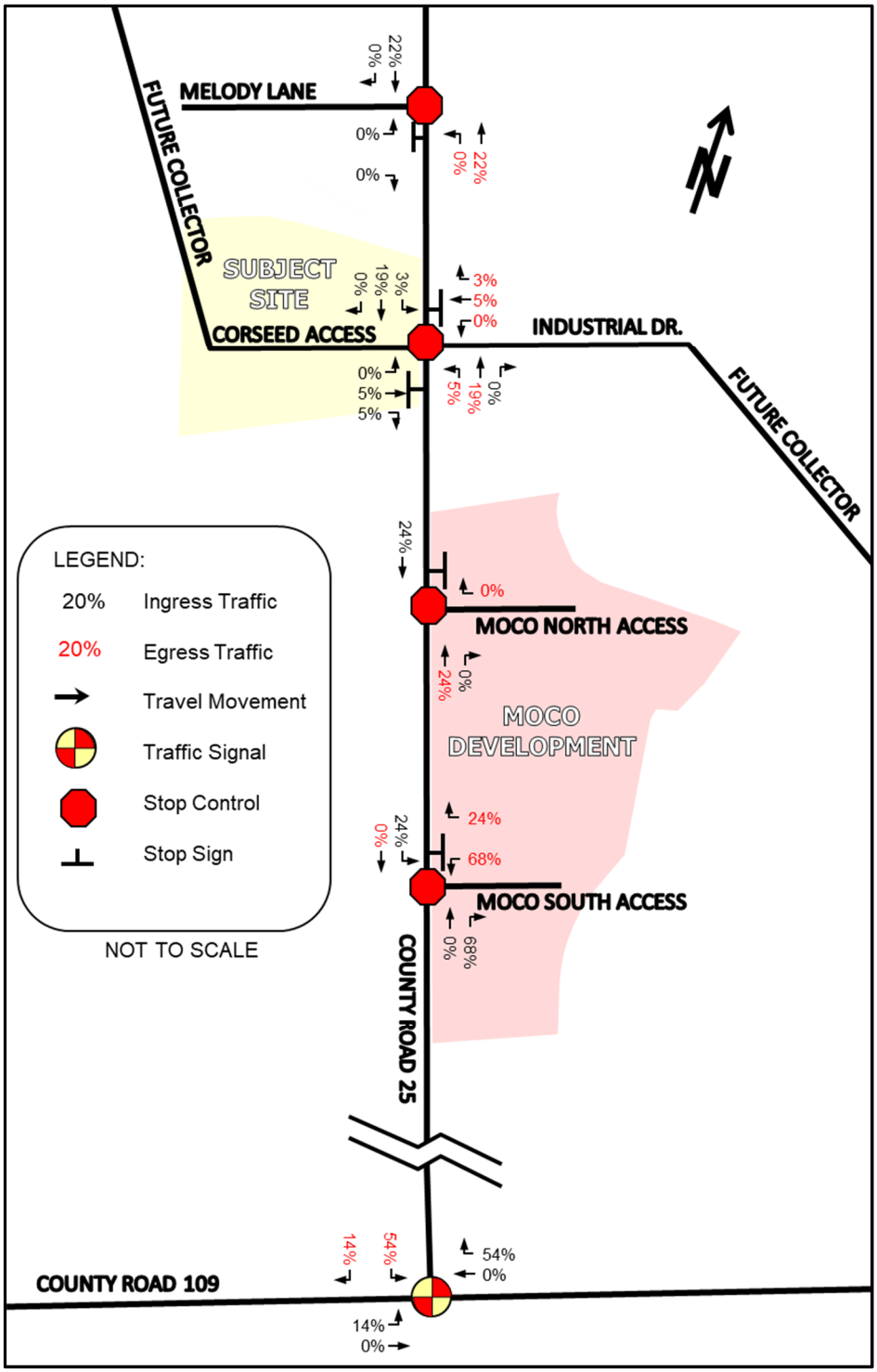


Figure C – Residential Traffic Distribution for the Proposed Corseed Development

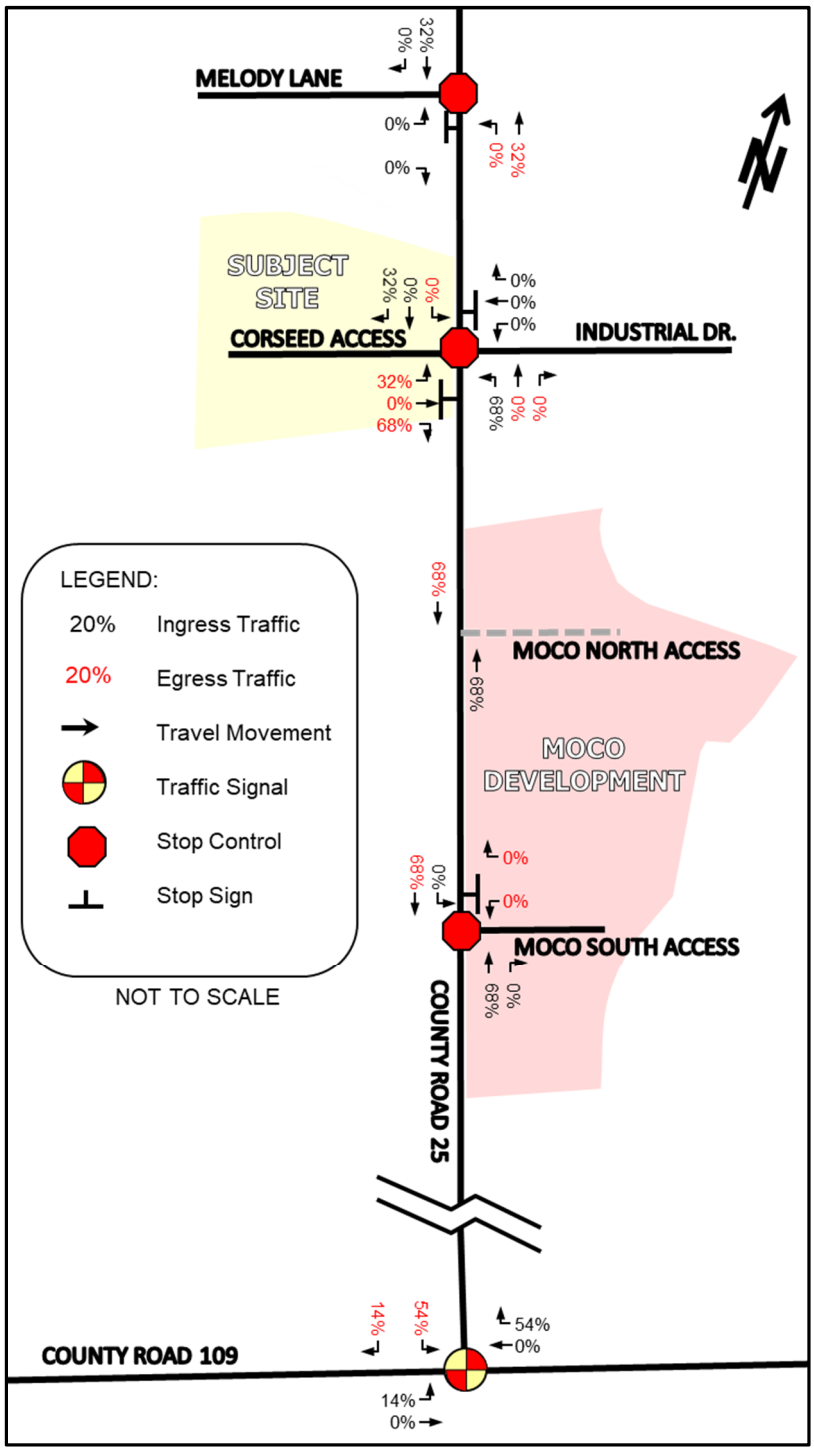


Figure D – Commercial Traffic Distribution for the Proposed Development Moco Development

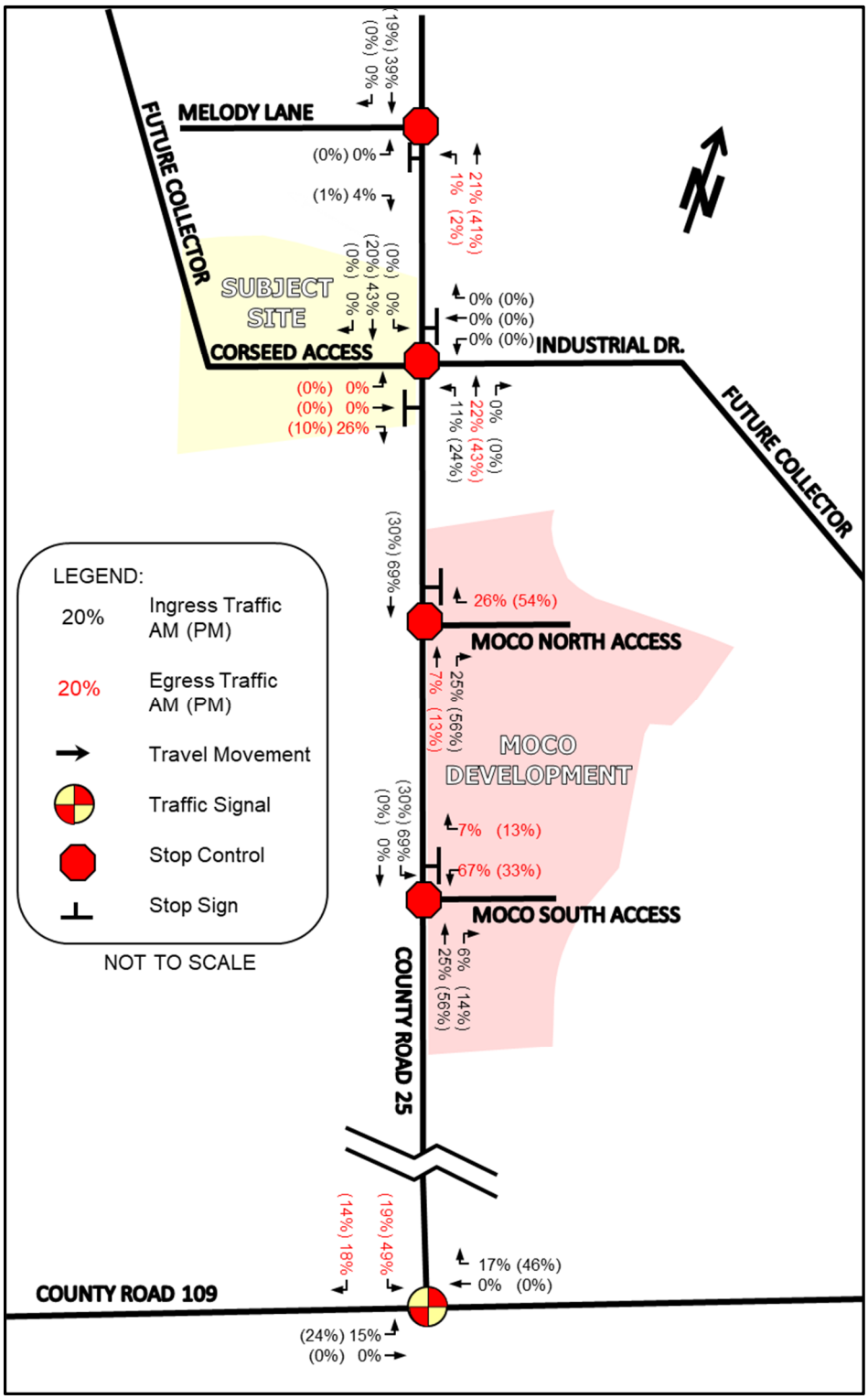
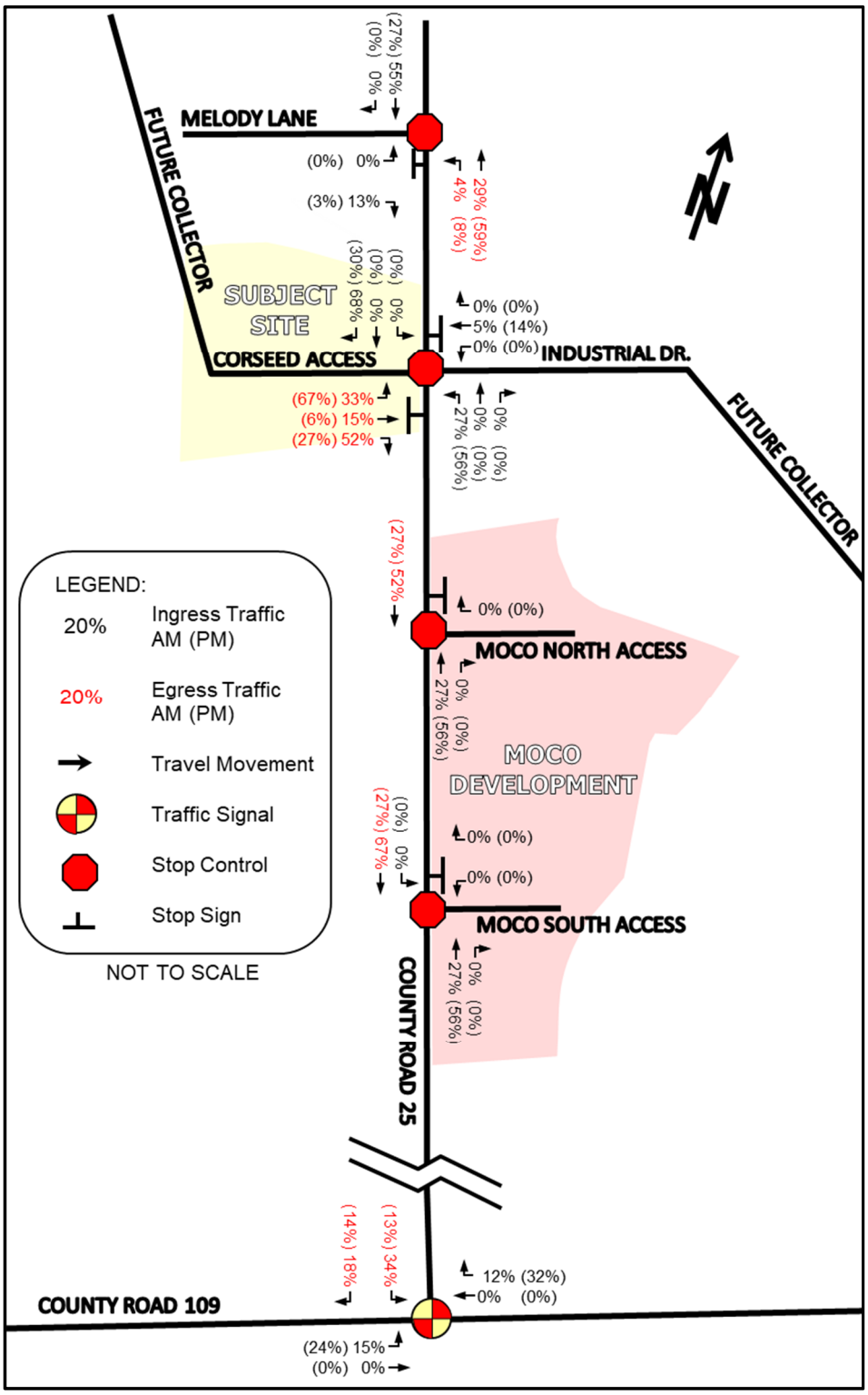


Figure E – Commercial Traffic Distribution for the Proposed Corseed Development



Appendix M –
Transportation Tomorrow Survey Excerpt

Cross Tabulation Query Form - Trip - 2011

Filter Variables

2006 GTA zone of work × ▾ | Planning district of origin × ▾ | (Optional) Table Attribute ▾

Group Attributes

Row Grouping | Column Grouping | Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☐ 2006 GTA zone of work ▾ | In ▾ | 8416

Add Delete

Output

○ Comma-delimited table ◉ Column format | Expansion Factor On | Click to Select Load | Load

Execute Query | Select All | Save As

```
Fri Nov 18 2016 11:45:00 GMT-0500 (Eastern Standard Time) - Run Time: 1853ms

Cross Tabulation Query Form - Trip - 2011
Row: 2006 GTA zone of work - gta06_emp
Column: Planning district of origin - pd_orig


Filters:
2006 GTA zone of work - gta06_emp In 8416

Trip 2011
ROW : gta06_emp
COLUMN : pd_orig
   gta06_emp     pd_orig      total
        8416           9         20
        8416          36        258
        8416          39         29
        8416          42         33
        8416          73         67
        8416          80        117
        8416         142         50
        8416         145       1324
```

TTS Cross Tabulation

Cross Tabulation Query Form - Trip - 2011

Filter Variables

2006 GTA zone of origin × | Planning district of desti... × | (Optional) Table Attribute

Group Attributes

Row Grouping | Column Grouping | Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

2006 GTA zone of origin | In | 8416

And

Start time of trip | In | 700 - 900

Add | Delete

Output

Comma-delimited table | Column format | Expansion Factor On | Click to Select Load | Load

Execute Query | Select All | Save As

```
Wed Nov 23 2016 06:53:39 GMT-0500 (Eastern Standard Time) - Run Time: 2367ms

Cross Tabulation Query Form - Trip - 2011
Row: 2006 GTA zone of origin - gta06_orig
Column: Planning district of destination - pd_dest


Filters:
2006 GTA zone of origin - gta06_orig In 8416
and
Start time of trip - start_time In 700 - 900

Trip 2011
ROW : gta06_orig
COLUMN : pd_dest
  gta06_orig     pd_dest      total
        8416          36         33
        8416          73         67
        8416          79         33
        8416          80        134
        8416         121         33
        8416         141         67
        8416         142         33
        8416         144        100
        8416         145        167
        8416         146         33
        8416         998         33
```