

ROAD 2 EAST CORRIDOR STUDY

COUNTY ROAD 29 TO COUNTY ROAD 45

KINGSVILLE, ONTARIO

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ROAD 2 EAST CORRIDOR STUDY (NOVEMBER 2020)
COUNTY ROAD 29 TO COUNTY ROAD 45, KINGSVILLE, ONTARIO

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INTRODUCTION AND BACKGROUND

As illustrated on Figure 1 – Area Plan, Road 2 East is an east / west minor arterial road in the Town of Kingsville. The Town has a population of approximately 21,000 and is the result of an amalgamation of the former Townships of Gosfield North, Gosfield South and the Town of Kingsville, as well as a number of smaller communities, such as Cottam and Ruthven. The Town of Kingsville consists of primarily agricultural land, including numerous greenhouse operations. The Town is currently planning to reconstruct Road 2 East from County Road 29 (Division Road) to County Road 45 (Union Avenue), as defined on Figure 2 – Study Area.

The Town of Kingsville intends to reconstruct the granular road base to accommodate heavy truck traffic, surface the roadway with an appropriate asphalt pavement design, and improve the existing road profile to accommodate both vehicular traffic and active transportation users. It is noted that the Chrysler Greenway, a major regional recreational trail, crosses Road 2 East just east of Graham Sideroad; it also crosses the Graham Sideroad just south of Road 2 East. Furthermore, the Kingsville Recreation Complex is located on the south side of Road 2 East between Kratz Sideroad and Jasperson Drive, which further emphasizes the need for active transportation connectivity. Accordingly, active transportation facilities along Road 2 East may be integrated to facilitate alternative modes of transportation and leisure within the region.

The reconstruction of Road 2 East is scheduled for reconstruction in three phases. Phase 1 of the project is comprised of the 1.8km stretch from County Road 45 (Union Avenue) at the east to Graham Sideroad at the west; it is scheduled for reconstruction in 2021. Phase 2 of the project is comprised of the 1.9km stretch from Graham Sideroad at the east to Kratz Sideroad at the west; it is scheduled for reconstruction in 2022. Phase 3 of the project is comprised of the 1.78km stretch from Kratz Sideroad at the east to County Road 29 (Division Road) at the west; it is scheduled for reconstruction in 2023.

County Road 45 (Union Avenue) and County Road 29 (Division Road) at the project limits are major arterial roads, while Kratz Sideroad, Graham Sideroad, and Peterson Road are best characterized as rural local / collector roads. All intersecting roads west of Kratz Sideroad are best classified as urban collector roads, while Queen Boulevard just west of County Road 45 is also best classified as an urban collector road.

The purpose of this study is to evaluate the Road 2 East corridor between County Road 29 and County Road 45 with respect to its right-of-way cross-section elements, road safety, and active transportation needs. Specifically, an urban cross-section with off-road multi-use pathway, rural cross-section with multi-use pathway, hybrid cross-section with off-road multi-use pathway, and rural cross-section with paved shoulders will be compared for Council's decision.

EXISTING CONDITIONS

As provided in Appendix A, turning movement counts were completed by Pyramid Traffic Inc. on 1 November 2018 for the northbound stop-controlled tee intersection of Jasperson Drive at Road 2 East, which is approximately 400m west of Kratz Sideroad. During the eight hours of data collection, 1,044 vehicles (including 4% heavy vehicles) proceeded east on Road 2 East from the intersection and 1,235 vehicles (including 3.5% heavy vehicles) proceeded west. Using industry factors to convert 8-hour traffic volumes to average annual daily traffic (AADT), the estimated AADT on this 5.48km stretch of roadway is a maximum of 6000 vehicles per day. Recent AADT counts for this corridor, as provided by the Town of Kingsville, are consistent with this assumption. Table 1 reports the AADT counts and the dates they were collected:

Table 1: Average Annual Daily Traffic (AADT) Data by Street Segment and Date

Street Name	From	To	Functional Class	AADT	Date
Road 2 E.	Kratz Sdrd.	Graham Sdrd.	Minor Arterial	5303	25 June 2019
Road 2 E.	Graham Sdrd.	Peterson Ln.	Minor Arterial	5409	26 June 2019
Road 2 E.	Peterson Ln.	Queen Blvd.	Collector	3408	28 August 2019
Road 2 E.	Queen Blvd.	Union Ave.	Collector	3472	19 August 2019
Kratz Sdrd.	Road 2 E.	Seacliff Dr.	Local	1389	18 July 2019
Graham Sdrd.	3 rd Concession	Road 2 E.	Local	2986	18 June 2019
Graham Sdrd.	Road 2 E.	Seacliff Dr.	Local	1514	20 June 2019

POTENTIAL CORRIDOR DEVELOPMENT CONSIDERATIONS

Land use in the study area is primarily agricultural, with several large greenhouse operations fronting along Road 2 East, which generate some heavy truck traffic. Kratz Sideroad and Jasperson Drive, near the middle of the study area, are adjacent to the Kingsville Recreational Complex, a facility which may generate recreational and active transportation travel demand along Road 2 East. At the east end of the study area, Road 2 East passes through a small residential subdivision adjacent to Queen Boulevard prior to reaching County Road 45.

Proposed developments on Road 2 East include a new commercial development at the southeast corner of Division Road at Road 2 East, as well as a residential development on farmlands located at 319 Road 2 East. Additionally, future greenhouse development is anticipated to continue all along the Road 2 East corridor. The expectation is that Road 2 East will continue to experience growth in traffic volumes as a result of ongoing build-out of development projects. Road 2 East is also used as a bypass for the Town's commercial core.

EXISTING TURNING MOVEMENT IMPLICATIONS

Since it is anticipated that the Road 2 East corridor will exhibit increased traffic volumes as a result of area development, an analysis was completed to quantify the potential impact of existing and future turning movements.

Traffic counts were obtained by RC Spencer Associates Inc. for the following intersections:

- Jasperson Drive at Road 2 East (18 August 2020);
- Kratz Sideroad at Road 2 East (19 August 2020);
- Graham Sideroad at Road 2 East (20 August 2020); and
- County Road 45 (Union Avenue) at Road 2 East (25 August 2020).

All turning movement counts are provided in Appendix B. These counts were compared to the previous turning movement counts at the Jasperson Drive at Road 2 East intersection and to the available AADT counts in the area to account for historical (pre-pandemic) traffic patterns which were somewhat higher. Accordingly, the observed counts were increased by a factor of 1.3 to provide factored traffic counts as a basis for analysis. It is the engineers' opinion that the factored volumes represent a somewhat conservative (on the high side) estimate of potential traffic volumes in year 2020, had traffic volumes not been affected by a global pandemic.

The factored counts for the intersections of Road 2 East at Kratz Sideroad, Graham Sideroad and County Road 45 and the existing traffic counts dated 1 November 2018 for Road 2 East at Jasperson Drive were analyzed using the Synchro 10 program, which calculates various parameters of intersection performance, such as level of service (LOS), intersection capacity utilization (ICU), and control delay.

CAPACITY AND LEVEL OF SERVICE ANALYSIS

Detailed analysis using the Synchro 10 analysis program was carried out for all intersections for AM and PM peak time periods with respect to the following scenarios:

- Existing / Factored Traffic;
- Total Traffic 2025; and
- Total Traffic 2030.

To be conservative, background traffic was increased by 2% per year for the 2025 and 2030 horizon forecasts; this anticipated background growth is consistent with previous studies and the pace of area development.

Figures 3 to 5 (AM / PM Peak Hour) summarize total traffic estimates for the factored, 2025, and 2030 horizon year forecasts for background traffic in the study area. The effect of factored and horizon traffic volumes at each specific intersection can be found in Appendix C – Traffic Projection Figures.

The resulting Synchro 10 simulation reports are provided in Appendix D – Detailed Synchro Results. In order to quantify the effect of traffic growth on individual intersections within the study area and to assess the need for geometric or traffic infrastructure improvements, the Synchro results were summarized as follows:

Jasperson Drive at Road 2 East

The unsignalized, tee intersection of Jasperson Drive at Road 2 East is currently controlled by a northbound stop condition. This intersection is currently operating at a good level of service, and it is anticipated that the intersection will continue to operate at a good level of service in all horizon years.

Table 2: Level of Service by Approach – Jasperson Drive at Road 2 East

Scenario	Jasperson Drive at Road 2 East							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Existing Traffic	A	A	B	N/A	A	A	B	N/A
Total Traffic 2025	A	A	B	N/A	A	A	B	N/A
Total Traffic 2030	A	A	B	N/A	A	A	B	N/A

Kratz Sideroad at Road 2 East

The unsignalized, tee intersection of Kratz Sideroad at Road 2 East is currently controlled by a northbound stop condition. This intersection is currently operating at a good level of service, and it is anticipated that the intersection will continue to operate at a good level of service in all horizon years.

Table 3: Level of Service by Approach – Kratz Sideroad at Road 2 East

Scenario	Kratz Sideroad at Road 2 East							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Factored Traffic	A	A	B	N/A	A	A	B	N/A
Total Traffic 2025	A	A	B	N/A	A	A	B	N/A
Total Traffic 2030	A	A	B	N/A	A	A	B	N/A

Graham Sideroad at Road 2 East

The unsignalized intersection of Graham Sideroad at Road 2 East is currently controlled by a northbound / southbound stop condition. This intersection is currently operating at a satisfactory level of service, and it is anticipated that the intersection will continue to operate at a satisfactory level of service in all horizon years.

Table 4: Level of Service by Approach – Graham Sideroad at Road 2 East

Scenario	Graham Sideroad at Road 2 East							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Factored Traffic	A	A	B	B	A	A	B	C
Total Traffic 2025	A	A	B	B	A	A	C	C
Total Traffic 2030	A	A	B	B	A	A	C	C

County Road 45 (Union Avenue) at Road 2 East

The unsignalized intersection of County Road 45 at Road 2 East is currently controlled by an eastbound / westbound stop condition. This intersection is currently operating at a satisfactory level of service, and it is anticipated that the intersection will continue to operate at a satisfactory level of service in all horizon years, with the exception of the eastbound approach.

Table 5: Level of Service by Approach – County Road 45 at Road 2 East

Scenario	County Road 45 at Road 2 East							
	AM Peak Hour				PM Peak Hour			
	E/B	W/B	N/B	S/B	E/B	W/B	N/B	S/B
Factored Traffic	C	B	A	A	C	B	A	A
Total Traffic 2025	C	B	A	A	D	B	A	A
Total Traffic 2030	C	B	A	A	E	B	A	A

POTENTIAL GEOMETRIC IMPROVEMENTS

Based on the potential of the Road 2 East corridor and the level of service results provided in the above tables, it is the engineers' opinion that Road 2 East may benefit from geometric improvements at the time of its reconstruction. The eastbound single-lane approach to the County Road 45 at Road 2 East intersection is anticipated to exhibit ever-worsening levels of service in the critical PM peak hour. As a result, it is the engineers' recommendation that the eastbound approach be widened to accommodate dedicated through / left and right turn lanes. Based on a Synchro 10 evaluation, this improvement could potentially decrease average control delay by about 10 seconds.

Additionally, for the critical Total Traffic 2030 scenario, left turn lane warrants were evaluated in accordance with provincial warrants for the entire length of Road 2 East between County Road 29 and County Road 45; the results are provided in Appendix E. Only the westbound approach to the Jasperson Drive at Road 2 East intersection would benefit from a dedicated left turn lane. It is anticipated that the future mega-school on Jasperson Drive, as well as the Kingsville Recreation Complex, will generate peak periods of activity, so it would be prudent to implement a dedicated left turn lane and a dedicated bypass lane on the westbound approach.

POTENTIAL TRAFFIC CONTROL IMPROVEMENTS

Signal warrants were completed for each of the four main intersections in the study area. The detailed results of the signal warrant analyses are presented in Appendix F. None of the intersections meet minimum warrants for signalization in the future scenarios.

EXISTING CROSS-SECTION ELEMENTS

As illustrated on Figure 6, the existing typical Road 2 East right-of-way cross-section between County Road 29 and County Road 45 is approximately 20m wide. However, much of the right-of-way is occupied by a large municipal drain (approximately 7.0m wide) on the north side of the roadway. The remaining cross-section elements are typical of a rural cross-section.

The roadway has been resurfaced between County Road 29 (Division Road) and Kratz Sideroad, but the Town has elected to reconstruct it because design / construction of a large diameter watermain has been incorporated into the road reconstruction project. Historically, this stretch of roadway has also experienced pavement support issues, so Town administration has asked that its reconstruction be considered as an added element to improving the Road 2 East corridor.

IDEAL FUTURE CROSS-SECTION ELEMENTS

The Town of Kingsville administration have requested that a multi-use pathway be implemented into the reconstruction of Road 2 East. Ontario Traffic Manual (OTM) Book 18 (Cycling Facilities) is currently under revision, and it is anticipated that the revisions will be formally adopted by the province within a year. As a result, Town administration is speculating that paved shoulders may no longer be suitable for Road 2 East and that a dedicated in-boulevard facility may be required. Furthermore, OTM Book 15 (Pedestrian Crossing Treatments) introduced new treatments to facilitate and standardize safe pedestrian crossings across the entire province. The legal framework for the new pedestrian crossing treatments was adopted by the province per Ontario Regulation 402/152, which came into effect January 01, 2016.

Per OTM Book 15, page 8, “The regulation introduces two levels of pedestrian crossovers. Level 1 Pedestrian Crossovers are distinctly defined by the use of a specific set of regulatory signs, internally illuminated overhead warning signs, pavement markings, and flashing amber beacons. Level 2 pedestrian crossovers are distinctly defined by the prescribed use of a different set of regulatory signs, warning signs, pavement markings, and rapid rectangular flashing beacons.” The OTM Book 15 reference is provided in Appendix G.

Per the most recent OTM Book 18 (Cycling Facilities) publication, pages 115-116, in-boulevard cycling facilities are “separated from motor vehicle traffic by a boulevard or a verge within the roadway right-of-way. These are typically implemented adjacent to roadways with higher motor vehicle speeds and volumes along key cycling corridors. An in-boulevard facility can be constructed with the bicycle path distinct from the sidewalk or with a single facility shared by cyclists and pedestrians.” These OTM Book 18 references are provided in Appendix H.

It is the engineers’ recommendation that, given the anticipated volume of active transportation users, dedicated pedestrian and cycling facilities are not required; a single in-boulevard facility shared by pedestrians and cyclists will suffice.

To accommodate safe passage across Road 2 East for both pedestrians and cyclists, it is the engineers’ recommendation that appropriate pedestrian crossing treatments should be integrated with existing and future cycling facilities to ensure a robust and reliable active transportation network. Furthermore, the proposed Road 2 East active transportation network should be compatible for existing active transportation master plans (i.e. CWATS).

As noted on page 115 of OTM Book 18, it is recommended that several geometric elements should be considered prior to implementing an in-boulevard facility: width, design speed, grade, stopping sight distance, horizontal curvature, crest, vertical curves and lateral clear zones.

It is the engineers’ opinion that the most critical design element to accommodate an in-boulevard facility is the available lateral clear zone. Clear zone industry best practices, as defined by the TAC Geometric Design Guide for Canadian Roads (2017), Chapter 7, page 12, suggest that lateral clear zone distance for a Road 2 East rural cross-section (assuming 60 km/h – 70 km/h design speed, 1,500 – 6,000 AADT) should be at least 4.5m. The reference is provided in Appendix I.

Ensuring an adequate clear zone results in a more forgiving boulevard to “run off the road” incidents; serious collisions are reduced if a reasonable recovery zone, free of obstacles, is provided. It also provides a safer “buffer” between on-road vehicles and in-boulevard active transportation facility users.

However, as acknowledged by the TAC reference, it is recognized that, in an urban environment and sometimes suburban environment, the concept of clear zone is not necessarily applicable due to urban street environment, especially when barrier curbs are present.

In consideration of the defined lateral clear zone design criteria for rural and urban environments, four alternative cross-sections were proposed for the stretch of Road 2 East between County Road 29 and County Road 45. The alternatives are illustrated on Figures 7 to 10.

ALTERNATIVE 1: URBAN CROSS-SECTION WITH OFF-ROAD A/T FACILITY

Alternative 1 (Figure 7) considers the implications of implementing a curb-and-gutter system to both control stormwater runoff and provide separation between respective users of the proposed roadway and the active transportation pathway.

The advantages to the proposed urban cross-section design, with off-road active transportation facility, are as follows:

- i) Minimum clear zone distance of 0.6m is acceptable when raised curbs are present;
- ii) Boulevard allows for safe buffer between roadway users and can be purposed to accommodate streetlight and above-ground utility infrastructure, thus allowing for more efficient roadway / pathway lighting and utilities distribution;
- iii) Adjacent existing municipal drain does not require enclosure, resulting in anticipated cost savings to the reconstruction project.

The disadvantages to the proposed urban cross-section design, with off-road active transportation facility, are as follows:

- i) No paved or gravel shoulder available for emergency stops;
- ii) Amendment to existing public works' protocols and maintenance procedures;
- iii) Minor inconvenience to farmers traversing the roadway with oversized machinery.

ALTERNATIVE 2: RURAL CROSS-SECTION WITH OFF-ROAD A/T FACILITY

Alternative 2 (Figure 8) considers the implications of retaining "status quo" rural roadway operations; however, in order to ensure adequate clear zone lateral separation and existing roadway alignment, the municipal drain must be enclosed, and a minimum 4.5m separation must be provided between respective users of the proposed roadway and the active transportation pathway.

The advantages to the proposed rural cross-section design are as follows:

- i) Gravel shoulder available for emergency stops and larger farm equipment;
- ii) Municipal drain enclosure simplifies access to adjacent properties and allows for a more functional use of the existing right-of-way width;
- iii) Minor amendment to existing public works' protocols and maintenance procedures.

The disadvantages to the proposed rural cross-section design are as follows:

- i) Minimum clear zone distance of 4.5m affects functionality of existing right-of-way;
- ii) Grassed boulevard cannot accommodate streetlight and utility infrastructure, as non-breakaway infrastructure within the clear zone is not recommended;
- iii) Adjacent existing municipal drain requires enclosure, resulting in a significant additional cost to the reconstruction project.

There is also a variation of this alternative whereby the roadway is shifted to the north (after the ditch is infilled) and the pathway is implemented in the southerly boulevard. However, it is the engineers' opinion that this variation would prove challenging, especially if the project is staged; the existing road alignment connectivity would result in severe geometric constraints. Additionally, to completely relocate the roadway towards the north, it is anticipated that the added traffic control costs in addition to the roadway relocation costs would significantly affect the cost efficiency of the construction project.

ALTERNATIVE 3: HYBRID CROSS-SECTION WITH OFF-ROAD A/T FACILITY

Alternative 3 (Figure 9) considers the implications of implementing a hybrid solution, whereby a curb-and-gutter system is implemented on the south side of Road 2 East to protect the proposed active transportation facility and a gravel shoulder is implemented on the north side to accommodate oversized farm equipment, and emergency stops in the westbound direction.

This alternative has been provided for discussion purposes only, as the proposed cross-section is very uncommon. Farmers would experience less inconvenience when travelling westbound with oversized farm equipment; however, when travelling eastbound, farmers would experience the same kinds of limitations and inconveniences associated with Alternative 1. As a result, it is the engineers' opinion that this alternative is best categorized as a "half-solution".

Regardless, the anticipated advantages to the proposed hybrid cross-section design, with off-road active transportation facility, are as follows:

- i) Minimum clear zone distance of 0.6m is acceptable when raised curbs are present;
- ii) South boulevard allows for safe buffer between roadway users and can be purposed to accommodate streetlight and above-ground utility infrastructure, thus allowing for more efficient roadway / pathway lighting and utilities distribution;
- iii) Adjacent existing municipal drain does not require enclosure, resulting in anticipated cost savings to the reconstruction project.

The disadvantages to the proposed hybrid cross-section design, with off-road active transportation facility, are as follows:

- i) To accommodate the 1.5m gravel shoulder, existing ditch will require significant modifications / realignment to maintain stable side slopes;
- ii) Non-symmetrical cross-section may be confusing to road users;
- iii) Public perception of the “half solution” may be negative;
- iv) Solution does not fully solve inconveniences to farmers hauling larger farm equipment.

ALTERNATIVE 4: RURAL CROSS-SECTION WITH PAVED SHOULDERS

Alternative 4 (Figure 10) considers the implications of retaining “status quo” rural roadway operations at the loss of a protected active transportation facility; in this alternative, users of active transportation are expected to use the paved shoulder.

This alternative is simply an extension of the existing cross-section between County Road 29 (Division Road) and Jasperson Drive. Currently, active transportation along this stretch of roadway is expected to travel directly alongside motorists. This alternative cross-section is convenient for oversized farm equipment; however, active transportation safety is compromised. Typically, only seasoned cyclists are comfortable riding alongside motorists in a rural cross-section, while pedestrians and joggers typically travel in the opposite direction to monitor oncoming traffic.

It is the engineers’ opinion that this alternative does little to address active transportation safety, and as a result, it is anticipated that the paved shoulders would see very little use. The cross-section design better accommodates farmers with oversized equipment; however, this alternative is largely deficient in ensuring safe active transportation options for “all ages and abilities” in the Road 2 East corridor. Therefore, it is the engineers’ recommendation that this

alternative be considered a “minimalist” solution for the Road 2 East corridor. Advantages and disadvantages of this alternative are largely subject to active transportation priority. In the engineers’ opinion, this alternative’s disadvantages largely outweigh the advantages, particularly since active transportation safety is compromised.

IMPACT ON FARM EQUIPMENT

In arriving at the preferred alternative for the reconstruction of Road 2 East, RC Spencer staff notified Road 2 East farmers that their input was invaluable to the public process. Of the farmers willing to discuss and / or showcase their farm equipment, the following was concluded:

- The largest tractor owned by local farmers is 3.7m wide;
- When in their largest tractor and travelling down a roadway with curbs, local farmers typically mount the curb and ride on top of it to stay in their lane; all local farmers indicated that mounting the curb can be uncomfortable for the driver;
- The largest farm equipment is approximately 4.2m wide; however, all surveyed farmers indicated that their equipment can be lifted a foot off the ground, so transportation above any 150mm (6 in.) barrier curb is never a problem;
- Local farmers typically look for depressions in the curb (ie. driveway accesses) to smoothly mount onto the curb; should curbs be implemented in the road reconstruction design, all driveway approaches should utilize a 1.5m (5 ft.) taper for a smooth transition;
- Use of the largest farm equipment is typically two times a week during the busiest season.

Local farmers that were willing to meet with RC Spencer staff were informed that the purpose of the project was to address existing pavement issues and to address active transportation connectivity between Ruthven and Kingsville. All local farmers agreed that implementation of a protected off-road facility on the south side of the roadway would most benefit the corridor. All local farmers that were surveyed observed that most activity is currently generated by the recreational complex and migrant worker employment, and they fully anticipate that the future mega-school on Jasperson Drive will draw even more active transportation users (cyclists, roller bladers, pedestrians, etc.) between Kingsville and Ruthven.

Some local farmers expressed concern regarding the inconvenience of an urban cross-section; however, when surveyed, all the local farmers indicated that they understand the need for safe and practical active transportation connectivity. In addition, they acknowledged that speeding on Road 2 East was problematic and was likely the result of the “wide open” rural cross-section.

COST COMPARISON

A functional cost comparison was completed in order to evaluate the fiscal implications of reconstructing Road 2 East in accordance with the four alternatives. The cost comparison was based on linear metre cost estimates for the respective alternative's cross-section elements. After considering the linear metre costs to reconstruct 5.48km of Road 2 East per the urban cross-section and rural cross-section alternatives, it was determined that Alternative 2 (Rural Cross-Section and Municipal Drain Enclosure) will cost approximately \$2.5 million more than Alternative 1 (Urban Cross-Section). No land acquisition is anticipated for either option.

Therefore, it is the engineers' opinion that the urban cross-section alternative is the more fiscally responsible choice for reconstructing Road 2 East between County Road 29 and County Road 45. Furthermore, with respect to the identified advantages versus disadvantages of implementing the urban cross-section, it is the engineers' recommendation that Alternative 1: Urban Cross-Section with Off-Road Active Transportation Facility be implemented as the preferred design.

SUMMARY AND CONCLUSIONS

The reconstruction of Road 2 East is scheduled for reconstruction in three phases. Phase 1 of the project is comprised of the 1.8km stretch from County Road 45 (Union Avenue) at the east to Graham Sideroad at the west; it is scheduled for reconstruction in 2021. Phase 2 of the project is comprised of the 1.9km stretch from Graham Sideroad at the east to Kratz Sideroad at the west; it is scheduled for reconstruction in 2022. Phase 3 of the project is comprised of the 1.78km stretch from Kratz Sideroad at the east to County Road 29 (Division Road) at the west; it is scheduled for reconstruction in 2023.

Using recently obtained turning movement counts and applying the best available trip generation and distribution data and methodologies, an analysis was completed to quantify existing and horizon year traffic operations. To be conservative, background traffic was increased by 2% per year for the 2025 and 2030 horizon forecasts; this anticipated background growth is consistent with previous studies and the pace of area development.

Upon completion of the analysis, it was concluded that:

- The unsignalized, northbound stop-controlled, tee intersection of Jasperson Drive at Road 2 East is currently operating at a good level of service, and it is anticipated that the intersection will continue to operate at a good level of service in all horizon years; however, according to provincial warrants, the westbound approach would benefit from implementation of a dedicated left turn lane at the time of Road 2 East's reconstruction;

- The unsignalized, northbound stop-controlled, tee intersection of Kratz Sideroad at Road 2 East is currently operating at a good level of service, and it is anticipated that the intersection will continue to operate at a good level of service in all horizon years; no geometric improvements are required at the time of Road 2 East's reconstruction;
- The unsignalized, northbound / southbound stop-controlled intersection of Graham Sideroad at Road 2 East is currently operating at a satisfactory level of service, and it is anticipated that the intersection will continue to operate at a satisfactory level of service in all horizon years; no geometric improvements are required at the time of Road 2 East's reconstruction;
- The unsignalized, eastbound / westbound stop-controlled intersection of County Road 45 at Road 2 East is currently operating at a satisfactory level of service, and it is anticipated that the intersection will continue to operate at a satisfactory level of service in all horizon years, with the exception of the eastbound approach; as a result, it is recommended that the eastbound approach be widened to accommodate dedicated through / left and right turn lanes;
- Traffic signals are not warranted at any intersection within the study area;

Land use in the study area is primarily agricultural, with several large greenhouse operations fronting along Road 2 East. Kratz Sideroad and Jasperson Drive, near the middle of the study area, are adjacent to the Kingsville Recreational Complex, a facility which may generate recreational and active transportation travel demand along Road 2 East.

Proposed developments on Road 2 East include a new commercial development at the southeast corner of Division Road at Road 2 East, as well as a residential development on farmlands located at 319 Road 2 East. Additionally, future greenhouse development is anticipated to continue all along the Road 2 East corridor. The expectation is that Road 2 East will continue to experience growth in traffic volumes as a result of ongoing build-out of development projects. Road 2 East is also used as a bypass for the Town's commercial core.

The existing typical Road 2 East right-of-way cross-section between County Road 29 and County Road 45 is approximately 20m wide. However, much of the right-of-way is occupied by a large municipal drain (approximately 7.0m wide) on the north side of the roadway. The remaining cross-section elements are typical of a rural cross-section.

The Town of Kingsville administration have requested that a multi-use pathway be implemented into the reconstruction of Road 2 East. Town administration is speculating that paved shoulders may no longer be suitable for Road 2 East; a dedicated in-boulevard facility may be required.

It is the engineers' recommendation that, given the anticipated volume of active transportation users, dedicated pedestrian and cycling facilities are not required; a single in-boulevard facility shared by pedestrians and cyclists will suffice. Appropriate pedestrian crossing treatments should be integrated with existing and future cycling facilities to ensure a robust and reliable active transportation network. Furthermore, the proposed Road 2 East active transportation network should be compatible for existing active transportation master plans (i.e. CWATS).

It is the engineers' opinion that the most critical design element to accommodate an in-boulevard facility is the available lateral clear zone. Clear zone industry best practices suggest that lateral clear zone distance for a Road 2 East rural cross-section should be at least 4.5m. In an urban environment and sometimes suburban environment, the concept of clear zone is not necessarily applicable, especially when barrier curbs are present.

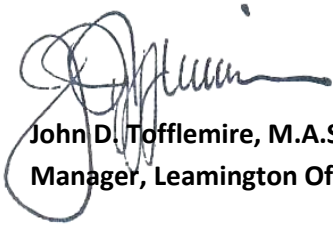
Four alternative cross-sections were proposed for the stretch of Road 2 East between County Road 29 and County Road 45. Alternative 1: Urban Cross-Section with Off-Road Active Transportation Facility considers the implications of lowering the road and implementing a curb-and-gutter system to both control stormwater runoff and provide separation between respective users of the proposed roadway and the active transportation pathway. Alternative 2: Rural Cross-Section with Off-Road Active Transportation Facility considers the implications of retaining "status quo" rural traffic operations the road; however, in order to ensure adequate clear zone lateral separation, the municipal drain must be enclosed, and a minimum 4.5m separation must be provided between respective users. Also, the active transportation facility would have to be implemented on the north side of Road 2 East; this alternative would require additional crossing locations across Road 2 East to ensure connectivity with active transportation attractions on the south side of the roadway.

A functional cost comparison was completed in order to evaluate the fiscal implications of reconstructing Road 2 East in accordance with the four alternatives. After disregarding Alternatives 3 and 4 based on significant geometric and fiscal complications to reconstruct 5.48km of roadway, it was determined that Alternative 2 (Rural Cross-Section and Municipal Drain Enclosure) will cost approximately \$2.5 million more than Alternative 1 (Urban Cross-Section). No land acquisition is anticipated for either option.

After reviewing the advantages, disadvantages, and costs associated with each alternative, it is the engineers' opinion that Alternative 1: Urban Cross-Section is the more fiscally responsible choice and provides a safe solution for reconstructing Road 2 East between County Road 29 and County Road 45. Furthermore, with respect to the identified advantages versus disadvantages of implementing the urban cross-section, it is the engineers' recommendation that Alternative 1: Urban Cross-Section be implemented as the preferred functional cross-section design.

All of which is respectfully submitted,

RC Spencer Associates Inc.

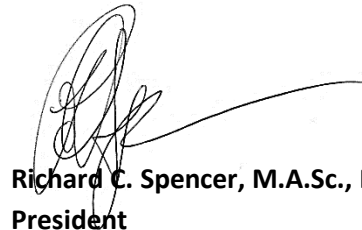


John D. Tofflemire, M.A.Sc., P.Eng.
Manager, Leamington Office

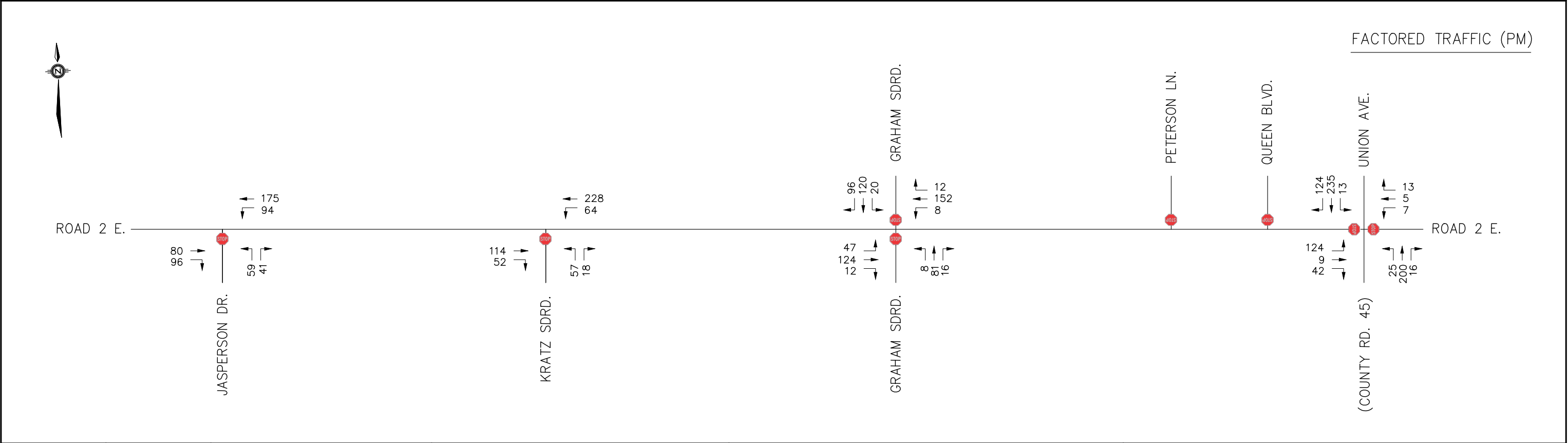
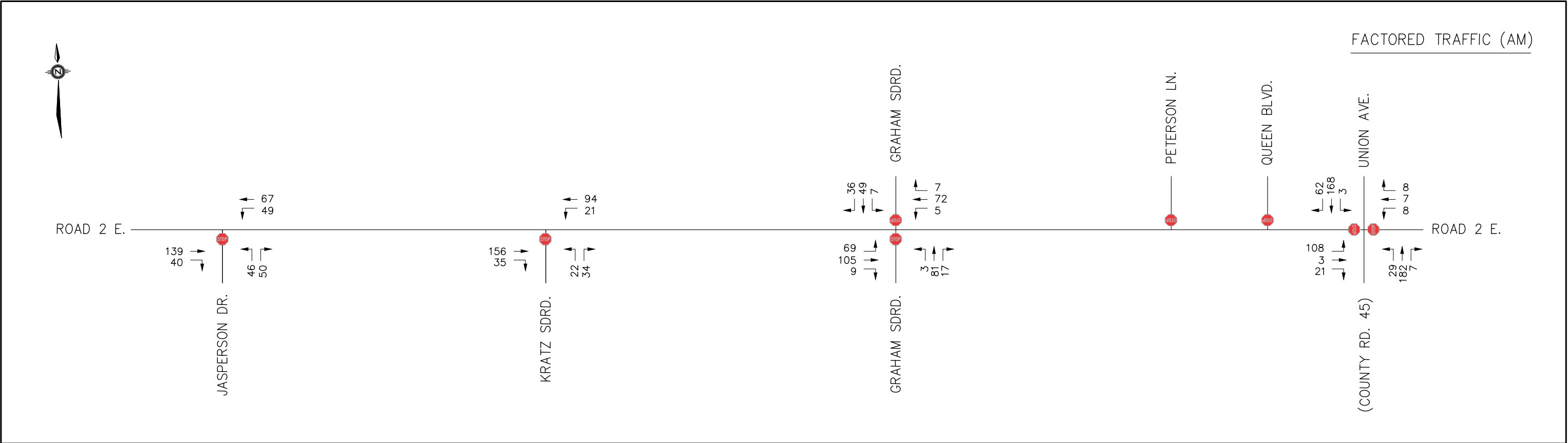




Aaron D. Blata, M.Eng., P.Eng., PTOE
Traffic Operations Project Engineer

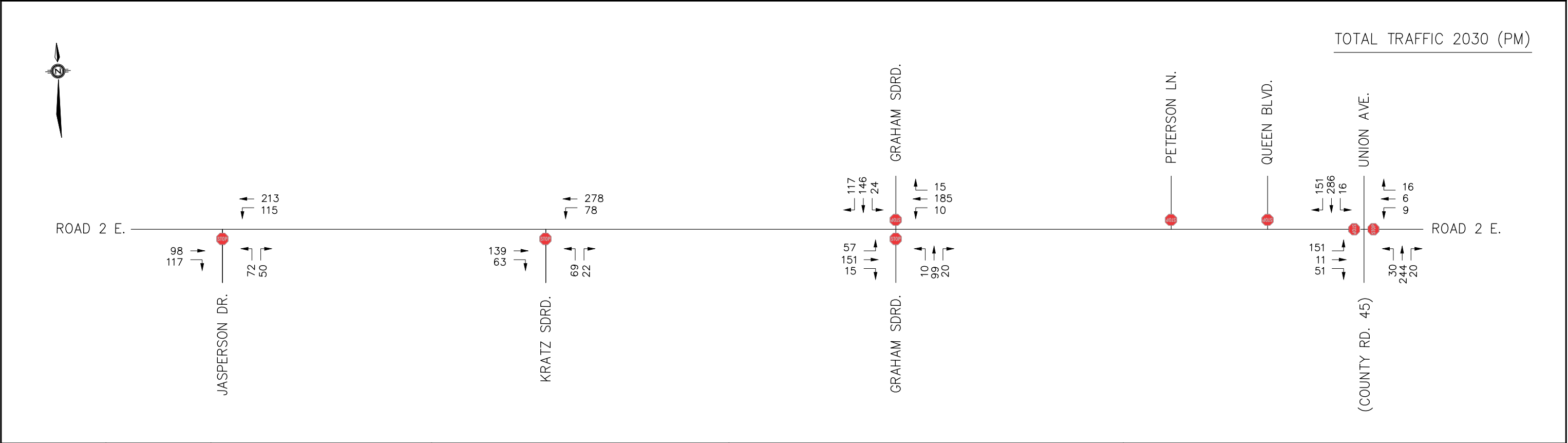
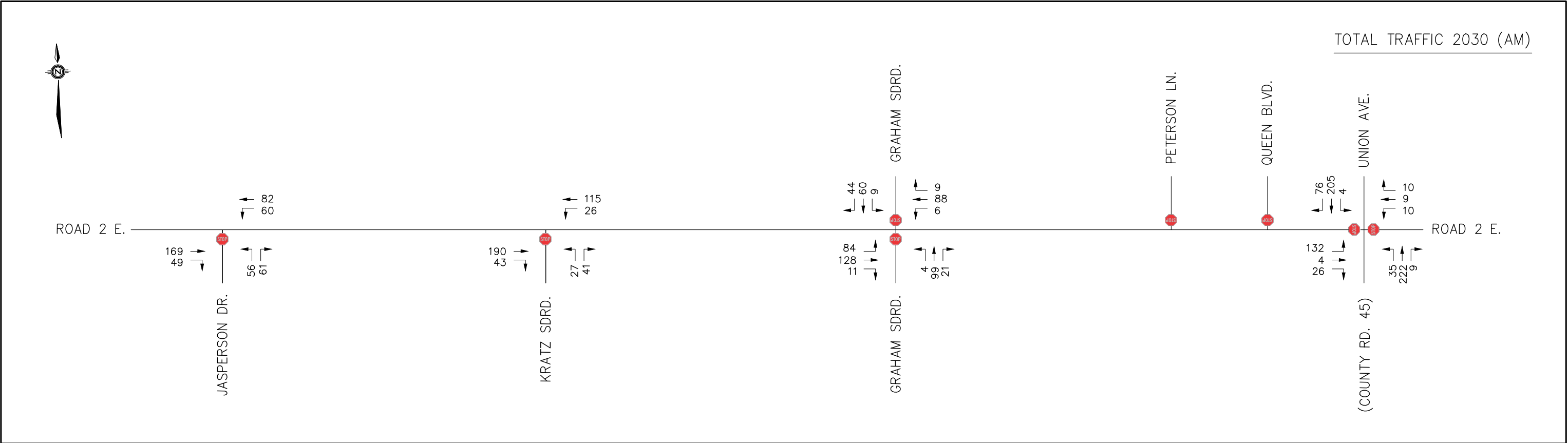
Reviewed by:





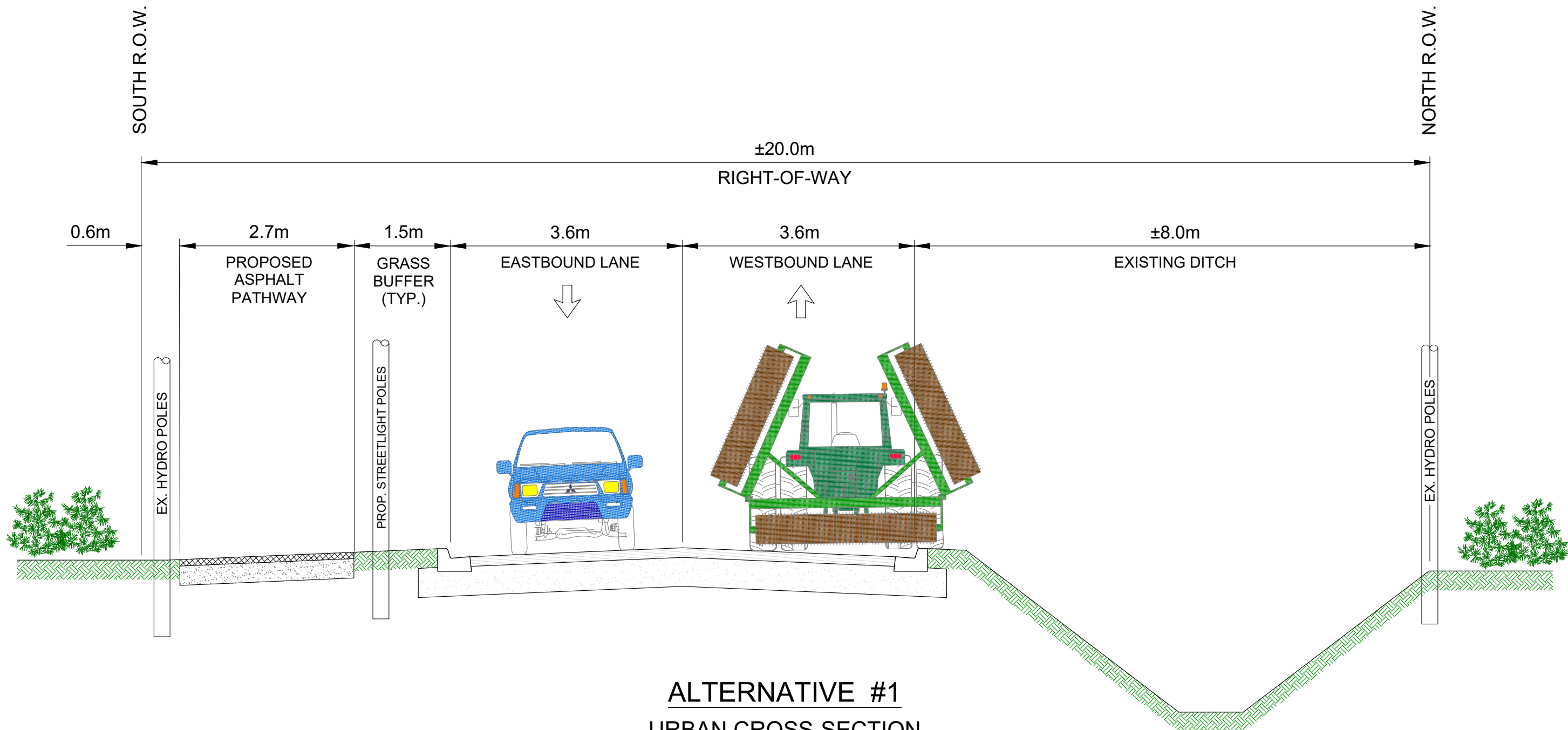
Richard C. Spencer, M.A.Sc., P.Eng.
President



			<div><div>RC SPENCER ASSOCIATES INC. Consulting Engineers Windsor: 800 University Avenue W. – Windsor ON N9A 5R9 Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4 Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6</div><div>Professional Engineers Ontario</div></div>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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			<div><div><div><div>RC SPENCER ASSOCIATES INC.</div><div>Consulting Engineers</div><div>Windsor: 800 University Avenue W. – Windsor ON N9A 5R9 Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4 Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6</div></div><div>Professional Engineers Ontario</div></div></div>						DESIGN	A.D.B.	ROAD 2 EAST – CORRIDOR STUDY	PROJECT NO.
4.	REVISED CROSS-SECTION ALTERNATIVES	02 NOV 2020	A.D.B.	A.D.B.	CHECKED	J.T.		20-1000				
3.	REVISED REPORT AND FIGURES	23 SEP 2020	A.D.B.	A.D.B.	DR -WN	J.B.		FIGURE NO.				
2.	REVISED URBAN CROSS-SECTION	13 MAY 2020	A.D.B.	A.D.B.	CHECKED	A.D.B.		5				
1.	COMPLETED REPORT FIGURES	01 MAY 2020	J.B.	A.D.B.	D- TE	NOVEMBER 2020		OF				
NO.	REVISION	DATE	BY	APP	SC-LE	N.T.S.			10			



ALTERNATIVE #1
URBAN CROSS-SECTION
WITH OFF-ROAD A/T FACILITY

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

Professional Engineers
Ontario

				DESIGN	A.D.B.
4.	REVISED CROSS-SECTION ALTERNATIVES	02 NOV 2020	A.D.B.	A.D.B.	CHECKED J.T.
3.	REVISED REPORT AND FIGURES	23 SEP 2020	A.D.B.	A.D.B.	DRAWN J.B.
2.	REVISED URBAN CROSS-SECTION	13 MAY 2020	A.D.B.	A.D.B.	CHECKED A.D.B.
1.	COMPLETED REPORT FIGURES	01 MAY 2020	J.B.	A.D.B.	DATE NOVEMBER 2020
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.

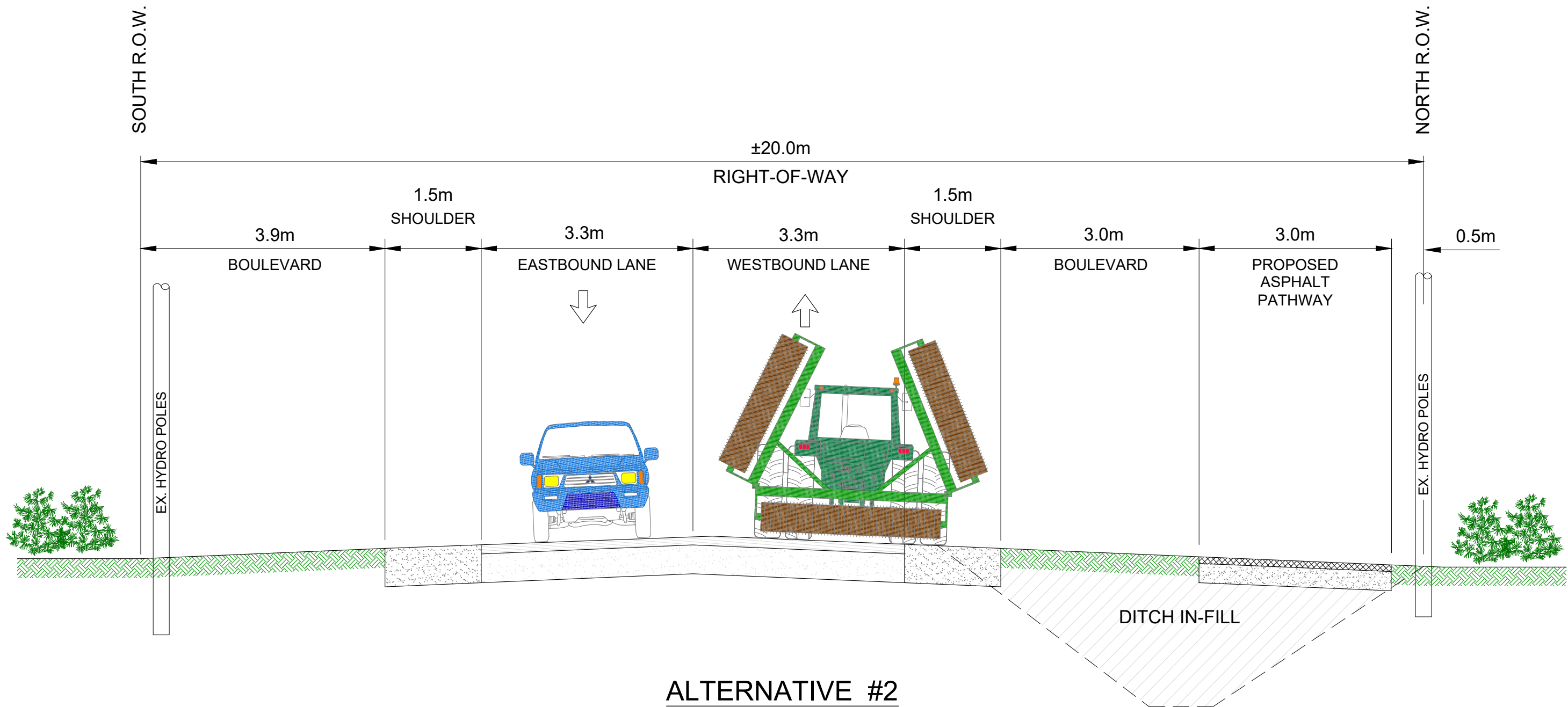
ROAD 2 EAST – CORRIDOR STUDY

ALTERNATIVE #1

PROJECT NO.
20-1000

FIGURE NO.
7

OF
10



ALTERNATIVE #2
RURAL CROSS-SECTION
WITH OFF-ROAD A/T FACILITY

R.C. SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

 Professional Engineers
Ontario

				DESIGN	A.D.B.
4.	REVISED CROSS-SECTION ALTERNATIVES	02 NOV 2020	A.D.B.	A.D.B.	CHECKED J.T.
3.	REVISED REPORT AND FIGURES	23 SEP 2020	A.D.B.	A.D.B.	DRAWN J.B.
2.	REVISED URBAN CROSS-SECTION	13 MAY 2020	A.D.B.	A.D.B.	CHECKED A.D.B.
1.	COMPLETED REPORT FIGURES	01 MAY 2020	J.B.	A.D.B.	DATE NOVEMBER 2020
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.

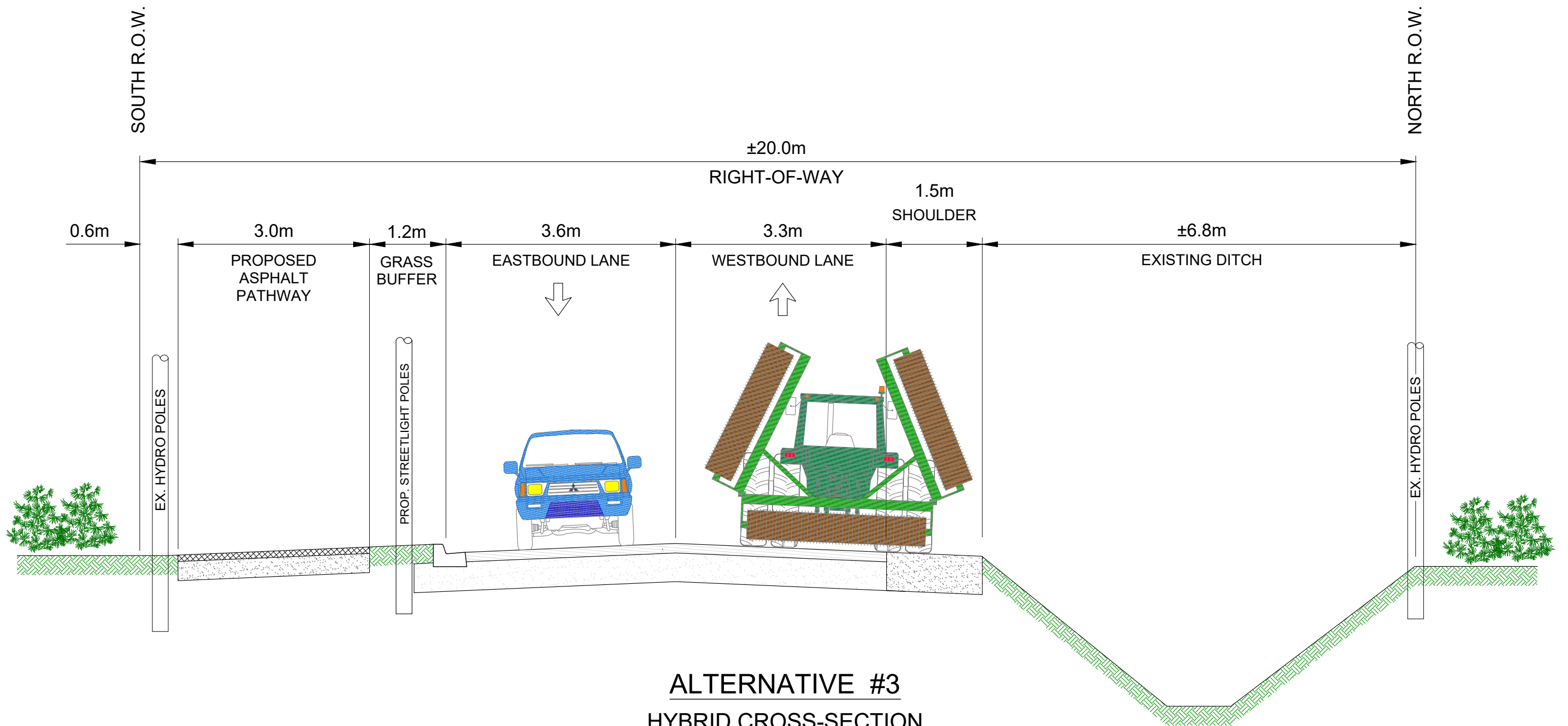
ROAD 2 EAST – CORRIDOR STUDY

ALTERNATIVE #2

PROJECT NO.
20-1000

FIGURE NO.
8

OF
10



ALTERNATIVE #3
HYBRID CROSS-SECTION
WITH OFF-ROAD A/T FACILITY

RC SPENCER ASSOCIATES INC.
 Consulting Engineers
 Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
 Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
 Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

Professional Engineers
 Ontario

				DESIGN	A.D.B.
4.	REVISED CROSS-SECTION ALTERNATIVES	02 NOV 2020	A.D.B.	CHECKED	J.T.
3.	REVISED REPORT AND FIGURES	23 SEP 2020	A.D.B.	DRAWN	J.B.
2.	REVISED URBAN CROSS-SECTION	13 MAY 2020	A.D.B.	CHECKED	A.D.B.
1.	COMPLETED REPORT FIGURES	01 MAY 2020	J.B.	DATE	NOVEMBER 2020
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.

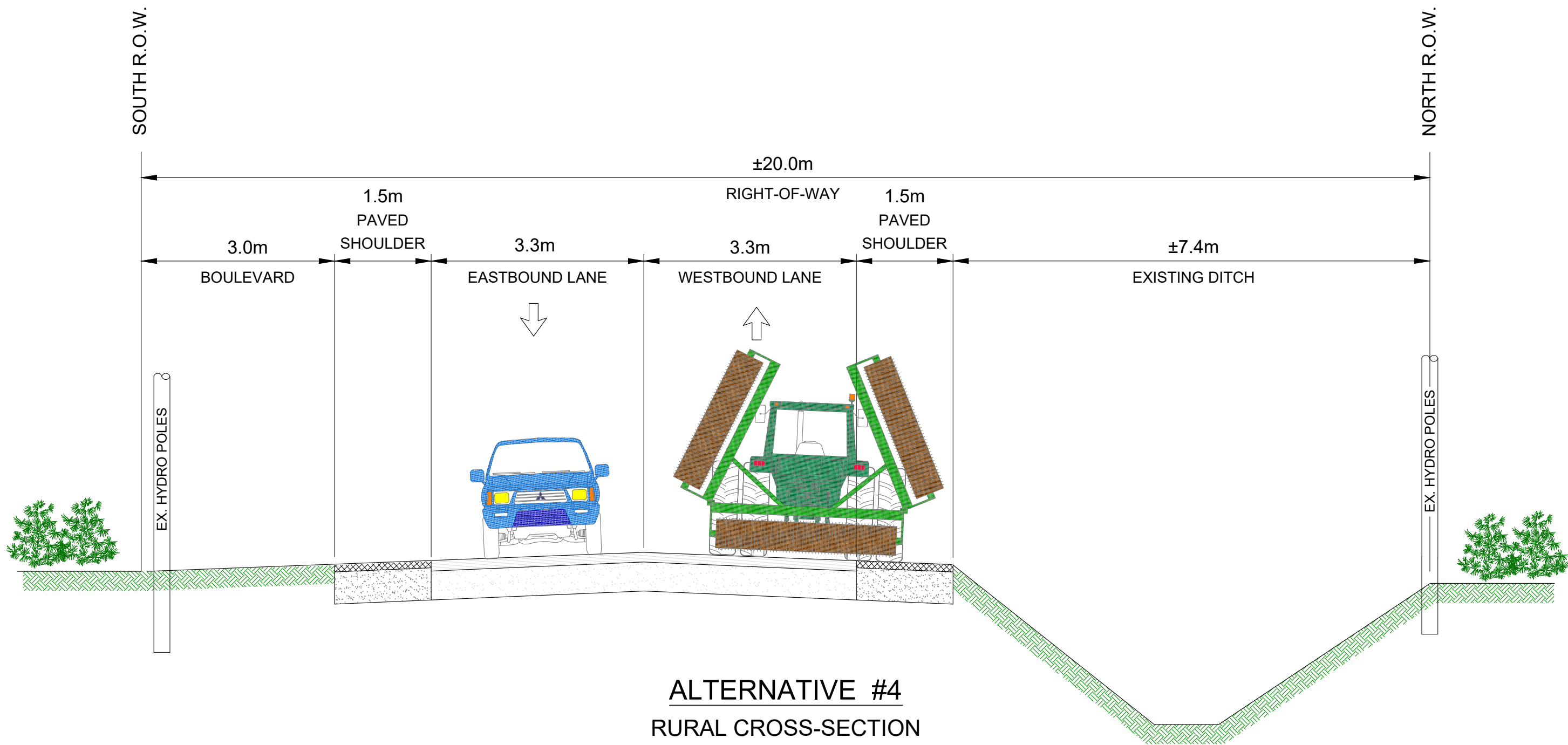
ROAD 2 EAST – CORRIDOR STUDY

ALTERNATIVE #3

PROJECT NO.
20-1000

FIGURE NO.
9

OF
10



ALTERNATIVE #4
RURAL CROSS-SECTION
WITH PAVED SHOULDERS

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. - Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. - Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street - Chatham ON N7M 2M6

Professional Engineers
Ontario

				DESIGN	A.D.B.
4.	REVISED CROSS-SECTION ALTERNATIVES	02 NOV 2020	A.D.B.	CHECKED	J.T.
3.	REVISED REPORT AND FIGURES	23 SEP 2020	A.D.B.	DRAWN	J.B.
2.	REVISED URBAN CROSS-SECTION	13 MAY 2020	A.D.B.	CHECKED	A.D.B.
1.	COMPLETED REPORT FIGURES	01 MAY 2020	J.B.	DATE	NOVEMBER 2020
NO.	REVISION	DATE	BY	APP	SCALE N.T.S.

ROAD 2 EAST - CORRIDOR STUDY

ALTERNATIVE #4

PROJECT NO.	20-1000
FIGURE NO.	10
OF	10

Appendix A

HISTORICAL TRAFFIC DATA

Jasperson Drive at Road 2 East

Jasperson Dr @ Road 2

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:30:00

To: 8:30:00

Municipality: Kingsville

Site #: 0000000001

Intersection: Road 2 & Jasperson Dr

TFR File #: 1

Count date: 1-Nov-2018

Weather conditions:

Rain

Person(s) who counted:

Cam

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

Major Road: Road 2 runs W/E

East Leg Total: 305

East Entering: 116

East Peds: 0

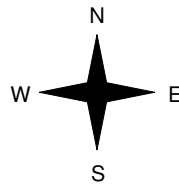
Peds Cross: X

Heavys	Trucks	Cars	Totals
6	1	106	113



Road 2

Heavys	Trucks	Cars	Totals
3	0	136	139
1	1	38	40
4	1	174	



Jasperson Dr

Cars	Trucks	Heavys	Totals
61	1	5	67
48	0	1	49
109	1	6	



Road 2



Cars	Trucks	Heavys	Totals
184	0	5	189

Peds Cross: X
West Peds: 0
West Entering: 179
West Leg Total: 292

Cars	86
Trucks	1
Heavys	2
Totals	89



Cars	45	48	93
Trucks	0	0	0
Heavys	1	2	3
Totals	46	50	

Peds Cross: X
South Peds: 0
South Entering: 96
South Leg Total: 185

Comments

Jasperson Dr @ Road 2

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 13:00:00

One Hour Peak

From: 11:45:00

To: 12:45:00

Municipality: Kingsville

Site #: 0000000001

Intersection: Road 2 & Jasperson Dr

TFR File #: 1

Count date: 1-Nov-2018

Weather conditions:

Rain

Person(s) who counted:

Cam

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

Major Road: Road 2 runs W/E

East Leg Total: 267

East Entering: 150

East Peds: 0

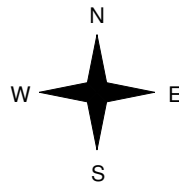
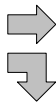
Peds Cross: X

Heavys	Trucks	Cars	Totals
4	4	129	137



Road 2

Heavys	Trucks	Cars	Totals
3	4	75	82
0	1	48	49
3	5	123	



Jasperson Dr

Cars	Trucks	Heavys	Totals
84	3	3	90
59	1	0	60
143	4	3	



Road 2

Cars	Trucks	Heavys	Totals
107	6	4	117

Peds Cross: X
West Peds: 0
West Entering: 131
West Leg Total: 268

Cars	107
Trucks	2
Heavys	0
Totals	109



Cars	45	32	77
Trucks	1	2	3
Heavys	1	1	2
Totals	47	35	

Peds Cross: X
South Peds: 0
South Entering: 82
South Leg Total: 191

Comments

Jasperson Dr @ Road 2

Afternoon Peak Diagram

Specified Period

From: 14:00:00

To: 18:00:00

One Hour Peak

From: 16:45:00

To: 17:45:00

Municipality: Kingsville

Site #: 0000000001

Intersection: Road 2 & Jasperson Dr

TFR File #: 1

Count date: 1-Nov-2018

Weather conditions:

Rain

Person(s) who counted:

Cam

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

Major Road: Road 2 runs W/E

East Leg Total: 390

East Entering: 269

East Peds: 0

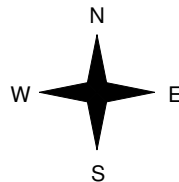
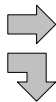
Peds Cross: X

Heavys	Trucks	Cars	Totals
1	2	231	234



Road 2

Heavys	Trucks	Cars	Totals
1	1	78	80
1	0	97	98
2	1	175	



Jasperson Dr

Cars	Trucks	Heavys	Totals
------	--------	--------	--------

173	1	1	175
94	0	0	94
267	1	1	

Road 2



Cars	Trucks	Heavys	Totals
118	2	1	121

Peds Cross: X
West Peds: 0
West Entering: 178
West Leg Total: 412

Cars	191
Trucks	0
Heavys	1
Totals	192



Cars	58	40	98
Trucks	1	1	2
Heavys	0	0	0
Totals	59	41	

Peds Cross: X
South Peds: 0
South Entering: 100
South Leg Total: 292

Comments

Jasperson Dr @ Road 2

Total Count Diagram

Municipality: Kingsville
Site #: 0000000001
Intersection: Road 2 & Jasperson Dr
TFR File #: 1
Count date: 1-Nov-2018

Weather conditions:
 Rain
Person(s) who counted:
 Cam

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

Major Road: Road 2 runs W/E

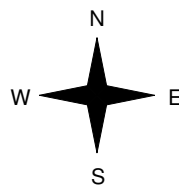
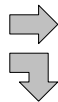
East Leg Total: 2279
 East Entering: 1235
 East Peds: 0
 Peds Cross: X

Heavys	Trucks	Cars	Totals
32	19	1115	1166



Road 2

Heavys	Trucks	Cars	Totals
19	10	711	740
7	8	405	420
26	18	1116	



Jasperson Dr

Cars	Trucks	Heavys	Totals
764	13	26	803
428	2	2	432
1192	15	28	



Road 2



Cars	Trucks	Heavys	Totals
1005	15	24	1044

Peds Cross: X
 West Peds: 0
 West Entering: 1160
 West Leg Total: 2326

Cars	833
Trucks	10
Heavys	9
Totals	852



Cars	351	294	645
Trucks	6	5	11
Heavys	6	5	11
Totals	363	304	

Peds Cross: X
 South Peds: 0
 South Entering: 667
 South Leg Total: 1519

Comments

Appendix B

CURRENT TRAFFIC DATA

Jasperson Drive at Road 2 East

Kratz Sideroad at Road 2 East

Graham Sideroad at Road 2 East

County Road 45 (Union Avenue) at Road 2 East

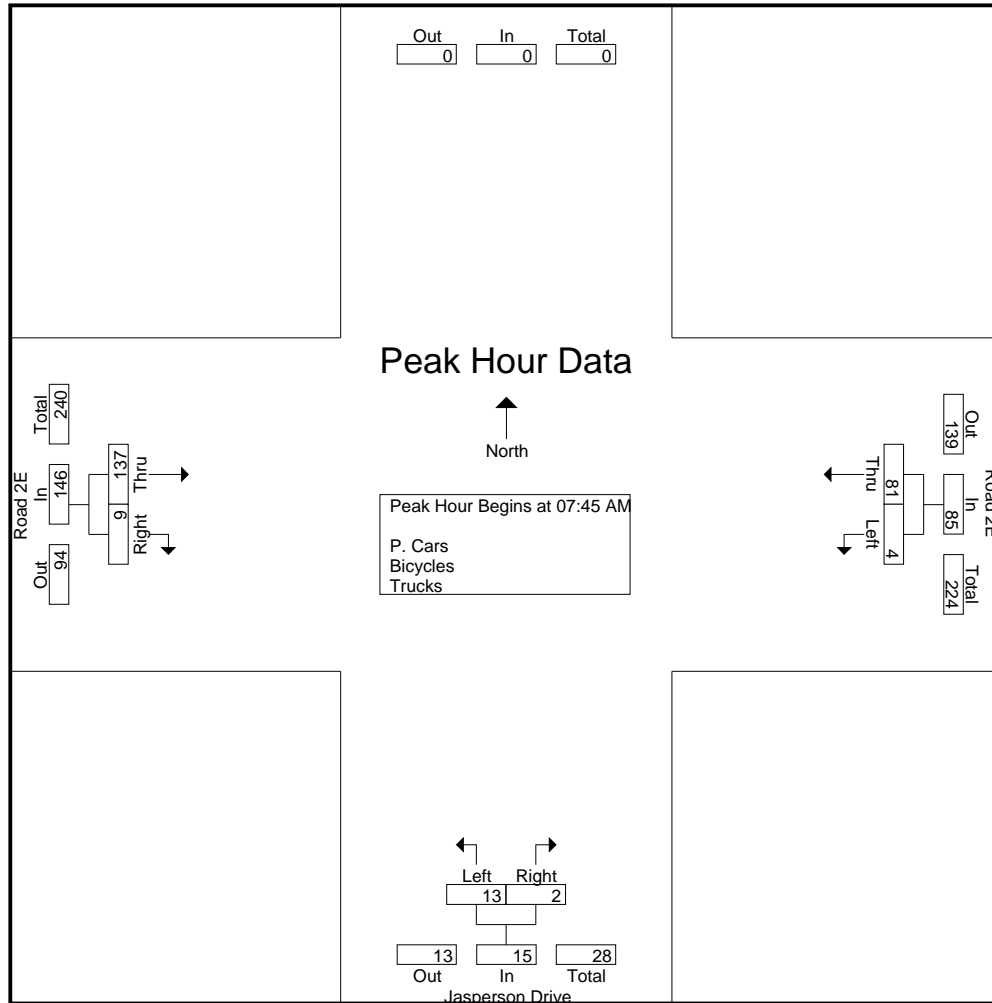
Date: 18 August 2020
 Counted by: Austin Greenhow
 Weather Conditions: Clear
 Jasperson Drive at Road 2E

Groups Printed- P. Cars - Bicycles - Trucks

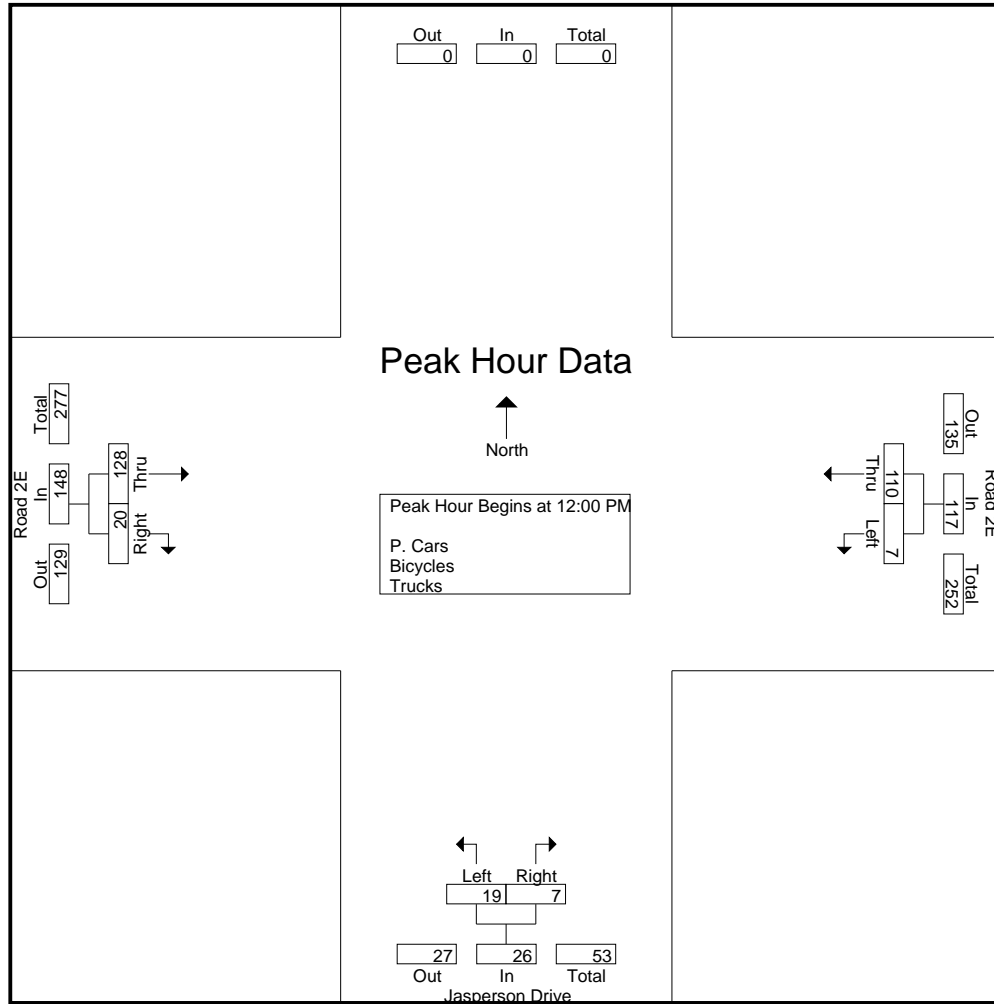
	Road 2E W/B				Jasperson Drive N/B				Road 2E E/B						
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
07:15 AM	16	2	(0)	18	0	2	(0)	2	0	22	(0)	22	0	42	42
07:30 AM	20	0	(0)	20	1	2	(0)	3	1	39	(0)	40	0	63	63
07:45 AM	19	1	(0)	20	0	1	(0)	1	1	41	(0)	42	0	63	63
Total	55	3	(0)	58	1	5	(0)	6	2	102	(0)	104	0	168	168
08:00 AM	18	1	(0)	19	0	1	(0)	1	3	33	(0)	36	0	56	56
08:15 AM	17	1	(0)	18	0	8	(0)	8	4	32	(0)	36	0	62	62
08:30 AM	27	1	(1)	28	2	3	(0)	5	1	31	(0)	32	1	65	66
*** BREAK ***															
Total	62	3	(1)	65	2	12	(0)	14	8	96	(0)	104	1	183	184
*** BREAK ***															
11:30 AM	32	2	(0)	34	3	6	(0)	9	10	23	(0)	33	0	76	76
11:45 AM	34	1	(1)	35	0	3	(0)	3	1	23	(0)	24	1	62	63
Total	66	3	(1)	69	3	9	(0)	12	11	46	(0)	57	1	138	139
12:00 PM	32	1	(0)	33	1	5	(0)	6	7	23	(0)	30	0	69	69
12:15 PM	33	2	(0)	35	2	9	(0)	11	3	18	(0)	21	0	67	67
12:30 PM	28	1	(0)	29	2	1	(0)	3	5	45	(0)	50	0	82	82
12:45 PM	17	3	(0)	20	2	4	(0)	6	5	42	(0)	47	0	73	73
Total	110	7	(0)	117	7	19	(0)	26	20	128	(0)	148	0	291	291
*** BREAK ***															
04:45 PM	40	1	(0)	41	2	2	(0)	4	3	29	(0)	32	0	77	77
Total	40	1	(0)	41	2	2	(0)	4	3	29	(0)	32	0	77	77
05:00 PM	54	2	(0)	56	4	5	(0)	9	2	20	(0)	22	0	87	87
05:15 PM	53	1	(0)	54	2	1	(0)	3	4	26	(0)	30	0	87	87
05:30 PM	39	0	(0)	39	2	1	(0)	3	6	20	(0)	26	0	68	68
05:45 PM	35	3	(0)	38	4	1	(0)	5	5	20	(0)	25	0	68	68
Total	181	6	(0)	187	12	8	(0)	20	17	86	(0)	103	0	310	310
06:00 PM	30	0	(0)	30	2	1	(0)	3	6	15	(0)	21	0	54	54
Grand Total	544	23	(2)	567	29	56	(0)	85	67	502	(0)	569	2	1221	1223
Apprch %	95.9	4.1			34.1	65.9			11.8	88.2					
Total %	44.6	1.9		46.4	2.4	4.6		7	5.5	41.1		46.6	0.2	99.8	
P. Cars	532	22		556	28	39		67	49	492		541	0	0	1164
% P. Cars	97.8	95.7	100	97.7	96.6	69.6	0	78.8	73.1	98	0	95.1	0	0	95.2
Bicycles	5	0		5	0	5		5	4	2		6	0	0	16
% Bicycles	0.9	0	0	0.9	0	8.9	0	5.9	6	0.4	0	1.1	0	0	1.3
Trucks	7	1		8	1	12		13	14	8		22	0	0	43
% Trucks	1.3	4.3	0	1.4	3.4	21.4	0	15.3	20.9	1.6	0	3.9	0	0	3.5



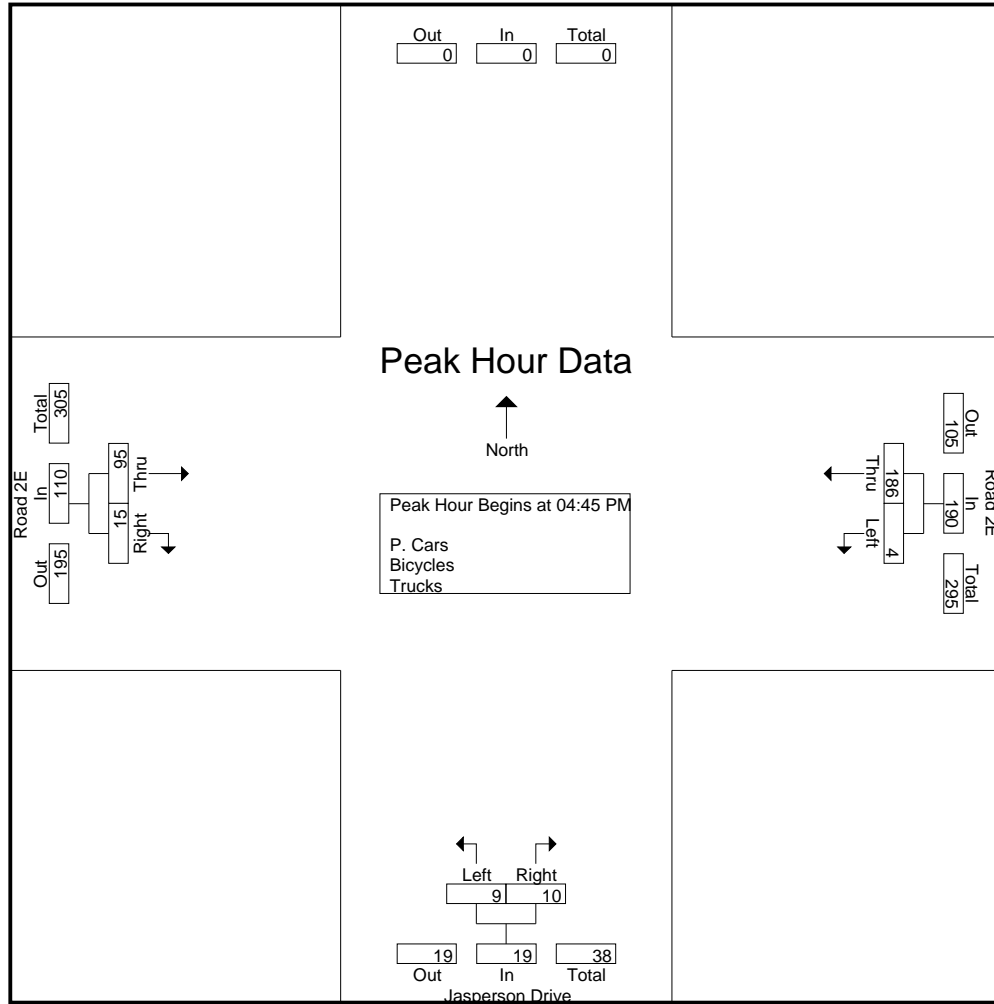
	Road 2E W/B			Jasperson Drive N/B			Road 2E E/B			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	19	1	20	0	1	1	1	41	42	63
08:00 AM	18	1	19	0	1	1	3	33	36	56
08:15 AM	17	1	18	0	8	8	4	32	36	62
08:30 AM	27	1	28	2	3	5	1	31	32	65
Total Volume	81	4	85	2	13	15	9	137	146	246
% App. Total	95.3	4.7		13.3	86.7		6.2	93.8		
PHF	.750	1.00	.759	.250	.406	.469	.563	.835	.869	.946



	Road 2E W/B			Jasperson Drive N/B			Road 2E E/B			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 12:00 PM										
12:00 PM	32	1	33	1	5	6	7	23	30	69
12:15 PM	33	2	35	2	9	11	3	18	21	67
12:30 PM	28	1	29	2	1	3	5	45	50	82
12:45 PM	17	3	20	2	4	6	5	42	47	73
Total Volume	110	7	117	7	19	26	20	128	148	291
% App. Total	94	6		26.9	73.1		13.5	86.5		
PHF	.833	.583	.836	.875	.528	.591	.714	.711	.740	.887



	Road 2E W/B			Jasperson Drive N/B			Road 2E E/B			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 06:00 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:45 PM										
04:45 PM	40	1	41	2	2	4	3	29	32	77
05:00 PM	54	2	56	4	5	9	2	20	22	87
05:15 PM	53	1	54	2	1	3	4	26	30	87
05:30 PM	39	0	39	2	1	3	6	20	26	68
Total Volume	186	4	190	10	9	19	15	95	110	319
% App. Total	97.9	2.1		52.6	47.4		13.6	86.4		
PHF	.861	.500	.848	.625	.450	.528	.625	.819	.859	.917



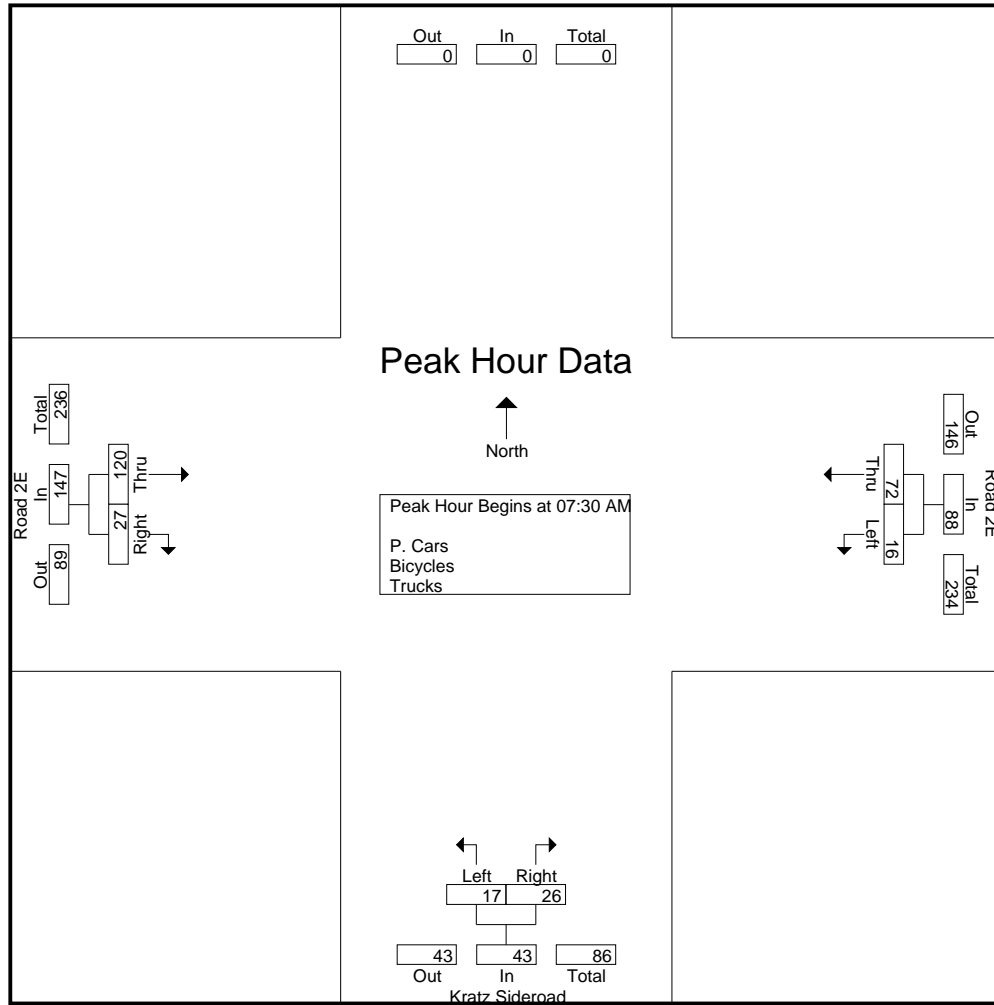
Date: 19 August 2020
 Counted by: Austin Greenhow
 Weather Conditions: Clear
 Kratz Sideroad at Road 2E

Groups Printed- P. Cars - Bicycles - Trucks

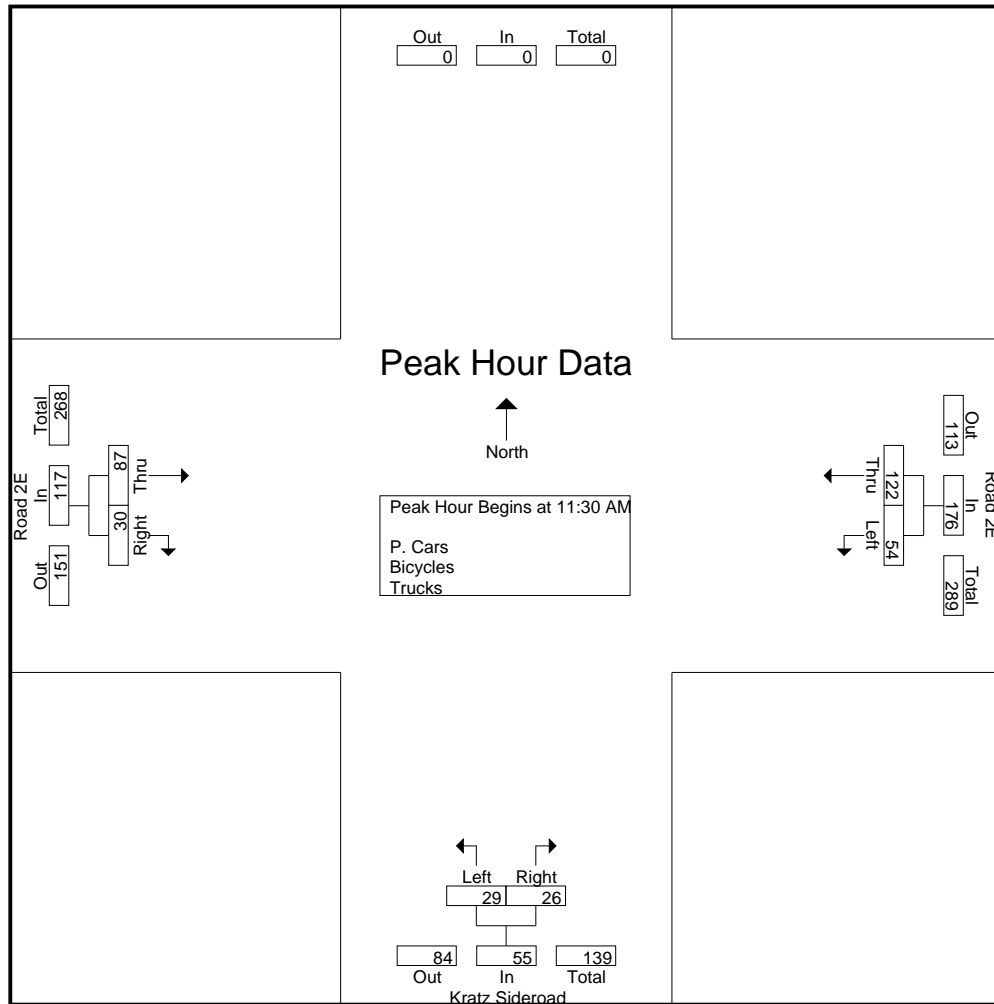
	Road 2E W/B				Kratz Sideroad N/B				Road 2E E/B						
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Exclu. Total	Inclu. Total	Int. Total
07:15 AM	14	5	(0)	19	5	4	(0)	9	6	23	(0)	29	0	57	57
07:30 AM	14	4	(0)	18	8	3	(0)	11	2	30	(0)	32	0	61	61
07:45 AM	27	4	(0)	31	7	5	(0)	12	12	38	(0)	50	0	93	93
Total	55	13	(0)	68	20	12	(0)	32	20	91	(0)	111	0	211	211
08:00 AM	12	5	(0)	17	6	6	(0)	12	7	26	(0)	33	0	62	62
08:15 AM	19	3	(0)	22	5	3	(0)	8	6	26	(0)	32	0	62	62
08:30 AM	11	5	(0)	16	3	6	(0)	9	4	29	(0)	33	0	58	58
*** BREAK ***															
Total	42	13	(0)	55	14	15	(0)	29	17	81	(0)	98	0	182	182
*** BREAK ***															
11:30 AM	28	11	(0)	39	5	5	(0)	10	9	24	(0)	33	0	82	82
11:45 AM	34	6	(0)	40	9	4	(0)	13	6	23	(0)	29	0	82	82
Total	62	17	(0)	79	14	9	(0)	23	15	47	(0)	62	0	164	164
12:00 PM	35	23	(0)	58	8	11	(0)	19	7	22	(0)	29	0	106	106
12:15 PM	25	14	(0)	39	4	9	(0)	13	8	18	(0)	26	0	78	78
12:30 PM	20	4	(0)	24	10	9	(0)	19	8	23	(0)	31	0	74	74
12:45 PM	27	4	(0)	31	12	6	(0)	18	14	25	(0)	39	0	88	88
Total	107	45	(0)	152	34	35	(0)	69	37	88	(0)	125	0	346	346
*** BREAK ***															
04:30 PM	34	11	(0)	45	3	16	(0)	19	10	25	(0)	35	0	99	99
04:45 PM	36	14	(0)	50	4	7	(0)	11	10	16	(0)	26	0	87	87
Total	70	25	(0)	95	7	23	(0)	30	20	41	(0)	61	0	186	186
05:00 PM	50	16	(0)	66	3	12	(0)	15	14	28	(0)	42	0	123	123
05:15 PM	55	8	(0)	63	4	9	(0)	13	6	19	(0)	25	0	101	101
05:30 PM	30	11	(0)	41	2	5	(0)	7	8	24	(0)	32	0	80	80
05:45 PM	23	9	(0)	32	6	4	(0)	10	7	16	(0)	23	0	65	65
Total	158	44	(0)	202	15	30	(0)	45	35	87	(0)	122	0	369	369
Grand Total	494	157	(0)	651	104	124	(0)	228	144	435	(0)	579	0	1458	1458
Apprch %	75.9	24.1			45.6	54.4			24.9	75.1					
Total %	33.9	10.8		44.7	7.1	8.5		15.6	9.9	29.8		39.7	0	100	
P. Cars	479	154		633	102	121		223	142	423		565	0	0	1421
% P. Cars	97	98.1	0	97.2	98.1	97.6	0	97.8	98.6	97.2	0	97.6	0	0	97.5
Bicycles	0	0		0	0	0		0	1	0		1	0	0	1
% Bicycles	0	0	0	0	0	0	0	0	0.7	0	0	0.2	0	0	0.1
Trucks	15	3		18	2	3		5	1	12		13	0	0	36
% Trucks	3	1.9	0	2.8	1.9	2.4	0	2.2	0.7	2.8	0	2.2	0	0	2.5



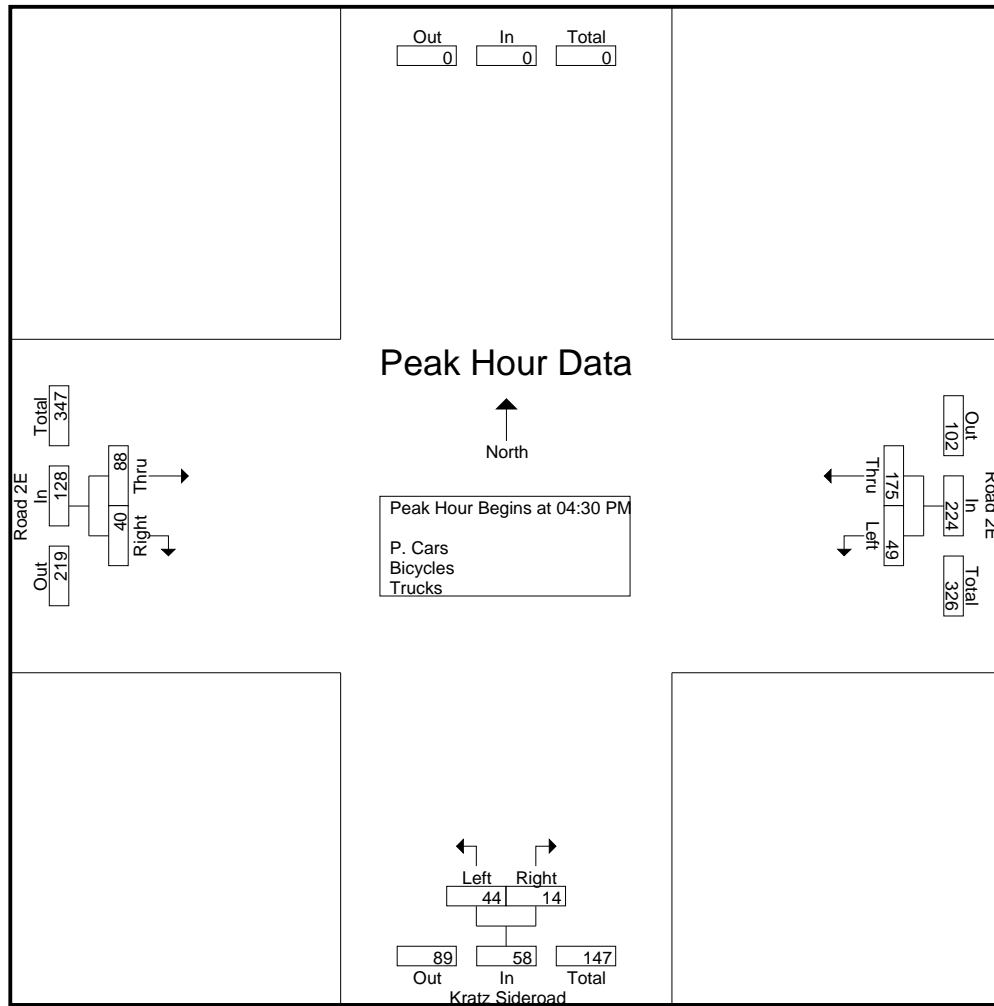
	Road 2E W/B			Kratz Sideroad N/B			Road 2E E/B			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 09:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:30 AM										
07:30 AM	14	4	18	8	3	11	2	30	32	61
07:45 AM	27	4	31	7	5	12	12	38	50	93
08:00 AM	12	5	17	6	6	12	7	26	33	62
08:15 AM	19	3	22	5	3	8	6	26	32	62
Total Volume	72	16	88	26	17	43	27	120	147	278
% App. Total	81.8	18.2		60.5	39.5		18.4	81.6		
PHF	.667	.800	.710	.813	.708	.896	.563	.789	.735	.747



	Road 2E W/B			Kratz Sideroad N/B			Road 2E E/B			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 11:30 AM										
11:30 AM	28	11	39	5	5	10	9	24	33	82
11:45 AM	34	6	40	9	4	13	6	23	29	82
12:00 PM	35	23	58	8	11	19	7	22	29	106
12:15 PM	25	14	39	4	9	13	8	18	26	78
Total Volume	122	54	176	26	29	55	30	87	117	348
% App. Total	69.3	30.7		47.3	52.7		25.6	74.4		
PHF	.871	.587	.759	.722	.659	.724	.833	.906	.886	.821



	Road 2E W/B			Kratz Sideroad N/B			Road 2E E/B			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	34	11	45	3	16	19	10	25	35	99
04:45 PM	36	14	50	4	7	11	10	16	26	87
05:00 PM	50	16	66	3	12	15	14	28	42	123
05:15 PM	55	8	63	4	9	13	6	19	25	101
Total Volume	175	49	224	14	44	58	40	88	128	410
% App. Total	78.1	21.9		24.1	75.9		31.2	68.8		
PHF	.795	.766	.848	.875	.688	.763	.714	.786	.762	.833

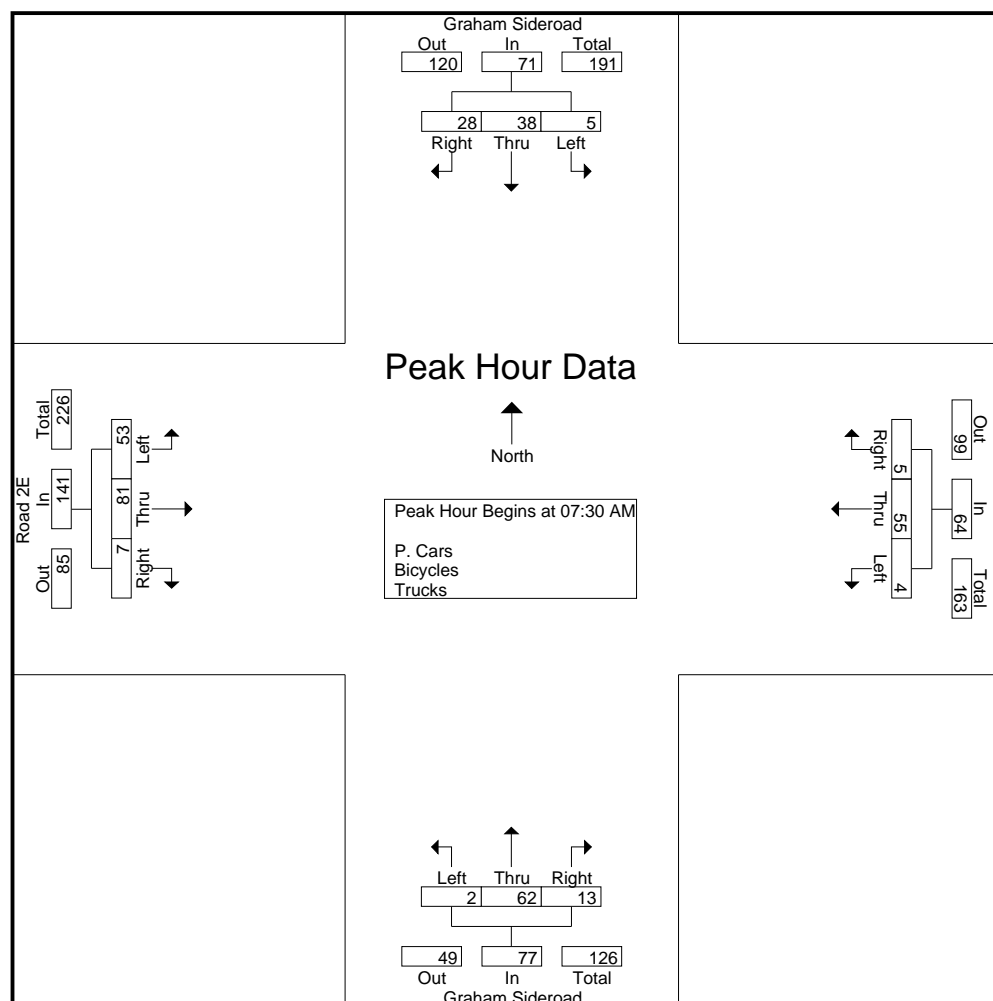


Date: 20 August 2020
 Counted by: Austin Greenhow
 Weather Conditions: Clear
 Graham Sideroad at Road 2E

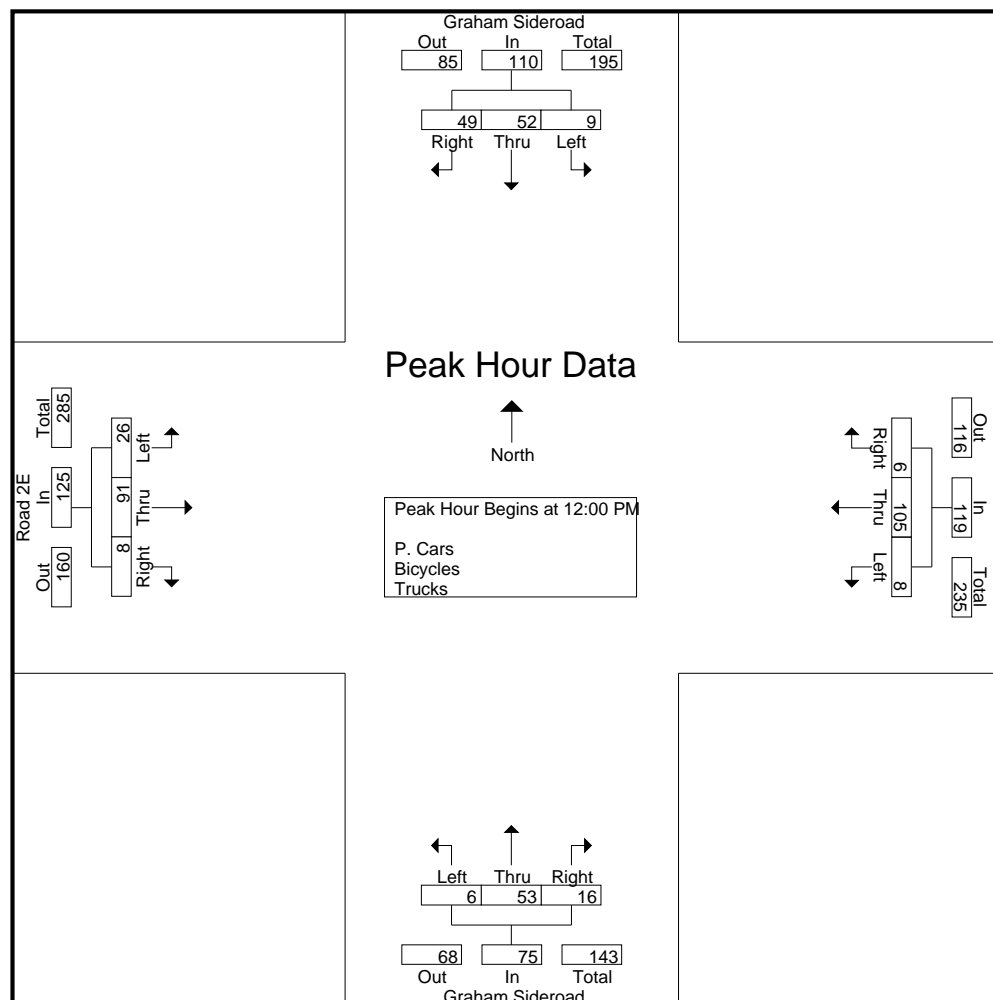
Groups Printed- P. Cars - Bicycles - Trucks

	Graham Sideroad S/B					Road 2E W/B					Graham Sideroad N/B					Road 2E E/B					Exclu. Total	Inclu. Total	Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total			
07:15 AM	5	7	0	(0)	12	0	12	0	(0)	12	1	14	2	(0)	17	0	16	7	(0)	23	0	64	64
07:30 AM	9	7	0	(0)	16	2	12	0	(0)	14	2	22	0	(0)	24	1	21	20	(0)	42	0	96	96
07:45 AM	9	6	2	(0)	17	1	13	3	(0)	17	3	10	0	(0)	13	5	28	20	(0)	53	0	100	100
Total	23	20	2	(0)	45	3	37	3	(0)	43	6	46	2	(0)	54	6	65	47	(0)	118	0	260	260
08:00 AM	3	10	0	(0)	13	1	13	0	(0)	14	4	15	1	(0)	20	0	20	9	(0)	29	0	76	76
08:15 AM	7	15	3	(0)	25	1	17	1	(0)	19	4	15	1	(0)	20	1	12	4	(0)	17	0	81	81
08:30 AM	8	11	1	(0)	20	0	13	1	(0)	14	2	11	0	(0)	13	2	24	5	(0)	31	0	78	78
*** BREAK ***																							
Total	18	36	4	(0)	58	2	43	2	(0)	47	10	41	2	(0)	53	3	56	18	(0)	77	0	235	235
*** BREAK ***																							
11:30 AM	9	13	2	(0)	24	2	17	0	(0)	19	3	7	3	(0)	13	4	19	10	(0)	33	0	89	89
11:45 AM	7	16	0	(0)	23	1	21	3	(0)	25	2	11	0	(0)	13	1	26	8	(0)	35	0	96	96
Total	16	29	2	(0)	47	3	38	3	(0)	44	5	18	3	(0)	26	5	45	18	(0)	68	0	185	185
12:00 PM	18	14	4	(0)	36	2	34	3	(0)	39	4	15	1	(0)	20	3	26	0	(0)	29	0	124	124
12:15 PM	7	15	1	(0)	23	2	17	3	(0)	22	1	9	2	(0)	12	0	21	5	(0)	26	0	83	83
12:30 PM	17	12	3	(0)	32	0	30	0	(0)	30	5	14	0	(0)	19	2	18	11	(0)	31	0	112	112
12:45 PM	7	11	1	(0)	19	2	24	2	(0)	28	6	15	3	(0)	24	3	26	10	(0)	39	0	110	110
Total	49	52	9	(0)	110	6	105	8	(0)	119	16	53	6	(0)	75	8	91	26	(0)	125	0	429	429
*** BREAK ***																							
04:30 PM	15	20	4	(0)	39	3	21	2	(0)	26	3	17	3	(0)	23	1	33	8	(0)	42	0	130	130
04:45 PM	14	20	2	(0)	36	2	33	0	(0)	35	1	19	0	(0)	20	2	22	14	(0)	38	0	129	129
Total	29	40	6	(0)	75	5	54	2	(0)	61	4	36	3	(0)	43	3	55	22	(0)	80	0	259	259
05:00 PM	22	27	4	(0)	53	1	33	2	(1)	36	5	14	2	(0)	21	5	21	9	(0)	35	1	145	146
05:15 PM	23	25	5	(0)	53	3	30	2	(1)	35	3	12	1	(0)	16	1	19	5	(0)	25	1	129	130
05:30 PM	19	23	3	(0)	45	4	22	2	(0)	28	2	14	1	(0)	17	2	14	4	(0)	20	0	110	110
05:45 PM	13	19	2	(0)	34	0	23	1	(0)	24	0	8	1	(0)	9	0	15	4	(0)	19	0	86	86
Total	77	94	14	(0)	185	8	108	7	(2)	123	10	48	5	(0)	63	8	69	22	(0)	99	2	470	472
Grand Total	212	271	37	(0)	520	27	385	25	(2)	437	51	242	21	(0)	314	33	381	153	(0)	567	2	1838	1840
Apprch %	40.8	52.1	7.1			6.2	88.1	5.7			16.2	77.1	6.7			5.8	67.2	27					
Total %	11.5	14.7	2		28.3	1.5	20.9	1.4		23.8	2.8	13.2	1.1		17.1	1.8	20.7	8.3		30.8	0.1	99.9	
P. Cars	202	258	35		495	26	381	22		431	51	238	20		309	31	373	145		549	0	0	1784
% P. Cars	95.3	95.2	94.6	0	95.2	96.3	99	88	100	98.2	100	98.3	95.2	0	98.4	93.9	97.9	94.8	0	96.8	0	0	97
Bicycles	0	10	0		10	0	0	0		0	0	1	0		1	1	1	0		2	0	0	13
% Bicycles	0	3.7	0	0	1.9	0	0	0	0	0	0	0.4	0	0	0.3	3	0.3	0	0	0.4	0	0	0.7
Trucks	10	3	2		15	1	4	3		8	0	3	1		4	1	7	8		16	0	0	43
% Trucks	4.7	1.1	5.4	0	2.9	3.7	1	12	0	1.8	0	1.2	4.8	0	1.3	3	1.8	5.2	0	2.8	0	0	2.3

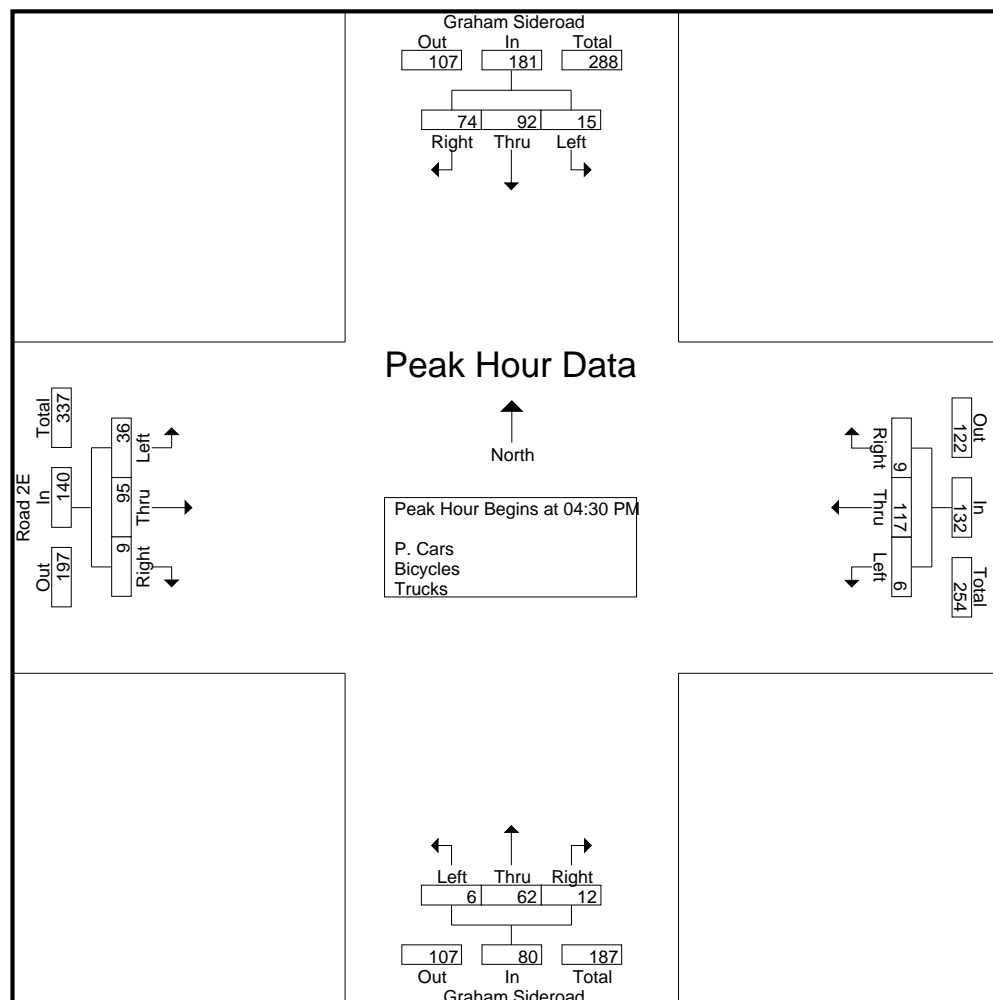
	Graham Sideroad S/B				Road 2E W/B				Graham Sideroad N/B				Road 2E E/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	9	7	0	16	2	12	0	14	2	22	0	24	1	21	20	42	96
07:45 AM	9	6	2	17	1	13	3	17	3	10	0	13	5	28	20	53	100
08:00 AM	3	10	0	13	1	13	0	14	4	15	1	20	0	20	9	29	76
08:15 AM	7	15	3	25	1	17	1	19	4	15	1	20	1	12	4	17	81
Total Volume	28	38	5	71	5	55	4	64	13	62	2	77	7	81	53	141	353
% App. Total	39.4	53.5	7		7.8	85.9	6.2		16.9	80.5	2.6		5	57.4	37.6		
PHF	.778	.633	.417	.710	.625	.809	.333	.842	.813	.705	.500	.802	.350	.723	.663	.665	.883



	Graham Sideroad S/B				Road 2E W/B				Graham Sideroad N/B				Road 2E E/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00 PM																	
12:00 PM	18	14	4	36	2	34	3	39	4	15	1	20	3	26	0	29	124
12:15 PM	7	15	1	23	2	17	3	22	1	9	2	12	0	21	5	26	83
12:30 PM	17	12	3	32	0	30	0	30	5	14	0	19	2	18	11	31	112
12:45 PM	7	11	1	19	2	24	2	28	6	15	3	24	3	26	10	39	110
Total Volume	49	52	9	110	6	105	8	119	16	53	6	75	8	91	26	125	429
% App. Total	44.5	47.3	8.2		5	88.2	6.7		21.3	70.7	8		6.4	72.8	20.8		
PHF	.681	.867	.563	.764	.750	.772	.667	.763	.667	.883	.500	.781	.667	.875	.591	.801	.865



	Graham Sideroad S/B				Road 2E W/B				Graham Sideroad N/B				Road 2E E/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	15	20	4	39	3	21	2	26	3	17	3	23	1	33	8	42	130
04:45 PM	14	20	2	36	2	33	0	35	1	19	0	20	2	22	14	38	129
05:00 PM	22	27	4	53	1	33	2	36	5	14	2	21	5	21	9	35	145
05:15 PM	23	25	5	53	3	30	2	35	3	12	1	16	1	19	5	25	129
Total Volume	74	92	15	181	9	117	6	132	12	62	6	80	9	95	36	140	533
% App. Total	40.9	50.8	8.3		6.8	88.6	4.5		15	77.5	7.5		6.4	67.9	25.7		
PHF	.804	.852	.750	.854	.750	.886	.750	.917	.600	.816	.500	.870	.450	.720	.643	.833	.919

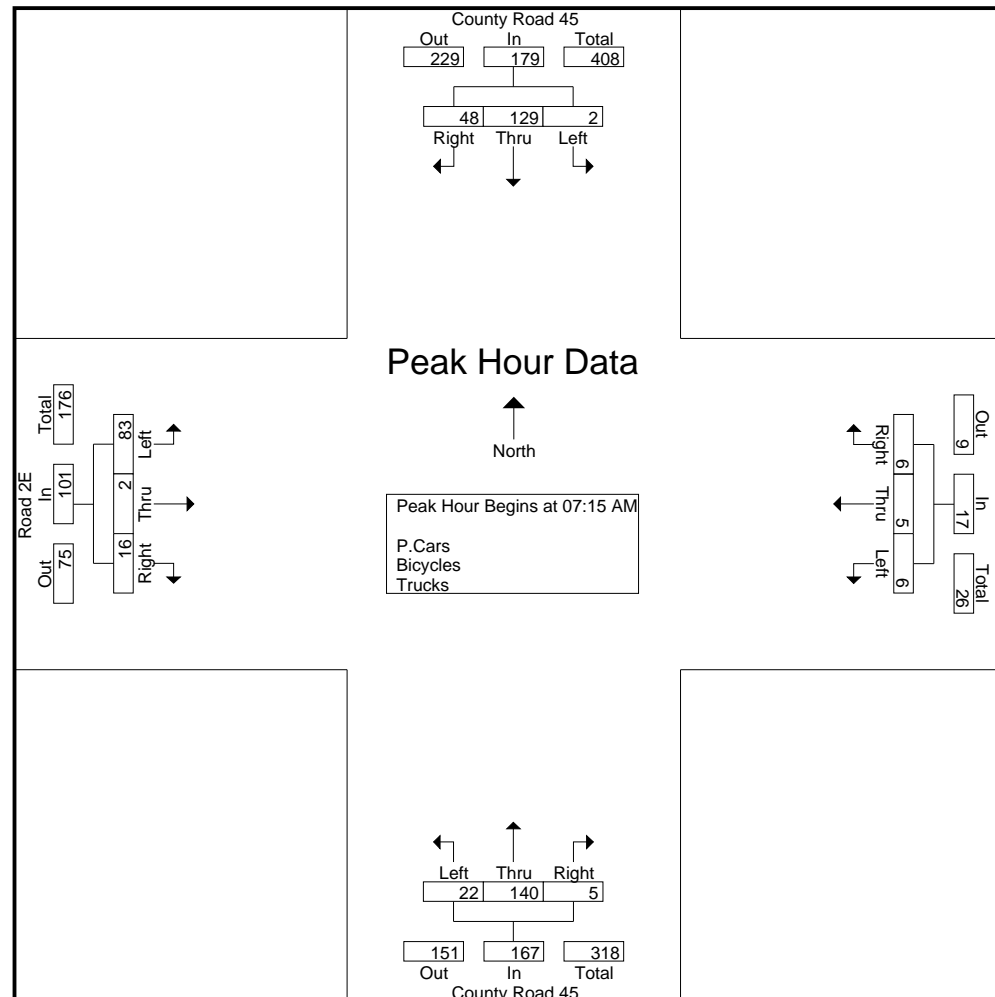


Date: 25 August 2020
 Counted by: Austin Greenhow
 Weather Conditions: Clear
 County Road 45 at Road 2E

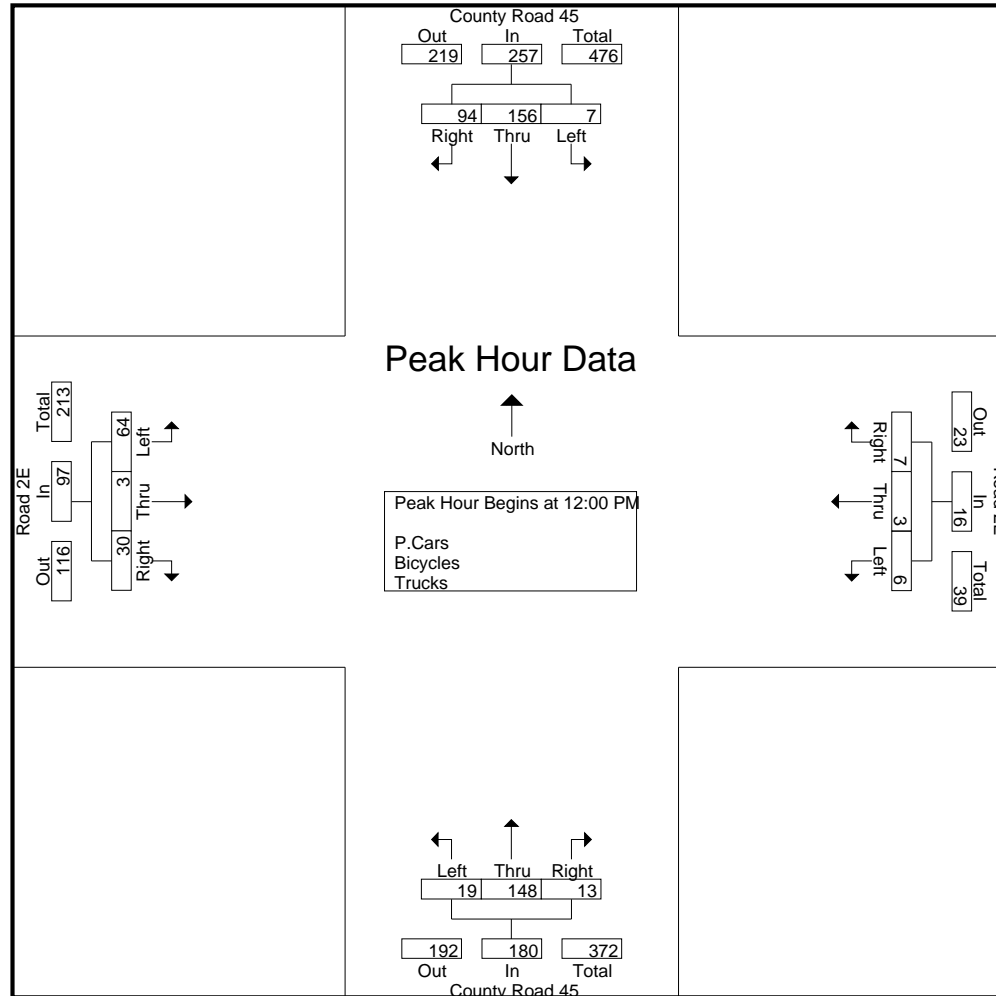
Groups Printed- P.Cars - Bicycles - Trucks

	County Road 45 S/B					Road 2E W/B					County Road 45 N/B					Road 2E E/B					Exclu. Total	Inclu. Total	Int. Total
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total			
07:15 AM	14	19	0	(0)	33	1	2	2	(0)	5	1	33	3	(0)	37	4	0	9	(0)	13	0	88	88
07:30 AM	12	34	0	(0)	46	3	2	3	(0)	8	0	24	3	(0)	27	4	1	24	(0)	29	0	110	110
07:45 AM	11	42	0	(0)	53	0	0	1	(0)	1	2	42	10	(0)	54	7	0	28	(0)	35	0	143	143
Total	37	95	0	(0)	132	4	4	6	(0)	14	3	99	16	(0)	118	15	1	61	(0)	77	0	341	341
08:00 AM	11	34	2	(0)	47	2	1	0	(0)	3	2	41	6	(0)	49	1	1	22	(0)	24	0	123	123
08:15 AM	15	25	2	(0)	42	2	0	2	(1)	4	0	27	1	(0)	28	1	0	11	(0)	12	1	86	87
08:30 AM	14	19	1	(0)	34	1	1	2	(0)	4	2	23	6	(0)	31	5	0	23	(0)	28	0	97	97
*** BREAK ***																							
Total	40	78	5	(0)	123	5	2	4	(1)	11	4	91	13	(0)	108	7	1	56	(0)	64	1	306	307
*** BREAK ***																							
11:30 AM	14	42	1	(1)	57	2	0	2	(0)	4	2	28	3	(0)	33	9	2	15	(0)	26	1	120	121
11:45 AM	15	27	1	(0)	43	0	2	0	(0)	2	1	41	7	(0)	49	8	2	26	(0)	36	0	130	130
Total	29	69	2	(1)	100	2	2	2	(0)	6	3	69	10	(0)	82	17	4	41	(0)	62	1	250	251
12:00 PM	22	44	3	(0)	69	2	0	2	(0)	4	3	38	6	(0)	47	9	0	16	(0)	25	0	145	145
12:15 PM	25	32	3	(0)	60	2	0	0	(0)	2	3	27	4	(0)	34	9	2	12	(0)	23	0	119	119
12:30 PM	18	41	1	(0)	60	1	2	1	(0)	4	6	47	3	(0)	56	6	1	18	(0)	25	0	145	145
12:45 PM	29	39	0	(0)	68	2	1	3	(0)	6	1	36	6	(0)	43	6	0	18	(0)	24	0	141	141
Total	94	156	7	(0)	257	7	3	6	(0)	16	13	148	19	(0)	180	30	3	64	(0)	97	0	550	550
*** BREAK ***																							
04:30 PM	26	43	2	(1)	71	3	2	0	(0)	5	6	47	2	(0)	55	11	3	31	(0)	45	1	176	177
04:45 PM	21	41	2	(0)	64	0	0	1	(0)	1	2	28	6	(0)	36	4	0	25	(0)	29	0	130	130
Total	47	84	4	(1)	135	3	2	1	(0)	6	8	75	8	(0)	91	15	3	56	(0)	74	1	306	307
05:00 PM	29	51	3	(0)	83	1	0	1	(0)	2	3	43	4	(0)	50	7	0	29	(0)	36	0	171	171
05:15 PM	19	46	3	(0)	68	6	2	3	(0)	11	1	36	7	(0)	44	10	4	10	(0)	24	0	147	147
05:30 PM	24	30	2	(0)	56	2	1	2	(0)	5	3	32	5	(0)	40	12	2	21	(0)	35	0	136	136
05:45 PM	13	28	1	(0)	42	1	1	1	(0)	3	4	29	7	(0)	40	4	1	15	(0)	20	0	105	105
Total	85	155	9	(0)	249	10	4	7	(0)	21	11	140	23	(0)	174	33	7	75	(0)	115	0	559	559
Grand Total	332	637	27	(2)	996	31	17	26	(1)	74	42	622	89	(0)	753	117	19	353	(0)	489	3	2312	2315
Apprch %	33.3	64	2.7			41.9	23	35.1			5.6	82.6	11.8			23.9	3.9	72.2					
Total %	14.4	27.6	1.2		43.1	1.3	0.7	1.1		3.2	1.8	26.9	3.8		32.6	5.1	0.8	15.3		21.2	0.1	99.9	
P.Cars	328	556	25		911	28	15	26		70	40	521	83		644	112	16	343		471	0	0	2096
% P.Cars	98.8	87.3	92.6	100	91.3	90.3	88.2	100	100	93.3	95.2	83.8	93.3	0	85.5	95.7	84.2	97.2	0	96.3	0	0	90.5
Bicycles	0	0	0		0	0	1	0		1	1	1	0		2	0	2	2		4	0	0	7
% Bicycles	0	0	0	0	0	0	5.9	0	0	1.3	2.4	0.2	0	0	0.3	0	10.5	0.6	0	0.8	0	0	0.3
Trucks	4	81	2		87	3	1	0		4	1	100	6		107	5	1	8		14	0	0	212
% Trucks	1.2	12.7	7.4	0	8.7	9.7	5.9	0	0	5.3	2.4	16.1	6.7	0	14.2	4.3	5.3	2.3	0	2.9	0	0	9.2

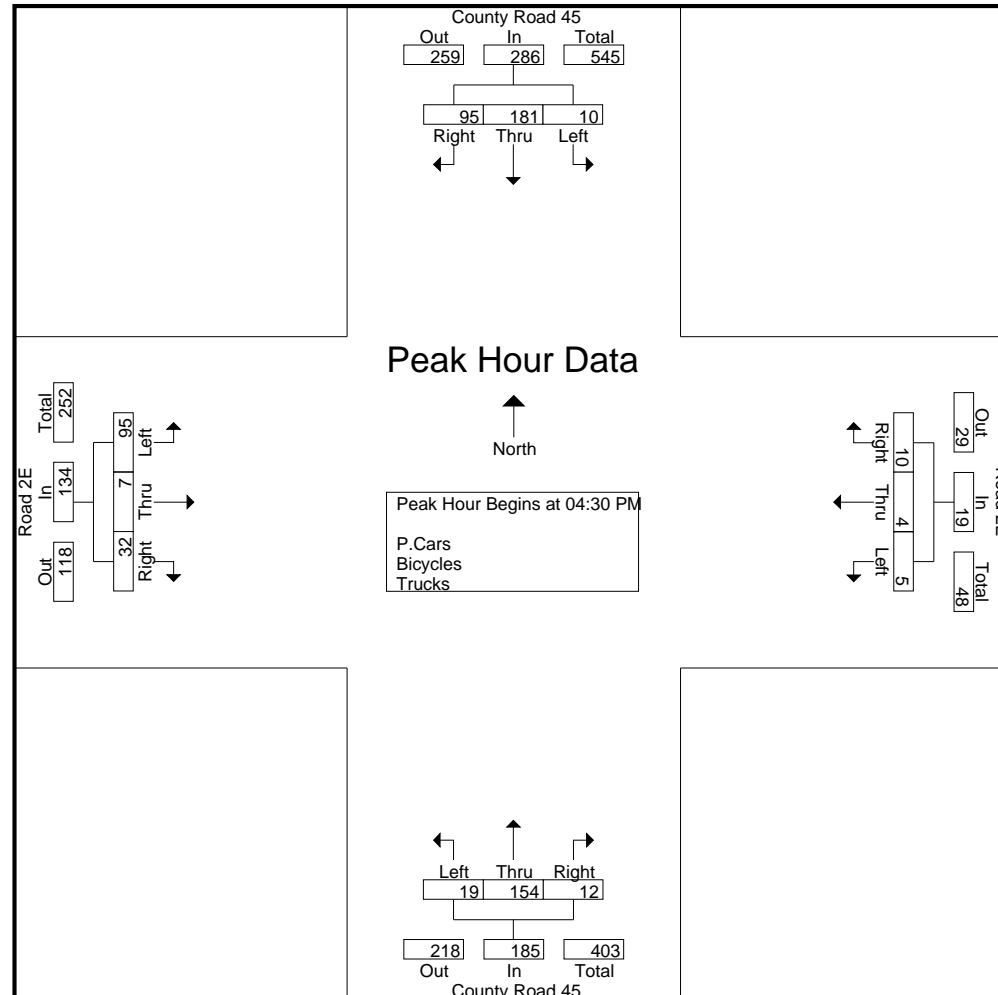
	County Road 45 S/B				Road 2E W/B				County Road 45 N/B				Road 2E E/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	14	19	0	33	1	2	2	5	1	33	3	37	4	0	9	13	88
07:30 AM	12	34	0	46	3	2	3	8	0	24	3	27	4	1	24	29	110
07:45 AM	11	42	0	53	0	0	1	1	2	42	10	54	7	0	28	35	143
08:00 AM	11	34	2	47	2	1	0	3	2	41	6	49	1	1	22	24	123
Total Volume	48	129	2	179	6	5	6	17	5	140	22	167	16	2	83	101	464
% App. Total	26.8	72.1	1.1		35.3	29.4	35.3		3	83.8	13.2		15.8	2	82.2		
PHF	.857	.768	.250	.844	.500	.625	.500	.531	.625	.833	.550	.773	.571	.500	.741	.721	.811



	County Road 45 S/B				Road 2E W/B				County Road 45 N/B				Road 2E E/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00 PM																	
12:00 PM	22	44	3	69	2	0	2	4	3	38	6	47	9	0	16	25	145
12:15 PM	25	32	3	60	2	0	0	2	3	27	4	34	9	2	12	23	119
12:30 PM	18	41	1	60	1	2	1	4	6	47	3	56	6	1	18	25	145
12:45 PM	29	39	0	68	2	1	3	6	1	36	6	43	6	0	18	24	141
Total Volume	94	156	7	257	7	3	6	16	13	148	19	180	30	3	64	97	550
% App. Total	36.6	60.7	2.7		43.8	18.8	37.5		7.2	82.2	10.6		30.9	3.1	66		
PHF	.810	.886	.583	.931	.875	.375	.500	.667	.542	.787	.792	.804	.833	.375	.889	.970	.948



	County Road 45 S/B				Road 2E W/B				County Road 45 N/B				Road 2E E/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	26	43	2	71	3	2	0	5	6	47	2	55	11	3	31	45	176
04:45 PM	21	41	2	64	0	0	1	1	2	28	6	36	4	0	25	29	130
05:00 PM	29	51	3	83	1	0	1	2	3	43	4	50	7	0	29	36	171
05:15 PM	19	46	3	68	6	2	3	11	1	36	7	44	10	4	10	24	147
Total Volume	95	181	10	286	10	4	5	19	12	154	19	185	32	7	95	134	624
% App. Total	33.2	63.3	3.5		52.6	21.1	26.3		6.5	83.2	10.3		23.9	5.2	70.9		
PHF	.819	.887	.833	.861	.417	.500	.417	.432	.500	.819	.679	.841	.727	.438	.766	.744	.886



Appendix C

TRAFFIC PROJECTION FIGURES

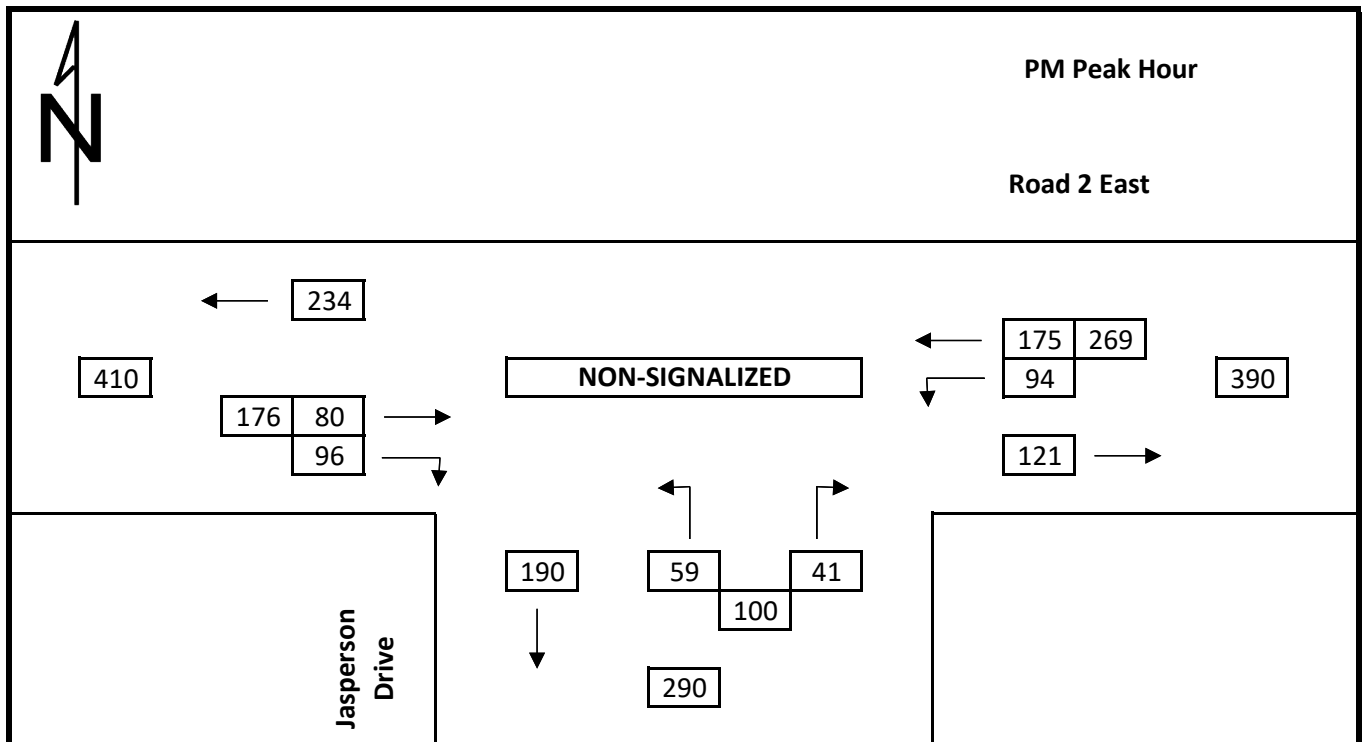
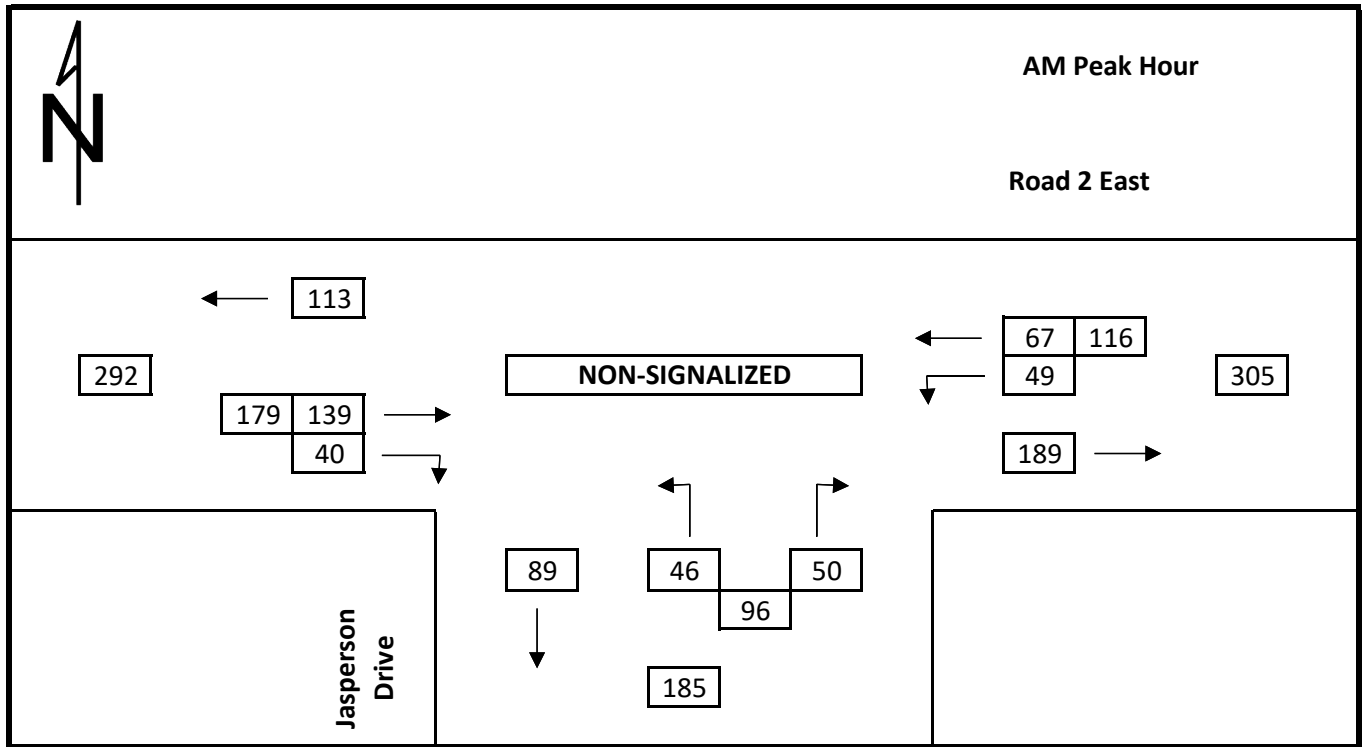
Jasperson Drive at Road 2 East

Kratz Sideroad at Road 2 East

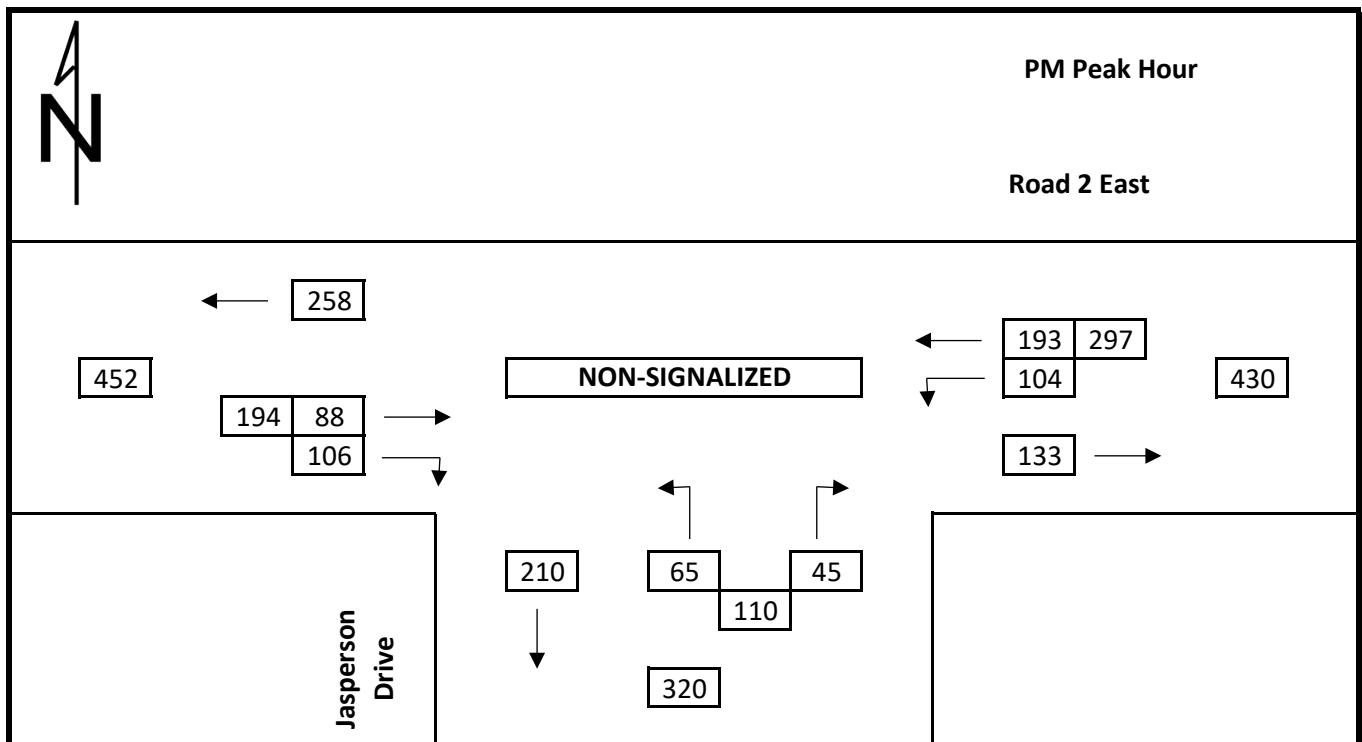
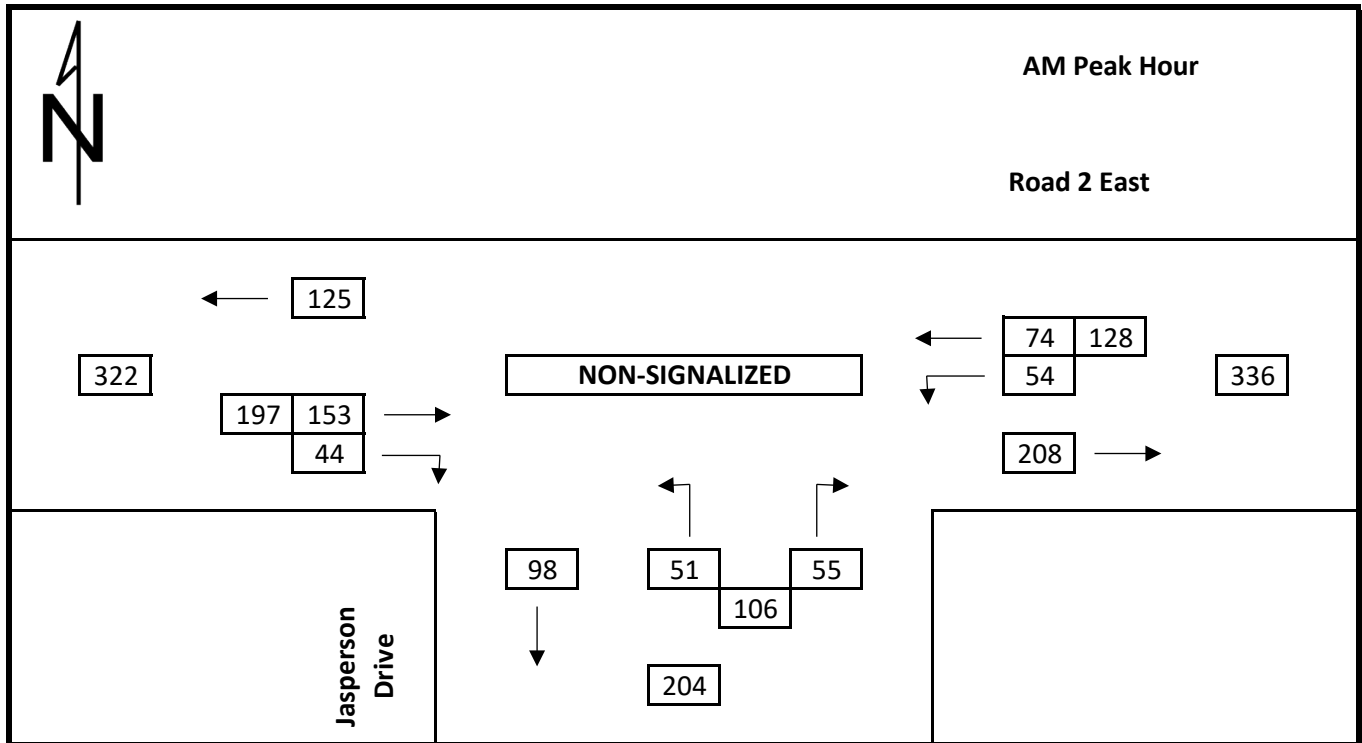
Graham Sideroad at Road 2 East

County Road 45 (Union Avenue) at Road 2 East

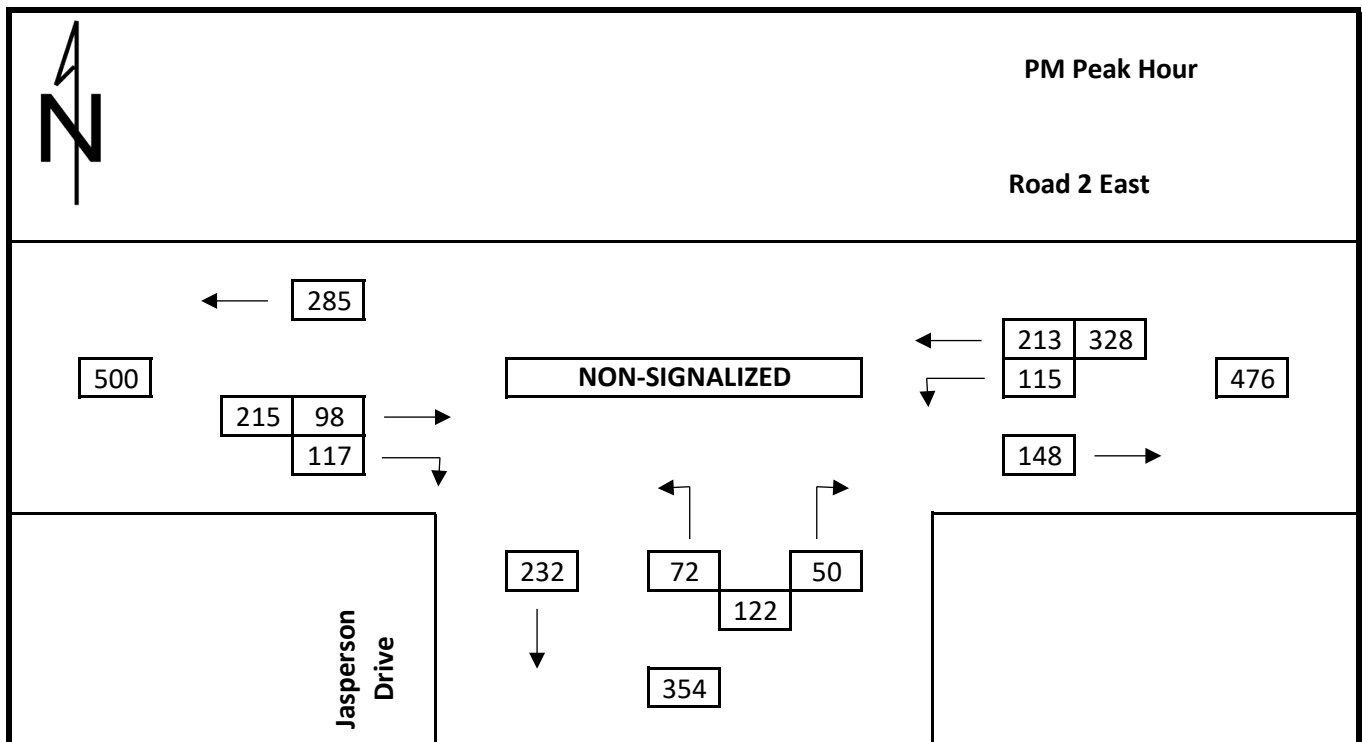
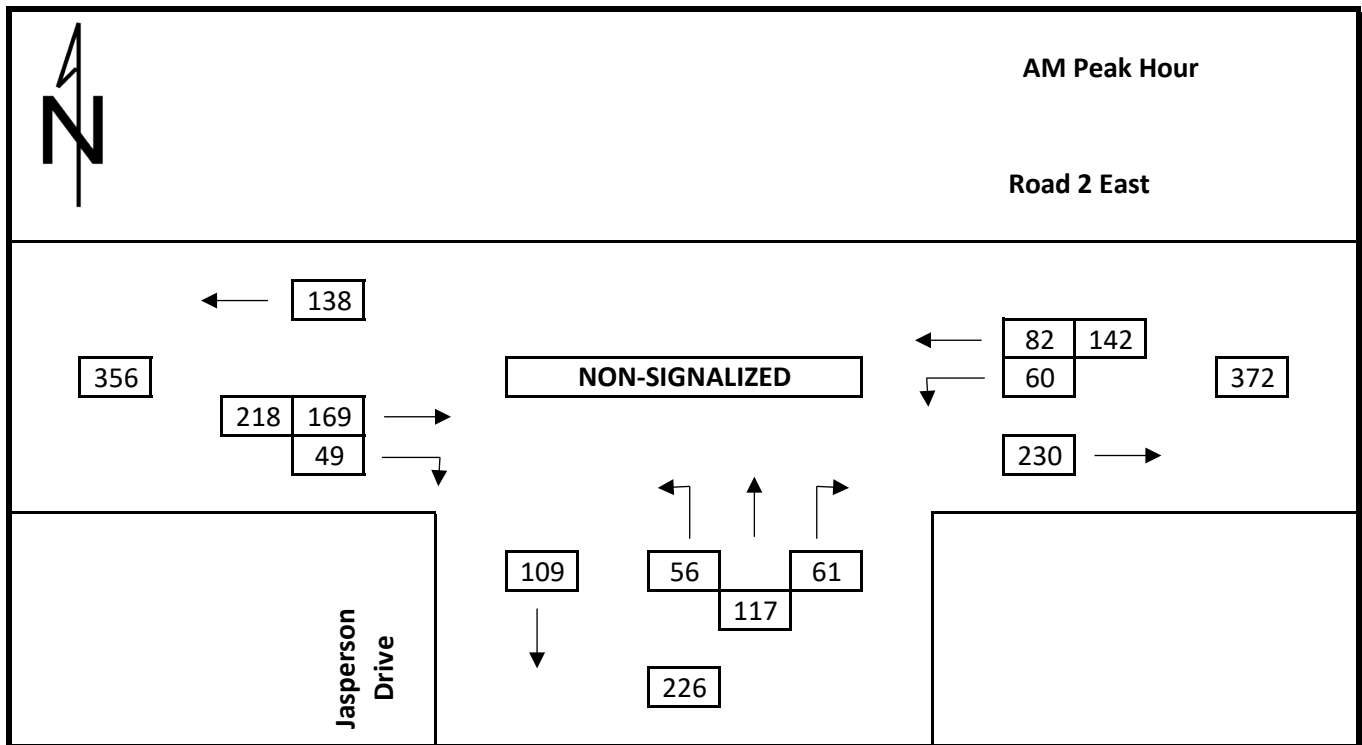
Existing Traffic Counts
Jasperson Drive at Road 2 East



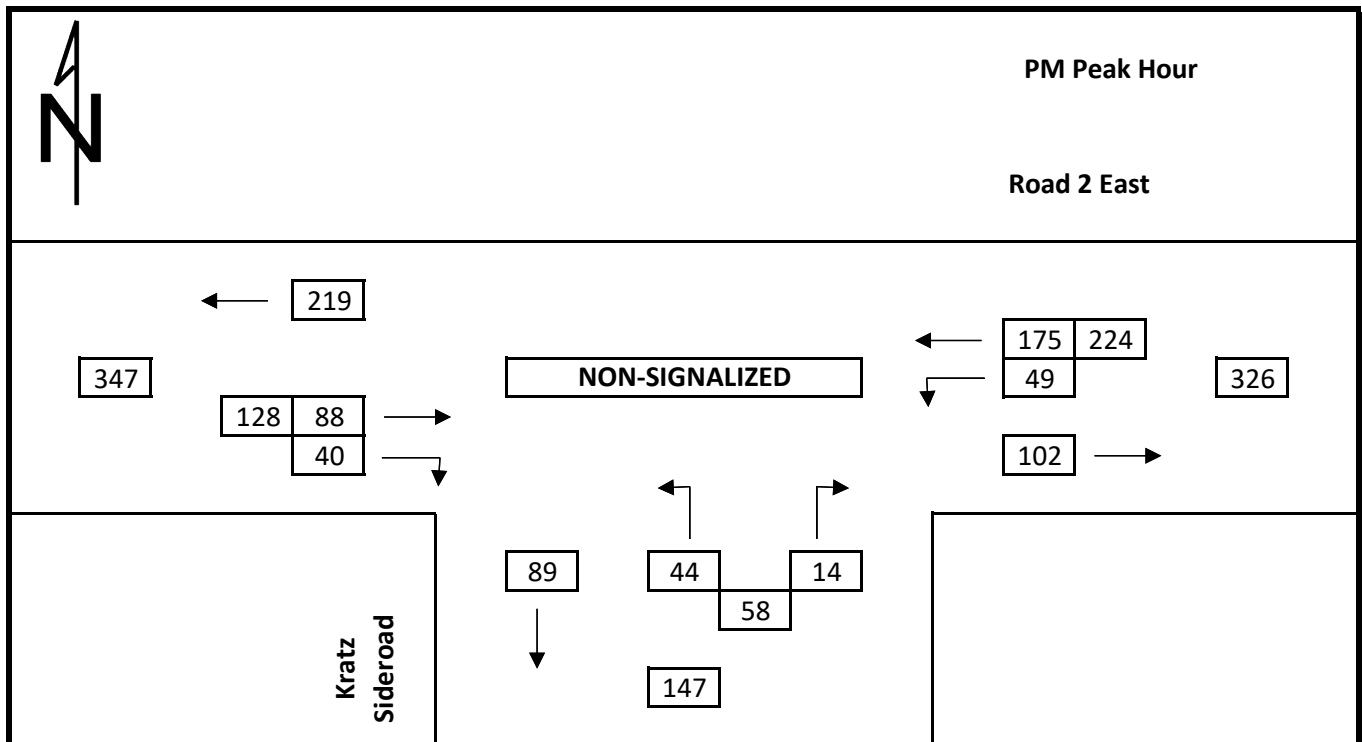
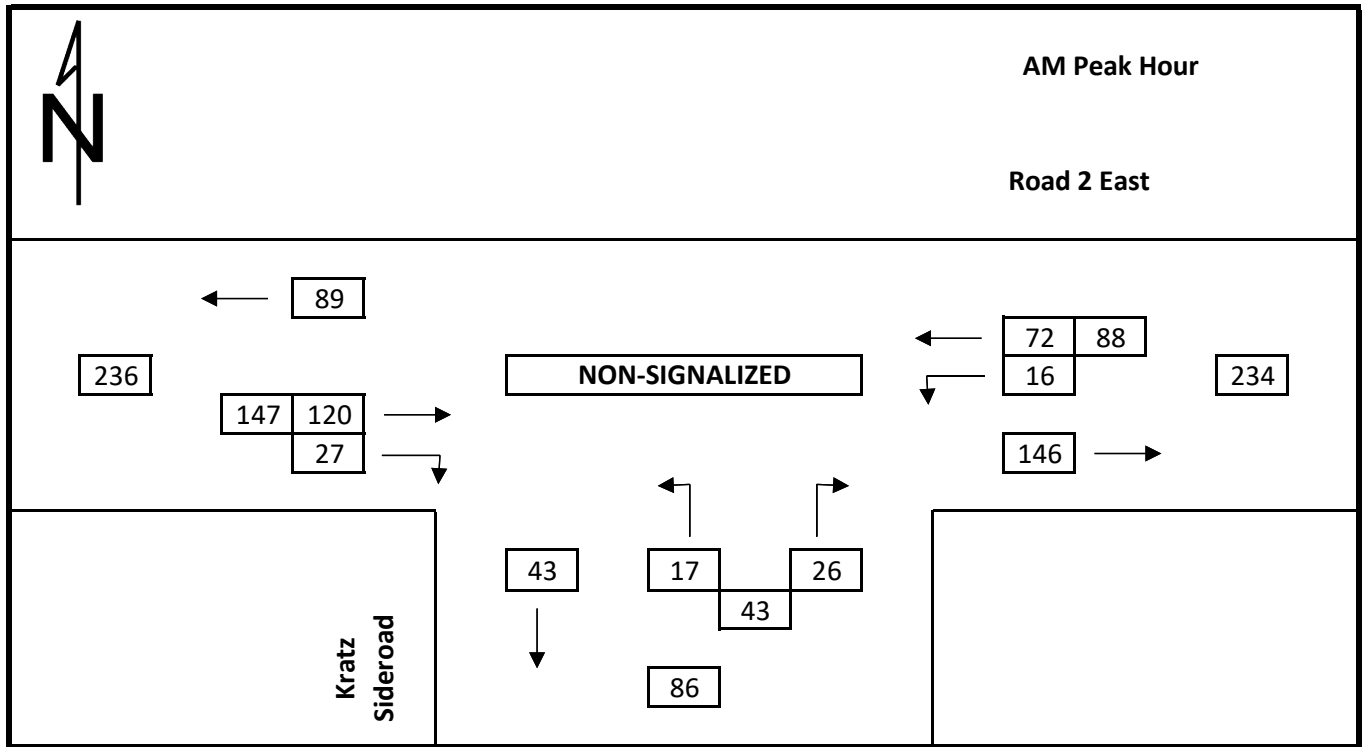
Total Traffic 2025
Jasperson Drive at Road 2 East



Total Traffic 2030
Jasperson Drive at Road 2 East

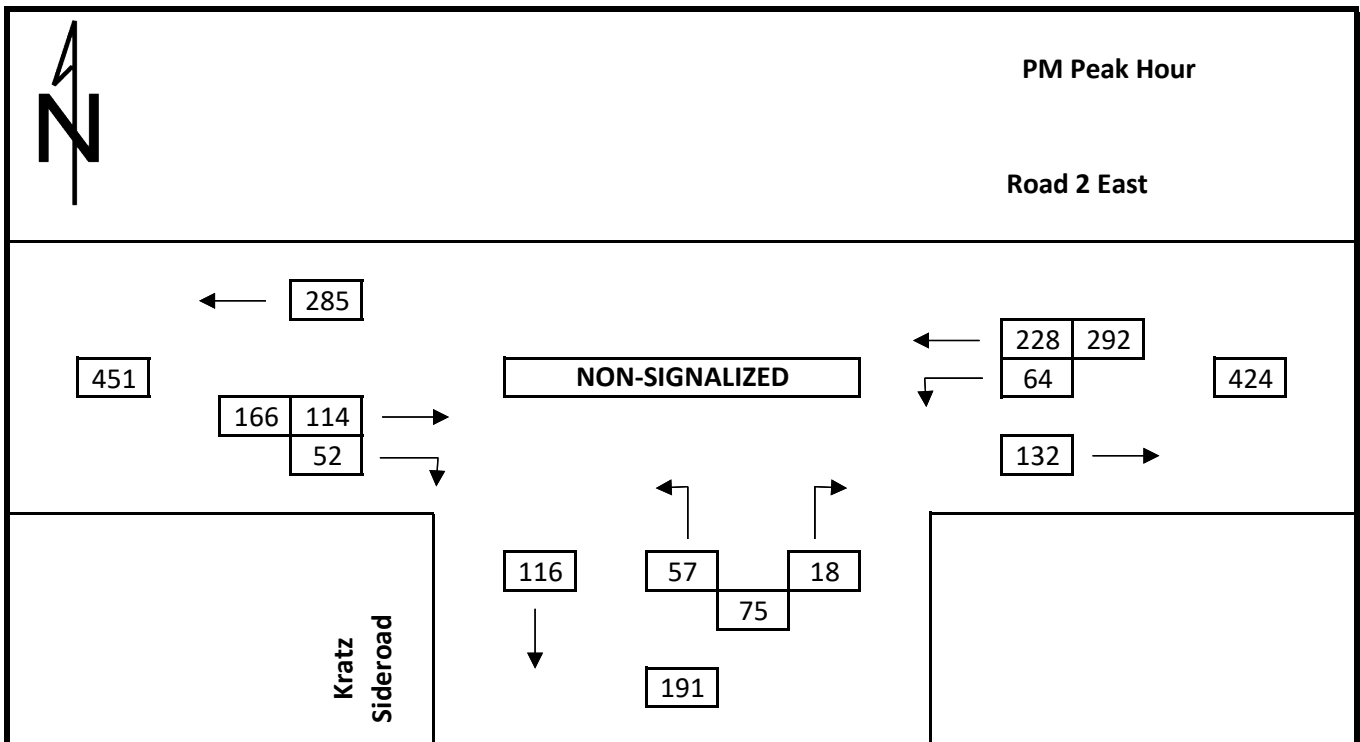
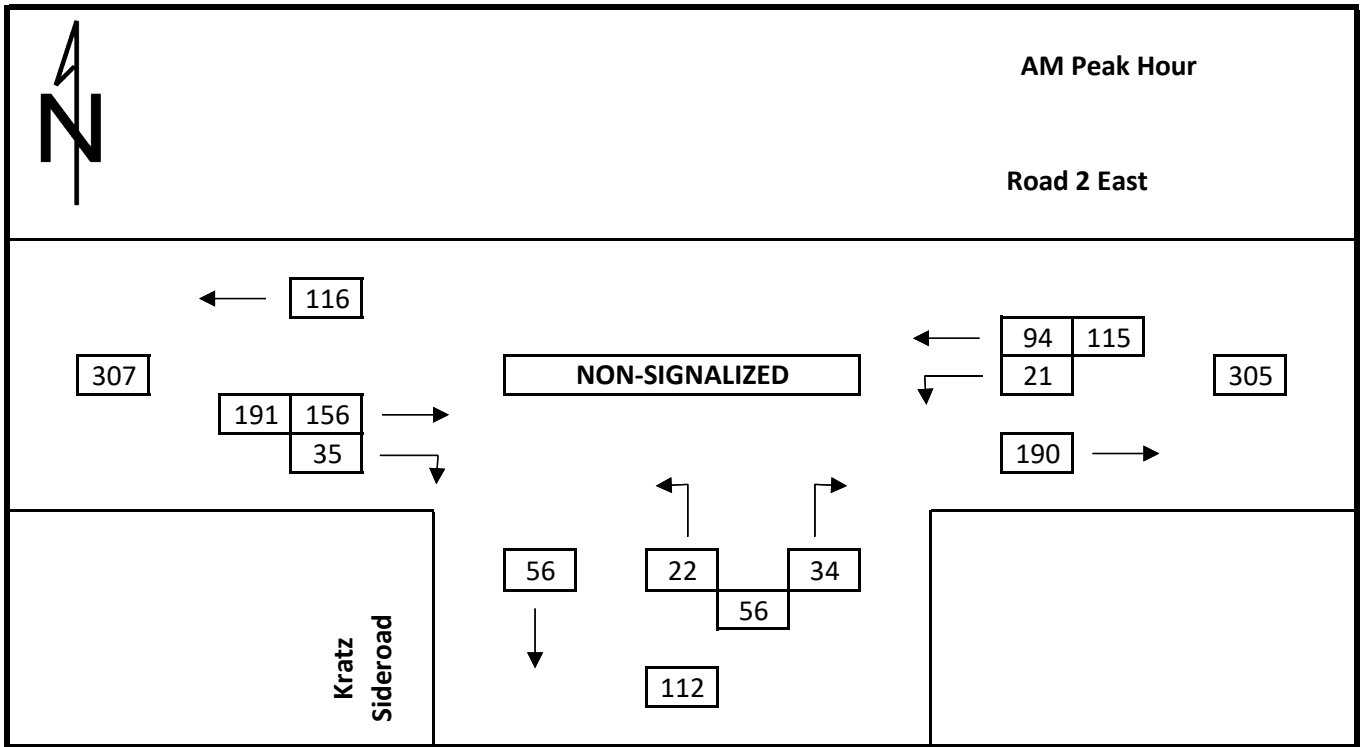


Observed Traffic Counts
Kratz Sideroad at Road 2 East

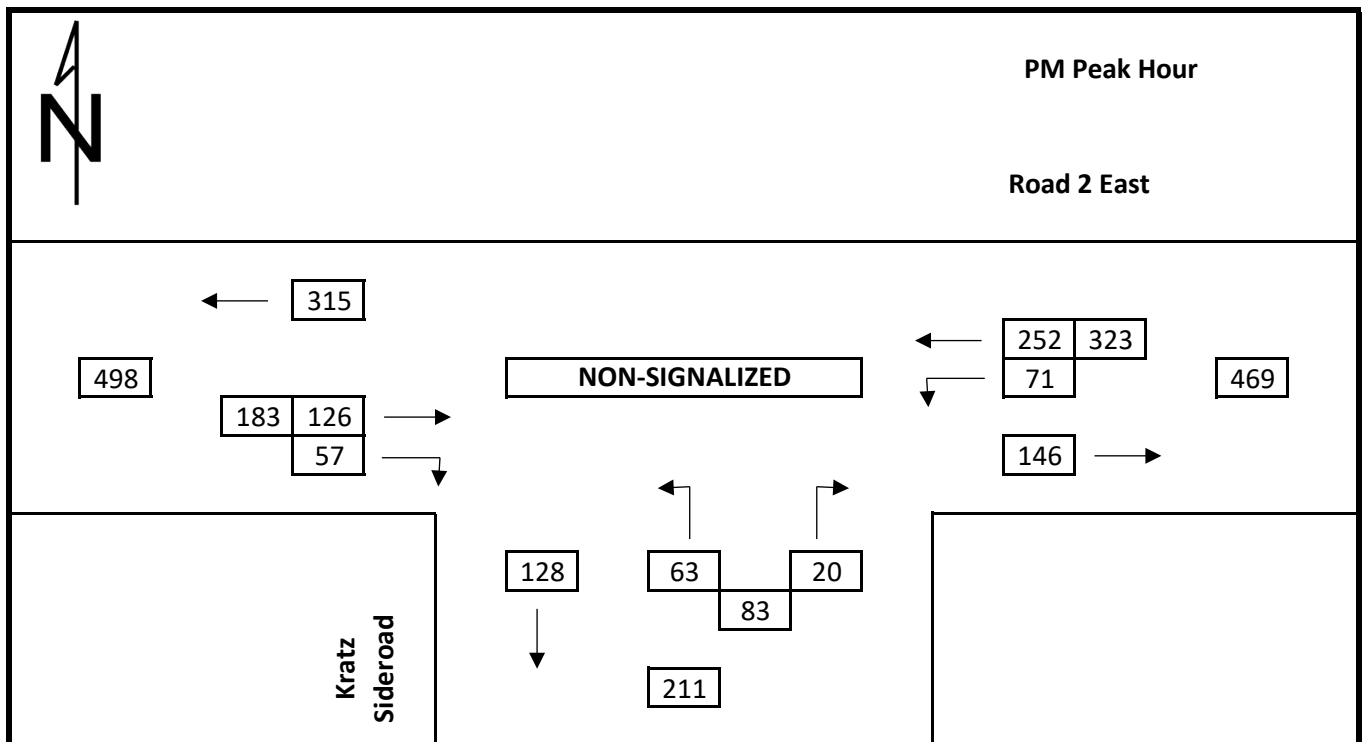
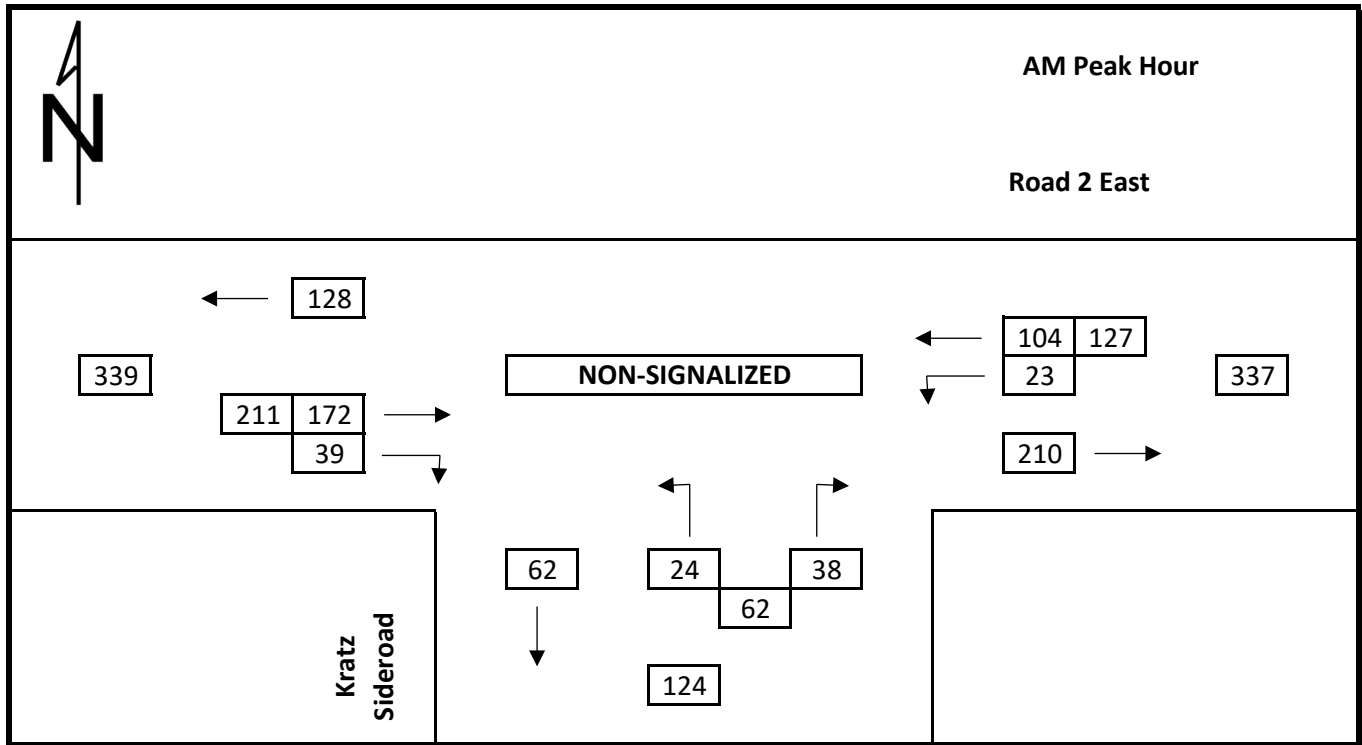


Factored Traffic Counts

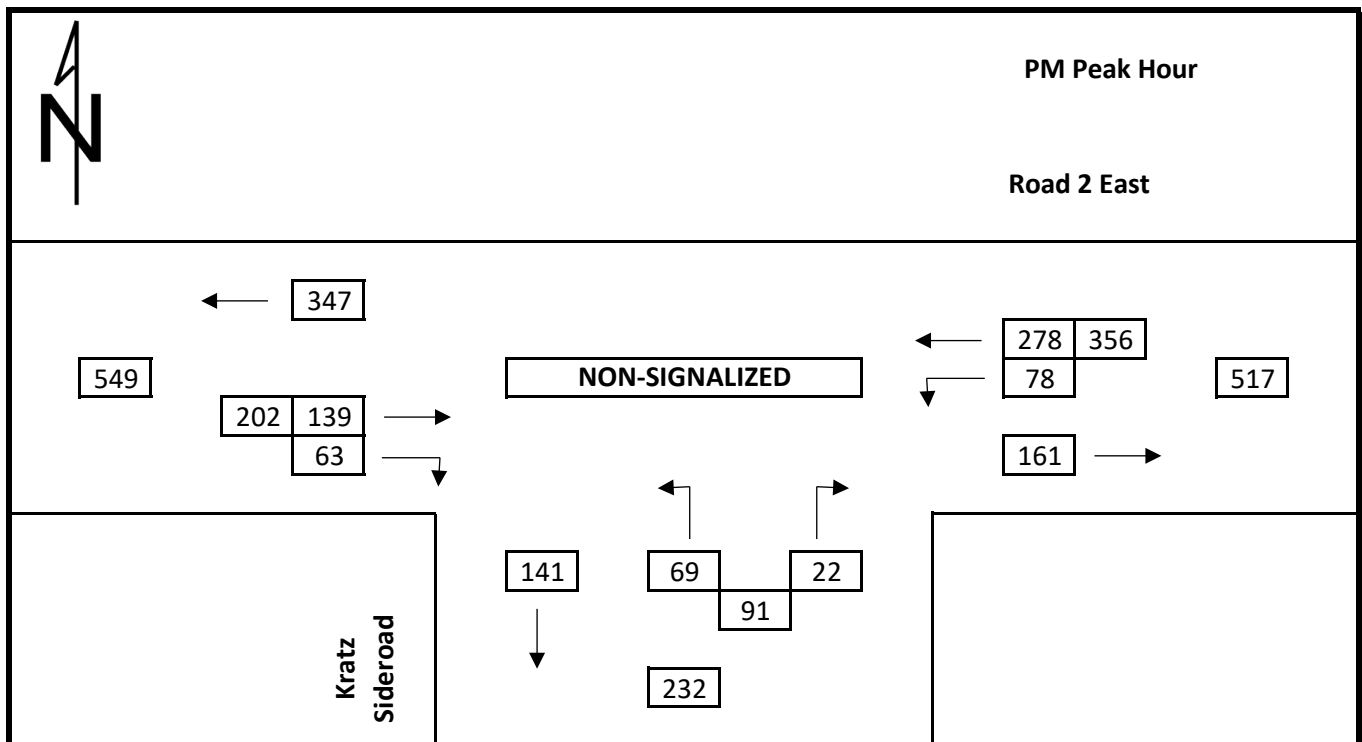
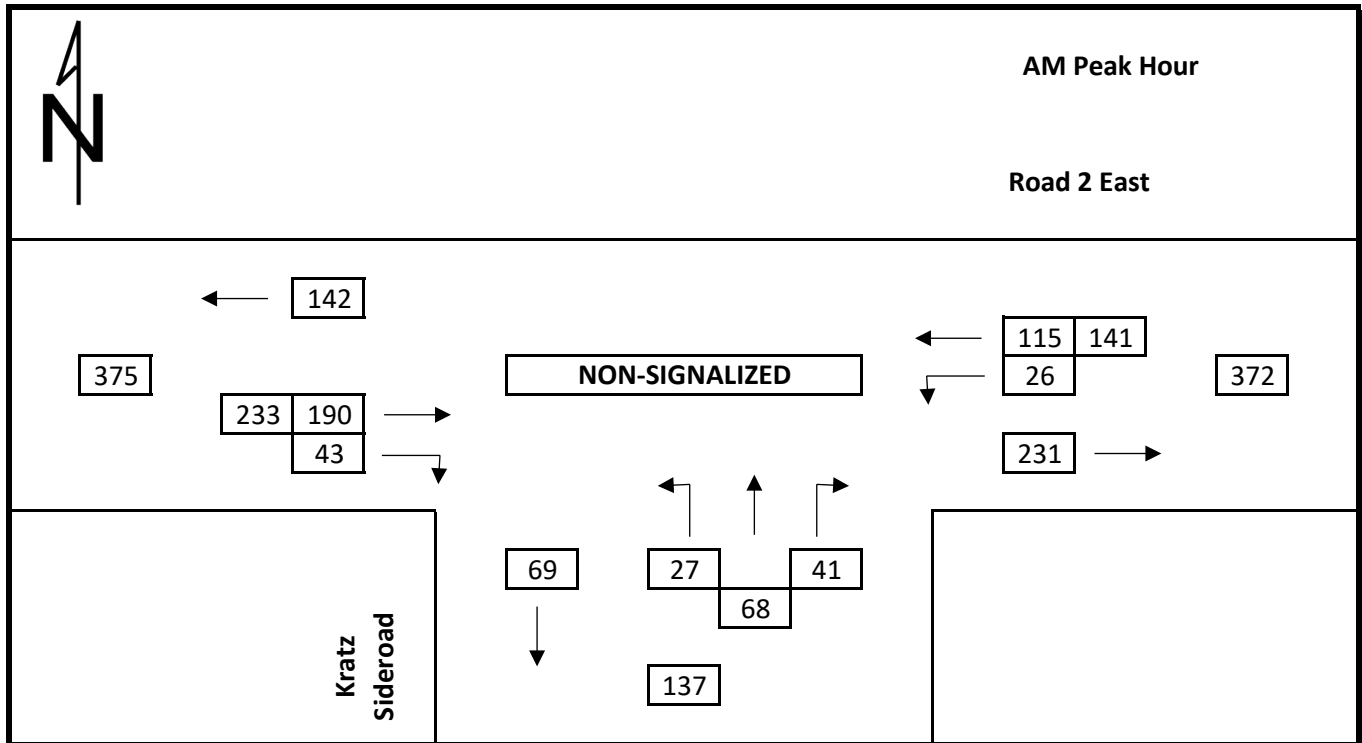
Kratz Sideroad at Road 2 East



Total Traffic 2025
Kratz Sideroad at Road 2 East

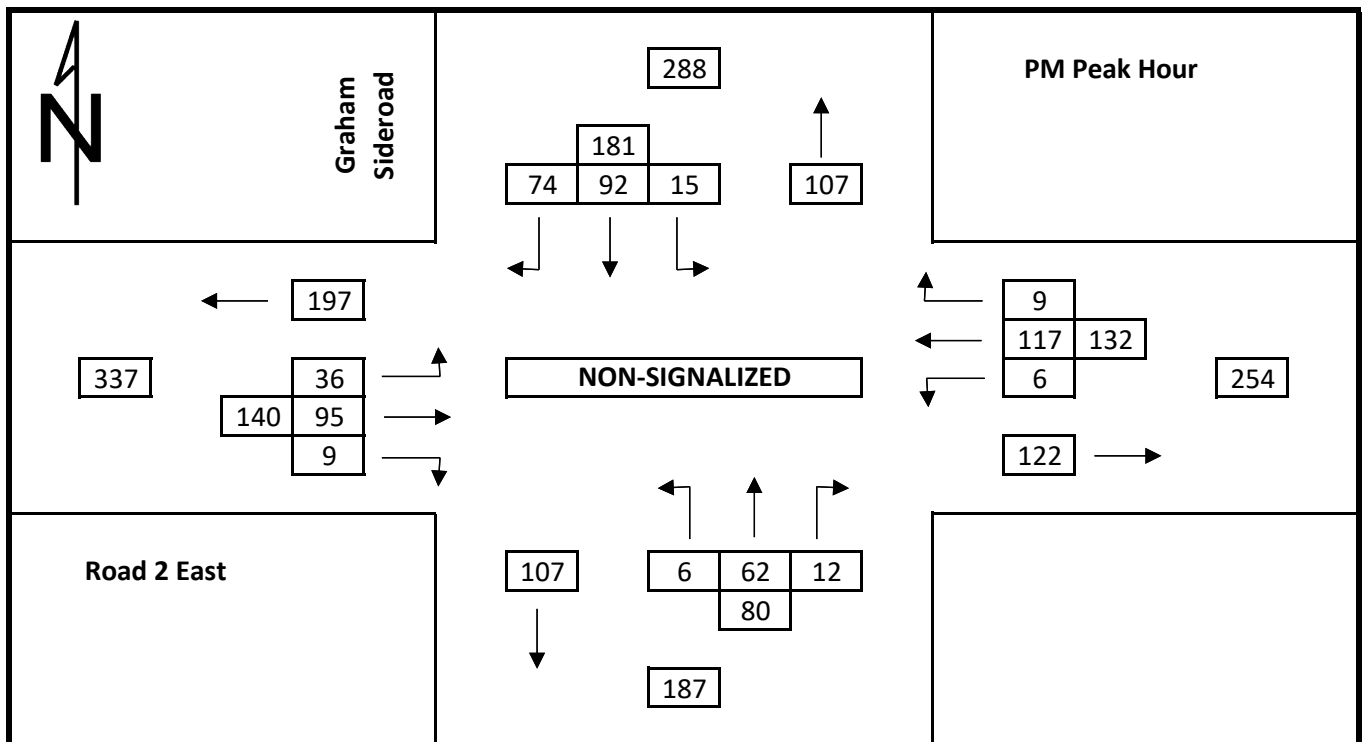
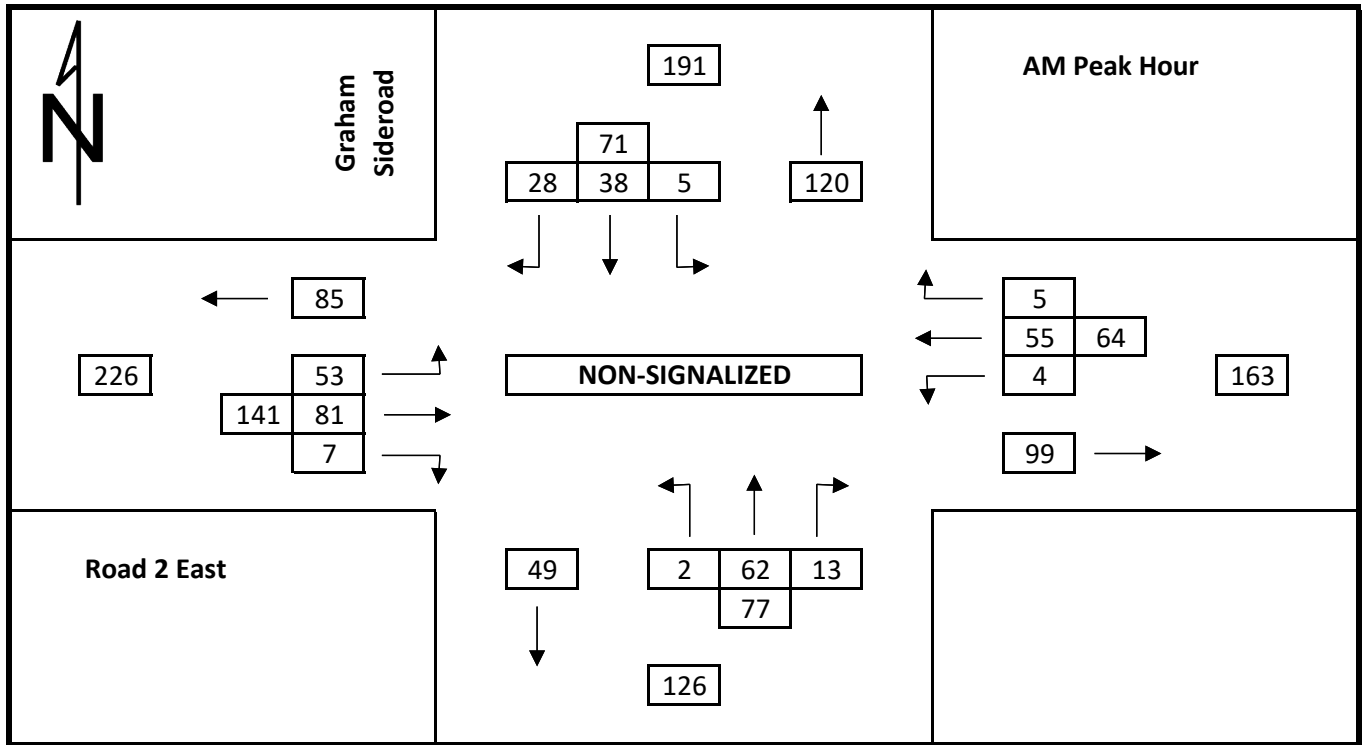


Total Traffic 2030
Kratz Sideroad at Road 2 East



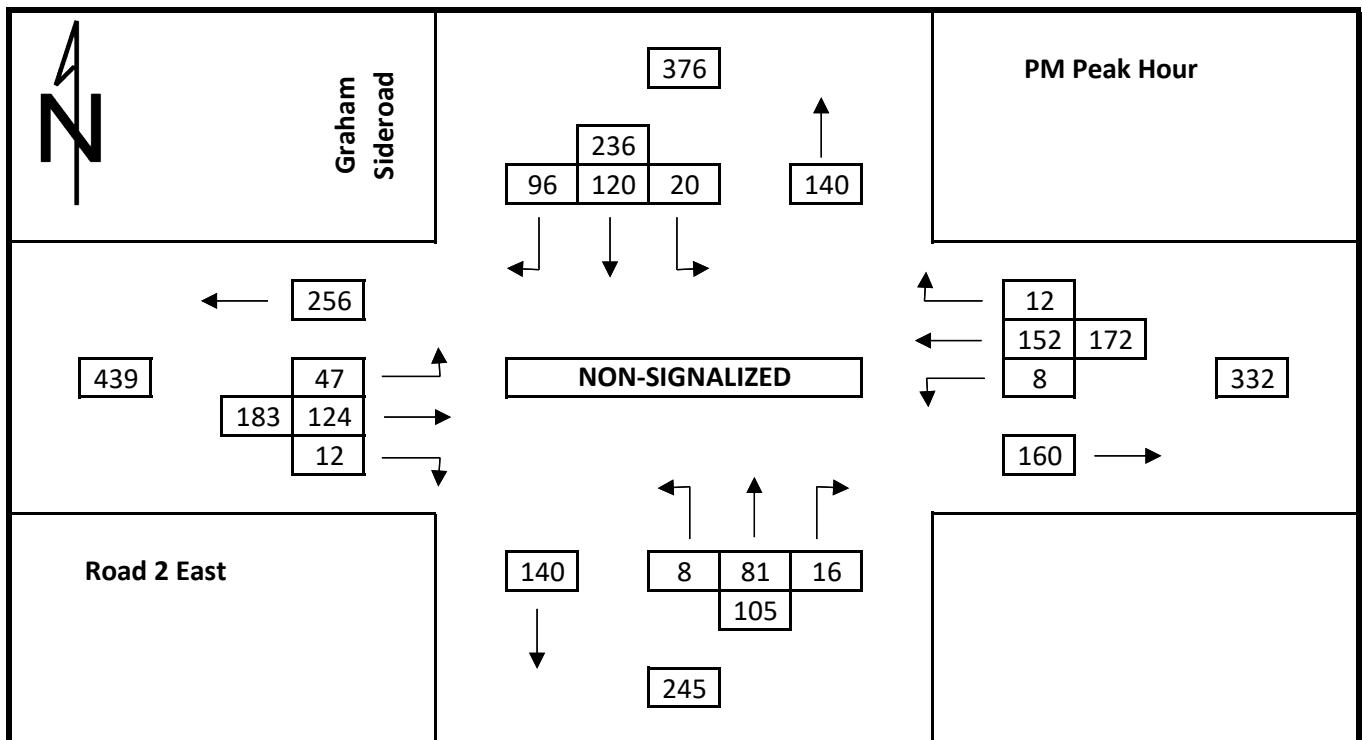
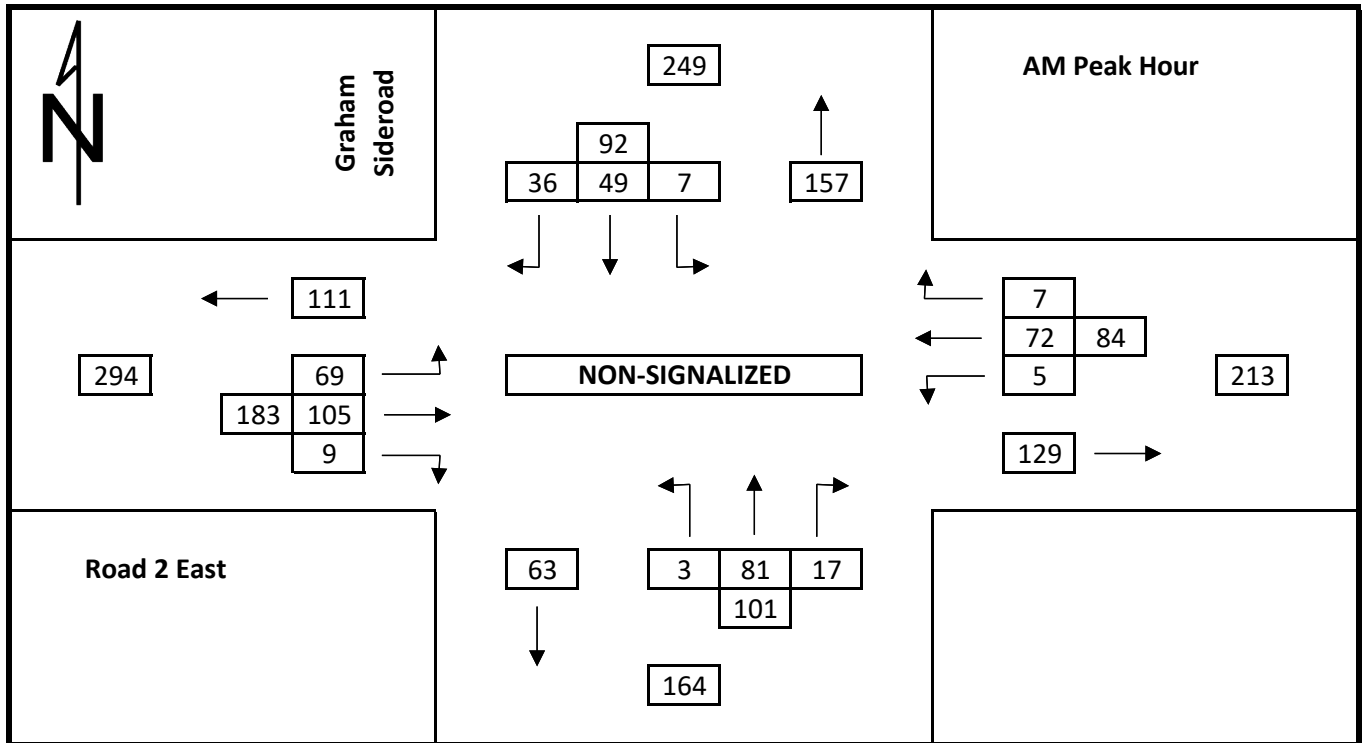
Observed Traffic Counts

Graham Sideroad at Road 2 East

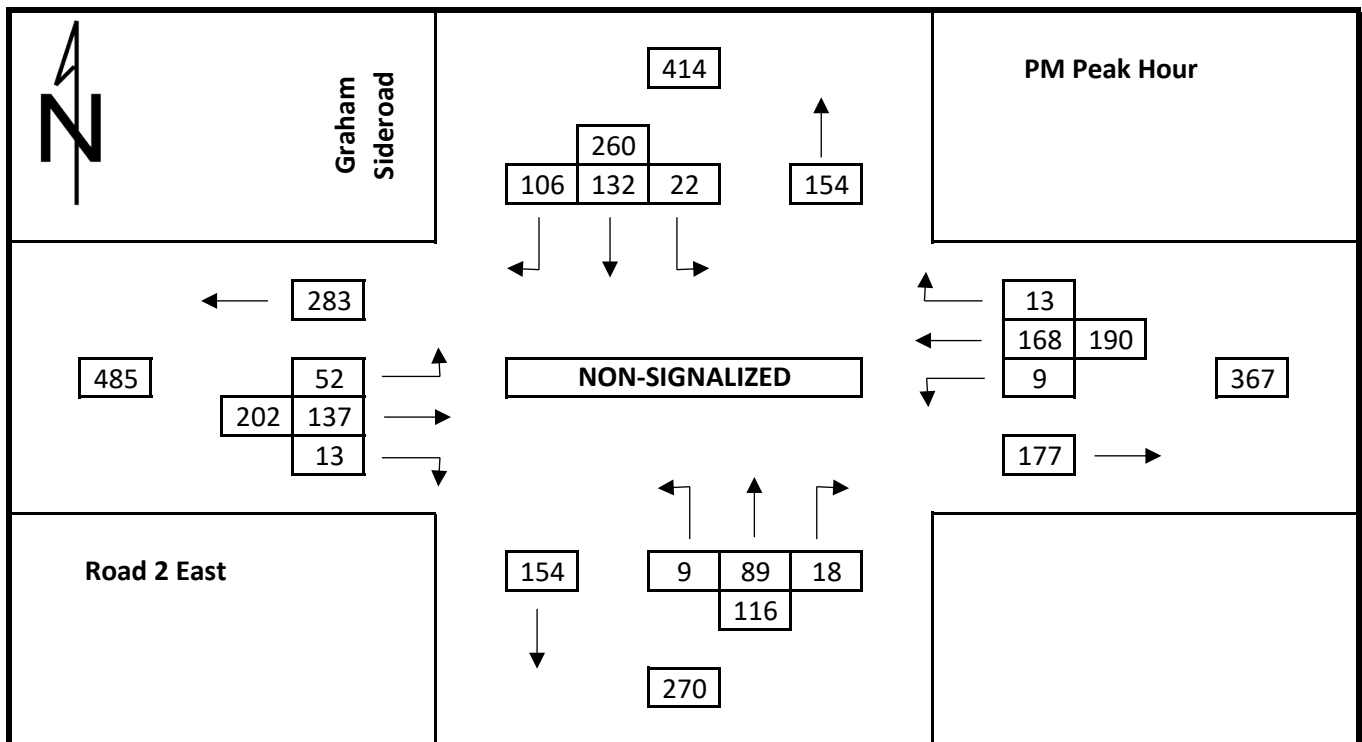
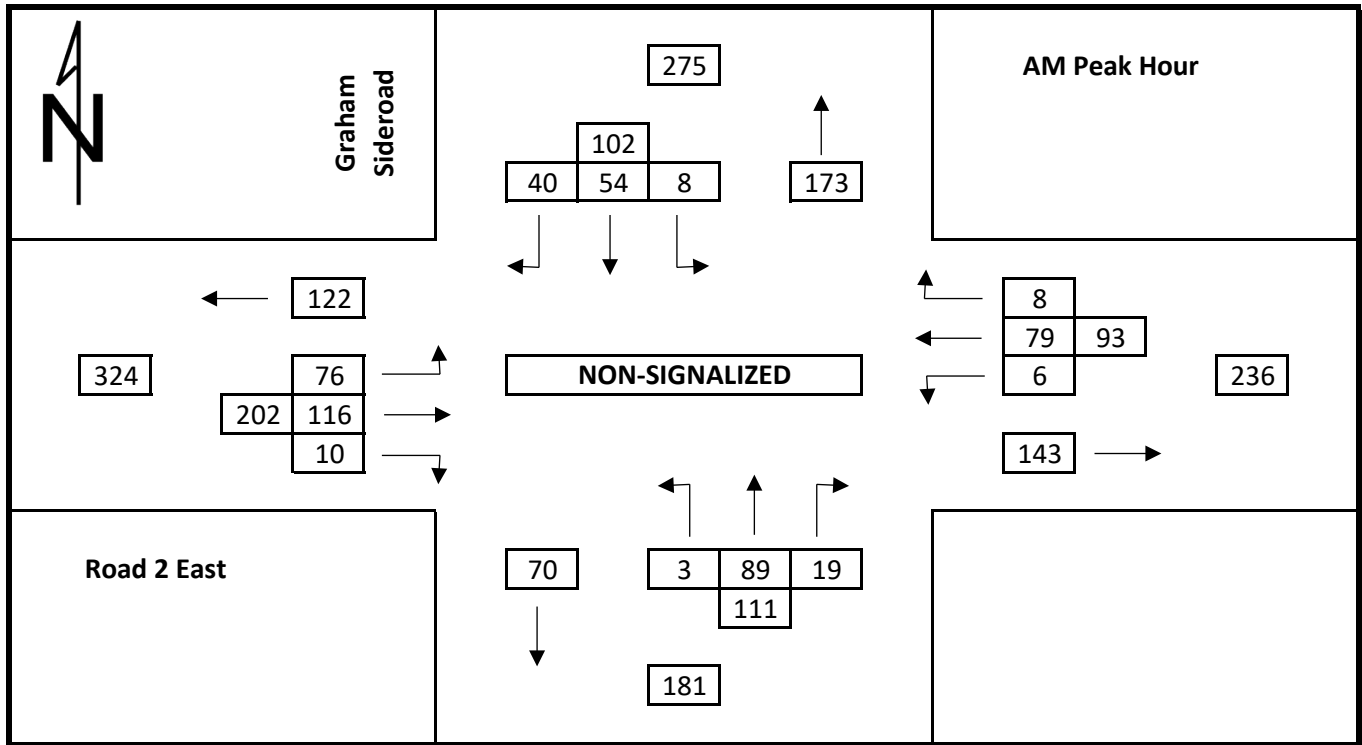


Factored Traffic Counts

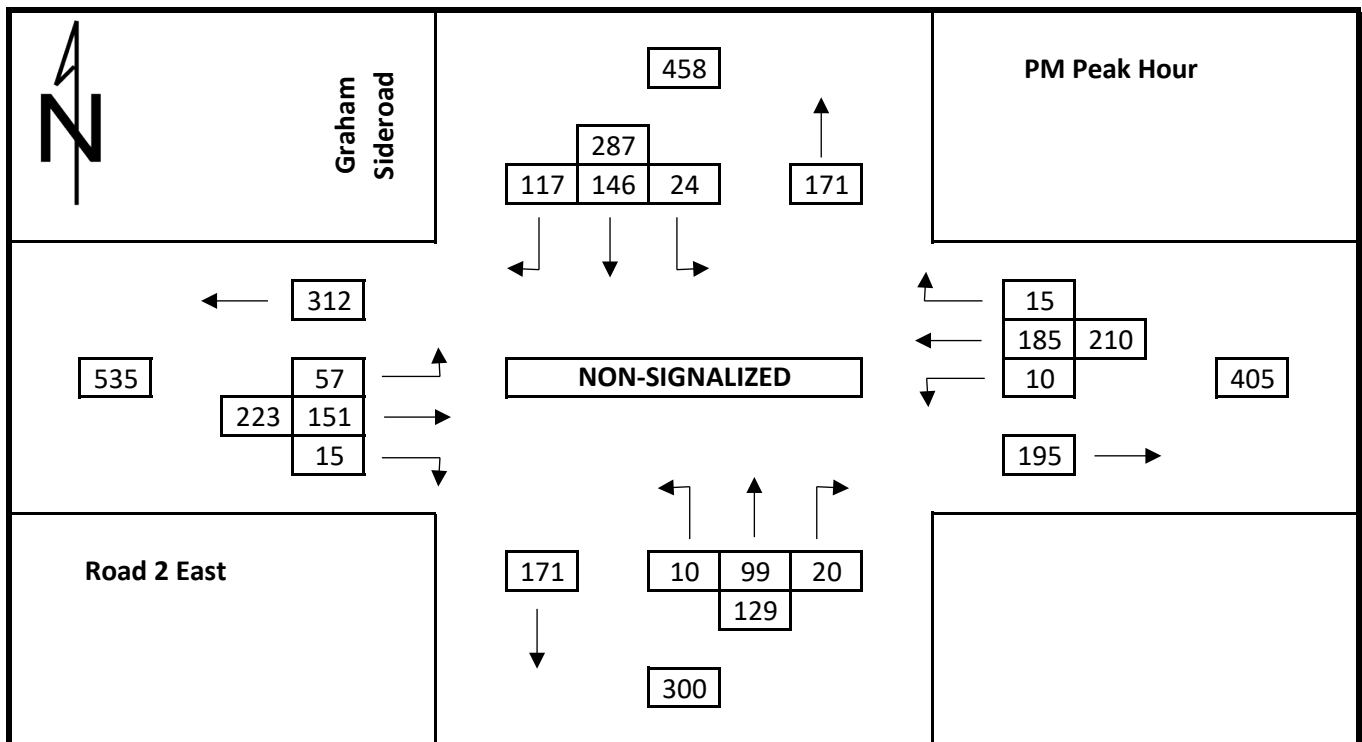
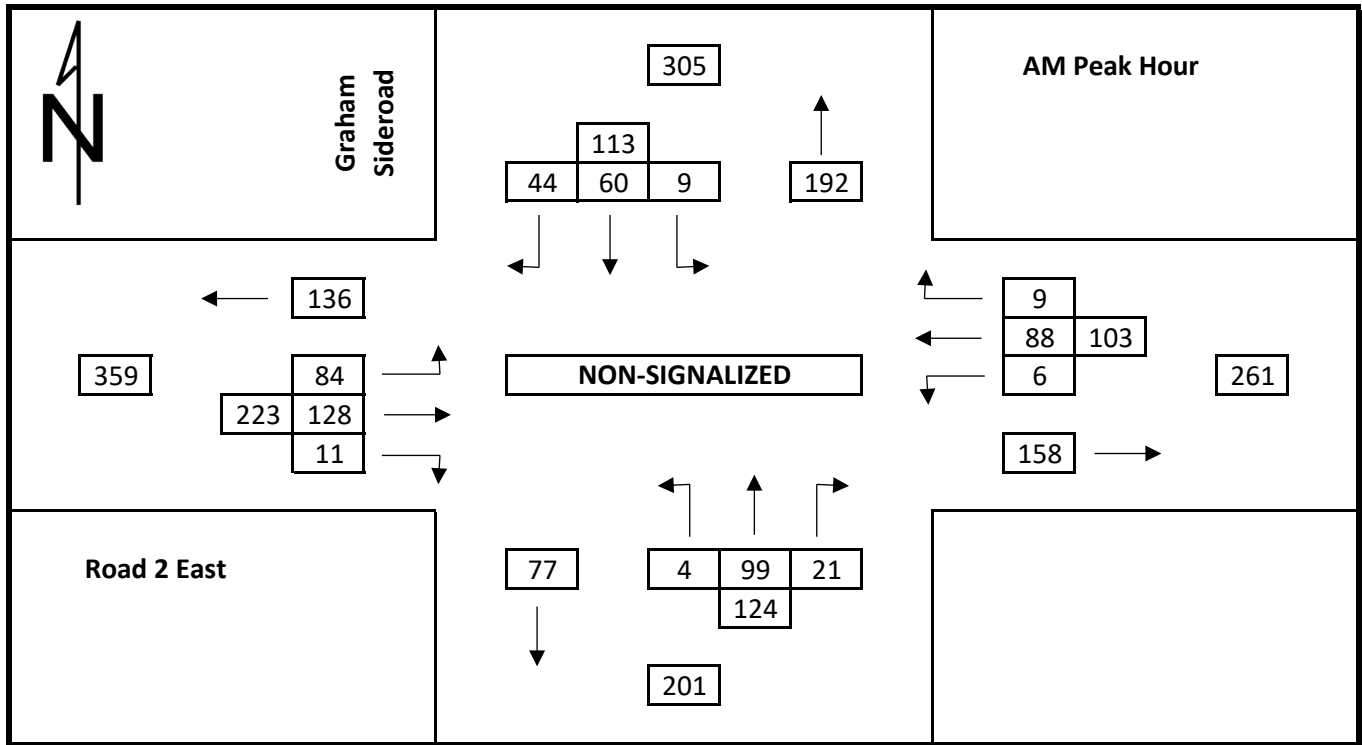
Graham Sideroad at Road 2 East



Total Traffic 2025
Graham Sideroad at Road 2 East

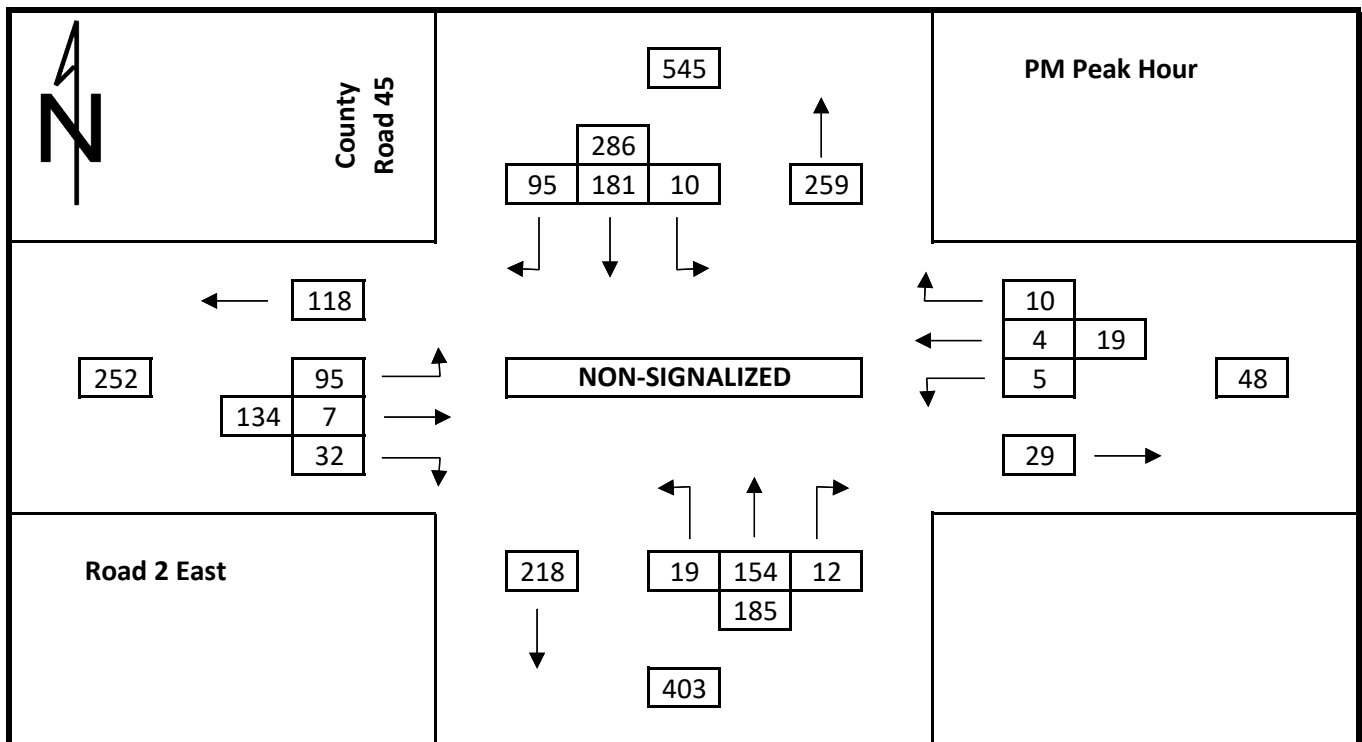
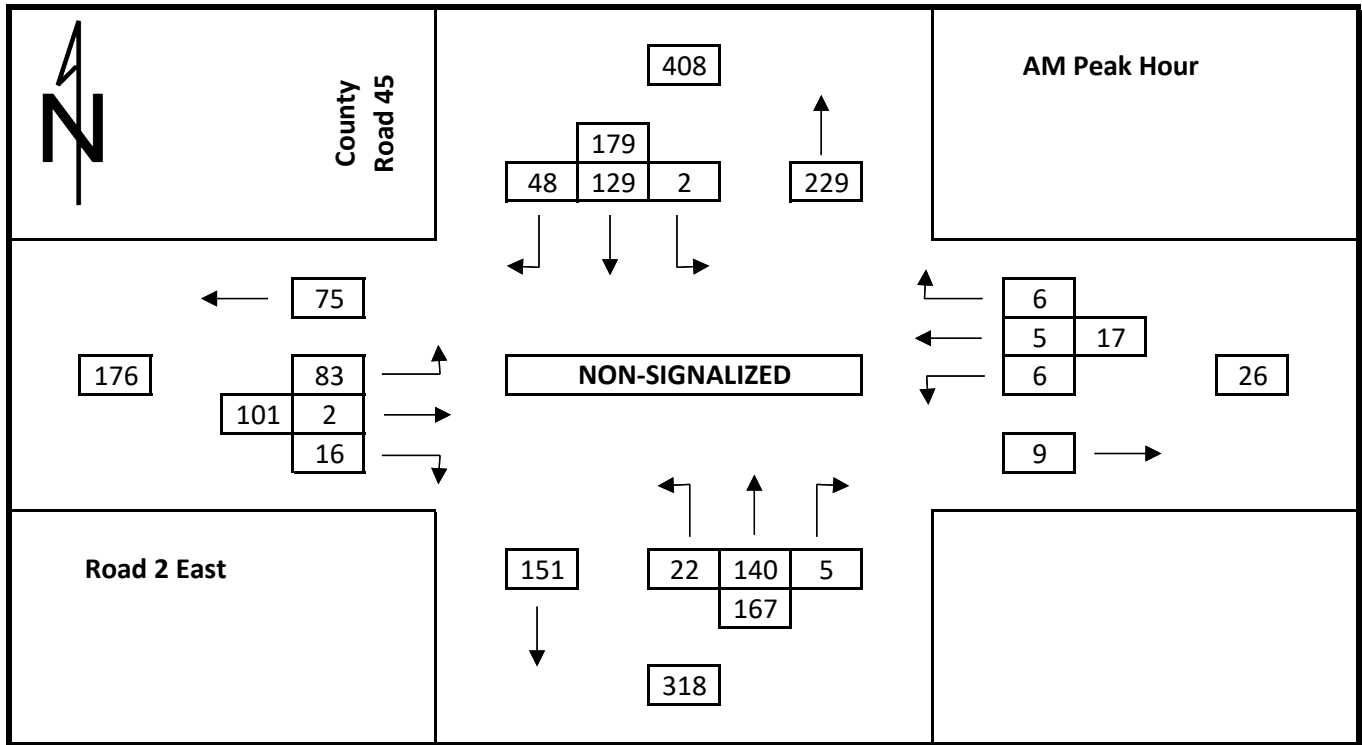


Total Traffic 2030
Graham Sideroad at Road 2 East



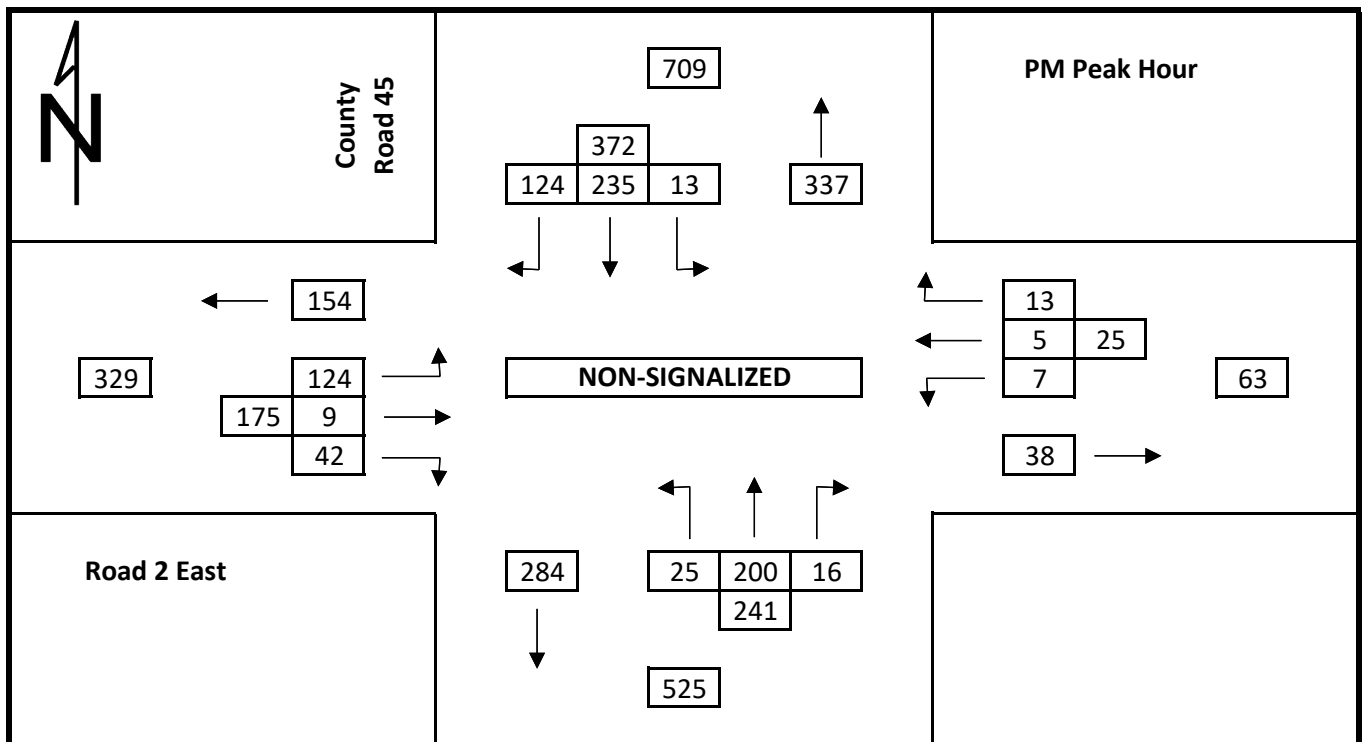
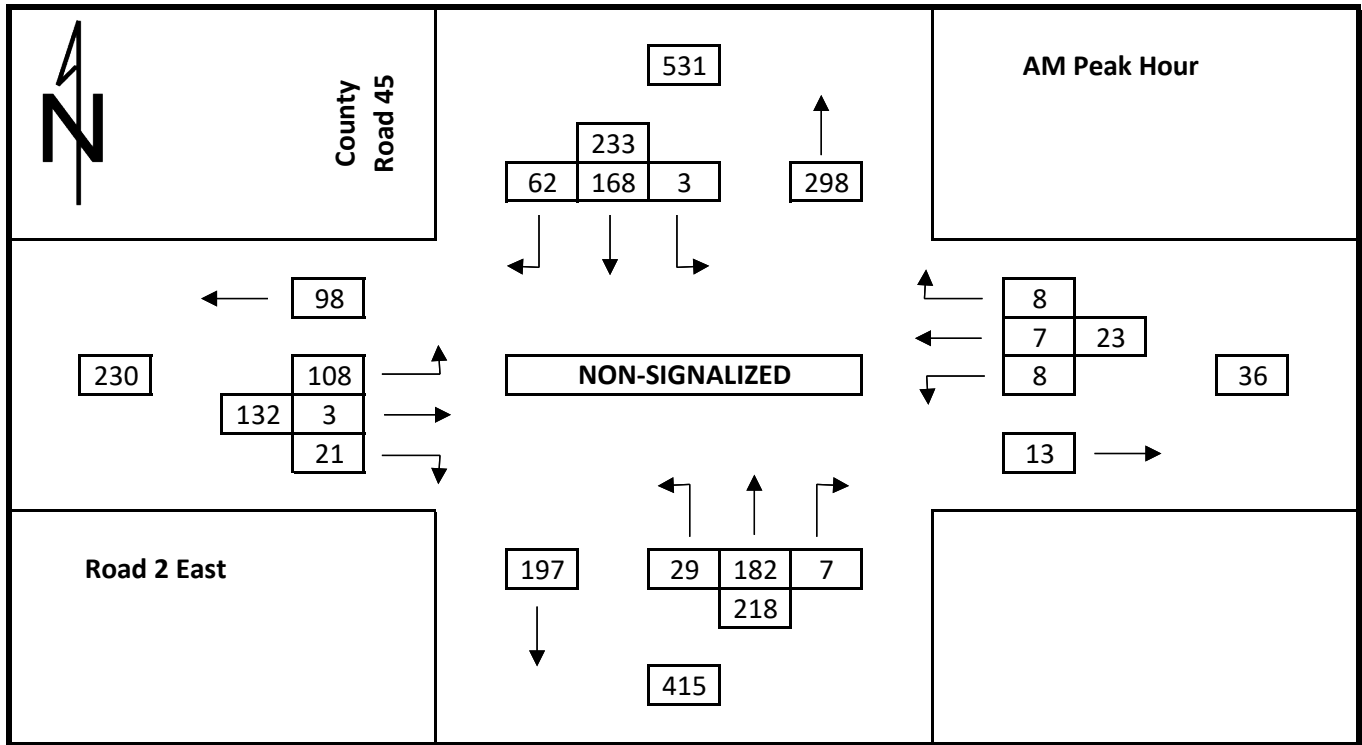
Observed Traffic Counts

County Road 45 at Road 2 East

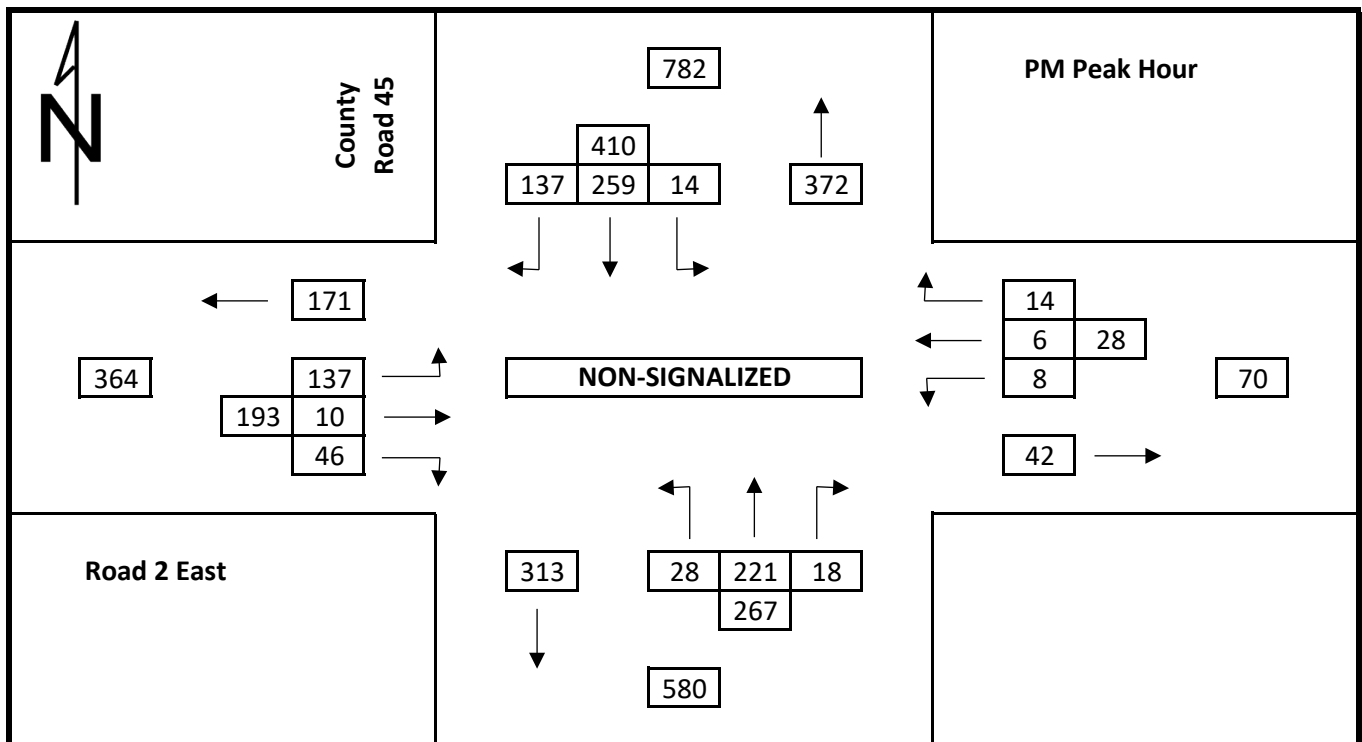
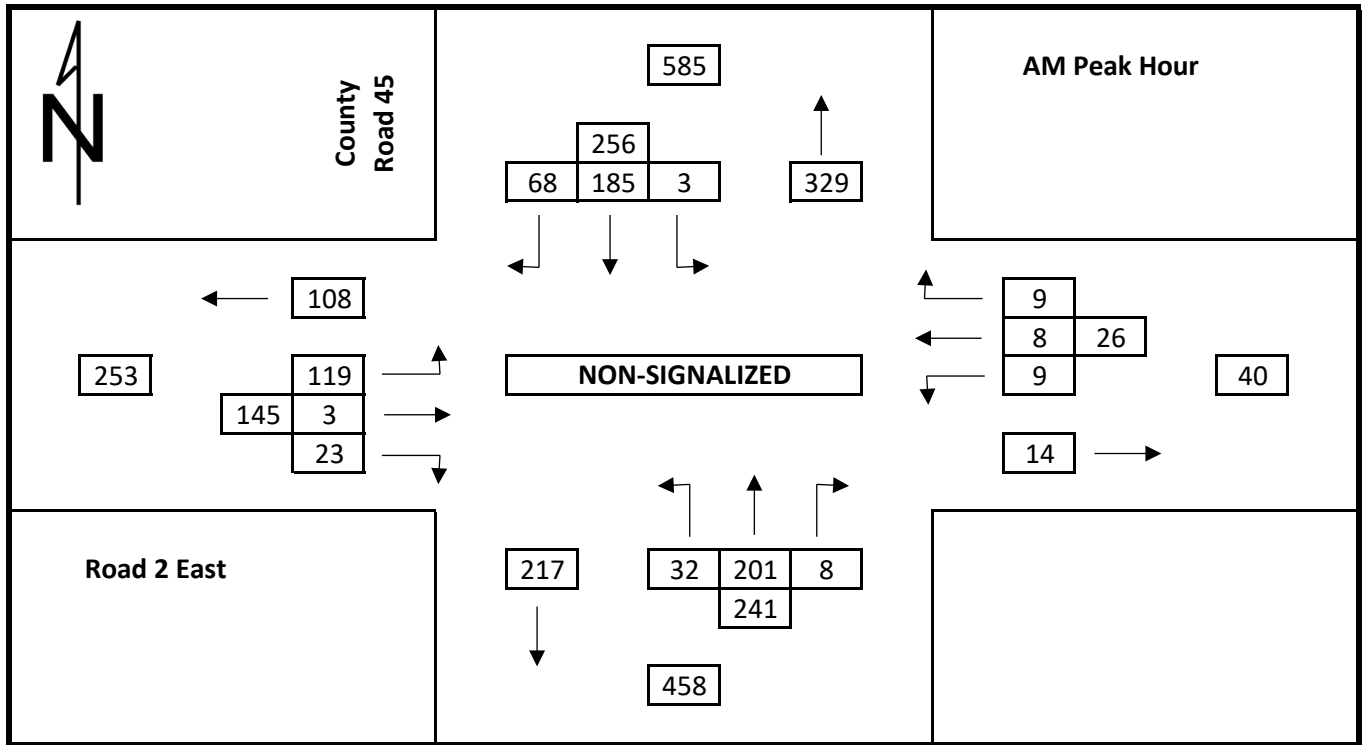


Factored Traffic Counts

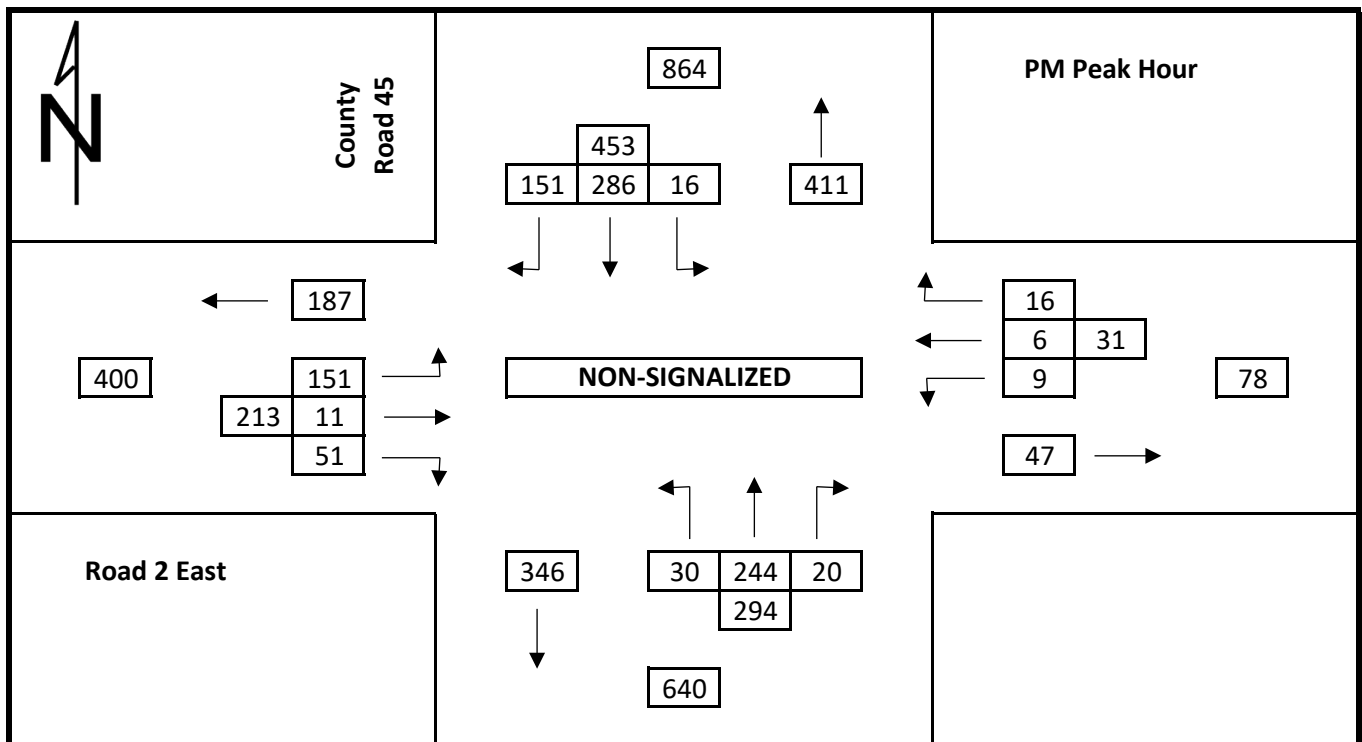
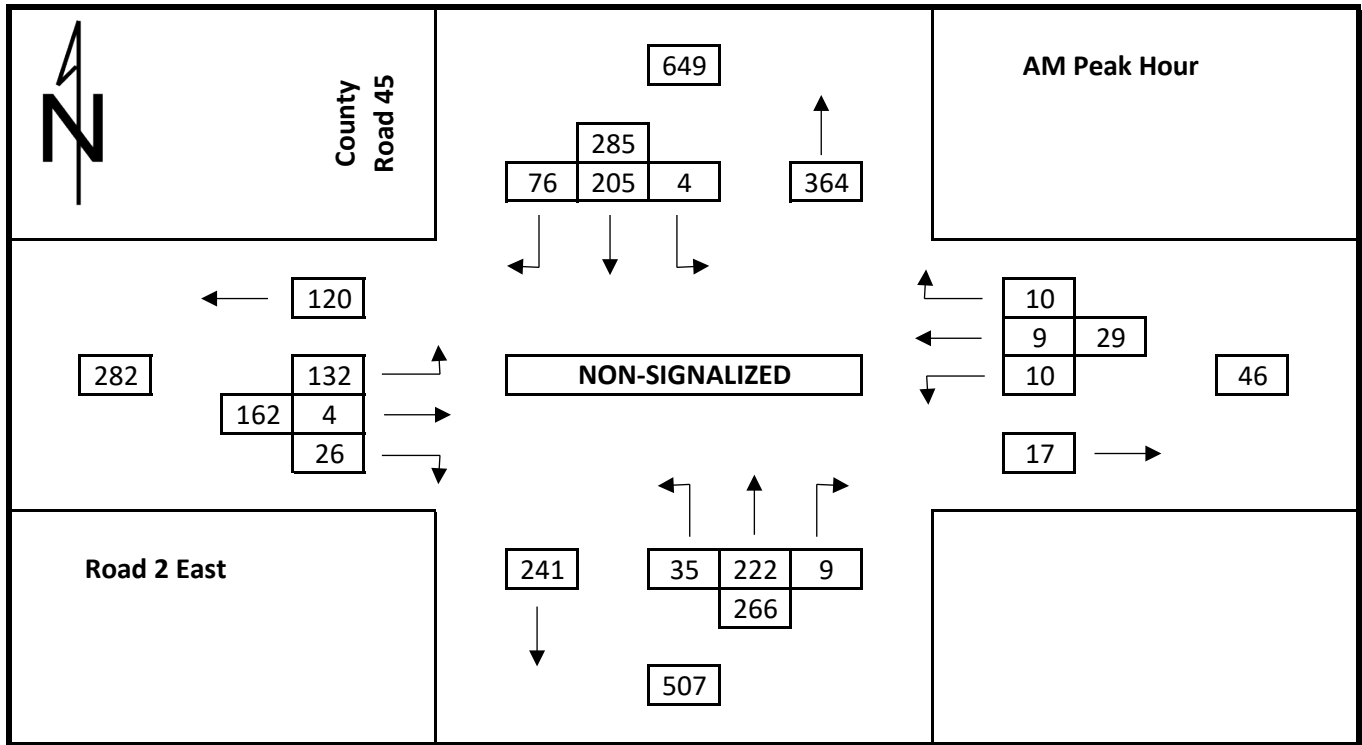
County Road 45 at Road 2 East



Total Traffic 2025
County Road 45 at Road 2 East



Total Traffic 2030
County Road 45 at Road 2 East



Appendix D

DETAILED SYNCHRO RESULTS

Jasperson Drive at Road 2 East




Kratz Sideroad at Road 2 East

Graham Sideroad at Road 2 East

County Road 45 (Union Avenue) at Road 2 East

Intersection




Int Delay, s/veh 3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	139	40	49	67	46	50
Future Vol, veh/h	139	40	49	67	46	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	5	2	9	2	4
Mvmt Flow	151	43	53	73	50	54

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	194
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1379
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1379
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	EB	WB	NB
HCM Control Delay, s	0	3.3	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	727	-	-	1379	-
HCM Lane V/C Ratio	0.144	-	-	0.039	-
HCM Control Delay (s)	10.8	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection						
Int Delay, s/veh	3.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	80	96	94	175	59	41
Future Vol, veh/h	80	96	94	175	59	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	0	1	3	2
Mvmt Flow	87	104	102	190	64	45
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	191	0	533	139
Stage 1	-	-	-	-	139	-
Stage 2	-	-	-	-	394	-
Critical Hdwy	-	-	4.1	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.2	-	3.527	3.318
Pot Cap-1 Maneuver	-	-	1395	-	506	909
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	679	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1395	-	465	909
Mov Cap-2 Maneuver	-	-	-	-	465	-
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	623	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.7		12.6	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	581	-	-	1395	-	
HCM Lane V/C Ratio	0.187	-	-	0.073	-	
HCM Control Delay (s)	12.6	-	-	7.8	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.7	-	-	0.2	-	

Intersection




Int Delay, s/veh 3.7




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	153	44	54	74	51	55
Future Vol, veh/h	153	44	54	74	51	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	5	2	9	2	4
Mvmt Flow	166	48	59	80	55	60




Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	214
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1356
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1356
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-




Approach	EB	WB	NB
HCM Control Delay, s	0	3.3	11.2
HCM LOS			B





Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	699	-	-	1356	-
HCM Lane V/C Ratio	0.165	-	-	0.043	-
HCM Control Delay (s)	11.2	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-




Intersection						
Int Delay, s/veh	3.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	88	106	104	193	65	45
Future Vol, veh/h	88	106	104	193	65	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	0	1	3	2
Mvmt Flow	96	115	113	210	71	49
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	211	0	590	154
Stage 1	-	-	-	-	154	-
Stage 2	-	-	-	-	436	-
Critical Hdwy	-	-	4.1	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.2	-	3.527	3.318
Pot Cap-1 Maneuver	-	-	1372	-	469	892
Stage 1	-	-	-	-	872	-
Stage 2	-	-	-	-	650	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1372	-	425	892
Mov Cap-2 Maneuver	-	-	-	-	425	-
Stage 1	-	-	-	-	872	-
Stage 2	-	-	-	-	590	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.8		13.5	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	541	-	-	1372	-	
HCM Lane V/C Ratio	0.221	-	-	0.082	-	
HCM Control Delay (s)	13.5	-	-	7.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.8	-	-	0.3	-	





Intersection						
Int Delay, s/veh	3.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	169	49	60	82	56	61
Future Vol, veh/h	169	49	60	82	56	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	5	2	9	2	4
Mvmt Flow	184	53	65	89	61	66
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	237	0	430	211
Stage 1	-	-	-	-	211	-
Stage 2	-	-	-	-	219	-
Critical Hdwy	-	-	4.12	-	6.42	6.24
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.336
Pot Cap-1 Maneuver	-	-	1330	-	582	824
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	817	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1330	-	552	824
Mov Cap-2 Maneuver	-	-	-	-	552	-
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	775	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		3.3		11.7	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	667	-	-	1330	-	
HCM Lane V/C Ratio	0.191	-	-	0.049	-	
HCM Control Delay (s)	11.7	-	-	7.8	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.7	-	-	0.2	-	




Intersection						
Int Delay, s/veh	4.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	98	117	115	213	72	50
Future Vol, veh/h	98	117	115	213	72	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	0	1	3	2
Mvmt Flow	107	127	125	232	78	54
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	234	0	653	171
Stage 1	-	-	-	-	171	-
Stage 2	-	-	-	-	482	-
Critical Hdwy	-	-	4.1	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.2	-	3.527	3.318
Pot Cap-1 Maneuver	-	-	1345	-	430	873
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	619	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1345	-	384	873
Mov Cap-2 Maneuver	-	-	-	-	384	-
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	553	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.8		14.8	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	498	-	-	1345	-	
HCM Lane V/C Ratio	0.266	-	-	0.093	-	
HCM Control Delay (s)	14.8	-	-	8	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	1.1	-	-	0.3	-	





Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	156	35	21	94	22	34
Future Vol, veh/h	156	35	21	94	22	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	2	3	2	2
Mvmt Flow	170	38	23	102	24	37
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	208	0	337	189
Stage 1	-	-	-	-	189	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1363	-	658	853
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1363	-	646	853
Mov Cap-2 Maneuver	-	-	-	-	646	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	864	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.4		10.2	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	758	-	-	1363	-	
HCM Lane V/C Ratio	0.08	-	-	0.017	-	
HCM Control Delay (s)	10.2	-	-	7.7	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	

Intersection						
Int Delay, s/veh	2.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	114	52	64	228	57	18
Future Vol, veh/h	114	52	64	228	57	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	2	3	2	2
Mvmt Flow	124	57	70	248	62	20
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	181	0	541	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	388	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1394	-	502	893
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	686	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1394	-	473	893
Mov Cap-2 Maneuver	-	-	-	-	473	-
Stage 1	-	-	-	-	875	-
Stage 2	-	-	-	-	646	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.7		12.7	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	473	893	-	-	1394	-
HCM Lane V/C Ratio	0.131	0.022	-	-	0.05	-
HCM Control Delay (s)	13.8	9.1	-	-	7.7	0
HCM Lane LOS	B	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0.2	-

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	172	39	23	104	24	38
Future Vol, veh/h	172	39	23	104	24	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	2	3	2	2
Mvmt Flow	187	42	25	113	26	41
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	229	0	371	208
Stage 1	-	-	-	-	208	-
Stage 2	-	-	-	-	163	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1339	-	630	832
Stage 1	-	-	-	-	827	-
Stage 2	-	-	-	-	866	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1339	-	617	832
Mov Cap-2 Maneuver	-	-	-	-	617	-
Stage 1	-	-	-	-	827	-
Stage 2	-	-	-	-	849	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.4		10.4	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	733	-	-	1339	-	
HCM Lane V/C Ratio	0.092	-	-	0.019	-	
HCM Control Delay (s)	10.4	-	-	7.7	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	126	57	71	252	63	20
Future Vol, veh/h	126	57	71	252	63	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	2	3	2	2
Mvmt Flow	137	62	77	274	68	22
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	199	0	596	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	428	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1373	-	466	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	657	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1373	-	435	876
Mov Cap-2 Maneuver	-	-	-	-	435	-
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	614	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.7		13.5	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	435	876	-	-	1373	-
HCM Lane V/C Ratio	0.157	0.025	-	-	0.056	-
HCM Control Delay (s)	14.8	9.2	-	-	7.8	0
HCM Lane LOS	B	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.2	-

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	190	43	26	115	27	41
Future Vol, veh/h	190	43	26	115	27	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	2	3	2	2
Mvmt Flow	207	47	28	125	29	45
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	254	0	412	231
Stage 1	-	-	-	-	231	-
Stage 2	-	-	-	-	181	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1311	-	596	808
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	850	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1311	-	582	808
Mov Cap-2 Maneuver	-	-	-	-	582	-
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	830	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.4		10.7	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	700	-	-	1311	-	
HCM Lane V/C Ratio	0.106	-	-	0.022	-	
HCM Control Delay (s)	10.7	-	-	7.8	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-	

Intersection						
Int Delay, s/veh	3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	139	63	78	278	69	22
Future Vol, veh/h	139	63	78	278	69	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	1	2	3	2	2
Mvmt Flow	151	68	85	302	75	24
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	219	0	657	185
Stage 1	-	-	-	-	185	-
Stage 2	-	-	-	-	472	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1350	-	430	857
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	628	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1350	-	397	857
Mov Cap-2 Maneuver	-	-	-	-	397	-
Stage 1	-	-	-	-	847	-
Stage 2	-	-	-	-	580	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.7		14.5	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	397	857	-	-	1350	-
HCM Lane V/C Ratio	0.189	0.028	-	-	0.063	-
HCM Control Delay (s)	16.2	9.3	-	-	7.8	0
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0.2	-

Intersection															
Int Delay, s/veh 6.4															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations															
Traffic Vol, veh/h	69	105	9	5	72	7	3	81	17	7	49	36			
Future Vol, veh/h	69	105	9	5	72	7	3	81	17	7	49	36			
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0			
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop			
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None			
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-			
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-			
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-			
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92			
Heavy Vehicles, %	5	2	3	12	1	4	5	1	0	5	1	5			
Mvmt Flow	75	114	10	5	78	8	3	88	18	8	53	39			

Major/Minor Stage	Major1	Major2	Major2	Minor1	Minor2									
Stage 1	86	0	0	124	0	0	407	365	119	414	366	82		
Stage 2	-	-	-	-	-	-	269	269	-	92	92	-		
Stage 3	-	-	-	-	-	-	138	96	-	322	274	-		
Critical Hdwy	4.15	-	-	4.22	-	-	7.15	6.51	6.2	7.15	6.51	6.25		
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-		
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-		
Follow-up Hdwy	2.245	-	-	2.308	-	-	3.545	4.009	3.3	3.545	4.009	3.345		
Stage 4-1 Maneuver	1492	-	-	1403	-	-	549	565	938	543	564	969		
Stage 5	-	-	-	-	-	-	730	688	-	908	821	-		
Stage 6	-	-	-	-	-	-	858	817	-	684	685	-		
Platoon blocked, %	-	-	-	-	-	-								
Stage 7-1 Maneuver	1492	-	-	1403	-	-	465	532	938	445	531	969		
Stage 7-2 Maneuver	-	-	-	-	-	-	465	532	-	445	531	-		
Stage 8	-	-	-	-	-	-	691	651	-	859	818	-		
Stage 9	-	-	-	-	-	-	767	814	-	549	648	-		

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.8	0.5	12.8	11.7
HCM LOS	B			

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	571	1492	-	-	1403	-	-	634
HCM Lane V/C Ratio	0.192	0.05	-	-	0.004	-	-	0.158
HCM Control Delay (s)	12.8	7.5	0	-	7.6	0	-	11.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.7	0.2	-	-	0	-	-	0.6

Graham Sideroad at Road 2 East
Kingsville, Ontario

Factored Traffic, PM Peak
Existing Geometric Configuration

Intersection													
Int Delay, s/veh 8.2													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Vol, veh/h	47	124	12	8	152	12	8	81	16	20	120	96	↕↕
Future Vol, veh/h	47	124	12	8	152	12	8	81	16	20	120	96	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-	
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92	
Heavy Vehicles, %	5	2	3	12	1	4	5	1	0	5	1	5	
Mvmt Flow	51	135	13	9	165	13	9	88	17	22	130	104	
Major/Minor	Major1	Major2			Minor1			Minor2					
Stage 1	178	0	0	148	0	0	551	440	142	486	440	172	
Stage 2	-	-	-	-	-	-	244	244	-	190	190	-	
Stage 3	-	-	-	-	-	-	307	196	-	296	250	-	
Critical Hdwy	4.15	-	-	4.22	-	-	7.15	6.51	6.2	7.15	6.51	6.25	
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-	
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-	
Stage 4 - Up Hdwy	2.245	-	-	2.308	-	-	3.545	4.009	3.3	3.545	4.009	3.345	
Stage 5 - 1st Lane	1380	-	-	1375	-	-	440	513	911	487	513	864	
Stage 6 - 1st Lane	-	-	-	-	-	-	753	706	-	805	745	-	
Platoon blocked, %	-	-	-	-	-	-	696	740	-	706	702	-	
Stage 7 - 1st Lane	1380	-	-	1375	-	-	297	489	911	397	489	864	
Stage 8 - 2nd Lane	-	-	-	-	-	-	297	489	-	397	489	-	
Stage 9 - 3rd Lane	-	-	-	-	-	-	723	678	-	773	740	-	
Stage 10 - 4th Lane	-	-	-	-	-	-	501	735	-	578	674	-	
Approach	EB	WB			NB			SB					
HCM Control Delay, s	2	0.4			14.3			16					
HCM LOS		B			B			C					
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	500	1380	-	-	1375	-	-	580					
HCM Lane V/C Ratio	0.228	0.037	-	-	0.006	-	-	0.442					
HCM Control Delay (s)	14.3	7.7	0	-	7.6	0	-	16					
HCM Lane LOS	B	A	A	-	A	A	-	C					
HCM 95th %tile Q(veh)	0.9	0.1	-	-	0	-	-	2.3					

Graham Sideroad at Road 2 East
Kingsville, Ontario

Total Traffic 2025 AM Peak
Existing Geometric Configuration

Intersection																
Int Delay, s/veh		6.7														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	76	116	10	6	79	8	3	89	19	8	54	40				
Future Vol, veh/h	76	116	10	6	79	8	3	89	19	8	54	40				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	5	2	3	12	1	4	5	1	0	5	1	5				
Mvmt Flow	83	126	11	7	86	9	3	97	21	9	59	43				

Major/Minor	Major1	Major2	Minor1	Minor2												
Stage 1	95	0	0	137	0	0	454	407	132	462	408	91				
Stage 2	-	-	-	-	-	-	298	298	-	105	105	-				
Stage 3	-	-	-	-	-	-	156	109	-	357	303	-				
Critical Hdwy	4.15	-	-	4.22	-	-	7.15	6.51	6.2	7.15	6.51	6.25				
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-				
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-				
Stage 4	2.245	-	-	2.308	-	-	3.545	4.009	3.3	3.545	4.009	3.345				
Stage 5	1480	-	-	1388	-	-	511	535	923	505	534	958				
Stage 6	-	-	-	-	-	-	704	669	-	893	810	-				
Stage 7	-	-	-	-	-	-	839	807	-	655	665	-				
Platoon blocked, %	-	-	-	-	-	-										
Stage 8	1480	-	-	1388	-	-	422	500	923	400	499	958				
Stage 9	-	-	-	-	-	-	422	500	-	400	499	-				
Stage 10	-	-	-	-	-	-	661	628	-	839	806	-				
Stage 11	-	-	-	-	-	-	739	803	-	509	624	-				

Approach	EB	WB	NB	SB												
HCM Control Delay, s	2.9	0.5	13.6	12.4												
HCM LOS					B				B							

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1								
Capacity (veh/h)	540	1480	-	-	1388	-	-	600								
HCM Lane V/C Ratio	0.223	0.056	-	-	0.005	-	-	0.185								
HCM Control Delay (s)	13.6	7.6	0	-	7.6	0	-	12.4								
HCM Lane LOS	B	A	A	-	A	A	-	B								
HCM 95th %tile Q(veh)	0.8	0.2	-	-	0	-	-	0.7								

Graham Sideroad at Road 2 East
Kingsville, Ontario

Total Traffic 2025, PM Peak
Existing Geometric Configuration

Intersection												
Int Delay, s/veh		9.3										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	52	137	13	9	168	13	9	89	18	22	132	106
Future Vol, veh/h	52	137	13	9	168	13	9	89	18	22	132	106
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	2	3	12	1	4	5	1	0	5	1	5
Mvmt Flow	57	149	14	10	183	14	10	97	20	24	143	115
Major/Minor	Major1	Major2	Major1		Minor1		Minor2					
Stage 1	197	0	0	163	0	0	609	487	156	539	487	190
Stage 2	-	-	-	-	-	-	270	270	-	210	210	-
Stage 3	-	-	-	-	-	-	339	217	-	329	277	-
Critical Hdwy	4.15	-	-	4.22	-	-	7.15	6.51	6.2	7.15	6.51	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-
Stage 4 Up Hdwy	2.245	-	-	2.308	-	-	3.545	4.009	3.3	3.545	4.009	3.345
Stage 4-1 Maneuver	1358	-	-	1357	-	-	403	482	895	449	482	844
Stage 4-2	-	-	-	-	-	-	729	688	-	785	730	-
Platoon blocked, %	-	-	-	-	-	-	669	725	-	678	683	-
Stage 5-1 Maneuver	1358	-	-	1357	-	-	253	456	895	353	456	844
Stage 5-2	-	-	-	-	-	-	253	456	-	353	456	-
Stage 6	-	-	-	-	-	-	695	656	-	749	724	-
Stage 6-1	-	-	-	-	-	-	459	719	-	539	652	-
Approach	EB	WB		NB		SB						
HCM Control Delay, s	2	0.4		15.7		18.5						
HCM LOS			C		C							
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	462	1358	-	-	1357	-	-	545				
HCM Lane V/C Ratio	0.273	0.042	-	-	0.007	-	-	0.519				
HCM Control Delay (s)	15.7	7.8	0	-	7.7	0	-	18.5				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.1	0.1	-	-	0	-	-	3				

Graham Sideroad at Road 2 East
Kingsville, Ontario

Total Traffic 2030 AM Peak
Existing Geometric Configuration

Intersection																
Int Delay, s/veh 7.1																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	84	128	11	6	88	9	4	99	21	9	60	44				
Future Vol, veh/h	84	128	11	6	88	9	4	99	21	9	60	44				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	5	2	3	12	1	4	5	1	0	5	1	5				
Mvmt Flow	91	139	12	7	96	10	4	108	23	10	65	48				

Major/Minor	Major1	Major2	Minor1	Minor2												
Stage 1	106	0	0	151	0	0	499	447	145	508	448	101				
Stage 2	-	-	-	-	-	-	327	327	-	115	115	-				
Stage 3	-	-	-	-	-	-	172	120	-	393	333	-				
Critical Hdwy	4.15	-	-	4.22	-	-	7.15	6.51	6.2	7.15	6.51	6.25				
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-				
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-				
Stage 4	2.245	-	-	2.308	-	-	3.545	4.009	3.3	3.545	4.009	3.345				
Stage 5	1467	-	-	1371	-	-	477	508	908	471	507	946				
Stage 6	-	-	-	-	-	-	679	650	-	883	802	-				
Stage 7	-	-	-	-	-	-	823	798	-	626	646	-				
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-				
Stage 8	1467	-	-	1371	-	-	383	471	908	358	470	946				
Stage 9	-	-	-	-	-	-	383	471	-	358	470	-				
Stage 10	-	-	-	-	-	-	633	606	-	823	798	-				
Stage 11	-	-	-	-	-	-	714	794	-	468	602	-				

Approach	EB	WB	NB	SB												
HCM Control Delay, s	2.9	0.4	14.6	13.1												
HCM LOS					B				B							

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1								
Capacity (veh/h)	509	1467	-	-	1371	-	-	567								
HCM Lane V/C Ratio	0.265	0.062	-	-	0.005	-	-	0.217								
HCM Control Delay (s)	14.6	7.6	0	-	7.6	0	-	13.1								
HCM Lane LOS	B	A	A	-	A	A	-	B								
HCM 95th %tile Q(veh)	1.1	0.2	-	-	0	-	-	0.8								

Graham Sideroad at Road 2 East
Kingsville, Ontario

Total Traffic 2030, PM Peak
Existing Geometric Configuration

Intersection																	
Int Delay, s/veh		10.9															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR					
Lane Configurations																	
Traffic Vol, veh/h	57	151	15	10	185	15	10	99	20	24	146	117					
Future Vol, veh/h	57	151	15	10	185	15	10	99	20	24	146	117					
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0					
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop					
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None					
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-					
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-					
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-					
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92					
Heavy Vehicles, %	5	2	3	12	1	4	5	1	0	5	1	5					
Mvmt Flow	62	164	16	11	201	16	11	108	22	26	159	127					
Major/Minor Stage	Major1	Major2	Minor1				Minor2										
Stage 1	217	0	0	180	0	0	670	535	172	592	535	209					
Stage 2	-	-	-	-	-	-	296	296	-	231	231	-					
Stage 3	-	-	-	-	-	-	374	239	-	361	304	-					
Critical Hdwy	4.15	-	-	4.22	-	-	7.15	6.51	6.2	7.15	6.51	6.25					
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-					
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.51	-	6.15	5.51	-					
Stage 4	2.245	-	-	2.308	-	-	3.545	4.009	3.3	3.545	4.009	3.345					
Stage 5	1335	-	-	1337	-	-	367	453	877	414	453	824					
Stage 6	-	-	-	-	-	-	706	670	-	765	715	-					
Stage 7	-	-	-	-	-	-	641	709	-	651	665	-					
Platoon blocked, %	-	-	-	-	-	-											
Stage 8	1335	-	-	1337	-	-	211	425	877	311	425	824					
Stage 9	-	-	-	-	-	-	211	425	-	311	425	-					
Stage 10	-	-	-	-	-	-	669	635	-	725	709	-					
Stage 11	-	-	-	-	-	-	417	703	-	500	630	-					
Approach	EB	WB	NB				SB										
HCM Control Delay, s	2	0.4	17.5				22.5										
HCM LOS					C				C								
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1									
Capacity (veh/h)	426	1335	-	-	1337	-	-	510									
HCM Lane V/C Ratio	0.329	0.046	-	-	0.008	-	-	0.612									
HCM Control Delay (s)	17.5	7.8	0	-	7.7	0	-	22.5									
HCM Lane LOS	C	A	A	-	A	A	-	C									
HCM 95th %tile Q(veh)	1.4	0.1	-	-	0	-	-	4.1									

Intersection																
Int Delay, s/veh		4.2														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	108	3	21	8	7	8	29	182	7	3	168	62				
Future Vol, veh/h	108	3	21	8	7	8	29	182	7	3	168	62				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1				
Mvmt Flow	117	3	23	9	8	9	32	198	8	3	183	67				

Major/Minor Stage	Minor2			Minor1			Major1			Major2		
Staging	498	493	217	502	522	202	250	0	0	206	0	0
Staging	223	223	-	266	266	-	-	-	-	-	-	-
Staging	275	270	-	236	256	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17	-	-
Critical Hdwy Sig 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-
Critical Hdwy Sig 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-
Stage 1 Up Hdwy	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263	-	-
Stage 1-1 Maneuver	483	473	818	483	454	819	1287	-	-	1336	-	-
Stage 1-2 Maneuver	780	713	-	744	681	-	-	-	-	-	-	-
Platoon blocked, %	731	680	-	772	688	-	-	-	-	-	-	-
Stage 1-1 Maneuver	460	458	818	456	440	819	1287	-	-	1336	-	-
Stage 1-2 Maneuver	460	458	-	456	440	-	-	-	-	-	-	-
Stage 1-3 Maneuver	758	711	-	723	662	-	-	-	-	-	-	-
Stage 1-4 Maneuver	695	661	-	745	686	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.2	12.1	1	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WB Ln1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	494	532	1336	-
HCM Lane V/C Ratio	0.024	-	-	0.29	0.047	0.002	-
HCM Control Delay (s)	7.9	0	-	15.2	12.1	7.7	0
HCM Lane LOS	A	A	-	C	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	1.2	0.1	0	-

Intersection																
Int Delay, s/veh		5.3														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	124	9	42	7	5	13	25	200	16	13	235	124				
Future Vol, veh/h	124	9	42	7	5	13	25	200	16	13	235	124				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1				
Mvmt Flow	135	10	46	8	5	14	27	217	17	14	255	135				

Major/Minor Stage	Minor2	Minor1			Major1			Major2		
Stage 1	640	639	323	659	698	226	390	0	0	234
Stage 2	351	351	-	280	280	-	-	-	-	-
Stage 3	289	288	-	379	418	-	-	-	-	-
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17
Critical Hdwy Sig 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-
Critical Hdwy Sig 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-
Stage 4	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263
Stage 5	388	390	713	380	359	794	1142	-	-	1305
Stage 6	666	627	-	731	672	-	-	-	-	-
Stage 7	719	668	-	647	584	-	-	-	-	-
Platoon blocked, %										
Stage 8	365	374	713	338	344	794	1142	-	-	1305
Stage 9	365	374	-	338	344	-	-	-	-	-
Stage 10	648	618	-	711	654	-	-	-	-	-
Stage 11	681	650	-	588	576	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.9	12.9	0.9	0.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WB Ln1	SBL	SBT	SBR
Capacity (veh/h)	1142	-	-	414	484	1305	-
HCM Lane V/C Ratio	0.024	-	-	0.459	0.056	0.011	-
HCM Control Delay (s)	8.2	0	-	20.9	12.9	7.8	0
HCM Lane LOS	A	A	-	C	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	2.4	0.2	0	-

Intersection																
Int Delay, s/veh		4.6														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	119	3	23	9	8	9	32	201	8	3	185	68				
Future Vol, veh/h	119	3	23	9	8	9	32	201	8	3	185	68				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1				
Mvmt Flow	129	3	25	10	9	10	35	218	9	3	201	74				

Major/Minor Stage	Minor2	Minor1			Major1			Major2		
Stage 1	546	541	238	551	574	223	275	0	0	227
Stage 2	244	244	-	293	293	-	-	-	-	-
Stage 3	302	297	-	258	281	-	-	-	-	-
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17
Critical Hdwy Sig 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-
Critical Hdwy Sig 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-
Stage 1 up Hdwy	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263
Stage 1-1 Maneuver	448	444	796	448	424	797	1260	-	-	1312
Stage 2-1	760	699	-	719	663	-	-	-	-	-
Platoon blocked, %	707	662	-	751	671	-	-	-	-	-
Stage 1-1 Maneuver	424	428	796	420	409	797	1260	-	-	1312
Stage 2-2 Maneuver	424	428	-	420	409	-	-	-	-	-
Stage 3-1	736	697	-	696	642	-	-	-	-	-
Stage 3-2	667	641	-	722	669	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.9	12.7	1.1	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WB Ln1	SBL	SBT	SBR
Capacity (veh/h)	1260	-	-	458	497	1312	-
HCM Lane V/C Ratio	0.028	-	-	0.344	0.057	0.002	-
HCM Control Delay (s)	7.9	0	-	16.9	12.7	7.8	0
HCM Lane LOS	A	A	-	C	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	1.5	0.2	0	-

Intersection																
Int Delay, s/veh		6.5														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	137	10	46	8	6	14	28	221	18	14	259	137				
Future Vol, veh/h	137	10	46	8	6	14	28	221	18	14	259	137				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1				
Mvmt Flow	149	11	50	9	7	15	30	240	20	15	282	149				

Major/Minor Stage	Minor2	Minor1			Major1			Major2		
Staging	708	707	357	727	771	250	431	0	0	260
Flow All	387	387	-	310	310	-	-	-	-	-
	321	320	-	417	461	-	-	-	-	-
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17
Critical Hdwy Sig 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-
Critical Hdwy Sig 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-
Storage Up Hdwy	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263
Storage-1 Maneuver	350	356	683	342	326	770	1102	-	-	1276
	637	604	-	705	652	-	-	-	-	-
	691	647	-	617	559	-	-	-	-	-
Platoon blocked, %								-	-	-
Storage-1 Maneuver	326	339	683	298	311	770	1102	-	-	1276
Storage-2 Maneuver	326	339	-	298	311	-	-	-	-	-
	617	594	-	682	631	-	-	-	-	-
	649	626	-	552	550	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.4	13.9	0.9	0.3
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WB Ln1	SBL	SBT	SBR
Capacity (veh/h)	1102	-	-	373	435	1276	-
HCM Lane V/C Ratio	0.028	-	-	0.562	0.07	0.012	-
HCM Control Delay (s)	8.4	0	-	26.4	13.9	7.9	0
HCM Lane LOS	A	A	-	D	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	3.3	0.2	0	-

Intersection																
Int Delay, s/veh		5.3														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Vol, veh/h	132	4	26	10	9	10	35	222	9	4	205	76				
Future Vol, veh/h	132	4	26	10	9	10	35	222	9	4	205	76				
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free				
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None				
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-				
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-				
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-				
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92				
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1				
Mvmt Flow	143	4	28	11	10	11	38	241	10	4	223	83				

Major/Minor Stage	Minor2			Minor1			Major1			Major2						
Stage 1	606	600	265	611	636	246	306	0	0	251	0	0				
Stage 2	273	273	-	322	322	-	-	-	-	-	-	-				
Stage 3	333	327	-	289	314	-	-	-	-	-	-	-				
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17	-	-				
Critical Hdwy Sig 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-				
Critical Hdwy Sig 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-				
Stage 4	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263	-	-				
Stage 5	409	411	769	409	390	774	1227	-	-	1286	-	-				
Stage 6	733	678	-	694	644	-	-	-	-	-	-	-				
Stage 7	681	642	-	723	649	-	-	-	-	-	-	-				
Platoon blocked, %																
Stage 8	383	395	769	379	374	774	1227	-	-	1286	-	-				
Stage 9	383	395	-	379	374	-	-	-	-	-	-	-				
Stage 10	707	675	-	669	621	-	-	-	-	-	-	-				
Stage 11	637	619	-	689	646	-	-	-	-	-	-	-				

Approach	EB	WB	WB	NB	SB
HCM Control Delay, s	19.8	13.4	1.1	0.1	0.1
HCM LOS	C	B			

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WB Ln1	SBL	SBT	SBR
Capacity (veh/h)	1227	-	-	417	458	1286	-
HCM Lane V/C Ratio	0.031	-	-	0.422	0.069	0.003	-
HCM Control Delay (s)	8	0	-	19.8	13.4	7.8	0
HCM Lane LOS	A	A	-	C	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	2.1	0.2	0	-

Intersection																	
Int Delay, s/veh 8.9																	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR					
Lane Configurations																	
Traffic Vol, veh/h	151	11	51	9	6	16	30	244	20	16	286	151					
Future Vol, veh/h	151	11	51	9	6	16	30	244	20	16	286	151					
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0					
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free					
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None					
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-					
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-					
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-					
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92					
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1					
Mvmt Flow	164	12	55	10	7	17	33	265	22	17	311	164					






Major/Minor Stage	Minor2			Minor1			Major1			Major2		
Stage 1	781	780	393	803	851	276	475	0	0	287	0	0
Stage 2	427	427	-	342	342	-	-	-	-	-	-	-
Stage 3	354	353	-	461	509	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17	-	-
Critical Hdwy Sig 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-
Critical Hdwy Sig 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-
Stage 4	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263	-	-
Stage 5	312	323	652	304	293	744	1061	-	-	1247	-	-
Stage 6	606	580	-	677	631	-	-	-	-	-	-	-
Stage 7	663	626	-	584	532	-	-	-	-	-	-	-
Platoon blocked, %												
Stage 8	287	305	652	258	277	744	1061	-	-	1247	-	-
Stage 9	287	305	-	258	277	-	-	-	-	-	-	-
Stage 10	584	569	-	652	608	-	-	-	-	-	-	-
Stage 11	617	603	-	513	522	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	37.2	14.9	0.9	0.3
HCM LOS	E	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WB Ln1	SBL	SBT	SBR
Capacity (veh/h)	1061	-	-	333	397	1247	-
HCM Lane V/C Ratio	0.031	-	-	0.695	0.085	0.014	-
HCM Control Delay (s)	8.5	0	-	37.2	14.9	7.9	0
HCM Lane LOS	A	A	-	E	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	4.9	0.3	0	-

County Road 45 at Road 2 East
Kingsville, Ontario

Total Traffic 2030, PM Peak
Proposed Geometric Configuration

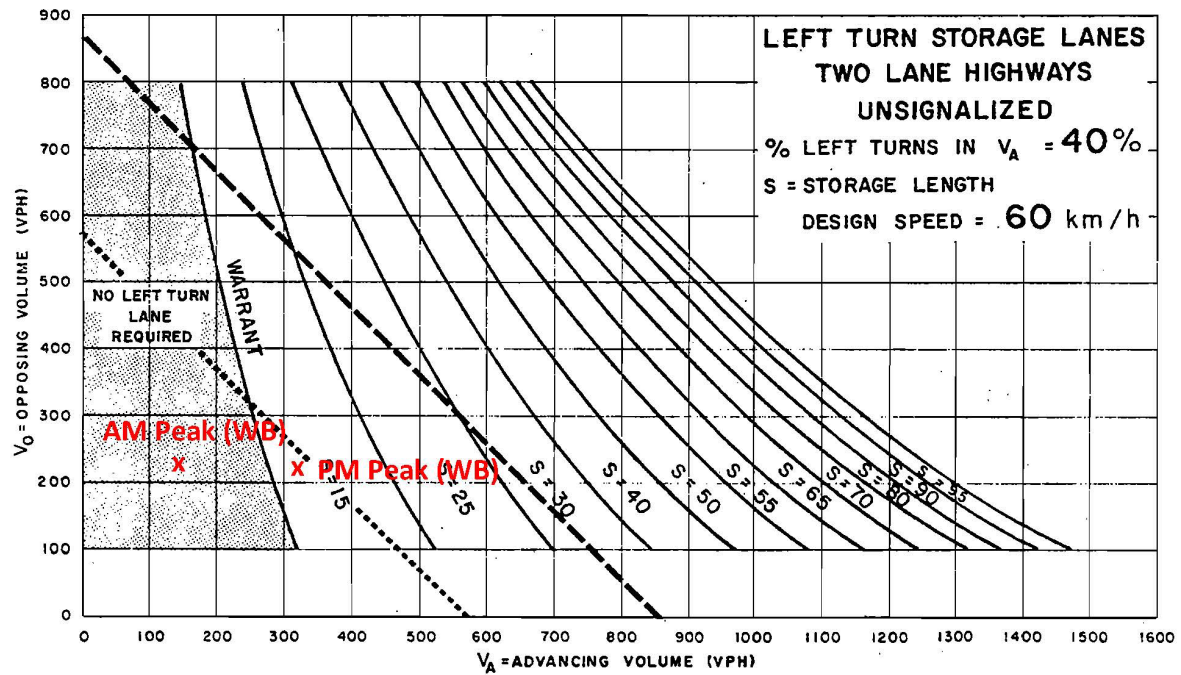
Intersection												
Int Delay, s/veh	6.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	151	11	51	9	6	16	30	244	20	16	286	151
Future Vol, veh/h	151	11	51	9	6	16	30	244	20	16	286	151
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	5	4	0	6	10	7	16	2	7	13	1
Mvmt Flow	164	12	55	10	7	17	33	265	22	17	311	164
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	781	780	393	803	851	276	475	0	0	287	0	0
Stage 1	427	427	-	342	342	-	-	-	-	-	-	-
Stage 2	354	353	-	461	509	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.55	6.24	7.1	6.56	6.3	4.17	-	-	4.17	-	-
Critical Hdwy Stg 1	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.55	-	6.1	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.045	3.336	3.5	4.054	3.39	2.263	-	-	2.263	-	-
Pot Cap-1 Maneuver	312	323	652	304	293	744	1061	-	-	1247	-	-
Stage 1	606	580	-	677	631	-	-	-	-	-	-	-
Stage 2	663	626	-	584	532	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	287	305	652	258	277	744	1061	-	-	1247	-	-
Mov Cap-2 Maneuver	287	305	-	258	277	-	-	-	-	-	-	-
Stage 1	584	569	-	652	608	-	-	-	-	-	-	-
Stage 2	617	603	-	513	522	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	27.1			14.9			0.9			0.3		
HCM LOS	D			B								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR			
Capacity (veh/h)	1061	-	-	287	542	397	1247	-	-			
HCM Lane V/C Ratio	0.031	-	-	0.572	0.124	0.085	0.014	-	-			
HCM Control Delay (s)	8.5	0	-	33.1	12.6	14.9	7.9	0	-			
HCM Lane LOS	A	A	-	D	B	B	A	A	-			
HCM 95th %tile Q(veh)	0.1	-	-	3.3	0.4	0.3	0	-	-			

Appendix E

LEFT TURN LANE WARRANT ANALYSES

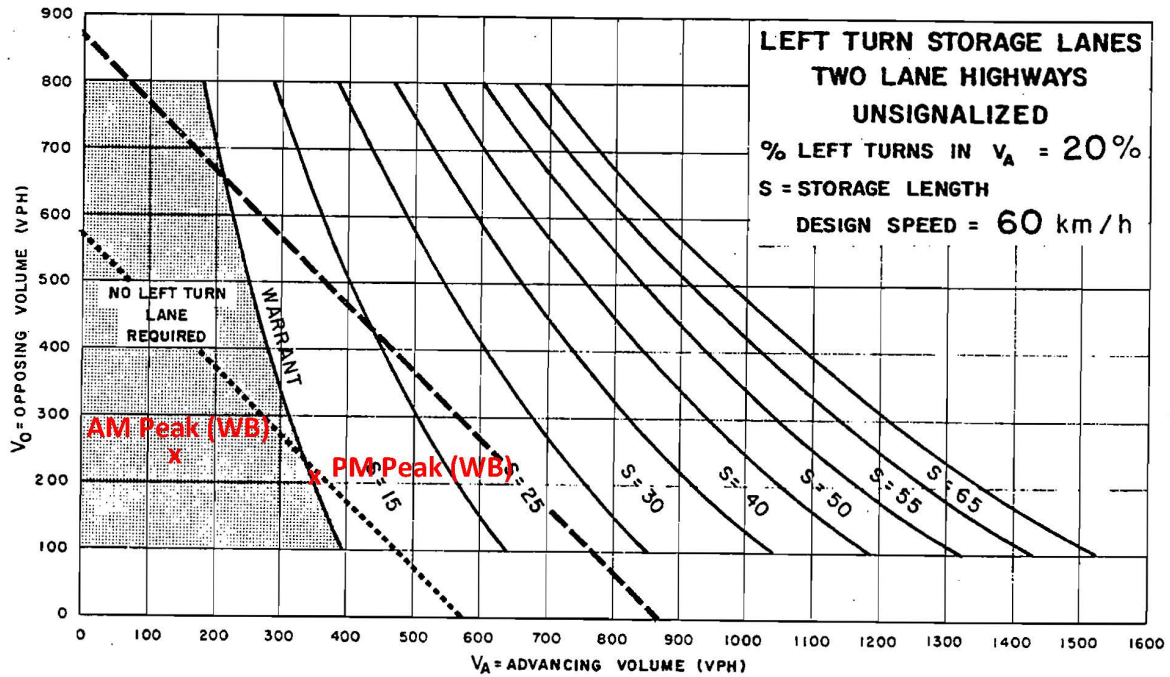
**Jasperson Drive at Road 2 East
Kratz Sideroad at Road 2 East
Graham Sideroad at Road 2 East**

Jasperson Drive at Road 2E – Left Turn Lane Warrant
Total Traffic 2030



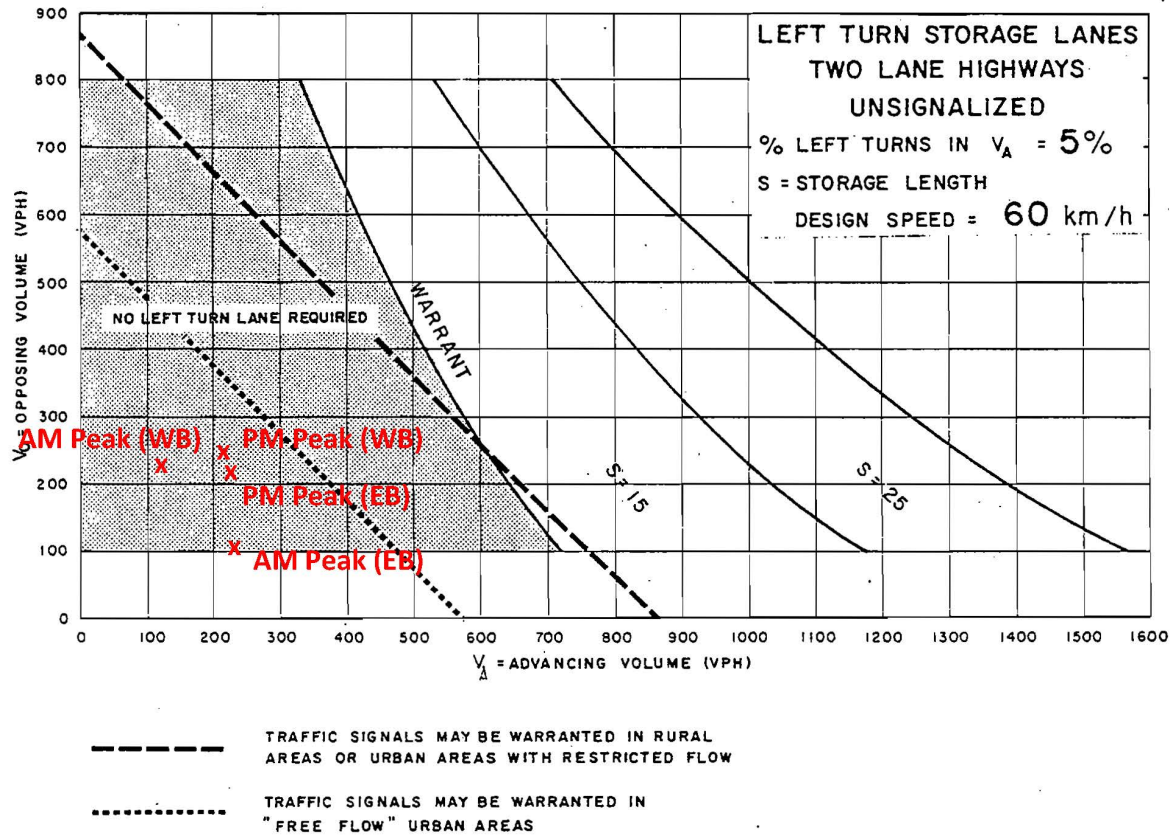
- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
- TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

Kratz Sideroad at Road 2E – Left Turn Lane Warrant
Total Traffic 2030



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

Graham Sideroad at Road 2E – Left Turn Lane Warrant
Total Traffic 2030



Appendix F

SIGNAL WARRANT ANALYSES

Jasperson Drive at Road 2 East

Kratz Sideroad at Road 2 East

Graham Sideroad at Road 2 East

County Road 45 (Union Avenue) at Road 2 East

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Background Traffic (Horizon Year 2025)

Jasperson Drive at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	36 ⁽¹⁾	21
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	21 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	28 ⁽³⁾	28
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	39 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		21
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (431 + 601) / 4 / 720 = 36\%$$

$$(2) = (106 + 110) / 4 / (170 \times 1.5) = 21\%$$

$$(3) = (325 + 491) / 4 / 720 = 28\%$$

$$(4) = (51 + 65) / 4 / 75 = 39\%$$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Background Traffic (Horizon Year 2030)

Jasperson Drive at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	40 ⁽¹⁾	23
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	23 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	31 ⁽³⁾	31
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	43 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		23
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

- * Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.
- ** The Lowest Sectional Percentage Governs the Entire Warrant.
- *** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

- (1) = $(477 + 665) / 4 / 720 = 40\%$
- (2) = $(117 + 122) / 4 / (170 \times 1.5) = 23\%$
- (3) = $(360 + 543) / 4 / 720 = 31\%$
- (4) = $(56 + 72) / 4 / 75 = 43\%$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Background Traffic (Horizon Year 2025)

Kratz Sideroad at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	34 ⁽¹⁾	14
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	14 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	29 ⁽³⁾	29
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	29 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		14
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (400 + 589) / 4 / 720 = 34\%$$

$$(2) = (62 + 83) / 4 / (170 \times 1.5) = 14\%$$

$$(3) = (338 + 506) / 4 / 720 = 29\%$$

$$(4) = (24 + 63) / 4 / 75 = 29\%$$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Background Traffic (Horizon Year 2030)

Kratz Sideroad at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	38 ⁽¹⁾	16
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	16 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	32 ⁽³⁾	32
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	32 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		16
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (442 + 649) / 4 / 720 = 38\%$$

$$(2) = (68 + 91) / 4 / (170 \times 1.5) = 16\%$$

$$(3) = (374 + 558) / 4 / 720 = 32\%$$

$$(4) = (27 + 69) / 4 / 75 = 32\%$$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2025)

Graham Sideroad at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	44 ⁽¹⁾	44
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	87 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	24 ⁽³⁾	24
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	88 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		24
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

(1) = $(508 + 768) / 4 / 720 = 44\%$

(2) = $(213 + 376) / 4 / 170 = 87\%$

(3) = $(295 + 392) / 4 / 720 = 24\%$

(4) = $(100 + 163) / 4 / 75 = 88\%$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2030)

Graham Sideroad at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	49 ⁽¹⁾	49
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	96 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	26 ⁽³⁾	26
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	97 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		26
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

(1) = $(563 + 849) / 4 / 720 = 49\%$

(2) = $(237 + 416) / 4 / 170 = 96\%$

(3) = $(326 + 433) / 4 / 720 = 26\%$

(4) = $(112 + 180) / 4 / 75 = 97\%$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2025)

County Road 45 at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	54 ⁽¹⁾	54
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	58 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	41 ⁽³⁾	41
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	97 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		41
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

(1) = $(668 + 898) / 4 / 720 = 54\%$

(2) = $(171 + 221) / 4 / 170 = 58\%$

(3) = $(497 + 677) / 4 / 720 = 41\%$

(4) = $(136 + 155) / 4 / 75 = 97\%$

Traffic Signal Warrants – Summary of Justifications (OTM Book 12)

Projected Total Traffic (Horizon Year 2030)

County Road 45 at Road 2 East

JUSTIFICATION	DESCRIPTION	MINIMUM REQUIREMENTS FOR TWO-LANE ROADWAYS		COMPLIANCE	
		FREE FLOW	RESTRICTED FLOW		
		OPERATING SPEED GREATER THAN OR EQUAL TO 70 km/h	OPERATING SPEED LESS THAN 70 km/h	SECTIONAL %	ENTIRE %**
1. MINIMUM VEHICULAR VOLUME	A*. Vehicle Volume, All Approaches for Each of the Heaviest 8 Hours of an Average Day, and	480	720	60 ⁽¹⁾	60
	B***. Vehicle Volume, Along Minor Streets for Each of the Same 8 Hours	120	170	64 ⁽²⁾	
2. DELAY TO CROSS TRAFFIC	A*. Vehicle Volume, Major Street for Each of the Heaviest 8 Hours of an Average Day, and	480	720	45 ⁽³⁾	45
	B*. Combined Vehicle and Pedestrian Volume Crossing the Major Street for Each of the Same 8 Hours.	50	75	107 ⁽⁴⁾	
3. VOLUME/DELAY COMBINATIONS	The Above Justifications (1 and 2) Both Satisfied to the Extent of 80% or more	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>		45
4. MIN. FOUR HOUR VEHICLE VOLUME	At Plotted Point Representing Hourly Volume for Minor Approach vs. Major Approach for Four Highest Hours of an Average Day Fall above the Applicable Curve	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
5. COLLISION EXPERIENCE	A. Total Reported Accidents of Types Susceptible to Correction by a Traffic Signal, per 12 Month Period Averaged over a 36 Month Period, and	5		N/A	N/A
	B. Adequate Trial of Less Restrictive Remedies. Where Satisfactory Observance and Enforcement Have Failed to Reduce the Number of Collisions	YES <input type="checkbox"/>	NO <input type="checkbox"/>		
6. PEDESTRIAN VOLUME AND DELAY	A. Plotted Point Representing 8 Hour Pedestrian Volume vs. 8 Hour Vehicular Volume Fall in Justified Zone, and	YES <input type="checkbox"/>	NO <input type="checkbox"/>		N/A
	B. Plotted Point Representing 8 Hour Volume of Pedestrian Experiencing Delays of 10 s or more vs. 8 Hour Pedestrian Volume Fall in Justified Zone	YES <input type="checkbox"/>	NO <input type="checkbox"/>		

Notes

* Vehicle Volume Warrants 1A and 2A for Roadways Having Two or More Moving Lanes in One Direction Should be 25% Higher than Values Given Above.

** The Lowest Sectional Percentage Governs the Entire Warrant.

*** For "T" Intersections, the Values for Warrant (1B) should be increased by 50%.

Justification 7 - Future Traffic Volumes

$$(1) = (742 + 991) / 4 / 720 = 60\%$$

$$(2) = (191 + 244) / 4 / 170 = 64\%$$

$$(3) = (551 + 747) / 4 / 720 = 45\%$$

$$(4) = (151 + 171) / 4 / 75 = 107\%$$

Appendix G

OTM BOOK 15: REFERENCES

Controlled Crossings	Pedestrian-Right-of-Way
School Crossing Guard	<p>School crossing guards may also provide a designated right-of-way for school children as vehicles must yield to a crossing guard. According to the HTA Section 176 – School crossings:</p> <p>1) School crossing guard means a person sixteen years of age or older who is directing the movement of persons across a highway and who is, (a) employed by a municipality, or (b) employed by a corporation under contract with a municipality to provide the services of a school crossing guard. R.S.O. 1990, c. H.8, s. 176 (1); 2005, c. 14, s. 1 (1).</p> <p>2) A school crossing guard about to direct persons across a highway with a speed limit not in excess of 60 kilometres per hour shall, prior to entering the roadway, display a school crossing stop sign in an upright position so that it is visible to vehicles approaching from each direction and shall continue to so display the school crossing stop sign until all persons, including the school crossing guard, have cleared the roadway. 2005, c. 26, Sched. A, s. 29 (1).</p> <p>Vehicles approaching guard displaying sign</p> <p>(3) Where a school crossing guard displays a school crossing stop sign as provided in subsection (2), the driver of any vehicle or street car approaching the school crossing guard shall stop before reaching the crossing and shall remain stopped until all persons, including the school crossing guard, have cleared the roadway and it is safe to proceed. 2005, c. 26, Sched. A, s. 29 (1); 2015, c. 14, s. 51.</p>

2.1.2 Pedestrian's Rights and Responsibilities

Notwithstanding the distinction between controlled and uncontrolled crossings, the rights and responsibilities for pedestrians are recognized in the [HTA](#)¹:

1. In the absence of statutory provisions or by-law, a pedestrian is not confined to a street crossing or intersection and is entitled to cross at any point, although greater care may then be required of him or her in crossing. However, pedestrians crossing the highway must look to ensure the crossing can be made safely or possibly be held responsible for any ensuing collision.
2. Pedestrians must exercise due care even when they are lawfully within a crossing and have right-of-way. It is not an absolute right and they must still exercise care to avoid a collision with a vehicle.

3. If there is a crosswalk at a signalized intersection, pedestrians have to walk within the crosswalk (see Section 6.2.1.1 for the definition of crosswalk):

Section 144 (22) – Duty at Traffic Control Signals — Pedestrian Crossing – where portions of a roadway are marked for pedestrian use, no pedestrian shall cross the roadway except within a portion so marked.

2.1.3 Ontario Regulations

[Ontario Regulation 402/15](#)² came into effect January 01, 2016. The regulation introduces two levels of pedestrian crossovers. Level 1 Pedestrian Crossovers are distinctly defined by the use of a specific set of regulatory signs, internally illuminated overhead warning signs, pavement markings, and flashing amber beacons. Level 2 pedestrian crossovers are distinctly defined by the prescribed use of a different set of regulatory signs, warning signs, pavement markings, and rapid rectangular flashing beacons.

Appendix H

OTM BOOK 18: REFERENCES

4.4 In-Boulevard Facilities

4.4.1 In-Boulevard Bicycle Facilities and In-Boulevard Active Transportation Facilities

In-Boulevard Bicycle Facilities are separated from motor vehicle traffic by a boulevard or a verge within the roadway right-of-way. These are typically implemented adjacent to roadways with higher motor vehicle speeds and volumes along key cycling corridors. An in-boulevard facility can be constructed with the bicycle path distinct from the sidewalk or with a single facility shared by cyclists and pedestrians. In the former case, the in-boulevard facility may transition to a raised cycle track that is immediately adjacent to the curb, as described in **Section 4.3.1**. Examples of in-boulevard facilities are depicted in **Figure 4.88**.

Prior to initiating design work on a given link, practitioners should refer to the Bicycle Facility Type Selection process in **Section 3.2.2**. This will confirm whether the in-boulevard bicycle facility is the most suitable and identify key design considerations.

4.4.1.1 Geometry

In-boulevard facilities are located outside the travelled portion of the roadway and do

not necessarily follow its geometric design. Practitioners should consider several geometric elements including the width, design speed, grade, stopping sight distance, horizontal curvature, crest vertical curves and lateral clear zones.

One- and two-way in-boulevard bicycle facilities should be 2.0 metres or 4.0 metres wide respectively. **Table 4.7** presents the desired and minimum widths for in-boulevard bicycle facilities, and **Figure 4.89** illustrates typical cross sections. It is recommended that practitioners always design to the desired width. However, through the use of sound engineering judgement, a practitioner may consider reducing the width to a value greater than or equal to the suggested minimum, but only for context specific situations on segments or corridors with constrained right-of-way widths.

In addition, a 'splash strip' should be provided between the in-boulevard facility and the curb. Splash strips provide a buffer to keep cyclists and other users away from the hazardous vertical drop-off at the curb face. They are also used to store plowed snow so that it does not obstruct the adjacent in-boulevard facility. A typical splash strip is 1.0 metres wide and is, therefore, too narrow to function as a sidewalk or other active transportation facility.

Table 4.7 – Desired and Suggested Minimum Widths for In-Boulevard Bicycle Facilities^a

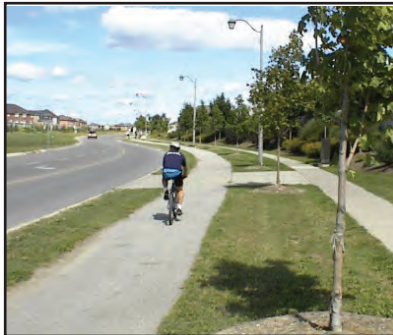
Facility	Desired Width	Suggested Minimum
One-Way In-Boulevard Bicycle Facility	2.0 m	1.8 m
Two-Way In-Boulevard Bicycle Facility	4.0 m	3.0 m ^b
Two-Way In-Boulevard Shared Facility	4.0 m	3.0 m ^b
^a Excludes splash strip (typical width 1.0 metre) where the in-boulevard facility abuts the curb.		
^b This may be reduced to 2.4 metres over very short distances in order to avoid utility poles or other infrastructure that may be costly to relocate.		

Source: Based on AASHTO Guide for Planning, Design and Operation of Bicycle Facilities, 2012; NACTO Urban Bikeway Design Guide, 2011

Figure 4.88 – Examples of In-Boulevard Facilities

(As an option, directional arrows may be applied within the in-boulevard facility.)

**One-Way In-Boulevard
Bicycle Facility (Brampton)**



Credit: MMM, 2013

**Two-way In-Boulevard
Bicycle Facility (Toronto)**



Credit: City of Toronto

**Two-way In-Boulevard
Shared-Use Facility (Mississauga)**

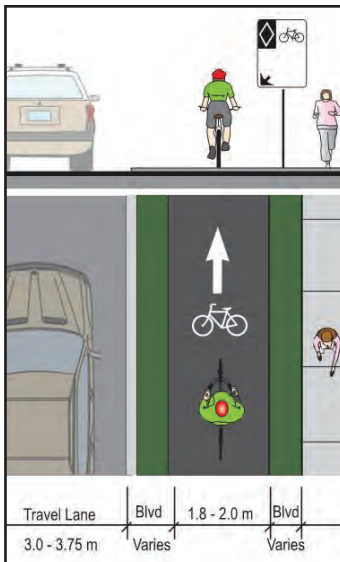


Credit: MMM, 2013

Figure 4.89 – Cross-Sections of In-Boulevard Facilities

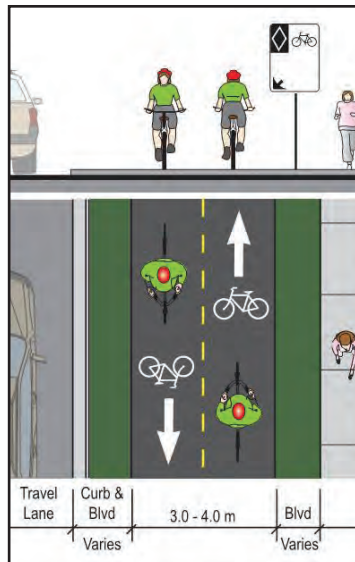
(See Table 4.7 for more details. As an option, directional arrows may be applied within the in-boulevard facility.)

**One-Way In-Boulevard
Bicycle Facility**

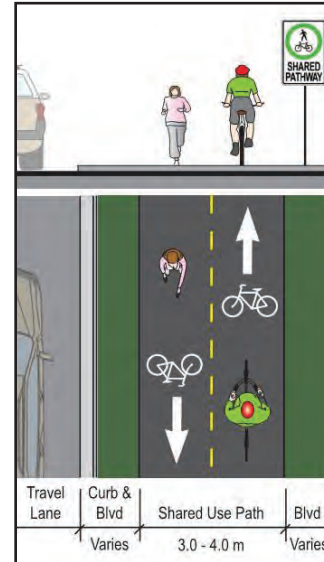


Source: MMM, 2013

**Two-way In-Boulevard Bicycle
Facility**



**Two-way In-Boulevard
Shared-Use Facility**



Appendix I

TAC GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS: REFERENCES

Clear Zone Distances

Table 7.3.1: Clear Zone Distances (m)

Design Speed (km/h)	Design ADT	Fill Slopes			Cut slopes		
		6:1 or flatter	5:1 to 4:1	3:1	3:1	5:1 to 4:1	6:1 or flatter
≤ 60	Under 750	2.0 – 3.0	2.0 – 3.0	See note 1	2.0 – 3.0	2.0 – 3.0	2.0 – 3.0
	750 – 1,500	3.0 – 3.5	3.5 – 4.5	"	3.0 – 3.5	3.0 – 3.5	3.0 – 3.5
	1,500 – 6,000	3.5 – 4.5	4.5 – 5.0	"	3.5 – 4.5	3.5 – 4.5	3.5 – 4.5
	> 6,000	4.5 – 5.0	5.0 – 5.5	"	4.5 – 5.0	4.5 – 5.0	4.5 – 5.0
70 – 80	Under 750	3.0 – 3.5	3.5 – 4.5	"	2.5 – 3.0	2.5 – 3.0	3.0 – 3.5
	750 – 1,500	4.5 – 5.0	5.0 – 6.0	"	3.0 – 3.5	3.5 – 4.5	4.5 – 5.0
	1,500 – 6,000	5.0 – 5.5	6.0 – 8.0	"	3.5 – 4.5	4.5 – 5.0	5.0 – 5.5
	> 6,000	6.0 – 6.5	7.5 – 8.5	"	4.5 – 5.0	5.5 – 6.0	6.0 – 6.5
90	Under 750	3.5 – 4.5	4.5 – 5.5	"	2.5 – 3.0	3.0 – 3.5	3.0 – 3.5
	750 – 1,500	5.0 – 5.5	6.0 – 7.5	"	3.0 – 3.5	4.5 – 5.0	4.5 – 5.0
	1,500 – 6,000	6.0 – 6.5	7.5 – 9.0	"	4.5 – 5.0	5.5 – 6.5	5.0 – 5.5
	> 6,000	6.5 – 7.5	8.0 – 10.0	"	5.0 – 5.5	6.0 – 6.5	6.0 – 6.5
100	Under 750	5.0 – 5.5	6.0 – 7.5	"	3.0 – 3.5	3.5 – 4.5	3.0 – 3.5
	750 – 1,500	6.0 – 7.5	8.0 – 10.0	"	3.5 – 4.5	5.0 – 5.5	5.0 – 5.5
	1,500 – 6,000	8.0 – 9.0	10.0 – 12.0	"	4.5 – 5.5	5.5 – 6.5	6.0 – 6.5
	> 6,000	9.0 – 10.0	11.0 – 13.5	"	6.0 – 6.5	7.5 – 8.0	8.0 – 8.5
≥ 110	Under 750	5.5 – 6.0	6.0 – 8.0	"	3.0 – 3.5	4.5 – 5.0	4.5 – 5.0
	750 – 1,500	7.5 – 8.0	8.5 – 11.0	"	3.5 – 5.0	5.5 – 6.0	6.0 – 6.5
	1,500 – 6,000	8.5 – 10.0	10.5 – 13.0	"	5.0 – 6.0	6.5 – 7.0	8.0 – 8.5
	> 6,000	9.0 – 10.5	11.5 – 14.5	"	6.5 – 7.5	8.0 – 9.0	8.5 – 9.0

- Notes:**
1. Since recovery is less likely on the unshielded, traversable 3:1 slopes, fixed objects should not be present near the toe of these slopes. Recovery of high-speed vehicles that encroach beyond the edge of the shoulder may be expected to occur beyond the toe of slope (see **Section 7.3.4.2** for more information).
 2. For low volume roads, it may not be practical to apply even the minimum values found in this table. Refer to **Section 7.8**.
 3. For higher design speeds than those shown above, or where investigation reveals a high probability of continuing crashes, it may be necessary to use higher clear zone values.