APPENDIX E
Traffic Analysis Summary Report
Traffic Assessment Report Summary
Proposed Closure of
Highway 417 E-E On-Ramp
at Carling Avenue Interchange

GWP 4255-15-01
1.0 INTRODUCTION

The planned widening of Highway 417 between the Maitland Avenue and Carling Avenue interchanges would result in significant safety and operational concerns at the Carling Avenue interchange eastbound on-ramps. The close proximity of the two existing eastbound on-ramps (W-E and E-E ramps) at the Carling Avenue interchange limits the ability to provide standard acceleration lanes for both ramps within the available right-of-way for the Highway 417 widening, given the existing site constraints. The W-E on-ramp currently has a “free-flow” condition which does not require traffic to merge into the highway traffic as it becomes the fourth highway lane. The planned widening will introduce the need for a significantly sub-standard merge condition for the high volume W-E on-ramp, prior to the introduction of the merge from the low volume E-E on-ramp. The permanent closure of the Highway 417 E-E on-ramp is proposed as a means to accommodate the planned widening and provide a standard merge lane for the high volume W-E on-ramp, while maintaining eastbound Highway 417 access within the Carling Avenue interchange. Figure 21 provides a pictorial summary of the existing ramp configuration, the conflict resulting from the planned widening and the proposed configuration that eliminates the conflict.

Figure 1: Existing Conditions, Future Configuration with Ramp Conflicts, and Proposed Configuration
This report identifies the transportation impacts on the arterial road network resulting from the proposed closure of the E-E on-ramp and consolidation of the traffic to a single eastbound Highway 417 access (W-E ramp), as well as proposed improvements to the arterial road network. The assessment and analysis of traffic operations for the arterial road network including redistributed of traffic resulting from the proposed improvements have been carried out in accordance with City of Ottawa practices.

The Study Area established for the analysis of potential impacts resulting from the proposed closure of the E-E on-ramp is illustrated in Figure 2. The Highway 417/Parkdale Avenue interchange currently experiences high levels of congestion and as such is not deemed to be desirable as an alternative route, as will be demonstrated within the analysis.

**Figure 2: Study Area Intersections**

2.0 EXISTING TRAFFIC VOLUMES

2.1 Carling Avenue / Kirkwood Avenue Interchange

A review of the historical traffic volumes on Highway 417 eastbound indicate that the maximum AM peak hour was reported in 2012 with approximately 6,725 vehicles per hour (vph) or about 2,240 vph per lane west of the Carling Avenue / Kirkwood Avenue interchange (IC). A review of peak hour traffic growth between the 2009 and 2012 observed traffic counts identified an average growth rate of 0.75% per annum. Highway 417 eastbound traffic volumes were also reviewed to identify the general distribution of traffic across the non-peak periods. While the peak hour was identified to be from 7:00-8:00 AM, traffic volumes between 8:00-9:00 were approximately 94% of the peak hour, indicating a relatively flat peak period. The
hour leading up to the AM peak hour was approximately 83% of the peak hour volume. Highway 417 eastbound PM peak hour traffic volumes were approximately 83% of the AM peak hour.

Historical traffic counts provided by MTO indicate that the E-E on-ramp traffic volumes are considerably lower than the remaining ramps at the interchange. MMM Group undertook additional traffic counts in 2016 to confirm vehicle volumes at the W-E and E-E on-ramps; the AM and PM peak hour volumes are presented in Table 1. It is noted that the 2016 peak hour volumes counted are similar to historical counts and show little growth between 2010 and 2016.

Table 1: Existing 2016 Peak Hour Ramp Volume Counts

<table>
<thead>
<tr>
<th>Carling Ave IC</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-E On-Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 27 (Mon)</td>
<td>1,164 vph (8:00 – 9:00 AM)</td>
<td>June 27 (Mon)</td>
</tr>
<tr>
<td>June 28 (Tue)</td>
<td>1,294 vph (7:45 – 8:45 AM)</td>
<td>June 28 (Tue)</td>
</tr>
<tr>
<td>E-E On-Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 22 (Wed)</td>
<td>360 vph (8:15 – 9:15 AM)</td>
<td>June 22 (Wed)</td>
</tr>
<tr>
<td>June 23 (Thu)</td>
<td>316 vph (8:15 – 9:15 AM)</td>
<td>June 23 (Thu)</td>
</tr>
<tr>
<td>June 24 (Fri)</td>
<td>268 vph (8:30 – 9:30 AM)</td>
<td>June 24 (Fri)</td>
</tr>
<tr>
<td>June 25 (Sat)</td>
<td>208 vph (9:00 – 10:00 AM)</td>
<td>June 25 (Sat)</td>
</tr>
<tr>
<td>June 26 (Sun)</td>
<td>148 vph (9:00 – 10:00 AM)</td>
<td></td>
</tr>
</tbody>
</table>

2.2 Arterial Road Network

Turning movement volumes at intersections as well as automated traffic recorder (ATR) counts at the highway ramps were provided by the City of Ottawa and MTO; the traffic data include a number of counts between 2006 and 2014. Additional ramp traffic counts were conducted as part of this study to confirm the existing traffic volumes. A review of the most current and historical counts was undertaken to establish 2016 weekday AM and PM peak hour traffic volumes; turning movement counts at the Study Area intersections were reviewed and the peak hour was identified. While the eastbound mainline Highway 417 peak hour traffic volume occurred between 7:00 and 8:00 AM, the arterial roadway traffic volumes for the signalized intersections at the Carling Avenue IC were highest between 8:00 and 9:00 AM. During the afternoon, the most recent 2016 traffic count indicates that arterial traffic volumes at Kirkwood North and Kirkwood South are highest between 4:45 and 5:45 PM. The balanced 2016 AM and PM peak hour arterial traffic volumes used for the traffic analysis are illustrated in Figure 3.
3.0 BLUETOOTH ORIGIN-DESTINATION SURVEY

A data collection program was designed to identify the primary trip patterns associated with ramp users using Bluetooth Technology as a basis to assess the traffic impacts associated with the consolidation of the two eastbound on-ramps. In this survey, Bluetooth receptors were placed along the road network to identify individual roadway users passing specific points; this data can then be used to identify the number of vehicles using specific routes to and from the Carling Avenue / Kirkwood Avenue interchange.

The data was collected 24 hours per day from Tuesday, July 27th to Sunday, August 7th, 2016; daily summaries were prepared for the AM peak period (4hr period from 6am – 10am) and PM peak (4hr period from 2pm to 6pm). Figure 4 and Figure 5 provide a summary of the origins and destinations for traffic using the E-E on-ramp and E-W off-ramp, respectively.
A further review of E-E on-ramp OD pairs indicated that 31% of the trip origins during the AM peak and 16% of the trip origins during the PM peak were from areas as far north as the Sir John A. Macdonald Parkway (i.e. including Gatineau). A large proportion of the westbound off-ramp trips (48% of the AM trips and 59% of the PM trips) are destined to locations west of Kirkwood on Carling Avenue. In addition, approximately 37% (26% + 11%) of AM peak off-ramp trips and 28% (18% + 10%) of PM peak off-ramp trips are destined south on Kirkwood Avenue or east on Carling Avenue. It is noted that these trips (OD pairs) are required to weave across the two westbound Carling Avenue though lanes in order to undertake a left turn movement onto Kirkwood Avenue southbound.

4.0 PROPOSED CLOSURE OF E-E RAMP AND TRAFFIC REDISTRIBUTION

Closure of the existing Highway 417 E-E on-ramp at Carling Avenue is proposed to alleviate potential operational and safety issues due to sub-standard highway geometrics that would result with the planned highway widening. Upon closure, the existing 360 vph during the AM peak hour and 250 vph during the PM peak hour using the E-E on-ramp will need to be reassigned along the existing roadway network; four primary diversion routes have been assessed as part of this study.

The total vehicle redistribution used in the analysis of the E-E ramp closure is presented in Figure 6 for both the AM and PM peak hours. The trip reassignments to the network were based on the trip distribution patterns identified by the Bluetooth survey and the GPS measurements of existing travel times along a number of key potential diversion routes in the field. The majority of the traffic reassignment is westbound on Carling Avenue beyond the existing E-E on-ramp to the Kirkwood Avenue intersection where vehicles would undertake a left turn onto southbound Kirkwood Avenue, followed by another left turn onto eastbound Carling Avenue to gain access to the W-E on-ramp onto Highway 417 eastbound; this routing represents the shortest and fastest alternative route to Highway 417 eastbound for the majority of traffic currently using the E-E ramp. Further discussion of the travel times for the various diversion routes is documented in Section 5.1 of this report to support the traffic redistribution.
A number of arterial road modifications are proposed to mitigate existing and anticipated capacity constraints and provide other operational and safety improvements; these modifications are discussed in more detail in Section 5.0.

### 4.1 Implications on Parkdale Avenue Interchange

Parkdale Avenue currently experiences congested traffic operations during peak periods with little opportunity to accommodate growth in traffic. The OD Survey revealed that an approximate 31% of the AM peak hour traffic and 35% of PM peak hour traffic using the Carling Avenue Highway 417 E-E on-ramp has trip origins located east of Merivale Road. This means that existing vehicle trips with origins east of Merivale Road travel west on Carling Avenue to the Highway 417 E-E ramp to reach Highway 417 eastbound rather than using the Parkdale Avenue Interchange. This validates our assumption that drivers are aware of the level of existing congestion and increased travel times on the Parkdale Avenue corridor and prefer using the E-E ramp to avoid that area.

A review of traffic operations indicate that the Carling Avenue W-E on-ramp access to Highway 417 eastbound will offer reduced travel times and delays over the existing congested traffic operations encountered along the Parkdale Avenue corridor to the highway interchange. In addition, trip origins located to the north are unlikely candidates to be diverted to Parkdale Avenue, largely due to the significant congestion on the southbound approach to the Parkdale Avenue interchange and circuitous routing required to access the northbound approach to the interchange.

The majority of trips that may be attracted to the Parkdale Interchange would be trip origins that are of a more local nature (i.e. trip origins east of Merivale Road). Facilitating improved access to the Highway 417 eastbound W-E on-ramp by implementing measures to minimize delays in reaching the on-ramp will ensure that the Carling W-E on-ramp diversion route remains as attractive as possible for all trip origins.
which are currently Highway 417 E-E on-ramp users, thereby minimizing the potential for traffic diversion to Parkdale Avenue. Proposed improvements to achieve these objectives are discussed in the next section.

### 5.0 ARTERIAL ROAD MODIFICATIONS

Discussions held with the City of Ottawa indicate their concern and need for safety improvements to the Carling Avenue and Kirkwood Avenue North intersection, to reduce the existing weaving movements across the Carling Avenue westbound through lanes by vehicles exiting Highway 417 westbound who wish to turn left to Kirkwood Avenue southbound, as illustrated in Figure 7. Elimination of the off-ramp to left turn weave is expected to improve westbound traffic flow and reduce the delays and safety concerns associated with the interaction between westbound traffic along Carling Avenue and traffic crossing the westbound traffic stream from the E-W off-ramp to the left turn lanes over the relatively short distance between the off-ramp and intersection with Kirkwood Avenue. The removal of the weave will result in a reduction in the left turn volumes from Carling Avenue westbound to Kirkwood Avenue southbound, providing an opportunity to accommodate the traffic diversion from the Highway 417 E-E on-ramp closure.

The removal of the existing weaving movement from the westbound Highway 417 off-ramp to southbound Kirkwood Avenue will be achieved by constructing a raised concrete median between the westbound through lanes and the westbound left turn lanes, as illustrated in Figure 8. This would allow traffic traveling westbound on Carling Avenue (including the traffic diverted due to the E-E ramp closure) to continue to gain access to the westbound left turn lanes. The proposed configuration maintains two westbound left turn lanes to Kirkwood Avenue southbound, providing the opportunity for the left turning traffic to align themselves to their desired movements downstream towards Kirkwood Avenue southbound or Carling Avenue eastbound.

Vehicles entering from the Highway 417 off-ramp would be required to continue straight through the intersection, and may also turn right onto Kirkwood northbound. The off-ramp traffic diverted through the intersection will have the opportunity to reach Kirkwood Avenue southbound or Carling Avenue eastbound through the use of the existing Saigon Court connection. These proposed changes have been reviewed and are endorsed by the City of Ottawa.
A review of the traffic counts indicates that approximately 335 vph during the AM peak hour, and 120 vph during the PM peak hour exits the westbound Highway 417 off-ramp and weaves across the westbound through traffic lanes on Carling Avenue to turn left onto Kirkwood Avenue southbound. With the proposed improvements, this weave movement will be prohibited and these volumes will be diverted to Saigon Court; the removal of these volumes from the westbound left turn is expected to offset the volumes added to this movement from the proposed E-E ramp closure. The net change in volumes and total combined detour volumes assuming the E-E ramp closure and the proposed modifications to Carling Avenue westbound are illustrated in Figure 9 and Figure 10 respectively; the resulting westbound left turn volumes to Kirkwood Avenue southbound are approximately 150 vph lower than existing volumes during the AM peak hour and approximately the same as existing during the PM peak hour.
It is noted that the existing configuration of Kirkwood Avenue southbound includes a through lane and a shared left turn / through lane on the approach to Carling Avenue eastbound. With the proposed double left turn in place on Carling Avenue westbound, both of these lanes will be fed by the westbound left turns from Carling Avenue. The potential for delays to southbound through traffic on Kirkwood Avenue may exist if drivers turning from the outside westbound left turn lane attempt to merge into the left turn / through lane once on Kirkwood Avenue southbound. It is recommended that overhead signage be implemented approaching the westbound double left turn on Carling Avenue to designate the inside left turn lane as
“Carling Avenue / Highway 417 Eastbound” and the outside left turn lane for “Kirkwood Avenue Southbound” to align drivers with their desired movement early on to prevent conflicts downstream.

Analysis of the diverted ramp traffic to Saigon Court identifies that the existing stop-controlled intersection of Saigon Court at Carling Avenue eastbound cannot adequately accommodate the traffic demands with the additional westbound Highway 417 E-W off-ramp traffic. Implementation of a traffic signal at the Saigon Court South intersection would allow the intersection to operate at acceptable levels of service during both the AM and PM peak hours. It is noted that with the 120 second signal cycle length that was used for coordination with upstream and downstream intersections on Carling Avenue, queues on Saigon Court may exceed the 60m of storage that is currently available within the single southbound lane between eastbound and westbound Carling Avenue (analysis reports 112m queue during the AM peak hour). Therefore, it is suggested that two southbound left turn lanes be provided approaching the Saigon South intersection in order to provide additional queue storage and reduce potential impacts to upstream intersections on westbound Carling Avenue. The configuration is illustrated in Figure 11.

A traffic analysis has been undertaken to assess the level of service of traffic movements at the Carling Avenue/Kirkwood Avenue interchange under 2016 volumes with and without the proposed improvements in place. A comparison of these operations is summarized in Table 2 and highlights all critical movements (Volume-to-capacity (V/C) ratio\(^1\) of 0.85 or greater).

\[\text{\textsuperscript{1} The volume-to-capacity (V/C) ratio is a comparison of the volume of a particular movement at an intersection to the capacity under the particular lane configuration and traffic signal timing being analyzed. For example, a V/C ratio of 0.90 for a movement can be interpreted as that movement being at 90\% capacity. Level of service (LOS) scores are derived from the V/C ratios as outlined in the City of Ottawa’s Traffic Impact Assessment Guidelines.}\]

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Figure 11: Proposed Modifications to Saigon Court Connection
### Table 2: Results of Traffic Analysis of Carling Avenue / Kirkwood Avenue

<table>
<thead>
<tr>
<th>Intersection</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
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<tr>
<td></td>
<td>Intersection LOS</td>
<td>Critical Movements (V/C)</td>
</tr>
<tr>
<td>Carling WB / Kirkwood</td>
<td>Existing</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>With Improvements</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carling EB / Kirkwood</td>
<td>Existing</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>With Improvements</td>
<td>D</td>
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The results of the analysis reflect the balancing of green time between movements to accommodate the traffic diverted to Saigon Court from the E-W off-ramp at Carling Avenue. At the intersection of Carling Avenue Westbound and Kirkwood Avenue, the proposed improvements will improve the morning overall LOS from E to C. During the afternoon, the intersection will remain at the existing LOS E with the proposed improvements; the modified lane configuration will result in an improvement in operations for the westbound through movement along Carling Avenue, but the balancing of available green time to achieve this will result in several other movements approaching capacity.

At the intersection of Carling Avenue eastbound and Kirkwood Avenue, the eastbound through movement and northbound right turn movement are near capacity under existing conditions. Signal timing modifications will be employed with the improvements in place to keep these movements operating within capacity; the reallocation of green time to achieve this will result in the southbound left turn reaching capacity as well. During the afternoon, the signal timing modifications implemented to accommodate the additional traffic redirected to Saigon Court from the E-W off-ramp are expected to result in all movements at the Carling Avenue eastbound / Kirkwood Avenue intersection still being below the critical threshold (V/C ≥ 0.85).

The analysis indicates that the intersections of Saigon Court with Carling Avenue eastbound and westbound operate at an acceptable level of service under existing conditions; all movements at these locations are expected to operate at a LOS B or better with the proposed improvements in place and associated traffic diversion.
5.1 Future Travel Times with Proposed Arterial Road Modifications

5.1.1 E-E On-ramp (Closure)

With the proposed closure of the Carling Avenue Highway 417 E-E on-ramp, a large portion of the existing users would divert to an alternate nearby highway on-ramp (i.e. the W-E on-ramp at Carling, or N/S-E on-ramp at Parkdale). While there are a number of potential routings, a key determinate which will make individual routings more attractive than other alternatives will be the associated observed network travel times for the various roadway segments. Network travel times incorporate the delays at traffic signals, the length of diversion and potential for vehicle congestion along the detour route. As such, opportunities to identify observed network travel times are considered important in undertaking an assessment of the attractiveness or overall likelihood of various traffic diversions resulting from the potential Carling Avenue to Highway 417 E-E on-ramp closure.

Projected travel times with closure of the E-E on-ramp and proposed arterial road modifications in place have been established based on GPS measurement of existing travel times and the changes in intersection delay resulting from the proposed modifications. The figures below illustrate comparative travel times for traffic originating from the north (Figure 12), south (Figure 13), and east (Figure 14) of the Carling Avenue / Kirkwood Avenue interchange, reflecting the impacts of diverted volumes on intersections and proposed arterial improvements; the existing travel times to the E-E on-ramp are also included for comparison purposes.

Figure 12: Projected Travel Times – Trips Originating from North
Travel times for trips originating from the north were measured from the intersection of Island Park Drive and Merivale Road, as this is will be the point where trips from Quebec, the Sir John A. Macdonald Parkway and the local neighbourhoods to the north converge before the E-E on-ramp; all travel times are measured to east of the Parkdale Avenue interchange on Highway 417. Assuming the E-E on-ramp is closed, the next fastest route for vehicles from the north will be via the W-E on-ramp from Kirkwood Avenue; this route will add between 1m 30s and 1m 50s of travel time when compared with the time to the current E-E on-ramp. Due to the longer routes and greater number of intersections passed, the routes via Coldrey Avenue to Kirkwood Avenue northbound and via Parkdale Avenue are less attractive options, adding an additional 2-3 minutes of travel time compared with the existing E-E ramp.

Figure 13: Projected Travel Times – Trips Originating from South

Travel times for trips originating from the south were measured from Merivale Road at Coldrey Avenue to Highway 417 east of Parkdale Avenue; the Merivale / Coldrey intersection is assumed to be the convergence point for most trips currently using the E-E ramp from neighbourhoods to the south. Assuming the closure of the E-E on-ramp, the fastest routes from the south will be via Carling Avenue to the Kirkwood Avenue W-E on-ramp in the morning and via Coldrey Avenue to the Kirkwood Avenue W-E Ramp in the afternoon. Both routes will add approximately 1m 40s of travel time in the morning compared with the existing time to the E-E ramp; in the afternoon, the route via Coldrey Avenue will add approximately 1 minute of travel time above the existing time to the E-E ramp. Parkdale Avenue again represents the longest diversion (travel time), adding approximately 3m 30s and 4m 15s of travel time over existing in the morning and afternoon respectively.
Travel times for trips originating from the east were measured from Carling Avenue west of Island Park Drive to Highway 417 east of the Parkdale Avenue interchange. Assuming the closure of the E-E on-ramp, the next fastest diversion route is via Carling Avenue and Kirkwood Avenue to the Kirkwood W-E on-ramp; this route will add between approximately 1m 35s and 1m 50s of travel time compared with existing trips to the E-E on-ramp. The Parkdale Avenue route may be feasible for trips originating in the east due to the short travel distance; however, congestion on Parkdale Avenue in the morning results in the route via the Kirkwood Avenue interchange being a slightly faster option, while during the afternoon the Kirkwood Interchange and Parkdale Avenue diversion routes will be approximately equivalent in terms of travel time. The diversion via Coldrey Avenue represents the longest route (travel time) for trips from the east due to the relative circuitous routing.

### 5.1.2 E-W Off-ramp (Weave)

Travel times have also been estimated for vehicles from the Highway 417 E-W off-ramp that will be redirected to Saigon Court with the proposed improvements restricting access to the left turn lanes to Kirkwood Avenue Southbound from the off-ramp.

Table 3 provides a summary of existing travel times to Carling Avenue eastbound via Kirkwood Avenue Southbound and via Saigon Court, as measured in the field. Estimated travel times for the redirected E-W off-ramp traffic via Saigon Court, with the improvements in place, are based on the change in intersection delays at each of the intersections along the diversion route.
### Table 3: Existing and Estimated Travel Times - Highway 417 E-W off-ramp at Carling Avenue

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Route</th>
<th>Existing</th>
<th>With Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Via Kirkwood SB</td>
<td>AM 1m 17s</td>
<td>PM 1m 20s</td>
</tr>
<tr>
<td></td>
<td>Via Saigon</td>
<td>AM 2m 26s</td>
<td>PM 2m 09s</td>
</tr>
</tbody>
</table>

Under existing conditions, reaching Carling Avenue Eastbound from the E-W off-ramp via Siagon Court takes an average of 2m 26s in the morning and 2m 09s in the afternoon; these times are respectively 1m 09s and 0m 49s longer than the travel times for the equivalent trip via Kirkwood Avenue southbound.

The proposed improvements which remove the current weave on Carling Avenue westbound approaching Kirkwood Avenue will result in some reductions in delay along Carling Avenue Eastbound and Westbound. The implementation of a traffic signal at Carling Avenue eastbound and Saigon Court will facilitate the southbound left turn from Saigon Court by providing a “protected” gap in eastbound traffic, but will result in additional delay for this movement due to the relatively low green time allocated for this movement in the signal timing. Overall the implementation of the proposed improvements will result in average travel times of 2m 32s and 2m 34s during the morning and afternoon peak hours respectively for vehicles from the E-W off-ramp, but will provide safety benefits through the removal of the existing weave which occurs across two lanes of through traffic on Carling Avenue westbound and be substituted with left turns at Saigon Court to Carling Avenue eastbound.

### 6.0 FUTURE (2031) TRAFFIC OPERATIONS

The Carling Avenue corridor is included in the City of Ottawa’s 2013 Transportation Master Plan (TMP) as a “Transit Priority Corridor” which is to be implemented as continuous bus-only lanes between Lincoln Fields Station and Carling Station. The TMP suggests re-designation of one of the existing eastbound and westbound vehicle lanes as a transit lane. The introduction of a higher order transit facility along Carling Avenue will impact upon the overall role of carrying capacity of Carling Avenue and influence how people will choose to travel within the Study Area and beyond. The City has initiated a study of the potential for transit priority along the Carling Avenue corridor; the baseline conditions established for the Carling Avenue and the 2031 Planning Horizon, including a review of proposed developments along the corridor, indicate significant transit ridership growth along Carling Avenue and a potential reduction in traffic...
volumes, reflecting lower vehicle demands throughout most of the corridor as provisions for higher order public transit services are introduced.

An assessment of future traffic operations for the 2031 Planning Horizon were carried out for both eastbound and westbound Carling Avenue based on the aforementioned arterial road modifications and an approximate 10% reduction in traffic volumes. The traffic operational assessment carried out for the 2031 Planning Horizon indicates that the intersection of Carling Avenue westbound and Kirkwood Avenue will experience a LOS of E (approaching capacity) for the westbound through/right, northbound left and northbound through traffic movements during the PM peak hour. During the AM Peak, the intersection of Carling Avenue eastbound and Kirkwood Avenue will experience a LOS of E for the southbound traffic lanes. The remaining traffic movements will be an acceptable LOS D, or better, for the intersections analyzed.

### 7.0 CONCLUSIONS

The closure of the Highway 417 E-E on-ramp at Carling Avenue is proposed as a means to accommodate the planned Highway 417 widening and provide a standard merge lane for the high volume W-E on-ramp, while maintaining eastbound Highway 417 access within the Carling Avenue interchange. The proposed closure will alleviate potential operational and safety issues due to sub-standard highway geometrics that would result with the planned widening.

Traffic volumes provided by MTO indicate that the E-E on-ramp experiences relatively low traffic volumes compared with the other ramps at the Carling Avenue / Kirkwood Avenue interchange. Updated traffic counts were undertaken in the summer of 2016 and confirm this pattern; morning and afternoon peak hour volumes on the E-E ramp are approximately 360 vehicles/hr and 250 vehicles/hr, respectively, compared with volumes between 800 and 1,300 vehicles per hour on the other remaining ramps during the same times.

An origin-destination (OD) survey was undertaken in order to obtain further information about the origins of vehicles using the E-E on-ramp; this survey used detectors distributed at key points along the road network to track traffic movements to determine the primary origin destination patterns associated with the two highway ramps. The OD Survey indicated that of the existing morning trips using the E-E on-ramp, approximately 50% originate from the north, 31% from the east and 19% from the south; of the 50% from the north, 31% originate from the Champlain Bridge or Sir John A. Macdonald Parkway, while the remaining 19% originate from the neighbourhoods surrounding Island Park Drive. During the afternoon, the ramp trips are distributed with 40% originating in the north (16% from Quebec/SJAM Parkway, 22% from neighbourhoods around Island Park Drive), 35% from the east and 25% from the south. The OD Survey also provided information on the distribution of destinations for traffic exiting at the Highway 417 E-W off-ramp to Carling Avenue / Kirkwood Avenue.
Based upon the proposed closure of the E-E on-ramp, a traffic analysis was undertaken with the diversion of the ramp volumes to other routes. This analysis indicated several existing capacity constraints being exacerbated and identified new constraints resulting from the additional volumes at the intersections of Kirkwood Avenue with Carling Avenue eastbound and westbound. As a result of these constraints, a number of arterial road modifications have been proposed to accommodate the additional demands and mitigate existing safety concerns. The most significant modifications will be the widening of Carling Avenue westbound at Kirkwood Avenue to provide for two dedicated westbound left turn lanes which will be separated from the through lanes by a raised concrete median; this median will protect the westbound left turn onto Kirkwood Avenue southbound for Carling Avenue westbound traffic only. Vehicles wishing to access Kirkwood Avenue southbound or Carling Avenue eastbound that are exiting from the Highway 417 E-W off-ramp will be redirected to Saigon Court to the west. This modification will prevent the off-ramp traffic from weaving across multiple lanes of traffic over a short distance to access the left turn lanes, and will consequently reduce the left turn volume and provide additional capacity for the volumes being redirected from the E-E ramp closure. Additional modifications are proposed at Saigon Court to accommodate the redirected traffic from the E-W off-ramp. LOS for turning movements with the proposed improvements in place are expected to be the same or better than existing conditions; green time at traffic signals will be redistributed to address existing and anticipated capacity constraints.

Travel times for trips diverted as a result of the consolidation of the two eastbound on-ramps at Carling Avenue were reviewed based on existing measurements and the changes in intersection delays resulting from the arterial road modifications as reported in the traffic analysis. With the modifications in place, the fastest alternative route after the closure of the E-E ramp for most vehicles will be to continue along Carling Avenue westbound, turn left onto Kirkwood Avenue southbound, and then left again to reach Highway 417 using the W-E on-ramp. For most trips, the additional distance and existing congestion will make the Parkdale Avenue corridor the longest and least desirable of all the diversion routes examined.

The proposed improvements associated with the placement of a median barrier to separate through and left turns at Carling Avenue westbound and Kirkwood Avenue result in slightly increased travel times for southbound Kirkwood vehicles coming from the E-W off-ramp as those vehicles will be redirected to Saigon Court, however there are significant safety improvements from removing the existing weave across the Carling Avenue WB lanes to reach Kirkwood Avenue southbound, and introducing a left turn traffic signal from Saigon Court to Carling Avenue eastbound.

The City of Ottawa’s future projections for travel on the Carling Avenue corridor indicate a slight reduction in automobile traffic resulting from the City’s continuing focus on transit and active transportation infrastructure. As a result, an analysis of 2031 traffic volumes indicates that several vehicle turning movements at the Carling Avenue / Kirkwood Avenue intersections will operate at more acceptable levels of service.

Overall, the proposed closure of the Highway 417 E-E on-ramp from Carling Avenue serves to address operational issues associated with the highway geometry resulting from the widening of Highway 417; the
traffic analysis undertaken indicates that the traffic impacted by this closure can be consolidated with the other eastbound on-ramp traffic within the interchange into a single eastbound on-ramp that meets current design standards. The analysis indicates that modifications to the arterial road network will be required to accommodate this consolidation of traffic in order to provide sufficient capacity for the existing E-E ramp traffic; these modifications, in turn, also serve to address existing safety and operational issues identified by the City of Ottawa, and ultimately support the City of Ottawa’s long term objectives for the Carling Avenue corridor.