Residential Development
96 Nepean Street, Ottawa

COMMUNITY TRANSPORTATION STUDY / TRANSPORTATION IMPACT STUDY

Prepared By:

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November 2011

Novatech File: 111153
Ref No. R-2011-196

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November 29th, 2011

City of Ottawa
Planning and Growth Management Branch
110 Laurier Ave. W., 4th Floor,
Ottawa, Ontario K1P 1J1

Attention: **Mr. Wally Dubyk, C.E.T.**
(A) Project Manager, Infrastructure Approvals

Dear Sir:

Reference: **Residential Development – 96 Nepean Street, Ottawa**
Community Transportation Study / Transportation Impact Study
Our File No. : 111153

We are pleased to submit the following combined Community Transportation Study (CTS) / Transportation Impact Study (TIS) in support of a Zoning By-law Amendment and Site Plan application for the above property.

The structure and format of this report follows the 2008 City of Ottawa Transportation Impact Assessment (TIA) Guidelines. A checklist of the documentation requirements as outlined in Appendix D of the TIA guidelines is attached overleaf with reference to corresponding report sections.

A .pdf version of this report and copies of the electronic software files are provided on the enclosed disk. Please call if you have any questions as you complete your review.

Please call if you have any questions as you complete your review of the revised study.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.

Graham O'Neill, EIT
Junior Engineer

cc. Neil Malhotra, Claridge Homes

Documentation and Reporting Checklist

Report Context (Section 1.0)

Description of the development (include all of the following that are known at the time of the application):

- ☐ Municipal address;
- ☐ Location relative to major elements of the existing transportation system (e.g., the site is located in the southwest quadrant of the intersection of Main Street/ First Street, 600 metres from the Maple Street Rapid Transit Station); Existing land uses or permitted use provisions in the Official Plan, Zoning By-law, etc.;
- ☐ Proposed land uses and relevant planning regulations to be used in the analysis;
- ☐ Proposed development size (building size, number of residential units, etc.) and location on site;
- ☐ Estimated date of occupancy;
- ☐ Planned phasing of development;
- ☐ Proposed number of parking spaces (not relevant for Draft Plans of Subdivision); and
- ☐ Proposed access points and type of access (full turns, right-in/ right-out, turning restrictions, etc.).
- ☐ Study area;
- ☐ Time periods and phasing; and
- ☐ Horizon years (include reference to phased development).

The CTS must include a key plan that shows the general location of the development in relation to the surrounding area. The CTS must also provide a draft site plan or development concept of a suitable scale that shows the general location of the development and the proposed access locations. If the proposed development/ redevelopment is to be constructed in phases, a description must be provided for each phase, identifying the proposed timing of implementation.

Existing Conditions (Section 2.0)

- ☐ Existing roads and ramps in the study area, including jurisdiction, classification, number of lanes, and posted speed limit;
- ☐ Existing intersections, indicating type of control, lane configurations, turning restrictions, and any other relevant data (e.g., extraordinary lane widths, grades, etc.);
- ☐ Existing access points to adjacent developments (both sides of all roads bordering the site);
- ☐ Existing transit system, including stations and stops;
- ☐ Existing on- and off-road bicycle facilities and pedestrian sidewalks and pathway networks;
- ☐ Existing system operations (V/C, LOS); and
- ☐ Major trip generators/ attractors within the Study Area should be indicated.

The CTS report must include figures documenting the existing travel demands by mode. A photographic inventory of the transportation network elements in the vicinity of the proposed access points would be beneficial to staff in their review of the Consultant's report.

Demand Forecasting (Section 3.0)

- ☐ General background growth;
- ☐ Other study area developments;
- ☐ Changes to the study area road network;
- ☐ Trip generation rates;
- ☐ Trip distribution and assignment:
    - include figures documenting total future travel demands by mode for each horizon year.

Impact Analysis (Section 4.0, 6.0, 8.0, 9.0)

- ☐ Network Capacity Analysis;
- ☐ Non-auto network connections and continuity;
- ☐ Potential for community impacts, and
- ☐ TDM.

Mitigation Measures and Site Design Characteristics (Section 5.0 and 7.0)

The CTS must identify all mitigation measures required to offset network impacts from the development. The CTS must also identify key site design features required to implement the Official Plan and Transportation Master Plan policies regarding site development.

The CTS must include all of the following, where they are required by the subject development:

- ☐ Major network elements required to bring the screenlines to or below acceptable operating guidelines, and comments regarding consistency of the requirements with the Transportation Master Plan and Capital Budget;
- ☐ Location and timing of proposed changes to existing traffic controls at intersections (e.g., new traffic signals, Stop signs, etc.);
- ☐ Location and timing of new intersections, including proposed traffic control measures (e.g., traffic signals, etc.);
- ☐ Requirements for new auxiliary lanes;
- ☐ Mitigation measures required to offset impacts on the surface and Rapid Transit networks;
- ☐ New or modified elements of the bicycle and pedestrian networks;
- ☐ Community impact mitigation measures;
- ☐ Demonstration that Official Plan policies regarding transit-supportive developments have been incorporated appropriately; and Proposed TDM features or programs to support the site development.

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EXECUTIVE SUMMARY

A residential/commercial development is proposed as part of a Zoning By-law Amendment and Site Plan Application at 96 Nepean Street in Ottawa. The 96 Nepean Street site has an area of 1,220m^2. The proposed development will consist of 199 condominium units and 2 townhouses. Six levels of underground parking will provide a total of 161 underground parking spaces. The development will have a single two-way ramp access to the underground parking garage located on Nepean Street.

The intersections to be evaluated in this report were confirmed with the City prior to the preparation of this report. The time periods for analysis include the weekday AM and PM peak hours. Analysis has been completed for a full build-out scenario in 2013 and a five year horizon of 2018.

The 2008 TMP identifies a proposed rapid transit network that includes the Downtown Ottawa Transit Tunnel (DOTT), a 3 kilometre tunnel with 5 underground or partially underground stations to serve the downtown area. The construction of the tunnel is expected to have a significant impact on traffic volumes in the downtown area.

A compound annual growth rate of 1% has been used to estimate future background traffic levels. Trips generated by the proposed development have been estimated using peak hour rates identified in the *ITE Trip Generation Manual, 8th Edition*. Total future traffic volumes have been calculated by adding the proposed site traffic to the projected background traffic volumes. All trips that will be generated by a nearby residential/retail development currently under construction at 187 Metcalfe, and two future residential developments at 89-91 Nepean Street and 70 Gloucester Street are considered to be part of future background traffic. These projected trips (derived from previous traffic studies completed by NECL) have been included as part of the 2013 and 2018 background traffic.

Intersection capacity analysis was undertaken for the future background and total traffic conditions. A screenline analysis has been completed in order to compare the forecasted demand and available capacity of the major road network connecting the site to the area transportation network. It was agreed with City staff that the forecasted traffic demand and future lane capacity at the CPR Screenline should be analyzed for the year 2031, which is the horizon year of the City of Ottawa Official Plan.

Provisions for non-auto travel modes were assessed, including access to local pedestrian, bicycle and transit systems. The proposed on-site design was reviewed in terms of vehicle access, on-site parking, and loading activities. Potential for community impacts and conformance to TDM principles were also evaluated. The main conclusions and recommendations of this report are as follows:

Background Traffic Conditions and Collision History

- Eastbound through movements at Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street are expected to operate at LOS F under 2013 background traffic conditions. In 2018 under background traffic conditions, analysis indicates that the maximum queue length for the eastbound approach to the O'Connor Street/Nepean Street

intersection may extend upstream to Bank Street, possibly creating blocking problems there.

- While not technically justified based on projected traffic volumes, the installation of traffic signal control at both of the aforementioned intersections would allow them to operate with acceptable LOS in all scenarios tested.

- The installation of traffic signals at O'Connor Street/Nepean Street is identified as a means of addressing safety concerns relating to a high number of angle collisions observed there during the last 3 years.

Total Traffic Conditions

- Site traffic represents less than 5% of 2011 AM and PM peak hour traffic at the upstream and downstream intersections of O'Connor Street/Nepean Street and Metcalfe Street/Nepean Street.

- With the addition of site traffic in 2013, analysis shows that delay on the eastbound approach of Metcalfe Street/Nepean Street increases by 65 seconds in the AM peak hour and by 15 seconds in the PM peak hour, as compared to expected delays of 795 seconds and 140 seconds in the 2013 background AM and PM peak hours, respectively.

- With the addition of site traffic in 2013, analysis shows that delay on the eastbound approach of O'Connor Street/Nepean Street increases by 60 seconds in the AM peak hour. The increase in delay for this movement during the PM peak hour cannot be quantified, because the Synchro model is unable to provide a delay forecast in cases where the approach volume greatly exceeds the available capacity (v/c > 3). The v/c ratio for this movement is expected to increase from 2.98 to 3.48 under PM peak hour total traffic conditions, which indicates that it is likely to operate with severe levels of congestion with or without the addition of site traffic.

- At the Metcalfe Street/Nepean Street intersection, traffic signals are only 71% justified with addition of site traffic in 2013. However, under total traffic conditions in 2013 and 2018, all movements would operate at an acceptable level with signals in place.

- At the O'Connor Street/Nepean Street intersection, traffic signals are only 69% justified with addition of site traffic in 2013. However, under total traffic conditions in 2013 and 2018, all movements would operate at an acceptable level with signals in place.

- Marginal increases in delay, v/c ratios and queue lengths are expected at all study area intersections under projected 2018 total traffic conditions, compared to 2013 total traffic conditions. During the PM peak hour, the expected delay on the eastbound approach of O'Connor Street/Nepean Street cannot be calculated by Synchro, because the approach volume greatly exceeds the approach capacity (v/c > 3). Severe congestion and long queues are likely on this approach in 2018, with or without the addition of site traffic.

- Acceptable LOS is expected at the signalized intersections of Metcalfe Street/Gloucester Street and O'Connor Street/Gloucester Street in 2013 and 2018. Maximum queue lengths are within available storage capacity, with no blocking problems anticipated.

- Acceptable LOS (B or better) is expected at the underground parking access in 2013 and 2018. Delays of approximately 15 seconds are anticipated for vehicles leaving the site during weekday peak hours, and queue lengths likely to be negligible.

- The provision of signals at the intersection of Nepean Street/O'Connor Street has been identified as a means of addressing existing congestion and safety concerns, not as a mitigation measure to offset the impact of site-generated traffic.

Screenline Analysis, On-Site Design & TDM

- By the 2031 horizon year of the 2008 Transportation Master Plan (TMP), the major road network in the vicinity of the subject site is projected to operate with an acceptable LOS (D) during the PM peak hour, and with minor levels of congestion (LOS E) during the AM peak hour. The analysis at the CPR screenline is predicated on the achievement of a Transit Modal Split (TMS) of 51% in the AM peak hour and 52% in the PM peak hour. It is expected that the implementation of the Rapid Transit Network identified in the TMP, most notably the introduction of Light Rail Transit to downtown Ottawa, will ensure that the TMS targets are achieved by 2031.

- The proposed development includes adequate provisions for non-auto travel modes, including easy access to local pedestrian, bicycle, and transit systems.

- The easternmost edge of the proposed underground parking access is approximately 3.3 metres west of the property line, which is compliant with Section 25 (o) of the Private Approach By-law's minimum spacing requirement (at least 3 metres at the streetline).

- The proposed underground parking satisfies the minimum and maximum requirements of the Zoning By-law (ZBL).

- On-site bicycle parking will be provided in accordance with the minimum requirements of the ZBL, and located in the underground parking garage.

- It is expected that garbage collection will take place at the curb on the north side of Nepean Street, as per Schedule B of the City's Solid Waste Management By-Law 2009-396. Occasional loading activities are also expected to take place at the curb. These activities are not expected to have any significant disruption to traffic flow on Nepean Street.

- Parking infiltration on area roadways is not anticipated.

- The proposed development conforms to the City's TDM initiatives by providing easy access to the local pedestrian, bicycle and transit systems as outlined in Section 5.0.

1.0 INTRODUCTION

A residential/commercial development is proposed as part of a Zoning By-law Amendment and Site Plan Application at 96 Nepean Street in Ottawa. The site is located south of Gloucester Street, mid-block between O'Connor Street and Metcalfe Street as shown in Figure 1a. A key plan is also shown in Figure 1b.

Figure 1a: Aerial Photo of Subject Site

Photo courtesy of www.bing.com/maps

The 96 Nepean Street site has an area of 1,220m^2, and is currently occupied by a privately-owned surface parking lot that is open to the public. The subject site is bounded by the following:

- to the south, a high-density apartment block (257 Lisgar Street),
- to the east, a three-storey residential building (88 Nepean Street),
- to the west, a private parking lot serving the residents at 257 Lisgar Street,
- to the north, a high-density apartment block (171 O'Connor Street) and a public parking lot to be developed as a high-density residential tower (89-91 Nepean Street).

Under the City of Ottawa's Zoning By-Law, the site is designated as R5B [482] F (3.0) – Residential Fifth Density Subzone B, Exception 482, with a Floor Space Index (FSI) of 3.0. The purpose of the Residential Fifth Density Zone is to allow a wide mix of residential building forms including mid-to-high rise apartment dwellings. The zoning amendment will revise the 482 exception to permit the proposed development as shown in the site plan; specific details are provided in a Planning Rationale submitted as part of the ZBL Amendment application.

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CITY OF OTTAWA

NEPEAN STREET RESIDENTIAL DEVELOPMENT

96 NEPEAN STREET

KEY PLAN

NOV 2011 111153 FIGURE 1b

The proposed development will consist of the following:

- 199 condominium units,
- 2 stacked townhouses,
- 161 underground parking spaces on 6 levels.

The development will have a single two-way ramp access to the underground parking garage located on Nepean Street, mid-block between O'Connor Street and Metcalfe Street.

The 96 Nepean Street site (currently operating as a parking lot) is currently accessible from a driveway that is located within the Nepean Street frontage of 257 Lisgar Street, approximately 50 metres east of O'Connor Street (measured from centreline to centreline). This access, which is located beyond the boundary of the subject site, will be retained to provide access to the portion of the existing parking lot that is not impacted by the proposed development at 96 Nepean Street. The underground parking garage of the proposed development will be served by a new access driveway on the south side of Nepean Street, located approximately 16 metres east of the aforementioned 257 Lisgar Street access (measured from centreline to centreline).

The proposed ground floor site plan is shown in Figure 2, and the proposed elevation is shown in Figure 3. Existing conditions at the 96 Nepean Street site are shown in Figure 4.

The expected completion date for the development is 2013.

1.1 Analysis Methods

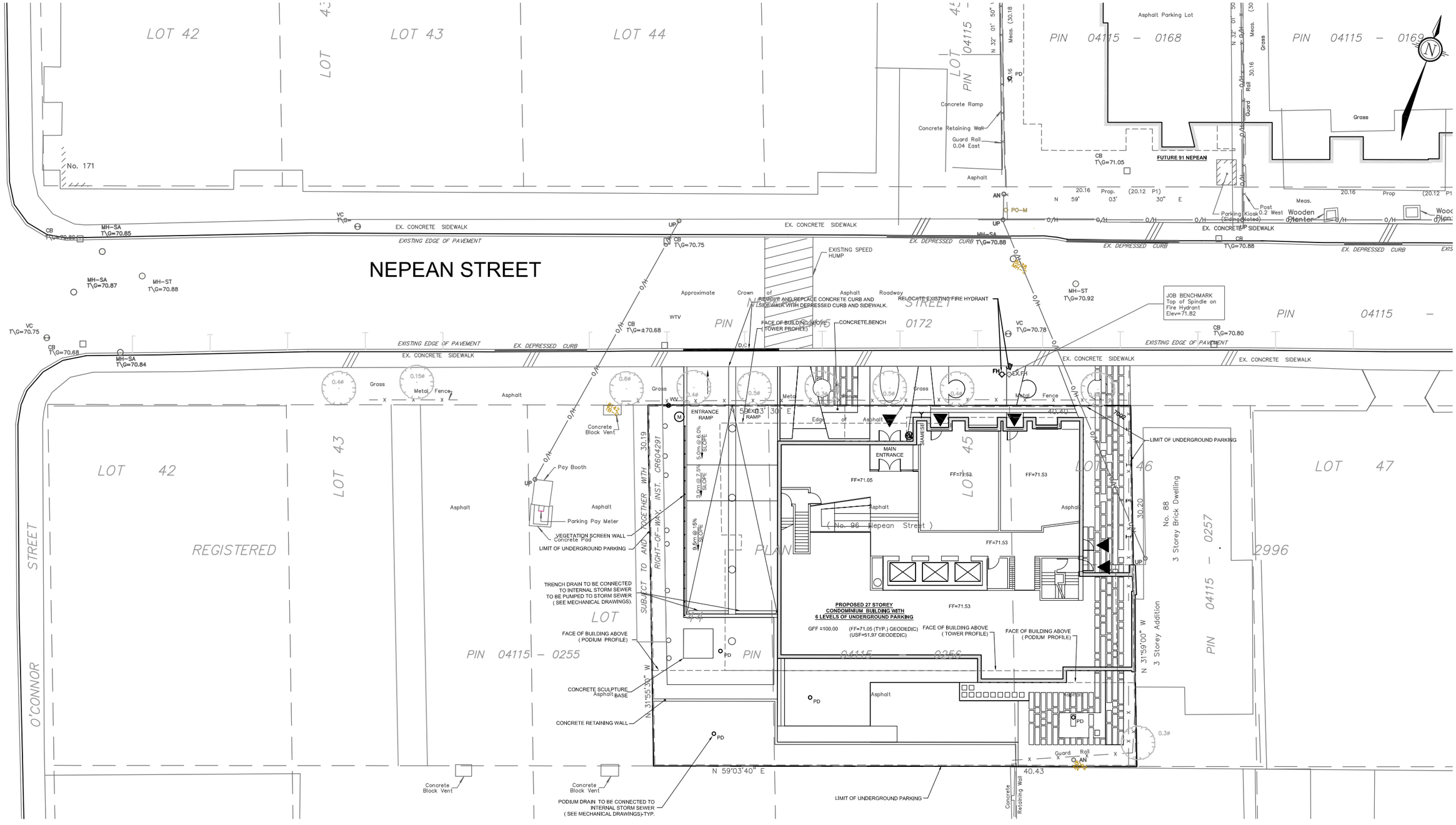
The types of analysis undertaken to assess the transportation impacts of the revised development are consistent with the requirements of the Ottawa *Transportation Impact Assessment (TIA) Guidelines*, published in October 2006.

Intersection capacity analysis has been completed using the software package Synchro 6.0. This software uses methodology from the *Highway Capacity Manual 2000* (HCM), published by the Transportation Research Board, to evaluate signalized and unsignalized intersections.

Intersection operating conditions are commonly described in terms of a Level of Service (LOS). LOS is a qualitative measurement of speed, freedom to manoeuvre, interruptions, comfort and convenience. Letters are assigned to six levels, with LOS 'A' representing optimal operating conditions and LOS 'F' representing failing operating conditions.

The City of Ottawa has adopted criteria that directly relate the LOS of a signalized intersection to a volume to capacity (v/c) ratio. Vehicle capacity is defined as the maximum number of vehicles that can pass a given point during a specified period under prevailing traffic conditions. The City's criteria are as follows:

LOS	v/c ratio
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	>1.00



LEGEND

SITE PLAN AREA

ON STREET PARKING

NTS

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CITY OF OTTAWA

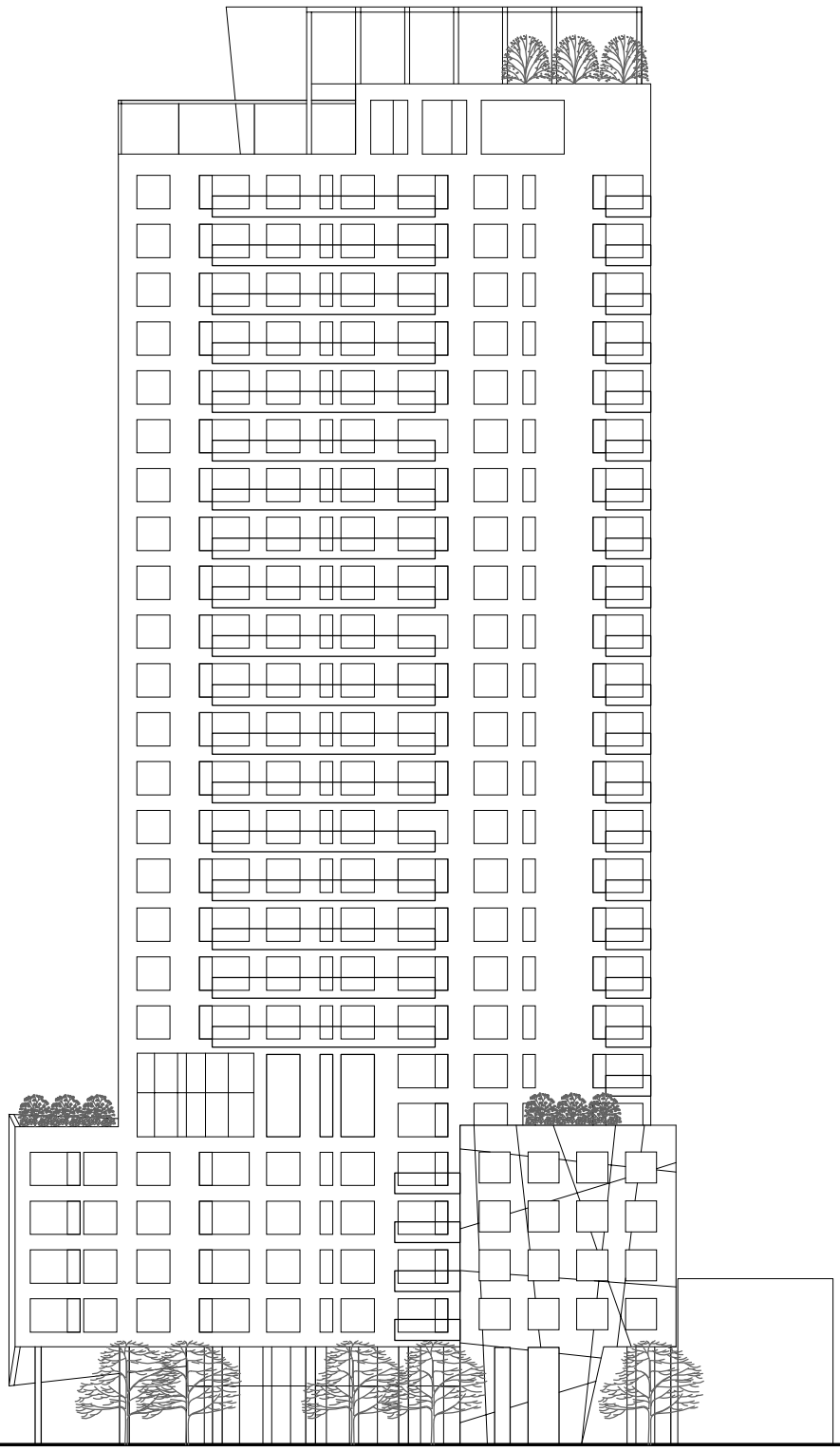
NEPEAN STREET RESIDENTIAL DEVELOPMENT

96 NEPEAN STREET

SITE PLAN

NOV 2011 111153 FIGURE 2

SHT11X17.DWG – 278mmX431mm



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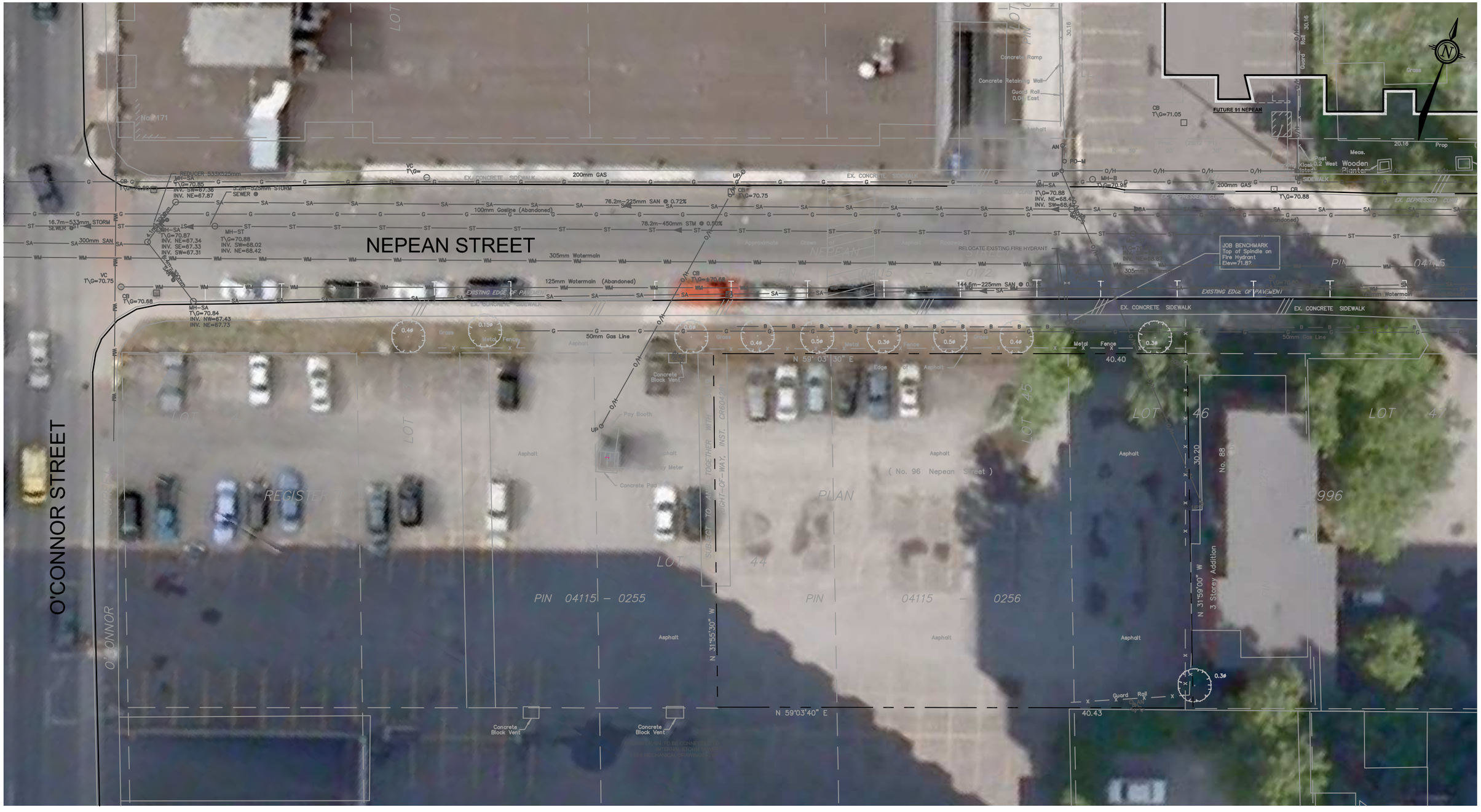
CITY OF OTTAWA

NEPEAN STREET RESIDENTIAL DEVELOPMENT

96 NEPEAN STREET

SOUTH ELEVATION

NOV 2011 111153 FIGURE 3



LEGEND

SITE PLAN AREA

ON STREET PARKING

NTS

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CITY OF OTTAWA

NEPEAN STREET RESIDENTIAL DEVELOPMENT

96 NEPEAN STREET

EXISTING CONDITIONS

NOV 2011 111153 FIGURE 4

SHT11X17.DWG – 278mmX431mm

The LOS for an unsignalized intersection is based on average control delay and is defined for individual movements. Control delay includes initial deceleration, queue move-up time, stopped time and final acceleration. The HCM presents the following criteria relating the LOS for individual movements to average control delay:

LOS	Delay (sec/veh)
A	<10
B	10 to 15
C	15 to 25
D	25 to 35
E	35 to 50
F	>50

In this study, movements at signalized and unsignalized intersections have been evaluated in terms of the LOS as defined in the foregoing tables. Mitigation measures in the form of additional lane capacity and/or signal adjustments have been identified for movements with a LOS E or F.

This Combined Community Transportation Study (CTS)/TIS has been prepared to provide an assessment of the development proposal. The methodologies used to analyze the transportation impacts of the proposed development are described as follows:

- An operational evaluation of the site access and study area intersections under the background and total traffic conditions (i.e. background traffic plus development traffic) for the weekday AM and PM peak hours,
- A screenline analysis in order to compare the forecasted demand and available capacity of the major road network connecting the site to the area transportation network,
- An assessment of provisions for non-auto travel modes, including integration with local transit service, and connections with the local pedestrian and bicycle networks,
- A review of the proposed on-site design in terms of access, parking facilities, and emergency/garbage service requirements,
- An evaluation of conformance with Transportation Demand Management (TDM) principles.

1.2 Analysis Parameters

The study area for this report was confirmed with City staff, and includes the proposed access on Gloucester Street as well as the following intersections:

- Nepean Street/Metcalfe Street
- Metcalfe Street/Gloucester Street
- Gloucester Street/O'Connor Street
- O'Connor Street/Nepean Street

The selected time periods for analysis are the weekday AM and PM peak hours. The weekday AM and PM peak hours are considered to represent the 'worst-case' combination of site-generated traffic and adjacent street traffic. Existing traffic conditions within the study area have been be examined, along with background and total traffic conditions at the build-out year (2013) and a five-year horizon (2018).

2.0 EXISTING CONDITIONS

2.1 Roadways

Metcalfe Street is a one-way arterial roadway, carrying northbound traffic. In the vicinity of the subject site, Metcalfe Street consists of two lanes for general traffic and one lane for on-street parking. On-street parking is not permitted between 7 and 9 AM or between 3:30 and 5:30 PM, Monday through Friday. Between Slater Street to the north and Somerset Street to the south, Metcalfe Street is a designated truck route with restricted loads. The City of Ottawa Official Plan requires a 20m Right-of-Way (ROW) to be protected along Metcalfe Street in the vicinity of the subject site.

Nepean Street is a one-way local roadway, carrying eastbound traffic. Through lane delineation is not provided, however the existing roadway width is sufficient for two lanes of traffic. In the vicinity of the subject site, on-street pay and display parking is provided during peak hours (7:00AM – 7:00PM) on the south side of Nepean Street. On-street parking not exceeding 2 hours duration is permitted free of charge during off-peak hours (7:00 PM – 7:00 AM). Parking is prohibited on the north side of Nepean Street.

Gloucester Street is a one-way local roadway, carrying westbound traffic. As with Nepean Street, through lane delineation is not provided, however the existing roadway width is sufficient for two lanes of traffic. In the vicinity of the subject site, on-street metered parking is provided on the north side of Gloucester Street. On-street parking not exceeding 1 hour duration is permitted free of charge during off-peak hours (7:00 PM – 7:00 AM). Parking is prohibited on the south side of Gloucester Street.

O'Connor Street is a one-way arterial roadway, carrying southbound traffic. In the vicinity of the subject site, O'Connor Street consists of two central lanes for general traffic at all times, and two outer lanes that are used for on-street parking during off-peak periods. On-street parking or stopping is not permitted between 7 and 9 AM or between 3:30 and 5:30 PM, Monday through Friday. O'Connor Street is a designated truck route with no load restrictions. The City of Ottawa Official Plan requires a 20m Right-of-Way (ROW) to be protected along O'Connor Street in the vicinity of the subject site.

Regulatory speed for Nepean Street is 50kph as provided through the Ontario Highway Traffic Act. There is one speed hump located mid-block between Metcalfe Street and O'Connor Street on both Nepean Street and Gloucester Street. Both speed humps are signposted with a Wa-74 SPEED HUMP sign. Recent field observations indicate that passing vehicles rarely exceed 30kph on the adjacent sections of Nepean Street and Gloucester Street, and as such they are considered to provide an effective means of traffic calming in this residential area.

2.2 Study Area Intersections

Pre-timed and coordinated traffic signal control is provided at the Metcalfe/Gloucester and O'Connor/Gloucester intersections. Stop control is provided on Nepean Street at the Metcalfe Street intersection and at the O'Connor Street intersection.

Nepean Street and Gloucester Street each have a road width of approximately 9 metres and can accommodate more than a single lane of traffic at the Metcalfe Street and O'Connor Street intersections. The following operating conditions were noted during field visits undertaken on Tuesday, September 28th 2010 between 3:00 PM and 4:00 PM, and Tuesday, January 17th 2011 between 4:00 PM and 5:00 PM:

- motorists use the eastbound approach of the Nepean Street/O'Connor Street intersection as one right-turn lane and one through lane,
- motorists use the eastbound approach of the Nepean Street/Metcalfe Street intersection as one left-turn lane and one through lane,
- motorists use the westbound approach of the Gloucester/Metcalfe Street intersection as one right-turn lane and one through lane,
- motorists use the westbound approach of the Gloucester/O'Connor Street intersection as one left-turn lane and one through lane.

The proximity of on-street parking limits the opportunity to delineate the above lane configurations in a meaningful way. However, the observed operating conditions have been assumed for the intersection analysis presented in this report.

2.3 Existing Pedestrian Facilities

Sidewalks are provided along both sides of Metcalfe Street, Nepean Street, Gloucester Street, and O'Connor Street. Within the study area, the sidewalk is primarily of concrete construction. Unit pavers are used on the east side of Metcalfe Street, north of Nepean Street, and in localized areas on O'Connor Street. An asphalt boulevard separates pedestrians from roadway users along the west side of Metcalfe Street, north of Lisgar Street. Extra wide sidewalks (in excess of 3m) are provided along the following roadway sections within the study area:

- on the east side of Metcalfe Street, north of Nepean Street,
- on the north side of Gloucester Street east of O'Connor Street, close to the Gloucester/O'Connor intersection.

Crosswalks with depressed curbs are provided on all four arms of the signal-controlled intersections of Gloucester Street/Metcalfe Street and Gloucester Street/O'Connor Street, and also on the east and west arms of the stop-controlled intersections of Nepean Street/O'Connor Street and Nepean Street/Metcalfe Street. The north-south crosswalks at the O'Connor Street/Gloucester Street and O'Connor Street/Nepean Street are visually and texturally distinct from the adjacent pavement through the use of coloured unit pavers.

2.4 Existing Bicycle Facilities

The City of Ottawa's Primary Urban Cycling network from the 2008 *Transportation Master Plan* (TMP) designates Metcalfe Street and O'Connor Street as on-road cycling routes. Designated cycling lanes are not provided along either street.

Metcalfe Street is a designated Spine or City-wide Cycling Route in the City of Ottawa's *Ottawa Cycling Plan (OCP).* The OCP identifies a need to provide bicycle lanes on Metcalfe Street to cater for cyclists on this City-wide Cycling Route.

O'Connor Street is also a designated Spine or City-wide Cycling Route in the City of Ottawa's *Ottawa Cycling Plan (OCP).* The OCP identifies a need to provide bicycle lanes on O'Connor Street to cater for cyclists on this City-wide Cycling Route.

No designated cycling facilities are provided on Nepean Street or Gloucester Street in the vicinity of the subject site, nor are any proposed in the future concepts of either the TMP or the OCP. The OCP's proposed cycling network in the downtown core is to be reviewed as part of the TMP update and future transit strategies.

2.5 Existing Transit Facilities

A copy of the 2009 OC Transpo system map for the study area is included in Appendix A. This report describes all existing transit facilities within a five minute walk of the subject site, which equates to a distance of 400 metres. OC Transpo guidelines recommend that all development in the vicinity of a bus route should have at least one bus stop within a walking distance of 400 metres.

The Metcalfe Transitway Station on Slater Street (bus stop #3008) is located north of the subject site at a walking distance of approximately 280 metres. This station provides service to six rapid transit routes, five regular routes, thirty-one express routes and eight peak-only routes. A new bus shelter was provided for this bus stop in early October, as part of OC Transpo improvements to the Transitway stations on Albert Street and Slater Street.

OC Transpo bus stops #8465 and #7675 are located at the northwest and southeast corners of the Elgin Street/Nepean Street intersection respectively, at a walking distance of approximately 330 metres from the subject site. These stops provide service to regular routes 5, 6 and 14. A shelter is provided for bus stop #8465, but not for bus stop #7675. Route details are provided in Appendix A.

OC Transpo bus stops #2486 and #2484 are located at the northwest and southeast corners of the Bank Street/Gloucester Street intersection respectively, at a walking distance of approximately 290 metres from the subject site. These stops are served by regular routes 1, 2, 4 and 7. There are no shelters provided for either of these bus stops. Route details are provided in Appendix A.

2.6 Existing Traffic Volumes

Eight-hour weekday traffic counts were completed by the City of Ottawa at the following study area intersections:

- O'Connor and Nepean (4 May, 2010)
- O'Connor and Gloucester (July 27, 2010)
- Gloucester and Metcalfe (July 27, 2010)

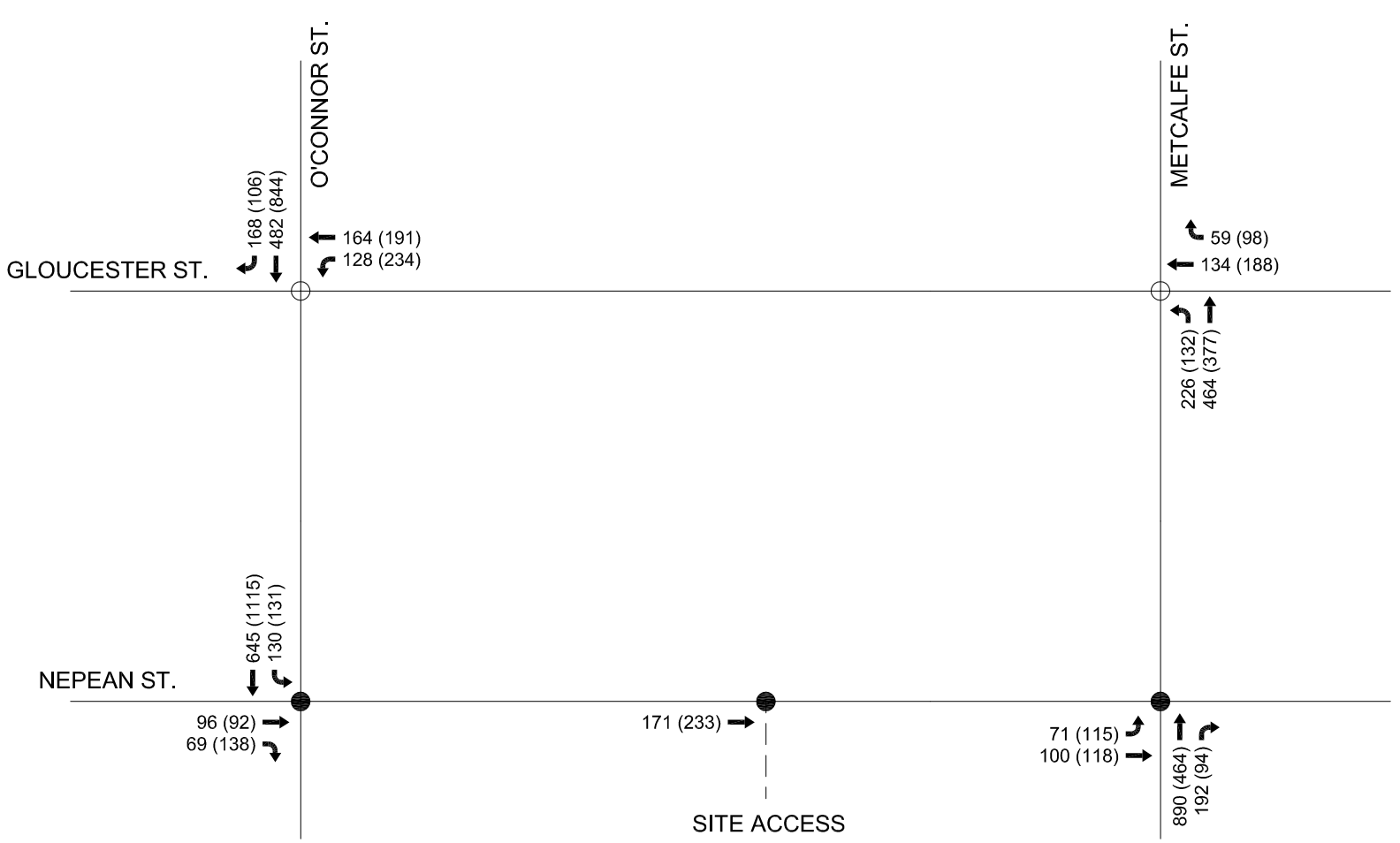
An eight-hour weekday traffic count was completed by Novatech at the Metcalfe Street/Nepean Street intersection on October 6, 2009. Existing traffic volumes are shown in Figure 6.

Peak hour summary sheets for the above traffic counts are included in Appendix B.

2.7 Collision Records

Historical collision data from the last three years was obtained from the City's Public Works and Service Department for all study area intersections. Copies of the collision summary reports are included in Appendix C.

The collision data has been evaluated to determine if there are any identifiable collision patterns. The Ottawa *TIA Guidelines* define a collision pattern as more than one collision involving similar directions and impact types. Further analysis may be warranted for intersections with a pattern of six or more collisions for any one movement or a total of 33 or more collisions, over a three-year period.



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LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

2011 BACKGROUND TRAFFIC

NOV 2011 111153 FIGURE 6

The following table summarizes the number of collisions reported at each intersection from January 1, 2008 to January 1, 2011.

Table 1: Reported Collisions

Location	Number of Reported Collisions (Jan 1, 2008 to Jan 1, 2011)
O'Connor Street & Nepean Street	26
Metcalfe Street & Nepean Street	11
Metcalfe Street & Gloucester Street	11
Gloucester Street & O'Connor Street	5

2.7.1 O'Connor Street & Nepean Street

Thirteen of the twenty-six collisions at the intersection of O'Connor Street and Nepean Street were angle impacts involving southbound vehicles and eastbound vehicles. Three of these thirteen collisions caused personal injury, but no fatalities. As the observed number of collisions for this movement over the last three years exceeds six, a more detailed analysis of the intersection has been provided. The City of Ottawa does not have a basic collision diagram for this intersection.

On-site observations suggest that a critical factor that results in such a high number of angle impacts is inadequate sight distance for eastbound vehicles on Nepean Street who wish to cross O'Connor Street. At the stop line on Nepean Street, sight distance looking north is limited by the adjacent building at 172 O'Connor Street. This building has no setback from the adjacent sidewalk, and the sidewalk has no setback from the curb, as shown in Figure 5.

Figure 5 – Sightline for EB vehicles at the stop line on Nepean Street, looking north

Traffic signals at this intersection would not improve the existing sightlines for vehicles on Nepean Street, but they could at least provide intervisibility between vehicles waiting at stop lines on Nepean Street and O'Connor Street. Angle collisions, such as those most commonly observed at this intersection, are categorised in the *Ontario Traffic Manual Book 12* as 'collisions susceptible to reduction'. This term refers to collisions involving vehicles that, under signalized conditions, would move on completely separate phases.

The crossing distance for eastbound vehicles on Nepean Street is approximately 26 metres. During off-peak traffic periods, O'Connor Street has two central southbound lanes of traffic operating under free flow conditions, with two parking lanes at either edge. This means that there are two potential impact points between a vehicle heading south on O'Connor Street, and a vehicle heading east on Nepean Street looking to cross O'Connor Street.

Eight of the thirteen angle impacts occurred during the relatively short peak periods when O'Connor Street carries four lanes of southbound traffic. During peak hour traffic, O'Connor Street has four southbound lanes of traffic operating under free flow conditions. With this lane configuration the crossing distance of 26 metres remains unchanged, but the number of potential impact points between intersecting traffic on Nepean and O'Connor doubles to four.

As shown in Figure 11, the proposed development is expected to add 5 extra vehicles to the eastbound through movement during the PM peak hour. This is a marginal increase relative to the existing number of vehicles currently making this movement, and is expected to have a negligible impact on the overall safety of the intersection.

The need for traffic signal control at the O'Connor Street/Nepean Street intersection was reviewed according to the procedure outlined in the *Ontario Traffic Manual Book 12* for Justification 5 – Collision Experience. Traffic signal justification calculations are provided in Appendix E. Based on historical collision data for 36-month period from January 1st 2008 to January 1st 2011, the calculations show that traffic signals are 86% justified for the O'Connor Street/Nepean Street intersection.

While not technically justified based on collision experience, the installation of traffic signal control at this intersection is identified as a means of addressing the high number of angle impacts observed during the last 3 years. It is noteworthy that traffic signal control is also expected to improve the overall capacity of the intersection, allowing the currently failing eastbound approach to operate with acceptable LOS during peak hours. This is discussed in greater detail in Section 4 of this report.

2.7.2 Metcalfe Street & Nepean Street

Seven of the eleven collisions at the intersection of Metcalfe Street and Nepean Street were angle impacts involving northbound vehicles and eastbound vehicles. One of the seven collisions caused personal injury, but no fatalities. As the observed number and type of collisions for this movement over the last three years exceeds six, a more detailed analysis of the intersection has been provided. The City of Ottawa does not have a basic collision diagram for this intersection.

As noted at the adjacent intersection of O'Connor Street and Nepean Street, on-site observations suggest that a critical factor that results in such a high number of angle impacts is inadequate sight distance for eastbound vehicles on Nepean Street who wish to cross Metcalfe Street. At the stop line on Nepean Street, sight distance looking north is limited by the adjacent building at 180 Metcalfe Street. This building has no setback from the adjacent sidewalk, and the sidewalk has no setback from the curb.

It is understood that traffic signals are to be provided at this intersection, in order to meet a condition of Site Plan approval for the residential/commercial development at 187 Metcalfe Street. This development is currently under construction, and is likely to be completed sometime next year.

For the same reasons as those outlined in Section 2.7.1 of this report, it is considered likely that the future provision of signals at this intersection will effectively address the high number of angle impacts observed during the last three years.

2.7.3 Metcalfe Street & Gloucester Street

Four of the eleven collisions at the Metcalfe Street/Gloucester Street intersection were turning impacts involving northbound vehicles. Three of the eleven collisions at the intersection were sideswipe impacts involving northbound vehicles, one of which involved a bicycle. Personal injuries were not sustained in any of the turning or sideswipe impacts. This intersection does not meet the City's criteria for further analysis with respect to collision patterns or total collisions.

2.7.4 Gloucester Street & O'Connor Street

During the last three years, five collisions have occurred at this intersection. Two of the five collisions were turning impacts involving southbound vehicles, neither of which resulted in personal injury. One collision involved an angle impact between a pick-up truck and a bicycle, and another involved a single vehicle collision with a pedestrian who sustained personal injury. No fatalities were recorded. This intersection does not meet the City's criteria for further analysis with respect to collision patterns or total collisions.

3.0 TRAVEL DEMAND FORECASTING

3.1 Planned Network Changes

The 2008 TMP identifies a Rapid Transit Network that proposes to implement Light Rail Transit (LRT) through downtown Ottawa, on a route which will ultimately extend east to Blair Road and west to Tunney's Pasture. The EA Study for the Downtown Ottawa Transit Tunnel (DOTT) project received final approval from the Ontario Ministry of the Environment in August, and preliminary engineering commenced in early September. Construction is scheduled to commence in 2014, and is expected to take five years.

The downtown section of the proposed LRT route includes a 3 kilometre tunnel with 5 underground or partially underground stations to serve the downtown area. The DOTT project includes a Downtown East transit station located north of Albert Street between Bank Street and O'Connor Street. The recommended design for this station incorporates entries on Albert Street, east of Bank Street and on Queen Street at O'Connor Street, approximately 400 metres northwest of the subject site. The construction of the tunnel is expected to have a significant impact on traffic volumes and modal shares in the downtown area. It is anticipated that the DOTT will increase the transit modal share and decrease the car modal share within the downtown area, resulting in a decrease in the number of vehicles on the downtown road network.

However, the analysis presented in this report is based on the existing traffic patterns and transit network, as the expected year of project completion is beyond the horizon year of this study. No reduction has been applied to future traffic volumes to account for the anticipated impact of LRT implementation in the downtown area.

It is noted that the installation of signals at the Nepean Street/Metcalfe Street intersection has recently been approved by the City. However, the analysis presented in this report is based on present-day operations at the intersection i.e. without signals.

3.2 General Background Growth

Over a 26-year period between 2005 and 2031, the 2008 TMP projects an increase in combined automobile and transit travel demand of 28% at the adjacent Rideau River screenline. This equates to an annual growth rate of approximately 0.9%. Based on the foregoing calculation, an annual growth rate of 1.0% was confirmed with City staff for future background traffic projections at all study area intersections.

Background traffic volumes for the 2013 and 2018 analysis years were estimated by applying the 1% growth rate to the most recent traffic count data available at all study area intersections.

The 2013 and 2018 background traffic projections are shown in Figures 10 and 11 respectively.

3.3 Other Planned Developments

3.3.1 187 Metcalfe Street

A high density residential/commercial development is currently under construction at 187 Metcalfe Street, which is located approximately 75 metres southeast of the subject site. This development shall consist of two 27-storey and one 7-storey condominium towers, a 2,330m^2 grocery store, and a 300m^2 daycare centre. The development is to be constructed in 3 phases, with full completion scheduled for 2013.

NECL produced a combined CTS/Revised TIS in February 2010 in support of a Zoning By-law Amendment and Site Plan Approval application for this development. This study estimated that at full buildout, the development would generate 177 two-way trips in the AM peak hour and 305 two-way trips in the PM peak hour. An excerpt of this report detailing the trip generation of the proposed development, and the distribution of those trips throughout the adjacent road network, is included in this report as Appendix F1.

3.3.2 89-91 Nepean Street

A high density residential/commercial development is also proposed at 89-91 Nepean Street, which is located immediately south of the subject site. This development shall consist of a 27-storey condominium tower containing 233 units, a 1,200ft^2 commercial unit, and 135 parking spaces on 7 underground levels. The development is to be constructed in a single phase, with full completion scheduled for 2013.

NECL produced a combined CTS/Revised TIS in January 2011 in support of a Zoning By-law Amendment and Site Plan Approval application for this development. This study estimated that at full buildout, the development would generate 74 vehicle trips in the AM peak hour and 75 vehicle trips in the PM peak hour. An excerpt of this report detailing the trip generation of the proposed development, and the distribution of those trips throughout the adjacent road network, is included in this report as Appendix F2.

3.3.3 70 Gloucester Street

A high density residential/commercial development is also proposed at 70 Gloucester Street, which is located approximately 100m north of the subject site (adjacent to the 89-91 Nepean Street site). This development shall consist of a 27-storey condominium tower containing 229

units, 4 stacked townhouses and 207 parking spaces on 6 underground levels. The development is to be constructed in a single phase, with full completion scheduled for 2013.

NECL produced a combined CTS/Revised TIS in February 2011 in support of a Zoning By-law Amendment and Site Plan Approval application for this development. This study estimated that at full buildout, the development would generate 65 vehicle trips in the AM peak hour and 63 vehicle trips in the PM peak hour. An excerpt of this report detailing the trip generation of the proposed development, and the distribution of those trips throughout the adjacent road network, is included in this report as Appendix F3.

3.3.4 Impact of Future Planned Developments

For the purposes of this study, all trips that are likely to be generated by the 187 Metcalfe Street, 89-91 Nepean Street and 70 Gloucester Street developments are considered to be part of future background traffic. To account for this, the trip distribution volumes shown in Figures 7-9 have been included as part of the 2013 and 2018 background traffic volumes that are shown in Figures 10 and 11, respectively.

3.4 Trip Generation

Trips generated by the proposed residential dwelling units and commercial floor space have been estimated using relevant peak hour rates identified in the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition*. The specific land use of the commercial land use is unknown at this time, so it has been conservatively assumed that it will be developed as a convenience market (Mac's or similar). This land use is considered to be one of the most intensive trip generators that could be feasibly contained within the floor space area available. On this basis, the following trip generation calculations are considered to be robust. The trip generation is based on full development as shown in the site plan. The peak hour vehicle trips generated by the proposed development are outlined in the following table.

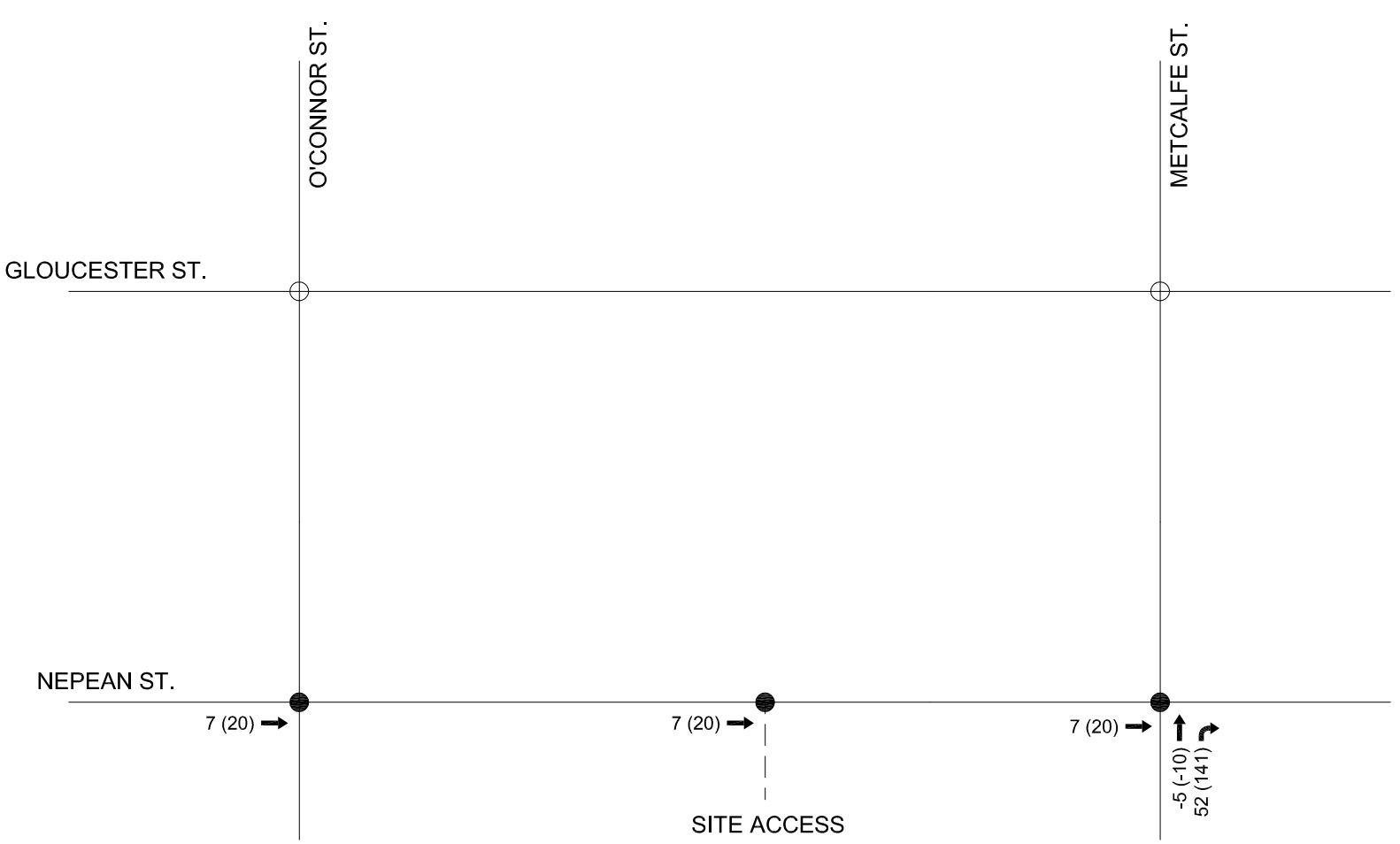
Table 2: ITE Trip Generation

Land Use	ITE Code	Units/GFA	Trip Rates		Vehicle Trips	
			AM Peak	PM Peak	AM Peak	PM Peak
High Rise Residential Condominiums	232	201	Equation[1]	Equation[2]	87 vph	84 vph

1. ITE Trip Equation: T = 0.29x + 28.86, where x = number of units
2. ITE Trip Equation: T = 0.34x + 15.47, where x = number of units
3. vph = vehicles per hour

Based on the relevant ITE trip rates, the proposed development is expected to generate 87 vph and 84 vph during the AM and PM peak hours respectively. The trip generation surveys compiled in the *ITE Trip Generation Manual* only record vehicle trips, and the sites surveyed are typically located in suburban locations in the United States where non-auto modes of transportation typically have a modal share of 10% or less. For urban infill developments in downtown locations such as Nepean Street, where multiple modes of transportation are readily available, it is considered good practice to express projected trip generation volumes in terms of person trips, instead of vehicle trips. To convert ITE vehicle trip rates to person trip rates, two adjustment factors have been applied:

- Vehicle occupancy factor: **1.23** (taken from the TRANS 2005 O-D Survey Report)
- Non-auto usage factor: **1.1** (non-auto trips not counted in ITE surveys, assumed 10%)



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LEGEND

- Unsignalized Intersection
- Signalized Intersection

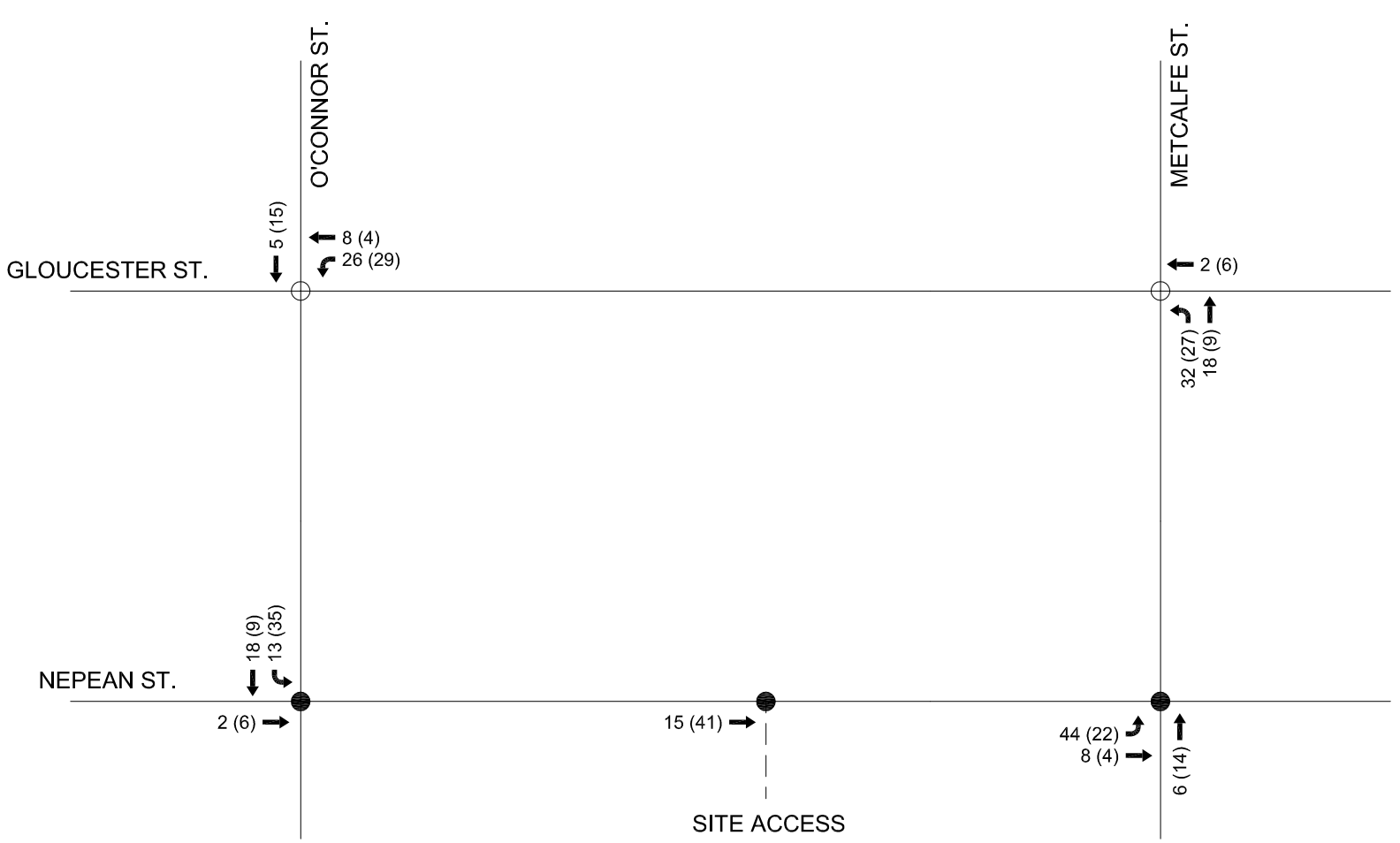
xx VPH AM Peak Hour

(xx) VPH PM Peak Hour

96 NEPEAN STREET

FUTURE SITE TRAFFIC @ 187 METCALFE STREET

NOV 2011 111153 FIGURE 7



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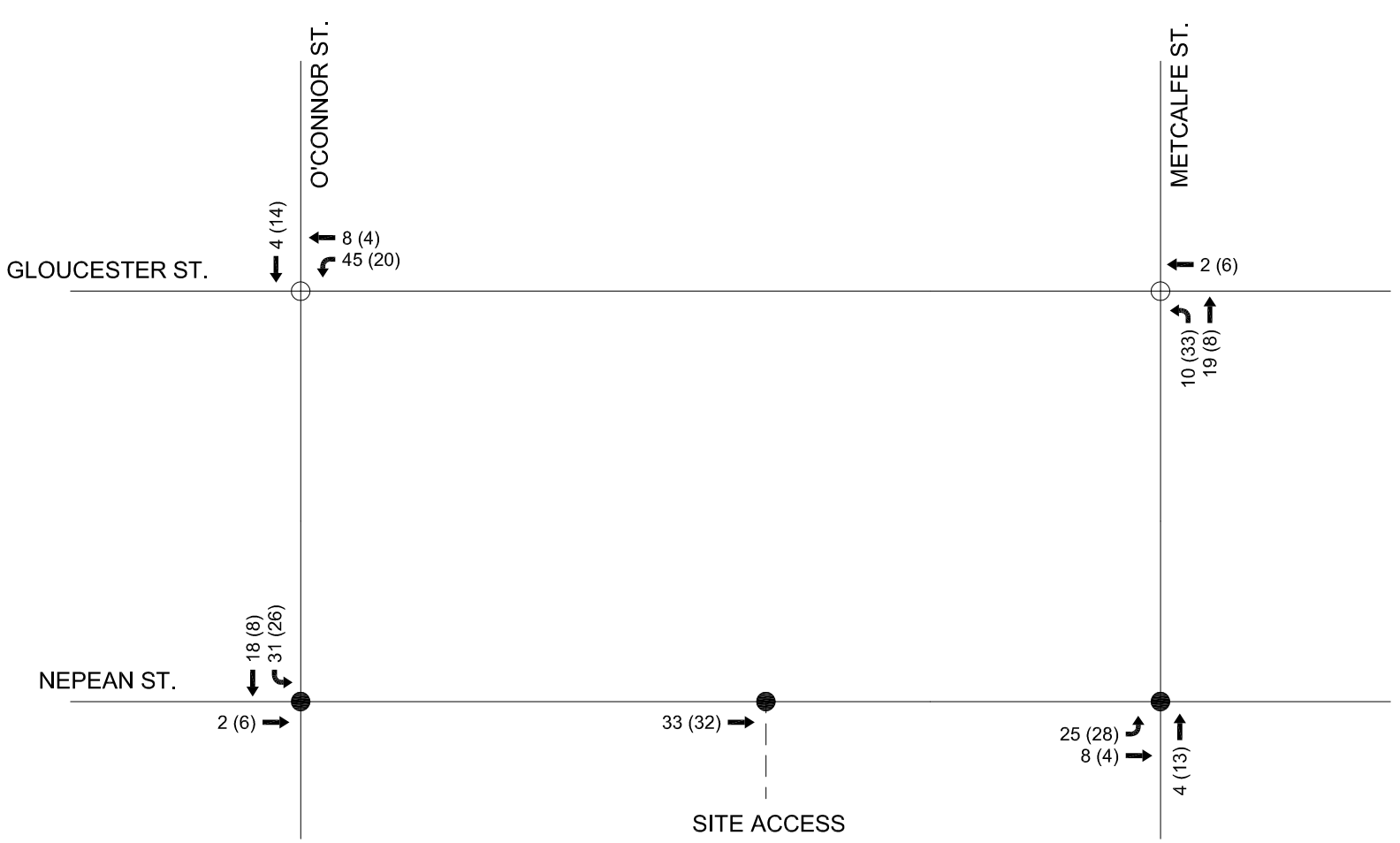
LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

FUTURE SITE TRAFFIC @ 89-91 NEPEAN STREET

NOV 2011 111153 FIGURE 8



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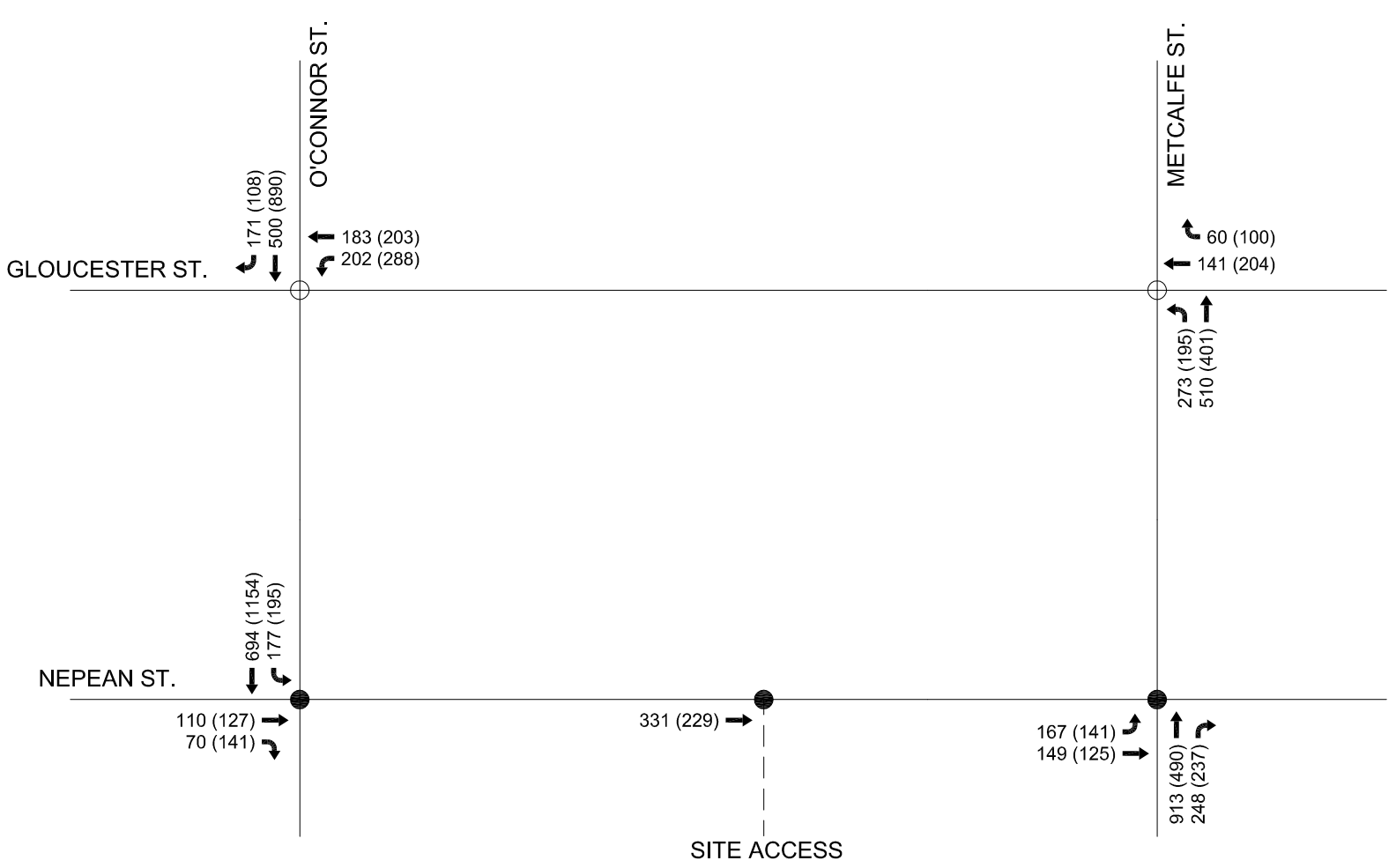
LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

FUTURE SITE TRAFFIC @ 70 GLOUCESTER STREET

NOV 2011 111153 FIGURE 9



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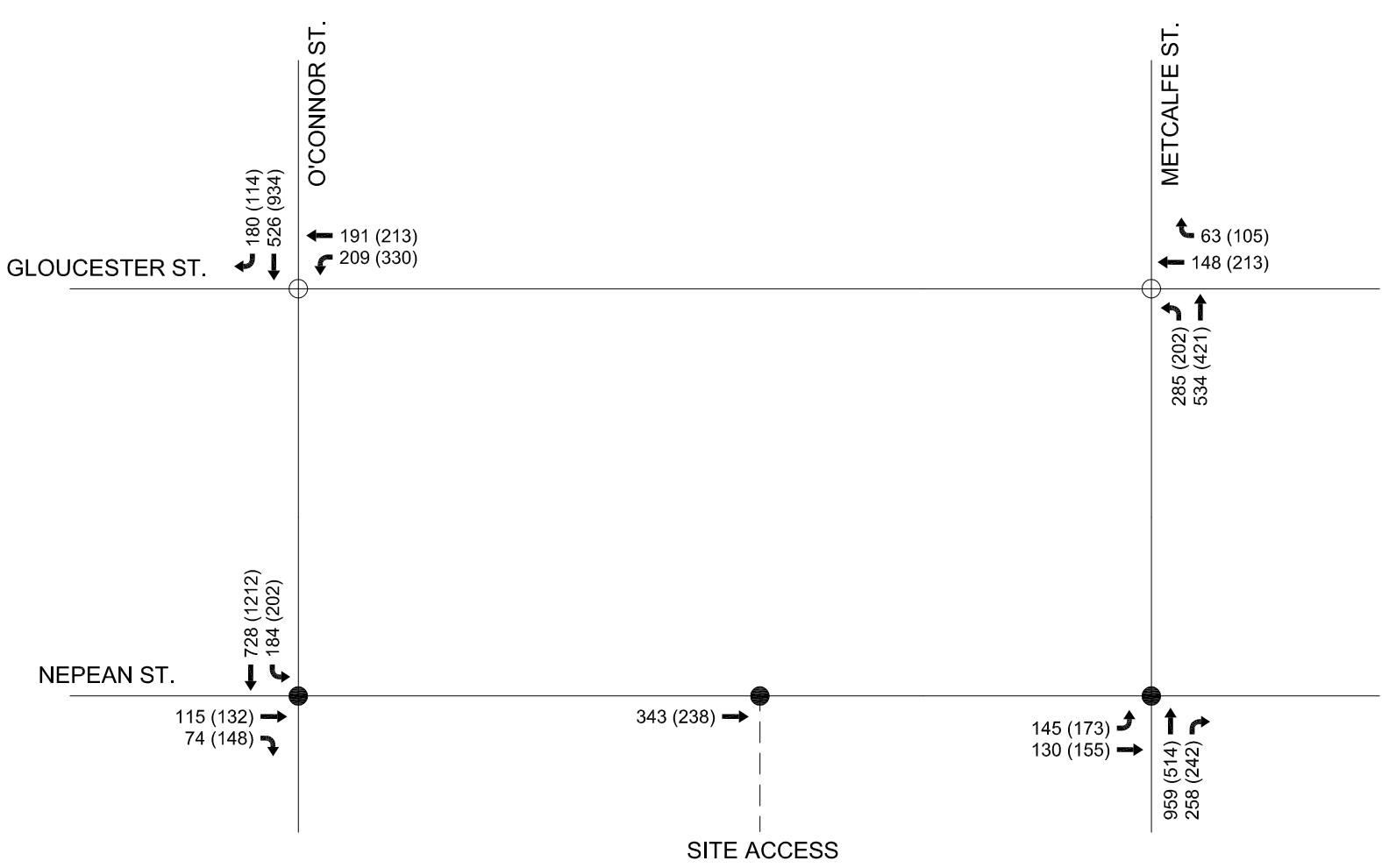
LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

2013 BACKGROUND TRAFFIC

NOV 2011 111153 FIGURE 10



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LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

2018 BACKGROUND TRAFFIC

NOV 2011 111153 FIGURE 11

Combining the two factors gives an overall vehicle trip to person trip adjustment factor of approximately 1.35. Applying this factor to the vehicle trips projected by the ITE rates, the site is expected to generate 117 and 113 person trips during the AM and PM peak hours, respectively.

Table 3: Person Trips

Land Use	Vehicle Trips		x 1.35 →	Person Trips	
	AM Peak	PM Peak		AM Peak	PM Peak
High-rise Residential Condominiums	87 vph	84 vph		117 pph[1]	113 pph

1. pph = persons per hour

The number of car trips that the site will generate has been estimated by categorising the external primary trips and pass-by trips by modal share. The modal shares are based on observed percentages in the *2005 Trans O-D Survey Report* that are specific to the region referred to as the Ottawa Inner Area. The Ottawa Inner Area is close to major centres of retail and employment, has well developed transit facilities, and an extensive sidewalk network. This is reflected in the relatively high observed modal share for non-auto transportation. The modal share values applied to trips generated by the convenience store relate specifically to observed trips that had an origin and destination within the Ottawa Inner Area, as it is considered extremely unlikely that the convenience store will generate a statistically significant volume of trips with an origin or destination beyond the Ottawa Inner Area. The modal shares for trips generated by the residential units relate to all observed trips within the Ottawa Inner Area, including those with an origin or destination beyond that area.

A full breakdown of the projected person trips by modal share and arrival/departure is given in the table below.

Table 4: Site-Generated Trips by Modal Share

Travel Mode	Modal Share	AM Peak	PM Peak
Total Person Trips		117 pph 22 in, 95 out	113 pph 70 in, 43 out
Non-Motorized	10%	12 pph 2 in, 10 out	11 pph 7 in, 4 out
Transit	30%	35 pph 7 in, 28 out	34 pph 21 in, 13 out
Car Passenger	10%	11 pph 2 in, 9 out	11 pph 7 in, 4 out
Car Driver	**50%**	**59 vph 11 in, 48 out**	**57 vph 35 in, 22 out**

The above table shows that the proposed development is expected to generate 59 and 57 vehicle trips in the AM peak and PM peak hour respectively.

3.5 Trip Distribution

The distribution of primary trips generated by the development was determined based on the existing traffic patterns and the location of the site access with respect to the adjacent roadway system.

The distribution of primary trips is summarized as follows:

- 35% to/from the north,
- 35% to/from the south,
- 15% to/from the west,
- 15% to/from the east.

The site-generated trip volumes for the weekday AM and PM peak hours are shown in Figure 12. Total traffic volumes for 2013 and 2018 have been calculated by adding the estimated site generated traffic with the background traffic projections. The 2013 and 2018 total traffic volumes are shown in Figures 13 and 14.

4.0 INTERSECTION ANALYSIS

Intersection capacity analysis has been completed using the Synchro 6.0 software package. Operating conditions at signalized intersections have been evaluated in terms of the volume to capacity (v/c) ratio and the corresponding Level of Service (LOS) based on City of Ottawa criteria. Operating conditions at unsignalized intersections have been evaluated in terms of delay and LOS based on *Highway Capacity Manual 2000* (HCM) criteria. Mitigation measures in the form of additional lane capacity, intersection control modifications, and/or traffic signal adjustments have been identified for movements with a LOS E or F.

4.1 2011 Existing Traffic

Intersection capacity analysis has been completed for the 2010 existing traffic conditions. The analysis is based on existing lane configurations and traffic signal timing plans obtained from the Public Works & Services Department.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in Appendix D1.

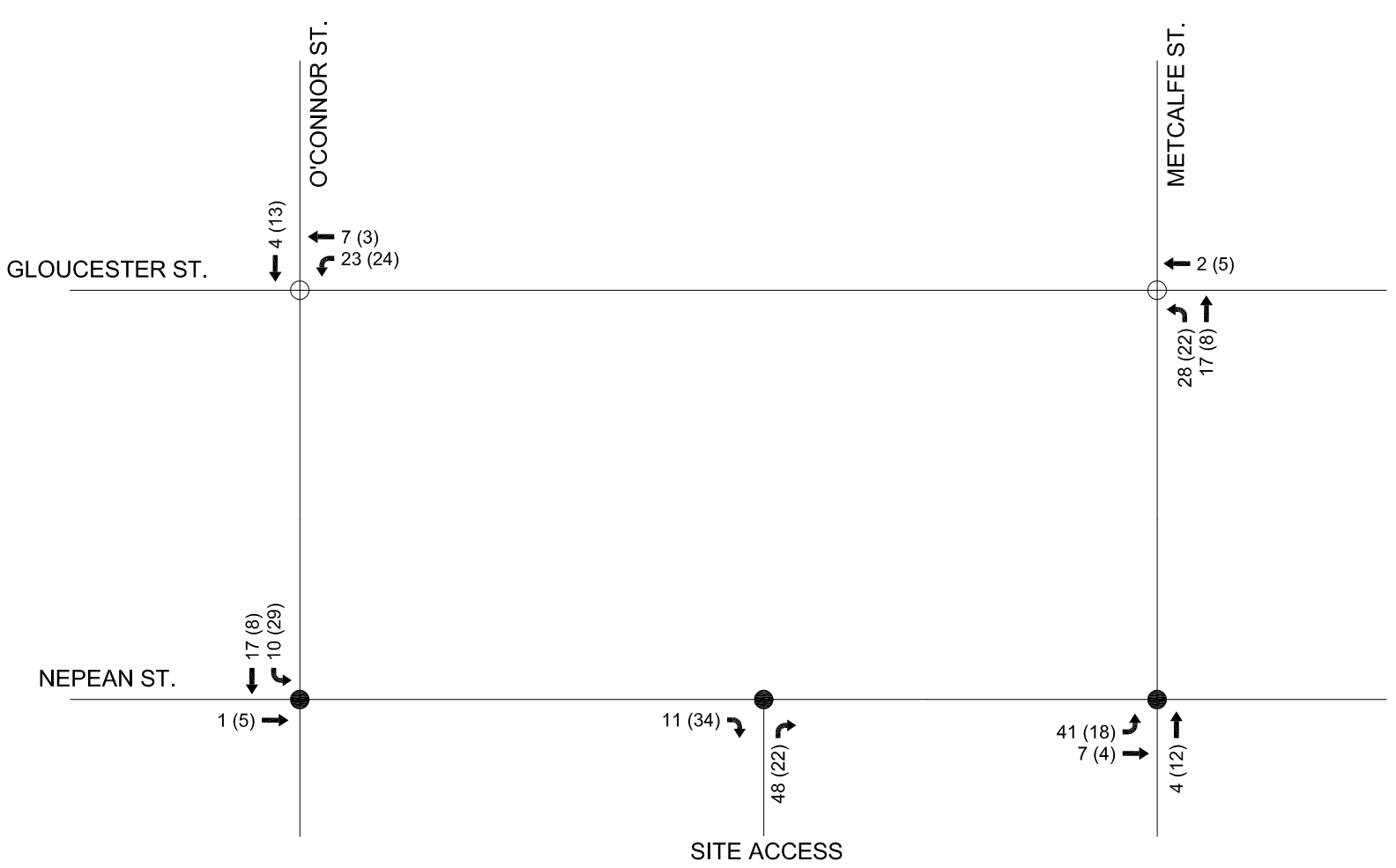
Table 5: Intersection Analysis – 2011 Existing Traffic

Intersection	AM Peak			PM Peak		
	max. v/c or delay	LOS	movement	max. v/c or delay	LOS	movement
Metcalfe / Nepean[1]	**460 sec**	**F**	**EBT**	50 sec	E	EBT
O'Connor / Nepean[1]	**170 sec**	**F**	**EBT**	**395 sec**	**F**	**EBT**
Metcalfe / Gloucester[2]	0.34	A	WBT	0.48	A	WBT
O'Connor / Gloucester[2]	0.30	A	WBT	0.44	A	WBL

1. Unsignalized (Stop control)
2. Signalized

The eastbound through movement at the intersection of Metcalfe Street and Nepean Street is currently operating beyond capacity (LOS F) in the AM peak hour, with a maximum queue length of 75 metres.

The eastbound through movement at the intersection of O'Connor Street and Nepean Street is currently operating beyond capacity (LOS F) in the AM and PM peak hour, with maximum queue lengths of 75 and 105 metres respectively.



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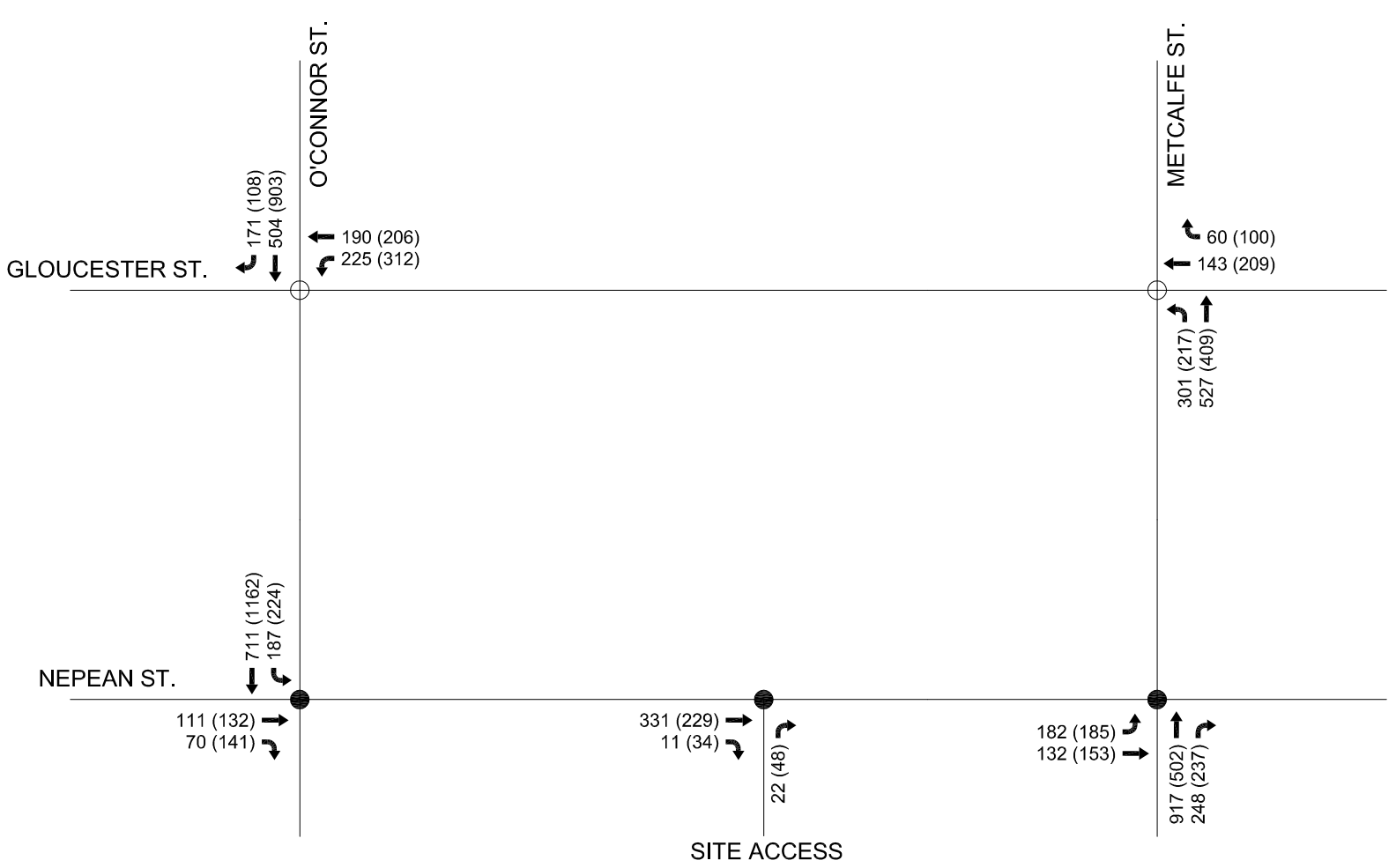
LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

SITE TRAFFIC

NOV 2011 111153 FIGURE 12



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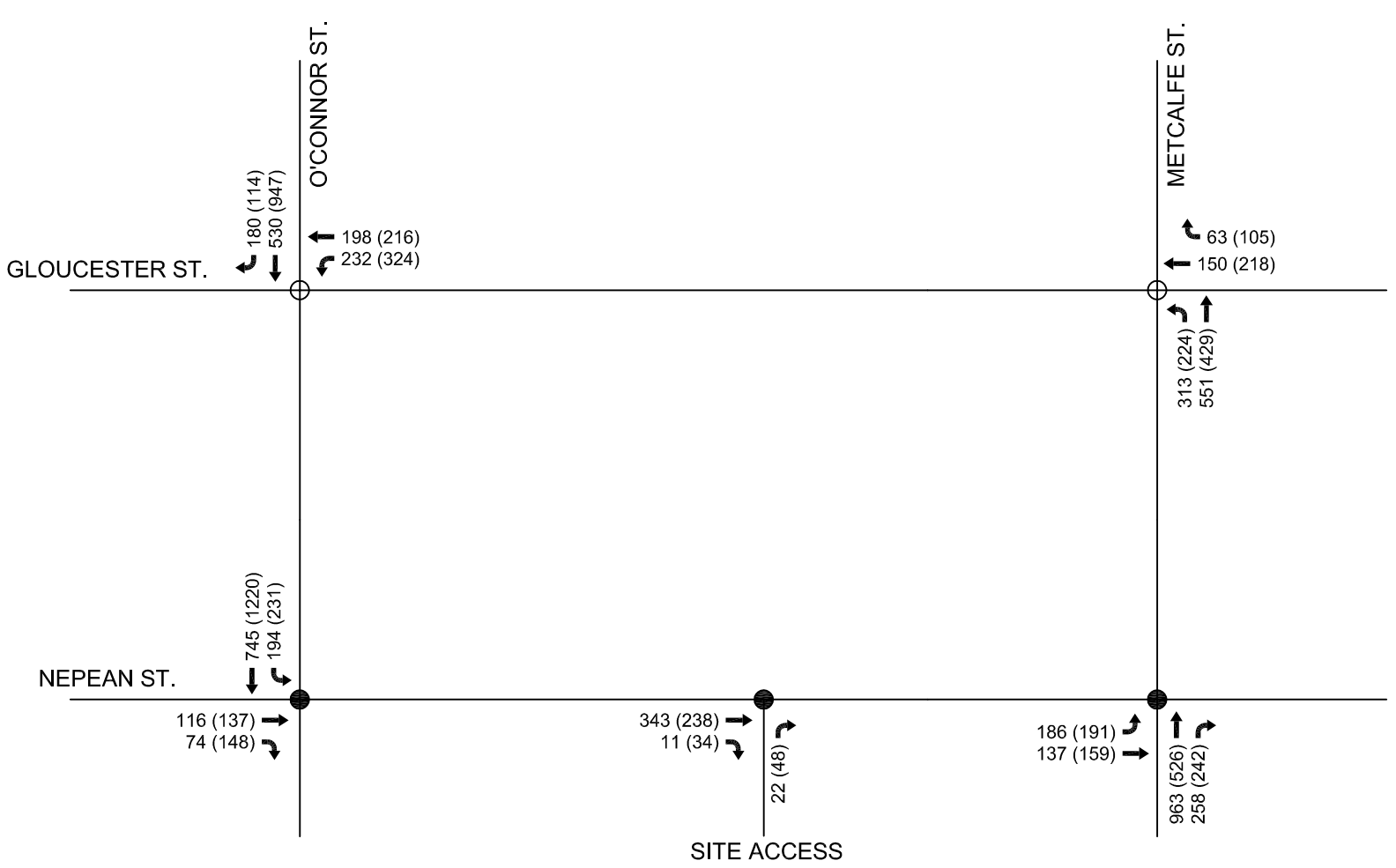
LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

2013 TOTAL TRAFFIC

NOV 2011 111153 FIGURE 13



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LEGEND

- Unsignalized Intersection
- Signalized Intersection
- xx VPH AM Peak Hour
- (xx) VPH PM Peak Hour

96 NEPEAN STREET

2018 TOTAL TRAFFIC

NOV 2011 111153 FIGURE 14

The intersection analysis completed as part of this study indicates that the eastbound through movement at this intersection is currently operating under failing conditions, with large delays during peak hours, most notably the PM peak hour. The failing conditions for the eastbound approach is likely a contributing factor to the high number of collisions observed at this intersection, as drivers who are forced to endure excessive delays at a stop sign can easily become frustrated. When this happens, they are more likely to accept smaller gaps in intersecting traffic, which increases the likelihood of angle impacts caused by poor driver judgement.

All other study area intersections are currently operating under acceptable conditions in the AM and PM peak hours.

4.2 2013 Background Traffic

Intersection capacity analysis has been completed for the projected 2013 background traffic conditions. As noted in Section 3.3.4 of this report, the additional traffic likely to be generated by nearby planned developments at 187 Metcalfe Street, 89-91 Nepean Street and 70 Gloucester Street have been accounted for in the 2013 background traffic projections.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in Appendix D1.

Table 6: Intersection Analysis – 2013 Background Traffic

Intersection	AM Peak			PM Peak		
	max. v/c or delay	LOS	Movement	max. v/c or delay	LOS	Movement
Metcalfe / Nepean[1]	**795 sec**	**F**	**EBT**	**140 sec**	**F**	**EBT**
O'Connor / Nepean[1]	**395 sec**	**F**	**EBT**	**985 sec**	**F**	**EBT**
Metcalfe / Gloucester[2]	0.36	A	WBT	0.52	A	WBT
O'Connor / Gloucester[2]	0.34	A	WBT	0.55	A	WBL

1. Unsignalized (Stop control)
2. Signalized

The eastbound through movement at the intersection of Metcalfe Street and Nepean Street is expected to operate beyond capacity (LOS F) in the AM and PM peak hours, with maximum queue lengths of 105 metres and 60 metres respectively.

The eastbound through movement at the intersection of O'Connor Street and Nepean Street is expected to operate beyond capacity (LOS F) in the AM and PM peak hours, with maximum queue lengths of 110 and 215 metres respectively.

The need for traffic signal control at the Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street intersections was reviewed according to the procedure outlined in the *Ontario Traffic Manual Book 12* for projected future traffic demands. Average Hourly Volumes (AHV) were estimated by dividing the sum of projected AM and PM peak hour volumes by four. Traffic signal justification calculations are provided in Appendix E. Based on projected 2013 background traffic volumes, the calculations show that traffic signals are only 69% justified for the Metcalfe Street/Nepean Street intersection and 66% justified for the O'Connor Street/Nepean Street intersection.

While not technically justified based on project traffic volumes, the installation of traffic signal control at both intersections is identified as a means of addressing the currently failing LOS identified in the capacity analysis. Additional analysis shows that under background traffic conditions, all movements at the intersections would operate with an acceptable LOS under pre-timed traffic signal control. Detailed reports are included in Appendix D1.

Acceptable operating conditions are expected at all other study area intersections in the AM and PM peak hours.

4.3 2018 Background Traffic

Intersection capacity analysis has been completed for the projected 2018 background traffic conditions.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in Appendix D1.

Table 7: Intersection Analysis – 2018 Background Traffic

Intersection	AM Peak			PM Peak		
	max. v/c or delay	**LOS**	**movement**	**max. v/c or delay**	**LOS**	**movement**
Metcalfe / Nepean[1]	**950 sec**	**F**	**EBT**	**170 sec**	**F**	**EBT**
O'Connor / Nepean[1]	**495 sec**	**F**	**EBT**	**n/a[3] (v/c 3.42)**	**F**	**EBT**
Metcalfe / Gloucester[2]	0.38	A	WBT	0.55	A	WBT
O'Connor / Gloucester[2]	0.37	A	WBL	0.57	A	WBL

1. Unsignalized (Stop control)
2. Signalized
3. Synchro unable to compute delay at stop sign for v/c > 3

The eastbound through movement at the Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street intersections will continue to experience failing operating conditions in 2018 under the existing traffic control.

Under 2018 background traffic conditions, Synchro is unable to provide a delay forecast for the eastbound approach to the O'Connor Street/Nepean Street intersection during the PM peak hour. In general, Synchro cannot compute delays for any movement with a v/c ratio greater than 3, as is the case here. A v/c ratio of this magnitude indicates that severe congestion and long queues are very likely, and can be attributed to the high volume of free-flowing southbound traffic on O'Connor Street during the 2018 PM peak hour. This traffic stream has a limited number of 'acceptable' gaps that would allow traffic on the side street (Nepean) to safely cross all four lanes of O'Connor Street, which reduces the capacity available for this movement.

Maximum queue length at the O'Connor Street/Nepean Street intersection is anticipated to be in excess 215 metres during the PM peak hour. A queue of this length would extend back to the Bank Street/Nepean Street intersection, and could create blocking problems there.

Marginal increases in v/c ratios and queue lengths are expected at the signalized intersections of Metcalfe Street/Gloucester Street and O'Connor Street/Gloucester Street. No mitigation measures

are identified at these intersections, as none are required. Acceptable operating conditions are expected at the intersections of Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street with the provision of traffic signals, as discussed in Section 4.2.

4.4 2013 Total Traffic

Intersection capacity analysis has been completed for the projected 2013 total traffic conditions, i.e. the sum total of the background traffic plus the traffic likely to be generated by the proposed development. The analysis is based on existing lane configurations and traffic signal timing plans obtained from the Public Works & Services Department.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in Appendix D2.

Table 8: Intersection Analysis – 2013 Total Traffic

Intersection	AM Peak			PM Peak		
	max. v/c or delay	LOS	movement	max. v/c or delay	LOS	movement
Metcalfe / Nepean[1]	**860 sec**	**F**	**EBT**	**155 sec**	**F**	**EBT**
O'Connor / Nepean[1]	**455 sec**	**F**	**EBT**	**n/a[3] (v/c 3.48)**	**F**	**EBT**
Metcalfe / Gloucester[2]	0.37	A	WBT	0.54	A	WBT
O'Connor / Gloucester[2]	0.39	A	WBL	0.60	A	WBL
Site access/Nepean[1]	10 sec	A	NBR	11 sec	B	NBR

1. Unsignalized (Stop control)
2. Signalized
3. Synchro unable to compute delay at stop sign for v/c > 3

The site traffic represents less than 5% of the peak hour traffic at the upstream and downstream intersections of Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street.

The results obtained from the Synchro analysis indicate that with the addition of site traffic, delay on the eastbound approach to the Metcalfe Street/Nepean Street intersection is expected to increase by 65 seconds in the AM peak hour and by 15 seconds in the PM peak hour, as compared to expected delay without the addition of site traffic.

Similarly, delay on the eastbound approach to the O'Connor Street/Nepean Street intersection is expected to increase by 60 seconds in the AM peak hour. The increase in delay for this movement during the PM peak hour cannot be determined, because the Synchro model is unable to provide a delay forecast for this scenario. With the addition of site traffic, the projected v/c ratio for this movement is 3.48, which indicates that severe congestion and long queues are very likely. By comparison, the v/c ratio for this movement under background traffic conditions in 2013 is 2.98, which indicate that severe congestion and long queues are likely at this intersection with or without the addition of site-generated traffic.

The traffic signal justification criteria were reviewed for the Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street intersections, under the projected total traffic condition. The calculations show that with the addition of site traffic, signals are only 71% justified at the Metcalfe Street/Nepean Street intersection, and 69% justified at the O'Connor Street/Nepean Street

intersection. A copy of the calculations is provided in Appendix E. Installation of signal control at both intersections has already been identified in this report as a means of addressing the failing background traffic condition, and additional analysis shows that in 2013, all approaches at both intersections would operate with an acceptable LOS under pre-timed signal control with the addition of site traffic.

Marginal increases in v/c ratios and queue lengths are expected at all other study area intersections on Gloucester Street, but all movements still operate with LOS A. No additional mitigation measures are identified.

Acceptable Levels of Service are expected at the underground parking access in the AM and PM peak hours. Delays of 11 seconds or less (LOS B) are anticipated for vehicles leaving the site, and queue lengths are expected to be negligible (less than 5 metres).

4.5 2018 Total Traffic

Intersection capacity analysis has been completed for the projected 2018 total traffic conditions.

The results of the analysis are summarized in the following table for the weekday AM and PM peak hours. Detailed reports are included in Appendix D2.

Table 9: Intersection Analysis – 2018 Total Traffic

Intersection	AM Peak			PM Peak		
	max. v/c or delay	LOS	movement	max. v/c or delay	LOS	movement
Metcalfe / Nepean[1]	**1025 sec**	**F**	**EBT**	**190 sec**	**F**	**EBT**
O'Connor / Nepean[1]	**560 sec**	**F**	**EBT**	**n/a[3] (v/c 4.01)**	**F**	**EBT**
Metcalfe / Gloucester[2]	0.38	A	WBT	0.56	A	WBT
O'Connor / Gloucester[2]	0.41	A	WBL	0.63	B	WBL
Site access/Nepean[1]	10 sec	A	NBR	11 sec	B	NBR

1. Unsignalized (Stop control)
2. Signalized
3. Synchro unable to compute delay at stop sign for v/c > 3

Marginal increases in delay, v/c ratios and queue lengths are expected at study area intersections under the projected 2018 total traffic conditions.

Under 2018 total traffic conditions, Synchro is unable to provide a delay forecast for the eastbound approach to the O'Connor Street/Nepean Street intersection during the PM peak hour. In general, Synchro cannot compute delays for any movement with a v/c ratio greater than 3, as is the case here. A v/c ratio of this magnitude indicates that severe congestion and long queues are very likely, and can be attributed to the high volume of free-flowing southbound traffic on O'Connor Street during the 2018 PM peak hour. This traffic stream has a limited number of 'acceptable' gaps that would allow traffic on the side street (Nepean) to safely cross all four lanes of O'Connor Street, which reduces the capacity available for this movement.

It should be noted that a severe level of congestion is also expected under background traffic conditions for this approach, with v/c ratio of 3.42 expected during the PM peak hour in 2018. In

practical terms, the addition of a small volume of site traffic will have no measurable impact, because the entire approach will already be completely gridlocked under background traffic conditions. At the levels of congestion likely to be encountered in 2018 (v/c approaching 4), the usefulness of Synchro as a means of determining likely traffic impact is greatly diminished, and the results it produces should be treated with extreme caution.

Additional analysis indicates that with the addition of site traffic in 2018, the Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street intersections would both be expected to operate with acceptable LOS under pre-timed signal control.

5.0 SCREENLINE ANALYSIS

In accordance with the requirements of the City of Ottawa *Transportation Impact Assessment* guidelines, a screenline analysis has been completed in order to compare the forecasted demand and available capacity of the major road network connecting the site to the area transportation network. It was agreed with City staff that the forecasted traffic demand and future lane capacity at the CPR Screenline should be analyzed for the year 2031, which is the horizon year of the City of Ottawa Official Plan.

Relative to the subject site, the CPR screenline is the closest screenline in the City of Ottawa's Strategic Screenline System. The CPR screenline (#27-29) follows the CPR railway corridor from Ottawa River Parkway to Colonel By Drive, and is shown in Appendix G. The projected transportation demand, transit modal shares, and lane capacities at the CPR screenline in 2031 have been derived from the City of Ottawa's *TRANS* model*,* and the *Road Infrastructure Needs Study* produced by Delcan Corporation.

The TRANS model identifies a target Transit Modal Split (TMS) of 51% in the AM peak hour (observed at 37% in 2005), and a TMS of 52% in the PM peak hour (observed at 32% in 2005). It is expected that these targets can be achieved through the implementation of light rail transit (LRT) within the downtown area (including the aforementioned DOTT), and the development of Carling Avenue as a supplementary LRT corridor between Lincoln Fields Station and the Carling O-Train Station, as outlined in the TMP Rapid Transit Network. The downtown transit priority measures proposed in the TMP will also improve the competitiveness of transit compared to the car, by reducing travel times along major bus routes and improving service reliability. It is expected that the improved competitiveness of transit will result in greater levels of transit utilization. The TMP Rapid Transit Network is included in this report as Appendix H.

If the 2008 TMP forecast that these TMSs will be achieved by the horizon year 2031 is assumed to be accurate, the screenline analysis may be summarized as follows.

Table 12: Screenline Analysis (CPR #27 – 29)

Peak hour person trips, peak direction AM / PM	Peak hour TMS AM / PM	Peak hour auto trips AM / PM	Auto occupancy[3]	Projected pcu[2], peak direction AM / PM	Commercial Vehicle Factor[4]	Projected pcu, peak direction AM / PM	Current Screenline Capacity @ LOS 'D' (v/c = 0.9)	Projected deficiency in 2031, peak direction AM / PM
34,200 / 33,200	51% / 52%	16,700 / 16,100	1.2 ppv[1]	13,920 / 13,420	1.16	16,150 / 15,570	15,660	490 / none

1. ppv = persons per vehicle
2. pcu = passenger car units
3. Auto occupancy rate taken from *Road Infrastructure Needs Study* (Delcan)
4. Commercial vehicle factor taken from *Road Infrastructure Needs Study* (Delcan), assumes 5% HGVs & 6% LGVs

The screenline analysis indicates that in 2031, a deficiency of 490 pcu is anticipated at the CPR screenline during the AM peak hour. No deficiency is anticipated during the PM peak hour. Based on the foregoing calculations, it is anticipated that the major road network in the vicinity of the screenline will operate with LOS E (v/c = 0.93) and LOS D (v/c = 0.89) during the AM and PM peak hours respectively. If no additional lane capacity is provided, traffic congestion is expected to occur during AM peak hour by the horizon year 2031.

It is expected that the development of Carling Avenue as a supplementary LRT corridor will effectively eliminate the possibility of providing additional lane capacity along Carling Avenue to address the AM peak hour deficiency. However, the TMP outlines a number of future road projects that are intended to develop both new and existing east-west road corridors beyond the CPR Screenline. Relevant examples include:

- the widening of Hunt Club Road from 4 lanes to 6 lanes between Riverside Drive and Bank Street,
- the extension of Hunt Club Road east to Highway 417,
- the construction of the Strandherd-Earl Armstrong Bridge across the Rideau River,
- the construction of a new bridge across the Rideau River between Hunt Club Road and the Strandherd-Earl Armstrong Bridge,
- the widening of Riverside Drive from 2 lanes to 6 lanes (in two phases) between Hunt Club Road to Limebank Road.

Most of the road projects listed above are designed to address capacity deficiencies at the Rideau River and Manotick screenlines. However, it is possible that these improvements will also have a greater residual effect on the CPR screenline than had been previously anticipated, potentially reducing or eliminating the projected AM peak hour deficiency at the CPR screenline.

The possibility of achieving a 2031 AM peak hour TMS that exceeds the TMP target of 51% identified should also be considered. If a TMS of 53% can be achieved during the AM peak hour by 2031, no capacity deficiency is expected at the screenline.

Mitigating factors notwithstanding, it is concluded that at least some congestion will be observed on the major road network close to the subject site during the AM peak hour in 2031.

6.0 PROVISIONS FOR NON-AUTO MODES

Pedestrian connections will be provided between adjacent sidewalks and the main building entrances to the residential tower and the commercial floor space. The sidewalk will be depressed and continuous across the proposed underground parking access, in accordance with City standards.

Bicycle parking will be provided on the underground parking levels in accordance with the requirements of the Zoning By-law. The minimum requirements are outlined in Section 6.0 below.

OC Transpo bus stops #8465 and #7675 are located at a walking distance of approximately 310 and 325 metres from the entrance to the residential tower, respectively. Bus stops #2486 and #2484 are located at a walking distance of approximately 300 and 290 metres from the entrance to the residential tower, respectively.

7.0 ON-SITE DESIGN

This section of the report provides a review of the on-site design in terms of vehicle access, on-site parking, and on-site loading activities.

7.1 Proposed Access

It is noted that the subject site does not abut on or is within 46 metres of an arterial or major collector roadway. The nearest arterial is O'Connor Street, which is approximately 50 metres from the subject site, measuring from the nearest edges of the subject site and the protected ROW.

Based on the foregoing, Section 25 (o) of the City of Ottawa's Private Approach By-law identifies a requirement to provide minimum spacing of 3 metres between the nearest edge of the development access and the property line as measured at the intersecting streetline. The spacing between the nearest edge of the proposed access and the property line is approximately 3.3 metres at the streetline (Nepean Street), which is compliant with the Private Approach By-law.

The proposed access driveway will also have adequate spacing from the adjacent intersections of O'Connor Street/Nepean Street (approx. 60m) and Metcalfe Street/Nepean Street (approx. 100m).

The access is intended to accommodate two-way traffic and will consist of a 3.5m ingress lane, a 0.6m concrete median, and a 3.3m egress lane. The total width of the access is 7.6m. Depressed curb and a continuous concrete sidewalk shall be provided across the full width of the access.

The existing accesses to the surface parking lots at 96 Nepean Street will be removed as part of the proposed development.

7.2 On-site Parking

The site is located in Area B of Schedule 1 to the Zoning By-law and within 600 metres of a rapid transit station. Minimum parking space rates are outlined as follows:

- Residential (occupants) — 0.5 per dwelling unit
- Residential (visitors) — 0.2 per dwelling unit after the first 12 units, to a maximum of 300 units

Where all parking spaces for a proposed development are to be provided underground, the Zoning By-law permits a reduction of 10% in the minimum number of parking spaces required, to a maximum of 20 spaces. Based on the foregoing, a requirement to provide at least 139 vehicle parking spaces has been identified.

Maximum parking space rates are outlined as follows:

- Residential (occupants) – 1.75 per dwelling unit, occupant and visitor combined

A maximum of 352 vehicle parking spaces are permitted for the development.

A total of 161 vehicle parking spaces are proposed for the development, which meets the minimum and maximum parking requirements of the Zoning By-law.

The Zoning By-law requires a minimum of 0.50 bicycle parking spaces per dwelling unit for the proposed residential land use. Applying this rate to the proposed development identifies a

minimum requirement to provide 101 bicycle parking spaces. On-site bicycle parking will be provided in accordance with the minimum requirements of the Zoning By-law.

7.3 Garbage Collection/Loading

It is expected that garbage collection will take place at the curb on the north side of Nepean Street, as per Schedule B of the City's Solid Waste Management By-Law 2009-396. Occasional loading activities are also expected to take place at the curb. There is sufficient roadway width to accommodate garbage collection vehicles and typical loading vehicles at the curb without impeding traffic flow on Nepean Street.

8.0 COMMUNITY IMPACTS

The site is surrounded by high density residential buildings, office/commercial developments, a church, and several surface parking lots. Speed humps are currently provided on Nepean Street adjacent to the subject site in an effort to limit area travel speeds to approximately 30 kph. Nepean Street is neither an arterial nor a collector road, and is only designed to carry local residential traffic. The proposed development will only generate local residential traffic, so no significant disruptive impact to local residents is expected.

On-site underground parking will be provided in accordance with the requirements of the Zoning By-law. Parking infiltration onto area roadways is not anticipated, but on-street and off-street parking is readily available nearby if this should this occur from time to time.

9.0 TRANSPORTATION DEMAND MANAGEMENT

The City of Ottawa is developing a comprehensive Transportation Demand Management (TDM) strategy as part of its efforts to reduce automobile dependency. TDM measures can reduce transportation infrastructure requirements by encouraging people to change their travel mode, timing or destination.

The proposed development conforms to the City's TDM initiatives by providing easy access to the local pedestrian, bicycle and transit systems as outlined in Section 6.0.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the foregoing analysis, the main conclusions and recommendations of this report are as follows:

Background Traffic Conditions and Collision History

- Eastbound through movements at Metcalfe Street/Nepean Street and O'Connor Street/Nepean Street are expected to operate at LOS F under 2013 background traffic conditions. In 2018 under background traffic conditions, analysis indicates that the maximum queue length for the eastbound approach to the O'Connor Street/Nepean Street intersection may extend upstream to Bank Street, possibly creating blocking problems there.

- While not technically justified based on projected traffic volumes, the installation of traffic signal control at both of the aforementioned intersections would allow them to operate with acceptable LOS in all scenarios tested.

- The installation of traffic signals at O'Connor Street/Nepean Street is identified as a means of addressing safety concerns relating to a high number of angle collisions observed there during the last 3 years.

Total Traffic Conditions

- Site traffic represents less than 5% of 2011 AM and PM peak hour traffic at the upstream and downstream intersections of O'Connor Street/Nepean Street and Metcalfe Street/Nepean Street.

- With the addition of site traffic in 2013, analysis shows that delay on the eastbound approach of Metcalfe Street/Nepean Street increases by 65 seconds in the AM peak hour and by 15 seconds in the PM peak hour, as compared to expected delays of 795 seconds and 140 seconds in the 2013 background AM and PM peak hours, respectively.

- With the addition of site traffic in 2013, analysis shows that delay on the eastbound approach of O'Connor Street/Nepean Street increases by 60 seconds in the AM peak hour. The increase in delay for this movement during the PM peak hour cannot be quantified, because the Synchro model is unable to provide a delay forecast in cases where the approach volume greatly exceeds the available capacity (v/c > 3). The v/c ratio for this movement is expected to increase from 2.98 to 3.48 under PM peak hour total traffic conditions, which indicates that it is likely to operate with severe levels of congestion with or without the addition of site traffic.

- At the Metcalfe Street/Nepean Street intersection, traffic signals are only 71% justified with addition of site traffic in 2013. However, under total traffic conditions in 2013 and 2018, all movements would operate at an acceptable level with signals in place.

- At the O'Connor Street/Nepean Street intersection, traffic signals are only 69% justified with addition of site traffic in 2013. However, under total traffic conditions in 2013 and 2018, all movements would operate at an acceptable level with signals in place.

- Marginal increases in delay, v/c ratios and queue lengths are expected at all study area intersections under projected 2018 total traffic conditions, compared to 2013 total traffic conditions. During the PM peak hour, the expected delay on the eastbound approach of O'Connor Street/Nepean Street cannot be calculated by Synchro, because the approach volume greatly exceeds the approach capacity (v/c > 3). Severe congestion and long queues are likely on this approach in 2018, with or without the addition of site traffic.

- Acceptable LOS is expected at the signalized intersections of Metcalfe Street/Gloucester Street and O'Connor Street/Gloucester Street in 2013 and 2018. Maximum queue lengths are within available storage capacity, with no blocking problems anticipated.

- Acceptable LOS (B or better) is expected at the underground parking access in 2013 and 2018. Delays of approximately 15 seconds are anticipated for vehicles leaving the site during weekday peak hours, and queue lengths likely to be negligible.

- The provision of signals at the intersection of Nepean Street/O'Connor Street has been identified as a means of addressing existing congestion and safety concerns, not as a mitigation measure to offset the impact of site-generated traffic.

Screenline Analysis, On-Site Design & TDM

- By the 2031 horizon year of the 2008 Transportation Master Plan (TMP), the major road network in the vicinity of the subject site is projected to operate with an acceptable LOS (D) during the PM peak hour, and with minor levels of congestion (LOS E) during the AM peak hour. The analysis at the CPR screenline is predicated on the achievement of a Transit Modal Split (TMS) of 51% in the AM peak hour and 52% in the PM peak hour. It is expected that the implementation of the Rapid Transit Network identified in the TMP, most notably the introduction of Light Rail Transit to downtown Ottawa, will ensure that the TMS targets are achieved by 2031.

- The proposed development includes adequate provisions for non-auto travel modes, including easy access to local pedestrian, bicycle, and transit systems.

- The easternmost edge of the proposed underground parking access is approximately 3.3 metres west of the property line, which is compliant with Section 25 (o) of the Private Approach By-law's minimum spacing requirement (at least 3 metres at the streetline).

- The proposed underground parking satisfies the minimum and maximum requirements of the Zoning By-law (ZBL).

- On-site bicycle parking will be provided in accordance with the minimum requirements of the ZBL, and located in the underground parking garage.

- It is expected that garbage collection will take place at the curb on the north side of Nepean Street, as per Schedule B of the City's Solid Waste Management By-Law 2009-396. Occasional loading activities are also expected to take place at the curb. These activities are not expected to have any significant disruption to traffic flow on Nepean Street.

- Parking infiltration on area roadways is not anticipated.

- The proposed development conforms to the City's TDM initiatives by providing easy access to the local pedestrian, bicycle and transit systems as outlined in Section 5.0.

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