THE CORPORATION OF THE CITY OF MISSISSAUGA

TRAFFIC IMPACT STUDY GUIDELINES

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1.0 INTRODUCTION

1.1 Traffic Impact Study

The goal of a traffic impact study (TIS) is to assess the potential impact of traffic generated by a proposed development or redevelopment and to identify the roadway improvements required to ensure that the road network will operate safely and efficiently upon completion of the development.

A TIS is an important part of the development review and approval process. A TIS assists public agencies in making land use decisions where the proposal may have a significant impact on traffic operations within the immediate area of the development and in some cases within the overall transportation network.

The TIS benefits the municipality by:

- Providing decision makers with a basis on which to assess transportation implications of a proposed development applications;
- Providing a rational basis on which to evaluate if the type and scale of the development is appropriate for a particular site and what improvements may be necessary, on and/or off of the site, to provide for safe and efficient traffic flow;
- Providing a basis for assessing existing or future localized transportation system deficiencies which should be improved;
- Addressing transportation-related issues associated with development proposals that may be of concern to neighbouring residents, businesses and property owners; and
- Providing a basis for negotiations for improvements and funding participation in conjunction with a development or zoning application.

A TIS may vary in scope and complexity depending on the type and size of the proposed development.

1.2 Need and Justification

The City has prepared these guidelines in order to streamline the approval process and provide a standardized framework for consultants to follow when submitting studies for review. At all times, they should be complemented with good engineering judgment.

1.3 Purpose of Guidelines

The purpose of these guidelines is to ensure that a TIS prepared for the City's review meet the following criteria:

1. Objective assessment – the study will evaluate the impacts of proposed new development in a rational manner.
2. Consistency – the study will utilize assumptions consistent with the city's accepted methodologies and parameters and thus be comparable to other traffic studies in the area;

3. Recognized by developers and consultants – the guidelines will provide a standard approach to be followed and will reduce confusion and delay in processing development proposals;
4. Promote understanding of process – the steps outlined in these guidelines will enable proponents, reviewers and elected officials to understand the process more effectively; and
5. Ease of review by staff – a standardized set of guidelines will aid staff in the timely review of TISs.

2.0 GENERAL REQUIREMENTS

2.1 Need for a Traffic Impact Study

There are a number of criteria under which a TIS may be required. In general, a TIS should be conducted whenever a proposed development will generate more than 75 additional peak hour trips to or from the site. A TIS may also be required when there are less than 75 additional peak hour trips under one or more of the following conditions:

- The development is located in an area of high roadway congestion and/or a high employment or population growth area.
- The development requires an amendment to the Official Plan, or Zoning By-Law.
- The development, its access(es) or type of operation is not consistent with land-use zoning or transportation plans.
- As part of the proposed development, a new traffic signal is proposed.
- If in the opinion of the City, the development has the potential to create unacceptable adverse traffic operational and/or safety impacts on the road network. The onus is on the applicant to demonstrate that a TIS is not required.
- Existing access(es) are operating inefficiently or there are traffic safety concerns.

2.2 Staff Consultation

It is strongly recommended that prior to commencing a TIS that the consultant meet with City staff to review the level of detail required, to confirm the scope and to determine data requirements and their availability. In addition, developments that may impact the regional or provincial road network may require additional information or analysis. The applicant should contact these road authorities, where applicable, to determine these requirements.

2.3 Study Updates

A TIS typically has a shelf life of 5 years. Major changes within the study area may reduce the usefulness of the document if they were not considered in the initial assessment. Where the timing of subsequent development approvals exceeds five years, a new TIS will be required. In addition an updated TIS may be required if the traffic data utilized exceeds two years.

2.4 Qualifications to Conduct Traffic Impact Studies

It is the applicant's responsibility to retain a qualified transportation engineering consultant experienced in traffic engineering and transportation planning. The consultant must be a registered professional in the Province of Ontario as a Certified Engineering Technologist, Professional Engineer or Planner.

Alternatively, at the discretion of the City, the City may retain a consultant at the proponent's expense.

2.5 Data Collection

The applicant must provide both electronic and hard copies of all raw data collected for the TIS. This includes but is not limited to the following:

- Turning movement counts;
- Traffic signal timings;
- ATR and AADT counts;
- Collision records;
- Gap study observations;
- Proxy site surveys;
- Cordon counts;
- etc.

2.6 Submission Requirements

The applicant must submit five copies (unless otherwise advised by the City) of the final TIS complete with all supporting documentation. The applicant must also submit an electronic copy of all analyses contained in Appendices. All information submitted to City staff in connection with any TIS will be considered to be in the public domain.

3.0 TRAFFIC IMPACT STUDY REQUIREMENTS

The following sections outline the required content for the TIS. In general, the content and extent of the TIS will depend on the location and size of the proposed development and the prevailing traffic conditions in the surrounding area.

The TIS should consist of a main document supplemented by technical appendices containing required detailed analyses. The following is a suggested structure that will aid staff in a timely review of the TIS:

- Description of the Proposal (with site plan or plan of subdivision if applicable);
- Study Area (with map identifying the study area and site);
- Horizon Year(s) and Time Periods for Analysis;
- Existing Conditions (exhibits required);
- Background Traffic Demand – Existing and Future Background (exhibits required);
- Site Generated Traffic Demands (exhibits required);
- Total Traffic Demand – Future Background plus Site Generated Traffic (exhibits required);
- Evaluation of Impacts of Site Generated Traffic;
- Access Location Analysis;
- Improvement Alternatives Required to Mitigate Traffic Impacts, including Traffic Impacts for Future Background and Total Traffic with and without Mitigation Measures (tabular summaries); and
- Recommendations.

Maps, graphs and tables should be placed adjacent to relevant text.

3.1 Description of the Proposal

The TIS should include a full description of the proposed development. It is recommended that this include the following elements, as appropriate:

- Municipal address;
- Existing land uses or permitted use provisions of the Official Plan, Official Plan Amendments, Zoning Bylaws, etc.;
- Proposed land uses and relevant planning regulations to be used in the study;
- Total building size and building location on the site;
- Floor space including a summary of each type of use and/or number of units;
- Anticipated date of occupancy;
- Approximate days and hours of operation;
- Planned phasing of the development;
- Nearby intersections and access points for adjacent developments, including type of traffic control and existing access restrictions;
- Proposed access points and types of access (e.g. full moves, right-in-right-out only, specific turning restrictions, etc.);
- Locations of elementary school and senior citizen residences/facilities; and

- Nearby transit facilitates and stops.

If the development is to be constructed in phases then a description of each phase and its proposed timing of implementation should also be included. A site plan or plan of subdivision of suitable scale must be submitted for consideration in the review of the TIS.

3.2 Study Area

The study area should extend far enough from the development to contain all municipal, regional and provincial roadways that will be noticeably affected by the traffic generated by the proposed development. The analysis area should include all roads, ramps and intersections through which peak hour site traffic comprises 5% or greater of the existing capacity on an intersection approach.

Roads in the area of the development that have an annual traffic growth in excess of 5 % and intersections where volume to capacity (V/C) ratios for the overall intersection or for shared through/turning movements increase to over 0.85 or where the V/C ratio for exclusive turning movements increase to 0.95 should also be evaluated. The City reserves the right to establish the study area as may be deemed necessary.

Within the study area, the applicant must use maps and other documentation to identity the components of the existing transportation system, including the following:

- All adjacent and nearby roads, indicating the number of lanes and the posted speed limit on each;
- All adjacent and affected intersections, indicating the type of control, lane configuration, lane widths and any turning or similar restrictions;
- On-street parking locations and areas with parking prohibitions in the vicinity of the site, clearly identifying those that would be affected by the proposed development;
- Transit routes;
- Heavy vehicle prohibitions and restrictions;
- Other transportation facilities, as appropriate.

Potential future transportation improvements that are currently being considered and may accommodate a proportion of the traffic demand produced by the development should be identified. These improvements should be described in sufficient detail to assess their implications for travel to/from the development. In each case, the status and anticipated date of implementation must be identified.

3.3 Horizon Year(s) and Time Periods for Analysis

The horizon year for TIS analysis is 5 years from the date of the TIS, unless an earlier date for full occupancy of the project can be identified and approved in advance by City staff. Horizon years must also be identified for any interim phases of the development. Additional horizon years may also be required depending on the magnitude of the development, ranging from a minimum of 5 years after the study date to a maximum of full build-out of the defined

study area. This type of longer-range evaluation is generally only required for larger scale projects, with multiple phases.

Typically the AM Peak and PM Peak traffic periods will constitute the heaviest combination of site related and background traffic. However, Saturday, Sunday and site specific peak period analyses may be required for some proposed developments, such as retail, entertainment, religious, institutional and sports facilities, or developments which are located in areas in close proximity to these specific facilities.

3.4 Existing Traffic Conditions

The TIS must include exhibits showing the existing traffic volumes and turning movements for roadways and intersections in the study area, including pedestrian and heavy vehicle volumes. Traffic volumes may be acquired from the City, Peel Region, Ministry of Transportation or from previous approved transportation planning, traffic operation or traffic impact studies in the study area. Traffic counts that are more than two years old must be recounted to ensure that they reflect current traffic levels.

Regardless of the age of the traffic volume data, a minimum one hour field observation during the peak hour must be undertaken at each affected intersection to verify that traffic volumes through each intersection reflect actual demand and to confirm the necessary adjustment factors for level of service calculations.

3.5 Background Traffic Demand

3.5.1 Background Traffic

The background growth in traffic should be established in consultation with City staff through one of the following methods:

- Estimation of roadway growth factors from a calibrated traffic forecasting model;
- Regression analysis of historical traffic growth; or
- Traffic growth forecasts established through a previous land-use or transportation planning study.
- It is important that the proponent/consultant consult with City staff to obtain agreement on the most applicable strategy for addressing background traffic growth in the TIS.

3.5.2 Other Area Developments

All significant developments under construction, approved and in the approval process within the study area that are likely to occur by the specific horizon year(s) are to be identified and included in the background traffic growth for the study. The land-use types and magnitude of the probable future developments in the horizon years should be identified through consultation with City staff.

3.5.3 Transportation Network Improvements

Changes to the present or planned transportation network should be determined from the approved City, Regional and Provincial capital programs, if available, and consultation with City staff. The impacts of the transportation system changes should be identified; in particular, diversion of volumes from other facilities to new or improved facilities should be estimated.

3.5.4 Transit Considerations

In areas with transit service, the existing service should be identified. The potential impact and possible changes in modal split should be evaluated and discussed with appropriate City Staff.

3.6 Site Generated Traffic Demands

All trip generation, trip distribution, assignment and modal split assumptions should be in accordance with standard/accepted techniques and based on local parameters.

Sources should be well documented and any assumptions that may be considered less than conservative should be rigorously justified. Any "soft" parameters where there is a significant uncertainty or a range of possible values should be subjected to sensitivity analysis unless a demonstrated "worst case" situation is assumed.

3.6.1 Trip Generation

Consultation with City Staff is recommended to ensure that appropriate and agreed upon trip generation rates are being employed in the TIS. Available trip generation methods, in order of preference include:

- Trip generation surveys from similar developments in the City, Region and GTA, which have similar operating characteristics as the proposed development. Modifications should be made to the trip generation rates to account for differences in the surveyed and proposed development sites. Synergy assumptions must be supported by proxy surveys or industry accepted assumptions;
- "First principles calculations" of anticipated trips to and from the site.
- ITE Trip Generation (most recent edition) rates, provided that differences in the site nature and size are accounted for; and

Where appropriate, it may be justified to change the trip generation of the proposed development to account for:

- Captive market effects/"Synergy" - Represents trips which are shared between two or more uses on the same site, i.e., a motorist visiting a retail store and a grocery store on the same site;
- Pass-by trips - trips that represent intermediate stops on a trip already on the road network, i.e. a motorist stopping into a retail store on their way home from work. It should be recognized that pass-by trips must be accounted for in the turning movements into/out of the site; and

- Travel Demand Management (TDM) strategies.

All trip generation assumptions and adjustments assumed in the calculation of "new" vehicle trips should be supported and documented. Sensitivity analysis should be undertaken where trip generation parameters have the potential to vary considerably and most probable values cannot be readily identified.

A table should be provided in the study report identifying the categories and quantities of land uses, with the corresponding trip generation rates or equations and the resulting number of trips. For large developments that will be phased in over time, the table should identify each significant phase separately.

3.6.2 Trip Distribution

The directions from which traffic will approach and depart the site can vary depending on several location specific factors, including:

- Size of the proposed development;
- Type of proposed development;
- Surrounding and in some case competing land uses, population and employment distributions; and
- Prevailing conditions on the existing street network.

The trip distribution assumptions should be supported by one or more of the following, in the order of preference:

- Transportation Tomorrow Survey (TTS) data, if applicable;
- Origin-destination surveys;
- Comprehensive travel surveys;
- Existing/anticipated travel patterns;
- Output from transportation planning models; and
- Market studies.

Engineering judgment should be utilized to determine the most applicable of the above methodologies for each particular application.

3.6.3 Trip Assignment

Trip assignment assumptions should reflect the most "probable" travel patterns expected. They should consider logical routings, available and projected roadway capacities and travel times. Traffic assignments may be estimated using a transportation planning model or "hand assignment" based on knowledge of the proposed/future road network in the study area.

3.7 Total Future Traffic Demand

A summary of the existing and future traffic demands should be provided in the form of exhibits/illustrations that summarize the following:

- Existing traffic;

- Future background;
- Site generated traffic;
- Pass-by or other diversionary traffic; and
- Future total traffic (Future background + site generated traffic).

Summary exhibits must be provided for each peak period and analysis horizon. It is recommended that the exhibits be provided within the body of the document where they are referenced as opposed to an appendix. This layout will aid in the timely review of the TIS. In some cases, interim traffic conditions may need to be assessed to reflect phasing of developments, interim site access arrangements or planned transportation system improvements.

3.8 Evaluation of Impacts of Site Generated Traffic

An evaluation of all signalized and unsignalized intersections that will be affected by site generated traffic volumes for all relevant time periods is required. Summaries are to be provided in tabular format. Appendix A provided assumptions to be used in these analyses. It should be noted that the City has its own requirements for assumptions when using Synchro 6.0. Contact Traffic Planning Staff for details.

The objective must be to ensure that no new "problem" movements are created by the development and that "problem" movements that exist are not worsened with the addition of site generated traffic. Supplementary surveys or analyses may be required to assess saturation flows, gap availability and projected queue lengths.

An appendix to the TIS must provide complete documentation of all assumptions used in the analyses concerning lane configuration, lane use, pedestrian activity, on-street parking, vehicle classification, saturation flows, traffic signal timing, utilization of inter-green timing and other relevant parameters. Existing signal timings should be used for analysis of existing intersections. Modified timings, subject to approval by the City of Mississauga staff, may be considered as a measure to address capacity or level of service deficiencies.

3.8.1 Capacity Analyses at Intersections

For each intersection, the analyses must include level of service calculations with average vehicle delays and volume to capacity (V/C) ratios for overall intersection operations and individual critical movements for each combination of time period and time horizon. The analyses must incorporate adequate crossing times for pedestrians and appropriate assumptions for modeling heavy vehicle operations. A summary of the conclusions should be included in the report with full documentation provided in an appendix.

The City accepts both the Highway Capacity Manual (HCM) and Canadian Capacity Guide (CCG) methodologies of intersection analysis. Analysis may be performed using the most current versions of CCG, HCS and/or Synchro. Prior approval of the City is required to use a software product other than those listed above. Under this circumstance, it should be recognized that the City reserves the right to request that specific intersection analysis is undertaken with one of the above noted software packages, should the verification of results be required.

The analysis must include identification of signalized intersections where:

- V/C ratios for overall intersections operations, through movements or shared through/turning movements increase to 0.85 or above;
- V/C ratios for exclusive movements increase to 0.90 or above; or
- Queues for an individual movement are projected to exceed available turning lane storage.

The analysis must include identification of unsignalized intersections where:

- Level of service, based on average delay per vehicle or on individual movements is LOS "E" or greater; or
- The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

3.8.2 Safety Analysis

The TIS must include an evaluation and identification of potential safety and/or operations issues associated with the following, as applicable:

- Weaving;
- Merging;
- Sight distance;
- Vehicle-pedestrian conflicts;
- Traffic infiltration;
- Access conflicts;
- Cyclist movements;
- Heavy vehicle movement conflicts;
- Transit operational conflicts.

Where the proposed development is in the vicinity of an intersection or roadway with identified safety problems, existing collision data (available from the City) must be reviewed and an assessment of the impact of the proposed development provided.

3.9 Access Analysis

3.9.1 Geometrics

The number and location of access points must not negatively impact the flow of traffic along abutting roads. Access points should be located on minor roads where feasible. The justification for more than one access must be based on the volume of site traffic and not on design preference.

The locations of access points must line up with existing intersections wherever possible. Where this is not possible, access points must be adequately spaced from both adjacent roads and access points to adjacent properties. The number of exit lanes, radii and vehicle storage should be appropriate to accommodate site generated traffic demands. The throat length at the access must be sufficiently long to minimize conflicts between site and through traffic on the road network.

Access points must be evaluated in terms of capacity, safety and adequacy of queue storage capacity. Access points should be free of all encumbrances and provide sufficient sight distance. Proposed loading facilities and access to/from these facilities must be evaluated to ensure they are adequately designed so that they will not adversely affect traffic on City roads.
Access standards must be in accordance with those outlined in the Geometric Design Guide for Canadian Roads, most recent edition, issued by the Transportation Association of Canada (TAC).

3.9.2 Turn Lane Requirements

The TIS must examine the requirements for right and left turn lanes. Adequate spacing must be provided between access points to avoid potential turn lane overlaps. All design standards must be in accordance with those outlined in the TAC Manual.

The TIS must include a pavement marking and signage plan for the roadway(s) along the frontage of the development showing both existing and proposed traffic control devices.

3.9.3 Sight Distance Evaluation

At each access point and at each intersection where a new road is proposed, the sight distance requirements must be determined based on appropriate standards (TAC Manual). These must be compared with actual field measurements in the TIS to determine any areas of concern.

3.10 Improvement Alternatives to Mitigate Traffic Impacts

The physical and operations road network deficiencies identified in the TIS must be addressed and feasible solutions to mitigate these deficiencies identified. Functional design plans and detailed design drawings may be required for identified improvements to ensure their feasibility. A cost estimate and detailed design drawings must be provided for all identified infrastructure improvements.

3.11 Recommendations

The final section of the TIS must present recommendations for improvements within appropriate time perspectives. Recommendations must be sensitive to the following issues:

- Timing of short term and longer range network improvements that are already planned and scheduled;
- Anticipated schedule for adjacent developments;
- Size and timing of individual phases of the proposed development;
- Logical sequencing of various improvements or segments;
- Right-of-way needs and availability of additional right-of-way within the appropriate time frames;
- Local priorities for transportation improvements and funding;
- Cost effectiveness of implementing improvements at a given stage of development; and
- Necessary lead time for additional design and construction.

Appendix A
Traffic Impact Study Assumptions

A. Saturation Flow

The saturation flow rate is a measure of the rate at which vehicles may enter the intersection on a green phase. The Highway Capacity Manual (HCM) and Canadian Capacity Guide (CCG) methodologies vary in terms of their definition of saturation flow rates. The proponent/consultant must ensure that the factored saturation flow rates calculated by intersection analysis software package reasonably reflect the actual rates being obtained at the intersection. Saturation flow rates may need to be modified to reflect downstream congestion/constraints. Field observations and surveys should be undertaken to determine appropriate assumptions under these circumstances.

Base Saturation Flow Rates For Arterial Roadways

Movement Saturation Flow Rate (veh/hr/lane)
Advanced Left 1860
Through 1900
Right 1640

B. Lost Time

Lost time occurs at the start of each green phase. The following values are for passenger vehicles. Variations from these assumptions should be supported by documented engineering studies. Where heavy vehicles comprise a significant proportion of the traffic flow, higher values should be applied.

Lost Time
Phase Lost Time (sec)
Advanced green 1.0
Back-to-back-lefts 1.0
Main phase 5.0

C. Lane Utilization

Where two or more exclusive lanes are provided on an approach for the same movement, an appropriate lane utilization assumption must be assumed. In the case of dual left turns, a lane utilization factor must be incorporated to account for this reduced capacity compared to that of two left turn lanes, i.e., generally the capacity of a dual left turn lane is not twice the capacity of a single left turn lane. This differential becomes more pronounced with increased presence of buses and other heavy vehicles.

D. Signal Timing Parameters

The applicant must contact the City of Mississauga traffic signals staff to confirm acceptable minimum and maximum cycle length, pedestrian and vehicular phase times; amber and all-red intervals times; and right-turn-on-red and inter-green movement assumptions to be used in capacity analyses.

E. Pedestrian Walking Speeds

Analyses will utilize a pedestrian walking speed of 1.2 m/s, unless the proposed development is within 500 meters of an elementary school or a senior citizens residence or facility where a value of 1.0 m/s will be used.

F. Heavy Vehicle Factors

Heavy vehicle factors provide a conversion rate to equate trucks and buses to an equivalent number of passenger car units (PCU) within the traffic stream. An average factor of 2.0 PCUs should be assumed for trucks, buses and recreational vehicles. In situations where a high percentage of multi-unit or heavily loaded vehicles is measured or projected, a higher PCU factor should be used.

G. Critical Gaps

A critical gap represents the gap in main street traffic that a motorist on a side street is willing to accept to proceed across or into the main street traffic flow. Critical gap assumptions should reflect the most recent research provided in the Highway Capacity Manual published by the Transportation Research Board. Deviations from these values must be justified by engineering studies.