Traffic Impact Study Guidelines

July 2009

Public Works Department
Engineering Services
Traffic Engineering

1.0 Introduction

1.1 Traffic Impact Studies

The municipal road network serves as a system of routes for the safe and efficient movement of people and goods. It was constructed and is maintained at great public expense and forms a significant public asset. The City of Hamilton has a responsibility to effectively manage and maintain each roadway and intersection within its municipal boundary in order to preserve its safety, functional integrity and public purpose.

The goal of a traffic impact study is to assess potential impacts of traffic changes caused by proposed development on municipal roads and to identify any infrastructure improvements or mitigation measures needed to ensure the road network will operate acceptably and safely upon completion of the proposed development.

Traffic impact studies benefit the municipality by:

- Providing decision makers with a consistent basis on which to assess transportation implications of proposed development applications.
- Providing a rational basis on which to evaluate if the type and scale of the development is appropriate for a specific site and what improvements may be necessary to provide safe and efficient traffic, pedestrian, cycling and transit flow.
- Providing a basis for determining existing or future transportation system deficiencies that should be addressed.
- Addressing transportation related issues associated with development proposals that may be of concern to neighbouring residents, businesses and other stakeholders.
- Providing a basis for negotiations for improvements and funding in conjunction with planning applications.

A traffic impact study may vary in scope and complexity depending on the type and size of the proposed development. A traffic impact study should consider all modes of travel including cars, trucks, transit, cyclists and pedestrians. It should be consistent with the City's goals as expressed in the Strategic Plan, Transportation Master Plan and other planning documents.

1.2 Purpose of Guidelines

The purpose of these guidelines is to ensure that traffic impact studies prepared for the City of Hamilton meet the following goals:

- Objective assessment – the study will evaluate the impact of proposed new development in a rational manner.
- Consistency – the study will utilize assumptions consistent with the City's generally accepted methodologies and parameters and will be comparable to other traffic studies submitted to the City for review. Industry standards will be applied to projects in the City of Hamilton.
- Standardization – the guidelines will provide a standard approach and will reduce confusion and delay in processing planning applications.

- Efficient use of staff time – a standardized set of guidelines will assist staff in reviewing traffic studies and reduce revisions and resubmissions.

2.0 General Traffic Study Requirements

2.1 Need for a Traffic Impact Study

Generally, the need for a traffic impact study will be identified by Traffic Engineering staff during the City of Hamilton's Formal Consultation process for development applications.

There are a number of criteria under which a traffic impact study may be required. Generally, a traffic impact study will be required whenever a proposed development will generate more than 100 additional (new) peak hour, peak direction trips to or from the site during the adjacent roadway's peak hour or the development's peak hour.

A traffic impact study may also be required under one or more of the following conditions:

- The development is located in an area exhibiting high roadway congestion and/or a high rate of population or employment growth is anticipated.
- The proposed development requires an Official Plan Amendment.
- The proposed development, its accesses, or type of operation is not envisioned by transportation master plans, Secondary or Neighbourhood Plans.
- As part of the new development, a new traffic control signal or a roundabout is proposed to be constructed on a City road.
- If, in the opinion of the City, the proposed development has the potential to create adverse operational or safety impacts on the road network. Including but not limited to:
    - Substandard horizontal or vertical sight distances at access or proposed municipal roads.
    - Absence of a left or right turn lane(s) on municipal roads affected by the proposed development.

The City of Hamilton reserves the right to require the submission of a traffic impact study notwithstanding the criteria listed above.

2.2 Staff Consultation

It is recommended that prior to commencing a traffic impact study the consultant meet with City of Hamilton Traffic Engineering staff to review the level of detail required, to confirm the scope, and to determine data requirements and their availability. Alternatively, in the event of critical time constraints, the consultant can submit a detailed work plan to City staff for review and comment.

2.3 Study Updates

A traffic impact study will have a functional life of three years from the date on the study. Major changes within the study area may reduce the applicability of the study if they were not considered in the original impact assessment.

2.4 Qualifications to Conduct a Traffic Impact Study

Where a traffic impact study is required or requested by the City, it will be the responsibility of the proponent to retain a qualified transportation consultant experienced in transportation planning and traffic engineering.

The consultant must be registered as a Professional Engineer in the Province of Ontario and a member of both the Transportation Association of Canada and the Institute of Transportation Engineers. The study must be signed, dated and stamped accordingly. The signing Engineer is verifying that appropriate assumptions and methodologies have been utilized in the completion of the traffic impact study and that (s)he is the individual who is taking corporate and professional responsibility for the study.

Alternatively, at the discretion of the Manager of Traffic Engineering and Operations, City of Hamilton, or his/her designate, the City may retain a transportation consultant at the proponent's expense.

3.0 Traffic Impact Study Outline Requirements

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

The traffic impact study should consist of a main document supplemented by technical appendices. The following is a suggested structure that will assist Traffic Engineering staff in a timely review. Detailed information for each step is provided in the following subsections.

3.1	Description of the Proposed Development
3.2	Study Area
3.3	Horizon years and time periods for analysis
3.4	Existing traffic conditions
3.5	Background traffic
3.6	Site generated traffic
3.7	Total future traffic
3.8	Evaluation of site generated traffic
3.9	Access location analysis
3.10	Collision and safety analysis
3.11	Improvement alternatives required to mitigate traffic impacts as per City policies
3.12	Recommendations

3.1 Description of the Proposed Development

A detailed description of the proposed development will enable City staff to identify the site location, its anticipated operation and its area of potential influence. It is recommended that the description include the following elements, as appropriate:

- Municipal address;
- Existing land uses or permitted use provisions;
- Proposed land use;
- Number and type of residential units;
- Proposed total building size and building location(s);
- Floor space including a summary of each type of use;
- Anticipated date of occupancy;
- Approximate days and hours of operation;
- Planned phasing of development.

If the development is to be constructed in phases then a description of each phase and its proposed timing of implementation should be included.

A site plan or plan of subdivision, if available, would be useful for consideration in the review of the traffic impact study.

3.2 Study Area

The study area should extend far enough from the development to contain all municipal and provincial roadways that will be noticeably affected by the traffic generated by the proposed development. Typically, this will include the area that may be impacted as follows:

- An increase by 5% or more of traffic volumes on adjacent facilities;
- Volume/capacity (v/c) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or greater;
- Volume/capacity (v/c) ratios for exclusive turning movements increased to 0.90 or greater.

The City of Hamilton reserves the right to establish the study area as may be deemed necessary. Consultation with appropriate City of Hamilton Traffic Engineering staff, prior to initiating the study, is recommended.

A description of the existing transportation system within the study area, using a combination of maps and other documents should identify relevant information such as;

- Existing roads, number of lanes, on-street bike lanes and posted speed limits;
- Existing signalized intersections, roundabouts, lane configurations, lane widths;
- If appropriate, on-street parking spaces, stopping restrictions, parking meters in the vicinity of the development site and those which affect the operation of key intersections being analyzed;
- Other traffic controls and transportation facilities;
- Existing transit routes, stops and terminals;
- Other features of interest such as designated trails, walkways etc.

3.3 Horizon Year(s) and Time Periods for Analysis

Generally, the horizon year will be taken as 5 years from the anticipated build-out of the site. Horizon years must also be identified for any interim development where phasing,

temporary access measures and planned transportation system improvements are anticipated.

The highest 2 weekly peak hours will be the defining factors for determining the study peaks. Typically, the AM peak or PM peak hours will constitute the heaviest combination of site related and background traffic, however in the case of commercial, entertainment, religious, institutional or sport facility uses one or more weekend peaks may be the contributing factor. In some cases site peak analysis may be required to identify the key peak hour.

3.4 Existing Traffic Conditions

The traffic impact study must include exhibits showing the existing traffic volumes and turning movements for roadways and intersections within the study area, including pedestrian, cyclist and heavy vehicle volumes.

Traffic volume information may be acquired from the City of Hamilton or previous traffic impact studies undertaken in the study area. Traffic counts more than 2 years old or counts that appear not to be reflecting existing conditions should be updated to ensure they reflect current traffic volumes. Where the consultant chooses to conduct studies on behalf of the proponent, the raw data must be included in the appendices of the report and must include date, day, road surface and weather conditions.

Regardless of age of the traffic volume data, a minimum one hour field observations 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.

Concerns regarding discrepancies in volume data provided by the City should be brought to the attention of Traffic Engineering staff rather than adjusting volume data.

3.5 Background Traffic

3.5.1 Future Background Traffic

The background growth projects future traffic without the proposed development. It includes at a minimum, annual growth rates and future traffic from other proposed (approved) developments to be located within the vicinity of the site. The 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 forecast model.
- Regression analysis of historical traffic growth.
- A growth rate based on approved area transportation studies including Environment Assessments, master plans and neighbourhood studies.

In the absence of these methods, a growth rate of 2% per annum should be used.

3.5.2 Planned Roadway Improvements

Any planned roadway improvements to be completed within the study area should be identified and discussed within the report. These improvements shall be reflected in the Future Background and the Future Total Traffic conditions. Notwithstanding this, the existing road conditions must also be analyzed under future background and future total traffic conditions.

3.5.3 Other Developments within the Study Area

All significant developments under construction, approved or in the approval process and are likely to occur by the horizon years should be identified. The trips that are expected to be generated by these developments should be included in the future background volumes.
The City of Hamilton Planning and Economic Department should be contacted to establish the approved/active development proposals within the study area.

3.6 Site Generated Traffic

All trip generation, trip distribution, trip assignment and modal split assumptions should be in accordance with standard/accepted techniques and be based on local parameters. Sources should be well documented and any assumptions which may be considered less than conservative must be justified.

3.6.1 Trip Generation

The method of determining trip generation rates should be clearly identified.

Trip generation methods may include one or more of the following and will be a function of the proposed development and its intended operations:

- Trip generation surveys from similar developments in the City of Hamilton or comparable municipality which have similar operating characteristics as the proposed development.
- ITE Trip Generation Manual (most recent edition).
- "First Principles" calculations of anticipated trips to/from the site.

Where appropriate it may be justified to reduce the base trip generation rates of the proposed development to account for:

- ***Pass-by Trips*** – Trips that represent intermediate stops on a trip already on the road network, i.e. a motorist stopping into a service station on their route to/from work. These trips are also called "Synergy" trips. It is important to note that the trip generation rates at the accesses themselves will not be affected by pass-by trips. Only the estimated number of new trips on the surrounding road network will be affected.
- ***Transit Usage*** – Reductions in automobile travel to the site to account for travel to/from the site by public transit. Transportation planning projections/goals shall be considered; however, shall not replace good engineering judgment and actual modal split data current and historic.

- ***Internal Synergy or Captive Market Effects*** – 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.
- ***Redundant Land Use*** – Trips which are generated by existing land use activity and reflected in current traffic volumes and will be replaced by the proposed development. Unless otherwise accounted for, these trips will normally be subtracted from the trip generation estimates.
- ***Travel Demand Management (TDM)*** – strategies to be employed at the proposed development to reduce single occupancy vehicle (SOV) trip making; i.e. staggered work hours, ridesharing, company/hotel shuttle etc.

All trip generation assumptions and adjustments assumed in the calculation of "new" vehicle trips should be supported and well 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

Trip distribution assumptions should be supported by one or more of the following:

- Transportation Tomorrow Survey (TTS) data
- Origin-destination surveys
- Comprehensive travel surveys
- Existing/anticipated travel patterns

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

3.6.3 Trip Assignments

Traffic assignment assumptions shall reflect the most "probable" travel patterns considering the planned site accesses. Traffic assignments may be estimated using a transportation planning model or "hand assignment" based on knowledge of the proposed road network in the study area.

The assumptions shall take into account projected "pass-by" trips and "internal" trips.

3.7 Total Future Traffic

A summary of the existing and future traffic demands shall be provided in a series of exhibits/illustrations that summarize the following:

- Existing traffic;
- Future background traffic – existing plus background traffic growth

- Site generated traffic including a separate graphic for pass-by trip assumptions and:
- Future total traffic – future background plus 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.

3.8 Evaluation of Site Generated Traffic

An evaluation of signalized and unsignalized intersections that will be affected by site generated traffic volumes for the peak time periods is required with summaries provided in a tabular format.

The objective should be to ensure that no new problem movements are created by the development and that existing problem movements are not worsened to an unacceptable level with the addition of site generated traffic.

An appendix to the traffic study must provide complete documentation of all assumptions used in the analyses concerning lane configuration/use, pedestrian activity, saturation flows, traffic signal cycle length, phasing and timing, utilization of inter-green phase and other relevant parameters. Existing signal timings should be used for existing intersections and signal timing modifications, when not part of a signal system, may be considered as a measure to address capacity or level of service deficiencies.

3.8.1 Capacity Analysis at Intersections without Roundabouts

For each intersection in the study area, the analyses must include capacity calculations with average vehicle delays and volume to capacity ratios for overall intersection operations and individual critical movements for each combination of time and horizon year. Level of service will be stated based both on delay and volume to capacity ratios. Analysis will be done for the existing plus background growth scenarios; and for the scenario with full development. If the development is proposed to be phased, phasing scenarios must also be analyzed as noted above.

The analyses must incorporate adequate crossing times for pedestrians and appropriate assumptions for modelling heavy vehicle operations. A summary of the conclusions should be included in the report with full documentation provided in an appendix.

The City of Hamilton accepts both the Highway Capacity Manual (HCM) and Canadian Capacity Guide (CCG) methodologies for intersection analysis.

The analysis must highlight all conditions at signalized intersections or movements where:

- Volume to capacity (v/c) ratios for through movements or shared through/turning movements will operate at 0.85 or greater (0.85 is considered the maximum acceptable level of service for these movements);

- Volume to capacity (v/c) ratios for exclusive turning movements increase to 0.90 or greater (0.90 is considered the maximum acceptable level of service for these movements):
- Queues for an individual movement are projected to exceed available turning lane storage at 95th percentile volumes.

The analysis must highlight unsignalized intersections or movements where:

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

Synchro Modelling

The model must be calibrated to accurately reflect existing conditions. This will be achieved by adjusting saturation flow rates, lost time or other variable inputs. Proof and verification that outputs such as volume to capacity, queue lengths, delay etc. reflect actual conditions is required. For existing volumes, the volume to capacity should be 1.0 or less since counted volumes are used

The following system settings are to be used:

- Metric units (km/h, m etc.).
- Lane widths – use actual width or default to 3.3m if modeling future roads.
- Base saturation flow rates for existing and future conditions will be 1900 pcu/hr green. These will then be adjusted for traffic composition, geometrics, lane configurations, pedestrian flows, transit stops, bicycles, and all other applicable factors, as per the Canadian Capacity Guide, Highway Capacity Manual or other recognized methodology for defining and applying the adjustments. The adjustments may be internal to Synchro or applied externally to the saturation flow rate for a particular movement, depending on the specific adjustment. Adjustments may be based on actual conditions, if appropriately documented field observations can be provided, on typical Hamilton values or on future assumptions, but the assumptions must be stated in all cases.
- Peak hour factor (PHF) is to be 0.92 unless a calculation based on actual traffic counts demonstrates another value is more appropriate.

The following applies to input data:

- Proper lane designation and storage; do not include taper as storage length
- Volume data must be City approved. Conflicting pedestrian volumes for right and left turns are to be entered accordingly from existing traffic counts or based on approved volumes for future scenarios.
- For actuated operation, include at least one pedestrian call/cycle based on calculated cycle lengths and pedestrian volumes.
- Account for on-street parking by varying the number of lanes for mid-block locations and intersections. (Assume that parking zones are fully occupied).
- Mode of operation should be based on existing conditions; future signals should be modeled as fully actuated with recall to the main street.

- Minimum phase timings will be 10s for through phases, 5s for protected/permissive turn phases with a 3s amber and 5s for fully protected left turn phases with a 3s amber and 1.5s all red.
- The model must include at least 2 existing signalized intersection both upstream and downstream of the proposed signal.
- Future proposed signals must have amber and all-red clearances based on OTM Book 12.
- Pedestrian timings for proposed signals must include a clearance sufficient to cross the entire road at 1.2 m/s; the pedestrian clearance input will be the required clearance minus the amber/all-red for that phase; minimum walk time is 7s.
- Heavy vehicle percentage must be based on actual volumes or City approved volumes for future scenarios; do not use defaults.

The following applies to proposed new signals:

- Network seeding for simulation should be at least a 15 minute interval; recording for four 15 minute intervals with one interval using the PHF and one using the anti-PHF.
- Time-space diagrams should show 100% usage of green time (i.e. as though the signal was operating in a fixed time mode).
- Queue length vs. storage: 95th percentile queue length must not create obstructions.
- All movements at new signals must not have volume to capacity ratios of 0.85 or greater and delay greater than one cycle length.
- Progression and time space diagrams: identify any narrowing of green bands.
- Output should summarize levels of service for each movement at each intersection under all scenarios as well as SimTraffic delay, stops, fuel consumption and GHG emission and any progression issues.
- When Synchro results are questionable a comparison of Synchro and SimTraffic results is required to determine the cause of discrepancy.

Justification of New Signals

The applicant will be responsible for justifying the need for a new signal by addressing the following:

- Details of the full 8 hour signal warrant data and output using Hamilton's signal warrant worksheet with up to date data.
- A safety audit to determine if the proposed traffic management plan could result in a safer overall operation. The audit will be based on the most recent collision data available for the 5 previous calendar years.
- Functional requirements of the proposed signal must be identified including a detailed review of proposed geometry/alignment, pavement markings, signal head locations, new or modified traffic islands etc.
- Identify any easements required from all property owners affected and approval of said property owners.

3.8.2 Roundabouts

As per City of Hamilton Council Policy, a modern roundabout analysis must be completed for any potential traffic signal installation or an existing signalized intersection that is or is projected to experience collision patterns, congestion or poor level of service. A feasibility study using the Rodel program is required. Neighbourhood

roundabouts at local/collector road intersections must also be considered as part of the draft plan of subdivision or site plan analysis. As a general design guideline the applicant can reference The USA based Federal Highway Administration publication "Roundabouts: An Informational Guide" (FHWA-RD-00-067), and "Synthesis of North American Roundabout Practices" soon to be released by the Transportation Association of Canada (TAC).

3.9 Access Location Analysis

3.9.1 Access Geometrics

Existing and proposed access locations should be reviewed to ensure the minimum number is provided to serve the development without negatively impacting flow of traffic along abutting streets. Consideration with respect to possible mutual access with adjacent properties or consolidation of properties should be explored. Access points should be located appropriately in terms of land use and road classification (i.e. no commercial access to local roads). Justification for more than one access must be based on capacity of site traffic and not design preference.

The locations should be adequately spaced from adjacent street and driveway intersections. The number of exit lanes, radii and vehicle storage should be appropriate to accommodate traffic demands. The driveway throat length at the road should be sufficiently long to minimize conflicts between street traffic and vehicles within the site.

Access points should be evaluated in terms of capacity, safety and adequacy of queue storage. Accesses should be free of all encumbrances and provide appropriate visibility triangles. For local roads a minimum 3m x 3m visibility triangle will be required and for collector and arterial roads a minimum 5m x 5m visibility triangle will be required. Proposed loading facilities and access to such facilities should be evaluated to ensure they are adequately sized, designed and accessible so they will not adversely affect traffic operations or pedestrian movements on municipal roads. Manoeuvring on municipal right of way to access loading facilities is not considered acceptable.
Access standards should be in conformity with the Transportation Association of Canada (TAC) Manual.

3.9.2 Turn lane requirements

The traffic study 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 the TAC Manual. Left turn lane determinations at unsignalized intersections must be based on the Geometric Design Standards for Ontario Highways Manual, published by the Ministry of Transportation of Ontario and must also consider the safety benefits of providing a turning lane for the site.

Where turning lanes are warranted the length of storage and taper must be documented in the study.

3.9.3 Sight Distance Evaluation

Analysis for access design and roadway improvements should ensure:

- Safe stopping distance
- Decision sight distance
- Departure sight distance

At each access and at each intersection where a new road is proposed, the sight distance requirements should be examined based on appropriate standards (TAC) and the availability of sight distance determined from actual field measurements.

3.10 Collision and Safety Analysis

The initial review of existing conditions within the study area should include recent (5 year) collision history. A safety evaluation shall be undertaken for each intersection and/or major accesses within the study area to identify locations where traffic safety should be given extra consideration. High collision locations (based on number, rate and severity) within the study area must be analyzed and measures to alleviate collision hazards must be explored.

For locations in the top 25% of the City's network screening list, evidence must be provided that the development will not exacerbate conditions or an alternative to improve conditions must be proposed.

The objective of the safety analysis is to assess the proposed development and determine if there are design alternatives that would enhance the level of safety of the site and adjacent road network for all users.

3.11 Improvement alternatives to mitigate traffic impacts

This section of the traffic impact study will identify operational transportation system improvements and other measures required to ensure that acceptable operation of the transportation system is maintained. The improvements must incorporate recommendations outlined in previous city transportation studies or improvement projects.

The physical and operational road network deficiencies that have been identified in the traffic impact study must be addressed and solutions provided that are feasible and economic to implement.

Improvements could include but are not limited to:

- Widening of the adjacent road network
- Pedestrian sidewalks, multi-use paths or walkways
- Addition of on-street bike lanes
- New transit stops or relocation of existing stops
- Addition of left or right turn lanes at intersections and/or accesses

- Restriction or relocation of existing accesses
- Change in traffic control at an intersection
- Upgrading of traffic control signal through additional phasing and/or improved timing
- Co-ordination of traffic control signals
- Relocation or closure of existing public streets or intersections
- Installation or removal of a median barrier or other median treatments
- Turning restrictions at accesses or intersections

The traffic study must demonstrate the required improvements are:

- In conformity with applicable City policy including but not limited to:
    - Roundabout Policy (PW08078)
    - Full Signal Policy (TOE01011)
    - New IPS Policy (TOE01010)
    - All Way Stop Policy (TOE01053)
    - Traffic Calming Policy (PW07150)
    - Speed Limit Policy (TOE01189)
- Implemented in conjunction with the planned timing of the development. For example, some roadway improvements may require an environmental assessment prior to implementation. The study must demonstrate the development will be phased or timed, as necessary, in conjunction with implementation of transportation infrastructure or service improvements and/or TDM strategies to ensure that travel supply and demand are kept in balance over time.
- Feasible given existing operational or physical constraints of the road network, transit service or field equipment. i.e. if an advance phase is required at a signalized intersection, then the ability of the controller to accommodate additional phases will need to be verified.
- Adequately funded by City and/or Proponent funds. The traffic study must address what extent the required improvements will be provided or contributed by the Proponent.

3.12 Recommendations

It is important to structure recommendations for improvements within the appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-range and long-range network improvements that are already planned and scheduled.
- Anticipated time schedule of adjacent developments.
- Size and timing of individual phase of the proposed developments.
- Part of the City's transportation planning initiatives.
- Logical sequencing of various improvements if not completed in Phase 1.
- Right-of-way requirements and the 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
- Necessary lead-time for additional design and construction

Since improvements can often be implemented in more than one order, the recommendation should address an implementation sequence that provides maximum compatibility with the overall roadway system.

4.0 Documentation and Reporting

The structure and format of the traffic impact study should follow the guidelines outlined in this document, as applicable. The following is a suggested study structure:

- Executive Summary
- Development description with a suitable plan
- Study area map identifying the study area and site
- Existing traffic conditions in the study area
- Anticipated nearby development (tabular summaries)
- Identification of all assumptions
    - Analysis period
    - Trip generation rates for each land use
    - Synergy trips
    - Trip assignment
    - Modal split
- Existing traffic volumes (exhibit required)
- Site generated traffic assignment (exhibit required)
- Traffic demand (future background without development – exhibit required)
- Total traffic demand (future total background with development – exhibit required)
- Improvement alternatives required to mitigate traffic impacts
- Transportation impacts for future background and total traffic with and without mitigation measures (tabular summaries)
- Access requirements including visibility requirements
- Safety considerations including collision summaries (collision diagrams, tabular summary)
- Summary of findings
- Conclusions and Recommendations

This format will facilitate review, discussion and communication. Relevant maps, graphs and tables should be placed adjacent to the relevant text.

The traffic impact study should consist of a main document, supplemented by technical appendices containing detailed analyses as required.

Three (3) copies of the final traffic impact study complete with supporting documentation must be submitted to City staff (1- Planning and Development, 1 – Traffic Engineering, 1- Development Engineering). All electronic Synchro and SimTraffic files must be provided on one compact disk upon submission of the reports. The files shall be appropriately names to easily identify their targeted analysis period.

All information submitted to the City of Hamilton in connection with any traffic impact study will be considered to be in the public domain.

5.0 Bibliography

Guidelines for the Preparation of Transportation Impact Studies – City of Niagara Falls, Revised December 2005

Traffic Impact Study Guidelines - City of Cambridge, January 2007

Transportation Impact Study Guidelines – City of London, June 2006