APPENDIX 4

TRANSPORTATION IMPACT ASSESSMENT GUIDELINES

City of Brantford

TRANSPORTATION MASTER PLAN UPDATE: TRANSPORTATION IMPACT STUDY GUIDELINES

DRAFT REPORT

JUNE 2014

IBI GROUP

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1. INTRODUCTION

A transportation impact study (TIS) provides valuable information and analysis for governing agencies and others reviewing development and redevelopment proposals. The City of Brantford Transportation Impact Study Guidelines have been compiled to outline the process and structure required to produce a comprehensive transportation impact assessment for a development or redevelopment proposal in the City. A TIS includes explicit consideration of all modes of travel including automobiles, trucks, transit vehicles, cyclists and pedestrians.

1.1 Why is a Transportation Impact Study Required?

The main purpose of a TIS is to demonstrate that the transportation impacts of a proposed development or redevelopment will be manageable and that the transportation aspects of the proposal are consistent with the objectives of the City of Brantford. The TIS also provides the basis for the identification and evaluation of transportation related improvements or measures to be included as conditions of approval for the development or redevelopment application. Hereafter, all references to the terms “development” or “development proposal” will be equally applicable to redevelopment applications/proposals.

Through the TIS, the proponent must demonstrate that the application or proposal meets the following City objectives:

- That there is sufficient arterial road network capacity to accommodate the proposed development, taking into account transportation system improvements and any travel demand management initiatives which will be secured in conjunction with the proposal;
- That the development must be phased, if necessary, in conjunction with the implementation of transportation system and service improvements and any travel demand management initiatives, to ensure that supply and demand are balanced over time;
- That the proposal incorporate a suitable travel demand management strategy which includes all reasonable measures to facilitate and promote cycling and walking for trips to and from the site, and future potential transit service; and
- That the number of vehicular parking spaces provided in conjunction with the proposal be minimized with explicit consideration for short and long term parking demands, special needs parking and commercial vehicle loading facilities.

In some cases the trip generation potential from a development proposal may be insignificant when considered in isolation; however, the cumulative effects of a number of such proposals in one area may, in combination, require transportation improvements. It is for this reason, that the City may request the preparation of a transportation impact statement to ensure that the land uses and trip generation potential of these smaller proposals can be collectively accounted for in overall planning initiatives (Refer to the requirements in **Section 2.2**)

1.2 Applicability

It should be recognized that the guidelines included in this document are relevant at the time of printing. These guidelines will be revised, as necessary, to reflect current City policy, practice and

accepted standards. The proponent shall contact the City of Brantford – Public Works Commission at the contact noted below to obtain any updates since this compilation date.

The following document outlines general guidelines for the preparation of transportation impact studies for submission to the City. There may be instances where the guidelines and general study assumptions may not be applicable to certain locations in the City, or specific types of developments. It should be recognized that the purpose of this document is to provide a framework for the preparation of a TIS and shall not be substituted for good transportation engineering judgement.

For additional information or for clarification of any of the material contained in this document, please contact the departments/agencies included in **Exhibit 1-1**, as applicable:

Exhibit 1-1: Department and Agency Contacts

Planning Services	City of Brantford 100 Wellington Square P.O. Box 818 Brantford, ON N3T 5R7 519-759-4150
Public Works Commission	Supervisor, Transportation & Parking City of Brantford 100 Wellington Square P/O/ Box 818 Brantford, ON N3T 519-759-4150
Provincial Roads	Ministry of Transportation of Ontario Regional Traffic Section Southwestern Region 659 Exeter Road London, Ontario, N6E 1L3 Telephone: 519-873-4351

1.3 Acknowledgement of Responsibility

When the scale of the development requires a TIS (see Section 2.1), it is the Proponent's responsibility to retain an experienced transportation consultant to complete the assessment. The City of Brantford requires that a TIS be prepared and/or reviewed under the supervision of qualified, registered professional Engineers with specific training in traffic and transportation engineering and more than five years of experience related to preparing transportation impact studies for existing or proposed developments. The report must be signed by an individual accredited by the Institute of Transportation Engineers

Included in **Appendix A** is a Project Record that must be submitted with all TIS reports and addendums, including the stamp of the professional engineer taking responsibility for the work. In completing this form, the engineer is verifying that appropriate assumptions and methodologies have been used in the completion of the TIS and is indicating the individual(s) who are taking corporate/professional responsibility for the work. This information will also assist City staff in

contacting the appropriate individual if clarification of any part of the transportation impact assessment is required during the review process, or at some time in the future.

2. TIS REQUIREMENTS AND SCOPE

2.1 When is a Transportation Impact Study Required?

In general, a complete TIS will be requested whenever a proposed development will generate 75 or more additional peak direction trips to or from the site during the adjacent roadway's peak hour (i.e. 75 new trips inbound or outbound). Judgment may also enter into the process. In some cases although a development will generate fewer trips than peak hour, peak direction minimum requirement of 75 trips, a study may be requested due to localized safety or capacity deficiencies.

A TIS will also be requested when two of more proposed developments will generate 75 or more additional peak direction trips to or from the site during the adjacent roadway's peak hour.

There are a number of other considerations in determining the need, elements and level of detail for a TIS. Generally a TIS may be required when one or more of the following are anticipated/present:

- The development is planned with an access to an arterial roadway within 200 meters of a signalized intersection;
- The development is located in an area of high roadway congestion, high operating speeds, and limited sight distance where safety is an issue;
- If in the opinion of the City the development has the potential to create unacceptable adverse operational and safety impacts on the area road network;
- The development, its access, or type of operation, is not envisaged by local land-use or transportation plans;
- The development requires a change or an exception to a City planning or by-law policy, strategy or plan, including rezoning;
- The development is a large recreation or entertainment facility, or is in the vicinity of one, that would likely serve as a regional attraction; and/or
- If in the opinion of the City the previous TIS prepared for the same site is outdated.

The above criteria are necessarily general and in view of the lack of definitive criteria to establish the need for and scope of a TIS for a particular proposal, the Proponent shall consult with City Staff, to determine site specific TIS requirements.

2.2 TIS Scope/Detail

The level of detail and the required components of the TIS will be a function of the location, size and operations of the development proposal. Included in **Exhibit 2-1** is a summary of the points in the development approval process where a TIS may be requested and its overall objectives.

In some cases, the size, location and nature of the proposal will be such that a detailed transportation impact study is not required. Through discussions with City staff, the proponent may be required to prepare a more basic Transportation Impact Statement, which would outline the

general characteristics of the site, its operation and trip generation potential, and a high level assessment of traffic, access, safety and parking requirements. The Transportation Impact Statement would be a technical letter, stamped by a Professional Engineer specializing in transportation planning, which outlines the required components agreed upon with the City.

The proposed development may lie within an area for which a recent and relevant Secondary Plan has already been completed. Under this scenario, the City shall determine if certain elements of the TIS can be omitted or directly incorporated into the current TIS work, i.e., background growth potential, identified arterial road improvements, etc.

Exhibit 2-1: General TIS Scope

Stage of Approval	General Transportation Impact Study Scope
Secondary Plan/Area Plan	• Identification of major/arterial transportation infrastructure and operational improvements associated with area wide development potential • Determination of the collector roadway network and the major intersection configurations and type of control
Draft Plan of Subdivision	• Arterial and collector roadway requirements and operations • Phasing plan • General description of access locations and operations • Allocation of responsibility for implementation of transportation infrastructure improvements
Rezoning	• Arterial and collector roadway requirements and operations • Phasing plan • Transportation infrastructure improvements tied to phasing plan • Description of access locations and operations
Site Plan	• Access location and operations • Transportation infrastructure improvements tied to phasing plan • Site specific impacts on road network including adjacent site operations

Included in **Exhibit 2-2** is an indication of the components that the City of Brantford will require at the various points in the development process. The proponent is to review the TIS requirements included in the column representing their specific point in the development process and discuss relevancy with City of Brantford Staff.

The onus will be on the Proponent to demonstrate that certain aspects of the general requirements for a TIS are not required based on the point in the approval process, or availability and content of recent studies. The proponent should discuss the study scope before initiating the study.

Exhibit 2-2: Specific TIS Elements

TIS Component	Site Development Process			
	Secondary Plan/Area Plan	Draft Plan of Subdivision	Rezoning	Site Planning
Transportation Network				
Major transportation improvements • Planned roadways • New interchange/intersection • Road widening • New transit routes/services • Pedestrian and bicycle routes	√	√	√	
Local transportation system improvements • Intersection improvements • Traffic signal installation or modifications • Traffic calming plans		√	√	√
Long range transit route and facilities planning	√	√		
Travel Demand Analysis				
Development potential beyond the study area	√	√	√	√
Site specific travel demand from other approved developments within study area			√	√
Project specific travel demands and assignments		√	√	√
Area wide transit demands	√	√		
TDM measures (where applicable)	√	√	√	√
Transportation Analysis				
Arterial road link capacity, intersection location, configuration and control	√	√	√	√
Traffic control, lane requirements and operations at collector and local road intersections	√	√	√	√
Storage lengths and tapers for auxiliary lanes at all intersections		√	√	√
Impact on movement of farm machinery	√	√		
Transit route planning	√	√		
Bicycle route planning	√	√		
Off-site pedestrian facilities		√		√
On-street parking requirements/provisions		√	√	√
Driveway access and operations			√	√
Traffic infiltration potential	√	√	√	√
Traffic management plan	√	√		
Site Operations				

TIS Component	Site Development Process			
	Secondary Plan/Area Plan	Draft Plan of Subdivision	Rezoning	Site Planning
Driveway access design and operations including sight distances and corner clearances			√	√
On-site pedestrian/bicycle facilities and operations				√
On-site traffic calming elements				√
Parking and loading layout and design				√
Parking supply			√	√
Improvements and Funding				
Identification of major transportation infrastructure improvements	√	√	√	√
Site phasing and required improvements	√	√	√	√

Having established the TIS scope, the remainder of this guideline document, including the appendices, outlines the acceptable methodologies for which to document the required components. Provided next in **Exhibit 2-3** is a graphic illustrating the various components of a standard TIS.

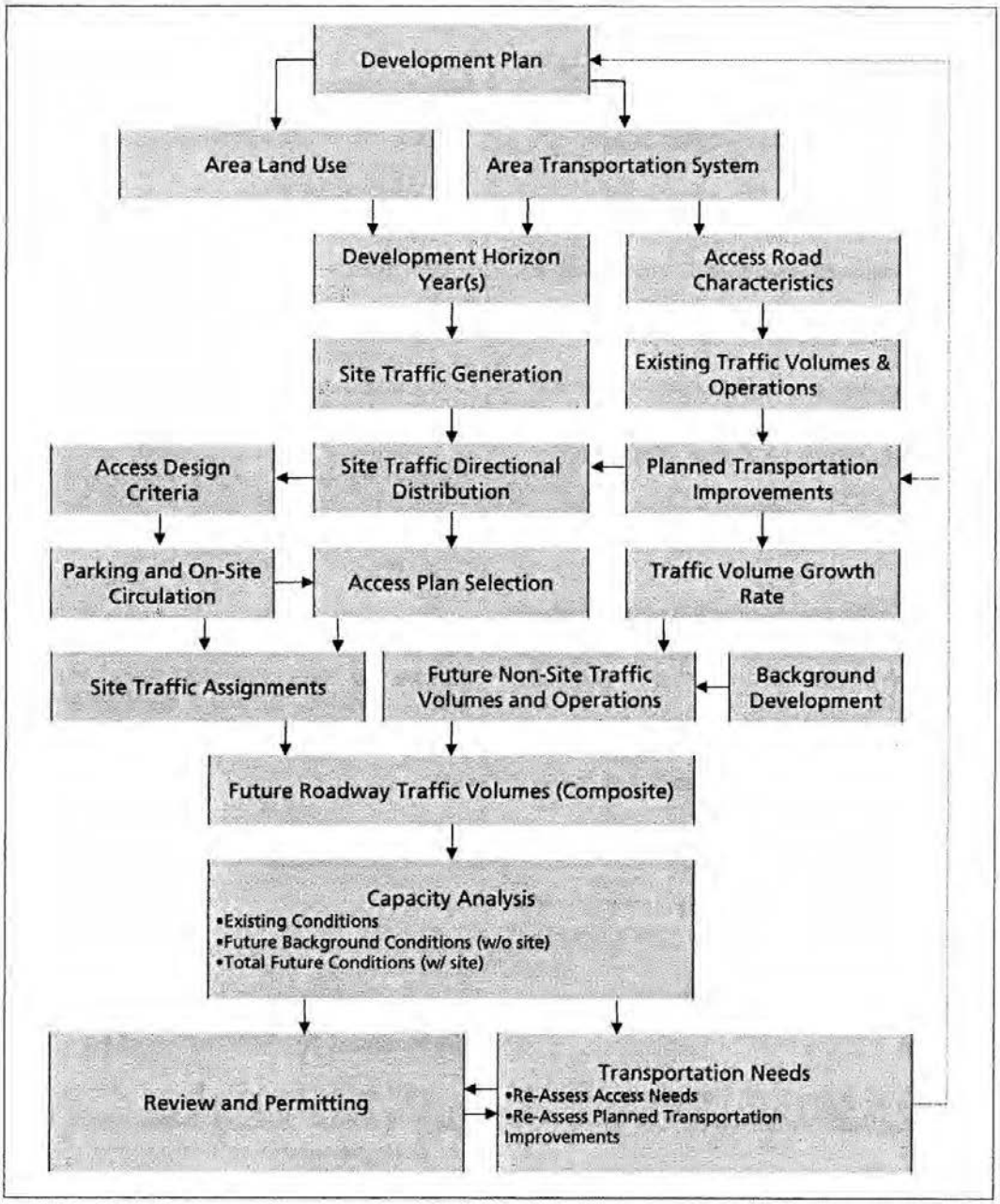
2.3 Other Jurisdictional Requirements

In addition to the requirements outlined herein for the City of Brantford for the preparation and submission of a TIS, the Province of Ontario and/or County of Brant may require additional information or analysis to satisfy their requirements for a development proposal if within their area of control along provincial highways within the City of Brantford or adjacent County roads. The proponent shall meet with all affected jurisdictions simultaneously to expedite the process and ensure consistency for the TIS scope/approach.

2.4 Functional Life of TIS

Generally, a TIS will have a "functional life" of three years. However, major planning/ development, road network or transit changes within the study area during this timeframe may reduce the applicability of the document if they were not previously considered.

Exhibit 2-3: TIS Process



SOURCE: Adapted from Stover and Koepke 2002.

3. DESCRIPTION OF THE DEVELOPMENT PROPOSAL AND THE STUDY AREA

3.1 Pre-Study Conference

A pre-study conference should be first held with the reviewing departments to discuss the following:

- proposed development
- issues
- technical analysis needed
- specific land uses
- horizon years
- study area limits
- study period
- data
- procedures
- assumptions
- reporting
- reviewer and approval process

The land uses that are representative of the zoning must be agreed upon at the pre-study conference.

A description of the development proposal, its location and the proposed TIS study area is required as part of the pre-study conference to allow City Staff to identify the site location, its anticipated operation and area of potential impact. In addition, this valuable information allows timely review of key study assumptions. Provided below is a summary of the required elements of the project and study area.

3.2 Description of the Development Proposal

The following components of the project shall be summarized at the beginning of the transportation impact study document, *as applicable*:

- Existing land uses or special provisions in an Official Plan, Official Plan Amendments, Zoning By-law etc.;
- Planned staging of the development;
- Boundary roadways, nearby intersections and accesses to adjacent land uses or developments; and
- Proposed access points and types.

For a site-specific TIS, the following shall be provided, as applicable:

- Municipal address;
- Rezoning application number;
- Total building size and building locations;

- Floor space including a summary of each type of use;
- Number of parking spaces along with location and access arrangements;
- Number and type of loading areas along with location and access arrangements; and
- Anticipated date of occupancy and hours of operation, if known.

As applicable, the Proponent shall provide an area road network, subdivision drawings or a preliminary site plan, of a suitable scale, for consideration in the evaluation of the TIS.

3.3 Description of Study Area

3.3.1 DEFINITION OF THE STUDY AREA

Generally, the size of the study area will be a function of the size and nature of the development proposal and the existing and future operations of the surrounding road network.

The study area shall encompass all City and Provincial roads, intersections, interchange ramp terminals and transit facilities, which will be noticeably affected by the travel generated by the proposed development. Typically, this will include areas that may be impacted as follows:

- Increase by 10% 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 above; or
- V/C ratios for exclusive movements increased to 0.95 or above.

Since the definition of a TIS study area cannot be based on definitive criteria, it is important that the Proponent contact City Staff to establish mutually acceptable study area limits and scope of study.

3.3.2 FEATURES OF STUDY AREA

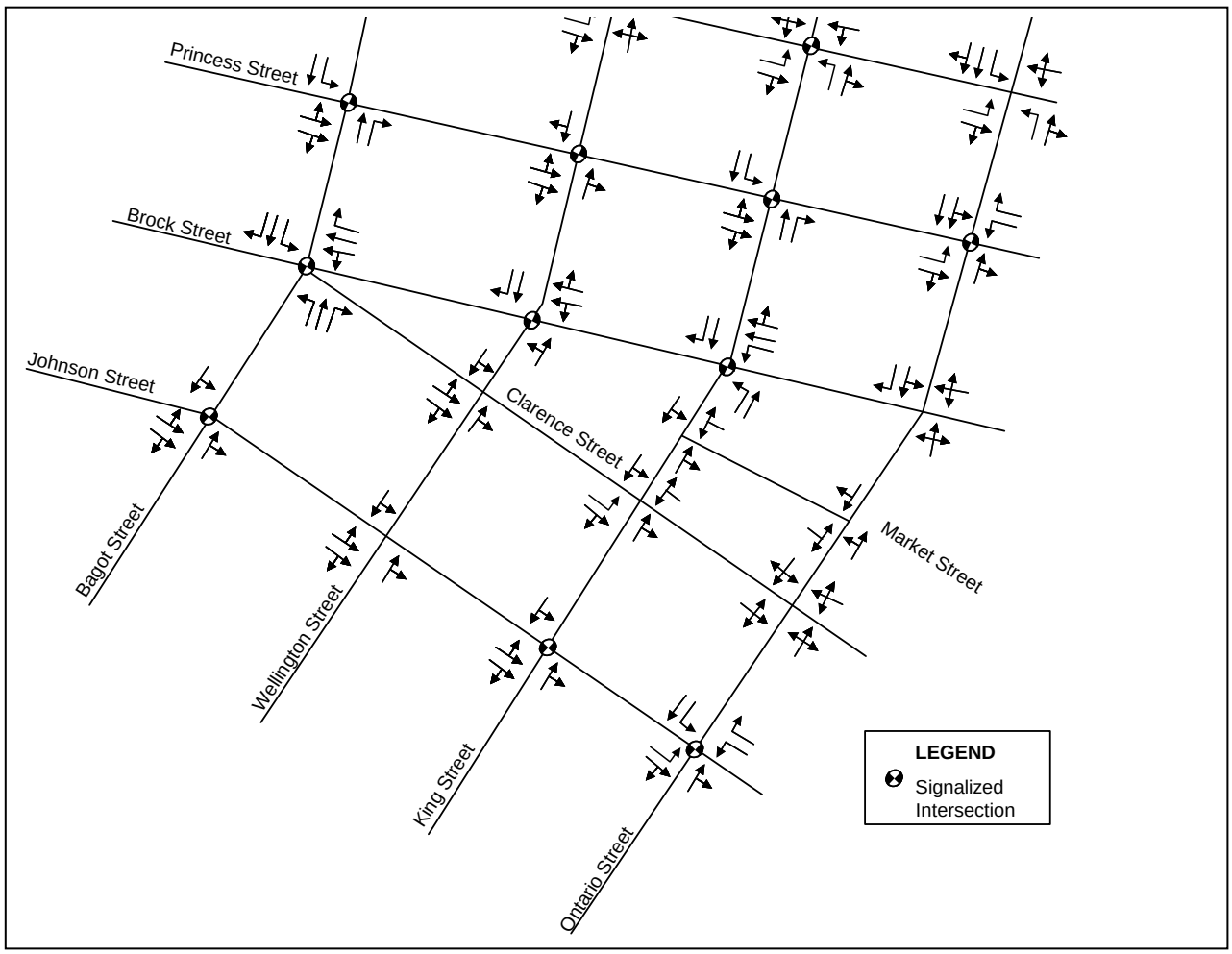
A description and an illustration of the existing transportation system within the study area shall be provided in the existing conditions section of the TIS and shall include, but not be limited to, the following:

- Roads indicating the number of lanes, jurisdiction and posted speed;
- Signalized/unsignalized intersections and interchange ramps terminals indicating, as relevant:
  - Lane configurations, widths and storage lengths;
  - Available permitted movements;
  - Turning restrictions, by time of day/day of week, as applicable; and
  - Type and mode of control.

- Location of sidewalks, bicycle paths/routes and pedestrian control and school crossing guard locations;
- Location of on-street parking, parking/stopping restrictions adjacent to the development and those, which would affect the operation of the roadways and intersections in the study area;
- Truck haul routes/heavy vehicle load restrictions including the times they are in effect;
- Routes used for movement of farm machinery along and/or across public rights-of-way;
- Planned roadway and pedestrian improvements which will have a noticeable impact on the transportation operations within the study area; and
- Other developments in the study area, which are under construction, approved or for which an application has been submitted. Briefly describe the size and nature of these developments in general terms.

Included in **Exhibit 3-1** is an example of a typical graphic that should be included with the description of the study area.

Exhibit 3-1: Example Road Network and Traffic Control Graphic



3.4 Data Collection

The assembly of available data should be accompanied by a detailed examination of the project size, area roadways and the surrounding vicinity. This process should include recording of all relevant characteristics needed for the analysis plus observations of existing traffic conditions.

Current data should also be collected to supplement available information as necessary. New data should be obtained in surveys consistent with procedures described in the current edition of the Manual of Traffic Engineering Studies published by the Institute of Transportation Engineers.

Information regarding existing traffic counts, collision data and trip distribution may be obtained from the City's Public Works Commission.

Population and employment growth data may be obtained from the Planning Services department.

Any factors utilized in the TIS, which are not in concurrence with the recognized standards, must be agreed upon with City staff prior to submission of the final report.

4. ANALYSIS PERIODS

4.1 Horizon Year(s)

It is important that the Proponent obtain agreement from City Staff regarding appropriate horizon years for the specific development prior to proceeding. Generally, the horizon year will be taken as five (5) years from the full build-out of the site/area. Other considerations to be taken into account are as follows:

- Area plan/secondary planning horizons;
- Other area development proposals;
- Future roadway infrastructure initiatives; and
- Occupancy date.

Interim horizon years may need to be evaluated to account for:

- Phasing of developments;
- Interim site access arrangements; and/or
- Planned transportation system improvements.

4.2 Analysis Periods

Identification of the time periods for analysis should take into consideration the following:

- Type and size of development;
- Trip generation potential during weekday AM and PM peaks of the adjacent road network;

- Hours of operation;
- Reoccurring special events; and
- Seasonal fluctuations.

Typically, the weekday AM and PM peak traffic periods will constitute the "worst case" combination of site related and background traffic; however, in the case of retail, entertainment, religious, institutional, sports facility uses, weekend or site peak analysis may be required.

5. EXISTING TRANSPORTATION CONDITIONS

To provide a representative picture of the existing conditions, the following shall be included in the TIS, as applicable:

- Exhibit(s) showing the existing traffic volumes for the roadways and intersections in the study area including pedestrian volumes and heavy vehicle percentages. Traffic volumes may be acquired from the City if available, along with previous (no older than 3 years) transportation planning, traffic operation or transportation impact studies undertaken in the vicinity of the proposed development. In general, traffic counts more than three (3) years old or counts that do not appear to reflect current conditions, shall be updated by the applicant;
- Intersection analysis of the existing conditions for all peak periods. The analysis shall be undertaken with industry-accepted methodologies and assumptions. Intersection analysis should be undertaken using the Highway Capacity Manual (HCM) methodology, with preference for Synchro 6.0 (or newer) or the Highway Capacity Software (HCS). Calibration of the analysis to actual conditions must be undertaken;
- Summary of level-of-service including volume to capacity (v/c) ratios and critical queue lengths for all intersections and critical movements. Full documentation of the results of all level of service analyses shall be provided in an appendix; and
- Summary of key field observations of the existing conditions.

6. BACKGROUND TRAFFIC

6.1 Future Developments

The Proponent shall include anticipated traffic growth on the area road network from developments that are expected to proceed prior to or within the selected study horizons, as identified in **Section 4.1**. This may include land zoned for development, but for which there isn't an active development application. The Proponent shall contact the City's Planning and Building Department to establish the approved/active development proposals within the Study Area.

The background changes in traffic growth shall take into account:

- Developments that are being constructed;
- Occupancy levels of adjacent development, i.e., buildings which are constructed but not fully occupied; and

- Developments/land uses that are planned to be closed, or activities suspended which will noticeably impact the transportation system in the study area.

6.2 Future Transit Services

The Proponent shall review the development proposal, including the site design (if applicable), in the context of having the area serviced by existing or potential future Brantford Transit service. The report should identify the development attributes that lend to the provision of transit service or connections. The following documents will provide guidance in this regard:

- Promoting Sustainable Transportation Through *Site Design*: An ITE Proposed Recommended Practice, Institute of Transportation Engineers, 2004; and

- Transit-Supportive Land Use Planning Guidelines, Ministry of Transportation and Ministry of Municipal Affairs of Ontario, April 1992, http://www.mah.gov.on.ca/userfiles/HTML/nts_1_3173_1.html

7. SITE TRAVEL DEMANDS

7.1 Estimation of Traffic Demand

Available 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 Brantford or comparable municipality, which have similar operating characteristics as the proposed development;

- ITE Trip Generation rates provided that differences in the site operations and size are accounted for; and

- "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. Pass-by trips must be accounted for in the turning movements into/out of the site;

- **Captive Market Effects** - Trips which are shared between two or more uses on the same site; and

- **Travel Demand Management (TDM)** – any strategies to be employed at the proposed development to reduce single occupancy vehicle (SOV) trip making, i.e., staggered work hours, ridesharing or company shuttle for commercial/industrial projects, or bike storage, bike lanes or transit-supportive design in a residential project.

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

7.2 Trip Distribution and Assignment

7.2.1 TRIP DISTRIBUTION

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

- Origin-destination surveys;
- Comprehensive travel surveys;
- Existing travel patterns; and/or
- Market studies.

Engineering judgement shall be used to determine the most applicable of the above methodologies for each particular application.

7.2.2 TRIP ASSIGNMENTS

Trip assignment assumptions shall reflect the most "probable" travel patterns considering the planned site access. 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, “diverted” trips, and “internal” trips.

7.3 Summary of Traffic Demand Estimates

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

- Existing traffic;
- Future background - existing plus background traffic growth;
- Site generated traffic; and
- Future total traffic - future background + site generated traffic.

Summary exhibits must be provided for each peak period and analysis horizon. 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. Should pass-by or diverted trips be assumed, separate assignments should be shown to allow the reviewer to follow the logic.

8. EVALUATION OF IMPACTS OF SITE GENERATED TRAVEL DEMAND

The following are the steps that shall be undertaken to evaluate the impacts of the site-generated traffic on the area road network:

- Calculate the travel demand generated by the development proposal and assign it to the area road network consistent with the methodology outlined in **Section 7**.

- Undertake intersection analysis for all intersections and accesses within the study area;

- Provide a summary of level-of-service for all analysis periods and time horizons. Full documentation of the results of all level of service analyses shall be provided in an appendix.

- Identify signalized intersections where:

  - Volume/capacity (V/C) ratios for overall intersection operations, through movements, or shared through/turning movements increased to 0.85 or above;

  - V/C ratios for dedicated turning movements increased to 0.95 or above; or

  - Queues for an individual movement are projected to exceed available turning lane storage or impact upstream transportation facilities.

- Identify unsignalized intersections where the overall intersection or individual movement are operating level of service is “E” or above.

- Identify potential safety or operational issues associated with the following:

  - Weaving/merging;
  - Corner clearances;
  - Sight distances;
  - Vehicle-pedestrian conflicts;
  - Access conflicts;
  - Traffic infiltration;
  - Cyclist operations;
  - Heavy truck movement conflicts;

  All of the above considerations may not be applicable to the development site/area. It should also be recognized that the above list is not exhaustive and there may be other operational or safety concerns that may need to be addressed in the TIS; and

- Provide supplementary analysis required to address vehicle queue lengths/queue blocking, merging, weaving, gap availability/acceptance, sight distance availability, etc.

9. TRANSPORTATION SYSTEM IMPROVEMENTS

This section outlines the process of identification of physical and operational transportation system improvements and other measures required to ensure that the impacts associated with proposed development can be mitigated to the satisfaction of the City.

9.1 Identification of Required Improvements

The physical and operational remedial measures recommended in the TIS must address all deficiencies identified through the completion of the tasks outlined in **Section 8** of this document. The road network improvement requirements identified in the TIS must address and ensure that:

- Site generated traffic does not create conditions in which the capacity criteria summarized in **Section 8** are exceeded;
- Vehicular, pedestrian and cyclist operations and safety are maintained or improved; and
- Site generated traffic will not have a noticeable adverse impact on existing or proposed residential communities.

Additional analysis shall be provided to demonstrate that the proposed mitigating measures will in fact address the impacts of the site generated traffic. The City requests that functional plans be provided for all recommended road improvements. A “to-scale” drawing illustrating edge of pavement and lane designations is typically required. An exhibit should be provided within the body of the report, which illustrates the proposed physical improvements.

9.2 Implementation and Funding of Required Improvements

The Proponent must demonstrate that the required improvements are:

- Implemented in conjunction with the planned timing of the development. For example, some roadway improvements may require an Environmental Assessment prior to implementation (i.e. road widening). The Proponent must demonstrate that the development will be phased or timed, as necessary, in conjunction with the implementation of transportation infrastructure and/or service improvements, to ensure that travel supply and demand are kept in balance over time.
- Feasible given existing operational or physical constraints of the road network 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 Proponent funds. The TIS must address to what extent the required transportation system or service improvements will be provided or contributed to by the Proponent.

10. SITE PLAN, PARKING AND ACCESS REQUIREMENTS

This section addresses site plan criteria, parking and access locations in order to develop a plan that will be harmonized with the surrounding developments and provide acceptable access and site circulation for all anticipated modes of travel.

Points of consideration with respect to site plan criteria, parking and access are:

- Evaluation of proposed access points with respect to possible mutual interference with other adjacent or opposed access points shall be undertaken;

- Evaluation of sight lines to ensure safe conditions in accordance with accepted standards;
- Evaluation of the potential for access and circulation movements with on-site parking, traffic control, drive through facility etc. to result in queues extending onto or vehicles backing onto public roadways;
- Demonstration that the parking policies and standards applied to the development are in accordance with City requirements, including bicycle parking;
- Evaluation of delivery vehicle/courier unloading facilities and access to these facilities with respect to location, size and design. Convenient access shall be provided in order to avoid the possibility of pick-up/delivery occurring on City rights-of-way;
- Description and evaluation of site access provisions for pedestrians and cyclists; and
- Description of the measures taken to make the proposed development accessible to persons with personal mobility limitations.

11. DOCUMENTATION AND REPORTING

The report must follow the format outlined in **Appendix B** unless other requirements are established in the pre-study conference. The following is the required content topics for a TIS:

- Introduction
- Content
- Travel Demand
- Evaluation of Impacts
- Site Access and Circulation
- Remedial Measures
- Conclusions and Recommendations
- Appendices

Any variation from this methodology without prior consultation with the reviewing agency will result in the report being returned to the applicant without consideration. Three (3) copies of the report must be submitted to the Supervisor of Transportation and Parking, or alternative designated City contact who will distribute the reports in accordance with existing policy.

Approval of the TIS does not constitute approval of the development application. Conditions imposed by other reviewing departments must also be resolved.

An electronic copy of the text material and analysis shall be provided in Adobe Acrobat (pdf) and/or other file formats acceptable to the City. A technical appendix included under another cover shall be provided in the case where the analysis and other technical materials are too substantial to provide in one document. The City prefers to have large appendix materials provided in electronic format. Where possible, key maps, diagrams, graphs, tables and other exhibits shall be placed adjacent to the relevant text as opposed to an appendix.

APPENDIX A

EXAMPLE PROJECT RECORD

City of Brantford

Transportation Impact Study

PROJECT RECORD

Development Name/Reference:

Company or Firm:

Original Report Name:

Original Submission or Addendum:

I hereby certify that the attached document has been prepared accurately and to the best of my knowledge. The assumptions and analysis contained herein have been formulated using sound transportation planning and traffic operations methodologies.

Individual accepting corporate responsibility:

Name: _____ Signature: _____

Project Manager (if applicable):

Name: _____

Other Individuals involved in the preparation of the study and can be contact regarding study content:

Name: _____

Name: _____

Engineer's Stamp

APPENDIX B

TIS REPORT CONTENT

TIS REPORT CONTENT

1. TITLE PAGE

2. TABLE OF CONTENTS
LIST OF EXHIBITS
LIST OF APPENDICES

3. EXECUTIVE SUMMARY

- summary of key findings and recommendations of Traffic Impact Study.

4. INTRODUCTION

- identification of applicant;
- site location;
  - municipal address;
  - map(s) to show site in area context;
- nature of application (Zoning Amendment, Site Plan Control Application, etc.);
- summary of key issues.

5. CONTEXT

- map(s) to show study area. The study area must include all roads, expressways, intersections, interchanges, transit services and facilities, etc. which will be noticeably affected by the proposed development (i.e. intersection level-of-service affected by more than 5%, volume/capacity ratio of individual intersection traffic movements increased to more than 0.85, etc.);

- proposed land use on site:

- type of land uses proposed;

- size of individual land use components expressed in units related to transportation analysis (e,g, floor area, number of residential units, population, employment, number of parking spaces, etc.) Special attention should be paid to gross vs. net definitions;

- identification of any phasing schemes with their associated land use statistics;

- expected dates of completion and full occupancy of the ultimate development and of any interim phases, if known;

- proposed development in terms of pedestrian access routes and on-site circulation for pedestrians;

- other developments in study area:

  - identify other developments under construction, approved, or in the approval process within the study area, along with the type and size of development;

- text and map(s) to show the existing transportation system in the study area;

  - existing roads, number of lanes, posted speeds;
  - existing signalized intersections, lane configuration, restrictions on movements;
  - other traffic controls, restrictions on movements;

- heavy vehicle (truck) restrictions;
- existing transit routes and service frequencies
- existing transit stops and stations;
- other features of interest;
- other access points adjacent to or opposite the site;
- anticipated nearby development.

- committed and proposed transportation improvements:

  - identify the nature and timing of such transportation system improvements within the study area, or which may affect transportation to/from the proposed development.

6. TRAVEL DEMAND

- horizon year for study:

  - the horizon year will be five years from the date of the TIS unless an earlier date for occupancy of the development can be supported.

  - horizon years should also be identified for any interim phases of development;

- time periods of analysis:

  - in general, the p.m. peak hour and peak hour of the development should be evaluated. The peak hours should be identified on the basis of the "worst-case" combination of site-generated trips plus background traffic/transit volumes across the study area;

  - other peak hours, such as Saturday afternoons for retail uses, should be examined to see if they will result in a "worst-case" situation in any respect;

- map(s) to show existing traffic/transit volumes:

  - should be based on the most recent traffic/transit counts available. The consultant should undertake additional traffic counts where existing count data is more than two years old or where existing data appears to be abnormal. Transit counts should be based on the peak points of the routes involved;

- evaluation of background traffic/transit volumes:

  - existing traffic/transit volumes should be factored to account for growth between the date of the counts used and the horizon year(s). Growth factors must be agreed upon with the City's Engineering Department prior to submission of the report. This component of background traffic growth will be deemed to represent travel increases resulting from general growth outside the study area;

  - other development projects which have been approved or are reasonably expected in the study area should be specifically accounted for;

- site-generated traffic/transit volumes:
    - trip generation, trip distribution, assignment and modal split assumptions should be in accordance with standard/accepted parameters and techniques or based on surveys or other local knowledge. Data sources should be well documented and any assumptions which may be considered less-than-conservative should be rigorously justified. Any "soft" parameters where there is significant uncertainty or a range of possible values should be subjected to sensitivity analysis unless a demonstrated "worse-case" situation is assumed;
    - assumed travel demand parameters (generation, distribution, modal split, etc.) should be clearly summarized
    - the information on pass-by trips (e.g. retail trips which represent intermediate stops on a trip already on the transportation system) included in the ITE trip generation report should be reviewed. If pass-by trips are a major consideration for the land use in question, studies and interviews at similar land uses may be requested.
    - trips generated by on-site synergy (e.g. internal shopping trips by workers in a combined office/retail building) where appropriate may be subtracted from trip generated estimates.
    - any significant differences between sums of single-use rates and proposed mixed-use estimates must be justified in the study report.
- map(s) to summarize existing traffic/transit volumes, existing plus background growth, and existing plus background, and existing plus background growth plus site-generated volumes:
    - p.m. peak hour, peak hour of the development and any other relevant peak hours should be summarized;
    - horizon years for full occupancy and for any interim phases should be presented; and
    - any major transportation improvements, committed or planned within the study horizon, which may significantly affect the travel demand pattern associated with the development proposal should be considered. Scenarios with and without such improvements should be summarized as appropriate.

7. EVALUATION OF IMPACTS

- impacts on roads and transit facilities should be evaluated for:
    - p.m. peak hour, peak hour of the development and for other relevant hours;
    - horizon years for full development and for interim phases;
    - existing situation, existing plus background growth, and existing plus background growth plus site-generated travel;
    - scenarios with and without relevant major transportation system improvements;
- traffic impact analysis:
    - all relevant signalized and major unsignalized intersections in the study areas must be evaluated;

- any roadway segment deemed sensitive to traffic such as merging and weaving sections, ramps internal site roadways, parking facility access points and reservoirs for vehicles queuing off-site and on-site must be evaluated;

- all assumptions concerning land configurations/use, pedestrian activity, cycle length, signal phasing, and signal timings, should be clearly documented in an appendix. The consultant should confirm that any such assumptions where applicable, are in conformance with City standards/practice;

- traffic volumes and volume/capacity ratios should be documented in a clearly understandable table in an appendix for all signalized intersections (overall volume/capacity ratio) and for each individual traffic movement;

- traffic volumes and volume/capacity ratios for all "problem" intersections/individual movements in those peak hours where:

  (i) an overall intersection volume/capacity ratios will exceed 0.85; or,

  (ii) an individual through/shared movement volume/capacity ratio will exceed 0.85

  (iii) an exclusive turning movement volume/capacity ratio will exceed 0.9; or,

  (iv) an exclusive turning movement volume/capacity ratio (of any value) which will result in queues which will exceed the available storage space.

- should be summarized in a table in the body of the report. This table should include volume/capacity ratios for the existing situation, existing plus background growth plus site-generated traffic and for any scenarios involving general improvements to the transportation system;

- all level of service analysis of existing traffic volumes/movements at major signalized intersections where volume/capacity ratios will exceed 0.85 should be supplemented by field evaluation of average delays and queue lengths. Evaluation of future scenarios should be supplemented by estimates of these parameters as available from the capacity analysis technique utilized;

- all intersections/individual movements identified above as "problems" should be discussed in terms of contribution of the development proposal to the situation, possible remedial measures, a recommended solution, and the effectiveness of the solution (quantitative) towards resolving the situation. IN GENERAL, THE OBJECTIVE SHOULD BE TO ENSURE THAT NO NEW "PROBLEM" MOVEMENTS ARE CREATED BY THE DEVELOPMENT AND THAT "PROBLEM" MOVEMENTS ARE CREATED BY THE DEVLOPMENT AND THAT "PROBLEM" MOVEMENTS WHICH EXIST WITHOUT THE ADDITION OF SITE-GENERATED TRAFFIC ARE NOT WORSENED BY THIS ADDITION;

- all exclusive turning lanes used by site-generated traffic should be examined to ensure adequate queue storage space, adequate storage lengths will be designed for Level of Service A (95% arrival rate);

- all proposed new traffic signals should be evaluated in terms of signal warrants, distance from other signals, effects on existing signal co-ordination, likely timing of implementation, etc.;

- all proposed adjustments to signal phasing, signal timing and new signals should be evaluated in terms of pedestrian crossing time, effect on queue lengths and adequacy of existing storage,

and effects on existing signal co-ordination.

- all methodologies and assumptions should be documented as to source and their use should be justified.

8. SITE ACCESS AND CIRCULATION

- all site access points on City roads should be evaluated in terms of capacity, safety and adequacy of queue storage capacity. This evaluation should be similar in scope to that for signal/unsignalized intersections described previously;

- proposed access points should be evaluated with respect to possible mutual Interference with other access points (including those of other sites), on-street weaving problems, need for acceleration/deceleration lanes, pedestrian safety, etc.;

- on-site parking/circulation systems should be evaluated to demonstrate a high safety-factor with respect to the possibility of queues backing onto City roads, the need for vehicles to back onto City roads, etc.;

- sight lines (for roads and access points) should be evaluated to ensure safe conditions in accordance with accepted City standards where these are affected by the site design;

- proposed truck/courier loading facilities and access to these facilities should be evaluated to ensure that they are adequately sized, designed, and provided with suitable access so that they will adversely affect traffic and transit operations on City roads;

- any required turning or other restrictions should be identified;

- All accesses should be designed in accordance with City of Brantford standards and policy;

- Adequate access for emergency vehicles should be provided.

9. REMEDIAL MEASURES

- all transportation system improvements identified as necessary or desirable to serve the proposed development should be listed and the timing of their implementation should be identified;

- all road improvements should be shown on a functional sketch indication dimensions, required pavement widenings required right-of-way widenings; traffic control and other significant characteristics;

- other factors that should be analyzed included safety considerations, traffic control needs, neighbourhood impacts and pedestrian and bicycle movements;

- all “problem” traffic movements or other traffic/transit impacts which cannot be successfully mitigated should be identified; and

- a table should be prepared (similar to that described under “traffic impact analysis”) to show the volume/capacity ratios of intersections/individual movements as affected by the recommended remedial measures.

- once the traffic analysis has been accepted, approval of the Traffic Impact Study will be granted conditional upon the feasibility of the recommended plan,

- a sufficient amount of design should be undertaken to ensure all recommended improvements can be physically constructed. In some cases where new roads or road widenings are recommended a public meeting may be required.

- cost estimates must be provided for all recommended improvements

10. CONCLUSIONS AND RECOMMENDATIONS

- summary of key study findings with respect to the transportation impact of the proposed development; and

- summary of recommended improvements and unresolved “problems”.

11. APPENDICES

- calculations for capacity analysis lane warrants and traffic control warrants must be included in the Appendix.