Huron County

Transportation Impact Assessment and Access Management Guidelines

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Contents

Appendices

Tables

Figures

Preface

Section 3.3 (Community Policies and Actions) of the Huron County Official Plan states:

> 9) *Transportation land use considerations will be integrated at all stages of the planning process, including connectivity among transportation systems and promotion of alternative, safe, energy efficient transportation modes. Land use patterns will be promoted which support active transportation and minimize the length and number of trips and reduce dependence on the automobile.*

The **Transportation Impact Assessment and Access Management Guidelines** outlined in this document are intended to assist in land development planning within the County consistent with this provision of the Official Plan. The guidelines are divided into two parts:

- **Part A – Transportation Impact Assessment Guidelines** outline the requirements and process to assess and mitigate the potential effects of a proposed development on the transportation system, with emphasis on the County's road network.
- **Part B – Access Management Guidelines** provide guidance on the methods and process of controlling vehicular access to the County's road network.

Interpretation

The words "shall", "should" and "may" are used to describe specific conditions concerning these guidelines. To clarify the meaning intended in this document by these words, the following definitions apply:

- **Shall or Must** is a mandatory condition. This falls under the categories of "Legal Requirement(s)" or "Interpretation". Where certain requirements in design or application are described with the "shall" stipulation, it is mandatory that these requirements be met.
- **Should** is an advisory condition. This falls under the category of "Recommended Practice". Where the word "should" is used, it is considered to be advisable usage, recommended but not mandatory.
- **May** is a permissive condition. This falls under the category of "Guideline". No requirement for design or application is intended.

All references to the terms "proposed development", "development proposal" and "development application" in this document mean the same and apply equally to redevelopment initiatives.

Reference Documents

The guidelines refer to the most recent editions of the following reference documents:

- Institute of Transportation Engineers (ITE) *Trip Generation Manual and Handbook*
- ITE *Traffic Access and Impact Studies for Site Development: A Recommended Practice*
- Ministry of Transportation Ontario (MTO) *Design Supplement for the TAC Geometric Design Guide for Canadian Roads*
- MTO *Ontario Traffic Manual (OTM) Books*
- MTO *Roadside Safety Manual*
- Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*
- TAC *Canadian Roundabout Design Guide*
- Transportation Research Board (TRB) *Highway Capacity Manual*
- American Association of State Highway and Transportation Officials (AASHTO) *Highway Safety Manual*

Other documents may be referenced as appropriate.

Applicability and Disclaimer

The **Transportation Impact Assessment and Access Management Guidelines** are not intended to be used as a basis for establishing civil liability. The material presented in this document was carefully researched and is based on a scan of industry practices recommended by other jurisdictions, governing bodies and professional associations. No warranty expressed or implied is made on the accuracy of the contents or their extraction from referenced publications.

Users of the guidelines are cautioned that the policies and standards included in this document are relevant at the time of publication. The County may revise the guidelines as necessary and at any time to reflect changes to County policy, industry practice and/or accepted standards. The applicant and/or transportation consultant should contact the County and/or check the Huron County website to inquire whether any modifications to this document have occurred since its compilation date to ensure the most current version is being referenced.

Adherence to these guidelines should aid and expedite the review process for most development applications but does not guarantee approval, especially in circumstances where the context or conditions require a unique, site specific approach.

PART A

Transportation Impact Assessment Guidelines

1 Introduction to Transportation Impact Assessment

1.1 Overview

A Transportation Impact Assessment (TIA) assesses the potential effects of travel demand generated by a proposed development on the transportation system and identifies improvement measures to mitigate anticipated impacts. These technical studies serve an important role in the development review and approval process and support Huron County's goal of promoting a high quality, efficient, safe and integrated transportation network.

A TIA helps the County evaluate the merits and implications of a proposed development from a transportation perspective. The County will review the study to assess whether:

- The proposed development can be well-integrated with the existing and planned transportation networks;
- The transportation system can function safely and efficiently with the proposed development, after considering, if necessary, improvement measures to be secured/identified in conjunction with the proposal; and
- The proposed development can be phased, if necessary, to coincide with the implementation of the identified improvement measures, thereby ensuring transportation supply and demand are balanced over time.

1.2 Purpose of the Guidelines

Huron County has prepared these **Transportation Impact Assessment Guidelines** to outline the process and structure for preparing a TIA. The guidelines are intended to:

- Provide a standard framework and approach for the consistent preparation and objective assessment of a TIA, ensuring the results will be comparable to other transportation studies carried out in the County;
- Guide County and other agency staff and elected officials in their review and assessment of the submitted studies;
- Standardize the guidelines, parameters and requirements to aid transportation consultants in the preparation and County staff in the review and assessment of TIAs; and
- Promote better understanding of the development review process related to transportation for applicants, review agencies and elected officials.

By following these guidelines, the TIA will evaluate the effects of a proposed development on the transportation system in a rational manner and utilize

assumptions consistent with the County's accepted methodologies. This can benefit both the applicant and the County by:

- Providing guidance to development proponents on how to comply with and implement County regulations, standards, requirements and guidelines;
- Reducing confusion and delay in processing development applications thereby helping to streamline and expedite the approval process;
- Reducing preparation and agency review times for TIAs, with both staff and transportation consultants following the same set of guidelines;
- Requiring fewer iterations and revisions to reports; and
- Reducing the number of technical issues related to transportation at Local Planning Appeal Tribunal (LPAT) and other hearings.

1.3 Applicability

This document outlines general guidelines for the preparation of a TIA for submission to the County. There may be instances where the guidelines and typical study assumptions may not be applicable to certain locations or specific types of developments. It should be recognized that the purpose of this document, as noted above, is to provide a framework for the preparation of a TIA and shall not be substituted for good transportation engineering judgement.

Following the guidelines does not relieve the applicant from the obligation to prepare other studies required by the County and other review agencies. This document and process does not supersede the guidelines and standards in effect for roads and highways governed by the Ministry of Transportation (MTO) and the Local Municipalities and Townships within Huron County.

Huron County reserves the right to determine the need for a TIA, specify the type and scope of the report, define the study area, set analysis parameters and establish the scope of investigations with each TIA based on its professional judgement, notwithstanding these guidelines.

1.4 Qualifications

It is the applicant's responsibility to retain a qualified transportation consultant to complete the TIA. Unless explicitly permitted by the County, the transportation consultant must be a registered Professional Engineer in the Province of Ontario with specific training in transportation planning and traffic engineering and several years of experience related to preparing TIAs.

1.5 Pre-Consultation

Prior to commencing work, transportation consultants are strongly encouraged to contact the County (by phone or e-mail) to confirm the need for a TIA (per **Section 2.1**) and if required, establish data requirements, analysis assumptions and the scope of work (see **Table 2.2**). Consulting with the municipality in advance can help to avoid potential delays and additional work (and cost).

The checklist provided in **Table 1.1** outlines the typical items addressed through pre-consultation. The County will review and comment on the assumptions and provide available transportation data to complete the analysis. A fee may apply for data requests in accordance with County practices, policies and by-laws.

TABLE 1.1: PRE-CONSULTATION CHECKLIST

Item	Section Reference
Type of TIA to be completed and scope of work	2.1 and Table 2.2
Existing and planned conditions for all modes of transportation	3.6 and 3.9
Study area, analysis periods and horizon years	3.4, 3.5 and 3.8
Method of establishing future background traffic and site generated trips (i.e. other development applications in the area, growth rates, need for proxy survey)	3.9 and 3.10
Types of analyses required and methodologies to be used, including software programs and analysis parameters	2.4, 3.6, 3.9, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16 and Appendices A and B
Any scope exemptions that would eliminate typical elements of work not relevant for the development proposal	Table 2.2
Data needed to complete the TIA and how that data should be collected	1.6, 3.5, 3.6, 3.7 and 3.10
Any other identified issues	

The County may recommend/request the preparation of a more detailed Terms of Reference and/or a formal transportation-specific pre-consultation meeting (in person or by phone) with the applicant and transportation consultant prior to commencing work, depending on the scale of the proposed development, the location of the subject lands, and the type and scope of TIA required.

1.6 Data Collection

The transportation consultant must provide copies of all data assembled for the TIA in digital format. This includes, but is not limited to:

- Turning movement counts for all modes;
- Traffic signal timings;
- ATR and AADT counts;
- Collision records;
- Gap study observations;
- Queue studies;
- Proxy site surveys;
- Cordon counts;
- Pedestrian and bicycle circulation plans; and
- Other data as requested.

The data required for the TIA may be available from the County, the Local Municipalities/Townships and/or MTO. The transportation consultant should contact the applicable agency at project commencement to request available information. If possible, the County prefers the use of data supplied by agencies to other independent sources.

In many instances, original data collection will be required to update base information (e.g. traffic counts older than two years or other appropriate time period) and/or address data gaps. The applicant will need to gather this information at their own cost. The transportation consultant should confirm the scope and schedule for the data collection program before commencing field studies (preferably during pre-consultation), particularly proposed survey locations, time periods and dates and collection methods.

2 Requirements

2.1 Need to Complete a Transportation Impact Assessment

The County may request a TIA for any development application requiring approval pursuant to the *Planning Act*, including:

- Official Plan Amendments and Secondary Plans;
- Zoning By-law Amendments;
- Draft Plans of Subdivision and Condominium; and
- Site Plans.

The need to complete a TIA is assessed based on the following three criteria:

- *Trip Generation* of the proposed development;
- *Location* of the subject lands, and/or
- *Operational or Safety* concerns on the road network.

The initial step in determining the need to complete a TIA is to estimate the anticipated travel demand generated by the proposed development. **Section 3.10.1** provides guidance on the calculation of site generated traffic volumes (development trips).

Table 2.1 defines the *Trip Generation* thresholds applied in determining the need for a TIA and the type of report required based on the volume of site generated traffic. There are two types of TIAs, which differ based on the required scope of work (see **Table 2.2**):

- **Traffic Impact Brief and Safety Plan** for developments expected to generate relatively low traffic volumes (typically smaller in size); and
- **Comprehensive Transportation Impact Study** for developments expected to generate more significant traffic volumes (typically larger in size and more complex).

TABLE 2.1: TRIP GENERATION THRESHOLDS

Volume of Site Generated Traffic (vph – peak hour vehicle trips)		
No Assessment	**Traffic Impact Brief and Safety Plan**	**Comprehensive Transportation Impact Study**
0 – 25 vph	**25 – 100 vph**	**> 100 vph**

The County may still require the preparation of a more detailed Comprehensive Transportation Impact Study for a proposed development that does not exceed the *Trip Generation* threshold (i.e. generates 100 peak hour vehicle trips or less) but satisfies the *Location* and/or *Operational or Safety* criteria. If either of these criteria are met, a TIA must be prepared to assess access to the subject site and localized operational and/or safety issues.

The *Location* conditions that may trigger a TIA regardless of the number of vehicle trips generated by the proposed development include:

- Areas designated for more intense development;
- Potential for changes to intersection traffic control on a County roadway;
- Developments with proposed drive-through facilities (to demonstrate adequate queue storage is being provided on-site); or
- Developments expected to serve as a regional destination (e.g. recreation, commercial or entertainment facility).

The *Operational or Safety* concerns that may trigger a TIA regardless of the number of vehicle trips generated include:

- Operating speeds of the adjacent roadway exceeding 80 km/h;
- Limited sight distances;
- Existing traffic experiencing significant delay, long queues or approaching roadway capacity;
- Driveway(s) within 200 metres of a signalized intersection;
- Proposed land use significantly different from existing land use;
- High percentage of truck traffic;
- Close to existing entrances that may create turning movement conflicts;
- Within or close to tapers of additional lanes of traffic; and
- Close to an existing intersection.

If none of the criteria are met, no TIA is required.

As noted in **Section 1.5**, the applicant is strongly encouraged to confirm the need for and type of TIA with the County prior to commencing work. The onus is on the applicant to demonstrate that a (more detailed) TIA would not be required if the criteria are met or the County identifies the need for a report.

2.2 Scope of Work

The Scoping Checklist provided in **Table 2.2** outlines the typical requirements for each type of TIA. **Chapter 3** explains the requirements in greater detail.

TABLE 2.2: TRANSPORTATION IMPACT ASSESSMENT SCOPING CHECKLIST

Report Element	Chapter 3 Reference	Type of TIA	
		Traffic Impact Brief and Safety Plan	Comprehensive Transportation Impact Study[1]
Trip Generation Threshold (Peak Hour Vehicle Trips)		**25 – 100**	**> 100**
Executive Summary	3.1		●
Introduction	3.2	●	●
Description of Development	3.3	●	●
Study Area	3.4	●	●
Analysis Periods	3.5	●	●
Existing Transportation Network:	3.6		
Characteristics	*3.6.1*	●	●
Existing Traffic Operations	*3.6.2*	○	●
Site Visit Observations	3.7	●	●
Horizon Years	3.8		●
Future Background Conditions:	3.9		
Growth Rate	*3.9.1*		●
Planned Network Improvements	*3.9.2*		●
Other Planned Developments	*3.9.3*		●
Future Background Traffic Operations	*3.9.4*		●
Development Trips:	3.10		
Trip Generation	*3.10.1*	●	●
Trip Distribution	*3.10.2*	○	●
Trip Assignment	*3.10.3*	○	●
Future Total Conditions:	3.11		
Future Total Traffic Operations	*3.11.1*	○	●
Traffic Impact Assessment	3.12	●	●

TABLE 2.2: TRANSPORTATION IMPACT ASSESSMENT SCOPING CHECKLIST

Report Element	Chapter 3 Reference	Type of TIA	
		Traffic Impact Brief and Safety Plan	Comprehensive Transportation Impact Study[1]
Safety Analysis	3.13	●	●
Access Review:	3.14		
Access Design	*3.14.1*	●	●
Turn Lane Requirements	*3.14.2*	●	●
Traffic Control Devices	*3.14.3*	●	●
Turning Movement Conflicts	*3.14.4*	●	●
Site Circulation Review	3.15	●	●
Walking and Cycling Considerations	3.16	●	●
Findings and Recommendations	3.17	●	●

Legend and Notes:

● Required

○ May be required (determined on a case-by-case basis)

1 A more detailed Comprehensive Transportation Impact Study may still be required for a proposed development that does not exceed the *Trip Generation* threshold (i.e. generates 100 peak hour person trips or less) but satisfies the *Location* and/or *Operation or Safety* criteria.

As noted in **Section 1.5**, the transportation consultant should confirm the scope of work with the County before commencing the TIA. Any deviations from the Scoping Checklist provided in **Table 2.2** should be documented and sent to the County for confirmation in writing (by e-mail). County staff will be relying on the Scoping Checklist when reviewing the report for completeness. If required elements are not included without a detailed explanation in the document, the submitted TIA may be considered incomplete and returned to the transportation consultant for revision.

2.3 Requirements of Other Jurisdictions

In addition to the requirements outlined herein for preparation and submission of TIAs to Huron County, the transportation consultation should also contact the Local Municipality/Township, adjacent municipalities and/or MTO if the proposed development could impact roads under their respective jurisdictions.

To the extent possible, the County has based these guidelines on the September 2014 version of the MTO *Transportation Impact Study Guidelines*, recognizing that applicants may be required to submit TIAs to both Huron County and the Ministry for certain development proposals.

2.4 Tools and Methods

The County will accept the following tools and methods for intersection operational analysis:

- Highway Capacity Software based on the procedures of the *Highway Capacity Manual* (HCM);
- Synchro software using HCM outputs;
- Microsimulation software (e.g. Vissim, Paramics, SimTraffic); and
- Roundabout analysis software (e.g. Rodel, Arcady, Sidra, etc.).

The latest version of the software should be used, where applicable.

All input parameters and assumptions should be clearly documented and confirmed to comply with the County's standards and current practices. **Appendix A** lists typical, recommended input parameters for conducting intersection capacity analysis using Synchro. It should be noted that these parameters may change over time. The transportation consultant should contact the County and/or check the Huron County website to ensure the most current values are being used before commencing analysis.

2.5 Documentation and Reporting

The TIA report will consist of a main document and technical appendices. The appendices should include all assumptions used in the analysis concerning lane

configuration/use, pedestrian activity, saturation flows, traffic signal cycle length, phasing and timing, utilization of the inter-green phase and other relevant parameters. Copies of detailed software output results can be attached for this purpose.

The TIA report should adhere to the structure set out in **Table 2.2.** Following this structure will simplify review, discussion and communication. Relevant figures, graphs and tables should be placed adjacent to the relevant text.

The applicant shall provide one digital PDF copy of the final TIA report and technical appendices to Huron County for review. The County reserves the right to request one or more hard copies of the submission and/or the digital files from the analysis at the applicant's expense.

The TIA and all related information submitted to Huron County is within the public domain and subject to the provisions of the *Municipal Freedom of Information and Protection of Privacy Act*.

2.6 Revisions, Updates and Lifespan

Should the County deem the data and/or analyses used in the TIA inadequate, the report may be returned to the transportation consultant for revisions and/or directed for technical (peer) review by an expert appointed by the County at the applicant's expense. In response, the applicant will be required to:

- Address any study issues or deficiencies as identified in the County's review; and
- Depending on the extent of the review comments from the County, submit a revised or addendum report identifying how the issues and deficiencies have been or are to be addressed.

Pending receipt and subsequent acceptance of a revised or addendum report, favourable comment on the development proposal will be withheld by the County. To avoid potential delays and additional work caused by inaccurate or inappropriate data or assumptions, the transportation consultant is strongly encouraged to contact the County before commencing the TIA.

If the applicant revises the development application prior to receiving approval, the transportation consultant must submit a revised or addendum report updating the transportation analysis based on the new proposal. The transportation consultant should contact the County prior to commencing the update to (re)confirm the assumptions, scope of work and type of report.

Generally, a TIA will have a "shelf-life" of five years. Major changes within the study area may reduce the "life" of the document if they were not considered in the impact assessment. Where the timing of subsequent development approvals exceeds five years, a new study will generally be required.

3 Report Outline

This chapter summarizes the typical requirements for a Comprehensive Transportation Impact Study report per **Table 2.2**. The contents of a Traffic Impact Brief and Safety Plan report would only include select sections, as noted in **Table 2.2**. **Appendix B** provides a more concise outline of the requirements for this type of TIA.

As noted in Section 1.5, the transportation consultant should confirm data requirements, analysis assumptions and the scope of work with the County prior to commencing the TIA.

3.1 Executive Summary

Provide an executive summary outlining:

- Proposed development, including location, statistics, phasing, type of land use(s) and other background information to help the reviewer understand the context of the plan;
- Study/analysis process;
- Key findings and recommendations; and
- Implementation plan for the recommendations.

3.2 Introduction

Include an introduction identifying/describing:

- Applicant;
- Site location, with a map or plan illustrating the extent of the proposed development;
- Type of application (Official Plan Amendment, Secondary Plan, Zoning By-law Amendment, Draft Plan of Subdivision or Condominium, Site Plan or other);
- Scope of work; and
- Acknowledgement of pre-consultation, with a summary of any comments provided by the County or other review agency. Copies of relevant correspondence, e-mails and/or meeting minutes should be included in an appendix.

3.3 Development of Description

Provide a suitable scale plan of the proposed development. Include a description specifying (as applicable):

- Municipal address;
- Existing land uses or permitted use provisions in the Huron County Official Plan, applicable Official Plan Amendments, the Zoning By-law, etc. for the subject site and adjacent lands;
- Type of planning application(s);
- Relevant Secondary Plan studies and approved and pending subdivision and site plans within the study area;
- Proposed land uses and relevant planning regulations;
- Total building size and the 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). Special attention should be paid to gross versus net floor area definitions;
- Building location(s) on the site;
- Approximate hours of operations;
- Expected vehicle types (e.g. passenger vehicles, commercial vehicles, A-Train/B-Train transports);
- Planned phasing and timing of the proposed development (if applicable);
- Anticipated dates of full and interim (if applicable) occupancy;
- Proposed access points and type of access (e.g. full movement, right-in/right-out, turning movement restrictions);
- Proposed parking supply for autos and bicycles; and
- Proposed loading spaces.

3.4 Study Area

Define the study area using a combination of maps, figures and text. The study area will vary based on the extent and nature of the development proposal but should extend far enough (within reason) to contain all County, Local Municipal/Township and MTO roads that will be noticeably affected by site generated traffic volumes. In general, the analysis area should include:

- All roads, ramps and intersections where peak hour site traffic comprises at least five percent (5%) of the existing capacity on an intersection approach. In instances where the intersection volume to capacity (v/c) ratio is greater than 0.85 or the County has identified existing intersection operational concerns, the threshold may be lowered to two percent (2%); and

- All intersections where the addition of peak hour site traffic will cause overall or individual through or turning movement v/c ratios to exceed 0.85.

3.5 Analysis Periods

Identify the analysis periods based on trip generation characteristics of the proposed land use(s) and existing traffic conditions. Conditions for the "worst case" combination of site-generated trips plus background volumes across the study area should typically be analyzed for impact to the surrounding transportation system. Special consideration should be given to locations that experience peak traffic demands during high tourism periods. For mixed-use developments, the predominant trip generation and background volume combination should be considered.

Table 3.1 lists the typical peak periods based on type of land use. In most cases, the AM and PM peak hours will be analyzed for residential and employment land uses. In the case of retail, entertainment, religious, institutional and sports facility uses, the weekend or site peak may (also) require analysis.

TABLE 3.1: TYPICAL PEAK PERIODS FOR ANALYSIS

Type of Land Use	AM Peak	PM Peak	Weekend/ Saturday	Site Specific
Residential (e.g. single family, townhouse, apartments, senior homes)	Yes	Yes	No	No
Commercial (Retail) (e.g. shopping centre, restaurant, specialty store, supermarket)	No	Yes	Yes	No
Employment (e.g. business park, industrial park, office, warehouse)	Yes	Yes	No	No
Institutional (e.g. school, church, banquet hall, community centre)	-	-	-	Yes
Mixed Use (e.g. ground floor retail and apartments above)	Yes	Yes	Yes	No

If the proposed development generates a significant amount of truck traffic, specify the analysis periods and volumes and include a heavy vehicle assessment in the analysis.

3.6 Existing Transportation Network

3.6.1 Characteristics

Describe the existing transportation system in the study area by mode using a combination of maps, figures and text. The documentation should include:

- Roads:
  - Existing roads and ramps, including jurisdiction, classification, number of lanes and posted speed limit;
  - Existing intersections, indicating type of control, lane configurations, turning restrictions, alignment, and any other relevant data (e.g. extraordinary lane widths, grades);
  - Existing entrances to adjacent developments (both sides of all roads bordering the site) within 200 metres of the proposed driveway(s), noting the land use associated with the entrances;
  - Current on-street parking spaces and regulations;
  - Locations of critical horizontal and vertical curves and significant grades;
  - Current heavy vehicle prohibitions and restrictions; and
  - Existing area traffic management measures (e.g. traffic calming).
- Pedestrian and Bicycle Network:
  - Existing on-and off-road bicycle facilities, pedestrian sidewalks and multi-use trails; and
  - Location of bicycle parking facilities and any other measures influencing or impacting potential walking and cycling (e.g. showers, bicycle lockers).

3.6.2 Existing Traffic Operations

Summarize existing traffic volumes and turning movements, including pedestrians, cyclists and heavy vehicles, for roadways and intersections within the study area based on the most recent traffic counts available from the County, Local Municipality/Township and MTO. If required (and confirmed through pre-consultation, see **Table 1.1**), collect new traffic counts for all required analysis periods (see **Section 3.5**). In cases where tourism traffic is not a factor, counts should at least be conducted on a typical weekday (Tuesday through Thursday) at the following times:

- 7 AM to 10 AM
- 11 AM to 2 PM (as applicable)

- 4 PM to 7 PM

Prepare figures showing existing traffic volumes for each analysis period based on the most appropriate data source.

Analyze and describe existing intersection operations. Use current signal timing parameters obtained from the County and MTO (if appropriate) for signalized intersections. Summarize the performance results in a table. The summary should include v/c ratios, levels of service (LOS), average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

Identify potential improvement measures to mitigate any existing operational concerns. Any proposed changes to existing conditions (if necessary) should be documented and approved by the County before being used in analysis referencing the “Existing” scenario. Summarize the performance results with improvement measures in a table (if appropriate).

3.7 Site Visit Observations

Conduct a site visit during peak periods to observe and document existing conditions pertaining to site operation, local road network, access arrangements, local area travel patterns and general traffic operations. The observation should be carried out concurrently with traffic data collection if applicable. Note lane configurations, speed limits and other traffic control measures on study area roads.

Verify that traffic volumes through study area intersections reflect actual demand. Necessary adjustments to level-of-service calculations should also be determined from the site visit to ensure actual conditions are fairly represented.

3.8 Horizon Years

Select the horizon year(s) for analysis. Future transportation conditions for the opening year of the development and five years after the development opening should be analyzed at a minimum for Comprehensive Transportation Impact Studies. Separate analysis for each major phase in a multi-phase development should typically be carried out in five-year intervals. Note that MTO may require analysis for additional horizon years.

3.9 Future Background Conditions

3.9.1 Growth Rate

Estimate general background traffic growth rates at a corridor level (by road) through regression analysis of historical volumes if data is available. Growth rates from other area transportation studies may also be used if still applicable (e.g.

time since previous study not long). The County may prescribe a nominal growth rate (e.g. 2% per annum) in cases where historical data is not available.

3.9.2 Planned Network Improvements

Identify planned transportation network improvements within the study area based on a review of existing capital plans and/or information requested from road authorities. Determine/predict the likelihood and timing of the proposed works and their possible implications for the transportation system, particularly the potential for diversion from existing routes.

3.9.3 Other Planned Developments

List all significant developments under construction, already approved or in the application process within the study area likely to be built out by the specified horizon years. Estimate the traffic generated by these developments and assign to the transportation network, preferably based on the traffic studies completed for these applications. Information pertaining to these developments (e.g. land uses, development statistics, timing) should be requested from the County and/or MTO (if appropriate).

3.9.4 Future Background Traffic Operations

Estimate future background traffic volumes by applying the proposed growth rate to existing volumes (per **Section 3.9.1**) and adding traffic generated by other planned developments (per **Section 3.9.3**). Prepare figures showing the volumes for each horizon year and analysis period.

Analyze and describe future background intersection operations for each horizon year and analysis period. Use current signal timing parameters for signalized intersections. Summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

3.10 Development Trips

3.10.1 Trip Generation

Estimate vehicle trips generated by the proposed development based on one of the following methodologies (in the following order):

- Trip generation surveys of similar developments in Huron County. Surveyed developments should have similar operating and market characteristics as the proposed development;
- “First principles” calculations of anticipated trips to/from the proposed development;

- Trip generation rates (or equations) selected from the latest edition of the ITE *Trip Generation Manual* or another technical source from ITE, provided differences in the site nature, size, mode share and land use are accounted for; and
- Other transportation studies from the area or similar communities.

Where appropriate:

- Deduct trips attracted to the proposed development from the site-generated traffic volumes to account for **pass-by trips** making an intermediate stop at the subject site. Since pass-by trips are not new traffic added to the road network, the trip adjustments should only be accounted for at intersections immediately adjacent to the subject lands and in turning movements into and out of the site. The ITE *Trip Generation Handbook* suggests pass-by trip percentages for different land uses; and/or
- Reduce the site-generated traffic volumes assigned to the abutting transportation network to account for **synergy (or internal capture)** between two or more uses within a mixed-use development. It is important to note that these reductions are applied externally to the site (i.e. at entrances, at adjacent intersections and on abutting roadways), not to roads within the proposed development lands. The ITE *Trip Generation Handbook* provides guidance to calculate the internal capture rate for different land uses and analysis periods.

Document all assumptions and adjustments made in estimating site-generated traffic volumes, referencing available research and surveys where applicable. Deviations from recommended values must be noted and justified.

Sensitivity analysis should be considered where trip generation parameters have the potential to vary considerably and most probable values cannot be readily identified, unless a demonstrated “worst case” situation is assumed.

Summarize the trips generated by the proposed development in a table by land use. The table should include the trip generation rates and/or equations used to estimate the traffic volumes. For large developments that will be phased over time, the table should identify each phase separately.

3.10.2 Trip Distribution

Estimate distribution of site-generated vehicle trips by cardinal direction (i.e. north, south, east, and west). The directions from which trips will approach and depart the subject site will vary depending on several location-specific factors, including:

- Size and type of the proposed development;
- Surrounding land uses, particularly location of competing developments;

- Distribution of population and employment; and
- Characteristics of the surrounding transportation network.

The trip distribution may be based on one or more of the following data sources:

- Origin-destination surveys;
- Existing or anticipated travel patterns;
- Census data;
- Population and employment forecasts provided by the County; and
- Market studies.

Engineering judgement should be utilized to determine the most applicable of the above methodologies for each application. Due consideration should also be given to potential variations in trip distribution patterns associated with different time periods, days of the week and land uses. The County may have data available to assist in determining appropriate trip distribution.

Summarize origin/destination and percent distribution in a table.

3.10.3 Trip Assignment

Assign the site-generated vehicle trips to the transportation network for each analysis period, considering logical routings, current and projected roadway capacities and travel times. The assignment may be premised on existing traffic patterns, data from other area transportation studies and/or manual techniques based on knowledge of the study area (logical routing). Traffic cannot be assigned to private roadways or routed through private lands.

The applicant should not assume current access rights will be retained with the redevelopment of an existing property. A review of the proposed land use and conditions on the adjacent road network should be completed to identify an acceptable access pattern. This review must be documented and included in the TIA report.

Prepare figures showing the assignment of site-generated volumes to the transportation network and pass-by traffic (if applicable) to adjacent roads for each analysis period. The figures should depict traffic volumes for each intersection and driveway by turning movement and approach.

3.11 Future Total Conditions

3.11.1 Future Total Traffic Operations

Derive future total traffic volumes by adding future background volumes (per **Section 3.9.4**) and site trip assignment (per **Section 3.10.3**). Prepare figures showing the volumes for each horizon year and analysis period.

Analyze and describe future total intersection operations for each horizon year and analysis period. Use current signal timing parameters for signalized intersections. Summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

3.12 Traffic Impact Assessment

The following criteria define critical movements and intersections:

- For signalized intersections and driveway locations:
  - v/c ratios for overall intersection operations, through movements or shared through/turning movements that operate at 0.85 or greater;
  - v/c ratios for exclusive movements that operate at 0.90 or greater; or
  - The estimated 95th percentile queue length for an individual movement exceeds the available turning lane storage.
- For unsignalized intersections and driveway locations:
  - Level of service based on average delay per vehicle on individual movements is LOS E or greater; or
  - The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

Identify required modifications and improvements to mitigate projected “critical” movements for future background and future total traffic volumes, including potential changes in roadway geometry, traffic control and signal timings required to support the proposed development. Any adjustments to traffic signal timing, phasing and/or cycle lengths must be evaluated in terms of pedestrian crossing time, effect on queue lengths, adequacy of existing storage, and impact on existing signal coordination, if applicable.

For all “critical” intersections, determine the contribution of the proposed development to the forecast condition, identify possible remedial measures, recommend a solution and assess the effectiveness of the solution towards resolving the situation. In general, the objective is to ensure that no new “critical” movements are created by the proposed development and “critical” movements that exist without the addition of site-generated traffic are not worsened by the development proposal.

Recommended solutions must be feasible and economic to implement. Functional design plans or detailed design drawings may be required for identified physical improvements to ensure their feasibility.

Analyze and describe future background and total intersection operations for each horizon year and analysis period with the improvement measures. Optimize

signal timing splits within the existing cycle length to provide the best possible traffic operations for all movements. Summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

3.13 Safety Analysis

Complete a safety analysis to assess the impact of the proposed development on the adjacent road network and recommend potential mitigation measures. The level of safety analysis to be included in the TIA is to be discussed during pre-consultation with the County. This could range from a detailed examination of collision history for locations known to exhibit safety concerns to a basic consideration of typical safety-related factors such as, but not limited to the following:

- Conflict areas where vulnerable road users (pedestrians and cyclists) are at risk;
- Weaving and merging on the roadway;
- Non-local traffic infiltration in residential areas; and
- Conflicts and safety issues specifically related to truck movements.

3.14 Access Review

3.14.1 Access Design

Limit the number of accesses to the County road network per **Table 5.1** of **Part B – Access Management Guidelines**.

Design all accesses to the County road network based on the criteria specified in **Chapter 5** of **Part B**.

Evaluate sight distance at each access based on the criteria in **Section 5.8** of **Part B**. Note any geometric elements that may restrict visibility.

Review queue lengths to ensure adequate storage on-site and within exclusive turn lanes. Configure driveways to provide adequate ingress and egress lanes, clear throat length, corner radii and vehicle storage. The clear throat distance should minimize conflicts with the adjacent road network and within the site.

3.14.2 Turn Lane Requirements

Assess the need for exclusive left- and/or right-turn lanes at proposed access locations based on the criteria in **Section 6.2** of **Part B**. Adequate spacing should be provided between access points to avoid potential turn lane overlaps.

Provide a pavement marking and signage plan for the roadway(s) along the frontage of the proposed development showing both existing and proposed lane markings and traffic control devices.

3.14.3 Traffic Control Devices

Evaluate the need for traffic control signals, all-way stop control and/or other traffic control devices at proposed access locations based on the warrant criteria specified in **Chapter 6** of **Part B**.

Consider the installation of roundabouts in parallel with analysis for all-way stops and signals. **Appendix C** provides a Roundabout Screening Tool.

3.14.4 Turning Movement Conflicts

Examine the potential for turning movement conflicts within the road right-of-way.

3.15 Site Circulation Review

Evaluate on-site parking and circulation systems to demonstrate appropriate maneuverability, sight distances, clear throat distances and avoid any possible queuing onto public roads, especially as related to drive-through operations that may have the potential to impact the adjacent road network.

Where appropriate, analyze and describe future total operations for on-site intersections for each horizon year and analysis period. Summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

Demonstrate emergency vehicle access and circulation within the site, including the explicit designation of fire routes.

Evaluate proposed truck/courier loading facilities and access to these facilities to ensure they are adequately sized and properly designed to not impact traffic operations on public roads or interfere with pedestrian activity on site.

Complete transport truck swept path analysis for developments that receive deliveries (e.g. gas stations) or expect trucks as customers (e.g. fuel or eating establishments).

Identify locations for snow storage on site and assess potential implications for parking and access.

3.16 Walking and Cycling Considerations

Provide an on-site circulation system of walkways, paths and delineated routes for pedestrians and cyclists. Design the system to serve natural desire lines and

minimize potential conflicts between vehicles, pedestrians and cyclists. Connect the proposed development to existing off-site sidewalks, cycling facilities and trails. Address any gaps or missing links in the active transportation network within the study area.

Ensure accessibility for persons with mobility limitations.

Encourage pedestrian and cycling activity to and within the proposed development by:

- Locating building entrances close to the street;
- Providing protected bicycle parking at building entrances, secure bike storage and shower facilities within buildings; and
- Providing shelter/relief for pedestrians from natural elements.

Consider pedestrian and cyclist needs with any intersection improvements (e.g. signal timings).

3.17 Findings and Recommendations

Provide a summary of the key findings and recommendations of the TIA.

Summarize impacts for all horizon years and analysis periods in a table. List proposed improvement measures to mitigate impacts in the table. Structure recommendations for improvements within appropriate time perspectives, with sensitivity to the following issues:

- Timing of short and long-range network improvements that are already planned and scheduled;
- Anticipated time schedule of adjacent developments;
- Size and timing of individual phases of the proposed development;
- Logical sequencing of various improvements or segments; and
- Right-of-way needs and availability of additional right-of-way within the appropriate time frames.

PART B

Access Management Guidelines

4 Introduction to Access Management

4.1 Overview

Access management "is the systematic control of the location, spacing, design and operation of driveways, median openings, interchanges and street connections to a roadway. It also involves roadway design applications, such as median treatments and auxiliary lanes, and the appropriate spacing of traffic control signals."[1]

Through the access management and control process, Huron County can maintain and enhance capacity and safety for through traffic movement on the County's road network while providing reasonable access to abutting properties. Managing and controlling impacts from roadside development to maintain the efficient movement of traffic can be achieved, in part, through control of the number of accesses, spacing between entrances, auxiliary turn lane provision, and distance between driveways and intersections. The goal is to minimize conflict points and provide appropriate traffic control measures at access points and intersections.

Access management is a key element in the process by which Huron County will effectively maintain control, operational function and hierarchy of roads under its jurisdiction. Additionally, access management can influence and contribute to the successful sharing of a right-of-way between autos, trucks and other modes of travel including pedestrians and cyclists.

This guideline covers all roads under the jurisdiction of the County and will serve as a tool for the continuing preservation of a safe and efficient roadway transportation network.

4.2 Purpose of the Guidelines

Huron County has prepared these **Access Management Guidelines** to provide guidance on the methods and process of controlling access to the County's roads when:

- Reviewing retrofit applications for redevelopment proposals or reconstruction projects;
- Processing new development applications abutting County roads; and
- Promoting the consideration of traffic service when considering new road additions or existing road deletions.

[1] *Access Management Manual*, Transportation Research Board Committee on Access Management, Washington, D.C., 2003

The guidelines are intended to:

- Achieve safety and efficiency of the road network while permitting an appropriate degree of access for residents, businesses and institutions;
- Support infrastructure design guidelines to maintain an efficient and effective road network; and
- Ensure the planned road alignments detailed in the Huron County Official Plan are not comprised regarding their intended role and function.

4.3 Land Use

Access management is influenced by land use type and density. Increased density generally leads to an increase in the number of transportation options available and a higher percentage of travel by walking and cycling modes. By contrast, low density development reinforces reliance on the automobile given the longer distances to travel. Greater reliance on the auto also increases the necessity to provide private driveway access to properties abutting arterial road corridors.

The three most common land use categories in the County are residential, commercial and industrial. Residential land use generally attracts autos with occasional school buses and heavy truck traffic volume. Commercial land use generally attracts autos with little to no school buses and high volumes of heavy traffic, typically delivery trucks and transport trucks. Industrial land use generally attracts significant heavy truck traffic volumes along with auto traffic volumes.

The intersections, accesses, parking and sight distances required to serve these land uses can vary significantly. The road networks found within different land use areas will therefore be required to perform different roles and functions. Access management must address different situations that may arise on County roads depending on abutting land use.

5 Design Criteria

The design criteria presented in this chapter are based primarily on the guidance provided in the TAC *Geometric Design Guide for Canadian Roads*.

5.1 Roadway Classification

A functional roadway classification system establishes a “hierarchy” of roads that provides for a gradation in service from access to movement. In a functional system, each type of road serves a distinct stage of the trip making process. The concept is premised on the principle that roads do not operate independently but are part of an interconnected system. Each type of road performs a specific function in moving traffic throughout the network and in providing access to abutting lands.

The road system operates most efficiently and safely when each type of facility is designed and managed to serve a defined trip stage consistent with its position in the hierarchy. When a roadway attempts to prioritize both movement and access, neither function is well served. This compression of functions typically results in higher collision rates, traffic congestion and excessive vehicle emissions and fuel consumption.

Roadway classification systems typically define the following categories of roads: Freeway/Expressway, Arterial, Collector, Local and Public Lane. **Figure 5.1** illustrates the relative importance of the service functions of traffic movement and land access for the different roadway classifications.

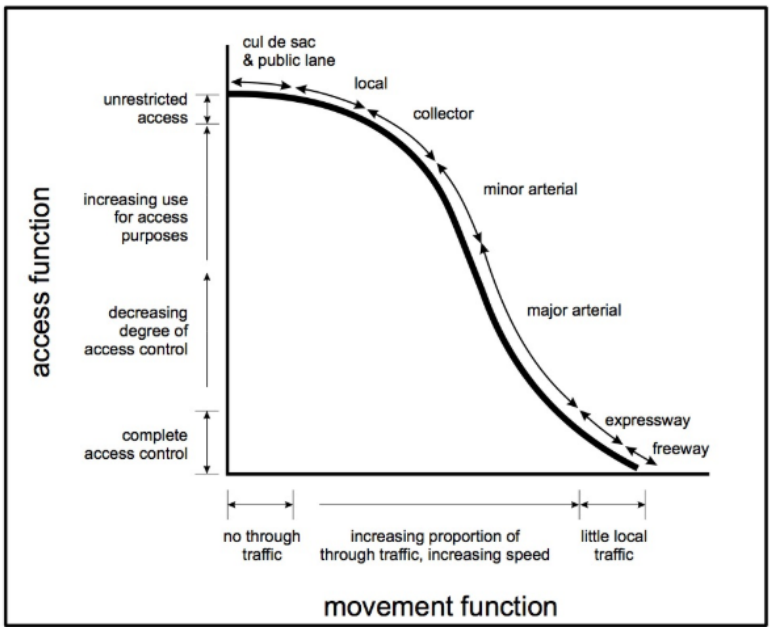

Figure 5.1: Service Function
(Source: TAC *Geometric Design Guide for Canadian Roads*, p. 41, Figure 2.6.1)

The function of each road type is described as follows:

- Freeway/Expressway:
  - Serve high volumes of intra-urban and long-distance traffic movements at high speeds;
  - Full access control (no access) to abutting lands; and
  - Connect with freeways/expressways and/or arterials.
- Arterial:
  - Serve moderate to high volumes of intra-urban and long-distance traffic movements at moderate speeds;
  - High degree of access control, restricted and limited direct access to abutting lands; and
  - Connect with freeways/expressways, arterials and/or collectors.
- Collector:
  - Serve light to moderate volumes of traffic for short distances; between local and arterial roads;
  - Intermediate degree of access control, generally allows access to abutting properties; and
  - Connect with arterials, collectors, locals and/or public lanes.
- Local:
  - Serve light volumes of traffic for short distances;
  - Allow full access to properties; and
  - Connect with public lanes, locals and/or collectors.
- Public Lane:
  - Provide single loaded access to individual properties; and
  - Connect with collectors and/or locals.

Prescribing a road network hierarchy helps to minimize potential conflicts between local and non-local traffic by classifying roads based on their intended role and function. Factors influencing roadway classification include the density of access, service function, traffic volume, flow characteristics and design speed. The number of access points and their spacing is a major influence on the running speed and flow characteristics of a roadway.

With Huron County only responsible for arterial roadways, this policy is focused strictly on the management and service of arterials under the County's jurisdiction, recognizing the County roads intersect with other classifications.

5.2 Maximum Number of Entrances

Generally, it is preferable to minimize the number of private site accesses to County roads to maintain the integrity of the road network. Site access should be provided to the local road network wherever possible. Any additional accesses above minimum shall be justified based on capacity of site traffic, not design preference.

An effective means of ensuring reasonable spacing between adjacent access points is to limit the number of entrances permitted for each property. The number permitted may be based on original lot lines.

Table 5.1 specifies the number of entrances permitted per property.

TABLE 5.1: NUMBER OF ENTRANCES

Type	Number of Entrances
Field Entrances	A minimum of one per farm with additional field entrances where natural obstructions within the field prevent reasonable access across the field
Farm	One per farm for farm buildings
Residential	One per property
Non-Residential (Commercial, Industrial and Institutional)	Maximum of two with a minimum spacing of 30 m between entrances

For corner lots or lots having frontage on two roads (front/rear), driveways shall be located on the lower classified roadway, all factors being equal.

5.3 Access Spacing Corner Clearance

There are three types of access connections to County roads:

- Signalized intersections/driveways;
- Major access connections (intersections and major driveways); and
- Minor access connections (driveways).

All major access connections on County roads shall meet or exceed the connection spacing requirements of the appropriate road class as specified in **Tables 5.2 and 5.3**. A major driveway is defined as an access serving a land use or development block that generates 100 or more peak hour vehicle trips.

5.3.1 Signalized Intersections

Separation distances between signalized intersections should be adequate to facilitate reasonable traffic flow and safety, especially on major roads. Arterial roads require greater distances due to higher traffic speeds and the complexity of driver decision making. A greater separation distance is also needed to allow room for queuing and deceleration.

Table 5.2 specifies the desirable and minimum allowable spacing for signalized intersections on County roads.

TABLE 5.2: SPACING BETWEEN SIGNALIZED INTERSECTIONS/DRIVEWAYS

Class	Desirable	Minimum
Rural Arterial	800 m	400 m
Divided Urban Arterial	800 m	400 m
Urban Arterial	300 m	215 m

5.3.2 Major Access Connections

Table 5.2 also provides the minimum spacing requirements between signalized intersections and major access connections. The separation distances noted in the table corelate to the minimum spacing between signalized intersections to allow for the potential future signalization of the major access connection.

Table 5.3 specifies the minimum spacing requirements between major access connections.

TABLE 5.3: SPACING BETWEEN MAJOR ACCESS CONNECTIONS

Class	Full Movement	Right-In/Right-Out
Rural Arterial	300 m	150 m
Divided Urban Arterial	200 m	75 m
Urban Arterial	150 m	75 m

Notes:

1. Intersection/driveway spacing shall be measured from centre-line to centre-line.
2. Additional spacing over and above that set forth in **Tables 5.2 and 5.3** may be required if determined that there is adequate left-turn queue storage or weave manoeuvre area between adjacent intersections. This determination shall be made under peak conditions.

5.3.3 Minor Access Connections

Corner Clearance

Corner clearance is the distance between an upstream or downstream intersection and a driveway or public road. Measured from the extension of the curb line at the intersection to the near curb of the proposed driveway, the corner clearance distance should be adequate to allow a driver to enter an arterial road without interfering with the through traffic movement.

Table 5.4 provides minimum corner clearance distances for arterial roads. Corner clearance for driveways shall meet or exceed the minimum driveway spacing requirements as detailed, unless:

- No other reasonable access to the property is available;
- Effective joint use and cross access with abutting properties cannot be achieved; and
- The County determines that the connection does not create a safety or operational problem.

Where no other alternatives exist, the County may permit a driveway along the property line farthest from the intersection. In these cases, directional movements for connections on County roads may be permitted where the minimum corner clearance meets or exceeds the requirements of the appropriate road classification. In such cases, directional prohibitions may be implemented.

TABLE 5.4: MINIMUM CORNER CLEARANCE DISTANCES TO ACCESSES OR INTERSECTIONS

Class	Full Movement	Right-In/ Right-Out		Right-In Only		Right-Out Only	
		Near Side	Far Side	Near Side	Far Side	Near Side	Far Side
Rural Arterial	100	-	-	-	-	-	-
Divided Urban Arterial	-	70	70	50	70	70	50
Urban Arterial	70	35	70	30	70	35	30

Spacing between Minor Adjacent Driveways

The spacing of accesses is related to the number and location of existing adjacent driveways, opposing driveways and the number of new driveways proposed. The minimum spacing between driveways is measured between the end and start of the curb returns on the adjacent driveways.

The following objectives should be addressed when considering adjacent driveways:

- Clearly identify to the user which property each driveway serves;
- Ensure adequate space is available between driveways for the positioning of traffic signs, lighting poles and other surface utility fixtures and road hardware;
- Separate conflict areas for each driveway;
- Provide appropriate space between driveways for on-street parallel parking, where permitted and in consideration of sight line requirements;
- Increase length of potentially collision free pedestrian areas by minimizing the number and width of driveways;
- Avoid on-street overlapping left turns; and
- Provide length of left-turn storage required.

Table 5.5 provides guidelines for the desirable minimum spacing of minor driveways.

TABLE 5.5: DESIRABLE SPACING BETWEEN MINOR DRIVEWAYS

Class	Full Movement	Right-In/ Right-Out	Right-In or Right-Out
Rural Arterial	100 m	-	-
Divided Urban Arterial	100 m	50 m	40 m
Urban Arterial	70 m	35 m	30 m

5.4 Access Alignment

For low volume roadways, such as locals and collectors or low volume driveways, the spatial relationship between driveways on opposite sides of the road is not as important a design consideration. However, when the traffic volume is moderate to high, such as for an undivided arterial, introducing a new driveway will likely impact traffic operations.

New driveway connections must be carefully integrated into arterial road corridors to minimize turning conflicts and avoid impacting through traffic. Where possible, the centreline of the new driveway should align with the centreline of any existing opposing driveway or road, unless cross traffic is high and traffic control signals are not warranted or feasible. This offset arrangement should be considered in a way that avoids overlapping left turns and does not create less safe weaving manoeuvres. For this reason, driveways should be positioned to

allow left-turning movements to occur before right turns. Based on this premise, the following guidance is provided:

- A minimum offset of 100 metres is required when left turns are permitted at both driveways at split “T” alignments;
- A minimum offset of 50 metres is required when left turns are permitted only at one driveway at split “T” alignments; and
- Site specific analysis is required when there is a left turn storage lane or taper along the road.

5.5 Angle of Intersection

The angle at which the driveway intersects the roadway is measured between their centrelines. The angle of intersection affects driver visibility, length of time to cross the road and the potential for and severity of collisions.

It is desirable that two-way driveways intersect the roadway at or near right angles (90 degrees). A minimum acute angle of 70 degrees as measured from the roadway curb line is acceptable. In industrial areas where pedestrians are infrequent, one-way driveways ranging from 45 degrees to 60 degrees may be permitted. For commercial and residential land uses, where pedestrian volumes are normally moderate to high, minimum one-way driveway angles in the range of 60 to 70 degrees are recommended.

5.6 Shared Access

Joint accesses for abutting properties should be encouraged on County roads wherever possible if land uses are compatible. Where direct property access is required, the use of shared driveways and inter-connected on-site circulation systems with abutting properties should be encouraged to limit the number and increase the spacing of access points.

If joint access with adjacent lands cannot be realized immediately because the properties are at different stages of development or if the abutting landowner is not currently co-operative, the in-stream application should be required to provide:

- An access easement or right-of-way across a portion of the property to facilitate joint access in future; or
- A restrictive covenant registered on the land title stipulating that “in future when the adjacent property(s) redevelop(s), the property owner will enter into a reciprocal access agreement and will remove/relocate their existing driveway(s)”.

A bond or cash-in-lieu would be secured at the time of approval for the future removal/relocation of the driveway.

5.7 Driveway Grades

When determining an appropriate driveway grade, the following considerations should be addressed:

- Road classification;
- Driveway volume;
- Maximum driveway grade on-site;
- Maximum rate of grade change;
- Pedestrian crossing slope;
- Roadway, driveway, roadside and property drainage; and
- Cyclist accommodation.

Driveways on urban cross-section roads are constructed at an incline away from the roadway to prevent surface drainage discharging down the driveway and onto private property. Where it is impractical, curb drainage across the driveway can be effectively controlled by using a slightly deeper gutter and adjacent catch basins. In some cases, on-site drainage is required to prevent property drainage onto the roadway via the driveway.

Table 5.6 recommends driveway grades for different conditions. It is noted that constrained local conditions may not allow driveway grades within these limits.

Driveways in areas with rural road cross-sections should be constructed with a grade corresponding to the shoulder crossfall to facilitate shoulder maintenance and enhance safety for vehicles pulling off the road.

TABLE 5.6: STANDARDS FOR DRIVEWAY GRADE

Driveway Volume	Grade Between Edge of Road and Property Line		Grade Change from Property Line into the Site	
	Min	Max	Min	Max
High	1.0%	1.0%	-2.0%	4.0%
Low-Moderate	1.0%	3.0%	-4.0%	10.0%

Notes:

1. Downgrades are avoided to control road drainage runoff.
2. 0.5% acceptable as absolute minimum.
3. Assumes the road has a normal cross slope of 2.0%.
4. This table has been adapted from the TAC *Geometric Design Guide for Canadian Roads*.

5.8 Sight Distance

The provision of adequate sight distance for the egress manoeuvre from a driveway is one of the most critical design elements. The required sight distance is determined considering the design speed of the intersecting roadway and sight triangle requirements.

When measuring sight distance, the following methodology from the TAC *Geometric Design Guide for Canadian Roads* applies:

- The driver's eye level is defined as 1.08 metres above the road surface;
- The height of the object (representing the approaching vehicles) is defined as 0.6 metres above the road surface; and
- For vehicles entering the highway, visibility is measured from the driver's eye level at a point setback 5.0 metres from the edge of pavement of the through lane in both directions.

All accesses should provide adequate stopping, crossing and turning sight distance, as detailed in the TAC *Geometric Design Guide for Canadian Roads* for the applicable road classification and described below:

- **Stopping Sight Distance**: The sight distance required for a passenger vehicle to safely stop and avoid a conflict with another vehicle entering the stream of traffic from the side street or driveway. The distance is the sum of the distance travelled during perception/reaction and braking.
- **Crossing Sight Distance**: The sight distance for a crossing manoeuvre is based on the time it takes for the stopped vehicle to clear the intersection and the distance that a vehicle would travel along the major roadway at its design speed in that amount of time.
- **Turning Sight Distance**: The sight distance for a turning manoeuvre is based on the turning vehicle being able to accelerate to a speed which does not significantly interfere with the vehicles approaching on the major roadway. It is assumed that the mainline vehicle will slow down to a speed 85% of the design speed and there should always be a gap of 2.0 seconds between the turning vehicle and the mainline vehicle.

Sight distance requirements may vary due to existing characteristics such as width of roadway to cross, vehicle type, surface type and surface conditions.

Adequate sight distance is particularly important for commercial driveways and accesses on arterial roads, where higher operating speeds and volumes provide few safe gaps in the traffic stream to complete the manoeuvre. Access locations adjacent to bridges and other structures that could interfere with a motorist's line of sight must be located as detailed in the TAC *Geometric Design Guide for Canadian Roads.*

5.9 Access Width and Radii

Insufficient driveway width and corner radii can significantly influence safe and efficient traffic operation to/from the road. In determining appropriate dimensions, factors that must be considered include:

- Proposed land use;
- Type of operation (1-way or 2-way traffic flow);
- Volume of traffic; and
- Type of vehicles the driveway will serve.

Driveways should be sufficiently narrow to discourage erratic manoeuvres, control the location and angle of conflict points, and limit entry/exit to the intended number of lanes of operation. Whether a driveway will operate with one-way or two-way traffic flow must also be considered. For low volume driveways (< 25 vehicles per day), like those serving single family residential land uses, the two-way movements may consist of a single lane, drive-in and back-out manoeuvre. For high volume two-way entrances (> 750 vehicles per day or 100 peak hour vehicles), the driveway should be separated by a centreline or median. A two-lane exit in combination with a single-lane entrance is recommended to increase capacity for moderate or high-volume driveways.

The radius of the curb is dependent on the turning path of a vehicle making a right turn into or out from the site and the width of the driveway. The radius of the curb return or amount of flare/taper of the curb connecting the edge of throat of a driveway with the edge of the nearest travelled lane is an important element in ensuring that the driveway is accessible to all vehicular traffic. TAC turning templates should be used for heavy vehicles. The TST (Transport Truck) vehicle turning template is typically used for heavy truck accommodation. The SU-9 (Single Unit Truck) is typically used to assess for a garbage or fire truck.

Table 5.7 details typical driveway dimensions. Greater driveway widths may be considered where there is more than one traffic lane.

TABLE 5.7: TYPICAL DRIVEWAY DIMENSIONS

Dimension (m)	Land Use[iii]		
	Residential	Commercial	Industrial
Width (W)			
▶ One-way	3.0[i] – 4.3	4.5[i] – 7.5	5.0 – 9.0
▶ Two-way	2.0[i] – 7.3	7.2[i] – 12.0[ii]	9.0[i] – 15.0[ii]
Right-turn Radius (R)	3.0 – 4.5	4.5 – 12.0	9.0 – 15.0

Notes:

i Minimum widths are normally used with radii at or near the upper end of the specified range
ii Increased widths may be considered for capacity purposes; where up to 3 exit lanes and 2 entry lanes are employed, 17.0 metres is the maximum width exclusive of any median
iii Applicable to driveways only, not road intersections.
iv. This table has been adapted from the TAC *Geometric Design Guide for Canadian Roads*.

5.10 Clear Throat Length

Clear throat distance is the area provided within a driveway to store vehicles queued to enter and exit a site. The distance is measured from the ends of the ultimate street line and the turning point on site, usually to a parking area.

For major accesses to operate efficiently, both from the roadway and internally, it is desirable to eliminate conflicts and storage within the driveway. Failure to provide adequate clear throat distance results in frequent blocking of on-site circulation, which can create queues of entering vehicles and impede the through movement of vehicles on the adjacent road network. Queuing also presents safety concerns for pedestrians crossing the driveway. The provision of adequate clear throat length or storage space is particularly important for developments that propose a drive-through service, where customers remain in their vehicles waiting to be served. The types of uses in this category include restaurants, banks, automatic car washes and parking facilities with entry control.

Table 5.8 provides a sample range of minimum and desirable clear throat distances based on development size. The storage length required is directly related to the peak hour traffic demands of the parking lot and should be assessed on a site-to-site basis. For larger developments, the appropriate throat length should be determined by a detailed traffic analysis and queuing study.

TABLE 5.8: DRIVEWAY MINIMUM CLEAR THROAT LENGTH

Land Use	Development Site	Minimum Clear Throat Length	
		Arterial (m)	Collector (m)
Light Industrial	10,000 – 45,000 m^2	30	15
Supermarket	> 2,000 m^2	40	25
Restaurant	> 200 m^2	40	15
Plaza	25,000 – 45,000 m^2	25	15
Office	10,001 – 20,000 m^2	30	15

Note:

This sample has been adapted from the TAC *Geometric Design Guide for Canadian Roads.*

5.11 Minimum Clearance from Obstructions

Driveways shall be clear of any and all obstructions like street hardware (e.g. utility cabinet power, mailboxes, poles, and hydro kiosks), street furniture (e.g. traffic lights/signs) and vegetation (e.g. trees, bushes. A minimum offset of 1.0 metre to the edge of pavement is recommended. Driveways shall not be built around obstructions and must be placed on one side of the feature.

6 Warrant Criteria

6.1 Capacity and Level of Service

As noted in **Section 3.12**, access connections to the County road system must maintain adequate capacity and operate acceptably for all movements permitted. Left-turn movements from the arterial road network must operate within capacity (v/c < 0.90) and at an acceptable level of service (LOS D or better). Similarly, left turns onto the arterial road network must operate within capacity (v/c < 0.90) with manageable delays and queues. Signalized access points must also operate within capacity (v/c < 0.85) with favourable road environment conditions.

Where an acceptable level of service cannot be maintained during peak hour conditions, and/or if there is potential to create unacceptable adverse operational and safety impacts on the arterial road network, directional prohibitions (i.e. right-in/right-out, right-in or right-out) may be implemented and/or required. Other mitigating measures such as roadway or traffic control improvements, joint access arrangements and/or common internal driveways may also be necessary to facilitate safe and efficient access to the arterial road network.

6.2 Auxiliary Turn Lanes

The need for left- and right-turn auxiliary lanes shall be justified based on analysis completed through a TIA accepted by Huron County (see **Part A – Transportation Impact Assessment Guidelines**) based on the following considerations:

6.2.1 Left-Turn Lanes

Refer to the MTO *Design Supplement for the TAC Geometric Design Guide for Canadian Roads* for left-turn lane volume warrants.

A left-turn storage lane may be considered at locations where four or more collisions related to left turns occur per year or where six or more occur within a period of two years, provided the collisions are of a type that could reasonably be expected to be eliminated by provision of a left-turn lane. The minimum storage length for the collision warrant is 15 metres.

Adequate spacing should be provided between access points to avoid potential turn lane overlaps. All design standards must be in conformance with those outlined in latest version of the TAC *Geometric Design Guide for Canadian Roads*.

6.2.2 Right-Turn Lanes

Although right turns are generally made more efficiently than left-turn movements, exclusive right-turn lanes are often provided for many of the same

reasons as left-turn lanes. Right turns may encounter a conflicting pedestrian movement but will not experience opposing vehicle flow.

In general, an exclusive right-turn lane should be considered when the volume of right-turning vehicles is between 10 to 20 percent of the through volume, subject to a minimum of 60 vehicles per hour in the design hour. Design speed should be considered when determining right-turn requirements.

The TAC *Geometric Design Guide for Canadian Roads* recommends the use of an exclusive right-turn lane when the volume of decelerating or accelerating vehicles compared with the through traffic volume causes undue hazard.

6.3 Traffic Control Signals

Signalization of a private access is normally considered in the context of a TIA for a major development. Traffic signals shall be considered justified if intersection traffic volumes (and other criteria) meet or exceed the warrant requirements set out in Ontario Traffic Manual (OTM) Book 12 – Traffic Control Devices, as determined by an intersection turning movement count.

6.4 All-Way Stops

6.4.1 Installation

OTM Book 5 – Regulatory Devices states that all-way stop control may be considered on arterial roads under one or more of the following situations:

- As an interim measure, where traffic control signals are warranted but cannot be implemented immediately;
- As a means of providing a transition period to accustom drivers to a change in intersection right-of-way control from one direction to another; and
- At locations having a high collision frequency where less restrictive measures have been tried and found inadequate. The manual defines this as an average of four collisions per year of a type considered preventable by all-way stop control, over a three-year period.

Furthermore, an all-way stop should not be used as a speed control device, on roads within urban areas having a posted speed in excess of 60 km/h or as a means of deterring the movement of through traffic in a residential area.

When considering an all-way stop, OTM Book 5 Vehicular Volume Criteria and/or Accident Criteria should be satisfied.

6.4.2 Removal

If conditions change at an all-way stop control intersection over time, it may be necessary to re-evaluate the need for the traffic control device. Recent traffic counts should be used to complete the warrant analysis to determine if all-way stop control is still justified. Sightlines at the intersection should be assessed to ensure the provision of adequate stopping sight distance.

If an intersection does not meet the volume warrants and adequate sightlines are provided, the intersection should revert to two-way stop control with free flow on the major road. The intersection should be signed to alert motorists of the change in traffic control.

6.5 Roundabouts

Roundabouts are becoming a more prominent intersection treatment across Canada. A type of circular intersection in which vehicles travel counter-clockwise around a central island, roundabouts offer several safety and operational advantages to conventional intersections.

Roundabouts have been proven to reduce the frequency and severity of collisions when compared to stop controlled and signalized intersections due to fewer conflict points, lower entering and circulating speeds and deflection on entry. Roundabouts also often operate with lower delays and shorter queues than other forms of intersection control at lower traffic volumes.

From an access management perspective, roundabouts can be used to facilitate safer and more efficient turning movements at intersections and driveways, provided access is not permitted directly into the circulatory roadway. Roundabouts also provide U-turn opportunities at safer locations, eliminating the need for more difficult midblock left-turns and the number of full movement access points along a roadway corridor.

There may be locations where the County would be amenable to considering a roundabout installation in lieu of more conventional. **Appendix C** provides a Roundabout Screening Tool to provide a relatively quick assessment of the feasibility of implementing a roundabout at a specific intersection in comparison to other appropriate forms of traffic control or road improvements, including auxiliary lanes, traffic control signals, all-way stop, etc. This tool is intended to assist the County in deciding whether to proceed to an Intersection Control Study to further investigate the feasibility of a roundabout. Use of the screening tool should be supplemented with the criteria and guidance provided in the TAC *Canadian Roundabout Design Guide*.

6.6 Pedestrian Crossing Treatments

Treatments may be required where there is a high volume of pedestrians traversing the roadway and no controlled crossing points within a reasonable walking distance. Pedestrian crossing treatments shall be considered justified if the conditions in OTM Book 12 – Traffic Signals or OTM Book 15 – Pedestrian Crossing Treatments are met. OTM Book 15 sets out the decision-making process for the installation of pedestrian crossing treatment systems for controlled crossings and provides a decision support tool (DST) for selecting the most appropriate treatment.

6.7 On-Street Parking

The provision of on-street parking in commercial and settlement areas is typically not encouraged given its impact on roadway capacity, operational efficiency and road safety. Retail and office developments especially should be required to provide adequate parking on-site to serve demands.

Recognizing these potential concerns, on-street parking can assist in creating a more vibrant and active street presence. For example, allowing on-street parking in main street retail environments can help support local businesses, reduce redevelopment costs, promote walking, slow traffic and enhance the overall experience for residents and visitors. If provided, placement and design should be carefully considered to minimize the above-noted safety concerns.

The impact of on-street parking on roadway operations and safety varies depending on the number of lanes, location, orientation (i.e. parallel or angled), curbing and time of day/week. Studies have shown that on-street parking can reduce roadway capacity by one third even with time of day and other restrictions in place. The effect varies, with capacity less effected as the number of lanes and offset from an intersection increase.

Guidelines have been developed from these studies to aid in assessing the impact of on-street parking on corridor capacity. **Table 6.1** summarizes the criteria, which apply to arterial and collector roadways only.

TABLE 6.1: ON-STREET PARKING GUIDELINES

Location of On-Street Parking	Peak Hour Volume per Lane in Same Direction of Flow	
	1 Lane	Multiple Lanes
Midblock	< 400 vph	< 600 vph
Intersection within 50 m	< 300 vph	< 500 vph

Based on these guidelines, a multilane road with on-street parking at a midblock location would likely experience operational and capacity concerns if traffic

volumes exceed 600 vehicles per hour in the same direction. Below that threshold, on-street parking is not expected to cause adverse issues with traffic flow. The table also clearly illustrates greater merit in restricting parking close to intersections and during peak periods.

Appendix A

Recommended Synchro Analysis Parameters

GENERAL TIMING STANDARDS	
Optimum Cycle Length for Analysis	90 to 120 seconds
Maximum Cycle Length for Analysis	130 seconds
Minimum Green Time	10 seconds for side street through movements. 5 seconds for left-turn phases.
Vehicle Clearance	Must consist of amber and all-red display. Duration in accordance with Ontario Traffic Manual Book 12 (Traffic Signals).
PEDESTRIAN PHASES	
Minimum Walk Time	7 seconds
Walking Speed	1.0 metres per second, or 0.8-0.9 metres per second if near high elderly population
Pedestrian Clearance	Must be adequate to allow crossing from curb to curb (including central medians). Includes vehicle clearance time in accordance with Ontario Traffic Manual Book 12 (Traffic Signals).
Median Storage	If centre median storage for pedestrians is provided, then the minimum walk time must be of adequate duration to allow a crossing from the curb to the far side of the median plus one lane. The pedestrian clearance interval must be of adequate duration to permit the longest crossing from the median to the curb. Use of the median for pedestrian refuge shall only be considered in consultation with the County.
AUXILIARY TURN LANE PHASING	
Overlap Left-Turn	In cases where left-turn phasing is required for opposing left-turn movements and one of the movements is much heavier than the opposing, consideration should be given to early termination of the arrow indication for the lighter left-turn movement to permit an earlier commencement of the conflicting through. Appropriate vehicle clearance displays must be provided for all left-turn phases. Proper account must be made for lost time resulting from these clearances.
Protected Only Left- Turn Phasing	Protected only left-turn phasing must be used when conditions are such that an undue hazard might result if permissive phasing were used. This is normally considered to be the case with a double left turn.
Shared Lane Operation	All movements permitted from a shared use lane must operate on the same signal phase.
Dual Right/Left-Turn Movements	Conflicting pedestrian movements should not be permitted simultaneously with dual right/left-turn movements. Normally, dual right turns will also require signalization.
Right/Left-Turn Arrows	A right/left-turn arrow shall not be displayed at the same time a conflicting pedestrian movement is permitted.

INTERSECTION SPACING AND MINIMUM STORAGE LENGTHS	
Visibility	As per the requirements of the Ontario Traffic Manual Book 12 (Traffic Signals), signalized intersection spacing must be determined based on posted speed, to ensure adequate visibility of the signal heads.
Through Vehicle Storage Between Intersections	Signalized intersections must be spaced to ensure that storage is available to accommodate 1.5 times the average number of vehicles arriving on each red indication during the heaviest hour (assuming an average vehicle length of 7 metres).
Storage Lane Lengths	Left-turn storage lanes must be long enough to accommodate 1.5 times the average number of arrivals per cycle in the heaviest hour. Where double left-turn lanes are in use, calculations should assume a 45%/55% distribution of traffic between the lanes. Right-turn storage lanes must be long enough to permit right-turning traffic to clear the maximum queue of through vehicles that is anticipated to accumulate during the red indication. All calculations must assume an average vehicle length of 7 metres.
PARAMETERS FOR INTERSECTION ANALYSIS	
Link Speed	Posted speed limit of the roadway
Conflicting Pedestrians	As identified in the TMC data
Heavy Vehicle (%)	As identified in the TMC data
Saturation Flow Rate	The maximum assumed ideal unadjusted saturation flow rate shall not exceed 1900 passenger cars per hour of green per lane, unless a higher or lower rate can be justified by the transportation consultant through data.
Peak Hour Factor	Existing Conditions: 0.92 Future Conditions: 0.92
Analysis Period	15 minutes
Area Type	Other

Appendix B

Report Outline for Traffic Impact Brief and Safety Plan

This appendix should be read in conjunction with **Part A** of the **Huron County Transportation Impact Assessment and Access Management Guidelines**, which outlines the requirements and process to assess and mitigate the potential effects of a proposed development on the transportation system, with emphasis on the County's road network.

The County may request a Transportation Impact Assessment (TIA) with any development application requiring approval pursuant to the *Planning Act*. For developments expected to generate relatively low traffic volumes (25 to 100 vehicle per peak hour), the TIA would normally take the form of a **Traffic Impact Brief and Safety Plan**. This type of study focuses on the analysis of potential traffic impacts of a proposed development (typically a Site Plan Control application) on existing and proposed access locations and on-site circulation. A Traffic Impact Brief and Safety Plan will also determine locations on the adjacent road network where potential operational or safety concerns may occur and identify mitigating measures where required. The study area is typically scoped to the nearest one or two off-site intersections.

The following summarizes the typical outline of a Traffic Impact Brief and Safety Plan report. See **Chapter 3** of **Part A – Transportation Impact Assessment Guidelines** for more detailed explanations of each element.

Prior to commencing work, transportation consultants are strongly encouraged to contact Huron County to confirm the need for a TIA and if required, establish data requirements, analysis assumptions and the scope of work. Consulting with the municipality in advance can help to avoid potential delays and additional work (and cost).

1 Introduction (Section 3.2 of Part A)

- Include an introduction identifying/describing the applicant, site location with a map or plan, type of application, scope of work and acknowledgement of pre-consultation, with a summary of any comments provided by the County and other review agencies.

2 Description of Development (Section 3.3 of Part A)

- Provide a suitable scale plan of the proposed development showing structures, parking, access and site circulation.
- Describe the proposed development location and land uses.

- Detail the total building size and the size of individual land use components expressed in units related to transportation analysis.
- Identify the planned phasing and timing of the proposed development and anticipated dates of full and interim occupancy.

3 Study Area (Section 3.4 of Part A)

- Describe the study area using a combination of maps, figures and text, including but not limited to the site location, land use, type of the surroundings and subject development lands. The study area should comprise the existing and proposed access location(s) and immediately adjacent intersection(s) (one or two) only.

4 Analysis Periods (Section 3.5 of Part A)

- Identify the analysis periods based on trip generation characteristics of the proposed land use(s) and existing traffic conditions. Refer to **Table 3.1** for typical peak periods based on type of land use.

5 Existing Transportation Network (Section 3.6 of Part A)

- Describe the existing transportation system, including road jurisdiction, road classification, lane configurations, speed limits, intersection configurations, intersection controls, active transportation facilities and restrictions in the study area using a combination of maps, figures and text.
- Summarize existing traffic volumes and turning movements, including pedestrians, cyclists and heavy vehicles, for intersection(s) and driveway(s) within the study area based on the most recent traffic counts available from the County, Local Municipality/Township and MTO. Conduct new counts if necessary (to be confirmed through pre-consultation with the County).
- Prepare figures showing existing traffic volumes for each analysis period.
- Analyze and describe existing intersection operations using current signal timing parameters for signalized intersections and summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).
- Identify potential improvement measures to mitigate any existing operational concerns. Any proposed changes to existing conditions (if necessary) should be documented and approved by the County before being used in analysis referencing the “Existing” scenario. Summarize the performance results with improvement measures in a table (if appropriate).

6 Site Visit Observations (Section 3.7 of Part A)

- Conduct a site visit during peak periods to observe and document existing conditions pertaining to site operation, local road network, access arrangements, local area travel patterns and general traffic operations.
- Verify that traffic volumes through study area intersections reflect actual demand.

7 Development Trips (Section 3.10 of Part A)

- Estimate vehicle trips generated by the proposed development based on one of the following methodologies:
  - Trip generation surveys of similar developments in Huron County;
  - "First principles" calculations of anticipated trips to/from the proposed development;
  - Trip generation rates (or equations) selected from the latest edition of the ITE *Trip Generation Manual* or another technical source from ITE; and
  - Other transportation studies from the area or similar communities.
- Where appropriate, deduct pass-by trips making an intermediate stop at the subject site and/or reduce the site-generated traffic to account for synergy (or internal capture) within a mixed-use development based on methodologies in the ITE *Trip Generation Handbook*.
- Summarize the trips generated by the proposed development in a table by land use, including trip generation rates and/or equations used to estimate the traffic volumes.
- Estimate distribution of site-generated vehicle trips by cardinal direction (i.e. north, south, east, and west). Assumptions for trip distribution should be supported by origin-destination surveys, existing or anticipated travel patterns, census data, population and employment forecasts and/or market studies.
- Summarize origin/destination and percent distribution in a table.
- Assign the site-generated vehicle trips to the intersection(s) and driveway(s) for each analysis period, considering logical routings, current and projected roadway capacities and travel times.
- Prepare figures showing the assignment of site-generated volumes to the transportation network and pass-by traffic (if applicable) to adjacent roads for each analysis period.
- Document all assumptions and adjustments, referencing available research and surveys where applicable. Deviations from recommended values must be noted and justified.

8 Future Total Conditions (Section 3.11 of Part A)

- Derive future total traffic volumes for the intersections and driveway(s) by adding the existing volumes and site trip assignment.
- Prepare figures showing the volumes for each analysis period.
- Analyze and describe future total intersection operations for each horizon year and analysis period using current signal timing parameters for signalized intersections and summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

9 Traffic Impact Assessment (Section 3.12 of Part A)

- Identify required modifications and improvements to mitigate projected "critical" movements at the driveway(s) for future total traffic volumes. See **Section 3.12** for definitions of critical movement and intersection.
- For all "critical" intersections, determine the contribution of the proposed development to the forecast condition, identify possible remedial measures, recommend a solution and assess the effectiveness of the solution towards resolving the situation.
- Analyze and describe future total intersection operations for each analysis period with the improvement measures. Optimize signal timing splits within the existing cycle length to provide the best possible traffic operations for all movements. Summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).

10 Safety Analysis (Section 3.13 of Part A)

- Complete a safety analysis to assess the impact of the proposed development on the adjacent road network and recommend potential mitigation measures. Depending on input received from the County through pre-consultation, the analysis could range from a detailed examination of collision history for locations known to exhibit safety concerns to a basic consideration of typical safety-related factors such as, but not limited to the following:
  - Conflict areas where vulnerable road users (pedestrians and cyclists) are at risk;
  - Weaving and merging on the roadway;
  - Non-local traffic infiltration in residential areas; and
  - Conflicts and safety issues specifically related to truck movements.

11 Access Review (Section 3.14 of Part A)

- Limit the number of accesses to the County road network per **Table 5.1** of **Part B – Access Management Guidelines**.
- Design all proposed accesses to the County road network based on the criteria specified in **Chapter 5** of **Part B**.
- Evaluate sight distance at each access based on the criteria in **Section 5.8** of **Part B**. Note any geometric elements that may restrict visibility.
- Review queue lengths to ensure adequate storage on-site and within exclusive turn lanes. Configure accesses to provide adequate ingress and egress lanes, clear throat length, corner radii and vehicle storage.
- Assess the need for exclusive left- and/or right-turn lanes at proposed access locations based on the criteria in **Section 6.2** of **Part B**. Adequate spacing should be provided between access points to avoid potential turn lane overlaps.
- Provide a pavement marking and signage plan for the roadway(s) along the frontage of the proposed development showing both existing and proposed lane markings and traffic control devices.
- Evaluate the need for traffic control signals, all-way stop control and/or other traffic control devices at proposed access locations based on the warrant criteria specified in **Chapter 6** of **Part B**.
- Consider the installation of roundabouts in parallel with analysis for all-way stops and signals. **Appendix C** provides a Roundabout Screening Tool.
- Examine the potential for turning movement conflicts within the road right-of-way.

12 Site Circulation Review (Section 3.15 of Part A)

- Evaluate on-site parking and internal circulation systems to ensure adequate manoeuverability for design vehicles, sight distances at internal intersections, and clear throat distances to avoid possible queuing onto public roads.
- Where appropriate, analyze and describe future total operations for on-site intersections for each analysis period. Summarize the performance results in a table. The summary should include v/c ratios, LOS, average vehicle delays and queue lengths for overall intersection operations and individual critical movements (as appropriate).
- Demonstrate emergency vehicle access and circulation within the site, including the explicit designation of fire routes.
- Evaluate proposed truck/courier loading facilities and access to these facilities to ensure they are adequately sized and properly designed to not impact traffic operations on public roads or interfere with pedestrian activity on site.

- Complete transport truck swept path analysis for developments that receive deliveries (e.g. gas stations) or expect trucks as customers (e.g. fuel or eating establishments).
- Identify locations for snow storage on site and assess potential implications for parking and access.

13 Walking and Cycling Considerations (Section 3.16 of Part A)

- Provide an on-site circulation system of walkways, paths and delineated routes for pedestrians and cyclists. Design the system to serve natural desire lines and minimize potential conflicts between vehicles, pedestrians and cyclists. Connect the proposed development to existing off-site sidewalks, cycling facilities and trails. Address any gaps or missing links in the active transportation network within the study area.
- Ensure accessibility for persons with mobility limitations.
- Encourage pedestrian and cycling activity to and within the proposed development by:
  - Locating building entrances close to the street;
  - Providing protected bicycle parking at building entrances, secure bike storage and shower facilities within buildings; and
  - Providing shelter/relief for pedestrians from natural elements.
- Consider pedestrian and cyclist needs with any intersection improvements (e.g. signal timings).

14 Findings and Recommendations (Section 3.17 of Part A)

- Provide a summary of the key findings and recommendations of the TIA.
- Summarize impacts for all horizon years and analysis periods in a table. List proposed improvement measures to mitigate impacts in the table. Structure recommendations for improvements within appropriate time perspectives.

Appendix C

Roundabout Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the merit of implementing a modern roundabout at an intersection in comparison to other appropriate forms of traffic control or road improvements, including auxiliary lanes, traffic control signals, all-way stop, etc. The tool is intended to assist in deciding whether to proceed to a more detailed Intersection Control Study to further investigate the feasibility of a roundabout. The checklist is based on the Region of Waterloo Roundabout Feasibility Initial Screening Tool.

1. **Project Name/File Number**

2. **Intersection Location** – Street/road names, distances from major intersections, etc.

3. **Brief Description of Intersection** – Number of legs, lanes on each leg, total AADT, AADT on each road, etc. Attach or sketch diagram showing existing and horizon year turning movements.

4. **Are there any operational problems currently being experienced at this location?**

5. Is it a new intersection or is it a retrofit of an existing intersection? If existing, what is the existing traffic control?

6. Is the intersection in the vicinity of a railroad crossing or another intersection? If so, how close and what type of traffic control exists at the adjacent intersection? Will queues be a problem if they form?

7. Is the intersection located within a corridor that is scheduled for improvements in the Capital Program? What are the ultimate cross-sections of the approach roads?

8. If existing, what is the collision history of the intersection over the past five years? Is there a collision problem that needs to be addressed?

9. Are persons with disabilities frequent users of this intersection?

10. What traditional road improvements are proposed for this intersection? – (e.g. traffic signals, all-way stop, auxiliary lanes, etc.). Please attach a sketch of the traditional road improvements.

11. If traffic control signals are being considered, are warrants met for the horizon year?

12. What size of roundabout should be considered for this intersection?

Estimate the 20-Year Life Cycle Cost:

10-Year AADT: _____

Injury Collision Cost (ICC)[1]: _____

Discount Rate (i): _____

TABLE C.1: 20-YEAR LIFE CYCLE COST COMPARISON

Cost Item	Other Traffic Control	Roundabout
Implementation Cost[2]	$	$
Injury Collision Cost (Present Value)[3]	$	$
Total Life Cycle Cost	**$**	**$**

Notes:

1. Follow the procedures documented in the *Highway Safety Manual* to estimate the ICC.
2. Implementation Cost = Sum of costs for construction, property, utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%)
3. Present Value of 20 Year Injury Collision Cost = Expected annual collision frequency x ICC $((1 + i)^{20}-1) / i(1+i)^{20}$

Conclusions and Recommendations