Site Impact Analysis Requirements Manual

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1. INTRODUCTION

Chapter 1 contains background information about Site Impact Analysis Studies in general, and outlines the need for Site Impact Analysis Studies. In addition, the purpose it defines the purpose of this manual, and provides an overview of its contents.

1.1 Background

One of the key elements in the provincial transportation infrastructure is the highway system. Roads and highways provide the means of travel not only for short trips to and from friends, school, and the corner store, but also intermediate length trips to and from work and shopping, and longer trips between cities, provinces and countries. Highways are heavily used for the transportation of goods to and from markets for local, provincial, national and international consumers.

The majority of the highways constructed by the Province and used for regional travel were built many years ago when traffic volumes were relatively light. Over the years, development and the accompanying traffic volumes have increased continually. As new intersecting roads and accesses are constructed and traffic signals erected, the speed and capacity of highways decrease, and the motorist experiences more traffic congestion and conflicts.

As a result, more and more of the existing highway system is reaching its practical capacity, and planners must consider improvements like increasing the number of lanes, intersection upgrading or bypasses. In some areas of the province this is done in the context of Regional Plans.

Since 1977, the Ministry has sought to regulate access to development close to provincial highways through the introduction of controlled access legislation. The aim of this legislation was to ensure that the impact of such developments on the highways, especially in terms of access to and from the highway, is provided in a safe and orderly manner. In this way, the Ministry can maintain and preserve existing capacity and consider upgrades in terms of local and regional system plans.

At this time, many roads are approaching their capacity. With limited funds available to upgrade these roads, we must take a more proactive stance to ensure that developments are constructed to minimize their impact on the highway network system and to coordinate with other plans and transportation modes.

1.2 Need for Site Impact Analysis Studies

The provincial highway system is a network of routes for the safe and efficient movement of people and goods. It has been constructed and maintained at great public expense and is an irreplaceable public asset. The Province has a responsibility to manage and maintain effectively each highway within the provincial system to preserve its safety, functional integrity and public purpose, both now and in the future.

In order to manage and maintain the safety and integrity of existing and future highways, it is essential to assess the amount of new traffic entering the highways from adjacent developments, and to design thoughtfully the access and layout configuration of the developments.

A Site Impact Analysis Study determines the impact of the traffic generated by a proposed site development on the surrounding road network system, and identifies what improvements may be required in order to accommodate adequately and safely the generated traffic. Within the context of provincial, regional, corridor and local plans, this study evaluates alternative access possibilities and provides information which will help determine the acceptability of proposed access points.

It will also address other issues that influence the impact of a new development on a highway, such as the location of access, the provision of additional travel lanes or separate turn lanes on the highway, on-site storage lengths, and the internal layout of parking.

The Site Impact Analysis Study should help:

- Clarify how to identify the contribution a particular site or group of sites makes to the roadway system traffic loads
- Provide a credible basis for estimating roadway improvement requirements attributable to a particular project
- Assess compatibility with local, regional and provincial transportation plans

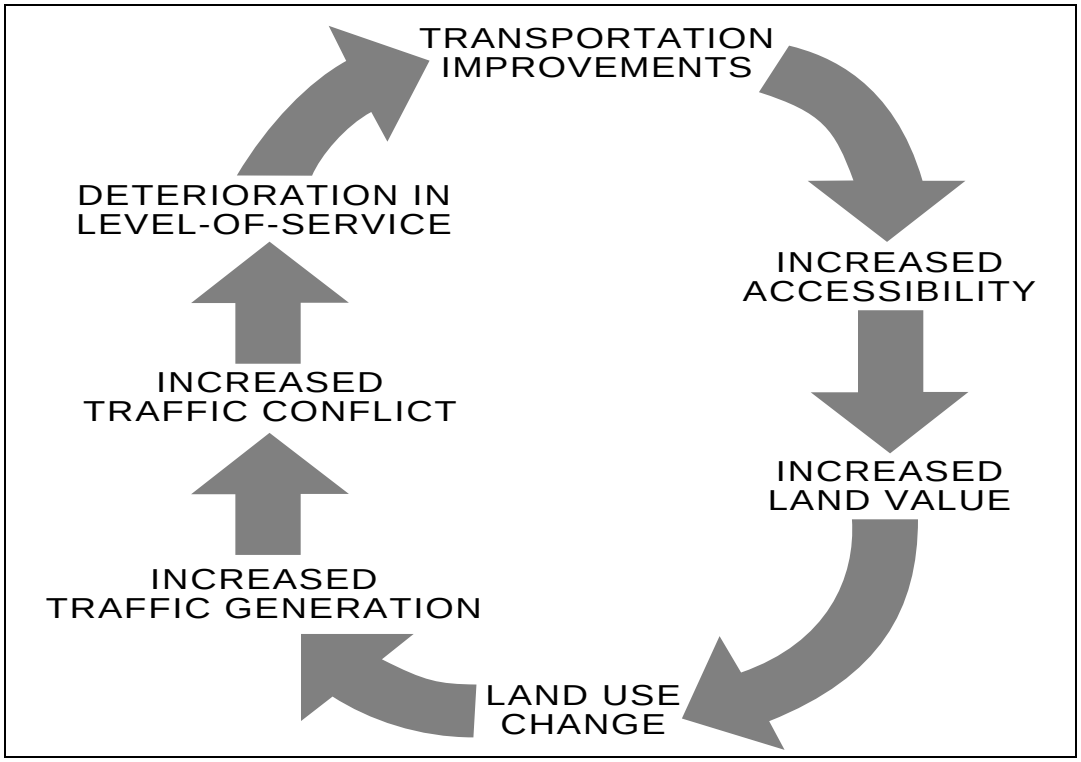
1.3 Context of Site Impact Analysis Studies

Site Impact Analysis Studies must consider the proposed development within the context of system plans, corridor plans, access management plans and other transportation plans which define the function of the provincial highway system. Before beginning a Site Impact Analysis Study, it is important to review previous plans so that the proposed development takes place within the context of these plans.

Site development often focuses primarily on local land use planning, but it is also important to consider the transportation planning elements. In British Columbia, transportation plans consider the complete range of perspectives from the entire provincial transportation system right down to individual segments of corridors. These transportation plans provide a context for viewing land use and development.

Planned future roads and road improvements contribute greatly to the ability of the transportation system to handle additional traffic which comes from the increase in development safely and efficiently. In turn, the new developments themselves contribute to economic growth which increases demand for the movement of goods and thus will benefit from improvements to both the local and the regional transportation system. Figure 1.1 illustrates the Land Use and Transportation Life Cycle. This issue is dealt with in more detail throughout this manual.

Figure 1.1 - Transportation and Land Use Life Cycle



1.4 Purpose of the Manual

The purpose of this manual is to develop a comprehensive strategy for Site Impact Analysis Study requirements related to Ministry, Regional and Local Government development review processes. For those involved with preparing or reviewing Site Impact Analysis Studies, this manual will:

- Outline legislative and regulatory authority
- Present Ministry policies
- Justify study requirements
- Define the study process
- Outline the key elements and recommended practices

POLICY
It is intended that this manual provide a consistent approach to Site Impact Analysis, which recognizes the need for flexibility in cases where site specific elements or technically justified alternatives allow. It is the responsibility of the applicant completing the study to ensure that all feasible alternatives are properly reviewed and that any requests for consideration of variances to the methodologies outlined here are discussed and approved with the Ministry and appropriate Local Government before commencing the study.

This manual was prepared with consideration to processes defined by the Institute of Transportation Engineers (ITE), Local Government processes and existing provincial development review requirements.

1.5 Manual Overview

The Site Impact Analysis Requirements Manual was developed for use by engineers and development technicians in the various offices of the British Columbia Ministry of Transportation, and by Local Government staff, developers and traffic engineering consultants who are responsible for the preparation or review of Site Impact Analysis Studies in support of new development projects. The general public may also wish to use this manual as a reference document.

The manual:

- Outlines the procedures for both a simplified application process and for conducting detailed Site Impact Analysis Studies including study warrants, preparing a Proposed Study Terms of Reference, developing an approved study scope, the study review process, identifying stakeholders and obtaining reference materials (Chapter 2)

- Outlines how to establish the basic criteria to be used in the detailed Site Impact Analysis Study (Chapter 3)

- Discusses various network analysis techniques to be used in the detailed Site Impact Analysis Study (Chapter 4)

- Describes the various on-site planning and design elements required in the detailed Site Impact Analysis Study (Chapter 5)

- Lists titles for further reading (Chapters 6)

The Appendices:

- **Appendix A** - Provides a Recommended Terms of Reference for a detailed Site Impact Analysis Study

- **Appendix B** - Includes a map and a directory of Ministry District and Regional Office phone numbers and addresses

- **Appendix C** - Provides a list of provincial Controlled Access Highways

- **Appendix D** - Provides Left Turn Lane Warrants

- Glossary and Index

2. ADMINISTRATIVE PROCEDURES FOR CONDUCTING SITE IMPACT ANALYSIS STUDIES

Chapter 2 contains a review of the administrative procedures for initiating, conducting and reviewing Site Impact Analysis Studies to be submitted to the Ministry. This chapter describes:

- The Ministry's legislative and regulatory authority
- Study review process - overview
- Study warrants
- Proposed Study Terms of Reference
- *Scope Development Meetings*
- Report contents
- Study submission and review process
- Stakeholders
- Reference Materials

2.1 Legislative and Regulatory Authority

Development projects come in a wide range of sizes, uses, and complexities. A Site Impact Analysis Study is used to evaluate the individual and combined impacts of proposed developments on the surrounding road network. The purpose of a Site Impact Analysis Study is to ensure that traffic going to and from each proposed development will not impede the safe and efficient flow of through traffic on the highway system. Parking and trip generation rates are used to determine the requirement for a detailed Site Impact Analysis Study.

In this manual, the word "highway" is generally used to refer to public roads for which the Ministry of Transportation is responsible, whether within or outside of municipal boundaries. A "Controlled Access Highway" means the highway or portions designated or designed for through traffic as defined in Part 6 of the Highway Act. A list of provincial controlled access highways appears in Appendix C of this manual and will be updated periodically. The term "municipal road" will be used to describe roads within an incorporated municipality under municipal jurisdiction.

The following is a list of some of the situations when the Ministry may request a detailed or simplified Site Impact Analysis Study:

(a) Rezoning of a site within 800 metres of an intersection of a controlled access highway with any other public road. [Highway Act, Section 57(2)]

(b) Subdivision of a parcel of land adjacent to a controlled access highway within an incorporated area. [Land Title Act, Section 80]

(c) Subdivision of a parcel of land in an unincorporated area. [Land Title Act, Sections 79(1) and 83(1)(b)]

(d) Request for a development permit to construct a commercial or industrial building over 4500 sq. m gross floor area on a site where a zoning bylaw is subject to (a) above. [Municipal Act[cvs1], Section 979]

(e) Request for an access permit onto a controlled access highway. [Highway Act, Section 57(1)]

(f) Request for a permit to construct an access within a rural area or on a provincial (arterial) highway in a municipality. [Highway Act, Section 17]

(g) A heritage revitalization agreement or amendment by a local government covering land subject to (a) above. [Municipal Act[cvs2], Section 1021(6)(b)]

(h) An amendment of a land use contract or a request for a development variance permit or a development permit on land subject to (a) above. [Municipal Act, [cvs3]Section 982(3)]

All applications must be submitted to the Ministry through the District Office. The development review process occurs at the District level, with support from Regional staff. A list of the Ministry District and Regional Offices is in Appendix B of this manual.

Those affected by the above should contact the local Ministry District Office before submitting an application and/or a study in order to determine whether a Site Impact Analysis Study is required and how it should be conducted. Section 2.3.3 provides guidance on how the need for a study is determined. Contact the Local Government to determine their study requirements and to obtain information on any local issues, land use plans and the feasibility of alternate access. A more complete listing of stakeholders can be found in Section 2.10.

2.2 Ministry Site Impact Analysis Study Review Process - Overview

The three main components of the process for undertaking a Site Impact Analysis Study include :

- Determining the need for a detailed Site Impact Analysis Study (Figure 2.2)
- Determining the required components of a study
- Detailed study review process (Figure 2.3) and simplified study review process (Figure 2.4)

Upon acceptance of the Site Impact Analysis Study recommendations, the applicant must ensure that construction inspections take place before the Ministry can give final acceptance. Section 2.3 outlines the process for determining whether a detailed study or simplified study is required. Sections 2.4 to 2.8 provide information on elements of the detailed study review process, and Section 2.9 outlines the simplified application review process. The applicant should contact the District Office if more information is needed.

2.3 Determining the Need for a Study

When an application requiring Ministry approval as outlined previously in Section 2.1 (a) to (h) is requested or an inquiry is made over the need for an application, an approval or a permit, Ministry staff will determine whether a detailed Site Impact Analysis Study must be submitted in support of the application or whether a Simplified Application Review Process may be followed.

The following Sections 2.3.1 and 2.3.2 outline the study warrant recommendations of the Institute of Transportation Engineers (ITE) and the Transportation Research Board (TRB). These are followed by the Ministry's study warrants in Section 2.3.3 for both new sites and existing sites where there is a proposal for a change in use of an existing access.

2.3.1 Institute of Transportation Engineers (ITE)

The ITE indicates the following situations or thresholds which commonly trigger a requirement for a Site Impact Analysis Study:

- When the development will generate a specified number of peak hour trips
- When the development will generate a specified number of daily trips
- When a specified amount of acreage is being rezoned
- When the development contains a specified number of dwelling units or floor area
- When the development will occur in an environmentally sensitive area and a widening of the highway may be necessary
- When financial assessments are required and the extent of the impact of the development must be determined
- At the discretion of staff

2.3.2 Transportation Research Board (TRB)

The Transportation Research Board's NCHRP Report 348 suggests that a detailed Site Impact Analysis Study should be performed for each of the following situations:

- All developments that can be expected to generate more than 100 peak hour vehicle trips on the adjacent streets
- A development generating less than 100 new peak hour vehicle trips if it affects local "problem" areas such as high accident locations, currently congested areas or areas of critical local issues

- All applications for rezoning (Note that where areas are being down-zoned, a traffic study may not be required)

- Any change in the land use or density that will change the site traffic generation by more than 15 percent where at least 100 new peak hour vehicle trips are involved

- Any change that will cause the directional distribution of site traffic to change by more than 20 percent.

2.3.3 Ministry Detailed Site Impact Analysis Study Warrants

This section provides details of the process which is used by Ministry staff to determine whether a detailed Site Impact Analysis Study is required or whether a Simplified Application Review Process may be followed. Due to the diversity of the types and locations of developments in British Columbia, the Ministry's detailed study warrants must be considered at both the general provincial level and at the site specific level. A general overview of how the requirement for a detailed Site Impact Analysis Study is determined is provided in Figure 2.2.

The policies outlined in this chapter begin at the general level while ensuring that site specific issues can also be accommodated. **For this reason, it is imperative that the applicant consult with the District Office before submitting an application or requesting an approval in order to determine what type of study is required.**

POLICY
***In general**, a detailed Site Impact Analysis Study will be required for a site which meets the criteria in Section 2.1 (a) to (h) and has an estimated trip generation rate of 100 or more two-way trips, (i.e. inbound plus outbound) during the peak hour. The trip generation rate will be estimated using the Ministry's* Parking and Trip Generation Rate Manual *and Section 3.8 of this manual. Care must be taken to consider both street peak hour and site peak hour rates when selecting a design hour. The warrant of 100 peak hour trips will apply to applications related to:*
• *New sites* • *Existing sites where a change in use of the access is being proposed as described in this section*

A Site Impact Analysis Study may be required for a change in use of an existing access which results in changes in:

- The type of access operation

- The peak hour access volumes

- The type of access traffic

In these situations, the safety and efficiency of the highway may be compromised and a study may be required to determine the adequacy of the existing access design or whether the reconstruction, relocation or closure of the access is required. Ministry staff will also wish to consider Municipal Major Street Network Plans, Regional System Plans and/or Corridor Plans in determining whether alternative access is available for relocation of site access.

POLICY
The applicant, may be required to reconstruct, relocate or close the access to conform to the highway operational requirements if a change in use of the property results in a change in the type or nature of access operation.

A change in use which results in a change in the type or nature of access operation is established when any of the following criteria are met:

(a) The use of the access in the design hour increases in actual or proposed vehicular volume by 20 percent or more.

(b) The design hour traffic volume of a particular directional characteristic (such as left turns) increases by 20 percent or more.

(c) The actual or proposed use of the access will shift the peak hour from that for which the access was originally designed requiring that a new design hour be evaluated.

(d) The daily use of the access by vehicles exceeding 13,500 kilograms gross vehicle weight increases by 10 vehicles per day or more.

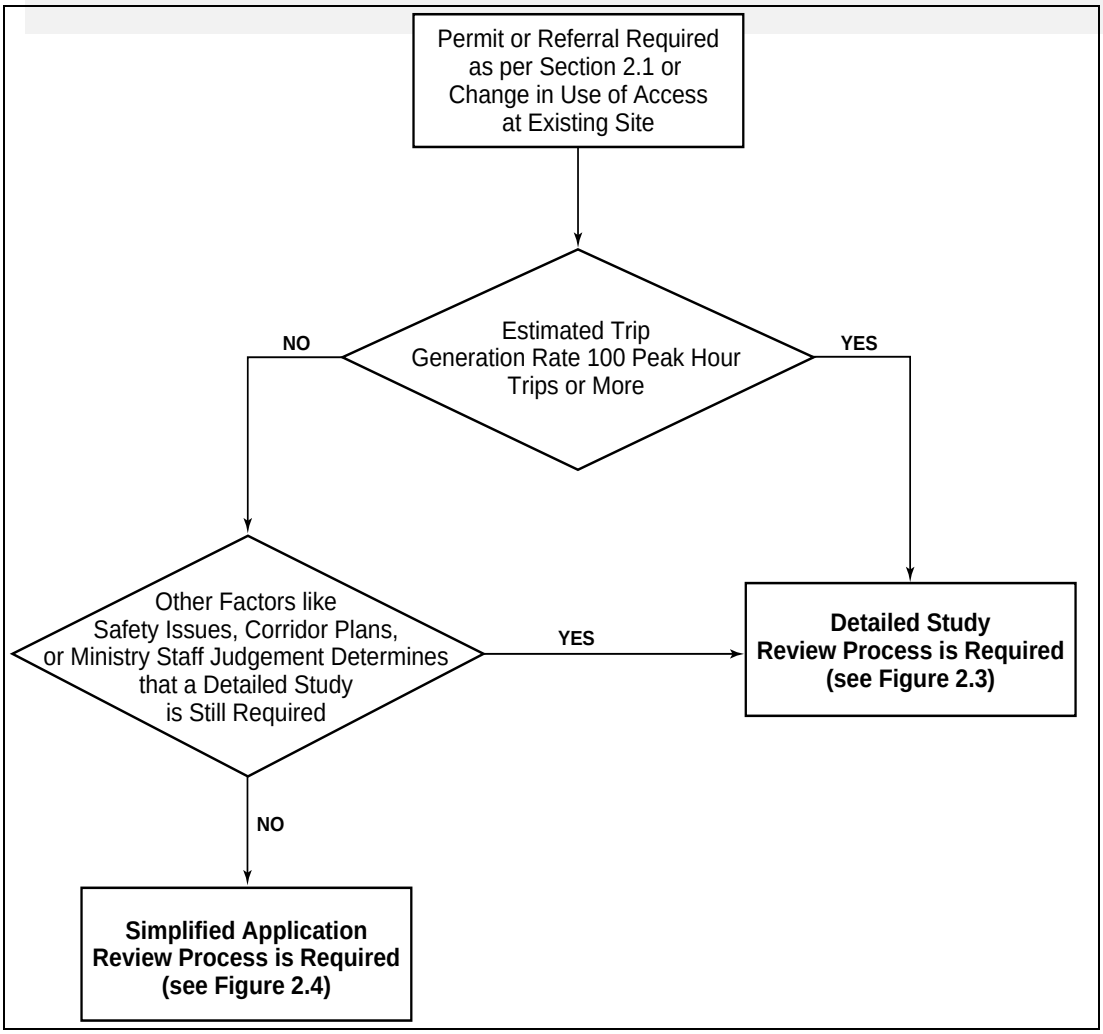
(e) The free flow of vehicles entering the property is restricted or such vehicles queue or hesitate on the highway, creating a safety hazard.

(f) The access location fails to meet the minimum sight distance standards of the current edition of the Ministry's Design Manual.

Table 2.1 - Change in Use

A CHANGE IN USE MAY INCLUDE:	A CHANGE IN USE DOES NOT INCLUDE:
• Structural modifications of an access • Remodeling • Change in the type of business conducted • Expansion of an existing business • Change in zoning • Property division creating new parcels	• Modifications in advertising • Landscaping • General maintenance • Aesthetics that do not affect internal or external traffic flow, parking supply, sight distance or safety

Figure 2.2 - Determining the Need for a Detailed Site Impact Analysis Study



POLICY

In addition, there may be other site specific factors which Ministry staff must consider in determining whether a detailed Site Impact Analysis Study is required for a proposed development which has an estimated trip generation rate below 100 peak hour trips. Some of these factors include developments in:

- *Environmentally sensitive areas where road widening may be required*
- *High accident areas*
- *Currently congested areas*
- *Regional planning or corridor planning areas*

For this reason, it is imperative that the applicant consult with the District Office before submitting an application to determine whether a study is required. *District and regional staff will determine whether these or any additional issues affect the warrant for a study for a specific site.*

If the requirement for a detailed Site Impact Analysis Study based on site specific issues is not clear, the applicant may contact the District Office for an explanation of the requirement. These site specific issues will become an important component of the detailed Site Impact Analysis Study.

Local Governments may have their own guidelines regarding site studies and permits and the applicant should contact them to determine their requirements. Local Governments should refer any applicants which may be affected by the requirements outlined in this manual to the Ministry District Office where more information on Ministry requirements can be provided.

POLICY

Sites which have an estimated peak hour trip generation rate below 100 and which Ministry staff have determined do not require a detailed Site Impact Analysis Study, will follow a Simplified Application Review Process as outlined in Section 2.9 and Figure 2.4. The Ministry's District Office staff will provide a list of the information required for these applications.

2.4 Proposed Study Terms of Reference

POLICY
When the need for a detailed Site Impact Analysis Study has been established as outlined in Section 2.3, a Proposed Study Terms of Reference must be submitted. A Recommended Terms of Reference for a detailed Site Impact Analysis Study is provided in Appendix A of this manual and should be used along with this manual as a guide to determining what information will be required for a complete detailed study.

Without proper coordination, the Local Government and the Ministry would issue separate instructions on the requirements for the Site Impact Analysis Study which can lead to two sets of different guidelines or analysis criteria. This can be prevented by the proper development of a Proposed Study Terms of Reference for the Site Impact Analysis Study which can be approved by the Ministry and other Reviewing Agencies before commencement of the study.

A copy of Appendix A should be provided to the applicant at the time when the need for the detailed study has been established according to Section 2.3. The Ministry's District and Regional staff may also provide an attachment listing any special conditions that the Site Impact Analysis Study will be expected to address.

The applicant and their traffic engineering consultant will then prepare a Proposed Study Terms of Reference for the specific Site Impact Analysis Study. This Proposed Study Terms of Reference should be tailored to the specific issues, existing information, constraints and alternatives of the site and should identify any special techniques and variances from Appendix A and this manual. It could also outline any existing sources of information and analysis for the site or study area which could be used in the study.

Two copies of the Proposed Study Terms of Reference will then be forwarded to the District Office along with a request for a *Scope Development Meeting*. The Applicant should also forward a copy of the Proposed Study Terms of Reference to the appropriate Local Government and any other Reviewing Agencies in order to ensure that all parties have had the opportunity to review the document before the *Scope Development Meeting*.

The District Office will forward one copy of the Proposed Study Terms of Reference to the Regional Planning Engineer. After the District and Regional Ministry staff have reviewed the Proposed Study Terms of Reference, the District staff will schedule a *Scope Development Meeting*. The final approved study scope will be determined through discussion of Ministry and Reviewing Agency comments or revisions to the Proposed Study Terms of Reference at the *Scope Development Meeting*.

The Proposed Study Terms of Reference must consider all the elements outlined in this manual which include the following specific issues:

- Scheduled improvements to the road network that can be assumed to be in place at opening day and throughout the study horizon period
- Any required extension of the standard study area
- All options for access location and design including no direct access
- Known problem intersections, safety issues or other conditions that should be addressed
- Municipal Major Street Network Plans, Regional Systems Plans and Corridor Plans
- Access Management Plans or Access/Traffic Plans for the highway
- Any potential network changes that the Ministry and/or the Local Government are considering which the Site Impact Analysis Study should evaluate in terms of the impact of the development

If a detailed Site Impact Analysis Study is not required for the site as established in Section 2.3, then a Proposed Study Terms of Reference is not required and the process in Section 2.9 will apply.

2.5 Scope Development Meeting

When the Proposed Study Terms of Reference has been received and reviewed by District and Regional Ministry staff, a *Scope Development Meeting* will be scheduled. The purpose of this meeting is to bring the Applicant, their Traffic Engineering Consultant, Local Government Staff, and District and Regional Ministry Staff and other Reviewing Agencies together to review the Proposed Study Terms of Reference and provide the required scope elements of the Site Impact Analysis Study prior to commencing the study.

POLICY
In order to ensure that there is a coordinated approach to determining the requirements for a detailed Site Impact Analysis Study, it is the responsibility of the applicant and their traffic engineering consultant to ensure that the review process begins before starting a Site Impact Analysis Study. To this end, the applicant and their traffic engineering consultant, Local Government Staff, Ministry staff and all other Reviewing Agencies must get together for a Scope Development Meeting *before beginning a detailed Site Impact Analysis Study.*

Key items which should be discussed in the *Scope Development Meeting* include:

- Outlining any site specific issues, conditions, operational criteria and corridor objectives which will affect/limit the range of possible solutions that may be considered in the study
- Outline any specific tools (like regional or area transportation models) or methods to be used
- Ensuring that all pertinent background material is taken into consideration
- Review of the Proposed Study Terms of Reference and any preliminary plans or proposals of an applicant
- Assisting in identifying all available data sources
- Review of all options for access location and design including no direct highway access
- Review of committed and planned roadway improvements and timing
- Review of Official Community Plans and Municipal Major Street Network Plans
- Review of Regional System Plans, Corridor Plans and Access Management Plans in the study area
- Review of existing Municipal Zoning Bylaws and design standards
- Items listed in the Scope Development Checklist in Table A.2 of Appendix A

- Review of whether a variance may be considered for the site
- Establishing any non-standard analysis techniques
- Review of proposed transit plans and/or Transportation Demand Management (TDM) initiatives which may impact the site
- Review of landscape and visual impact issues
- Review of whether an Environmental Impact Assessment is required

Applicants should provide preliminary maps, plans and documents to illustrate the site, ownership, land use, traffic volumes, existing and proposed adjacent public roads, available access, proposed access alternatives and other adjacent accesses and intersections. The preliminary conferences, comments and recommendations of the *Scope Development* Meeting will in no way bind the Ministry or the applicant in future decisions of a formal application submission.

It is intended that the applicant and their traffic engineering consultant come away from the *Scope Development Meeting* with an understanding of what must be included in the study. A copy of the discussion items and requirements outlined in this *Scope Development Meeting* will be recorded in the meeting minutes and in the checklist in Table A. 2 in Appendix A of this manual. The meeting minutes are to be completed by the applicant or their traffic engineering consultant and submitted to the District Office for approval. When the meeting minutes have been approved and returned, the applicant has the information necessary to begin the study. These items will then become the approved scope for the Site Impact Analysis Study for that particular site.

The Ministry Scope Development Checklist in Table A.2 in Appendix A may be used to direct the discussion at the meeting and to document the required study scope elements. If items remain unresolved after the *Scope Development Meeting*, the applicant may need to resubmit a new Proposed Study Terms of Reference and schedule an additional *Scope Development Meeting.*

If information becomes available during the study which impacts the approved study scope, the applicant may contact the Ministry and other Reviewing Agencies, in order to determine whether a revision to the scope is warranted. Scope revisions must be approved in writing by the Ministry and must accompany the application and study when submitted.

Although the information and application process takes place at the District Office, Regional Planning/Traffic Engineers should also review the Proposed Study Terms of Reference and attend the *Scope Development Meeting*. It is important to the applicant that a single set of requirements/comments come from both the District and Regional Ministry staff. This means that communication to the applicant should only take place after both the District and Regional staff have had a chance to review the Proposed Study Terms of Reference and their responses have been coordinated.

From time to time, the applicant may wish to request that the communication for the *Scope Development Meeting* not be held in person. This meeting may only be waived if the Proposed Study Terms of Reference is determined to be acceptable by the Ministry, Local Governments and other Reviewing Agencies and all parties agree that another form of correspondence can adequately be used to establish the required scope of the study. However, the applicant is strongly encouraged to participate in the *Scope Development Meeting*.

2.6 Ensuring Acceptable Standards of Study

All detailed Site Impact Analysis Studies must be undertaken by~~, or under the direction of,~~ a Professional Engineer, qualified in the field of traffic engineering and registered in the Province of British Columbia. This person must also:

- Make a personal visit to the site
- Show all assumptions, data and calculations used to arrive at the conclusions presented in the report
- Include the name, address, phone number and professional stamp of the report's author
- Ensure that the study meets all requirements specified in the approved Study Terms of Reference, this manual and the *Scope Development Meeting*
- Prepare a report that includes a clear and concise documentation of the methodologies, findings and recommendations

2.7 Report Contents

In general, the detailed Site Impact Analysis Study must document the study purpose, procedures, assumptions, findings, conclusions, and recommendations. This will be most effectively done keeping in mind the three most common uses for these reports.

(a) To provide developers or designers with recommendations on site selection, site transportation planning and traffic impact.

(b) To assist public agencies in reviewing the attributes of the proposed developments in conjunction with any request for annexation, land subdivision, zoning changes, building permits, access or other development reviews and to establish mitigation requirements where off-site impacts require improvements.

(c) To assist some public agencies in determining development cost charges or to assess developer contributions to roadway facility improvements.

The analysis should be presented in a straightforward and logical sequence. Table A.1 in Appendix A of this manual provides an acceptable detailed study outline. In some cases, studies will be easily documented using these outlines. In other cases, additional analysis may be warranted because of site specific issues and Local Government and/or Reviewing agency study requirements. Section 2.8.1 outlines the items used to determine whether the report is complete.

All feasible options for providing access, as outlined in the approved minutes of the *Scope Development Meeting,* must be evaluated. The study should lead the reviewer through the various stages of the analysis and to the resulting conclusions and recommendations. Sufficient detail should be included so that the staff of the Ministry and any other Reviewing Agencies will be able to follow the logic and methodology of the analysis.

POLICY
Transportation improvements related to providing the required level of site access and mitigation of the adverse effects of the development-related traffic on the transportation network must be described. Recommendations should be made for any required off-site roadway improvements such as additional through lanes, auxiliary lanes and traffic control devices necessitated as a result of the development. Also, required improvements to the internal roadway system and facilities for transit, pedestrians and cyclists should be developed and presented.

If the assumptions made in the analysis are based on published sources, then those sources must be specifically referenced. If other, less readily available sources are used, a more detailed explanation and prior approval is necessary and their use must be discussed in the *Scope Development Meeting*.

If required improvements to the surrounding road system are identified during the analysis, the recommendations must specify:

- The time period within which the improvements should be made
- Links between the improvements and the various phases of the development construction
- Links between the improvements and the trip generation and parking rates attributed to the site
- The estimated cost of the improvements
- Any monitoring of operating conditions and improvements that may be required

Inapplicable sections listed in the Study Outline (Table A.1) may be omitted from the report with the written agreement of the Ministry and Reviewing Agencies. The approved *Scope Development Meeting* minutes and Table A.2 should provide clear direction as to what is to be included and what may be omitted from the report. This may be amended throughout the duration of the study development and review process according to Section 2.5 if justification can be submitted and agreement is provided in writing from the Ministry and Reviewing Agencies.

2.8 Study Review, Permits, Inspection and Final Acceptance

2.8.1 Initiation of the Study Review Process

Two copies of the completed Site Impact Analysis Study are submitted to the applicable District Office along with any applications or approvals outlined previously in Section 2.1. A copy should also be submitted to the Local Government and other Reviewing Agencies when the study recommendations may have an impact on municipal roads or planned improvements of other agencies. The study will be given an initial review by the District staff to determine whether it is complete. All submitted materials become the property of the Ministry.

POLICY

The Site Impact Analysis Study will be accepted for Ministry review when it has been determined that it conforms to:

(a) the approved Terms of Reference

(b) the approved minutes of the Scope Development Meeting

(c) items provided in the Ministry Scope Development Checklist (Table A.2) in Appendix A and this manual

(d) policies and procedures outlined in this manual

(e) any other correspondence or revisions approved or issued by the Ministry in writing

Failure to provide this information with the completed study will result in the return of the study and any accompanying application without detailed Ministry review. It is the responsibility of the applicant to ensure that all the required information is provided.

2.8.2 Detailed Site Impact Analysis Study Review Process

If the report is determined to be initially complete by the District Office, then a detailed review will take place according to Figure 2.3. A copy of the study will be forwarded by the District to the Regional Engineer for review. The Engineer's comments are returned to the District Development Approvals staff.

If the study and it's recommendations are acceptable, then the District will forward the Ministry's comments to the applicant stating all off-site conditions of approval. If the applicant agrees to the off-site conditions specified for the site, then they must forward a letter of agreement to the District Office indicating their acceptance. If the study and it's recommendations are not acceptable, then the study will be returned to the applicant stating the reasons why the study was not accepted.

Once the applicant's letter of agreement to the off-site conditions has been received, the development application process can continue with the preparation and submission of a more detailed on-site design. If this design is acceptable, a response will be sent to the applicant with conditions of approval identified. If the applicant agrees to the on-site conditions specified for the site, then they must forward a letter of agreement indicating their acceptance to the District Office. If the on-site design is not acceptable, then the study will be returned to the applicant stating the reasons why the study was not accepted.

When the off-site and on-site conditions of approval have been accepted by the applicant, the Ministry and Reviewing Agencies, then the final development proposal may be prepared and submitted. If the final development proposal is reviewed and accepted, then the approval can be executed and any conditions of approval which have not been completed will be identified.

Once the final report is accepted, the relevant Local Government should be advised in writing of the Ministry decision. All submitted materials become the property of the Ministry.

2.8.3 Permits, Inspection and Final Acceptance

When the Site Impact Analysis Study is complete and approved by the Ministry, it is the responsibility of the applicant to ensure that the following construction inspection process is followed. This process must be followed in order to ensure that any construction on Ministry right-of-way is completed according to Ministry standards and specifications.

1. Where road improvements were proposed and approved, the Ministry issues a permit to construct on highway right-of-way.

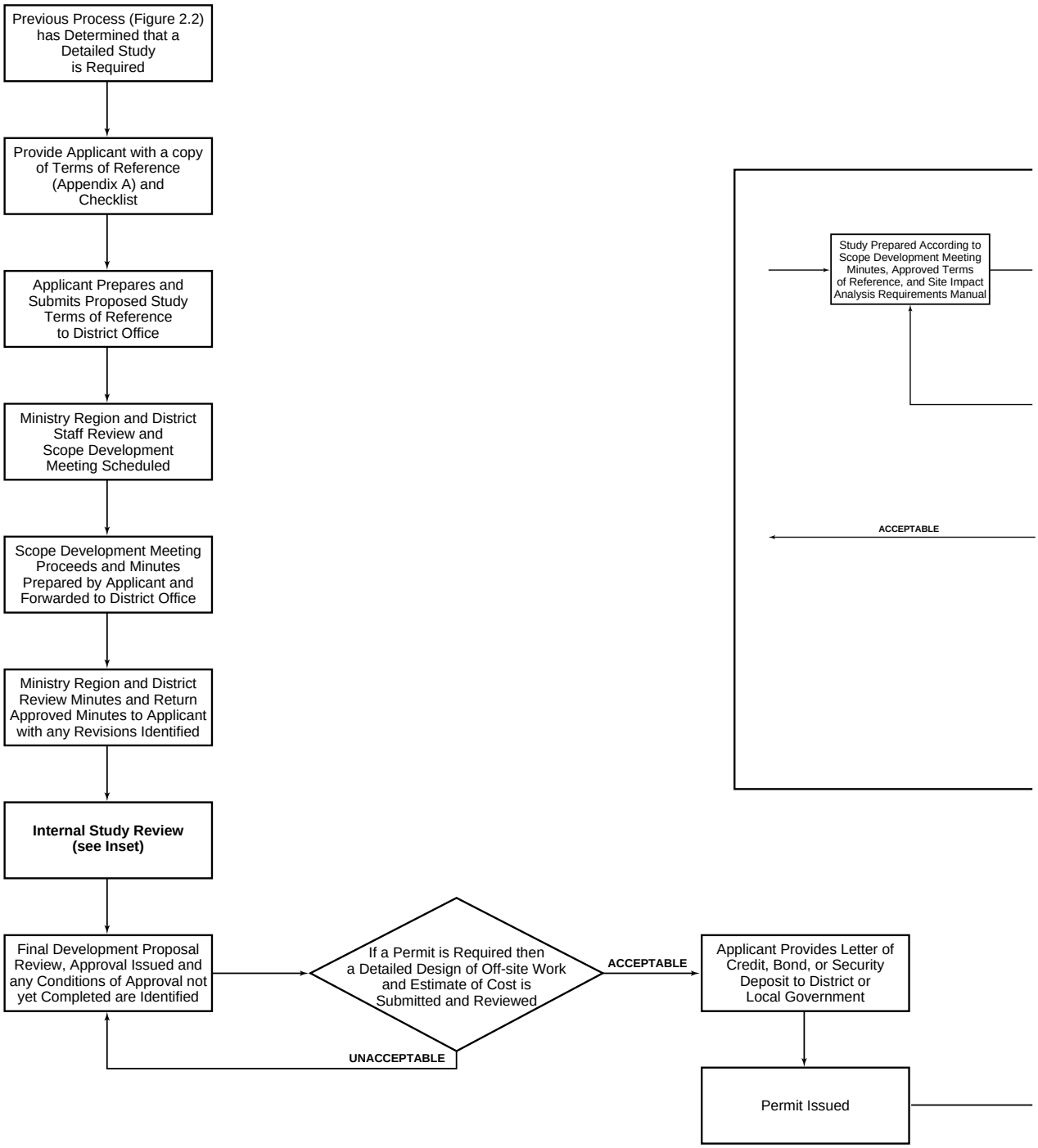
2. The applicant will provide a letter of credit, bond or security deposit to the district or Local Government.

3. The Applicant must contact the District Office prior to commencement and completion of the construction to arrange for interim and final inspections.

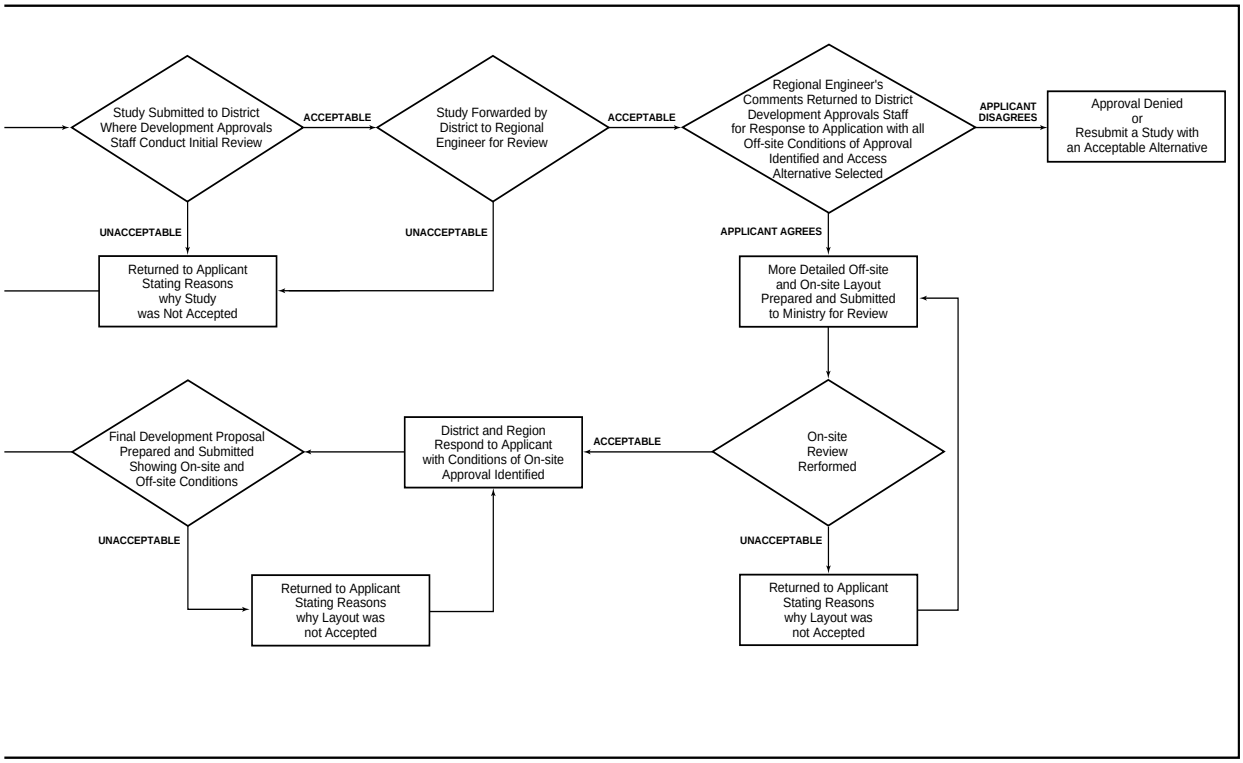
4. When the work is compete, a final inspection is required by Ministry staff and, where applicable, Local Government staff and other Reviewing Agencies.

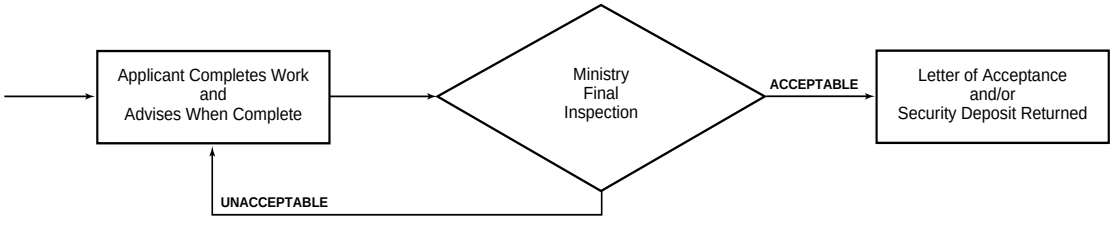
5. When the final inspection is acceptable, a letter of acceptance will be issued and the security deposit, where provided, will be returned.

Figure 2.3 - Detailed Site Impact Analysis Study Review Process



Inset – Internal Study Review





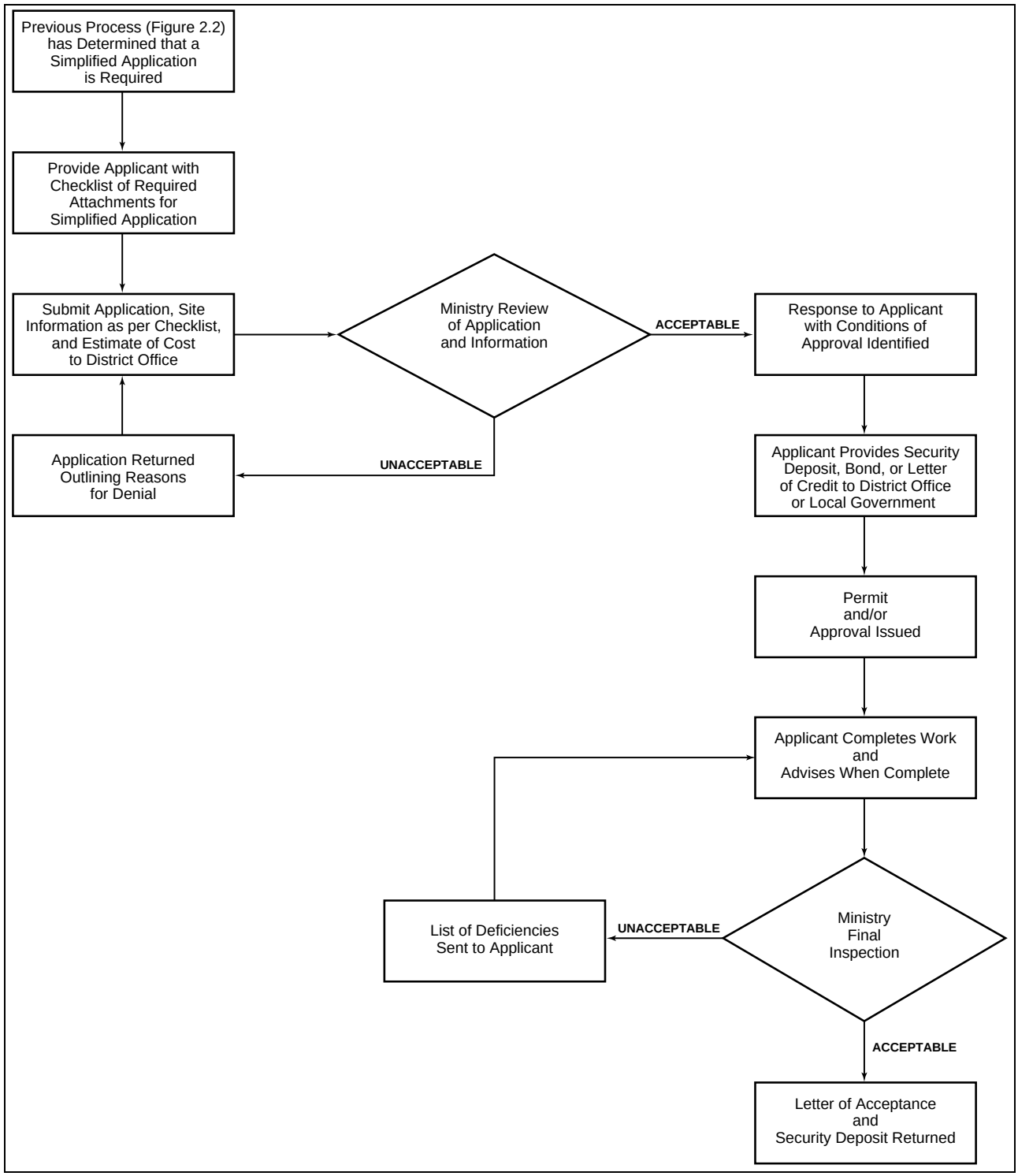
2.9 Simplified Application Review Process

If the Ministry has determined that a detailed Site Impact Analysis Study is not required as outlined in Section 2.3, then a simplified review process takes place. This simplified process has been established for sites which are not expected to have a high impact on the road network that they will connect to as determined in Section 2.3. The simplified application review process is outlined in Figure 2-4.

At the time when the application is requested, the District Office will outline the required information on the checklist in Table A.4 in Appendix A of this manual. The application and the required information will be submitted to the District Office where it will be accepted if all the information required in the Table A.4 checklist is provided. If the application and attached information are acceptable to Ministry staff, then the applicant will be notified of the conditions of approval.

If the applicant agrees to the conditions of approval specified for the site, then they must forward a letter indicating their acceptance to the District Office. If the application and it's attachments are not acceptable, then the study will be returned to the applicant stating the reasons why the study was not accepted. All submitted materials become the property of the Ministry. Once the applicant's letter of agreement to the conditions of approval has been received, the applicant can complete the process with Section 2.8.3 for permit issuance and inspection.

Figure 2.4 - Simplified Application Review Process



2.10 Stakeholders

The recommendations of Site Impact Analysis Studies have an impact on many different groups or "stakeholders" who may have a direct interest in either the development of the site itself or the effects of the traffic generated by the development. The following list should be used as a guide to identifying potential stakeholders and their level of interest in a Site Impact Analysis Study.

(a) **Ministry Regional Office** planning and traffic staff look at the long range and short range needs of the highway system and identify deficiencies and improvements. They are responsible for the development of the regional system plans and corridor plans which aid in determining the acceptability of development proposals and provide guidance for the protection of right-of-way and operational strategies. Ministry regional design staff review designs proposed by the applicant for access to the highway and provide technical assistance to the District Offices for more complex initiatives. In addition, regional traffic staff work with design staff to determine compliance of the applicant's design to Ministry standards for elements like laning, geometrics, signal progression, safety and volumes. Approving Officers have final approval authority over subdivisions under the Land Title Act and some developments under the Condominium Act.

(b) **Ministry District Office** staff are responsible for the day-to-day operation of the highway and also for the review and approval of zoning and access applications and the review of subdivision applications. The District Office serves as an initial point of contact for applicants with questions about proposed developments or requests for applications. The District Highways Manager may be contacted about design standards and must coordinate all construction inspections and approvals.

(c) **Municipal Engineering** staff will wish to ensure that municipal roads operate in a safe and efficient manner, that municipal design standards, land use and strategic planning requirements are met and that the impacts of new developments are mitigated.

(d) **Municipal Planning** staff are responsible for ensuring that the development complies with Official Community Plan policies, development permit guidelines, zoning regulations, Land Development Guidelines, municipal council needs and the general public interest within their municipal boundaries.

(e) **Regional District** staff are responsible for ensuring that the development complies with Official Community Plan policies, development permit guidelines, zoning regulations, Land Development Guidelines, rural design guidelines and the general public interest in areas that are not incorporated and others like the Greater Vancouver Regional District (GVRD) and the Capital Regional District (CRD).

(f) **Property Owners, Business Operators and Developers** will be interested in how their development or business will be affected by study conclusions and recommendations. In addition, they will be required to implement the recommendations for off-site improvements resulting from the study.

(g) **Property Owners, Residents, and Developers of Adjacent Lands** may be interested in the access treatments of a neighboring property. They may also be concerned about the impact of a development on their property. A coordinated approach to development can provide benefits in terms of phasing, shared facilities and cost-sharing of studies and improvements.

(h) **Traffic/Transportation Engineering Consultants** require a clear outline of the requirements for conducting site impact analysis studies in order to adequately coordinate their recommendations for the applicant, the Local Government and the Ministry. They are also interested in obtaining access to related planning studies, computer models, data and information about other developments in the area.

(i) **Project Management Consultants, Architects or Planning Consultants** who may be acting on behalf of the developer of the site require early information about standards, rates, bylaw requirements and review processes in order to determine their influence on the conceptual layout, schedule and the financial viability of the development.

(j) **Provincial and Federal Agencies** have varying degrees of involvement with development reviews and require their processes to be linked with those of other stakeholders. For example, an agency may require an environmental assessment for a development which has environmental impacts.

(k) **Residents Associations** may be concerned about the impact of the additional traffic generated by the new development, both on the local neighborhood roads and on "their" highways. They may also be interested in the accommodation of alternate modes including pedestrian and cycling access.

(l) **Emergency Services** may require inputs to access location and design to minimize response times.

(m) **BC Transit** will be interested in reviewing the impact of development on transit service, facilities and operations.

(n) **Road Users** will be interested on the impacts which developments and proposed road improvements have on their travel times and safety. Examples of road user associations include the B.C. Trucking Association, Cycling B.C., the B.C. Automobile Association, Downtown Parking Associations, etc.

2.11 Reference Materials

The following is a list of reference materials which were used in the development of this manual. Where possible, phone numbers and/or addresses have been provided for anyone wishing to obtain a copy of the reference. Information on how Ministry manuals and standards may be obtained is available by contacting the applicable Ministry District Office (Appendix B).

The information contained in this manual is based on accepted engineering practice and the following standard engineering references used by the Ministry of Transportation.

1. The current editions of the following manuals and standards of the Ministry of Transportation:

   (a) *Design Manual*

   (b) *Standard Specifications for Highway Construction*

   (c) *Traffic Engineering Manual*

   (d) *Traffic Control Manual for Work on Roadways*

   (e) *Manual of Standard Traffic Signs*

   (f) *Pavement Marking Standards Manual*

   (g) *Utility Policy Manual*

   (h) *Pedestrian Crossing Control Manual for BC*

   (i) *Traffic Volumes in BC*

   (j) *Interim Cycling Policy*

   (k) *Highway Functional Classification*

   (l) *Parking and Trip Generation Rates Manual*

   (m) *Manual of Aesthetic Design Practice*

2. *Traffic Access and Impact Studies for Site Development,* A Proposed Recommended Practice, Institute of Transportation Engineers, Washington, DC (1988) [(202) 554-8050]

3. *Manual of Geometric Design Standards for Canadian Roads*, Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

4. *Urban Supplement to the Geometric Design Guide for Canadian Roads*, Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

5. *Uniform Traffic Control Devices for Canada, (Metric Edition)* Transportation Association of Canada (TAC), Ottawa, as amended. [(613) 736-1350]

6. *Turning Vehicle Templates,* Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

7. *Highway Capacity Manual,* Special Report 209, Transportation Research Board (TRB), Washington, DC. [(202) 334-3238]

8. *Guidelines for Parking Facility Location and Design,* Institute of Transportation Engineers, (1994). [(202) 554-8050]

9. *Trip Generation*, fifth edition, Institute of Transportation Engineers, (ITE) Washington, DC (1991). [525 School Street, SW, Suite 410, Washington DC 20024-2729. [(202) 554-8050]

10. *Parking Generation,* Second Edition, Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

11. *Transportation and Land Development,* Institute of Transportation Engineers (ITE), Washington, DC (1988), [(202) 554-8050]

12. *Canadian Capacity Guide for Signalized Intersections*, Second Edition, (1995), Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

13. *Manual for Transportation Engineering Studies*, Fourth Edition, Institute of Transportation Engineers (ITE), Washington, DC (1994) [(202) 554-8050]

14. *Transportation and Traffic Engineering Handbook*,), Second Edition, Institute of Transportation Engineers (ITE), Washington DC (1982) [(202) 554-8050]

15. *Land Development Guidelines for the Protection of Aquatic Habitat*, Fisheries and Oceans and BC Ministry or Environment, Lands and Parks, (1993), Copies are available from Department of Fisheries and Oceans, Communications Branch, 555 West Hastings, Vancouver, B.C. V6B 5G3.

16. *Stream Stewardship: A Guide for Planners and Developers*, Fisheries and Oceans and BC Ministry or Environment, Lands and Parks, (1994/94), Copies are available from Department of Fisheries and Oceans, Communications Branch, 555 West Hastings, Vancouver, B.C. V6B 5G3.

17. *Community Cycling Manual: A Planning and Design*, Canadian Institute of Planners, (1990), 404 126 York St., Ottawa, Ontario, K1N 5T5.

18. *Shared Parking Planning Guidelines*, (Prepared by ITE Technical Committee 6F-52), Institute of Transportation Engineers (ITE), Washington DC (1995) [(202) 554-8050]

19. *Shared Parking,* Urban Land Institute, Washington DC (1983) [(202) 289-8500]

3. ESTABLISHING BASIC CRITERIA

Chapter 3 contains a review of the many basic criteria and key elements which are contained in a detailed Site Impact Analysis Study. These include:

- Definition of the study area
- Traffic data
- Links to other studies and plans
- Field observations
- Requirements for horizon years
- Determining peak periods for analysis
- Use of historic and current traffic counts
- General guidelines for establishing parking and trip generation rates
- Key elements involved in determining trip generation rates

3.1 Study Area

The extent of the area to be included in a Site Impact Analysis Study depends on many factors including the location and size of the proposed development and the existing conditions on the adjacent road network. In general, large, urban development proposals may require more extensive areas of analysis than smaller sites. This is because larger developments often have trip generations which are regional rather than local.

POLICY
In establishing the study area, care should be taken to ensure that the complexity of the study is in proportion to the impact of the development traffic. Unless the Ministry indicates otherwise in writing, the Site Impact Analysis Study must include all of the site's proposed access points and any other accesses and intersections within two kilometres of the property lines of the site.

The study area should be outlined in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting*. Elements which should be considered in determining the study area include:

- The type of land use
- The size of the development
- Existing traffic conditions
- Other developments about to take place within the study area
- Anticipated changes to the road network
- Future traffic conditions
- Other developments which are about to take place in the study area

In some urban settings, the Ministry may determine that analysis of only key or major intersections within the two kilometre study area is acceptable. Any request for a change to the scope of the study area must be requested and justified in the Proposed Study Terms of Reference and at the *Scope Development Meeting* prior to commencing the study. If the Ministry and any other Reviewing Agencies agree that the change in the scope of the study area is justified, it will be noted in the *Scope Development Meeting* minutes where it must be reviewed and approved by the Ministry before becoming part of the approved study scope.

Depending on the location of the proposed development, the Ministry may determine that the two kilometre radius study area is not adequate. In these cases, the study area will be defined for the applicant by the Ministry representative at the *Scope Development Meeting* and must be included in the Meeting minutes in order to become part of the approved study scope.

Conditions where it may be desirable to extend the study area could include:

- An intersection outside the two kilometre radius where there are known design, capacity or safety problems

- Adequate analysis of diverted linked trips requires a larger study area to be considered

- The development includes a large development area such as a regional shopping centre, sports arena or industrial park with numerous box warehouses that will have a major regional impact on the road network

- An already congested or hazardous area that could experience a significant deterioration in safety and/or capacity with the development generated traffic

The Ministry or any other Reviewing Agency must therefore reserve the right to modify the study area to ensure that it is appropriate for the location and the proposed development.

3.2 Traffic Data

The Ministry and some Local Governments collect traffic data on an annual basis (e.g. vehicle volumes, vehicle classification, vehicle speed, pedestrian movements, accident records, intersection counts, etc.). Data requirements may be matched with available data during the development of the Proposed Study Terms of Reference and at the *Scope Development Meeting*. Data collected by Local Governments may be acquired from the associated municipality or regional district and included as an appendix to the report if it is accepted for use by the Ministry. Data collected by the Ministry is available by contacting the following:

Transportation Officer
Information Management Section
Highway Planning and Policy Branch
3B - 940 Blanshard Street,
Victoria, B.C.
V8W 3E6
Phone: 387-7547
Fax: 387-7549

A suggested list of traffic data to be obtained for use in the study can be found in Table 3.1. It is important when undertaking a Site Impact Analysis Study to ensure that any existing data required for the study is current and has been collected in a manner which is acceptable to the Ministry for use in the study.

Where current acceptable traffic data is not available, the applicant and their traffic engineering consultant are responsible for the data collection required to complete the Site Impact Analysis Study. Failure to collect data according to Ministry requirements will result in a return of the study. For this reason, data collection proposals and requirements should be discussed in the *Scope Development Meeting*.

The Transportation Officer should be contacted at the address and number at the beginning of this section for more information on data collection methodologies which are acceptable to the Ministry. In general, traffic data must be collected, recorded and submitted consistent with standard engineering practice like that outlined in the following Institute of Transportation Engineers (ITE) publications:

(a) *Manual for Transportation Engineering Studies*, Fourth Edition, Institute of Transportation Engineers (ITE), Washington, DC (1994) [(202) 554-8050]

(b) *Transportation and Traffic Engineering Handbook*,), Second Edition, Institute of Transportation Engineers (ITE), Washington DC (1982) [(202) 554-8050]

Time periods selected for data collection should reflect local traffic operating characteristics and accurately capture peak conditions. All traffic data shall be adjusted for peak hour characteristics (i.e. season, peak hour factors, day-of-the-week, etc.) and converted to Design Hour Volumes for analysis. The traffic engineering consultant shall use engineering judgment to determine if the data is representative of normal conditions.

Table 3.1 - Traffic Data Checklist

Traffic Volumes *(Ministry and Local Government]*	1	Current and (if needed for analysis) historic daily and hourly vehicle volume counts	
	2	Recent intersection turning movement counts	
	3	Information on seasonal variations	
	4	Projected volumes from previous studies or plans	
	5	Vehicle classification counts	
Land Use *[Local Government]*	6	Current land use, densities, and occupancy in the study area	
	7	Approved development projects and planned completion dates, densities, and land use types	
	8	Anticipated development on other adjacent undeveloped parcels	
	9	Land use master plan or Official Community Plans (OCP)	
	10	Approved land use zoning and growth rates in the study area	
Demographics	11	Current and future population and employment within the study area by census tract or traffic zone (as needed for use in site traffic distribution)	
Transportation System *[Ministry, Local Government and On-Site Inspection]*	12	Current street system characteristics including; - direction of flow - number and width of lanes (particularly at intersections) - right-of-way - access control - median treatment - separate left and right turn lanes	
	13	Roadway functional classification according to; - Local Government's Official Community Plan (OCP) and Municipal Major Street Network Plan - Provincial Highway Functional Classification	
	14	Ministry's Photolog (this information can be provided on video)	
	15	Traffic signal locations (existing or planned), spacing, coordination, phasing, and timing	
	16	Other traffic control devices	
	17	Adopted local and regional plans	
	18	Cadastral as legal plan of area showing all road rights-of-way	
	19	Proposed new or improved roads in the study area	
	20	Transit service and usage	
	21	Pedestrian and bicycle routes, linkages, volumes and usage	
	22	Available curb and off-site parking facilities	
	23	Implementation timing and availability of funding for study area transportation improvements	
Other Transportation Data [*Ministry and Local Government]*	24	Accident history (three years, if available) adjacent to site and at nearby major intersections if hazardous area has been identified	
	25	Computer-based transportation planning models or their traffic projections for a horizon year	

Indicate data availability or requirement in right column: M (Ministry), LG (Local Government), O (Other) and A (Applicant)

Pedestrian movements must be counted for any intersection counts undertaken by the traffic engineering consultant. Cycling data should also be collected where a development may intersect an established bicycle route or where Transportation Demand Management measures are being considered.

Copies of all collected traffic data are to be included as an appendix to the study. This must include both raw data and summary statistics. Where available, electronic templates should be acquired from the Information Management Section and the traffic data submitted in this Excel compatible digital format. When the data is submitted to the Ministry along with the study and accepted, it will become the property of the Ministry and included in the Ministry data base so that it can be used by others who may conduct future studies in the same area.

If the applicant or their traffic engineering consultant has any questions regarding traffic data collection, they should contact the District Office who will be able to direct their call to the appropriate person.

3.3 Links to Other Studies and Plans

In undertaking a Site Impact Analysis Study, it is very important to consider all other studies and plans that may impact current and future traffic flows in the study area. Where available, informational items that should be obtained include but are not limited to the following:

(a) Municipal Major Street Network Plans

(b) Regional System Plans and Corridor Plans

(c) Ministry planning studies on upgraded or new arterial or highway facilities

(d) Access Management Plans

(e) Studies outlining proposed future accesses to adjacent lands

(f) Official Community Plans

(g) Municipal studies on:
- traffic operations
- downtown parking
- new roads
- transportation network planning
- Transportation Demand Management (TDM)

(h) Municipal and Regional District master plans for:
- sidewalk networks
- cycle path network plans
- pedestrian networks

(i) Municipal local area plans and traffic management plans

(j) Road and highway improvements including signalization, as provided for in the Ministry's current year program and the municipality's five year capital works program

(k) Regional District Plans, policies and programs

(l) Current BC Transit services including bus stop locations

(m) BC Transit five year service plans

(n) Other Site Impact Analysis Studies concerning other developments in the study area

(o) Inter-city bus service

In addition to these studies and plans, consideration must also be given to the functional classification of the surrounding road and highway network. The Ministry has established a functional classification system for provincial roads and highways as published in the publication entitled, "*British Columbia Highway Functional Classification*". The functional classification system groups various roads and highways into classes according to the character of the service they are intended to provide. These classifications and their permitted connections are given in Table 3.2.

Table 3.2 - Provincial Highway Functional and Service Classifications

Service Class	Strategic Class	Normally Connects With
Freeway	Primary Highway	Freeway Expressway Arterial
Expressway	Primary Highway Secondary Highway	Freeway Expressway Arterial
Arterial	Primary Highway Secondary Highway Major Road	Freeway Expressway Collector
Collector	Major Road Minor Road	Arterial Collector Local
Local	Local	Collector Local

The character of service of the functional classification is largely dependent on the relative emphasis given to mobility on the one hand and access to adjacent lands on the other. The Site Impact Analysis Study must consider the functional importance of the surrounding road and highway network in order to ensure that the functional classification is not compromised and that connections are made to appropriately classified roads.

A proposed development which is undergoing a site impact analysis must consider the provincial and local strategies and plans in order to determine land use consistency with system goals and objectives. It is the functional classification of the surrounding network of roads and highways that determines the required performance levels, the availability of direct access and the restrictions that may be required.

Consideration of the functional classifications of the surrounding road network will aid in the establishment of feasible access alternatives for the proposed site. It is therefore essential that this issue be discussed in the *Scope Development Meeting* with both the Ministry and the Local Government.

It is the responsibility of the applicant or their traffic engineering consultant to obtain this material. Identification of available materials to be included in the Site Impact Analysis Study should take place at the *Scope Development Meeting* and will be noted in the meeting minutes.

3.4 Field Observations

It is recommended that in undertaking a Site Impact Analysis Study, the traffic engineering consultant should make at least one visit to the site. This visit should be made after available information has been obtained from the Ministry, Local Government and any other Reviewing Agency. By this time, the traffic engineering consultant will be more familiar with the site and the issues that need to be addressed. Any traffic count or field measurement information not available could be obtained at this time. Items to be checked when in the field include:

(a) Posted speed limits

(b) Prevailing operating speeds

(c) Sight visibility to both the left and right for all proposed access points and adjacent intersections

(d) Presence of curb, gutter and sidewalk

(e) Width of pavement and shoulders

(f) Vertical and lateral clearances

(g) Curvatures

(h) Grades

(i) Presence of raised or painted medians

(j) Turn restrictions at all intersections

(k) Signal heads at signalized intersections

(l) Location of access points to properties both adjacent to and on the opposite side of the road and permitted movements on each

(m) On-street parking regulations and availability

(n) Current uses of adjacent sites

(o) Restricted Use lanes including High Occupant Vehicle (HOV) lanes and Transit Only lanes

(p) Street lighting

(q) Bicycle lanes or bicycle travel on adjacent roads and bicycle facilities on-site

(r) Bus stops

(s) Unopened road right-of-way allowances

(t) Potential for frontage or backage roads or linkages to other local roads

(u) Drainage

In addition, photographs of the site can provide an office record of the site and its environment for both the traffic engineering consultant and the agencies reviewing the study and its recommendations. It is very common to require additional information once the site visit is over and a good photographic record can often provide this information.

3.5 Horizon Years

Horizon years for analysis are typified by:

- The estimated completion date of the proposed development
- Development phasing
- Regional planning horizons (e.g. Year 2021 to coincide with the Transport 2021 Study)
- A capital improvement program planning horizon (e.g. 5 and 10 years)
- Major transportation system changes

In addition, if the development size is significant and the development is constructed in phases, then the completion of each phase may represent a horizon year. Further information about estimating future background traffic can be found in Section 4.3. Information on the impacts of phased developments on trip generation rates can be found in Section 3.9.2 of this manual.

3.5.1 Local Government Requirements

There is no standard practice among the various Local Government agencies that request studies for determining horizon years. Some require five years for smaller developments and ten or more years for larger developments. Others require a straight ten year horizon.

In larger urban centres where computerized transportation models have been completed, the models will establish horizon years. For example, the horizon years of 2006 and 2021 were established for the Transport 2021 Study by the Greater Vancouver Regional District's computer based transportation planning model (EMME/2). The Capital Regional District (CRD) model established horizon years of 2000 and 2010. The City of Kelowna model established horizon years of 1998, 2003, 2008, 2013 and 2018. The Local Government should be contacted to determine the appropriate horizon years required by that agency.

3.5.2 Ministry Requirements

POLICY
Unless the Ministry indicates otherwise in the Scope Development Meeting*, the following horizon years should be used for the projection of base traffic for a non-phased development:*

***Horizon Year #1** - Day One (opening day)*
***Horizon Year #2** - Day One + 5 years*
***Horizon Year #3** - Day One + 10 years*
***Horizon Year #4 -** Day One + 15 years*

Outside of large established metropolitan areas of the province, a fifteen year horizon year is necessary to reveal the full extent of the mitigation required by a new or changed development. In areas of the province with high growth in traffic volumes and/or existing low levels of service on the study area network roads, the Proposed Study Terms of Reference for the Site Impact Analysis Study may wish to provide a justification for removal of the requirement to study Horizon Year #4. The elimination of Horizon Year #4 must be discussed at the *Scope Development Meeting* and if it is acceptable, it will be noted in the Meeting minutes where it must be reviewed and approved by the Ministry before becoming part of the approved study scope.

In addition, if the development is to be phased, the analysis must be done for the end of the horizon year for each of the major phases and for the year of ultimate full "build-out" in order to determine what improvements are required at these times. Horizon years for phased developments may extend beyond ten or fifteen years and therefore, analysis of additional horizon years will be required.

The construction schedule for road improvements may be linked to these phases provided that these future requirements are linked to the zoning in such a way as to inform subsequent property owners of these future obligations. This may be done through the zoning bylaws themselves, through restrictive covenants or through phased or spot zoning which would ensure that phases of the development are accompanied by the required improvements.

The method by which the phased improvements are to be linked to the phases must be presented in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. This will require the review and approval of both the Ministry and the Local Government as a Reviewing Agency and will become part of the final agreement for site impact mitigation on a phased development.

General information on traffic projections for the approved horizon years can be found in Section 4.3 of this manual. The base traffic must be projected to each approved study horizon year. The Proposed Study Terms of Reference must indicate the appropriate horizon years for the site as well as the method or combination of methods considered appropriate for the traffic projections.

Where future volumes have already been determined by the Local Government or the Ministry, these volumes will be provided and must be used. Unless network improvements and major highway upgrading projects are currently funded, the Site Impact Analysis Study should not assume any reduction to the background traffic volumes that would result from planned future projects.

In some municipalities, there may be an existing computer based transportation model which could be used to determine future traffic volumes on the road network. In such instances, the Proposed Study Terms of Reference must indicate whether horizon years have to be modified to match those of the model or whether adjustments must be made to the model's projections. It is important to note that such computer models may only be used to review the impacts of network road issues and should not be used directly to determine individual access drive requirements.

It should also be noted that some traffic models already contain estimated trips for future horizon years from developments. If it can be shown that a development is already included in model volumes, then the horizon years must be reviewed to ensure they still match with highway upgrading projects, corridor plans and Municipal Major Street Network Plans. More information on the use of computer models can be found in Section 4.3.2 of this manual.

For certain sites, the Ministry or Reviewing Agencies may require additional horizon years to be evaluated. In all cases, the required horizon years and the allowable network improvements must be outlined in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. The Applicant will note the approved horizon years and allowable network improvements (if any) in the Meeting minutes where it must be reviewed and approved by the Ministry before becoming part of the approved study scope.

3.6 Determining Peak Periods for Analysis

The primary purpose of requesting a Site Impact Analysis Study is to demonstrate what effect the development will have on the transportation system and to identify what improvements may be required. In general, the maximum impact occurs during the site peak hour and/or during the peak hour of the adjacent roads.

POLICY
The time period(s) that provide the highest cumulative directional traffic demands should be used to assess the impact of site traffic on the adjacent street system and to define the roadway configurations and traffic control measure changes needed in the study area. The peak hour traffic volume(s) determined in this way become the design hour volume(s) for the site.

Chapter 2 of the Ministry's Parking and Trip Generation Rates Manual contains a detailed description of how the peak hour volume(s) of a development site are established. However, the site peak hour(s) may not occur at the same time as the adjacent street peak hour(s). In this case, additional analysis may be required for any of the adjacent street peak hours that are required to properly assess the impacts of the site. Seasonal peaks must also be considered.

The highest traffic volumes on the adjacent transportation system typically occur during the morning and afternoon weekday peak periods with other lesser peaks at noon and on Saturday afternoon. More detailed information about these peak periods can be found below in Sections 3.6.1 to 3.6.3.

When selecting peak periods for analysis, consideration must be given to the peak traffic characteristics of the:

- Proposed development
- Adjacent land uses
- Adjacent road and highway network

In general, the peak traffic generated by the site should be analyzed for the purpose of determining the requirements for on-site access design features such as vehicle queuing storage (magazine) length, number of lanes and internal circulation requirements. The adjacent street peak hour traffic should be analyzed to determine the required improvements to the existing or proposed adjacent road network for all access alternatives being evaluated. In addition to reviewing the site peak hour(s) and the adjacent street peak hour(s), individual turning movements or operations must be reviewed to determine whether they may become critical during secondary peak periods.

POLICY
The Ministry requires that the study shall include an analysis of the highest peak hour volume for each turning movement. Saturday afternoon traffic shall also be analyzed if the development is to be part of a significant retail area.

In general, periods which should be considered for analysis include:

- Weekday morning street peak hours
- Weekday afternoon street peak hours
- Site peak hours
- Saturday and Sunday peak hours
- Any other time which Ministry or Reviewing Agency staff consider to have the potential to be the design hour volume

It will also be necessary to determine the total average daily traffic generated by the site. This provides a measure of the overall magnitude of traffic generated by the site.

The proposed peak hour(s) to be evaluated in the study should be presented and justified in the Proposed Study Terms of Reference. Then, at the *Scope Development Meeting*, the Ministry and other Reviewing Agencies will determine whether the proposed peak period(s) are acceptable as the Design Hour Volume(s) and suggest any other peak periods which must be evaluated. The Applicant will note the approved design hour(s) in the Meeting minutes where it must be reviewed and approved by the Ministry before becoming part of the approved study scope. These and any other peak hour(s) selected for analysis must be documented in the Site Impact Analysis Study.

3.6.1 Afternoon Peak Hour

The afternoon street peak period typically occurs on a weekday between 3:30 p.m. and 5:30 or 6:30 p.m. when the transportation system experiences the highest combination of work, personal, shopping and recreational trips. The actual peak hour on the street network can normally be determined by analyzing the peak hours from weekly traffic count data.

While some land uses may have peak generating times outside of these street peak hours, the cumulative effect of both the street and site generated traffic volumes means that the critical time period is often the afternoon peak hour. An example of this concept is illustrated in Figure 3.3.

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Figure 3.3 - Example of Variation in Hourly Volumes on Urban Streets

3.6.2 Morning Peak Hour

The weekday morning peak period typically consists of work and school trips. In the morning peak hour the street traffic volumes may be lower but the peak direction is reversed and for this reason it may be a secondary peak hour and it may be necessary to analyze these movements to determine the requirements for access design and intersection improvements like turning lane storage length in the study area. This is particularly important for land uses like office buildings and industrial parks which have a high number of work trips in the morning peak hour.

3.6.3 Other Peak Hours

For some land uses like industrial or warehouse, truck trips entering or leaving the site at noon can also have a significant impact on the operation of the road network and should be considered. Shopping centres typically generate their highest volumes on a Saturday afternoon and if a new development is located in the midst of an existing commercial area, traffic volumes on the street system may already be high at that time. A summary of typical peak traffic flow hours for selected land uses is given in Table 3.4. Section 5.3.2 contains information regarding on-site design requirements specific to trucks and service vehicles.

Table 3.4 - Typical Peak Hours of Traffic for Selected Land Uses

Land Use	Typical Peak Hours[a]	Peak Direction
Residential	7:00 - 9:00 am weekday	Outbound
	4:00 - 6:00 pm weekday	Inbound
Regional Shopping	5:00 - 6:00 pm weekday	Total[b]
	12:30 - 1:30 pm Saturday	Inbound
	2:30 - 3:30 pm Saturday	Outbound
Office	7:00 - 9:00 am weekday	Inbound
	4:00 - 6:00 pm weekday	Outbound
Industrial	Varies with shift schedule	
Recreational	Varies with type of activity	

[a]Hours may vary based on local conditions.
[b]Period of maximum weekday traffic impact.

3.7 Use of Historical and Current Traffic Counts

Where available, current and historic traffic count data may be obtained from the Ministry as outlined previously in Section 3.2. Local Governments may also have data for the roads under their jurisdiction.

3.7.1 Establishing Existing Volumes

In establishing traffic volumes that represent existing conditions, it may be necessary to factor up counts taken in previous years to represent the current year. In general, counts more than three years old should not be used and the applicant will be responsible for collecting more up-to-date traffic counts.

Ideally, all spot intersection turning movement counts should be reviewed to determine if any adjustments should be made to account for any seasonality. Also, a comparison should be made of any available 30th highest hourly volume data available from the Ministry with peak hour intersection counts or traffic counters. Then adjustments may be made to express all volumes as design hour volumes (DHV) for analysis purposes.

Traffic volumes for the road and highway network in the study area must be balanced when there are significant disparities between adjacent intersection counts or short counts and there are no accesses or major traffic generators to account for the difference in traffic volumes.

Any proposed adjustments should be recorded in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. The approved adjustments will be noted in the Meeting minutes where they must be reviewed and approved by the Ministry before becoming part of the approved study scope. The adjustments selected for analysis must be documented in the Site Impact Analysis Study.

3.7.2 Daily vs. Peak Hour Volumes

When using data, care should be taken to differentiate between annual or summer average daily traffic (AADT and SADT) and peak hour or 30th highest hourly volumes. This is because a road which is at or close to capacity will have its hourly volume increase at a very slow rate (perhaps less than one percent per annum) whereas the daily volume may continue to increase at a far higher rate (perhaps at five percent per annum or higher) as the peak hour spreads.

All traffic data shall be adjusted for peak hour characteristics (i.e. season, peak hour factors, day-of-the-week, etc.) for analysis. The traffic engineering consultant shall consult with District and Local Government staff to determine if the data is representative of normal peak conditions. The proposed peak hour volume(s) will be presented in the Proposed Study Terms of Reference and reviewed in the *Scope Development Meeting*. The approved peak hour volume(s) will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

3.8 General Guidelines for Establishing Parking and Trip Generation Rates

In order to manage and maintain existing and future highway facilities, it is essential that the amount of new traffic entering the road system from adjacent developments be assessed and the access and layout configuration of the developments be designed in such a manner that the integrity of the adjacent road system is maintained. Poorly designed access and site layouts can cause safety hazards and congestion. The parking and trip generation rates for the site are two of the key aspects to be considered when determining the requirements for and adequacy of the access design and site layout of a development.

More detailed information is available in the Ministry's "Parking and Trip Generation Rates Manual". However, the basic elements of parking and trip generation related to Site Impact Analysis Studies are provided in this manual as follows:

- Section 3.8 of this manual will outline the basic requirements for establishing parking and trip generation rates for a proposed site.
- Section 3.9 of this manual will provide more detailed information about key elements which can affect trip generation rates.
- Section 5.2 of this manual outlines detailed information about the key elements which can affect parking rates as well as parking layout and dimension requirements.

3.8.1 Ministry's Parking and Trip Generation Rates Manual

POLICY
The Ministry's Parking and Trip Generation Rates Manual will be used to establish the parking and trip generation rates for use in a Site Impact Analysis Study.

The Ministry's "Parking and Trip Generation Rates Manual" uses the data from the Institute of Transportation Engineers (ITE) publications entitled, *"Trip Generation"* and *"Parking Generation"*, combined with local BC data to determine the rates which apply to land uses in the following categories:

- Residential Developments
- Commercial Developments
- Office Developments
- Restaurant Developments
- Institutional Developments
- Industrial Developments

- Miscellaneous Developments

The parking and trip generation rates which are proposed for use should be recorded in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. The approved parking and trip generation rates will be noted in the Meeting minutes where they must be reviewed and approved by the Ministry before becoming part of the approved study scope. The parking and trip generation rates selected for analysis must be documented in the Site Impact Analysis Study. The policy regarding Local Government rates is outlined in Section 3.8.4.

3.8.2 Rates for Land Uses Not Included in the Ministry Manual

The ITE publications referenced above in Section 3.8.1 also contain land use categories which are not yet included in the Ministry's Parking and Trip Generation Rates Manual. These ITE rates may be used for land uses which are not in the Ministry Parking and Trip Generation Manual if their use is justified in the Proposed Study Terms of Reference and accepted in the *Scope Development Meeting* by the Ministry.

3.8.3 Establishing New Rates

When the proposed land use is not included in either the Ministry's Parking and Trip Generation Rates Manual or the ITE publications referenced above in Section 3.8.2, the Proposed Study Terms of Reference for the Site Impact Analysis Study should justify this and outline how the rate will be established.

This proposal will then be discussed at the *Scope Development Meeting* with the Ministry and other Reviewing Agencies to determine the acceptability of the rate or rate survey outlined in the Proposed Study Terms of Reference. The approved rates or rate survey will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

The data for a rate survey must be collected according to Chapter 8 of the Ministry's Parking and Trip Generation Rates Manual. All data collected to establish the rates must be submitted as an appendix to the study. Documentation of how the rate was established must be included in the Site Impact Analysis Study. If approved, data used to establish the rates will become the property of the Ministry and may be published in future revisions of the Parking and Trip Generation Rates Manual.

3.8.4 Local Government Rates

Local Governments may have their own parking and trip generation rates which may differ from the Ministry's rates. Local Government parking rates are defined by bylaw. The Institute of Transportation Engineers (ITE) reference documents are generally the source referenced by most municipalities in British Columbia.

POLICY
The parking and trip generation rates of both the Ministry and Local Government must be provided and the higher of the two rates shall be used.

3.8.5 Applying Variances to the Rates

There is an emerging attitude that suburban activity centres need more thoughtful structuring or restructuring in order to intensify land use and introduce modes of transportation other than the automobile both to and within such activity areas. Land use planning should anticipate that low-density, automobile oriented suburban activity areas can evolve into urban centres.

Public policy can influence and shape this emerging land use trend through mixing land uses, providing alternatives to the automobile and integrated vertical land use rather than disconnected horizontal multi-use projects. Achievement of these goals will depend on:

- The market support for such concepts
- The amount of integration provided between these goals
- The Local Government development planning and approval processes
- The development facility design and coordination with regional and local plans

The ITE Trip Generation and Parking Generation reports are informational reports with rates based on surveys done throughout North America and the rates at a specific site may differ due to local characteristics. For this reason, the applicant may wish to collect data and establish points for a particular land use to determine the site specific impacts which may affect the rates at that site.

Chapter 4 of the Ministry's *Parking and Trip Generation Rates Manual* discusses several factors and issues associated with parking and trip generation. It emphasizes:

- The land uses affected by each factor
- How the factors can influence parking and trip generation rates
- The issues that need to be considered when evaluating developments

The Ministry's policy on parking and trip generation rate reduction can be found in Section 4.16 of the Ministry's *Parking and Trip Generation Rates Manual*. In general, available research indicates that the quantitative impact of individual factors on parking and trip generation rates cannot be reliably predicted. However, the Ministry wishes to encourage a reduction in the demand for vehicle trips, and will consider variances where they are supported by acceptable technical justification and documented in the Site Impact Analysis Study.

POLICY
Ministry staff will consider allowing for a variance process whereby applicants may present technical evidence to support their request for a reduced rate. The applicant's case would then be reviewed by one or more Professional Engineers in the Ministry and a variance issued in writing if considered appropriate. Such a variance would be based on the individual circumstances and may or may not revise the rates in future editions of the Ministry's Parking and Trip Generation Rates Manual for that land use.

The request for a parking and/or trip generation rate variance process must be justified in the Proposed Study Terms of Reference for the Site Impact Analysis Study. The request will be reviewed and discussed at the *Scope Development Meeting.*

If the Ministry and other Reviewing Agency agree that a rate variance may be considered for the site, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of a variance does not bind the Ministry or Reviewing Agency to accept the variance after the analysis is complete. Variances on rates which are established by Local Government by-law, must be approved in writing by the applicable Local Government representative. It should be noted that not all Local Governments will allow variances on parking and trip generation rates.

3.9 Key Elements Involved in Determining Trip Generation Rates

In addition to the basic requirements for establishing trip generation rates outlined previously in Section 3.8, the following key elements may also be considered for use in a Site Impact Analysis Study.

- Pass-by trip percentages
- Phased Developments
- Accounting for Internal Trips in Mixed Use Developments
- Diverted linked trip percentages

When these key elements are being considered for a Site Impact Analysis Study, all possible uses of the development shall be considered in determining the trip generation rate. If applicable, the site zoning, adjacent site zoning, highest and best use of the land and any information on known tenants shall be provided in the analysis of these key elements.

Use of these additional key elements in determining site trip generation rates and network vehicle trips must be justified in the Proposed Study Terms of Reference for the Site Impact Analysis Study and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that use of these key elements may be considered for the site, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of these additional key elements does not bind the Ministry or Reviewing Agency to accept the results presented in the study.

3.9.1 Pass-by Traffic

In general, trip generation analysis yields the number of vehicle trips that a site is expected to generate at its driveways. However, some land uses may not generate vehicle trips that are all new to the surrounding road and highway network. A proportion of the site trips may be diverted from vehicle trips already passing by on nearby roads. These are pass-by trips (also called captured trips). It is important to note, however, that the trip generation rates at the accesses themselves will not be affected by pass-by trips. Only the estimated number of additional trips on the surrounding road and highway network will be affected.

A thorough analysis is required to account for pass-by trips since these trips may be easily underestimated or overestimated. The total trip generation should be split up into volumes of new trips and volumes of pass-by trips based on survey results for the peak hour(s) being analyzed.

The Proposed Study Terms of Reference may also wish to request Ministry and Reviewing Agency approval of other sources of the percentage of pass-by trips. Then estimates can be done for both:

- A normal trip distribution (for new trips)
- A trip distribution for pass-by trips (giving strong consideration to the commuting work trip)

Two separate trip assignments can then be performed based on the two distributions. Pass-by trips can be accounted for in the impacts to traffic on the adjacent road network. Pass-by analysis must consider the following elements in the trip assignments:

- Pass-by trips may use a different outbound route than inbound route
- Diversions may require removing trips from some existing movements and assigning them to others
- The pass-by trip assignments may be sensitive to the peak hour selected as well as the development size

Upon completion of the initial site traffic assignment, the results should be reviewed to see if the volumes appear logical given the characteristics of the road and highway system and the trip distribution. Adjustments should be made if the initial results do not appear to be logical or reasonable. Documentation of all calculations, assumptions, studies and sources used in establishing pass-by trips must be included in the Site Impact Analysis Study.

3.9.2 Phased Developments

Many large development projects are constructed in a phased approach which may by spread out over periods of up to ten years or more. The subject of horizon years associated with phased developments was addressed earlier in Section 3.5. The impact of phasing on trip generation rates is addressed here.

If the development is to be phased, then it may not be necessary to provide all road improvements with the first phase of the project. Instead, the number of trips generated at the completion of each phase may be identified as well as the improvements required to adequately and safely accommodate the trips associated with each phase.

It is important when undertaking studies for such phased developments to ensure that the analysis of projected traffic conditions be carried out at the end of each major phase. This analysis includes:

- Background traffic
- Planned road and highway network improvements
- Analysis of access points
- Level of service at intersections
- Identifying required improvements at each phase

The improvements required for each phase of the development will then be determined. If substantial changes occur between phases which affect the analysis and recommendations of the Site Impact Analysis Study, the original study will have to be reviewed using the most up to date information. Also, monitoring of the first phase traffic may result in the requirement for additional analysis which would incorporate adjusted traffic projections for later stages.

Where available, the land use as designated in the Local Government Official Community Plan (OCP) should be used in the analysis for phased developments. Where nearby land uses are unknown, the land use which represents the highest trip generation rate according to the existing zoning should be used.

A schedule of the required improvements must be provided for phased developments in order to determine the timing of the various improvements tied to the stages of the development. Before agreement can be given to the phasing of improvements, the applicant must provide a traffic phasing agreement. This may be done through the zoning bylaws themselves, through restrictive covenants or through phased or spot zoning which would ensure that phases of the development are accompanied by the required improvements.

The method by which the phased improvements are to be linked to the phases must be presented in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. This will require the review and approval of both the Ministry and the Local Government as a Reviewing Agency and will become part of the final agreement for site impact mitigation on a phased development.

For a larger phased development proposal where the characteristics of the facility cannot be adequately documented, it may be appropriate for the Ministry and other Reviewing Agencies to review on a phase by phase basis (i.e. approval for subsequent phases will be based on the performance of operating phases in terms of trip generation, parking, roadway operation, etc.).

The Proposed Study Terms of Reference must provide information about whether a phased approach to the development will be requested. Ministry and Local Government staff will discuss the request at the *Scope Development Meeting* and provide details of an acceptable approach to the phased development for the study.

3.9.3 Accounting for Internal Trips in Mixed Use Developments

For mixed use developments like hotel and retail or residential and retail, some of the trips calculated as being generated by one use may also be traveling~~travelling~~ to another use on the same site. In this case, these trips do not need to be included in the trip generation calculations more than once. Internal trips can be a significant factor in the travel patterns at multi-use developments.

However, very few studies have been conducted to quantify the impact of internal trips on the trip generation rates of mixed use developments. Therefore, requests for reductions in trip generation rates to account for such internal trips must be outlined in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting*. Reductions in rates due to internal trips will only be accepted if they are clearly justified by documented studies which are accepted by the Ministry and other Reviewing Agencies.

3.9.4 Diverted Linked Trips

Diverted linked trips are trips attracted from the traffic volume on roadways within the vicinity of the development but which require a diversion from that roadway to another roadway to gain access to the site. The roadways impacted in this way could include streets or freeways adjacent to the development but without direct access.

It is essential that diverted linked trips be recognized when examining the traffic impact of a development on the adjacent road and highway network. Consideration of diverted linked trips should be given in the selection of the study area, horizon years and required roadway improvements. Analysis of diverted linked trips should be identified in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting.*

4. NETWORK ANALYSIS TECHNIQUES

Various road network analysis techniques are discussed in Chapter 4 including:

- Existing conditions
- Impacts of transportation system changes
- Traffic Projections
- Trip distribution and trip assignment
- Capacity and corridor analysis
- Safety analysis
- Sight distance analysis
- Intersection capacity analysis
- Traffic signal warrants and phasing
- Weaving analysis
- Mitigation measures
- Access and road network improvement alternatives
- Transportation demand management
- Environmental considerations
- Development of cost estimates

In this chapter of the report, the analytical techniques to be used in a Site Impact Analysis Study are documented. This is not intended to limit analysis techniques but rather to act as a guide to the practitioner.

4.1 Existing Conditions

The Site Impact Analysis Study should include a review of existing conditions in the study area without the traffic generated by the proposed development or the proposed change in use of an existing development. This will determine existing road, highway and intersection volumes and any available capacity. This analysis and documentation in the report should include the following components:

- Existing zoning and uses on all lands within the study area including the site of the proposed development
- Average daily and peak hour traffic volumes on the surrounding road and highway network
- Percentage of trucks as well as existing and proposed truck movements
- Traffic controls
- Peak hour volumes for each movement at all intersections within the defined study area
- Intersection lane configurations and geometrics
- Level of service calculations at all signalized and unsignalized intersections
- Traffic signal warrant calculations where appropriate
- Any known safety and operational problems within the study area
- Traffic accidents
- Visibility restrictions
- Accesses within the study area
- Transit service including mode, frequency, schedule, routes and stop locations
- Pedestrian facilities including sidewalks, walkways, and crosswalks
- Special provisions for bicycles including bike lanes and bike paths

In general, Sections 3.2 and 3.3 of this manual should be consulted for a listing of various informational items which may assist in the establishment and documentation of existing conditions. In particular, the Municipal Major Street Network Plan and the Official Community Plan should be consulted to confirm existing and future road classifications. It is essential that the function of each class of road and highway be preserved.

A listing of the materials to be used in the establishment of existing conditions must be provided in the Proposed Study Terms of Reference for the site and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that these items properly reflect existing conditions for the study area and the site, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.2 Impacts of Transportation System Changes

As was noted in previous sections, there are many sources of information as to the future transportation plans of either the Ministry or the relevant Local Government. Sometimes, these proposed improvements are long term with no current funding or definitive time frame for implementation.

POLICY
Unless the approved minutes of the Scope Development Meeting *indicate that network improvements and major highway upgrading projects are currently funded and can be used, the Site Impact Analysis Study should not assume any reduction to the background traffic volumes that would result from planned future projects.*

In undertaking Site Impact Analysis Studies, the transportation network may have to be examined both with and without such improvements. Since an improvement like an alternate route may decrease traffic volumes on the existing road network, it is important to be able to identify what improvements may be required both with and without the proposed network improvements in place so that the impact of the system improvements on the site study recommendations can be determined.

The use of transportation system changes in the study must be outlined and justified in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting*. The Applicant will note the approved transportation system changes in the Meeting minutes where they must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.3 Traffic Projections

Estimates of the future background traffic or "base" traffic in the study area are required to complete the analysis of horizon year conditions on the surrounding road network. General information about appropriate horizon years for traffic projections can be found in Section 3.5 of this manual. The three primary methods of projecting base traffic are:

- The build-up method
- The use of area transportation plan or modeled volumes
- Projection of past trends or growth rates into the future

All three primary methods have their appropriate use. The build-up method will normally provide the most accurate results especially when considering developments in areas of moderate growth over a period of 10 years or less. The use of transportation plan data or modeled volumes is generally most applicable to large regional projects which will develop over a long period of time in an area of high growth and is generally the second best method. The use of growth rates relies on the availability of existing and historic traffic count data but does not readily take into account the possible impacts of changes to the transportation network or local land uses. If neither of the first two methods can be used, then the growth rate method may be appropriate.

The base traffic is an estimate of the traffic volumes which will occur in the study area without the proposed site development (or change in use). Projection of base traffic will often utilize a combination of the above three methods. Traffic projections must be done for each approved horizon year as outlined in the approved *Scope Development Meeting* minutes.

The Proposed Study Terms of Reference must outline and justify which traffic projection method or combination of methods is appropriate for the proposed Site Impact Analysis Study. If the Ministry and other Reviewing Agency agree that the proposed methodology is appropriate for the study area and the site, it will be noted in the *Scope Development Meeting* minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.3.1 Build-Up Method

The build-up method is appropriate for study areas where several other major developments are occurring during the same period as the proposed development. This technique can more accurately reflect local area traffic patterns that will change as a result of limited or moderate adjacent development or that are in an area where available traffic projections are not accurately known. This method consists of:

- Projecting peak hour traffic to be generated by approved and anticipated developments in the study area
- Assigning the projected traffic to the projected street system
- Adding in any through traffic which has both trip ends outside the study area

Trips already made in the area street system should be accounted for in order to avoid double counting.

4.3.2 Use of Area Transportation Plan or Modeled Volumes

Regional or sub-regional transportation plans and models usually project traffic volumes on major roads and highways for approximately 20 years into the future. Sometimes interim horizon year projections are also made. Projected traffic volumes from transportation plans or models are particularly applicable to the following types of studies:

- Very large projects with area-wide or regional impacts
- Situations where the traffic projections have local credibility (i.e. land use and demographic projections and their acceptability must be reviewed with the Ministry and other Reviewing Agencies)
- The transportation model has a level of network detail required for site traffic analysis in the study area

The decision process in which modeled information is used is generally oriented towards determining the basic number of roadway lanes and right-of-way requirements. The transportation model can show changes in traffic patterns on area roads and the reassignment of adjacent traffic to alternative routes. However, computerized transportation models may only be used to review the impacts of network road issues and are not accurate for the level of detail needed for operational intersection analysis and individual access drive requirements.

It is more typical to use the transportation model to provide future forecasts of base traffic and the distribution pattern of trips generated by the development site or the zone that the site is in. Then other techniques can be used to carry out the assignment of generated trips for the specific site. The impacts of computer models on horizon years was discussed previously in Section 3.5.2 of this manual.

4.3.3 Trends or Growth Rate Method

This is one of the simplest approaches to use although it is very often the source of the greatest errors. The growth rate method is based on the assumption that recent traffic volume growth rates will continue to the horizon year(s) or will change predictably. Behind this is the underlying assumption that:

- Variations in traffic volumes correspond to the economic climates that are experienced in British Columbia

- Development trends both within and external to the study area will continue at approximately the same rate as in the past

If recent growth rates are not expected to continue, then another method of forecasting should be considered.

Average daily traffic volumes and/or individual intersection turning movements should be used to develop the growth rates. Seasonal variations in traffic volumes should be considered. It is important that the growth rates be based on traffic data taken over at least a ten year period. The growth rate may then be determined by analyzing the patterns of this data. It is considered worthwhile to prepare a plot of the historic growth figures.

Caution should be exercised when using this method since it is often insensitive to localized changes. Other methods may be necessary to take into account changes to the transportation network or other extensive nearby developments that have occurred or will occur during the study period. Also, average daily traffic growth does not always parallel peak hour traffic growth.

In some cases, Ministry staff may already have determined the growth rate of the highway in which case this value will be provided at the *Scope Development Meeting* and must be used. Where the growth rate is to be developed in the Site Impact Analysis Study, the methodology and the rate must be approved by the Ministry and other Reviewing Agencies prior to use in the Site Impact Analysis Study.

4.4 Trip Distribution

Trip distribution refers to the estimates of the origins and destinations of site generated trips. The total trips generated by the development must be distributed and assigned to the road network. The directions from which traffic will access the site can vary depending on many factors including:

- The size and type of proposed development
- The area from which it will attract traffic
- Competing developments (if applicable)
- Surrounding land uses and population
- Conditions on the surrounding street network

In undertaking Site Impact Analysis Studies, the catchment area assumed for distributing the generated trips should be clearly documented. The size of the catchment area can be based on:

- A reasonable maximum convenient travel time to the site
- Delineating area boundaries based on locations of competing developments
- Market studies

The three most commonly accepted methods for estimating trip distribution are provided in Sections 4.4.1 to 4.4.3 below. Whichever method is used, trip distribution should be estimated and analyzed for each horizon year since population levels change over time on an area-by-area basis. Consideration should also be given to whether inbound and outbound trips will have similar distributions. The derivation of trip distribution percentages must be fully documented in the Site Impact Analysis Study.

POLICY
If an analytical approach to trip distribution can not be used or the site has operational limitations or the Ministry states otherwise, all directional splits shall be assumed to be equally allocated in each direction for each access. A full movement access shall be considered to have 50 percent of entering vehicles making a left turn and 50 percent making a right turn. The same applies to exiting vehicles. The analysis may include analysis of additional directional splits or elements at the discretion of the Ministry.

The Proposed Study Terms of Reference must outline and justify which trip distribution method is appropriate for the Site Impact Analysis Study. If the Ministry and other Reviewing Agency agree that the proposed methodology is appropriate for the study area and the site, it will be noted in the *Scope Development Meeting* minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.4.1 Analogy Method

This method can be used to estimate the distribution of the proposed site traffic if a similar existing development is located near the proposed development. Data for the existing site can be collected by:

- counting access and intersection turning movements
- conducting a license plate origin-destination or driver response survey
- using other methods defining distribution of travelers to and from the site constant with procedures acceptable to the Ministry

The trip distribution can then be estimated for the proposed site based on data collected from the similar site.

4.4.2 Trip Distribution Model

The gravity model or other locally acceptable trip distribution model can be used to estimate site trip distribution. Some municipalities have developed computer-based transportation models for use in projecting travel patterns on the street network system for future years. This data can, with caution, be adapted for use in Site Impact Analysis Studies. It should be noted, however, that such computer models may only be used to review the impacts to the road network and should not be used directly to determine individual access drive requirements.

Manual estimation based on the gravity model principle can often also be accomplished using experience, judgment and knowledge of local conditions. Specific information on locally available and applicable distribution models may be available from the Ministry or Local Governments.

4.4.3 Surrogate Data

The origins and distributions of destinations can be developed when an adequate socio-economic and/or demographic database of usable detail by zones or other sub-areas is available for the population or employment distribution representative of the study horizon year. In most cases, population can be used as the basis for estimating distribution of office, retail, and entertainment trips and employment as a reasonable surrogate for residential trips, and other trips can be similarly distributed using logical surrogates.

4.5 Assignment of Development Traffic

Trip assignment involves estimating the amount of generated traffic allocated to the alternative routes on the road network. The product of this process is the total number of development generated trips by direction and turning movement on each segment of the study area road network. Trip assignment should be made considering:

- Logical routings
- Available road and highway capacities
- Delays because of left turns at critical intersections
- Location of traffic signals
- Projected and perceived minimum travel times

In order to achieve realistic estimates, multiple paths should be assigned between origins and destinations rather than assigning all of the trips to the route with the shortest travel time. The assignment of trips should reflect the study horizon years and should consider future conditions such as funded road and highway improvements and proposed land use in and around the study area. The trip assignment should reflect the peak periods or peak hours determined for the study and take into account any turn restrictions or other constraints which apply to that time of day.

Trip assignments can be done either manually or with applicable computer models. Regardless of which method is used, it is important that trip lengths be considered, particularly for large study areas and land uses which have a regional significance. For other types of land use, trips will be completed within a few kilometres of the site. Unless a gravity model is used to account for trip lengths, a trip length frequency curve should be utilized.

The total projected traffic for the horizon year is determined by superimposing the site generated traffic volumes onto the projected base traffic volumes. Traffic volume conditions in the study area for existing and projected horizon years with and without the site generated traffic from the proposed development are to be graphically illustrated and clearly documented in the Site Impact Analysis Study.

4.6 General Traffic Analysis Elements

A detailed traffic analysis must be undertaken on the projected traffic volumes with and without site generated traffic in order to:

- Assess the traffic impacts of the proposed development
- Show the relationship between operations and geometry
- Assess deficiencies in the system

Components of traffic analysis which are to be examined may include but are not limited to capacity analysis, corridor analysis, traffic safety and sight distance. These elements shall be outlined in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. The Ministry or other Reviewing Agency may also wish to outline any other analysis elements which should be considered in the Site Impact Analysis Study.

This section deals with the traffic analysis requirements for traffic external to the development site itself. The development must also be capable of accommodating the access, circulation and parking requirements of generated traffic as well as service and emergency vehicles. The requirements for on-site planning and design can be found in Chapter 5 of this manual.

4.6.1 Capacity Analysis

This analysis will consist of determining the intersection and roadway capacity and level of service in the study area at each of the horizon years based on the projected traffic volumes for the following conditions:

- Base traffic
- Base traffic + site generated traffic (without road improvements)

The requirements for analysis of signalized and unsignalized intersections can be found in Section 4.7 of this manual. The level of service, delay and volume/capacity ratios for each movement at an intersection are to be determined and documented in the Site Impact Analysis Study. The analysis shall also determine if there are sufficient gaps for all through, right turn and left turn movements at unsignalized intersections or site accesses.

4.6.2 Corridor Analysis

The network analysis must ensure that a corridor level view of the adequacy of the adjacent road system is taken. Therefore, any intersections under analysis should be considered as part of the total system and not analyzed/optimized as individual entities. Details on progression analysis can be found in Section 4.7.4 of this manual.

Signal spacing must be consistent with the functional classification, desired operating speed and progression of the associated roadway. Recommendations which do not conform to corridor plans or which erode the function or proposed function of the study area roads will not be acceptable.

4.6.3 Traffic Safety

The initial review of existing data within a study area should include recent (within 3 years) accident experience. A safety evaluation shall be undertaken for each intersection and access within the study area to identify locations where traffic safety should be given extra consideration. High accident locations (based on number, rate and severity) on roadways in the study area must be analyzed and measures to alleviate accident hazards must be considered.

Analysis for access design and roadway improvements should ensure safe stopping, decision sight distances and intersection sight distances. Vehicle conflicts, accident potential locations, pedestrian, transit and bicycle activities are to be considered. Many of the issues that come under the heading of safety are covered in other sections of this manual and include but are not limited to:

- High accident locations at intersections or mid-block
- Intersections in the study area which are in the top 10% in terms of numbers of accidents
- Right turn, left-turn and through movements onto and off of the highway
- The geometry of the access and its impacts on entering and exiting vehicles
- Conflicts between vehicles turning into or out of the site and pedestrians walking along sidewalks or cyclists in bicycle lanes on the street
- Location of bus stops in proximity to a new access or intersection
- Visibility for vehicles exiting from the site
- The weaving distance of vehicles exiting the site

4.6.4 Sight Distance

It is important to ensure that the proposed access has adequate vertical and horizontal sight distance especially on a curve or on a road which passes through rolling or mountainous terrain. Sometimes landscaping or a raised barrier may hinder the driver's ability to find a suitable gap in the traffic stream. The sight distance is adequate when a driver has an unobstructed view of the entire access or intersection and sufficient length of the intersecting road or highway to avoid conflicts.

Basic design requirements are provided in the TAC design manual and can be found in Chapter 7 of the Ministry's Design Manual. These should be compared with field observations to ensure that the sight distance criteria for the approved design speed are met.

4.7 Intersection Analysis

All intersections and/or accesses included in the Site Impact Analysis Study should be analyzed using a standard methodology such as that documented in the Ministry's Traffic Engineering Manual. Other references include the Transportation Research Board's Special Report 209, "*Highway Capacity Manual"* (HCM) and the Canadian Capacity Guide for Signalized Intersections (Institute of Transportation Engineers).

The standard used to evaluate the traffic operating conditions of the transportation system is referred to as the level of service (LOS). This is a qualitative assessment of the quantitative effect of factors such as travel speed, road capacity, volume of traffic, turning movements, geometric features, traffic interruptions, delays, and freedom to manoeuvre.

POLICY
An intersection capacity analysis must be done for each proposed access to the development for the study area, the horizon years and analysis periods defined previously in Chapter 3 of this manual and approved in the Scope Development Meeting *minutes.*

The intersection analysis for each proposed access to the site is required to ensure that the access design is adequate since each access operates as an unsignalized intersection. The various options for access to the development must be documented in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. Intersection capacity analysis must be done for all these options. This includes left turn and right turn lane warrants and design requirements.

Also, the Proposed Study Terms of Reference should outline and justify any proposed alternative evaluation techniques and the acceptability of these will be discussed at the *Scope Development Meeting*. If the options for access and the analysis methodologies are acceptable to the Ministry and other Reviewing Agency, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

Any intersection capacity analysis to be submitted with a Site Impact Analysis Study shall use the following standards, guidelines and provide the following information for the study area according to the Ministry's Traffic Engineering Manual:

(a) An intersection capacity operation analysis using the Highway Capacity Manual (HCM) or Software for all signals in the progression analysis using a standard method referenced above and providing all software input and output reports as well as any manual adjustments to the software's base assumptions.

(b) A signal cycle length of between 60 seconds for simple intersections up to 120 seconds for more complex intersections or as determined by the Ministry.

(c) Any analysis will use the posted speed limit(s) but may submit an additional analysis if corridor plans allow and it can be shown that a different speed is more efficient for capacity, highway delay and travel time. (Submitting analysis for an operating speed other than the posted speed must be approved in writing by the Ministry before submission of the study and does not mean that a change in the posted speed will be approved.)

(d) A safety analysis including existing accident experience, conflict points and movements.

(e) Conceptual designs showing all geometric elements and approximate dimensions of road and highway improvements required to mitigate the impact of the development.

(f) Analysis of queue lengths for signalized intersections and proposed accesses within the study area.

(g) Analysis of queue lengths for all turn lanes affected.

(h) If the access option involves signalization of an adjoining public road, then the signal spacing requirements of Section 4.7.3 must be met.

(i) Information, data and reference sources.

(j) Additional information and additional analysis based upon other factors and standards may be included at the discretion of the Ministry and/or the Local Government and should be discussed at the *Scope Development Meeting*.

Within an existing or future coordinated signal system, the following analysis is also required:

(a) Highway traffic signal progression analysis including progression bandwidth, efficiency and level of service determinations with all software output reports provided and including all existing and future signals within the approved study area for the coordinated signal system.

(b) The highway bandwidth shall be no less than 30 percent.

(c) For existing coordinated systems, the highway bandwidth after development shall be no less than the existing bandwidth.

(d) When pedestrian phases are present, the green time allowed for the cross street shall be no less than the time necessary to accommodate pedestrian movements. When pedestrian volume counts are negligible, the applicant may apply for a waiver of the requirement for minimum phase times by presenting all applicable pedestrian counts, technical justification and by indicating the impact of any pedestrian movements that do occur on signal progression.

POLICY
No application will be approved which requires signalization of a private access within the study horizon period. In order to negate the requirement to signalize a private access, other options must be evaluated which would accommodate the anticipated traffic.

If the access option involves signalization of an adjoining public road, then the signal spacing requirements of Section 4.7.3 must be met.

4.7.1 Signalized Intersections

The measure of effectiveness for signalized intersection operation is level of service (LOS), which is based on roadway system characteristics including;

- Lane geometry and number of lanes
- Peak hour factor
- Signal progression
- Signal Spacing
- Traffic volume and percentage of trucks
- Ratio of signal green time to cycle time (G/C)
- Roadway grades
- Pedestrian flows

Level of service (LOS) categories have been established based on relative levels of driver acceptability of various delays. The application of the Highway Capacity Manual techniques requires the use of parameters (for example, peak hour factor, saturation flow, etc.) which may vary from one location to another. A summary of the relationship between level of service and average stopped delay per vehicle, together with a qualitative description, is provided in Table 4.1.

The overall intersection LOS is one of the most important measures of effectiveness for signalized intersections operation. For those intersections that include turning movements with LOS definitions of D, E or F, the volume/capacity ratio (v/c) should be shown in order to further illustrate the relationship of these evaluation parameters.

In most larger urban areas, overall LOS ratings of A to D are normally considered acceptable for signalized intersections. Levels of service E and F are undesirable. The intersection LOS is computed as a weighted average of the vehicle delay for all vehicle movements. Therefore, an intersection may have an overall LOS of C or D and have individual movements of LOS E or F. As a result, all movements must be analyzed and presented individually.

Table 4.1 - Level of Service Criteria for Signalized Intersections

Highway Capacity Manual

Level of Service	Average Stopped Delay per Vehicle (sec)	Qualitative Description
A	<5.1	Good progression, few stops, and short cycle lengths.
B	5.1-15.0	Good progression and/or short cycle lengths; more vehicle stops.
C	15.1-25.0	Fair progression and/or longer cycle lengths, some cycle failures; significant portion of vehicles must stop.
D	25.1-40.0	Congestion becomes noticeable; high volume-to-capacity ratio, longer delays, noticeable cycle failures.
E	40.1-60.0	At or beyond limit of acceptable delay; poor progression, long cycles, high volumes, long queues.
F	>60.0	Unacceptable to drivers. Arrival volumes greater than discharge capacity; long cycle lengths, unstable-unpredictable flows.

Two levels of analysis are available for determining intersection level of service:

- Planning analysis
- Operational analysis

Although planning analysis is usually considered adequate for public roads with simple intersection operations, it does not estimate the actual levels of service for existing signalized intersections because it assumes that the signal is optimally timed. If the study includes a review of existing and/or proposed signals, then the operational analysis will be required. Left-turn and right-turn channelization requirements like storage length must also be determined for signalized and unsignalized intersections and proposed accesses.

Operational analysis should also be used for analyzing future conditions in which traffic, geometric, and control parameters can be established based on projections and design sketches. It is recommended that levels of service for existing conditions be confirmed through field observation and traffic counts whenever possible. This will help to confirm assumed parameters.

When recommendations are formulated, they may include modifications to reduce delay and increase capacity on critical movements. These modifications may include:

- Adding lanes
- Reducing friction by removing curb parking
- Changing signal phasing or timing

However, it will not always be acceptable to reduce the percentage of the cycle available as green time to the traffic stream on the highway. This must be approved by the Ministry and Reviewing Agency prior to use in the Site Impact Analysis Study.

For analysis purposes at signalized intersections in urban areas, a volume/capacity (v/c) ratio of 0.85 and Level of Service D (based on delay) should be used as the maximum acceptable values for the overall intersection and a maximum volume/capacity (v/c) ratio of 0.90 for individual movements. In suburban and rural areas, the maximum acceptable volume/capacity (v/c) ratio should be 0.80 for both the overall and individual performances to reflect the lower tolerance for congestion associated with these areas.

POLICY
Where existing or horizon year levels of service are E or F without the proposed development or change in use, or volume/capacity ratios exceed the maxima outlined here, any level of service or volume/capacity ratio equal to or better than existing levels (overall and for individual movements) may be acceptable. Where existing or horizon level of service is F without the proposed development or change in use, the average stopped delay per vehicle per movement may not be increased after the development.

4.7.2 Unsignalized Intersections

Unsignalized intersection LOS is based on delay. The Highway Capacity Manual's LOS procedures estimate average delay for each movement based upon:

- The critical time gap required to complete the manoeuvre
- The movement's traffic volume
- The volume of traffic opposing the movement

Overall LOS for an intersection is based on a weighted average of the delays on individual movements. The relationship between level of service and average delay is given in Table 4.2. A minimum LOS D should be used for all areas of the province. Where the existing LOS is E or F, any LOS equal to or greater than the existing LOS may be acceptable.

Table 4.2 - Level of Service Criteria for Unsignalized Intersections

(Highway Capacity Manual)

LEVEL OF SERVICE	AVERAGE STOPPED DELAY PER VEHICLE (SEC)	QUALITATIVE DESCRIPTION
A	< 5.1	Little or no delay
B	5.1 - 10.0	Short traffic delays
C	10.1 - 20.0	Average traffic delays
D	20.1 - 30.0	Long traffic delays
E	30.1 - 45.0	Very long traffic delays
F	> 45.0	Extremely long delays

When outbound left and right turns are to be permitted at an unsignalized road or access, an analysis of channelization warrants must be conducted according to the Ministry's Design Manual and Appendix D of this manual. A gap analysis according to the Highway Capacity Manual may provide another assessment of whether separate turn lanes are needed. Combined with a traffic signal warrant study, this analysis will also aid in the determination of whether signalization would be warranted within the horizon period.

Consideration may also be given to alternative access or operational changes such as turn restrictions. The addition of an unsignalized public road intersection within a signal network may require the analysis of platoon flows. The gaps found in the time-space diagram could allow additional capacity.

4.7.3 Traffic Signal Warrants and Spacing

Traffic signal warrant calculations must be undertaken to the approved horizon years using the Ministry's *Traffic Engineering Manual*. If a public road intersection warrants traffic signals, it must comply with the following key elements used in determining the acceptability of a signal location.

(a) The proposed signal location complies with Ministry approved corridor plans and Municipal Major Street Network Plans which have identified acceptable locations for signals given the road function, the posted speed and the location of existing and proposed signalized and unsignalized intersections.

(b) Where Ministry approved plans do not exist, the Proposed Study Terms of Reference for the Site Impact Analysis Study may outline a process whereby a network analysis is done to determine acceptable signal locations which maintain the posted speed limit(s) and ensure proper signal progression including all existing and future traffic signals.

(c) Where Ministry approved plans do not exist and a network analysis is not proposed, the acceptable signal spacing will be 800m.

(d) In existing developed areas where 50 to 60 km/h posted speeds exist and corridor plans allow, the acceptability of signal spacing will be based on the existing posted speed and a signal progression analysis in accordance with the Ministry's Traffic Engineering Manual.

The basic requirements for signal spacing can be found in Table 4.3. Any road which would reduce the optimal highway bandwidth if a traffic signal was installed may have turning and crossing movements restricted.

In all cases, the analysis of a proposed access option which includes the signalization of a public road must be documented in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting*. In every study, the applicant must also present access options which do not require signal installation in order to ensure that the best overall solution for the study area may be identified.

The Ministry will not accept any study which contains a recommendation for signalizing a public road intersection unless the approved Meeting minutes have outlined the acceptability of this analysis for the proposed development and the study area. If the analysis of a proposed access option which includes the signalization of a public road is acceptable to the Ministry and other Reviewing Agency, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of signalization of a public road does not bind the Ministry or Reviewing Agency to accept the signal location upon presentation of the analysis results in the completed study.

Table 4.3 - Signal Spacing

POSTED SPEED	MINIMUM RANGE FOR SIGNAL SPACING
50 km/h	400 - 700 m
60 km/h	500 - 800 m
70 km/h	600 - 800 m
80 km/h	700 - 800 m
90 km/h	800 m

4.7.4 Traffic Signal Phasing

The Highway Capacity Manual methodology for determining the level of service at a signalized intersection covers both a planning analysis and an operational analysis. In the planning analysis, information on the timing and phasing of signals is not an input and the results assume an optimum phasing and timing of the other signals in the study area.

In the operational analysis, however, this information is very much a key component and it will be necessary to analyze a variety of different phasing and/or timing combinations in order to arrive at an optimum condition. Failure to undertake this analysis in a thorough manner could result in some erroneous and potentially expensive conclusions. Any review of signal phasing should be in accordance with the Ministry's Traffic Engineering Manual.

Traffic signal progression analysis submitted in the Site Impact Analysis Study must include progression bandwidth, efficiency and level of service determinations, with all software output reports provided and including all existing and future signals within the coordinated signal system of the approved study area. The software to be used must be approved in the *Scope Development Meeting* before use in the study.

Ministry regional traffic engineers should be contacted to advise of any special phasing requirements prior to commencement of detailed analysis. Any proposed multi-phase analysis should be discussed prior to commencement of detailed analysis. In addition, the Proposed Study Terms of Reference should contain a communication plan for discussion of specific phasing requirements and details. Any analysis based on unacceptable phasing will result in the return of the Site Impact Analysis Study without a detailed review.

4.8 Weaving Analysis

The standard weaving analysis methodology, as provided in the *"Highway Capacity Manual"* is applied to freeways. Weaving on urban streets is covered in Figure 16.12 (a nomograph) of the ITE's *"Transportation and Traffic Engineering Handbook (Second Edition)"* which provides the level of service for various traffic volume levels and weave distances.

This type of analysis is particularly important in determining whether or not there is sufficient separation between right-turn exit movements from a site's access and the beginning of the tapers for a left-turn lane at the next intersection. This distance must be adequate or vehicles will cause delays and conflicts to through traffic.

Weaving analysis should be documented in the Proposed Study Terms of Reference for the Site Impact Analysis Study and discussed in the *Scope Development Meeting*. If the weaving analysis is acceptable to the Ministry and other Reviewing Agency, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.9 Mitigation Measures

When the impacts of the development have been determined, the Site Impact Analysis Study should document the proposed mitigation measures for all the access options. These mitigation measures would apply to the access location and design, the adjacent road network and the site itself. All access points associated with the proposed development should be designed in accordance with good design practice to:

- Protect the public safety
- Maintain smooth traffic flow
- Maintain highway right-of-way drainage
- Protect the functional classification of the highway

Sections 4.9.1 to 4.9.6 provide more detailed information about the various measures which can be used to mitigate development impacts. The alternatives and access options being evaluated should be outlined in the Proposed Study Terms of Reference and reviewed in the *Scope Development Meeting*. If these alternatives and mitigation measures are acceptable to the Ministry and other Reviewing Agency for analysis in the study, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

All possible mitigation measures should be considered and presented in the Site Impact Analysis Study. Failure to provide documentation of a comprehensive list of options will result in the return of the study to the applicant without detailed Ministry review.

All modifications and improvements to Ministry facilities must be sonsistent with the TAC Geometric Design Guide For Canadian Roads, or where applicable, to the BC Supplement to TAC Geometric Design Guide (www.th.gov.bc.ca/publications/eng_publications/geomet.TAC/TAC.htm.)

4.9.1 Site Access Alternatives

POLICY
The Site Impact Analysis Study must provide documentation which shows that all feasible access alternatives and options (existing and proposed) have been reviewed and provides the impacts of these options. This includes not only those shown in the concept plans for the site, but also any other alternatives that may reduce the impact of the development traffic on the adjacent road and highway network including those requested by the Ministry and other Reviewing Agencies and outlined in the minutes of the Scope Development Meeting*. For some corridors, limited direct access may only be granted when the study shows that there are no other reasonable alternatives.*

Access alternatives that should be considered include but are not limited to:

(a) Alternate access routes to the municipal road network instead of the highway.

(b) Amalgamation or relocation of existing or proposed accesses.

(c) The provision of access roads, frontage roads or rear service roads.

(d) Turn restrictions at access points (must provide a physical barrier).

(e) Provision of auxiliary lanes to accommodate acceleration, deceleration and turning movements without impacts to through traffic.

(f) Provide separate one-way entrance and exit accesses.

(g) All site access movements unsignalized.

POLICY
In all cases, alternate access for the proposed development will be required where a secondary street system exists rather than allowing direct access to a Controlled Access Highway. Direct access to a Controlled Access Highway can only be considered where it has been proven that no other reasonable alternative exists or that direct access or limited direct access would provide better over all performance of the study area network roads and does not impede the safety of the traveling public. Where direct access is allowed, the development design should be able to take advantage of future alternate access when it is available.

All possible alternatives should be analyzed and evaluated regardless of the associated costs. The recommended improvements and measures developed should be feasible and reasonable. This is accomplished by site visits and discussions with the Ministry both at the *Scope Development Meeting* and throughout the course of the study.

4.9.2 Off-Site Road Network Improvement Alternatives

The traffic generated by the proposed development should not contribute to the deterioration of the highway corridor and/or the road network in the study area. Acceptable access and intersection levels of service were previously discussed in Section 4.7.

If an acceptable level of service can not be provided on the existing road network, then the Site Impact Analysis Study should thoroughly investigate and document all possible road network improvements or mitigation measures required to accommodate site traffic and preserve the safety and mobility of the surrounding road network. Delay should also be considered.

The improvements could include but are not limited to the following:

(a) Widening of the surrounding network roads.

(b) Addition of left-turn or right-turn lanes at the access and/or intersections.

(c) Construction of a new overpass or interchange.

(d) Construction of new frontage or rear service roads.

(e) Restriction or relocation of existing accesses.

(f) Signalization of an existing unsignalized public road intersection.

(g) Upgrading of signals through additional phases and/or improved timing.

(h) Coordination of signals.

(i) Relocation or closure of existing public street intersections.

(j) Construction of a missing link of the local or regional road network.

(k) New local road connections which provide alternative access locations for site traffic instead of direct access to major arterial roads or highways.

(l) Provision of centre acceleration lane on the highway.

(m) Installation of median barrier or other median treatments.

All highway network improvements must comply with the Ministry's design standards. If the improvements are not covered in the current edition of the Ministry's Design Manual, then TAC standards would apply.

All possible alternatives should be analyzed and evaluated regardless of the associated costs. The recommended improvements and measures developed should be feasible and reasonable. This is accomplished by site visits and discussions with the Ministry both at the *Scope Development Meeting* and throughout the course of the study.

4.9.3 On-Site Mitigation Measures

In the Site Impact Analysis Study, consideration must also be given to identifying ways in which the on-site development impacts can be reduced through the site plan. In this way, the applicant, Ministry, and/or Local Government may be able to reduce the off-site road network improvements required to accommodate the increased demand resulting from the proposed development.

Generally, the goal of on-site mitigation measures is to maintain the acceptable strategic function and level of service for the highway corridor and the surrounding road network and to create a safe and efficient environment for vehicles entering and exiting the site. The Site Impact Analysis Study can coordinate these on-site measures with any off-site road and highway improvements required to mitigate safety or specific operational concerns.

On-site mitigation measures that should be investigated as a means of reducing the impacts of the proposed development could include but are not limited to:

(a) Access points onto lower speed adjacent local roads.

(b) Turn restrictions at the access points.

(c) Relocation of existing or proposed access points.

(d) Combination of existing nearby accesses to reduce or eliminate the number or density of accesses.

(e) Addition of on-site left and right turn channelization.

(f) Improved access design standard.

(g) Transportation Demand Management (TDM) measures.

All possible on-site mitigation measures should be considered and presented in the Site Impact Analysis Study. Chapter 5 of this manual provides more specific details for on-site planning and design.

4.9.4 Corner Clearances

One of the key elements in determining an acceptable location for a site access is its location with respect to adjacent roads and its proximity to the functional area of adjacent intersections. The distance from an intersection to the nearest upstream or downstream access is called a corner clearance.

Driveway traffic can reduce the saturation flow rates on signalized intersection approaches. For example, the amount of the road capacity reduction caused by a right-in/right-out access depends on the corner clearance of the driveway and the proportion of the curb-lane volume that enters and exits the driveway. The length of an acceptable corner clearance depends upon site specific constraints which include:

- Access design, volumes and turning restrictions
- Posted speed
- Design hour volume of the adjacent road(s)
- Accident history
- Existing or proposed restrictive median, channelization and/or auxiliary lanes
- Whether the existing intersection is signalized or will require signalization within the horizon period

Recommendations on minimum corner clearances from an existing intersection to an access or local road intersection are provided in Figure 4.4 based on the Institute of Transportation Engineer's publication entitled "Transportation and Land Development".

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Figure 4.4 - Minimum Corner Clearances for Urban Conditions

4.9.5 Speed Change Lanes

Speed change lanes or acceleration and deceleration lanes should be designed in accordance with the standards established in Section 7 of the current edition of the Ministry's Design Manual~~State of Colorado based on their research and experience~~. If the required design standards are not covered in the current edition of the Ministry's Design Manual, then TAC standards would apply.

The warrants for left-turn lanes currently accepted by the Ministry can be found in Chapters E.A.1 and E.B.1 of the manual entitled, “Geometric Design Standards for Ontario Highways” (1985). A copy of this reference is provided in Appendix D of this manual until such a time as the Ministry’s warrants have been included in the Design Manual. In determining the need for speed change lanes, it is important to note the following:

(a) Trucks exceeding 15,000 kilograms gross vehicle weight (GVW) should be less than seven percent of the peak or design hour volume. If the access will have a larger percentage of vehicles exceeding 15,000 kilograms GVW, the access peak hour volumes should be adjusted to reflect the impacts to auxiliary speed change lane warrants in the interest of public safety.

(b) An auxiliary lane should be parallel and immediately adjacent to the travel lane for its entire required length.

(c) If a design element of the access is within two different speed zones, the criteria for the higher speed zone shall apply.

(d) When safety is a concern due to site specific conditions such as limited sight distance, a turn lane may be required even though the volume warrants are not met.

(e) When there are three or more through lanes in the direction of travel, consideration may be given to dropping the requirement for the right turn acceleration and deceleration lanes unless the site has a high volume access or when a specific geometric safety problem exists. In waiving the requirement for a speed change lane, the posted speed and the function of the highway will also be considered. Prior approval is required in writing from the Ministry before a study can be submitted which has waived the requirement for a speed change lane.

(f) When calculating the highway single lane peak hour volume, it may be assumed that all lanes have equal volumes unless the Ministry states otherwise in the *Scope Development Meeting*. If Ministry staff have local knowledge which indicates that traffic in the lanes is not balanced, then the actual volume per lane will be required.

The following are examples of speed change lanes or auxiliary lanes which should be considered in a Site Impact Analysis Study:

- Deceleration Lanes for Right Turning Vehicles
- Acceleration Lane for Right Turning Vehicles
- Deceleration Lanes for Left Turning Vehicles
- Acceleration Lanes for Left Turning Vehicles

Construction of speed change lanes must be to Ministry standards as outlined in the current editions of the Ministry Design Manual and the Standards and Specifications Manual. The District Office should be contacted for inspection and final construction approval at the time of construction.

4.9.6 Transportation Demand Management Measures

Transportation Demand Management (TDM) is a term used to describe measures designed to reduce the use of single-occupant vehicles or shift travel time to non-peak conditions. Section 4.2 of the Ministry's Parking and Trip Generation Rates Manual should be consulted for more information on Transportation Demand Management. When properly implemented, Transportation Demand Management (TDM) measures will change people's travel behaviour to reduce the amount of vehicle traffic, congestion, air pollution and travel time delays.

Transportation Demand Management (TDM) measures accomplish this in three ways:

(a) Shifting the Mode of Transportation e.g. getting people to switch from single-occupant automobiles to public transit, car pools, van pools, bicycles, and walking.

(b) Eliminating Trips e.g. telecommuting, where the employee works at home by being connected to the office by phone, fax, or modem.

(c) Lowering Peak Demands to reduce congestion in the peak hour(s).

Some TDM measures are voluntary and emphasize incentives to encourage people to change their travel behaviour. Examples include high occupancy vehicle (HOV) lanes, ride sharing~~ridersharing~~ programs, park-and-ride lots, transit priority, and bicycle and transit inter modal~~intermodal~~ treatments.

Other measures are mandatory and rely on time and cost penalties to actively discourage the use of single occupant vehicles, especially during peak periods. Examples include parking supply controls or pricing, road pricing at key crossings or areas, and increased gas tax.

Available research indicates that, in general, the quantitative impact of individual TDM measures on network traffic, parking rates and trip generation rates cannot be reliably predicted for each development anywhere in the province. Also, TDM measures are generally only applied to large population centres because of the high commuter base, high existing congestion levels and the availability of alternatives like transit and HOV lanes. Applying variances to parking and trip generation rates due to TDM measures was previously discussed in Section 3.8.5 with a more complete review in Chapter 4 of the Ministry's *Parking and Trip Generation Rates Manual*.

The application of TDM measures for a proposed site must be outlined in the Proposed Study Terms of Reference for the site and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that these items may be properly used as options in the study given existing conditions for the study area and the site, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of TDM impacts for a site does not bind the Ministry of Reviewing Agency to accept the recommendations when the study is complete.

4.10 Environmental Considerations

Site Impact Analysis Studies must also evaluate whether changes in the transportation system have unacceptable impacts on the environment. Some emphasis should be placed on this aspect, especially when comparing and evaluating alternative solutions or networks. Any site development plans must successfully accommodate environmental considerations. It is possible that environmental issues were dealt with at the time of zoning and requirements associated with development in the area will have already been defined. However, evaluation may also be required for such things as vehicle emissions.

In the Site Impact Analysis Study, environmental considerations can be addressed in a number of different ways. Environmental impacts and roadside development issues should be reviewed with the Ministry's Highway Environment Section and other environmental reviewing agencies.

The necessary environmental elements should be outlined in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting* to ensure that environmental requirements are clearly laid out at the start of the analysis and consideration is given to their impacts on site development and layout.

4.11 Cost Estimates

The *Scope Development Meeting* should include discussion of how development construction projects may be coordinated with Ministry and/or Local Government road upgrade projects or other developments. Where opportunities for coordination are identified, it is recommended that the Site Impact Analysis Study include an estimate of the cost of all required improvements.

Preparing cost estimates for construction purposes will provide an indication of the magnitude of the costs associated with the development and will ensure that consideration is given to how those costs are to be allocated. The applicant will also need to be aware of the cost of off-site improvements or site impact mitigation. Costs associated with transportation system improvements required to support the proposed development will be the direct responsibility of the applicant.

Costs and cost sharing outlines should be referenced in the Proposed Study Terms of Reference and reviewed in the *Scope Development Meeting*. If these costs and cost sharing outlines are acceptable to the Ministry and other Reviewing Agency for analysis in the study, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of cost sharing does not bind the Ministry or Reviewing Agency to accept the recommendations of the completed study.

5. ON-SITE PLANNING AND DESIGN

An integrated system should deliver vehicles from the external roadway system to the internal roadway system in a safe and efficient manner which accommodates anticipated traffic patterns. There should also be linkages for truck, pedestrian, transit and cyclist use. This chapter describes various on-site planning and design elements which should be reviewed and documented in a detailed Site Impact Analysis Study. These elements are a function of the land-use being served and include:

- Access Design Elements
- Parking Rates and Design Elements
- Site Design Elements

5.1 Access Design Elements

While access location was discussed previously in Section 4.9 with respect to external impacts, there are also on-site and geometric design features of an access that are required for safe and efficient traffic operation. An access should be designed from the same perspective as an intersection having similar characteristics and volumes.

The adequacy of site access points is directly related to:

- The directional distribution of site traffic
- The internal circulation system configuration
- The functional classification of the adjacent roads and highways

5.1.1 General Access Design Standards

The Ministry has developed standards for use in locating and designing accesses. These standards are based on recognized engineering practice and exist to ensure that Ministry roads and highways function safely and efficiently. Where direct access to Ministry roads or highways is to be permitted, the standards for access design and construction are outlined in the Ministry manuals listed in Section 2.11.

Access design standards apply to such features as:

- Sight distance
- Access surface and profile
- Access width, radius and angle
- Acceleration and deceleration lane warrants
- Left-turn and right-turn lane requirements
- Length, width, and taper of turn bays
- Corner clearance
- Access turn restrictions
- Vehicle queuing storage length and cross section
- Drainage
- Design vehicle requirements (trucks)

- Sign location
- Visibility of access
- Landscape and environmental requirements (i.e. aesthetics)

5.1.2 Vehicular Queuing Storage Lengths (Magazine)

Vehicle queuing analysis is an integral component of access design. Queuing areas must provide sufficient storage for entering and exiting vehicles so that they do not block internal circulation roads or the adjacent road network. The amount of queuing length to be provided at an access is related to the amount of traffic expected to enter and exit the parking area and the peaking characteristics of that traffic. The same queuing analysis procedures should be used for on-site queuing reservoirs as for off-site left and right turn lanes as described previously in section 4.7.

Queuing analysis is very critical for large traffic generators and sites with drive-in service. Consideration must be given to measuring and analyzing not only the peak hour demand but also the 5-minute, 15-minute or 30-minute demand if the peaking characteristics warrant. When determining design information like short-term demand volume and service time, similar facilities should be studied.

5.2 Parking Rates and Parking Design Elements

The provision of an adequate supply of well designed parking spaces within a development is an important element of the site's concept plan. If the parking is inadequate in terms of the number of stalls, dimensions of stalls and site layout, the resultant on-site congestion may result in vehicles queuing back onto the highway and overflow street parking. Both of these situations are undesirable when they impact the safety and efficiency of the surrounding road network and the viability of the development. General guidelines and policies regarding the determination of parking rates for a proposed development can be found in Section 3.8 of this manual.

The parking area must support the type of land use with consideration given to the location of the development and the adjacent road infrastructure. Whether the parking area is surface or structure, it should be carefully planned and designed. The parking area planning and design should consider the following key elements:

- Parking area location, layout and size
- Driveway and internal road layout
- Access aisles
- Individual stall dimensions and arrangements
- Pedestrian movements from the parking areas and transit bays to the development buildings
- Security issues like lighting and proximity to public view
- The grading, paving, landscaping and lighting of the parking area

The parking lot layout should consider breaking the area down into smaller lots which are dispersed evenly throughout the development and integrated with landscaping. Also note that general environmental considerations which may relate to parking design should be discussed in the *Scope Development Meeting*.

5.2.1 Number of Parking Spaces

Information about the number of parking spaces required for any development can be found in Section 3.8 of this manual and in the Ministry's "Parking and Trip Generation Rates Manual". Proposed parking rates should be outlined in the Proposed Study Terms of Reference and reviewed in the *Scope Development Meeting*.

If the rates proposed are acceptable to the Ministry and other Reviewing Agency for use in the study, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. The Proposed Study Terms of Reference must provide parking rates for the Ministry and Local Government in order to determine which rate is higher and must therefore be used.

5.2.2 Dimensions of Standard Parking Stalls

POLICY
The parking stall and aisle dimensions of both Ministry and Local Government should be reviewed and the higher of the two requirements shall be used. The Ministry's parking stall and aisle dimensions are the same as those established by the Institute of Transportation Engineers in their document "Guidelines for Parking Facility Location and Design" (1994).

The relevant information from this document for standard-size parking layout dimensions is included in Figure 5.1 and Table 5.2 of this manual. The stall dimensions and parking area dimensions must be shown on the site plan and submitted with the Site Impact Analysis Study. A landscape concept plan should be provided on a separate drawing as part of the Site Impact Analysis Study to ensure that landscape mitigation can be accommodated.

5.2.3 Provision of Small-Car Spaces

Although the application of special dimensions for small-car parking has increased in North America, the percentage of such cars varies by year and by geographic location. Small car~~s~~stalls can use both small and standard car spaces, but the use of a small car space by a large car can prevent one or both of the adjacent spaces from being used. For this reason, it is necessary to maximize the number of standard-size parking spaces. A detailed description of small car parking issues can be found in Section 4.10 of the Ministry's "Parking and Trip Generation Rates Manual".

Small-car parking stalls should only be considered for developments which have low parking turnover such as office staff or student parking lots. High turnover developments and/or small parking lots should not consider allowances for small-car parking stalls. Where small-car parking is being considered, the following three factors must be considered in the Site Impact Analysis Study:

- The number of small-car-only spaces to provide
- Where the small-car stalls are to be located on the site
- How to control the use of these spaces

POLICY

The allowances for small-car parking of both the Ministry and Local Government should be reviewed and the lower of the two allowances shall be used. The Ministry's small-car parking allowance limits the number of small car spaces to 20 percent of the site's total for all sites having 31 or more parking spaces. All parking spaces in parking areas which contain fewer than 31 parking spaces must provide standard parking spaces only.

In addition, the Ministry has found that there is a geographic variation in the percentage of small cars throughout BC with a higher percentage of pick-up trucks and vans in the interior. Therefore, the allowance for small cars will be restricted to the Greater Vancouver, the Fraser Valley, and Capital Region areas. For other areas, standard-size parking stall dimensions must be applied. Consideration will be given to provision of small-car spaces in other areas of the province if justification is presented in the Proposed Study Terms of Reference and discussed in the Scope Development Meeting and the applicant receives permission in writing from the Ministry to review the issue in the Site Impact Analysis Study.

The Ministry's small-car parking stall and aisle dimensions are the same as those established by the Institute of Transportation Engineers in their document "Guidelines for Parking Facility Location and Design" (1994). The relevant information from this document for small-car parking layout dimensions is included in Figure 5.1 and Table 5.3 of this manual.

The small-car stall dimensions and location in the parking area must be shown on the site plan and submitted with the Site Impact Analysis Study. In order to ensure that these spaces get used first, they should be located close to the pedestrian entrances to the site's buildings. Furthermore, these spaces should be contiguous in groups of 20 spaces or more and clearly designated through markings on the pavement and elevated signs, as being limited to small cars.

If the proposed small-car rates and dimensions are acceptable to the Ministry and other Reviewing Agency for use in the study, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. The Proposed Study Terms of Reference must provide small-car parking rates and dimensions for the Ministry and Local Government in order to determine which rate is higher and must therefore be used.

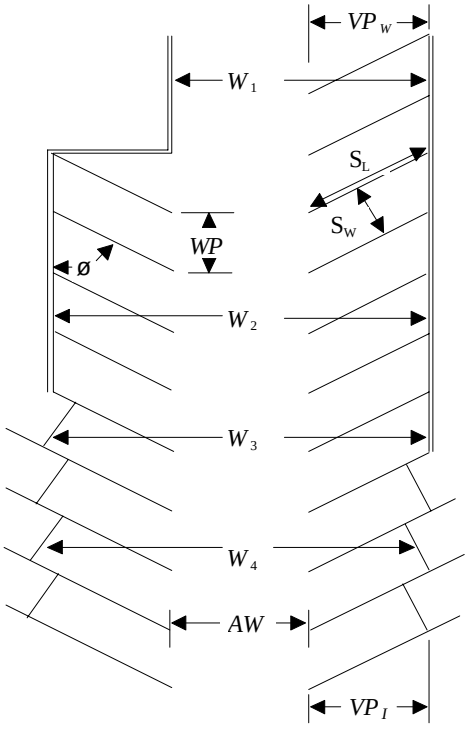
5.2.4 Handicapped Parking Spaces

POLICY
The handicapped parking stall dimensions and rates of both the Ministry and Local Government should be reviewed and the higher of the two rates and dimensions shall be used. The Ministry's handicapped parking rates recommended that a minimum of two percent of the parking spaces should be designated for handicapped parking with a minimum of one space per site. Handicapped stalls should be provided in addition to the minimum required number of stalls. Handicapped parking spaces should be located close to elevators, ramps, walkways and building entrances.

These stalls should be a minimum of 2.8 metres wide with an additional 1.2 to 1.5 metres on both sides of the stall to allow wheelchair access for a driver or a passenger. Adjacent handicapped spaces can share the 1.2 metres separating the two stalls provided that the parking stall is perpendicular and a vehicle can be backed in. These stalls should be clearly marked with signs and painted symbols on the pavement as outlined in the standards of the Transportation Authority of Canada (TAC) publication entitled "Uniform Traffic Control Devices for Canada".

Recommended stall dimensions for handicapped parking stalls are included as Figure 5.4 of this manual and were derived from the Institute of Transportation Engineer's publication entitled "Guidelines for Parking Facility Location and Design". More details on handicapped parking can also be found in Chapter 4 of the Ministry's Parking and Trip Generation Rates Manual.

Figure 5.1 - Dimensional Elements Of Parking Layouts



ø Parking Angle
W_1 Parking module width (wall to wall), single loaded aisle
W_2 Parking module width (wall to wall), double loaded aisle
W_3 Parking module width (wall to interlock), double loaded aisle
W_4 Parking module width (interlock to interlock), double loaded aisle
AW Aisle Width
WP Stall width parallel to aisle
VP_I Projected vehicle length from interlock
VP_w Projected vehicle length from wall measured perpendicular to aisle
S_L Stall length
S_w Stall width

Table 5.2 - Standard Car Parking Layout Dimensions

(Institute of Transportation Engineers - "Guidelines for Parking Facility and Design")

Parking Class	S_W Basic Stall Width (m)	WP Stall Width Parallel to Aisle (m)	VP_W Stall Depth to Wall (m)	VP_I Stall Depth to Interlock (m)	AW Aisle Width (m)	---------Modules--------- W_2 Wall to Wall (m)	W_4 Interlock to Interlock (m)
	Two-Way Aisle--90°						
A	2.8	2.8					
B	2.7	2.7	5.4	5.4	7.9	18.6	18.6
C	2.6	2.6					
D	2.5	2.5					
	Two-Way Aisle--60°						
A	2.8	3.2					
B	2.7	3.1	5.5	5.0	7.9	18.9	18.0
C	2.6	3.0					
D	2.5	2.9					
	One-Way Aisle--75°						
A	2.8	2.8					
B	2.7	2.8	5.6	5.3	6.7	18.0	17.4
C	2.6	2.7					
D	2.5	2.6					
	One-Way Aisle--60°						
A	2.8	3.2					
B	2.7	3.1	5.5	5.0	5.5	16.5	15.5
C	2.6	3.0					
D	2.5	2.9					
	One-Way Aisle--45°						
A	2.8	3.9					
B	2.7	3.8	5.0	4.4	4.6	14.6	13.4
C	2.6	3.7					
D	2.5	3.6					

PARKING CLASSIFICATIONS FOR TABLES 5.2 and 5.3

Parking Class	Typical Turnover Rate			Typical Land Uses
	Low	Medium	High	
A			X	Retail customers, banks, fast foods, other very high turnover land uses
B		X	X	Retail customers, visitors
C	X	X		Visitors, office employees, residential, airport, hospitals
D	X			Industrial, commuter, university

Table 5.3 - Small Car Parking Layout Dimensions

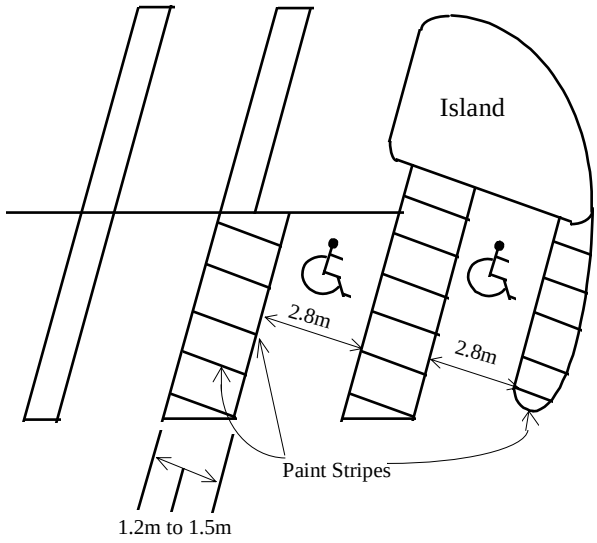
Institute of Transportation Engineers - "Guidelines for Parking Facility and Design"

Parking Class	S_W Basic Stall Width (m)	WP Stall Width Parallel to Aisle (m)	VP_W Stall Depth to Wall (m)	VP_I Stall Depth to Interlock (m)	AW Aisle Width (m)	---------Modules--------- W_2 Wall to Wall (m)	W_4 Interlock to Interlock (m)
	Two-Way Aisle--90 °						
A/B	2.5	2.5	4.6	4.6	6.4	15.5	15.5
C/D	2.3	2.3					
	Two-Way Aisle--60 °						
A/B	2.5	2.9	4.7	4.3	6.4	15.9	15.3
C/D	2.3	2.7					
	One-Way Aisle--75 °						
A/B	2.5	2.6	4.9	4.6	5.2	15.0	14.4
C/D	2.3	2.4					
	One-Way Aisle--60 °						
A/B	2.5	2.9	4.7	4.3	4.6	14.0	13.1
C/D	2.3	2.7					
	One-Way Aisle--45 °						
A/B	2.5	3.5	4.4	3.8	4.00	12.8	11.6
C/D	2.3	3.3					

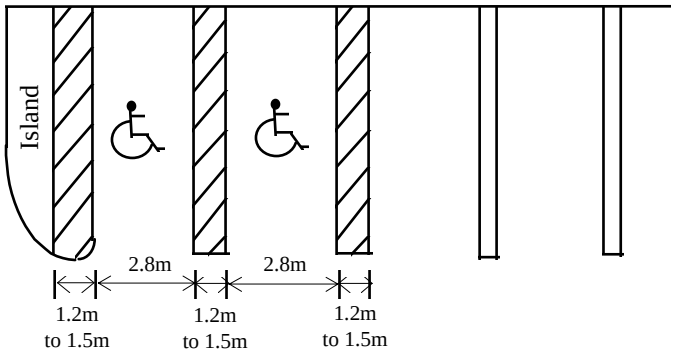
PARKING CLASSIFICATIONS FOR TABLES 5.2 and 5.3

Parking Class	Typical Turnover Rate			Typical Land Uses
	Low	Medium	High	
A			X	Retail customers, banks, fast foods, other very high turnover land uses
B		X	X	Retail customers, visitors
C	X	X		Visitors, office employees, residential, airport, hospitals
D	X			Industrial, commuter, university

FIGURE 5.4 - HANDICAPPED PARKING STANDARDS



(a) 60 - Degree parking



(b) 90 - Degree parking

(c) Stall parking signs and pavement marking standards as outlined in the Transportation Authority of Canada (TAC) publication entitled, *Uniform Traffic Control Devices for Canada*

Figure 5.4 - Handicapped Parking Standards

5.2.5 Shared Parking

Shared parking is defined as a parking space that can be used to serve two or more land uses over the course of a day or week or month. It is a method of optimizing the use of available parking space by sharing it among a group of users who have different peak parking characteristics. Another benefit of shared parking is that it can reduce the number of access points required to a mixed use development area.

Section 4.5 of the Ministry's "Parking and Trip Generation Rates Manual" provides some background information on shared parking. If the applicant is seeking approval of a shared parking arrangement, a detailed analysis is required. This analysis may include:

- Multi-day parking surveys
- Analysis of parking demand peaks
- Parking management plan

The shared parking planning study should be conducted in accordance with the following publications;

- *Shared Parking,* Urban Land Institute (1983)
- *Shared Parking Planning Guidelines*, (Prepared by ITE Technical Committee 6F-52), Institute of Transportation Engineers (ITE), Washington DC (1995) [(202) 554-8050]

If shared parking is being suggested for the site, the Proposed Study Terms of Reference must provide a discussion of analysis methodology and how shared parking is appropriate for the proposed development. This will be reviewed by Ministry staff and Local Government staff and discussed at the *Scope Development Meeting*. If the proposal for shared parking analysis is acceptable to the Ministry and other Reviewing Agency for inclusion in the study, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of shared parking does not bind the Ministry or Reviewing Agency to accept the recommendations of the completed study.

In a shared parking analysis, all uses of the development shall be considered unless a specific use on the site is to have its own reserved parking. Any reserved parking spaces should be omitted from the analysis. If shared parking analysis is undertaken to justify a reduced number of parking spaces, then the highest generated land use within the current zoning must be used. Ministry agreement to accept shared parking for the site will require a legal agreement and/or restrictive covenant.

5.2.6 Recreational Parking

Many roads and highways in British Columbia carry a high percentage of recreational traffic, especially in the summer months. Land uses like boat launches, marinas and campgrounds which provide services to recreational traffic should consider providing parking arrangements and dimensions which will facilitate the larger dimensions of boats, trailers and recreational vehicles.

In general, oversize vehicle and trailer parking should be arranged so that drivers can pull through the stall rather than backing out. The dimensions for oversize vehicle and trailer pull through stalls should be 3.0 to 4.5 metres wide by 12 to 15 metres long.

5.3 Site Design Elements

Consideration of on-site design elements is important to the safe and efficient operation of site traffic and to reducing the site's impact on the adjacent road system. Good site design will integrate the building with the access, parking areas, loading areas, transit facilities, cyclist facilities and pedestrian facilities.

5.3.1 Internal Vehicular Circulation

The Site Impact Analysis Study must show how adequate internal circulation roadways are to be provided. Site circulation should be designed in such a way as to minimize the required number of accesses. Internal circulation roadways should provide safe and efficient circulation of site traffic to and from:

- Accesses
- Buildings
- Parking areas
- Pick-up/drop-off points (including transit)
- Service and loading areas

The on-site planning and design for the internal circulation should consider elements like:

- Horizontal and vertical alignments
- Pavement marking and signing
- Paving delineation (materials and finishes) of all pedestrian areas including walkways and plazas.
- Sight distance
- Emergency vehicle access
- Design vehicle turning movements and storage
- Internal intersection control, channelization and main aisle location
- Transit
- Pedestrian and cyclist movements
- Site furnishings (lighting, bollards, benches)

- Speed control
- Garbage bins and how they are accessed
- Surveillance from adjacent buildings to discourage crime and vandalism

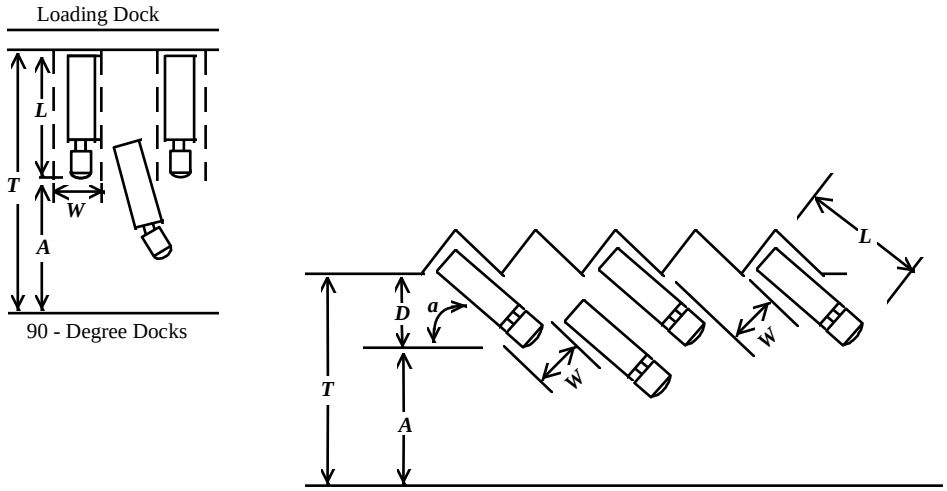
5.3.2 Service and Delivery Vehicle Design Elements

Service and delivery vehicles require separate criteria for movement to and from the site as well as within the site. Design vehicle requirements can be found in the current edition of the Ministry' Design Manual. Recommended loading dock dimensions, based on the Institute of Transportation Engineers publication entitled, *"Transportation and Land Development"* are given in Figure 5.5.

Consideration should be given to design elements including:

- Design vehicle size, type and weight
- Turning paths and maneuvering space
- Clearances
- On-site and off-site storage length
- Separate access and parking areas which minimize the impacts on internal and external traffic
- Appropriate screening of service areas
- Adequate design and location of loading bays
- Appropriate mix of loading dock sizes
- Signing
- Dangerous goods routes

FIGURE 5.5 - LOADING DOCK DIMENSIONS
Institute of Transportation Engineers - "Transportation and Land Development"



Design Vehicle	Length in metres (L)	Dock angle in degrees (a)	Clearance in metres (D)	Berth width in metres (W)	Apron space in metres (A)	Total offset in metres (T)
WB-12	15.2	90	15.25	3.0	19.25	34.50
				3.6	17.00	32.25
				4.3	15.75	31.00
		60	13.50	3.0	14.00	27.50
				3.6	12.00	25.50
				4.3	10.50	24.00
		45	11.0	3.0	11.25	22.25
				3.6	9.75	20.75
				4.3	8.75	19.75
WB-15	16.7	90	16.75	3.0	23.50	40.25
				3.6	22.00	38.75
				4.3	20.50	37.25
		60	14.50	3.0	16.75	31.25
				3.6	15.50	30.00
				4.3	14.00	28.50
		45	12.00	3.0	13.50	25.50
				3.6	12.00	24.00
				4.3	11.25	23.25

Figure 5.5 - Loading Dock Dimensions

5.3.3 Pedestrian, Transit and Bicycle Facilities

The impacts of alternative modes of travel on the reduction of motor vehicle use were discussed in Chapters 3 and 4 of this manual and in Chapter 4 of the Ministry's "Parking and Trip Generation Rates Manual". The Site Impact Analysis Study should consider and document provisions which would encourage alternative modes of travel to and from the site. Where variances are being requested according to Section 3.8.5, provision of these facilities will be a large consideration in the Site Impact Analysis Study review process.

Pedestrian connections should integrate the site's buildings with transit stops, pick-up and drop-off points and other developments in the area. Proper design of pedestrian facilities can reduce the use of motor vehicles for trips within a development and between nearby developments. This is especially important when shared parking is being considered. Pedestrian walkways should be designed in accordance with Local Government guidelines or standards and with adequate dimensions for the anticipated pedestrian volumes.

Pedestrian facilities must consider the comfort and safety of the users through provision of adequate crosswalks, designated walkways, lighting and security in addition to curb cuts and ramps for wheelchair access. Pedestrian crosswalks should be delineated with a different paving material from the roadway (i.e. pavers or scored concrete) and provided across vehicular lanes. Nearby signals should have adequate pedestrian crossing times.

Transit facility locations should be considered:

- For areas adjacent to building entrances
- At key locations along circulation drives
- At major pedestrian focal points along the external roadway system

Provisions for cyclists should include secure and sheltered parking facilities located close to building entrances and in high visibility locations. Consideration should also be given to shower and change-room facilities within developments where commuter cyclists are expected. The study should review the adequacy of the road and bicycle path network within the study area to ensure that this is a viable alternative mode. This includes features like bicycle-safe storm sewer covers.

Pedestrian, transit and bicycle facilities may be outlined in the Proposed Study Terms of Reference for the study and discussed in the *Scope Development Meeting*. The Ministry's Interim Cycle Policy may be used as a guide to providing cycling facilities and the references listed in Section 2.11 contains a Community Cycling Manual by the Canadian Institute of Planners.

5.3.4 General Landscape Design Considerations

The on-site design considerations should include consideration of landscape elements and minimizing the visual impact of the development on the adjacent road and highway network. In some cases, local governments may have their own requirements for landscaping. Landscape design should consider the following key elements:

- Defining areas required for mitigation, including visual integration with the landscape
- Maintaining and/or enhancing landscape character specific to the area and restoration of distinctive landscapes
- Minimizing visual impacts of scenic roadsides
- Providing a visual buffer of views to the road, appropriate to the local character and the land uses affected
- Using fences or walls that are compatible with existing ones
- Using plant and seed species that integrate visually with the existing vegetation
- Retention of existing land forms to minimize noise and visual intrusion
- Defining areas needed for effective mitigation by planting. In rural area, tall tree screens require a minimum 10 metre width and eye level shrub screens require a minimum 5 metre width.
- Design guidelines for landscape features, such as fencing walls and planting types that are compatible with local landscape character
- Retaining existing patterns of vegetation and using mainly native species in rural areas
- Areas required for retention of significant existing vegetation
- Ensure preservation of sight distance at internal intersections including pedestrian and cyclist crossings

These issues should be considered in terms of Local Government or regional environmental and landscape plans that may have implications on the way in which the site is designed. Site development plans must successfully accommodate landscape and visual concerns across a broad range of urban, suburban rural and natural landscape situations. In general, the intent is that design solutions for landscape and visual issues be corridor and site specific, based on basic accepted environmental planning processes and design principles.

5.3.5 Other Site Design Elements

The following items may also be considered in a Site Impact Analysis Study:

- Vehicular conflict points
- Vehicular-pedestrian conflict points
- Location of curbs/wheel stops relative to front of parking stall
- Minimum vehicle bumper overhang of 0.6 metres to reduce the impact of parking on landscape areas
- Location and design of handicapped parking stalls
- Building entrances and pedestrian circulation between the entrances and the parking areas
- Sidewalk and road widths
- Fire lanes
- Access to solid waste/garbage containers should be provided while minimizing the visual impacts
- Visibility of obstruction such as curbed end islands, guard rails, barriers, retaining walls, landscaping, signs and light posts
- Delineation of edge of development from adjacent streets
- Existing and proposed utilities, including fire hydrant locations
- Location and type of fencing and/or landscaped buffers
- Location of any on-site items such as any kiosks and Canada Post drop boxes
- Location and angle of exterior lighting
- Drainage study
- Speed limits for internal roads
- Visibility and access to telephone kiosks
- Positive and negative impacts of views to and from the site
- Provide irrigation if required.

6. Further Reading

The reference materials found in Section 2.11 were used in the development of this manual and should be used to determine acceptable standards and methods for use in a Site Impact Analysis Study. The following is a list of other sources which may be used as general reference material for those readers wishing more detailed information.

1. *Effect of Driveway Traffic on Saturation Flow Rates at Signalized Intersections*, ITE Journal - February 1990

2. *Guidelines for Urban Major Street Design,* Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

3. *Shopping Center Development Handbook, Second Edition*, Urban Land Institute, Washington DC (1985) [(202) 289-8500]

4. *Traffic Engineering Handbook*, Fourth Edition, Institute of Transportation Engineers, Washington, DC (1992) [(202) 554-8050]

5. *Transportation Planning Handbook,* Institute of Transportation Engineers, (ITE), Washington, DC (1992) [(202) 554-8050]

6. *Design and Safety of Pedestrian Facilities*, Institute of Transportation Engineers, (ITE), Washington, DC (1995) [(202) 554-8050]

7. *Transit and Land Use Planning*, BC Transit, Surrey, B.C. (604) 540-3000

8. *Transit Friendly Subdivision and Development Guidelines*, BC Transit, Victoria, B.C. (1995) (250) 385-2551

Appendix A - Recommended Terms of Reference for a Site Impact Analysis Study

MINISTRY OF TRANSPORTATION

SITE IMPACT ANALYSIS STUDY RECOMMENDED TERMS OF REFERENCE

1.0 INTRODUCTION

The purpose of a Site Impact Analysis Study is to determine the impact of the traffic generated by the proposed development of a specific site on the surrounding road and highway network and identify what improvements may be required in order to adequately and safely accommodate the generated traffic. The Site Impact Analysis Study evaluates access alternatives and provides information which will help determine the acceptability of proposed access points. It will also address other issues that influence the impact of a new development on a highway, such as the provision of additional travel lanes or separate turn lanes on the highway, on-site storage lengths, and the internal layout of parking.

All Site Impact Analysis Studies undertaken for submission to the Ministry in support of an application or approval should fulfill the requirements of this Recommended Terms of Reference as outlined in the remainder of this document. The Recommended Terms of Reference should be used with the Ministry's Site Impact Analysis Requirements Manual, the *Scope Development Meeting* minutes, the Ministry Scope Development Checklist (Table A.2) and current engineering practice to ensure that the study is accurate and complete. These terms of reference have been developed with the assumption that the need for a Site Impact Analysis Study has already been determined by the Ministry. Local Government warrants and requirements for Site Impact Analysis Studies should also be determined.

This Terms of Reference will refer to the Ministry's Site Impact Analysis Requirements Manual as "the manual". Site Impact Analysis Studies that do not meet the Ministry's requirements as laid out in the Site Impact Analysis Requirements Manual, the *Scope Development Meeting* minutes and this terms of reference will be deemed incomplete and returned to the applicant without detailed review.

2.0 WARRANTS FOR A STUDY

In general, a detailed Site Impact Analysis Study will only be required for a site which meets the criteria in Section 2.1 (a) to (h) of the manual **and** has an estimated trip generation rate of 100 or more two-way trips, (i.e. inbound plus outbound) during the peak hour. The trip generation rate will be estimated using the Ministry's *Parking and Trip Generation Rate Manual*. Care must be taken to consider both street peak hour and site peak hour rates when selecting a peak hour. The warrant of 100 peak hour trips will apply to applications related to:

- New sites
- Existing sites where a change in use is being proposed.

In addition, there may be other site specific factors where a study is required regardless of the trip generation rate. More information on study warrants for a detailed Site Impact Analysis Study can be found in Sections 2.1 and 2.3 of this manual. If the Ministry has determined that a detailed Site Impact Analysis Study is not required then the simplified review process outlined in Section 2.9 of the manual takes place. Also note that some Local Governments have their own guidelines to determine whether or not a study is required. The study must be undertaken by a Professional Engineer qualified in the field of traffic engineering and registered in the Province of British Columbia.

3.0 BASIC CRITERIA

3.1 Proposed Study Terms of Reference

A copy of Appendix A should be provided to the applicant when the need for the study has been established according to Section 2.3 of the manual. Ministry staff may also provide an attachment listing any known special conditions that the Site Impact Analsysis Study will be expected to address

The applicant or their traffic engineering consultant will then prepare a Proposed Study Terms of Reference for the specific Site Impact Analysis Study. This Proposed Study Terms of Reference should be tailored to the specific issues, constraints and alternatives of the site and should identify any requested deviations or variances from Appendix A and this manual. This Proposed Study Terms of Reference is then forwarded to the District Office along with a request for a *Scope Development Meeting*. More information on the Proposed Study Terms of Reference can be found in Section 2.4 of the manual.

3.2 Scope Development Meeting

When the Proposed Study Terms of Reference has been received and reviewed by Ministry staff, a *Scope Development Meeting* will be scheduled. The purpose of this meeting is to bring the Applicant, their Traffic Engineering Consultant, Local Government Staff, Ministry Staff and other Reviewing Agencies together to review the Proposed Study Terms of Reference and provide the required scope elements of the Site Impact Analysis Study prior to commencing the study. More information on the *Scope Development Meeting* can be found in Section 2.5 of the manual.

In order to ensure that there is a coordinated approach to determining the requirements for a detailed Site Impact Analysis Study, it is the responsibility of the applicant and their traffic engineering consultant to ensure that the review process begins before starting a Site Impact Analysis Study. To this end, the applicant, traffic engineering consultant, Ministry staff and all other Reviewing Agencies must get together for a *Scope Development Meeting* before beginning a Site Impact Analysis Study that is to be submitted to the Ministry.

A Ministry Scope Development Checklist can be found in Table A.2 at the end of Appendix A. This checklist will be used to determine the acceptability of the Proposed Study Terms of Reference and to record any changes, additions or revisions to the Proposed Study Terms of Reference which are discussed in the *Scope Development Meeting.* A copy of the completed checklist will be provided to the applicant and included as part of the approved study scope for the Site Impact Analysis Study for that particular site.

In addition to the checklist, the meeting minutes are to be completed by the applicant or their traffic engineering consultant and submitted to the District Office for approval. When the meeting minutes have been approved and returned, the applicant has the information necessary to begin the study.

3.3 Study Area

The extent of the area to be covered by a Site Impact Analysis Study depends on many factors including the location and size of the proposed development and the conditions existing on the adjacent road network. In general, large, urban development proposals may require more extensive analysis than smaller sites.

In establishing the study area, care should be taken to ensure that the complexity of the study is in proportion to the impact of the development traffic. Unless the Ministry indicates otherwise in writing, the Site Impact Analysis Study must include all of the site's proposed access points and any other accesses and intersections within two kilometres of the property lines of the site. Section 3.1 of the manual contains detailed information on the requirements for the study area. The approved study area must be confirmed by the Ministry and other Reviewing Agency at the *Scope Development Meeting*.

3.4 Background Data

The Ministry and some Local Governments collect traffic data on an annual basis. Data requirements may be matched with available data during the development of the Proposed Study Terms of Reference and at the *Scope Development Meeting*. Data collected by Local Governments may be acquired from the associated municipality or regional district and included as an appendix to the study. Data collected by the Ministry is available by contacting the following:

Transportation Officer
Information Management Section
Highway Planning and Policy Branch
3B 940 Blanshard Street,
Victoria, B.C.
V8W 3E6
Phone: 387-7547
Fax: 387-7549

Where current traffic data is not available, the Site Impact Analysis Study must complete any data collection required for the Site Impact Analysis Study. Copies of all date are to be included as an appendix to the study and will become the property of the Ministry. A suggested list of background data to be obtained for use in the study can be found in Table 3.1 of the manual. More information on obtaining and collecting data can be found in Section 3.2 of the manual.

3.5 Links to Other Studies and Plans

In undertaking a Site Impact Analysis Study, it is very important to consider all other studies and plans that may have an influence on current and future traffic flows in the study area. A list of informational items that should be obtained in order to assist in this aspect can be found in Section 3.3 of the manual.

In addition to these studies and plans, consideration must also be given to the functional classification of the surrounding road and highway network in order to ensure that the functional classification is not compromised and that connections are made to appropriately classified roads. The Ministry has established a functional classification system for provincial roads and highways as published in "*British Columbia Highway Functional Classification*". It is the functional classification of the surrounding network of roads and highways that determines the required performance levels, the availability of direct access and the restrictions that may be required. These classifications and their permitted connections are given in Table 3.2 of the manual.

It is the responsibility of the applicant or their traffic engineering consultant to obtain the required materials. Identification of available materials to be included in the Site Impact Analysis Study should take place at the *Scope Development Meeting* and will be noted in the meeting minutes. The Site Impact Analysis Study must document the functional classifications of the surrounding road network and provide details and schedules of any related studies and plans including other proposed developments in the study area.

3.6 Field Observations

The documentation of the Site Impact Analysis Study must confirm that a field visit has been undertaken according to Section 3.4 of the manual and that existing road, highway and traffic conditions within the study area have been observed for the appropriate times.

3.7 Horizon Years

Horizon years for analysis are typified by:

- The estimated completion date of the proposed development
- Development phasing on-site and in the study area
- Regional or Local Government planning horizons (e.g. Year 2021 to coincide with the Transport 2021 Study)
- A capital improvement program planning horizon (e.g. 5 and 10 years)
- Major transportation system changes

In addition, if the development size is significant and the development is constructed in phases, then the completion of each phase may represent a horizon year. Further information about determining horizon years for the study can be found in Section 3.5 of the manual.

Unless the Ministry indicates otherwise in the *Scope Development Meeting*, the following horizon years should be used for the projection of base traffic for a non-phased development:

Horizon Year #1 - Day One (opening day)

Horizon Year #2 - Day One + 5 years

Horizon Year #3 - Day One + 10 years

Horizon Year #4 - Day One + 15 years

Outside of large established metropolitan areas of the province, a fifteen year horizon year is necessary to reveal the full extent of the mitigation required by a new or changed development. In areas of the province with high growth in traffic volumes and/or existing low levels of service on the study area network roads, the Proposed Study Terms of Reference for the Site Impact Analysis Study may wish to provide a justification for removal of the requirement to study Horizon Year #4. The elimination of Horizon Year #4 must be discussed at the *Scope Development Meeting* and if it is acceptable, it will be noted in the Meeting minutes where it must be reviewed and approved by the Ministry before becoming part of the approved study scope.

In addition, if the development is to be phased, the analysis must be done for the end of the horizon year for each of the major phases and for the year of ultimate full “build-out” in order to determine what improvements are required at these times. Horizon years for phased developments may extend beyond ten or fifteen years and therefore, analysis of additional horizon years will be required.

3.8 Peak Periods for Analysis

The primary purpose of requesting a Site Impact Analysis Study is to demonstrate what effect the development will have on the transportation system and to identify what improvements may be required. In general, the maximum impact occurs during the site peak hour and/or during the peak hour of the adjacent roads.

The time period(s) that provide the highest cumulative directional traffic demands should be used to assess the impact of site traffic on the adjacent street system and to define the roadway configurations and traffic control measure changes needed in the study area. The peak hour traffic volume(s) determined in this way become the design hour volume(s) for the site. Detailed information about determining peak periods for analysis can be found in Section 3.6 of the manual.

Chapter 2 of the Ministry's Parking and Trip Generation Rates Manual contains a detailed description of how the peak hour volume(s) of a development site are established. It should be noted that the site peak hour(s) may not occur at the same time as the adjacent street peak hour(s). In this case, additional analysis may be required for any of the adjacent street peak hours that are required to properly assess the impacts of the site. Seasonal peaks must also be considered.

In general, the peak traffic generated by the site should be analyzed for the purpose of determining the requirements for on-site access design features such as vehicle queuing storage (magazine) length, number of lanes and internal circulation requirements. The adjacent street peak hour traffic should be analyzed to determine the required improvements to the existing or proposed adjacent road network for all access alternatives being evaluated. In addition to reviewing the site peak hour(s) and the adjacent street peak hour(s), individual turning movements or operations must be reviewed to determine whether they may become critical during secondary peak periods.

The Ministry requires that the study shall include an analysis of the highest peak hour volume for each turning movement. Saturday afternoon traffic shall also be analyzed if the development is to be part of a significant retail area. Peak periods for analysis in the study must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

3.9 Trip Generation

Trip generation rates should be determined according to the Ministry's *Parking and Trip Generation Rates* Manual. Sections 3.8 and 3.9 of the manual also provide more detailed information on the following items related to trip generation including:

- Rates for land uses not included in the Ministry manual
- Establishing new rates
- Local Government rates
- Applying variances to the rates
- Pass-by traffic
- Phased Developments
- Accounting for internal trips in mixed use developments
- Diverted linked trips

Any rates determined by a survey of new data must be approved before being used in the Site Impact Analysis Study. While the rates used for analysis purposes will be based on the appropriate peak hour rates, the report must also include estimates of daily traffic volumes generated by the site. The number of trucks included in this total must also be provided. Trip generation rates for use in the study must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

3.10 Access Alternatives

The Site Impact Analysis Study must provide documentation which shows that all feasible access alternatives and options (existing and proposed) have been reviewed and the impacts of these options. This includes not only those shown in the concept plans for the site, but also any other alternatives that may reduce the impact of the development traffic on the adjacent road and highway network including those requested by the Ministry and other Reviewing Agencies and outlined in the minutes of the Scope Development Meeting. For some corridors, limited direct access may only be granted when the study shows that there are no other reasonable alternatives. Where direct access is allowed, the development design should be able to take advantage of future alternate access when it is available. A more detailed discussion of access alternatives can be found in Section 4.9.1 of the manual.

4.0 NETWORK ANALYSIS TECHNIQUES

4.1 Existing Conditions

The Site Impact Analysis Study should include a review of existing conditions in the study area without the traffic generated by the proposed development or the proposed change in use of an existing development. This will determine existing road, highway and intersection volumes and any available capacity. More detailed information about existing conditions can be found in Section 4.1 of the manual.

The review of existing conditions shall include those items listed in Section 4.1 of the manual and any other items which appear in the *Scope Development Meeting* minutes. Documentation of this information should be included in the Proposed Study Terms of Reference and should be discussed at the *Scope Development Meeting*.

4.2 Impacts of Transportation System Changes

Unless the approved minutes of the *Scope Development Meeting* indicate that network improvements and major highway upgrading projects are currently funded and can be used, the Site Impact Analysis Study should not assume any reduction to the background traffic volumes that would result from planned future projects.

In undertaking Site Impact Analysis Studies, the transportation network may have to be examined both with and without such improvements. Since an improvement may decrease traffic volumes on the existing road network, it is important to be able to identify what improvements may be required both with and without the proposed network improvements in place so that the impact of the system improvements on the site study recommendations can be determined.

The analysis of future conditions should also include an evaluation of the combined impacts of both the proposed development and also other developments and development improvements expected to take place within the approved study area. The use of transportation system changes in the study must be outlined and justified in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting*.

4.3 Traffic Projections

Estimates of future background traffic or "base" traffic in the study area are required to complete the analysis of horizon year conditions on the surrounding road network. General information about appropriate horizon years for traffic projections can be found in Section 3.5 of this manual. The three primary methods of projecting base traffic are:

- The build-up method
- The use of existing transportation plan or modeled volumes
- Projection of past trends or growth rates into the future

All three primary methods have their appropriate use. Projection of base traffic will often utilize a combination of these three methods. Traffic projections must be done for each approved horizon year as outlined in the approved *Scope Development Meeting* minutes. More information on traffic projections can be found in Section 4.3 of the manual.

The Proposed Study Terms of Reference for the study must outline and justify which method or combination of methods is appropriate for the proposed Site Impact Analysis Study. If the Ministry and other Reviewing Agency agree that the proposed methodology is appropriate for the study area and the site, it will be noted in the *Scope Development Meeting* minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.4 Trip Distribution

Section 4.4 of the manual contains detailed information about trip distribution of development traffic. In undertaking Site Impact Analysis Studies, the catchment area assumed for distributing the generated trips should be clearly documented. The three most commonly accepted methods for estimating trip distribution are provided in Section 4.4.1 to 4.4.3 of the manual. Trip generation rates for use in the study must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

Whichever method is used, trip distribution should be estimated and analyzed for each horizon year since population levels change over time on an area-by-area basis. Consideration should also be given as to whether inbound and outbound trips will have similar distributions. The derivation of trip distribution percentages must be fully documented in the Site Impact Analysis Study.

If an analytical approach to trip distribution can not be used or the site has operational limitations or the Ministry states otherwise, all directional splits shall be assumed to be equally allocated in each direction for each access. A full movement access shall be considered to have 50 percent of entering vehicles making a left turn and 50 percent making a right turn. The same applies to exiting vehicles. The analysis may include analysis of additional directional splits or elements at the discretion of the Ministry.

4.5 Assignment of Development Traffic

Trip assignment involves estimating the amount of generated traffic allocated to the alternative routes on the road network. The product of this process is the total number of development generated trips by direction and turning movement on each segment of the study area road network. Trip assignment should be made considering those items outlined in Section 4.5 of the manual.

Trip assignments can be done either manually or with applicable computer models. Regardless of which method is used, it is important that trip lengths be considered, particularly for large study areas and land uses which have a regional significance. For other types of land use, trips will be completed within a few kilometres of the site. Unless a gravity model is used to account for trip lengths, a trip length frequency curve should be utilized. Methodologies for assignment of development traffic must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

The total projected traffic for the horizon year is determined by superimposing the site generated traffic volumes onto the projected base traffic volumes. Traffic volume conditions in the study area for existing and projected horizon years with and without the site generated traffic from the proposed development are to be graphically illustrated and clearly documented in the Site Impact Analysis Study.

4.6 General Traffic Analysis Elements

A detailed traffic analysis must be undertaken on the projected traffic volumes with and without site generated traffic in order to:

- Assess the traffic impacts of the proposed development
- Show the relationship between operations and geometry
- Assess deficiencies in the system

Components of traffic analysis which are to be examined may include but are not limited to capacity analysis, corridor analysis, traffic safety and sight distance. More details on these elements can be found in Section 4.6 of the manual. General traffic analysis elements must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

This section deals with the traffic analysis requirements for traffic external to the development site itself. The development must also be capable of accommodating the access, circulation and parking requirement of generated traffic as well as service and emergency vehicles. The requirements for on-site planning and design can be found in Chapter 5 of the manual.

4.7 Intersection Analysis

All intersections and/or accesses included in the Site Impact Analysis Study should be analyzed using a standard methodology such as that documented in the Ministry's Traffic Engineering Manual. Other references include the Transportation Research Board's Special Report 209, "*Highway Capacity Manual*" (HCM) and the Canadian Capacity Guide for Signalized Intersections (ITE).

An intersection capacity analysis must be done for each proposed access to the development for the study area, horizon years and analysis periods defined in Chapter 3 of the manual and approved in the *Scope Development Meeting*. The intersection analysis for each proposed access to the site is required to ensure that the access design is adequate since each access operates as an unsignalized intersection. The various options for access to the development must be documented in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. Intersection capacity analysis must be done for all these options. This includes left turn and right turn lane warrants and design requirements.

Also, the Proposed Study Terms of Reference should outline and justify any proposed alternative evaluation techniques and the acceptability of these will be discussed at the *Scope Development Meeting*. If the options for access and the analysis methodologies are acceptable to the Ministry and other Reviewing Agency, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

The intersection capacity analysis to be submitted with a Site Impact Analysis Study shall use the standards and guidelines and provide all information as outlined in Section 4.7 of the manual. This includes signalized intersections, unsignalized intersections, traffic signal warrants, traffic signal spacing and traffic signal phasing.

No application will be approved which requires signalization of a private access within the study horizon period. In order to negate the requirement to signalize a private access, other options must be evaluated which would accommodate the future traffic. If the access option involves signalization of an adjoining public road, then the signal spacing requirements of Section 4.7.3 of the manual must be met.

Traffic signal progression analysis submitted in the Site Impact Analysis Study must include progression bandwidth, efficiency and level of service determinations, with all software output reports provided and including all existing and future signals within the coordinated signal system of the approved study area. The software to be used must be approved in the *Scope Development Meeting* before use in the study.

Ministry regional traffic engineers should be contacted to advise of any special phasing requirements prior to commencement of detailed analysis. Any proposed multi-phase analysis should be discussed prior to commencement of detailed analysis. In addition, the Proposed Study Terms of Reference should contain a communication plan for discussion of specific phasing requirements and details. Any analysis based on unacceptable phasing will result in the return of the Site Impact Analysis Study without a detailed review.

4.8 Weaving Analysis

The standard weaving analysis methodology, as provided in the *"Highway Capacity Manual"* is applied to freeways. Weaving on urban streets is covered in Figure 16.12 (a nomograph) of the ITE's *"Transportation and Traffic Engineering Handbook (Second Edition)"* which provides the level of service for various traffic volume levels and weave distances. More information on weaving can be found in Section 4.8 of the manual. Weaving analysis should be documented in the Proposed Study Terms of Reference for the Site Impact Analysis Study and discussed in the *Scope Development Meeting*.

4.9 Mitigation Measures

When the impacts of the development have been determined, the Site Impact Analysis Study should document the proposed mitigation measures. These mitigation measures would apply to the access location and design, the adjacent road network and the site itself. All access points associated with the proposed development should be designed in accordance with good design practice to:

- Protect the public safety
- Maintain smooth traffic flow
- Maintain highway right-of-way drainage
- Protect the functional classification of the highway

All possible mitigation measures should be considered and presented in the Site Impact Analysis Study according to Section 4.9 of the manual and the access options outlined in the approved *Scope Development Meeting* minutes. The mitigation measures which should be reviewed in the study include:

- Site access alternatives
- Off-site road network improvement alternatives
- On-site mitigation measures
- Corner clearances
- Speed change lanes
- Transportation demand management measures

If transportation demand management measures are being proposed for the site, the study must include a transportation demand management plan for the development. The plan should indicate the reduction program proposed, specify the actions that should be taken to reduce total peak-period vehicular trips, and the benefits expected to result from the plan. This analysis must be presented as an option unless rate reductions were previously approved by the Ministry in writing.

Failure to provide documentation and analysis of a comprehensive list of options will result in the return of the study to the applicant without complete Ministry review. Costs associated with transportation system improvements required to support the proposed development will be the direct responsibility of the applicant. All modifications and improvements to Ministry facilities must be to the Ministry's Design Standards (or if not in the Design Manual, with TAC standards).

4.10 Environmental Considerations

Site Impact Analysis Studies must also evaluate whether changes in the transportation system have unacceptable impacts on the environment. Some emphasis should be placed on this aspect, especially when comparing and evaluating alternative solutions or networks. More information on environmental considerations can be found in Section 4.10 of the manual. Environmental issues should be documented in the Proposed Study Terms of Reference for the Site Impact Analysis Study and discussed in the *Scope Development Meeting* to ensure that requirements are clearly laid out at the start of the analysis.

4.11 Cost Estimates

The *Scope Development Meeting* should include discussion of how development construction projects may be coordinated with Ministry and/or Local Government road upgrade projects or other developments. Where opportunities for coordination are identified, it is recommended that the Site Impact Analysis Study include an estimate of the cost of all required improvements.

Costs and cost sharing outlines should be referenced in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that these items warrant further study for the study area and the site, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of cost sharing does not bind the Ministry or Reviewing Agency to accept the recommendations of the completed study.

Cost estimates which may be outlined in the study include an estimate of the cost of undertaking all improvements to the road and highway network required to mitigate traffic capacity or safety problems caused by:

- Existing conditions
- Increases in through traffic
- The proposed development

5.0 ON-SITE PLANNING AND DESIGN

5.1 Access Design Elements

The location of the access was discussed in Section 4.9.1 of the manual and all access options to be analyzed in the study are reviewed in the *Scope Development Meeting*. However, these aspects of access deal with the external impacts. There are also on-site and geometric design features of an access and site layout that are required for safe and efficient traffic operation. An access should be designed from the same perspective as an intersection which has similar characteristics and volumes. More detailed information on general access design standards and vehicular queuing storage lengths can be found in Section 5.1 of the manual.

The Ministry has developed standards for use in locating and designing accesses. These standards are based on recognized engineering practice and exist to ensure that Ministry roads and highways function safely and efficiently. Where direct access to Ministry roads or highways is to be permitted, the standards for access design and construction are outlined in the Ministry manuals listed in Section 2.11 of the manual.

Vehicle queuing analysis is an integral component of access design. Queuing areas must provide sufficient storage for entering and exiting vehicles so that they do not block internal circulation roads or the adjacent road network. The amount of queuing length to be provided at an access is related to the amount of traffic expected to enter the parking area and the peaking characteristics of that traffic. The same queuing analysis procedures should be used for on-site queuing reservoirs as for off-site left and right turn lanes.

5.2 Parking Rates and Parking Design Elements

General guidelines and policies regarding the determination of parking rates for a proposed development can be found in Section 3.8 of the manual and in the Ministry's Parking and Trip Generation Rates Manual. The dimensions of the stalls and aisles shall be in accordance with those given in Section 5.2 of the manual. Section 5.2 also contains details regarding small-car parking, handicapped parking, shared parking and recreational parking. Note that Local Governments may also have guidelines and bylaws which must be considered.

Parking requirements must be outlined in the Proposed Terms of Reference and discussed in the *Scope Development Meeting* with consideration of Local Government requirements. Special provisions like small-car parking and shared parking must be referenced in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that these items warrant further study, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow this analysis does not bind the Ministry or other Reviewing Agency to accept the recommendations of the completed study.

The parking area must support the type of land use with consideration given to the location of the development and the adjacent road infrastructure. All supporting documentation, indicating the location, layout, available accesses, and all uses at the surveyed sites as well as the sites immediately adjacent must be included in the report. While the rates used for analysis purposes will be based on the appropriate peak hour rates, the report must also include estimates of daily traffic volumes generated by the site. The number of trucks included in this total must also be provided.

5.3 Site Design Elements

Consideration of on-site design elements is important to the safe and efficient operation of site traffic and to reducing the site's impact on the adjacent road system. Good site design will integrate the building with the access, parking areas, loading areas, transit facilities, cyclist facilities and pedestrian facilities. Key issues to be addressed at this time include:

- Internal vehicular circulation
- Service and delivery vehicle design elements
- Pedestrian, transit and bicycle facilities
- General landscape design considerations
- Other site design elements

On-site design elements are outlined in Section 5.3 of the manual. The study must confirm that all on-site design elements meet accepted technical standards.

The Ministry's standards for access design and location are provided in Section 5.1 of the manual as well as in the current issue of the Ministry's Design Manual.

6.0 REFERENCE MATERIALS

The following is a list of reference materials which were used in the development of this manual. Where possible, phone numbers and/or addresses have been provided for anyone wishing to obtain a copy of the reference. Information on how Ministry manuals and standards may be obtained is available by contacting the applicable Ministry District Office (Appendix B).

The information contained in this manual is based on accepted engineering practice and the following standard engineering references used by the Ministry of Transportation.

1. The current editions of the following manuals and standards of the Ministry of Transportation:

   (a) *Design Manual*

   (b) *Standard Specifications for Highway Construction*

   (c) *Traffic Engineering Manual*

   (d) *Traffic Control Manual for Work on Roadways*

   (e) *Manual of Standard Traffic Signs*

   (f) *Pavement Marking Standards Manual*

   (g) *Utility Policy Manual*

   (h) *Pedestrian Crossing Control Manual for BC*

   (i) *Traffic Volumes in BC*

   (j) *Interim Cycling Policy*

   (k) *Highway Functional Classification*

   (l) *Parking and Trip Generation Rates Manual*

   (m) *Manual of Aesthetic Design Practice*

2. *Traffic Access and Impact Studies for Site Development,* A Proposed Recommended Practice, Institute of Transportation Engineers, Washington, DC (1988) [(202) 554-8050]

3. *Manual of Geometric Design Standards for Canadian Roads*, Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

4. *Urban Supplement to the Geometric Design Guide for Canadian Roads*, Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

5. *Uniform Traffic Control Devices for Canada, (Metric Edition)* Transportation Association of Canada (TAC), Ottawa, as amended. [(613) 736-1350]

6. *Turning Vehicle Templates,* Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

7. *Highway Capacity Manual,* Special Report 209, Transportation Research Board (TRB), Washington, DC. [(202) 334-3238]

8. *Guidelines for Parking Facility Location and Design,* Institute of Transportation Engineers, (1994). [(202) 554-8050]

9. *Trip Generation*, fifth edition, Institute of Transportation Engineers, (ITE) Washington, DC (1991). [525 School Street, SW, Suite 410, Washington DC 20024-2729. [(202) 554-8050]

10. *Parking Generation,* Second Edition, Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

11. *Transportation and Land Development,* Institute of Transportation Engineers (ITE), Washington, DC (1988), [(202) 554-8050]

12. *Canadian Capacity Guide for Signalized Intersections*, Second Edition, (1995), Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

13. *Manual for Transportation Engineering Studies*, Fourth Edition, Institute of Transportation Engineers (ITE), Washington, DC (1994) [(202) 554-8050]

14. *Transportation and Traffic Engineering Handbook*,), Second Edition, Institute of Transportation Engineers (ITE), Washington DC (1982) [(202) 554-8050]

15. *Land Development Guidelines for the Protection of Aquatic Habitat*, Fisheries and Oceans and BC Ministry or Environment, Lands and Parks, (1993), Copies are available from Department of Fisheries and Oceans, Communications Branch, 555 West Hastings, Vancouver, B.C. V6B 5G3.

16. *Stream Stewardship: A Guide for Planners and Developers*, Fisheries and Oceans and BC Ministry or Environment, Lands and Parks, (1994/94), Copies are available from Department of Fisheries and Oceans, Communications Branch, 555 West Hastings, Vancouver, B.C. V6B 5G3.

17. *Community Cycling Manual: A Planning and Design*, Canadian Institute of Planners, (1990), 404 126 York St., Ottawa, Ontario, K1N 5T5.

18. *Shared Parking Planning Guidelines*, (Prepared by ITE Technical Committee 6F-52), Institute of Transportation Engineers (ITE), Washington DC (1995) [(202) 554-8050]

19. *Shared Parking,* Urban Land Institute, Washington DC (1983) [(202) 289-8500]

7.0 REPORT CONTENTS

In general, the detailed Site Impact Analysis Study must document the study purpose, procedures, assumptions, findings, conclusions, and recommendations. This will be most effectively done keeping in mind the three common uses for these reports.

(a) To provide developers or designers with recommendations on site selection, site transportation planning and traffic impact.

(b) To assist public agencies in reviewing the attributes of the proposed developments in conjunction with any request for annexation, land subdivision, zoning changes, building permits, access or other development reviews and to establish mitigation requirements where off-site impacts require improvements.

(c) To assist some public agencies in determining development cost charges or to assess developer contributions to roadway facility improvements.

The analysis should be presented in a straightforward and logical sequence. Table A.1 in this appendix provides an acceptable detailed study outline. In some cases, studies will be easily documented using these outlines. In other cases, additional analysis may be warranted because of site specific issues and Local Government and/or Reviewing Agency study requirements. Section 2.8.1 of the manual outlines the items used to determine whether the report is complete. Three copies of the final report must be submitted to the District Office.

All feasible options for providing access, as outlined in the approved minutes of the *Scope Development Meeting,* must be evaluated. The study should lead the reviewer through the various stages of the analysis and to the resulting conclusions and recommendations. Sufficient detail should be included so that the staff of the Ministry and any other Reviewing Agency will be able to follow the logic and methodology of the analysis.

Transportation improvements related to providing the required level of site access and mitigation of the adverse effects of the development-related traffic on the transportation network must be described. Recommendations should be made for any required off-site roadway improvements such as additional through lanes, auxiliary lanes and traffic control devices necessitated as a result of the development. Also, required improvements to the internal roadway system and facilities for transit, pedestrians and cyclists should be developed and presented.

If the assumptions made in the analysis are based on published sources, then those sources must be specifically referenced. If other, less readily available sources are used, a more detailed explanation and prior approval is necessary and their use must be discussed in the *Scope Development Meeting*.

If required improvements to the grid road system are identified during the analysis, the recommendations must specify:

- The time period within which the improvements should be made
- Links between the improvements and the various phases of the development construction
- Links between the improvements and the trip generation and parking rates attributed to the site
- The estimated cost of the improvements
- Any monitoring of operating conditions and improvements that may be required

Inapplicable sections listed in the Study Outline (Table A.1) may be omitted from the report with the written agreement of the Ministry and Reviewing Agencies. The approved *Scope Development Meeting* minutes and Table A.2 should provide in writing, clear direction as to what is to be included and what may be omitted from the report. This may be amended throughout the duration of the study development and review process according to Section 2.5 if justification can be submitted and agreement is provided in writing from the Ministry and Reviewing Agencies.

Table A.1 Recommended Outline For A Detailed Site Impact Analysis Study

I. EXECUTIVE SUMMARY

A. Study Purpose
B. Key Findings
C. Study Conclusions
D. Study Recommendations

II. INTRODUCTION

A. Study Purpose and Background
B. Site Location and Study Area
C. Development Description
D. Approved Study Scope Elements

III. PROPOSED DEVELOPMENT (SITE AND NEARBY)

A. Off-Site Development
B. Description of On-Site Development
   1. Land use, intensity and zoning
   2. Location and site plan
   3. Phasing and timing
   4. Environmental considerations

IV. AREA CONDITIONS

A. Study Area
   1. Definition
   2. Field observations

B. Study Area Land Use
   1. Existing land uses and zoning
   2. Anticipated future development
   3. Related studies and plans

C. Site Accessibility
   1. Area roadway system - existing and future (including functional classification and goals and strategies defined in relevant plans like system plans, corridor plans and access management plans)
   2. Existing traffic volumes and conditions
   3. Transit service
   4. Pedestrian and cycling facilities
   5. Existing relevant transportation system management programs

V. PROJECTED TRAFFIC

A. Site Traffic (each horizon year)
   1. Horizon years
   2. Peak period(s)
   3. Trip generation
   4. Trip distribution
   5. Modal split
   6. Trip assignment

B. Through Traffic (each horizon year)
   1. Horizon years
   2. Peak period(s)
   3. Method of projection
   4. Non-site traffic for anticipated development in study area
      a. Method of projection
      b. Trip generation
      c. Trip distribution
      d. Modal split
      e. Trip assignment
   5. Through traffic volumes
   6. Estimated volumes

C. Total Traffic (each horizon year)

VI. TRAFFIC ANALYSIS

A. Capacity analysis
B. Corridor analysis
C. Safety analysis
D. Sight distance
E. Intersection analysis
F. Traffic signal phasing analysis
G. Weaving analysis

VII. MITIGATION MEASURES

A. Analysis of site access alternatives
B. Off-site road network improvement alternatives
C. On-site mitigation measures
D. Corner clearances
E. Speed change lanes
F. Transportation demand management measures
G. Site Circulation and Parking

VIII. IMPROVEMENT ANALYSIS

A. Plans and Studies Reviewed
B. Improvements to Accommodate Base Traffic
C. Improvements to Accommodate Site Traffic
D. Alternative Improvements
E. Transportation System Improvements Already Funded
F. Evaluation

IX. FINDINGS

A. Site accessibility
B. Traffic impacts
C. Need for any improvements
D. Compliance with applicable local bylaws
E. Costs

X. RECOMMENDATIONS

A. Site access/circulation plan
B. Roadway improvements
   1. on-site
   2. off-site
   3. phasing, if appropriate

C. Transportation System Management Actions
   1. off-site
   2. on-site operational
   3. on-site

D. Other

XI. CONCLUSIONS

APPENDIX References and Data

* (Reference - ITE - Traffic Access and Impact Studies for Site Development - A Proposed Recommended Practice)

Table A.2 Scope Development Checklist - Detailed Site Impact Analysis Study

BC Ministry of Transportation (MoTH)

Date: _____

Municipal Information:

☐ Subdivision ☐ Rezoning ☐ Development Permit ☐ Urgent

File Number: _____ Bylaw Number: _____

Staff Contact: _____ Phone Number: _____

Applicant Information:

Name: _____

Address: _____

Postal Code: _____ Phone Number: _____

Project Information:

Legal Description: _____

_____

_____

Civic Address: _____

Topographic Description: _____

Present Land Use: _____ Proposed: _____

Present Zoning: _____ Proposed: _____

1. Proposed Study Terms of Reference prepared and submitted by: _____
   date: _____
2. Proposed Study Terms of Reference reviewed for MoTH by: _____
   date: _____
3. Scope Development Meeting Scheduled for (date and time): _____
4. Local Government notified of meeting date and time by: _____
5. Scope Development Meeting attendees: _____
   _____
   _____
   _____
   _____
   _____
   _____

6. Proposed Study Terms of Reference has outlined all feasible and acceptable options for providing access? (See manual section 2.7)

   Yes
   No
   Unacceptable Access Options:

   _____
   _____
   _____
   _____

   Additional Access Options which must be evaluated:

   _____
   _____
   _____
   _____

7. All proposed study assumptions or methodologies based on those outlined in this manual? (See manual section 2.7)

   Yes
   No
   Unacceptable assumptions and/or methodologies:

   _____
   _____
   _____
   _____

   Acceptable assumptions and methodologies which may be used in this study:

   _____
   _____
   _____
   _____

8. Proposed Study Terms of Reference includes all elements of the study outline (Table A.1)? (See manual section 2.7)

   Yes
   No
   Study Outline Sections which may be eliminated

   _____
   _____
   _____
   _____

   Study outline sections which may not be eliminated

   _____
   _____
   _____
   _____

9. Approved Study Area (See manual section 3.1)

   As required by the Site Impact Analysis Requirements Manual - Section 3.1
   As presented in Proposed Study Terms of Reference
   Include following additional intersections in study analysis:

   _____
   _____
   _____

10. Data requirements for the Proposed Study (See manual section 3.2)

As provided in Table 3.1 of the Site Impact Analysis Requirements Manual (copy attached)

Additional data collection as outlined in Proposed Study Terms of Reference

Acceptable as proposed

Unacceptable as proposed (provide reasons below)

_____

_____

_____

_____

Additional data collection required as follows:

_____

_____

_____

_____

11. Other Plans and Studies which shall be used in the development of the Site Impact Analysis Study. (See manual section 3.3)

As noted in the Proposed Study Terms of Reference

Additional studies which should be used.

_____

_____

_____

_____

12. Functional Classification of MoTH and Local Government Roads in the Approved Study Area. (See manual section 3.3)

As noted in the Proposed Study Terms of Reference.

Functional Classifications to be used in the Study as noted below.

Road Name	Controlled Access	Functional Classification

13. Horizon Years to be used in the Site Impact Analysis Study. (See manual section 3.5.2)

As noted in the Proposed Study Terms of Reference _____

Day One (opening day)

Day One + Five Years

Day One + Ten Years

Day One + Fifteen Years

Other horizon years which must be evaluated in the study

_____

_____

_____

_____

14. Proposed peak hour(s) including day of the week to be used in the Site Impact Analysis Study. (See manual section 3.6)

    As noted in the Proposed Study Terms of Reference_____

    Morning Peak _____

    Afternoon Peak _____

    Peak Hour of Proposed Development _____

    Other peak hours which must be evaluated in the study

    _____

    _____

    _____

    _____

15. Does the Proposed Study Terms of Reference outline and justify adjustments to existing traffic volumes? (See manual section 3.7)

    No adjustments outlined in the Proposed Study Terms of Reference.

    Adjustments noted in the Proposed Study Terms of Reference are acceptable.

    Adjustments noted in the Proposed Study Terms of Reference are unacceptable as proposed (provide reasons below).

    _____

    _____

    _____

    _____

    The following existing volumes are provided to the applicant to be used in the Site Impact Analysis Study.

Road or Highway	Direction of Travel	Day of Week and Time	Existing Volume

16. Trip Generation Rates for the proposed development. (See manual section 3.8)

Ministry Rate	Local Government Rate	ITE Rate

Ministry Rate applies. (See manual section 3.8.1)
Local Government Rate applies. (See manual section 3.8.4)
ITE Rate applies. (See manual section 3.8.2)
Proposed Study Terms of Reference outlines the requirement for new trip generation rate data collection. (See manual section 3.8.3)
Acceptable as proposed
Number of sites proposed _____
Locations of acceptable sites for trip generation rate data collection.

Site Name	Site Address

Sites approved by: _____ date:_____
Unacceptable as proposed (provide reasons below)
_____
_____
_____
_____
Variance Requested in Proposed Study Terms of Reference? (See manual section 3.8.5)
Acceptable to allow analysis of the variance as proposed. (Note that agreement to allow the analysis of a variance does not bind the Ministry or Reviewing Agency to accept the variance after analysis is complete.)
Unacceptable to allow analysis of the variance as proposed. (provide reasons below)
_____
_____
_____
_____

17. Proposed Study Terms of Reference outlines that the following key elements impacting trip generation rates are to be analyzed. (See Section 3.9)
Pass-by Trips (See manual section 3.9.1)
Acceptable as proposed
Unacceptable as proposed. (Provide reasons below)
_____
_____
_____
_____
Phased Development (See manual section 3.9.2)
Acceptable as proposed
Unacceptable as proposed. (Provide reasons below)
_____
_____
_____
_____

Internal Trips for Mixed Use Developments (See manual section 3.9.3)
Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

Diverted Linked Trips (See manual section 3.9.4)
Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

18. Listing of all materials which will be used to establish existing or "known" conditions in the approved study area. (See manual section 4.1)
Acceptable as noted in the Proposed Study Terms of Reference.
Other materials which must be used in the study.

_____
_____
_____
_____

19. Network improvements and highway upgrades which may be included in the Site Impact Analysis Study. (See manual section 4.2)
Acceptable as noted in the Proposed Study Terms of Reference.
Other network improvements and highway upgrades which may be used in the study.

_____
_____
_____
_____

Network improvements and highway upgrades in the Proposed Study Terms of Reference which may not be used in the study.

_____
_____
_____
_____

20. Proposed methodologies for estimating traffic projections. (See manual section 4.3)
Acceptable as noted in the Proposed Study Terms of Reference.
Build-up method. (See manual section 4.3.1)
Use of area transportation plan or modeled volumes. (See manual section 4.3.2)
Projection of past trends or growth rates. (See manual section 4.3.3)
Growth rate to be used has been provided by:
MoTH (rate) _____
Local Government (rate) _____

21. Proposed methodology for determining Trip Distribution. (See manual section 4.4)
Acceptable as noted in the Proposed Study Terms of Reference.
Analogy Method. (See manual section 4.4.1)
Trip Distribution Model. (See manual section 4.4.2)
Surrogate Data. (See manual section 4.4.3)
Unacceptable as proposed. (provide reasons below).

_____
_____
_____
_____

22. Trip assignment of proposed development traffic. (See manual section 4.5)
Acceptable as noted in the Proposed Study Terms of Reference.
Manual.
Computer Model.
Unacceptable as proposed. (provide reasons below).

_____
_____
_____
_____

23. General traffic analysis elements to be included in the Site Impact Analysis Study. (See manual section 4.6)
Acceptable as noted in the Proposed Study Terms of Reference.
Capacity analysis is required. (See manual section 4.6.1)
Corridor analysis is required. (See manual section 4.6.2)
Traffic Safety analysis is required. (See manual section 4.6.3)
Sight Distance analysis is required. (See manual section 4.6.4)

24. Intersection Capacity Analysis. (See manual section 4.7)
Acceptable as noted in the Proposed Study Terms of Reference.
Additional Access Options which must be evaluated or proposed access options which may not be evaluated in the study as agreed to and documented in item 6 of this Ministry Scope Development Checklist.
Alternative evaluation techniques proposed for intersection(s) in the study area
Acceptable as proposed
Unacceptable as proposed (provide reasons below)

_____
_____
_____
_____

Public road intersection signalization may be or will be required for the following intersection(s) in the study area to the final horizon year which was identified in item 13 of this Ministry Scope Development Checklist?

_____
_____
_____
_____

Public road intersection signal spacing for all legs of the following intersection(s). This includes existing signals and signals proposed in corridor plans, regional plans or approved municipal street network plans.

Intersecting Street Names	Signal spacing of all intersection legs				Indicate whether spacing is acceptable for all intersection legs			

Other options have been proposed and will be analyzed which do not require public road intersection signalization?

Yes
No
Acceptable
Unacceptable

Analysis of public road intersection signalization is acceptable for the following intersection(s). (Note that agreement to allow this analysis does not bind the Ministry or Reviewing Agency to accept the signalization after analysis is complete.)

_____
_____
_____
_____

Analysis of public road signalization is unacceptable for the following intersection(s). (Provide reasons below)

_____
_____
_____
_____

25. Signal progression or signal phasing analysis software proposed for use in the study. (See manual section 4.7.4)

No
Yes
Name(s) of software

_____

Acceptable
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

26. Weaving analysis proposed for the study? (See manual section 4.8)

No

Yes

Acceptable as proposed

Unacceptable as proposed. Weaving analysis required for the following movements:

_____

_____

_____

_____

27. Corner clearance for access to the proposed development. (See manual section 4.9.4)

Acceptable as noted in the Proposed Study Terms of Reference.

Acceptable as noted in the Proposed Study Terms of Reference for the following options. (state option number)

_____

_____

_____

_____

Unacceptable as noted in the Proposed Study Terms of Reference for the following options. (state option number)

_____

_____

_____

_____

28. Speed change lane(s) will be or may be required for the proposed development site and access options. (See manual section 4.9.5)

Acceptable to assume that all lanes have equal volumes

Lane volume data is required

Ministry to provide lane volume data

_____

Applicant to provide lane volume data

_____

Acceptable as noted in the Proposed Study Terms of Reference for the following options. (State option number)

_____

_____

_____

_____

Unacceptable as noted in the Proposed Study Terms of Reference for the following options. (State option number)

_____

_____

_____

_____

29. Transportation Demand Management measures have been proposed for the development site? (See manual section 4.9.6)

No
Yes

List any variance requests which accompany proposed TDM measures.

_____
_____
_____
_____

TDM variance requests which are unacceptable for further study as proposed. (provide reasons)

_____
_____
_____
_____

TDM variance requests which are acceptable for further study as outlined in the Proposed Study Terms of Reference. An interim study providing variance justification must be submitted to the Ministry and Reviewing Agency prior to the use of any variance in the final study.

_____
_____
_____
_____

Interim study for TDM variance request:
Submitted on (date): _____
Submitted by (name): _____
Reviewed on (date): _____
Reviewed by (name): _____
Decision:

Acceptable for further use in study.
Unacceptable for further use in study. (provide reasons)

_____
_____
_____
_____
_____

30. Environmental considerations proposed for the Site Impact Analysis Study. (See manual section 4.10)

Acceptable as noted in the Proposed Study Terms of Reference.
Analysis required for the following items:

_____
_____
_____
_____

31. Cost and cost sharing estimates. (See manual section 4.11)

No cost sharing was noted in the Proposed Study Terms of Reference.
The cost sharing noted in the Proposed Study Terms of Reference is acceptable.
Signed by Ministry staff:_____date:_____
Signed by Local Government staff:_____date:_____
The cost sharing noted in the Proposed Study Terms of Reference is unacceptable.
Signed by Ministry staff:_____date:_____
Signed by Local Government staff:_____date:_____

32. Proposed on-site access design elements. (See manual section 5.1)

Acceptable as noted in the Proposed Study Terms of Reference.
Unacceptable as proposed. Analysis required for the following items:

_____
_____
_____
_____

33. Parking Rates for the proposed development. (See manual section 5.2)

Ministry Rate	Local Government Rate	ITE Rate

Ministry Rate applies. (See manual section 3.8.1)
Local Government Rate applies. (See manual section 3.8.4)
ITE Rate applies. (See manual section 3.8.2)
Proposed Study Terms of Reference outlines the requirement for new parking rate data collection. (See manual section 3.8.3)
Unacceptable as proposed (provide reasons below)

_____
_____
_____
_____

Acceptable as proposed
Number of sites proposed _____
Locations of acceptable sites for parking rate data collection.

Site Name	Site Address

Sites approved by: _____ date:_____

Variance Requested in Proposed Study Terms of Reference? (See manual section 3.8.5)

Acceptable to allow analysis of the variance as proposed. (Note that agreement to allow the analysis of a variance does not bind the Ministry or Reviewing Agency to accept the variance after analysis is complete.)
Unacceptable to allow analysis of the variance as proposed. (provide reasons below)

_____
_____
_____
_____

34. Proposed Study Terms of Reference outlines that the following key elements impacting parking for the site are to be analyzed. (See manual Section 5.2)

Dimensions of Standard Stalls (See manual section 5.2.2)
- Acceptable as proposed
- Local Government standards apply.
- Ministry standards as outlined in Figure 5.1 and Table 5.2 apply.

Provision of Small-car parking stalls. (See manual section 5.2.3)
- Acceptable as proposed
- Ministry allowance for small-call stalls for the site is _____
- Local Government allowance for small-call stalls for the site is _____
- No allowance for small car parking stalls for the site.

Dimensions of small-car parking stalls. (See manual section 5.2.3)
- Acceptable as proposed
- Local Government standards apply.
- Ministry standards as outlined in Figure 5.1 and Table 5.3 apply.
- No allowance for small car parking stalls for the site.

Handicapped Parking Spaces. (See manual section 5.2.4)
- Acceptable as proposed
- Ministry rate for handicapped stalls for the site is _____
- Local Government rate for handicapped stalls for the site is _____

Dimensions of handicapped parking stalls. (See manual section 5.2.4)
- Acceptable as proposed
- Local Government standards apply.
- Ministry standards as outlined in Figure 5.4 apply.

Analysis of Shared Parking is proposed for the site (See manual section 5.2.5)
- Acceptable as proposed
- Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

35. Proposed on-site vehicular circulation elements. (See manual section 5.3.1)
- Acceptable as noted in the Proposed Study Terms of Reference.
- Unacceptable as proposed. Analysis required for the following items:

_____
_____
_____
_____

36. Proposed on-site service and delivery vehicle design elements. (See manual section 5.3.2)
- Acceptable as noted in the Proposed Study Terms of Reference.
- Unacceptable as proposed. Analysis required for the following items:

_____
_____
_____
_____

37. Transit Facilities proposed for the site? (See manual section 5.3.3)

No
Yes

List any variance requests which accompany proposed transit facilities.

_____
_____
_____
_____

Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

38. Pedestrian facilities proposed for the site? (See manual section 5.3.3)

No
Yes

Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

39. Cycling facilities proposed for the site? (See Section 5.3.3)

No
Yes

Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

40. Additional items

No
Yes

See meeting minutes
See attached notes

Table A.3 Development Application Referral for Local Government

Date: _____

Municipal Information:

☐ Subdivision ☐ Rezoning ☐ Development Permit ☐ Urgent

File Number: _____ Bylaw Number: _____

Staff Contact: _____ Phone Number: _____

Applicant Information:

Name: _____

Address: _____

Postal Code: _____ Phone Number: _____

Project Information:

Legal Description: _____

_____

_____

Civic Address: _____

Topographic Description: _____

Present Land Use: _____ Proposed: _____

Present Zoning: _____ Proposed: _____

Conform With Official Community Plan? ☐ No ☐ Yes

Floor Area/No. of Seats/No. of Employees/No. of Units: _____

Trip Generation Rate for site: _____ Detailed Site Impact Analysis Study Required?

Does Property Abut:

a) Network Element? ☐ No ☐ Yes Name: _____

b) Controlled Access Highway? ☐ No Distance From: _____

☐ Yes Name: _____

If Yes, Complete the Following:

- Access ***Proposed*** From the Provincial Highway? ☐ No ☐ Yes
- Site Plan Attached? ☐ No ☐ Yes
- Off-Street Parking Provided? ☐ No ☐ Yes No. of Stalls: _____
- Proposed Drainage to Highway Storm System? ☐ No ☐ Yes
- Provincial Setback Requirement (4.5m) Affected? ☐ No ☐ Yes

Staff Recommended? ☐ No ☐ Yes

Council Consideration of This Application? ☐ No ☐ Yes Date: _____

Action: _____

Planning Department Comments:

Traffic/Engineering Department Comments:

Table A.4 Simplified Application Process - Information Requirements Checklist

	STUDY ELEMENT	X
1	A complete description of the proposed land use, including the size and type of each property.	
2	The type of development, including the number of units and buildings and the area of each.	
3	Subdivision plans or maps.	
4	Proof of subdivision approval.	
5	Zoning plans or maps.	
6	Proof of zoning approval and any zoning conditions for the site.	
7	Site development plan, or other plan or map including both sides of the highway and all corners of any driveway or intersections on, across, adjacent to or near the property affecting the proposed access design or operation.	
8	Site plans which shall clearly indicate the location of the property, existing conditions and the character and extent of the access work proposed, opening date or phasing of the proposed development and buildout year.	
9	Vicinity, property, parcel and ownership maps including easements, maps indicating any other access and abutting public roads and streets, with clear indication of all contiguous ownership.	
10	Property description (text format) including dimensions, maps and easements.	
11	Recorded copies of titles of ownership.	
12	Legal proof that an easement or agreement exists allowing cross access between adjacent properties.	
13	Maps and letters detailing utility locations before and after development in and along the highway.	
14	Highway plan and grade.	
15	Access plan and profile.	
16	Proof of liability insurance or service agreements.	
17	Complete drainage plan of the site showing impact to the highway right-of-way and drainage system.	
18	Examine impacts of drainage plan on downstream properties and watercourses.	

	STUDY ELEMENT	X
19	Proposed access design and appurtenances including but not limited to width, radii, angle to the highway, taper lengths, auxiliary lane lengths, shoulders, sidewalks, curb and gutter, proposed and existing drainage structures and ditches, grade of side slopes, pavement design including base and surfacing materials and thickness (minimum scale 1:500). This drawing must be prepared by a Professional Engineer of BC using standards outlined in the current edition of the Ministry's Design Manual.	
20	Highway capacity analysis to determine off-site mitigation requirements. This should include other proposed future developments within the study area according to existing zoning.	
21	Traffic data, information and analysis for the land use including prior, existing and future conditions to full development for peak hour volumes for each design element and total average daily traffic, trip generation, distribution and assignment for each land use as outlined in the Site Impact Analysis Requirements Manual. Studies for retail commercial sites should include Saturday and Sunday peak hour analysis.	
22	A traffic signal operation analysis, including all input and output reports and all factors.	
23	Grades, both existing and proposed for all features including: setback and location of structures, curb, gutter, sidewalks, signs, utility poles, lighting, underground utilities, all site access, access design, contours, number and location of lanes, parking areas and traffic circulation aisles, magazine location and lengths, pavement location and types, drainage systems, side slopes and profiles with location of top and bottom, size and design and elevations of drainage pipes.	
24	Plans pertaining to all parking, interior drives and internal traffic circulation plans, magazine storage, pedestrian and cyclist facilities, transit facilities, building location, traffic control devices and lighting locations.	
25	Internal and external signing and striping plans (including temporary and permanent).	
26	Traffic control plan for any construction work when the work or construction will encroach upon the current highway.	
27	Studies and or clearances determining that natural and cultural resources including flora, fauna, paleontology, archeology, historical sites and cemeteries will not be damaged or destroyed during and after development.	
28		
29		
30		
31		
32		
33		

Appendix B - District Offices

For a current list of Ministry of Transportation District Offices and contacts, go to the Contacts page on the Ministry of Transportation website: www.th.gov.bc.ca/contacts.htm

Appendix C - Controlled Access Highways

Controlled Access Highways

Note: The following is a general list. For more information, please refer to the appropriate District Office.

Alaska Highway
Aldergrove–Bellingham Highway County Line Road
Annacis Island Highway
Ashcroft-Cache Creek Highway
Ashcroft Manor Road
Barkerville Highway
Barnet Highway
Blanshard Street Extension
Burns Lake-Francois Lake Highway
Campbell River-Gold River Highway
Cariboo Highway
Carvolth Road
Chilcotin-Bella Coola Highway
Clydesdale Street
Coquihalla Highway
Cowichan Valley Highway
Crows Nest Highway (Southern Trans Provincial)
Cypress Bowl Access Road
Dangerous Goods Route 94
Dawson Creek -Spirit River (Alberta) Highway
Deas Tunnel Throughway
Elko-Roosville Highway
Ferry Approaches:
- Fulford-Ganges Road
- Long Harbour-Vesuvius Bay Road
- Monague Road
- Sturdies Bay Road
- MacKinnon Road and Pender Road
- Deacon Road and Village Road
- East Point Road
- Ferry Road
- Buckley Bay Road
- West Road
- Quathiaski Cove Road
- River Road and 240th Street
- McMillan Island Road

56th Street (Point Roberts Road)
Fort Nelson-Fort Simpson Highway
Fraser Highway
Garibaldi Highway
Highland Valley Road
Hudson Hope-Chetwynd Highway
Huntingdon-Mission Highway
Island Highway
(Old) Island Highway
John Hart Peace River Highway
Kalum Lake Road
Kamloops-Vernon Highway
Keremeos-Kaleden Junction Highway
King George VI Highway
Kingsgate-Yahk Highway
Kinnaird-Nelson-Creston Highway
Kitimat-Cassiar Highway 37
Kitwanga-Meziadin Lake Highway
Knight Street and Westminster Highway
Kootenay-Columbia Highway
Lac Le Jeune Road
Ladner-(Langley Bypass)-Livingstone Interchange highway
Lougheed Highway
McKenzie Highway
Marine Way
Mary Hill Bypass
Meadow Creek Road
Middle Arm Bridge (Approaches)
Nanaimo Parkway
Nelson-Nelway Highway
Ninety-three (93) Mile-Little Fort Highway 24
Northeast Development Road and Heritage Highway
Oak Street Bridge (Southerly Approach)
Okanagan Connector Highway 97C
Okanagan Highway
Pacific Highway
Parksville-Port Alberni-Tofino Highway
Paterson-Rossland-Trail Highway
Patricia Bay Highway
Pemberton-Lillooet Highway 99
Port Alberni Highway
Port Mellon Highway
Princeton Kamloops Highway
Revelstoke Eastern Access Road

Revelstoke-Nakusp Highway
Richmond Freeway
Ridley Island Access Road
Robson Road
Rock Creek-Kelowna Highway
Rosedale-Agassiz Bypass Highway
Rossland-Sheep Lake Highway
Ryan, Anderton, Ellenor Roads
Sicamous Grindrod Highway
Simon Fraser University Access Highway
Southern Trans-Provincial Highway
Sparwood-Elkford Highway
Stewart-Watson Lake Highway
Sunshine Coast Highway
Taylor Way-Marine Drive
Terrace-Kitimat Highway
Topley Landing Road
Trail-Castlegar Highway
Trail-Salmo Highway
Trans-Canada Highway
Tsawwassen Highway
United Boulevard
Vernon-Sicamous Highway
Vernon-Slocan Highway
West Coast (Sooke) Highway
Westside Road
Yellowhead Highway No. 16
Yellowhead South
(North Thompson) Highway

Glossary

Abutting	Having a common boundary with or touching along a border.
Acceleration Lane	A speed-change lane, including tapered areas, for the purpose of enabling a vehicle entering a roadway to increase its speed to a rate at which it can more safely merge with through traffic.
Access	Includes any private driveway or other point of access such as a strata road, street, road or highway that connects to the general street system. Where two public roadways intersect, the secondary roadway shall be considered the access.
Access Management Plan (AMP)	A roadway design plan which designates access locations and their designs for the purpose of bringing those portions of roadway included in the access management plan into conformance with their functional classification to the extent feasible.
Auxiliary Lane	Any additional special purpose lane such as; speed-change lanes, hill climbing lanes and turning lanes.
Average Annual Daily Traffic (AADT)	The total volume passing a point or segment of a highway facility, in both directions for one year, divided by the number of days in the year
Average Travel Speed	The average speed of a traffic stream computed as the length of a highway segment divided by the average travel time of vehicles traversing the segment, in kilometres per hour.
Average Travel Time	The average time spent by vehicles traversing a highway segment of given length, including all stopped-time delay, in seconds per vehicle or minutes per vehicle.
Backage Road	means a public street or road parallel to a highway and along the rear of properties fronting on to a highway, constructed for the purpose of maintaining local road continuity and the control of direct access to the main highway.
Bandwidth	The time in seconds or the percent of traffic signal cycle between a pair of parallel speed lines which delineate a progressive movement on a time-space diagram. It is a quantitative measurement of the through traffic capacity of a signal progression system. The greater the percentage of bandwidth, the higher the roadway capacity.

Bike Lane A portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicycles.

Bike Path A bikeway physically separated from motorized traffic by an open space or barrier, either within the highway right-of-way or within an independent right-of-way.

Capacity The maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic and control conditions; usually expressed as vehicles per hour or persons per hour.

Channelization The separation and direction of traffic movements and pedestrian crossings, at an at-grade intersection, into defined paths through the use of geometric features, pavement markings and traffic control devices.

Collector Roads Roads that connect local roads with primary arterial roads and provide access to individual properties.

Controlled Access Highways Highways or portions of highways designated or designed for through traffic. Highways designated as such by Order-in-Council to enable the Ministry of Transportation to restrict access onto the highway, approve rezoning at intersection and review subdivisions along the highway. This maintains highway safety and capacity

Corner Clearance The distance between the near curb of a street intersection and the near edge of a driveway throat or public lane.

Critical Gap The median time headway between vehicles in a major traffic stream which will permit side-street vehicles at a stop or yield controlled approach to cross through or merge with the major traffic stream under prevailing traffic and roadway conditions, in seconds.

Crosswalk The marked crossing area for pedestrians crossing the street at an intersection or designated midblock location.

Cycle Any complete sequence of traffic signal indications.

Cycle Length The total time for a traffic signal to complete one cycle.

Deceleration Lane A speed-change lane, including tapered areas, for the purpose of enabling a vehicle that is to make an exit turn from a roadway to slow to a safe turning speed after it has left the mainstream of faster-moving traffic.

Delay Additional travel time experienced by a driver, passenger or pedestrian beyond what would reasonably be desired for a given trip.

Density The number of vehicles occupying a given length of lane or roadway averaged over time; usually expressed as vehicles per kilometre or vehicles per kilometre per lane.

Design Hour Volume (DHV)	A traffic vehicle volume determined for use in the geometric design of the access and adjacent road network. See **peak hour volume.**
Direction Design Hour Volume	The traffic volume for the design hour in the peak direction of flow, usually a forecast of the relevant peak hour volume, in vehicles per hour.
Double Left-Turn Lanes	A pair of adjacent lanes intended for the exclusive use of vehicles about to turn left. Interchangeable with "dual" left-turn lane.
Downstream	The direction in which traffic is flowing.
Driveway	An access that is not a public street, road or highway.
Frontage Road	See **Service Road.**
Functional Classification	A classification system that defines a public roadway according to its purposes and hierarchy in the local or provincial highway plans as defined in the BC Highway Functional Classification Study, 1992.
High Occupant Vehicle (HOV) Lane	A land designated for the exclusive use of high occupancy vehicles, such as cars with 3 or more occupants, buses and taxis.
General Street System	The interconnecting network of city streets and provincial roads and highways in an area.
Intersection Approach	The portion of an intersection leg which is used by traffic approaching the intersection (opposite term: intersection exit).
ITE	Institute of Transportation Engineers
Lane Balance	A condition at a diverge point where the number of lanes leaving the diverge is equal to the number of lanes approaching it plus one.
Left Turn Lane	A traffic lane within the normal surfaced width of a roadway reserved for left-turning vehicles.
Level of Service	A qualitative measure describing operational conditions within a traffic stream; generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience and safety.
Local Government	A term referring to Regional Districts, Islands Trust or municipalities.
Merge	A movement in which two separate lanes of traffic combine to form a single lane without the aid of traffic signals or other right-of-way controls.
Multilane Highway	A highway with at least two lanes for the exclusive use of traffic in each direction, with no or partial control of access, that may have periodic interruptions to flow at signalized intersections.
Official Community Plan (OCP)	A community plan adopted under section 947 or 948 of the Municipal Act.

Operational Analysis A use of capacity analysis to determine the prevailing level of service on an existing or projected facility, with known or projected traffic, roadway and control conditions.

Parking Generation Total spaces required for the development per unit of variable.

Pass-by Trips The portion of trips generated by a development that are already on the road system. Pass-by trips are not new trips generated by the development.

Peak Hour Factor The hourly volume during the maximum volume hour of the day divided by the peak 15-minute rate of flow within the peak hour; a measure of traffic demand fluctuation within the peak hour.

Peak Hour Volume The time period(s) that provide the highest cumulative directional traffic demands which are used to assess the impact of site traffic on the adjacent street system and to define the roadway configurations and traffic control measure changes needed in the study area.

Pedestrian An individual traveling on foot.

Permitted Turns Left or right turns at a signalized intersection which are made against an opposing or conflicting vehicular or pedestrian flow.

Phase The part of the signal cycle allocated to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals.

Planning Analysis A use of capacity analysis procedures to estimate the number of lanes required by a facility in order to provide for a specified level of service based on approximate and general planning data in the early stages of project development.

Primary and Secondary Highways Roads that allow high-speed movement of inter- and intra-provincial traffic.

Protected Turns Left or right turns at a signalized intersection made with no opposing or conflicting vehicular or pedestrian flow.

Rate A value per unit measure that specifies the requirements that need to be considered in evaluating a development. A **parking generation rate** specifies the parking requirements that should be provided for. A **trip generation rate** specifies the volume of traffic that should be accommodated.

Rate of Flow The equivalent hourly rate at which vehicles or persons pass a point on a lane, roadway or other trafficway for a period of time less than one hour; computed as the number of persons or vehicles passing the point divided by the time interval in which they passed (in hours); expressed as vehicles or persons per hour.

Recreational Vehicle A heavy vehicle, generally operated by a private motorist, engaged in the transportation of recreational equipment or facilities; examples include campers, boat trailers, motorcycle trailers and the like.

Retrofit The reconstruction of an existing street with geometric improvements to the existing design.

Right-Turn Lane A traffic lane within the normal surfaced width of a roadway reserved for right-turning vehicles.

Service (Frontage) Road A roadway contiguous to and generally paralleling an expressway, freeway or major street so designed as to intercept, collect and distribute traffic desiring to cross, enter or leave such facility and to furnish access to property which otherwise would be isolated as a result of the controlled-access feature.

Shared Parking Parking space that can be used to serve two or more land uses over the course of a day or week or month. It is a method of optimizing the use of available parking space by sharing it among a group of users with different peak parking characteristics.

Sight Distance The distance visible to the driver of a passenger vehicle measured along the normal path of a roadway from a designated location and to a specified height above the roadway when the view is unobstructed by traffic.

Sight Triangle The triangle formed by the line of sight and the two sight distances of drivers in vehicles, cyclists or pedestrians approaching an intersection on two intersecting streets.

Signal Progression The progressive movement of traffic, at a planned rate of speed without stopping, through adjacent signalized locations within a traffic control system.

Speed A rate of motion expressed as distance per unit time.

Speed-Change Lane A separate lane for the purpose of enabling a vehicle entering or leaving a roadway to increase or decrease its speed to a rate at which it can more safely merge or diverge with through traffic. Acceleration and deceleration lanes are speed change lanes.

Standard A value for a specific design feature, which practice or theory has shown to be appropriate, where the prevailing circumstances are normal and general, and where no unusual constraints influence the design.

TAC Transportation Association of Canada

Taper The widening of pavement to allow the redirection of vehicles around or into an auxiliary lane.

Throat Length	The provision of sufficient unobstructed on-site driveway length to prevent stopped vehicles from blocking the path of entering vehicles or vehicles traveling along the internal circulation roadways.
Transportation Demand Management (TDM)	A term used to describe measures designed to reduce the use of single-occupant vehicles or shift travel time to non-peak conditions. TDM is usually directed at commuter travel in large population centres.
TRB	Transportation Research Board
Trip	A single or on-direction vehicle movement with either the origin or the destination (exiting or entering) inside a study site.
Trip Generation	Total (two-way) vehicles per hour generated by a development per unit of the variable during a given period. Also, the sum of the vehicle arrivals and vehicle departures during a given time period.
Truck	A heavy vehicle engaged primarily in the transport of goods and materials, or in the delivery of services other than public transportation.
Two-Way Left-Turn Lane	The middle lane on a two way undivided street intended for the exclusive use of vehicles about to turn left from either direction.
Unsignalized Intersection	Any intersection not controlled by traffic signals.
Volume/Capacity (v/c) Ratio	The ration of demand flow rate to capacity for a traffic facility.
Volume	The number of persons or vehicles passing a point on a lane, roadway or other trafficway during some time interval, often taken to be one hour, expressed in vehicles.
Walkway	A facility provided for pedestrian movement, segregated from vehicular traffic by a curb, or provided on a separate right-of-way.
Weaving Area	A length of highway over which traffic streams cross each other's path without the aid of traffic signals over a length of highway, doing so through lane-changing maneuvers; formed between merge and diverge points, as well as between on-ramps and off-ramps on limited access facilities.
Weaving Lane	A lane added to provide additional capacity and operational improvement in sections experiencing significant weaving volumes. A length of lane at one end of which two lanes merge and at the other end diverge.

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Appendix A - Recommended Terms of Reference for a Site Impact Analysis Study

MINISTRY OF TRANSPORTATION

SITE IMPACT ANALYSIS STUDY
RECOMMENDED TERMS OF REFERENCE

1.0 INTRODUCTION

The purpose of a Site Impact Analysis Study is to determine the impact of the traffic generated by the proposed development of a specific site on the surrounding road and highway network and identify what improvements may be required in order to adequately and safely accommodate the generated traffic. The Site Impact Analysis Study evaluates access alternatives and provides information which will help determine the acceptability of proposed access points. It will also address other issues that influence the impact of a new development on a highway, such as the provision of additional travel lanes or separate turn lanes on the highway, on-site storage lengths, and the internal layout of parking.

All Site Impact Analysis Studies undertaken for submission to the Ministry in support of an application or approval should fulfill the requirements of this Recommended Terms of Reference as outlined in the remainder of this document. The Recommended Terms of Reference should be used with the Ministry's Site Impact Analysis Requirements Manual, the *Scope Development Meeting* minutes, the Ministry Scope Development Checklist (Table A.2) and current engineering practice to ensure that the study is accurate and complete. These terms of reference have been developed with the assumption that the need for a Site Impact Analysis Study has already been determined by the Ministry. Local Government warrants and requirements for Site Impact Analysis Studies should also be determined.

This Terms of Reference will refer to the Ministry's Site Impact Analysis Requirements Manual as "the manual". Site Impact Analysis Studies that do not meet the Ministry's requirements as laid out in the Site Impact Analysis Requirements Manual, the *Scope Development Meeting* minutes and this terms of reference will be deemed incomplete and returned to the applicant without detailed review.

2.0 WARRANTS FOR A STUDY

In general, a detailed Site Impact Analysis Study will only be required for a site which meets the criteria in Section 2.1 (a) to (h) of the manual **and** has an estimated trip generation rate of 100 or more two-way trips, (i.e. inbound plus outbound) during the peak hour. The trip generation rate will be estimated using the Ministry's *Parking and Trip Generation Rate Manual*. Care must be taken to consider both street peak hour and site peak hour rates when selecting a peak hour. The warrant of 100 peak hour trips will apply to applications related to:

- New sites
- Existing sites where a change in use is being proposed.

In addition, there may be other site specific factors where a study is required regardless of the trip generation rate. More information on study warrants for a detailed Site Impact Analysis Study can be found in Sections 2.1 and 2.3 of this manual. If the Ministry has determined that a detailed Site Impact Analysis Study is not required then the simplified review process outlined in Section 2.9 of the manual takes place. Also note that some Local Governments have their own guidelines to determine whether or not a study is required. The study must be undertaken by a Professional Engineer qualified in the field of traffic engineering and registered in the Province of British Columbia.

3.0 BASIC CRITERIA

3.1 Proposed Study Terms of Reference

A copy of Appendix A should be provided to the applicant when the need for the study has been established according to Section 2.3 of the manual. Ministry staff may also provide an attachment listing any known special conditions that the Site Impact Analsysis Study will be expected to address

The applicant or their traffic engineering consultant will then prepare a Proposed Study Terms of Reference for the specific Site Impact Analysis Study. This Proposed Study Terms of Reference should be tailored to the specific issues, constraints and alternatives of the site and should identify any requested deviations or variances from Appendix A and this manual. This Proposed Study Terms of Reference is then forwarded to the District Office along with a request for a *Scope Development Meeting*. More information on the Proposed Study Terms of Reference can be found in Section 2.4 of the manual.

3.2 Scope Development Meeting

When the Proposed Study Terms of Reference has been received and reviewed by Ministry staff, a *Scope Development Meeting* will be scheduled. The purpose of this meeting is to bring the Applicant, their Traffic Engineering Consultant, Local Government Staff, Ministry Staff and other Reviewing Agencies together to review the Proposed Study Terms of Reference and provide the required scope elements of the Site Impact Analysis Study prior to commencing the study. More information on the *Scope Development Meeting* can be found in Section 2.5 of the manual.

In order to ensure that there is a coordinated approach to determining the requirements for a detailed Site Impact Analysis Study, it is the responsibility of the applicant and their traffic engineering consultant to ensure that the review process begins before starting a Site Impact Analysis Study. To this end, the applicant, traffic engineering consultant, Ministry staff and all other Reviewing Agencies must get together for a *Scope Development Meeting* before beginning a Site Impact Analysis Study that is to be submitted to the Ministry.

A Ministry Scope Development Checklist can be found in Table A.2 at the end of Appendix A. This checklist will be used to determine the acceptability of the Proposed Study Terms of Reference and to record any changes, additions or revisions to the Proposed Study Terms of Reference which are discussed in the *Scope Development Meeting.* A copy of the completed checklist will be provided to the applicant and included as part of the approved study scope for the Site Impact Analysis Study for that particular site.

In addition to the checklist, the meeting minutes are to be completed by the applicant or their traffic engineering consultant and submitted to the District Office for approval. When the meeting minutes have been approved and returned, the applicant has the information necessary to begin the study.

3.3 Study Area

The extent of the area to be covered by a Site Impact Analysis Study depends on many factors including the location and size of the proposed development and the conditions existing on the adjacent road network. In general, large, urban development proposals may require more extensive analysis than smaller sites.

In establishing the study area, care should be taken to ensure that the complexity of the study is in proportion to the impact of the development traffic. Unless the Ministry indicates otherwise in writing, the Site Impact Analysis Study must include all of the site's proposed access points and any other accesses and intersections within two kilometres of the property lines of the site. Section 3.1 of the manual contains detailed information on the requirements for the study area. The approved study area must be confirmed by the Ministry and other Reviewing Agency at the *Scope Development Meeting*.

3.4 Background Data

The Ministry and some Local Governments collect traffic data on an annual basis. Data requirements may be matched with available data during the development of the Proposed Study Terms of Reference and at the *Scope Development Meeting*. Data collected by Local Governments may be acquired from the associated municipality or regional district and included as an appendix to the study. Data collected by the Ministry is available by contacting the following:

Transportation Officer
Information Management Section
Highway Planning and Policy Branch
3B 940 Blanshard Street,
Victoria, B.C.
V8W 3E6
Phone: 387-7547
Fax: 387-7549

Where current traffic data is not available, the Site Impact Analysis Study must complete any data collection required for the Site Impact Analysis Study. Copies of all date are to be included as an appendix to the study and will become the property of the Ministry. A suggested list of background data to be obtained for use in the study can be found in Table 3.1 of the manual. More information on obtaining and collecting data can be found in Section 3.2 of the manual.

3.5 Links to Other Studies and Plans

In undertaking a Site Impact Analysis Study, it is very important to consider all other studies and plans that may have an influence on current and future traffic flows in the study area. A list of informational items that should be obtained in order to assist in this aspect can be found in Section 3.3 of the manual.

In addition to these studies and plans, consideration must also be given to the functional classification of the surrounding road and highway network in order to ensure that the functional classification is not compromised and that connections are made to appropriately classified roads. The Ministry has established a functional classification system for provincial roads and highways as published in "*British Columbia Highway Functional Classification*". It is the functional classification of the surrounding network of roads and highways that determines the required performance levels, the availability of direct access and the restrictions that may be required. These classifications and their permitted connections are given in Table 3.2 of the manual.

It is the responsibility of the applicant or their traffic engineering consultant to obtain the required materials. Identification of available materials to be included in the Site Impact Analysis Study should take place at the *Scope Development Meeting* and will be noted in the meeting minutes. The Site Impact Analysis Study must document the functional classifications of the surrounding road network and provide details and schedules of any related studies and plans including other proposed developments in the study area.

3.6 Field Observations

The documentation of the Site Impact Analysis Study must confirm that a field visit has been undertaken according to Section 3.4 of the manual and that existing road, highway and traffic conditions within the study area have been observed for the appropriate times.

3.7 Horizon Years

Horizon years for analysis are typified by:

- The estimated completion date of the proposed development
- Development phasing on-site and in the study area
- Regional or Local Government planning horizons (e.g. Year 2021 to coincide with the Transport 2021 Study)
- A capital improvement program planning horizon (e.g. 5 and 10 years)
- Major transportation system changes

In addition, if the development size is significant and the development is constructed in phases, then the completion of each phase may represent a horizon year. Further information about determining horizon years for the study can be found in Section 3.5 of the manual.

Unless the Ministry indicates otherwise in the *Scope Development Meeting*, the following horizon years should be used for the projection of base traffic for a non-phased development:

Horizon Year #1 - Day One (opening day)

Horizon Year #2 - Day One + 5 years

Horizon Year #3 - Day One + 10 years

Horizon Year #4 - Day One + 15 years

Outside of large established metropolitan areas of the province, a fifteen year horizon year is necessary to reveal the full extent of the mitigation required by a new or changed development. In areas of the province with high growth in traffic volumes and/or existing low levels of service on the study area network roads, the Proposed Study Terms of Reference for the Site Impact Analysis Study may wish to provide a justification for removal of the requirement to study Horizon Year #4. The elimination of Horizon Year #4 must be discussed at the *Scope Development Meeting* and if it is acceptable, it will be noted in the Meeting minutes where it must be reviewed and approved by the Ministry before becoming part of the approved study scope.

In addition, if the development is to be phased, the analysis must be done for the end of the horizon year for each of the major phases and for the year of ultimate full “build-out” in order to determine what improvements are required at these times. Horizon years for phased developments may extend beyond ten or fifteen years and therefore, analysis of additional horizon years will be required.

3.8 Peak Periods for Analysis

The primary purpose of requesting a Site Impact Analysis Study is to demonstrate what effect the development will have on the transportation system and to identify what improvements may be required. In general, the maximum impact occurs during the site peak hour and/or during the peak hour of the adjacent roads.

The time period(s) that provide the highest cumulative directional traffic demands should be used to assess the impact of site traffic on the adjacent street system and to define the roadway configurations and traffic control measure changes needed in the study area. The peak hour traffic volume(s) determined in this way become the design hour volume(s) for the site. Detailed information about determining peak periods for analysis can be found in Section 3.6 of the manual.

Chapter 2 of the Ministry's Parking and Trip Generation Rates Manual contains a detailed description of how the peak hour volume(s) of a development site are established. It should be noted that the site peak hour(s) may not occur at the same time as the adjacent street peak hour(s). In this case, additional analysis may be required for any of the adjacent street peak hours that are required to properly assess the impacts of the site. Seasonal peaks must also be considered.

In general, the peak traffic generated by the site should be analyzed for the purpose of determining the requirements for on-site access design features such as vehicle queuing storage (magazine) length, number of lanes and internal circulation requirements. The adjacent street peak hour traffic should be analyzed to determine the required improvements to the existing or proposed adjacent road network for all access alternatives being evaluated. In addition to reviewing the site peak hour(s) and the adjacent street peak hour(s), individual turning movements or operations must be reviewed to determine whether they may become critical during secondary peak periods.

The Ministry requires that the study shall include an analysis of the highest peak hour volume for each turning movement. Saturday afternoon traffic shall also be analyzed if the development is to be part of a significant retail area. Peak periods for analysis in the study must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

3.9 Trip Generation

Trip generation rates should be determined according to the Ministry's *Parking and Trip Generation Rates* Manual. Sections 3.8 and 3.9 of the manual also provide more detailed information on the following items related to trip generation including:

- Rates for land uses not included in the Ministry manual
- Establishing new rates
- Local Government rates
- Applying variances to the rates
- Pass-by traffic
- Phased Developments
- Accounting for internal trips in mixed use developments
- Diverted linked trips

Any rates determined by a survey of new data must be approved before being used in the Site Impact Analysis Study. While the rates used for analysis purposes will be based on the appropriate peak hour rates, the report must also include estimates of daily traffic volumes generated by the site. The number of trucks included in this total must also be provided. Trip generation rates for use in the study must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

3.10 Access Alternatives

The Site Impact Analysis Study must provide documentation which shows that all feasible access alternatives and options (existing and proposed) have been reviewed and the impacts of these options. This includes not only those shown in the concept plans for the site, but also any other alternatives that may reduce the impact of the development traffic on the adjacent road and highway network including those requested by the Ministry and other Reviewing Agencies and outlined in the minutes of the Scope Development Meeting. For some corridors, limited direct access may only be granted when the study shows that there are no other reasonable alternatives. Where direct access is allowed, the development design should be able to take advantage of future alternate access when it is available. A more detailed discussion of access alternatives can be found in Section 4.9.1 of the manual.

4.0 NETWORK ANALYSIS TECHNIQUES

4.1 Existing Conditions

The Site Impact Analysis Study should include a review of existing conditions in the study area without the traffic generated by the proposed development or the proposed change in use of an existing development. This will determine existing road, highway and intersection volumes and any available capacity. More detailed information about existing conditions can be found in Section 4.1 of the manual.

The review of existing conditions shall include those items listed in Section 4.1 of the manual and any other items which appear in the *Scope Development Meeting* minutes. Documentation of this information should be included in the Proposed Study Terms of Reference and should be discussed at the *Scope Development Meeting*.

4.2 Impacts of Transportation System Changes

Unless the approved minutes of the *Scope Development Meeting* indicate that network improvements and major highway upgrading projects are currently funded and can be used, the Site Impact Analysis Study should not assume any reduction to the background traffic volumes that would result from planned future projects.

In undertaking Site Impact Analysis Studies, the transportation network may have to be examined both with and without such improvements. Since an improvement may decrease traffic volumes on the existing road network, it is important to be able to identify what improvements may be required both with and without the proposed network improvements in place so that the impact of the system improvements on the site study recommendations can be determined.

The analysis of future conditions should also include an evaluation of the combined impacts of both the proposed development and also other developments and development improvements expected to take place within the approved study area. The use of transportation system changes in the study must be outlined and justified in the Proposed Study Terms of Reference and discussed in the *Scope Development Meeting*.

4.3 Traffic Projections

Estimates of future background traffic or "base" traffic in the study area are required to complete the analysis of horizon year conditions on the surrounding road network. General information about appropriate horizon years for traffic projections can be found in Section 3.5 of this manual. The three primary methods of projecting base traffic are:

- The build-up method
- The use of existing transportation plan or modeled volumes
- Projection of past trends or growth rates into the future

All three primary methods have their appropriate use. Projection of base traffic will often utilize a combination of these three methods. Traffic projections must be done for each approved horizon year as outlined in the approved *Scope Development Meeting* minutes. More information on traffic projections can be found in Section 4.3 of the manual.

The Proposed Study Terms of Reference for the study must outline and justify which method or combination of methods is appropriate for the proposed Site Impact Analysis Study. If the Ministry and other Reviewing Agency agree that the proposed methodology is appropriate for the study area and the site, it will be noted in the *Scope Development Meeting* minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

4.4 Trip Distribution

Section 4.4 of the manual contains detailed information about trip distribution of development traffic. In undertaking Site Impact Analysis Studies, the catchment area assumed for distributing the generated trips should be clearly documented. The three most commonly accepted methods for estimating trip distribution are provided in Section 4.4.1 to 4.4.3 of the manual. Trip generation rates for use in the study must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

Whichever method is used, trip distribution should be estimated and analyzed for each horizon year since population levels change over time on an area-by-area basis. Consideration should also be given as to whether inbound and outbound trips will have similar distributions. The derivation of trip distribution percentages must be fully documented in the Site Impact Analysis Study.

If an analytical approach to trip distribution can not be used or the site has operational limitations or the Ministry states otherwise, all directional splits shall be assumed to be equally allocated in each direction for each access. A full movement access shall be considered to have 50 percent of entering vehicles making a left turn and 50 percent making a right turn. The same applies to exiting vehicles. The analysis may include analysis of additional directional splits or elements at the discretion of the Ministry.

4.5 Assignment of Development Traffic

Trip assignment involves estimating the amount of generated traffic allocated to the alternative routes on the road network. The product of this process is the total number of development generated trips by direction and turning movement on each segment of the study area road network. Trip assignment should be made considering those items outlined in Section 4.5 of the manual.

Trip assignments can be done either manually or with applicable computer models. Regardless of which method is used, it is important that trip lengths be considered, particularly for large study areas and land uses which have a regional significance. For other types of land use, trips will be completed within a few kilometres of the site. Unless a gravity model is used to account for trip lengths, a trip length frequency curve should be utilized. Methodologies for assignment of development traffic must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

The total projected traffic for the horizon year is determined by superimposing the site generated traffic volumes onto the projected base traffic volumes. Traffic volume conditions in the study area for existing and projected horizon years with and without the site generated traffic from the proposed development are to be graphically illustrated and clearly documented in the Site Impact Analysis Study.

4.6 General Traffic Analysis Elements

A detailed traffic analysis must be undertaken on the projected traffic volumes with and without site generated traffic in order to:

- Assess the traffic impacts of the proposed development
- Show the relationship between operations and geometry
- Assess deficiencies in the system

Components of traffic analysis which are to be examined may include but are not limited to capacity analysis, corridor analysis, traffic safety and sight distance. More details on these elements can be found in Section 4.6 of the manual. General traffic analysis elements must be outlined in the Proposed Study Terms of Reference for the site and discussed in the *Scope Development Meeting*.

This section deals with the traffic analysis requirements for traffic external to the development site itself. The development must also be capable of accommodating the access, circulation and parking requirement of generated traffic as well as service and emergency vehicles. The requirements for on-site planning and design can be found in Chapter 5 of the manual.

4.7 Intersection Analysis

All intersections and/or accesses included in the Site Impact Analysis Study should be analyzed using a standard methodology such as that documented in the Ministry's Traffic Engineering Manual. Other references include the Transportation Research Board's Special Report 209, "*Highway Capacity Manual*" (HCM) and the Canadian Capacity Guide for Signalized Intersections (ITE).

An intersection capacity analysis must be done for each proposed access to the development for the study area, horizon years and analysis periods defined in Chapter 3 of the manual and approved in the *Scope Development Meeting*. The intersection analysis for each proposed access to the site is required to ensure that the access design is adequate since each access operates as an unsignalized intersection. The various options for access to the development must be documented in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. Intersection capacity analysis must be done for all these options. This includes left turn and right turn lane warrants and design requirements.

Also, the Proposed Study Terms of Reference should outline and justify any proposed alternative evaluation techniques and the acceptability of these will be discussed at the *Scope Development Meeting*. If the options for access and the analysis methodologies are acceptable to the Ministry and other Reviewing Agency, they will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope.

The intersection capacity analysis to be submitted with a Site Impact Analysis Study shall use the standards and guidelines and provide all information as outlined in Section 4.7 of the manual. This includes signalized intersections, unsignalized intersections, traffic signal warrants, traffic signal spacing and traffic signal phasing.

No application will be approved which requires signalization of a private access within the study horizon period. In order to negate the requirement to signalize a private access, other options must be evaluated which would accommodate the future traffic. If the access option involves signalization of an adjoining public road, then the signal spacing requirements of Section 4.7.3 of the manual must be met.

Traffic signal progression analysis submitted in the Site Impact Analysis Study must include progression bandwidth, efficiency and level of service determinations, with all software output reports provided and including all existing and future signals within the coordinated signal system of the approved study area. The software to be used must be approved in the *Scope Development Meeting* before use in the study.

Ministry regional traffic engineers should be contacted to advise of any special phasing requirements prior to commencement of detailed analysis. Any proposed multi-phase analysis should be discussed prior to commencement of detailed analysis. In addition, the Proposed Study Terms of Reference should contain a communication plan for discussion of specific phasing requirements and details. Any analysis based on unacceptable phasing will result in the return of the Site Impact Analysis Study without a detailed review.

4.8 Weaving Analysis

The standard weaving analysis methodology, as provided in the *"Highway Capacity Manual"* is applied to freeways. Weaving on urban streets is covered in Figure 16.12 (a nomograph) of the ITE's *"Transportation and Traffic Engineering Handbook (Second Edition)"* which provides the level of service for various traffic volume levels and weave distances. More information on weaving can be found in Section 4.8 of the manual. Weaving analysis should be documented in the Proposed Study Terms of Reference for the Site Impact Analysis Study and discussed in the *Scope Development Meeting*.

4.9 Mitigation Measures

When the impacts of the development have been determined, the Site Impact Analysis Study should document the proposed mitigation measures. These mitigation measures would apply to the access location and design, the adjacent road network and the site itself. All access points associated with the proposed development should be designed in accordance with good design practice to:

- Protect the public safety
- Maintain smooth traffic flow
- Maintain highway right-of-way drainage
- Protect the functional classification of the highway

All possible mitigation measures should be considered and presented in the Site Impact Analysis Study according to Section 4.9 of the manual and the access options outlined in the approved *Scope Development Meeting* minutes. The mitigation measures which should be reviewed in the study include:

- Site access alternatives
- Off-site road network improvement alternatives
- On-site mitigation measures
- Corner clearances
- Speed change lanes
- Transportation demand management measures

If transportation demand management measures are being proposed for the site, the study must include a transportation demand management plan for the development. The plan should indicate the reduction program proposed, specify the actions that should be taken to reduce total peak-period vehicular trips, and the benefits expected to result from the plan. This analysis must be presented as an option unless rate reductions were previously approved by the Ministry in writing.

Failure to provide documentation and analysis of a comprehensive list of options will result in the return of the study to the applicant without complete Ministry review. Costs associated with transportation system improvements required to support the proposed development will be the direct responsibility of the applicant. All modifications and improvements to Ministry facilities must be to the Ministry's Design Standards (or if not in the Design Manual, with TAC standards).

4.10 Environmental Considerations

Site Impact Analysis Studies must also evaluate whether changes in the transportation system have unacceptable impacts on the environment. Some emphasis should be placed on this aspect, especially when comparing and evaluating alternative solutions or networks. More information on environmental considerations can be found in Section 4.10 of the manual. Environmental issues should be documented in the Proposed Study Terms of Reference for the Site Impact Analysis Study and discussed in the *Scope Development Meeting* to ensure that requirements are clearly laid out at the start of the analysis.

4.11 Cost Estimates

The *Scope Development Meeting* should include discussion of how development construction projects may be coordinated with Ministry and/or Local Government road upgrade projects or other developments. Where opportunities for coordination are identified, it is recommended that the Site Impact Analysis Study include an estimate of the cost of all required improvements.

Costs and cost sharing outlines should be referenced in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that these items warrant further study for the study area and the site, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow the analysis of cost sharing does not bind the Ministry or Reviewing Agency to accept the recommendations of the completed study.

Cost estimates which may be outlined in the study include an estimate of the cost of undertaking all improvements to the road and highway network required to mitigate traffic capacity or safety problems caused by:

- Existing conditions
- Increases in through traffic
- The proposed development

5.0 ON-SITE PLANNING AND DESIGN

5.1 Access Design Elements

The location of the access was discussed in Section 4.9.1 of the manual and all access options to be analyzed in the study are reviewed in the *Scope Development Meeting*. However, these aspects of access deal with the external impacts. There are also on-site and geometric design features of an access and site layout that are required for safe and efficient traffic operation. An access should be designed from the same perspective as an intersection which has similar characteristics and volumes. More detailed information on general access design standards and vehicular queuing storage lengths can be found in Section 5.1 of the manual.

The Ministry has developed standards for use in locating and designing accesses. These standards are based on recognized engineering practice and exist to ensure that Ministry roads and highways function safely and efficiently. Where direct access to Ministry roads or highways is to be permitted, the standards for access design and construction are outlined in the Ministry manuals listed in Section 2.11 of the manual.

Vehicle queuing analysis is an integral component of access design. Queuing areas must provide sufficient storage for entering and exiting vehicles so that they do not block internal circulation roads or the adjacent road network. The amount of queuing length to be provided at an access is related to the amount of traffic expected to enter the parking area and the peaking characteristics of that traffic. The same queuing analysis procedures should be used for on-site queuing reservoirs as for off-site left and right turn lanes.

5.2 Parking Rates and Parking Design Elements

General guidelines and policies regarding the determination of parking rates for a proposed development can be found in Section 3.8 of the manual and in the Ministry's Parking and Trip Generation Rates Manual. The dimensions of the stalls and aisles shall be in accordance with those given in Section 5.2 of the manual. Section 5.2 also contains details regarding small-car parking, handicapped parking, shared parking and recreational parking. Note that Local Governments may also have guidelines and bylaws which must be considered.

Parking requirements must be outlined in the Proposed Terms of Reference and discussed in the *Scope Development Meeting* with consideration of Local Government requirements. Special provisions like small-car parking and shared parking must be referenced in the Proposed Study Terms of Reference and discussed at the *Scope Development Meeting*. If the Ministry and other Reviewing Agency agree that these items warrant further study, it will be noted in the Meeting minutes which must be reviewed and approved by the Ministry before becoming part of the approved study scope. Agreement to allow this analysis does not bind the Ministry or other Reviewing Agency to accept the recommendations of the completed study.

The parking area must support the type of land use with consideration given to the location of the development and the adjacent road infrastructure. All supporting documentation, indicating the location, layout, available accesses, and all uses at the surveyed sites as well as the sites immediately adjacent must be included in the report. While the rates used for analysis purposes will be based on the appropriate peak hour rates, the report must also include estimates of daily traffic volumes generated by the site. The number of trucks included in this total must also be provided.

5.3 Site Design Elements

Consideration of on-site design elements is important to the safe and efficient operation of site traffic and to reducing the site's impact on the adjacent road system. Good site design will integrate the building with the access, parking areas, loading areas, transit facilities, cyclist facilities and pedestrian facilities. Key issues to be addressed at this time include:

- Internal vehicular circulation
- Service and delivery vehicle design elements
- Pedestrian, transit and bicycle facilities
- General landscape design considerations
- Other site design elements

On-site design elements are outlined in Section 5.3 of the manual. The study must confirm that all on-site design elements meet accepted technical standards. The Ministry's standards for access design and location are provided in Section 5.1 of the manual as well as in the current issue of the Ministry's Design Manual.

6.0 REFERENCE MATERIALS

The following is a list of reference materials which were used in the development of this manual. Where possible, phone numbers and/or addresses have been provided for anyone wishing to obtain a copy of the reference. Information on how Ministry manuals and standards may be obtained is available by contacting the applicable Ministry District Office (Appendix B).

The information contained in this manual is based on accepted engineering practice and the following standard engineering references used by the Ministry of Transportation.

1. The current editions of the following manuals and standards of the Ministry of Transportation:

   (a) *Design Manual*

   (b) *Standard Specifications for Highway Construction*

   (c) *Traffic Engineering Manual*

   (d) *Traffic Control Manual for Work on Roadways*

   (e) *Manual of Standard Traffic Signs*

   (f) *Pavement Marking Standards Manual*

   (g) *Utility Policy Manual*

   (h) *Pedestrian Crossing Control Manual for BC*

   (i) *Traffic Volumes in BC*

   (j) *Interim Cycling Policy*

   (k) *Highway Functional Classification*

   (l) *Parking and Trip Generation Rates Manual*

   (m) *Manual of Aesthetic Design Practice*

2. *Traffic Access and Impact Studies for Site Development,* A Proposed Recommended Practice, Institute of Transportation Engineers, Washington, DC (1988) [(202) 554-8050]

3. *Manual of Geometric Design Standards for Canadian Roads*, Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

4. *Urban Supplement to the Geometric Design Guide for Canadian Roads*, Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

5. *Uniform Traffic Control Devices for Canada, (Metric Edition)* Transportation Association of Canada (TAC), Ottawa, as amended. [(613) 736-1350]

6. *Turning Vehicle Templates,* Transportation Association of Canada (TAC), Ottawa. [(613) 736-1350]

7. *Highway Capacity Manual,* Special Report 209, Transportation Research Board (TRB), Washington, DC. [(202) 334-3238]

8. *Guidelines for Parking Facility Location and Design,* Institute of Transportation Engineers, (1994). [(202) 554-8050]

9. *Trip Generation*, fifth edition, Institute of Transportation Engineers, (ITE) Washington, DC (1991). [525 School Street, SW, Suite 410, Washington DC 20024-2729. [(202) 554-8050]

10. *Parking Generation,* Second Edition, Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

11. *Transportation and Land Development,* Institute of Transportation Engineers (ITE), Washington, DC (1988), [(202) 554-8050]

12. *Canadian Capacity Guide for Signalized Intersections*, Second Edition, (1995), Institute of Transportation Engineers (ITE), Washington, DC [(202) 554-8050]

13. *Manual for Transportation Engineering Studies*, Fourth Edition, Institute of Transportation Engineers (ITE), Washington, DC (1994) [(202) 554-8050]

14. *Transportation and Traffic Engineering Handbook*,), Second Edition, Institute of Transportation Engineers (ITE), Washington DC (1982) [(202) 554-8050]

15. *Land Development Guidelines for the Protection of Aquatic Habitat*, Fisheries and Oceans and BC Ministry or Environment, Lands and Parks, (1993), Copies are available from Department of Fisheries and Oceans, Communications Branch, 555 West Hastings, Vancouver, B.C. V6B 5G3.

16. *Stream Stewardship: A Guide for Planners and Developers*, Fisheries and Oceans and BC Ministry or Environment, Lands and Parks, (1994/94), Copies are available from Department of Fisheries and Oceans, Communications Branch, 555 West Hastings, Vancouver, B.C. V6B 5G3.

17. *Community Cycling Manual: A Planning and Design*, Canadian Institute of Planners, (1990), 404 126 York St., Ottawa, Ontario, K1N 5T5.

18. *Shared Parking Planning Guidelines*, (Prepared by ITE Technical Committee 6F-52), Institute of Transportation Engineers (ITE), Washington DC (1995) [(202) 554-8050]

19. *Shared Parking,* Urban Land Institute, Washington DC (1983) [(202) 289-8500]

7.0 REPORT CONTENTS

In general, the detailed Site Impact Analysis Study must document the study purpose, procedures, assumptions, findings, conclusions, and recommendations. This will be most effectively done keeping in mind the three common uses for these reports.

(a) To provide developers or designers with recommendations on site selection, site transportation planning and traffic impact.

(b) To assist public agencies in reviewing the attributes of the proposed developments in conjunction with any request for annexation, land subdivision, zoning changes, building permits, access or other development reviews and to establish mitigation requirements where off-site impacts require improvements.

(c) To assist some public agencies in determining development cost charges or to assess developer contributions to roadway facility improvements.

The analysis should be presented in a straightforward and logical sequence. Table A.1 in this appendix provides an acceptable detailed study outline. In some cases, studies will be easily documented using these outlines. In other cases, additional analysis may be warranted because of site specific issues and Local Government and/or Reviewing Agency study requirements. Section 2.8.1 of the manual outlines the items used to determine whether the report is complete. Three copies of the final report must be submitted to the District Office.

All feasible options for providing access, as outlined in the approved minutes of the *Scope Development Meeting,* must be evaluated. The study should lead the reviewer through the various stages of the analysis and to the resulting conclusions and recommendations. Sufficient detail should be included so that the staff of the Ministry and any other Reviewing Agency will be able to follow the logic and methodology of the analysis.

Transportation improvements related to providing the required level of site access and mitigation of the adverse effects of the development-related traffic on the transportation network must be described. Recommendations should be made for any required off-site roadway improvements such as additional through lanes, auxiliary lanes and traffic control devices necessitated as a result of the development. Also, required improvements to the internal roadway system and facilities for transit, pedestrians and cyclists should be developed and presented.

If the assumptions made in the analysis are based on published sources, then those sources must be specifically referenced. If other, less readily available sources are used, a more detailed explanation and prior approval is necessary and their use must be discussed in the *Scope Development Meeting*.

If required improvements to the grid road system are identified during the analysis, the recommendations must specify:

- The time period within which the improvements should be made
- Links between the improvements and the various phases of the development construction
- Links between the improvements and the trip generation and parking rates attributed to the site
- The estimated cost of the improvements
- Any monitoring of operating conditions and improvements that may be required

Inapplicable sections listed in the Study Outline (Table A.1) may be omitted from the report with the written agreement of the Ministry and Reviewing Agencies. The approved *Scope Development Meeting* minutes and Table A.2 should provide in writing, clear direction as to what is to be included and what may be omitted from the report. This may be amended throughout the duration of the study development and review process according to Section 2.5 if justification can be submitted and agreement is provided in writing from the Ministry and Reviewing Agencies.

Table A.1 Recommended Outline For A Detailed Site Impact Analysis Study

I. EXECUTIVE SUMMARY

A. Study Purpose
B. Key Findings
C. Study Conclusions
D. Study Recommendations

II. INTRODUCTION

A. Study Purpose and Background
B. Site Location and Study Area
C. Development Description
D. Approved Study Scope Elements

III. PROPOSED DEVELOPMENT (SITE AND NEARBY)

A. Off-Site Development
B. Description of On-Site Development
   1. Land use, intensity and zoning
   2. Location and site plan
   3. Phasing and timing
   4. Environmental considerations

IV. AREA CONDITIONS

A. Study Area
   1. Definition
   2. Field observations

B. Study Area Land Use
   1. Existing land uses and zoning
   2. Anticipated future development
   3. Related studies and plans

C. Site Accessibility
   1. Area roadway system - existing and future (including functional classification and goals and strategies defined in relevant plans like system plans, corridor plans and access management plans)
   2. Existing traffic volumes and conditions
   3. Transit service
   4. Pedestrian and cycling facilities
   5. Existing relevant transportation system management programs

V. PROJECTED TRAFFIC

A. Site Traffic (each horizon year)
   1. Horizon years
   2. Peak period(s)
   3. Trip generation
   4. Trip distribution
   5. Modal split
   6. Trip assignment

B. Through Traffic (each horizon year)
   1. Horizon years
   2. Peak period(s)
   3. Method of projection
   4. Non-site traffic for anticipated development in study area
      a. Method of projection
      b. Trip generation
      c. Trip distribution
      d. Modal split
      e. Trip assignment
   5. Through traffic volumes
   6. Estimated volumes

C. Total Traffic (each horizon year)

VI. TRAFFIC ANALYSIS

A. Capacity analysis
B. Corridor analysis
C. Safety analysis
D. Sight distance
E. Intersection analysis
F. Traffic signal phasing analysis
G. Weaving analysis

VII. MITIGATION MEASURES

A. Analysis of site access alternatives
B. Off-site road network improvement alternatives
C. On-site mitigation measures
D. Corner clearances
E. Speed change lanes
F. Transportation demand management measures
G. Site Circulation and Parking

VIII. IMPROVEMENT ANALYSIS

A. Plans and Studies Reviewed
B. Improvements to Accommodate Base Traffic
C. Improvements to Accommodate Site Traffic
D. Alternative Improvements
E. Transportation System Improvements Already Funded
F. Evaluation

IX. FINDINGS

A. Site accessibility
B. Traffic impacts
C. Need for any improvements
D. Compliance with applicable local bylaws
E. Costs

X. RECOMMENDATIONS

A. Site access/circulation plan
B. Roadway improvements
   1. on-site
   2. off-site
   3. phasing, if appropriate

C. Transportation System Management Actions
   1. off-site
   2. on-site operational
   3. on-site

D. Other

XI. CONCLUSIONS

APPENDIX References and Data

* (Reference - ITE - Traffic Access and Impact Studies for Site Development - A Proposed Recommended Practice)

Table A.2 Scope Development Checklist - Detailed Site Impact Analysis Study

BC Ministry of Transportation (MoTH)

Date: _____

Municipal Information:

☐ Subdivision ☐ Rezoning ☐ Development Permit ☐ Urgent

File Number: _____ Bylaw Number: _____

Staff Contact: _____ Phone Number: _____

Applicant Information:

Name: _____

Address: _____

Postal Code: _____ Phone Number: _____

Project Information:

Legal Description: _____

_____

_____

Civic Address: _____

Topographic Description: _____

Present Land Use: _____ Proposed: _____

Present Zoning: _____ Proposed: _____

1. Proposed Study Terms of Reference prepared and submitted by: _____
   date: _____
2. Proposed Study Terms of Reference reviewed for MoTH by: _____
   date: _____
3. Scope Development Meeting Scheduled for (date and time): _____
4. Local Government notified of meeting date and time by: _____
5. Scope Development Meeting attendees: _____
   _____
   _____
   _____
   _____
   _____
   _____

6. Proposed Study Terms of Reference has outlined all feasible and acceptable options for providing access? (See manual section 2.7)

Yes
No
Unacceptable Access Options:

_____
_____
_____
_____

Additional Access Options which must be evaluated:

_____
_____
_____
_____

7. All proposed study assumptions or methodologies based on those outlined in this manual? (See manual section 2.7)

Yes
No
Unacceptable assumptions and/or methodologies:

_____
_____
_____
_____

Acceptable assumptions and methodologies which may be used in this study:

_____
_____
_____
_____

8. Proposed Study Terms of Reference includes all elements of the study outline (Table A.1)? (See manual section 2.7)

Yes
No
Study Outline Sections which may be eliminated

_____
_____
_____
_____

Study outline sections which may not be eliminated

_____
_____
_____
_____

9. Approved Study Area (See manual section 3.1)

As required by the Site Impact Analysis Requirements Manual - Section 3.1
As presented in Proposed Study Terms of Reference
Include following additional intersections in study analysis:

_____
_____
_____

10. Data requirements for the Proposed Study (See manual section 3.2)

As provided in Table 3.1 of the Site Impact Analysis Requirements Manual (copy attached)

Additional data collection as outlined in Proposed Study Terms of Reference

Acceptable as proposed

Unacceptable as proposed (provide reasons below)

_____

_____

_____

_____

Additional data collection required as follows:

_____

_____

_____

_____

11. Other Plans and Studies which shall be used in the development of the Site Impact Analysis Study. (See manual section 3.3)

As noted in the Proposed Study Terms of Reference

Additional studies which should be used.

_____

_____

_____

_____

12. Functional Classification of MoTH and Local Government Roads in the Approved Study Area. (See manual section 3.3)

As noted in the Proposed Study Terms of Reference.

Functional Classifications to be used in the Study as noted below.

Road Name	Controlled Access	Functional Classification

13. Horizon Years to be used in the Site Impact Analysis Study. (See manual section 3.5.2)

As noted in the Proposed Study Terms of Reference _____

Day One (opening day)

Day One + Five Years

Day One + Ten Years

Day One + Fifteen Years

Other horizon years which must be evaluated in the study

_____

_____

_____

_____

14. Proposed peak hour(s) including day of the week to be used in the Site Impact Analysis Study. (See manual section 3.6)

As noted in the Proposed Study Terms of Reference_____

Morning Peak _____

Afternoon Peak _____

Peak Hour of Proposed Development _____

Other peak hours which must be evaluated in the study

_____

_____

_____

_____

15. Does the Proposed Study Terms of Reference outline and justify adjustments to existing traffic volumes? (See manual section 3.7)

No adjustments outlined in the Proposed Study Terms of Reference.

Adjustments noted in the Proposed Study Terms of Reference are acceptable.

Adjustments noted in the Proposed Study Terms of Reference are unacceptable as proposed (provide reasons below).

_____

_____

_____

_____

The following existing volumes are provided to the applicant to be used in the Site Impact Analysis Study.

Road or Highway	Direction of Travel	Day of Week and Time	Existing Volume

16. Trip Generation Rates for the proposed development. (See manual section 3.8)

Ministry Rate	Local Government Rate	ITE Rate

Ministry Rate applies. (See manual section 3.8.1)
Local Government Rate applies. (See manual section 3.8.4)
ITE Rate applies. (See manual section 3.8.2)
Proposed Study Terms of Reference outlines the requirement for new trip generation rate data collection. (See manual section 3.8.3)
Acceptable as proposed
Number of sites proposed _____
Locations of acceptable sites for trip generation rate data collection.

Site Name	Site Address

Sites approved by: _____ date:_____
Unacceptable as proposed (provide reasons below)
_____
_____
_____
_____
Variance Requested in Proposed Study Terms of Reference? (See manual section 3.8.5)
Acceptable to allow analysis of the variance as proposed. (Note that agreement to allow the analysis of a variance does not bind the Ministry or Reviewing Agency to accept the variance after analysis is complete.)
Unacceptable to allow analysis of the variance as proposed. (provide reasons below)
_____
_____
_____
_____

17. Proposed Study Terms of Reference outlines that the following key elements impacting trip generation rates are to be analyzed. (See Section 3.9)
Pass-by Trips (See manual section 3.9.1)
Acceptable as proposed
Unacceptable as proposed. (Provide reasons below)
_____
_____
_____
_____
Phased Development (See manual section 3.9.2)
Acceptable as proposed
Unacceptable as proposed. (Provide reasons below)
_____
_____
_____

_____

Internal Trips for Mixed Use Developments (See manual section 3.9.3)

Acceptable as proposed

Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

Diverted Linked Trips (See manual section 3.9.4)

Acceptable as proposed

Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

18. Listing of all materials which will be used to establish existing or "known" conditions in the approved study area. (See manual section 4.1)

Acceptable as noted in the Proposed Study Terms of Reference.

Other materials which must be used in the study.

_____
_____
_____
_____

19. Network improvements and highway upgrades which may be included in the Site Impact Analysis Study. (See manual section 4.2)

Acceptable as noted in the Proposed Study Terms of Reference.

Other network improvements and highway upgrades which may be used in the study.

_____
_____
_____
_____

Network improvements and highway upgrades in the Proposed Study Terms of Reference which may not be used in the study.

_____
_____
_____
_____

20. Proposed methodologies for estimating traffic projections. (See manual section 4.3)

Acceptable as noted in the Proposed Study Terms of Reference.

Build-up method. (See manual section 4.3.1)

Use of area transportation plan or modeled volumes. (See manual section 4.3.2)

Projection of past trends or growth rates. (See manual section 4.3.3)

Growth rate to be used has been provided by:

MoTH (rate) _____

Local Government (rate) _____

21. Proposed methodology for determining Trip Distribution. (See manual section 4.4)

Acceptable as noted in the Proposed Study Terms of Reference.
Analogy Method. (See manual section 4.4.1)
Trip Distribution Model. (See manual section 4.4.2)
Surrogate Data. (See manual section 4.4.3)
Unacceptable as proposed. (provide reasons below).

_____
_____
_____
_____

22. Trip assignment of proposed development traffic. (See manual section 4.5)

Acceptable as noted in the Proposed Study Terms of Reference.
Manual.
Computer Model.
Unacceptable as proposed. (provide reasons below).

_____
_____
_____
_____

23. General traffic analysis elements to be included in the Site Impact Analysis Study. (See manual section 4.6)

Acceptable as noted in the Proposed Study Terms of Reference.
Capacity analysis is required. (See manual section 4.6.1)
Corridor analysis is required. (See manual section 4.6.2)
Traffic Safety analysis is required. (See manual section 4.6.3)
Sight Distance analysis is required. (See manual section 4.6.4)

24. Intersection Capacity Analysis. (See manual section 4.7)

Acceptable as noted in the Proposed Study Terms of Reference.
Additional Access Options which must be evaluated or proposed access options which may not be evaluated in the study as agreed to and documented in item 6 of this Ministry Scope Development Checklist.
Alternative evaluation techniques proposed for intersection(s) in the study area
Acceptable as proposed
Unacceptable as proposed (provide reasons below)

_____
_____
_____
_____

Public road intersection signalization may be or will be required for the following intersection(s) in the study area to the final horizon year which was identified in item 13 of this Ministry Scope Development Checklist?

_____
_____
_____
_____

Public road intersection signal spacing for all legs of the following intersection(s). This includes existing signals and signals proposed in corridor plans, regional plans or approved municipal street network plans.

Intersecting Street Names	Signal spacing of all intersection legs				Indicate whether spacing is acceptable for all intersection legs			

Other options have been proposed and will be analyzed which do not require public road intersection signalization?

Yes
No
Acceptable
Unacceptable

Analysis of public road intersection signalization is acceptable for the following intersection(s). (Note that agreement to allow this analysis does not bind the Ministry or Reviewing Agency to accept the signalization after analysis is complete.)

_____
_____
_____
_____

Analysis of public road signalization is unacceptable for the following intersection(s). (Provide reasons below)

_____
_____
_____
_____

25. Signal progression or signal phasing analysis software proposed for use in the study. (See manual section 4.7.4)

No
Yes
Name(s) of software

_____

Acceptable
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

26. Weaving analysis proposed for the study? (See manual section 4.8)

No

Yes

Acceptable as proposed

Unacceptable as proposed. Weaving analysis required for the following movements:

_____

_____

_____

_____

27. Corner clearance for access to the proposed development. (See manual section 4.9.4)

Acceptable as noted in the Proposed Study Terms of Reference.

Acceptable as noted in the Proposed Study Terms of Reference for the following options. (state option number)

_____

_____

_____

_____

Unacceptable as noted in the Proposed Study Terms of Reference for the following options. (state option number)

_____

_____

_____

_____

28. Speed change lane(s) will be or may be required for the proposed development site and access options. (See manual section 4.9.5)

Acceptable to assume that all lanes have equal volumes

Lane volume data is required

Ministry to provide lane volume data

_____

Applicant to provide lane volume data

_____

Acceptable as noted in the Proposed Study Terms of Reference for the following options. (State option number)

_____

_____

_____

_____

Unacceptable as noted in the Proposed Study Terms of Reference for the following options. (State option number)

_____

_____

_____

_____

29. Transportation Demand Management measures have been proposed for the development site? (See manual section 4.9.6)

No
Yes

List any variance requests which accompany proposed TDM measures.

_____
_____
_____
_____

TDM variance requests which are unacceptable for further study as proposed. (provide reasons)

_____
_____
_____
_____

TDM variance requests which are acceptable for further study as outlined in the Proposed Study Terms of Reference. An interim study providing variance justification must be submitted to the Ministry and Reviewing Agency prior to the use of any variance in the final study.

_____
_____
_____
_____

Interim study for TDM variance request:
Submitted on (date): _____
Submitted by (name): _____
Reviewed on (date): _____
Reviewed by (name): _____
Decision:

Acceptable for further use in study.
Unacceptable for further use in study. (provide reasons)

_____
_____
_____
_____
_____

30. Environmental considerations proposed for the Site Impact Analysis Study. (See manual section 4.10)

Acceptable as noted in the Proposed Study Terms of Reference.
Analysis required for the following items:

_____
_____
_____
_____

31. Cost and cost sharing estimates. (See manual section 4.11)

No cost sharing was noted in the Proposed Study Terms of Reference.
The cost sharing noted in the Proposed Study Terms of Reference is acceptable.
Signed by Ministry staff:_____date:_____
Signed by Local Government staff:_____date:_____
The cost sharing noted in the Proposed Study Terms of Reference is unacceptable.
Signed by Ministry staff:_____date:_____
Signed by Local Government staff:_____date:_____

32. Proposed on-site access design elements. (See manual section 5.1)

Acceptable as noted in the Proposed Study Terms of Reference.

Unacceptable as proposed. Analysis required for the following items:

_____

_____

_____

_____

33. Parking Rates for the proposed development. (See manual section 5.2)

Ministry Rate	Local Government Rate	ITE Rate

Ministry Rate applies. (See manual section 3.8.1)

Local Government Rate applies. (See manual section 3.8.4)

ITE Rate applies. (See manual section 3.8.2)

Proposed Study Terms of Reference outlines the requirement for new parking rate data collection. (See manual section 3.8.3)

Unacceptable as proposed (provide reasons below)

_____

_____

_____

_____

Acceptable as proposed

Number of sites proposed _____

Locations of acceptable sites for parking rate data collection.

Site Name	Site Address

Sites approved by: _____ date:_____

Variance Requested in Proposed Study Terms of Reference? (See manual section 3.8.5)

Acceptable to allow analysis of the variance as proposed. (Note that agreement to allow the analysis of a variance does not bind the Ministry or Reviewing Agency to accept the variance after analysis is complete.)

Unacceptable to allow analysis of the variance as proposed. (provide reasons below)

_____

_____

_____

_____

34. Proposed Study Terms of Reference outlines that the following key elements impacting parking for the site are to be analyzed. (See manual Section 5.2)

Dimensions of Standard Stalls (See manual section 5.2.2)
- Acceptable as proposed
- Local Government standards apply.
- Ministry standards as outlined in Figure 5.1 and Table 5.2 apply.

Provision of Small-car parking stalls. (See manual section 5.2.3)
- Acceptable as proposed
- Ministry allowance for small-call stalls for the site is _____
- Local Government allowance for small-call stalls for the site is _____
- No allowance for small car parking stalls for the site.

Dimensions of small-car parking stalls. (See manual section 5.2.3)
- Acceptable as proposed
- Local Government standards apply.
- Ministry standards as outlined in Figure 5.1 and Table 5.3 apply.
- No allowance for small car parking stalls for the site.

Handicapped Parking Spaces. (See manual section 5.2.4)
- Acceptable as proposed
- Ministry rate for handicapped stalls for the site is _____
- Local Government rate for handicapped stalls for the site is _____

Dimensions of handicapped parking stalls. (See manual section 5.2.4)
- Acceptable as proposed
- Local Government standards apply.
- Ministry standards as outlined in Figure 5.4 apply.

Analysis of Shared Parking is proposed for the site (See manual section 5.2.5)
- Acceptable as proposed
- Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

35. Proposed on-site vehicular circulation elements. (See manual section 5.3.1)
- Acceptable as noted in the Proposed Study Terms of Reference.
- Unacceptable as proposed. Analysis required for the following items:

_____
_____
_____
_____

36. Proposed on-site service and delivery vehicle design elements. (See manual section 5.3.2)
- Acceptable as noted in the Proposed Study Terms of Reference.
- Unacceptable as proposed. Analysis required for the following items:

_____
_____
_____
_____

37. Transit Facilities proposed for the site? (See manual section 5.3.3)

No
Yes

List any variance requests which accompany proposed transit facilities.

_____
_____
_____
_____

Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

38. Pedestrian facilities proposed for the site? (See manual section 5.3.3)

No
Yes

Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

39. Cycling facilities proposed for the site? (See Section 5.3.3)

No
Yes

Acceptable as proposed
Unacceptable as proposed. (provide reasons below)

_____
_____
_____
_____

40. Additional items

No
Yes

See meeting minutes
See attached notes

Table A.3 Development Application Referral for Local Government

Date: _____

Municipal Information:

☐ Subdivision ☐ Rezoning ☐ Development Permit ☐ Urgent

File Number: _____ Bylaw Number: _____

Staff Contact: _____ Phone Number: _____

Applicant Information:

Name: _____

Address: _____

Postal Code: _____ Phone Number: _____

Project Information:

Legal Description: _____

_____

_____

Civic Address: _____

Topographic Description: _____

Present Land Use: _____ Proposed: _____

Present Zoning: _____ Proposed: _____

Conform With Official Community Plan? ☐ No ☐ Yes

Floor Area/No. of Seats/No. of Employees/No. of Units: _____

Trip Generation Rate for site: _____ Detailed Site Impact Analysis Study Required?

Does Property Abut:

a) Network Element? ☐ No ☐ Yes Name: _____

b) Controlled Access Highway? ☐ No Distance From: _____

☐ Yes Name: _____

If Yes, Complete the Following:

- Access ***Proposed*** From the Provincial Highway? ☐ No ☐ Yes
- Site Plan Attached? ☐ No ☐ Yes
- Off-Street Parking Provided? ☐ No ☐ Yes No. of Stalls: _____
- Proposed Drainage to Highway Storm System? ☐ No ☐ Yes
- Provincial Setback Requirement (4.5m) Affected? ☐ No ☐ Yes

Staff Recommended? ☐ No ☐ Yes

Council Consideration of This Application? ☐ No ☐ Yes Date: _____

Action: _____

Planning Department Comments:

Traffic/Engineering Department Comments:

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