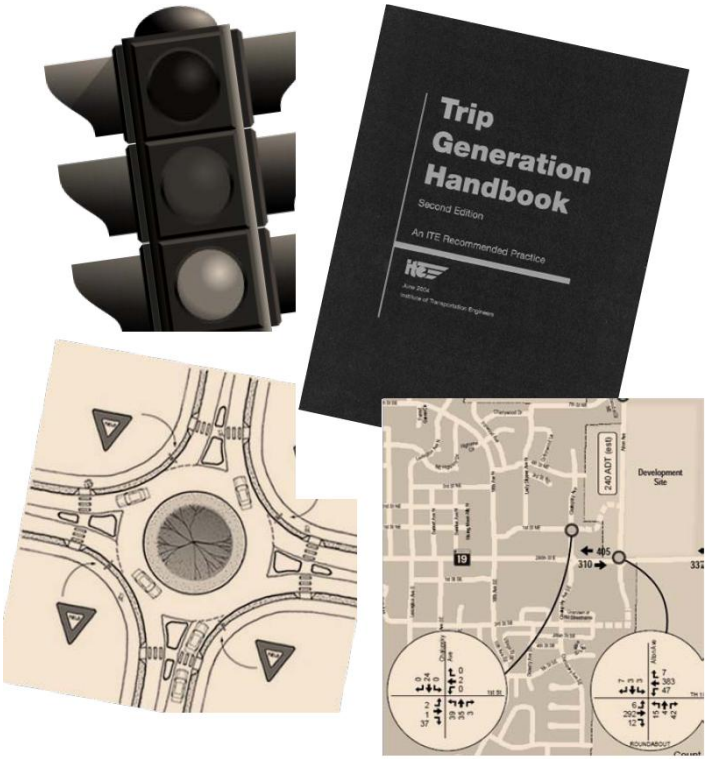
Traffic Impact Study Guidelines & Process

Adopted by the New Prague City Council September 7, 2010



1.0 Introduction

Traffic Impact Studies are utilized to evaluate the interaction between existing transportation infrastructure and proposed land development projects. The basic premise is that land development generates new traffic that will travel on the adjacent highway system and that the amount of traffic and the relative impact to the system is predictable.

The following guidelines are intended to provide an understanding of the process through which a Traffic Impact Analysis is developed and submitted within the City of New Prague, as well as an understanding of the technical requirements of the deliverables to be provided. The procedures contained in this document are provided to:

- Assist developers through an approval process by outlining the requirements and level of detail of traffic analysis that is expected based on the type and intensity of the proposed development,
- Standardize the types and details of analysis required in the assessment of traffic impacts for developments with similar levels of size and intensity,
- Encourage consistency in the preparation and review of a traffic impact study through standardization of reports.

2.0 Purpose of Traffic Impact Study

A Traffic Impact Study is a specialized engineering study that determines the potential traffic impacts of a proposed traffic generator.

The goals of a Traffic Impact Study are as indicated below:

- Identify potential adverse impacts to the existing transportation system and to proposed developments such as:
  - On-site congestion and or congestion on adjacent roadways
  - Inadequate access capacity
  - Crash experience / crash expectancy
- Assist public and private sector entities in indentifying and resolving issues related to the location of driveways, public streets, traffic controls (i.e. signals, signs, striping) and other transportation facilities that are requested.
- Assist in long term planning such that the extension and growth of the transportation system may occur in a manner that is comprehensive in nature and supportive of public good.

3.0 Need for Traffic Impact Study

In general, a comprehensive traffic impact study is required if any of the following conditions are expected:

- The development will generate 100 or more new a.m. or p.m. peak hour vehicle trips.
- The development will generate 750 or more new daily vehicle trips.

- New development traffic will substantially affect an intersection or roadway segment already identified as operating at an unacceptable level of service.
- The development would likely create a hazard to public safety.
- The location of the development is in an environmentally or otherwise sensitive area, or in an area which is likely to generate public controversy.
- The development will substantially change the off-site transportation system or connections to it.

Certain types of development, because of their size, nature, or location, are less likely to result in traffic impacts and therefore do not require the investment of time or effort in conducting a comprehensive traffic analysis. When a development is staged or phased over time, the City requires that a Traffic Impact Study be completed based on the impacts of the final phase or build out. At a minimum, all development projects will need to prepare some documentation such as driveway/access locations, showing consistency with the New Prague Comprehensive Plan, and compliance with the access spacing guidelines which are part of the New Prague Zoning Ordinance.

Table 1 - Level of Analysis Required

Minimal Analysis	**Comprehensive Analysis**
Used when development has all of the following:	***Used when development has all of the following:***
Low Traffic Generation	High Traffic Generation
Access onto Local Streets	Access to Collector or Arterial Streets
Sufficient Reserve Capacity on Existing System	Insufficient Reserve Capacity on Existing System
Required Information:	***Required Information:***
Driveway & Access Location	All of the Requirements under the Minimal Analysis, Plus:
Driveway Design	Traffic Impact Analysis/Study
Consistency with Comp Plan and Zoning Ordinance	Identification of Mitigation Strategies
	Safety Analysis

The number of peak hour trips generated should be estimated using the ITE Trip Generation Handbook (8th Edition or most current publication). Some examples of the size of development generating 100 peak hour trips are included in Table 2 and a more detailed discussion of the trip generation is in Section 6.

Table 2 – Development Sizes Generating 100 A.M. or P.M. Peak Hour Trips

Type of Development	**Threshold**
Single Family Residential	90 units
Condominium / Townhome	190 units
Apartments	140 units
Office	45,000 square feet
Medical / Dental Office	22,000 square feet
Light Industrial / Warehousing	93,000 square feet / 145,000 square feet
Shopping Center / Strip Mall	6,000 square feet
24 hour Convenience Store	1,900 square feet
Gas Station	7 single pumps
Sit Down Restaurant	5,400 square feet
Fast Food (with drive-thru)	2,000 square feet

Source: ITE Trip Generation, 8th Edition

The City of New Prague, at its discretion, may require that a Traffic Impact Study be prepared for any development, regardless of size, if there are concerns over safety, operational issues, or if located in an area heavily impacted by traffic.

4.0 Policy

The City of New Prague hereby adopts the quality of traffic operations as the key performance measure for the road system within the City. The Highway Capacity Manual estimates the quality of traffic flow in letter grades, referred to as Levels of Service. A and B represent uncongested conditions, C and D are approaching congestion, and E and F are very congested

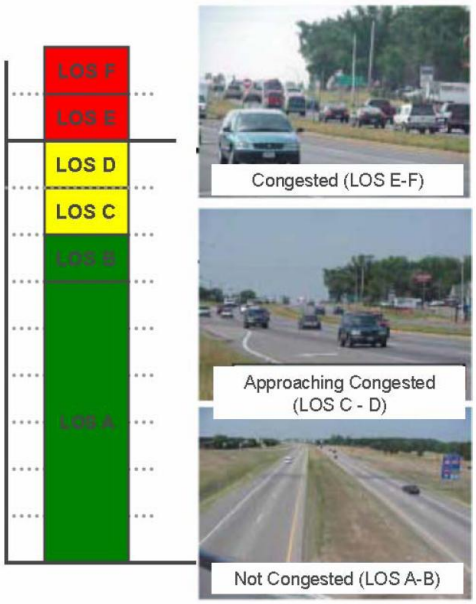


FIGURE 1
Level of Service Thresholds of Congestion

The City of New Prague hereby established, as a citywide target, a Level of Service (LOS) "C" on all roads and intersections within the City. Overall intersection LOS should satisfy the specified LOS target. In addition, the LOS for individual intersection approaches and/or traffic movements should satisfy the LOS goals. In accordance with this target of LOS C, the performance goals and strategies developed within Traffic Impact Studies should adopt Levels of Service objectives in accordance with Table 3. To summarize, Table 3 indicates that:

When the LOS without development is LOS A, B or C, the minimum acceptable projected LOS shall be LOS C.

- When the LOS without development is LOS D, E, or F, the minimum acceptable projected LOS shall be equal to the LOS without development.

Table 3 - Level of Service Required

		Level of Service Without Development					
		A	**B**	**C**	**D**	**E**	**F**
Projected Level of Service	**A**	N.A.					
	B	B	N.A				
	C	C	C	N.A			
	D	C	C	C	N.A.		
	E	C	C	C	D	N.A.	
	F	C	C	C	D	E	N.A

5.0 Early Coordination Meeting

To determine the need for and scope of a Traffic Impact Study in the City of New Prague, early coordination between the developer, the City, and any other affected roadway authorities is critical. The coordination will provide an opportunity to discuss the following key points before initiating a traffic study:

- Existing known delay (level of service) or safety issues
- Study area definition including key intersection and roadways that will be affected
- Traffic data needs and requirements
- Proposed development land uses (Is the proposed land use represented in ITE Trip Generation Manual?)
- Traffic forecast assumptions (background growth, other planned developments or roadway network improvements)
- Development schedule and/or phasing of site occupancy
- Need for involvement from other governmental agencies (MnDOT, Scott or LeSueur Counties, Helena or Lanesburgh Townships).
- Study schedule
- Review process
- Relationship of Traffic Impact Study to City approval

6.0 Traffic Impact Study Process

A Traffic Impact Study includes a comprehensive analysis of both operational and safety impacts of the proposed development. Documentation of both conditions provides the necessary information to determine appropriate mitigation strategies, provides additional justification for the improvements and begins the discussion of potential cost sharing alternatives. The basic process, summarized in Figure 2, includes:

- Documentation of existing, pre-development, conditions
- Estimation of site traffic generation
- Documentation of expected post development conditions
- Comparison of pre and post development conditions to determine operational and safety impacts caused by site generated traffic and if the performance measure thresholds have been exceeded.

Operational Analysis

The following are the key steps in the process through which a Traffic Impact Study is developed including the expected methodologies required by the City of New Prague.

Step 1 – Identify Key Locations and Scenarios

The identification of key locations includes determining intersections, driveways, and roadway segments that may be impacted by the proposed development. The minimum study area will be determined by development type and size as shown in Table 4. For example, a moderate size development (500-999 peak hour site generated trips) would require all site access drives and all signal controlled and non-controlled intersections within one half mile of the development be analyzed as part of the Traffic Impact Study. The City of New Prague may require expansion of the study area when the minimum study areas identified in Table 4 do not provide sufficient information to meet the goals of the Traffic Impact Study Guidelines.

Study Years and Scenarios

The Traffic Impact Study always begins with documentation of the existing conditions. The number of additional analysis of future years is determined by project type and size in accordance with the criteria in Table 4. Generally, small developments will require documenting conditions in the year of opening. Moderate size developments add an analysis of conditions five years after the opening. Large developments and those of regional significance require consideration of conditions at the typical planning horizon, 20 years after the opening.

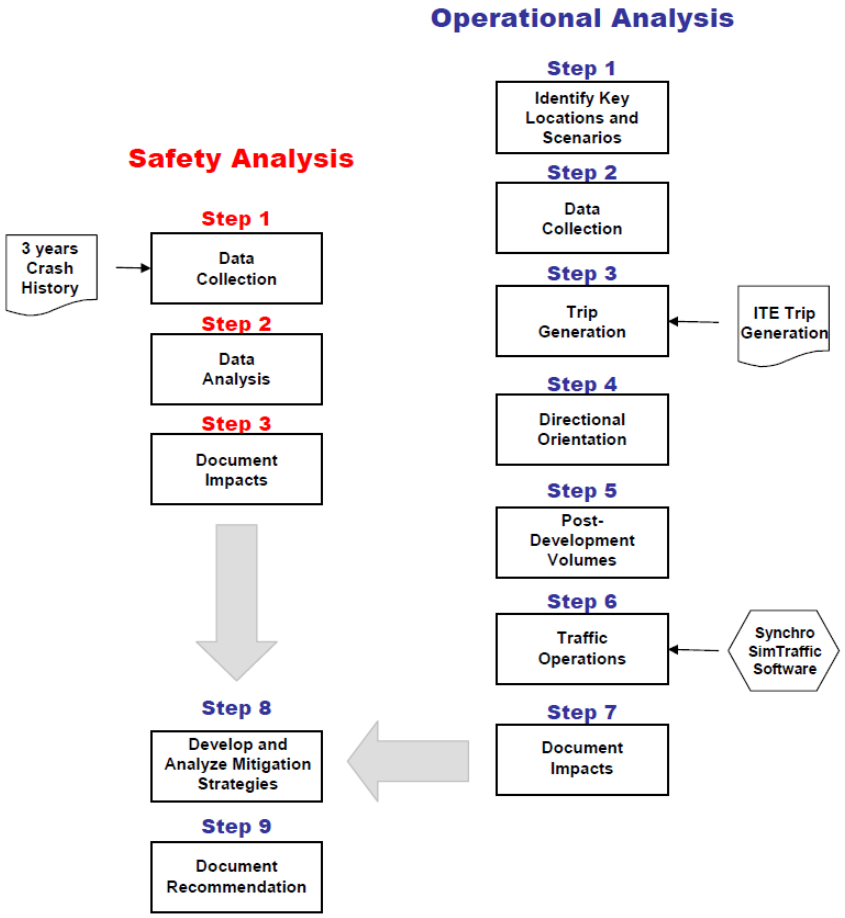


Figure 2

Table 4 – Minimum Study Area Guidelines

Development Characteristics	Study Year(s)	Minimum Study Area
Small Development 100 – 499 peak trips	1. Existing 2. Opening Year	1. Site Access Drives 2. Adjacent signal controlled intersections within ¼ mile and/or major street intersection without signal control and driveways within 500 feet
Moderate Development 500 – 999 peak hour trips	1. Existing 2. Opening Year 3. 5 Years After Opening	1. Site Access Drives 2. All signal controlled intersections within ½ mile and/or major street intersections without signal control and major driveways within ½ mile
Large Developments 1,000 – 1,500 peak hour trips	1. Existing 2. Opening Year 3. 20 Years After Opening	1. Site Access Drives 2. All signal controlled intersections within 1 mile and/or major street intersections without signal control and major driveways within 1 mile
Regional Development > 1,500 peak hour trips	1. Existing 2. Opening Year 3. 20 Years After Opening	1. Site Access Drives 2. Key signal controlled intersections and major street intersections without signal control within 3 miles

Step 2 – Data Collection

The amount of data that will need to be collected will vary depending on size and type of development. Table 5 provides a summary of suggested background data that may be useful in the development of a Traffic Impact Study. Basically, this information documents current conditions relating to traffic volumes, transportation system characteristics, land use / zoning and demographics.

Table 5 – Suggested Background Data for Review

Traffic Volumes	Current and (if needed) historic daily and hourly volume counts Recent (no more than 2 years old) intersection turning movement counts Seasonal variations Forecast future volumes from previous studies or regional plans Relationship of count day to both average and design days (account for seasonal variations)
Land Use	Current land use, densities, and occupancy in vicinity of site Approved development projects and planned completion dates, densities, and land use types Anticipated development on other undeveloped parcels Comprehensive land use plan Zoning in vicinity Absorption rates by type of development
Demographics	Current and future population and employment within the study area by census tract or transportation analysis zone
Transportation System	Current street system characteristics, including direction of flow, number and types of lanes, right-of-way width, type of access control, and traffic control including signal timings Roadway functional classification Route governmental jurisdiction Traffic signal locations, coordination and timing Adopted local and regional plans Applicable studies in the area that are completed or in progress Planned thoroughfares in the study area and local streets in vicinity of site, including improvements Transit service and usage Pedestrian and bicycle linkages and usages Available curb and off-site parking facilities Obstacles to implementation of planned project Implementation timing, funding source, and certainty of funding for study area transportation improvements (whether or not funded in current capital improvement program)

Step 3 – Trip Generation

In order to provide a reasonable measure of consistency in estimating traffic generation, the latest edition of the ITE's Trip Generation shall be used for selecting trip generation rates for new development. There are three basic methodologies for estimating trip generation. The most fundamental display of available information is a plot of the total trip ends versus a related independent variable, i.e. acres or 1,000 square feet of development. The traditional method of forecasting the number of site generated trips has been to multiply the weighted average trip rate by the number of units of the independent variable. The last method uses a regression equation to directly compute the forecast number of trips based on the independent variable of the proposed development. The recommended approach for estimating trip generation for proposed development is as follows:

- When the ITE Trip Generation data plot contains more than 20 data points and a regression curve and equation are provided use the regression equation.
- If there are fewer than 20 data points or if a regression equation is not provided, the weighted average rate should be used when the standard deviation is less than 100 percent of the weighted average rate.
- If the ITE data does not include sufficient data points, does not provide a regression equation or has a standard deviation that is too high the analyst has two choices. First, attempt to collect local data to supplement the ITE data or second, proceed with the ITE data and include a caution statement warning of possible reliability concerns.

It should be noted that the ITE trip rates and equations are derived from actual measurements of traffic generated by individual sites. These rates and equations represent the total traffic entering a site at its driveways. The City of New Prague's required traffic impact analysis process assumes that the site generated traffic is new traffic added to the system. ITE suggests that for some retail oriented development this assumption may not be entirely valid. However, they also conclude that predictive mathematical models for "Pass-By" and linked trips are not currently available. Therefore, reductions in trip generation for Pass-By and/or linked trips will NOT be considered.

Step 4 – Directional Orientation

The directional orientation of the generated traffic is the most subjective part of the entire Traffic Impact Study process and is used to assign the site generated trips to and from the regional road system. The trip distribution and assignment should be discussed with City staff and should use one of the following methods:

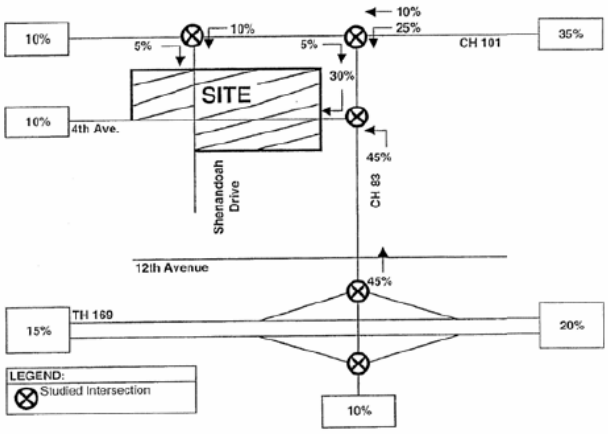


FIGURE 3
Weighted ADT Distribution Example
Source: United Properties/Opus AUAR Traffic Analysis – Shakopee, MN

- Market Analysis – probably the most accurate method, but is only occasionally provided.
- Home address locations of known users (i.e. employee or customer home address zip codes)
- Regional Travel Model – can be a good source of directional information, but its primarily intended to document home based work trips. New Prague is geographically located on the fringe of the Twin Cities Met Council Regional model. Influences from outside the model limits should also be considered.
- Weighted ADT Distribution – if a market analysis does not exist and regional model data is considered to be a poor fit, a weighted distribution of daily traffic volumes on roadways adjacent to the site can be used to provide a reasonable estimate of general travel patterns in the study area. An example of this technique is illustrated in Figure 3.

Step 5 – Post-Development Traffic Volumes

The post-development traffic volumes are computed by adding the site generated trips (Step 3) to the existing peak hour turning movements in accordance with the directional orientation (Step 4). The results of this computation are the traffic volumes in and out of the properties accesses and turning volumes at any intersections included in the study area.

If the expected year of opening is not the current year, the background traffic volumes must be increased to account for general growth in the area. The growth factor can be computed from a minimum of 10 years of historic data by linear regression or by applying a 3.25 percent per year factor.

The five year after opening and 20 years after opening analysis associated with moderate and large scale developments also required adjusting background traffic volumes to account for growth in the City and surrounding area. Reasonable approaches to account for this growth include regression analysis of historical data, use of output from regional or county travel demand models or application of the City's general growth factor (3.25%).

Step 6 – Traffic Operations Analysis

Intersection Level of Service Analysis

The City of New Prague requires the use of the Transportation Research Board – Highway Capacity Manual (HCM), 2000 Update, or most recent release for signalized and unsignalized intersection level of service analysis. For more detailed study areas, capacity software may be utilized to determine existing and future traffic operations. New Prague approves the use of the software Synchro© and SimTraffic© for intersection capacity analysis. Roundabout design and capacity analysis should be performed using RODEL and/or VISSIM depending upon the complexity of the intersection and it's interaction with adjacent intersections. A comparison of the recommended applications for the software packages is included in Table 6. The selection of modeling software for a Traffic Impact Study should be discussion with city staff during the early coordination meeting.

Table 6 – Recommended Modeling Analysis Tools

Macroscopic (Synchro© or RODEL)	Microscopic (SimTraffic © or VISSIM)
• Easy Conditions • Low to Moderate Volumes • Isolated Intersections • Quick Analysis • RODEL for entry design of roundabouts (single or multi-lane)	• Complex Geometry • Heavy Volumes • Network Operations • Detailed Analysis • Closely spaced intersections • Queuing concerns • Pedestrians and bicyclists • Multi-lane roundabouts

The traffic operations analysis of signalized intersections for any particular year requires three basic inputs:

- Peak Hour Turning Movement Volumes – Existing and forecast conditions as determined in Steps 2 and 5.
- Intersection Traffic Control – Existing conditions should be based on information provided by the operating agency documenting the in place hardware, phasing, and signal timing. The analysis of future years must document the effects of using the current traffic control before attempts to optimize phasing and timing.
- Roadway Geometry – Existing conditions should be based on the field inventory and document the number of through lanes, turn lanes, grades, lane widths, parking, etc. The analysis of future years must document the effects of using the current geometry before attempts to identify roadway improvement mitigations. The possible effects of planned roadway improvements will only be considered if those improvements are part of an approved Capital Improvement Plan.

Mainline Level of Service Analysis

The mainline capacity analysis is to be performed by comparing the Average Daily Traffic (ADT) on a segment with the appropriate street classification and Level of Service bar charts included in Appendix A.

Step 7 – Document Impacts

Appropriate documentation of operations (Level or Service at intersections and mainline segments, queuing information, etc) should be included for both existing conditions and for future scenarios as determined in Step 1. The results of the analysis will then need to be compared to the policy established by the City in regards to acceptable Level of Service and the determination of impact. If the Traffic Impact Study reveals that the future traffic operations on the roadway network will operate in a safe and efficient manner at an acceptable Level of Service, then no additional steps are required and the Traffic Impact Study can be reviewed by City staff. If there are potential impacts associated with the proposed development, additional work should be completed as described in Steps 8 and 9.

Step 8 – Develop and Test Mitigation

Improvements for mitigation of operational traffic impacts include modification, expansion, and in some cases additional roadway facilities in the immediate vicinity of the proposed development. The improvements should address specific site and through traffic needs consistent with local objectives and compatible with long-term improvements. In addition, the mitigation strategies should take into account any results of the safety analysis and be in agreement with safety goals. The traffic operational analysis should then be repeated to include the proposed improvements. Possible intersection improvements include the following:

- New or additional left-turn or right-turn lanes
- Additional intersection through lanes
- Access modification
- Changes in intersection control
- Addition of a traffic signal
- Re-phasing or re-timing of existing signal
- Restriction of particular turning movements
- Conversion of intersection to a roundabout

Site specific improvements should also be considered including:

- Site intersection improvements
- Reduce the number of driveways
- Increase driveway spacing (either at external access points, or along internal roadways near external access points)
- Improve circulation of internal roadways
- Improve site distance
- Add or remove median openings
- Changing the type or intensity of the development in order to reduce the site generated traffic

Mitigation or improvement strategies should be made with respect to the following:

- Safety analysis
- Right of way
- Intersection spacing
- Design criteria
- Feasibility
- Implementation cost, developer participation, schedule

Step 9 – Document Mitigation

Documentation of mitigation strategies should include details of the proposed improvements, discussion of required agency participation and preliminary cost estimates. In addition, if the installation of an all-way stop, traffic signal or roundabout is part of the comprehensive mitigation strategies, signal warrant or all-way stop warrant documentation needs to be completed. A roundabout is considered warranted if demands at the intersection satisfy traffic signal or all-way stop control

warrants. At a minimum the following warrants from the Minnesota Manual on Uniform Traffic Control Devices (MNMUTCD) should be considered:

All-Way Stop Control Warrant

The decision to install Multi-way stop control should be based on an engineering study. The following criteria should be considered in the engineering study for a multi-way STOP sign installation:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
B. A crash problem, as indicated by five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right- and left-turn collisions as well as right-angle collisions.
C. Minimum volumes:

    1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any eight hours of an average day, and
    2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same eight hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour, but
    3. If the 85th-percentile approach speed of the major street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.
D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;
B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the intersection unless conflicting cross traffic is also required to stop; and
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where Multi-way stop control would improve traffic operational characteristics of the intersection.

Traffic Signal Warrants

Warrant 1 – Eight Hour Vehicular Volume – This warrant is intended for application where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal. However, the eighth highest hour traffic volumes are not usually known during the traffic impact analysis process. For this reason the relationship between eight hour vehicle volumes and average daily traffic volumes in used in Figure 4. This figure can be used during planning level analysis to determine the warrant threshold and provide support for the mitigation strategy.

Warrant 3 – Peak Hour – The trip generation traffic volumes calculated in Step 3 provide the necessary information for applying signal warrants using the peak hour volumes. Figure 5, from the MNMUTCD, provides the thresholds for installation of a traffic signal based on the peak hour volumes. Note – the City of New Prague typically does not justify signals based solely on this warrant.

Research has shown that the installation of a traffic signal at an intersection will likely increase crashes. As a result, safety issues associated with the suggestion of signal installation must be discussed in the mitigation documentation. This relationship between the control at an intersection and safety is discussed further in the Safety Analysis section of these guidelines.

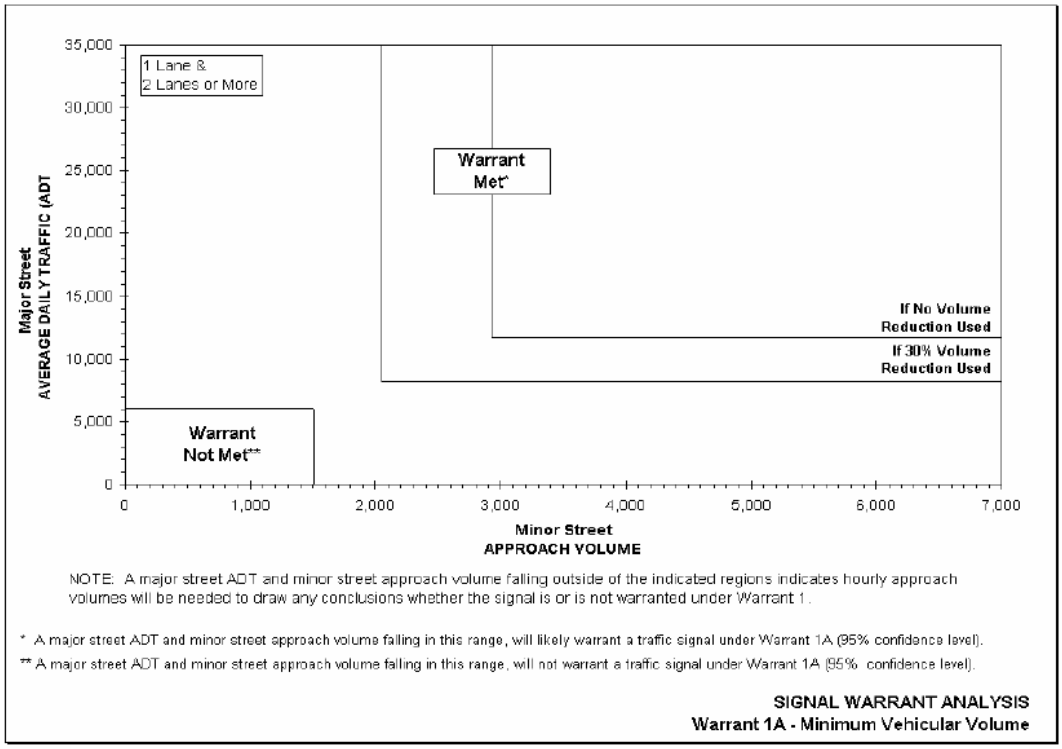
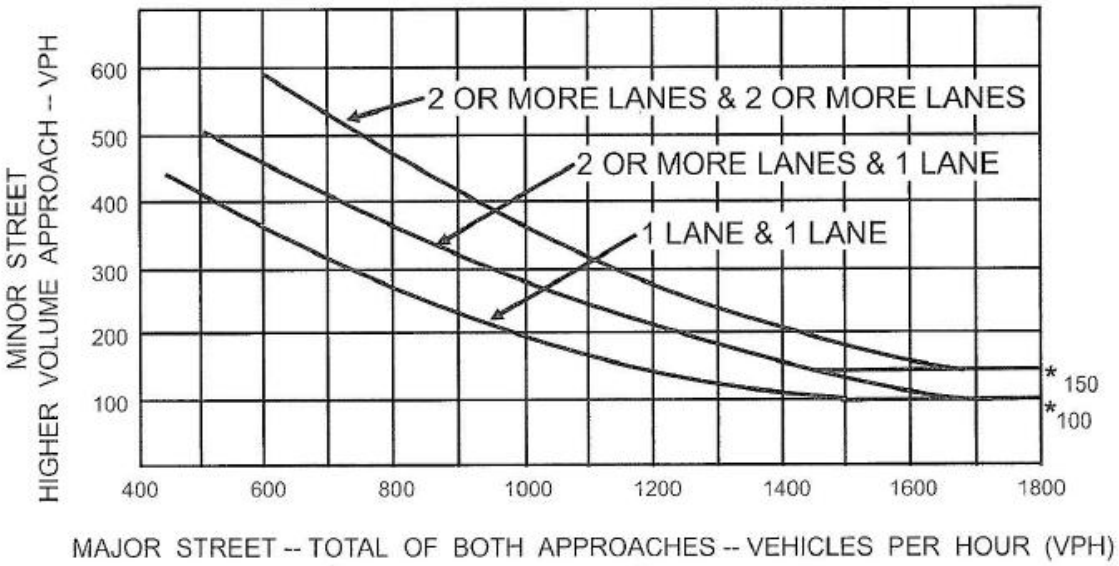


FIGURE 4
Eight-Hour Signal Warrant Analysis
(Using Average Daily Traffic Volumes)



*NOTE: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-3. Warrant 3 - Peak Hour

FIGURE 5
Peak Hour Signal Warrant Analysis

Safety Analysis

Similar to the operational analysis, the safety analysis requires comparing the existing conditions, forecasting future conditions after development and developing improvement strategies to mitigate safety impacts. The following are the preferred analysis procedures and expected documentation.

Step 1 – Data Collection

The safety analysis will use information gathered for the operational analysis including the physical and operational conditions of the study area in addition to the available crash data (from City, County or MnDOT) including characteristics and patterns. The preferred documentation of crash data would be a crash diagram. Details included in the crash diagram would be:

- Location
- Direction of travel or vehicle intent
- Time, day, date
- Severity and type of crash
- Contributing factors including light condition, weather, roadway conditions, traffic control, and roadway design.

In order to determine crash rates for Step 2, three to five years of crash data should be collected.

Step 2 – Data Analysis

Analysis of the crash data includes calculating the crash rate and comparing it to the state average for similar facility or intersection type. Review of the crash diagram should also be done to determine if there are crash clusters, types of crashes that seem over represented in the crash diagram.

In addition to documenting safety issues for the existing conditions, analysis of future conditions with the traffic generated by the proposed development should be completed. Additional traffic may increase safety issues. An example is an intersection that has no safety issue today, but would have a substantial increase in left-turn movements in the future due to the proposed development. Depending on the design and control of the intersection this could increase the crash frequency at the intersection.

Step 3 – Document Impacts

Documentation of the crash rate analysis and review of future conditions should be included in the Traffic Impact Study.

Develop and Test Mitigation (Operational Analysis Steps 8 & 9)

This step should be completed concurrently with Steps 8 & 9 of the operational analysis. Some mitigation strategies can be implemented for both operational and safety issues. Some examples of mitigation strategies for the increased left-turn movement volumes described earlier would be:

- Provide additional sight distance
- Reducing crossing conflicts by prohibiting the most hazardous turning movements (right in/out design or ¾ design)
- Reduce mainline conflicts by providing auxiliary turning lanes
- Add left-turn phase to signal

7.0 Study and Report Format

1. Introduction and Summary
    a. Purpose of report and study objectives
    b. Executive Summary
        - Site location and study area
        - Development description
        - Principal findings
        - Conclusions/Recommendations

2. Proposed Development
    a. Site location
    b. Land use and intensity
    c. Site Plan including access geometrics
    d. Development phasing and timing

3. Analysis of Existing Conditions
    a. Physical characteristics
        - Roadway characteristics
        - Traffic control devices
        - Transit service
        - Pedestrian/bicycle facilities
    b. Traffic volumes
        - Daily, morning and afternoon peak periods (one hour for each peak period) and others as required
    c. Level of service
        - Morning peak hour, afternoon peak hour, and others as required
    d. Crash rate comparison
    e. Data sources

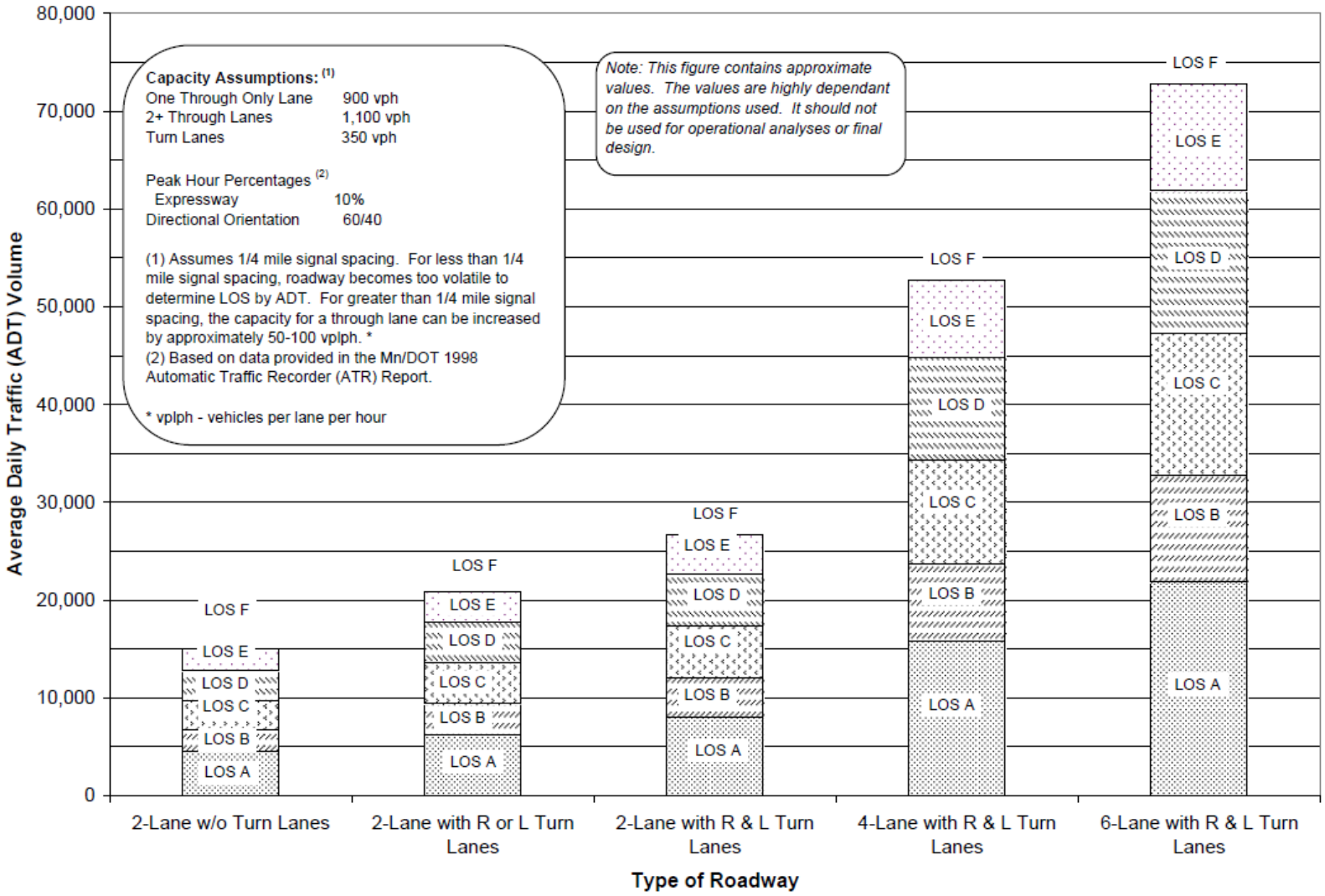
4. Projected Traffic
    a. Site traffic forecasting
        - Trip generation
        - Trip distribution
        - Trip assignment
    b. Non-site traffic forecasting
        - Projections of non-site traffic should be coordinated with New Prague Transportation Staff
    c. Total traffic (for each study year)

5. Traffic and Improvement Analysis
    a. Site access
    b. Level of service analysis
        - Without development (including programmed improvements for each study year)
        - With development (including programmed improvement for each study year)
    c. Roadway improvements
        - Strategies to mitigate deficiencies of LOS performance goals
        - Cost estimates of proposed improvements
    d. Traffic safety
        - Sight distance
        - Acceleration/deceleration lanes, left-turn lanes
        - Adequacy of location and design of driveway access
    e. Traffic control needs

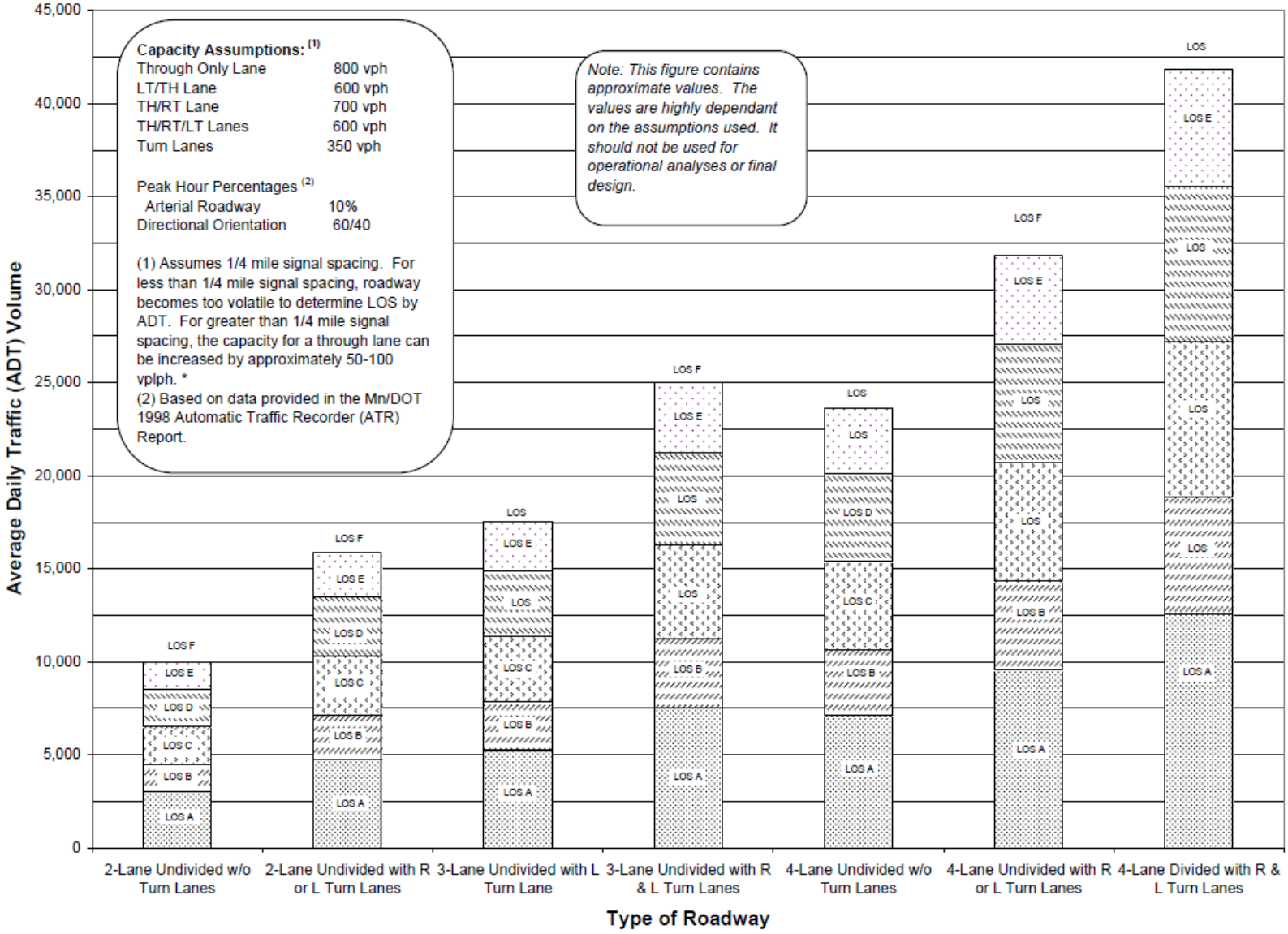
6. Conclusions
   Conclusions based on capacity and safety analysis of proposed development.

7. Recommendations
        - Roadway improvements
        - Site access
        - Internal site circulation
        - Other

Appendix
        - Traffic counts
        - Capacity analysis backup
        - Traffic signal needs study



Estimated Daily Level of Service – Expressways



Estimated Daily Levels of Service – Arterial Roadways