

Traffic Impact Studies

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Traffic Study Process

1. Determine how things work now
2. Determine how they'll work in the future without the development
3. Determine how they'll work in the future with the development
4. If things work poorly at any stage, define what will it take to correct poor operation

Policies

- Go to City first
- Check County
- Check Mn/DOT
- ITE's Recommended Practice: *Transportation Impact Analyses for Site Development*

Extent of Study

- Determine the peak hour traffic generation
- If < 100 peak hour trips, review driveways
- If > 100 peak hour trips, do full study

Development Size that Generates 100 Peak Hour Trips

Land Use	Development Size
Residential: Single Family Home Apartment Owned Condominium/Townhouse Mobile Home Park	90 Dwelling Units 150 Dwelling Units 190 Dwelling Units 260 Dwelling Units
Shopping Center	26,000 sq. ft. (Gross Leasable Area)
Fast Food Restaurant with Drive-in	2,000 sq. ft. (Gross Floor Area)
Gas Station with Convenience Store	7 Fueling Positions
Bank with Drive-in	3,800 sq. ft. (Gross Floor Area)
General Office	64,000 sq. ft. (Gross Floor Area)
Medical/Dentist Office	29,000 sq. ft. (Gross Floor Area)
Research and Development Facility	93,000 sq. ft. (Gross Floor Area)
Light Industrial/Warehousing	104,000 sq. ft. (Gross Floor Area)
Manufacturing Plant	137,000 sq. ft. (Gross Floor Area)

Source: ITE's *Trip Generation*, 8th Edition

Scope of Full Traffic Impact Study

1. Site Visit
2. Study Intersections
3. Data Collection
4. Study Years
5. Traffic Forecasts
6. Analysis (Existing, Future Year No-Build, Future Year Build)
7. Determine Mitigation
8. Internal Operations
9. Alternates: Crash/Bicycle/Transit/Pedestrians
10. Prepare Report

Communication with Agencies

- Kick-off Meeting/Email with Scope and Assumptions
 - Study Intersections
 - Peak Hours Analyzed
 - Trip Generation
 - Trip Distribution
 - Analysis Methods
- Optional Meeting at Mitigation Stage

Site Visit

- Stop Sign Locations
- Speed Limits
- Through and Turn Lanes
- Roundabout Geometry
- Traffic Signals – Phasing and Timing
- On-Street Parking
- Bus Stops
- Sidewalks, Trails, or On-Street Bike Lanes
- Nearby Developments Underway
- Schools, Factories, or Other Big Traffic Generators
- One Way Streets
- Peak Hour Queue Observations

Study Area

	Peak Hour Trips				
	0 - 100	100-200	200-500	500+ Mixed Use	500+ Single Use
Site Driveways	x	x	x	x	x
Adjacent Intersections within 1,000 ft		x	x	x	x
Signalized within half mile & Unsignalized within quarter mile			x	x	x
Signalized within 1 mile & Unsignalized within quarter mile				x	x
Signalized within 2 miles & Unsignalized within 1 mile					x

ITE's Recommended Practice: *Transportation Impact Analyses for Site Development*

Data Collection

- Daily Traffic Volumes
- Peak Hour Turning Movement Counts (am, noon, pm, Saturday,....?)
- Gap Data
- Crash Data
- Transit Schedule
- Comprehensive Transportation Plans
- Zoning/Land Use Designations
- Improvement Projects

Study Horizons

	Peak Hour Trips			
	0 – 500	500 – 1000	1000+ Single Phase	1000+ Multiple Phase
Opening year	x	x	x	x
Opening Year + 5 years After Opening		x	x	x
Opening Year + 5 years After Opening + Transportation Plan Horizon Year			x	x
Opening Year of Each Major Phase + Anticipated Year of Build Out or 5 Years After Opening (whichever comes first) + Transportation Plan Horizon Year				x

ITE's Recommended Practice: *Transportation Impact Analyses for Site Development*

Traffic Forecasts for Intersections and Corridors

- Existing Data
- Factor to Study Year No-Build
 - Corridor Growth Rate
 - Growth Rate Based on Transportation Plan
 - Regional Growth Rate
 - Account for Nearby Developments
 - Account for Seasonal Variation
- Forecast Traffic Generated by Development
 - Traffic Generated per ITE's *Trip Generation*
 - Internal Trip Reductions
 - Pass-By Trip Reductions
 - Diverted Trip Reductions
 - Transit Oriented Trip Reductions
 - Trip Distribution Pattern
- No-Build + Traffic Generated = Build

Analysis – Tools in MN

- *Highway Capacity Manual*
- Highway Capacity Software, Traffix, or Teapac
- Synchro
- **SimTraffic** (use micro-simulation when congested conditions or potential for interactions between intersections)
- Rodel - Roundabouts
- Mn/DOT's Gap Analysis Procedure – Two Way Stop Signs
- Vissim

Analysis – Levels of Service

Level of Service	Description	Signalized Intersection	Un-signalized Intersection
A	Free Flow	0-10 sec	0-10 sec
B	Reasonably Free Flow	10-20 sec	10-15 sec
C	Stable Flow	20-35 sec	15-25 sec
D	Approaching Unstable Flow	35-55 sec	25-35 sec
E	Unstable Flow	55-80 sec	35-50 sec
F	Forced or Breakdown Flow	80+ sec	50+ sec

Transportation Research Board's 2000 *Highway Capacity Manual*

Analysis – Corridor Capacity (daily volumes)

Roadway	Arterial	Expressway	Freeway
2 Lane – No Turn Lanes	8,500-10,000	14,000-15,000	---
2 Lane – R or L Turn Lanes	13,000-16,000	18,000-21,000	---
2 Lane – R & L Turn Lanes	15,000-17,500	23,000-26,000	---
4 Lane – Undivided, No Turn Lanes	20,000-23,000	---	---
4 Lane – Divided	---	---	71,000-83,000
4 Lane – Undivided, R or L Turn Lanes	27,000-32,000	---	---
4 Lane – Divided, R & L Turn Lanes	35,000-42,000	45,000-54,000	---
6 Lane – Divided	---	---	109,000-129,000
6 Lane – Divided, R & L Turn Lanes	---	62,000-73,000	---
8 Lane – Divided	---	---	145,000-170,000

- Estimates based on Transportation Research Board's 2000 *Highway Capacity Manual*
- Volume ranges are Average Daily Traffic Volumes for Level of Service E operation
- CAUTION – These are planning level estimates. Daily capacity is highly dependent on traffic characteristic assumptions.

Mitigation Strategies

- Change Traffic Signal Phasing and/or Timing
- Add Turn Lanes
- Upgrade Traffic Control
 - Two Way Stop Sign Control
 - All Way Stop Sign Control (Need Signal Warrant Analysis per *MnMUTCD*)
 - Roundabout (Need Signal Warrant Analysis per *MnMUTCD*)
 - Traffic Signal (Need Signal Warrant Analysis per *MnMUTCD*)
 - Interchange
- Limit Access (Add Median)
 - Three Quarter (prohibit through and left movements on cross street)
 - Michigan Left Turn and Other Turn Lane Alterations
 - Right-in/Right-out
 - Close
- Change Development Plan (Reduce traffic generated)
- Travel Demand Management (ITE's *Trip Generation Handbook* reductions)

Internal Operations

- Enough Parking (City Codes, ITE's *Parking Generation-3rd Edition*, ULI's *Parking Standards*)
- Parking Layout (minimize conflicts – car/ car and car/pedestrian)
- Trails/Sidewalks
- Traffic Control in Subdivisions or Parking Lots
- Drive-Throughs
- Loading Docks

Alternate Analyses

- Crashes (Mn/DOT's *Crash Mapping Analysis Tool*)
- Pedestrians
- Bicycles
- Transit

Prepare Report

- Executive Summary
- Table of Contents
- Clear Graphics and Tables
- Minimize Jargon
- Show $A + B = C$ in forecasts
- Make Recommendations
- Appendix
 - Existing Data
 - Capacity Analyses
 - Warrant Analyses
 - Simulation Summaries

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