LADOTD's Traffic Impact Study Guidance Manual

Executive Summary

This Traffic Impact Study (TIS) Guidance Manual establishes a scalable, tiered framework for evaluating the operational and safety effects of new or modified developments on the State Highway System. By matching study requirements to a development's expected trip impacts, the Department seeks to preserve the functional integrity of state corridors and provide a predictable process for developers, local entities, and consultants.

1 Purpose

This manual standardizes the criteria used to determine when a traffic impact study is required and defines the necessary depth of analysis. Its purpose is to ensure that development-related traffic minimizes adverse effects on the safety, capacity, and efficiency of state highways and that necessary infrastructure mitigation is identified and implemented. See the Louisiana Administrative Code, Title 70, Part I, Chapter 11 and Chapter 15, Louisiana Division of Administration https://www.doa.la.gov/doa/osr/louisiana-administrative-code/

2 Applicability

This guidance may apply to developments requesting direct access to a state highway, using existing access or adjacent access, or connecting through adjacent parking lots. It also applies to developments on local public or private streets with an access point within one quarter mile of a state highway. Early coordination with the DOTD District Traffic Operations Engineer or the engineer's designee is encouraged to confirm the study scope and data needs.

This guidance is typically triggered when a proposed development meets one or more of the following conditions:

- **New commercial access.** A proposed connection(s) is expected to generate 100 or more peak-hour trips onto the state highway network.
- **A modification to existing access** meets one or more of the following conditions:
    - Traffic at a previously permitted commercial access point will increase by at least 100 vehicles per hour during the development's peak hour.
    - A site that has been closed for more than two years.
    - A new phase is added to a previously studied development. If the original study is more than two years old, it may need to be validated or updated.
    - A modification or remodel is significant enough to increase traffic or change circulation compared with the existing operating business.
    - An access point is proposed to be realigned with a median opening or intersection.
- **A unique development that may generate fewer than 100 peak-hour trips but may cause operational or safety concerns.** The District Traffic Operations Engineer or designee may require a study when, for example, the development has a high directional flow of approximately 75 vehicles per hour in one direction, is near an over-capacity intersection, is near a poorly performing intersection with a safety concern or creates a need for signal retiming.
- **More than one access point is requested**, with at least one access point on a state highway.
- **The vehicle composition or road-user mix changes**, such as an increase in trucks or pedestrians.

3 Key Definitions

Controlled intersection. A junction with a state highway controlled by a traffic signal, roundabout, or stop control. For study purposes, controlled intersections are typically included when development-generated traffic is expected to affect them.

Peak-hour trips. The total two-way vehicle trips generated by a development during the highest adjacent-street peak hour. If a peak-hour generator, such as a school, church, or major event venue, produces more trips than the adjacent-street peak hour, the study must analyze the generator's specific peak hour. See the latest ITE Trip Generation Manual.

Study area: The roadway network, encompassing intersections and segments, required for the technical evaluation.

4 Traffic Study Screening and Category Determination

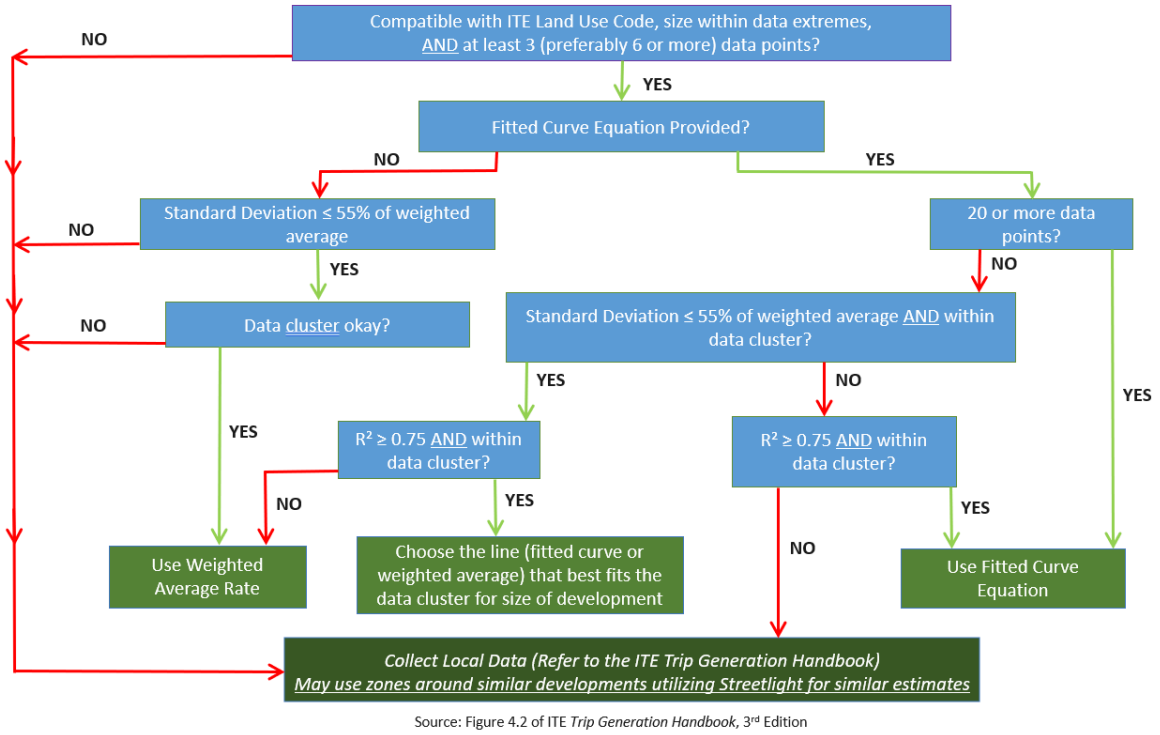
4.1 Trip Generation Methodology

The first step in determining study requirements is to estimate site-generated peak-hour trips using the current ITE Trip Generation Manual or a study of a similar site in a comparable context. Peak-hour trips should generally be evaluated for the adjacent-street peak hour that is most critical to the state highway system, typically the weekday AM or PM peak period. If the development's peak-hour generator period exceeds the adjacent-street peak hour, the generator's specific peak period shall be used. Figure 1 lists typical analysis and design periods.

Development type	Weekday AM	Weekday PM	Other peak-hour generator
Residential	X	X	
Office	X	X	
Convenience market or gas station	X	X	
Shopping center		X	Saturday, 11:00 a.m. to 1:00 p.m.
Restaurant - fast food	X	X	AM peak may be needed for breakfast service; 11:00 a.m. to 1:00 p.m. for lunch service
Restaurant - dinner specialty		X	
Hotel or motel		X	
Industrial	X	X	Planned shifts may make another period more representative
School - grade	X		2:30 p.m. to 4:00 p.m.
School - high	X		2:30 p.m. to 4:00 p.m.
School - college	X	X	
Medical - hospital	X	X	
Medical - doctor's office		X	
Sports or recreational			Peak entry or exit period for the event

Figure 1: Typical design periods

Use the decision process shown in Figure 2, adapted from Figure 4.2 of the ITE Trip Generation Handbook, Third Edition, to select the appropriate trip-generation method. The process considers compatibility with the ITE land-use code, the number and range of data points, availability of a fitted-curve equation, standard deviation, the data cluster, and the coefficient of determination. When the ITE data are not suitable, collect local data; Probe Data (ex: StreetLight, origin-destination zones around comparable developments may be used to support similar estimates.



Source: Figure 4.2 of ITE *Trip Generation Handbook*, 3rd Edition

Figure 2: ITE trip-use selection matrix and trip determination process

New and modified developments should be designed for full buildout. If the owner or developer phases the development over several years, the traffic impact study shall address all phases, including preconstruction, construction, and operation. The study must evaluate the impacts of each scenario and identify the corresponding improvements or mitigation.

When mitigation is phased, the local entity and the owner or developer should execute a written agreement and attach it to the first access permit. The agreement should require renewed coordination with DOTD before construction begins on each phase. Some parcels may have an unknown use when the first access permit is requested. If later development changes the type or size of the project, traffic patterns may change; the traffic impact study must be updated and the driveway access re-permitted. Proper mitigation must remain in place through full buildout.

4.2 Traffic Impact Study Categories

Traffic impact studies are divided into categories and cases. Each category establishes a different study area, level of analysis, and expected level of mitigation.

DISCLAIMER: For every category and case described below, an existing intersection's satisfaction of a turn-lane, all-way-stop, or traffic-signal warrant, or other mitigation does not obligate DOTD to mitigate the intersection or make DOTD responsible for its existing performance. The developer is responsible for avoiding significant adverse effects on the intersection's existing safety and operations including costs associated with the required mitigation.

Category 1 Developments Generating 100 to 300 Peak Hour Trips

Category 1 Case 1

Category 1 Case 1 applies when a development is located along a highway more than one quarter mile from nearby intersections or commercial driveways, its expected traffic distribution will not significantly affect the next nearest intersection or nearby commercial access, and it will have only one access point.

Typical study. Evaluate turn-lane needs using existing peak-period traffic counts, with the development's generated traffic and distribution. Use NCHRP Report 745 turn-lane warrant and required turn-lane-length procedures and, when appropriate, highway-capacity-analysis software for the development's access. The study may also need to demonstrate that the site's internal circulation contains vehicles on site and does not affect safety or operations on the state highway.

Typical mitigation. New or modified right or left-turn lanes may be required on any approach to the proposed access. The appropriate mitigation depends on the potential conflicts, including conflicts involving vehicles and nonmotorized users, as well as generated traffic, speed, capacity, and direction of flow.

Category 1 Case 2

Category 1 Case 2 applies when the Category 1 trip threshold is met and one or more of the following conditions is present:

1. The developer requests more than one access point or asks to retain more than one existing access point.
    - The study must demonstrate that additional access connections improve the safety and efficiency of the adjacent roadway and transportation system and are not solely beneficial to site access.
    - A typical evaluation compares Highway Capacity Manual analysis for a single access, including added mitigation such as turn lanes even when not warranted, with an additional-access alternative. If the single-access alternative still produces heavy approach delays, additional access may be supported when the accesses delay reduction outweighs the added conflict points required to disperse traffic. When engineering judgment supports multiple access points, demonstrate that the spacing satisfies stopping-sight-distance needs and that conflict points do not interfere with adjacent access points.
2. The property’s physical constraints, such as limited building or parking setbacks, should be thoroughly reviewed to determine whether internal reconfiguration can address circulation needs before requesting additional access.
    - Perform operational analysis and compare safety conflict points for alternatives such as one-way access or right-in/right-out access to reduce risk by removing conflicts.
3. The development is within one-quarter mile of a controlled intersection.
    - Analyze the nearby intersection under existing, existing + generated trips, and build conditions scenarios (existing + generated trips + recommended mitigations).
    - If the nearby intersection is stop-controlled, prepare NCHRP Report 745. If existing volumes already meet the warrant, provide both existing and build analyses to show the magnitude of the change. Because the NCHRP graph is nonlinear and crash exposure may increase sharply as volumes increase, and this tool is only one metric, the District Traffic Operations Engineer or designee will apply engineering judgment when determining whether a turn lane is required.

Typical mitigation. In addition to turn lanes at the access points, potential measures include access spacing or consolidation, one-way driveway operation, right-in/right-out restrictions, raised-median channelization between the access and nearby intersection, intersection turn-lane extensions, and minor signal-timing/phasing adjustments at the adjacent controlled intersection.

Category 2 Developments Generating 300 to 500 Peak Hour Trips

Category 2 Case 1

Category 2 Case 1 applies when development traffic affects controlled intersections upstream or downstream along one corridor and those intersections are more than one half mile from the site.

Typical study. Perform additional intersection analysis and turn-lane assessments at the access points and the next downstream intersections. Analyze the access points and nearby existing intersections using existing volumes and existing control and geometry, then add generated trips and evaluate recommended build mitigation. Include nearby access points that may interfere with sight distance or create conflicting maneuvers. Continue in each direction to the next controlled intersection and, as a rule of thumb, continue until development-generated traffic dissipates below 5 percent of that intersection's total volume (see figure 3). Coordinate the final scope with the District Traffic Operations Engineer or designee. Analyze existing, opening or phased-year, and full-build conditions at each study intersection using Highway Capacity Manual procedures. Report and compare 95th-percentile back-of-queue and approach/maneuver delay.

Typical mitigation. Potential measures include right and left-turn lanes at the access points and next adjacent intersection(s); signal-timing or phase changes at an existing signal; restricted right-in/right-out or left-restricted movements; raised-median channelization between the access and intersection; and access-management improvements such as consolidation, spacing, or alignment with cross streets. Select the combination based on the controlling movement, available gaps, queue length, and crash potential.

Category 2 Case 2

Category 2 Case 2 applies to proposed access along a corridor near closely spaced existing intersections that are typically less than one half mile apart from each other.

Typical study. Meet the Category 1 requirements, and may include **a**dditional operational analysis, including simulation using SIM TRAFFIC or VISSIM, may be required based on existing data, Probe Data (such as StreetLight) performance measures, and coordination with the District Traffic Operations Engineer or designee. Simulation is particularly important when intersections are over capacity, available space is limited, or Highway Capacity Software results are unstable or unreliable. In those situations, simulation provides more realistic delay and queue estimates. The scope may extend across an entire connected signal system, even when some intersections are not directly affected, because a development that affects one signal may require retiming and resynchronizing the coordinated corridor. Obtain existing signal-system information and coordinate with the District Traffic Operations Engineer or designee while limiting changes to portions of the corridor that are not adjacent to the development.

Typical mitigation. Because impacts extend beyond a single access point, mitigation may include access-point turn lanes; new traffic control; corridor signal retiming and re-coordination; split or offset changes; lead-lag phase changes; protected phases; restricted turning movements; raised-median channelization; U-turn relocation; pedestrian and bicycle upgrades; and, when simulation identifies capacity or queue-spillback concerns, added through lanes, taper extensions, or driveway modification or relocation.

Category 3 Developments Generating 500 or More Peak Hour Trips

Category 3 Case 1

Category 3 Case 1 applies when impacts are primarily contained within a single corridor, such as one state route or one signalized arterial system. The development is large enough to require corridor-level operational analysis, but its effects do not extend across multiple parallel or intersecting corridors.

Typical study. Meet the Category 2 requirements, including corridor simulation, coordinated signal system analysis, balanced turning-movement-count data, and queue and 95th-percentile reporting, etc. Expand the study to include each access point and each signalized or unsignalized intersection until generated traffic dissipates below 5 percent, or below 2 percent on capacity-sensitive segments. Perform turn-lane, traffic signal, and all-way-stop warrant

analyses for each newly affected intersection. Analyze existing, existing + generated trips, and build condition scenarios (existing + generated trips + recommended mitigations), including phased years and a 20-year design year when applicable.

Typical mitigation. A corridor-scale package may combine several Category 2 measures, including turn lanes at multiple access points and intersections; new traffic control; full corridor retiming and re-coordination; phase changes; raised medians and U-turn relocation; restricted turning movements; added through lanes or intersection widening; pedestrian refuge islands or curb extensions; and access consolidation. Pedestrian, bicycle, and transit-stop improvements may also be required. When mitigation is phased, the local entity and the owner or developer should execute a written agreement and attach it to the first access permit. The agreement should require renewed coordination with DOTD before construction begins on each phase.

Category 3 Case 2

Category 3 Case 2 applies when impacts extend across multiple corridors, regional arterials, or freeway interchanges. Examples include large mixed-use developments, very large subdivisions, major employment centers, distribution centers, hospitals, regional retail centers, and event venues. If a development triggers a new interchange or an interchange modification, an Access Justification Report may be required and additional coordination with FHWA will be necessary.

Typical study. Perform network-level analysis across multiple corridors. Tools may include TransCAD metropolitan-planning-organization models, mesoscopic models, Highway Capacity Manual models, and/or simulation. The scope must include warrant analyses for all newly affected intersections and network analyses for existing, no build (20-years without the development), existing + generated trips, and build condition scenarios (existing + generated trips + recommended mitigations), at opening, phased buildout, and the 20-year design year when an Access Justification Report is required under EDSM I.4.3.2. Additional design periods, origin-destination data, travel times, and other data may be needed to calibrate a large network.

Typical mitigation. A multi-corridor mitigation package may be funded jointly with the local entity and, when controlled-access facilities are affected, coordinated with FHWA. It may include Category 2 measures at multiple intersections; warranted traffic signals; signal-system re-coordination across corridors; interchange-ramp modifications; auxiliary lanes; frontage-road or backage-road treatments; roundabout conversion; grade separation in extreme cases; and corridor-wide access-management plans. Mitigation supported by an Access Justification Report may include new or modified interchange access, ramp extensions, or auxiliary lanes. When mitigation is phased, the local entity and the owner or developer should execute a written agreement and attach it to the first access permit. The agreement should require renewed coordination with DOTD before construction begins on each phase.

5 Study Area Determination

The study area begins where development traffic enters a state route from the site access or a side street. It extends along the affected state routes to the number of controlled intersections appropriate for the development category and its peak-hour trip generation. Controlled intersections are counted from the location where site-generated traffic enters the state route or, if a side street carries the generated traffic, then intersections are counted from where that side street enters the state route. Studies that expand site driveways or intersections on local streets should be coordinated and reviewed so the local entity can approve access on local streets.

5.1 Determine the Scope Area

Determine the scope iteratively by evaluating the development's trip distribution and the potential effects on nearby intersections. Location, peak-hour trip generation, and the rate at which trips dissipate through the network affect the required limits. Include nearby intersections within one quarter mile, or approximately 1,300 feet, in all cases. A

minor intersection may not require capacity analysis, but the study may still need to address queue spillback, overlapping turns, weaving, or other operational concerns.

As a rule of thumb, include a downstream or upstream intersection when generated trips increase its total nodal volume by more than 5 percent. On corridors at or above capacity, an increase as low as 2 percent may be material and may expand the scope. Use Probe data (i.e. the StreetLight Turning Movement Count module), previously collected data, or other appropriate information for this assessment. Origin-Destination Probe data, such as StreetLight may also support traffic-distribution estimates.

Generated traffic development is often assumed to follow nearby roadway traffic patterns, but comparable developments on similar routes may distribute differently. For example, a development near an interstate may have a strong origin-destination attraction to the interstate even when existing adjacent-corridor traffic is primarily commuter traffic. Similar differences may occur on the outskirts of a community.

The scope is generally defined within a radius of the development and ends where generated traffic has dissipated enough that it no longer materially affects the network. Trip dissipation may occur quickly in urban or suburban settings; rural settings may require a longer study distance. Figure 3 illustrates the 5-percent "rule-of-thumb" test of a nearby intersection. This intersection has an existing 1873 vehicles per hour traveling through it during a PM peak hour. If a nearby development is expected to increase the volume by adding an additional ~95-100 veh/hr to this intersection, then this intersection should likely be included in the study.

All Days Peak PM 4:15pm-5:15pm

Day Parts	South - Sampson Street (LA 378) [S]			West - Sulphur Avenue [W]			North - Sampson Street [N]			East - Sulphur Avenue [E]			Total per Day Part	Total Percentage
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
4:15pm	26	168	11	29	9	65	3	110	20	12	4	3	460	24.56%
4:30pm	22	170	12	42	12	89	3	113	17	15	4	4	503	26.86%
4:45pm	22	173	13	27	8	47	3	119	17	13	4	3	449	23.97%
5:00pm	23	179	11	30	7	45	2	126	16	14	5	3	461	24.61%
Hourly Total	93	690	47	128	36	246	11	468	70	54	17	13	1,873	100.00%
Hourly Total %	11.20%	83.13%	5.66%	31.22%	8.78%	60.00%	2.00%	85.25%	12.75%	64.29%	20.24%	15.48%		
PHF	0.89	0.96	0.90	0.76	0.75	0.69	0.92	0.93	0.88	0.90	0.85	0.81		

1873 X .05 = 94

1873 X .02 = 38

***Figure 3 Intersection scope example:** A development generating more than approximately 94 vehicles per hour through an intersection with 1,873 total vehicles per hour exceeds the 5 percent test*

5.2 Capacity and Congestion Considerations

Traffic volume on the surrounding corridor affects how far a development's impacts may extend. Higher-volume corridors typically require analysis of additional intersections and are sensitive to the selected capacity-analysis method. Simulation may be necessary to determine the full effects. Coordinate the method and scope with the District Traffic Operations Engineer or designee.

1. Use available probe data, including StreetLight, RTIS, or other sources, and district knowledge to determine whether the area is near or over capacity. Probe data may validate assumptions or identify unknown conditions. Indicators include excessive queues in the probe data and observed traffic at or above lane capacity within the corridor.
2. If the development is near intersections that are near or over capacity, expand the scope as needed to capture the full effect.

    - Existing, historic, or available probe data may be used to assess the next upstream and downstream intersections. As a rule of thumb, when existing nearby intersections are near or at capacity, they may need

to be included in the scope when the development traffic is expected to increase its volume as low as 2 percent or more.

- Continue the assessment to successive intersections until generated traffic dissipates below 2 percent. See the source reference to Figure 3.

6 Data Collection

Traffic impact studies generally rely on turning-movement counts, roadway geometry, operating speeds, safety data, and signal-timing data. Collect traffic counts during representative weekday peak periods.

Initial data collection. Use initial information to identify peak periods, peak hours, and operating speeds before commissioning multiple seven-day or 48-hour counts. Review prior counts and probe data (such as StreetLight, RITIS, or other probe data) to define the study area and identify remaining data needs. When practical, use this data in the final study. Probe data origin-destination, pedestrian, and bicycle data may also support distribution assumptions.

When probe data are used or provided, analyze segments and intersections throughout the scope and average a data set that is representative of the design condition. Use typical months, such as avoiding summer data for a school analysis, and appropriate weekdays. Review segment and turning-movement-count data to identify the applicable peak periods or peak hours.

Because ITE traffic projections are based on peak hours, multiple hours of observations may be needed to calibrate software models and represent over-capacity intersections or corridors. Determine whether to analyze a peak hour or a longer peak period by reviewing turning-movement counts, prior data, and probe data to determine whether an intersection remains at capacity for more than one hour. Consider traffic volume, number of lanes, queues, congestion, and extended travel time. For example, a four-lane highway at a major four-phase signal may reach capacity at approximately 1,800 vehicles per hour with an effective 50 percent green time. Historical counts, Probe data (such as StreetLight) near this threshold, travel-time changes, or queues that persist for more than an hour may indicate that the turning-movement-count period should be extended.

One hour per design peak is generally sufficient for an under-capacity intersection. A near-capacity or over-capacity intersection will likely require more than one hour, with the time duration based on how long the intersection remains over capacity. Probe data (such as StreetLight) turning-movement data do not necessarily eliminate the need for field counts. Field counts provide vehicle classification and pedestrian and bicycle activity. Estimate unmet demand only on over-capacity approaches at existing intersections, typically using drone footage or field queue observations. Probe data can fill gaps, for instance, an analyst may collect field counts at two major intersections, use probe data for intermediate minor roads or driveways, and then balance the full network into a final demand map. Probe data may also screen approaches for the potential to satisfy traffic-signal or all-way-stop warrants and identify other likely alternatives.

Safety data. Traffic impact study typically does not require a crash history for new access because access does not yet exist. Address safety through alternatives that minimize access points and turning conflicts, provide stopping and intersection sight distance, and size turn lanes to minimize queues and potential rear-end crashes. Crash-history data will generally be needed when the development must modify an existing intersection. For example, the MUTCD requires safety analysis when a study recommends converting an existing intersection to traffic-signal control or all-way stop. If needed, for access to safety data the following link can be used to request access: https://carts.lsu.edu/DataRequest

7 Traffic Analysis Procedures

A traffic impact study typically includes trip generation, trip distribution, traffic assignment, warrant analysis, and intersection-capacity analysis. Operational analysis may use Highway Capacity Manual procedures, simulation, or a combination of methods. For example, Highway Capacity Manual methods may be appropriate for most locations while simulation is used where software warns of unstable results, turn lanes are too short, or queues spill back into

another intersection. Compare results carefully and be mindful of any flags that the software tool produces such as warnings or footnotes (metering, over capacity, etc). It may be appropriate to check a specific maneuver with simulation to ensure that the design is sufficient, rather than simulating the entire project limits. If multiple maneuvers/approaches are over capacity or are flagged by other software tools, then the full project limits may need to be simulated. In this case, all results and comparisons in the report should use the simulated results.

Balancing the final existing turning-movement-count data is required, as it is needed to evaluate the development's generated traffic impact throughout the study area. The methods in Table 1 may be used.

Method	Description	Advantages	Limitations
Split the difference	Add half of the link imbalance to the lower-volume intersection and subtract the remainder at the higher-volume intersection.	Produces realistic results	Time-consuming, particularly across several intersections or corridors
Distribute the higher volume	Use the higher volume at one intersection to override the lower volume at the adjacent intersection, then distribute the difference using the existing turning-movement distribution.	Produces realistic results	Time-consuming
Carry the higher volume through	Carry the higher volume through the other locations and add the missing traffic only to through movements.	Easy to calculate	May produce conservatively high through volumes relative to turning movements at the lower-volume intersection
Spreadsheet link-volume forcing	Use the link-volume-forcing option in the NCHRP 255 or NCHRP 765 spreadsheet to balance or match volumes automatically. Use caution because convergence may not produce the intended result.	Automated calculations	May not produce every desired result
Combination	Combine methods as appropriate. For example, use the NCHRP forcing process first, then use distributed higher volumes at internal intersections and carry higher volumes through at network termini.	Produces realistic results	Time-consuming

Table 1: Typical traffic-volume balancing methods

General Balancing Rules

- May use probe data to help validate a balancing method when compared to collected field data. Understand the roadway context and the limitations of each source. Multiple sources may be necessary. Use field counts or other accepted source data as the basis for the traffic volumes carried forward in the balancing process.
- Match the balancing effort to the project's needs and the required calculations. For a high-level analysis, it may be acceptable to retain conservatively high volumes at selected locations. Carrying the higher volume through the network may be more conservative than a detailed relative analysis. When preliminary engineering or greater detail is required, combine methods and apply engineering judgment.
- Quantify the imbalance. If volumes differ by 10 percent or more, revisit the data and determine whether processing or collection errors occurred. If the imbalance remains, collection of additional data may be needed.

Growth Rate by Category

Category 1. No growth is required when the development is expected to open within two years. Compare existing volumes with build volumes, defined as existing traffic plus generated traffic.

Category 2. Use no growth, as in Category 1, when all development trips are expected within two years. If full trip generation will occur more than two years later, apply an appropriate growth rate to the balanced existing-volume map to develop opening-year no-build and build volumes.

Category 3. These large developments often take more than five years to construct and open. Apply growth from existing conditions to no-build and build conditions for phased years and final opening. Future-year projections may include background growth and nearby planned development. An Access Justification Report requires a 20-year design horizon.

8 Traffic Impact Study Analysis and Workflow

Studies shall follow I.C.E. policy EDSM VI.1.1.2, the median-opening policy in EDSM IV.2.1.4, and the public-involvement requirements in EDSM VI.1.1.9, as applicable. The recommended meetings and deliverables do not necessarily require work to stop at each step; a consultant may proceed to the final report at its own risk. If the development and traffic report results in new or modified Interstate access, then a formally sequenced deliverable process is required under EDSM I.4.3.2. Not every activity below applies to every traffic impact study.

8.1 Scope

Use the preceding methods to define the study area, analysis type, traffic-modeling software, and trip-distribution method.

- Confirm the scope with the District Traffic Operations Engineer or designee before completing the remaining steps.

  Coordination point: The Developer and/or its Engineer shall agree with the District Traffic Operations Engineer or designee on the scope area, subject intersections, and required tools for analysis.

8.2 Traffic Volumes

- Provide charts, graphs, tables, or other material that identify the design periods and operating speeds in the study area.
- Provide traffic-volume maps and explain the assumptions used.
  - Existing and no-build volume maps, including demand estimates on over-capacity approaches.
  - Trip-distribution maps showing percentage distributions, generated traffic, and other assumptions.
  - Final build-volume maps, including nearby expected development volumes when applicable.

  Recommended coordination point: The Developer and/or its Engineer may submit trip-generation assumptions, justification, traffic-volume maps, existing volumes, growth rates, and final volume maps to the District Traffic Operations Engineer or designee for review and concurrence before beginning the traffic analysis.

8.3 Existing and No Build Analysis

Where practical, perform existing and no-build traffic analysis in one network traffic model. Depending on the study category, safety analysis may be required.

- For existing, no-build, as applicable
- Develop traffic-model networks that include the complete geometry, appropriate vehicle composition, signal parameters, turning-movement counts, number and length of turn lanes, radii, and other relevant features.
- Summarize every calibration change used for existing and no-build conditions.
  - Document changes to headways or gaps.
  - For simulation, document each nondefault setting used to replicate field conditions.
- Prepare an existing-safety-analysis summary when nearby existing intersections are affected and the proposed alternatives require safety analysis for MUTCD warrants, including a new traffic signal or all-way stop, or when another significant modification is proposed. Focus on specific conflict points and identify conflicts associated with critical outcomes such as injuries and fatalities.

  Recommended coordination point for some Cat 2 or 3 studies: before finalizing the report, submit the traffic models and measures of effectiveness to the District Traffic Operations Engineer or designee to obtain agreement on calibration and results. Discuss the crash-history summary when applicable. Smaller studies are lower-risk and may combine this discussion with the alternatives review in Section 8.4.

8.4 Alternatives Analysis

Follow I.C.E. policy EDSM VI.1.1.2 and the median-opening policy EDSM IV.2.1.4 when considering alternatives.

Category 1. Document whether more than one access is needed, perform NCHRP turn-lane warrant analyses and recommend access-point turn-lane lengths when required, whether access should be restricted, and whether a nearby intersection should be improved. Drive-through analysis, a circulation plan, or AutoTURN may be required to demonstrate that circulation can be contained on site.

Categories 2 and 3. Summarize the alternatives considered and explain why some were eliminated. Tools such as CAP-X and SPICE may be used to explore intersection and lane configurations, but engineering judgment should be used with those tools to document how alternatives were narrowed, particularly on corridors with multiple intersections. The narrowing could consist of a few sentences, a decision matrix, a Pros and Cons list, etc. You do not have to force at least two alternatives into full detailed analysis to meet the I.C.E policy. However, at times, there may be 3 to 4 alternatives that may need to be further quantified to distinguish the difference in alternatives.

For example, a first-level screening could state that, because the roadway is a principal arterial in a rural area with a 55-mph operating speed and more than 2,500 vehicles per hour, only traditional signalized intersections and restricted-crossing alternatives were advanced for Highway Capacity Software analysis. Those alternatives could include adding capacity to existing signals, converting intersections to R-CUTs, or using median U-turns. A summary like this could possibly be enough documentation of considering alternatives that are required by I.C.E. policy EDSM VI.1.1.2.

For a complex Category 3 corridor, explain how the alternatives were refined after evaluating the planning tools and how a cohesive corridor alternative was selected. The iterative model-development process should identify the preferred lane configuration and traffic control for each alternative. It may be appropriate to carry one alternative into full Highway Capacity Software or simulation analysis. Larger studies may carry two or more fundamentally different alternatives, each with additional modification options.

> *Recommended coordination point: before finalizing the report, submit the build traffic models and measures of effectiveness to the District Traffic Operations Engineer or designee to obtain agreement on calibration and results. A discussion of proposed safety countermeasures is encouraged.*

8.5 Final Report for Traffic Impact Studies

Executive summary. Describe the development type, the context of the directly affected roadway, the additional trips expected from the development, and the justification and mitigation for the recommended alternative that minimizes impacts on state highways.

Design periods. Identify the study peak hours and any atypical data characteristics relevant to the design periods. Reference supporting appendix material.

Existing conditions. Summarize existing traffic operations and existing safety conditions (if applicable). If a future no-build scenario is required, state the growth rate, cite its appendix documentation, and summarize the resulting change in performance. For a large study area, do not describe every feature and conflict. Focus on the critical movements and/or paths through the network that operate or are expected to operate poorly (i.e. critical maneuvers that operate at a level of service D or worse. If applicable, summarize safety concerns with recognizable crash patterns and their significance (i.e. there is a history of three left turn crashes per year on a northbound approach at a particular intersection). Reference source material in the appendices. The existing and No-build conditions will be used to explain the differences among alternatives.

Alternative performance and comparisons. Explain how alternatives were explored in accordance with I.C.E. policy, how the process in Section 8.4 narrowed the alternatives, and which alternatives were advanced to detailed Highway Capacity Software or simulation analysis. Compare existing and no-build performance with each alternative. Provide relevant measures-of-effectiveness tables, typically 95th-percentile queue or simulation average and

maximum queue, and delay in seconds per vehicle, by approach/movement. Describe safety countermeasures and their expected qualitative or quantitative benefit. Projects with phased mitigation approaches should include additional measures-of-effectiveness results for each of the phases. Reference detailed material in the appendix.

Required Appendices

Supporting data used in calculations. Include relevant data such as probe-data charts, graphs, and tables for counts and speeds from StreetLight, RITIS, or other sources; seven-day or 48-hour tube-count and classification data; turning-movement counts; field observations used to interpret model results and that further explain operation performance beyond model capabilities (for example; model result that does not represent the full study period, such as a 50-second delay that occurs only during a 15-minute school-release period and dissipates in less than 15 minutes) ; trip-generation information and trip-distribution maps; existing, no-build, and build turning-movement-count maps; and existing and/or proposed future warrant analyses.

Safety data when applicable. Provide the existing safety-performance summary and applicable charts, graphs and diagrams. Place the 23 U.S.C. Section 407 statement on every page that discusses safety and/or crash data. The following text can be used: "*23 U.S.C. § 407 Disclaimer: This document, and the information contained herein, is prepared for the purpose of identifying, evaluating, and planning safety improvements on public roads, which may be implemented utilizing federal aid highway funds. This information shall not be subject to discovery or admitted into evidence in a Federal or State court pursuant to 23 U.S.C. § 407.*"

Existing and No-Build Analysis Appendix. Include only the relevant measures-of-effectiveness output from the analysis software. Reduce automated output to the pages needed to support the report.

Alternative Analysis Appendix. Like the existing and No-Build results, include only the relevant measures-of-effectiveness output from the software and reduce automated output to the pages needed for the report.

> **Comparison of congestion maps.** Provide maps comparing approach delay under no-build and build conditions and maps comparing queues under no-build and build conditions. Each comparison may use two separate maps or one map showing both conditions. Most traffic software being built in networks can auto-produce these map types.
>
> **Safety countermeasures.** Include the proposed countermeasures and supporting analysis when performed.
>
> **Proposed geometric layout.** Illustrate design-vehicle circulation, appropriate sight-distance lines, turn-lane details, signals, striping, and other access-permit requirements under Louisiana Administrative Code Title 70 Chapter 15. The geometric plans/layouts are typically attached to the access permit application for further processing and approvals.

8.6 Final Report for Traffic Impact Studies that are Administered Through DOTD Headquarters and FHWA

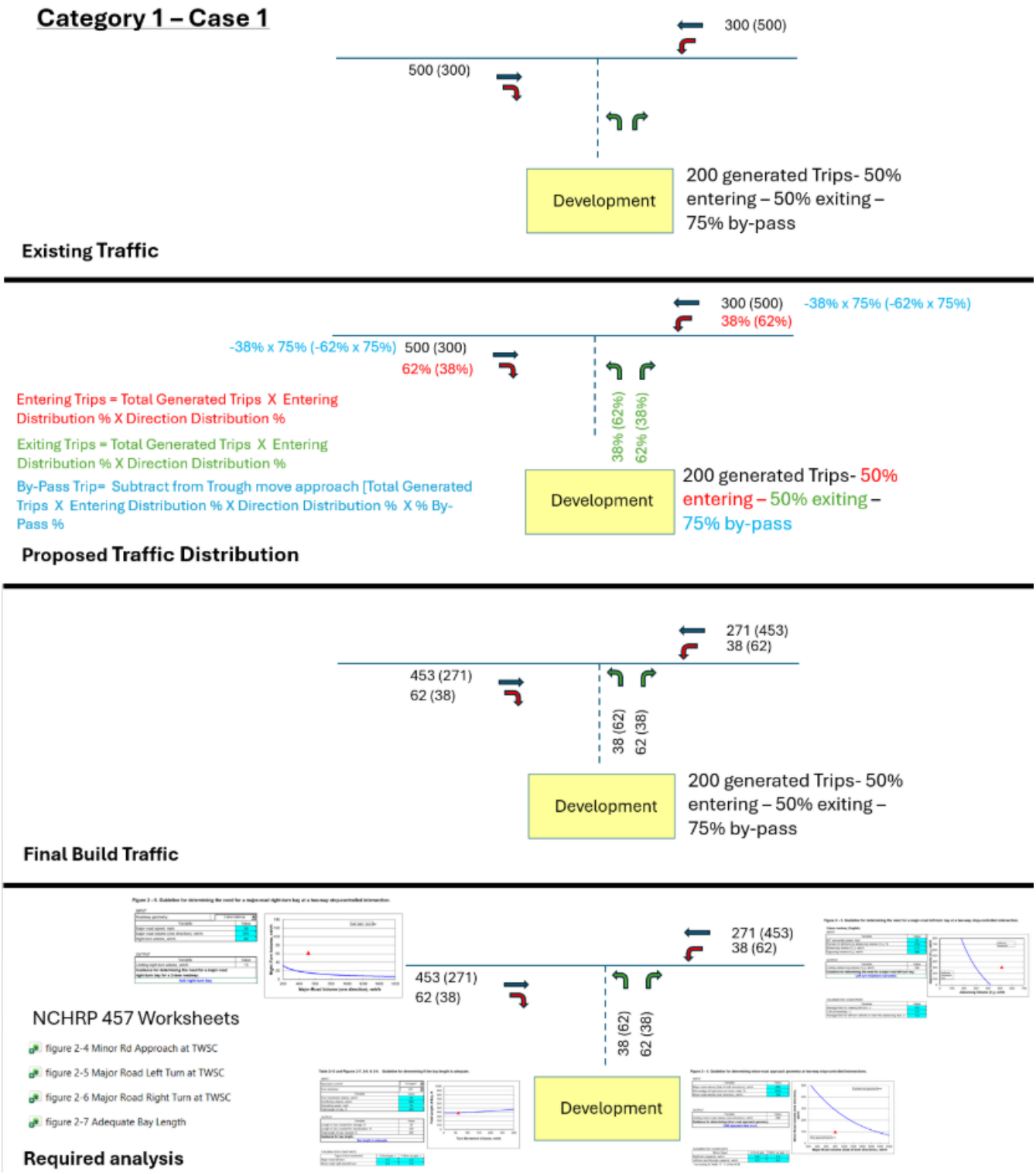
A development that requires coordination across multiple disciplines or with another agency, including but not limited to FHWA, railroad, local government, etc., will generally require a substantially expanded scope. The scopes in these cases will have required stopping points where DOTD and the Agency will review and provide concurrence at various stages prior to allowing the study/project to advance further.

9 Citations within this Guidance

- Institute of Transportation Engineers Trip Generation Manual
- Institute of Transportation Engineers Trip Generation Handbook Third Edition
- Streetlight Analysis Software

Example Study Deliverables and Guidance

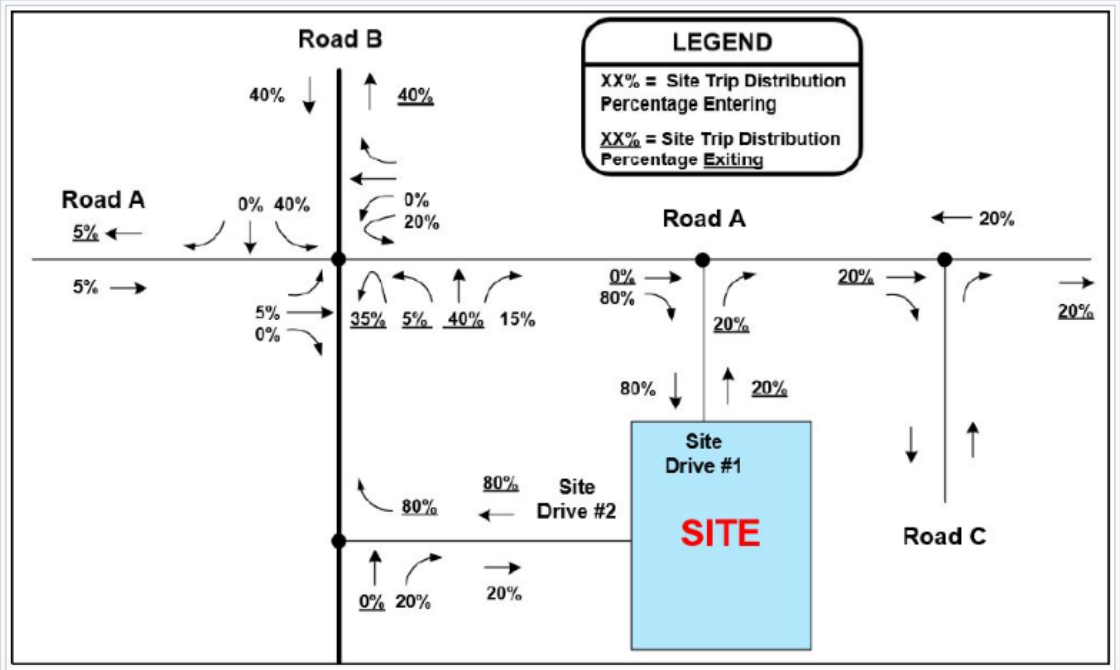
Below are some guidance and examples of deliverables for different levels of Traffic Impact Studies for various size/complexity scenarios.



Appendix Figure A1: Category 1 Case 1 traffic assignment and NCHRP worksheet example

Trip Distribution Example for Category 1-3 Studies

The example below shows existing traffic, the proposed trip distribution, final build traffic, and the required turn-lane analysis for a development generating 200 trips with 50 percent entering, 50 percent exiting, and 75 percent pass-by traffic. For more complex networks (Category 2 and Category 3), these volume maps would include additional intersections along the corridor(s).



Appendix Figure A2: Example site-trip entering and exiting distribution

Typical Category 1-3 Study Examples based on Context

Category	Example	Case	Roadway context
Category 1	ITE Land Use 210 Single-Family Detached Housing approximately 105 units or 350 residents through 350 dwelling units or 1,100 residents	1	Isolated roadways with low-density access points and intersections, rural context, and low capacity
Category 1	ITE Land Use 934 Fast-Food Restaurant approximately 3,200 square feet and larger	2	Dense access and intersections, urban or suburban context, and high capacity
Category 1	ITE Land Use 945 Convenience Store or Gas Station approximately 8 fueling positions or 4 pumps through 20 fueling positions or 10 pumps	2	Dense access and intersections, urban or suburban context, and high capacity
Category 1	ITE Land Use 937 Coffee/Donut Shop w/ drive-thru – 1250 sq/ft	2	Dense access and intersections, urban or suburban context, and high capacity

Category	Example	Case	Roadway context
Category 2	ITE Land Use 210 Single-Family Detached Housing approximately 350 units (1100 residents) to 600 dwelling units (1,825 residents)	1	Isolated roadways with low-density access points and intersections, rural context, and low capacity
Category 2	ITE Land Use 955 – Travel Center: 26 fueling positions (13 pumps) to 44 fueling positions (22 pumps)	2	Dense access and intersections, urban/suburban, high capacity
Category 2	ITE Land Use 945 – Convenience Store/gas station: 8 fueling positions (4 pumps) – 20 fueling positions (10 pumps)	2	Dense access and intersections, urban/suburban, high capacity
Category 3	Typically, very large generators and/or large properties with multiple developments that add up to 500+ trips.		