Applicant's Guide

TRANSPORTATION IMPACT STUDIES FOR PROPOSED DEVELOPMENT;

Within Hendricks County, Indiana

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I. PURPOSE OF THE APPLICANT'S GUIDE

The purpose of this guide is to:

1. Provide consistency in the request, preparation, and review of transportation impact studies and traffic operations analyses
2. Ensure that critical transportation and development issues are addressed
3. Provide staff with guidance and a checklist in the review process
4. Promote increased understanding of transportation impact issues among those involved in the development process.

Topics addressed in this Applicant's Guide include:

1. When to provide a transportation impact study
2. TIS study area
3. Preparer/reviewer qualifications
4. Transportation impact study process
5. Time periods to be analyzed
6. Development to be analyzed
7. Analysis horizon years
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9. Background traffic estimates
10. Traffic distribution and assignment
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II. WHEN TO PROVIDE A TRANSPORTATION IMPACT STUDY

The need for a transportation impact study or traffic operations analysis may be identified by the Planning & Building Department, the Engineering Department, or the Plan Commission when rezoning, special exception, variance or plan approval petitions are filed.

A traffic operations analysis may be requested as part of a complete transportation impact study or for petitions which do not meet the warrants for a complete impact study. Examples of traffic operations analyses include:

1. Study of proposed driveway locations, resulting sight distances, and adequacy of proposed queuing provisions.
2. Accident experience and safety analysis.
3. Traffic signal warrant and progression analysis.

STUDY WARRANTS FOR A COMPLETE TRANSPORTATION STUDY

A complete transportation impact study (as described in subsequent chapters of this document) may be requested for any proposed development that meets criterion A and either criterion B or C (or both):

Significantly Sized Project

A development meets this criterion if it contains 150 or more single-family residential units or if it generates 100 or more peak hour trips in the peak direction.

Nearby Congestion

A development meets this criterion if the proposed development is expected to significantly impact surrounding roadways, intersections, or sets of intersections. The level of service will be determined by an analysis prescribed in the current edition of the Highway Capacity Manual (Transportation Research Board) using data that reflects the current traffic condition.

Modifications to Roadways

This criterion is met when the proposed development is expected to significantly impact a roadway segment identified for improvements. This criterion is also met when the proposed development includes modifications to the roadway system, other than curb cuts or deceleration/acceleration lanes.

STUDY WARRANTS FOR A TRAFFIC OPERATIONS ANALYSIS:

A traffic operations analysis may be requested for any of the following conditions:

1. requests for a driveway(s) on any frontage road, arterial, or collector street
2. requests or probable need for a new traffic signal to control driveway(s) or street(s) serving a proposed or existing development
3. existing sight distance limitations or high accident experience adjacent to a site.

III. PREPARER QUALIFICATIONS

PREPARER QUALIFICATIONS

Transportation impact studies shall be prepared by professionals with training and experience in traffic engineering and under the supervision of a registered professional engineer with training and experience in traffic engineering (operations and safety analysis experience).

Hendricks County requires that the responsible registered professional engineer sign and seal the study report.

IV. TRANSPORTATION IMPACT STUDY REVIEW PROCESS

It is intended that the formalized study review process assist study preparers to develop their reports in the most efficient and responsive manner possible. It is specifically not intended that the process be either cumbersome or induce unnecessary delay to the development review process.

It is also intended to answer the following questions:

1. Is a TIS warranted?
2. Is there an agreement on study area, horizon year, scope, and report contents? (This is accomplished in an initial meeting between the preparer and the reviewers.)
3. Is there agreement on methods and technique for analysis? Are they adequate?
4. Are findings and recommendations reasonable and acceptable?
5. Should the staff recommend approval or denial based on professional guidelines, County policies, and regulations?

Depending on the type of development, there will be either five or six required review steps involved in the study process:

1. Determination of whether or not a traffic study will be required.
2. Initial meeting between preparer and reviewers to discuss study issues, scope, assumptions, data and data sources, technical procedures, and desired report contents.
3. Preparation (by applicant) and approval (by reviewer) of a Memorandum of Understanding which details the assumptions and methodologies to be used.
4. Formal transportation study.
5. Additional review in conjunction with other components of supplemental review process if required.
6. Approval or denial of the development petition or application.

V. STUDY AREA

MINIMUM STUDY AREA

Any complete transportation study analyzing off-site access needs and impacts will include at least all site access points and major intersections (signalized and unsignalized) adjacent to the site.

ADDITIONAL STUDY AREA

Beyond this basic area, the County will determine any additional area to be included based on local or site-specific deficiencies, development size, traffic conditions, or local policy potentially affected by the proposed development. The study area will also encompass vacant parcels of land believed to impact the intersections being analyzed, so as to analyze the proposed project in the context of other previously approved or anticipated developments in the surrounding area.

Generally the study area must be large enough to encompass the critical intersections to be analyzed and the vacant land, which once developed, is believed to have a significant impact upon them.

The County shall identify and provide land use projections for vacant parcels within the study area.

VI. STUDY HORIZON YEARS AND TIME PERIODS TO BE ANALYZED

STUDY HORIZON YEARS

Transportation impact studies are to address conditions in the current year plus the anticipated completion year of the proposed development assuming full build-out and occupancy. If the proposed development is to be implemented in phases, it may be appropriate to analyze each major phase (i.e., initial phase, one intermediate phase, and full project buildout). Additional horizon years, ranging from a minimum of 10 years after the study date to a maximum of full build-out of the defined study area, will be required. TIS for developments which will significantly impact the interstate highway system are to be based on a full build-out condition.

TIME PERIODS TO BE ANALYZED

For each defined horizon year specific time periods are to be analyzed. In most cases only analyses of street peak hours will be required. However, land use classifications which experience their highest trip generation levels during periods other than street peak hours may require analyses for such periods to determine proper site access and turn lane storage requirements. Traffic signal warrant studies normally require determination of the highest eight hours of traffic volumes during a day; as a result, longer time periods are needed for these analyses.

In some instances, analysis of a different time period may be appropriate to assess site access needs or traffic signal needs rather than traffic impacts on the adjacent street system. For proposed developments located in high traffic areas, analysis of a time period other than and in addition to weekday street peak hours may be appropriate. Examples of land use classifications which typically have substantially higher site trip generation peaks at times other than weekday street peak hours are:

- shopping centers (Saturday afternoon) discount stores (Saturday afternoon)
- recreational uses (e.g., theaters, zoos, theme parks, stadiums, arenas) (various times)
- restaurants (usually Friday or Saturday evenings)
- schools (at start and finish time)
- churches (on Sundays or Saturdays, before and after largest service)
- garden centers (on weekends)

The analysis time period should be discussed and designated by the County in the initial meeting. However, analysis of transportation impacts should always include weekday A.M. and P.M. street peak hours if the proposed developments generate significant activity during these periods.

VII. DEVELOPMENT TO BE ANALYZED

The total anticipated transportation infrastructure needs in the study horizon year(s) are needed so the County can accurately evaluate implications associated with the applicant's request for development approval. However, the impacts and infrastructure needs will be assessed separately for the baseline condition (horizon year development excluding site) and total development (site plus non-site development).

SITE DEVELOPMENT

Development proposed to be located on the site under study should be categorized by specific land use type consistent with classifications contained in the latest edition of Trip Generation (Institute of Transportation Engineers). The proposed number of development (building) units (e.g., gross square feet of building area, dwelling units, hotel rooms, etc.) should be provided. Land area is insufficient to provide a basis for analysis.

If the proposed land-use or density is inconsistent with the Comprehensive Plan recommendation, comparison of the proposed land use and the Comprehensive Plan recommendation should be made using classifications contained in the Trip Generation report.

NON-SITE WITHIN STUDY AREA

The impacts of the anticipated non-site development should be assessed separately from those of the proposed development to aid both the County and applicant to determine sources of transportation infrastructure needs.

All significant developments within the study area that have been approved or are likely to occur by the specific horizon years should be identified and incorporated into the study. The land-use type and magnitude of the probable future developments in the horizon years should be identified in conversations with staff.

VIII. NON-SITE TRAFFIC ANALYSIS

Traffic having neither an origin from nor destination to the subject site is considered "non-site traffic". For any horizon year, non-site traffic volumes are estimated to characterize the base conditions for the area of study -- that is, the traffic volume conditions of the study area in the horizon year, assuming the subject site is not developed or redeveloped.

The purpose of the non-site traffic analyses is to determine:

1. What are existing conditions and what improvements will be needed to alleviate current deficiencies?
2. What will conditions be in the horizon year(s) without the site under study being developed, and what improvements are needed?
3. What additional improvements will be needed in the horizon year(s) to meet the additional needs generated by the proposed development of the study site?

COMPONENTS TO BE CONSIDERED

Two components need to be considered when estimating non-site traffic volumes. They are:

- Through traffic. This consists of trips which have neither an origin nor destination in the study area. These trips begin and end at points external to the study area; however, their paths are within the study area.
- Traffic generated by other developments within the study area. These trips have either an origin, a destination, or both in the study area.

METHODOLOGY

Non-site traffic volumes should be developed using the "build-up" method. This method will typically provide accurate and easily traced results. The concept consists of forecasting peak-hour traffic to be generated by approved and anticipated developments in the study area, estimating growth in through traffic generated outside the study area, and adding both to existing traffic in the study area. If the subject site is being redeveloped, existing site traffic is subtracted from this total to provide the estimate of future non-site traffic. The general procedure to be followed in developing non-site traffic is given below:

1. Assess impacts of transportation system changes on study area travel patterns. Transportation system improvements that are programmed, committed, or deemed highly likely to be in place by the horizon year should be identified in conversations with the County
2. Identify study area developments to occur before horizon year. All significant developments within the study area that have been approved or are likely to occur should be identified and incorporated into the study. The land-use type and magnitude of the probable future developments m the horizon year should be identified in conversations with the staff.
3. Estimate trip generation. Using techniques consistent with the Trip Generation section of this document, estimate the peak hour trip generation for each of the developments identified in Step 2.
4. Estimate directional trip distribution. Consistent with the procedures presented in the Traffic Distribution and Assignment section of this document, develop the directional distribution of traffic for each identified development from Step 2.
5. Assign traffic. Once the traffic for the probable developments within the study area is generated and distributed, assign it to the horizon year study area roadway network using procedures presented in the Traffic Distribution and Assignment section of this document.
6. Estimate through traffic growth. Recent growth trends in traffic volumes through the entire study area should be used to estimate the growth in traffic having both trip ends outside the study area. These growth rates should be obtained from or discussed with the County reviewers. They should be applied to an estimate of existing through traffic. As an alternative, the County may provide an estimate of through traffic based on travel forecasts or the petitioner can conduct a license plate study as part of the transportation impact study to determine current through traffic. The approach to defining through traffic will be discussed at the initial meeting with County.
7. Sum study area and through traffic. Add the results of Steps 5 and 6 to yield total non-site traffic volume projections for the horizon year.
8. Review results for reasonableness. The preparer should review the results for reasonableness of the proposed final projection of non-site traffic.

ALTERNATE METHODOLOGY

For study horizons using the adopted transportation plan horizon year, the County staff may, at its discretion, require that travel simulation modeling forecasts be used to replace or supplement the "build-up" method to estimate non-site traffic.

NON-SITE TRAFFIC ANALYSIS AND NECESSARY IMPROVEMENTS

Once the non-site traffic volumes have been estimated, an analysis of the future base conditions should begin. This will provide an assessment of the traffic operations and needed improvements in the horizon years without the subject development in place. With the base conditions established, the impact of the subject site can be measured. Analysis procedures should be consistent with those described in the Analyses section of this document.

Improvements necessary to accommodate the non-site traffic in the horizon year at the design level of service (discussed in a later chapter) should be determined. It is very important to research and identify improvements that have already been committed by other developments.

Additional improvements needed to alleviate existing high accident experience or solve other traffic-related problems or deficiencies should be identified. Documentation should clearly state that these improvements are needed to satisfy base conditions -- without the development being proposed -- and that the need for them is not generated by the proposed development of the site under study.

IX. TRIP GENERATION ESTIMATION

Trip generation is the process of estimating the amount of traffic to be generated by a subject development. This is usually done through the use of rates or equations expressed in terms of units of development (i.e., per dwelling unit or per thousand feet of building floor area).

ACCEPTABLE DATA SOURCES

Several data sources and methods for estimating trips generated by a development are available:

1. Institute of Transportation Engineers (ITE) Trip Generation report (latest edition) containing data from observations around the country for over 20 years.
2. Prior local studies which have been made for various reasons, but which are applicable for the purpose of estimating trip generation for site development. These studies should be approved by the County prior to being used.
3. Prior studies made outside the Indianapolis area for a similar land use. These studies should only be used if they are approved in advance by the County.
4. Special studies conducted especially for the study at hand. Developments surveyed should be representative of the development for which the trip generation estimate is to be made. These should be local if similar developments exist and can be isolated for proper surveys. They may be made out of town if no adequate local examples can be surveyed. Proper procedures should be used. Study sites should be approved in advance by the County.
5. A combination of the above, adding local data to the ITE data, or combining local or special study data. Additions to ITE data should be plotted on the scatter diagram provided in the latest edition of Trip Generation, if available, to check for consistency. Combination of data from different sources should be approved in advance by the County.

X. TRAFFIC DISTRIBUTION AND ASSIGNMENT

After the trip generation analysis for the proposed development has been completed, the traffic must be distributed and assigned to the roadway system for the impacts to be determined. The trip distribution process estimates the off-site origins and destinations of the generated trips. The assignment process produces estimates of the amount of site traffic that will use each route in the study area.

ACCEPTABLE DISTRIBUTION PROCEDURES

The directions from which traffic will approach and depart the site can vary depending on several location-specific factors, including:

- Size of the proposed development
- Type of the proposed development
- Surrounding and, in some cases, competing land uses, population, and
- employment distributions
- Prevailing conditions on the existing street system

To help in the distribution of traffic, an influence area (area within which most site trips are made) may be defined. The influence area should be large enough to include most of the trip ends attracted to the site. Ideally, an existing market study could be used to establish the influence area. However, if no market study exists, the influence area should be established and documented based on a reasonable estimate.

ASSIGNMENT PROCEDURES

Traffic assignments should consider logical routings, available and projected roadway capacities, and travel times. Often multiple path assignments should be made to account for spreading of traffic among different routes with similar travel times. Realistic estimates should be made of traffic diverting to avoid horizon year congestion if any is expected. Assignments should consider transportation improvements projected to be in place by the analysis year. Existing trip distribution data from actual sites within the immediate vicinity may be used for the purpose of making traffic assignments.

It is important to remember that if the site is a redevelopment project, assigned traffic generated by the old or existing development should first be subtracted to avoid "double counting".

PASS-BY TRIPS

Many land uses (e.g., retail and restaurant) not only generate new vehicle trips, but also attract trips that were already passing by in the traffic stream and are simply attracted to the subject site. These trips, commonly referred to as pass-by trips, are captured from a traffic stream that moves past the site. The procedures described in the ITE Trip Generation report should be used to account for these trips. Locally collected data as well as current research may also be used in determining these values if approved.

INTERNAL TRIPS

Very little data has been collected locally or elsewhere to quantify the extent of internal trip making within a mixed use development. Common current practice is to consider internal trip reductions only where mixed use developments consisting of at least two major complementary uses exists. This includes such complementary use combinations as office-retail, office-hotel, office-residential, retail-residential, and office-restaurant. Other combinations may be considered.

XI. CAPACITY AND OTHER ANALYSES

Several analyses are applicable to derive the study findings, conclusions, and recommendations. Measurements of the capacity conditions at critical locations within the study area are the primary means of estimating traffic impacts. Site access, safety, traffic control, geometric, and parking should also be considered.

CAPACITY ANALYSIS

Capacity analyses should be performed at all proposed site access locations and all intersections adjacent to the subject site. Other critical or currently congested segments of the network within the study area may also be identified for analysis at the discretion of the County. Elements such as parking facility access points, and site access vehicular storage reservoirs are examples.

For each horizon year, the capacity analyses should be conducted for conditions with and without the proposed development to determine the incremental impacts of the project and the improvements necessary to support each phase of the development.

The latest edition of the Highway Capacity Manual, published by the Transportation Research Board, is to be used for performing all capacity analyses. However, the results of any capacity analysis does not replace the need for professional engineering judgment, but rather provides additional information from which to partially base such judgment. Careful review of the numbers and a field check of the location are very important.

LEVEL OF SERVICE

The standard criterion used to define quality of traffic flow is "level of service" (LOS). This is a qualitative assessment of factors such as speed, volume, geometry, delays, and ease of maneuvering. LOS can be quantified in different ways depending on the focus of the analysis. For instance, LOS for signalized intersections is based on average stopped delay time per vehicle, while unsignalized intersection LOS is based on critical gaps and estimated reserve capacity, and freeway ramp LOS is based on the capacities of the ramp lane(s) and the freeway main lanes.

All analysis techniques specify the quality of operations as a letter (see Tables 12.1 and 12.2).

TABLE 12.1

LEVEL OF SERVICE DESCRIPTION FOR SIGNALIZED INTERSECTIONS

Level of Service	Qualitative Description
A	Good progression, few stops, and short cycle lengths
B	Good progression and/or short cycle lengths; more vehicle stops.
C	Fair progression and/or longer cycle lengths, some cycle failures; significant portion of vehicles must stop.
D	Congestion becomes noticeable; high volume-to-capacity ratio, longer delays, noticeable cycle failures.
E	At or beyond limit of acceptable delay; poor progression, long cycles, high volumes, long queues.
F	Unacceptable to driver. Arrival volumes greater than discharge capacity; long cycle lengths, unstable/unpredictable flows.

SOURCE: Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C. 1985

TABLE 12.2

LEVEL OF SERVICE DESCRIPTION FOR UNSIGNALIZED INTERSECTIONS

Level of Service	Reserve Capacity (peph)	Impact on Minor Street Traffic
A	≥400	Little or no delay
B	300-399	Short traffic delays
C	200-299	Average traffic delays
D	100-199	Long traffic delays
E	0-99	Very long traffic delays
F	*	*

SOURCE: Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C. 1985

peph = passenger cars per hour

* When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing, which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.

The minimum acceptable LOS (design level) in the Hendricks County is "C". Analyses should show an intersection LOS of "C" or better to be acceptable. Anything below "C" for an intersection is considered unacceptable.

If the analyses shows that conditions with only non-site traffic will result in a level of service below "C", the preparer should document this finding and ascertain the level of improvement needed to maintain at least the base level of service once site traffic is added.

OTHER ANALYSES

Additional analyses may be needed depending on the characteristics of the proposed development its impacts, and the transportation system within the study area. These analyses will be stipulated by the County and may include traffic control, traffic signal warrant or progression studies, accident analyses, geometric feasibility of recommended improvements, sight distance, parking, or other analyses appropriate to the particular situation.

In all cases specific site access shall be proposed. Analyses should identify the baseline conditions and impacts of off-site growth during the horizon period without the proposed development as well as conditions with the proposed development together with a statement of the impacts and needs generated by the proposed development.

The study report should state the findings of all analyses and provide conclusions.

XII. RECOMMENDATIONS

Recommendations should be developed to address the conclusions resulting from the analyses of the proposed development's access needs and impacts on the transportation system. Recommendations should be grouped into two categories: site-specific recommendations and non-site recommendations.

Recommendations should address feasible transportation system improvements needed to satisfactorily accommodate site and non-site traffic, respectively (identify these separately). The recommendations should reflect improvements currently planned or programmed by any public or private agency. Recommendations may include improvement scheduling that could beneficially be changed. Transportation facility improvements can be classified as either major structural improvements, such as the widening of roadways, or operational improvements, such as installing a traffic signal or changing lane usage.

It is important to view recommendations for improvements within appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-range and long-range network improvements that are already committed and scheduled.
- Anticipated time schedule of adjacent developments.
- Size and timing of individual phases of the proposed development.
- Logical sequencing of various improvements or segments
- Right-of-way needs and availability of additional right-of-way within the appropriate time frames.
- Local priorities for transportation improvements and funding.
- Cost-effectiveness of implementing improvements at a given stage of development.
- Necessary lead time for additional design and construction.

Since improvements can often be implemented in more than one order, the recommendation should address an implementation sequence that would provide maximum compatibility with the overall roadway system configuration needed for network effectiveness.

REPORT

All transportation impact studies and traffic operations analyses will be documented in a report. The report will describe:

- proposed development
- existing conditions
- study procedures
- data collected
- findings of analyses
- conclusions and recommendations

Reports should be complete but concise. Letter or memorandum reports may be acceptable for studies of limited scope. All reports will be reviewed by the County; those requiring additional information or revision will be discussed with the preparer and returned for revisions.

XIII. PUBLIC RECORD

Transportation impact studies, including both reports and data, become public record upon submittal. Information contained in these submittals may be used by agency staffs or other study preparers in subsequent studies. The original sources of reused information should be cited when taken from prior submittals.