City of Mt. Juliet, TN

Multimodal Transportation Analysis Guidelines

April 2024

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General Information

Abbreviations

The following are abbreviations referenced in this document:

- COMJ – City of Mt. Juliet
- TDOT – Tennessee Department of Transportation
- MTA – Multimodal Transportation Analysis
- FHWA – Federal Highway Administration
- AASHTO – American Association of State Highway and Transportation Officials
- MUTCD – Manual on Uniform Traffic Control Devices
- ITE – Institute of Transportation Engineers
- MPO – Metropolitan Planning Organization
- LRTP – Long-Range Transportation Plan
- TIP – Transportation Improvement Program
- ADA – Americans with Disability Act
- HCM – Highway Capacity Manual
- HCS – Highway Capacity Software
- HSAM – Highway System Access Manual
- LOS – Level of Service

1 Introduction

1.1 Background

The purpose of this document is to establish a set of standard transportation analysis requirements and procedures to provide the City of Mt. Juliet (COMJ) with sufficient information concerning the multimodal transportation and safety impacts resulting from the proposed development or redevelopment of properties. The submitted multimodal transportation analysis report will assist the COMJ in their evaluation of whether the proposed development or redevelopment is appropriate for a particular site; or, if necessary, identify appropriate mitigation measures to maintain the integrity of the surrounding transportation system. If the transportation analysis includes state routes within the study area limits, then Tennessee Department of Transportation (TDOT) will also be involved in the process as a reviewer.

All transportation analyses shall be prepared by a registered Professional Engineer (P.E.), or an individual under the supervision of a registered P.E. The P.E. shall have specific training in traffic engineering and be in good standing with the State of Tennessee. All transportation analysis reports submitted to the COMJ for final review shall be signed and sealed by the P.E. in responsible charge throughout the completion of the study.

1.2 Multimodal Transportation Analysis Components

The developer of a proposed development or redevelopment, as part of the application process, shall submit a *Multimodal Transportation Analysis (MTA) Screening Evaluation Form*. This form can be found in Appendix A. When submitted for review, the COMJ will determine the appropriate next step in the transportation analysis process.

The transportation analysis consists of four components, as depicted in Figure 1. The traffic review (also referred to as traffic study) includes analysis of traffic capacity, supplementary traffic considerations, and site design. The multimodal review evaluates bicycle and pedestrian networks. The safety review includes evaluations of historical crashes, site access, and the relationship between traffic and multimodal considerations with safety. Lastly, a mitigation section should identify mitigation measures and potential improvements.

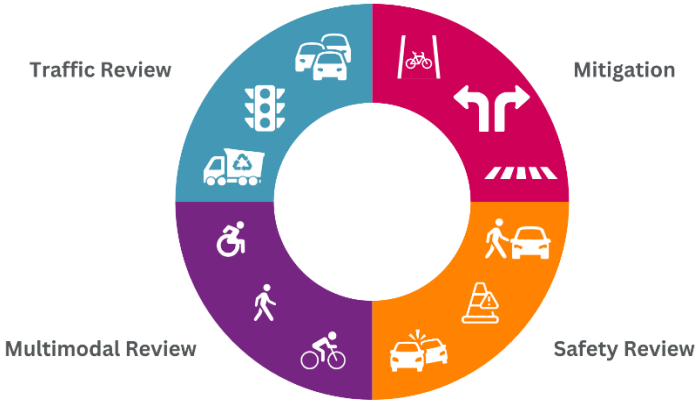

Figure 1. Multimodal Transportation Analysis Components

1.3 Scoping a Multimodal Transportation Analysis

Before beginning a transportation analysis, the developer of a proposed development and/or their traffic consultant shall meet with the COMJ to determine the scope of the transportation analysis. The traffic engineer responsible for developing the transportation analysis must be present at the scoping meeting. The transportation analysis scoping meeting shall be coordinated with the COMJ Engineering Department for time and location. It shall occur after the pre-application meeting and prior to the submitting an application for the Planning Commission Review. The *MTA Screening Evaluation Form* shall be submitted to the COMJ at least two days prior to the scoping meeting. Figure 2 depicts where the transportation analysis scoping meeting occurs during the COMJ Planning Commission Meeting and Submittal Process.

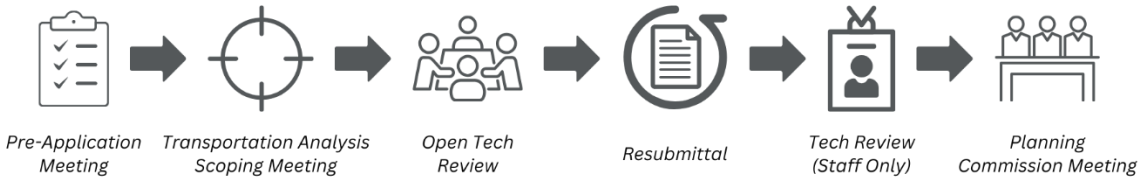

Figure 2. City of Mt. Juliet Planning Commission Meeting and Submittal Process

The following items will occur during the scoping meeting:

- Review of the MTA Screening Evaluation Form.
- Verification of the scope of transportation analysis required for the proposed development.
- Determination of the extent of the study area limits, including the existing adjacent public roads and the major study intersections (signalized and unsignalized) to be analyzed.
- Confirmation of the trip generation, distribution, and assignment methodology.
- Confirmation of the assumptions for pass-by and internal capture trip reductions.
- Confirmation of the assumptions for background growth rates.
- Confirmation of the traffic analysis review years (e.g. opening year, construction phase year, horizon year, etc.) for the proposed development.
- Confirmation of the traffic analysis time periods (e.g. AM peak hour, PM peak hour, weekend peak periods, etc.) for the proposed development.
- Determination of if additional analyses such as traffic signal warrant, safety, intersection sight distance, gap, and traffic simulation analyses are needed.
- Review of other current and/or proposed transportation improvement projects within the vicinity of the proposed development site.
- Consideration of pedestrian, bicycle, and ADA accommodations within the study area.
- Confirmation of the analysis software and reporting requirements.

The minutes of the transportation analysis scoping meeting shall be prepared by the developer of a proposed development and/or their traffic consultant. Some meeting items may require follow up after the transportation analysis scoping meeting. When ready, the prepared minutes shall be submitted to the COMJ for approval. Written approval from the COMJ shall be obtained prior to initiating the transportation analysis.

1.4 Study Area Criteria

The study area required for each of the transportation analysis components is to be based on the trip generation projections for the proposed development. Table 1 presents the typical study area required based upon the number of new trips generated by a proposed development.

The minimum thresholds present in Table 1 are calculated for both new peak hour trips and new daily trips. The minimum threshold is satisfied if the calculated number of new trips satisfies either condition. If the new peak hour trip and new daily trip calculations satisfy different transportation analysis levels, then the higher analysis level is required. If necessary, the typical study area limits for each level of transportation analysis may also be extended or shortened up to ½-mile at the sole discretion of the COMJ. An applicant of a proposed development shall not avoid the intent of these transportation analysis requirements by submitting piecemeal applications or approval requests for subdivision plats, site development plans, building permits, etc.

Table 1. Transportation Analysis Levels

Transportation Analysis Level	Trip Generation Thresholds	Transportation Analysis Report Component	Typical Study Area Requirements*
0	Less than 50 new peak hour trips and less than 250 new daily trips	Traffic Review	May be waived by COMJ staff.
		Multimodal Review	All facilities along property frontage.

		Safety Review	• Intersection(s):
			  ○ Property Access only
			• Roadway Segment
			  ○ Property Frontage

1	50 to 99 new peak hour trips or 250 to 499 new daily trips, whichever is greater	Traffic Review	• Intersections:
			  ○ Property Access
			  ○ First signalized or unsignalized intersection within ¼-mile of property access
			• Roadway Segments
			  ○ Between each intersection or within ¼-mile from each property access

		Multimodal Review	All facilities within a ¼-mile radius of the proposed development.

		Safety Review	• Intersections:
			  ○ Property Access
			  ○ First signalized or unsignalized intersection within ¼-mile of property access intersection(s)
			• Roadway Segments
			  ○ ¼-mile in each direction from all property access intersections

*If necessary, the typical study area limits for each level of transportation analysis may also be extended or shortened up to ½-mile at the sole discretion of the COMJ.

Transportation Analysis Level	Trip Generation Thresholds	Transportation Analysis Report Component	Typical Study Area Requirements*
2	100 to 249 new peak hour trips or 500 to 2,999 new daily trips, whichever is greater	Traffic Review	• Intersections: ○ Property Access ○ All signalized or unsignalized intersections within ¼-mile of property access • Roadway Segments ○ Between all intersections
		Multimodal Review	All facilities within a ½-mile radius of the proposed development.
		Safety Review	• Intersection(s): ○ Property Access ○ All signalized or unsignalized intersections within ¼-mile of property access intersection(s) • Roadway Segment(s) ○ ¼-mile in each direction from all property access intersections
3	250 to 399 new peak hour trips or 3,000 to 5,999 new daily trips, whichever is greater	Traffic Review	• Intersections: ○ Property Access ○ All signalized or unsignalized intersections within ½-mile of property access • Roadway Segments ○ Between all intersections
		Multimodal Review	All facilities within a ½-mile radius of the proposed development.
		Safety Review	• Intersection(s): ○ Property Access ○ All signalized or unsignalized intersections within ½-mile of property access intersection(s) • Roadway Segment(s) ○ ½-mile in each direction from all property access intersections
4	≥400 new peak hour trips or ≥6,000 new daily trips, whichever is greater	Traffic Review	• Intersections: ○ Property Access ○ All signalized or unsignalized intersections within ¾-mile of property access • Roadway Segments ○ Between all intersections
		Multimodal Review	All facilities within a ½-mile radius of the proposed development.
		Safety Review	• Intersection(s): ○ Property Access ○ All signalized or unsignalized intersections within ¾-mile of property access intersection(s) • Roadway Segment(s) ○ ¾-mile in each direction from all property access intersections

*If necessary, the typical study area limits for each level of transportation analysis may also be extended or shortened up to ½-mile at the sole discretion of the COMJ.

1.5 Submittal and Review Timelines

A final version of the transportation analysis report is required prior to going before the Planning Commission or Board of Commissioners. A completed transportation analysis (including all discussions with TDOT, as necessary) is required with the open tech review submittal. Submittals without a completed transportation analysis report will not be allowed to stand before the Planning Commission. If land uses change during the submittal process that result in an additional 100 peak hour trips or 500 daily trips, or at the discretion of the COMJ, the transportation analysis must be revised. The typical transportation analysis process is summarized graphically in Figure 3.

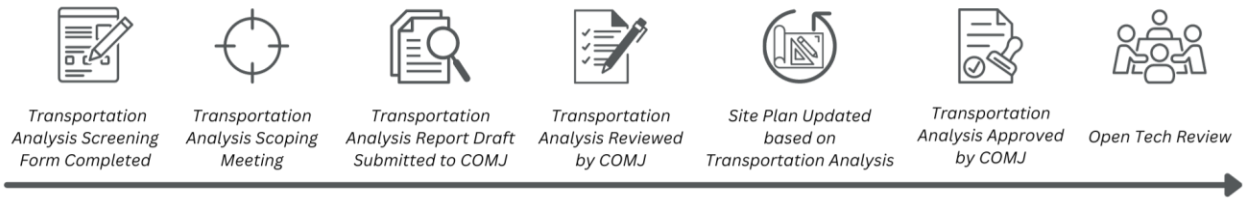

Figure 3. Transportation Analysis Process

One digital copy of the transportation analysis report is required for each review submittal. In addition, the transportation analysis report submittal shall include all of the electronic data analysis files (including traffic models) that matches the data analysis results presented in the transportation analysis report. When approved, the final version of the transportation analysis report shall be signed and sealed as discussed in Section 1.1. The final submittal shall include one signed and sealed printed copy along with one digital copy of the electronic analysis files that matches the data analysis files presented in the approved transportation analysis report.

1.6 Transportation Analysis Approval

Once a transportation analysis has been approved by the COMJ, the approved transportation analysis shall be valid for a period of two (2) years unless significant changes are made to the original proposed development that result in additional impacts to the surrounding transportation system. Significant changes include, but are not limited to, the following:

- Change from a single land use to multiple land uses that generates an additional 100 new peak hour trips or 500 new daily trips.
- Change from one land use to another land use that generates an additional 100 new peak hour trips or 500 new daily trips.
- Changes to the site plan that alters the number of access points or that grants access to a different combination of streets.

After the two-year effective period has elapsed, any proposed development seeking permits who have not demonstrated due diligence towards the completion of the project shall complete a new transportation analysis to determine if any additional mitigation measures are necessary. Due diligence is defined for a non-phased development as achieving at least 50% of the total proposed development's build out (e.g. in SF, units, etc.) by the end of the three-year period. For phased developments, due diligence is defined as achieving at least 50% of the proposed buildout assumed to occur in the three-year period starting at the time of the study's approval. If an area was studied sufficiently as part of a larger planned unit development (PUD) style transportation analysis, then a secondary analysis is not needed unless there is a significant change, as defined previously.

2 Scoping and Preparing a Study

This section provides specific guidance on defining trip generation, trip reductions, trip distribution, traffic growth, and collecting traffic counts. This section shall be referenced while preparing a *MTA Screening Evaluation Form*.

2.1 Trip Generation Volumes

The number of trips generated by a proposed development shall be calculated using land use codes published in the latest edition of the ITE Trip Generation Manual. If the type of proposed development is not addressed in the ITE Trip Generation Manual, then other rates may be used as long as they are published documents and pre-approved by the COMJ.

A trip is defined as a single, one-way movement either to or from the proposed development. In all cases, the total number of trips generated will be based on 100% occupancy of the proposed development, whether by a construction phase approach or full build-out.

2.2 Trip Reductions

Trip reductions may apply to a development's net trip generation if there is an expected portion of trips that do not directly impact the transportation network. As outlined on the *MTA Screening Evaluation Form*, there are three possible trip reduction categories: internal capture, pass-by, and existing development trips. The utilization of a reduction in generated trips for internal capture trips and pass-by trips is allowed and shall be conducted in good faith based on ITE approved data and methodologies. However, trip reductions may not be applied when determining the transportation analysis level outlined in Table 1. For the purposes of redevelopment (i.e. proposed modifications to existing developments), the estimated number of trips generated shall be measured as the net new trips generated by the proposed development as compared to trips generated by the existing use(s) on the site to be removed. Trip reductions from these categories shall be applied individually to each land use in the order presented in this document and the *MTA Screening Evaluation Form*.

Internal Capture Trips

The base number of trips generated by a proposed development may be reduced by rate of internal capture trips when two or more land uses are proposed using the methodology recommended in the latest edition of the ITE Trip Generation Manual. ITE provides an internal capture calculation spreadsheet, available at the time of this document's publication, on their Resources page[1]. Internal capture reduction percentages greater than 10% require pre-approval by the COMJ during the scoping meeting for use in the traffic study. The internal capture reduction percentage shall be applied before the pass-by trip percentages are applied.

[1] https://www.ite.org/technical-resources/topics/trip-and-parking-generation/other-resources/

Pass-by Trips

The base number of trips generated by a proposed development may be reduced by rate of pass-by trips using the methodology recommended in the latest edition of the ITE Trip Generation Manual. Pass-by trips are considered intermediate trips between an origin and primary destination (i.e., home to work, home to shopping, work to shopping, etc.). Pass-by trips were trips already utilizing a roadway within the study area and therefore are not diverted from another roadway. Pass-by trip reduction percentages of the existing adjacent public roads greater than 10% require pre-approval by the COMJ during the scoping meeting for use in the traffic study. Pass-by trips do not reduce the total number of trips entering the development.

Existing Development Trips

In instances where there are existing developments within a proposed site, the existing development trips may be removed from the total trip generation of the development to calculate a “net” trip generation for the proposed site. Existing development trips do not reduce the total number of trips entering the development.

2.3 Trip Distribution and Traffic Assignment

A directional trip distribution percentage model of the new trips generated by the proposed development shall be based on an acceptable trip distribution methodology including, but not limited to, existing traffic patterns on adjacent public roads, population centers, and employment centers of the surrounding transportation system within the study area limits. If the proposed development is a mixed-use development, each land use may justify a separate directional trip distribution percentage model. Typically, the same directional trip distribution percentage models are utilized for each construction phase or full build-out. Once a directional trip distribution percentage model is developed, the total number of trips generated by the proposed development is assigned throughout the surrounding transportation system within the study area limits by multiplying the total number of trips by each directional trip distribution percentage model. If multiple directional trip distribution percentage models are utilized to develop the site traffic conditions, then the trip assignment for each land use and/or construction phase shall be developed separately, and an overall total trip assignment generated by the entire proposed development shall be prepared to summarize all the directional trip distribution percentage models. The COMJ shall approve the trip distribution and assignment prior to the analysis moving forward.

2.4 Traffic Growth

Projects that have an opening date at least one year out from the preparation of the transportation analysis will be impacted by natural background traffic volume growth (e.g. traffic from approved projects, population growth, etc.). The background traffic development and growth are developed by applying a background growth rate to the traffic volumes contained in the existing traffic conditions for each analysis year. The background growth rate shall be based on 5-year historical traffic count information from ADT counts located in the vicinity of the study area limits. Abnormal jumps in year-over-year traffic volumes at a particular location, such as a variance due to COVID-19, shall be considered during the growth rate determination process.

It is acceptable to use a recently approved transportation analysis for an area in the vicinity of the proposed development as a reference point for background growth rates; however, background growth rates shall be independently defensible and justified in the *MTA Screening Evaluation Form*. The background growth rate shall be documented in the *MTA Screening Evaluation Form* and be pre-approved by the COMJ during the scoping meeting.

2.5 Background Developments

In addition to the background growth rate, consideration shall be given to the likelihood for future growth in the study area. Background traffic shall include both the application of a historic growth rate and traffic from other approved developments, where applicable. If no projects have been identified for a location with high development potential, it may be appropriate to utilize a higher background growth rate to account for future additional trips to an area. A list of potential background developments shall be identified on the *MTA Screening Evaluation Form*.

Transportation improvement projects within the COMJ are contained in the Nashville Area MPO's TIP and LRTP. The developer shall obtain the latest version of these documents and review them to determine if any transportation improvement projects are planned for within a one-mile radius of the proposed development. The developer shall also determine when those projects might be completed. If applicable, the COMJ will supplement the Nashville Area MPO's TIP and LRTP list of transportation improvement projects with a list of other COMJ proposed roadway improvement projects along with other COMJ approved, but unconstructed, development projects in the vicinity of the proposed development site.

The COMJ will review the proposed list of background developments in the *MTA Screening Evaluation Form* and may suggest that either additional background developments shall be included, that all the correct developments have been identified, or that an identified development does not need to be included. When possible, the COMJ will supply any relevant trip generation and trip distribution information available for a background development.

2.6 Traffic Count Collection

The developer of a proposed development shall be responsible for the collection of traffic volume data at study intersections within the study area limits, as outlined in the scoping meeting. The time periods to analyze traffic impacts are typically based on when the highest traffic volumes from the proposed development are expected. The default duration of the AM or PM peak period count shall be 3 hours (6:00-9:00 AM, 3:00-6:00 PM) unless prior approval is granted by the COMJ during scoping. Additional considerations to help determine the necessary time periods and duration to analyze shall include the weekday AM and PM peak hours of adjacent street traffic that the proposed development is accessing. Depending upon the type of proposed development, additional weekend or mid-day (I.e. lunchtime) peak periods may be required to analyze traffic impacts.

Previously collected peak hour traffic volumes may be utilized with prior approval from the City if the counts were collected within two (2) years of the date of the transportation analysis scoping meeting. These counts must be grown to the current year utilizing a growth rate approved by the City.

3 Traffic Review

A traffic review is required by the COMJ to evaluate existing and expected traffic operations in a project's study area. The traffic review should also identify potential improvements that will mitigate a proposed development's impacts on the surrounding transportation network.

The traffic review shall be developed through the horizon year, as defined by Table 2. If a construction phase approach is being planned, then traffic conditions for multiple horizon years shall be developed for each construction phase year as determined by the developer.

Table 2. Traffic Review Horizon Year by Analysis Level

Transportation Analysis Level	Horizon Year
1	Anticipated development completion year (same as Build)
2	Three (3) years after development completion year
3	Five (5) years after development completion year
4	Ten (10) years after development completion year

3.1 Traffic Capacity Analysis

Capacity analyses shall be conducted by calculating vehicle delay at intersections to quantify the impact the additional traffic generated by a proposed development will likely have on the surrounding road network identified in the approved *MTA Screening Evaluation Form*. Although other measurements may be considered, the primary measurement for determining traffic impacts on the surrounding transportation system within the study area limits is Level of Service (LOS), as defined in the latest edition of the HCM. The traffic capacity analysis shall be conducted using the latest version of Synchro, or a similar software based on HCM methodology to be approved during the scoping process. The Synchro default flow rate shall be used, as well as other Synchro default settings. Any deviation from default settings shall be documented in the transportation analysis report and is subject to approval by the COMJ.

For fully-controlled intersections (signals, all-way stops, and roundabouts), the average vehicle delay for the overall intersection and each approach shall be presented in the transportation analysis report. For side-street stop-controlled intersections, the average vehicle delay for movements that experience delay (mainline left turns and side street movements) shall be presented. Results shall be compiled in one or more summary LOS tables in the body of the report, with a complete set of report outputs from the analysis software being provided in the transportation analysis report appendix. The COMJ requires that the summary tables compare the LOS results from each traffic condition side-by-side.

There are five traffic conditions requiring capacity analysis for a proposed development, as depicted in the different colors of Figure 6. Note, a phased development will require interim future year and build capacity analyses for each phase.

Figure 4. Traffic Analysis Conditions

Key aspects of the capacity analysis include:

- **Peak Hours:** Capacity analyses shall be completed for all peak hours identified in the approved *MTA Screening Evaluation Form*. This typically includes at minimum AM and PM peak hours and may also include midday or weekend peak hours if applicable to the development land use or location.
- **Signal Timing:** The capacity analysis for existing traffic conditions shall utilize existing traffic signal timing plans provided by the COMJ. All signalized intersections that are part of a coordinated traffic signal system shall be analyzed as such under all traffic conditions. The signal timing sheets needed for this analysis shall be requested in the *MTA Screening Evaluation Form*. Future traffic condition scenarios may optimize signal timings but may not adjust signal phases or cycle lengths, and comparable levels of optimization shall be applied to "without Project" and "with Project" scenarios to ensure that impacts from the proposed development are adequately captured. Future traffic conditions with mitigations may adjust signal phases and timings if a proposed signal timing plan is included in the transportation analysis report appendix that is supported by appropriate justification in the capacity analysis section.
- **Acceptable LOS:** Identifying and mitigating the increase in traffic delay that can be specifically attributed to a proposed development is a main goal of the transportation analysis process. As identified by the HCM, LOS A-D results are deemed acceptable levels of delay. Any result of LOS E or LOS F requires that potential mitigation strategies be identified and assessed in the Mitigation chapter.
- **Queuing Analysis:** Queuing analyses shall be conducted at all signalized and unsignalized intersections for all peak hours used in the capacity analysis. Queue results shall be reported for each lane group at fully-controlled intersections (signals, all-way stops, and roundabouts) and for all lane groups that experience delay at side-street stop-controlled intersections. This analysis calculates the storage length required to manage queue spillover. The HCM 95% percentile queue model shall be utilized to determine the appropriate vehicle queue length in feet and shall be rounded up and reported in 25-foot increments. Discussion shall be provided in the transportation analysis report related to excessive queuing (such as turn lane queues that extend past the available storage, through lane queues that block access to turn bays, and queues that extend through upstream intersections). Mitigation measures shall be recommended as appropriate.

3.2 Supplementary Analyses

In some cases, based on the observed conditions in the study area and at the discretion of the COMJ, additional analyses may be required as part of the traffic review. Additional analyses may include:

- **Turn Lane Warrant Analysis:** A turn lane warrant analysis evaluates the need for dedicated right or left turn lanes on an intersection approach. The turn lane analyses shall follow the methodology described in the TDOT HSAM.
- **Signal Warrant Analysis:** A signal warrant analysis evaluates if a traffic signal is warranted at an intersection. This analysis will be required when the capacity analysis or crash analysis suggests that an unsignalized intersection may benefit from signalization. The traffic signal warrant analysis shall be conducted using procedures outlined in the latest edition of the FHWA MUTCD and shall be in accordance with TDOT guidance.
- **Roundabout Analysis:** If a roundabout is proposed at a new intersection for a proposed development, then a capacity analysis for the roundabout shall be completed utilizing the latest Sidra software. The analysis should use default Sidra settings, with any deviations from default noted. Overall intersection and individual approach delays shall be included in the transportation analysis report, following the general structure for fully-controlled intersections outlined in Section 3.1.
- **Sight Distance Analysis:** A sight distance analysis evaluates a drivers' ability to see other road users along roadways or at an intersection. Sight distance could be impacted by roadway design characteristics such as vertical or horizontal curves or could be impacted by features such as landscaping or signage, and the review may be required to confirm that no such impacts occur from elements included in the proposed site plan. The COMJ requires a sight distance analysis for all new roadways, intersections, or accesses, and at any location that a site review or historical crash data suggests may have existing sight distance constraints. Sight distance calculations shall be performed based on methodology in the latest edition of AASHTO's *A Policy on Geometric Design of Highways And Streets* (the "Green Book").
- **Speed Study:** On road segments where there are concerns about excessive speeds or safety issues based on historical crash data, a speed study may be requested by the COMJ. A speed study measures and analyzes vehicle speeds to determine if existing roadway characteristics, such as speed limits and roadway design, are appropriate. The findings of a speed study shall be included in the transportation analysis report and shall influence the recommended mitigation measures for a proposed development.

3.3 Site Design

The traffic review findings shall influence the site design for the proposed development, minimizing adverse impacts to the adjacent road network. The site design shall be influenced by the following design strategies:

- Minimize the number of access points to public roadways.
- Maximize the spacing between access points and between access points and intersections. All accesses on state routes must at minimum meet the requirements in TDOT's HSAM.
- Minimize queueing for ingress and egress movements. This includes an evaluation of internal site circulation.
- Maximize access for walking and bicycling.
- Accommodate site operations such as pick-up and drop-off, valet, trash, and loading to prevent the impediment of vehicular, bicycle, pedestrian, or other traffic.

4 Multimodal Review

A multimodal review is required by the COMJ to evaluate the existing multimodal transportation network. The multimodal review shall support the development of the COMJ's multimodal transportation network and create a safe system for all road users. This review will analyze bicycle and pedestrian networks within a 0.5-mile radius of a proposed development for accessibility, connectivity, and compliance with COMJ standards. The Mt. Juliet Comprehensive Transportation Plan[2] and Greenway Bike and Pedestrian Master Plan[3] shall serve as references for the multimodal review.

Figure 5. Multimodal Review Considerations

4.1 Bicycle Network Evaluation

The bicycle network evaluation shall document any bicycle facilities within the multimodal review area, provide a description of the condition of those facilities, and discuss the site's connectivity to these facilities. Condition descriptions should identify any instances of excessive deterioration (pavement conditions, pavement markings, debris or vegetation blocking the route, etc.) and discuss connectivity to other multimodal facilities as well as destinations.

The bicycle network evaluation shall also include an evaluation of bicyclist comfort, with consideration given to:

- Bicycle lane width
- Bicycle lane separation from vehicular traffic
- Adjacent vehicle speed limits
- Intersection accommodations (presence of bike boxes, bike lane delineations through intersections, bicycle detection or push buttons accessible by bicycle, etc.)

[2] https://www.mtjuliet-tn.gov/DocumentCenter/View/3106/Mt-Juliet-Transportation-Plan
[3] https://www.mtjuliet-tn.gov/DocumentCenter/View/68/Greenway-Bike-and-Pedestrian-Master-Plan-PDF

4.2 Pedestrian Network Evaluation

The pedestrian network evaluation shall document any pedestrian facilities within the multimodal review area, provide a description of the condition of those facilities, and discuss the site's connectivity to these facilities. Condition descriptions should identify any instances of excessive deterioration (pavement conditions, pavement markings, debris or vegetation blocking the route, etc.) and discuss connectivity to other multimodal facilities as well as destinations.

The pedestrian network evaluation shall also include an evaluation of pedestrian comfort, with consideration given to:

- Sidewalk/walking path width
- Sidewalk/walking path separation from vehicular traffic
- Adjacent vehicle speed limits
- Intersection accommodations (presence of ADA compliant ramps, pedestrian countdown heads, ladder style crosswalks, etc.)

5 Safety Review

A safety review is required by the COMJ to identify potential safety issues in a project's study area. These issues may relate to concerns identified in the traffic or multimodal reviews. The safety analysis required for all traffic studies includes three components, discussed in the following sections.

5.1 Historical Crash Evaluation

A historical crash evaluation shall be conducted utilizing the AASHTOWare Safety Data Warehouse. Five-year historical crash data from AASHTOWare will be provided by the COMJ within two weeks of an approved traffic screening form. The crash data will include the entire study area as defined by the transportation analysis level identified in the traffic screening form.

Intersection limits for the historical crash evaluation will include the intersection "functional area" as defined by the FHWA, stretching away from the intersection to "the point at which a turn lane tapers". In instances where an intersection does not have tapers, or in cases where the tapers are very short, the study area will encompass a minimum distance of 150' back from the stop bar. A depiction of the intersection functional area can be found in Figure 6.

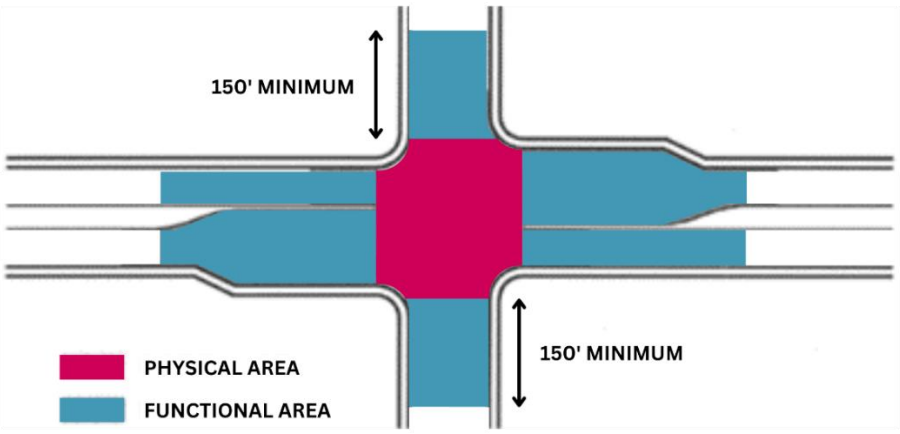

Figure 6. Intersection Physical vs. Functional Area

The historical crash evaluation shall identify crash types, characteristics, and potential causes. Graphical analysis should be included to show:

- Crashes by Type of Crash (Severity)
- Crashes by Year, Month, Day of the Week, and Time of Day
- Crashes by Weather Condition
- Crashes by Light Condition
- Crashes by Manner of Collision
- Crashes by First Harmful Event
- Crashes by Driver Actions

The analysis shall also include intersection crash rate calculations (in crashes per million entering vehicles) with comparisons made to the statewide average.

5.2 Site Access Evaluation

New access points have the potential to introduce new conflict points to the transportation network, and therefore require careful consideration and planning. Additional conflict points may impact the safety of one, many, or all transportation network travel modes. The COMJ requires that all potential high-risk conflict points between road users be identified for each proposed site access. Examples of high-risk conflict points as defined by the COMJ include, but are not limited to, conflict points that involve the following factors:

- Moderate to high posted speed limits (35 mph and above);
- Left turns into heavily congested roadways;
- Left turns entering the site at locations without a left-turn lane;
- Long crossing distances for vehicle turning movements and/or pedestrian crossings (2 or more crossing lanes);
- Limited visibility or sight distance; and
- Conflict points between vehicles and vulnerable road users such as pedestrians or bicycles

Site access for the proposed development shall be designed to reduce all conflict points, especially those that are high-risk. All site accesses on state routes are required to meet the guidelines defined in the TDOT HSAM.

5.3 Traffic and Multimodal Considerations

Referencing the analysis completed in the Traffic Review and Multimodal Review, the safety analysis shall specifically answer the following questions:

- Are there geometric elements of a segment or intersection that impact safety?
- Does poor intersection operational performance negatively impact safety in the study area?
- Does vehicle speed contribute to traffic crashes in the study area?
- Does vehicle queuing negatively impact safety in the study area or impact site ingress and egress movements?
- What improvements can be implemented to reduce expected crash frequency and severity?
- Are there conflict points involving vehicles and pedestrians or bicyclists?
- Is the pedestrian path of travel from the development to multimodal facilities in the study area safe?
- Does the proposed site design accommodate safe mobility for vulnerable road users?

The transportation analysis report shall summarize how the traffic facilities and operations, as well as the multimodal accommodations, impact safety in the study area.

6 Mitigation

Once the traffic, multimodal, and safety reviews have been completed, improvements shall be proposed that address the deficiencies identified in each review, mitigate the proposed development's impact, and enhance the transportation network for the community.

The transportation analysis should identify potential mitigation measures as well as potential improvement projects, evaluate how these measures would perform, and make recommendations and/or commitments on behalf of the developer to implement these measures.

6.1 Mitigation Measures and Potential Improvement Projects

Mitigation measures are those that serve to balance a proposed development's impact on the surrounding transportation network. Mitigation measures are defined as modifications to the existing surrounding transportation system within the study area limits that are recommended to minimize the impact of a proposed development on the surrounding transportation network. To be considered an adequate proposed solution, mitigation measures shall be specific and have a measurable improvement.

In contrast, improvements are identified ways that the performance of the overall transportation system can be enhanced and are not necessarily related to the identified impacts noted previously. Improvements identified in the transportation analysis will not be the sole responsibility of the developer to complete. While the developer may choose to provide added benefit to the community by incorporating some or all the identified improvements into their project, the identified improvements may also be considered for future implementation by the COMJ.

6.2 Evaluation and Implementation

Mitigation measures may be required based on the results of the traffic capacity analysis, where an intersection in the study area fails to meet the acceptable LOS standards. A reduction of the proposed development's size to reduce the number of peak hour trips that are generated is an acceptable traffic mitigation measure.

Mitigation measures to improve the multimodal transportation network shall meet ADA requirements, align with the Mt. Juliet Comprehensive Transportation Plan[4], Greenway Bike and Pedestrian Master Plan[5], and meet or exceed Planning/Public Works requirements. Safety mitigation measures shall be identified from the FHWA Proven Safety Countermeasures[6].

For proposed developments with multiple construction phases, a construction phasing plan of the mitigation measures is acceptable. Unless a construction phasing plan is being proposed, all mitigation measures implemented by the developer shall be completed prior to receipt of any certification of occupancy or final plat approval, whichever is appropriate.

[4] https://www.mtjuliet-tn.gov/DocumentCenter/View/3106/Mt-Juliet-Transportation-Plan
[5] https://www.mtjuliet-tn.gov/DocumentCenter/View/68/Greenway-Bike-and-Pedestrian-Master-Plan-PDF
[6] Proven Safety Countermeasures | FHWA (dot.gov)