

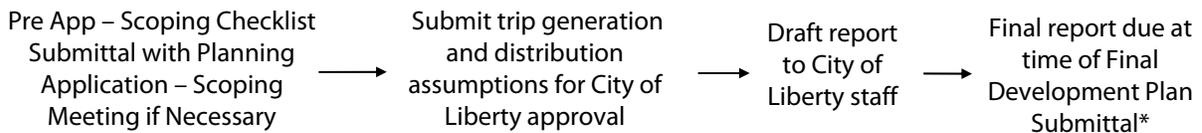


## Introduction

The purpose of this document is to clearly outline the minimum requirements for a TIS prepared as part of the land development approval process in the City of Liberty, MO. A TIS identifies and quantifies the potential impacts of site development on the local and regional transportation system and specifies the measures necessary to mitigate those impacts. Any deviations from the guidance herein must be approved by the City of Liberty.

The general process for scoping and preparing a TIS is outlined in **Figure 1**. Submittal timeline requirements should be set by City of Liberty staff during project scoping. The subsequent sections present more detailed information on the TIS preparation requirements.

**Figure 1: TIS Process Flow Chart**



*\*Final TIS due at the time of Final Development Plan (FDP) Submittal; however, applicants may elect to submit earlier within the process. It should be noted that TIS submitted prior to FDP approval are subject to change based on final approved development plans.*

## TIS Triggers and Scope

The following situations will require a TIS:

- A currently undeveloped property proposed for development and/or rezoning.
- A currently developed property proposed for expansion, intensification, or redevelopment.
- A previously approved project in either category above that has not been developed within time frames specified in this section and is re-starting.

The final determination of whether a TIS is required will be made by the City of Liberty.

The scope of the TIS for a proposed development is gauged by the number of new vehicular trips the development, redevelopment, or expansion is expected to add to the roadway system. This document establishes four Levels of TIS, depending on the magnitude of traffic generated – as shown in **Table 1**. The City of Liberty can request a TIS and/or modify the scope requirements of a TIS based on local conditions and knowledge.



**Table 1. Traffic Impact Study Levels**

	Level 1	Level 2	Level 3	Level 4
<b>Criteria</b>				
Projected net new peak-hour vehicular trips generated by project	20-99	100 – 499	≥500	≥500
Proposed land-use deviates from Liberty, MO Zoning	n.a.	n.a.	No	Yes
<b>Requirements</b>				
Connectivity and circulation review, trip generation estimates, access management review	✓	✓	✓	✓
Multimodal Impact Analysis				
<i>Existing, Opening Day</i>		✓	✓	✓
<i>20 years (No Project)</i>				✓
<i>20 Years (With Project)</i>			✓	✓

**Scoping Checklist.** The City of Liberty must approve the scope of work and technical approach. As part of the pre-application process, the applicant (or authorized representative) should complete the **Scoping Checklist**, provided at the end of this document. If needed, a scoping meeting may be held to discuss the potential scope elements, with the goal of reaching agreement regarding which transportation modes are to be studied, and in what level of detail. For most studies, many of the elements in the Checklist will not be needed – but this format gives the City of Liberty the ability to draw in almost any element that could be needed. Each item that will be part of the TIS, and other study specifics (study intersection list, peak hours, clarifications, what data the City of Liberty or other agencies can provide, etc.) should be attached on a separate sheet. The discussion beginning on page 8 provides guidelines for each step and element of the checklist.

**Horizon Years.** Study horizon years are associated with each TIS Level in **Table 1**. Note that 20-year analyses, which should use the Mid-America Regional Council (MARC) travel-demand model and other available sources, are required for Levels 3 and 4. Level 3 analysis does not require a “No Project” scenario – it is treated as a cumulative analysis. In contrast, Level 4 analysis requires comparison of conditions with and without the project – a true long-term impact analysis.

**Phased Projects.** If a large project (expected to generate more than 500 peak-hour vehicle trips) is phased, the opening day for each major phase should be studied as well as the build-out. For later-year phases, an updated TIS will be required if the original study is more than two years old; unless the applicant can demonstrate that the nature of the proposed development, and the near-term and long-term forecasted background transportation conditions, have not changed substantially, with concurrence from the City of Liberty.



*Study Area.* For Level 1 studies, the study area contains the site and its bounding transportation infrastructure (streets, trails, etc.). For all other Levels: at a minimum, the study area should contain roadways extending in all directions from the site to the nearest arterial or collector intersection. As a rule of thumb, all intersections experiencing an increase of 50 or more vehicles during any peak hour as a result of the project should be studied – within a reasonable distance of the project. The City of Liberty should make the final determination of what study area is reasonable.

*Data Collection.* The applicant is responsible for collecting all of the required transportation data. The applicant should confer with City of Liberty staff, and the staff of other agencies (such as MARC or MoDOT, as appropriate) regarding available transportation data in the agency's possession.

*Responsibility and Qualifications.* It is the applicant's responsibility to prepare the TIS. The individual preparing the TIS must be a registered engineer in the state of Missouri, qualified and experienced in preparing a TIS. The City of Liberty will make the final determination as to whether a particular individual is qualified, and will provide a reviewer meeting the same qualification criteria.

*Submittal Requirements.* TIS reports should generally follow a consistent outline (see next section). Alternate formats must be approved by the City of Liberty prior to submittal. A draft report should be submitted electronically to the City of Liberty. After the applicant receives and addresses the City of Liberty's comments, a final report should be submitted to the City of Liberty. The report should contain, in appendices, detailed calculations supporting the main body of the report, such as intersection level of service (LOS) analysis.

## TIS Report Outline

The TIS should be prepared according to generally acceptable professional practice and should address the study elements listed below. The City of Liberty must approve all major assumptions. The TIS should provide sufficient text, maps, graphics, and tables to describe the study findings and recommendations.

*Executive Summary:* This section should summarize key findings of the TIS, including the identified impacts and proposed mitigation.

*Introduction and Study Scope:* This section should explain the context of the TIS and the scope of the work.

*Existing Conditions:* The TIS should document existing transportation conditions – covering the Scoping Checklist's infrastructure/service inventory, existing demand/usage, safety issues, and operational performance.



*Project Description:* This section should provide the following information:

- Proposed site location, layout, access (motorized and non-motorized), land-uses, and development phasing
- Existing site access (motorized and non-motorized), land-uses (types, intensities, building arrangement), and parking
- Information on nearby parcels' access and land-use, and their relationship to the proposed project

*Opening Day Conditions (No Project):* The TIS should present the background transportation conditions on the assumed opening day. This includes any changes in transportation infrastructure, service, demand, safety, or operational performance anticipated to take place between the existing conditions and opening day – for each mode identified on the Scoping Meeting Checklist. If opening day is within one year of existing conditions, and no substantial changes are expected during that time frame, existing conditions can be used for Opening Day.

*Opening Day Conditions (With Project):* This section should present the opening day conditions with the proposed project added, evaluating all the elements identified in the Scoping Meeting Checklist. If the project will cause any impact thresholds to be exceeded (see “Description of Checklist Elements” beginning on **Page 8**), mitigation measures should be identified, and their effect on the performance of the relevant mode should be identified.

*Long-Term (20-Year) Conditions (without project):* This section is only required for Level 4 studies. The goal of this analysis is to provide a base scenario against which to compare “with project” conditions against, in cases where the project is large and represents a land-use change from the Comprehensive Land-Use Plan. In most cases, this scenario should be based on traffic forecasts provided by MARC. For large projects (more than 500 peak-hour trips), the applicant should develop a forecasting methodology subject to approval by the City of Liberty.

*Long-Term (20-Year) Conditions (with project):* This section is only required for Level 3 and 4 studies. The goal of this analysis is to provide the City of Liberty with a clear picture of how the proposed project affects the City’s long-range roadway and land-use planning.

- For Level 3 studies, a detailed impact comparison is not required. The section should present long-term conditions, identify areas where impact thresholds are exceeded in the long-term, and identify possible long-term mitigation measures.
- For Level 4 studies, long-term conditions with and without the proposed project should be compared. If the project causes an impact threshold to be exceeded for any mode, mitigation measures should be identified.

*Recommendations:* This section should explicitly state all recommended mitigation measures developed in the TIS. This section should also detail why the recommended measures were selected as the best option(s), and why other potential measures were not selected or were determined to be infeasible.



## Technical Details

Details supporting the **Scoping Meeting Checklist** are included on the following pages. (The checklist itself is included at the end of the Appendix.) Some common terms are defined here:

- *Study Area*: The geographic area to be included in the TIS. It is selected to contain the site boundaries, all study intersections, and all study non-motorized crossings. Study area limits were defined previously in this document.
- *Study Roadways*: Includes all collectors and arterials in the study area, and any local street that connects directly to the project site.
- *Study Intersections*: As a rule of thumb, all signalized intersections on the study roadways experiencing an increase of 50 or more vehicles during any peak hour as a result of the project should be studied – within a reasonable distance of the project. Key unsignalized intersections, at which the project affects side-street movements, should also be considered. The City of Liberty will make the final determination of what study intersection list is reasonable.
- *Study Non-Motorized Crossings*: Includes all existing mid-block pedestrian crossings of study roadways, and off-street bicycle path intersections with study roadways, if they have the potential to either (1) be crossed by vehicular traffic generated by the proposed site or (2) be used by pedestrian or bicycle trips generated by the proposed site.
- *Study Railroad Crossings*: Includes any at-grade railroad crossing of a study roadway.
- *Safety Focus Areas*: Includes any areas, within the study area, identified as a safety concern (for any transportation mode) by the City of Liberty.
- *Freight Generator*: Any proposed site that is anticipated to generate 100 or more truck trips per day, or more than 5 trucks during any peak hour.
- *Impact Threshold*: A value above which a study element (intersection, pedestrian crossing, etc.) is considered to be operating unacceptably.
- *Mitigation Measures*: Infrastructure modifications required to address the identified impacts. Modifications could be on- or off-site and could affect any of the study modes (auto, truck, bike, pedestrian). Typical mitigation measures include the addition of turn lanes, installation of signals (if warranted), provision of sidewalk connections, or other such improvements.



## Descriptions of Checklist Elements

### Existing and No-Project Conditions

	Ped	Bike	Auto	Truck	Rail
Infrastructure/ Service Inventory	<input type="checkbox"/> Sidewalks <input type="checkbox"/> Trails/Paths <input type="checkbox"/> Mid-block Crossings <input type="checkbox"/> Signalization	<input type="checkbox"/> On-street <input type="checkbox"/> Off-Street	<input type="checkbox"/> Functional Classes <input type="checkbox"/> Lanes <input type="checkbox"/> Traffic Control <input type="checkbox"/> Speeds <input type="checkbox"/> Parking – On-Street <input type="checkbox"/> Parking – Off-Street	<input type="checkbox"/> Truck Routes	<input type="checkbox"/> Grade Xings

The purpose of the infrastructure/service inventory is to identify transportation infrastructure in the study area that is relevant to the analysis of the proposed site. **These inventories are conducted for all TIS Levels (1-4).**

***Pedestrians:*** The TIS should clearly describe the locations of existing sidewalks, trails and paths in the study area, including widths and surface type. Gaps should be noted. Study intersections with missing crossings should be noted. The type of crossing control used at each study pedestrian crossing should be described (crosswalk markings, pedestrian signalization, countdown signals, detection, etc.).

***Bicycles:*** The TIS should clearly describe the locations of existing on-street and off-street bicycle facilities, including widths and surface type. Gaps should be noted. The type of crossing control used at each study bicycle crossing should be described (signs or extended markings, etc.).

***Automobiles:*** The TIS should clearly describe the locations of all study roadways, as well as number of lanes, posted speeds, and functional class. Any existing local streets that are proposed to be directly connected to the site should be similarly described. The existing traffic control type (signal, two-way stop, four-way stop, roundabout, etc.) at each of the study intersections should be identified. Traffic signal timing information for study intersections should be obtained from the City of Liberty at this stage.

- ***Parking:*** The TIS should clearly describe the locations of existing on-street parking in the study area. If any existing off-street parking area is relevant to the site under study (either an adjacent use for which parking could potentially be shared, or a public parking lot that could potentially be used by vehicles generated by the proposed site), the TIS should clearly describe its location as well. For any existing parking that may be used by the proposed project, the TIS should also document the parking capacity, time/usage restrictions, and pricing characteristics (if any).

***Trucks:*** The TIS should clearly describe the locations of any existing truck routes on the study roadways.



*Rail:* The TIS should clearly describe the locations of study grade crossings, including the type of control (gated, flashers, etc.) and number of train tracks at each.

For each of the modes described above, the TIS should also identify known/planned changes to the inventoried infrastructure anticipated over the planning horizon selected for the TIS. This includes specific funded projects as well as those contained in relevant plans such as Liberty’s Transportation Master Plan.

	Ped	Bike	Auto	Truck	Rail
Demand/ Usage	<input type="checkbox"/> Intersection Crossings <input type="checkbox"/> Mid-block Crossings	<input type="checkbox"/> Turning Mvmts	<input type="checkbox"/> ADT <input type="checkbox"/> Turning Mvmts <input type="checkbox"/> Parking Occupancy	<input type="checkbox"/> Truck Turning Mvmts <input type="checkbox"/> Truck ADT	<input type="checkbox"/> Grade Xing Vols

The purpose of the Demand/Usage element is to identify the extent to which existing transportation infrastructure in the study area is being used, to set up for the comparative analysis of Proposed Conditions. **These items are not evaluated for Level 1 studies, unless specifically noted.**

*Pedestrians:* The TIS should include pedestrian counts at each study pedestrian crossing, separated by direction. These counts should be conducted simultaneously with the vehicular turning movement counts described below, and reported in the same time increments.

*Bicycles:* The TIS should include counts of existing on-street bicycle turning movements at each study bicycle crossing. These counts should be conducted simultaneously with the vehicular turning movement counts described below, and reported in the same time increments.

*Automobiles:* The TIS should identify existing Average Daily Traffic (ADT) volumes on study roadways for which information is available. The City of Liberty, at its discretion, may require new ADT counts to be conducted on specific study roadways (preferably for 48 continuous hours in 15-minute increments) if available counts are outdated (over two years old) or if no counts are available.

The TIS also should identify existing peak-hour turning movements at each study intersection as well as each study crossing. Typically, both the a.m. (7-9) and p.m. (4-6) peak hours should be studied. If it can be demonstrated that the project will not generate traffic during one of the peak hours (for example, a restaurant that is only open for lunch and dinner), the City of Liberty may waive the requirement to analyze that period. Mid-day and weekend counts may also be required, based on the nature of the proposed project, at the discretion of the City of Liberty. Where current City of Liberty-approved turning-movement counts (no more than two years old) are not available, new counts must be conducted (and should be provided in 15-minute increments). As mentioned in other areas, the counts should include (and identify) bicycles, pedestrians, and heavy vehicles.



Any new peak-hour and daily counts should be conducted on a Tuesday, Wednesday, or Thursday while school is in session (except for special studies when weekends or Monday/Friday counts are needed).

- **Parking:** If any existing on- or off-street parking areas may be used by the proposed project, the analysis should include counts to identify peak parking occupancies in these areas.

**Trucks:** The vehicular peak-hour turning-movement counts at all study intersections and non-motorized crossings should include heavy vehicles, to support the accuracy of operational calculations. For a TIS involving a freight generator, the vehicular ADT counts should also break out heavy vehicles separately.

**Rail:** For railroad crossings being studied, the TIS should identify daily train volumes and crossroad vehicular volumes. Unless otherwise directed by the City of Liberty, this data can be obtained from the FRA railroad crossing inventory.

	Ped	Bike	Auto	Truck	Truck/Rail
Safety	<input type="checkbox"/> Crash Patterns	<input type="checkbox"/> Crash Patterns	<input type="checkbox"/> Crash Patterns <input type="checkbox"/> Sight Distances	<input type="checkbox"/> Crash Patterns	<input type="checkbox"/> Xing Crashes

The purpose of the safety element is to identify existing safety issues (primarily crash patterns) that could affect, or be affected by, the proposed project. **Safety analyses are not included in Level 1 studies, and are only included in other TIS Levels if very specific safety issues have been identified in the study area by the relevant agencies.**

If a safety concern for a given transportation mode has been identified within the study area by the City of Liberty, the TIS will include analysis of the most recent available five-year record of crashes related to that mode in the safety focus area(s) identified for that mode, to determine if a crash pattern exists.

	Ped	Bike	Auto	Truck	Rail
Operational Performance	<input type="checkbox"/> Ped LOS	<input type="checkbox"/> Bike LOS	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> Grade Xing Delay

The purpose of the Operational Performance element is to identify how well the existing transportation infrastructure currently serves each of the studied transportation modes, to set up for the comparative analysis of Proposed Conditions. **These items are not evaluated for Level 1 studies.**

**Pedestrians:** For study intersections or crossings with 10 or more pedestrians per hour crossing any leg (both directions combined) during any of the studied peak hours, the intersection or crossing should be assessed with regard to the adequacy of the crossing treatment, including topics such as crosswalk design and pedestrian signal timing.



*Bicycles:* For study intersections or crossings that include bike lanes and at which any single approach experiences more than 10 bicycles per hour, the intersection or crossing should be assessed with regard to bicycle facility design and operations including signing and striping.

*Automobiles and Trucks:* The TIS should examine the following items:

- *Level of Service (LOS):* The TIS should include computation of Level of Service (LOS) for each study intersection using the methods described in the most recent version of the Transportation Research Board's *Highway Capacity Manual (HCM)*. LOS should be reported for each movement (or lane group) at the intersection. If required by the City of Liberty, traffic simulation will be conducted for closely spaced intersections, improvements relying on signal timing/phasing, or complex traffic conditions. The impact thresholds for intersection-wide LOS are:
  - LOS A – D acceptable on all streets identified on the Major Street Map as major and minor arterials
  - LOS A – C acceptable on all other roadways (the highest class of road defines an intersection)
- *Queuing:* The TIS should identify whether any existing study-intersection queues exceed acceptable thresholds. The impact threshold for queuing is a queue storage ratio of 1.0 (queue exceeds storage length) for 95th percentile queues.
- *Residential Traffic:* The TIS should identify whether traffic volumes on any study roadways that are local residential streets exceed acceptable thresholds. The impact threshold for local residential streets is 2,000 vehicles per day.
- *Parking:* If parking demand will be studied under Proposed Conditions, and potential on-or off-street areas to share site-generated parking were identified as part of the Infrastructure/Service Inventory, the TIS should include the parking locations identified in the Demand/Usage element. The impact threshold for parking is a peak occupancy of 85 percent.

*Rail:* For any study railroad crossings at which the peak-hour crossroad volume exceeds 200 vehicles per hour and the conflicting hourly train volume (determined by dividing the daily train volume by 24) exceeds 2 trains per hour, the TIS should analyze vehicular delay at the crossing. This delay should be converted to an LOS using the HCM signalized intersection scale, and the impact thresholds are the same as for intersections.



## Conditions with Project

	Ped	Bike	Auto	Truck	Rail
Connectivity and Circulation	<input type="checkbox"/> Pedestrian Gaps <input type="checkbox"/> Site Review	<input type="checkbox"/> Bike Gaps <input type="checkbox"/> Site Review	<input type="checkbox"/> Network Connectivity <input type="checkbox"/> Access Management <input type="checkbox"/> Site Review	<input type="checkbox"/> Proximity to Truck Route <input type="checkbox"/> Site Review	<input type="checkbox"/> Site Review

The purpose of the Connectivity and Circulation element is to determine whether the project provides necessary internal connectivity and circulation for all relevant transportation modes, as well as necessary connectivity to the existing transportation system. **Connectivity analyses are conducted for all study Levels (1-4).**

***Pedestrians:*** The TIS should identify whether the internal site plan provides adequate sidewalks and pedestrian connections as required by the relevant regulations and standards of the City of Liberty. This also includes pedestrian connections between abutting cul-de-sacs, pedestrian connections to adjacent collectors/arterials, and consistency with Safe Routes to School principles. If the site abuts or includes collector/arterial roadways that have been identified as pedestrian gaps by the City of Liberty, the TIS should address the ways in which the project will address these gaps. Similarly, if the site abuts or includes uncompleted portions of the planned trail system, the TIS should address the project’s role in their completion.

***Bicycles:*** The TIS should identify whether the internal site plan provides any impediments to bicycle travel, as well as the steps needed to relieve those impediments. As with the pedestrian analysis, this also includes bicycle connections between abutting cul-de-sacs, bicycle connections to adjacent collectors/arterials, and consistency with Safe Routes to School principles. If the site abuts or includes roadways or connections that have been shown as future (on- or off-street) bicycle facilities in current planning documents, the TIS should address the project’s role in completing these facilities. If the site presents an opportunity to add to the bicycle network in a previously unplanned or unforeseen way, the TIS should address this as well.

***Automobiles:*** Three major categories are evaluated:

- ***Connectivity:*** Sites shall be designed to be in compliance with Article XV – Subdivision and Neighborhood Design Standards and Article XVI - Site Development and Design Standards of the current version of the City of Liberty’s Unified Development Ordinance. Furthermore, each site shall provide multiple access connections between the site and City arterial/collector streets.
- ***Site Plan Review:*** The TIS should evaluate and comment on the on-site circulation. Items discussed should include an assessment of on-site intersections and driveways/roadways with respect to operations and safety (including driveway throat length, driveway widths,



vehicle turning radii, sight distance, queueing, emergency access, etc.). Shared access and cross-parcel traffic flows should also be considered.

- *Access Management Review:* The TIS should compare the proposed site access to the *Liberty, Missouri – Code of Ordinances (Chapter 30)* as well as other applicable design standards and guidelines, and comment on the plan’s consistency with these standards.

*Trucks:* If the site is identified as a freight generator, the TIS should discuss the site’s proximity and connectivity to the truck route system and any truck connectivity issues raised by the site design or location. The TIS should also evaluate the site plan from a truck standpoint – items such as on-site truck circulation, truck loading/unloading areas, truck loading/unloading area dimensions, truck parking, truck queueing etc.

*Rail:* If travelways to/from or within the site involve an at-grade railroad crossing(s), the TIS should identify the alternative routes that may be available if the railroad tracks are blocked for unexpected lengthy periods of time. This should include consideration of emergency vehicle access.



	Ped	Bike	Auto	Truck	Rail
Demand/ Usage	<input type="checkbox"/> Pedestrian Trip Generation	<input type="checkbox"/> Pedestrian Trip Generation	<input type="checkbox"/> Auto Trip Generation <input type="checkbox"/> Auto Trip Distribution <input type="checkbox"/> Auto Trip Assignment <input type="checkbox"/> Auto Parking Generation	<input type="checkbox"/> Truck Trip Generation	

The purpose of the Demand/Usage element is to evaluate the effects of the demand generated by the site for each relevant mode of transportation.

*Pedestrians:* Pedestrian trip generation will generally not be calculated for projects unless the project is known to be a major pedestrian generator anticipated to affect study intersections or crossings. In such cases, the added pedestrian demand should be incorporated into the operational analysis.

*Bicycles:* Bicycle trip generation will generally not be calculated for projects unless the project is known to be a major bicycle generator anticipated to affect study intersections or crossings. In such cases, the added bicycle demand should be incorporated into the operational analysis.

*Automobiles:* The TIS should evaluate projected vehicular demand in the following ways:

- *Trip Generation:* Vehicular trip generation should be calculated (for the previously identified peak hours) using the most recent version of ITE’s *Trip Generation*. Local trip generation characteristics may be used if deemed to be properly collected and consistent with the subject development application, and are especially encouraged in three cases:
  - When a proposed use(s) does not have a corresponding ITE category
  - When an ITE rate is based on antiquated data or a small sample
  - When the TIS addresses an existing project that is relocating or expanding

For redevelopment or rezoning projects, the applicant should calculate both the total project trip generation and the net difference between the proposed project and the existing use. **If operational analysis is required, the trip generation assumptions and calculations must be approved by the City of Liberty prior to initiation of the operational analysis.**

- *Trip Distribution and Assignment:* **This step is not required for Level 1 studies.** For Level 2 and above, The TIS should clearly present and support the assumed trip distribution throughout the study area for the previously identified peak hours (including project driveways for developments that are not single-family residential). Similarly, the major assignment assumptions will be presented and explained. For redevelopment or rezoning projects, the applicant will need to determine whether the distribution of the proposed project differs from that of the existing or previously approved/zoned use, because the assignment will need to represent the net difference. **If operational analysis is required,**



the trip distribution assumptions must be approved by the City of Liberty prior to initiation of the operational analysis.

- *Parking*: The TIS should discuss the proposed site's parking provisions in relationship to the City of Liberty's required parking ratios, and confirm that both the ratios and the proposed parking are reasonable. When a use does not fit into the categories identified by the parking ratio requirements, or it is more specialized in a way that could affect parking ratios, ITE's *Parking Generation* should be consulted as a source for determining potential parking demand. If a use is not covered by *Parking Generation* or the parking ratio requirements, actual field studies of similar uses should be conducted to verify expected demand. In the case of mixed-use developments, or projects that are proposing to share parking with other uses, the TIS should include a shared parking analysis that accounts for the time-of-day variations in on-site demand in order to prevent inefficient, oversized parking provisions. The TIS should also discuss the site's provisions of accessible parking in relation to the City of Liberty's policies and ADA requirements.

*Trucks*: If the site is identified as a freight generator, the trip-generation, distribution, and assignment components of the analysis should identify trucks separately.



	Ped	Bike	Auto	Truck	Rail
Operational Performance	<input type="checkbox"/> Ped LOS	<input type="checkbox"/> HCM Bike LOS	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> Grade Xing Delay

The purpose of the Operational Performance element is to identify the operational impacts of the proposed project on the transportation system. **These items are not evaluated for Level 1 studies.** If impacts are identified, the TIS should evaluate mitigation measures to address them.

*Pedestrians:* Study intersections or crossings that were examined under Existing Conditions should be re-examined for all future scenarios using the same methodology. In addition, if any future scenario causes any other intersection or pedestrian crossing to exceed 10 pedestrians per hour (both directions combined), that intersection or crossing should be examined as well.

*Bicycles:* Study intersections or crossings that were examined under Existing Conditions should be re-examined for all future scenarios using the same methodology. In addition, if any future scenario causes any other intersection or bicycle crossing to exceed 10 bicycles per hour (both directions combined), that intersection or crossing should be examined as well.

*Automobiles and Trucks:*

- *Level of Service (LOS):* The TIS should duplicate the operational analysis conducted for No Project conditions (with LOS reported by movement or lane group), but using traffic volumes and assumptions for the project for appropriate horizon years. The future scenarios should also include applicable study driveways and/or new intersections created as part of the project.
- *Queueing:* The TIS should examine intersection queues for the future scenarios using the same impact thresholds described under Existing Conditions.
- *Residential Traffic:* The TIS should identify whether traffic volumes on any study roadways that are local residential streets will exceed the vehicular volume impact threshold under the “With Project” scenarios.

*Rail:* For any study railroad crossings at which the peak-hour crossroad volume will exceed 200 vehicles per hour with the proposed project and the conflicting hourly train volume (determined by dividing the daily train volume by 24) exceeds 2 trains per hour, the TIS should analyze vehicular delay at the crossing with the same impact thresholds used for No Project conditions.



	Ped	Bike	Auto	Truck	Rail
Safety	<input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Sight Distance <input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Sight Distance <input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Safety Impacts

The purpose of the safety element is to identify the project’s impacts on any safety issues identified under No Project conditions.

If a safety concern for any of the transportation modes was analyzed under “No Project” conditions, the TIS should include analysis of the project’s anticipated impact to that safety concern using available standard safety methodology. In addition, if there are new safety issues related to the new demand (considering all modes), these issues should also be addressed in the TIS in this section.

The TIS should identify whether adequate sight distance has been provided at project driveways and any intersections whose design will change in conjunction with the project.



**Scoping Checklist – Items to Potentially Be Addressed in TIS**

TIS level: 1 2 3 4 Analysis Years:  Existing: \_\_\_\_  Opening Day: \_\_\_\_  20 Years: \_\_\_\_  Other: \_\_\_\_

	Ped	Bike	Auto	Truck	Rail
<b>Existing and No-Project Conditions</b>					
<b>Infrastructure/ Service Inventory</b>	<input type="checkbox"/> Sidewalks <input type="checkbox"/> Trails/Paths <input type="checkbox"/> Mid-block Crossings <input type="checkbox"/> Signalization	<input type="checkbox"/> On-street <input type="checkbox"/> Off-Street	<input type="checkbox"/> Functional Classes <input type="checkbox"/> Lanes <input type="checkbox"/> Traffic Control <input type="checkbox"/> Speeds <input type="checkbox"/> Parking – On-Street <input type="checkbox"/> Parking – Off-Street	<input type="checkbox"/> Truck Routes	<input type="checkbox"/> Grade Xings
<b>Demand/ Usage</b>	<input type="checkbox"/> Intersection Crossings <input type="checkbox"/> Mid-block Crossings	<input type="checkbox"/> Turning Mvmts	<input type="checkbox"/> ADT <input type="checkbox"/> Turning Mvmts <input type="checkbox"/> Parking Occupancy	<input type="checkbox"/> Truck Turning Mvmts <input type="checkbox"/> Truck ADT	<input type="checkbox"/> Grade Xing Vols
<b>Safety</b>	<input type="checkbox"/> Crash Patterns	<input type="checkbox"/> Crash Patterns	<input type="checkbox"/> Crash Patterns <input type="checkbox"/> Sight Distances	<input type="checkbox"/> Crash Patterns	<input type="checkbox"/> Xing Crashes
<b>Operational Performance</b>	<input type="checkbox"/> Ped LOS	<input type="checkbox"/> Bike LOS	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> Grade Xing Delay
<b>Conditions with Project</b>					
<b>Connectivity and Circulation</b>	<input type="checkbox"/> Pedestrian Gaps <input type="checkbox"/> Site Review	<input type="checkbox"/> Bike Gaps <input type="checkbox"/> Site Review	<input type="checkbox"/> Network Connectivity <input type="checkbox"/> Access Management <input type="checkbox"/> Site Review	<input type="checkbox"/> Proximity to Truck Route <input type="checkbox"/> Site Review	<input type="checkbox"/> Site Review
<b>Demand/ Usage</b>	<input type="checkbox"/> Pedestrian Trip Generation	<input type="checkbox"/> Pedestrian Trip Generation	<input type="checkbox"/> Auto Trip Generation <input type="checkbox"/> Auto Trip Distribution <input type="checkbox"/> Auto Trip Assignment <input type="checkbox"/> Auto Parking Generation	<input type="checkbox"/> Truck Trip Generation	
<b>Operational Performance</b>	<input type="checkbox"/> Ped LOS	<input type="checkbox"/> HCM Bike LOS	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> LOS <input type="checkbox"/> Queueing	<input type="checkbox"/> Grade Xing Delay
<b>Safety</b>	<input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Sight Distance <input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Sight Distance <input type="checkbox"/> Safety Impacts	<input type="checkbox"/> Safety Impacts