Office of Transportation (OOT)

City of Berkeley

Guidelines for Development of Traffic Impact Reports

1. Overview

These guidelines provide a framework to help developers and consultants in preparing Traffic Impact Reports (TIRs) for developments in the City of Berkeley. It is important that the document be prepared in close coordination with City transportation and planning staff. At a minimum, this coordination would include the following: (1) development of a scope of work to include the study area, the appropriate scenarios, and special issues to be analyzed and data collection requirements; (2) review of all project traffic assumptions; (3) review of the analysis of existing conditions, and (4) review of a draft report. It is possible that additional work will be required even after the document has been initially accepted, based on comments raised by citizens and review by the Zoning Adjustment Board, Planning Commission, or City Council. The City will provide the developer/consultant with available information, but the extent of available traffic count data can vary greatly.

2. Structure of Traffic Impact Report

- Executive Summary
- Description of Existing Conditions
  - Study Area
  - Roadways and Signals
  - Traffic Volumes and Level of Service
  - Collision history on adjacent roadways and intersections
  - Land Use/Zoning
  - On-Street Parking
  - Pedestrian & Bicycle Traffic/Facilities
  - Transit Services
- Project Description
  - Location and Site Plan
  - Proposed Uses and Zoning Requirements
  - On-site circulation and parking
  - Trip Generation
  - Trip Distribution
  - Trip Assignment
- Analysis of Existing + Approved + Project Conditions (all projects)
  - Level of Service Methodologies and Standards
  - Baseline (Ex. + Approved) Level of Service Analysis
  - Baseline + Project Level of Service
  - Discussion of Impacts and Recommended Mitigations
- Analysis of Cumulative + Project Conditions (for larger projects)
  - Cumulative w/o Project Level of Service Analysis
  - Cumulative + Project Level of Service
  - Discussion of Impacts and Recommended Mitigations
- Technical Appendix: Level of Service Calculation sheets as well as traffic counts, collision data, and other back-up data and calculations

The report should contain adequate tables and figures so that readers can readily follow descriptions of transportation facilities, the development of traffic volumes for each scenario, and the results of level of service and other analyses. At a minimum, the following figures should be provided: (a) location map, (b) site plan showing driveways, (c) building footprints, (d) internal circulation and parking, (e) existing traffic volumes and lane geometry, (f) project trip distribution and assignment. The derivation of trip generation and future base volumes shall be documented either in the body of the report or in the appendix.

The detail for each of the bulleted items listed above varies by the size and location of project. Table 1 provides general information concerning the level of analysis by size of project for key analysis elements in a TIR. Many of these elements are influenced by the fact that Berkeley is a "Transit First" city that seeks to improve the utilization of alternate modes of travel. Consequently, the TIR needs to examine pedestrian, bicycle, and transit issues as well as motor vehicle congestion.

Table 1
Levels of Analysis by Size of Development

		Net Peak Hour Project Trips			
		<25	25-50	51-100	>100
On-Site Analysis	Circulation	✔	✔	✔	✔
	Off-Street Parking	✔	✔	✔	✔
	Driveway	✔	✔	✔	✔
Off-site Analysis	Adjacent Intersections	✔	✔	✔	✔
	Groups of Signals			✔	✔
	Access Corridors			✔	✔
	High Collision Locations	✔	✔	✔	✔
	On-street Parking		✔	✔	✔
Scenarios	Existing	✔	✔	✔	✔
	Ex + Appr	✔	✔	✔	✔
	Ex + Appr + Proj	✔	✔	✔	✔
	Cum + Appr			✔	✔
	Cum + Appr + Proj			✔	✔
Analysis	Level of Service	✔	✔	✔	✔
	Signal Warrant	✔	✔	✔	✔
	Signal Coordination	✔	✔	✔	✔
	Ped, Transit, and Bike Traffic	✔	✔	✔	✔
Mitigation Analysis	Site	✔	✔	✔	✔
	Adjacent Intersections	✔	✔	✔	✔
	Area wide Facilities			✔	✔
	TDM	✔	✔	✔	✔

Many neighborhoods are located adjacent to major trip generators, and in many cases studies will require analysis of on-street parking in the adjacent area. Developers are encouraged to provide transportation demand management measures; such measures likely will be required if variances are sought in required off-street parking.

The City requires the analysis of cumulative conditions for larger projects in order to identify whether mitigations in the future are required and the extent to which the project contributes to unacceptable conditions. The cumulative scenario generally is designed to represent conditions 20 years in the future. Several acceptable options exist for the development of baseline conditions for the cumulative scenario, as follows: (1) use of growth rates based on link forecasts contained in the most recent Berkeley General Plan (2000), or (2) forecasts generated by the most recent traffic forecasting model developed by the Alameda County Congestion Management Agency (ACCMA). The developer should contact City staff to decide on the most appropriate choice. Generally, trips from projects likely to occur should be added to the baseline forecasts for the cumulative scenario.

3. Data Available from City of Berkeley

The City will provide available data that may include the following: Traffic counts, past traffic studies, traffic signal data, collision data, and list of approved projects. The consultant should request available data when the scope of work is finalized.

4. Project Assumptions

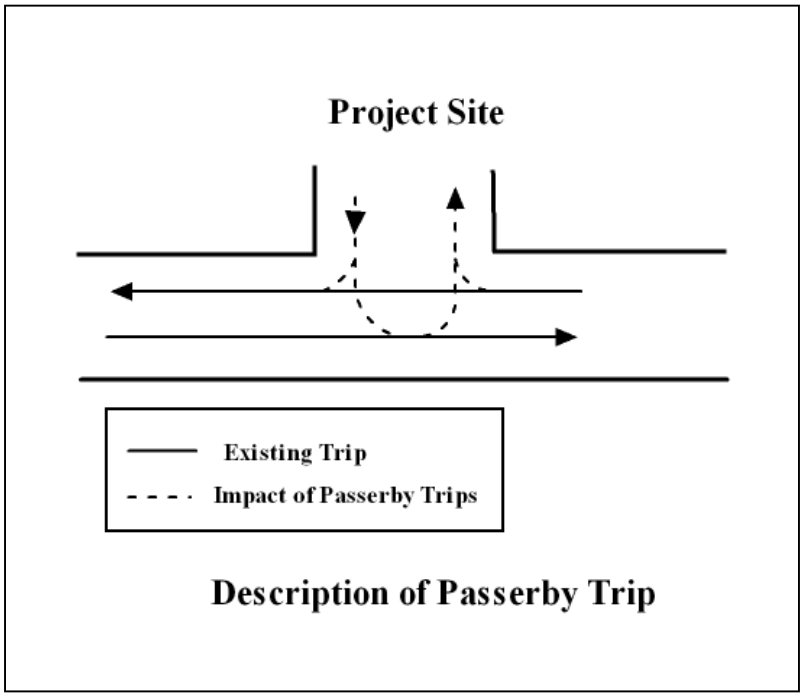
4(a). Trip Generation: The starting point for all project trip generation shall be peak hour trip generation estimates as contained in the most recent ITE Trip Generation Manual. Professional judgment should be used in the application of data in this reference to decide which land use is appropriate and whether average rates or formulas should be utilized. The category used should reflect the time period for peak travel on adjacent streets. With approval of City staff, other sources can be accepted, such as San Diego Trip Generation data or driveway counts from comparable land uses. For the latter, it is important to provide information supporting the fact that conditions actually are comparable.

In most cases, it is recommended that analyses utilize ITE trip rates without modification in order to simplify the analysis and to eliminate questions involving accuracy of assumptions. Three potential reductions in project trip generation may be considered, but City staff should approve the assumptions in advance. These potential reductions are as follows:

- Existing Trips on Project Site: The developer is allowed to deduct from the total project trip generation any existing trips that are already contained in existing traffic counts. It is recommended that driveway counts be conducted for existing uses, especially if they do not represent a land use category with well-documented trip generation data. No trip generation credits exist if there is no trip generation activity on the site when traffic counts are made. Subtracting existing project site trips directly from proposed project trips is unacceptable where there are different traffic patterns, either because of differences in access points or other reasons. In these cases, existing trips shall be distributed and assigned separately to the network as negative trips.

- Passerby Trips: Passerby trips are portions of trips to or from the project site that are the result of diversions from existing trips already traveling on roadways adjacent to the site. Deductions for passer-by trips must be justified. An acceptable source is the most recent San Diego Trip Generation report that provides separate numbers for driveway and

cumulative trips. Deductions can only be made for those portions of trips that are already included in counts for existing conditions (see Figure below). Analysis of turning movements to and from the project generally must include the passerby trips. Except for high passerby percentages or large projects, it is recommended that passerby trip reductions not be considered. The analysis without consideration of passerby trips is greatly simplified and represents a worst-case condition. Consideration of passerby trips is appropriate in establishing the study area for the project even if deductions are not included in the analysis itself.



- Modal Split: Berkeley, as a "transit first" city, is interested in promoting and achieving a high level of non-auto travel, particularly for commuting. Nevertheless, trip reductions for high levels of non-auto use during peak hours need to be justified. It should be remembered that the ITE trip generation figures are based primarily on driveway counts and, thus, implicitly exclude some non-auto trips. Any estimate of non-auto trips must be at least partially offset by a reasonable estimate of non-auto trips in the ITE data.
  It should be noted that high utilization of non-auto travel modes must be justifiable; the modes must be available, and incentives must exist. Developers may be asked to include numerous incentives through project design and financial incentives to promote this objective.

4(b). Trip Distribution: In many cases, trip distribution can be estimated by examination of existing traffic flows on major streets. For large projects, the City might require the use of the ACCMA model to provide more accurate estimates of tip distribution.

4(c). Trip Assignment: Assumptions should be based on a logical assignment of traffic. Assignments can consider the degree of congestion, but congestion cannot be used as the

primary determinant of trip assignment, as such assumptions can lead to illogical traffic patterns that differ significantly from those that would actually be used. The City will carefully review trip assignment assumptions.

4(d). Parking

The City of Berkeley has established specific off-street parking requirements for different zoning classifications and land use types that reflect the demand for off-street parking as well as the desire to promote the use of alternative modes of travel. Required parking based on the zone where the development site is located should always be the starting point, and any proposed deductions should be thoroughly justified. Parking reductions and high modal splits need to be justified separately. The former does not necessarily follow directly from the latter. For example, it is possible to be a frequent transit user and still own an automobile. At a minimum, where parking reductions are desired for residential projects, the developer should include strong Transportation Demand Management (TDM) measures. Where on-street parking impacts are likely to occur, parking occupancy counts should be made at appropriate times, generally late in the evening and at the time of peak daytime usage, e.g. 2:00 PM.

The City has a Residential Preferential Parking (RPP) permit program designed to limit long-term parking by non-residents in residential neighborhoods. Their location near project sites should be mentioned as part of exiting conditions. As a general rule, the City does not allow residents of a high-density development to obtain RPP permits. For projects located within a RPP area, parking impacts can still occur, as enforcement currently exists only from 7 AM to 7 PM, Monday-Saturday. With the ability of non-permit vehicles to park for a two-hour period between 7 AM- 7 PM, such vehicles can legally park in an on-street space from 5 PM to 9 AM.

5. Assessment of Traffic Impacts

5(a). Level of Service Analysis and Significance Thresholds

Methodology: The level of service analyses should be based on the latest edition of the Highway Capacity Manual (HCM) for the selected study area (signalized and unsignalized intersections). The most prevalent software programs utilized in the Bay Area that have implemented the HCM are TRAFFIX and Synchro. TRAFFIX is particularly well suited for the preparation of TIRs, as it documents assumptions well and can be used to efficiently analyze a variety of scenarios. However, in many cases, a project can have potential impacts on signal operation or coordination; and in this regard Synchro is a more desirable tool. It should be noted that TRAFFIX provides for the exchange of data to and from Synchro. Consultants should consult with City staff in the selection of appropriate software for level of service analyses. Because of the increasing importance of signal coordination, the City of Berkeley is likely to require Synchro more and more in the future.

Level of Service Thresholds: Level of Service (LOS) D is the level of service standard within the City of Berkeley. It applies to all signalized intersections for operational planning and for major non-freeway segments for long-range planning. As long as a minimum threshold of project trips is met, impacts requiring adequate mitigation are assumed to have occurred if the LOS goes from D to E or F or is already at E or F. The project at a minimum will be asked to maintain key performance measures at the No Project level. The manner in which level of service is calculated and assessed depends upon the type of traffic control involved, as follows:

- Signalized intersections: The Highway Capacity Manual (2000) defines levels of service based on average seconds of delay per vehicle. The upper threshold for LOS D is 55 sec/veh and for LOS E is 80 seconds/vehicle. The average delay can be significantly affected by signal timing at a signalized intersection. In general, traffic impact analyses should retain cycle lengths, phase minimums, and phasing that occur for existing conditions. Phase lengths can be adjusted but should not adversely affect signal coordination. Any major changes need to be documented and fully justified.

  The City has established significance thresholds based on the fact that for a given level of traffic on critical movements, the delay increases at a greater rate as LOS F is approached. The following average delay thresholds have been established: LOS D to E=2 seconds; LOS E and LOS E to F=3 seconds.

  The volume-to-capacity ratio (v/c) is also an important indicator of capacity and should be included as part of all Level of Service tables. It can indicate the extent to which the signal timing is optimal and provides a useful indicator for over-saturated conditions. However, v/c's are not utilized for identifying level of service. As the delay can increase dramatically with small increases of traffic after LOS F has been reached, a threshold of an increase of 0.01 in the volume-to-capacity ratio will be used.

  Intersection level of service is dependent on a variety of factors. In general, existing timing and phasing should be retained for scenarios with and without the project. In this way, the only variable is the traffic volume, which ensures a valid comparison of project impacts. Nevertheless, with the approval of City staff, mitigations can include changes in signal timing; but care must be taken to ensure that these changes do not affect operations at adjacent signals. Finally, where closely spaced signals exist, estimated queue lengths should be provided to demonstrate whether or not there are potential impacts on upstream intersections or on access to turn lanes.

- Unsignalized intersections: The level of service thresholds for LOS D and E, respectively, are 35 and 50 seconds, for unsignalized intersections. For all-way stop intersections, the results of the level of service analysis provide a meaningful overall delay that can be presented similar to that for a signalized intersection. However, for two-way stop intersections, levels of service are established separately for each movement with conflicting movements that pass through the intersection. As a result, an unfavorable level of service can occur for a small number of vehicles, and a large increase in delay can occur for a small increase in traffic volume. Unlike for signalized intersections, it is difficult to establish fixed significance thresholds for unsignalized intersections, particularly those with only side-street stop control. In general, mitigations are required if a movement is at LOS F, the peak hour signal warrant is met, and a minimum of 10 vehicles is added to the critical movement. Nevertheless, as delays increase dramatically once LOS F is reached, consideration should be given to the number of new trips added by a project and other factors, such as the feasibility of alternative routes and the proximity of adjacent traffic signals.

5(b). Pedestrian, Bicycle, and Transit

Impacts on alternative modes can result from projects that in themselves generate a significant number of trips for these modes or that are located on roadways that have been designated to serve these modes of travel. The assessment of impacts may be based on one or more of the following factors: counts for bicycle and pedestrian movements, location of bus stops, street width, collision history, transit boardings and alightings, and approved land use and transportation plans and capital improvement projects. Generally, project will be asked to implement pedestrian and bicycle improvements that have been identified in transportation plans, specific plans, or landscaping plans. Also, site-specific improvements may be identified to encourage alternate modes and /or enhance the safety of alternate modes.

6. Mitigation

Where potential significant impacts are identified, the report should identify feasible mitigation measures and provide recommendations. Appropriate back-up data and/or calculations should be provided to justify all recommendations. Mitigations may include low-cost improvements (such as revised striping, signing, modified signal timing) as well as capital improvements. Phasing of development improvements is desirable where appropriate. The applicant should work with the City to establish appropriate mitigations where impacts have been identified.

Mitigation measures identified for Existing + Project scenario generally are expected to be implemented at the time of occupancy. Mitigation measures identified for Cumulative + Project scenario generally are not required until a later date and generally be funded in part by the applicant. A fair share will be established by the City based on the results of the traffic analysis, and the applicant will pay this amount as a condition of project approval.
It should be recognized that during the project approval process, conditions might be imposed that go beyond the mitigations identified in the TIR.