VII. Assigning Values to Traffic Study Factors

A. Capital Improvements Program Definition

If the applicant finds it necessary or appropriate to incorporate programmed transportation improvements into a traffic study, they must rely upon the County's Capital Improvement Program (CIP) or the State's Consolidated Transportation Program (CTP). For an improvement to qualify for use in a traffic study, it must be fully funded in the CIP or CTP for construction within four years as of the date of the traffic study's submission.

However, under certain circumstances, staff may recommend the Planning Board delay a decision on physical intersection improvements until building permit, when the County or State is ready to purchase or construct a capital project. The Planning Board would require the developer to consult with the County or State when building permit applications are filed. If the County or State agrees in writing that the capital project will be constructed within four years, then the developer will contribute an amount equivalent to the cost of the LATR improvements at that time.

B. Trip Generation

Trip generation equations and rates are shown in Appendix A for nine general land uses: general office, retail, residential, fast food restaurants, child day care centers, private schools/educational institutions, senior/elderly housing, mini-warehouse, and automobile filling stations with or without ancillary uses for car washes, convenience stores, and garages. Equations for calculating trips from other land uses or zoning classifications can be obtained from ITE's latest edition of the *Trip Generation Report*. Guidance regarding pass-by and internal trip capture rates can be found in the current ITE *Trip Generation Handbook (2nd Edition).* Staff can assist in calculating tips and/or using the trip tables in Appendix B. In the Silver Spring, Bethesda, and Friendship Heights CBDs, different rates reflecting higher transit use apply (see Appendix C).

The rate for a retail site over 200,000 square feet GLA will be set after discussion with staff and the applicant's analysis of one or more similar-sized retail sites within Montgomery County. In lieu of data collection, a retail rate set at two times the latest edition of ITE's *Trip Generation Report* rate may be used.

Transportation Planning staff is authorized to make minor technical changes to Appendices A, B, and C as needed to reflect new information or to correct errors. Users should check with staff to ensure they are using the latest version.

In some cases, adjusting the trips from the equations may be appropriate. Examples include the effect of pass-by trips for retail, including fast food restaurants, child day care centers, and automobile filling stations, and the total trips from mixed uses such as office and retail. These will be considered on a case-by-case basis, using the best available information concerning each site situation. There may be instances where site characteristics will make it appropriate to deviate from the referenced rates. These proposed deviations could be determined by ground

counts of comparable facilities, preferably in Montgomery County, and will be considered by staff and used with their concurrence.

C. Peak Hour

The traffic study shall be based on the highest one-hour period that occurs during the typical weekday morning (6:30 a.m. – 9:30 a.m.) and/or evening (4 p.m. – 7 p.m.) peak periods, i.e., the street peak, or the time period established and agreed to in Section II.A. This one-hour period shall be determined from the highest sum of the existing traffic entering all approaches to each intersection during four consecutive 15-minute intervals.

D. Trip Distribution

Staff shall provide the applicant with the directional distribution of background and site traffic generated by office and residential uses, per the latest edition of the *Trip Distribution and Traffic Assignment Guidelines* (see Appendix D). The distribution of trips entering and leaving the proposed development and background development via all access points must be justified by the relative locations of other traffic generators (employment centers, commercial centers, regional or area shopping centers, transportation terminals, or trip table information provided by staff). For land uses not covered by the guidelines, distribution should be developed in consultation with Transportation Planning staff.

E. Directional Split

The directional split is the percentage of the generated trips entering or leaving the site during the peak hour. Refer to Appendix A for the directional split for general land uses and to Appendix C for directional split assumptions for the Bethesda, Friendship Heights, and Silver Spring CBDs. For all other uses, refer to the latest edition of ITE's *Trip Generation Report*. If data are not available, staff and the applicant will determine an appropriate in/out directional split.

F. Trip Assignment

The distribution factors furnished by Transportation Planning staff shall be applied to the generated trips, and the resulting volumes assigned to the road network providing access to the proposed development. These trips will be added to existing traffic as well as the trips generated by background development to determine the adequacy of transportation facilities. The assignment is to be extended to the nearest major intersection, or intersections, as determined by staff (see Table 4).

Trip distribution and assignment is an estimate of the impact of future traffic on the nearby road network and is less accurate farther from the trip origin/destination.

Once an intersection under assignment conditions of existing plus background traffic or existing plus background plus site-generated traffic exceeds a CLV of 2,000, diversions to alternate routes may be considered if there are feasible alternatives, as discussed in paragraph IV.C, Unavoidable Congestion. Appropriate balancing of assignments to reflect impacts of the site on both the primary and alternate routes is necessary. Impacts on the primary and alternate intersections must be identified and mitigated in accordance with the congestion standards of these Guidelines. Such situations should be discussed with staff, SHA, and MCDOT and resolved on a case-by-case basis before presentation to the Planning Board.

G. Critical Lane Volume Analysis

At the intersections identified by Transportation Planning staff, the existing, background, and site-generated traffic is to be related to the adequacy of the intersection by using the critical lane volume method (see Section J). The methodology and assumptions shall be updated to maintain consistency with revisions to the *Highway Capacity Manual* published by the TRB. The analysis should be carried out for the peak hour of both the weekday morning and evening peak periods and should use traffic data for non-holiday weekdays.

H. Traffic Data

1. Current existing traffic volume data may be available from either Transportation Planning's traffic count database, SHA or MCDOT.

2. New traffic counts should be conducted by the applicant if, in the opinion of Transportation Planning staff, traffic volumes have increased due to some change in the traffic pattern, such as the completion of a development project after the count was made.

3. If turning movement data are older than one year when the traffic study is submitted or, if there are locations for which data are non-existent, it must be acquired by the applicant using his/her own resources.

4. Intersection traffic counts obtained from public agencies or conducted by the applicant must be manual turning movement counts of vehicles and pedestrian/bicycle crossing volumes covering the typical weekday peak periods, i.e., 6:30 a.m. – 9:30 a.m. and 4 p.m. – 7 p.m., or the time period established and agreed to in Section II.A. The data must be collected in 15-minute intervals to allow selection of the peak hour within the nearest 15 minutes (4:00-5:00, 4:15-5:15, 4:30-5:30, 4:45-5:45, 5:00-6:00, 5:15-6:15, 5:30-6:30, 5:45-6:45, or 6:00-7:00) as described in Section VII.C. All weekday peak-period (6:30 a.m. – 9:30 a.m. and 4 p.m. – 7 p.m.) turning movement data are required to be included with and submitted as part of the applicant's traffic study. All intersection traffic counts must be submitted in a digital format provided by staff. The subsequent digital database will be available upon request to developers, consultants, and others.

5. Traffic counts affected by adverse weather or nearby traffic incidents will not be accepted.

6. For applicants resubmitting all or portions of their development plans for the Planning Board's approval under the expired Expedited Development Approval legislation that requires LATR, the traffic study must be updated if the traffic counts were collected more than one year from the date of resubmittal, and must reflect updated background development.

I. Adequate Accommodation of Traffic

A highway system's ability to carry traffic is expressed in level of congestion at critical locations, usually an intersection. Current CLV congestion standards for intersections in each policy are (Table 1) are based on achieving approximately equivalent total transportation levels of service

in all areas of the County. Greater vehicular traffic congestion is permitted in policy areas with greater transit accessibility and use.

J. Critical Lane Volume Method

The Critical Lane Volume method of calculating the level of congestion at a signalized or unsignalized intersection is generally accepted by most public agencies in Maryland, SHA, the MCDOT, the Cities of Rockville, Gaithersburg, Takoma Park, and M-NCPPC Transportation Planning staff. The methodology will fit most intersection configurations and can be varied easily for special situations and unusual conditions.

While some assumptions for example, lane use factors, may vary between jurisdictions, the general CLV methodology is consistent. An excellent reference source is SHA's web site: www.sha.state.md.us/businesswithsha/permits/ohd/AppendixE.asp

An applicant can use the following procedure at signalized or unsignalized intersections. For unsignalized intersections, a two-phase operation should be assumed. The traffic volumes used in the analysis are those approaching the intersection as determined in each step of the traffic study (existing, existing plus background, and existing plus background plus site).

The following steps describe how to determine the congestion level of an intersection with a simple two-phase signal operation.

Step 1. Determine the signal phasing, number of lanes, and the total volume on each entering approach to an intersection and the traffic movement permitted in each lane.

Step 2. Subtract from the total approach volume any right-turn volume that operates continuously throughout the signal cycle, (a free-flow right-turn by-pass). Also, subtract the left-turn volume if it is provided with an exclusive lane.

Step 3. Determine the maximum volume per lane for each approach by multiplying the volume calculated in Step 2 by the appropriate lane-use factor selected from the following table. (Note: Do not count lanes established for exclusive use such as right- or left-turn storage lanes – the lane use factor for a single exclusive use lane is 1.00. Consult with staff and/or MCDOT regarding any overlap signal phasing.)

Table 6
Montgomery County Lane Use Factors

Number of Approach Lanes	Lane Use Factor*
1	1.00
2	0.53
3	0.37
4	0.30
5	0.25

* Based on local observed data and the 2000 Edition of the Highway Capacity Manual

Step 4. Select the maximum volume per lane in one direction (e.g., northbound) and add it to the opposing (e.g., southbound) left turn volume.

Step 5. Repeat Step 4 by selecting the maximum volume per lane in the opposite direction (e.g., southbound) and the opposing (e.g., northbound) left-turn volume.

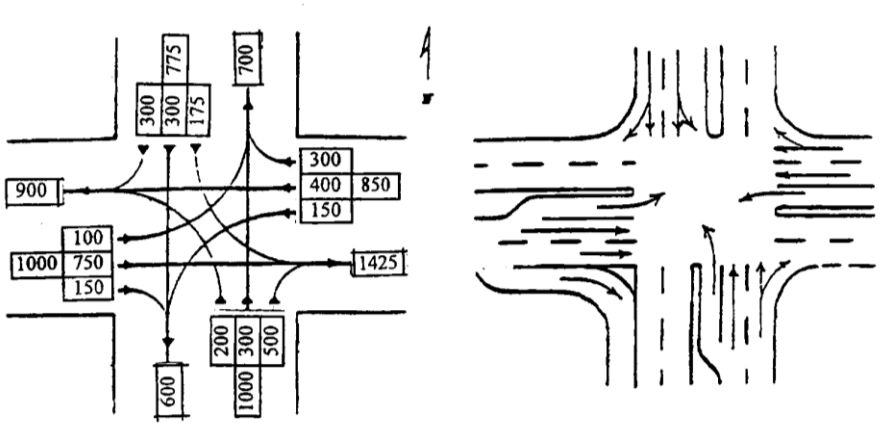
Step 6. The higher total of Step 4 or Step 5 is the critical volume for phase one (e.g., north-south).

Step 7. Repeat Steps 4 through 6 for phase two (e.g., east-west).

Step 8. Sum the critical lane volumes for the two phases to determine the CLV for the intersection. (Note: At some intersections, two opposing flows may move on separate phases. For these cases, each phase becomes a part of the intersection's CLV. Check with Transportation Planning staff for clarification.)

Step 9. Compare the resultant CLV for the intersection with the congestion standards in Table 1.

Table 7
Critical Volume Calculations



Turning Volumes **Intersection Geometrics**

Direction from the	Lane Approach Volume		Critical Lane-Use Factor		Approach Volume		Opposing Lefts		Lane Volume Per Approach
North	775 [1]	X	0.53	=	411	+	200	=	611
South	800 [2]	X	0.53	=	424	+	175	=	599
Or South	500	X	1.00	=	500	+	175	=	675 [5]
East	700 [3]	X	0.53	=	371	+	100	=	471
West	750 [4]	x	0.53	=	398	+	150	=	548 [5]

[1] Approach volumes sum of throughs, rights, and lefts in two lanes
[2] For a heavy right turn, evaluate worst of rights in one lane or through and rights in two lanes
[3] Approach volume sum of throughs and rights in two lanes
[4] Approach volume is through only because of free right and separate left
[5] Intersection Critical Lane Volume = higher sum = 675 + 548 = 1,223

The following conditions should be observed where applicable:

- Right turn overlaps can be assumed where an exclusive right turn lane exists.
- The CLV for five leg intersections should be addressed according to the individual signal phases identified in the field.
- In cases where pedestrian crossing time criteria are not met, the applicant must inform MCDOT and request that they revise the signal timing.
- The CLV calculation for roundabouts should calculate the sum of the approach flow and circulating flows, as defined by the *Highway Capacity Manual*, for each approach and comparing the highest sum to the LATR standards.

K. Required Traffic Study Submittals to Satisfy Local Area Transportation Review

Two copies of the traffic study must be submitted with the development application. Once Transportation Planning staff confirms that the traffic study is complete, 10 copies must be submitted within five working days of notification.

In an effort to standardize the information included with a traffic study, the following items must be submitted before the application is considered complete.

1. A site or area map showing existing roads that serve the site.

2. The location on the site map of any CIP or CTP programmed transportation improvements that affect traffic at the critical intersections.

3. Name and contact information of the licensed or certified professional submitting the traffic study. Any traffic study required for LATR must be submitted by a registered Professional Engineer (PE), Certified Professional Traffic Operations Engineer (PTOE), or Certified Professional Transportation Planner (PTP). This requirement will be effective for studies submitted after July 1, 2008.

4. Existing weekday morning and evening peak period vehicle and pedestrian/bicycle traffic count summaries for the critical intersections identified by Transportation Planning staff. It will include a qualitative statement regarding the observed traffic conditions if, during the time period that the counts were obtained, any queuing from downstream locations or other operational issues were observed.

5. Nearby approved but unbuilt developments and associated improvements that would affect traffic at the critical intersections with their location shown on the area map. (This information is provided by staff and included as part of the traffic study.)

6. A table showing the weekday morning and evening peak hour trips generated by each of the nearby approved but unbuilt developments, including the source of the generation rates/equations for each type of development.

7. The trip distribution patterns, as percentages, for nearby approved but unbuilt developments during the weekday morning and evening peak hours, with the pattern being shown on an area map.

8. Weekday morning and evening peak hour trips entering and leaving the site, generated by the proposed development, including the site driveways.

9. The trip distribution patterns, as percentages, for the proposed development during the weekday morning and evening peak hours, with the pattern being shown on an area map.

10. Maps that show separately and in combination:

    a. Existing weekday morning and evening peak hour traffic volumes using the affected highway system, including turning movements at the critical intersections.

    b. Projected weekday morning and evening peak hour trips assigned to the affected highway system for all nearby approved developments, included as part of the background.

    c. The traffic volumes derived by adding trips from approved development to existing traffic.

    d. Projected weekday morning and evening peak hour trips assigned to the affected highway system for the proposed development.

    e. The traffic volumes derived by adding site trips to the sum of existing plus background traffic.

11. Any study performed to help determine how to assign recorded or proposed development trips, such as a license plate study or special turning movement counts.

12. Copies of all critical lane volume analyses, showing calculations for each approach.

13. A list of all transportation improvements, if any, that the applicant agrees to provide and a scaled drawing of each improvement showing available or needed right-of-way, proposed roadway widening, and area available for sidewalks, bike path, landscaping, as required.

14. Electronic copies of all vehicle, pedestrian, and bicycle traffic counts in approved digital format submitted to MCP-TrafficCounts@mncppc-mc.org. Traffic counts affected by adverse weather or nearby traffic incidents will not be accepted.

15. Once accepted, a copy of the traffic study as a PDF will be submitted to staff for inclusion in the application file and available for public view via the web site's Development Activity Information Center or FTP.