Exhibit 2-13 LATR Intersection Congestion Standards

2003	2007	Difference	Policy Areas	
1450	1400	-50	Rural Areas	
1500	1450	-50	Clarksburg Damascus Gaithersburg City Germantown Town Center	Germantown West Germantown East Montgomery Village/ Airpark
1525	1475	-50	Cloverly Derwood North Potomac	Olney Potomac R & D Village
1550	1500	-50	Aspen Hill Fairland/ White Oak	Rockville City
1600	1550	-50	North Bethesda	
1650	1600	-50	Bethesda/ Chevy Chase Kensington/ Wheaton	Silver Spring/ Takoma Park
1800	1800	0	Bethesda CBD Friendship Heights CBD Glenmont Grosvenor Shady Grove	Silver Spring CBD Twinbrook Wheaton CBD White Flint

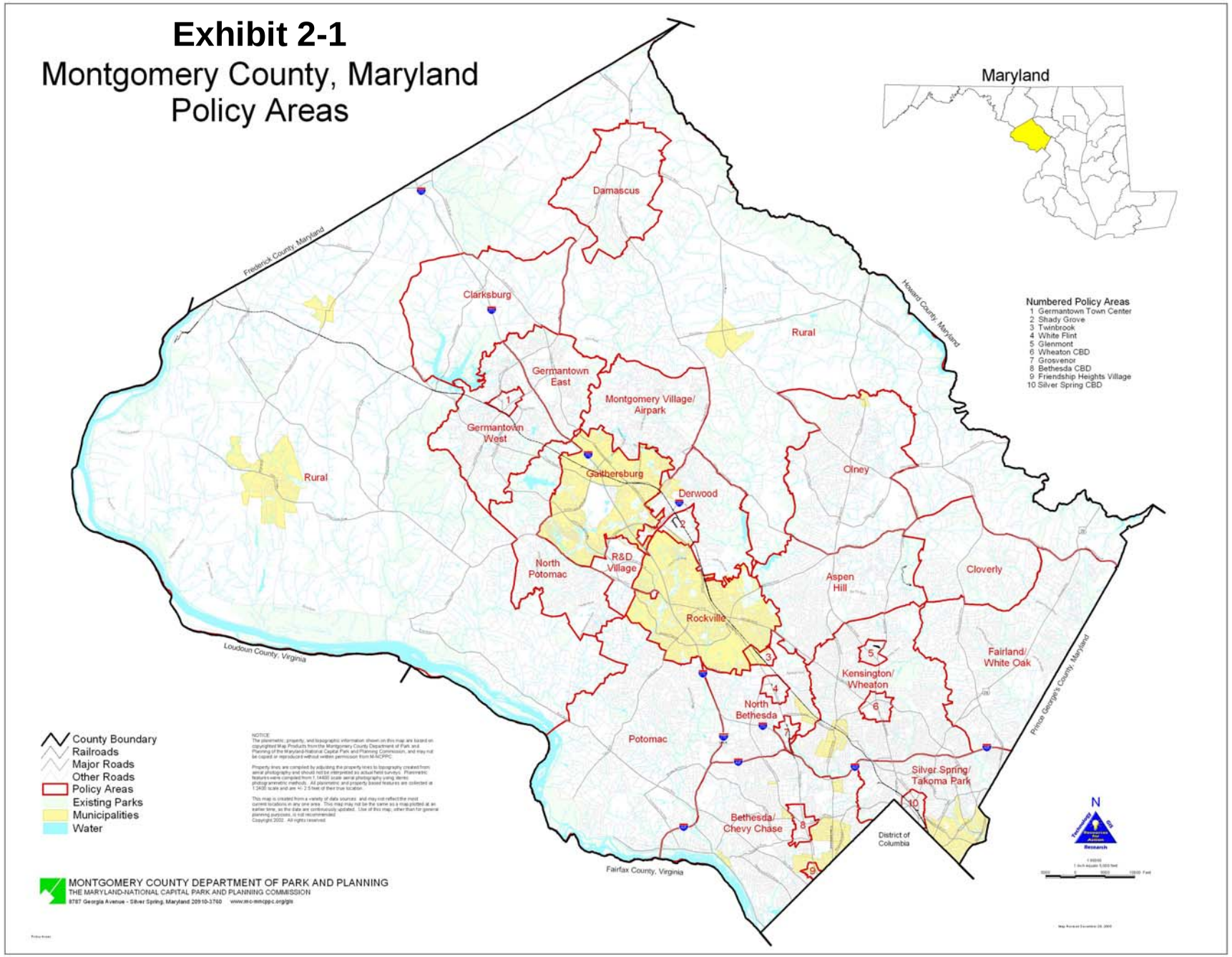


Exhibit 2-1
Montgomery County, Maryland
Policy Areas
Maryland
Numbered Policy Areas
1 Germantown Town Center
2 Shady Grove
3 Twinbrook
4 White Flint
5 Glenmont
6 Wheaton CBD
7 Grosvenor
8 Bethesda CBD
9 Friendship Heights Village
10 Silver Spring CBD
Damascus
Clarksburg
Germantown East
Montgomery Village/ Airpark
Germantown West
Gaithersburg
Derwood
Rural
Rural
Olney
North Potomac
R&D Village
Rockville
Aspen Hill
Cloverly
Fairland/ White Oak
Kensington/ Wheaton
North Bethesda
Potomac
Bethesda/ Chevy Chase
Silver Spring/ Takoma Park
District of Columbia
Frederick County, Maryland
Howard County, Maryland
Loudoun County, Virginia
Prince George's County, Maryland
Fairfax County, Virginia
County Boundary
Railroads
Major Roads
Other Roads
Policy Areas
Existing Parks
Municipalities
Water
MONTGOMERY COUNTY DEPARTMENT OF PARK AND PLANNING
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
8787 Georgia Avenue - Silver Spring, Maryland 20910-3760 www.mc-mncppc.org/gis

Exhibit 2-2. PAMR Transit Level of Service Standard

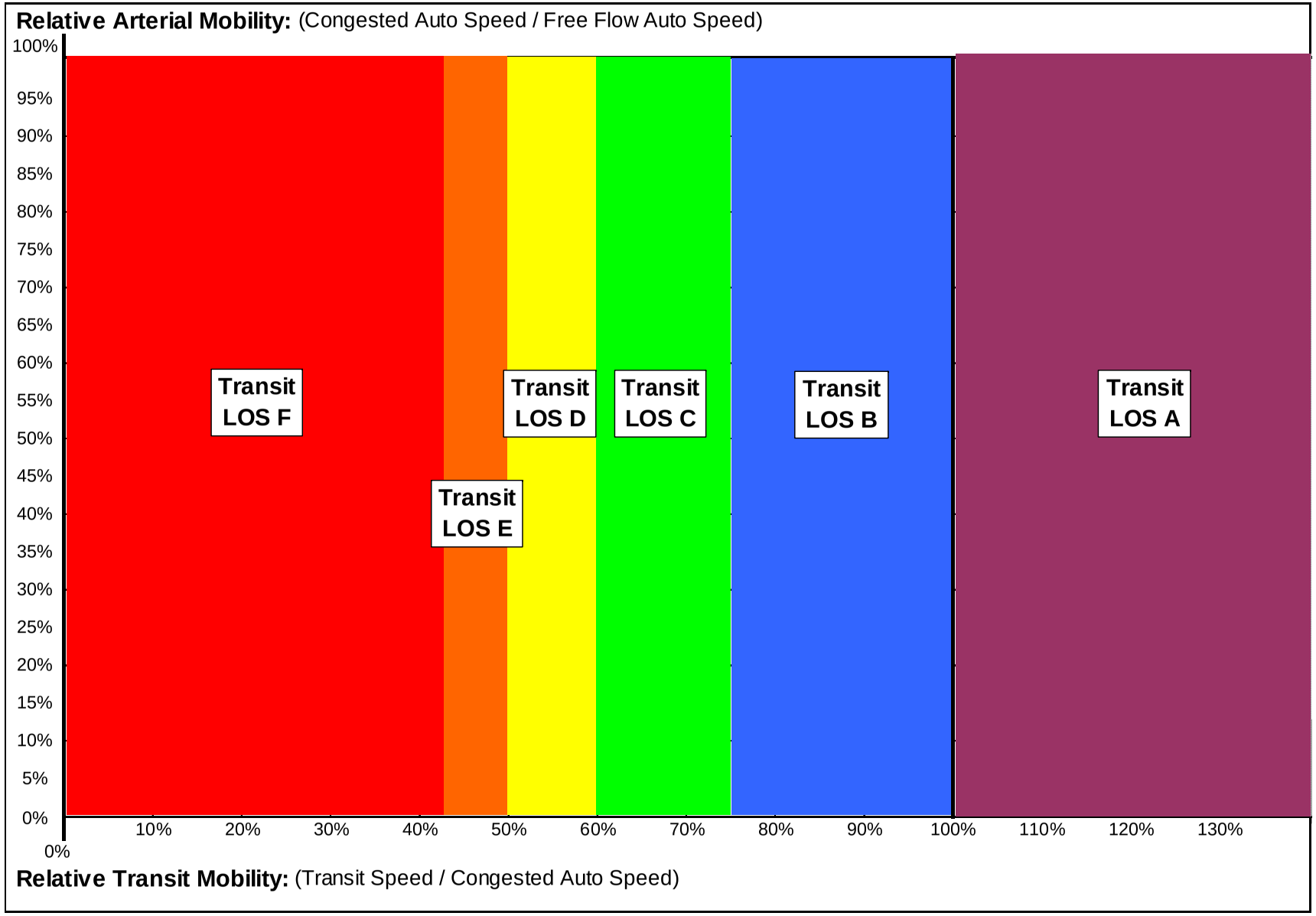


Exhibit 2-3. PAMR Arterial Level of Service Standard

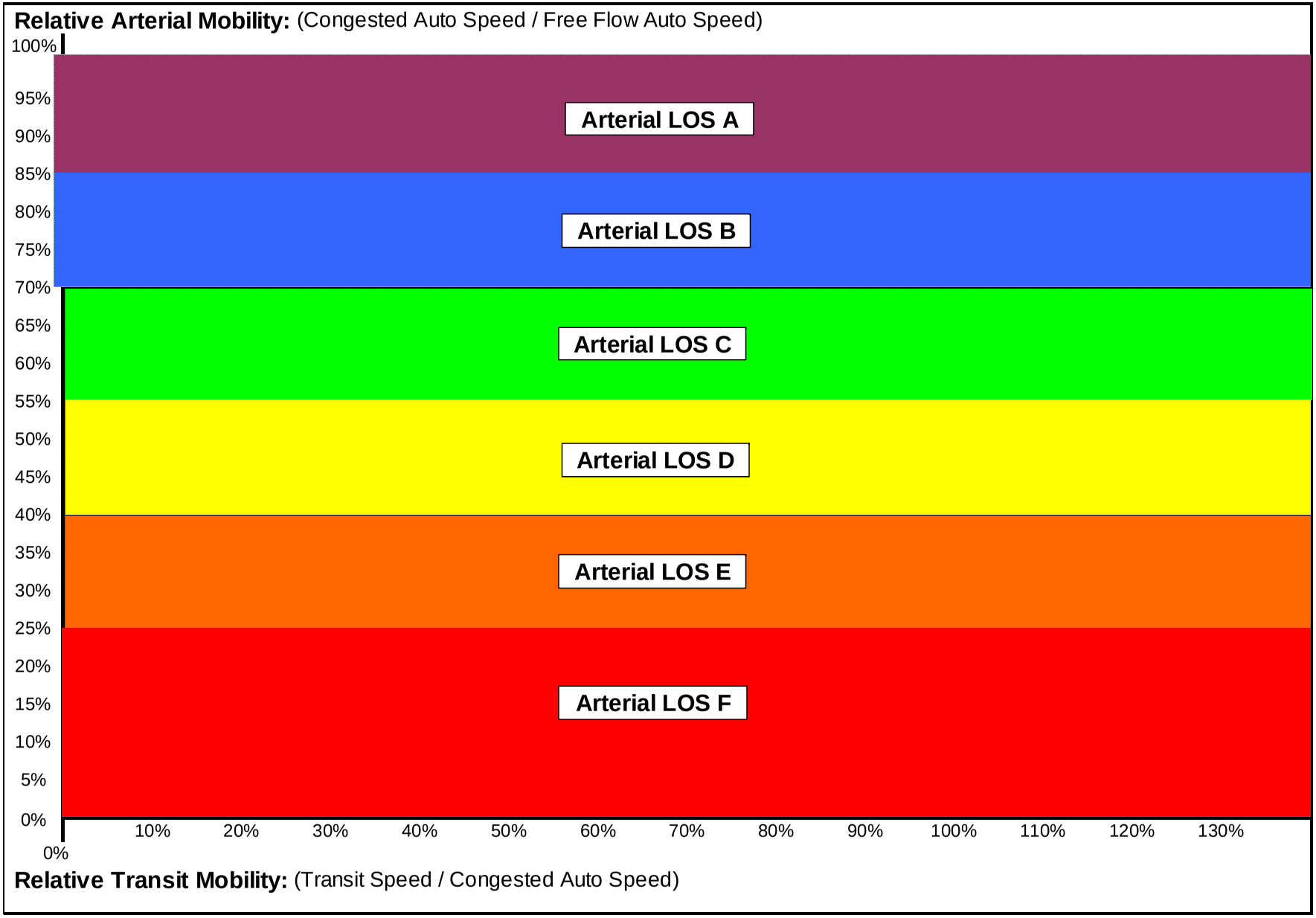


Exhibit 2-4. PAMR Adequacy Standard

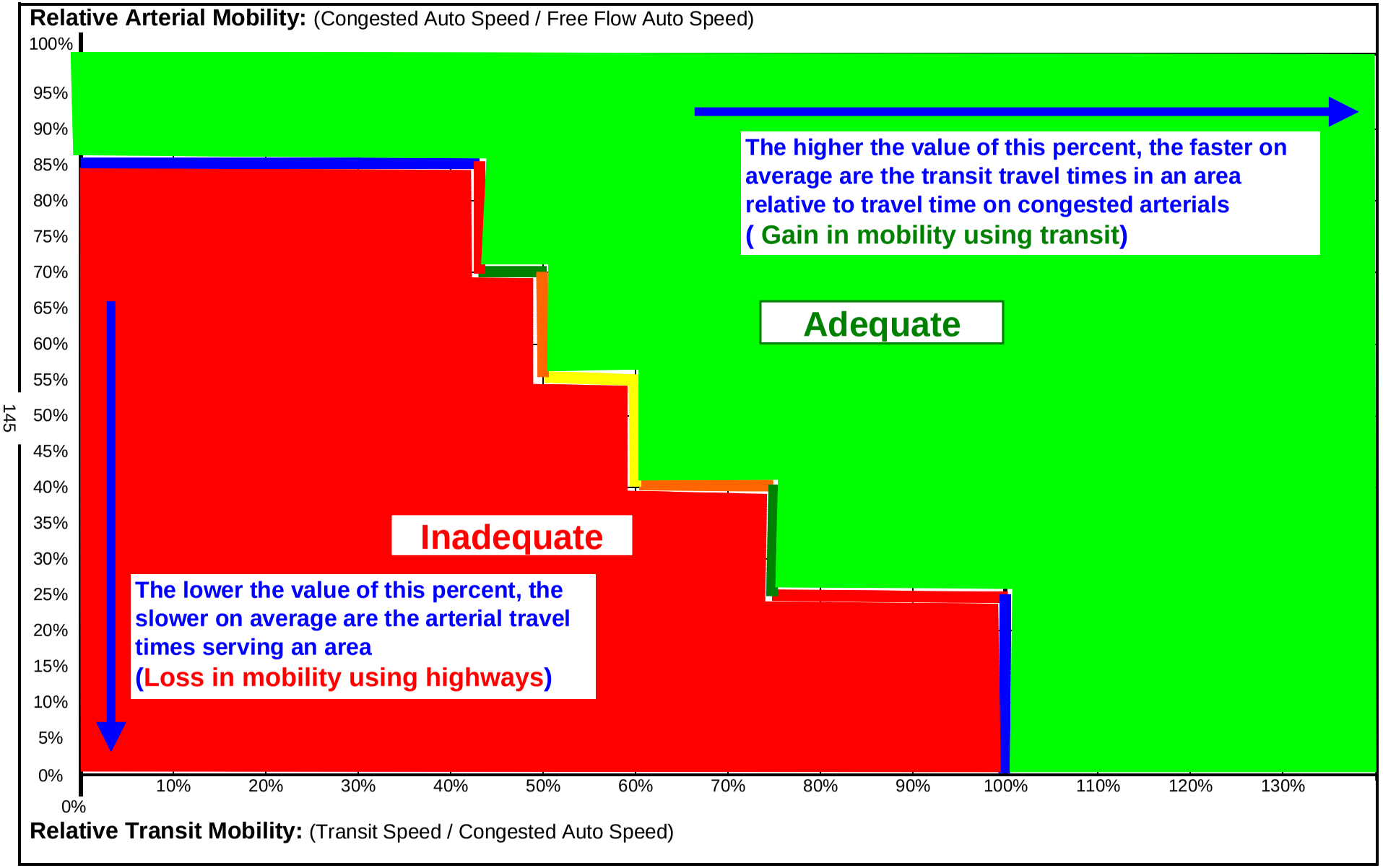


Exhibit 2-5. Year 2013 PAMR Chart

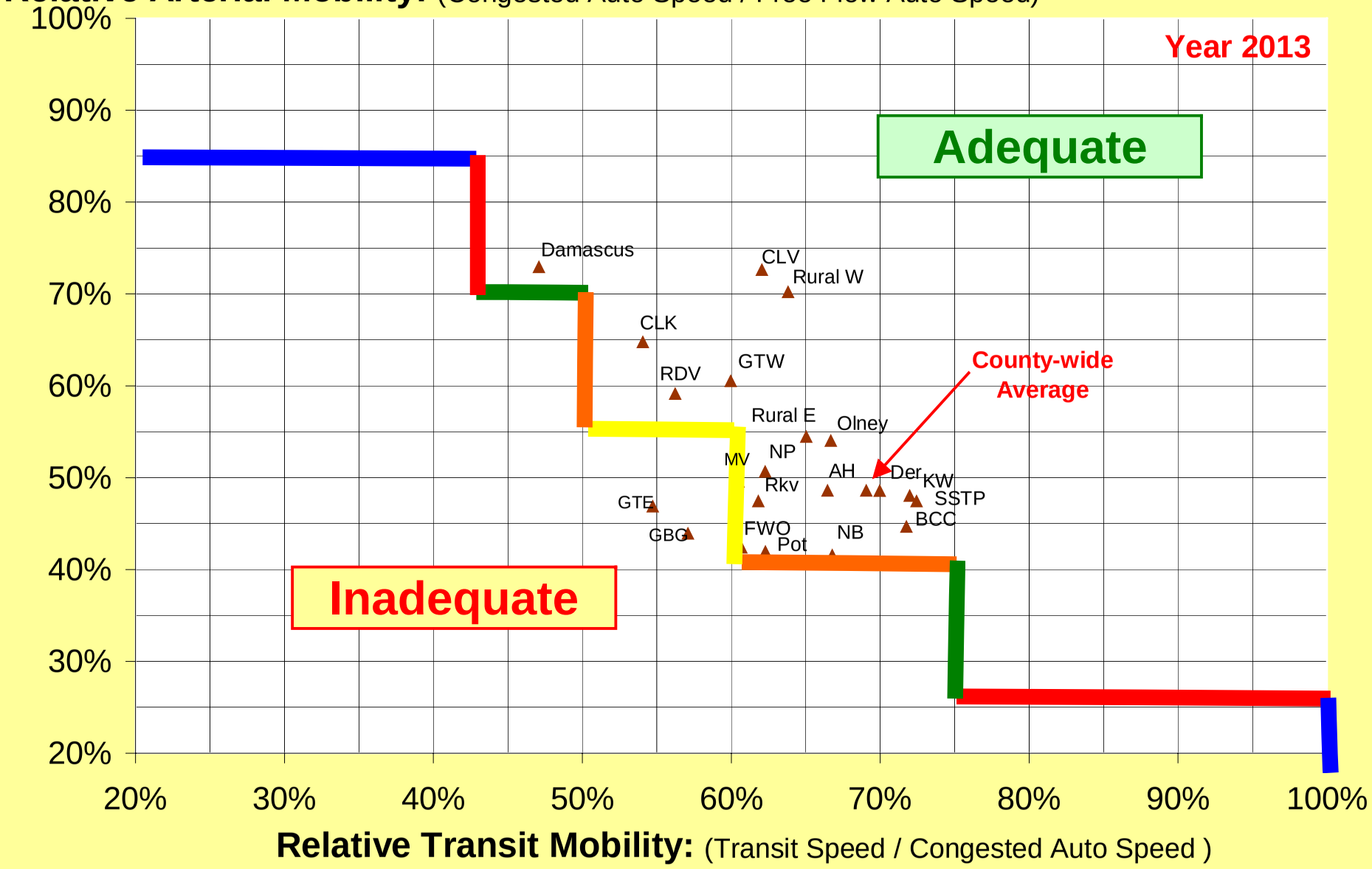


Exhibit 2-6. Year 2013 PAMR Tabulation

Policy Area	Exhibit 2-5 Key	Forecasted Relative Transit Mobility	Transit LOS Standard	Arterial LOS Standard	Relative Arterial Mobility Standard	Forecasted Relative Arterial Mobility	Difference Between Forecast and Standard	Adequacy Finding
Aspen Hill	AH	66%	C	D	40%	49%	9%	Adequate
Bethesda Chevy Chase	BCC	72%	C	D	40%	45%	5%	Adequate
Clarksburg	CLK	54%	D	C	55%	65%	10%	Adequate
Clovery	CLV	62%	C	D	40%	73%	33%	Adequate
Damascus	Damascus	47%	E	B	70%	73%	3%	Adequate
Derwood	Der	70%	C	D	40%	49%	9%	Adequate
Fairland/White Oak	FWO	61%	C	D	40%	42%	2%	Adequate
Gaithersburg	GBG	57%	D	C	55%	44%	-11%	Inadequate
Germantown East	GTE	55%	D	C	55%	47%	-8%	Inadequate
Germantown West	GTW	60%	D	C	55%	61%	6%	Adequate
Kensington/Wheaton	KW	72%	C	D	40%	48%	8%	Adequate
Montgomery Village/Airpark	MVA	60%	C	D	40%	50%	10%	Adequate
North Bethesda	NB	67%	C	D	40%	42%	2%	Adequate
North Potomac	NP	62%	C	D	40%	51%	11%	Adequate
Olney	Olney	67%	C	D	40%	54%	14%	Adequate
Potomac	Pot	62%	C	D	40%	42%	2%	Adequate
R&D Village	RDV	56%	D	C	55%	59%	4%	Adequate
Rockville	Rkv	62%	C	D	40%	47%	7%	Adequate
Silver Spring/Takoma Park	SSTP	72%	C	D	40%	47%	7%	Adequate
Rural Area East	Rural E	65%	C	D	40%	54%	14%	Adequate
Rural Area West	Rural W	64%	C	D	40%	70%	30%	Adequate
Montgomery County Total		69%				49%		

Exhibit 2-7. Year 2005 PAMR Chart

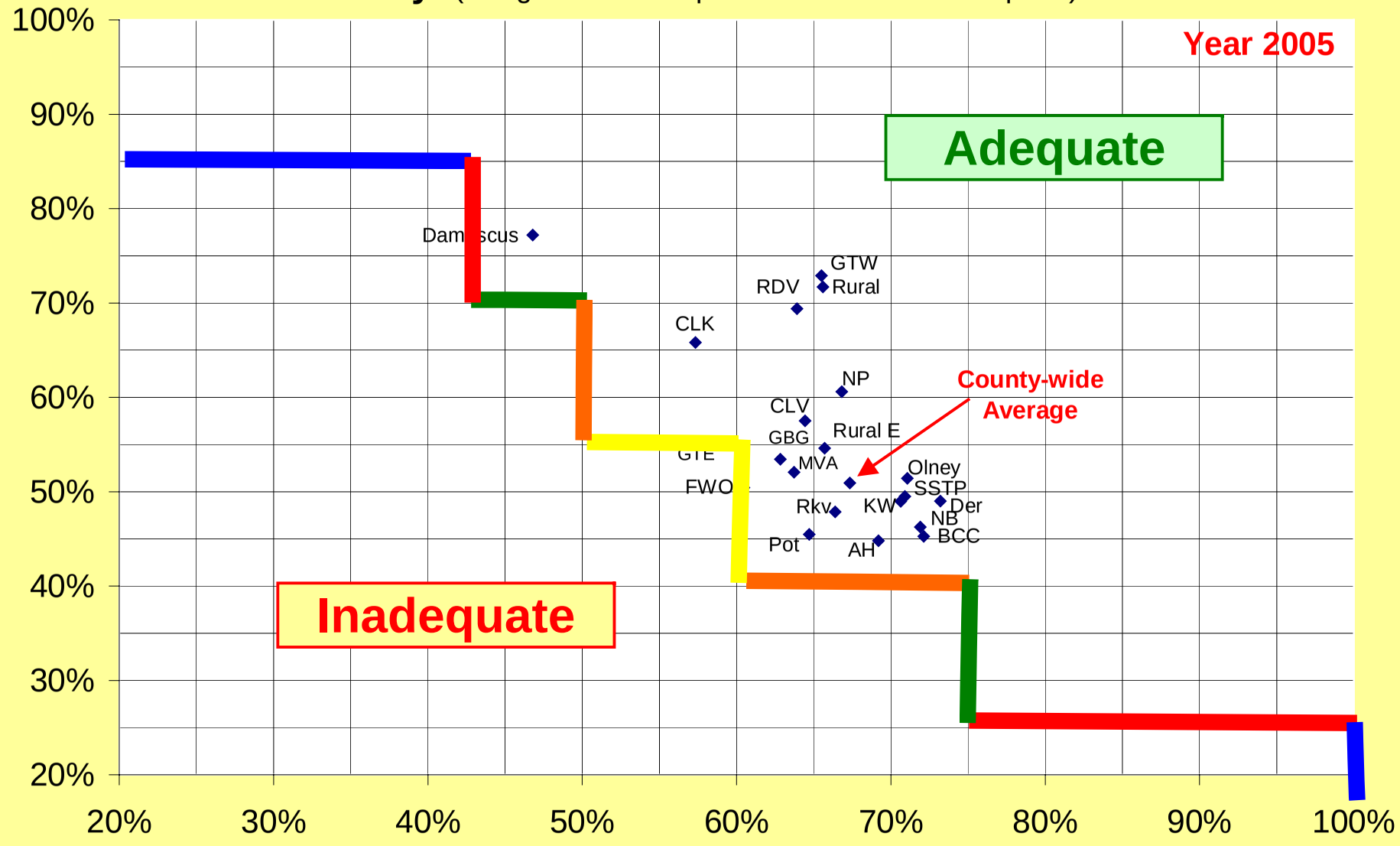


Exhibit 2-8. Year 2030 CLRP PAMR Chart

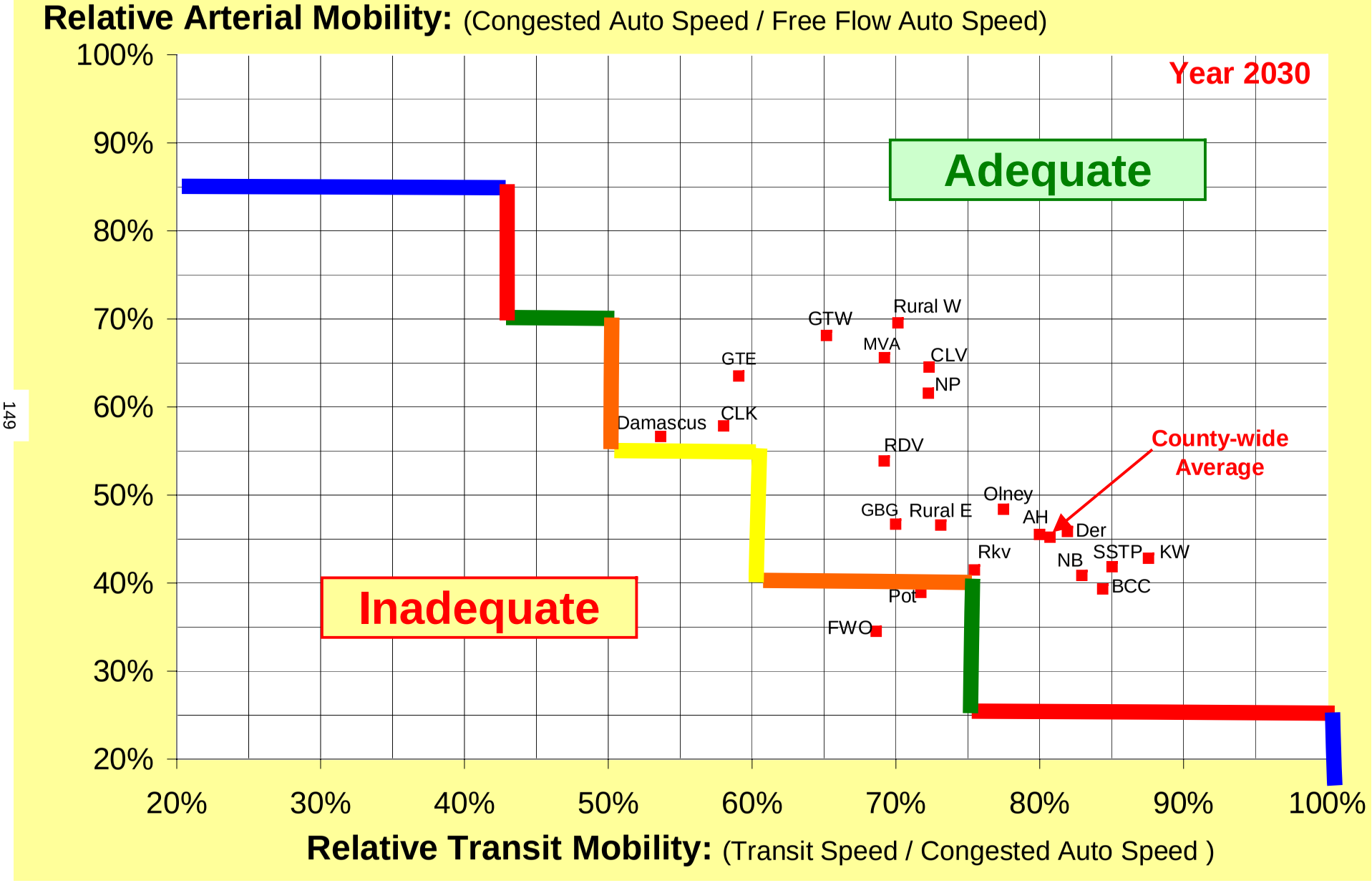


Exhibit 2-9. LATR Mitigation Options for Non-Auto Amenities

Non-Automobile Transportation Amenity	Trip Credit vs Congestion Standard		
	1400-1500	1550-1600	1800
100 linear feet of five-foot sidewalk	0.5	0.75	1.0
100 linear feet of eight-foot bike path	0.5	0.75	1.0
Curb Extension/Pedestrian Refuge Island/Handicap Ramp	2.0	3.0	4.0
LED Traffic Signals/ Intersection	4.5	6.75	9.0
Accessible or Countdown Pedestrian Signals/ Intersection	1.0	2.0	3.0
Bus Shelter	5.0	7.5	10.0
"Super" Bus Shelter	10.0	15.0	20.0
Bus Bench with Pad	0.5	0.75	1.0
Information Kiosk	1.5	3.0	4.5
Bike Locker (set of eight)	2.0	3.0	4.0
Real-Time Transit Information Sign	10.0	15.0	20.0
Static Transit Information Sign	0.25	0.4	0.5
Maximum Trip Credits	60	90	120

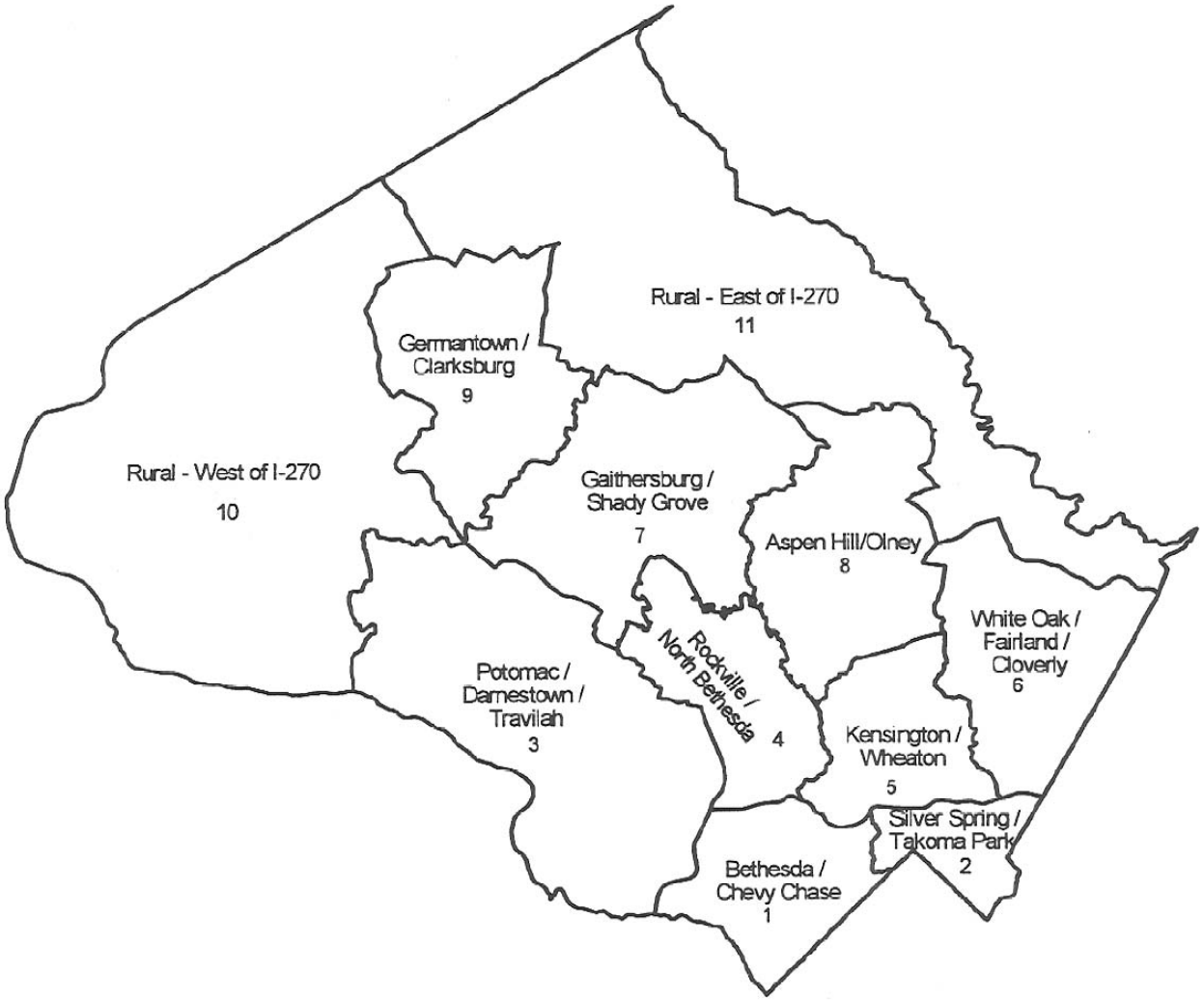
Exhibit 2-10. PAMR Mitigation Options for Providing Roadway Capacity

Minimum Length of Roadway Construction
(Lane-miles of widening or new construction per 100 vehicle trips generated)

Land Use Type	Facility type			
	Freeway	Major Highway	Arterial	Primary Residential
Office	0.38	0.51	0.77	1.54
Retail	0.24	0.31	0.47	0.94
Other Commercial	0.31	0.41	0.62	1.23
Residential	0.31	0.41	0.62	1.24

Notes:
Arterial class also includes industrial and business streets
Construction must be recommended in a master plan and have logical termini

Exhibit 2-11. LATR Superdistricts



APPENDICES FOR APFO REFORM PART 2: TRANSPORTATION

The Sections below provide additional information on topics related to the recommendations and findings in the report. These include:

1. **Review of current transportation forecasting model process**
2. **Details of proportional staging analysis**
3. **Staff recommendations on LATR Guidelines**
4. **Report to Council on appropriate standards and CLV procedures, 1999**

1. Review of the Current Transportation Modeling Process

M-NCPPC has historically been at the forefront in developing and applying travel demand forecasting procedures. For many years Montgomery County maintained a travel forecasting model, called Travel/2, that was separate from the regional MWCOG travel model. Travel/2 was used for a variety of planning applications, including area master plan studies, countywide planning studies and PATR growth policy analyses. M-NCPPC developed this separate modeling tool, in part, because of perceived weaknesses in the Metropolitan Washington Council of Governments (MWCOG) model that staff was able to address by developing Travel/2. In 2002, staff determined that the MWCOG transportation model had evolved to the point where the previous weaknesses no longer existed. Staff also determined that there were many benefits if the Department adopted the MWCOG process. In the final analysis, it was clear that a transition to the MWCOG model would allow staff to focus the Department's forecasting resources on applications, while benefiting from the huge investment by the region and USDOT in the MWCOG model development and maintenance.

Staff has now developed a Montgomery County-focused version of the MWCOG transportation model, called **Travel/3.** This model has replaced Travel/2 as the Department's regional transportation analysis tool.

What components of the MWCOG modeling process have been adopted?

It should be noted that what is often referred to as "The Model" is really an analytical **process** that includes many components such as:

- **Software to run the model** – Travel/2 used a software package called EMME/2, along with other GIS and database software for post-processing and analysis. MWCOG uses a software package called TP+/Viper, the same software used by the Baltimore Metropolitan Council.

- **Mathematical parameters and equations** (these are the "real" models).

- **Inputs to the model**. Montgomery County land use and socio-economic data come from the Department's Research and Technology Center staff. Montgomery County transportation network data come from the Department's Transportation Planning staff. Regional land use, socio-economic data and transportation network data come from MWCOG.

- **Analysts** (real people) to develop, maintain, and apply the model, and to analyze the results to answer difficult planning questions.

Travel/3 has adopted the TP+/Viper software and the MWCOG model's mathematical parameters and equations, while recognizing the critical role that our own staff have in developing population and job forecasts as inputs to the model, and applying the model for numerous transportation studies that the Department conducts.

2. Proportional Staging Method Analysis

Methodology and Alternatives Tested

The proportional staging method compares the percentage of planned development that has been built to the percentage of existing/programmed[1] transportation infrastructure for the various study areas[2] of the County. The calculation process involves a number of process assumptions for existing and planned capacity for roads, interchanges, and transit. The calculated percentages are then used to determine whether or not there is remaining development capacity to allow for additional planned development to be approved.

*For example, if **75%** of planned development in an area has been built, and **95%** of planned transportation infrastructure is on the ground, then the result would be a remaining capacity of **20%** for additional planned development to be approved.*

In this application "planned development" is defined as the jobs and households from the County Adopted Forecasts. Built development will come from our Planning Department totals of current development plus the pipeline of approvals.

The remaining capacity figures vary significantly depending on the method selected for estimating the percent-built for transportation infrastructure. This is arrived at by taking the total of (existing network + programmed additions), and dividing by the total master-planned network

[1] New infrastructure/additional capacity that is funded for construction within the first six years of the Consolidated Transportation Program (CTP) and the Capital Improvement Program (CIP)
[2] Geographies used for the 2002 Transportation Policy Report (TPR) II

The analysis for this report used 3 scenarios for estimating the transportation infrastructure percent-built figure. The percent-built calculations considered each of the following scenarios:

- Inclusion of the arterial system interchanges (scenario A)
- Exclusion of the arterial system interchanges (scenario B)
- Inclusion of the arterial system interchanges, excluding the US 29 interchanges (scenario C)

Summary of Findings

After initial development of this procedure, staff has looked more closely and finds that it has a logic "fatal flaw" that make its application problematic for regulatory process. Defining the "total build out" of jobs, housing or the transportation system is trying to hit a moving target, with zoning, redevelopment and other changes occurring often that change the total amount of future development in an area. Similarly, the transportation network is constantly undergoing refinement, and can be expanded in many ways, even within master planned constraints. However the biggest concern is that the findings of remaining development capacity run counter to the normal public policy directions. In this process, adding transportation capacity to a master planned network will actually decrease the ability to approve more development until it is fully funded, even thought the actual capacity of the programmed network could possibly accommodate more development. Similarly, taking pieces out of the future network would add to the ability to approve development, since the percent of the (smaller) future total would be larger.

It may be that this procedure can be a useful tool in looking at the need for capital programming among areas of the County, so we have developed the findings described below.

Scenario B of the methodology, which excludes the arterial system interchanges from the analysis, would result in the most capacity (3.5% countywide) for new development to be approved. Scenario A, the most stringent of the staging concept, would result in the least amount of capacity (-0.5% countywide) for new development to approved. In its current state, the proportional staging method favors the approval of new jobs over housing, for several areas of the County. All three scenarios of this staging concept would allow for the approval of new jobs in the Georgia Ave Corridor, and Eastern Montgomery County. All three scenarios would allow for the approval of new housing Inside the Beltway. Furthermore, the application of all three scenarios of the methodology results in capacity deficits in either jobs or housing in three of the five study areas (Georgia Ave, Eastern Montgomery County, and Rural).

Under scenario A of this staging concept, Eastern Montgomery County would have a net remaining capacity for new jobs of 15.7%. Conversely, this area

would have the greatest capacity deficit for new housing at –15.2%. The Georgia Ave Corridor and Inside the Beltway study areas would have remaining capacity for housing (6.5%) and jobs (6.6%) respectively. The I-270 Corridor would have a capacity deficit for both housing and jobs at -0.7% and -1.0% respectively.

Scenario A - Capacity Surplus/Deficit by Study Area

	Capacity Surplus		Capacity Deficit	
	Housing	Jobs	Housing	Jobs
Inside The Beltway	*			*
Georgia Ave		*	*	
Eastern Mont. Co.		*	*	
I-270 Corridor			*	*
Rural			*	*

Scenario B of the proportional staging method results in more capacity for the approval of new development, particularly jobs, more so than that of scenario A. Eastern Montgomery County would have a net remaining capacity of 22.8%, which is 7.1% higher than what the remaining capacity would be under scenario A. In contrast, this area would have the greatest capacity deficit for new housing at –8.8%. This scenario would yield a capacity surplus for new housing in the I-270 Corridor and Inside the Beltway at 1.6% and 7.3% respectively. In addition, the scenario results would yield a net remaining capacity for new jobs in the Georgia Ave Corridor (8.8%) and the I-270 Corridor (1.2%). The Rural study area would have a capacity deficit for both housing (–1.0%) and jobs (–6.5%).

Scenario B - Capacity Surplus/Deficit by Study Area

	Capacity Surplus		Capacity Deficit	
	Housing	Jobs	Housing	Jobs
Inside The Beltway	*			*
Georgia Ave		*	*	
Eastern Mont. Co.		*	*	
I-270 Corridor	*	*		
Rural			*	*

Scenario C of the analysis involves a slight modification of scenario A, in that the planned and programmed interchanges in Eastern Montgomery County are removed from the capacity assumptions, since these are dependant upon Council approval for the “later phases of the interchanges”. . Therefore, the remaining capacity totals are very similar to those seen in scenario A. Moreover, the area Inside the Beltway would have a capacity surplus of 6.5% for new housing. The Georgia Ave Corridor and Eastern Montgomery County would have a net remaining capacity of 5.5% and 21.4% respectively for new jobs. Similar to the results seen with scenarios A and B, Eastern Montgomery County would have the greatest capacity deficit for housing (-9.5%). Under this scenario,

both the I-270 Corridor and the Rural areas would have a capacity deficit for both housing and jobs.

Scenario C - Capacity Surplus/Deficit by Study Area

	Capacity Surplus		Capacity Deficit	
	Housing	Jobs	Housing	Jobs
Inside The Beltway	*			*
Georgia Ave		*	*	
Eastern Mont. Co.		*	*	
I-270 Corridor			*	*
Rural			*	*

Additional refinements

Currently, the study areas used in this analysis are aggregates of the County's growth policy areas. Ideally, the study areas used in this analysis should more closely resemble the growth policy area boundaries. However, staff feels that performing this type of analysis for all 34 of the County's policy areas may produce misleading results since many larger projects span several area, and cannot be built in small pieces.

The staging methodology involves a number of calculations, process and capacity assumptions that may require some additional refinement in order to obtain the most relevant and accurate results possible. For instance, a weighting[3] component could be introduced to the calculation process to alter the way in which the percent-built figures for jobs, housing, and transportation infrastructure are calculated taking into account the travel expected on each part of the network. In addition, the process and capacity assumptions may need to be modified as new transit policy initiatives are introduced, and/or as the region's travel demand model capacities are refined.

Additional Staff Recommendations for the LATR Guidelines

Transportation Planning staff and consultants who work with the Planning Board LATR Guidelines on a daily basis are often confronted with situations that are not covered or where the Guidelines no longer reflect the best procedures. The following are changes staff expects to be proposing in the Guidelines when they are updated next, probably in the context of reflecting any changes made by the Council in the overall Growth Policy. These are not felt to be of a nature that the Council would need to adopt them, as with the ones identified in the LATR Recommendations section of this report. These are included to inform the Board

[3] Adjustment of a calculated figure(s) based on the relevance/importance of an equation's inputs.

Annual Growth Policy Study (AGP) - March 2007
Proportional Staging Method - Illustrative Example

Scenario A. Includes Arterial System Interchanges

	Housing*	Jobs	Transportation
Inside The Beltway			
Percent Built	81.1%	89.6%	87.6%
2030 Forecast	93,108	160,821	
Gross Capacity	81,570	140,892	
Existing Development	75,528	144,076	
Pipeline	4,795	7,427	
Net Remaining Capacity	1,247	-10,611	
Old Growth Policy	*4,835*	*11,783*	
Georgia Avenue			
Percent Built	92.2%	82.4%	87.9%
2030 Forecast	80,668	42,312	
Gross Capacity	70,944	37,211	
Existing Development	74,376	34,883	
Pipeline	1,575	636	
Net Remaining Capacity	-5,007	1,692	
Old Growth Policy	*4,924*	*3,929*	
Eastern Montgomery County			
Percent Built	96.9%	65.9%	81.7%
2030 Forecast	35,589	42,312	
Gross Capacity	29,061	34,551	
Existing Development	34,476	27,902	
Pipeline	1,464	6,461	
Net Remaining Capacity	-6,879	188	
Old Growth Policy	*1,939*	*1,245*	
I-270 Corridor			
Percent Built	74.3%	74.7%	73.7%
2030 Forecast	147,240	244,072	
Gross Capacity	108,448	179,768	
Existing Development	109,428	182,204	
Pipeline	14,906	56,621	
Net Remaining Capacity	-15,886	-59,057	
Old Growth Policy	*14,270*	*11,281*	
Rural			
Percent Built	86.9%	92.4%	85.9%
2030 Forecast	25,197	12,990	
Gross Capacity	21,639	11,156	
Existing Development	21,903	12,001	
Pipeline	712	891	
Net Remaining Capacity	-976	-1,736	
Old Growth Policy	*4,539*	*3,950*	
Countywide			
Percent Built	82.7%	79.8%	80.9%
2030 Forecast	381,802	502,507	
Gross Capacity	311,661	403,578	
Existing Development	315,711	401,066	
Pipeline	23,452	72,037	
Net Remaining Capacity	-3,490	-21,079	
Old Growth Policy	*28,715*	*28,588*	

*Total Housing Units

Annual Growth Policy Study (AGP) - March 2007
Proportional Staging Method - Illustrative Example

Scenario B. Excludes Arterial System Interchanges

	Housing*	Jobs	Transportation
Inside The Beltway			
Percent Built	81.1%	89.6%	88.5%
2030 Forecast	93,108	160,821	
Gross Capacity	82,360	142,257	
Existing Development	75,528	144,076	
Pipeline	4,795	7,427	
Net Remaining Capacity	2,037	-9,246	
Old Growth Policy	*4,835*	*11,783*	
Georgia Avenue			
Percent Built	92.2%	82.4%	91.2%
2030 Forecast	80,668	42,312	
Gross Capacity	73,598	38,604	
Existing Development	74,376	34,883	
Pipeline	1,575	636	
Net Remaining Capacity	-2,353	3,085	
Old Growth Policy	*4,924*	*3,929*	
Eastern Montgomery County			
Percent Built	96.9%	65.9%	88.1%
2030 Forecast	35,589	42,312	
Gross Capacity	31,352	37,275	
Existing Development	34,476	27,902	
Pipeline	1,464	6,461	
Net Remaining Capacity	-4,588	2,912	
Old Growth Policy	*1,939*	*1,245*	
I-270 Corridor			
Percent Built	74.3%	74.7%	75.9%
2030 Forecast	147,240	244,072	
Gross Capacity	111,714	185,183	
Existing Development	109,428	182,204	
Pipeline	14,906	56,621	
Net Remaining Capacity	-12,620	-53,643	
Old Growth Policy	*14,270*	*11,281*	
Rural			
Percent Built	86.9%	92.4%	85.9%
2030 Forecast	25,197	12,990	
Gross Capacity	21,639	11,156	
Existing Development	21,903	12,001	
Pipeline	712	891	
Net Remaining Capacity	-976	-1,736	
Old Growth Policy	*4,539*	*3,950*	
Countywide			
Percent Built	82.7%	79.8%	83.0%
2030 Forecast	381,802	502,507	
Gross Capacity	320,664	414,474	
Existing Development	315,711	401,066	
Pipeline	23,452	72,037	
Net Remaining Capacity	746	-14,232	
Old Growth Policy	*28,715*	*28,588*	

*Total Housing Units

Annual Growth Policy Study (AGP) - March 2007
Proportional Staging Method - Illustrative Example

Scenario C. Includes Arterial System Interchanges, Excluding the US 29 Interchanges

	Housing*	Jobs	Transportation
Inside The Beltway			
Percent Built	81.1%	89.6%	87.6%
2030 Forecast	93,108	160,821	
Gross Capacity	81,570	140,892	
Existing Development	75,528	144,076	
Pipeline	4,795	7,427	
Net Remaining Capacity	1,247	-10,611	
Old Growth Policy	*4,835*	*11,783*	
Georgia Avenue			
Percent Built	92.2%	82.4%	87.9%
2030 Forecast	80,668	42,312	
Gross Capacity	70,944	37,211	
Existing Development	74,376	34,883	
Pipeline	1,575	636	
Net Remaining Capacity	-5,007	1,692	
Old Growth Policy	*4,924*	*3,929*	
Eastern Montgomery County			
Percent Built	96.9%	65.9%	87.4%
2030 Forecast	35,589	42,312	
Gross Capacity	31,100	36,975	
Existing Development	34,476	27,902	
Pipeline	1,464	6,461	
Net Remaining Capacity	-4,840	2,612	
Old Growth Policy	*1,939*	*1,245*	
I-270 Corridor			
Percent Built	74.3%	74.7%	73.7%
2030 Forecast	147,240	244,072	
Gross Capacity	108,448	179,768	
Existing Development	109,428	182,204	
Pipeline	14,906	56,621	
Net Remaining Capacity	-15,886	-59,057	
Old Growth Policy	*14,270*	*11,281*	
Rural			
Percent Built	86.9%	92.4%	85.9%
2030 Forecast	25,197	12,990	
Gross Capacity	21,639	11,156	
Existing Development	21,903	12,001	
Pipeline	712	891	
Net Remaining Capacity	-976	-1,736	
Old Growth Policy	*4,539*	*3,950*	
Countywide			
Percent Built	82.7%	79.8%	81.4%
2030 Forecast	381,802	502,507	
Gross Capacity	313,700	406,002	
Existing Development	315,711	401,066	
Pipeline	23,452	72,037	
Net Remaining Capacity	-3,490	-18,655	
Old Growth Policy	*28,715*	*28,588*	

*Total Housing Units

and others on these potential changes, and to show the evolving state of the LATR analysis. (Page numbers refer to the 2004 Adopted LATR Guidelines).

1. **Inclusion of pass-by trips in defining significantly sized project (p. 5&7).** Pass-by trips are to be included in establishing the 30-vehicle trip threshold requiring a traffic study. The page 5 definition is correct and the page 7 definition should be amended.

2. **Citation that LATR may apply building permit review (p. 5)** for cases not requiring an APF finding without subdivision, and that in limited cases (less than 12 months vacancy, no increase in square footage, and fewer than 30 peak-hour trips) the APF test may be approved administratively by staff

3. **Clarification of submittal and review processes (p. 5, 11, 12, 17, 37).** Clarify timelines, including:

   a. Transportation Planning staff have 15 working days to develop a study scope after receipt of a written request

   b. Transportation Planning staff have 15 working days to review a submitted study for completeness (retain p. 11 text, revise p. 5

   c. SHA and DPWT have 30 calendar days to review an approved study and comment on the feasibility of the recommendations, however

   d. The applicant must obtain comments from SHA and DPWT and transmit them to Transportation Planning staff four weeks prior to a scheduled Planning Board hearing.

4. **Clarifying the definition of "all land at one location" (p. 7).** The LATR Guidelines require consideration of all land at one location in considering the size of total (existing plus proposed) development in traffic study scoping. The LATR guidelines allow professional judgment. Staff judgment in the past has generally, but not always, been that parcels separated by unbuilt roadways or local subdivision streets remain "land at one location" but that parcels separated by business district streets, arterial roadways, major highways, or freeways cease to be "land at one location" even if still in common ownership.

5. **Clarifying the definition of "mitigating 50% of their total weekday morning and evening peak-hour trips" (p. 9)**. The LATR Guidelines should define how both the "non-mitigated" and "mitigated" trips should be calculated. In both cases the applicant must explicitly document the conversion between person-trips and vehicle-trips to account for transit use, vehicle occupancy, walk/bike use, internal site trip capture, and telecommute options. The estimates should document the effect of home-based work trips separately from all other trips. Special trip rates, such as for office uses within 1,000 feet of Metrorail stations outside the Beltway (p. 48), or rates for any uses within the Bethesda, Silver Spring, and Friendship Heights CBDs (p. 54) should not be used in either "non-mitigated" or "mitigated" trip rate calculations.

6. **Clarifying the LATR study area (p. 13).** There are several clarifications required to this study scope parameter:

   a. The number of signalized intersections in each direction should be described as a "minimum" rather than a "maximum".

   b. The Guidelines should indicate that the term "each direction" applies at every study intersection. For instance, in a hypothetical perfect rectangular grid, the first "ring" would include four intersections. The second "ring" would include not only the next four intersections along the streets serving the site, but also the four intersections among the cross streets encountered in the first "ring". In this manner, as the number of intersections in each direction grows linearly from one to five, the number of total study area intersections grows exponentially.

   c. The site access driveways are not included in the "first ring" of intersections.

   d. Intersections in jurisdictions for which the Planning Board does not have subdivision authority will not be included in the traffic study.

   e. Unsignalized intersections may be included in the definition of "rings" if they are between two master-planned roadways.

   f. Intersections distant enough so that fewer than 5 peak hour vehicle trips from the site will travel through the intersection need not be included in the traffic study, even if they would otherwise be identified as candidate locations.

   g. The statement that the background development to be considered will be in "the same geographic area as the intersections to be studied" should be clarified to indicate that generally a polygon should be drawn connecting the intersections furthest from the site and the background development should be included in that area.

   h. Individual background developments that generate less than five peak hour trips (i.e., subdivisions of four or fewer single family detached dwelling units) should not be included, as tracking those trips is not pragmatic.

7. **Addressing the effects of the ICC (p. 14)**. The applicant and staff must agree upon the impact of transportation projects fully funded for construction within the first four years of the CIP or CTP. The FY 2007-2012 CTP identifies the ICC as a single project that will be 99% complete in FY 2012. Staff recommends that the ICC continue to be considered as a single project, even though it will be constructed in stages, and that once the entire project is fully funded within four years its effects be considered by application of a proportional volume change (either reductions or increases) to background traffic conditions on intersection approaches based on the impacts identified in the ICC EIS.

8. **Clarification of pedestrian and bicycle impact statement requirements (p. 15)**. The Guidelines should require that the pedestrian and bicycle impact statement cover an area within a ¼ mile radius of the site, regardless of the LATR study area size. Information on bus route numbers and service frequency should be included. An inventory map of sidewalks and off-road shared-use paths within the ¼ mile radius should be included.

9. **Clarification of queue length analysis (p. 21)**. The generally accepted practice for evaluating queue lengths in CBDs and MSPAs is to observe the existing maximum queue during the peak hour and add background and site-generated traffic, assuming LATR lane distribution factors, a 25' average vehicle length, and a division of hourly approach volumes equally among the number of signal cycles in the hour. These factors should be identified in the Guidelines, as well as a statement that alternatives methods, such as simulation using Synchro or CORSIM, may be accepted if all simulation parameters are agreed to by staff.

10. **Guidance regarding pass-by trips and internal capture rates (p. 31)** should be included directing the user to the current ITE Trip Generation Handbook.

11. **Clarification of unusual CLV processes.** The discussion regarding CLV calculation should address:

    a. Right turn overlaps can be assumed where an exclusive right turn lane exists.

    b. Five leg intersections: The CLV for these intersections should be assessed according to the individual signal phases identified in the field

    c. Pedestrian crossing time: In MSPA cases where pedestrian crossing time criteria are not met (per p. 22), the applicant must inform DPST of the condition and request them to revise the signal timing.

    d. Identifying a CLV process for roundabouts. The LATR Guidelines should state that a CLV for a roundabout calculation should be performed by calculating 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.

12. **Addressing effects of nearby traffic constraints**. A continuing community concern relates to the degree to which observed traffic volumes may be reduced by either upstream or downstream congestion. Staff notes that the purpose of the LATR is not to establish delay-free conditions, but rather to assess the appropriate degree of responsibility applicable to private sector applicants. Staff recommends that the studies require a qualitative statement regarding observed traffic conditions if during the time period that the counts were obtained any queueing from downstream locations or other operational issues were observed. The

Guidelines should also clarify that traffic counts affected by adverse weather or nearby traffic incidents will not be accepted.

13. **Clarification of impacts assessment for special exception cases where the current operations exceed the permitted parameters**. In some cases, a special exception modification may be submitted wherein the observed traffic reflects a level of activity greater than that already permitted. In such cases, the petitioner must estimate the reduction in traffic activity that would be caused by reducing the operations to the permitted level, and use those conditions for establishing adequate public facility impacts.

4. MARCH 2, 1999 LETTER TO THE COUNCIL FROM THE PLANNING BOARD ON LATR GUIDELINES

This presents the detailed review that the Board and a citizen panel did on the LATR procedures, including Critical Lane Volume analysis, in the late 1990's. The Board, and subsequently the Council, endorsed the standards and procedures after an in-depth review. Staff finds the basic validity of the process remains sound.

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
8787 Georgia Avenue • Silver Spring, Maryland 20910-3760
(301) 495-4605

Montgomery County Planning Board
Office of the Chairman

March 2, 1999

The Honorable Isiah Leggett, President
Montgomery County Council
100 Maryland Avenue
Rockville, MD 20850

Dear Mr. Leggett:

We are writing in response to Council's concern regarding the Planning Board's decision in April 1998 to adopt revisions to the *Local Area Transportation Review (LATR) Guidelines*, including specifically the adoption of revised lane-use factors used in the Critical Lane Volume (CLV) methodology for calculating intersection congestion. We have completed an in-depth staff review and Board discussion of this topic, and are pleased to report to you on our process and decisions.

Concerns about the effect of the revised lane-use factors on the Annual Growth Policy (AGP) congestion standards adopted by the Council in 1994 were raised by citizens, including two who were members of the Intersection Congestion Working Group (ICWG) that had confirmed the appropriateness of those standards in a report to the Council in April 1997.Their concern was that the current lane-use factors might suggest a revision to the congestion standards.

In response, our staff has undertaken an in-depth review of the current lane-use factors and their relationship to the congestion standards. In doing so, staff considered whether other factors, such as a peak-hour factor, should be included in our CLV methodology for planning level analysis of the traffic impacts of proposed development. A working group that included John Viner, Dan Wilhelm, representatives of academia and the County Executive, our staff and other transportation professionals reviewed this issue in great detail.

Staff presented a report and recommendations to the Planning Board at public sessions held on January 7 and February 18, 1999. Testimony from interested citizens, including Mr. Viner and Mr. Wilhelm, was received at both sessions. There was consistent testimony from staff, citizens, and transportation professionals at the January 7 public hearing that the current lane-use factors are the "correct" factors, as substantiated by field data and as recommended in the *Highway Capacity Manual*. The question of including a peak-hour factor in our CLV methodology was raised at the January 7 public hearing; the Planning Board requested staff to consider that option.

At the February 18 public hearing, staff recommended that the lane-use factors adopted by the Planning Board in April 1998 should be retained and that a peak-hour factor should not be added to the planning level of analysis in the LATR Guidelines. The Planning Board concurred with those recommendations.

Further, and perhaps more importantly from the Council's perspective, the Planning Board unanimously supported staff's recommendation that the congestion standards adopted by the County Council in 1994 are valid and conservative standards upon which to base decisions regarding the approval of development in Montgomery County and should not be changed. Those standards continue to reflect our understanding of the intent of the Council to permit different levels of traffic congestion in policy area groups. Those standards are not affected by the change in lane-use factors. One effect of adopting the new and correct lane-use factors is that the Planning Board has provided intersection capacity for a very small increment of additional development at a few intersections before reaching the congestion standard. The total level of development in an area continues to be governed by both zoning limits and staging ceiling.

There is no increased risk of excessive delay in using the current lane-use factors. In fact, local data strongly suggests that signalized intersections in Montgomery County are handling traffic better today than they were in 1994. This can be attributed in part to the efficiencies gained from the County's Advanced Transportation Management System (ATMS).

On a very practical level, the Planning Board was convinced that using the new lane-use factors would have only a marginal effect on the decisions made at subdivision approval. The typical impact on CLV calculations is 50 to 90. Even so, only about 20 intersections are close to the standard where some minimal additional development would be permitted.

A copy of our staff's report is enclosed for your information and reference. We consider this report to be a very comprehensive and understandable discussion of a very complex subject. You may wish to contact Ron Welke in our Transportation Division at (301)495-4525 for further clarification of the recommendations and our decision.

Sincerely,

Arthur Holmes/GAP

Arthur Holmes
Vice Chairman

WHH:RCW:cmd
Enclosure

ltr to leggett re LATR.wpd

M-NCPPC

MONTGOMERY COUNTY DEPARTMENT OF PARK AND PLANNING

THE MARYLAND-NATIONAL CAPITAL
PARK AND PLANNING COMMISSION

8787 Georgia Avenue
Silver Spring, Maryland 20910-3760

MCPB
Item No. 11
02-18-1999

February 12, 1999

MEMORANDUM

TO: The Montgomery County Planning Board

VIA: Jeffrey Zyontz, Acting Chief
County-Wide Planning Division

FROM: Richard C. Hawthorne, P. E., Chief RCH

Ronald C. Welke, Coordinator
Transportation Planning

SUBJECT: Review of the Local Area Transportation Review (LATR) Guidelines Adopted by the Planning Board in April 1998 and Their Relation to the Congestion Standards Adopted by the County Council in 1994

In January, after a staff presentation, citizen comment, and considerable discussion on the issue of lane use factors, the Planning Board decided the following:

1. The revisions to the lane use factors are appropriate and their use in the planning level of analysis using the Critical Lane Volume (CLV) methodology should continue,

2. Staff will analyze whether a "peak hour factor" is appropriate to use in the CLV calculation, and

3. If staff recommends that a "peak hour factor" is not appropriate, should there be changes in the congestion standards adopted by the County Council?

In order to respond to these issues, staff has reviewed thoroughly the origin of the LATR Guidelines and the CLV methodology, and their relationship to both the congestion standards and the *Highway Capacity Manual* (HCM). Staff requests that you, as decision makers, follow closely the discussion that follows, as it is the basis upon which you make decisions each week as to the transportation conditions tied to your approval of subdivision development.

CONCLUSIONS AND RECOMMENDATIONS

1. The lane use factors adopted by the Board in April 1998 are the correct factors, as substantiated by local field data, are consistent with those in the HCM, and should be retained.

2. A "peak hour factor" should not be added to the planning level of analysis, i.e. the CLV methodology, in the LATR Guidelines. This is based on at least three considerations.

   a. A peak hour factor does not improve the accuracy of the CLV calculations.

   b. The difficulty of determining a peak hour factor for a future condition (consider forecasting the peak 15 minutes in a peak hour five to 20 years in the future).

   c. It adds complexity to the CLV procedure, and opens up the process to other "adjustment" factors. These have not proven to be useful in previous attempts by others to add such adjustments.

3. The congestion standards recommended by the Planning Board and adopted by the County Council in 1994 should not be changed.

POLICY IMPLICATIONS OF CONCLUSIONS AND RECOMMENDATIONS

The congestion standards adopted by the County Council in 1994 have not changed. By adopting the new and correct lane use factors, the Board has allowed a very small increment of development to be approved before reaching the congestion standard in a given policy area.

To assist you in visualizing CLVs relative to the congestion standards and relating them to conditions as they exist today, a listing of intersections where the existing CLVs (using the new lane use factors) are close to the congestion standard follows. In some cases, they are slightly over the standard which would suggest that mitigation is needed at this time. In other cases, they are slightly under the standard and would suggest that mitigation is not needed at this time. Staff believes that this list will assist you in judging the validity of staff's conclusions and recommendations.

Intersection	Policy Area	Standard	CLV	Comment
Aspen Hill Rd & Veirs Mill Rd	Aspen Hill	1550	1591(PM)	Needs improvement
Bauer Dr. & Norbeck Rd	Aspen Hill	1550	1640(PM)	Needs improvement
Beach Dr & Connecticut Av	Beth/ChChase	1650	1677(AM)	Needsimprovement
Frederick Rd & Redland Rd	Derwood	1525	1523(AM)	OK but close
Elton Rd & New Hampshire Av	Fair/WO	1550	1526(AM)	Metered flow
Columbia Pk & Fairland Rd	Fair/WO	1550	1526(AM) 1509(PM)	OK
Briggs Chaney Rd & Columbia Pk	Fair/WO	1550	1609(AM) 1567(PM)	Improve

New Hampshire Av & Pdr Mill Rd	Fair/WO	1550	1634(PM)	Improve
Georgia Av & Plyers Mill Rd	Ken/Wh	1650	1577(AM)	OK
Dennis Av & Georgia Av	Ken/Wh	1650	1579(AM) 1528(PM)	OK
Fieldcrest Rd & Woodfield Rd	MV/Airpark	1500	1525(PM)	Improve
Democracy Bl & Fernwood Rd	N.Beth	1600	1603(PM)	Improve
Twinbrook Pk & Rockville Pk	N.Beth	1600	1621(AM)	Improve
Old Grgtn Rd & Tuckerman Ln	N.Beth	1600	1651(PM)	Improve
Executive Bl & Old Grgtn Rd	N. Beth	1600	1681(AM)	Improve
Georgia Av & MD 108	Olney	1525	1551(PM)	Improve
Emory Ln & Georgia Av	Olney	1525	1497(AM)	OK
Democracy Bl & Seven Locks Rd	Potomac	1525	1618(PM)	Improve
Colesville Rd & Sligo Creek Pk	SS/TakPk	1650	1698(PM)	Improve

DISCUSSION

There are five basic questions to be asked, answered and understood relative to this issue:

1. What is "capacity" and how does capacity relate to the CLV analysis in the LATR Guidelines? How is "capacity" measured? Has it changed over time?

2. What "volume" of traffic is "acceptable" within Montgomery County? Is it different in different policy areas? What is the relationship of "volume" to the congestion standards adopted by Council?

3. What is the relationship between "capacity" (c) and "volume (v)? What is the "v/c ratio" and how does this ratio relate to the congestion standards, HCM method of planning analysis and the CLV methodology used in Montgomery County?

4. Does the change in lane use factors permit more development than was permitted with the old lane use factors? Should the congestion standards be changed or another factor, the "peak hour factor," be added to our methodology to "offset" the effect of the new lane use factors?

5. Has adoption of the new lane use factors increased the risk of excessive delay at signalized intersections in Montgomery County?

In order to understand the relationship of capacity, volume and the congestion standards, a discussion of these critical elements of the LATR process will precede discussion of the "peak hour factor" and its relevance to the planning level of analysis used in the CLV methodology.

What is "Capacity?"

"Capacity" is the number of vehicles that can pass a given point in a given time. It is expressed in "vehicles (or passenger cars) per lane per hour." This is a value that has been measured at locations throughout the United States and can be measured here in Montgomery County. In contrast, the factors used in our CLV analysis procedure, i.e. lane use factors, that initiated these questions have no bearing on "capacity," but rather are related to the calculation of "volume" as discussed later in this memorandum.

The recognized source for defining "capacity" is the *Highway Capacity Manual* (HCM) published by the Transportation Research Board (TRB). The HCM defines capacity for intersections using the "saturation flow" of a lane.

In the 1960s, the saturation flow for a lane at a signalized intersection was considered to be 1,400-1,500 vehicles per lane per hour. That value has increased steadily since that time, as vehicles have become more efficient and traffic engineering knowledge, understanding and application has improved.

In 1985, the HCM recognized a saturation flow rate for a lane at a signalized intersection of 1,800 passenger cars per hour of green. In 1994, the HCM value for saturation flow increased to 1,900. There is consideration to increasing the saturation flow to 2,000 or higher in the Year 2000 edition of the HCM.

What Is Theoretical "Capacity" at a Traffic Signal?

What is the relationship of "capacity" of a lane with 3600 seconds of green time to "capacity" of a lane when a traffic signal is installed? At a traffic signal, there is something called "lost time" which is the time when the indications change from green to yellow to red on each approach to the intersection. Generally, three to four seconds per signal phase or about 10% of the time available to move traffic is assumed to be "lost" at a traffic signal. For example, if saturation flow is 1,900 vehicles per lane per hour, then the capacity of a lane at a traffic signal would be about 1,700 vehicles per hour (90% of 1,900.)

What Is the Real World "Capacity" of a Traffic Signal in Montgomery County?

The capacity of a lane at a traffic signal in Montgomery County is assumed to be 1,700 vehicles per hour. However, actual calculations of critical lane volumes at over 25 intersections in the County using the adopted lane use factors indicate that the saturation flow may be approaching 2,000 vehicles per hour, suggesting that the "capacity" of a lane at a signalized intersection in Montgomery County may be closer to 1,800 vehicles per hour (90% of 2,000) rather than 1,700 (See Appendix A). The measured CLVs at these intersections all are above 1,800 and range from 1,800 to over 2,200 vehicles per lane per hour. Deployment of new technologies associated with the County's Advanced Transportation Management System (ATMS), as well as more aggressive drivers, account for these increased flow rates.

Research studies have verified that the deployment of state-of-the-art technology can increase the efficiency or "capacity" of an arterial road network by about 10%. Montgomery County began installing their computer-controlled traffic signal system in the early 1980s. That system is now fully deployed but is not running "real time," (i.e. signal timing is not yet being adjusted cycle-by-cycle as data is received from detectors.) Also, the County is installing cameras at intersections and providing traveler information to motorists. It is estimated that their system as it exists today has achieved about one-half of the efficiency possible with today's technology. It is important that we recognize and understand the increased "capacity" that has and will be achieved.

Staff is not suggesting that the congestion standards be reevaluated at this time. However, as there is increasing factual evidence that the capacity of our signalized intersections has increased, and as the County continues to deploy more transportation management and traveler information technology, it may be appropriate to consider raising the congestion standards in the future to reflect the levels of congestion desired by policy makers in different areas of the county.

How Is "Volume" Measured at a Signalized Intersection?

Traffic volume at a signalized intersection is measured by manually counting the traffic approaching the intersection from all directions for a period of time, usually four, six or 12 hours, and how much of the total traffic goes through, turns right or turns left. The calculation that is made has become identified in Montgomery County as the "critical lane volume technique." It is a procedure that calculates the "critical lane volume" on each approach to the intersection.

In April 1998, the Board adopted revised LATR Guidelines that included a change in the "lane use factors," i.e. the percent of traffic in the most-used lane of each approach. Specifically, for a two-lane approach, the lane use factor was changed from 0.55 to 0.53, and for a three-lane approach, the lane use factor was changed from 0.40 to 0.37. The change reflected measurements from local video data and is consistent with changes made in the 1994 edition of the HCM.

The new lane use factors resulted in a 1-6% reduction in calculated CLVs compared to use of the old lane use factors, or about 20-100 CLVs. To put this change in perspective, a change of 50 CLVs is equivalent to about 30,000 to 100,000 square feet of office, 7,000 to 20,000 square feet of retail, or 50 to 150 single family residences, depending on whether it is spread over one, two or three lanes. Whereas theoretical changes in CLVs of up to 120 are possible, in practice this magnitude of change is rare since such a change would require that each "critical lane" be a three-lane approach. As an example, the decrease in CLVs using the current lane use factors at ten intersections studied for the Hecht's site in Friendship heights ranged from 0 to 72 and averaged 41 less than they would have been with the previous lane use factors.

The lane use factors originally adopted by the Board (0.55 and 0.40) were the product of work done in the early 1970s. My observations during the 1980s and 1990s suggested that we were doing a better job of moving traffic with the advent of the computer. Particularly at congested intersections, we were making more efficient use of green time and queues were more evenly distributed over the approach lanes. This was confirmed in mid-1998 by actual field data from video cameras that are part of the County's ATMS (Advanced Transportation Management System).

A comparison of CLV calculations to the HCM planning method of analysis indicates that use of the adopted lane use factors, i.e. 0.53 and 0.37, more closely matches the HCM planning method results and can be considered to produce comparable results. Use of flat lane use factors, i.e. 0.50 and 0.333, in the CLV methodology as recommended for intersections at or near capacity in the HCM, produces results that are too optimistic, whereas use of the previous lane use factors, i.e. 0.55 and 0.40, produces results that are too conservative. (See table below)

Procedure	Alternative	Morning Peak Hour		Evening Peak Hour	
		Result (v)	v/c	Result (v)	v/c
HCM	"Standard"	1654	0.97	1212	0.71
Critical	LUF - 50/33	1592	0.94	1170	0.69
Lane	LUF - 53/37	1644	0.97	1204	0.71
Technique	LUF - 55/40	1678	0.99	1226	0.72

What Is the Relationship Between "Capacity" and "Volume"?

The relationship between capacity and volume, as described in the HCM, is defined as the "volume to capacity ratio," or v/c ratio. Simply stated, as it relates to the LATR Guidelines, it is the relationship between a desired maximum volume for a given policy area and the "capacity" of a signalized intersection as defined by the HCM and measured in the field, and is reflected by the congestion standards adopted by Council.

The adopted Congestion Standards for Montgomery County are as follows:

1450	Rural Areas
1500	Clarksburg, Damascus, Gaithersburg, Germantown East and West, Germantown town center, Montgomery Village/Airpark
1525	Cloverly, Derwood, North Potomac, Olney, Potomac, R&D Village
1550	Aspen Hill, Fairland/White Oak, Rockville
1600	North Bethesda
1650	Bethesda/Chevy Chase, Kensington/Wheaton, Silver Spring/Takoma Park

1800 Bethesda CBD, Friendship Heights CBD, Grosvenor, Shady Grove, Silver Spring CBD, Twinbrook, Wheaton CBD, White Flint

The HCM relates v/c values to capacity as follows:

V/C Ratio	Relationship to Capacity
= or < 0.85	Under
0.85 to = or < 0.95	Near
0.95 to = or < 1.00	At
> 1.00	Over

When the County Council adopted the congestion standards in 1994, it was understood that policy areas with a 1,600-1,650 CLV standard were near but not at capacity and that policy areas with a CLV standard of 1,800 were at or slightly above capacity. Assuming a saturation flow of 1,900 vehicles per lane per hour, as the 1994 HCM stated, the "capacity" of a lane at a traffic signal would have been 1,700 vehicles per hour, and the v/c ratios would have been between 0.94 and 0.97 for CLVs between 1,600 and 1,650 and between 1.00 and 1.06 for CLVs between 1,700 and 1,800. **These comparisons of the congestion standards to expected acceptable volumes in different policy areas confirm that the adopted congestion standards conform to national norms, are valid and should not be adjusted.**

If, in fact, the capacity of a lane at a signalized intersection has increased to 2,000 vehicles per hour, as discussed above, then the current congestion standards are conservative and have an inherent safety factor built into them. For example, assuming that saturation flow has increased from 1,900 to 2,000 vehicles per lane per hour, the "capacity" of a lane at a traffic signal has increased from 1,700 to 1,800 vehicles per hour. The v/c ratios would then be between 0.89 and 0.92 for CLVs between 1,600 and 1,650 and between 0.94 and 1.00 for CLVs between 1,700 and 1,800. This would suggest that the congestion standards are more conservative than originally intended when adopted by Council. Based on this evaluation, staff concludes that a "peak hour factor" should not and does not need to be added to the planning level of analysis used in the LATR Guidelines.

What Is the Impact of Use of the New (Correct) Lane Use Factors?

I suggest that you visualize the adopted congestion standards as the height of a bridge under which a truck must pass. The height of the truck is the CLV for a development that includes existing, background and site traffic. With the new lane use factors, the height of the truck is slightly lower than it had been with the old lane use factors. As discussed above, the new lane use factors resulted in a 1-5% reduction in calculated CLVs compared to use of the old lane use factors, or about 20-90 CLVs.

As a result, Developer A may now get under the bridge if total traffic is close to the congestion standard, whereas Developer A would not have cleared the bridge before. However, Developer B who comes along after Developer A will not get under the bridge and will have to mitigate his trips. So it is not a question of allowing more development but rather a question of which developer gets caught under the bridge. What has happened is that a small increment of additional development has been permitted before reaching the congestion standard. Most of the major intersections in the county are already above the applicable congestion standards and are not affected by the change in lane use factors (See Appendix B). Only a very few intersections, as discussed above under "Policy Implications," may be affected by the change.

Should A "Peak Hour Factor" Be Added to the CLV Methodology?

Staff recommends that a "peak hour factor" not be included in the planning level of analysis in the CLV methodology. There is consensus among members of the Traffic Growth Working Group (TGWG) with this recommendation. This is based on at least three concerns.

- A peak hour factor does not improve the accuracy of the CLV calculations.
- The difficulty of determining a peak hour factor for a future condition (consider forecasting the peak 15 minutes in a peak hour five to 20 years in the future).
- It adds complexity to the CLV procedure, and opens up the process to other "adjustment" factors. These have not proven to be useful in previous attempts by others to add such adjustments.

What is the "peak hour factor?" The "peak hour factor" converts peak hourly traffic volumes to flow rates for the peak 15-minute period within that peak hour. This is done by dividing the hourly volume by the peak 15-minute volume multiplied by four. The conversion of hourly volumes to peak flow rates assumes that all movements peak during the same 15-minute period, and is, therefore, a conservative approach. Essentially, it is a "safety factor" to account for peaking of traffic within the peak hour.

If a peak hour factor were used in our process, it would basically increase all CLV's by the amount of the factor. So a 0.95 factor would take the current 1,500 CLV to 1,575. This would "undo" the accuracy gained from the new lane use factors.

An "additional finding" from the Intersection Congestion Working Group (ICWG) report prepared in April 1997 was that "some fine-tuning of the CLV procedures could be tested based on adjustment factors found in the 1994 *Highway Capacity Manual.* These factors could include calculating a peak hour factor accounting for the peaking within the peak hour, and modifying the lane use factors on multiple lane roadways to account for spreading of vehicles more uniformly in congested situations."

In developing the recommendations for the LATR Guidelines in April 1998, staff did consider this issue in recommending the adjustment to lane use factors that were adopted by the Board. The

Highway Capacity Manual (HCM) planning method for calculating delay or congestion at signalized intersections indicates that as the volume approaches the capacity of the intersection, lane use becomes uniform. Staff could have recommended uniform lane use factors and a peak hour factor at that time. This was not considered appropriate.

The HCM recognizes default lane use values when average conditions exist or traffic distribution on a lane group is not known. The default values for two and three lane approaches are 0.525 and 0.367, respectively. Staff believed that it was reasonable and conservative to adopt lane use factors that were consistent with the HCM's default values, i.e. 0.53 and 0.37, even though the HCM would suggest flat lane use factors, i.e. 0.500 and 0.333. Lane use data collected from video cameras at several signalized intersections in Montgomery County confirm that the adopted lane use factors are representative of existing conditions.

In the late 1970's, a national research publication (TRB Circular 212) proposed a CLV procedure with a number of adjustment factors. Applications in real world situations showed the forecast CLV's to be much higher than observations of congestion reflected. These adjustment factors were not well received, and the more complex procedure faded from the technical scene.

Staff believes, and, after some detailed review, most members of the TGWG concur, that there is no technical basis to modify the current planning level of analysis in the CLV methodology to include a peak hour factor. It does not improve the accuracy of the calculations, exceeds the ability of the procedure to be accurate, and makes the procedure more complex. Peak hour factors will move toward 1.0 as volumes increase, so even knowing the current number, there is no practical way to estimate what they will be in the future. The CLV methodology was adopted in Montgomery County in the early 1970s because it was relatively simple and easy to understand, and only needed data always available for a planning-type analysis, i.e. volumes and lane configurations. These are important characteristics to retain.

Has the Risk of Excessive Delay Increased?

The answer simply is NO. A small increment of development can now be approved **before** reaching a congestion standard, but the standards have not changed. In fact, the standards adopted by the Council in 1994 have a safety factor built into them if we assume that the "capacity' of a signalized intersection has increased.

CONCLUSION

In conclusion, a) the lane use factors adopted by the Board in April 1998 are correct, b) it is not appropriate to include a "peak hour factor" in the LATR Guidelines planning level of analysis using the CLV methodology, and c) the congestion standards adopted by Council in 1994 are valid and indeed conservative standards upon which to base decisions regarding the approval of development in Montgomery County.

RW:RCH:cmd

LATR Guidelines Adopted by PB - memo3.wpd

Appendix A

EXISTING CRITICAL LANE VOLUMES ABOVE 1800
(WITH ADOPTED LANE USE FACTORS)

Intersection	Critical Lane Volume AM Peak	Critical Lane Volume PM Peak	Congestion Standard
Twinbrook Pkwy & Veirs Mill Rd	1815		1550
Arcola Ave & Georgia Ave		1820	1650
Lost Knife Rd & Montgomery Village Ave	1821	1828	1500
New Hampshire Ave & Powder Mill Rd	1832		1550
Democracy Blvd & Old Georgetown Rd		1833	1600
Montrose/Randolph Rds & Rockville Pike		1834	1800
Colesville Rd & Sligo Creek Pkwy	1840		1650
Wisconsin Ave & Jones Bridge Rd		1847	1650
Twinbrook Pkwy & Rockville Pike		1851	1800
East Jefferson St & Montrose Rd		1852	1600
Midcounty Hwy & Shady Grove Rd	1853		1800
Georgia Ave & Norbeck Rd	1876		1550
Cedar Ln & Rockville Pike		1875	1650
Ednor/Layhill Rds & Norwood Rd	1910	1816	1525
Executive Blvd & Old Georgetown Rd		1923	1800
Aspen Hill Rd & Connecticut Ave		1955	1550
Columbia Pike & Spencerville Rd	1973	1961	1550
Lockwood Dr & New Hampshire Ave	1912	2003	1550

Democracy Blvd & Seven Locks Rd	2007		1525
Connecticut Ave & East West Hwy		2053	1650
East West Hwy & 16th St		2083	1650
Midcounty Hwy & Woodfield Rd		2089	1525
Georgia Ave & Randolph Rd	2101	1935	1650
Piney Branch Rd & University Blvd	2213	2154	1650
East Jefferson St & Montrose Rd		2268	1600
Connecticut Ave & Jones Bridge Rd		2013	1650

Appendix B

EXISTING CRITICAL LANE VOLUMES BY POLICY AREA (WITH ADOPTED LANE USE FACTORS)

Intersection	Critical Lane Volume AM Peak	PM Peak
POLICY AREA - ASPEN HILL		
Congestion Standard - 1550		
Aspen Hill Rd & Veirs Mill Rd		1591
Bauer Dr & Norbeck Rd		1640
Georgia Ave & Norbeck Rd	1876	
Aspen Hill Rd & Connecticut Ave		1955
POLICY AREA - BETHESDA/CHEVY CHASE		
Congestion Standard - 1650		
Beach Dr & Connecticut Ave	1677	
Wisconsin Ave & Jones Bridge Rd		1847
Cedar Ln & Rockville Pike		1875
Connecticut Ave & East West Hwy		2053
Connecticut Ave & Jones Bridge Rd		2013
POLICY AREA - BETHESDA CBD		
Congestion Standard - 1800		
Bradley Blvd & Wisconsin Ave	1644	1690

POLICY AREA - CLOVERLY

Congestion Standard - 1525

Ednor/Layhill Rds & Norwood Rd	1910	1816

POLICY AREA - DERWOOD

Congestion Standard - 1525

Needwood Rd & Redland Rd	1691	1663
Midcounty Hwy & Shady Grove Rd	1853	
Midcounty Hwy & Woodfield Rd		2089

POLICY AREA - FAIRLAND/WHITE OAK

Congestion Standard - 1550

Briggs Chaney Rd & Columbia Pike		1567
Elton Rd & New Hampshire Ave	1526	
Columbia Pike & Fairland Rd	1526	1509
Briggs Chaney Rd & Columbia Pike	1609	
New Hampshire Ave & Powder Mill Rd	1832	1634
~~New Hampshire Ave & Powder Mill Rd~~		~~1634~~
Lockwood Dr & New Hampshire Ave	1912	2003

POLICY AREA - KENSINGTON/WHEATON

Congestion Standard- 1650

Georgia Ave & Plyers Mill Rd	1577

Dennis Ave & Georgia Ave	1579	1528
Connecticut Ave & Randolph Rd	1551	1514
Georgia Ave & Plyers Mill Rd	1689	
Arcola Ave & Georgia Ave		1820
Georgia Ave & Randolph Rd	2101	1935

POLICY AREA - MONTGOMERY VILLAGE/AIRPARK

Congestion Standard - 1500

Fieldcrest Rd & Woodfield Rd	1682	1525
Centerway Rd & Snouffer School Rd	1662	
Lost Knife Rd & Montgomery Village Ave	1821	1828

POLICY AREA - NORTH BETHESDA

Congestion Standard - 1600

Democracy Blvd & Old Georgetown Rd	1502	1833
Democracy Blvd & Fernwood Rd		1603
Twinbrook Pkwy & Rockville Pike	1621	1851
Old Georgetown Rd & Tuckerman Ln		1651
Executive Blvd & Old Georgetown Rd	1681	1923
Twinbrook Pkwy & Veirs Mill Rd	1815	
Montrose/Randolph Rds & Rockville Pike		1834
East Jefferson St & Montrose Rd		1852

POLICY AREA - OLNEY

Congestion Standard - 1525

Georgia Ave & MD 108		1551

POLICY AREA - POTOMAC

Congestion Standard - 1525

River Rd & Seven Locks Rd	1641	
Democracy Blvd & Seven Locks Rd	2007	1618

POLICY AREA - SHADY GROVE

Congestion Standard - 1800

Frederick Rd & Shady Grove Rd	1590	1575
Frederick Rd & Redland Rd	1523	

POLICY AREA - SILVER SPRING CBD

Congestion Standard - 1800

Colesville Rd & Georgia Ave	1676	1631
Colesville Rd & East West Highway		1684
Colesville Rd & 16th St		1664
East West Hwy & 16th St		2083

POLICY AREA - SILVER SPRING/TAKOMA PARK

Congestion Standard - 1650

Colesville Rd & Dale Dr		1509
Colesville Rd & Sligo Creek Pkwy	1840	1698
Piney Branch Rd & University Blvd	2213	2154

POLICY AREA - WHEATON CBD

Congestion Standard - 1800

University Blvd & Veirs Mill Rd		1583
Georgia Ave & University Blvd	1506	

POLICY AREA - WHITE FLINT

Congestion Standard - 1800

Nicholson Ln & Rockville Pike		1592

F 2-18-99

To: Planning Board
VIA FAX 301 495 1320

February 5, 1999

From: John G. Viner, P.E.

Subject: February 18th Agenda Item 'Lane Use Factors in LATR Guidelines'

I think it would be helpful for the Planning Board to review the July 14, 1998 letter from the County Council President to Mr. Hussman on this topic. A copy is enclosed for your convenience. Note the concern of the Council on the question has the new Lane Use Factor (LUF) caused a significant de-facto change in congestion standards?

We now know the answer. The new LUF lowers calculated CLV by 70-120, for multi-lane intersections where congestion is a concern. County congestion standards have been degraded by 50% to 80% of an entire Level of Service (LOS) as LOS levels cover a 150CLV band. This is obviously a significant degradation in standards requiring corrective measures as outlined in the last paragraph of Mr. Leggett's letter.

2/15

MONTGOMERY COUNTY COUNCIL
ROCKVILLE, MARYLAND

OFFICE OF THE COUNCIL PRESIDENT

July 14, 1998

Mr. William H. Hussmann, Chairman
Montgomery County Planning Board
8787 Georgia Avenue
Silver Spring, Maryland 20910-3760

Dear Mr. Hussmann:

We received a copy of your response to John Viner's letter raising concerns about the Planning Board's having revised the lane-use factors utilized in the calculation of intersection capacity under the Local Area Transportation Review (LATR) Guidelines. We have received similar letters from the Montgomery County Civic Federation and the Greater Colesville Citizens Association (attached).

We appreciate your willingness to review this matter again. While it is clear to us that the Board has full authority to adjust the lane-use factors or any of factors or rates used to calculate the critical lane volume at intersections, we need to understand how the calculated CLV relates to the LATR standards, which we have the responsibility to adopt. In particular, the Intersection Congestion Working Group attempted to draw a mathematical relationship between the calculated CLV and actual travel delay in order to determine whether the LATR standards we had adopted (1800 CLV in Metro Station policy areas, ranging from 1650 to 1450 CLV elsewhere) were appropriate. In the review of the ICWG's work as part of the Policy Element of the FY 98 Annual Growth Policy, the Council decided to confirm the current standards. However, adjusting the lane-use factor in some instances would change the calculated CLV, and in those instances the relationship to actual travel delay would be altered.

Therefore, in your review we request that the Board pay particular attention to the relationship between the calculated CLV and actual delay. If the Board finds that relationship is sufficiently changed to the point where the LATR standards should be adjusted, then we would entertain a proposed amendment to the Policy Element that would allow us to effect such an adjustment. Alternatively the Board may wish to consider other factors in the LATR Guidelines, such as the inclusion of a peak-hour factor suggested by GCCA.

Sincerely,

Isiah Leggett
Council President

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Attachments