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MEMORANDUM

To: Technical Committee Members

From: Donald McAuslan,
Transportation Planner II

Subject: Technical Report for Regional Mobility and Accessibility Study

Date: September 29, 2006

This document is the latest version of the Technical Report for the Regional Mobility and Accessibility Study. The Joint Technical Working Group committee members have been providing staff with useful suggestions, and we are continuing to incorporate those suggestions into the report. An updated version of this report with an executive summary will be provided at the Technical Committee meeting, October 6th, 2006.

Regional Mobility and Accessibility Study

Alternative Land Use and Transportation Scenarios
Technical Report

DRAFT

September 15, 2006

National Capital Region Transportation Planning Board

Executive Summary

1. Introduction
2. Study Purpose
3. Organizational Structure for Study
4. Study Approach
5. Measures of Effectiveness
6. Shortcomings of the 2000 CLRP Relative to the TPB vision
7. Baseline Regional Congestion Management Scenario (CLRP+)
8. Description of Land Use and Transportation Scenarios
 - 8.1. Higher Households in Region
 - 8.2. More Households in Inner Area
 - 8.3. More Job in Outer Areas
 - 8.4. Region Undivided
 - 8.5. Transit Oriented Development
9. Scenario Analysis
 - 9.1. Higher Households in Region
 - 9.2. More Households in Inner Area
 - 9.3. More Job in Outer Areas
 - 9.4. Region Undivided
 - 9.5. Transit Oriented Development
10. Summary of Major Findings
 - 10.1. Results to Date
 - 10.2. Next Steps
 - 10.2.1. Hot Lane Scenario
 - 10.2.2. Composite Scenario

Appendix

(See “Alternative Land Use and Transportation Scenarios Technical Report Appendices”)

1. Introduction

The Regional Mobility and Accessibility Study grew out of the dissatisfaction expressed by members of the National Capital Region Transportation Planning Board (TPB) in voting to approve a Constrained Long-Range Transportation Plan (CLRP) in 2000 that showed the performance of the regional transportation worsening significantly over the next 25 years. Because federal requirements limit the transportation facilities included in the CLRP to only those that can be funded with revenues currently projected to be available over the next 25 years and the fact that most of the projected revenues will be needed to maintain and operate the existing transportation system, little funding is left for new roads and transit. Thus, with the high rates of population and employment growth forecast for our region, future travel demands on the regional highway and transit networks are expected to greatly exceed our current financial capacity to accommodate this growth in demand.

In response to the concerns expressed about the 2000 CLRP, the TPB called for a special study, entitled the “Improving Regional Mobility and Accessibility Study.” The desire of the TPB in authorizing this study was to evaluate alternative options to improve mobility and accessibility in the region and to identify additional highway and transit facilities beyond those included the 2000 CLRP that would improve mobility and accessibility between and among regional activity centers and the regional core. It was also directed that by the members of the TPB that this study examine future land use as well as transportation improvement in evaluating alternative options to improve regional mobility and accessibility.

The concept underlying the Regional Mobility and Accessibility Study is that by examining additional transportation improvements together with potential land use changes focusing more future growth in regional activity centers, creative new options for improving the future performance of the region’s transportation can be identified. Further, if some of these options are attractive enough to all the stakeholders in the regional transportation planning process, a consensus may be reached on some of them and this consensus would enable the region to move forward to find the needed revenues to implement the most promising additional transportation improvements and to make necessary changes in local land use plans.

This technical report discusses and documents the technical analysis and evaluation of the five alternative land use and transportation scenarios examined in the first phase of the Regional Mobility and Accessibility Study.

2. Study Purpose

The stated purpose of the Regional Mobility and Accessibility Study as defined by the TPB Resolution on this study is to:

“evaluate alternative options to improve mobility and accessibility between and among regional activity centers and the regional core.” This study “shall include the identification of ‘additional highway and transit circumferential facilities and capacity, including Potomac River crossings where necessary and appropriate, that improve mobility and accessibility between and among regional activity centers and the regional core’ (Vision Goal 2, Strategy 5) and that take into consideration the adopted land use plans of individual jurisdictions. The study shall also include the development of ‘a regional congestion management program, including coordinated regional bus service, traffic operations improvements, transit, ridesharing, and telecommuting incentives, and pricing strategies.’ (Vision Goal 5, Strategy 1.)” [TPB Resolution TPB R12-2001]

3. Organizational Structure for Study

The TPB has provided overall policy direction and guidance on the Regional Mobility and Accessibility Study throughout this study. Several special work sessions with the TPB were held at the beginning of this study and the TPB has been regularly briefed on the major findings of the technical analysis as results have become available. Staff has also briefed the COG Board and the Metropolitan Development Policy Committee (MDPC) on this study as work has progressed.

Technical insight and guidance on the conduct of the RMAS was provided by a Joint Technical Working Group (JTWG) composed of members of the TPB Technical Committee, the Planning Directors’ Technical Advisory Committee and the MWAQC Technical Advisory Committee. In addition, the TPB’s Citizen Advisory Committee and the citizen advisory committees to MWAQC and MDPC were also invited to participate in the meetings of the JTWG.

During the years of the study, JTWG has provided continuing technical guidance to staff in the development and conduct of a work plan to carry out this study. These work plan activities have included: (1) development of Measures of Effectiveness (MOEs), (2) analysis of the 2000 CLRP using the study MOEs and identification of its shortcomings relative to the TPB Vision, (3) specification of the elements of a regional congestion management scenario to be tested as part of this study, and (4) development of five alternative land use scenarios for analysis and testing.

4. Study Approach

In providing guidance on the general outlines of the request study, the TPB directed staff to use a “building block” approach. The first building block in this approach was to identify a set of measures of effectiveness by which the alternative options for improving regional mobility and accessibility would be evaluated. The second step was to apply these measures of effectiveness to the current CLRP to identify the short-comings of this plan relative to the TPB’s Vision adopted in 1998. Next, with the active involvement of TPB, Metropolitan Development Policy Committee (MDPC), and Metropolitan Washington Air Quality Committee (MWAQC) technical and citizen committee members, several alternative regional transportation and land use scenarios for 2030 that could address the identified short-comings of the CLRP would be developed, specified, and analyzed. It was also directed by the TPB that a “regional congestion management” scenario focusing on operational and management improvements to maximize the region’s existing and planned investment in transportation infrastructure be developed and analyzed first and serve as a baseline for comparison with the alternative land use and transportation scenarios. In the second phase analysis of this study, one or two “composite scenarios” are to be further developed, analyzed and evaluated.

5. Measures of Effectiveness

After much discussion by the TPB and the JTWG, twelve major categories for Measures of Effectiveness (MOE) were identified for this study. These are:

- Land Use
- Travel Modal Shares
- Per Capita Vehicle Miles Traveled
- Highway and Rail Transit Congestion levels
- Peak Period Accessibility by Travel Mode
- Airport, Inter-City rail and Bus Accessibility
- Freight (Measure of Information)
- Air Quality- Mobile Emissions
- Water Quality-Indicators of Imperviousness (Measure of Information)
- Energy Consumption per Unit of Travel
- Water Quality- Nitrogen Deposition from Mobile Sources
- Safety (measure of Information)

The members of the JTWG then specified specific performance measures for each of these major MOE categories. These detailed MOE performance measures are discussed in the text of this report and presented in the technical report appendices.

6. Shortcomings of the 2000 CLRP Relative to the TPB Vision

Applying the identified MOEs the following major shortcomings of the 2000 CLRP Relative to the TPB Vision were identified:

- The region is forecast to add twice as many jobs as households.
- The region is projected to need an additional 250,000 in-commuters from outside the region.
- Regional activity centers/clusters are expected to capture 70% of the region's future employment growth, but only 40% of its household growth
- Only 30% of the region's employment growth and 20% of its household growth is expected to occur near Metrorail and commuter rail stations.
- Daily vehicle miles of travel are projected to increase significantly.
- Peak period highway and transit congestion is expected to become worse.
- Growth is uneven between the eastern and western portions of the region.
- Significant concern has been expressed about how current growth and transportation trends will impact future air and water quality in the region.

7. Baseline Regional Congestion Management Scenario

A baseline “regional congestion management” scenario focusing on operational and management improvements to maximize the region’s existing and planned investment in transportation infrastructure was developed in accordance with the direction provided by the TPB and JTWG. This baseline scenario, termed the CLRP+, consisted of the latest forecast of future growth at the time, the COG Round 6.4 Cooperative growth forecasts, and the 2003 CLRP highway and transit networks. Traffic management and operational enhancements were assumed for the CLRP highway network and a significantly increased frequency of rail and bus service was assumed for the CLRP transit.

The most significant assumption for this baseline scenario compared to the 2003 CLRP was the assumption that WMATA would have the necessary funding to accommodate all forecast rail and bus ridership in 2030. In the 2003 CLRP, forecast transit ridership in 2030 for trips to and through the regional core area were reduced to projected 2005 ridership levels. The reason for this “transit constraint” in the 2003 CRLP was that WMATA, prior to the Metro Matters funding agreement, could not identify the source of the funding that would be needed to purchase the additional rail cars and buses that would needed to accommodate projected regional core area-related ridership growth after 2005.

8. Description of Land Use and Transportation Scenarios

The Planning Directors, working with the JTWG and TPB Citizen Advisory Committee, were asked to push the envelope when determining the general nature of the land use scenarios, but they were to do so while following some general guidelines. The first idea considered was that of achieving balance in the number of jobs to workers. This was done on three levels. Because many of our region’s jobs are filled by in-commuters from external counties, the first level was at a regional scale. Secondly, the Planning Directors considered jurisdictional jobs / workers balance. And thirdly, they considered the jobs / workers balance in the Regional Activity Clusters. The total amount of jobs and / or households shifted in a scenario was very dependent on satisfying one or more levels of this jobs / workers balance.

Also, it was decided that only future growth between 2010 and 2030 would be affected. Any development before 2010 was considered too far along in the process to be changed. Existing households and employment development was considered untouchable, but infill development was considered acceptable.

And because all land use changes dealt with growth after 2010, the Planning Director’s did not have to stay within existing zoning laws and comprehensive plans. They did however have to make reasonable decisions as to where the shifts in household and employment growth would occur. In general, no matter the scenario, households and jobs were shifted from outside of Regional Activity Clusters to either inside them or near transit facilities. However, the Planning Directors did carefully examine all the TAZs

inside of Regional Activity Clusters and those that were in close proximity to transit stations to determine if they were ripe for added household and / or employment growth. In some instances, certain TAZs were legitimately considered off-limits. For example, a TAZ in Prince William County might have been an ideal candidate for added household and employment growth in some scenarios, but a new housing development had recently been built in this area and it would not have been politically feasible to even consider rebuilding on this tract of land. Also, it was originally determined that an additional 225,000 households were needed to satisfy the region's employment demand. These households were spread around the region, but some jurisdictions could not entirely absorb their allotment. Both Fairfax County and the District of Columbia absorbed tens of thousands of households, but believed they had absolutely gone as far as they possibly could.

Five alternative land use scenarios were used for analysis in this study. These scenarios were developed by the region's Planning Directors with the active involvement of the members of the JTWG and the TPB Citizen Advisory Committee.

These five alternative land use scenarios are:

- Higher Household Growth in Region
- Transit-Oriented Development
- Region Undivided
- More Households in Inner Areas
- More Jobs in Outer Areas

8.1 Higher Households in Region Scenario

The **Higher Households in Region** land use scenario examines the transportation impacts of reducing the forecast growth in long distance commuting trips to the Washington region from external areas, by providing more future housing opportunities for workers to both live and work in the metropolitan region. It assumes an additional 216,000 households beyond those forecasted in the Round 6.4 Cooperative Forecast. Growth forecasts for the year 2030 would be added to the metropolitan Washington region in the inner suburbs and core areas of the region. Correspondingly, commuting and other vehicle trips from areas outside of the region would be reduced by an amount equivalent to the number of trips that would have been made by the additional households if they had located outside of the Washington region. The assumed additional 216,000 households would represent approximately a 9% increase in the total number of households in the region by 2030 and would increase projected 2010 to 2030 household growth in the region by 60%.

Table 6.a- Higher Households in Region Scenario: Percent Change in Households and Employment

Higher Households in Region						
Jurisdictions	Households (Year 2030)			Employment (Year 2030)		
	CLRP+	Higher Households	Percent Change	CLRP+	Higher Households	Percent Change
District of Columbia	304,400	358,700	17.8%	831,200	831,200	0.0%
Montgomery County	417,400	466,000	11.6%	651,900	651,900	0.0%
Prince Georges County	372,400	411,000	10.4%	553,000	553,000	0.0%
Arlington County	116,700	127,200	9.0%	275,800	275,800	0.0%
Alexandria	75,300	85,600	13.7%	141,000	141,000	0.0%
Fairfax County	453,100	506,600	11.8%	801,100	801,100	0.0%
Loudon County	163,900	163,900	0.0%	258,100	258,100	0.0%
Prince Williams County	182,400	182,400	0.0%	209,400	209,400	0.0%
Frederick County	120,200	120,200	0.0%	177,800	177,800	0.0%
Charles County	76,100	76,100	0.0%	69,100	69,100	0.0%

In addition to increasing the number of households in the region, this scenario includes various transit assumptions, inclusive of five different facility types including Metro rail extensions, VRE extensions, light rail construction, a dedicated busway, and “transitway” construction. Transitway could vary between light rail and bus rapid transit, but for these facilities it has not been decided specifically which it will be. These facilities are located in the District and ten other counties around the region. The Transportation Scenarios Subgroup decided to use the exact same transit assumptions for the **Higher Households in Region** scenario, as the TOD scenario. Transit assumptions include approximately 54 miles of light rail is added in the District. Additional light rail includes connecting Silver Spring to New Carrollton (Bi-County Connector), along the Corridor Cities Transitway, south from Branch Avenue to Waldorf, and along Columbia Pike in Arlington County. to just inside Fairfax County. VRE extensions are added from Manassas to Haymarket and Spotsylvania County. There is a Metro rail extension to Centreville and connection of Eisenhower Avenue and Branch Ave. stations. Prince George’s County receives approximately 42 miles of transitway along, MD 210, MD 193, Rt. 1, and Pennsylvania Avenue. Additional transitway is also added long Rt. 1 in Virginia from Pentagon City to the Joplin area in Prince William County.

Figure 6.b- Higher Households in Region Scenario: Change in Number of Households

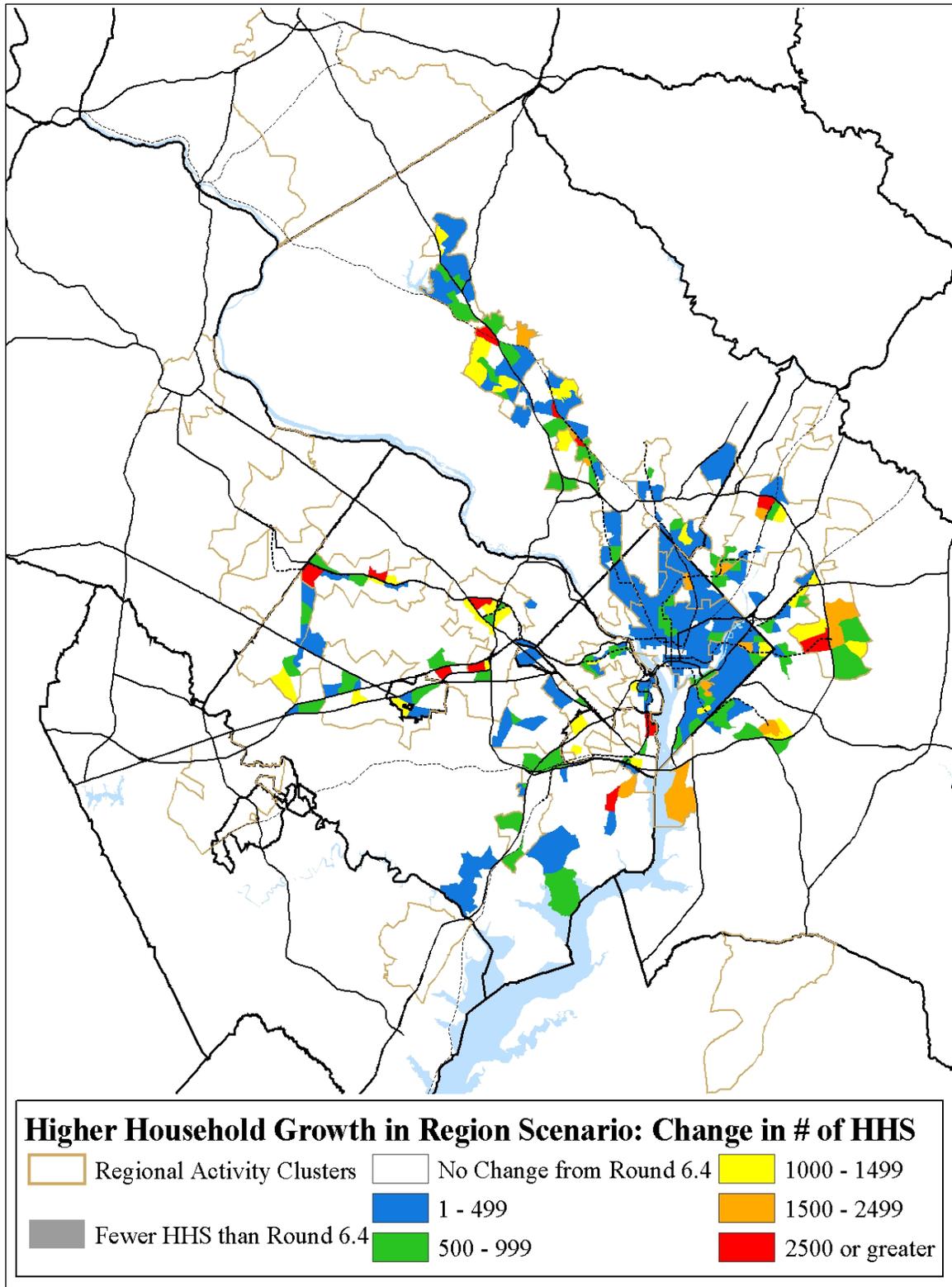
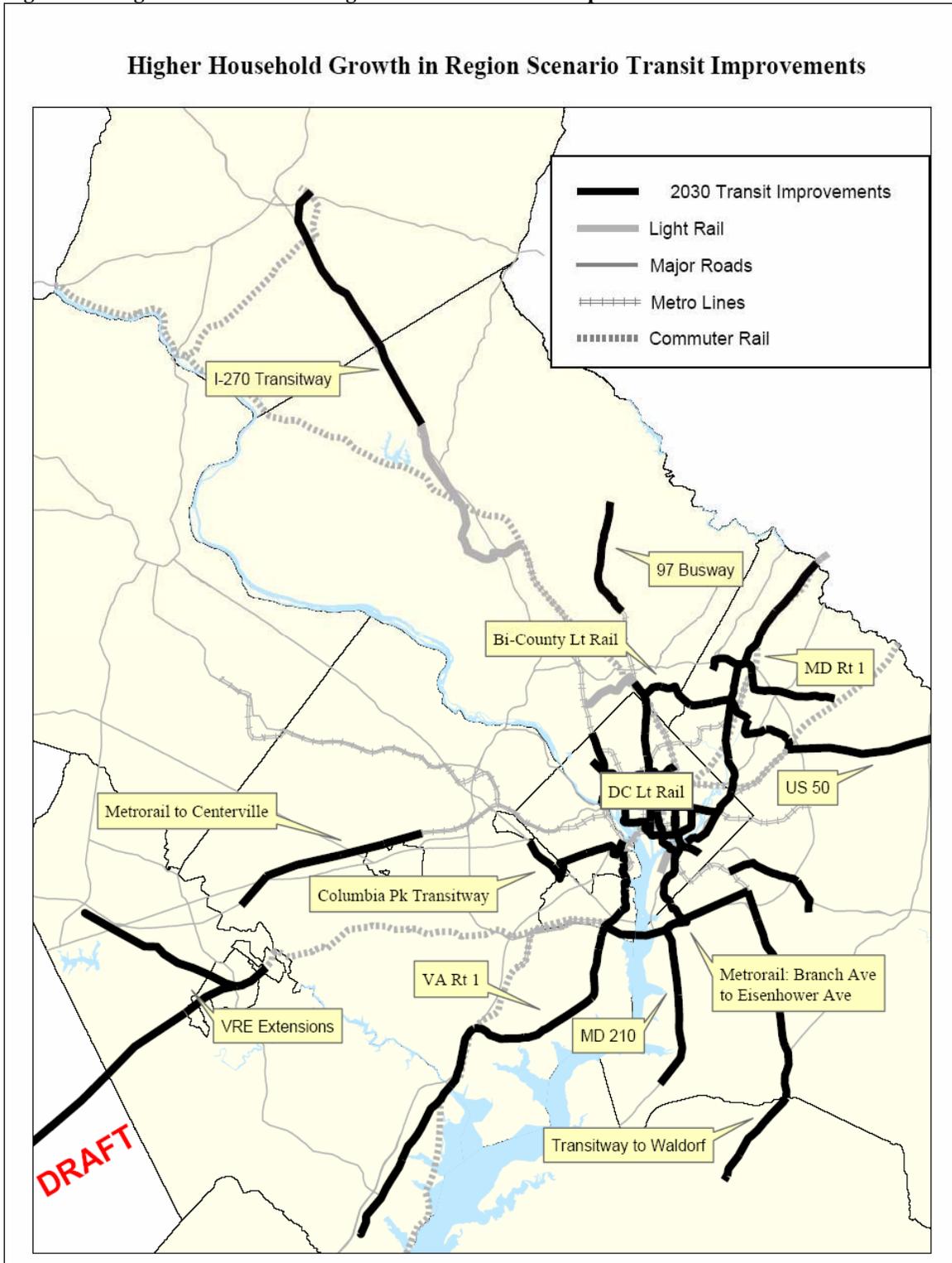


Figure 6.c- Higher Households in Region Scenario: Transit Improvements



8.2 More Household Growth in Inner Areas Scenario

The **More Household Growth in Inner Areas** land use scenario places more of the forecast household growth in areas closer to major regional employment concentrations in core area jurisdictions. It examines the transportation impacts of reducing average commuting distances by providing more housing opportunities closer to major regional employment concentrations in the inner areas of the region and by improving the mix of job and housing opportunities within regional activity clusters. This scenario assumes a shift of approximately 84,000 households, 23% of the forecast 2010 to 2030 household growth in the region, from areas outside of regional activity clusters to regional activity clusters in inner suburban and core area jurisdictions projected to have the greatest jobs/housing imbalance in 2030. The 2010 to 2030 household growth increment for Montgomery County will remain the same. Prince George's County's household growth increment will be reduced by 32,400 to achieve a 1.67 jobs/household ratio. Fairfax County/Cities household growth increment will be increased by 32,400 to achieve a 1.77 jobs /household ratio. The 2010 to 2030 household growth increment for the outer suburban jurisdictions of Prince William, Stafford, Charles and Calvert will be reduced by slightly more than one-half. Because Loudoun County forecasts a desirable 1.64 jobs/household ratio for 2030, Loudoun County's Round 6.4 household growth increment will remain unchanged for this scenario. The 2010-2030 household growth increment for Frederick will be reduced by 6,500 households so it also attains a more desirable 1.56-jobs/household ratio. Re-allocating some of the forecast 2010-2030 household growth from areas outside of activity clusters to region's core area jurisdictions and activity clusters would improve the jobs-housing balance throughout the region in 2030.

Table 7.a More Households in Inner Area Scenario: Percent Change in Households and Employment

More Households in Inner Areas						
Jurisdictions	Households (Year 2030)			Employment (Year 2030)		
	CLRP +	Households In	Percent Change	CLRP+	Households In	Percent Change
District of Columbia	304,400	342,800	12.6%	831,200	831,200	0.0%
Montgomery County	417,400	417,400	0.0%	651,900	651,900	0.0%
Prince Georges County	372,400	340,000	-8.7%	553,000	553,000	0.0%
Arlington County	116,700	120,200	3.0%	275,800	275,800	0.0%
Alexandria	75,300	84,700	12.5%	141,000	141,000	0.0%
Fairfax County	453,100	485,500	7.2%	801,100	801,100	0.0%
Loudon County	163,900	163,900	0.0%	258,100	258,100	0.0%
Prince Williams County	182,400	164,800	-9.6%	209,400	209,400	0.0%
Frederick County	120,200	113,700	-5.4%	177,800	177,800	0.0%
Charles County	76,100	63,900	-16.0%	69,100	69,100	0.0%

The **More Households in Inner Areas** scenario transit assumptions include approximately 54 miles of light rail is added in the District. Additional light rail includes connecting Silver Spring to New Carrollton (Bi-County Connector) and, along Columbia Pike in Arlington County, to just inside Fairfax County. There is a Metro rail extension to Centreville and the connection of Eisenhower Avenue and Branch Avenue stations. And in Virginia there is transitway south on Rt. 1, but only to I-95S.

Figure 7.b- More Households in Inner Areas Scenario: Change in Number of 2030 Households

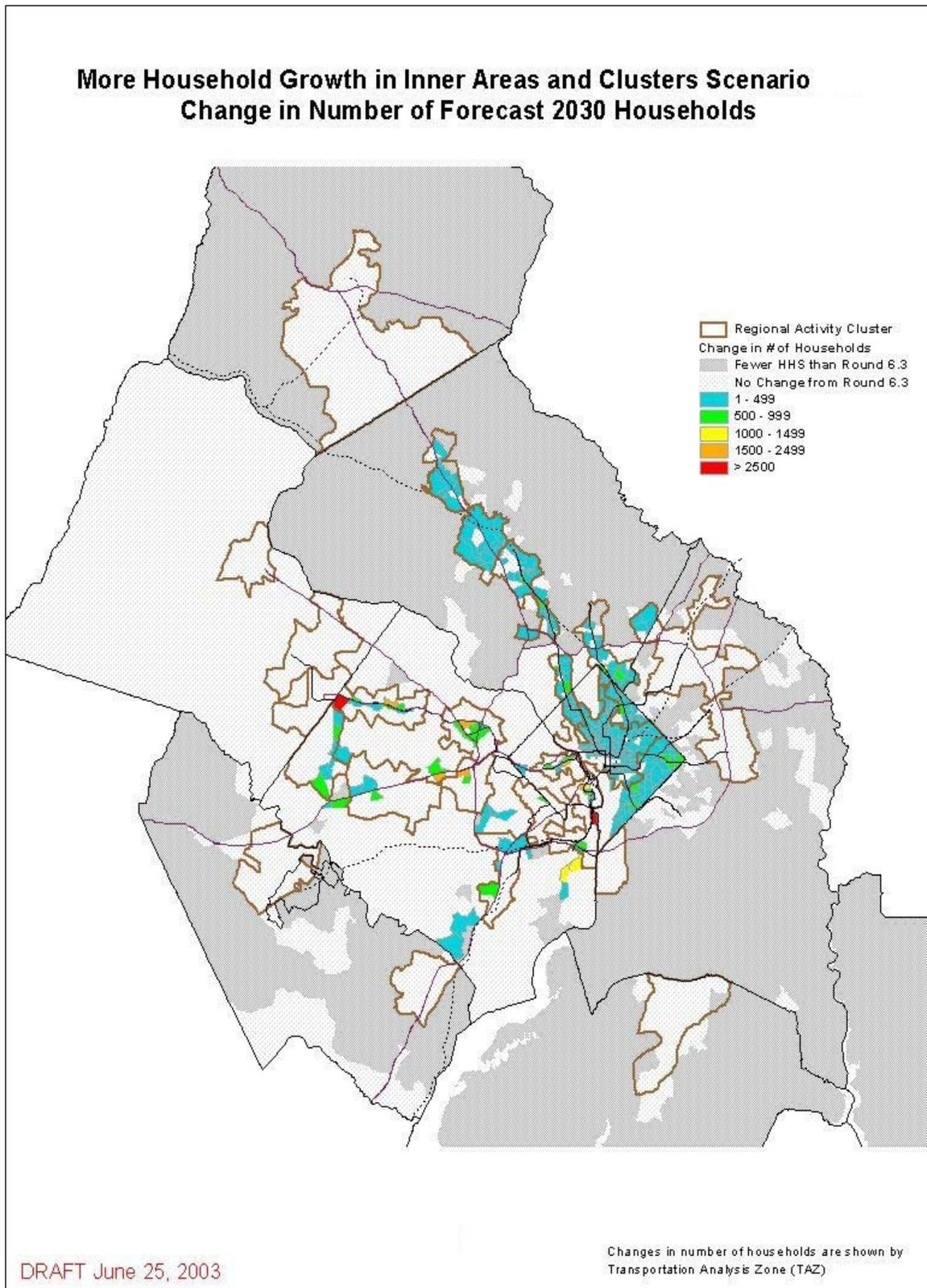
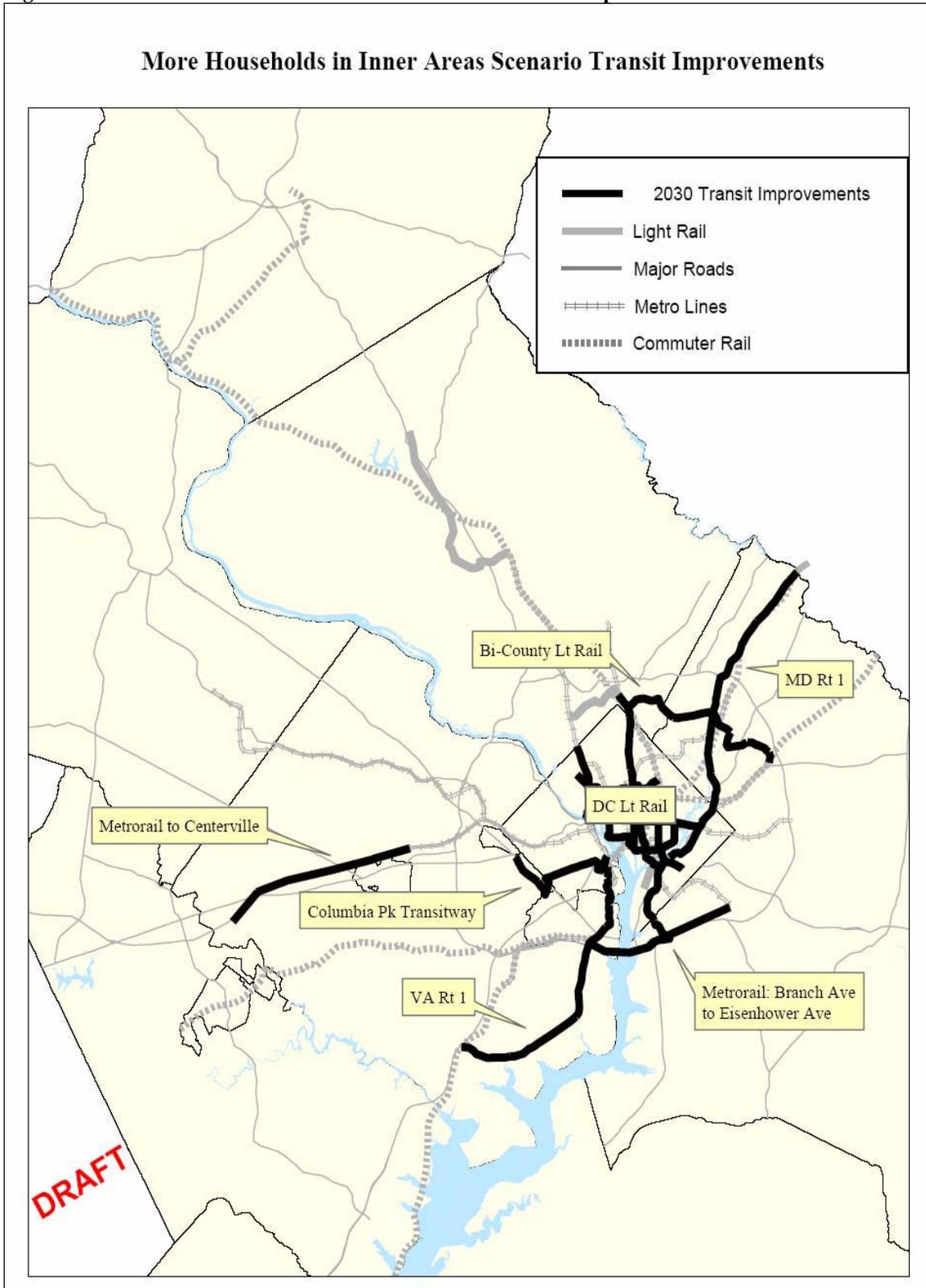


Figure 7.c- More Households in Inner Areas Scenario: Transit Improvements



8.3 More Jobs in Outer Areas Scenario

The **More Jobs in Outer Areas** land use scenario places more of the forecast job growth in the outer suburban jurisdictions that are projected to have more workers than jobs in 2030. This scenario examines the transportation impacts of reducing average commuting distances by providing more employment opportunities closer to major residential concentrations of workers in the outer areas of the regions. It assumes a shift of approximately 82,000 jobs, approximately 11% of the forecast 2010 to 2030 employment growth, to regional activity clusters in the outer suburban jurisdictions from core area jurisdictions projected to have more jobs than workers. Re-allocating some of the forecast 2010-2030 job growth from the region's core area jurisdictions to its outer suburban jurisdictions would improve the jobs-housing balance throughout the region in 2030. The 2010 to 2030 employment growth increment assumed for the outer suburban jurisdictions will be adjusted such that Loudoun and Frederick Counties have a 1.63 and 1.68-jobs/household ratio respectively; Prince William Counties/Cities has 1.44-jobs/household ratio. Charles has approximately a 1.00-jobs/household ratio. Because Loudoun County forecasts a desirable 1.63 jobs/household ratio for 2030, Loudoun County's Round 6.4 2010 to 2030 job growth increment will remain unchanged for this scenario. The 2010 to 2030 employment growth increment for core area jurisdictions (DC, Arlington, and Alexandria) will be reduced by 84,500, resulting in a 2.48 jobs/household ratio for the core. The 2010 to 2030 employment growth increment for the inner suburban jurisdictions (Montgomery, Prince George's and Fairfax Counties) will remain virtually unchanged from Round 6.4.

Table 8.a- More Jobs in Outer Areas Scenario: Percent Change in Households and Employment

More Jobs in Outer Areas						
Jurisdictions	Households (Year 2030)			Employment (Year 2030)		
	CLRP +	More Jobs	Percent Change	CLRP+	More Jobs	Percent Change
District of Columbia	304,400	304,400	0.0%	831,200	788,300	-5.4%
Montgomery County	417,400	417,400	0.0%	651,900	651,900	0.0%
Prince Georges County	372,400	372,400	0.0%	553,000	553,000	0.0%
Arlington County	116,700	116,700	0.0%	275,800	244,400	-12.8%
Alexandria	75,300	75,300	0.0%	141,000	133,300	-5.8%
Fairfax County	453,100	453,100	0.0%	801,100	801,100	0.0%
Loudon County	163,900	163,900	0.0%	258,100	258,100	0.0%
Prince Williams County	182,400	182,400	0.0%	209,400	250,800	16.5%
Frederick County	120,200	120,200	0.0%	177,800	187,800	5.3%
Charles County	76,100	76,100	0.0%	69,100	84,500	18.2%

The **More Jobs in Outer Areas** scenario transit assumptions include light rail connecting Silver Spring to New Carrollton (Bi-County Connector) and the Corridor Cities Transitway. VRE extensions are added from Manassas to Haymarket and Spotsylvania County, and a Metro rail extension to Centreville. Added transitway is along Rt. 1 in Virginia from Pentagon City to the Joplin area in Prince William Co

Figure 8.b- More Jobs in Outer Areas Scenario: Change in Number of 2030 Jobs

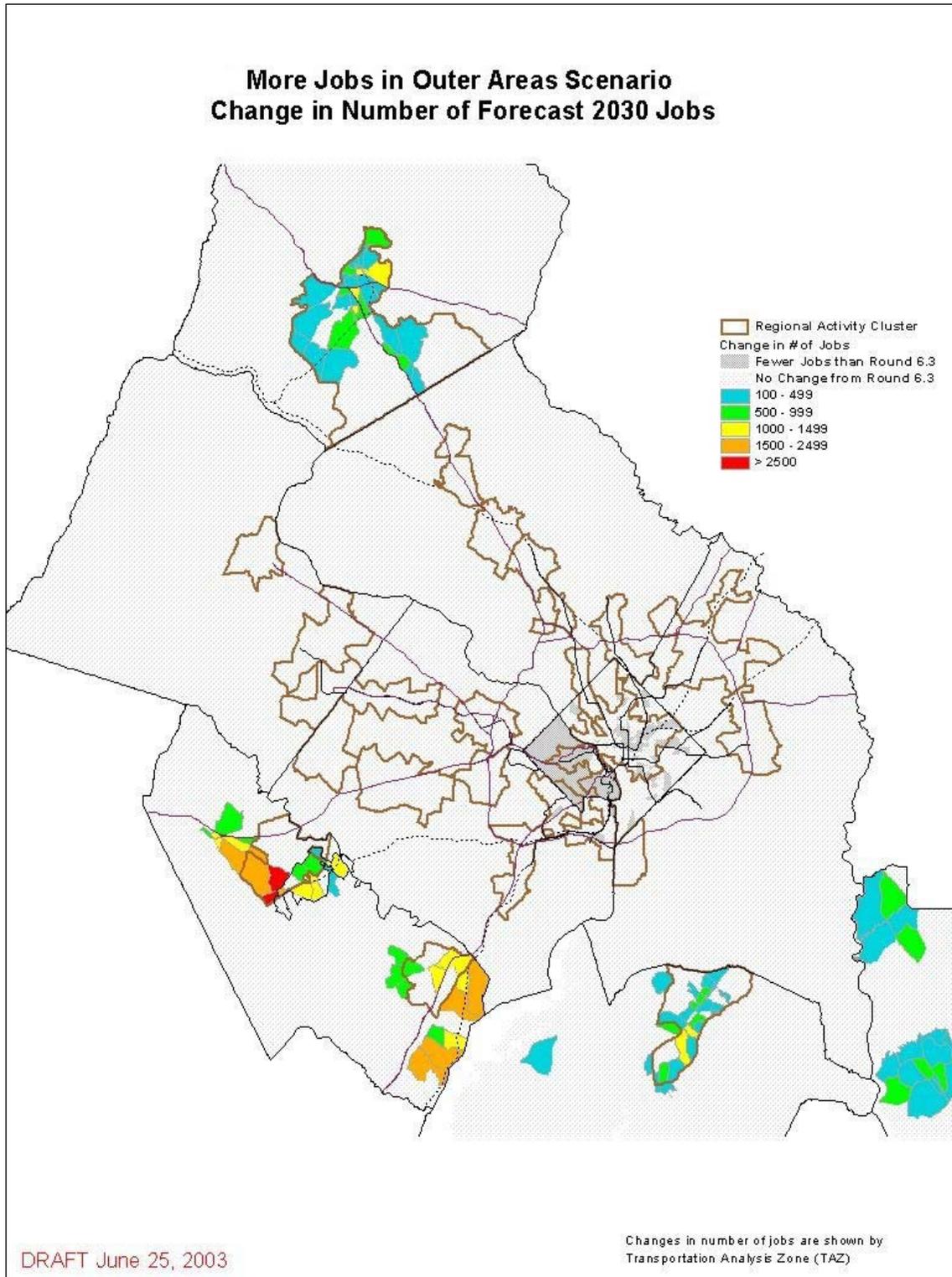
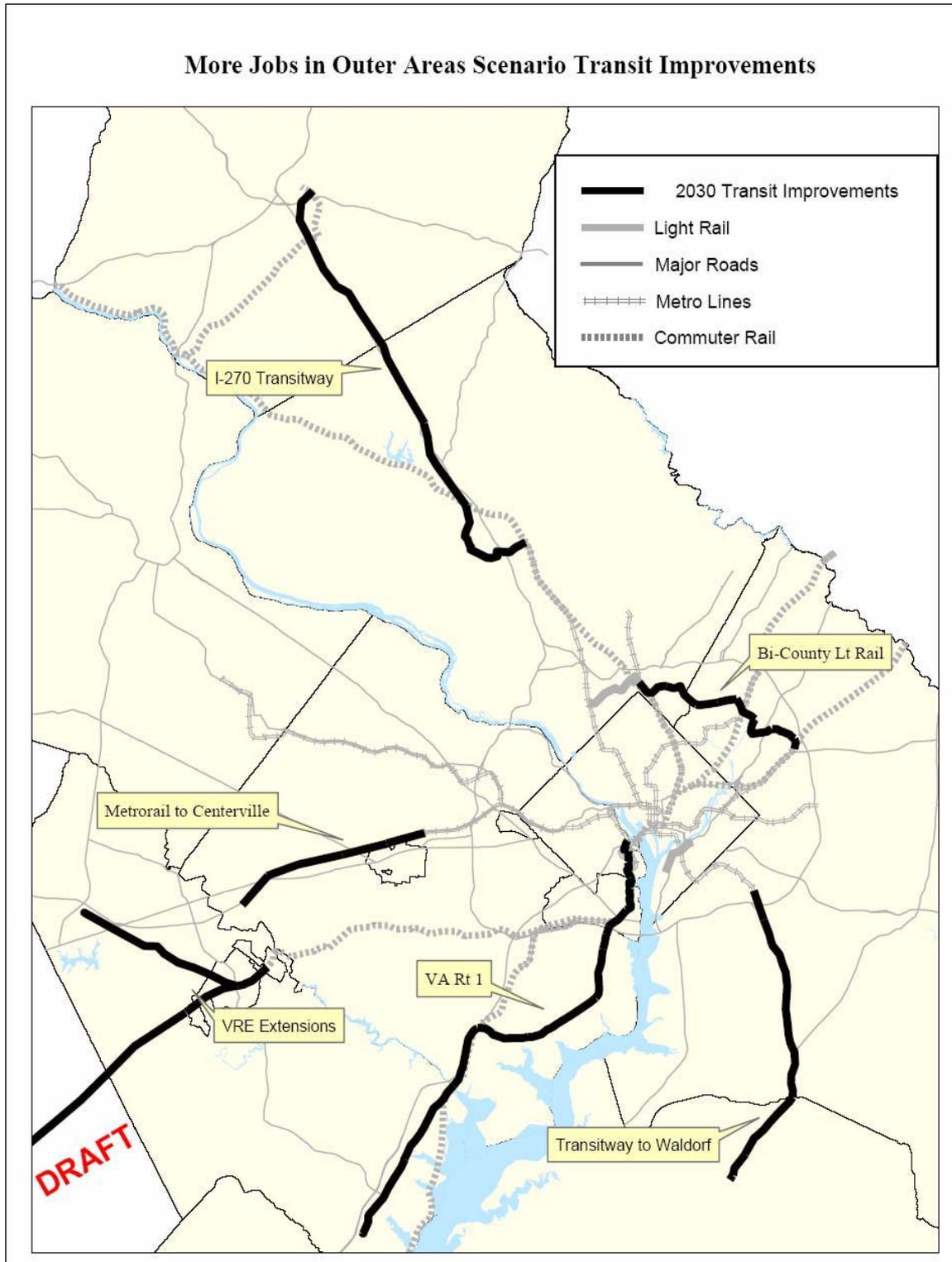


Figure 8.c- More Jobs in Outer Area Scenario: Transit Improvements



8.4 Region Undivided Scenario

The **Region Undivided** scenario examines the transportation impacts of a land uses that address some of the problems noted in the Brookings' "A Region Divided"¹ report, such as the job and transportation divide in the region. Jurisdictions, in the eastern portion of the region, receiving additional job and household growth will place it within their regional activity clusters, near transit centers, or in other areas within their jurisdiction in a concentrated manner (e.g. new Regional Activity Clusters). More household and employment growth between the years 2010-2030 would be assumed in areas east of 16th NW in the District of Columbia, east of I-95 in Prince George's County (and part of Montgomery County between 16th NW in DC, and I-95 in Prince Georges's) in Maryland and east of I-95 in Arlington County, Alexandria, Fairfax County and Prince William County in Virginia, particularly in areas around transit stations . This scenario assumes a shift of approximately 114,000 jobs (15% of the 2010 to 2030 employment growth and 57,000 households (16% of the 2010 to 2030 household growth) to regional activity clusters in the eastern portion of the region from areas outside of regional activity clusters in the Western portion of the region. No significant change in forecast 2030 regional jobs and household totals would be assumed for this scenario.

Table 9.a- Region Undivided Scenario: Percent Change in Households and Employment

Region Undivided						
Jurisdictions	Households (Year 2030)			Employment (Year 2030)		
	CLRP +	Region Undivided	Percent Change	CLRP+	Region Undivided	Percent Change
District of Columbia	304,400	324,600	6.6%	831,200	871,100	4.6%
Montgomery County	417,400	415,100	-0.6%	651,900	640,900	-1.7%
Prince Georges County	372,400	391,600	5.2%	553,000	587,700	5.9%
Arlington County	116,700	120,700	3.4%	275,800	283,600	2.8%
Alexandria	75,300	79,600	5.7%	141,000	149,500	5.7%
Fairfax County	453,100	455,100	0.4%	801,100	799,000	-0.3%
Loudon County	163,900	134,000	-18.2%	258,100	209,700	-23.1%
Prince Williams County	182,400	174,900	-4.1%	209,400	195,400	-7.2%
Frederick County	120,200	107,500	-10.6%	177,800	157,600	-12.8%
Charles County	76,100	78,600	3.3%	69,100	74,000	6.6%

The Region Undivided scenario transit assumptions includes light rail in the District generally east of Woodley Park Metro and Foggy Bottom Metro, the Columbia Pike light rail, the Bi-County light rail connecting from Silver Spring station all the way to Branch Avenue station, and the light rail to Waldorf, the Route 1 transitway in Virginia, Metro rail from Eisenhower Avenue to Branch Avenue stations and, all transitway in Prince George's County, except for down US50 and Pennsylvania Avenue.

¹ "A Region Divided, The State of Growth in Greater Washington, D.C.", 1999, The Brookings Institution. The report documents a number of disparities in the eastern versus western portions of the region. Among the issues cited by the report are: "The Income Divide"; "The Race Divide"; "The School Divide"; "The Job Divide"; and "The Transportation Divide".

Figure 9.b- Region Undivided Scenario: Change in Number of Households

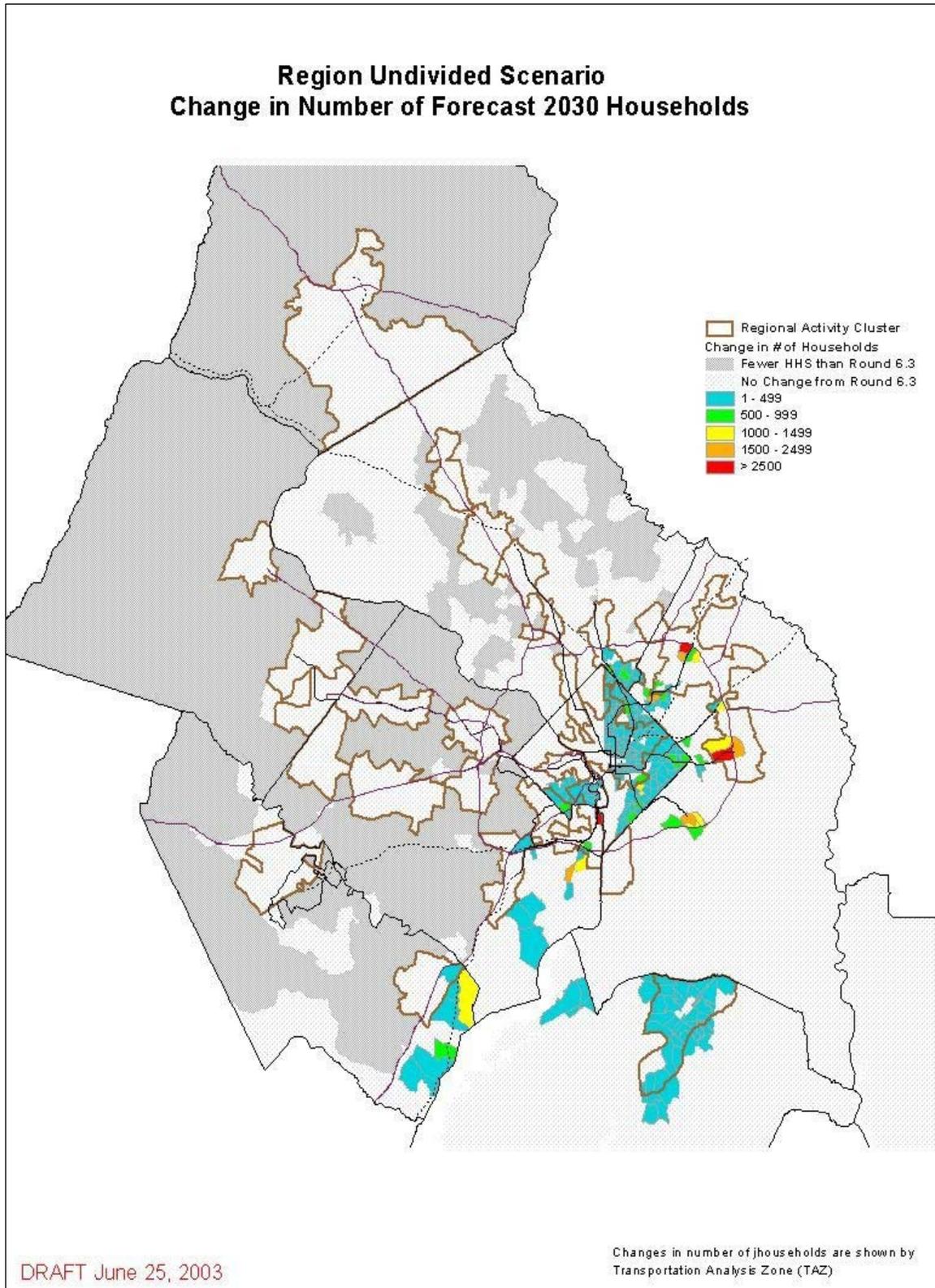


Figure 9.c- Region Undivided Scenario: Change in Number of Households

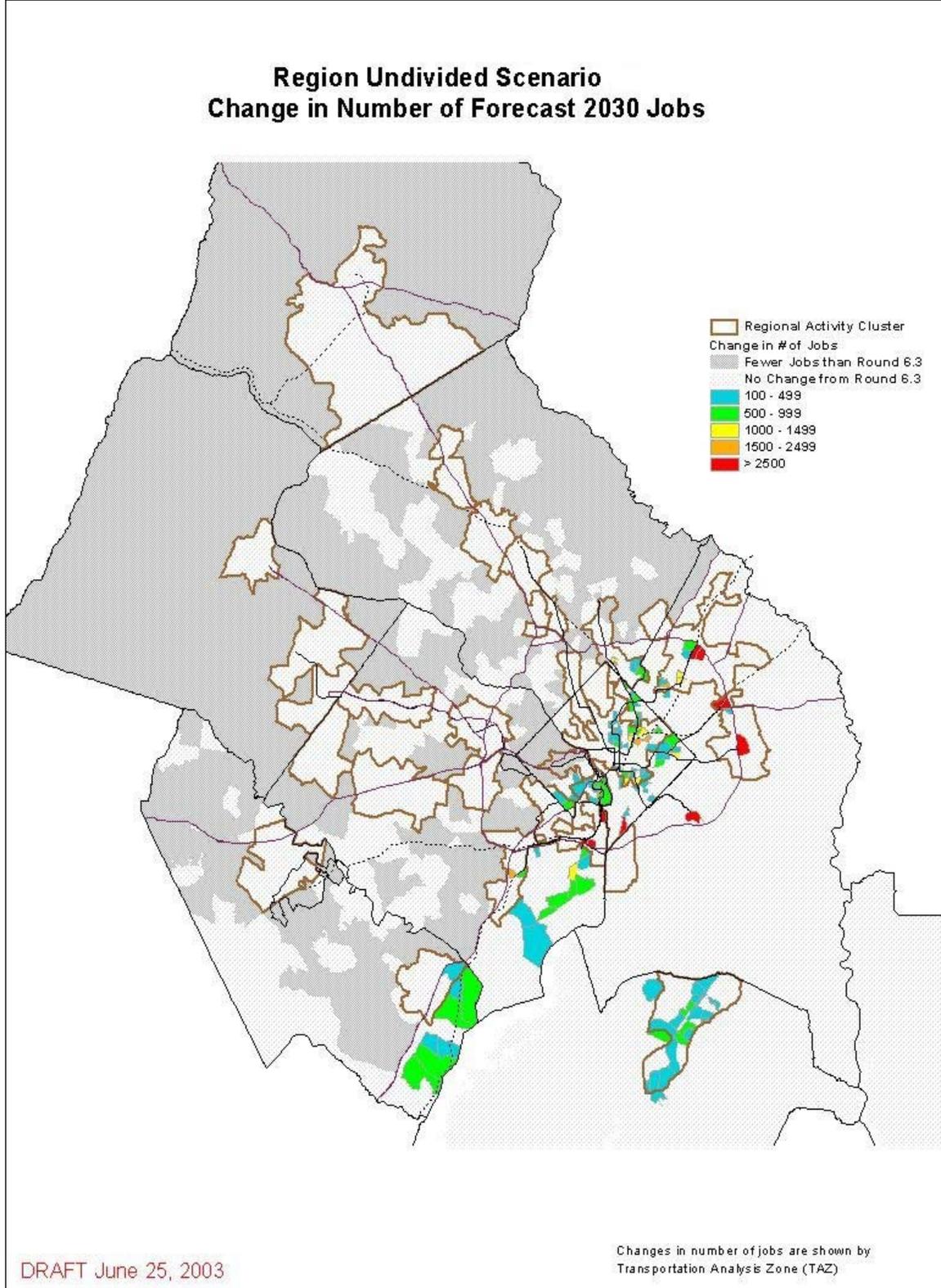
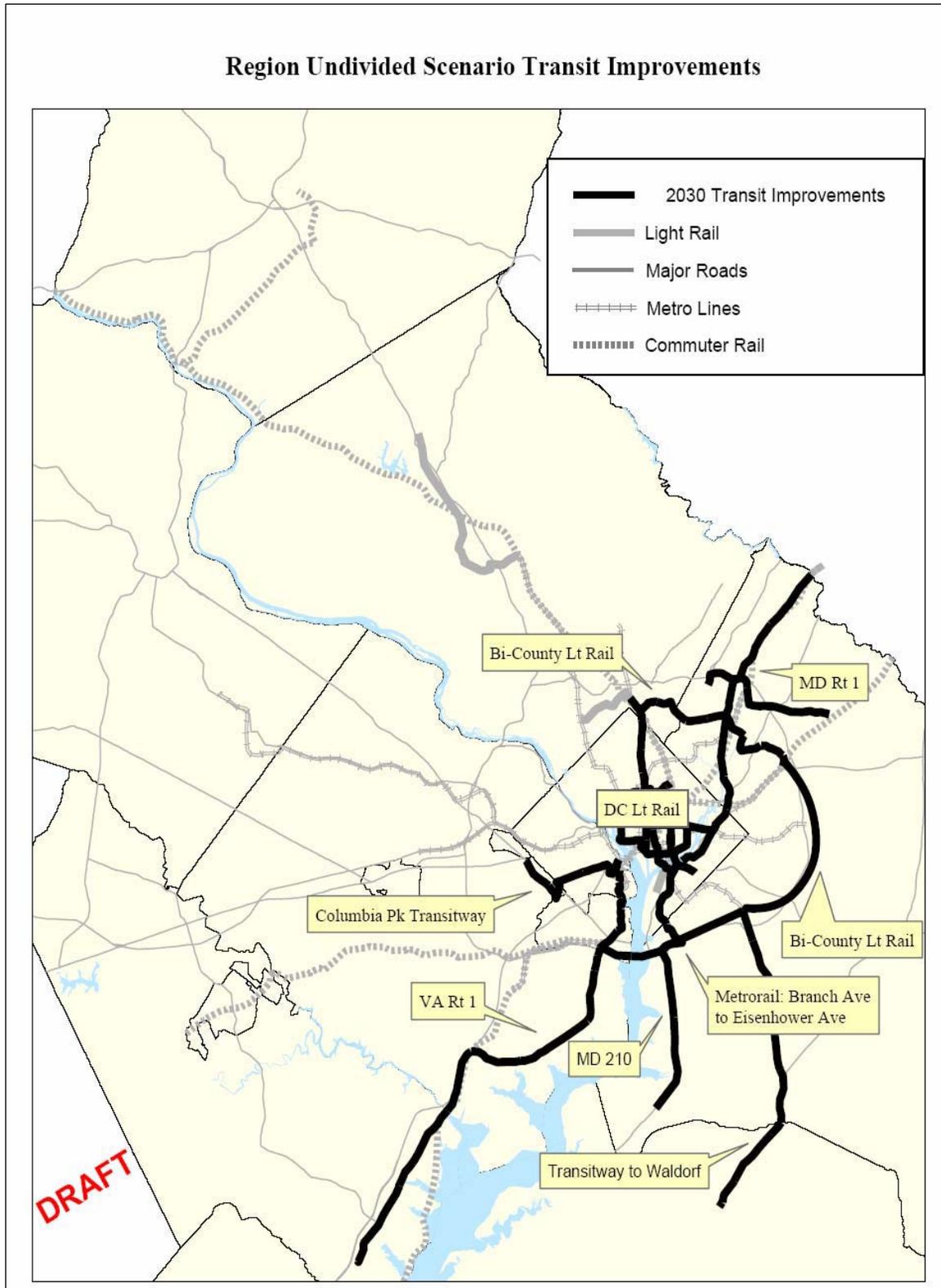


Figure 9.d- Region Undivided Scenario: Transit Improvements



8.5 Transit-Oriented Development Scenario

The **Transit-Oriented Development** land use scenario places more future job and household growth in areas around current and planned Metrorail stations, commuter rail stations or other transit centers. The Transit-Oriented Development scenario also examines the transportation impacts of reducing average commuting distances by providing more housing and job growth closer to major regional employment concentrations in the inner areas of the region. This scenario assumes a shift of approximately 150,000 jobs (19% of the 2010 to 2030 employment growth) and 125,000 households (35% of the 2010 to 2030 household growth) to transit station areas and other areas planned to be well-served by transit in the future from areas further away from these transit stations areas.

Table 10.a- Transit Oriented Development: Percent Change in Households and Employment

Transit Oriented Development						
Jurisdictions	Households (Year 2030)			Employment (Year 2030)		
	CLRP +	TOD	Percent Change	CLRP+	TOD	Percent Change
District of Columbia	304,400	310,700	2.1%	831,200	831,200	0.0%
Montgomery County	417,400	427,300	2.4%	651,900	667,200	2.3%
Prince Georges County	372,400	378,000	1.5%	553,000	575,900	4.0%
Arlington County	116,700	116,700	0.0%	275,800	275,800	0.0%
Alexandria	75,300	75,300	0.0%	141,000	141,000	0.0%
Fairfax County	453,100	466,500	3.0%	801,100	801,100	0.0%
Loudon County	163,900	153,000	-6.7%	258,100	246,600	-4.7%
Prince Williams County	182,400	175,100	-4.0%	209,400	203,100	-3.1%
Frederick County	120,200	103,100	-14.2%	177,800	157,600	-12.8%
Charles County	76,100	76,100	0.0%	69,100	69,100	0.0%

Transit assumptions for the **Transit Oriented Development** scenario encompasses five different facility types including Metro rail extensions, VRE extensions, light rail construction, a dedicated busway, and “transitway” construction. Approximately 54 miles of light rail is added in the District. Additional light rail includes connecting Silver Spring to New Carrollton (Bi-County Connector), along the Corridor Cities Transitway, south from Branch Avenue. to Waldorf, and along Columbia Pike in Arlington County. to just inside Fairfax County. VRE extensions are added from Manassas to Haymarket and Spotsylvania County. There is a Metro rail extension to Centreville and connection of Eisenhower Avenue and Branch Ave. stations. Prince George’s County receives approximately 42 miles of transitway along, MD 210, MD 193, Rt. 1, and Pennsylvania Avenue. Additional transitway is also added long Rt. 1 in Virginia from Pentagon City to the Joplin area in Prince William County. Approximately 7 miles of busway is added from Glenmont Metro station to the Olney area.

Figure 10.b- Transit Oriented Development: Change in Households

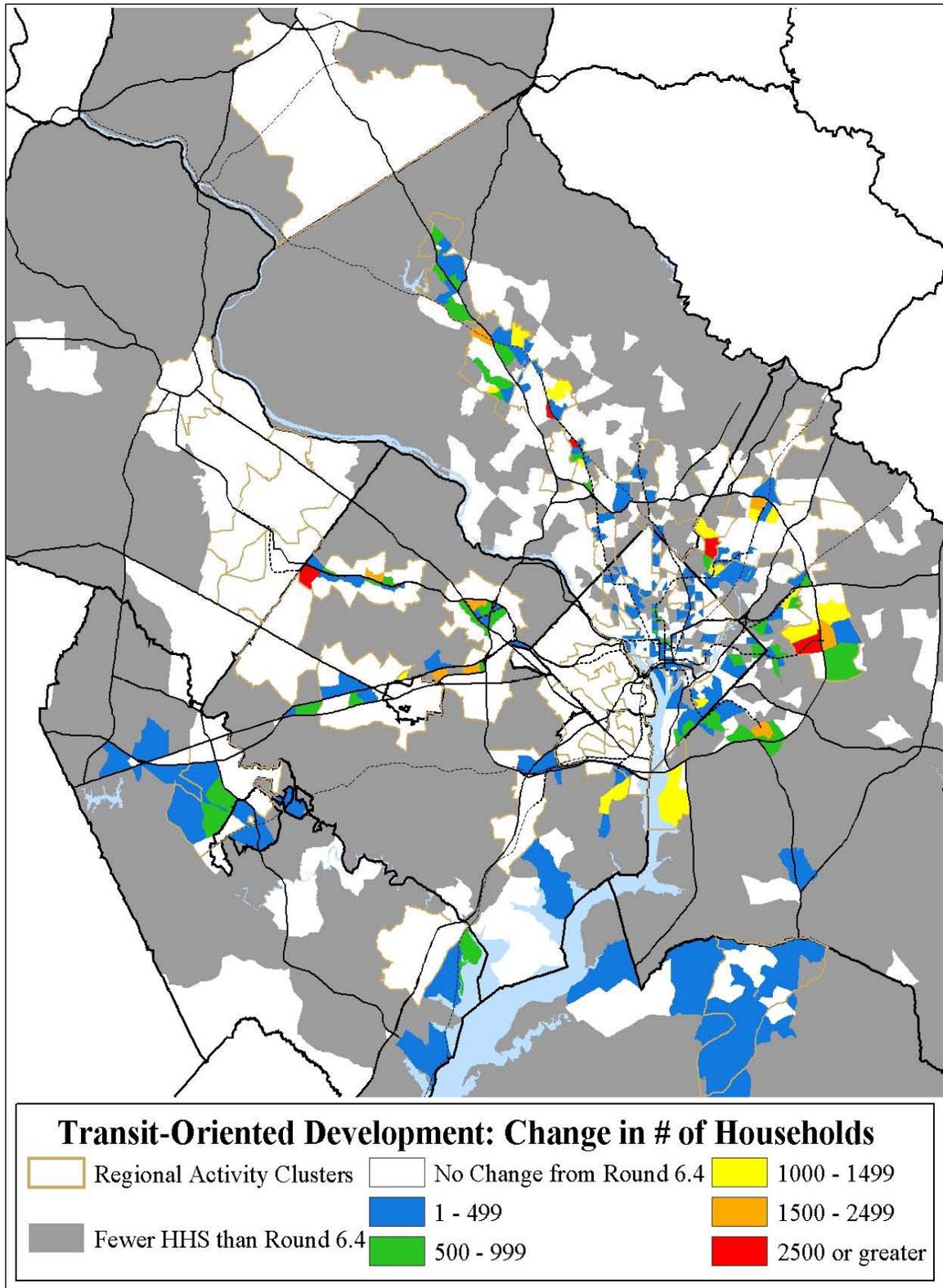


Figure 10.c- Transit Oriented Development: Change in Jobs

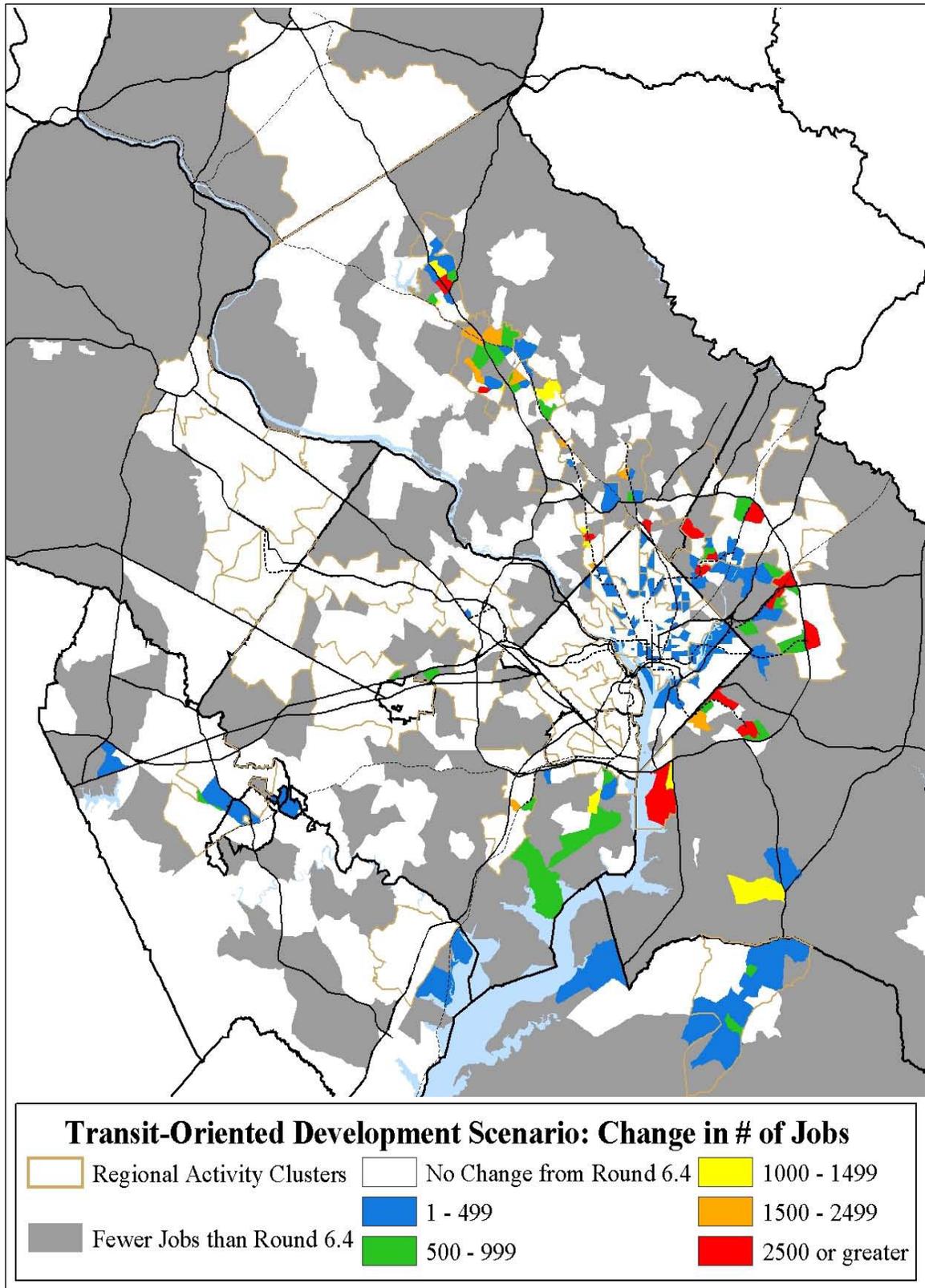
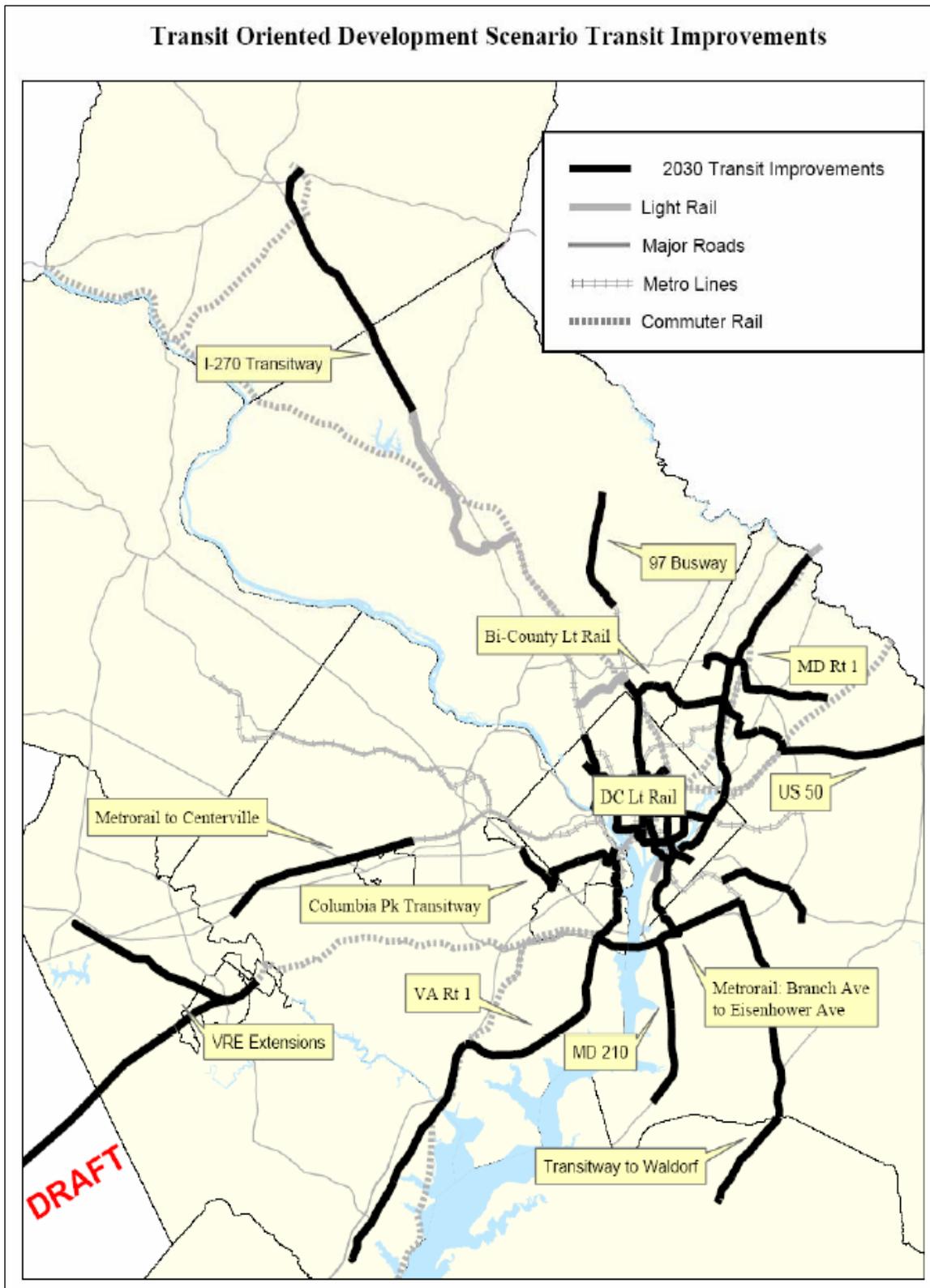


Figure 10.d- Transit Oriented Development: Transit Improvements



9. Scenario Analysis

9.1 Higher Household Growth in Region

Land Use

- In the **Higher Household Growth in Region** scenario, 90% of the region's jobs will be located within a land area of 571 square miles, approximately 16.1% of the region's total land area (3541 square miles). This total is the same as the base because no jobs were shifted within the region in this scenario (Figure 1.1.b). In the region, 90% of the households will be located within a land area of 1085 square miles, approximately 30.6% of the region's total land area (3541 square miles). This total is 43 square miles less than the base (Figure 1.2.b). The combined land area used for 90% of the region's employment and households will be 1,211 total square miles, approximately 34.2% of the region's total land area. 9.2% of the 2010 to 2030 employment growth and 15.1% of the household growth is expected to occur outside of the 2010 90th percentile boundary (Figure 1.3.b).
- The average ratio of jobs to workers in the Regional Activity Clusters is 1.94, compared to 2.35 in the base (Figure 1.4.a). The ratio of jobs to workers lowers or holds steady in all Regional Activity Clusters, with the exception of Bailey's Crossroads, which dropped from 0.8 to 0.7. The largest decreases in the jobs to workers ratio occur in the Dulles Corridor and the Dulles South clusters (Table 1.1).
- In the Regional Activity Clusters, 26% of households and 36% of employment will be located within a ¼-mile of a transit station, compared respectively to 13% and 26% in the base (Table 1.1.a-b). Regional Activity Clusters also have 50% of households and 58% of employment located within a ½-mile of a transit station, compared respectively to 35% and 50% in the base (Table 1.1.c-d).
- The region includes 13% of households and 27% employment that will be located within a ¼-mile of a transit station, as compared respectively to 6% and 19% in the base (Table 1.2.a-b). Also within the region, 29% of households and 46% of employment will be located within ½-mile of a transit station, compared respectively with 17% and 38% in the base (Table 1.2.c-d).
- There are 278 of the 446 transit stations that will be inside of inside a Regional Activity Cluster, compared with 115 of 172 in the base (Table 1.3). And 22 of the 24 Regional Activity Clusters will contain a transit station, compared to 16 in the base (Table 1.4).
- The same dot density pattern occurs as in the base because no jobs were shifted in this scenario (Figure 1.5.b).The dot density pattern for household growth reveals

Higher Households in Region Scenario

higher concentrations in the core area and the inner suburbs compared to the base (Figure 1.6.b).

- (Figure 1.6.b shows higher concentration of household growth in the core area and inner suburbs)

Vehicle Travel and Congestion

- Daily vehicle miles traveled (VMT) per capita is 22.0, compared with 24.2 for the base (Figure 2.1).
- Highway congestion levels decrease primarily in outer suburban highways. Increased congestion levels occur in scattered spots throughout the region, mainly in areas of increased household development (Figure 2.2.b).

Mode Choice

- Most of the regional activity clusters show a decrease in SOV commuting mode share productions compared with the base and only Leesburg, Fairfax Center, Manassas, and Potomac Mills show increases (Figure 3.1.a). Most of the regional activity clusters show a decrease in SOV commuting mode share attractions compared with the base, only Leesburg, Dulles South, and Fairfax Center show minimal increases (Figure 3.2.a).
- Several regional activity clusters show an increase in transit commuting mode share productions, with National Harbor showing the largest increase at 10.5%. Leesburg, Dulles North, Dulles South, and Potomac Mills showing a slight decrease (Figure 3.3.a). Most of the regional activity clusters show an increase in transit commuting mode share attractions, with the Pentagon area showing a 4.0% increase and National Harbor showing a 5.9% increase, only Leesburg shows a decrease (Figure 3.4.a).
- Most of the regional activity clusters show a decrease in HOV commuting mode share productions and attractions, only Gaithersburg, Bethesda, Silver Spring, and Waldorf show slight increases (Figure 3.5-3.a). All regional activity clusters show increases in walk / bike mode share productions, with Tysons Corner showing the largest increase at 4.8% (Figure 3.7.a).

Accessibility

- There is moderate increase in highway accessibility to jobs within 45 minutes primarily northern Prince George's County and eastern Montgomery County. Moderate losses occur in Prince George's county inside the beltway (Figures 4.1.b & 4.7.a).

- Moderate increases also occur in transit accessibility to jobs within 45 minutes scattered around the region, primarily around the transit improvements. There are some significant increases along the MD 301 and MD 5 transitway improvements (Figures 4.2.b & 4.8.a).
- There are scattered moderate and significant increases in walk access transit accessibility to jobs within 45 minutes, inside the beltway along the scenario transit improvements (Figures 4.3.b & 4.9.a).
- There are moderate increases in highway accessibility to households within 45 minutes throughout most of the core, Montgomery County, Prince George's County and Fairfax County. There are no decreases in highway accessibility to households (Figures 4.4.b & 4.10.a).
- There are moderate and significant increases in transit accessibility to households within 45 minutes throughout the region in areas of increased households and / or improved transit (Figures 4.5.b & 4.11.a)
- Walk access transit accessibility to households within 45 minutes increase throughout the region in areas of increased households and / or improved transit (Figures 4.6.b & 4.12.a).
- Highway accessibility to major airports within 45 minutes had few gains or losses (Figure 4.13.a). There are a few pockets that increase transit accessibility to major airports within 45 minutes, mostly in western Prince George's County and western Fairfax County (Figure 4.14.a).
- There are few gains or losses in highway accessibility to regional rail stations within 45 minutes (Figure 4.15.a). But transit accessibility to regional rail stations within 45 minutes increases along many of the scenario transit improvements, as well as along the Manassas bound VRE line (Figure 4.16.a). Northern Montgomery County is the only area that had significant change in highway accessibility to regional bus depots (Figure 4.17.a). There are pockets of transit accessibility gains to regional bus depots within 45 minutes scattered around the transit improvements in Arlington County, the inner suburbs, southeastern Prince William County (Figure 4.18.a).
- There is no significant change in accessibility to a regional freight terminal within 60 minutes (Figure 4.19.a).

Environment

- Mobile source emissions changed. In comparison to the base, for this scenario, volatile organic compounds (VOC) mobile source emissions increased from 30.2 to 30.5 tons per day (Figure 5.1), Nitrogen oxides (NOx) decreased from 32.7 to 32.5 tons per day (Figure 5.2), Winter carbon monoxide (CO) increased from

1,138 to 1,163 tons per day (Figure 5.3), Direct particulate matter (PM) 2.5 decreased from 746 to 736 tons per year (Figure 5.4) and, particulate matter (PM) 2.5 precursor decreased from 10,786 to 10,709 tons per year (Figure 5.5).

- Watersheds see increases in 2010 to 2030 employment growth of 100% or higher in Catoctin Creek – Loudoun County, Double Pipe Creek, and Piney Run – Dutchman Creek (Figure 5.6.b). Limestone Branch, Catoctin Creek – Loudoun County, Mattawoman Creek, and Piney Run – Dutchman Creek watersheds see increases in 2010 to 2030 household growth of 55% or higher (Figure 5.7.b).
- Accotink Creek, Broad Run, Cabin John Creek and Potomac River – Upper Tidal are watersheds that have a 13.7% to 17.2% level of impervious surface in 2000 that see significant household and / or employment growth between 2010 and 2030 (Figure 5.8.b).
- The percent impervious surface in the regional watersheds for year 2000 is 8.1%. There is a 2010 to 2030 employment growth of 22% and household growth of 28% in this area (Table 5.1.b).
- Nitrates Deposition in the Chesapeake Bay (Figure 5.9).
- Energy Use (Figure 5.10).

Safety (measure of Information)

- No forecasts, therefore no comparisons, can be assumed for traffic accidents or fatalities based on VMT or transportation infrastructure improvements. However, the region will always consider safety to be a top priority in transportation planning.

9.2 More Households in Inner Areas

Land Use

- In the More Households in Inner Areas scenario, 90% of the region's jobs will be located within a land area of 571 square miles, approximately 16.1% of the region's total land area (3541 square miles). This total is the same as the base because no jobs were shifted within the region in this scenario (Figure 1.1.c). 90% of the region's households will be located within a land area of 1043 square miles, approximately 29.5% of the region's total land area (3541 square miles). This total is 85 square miles less than the base (Figure 1.2.c).
- The combined land area used for 90% of the region's employment and households will be 1,186 total square miles, approximately 33.5% of the region's total land area. 9.2% of the 2010 to 2030 employment growth and 12.1% of the household growth is expected to occur outside of the 2010 90th percentile boundary (Figure 1.3.c).
- The average ratio of jobs to workers in the Regional Activity Clusters is 2.14, compared to 2.35 in the base (Figure 1.4.b). The ratio of jobs to workers lowers or holds steady in all Regional Activity Clusters. The largest decreases in the jobs to workers ratio occur in the Dulles Corridor and the Dulles South clusters (Table 1.1).
- 25% of the Regional Activity Clusters' households will be located within a ¼-mile of a transit station, compared with 13% in the base (Table 1.1.a). 35% of the Regional Activity Clusters' employment will be located within a ¼-mile of a transit station, compared with 26% in the base (Table 1.1.b).
- 48% of the Regional Activity Clusters' households will be located within a ½-mile of a transit station, compared with 35% in the base (Table 1.1.c). 57% of the Regional Activity Clusters' employment will be located within a ½-mile of a transit station, compared with 50% in the base (Table 1.1.d).
- 13% of the region's households will be located within a ¼-mile of a transit station, compared with 6% in the base (Table 1.2.a). 26% of the region's employment will be located within a ¼-mile of a transit station, compared with 19% in the base (Table 1.2.b). 27% of the region's households will be located within a ½-mile of a transit station, compared with 17% in the base (Table 1.2.c). 44% of the region's employment will be located within a ½-mile of a transit station, compared with 38% in the base (Table 1.2.d).
- 261 of the 384 transit stations will be inside a Regional Activity Cluster, compared with 115 of 172 in the base (Table 1.3). 19 of the 24 Regional Activity Clusters will contain a transit station, compared to 16 in the base (Table 1.4).

More Households in Inner Areas Scenario

- The same dot density pattern as the base because no jobs were shifted in this scenario (Figure 1.5.b). The dot density pattern for household growth reveals higher concentrations in the core area and along the Dulles Corridor and I-66 compared to the base (Figure 1.6.b).

Vehicle Travel and Congestion

- Daily vehicle miles traveled (VMT) per capita is 24.1, compared with 24.2 for the base (Figure 2.1).
- Highway congestion levels decrease primarily in outer suburban highways where households were shifted from. Increased congestion levels occur in scattered spots throughout the region, mainly in areas where households were shifted (Figure 2.2.c).

Mode Choice

- Most of the regional activity clusters show a decrease in SOV commuting mode share productions compared with the base. Only the outer areas of Leesburg, Dulles South, Dulles North, Waldorf, and Potomac Mills show increases (Figure 3.1.b). Most of the regional activity clusters show a decrease in SOV commuting mode share attractions compared with the base. Only Fairfax, Prince William, and Loudoun counties have clusters that show minimal increases (Figure 3.2.b).
- Most of the regional activity clusters show an increase in transit commuting mode share productions, with National Harbor showing the largest increase at 10.9%. Dulles North, Dulles South and Waldorf show a slight decrease (Figure 3.3.b). Most of the regional activity clusters show an increase in transit commuting mode share attractions, with the National Harbor, Silver Spring, and New Carrollton areas showing increases over 2.5%. Decreases are seen in the outer clusters of Northern Virginia (Figure 3.4.b).
- Most of the regional activity clusters show a decrease in HOV commuting mode share productions. Only six of the clusters show very slight increases (Figure 3.5.b). Most of the regional activity clusters show a decrease in HOV commuting mode share attractions. Eight of the clusters show very slight increases (Figure 3.6.b).
- Most of the regional activity clusters show increases in walk / bike mode share productions, with Tysons Corner showing the largest increase at (?), and only the Pentagon area showing a slight decrease (Figure 3.7.b).

More Households in Inner Areas Scenario

Accessibility

- There is moderate increase in highway accessibility to jobs within 45 minutes primarily inside the beltway in Prince George's. Some moderate losses occur around the Tysons Corner area (Figures 4.1.c & 4.7.b). There are moderate increases in transit accessibility to jobs within 45 minutes scattered around the region, primarily in eastern D.C. and western Prince George's County. There are some significant increases around the National Harbor area. There are a few scattered pockets of moderate loss in accessibility (Figures 4.2.c & 4.8.b).
- There are scattered moderate and significant increases in walk access transit accessibility to jobs within 45 minutes, primarily inside the beltway along the scenario transit improvements and around the National Harbor area (Figures 4.3.c & 4.9.b).
- There are moderate increases in highway accessibility to households within 45 minutes throughout most of the core and in Fairfax County. Only one zone has a decrease in highway accessibility to households (Figures 4.4.c & 4.10.b).
- There are mostly moderate and significant increases in transit accessibility to households within 45 minutes in the core area and inside the beltway, as well as along I-66 along the improved transit line (Figures 4.5.c & 4.11.b).
- There are mostly moderate, with a few significant, increases in walk access transit accessibility to households within 45 minutes in the core area and inside the beltway, as well as along I-66 (Figures 4.6.c & 4.12.b).
- There are few gains or losses in highway accessibility to major airports within 45 minutes (Figure 4.13.b). There are a few pockets that increase transit accessibility to major airports within 45 minutes, mostly in western Prince George's County and western Fairfax County (Figure 4.14.b).
- There are gains in highway accessibility to regional rail stations within 45 minutes in western Fairfax County. Only a few zones show a decrease (Figure 4.15.b). Transit accessibility to regional rail stations within 45 minutes increases along the transit improvements around the beltway and along I-66 (Figure 4.16.b).
- There are gains in highway accessibility to regional bus depots within 45 minutes in the Dulles Corridor and along I-66 (Figure 4.17.b).
- There are pockets of transit accessibility gains to regional bus depots within 45 minutes in the National Harbor area and along the Columbia Pike transitway (Figure 4.18.b).
- There is no significant change in accessibility to a regional freight terminal within 60 minutes (Figure 4.19.b).

Environment

- Volatile organic compounds (VOC) mobile source emissions are 29.8 tons per day, compared with 30.2 in the base (Figure 5.1). Nitrogen oxides (NO_x) mobile source emissions are 32.4 tons per day, compared with 32.7 in the base (Figure 5.2). Winter carbon monoxide (CO) mobile source emissions are 1,127 tons per day, compared with 1,138 in the base (Figure 5.3). Direct particulate matter (PM) 2.5 mobile source emissions are 740 tons per year, compared with 746 in the base (Figure 5.4). Particulate matter (PM) 2.5 precursor NO_x mobile source emissions are 10,690 tons per year, compared with 10,786 in the base (Figure 5.5).
- Catoclin Creek – Loudoun County, Double Pipe Creek, and Piney Run – Dutchman Creek watersheds see increases in 2010 to 2030 employment growth of 100% or higher (Figure 5.6.c). Limestone Branch, Catoclin Creek – Loudoun County, and Piney Run – Dutchman Creek watersheds see increases in 2010 to 2030 household growth of 55% or higher (Figure 5.7.c). Accotink Creek, Broad Run, Cabin John Creek and Potomac River – Upper Tidal are watersheds that have a 13.7% to 17.2% level of impervious surface in 2000 that see significant household and / or employment growth between 2010 and 2030 (Figure 5.8.c). The percent impervious surface in the regional watersheds for year 2000 is 8.1%. There is a 2010 to 2030 employment growth of 22% and household growth of 17% in this area (Table 5.1.c).
- Nitrates Deposition in the Chesapeake Bay (Figure 5.9).
- Energy Use (Figure 5.10).

Safety (measure of Information)

- No forecasts, therefore no comparisons, can be assumed for traffic accidents or fatalities based on VMT or transportation infrastructure improvements. However, the region will always consider safety to be a top priority in transportation planning.

9.3 More Job Growth in Outer Areas

Land Use

- In the **More Job Growth in Outer Areas** scenario, 90% of the region's jobs will be located within a land area of 583 square miles, approximately 16.5% of the region's total land area (3541 square miles). This total is 12 square miles more than the base (Figure 1.1.c). 90% of the region's households will be located within a land area of 1043 square miles, approximately 29.5% of the region's total land area (3541 square miles). This total is the same as the base as no households were shifted in this scenario (Figure 1.2.c). The combined land area used for 90% of the region's employment and households will be 1,258 total square miles, approximately 35.5% of the region's total land area. 11.1% of the 2010 to 2030 employment growth and 25.1% of the household growth is expected to occur outside of the 2010 90th percentile boundary (Figure 1.3.c).
- The average ratio of jobs to workers in the Regional Activity Clusters is 2.39, compared to 2.35 in the base (Figure 1.4.b). The ratio of jobs to workers moves towards 1.0 or holds steady in most Regional Activity Clusters. Frederick, Manassas, and Waldorf have increasing ratios because jobs were shifted to these areas (Table 1.1).
- 15% of the Regional Activity Clusters' households will be located within a ¼-mile of a transit station, compared with 13% in the base (Table 1.1.a). 28% of the Regional Activity Clusters' employment will be located within a ¼-mile of a transit station, compared with 26% in the base (Table 1.1.b). 37% of the Regional Activity Clusters' households will be located within a ½-mile of a transit station, compared with 35% in the base (Table 1.1.c).
- 52% of the Regional Activity Clusters' employment will be located within a ½-mile of a transit station, compared with 50% in the base (Table 1.1.d). 7% of the region's households will be located within a ¼-mile of a transit station, compared with 6% in the base (Table 1.2.a). 21% of the region's employment will be located within a ¼-mile of a transit station, compared with 19% in the base (Table 1.2.b). 19% of the region's households will be located within a ½-mile of a transit station, compared with 17% in the base (Table 1.2.c). 40% of the region's employment will be located within a ½-mile of a transit station, compared with 38% in the base (Table 1.2.d).
- 157 of the 261 transit stations will be inside a Regional Activity Cluster, compared with 115 of 172 in the base (Table 1.3). 20 of the 24 Regional Activity Clusters will contain a transit station, compared to 16 in the base (Table 1.4).
- There is a more concentrated dot density pattern in the outer suburbs, most noticeable in Charles County (Figure 1.5.b). The dot density pattern for household growth is the same as the base because households were shifted (Figure 1.6.b).

Transit Oriented Development Scenario

Vehicle Travel and Congestion

- Daily vehicle miles traveled (VMT) per capita is 24.2, the same as in the base (Figure 2.1).
- Highway congestion levels decrease primarily along the major corridors heading into the core area, where jobs were shifted from. Increased congestion levels occur along corridors heading toward outer suburban clusters, areas where jobs were shifted to (Figure 2.2.d).

Mode Choice

- Most of the regional activity clusters show an increase in SOV commuting mode share productions compared with the base, with Potomac Mills having the highest increase at 3%. Only the Waldorf area has a decrease (Figure 3.1.c). About half of the regional activity clusters show an increase in SOV commuting mode share attractions, mostly in the core area and Fairfax County. The decreases occur mostly in clusters outside the beltway (Figure 3.2.c).
- Most of the regional activity clusters show a decrease in transit commuting mode share productions, with only Frederick, Manassas, and Waldorf showing increases (Figure 3.3.c). The regional activity clusters in the core area and in Fairfax County show a decrease in transit commuting mode share attractions, while the outer clusters show slight increases (Figure 3.4.c).
- Most of the regional activity clusters show decreases in HOV commuting mode share productions. Only the District and the clusters around the beltway in Montgomery and Prince George's counties show slight increases (Figure 3.5.c). Most of the regional activity clusters show a decrease in HOV commuting mode share attractions, with the outer areas of Frederick, Waldorf, National Harbor, and Leesburg showing slight increases (Figure 3.6.c). Most of the regional activity clusters show increases in walk / bike mode share productions, with Manassas showing the largest increase at (?), with only the core area clusters showing slight decreases (Figure 3.7.c).

Accessibility

- There are moderate decreases in highway accessibility to jobs within 45 minutes primarily in the core area where jobs were shifted from. Few moderate gains occur (Figures 4.1.d & 4.7.c). There are moderate increases in transit accessibility to jobs within 45 minutes along the transit improvements connecting the outer suburban regional activity clusters. There are very few zones of moderate loss (Figures 4.2.d & 4.8.c).

Transit Oriented Development Scenario

- There are moderate and significant increases in walk access transit accessibility to jobs within 45 minutes along the Route 1 and I-66 corridors in Virginia (Figures 4.3.d & 4.9.c). There are scattered moderate increases in highway accessibility to households within 45 minutes in the core area. Only the Manassas area shows any decrease in highway accessibility to households (Figures 4.4.d & 4.10.c).
- There are mostly moderate and significant increases in transit accessibility to households within 45 minutes along all transit improvements, except for the I-270 transitway (Figures 4.5.d & 4.11.c). There are moderate increases in walk access transit accessibility to households within 45 minutes primarily along the Route 1 corridor in Virginia (Figures 4.6.d & 4.12.c).
- There are few gains or losses in highway accessibility to major airports within 45 minutes (Figure 4.13.c). There is increased transit accessibility to major airports within 45 minutes along the Route 1 corridor in Virginia, as well as in the areas of Manassas / Centreville (Figure 4.14.c). There are few gains or losses in highway accessibility to regional rail stations within 45 minutes (Figure 4.15.c).
- Transit accessibility to regional rail stations within 45 minutes increases along the transit improvements in Virginia and northern Prince George's County (Figure 4.16.c). There are some scattered losses in Highway accessibility to regional bus depots within 45 minutes mostly stays the same, although here are some scattered losses in Virginia (Figure 4.17.c). There are pockets of transit accessibility gains to regional bus depots within 45 minutes mostly along Route 1 in Fairfax and Prince William counties (Figure 4.18.c).
- There is no significant change in accessibility to a regional freight terminal within 60 minutes (Figure 4.19.c).

Air Quality- Mobile Emissions

- Volatile organic compounds (VOC) mobile source emissions are 30.2 tons per day, the same as in the base (Figure 5.1). Nitrogen oxides (NOx) mobile source emissions are 32.7 tons per day, the same as in the base (Figure 5.2). Winter carbon monoxide (CO) mobile source emissions are 1,139 tons per day, compared with 1,138 in the base (Figure 5.3). Direct particulate matter (PM) 2.5 mobile source emissions are 746 tons per year, the same as in the base (Figure 5.4). Particulate matter (PM) 2.5 precursor NOx mobile source emissions are 10,781 tons per year, compared with 10,786 in the base (Figure 5.5).
- Catoctin Creek – Loudoun County; Double Pipe Creek; Cedar, Kettel and Broad Runs; and Piney Run – Dutchman Creek watersheds see increases in 2010 to 2030 employment growth of 100% or higher (Figure 5.6.d). There is no change compared to the base in household growth in the regional watersheds (Figure 5.7.d). Occoquan Bay has a 13.2% level of impervious surface in 2000 and has a 47% increase in employment growth, indicating an area of concern (Figure 5.8.d).

Transit Oriented Development Scenario

The percent impervious surface in the regional watersheds for year 2000 is 8.1%. There is a 2010 to 2030 employment growth of 22% and household growth of 16% in this area (Table 5.1.d).

- Nitrates Deposition in the Chesapeake Bay (Figure 5.9).
- Energy Use (Figure 5.10).

Safety (measure of Information)

- No forecasts, therefore no comparisons, can be assumed for traffic accidents or fatalities based on VMT or transportation infrastructure improvements. However, the region will always consider safety to be a top priority in transportation planning).

Region Undivided Scenario

9.4 Region Undivided Scenario

Land Use

- In the **Region Undivided** scenario, 90% of the region's jobs will be located within a land area of 526 square miles, approximately 14.9% of the region's total land area (3541 square miles). This total is 45 less square miles than the base (Figure 1.1.e). 90% of the region's households will be located within a land area of 1068 square miles, approximately 30.2% of the region's total land area (3541 square miles). This total is 60 square miles less than the base (Figure 1.2.e). The combined land area used for 90% of the region's employment and households will be 1,201 total square miles, approximately 33.9% of the region's total land area. 4.5% of the 2010 to 2030 employment growth and 16.4% of the household growth is expected to occur outside of the 2010 90th percentile boundary (Figure 1.3.e).
- The average ratio of jobs to workers in the Regional Activity Clusters is 2.33, compared to 2.35 in the base (Figure 1.4.d). The ratio of jobs to workers lowers slightly or holds steady in all Regional Activity Clusters, except for Waldorf Commercial, which increases marginally. (Table 1.1).
- 24% of the Regional Activity Clusters' households will be located within a ¼-mile of a transit station, compared with 13% in the base (Table 1.1.a). 35% of the Regional Activity Clusters' employment will be located within a ¼-mile of a transit station, compared with 26% in the base (Table 1.1.b). 47% of the Regional Activity Clusters' households will be located within a ½-mile of a transit station, compared with 35% in the base (Table 1.1.c). 57% of the Regional Activity Clusters' employment will be located within a ½-mile of a transit station, compared with 50% in the base (Table 1.1.d). 12% of the region's households will be located within a ¼-mile of a transit station, compared with 6% in the base (Table 1.2.a). 27% of the region's employment will be located within a ¼-mile of a transit station, compared with 19% in the base (Table 1.2.b). 26% of the region's households will be located within a ½-mile of a transit station, compared with 17% in the base (Table 1.2.c). 46% of the region's employment will be located within a ½-mile of a transit station, compared with 38% in the base (Table 1.2.d).
- 254 of the 396 transit stations will be inside a Regional Activity Cluster, compared with 115 of 172 in the base (Table 1.3). 20 of the 24 Regional Activity Clusters will contain a transit station, compared to 16 in the base (Table 1.4). There is a more concentrated dot density pattern for employment growth in Prince George's County, Charles County and D.C. (Figure 1.5.d).
- There is an marked concentration of dot density pattern for household growth in eastern D.C., Prince George's County, Charles County, and along the Route 1

Transit Oriented Development Scenario

corridor in Virginia. There is a noticeable drop in the household growth dot density in the western portions of the region (Figure 1.6.d).

Vehicle Travel and Congestion

- Daily vehicle miles traveled (VMT) per capita is 24.1, compared with 24.2 for the base (Figure 2.1).
- Highway congestion levels decrease where jobs and households were shifted from, primarily along the beltway in Virginia and to the west. Increased congestion levels occur primarily along the highways in the District, Prince George's County and Charles County (Figure 2.2.e).

Mode Choice

- Most of the regional activity clusters show a decrease in SOV commuting mode share productions compared with the base. Only the outer areas of Leesburg and Potomac Mills show increases (Figure 3.1.d). Most of the regional activity clusters show a decrease in SOV commuting mode share attractions compared with the base. The areas where jobs were shifted from tend to show slight increases, including the outer ring of suburban Virginia clusters (Figure 3.2.d).
- All of the regional activity clusters show an increase in transit commuting mode share productions. Waldorf has an increase of 6.1%, while National Harbor has the largest increase at 14.4% (Figure 3.3.d). Most of the regional activity clusters show an increase in transit commuting mode share attractions, with the National Harbor and New Carrollton areas showing increases over 6%. Decreases are seen in the western outer clusters of Northern Virginia (Figure 3.4.d).
- Most of the core area and inner suburban regional activity clusters show a decrease in HOV commuting mode share productions. Many clusters in Northern Virginia and along the I-270 corridor show slight increases (Figure 3.5.d). All of the regional activity clusters that show a decrease in HOV commuting mode share attractions are outside of the District in the western portion of the region. The clusters with a slight increase are scattered throughout the region (Figure 3.6.d).
- Most of the regional activity clusters show increases in walk / bike mode share productions, with only the I-95 / Springfield area showing a slight decrease (Figure 3.7.d).

Accessibility

- Moderate increases in highway accessibility to jobs within 45 minutes primarily occur inside the beltway in Prince George's County and inside eastern D.C.

Transit Oriented Development Scenario

Some moderate losses occur just outside of northwest D.C. and in the Dulles area (Figures 4.1.e & 4.7.d). There are moderate increases in transit accessibility to jobs within 45 minutes scattered around the beltway from Silver Spring to Springfield, and significant increases in many parts of Prince George's County (Figures 4.2.e & 4.8.d).

- There are scattered moderate and significant increases in walk access transit accessibility to jobs within 45 minutes, primarily inside the beltway along the scenario transit improvements and in the District of Columbia (Figures 4.3.e & 4.9.d). There are very few moderate increases or decreases in highway accessibility to households within 45 minutes in the region (Figures 4.4.e & 4.10.d).
- There are mostly moderate and significant increases in transit accessibility to households within 45 minutes in the core area and inside the beltway, as well as along the Virginia Route 1, and Maryland Highways 5 and 301 transit improvements (Figures 4.5.e & 4.11.d). There are mostly moderate and significant increases in transit accessibility to households within 45 minutes in the core area and inside the beltway (Figures 4.6.e & 4.12.d).
- There are few gains or losses in highway accessibility to major airports within 45 minutes (Figure 4.13.d). There are a few pockets that increase transit accessibility to major airports within 45 minutes, mostly in western Prince George's (Figure 4.14.d). There are gains in highway accessibility to regional rail stations within 45 minutes in western Fairfax County. Only a few zones show a decrease (Figure 4.15.d). Transit accessibility to regional rail stations within 45 minutes increases along the transit improvements around the beltway and along Virginia Route 1 (Figure 4.16.d). There are gains in highway accessibility to regional bus depots within 45 minutes in western Fairfax County, with very few zones showing a loss in accessibility (Figure 4.17.d). Transit accessibility to regional rail stations within 45 minutes increases along the transit improvements around the beltway and along Virginia Route 1 (Figure 4.18.d).
- There is no significant change in accessibility to a regional freight terminal within 60 minutes (Figure 4.19.d).

Environment

- Volatile organic compounds (VOC) mobile source emissions are 29.8 tons per day, compared with 30.2 in the base (Figure 5.1). Nitrogen oxides (NOx) mobile source emissions are 32.4 tons per day, compared with 32.7 in the base (Figure 5.2). Winter carbon monoxide (CO) mobile source emissions are 1,123 tons per day, compared with 1,138 in the base (Figure 5.3). Direct particulate matter (PM) 2.5 mobile source emissions are 738 tons per year, compared with 746 in the base

Transit Oriented Development Scenario

(Figure 5.4). Particulate matter (PM) 2.5 precursor NOx mobile source emissions are 10,682 tons per year, compared with 10,786 in the base (Figure 5.5).

- Potomac River – Upper Tidal watershed sees an increase in 2010 to 2030 employment growth of 72% (Figure 5.6.e). Mattawoman Creek, Zekiah Swamp and Patuxent River – Lower watersheds see increases in 2010 to 2030 household growth of 54% or higher (Figure 5.7.e). Broad Run, Cabin John Creek and Potomac River – Upper Tidal are watersheds that have a 13.7% to 15.7% level of impervious surface in 2000 that see significant household and / or employment growth between 2010 and 2030 (Figure 5.8.e). The percent impervious surface in the regional watersheds for year 2000 is 8.1%. There is a 2010 to 2030 employment growth of 22% and household growth of 16% in this area (Table 5.1.e).
- Nitrates Deposition in the Chesapeake Bay (Figure 5.9).
- Energy Use (Figure 5.10).

Safety (measure of Information)

- No forecasts, therefore no comparisons, can be assumed for traffic accidents or fatalities based on VMT or transportation infrastructure improvements. However, the region will always consider safety to be a top priority in transportation planning (Figure ?).

9.5 Transit Oriented Development Scenario

Land Use

- In the **Transit Oriented Development** scenario, 90% of the region's jobs will be located within a land area of 526 square miles, approximately 14.9% of the region's total land area (3,541 square miles). This total is 45 less square miles than the base (Figure 1.1.f). 90% of the region's households will be located within a land area of 1,026 square miles, approximately 29.0% of the region's total land area (3,541 square miles). This total is 102 square miles less than the base (Figure 1.2.f). The combined land area used for 90% of the region's employment and households will be 1,152 total square miles, approximately 32.5% of the region's total land area. 4.8% of the 2010 to 2030 employment growth and 11.3% of the household growth is expected to occur outside of the 2010 90th percentile boundary (Figure 1.3.f).
- The average ratio of jobs to workers in the Regional Activity Clusters is 2.20, compared to 2.35 in the base (Figure 1.4.e). The ratio of jobs to workers lowers slightly or holds steady in most Regional Activity Clusters, with Dulles Corridor dropping from 3.5 in the base to 2.4. Bethesda, Waldorf, and National Harbor slightly increase (Table 1.1). 24% of the Regional Activity Clusters' households will be located within a ¼-mile of a transit station, compared with 13% in the base (Table 1.1.a). 36% of the Regional Activity Clusters' employment will be located within a ¼-mile of a transit station, compared with 26% in the base (Table 1.1.b).
- 49% of the Regional Activity Clusters' households will be located within a ½-mile of a transit station, compared with 35% in the base (Table 1.1.c). 59% of the Regional Activity Clusters' employment will be located within a ½-mile of a transit station, compared with 50% in the base (Table 1.1.d). 13% of the region's households will be located within a ¼-mile of a transit station, compared with 6% in the base (Table 1.2.a). 28% of the region's employment will be located within a ¼-mile of a transit station, compared with 19% in the base (Table 1.2.b). 28% of the region's households will be located within a ½-mile of a transit station, compared with 17% in the base (Table 1.2.c). 42% of the region's employment will be located within a ½-mile of a transit station, compared with 38% in the base (Table 1.2.d).
- 278 of the 446 transit stations will be inside a Regional Activity Cluster, compared with 115 of 172 in the base (Table 1.3). 22 of the 24 Regional Activity Clusters will contain a transit station, compared to 16 in the base (Table 1.4).
- Throughout the region, all employment growth is shown in a concentrated dot density (Figure 1.5.e). Compared to the base, there is a noticeable lack of concentration of dot density pattern for household growth throughout the region and there is a marked concentration around transit (Figure 1.6.e).

Transit Oriented Development Scenario

Vehicle Travel and Congestion

- Daily vehicle miles traveled (VMT) per capita is 24.0, compared with 24.2 for the base (Figure 2.1).
- Highway congestion levels increase and decrease throughout the region (Figure 2.2.f).

Mode Choice

- Most of the regional activity clusters show a decrease in SOV commuting mode share productions compared with the base. The outer areas of Leesburg, Dulles North and Potomac Mills, as well as Bethesda, show slight increases (Figure 3.1.e). Most of the regional activity clusters show a decrease in SOV commuting mode share attractions compared with the base. The clusters of western Fairfax County and Leesburg show slight increases (Figure 3.2.e).
- All of the regional activity clusters, except for Dulles North, show an increase in transit commuting mode share productions. Waldorf has an increase of 4.4%, while National Harbor has the largest increase at 10.5% (Figure 3.3.e). Most of the regional activity clusters show an increase in transit commuting mode share attractions, with Silver Spring increasing by 3.7% and National Harbor increasing by 6.1%. Slight decreases are found in Fairfax Center, Dulles South, and Leesburg (Figure 3.4.e).
- Most of the core area and inner suburban regional activity clusters show a decrease in HOV commuting mode share productions. Clusters are scattered throughout the region showing slight increases (Figure 3.5.e). Most of the core area and inner suburban regional activity clusters show a decrease in HOV commuting mode share attractions. Clusters are scattered throughout the region showing slight increases (Figure 3.6.e).
- All of the regional activity clusters show increases in walk / bike mode share productions, with Tysons Corner (4.2 %) and National Harbor (5.8%) having the largest increases (Figure 3.7.e).

Accessibility

- Moderate increases in highway accessibility to jobs within 45 minutes are scattered primarily inside the beltway. Some moderate losses occur inside the beltway as well (Figures 4.1.f & 4.7.e).
- There are moderate increases in transit accessibility to jobs within 45 minutes scattered around the beltway primarily in eastern D.C., western Prince George's

Transit Oriented Development Scenario

County and inner Fairfax County. Significant increases occur along the MD 5 and 301 transit improvements (Figures 4.2.f & 4.8.e).

- There are scattered moderate and significant increases in walk access transit accessibility to jobs within 45 minutes, primarily inside the beltway along the scenario transit improvements and along the I-66 transit improvement (Figures 4.3.f & 4.9.e).
- There are very few moderate increases in highway accessibility to households within 45 minutes primarily just to the west of the beltway, with a few scattered moderate losses in Prince George's County (Figures 4.4.f & 4.10.e). There are mostly moderate and significant increases in transit accessibility to households within 45 minutes in the core area and inside the beltway, as well as along the Virginia Route 1, I-66, and Maryland Highways 5 and 301 transit improvements (Figures 4.5.f & 4.11.e). There are mostly moderate increases in transit accessibility to households within 45 minutes in the core area and inside the beltway, with significant increases in the National Harbor area (Figures 4.6.f & 4.12.e).
- There are few gains or losses in highway accessibility to major airports within 45 minutes (Figure 4.13.e). There are increases in transit accessibility to major airports within 45 minutes in western Prince George's and the Centreville area in Fairfax County. (Figure 4.14.e). There are gains in highway accessibility to regional rail stations within 45 minutes in western Fairfax County (Figure 4.15.e).
- Transit accessibility to regional rail stations within 45 minutes increases in Mt. Vernon, National Harbor, Greenbelt, Fairfax County and Prince William County (Figure 4.16.e).
- There are gains in highway accessibility to regional bus depots within 45 minutes in the National Harbor area, along Virginia Route 1, Prince George's County and Montgomery County (Figure 4.17.e).
- Transit accessibility to regional rail stations within 45 minutes increases along the transit improvements around the beltway and along Virginia Route 1 (Figure 4.18.e).
- There is no significant change in accessibility to a regional freight terminal within 60 minutes (Figure 4.19.e).

Environment

- Volatile organic compounds (VOC) mobile source emissions are 29.8 tons per day, compared with 30.2 in the base (Figure 5.1). Nitrogen oxides (NOx) mobile source emissions are 32.4 tons per day, compared with 32.7 in the base (Figure 5.2). Winter carbon monoxide (CO) mobile source emissions are 1,126 tons per

Transit Oriented Development Scenario

day, compared with 1,138 in the base (Figure 5.3). Direct particulate matter (PM) 2.5 mobile source emissions are 739 tons per year, compared with 746 in the base (Figure 5.4). Particulate matter (PM) 2.5 precursor NOx mobile source emissions are 10,682 tons per year, compared with 10,786 in the base (Figure 5.5).

- Potomac River – Upper Tidal watershed sees an increase in 2010 to 2030 employment growth of 98% (Figure 5.6.f). Mattawoman Creek watershed sees an increase in 2010 to 2030 household growth of 53% or higher (Figure 5.7.f). Broad Run has a 2000 level of impervious surface of 14.7% with an increase of 91,100 jobs and 26,500 households. Potomac River – Upper Tidal has a 2000 level of impervious surface of 13.7% and has an increase of 40,800 jobs forecast (Figure 5.8.f). The percent impervious surface in the regional watersheds for year 2000 is 8.1%. There is a 2010 to 2030 employment growth of 23% and household growth of 16% in this area (Table 5.1.f).
- Nitrates Deposition in the Chesapeake Bay (Figure 5.9).
- Energy Use (Figure 5.10).

Safety (measure of Information)

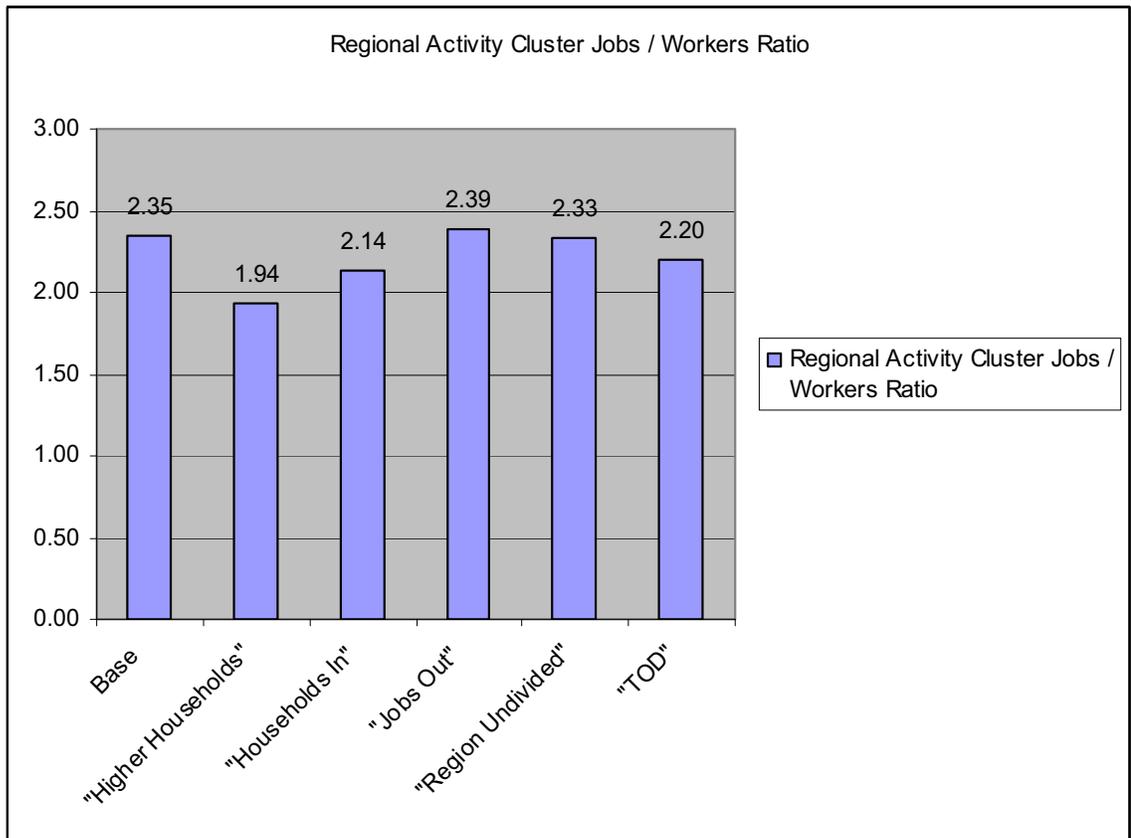
No forecasts, therefore no comparisons, can be assumed for traffic accidents or fatalities based on VMT or transportation infrastructure improvements. However, the region will always consider safety to be a top priority in transportation planning.

10. Summary of Major Findings

Land Use

Ratio of Total Jobs to Number of Workers: The goal of the Planning Directors and COG staff was to improve the job / worker balance within the regional activity clusters. Staff was mostly able to move the job / worker ratio closer to 1.0 by mostly adding households to the primarily employment based regional activity clusters. Of the twenty-four clusters, only the Baileys Crossroads (0.8) area had a ratio less than 1.0 in Round 6.4 cooperative forecasts for the year 2030. This means there were only 8 jobs for every 10 workers. As expected, all other regional activity clusters had more jobs than workers. The changes in ratio to the region throughout the clusters reveal two key points. One, moving households into clusters has more of an effect than moving employment. This is seen in the chart below, where we see that the largest overall drop in the ratio occurs in the “Higher Households” scenario, followed by the “Households In” scenario. The other three scenarios do not have the same overall effect because they each move employment, which either offsets the household shifts in the “Region Undivided” and “TOD” scenarios, or because employment was generally shifted from inner cluster to outer cluster in the “Jobs Out” scenario, has no real effect on the overall ratio for all clusters.

Figure 11- Regional Activity Clusters, Jobs /Workers Ratio



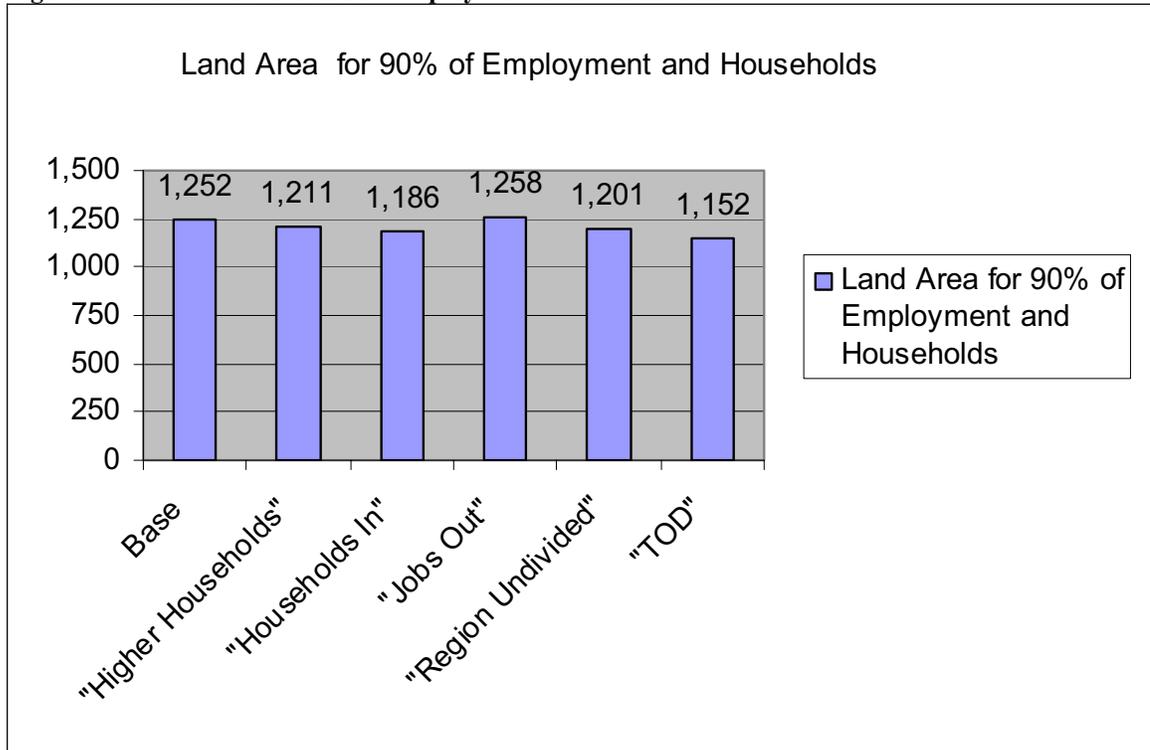
The second key point we see is the effect on the clusters in western Fairfax County. Tysons Corner, the Dulles Corridor, and Dulles South have dramatic changes drops in the job / worker ratio in scenarios that shift housing. Currently, and in the Round 6.4 cooperative forecast, these areas are primarily employment based clusters. Tysons Corner shifts from 3.8 to 2.8 and Dulles Corridor shifts from 3.5 to 2.4 in the “Higher Households” and “TOD” scenarios, while Dulles South shifts from 5.2 to around to just either side of 4.0 in the “Higher Households” and “Households In” scenarios.

It is important to note that not all workers living in a cluster will actually work in that cluster, but certainly, more will.

Employment and Household Growth Patterns

90% of the combined households and employment require less total land area for most of the scenarios, while the “Jobs Out” scenario uses virtually the same land area as the base, only requiring 6 more square miles.

Figure 12- Land Area for 90% of Employment and Households

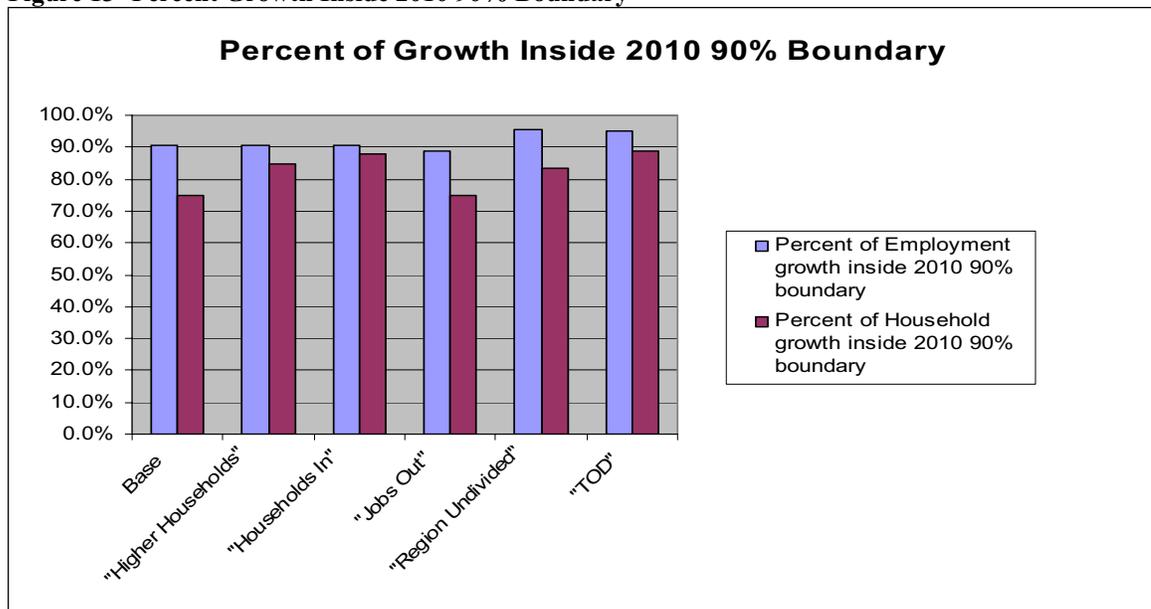


The “TOD” scenario has the most dramatic change compared to the base, requiring 100 square miles less than the base, an area roughly about the size of core (DC, ARL, ALEX). Also very significant for “TOD” is that the total land area for its 90% boundary is virtually the same as the boundary for 2010, meaning that basically all future development can be accommodated into that area. “Higher Households”, “Region

Undivided” and “Households In” used between 41 and 66 less square miles for their first 90% of combined household / employment density. As in the job / worker ratios, we see that scenarios that shift or add households have the most effect.

Future development was concentrated in existing development areas, as indicated in below. The base and all the scenarios had a vast majority of their 2010-2030 household and employment development occurring within the 2010 90% boundary, indicating development is generally following existing development patterns. “TOD” and “Region Undivided” have a greater percentage of employment growth inside the boundary. All scenarios that shifted households increased the percentage of growth inside the 2010 boundary. The scenarios that shifted both jobs and households show the greatest overall improvements.

Figure 13- Percent Growth Inside 2010 90% Boundary



Employment and Households near Transit

The percent of regional households and jobs near transit stations is affected by both land use changes and transit improvements. The measures of effectiveness reflect the number of jobs and households within both ¼-mile and ½-mile of transit stations. Although many people would be willing to walk further, these distances were chosen as reasonable distance most people would be willing to walk to a transit station. A transit station for this purpose is defined as one along a fixed guideway, meaning a Metro station, a VRE or MARC station, a light rail station, or a transitway station. WMATA and local bus stations are not included in this analysis.

All scenarios show improvement in the percentage of employment and households within both distances, even if some scenarios only shifted one or the other. This makes sense because each scenario has significant transit improvements. “Higher Households”, “Households In”, “Region Undivided” and “TOD” show significant improvements

between 8-9% in employment within ¼-mile of a station, while also showing a 6-10% improvement in employment within ½-mile of stations. The same scenarios also have 6-7% improvements for households within ¼-mile of stations, while also showing a 9-12% improvement for households within a ½-mile. “Jobs Out” has improvements between 1-2% for both employment and households within both distances specified. The improvements for “Jobs Out” were not as high because jobs were shifted away from the Metro heavy core area to outer jurisdictions where development and transit stations are more spread out. However, the “Jobs Out” scenario did show increases in the outer clusters that received increased employment and where transit improvements were made. The charts below indicate the total percent of regional households and employment near transit stations and how they relate to the base.

Figure 14- Employment and Households within ¼-mile of a Transit Station

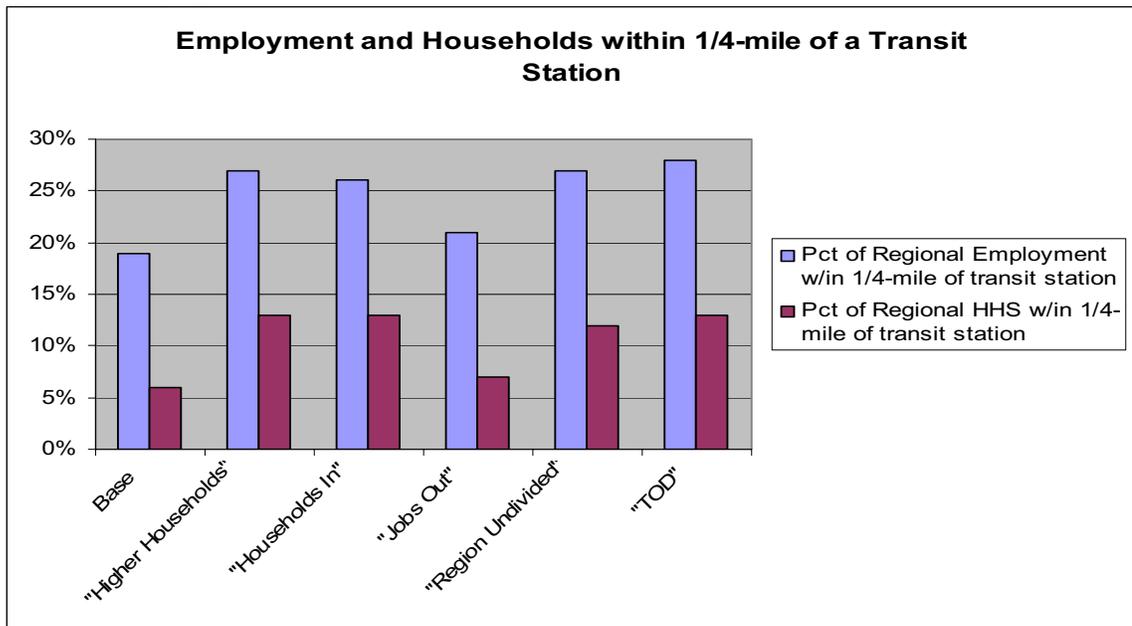
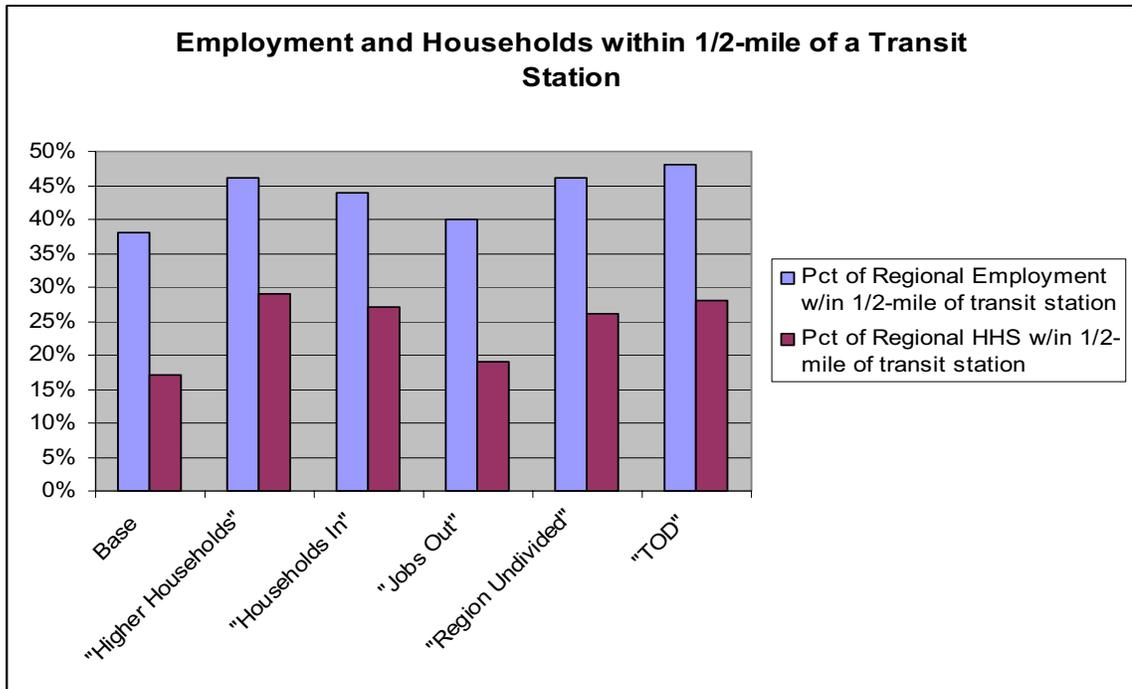


Figure 15- Employment and Households within ½-mile of a Transit Station



Vehicle Miles Traveled and Congestion

Daily Vehicle Miles Traveled (VMT) and VMT Per Capita: Because all scenarios move either jobs closer to households, households closer to jobs, or a combination of both, and are then combined with transit improvements, all scenarios have a decrease in daily VMT and per capita VMT. Somewhat surprisingly, “Jobs Out” shows a decrease in VMT despite having more daily vehicle trips. Even more surprising, “Higher Households” has the largest decrease in VMT and VMT per capita despite having nearly 170,000 more vehicle trips per day. This is primarily due to external trips being cut, thereby shortening the average vehicle trip. “Households In”, “Region Undivided” and “TOD” are all very similar, showing decreases in VMT between 0.8% and 1.0%. The percent may seem small, but this change accounts for between 1.21 and 1.47 million miles driven each day.

Figure 16- Daily VMT

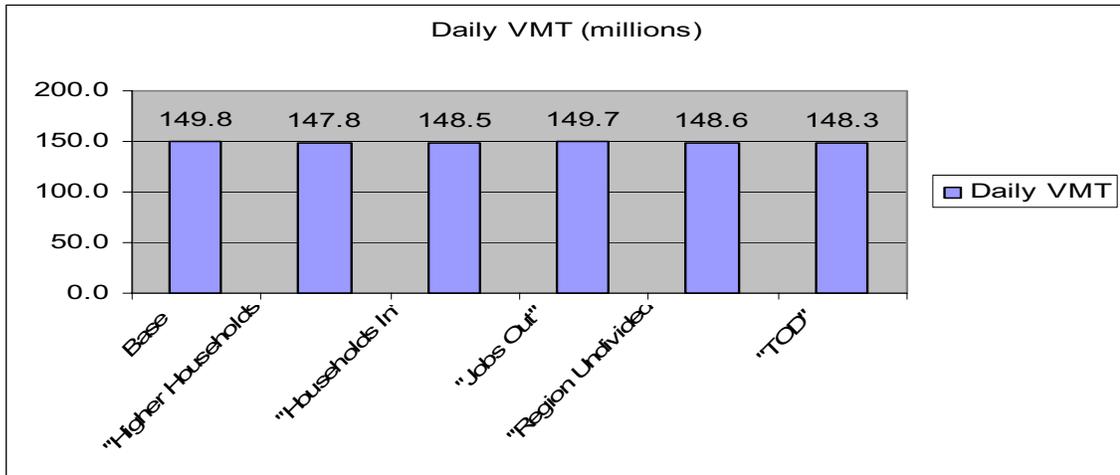
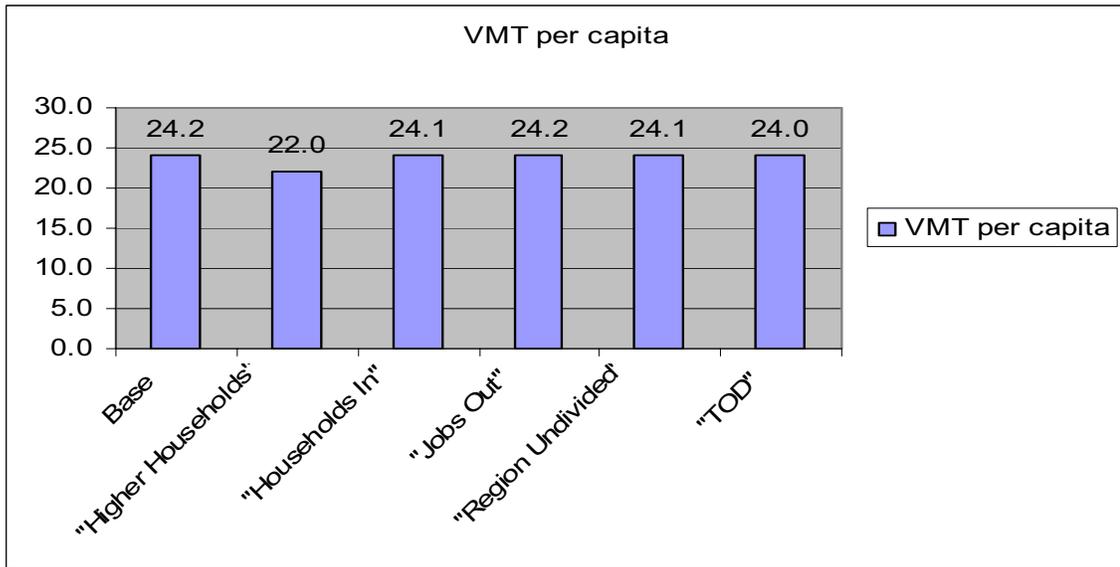


Figure 17- VMT per capita

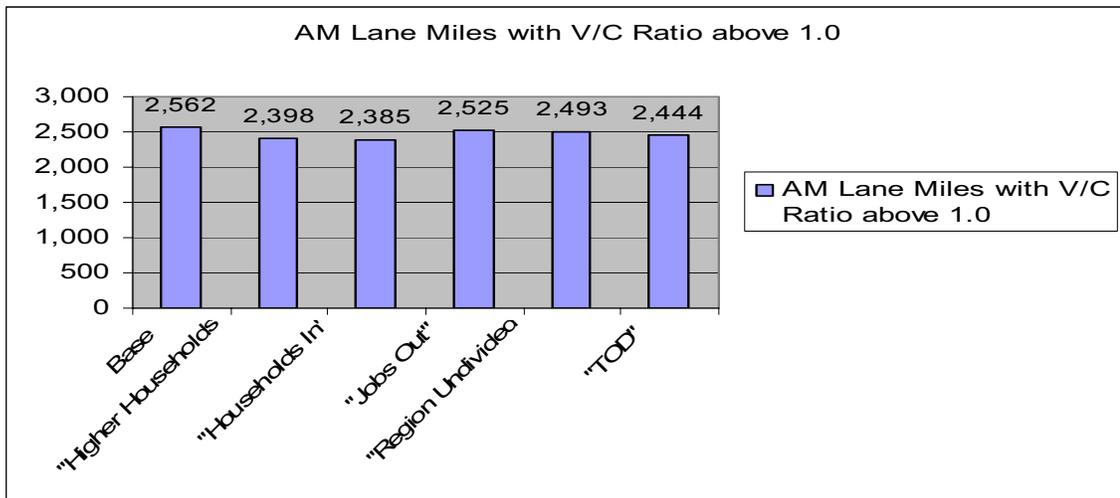


A.M. Peak Highway Congestion Levels

All scenarios show improvements in the amount of lane miles that have a volume to capacity (V/C) ratio above 1.0, considered beyond capacity. All scenarios have 1.4% to 6.9% less congested lane miles compared to the base, which equates to between 37 to 177 miles. Also, staff analyzed the loaded links networks to try and determine where highways became less congested and where they become more. The CLRP+ 2030 network shows highways with V/C ratios above throughout the region. "Higher Households" primarily shows improvements in the outer jurisdictions which are a function of the external trips being cut. Increased congestion occurs in "Higher Households" in the areas most affected by the increase in households, especially western Fairfax and eastern Loudoun counties. "TOD" is interesting because congestion is increased and lessened throughout the region, often in the same place. This reflects

positive changes in one direction and negative changes in the opposite direction. It also reflects the widespread land use and transit changes in this scenario. “Region Undivided” primarily has improvements in congestion in Fairfax, Prince William and Loudoun counties, while showing increased congestion primarily in eastern D.C., Prince George’s county and Charles County. “Households In” improves in areas where household growth was shifted from, such as Loudoun County, Charles County and along I-95 in Fairfax and Prince William counties. Increased congestion mostly occurs in areas that received additional household development. “Households In” is similar to S2 in that many areas show increases and decreases in many of the same areas. “Jobs Out” shows improvements in the core area, as well as in the inner areas of the inner suburbs. “Jobs Out” sees increased congestion in mostly in Prince William and Charles counties. When viewing the maps in the appendix (cite), assumptions must be made as to the directionality of the increases or decreases in congestion. Staff has not been able to go into the fine detail required to investigate each link’s directionality. However, with knowledge of the land use patterns, we can assume that most improvements occur in areas that have less household and / or employment growth compared to the base and more congestion occurs where there is more.

Figure 18- AM Lane Miles with V/C Ratio above 1.0



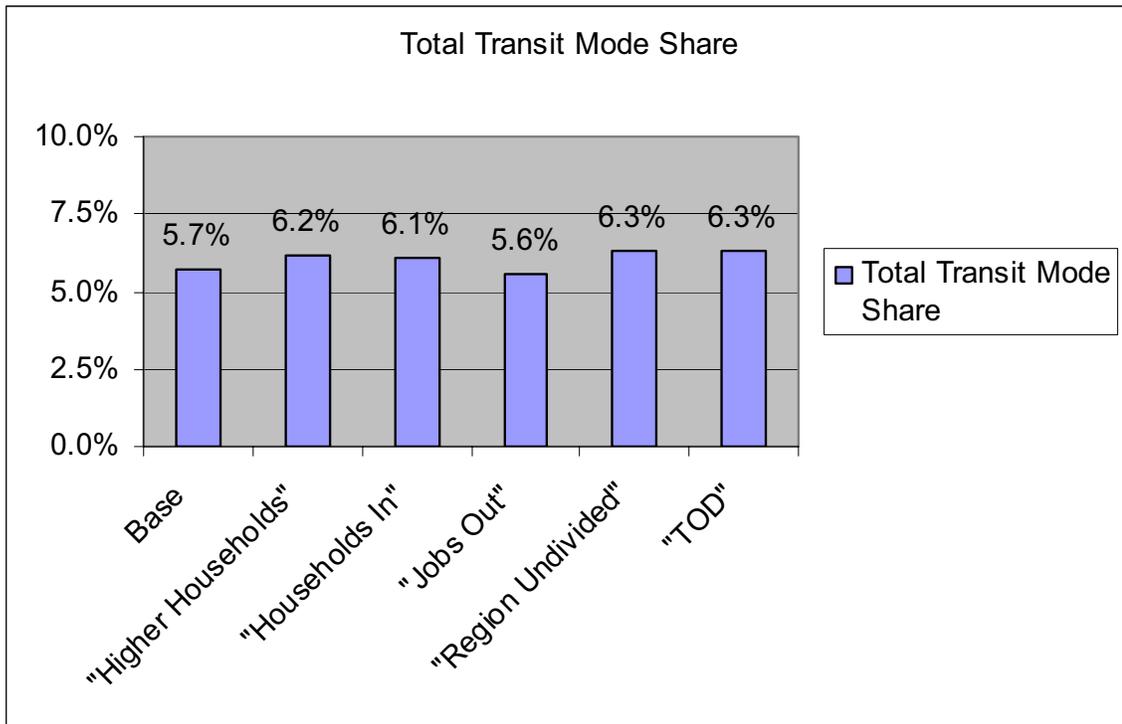
Mode Choice

Mode Share: On a regional activity cluster level, we can identify some general patterns regarding SOV, HOV, transit and walk / bike mode share production and attractions. Mode share is based on land use patterns, and does not change much in either direction for most clusters. SOV mode share decreases in a large majority of clusters in all scenarios, except for “Jobs Out”. HOV mode share generally drops in regional activity clusters for all scenarios. Transit mode generally increases in all clusters in all scenarios, except for the “Jobs Out” scenario. And walk / bike mode share generally increases in all clusters in all scenarios, except for in the “Jobs Out” scenario. Mode share is based on land use patterns, and does not change much in either direction for most clusters. However, large increases in transit and walk / bike mode share can be found in some

clusters that gain a large amount of households, like Tysons Corner, and / or have major transit improvements that connect to the existing system, such as in National Harbor.

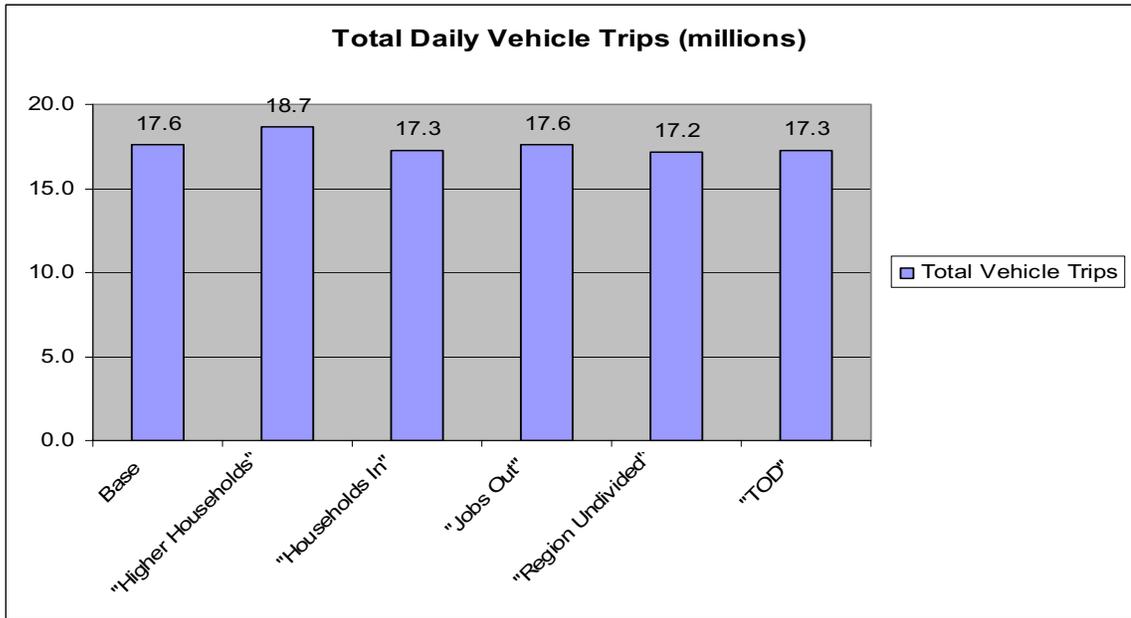
Regionally, transit mode share increases for all scenarios except for “Jobs Out”, as seen in the chart below.

Figure 19- Total Transit Mode Share



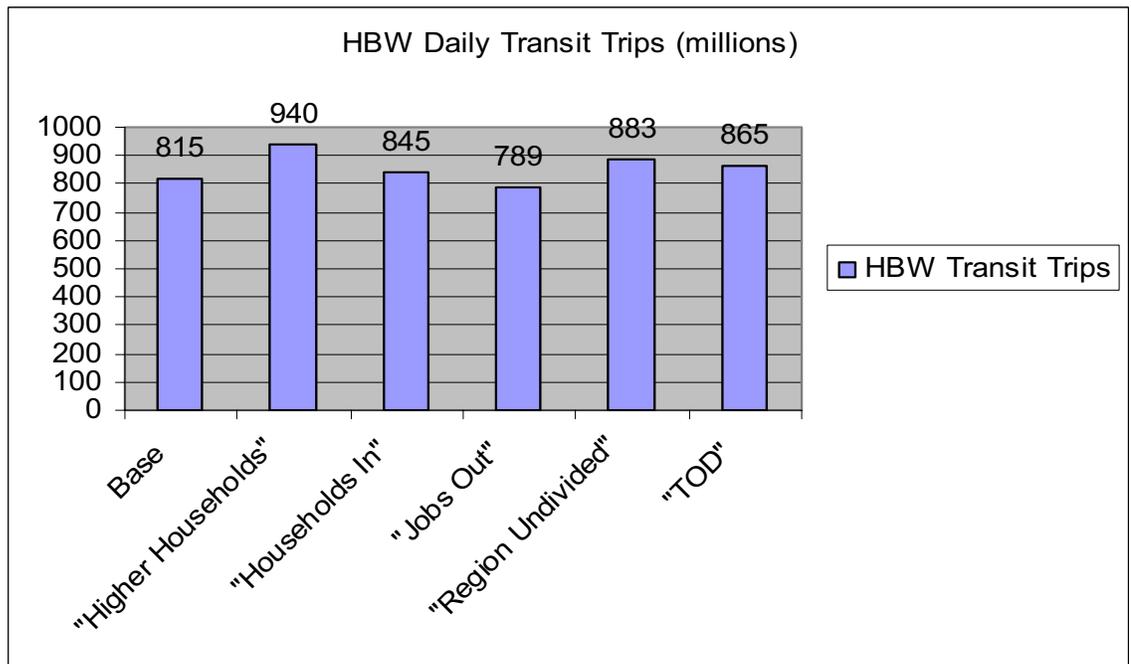
Trips: By increasing the number of households in “Higher Households”, we have a large jump in the number of daily vehicle trips. Also, daily vehicle trips are increased if jobs are shifted away from the core area to the outer area, as evidenced in “Jobs Out”. Shifting household growth closer to job growth, as done in “Households In”, “Region Undivided” and “TOD” results in decreased daily vehicle trips.

Figure 20- Total Daily Vehicle Trips



For all scenarios except for “Higher Households”, there is an opposite effect on daily transit trips, especially when combined with transit improvements. Home based work transit trips increase 3.7 to 8.4% for “Households In”, “Region Undivided” and “TOD”, while “Higher Households” increases by more than 15%. Overall transit trips drop in the “Jobs Out” scenario by 3.1%, but transit trips do increase in the outer areas.

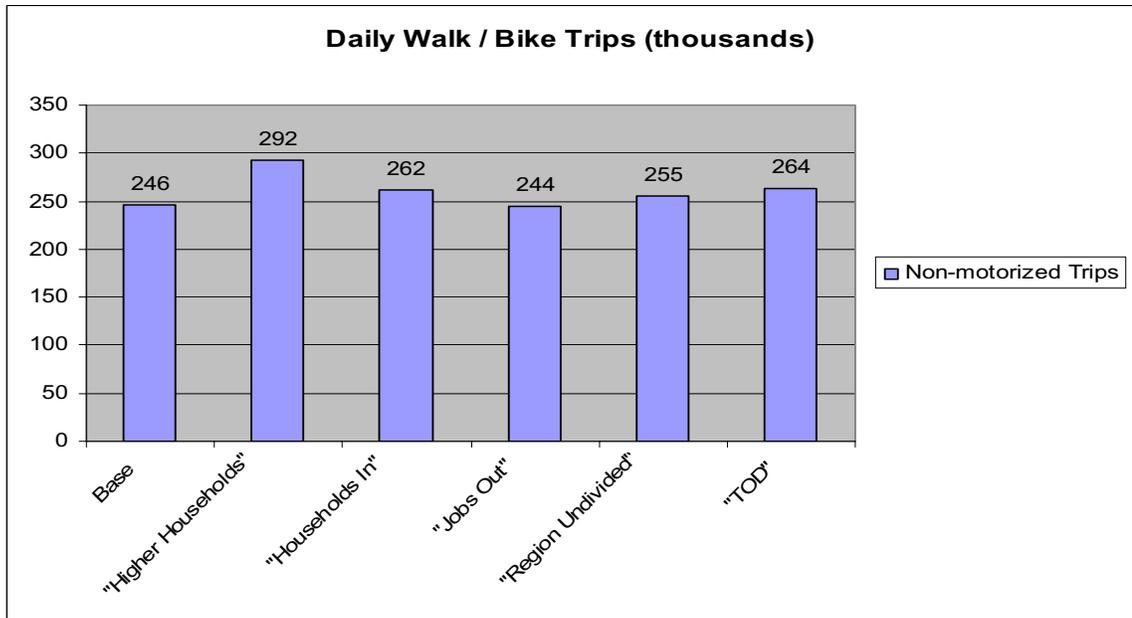
Figure 21- HBW Daily Transit Trips



Walk and bike trips change in a similar pattern to transit trips. “Higher Households” increases these trips by 18.7%. “Households In”, “Region Undivided” and “TOD”

increases walk / bike trips by 3.7 to 7.3%. “Jobs Out” sees a decrease in walk / bike trips by about 1%.

Figure 22- Daily Walk/ Bike Trips



The overall pattern suggests that by moving households closer to employment centers, rather than the other way around, will increase alternative modes of transportation to SOV.

Transit accessibility

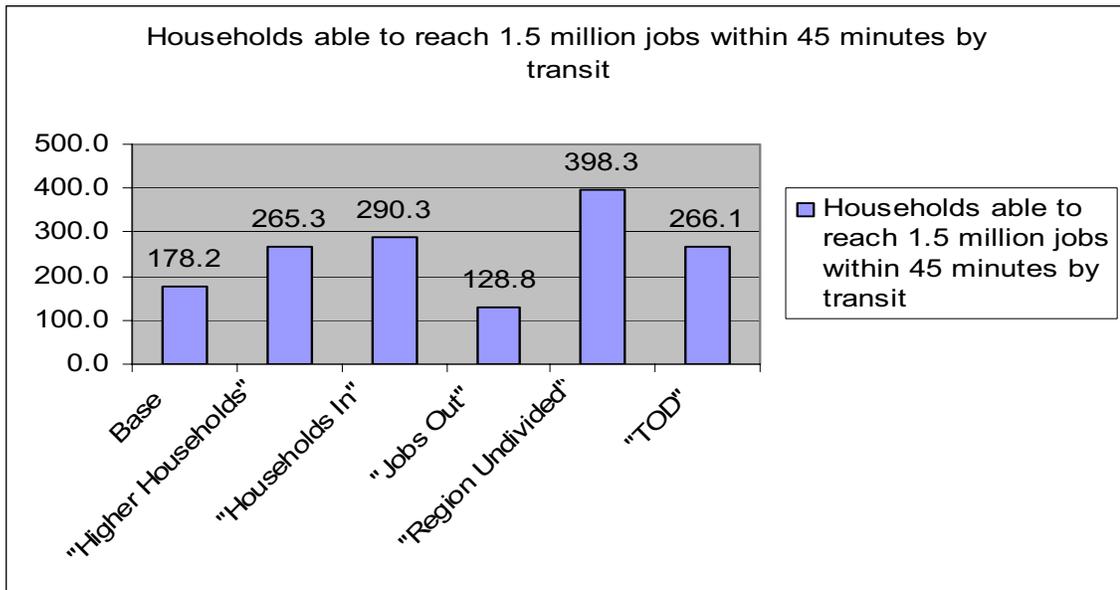
For accessibility, 45 minutes was chosen as the threshold because less time would not have allowed us to analyze numbers in great detail, while moving up to 60 minutes would have become less meaningful because not enough change between scenarios would have been seen. All scenarios show some moderate and significant increases in transit accessibility to jobs and households, with very few losses in job accessibility or household accessibility. Moderate change in accessibility to jobs is defined as gaining or losing access to at least 150,000 jobs from a particular TAZ, while significant change is defined by a change of at least 300,000. Moderate change in accessibility to households is defined as gaining or losing access to at least 50,000 households from a particular TAZ, while significant change is defined by a change of at least 150,000. Changes in accessibility to jobs and households generally adhere to assumptions made based on changes in land use and transit enhancements. The effect on transit accessibility can mostly be based on either the land use or transit changes, but most often are a result of the two working together.

There is some consistence in transit accessibility to jobs in all scenarios. First, there are no areas with significant losses in accessibility to jobs by transit and very few areas with

moderate losses. Even in areas where employment was shifted from, the numbers were not high enough to have a major effect. Coupling that with transit improvements in all scenarios and it makes sense that we see no real losses in job accessibility by transit. Secondly, we see moderate increases and significant increases in all scenarios. Most of the transit improvements in all scenarios show some moderate gains, but certain areas stand out more often than others in gaining a “significant” amount of job accessibility. The MD 210 and MD 5/301 corridors significantly gain jobs in all scenarios because of transit improvements and because of the employment shifts in three scenarios. Also, Prince George’s County in and around the beltway consistently gains accessibility to jobs in most scenarios. The “Region Undivided” scenario has a dramatic display of significant gains to jobs by transit with large concentrations in the northern and western areas of the county.

Although the maps in Figures 8.3.a – 8.4.f give an indication of the concentrations of different levels of transit accessibility, they do not tell the whole story. It is also important to know how many people are affected by that change. The chart below indicates the total households able to reach 1.5 million jobs by transit, what is defined as “significant” accessibility. First glance at the maps indicates similarities between all the scenarios. However, quite clearly, disparities exist. In the “Jobs Out” scenario, the region has 50,000 less households with access to a “significant” level of jobs than the base. The “Region Undivided” scenario more than doubles the number of households with “significant” access to jobs; due to the potent combination of transit improvements in previously underserved, highly populated areas and the gain of more jobs and household development.

Figure 23- Households able to reach 1.5 million Jobs with 45 minutes by Transit



There are no losses in accessibility to households across all scenarios. Again, most gains in household accessibility are moderate and occur along the transit improvements or in

areas that gained households. The “Higher Households” scenario has the most dramatic display of significant gains in accessibility to households due to the 216,000 extra households in the area.

In general, both employment and household accessibility increases in areas that have increased employment development and / or along the transit improvements. Without analyzing individual lines, it is evident that the transit improvements along Route 1 in Virginia, the Bi-County from Silver Spring to Branch Avenue, and Metro extension over the Wilson Bridge have the most noticeable improvements.

Highway Accessibility

Accessibility to households and employment by highway does not have the same consistency as by transit. All scenarios show moderate gains and losses in job accessibility. All scenarios show moderate increases in accessibility to households. All of the scenarios, with the exception of the “Higher Households” scenario, have a very few scattered moderate losses in household accessibility. Increases in accessibility to households and employment are primarily an effect of more households and employment in that area, while a decrease in highway accessibility to households and employment is primarily caused by congestion associated with increased housing and / or employment in those areas.

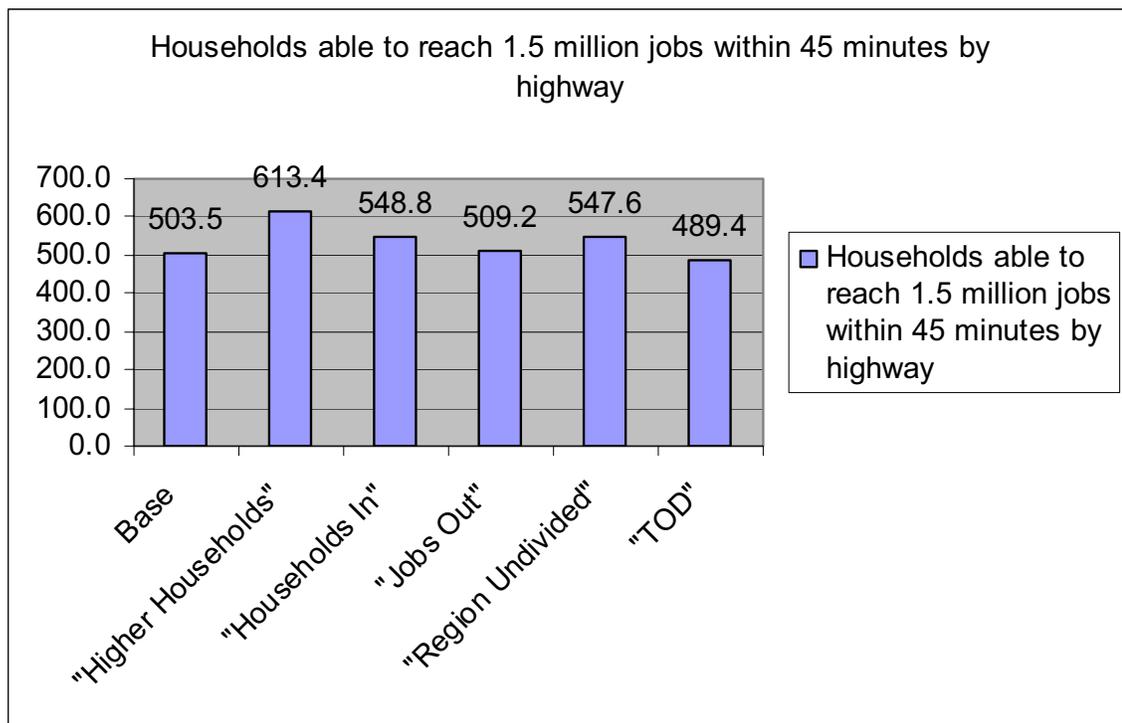
Somewhat surprisingly, the “Region Undivided” scenario does not show the same level of moderate gains in household accessibility as the other three scenarios that shift or gain households. The increased congestion in the eastern part of the region for this scenario, must offset the gains in households. For the other three scenarios, there are large concentrations of moderate gains found inside the beltway and in Fairfax County, with the “Higher Households” scenario also gaining accessibility to households in Montgomery County and Prince George’s County.

There are no significant gains or losses in job accessibility by highway. Each scenario has different areas of moderate gains and losses in job accessibility. Expectedly, “Jobs Out” shows losses in the core and gains in the outer suburbs. Surprisingly, most of the job accessibility gains occur inside the beltway, most likely due to less congestion in those areas. “Higher Households” primarily shows outside the beltway in eastern Montgomery and northern Prince George’s counties, and losses inside the beltway. The opposite occurs in the “TOD” and “Households In” scenarios, with their losses occurring around the Tysons Corner area and their gains scattered inside the beltway. Not surprising, the “Region Undivided” scenario has gains inside the beltway in D.C. and Prince George’s County, and losses scattered throughout the west.

Again, first glance at the job accessibility (not the “change in accessibility”) maps indicates a similar pattern for all scenarios’ highway accessibility to jobs. But the chart below indicates there are significant differences. Obviously, the “Higher Households”

scenario would have the highest total because of the large increase in households to the region assumed in this scenario. The “Households In”, “Jobs Out” and “Region Undivided” scenarios all have more of the total households able to reach “significant” jobs by highway. The “TOD” scenario has a decrease, primarily due to the increased congestion associated with the employment and household shifts.

Figure 24- Households able to reach 1.5 million Jobs within 45 minutes by Highway



In general, increases in highway accessibility to jobs and households are generally seen in areas that have reduced development, therefore reduced congestion. Decreases are generally seen in areas of increased development, resulting in increased congestion. In many areas, it is possible that congestion may not change dramatically because shifts from SOV to transit use may offset some of the congestion effects of increased development. Also, even with these assumptions, some areas that have less forecast growth may have increased highway mobility due to less congestion.

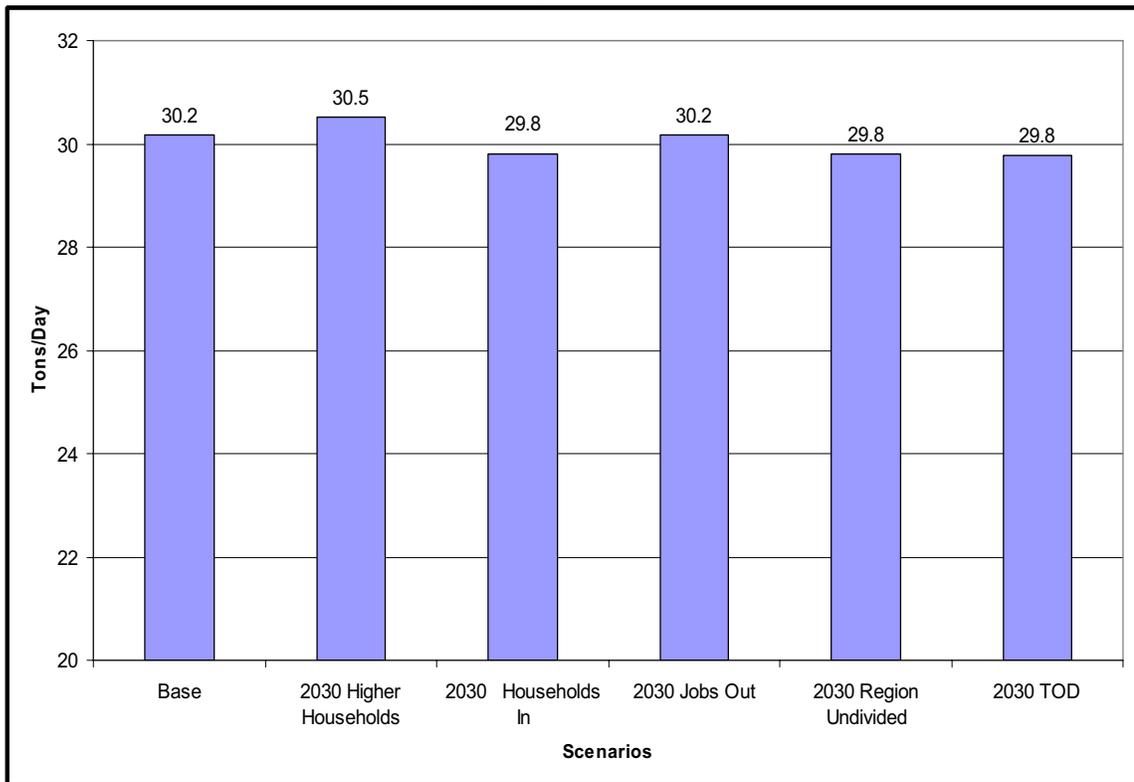
Air Quality

Because mobile source emissions are primarily a factor of VMT, all scenarios generally show slight improvements or hold steady for NOx, Direct PM2.5 and PM2.5 Precursor NOx compared to the year 2030 base. Mobile source emissions modeling was done for the MSA, so each of the pollutant totals may not necessarily reflect the metropolitan Washington “attainment area.”

Volatile Organic Compounds (VOC) Emissions

Despite having the lowest VMT (affecting running emissions) of the five scenarios, the “Higher Households” scenario increases (VOC) because the number of trips also increases, thereby increasing the emissions from cold starts and hot soaks.

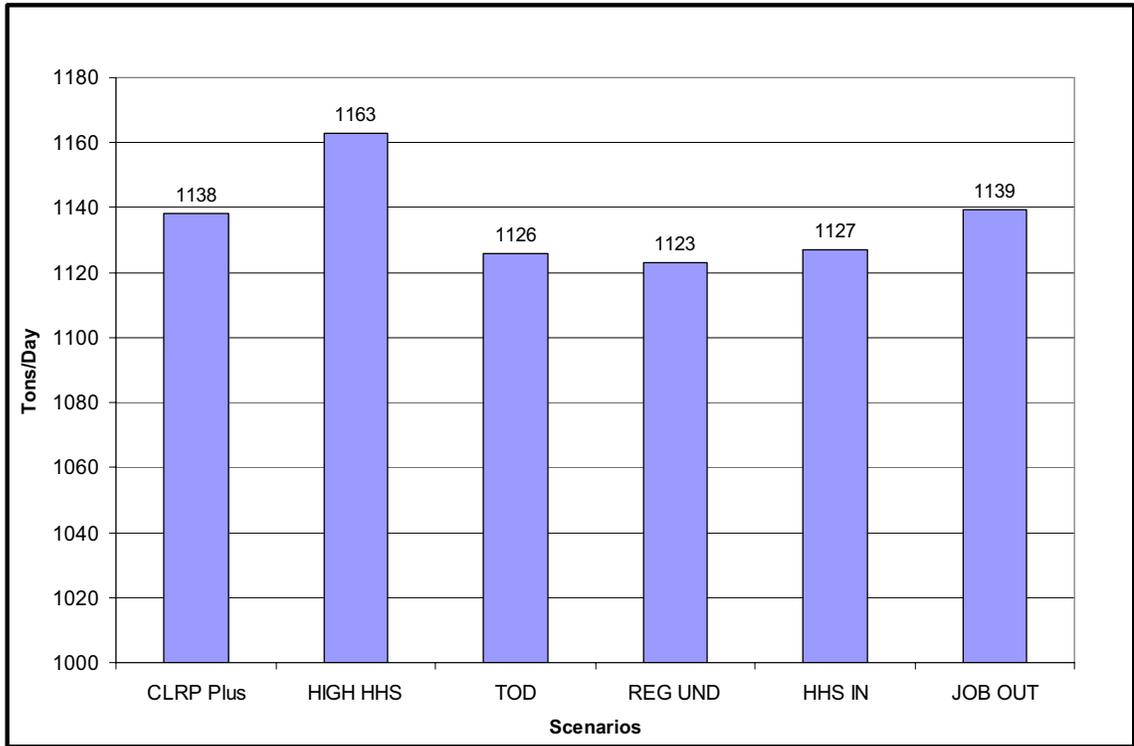
Figure 5.1- Volatile Organic Compounds (VOC) Emissions



Winter CO Emissions

As in the VOC emissions, only the “Higher Households” scenario increases winter CO by a noticeable amount, 25 tons per day, a 2.2% jump. The running emissions for “Higher Households” are better than the other scenarios. However, the increased number of daily vehicle trips results in more emissions from starts. The “Jobs Out” scenario virtually stays the same, while “Households In”, “Region Undivided” and “TOD” decrease 1 to 1.3%.

Figure 5.3- Winter CO Mobile Source Emissions



Although the scenarios do not differ greatly from the base, all scenarios and the base have less negative impact on air quality than in 2010. These forecast reductions are largely the result of assumed improvements in vehicle emissions technology and fleet turnover.

Caveats

It is important to note some caveats regarding the findings in this study. The first is that land use changes only occur for future growth between the years 2010 and 2030. Housing and employment in place today remain. And of that future development, less than half was shifted. Therefore, these results are based off a small percentage of the overall employment and households in the region. The second thing to remember when comparing results between scenarios is that not all scenarios are equal in terms of land use changes and transit improvements. The “Higher Households” scenario has 216,000 more households than the other four scenarios and a transit network rivaled only by the “TOD” scenario. Also, the “TOD” and “Region Undivided” scenarios have more dramatic land use changes and transit improvements than either the “Households In” or “Jobs Out” scenario.

10.2 Next Steps (Phase II)

COG TPB staff and the Joint Technical Working Group (JTWG) will work to supplement the regional Variably-Priced Lanes work done by the TPB Value Pricing Task Force. Discussion will focus on the needs and opportunities for transit on the Variably-Priced Lanes network and any land use assumptions that may need to be made in conjunction with those transit additions.

The transit networks assumed for the land use scenarios may prove too costly to build and some land use changes may not prove to be politically feasible, therefore, discussion will also begin on the development of one or more “composite scenarios” that emphasize common themes, combine positive features of the distinct scenarios defined and analyzed to date and offer more realistic opportunities for implementation recommendations. Finally, the JTWG, in conjunction with the Citizen’s Advisory Committee, will seek opportunities to do public outreach regarding the study’s Phase I results.