EXECUTIVE SUMMARY OF
Chapter 527 Submittal for Fairfax County Comprehensive Plan Amendment
TYSONS CORNER URBAN CENTER

EXECUTIVE SUMMARY

Chapter 527 legislation and guidelines call for local jurisdictions contemplating significant changes to their Comprehensive Plans to perform analysis of the impacts of land use decisions to the state-controlled highway network. In accordance with the state legislation, in late December 2009 Fairfax County submitted to VDOT for review a summary of proposed revisions to the Tysons Corner area, and their effect on the road network. County staff selected the 2030 horizon as the focus of their analysis in this submission, consistent with planning horizons being used in the region at the time the Tysons study was initiated. The 2030 horizon is considered a step in the longer-term vision to transform Tysons over the next forty years into a dense, multimodal urban center, as expressed by the Tysons Land Use Task Force. The submission demonstrates the strong efforts by County staff and their consultants, over months of assessments and evaluations, to translate the complex vision into manageable components for analysis, assumptions, and transportation recommendations for 2030 and intermediate phases.

VDOT's review process was multifaceted due not only to the complexity and extent of the submission, but also to the various clarifications needed, and timing of supplemental material forwarded in installments by County staff during the review period. VDOT technical staff put considerable effort to understand several aspects of the modifications and assumptions behind the model, review the model files' inputs, and evaluate the resulting outputs. VDOT sought additional documentation beyond the original submission, noted discrepancies and assessed revised files, and received additional background and clarifications on several technical questions regarding network coding, traffic assignments, mode share, possible rationale for unexpected output, and the like. These have been presented and discussed in detail in the body of this report.

The submission notes that the backbone of the transportation impact analysis and associated needs assessment is the **transportation modeling analysis**. The process used by the County relied on state-of-the-practice models, tailored to Tysons Corner conditions. The travel demand forecasting utilized the Fairfax County Subarea Model, which incorporates the Metropolitan Washington Council of Governments (MWCOG) / Transportation Planning Board (TPB) model version at the time the study began (Version 2.1D#50). The Washington Metropolitan Area Transit Authority (WMATA) Post-Processor Mode Choice Model was used for the Tysons area, and resulting trip table was applied in the highway assignment.

- Land use inputs for 2030 modeling were derived from the 2050 vision, using an analysis of reasonable market expectations of development conducted for Fairfax County by George Mason University (GMU) Center for Regional Analysis. Of three alternative activity levels in 2030, County staff conservatively selected the "high" option for input to the model.
- The use of the WMATA Post-Processor Mode Choice Model provides better accuracy in modeling transit and mode choice options in Tysons.
- Comparisons with regional modeling data and outputs for major arterials suggest that, for some of the roads/ classifications, the underlying per lane capacities used in the County's volume/capacity analyses are higher than those assumed in the MWCOG/TPB model. Even after application of adjustments to initial capacity values the model outputs may depict

"better" levels of service (LOS) for some locations than what the regional model would indicate. We are unclear about the compounded effect of all assumptions; it appears that operational or other conditions that affect capacity have not been fully accounted.

- The speeds for the proposed plan's circulator routes were adjusted up under the assumption that one-half of the routes would operate along their own right-of-way. The capacity available to other vehicles was not reduced to account for this circulator assumption; whether the independent circulator right-of-way would be achieved by extending typical road sections or other means (such as aerial structures) was not addressed in the submission.
- The road network assumed in the analysis includes several improvements and additions to the existing system: some are consistent with the current 2030 Comprehensive Plan (widening of several roads, extensions to minor arterials parallel to Route 7), while others are new proposed additions (grid of streets, three new connections to the Dulles Toll Road and one extension to a Beltway HOT lanes connection).

A travel demand model is one of the principal tools employed by transportation planners to forecast future traffic volumes and transit ridership. These are computerized procedures that combine forecasts of population and jobs (land use), along with anticipated characteristics of the transportation network (roads and transit), to produce estimates of existing and future travel (trips generated, mode of travel selected by persons, travel patterns and traffic volumes, etc). The models also reflect observed and anticipated characteristics of travel behavior such as the relative importance of travel time, cost, and convenience that influence individual travel choices. For the road network, the travel volume estimates are then used to calculate projected performance of the network, expressed as volume/capacity (V/C) ratios and related LOS. Following is a summary of **key findings from the travel demand model outputs**, which focused on the Tysons study area (analysis for surrounded communities was conducted separately, as discussed later).

- VDOT requested loaded link files from the travel demand process and compiled a comparative table for the following three scenarios modeled by the County: "Existing" (2005), Current 2030 Comprehensive Plan, and Proposed 2030 Comprehensive Plan. For each scenario, the table presents input data (number of lanes) and model results (volumes and performance expressed as V/C ratios and LOS) for 40 road segments selected for review, for the afternoon peak period. The "existing" conditions (2005 in this case) provide a starting point for reviewing how well the model portrays known experience, as well as a basis for comparing future year (2030) changes. The current 2030 Comprehensive Plan values provide a view of what is already assumed under the currently adopted plan, and a basis for comparing the proposed amendment. The proposed Comprehensive Plan values summarize the conditions if the proposed amendment is adopted.
    - Existing (2005) values indicate that highly congested conditions (V/C > 1.0) are rare in the PM peak. Thirty-four of the 37 road segments listed (excluding the Beltway currently being widened) are shown to operate at LOS A through E and only one segment along Routes 7 and 123 indicates operation at V/C of 1.0 (the lower end of LOS F). This road network performance does not necessarily represent the frequent experience of commuters driving in the afternoon peak along the major arterials in the area, during the period prior to rail construction activities in Tysons. Major arterial V/C ratios appear to be on the low side of observed conditions.
    - Model results indicate that the overall performance of the road system in Tysons will improve between 2005 and the proposed 2030 amendment conditions (road segments

operating at LOS F will decrease), even though underlying land use intensity is planned to increase substantially. The main reason for this trend is the significant transportation capacity additions proposed for 2030 (roadway and transit). In addition, trip generation rates for the proposed land use mix and transit-oriented development (TOD) are anticipated to be lower, per square foot of development, than for less intense, more employment-focused and segregated land use developments.

  - Compared to current Comprehensive Plan conditions, the proposed plan amendment would result in improved peak hour LOS in several of the road segments examined, including portions of Route 123, Route 7 and the Capital Beltway. This can be partially attributed to the additional proposed connections (to the Dulles Toll Road and Beltway, grid system) which provide better connectivity and improved traffic distribution in Tysons.
  - The proposed grid system adds capacity to the overall road network and allows travelers to turn toward their destinations as early as possible, which tends to free arterial capacity. However, the effect of the resulting many new intersections along the arterials, particularly Routes 7 and 123, has not been fully assessed.

- The recommendation to eliminate from the current Comprehensive Plan three interchanges in Tysons (International Dr. at both Route 7 and at Route 123, Route 7 at Westpark Dr./Gosnell Rd.) is supported by the model results. This proposed revision to at-grade intersections is also consistent with the urban environment sought for Tysons, and with the design of the Metrorail stations in the proximity of two of those intersections.
- Model output summaries received in the latest supplemental indicate that the systemwide level of congestion is anticipated to increase substantially between existing conditions and the proposed Comprehensive Plan for the afternoon peak period (85,000 to 101,000 congested vehicle miles of travel) but to increase very moderately in the morning peak period. The afternoon increase does not appear to be consistent with the individual link performance output described earlier; we believe this merits further investigation.
- Internal vs. through vehicle trips. The model output of 2030 daily trips shows that the number of internal trips will increase by more than 85% when comparing current and proposed Comprehensive Plans (from 75,000 to 142,000). In contrast, both the number and proportion of vehicle trips going through Tysons would be lower under the proposed Comprehensive Plan (307,000 or 68%) than for the current Comprehensive Plan (335,000 or 82%). This suggests that some of the 2030 through trips will be using other arterials not in the Tysons area; an assessment of possible revised trip patterns and related effects outside Tysons was not conducted or presented.
- Under the proposed 2030 amendment, several of the ramps to the freeway system and some of the internal roads in Tysons would operate at V/C above 1.0 (LOS F). More detailed analysis, including operations and safety reviews and identification of mitigation measures, will be necessary concurrent with design of proposed connections to the freeways or with individual submissions for localized land use implementation.
- It should be noted that the model is not designed to determine whether the network connections that have been coded into the model, assumed transit and TDM levels can actually be implemented. As such, the model output assumes that all proposed improvements are feasible from the engineering perspective, can be approved by appropriate agencies, will be funded, and implemented in the scheduled timeframes. If a major proposed connection or assumed transit or TDM level is not implemented, the trip distributions and performance of the surrounding road network would be different from those modeled.

To assess the **impact on surrounding communities** of the proposed 2030 land use intensities for Tysons, the County conducted an operational analysis of nineteen selected intersections at locations bordering or outside Tysons. Micro-simulation tools were used to evaluate operations under existing and proposed 2030 Comprehensive Plan conditions. Forecasts indicated that 14 of the 19 intersections would operate at LOS E or F during morning or afternoon peak hours. Targeted mitigation measures identified in the submission (such as turn lane extensions, addition of signals, revisions to signal timing), in conjunction with widening of road facilities already included in the current Comprehensive Plan, were found to result in improved performance to LOS D or better at all but three intersections. The remaining three intersections with LOS E would experience either LOS improvement or no degradation, when compared to existing conditions.

The submittal also included a **brief 2050 "Sketch Planning" assessment**, more of an exploratory review than a rigorous analysis. The potential level of trips that could be generated by the additional 29 million square feet of development between 2030 and 2050 was not presented analytically. The submission included the assessment that the major road network could not be expanded beyond the recommended 2030 level. In order to accommodate the 2050 land use level being considered, the built-in assumptions include aggressive TDM programs forecasted to reduce vehicle trips by 4%, and a required 31% transit share dependent on implementation of two new high-quality Metrorail corridors, in addition to the Silver Line serving Tysons and the Dulles Corridor. The two additional corridors were not clearly identified. The combined measures are "required to keep vehicle trips reasonably constant at the 2030 level."

The **proposed typical street sections** (urban cross-sections) incorporate the concept of "complete streets" which provide capacity, mobility and safety for various users: private cars/motorists, transit buses, bicyclists, pedestrians and transit riders. The proposed lane widths are in agreement with the minimum AASHTO design standards. However, we recommend that ultimate design of streets take a comprehensive "context sensitive" approach rather than rely on minimum values across the board. The context-sensitive approach considers impacts to various users, features and integration into the community, and addresses safety, mobility and preservation. Guided by the proposed cross-sections, final street design may need to incorporate tradeoffs to account for the road's classification and standards (such as those for national highway system routes where applicable), proportion of user types (trucks, buses, bicyclists, pedestrians, other vehicles), transition between existing and ultimate sections, and surrounding land uses (existing and planned).

The proposed Plan is based on changing the way people travel to, from, within and through Tysons. These changes include increasing the relative use of public transportation and ridesharing, as well as walking and biking. In order to achieve these travel characteristics and approximately realize the modeled effects, a number of **supporting actions need to be taken between now and 2030**, some of which rely on subsequent studies, significant funding and/or land use commitments, support and approvals from appropriate agencies, and / or legislative decisions. For the 2030 timeframe, such measures and key commitments include:

- Providing additional road capacity. Some of these were anticipated in the current Comprehensive Plan (such as extending Boone Boulevard and Greensboro Drive, widening

Route 7, Route 123 and Gallows Road in Tysons) while others are new recommendations (implementation of grid of streets and associated bike and pedestrian-friendly elements).

- Providing additional connections and improvements to major freeways. The Plan assumes that access to the Dulles Toll Road and I-495 will be improved with additional ramp connections and expanded capacity. The existing DTR interchanges at Route 7 and Spring Hill Road would not be able to accommodate projected 2030 volumes unless these DTR ramps are added to distribute traffic. Although most of the proposed connections appear to be feasible from an engineering perspective, some potential issues have been identified. Further coordination and approvals from stakeholder agencies (FHWA[1], VDOT, MWAA[2] and MWCOG) will be required during project development and funding allocations, and more detailed studies will be needed to finalize specific locations, alignments, design, impacts assessment, and cost estimates. The Phasing outlined in the plan recommends implementation by 2020 of the proposed new ramps connecting Boone Boulevard and Greensboro Drive to the Dulles Toll Road (DTR) and extension inside the Beltway of the Jones Branch Drive Connector between the HOT lanes and Scotts Crossing Road. These key arterial connections would not only relieve existing interchanges but also redistribute some traffic away from Route 7 and Route 123, National Highway System roads. To mitigate the failing merge condition that would result at the DTR connection with the Boone Boulevard extension, the plan recommends construction of collector-distributor (CD) roads along the DTR between Greensboro Drive and Hunter Mill Road; feasibility analysis of these eastbound and westbound auxiliary lanes was not presented. In view of the lengthy lead times required to implement major projects, as well as current funding limitations, it would appear that more rigorous feasibility analyses and preliminary engineering work on these improvements should be initiated immediately.

- As indicted in the Plan, implementing an efficient transit circulator within Tysons, without removing needed capacity for other traffic. The circulator system is envisioned to operate within mixed traffic initially, but the 2030 model assumes higher speeds for half of this system in its own right-of-way, while maintaining road capacity for other vehicles.

- Provision of significantly expanded transit service to and from Tysons, in addition to the transit circulator within Tysons. While the most significant such enhancement is the opening of the Metrorail Silver Line, the transit forecasts embedded in the Plan also incorporate significant increases in bus routes to and from Tysons. Metrorail alone will not provide the level of transit service required to achieve the transit ridership embodied in the Plan, and a significant expansion of bus service to and from Tysons is also required. These combined assumptions highlight the need for aggressive planning on the part of transit providers for the additional transit capacity anticipated, both for the Metrorail components that will be recipients of Silver Line riders, as well as bus transit and supporting facilities.

- Implementation of aggressive TDM programs, with monitoring and follow-up by the County to ensure effectiveness.

- Establishment of a monitoring entity for ensuring that the forecast levels of traffic, transit ridership, TDM performance, and other travel characteristics are being realistically achieved. This is a highly desirable component of the Plan, since travel behavior is influenced by many

[1] FHWA: Federal Highways Administration
[2] MWAA: Metropolitan Washington Airports Authority

factors which may change over time, and static modeling of future conditions may not capture these variables. The road performance in the model output assumes all proposed improvements (transit and highway), TDM measures and land use mix will be implemented. The draft Plan text included in the submission notes that, should an imbalance in the transportation demand side and supply side be identified, possible corrective measures may include amendment to the Plan to modify intensities and/or mix of uses, congestion pricing, facility user charges, and other tools.

- Implementing additional innovative measures related to incident management, transit and traffic operations, wayfinding and other uses of technology to maximize the efficiency of the transportation system.

The submittal explains that the **estimated costs** of implementing the grid (approximately half of the total $1.48 billion cost estimate, including right-of-way and construction), is anticipated to be funded mostly by the private sector as development occurs. Funding sources for the remaining portion of the roadway and transit improvements are not spelled out in the report, although the chapter of the draft Plan text (included as and Attachment in the submission) refers to the ability to generate stable and ongoing sources of funding for transportation improvements, as a key factor in their implementation. Tax district, Tysons Transportation Fund (TTF), Community Development Authorities (CDAs) are all mentioned as potential partial elements of innovative public-private financing options for improvements within Tysons. However, it is clear that significant public sector funding would also be necessary to achieve phases of the vision for the future of Tysons. It is common knowledge that public funding availability is a current concern in Virginia and, specifically, Northern Virginia. Proposed connections or improvements to limited access facilities scheduled to be completed in the next ten years, mentioned above, are key to achieving the traffic distributions and levels of service represented by the travel demand model output. Additional improvements noted by 2020 include widening of Gallows Road (to include bike lanes) and of Magarity Road.

Additional significant measures assumed under the 2050 “Sketch Planning” assessment include implementation of two high-quality Metrorail corridors with TOD characteristics, in addition to the Silver Line, as well as successful implementation of an aggressive package of Transportation Demand Management (TDM) measures.

VDOT supports measures aimed at achieving improved balance between land use and transportation. However, it is not clear at this time how the complex phasing of land use activity will be reviewed and approved (both for 2030 and eventual 2050 levels), how the supporting infrastructure will be funded and fully implemented, how the potential imbalance between transportation demand and supply will be monitored, and how corrective measures will be targeted and implemented. We recommend that these be further defined as much as possible in the near future, so that they can be incorporated into the phasing and review of future private development applications and further infrastructure planning.

EVALUATION REPORT OF
Chapter 527 Submittal for Fairfax County Comprehensive Plan Amendment
TYSONS CORNER URBAN CENTER

REPORT ORGANIZATION

Fairfax County's Chapter 527 submittal for Fairfax County Comprehensive Plan Amendment, Tysons Corner Urban Center, consisted of an initial report, received by VDOT on December 23, 2009, and four supplemental submissions received between January and March 2010. The original submission presents a good summary of the process, goals, and various transportation analyses that relied on state-of-the-practice models and assumptions guided by experienced professional staff. To help organize our review comments we prepared a Table of Content of the initial submission, included below. Our review follows the order in the table; Section and subsections added by VDOT to address specific areas are listed in italics.

The material in the original submission presented brief summaries of model output but did not contain sufficient data for VDOT to gain a good understanding of the model's inputs and assumptions, perform traditional technical cross-checks of the data and outputs, and otherwise evaluate the overall model process. VDOT requested travel demand model files and technical documentation to aid in the review and analysis. In response to additional questions and preliminary comments, supplementary material was received which included follow-up to questions, additional model output summaries and background material. These various submittals are listed following the table of contents. The substantial amount of information received in several packages and at various points during the review period, made the review process somewhat circular and difficult. We have tried to incorporate major findings as they became available, and have included additional background to clarify both the submission and VDOT's comments.

Several of our comments are technical or informational, intended to express our understanding of the submission's context and various analyses presented, assist technical staff in the County's evaluations and work in progress, and provide added information to be considered in decisions. It is hoped that our comments will be informative and helpful to the teams and stakeholders involved in the County's Comprehensive Plan update; they are respectfully offered with that goal in mind.

TABLE OF CONTENTS OF CHAPTER 527 SUBMISSION REPORT
(INITIAL COUNTY SUBMISSION)

Note: VDOT's review comments follow the submission's chapter structure; ***SECTION*** *and subsections added by VDOT to address submittal content are listed in italics*

	6.3.1 Background **6.3.2** Transit Goals **6.3.3** Circulator System **6.3.4** Multimodal Transportation Hubs **6.3.5** The Grid of Streets **6.3.6** Road Improvements **6.3.7** Transportation Demand Management **6.3.8** Parking Management **6.3.9** Information and Communications Technology and Intelligent Transportation Systems **6.3.10** Monitoring System **6.3.11** Residential Development
Attachment A	**TRANSPORTATION** (Draft Transportation Chapter text of full "Fairfax County Comprehensive Plan"; original submission substituted with 1/14/2010 revision)
Attachment B	**FRAMEWORK FOR EVALUATION** Model Methodology
Attachment C	**NEIGHBORHOOD IMPACT STUDY – TRAFFIC ANALYSIS REPORT** Existing and future capacity analysis
	- ***SUMMARY AND CONCLUSIONS***

SUPPLEMENTAL SUBMISSIONS (Additional Material Received during Review Period)

I. **Travel Demand Model files (**revised/ corrected files received in late January 2010**)**
II. **Responses to Follow-Up Questions** (received 2/2/2010)
- Part 1: Lane miles for improvements to 2030; Tysons Transit Service
- Part 2: Travel Demand and TDM Data
- Part 3: TDM and Transit share
- Part 4: Total Home-Based Work Trips (Current and Proposed Comp. Plans)
- Part 5: Fairfax County Transportation Model – User's Guide
- Part 6: Employment, Household, Population data by subzone; Peak hour v/c data

III. **Regional Impact Analysis – Supplemental Information** (received 2/18/2010)
IV. **Model-related (2030) and transit share topics** (received 3/5/2010)

CHAPTER 1 – INTRODUCTION AND BACKGROUND

This section presents an overview of Tysons Corner (also referred to as Tysons), a 1,700 acre area between downtown Washington D.C. and Dulles International Airport, located at the confluence of the Dulles Airport Access and Toll Road (VA 267), the Capital Beltway (I-495), Route 7 and Route 123. The eight individual districts defined in the proposed Comprehensive Plan Amendment are shown, with four of these surrounding each of the future Metrorail stations.

The Tysons Land Use Task Force, established in mid 2005 by the Fairfax County Board of Supervisors (BOS) and consisting of 36 members representing a broad cross-section of community interests, was tasked with updating the 1994 Comprehensive Plan to incorporate the extension of Metrorail through Tysons while guiding its transformation following stated goals. These goals included facilitating transit-oriented development (TOD), enhancing pedestrian connectivity and increasing the residential component, among others. After significant public outreach and considerable analysis over two and a half years, the Task Force presented the document "Transforming Tysons Vision and Area Wide Recommendations" to the BOS in September 2008. Guided by the recommendations in the Vision, additional stakeholder input, and further analysis of population and employment forecasts and of transportation and other impacts, Fairfax County Planning Commission and county staff have been developing detailed Comprehensive Plan text for the updated plan.

The Chapter 527 submission being reviewed under this process highlights the components, assumptions, methodology and results of the transportation impact analysis conducted in the process of updating the Comprehensive Plan. The primary transportation analysis for the submission is based on the forecasted 2030 land use (roughly 84 million square feet of development). The development intensity anticipated by 2050, closer to the "Vision" level expressed in the 2008 Task Force document, is assumed to be in the 113 million square feet range.

The submission's introduction presents several highlights of the proposed Comprehensive Plan to transform Tysons into an urban, mixed-use, high-density, pedestrian- and bicycle-friendly environment, with multiple public transit options and consequent reduced vehicle trip generation rates. It should be noted that some of the figures mentioned in the introduction (overall intensity levels 70% higher than current Rosslyn-Ballston corridor, 65% vehicle trip reduction for development closest to rail stations, 31% transit mode share), are goals for the 2050 time-frame, rather than factors in the 2030 analytical transportation impact assessment, which is the primary focus of this submission. Due to the complexity of this submission, the review below presents a summary of the material submitted and its context, along with review comments from the perspective of effects on the road transportation network, as appropriate.

CHAPTER 2 – LAND USE INPUTS

The proposed land use links intensity of development to accessibility by transit. The plan recommends higher development intensities closer to the future rail stations with floor-area-ratios (FAR) as high as 4.75 within 1/8 mile of a Metrorail station, tapering down to 2.75 and 2.0 within ¼ mile and ½ mile respectively (Table 2.1 on page 8 of submission). The four transit-oriented-

developments (TOD) within this ½ mile radius of each of the four rail stations are planned to contain about **75% of all development in Tysons**, with a mix of residential and non-residential uses within walking distance. These are designed to promote both "internal capture" of non-auto trips within TOD districts, and convenient accessibility from other locations to sites within TOD districts via non-auto modes (transit, biking and walking). It should be noted that the Employment and Population estimates for the 2030 proposed scenario reflect lower percentages of these variables within TOD areas -- **66% and 54%** respectively (Tables 2.3 and 2.4 on page 9 of the submission). Although it is not clearly stated in the submission, County staff confirmed that the high FAR and development levels for TOD areas are goals for the very long run (2050 vision year) rather than for the 2030 horizon year analyzed.

A pedestrian and bicycle friendly environment is also considered key to achieving the plan's goals of multi-modal connectivity and reduced reliance on auto trips; this is achieved through a variety of ways: land use mix and intensity, ample sidewalk / bicycle network, incorporating "complete street" principles and other urban design strategies, such as smaller block sizes and pedestrians closer to buildings and human activity than to parking areas. Three bus circulator systems are intended to extend the reach of the Metrorail advantage beyond these distances and encourage the creation of urban residential neighborhoods in large portions of the non-TOD Districts.

Conceptual land use patterns (Figure 2.1 on page 6 of the submission) reveal:

- Most office mixed use is planned around or in close proximity to the two future Route 7 rail stations (West and Central 7), along the Dulles Toll Road between Route 7 and International Drive, north of the Central 123 station, and in proximity to the East station.
- Mixed Use (Residential, Office, Retail, etc), is scattered primarily along Routes 7 and 123.
- Residential Mix Use is planned typically farther from the future rail stations than the above two uses. This decision is supported by the knowledge that, among users of Metrorail, residential users are more open to longer walking distance to the stations than are office users.
- Retail Mixed Use locations are approximately consistent with the two major existing Regional Shopping Centers (Tysons Corner Center and Tysons Galleria).

As a result most of Tysons will have a mix of land uses. From the perspective of the roadway network, the proposed land use mix and other "urban center" policies in the plan are intended to promote reduced reliance on auto trips and have the overriding effect of lower auto trip generation per square foot of development than for land use options where uses are segregated geographically. The proposed 2030 Comprehensive Plan employment densities (Figure 2.5 on page 13) are highest in proximity of future rail stations and along planned future circulator routes (Figure 4.4 on page 31). The proposed 2030 Comprehensive Plan population densities (Figure 2.4 on page 12) indicate highest levels along Route 7 between Spring Hill Road and Route 123 in proximity of two of the future rail stations, and inside the Beltway on both sides of the Route 123 junction. The combined high population and employment densities are generally highest near the future rail stations, consistent with Transit Oriented Development principles mentioned earlier.

The two **Proposed** Land use scenarios below are presented and analyzed in Fairfax County's submission. The 2030 evaluation was performed in considerable depth. In contrast, the 2050 land use intensity issues are evaluated at the sketch planning level. VDOT's review reflects the level of analysis in each of the proposed scenarios in the submission. Other scenarios (such as 2020

phasing, 2040 and "Task Force Preferred"), are briefly described but not analyzed in the submission, and are therefore reviewed here only briefly.

As mentioned, the primary **transportation analysis in this submission is based on forecasted 2030 land use.** The development levels "achievable" by 2030 were arrived at based on the Tysons Task Force long-term vision for Tysons Corner, and an assessment of market absorption developed by George Mason University (GMU)'s Center for Regional Analysis. GMU's forecasts provided "reasonable market expectations of development" over a period of time; of the three 2030 forecasts developed for Tysons (low, intermediate and high), Fairfax County staff conservatively selected the highest level for input to the transportation model. The **proposed** square footage below does not include bonus densities that have been considered during the planning process for special circumstances, such as provision of affordable housing.

Land Use Scenario	**Intensity (total Gross Floor Area, sq. ft.)**		**Information source**
		% increase vs. Base (vs. 2005)	
Existing Development	46 million	N/A	1/14/10 Draft Plan amendment by County staff
Current Comprehensive Plan 2023 Land Use Intensity (Base)	73 million	Base (59%)	
Proposed Comprehensive Plan **2030** GMU High Land Use	84 million	15% (83%)	Submission document, Table 5.11, pg 54
Proposed Comprehensive Plan **2050** Land Use Intensity	113 million	55% (146%)	

2.2 Inputs to Transportation Model

Land use figures were converted to population and employment figures by traffic analysis subzones (subdivisions of the larger Traffic Analysis Zones or TAZs), since population and employment figures (rather than square footage for each land use) are the traditional input to the travel demand model. Following are the approximate Population and Employment data by scenario. The first three land use scenarios were modeled using corresponding transportation system network inputs described in Chapter 4.

Land Use Scenario	**Population**		**Employment**	
		% increase vs. Base (vs. 2005)		% increase w.r.t. Base
2005	16,000	N/A	103,000	
Current Comprehensive Plan 2030 Land Use Intensity (Base)	41,000	Base (56%)	139,000	0%: Base (35%)
Proposed Comprehensive Plan **2030** GMU High Land Use	54,000	32% (237%)	159,000	14% (54%)
Proposed Comprehensive Plan **2050** Land Use Intensity	99,000	141% (519%)	199,000	43% (93%)

As noted in the above table, population and employment estimates for the Proposed 2030 land use represent an increase of 32% in Population and 14% in Employment over the currently adopted Comprehensive Plan. The proportionally higher increase in population (rather than employment) are reflective of the County's previous analysis indicating that housing increases resulted in better balance and lower trip generations than similar increases in other uses. The move to a more balanced jobs-to-housing ratio is indicated in the table below.

Land Use	Population	Employment	Emp/Pop
Existing	16,000	103,000	6.4
Current plan	41,000	139,000	3.4
Proposed plan	54,000	159,000	2.9

The "vision" timeframe (2050) considers increases of 141% in population and 43% in employment over the currently adopted Comprehensive Plan. As mentioned, this "vision" timeframe is not analyzed in detail in the submission.

It is noted in the submission's introduction that these very high densities within ½ mi. walking distance of future rail stations represent an overall level of intensity that is 70% higher than the Rosslyn-Ballston corridor. Although the analysis horizon for this intensity is not spelled out in the document, County staff confirmed that the very high development intensity applies to the 2050 timeframe. However implementation of the land use approval progression between the 2030 and 2050 development levels and intensities is not explained in the submission.

CHAPTER 3 – URBAN DESIGN

3.1 Urban Design Strategy

The section describes the urban design strategy of the proposed Comprehensive Plan Amendment, intended to implement the vision to transform Tysons Corner into a "highly livable place for residents, employees and visitors." The submission briefly mentions some of the guidance which is provided in the proposed Tysons Corner Urban Center Plan on various transportation elements: the pedestrian environment, bicycle network and the grid of streets. Examples of guidance areas include:

- Pedestrian realm: should be continuous but can vary in character depending on adjacent uses and street scale. The proposed street cross sections included in section 3.2 of the submission all include "Streetscape" sections of varying width between the travel lanes and the buildings intended to accommodate pedestrians and other uses (these are not detailed in the submission, but are described in the Urban Design Recommendations section of the Urban Corner Urban Center Plan Amendment).
- Bicycle friendly community: new streets will be designed and older streets retro-fitted to better accommodate bicycles, ample and safe bicycle parking and wayfinding signage will be provided.
- Grid of streets: existing superblocks will be replaced with smaller block sizes forming a grid of streets which have the effect of dispersing vehicle traffic and of improving mobility for

pedestrians and bicyclists. The types of streets that will form the grid in Tysons are covered in the next section.

From the transportation-impact perspective, these guidelines are intended to have the overall positive effect of encouraging use of alternative modes (biking, walking and transit) and reducing dependence on the single occupancy vehicle. The guidelines will also have an indirect effect on vehicle throughput, which is explored in the following section and later chapters.

3.2 Street Cross Sections

Figure 6.1 on page 76 of the submission consists of a map denoting planned classification of Tysons streets: Boulevard (Major Arterials: VA Route 7 and VA Route 123), Avenue (Minor Arterials such as Boone Boulevard and Greensboro Drive), Collector streets (such as Tysons Boulevard and Tyco Rd.) and Local /Service Streets (new grid streets). Figures 1 through 9 in Attachment A of the submission (Transportation Chapter) depict typical street cross sections being proposed, with general features for each described in the text. All travel lanes are proposed to be 11 ft. wide. Eight-ft. wide on-street parking is included in all but the Boulevard cross sections, and a 5 ft. bike lane is included in the Avenue and Collector Street sections.

As outlined in the VDOT Road Design Manual (Appendix A, pp. A-1, A-2), VDOT has formally adopted the AASHTO *A Policy on Geometric Design of Highways and Streets*, commonly referred to as the AASHTO "Green Book", as the minimum design standards for streets adopted into the VDOT maintenance system. VDOT also uses AASHTO's A Guide for Achieving Flexibility in Highway Design and AASHTO's Guidelines for Geometric Design of Low-Volume Local Roads (ADT $\leq$ 400). These AASHTO guidelines provide specific guidance for urban highway and street design, and include flexibility to address urban design issues.

The proposed street cross-sections incorporate the concept of "complete streets" which provide capacity, mobility and safety for various users: private cars/motorists, transit buses, bicyclists, pedestrians and transit riders. The proposed lane widths are in agreement with the minimum AASHTO design standards. However, we recommend that ultimate design of streets take a comprehensive "context sensitive" approach rather than rely on minimum values across the board. Context-sensitive approach considers impacts to various users, features and integration into the community, and addresses safety, mobility and preservation. Guided by the proposed cross-sections, final street design may need to incorporate tradeoffs to account for the road's classification and standards (such as those for national highway system routes where applicable), proportion of user types (trucks, buses, bicyclists, pedestrians, other vehicles), transition between existing and ultimate sections, and surrounding land uses (existing and planned).

Example of context sensitive considerations include:

- Where a number of wide buses may be traveling next to bicyclists, the lane adjacent to the bicycle lane may need to be increased to prevent the outside mirrors on fast-moving buses to come too close to cyclists; a 12 ft. outside travel lane may be more appropriate under such circumstances.

- A pedestrian-friendly environment is created not only by street design elements (appropriate sidewalk widths, safe distance from moving vehicles, well-spaced crossings, management of driveway access, etc.) but also by other non-street elements, such as proximity to human activity (e.g. sidewalks near building fronts rather than parking).
- Clear sidewalk widths should take into consideration the anticipated volume of pedestrians, which can be expected to be highest along approaches to the future rail stations. There needs to be an additional distance of 1 ft.(min) to 2 ft. (preferable) beyond the minimum clear sidewalk width to allow for maintenance, individuals stopping in front of buildings, and the preclusion of street furniture being placed in VDOT's R/W, etc. (surface finish for this clear distance area could be same as sidewalk).
- Retrofitting existing roads to match the planned cross sections will likely be necessary as development occurs; transitions between sections must be planned.
- National Highway System (NHS) routes follow more stringent standards than AASHTO minimums and consideration to utilize standards above the minimums should be examined based on the street priorities. In addition to I-495 and the Dulles Toll Road, there are two roads within Tysons that are also classified as NHS routes: VA 7 and VA 123. These state roads are subject to FHWA direct oversight and specific Level of Service (LOS) requirements which may affect design decisions such as provision of turn lanes (affecting minimum median width), access points, geometry and the spacing of intersections, etc.
- The independent application of design exceptions and waivers: When a design value or 'standard' is determined applicable for a particular project, but it cannot be applied consistently, it is necessary to request a design exception or waiver depending on exactly what standard is being compromised. Design exceptions and waivers are reviewed individually considering standards, public safety and the context where the application occurs. They may not be granted to a project, development, neighborhood, or other entity in an overall blanket manner, but require review on a site by site specific basis.
- Air quality is affected not only by vehicle miles traveled (VMT) but also by the number of engine starts, which in turn is affected by congestion and start-stops at traffic signals. While the per capita VMT will be positively affected by the anticipated mode shift to transit, decisions regarding the street network, including signal timing and spacing, provision of turn lanes, etc., will have an impact on automobile stop-starts.

We recommend adding a note referencing VDOT Access Management requirements: legislation was enacted during the 2008 General Assembly to require phased implementation of regulations (http://www.virginiadot.org/PROJECTS/accessmgt/default.asp). The first phase applies to VDOT highways that are classified as Principal Arterials and was effective on July 1, 2008. The second phase, involving access management regulations and entrance spacing standards for VDOT highways classified as a minor arterial, collector, or local, went into effect in October, 2009. Consolidating entrances is encouraged and may be necessary in some instances in order to meet the standards.

The cross sections do not show the proposed location of the VDOT Right-of-Way line with respect to the proposed curb. This line will affect not only ownership but also applicable construction standards and maintenance responsibilities and agreements. ROW would normally be 3' beyond anything that the Department will maintain.

Boulevard Section (Primary Arterial) – (Figure 3.1 on page 17 of submission)

The plan notes that Route 7 and Route 123 are the only Boulevards in Tysons (major arterials). As mentioned, these state roads are part of the NHS and subject to all regulations and guidelines applicable to this system. The portion of Route 7 between Route 123 and the Dulles Toll Road was designed in conjunction with the Dulles Metrorail project design plans. While the general Route 7 cross-section (including placement of the rail line along the median) was discussed in early 2005, more detailed staff coordination occurred between representatives of the Rail Project, VDOT and Fairfax County (staff and urban design consultant for the Tysons Corner Comprehensive Plan update), to incorporate urban design elements. Rail alignment will be in the median of Route 7, with the Tysons Central 7 station being approximately at-grade and the Tysons West station elevated. Current design calls for four11-ft. lanes (consistent with the cross-section shown in the subject submittal) with the outside lane assigned for both through and right-turn traffic. Pedestrian bridges above Route 7 will allow pedestrians to access both stations from pavilions on either side of Route 7. In addition to sidewalks along both sides of the road and pedestrian crossings at intersections, the plans envision mid-block pedestrian crossings. As the road system adjacent to Route 7 further develops, it is recommended that direct access to individual parcels be shifted away from this Primary Arterial and toward the other roads.

A note for Figure 3.1 in the submission states that "the outside lane in the Boulevard Street Section may be used for on-street parking where applicable." It should be noted that the transportation analysis in this submission (travel demand model results) assumes four through lanes along Route 7 to provide sufficient capacity for the intended use of this NHS route / major arterial. On-street parking is not compatible with the through/right use of the (fourth) outside lane along the portion of Route 7 being reconstructed in conjunction with the Dulles Metrorail project.

The road cross-section, including availability of turn lanes, spacing of intersections and the timing of signals, will all influence its operation. It is noted that federal code calls for specific Level of Service (LOS) along NHS routes; levels below "C" in heavily developed sections of Metropolitan areas require concurrence from FHWA. Although turn lanes are not shown in the cross-section and may be discouraged for particular intersections in urban environments, there may be intersection approaches where these will be required, especially for vehicles turning left, for proper operations.

It is recommended that, prior to making modifications to the design of Routes 7 and 123 included with the rail plans, a detailed operational analysis be conducted that will incorporate the ultimate cross-section being considered, spacing of connections that will result with implementation of the proposed grid network, intersection treatments (signalization, signal spacing and timing, pedestrian crossings, turn lanes), grade-separation where applicable, and proposed access points.

Avenue Section with Landscaped Median (Figure 3.2)

The plan notes that Boone Boulevard, Greensboro Drive and Westpark Drive are examples of Avenues. At Fairfax County's request, VDOT presented preliminary comments on the conceptual design of Boone Boulevard and Greensboro Drive in March, 2009.

Additional bicycle and pedestrian accommodations. All new roadway construction should provide appropriate bicycle and pedestrian accommodation based on the designated street type. Reference to this provision has been made to Avenue sections, Collector and Local streets; the same reference should be made for proposed Beltway and ramp crossings.

CHAPTER 4 – TRANSPORTATION SYSTEM INPUTS

4.1 Road Network

The subject submittal describes the road network for the following three conditions:

- 2005 Road Network (Figure 4.1)
- Current Comprehensive Plan Road Network (Constrained Long Range Plan network plus extension of Boone Boulevard and Greensboro Drive) (Figure 4.2)
- Recommended 2030 Comprehensive Plan Network (Figure 4.3 on page 27 of the submittal)

The Recommended 2030 Comprehensive Plan Network was developed by County staff and their consultants, following transportation modeling analysis of land use scenarios and "Phase III" testing of a transportation network that contained a grid of streets, additional entrances to/ from Tysons and additional grade separation at the Route 123/ Route 7 interchange. The recommended network includes the following **additions** to the current Comprehensive Plan network ("old" Plan, to be superseded):

a. Ramps connecting the Boone Blvd Extension to westbound Dulles Toll Road and eastbound Dulles Toll Road to Boone Blvd Extension;
b. Ramp connecting the Greensboro Drive Extension to westbound Dulles Toll Road;
c. Ramps connecting Jones Branch Drive to westbound Dulles Toll Road and eastbound Dulles Toll Road to Jones Branch Drive;
d. Widen I-495 (Outer Loop) between Rt.7 and I-66 by one lane;
e. Grid west of Westpark Drive;
f. Grid bounded by Gosnell Rd, Rt.7 and Rt.123;
g. Grid connections to Greensboro Drive;
h. Grid of streets east of I495, including connection across I-495 to Jones Branch Drive;
i. Collector-distributor roads along the Dulles Toll Road from the Greensboro Drive extension to Hunter Mill Rd.

The Recommended 2030 Comprehensive Plan Network **excludes** the following three interchanges originally proposed in the Current Comprehensive Plan Network: Route 123 and International Drive, Route 7 and International Drive, Route 7 and Westpark Dr/Gosnell Rd. The revisions to at-grade intersections is consistent with the urban environment proposed by Fairfax County in this area, and with the design of the Metrorail stations in the proximity of two of those interchanges. The results of the travel demand model (discussed in Chapter 5 below) also support the removal of these interchanges: VDOT supports the proposed revision to the current Comprehensive Plan.

In general, the additional network connections proposed, if feasible, compared with the current Comprehensive Plan, will allow better traffic dispersion and travel distribution. Notably, the enhanced function of Greensboro Drive and Boone Boulevard extensions as minor arterials will redistribute some traffic away from Route 7, a Virginia state route in the National Highway System (NHS) intended to both carry regional traffic and serve major activity centers. The proposed new ramps connecting these two minor arterials to the Dulles Toll Road (a and b in above list) will provide additional options for major access to/from points west of Tysons, while their completion as roadways parallel to Route 7 will accommodate movement of intra-Tysons traffic and site access away from a major arterial.

The proposed connection of Jones Branch Drive to the Dulles Toll Road would, if feasible, provide considerable relief to the congested DTR/ Spring Hill Road interchange.

VDOT's preliminary comments regarding feasibility of the above proposed new connections to the Dulles Toll Road and the Beltway (listed under a, b, c and h) are included below.

Several connections to the Beltway on the east side of Tysons were already included in the Current Comprehensive Plan Tysons Corner Road Network (Figure 4.2). These are incorporated into the Beltway's design and will allow more direct access to/from the Beltway's future High Occupancy Toll (HOT) lanes and desired destinations.

It is noted that implementation of the grid of streets (e through h in list above) will be a complex undertaking, requiring intense coordination of private development and its phasing, proper design and operational transitions between new and old network segments as the implementation occurs, possible grade revisions particularly east of I-495, relocations, right-of-way acquisitions, etc.

Preliminary Feasibility Analysis of proposed new or revised connections to the Dulles Toll Road and Beltway

A preliminary feasibility analysis was conducted by VDOT of several major proposed revisions or connections to the Dulles Toll Road and the Beltway included in the submittal. (Figure 4.3 on page 27 of the submission). More detailed sketches prepared for Fairfax County by PBS&J were reviewed by VDOT, with comments forwarded to County staff in February 2009. The subject submission mentions some modifications made by the County to the original concepts, in response to those comments (modifications and rationale are noted below). This section summarizes a qualitative preliminary feasibility review of three proposed new or modified access points to the Dulles Toll Road (DTR) and one to the Beltway.

It should be noted that subsequent development of the proposed connections will require participation from additional stakeholder agencies (FHWA and Metropolitan Washington Airports Authority, as appropriate) for ultimate approval. It is also noted that all proposed new connections were coded into the travel demand model for 2030 GMU High land use scenario, so that the model's output (distribution, volumes, level of service, etc) assume all connections will be feasible from the operational and engineering perspectives. If one or more of the proposed connections do not materialize in the future, it can be anticipated that the traffic distributions and consequent performance of the nearby road network will be affected accordingly.

The following three new connections to the DTR and one additional connection to the Beltway from Tysons roads (beyond those already planned in conjunction with the Beltway HOT lanes project), plus a Beltway auxiliary lane segment, were evaluated at a conceptual level:

1. DTR to Boone Boulevard Extension (DTR eastbound off-ramp and westbound on-ramp);
2. DTR to Greensboro Drive (DTR westbound on-ramp);
3. DTR to Jones Branch Drive Connection (DTR eastbound off-ramp and westbound on-ramp).
4. Jones Branch Connector to Route 123 via proposed extension to the east to join Scotts Crossing Road (Route 8102)
5. Add southbound Beltway lane between Route 7 and I-66

The proposed connections to the DTR (1 through 3) are intended to supplement existing interchanges at Spring Hill Road / International Drive and Leesburg Pike (Route 7). Movements are focused on trips to and from the west, interfacing with the local street network via secondary roadway connections/extensions (rather than additional connections to the major arterials).

The Jones Branch Connector extension to the Beltway and Scotts Crossing Road toward Route 123 (4 above) would connect the areas east and west of the Beltway. The local network is proposed to be reconfigured between Route 123 and I-495 to provide a grid system, with several at-grade intersections on the Jones Branch Connector extension / Scotts Crossing Road. This extension would facilitate access to the future Tysons East metro station.

Location 1 - Dulles Toll Road to Boone Boulevard Extension

- The close proximity of the signals/ intersection along Boone Boulevard resulting from the proposed grid network will impact the operations and capacity of this road. This in turn has the likelihood to affect the operations of the off-ramp, particularly during the morning peak. Consideration should be given to the overall footprint that may be associated with multiple turn lanes or auxiliary lanes between the Boone Boulevard intersections.
- The proposed flyover to the westbound DTR would need to account for the transition of Dulles Rail from an elevated section along Route 7 to an at-grade section in the median of the Dulles Airport Access Road. Vertical conflicts and clearance requirements could be an issue, impact the point of vertical tie-in with the DTR, requiring additional right-of-way.
- The proposed alignment of the ramps connecting to the proposed Boone Boulevard Extension may encroach upon the floodplain of Spring Branch and cross an existing tributary.
- Addition of Collector-Distributor Lanes.
  - VDOT's preliminary analysis had indicated that the resulting close proximity of the high volume ramps would create congestion and weaving difficulties on the DTR as traffic would not have sufficient length to weave and merge properly. The results of the 2030 merge analysis included in Fairfax County's submission (Chapter 5, Table 5.9 on page 45) confirm that the westbound on-ramp would fail (LOS F). To mitigate this problem, the submission proposes the addition of Collector-Distributor (CD) lanes in both directions, extending to the Hunter Mill Rd. interchange. The submission's report states that further capacity analysis indicated operational improvement to LOS D. A LOS C would be considered standard for new projects affecting NHS routes; variations need to be addressed in more detailed project phases.
  - It is anticipated that in the westbound direction the additional lane will cause an expanded footprint on National Park Service land and require widening over Wolftrap Creek (fed by a

substantial set of box culverts). Overall, the new CD lanes in both directions would have additional impacts, requiring additional right-of-way acquisition and stormwater treatment that has not yet been evaluated.

Location 2 - Greensboro Drive to Dulles Toll Road Connection

- Several potential design issues were identified in VDOT's preliminary review; some or all of which could be addressed during final design. The reverse curves on the ramp movement from westbound Route 7 to westbound DTR are awkward. The tie in between this ramp from Route 7 and the ramp from Greensboro Dr. needs to be reviewed and additional acceleration lane length beyond the gore to the merge with the DTR is likely required.
- The structural design of the elevated section above the Toll Road and Airport Access Road appears difficult, given the curvature and angle of skew. Horizontal sight distance requirements associated with the curved alignments would necessitate wide left-side shoulders on the aerial portions of the new ramps, and could impact the footprint of the proposed concept.
- The touch down area for the set of on-ramps discussed above would likely require the relocation of the off-ramp from the westbound DTR to Route 7. Any feasible design will need to address the weave / merge distance between the main toll plaza and the off-ramp to Route 7 and will likely require replacement of the existing noise walls.
- VDOT reiterates that the DTR is to be designed to interstate standards; options that provide minimum geometry equating to low design speeds are considered substandard.

Location 3 - Jones Branch Drive Connection to Dulles Toll Road

- Current proposals for the DTR include future widening in the westbound direction in order to provide a continuous auxiliary lane between the Capital Beltway on-ramp and the Spring Hill Road off-ramp, thus resulting in a two-lane exit. The proposed new on-ramp from Jones Branch Drive would need to account for this dual-lane westbound exit.
- The proposed left-hand exit on the eastbound direction of the DTR could be problematic for several reasons. Although there are left exits elsewhere, this practice is not standard and is being avoided or eliminated where possible. Right hand exits should be provided where possible for new facilities. It is also important to note the complexity of the eastbound weaving condition of the DTR in this area, as follows:
  - Users of the Toll Plaza E-Z Pass-only lanes (left-most) weave right to access the Beltway ramps;
  - Vehicles using the center / right lanes of the Dulles Toll Plaza weave to the left to continue on the DTR Connector toward Route 123 or I-66;
  - Vehicles coming from the Spring Hill Road interchange on-ramp (right side) weave to the left to continue on the DTR Connector toward Route 123 or I-66;
  - Currently, vehicles coming from the Dulles Airport Access Road (left side slip ramp) weave all the way to the right to access the Beltway ramps. It should be noted that new direct connections between the Dulles Airport Access Road and the Beltway would eliminate this weave. A description of the proposed design modifications can be viewed in the project website (http://www.vamegaprojects.com/tasks/sites/default/assets/File/pdf/495hot/CIM/Meeting_Brochure.pdf)

The subject submission does not include a weave/ merge analysis of the proposed connection between Jones Branch Road and the Dulles Toll Road, utilizing a reasonable design speed for the Toll Road, or analyze the potential impact on crash rates. Other options of providing this movement (such as braiding the eastbound off-ramp on the right with the on-ramp from Spring Hill Road) should be examined.

- The proposed connection appears to impact an existing stream and/or its floodplain and an existing noise wall.
- At present, the DTR westbound in this area is congested in the evening; the additional traffic from the on-ramp would exacerbate this congestion. The operation of the westbound DTR with the proposed on-ramp and its impact on the merge from the southbound Beltway needs to be evaluated (a conceptual level build/no-build analysis) before this connection could be forwarded for additional consideration.

Given the proximity of other interchanges and ramps, and since the proposed connection may exacerbate weaving conflicts and related safety issues, it may be necessary to evaluate additional options to mitigate operational issues.

Locations 1, 2 and 3 to the Dulles Toll Road.

It is reiterated that the Dulles Toll Road is to be designed to interstate standards, including provision of adequate sight distance for all vehicular movements, and establishing acceleration/ deceleration lane lengths and weaving distances in desirable range based on the most current AASHTO Design Standards. Options that provide minimum geometry that equate to low design speeds are considered substandard. Given the combination of issues identified above for the proposed connections to the Dulles Toll Road, it may be difficult for all three connections (particularly the Jones Branch Drive connection) to be approved by FHWA as currently proposed, given the proximity of the various interchanges, on- and off-ramps, Main Toll Plaza location, weave / merge and related safety issues. Further coordination and approvals from stakeholder agencies (FHWA[3], VDOT, MWAA[4] and MWCOG[5]) will be required during additional planning, project development and funding allocations, and more detailed studies will be needed to finalize specific locations, alignments, design, impacts assessment, and cost estimates.

It is noted that, if approvable under appropriate standards, it is very desirable to add connections that provide new options to travelers using the Dulles Corridor, with origins/destinations in Tysons. The information provided in the subject planning-level submission is not sufficient to determine final feasibility / approvability of the combined proposed connections.

Location 4 – Extension of Jones Branch Connector (east leg extension toward Scotts Crossing Rd/ VA 123 intersection)

Current Beltway plans provide connection to the Beltway HOT lanes (northbound and southbound) from the west leg of the proposed Jones Branch Connector (from existing Jones Branch Road to the Beltway). In conjunction with the Beltway design, analysis is ongoing to consider possible Jones Branch Connector extension to the east (toward Scotts Crossing Rd./ VA

[3] FHWA: Federal Highways Administration
[4] MWAA: Metropolitan Washington Airports Authority
[5] MWCOG: Metropolitan Washington Council of Governments

123 intersection) that would provide access to the Beltway HOT lanes in both directions; the goal is for current Beltway design to not preclude this east leg extension in the future.

- As shown in the overall grid plan, the proposed extension and connection to the east includes the Jones Branch Connector intersecting with three different proposed crossroads prior to the existing intersection of Scotts Crossing Road at Route 123. The profile of the Jones Branch Connector will be at a higher elevation than the adjacent land inside the Beltway, in order to clear the northbound lanes of the Beltway. In order to provide a proper vertical transition and tie-in, the likely touch-down point of the extension to the east would be near the existing stormwater retention pond. These two factors would preclude the at-grade intersections shown in the street grid plan along the proposed Connector extension; however, a series of service roads could be built on either side of the extension to provide access to the proposed cross streets.

Location 5 -Adding a Beltway lane from Route 7 to I-66 (outer loop)

The submission includes a brief 2030 merge analysis of the on-ramp from Route 7 to southbound I-495, showing that the LOS F at the merge would improve to LOS C if a southbound CD lane is added between Route 7 and I-66. This lane is included in the Constrained Long Range Plan for 2030 and the current Beltway design does not preclude the lane.

4.2 Transit Network

The transit network evaluated for the proposed 2030 Comprehensive Plan Amendment includes service beyond the current Comprehensive Plan's, as follows:

- Current Comprehensive Plan Service.
  - CLRP services: Dulles Metrorail Project (Silver Line with four stations in Tysons), bus lines connecting Tysons to nearby areas, regional bus lines.
  - Submittal notes that the overall transit service in the CLRP and that in the County's 10-year Transit Development Plan (TPD) is approximately the same (comparison is not included).
- Three transit circulator routes. These were coded with preferential characteristics: speeds that assumed travel on own right-of-way for half of the route, bus stops every quarter mile, 6-minute headways.

Comments on transit needs are included under section 5.4.

CHAPTER 5 – TRANSPORTATION IMPACT ANALYSIS AND NEEDS ASSESSMENT

5.1 Overview of Technical Analysis (2030 timeframe)

As stated in the subject application, the backbone of the transportation impact analysis and associated needs assessment is the 2030 transportation modeling analysis (TMA), which used the traditional 4-step process (trip generation, trip distribution, modal split, and assignment). TMA was used in each of three phases; the first two included community workshops, and findings of each phase were incorporated into the next:

I. Testing impact of alternative land use strategies. Findings carried to next phase included: grid of streets performed important function, improving access to/from Tysons was needed, housing-focused land use scenario resulted in least congestion increase.
II. Two land use scenarios and two transportation networks were tested. Findings were incorporated by the Tysons Corner Task Force in the PB Placemaking report "Transforming Tysons Vision and Areawide Recommendations."
III. 2030 Land Use Scenario Analysis evaluated combinations of six land use inputs with appropriate transportation networks as follows: 1) existing (2005), 2) 2030 Comprehensive Plan (base), 3) **2030 George Mason University High forecast (focus of this review),** 4) 2040 (prototype A), 5) 2050 (Prototype B), and 6) Task Force Preferred (TFP).

Select findings of phase III analysis are presented in the County's submission. As mentioned, the bulk of the technical transportation analysis presented focuses on the phase III analysis for **2030 GMU high land use** (scenario (3) above), combined with the transportation network that evolved through prior analysis. The 2030 impact and needs assessment presented in the document relied on output from travel demand model forecasting. Therefore analysis of the forecasting efforts (input, methodology, assumptions, output) is important in evaluating the subject submission. Brief comments are included in the next section; additional detailed technical comments related to various sections in the submission are included primarily for technical staff's review and with the intention that they will inform and benefit future analyses.

5.2 - Modeling Process (p. 33)

This section of the submission explains that the travel demand forecasting utilized for the "existing" and 2030 analyses was the Fairfax County subarea highway assignment model, which incorporated the regionally adopted Metropolitan Washington Council of Governments (MWCOG) model version at the time the study was initiated (Version 2.1D#50). The WMATA Post-Processor Mode Choice Model (which includes nested logit mode choice model for transit submode and mode of access information), was used to better model the transit and mode choice options. County staff clarified that the application of "FHWA TDM" model and "4D Analysis" mentioned in the submission are not reflected in the 2030 model output. The FHW TDM model was used mostly in the 2050 sketch planning analysis to evaluate the impact of implementing a series of aggressive TDM strategies (such as flexible work hours and telecommuting). The "4D Analysis" looks at four variables (Density, Diversity, Design, and Destinations) that could potentially reduce vehicular trips.

The latest tools and methodologies available at the time the analysis was initiated were utilized to analyze the impacts of developments in Tysons Corner Urban Center. Since the inception of this project, some of these state-of-the-art tools and methodologies have evolved by either being updated using the latest data and surveys, modified, or just replaced by more advanced and enhanced procedures. It is our judgment, derived with support and reassurance from County and consultant staff involved in modeling for the submission, that many of these latest changes and modifications should not have a significant impact on the overall findings and results of this evaluation especially in the areas within and around Tysons Corner study area.

The regional model's built-in process takes into account some of the considerable trip reduction effects on work trip purposes due to higher densities and mixed complementary land use (balanced jobs to housing ratios, proximity of housing/office and supporting uses) featured in urban designs such as that envisioned for Tysons Corner. Similarly, the model captures the vehicle trip reduction effects of the enhanced HOV network. There are certain limitations built into the model process, and our review of the material submitted, that should be pointed out. The transportation analysis process used by the County and its consultants for 2030 relied on state-of-the practice modeling and analysis packages, based on a series of professional assumptions on input data (such as increased speed of circulator for assumed segments within own right of way) and on variations to default values (such as application of factors that may affect lane capacity). These were developed by Fairfax County staff and their consultants during their extensive analyses over a period spanning approximately two years. Although VDOT gained insight on this complex process from the submission and additional responses and clarifications, it is not possible for VDOT staff to fully evaluate the implication of all assumptions, without having had the opportunity to participate in earlier milestones in the modeling process.

Technical discussions, questions and clarifications on the model process are summarized under Attachment B. Selected outputs of the model process are presented and reviewed in the next section, which also addresses impacts to the regional highway network of combined land use and transportation network scenarios.

The model is not designed to determine whether the network connections that have been coded into the model can actually be implemented. As such, the model output assumes that all proposed improvements are feasible from the engineering perspective, can be approved by appropriate agencies (FHWA, MWAA and VDOT, in the case of the important connections to the Dulles Toll Road), and will be funded. If a major proposed connection or assumed transit level is not implemented, the trip distributions and performance of the surrounding road network would be different from those modeled.

5.3 - 2030 Land use Scenario Analysis (Phase III Analysis) (p. 33ff)

5.3.1 Land Use Inputs

Phase III analysis was described above. This section comments on the output of the model process as presented by Fairfax County. Since all proposed transportation system improvements (transit and road) in the Tysons analysis were being planned for within Tysons itself, VDOT suggested in 2009 that the impact evaluation should also cover road segments outside Tysons. Figure 5.1 on p. 34 of the submittal presents the key locations for impact analysis of highways both within and surrounding Tysons.

5.3.2 - 2030 Impact and Needs Assessment of Regional Highways

The bulk of the analysis presented in the submission focused in comparisons (change and percentage) between the 2030 land use scenarios: Current and Proposed Comprehensive Plans. The material presented indicates that the proposed Comprehensive Plan is more desirable than the current Comprehensive Plan in two areas:

- Land Use Mix. The more efficient land use mix and distributions associated with the proposed Plan are designed to result in much lower single-occupant-vehicle (SOV) trip generation per square foot of development. Reported Measures of Effectiveness (MOEs) indicate that the proposed Plan results in lower peak hour volumes in both AM and PM in many road segments than the current Plan (examined below). Considerable SOV trip reductions are expected not only as a result of Metrorail extension and public bus system extensions (common to both Comprehensive Plan scenarios) but also due to additional elements selected for the proposed Comprehensive Plan condition: enhanced bus circulator system to extend the reach of the rail stations and serve midday intra Tysons travel, transit-oriented development (TOD) with dense mixed use around rail stations, mix of land uses which encourage internal trip capture, better jobs-to-housing mix, etc.
- Transportation. The Proposed Comprehensive Plan relies on a more robust transportation system, with added highway connections to Dulles Toll Road and the Beltway and a grid of streets, and additional bus transit.

Trips Generated; Mode Share

To gain insight on the cumulative model outputs (trips generated, mode share) and related impacts (both cumulative and for additional road segments) of the proposed revisions to the Comprehensive Plan, VDOT sought and reviewed additional documentation beyond the original submission's very brief model data. In response, the County submitted Supplements (listed earlier in this review document), and also referenced a 2/09 presentation by Fairfax County transportation staff to the Planning Commission. The following notes summarize this material; page and table numbers refer to the Supplements noted, while slide references correspond to the presentation (overall material was confirmed to be current).

Supplemental material forwarded by County staff (Supplement IV) indicated that, compared to 2005 year, total motorized **person trips** for the study area shows a 20% growth in the current Comprehensive Plan and 45% growth in the proposed Comprehensive Plan Amendment (GMU High). When converted to **vehicle trips**, the growth compared to 2005 is only 6% under the current Comprehensive Plan and 24% under the proposed Comprehensive Plan; the rest will be diverted to transit trips (a majority percentage of growth). The assumed addition of high quality transit services over 2005 is one of the main reasons for this low vehicular trip growth. Additional highway infrastructure that will expand the HOV network is another reason. An assessment of potential travel pattern changes in areas beyond the study area, caused by the growth in motorized person trips and vehicle trips in Tysons, was not shown. This could potentially affect congestion just outside the study area where similar improvements (such as grid of streets or quality transit service) have not been planned. (The submission's analysis of impacts to surrounding communities is included in section 5.3.4).

The number of Tysons motorized daily person trips (transit and vehicle or auto) is summarized in the table below (from Supplement III, Table 4). Reference is also made to the slide presentations. Patterns are examined following the table.

Daily Person Trips (vehicle and transit)	Current Comp. Plan (2030)		Proposed Comp. Plan (2030)	
	Trips	%	Trips	%
Within Tysons	94,683	17%	135,031	20%
Out of Tysons	155,562	27%	153,168	22%
Into Tysons	314,719	56%	396,241	58%
Total	564,964	100%	684,440	100%

- Approximately 684,000 **total daily motorized person trips** (**transit and vehicle)** are estimated to begin and/or end in Tysons per the 2030 proposed Comprehensive Plan (GMU High forecasts). This represents about a 46% increase over the 470,000 trips for 2005 (slide 27) and more than 20% increase over the 565,000 trips in the current Comprehensive Plan (Supplement III Table 4).
- The proportion of **motorized trips within Tysons** is projected to be slightly higher in the proposed Plan (20%) compared to the current Comp. Plan (17%) and existing conditions (above table and slide 29). As Tysons evolves from its current employment-focused center to one with intensified and varied land use with increased housing proportions, lower job-to-housing ratios should be observed compared to current conditions (refer to Employment/ Population tabulation in section 2.2). The resulting land use mix is anticipated to result in relatively high intra-Tyson travel using either transit or vehicles, which can be viewed as **"internal capture"** within Tysons itself.

- Approximately 530,000 **person trips** are estimated to have origins or destinations within Tysons (only 1 end of the trip) in the 2030 GMU High forecast. This represents over a 1/3 increase compared to 2005 levels of about 390,000, and approximately 18% higher than 2030 Current Comp. Plan levels of approximately 450,000 (slide 28).
- **Through vs. internal vehicle trips**. Of approximately 449,000 daily **vehicle trips** traveling along the roads in Tysons under the proposed plan, about **68%** (307,000) are estimated to be through-trips (both trip ends outside Tysons), while the remaining **32% will be internal to Tysons** (Supplement IV page 24 and slide 35). The model output for 2030 conditions shows that both the number and proportion of through trips would be lower under proposed Comprehensive Plan (307,000 or 68%) than for the current Comprehensive Plan (335,000 or 82%). This can be attributed to both the removal of grade separations at 3 locations in the proposed road network, and the intensified internal trip pattern caused by the proposed new land use mix (142,000 or 32% in proposed Comp. Plan vs. 75,000 or 18% in current Comp. Plan). A slide note concludes that "with higher internal trips, driving through Tysons becomes less attractive." Although this suggests that some of the 2030 through trips will be using other arterials not in the Tysons area, an analysis of trip patterns and possible related effects outside Tysons was not presented.

- **Transit Trips, Mode Share and Sub Mode Share**.
  - The highest transit daily ridership is noted in the TOD areas (31,000) vs. non-TOD areas (12,000) (slide 32). These **43,000 daily transit person trips** represent a 5,000 or **13% increase** over the Current Comprehensive Plan forecast of about 38,000 transit trips (Table 17 of Supplement III), and highlights the need for aggressive planning on the part of transit providers for the additional transit capacity anticipated, both for the Metrorail

systems that will be recipients of Silver Line riders, as well as bus transit and supporting network. Similarly, the transit increase implies the need for good pedestrian connectivity to encourage safe access to transit mode.

- The percentage of 2030 **work trips using transit** is anticipated to be in the order of **17%** in Tysons, for both current and proposed Comprehensive Plan. This is consistent with existing transit share currently observed in other Washington D.C. Metropolitan Area locations: only slightly higher than the 15% around King Street Metro in Alexandria, lower than the 19% in Bethesda and 26% in Rosslyn-Ballston, and much lower than the 51% transit share of K-Street in downtown D.C. (Table 16 of Supplement III; slide 30, "Comparison Source 2000 CTPP with MWCOG Adjustments"). The majority of transit trips will occur by Metrorail, compared with bus transit trip (Table 10 on page 7 of Supplement III). In the context of 2050 "Sketch Planning" overview only, the submission notes a projected **peak period** transit modal share of **22%** for 2030; this percentage was not included with any 2030 analytical model process data.
- As noted in Supplement III, Home-based trips are "produced" at the home end of the trip and "attracted" at the work end of the trip (regardless of trip direction, in, within, or out of Tysons). For all daily person trips (all trip purposes), Productions are anticipated to exhibit a higher proportion of transit usage (27%) than Attractions (17%). In both cases, the majority of all transit trips (64% to 81% range) are anticipated to use Metrorail, with the remaining transit trips using bus system (Table 10 of Supplement III).

- **HOV 2+ mode share.** The percentage of 2030 work daily trips sharing rides is anticipated to be in the order of **18%** in Tysons, for both current and proposed Comprehensive Plan, doubling the 9% reported in the 2000 CTPP. (Table 16 of Supplement III; slide 30 "Comparison Source 2000 CTPP with MWCOG Adjustments"). We initially noted that HOV2+ percentage share of Home-Based Shopping and Non-Home Based trip purposes seemed to be high. However, due to the effective HOV network that will result from complementing the existing Dulles Toll Road/ I-66 HOV system with the HOT lanes currently under construction along the Beltway, and since these percentages include all shared ride components (carpoolers) and not only those using HOV facilities, we conclude that the modeled percentages should be reasonable. Plans call for HOV-3 to be free on the future Beltway HOT lanes.

- **Non-Motorized** (walk and bike). About **6%** of daily work trips in Tysons are anticipated to occur via non-motorized mode -- walking and biking – in the proposed Plan scenario, up from 5% under the current Comp. Plan conditions (slide 31). The proportion of non-motorized trip production is highest in the areas with highest employment and population densities. Non-motorized trips are "extracted" from total trips, and not carried forth into the travel demand model's trip distribution and mode choice steps. The percentage seems reasonable, when compared to non-motorized levels in several reports, and considering the plan's emphasis on urban design that provides ample facilities and connectivity for pedestrians and bikers. The resulting number of bikers and walkers underline the need for good and safe pedestrian connectivity envisioned in the plan, but also measures to facilitate biking to work (both public facilities and work-site features such as bike racks, showers, etc).

As is noted in the Supplement Information, the regional model assumes a certain level of trip reductions for **Transportation Demand Management (TDM)** and such measures including: carpool network priority treatments, parking pricing, development densities, jobs-to-housing balancing, and existing levels of Guaranteed-Ride-Home and shared-ride subsidies. To avoid double-counting, no additional trip reductions were taken in the model process for more aggressive TDM measures including potentially higher levels of employer-based programs (transit, carpool, and vanpool incentives), vanpool preferential treatment, higher levels of telecommuting and alternate work schedules.

Cumulative Volume / Capacity Analysis

One of the ways to evaluate cumulative impact from the travel demand model output is to look at "cordon" traffic volumes and volume/capacity (v/c) ratios. These were examined on major facilities entering Tysons Corner by establishing a "cordon" boundary which crosses the road network surrounding Tysons, just south of the Dulles Toll Road (Figure 2 in Supplement III). The cordon line included ramps into the study area, but excluded freeways. Tysons Corner Outbound and Inbound Volumes (in thousands) and volume/capacity ratios are summarized below (from Supplement III, Tables 18 and 19; existing conditions were not included).

2030 Comp. Plan Scenario	OUTBOUND						INBOUND					
	AM Peak		PM Peak		Off-peak	Daily	AM Peak		PM Peak		Off-peak	Daily
	Vol	v/c	Vol	v/c	Vol	Vol	Vol	v/c	Vol	v/c	Vol	Vol
Current	34.1	.48	85.2	.99	144.6	263.9	66.0	.93	57.4	.66	136.1	259.4
Proposed	36.5	.48	94.2	1.03	162.7	293.3	74.9	.98	62.8	.68	154.9	292.6

2030 peak period v/c ratios are not anticipated to change much between current and proposed Comprehensive Plan conditions, either in the morning or afternoon peaks. The only scenario where the model predicts cumulative volumes will exceed related road capacities is for the proposed Comprehensive Plan's outbound evening peak condition, when v/c of 1.03 was computed. Obviously cumulative cordon conditions do not reflect congestion that may occur along individual road segments. This topic is explored in the next section.

Road Network Performance from Travel Demand model output (Existing and 2030)

The table below summarizes the cumulative level of congestion anticipated under each of the three land use analysis scenarios modeled (Supplement IV). Brief comments on the output follow.

Land Use Scenario	Congested VMT (1,000)		
	AM Peak period	PM Peak period	Off-Peak
2005	37.5	84.7	25.9
2030 current Comp Plan	44.2	82.3	21.9
2030 prop. Comp. Plan (GMU High)	44.1	101.3	44.5

- Based on the above tabulation, a comparison of congested vehicle miles of travel (VMT) for different periods in a day, the level of congestion within the study area for afternoon peak period is noted to be significantly higher (roughly twice) that of the morning peak period for the three land use conditions listed. This is as expected. The AM peak period volume consists mostly of home-based work trips going from home to work (commuting trips). The PM peak period volume is also composed of other non-work trips, in addition to commuting trips. County clarification noted that for 2030 these non-work trips make the up the majority of the travel, are shorter in length and many of them stay within the study area.
- The higher peak period congestion levels in the PM compared to the AM, are not supported by the model output for road links within the study area. Comparing Tables 5.1 and 5.2 of the initial submission indicates that total PM peak period volumes for the selected segments are lower than AM peak period volumes. We believe this apparent discrepancy merits further consideration.
- The PM peak period congested VMT decreases (slightly) between 2005 and 2030 under the current Comprehensive Plan. County response explained this initially surprising output by several key factors: the extension of Metro to Tysons Corner by year 2030, added highway facilities and capacity, and changes in forecasted land use mix.
- Compared to the current Comprehensive Plan, the proposed Plan output reveals lower volumes in several road segments and major links. County staff explained that the proposed Comprehensive Plan network contains smaller zones and more extensive grid of streets, resulting in dispersion of traffic to parallel links. This would further indicate that this dispersion and lower traffic volumes would result in fewer congested Vehicle Miles Traveled (VMT) under the proposed plan. This is consistent with the above table's AM peak conditions (but not the afternoon's cumulative congestion).

Table 5.5 in the original submission presents changes in V/C and LOS by peak hour. The document notes that these measures of effectiveness do not take into account intersection delay which, if included, would result in decreased LOS in the facilities. The performance of VA 7 between the Toll Road and VA 123 was not included in the table. While V/C comparisons are informative, comparisons alone may obscure the anticipated congestion conditions. VDOT requested actual values volume/capacity ratios and other Measures of Effectiveness (MOE) resulting from the analysis (these data were included in supplemental County submissions). Compared to current Comprehensive Plan conditions, the proposed Comprehensive Plan amendments would result in improved peak hour LOS in four of the segments evaluated (notably VA 123 within Tysons). Peak hour LOS deterioration is noted in 10 of the segments; the only segment dropping to below LOS C is VA 267 west of Tysons (D to E). NB I-495 south of Tysons would operate at LOS F under both Current and proposed Comprehensive Plan conditions. Table 5.7 (page 43) report relatively large percent increases in hours of delay along Gallows Road, VA 123 west of Tysons and VA 267 West of Tysons.

The existing DTR interchanges at Route 7 and Spring Hill Road would not be able to accommodate projected 2030 traffic volumes unless other ramps are added to distribute traffic. Two additional ramps, connecting the extensions of Boone Boulevard and Greensboro Drive to the DTR would relieve the existing interchanges. However, merge analysis (utilizing HCM freeway merge analysis techniques) showed that the Boone Blvd. extension on-ramp would fail. To mitigate this condition, the plan proposes a Collector-Distributor (CD) lane be added in both

the EB and WB directions, extending to a point west of the Hunter Mill Rd. interchange. Potential difficulties implementing such a CD system include: Right of Way and environmental impacts, design considerations with respect to clearing of rail line features for EB CD, cost, approvals by FHWA and MWAA.

Merge analysis of ramps connecting VA 7 to SB I-495 also revealed failure of the merge. The submission recommends adding a CD lane to the Outer Loop between Route 7 and the I-66 interchange (pg. 45 of report).

VDOT's preliminary feasibility analysis of these proposed new connections to the DTR and Beltway are presented in Chapter 4.

Selected road segments – Peak Hour volumes and changes in v/c

Figure 5.1 on p. 34 of the original submission's documentation presents a few selected locations for impact analysis of highways, as follows:

- Within Tysons: VA 123 (east of Beltway) and VA 7 (southeast of VA 123).
- Road segments into/ just outside Tysons:
    - VA 267 (east and west of Tysons)
    - I-495 (north and south of Tysons)
    - VA 7 and VA 123 (east and west of Tysons)
    - Secondary roads just outside Tysons: Spring Hill Road, Gallows Road

Tables 5.1 and 5.2 compare peak hour volumes (vph) by facility for existing conditions (counts), and forecasted 2030 conditions (Current and Proposed Comp. Plans projections), for the locations listed above. The documentation presented by Fairfax County (Supplemental Information) explains that the MWCOG/TPB travel demand forecast model, which is the basis of the Fairfax County Subzone Assignment Model used, is not explicitly validated at the peak period level (peak periods are derived based on a static set of factors). Some of the unexpected results for the evening peak hour conditions presented on Table 5.2 are noted below; possible rationale (beyond model limitations) is explored where applicable.

- Compared to existing conditions (counts), the following segments were projected to experience noticeable traffic reductions in the Current Comprehensive Plan: Spring Hill Road SB, Gallows Rd. SB, VA 7 within Tysons (EB and WB), and VA 123 within Tysons (WB). Given the significant land use increases planned between the present and 2030 in Tysons, as well as the overall growth that can be expected in the region for the same time period, this reduction appears surprising. Possible explanations for these reductions include: the mode shift to transit (particularly new Metrorail line), additional road capacity (such as widening of Routes 7 and 123) and new links (such as extension of Boone Blvd. and Greensboro Drive).
- Compared to the Current Comp. Plan, volumes are noticeable lower under the proposed Comp. Plan conditions along **VA 123** by 59% to 71% in the PM peak and 46 to 59% in the AM peak. This unexpected drop may be partially due to the proposed additional major connections assumed in the model (Jones Branch Drive to Dulles Toll Road, Beltway to VA 123), improved connectivity due to grid system and other arterial extensions. Such revisions to the road network would provide, where feasible, options to vehicle travelers who may otherwise

use VA 123. Feasibility analysis of some of the proposed major connections is included in section 4.1.

- The largest increases in PM peak hour volume percentages, between current and proposed Comp. Plans, are noted along VA 7 within Tysons (56% EB and 69% WB) and Spring Hill Road SB, just north of the Toll Road. The same facilities experience the largest AM peak hour increases (80% increase for VA 7 WB; 23% increase along SB Spring Hill Rd). However, 2030 volumes for the proposed Comp. Plan at these locations are not projected to be very different from existing conditions.

In Tables 5.3 and 5.4, per lane volumes for westbound Route 7 west of Tysons should be based on 2 rather than 3 lanes.

Comparative Summary from Travel Demand model output

As discussion above, the original submission included limited peak hour data and did not include actual road performance (v/c) information for specific road segments. Since model output files were not included with the submission, VDOT requested these loaded link files and, after noting some coding errors, received corrected files in late January. VDOT then compiled a comparative table of model inputs and results for the following three scenarios: existing conditions, current 2030 Comprehensive Plan and Proposed 2030 Comprehensive Plan (GMU High or GMU F network). For each scenario modeled the comparative table (included at the end of this report) presents roadway network inputs (number of lanes), volumes and performance (volume/capacity ratios) for 40 selected road segments both within and outside Tysons. The PM peak period was selected for this comparison (submissions' summary tabulations above focused on peak hour).

A comparative view of the overall network performance indicates that for existing conditions, 8 of the 40 road segments examined experience volume/capacity ratios above 1.0 (LOS F, very congested conditions). This number remains the same under the current Comprehensive Plan: even though volumes are typically higher, so are capacities.

The proposed Comprehensive Plan tabulation indicates all but one road segment operate with V/C under 1.0, a better performance than both existing conditions and current 2030 Comprehensive Plan conditions. Given the large land use increases proposed, these results and the relatively low vehicular volume increases are initially surprising. County responses and VDOT's analysis of results indicate the following reasons, explored in more detail throughout this report:

- Added transportation capacity:
    - transit (Silver line metro; bus circulator and additional bus lines)
    - grid of streets and urban design: supports internal mobility and provides more direct access to destinations, promotes biking and walking
    - added road capacity (widening of existing roads anticipated in current Comp. Plan, including access to enhanced HOV network, plus additional extensions and connections to DTR and Beltway in the proposed Comprehensive Plan)
- Lower vehicle trip generation per square foot of development (per resident and/or employee) due to higher transit use and more walking and biking, and to well-designed mixed land use with more housing that provides lower jobs-to-housing ratio, create "synergy" and promote "internal capture" between complementary uses.

- Underlying model assumptions. VDOT verified some though not all of these, based on Supplemental material provided by the County.

The proposed Comprehensive Plan has V/C above 1.0 at only one location: Beltway between I-66 and VA 7. The submission recommends the addition of a collector-distributor (CD) lane along the Outer Loop between the Route 7 and I-66 interchanges, backed by merge analysis that indicates 2030 LOS C after this mitigation measure (page 45). The Tyco Road segment was coded as 2 lanes, apparently in error since this segment is shown with 4 lanes in both existing and current Comprehensive Plan conditions, resulting in good LOS.

Following are additional comments on specific road segments:

Interstates. There are two interstates that serve Tysons Corner; I-495 (Beltway) and Dulles Access/Toll road (DTR/Access). The number of lanes on both interstates remains the same under current comprehensive plan and proposed (GMU-High) recommended scenario though GMU-High assumes a higher land use density. The model output shows the Beltway (12 lanes: 8 general purpose & 4 HOT lanes) to have a V/C of 1.09 under current comprehensive plan and a V/C of 0.99 under GMU-High, about 10% improvement. This may be partially attributed to a variety of reasons: the additional road connections proposed that may provide more direct access to destinations, higher level of intra-Tysons travel anticipated, TDM measures considered for the higher density land use scenario, etc. The model output shows VA 267 to operate at an acceptable V/C under both scenarios with slight improvements under the GMU-High scenario.

VA 7 (Leesburg Pike) is one of the main arteries that goes through the heart of Tysons corner area and serves as a commuter route connecting points in Loudoun County to Washington DC. The most congested segment VA 7 is between Tyco Road and DTR for which model output shows a V/C of 1.0 (Link LOS F) under current comprehensive plan. Model output also shows that this segment of VA 7 will operate with a V/C 0.9 under GMU-High scenario, about 10% improvement.

VA 123 (Chain Bridge Road / Dolly Madison Boulevard) is the other main artery that travels through the heart of Tysons corner area and also serves as a commuter route connecting McLean to the north and Vienna to the south. The most congested segments of this roadway are between Beltway and Old Dominion Drive with an unacceptable V/C of 1.0 and worse under current comprehensive plan. The same segments show a 10% improvement in V/C under GMU-High scenario.

Gallows Road connects Tysons corner to region however is not a commuter route since it ends in Tysons. It is a main roadway for travelers to and from Tysons hence carries significant traffic volume. The most congested segment of this roadway is at the gateway to Tysons area (southeast corner) with V/C of 1.15 and 0.98 under current comprehensive plan and GMU-High, respectively.

Other Major Roadways in Tysons that carry significant traffic volumes are International Drive, Old courthouse Road, Spring Hill Road, Tyco Road, and Jones Branch Drive. Only a short portion of International Drive is expected to experience higher congestion amongst these roadways

and this portion includes a segment of International drive that connects to DTR on one end and connects to Tyco Road, Spring Hill road Jones Branch Drive. This portion of International Drive is carrying a traffic volume in excess of its existing capacity today and there are no geometric improvement planned; however under GMU-High, the output shows a slight V/C improvement.

The performance of ramp segments and local roads is not shown in the comparative table; however model output indicates that some of these would operate at V/C ratios above 1.0 (LOS F). More detailed analyses, including operational and safety reviews and identification of mitigation measures, will be necessary concurrent with individual submissions for localized land use implementations in the future.

5.3.3 2030 Impact and Needs Assessment – Highways *Within* Tysons (p. 45)

The only item reported in this section of the submission is a comparison of the cumulative congested (LOS F) conditions within Tysons Corner. Congested vehicle miles of travel (VMT) are anticipated to increase from about 38,000 in 2005 to about 44,000 under the proposed Comprehensive Plan Amendment AM peak period scenario, representing a 16% increase in congested conditions. Supplement III data indicate that PM peak period congestion will be more marked and increases more dramatic than in the morning, going from about 85,000 VMT in 2005, to about 101,000 under the proposed plan, about a 19% increase.

A discussion of road network performance from the travel demand model output, for locations both within and outside Tysons, was presented in the previous section.

Analysis of intersections within Tysons was not included in the submission, which states that "intersection improvements within Tysons Corner will be determined with subsequent rezoning analyses". As the grid system is implemented within Tysons it can be anticipated that traffic distribution will be gradually affected (vehicles will be able to turn earlier toward their ultimate destinations) and site access will generally be moved away from major arterials. On the other hand, the added intersections will have an impact on the progression of traffic and cumulative vehicle delays at intersections, and the effective capacity available for through traffic. Although the travel demand model makes some allowance for the frequency of intersections in urbanized areas, it is not clear that the model can fully account for the reduced effective capacity due to small block sizes and consequent multiple intersections planned for the Tysons core. This is particularly applicable to the major arterials in Tysons: as projects are implemented that impact Routes 7 or 123, the NHS standards will apply.

5.3.4 2030 Impact and Needs Assessment – Impact on *Surrounding Communities* (p. 46)

Fairfax County staff selected nineteen intersections at various locations outside of Tysons for analysis under the "Neighborhood Impact Analysis." The intersection analysis presented in this submission does not address locations within Tysons itself. Locations of the selected intersections are shown in Figure 5.3 (page 47 of submission) and include:

- 5 intersections on Route 123 (2 northeast, 3 southwest of Tysons)
- 3 intersections along Route 7 (1 northwest, 2 southeast of Tysons)

- 5 intersections along Lewinsville Road and Great Falls Street (including at Route 7 and 123, listed above)
- 4 additional signalized intersections (along Gallows Road and Georgetown Pike)
- 3 unsignalized intersections (along Old Courthouse Road and Lewinsville Road)

Synchro analysis was used to evaluate performance of the 18 intersections for three scenarios: 2008 (Existing), 2030 Current Comprehensive Plan, and 2030 Proposed (GMU High) scenario.

Traffic counts for 2008 and growth rates derived from the model process were used to develop 2030 turning movements for the intersections selected. Annual average growth rates were derived for links in the network using travel demand model outputs for the years 2005 and 2030 for both Comprehensive Plan scenarios (current and proposed). Link volumes from forecasting models were refined following NCHRP Report 255 and a software program called winTURNS was used to estimate projected turning movement volumes at each intersection. The technical approach is described in Attachment C of the submission.

The summary of overall performance of the selected intersections (LOS) is presented in Table 5.10 of the submission (page 48). The comparison table indicates that, although 2030 proposed Comprehensive Plan conditions would result in 14 of the 19 intersections operating at LOS E or F during AM or PM peak, targeted mitigation measures could result in improved performance in all intersections. The analysis presented indicates that the 3 intersections with LOS E in either AM or PM peak conditions after the improvements would experience level of service improvement or no degradation when compared to existing conditions. The proposed improvements are described in Attachment C of the submission (including items such as turn lane extension, new signals, revised signal timing), and are estimated to cost about $14 million. The spot improvements would be in addition to those already planned in the current Comprehensive Plan for Fairfax County.

Attachment C of the submission includes more details on the analysis and proposed improvements; VDOT's related comments are included under that Attachment. Some of the proposed mitigation measures include signal timing modifications. These may be acceptable for short and medium term improvements on a case-by-case basis. However, it should be noted that signals are timed as part of networks which are optimized to achieve certain progressions and minimize overall delays and cycle lengths cannot be changed independent of other signals in the system. Also, the accuracy of turning movement forecasts 20 years into the future is considered uncertain. It is recognized however, that the analysis presented made use of the tools available to the analyst.

5.4 Transit Needs Assessment

- It would be helpful if the existing mode shares to Tysons had been shown as a baseline in the main report.
- Overall, the plan assumes very aggressive levels of transit services to Tysons Corner, to achieve the 31% target mode share (by 2050). The Metrorail extension provides rail service from the Dulles Corridor and from points east in the region, and the proposed plan supplements this service with bus service recommendations from the County's Transit Development Plan. On top of that, the plan assumes that there will be two additional high

speed rail corridors serving the area in place by 2050, serving significant TOD residential centers.

- The section is not really clear on what improvements will happen when. However, Table 6.1 in the next chapter includes phasing of general levels of transportation program or infrastructure projects planned, including rail and bus transit routes. Comparison of what is accounted for in the Constrained Long Range Plan (CLRP) is not provided. For example, it is mentioned that the bus service levels for 2020 from the Transit Development Plan are comparable to what is in the CLRP for 2030, but will funding be available for implementing these services by 2020?
- The transit needs assessment seems to only discuss transit services that originate in Fairfax County. In future analyses, it may be beneficial to discuss some of the bus services in the CLRP to Tysons that are from outside the County, such as services from Prince William and Stafford counties in the I-95 corridor.
- The last sentence in Section 5.4.6 which discusses service increases from 2020 to 2030 states that "Additional express bus service would be added in the I-66 corridor". The demand coming from the I-66 Corridor to Tysons may be considerable, and merits a bit more attention in the discussion. The December 2009 "I-66 Transit / TDM Study" is a good reference.
- The report mentions the modeling was done including speeds for the circulators that assume half of the route was in its own right-of-way (page 31 of main report). It is not mentioned what segments were assumed to have exclusive right of way for the circulators. It should be noted that if roadway right of way is shifted to buses only, then reduced capacity available to cars needs to be adjusted in the modeling process and incorporated into subsequent operational analysis. However, County staff / consultant explained that the model did not assume any such capacity reductions for other vehicles.
- The impacts of enhanced TDM strategies may be optimistic. Currently the County and region provide TDM services to Tysons, although not as aggressive as mandatory in-house services and Telework requirements. It would be helpful to summarize the findings of the Countywide TDM Study which provides more information on the derivation of the reduced trip rates. It is not clear how the TDM trip reductions are supported by the study's findings.
- The sketch planning analysis for 2050 concludes that "at least two additional high quality transit corridors with TOD development" will be needed to get the required 31% mode share to Tysons. The documentation reviewed did not explain how the conclusion was reached that two additional corridors will get a 6% increase in transit use for the Tysons analysis.

5.5 Year 2050 Land Use Scenario Analysis (Sketch Planning Analysis)

2050 Land Use scenario estimated **113 million square feet of development**. The report concluded that further roadway network expansion beyond that already included in the proposed 2030 Comprehensive Plan Network does not seem possible. Therefore, to accommodate all the 2050 trips resulting from the additional development (**29 million square feet or 1/3 above the 2030 level of 84 million**) the plan calls for implementation or achievement of:

- Enhanced Transportation Demand Management (TDM) strategies above and beyond those assumed for 2030, which would, if successful, achieve an additional 4% auto trip reduction, requiring a relatively lower transit share
- Transit modal share of about 31% (rather than the 35% transit modal share required if TDM enhancements are not implemented). The submission notes a projected 2030 peak period

transit share of 22% so that implementation of the 2050 vision would require about a 9% increase in this share over about a 20-year period.
- Two additional "high quality" transit corridors, similar to the Silver Line, with TOD characteristics; the location of these has not been identified (Orange line extension along I-66 is one possibility).

The adopted regional model already assumes a certain level of TDM, such as guaranteed ride home, alternative work schedules, and other employer-based programs that encourage ridesharing and transit use. The basis for the lower 31% "required" transit mode split is the success of proposed additional TDM strategies, beyond those already represented in the adopted regional model, in reducing vehicle trips by an additional 4% beyond 2030 levels. Enhanced TDM strategies are listed in Table 5.13 of original submission. It is noted that the definition of TDM used in this portion of the submission is very different from the more open definition used under TDM Vehicle trip reductions goals in Table 6.6, which lists percentage trip reductions from ITE trip generation rates relying on more extensive measures including public transit, mixed land use "synergies", etc.

The FHWA TDM model was used as the estimation tool for analysis of enhanced TDM. Default assumptions are set for metropolitan areas of various sizes and characteristics. The model begins with "known" travel conditions and mode split ("known" for 2030 in this case, since this is the assumed basis year), and uses an internal composite utility to predict a revised mode split when a package of TDM strategies is applied. With 2030 being the base year for the "enhanced TDM" analysis in the FHWA TDM model, and all the uncertainties associated with the level of 2030 TDM strategies, parking management level that would affect the success of such strategies, and travel conditions, it is difficult to assess whether the additional 4% desired vehicle trip reduction is achievable from the added TDM program. However, the increasingly urban environment brought about by higher land use densities and designed amenities envisioned for the 2050 timeframe, is likely to contribute to the desired lower auto trip generation rates.

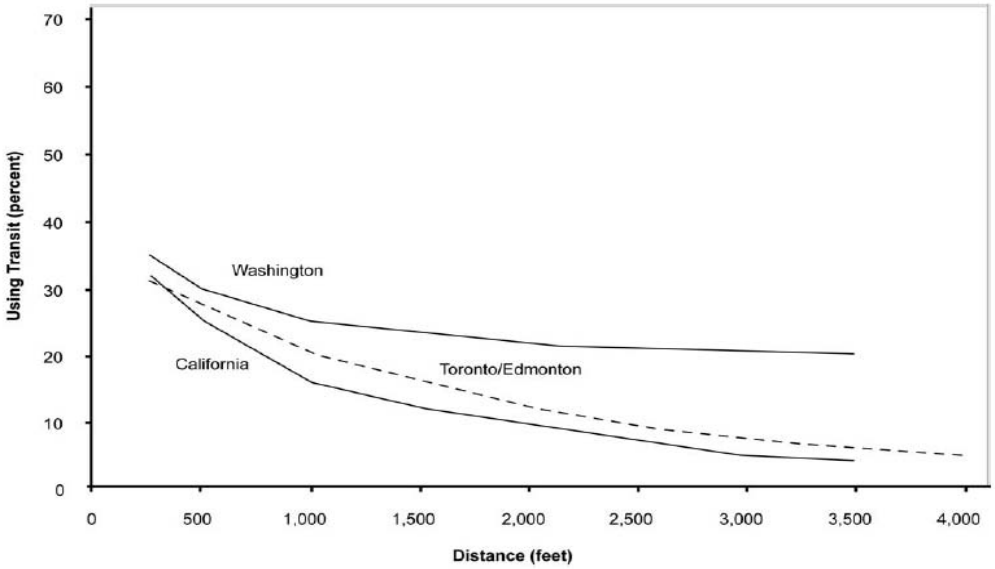
In looking at the "required" **31%** transit mode share for **evening peak** period it is helpful to examine data for locations that may be comparable to future Tysons. The travel demand model predicted 2030 daily transit share for work trip destinations similar to that in areas surrounding King Street metro in Alexandria and Bethesda, about 9% lower than Rosslyn-Ballston, and 34% lower than K-Street in D.C (Supplement III, table 16). These percentages are not directly comparable to the 31% required level (peak period percentages will be higher than daily values, TOD destinations typically have lower transit share than TOD origins) but provide an indication of the locations that Tysons can be compared to. Some reasons why the 2030 model revealed lower transit share proportions for Tysons than a CBD location (Washington, D.C.), include:
- Tysons will not have the very high number of converging transit lines (rail and bus) from all directions that typical CBDs (including D.C.) have. Even with the implementation of "two additional high quality transit corridors" beyond the Silver Metro line, the number of trains and support transit serving Tysons is likely to be only a portion of the extensive transit grid serving the Washington D.C. central core
- The densities in the adjacent areas will probably not be as high as those in the area immediately surrounding the CBD

- The demographics of the surrounding areas will probably be different – and less transit-oriented – than the areas surrounding the CBD (unlike D.C., points west / northwest of Tysons will probably continue to be less dense, suburban communities, with limited transit service, and more reliant on automobile for daily travel).
- Parking availability/ cost. It is not clear that 2030 Tysons will have a similar ratio of jobs / parking space as D.C. It is likely that 2050 parking conditions will resemble CBD levels more than earlier planning horizons.

A review of Table 3 of the 2005 Development-Related Ridership Survey (Washington Metropolitan Area Transit Authority) indicates a commute transit share (Metrorail, Metrobus and other transit) of approximately 34% for the 17 office sites surveyed, located on the average within 1/5 mile of stations (varied locations within CBD and Suburban sites inside and outside the Beltway). Table 4 in the same report indicates that office sites in CBD areas (within D.C. borders) will have much higher transit shares, while those in Suburban-Inside the Beltway have transit shares in the 30% range. The subject submission also identifies TCRP Report 95, Chapter 17; the figure below from that report provides another glimpse of work trip transit share as a function of distance from stations; relative percentages are higher for Washington D.C. (Central Business District).

Residential peak period transit share is anticipated to be higher than those for work trip destinations, as people who chose to pay the typically higher prices of residences near rail stations are also much more likely to use transit for their work and other trips. This effect can be seen in Tables 9 and 10 in the 2005 Development-Related Ridership Survey mentioned above, which indicate an average transit share of 45% (18 sites, average distance of about 2,000 ft. from stations) and 50% for sites classified as Suburban- Inside the Beltway.

Figure 17-4 Work trip rail mode share by distance to office sites from station



Notes: The graphed 1989 Washington, DC, area shares are for all transit (rail and bus combined). California and Canadian mode shares are for rail transit only. See last row of Table 17-24 for Washington, DC, 2005 mode share gradients for Metrorail only and rail and bus combined.

Source: Cervero (1993).

For the reasons explained above, it is our judgment that overall transit shares are higher for D.C. than what can be achieved in future Tysons. Typically, peak period transit shares will be higher than daily shares, and overall transit shares will be higher than those attributable to destination work trips only, due to the anticipated higher percentages for residential (origin) trips. The overall transit share of 31% appears initially high for the overall Tysons, with some users much farther from stations than those for the various office and residential sites mentioned above. However, as Tysons continues to develop into a more urbanized center between 2030 and 2050, conditions will likely continue to evolve toward, but not reach the levels of, a CBD. When one considers the relatively high levels of housing proposed for Tysons (higher transit proportions than for trips destined to Tysons), and the submission's stated goals that by 2050 75% of development is anticipated to occur within ½ mile of metro facilities, and that the circulator system will extend the reach of the stations for the remaining 25% of development, the target transit share seems more achievable, although possibly in the high end of the possible range. However, it should be noted that there are several conditions which would be necessary for this level: careful management of parking availability/ costs, implementation of "at least two additional high quality transit corridors with TOD development" mentioned, and of high levels of transit within Tysons (including circulators at least partially operating in their own right-of-way), success of the TDM program elements that promote transit usage (such as shuttles and subsidies), convenient and safe access to transit for bicyclists and pedestrians. These in turn require substantial funding and policy commitments, as well as agreement of stakeholders at the local, regional, state and federal levels.

5.6 Phasing Analysis

The plan highlights the phasing of the street and grid network improvements along Route 7, Route 123 and Greensboro Drive. However the plan does not include the phasing for the grid network bounded by Jones Branch Road to the North and on either side of West Branch Drive as well as the ramp connections from the Dulles Toll Road in this area.

Phase 1 improvements from 2010 to 2020 refer to widening of Route 7 in the core area before completing the grid system. Route 7 is a NHS route and therefore the widening will have to meet the NHS standards.

Similarly Route 123 is planned to be widened in the 2020-2030 time frame after the grid system along Route 123 is completed. It appears that an approach similar to the one used for the grid system along Route 7 may be more appropriate i.e. widening of Route 123 prior to the grid. Route 123 is a NHS route and therefore the widening will have to meet the NHS standards.

The approval of developments should be phased with the portions of the grid system completed to ensure that adequate connections to serve the new developments are available, especially the connections of the grid to the Dulles Toll Road.

Transitions between existing conditions and the various proposed development and associated supporting transportation network, will need to be carefully designed and phased to insure balanced traffic flow and safe access.

CHAPTER 6: RECOMMENDATIONS

6.1 Recommended Highway, Transit and Other Improvements

Table 6.1 presents the various transportation system elements (rail, bus, sidewalks, roads widening and connections, TDM) planned for implementation between opening of the Metrorail line to Wiehle Avenue in 2013 and 2050, the "Vision" year of the Comprehensive Plan. The transportation elements are shown as required in each of four phases, thus tying land use development levels to the implementation of specific transportation components. The four phases and their anticipated development levels are:

Cumulative Development (square feet)	Time frame
44 million	Present to 2013
60 million	2013-2020
84 million	2020-2030
113 million	2030-2050

As noted earlier, the transportation impact analysis in this submission focuses on the 2030 horizon. The impact on the transportation system of development beyond the 84 million square feet of cumulative development has only been analyzed at a very conceptual level. The potential level of vehicle trips that could be generated by the additional 29 million square feet of development between 2030 and 2050, or other development that may be considered for "bonus" densities, has not been assessed analytically. The sketch planning analysis presented in the submittal refers to "additional transit infrastructure as well as additional TDM measures" which, in combination, "are required to keep vehicle trips reasonably constant at the 2030 level." The information provided in the submission was not sufficient for VDOT to evaluate how successful those two combined measures would be in eliminating (significant) additional vehicle demand beyond the 2030 level, on the proposed road network.

6.2 Cost Estimates

The cost estimates provided include the cost of the highway improvements and transit operating costs. However the cost for additional buses needed to operate the circulator system, or of special measures to achieve the assumed operation of half of the circulator system in its own right-of-way, are not included. Similarly, the cost of associated ancillary facilities such as transfer stations or multimodal transportation hubs, are not shown. If these costs are not already included, we suggest including these capital costs in future estimates.

The cost of proposed connections to the Dulles Toll Road and Beltway may be higher than typical costs for similar partial interchanges, due to the variety of issues identified earlier under the preliminary feasibility evaluation, which would have to be investigated and addressed before construction could be completed. It does not appear that the total cost estimate includes the $14 million that would be required to implement recommended improvements identified for the 19 intersections surrounding Tysons, which were analyzed in section 5.3.4.

The submittal explains that the cost of implementing the grid (approximately half of the total $1.48 billion cost estimate, including right-of-way and construction), is anticipated to be funded mostly by the private sector as development occurs. Funding sources for the remaining portion of the roadway and transit improvements are not mentioned here. However, the section on "Funding for Transportation Improvements" in the draft Plan text (Attachment A) refers to the ability to generate stable and ongoing sources of funding for transportation improvements, as a key factor in their implementation. Tax district, Tysons Transportation Fund (TTF), Community Development Authorities (CDAs) are all mentioned as potential partial elements of innovative public-private financing options for improvements within Tysons. However, it is clear that significant public sector funding would also be necessary to achieve phases of the vision for the future of Tysons. It is common knowledge that public funding availability is a current concern in Virginia and, specifically, Northern Virginia. As an example, the following proposed connections or improvements to limited access facilities are scheduled to be completed in the next ten years: two connections to the Dulles Toll Road (Boone Boulevard extension, Greensboro Drive extension), collector-distributor road along DTR between Greensboro Drive and Hunter Mill Road), ramp connecting Jones Branch Drive to Scotts Crossing Road. These proposed connections are key to achieving the traffic distributions and levels of service represented by the travel demand model output, while the proposed additional CD road segments would be needed to achieve an acceptable operational level along NHS route.

6.3 Recommended Transportation Strategy for Tysons

This section of the submission summarizes the various transportation strategies that are considered necessary to support the proposed land use levels, while transforming Tysons into an accessible urban center with higher densities and mixed land uses (particularly the transit-oriented development around the four future rail stations) and walkable environments. The majority of these elements were discussed earlier: transit system (and goals), circulator system, the grid of streets, road improvements (widening, new connections, proposed cross sections).

TDM strategies and goals were discussed briefly, as related to Year 2050 Sketch Planning Analysis (please see Section 5.5 comments). The following comments pertain to the relationship of the mode split goals discussed in earlier sections, with the site-specific trip reductions cited in Table 6.6 of the submission (page 78) and in Table 6 of the Plan itself (included as Attachment A in submittal).

- Table 6.6, titled "Recommended TDM Vehicle Trip Reduction Goals," prescribes the required vehicular trip reduction goals from ITE peak –hour trip generation rates. The reductions include "non-auto mode shares, trips avoided due to use of telework, increased occupancy for shared rides, vehicle trips shifted out of the peak hour, and synergy among the planned uses on a site" (2/2/10 supplementary submittal). County staff confirmed that the "open" TDM definition used here also includes non-auto trip reductions due to rail/bus transit (not just employer-sponsored and such programs that can make a much smaller difference). The trip reductions were developed by FCDOT staff using mode shares resulting from transportation modeling, recommendations from a separate TDM consultant study, and adding walk trips projected through transportation modeling and "additional reductions for internal capture". The TDM consultant study which generated consultant recommendations was not included

with the submission and hence was not evaluated (we note that some research that informs analyses is often based on self-reporting, sometimes with relatively low response rates and widely varying resulting mode splits, not always verified with actual counts or before-after assessments). Without the benefit of the study's data and findings, but considering the 2030 model output, mode share analysis in section 5.5, and related needed commitments, our initial reaction is that the recommended vehicle trip reduction goals are aggressive. We realize these are "goals" but note that extensive funding and policy commitments are required to support them (transit implementation, parking supply levels, reporting/ monitoring and follow-up).

- The travel demand forecasting model does not employ ITE trip generation rates to estimate trip-making. Therefore, the relationship of ITE trip generation rates to the trip generation rates embedded in the travel demand forecasting model, mentioned above, and to the required trip reduction rates, is not clear. These two trip generation analysis tools are typically used for different purposes (travel demand forecasting for comprehensive or area-wide analyses; ITE trip generation and related reductions for more focused sub-area or site analysis). The travel demand model already incorporates a degree of "internal capture" reduction to auto trips, since it recognizes productions and attractions in close proximity to one another, and it is possible that the "additional reductions for internal capture" or "synergy" incorporated into the stated goals, as stated above, may introduce a certain level of double-counting.
- Notwithstanding the above comment, the ITE rates change over time as new data is submitted to ITE. Thus, the ITE rates published in the future may not be the same as those in effect today. To assist future analyses the Plan (included as Attachment A in submittal) should specify what the actual trip generation rates need to be in order to achieve the values represented in Table 6. This is a very easy and straightforward modification that will greatly facilitate future analyses.
- Table 6.6 prescribes the required vehicular trip reduction goals from ITE trip generation for several discrete areas within Tysons (i.e. three concentric rings within ½-mile around each Metro station, as well as areas beyond ½-mile from a station). (In addition, Table 6.4 also specifies transit mode splits that must be achieved). Since there are four Metro stations within Tysons, this means that traffic studies will need to be conducted to address 13 discrete areas. Since each area will contain residential, office, and retail land uses, the calculation of effective trip generation rates for each use as prescribed by Table 6.6 will require careful analysis. In sum, the collection and analysis of the data necessary to ascertain compliance with Table 6.6 will require significant resources.
- Table 6.1 of the Submission (Table 8 of the Plan) identifies a number of Transportation Infrastructure, Programs and Services that are required at various phases of development. One of these strategies is the implementation of enhanced express and neighborhood bus transit routes serving Tysons, as well as circulator routes within Tysons. The amount and extent of the required bus service implied in this table is not specified, so it will be difficult to determine the degree to which this strategy has been achieved in the future.
- County staff clarified that the definition of TDM used in Table 6.6 is the "open" definition, which includes a wide variety of measures intended to reduce single occupant vehicle (SOV) trip generation, anywhere from public Metrorail and bus transit, to employer-based teleworking, vanpools and transit subsidies. This is quite different from the more limited and focused TDM definition used under the 2050 Sketch Planning analysis in section 5.5 of the report or the transit mode percentages that result from the travel demand model output. It is recommended that the applicable measures be clarified when the term TDM is used, to avoid

confusion. The phrase "Non-Auto Trip Reduction Goals to Total Trip Generation" may be descriptive of Table 6.6's intent.
- The document states that TDM programs will only work where parking is not over-supplied. This acknowledges the need for County staff to coordinate both programs.
- As a whole, it is our opinion that the trip reductions in Table 6.6 are very aggressive goals, considering all the steps that need to happen as planned, within those timelines and hopefully without disruption to the availability of funds. Some of the components that need to happen are listed in the Executive Summary and throughout this report, and include implementation of significant transit commitments: four stations in Tysons, as much as 26 additional bus routes, express bus service, BRT, and feeder buses to rail stations, and realization of two additional high quality transit corridors, which require additional and more detailed feasibility studies not yet undertaken.

Additional strategies presented in the report include information and communications technology (ICT) and Intelligent Transportation systems (ITS). VDOT is in support of pursuing these strategies (such as electronic information systems, real-time information for operators and users of the transportation system, traffic management systems, etc.) both within Tysons and in coordination with other regional systems.

The submission proposes a system to **monitor over time** changes in vehicles volumes entering Tysons and associated delay at selected intersections (indicative of congestion) and suggests that "it might be desirable to establish a monitoring agency to conduct the continuous monitoring and reporting of vehicle trips". The stated objective of this monitoring is to maintain a balance between land use and transportation. Attachment A (draft Plan language, Transportation Chapter) lists strategies that need to be successfully implemented to maintain that balance: phased transportation infrastructure, vehicle trip reduction levels (TDM programs, transit modal split levels, parking management provisions, mixed use and urban deign), and monitoring system. The Attachment also lists the following transportation conditions that property owners should commit to: phasing development to required completion or timed programming of transportation infrastructure, and demonstrated ability to achieve required vehicle trip reduction levels. Forming and/or participating in a "**Community Development Authority" (CDA)** coincident with certain zoning applications, that commits to provision of "an acceptable level of funding to address the transportation improvement responsibilities of the CDA" is one of the ways to achieve the transportation condition associated with phasing development to implementation of required improvements.

VDOT fully supports these proposed measures aimed at achieving balance between land use and transportation. It is difficult to envision at this time how the combined strategies required for success will be monitored, and how adjustments will be determined and implemented, if goals are not being achieved. The draft Plan text wording also notes that monitoring of demand side and supply side should provide an assessment of existing conditions and an updated projection of future conditions. Should an imbalance be identified, an analysis of changes in travel behavior may be needed; possible corrective measures include:
- Use of TDM remedial and contingency funds to increase TDM activity
- Increase funding sources and facility user charges
- Congestion pricing

- Amendment to the Plan to modify Plan intensities and/or mix of uses

We recommend that these be further defined in the near future, so that they can be incorporated into the phasing and review of private development applications that will undoubtedly be submitted for the County's review shortly after a revised Comprehensive Plan is adopted for Tysons Corner.

Section 6.3 of the submittal and the Plan itself (Attachment A) stress the critical importance of implementing several strategies to maintain a balance between land use and transportation. All of these activities should be undertaken, and the county should monitor the degree to which they are achieved. It should be recognized that some of these strategies will be more difficult to measure than others. The implementation of physical elements of the Plan (e.g. new transportation infrastructure, new residential development, etc.) will be relatively easy to monitor and measure. However, the assessment of other strategies will be more difficult.

ATTACHMENT A – Transportation Chapter of Fairfax County Comprehensive Plan (Draft dated January 14, 2010; page numbers refer to "Clean Version")

Travel demand forecasting model used for Tysons Corner Urban Center analysis is based on Metropolitan Washington Council of Governments (MWCOG) Transportation Planning Board (TPB) 2006 adopted regional Constrained Long Range Plan (CLRP) Version 2.1D#50 model which, since the inception of this project, has gone through several modifications and updates. These modifications and revisions have been listed in TPB Travel Forecasting Model, Version 2.2 Specification, Validation, and User's Guide, dated March 1, 2008. There were 10 major refinements and 4 minor modifications. Some of these refinements include integration of an explicit commercial vehicle model into the four-step process, readjustments of external and through trips growths, and reduction or removal of K-factors and geographic mode choice adjustments. It is our understanding that some of these changes will impact the travel growth and distribution in the region but we have been assured that they should not have a significant impact within study area and overall model conclusions still will remain valid.

Elements of this Attachment were presented in various sections of the Chapter 527 submission. The reader is referred to the discussions above.

ATTACHMENT B – FRAMEWORK FOR EVALUATION - MODEL METHODOLOGY

Section 5.2 presents general overview on several aspects of the model process and output. Detailed responses to various technical questions were documented in Supplement IV. A summary of key technical comments follows.

- VDOT staff noted that the regional growth in VMT between the model's base year and forecast year (2030) has been decreased between the MWCOG Version 2.1 D#50 (2006 CLRP) used in the Tysons analysis, and the newer MWCOG Version 2.2 (2009 CLRP) for a variety of reasons, and as part of travel demand model modifications and improvements over the past three years. These changes could impact the projected growth in vehicular traffic on

major corridors such as I-66 and Capital Beltway which could consequently impact modeled growth on arterial streets such as Route 7 and Route 123 within Tysons Corner. We have been assured by those involved in the Chapter 527 process for Tysons that these changes and speed feedback process mandated by law for air quality conformity would not impact this project adversely, in terms of putting a cap on VMT growth.

- It is important to reiterate that TDM analysis was supplemental to and was not included in the results shown in various documents comparing the impacts between the two 2030 Comprehensive Plans (current and proposed). In addition, reporting of mode shifts due to TDM is based on collective package of TDM strategies and not on individual TDM measures.
- We initially noted that HOV2+ percentage share of Home-Based Shopping and Non-Home Based trip purposes seemed to be high. County consultant response indicated that, because these percentages include all shared ride components and not only those that use HOV facilities, the percentages should be reasonable.
- The magnitude of additional bus service to Tysons from current 2010 base to 2020 amounts to an increase of about 67%. Although the additional bus service from 2020 to 2030 is not identified in Supplementary material (Supplement IV) due to the uncertainty of future development patterns, the growth can be anticipated to also be significant.
- Regarding validation, the submission included Fairfax County Model User's Guide, dated October 2007 which refers in general terms about the County's model development using as a starting point NCRTPB model; however ratio of simulated to observed volumes, RMSE percents, and VMT at County or regional levels were not listed. We did not see documentation of how the base (2005) model was validated against 2005 counts or other available 2005 data such as transit mode share, HOV volumes, etc. Tables 5.1 through 5.4 in the main submittal compare 2030 current and proposed plan volumes (AM and PM peak period and peak hour) at certain locations, to 2005 counts, but no 2005 simulated volumes are presented for comparison.

The preliminary review of the 3 submitted loaded link files of existing condition (2005), current comprehensive plan for 2030 and GMU-Full plan for 2030 has revealed the following points:

<u>Network coding errors and revisions</u>

- VA 7 EB between Lewinsville Rd. & DTR is coded as 2 lanes (AMLane, PMLane, and OPLane) while the WB is coded as 3 lanes. County response indicated that the network will be updated for future runs and that the two lanes coded now do not impact decision-making process at this time.
- Beltway inner loop General Purpose (GP) lane should not have access to Jones Branch Drive; connection should be limited to HOT lanes traffic and the local traffic connecting eastside of the Beltway with the west side of the Beltway. County clarified that, after review of the assignments in this area, it appears that the corrected traffic will not change decisions resulting from this assignment.
- VA 7 west of VA 123 has what seem to be remaining piece of existing crossing of VA 7. (Approximate location of future Tysons Central 7 Station). Response indicated that the crossing of Route 7 is part of the Rt 123 SB exit to Rt 7 to both the EB and WB directions. There is a short link that allows U-turns on Rt 7 west of the station that should be removed during the next update.

Traffic Assignment/volumes

A general comparison of model parameters between the MWCOG and the proposed Fairfax County Comprehensive Plan (model file called GMUF) can be seen in the table below, for Route 7 and Route 23 segments (sections just outside Tysons area). The values represent PM peak period model outputs.

Rte	Name	Limits		Prop. Comp. Plan (GMU F or GMU High)			MWCOG*		
		From	To	# of Lns	PM Pk Period		# of Lns	PM Pk Period	
					Vol.	V/C		Vol.	V/C
7	Leesburg Pike	Idylwood Rd.	Magarity Rd.	6	17179	0.71	4	7967	0.92
7	Leesburg Pike	DTR	Lewinsville Rd.	6	11881	0.64	6	16465	1.06
123	Dolly Madison Blvd.	Old Dominion Dr.	Lewinsville Rd.	4	16521	0.92	4	10907	1.26
123	Chain Bridge Rd.	Old Courthouse Rd.	Vienna CL	4	12431	0.93	4	13375	1.55
			Total	20	58,012		18	48,714	

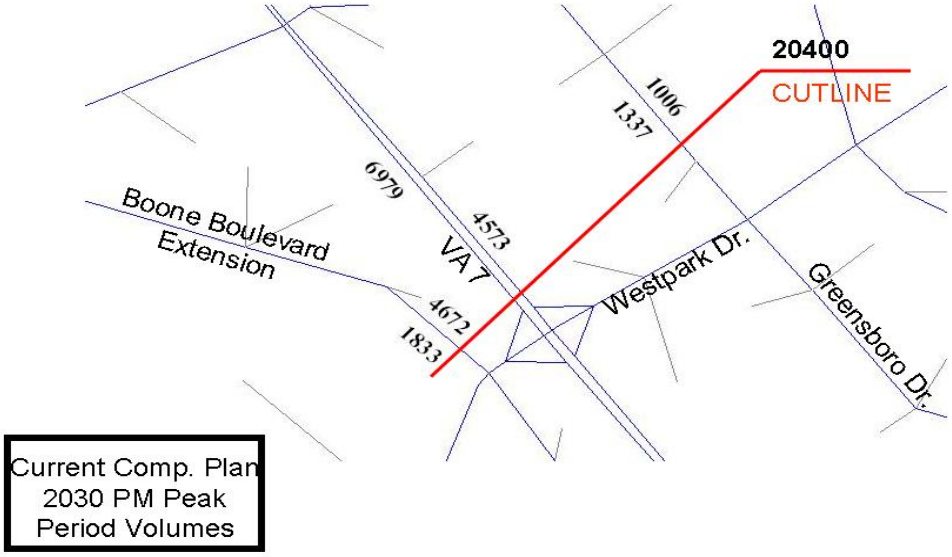
* MWCOG 2006 CLRP for 2030 (Round 7.0A)

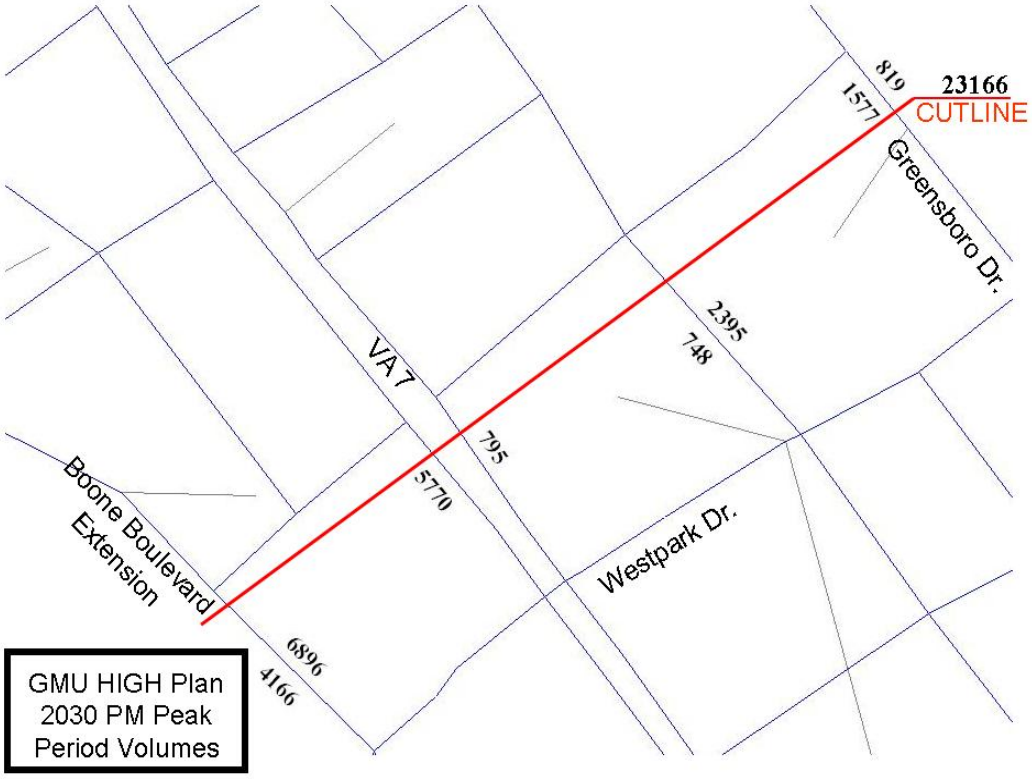
Comparison of the selected results reveals that PM peak period volumes per lane are comparable for both models (2,900 for GMU High versus 2,706 for MWCOG). The main difference between the models is the higher V/C ratios for MWCOG relative to its lower volumes, when compared with the GMU High model which shows lower V/C ratios (better segment performance) with similar or even higher volumes. For Route 7 between Idylwood Rd. and Magarity Road, this difference can be partially attributed to the added capacity under the GMU F conditions (6 vs. 4 lanes). For the other segments however, the differences are unexpected. County/ consultant response indicated that the two major differences between the COG and GMUF networks that impact the traffic assignments are (1) a large difference in the number of zones and thus zonal access points and (2) the grid of streets. However, these factors do not address why a higher traffic volume within a road segment results in a lower volume/ capacity ratio. We understand the County's proposed Comprehensive Plan model incorporate added subzone network detail, 12 different assigned road classifications (7 in the MWCOG model), starting capacities assigned in the County's model to each of the 12 road classifications, and modifying factors to reduce/adjust capacities. However, working back from the values in the above tabulation, the conclusion is that the assumed underlying unit lane capacities (vehicles per hour per lane) are significantly higher in the county's model, compared to the MWCOG model.

Cutlines.

In order to account for the additional detail network under GMU High, a cutline volume (see figures below) of the current Comprehensive Plan was compared with the GMU High Plan. This comparison indicates that all of the higher density land use will have little effect on the roadways' volumes. In other words, GMU High's higher development densities are shown to increases the traffic by only 14% across 20 lanes in the selected cutline. This result is unexpected and

surprising, considering that the current comprehensive plan already includes new rail stations, extensions of Boone Boulevard and Greensboro Drive, and a background level of TDM strategies. VDOT had anticipated higher volume increase. The County's response indicated that the current Comprehensive Plan does not contain an extensive grid which disperses traffic to many parallel links and therefore some of the major links show smaller volumes than expected. In addition to the grid system, proposed connections of roads roughly parallel to Route 7 (Boone Boulevard and Greensboro Drive) to the Dulles Toll Road would provide further options beyond Route 7 to traffic to/from the Dulles Toll Road. Another reason not mentioned in the response may include the added "internal trip" capture or synergy achieved by the proposed land use mix, which results in substantial auto trip reduction, compared to the current Comprehensive Plan.





Additional question/ answers on the model and mode share can be found in the Supplemental submission material "**Model-related (2030) and transit share topics" (**received 3/5/2010).

ATTACHMENT C – NEIGHBORHOOD TRAFFIC IMPACT STUDY

Summary of the methodology used in the analysis and of impacts of proposed mitigation measures is included under section 5.2.4 above. It should be noted that the intersection analysis presented in this submission does not address intersections within Tysons itself. Fairfax County selected nineteen intersections at various locations surrounding Tysons for operational analysis (map depicting location of selected intersections is included following page 3 of Attachment C). This section of the submission (Attachment C) mentions Appendices A, B, C and D, which were not included in the submission. Therefore we were unable to verify results of Synchro analysis and merging analysis in the report. Following are comments on the analysis for the nineteen intersections surrounding Tysons.

- At some of the intersections operating at LOS F under the 2030 Comp. Plan and 2030 GMU High Scenario signal timing optimization is considered to improve the operation. Changing of signal timings and/or optimizing can be a mitigation options; however, the entire corridor or network should be included to assess the overall impact of changes. VDOT generally operates signals within networks where the cycle lengths and progression are determined by optimizing the performance of the network, rather than individual signals. Subsequent analysis performed in conjunction with more detailed rezoning analyses should recognize these network characteristics.
- The improvements identified result in better overall intersection LOS and reduction in intersection level delay. However, individual approaches still continue to operate at significant delay and LOS F conditions indicating need for additional improvements.
- As indicated in the report of the 19 intersections analyzed, three will continue to operate at LOS E despite the proposed improvements: Route 123 at Old Dominion Drive (proposed improvement - optimize timing), Route 123 at Old Courthouse Road (proposed improvement – optimize timing, and add EBL, NBL and SBL turn lanes) and Route 123 at Maple Ave. (proposed improvements – Change signal operation to actuated- coordinated with 190 second cycle length, optimize splits, add EBL and SBL turn lanes, add exclusive EBR, WBR, NBR and SBR turn lanes). This LOS is consistent with the stated goal of LOS E "expected for the street network in Tysons Corner" (page 64 of Attachment A: January 14, 2010 draft text of Plan's Transportation Chapter). However, it should be noted that, if a project is initiated along an NHS route, stricter requirements would apply.
- The proposed plan shows several breaks in access to the interstate system which would require waivers and/or exceptions from VDOT.
- Figures following page 38:
  - Intersection #7, the proposed northbound right turn lane already exists.
  - Intersection #9, 2nd westbound through lane along Leesburg Pike is missing for existing condition. Elevation difference between westbound Route 7 and service road should be considered for additional right turn lane recommendation.
  - Intersection #14, westbound lane configuration should be shared left/through and right turn lanes instead of left and shared right/through lanes.

SUMMARY AND CONCLUSIONS

The submission presents a summary of the processes that led to the development of the proposed Comprehensive Plan Amendment under review. The Tysons Land Use Task Force members volunteered their skills and hundreds of hours over more than 2 years to put together an ambitious vision which incorporates the four new Metrorail stations into a different future Tysons; this vision of Tysons transformation into an urban center is expressed in the Task Force October 2008 document "Transforming Tysons Vision and Area Wide Recommendations." The Fairfax County Planning Commission and County staff are developing detailed Comprehensive Plan text to update the current plan, guided by the recommendations in that vision, additional stakeholder input, time-sequenced forecasts of reasonable market expectations of development activity, and a series of phased transportation analyses covering different time frames and locations.

The submission explains the analytical framework for the subject Chapter 527 document: the plan describes a vision for Tysons Corner that can only be achieved over a period of about 40 years (by about 2050). However, the transportation analysis presented is based on the land use forecasted for 2030, a more reasonable planning framework than a longer term forecast. The 20-year analysis period is also consistent with common transportation planning practice and the planning horizons being used at the time the Tysons study was initiated. The portion of the 2050 land use Vision that can be assigned to the 2030 analysis year was forecasted for Fairfax County assuming reasonable market expectations of development for Tysons. Consequently the focus of VDOT's review and comments also refers to the 2030 transportation impact analysis, which included output from the travel demand model (macroscopic view of the Tysons study area) and summaries of a "Neighborhood Traffic Impact Study" (microscopic view) for nineteen intersections outside the Tysons area core. The assessment for 2050 was presented at the "Sketch Planning" level which, based on the conclusion that the 2030 highway network will not be expanded, explores the transit mode share that would be required if supported by aggressive Transportation Demand Management (TDM) measures.

The following tables present a summary of key input data in the analysis. Comparisons of the proposals versus existing conditions and the current Comprehensive Plan are noted for reference:

Land Use Scenario	**Intensity (Gross Floor Area, sq. ft.)**		**Information source**
		% increase vs. Base (vs. 2005)	
Existing Development	46 million	N/A	1/14/10 Draft Plan amendment by County staff
Current Comprehensive Plan 2023 Land Use Intensity (Base)	73 million	Base (59%)	
Proposed Comprehensive Plan **2030** GMU High Land Use	84 million	15% (83%)	Submission document, Table 5.11, pg 54
Proposed Comprehensive Plan **2050** Land Use Intensity	113 million	55% (146%)	

Land use figures were converted to population and employment figures by traffic analysis subzones (subdivisions of the larger Traffic Analysis Zones or TAZs), for input into the travel demand model.

Land Use Scenario	**Population**		**Employment**	
		% increase vs. Base (vs. 2005)		% increase w.r.t. Base
2005	16,000	N/A	103,000	
Current Comprehensive Plan 2030 Land Use Intensity (Base)	41,000	Base (56%)	139,000	0%: Base (35%)
Proposed Comprehensive Plan **2030** GMU High Land Use	54,000	32% (237%)	159,000	14% (54%)
Proposed Comprehensive Plan **2050** Land Use Intensity	99,000	141% (519%)	199,000	43% (93%)

The improved balance of jobs/housing ratio can be seen in the following tabulation.

Land Use	Pop	Emp	Emp/Pop
Existing	16,000	103,000	6.44
Current plan	41,000	139,000	3.39
Proposed plan (2030 GMU High)	54,000	159,000	2.94

2030 Analysis

The travel demand model used to evaluate the impacts of 2030 land use changes on the transportation network is the MWCOG/TPB Version 2.1 D #50 model set, with the addition of the Fairfax County subzone highway assignment and the WMATA Post-Processor Mode Choice Model to better model the transit and mode choice options. The latest tools and methodologies available at the start of the study were used to analyze the impacts of developments. Since the inception of this project, some of these have evolved and have been modified or replaced by more advanced and enhanced procedures. After discussions with County staff/ consultant, it is our judgment that many of these latest changes and modifications should not have a significant impact on the overall results presented in the submission.

VDOT technical staff put considerable effort to understand several aspects of the modifications and assumptions behind the model, review the model files' inputs, and evaluate the resulting outputs. VDOT sought additional documentation beyond the original submission, noted discrepancies and assessed revised files, and received clarifications on several technical questions regarding network coding, traffic assignments, mode share, possible rationale for unexpected output, and the like. These have been presented and discussed in various sections above.

Following are key outputs and results of the travel demand modeling analysis. Interpretation and possible explanations of some of the results are included where available or applicable:

Daily Person Trips (vehicle and transit)	Current Comp. Plan (2030)		Proposed Comp. Plan (2030)	
	Trips	%	Trips	%
Within Tysons	94,683	17%	135,031	20%
Out of Tysons	155,562	27%	153,168	22%
Into Tysons	314,719	56%	396,241	58%
Total	564,964	100%	684,440	100%

Land Use Scenario	Congested VMT (1,000)		
	AM Peak period	PM Peak period	Off-Peak
2005	37.5	84.7	25.9
Comp Plan	44.2	82.3	21.9
Proposed Plan (2030 GMU High)	44.1	101.3	44.5

- The amount of traffic that the proposed Plan creates on the roadway system in the Tysons area is not projected to grow in proportion to the increase in development in the area. The model output submitted by the County indicates that there will be many road segments in the Tysons study area will operate generally better under the Proposed Plan than they do today or under the Current Plan. Given the large land use increases proposed, these results and the relatively low vehicular volume increases are initially surprising. County responses and VDOT's analysis of results indicate the following reasons, explored in more detail throughout this report:

  - Added transportation capacity under the Proposed Plan:
    - transit (Silver line Metro; bus circulator and additional bus lines)
    - grid of streets and urban design: supports internal mobility and provides more direct access to destinations, promotes biking and walking
    - added road capacity (widening of existing roads anticipated in current Comprehensive Plan, including access to enhanced HOV network, plus additional extensions and connections to DTR and Beltway in the proposed Comprehensive Plan)
  - Lower vehicle trip generation per square foot of development (per resident and/or employee) due to higher transit use and more walking and biking, and to well-designed mixed land use with more housing that provides lower jobs-to-housing ratio, create "synergy" and promote "internal capture" between complementary uses.
  - Underlying model assumptions. VDOT verified some though not all of these, based on Supplemental material provided by the County

- Model output summaries received in the latest supplemental indicate that the level of congestion is anticipated to increase substantially between existing conditions and the proposed Comprehensive Plan for afternoon peak period (85,000 to 101,000 congested vehicle miles traveled) but to increase very moderately in the morning peak. The afternoon increase does not appear to be consistent with the individual link performance output described above.

- The overall level of congestion across the "cordon" around Tysons in the 2030 peak period under the proposed Comprehensive Plan is not significantly different from that anticipated from the current Comprehensive Plan, either in the morning or afternoon peaks. The model predicted cumulative 2030 volumes slightly exceeding related road capacities (v/c of 1.03) in the proposed model's "Outbound" afternoon peak period conditions.

- Both the number and proportion of trips internal to Tysons are anticipated to increase relative to current conditions and the current Comprehensive Plan. The analysis presented did not evaluate where regional trips that would have otherwise gone through Tysons arterials will distribute.

- For the proposed Comprehensive Plan, the highest transit daily ridership is noted in the transit-oriented-development (TOD) areas (31,000) vs. non-TOD areas (12,000). These 43,000 daily transit person trips represent a 5,000 or 13% increase over the current Comprehensive Plan forecast of about 38,000 transit trips.

- The percentage of 2030 work trips using transit is anticipated to be in the order of 17% in Tysons, under both current and proposed Comprehensive Plan conditions, which is consistent with levels currently being experienced elsewhere in the metropolitan area. The overall peak period analysis is based on achieving an overall transit modal share of about 22% in 2030 and increasing to about 31% by 2050. This increased usage must be achieved through more aggressive transit-supportive policies and other TDM measures which may not be fully captured by the current model, as discussed elsewhere in these comments. The 2050 "Sketch Planning" analysis concludes that "at least two additional high quality transit corridors with TOD development" will be needed to achieve the 31% mode share.

Some outputs of the model appear to be counterintuitive, particularly with respect to the forecast level of congestion on some individual roadway links. While the County shared documentation of some of the model's initial values and general assumptions, and provided some background on procedures incorporated in its forecasting process, it was not possible for VDOT technical staff to review and verify all model parameters, assumptions and combined effect of modifications to default values. For example, information supplied by the County suggests that the per-lane capacities of some roads in the area are considerably higher than those assumed in the MWCOG/TPB model, which would indicate the V/Cs for those roads may show better level of service.

Impacts on Nearby Streets

Tysons growth will affect both Tysons itself and the surrounding areas. The subarea analyzed by the travel demand model focused on Tysons. For the surrounding areas, the submittal also included a draft "Neighborhood Impact Study," which presents operational analysis for nineteen intersections bordering or outside Tysons, under projected 2030 traffic volumes. Although the initial analysis indicated 14 of the 19 intersections would operate at LOS E or F during morning and/or afternoon peaks, several measures were recommended beyond the road widening projects envisioned in the current Comprehensive Plan, to mitigate those conditions. Measures considered include geometric improvements such as the extension or addition of turn lanes and receiving

lanes, and signal timing modifications. While these analyses were performed using current transportation and traffic evaluation techniques, it should be noted that the very detailed traffic volumes on which they are based rely on forecasts of turn volumes for 2030.

TDM Measures

As noted throughout these comments, the proposed Plan relies heavily on changing the way people travel to, from, and within Tysons. In addition to significantly increasing transit usage, the Plan also promotes a variety of other travel behavior changes. The term TDM is used to describe these various measures. VDOT fully supports these proposed measures aimed at achieving a greater balance between land use and transportation. It is difficult to envision at this time how the combined strategies required for success will be monitored, and how adjustments will be determined and implemented, if goals are not being achieved. The draft Plan text wording also notes that monitoring of both the transportation demand side and the transportation supply side should provide an assessment of existing conditions and an updated projection of future conditions. Should an imbalance be identified, an analysis of changes in travel behavior may be needed; possible corrective measures include:

- Use of TDM remedial and contingency funds to increase TDM activity
- Increase funding sources and facility user charges
- Congestion pricing
- Amendment to the Plan to modify Plan intensities and/or mix of uses

We recommend that these be further defined in the near future, so that they can be incorporated into the phasing and review of private development applications that will undoubtedly be submitted for the County's review shortly after a revised Comprehensive Plan is adopted for Tysons Corner.

Section 6.3 of the submittal and the Plan itself (Attachment A) stress the critical importance of implementing several strategies to maintain a balance between land use and transportation. All of these activities should be undertaken, and the County should monitor the degree to which they are achieved. Some of these strategies will be more difficult to measure than others. The implementation of physical elements of the Plan (e.g. new transportation infrastructure, new residential development, etc.) will be relatively easy to monitor and measure. However, the assessment of other strategies will be more difficult

2050 Analysis

The submittal also included a brief 2050 "Sketch Planning" assessment. The impact on the transportation system of development beyond the 2030 horizon's 84 million square feet of cumulative development was analyzed at a very conceptual level. The potential level of vehicle trips that could be generated by the additional 29 million square feet of development between 2030 and 2050, or other development that may be considered for "bonus" densities, was not modeled analytically. The built-in assumptions for 2050 include aggressive TDM programs forecasted to reduce vehicle trips by 4%, and a required 31% transit share dependent on implementation of two new Metrorail corridors in addition to the Silver Line. These combined

measures are "required to keep vehicle trips reasonably constant at the 2030 level." The information provided in the submission was not sufficient for VDOT to evaluate how successful those two combined measures would be in eliminating (significant) additional vehicle demand beyond the 2030 level, on the proposed road network.

To avoid confusion by readers and users of the Plan and related documents, we recommend clarification of the following:

- Analyses and figures that refer to the 2030 analysis horizon be clearly differentiated from those that refer to the Tysons "vision" for 2050
- Transit Demand Management (TDM) definition and associated trip reduction values. Discussions related to the FHWA TDM model indicate a relatively narrow definition of TDM (such as employer-based measures and policies to improve transit usage and rideshare) for achieving 4% vehicle trip reductions. In contrast, the trip reduction goals listed for various years (Table 6) assume a very broad definition of TDM, to include all measures and modes that would result in reductions to ITE trip generation and hence fewer auto traffic volumes. These broader measures include public transit, "internal capture" or synergy between neighboring land uses, and non-motorized travel, and can be viewed as "Non-Auto reductions to ITE Trip Generation".
- Goals that are simply "targets" be contrasted with those that must be met as conditions for specific development levels.

Conclusions

The proposed Plan is based on changing the way people travel to, from, within and through Tysons. These changes include increasing the relative use of public transportation and ridesharing, as well as walking and biking. In order to achieve these travel characteristics and approximately realize the modeled effects, a number of supporting actions need to be taken, some of which rely on subsequent studies, funding commitments, approvals of appropriate agencies, and / or legislative decisions. For the 2030 timeframe, such measures may include:

- Providing additional road capacity. Some of these were anticipated in the current Comprehensive Plan (such as extending Boone Boulevard and Greensboro Drive, widening Route 7, Route 123 and Gallows Road in Tysons) while others are new recommendations (implementation of grid of streets and associated bike and pedestrian-friendly elements).

- Providing additional connections and improvements to major freeways. The Plan assumes that access to the Dulles Toll Road and I-495 will be improved with additional ramp connections and expanded capacity. The existing DTR interchanges at Route 7 and Spring Hill Road would not be able to accommodate projected 2030 volumes unless these DTR ramps are added to distribute traffic. Although most of the proposed connections appear to be feasible from an engineering perspective, some potential issues have been identified. Further coordination and approvals from stakeholder agencies (FHWA[6], VDOT, MWAA[7] and MWCOG) will be required during project development and funding allocations, and more detailed studies will be needed to finalize specific locations, alignments, design, impacts assessment, and cost

[6] FHWA: Federal Highways Administration
[7] MWAA: Metropolitan Washington Airports Authority

estimates. The Phasing outlined in the plan recommends implementation by 2020 of the proposed new ramps connecting Boone Boulevard and Greensboro Drive to the Dulles Toll Road (DTR) and extension inside the Beltway of the Jones Branch Drive Connector between the HOT lanes and Scotts Crossing Road. These key arterial connections would not only relieve existing interchanges but also redistribute some traffic away from Route 7 and Route 123, National Highway System roads. To mitigate the failing merge condition that would result at the DTR connection with the Boone Boulevard extension, the plan recommends construction of collector-distributor (CD) roads along the DTR between Greensboro Drive and Hunter Mill Road; feasibility analysis of these eastbound and westbound auxiliary lanes was not presented. In view of the lengthy lead times required to implement major projects, as well as current funding limitations, it would appear that more rigorous feasibility analyses and preliminary engineering work on these improvements should be initiated immediately.

- As indicted in the Plan, implementing an efficient transit circulator within Tysons, without removing needed capacity for other traffic. The circulator system is envisioned to operate within mixed traffic initially, but the 2030 model assumes higher speeds for half of this system in its own right-of-way, while maintaining road capacity for other vehicles. It appears that the ultimate determination of these requirements will be dependent upon the outcome of a more detailed bus / transit circulator study that the County will undertake.

- Provision of significantly expanded transit service to and from Tysons, in addition to the transit circulator within Tysons. While the most significant such enhancement is the opening of the Metrorail Silver Line, the transit forecasts embedded in the Plan also incorporate significant increases in bus routes to and from Tysons. It is probably not necessary that these exact routes be established, but it is important to recognize that Metrorail alone will not provide the level of transit service required to achieve the transit ridership embodied in the Plan, and that a significant expansion of bus service to and from Tysons is also required. These combined assumptions highlight the need for aggressive planning on the part of transit providers for the additional transit capacity anticipated, both for the Metrorail components that will be recipients of Silver Line riders, as well as bus transit and supporting facilities.

- Implementation of aggressive TDM programs, with monitoring and follow-up by the County to ensure effectiveness (see below). Such programs may include a variety of strategies to encourage transit and other non-SOV modes (e.g. ridesharing support, etc.), as well as to possibly discourage SOV usage (e.g. parking ceilings and fees).

- Implementation of the mix of uses and urban design features recommended in the Plan. These features include establishing a street grid, providing sidewalks and streetscape amenities, ensuring that a mix of different land uses exist that balances jobs and housing and promotes "internal capture" and transit use, and a variety of other elements in the Plan. All of these features contribute to the creation of a transit-oriented, urban environment.

- Establishment of a monitoring entity for ensuring that the forecast levels of traffic, transit ridership, TDM performance, and other travel characteristics are being realistically achieved. This is a highly desirable component of the Plan, since travel behavior is influenced by many factors which may change over time, and static modeling of future conditions may not capture these variables. The road performance in the model output assumes all proposed

improvements (transit and highway), TDM measures and land use mix will be implemented. The draft Plan text included in the submission notes that, should an imbalance in the transportation demand side and supply side be identified, possible corrective measures may include amendment to the Plan to modify intensities and/or mix of uses, congestion pricing, facility user charges, and other tools.

- Implementing a number of additional innovative measures related to incident management, transit and traffic operations, wayfinding and other uses of technology to maximize the efficiency of the transportation system. While the individual benefits of specific programs such as these are difficult to measure or predict, they should nevertheless be implemented as additional ways of promoting the efficiency of the transportation system serving Tysons.

The proposed street cross-sections incorporate the concept of "complete streets" which provide capacity, mobility and safety for various users: private cars/motorists, transit buses, bicyclists, pedestrians and transit riders. The proposed lane widths are in agreement with the minimum AASHTO design standards. However, we recommend that ultimate design of streets take a comprehensive "context sensitive" approach rather than rely on minimum values across the board. The context-sensitive approach considers impacts to various users, features and integration into the community, and addresses safety, mobility and preservation. Guided by the proposed cross-sections, final street design may need to incorporate tradeoffs to account for the road's classification and standards (such as those for national highway system routes where applicable), proportion of user types (trucks, buses, bicyclists, pedestrians, other vehicles), transition between existing and ultimate sections, and surrounding land uses (existing and planned).

To help maintain a balance between land use and transportation, the proposal suggests the establishment of a monitoring agency to monitor vehicles volumes entering Tysons and associated delay at selected intersections, and lists transportation conditions that property owners should commit to perform or achieve. Conditions include phasing development to required completion or timed programming of transportation infrastructure, achieving required vehicle trip reduction levels, and forming and/or participating in a "Community Development Authority" (CDA) that would commit to provide an acceptable level of funding to address certain transportation improvement responsibilities. The draft Plan text wording also notes that, should an imbalance be identified, possible corrective measures may include use of TDM remedial and contingency funds to increase TDM activity, increase funding sources and facility user charges, implement congestion pricing, and amend the Plan to modify Plan intensities and/or mix of uses.

VDOT supports measures aimed at achieving improved balance between land use and transportation. However, it is not clear at this time how the complex phasing of land use activity will be reviewed and approved (both for 2030 and 2050 levels), how the supporting infrastructure will be implemented, and how the potential corrective measures will be targeted. We recommend that these be further defined as much as possible in the near future, so that they can be incorporated into the phasing and review of private development applications which may be submitted for the County's review following adoption of a revised Comprehensive Plan for Tysons Corner.

PROPOSED TYSONS COMPREHENSIVE PLAN
SELECTED COMPARATIVE MEASURES

	Sq.Ft. (m)	Pop.	Empl.	Daily Person Trips (Motorized modes)	Daily Transit Trips	Daily Vehicle Trips	Internal Vehicle Trips Within Tysons	Through Vehicle Trips Within Tysons	PM Outbound Cordon Vol.	Congested VMT (1,000)		
										AM Peak Period	PM Peak Period	Off-Peak
2005	46	16,000	103,000	470,000	n.a.	n.a.	n.a.	n.a.	n.a.	37.5	84.7	25.9
Current Plan	73	41,000	139,000	565,000	38,100	410,000	75,000	335,000	85,200	44.2	82.3	21.9
Prop Plan 2030	84	54,000	159,000	685,000	43,000	449,000	142,000	307,000	94,200	44.1	101.3	44.5
Prop. vs. Current Plan	**1.15**	**1.32**	**1.14**	**1.21**	**1.13**	**1.10**	**1.89**	**0.92**	**1.11**	**1.00**	**1.23**	**2.03**
Prop. vs. 2005	**1.83**	**3.38**	**1.54**	**1.46**	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**1.18**	**1.20**	**1.72**

n.a. - Not Provided

Comparative Summary of Tysons Corner Area (Fairfax County 2030 Model's Output) -- Selected Roadways												
Route #	Name	Limits		Existing Condition			Current Com. Plan			Prop. Comp. Plan (GMU F)		
		From	To	# of Lanes	PM Peak Period Volume	PM Peak Period V/C	# of Lanes	PM Peak Period Volume	PM Peak Period V/C	# of Lanes	PM Peak Period Volume	PM Peak Period V/C
495	Beltway	I-66	VA 7	8	17770	1.18	**12**	19,760	1.25	**12**	20390	1.2
495	Beltway	VA 7	VA 123	8	16900	1.07	**12**	19,060	1.09	**12**	18890	0.99
495	Beltway	VA 123	VA 267	8	15350	1.02	**12**	17,740	1.09	**12**	18040	0.96
495	Beltway	VA 267	Georgetown Pike	8	18410	1.07	**12**	21,100	1.02	**12**	20300	0.9
267	DTR EB	I-66	VA 123	2	2860	0.67	2	2,790	0.77	2	4090	0.68
267	DTR WB	I-66	VA 123	2	2410	0.56	2	940	0.26	2	1180	0.27
267	DTR EB	VA 7	Wolf Trap rd.	3	7540	0.88	3	6,990	0.81	3	6740	0.78
267	DTR WB HOV Lane	VA 7	Wolf Trap rd.	1	1720	0.8	1	490	0.23	1	1780	0.83
267	DTR WB GP Lane	VA 7	Wolf Trap rd.	4	6390	0.74	4	7,550	0.88	4	8000	0.93
7	Leesburg Pike	Idylwood Rd.	Magarity Rd.	4	5700	0.94	**6**	7,500	0.81	**6**	6360	0.71
7	Leesburg Pike	Old Courthouse Rd.	International Dr.	6	5710	0.68	**8**	4,110	0.49	**8**	5520	0.59
7	Leesburg Pike	International Dr.	VA 123	6	4610	0.88	**8**	3,820	0.44	**8**	4130	0.5
7	Leesburg Pike	VA 123	Gosnell Rd.	6 *	5370	0.88	**8**	3,840	0.69	**8**	3580	0.71
7	Leesburg Pike	Gosnell Rd.	Spring Hill Rd.	6 *	6950	0.96	**8**	4,480	0.65	**8**	2420	0.53
7	Leesburg Pike	Spring Hill Rd.	Tyco Rd.	6	6890	0.9	**8**	5,700	0.79	**8**	1340	0.18
7	Leesburg Pike	Tyco Rd.	DTR	6	6620	0.8	**8**	6,080	1.00	**8**	1720	0.9
7	Leesburg Pike	DTR	Lewinsville Rd.	4	4580	0.78	**6**	5,020	0.67	**6**	4400	0.64
123	Dolly Madison Blvd.	Old Dominion Dr.	Lewinsville Rd.	4	6290	1	4	6,380	1.01	4	6110	0.92
123	Dolly Madison Blvd.	DTR	I-495	6	6680	0.82	**8**	6,310	0.84	**8**	7220	0.91
123	Dolly Madison Blvd.	Tysons Blvd.	International Dr.	6	4900	0.67	**8**	4,760	0.56	**8**	4960	0.6
123	Chain Bridge Rd.	VA 7	Old Courthouse Rd.	4	4840	0.95	**6**	5,310	0.97	**6**	4880	0.8
123	Chain Bridge Rd.	Old Courthouse Rd.	Vienna CL	4	5390	0.92	4	4,650	0.89	4	4600	0.93
	Jones Branch Dr.	International Dr.	Park Run Dr.	4	1430	0.35	4	1,980	0.53	4	1640	0.4
	Jones Branch Dr.	Park Run Dr.	Westbranch Dr.	4	1000	0.22	4	1,510	0.43	4	840	0.18
	Jones Branch Dr.	Westbranch Dr.	Scotts Crossing	4	710	0.17	4	1,410	0.41	4	1500	0.44
684	International Dr.	Galleria Dr.	Greensboro Dr.	6	3240	0.54	6	4,140	0.63	6	4200	0.68
684	International Dr.	Tysons Blvd.	Westpark Dr.	6	2690	0.45	6	2,400	0.45	6	3480	0.54
684	International Dr.	Jones Branch Dr.	DTR	4	4470	1.12	4	4,090	1.11	4	4380	0.99
	Westpark Dr.	Greensboro Dr.	International Dr.	4	1400	0.34	4	1,150	0.28	4	1550	0.47
	Westpark Dr.	International Dr.	Park Run dr.	4	800	0.22	4	1,450	0.44	4	760	0.19
	Gosnell Rd.	Boone Blvd.	Old Courthouse Rd.	6	3190	0.61	6	2,290	0.32	6	2320	0.56
677	Old Courthouse Rd.	VA 123	Lord Fairfax Rd.	4	1730	0.4	4	2,530	0.56	4	2170	0.54
	Boone Blvd. Ext.	Spring Hill Rd.	Gosnell Rd.	N/A	N/A	N/A	4	1,990	0.72	4	3580	0.89
650	Gallows Rd.	Gallows Branch Rd.	SAIC Dr.	4	6440	1.17	**6**	7,240	1.15	**6**	6370	0.98
	Greensboro Dr.	International Dr.	Pinnacle Dr.	4	1270	0.58	4	1,880	0.84	4	1830	0.95
	Greensboro Dr. Ext.	Westpark Dr.	Spring Hill Rd.	4	430	0.17	4	860	0.21	4	880	0.21
	Spring Hill Rd.	VA7	Greensboro Dr. Ext.	2	640	0.22	**4**	810	0.23	**4**	1320	0.47
	Tyco Rd.	VA7	Greensboro Dr. Ext.	4	960	0.34	4	430	0.20	**2****	570	1.38
	Old Meadow Rd.	Old Meadow Ln.	VA 123	4	1880	1.29	4	1,940	0.94	4	1020	0.3
	Scotts Crossing Rd.	BRIDGE Crossing over I-495		N/A	N/A	N/A	N/A	N/A	N/A	**4**	970	0.72
	Lewinsville Rd.	VA 7	Spring Hill Rd.	2	880	0.31	2	940	0.48	2	1170	0.6
			TOTAL Volume		197,040			203,420			197,200	

* does not include the frontage road volume or capacity.

** Possible network coding error.

Notes:

1- v/c values (from Fairfax County model output)

a. Values listed are highest (worse) within each segment (not necessarily representative of entire segment: higher v/c often occurs at/near interchanges/intersections)

b. v/c over 1.0 suggests one (or more) links within roadway segment is over capacity. Analyst needs to consider additional factors to evaluate corridor performance.

c. v/c represent PM Peak direction (volumes are cumulative for both directions).

2- Bold numbers denote changes in # of lanes relative to existing conditions.

3- Level-of-Service (LOS) and V/C ranges:

LOS	A , B , C	D	E	F
V/C	0 - 0.6299	0.63 - 0.78999	0.79 - 0.9999	>=1.0