A New Sunrise at the Herndon-Monroe Station

George Mason University – School of Public Policy
Transportation Policy, Operations & Logistics (TPOL) Program

Prepared by: Melanie Allen (Project Manager), Audrey Allums, Brittany Martin, Vicki Miller, David Ridgley, and Rich Sampson

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PREFACE

This document was developed to meet a degree requirement for the Transportation Policy, Operations and Logistics Master’s Degree Program at George Mason University. Dr. Jonathan Gifford’s PUBP 722 class was engaged by Fairfax County, Virginia, to study the opportunities, benefits and consequences a proposed Metrorail station along the new 23-mile rail line to Dulles International Airport in Loudoun County and beyond. The class participants included Melanie Allen (Project Manager), Audrey Allums, Brittany Martin, Vicki Miller, David Ridgley, and Rich Sampson. Dan Rathbone and Dan Stevens were the contacts for Fairfax County.

The project is funded by Federal Transit Administration (FTA), the Commonwealth of Virginia, Fairfax County, Loudoun County, and the Metropolitan Washington Airports Authority (MWAA). MWAA oversees the management of the construction. Based on the information that was provided by Fairfax County and research by the study team, the participants determined that the proposed Station at Herdon-Monroe with its accompanying expansion of the Park-and-Ride facility would be appropriate for the report. The report would provide investigation into several elements of the station area, including the planning and management of the facility’s accessibility as well as the intensity, scope and locations of transit-oriented development. Recommendations then would be made by the study team on how accessibility to the station could be improved.

At the same time it was noted that several planning efforts have been conducted concerning the Dulles Corridor Extension. Along with the Environmental Impact Statement, the Washington Metropolitan Area Transit Authority, Fairfax County, the Town of Herndon and the Virginia Department of Rail and Public Transportation (DRPT) all had long range plans that were in development or developed, and that addressed accessibility. These plans were taken into consideration in the recommendations devised for this report.

The recommendations that have been developed address current conditions. As the Herndon-Monroe Station is slated for the second phase of development with a completion date of 2025, conditions may change over time. The recommendations in this report are based on planning, policy and reports pertinent to this time. The opinions and recommendations in this document are the responsibility of the members of the study team and do not represent the positions of the Fairfax County or George Mason University.

ACKNOWLEDGMENTS

A number of individuals provided input, guidance and technical assistance during the development of this study. The study team would like to thank Dr. Jonathan Gifford for providing invaluable guidance and oversight during the 14-week period in the development of this report. Additionally, Rick Stevens and Dan Rathbone of Fairfax County provided technical assistance and information essential to this report. Nat Bottigheimer and Thomas Harrington of the Metropolitan Washington Area Transportation Authority offered their perspectives and additional background materials. Eric Vogel, VDOT Transportation Planner, for his guidance and availability in sharing his working knowledge on high dense environments and trip generation rates. Don Deal, Fairfax County Department of Tax Administration, for his assistance in clarifying a few of the figures used to describe parcels in the vicinity of the proposed station. Sterling Wheeler of Fairfax County shared his insights into economic development topics in Fairfax County and the Northern Virginia region. Finally, Professor John McClain of George Mason University offered a number of helpful contacts and his experience in regional transportation planning in the Washington Metropolitan region. The insights, information and support shared by these practitioners in transportation planning was crucial to the final products produced by this study team. Finally, the study team would like to thank George Mason University for providing the opportunity and support for completing the Master’s Program.
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EXECUTIVE SUMMARY

The Town of Herndon, Virginia, in Fairfax County, will host its first link into the Washington Metropolitan area’s Metrorail system by 05 through the Herndon-Monroe Metrorail Station. Provision of Metrorail service to Herndon, and its surrounding area in Fairfax County, presents an opportunity to shape the future direction of the area.

Since its opening in 1976, the Metrorail network – operated by the regional transportation entity the Metropolitan Washington Area Transportation Authority (WMATA) – has served as a catalyst to move hundreds of thousands of passengers each day while also strongly influencing regional economic development and housing patterns. Similarly, the Herndon-Monroe Metrorail Station has the potential to drive development activity in and around the Town of Herndon and transform the way people live, move and interact in the community.

This study begins by detailing the background of the Town of Herndon and its surrounding areas – including demographics, infrastructure, planning efforts and other trends occurring in the status quo. Building upon that background, it then considers the broader concept of economic development, and – more specifically – Transit-Oriented Development (TOD), and some of the fundamental tenants involved in merging transit service and community planning.

These elements of community background and development planning are then combined with the project team’s original content developed under this study – a data collection effort chronicling the current land use and travel patterns within a half-mile radius of the planned Herndon-Monroe Station. The data compiled through that work led to the development of a unique model to project alternative uses of that same land. This model allows for the consideration of how a community development and planning approach more closely tied to the opportunities presented by the new Station might impact the Herndon area.

Utilizing that model, the study team developed three distinct options for development and transportation infrastructure in and around the Herndon-Monroe Station area. First, projects and activities planned through current planning efforts conducted by local and regional governments and the Commonwealth of Virginia are investigated en-masse, and used here as the control alternative. In comparison with that option of maintaining and implementing the current baseline plans, two additional alternatives posit increases in the density of development and also a more focused use of transportation-related infrastructure to facilitate Transit-Oriented Development.

The first such option – dubbed by the study team as the Maximum Development Option – projects the changes in land use and the number of vehicular trips generated by establishing a Floor-to-Area Ratio (FAR) of 2.5 for retail and commercial buildings and an average of 30 residential dwelling units per acre, in order to encourage more dense development near the Herndon-Monroe Station. Meanwhile, the second alternative – termed the Mid-Range Development Option – factors similar changes under a less-dense scenario of 0.9 FAR and 7-12 residential dwelling units per acre. These projections offer concise visions for two different ways of utilizing land near the Station that offer a stark contrast to those anticipated in current plans. Additionally, a detailed re-invisioning of transportation infrastructure is offered by the study team that applies to both options.

Lastly, based on the research conducted on the background of the Herndon area and concept of Transit-Oriented Development, and integrating the group’s original work on land use data, forecast projections and the development of alternatives, this study presents a set of four issue areas that are crucial to leveraging the opportunity of the Herndon-Monroe Station:

1) Identify a Vision for the Herndon-Monroe Station
2) Establish a Continuous Transit, Bicycle and Pedestrian Network
3) Limit Parking Availability
4) Utilize Zoning and Proffering Mechanisms to Reduce Roadway Network Impacts
More specifically, the following findings and recommendations are presented to this project’s client of Fairfax County, as well as to any and all leaders and officials in the Herndon area in order to affect change in the area around the planned Herndon-Monroe Station:

1) Identify a Vision for the Herndon-Monroe Station

Finding: No uniform vision has been adopted for the surrounding community, incorporating existing land use characteristics.

Recommendation: It is recommended to the localities and Metro, to maximize the opportunity of the rail investment through establishment of a vision with increased density in development and improved communication between stakeholders.

2) Establish a Continuous Transit, Bicycle and Pedestrian Network

Finding: The transit, pedestrian, and bike network is discontinuous with minimal infrastructure and a low level of service.

Recommendation: Improved amenities for other transportation modes are recommended with priority over vehicles.

3) Limit Parking Availability

Finding: Parking is a major feature of transportation and parking needs will change with construction of the Herndon-Monroe Metro station.

Recommendation: The building of additional parking structures is recommended at the station site; however, parking should be limited to encourage an increase to walking, biking and economic development.

4) Utilize Zoning and Proffering Mechanisms to Reduce Roadway Network Impacts

Finding: The existing road network does not provide for alternative route selection to reach destinations and congestion occurs during peak periods in the area.

Recommendation: Increased density of development will increase demand on surrounding roadways. Additional infrastructure, in addition to ITS is recommended.
I. INTRODUCTION

The construction of a new Metrorail station between Monroe Street and the Fairfax County Parkway presents a significant opportunity for the Herndon area. Metrorail will provide increased access and modal choice for getting to jobs, recreational opportunities or travel in the Washington Metropolitan region. The economic advantage rail service provides in enabling high density development will significantly benefit both the Town of Herndon and Fairfax County.

The Herndon-Monroe Metrorail Station will be located directly south of the Dulles Toll and Access Roads at the current site of the Herndon-Monroe Park-and-Ride facility. The location is bordered by Sunrise Valley Drive to its south, Monroe Street/Van Buren Avenue to its west and the Fairfax County Parkway to its east. As depicted in the schematic above, two additional parking structures will be constructed next to the current parking facility, one replacing an existing open-air parking lot. The Metrorail platform will be positioned in the grassy median of the Toll/Access Road, to the east of Monroe Street. A new pedestrian overpass will link the platform to an upgraded bus transit platform and parking structures on the south side of the station, while connecting to a new, but modest station pavilion on the north side of the Toll/Access Road.

In addition, Fairfax County currently owns a 13-acre, predominantly undeveloped land parcel, located directly adjacent to the proposed station and the Dulles Toll Road. This parcel currently hosts the current Park-and-Ride facility, and will also be the primary site of the Herndon-Monroe Station, but also possesses more than a half-dozen undeveloped acres that may become prime candidates for Transit-Oriented Development projects.

The station will be located on the second phase of construction for the Dulles Corridor Metrorail line, and is projected to open in 2015. Its neighboring rail stations will be located at Reston Parkway, near the Reston Town Centre, to the east of the Herndon-Monroe Station, and Route 8 to its west. All three stations are located within Fairfax County. The Herndon-Monroe Station will produce impacts – positive and negative – within Fairfax County, the Town of Herndon and the Town of Reston. This study attempts to examine and project those impacts through the development of alternatives for planning decisions and also by producing a set of findings and recommendations that might help leaders, officials, stakeholders and the public to leverage the opportunity of the Herndon-Monroe Station in a manner in best keeping with its priorities and objectives.
II. SETTING THE STAGE

A. Demographics

The town of Herndon, an independent jurisdiction describes itself as “the gateway to the world where the innovations and opportunities of the 21st century are enhanced by a sense of community and responsive local government.” Located on in the Western region of Fairfax County, a county known to be on of the nations richest, Herndon is quickly becoming the land of new opportunity. Being just three miles east of Dulles Airport, the Town is physically positioned to attract businesses from all over the world. Since it is part of the Dulles Technology Corridor, many companies have decided to call Herndon home. Some of the largest employers include: Boeing, Cisco Systems, J.D. Edwards, Oracle, Fannie Mae, Sprint Nextel, and the federal government. Overall, Herndon’s Technology Sector accounts for more than 5,000 jobs, which equals close to 30% of the technology submarket share, and over 275 businesses. In addition to the large technology sector, other business sectors are also doing well in Herndon and they include information, accommodation and food service, finance and insurance, and wholesale trade to name a few.

As the Town of Herndon continues to grow and become a technology haven, amazingly enough, it has been able to maintain its community feel. Herndon’s population is approaching 22,000 people according to the 2000 Census and while there has been a population increase, the 2006 American Fact Finder showed that the population is still lingering below the 22,000 mark. The growth of the area is expected to continue and the Census estimates the population to reach 23,948, 25,754, and 26,270 in the years 2010, 2020, and 2030 respectively. Increases in population usually lead to a diverse racial make-up and Herndon is no different. According to the 2000 Census, the composition of the Town was 57.89% White, 9.51% Black, .4% Native American, 13.86% Asian, 12.95% being from other races, and 5.32% claiming two or more races. Any race Hispanic/Latinos were equal to 6.01% of the population.

Since there is an increase in both industry and people, the number of housing units is also estimated to increase and with the estimates for the years 2010, 2020 and 2030 being 7,955, 8,555, and 8,726 respectively. The Town of Herndon Business report states that the average home price in Herndon is $431,500. (FCEDA, 2007) In order to afford the price of homes in Herndon, many of the residents are employed. In fact, Herndon has a strong labor force with a 76 percent labor force participation rate, which includes the complete population over the age of 16. That is over 12 percent more than the national average. Additionally, the median household income during the 2000 Census was $72,912 almost $31,000 more than the national average. The per capita income was $26,941, more than $5,000 higher than the national average. Since Herndon’s population is both young (median age of 31.5) and educated (more than forty percent of the population 25 and older have bachelor’s degrees), it is easy to see why Herndon had such as bright future.

Traffic is always a concern when an area is expected to experience continued growth and according to the Fairfax County Comprehensive Transportation Plan Update, “the most significant increases in travel to Fairfax County will come from Fairfax County’s most rapidly growing neighbors - Loudon County and Prince William Counties. The roadway facilities most directly affected by these trends in growth are I-95, U.S. 50, I-66, the Dulles Toll Road, Route 28, and Route 7.” Roadway/highway changes in addition to the metro extension are expected to “mitigate, but not eliminate, growing levels of congestion. In the evening peak period of weekday travel, travel in moderately congested conditions is forecast to increase by 31 percent, while travel in severely congested conditions is forecast to grow by 53 percent over year 2000 conditions” (see chart on next page) (Cambridge Systematics, 2006).
In 2004, the Virginia Department of Transportation (VDOT) calculated the average daily traffic of the Dulles Toll Road, which averages 45,000 vehicles per day moving east (See Traffic Counts below).

**TRAFFIC COUNTS**

<table>
<thead>
<tr>
<th>ROAD</th>
<th>FROM</th>
<th>TO</th>
<th>AVERAGE VEHICLES PER DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dulles Toll Road (Route 267), east</td>
<td>Loudoun County line</td>
<td>Centreville Road (Route 657)</td>
<td>16,000</td>
</tr>
<tr>
<td>Dulles Toll Road, east</td>
<td>Centreville Road</td>
<td>Herndon eastern town limits</td>
<td>45,000</td>
</tr>
<tr>
<td>Dulles Toll Road, east</td>
<td>Herndon western town limits</td>
<td>Herndon eastern town limits</td>
<td>45,000</td>
</tr>
<tr>
<td>Dulles Toll Road, east</td>
<td>Herndon eastern town limits</td>
<td>Reston Parkway (Route 607)</td>
<td>45,000</td>
</tr>
</tbody>
</table>


**B. Current Transit Service**

The current site for the Herndon Monroe Station is served by a large park and ride lot with over 1700 spaces of free parking. This lot is located at 12530 Sunrise Valley Drive. Several bus lines operated by Fairfax Connector currently serve the site as well as one Metrobus route. Fares on the Fairfax Connector buses are $1.00 and $.35 with a transfer from Metrorail. The fare on the Metrobus 5A is $3.00. The following are routes that currently serve the Herndon-Monroe facility.

- **RIBS 2 South Lakes / Herndon-Monroe Line.** This line travels between the Herndon/Monroe Park-and-Ride and Reston Town Center at 30 minute headways all times.

- **Route 551 South Reston Line.** This line provides weekday rush hour service between Herndon Monroe Park-and-Ride and West Falls Church Station via South Reston with 30 minute headways during rush hour in both directions.

- **Route 922 Herndon Line.** This line provides weekday service in a clockwise AM and counter-clockwise PM loop around Herndon via Worldgate Drive and Herndon Parkway. Service operates every 24 minutes during the rush and hourly during midday.

- **Route 924 Herndon Line.** This line provides weekday service only every 24 minutes in the peak direction. Service operates from Dranesville Rd and Route 7 to Herndon Monroe Park-and-Ride via Herndon Parkway.

- **Route 926 Herndon Line.** This line provides reverse commute peak weekday service from the Herndon Monroe P
& R to Dranesville Rd and Route 7. Service operates every 24 minutes.

- Route 927 South Herndon Line connects Dulles Corner and McNair Farms to Herndon Monroe P & R. Service operates all day weekdays counter clockwise in the AM and clockwise in the PM at 30-minute headways.

- Route 929 Centreville Road Line operates weekdays every 30 minutes during the rush hour from Renaissance Park to Herndon Monroe P & R via Franklin Farms.

- Route 950 Herndon/Reston Town Center Line daily every 30 minutes between Reston Town Center and West Falls Church Metro via Herndon Monroe Park-and-Ride.

- Route 951 Reston/Herdon Reverse Commute Line operates weekday, rush hours from West Falls Church Metro to Sunrise Valley Drive and Herndon/Monroe Park-and-Ride.

- Route 952 Reston/Herdon Reverse Commute Line. Weekday, rush hours, from West Falls Church Metro to Sunset Hills Rd. and Herndon/Monroe Park-and-Ride.

- Route 980 is the weekday, rush hours, express bus from this lot to the West Falls Church Metro. Service operates every 6 minutes or according to passenger demand during the rush.

- Route 5A Dulles-DC Line is the only Metrobus to serve the facility. Service is provided daily between Dulles Airport and L’Enfant Plaza Station via Herndon Monroe P & R and Rosslyn. Weekday service operates on 40-minute headways with weekend headways being hourly.

C. Local Planning Efforts

The Town of Herndon is in the final stages of producing a long range plan to discuss land usage, development and policy issues over the next 23 years. This plan, the Herndon 2030 Comprehensive Plan is currently in draft form. The plan includes a town profile and projected demographics and land usage, commercial space inventory and employment estimates. Specific areas of study included natural resources, heritage resources, transportation, public facilities and geographic areas of particular interest. The Transportation overview provides data and trends for traffic in Herndon. There have been several major highway projects the have benefited the Town of Herndon in the last few years. The most significant of those was the extension of the Fairfax County Parkway northward to Route 7. It previously terminated at Spring Street within the Town of Herndon. With a number of projects completed, traffic counts have actually been reduced on many roadways. The completion of Herndon Parkway created a significant decrease in traffic counts on many roadways (See Appendix B for more information).

Using the information provided by the report the Town of Herndon possesses numerous options for development. The Herndon-Monroe Metro Station will make a significant impact on those options and Herndon may consider planning specifically related to the station such as a rail state impact area. As part of the new Comprehensive Plan, the Town of Herndon may consider designating a specific rail station impact area, to include the non-residential land use within ¼ mile of the rail station. Coinciding with the new Comprehensive Plan, the staff envisions a separate, special planning effort for the station area. This effort would include technical analysis as well as community and landowner participation in the development of...
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A Comprehensive Plan Amendment. This effort would be intensive. Technical issues such as infrastructure capacity for transportation, water and sewer and other facilities would be examined. Moreover, community issues with developing greater density and more mixed use in the area of the station would be explored (Town of Herndon, 2007).

The Town of Herndon is also considering many options that would promote Transit Oriented Development (TOD). This would include more mixed use and higher density redevelopment. Both of these options would require rezoning. Future concerns regarding this area include the possibility of redevelopment with higher density and mixed use. While many of the existing buildings are multistory and still in the prime of their life cycle, others are less dense. On the north side of the Herndon Parkway, there are several one-story structures with surface parking that could become prime candidates for redevelopment as the rail system becomes reality. While the entire station area may have potential for additional density, these buildings would have significant redevelopment potential even without any change in the existing Comprehensive Plan or Zoning. Several other buildings are fairly dense multistory structures. And some have multi-level structured parking (Town of Herndon, 2007).

The Town of Herndon’s 2030 Comprehensive Plan is directly connected to the Northern Virginia Transportation Authority’s TransAction 2030. TransAction 2030 reflects a balanced approach toward alleviating Northern Virginia’s transportation woes. The TransAction network of road, transit, and bike facilities provides a 72 percent increase in the number of transfer stations that allow travelers to connect between modes (e.g., bus to rail). It doubles the number of Metrorail stations in Northern Virginia as a result of Metrorail extensions in the I-66 and I-95 corridors. It proposes light rail transit and/or bus rapid transit to the Route 7, Route 28, Crystal City-Potomac Yards and Columbia Pike corridors. The TransAction network increases highway capacity by 8 percent above what is already planned in the region’s Constrained Long-Range Plan (CLRP) and it adds 600 miles of on- and off-road trails to the region’s bicycle network (Quintana, 2006).

The TransAction 2030 plan for Northern Virginia is important to the Herndon Comprehensive Plan as it specifically provides for three projects that will improve transportation for Herndon.

**Town of Herndon Projects included in Transaction 2030 Plan:**

- Reconstruct East Elden Street from Monroe Street to Herndon Parkway East
- Reconstruct Downtown Elden Street from Center Street to Monroe Street
- Reconstruct South Elden Street from Herndon Parkway to Sterling Road
- Widen Spring Street from 4 to 6 lanes between Herndon Parkway and the Fairfax County Parkway
- Downtown streetscape and bike/pedestrian improvements
- Construct a bike-pedestrian trail from Van Buren Street/Worldgate Drive intersection to Herndon-Monroe Dulles Rail Station (Quintana, 2006)

Both the Town of Herndon 2030 Comprehensive Plan and TransAction 2030 hope to reduce congestion and improve access to the Metro Station. Increases in TOD will reduce the number of vehicles on the road and improved roadways will improve the flow of flow of vehicles on the roadways. With the Herndon-Monroe Metro Station travelers will have the option of riding an easily accessible rail system.

**D. Projected Ridership**

The Reston, Herndon, and Dulles Corner areas of Fairfax County are projected to grow to more than 119,000 residents and to provide 106,000 jobs by 2025. While many Herndon and Reston residents work in this growing technology hub, most still commute daily to other areas of the region, such as southern Fairfax County and the regional core (downtown Washington, D.C. and Arlington County). In addition, many of the Reston-based businesses draw their employees from southern Fairfax County and the outer Northern Virginia suburbs (Washington Airport Authority, 2004).
The projected ridership for the Herndon-Monroe station is provided by the Environmental Impact Statement (EIS) in the Forecast Daily Station Boardings in the Dulles Corridor. The Herndon-Monroe station currently has no Metrorail service and thus no current ridership exists. Ridership at the Herndon-Monroe Station is projected at 8,775 by 2025.

Additionally, the EIS projects that the Transit Mode Share for home-based work trips (trips produced in the Dulles Corridor) after both phases of the project are fully completed will be 16.2 percent. This is attributed to the fact the Metrorail is more attractive to riders than bus rapid transit (For more information, see Appendix B).

**E. Herndon-Monroe Park-and-Ride Lot**

This lot is located at 12530 Sunrise Valley Drive at the intersection of Roark Drive. As with all Reston/Herndon Park-and-Ride lots, parking at the 1,745 spaces is free. The 13-acre lot’s garage is well-lit and offers easy access to the bus bays. Overnight parking is prohibited in the garage and vehicles left are towed nightly. In addition to parking, there is a Kiss & Ride area for carpools to meet and disband. The Park-and-Ride offers convenient access to both the nearby Dulles Toll Road and Route 267. In the center of the bus waiting area is The Connector Store, which offers bus timetables and various fare media for sale. There are also bike lockers available for rent at the Park & Ride. In December 2007, the structure will close for four months to undergo structural repairs.

**F. Dulles Corridor Metrorail**

The Herndon-Monroe Station is part of Phase Two of the Dulles Corridor Metro Rail Project as depicted in the
There are currently eight park and ride facilities in the Dulles Corridor: East Falls Church, West Falls Church, West Fall Church Overflow, Reston East, Reston North Overflow, Reston South, Herndon-Monroe and Dulles North. A total of 5,379 parking spaces are available throughout the corridor. Information from the Environmental Impact Statement provided in Appendix B provides current usage rates.

**G. Project Stakeholders**

The new Metro Station at Monroe-Monroe and its accompanying increase in parking spaces at the Herndon-Monroe Park and Ride have many stakeholders. The Washington Metropolitan Area Transit Authority, Fairfax County, the Town of Herndon and the Virginia Department of Rail and Public Transportation (DRPT) are among the obvious stakeholders that have leadership roles in these projects as well as vast financial stakes in the construction and maintenance of the new station and Park-and-Ride. There are a number of additional stakeholders that hold an interest in the planning and development of the station and additional parking spaces at the park and ride. Listed below are the stakeholders in this project and what roles they play in the development and maintenance of the Monroe-Monroe station and Park-and-Ride.

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Function</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Transit Administration (FTA)</td>
<td>Federal government</td>
<td>Supports locally planned and operated public mass transit systems throughout the United States. Multi-year grant agreement with the State [sic] of Virginia in the amount of $6 million for completion of alternatives analysis and preliminary engineering. Provide $900 million in funding for completion of the project through FTA New Starts.</td>
</tr>
<tr>
<td>Virginia Department of Rail and Public Transportation (DRPT)</td>
<td>State government</td>
<td>Responsible for rail, public transportation and commuter services throughout Virginia. Responsible for providing oversight on projects to meet FTA requirements for funding.</td>
</tr>
<tr>
<td>Washington Metropolitan Area Transit Authority</td>
<td>A multi-jurisdictional, quasi-governmental authority</td>
<td>Owns and operates Metrorail (rapid transit), Metrobus (bus) and Metro Access (paratransit) networks.</td>
</tr>
</tbody>
</table>
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| Metropolitan Washington Airport Authority | Independent airport authority | Operate, maintain, and improve the Dulles Toll Road, Manage construction of the Metrorail extension, Finance all debt service for the Metrorail project and Toll Road improvements |
| Fairfax County | County government | Planning and financial resources |
| Fairfax County Department of Transportation | County government | Oversight of current multi – modal transportation systems |
| Northern Virginia Transportation Commission | Board of Commissioners (created by Virginia General Assembly) | Collects and uses transit data for policy development and operational analysis. |
| Town of Herndon | Local government | Comprehensive Planning and local Zoning |
| Dulles Transit Partners, LLC | Private partner: Engineering, construction and project management company | Virginia’s private partner conducting preliminary engineering for the Dulles Corridor Metrorail Project |

III. BEST PRACTICES FOR MERGING TRANSIT & DEVELOPMENT

Transit-Oriented Development (TOD) is a transit and community planning concept that attempts to maximize the presence of a transit facility in a given community or neighborhood in order to produce positive economic development activity. Crucial to the concept of TOD is the need to achieve a sense of place. More than just a collection of elements common to a transit facility and the surrounding area, well-devised and implemented TOD projects coalesce aspects such as transit service, bicycle and pedestrian access, parking, residential, retail and commercial development, and other amenities into a cohesive area with a distinct identity (Evans, 2007).

The number of projects including TOD components have experienced a marked increase in the past three decades. Growth in transit ridership and renewed interest in urban living indicates that a new set of preferences for living styles and trends are emerging. To satisfy this growing demand, community and transportation planners have deployed TOD projects in communities of all sizes across North America and around the world. Although many TOD communities are focused on passenger rail service, any high quality and frequent transit operation can serve as a strong foothold for a TOD project (Belzer, 2002).

Governmental bodies in general and transit entities in particular have developed policies and guidelines for TOD that speak to this notion. Atlanta’s Metropolitan Atlanta Rapid Transit Authority defines it as, “a broad concept that includes any development that benefits from its proximity to a transit facility and that generates significant transit ridership.” Meanwhile, the Maryland Transit Administration describes it as, “a relatively high-density place with a mixture
of residential, employment, shopping, and civic uses located within an easy walk of a bus or rail transit center. The development design gives preference to the pedestrian and bicyclist.” More locally, Washington’s Washington Metropolitan Area Transit Authority believes it to be, “projects near transit stops which incorporate the following smart-growth principles: reduce automobile dependence; encourage high shares of pedestrian and bicycle access trips to transit; help to foster safe station environments; enhance physical connections to transit stations from surrounding areas; and provide a vibrant mix of land-use activities.” (Cervero, 004).

It is important to note that the uniqueness of a specific area or neighborhood is a key factor in TOD. No two stations are the same. How a station area is planned and developed will depend on the particular attributes of that station and surrounding community. Mixed-use development can help facilitate walking and bicycling around one station, while at another a staple of historic buildings are enhanced by new parking facilities and a transit station (Belzer, 002). At the same time, the underlying concerns of the surrounding community must be given strong consideration. Residents of neighborhoods where government has proposed TOD development tend to resist increased density and its impacts, whether real or perceived. Even commercial development that brings new stores and services is not always welcomed. People tend to oppose change, especially if they believe there will be impacts such as increased vehicle traffic (Niles, 1999).

The local area around and near the Herndon-Monroe station site is already replete with examples of how a sense of place is fostered in a community. The station area falls within the boundaries of the Reston Association, a quasi-public entity that regulates how any structure to be constructed or altered in its vicinity fits within the established identity of the Reston community (Reston Association, 2003). Meanwhile, Arlington County – the neighboring county immediately to the east of Fairfax County – has produced a string of successful neighborhoods along its Orange Line Metro Rail stations between Rossyln and Ballston. The county started with a vision of how the corridor would look with transit and high-density development. To implement this vision, Arlington County embarked on an ambitious planning effort, lasting more than 25 years that was designed to encourage growth and generate transit ridership (Dunphy, 003).

The Herndon Monroe Station will be served by heavy rail. The high capacity of heavy rail supports high-density development however, it is no guarantee that a given site will necessarily be attractive for development; there may be other factors that impede real estate development, such as lack of market potential, environmental constraints, inadequate infrastructure, or neighborhood opposition (Dunphy, 003).

TOD includes more than just reliable transit at a station site. There are two distinct areas of focus, which combine to make a typical TOD project: the means of access to the transit facility along with how it drives economic development practices. The former aspect includes four common modes of conveyance to and from a transit station: pedestrian, bicycle, transit and the roadway and parking infrastructure for private automobiles. Meanwhile, the latter is the assemblage of the common theories, policies and tools to produce new and sustained economic activity in the area at and around the transit facility.

**A. Accessing the Station**

Every transit trip has a walking component. Creating a pedestrian environment, which makes transit trips easier and more enjoyable, is suggested in planning a successful station area. The overall pedestrian environment around the station should provide a walking route that is short, continuous and direct. The
sidewalks should be accessible to not only people but also any mobility aids and strollers. They should connect to the entrances of the station and bus bays or stops should be closer than any parking spaces. There should be as few crossings of pedestrians and vehicles as possible. Key destinations should be no more than 1/4 mile from the station. The distance that a person is willing to walk to take transit defines the catchment area within which TOD should occur which is typically ½ mile (City of Calgary, 2004).

Pedestrians and transit users should be protected from the elements whenever possible. This can be done through awnings, building projections, colonnades and bus shelters. The overall area should be well lit and designed to accommodate activity regardless of time of day.

B. Planned Service Changes

The current baseline plans would bring the Dulles Corridor Metrorail line to fruition. Trains would travel from Stadium-Armory Station to Ashburn in Loudoun County. Metrorail trains would alternate between Blue and Orange Line trains and it is presumed they will operate on 7-minute headways during peak periods and 12 minutes at all other times. WMATA intends to have 8 car trains operating on all lines by 2025. With this in mind, capacity at the already congested Rosslyn Tunnel will need to be addressed. WMATA plans to address this issue by routing every other blue line train via the current Yellow Line route over the Potomac River to between Pentagon and L’Enfant Plaza.

The trip from L’Enfant Plaza Station in downtown Washington to Dulles Airport will take one hour and fourteen minutes to travel, making 20 intermediate stops, while the current the 5A Express Metrobus route travels 47 minutes between Dulles and L’Enfant Plaza, with three intermediate stops at Herndon, Tyson’s Corner and Rosslyn (Dulles Corridor Rapid Transit Project, 2004).

Existing bus transit service is often restructured when a new passenger rail line opens in an area. While some routes are discontinued entirely to prevent duplication of the same route served by the rail line, others see increased service frequencies and new routings to focus service to the rail station. A common complaint of these changes has been their tendency to reduce low-cost bus service for the less privileged in exchange for rail transit service that tends to benefit those who are more privileged (Schrag, 2006).

The Transit Operations and Maintenance Plan prepared by the Federal Transit Administration, Virginia Department of Rail and Public Transportation and Dulles Corridor Rapid Transit Project suggests the following changes be considered for the transit operating plan for routes currently serving the Herndon Monroe Park-and-Ride.

- RIBS 2 South Lakes/Herndon-Monroe Line - No changes.
- Route 551 South Reston Line. This line provides weekday rush hour service between Herndon Monroe Park-and-Ride and West Falls Church Station via South Reston with 30 minute headways during rush hour in both directions.
- Route 922 Herndon Line - Modify “to provide a connection to the north side facility of the Herndon Monroe Station”.
- Route 924 Herndon Line - No Changes to the route but service is increased from every 24 to 21 minutes.
- Route 925 This is a new route propose to operate between Herndon Monroe Station and Reston Parkway Station via Reston South at 30 minute headways during the rush only.
- Route 926 Herndon Line - No Changes to the route but service is increased from every 24 to 21 minutes.
- Route 927 South Herndon Line - Modified to operate in both directions around the loop during both peak periods.
- Route 929 Centreville Road Line - Extended to connect to the Route 28 Station.
A New Sunrise at the Herndon-Monroe Station

• Route 950 Herndon/Reston Town Center Line - Modified to connect to Reston Parkway Station. Service would terminate at Herndon Monroe Station instead of continuing to West Falls Church Metro.

• Route 951 Reston/Herndon Reverse Commute Line - Discontinued and replaced by new Route 959.

• Route 952 Reston/Herndon Reverse Commute Line - Discontinued and replaced by new Route 959.

• Route 959 This is a new route proposed along Sunset Hills Road and Sunrise Valley Drive in two direction service between Wiehle Avenue Station and Herndon Monroe Station at 14-minute headways during the rush and 24 minutes during the midday.

• Route 980 would be discontinued.

• Route 5A would be discontinued.

C. The Role of Density

Fundamental to successful TOD is the need to utilize land on and adjacent to the station site to produce density in development. While the exact parameters of what density is and degree of density necessary for vibrant TOD community vary, a general understanding is to focus higher-density development within a quarter-mile of the transit facility. This allows transit passengers to access the features of the development by walking, whether they are residential, commercial or retail spaces. As a result, the number of trips made by private automobiles in the area is reduced – or at least made more efficient (Niles, 1999).

More specific veins in density of development are also found in the TOD culture. While some such projects focus on one type of use of land – again, retail, residential or commercial – many others have favored an approach of combining multiple types of spaces within the same building or groups of buildings. This practice, known in TOD nomenclature as mixed-use development, attempts to tap-in to common behavior of transit commuters by offering a range of retail properties and services located in the immediate vicinity of residential and/or commercial destinations. Buildings that are grouped together, or clustered, offer a “one-stop” opportunity to conveniently access a variety of destinations on foot. Clustered buildings can frame distinct character areas and create an easily navigable walking environment (City of Calgary, 2004). In communities where mixed-use development has occurred, aggressive changes to zoning statues have often been necessary to overcome the structural barriers to their implementation, which frequently prohibit the blending of uses in a property area (Levine, 2002).

Meanwhile, another component of increasing development density is the reuse of existing buildings and land plots in the area. Redevelopment efforts are often included as part of an overall development strategy, especially in a community that possesses historic structures in the area. In many TOD instances, the presence of redevelopment opportunities themselves become the centerpiece of the project’s identity, by accessing the historical trends and development of a given community or neighborhood over the years. Beyond the desire to re-capture buildings and properties for historic purposes, redevelopment projects also present the opportunity to leverage existing investment and assets in the area, rather than infuse entirely new funding streams (Rose, 2005).

Lastly, the area should plan appropriately for density. Areas around the station should address the ability
A New Sunrise at the Herndon-Monroe Station

to increase density over time. Vacant lots, surface parking lots and existing low intensity uses present opportunities for future infill development. A phasing plan that demonstrates how the station area can intensify over time offers flexibility to meet changing community needs and provides a vision for this transition. Buildings can placed to one side of a parcel – instead of in the center – leaving sufficient land that can be developed later. This will allow for initially low density that will intensify over time (City of Calgary, 2004).

D. The Role of Parking

By design, TOD lessens the need for automobile use in the station area. Accommodating vehicles is still critical to the success of a vibrant TOD project. Convenient parking and drop-off zones should be part of the development. Setting both minimum and maximum parking standards can help ensure the success of a station area as well as optimize transit ridership. Parking lots should be located at the periphery of the station area and to the rear or sides of buildings to keep the station and building entrances oriented to the sidewalk and to pedestrian users. Larger parking lots can be divided into smaller lots and separated by landscaped walkways. These smaller lots create an internal movement network and establish a framework for longer-term intensification. Structured parking consumes less land than surface parking and allows maximum development. If parking structures are located along key walking routes, they can enhance the public environment with pedestrian-friendly facades (City of Calgary, 2004).

The Herndon-Monroe Park and Ride must be considered separately for its own unique challenges. The Herndon-Monroe Park and Ride as designed will double in size with 3500 parking spaces. Along with an increase in parking spaces comes certain inefficiencies associated with a parking lot of that magnitude. At transit park-and-ride facilities, the problem is three-fold:

- Frustration associated with a commuter hunting for a parking spot while trying to meet a train or bus departure schedule may result in the vehicle being parked in nearby neighborhoods.
- A commuter who cannot find a parking spot and does not elect to abandon his or her vehicle in a neighborhood due to tight ticketing or towing policies will return to the freeway or arterial roadway, having lost valuable time.
- Commuters who habitually have problems finding parking at the park-and-ride facility ultimately may elect not to ride transit. As a consequence, these additional vehicles contribute to already excessive freeway and arterial roadway congestion and traffic-related emissions (Advanced Parking Management Systems, 2007).

E. Designing for Density

Once a community has determined the need for higher-density land use near a transit facility, it has several tools at its disposal to affect density on development. The most commonly utilized, but also the most rigid of these are the zoning regulations in use in a given jurisdiction. Whether administered at the state, county or other local level of government, zoning policies establish firm limits on how land parcels can be used. The preferences of the persons serving on zoning boards – and the elected officials who appoint them – are the greatest factor in determining whether zoning laws will be an asset or a barrier to TOD projects. If a community adheres to strict zoning codes that prevent multiple uses of property, or tend to guard against large development projects, TOD opportunities might be severely limited. Conversely, more progressive zoning boards who are willing to approve mixed-use zoning codes or allow for focused areas of higher density development are
communities primed to support TOD activities (Litman, 2006).

A subset of zoning policies is the ability to stipulate the intensity of land use. An objective measure of land use density is possible by determining the Floor-Area Ratio (FAR) of a given land plot. In dividing the total floor area of all buildings on a property by that parcel’s total size, the property’s density can be computed. A high FAR measure indicates higher density of land use, while a lower measure reflects the inverse. The jurisdiction responsible for zoning can establish minimum or maximum FAR levels for a specified area to encourage or discourage a density of development commiserate with their land use priorities (Meriam, 2004).

Meanwhile, all localities in Virginia, where the Herndon-Monroe station area is located, can utilize a system of proffering in respect to any land use approval. This ability allows these governments to demand that a developer or property owner make legally binding concessions to the host community in order to minimize the disruptions caused by their development project. Often this will involve ceding land rights to a governmental body or appropriating capital to cover the expense of infrastructure improvements, such as a new traffic signal or providing space for a new parking lane. Developers customarily comply with these requests in order to gain approval for their activity. These same principles can easily be applied to decision-making in TOD projects (Cervero, 2004).

Finally, while zoning boards have final authority on land use density, governments and transit entities hoping to realize TOD projects can further influence positive development density by entering into exclusive public-private partnerships to develop certain properties. If a government or transit authority can purchase, proffer, or otherwise gain access to a land parcel at or adjacent to transit facility, it may have the opportunity to work with a land developer to ensure it produces a desired degree of density. The ability of these entities to work directly with developers on TOD projects is an important tool to drive higher density development (Rose, 2005).

IV. MODELING & ANALYSIS

The relationship between land use and transportation is tied so closely together it is often difficult to separate the two. However, the Institute of Transportation Engineers (ITE) has identified an average number of vehicle trips, generated by varying types of land use. These figures allow a user to extrapolate trip generation into the future with projected land use changes. The values derived can be used to estimate potential demand on surrounding roadways. This section will describe how the model was created and how it has been used.

Using the ITE trip generation values, this report has estimated the trips generated by existing land use within ¼ and ½ mile of the proposed Herndon Monroe Metrorail station. Various land use patterns and densities of development were then applied to the model to estimate potential impacts. The results of this analysis were applied to the Alternatives Analysis section and guide its Findings and Recommendations.

The model is based on the trip generation rates derived from trip generation data submitted to the ITE. The rates are weighted averages from studies that have occurred since 1960 in the United States or Canada. Despite the longevity of the data, statistical tests have shown that all data, including the years prior to 1973 energy crisis are still relevant (Institute of Transportation Engineers, 2003, Vol. 1). The ITE has published hundreds of vehicle trip generation rates. Based on applicability to data available about the Herndon Monroe area and simplicity only seven were selected. The table below describes the rates selected for use.

<table>
<thead>
<tr>
<th>Land Use Number: Description</th>
<th>Trip Generation Rate Based on Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>210: Single Family Detached Housing</td>
<td>6.0 trips generated per dwelling unit (weekday)</td>
</tr>
<tr>
<td>220: Apartment (3 or more units)</td>
<td>6.72 trips generated per dwelling unit (weekday)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>222:</td>
<td>High Rise Apartment (10 or more levels)</td>
</tr>
<tr>
<td>230:</td>
<td>Residential Condominium/Townhouse (includes low-rise and high-rise buildings)</td>
</tr>
<tr>
<td>710:</td>
<td>General Office Building</td>
</tr>
<tr>
<td>820:</td>
<td>Shopping Center</td>
</tr>
<tr>
<td>90:</td>
<td>Park and Ride Lot with Bus Service</td>
</tr>
</tbody>
</table>

**DEFINITIONS**

**Gross Floor Area:** Area of each floor, including basements, mezzanines, lobbies. Architectural setbacks or projections are not included in the square footage.

**Trip or Trip End:** A single movement of a vehicle with an origin and destination. Total trips include all trips entering or exiting a destination.

**Weekday Trip:** Average trips within a 24-hour period between Monday and Friday.

The data available for the model and applicability of the model to the project were limiting factors in use of the trip generation rates. The original source data for the Herndon-Monroe Station area came from Fairfax County property maps and tax records. It included gross floor area of commercial structures, total parcel land area, the number of building stories and type of residential use. As some data was not available and had to be inferred based on the information available, please see the section on our assumptions for more detail. The availability of data reduced our rate selection to residential, commercial, retail and a park and ride lot with bus service.

**A. Rationale Behind Selection of Trip Generation Rates**

While the majority of existing land use is single family homes, an increase in density would require townhouses and apartment buildings of varying heights. Mid-Rise Apartments between 3 and 10 floors were not included because weekday trip generation rates were not available. Any mid-rise apartment building use is included in the general apartment category. High-Rise Apartment Buildings and High-Rise Residential Condominiums had very similar rates, so the condominium category was removed from the list of rates. While the absence of condominium rates in this model does not mean condominiums are not encouraged by the land use recommendations, these units have been included with the apartment units for simplification purposes. A plethora of rates exist for commercial and retail use; however, general categories were selected because this study did not identify specific types of commercial or retail development that should be encouraged in the area. The general office building category is recommended when trip estimates are being made for more than one office building in a single development (ITE, 2003). Similar to the relationship between high rise apartments and condominiums, specialty retail centers were not included in the model because of the similarity to shopping centers. As the difference in trip generation rate is minimal, all retail has been grouped together. The Park-and-Ride trip generation rate could be determined based on acreage or the number of parking spaces. The rate based on parking spaces was selected based on knowledge that this value was planned to increase with transit station construction. The trip generation rates were selected for a general weekday to add uniformity to the rates for comparison capability. The decisions made to select the trip generation rates are not anticipated to alter our final results significantly.

The sources of data for existing conditions and rational behind selection of the trip generation rates has been discussed. This next section will identify how the model has been used to determine the existing conditions and various scenarios of land use type and density. A discussion of potential introductions of error or...
assumptions made is discussed at the end.

B. Shaping the Model

The model was created using Microsoft Excel to assist in the analysis of how land use changes could impact demands on the surrounding transportation infrastructure and the quantity of constructed space necessary to attain specific densities within ½ mile of the area.

1) Existing Density

The model estimated the existing FAR of commercial, retail and dwelling units per acre, within ¼ mile and ½ mile of the station. The input data came from the Fairfax County Department of Tax Administration’s Real Estate Assessment Information site. Each parcel location was identified by distance from the proposed rail station platform and assigned a basic land use classification of commercial, retail or residential. The parcel size and gross floor area of any buildings were cataloged to determine the existing FAR of commercial and retail space. The parcel size of all single family homes and apartment buildings were identified and the number of dwelling units was assigned to determine the residential density in dwelling units per acre. The number of dwelling units for a single family home was identified as 1, and the number of dwelling units in the apartment buildings was based on an average apartment unit size of 850 square feet (Apartment Guide, 007). Accuracy of the existing density was checked by comparing the total parcel square footage in our data set to the area of a circle with a ¼ mile and ½ mile radius. The parcel data square footage was about 18% less than the total square footage. The values were not anticipated to be equal since a percentage of land is devoted to public facilities such as roads and utilities, which would not be listed in the Fairfax County Tax Database. The existing vehicle trips generated were calculated by multiplying the ITE trip generation rate by the associated independent variables.

2) Variable Land Use Forecasting

In addition to estimating the existing density and existing transportation trips generated per weekday, the model was designed to utilize various ratios in mixed-use development and density to forecast changes in trips generated. By first selecting the ratio of commercial, retail and residential uses, the area of land required within a quarter-mile and half-mile radius was calculated. The model separates mixed use land over a horizontal surface and not a vertical surface. Commercial and residential use could be shared vertically over a parcel; however, this model does not clearly delineate for vertical changes in land use.

The second variable included in the calculation is the density for Commercial and Retail FAR and Residential dwelling units per acre. The selected density is calculated against the ratio of mixed use development to determine the gross floor area required to meet the selected ratio and density criteria entered. The number of dwelling units required to meet a stipulated level of residential density is also calculated. These final figures can then be multiplied by the respective trip generation rate to determine the number of vehicle trips in a given weekday that would be produced by the selected ratio of mixed use and density of development. This model calculates the gross floor area of commercial and retail, the number of residential dwelling units and the number of vehicle trips generated.

Adding an additional variable to the trip generation rates forecasted the split between apartment buildings and high rise apartment buildings can also be forecast. The trips generated for these two types of building are different and since a greater number of high rise apartments would be located within ¼ mile than ½ mile to the station, this variable allows for a variation and more accurate calculation of trips generated.

The output from this data forecasting model has been utilized in the three alternatives selected for comparison. Many assumptions were made through the process, which may have introduced some error into its final results. It is important to analyze the values in their relative sense to each other and not for the accuracy of the specific value generated.
C. Model Assumptions

Assumptions were made at numerous levels with the model created in order to produce a functional method of comparison. The data, trip generation rates, and calculations within the model have all affected the final results created.

Based on the literature review process, no across-the-board ratio of land use was apparent for transit oriented development. Since the land use categories in the model were simplified into three categories – commercial, retail and residential – an according ratio of land use was estimated. These ratios selected were based on existing land use in similarly densely developed areas. For instance, the Rosslyn-Ballston Metro corridor in Arlington County provided a nearby comparison of density ratios. The percentage of residential land use ranged from 43 to 66%, retail land use spanned from 2 to 14%, and commercial uses comprised from 20 to 45% (Fairfax County Department of Planning and Zoning, 2005). Meanwhile, the Tysons Corner area in Fairfax County is currently composed of 20% residential, 12% retail, and 68% commercial (comprised of 2% industrial, 5% hotel, 60% office). However, with four new Metrorail stations are planned to serve Tysons Corner on the Dulles line, and as a result, the County plans for a mixed land-use of 30% residential, 8% retail, and 62% commercial (0.2% industrial, 4% hotel and 57% office) (Tysons Corner Urban Center Study, 2005). Please note that while it is customary to separate industry and hotel from office space, the simplified model used in this report did not. For consistency, the mixed-use at Tysons Corner was grouped as it was in this report.

Based on these relationships of land use, a vision of mixed use development was projected for the Herndon-Monroe area. Residential land use was selected to be greater than commercial or residential, as transit is most often used by those who chose to live near it, rather than those who work near that mode. A slight variation was accommodated for the increased density within ¼ mile of the station. The projected ratios of mixed use are shown in the table below. The distances referenced are the distance from the rail station platform.

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Ratio to 1/4</th>
<th>Ratio 1/4 to 1/2</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>28%</td>
<td>22%</td>
<td>25%</td>
</tr>
<tr>
<td>Retail</td>
<td>5%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Residential</td>
<td>47%</td>
<td>55%</td>
<td>51%</td>
</tr>
<tr>
<td>Nonuse (road/utility)</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

While the model allowed for a basic comparison of land use alternatives, there remained several gaps in the data which were unavoidable. From the Fairfax County data, 23 parcels did not identify the parcel square footage, only the gross floor area of the building on the site. It appeared these 23 parcels were part of a shopping center and that only the building was privately owned. To increase the accuracy of the total parcel area in calculating FAR, the gross floor area was entered as the value for the parcel square footage as well. In addition, the number of dwelling units in three of the four apartment buildings currently located in the area were not identified. An average apartment size of 850 square feet was divided into the total gross floor area of the residential building to estimate the number of apartment units it could potentially contain. The existing residential density is greatly influenced by the estimated number of apartment units in the multi-story buildings. The gross floor area could not be obtained for three commercial buildings of substantial size based on field reconnaissance and aerial photography. A gross floor area was assigned to these buildings based on their relative size to known buildings. By providing an estimate, it increased the overall accuracy of the existing commercial FAR. However, it also introduced the potential for error based on the invalidated information. In addition to objective assumptions, some subjective assumptions were added when the relative location to the proposed station was determined. Several parcels did not fit entirely within or outside of the quarter-mile and half-mile radius from the proposed station. Each parcel was individually evaluated and categorized based on where the majority of the parcels lay. The rough quarter- and half-mile boundary provides only a good average of land use since it was not possible to split parcels located at these boundaries.

The ITE Trip Generation Rates are complex and numerous. Those rates provide a weighted average rate to reduce error from the variation but the rates do focus on studies in suburban areas with limited transit service.
or travel demand management programs (ITE, 2005). The existing rates calculated do fit this scenario but the forecasted rates are overestimated since many trips would be made by rail and not vehicle. As stated earlier, the trip generation rates were selected to simplify the model as much as could reasonably be done. Only weekday rates were utilized, and commercial and retail uses were grouped into a general use category. More accurate results would have resulted from using a trip generation rate specified to each parcel had this option been feasible. The greatest loss was the lack of a weekday trip generation rate for mid-rise apartments (between 3 and 10 floors). Any mid-rise apartments had to be included in the general apartment category. An additional subjective change to the ITE trip generation rates was a reduction in the number of weekday trips resulting from a single-family dwelling. The rate provided varied from 4.0 to 9.57 trips per day, and a reduced value of 6.0 was selected for this model.

V. ALTERNATIVES ANALYSIS

Alternative I: Current Policy Baseline

The current policy baseline provides information on current planning and comprehensive planning that has been developed for the Herndon-Monroe Station area in the status quo. This information that was provided in the Environmental Impact Statement (EIS) was submitted by the Federal Transit Administration (FTA), the Virginia Department of Rail and Public Transportation (DRPT) and the Washington Metropolitan Transit Authority (WMATA) for the Dulles Corridor Rapid Transit Project. In the October 2003 Supplemental Draft EIS and Section 4(f) Evaluation, as well as this Final EIS, the term “full Locally-Preferred Alternative (LPA)” represents the first phase of the Dulles Metrorail project to Wiehle Avenue Extension and the second phase of the Dulles Corridor Rapid Transit Project. This second phase will extend west from Wiehle Avenue to Washington Dulles International Airport and Route 772 in Loudon County and is expected to begin operations in 2015. The terms “LPA”, “proposed action”, or “selected LPA” refer to both the Wiehle Avenue Extension and the full LPA collectively (EIS, 2004). This section also includes information from the draft Background Report for the Town of Herndon 2030 Comprehensive Plan, March 22, 2007.

This section considers the currently proposed plans for development around the Herndon-Monroe Metro Station. The existing Park-and-Ride facility will be increased to 3500 spaces, the impact on the Town of Herndon and increased traffic will be considerable. Levels of vehicle emissions will increase and Levels of Service on local roadways will decline at a number of intersections assuming no changes are made to the current infrastructure. While the Herndon-Monroe Metro Station may reduce congestion outside of the Town of Herndon, the town may suffer consequences from the largest Park-and-Ride facility along the corridor. Plans are currently being developed to reduce those consequences with emission control programs, bicycle, pedestrian planning and the inclusion of Transit Oriented Development.

1) Density Parameters

According to the Herndon Town Council Minutes from June 1, 2004, mixed use for the development of the downtown district has been encouraged with a FAR of 2.5 in the densest areas. However, other sectors are limited to a .5 FAR where on-site parking is required (Town Meeting, 2007). According to on-site research, the area around the Park and Ride currently has a FAR of .30 for commercial buildings and no retail space within a half-mile of the station site. Residential dwelling make up 3.6 units per acre on average within in that same area. The FAR levels become less dense as the distance...
from the Park and Ride increases.

The Residential Multi-Family (RM) district allows for a number of dwellings per acre. RM District is a zoning district in which the principal use of land is for multi-family dwellings. The intent of the district is to provide for medium density multi-family uses in locations that are harmonious with nearby lower density residential uses. These districts are located so as to ensure that adequate community uses, open space and recreational facilities are located nearby, or within the district itself, to serve the needs of the persons who would be living in the district. The maximum density allowed is 15 dwelling units per acre (Ord. No. 07-O-08, §§ 1, 2, 2-27-2007).

The Town of Herndon has strict residential occupancy regulations with Occupancy Standards for Bedrooms: One occupant — requires at least 70 square feet of floor area. Two or more occupants — at least 50 square feet of floor area per person. The maximum occupants per bedroom is four, including adults and children. (Herndon Virginia 101, 2007) This may or may not impact the building of town houses or condominiums for maximum mixed use in Transit Oriented Development.

2) Related Infrastructure

a. Parking

The expansion of the existing Park-and-Ride at the Herndon-Monroe Station will allow for 3500 parking spaces. This is an increase from the current 1750 spaces. Parking fees are assumed to be $3.75 per day with increases possible over future years, in accordance with Metro parking fare policies. Increased parking spaces have many advantages, as it increases transit usage and can be a benefit to commercial and retail business. However, this must be balanced with increased emissions, loss of green spaces and the impact on storm water run off.
Once both phases of the Dulles Metrorail line are completed, the expected daily boardings at Herndon-Monroe are forecasted to be 8,775. With direct service to Herndon-Monroe, Herndon-Monroe is a more logical station for riders coming from Reston and Herndon, and therefore results in increased boardings (EIS, 2004). Increased boardings are important for the success of the Metro system. However, the transportation to and from the parking facility may lack in the ability to support increased boarding. Bus feeder services are limited and currently receive low ridership. Current transportation patterns show that most commuters still travel alone by private automobile. These issues could be addressed to improve the success of the Park-and-Ride.

The Town of Herndon is looking to improve parking. One of the Town of Herndon goals is to seek alternate means of providing parking facilities (e.g., structured parking on multiple levels) in order to provide green space (Town of Herndon, 2007). While this would not impact the additional parking at the Park-and-Ride, it would improve parking conditions within Town limits.

b. Roadways

Park-and-ride and Kiss and Ride demand at Herndon-Monroe will lead to increased traffic volumes, increased delay, and declining Levels of Service at a number of intersections in the vicinity of the station in the full LPA. Impacts at the following intersections would be significant enough to warrant mitigation:
- Fairfax County Parkway / Dulles Tool Road Westbound Ramp;
- Fairfax County Parkway / Dulles Tool Road Eastbound Ramp;
- Fairfax County Parkway / Sunrise Valley Drive;
- Herndon Parkway / Monroe Street / Van Buren Street; and
- Sunrise Valley Drive / Monroe Street.

Unless there are significant changes in that lead to increased transit usage, such as increased gas prices, commuters will still prefer to travel in their own vehicles. The Wiehle Avenue / Reston Parkway Station Access Management Plans: Profile of Existing Conditions provides information on the mode of travel that Reston area residents reported using to commute to work. Seventy-seven percent of the population commuted by driving alone, though 11% carpool and 5% take transit. Since regional employment locations tend to be clustered while residents are spread throughout the area, Reston area workers come from a wide area while the employment locations of Reston area residents are more concentrated and potentially more accessible by transit (Vanasse Hangen Brustlin, 2007).

c. Pedestrian

The Dulles Metrorail line is not expected to significantly impact existing and planned bicycle and pedestrian facilities in the corridor. Implementation of the full line to route 772 would include the construction of pedestrian and vehicular access to/from public rights of way (EIS, 2004).

The Town of Herndon has been working to improve pedestrian facilities throughout the town. This includes developing new trails and sidewalks including key route and links connecting to the station. The Town of Herndon plans for sidewalks in the subdivision review process. The Town has also built a number of trails and sidewalks through its own capital improvement program. The longest trail within the Town is the W & OD Trail, part of the Northern Virginia Regional Park Authority’s Washington and Old Dominion Railroad Region Park (Background Report, 2007).
Unfortunately, gaps in the sidewalk and trail system still exist. Without safe crossings, pedestrians are less likely to walk to the Metro station or any destination. The lack of a separate and safe pedestrian connection extending along the Centerville Road as it passes under the Dulles Toll Road is a project located just outside of the Town. This project has been added to the regional list of high priority pedestrian/bicycle projects maintained by the Northern Virginia Transportation Authority (Background Report, 2007).

The Town of Herndon has made one of its consensus goals to “enhance connectivity for pedestrians and enhance the quality of pedestrian facilities to truly encourage alternate modes of transportation such as biking and walking” (Meeting Summary, 2007). With this current policy the Town of Herndon can improve pedestrian infrastructure. This will hopefully lead to less congestion and need for parking at the Herndon-Monroe Park-and-Ride and in the Town.

d. Bicycle

Although significant portions of the regional network are already in place in Northern Virginia, the region faces challenges to establishing bicycling as a meaningful transportation alternative. Many routes within the region are inconvenient and difficult for bicyclists to use. Furthermore, physical and land-use barriers deter people who might travel by bicycle. Major challenges to cycling in the region include:

- Few bike lanes or wide shoulders on major through roads
- Discontinuous or unconnected bicycle and trail facilities
- Few parallel streets to major roads to serve as alternative routes
- Lack of appropriate signs to alert riders to route changes or alternatives
- Limited-access freeways and interstates without grade-separated bicycle and trail bridges
- Major intersections that put bicyclists and pedestrians in conflict with turning vehicles
- Sprawling, low-density development that spreads out and isolates land uses
- Insufficient bicycle parking facilities at transit stations in southern Fairfax County
- No signs leading bicyclists and pedestrians from trails and roadways to transit stations
- Lack of maintenance to address roadway conditions, including crumbling pavement, potholes, overgrown shrubbery, and slippery conditions due to ice and snow (TransAction 2030)

The Town of Herndon and Fairfax County on working on providing improved bicycle infrastructure. The Herndon 2030 Comprehensive plan and the Fairfax County 4 Year Transportation Plan include improved bicycle paths and facilities. Encouraging bicycling and providing safe routes will decrease traffic congestion. One vehicle takes up the space of four bicycles in a Park and Ride. Connectivity between the bicycle paths and the Park and Ride continue to be an issue.

Bicycle racks and lockers will be provided at all stations and express bus stops, adjacent to station entrances. The Metrorail system has a liberal “Bike-on-Rail” policy, which allows passengers, during designated hours, to bring bicycles on to the system. Both the Wiehle Avenue and Reston Parkway stations are located adjacent to the W&OD Trail, and, therefore, would serve as convenient bike/transit transfer points for passengers choosing to split their trip between bicycles and rail (EIS, 2004).

e. Transit

Public Transportation in Fairfax County is provided by the Fairfax Connector (FXC) and Metrobus with reverse
commute service being provided by Loudoun County Transit. There are a number of buses that feed into the Herndon Monroe Park and Ride including FXC 922, which loops around Herndon and serves the park and ride. According to the Wiehle Avenue/Reston Parkway Station Access Management Plans: Profile of Existing Conditions, the ridership is fairly low on this route with only an average of 138 riders per day or 4.9 riders per trip. Many of the feeder buses to the park and ride have a low ridership such as FXC 926, which provides an average of 2.4 riders per trip. FXC 980 provides the highest frequency of service during rush hour between the park and ride and West Falls Church Metrorail Station with weekday ridership of 3077 for an average of 38.4 riders per trip.

f. Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) are not discussed in many of the planning documents associated with the Herndon-Monroe Station or the Town of Herndon. TransAction 030 does refer to ITS in its future planning. The report states, “Intelligent Transportation Systems are one component of an overall transportation strategy for the region. ITS by itself does not create new capacity or reduce congestion; instead, ITS helps to manage capacity, optimize the use of the transportation network, and support transportation and emergency response services.” TransAction 030 has several goals related to ITS, however, again none are related to parking. Goal 4 relates to buses and high occupancy vehicles (HOV). In order to reduce travel time ITS will be used to improve schedule reliability for buses and HOV’s. The outcome of this goal would be to reduce the number of single occupancy vehicles (SOV’s) on the road to reduce peak congestion.

3) Output Projections

a. Vehicular Trip Generation

Job growth in the Dulles Corridor will significantly impart the number of vehicle trip generated. Over the next 25 years it is estimated there will be an additional 185,000 jobs. The Dulles EIS indicates that the “Total Weekday Corridor-related Work Trips” are projected to increase from 460,000 in year 2000 to 680,000 trips in year 2025. “Total Weekday Corridor-related Trips” (total travel trips for any purpose) are projected to increase from 2,150,000 trips in 2000 to 3,120,000 trips in the year 2025 (Background Report, 2007).
b. Square-Footage Space Available

**Inventory of Commercial Development – Land Parcels and Existing Gross Floor Area of Building Space**

The Town of Herndon currently includes 2,751 acres of land, with 595.8 acres zoned for commercial purposes. This is non-residential land that is not part of a community facility such as a park, library, church or government building. This land area constitutes 21.65% of the total acreage within the Town. Of the 595.8 acres, only 40.12 acres are vacant, according to the Town’s recent inventory of commercial land. The vacant portion equals 6.73% of the land that is zoned for business/commercial use.

The largest vacant commercial site within the Town is the Fairbrook tract, which includes 23.1 acres bounded by the Dulles Toll Road, the Fairfax County Parkway and Herndon Parkway. This site has an approved site plan for office development including three office buildings with a combined total of over 520,000 square feet of floor area.

There are a number of sites within the Town that could be viewed as prime for redevelopment, although there may currently be a small-scale commercial building on a portion of the site. These sites make up several additional acres of land within the Town with high potential for redevelopment.

As the following chart shows, growth in commercial floor area has been dramatic. The Town experienced an increase of over 35% within less than ten years. This data is based on development approvals and construction activity as tracked by the Town staff.

-From the Draft Background Report for the Town of Herndon 2030 Plan
1) Narrative Overview

Since density and the characteristics of development play an important role in the use of transit, this alternative considers what could be reasonably done within a quarter-mile of the proposed Herndon-Monroe station if all Transit Oriented Development opportunities were implemented. The build-out for this alternative would take longer due to the necessity for redevelopment to meet its proposed residential and commercial densities; however, it would ideally create the most transit friendly environment to maximize the benefits of a new transit station well into the future. This alternative focuses on encouraging the maximum functionality of the transit station, while creating an environment that puts pedestrians and bicyclists first in its design.

2) Density Parameters

A major component of this alternative is density. The activity generated by increased commercial and residential space can shape a community into an attractive place. Within a half-mile of the station, density with an average 30 dwelling units per acre and a 2.5 FAR is evaluated. These figures exhibit a sharp increase from what exists or has been proposed. This alternative requires the most change from existing land use but could also offer the greatest long-term benefits.

Initially, Mid-rise Apartment buildings of 3 to 10 stories would allow for an average of 30 dwelling units per acre to be achieved. The buildings would be clustered closer to the station for higher residential densities closest to the station. As distance from the station increased, the residential density would decrease down to the existing single-family homes.

The Floor to Area Ratio proposed is an average. The density would mimic the residential densities proposed, by placing the higher density commercial/retail attractions in closer proximity to the transit station as well as the majority of residential dwellings. The mixed-use environment is a strong component of Transit Oriented Design, as it brings convenience to consumers and the workforce. The FAR would decrease further from the station so a balance of scale could be achieved in relationship to the existing single-family homes.

The densities were selected based on other transit station characteristics and the surrounding metropolitan area. The Valley Transit Authority in Santa Clara County, CA promotes a residential density of 80 units per acre with an FAR of 5 (ULI, 2004). Based on existing land use characteristics these figures were not deemed to be as feasible. The 30 dwelling units per acre appears to be achievable and is within the range shown to best support transit based on a review of 11 studies by Reid Ewing (ULI, 2004). Residential density is only part of the density equation as commercial and retail spaces are important destinations for people. Based on review of the Reston Towne Center design and Rosslyn-Ballston corridor, an average FAR of 1.5 was selected. A maximum FAR of 6.0 is recommended within ¼ mile of the station to meet an average FAR of 2.5 within ¼ mile. An FAR of up to 10 or 12 could be achieved in some transit oriented developments, but a much lower
FAR was selected to protect the surrounding scale of development around the single family homes.

3) Output Projections

### Projected Building Demands and Trips Generated w/in ¼ mile

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<th>Commercial</th>
<th>Retail</th>
<th>Residential</th>
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<tr>
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### Projected Building Demands and Trips Generated w/in ½ mile

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<tr>
<th></th>
<th>Commercial</th>
<th>Retail</th>
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This section will describe the projected changes in vehicle trip generation, office space square footage, and dwelling units. Since this alternative is based on a significant increase in the average FAR and density of residential living space, it is expected the number of vehicle trips, residential dwelling units and gross floor area of commercial will also increase.

#### a. Vehicular Trip Generation

The number of single-family homes is projected to neither increase nor decrease so the number of trips generated is projected to not change from 1,668 trips in an average weekday. However, with increased walk-ability and transit access, the number of vehicle trips should decrease under this alternative.

To achieve a residential density of 30 dwelling units per acre, a significant increase in apartment buildings and high-rise apartment buildings is required. This density increase also increases the number of vehicle trips, when proximity to transit is not accounted for. The number of vehicle trips within a quarter mile would be 13,649 and 30,585 within a half-mile of the station.

Should the residential density forecasted in this alternative be realized, a retail market would be created. Current retail activity is negligible, but could be a significant economic generator for the County and Herndon if the opportunity is maximized. The majority of retail activity would be concentrated within a quarter mile of the station and within walking distance of the dense residential and commercial center. The number of vehicle trips generated would be a maximum of 29,366 within a quarter mile of the station and 39,938 within a half-mile of the station.

An increase in commercial space would increase the number of trips generated within a quarter mile of the station to 93,034. The majority of these trips would be concentrated within quarter mile of the proposed station at 42,166 trips on a given weekday. It is anticipated a large percentage of these vehicle trips would be replaced by transit due to the proximity to the proposed station.

All in all, the total number of trips produced within a quarter mile of the transit station would be 93,034 and within a half mile of the station, 140,240. These values include the trips generated by commuters using the Park-and-Ride in addition to the residential, retail and commercial trips described above in more detail.

#### b. Square-Footage Space Available

The maximum density alternative greatly increases economic opportunity through an increase in office and retail square footage. The projected commercial gross floor area required for an average FAR within a half-mile of the station is 5,635,270 square feet. The majority of this space would be located closest to the proposed station at 3,829,795 square feet.

Retail space mirrors the trend of commercial space with a concentration of space within a quarter mile of the...
station near the majority of residential dwelling units as well. The retail square footage within a quarter mile of the station is projected to be 683,892 and within half mile of the station to be 930,093 square feet.

Close to 6,000 dwelling units are proposed to meet an average residential density of 30 dwelling units per acre. To achieve the desired density an average of 45 dwelling units per acre were concentrated within a quarter mile of the station requiring 2,656 dwelling units, and 5,765 dwelling units within a half-mile of the station at 15 dwelling units per acre. No change in the number of single-family homes is anticipated.

**Alternative III: Mid-Range Development Alternative**

1) Narrative Overview

This Mid-Range Development alternative can be generally understood as a hybrid or middle-of-the-road response to the Current Baseline Plans and Maximum Development Option alternatives. This envisions a scenario envisioned where by a greater level of transit-oriented development is deployed than currently proposed in status quo plans. However, this option also includes a heightened awareness to the impact that the activity generated by such development causes on a community area.

Specifically, this alternative considers a Herndon-Monroe community area that allows for a greater density of development in retail and residential uses, while creating fewer negative consequences of increased traffic generation and infrastructure costs by retaining current plans for the amount of office space available along with use of the Park-and-Ride facility as currently expected. Meanwhile, non-development-related aspects of a transit-oriented community, such as improved bicycle and pedestrian infrastructure, increased transit service and improved station-area quality, are enhanced from those expected in the status quo.

2) Density Parameters

The Mid-Range Development alternative stresses incremental growth in densities of commercial and retail building structures. As described in the Current Baseline Plans alternative, the area currently supports a Floor-to-Area Ratio of 0.30 for commercial buildings and 0.45 for retail structures within a half-mile of the station site, while also containing a little more than 5 residential dwelling units per acre on average within in that same area. At the same time, within a quarter-mile of the station site, a FAR level exist at 0.20 and 0.39 for commercial and retail buildings, respectively, while also including an average 2.5 dwelling units per acre. Meanwhile, the Maximum Development Option alternative proposes a FAR of 4.0 within the half-mile radius and an average of 30 residential dwelling units per acre.

Under this Mid-Range Development option, a FAR of .9 and an average of 7-12 residential dwelling units per acre are modeled within the same half-mile area. This construct envisions a Herndon-Monroe community area that supports an increased density in all commercial, retail and residential land use when compared with current conditions in and plans for the status quo. Unlike those plans, which effect marginal leverage of the investment of the
Herndon-Monroe Metro rail station, this alternative considers an increased focus on development density in relation to the rail facility. Under this option, both the FAR levels and residential unit densities are more than double than those that exist currently in the half-mile area, offering a significantly expanded vision of the role of multi-faceted development.

However, when considered in contrast with the Maximum Development Option, this alternative places a greater emphasis on the impact that heightened development would create on the community area. As that option stipulates development densities more than three times greater than those that currently exist, a resulting increase would occur in vehicular traffic, utility infrastructure and other ramifications of the expanded activity produced by denser development. This growth in activity can have substantial and lasting impacts on a community area, most notably in terms of costs associated with upgrades to and maintenance of all manner of transportation and utility infrastructure, as well as quality of life concerns. The degree to which community members – both residential and corporate citizens – value these factors should play a strong role in determining the development density appropriate for a given area.

Finally, the levels of development density considered in this option were not only constructed in relation to the Current Baseline Plans and Maximum Development alternatives, but also to emulate those established in similar nearby communities. For instance, the Reston community – to be the next immediate inbound station on the Dulles Line and located one mile east of the Herndon-Monroe area – currently supports similar development densities of 2.0 FAR and an average 10 residential dwelling units per acre within a half-mile of the Reston Town Center area. Meanwhile, in the Rosslyn-Ballston corridor – located in Arlington County, adjacent to Fairfax County and also host to current Orange Line Metro rail service – includes an average 1.31 FAR within five station areas (Fairfax County, 2005). The trends in development density in neighboring areas establishes a baseline for comparison between communities within the same metropolitan area as Herndon-Monroe and allows for common-knowledge examples to further codify the intent of this development option.

3) Output Projections

a. Vehicular Trip Generation

The additional development density considered under this alternative will produce a net increase in trip generation when compared to the Current Baseline Plans. Traffic produced by Single-Family Detached Housing units will remain largely unchanged from current levels, yielding a projected 297 trips within a quarter-mile radius and 2,364 trips within a half-mile area on a given weekday. However, within the same area, the number of trips produced by general Townhouses, Apartments, and High-Rise Apartments will grow under this option. Percentages of each type of residential use are set at zero, 40 and 60 percent, respectively within a quarter mile of the station, and 25, 35 and 40 percent of residential space within a quarter-to-half mile. Standard Apartment units that currently produce zero trips within a quarter-mile area and 2,445 in a half-mile radius will expand to a new high of 1,767 weekday trips within a quarter-mile and 617 daily trips in the quarter-to-half mile radius, generating a total of 2,384 new trips per weekday in the area. Additionally, High-Rise Apartments will increase from zero weekday trips in both quarter- and half-mile areas currently to 1707 and 596 trips each weekday, for a total of 2303 new daily trips produced by High-Rise Apartments. Lastly, new Townhouses in the quarter-to-half mile area a total of 1,745 new trips. As a result, the number of new trips each weekday generated by the increase in residential density is projected to be 6,432.

Likewise, a similar degree of growth will occur in traffic generated by new retail activity. While no trips are
A New Sunrise at the Herndon-Monroe Station

currently produced by retail structures within a quarter-mile and only 50 trips generated in a half-mile radius, this alternative projects an additional 17,620 and 2,114 weekday movements created by new retail projects in the respective quarter- and half-mile increments. An amount of parking facilities needed to support this new residential and retail growth is factored into these projections.

Although this alternative stipulates increased density in residential and retail development, additional vehicular traffic is not produced by increases in office space or the Park-and-Ride Metro facility at the rail station. As a result, the current levels of trips generated by Office Buildings and the Park-and-Ride facility will remain at 13,337 and 25,154 weekday trips for Office Buildings in the quarter- and half-mile radii, while the Park-and-Ride lot will produce 10,185 daily trips.

Collectively, when combing both the trips produced by unchanged levels of Single-Family Detached Housing, Office Space and Park-and-Ride (23,789 quarter-mile; 28,518 half-mile) and those generated by new Townhouse, Apartment, High-Rise Apartment and Retail development (21,094 quarter-mile; 5,072 half-mile), a total of 44,883 weekday trips will occur within a quarter-mile and 33,590 will take place within a half-mile of the station site under this alternative.

b. Square-Footage Space Available

As this alternative includes an increase in the density of retail and residential land use, but suggests that the amount of general office space available remain unchanged, this option projects less overall new square-footage available than the Maximum Development Option, but more than what is envisioned in the Current Baseline Plans.

Specifically, the number of residential dwelling units in new Apartments is increased from current conditions of zero in the quarter-mile area and 50 in the half-mile radius to 708 and 483 new apartment units within the quarter- and half-mile increments respectively, yielding a total of 2,434 units in the entire half mile radius. Additionally, as just 273,556 square feet of retail space exists presently within a quarter-mile and another 164,134 square feet of retail space is available within a half-mile, a new supply of 410,335 and 49,40 new square feet for retail uses will be afforded in this development option, producing a total of almost 788,000 new retail space.

Related Infrastructure for Maximum Development & Mid-Range Development Alternatives

1) Parking

The conventional parking zoning ordinances and policies do not reflect site-specific conditions. Instead, they are based on standardized national guides such as the ITE Parking Generation. The ITE method does not account for changes with density and transit availability. Research on parking utilization and pricing often concludes that conventional practice results in the oversupply and underpricing of parking (Willson 1995, 2000). Since parking facilities are a major cost to society, an oversupply of parking consumes land and wastes money.

Currently, the parking facilities at the Herndon-Monroe Park-and-Ride are underutilized. Studies of parking use indicate that up to 50 percent of available
parking remains unused at peak times (EIS, 2004). Hence, there is a need for more flexible parking management strategies, particularly in a TOD environment. A report completed by the Transit Cooperative Research Program in 2005 stated that “households living in TOD are twice as likely to not own a car and TOD was shown to increase ridership by 20-40 percent” (Ohland, 2006).

Several innovative parking management strategies are available to balance parking (better match parking supply with demand) and other goals. There is a broad spectrum of parking policies options available such as revised parking requirements, maximums, minimums, shared parking, cash out programs, and variable pricing strategies on- and off-street parking:

Shared Parking: The goal of shared parking is to find the balance between providing adequate parking to serve multiple users and destinations. For example, an office building can share parking with a restaurant, since peak demand for offices occurs during weekdays, and on weekends and evenings for restaurants. Studies suggest 10-30% reduction in parking spaces can be realized.

Parking Maximums: Maximum parking standards can be established in high density areas where there is high transit accessibility. This also can yield a 10-30% reduction in parking spaces required.

Parking Pricing: Charge motorists directly and efficiently for using parking facilities. Rates should be set to optimize parking facility use, called performance-based pricing, which means that about 15% of parking spaces are vacant and available at any time (Shoup, 2006).

Unbundle Parking: Unbundling means that parking is rented or sold separately, rather than automatically included with building space. For example, rather than renting an apartment with two parking spaces for $1,000 per month, the apartment would rent for $800 per month, plus $100 per month for each parking space. This is more equitable and efficient, since occupants only pay for parking they need.

Cash-out programs: The intent is to reduce vehicle commute trips by offering employees the option of “cashing out” their subsidized parking space. The cash value of the parking benefit can then be used for transit, biking, walking, or carpooling to work.

Too much parking makes an area less pedestrian friendly and wastes space that could be used for development projects that increase transit ridership. Too little parking undermines the economic viability of projects built to take advantage of transit and force transit patrons to park in the surrounding neighborhoods, creating problems for nearby residents and businesses (Dunphy, 2003). Flexible parking standards could be an option to optimize the use of parking spaces. Parking in addition to the decks planned should be away from the station, allowing more development right at the station. This clears a place for prime real estate for development. This additional parking could be shared with those that need the spaces at different times of the week for example, using a nearby church parking lot, a retail establishment that only draws large weekend patronage or a cinema
that attracts a large number of patrons in the evening.

Nearby parking structures can be wrapped with retail and commercial establishments on the street level. This eliminates the need for large sprawling station lots which are unfriendly to pedestrians. If surface lots must be used, they should be constructed at the rear or the side of buildings so buildings can still easily be accessed by pedestrians.

Parking Guidance Management Systems (PGMS) can be implemented to increase the success of the Herndon-Monroe Park and Ride. Park and Ride management offers a wide degree of opportunity to efficiency in the use of parking spaces due to the ability to detect vehicles, inventory space and provide fixed communication equipment. PGMS can be as simple as maps that are provided to traveling public and web pages with parking information.

Typically, there are two types of counters for parking space management: entry and exit and space occupancy. Entry and exit is the easiest and cheapest form of counter but does not alleviate the frustration of finding a specific parking spot. To provide the highest level of information, Space Occupancy detectors should be added into the construction of the additional parking spaces and retrofitted into existing spaces. Space Occupancy detectors can provide information to lead the driver to the specific open parking space such as floor, aisle and space.

In the Maximum Development vision for the Herndon-Monroe Park-and-Ride, investment should be made in providing the most advance Intelligent Transportation Systems available. By the time that additional parking spaces are constructed, the traveler will expect to be able to find a parking space as quickly as possible. Traveler will be able to access many services via wireless devices and reserved parking will be one service available. Some advanced parking management systems allow the traveler to reserve and pay for a parking space using the telephone, Internet or wireless handheld devices. The system used by Bay Area Rapid Transit at a park-and-ride facility in Millbrae, California, and the services offered by private companies such as MobileParking LLC and SpotScoutTM (Advanced Parking Management Systems, 2007). In 2005, XM Satellite Radio, which already provides real-time traffic information to in-vehicle navigation devices, demonstrated a potential service called “Dynamic Parking Information.” The service provides XM Radio users with the number of available parking spaces at specific lots. The system relies on sensors within the parking lots to transmit the availability information to the vehicle’s navigation system. (Parking lots in San Francisco, Los Angeles and Detroit provided data for the demonstration.) The in-vehicle display uses color-coded icons to reflect the percentage of unoccupied spaces. XM Radio has plans to take the service nationwide. At the time of the demonstration, company officials announced that it was in negotiation with major parking providers about participating in the service (Advanced Parking Management Systems, 2007).

A hybrid solution would be to ensure that the new construction be completed with technology that at minimum inform the driver where parking spaces are located by floor and row. Entry and exit counters will not be sufficient to reduce the frustration of finding parking in a large facility. With efficient, managed parking connected to the Metro Station the public will be more likely to use a Transit system. An increased parking fee may also impact the number of SOV’s. While it would be important not reduce the number of riders from the Metro Station an increased fee along with improved Transit could reduce the number of parking spaces need for the park and ride. The combination of low parking prices and high transit service is more effective in increasing transit share and decreasing SOV share than the combination of high parking price and low transit service. Not surprisingly, the most effective means of increasing transit share is by increasing parking price and improving transit service (Dueker, 1998).

2) Roadways

An essential tenet of higher density and greater mix of land use development is the evaluation of impacts on roadways. The ability to predict traffic conditions and effectively manage traffic is paramount. Policies that require every road construction or improvement to design residential streets for speed and volume control provides safe access for everyone using the road, including bicyclists, pedestrians, and other non-motorized
The closest area to the proposed Herndon Monroe Station requiring congestion management is at Van Buren and Elden Street in Herndon according to the BMI Traffic Study (Alpha Corporation, 2003). Although slightly out of the half-mile catchment area of the proposed station, the intersections of Van Buren, Monroe and Elden should be realigned to alleviate additional vehicle traffic traveling to and from the station. Access ramps from Route 267 that spill into the park and ride for traffic traveling west would be ideal to avoid traffic backing up onto Fairfax County Parkway and Sunrise Valley Drive.

Traffic calming devices should be considered on and around Sunrise Valley Drive. For example, making certain streets around the station accessible to local traffic only during rush hour thus deterring traffic bound for the station or through traffic. This would assist with ensuring commuters do not cut through residential neighborhoods on their way to the station. In addition, there should be signage provided on Elden Street and Van Buren Street directing drivers to major roadways such as the Herndon Parkway, Fairfax County Parkway to divert traffic from local roads (Vanasse Hangen Brustlin, 2007).

Transit oriented develop should have streets arranged if possible in a grid like pattern avoiding cul-de-sac and curvilinear designs. The streets should include sidewalks on both sides of the road and include narrow streets and other traffic calming features to allow mobility but also encourage other modes of movement (Niles, 2007). These other traffic-calming measures might include on-street parking, vertical realignments (e.g. street tables), and horizontal realignments. The main objective of horizontal alignment is to ensure consistency and uniformity along the alignment, in order to avoid the creation of sections demanding an important adjustment of travel speed. The balance between the alignments is very important. This is because improving the alignment and sight conditions of a road makes it easier to plan driving. The path of the road and other road users are more easily visible. These measures induce motorists to slow down and discourage rolling stops when turning at corners. With respect to traffic operations devices signalized crossings with countdown mechanisms are recommended.

Simply put, the goal is to have a complete street system that will provide high levels of mobility for those driving, walking or taking the bus. Buses that are able to easily cut through multiple communities in a fairly direct path are likely to serve more residents and provide optimal service. A well-connected street system is able to grow easily as the community does.

Red light cameras and speed cameras are simple ITS solutions for the roadways in the station area that would improve safety for pedestrians and cyclists. With the increased traffic flow on Sunrise Valley Drive and the Fairfax County Parkway, collision avoidance systems could be implemented here. The system would also be beneficial at any two way unsignaled stops around the Station to improve safety. These systems operate on simple in-pavement loop detectors, which activate signs that graphically advise drivers of the presence and direction of approaching traffic.

3) Transit

The Herndon Background Draft Comprehensive Plan explains that “Dulles Rail will impact a significant area within the Town of Herndon. In this alternative, existing bus service will be modified as recommended in the Operations Plan. (Details of the existing routes serving the study area are provided in Section I of this document) (Town of Herndon, 2007).
These modified routes will need to meet the need of riders going to and from the rail station as to assist them in reaching their destinations. Although not listed in the routes proposed in the operation plan, more neighborhood-oriented or collector-distributor service should be considered in addition to traditional Fairfax Connector long haul routes. It is important to remember that people who live in TOD are five times more likely to use transit than those who do not live in TOD (Ohland, 2006).

Direct access to the station is a must instead of service terminating near the station on periphery streets. Routes should be direct to reduce the operating costs, attract more potential riders and minimize redundant service. This will in turn reduce the amount of time it takes to walk to the bus stop and decrease the amount of time spent on the bus. The area around the station should be designed to meet the needs of traditional 40-foot buses as well as some non-traditional sizes for neighborhood-oriented routes. Stops should be spaced at fairly even intervals avoiding immense numbers that impede traffic flow. For roads traveled that require more frequent stops, the County or Town should consider curb cuts to allow buses to exit traffic thus allowing free traffic flow while boarding and alighting passengers.

Bus stops need to have basic amenities such as a garbage can, bus stop sign listing the routes serving the stop, schedule and route map and in cases of heavier patronized stops, a bench or shelter that blends in with the surrounding area. The stops should be placed to avoid left hand turns, diversions and backtracking (i.e. placing stops in shopping centers instead of on the road in front of the center) to avoid delays and indirect routing that is unappealing to the rider.

The plan for the Herndon Trolley should be implemented in addition to bus services changes proposed for this alternative. The trolley should not be a replacement for existing bus service. The trolley will assist in reducing congestion and parking issues within the Town. The trolley will also make the town more accessible by providing frequent service connecting the Town’s various retail and restaurants. The route should connect major restaurants, shopping and office locations in downtown as well as those that assist in funding the service. The route should travel eastbound on Herndon Parkway as to provide an easy connection to the Herndon Monroe Metro Station without having to cross the Toll Road and jeopardizing headways. The initial plan was to have the trolley operate weekdays from 11am-3pm (Herndon Trolley Committee, 2005). These hours should be increased to operate from 9am-7pm and perhaps extended on Friday evenings and offer service on Saturday evenings as well. Headways should be 15 minutes maximum so that office workers can utilize the service during their lunch hour and return to work. It is proposed the service be provided free of charge to passengers and be funded by Town businesses, advertising revenues and leasing revenues obtained from leasing the trolleys for private events during non service hours. Stops and schedule should be adjusted to meet demand. Service should be provided using traditional rubber tired trolleys such as those seen in various other cities around the country.

This service will help encourage transit ridership within the station area as well as the town center and reduce auto congestions. Retail and restaurant establishments would be promoted through advertising on the trolley and through other trolley printed materials such as stops and schedules. With the new station coming, increased feeder bus service and potentially trolley service, amenities must be added to encourage ridership within the half-mile radius of the station as well as beyond.

Two types of ITS are applicable to improved transit service: transit signal priority (TSP) and real-time information. These options should be examined for deployment which would benefit not only bus service to the Herndon-
A New Sunrise at the Herndon-Monroe Station

Monroe Station but also other stations on the line.

Transit signal priority systems use sensors to detect approaching transit vehicles and alter signal timings to improve transit performance. Systems can extend green signals for buses or make the duration of red signals shorter for buses. In this case, an agreement would need to be met between Fairfax Connector and VDOT. TSP can reduce run times, fuel consumption, improve on-time reliability and reduce other costs. Delays are reduced thus making using transit more appealing to discretionary riders. The ITS Joint Program Office says that TSP can “decrease bus travel time variability up to 35% ITS Joint Program Office, 2007). The result of this is more vehicles to offer service in other parts of the County or increase service around Herndon-Monroe. Implementation might be considered within the Town of Herndon on routes leading to the Station or on the south side at Fairfax County Parkway and Sunrise Valley Drive.

Meanwhile, the availability of real time information at bus stops around the station area and the bus bays at the station would increase ridership and make bus service more appealing to those that might drive to the station. If a passenger knows exactly how long until a bus arrives, they are more likely to use the bus service.

4) Pedestrian

The Dulles Corridor project is not expected to have a significant impact on existing and planned bicycle and pedestrian facilities in the corridor. Implementation of the Wiehle Avenue Extension or the full LPA would include the construction of pedestrian and vehicular access to/from public rights of way (EIS, 2004).

The Town of Herndon has been working to improve pedestrian facilities throughout the town; developing new trails and sidewalks including key route and links connecting to the transit station areas (Herndon Monroe and Route 28 stations). The Town of Herndon plans for sidewalks and looks for sidewalks in the subdivision review process. The Town has also built a number of trails and sidewalks through its own capital improvement program. The longest trail within the Town is the W & OD Trail, part of the Northern Virginia Regional Park Authority’s Washington and Old Dominion Railroad Region Park (Background Report, 2007).

Unfortunately, gaps in the sidewalk and trail system still exist. Without safe crossing pedestrians are less likely to walk to the Metro station or any destination. The lack of a separate and safe pedestrian connection extending along the Centerville Road as it passes under the Dulles Toll Road is a project located just outside of the Town. This project has been added to the regional list of high priority pedestrian/bicycle projects maintained by the Northern Virginia Transportation Authority (Background Report, 2007).

The Town of Herndon has made one of its consensus goals to “Enhance connectivity for pedestrians and enhance the quality of pedestrian facilities to truly encourage alternate modes of transportation such as biking and walking.” With this current policy the Town of Herndon can improve pedestrian infrastructure. This will hopefully lead to less congestion and need for parking at the Park and Ride and in the Town.

A goal to build a completely pedestrian-friendly Herndon-Monroe metro station located within the Town of Herndon would require a redevelopment plan that would increase residential and commercial densities. From the current station, pedestrian bridges are needed so that residents...
can have easy access to and from the station on both sides of the Dulles Toll Road. If complete redevelopment were pursued, the incorporation of strategically placed retail, commercial office, recreational and residential developments can increase the overall attractiveness and walkability of the site.

For many pedestrians, the reasonable walking distance is between a quarter and half mile, which equates to approximately 5-15 minutes of comfortable walking (NJTransit, 1994). Above this amount of walking, people began to see their personal vehicle as a better alternative to get from one place to another. As it stands now, within both a ¼ and ½ mile of the proposed transit station, there are few if any locations that act as attractors to increasing walkability.

The walking distance that pedestrians accept can be influenced by many factors one of the major factors includes having places to walk to. If you have nowhere to go within “walking distance,” then nothing else matters. Additional issues that potential pedestrians can face include safety, vehicle driver interactions, weather conditions and the overall pleasantness of the walk. The creation of crosswalks at intersections or separating pedestrians from cars using barrier placement (such as buildings) are both ways to increase safety in a new development area. The utilization of strategically placed awnings, buildings, and/or trees can create a shield from the elements and enhance walking conditions. Below is a chart created by Victor Gruen in 1964 to illustrate people’s tolerance for walking, and not much has changed between now and then.

Chart to illustrate people’s tolerance for walking:

<table>
<thead>
<tr>
<th>In a highly attractive, completely weather-protected and artificially climatized environment</th>
<th>Minutes</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>5,000</td>
</tr>
<tr>
<td>In a highly attractive environment in which sidewalks are protected from sunshine and rain</td>
<td>10</td>
<td>2,500</td>
</tr>
<tr>
<td>In an attractive but not weather-protected area during periods of inclement weather</td>
<td>5</td>
<td>1,250</td>
</tr>
<tr>
<td>In an unattractive environment (parking lot, garage, traffic-congested streets)</td>
<td>2</td>
<td>600</td>
</tr>
</tbody>
</table>

Since pedestrians tend to favor walking when the route is more pleasant, the creation of more trails through parks and open-space could be seen as a bonus to the new metro-community.

5) Bicycles

Modal choice is an important component of transit oriented development and high density environments. Reductions in parking and other measures to reduce vehicular trips must be compensated by improved services for other modes, such as bicycles. Encouraging a bicycle friendly environment should promote transit use (TRB, 1997). Bike-and-ride is the term coined for accessing a transit station by bicycle. The benefits of increased bike-and-ride have shown benefits for both the environment and society. The benefits include, reduction in fossil fuels consumed, reduction in air and noise pollution, reduced congestion on access roads to stations and limited vehicle parking demand (Martens, 2004).

While this paper focuses on a ½ mile radius, bike-and-ride transit users may come from distances beyond...
½ mile. The bike path and bike lane network needs to extend well beyond a 1/2 mile from the station to attract the full potential of ridership. Despite the often cited importance of routes to the transit station, one study indicates the built environment is not a significant variable in encouraging use of a bicycle (Moudon, 2005). However, providing safe routes is important and increased bike travel will decrease traffic congestion (Martens, 2004). Connectivity between the bicycle paths is not very strong and will continue to be an issue without improvements.

The Metrorail system is working to improve the situations for bicyclists. Bicycle racks and lockers would be provided at all stations and express bus stops, adjacent to station/stop entrances. A study in the Netherlands indicates the presence of quality parking facilities can promote use of bikes to transit stations, since bike use increased in areas where parking facility previously did not exist (Martens, 2006). One vehicle takes up the space of four bicycles in a Park and Ride so less space for parking would be required for cyclists, even if additional amenities are provided. During a site visit, only one bike rack was located and many more will be required if bike-and-ride is going to be encouraged.

With implementation of the measures suggested above, bicycle use to access the transit station could be increased and provide a better living environment in a more densely populated Herndon-Monroe area. Despite the literature noting that all of the reasons behind choice to use a bicycle are not fully understood, improved bicycle facilities will be necessary in a densely built out Herndon-Monroe area (Moudon, 2005).

VI. FINDINGS & RECOMMENDATIONS

The purpose of this analysis is to make recommendations to Fairfax County so the full spectrum of opportunities presented by the new transit station may be realized. These findings and recommendations are predominantly based on literature review, assessment of land use plans, interviews with stakeholders, site visits to other transit oriented developments in the vicinity, and an analysis of original data on current land use.

Research and subsequent analysis identified 5 main characteristics of the existing Herndon-Monroe area that will have a large influence on the area. A vision to enhance the existing characteristics of the landscape, improved communication between stakeholders, enhancements to other modes of transportation, parking availability and the demands placed on the roadway network, were all identified as priority topics in the development of this site for transit oriented development. Each finding, which resulted from site visits and

**TOPIC AREAS for FINDINGS & RECOMMENDATIONS**

1) Identify a Vision for the Herndon-Monroe Station

2) Establish a Continuous Transit, Bicycle and Pedestrian Network

3) Limit Parking Availability

4) Utilize Zoning and Proffering Mechanisms to Reduce Roadway Network Impacts
research, are supported by recommendations to improve or make the most of the area.

1) Identify a Vision for the Herndon-Monroe Station

**Finding:** No uniform vision has been adopted for the surrounding community, incorporating existing land use characteristics. One of the main themes of TOD is the establishment of a vision for the community; however, there is currently no vision or a planned sense of place for the Herndon-Monroe Station area. Communication appears weak between stakeholders, likely contributing to inconsistencies. Each report reviewed held different ideas for the future of the area and no report or entity references or acknowledges another. The Town of Herndon and Fairfax County appear to have competing priorities for the area since no shared vision has been observed. The lack of communication was observed during research, when localities were unaware of studies performed or information available regarding planned bus service after the rail station was in service. Communication is important in establishment of the vision because of the resources near the site. A predominantly undeveloped 13-acre parcel sits directly adjacent to the proposed station and is one of the few undeveloped parcels in the surrounding area. The majority of existing land use is dominated by single-family housing and large uncoordinated office parks. The Dulles Toll Road, a wetland and utility lines, present a unique set of factors that affect development opportunity and connection.

**Recommendation:** It is recommended to the localities and Metro, to maximize the opportunity of the rail investment through establishment of a vision with increased density in development and improved communication between stakeholders. The proposed station can be a catalyst for the community while increasing density of development and an infrastructure enhancement program. Experiences from more highly developed corridors in the area may suggest ideas for land use change. For example, nearby Reston Town Center has achieved considerably higher densities than its immediate neighbors, and the Rosslyn-Ballston Corridor in Arlington is a nationally recognized transit oriented development success story. To maximize density, no changes to the existing single-family homes are recommended, this includes no additional construction of single family detached dwellings. Building density for residential and commercial should be maximized within ¼ mile of the station with a tapering of density into the ½ mile radius to maintain a sense of scale. Undeveloped parcels, such as the 13-acre parcel adjacent to the station, should fully developed with a mix of residential, commercial and retail in high density to provide convenient use of the transit station. Surface parking should be removed with time and consolidated into structured shared parking structures with the creation of a community parking garage. The Metro Arts program is encouraged in this area since artwork can enhance the visual appeal of an area for pedestrians and add character. Architectural elements should be encouraged for new buildings and amenities to help foster a sense of continuity. While many perceive wetlands to be useless land it is recommend to transform the area into a green space amenity and educational opportunity through kiosks and park benches. Increased density, while maintaining a sense of scale with surrounding single family homes, structured parking, visual character and an ecological area are elements encouraged to be part of the vision for the area. In addition, current bus riders in the area as well as those driving to the current park and ride should be surveyed as to what they would like to see in term of bus changes. Citizen involvement is an important factor is setting growth priorities.

2) Establish a Continuous Transit, Bicycle and Pedestrian Network

**Finding:** The transit, pedestrian, and bike network is discontinuous with minimal infrastructure and a low level of service. Bus stop shelters, where they exist, do not have continuous sidewalks leading to them. Bike racks are only present at the Park and Ride, with no lockers available for temporary storage. Access to Herndon from the south side of Fairfax County is limited to crossing by Monroe Street and the Fairfax County Parkway. The Dulles Toll Road creates a physical barrier between the two communities. The Monroe Street bridge crossing the Dulles Toll Road is not conducive to bike or pedestrian use. Plans have been developed,
as shown in TransAction 2030, to construct a bike-pedestrian trail from Van Buren Street/Worldgate Drive intersection to Herndon-Monroe Dulles Rail Station.

**Recommendation:** Improved amenities for other transportation modes are recommended with priority over vehicles. A continuous network of sidewalks on both sides of the roadways should be constructed as well as a well-connected bike network resulting from community input on the location/type of bike paths. The plan for the Herndon Trolley should be implemented, but it should not be a replacement for additional feeder bus service to and from the station. Bus shelters should be installed at stops around the station and smaller buses should be purchased to implement smaller neighborhood friendly routes in addition to main trunk routes. The construction of the Metro station solves a majority of the community access problems based on plans for pedestrian access to the station from both sides of the Dulles Toll Road. To encourage a breakdown of the barrier naturally induced by the Dulles Toll Road, amenities to encourage cross traffic could be built.

### 3) Limit Parking Availability

**Finding:** Parking is a major feature of transportation and parking needs will change with construction of the Herndon-Monroe Metro station. To access the proposed transit station, vehicular travel dominates. Based on review of bus schedules it is apparent the current usage of the Herndon-Monroe park and ride facility is fairly high and the demands required relocation of buses from other local routes to support increased express service to the Metro (David providing rewrite to eliminate need for citation). The condition of the current parking structure required renovations to improve the soundness of the structure. These renovations have not been complete to date and construction is ongoing. Prior to renovations of the parking structure at the Herndon-Monroe Park and Ride, the majority of the spaces were utilized. The addition of two parking structures totaling 3500 spaces is currently proposed at the Park and Ride. Surface parking lots in the surrounding area as well as the parking structure at Herndon-Monroe Park and Ride are used primarily for commercial businesses and commuters on weekdays.

**Recommendation:** The building of additional parking structures is recommended at the station site; however, parking should be limited to encourage an increase to walking, biking and economic development. The quantity and location of parking has a large influence on the convenience of driving versus use of other modes of transport such as walking or use of bikes. Intelligent Transportation Systems (ITS) should be utilized to reduce congestion, increase efficiency of the park and ride and increase Transit Ridership. Fairfax County and the Town on Herndon should invest increased ITS. These systems include Parking Guidance Management Systems (PMGS), Transit Signal Priority Systems (TSP) and Active Transit Station Signs (ATSS). In order to reduce the need for parking spaces at the Park and Ride there are several strategies that could be implemented. Incentives for High Occupancy Vehicles (HOV) could be provided through premium parking spaces. Bus ridership to the Metro station could be increased by providing increased transit services, clean and safe bus shelters. Finally an increased parking fee that accompanies the upgraded transit service could reduce the need for parking spaces while encouraging Metro riders to walk, bike or take the bus to the Metro station. As referenced in the paper an increase in fees must accompany increased service however, HOV parking incentives and increased service, safe and clean bus shelters could be implemented individually. Preventing parking for airport customers is a double edged sword. The idea of the transit station is to encourage its use, even if the destination is the airport; however, the Metro parking lot cannot support parking for business travelers seeking a reduced
parking rate. Towing overnight cars, on a regular basis, would reduce the patronage of the Metro parking lot for use by airport travelers.

4) Utilize Zoning and Proffering Mechanisms to Reduce Roadway Network Impacts

Finding: The existing road network does not provide for alternative route selection to reach destinations and congestion occurs during peak periods in the area. The existing road network consists of multiple cul-de-sacs in the community south of the station. Sunrise Valley Drive, the Herndon Parkway and the Fairfax County Parkway are the main arterials that must be used for the majority of north/south or east/west directional travel. Restricted access to the current park and ride could pose congestion hazards when demand for the site peaks. In addition, current access to the park and ride by car from the Dulles Toll Road could pose a congestion issue depending on how many new riders utilize the Herndon Monroe station by car. If bus service were to increase to the station, circulation around the bus bays could pose an issue.

Recommendation: Increased density of development will increase demand on surrounding roadways. Additional infrastructure, in addition to ITS is recommended. Additional turn lanes, access options and through lanes would likely be required on arterial roads. Sunrise Valley Drive would be the most severely impacted due to its proximity to the Park and Ride and proposed increase to structured parking. Sun Rise Valley Drive would likely need additional capacity to handle the turning movements of vehicles trying to reach and leave the station. While additional access to the Dulles Toll Road from the station could alleviate the requirement for use of local roads to access the highway, it is understood the Dulles Toll Road is severely congested during peak commute hours. Direct access to the Dulles Toll Road should be allowed during free flow conditions to reduce the traffic on local roads. Future road infrastructure should be allowed for more connections on roads resembling more of a grid pattern. The movement through the facility should be rationalized to increase efficiency of Herndon Parkway, Sunrise Valley and other local thoroughfares around the station. Use of the zoning and proffering structures for transportation demand management is encouraged to help increase density and produce transit oriented development.
A New Sunrise at the Herndon-Monroe Station

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APPENDIX A

PROBLEM STATEMENT
PRACTICUM PROJECT - TPOL Fall 2007

This Practicum Project of the Transportation Policy, Operations & Logistics (TPOL) program of George Mason University will conduct an analysis of, and develop a series of recommendations for, the planned Herndon-Monroe station area on the Dulles corridor Metro rail line in Fairfax County. Specifically, this effort will investigate several elements of the station area, including the planning and management of the facility’s accessibility, the intensity, scope and locations of transit-oriented development, and actions needed to produce overall positive functionality. This study will consider both the integrity of the actual station site as well as its impact on the surrounding neighborhood and vicinity.

Although the general aspects of a Metro rail station facility, such as pedestrian movement, bus bays and parking lots, are largely already determined, as per Metro’s Guidelines for Station Site and Access Planning, that same document repeatedly stresses the importance of responsiveness to the unique attributes of each location in their placement. Thus, this project will examine how these elements might be best positioned and integrated into the facility. Additionally, within a yet-to-be-specified perimeter around and near the station, the degree to which the station influences and affects the area in terms of infrastructure, economic and development activity, and traffic flow, among other factors, will be investigated. Information concerning transit-oriented development will be reviewed and incorporated as part of the long-range plan for the area.

The scope of work for this project will include a review of general transit station design literature and relevant project documents, site visits, and a intra-team visioning process to develop potential options and alternatives. This will culminate in a final report that will describe the various opportunities and conflicts presented by the station area and produce a set of recommendations for implementing site design. Finally, this information will be delivered to all relevant and interested parties in a presentation on or about December 12, 2007.

Note: this problem statement and scope of work are subject to change, and the approval of Dr. Jonathan Gifford and the project client team representing the Fairfax County Department of Transportation.
Appendix B
Travel Projections from the Environmental Impact Statement

Change in Traffic Counts:

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drake Avenue (south of HP)</td>
<td>32</td>
<td>10,145</td>
<td>10,473</td>
<td>9,721</td>
<td>7,555</td>
<td>-2,590</td>
<td>-25.5%</td>
</tr>
<tr>
<td>East Elden Street (west of HP)</td>
<td>18</td>
<td>22,089</td>
<td>22,672</td>
<td>22,913</td>
<td>23,490</td>
<td>1,401</td>
<td>6.3%</td>
</tr>
<tr>
<td>Spring Street (west of HP)</td>
<td>19</td>
<td>14,093</td>
<td>15,780</td>
<td>11,794</td>
<td>10,395</td>
<td>-4,298</td>
<td>-29.3%</td>
</tr>
<tr>
<td>Van Buren Street (north of HP)</td>
<td>34</td>
<td>9,226</td>
<td>9,044</td>
<td>0,330</td>
<td>0,443</td>
<td>-769</td>
<td>-8.5%</td>
</tr>
<tr>
<td>South Elden Street (north of HP)</td>
<td>47</td>
<td>22,071</td>
<td>22,132</td>
<td>22,371</td>
<td>26,340</td>
<td>3,260</td>
<td>14.8%</td>
</tr>
<tr>
<td>Sterling Road (east of HP)</td>
<td>87</td>
<td>10,376</td>
<td>10,211</td>
<td>9,868</td>
<td>13,513</td>
<td>3,137</td>
<td>30.2%</td>
</tr>
<tr>
<td>Crestview Drive (south of HP)</td>
<td>38</td>
<td>5,765</td>
<td>5,392</td>
<td>4,569</td>
<td>4,867</td>
<td>-808</td>
<td>-15.6%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>94,365</td>
<td>95,704</td>
<td>89,574</td>
<td>93,603</td>
<td>-762</td>
<td></td>
<td>-0.80%</td>
</tr>
</tbody>
</table>

Table 6.1.3: Average Weekday Transit Patronage Forecasts

|                      | Locally Preferred Alternative |                      |                      |                      |                      |                      | Full LPA (2025) |
|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------|
|                      | No Build Alternative          | Metrorail            | Corridor Express Bus | Total                | Metrorail            | Corridor Express Bus | Total            |
|                      | 2025                           | 2011                 |                      | 2025                 | 2011                 |                      | 2025             |
| Project-Related Corridor Ridership Activity          |                                |                      |                      |                      |                      |                      |                  |
| Total Corridor Trips| n.a                           | n.a                  | 59,000               | 3,800                | 62,800               | 88,500             | 4,800            | 73,300           | 91,200           |
| Total Corridor Boardings| n.a                           | n.a                  | 24,600               | 13,200               | 37,800               | 27,300             | 16,800           | 44,100           | 57,500           |
| Project-Related Regional Ridership Activity          |                                |                      |                      |                      |                      |                      |                  |
| Regional HWB Rail/Corridor Express Bus               | 541,100                       | 471,400              | 490,000              | n.a                  | 563,500              | n.a                 | 575,300          |
| Regional Total Rail/Corridor Express Bus             | 914,500                       | 785,400              | 835,300              | n.a                  | 960,600              | n.a                 | 977,300          |
| Regional Total Transit Trips                          | 1,351,200                     | 1,159,500            | 1,166,600            | n.a                  | 1,365,600            | n.a                 | 1,379,000        |
| Regional New Trips                                    | n.a                           | 29,100               | n.a                  | 34,400               | n.a                  | 47,500             |

HWB = home-based work

This figure represents ridership activity that occurs on express but only with no transfer to rail. Trips that start with express bus but also involve utilization of Metrorail are included in the Metrorail column.
A New Sunrise at the Herndon-Monroe Station

Table 6.1-4: Forecast Daily Station Boardings in Dulles Corridor

<table>
<thead>
<tr>
<th></th>
<th>Locally Preferred Alternative</th>
<th>No Build Alternative</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Metrotrail</td>
<td>Corridor Express Bus</td>
<td>Metrotrail</td>
<td>Corridor Express Bus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tysons East</td>
<td>n.a.</td>
<td>3,803</td>
<td>n.a.</td>
<td>3,920</td>
<td>n.a.</td>
</tr>
<tr>
<td>Tysons Central 123</td>
<td>n.a.</td>
<td>5,200</td>
<td>n.a.</td>
<td>5,726</td>
<td>n.a.</td>
</tr>
<tr>
<td>Tysons Central 7</td>
<td>n.a.</td>
<td>3,308</td>
<td>n.a.</td>
<td>3,506</td>
<td>n.a.</td>
</tr>
<tr>
<td>Tysons West</td>
<td>n.a.</td>
<td>4,002</td>
<td>n.a.</td>
<td>4,391</td>
<td>n.a.</td>
</tr>
<tr>
<td>Wiehle Avenue</td>
<td>n.a.</td>
<td>8,244</td>
<td>n.a.</td>
<td>9,587</td>
<td>n.a.</td>
</tr>
<tr>
<td>Reston Parkway</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Reston Town Center</td>
<td>n.a.</td>
<td>n.a.</td>
<td>1,546</td>
<td>n.a.</td>
<td>1,534</td>
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<tr>
<td>Herndon-Monroe</td>
<td>n.a.</td>
<td>n.a.</td>
<td>4,748</td>
<td>n.a.</td>
<td>5,531</td>
</tr>
<tr>
<td>Route 28</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Dulles Airport</td>
<td>n.a.</td>
<td>n.a.</td>
<td>3,456</td>
<td>n.a.</td>
<td>4,066</td>
</tr>
<tr>
<td>Route 636</td>
<td>n.a.</td>
<td>n.a.</td>
<td>1,495</td>
<td>n.a.</td>
<td>1,581</td>
</tr>
<tr>
<td>Route 772</td>
<td>n.a.</td>
<td>n.a.</td>
<td>1,973</td>
<td>n.a.</td>
<td>3,110</td>
</tr>
</tbody>
</table>

n.a. = not applicable – no stations exist at those locations for the alternative.

the public parking facilities designed to facilitate use of public transportation and/or ridesharing in the corridor.

Table 6.3-1: Park-and-Ride Facilities in the Dulles Corridor

<table>
<thead>
<tr>
<th>Park-and-Ride Facilities</th>
<th>Owner/Operator</th>
<th>Daily Cost</th>
<th>Number of Spaces</th>
<th>Usage Rate (2000)</th>
<th>Connecting Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Reston South</td>
<td>Fairfax County</td>
<td>Free</td>
<td>(2,300)*</td>
<td>47.2%</td>
<td>Fairfax Connector, NBSI</td>
</tr>
<tr>
<td>2 - Herndon-Monroe</td>
<td>Fairfax County</td>
<td>Free</td>
<td>1,745</td>
<td>47.2%</td>
<td>Fairfax Connector, NBSI</td>
</tr>
<tr>
<td>3 - Dulles North</td>
<td>Loudoun County</td>
<td>Free</td>
<td>750</td>
<td>31.6%</td>
<td>Loudoun County Community Bus Service</td>
</tr>
</tbody>
</table>

Total Capacity

|                      | 5,739 (7,212)* |

NOTES: See Figure 6.1-1 for locations.
* Planned total number of spaces by 2010.
** For Year 2002
Source: WMATA, Fairfax County, VDOT, and CTC.
Appendix C

<table>
<thead>
<tr>
<th>Economic</th>
<th>Social</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved accessibility, particularly for non-drivers.</td>
<td>Improved accessibility for people who are transport disadvantaged.</td>
<td>Reduced land needed for roads and parking facilities.</td>
</tr>
<tr>
<td>Reduced transportation costs.</td>
<td>Reduced external transportation costs (crash risk, pollution, etc.).</td>
<td>Open space preservation.</td>
</tr>
<tr>
<td>Increased parking efficiency (parking facilities can serve more destinations).</td>
<td>Increased neighborhood interaction and community cohesion.</td>
<td>Reduced energy consumption and pollution emissions.</td>
</tr>
<tr>
<td>Can increase local business activity and employment.</td>
<td>Improved opportunities to preserve cultural resources (e.g., historic buildings).</td>
<td>Improved aesthetics.</td>
</tr>
<tr>
<td>Support for transit and other alternative modes.</td>
<td>Increased exercise.</td>
<td>Reduced water pollution.</td>
</tr>
<tr>
<td>Special support for some businesses, such as walking tourism.</td>
<td></td>
<td>Reduced “heat island” effects.</td>
</tr>
<tr>
<td>Health cost savings from improved exercise.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table summarizes various benefits from a more walkable community.

(Litman, 2004)

The chart above describes the economic, social, and environmental benefits a community receives by improving walkability.