Route 1
Multimodal Alternatives Analysis

Route 1 Multimodal Alternatives Analysis

Final Report

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1.0 Introduction

The Virginia Department of Rail and Public Transportation (DRPT) has undertaken a Multimodal Alternatives Analysis in coordination with Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Virginia Office of Intermodal Planning and Investment (OIPI). The purpose of the project is to provide improved performance for transit, bicycle and pedestrian, and vehicular conditions and facilities along the Route 1 corridor that support long-term growth and economic development.

The study corridor consists of a 15-mile segment of U.S. Route 1 ("Route 1"), extending from Route 123 in Woodbridge in Prince William County to the I-95/I-495 Beltway in Fairfax County near its border with the City of Alexandria. The corridor is known more familiarly in this segment as Richmond Highway. **Figure 1-1** shows a map of the study corridor.

The study defines key transportation issues for local and through travelers, and considers a range of transportation solutions to address the needs. These solutions include a combination of transit, roadway, and pedestrian and bicycle improvements. Solutions also consider the future of land use and development on the corridor. Through stakeholder participation and technical analysis, the study results in a recommended program of transportation improvements for adoption by Fairfax County and Prince William County.

This report discusses the process of developing and evaluating the multimodal alternatives. It provides detail on performance measures and associated analysis methodologies used to screen and recommend a multimodal solution that best meets the needs of the corridor.

An important part of the alternatives evaluation is an assessment of potential funding and implementation steps for the recommended alternative. Implementation considerations are the levels of anticipated population and employment, the need for additional transportation infrastructure, and general viability of the preliminary funding plan including competitiveness for federal transit funding.

Figure 1-1: Study Corridor

The document is organized as follows:

Section 1.0: Introduction: *Describes the study corridor, purpose of the project, and the evaluation process.*

Section 2.0: Project Overview: *Provides an overview of the purpose of the project, key stakeholders, and study process.*

Section 3.0: Relationship to Previous Studies: Describes the previous plans and studies associated with the corridor.

Section 4.0: Purpose and Need: *Describes the purpose of the project and the transportation challenges present along the corridor that this project seeks to address.*

Section 5.0: Evaluation Overview: *Defines the range of preliminary alternatives that were initially considered. Preliminary alternatives are screened based on basic project requirements.*

Section 6.0: Initial Alternatives: *Defines the initial vehicular lane configurations, bicycle and pedestrian, and transit alternatives. It also describes the evaluation measures and screening results of the initial alternatives.*

Section 7.0: Refined Multimodal Alternatives: *Defines the refined multimodal alternatives that are evaluated in detail. The refined multimodal alternatives assume the same vehicular and bicycle and*

pedestrian facility with varying transit modes and operations. The alternatives are evaluated using a robust screening methodology.

Section 8.0: Evaluation of Multimodal Alternatives: *Evaluates the alternatives based on goals and objectives and project implementation factors. It describes the measures, evaluation findings and results, and the technical recommendation.*

Section 9.0: Recommendations - Action Plan for Implementation: *Lays out an action plan for implementing the technical recommendation.*

Six technical reports were developed and support the findings in this report. The following memoranda are appended to this report:

- *Purpose and Need Report*
- *Outreach Summary Report*
- *Traffic and Transportation Report*
- *Land Use and Economic Development Report*
- *Additional Transportation Analysis Report*
- *Detailed Evaluation of Alternatives Report*
- *Environmental Scan Report*
- *Preliminary Funding Analysis Report*

2.0 Project Overview

An Alternatives Analysis (AA) is a transportation planning process for evaluating all reasonable modal and multimodal alternatives and general alignment options for identified transportation needs in a corridor. The alternatives analysis process studies a transportation problem in detail and considers a range of options, along with an analysis of benefits and costs to ensure that potential solutions are feasible and meet the project goals and objectives. At the conclusion of this alternatives analysis, the local jurisdictions and implementing agencies can adopt the technical recommendation as the Locally Preferred Alternative (LPA), which will allow the project to initiate the process of seeking local, regional, and federal funding.

Both Fairfax County and Prince William County would most likely require federal funding assistance to construct a major project. For the transit investment, the counties will likely seek funding from the Federal Transit Administration's Capital Investment Program (Section 5309, "New Starts/Small Starts"). This discretionary grant program is highly competitive and structured to advance projects through the major phases of project development: planning, engineering, construction, and operation. Eligible projects are evaluated and re-evaluated at key phases in the process using a robust set of evaluation criteria.

With the likely need for state and/or federal funding, next steps for the counties would be to assess the potential impacts on the natural and human environments in accordance with the National Environmental Policy Act of 1969 (NEPA). After the adoption of the LPA, the responsible or "lead" federal agency will determine the appropriate level of environmental documentation to accurately assess and mitigate all potential impacts.

2.1 Project Team

The Virginia Department of Rail and Public Transportation (DRPT) managed this alternatives analysis. Key partner agencies included Fairfax County, Prince William County, the Virginia Department of Transportation (VDOT), and the Office of Intermodal Planning and Investment (OIPI). These stakeholders (listed above) met monthly and served as the Project Management Team. Additional project input and guidance was provided by:

- A **Community Involvement Committee** composed of business and community leaders and interested organizations. The committee met quarterly and provided guidance to the project team.
- An **Executive Steering Committee**, consisting of elected officials and senior agency staff, to assist with policy-related decision making and funding strategies. This committee met quarterly and provided strategic guidance throughout the study.
- A **Technical Advisory Committee** consisting of state and local agency staff with expertise in a range of relevant topic areas. This committee met quarterly and provided technical guidance on the work products.

2.2 Community and Stakeholder Engagement

The Route 1 Multimodal Alternatives Analysis project team ("team") employed a range of strategies to obtain diverse, active participation in the development and evaluation of multimodal alternatives for the project corridor. These strategies emphasized both sharing information and gathering input at key times during each project phase. The intent was to ensure that diverse community opinions were captured and served to guide project evolution. A summary of the specific strategies and outcomes is provided below, with further detail provided in *the Community and Stakeholder Engagement Report.*

The team shared information about the project:

- At public meetings
- On the project website
- Through information booths at corridor events
- Through attendance at business association and neighborhood meetings
- On hard copy flyers, newsletters, and posters distributed on the corridor
- On Twitter and Facebook
- Using press releases and newspaper advertisements

After each public meeting, the project website was updated with all of the meeting materials in an interactive format. In this way the project team could continue to receive input on the meeting materials from those who were not able to attend in person. The team regularly posted to the website and its Twitter and Facebook accounts to advertise all outreach activities. The team gathered input through discussions and activities at stakeholder and public meetings, as well as through surveys and

other materials posted on the website. Any material that was shown at a public meeting was available for review on the website, along with easy-to-use comment forms. The public was also invited to share their comments via social media, email, and a website comment form throughout the process.

3.0 Relationship to Previous Studies

Community, agency, and political leaders have long recognized the transportation challenges in the Route 1 corridor. Numerous studies and plans completed over the last 15 years have assessed various transportation issues in the corridor. These studies are shown chronologically in **Figure 3-1.** The studies have consistently identified four key issues:

- Growth in general regional population and employment, as well as locally concentrated changes in job concentration, have driven greater demand for travel in the constrained corridor.
- Safety for users of all types remains a concern.
- Land use and economic plans anticipate further growth and development.
- Maintaining affordability and diversity is an increasing challenge.

Each study shown in **Figure 3-1** has identified transportation challenges in the corridor as well as provided recommendations to address these challenges. A summary of the recommendations identified in these plans is included in **Table 3-1**, and a comprehensive list is provided in the *Purpose and Need Report*.

Figure 3-1: Previous Studies

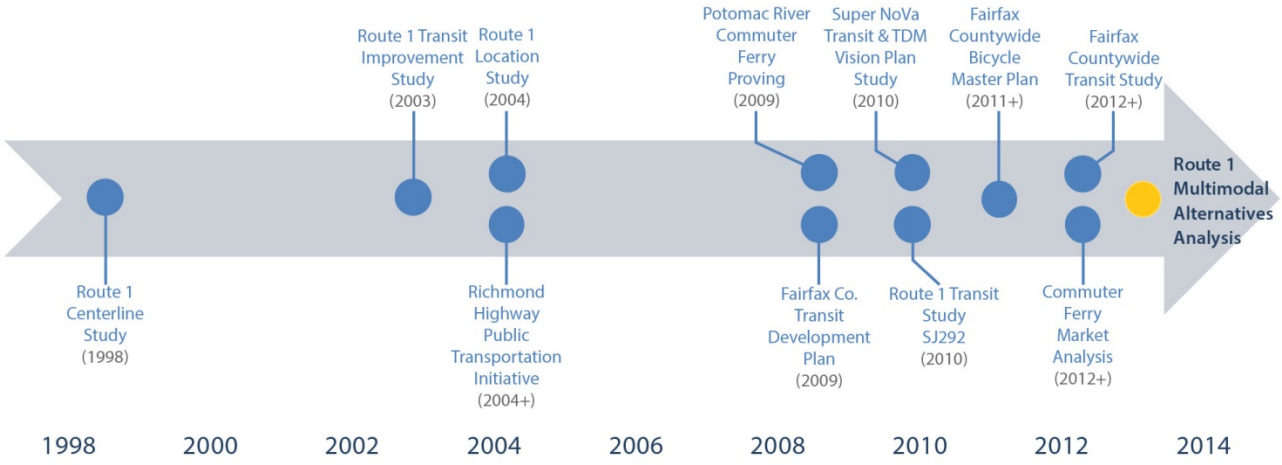


Table 3-1: Previous Plans and Recommendations for Route 1

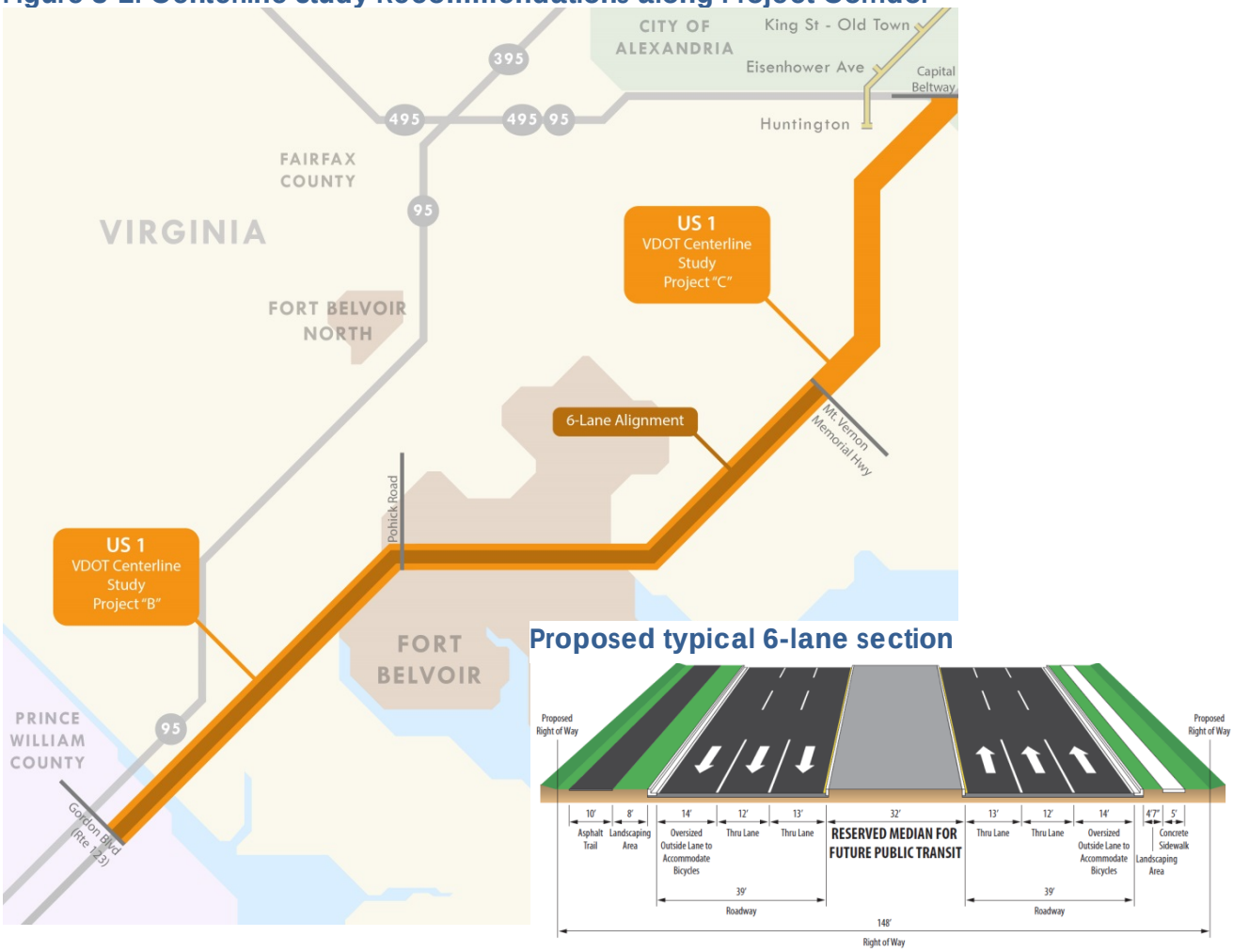
Plan	Agency	Date	Alternatives Recommended for Route 1
Route 1 Centerline Study	VDOT	1998	• Additional lane in each direction throughout • Bicycles in shared outer lane (15') • Pedestrians (10' planting strip, 6' sidewalk) • Accommodation for higher quality transit (undefined)
Route 1 Transit Improvement Study	WMATA	2003	• Phased: BRT "light" (in shared lanes) preceding BRT in dedicated curbside lanes. • Light rail in dedicated or semi-exclusive lanes
Richmond Highway Public Transportation Initiative	Fairfax County DOT	2004-present	• Safety improvements at intersections • Complete sidewalk network • Local and express bus stop improvements
Mt. Vernon Vision	Citizens	2010	• Metrorail. Light rail or monorail as an alternative • Complete sidewalk network
Route 1 Transit Study SJ292	DRPT	2010	• Bus rapid transit • Complete pedestrian network • Additional lane in each direction throughout
Fairfax County Comprehensive Plan	Fairfax County	2011, amended 2014	• High quality transit (heavy rail, light rail, monorail or bus rapid transit) in dedicated guideway (26' + 15' medians) • Consistent 3 lanes per direction throughout • Multiuse trail for bikes and pedestrians (9' buffer, 9' trail)
SuperNoVa Transit/TDM Vision Plan	DRPT	2012	• BRT or LRT north of Fort Belvoir • Pedestrian and bicycle accommodation
Constrained Long Range Plan and Regional Vision	MWCOG	2013	• Additional lane per direction (Fort Belvoir segment) • Provide bus right turn lanes

The two foundational studies for this effort are the VDOT Route 1 Centerline Study (1998) and the DRPT Route 1 Transit Study (2010), while several others are critical in highlighting, redirecting, guiding and confirming need.

VDOT Route 1 Centerline Study (1998 and 2004 Location Study)

The Centerline study examined 27 miles of Route 1 from Stafford County north to I-495 and Alexandria. The study was subdivided into three projects: Project A (Stafford County line to Route 123), Project B (Route 123 to Armistead Road), and Project C (Belvoir Woods Parkway to the Capital Beltway). Projects B and C correspond with this project study area (See **Figure 3-2**). The study recommended widening from 4 lanes to 6 in the southern portion and 6 lanes to 8 in Project C in the northern segment. Pedestrian and bicycle improvements including both facilities along the corridor as well as improved crossings were also recommended. The study recommended the preservation of right-of-way for transit but did not make a final recommendation or determination on transit alignment, running way or mode. **Figure 3-2** shows the proposed typical six-lane cross section.

Figure 3-2: Centerline Study Recommendations along Project Corridor



DRPT Route 1 Transit Study SJ292 (2010)

This transit study was intended to evaluate the level of study necessary to advance transit services to the growing employment centers of Fort Belvoir in Fairfax County and Marine Base Quantico in Prince William and Stafford Counties along Route 1. The study found that existing transit services and roadway operations were generally insufficient to address the travel demand needs resulting from the Base Realignment and Closure that concentrated employees at those facilities. It found substantial need to improve transit service on the corridor to accommodate the projected growth, increase transit mode share, and preserve mobility on the Route 1 corridor. Pedestrian access and safety were noted as significant needs. Persistent levels of extreme congestion on the corridor necessitated an increase of person capacity on the corridor to provide viable options for higher capacity vehicle travel. The study recommended further detailed assessment to examine the feasibility of dedicated transit running way and evaluation of modes. The current study builds off this previous effort.

4.0 Purpose and Need

This section summarizes the purpose of the project and describes why multimodal improvements are needed along the corridor. The "Purpose and Need" is the cornerstone of any transportation improvement project. It summarizes the existing conditions and relevant issue(s) to be solved by succinctly defining the transportation problem and setting the context for consideration of alternatives. The Purpose and Need informed the project goals and objectives and helped guide the development of alternatives for evaluation.

The Purpose and Need is derived through three primary inputs:

- Review and analysis of past plans and studies and current policy guidance
- Assessment of existing and forecasted/desired conditions for transportation and land use
- Community input through public and stakeholder meetings and communication

Past plans and studies, agency and stakeholder inputs, and assessment of existing conditions to date have repeatedly identified the following broad issue areas of need on the corridor:

- Viable multimodal travel options on the corridor are limited and/or insufficient
- Congestion impedes reliable and efficient travel
- Existing transportation services and networks fail to support planned land uses and economic development efforts

The need for the project stems from existing and expected transportation problems along the corridor related to limited transit service, poor bicycle and pedestrian facilities, and high traffic volumes. These deficiencies limit accessibility and are not supportive of the desired economic development growth along the corridor.

The existing carrying capacity of the corridor is constrained. People traveling by automobile experience congestion and delays; people traveling by transit experience infrequent service as well as delays because of traffic congestion. Integrated multimodal improvements are needed to support the anticipated high levels of employment and residential growth. County Comprehensive Plans envision this growth in the form of focused, pedestrian- and transit-oriented development. Without transportation capacity improvements that encourage pedestrian and transit travel, it is unlikely that the projected growth can be accommodated within the corridor, and the associated economic opportunity of additional jobs and residents will be limited.

Attractive multimodal options are needed to help serve the high transit-dependent population who rely on bicycling, walking and/or transit to meet the needs of daily life. According to the American Community Survey (2008-2012), within ½-mile of the study corridor, there are over 2,000 households that do not own a car.

Of the existing transit riders, nearly three-quarters of existing transit riders have no access to an automobile as a travel alternative. Over half of corridor transit riders have household incomes of less than $30,000. Preserving community and affordability over the long term requires improved transit and other transportation options to meet the needs of this population.

The document identifies four specific areas of need for a major multimodal investment in the corridor: Transit, Pedestrian and Bicycle, Vehicular, and Land Use/Economic Development. **Table 4-1** summarizes the problems and need by area; the subsequent sections describe the needs in more detail.

Table 4-1: Problems and Needs Summary

Multimodal Area	Problems and Needs	
Transit	• Transit travel time is not competitive with auto • Peak and off-peak transit service is infrequent • Dwell time at stops and peak period congestion delays transit	*Attractive and competitive transit service to support transit dependent population*
Pedestrian/ Bicycle	• Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness of single occupancy vehicle travel • Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops • Bicycle access is difficult with few alternative paths	*Safe and accessible pedestrian and bicycle access*
Vehicular	• Users experience significant congestion along Route 1 during peak periods • Travel times are highly variable and unpredictable	*Appropriate level of vehicle accommodation*
Land Use/Economic Development	• Current development patterns fail to optimize development potential at designated activity centers • Existing street connectivity is poor at commercial nodes	*Support and accommodate more robust land development to support anticipated population and employment growth*

4.1 Transit Needs

Existing transit service in the corridor does not meet the needs of current and future residents, which is leading to low rate of transit use. On an average weekday, only 3 percent of all trips are made using transit.[1] This is well below the regional average of 15 percent transit mode share for "middle ring" locations.[2]

Challenges with the existing transit service include:

- **Transit travel time is not competitive with automobile:** Frequent stops and congested segments of roadway make transit travel both slower and more unpredictable than auto travel, with bus travel times increasing significantly during peak hours. **Table 4-2** provides sample travel times to key destinations.
- **Peak and off-peak transit service is infrequent:** For travel from Fort Belvoir to Huntington Station, transit service is fairly frequent in the peak hours (every 12 to 20 minutes), but less frequent in non-peak periods (to 30 to 60 minute headways). For trips originating south of Fort Belvoir, service is even less frequent and a direct transit route to Fort Belvoir and other destinations near Huntington does not exist.
- **Dwell time at stops and peak period congestion delays transit:** Traffic congestion introduces significant delays for buses in both directions; dwell time at stops increases total transit travel time by about 20 percent, as compared to both transit travel time without dwell and general traffic.

The corridor needs attractive, high-quality transit service to improve local and regional mobility. High-quality transit would reduce travel time and increase frequency, reliability, and attractiveness.

Table 4-2: Sample Travel Times

Origin	Destination	Distance	Drive Time	Transit Time	Transit Transfers
Fort Belvoir Community Hospital	Huntington Metro Station	8.8 miles	20 min	35 min	0
Fort Belvoir Community Hospital	Mt. Vernon Shopping Center (Hybla Valley)	5.7 miles	15 min	25 min	0
Mt. Vernon Shopping Center (Hybla Valley)	Huntington Metro Station	5.2 miles	15 min	20 min	0
Woodbridge	Fort Belvoir Community Hospital	8 miles	15 min	40 min	1

[1] MWCOG 2.2
[2] MWCOG "State of the Commute" survey findings reported September 18, 2013. http://www.mwcog.org/transportation/weeklyreport/2013/files/09-17/TPB-Presetnation_2013_StateOfTheCommute.pdf

4.2 Pedestrian and Bicycle Facilities

Existing pedestrian facilities are disjointed and discontinuous, limiting pedestrian travel and reducing access to transit. Very few residents walk to access transit or to other local destinations. Public meeting attendees cited improved pedestrian and bicycle conditions as one of the most urgent improvements needed for the corridor. The poor accommodation for cyclists is reflected in a very low rate of cycling in the corridor. The US Census estimates that just 0.15 percent of commuters in both the northern and southern segments of this corridor use a bicycle to get to work. This compares with 2 percent Fairfax County-wide, according to the 2010 Census.[3] **Figures 4-1** and **4-2** show current pedestrian facilities and the network of bicycle pathways near the corridor.

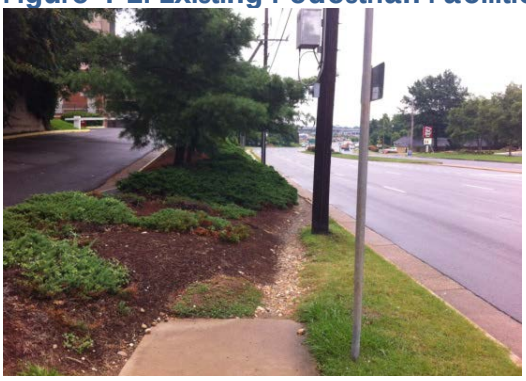
Specific pedestrian and bicycle needs include:

- **Facilities for non-auto travel are limited, substandard, and unable to compete with the attractiveness and efficiency of single occupancy vehicle travel**: Walking paths along the corridor are incomplete with 6.8 miles of identified sidewalk gaps.[4] The sidewalk facilities that exist are largely unbuffered from the heavy traffic on the corridor. ADA accommodations to pedestrian destinations such as bus stops are missing and/or substandard in several locations.
- **Pedestrian crossings of Route 1 are infrequent, wide, and not near existing transit stops:** Crosswalks are spaced at significant distances from one another, the longest gap exceeding 1.8 miles. Crossing distance commonly exceeds 100 feet.
- **Bicycle access is difficult with few alternative paths:** Few bicycle facilities currently exist on Route 1. In its Bicycle Master Plan, Fairfax County characterizes Route 1 as a "corridor of caution" -- a route where "bicyclists are urged to exercise extra caution due to narrow shoulders or lanes, poor sight distances, high traffic volumes, or other challenging characteristics."

Attractive, high-quality pedestrian and bicycle facilities are needed to accommodate the future planned growth, and appropriately meet the diverse travel demands and abilities of Route 1 residents and stakeholders. Improved bicycle and pedestrian facilities will also improve transit access along the corridor to connect transit with surrounding uses via safe and continuous pathways.

[3] http://www.fairfaxcounty.gov/news/2012/updates/may-is-bike-month.htm
[4] Richmond Highway Transportation Initiative, Fairfax County, 2004.

Figure 4-1: Existing Pedestrian Facilities



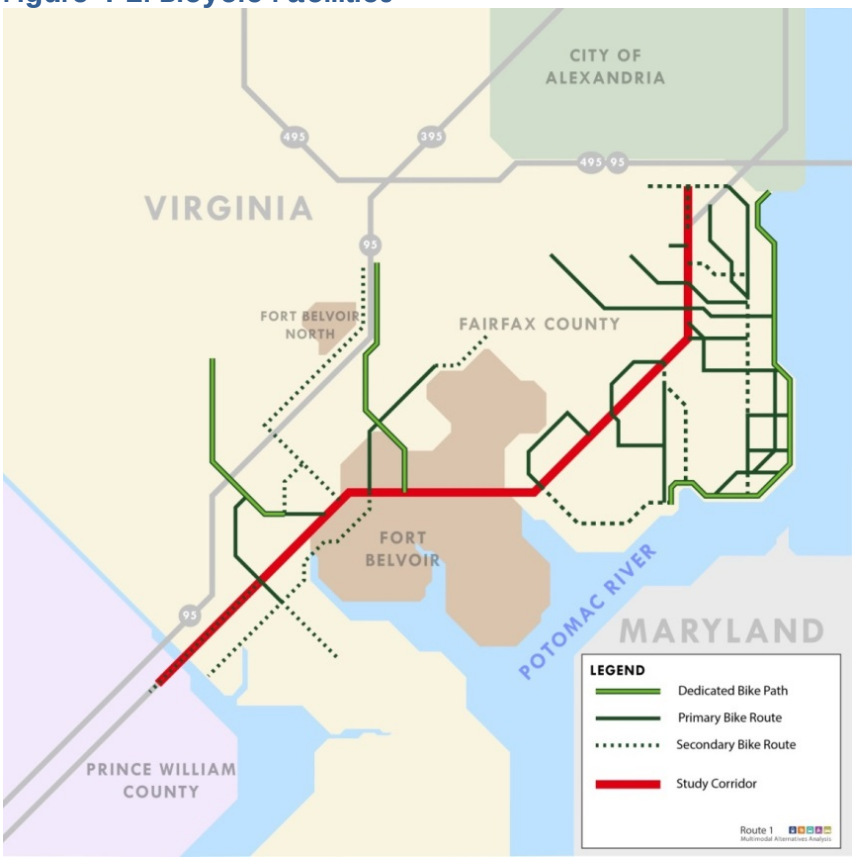
Goat Track at Groveton Spring Road

Goat Track at Groveton Spring Road

Accessibly challenges at Hybla Valley

Discontinuous sidewalk at Hybla Valley

Figure 4-2: Bicycle Facilities



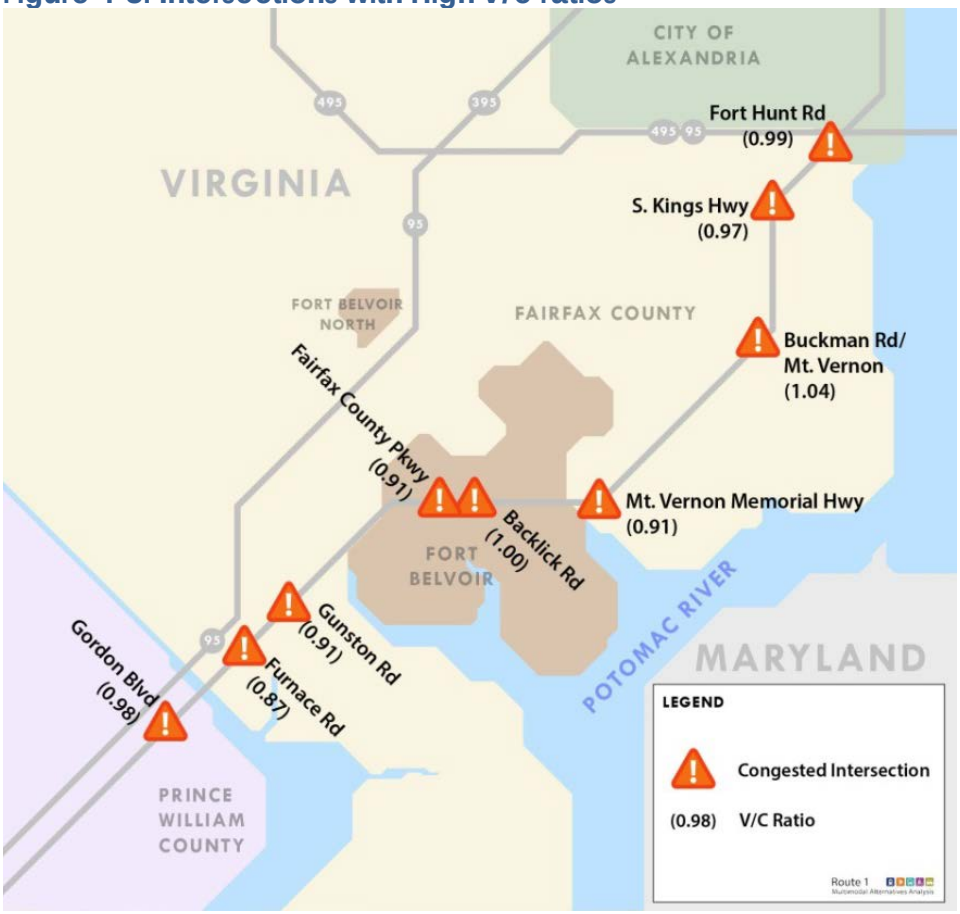
4.3 Traffic Problems and Vehicular Operations Needs

Users experience significant congestion along Route 1 during peak periods and on weekends. At public meetings, participants noted this as a key concern for the corridor. Specific vehicular needs include:

- **Users experience significant congestion along Route 1 during peak periods:** The Route 1 (Richmond Highway) corridor experiences significant peak hour congestion. Presently, six intersections along the 15-mile corridor experience significant congestion and are considered "failing", operating at a Level of Service E or F in the AM or PM peak hour.
- **Travel times are highly variable and unpredictable:** Volume to capacity (v/c ratio) is a measure of congestion. A v/c ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are typically not expected to experience significant queues and delays. During the AM peak hour under existing conditions, nine signalized intersections in the study area (22.5 percent of all intersections) have v/c ratios greater than 0.85 (See **Figure 4-3**).

With increased population and employment growth, the corridor needs to maintain adequate vehicular accommodation to improve travel time reliability.

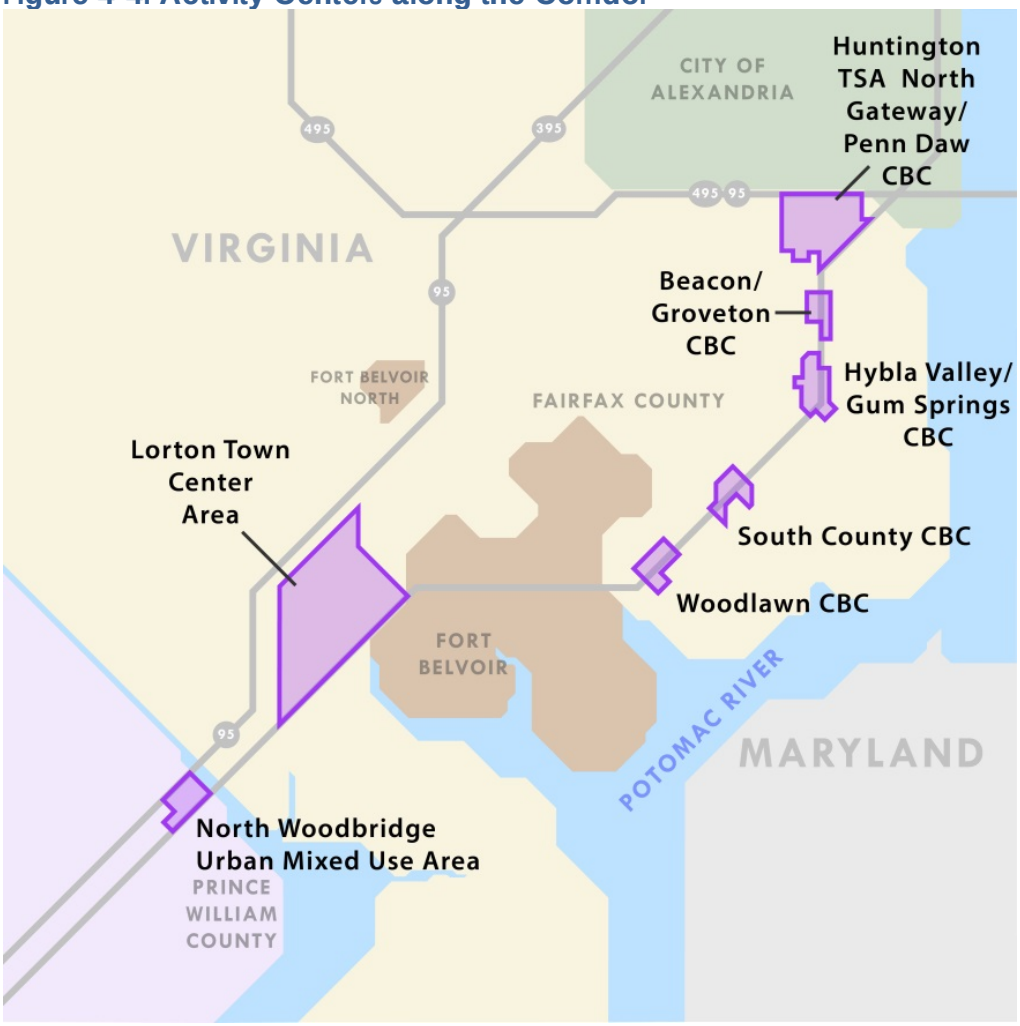
Figure 4-3: Intersections with High v/c ratios



4.4 Land Use and Connectivity

Significant population and employment growth is anticipated both regionally and along the Route 1 corridor. Fairfax County and Prince William County have designated several nodes along the Route 1 corridor as Activity Centers, referred to as Community Business Centers (CBCs) in Fairfax County and Urban Mixed Use Areas in Prince William County (see **Figure 4-4**). County policies anticipate growth to concentrate in these areas, thereby increasing the density of housing and employment activity on the corridor and necessitating additional travel capacity and options to support and enable this growth. The Fairfax County Comprehensive Plan lists specific development targets for each activity center.

Figure 4-4: Activity Centers along the Corridor



Fairfax County and Prince William County plans both envision nodes of compact, walkable development focused in moderate to high density activity nodes; however, current development patterns fail to optimize potential development. Much of the corridor is characterized by commercial strip malls with large setbacks and unconnected driveways and access roadways. This leads to greater dependence on driving instead of walking to local destinations.

Specific land use and economic needs include:

- **Development potential has not been realized in designated activity centers:** Although there has been significant development in recent years, this development has been lower density and typically auto-oriented (which is contrary to the vision of several communities along the corridor).
- **Existing Street connectivity is poor around commercial centers:** Within the activity zones, there are large "mega-blocks" around commercial development. This development pattern limits access and does not support a pedestrian friendly environment. **Figure 4-5** shows the existing links and nodes at Beacon Hill Station.

The corridor needs a clear plan for investment in transportation services and infrastructure that will accommodate expected growth (mix of uses and residents) and provide the basis for ongoing private investment in the corridor. It also needs to define coordinated land use and transportation policies and programmed improvements to facilitate high capacity transit investment and appropriate transit oriented development.

Figure 4-5: Beacon Station Area Street Network: Existing Links and Nodes

4.5 Goals and Objectives

Goals and objectives for the Route 1 Multimodal Alternatives Analysis emerge from the problems and needs. Goals are overarching outcomes desired in satisfying the stated needs. Goals relate to and reflect agency policies and community values. Objectives are specific, measurable steps toward achieving the larger goals.

GOAL 1: Expand attractive multimodal travel options to improve local and regional mobility

Objectives:

- Increase transit ridership
- Improve transit to reduce travel times and increase frequency, reliability, and attractiveness
- Increase transportation system productivity (passengers per hour) within the corridor
- Increase comfort, connectivity, and attractiveness of bicycle and pedestrian networks to and along the corridor
- Integrate with existing and planned transit systems and services

GOAL 2: Improve safety; increase accessibility

Objectives:

- Provide accessible pathways to and from transit service and local destinations
- Reduce modal conflicts
- Improve pedestrian crossings
- Maintain traffic delays at acceptable levels

GOAL 3: Increase economic viability and vitality of the corridor

Objectives:

- Increase and improve connectivity to local and regional activity centers
- Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives
- Secure public and investor confidence in delivery and sustainability of new transit investments
- Provide high-capacity transit facilities at locations where existing and future land uses make them mutually supportive

GOAL 4: Support community health and minimize impacts on community resources

Objectives:

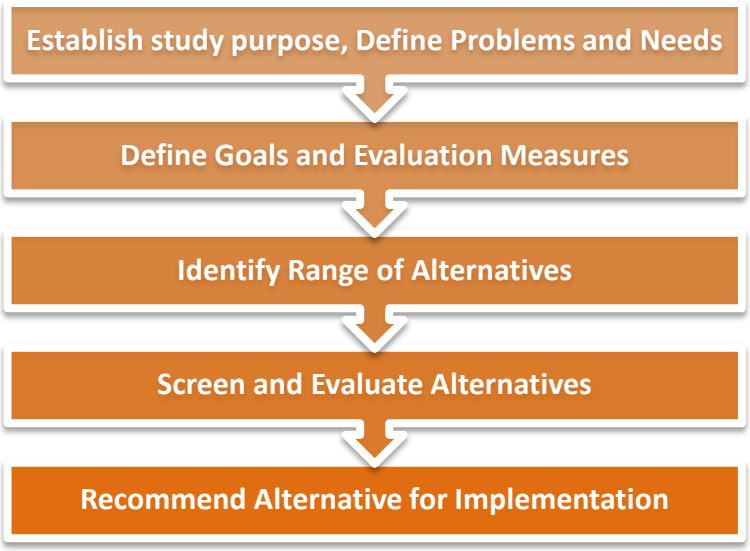
- Minimize negative impacts to the natural environment
- Contribute to improvements in regional air quality
- Increase opportunities for bicycling and walking to improve health and the environment

These goals serve as the basis for development of the alternatives, which are described in the subsequent sections.

5.0 Evaluation Overview

This alternatives analysis follows the typical approach. It first identifies an inclusive set of transportation ideas based on previous studies, input from stakeholders, and the review of problems and needs. From this range of alternatives the most appropriate to the study corridor are highlighted and carried forward for refinement and further screening and evaluation. The evaluation is based on an agreed upon set of criteria. The goal is to arrive at a recommended alternative at the end of the process. **Figure 5-1** provides an overview of the evaluation process.

Figure 5-4-1: Evaluation Process



The alternatives development process involves three levels of evaluation to define the recommended alternative:

Screen 1 - Basic Requirements: Evaluates a wide range of transit, vehicular lane, and bicycle and pedestrian alternatives using basic project requirements according to broad principles based on the project Purpose and Need. In order to be considered minimally viable, alternatives must:

1. Improve attractive multimodal travel by improving transit travel time (over the existing) and providing attractive bicycle and pedestrian accommodation.
2. Increase the economic viability and vitality of the corridor by supporting and advancing local land use objectives.
3. Increase public and investor confidence in delivery and sustainability of new transit investments.
4. Support competitive transit options by integrating with existing or planned regional transit systems.

Alternatives that meet these prerequisites are advanced and identified as “initial alternatives”.

Screen 2 - Qualitative and Quantitative Measures: Evaluates the initial transit, vehicular lane, and bicycle/pedestrian alternatives using key indicators and evaluation measures based on goals and objectives and competitiveness for federal funding; initial alternatives are either eliminated or carried forward for further evaluation.

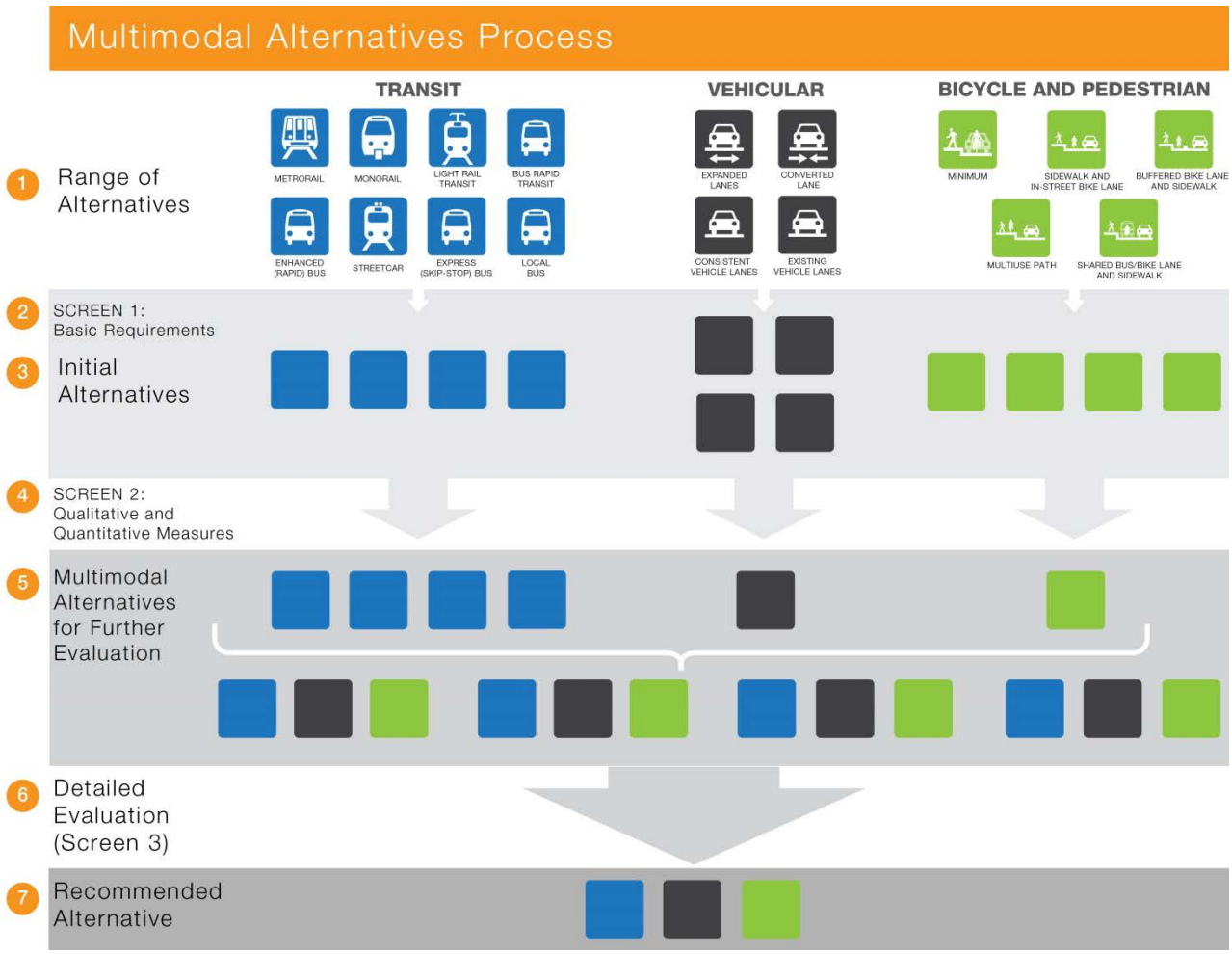
Screen 3 - Detailed Evaluation: Evaluates four multimodal alternatives using measures based on project goals and objectives and project implementation factors. The four multimodal alternatives were developed by combining the best vehicular lane configuration and bicycle and pedestrian facility alternatives with three transit modes.

Evaluation measures were developed in coordination with the project management team, elected officials, technical advisors, and community measures. The needs as well as the goals and objectives served as the basis for developing the evaluation criteria and performance measures.

At the conclusion of the detailed evaluation, Screen 3, the project team recommends a multimodal alternative to advance towards project implementation. This program of improvements is expected to be adopted by the counties as a Locally Preferred Alternative.

Figure 5-2 shows the development and screening process.

Figure 5-2: Overview of Multimodal Alternatives Development and Screening Process



6.0 Initial Alternatives

Alternatives in three different mode categories were developed and evaluated:

- **Transit technology:** Broad range of potential transit technologies (local bus to heavy rail)
- **Vehicular Travel lanes:** Variations on number and arrangement of general purpose travel lanes
- **Bicycle and Pedestrian**: Broad range of bicycle and pedestrian accommodation options

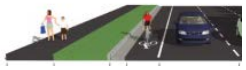
From the broad range of possible approaches to addressing transportation needs, a set of initial alternatives emerged based on their conformance to minimum requirements. The following sections describe the development and evaluation of these initial alternatives.

6.1 Bicycle and Pedestrian Alternatives

Four initial bicycle and pedestrian alternatives were developed and evaluated. The alternatives include:

1. **Minimum Accommodation- shared vehicle lane:** Sidewalk and no dedicated bike lane. Bicycle would be permitted in general purpose travel lane.

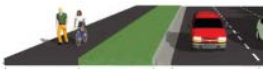
2. **Sidewalk and In-Street Bike Lane:** The sidewalk and in-street bike lane alternative proposes separate rights-of-way for pedestrians and bicyclists.



3. **Shared Bus/Bike Lane and Sidewalk:** The shared bus/bike lane and sidewalk alternative proposes separate rights-of-way for pedestrians and bicyclists.

4. **Buffered Bike Lane and Sidewalk:** The buffered bus/bike lane and sidewalk alternative proposes separate rights-of-way for pedestrians and bicyclists.

5. **Multiuse Path (Bicycle and Pedestrians):** The multiuse path alternative proposes a shared right-of-way for pedestrians and bicyclists.



The *Minimum Accommodation Alternative* was eliminated after failing to meet the minimum project requirements, as it did not provide facilities for bicyclists.

For the remaining four alternatives, three major considerations inform the recommendation:

1. Safety and comfort for cyclists of all abilities
2. Possible to implement incrementally/ flexibility over time
3. Right-of-way requirements and potential impacts on properties and community resources

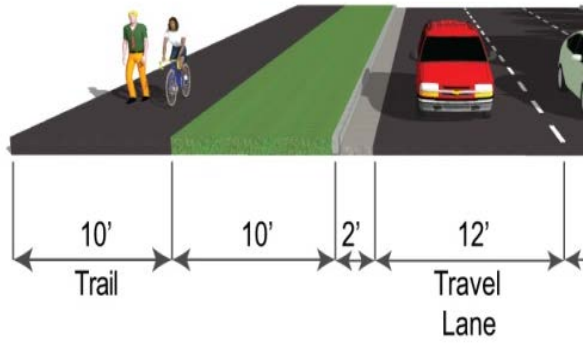
Table 6-1 summarizes the key tradeoffs of the four alternatives. The table shows that the Multiuse Path alternative best provides a safe bicycle facility, given the current posted speed limit along Route 1, and best pedestrian accommodations while minimizing impacts on right-of-way. **Figure 6-1** shows the recommended alternative.

Implementation of the recommended section will likely vary along the corridor due to availability of right-of-way, adjacent development, and other considerations. Given the 15 mile length of the corridor and the different land use characteristics along different segments of the corridor, no single solution for bicycle/pedestrian facilities is likely to be implemented for the full length of the corridor. In station areas, where multi-story buildings are constructed along Route 1, sidewalks for pedestrians and on-street bicycle facilities are appropriate. Other sections of Route 1 outside the station areas may have multiuse paths or on-street bicycle lanes as determined by right-of way availability and other considerations. The new DRPT Multimodal System Design Guidelines should be used in the final determination of the appropriate bicycle and pedestrian facility.

Table 6-1: Pedestrian and Bicycle Facility Alternatives

	In-street bike lane and sidewalk	Shared bus/bike lane and sidewalk	Buffered bike lane and sidewalk	Multiuse path
Provides access along full corridor	Improves walk & bike access to destinations	Improves walk & bike access to destinations	Improves walk & bike access to destinations	Improves walk & bike access to destinations
Provides safety and comfort given high auto speeds and volumes	In-street bike lane not recommended for 45 mph+	Shared bike/travel lane not recommended for 45 mph+	Bike lane buffered from 45 mph traffic	Bike lane buffered from 45 mph traffic with curb and landscape strip
Requires additional right-of-way	Requires some new ROW	Requires little new ROW	Requires significant new ROW	Requires some new ROW

Figure 6-1: Recommended Bicycle and Pedestrian Facility: 10-foot Multiuse Path



6.2 Vehicular Lane Alternatives

The purpose of the vehicle lane analysis is to confirm that six general purpose travel lanes along the majority of the corridor would support the projected increase of traffic volume in 2035; this recommendation is referred to as the "Consistent Lanes" alternative, as it assumes improvements identified in the VDOT Centerline Study (1998). A six general purpose lane configuration is consistent with the Fairfax County Comprehensive Plan. **Figure 6-2** shows the proposed cross-section.

Figure 6-2: Consistent Lane Configuration

The Consistent Lane Alternative was compared to three additional alternatives:

- **Existing Lanes:** Retains the varied cross section as presently built. In general, there are two travel lanes in each direction in the southern segment, and three travel lanes in each direction in most of the northern segment.

- **Expanded Lanes:** Adds an additional lane, making the majority of the corridor a four lane per direction configuration (although some areas are expanded from two to three lanes).This alternative is also the widest cross-section.

Expanded Lanes

- **Converted Lanes**: Repurposes one existing travel lane per direction to serve as a managed lane for transit and potentially other high occupancy vehicles.

Converted Lanes

The four travel lane alternatives met the minimum requirements and were evaluated using three major considerations:

1. Forecasted future traffic volumes and operational impacts along the corridor.
2. Pedestrian conditions: pedestrian-friendly environments are associated with shorter crossing distances.
3. Right-of-way requirements and potential impacts on properties and community resources.

The key evaluation measures summarized above serve to balance these considerations. Taken together they lead to an alternative for travel lanes that:

- Accommodates future traffic while being informed by pedestrian accessibility; and
- May require additional right-of-way but avoids the most pronounced impacts to properties and resources.

Table 6-2 summarizes the evaluation findings of the four initial alternatives. The table shows that the Consistent Lanes Alternative best accommodates future traffic while minimizing right-of-way needs. This alternative is also consistent with the Fairfax County and Prince William County Comprehensive Plans and findings from the VDOT Center Line Study (1998). **Figure 6-3** shows the recommended section. Further detail on traffic analysis is contained in the Traffic and Transportation Report.

Table 6-2: Vehicular Lane Evaluation

	Existing	Consistent Lanes	Expanded Lanes	Converted Lanes
Intersection Performance	4 intersections with LOS E or worse	3 intersections with LOS E or worse	No Intersections with LOS E or worse	10 intersections with LOS E or worse
Right-of-Way (ROW) Impacts	Moderate ROW impacts	Moderate ROW impacts	Significant ROW impacts	Few ROW impacts
Pedestrian Accommodation	Varies, inconsistent along the corridor	Moderate pedestrian crossings	Longest pedestrian crossings	Shortest pedestrian crossing
Consistency with Local Plans	Not included in previous plans	Consistent with Fairfax County Comprehensive Plan; Previous VDOT study recommendations	Not included in previous plans	Not included in previous plans

[5] For convenience in describing the varying typical sections within the study area, the, corridor is divided into:
(North) - the North section from I-495 to Mount Vernon Highway;
(Middle) – the central segment of the corridor from Mount Vernon Highway to Telegraph Road;
(South) - the Southern segment extends from Telegraph Road to VA 123

Figure 6-3: No Build/Consistent Lanes Alternative

6.3 Transit Alternatives

6.3.1 Range of Transit Alternatives

Several transit alternatives were considered and screened based on the minimum project requirements. Four alternatives did not meet the minimum project requirements and were not advanced for further evaluation. Alternatives that did not advance include: monorail, streetcar, express/skip stop, and local bus. **Table 6-3** summarizes this preliminary screening.

Table 6-3: Alternatives Failing to Meet Principles Based on Purpose and Need (Screen 1)

	Improves transit travel time or provides attractive multimodal accommodations	Increases economic viability and vitality of corridor	Increases public and investor confidence in delivery and sustainability of investment	Integrates with existing or planned regional transit systems
Metrorail	✓	✓	✓	✓
Monorail	✓	✓	X	X
Light Rail Transit	✓	✓	✓	✓
Bus Rapid Transit	✓	✓	✓	✓
Enhanced (or rapid) bus	✓	✓	✓	✓
Streetcar	X	✓	✓	✓
Express/skip stop bus	X	X	✓	✓
Local bus	X	X	✓	✓

6.3.2 Initial Transit Alternatives

The four transit alternatives that met the minimum requirements and were advanced for evaluation in Screen 2 include:

- **Metrorail:** operates on an electric railway. It is characterized by high speed and rapid acceleration passenger rail cars, a dedicated right-of-way separate from other modes, sophisticated signaling, and high platform loading (APTA *Mode of Service Definitions*, 2014).

- **Light Rail Transit (LRT):** LRT operates with passenger rail cars (usually in either in one-, two-, or three-car trains) on fixed rails in right-of-way that is often separated from traffic for most or part of the way. Light rail vehicles operate using electric power from an overhead electric line via a trolley or pantograph, are driven by an operator on board the vehicle, and feature high or low level platform loading (APTA *Mode of Service Definitions*, 2014).

- **Bus Rapid Transit (BRT):** BRT operates with roadway vehicles powered by diesel, gasoline, battery, or alternative fuel engines contained within the vehicle. Vehicles operate on streets and roadways in fixed-route and regular service, with "rapid transit" indicating that buses operate along a dedicated right-of-way for most or part of the route (APTA *Mode of Service Definitions*, 2014).

- **Enhanced Bus:** Enhanced Bus operates with roadway vehicles. Vehicles operate on streets and roadways in fixed-route and regular service, with "enhanced" indicating that buses make limited stops and operate at more frequent headways than local buses (APTA *Mode of Service Definitions*, 2014).

For the purposes of Screen 2, all alternatives were assumed to operate along the full 15-mile corridor. Preliminary station stop locations were identified for each transit technology (see **Figure 6-4**). To compare alternatives fairly, a consistent policy service level of 6 minute headways in the peak and 12 minute headways in the off-peak periods was assumed for all alternatives. The *Traffic and Transportation Report* (June 2014) details assumptions regarding service span, service frequency, operating days and peak and off-peak hours.

Figure 6-4: Initial Alternatives

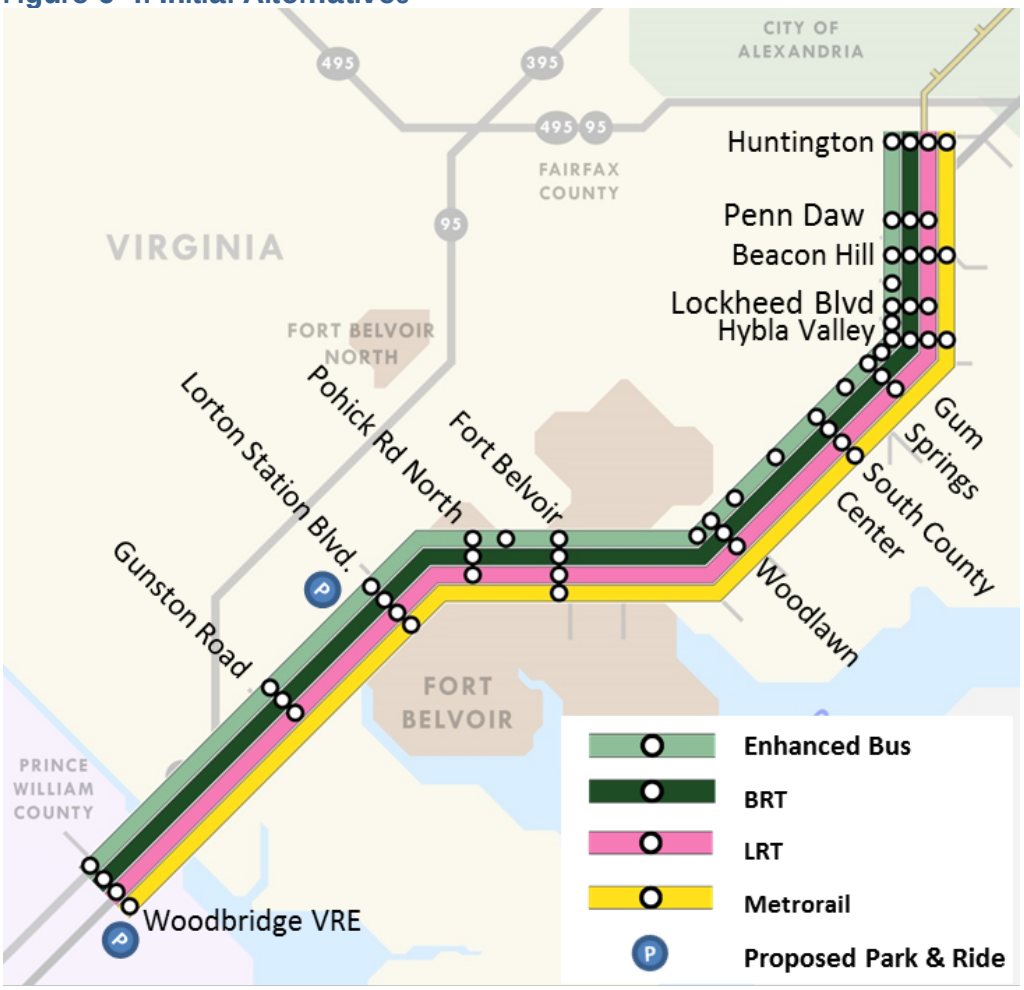


Table 6-4 summarizes the key performance indicators for the initial alternatives. Screen 2 evaluated the performance of each transit alternative in its application along the corridor as a whole from end to end. However, the performance evaluation, coupled with cost considerations, illustrates that a given transit alternative may provide the best performance when used for a portion of the corridor in conjunction with other transit alternatives.

Table 6-4: Key Indicators of Initial Alternatives

	Enhanced Bus	Bus Rapid Transit	Light Rail Transit	Metrorail
Average Weekday Ridership (2035)	9,500	16,600	18,400	38,500
Conceptual Capital Cost*	$12 M / mile ($180 M)	$52 M / mile ($780 M)	$80 M / mile ($1.20 B)	$320 M / mile ($4.80 B)
Annual O&M Cost	$14 M	$17 M	$24 M	$84 M
Cost Per Rider**	$10	$15	$21	$37

*Based on general per mile cost averages.

** Does not represent FTA Cost Effectiveness evaluation.

6.3.3 Initial Transit Alternatives: Key Findings

The key findings and conclusions for each initial transit alternative are discussed below:

- **Enhanced Bus:** Enhanced bus is the lowest-cost alternative, but also attracts the lowest ridership; for areas north of Fort Belvoir, enhanced bus provides similar service as REX and inadequate to support the 2035 population and employment estimate.

- **Bus Rapid Transit:** Bus Rapid Transit (BRT) performs moderately well in transit performance characteristics and is more cost effective than the rail alternatives. BRT was recommended to be further explored, and the performance tradeoffs among configuration options documented: BRT operating in dedicated lane in the curb lane and center median, versus BRT operating in mixed traffic.

- **Light Rail Transit:** LRT performs well in transit performance characteristics and is likely to be a strong catalyst for economic development. LRT is also more cost effective than a full 15-mile Metrorail extension. This alternative was recommended for further evaluation.

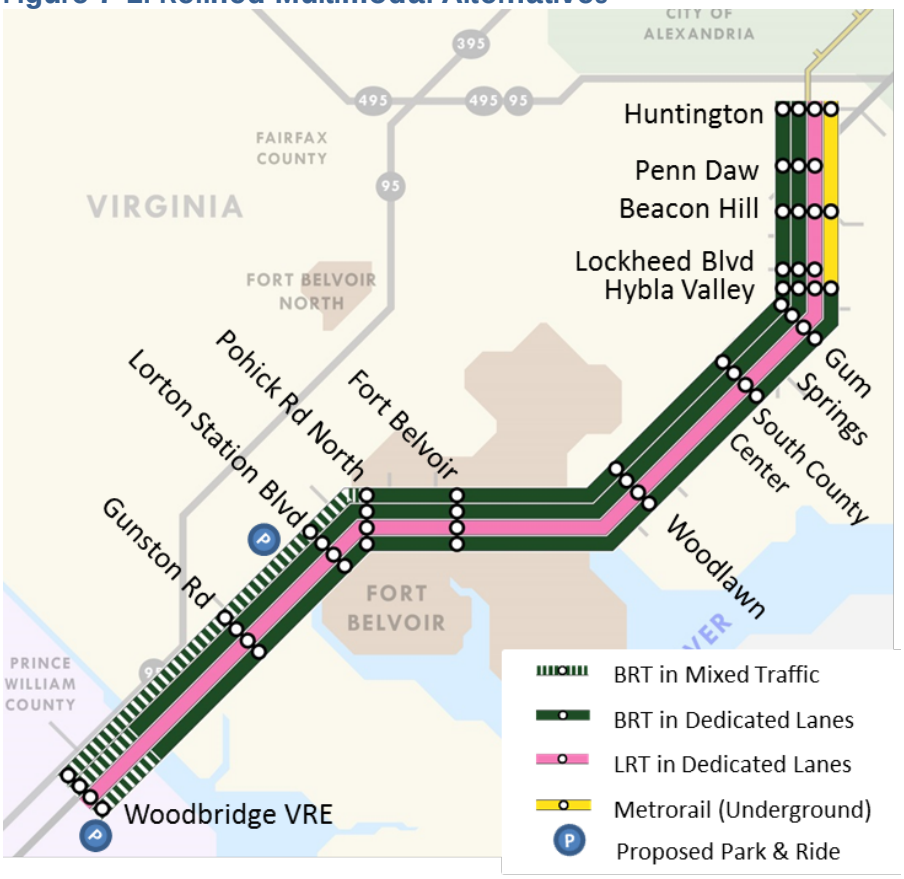
- **Metrorail:** Metrorail performed well in transit performance characteristics and attracted the highest ridership; however due to the extremely high capital cost for the full alignment to Woodbridge, it was considered infeasible. The 2035 activity density levels would not support a Metrorail extension. In the northern section, where population and employment levels are forecasted to be highest along the corridor, a two- to three-mile extension was recommended to be explored. A short Metrorail extension could be complemented by Bus Rapid Transit to Woodbridge.

7.0 Refined Multimodal Alternatives

The best performing initial alternatives from Screen 2 were combined as four multimodal alternatives for detailed evaluation. The four alternatives assume the same vehicular lane and bicycle/pedestrian facility configuration, but the transit mode and operating assumptions vary. The multimodal alternatives assume a consistent, six-lane vehicular lane configuration and a 10-foot multi-use path along the majority of the corridor. The bicycle/pedestrian facility configuration will vary depending upon urban design, right-of-way availability, and other local considerations. The four alternatives are referred to by the transit component (see **Figure 7-1**) and include:

1. Alternative 1 - Bus Rapid Transit – curb running
2. Alternative 2 - Bus Rapid Transit – median running
3. Alternative 3 - Light Rail Transit – median running
4. Alternative 4 - Hybrid – Yellow line extension to Hybla Valley with supporting Bus Rapid Transit (median) to Woodbridge

Figure 7-1: Refined Multimodal Alternatives



All the multimodal alternatives assume the following characteristics:

- 6 minute peak/ 12 min off-peak service headways
- Off-board fare collection
- TSP for peak direction[6]
- Two park and ride facilities (3,000 spaces each) at Lorton Station Blvd and Woodbridge Station

The subsequent sections describe the alternatives in detail, including operating and capital cost assumptions. All costs are reported in 2013 dollars.

7.1 Alternative 1: BRT – Curb

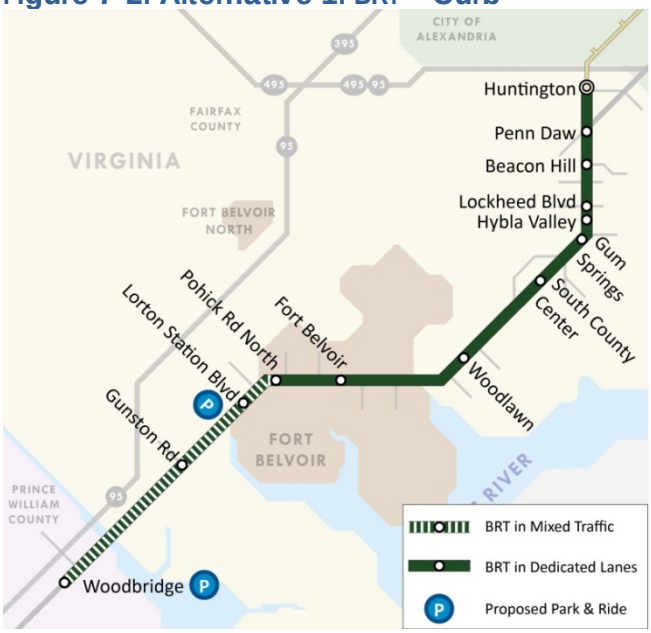
Transit Operations

This alternative assumes BRT service in dedicated outside lanes in the north portion of the corridor (10 miles) to Fort Belvoir. From Fort Belvoir south to Woodbridge, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes (5 miles). **Figure 7-2** shows the station location names and **Figures 7-3** and **7-4** show typical sections.

Capital and Operating Costs

The estimated capital cost for Alternative 1 is $832 million. The annual estimated operations and maintenance cost for Alternative 1 is $18 million.

Figure 7-2: Alternative 1: BRT – Curb



[6] Alternative 1- BRT Curb also assumes queue jump for mixed traffic sections.

Figure 7-3: Alternative 1: BRT – Curb, typical section (Huntington to Fort Belvoir)

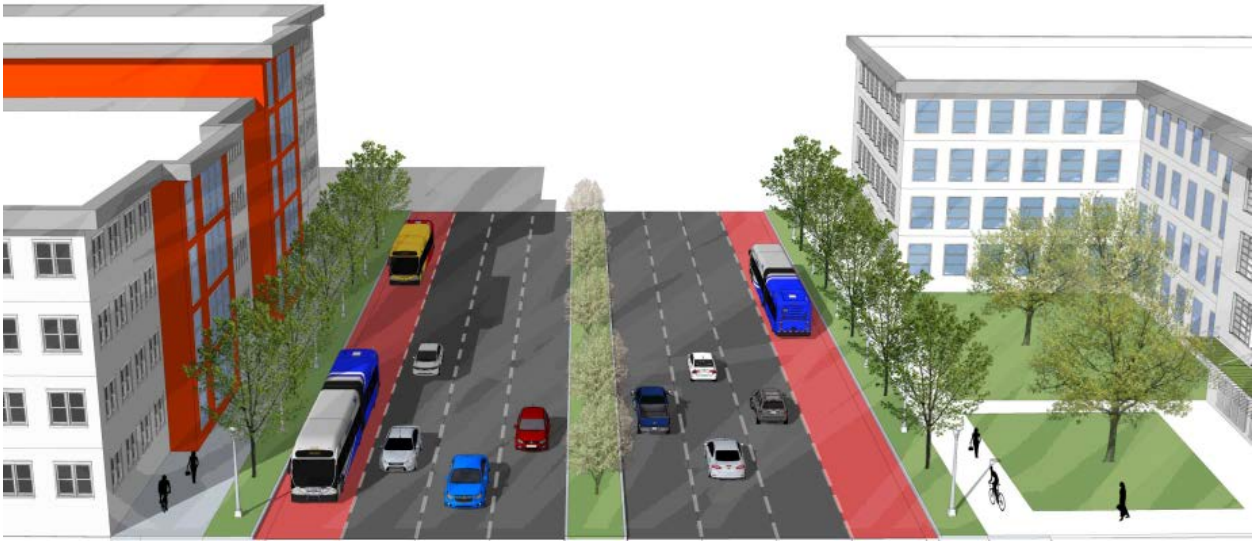


Figure 7-4: Alternative 2: BRT – Curb, typical section (Pohick Road to Woodbridge VRE)

7.2 Alternative 2: BRT – Median

Transit Operations

This alternative assumes BRT operates in the median of Route 1 in dedicated lanes in Fairfax County (14 miles), and transitions to mixed traffic in Prince William County (1 mile). Within Prince William County, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes. **Figure 7-5** shows the station location names and **Figure 7-6** shows a typical section.

Capital and Operating Costs

The estimated capital cost for Alternative 2 is $1.01 billion. The annual estimated operations and maintenance cost for Alternative 2 is $17 million.

Figure 7-5: Alternative 2: BRT – Median

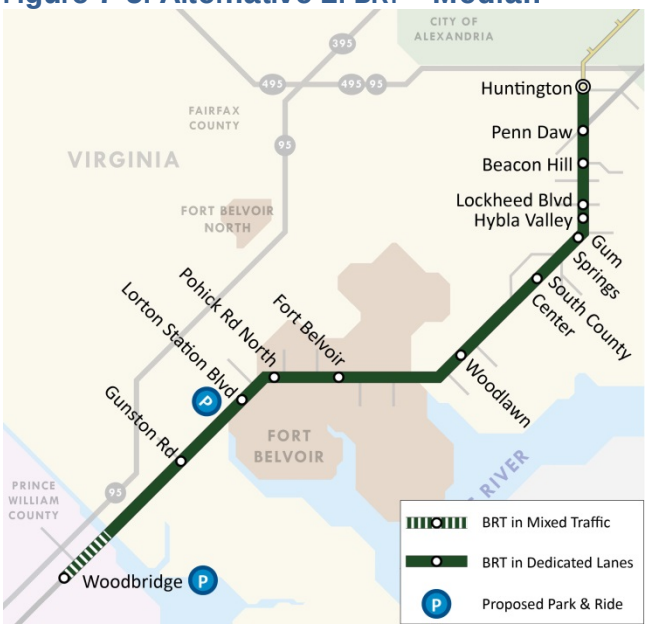


Figure 7-6: Alternative 2: BRT – Median, typical section (Fairfax County)

7.3 Alternative 3: Light Rail Transit

Transit Operations

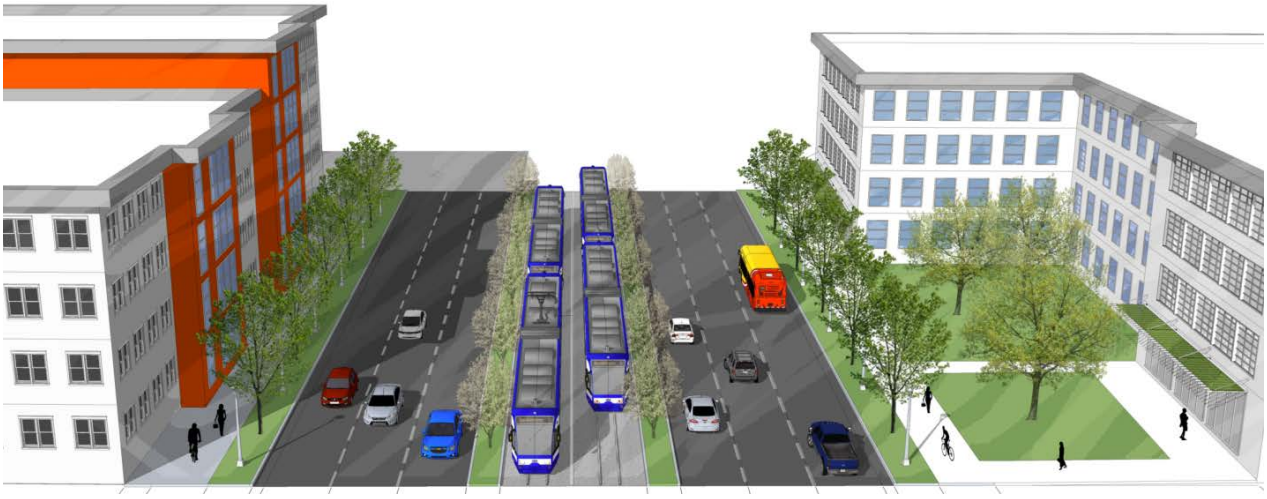
This alternative assumes Light Rail Transit service in a dedicated median transitway for the majority of the corridor (14 miles). In Prince William County, LRT service would be configured in a dedicated transitway parallel to Route 1 (1 mile). **Figure 7-7** shows the station location names and **Figure 7-8** shows a typical section.

Capital and Operating Costs

The estimated capital cost for Alternative 3 is $1.56 billion. The annual estimated operations and maintenance cost for Alternative 3 is $24 million.

Figure 7-7: Alternative 3: LRT

Figure 7-8: Alternative 3: LRT – Median, typical section



7.4 Alternative 4: Metrorail/BRT Hybrid

Transit Operations

This alternative assumes BRT operates in the median in dedicated lanes in Fairfax County (14 miles), and transitions to mixed traffic in Prince William County (1 mile). Across the Occoquan River Bridge and within Prince William County, BRT service would be configured in mixed traffic with special treatments at key locations including transit signal priority (TSP) and queue jump lanes. **Figure 7-9** shows the station locations. In the long-term, this alternative assumes a Yellow Line Metrorail Extension underground to Hybla Valley (3.1 miles). **Figure 7-10** shows the typical section for BRT and **Figure 7-11** shows the typical section for Metrorail extension.

Capital and Operating Costs

The estimated capital cost for Alternative 4 is $2.46 billion in 2013 dollars. The annual estimated operations and maintenance cost for Alternative 4 is $34 million in 2013 dollars.

Figure 7-9: Alternative 4: Metrorail/BRT Hybrid

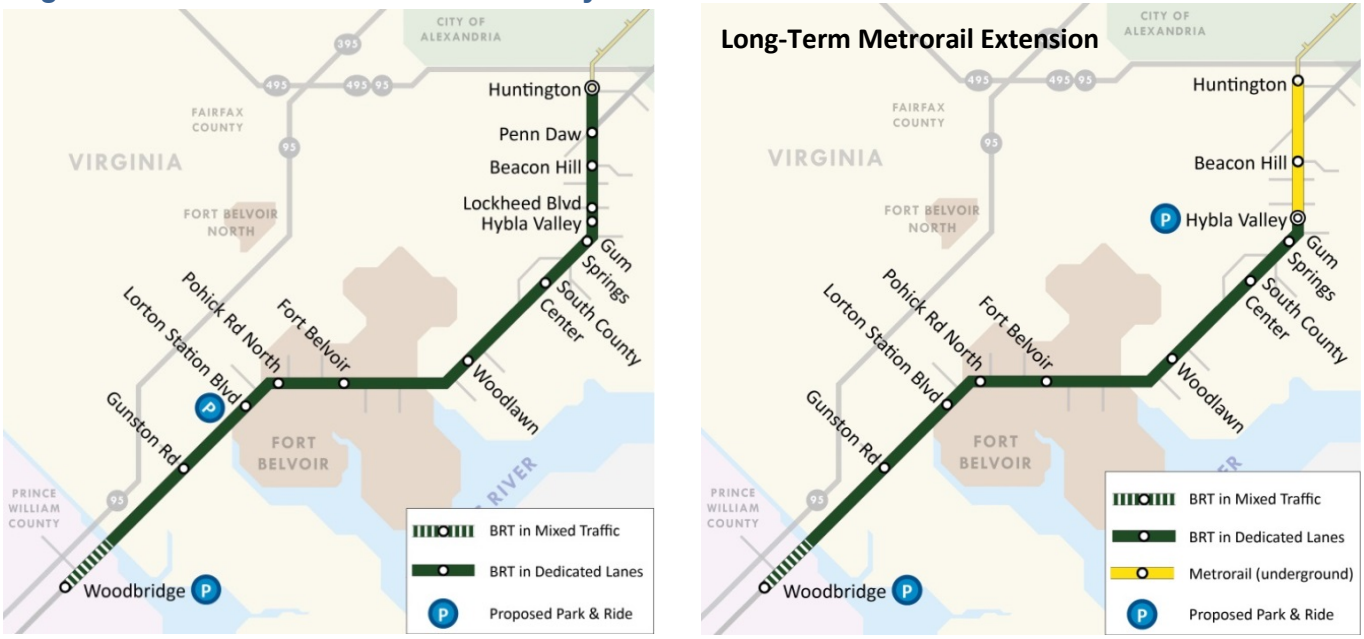
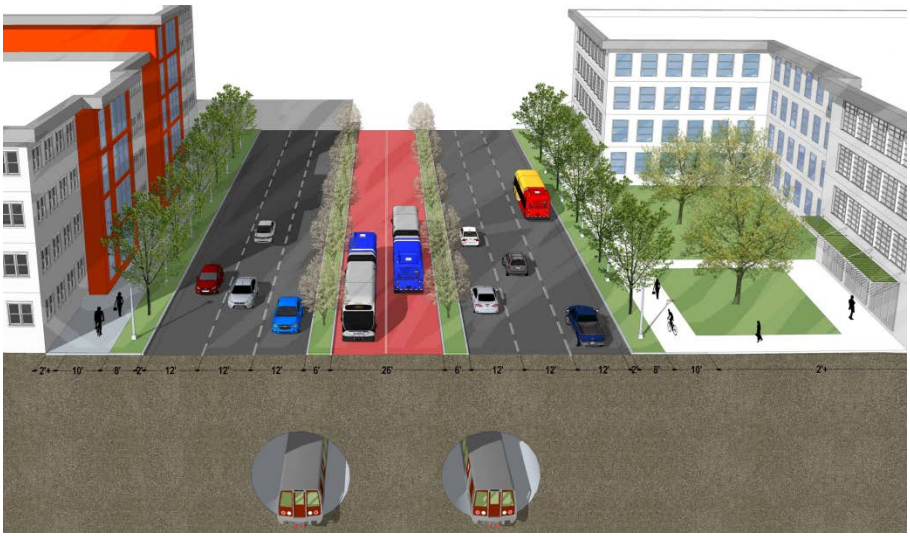


Figure 7-10: Alternative 4: Metrorail/BRT Hybrid – Median, Typical Section (Hybla Valley to Woodbridge)

Figure 7-11: Alternative 4: Metrorail/BRT Hybrid – Underground, typical section (Yellow line extension)



8.0 Evaluation of Multimodal Alternatives

8.1 Introduction and Summary of Findings

The goal of the evaluation is twofold:

1. Assess how well each alternative addresses the project goals and objectives
2. Assess feasibility of implementing each alternative (requirements articulated by public participants, elected officials, and technical staff)

The first evaluation considers the ability of each alternative to meet the project goals and objectives, as described in Chapter 4. This is performed using identified evaluation measures that provide either quantitative or qualitative data on how well each alternative meets the goals.

The second evaluation is a qualitative assessment of the feasible timing for implementation and financial feasibility of each Alternative. The evaluation focuses on development levels appropriate to the type of transportation investment, and ability to secure funding for recommended improvements.

8.1.1 Summary of Findings

The study team recommends a phased implementation of the multimodal (roadway, bicycle/pedestrian, and transit) improvements of "Alternative 4- BRT/Metrorail Hybrid", including:

- **Roadway Widening**: Widen roadway from four lanes to six lanes where necessary to create a consistent, six-lane cross section along the corridor.
- **Bicycle and Pedestrian Facilities:** Create a continuous facility for pedestrians and bicyclists along the 15 mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations.
- **Transit:** Contingent upon increased land use density and project funding, implement a median-running Bus Rapid Transit (BRT) system from Huntington to Route 123 in Woodbridge (curb-running BRT in mixed traffic within the Prince William County portion) and a 3-mile Metrorail Yellow Line extension from Huntington to Hybla Valley as expeditiously as possible.

Table 8-1 presents the evaluation results that support this technical recommendation.

Table 8-1: Evaluation of Alternatives Summary

Evaluation Factors (Goals)	Alternative 1: BRT-Curb	Alternative 2: BRT-Median	Alternative 3: LRT	Alternative 4: Metrorail-BRT (Hybrid)
Goal 1: Local and Regional Mobility	0.7	0.8	0.8	**1.00**
Goal 2: Safety and Accessibility	0.7	**0.8**	**0.8**	**0.8**
Goal 3A: Economic Development	0.6	0.6	0.6	**0.7**
Goal 3B: Cost Effectiveness	**1.0**	0.9	0.7	0.5
Goal 4: Community and Health Resources	0.7	0.7	0.7	**0.8**
Ability to Meet Project Goals Average	**0.7**	**0.8**	**0.7**	**0.8**

The next sections summarize the key findings by evaluation factor and present tables that show the comparative measures. Explanatory text for each measure is provided below the summary tables. Further detail on the technical methods that support the quantitative measures is presented in the following related reports:

- *Traffic and Transportation Report*
- *Land Use and Economic Development Report*
- *Preliminary Funding Analysis Report*
- *Environmental Scan Report*

8.2 Ability to Address Project Goals and Objectives

At the beginning of this Alternatives Analysis study, goals and objectives were established to help guide development of the alternatives. The goals and objectives were created through public and stakeholder involvement and reflect the underlying locally adopted land use and transportation plans. The goals represent the combined vision of policy-makers, stakeholders, and members of the community.

In this evaluation each alternative is assigned a score for each measure, shown in grey text below each set of results. The best performing alternative for each measure receives a perfect score of 1.0. The other alternatives are assigned values relative to the best score. This methodology provides proportional comparison of the alternatives against one another.

For each goal, specific measures are weighted more heavily than others, indicated by bold text. The weighting reflects input received from participants at the March 2014 public, results of a public survey posted on the project website from March 26 to April 26, 2014, and professional judgment of Project Management Team staff.

8.2.1 Goal 1 Evaluation and Summary

Goal 1:	**Expand attractive multimodal travel options to improve local and regional mobility**
Objectives:	Increase transit ridership Improve transit to reduce travel times Increase transportation system productivity Improve bicycle and pedestrian networks Integrate with other transit service

Key Results:

- All alternatives improve local and regional mobility by providing improved transit and bicycle/pedestrian facilities and connecting to the regional transit network
- Projected daily project ridership in 2035 ranges from 15,000-27,000; Alternative 4 attracts the highest ridership
- Transit travel time savings are greatest for alternatives that operate in dedicated right-of-way (Alternatives 2, 3, and 4)

Summary of Findings:
Compared to the other alternatives, Alterative 4 provides the greatest improvement to corridor mobility. Alternative 4 attracts the highest ridership, carries the most people along the corridor, and provides a slightly faster travel time. Alternative 4 performs best under this goal due to Metrorail's relatively higher operating speed and direct connection with the regional rapid transit network. Because the transit vehicles operate in dedicated lanes in the median, Alternatives 2 and 3 provide greater travel

time savings than Alternative 1. All alternatives provide improved bicycle and pedestrian improvements and connect to the regional transit system. The evaluation results are presented in **Table 8-2**.

Table 8-2: Goal 1 - Expand Attractive Multimodal Travel Options to Improve Local and Regional Mobility

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Daily project ridership (2035)*	15,200	16,600	18,400	26,500* (BRT 10,600; Metro 22,900)
	0.57	0.63	0.69	1.00
Number of new transit riders	1,500	2,000	2,500	4,750
	0.32	0.42	0.53	1.00
Number of transit dependent riders*	5,157	5,438	5,788	6,350
	0.81	0.86	0.91	1.00
Transit Travel Time Savings (Ft Belvoir to Huntington Metro Station)*	6 min	9 min	9 min	10 min
	0.59	0.85	0.92	1.00
Average transit person throughput	1,050	1,180	1,360	2,600
	0.40	0.45	0.52	1.00
Ratio of transit person throughput to total person throughput, peak hour	26%	28%	32%	47%
	0.55	0.60	0.68	1.00
Number of riders who walked to access transit	4,700	5,000	5,200	5,200
	0.90	0.96	1.00	1.00
Provides improved bicycle and pedestrian facilities	High	High	High	High
	1.00	1.00	1.00	1.00
Provides connections to regional transit network*	Connects to Huntington Metro Station	Connects to Huntington Metro Station	Connects to Huntington Metro Station	Connects to Huntington Metro Station
	1.00	1.00	1.00	1.00
Average Score	**0.70**	**0.78**	**0.83**	**1.00**

*Measure given double weighting in the Average Score

8.2.2 Goal 2 Evaluation and Summary

Goal 2:	**Improve safety; increase accessibility**
Objectives:	Provide accessible pathways Reduce modal conflicts Improve pedestrian crossings Maintain traffic delays at acceptable levels

Key Results:

- All alternatives assume construction of additional lanes or guideway for transit vehicles, and therefore have comparable, relatively minor impacts on traffic operations.
- Alternative 1 operates in the curb lane, providing superior pedestrian access to stations, but results in slower travel time and precludes a future on-street bike lane.
- Alternative 1 operates in the curb lane; frequent curb cuts and access points along Route 1 degrade reliability of the transit service.
- Alternatives 1 and 4 have the narrowest roadway section which minimizes the total distance of exposure for a pedestrian crossing the street.

Summary of Findings:
This goal relates to the performance of the overall transportation system; it compares the alternatives in terms of network performance and access to corridor destinations. All of the alternatives have been developed to improve accessibility and safety.

This goal highlights the key trade-offs between median-running and curb-running transit, including pedestrian accessibility to stations, travel time, transit reliability, and flexibility for a future on-street bike lane. Alternative 1 operates in the curb lane, and Alternatives 2, 3, and 4 operate in the median. Although curb-running transit allows convenient pedestrian access to stations, it can lead to greater variability and slower travel times for transit and traffic because it shares its dedicated lane with local buses as well as cars making right turns. In general, traffic evaluation results show that impacts to the auto network are similar for curb-running versus median-running transit. However, in practice curb-running transit introduces more friction from an operations perspective; median-running transit preserves dedicated transit operations and allows different access and urban design approaches as property along Route 1 is developed and redeveloped.

With implementation of bike lanes, curb-running transit also introduces points of conflict between transit vehicles and bicycles and between transit passengers and bicyclists.

The evaluation results are presented in **Table 8-3**.

Table 8-3: Goal 2 Evaluation – Improve Safety and Increase Accessibility

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Pedestrian access to station stops*	Medium 0.60	Medium 0.60	Medium 0.60	Medium 0.60
Pedestrian crossing time (including signal delay)*	102 sec 0.95	116 sec 0.84	116 sec 0.84	97 sec 1.00
Automobile travel time (minutes during peak hour, Ft. Belvoir to Huntington Station)	24.0 0.99	23.7 1.00	24.0 0.99	23.7 1.00
Automobile network delay, Ft. Belvoir and Hybla Valley test segments (vehicle hr/hr)*	466 0.99	468 0.98	460 1.00	468 0.98
Traffic impacts due to turning vehicles (left turns)	Minimal impact 0.80	Moderate impact 0.40	Moderate impact 0.40	Moderate impact 0.40
Impacts due to turning vehicles (right turns)	Significant impact 0.20	No impact 1.00	No impact 1.00	No impact 1.00
Preserves flexibility for bike lane in higher activity nodes	Less flexible 0.40	More flexible 0.80	More flexible 0.80	More flexible 0.80
Average Score	**0.71**	**0.79**	**0.79**	**0.82**

*Measure given double weighting in the Average Score

8.2.3 Goal 3 Evaluation and Summary

Goal 3:	**Increase economic viability and vitality of the corridor**
Objectives:	Increase and improve connectivity to local and regional activity centers Encourage and support compact, higher density, mixed use development consistent with local plans, policies, and economic objectives Secure public and investor confidence in delivery and sustainability of new transit investments Provide high-capacity transit facilities at locations where existing and future land uses make them mutually supportive

This goal encompasses two distinct categories of measures; results and findings are summarized under these two categories:

3A: Ability to support corridor economic development, and
3B: Cost effectiveness

Key Results for 3A:

- Alternatives 3 and 4 offer the greatest transit travel time savings, suggesting that these alternatives could increase the pace of new development built in the corridor and lead to additional new commercial development.
- All of the alternatives provide improved access to jobs and access by employers to workforce.
- Alternatives 1 and 2 have a higher probability of commencing operations within ten years. Alternatives 3 and 4 would not be operational within the next ten years given the greater engineering and construction requirements.

Key Results for 3B:

- Alternatives 3 and 4 are the most expensive to construct and operate, as well as the least cost effective.

Summary of Findings, 3A:

This goal relates to both the viability of implementing the alternatives, and their utility as catalysts for development in the corridor. Alternative 2 performs best overall under this goal because it is relatively affordable, provides good support for development plans, and is more flexible than Alternative 1 to accommodate future conversion to a rail technology.

All alternatives improve corridor mobility by improving travel time and increasing accessibility; Alternative 4 performs highest in terms of supporting and potentially spurring economic development for the corridor because of its benefits to corridor mobility. This relationship between transportation and economic development suggests that as all alternatives improve corridor mobility, all will contribute

and support economic development in the corridor. In terms of land redevelopment and the potential for a supporting street network expansion, literature reviews suggest that rail alternatives (Alternatives 3 and 4) are a stronger catalyst.

The evaluation results are presented in **Table 8-4**.

Table 8-4: Goal 3a Evaluation – Economic Development

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Tendency to encourage additional development*	Medium-Low	Medium	High	Medium-High
	0.50	0.60	0.80	0.70
Tendency to accelerate pace of development	Some potential to increase pace of development	Some potential to increase pace of development	More potential to increase pace of development	More potential to increase pace of development
	0.50	0.70	0.80	0.80
Per passenger O&M cost savings associated with increased population and employment growth	$0.75	$0.68	$1.14	$0.86
	0.66	0.60	1.00	0.75
Jobs within 60 minutes (change over No Build)*	636	920	1,163	2,878
	0.22	0.32	0.40	1.00
Potential to begin transit operations within 10 years**	High	High	Low	BRT portion is high; Metrorail is Very Low
	0.8	0.8	0.4	0.5
Average Score	**0.56**	**0.62**	**0.60**	**0.72**

*Measure given double weighting in the Average Score
**Measure given triple weighting in the Average Score

Summary of Findings, 3B:

This area relates to the cost of implementing the alternatives. Alternatives 1 and 2 are less capital and operating cost intensive, while Alternative 4 is the most capital and operating cost intensive. Cost effectiveness follows the same general trend.

The evaluation results are presented in **Table 8-5**.

Table 8-5: Goal 3b Evaluation -- Cost Effectiveness

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Estimated capital cost ($)*	$832 M ($10M Ft Belvoir Shuttle)	$1.01 B ($10M Ft Belvoir Shuttle)	$1.56 B ($10M Ft Belvoir Shuttle)	$2.46 B (Metro $1.46B; BRT $1B; Ft Belvoir Shuttle $10M)
	1.00	0.83	0.53	0.34
Estimated annual O&M cost ($)*	$18 M (BRT: $13M, Ft Belvoir Shuttle: $5M)	$17 M (BRT: $12M, Ft Belvoir Shuttle: $5M)	$24 M (LRT: $19M; Ft Belvoir Shuttle: $5M)	$31 M (Metro: $17M; BRT: $8M; Ft Belvoir Shuttle: $5M)
	0.94	1.00	0.71	0.50
Cost per rider ($) (Annualized capital + operating cost)/ Average of 2015 and 2035 ridership)	$21	$22	$30	$30 (Metrorail: $26; BRT: $32)
	1.00	0.95	0.70	0.70
Average Score	**0.98**	**0.93**	**0.65**	**0.54**

*Measure given double weighting in the Average Score

8.2.4 Goal 4 Evaluation and Summary

Goal 4:	**Support community health and minimize impacts on community resources**
Objectives:	Minimize negative impacts to the natural environment
	Contribute to improvements in regional air quality
	Increase opportunities for bicycling and walking to improve community physical health

Key Results:

- Alternative 1 requires the least additional right-of-way impacts and therefore would affect relatively fewer community resources.
- Alternatives 3 and 4 have the greatest ability to convert auto trips to non-auto alternatives, leading to a greater reduction in Vehicle Miles Traveled (VMT) and diversion of trips from I-95 and I-395 to transit—both of which minimize air quality impacts.
- Alternatives 3 and 4 would lead to the greatest temporary construction impacts. Alternative 4 includes tunneling.
- Alternatives 3 and 4 would add the most to land value which, in turn, could be leveraged to help construct the local street network and fund other supporting services.

Summary of Findings:
This goal relates to both the ability of an alternative to increase transit mode share and decrease automobile use as well as the potential impacts on the environment to the proposed project. Alternative 1 has fewer potential environmental effects because it proposes less right-of-way expansion, while Alternatives 2, 3, and 4 would attract more riders and lead more people to use transit rather than drive.

Several of the measures are drawn from an "environmental scan" conducted for each alternative according to typical approaches for assessing project impacts. Additional detail is provided in the *Environmental Scan Report*.

The evaluation results are presented in **Table 8-6**.

Table 8-6: Goal 4 Evaluation -- Support Community Health and Minimize Impacts on Community Resources

Evaluation Measures	Alternative 1 BRT-Curb	Alternative 2 BRT-Median	Alternative 3 LRT	Alternative 4 Metrorail-BRT (Hybrid)
Change in Vehicle Miles Traveled*	(20,000)	(26,000)	(34,000)	(45,000)
	0.44	0.58	0.76	1.00
Trips diverted from I-95/I-395	700	900	1,200	1,200
	0.58	0.75	1.00	1.00
Temporary Construction Impacts	Least Intensive	Moderate	Intensive	Intensive
	0.40	0.60	0.20	0.20
Ratio of environmental benefits to annualized project cost (FTA criterion)	2.0%	2.2%	1.9%	1.7%
	0.91	1.00	0.86	0.77
Total additional right-of-way required* (number of affected parcels)	20-30	30-40	35-35	30-40
	1.00	0.73	0.67	0.73
Environmental Impacts: Parklands, Cultural Resources, Wetlands	Fewest Impacts	Some impacts	Moderate impacts	Some impacts
	1.00	0.75	0.62	0.75
Average Score	**0.75**	**0.69**	**0.69**	**0.77**

*Measure given double weighting in the Average Score

8.3 Project Implementation Factors

This section of the report focuses on the Project Implementation Factors: critical indicators of successful and timely implementation, and financial feasibility of the project alternatives.

The implementation factors were developed based on input received by public participants at the March 26, 2014, public meeting; County leadership and elected officials during the Executive Steering Committee meeting on March 20, 2014; and technical advisors during the Technical Advisory Committee Meeting on March 6, 2014. Supplemental analysis was undertaken during Summer 2014 to complete a phasing and funding assessment that helped to differentiate the study alternatives and highlight the trade-offs surrounding implementation. The focus was on Alternatives 2 and 4, which performed best in the evaluation against the project goals and objectives.

The implementation factors are organized below as follows:

- **Development levels appropriate to the type of transportation investment**
    - Projected population and employment levels should support the intensity of land use typically associated with the mode.
    - County Comprehensive Plans should reflect the density required to support the mode.
    - A supporting street grid and other public infrastructure and services should be reflected in updated Comprehensive Plans.
- **Ability to secure funding for recommended improvements**
    - The recommended project should be potentially competitive for federal funding through the FTA Capital Investment Program.
    - Project costs should not exceed the reasonable expectation for local funding.

The evaluation and comparison of alternatives according to these factors are described in the subsequent sections.

8.3.1 Development Levels and Supporting Infrastructure

Population and employment levels in the corridor are increasing, and transportation services and infrastructure are necessary to accommodate growth. This assessment seeks to gauge the appropriate transportation investments given the projected levels of development.

Development Factor 1: Anticipated growth levels and appropriate transportation investment

Key Results:

- Alternatives 1 and 2 are most appropriate given the current and anticipated levels of population and employment growth.
- Major changes in the amount and concentration of population and employment growth would be necessary before Alternatives 3 and 4 are viable.

Summary of Findings:

Transportation investments are developed to respond to defined needs. The need for transit service relates to the levels of activity along the project corridor. In other words, a major transit investment must be supported by an appropriate level of population and employment density.

Transit investment can serve as a catalyst for growth in a project corridor, but unless there is a basic level of activity and land value already in place, decision makers run the risk that transit investments are too far ahead of activity levels and service is not utilized to an extent that—in the context of other pressing needs—justifies the expense of the project.

The DRPT Multimodal Design Guidelines describe population and employment density thresholds typically associated with levels of transit service investment. Taking into account the MWCOG projections for population and employment in 2035, and in consideration of the adopted Fairfax County and Prince William County Comprehensive Plans, Alternatives 1 and 2 are the most appropriate near-term transit investments given the projected growth and anticipated development levels. To support Alternatives 3 or 4, there would need to be a different expectation for the level of population and employment growth, and selected revisions to the Comprehensive Plans to accommodate the higher growth levels.

Development Factor 2: County Comprehensive Plans should reflect activity levels and station locations

Key Results:

- At the northern end of the corridor, the current Fairfax County Comprehensive Plan allows for growth levels that would support BRT (Alternatives 1 and 2) or LRT (Alternative 3). Current County Comprehensive Plans for areas south of Fort Belvoir do not generally support a premium transit investment.
- Changes in the planned amount and concentration of development would be necessary before Alternatives 3 and 4 are viable.

Summary of Findings

In consideration of the adopted Fairfax County and Prince William County Comprehensive Plans, Alternatives 1 and 2 are the most appropriate near-term transit investments given the projected growth and anticipated development levels. To support Alternative 3 or the Metrorail extension as part of

Alternative 4, there would need to be a different expectation for the level of population and employment growth, and selected revisions to the Comprehensive Plans to accommodate higher growth levels and associated public infrastructure investment.

The Fairfax County and Prince William County Comprehensive Plans articulate a development vision for the corridor and specify the density levels and FAR planned for this corridor. This study developed a comparison of the Comprehensive Plan development levels with the DRPT Multimodal Design Guidelines activity levels typically associated with transit investment types. BRT alternatives (Alternatives 1 and 2) are generally supported by the Comprehensive Plan activity density levels, while rail alternatives (Alternatives 3 and 4) are not currently supported by the Plans.

With regard to transit station areas, the Fairfax County Comprehensive Plan establishes Community Business Centers along the corridor between Fort Belvoir and Huntington. Transit stations for each of the alternatives have been located according to these clusters of higher-intensity development. Future updates to the Comprehensive Plans would reinforce proposed transit station areas by focusing planned development and investment in these areas.

Development Factor 3: A supporting street grid and other public infrastructure and services

Key Results:

- Traffic analysis shows that with growth levels that support a BRT investment, an enhanced local street grid would be required, including continuous street capacity parallel to Route 1—the equivalent of one or two new two-lane streets (see *Additional Transportation Analysis Report*)
- With growth levels that support Metrorail, more robust local street grid enhancements would be required, including continuous street capacity parallel to Route 1—the equivalent of up to six new two-lane streets.
- To accommodate growth, Route 1 transportation investment must be complemented by other major features including roads, schools, public safety, and parks. Metrorail supportive growth levels require significantly more infrastructure investment than BRT or LRT levels.

Summary of Findings:
A supporting street grid and other public infrastructure and services would need to be in place to support the alternatives and should be reflected in updated Comprehensive Plans. Even though these investments fall outside the formal scope of the Route 1 Multimodal Alternatives Analysis, they are important as the Counties plan for the future development and redevelopment of the Route 1 corridor.

8.3.2 Project Funding

Funding Factor 1: Ability to secure Federal Transit Administration grant funding for recommended transit projects

Key Results:

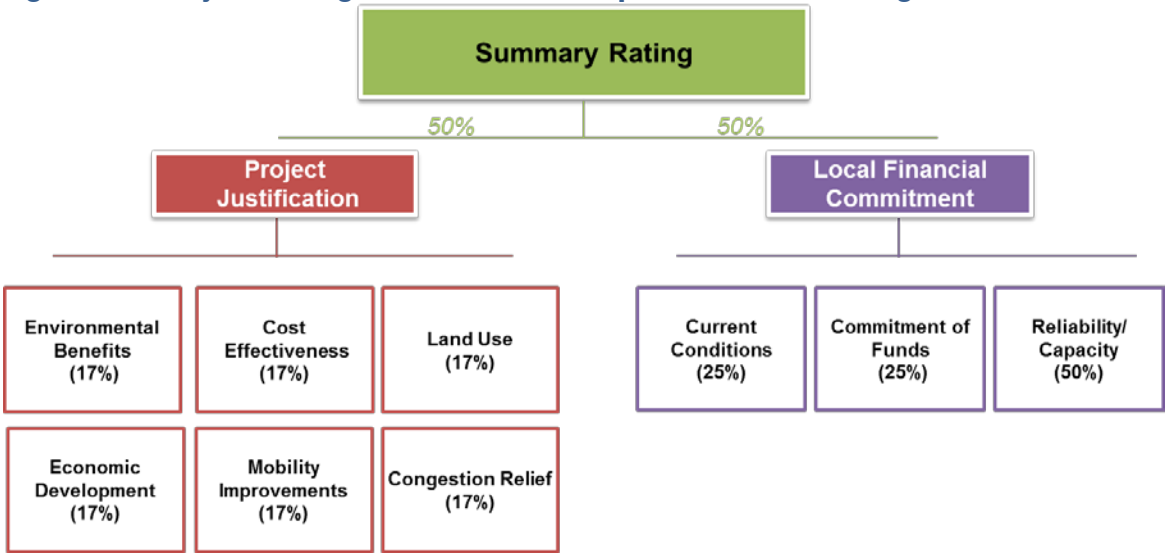
- None of the Alternatives—as a full 15-mile multimodal project—is competitive for a grant through the FTA Capital Investment Program.
- The northern segments of Alternatives 1 and 2, between Fort Belvoir and Huntington, could be competitive for a grant through the FTA Capital Investment Program.
- Alternatives 3 and 4 are more capital-intensive, and would likely not be competitive for FTA grants.
- With significant population and employment growth, and strong growth in transit ridership, a Metrorail extension (Alternative 4) could be competitive for an FTA grant in the long term.

Summary of Findings:

Given constrained local, regional, and state budgets, competitiveness for federal funds is a priority. The transit elements of the recommended multimodal project should be potentially competitive for federal funding through FTA Capital Investment Program, which has typically funded eligible transit projects at 50 percent of project capital costs.

Federal funding competitiveness for the FTA Transit Capital Investment Program is based on Project Justification Criteria and Local Financial Commitment (see Figure 8-1). For each criterion FTA assigns a rating from Low to High; a project must receive at least a Medium rating on both project justification (average of six criteria) and local financial commitment to obtain a Medium or better rating overall.

Figure 8-1: Project Rating Factors for FTA Capital Investment Program



Project Justification Criteria

Regarding Project Justification, several criteria would be consistent across alternatives; differentiators relate to Mobility Benefits (ridership) and Cost Effectiveness (cost per rider). Over the full 15-mile corridor, none of the alternatives performs well for Cost Effectiveness, but the BRT alternatives, Alternatives 1 and 2, come closest to reaching a Medium rating. A shorter initial BRT investment in the northern portion of the corridor is potentially more competitive. Section 9 below provides more detail related to potential performance of the alternatives related to the Project Justification Criteria.

Local Funding Commitment

Over the past ten years, federal funding grants have become increasingly competitive, as more projects apply for the program while the amount of available funding remains generally consistent. Recently updated guidance from the Federal Transit Administration indicates that projects with higher levels of local funding are more competitive and more likely to receive a federal grant.

Programming for locally funded transportation projects in Fairfax County and Prince William County shows commitments to major projects through 2020. After 2020 there are opportunities to commit local funds to a new significant project.

Funding Factor 2: Project costs should not exceed the reasonable expectation for local funding

Key Results:

- Without a strong commitment of funds from Fairfax County and Prince William County, the project will not only be less competitive for federal funding, it will not be feasible. The local funding commitment is an indicator of the likelihood that the project will be implemented in a reasonable time frame**.**
- Alternatives 1 and 2 are the least capital intensive projects and therefore are more easily funded through existing funding sources.
- Alternatives 3 and 4 are more capital intensive, and would exceed the capacity of current programs and funding sources.

Summary of Findings:

The project team developed funding assumptions for each of the Alternatives, and these were presented and discussed with senior County staff. First, these discussions confirmed the assumption that a mix of local, regional, state, and federal funds will be required to implement any of the Alternatives. Second, the project is constrained by the fact that local and regional transportation funding has been programmed and committed to other projects for the next six years (through 2020). Section 9 below provides more detail related to the project funding assumptions.

Beyond 2020, transportation and capital improvement programs will allow for addition of new projects, but there are other committed projects that will limit the amount of funding that may be available for Route 1. Therefore Alternatives 3 and 4, with their high overall capital and O&M costs, would be difficult to implement in the near term. Alternatives 1 and 2 are more likely to be funded in the near term.

9.0 Recommendations

The recommendation is for a phased implementation of the multimodal (roadway, bicycle/pedestrian, and transit) improvements of "Alternative 4 BRT/Metrorail Hybrid". A BRT system would be implemented in phases in the near term and a Metrorail extension would be implemented in the longer term. This section of the report lays out a plan for implementing the technical recommendation.

As described above, implementation of Alternative 4 consists of:

- **Roadway Widening**: Widen roadway from four lanes to six lanes where necessary to create a consistent, six-lane cross section along the corridor (three lanes in each direction).
- **Bicycle and Pedestrian Facilities:** Create a continuous facility for pedestrians and bicyclists along the 15 mile corridor; the configuration will vary depending upon urban design, right-of-way availability, and other local considerations.
- **Transit:** Contingent upon increased land use density and project funding, implement a median-running Bus Rapid Transit (BRT) system from Huntington to Route 123 in Woodbridge (curb-running BRT in mixed traffic within the Prince William County portion) and a 3-mile Metrorail Yellow Line extension from Huntington to Hybla Valley as expeditiously as possible.

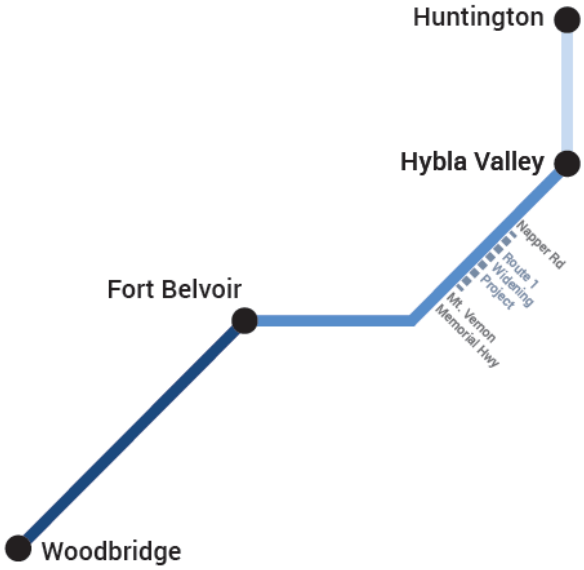
9.1 Phasing Plan

With the recommendation for a phased implementation of Multimodal Alternative 4—phased implementation of BRT and Metrorail service in the Route 1 corridor—a concrete program of actions is warranted. The BRT and Metrorail service will be implemented in phases, and reflect the following key considerations:

- **Prioritize segments that are most competitive for federal funding**—this reflects areas with higher population and employment and provide a connection to the regional transit network. The phases consider when the project could be competitive for federal funding.
- **Reflect county and VDOT planed widening project timelines** – this reflects the current programmed funding or widening plans in the CLRP.

Figure 9-1 shows the proposed phasing plan for the BRT and Metrorail implementation.

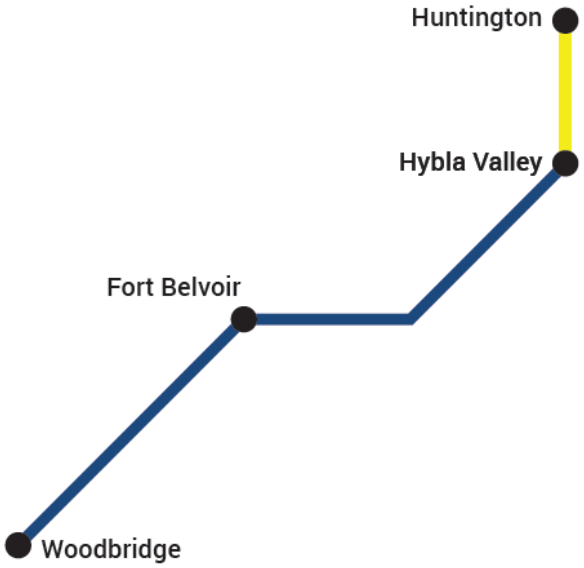
Figure 9-1: Proposed Phasing Plan



BRT Phase I (2026)
Huntington to Hybla Valley
$306M, 3.1 miles

BRT Phase II (2028)
Hybla Valley to Fort Belvoir
$224M, 7.3 miles

BRT Phase III (2032)
Fort Belvoir to Woodbridge
$472M, 4.6 miles



Metrorail Phase IV (2040)
Metrorail Yellow Line Extension to Hybla Valley
$1.46B, 3.1 miles

Note: The recommendation calls for implementation of the vehicular, bicycle, and pedestrian improvements at the same time, if not before, the phased transit improvements.

Woodlawn Vision (Artist's Rendering)

As shown in Figure 9-1, BRT would be implemented in three phases, and the fourth phase would extend Metrorail to Hybla Valley:

- **Phase I:** Huntington to Hybla Valley
- **Phase II:** Hybla Valley to Fort Belvoir
- **Phase III:** Fort Belvoir to Woodbridge
- **Phase IV:** Yellow Line Metrorail extension to Hybla Valley

Implementing Median-running BRT in the corridor is phased according to the competitiveness of the project segments for federal and state funding. Early, smaller scale projects will begin to signal to land

owners and developers the permanence of the proposed transit investment and commitment. Focused effort should be on implementation of a first and second phase of BRT dedicated lanes, high-quality stations, and frequent service between Huntington and Hybla Valley, then extending south to Fort Belvoir.

Phase I and II would be most competitive for federal funding, given the higher current and future population and employment density in the area. In addition, Fairfax County has identified and programmed funding to widen Route 1 from Mount Vernon Memorial Highway to Napper Road. This widening project would occur during Phase I. Initial coordination with VDOT and FTA staff indicates that Phases I and II could be combined and advanced as an initial Multimodal project.

Phase III would be less competitive for federal funding; however, the counties could choose to advance this project without federal funding. The MWCOG Constrained Long Range Plan (CLRP) includes the proposed Route 1 widening from Fort Belvoir to Annapolis Way in 2035.

Based on preliminary analysis, Phase IV- Metrorail extension could be competitive for federal funding by 2040. This horizon year considers the future population and employment growth needed to increase transit ridership for a cost effective FTA project. An important element of this work would be to coordinate with WMATA and other regional stakeholders to address Metrorail core capacity constraints.

9.2 Recommendations for Successful Implementation

Study findings include several supporting recommendations that would be necessary for successful implementation. One key finding is that a Metrorail Yellow Line extension to Woodbridge along Route 1 (a 15-mile extension) would not be feasible. In keeping with the Prince William County Comprehensive Plan, a potential Metrorail Blue Line extension could be considered in subsequent study**.**

Successful implementation for all phases will require sustained and coordinated effort in three key areas: land use and economic development, transportation investment, and financial planning. The sections below summarize the recommendations; each of these topic areas are discussed in detail in a supporting technical report.

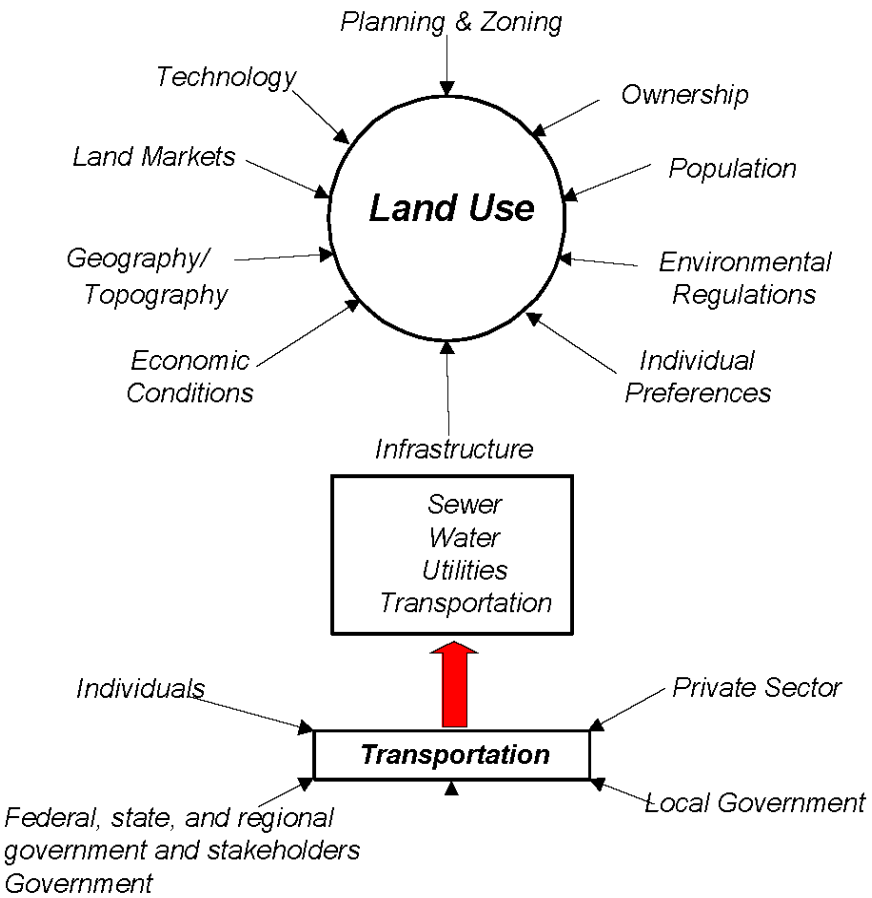
9.2.1 Land Use and Economic Development

Every transportation action affects land use, and all land use actions have transportation implications. As land development increases, it generates more travel and increases the need for new facilities; this in turn increases accessibility and attracts further development.

An integrated vision for the Route 1 corridor will guide actions to maximize economic development potential by creating a range of housing and commercial opportunities within the corridor. These actions will be taken in step with transportation infrastructure and services to achieve the maximum benefit of private and public investments. This vision will emerge in part through planned station areas that incorporate commercial space and a diversity of housing types within dynamic mixed-use centers connected by the multimodal corridor, as well as a walkable secondary street network. **Figure 9-2** shows transportation is a key influence on land use.

Fairfax and Prince William Counties have already created plans and guidelines for growth in key activity centers (called Community Business Centers and Urban Mixed Use Areas respectively) on the Route 1 corridor. The recommendations in this section build on the strong foundation already existing in the Comprehensive Plans, and take advantage of coordinated transportation investment as a mechanism to implement the Plans.

Figure 9-2: Transportation's Role in Land Use



[Source for Figure: Indirect and Cumulative Effects Analysis for Project Induced Land Development WisDOT 1996]

1. Market Absorption Study

As a first step toward implementing the study land use recommendations, County planning and economic development staff should conduct a market absorption study. The purpose of the market study is, to forecast a range of future land use and development scenarios in each station area. This exercise would not be a traditional, value-neutral real estate market analysis, which merely extrapolates from existing market trends, but a combination of quantitative market analysis techniques and qualitative, collaborative TOD planning and policy development. The objective is to identify future land use and development scenarios that are desirable from a TOD and Smart Growth standpoint and feasible from a development standpoint.

2. Comprehensive Plan Updates

Fairfax County and Prince William County have adopted Comprehensive Plans which help set the groundwork for focused transportation investments. These plans should be revisited in light of the Locally Preferred Alternative for transit and transportation, and they should be coordinated with efforts to attract added levels of employment and population growth for the Route 1 corridor. The Comprehensive Plan update should include the following:

- Station locations and specific station area plans
- Infrastructure requirements (schools, public safety, parks, and other critical public investments)
- Urban design regulations and parking policies
- Future Local Street Network

To achieve these objectives, Comprehensive Plans should include, or be accompanied by concrete, enforceable regulations and policies. The degree to which principles of the Comprehensive Plan are implemented in the form of adopted policy and physical development is a strong indicator of the success of federal transportation funding application.

3. Economic Development Activity

To encourage denser, mixed-use development at transit stations that will facilitate transit plan implementation, strategic economic development strategies should be deployed. Density bonuses, tax rebates and loan funds for transit-supportive development should be provided at higher levels than those already offered through the Richmond Highway CRD zoning overlay. The development approval process should be further streamlined to provide a greater incentive for transit station-area development.

Introduction of a major new catalyst development on or near Route 1 is a key strategy for spurring a significant increase in development that could support a high quality transit investment on the corridor. The Inova Mount Vernon Hospital and the expansions at Fort Belvoir provided further economic attraction for the corridor. An additional, successful major investment could continue this trend and could establish a model for the corridor.

The strategy would likely identify target sites for potential employers and active land assembly. The result of initial actions would be to define centers of economic activity. Over the longer term, other development would follow, reinforcing the planned centers and creating the sense of place articulated in the County Comprehensive Plans and the Route 1 Multimodal Alternatives Analysis.

4. Affordable Housing

The north section of Route 1 has a high proportion of affordable housing compared to Fairfax County as a whole. However, Fairfax County should evaluate and identify strategies to preserve and increase affordable housing in the corridor. Prince William County should consider adopting policies to preserve affordable housing in the corridor. Both jurisdictions should ensure that affordable housing is included as part of market-rate development. Within a region where land and housing prices continue to increase, active affordable housing policy is good economic development policy as well. As Route 1 transitions to a more pedestrian-friendly and transit-friendly place, the corridor will attract a new generation of residents and businesses.

9.2.2 Transportation

Travel along and within the current Route 1 corridor relies heavily on the Route 1 right-of-way. The intent of these recommendations is to implement changes along Route 1 that will safely and efficiently accommodate all modes of transportation.

1. Transit Investment

Phased implementation of high quality, high capacity transit service is at the core of the Route 1 Multimodal Alternatives Analysis. The project sponsors should act quickly to take the next steps in project development, and continue to coordinate actively across agencies to ensure consistency and efficiency of the continuing planning and design process. Phased construction/reconstruction of Route 1 will include a systematic effort to preserve right-of-way and remove utility conflicts, for median-running BRT.

2. Bicycle and Pedestrian Improvements

Fairfax County and Prince William County have already identified intersections and street segments where sidewalks and bicycle facilities are to be constructed (See Richmond Highway Public Transit Initiatives (RHPTI)). Additional locations for improvement will be identified with focus on low cost, strategic connections that will provide residents and workers with more direct walking and bicycling pathways. Specific recommendations for enhancing the bicycle and pedestrian network include:

- Prioritizing immediate small-scale connections to improve safety and access
- Aligning bus stops and cross walks to improve pedestrian safety
- Phasing construction of sidewalks and multiuse path along Route 1
- Continuing to improve intersection performance and overall traffic network functionality through signal control, signage, and focused lane reconfigurations

Given the 15 mile length of the corridor and the different land use characteristics along different segments of the corridor, no single solution for bicycle/pedestrian facilities is likely to be implemented for the full length of the corridor. In station areas, where multi-story buildings are constructed along Route 1, sidewalks for pedestrians and on-street bicycle facilities are appropriate. Other sections of

Route 1 outside the station areas may have multiuse paths or on-street bicycle lanes as determined by right-of way availability and other considerations. The new DRPT Multimodal System Design Guidelines should be used in the final determination of the appropriate bicycle and pedestrian facility.

3. Evaluate potential for supporting street grid

Successful transit-supportive land planning must be accompanied by enhancements to the local street network. The map in **Figure 9-3** shows a vision for a secondary street that generally parallels the Route 1 multimodal corridor through a network of local streets. The area of focus here is a connection between the Huntington Station Area and South County Center, on the west side of Route 1. It is intended as an alternative to Route 1 for local travelers between the station areas and should be part of a larger plan for a connected system of walkable streets, supporting access to transit stops and generating a framework for transit-related development along the entire corridor. Secondary roadways should have lower speeds and accommodate on-street bicycle facilities.

4. Protective Buying

To preserve adequate right-of-way for the proposed median BRT lanes and stations, VDOT and Fairfax County should undertake an active program of right-of-way preservation, or protective buying. As land values continue to rise in this area, protective buying will:

- Secure the corridor for future investment,
- Reduce developer/property owner uncertainty that some unknown quantity of their property will be taken at some unknown future time, and
- Signal to the market that corridor jurisdictions are committed and intent on delivering the transit projects.

Figure 9-3: Alternate Parallel Route (Illustrative purposes only)

9.2.3 Project Funding

Implementation of the recommended multimodal improvements will require funding from a variety of sources. The current study has explored a range of existing sources at the local, regional, state, and federal levels. Ongoing refinements of the project funding plan will continue to evaluate existing sources and assess possible new sources.

The current conceptual funding plan (see also the *Preliminary Funding Analysis Report*) includes the following considerations:

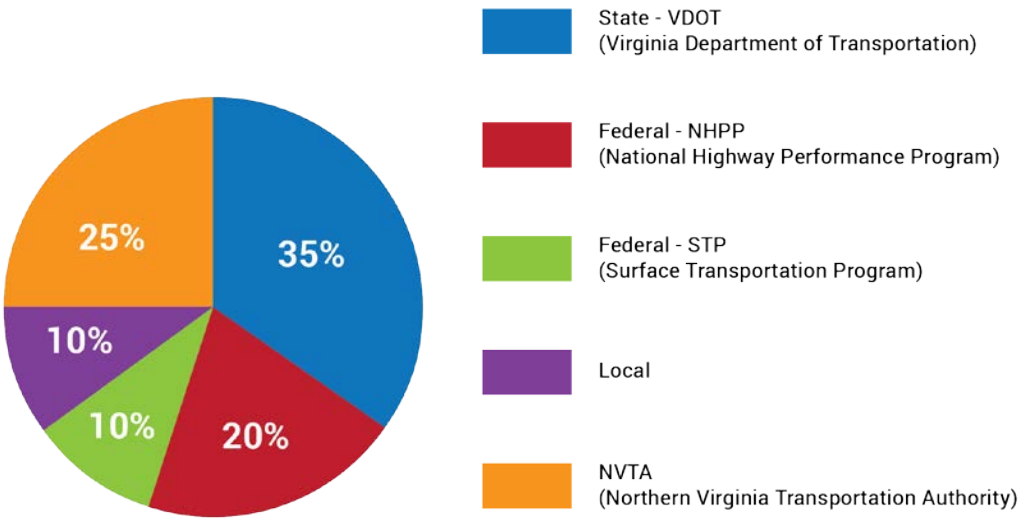
- **The project assumes FTA New Starts Funding:** The project team performed an initial analysis of the potential competitiveness for FTA New Starts funding for each phase of transit improvements. Preliminary results suggest that Phases I and II (Huntington to Fort Belvoir) of the BRT project could be competitive for FTA New Starts funding, while Phase III of the BRT project would likely not be competitive. Phase IV, Metrorail extension to Hybla Valley, may be competitive for FTA funding by 2040, contingent upon increased growth and development levels.

- **The project will rely heavily on the state and local funding sources:**
    - DRPT Capital Assistance Grant program (currently administered at 33 percent of transit capital costs).
    - NVTA dedicated funding to fund projects within 17 jurisdictions located in the Northern Virginia Transportation District (the projected current annual funding is $300 to $350 million per year).
    - Fairfax County has a dedicated revenue source for transportation in the Commercial and Industrial Real Estate Tax (roughly $50 to $60 million in annual funding).
    - Fairfax County issues general obligation and revenue bonds backed by the general fund and C&I revenues thus leveraging the tax funding it collects (currently $60 million in annual bond proceeds).
    - The Commonwealth Transportation Fund consolidates state and federal funding as well as planned bond proceeds, thus leveraging tax receipts with bond funding ($500 million allocated to rail and public transportation in FY2015-2020).
    - The potential for Value Capture and private proffer revenues will depend on the level of economic development and private sector interest. These sources are considered to provide a modest contribution to transit improvement along the corridor.

The text and graphics below illustrate the assumed mix of funding sources by type of improvement.

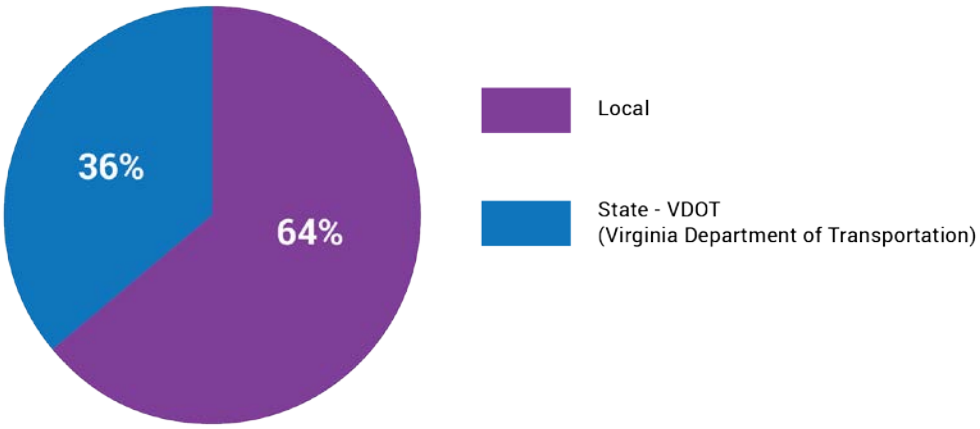
Roadway Improvements

The recommended alternative includes an estimated $292 million in roadway improvements. The funding mix for these investments would likely be a combination of state, federal formula, regional and local funds.



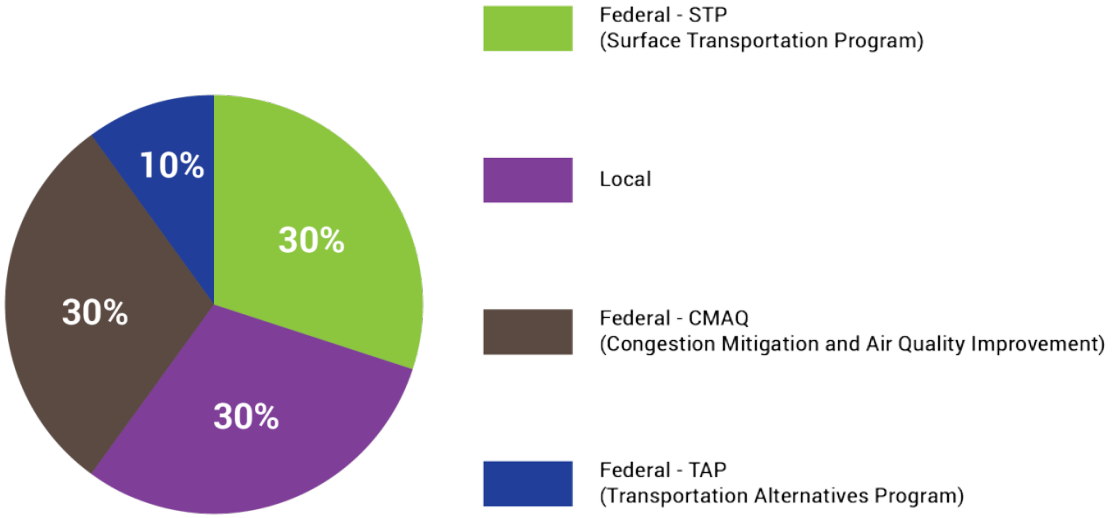
Right-of-Way

The total investment in right-of-way for the recommended alternative is an estimated $52 million.



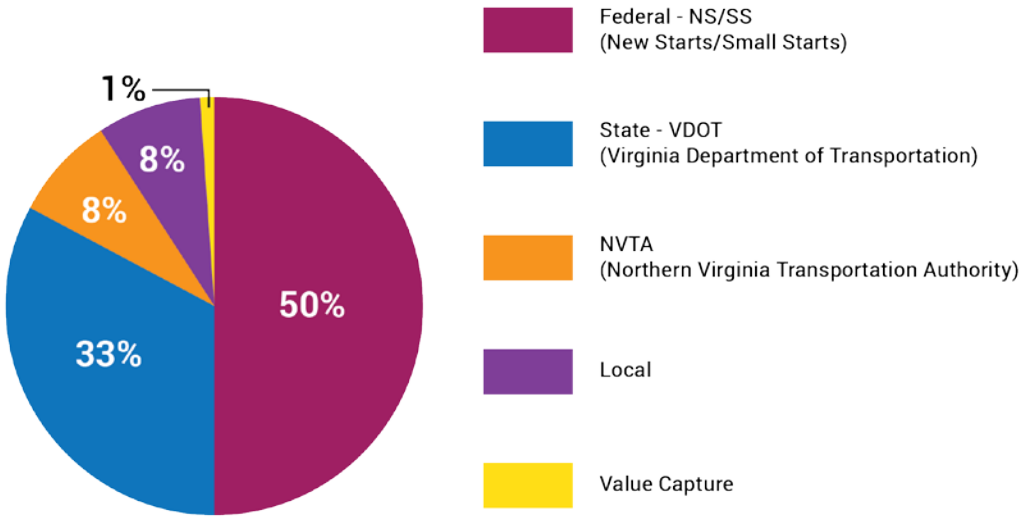
Sidewalks and Bicycle Facilities

The total investment in pedestrian and bicycle facilities is an estimated $21 million.

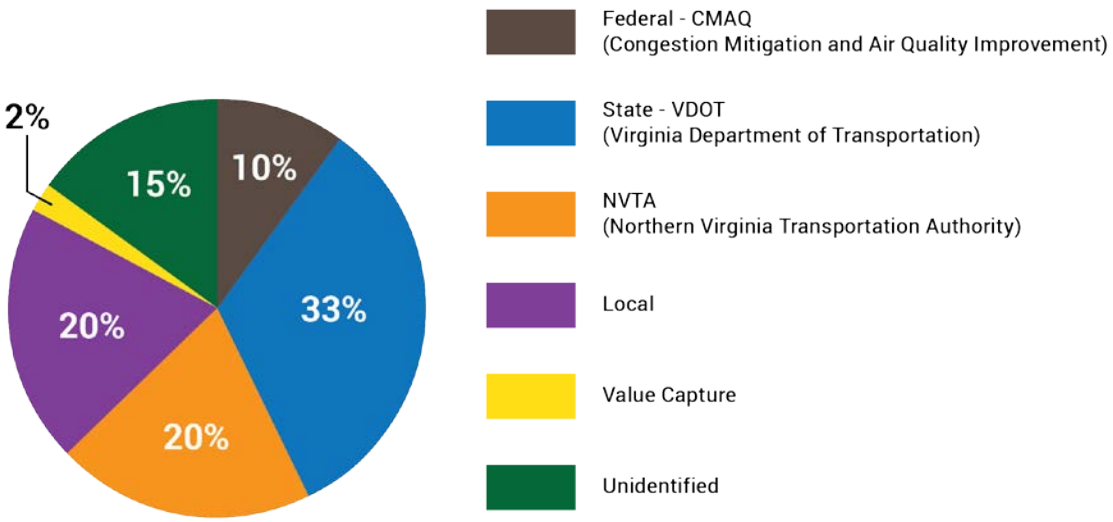


Transit

These investments total an estimated $1,764 million. The following funding mix is assumed for projects qualifying for FTA New Starts grant funding.



Preliminary analysis suggests that a BRT system from Fort Belvoir to Woodbridge may not be "completive" under FTA project justification criteria. The mix of funding for Phase III assumes a different mix of funding, including an "unidentified" category.



10.0 Project Schedule and Next Steps

This section lays out a plan for advancing the Route 1 Multimodal Alternatives Analysis recommendations. **Figure 10-1** illustrates a framework of implementation steps for both the near-term BRT project as well as the long-term Metrorail extension. **Figure 10-2** shows a more detailed implementation plan for each phase. Note that the immediate next phases of project development are accompanied by the recommended market absorption study and Comprehensive Plan updates.

Figure 10-1: Framework for Implementation

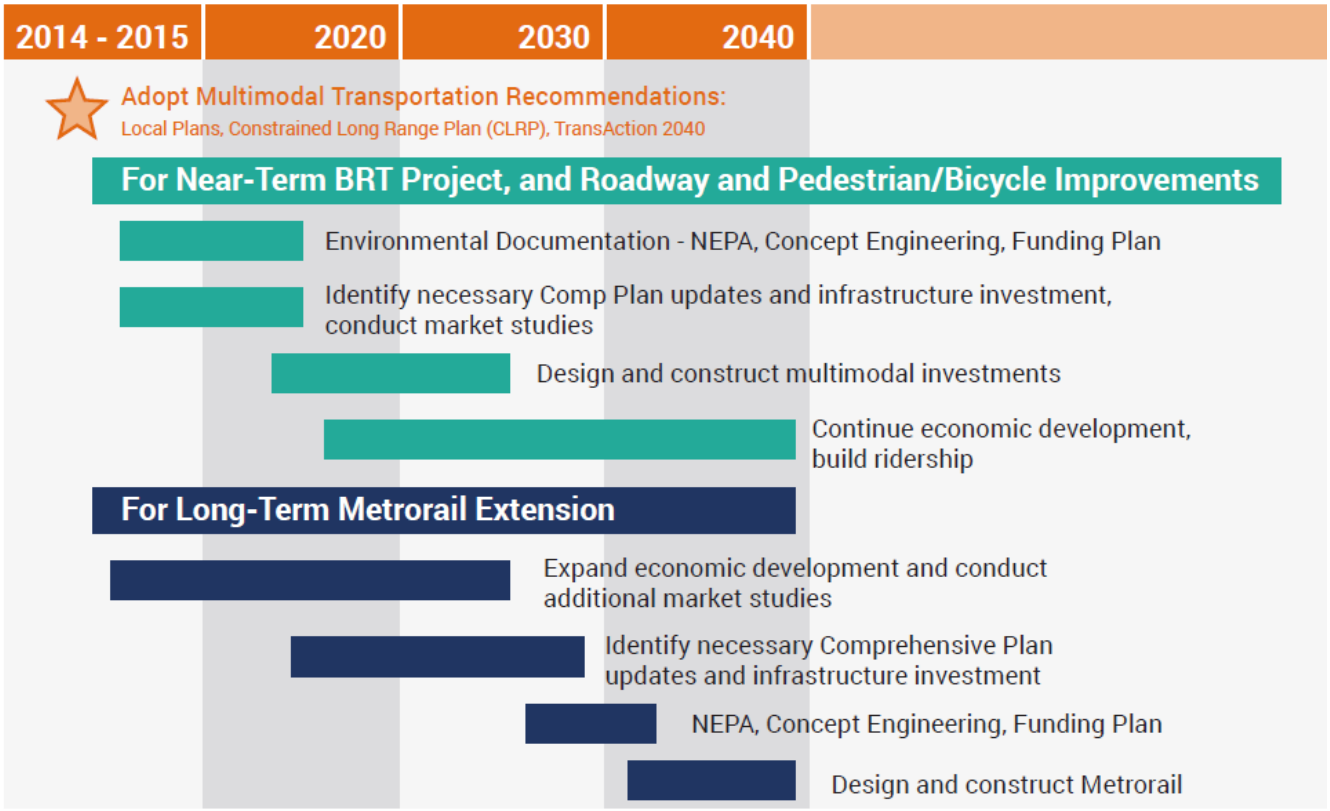
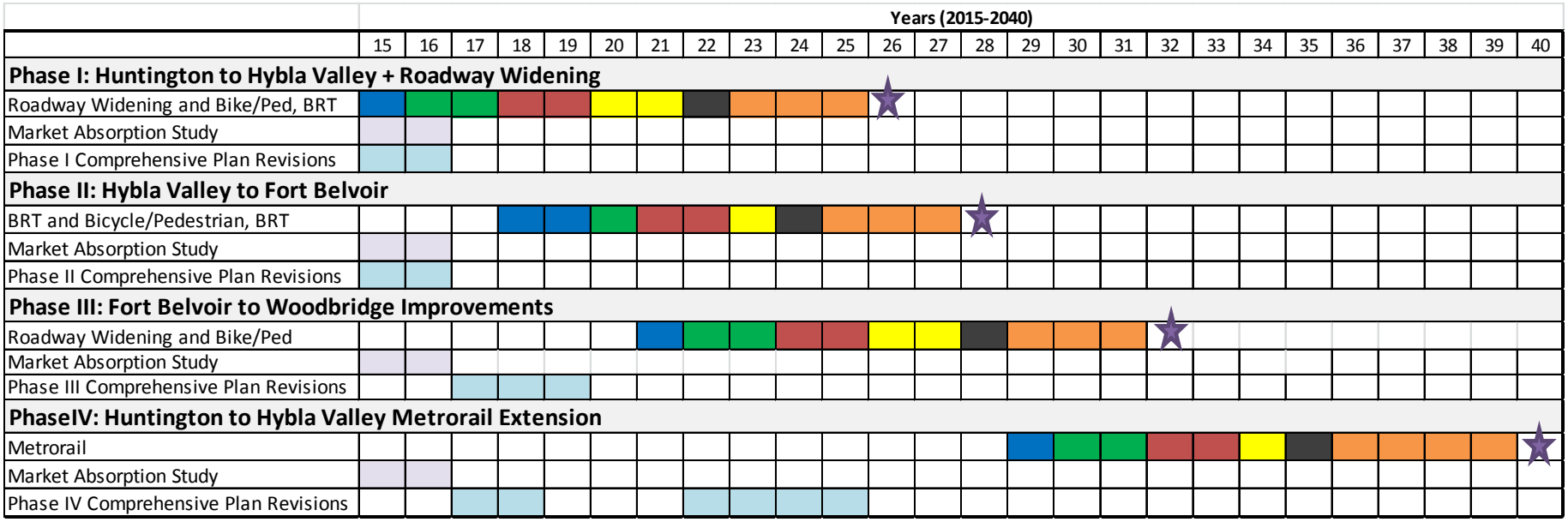


Figure 10-2: Potential Phasing and Implementation Schedule



Note: Timelines assume a funding stream to support project implementation.

*Contingent upon increased future land use density.

Legend: General Project Development Sequence

Comprehensive Plan	Planning	Scoping/ NEPA PE	Final Design	Right of Way	Utilities Relocation	Construction	Operation

The recommendations of this study recognize that many related corridor improvements are already underway. Roadway widening, a robust program of pedestrian and bicycle improvements, intersection upgrades, and transit service refinements are examples of the ongoing improvements being carried out in the study corridor by County and State agencies.

Immediate next steps toward project implementation are listed below.

1. Forward study recommendations to local governments for endorsement and implementation
2. Begin to incorporate recommendations in local, regional, and state plans:
    - County – Comprehensive Plans and Capital Improvement Programs
    - NVTA – TransAction2040 Plan and 6-Year Program
    - MWCOG – Constrained Long Range Plan and Transportation Improvement Program
    - Virginia – Statewide Transportation Plans and 6-Year Program
3. Coordinate environmental documentation "Class of Action" with responsible federal agencies: FTA and FHWA.
4. Initiate environmental documentation for Phases I and II (Huntington to Fort Belvoir)
5. Conduct corridor-wide market absorption study
6. Initiate Comprehensive Plan updates to reflect:
    - Transit station locations and station area plans
    - Infrastructure requirements due to increased land use density (roads, schools, etc.)
    - Refined street cross sections, corridor design standards, and additional street rights-of-way
7. Conduct a right-of-way survey to define potential impacts and create structure for public corridor preservation and private parcel consolidation