Route 1

Multimodal Alternatives Analysis

Public Meeting

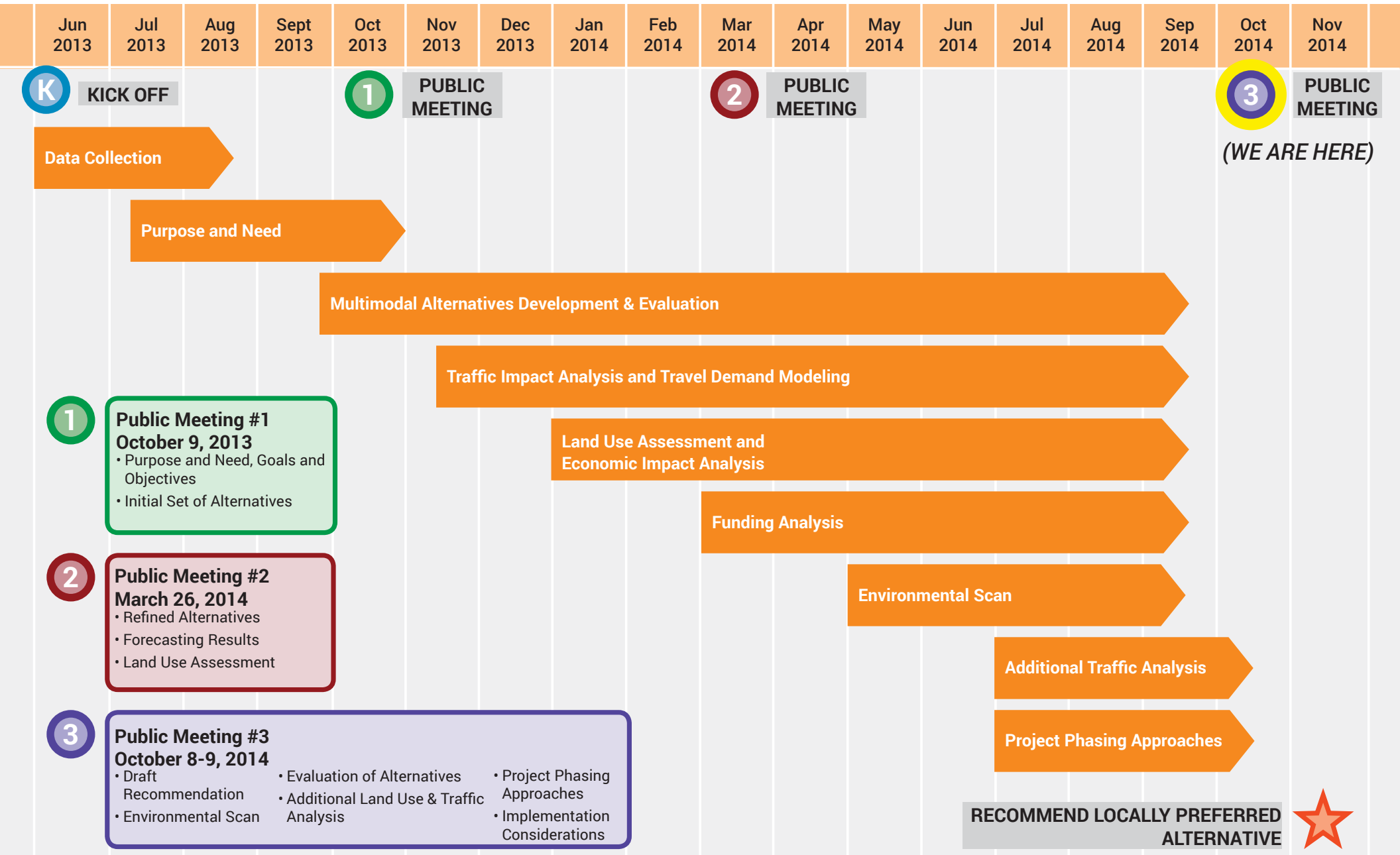
October 8, 2014

Belmont Elementary School
Prince William County, VA

October 9, 2014

South County Government Center
Fairfax County, VA

Project Schedule



Purpose & Need, Goals and Objectives

Purpose

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.

Needs

	Needs	
Transit	• Peak and off-peak transit service is infrequent • High transit dependent population • Traffic delays reduce transit reliability • High ridership potential for quality transit	*Attractive and competitive transit service*
Pedestrian/ Bicycle	• Pedestrian networks along and surrounding the corridor are disjointed, limiting pedestrian travel and reducing access to transit • 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	• Significant population and employment growth is anticipated regionally and along Route 1 corridor • Current development patterns fail to optimize development potential	*Support and accommodate more robust land development*

Goals and Objectives

Expand attractive multimodal travel options to improve local and regional mobility

- 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

Improve safety; increase accessibility

- Provide accessible pathways to and from transit service and local destinations
- Reduce modal conflicts
- Improve pedestrian crossings
- Minimize negative impact on transit and auto operations in the corridor
- Maintain traffic delays at acceptable levels

Increase economic viability and vitality of the corridor

- 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

Support community health and minimize impacts on community resources

- 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

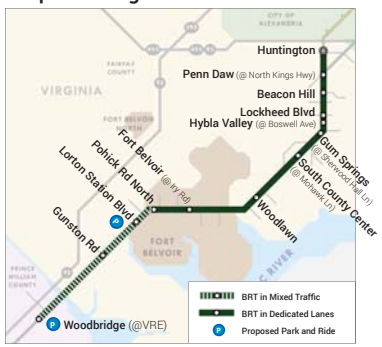
Refined Transit Alternatives

Alternative 1: Bus Rapid Transit - Curb Running

Summary

- Bus operates in curb, dedicated transit lanes from Huntington to Pohick Road North
- Bus operates in mixed traffic south of Pohick Road to Woodbridge

Proposed Alignment



Key Factors

Average Weekday Ridership (2035)	15,200
Conceptual Capital Cost	$832 M
Annual O&M Cost	$18 M
Cost Effectiveness (Annualized capital + operating cost per rider)	$19

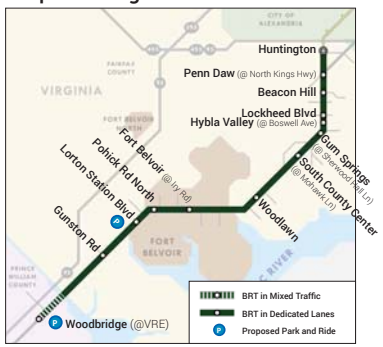
Typical Intersection

Alternative 2: Bus Rapid Transit - Median

Summary

- Bus operates in median in dedicated lanes for the entire length of the corridor and in mixed traffic in Prince William County

Proposed Alignment



Key Factors

Average Weekday Ridership (2035)	16,600
Conceptual Capital Cost	$1.01 B
Annual O&M Cost	$17 M
Cost Effectiveness (Annualized capital + operating cost per rider)	$20

Typical Intersection

Alternative 3: Light Rail Transit

Summary

- Light Rail operates in the median dedicated lanes for the entire length of the corridor

Proposed Alignment

Key Factors

Average Weekday Ridership (2035)	18,400
Conceptual Capital Cost	$1.56 M
Annual O&M Cost	$24 M
Cost Effectiveness (Annualized capital + operating cost per rider)	$27

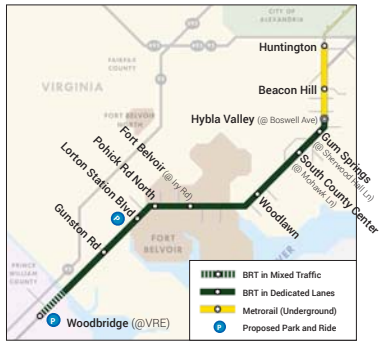
Typical Intersection

Alternative 4: Metrorail/BRT Hybrid

Summary

- Metrorail underground from Huntington to Hybla Valley; transfer to BRT service from Hybla Valley to Woodbridge
- BRT operates in dedicated lanes and transitions into mixed-traffic in Prince William County

Proposed Alignment



Key Factors

Average Weekday Ridership (2035)	26,500* (BRT 10,600; Metrorail 22,900)
Conceptual Capital Cost	$2.46 B
Annual O&M Cost	$31 M
Cost Effectiveness (Annualized capital + operating cost per rider)	$28 (BRT $29; Metrorail $28)

*Corridor ridership, excluding transfers between Metrorail and BRT Portions

Typical Intersection

Route 1 Multimodal Alternatives Analysis

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Evaluation of Multimodal Alternatives

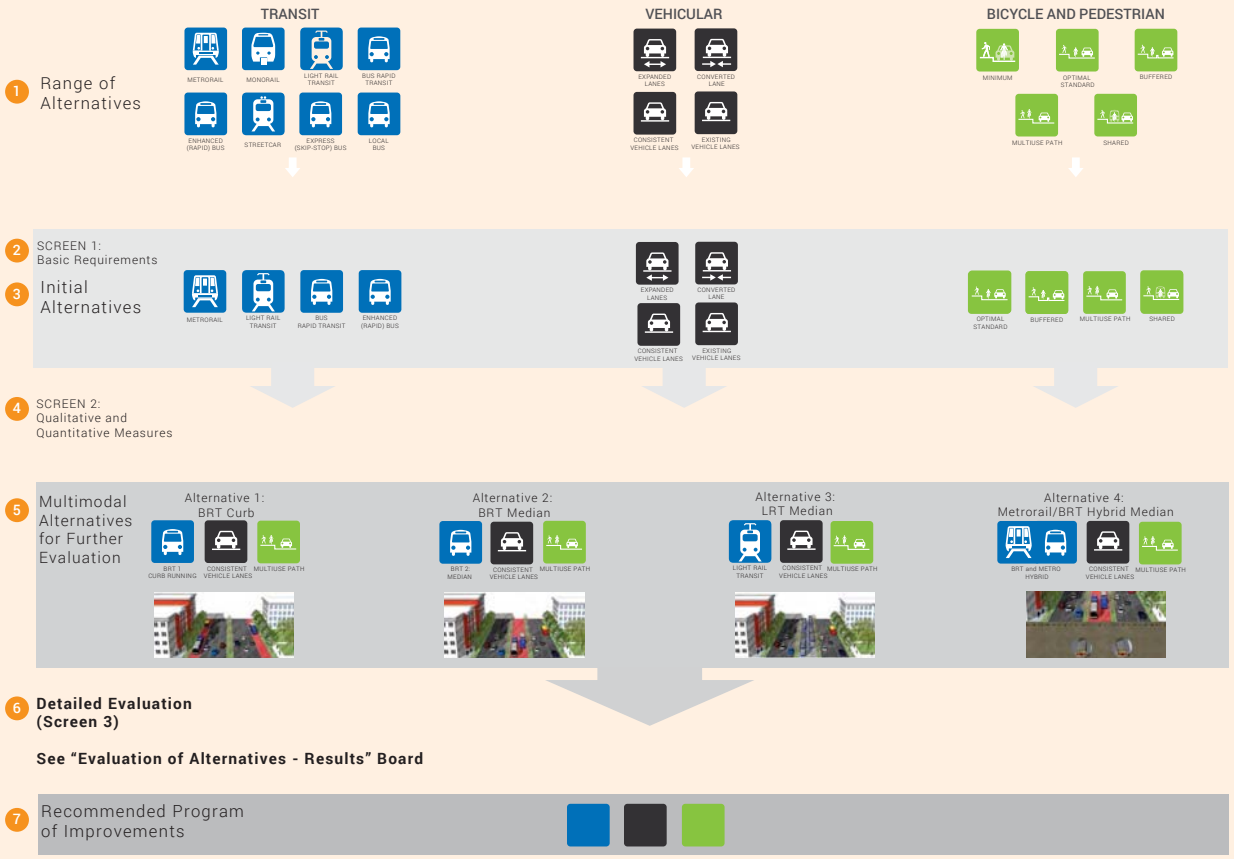
Evaluation Criteria

Evaluation measures were used to assess how well each potential mode and cross-section met the project goals. Based on feedback from community members and other stakeholders (including members of the Technical Advisory Committee, Executive Steering Committee, and Community Involvement Committee), certain measures were weighted double or triple to reflect their importance. Bold measures below were weighted double, while italics indicate that a measure's weight was tripled.

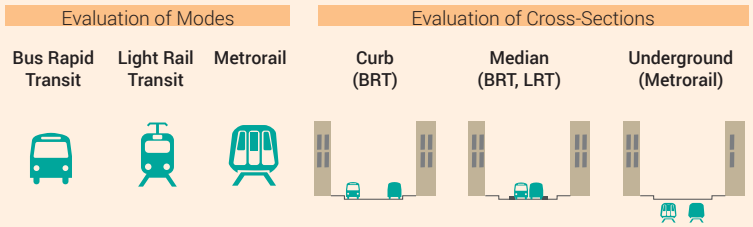
Goals	Evaluation Measures
Goal 1: Local and regional mobility	• **Project ridership** • **Number of transit dependent riders** • **Transit travel time savings** • **Provides connection to existing transit network** • New transit riders • Person throughput • Number of riders who walked to access transit • Provides improved bicycle and pedestrian facilities
Goal 2: Safety and accessibility	• **Auto Network Delay** • **Pedestrian access to stops** • **Pedestrian crossing time** • Auto travel time • Impacts due to turns • Preserves flexibility for bike lane
Goal 3A: Economic Development	• ***Potential to begin transit within 10 years*** • **Tendency to encourage additional development** • **Jobs within 60 minutes** • Per passenger O&M cost savings with growth • Tendency to accelerate development
Goal 3B: Cost Effectiveness	• ***Cost per rider*** • **Estimated Capital Cost** • **Estimated Annual O&M cost**
Goal 4: Community health and resources	• **Change in VMT** • **Total Right of Way** • Trips diverted from I-95 • Temporary construction impacts • Environmental benefits

Bold = measure weight doubled
Bold italics = measure weight tripled

Evaluation Process



Transit Evaluation



Recommendations		Near-Term Vision	Long-Term Vision
Transit	Median-running Bus Rapid Transit System in the near-term, with a Metrorail extension to Hybla Valley in the long-term		
Pedestrian/Bicycle	10-foot shared use path on both sides of street		
Vehicular	3 general purpose travel lanes in each direction		

Route 1 Multimodal Alternatives Analysis
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Evaluation of Transit Alternatives - Results

Summary Table

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 Score	0.7	0.8	0.7	0.8

Evaluation Details

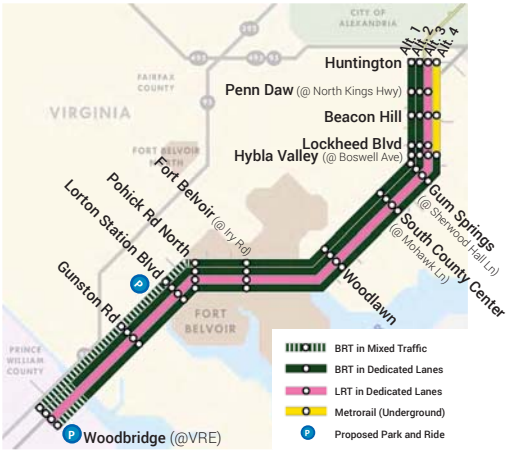
Goal 1: Expand Multimodal Travel Options to Improve Local and Regional Mobility

Evaluation Measures	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 4: Metrorail-BRT (Hybrid)
Daily Project Ridership (2035)*	15,200	16,600	18,400	26,500 (BRT 10,600; Metrorail 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
	0.55	0.60	0.68	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

Goal 2: Improve Safety and Increase Accessibility

Evaluation Measures	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 4: Metrorail-BRT (Hybrid)
Pedestrian access to station stops*	Medium	Medium	Medium	Medium
	0.60	0.60	0.60	0.60
Pedestrian crossing time (including signal delay)*	102 sec	116 sec	116 sec	97 sec
	0.32	0.42	0.53	1.00
Automobile travel time (minutes during peak hour, Ft. Belvoir to Huntington Station)	24.0	23.7	24.0	23.7
	0.99	1.00	0.99	1.00
Automobile network delay, Ft. Belvoir and Hybla Valley test segments* (vehicle hr/hr)	466	468	460	453
	0.99	0.98	1.00	0.98
Traffic impacts due to turning vehicles (left turns)	Minimal impact	Moderate impact	Moderate impact	Moderate impact
	0.80	0.40	0.40	0.40
Impacts due to turning vehicles (right turns)	Significant impact	No impact	No impact	No impact
	0.20	1.00	1.00	1.00
Preserves flexibility for bike lane in higher activity nodes	Less flexible	More flexible	More flexible	More flexible
	0.40	0.80	0.80	0.80
AVERAGE SCORE	0.71	0.79	0.79	0.82

Alternatives



Goal 3a: Economic Development

Evaluation Measures	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 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

Goal 3b: Cost Effectiveness

Evaluation Measures	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 4: Metrorail-BRT (Hybrid)
Estimated Capital Cost*	$832 M	$1.01 B	$1.56 B	$2.46 B
	1.00	0.83	0.53	0.34
Estimated Annual O&M cost*	$18 M	$17 M	$24 M	$31 M
	0.94	1.00	0.71	0.55
Cost per rider* (Annualized capital + operating cost) (Average of 2015 and 2035 ridership)	$21	$22	$30	$30
	1.00	0.95	0.70	0.70
AVERAGE SCORE	0.98	0.93	0.65	0.55

Goal 4: Support Community Health and Minimize Impacts on Community Resources

Evaluation Measures	Alt. 1: BRT-Curb	Alt. 2: BRT-Median	Alt. 3: LRT	Alt. 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
	0.60	0.40	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*	20-30	30-40	35-45	30-40
	1.00	0.73	0.67	0.72
Environmental Impacts: Parklands, Cultural Resources, Wetlands	Fewest Impacts	Some Impacts	Moderate Impacts	Some Impacts
	1.00	0.75	0.62	0.75
AVERAGE SCORE	0.72	0.71	0.69	0.77

** Based on input from the community and other stakeholders, these measures were weighted more heavily during score calculation.*

Current and Ongoing Projects in the Corridor

Segments

Route 1 Improvements at Ft. Belvoir (Under construction)

Road widening, including right-of-way reservation for future median transit lanes

Route 1 Improvements near Woodbridge (Ongoing)

Route 1/123 Interchange Project, Route 1 Widening, Other pedestrian facility improvement projects (see inset map).

Richmond Highway Public Transportation Initiative

Sidewalk Projects Under Construction:

1. Northbound from Mt. Vernon Highway/Buckman Road to north of Napper Road

Sidewalk Projects to be constructed in 2015:

2. Northbound from Virginia Lodge to Huntington Avenue
3. Northbound from Fairhaven Avenue/Quander Road to hotel complex
4. Southbound from Russell Road to Gregory Drive
5. Northbound from Roxbury Drive to Russell Road
6. Northbound from Radford Avenue to Frye Road
7. Northbound from Engleside Street to Forest Place

Intersections

New REX stops and pedestrian safety improvements (To be constructed in 2015)

a. Southgate Drive (new REX stops with sidewalk and accessibility improvements, four new crosswalks, median pedestrian refuge)

b. Lockheed Boulevard (new REX stops with sidewalk and accessibility improvements, one new crosswalk, median pedestrian refuge)

c. Arlington Drive (new REX stops with sidewalk and accessibility improvements, two new crosswalks, median pedestrian refuge, curb ramps)

d. Belford Drive (new REX stop with sidewalk and accessibility improvements, three new crosswalks, median pedestrian refuge)

e. Ladson Lane (new REX stops with sidewalk and accessibility improvements, two new crosswalks, median pedestrian refuge)

f. Mohawk Lane (sidewalk and accessibility improvements to existing bus stops, two new crosswalks, median pedestrian refuge)

g. Frye Road (new REX stops with sidewalk and accessibility improvements, four new crosswalks, median pedestrian refuge)

h. Lukens Lane (new REX stops with sidewalk and accessibility improvements, one new crosswalk, close entrance to service drive)

Route 1 Multimodal Alternatives Analysis

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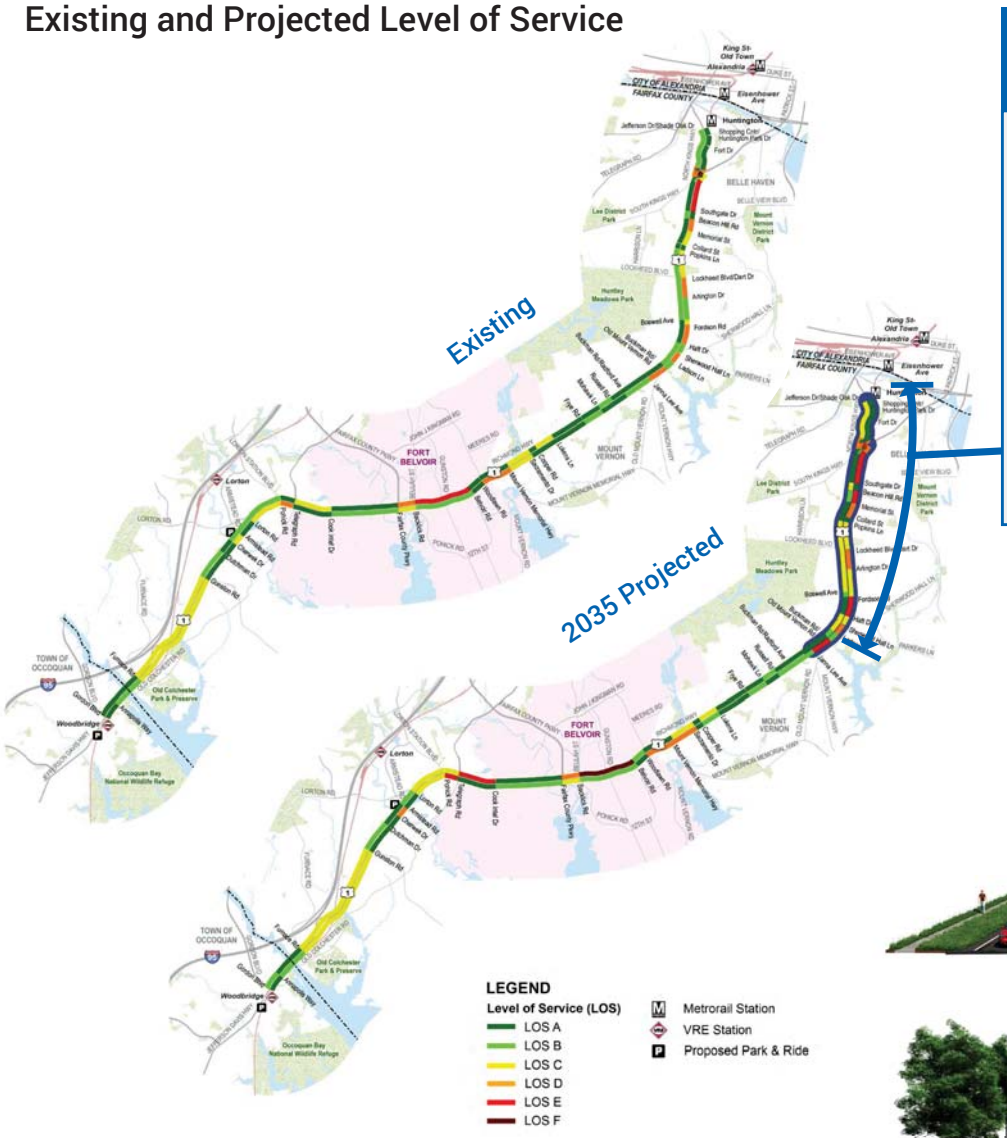
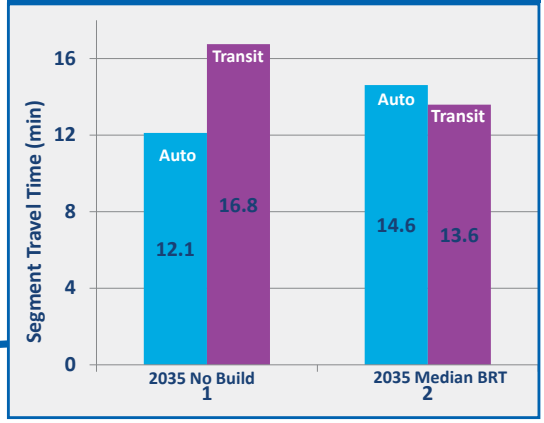
Route 1 Traffic Assessment for 2035 Projected Growth

Existing and Projected Level of Service

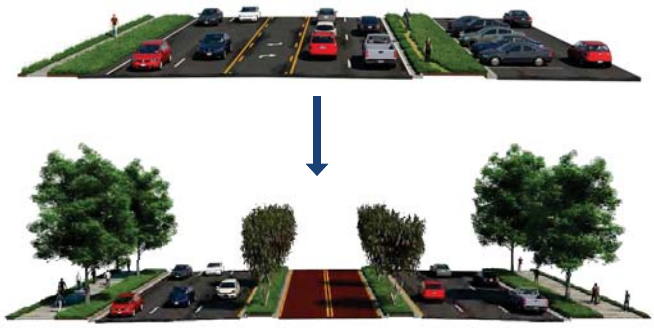


Additional Traffic Analysis (Janna Lee Ave to Huntington)



Addition of median transit lanes:

- Improves transit travel time
- Incrementally increases automobile travel time
- Left turns impacted
- Does not significantly degrade overall intersection performance



Level of Service

Highway traffic congestion is expressed in terms of Level of Service (LOS) as defined by the Highway Capacity Manual (HCM). LOS is a letter code ranging from "A" for excellent conditions to "F" for failure conditions. The conditions defining the LOS for roadways are summarized as follows:

LOS A

Represents the best operating conditions and is considered free flow. Individual users are virtually unaffected by the presence of others in the traffic stream.

LOS B

Represents reasonably free-flowing conditions but with some influence by others.

LOS C

Represents a constrained constant flow below speed limits, with additional attention required by the drivers to maintain safe operations. Comfort and convenience levels of the driver decline noticeably.

LOS D

Represents traffic operations approaching unstable flow with high passing demand and passing capacity near zero, characterized by drivers being severely restricted in maneuverability.

LOS E

Represents unstable flow near capacity. LOS E often changes to LOS F very quickly because of disturbances (road conditions, accidents, etc.) in traffic flow.

LOS F

Represents the worst conditions with heavily congested flow and traffic demand exceeding capacity, characterized by stop-and-go waves, poor travel time, low comfort and convenience, and increased accident exposure.

Route 1 Growth Scenarios 2 and 3
Supporting Infrastructure

Beacon Hill - Scenario 2

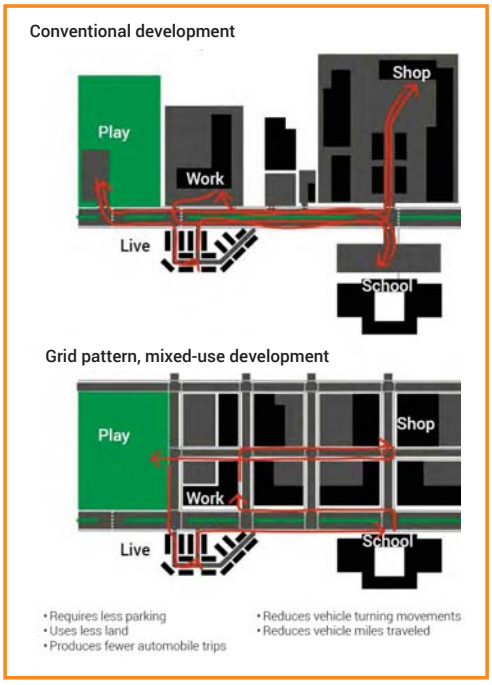
Beacon Hill - Scenario 3

Scenario 2: Growth of 15% to 25% above the regional forecast; typical for investment along a high-quality transit corridor (BRT or LRT)

Scenario 3: Population and employment levels associated with development supportive of Metrorail (Ballston-Rosslyn Corridor)

Public Infrastructure and Services

- Major growth is anticipated in the Route 1 corridor in all scenarios including COG 2035 forecast
- In Comprehensive Plan updates, corridor infrastructure needs will be evaluated:
  - Streets
  - Schools
  - Parks and public space
  - Public safety
  - Water and utilities
- Metrorail supportive growth levels require significantly more infrastructure investment than BRT levels



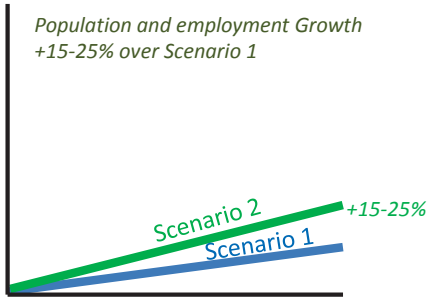
Traffic Assessment

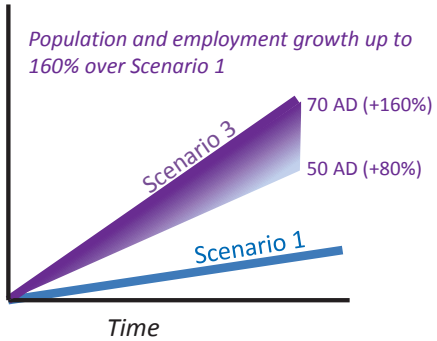
Population and employment levels beyond the MWCOG projections require:

- Completing planned widening of Route 1 to consistent 6-lanes
- Mixed use development
- Walkable, pedestrian friendly environment
- Investment in high-quality, higher-capacity public transit
- Network of local streets

Street Infrastructure Required to Accomodate Growth
Highest density proposed station areas: Beacon Hill and Hybla Valley

	Share of trips *transit, walk, bike, internal, and peak spreading*	***Add street capacity*** *to supplement Route 1, equivalent to:*
Scenario 2	*20%*	One new 2-lane street
	25%	One new 2-lane street
Scenario 3	*25%*	Six new 2-lane streets
	40% to 50%	Three new 2-lane streets





Route 1 Multimodal Alternatives Analysis

Median-Running Bus Rapid Transit (BRT)

What is Median-Running BRT?

Median-running bus rapid transit operates in designated lanes at the center of the roadway.

Metroway (Alexandria, VA)

Emerald Express (Eugene, OR)

El Trole (Quito, Ecuador)

HealthLine (Cleveland, OH)

sbX (San Bernadino, CA)

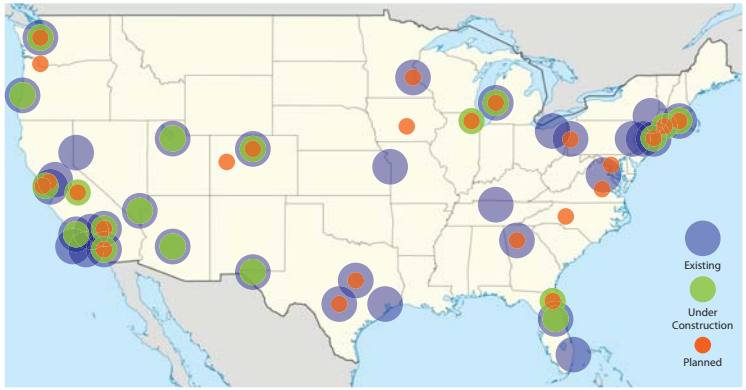
Linha Verde (Curitiba, Brazil)

Metropolitan Area Express (Las Vegas)

Features

- Dedicated lanes for transit
- High-quality stations
- High-quality pedestrian safety & access
- Traffic signal priority for transit
- Off-board fare collection for expedited boarding
- System-wide branding

Where else do bus rapid transit systems exist in the U.S.?



Transportation Recommendations, Phasing, and Funding

Recommendations

Transit — Median-running Bus Rapid Transit System in the near-term, with a Metrorail extension to Hybla Valley in the long-term

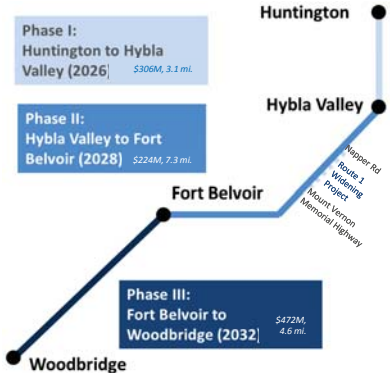
Pedestrian/Bicycle — 10-foot shared use path on both sides of street

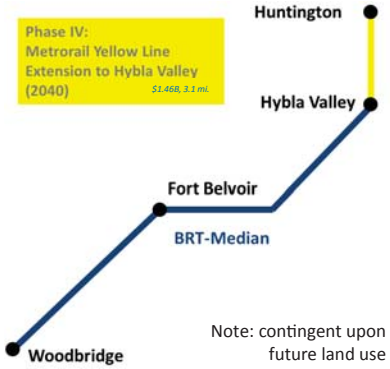
Vehicular — 3 general purpose travel lanes in each direction

Near-Term Vision

Long-Term Vision

Proposed Transit Phasing & Funding

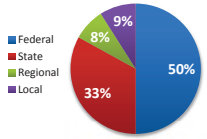




Note: contingent upon future land use

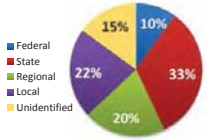
Phases I+II : BRT from Huntington to Fort Belvoir

- Potentially competitive segments for federal New Starts/Small Starts funding
- Highest population and employment
- Highest ridership potential



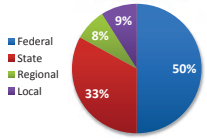
Phase III: BRT from Fort Belvoir to Woodbridge

- Less competitive for federal funding
- Lower population and employment
- Includes planned VDOT widening



Phase IV: Metrorail Extension to Hybla Valley

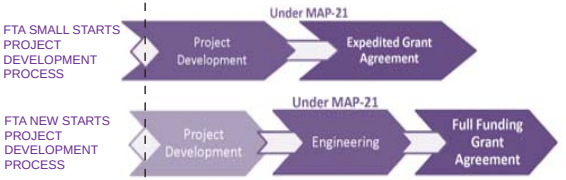
- Potentially competitive for federal New Starts funding in 2040
- Contingent upon increased future land use density



	Years (2015-2040)																									
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Phase I: Huntington to Hybla Valley + Roadway Widening																										
Roadway Widening, Bike/Ped, BRT												★														
Phase I Comprehensive Plan Revisions																										
Phase II: Hybla Valley to Fort Belvoir																										
Bike/Ped, BRT														★												
Phase II Comprehensive Plan Revisions																										
Phase III: Fort Belvoir to Woodbridge Improvements																										
Roadway Widening, Bike/Ped, BRT																		★								
Phase III Comprehensive Plan Revisions																										
Phase IV: Huntington to Hybla Valley Metrorail Extension																										
Metrorail																										★
Phase IV Comprehensive Plan Revisions																										

Legend

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



Route 1 Multimodal Alternatives Analysis

DRPT Virginia Department of Rail and Public Transportation

Office of INTERMODAL Planning and Investment

VDOT

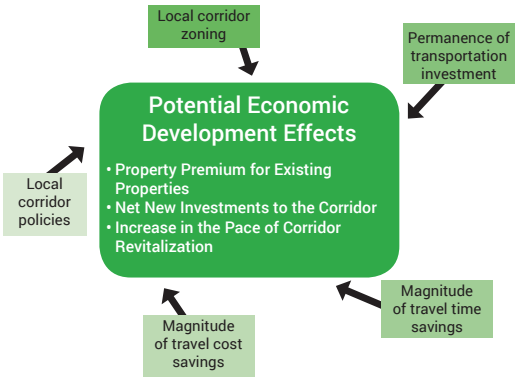
A Vision for Transit-Oriented Development

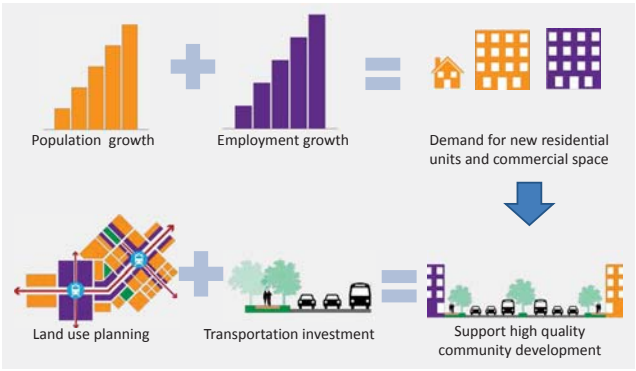
The vision for Route 1, as expressed in County land use plans and through the public visioning process, is a place that attracts the next generation of growth to promote economic competitiveness.

Station areas have:

- Focused growth that "steps down" as a transition to existing neighborhoods
- Compact, mixed-use development patterns
- Walkable and bikeable streets
- A development-focused rather than parking-focused design
- High-quality parks and public spaces

Transit investments help increase the economic viability and vitality of the corridor, and create an opportunity for high-quality community development.





Beacon Hill

Route 1 Multimodal Alternatives Analysis

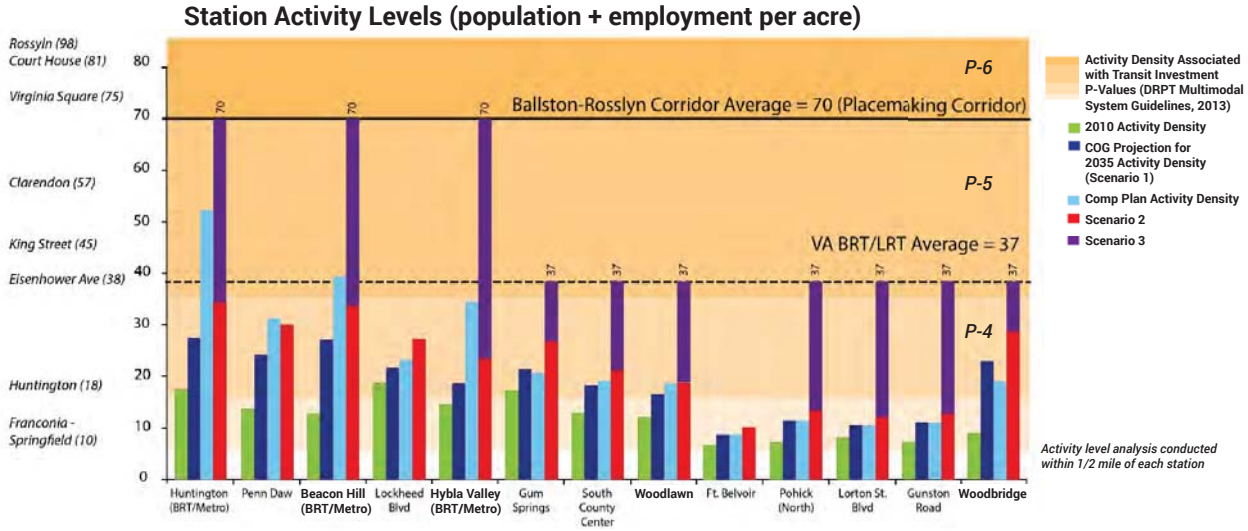
DRPT Virginia Department of Rail and Public Transportation

Office of INTERMODAL Planning and Investment

VDOT

Visualizing Future Station Areas

Understanding the activity levels and land use configurations to support high-quality transit.



- Focused growth at centers
- Compact, mixed-use development
- Walkable streets
- High-quality public realm

Action Plan for Implementation