

TRANSITWAY CORRIDOR FEASIBILITY STUDY



High Capacity Transit Corridor Work Group
Introduction and Background
Corridor C Recommendation
May 19, 2011 Meeting



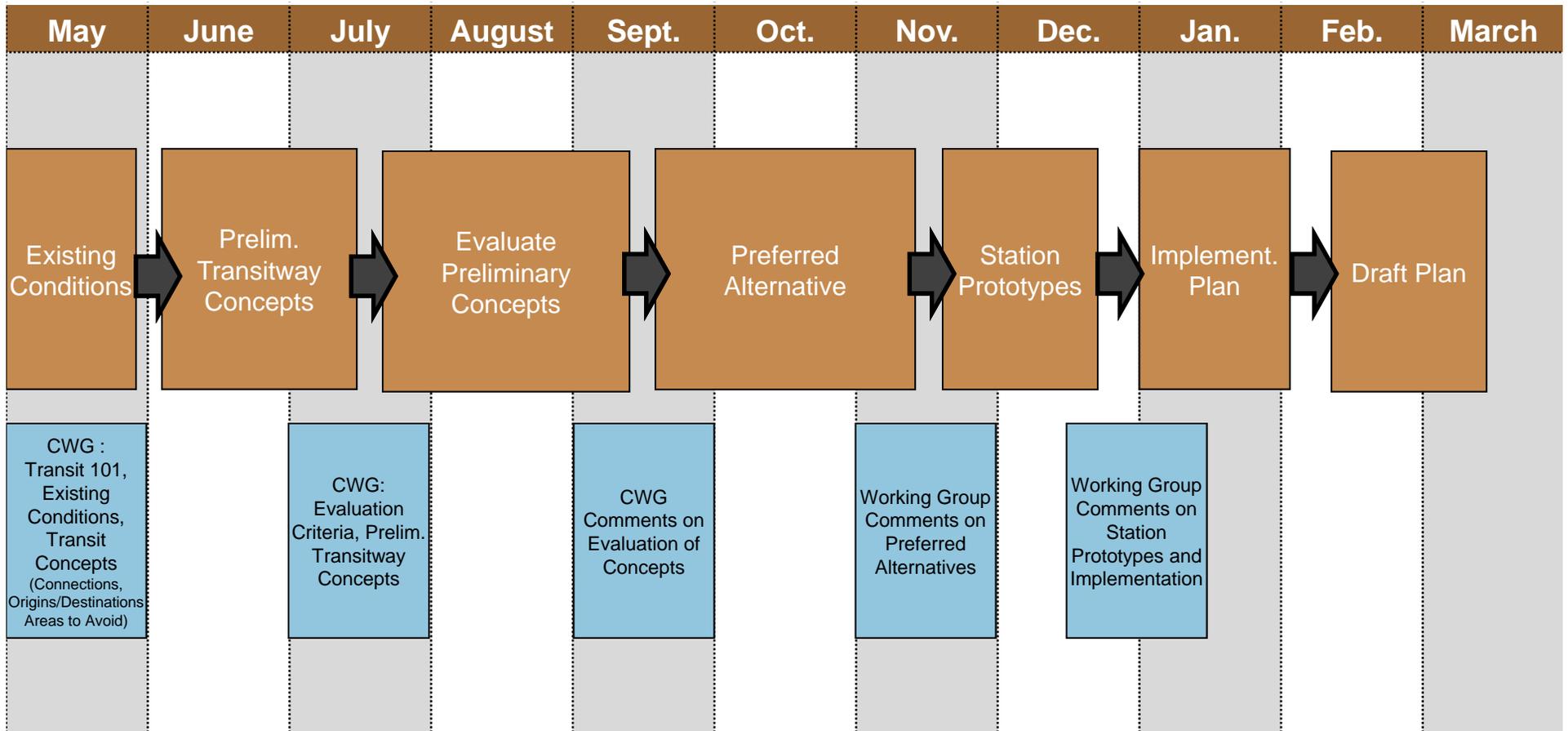
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Kimley-Horn
and Associates, Inc.

TRANSITWAY CORRIDOR FEASIBILITY STUDY

Project Schedule – Corridors A & B



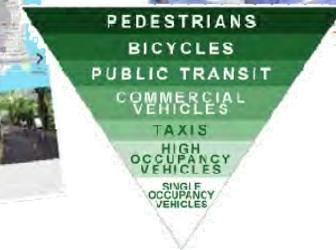
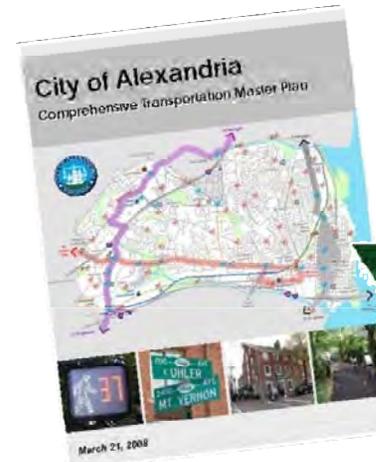
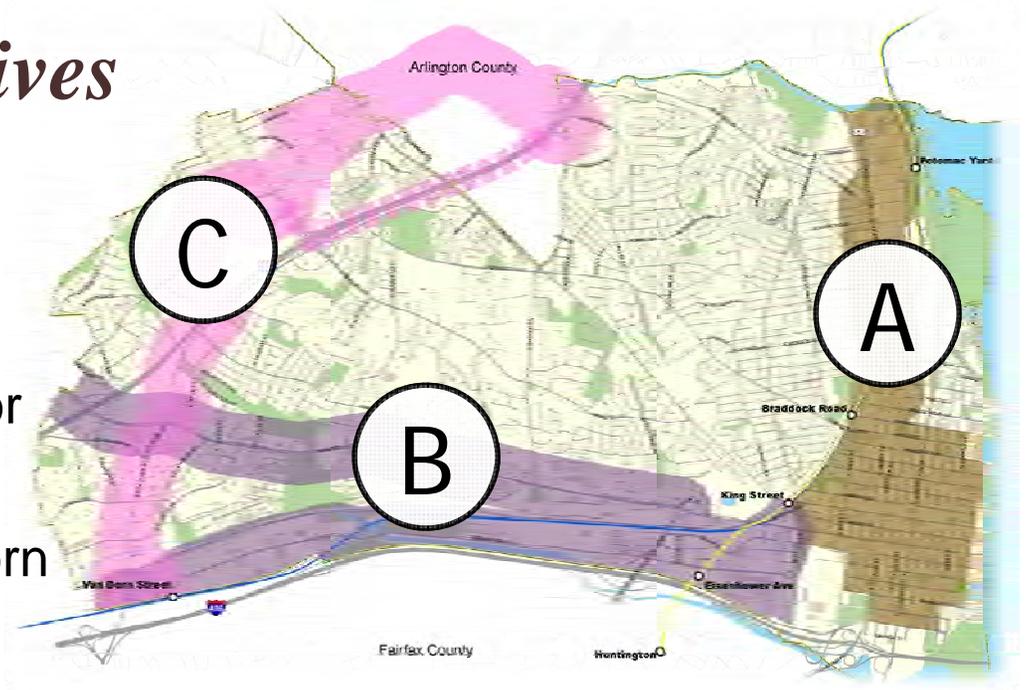
INTRODUCTION AND BACKGROUND



TRANSITWAY CORRIDOR FEASIBILITY STUDY

City Transitway Initiatives

- Development of a plan for dedicated transit services in three corridors
 - Corridor A: North-South Corridor
 - Corridor B: Duke/Eisenhower
 - Corridor C: Beauregard/Van Dorn
- Policy Direction and Needs
 - Council Strategic Plan Objectives
 - City's Transportation Master Plan, Beauregard/Mark Center Study, Landmark/Van Dorn Plan, Potomac Yard Plan, and Braddock Plan



City Transit Today and Tomorrow

Vision for Transit

- Reliable and convenient
- Integrated with land uses and transportation
- Travel time savings and an enjoyable transit experience
- Advanced technology and passenger amenities
- Connectivity with regional transitway network

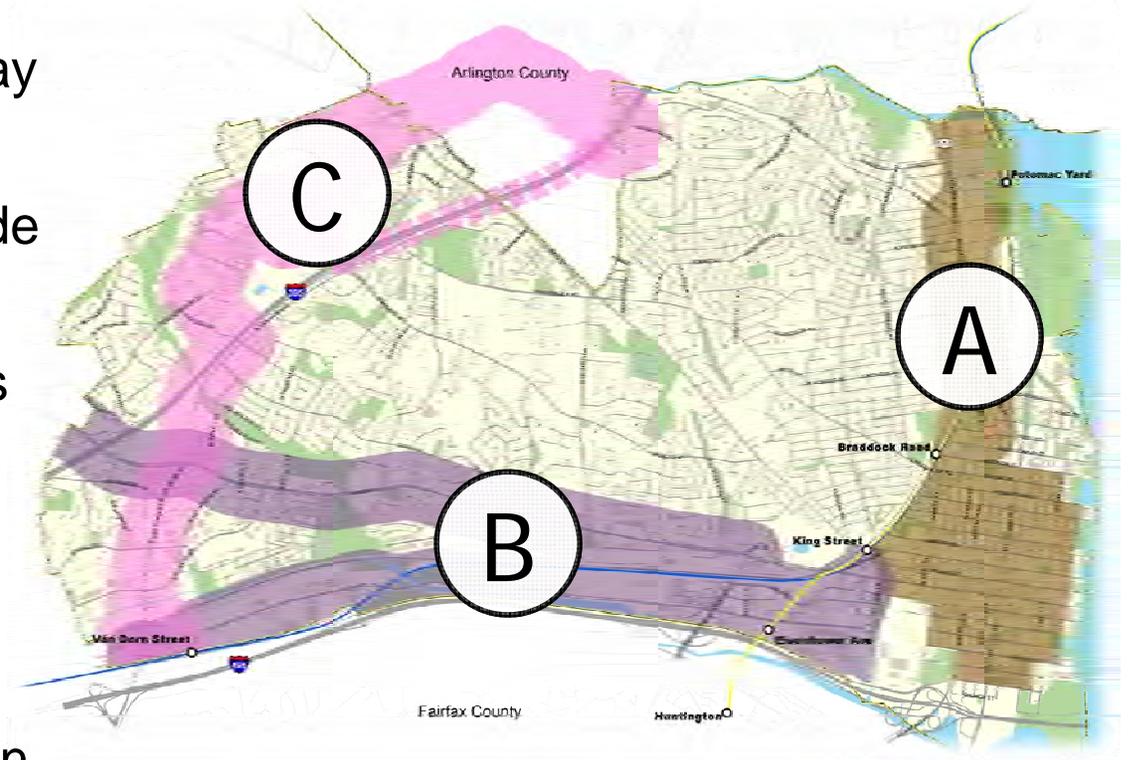
Consistent with Regional Mobility Policy Directions

- Regional increase in investment in transit
- Substantial increase in high-capacity transit services
- Regional network
- I-395 HOT Lanes transit expansion
- Wilson Bridge transit provision
- Arlington's transit expansion plans (Crystal City and Columbia Pike)



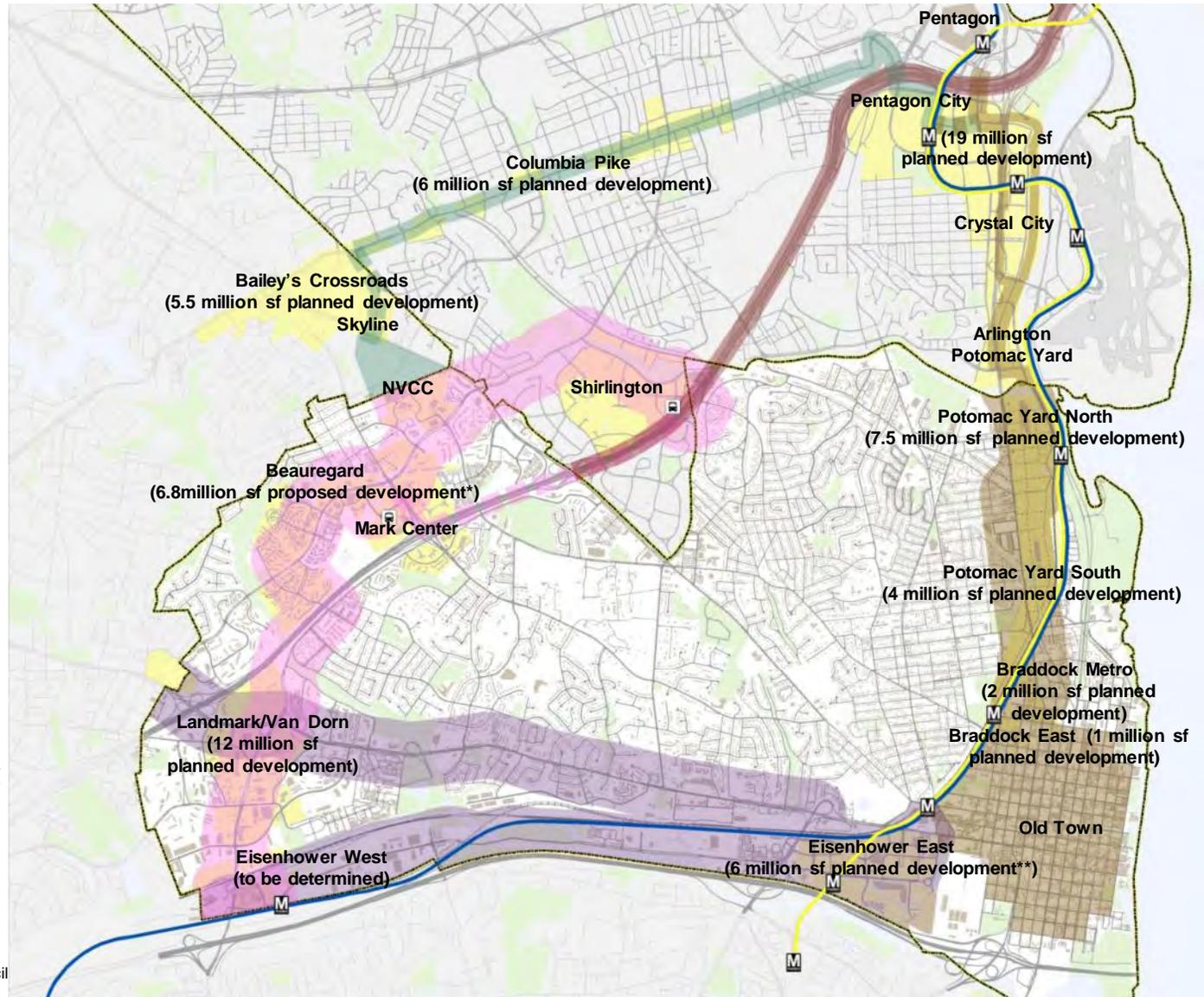
General Study Goals

- Define location and configuration of the transitway in each corridor
- Identify preferred transit mode technology for each corridor
- Develop plans for operations for each corridor
- Identify potential station locations
- Develop action plan - environmental documentation, funding levels/request, design, operations, governance, etc.



Land Use and Transportation Connectivity

- Beaugard corridor plan
- Braddock Metro & Braddock East plans
- Columbia Pike Initiative
- Crystal City plan
- Eisenhower East plan
- Eisenhower West area development
- Landmark/Van Dorn corridor plan
- Mark Center plan
- Metrorail blue & yellow lines
- NVCC Community College master plan
- Old Town
- Pentagon
- Pentagon City development
- Potomac Yard plans (Arlington and Alexandria)
- Shirlington



Regional development values approximate
 *Value approximate based on current developer plans for Beaugard Area that have not been approved by City Council
 **Value does not include Carlyle

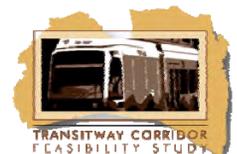
Technical Process

- High Capacity Transit Corridor Work Group
- Inventory, Review, and Analysis
- Concept Development and Refinement
- Land Use and Development Coordination
- Implementation and Action Plan



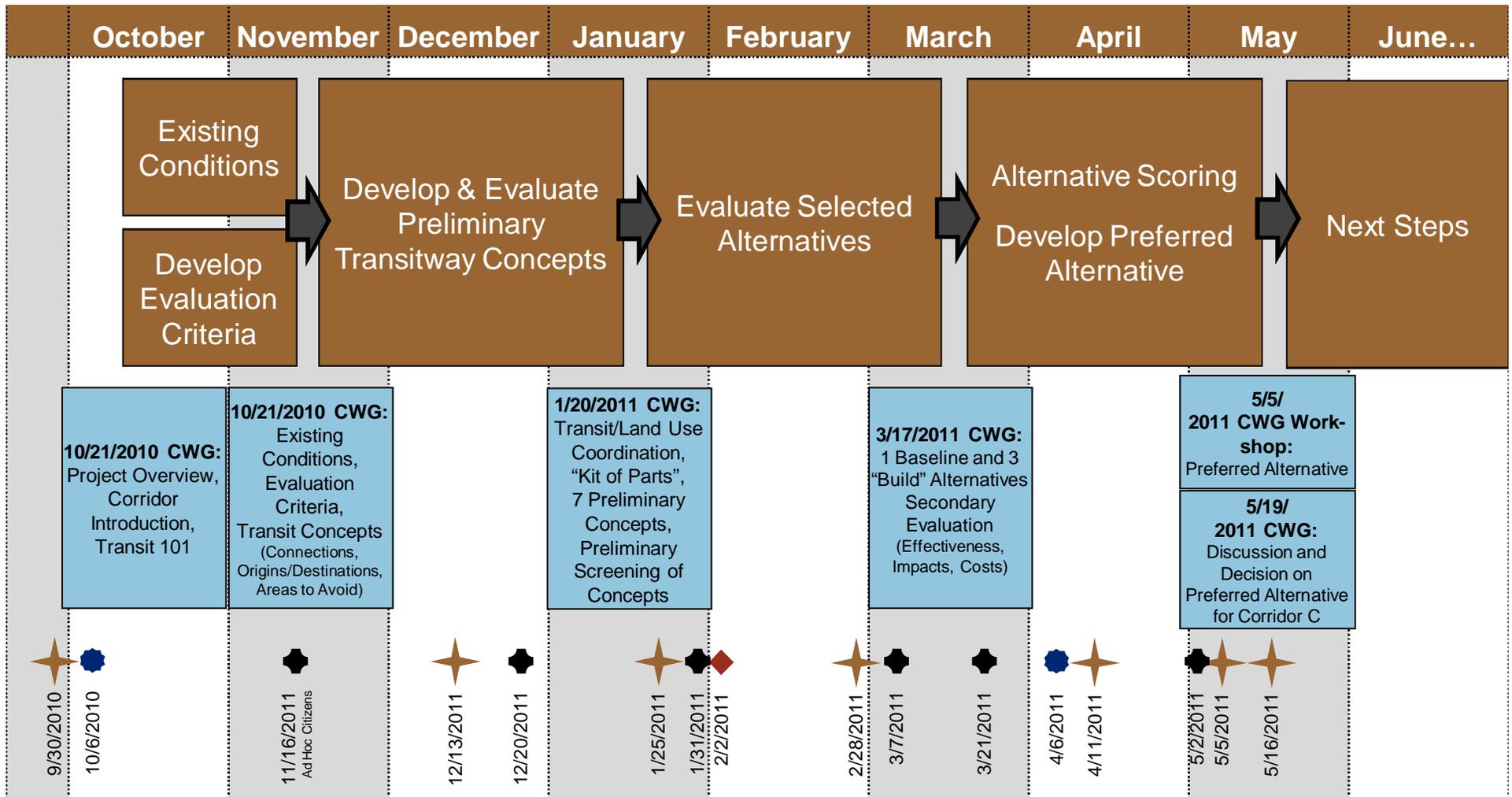
Corridor C

***REVIEW AND
RECOMMENDATION***



TRANSITWAY CORRIDOR FEASIBILITY STUDY

Project History – Corridor C



Legend

- Beauregard Corridor Plan Meeting
- Beauregard Corridor Stakeholder's Group
- Planning Commission
- Transportation Commission

Key Points from Discussions with CWG & Public

*What is the **purpose** of this study?*

- Adopt a transit enhancement strategy for each corridor.
- Provide an action plan for future study and implementation of the transitways in the city.

*How is the transitways study **interacting** with Mark Center/Beauregard planning?*

- Corridor C was studied first to provide input to the Beauregard planning process.
- Future BRAC-133 and potential Beauregard planning outcomes were considered in transitways study.

*Who will Corridor C **serve**?*

- People who already live and work in the corridor
- Planned and approved land uses (BRAC-133, Landmark/Van Dorn Plan, existing Beauregard zoning)
- Potential future Beauregard land uses (ongoing planning)
- Serve local destinations and connect to other transit systems in the region

*How could we implement high capacity **transit** in the Beauregard/Van Dorn corridor now?*

- Interim transit improvements are funded through a TIGER grant.
- BRAC-133 shuttle service to Metrorail
- Phased transitway implementation and potential DASH service reconfigurations are possible.



Key Points from Discussions with CWG & Public

*What is the impact to **vehicular level of service** in Corridor C?*

- General purpose vehicle lanes are maintained in the majority of the corridor.
- Transit is assumed to travel in dedicated lanes in the vast majority of the corridor.
- Right-of-way will be dedicated as a part of redevelopment in many locations along the corridor.

*How will **pedestrians and bicyclists** be impacted?*

- BRT and/or streetcar can safely interact with pedestrians and bicycles.
- Other plans, as well as the transitway plan, recommend improvements to the bicycle and pedestrian networks along the corridor.

*What are the impacts to existing the Beauregard **streetscape**?*

- Substantial streetscape enhancements are planned as a part of the transitway implementation and other plans' implementation.

*Can the transit implementation be **phased**?*

- Yes. For example, a BRT system in dedicated lanes could be modified to a streetcar system with supportive future conditions and additional investment.

*Are we planning for **future technologies**?*

- Yes. The configuration of the transitway planned as part of this study could accommodate many different future transit (mode and other) technologies.



Key Points from Discussions with CWG & Public

*What project **costs** are being considered?*

- Planning-level cost estimates were developed for capital, operating, vehicle lifecycle, and right-of-way.

*How could the transitway be **funded**?*

- Through a combination of local, regional, state, and federal partnerships along with private funds.
- Possible special taxes and/or fees
- Alternatives evaluation considered attractiveness for federal funding

*Who will make the **final decision** on the preferred alternative?*

- Alexandria City Council will make a recommendation on the locally preferred alternative for each corridor
- Council will receive guidance from the CWG, staff, Transportation Commission, Planning Commission, and public

*What are the **next steps**?*

- Environmental documentation and alternatives analysis
- Funding/financing package development
- Right-of-way acquisition
- Preliminary and final engineering



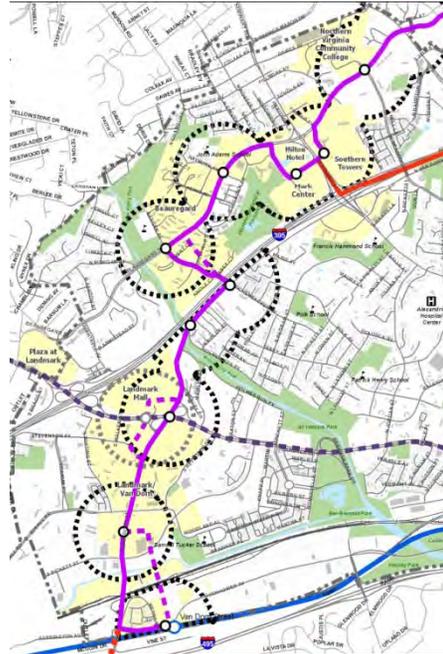
TRANSITWAY CORRIDOR FEASIBILITY STUDY

Alternative B (baseline)



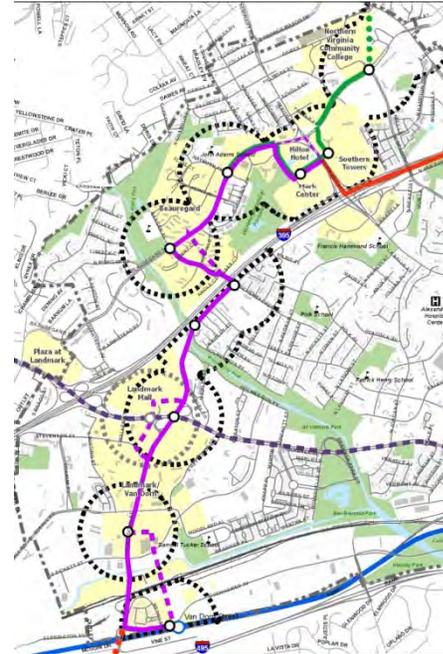
- Rapid bus
- Possible preliminary phase of any other alternative
- Baseline for evaluation

Alternative D



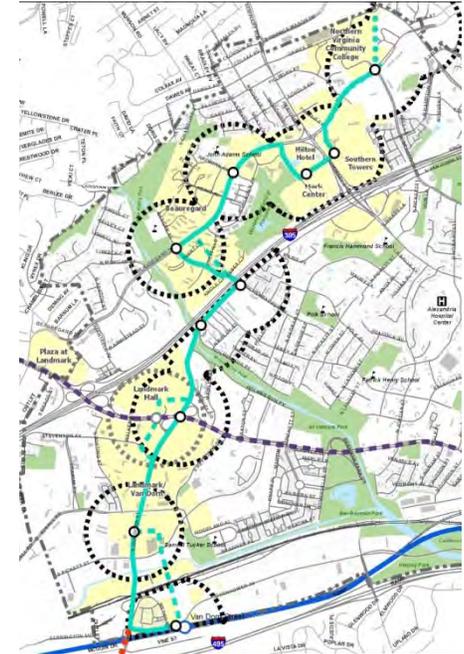
- BRT
- Dedicated lanes
- Shirlington and Pentagon/Pentagon City connections

Alternative E



- BRT and streetcar
- Dedicated lanes
- Columbia Pike and Pentagon/Pentagon City connections

Alternative G



- Streetcar option
- Dedicated lanes
- Columbia Pike connection

Legend	
	Rapid Bus
	Streetcar - Mixed Flow
	BRT (Bus Rapid Transit)
	Streetcar (dedicated lanes)
	Phased Route
	Optional Route
	or Columbia Pike Connection
	Transitway Station
	Quarter-mile station area



Secondary Evaluation - Effectiveness

Evaluation Criteria		Alternative				
		B <i>(baseline)</i>	D	E	G	
Transit Mode:		Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	Streetcar (dedicated)	
Northern Connection:		Shirlington & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Columbia Pike	
Coverage	Service to Regional Destinations	●	●	●	●	
	Service to Population, Employment, & Retail in the Corridor	●	●	●	●	
	Transit Connectivity	●	●	●	●	
Operations	Running-way Configuration(s)	○	●	●	●	
	Corridor Length	●	●	●	●	
	Capacity	●	●	●	●	
	Interoperability	●	●	●	●	
	Avoidance of Congestion	●	●	●	●	
	Transit Travel Times	In Corridor	●	●	●	●
		Between Termini	●	●	●	○
	Ridership	○	●	●	●	
	Intersection Priority	○	●	●	●	
Align-ment	Alignment Quality	●	●	●	●	
	Runningway Status	●	●	●	●	
Phasing		●	●	●	●	

Rating:	●	Best	●	Fair	○	Poor
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Secondary Evaluation - Impacts

Evaluation Criteria		Alternative			
		B (baseline)	D	E	G
Transit Mode:		Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	Streetcar (dedicated)
Northern Connection:		Shirlington & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Columbia Pike
Economic	Development Incentive	○	◐	◐	●
	Natural Environment	●	◐	◐	◐
Neighborhood and Community	Parks and Open Space	●	◐	◐	◐
	Property	●	◐	◐	◐
	Streetscapes	●	◐	◐	◐
	Community Resources	●	●	●	●
	Demographics	●	◐	◐	◐
Transportation	Noise and Vibration	○	◐	◐	●
	Traffic Flow Impact	○	●	●	●
	Traffic Signals	◐	○	○	○
	Multimodal Accommodation	○	◐	◐	●
	Parking	●	◐	◐	◐

Rating:	●	Best	◐	Fair	○	Poor
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Secondary Evaluation - Cost Effectiveness

Evaluation Criteria		Alternative			
		B <i>(baseline)</i>	D	E	G
Transit Mode:		Rapid Bus (mixed)	BRT (mixed & dedicated)	Streetcar (mixed) & BRT (mixed & dedicated)	Streetcar (dedicated)
Northern Connection:		Shirlington & Pentagon	Shirlington & Pentagon	Columbia Pike & Pentagon	Columbia Pike
Cost Effectiveness	Capital Cost	●	◐	◐	○
	Right-of-Way Cost	●	◐	○	○
	Operating Cost	◐	●	◐	●
	Order of Magnitude Cost Per Rider	○	◐	○	●

Rating:	●	Best	◐	Fair	○	Poor
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Notes

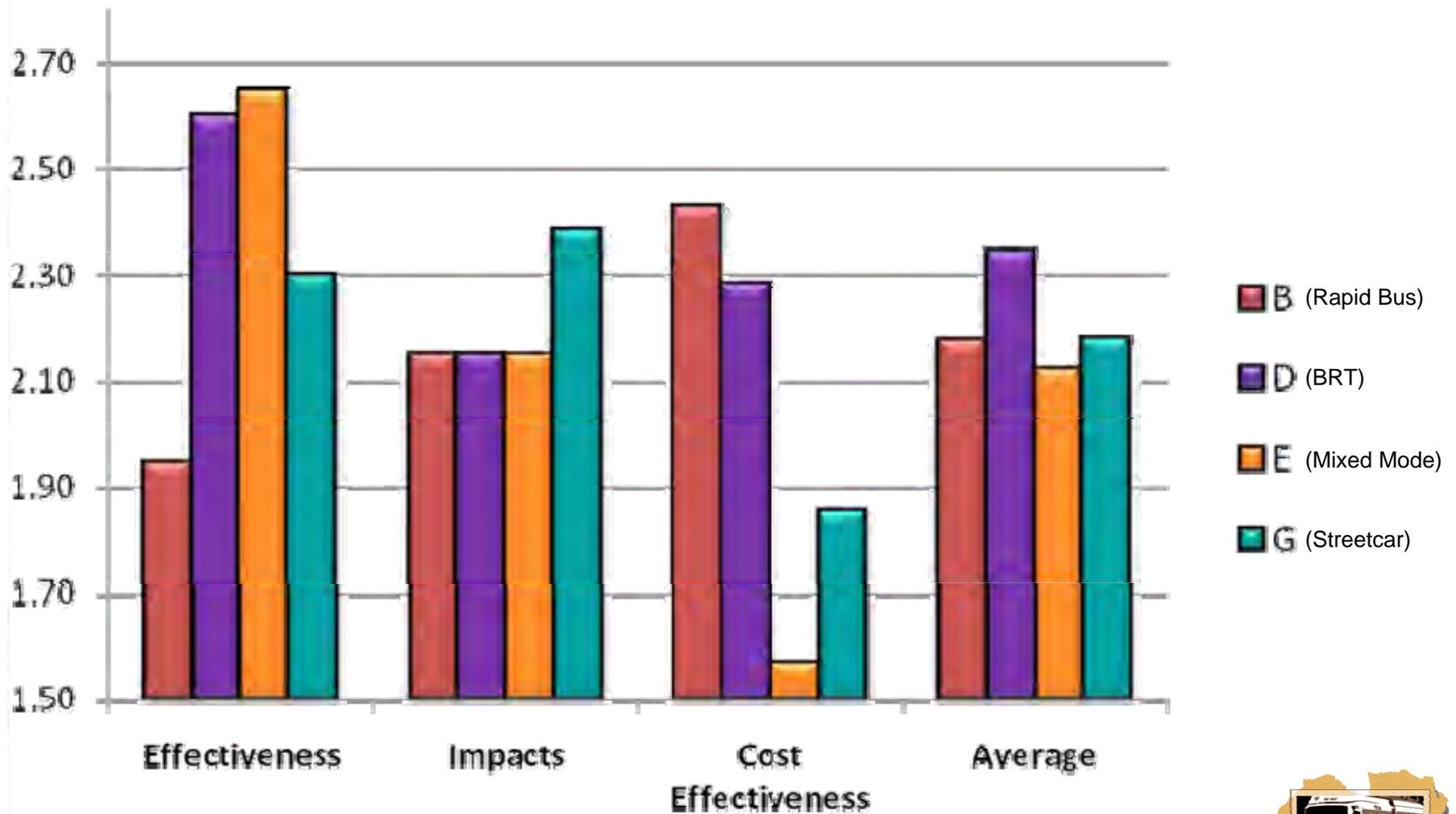
1. Costs assume that Arlington's Columbia Pike streetcar terminates at NVCC at a maintenance facility. Costs for Alternatives E and G would be higher if the Columbia Pike maintenance facility is located in Long Bridge Park due to the location of the terminus of Columbia Pike.
2. Streetcar fleet costs are for the Alexandria portion of the streetcar only and are assumed to supplement Arlington's Columbia Pike fleet.
3. Right of way costs do not include property along Eisenhower Avenue, within Northern Virginia Community College, or in locations where development contribution is expected.
4. Planning level cost estimates are shown in year 2010 dollars and do not include additional contingency or escalation to a future year mid-point of construction. Totals listed do not include costs for major utility relocations/new service, or the capital costs for roadway/streetscape improvements that may be implemented concurrently, but are not required for the transit project. Alignments designated as "optional" or "phased" are not included in the cost.

Secondary Evaluation & Scoring

- Criteria rating: best (3), fair (2), poor (1)
- Several criteria were weighted based on importance
 - Transit travel times in corridor
 - Transit travel times between termini
 - Ridership
 - Phasing
 - Traffic flow impact
 - Capital cost
 - Right-of-way cost
 - Operating cost
- Criteria group scores were computed
- Overall scoring summary for each alternative was developed



Scoring Summary by Evaluation Criteria Group



TRANSITWAY CORRIDOR FEASIBILITY STUDY

Recommendation

Alternative D Bus Rapid Transit in Dedicated Lanes

Connections

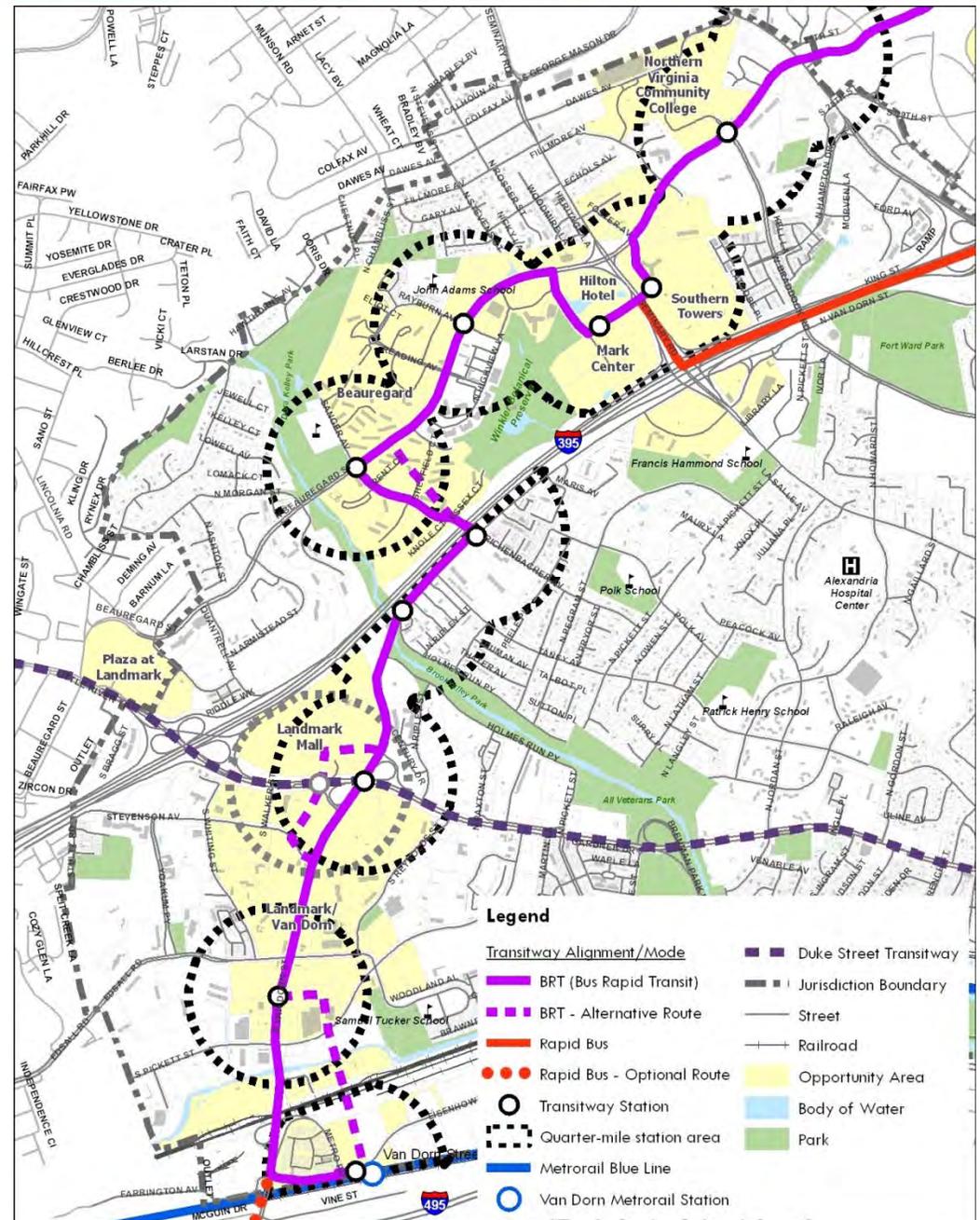
- Van Dorn Metrorail Station
- Landmark Mall
- Mark Center
- Southern Towers
- NVCC
- Shirlington
- Pentagon/Pentagon City

Planning-Level Cost Estimate¹

- Capital: \$48 million
- Fleet (25-year): \$20 million
- ROW²: \$33 million
- Operating (25-year): \$60 million

Notes

1. Planning level cost estimates are shown in year 2010 dollars and do not include additional contingency or escalation to a future year mid-point of construction. Totals listed do not include costs for major utility relocations/new service, or the capital costs for roadway/streetscape improvements that may be implemented concurrently, but are not required for the transit project. Alignments designated as "optional" or "phased" are not included in the cost.
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TRANSITWAY CORRIDOR FEASIBILITY STUDY

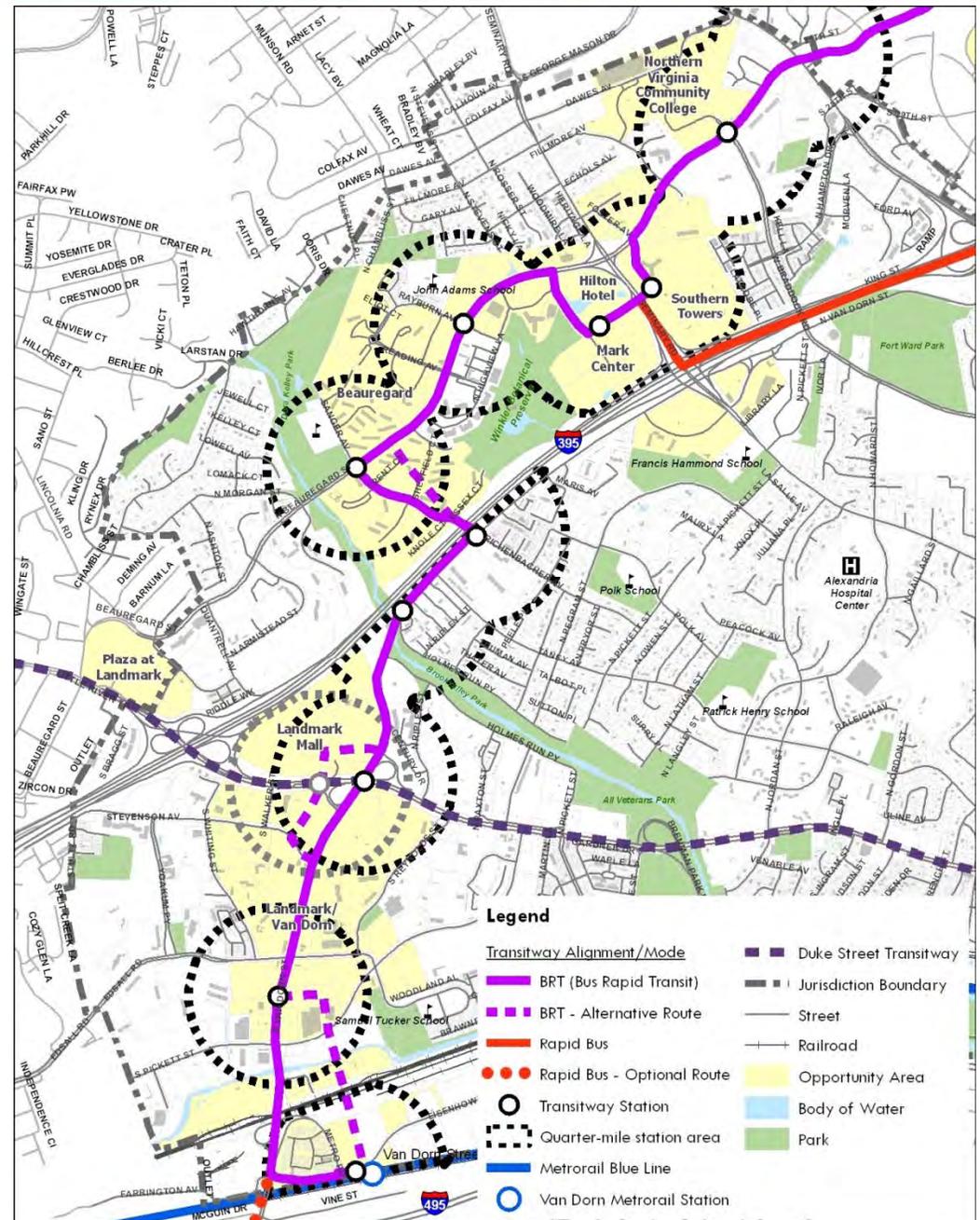
Recommendation

Physical Characteristics

- Low-floor BRT vehicles
- Dedicated lanes (~80% to 90% of corridor)
- Off-board fare collection
- Service specific branding and identity
- Substantial transit stations

Operational Characteristics

- Transit signal priority at intersections
- Real-time service information
- 15-minute peak period headways
- 20-minute off-peak headways
- 18 hours of service (Monday through Saturday)
- 12 hours of service on Sunday



TRANSITWAY CORRIDOR FEASIBILITY STUDY

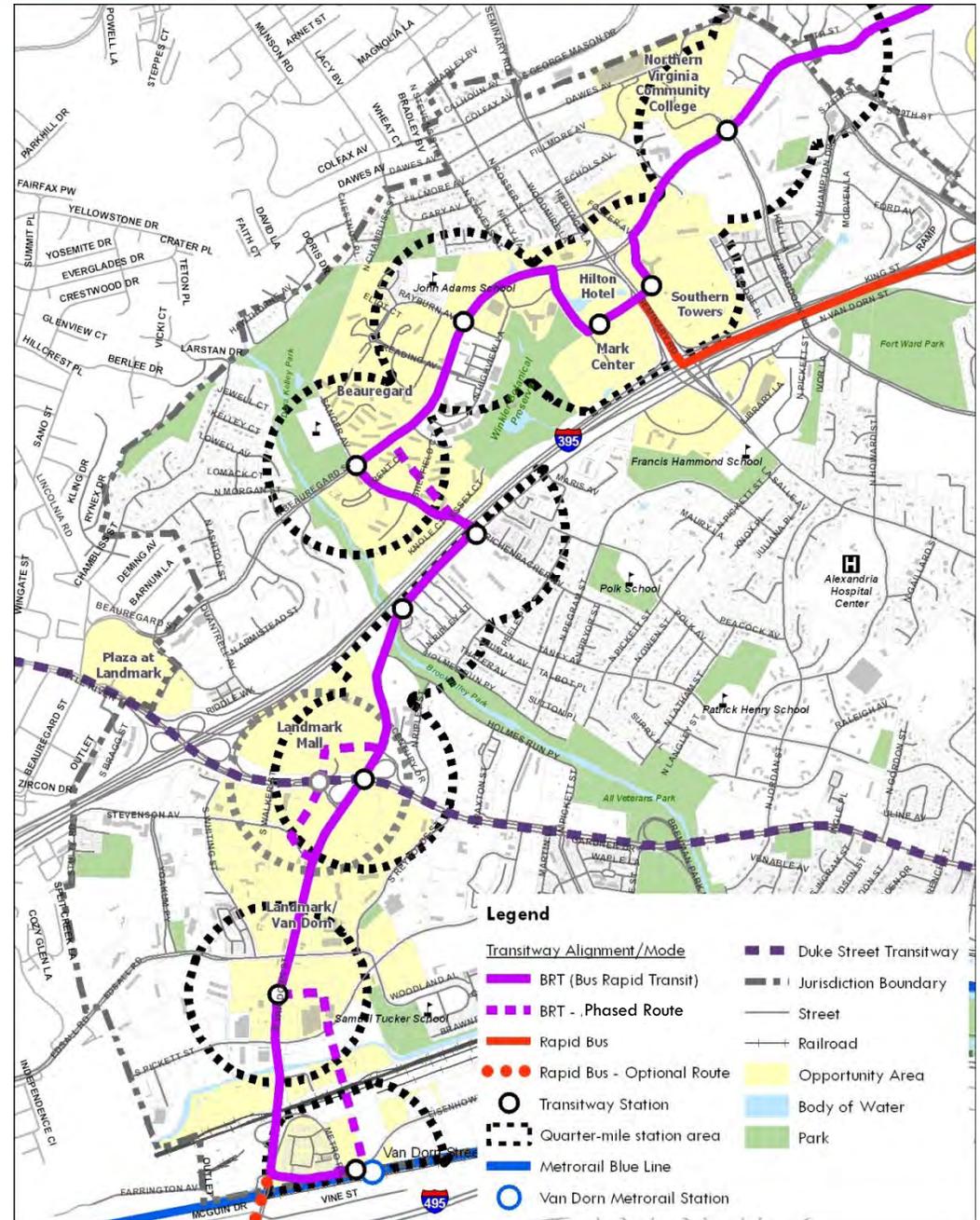
Recommendation

Alternative D

- Reliable and efficient
- Attractive to choice riders
- Significant seated capacity
- Regional and locally interconnected
- Moderate construction cost
- Potential to be attractive for federal funding

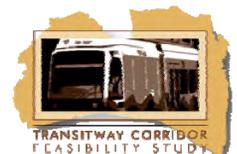
Notes

- Construct to not preclude streetcar
- Streetcar could be implemented as a later phase, with supportive conditions



Corridor Work Group

DISCUSSION & COMMENTS



Public

DISCUSSION & COMMENTS



Corridor Work Group

CORRIDOR C
RECOMMENDATION





October 11, 2009 4:23 pm

Route	Time
9 Powell to 98th Ave	5 min
9 Powell to Gresham TC	23 min
17 Holgate to 136th Ave	5 min
19 Woodstock to Mt Scott & 112th via 28th Ave	4:45 pm
44 Capital Fwy to PCC Sylvania	8 min 43 min

Let us know how we're doing. Email comments@trimet.org or call 503-238-RIDE. Get service updates!

TRANSIT INFORMATION

MODES | OPERATIONS | FACILITIES | URBAN CONSIDERATIONS



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WHO USES TRANSIT?

- **Transit Captive** – people in this group do not have access to a car or are unable to drive. Reliant on transit for mobility.

Services are typically designed to serve this group

- **Choice** – people in this group may have access to a car, but instead choose to use transit to meet their mobility needs.

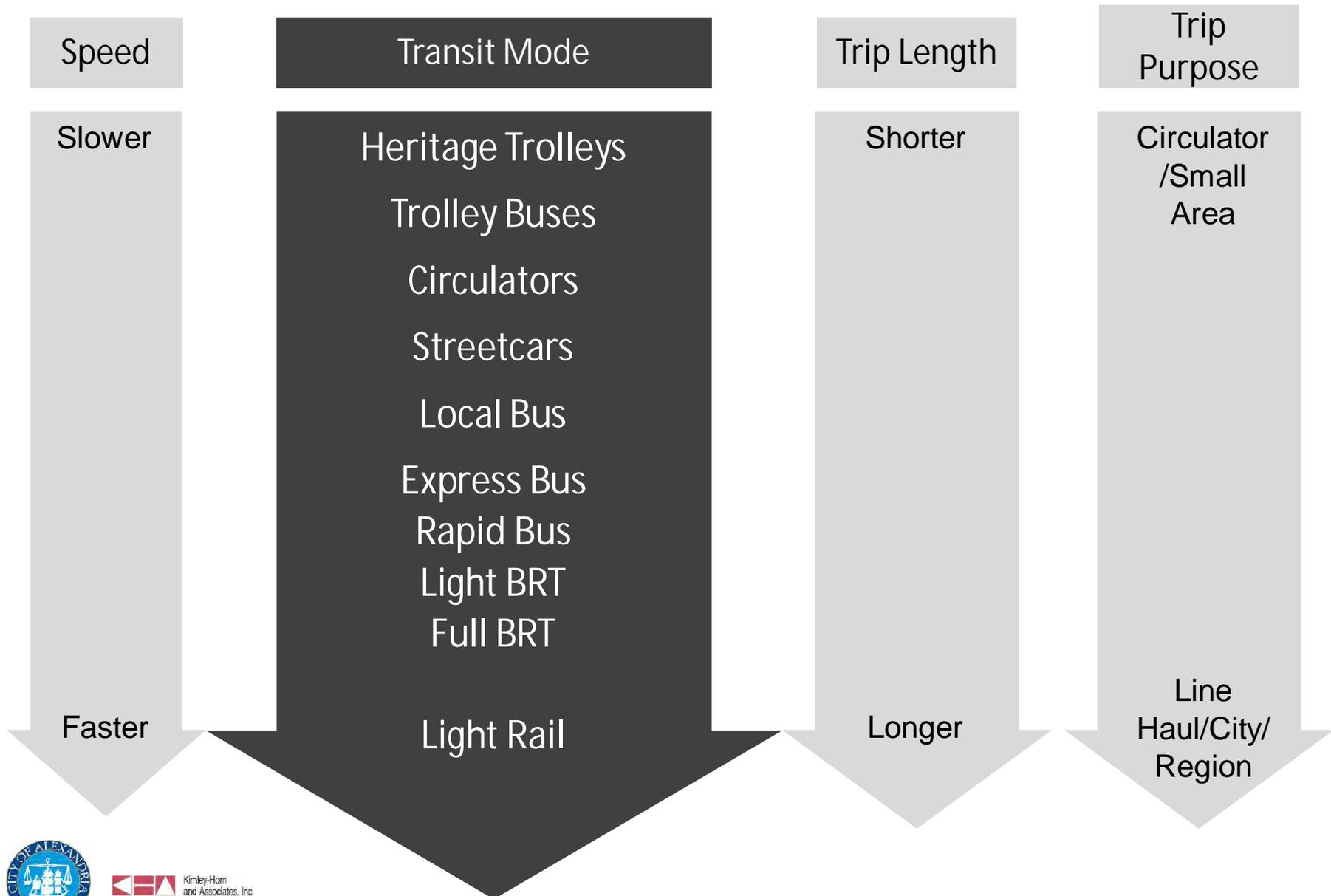
Could be very large market if services were made attractive

- **Auto Captive** – this group has *little to no inclination to use transit* – trips do not lend themselves to transit or the trip maker does not want to use transit

Likely inefficient use of resources and public money to serve



TRANSIT MODE CHARACTERISTICS



PLANNING-LEVEL CAPITAL COSTS OF TRANSIT MODES*

- Circulators and Shuttles - varies
- Local Bus - <\$50,000 per mile
- Express Bus - \$50,000 or less per mile
- Rapid Bus - \$3 million/mile
- Light Bus Rapid Transit - \$5 million/mile
- Full Bus Rapid Transit - \$5 to \$15 million/mile
- Modern Streetcar \$10 to \$25 million/mile
- Light Rail Transit - \$20 to \$60 million/mile



**Planning-level costs shown are approximate and are in year 2010 dollars. They do not include contingency or escalation to a future year mid-point of construction. Totals listed do not include for initial (or programmed replacement) vehicle purchases, maintenance facilities, right-of-way acquisition (including any condemnation, damages, or relocation costs), major utility relocations/new service, or roadway/streetscape improvements that may be implemented concurrently, but are not required for the transit project.*



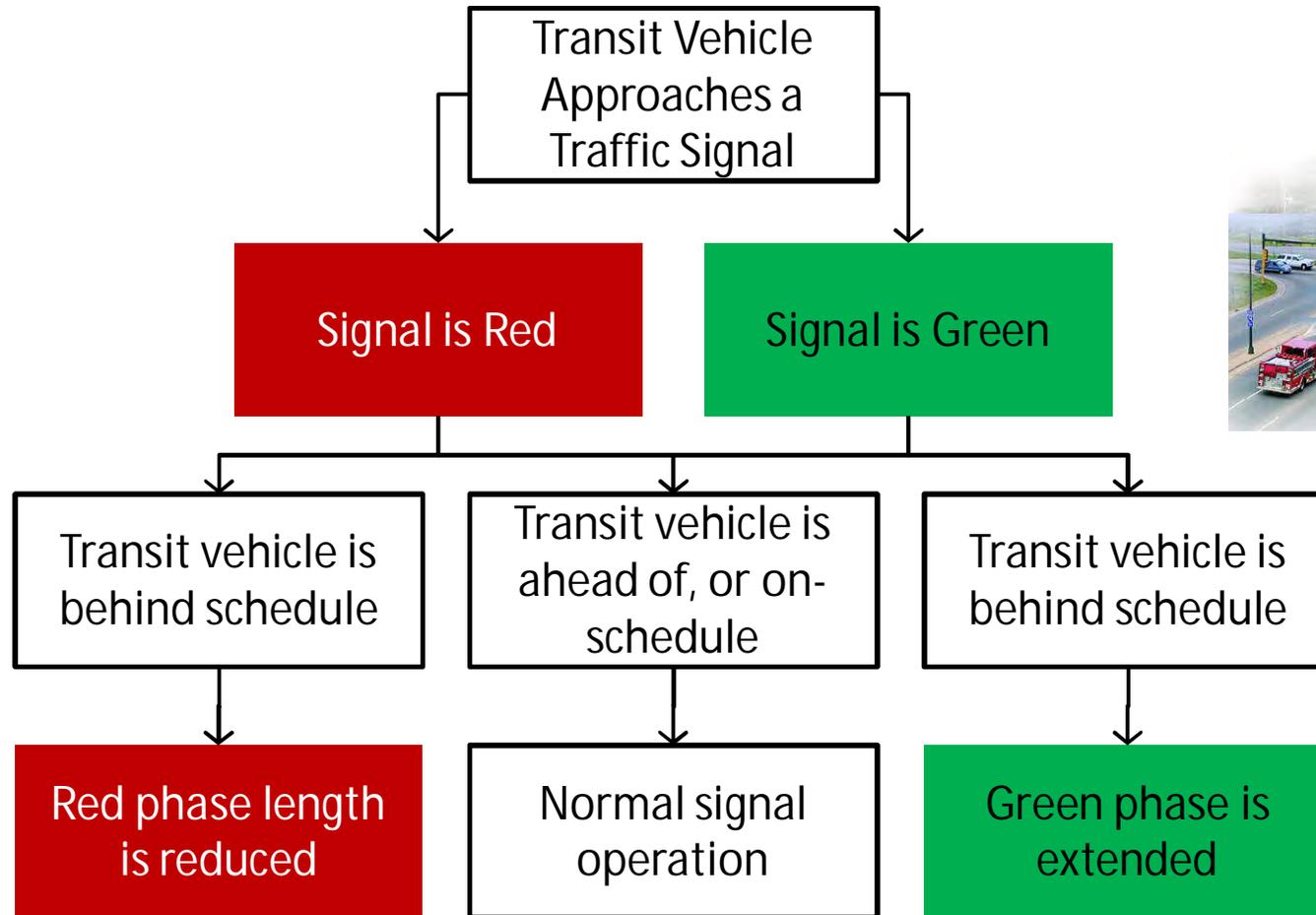


Alameda-Contra Costa Transit District, California



OPERATIONAL STRATEGIES AND PRIORITY TREATMENTS

OVERVIEW OF TRANSIT SIGNAL PRIORITY



OFF-BOARD FARE COLLECTION

- Fare collected before boarding
- Validated upon entering the station or through random enforcement
- Payment can be made using cash or credit/debit
- Decreases boarding time/stop dwell time
- Increases service efficiency
- Allows boarding through all doors



Off-board fare collection, Portland (Oregon)



BRT station, Curitiba (Brazil)



Median BRT station faregates, Bogota (Colombia)

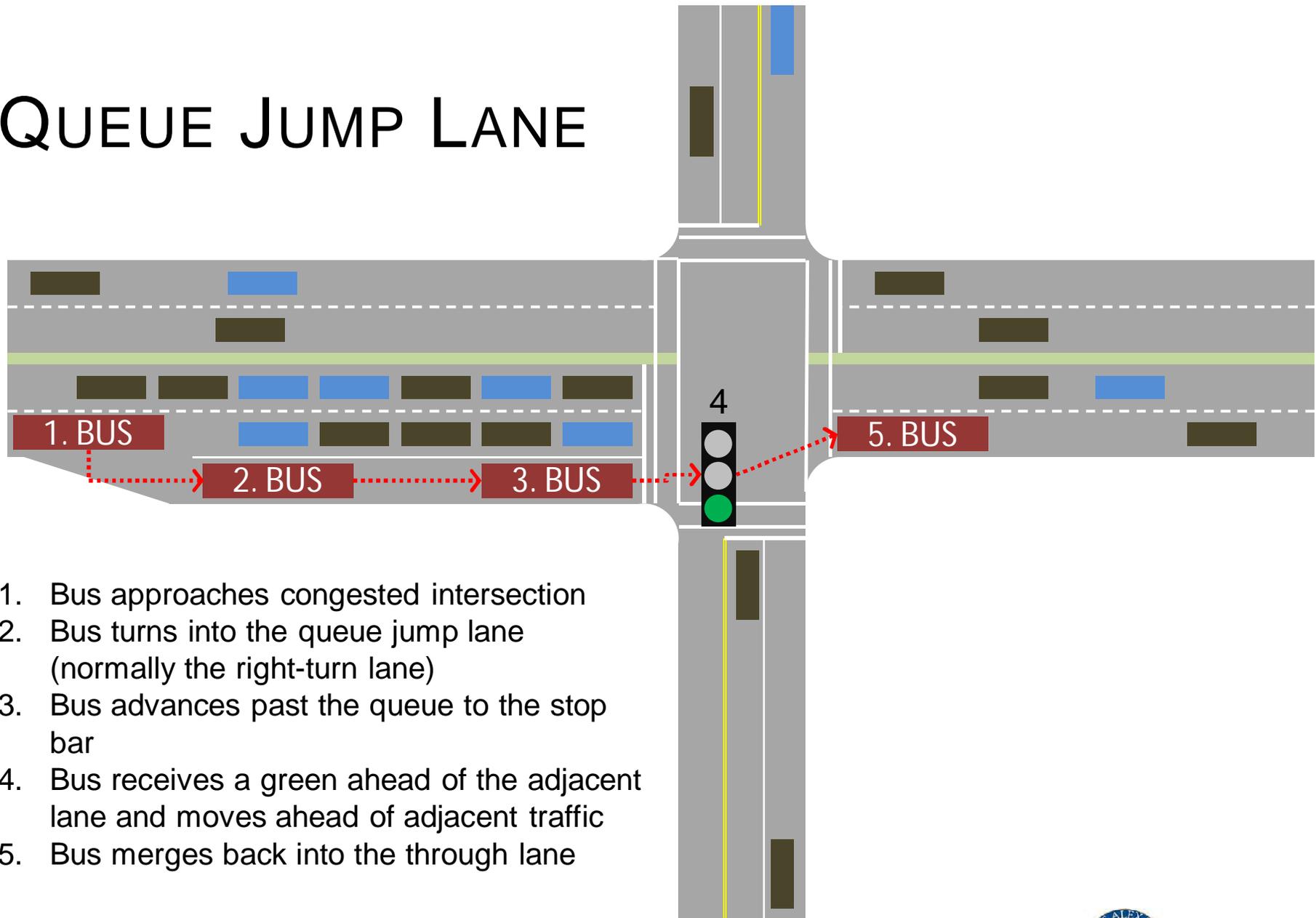


MIXED VS. DEDICATED RUNNINGWAYS

Characteristic	Mixed Traffic	Dedicated Lanes
Transit Vehicle Speeds	Lower	Higher
Travel Time	Longer	Shorter
Service Reliability	Lower	Higher
Impact on General Traffic	Minimal (if buses stop in bays)	Significant (if dedicated lane removes travel lane)
	Significant (if buses block traffic)	Minimal (if roads are widened)
Right-of-Way Impact	Minimal	Considerable
Transit Vehicle Bunching	More likely	Less likely
Cost	Low	High
Time to Implement	Short	Moderate



QUEUE JUMP LANE



1. Bus approaches congested intersection
2. Bus turns into the queue jump lane (normally the right-turn lane)
3. Bus advances past the queue to the stop bar
4. Bus receives a green ahead of the adjacent lane and moves ahead of adjacent traffic
5. Bus merges back into the through lane





Hiawatha Line LRT Station, Twin Cities (Minnesota)



FACILITIES

BASIC STOP



Bus stop, Toronto (Ontario, Canada)

- Bench
- Shelter
- Lighting
- Service information
- Trash can
- Paved waiting area

ENHANCED STOP/STATION



Healthline BRT station, Cleveland (Ohio)

- Purpose designed for a line or service
- Substantial shelter
- Larger waiting area
- Real time service information
- Off-board fare collection (optional)
- Climate controlled area
- Level boarding



OTHER FACILITIES

- Maintenance and storage yards
- Traction power components
- Catenary



Traction power transformer, unknown location



Catenary, Bay Area California



Streetcar storage and maintenance facility, Seattle (Washington)



Streetcar line, Portland (Oregon)

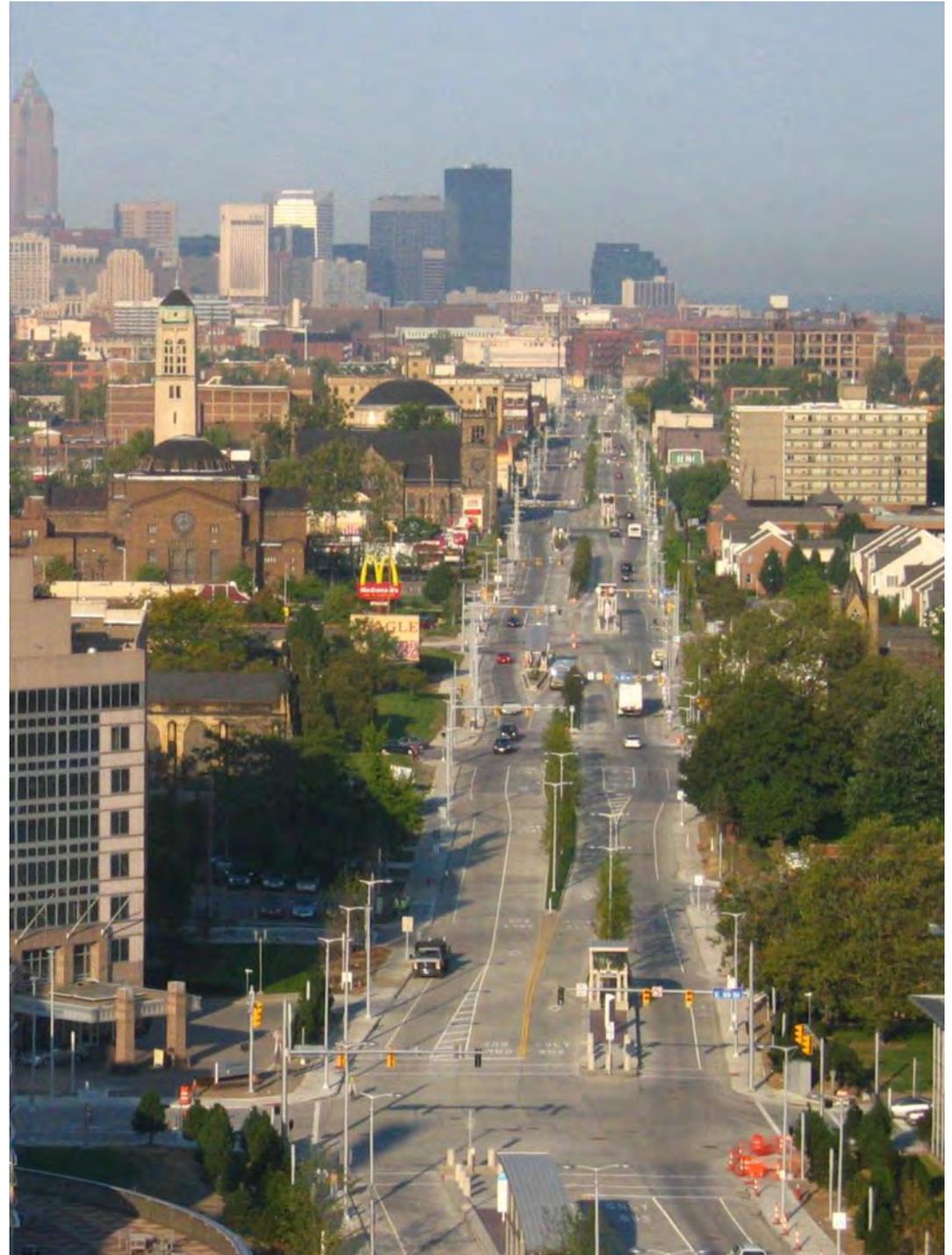
INTEGRATION INTO URBAN PLACES



Pioneer Square transit station, Portland (Oregon)



Bus stop, Charlotte (North Carolina)



Healthline BRT, Cleveland (Ohio)

STREETSCAPE

- Green runningways
- Landscaped medians
- Catenary does not need to damage the tree canopy



Healthline BRT, Cleveland (Ohio)



MULTIMODAL CONSIDERATIONS: PEDESTRIANS & BICYCLES



LUAS Streetcar, Dublin (Ireland)



Cyclist on rail line, Portland (Oregon)



TRANSITWAY CORRIDOR FEASIBILITY STUDY



High Capacity Transit Corridor Work Group
Corridor A and B: Existing Conditions & Concepts
May 19, 2011 Meeting



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Corridors A and B

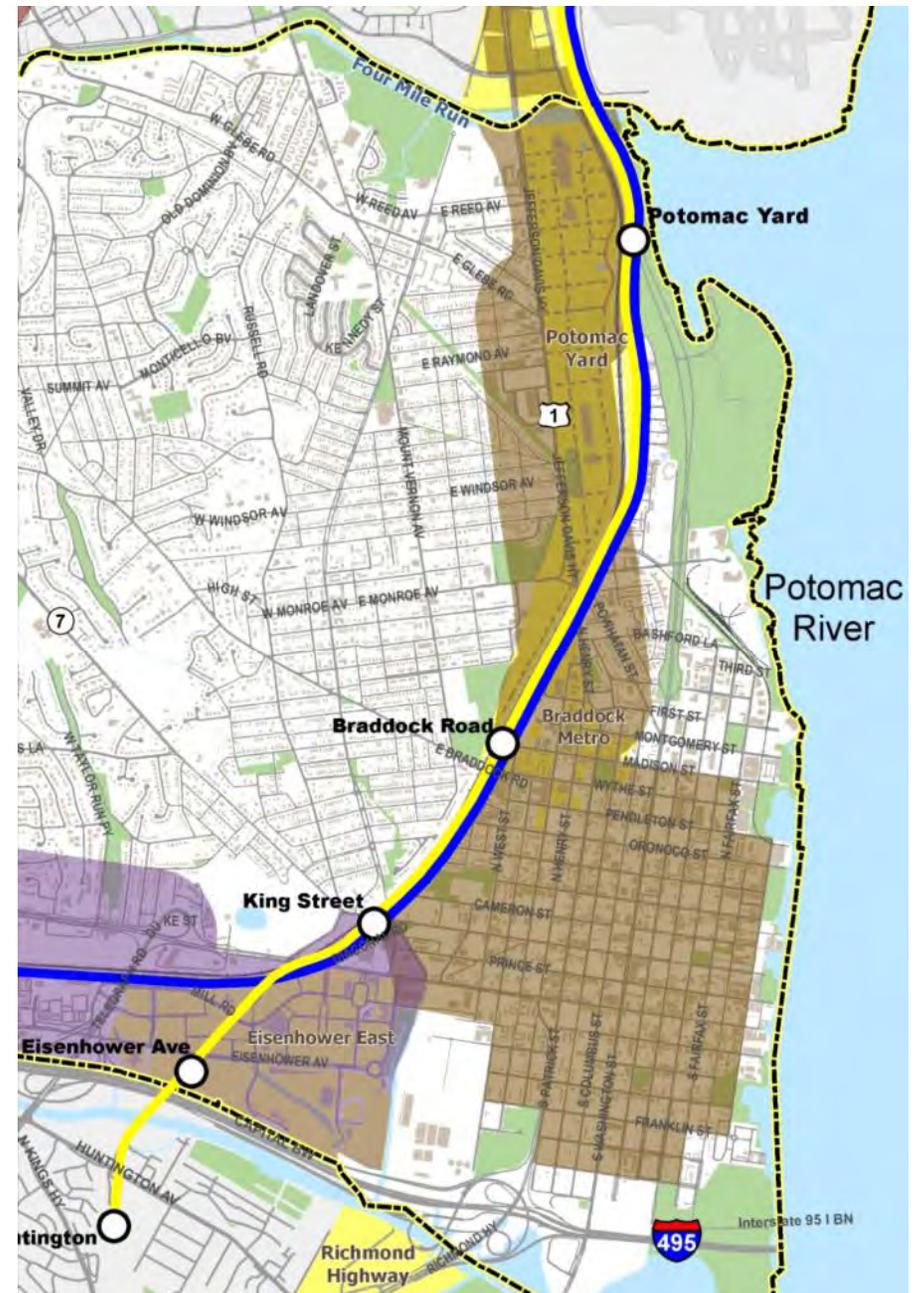
EXISTING CONDITIONS



TRANSITWAY CORRIDOR FEASIBILITY STUDY

Corridor A: North-South

- Connects to Regional Activity Centers
- Major Destinations
 - Old Town
 - Potomac Yard
 - Pentagon
 - Crystal City
 - King Street Metrorail Station
 - Braddock Road Metrorail Station



TRANSITWAY CORRIDOR FEASIBILITY

North-South Corridor Transit Service

Legend

--- City of Alexandria Line

Metro rail

Yellow Line

Blue Line

Bus

DASH Bus

Metrobus

Metrobus REX

0 0.25 0.5 Miles



Existing corridor transit ridership

Average Weekday Metrorail Ridership: 58,400

Average Weekday VRE Ridership: 650 (approx.)

Average Weekday Bus Ridership

Routes AT2 (King St, Fairfax St, others): 2,035

Routes AT3 (Washington St, Royal/Fairfax, Pendleton St, others): 976

Route AT4 (N. Fairfax St, others): 912

Route AT5 (King St, Fairfax St, Madison/Montgomery, others): 2,063

Route AT7 (King, Payne/Royal, Eisenhower Ave): 1,015

Route AT8 (Duke St, Royal St): 2,628

Route AT 10 (Commonwealth Ave, Mt Vernon Ave, others): 731

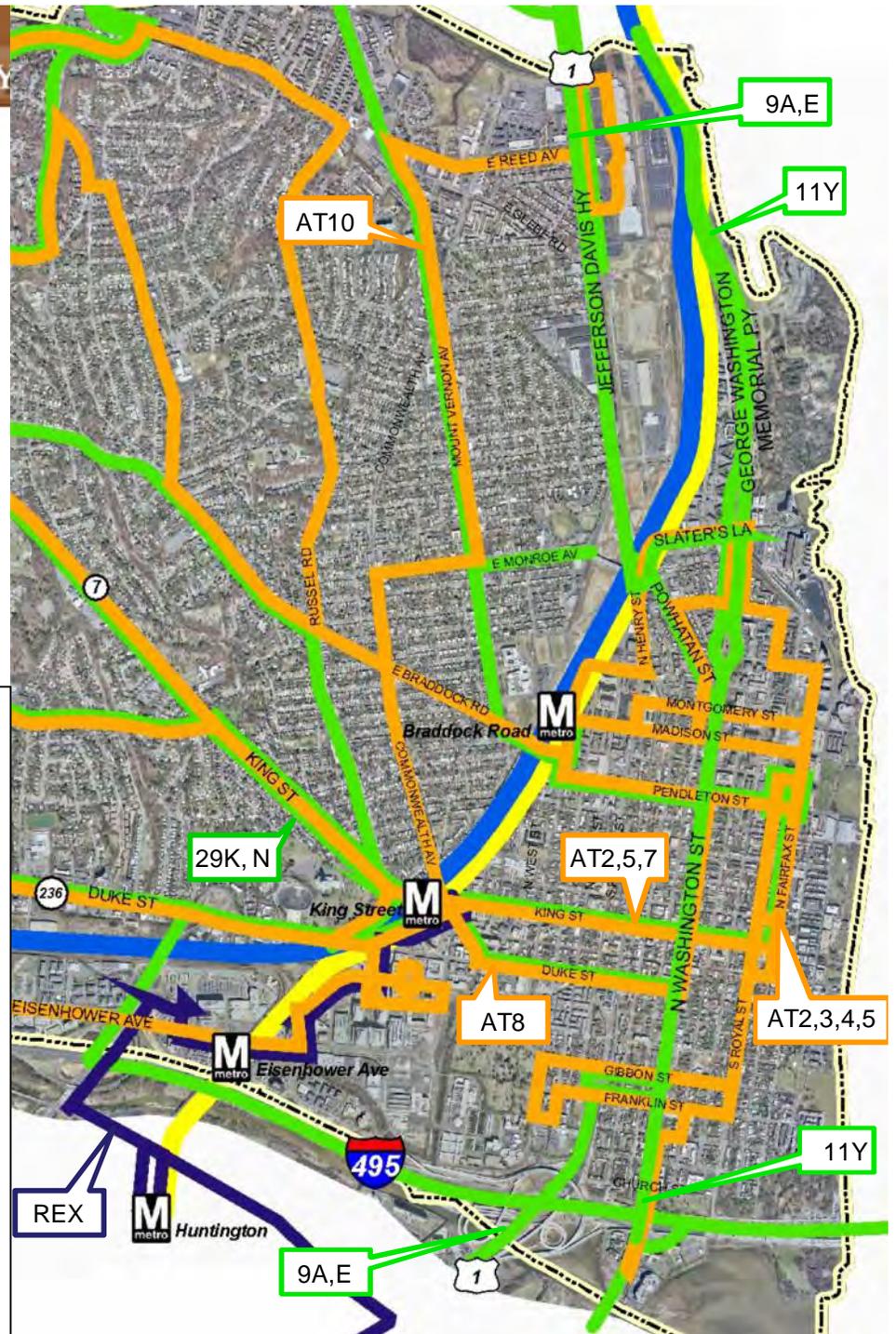
Metrobus Route 9A-E (Washington St, Jefferson David Hwy): 1,788

Metrobus Route 11Y (Washington St, George Washington Pkwy): 378

Metrobus Routes 29K,N (Duke St, others): 2,272

Metrobus REX (Eisenhower Ave, Telegraph Rd): 3,685

DASH ridership 2011, WMATA ridership 2009, VRE ridership 2010



TRANSITWAY CORRIDOR FEASIBILITY STUDY

DASH Service

Legend

----- City of Alexandria Line

Metrorail

Yellow Line

Blue Line

DASH Route

AT1

AT2

AT3

AT4

AT5

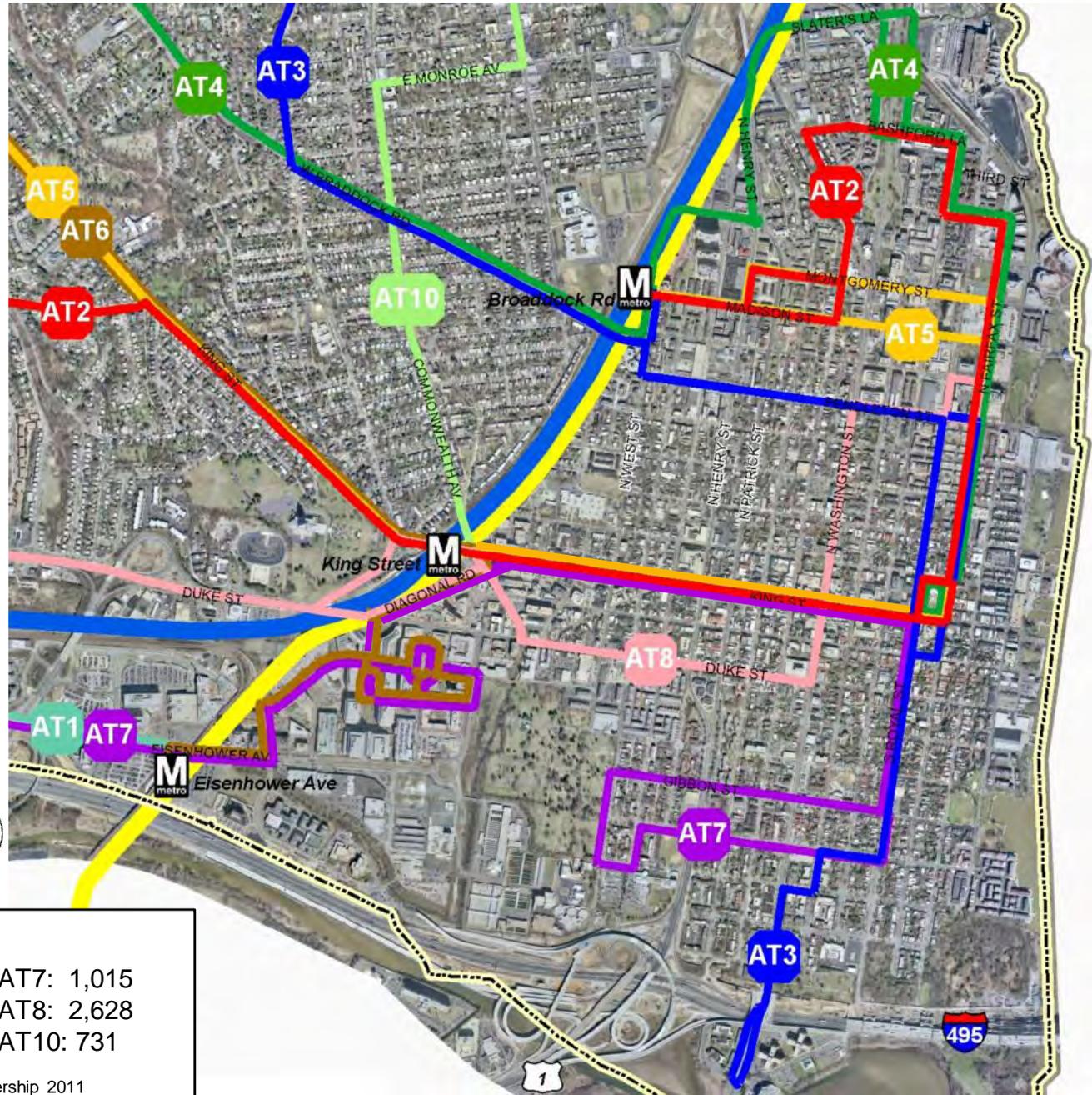
AT6

AT7

AT8

AT10

0 0.25 0.5 Miles



Average Weekday Bus Ridership

Route AT2: 2,035

Route AT3: 976

Route AT4: 912

Route AT5: 2,063

Route AT7: 1,015

Route AT8: 2,628

Route AT10: 731

DASH ridership 2011



AM Peak Period Travel Time

- Distance: 1.6 miles
 - Northbound: 12 minutes
 - Southbound: 4 minutes

Data Collected: Fall 2010

Legend

○ Signalized Intersection

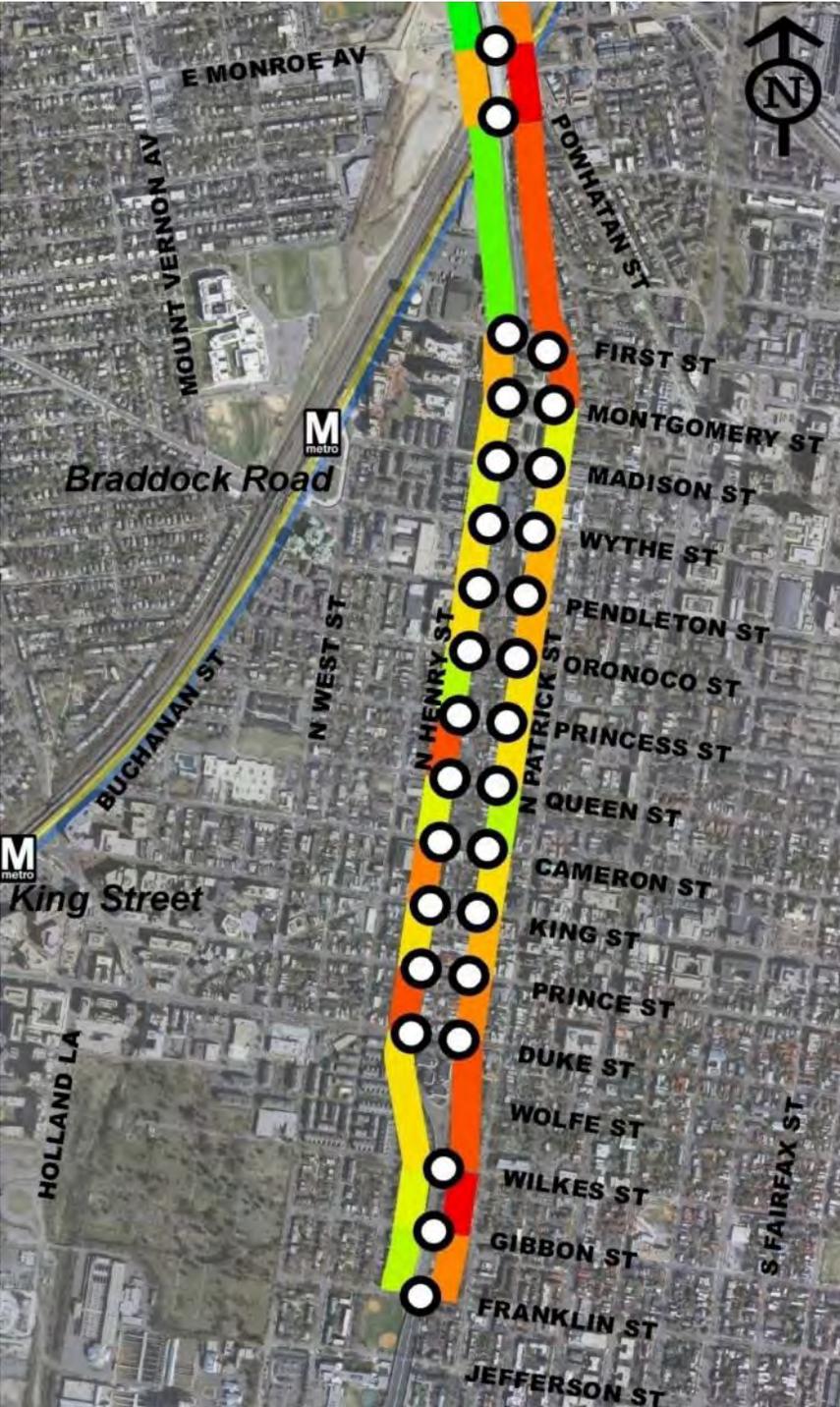
Corridor Travel Speed Range

■ Low (less than 20 mph)

■ Moderate

■ High (greater than 25 mph)





AM Peak Period Travel Time

- Distance: 1.7 miles
 - Northbound: 7 minutes
 - Southbound: 5 minutes

Data Collected: Fall 2010

Legend

- Signalized Intersection
- Corridor Travel Speed Range
 - Red Low (less than 20 mph)
 - Yellow Moderate
 - Green High (greater than 25 mph)





PM Peak Period Travel Time

- Distance: 1.6 miles
 - Northbound: 6 minutes
 - Southbound: 5 minutes

Data Collected: Fall 2010

Legend

○ Signalized Intersection

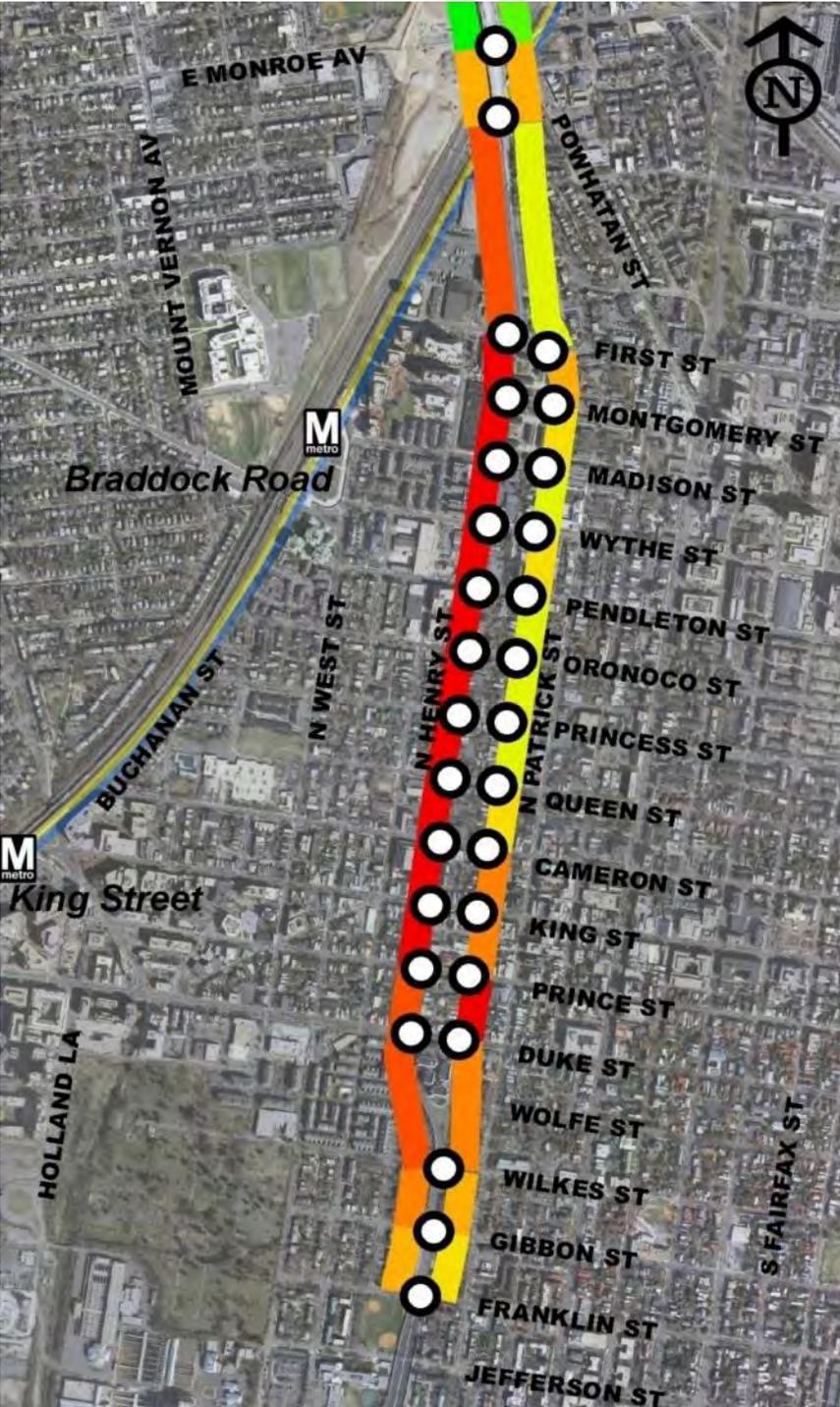
Corridor Travel Speed Range

■ Low (less than 20 mph)

■ Moderate

■ High (greater than 25 mph)





PM Peak Period Travel Time

- Distance: 1.7 miles
 - Northbound: 5 minutes
 - Southbound: 25 minutes

Data Collected: Fall 2010

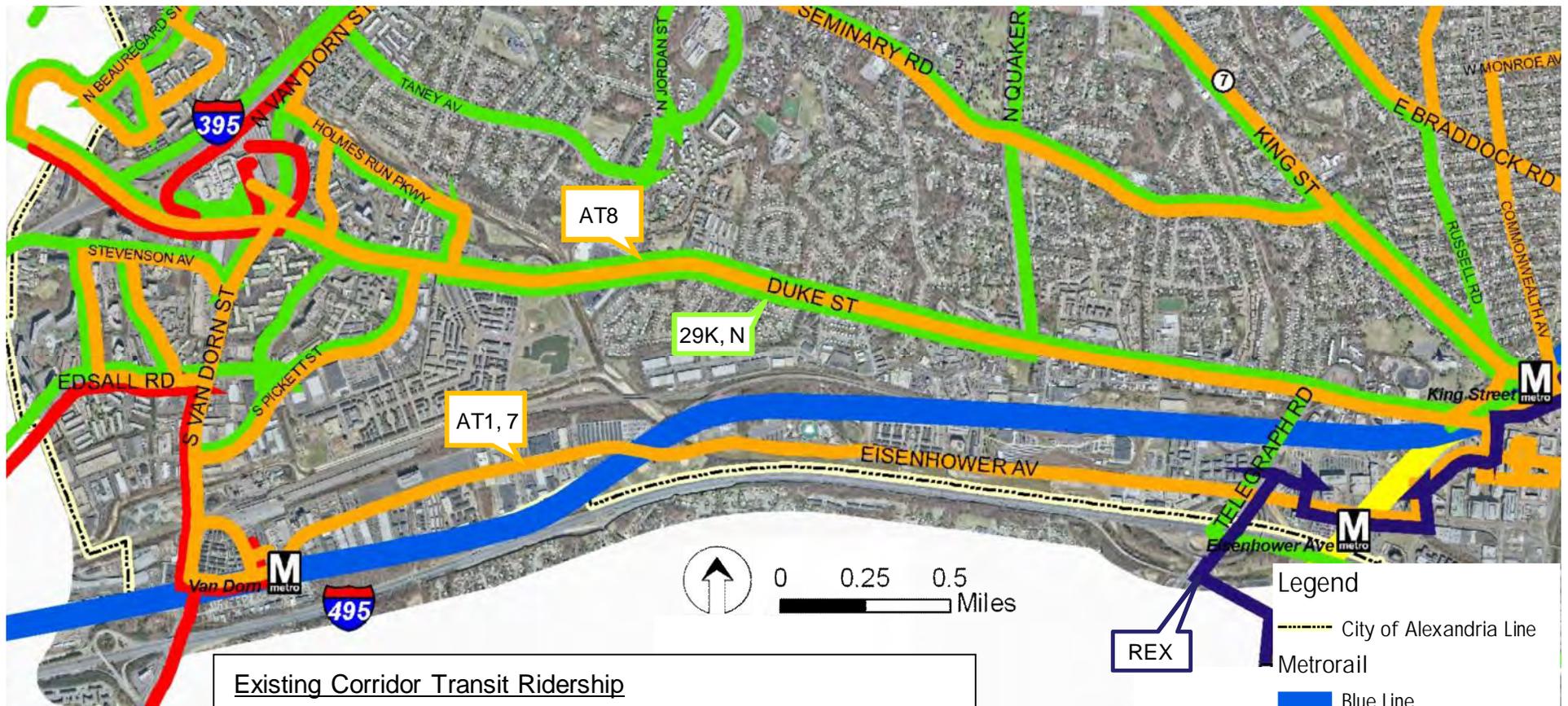
Legend

- Signalized Intersection
- Corridor Travel Speed Range
- Red Low (less than 20 mph)
- Yellow Moderate
- Green High (greater than 25 mph)



TRANSITWAY CORRIDOR FEASIBILITY STUDY

Duke/Eisenhower Corridor Transit Service



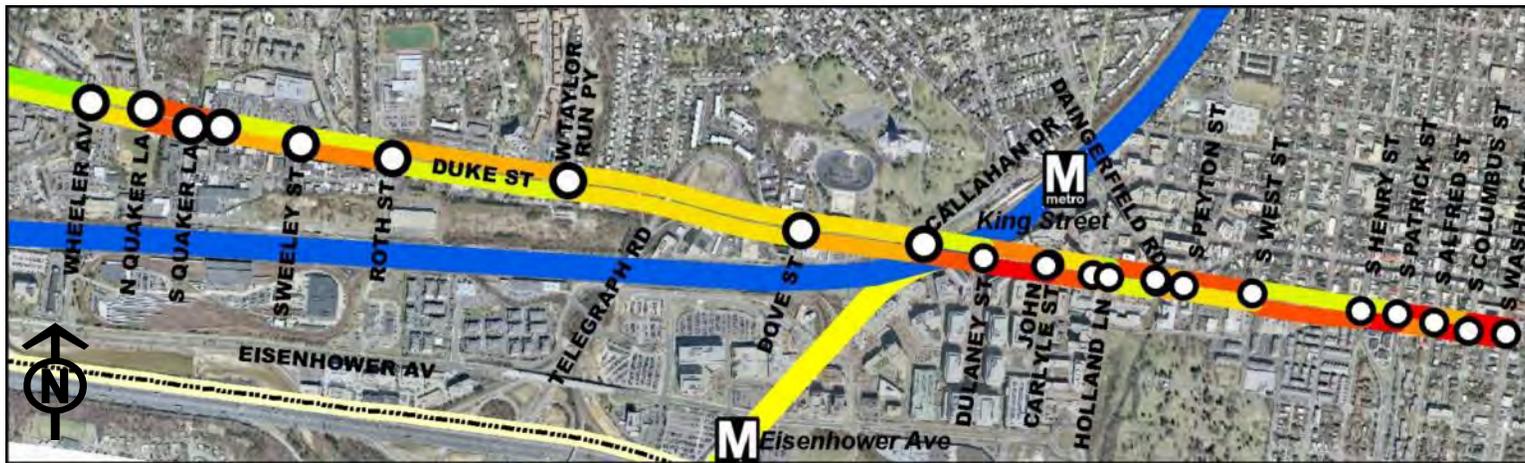
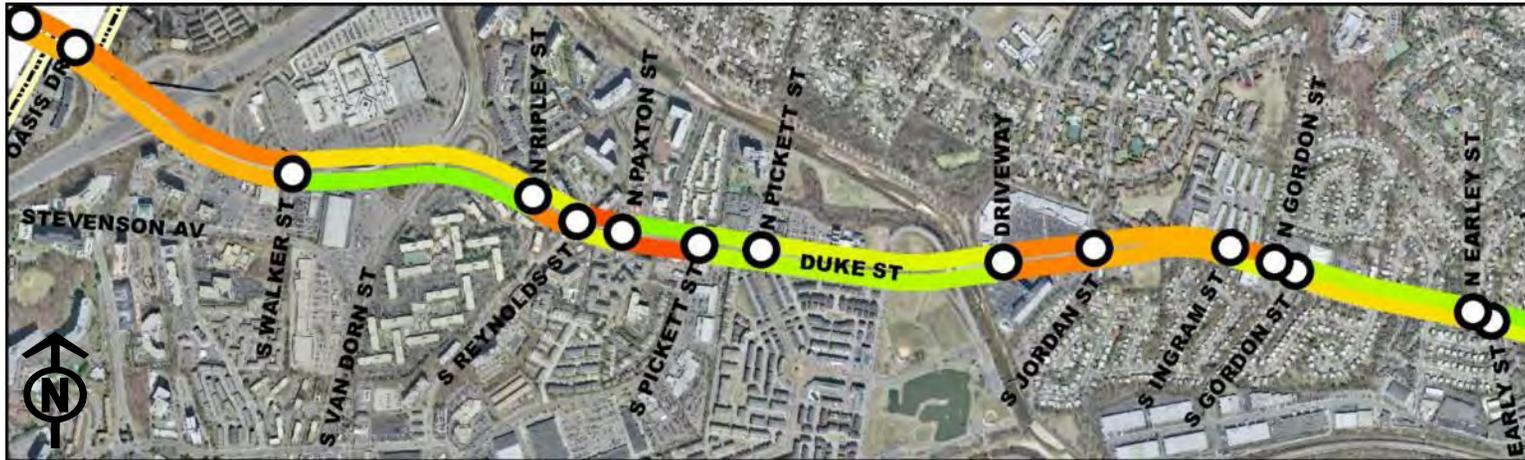
Existing Corridor Transit Ridership

Average Weekday DASH Ridership Route AT1: 1,765
 Average Weekday DASH Ridership Route AT7: 1,015
 Average Weekday DASH Ridership Route AT8: 2,628
 Average Weekday WMATA Ridership Route 29K,N: 2,272
 Average Weekday WMATA Metrobus REX: 3,685

DASH ridership 2011, WMATA ridership 2009

TRANSITWAY CORRIDOR FEASIBILITY STUDY

AM Peak Period Travel Time



Legend

● Signalized Intersection

Corridor Travel Speed Range

Red Low (less than 20 mph)

Yellow Moderate

Green High (greater than 25 mph)

● Distance: 5.3 miles

- Eastbound: 21 minutes

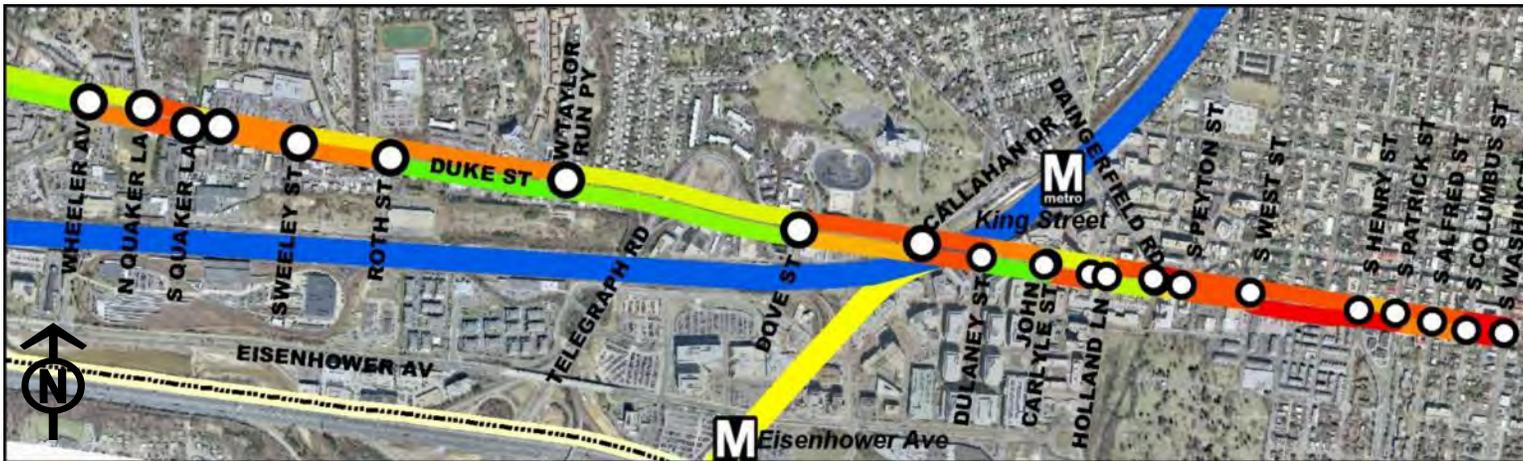
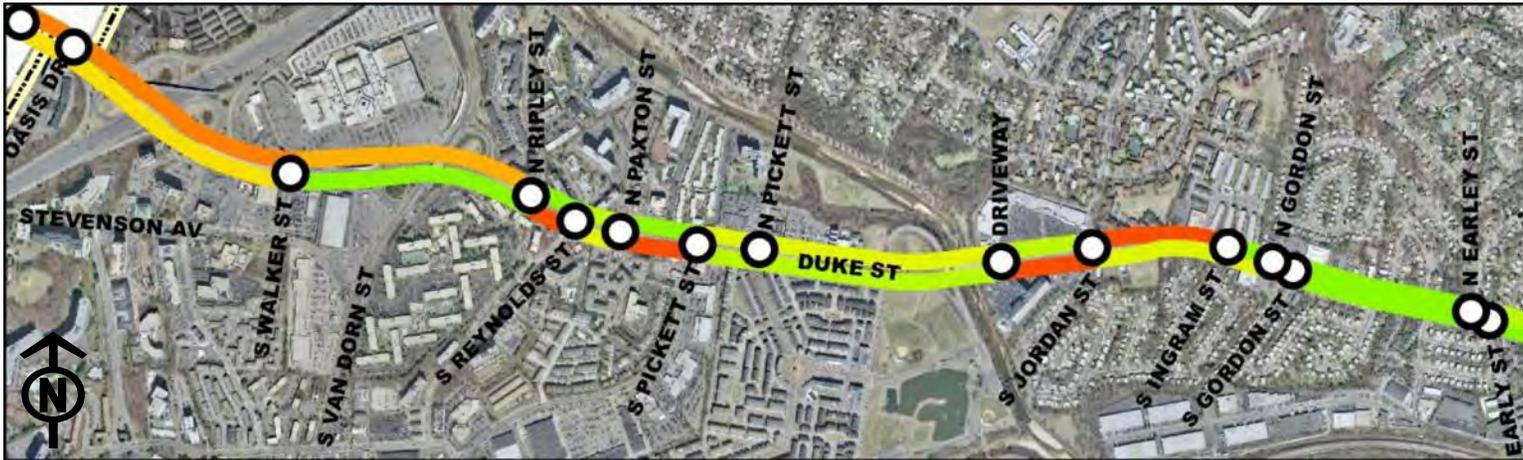
- Westbound: 19 minutes

Data Collected: Fall 2010



TRANSITWAY CORRIDOR FEASIBILITY STUDY

PM Peak Period Travel Time



Legend

○ Signalized Intersection

Corridor Travel Speed Range

Red Low (less than 20 mph)

Yellow Moderate

Green High (greater than 25 mph)

● Distance: 5.3 miles

- Eastbound: 23 minutes

- Westbound: 24 minutes

Data Collected: Fall 2010



Corridors A and B

TRANSITWAY CONCEPTS



Old Town Context

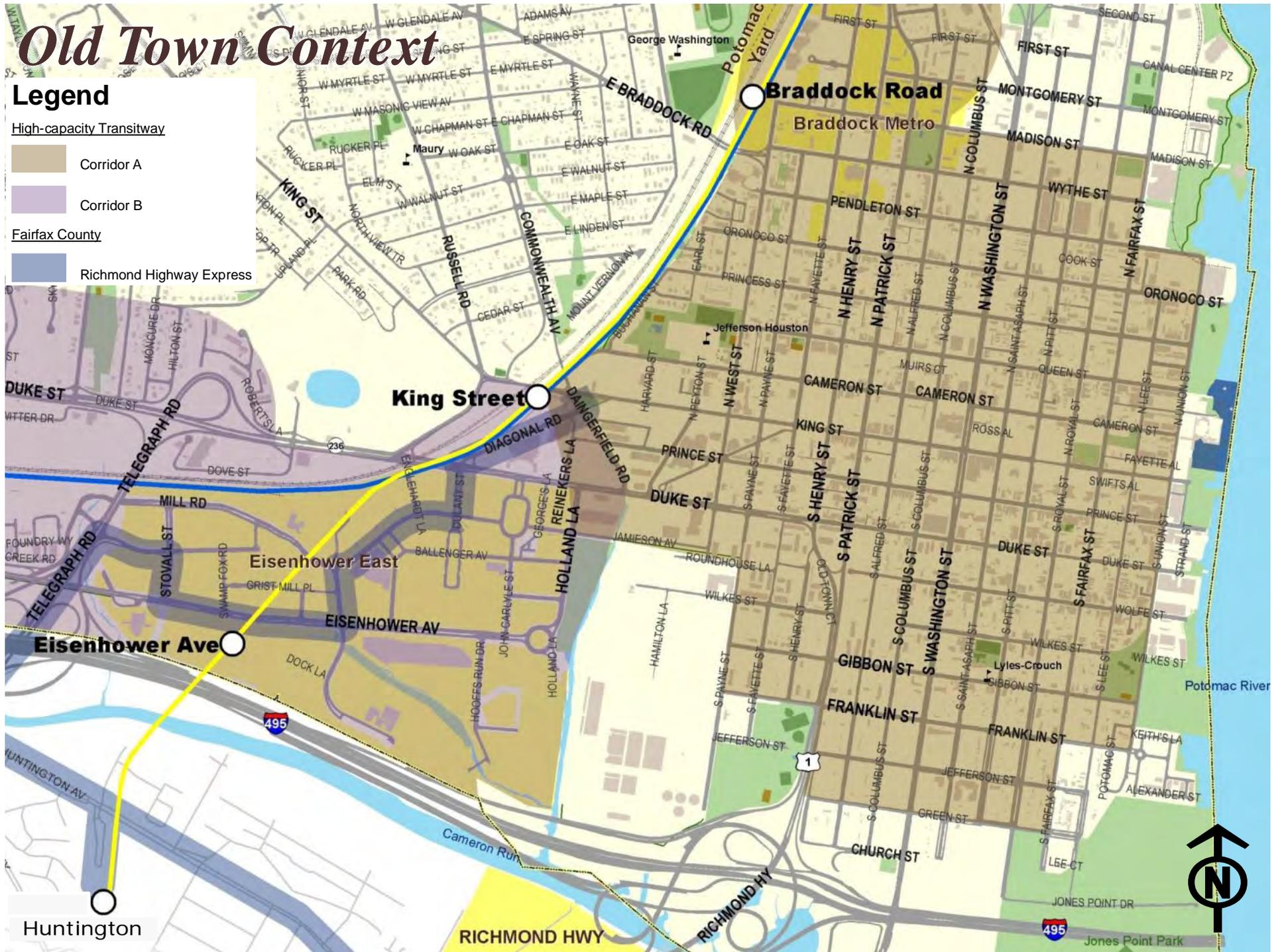
Legend

High-capacity Transitway

- Corridor A
- Corridor B

Fairfax County

- Richmond Highway Express



Huntington



City Context

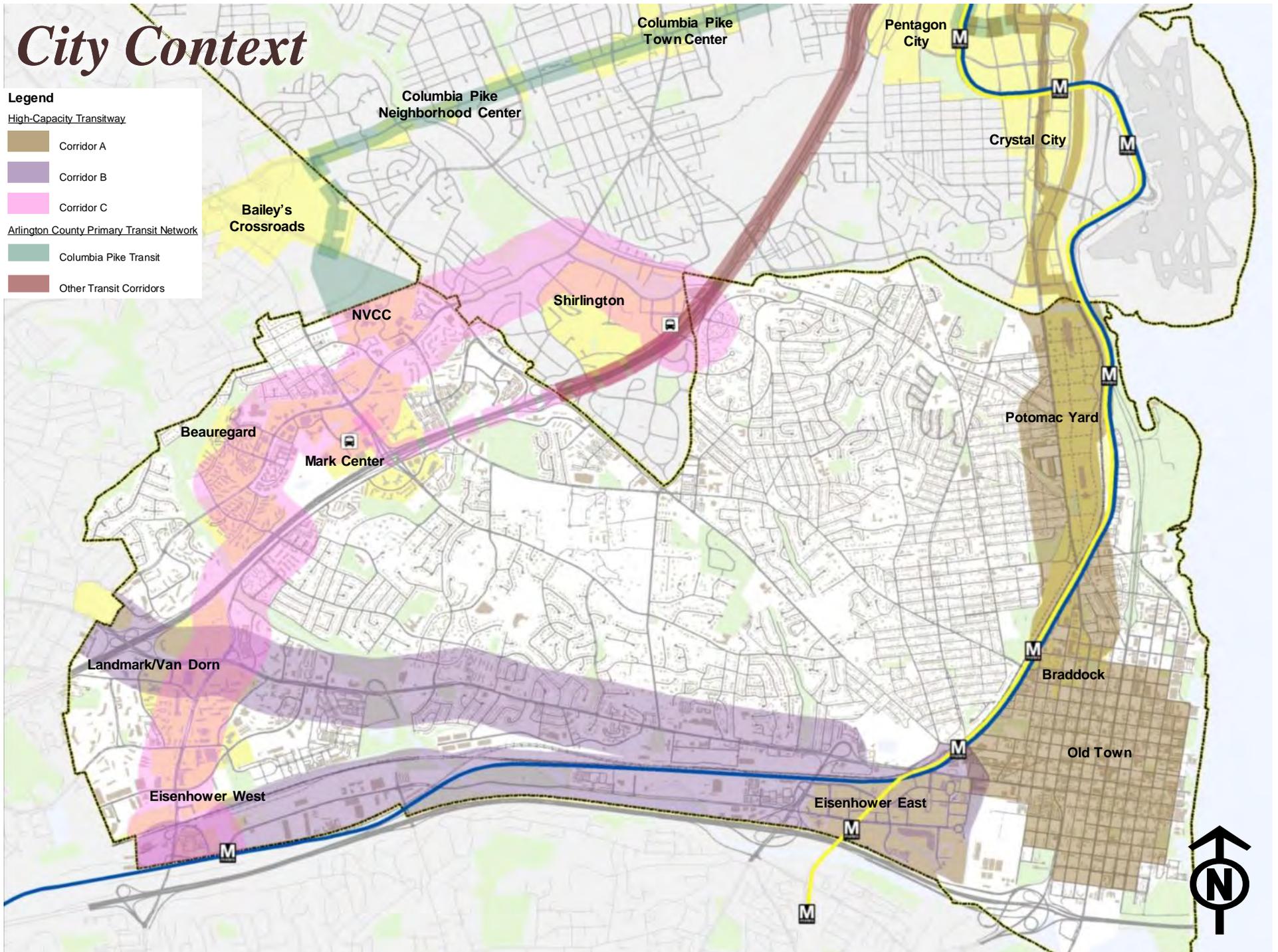
Legend

High-Capacity Transitway

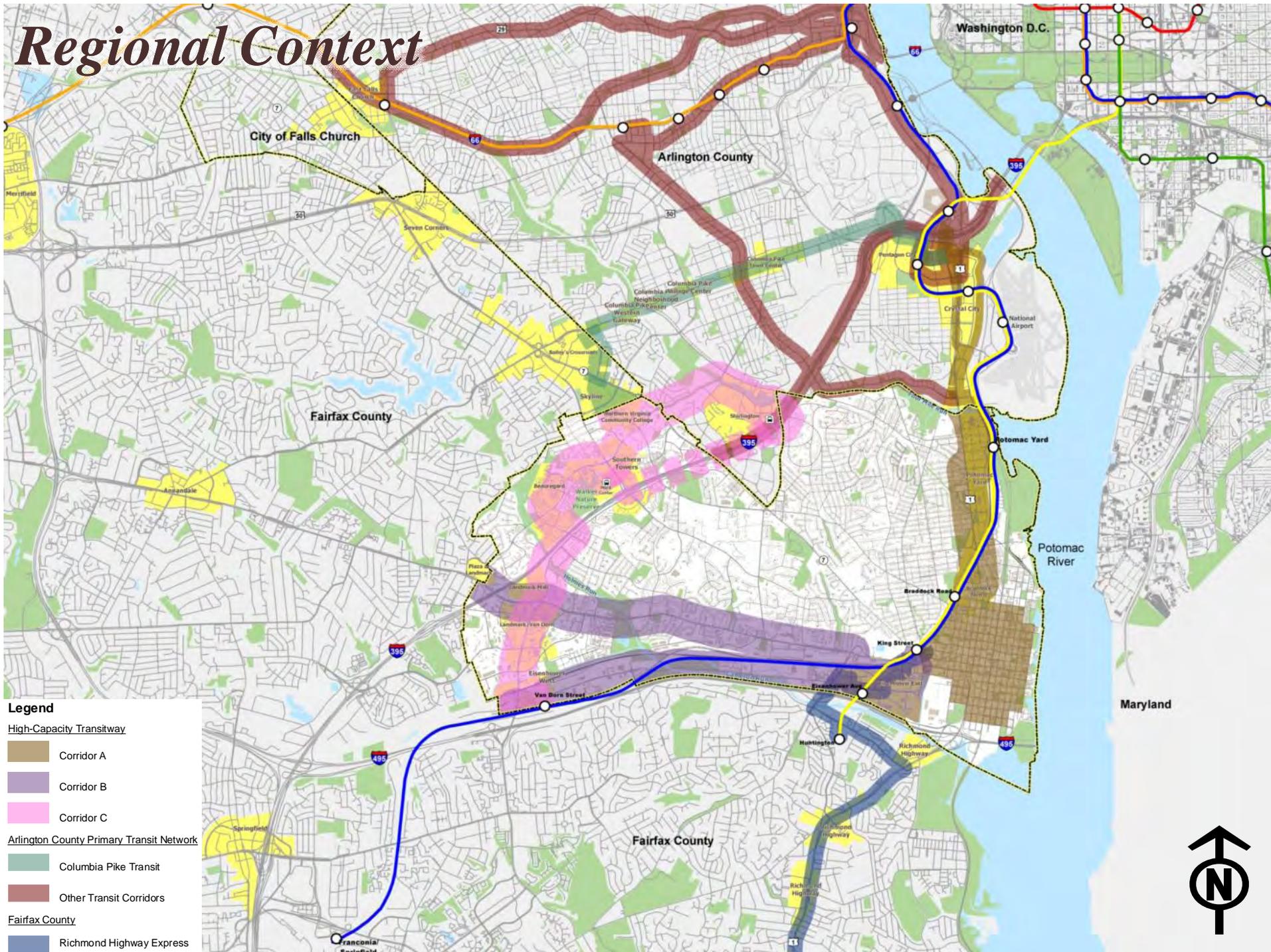
- Corridor A
- Corridor B
- Corridor C

Arlington County Primary Transit Network

- Columbia Pike Transit
- Other Transit Corridors



Regional Context



Legend

High-Capacity Transitway

- Corridor A
- Corridor B
- Corridor C

Arlington County Primary Transit Network

- Columbia Pike Transit
- Other Transit Corridors

Fairfax County

- Richmond Highway Express



DISCUSSION & COMMENT

