Transitway Corridor Feasibility Study

High Capacity Transit Corridor Work Group
July 21, 2011 Meeting

Corridor B Preliminary Transitway Concepts

T&ES

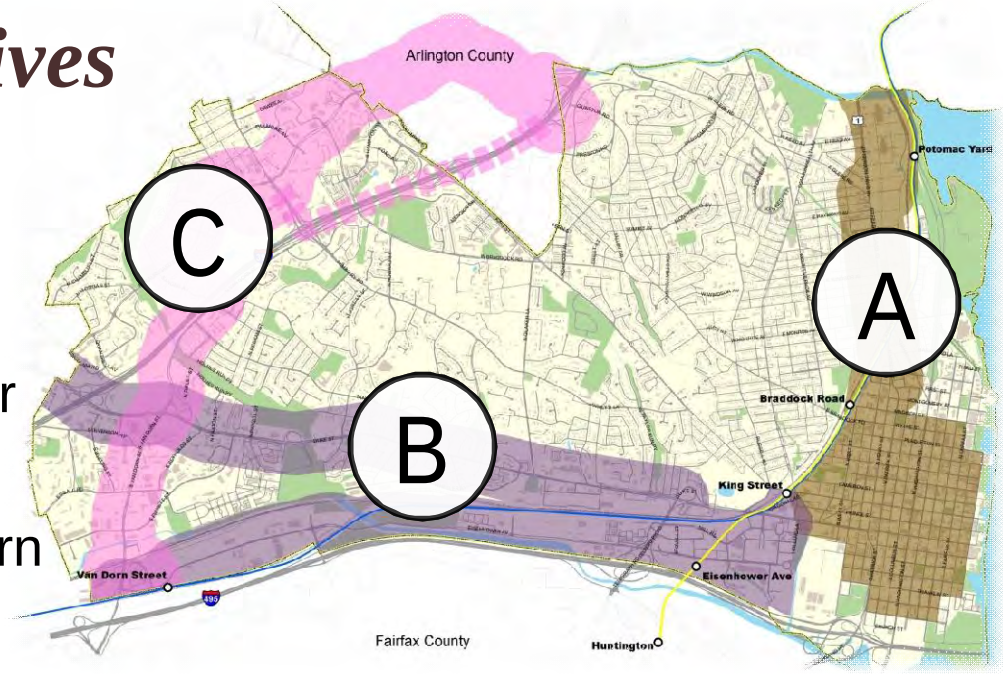
Kimley-Horn and Associates, Inc.

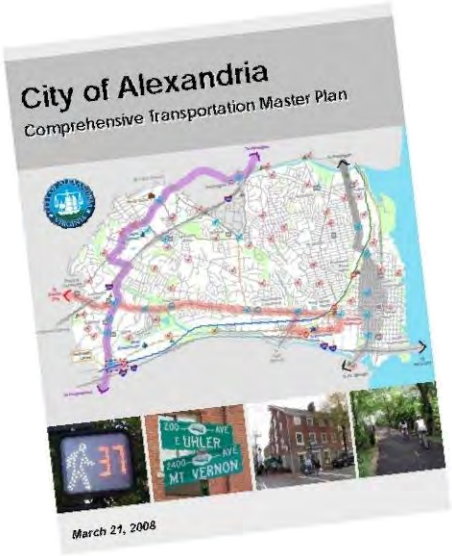
Meeting Agenda

- Introduction and Background
- Corridor B Discussion
  - Alignment Alternatives
  - Existing Physical Conditions
  - Preliminary Transitway Concepts/Screening
  - CWG Input and Observations
  - Public Input and Observations
- Break
- Corridor A Discussion

City Transitway Initiatives

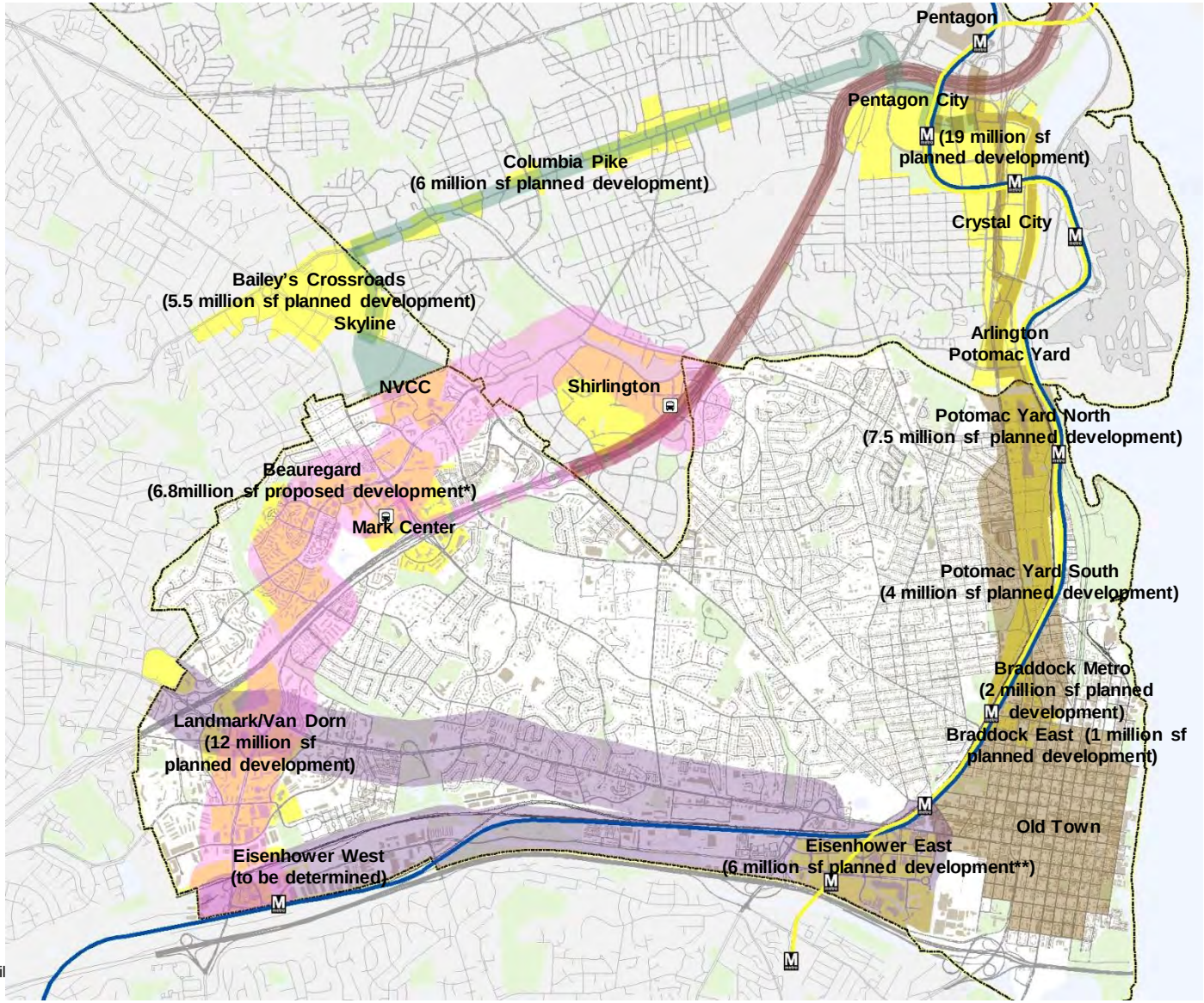
- Development of a plan for dedicated transit services in three corridors
  - Corridor A: North-South Corridor
  - Corridor B: Duke/Eisenhower
  - Corridor C: Beauregard/Van Dorn





Land Use and Transportation Connectivity

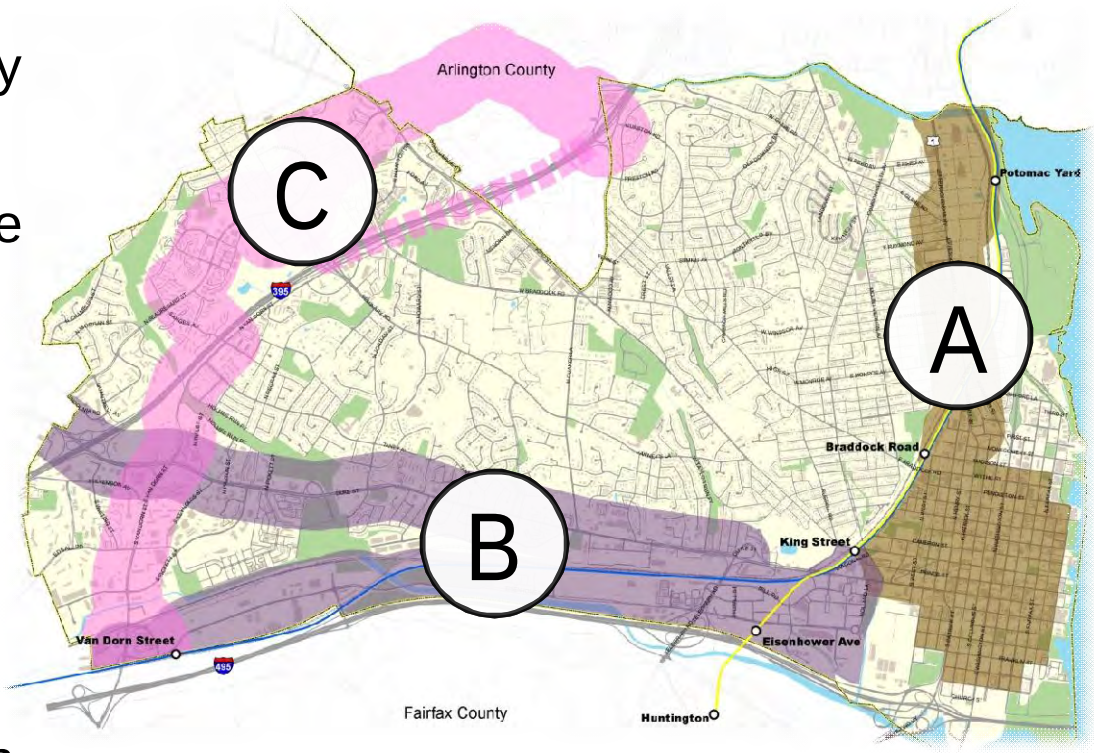
- Beauregard corridor plan
- Braddock Metro & Braddock East plans
- Columbia Pike Initiative
- Crystal City plan
- Eisenhower East plan
- Eisenhower West area development
- Landmark/Van Dorn corridor plan
- Mark Center plan
- Metrorail blue & yellow lines
- NVCC Community College master plan
- Old Town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



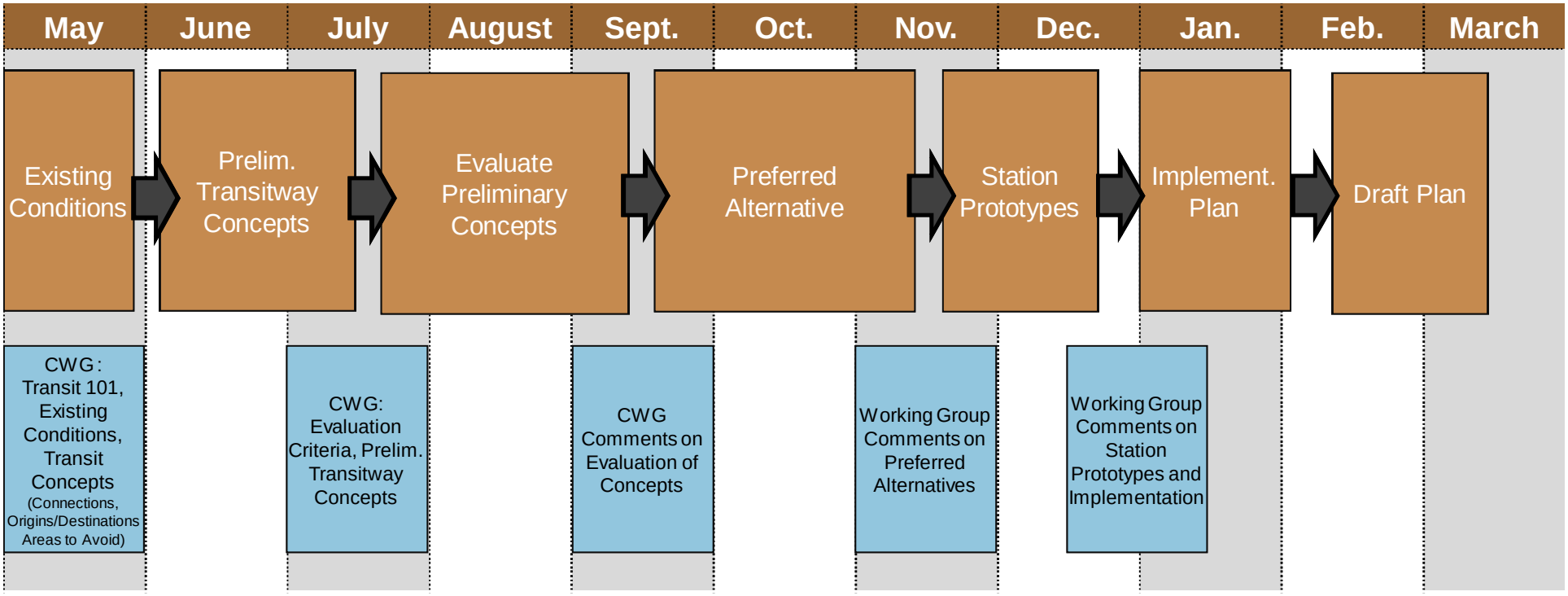
Regional development values approximate
*Value approximate based on current developer plans for Beauregard Area that have not been approved by City Council
**Value does not include Carlyle

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.



Project Schedule – Corridors A & B

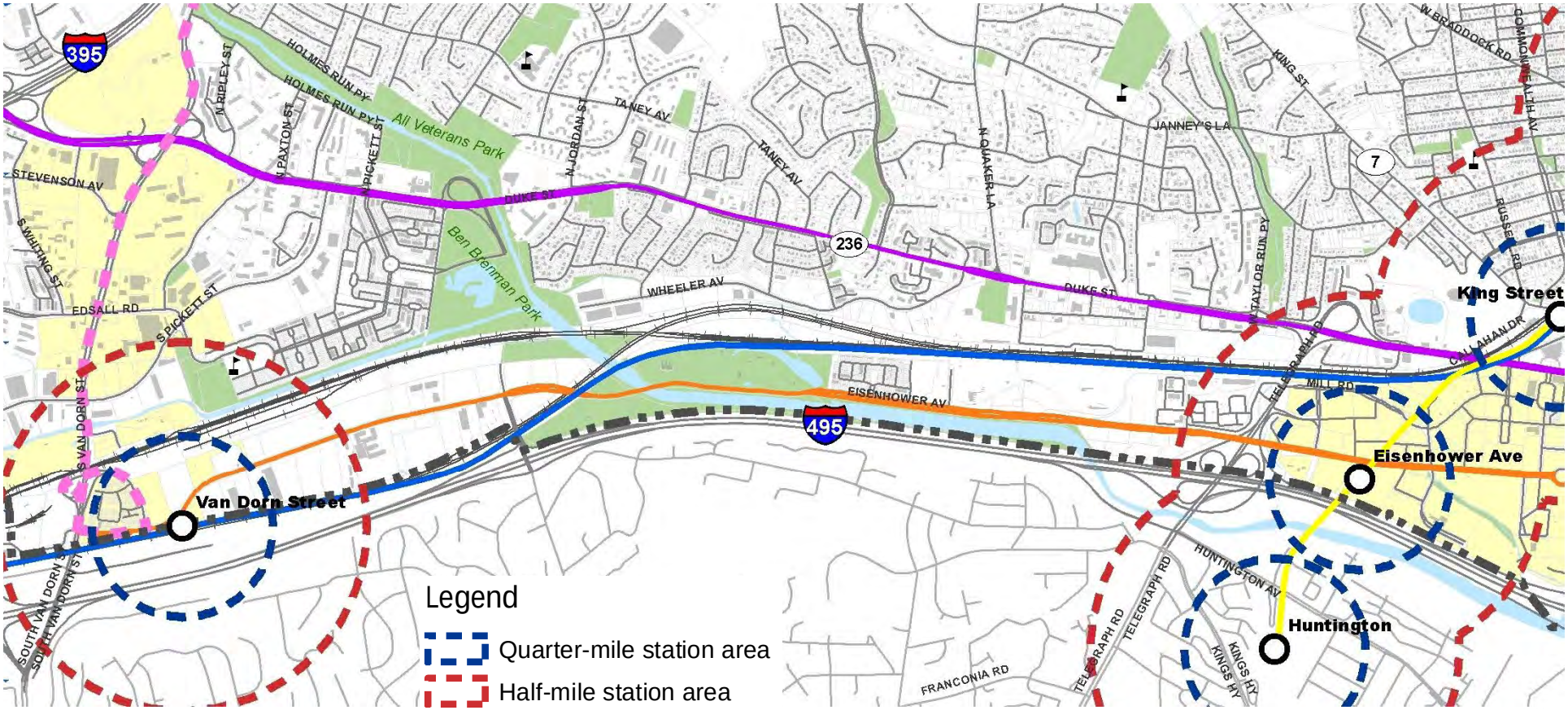


Corridor B

ALIGNMENT SCREENING

Alignments Options

- Duke Street
- Eisenhower Avenue



Zoning

Legend

- Quarter-mile station area
- Half-mile station area

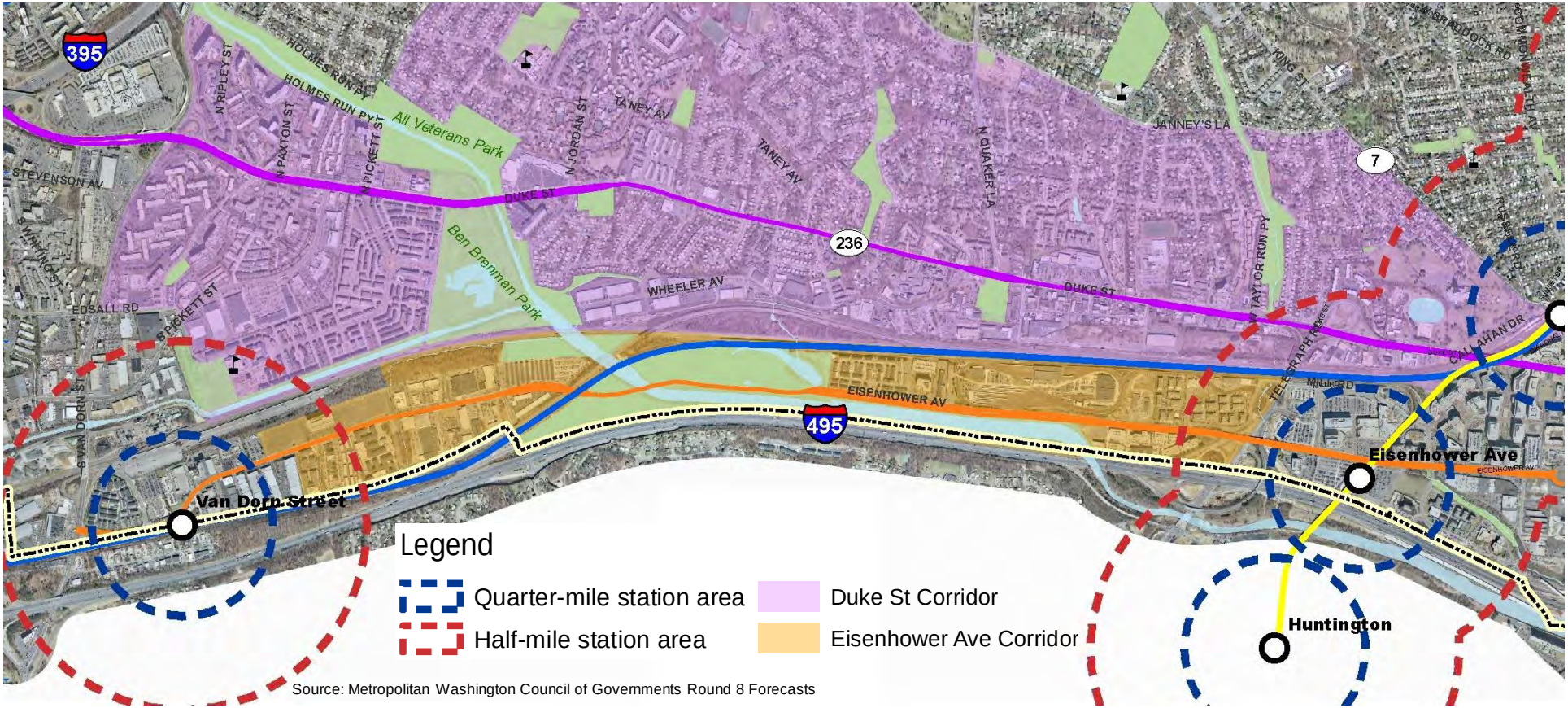
Zoning

- Commercial
- Industrial
- Mixed-use
- Office
- Park
- Single-family Residential
- Multi-family Residential
- Retail
- Utilities and Transportation

2010 Land Use

Area that does not have a Metrorail station within ½ mile:

- Households — *Duke: 13,800* — *Eisenhower: 900*
- Population — *Duke: 28,700* — *Eisenhower: 1,900*
- Employment — *Duke: 13,200* — *Eisenhower: 5,200*



Source: Metropolitan Washington Council of Governments Round 8 Forecasts

Evaluation Criteria

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Alignment Screening	For Use in Comparative Evaluation of Concepts	Measurement Method
Effectiveness - Addresses stated transportation issues in the corridor	Coverage	Service to Population, Employment, and Other Destinations	✓	✓	Tabulate population, employment, key destinations, and similar, served by option
		Transit Connectivity	✓	✓	Access to other transit services (existing and planned)
	Operations	Running-way Configuration(s)		✓	Quantify amount of runningway that is dedicated and amount that is mixed flow
		Corridor Length		✓	Measured length of the corridor (mi or feet)
		Capacity		✓	Potential corridor capacity (hourly) based on mode technology, headways, and other conditions
		Interoperability		✓	Identification of whether the chosen runningway configuration and transit mode technology are compatible with regionally planned systems
		Avoidance of Congestion		✓	Number and locations of LOS E/F intersections avoided
		Transit Travel Time	✓	✓	Transit travel time
		Intersection Priority		✓	Percent of intersections where TSP is needed and can be implemented successfully - notation of where it cannot be implemented successfully
		Ridership		✓	Forecast number of riders
	Alignment	Geometrics		✓	Geometric quality of alignment
		Runningway Status		✓	Percent of corridor to be located on new or realigned roadway
	Phasing	Phasing		✓	Identification of ability to phase operations and implementation
Impacts - Extent to which economics, environment, community, transportation are affected	Economic	Development Incentive		✓	Perceived value of transit mode technologies with regard to development potential
	Natural Environmental	Natural Environment		✓	Summary of key environmental conditions affected (wetlands, floodplains, T&E, streams, and similar)
		Parks and Open Space		✓	Summary of parks and/or open spaces affected
	Neighborhood and Community	Property		✓	Number, use type, and quantity of properties impacted with anticipated level of impact (ROW only, partial take, total take)
		Streetscapes		✓	Impact to existing streetscapes
		Community Resources		✓	Identify number and location of historical, cultural, community, archaeological resources affected
		Demographics		✓	Identification of impacts to special populations
		Noise and Vibration		✓	Summarize relative noise and vibration impacts of different mode types and corridor configurations
	Transportation	Traffic Flow Impact	✓	✓	Effect of transit implementation on vehicular capacity of corridor
		Traffic Signals		✓	Number of existing signalized intersections affected by transit, identification of need for new signal phases, and number/location of new traffic signals needed to accommodate transit
		Multimodal Accommodation		✓	Impacts to, and ability to accommodate bicycles and pedestrians
		Parking		✓	Impacts to parking
Cost Effectiveness - Extent to which the costs are commensurate with their benefits	Cost	Capital cost		✓	Order of magnitude capital cost for corridor (stations, runningway, etc.)
		Operating cost		✓	Order of magnitude operating cost
		Cost Per Rider		✓	Order of magnitude operating cost per rider
Financial Feasibility - Cost of system/concept is in alignment with available funding	Funding	Funding		✓	Availability to specific funding sources
		Private Capital Incentive		✓	Judgment as to whether the concept has the potential to attract private capital investment and innovative procurement

Preliminary Alignment Screening Criteria

Preliminary Screening Criteria	Description
Service to Regional Destinations	Key destinations served
Service to Population, Employment, and Retail in the Corridor	Population, employment, retail, and key destinations served
Transit Connectivity	Access to other transit services (existing and planned)
Transit Travel Time	Relative speed of transit along the Duke/Eisenhower corridor
Traffic Flow Impact	Effect of transit implementation on general vehicle flow (non-transit) in corridor

Alignment Screening Summary

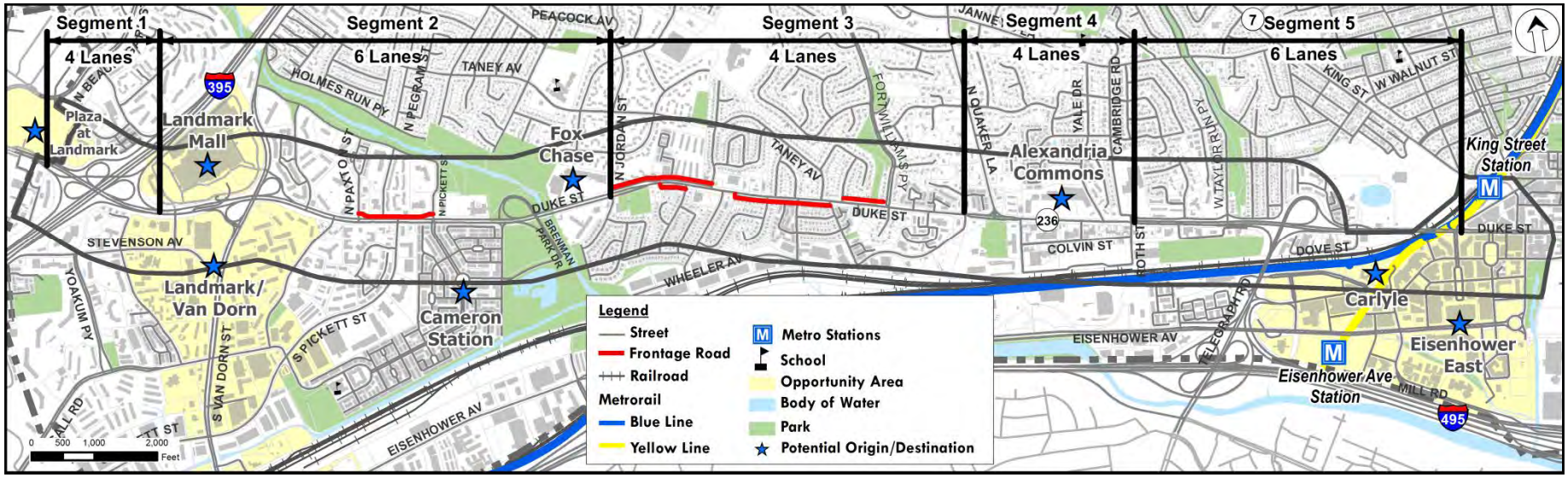
Preliminary Screening Criteria	Alignment Option	
	Duke	Eisenhower
Service to Regional Destinations	◑	○
Service to Population, Employment, and Retail in the Corridor	●	○
Transit Connectivity	◑	◑
Transit Travel Time	◑	●
Traffic Flow Impact	◑	◑

Rating:	●	Best	◑	Fair	○	Poor

Corridor B

EXISTING PHYSICAL CONDITIONS

Existing Conditions



The corridor consists of 5 distinct segments:

- Segment 1 – Oasis Drive to Landmark Mall: 4 Lanes with Median
- Segment 2 – Landmark Mall to Jordan Street: 6 Lanes with Median or Left-Turn Lane
- Segment 3 – Jordan Street to West of Quaker Lane: 4 Lanes Undivided
- Segment 4 – West of Quaker Lane to Roth Street: 4 Lanes with Left-Turn Lane
- Segment 5 – Roth Street to King Street Station: 6 Lanes with Median or Left-Turn Lane

Existing Conditions:
Segment 1 – Oasis Drive to Landmark Mall

- Roadway Section – 4 Lanes with Median
- Length – 0.5 Miles
- Curb to Curb Width – 90'
- ROW Width – N/A (within interchange)
- Frontage Roads – None

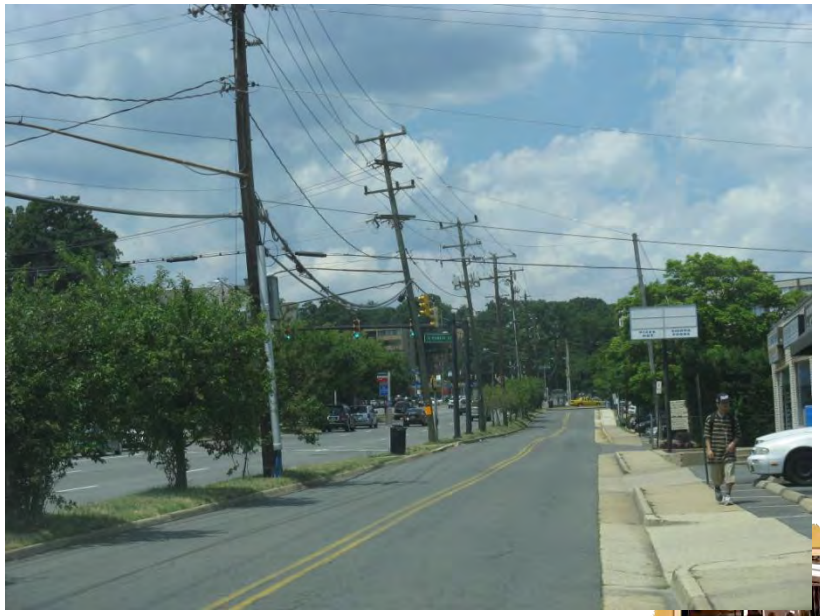
Looking Westbound at the Plaza at Landmark

Looking Eastbound at the Plaza at Landmark

Existing Conditions:
Segment 2 – Landmark Mall to Jordan Street

- Roadway Section – 6 Lanes with Median or Left-Turn Lane
- Length – 1.5 Miles
- Curb to Curb Width – 90’ to 130’
- ROW Width – 110’ to 180’
- Frontage Roads – 1 along Westbound

Traveling Eastbound at Jordan Street



Westbound Frontage Road at Canterbury Square

Existing Conditions:
Segment 3 – Jordan Street to West of Quaker Lane

- Roadway Section – 4 Lanes Undivided
- Length – 1.0 Miles
- Curb to Curb Width – 46’ to 100’
- ROW Width – 60’ to 120’
- Frontage Roads – 2 along Eastbound, 2 along Westbound

Traveling Eastbound at Early Street

Eastbound Frontage Road between Gordon Street and French Street

Existing Conditions:
Segment 4 – West of Quaker Lane to Roth Street

- Roadway Section – 4 Lanes with Left-Turn Lane
- Length – 0.5 Miles
- Curb to Curb Width – 60’ to 82’
- ROW Width – 80’ to 110’
- Frontage Roads – None

Traveling Eastbound at Sweeley Street

Traveling Westbound at Yale Drive

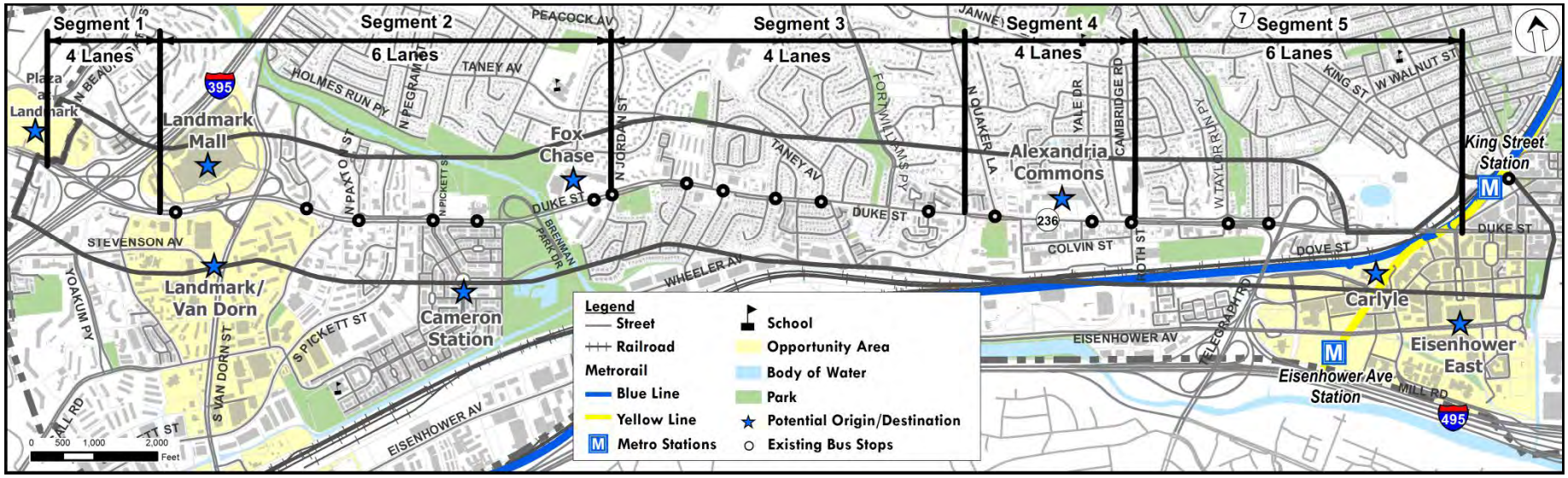
Existing Conditions:
Segment 5 – Roth Street to King Street Station

- Roadway Section – 6 Lanes with Median or Left-Turn Lane
- Length – 1.0 Miles
- Curb to Curb Width – 66' to 90'
- ROW Width – 90' to 190'
- Frontage Roads – None

Traveling Eastbound approaching Diagonal Road

Westbound grade separated roadway at Taylor Run Parkway

Existing Conditions: Bus Stops



Bus Service	Headway (Peak / Off-peak)
Dash – AT8	15 min / 30 min
WMATA – 29K,N	30 min / 60 min

- Bus Stops – 18 per direction
- Corridor Length – 4.5 miles
- Average Stop Spacing – every ¼ mile

Corridor B

PRELIMINARY CONCEPTS/SCREENING

Transit Modes

Transit Mode	Runningway Elements	Approximate Station Spacing
Rapid Bus	• Mixed flow • Transit signal priority (TSP) • Queue jump lanes at significant intersections	¼-mile
Light Bus Rapid Transit (BRT)	• Mixed flow • Transit signal priority (TSP) • Queue jump lanes at significant intersections • Enhanced stations and ITS	¼-mile to ½-mile
Full Bus Rapid Transit (BRT)	• Dedicated lanes • Transit signal priority (TSP) • Enhanced stations and ITS	½-mile
Streetcar in Mixed Flow	• Mixed flow • Transit signal priority (TSP) • Queue jump lanes at significant intersections • Enhanced stations and ITS	¼-mile
Streetcar in Dedicated Lanes	• Dedicated lanes • Transit signal priority (TSP) • Enhanced stations and ITS	½-mile

Proposed Alternatives

Alternative A –	Rapid Bus in Mixed Flow
Alternative B –	Light BRT in Mixed Flow
Alternative C –	Full BRT in Dedicated Lanes without Widening
Alternative D –	Full BRT in Dedicated Lanes with Widening
Alternative E –	Light BRT in Mixed Flow and Dedicated Lanes
Alternative F –	Streetcar in Mixed Flow
Alternative G –	Streetcar in Dedicated Lanes without Widening
Alternative H –	Streetcar in Dedicated Lanes with Widening
Alternative I –	Streetcar in Mixed Flow and Dedicated Lanes

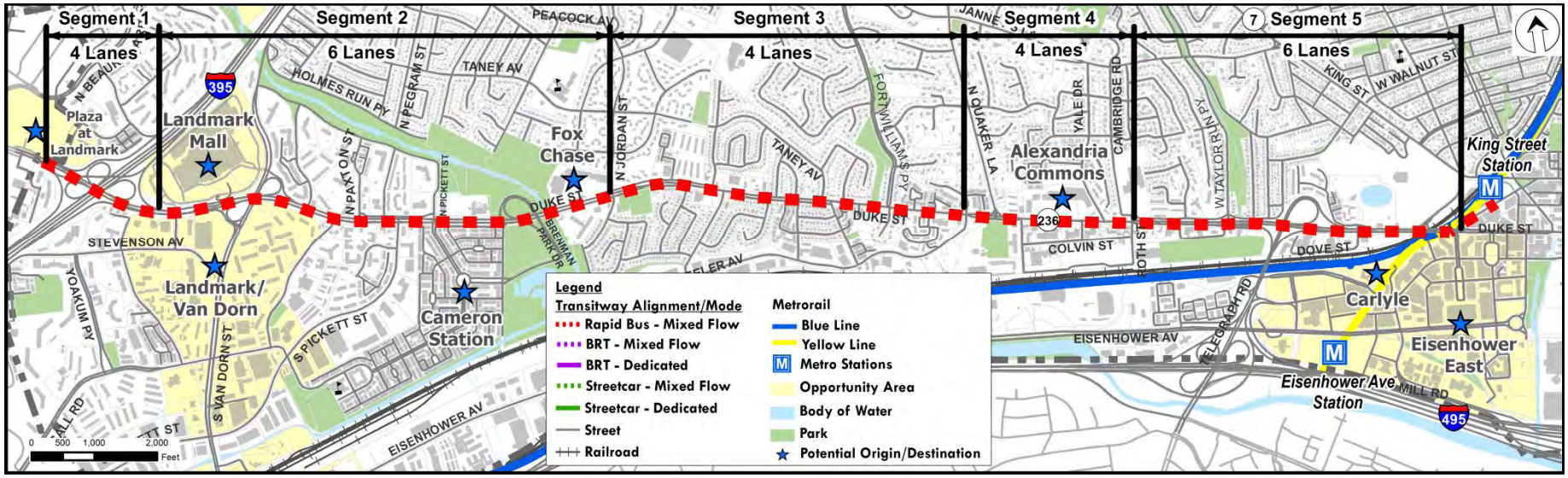
Detailed Evaluation Criteria

General Evaluation Criteria Grouping	Criteria Sub-Group	Evaluation Criteria	For Use in Preliminary Screening of Concepts	For Use in Comparative Evaluation of Concepts	Measurement Method
Effectiveness - Addresses stated transportation issues in the corridor	Coverage	Service to Population, Employment, and Other Destinations		✓	Tabulate population, employment, key destinations, and similar, served by option
		Transit Connectivity		✓	Access to other transit services (existing and planned)
	Operations	Running-way Configuration(s)	✓	✓	Quantify amount of runningway that is dedicated and amount that is mixed flow
		Corridor Length		✓	Measured length of the corridor (mi or feet)
		Capacity		✓	Potential corridor capacity (hourly) based on mode technology, headways, and other conditions
		Interoperability		✓	Identification of whether the chosen runningway configuration and transit mode technology are compatible with regionally planned systems
		Avoidance of Congestion		✓	Number and locations of LOS E/F intersections avoided
		Transit Travel Time	✓	✓	Transit travel time
		Intersection Priority		✓	Percent of intersections where TSP is needed and can be implemented successfully - notation of where it cannot be implemented successfully
		Ridership		✓	Forecast number of riders
	Alignment	Geometrics		✓	Geometric quality of alignment
		Runningway Status		✓	Percent of corridor to be located on new or realigned roadway
	Phasing	Phasing		✓	Identification of ability to phase operations and implementation
Impacts - Extent to which economics, environment, community, transportation are affected	Economic	Development Incentive		✓	Perceived value of transit mode technologies with regard to development potential
	Natural Environmental	Natural Environment		✓	Summary of key environmental conditions affected (wetlands, floodplains, T&E, streams, and similar)
		Parks and Open Space		✓	Summary of parks and/or open spaces affected
	Neighborhood and Community	Property	✓	✓	Number, use type, and quantity of properties impacted with anticipated level of impact (ROW only, partial take, total take)
		Streetscapes		✓	Impact to existing streetscapes
		Community Resources		✓	Identify number and location of historical, cultural, community, archaeological resources affected
		Demographics		✓	Identification of impacts to special populations
		Noise and Vibration		✓	Summarize relative noise and vibration impacts of different mode types and corridor configurations
	Transportation	Traffic Flow Impact	✓	✓	Effect of transit implementation on vehicular capacity of corridor
		Traffic Signals		✓	Number of existing signalized intersections affected by transit, identification of need for new signal phases, and number/location of new traffic signals needed to accommodate transit
		Multimodal Accommodation		✓	Impacts to, and ability to accommodate bicycles and pedestrians
		Parking	✓	✓	Impacts to parking
Cost Effectiveness - Extent to which the costs are commensurate with their benefits	Cost	Capital cost	✓	✓	Order of magnitude capital cost for corridor (stations, runningway, etc.)
		Operating cost		✓	Order of magnitude operating cost
		Cost Per Rider		✓	Order of magnitude operating cost per rider
Financial Feasibility - Cost of system/concept is in alignment with available funding	Funding	Funding		✓	Availability to specific funding sources
		Private Capital Incentive		✓	Judgment as to whether the concept has the potential to attract private capital investment and innovative procurement

Preliminary Screening Criteria

Preliminary Screening Criteria	Description
Running-way Configuration	Amount dedicated and amount mixed
Transit Travel Time	Relative speed of transit along the Duke/Eisenhower corridor
Property Impacts	Relative quantity and use type
Traffic Flow Impact	Effect of transit implementation on general vehicle flow (non-transit) in corridor
Parking Impacts	Relative quantity of parking spaces lost
Capital Cost	Comparative capital cost for initial system construction (order of magnitude)

Alternative A: Rapid Bus in Mixed Flow



Description

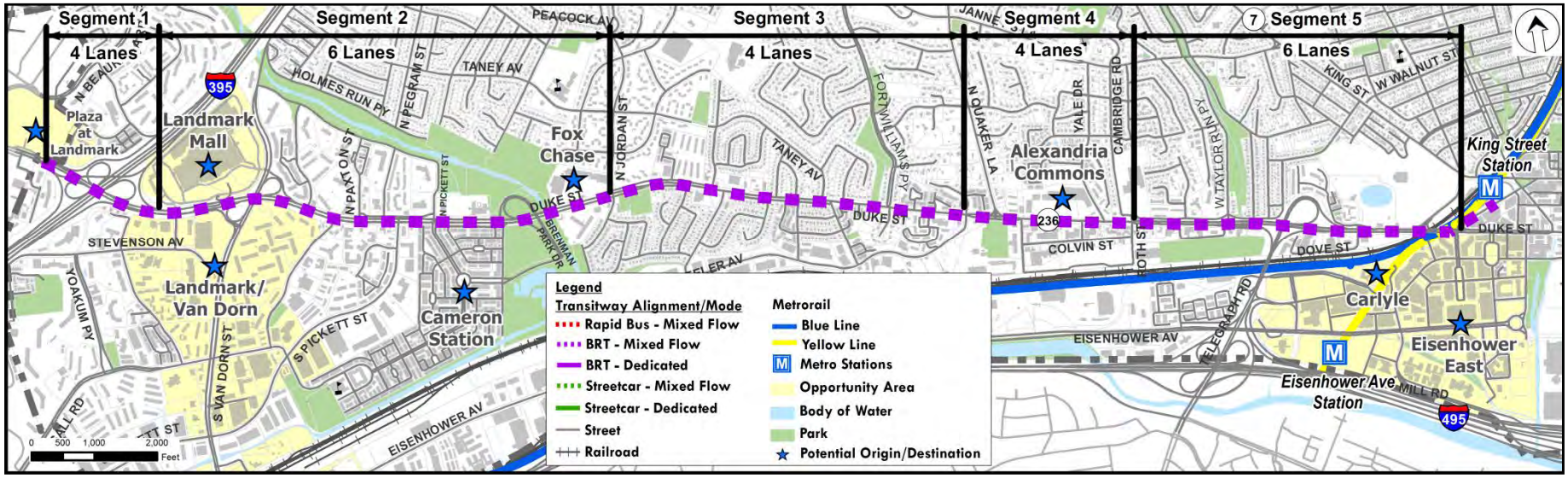
- Rapid Bus in mixed flow for full corridor length
- Quarter-mile station spacing
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating
Running-way Configuration	○
Transit Travel Times	○
Property Impacts	◑
Traffic Flow Impact	◑
Parking Impacts	◑
Capital Cost	●
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$14M

Rating:	●	Best	◑	Fair	○	Poor

**Opinions of probable cost 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 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.*

Alternative B: Light BRT in Mixed Flow



Description

- BRT in mixed flow for full corridor length
- Quarter-mile station spacing
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating
Running-way Configuration	○
Transit Travel Times	○
Property Impacts	◑
Traffic Flow Impact	◑
Parking Impacts	◑
Capital Cost	◑
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$32M

Rating:	●	Best	◑	Fair	○	Poor

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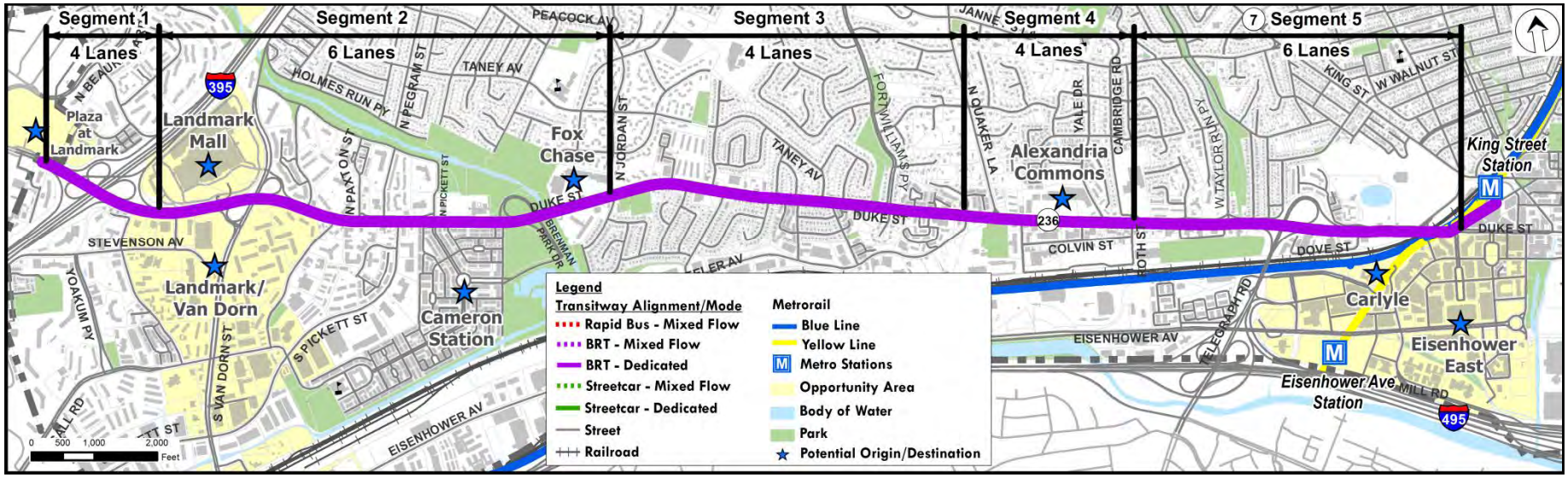
Alternative C: Full BRT in Dedicated Lanes without Widening



Description

- BRT in dedicated lanes for full corridor length
- Half-mile station spacing
- Reduces Duke Street to one lane per direction in 4-lane segments (2 miles total)
- No impacts to property or frontage roads

Preliminary Screening Criteria	Rating
Running-way Configuration	●
Transit Travel Times	●
Property Impacts	●
Traffic Flow Impact	○
Parking Impacts	●
Capital Cost	◑
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$23M

Rating:	●	Best	◑	Fair	○	Poor

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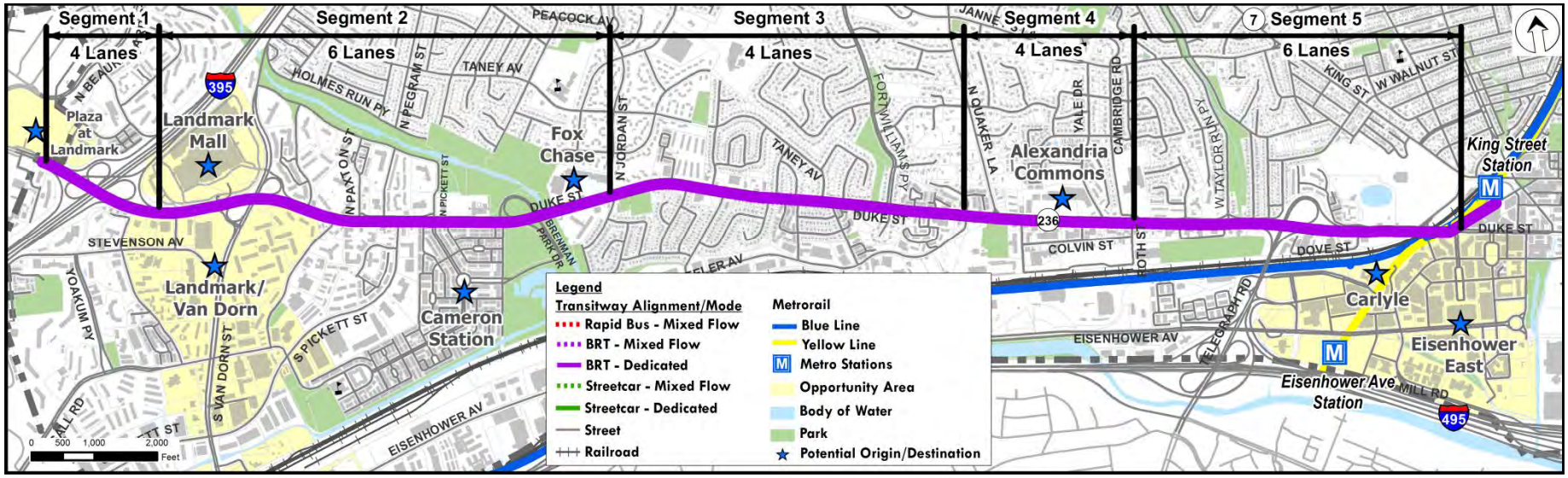
Alternative D: Full BRT in Dedicated Lanes with Widening



Description

- BRT in dedicated lanes for full corridor length
- Half-mile station spacing
- Requires widening in 4-lane segments (2 miles total)
- Large impacts to property and frontage roads

Preliminary Screening Criteria	Rating
Running-way Configuration	●
Transit Travel Times	●
Property Impacts	○
Traffic Flow Impact	●
Parking Impacts	○
Capital Cost	◑
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$33M

Rating:	●	Best	◑	Fair	○	Poor

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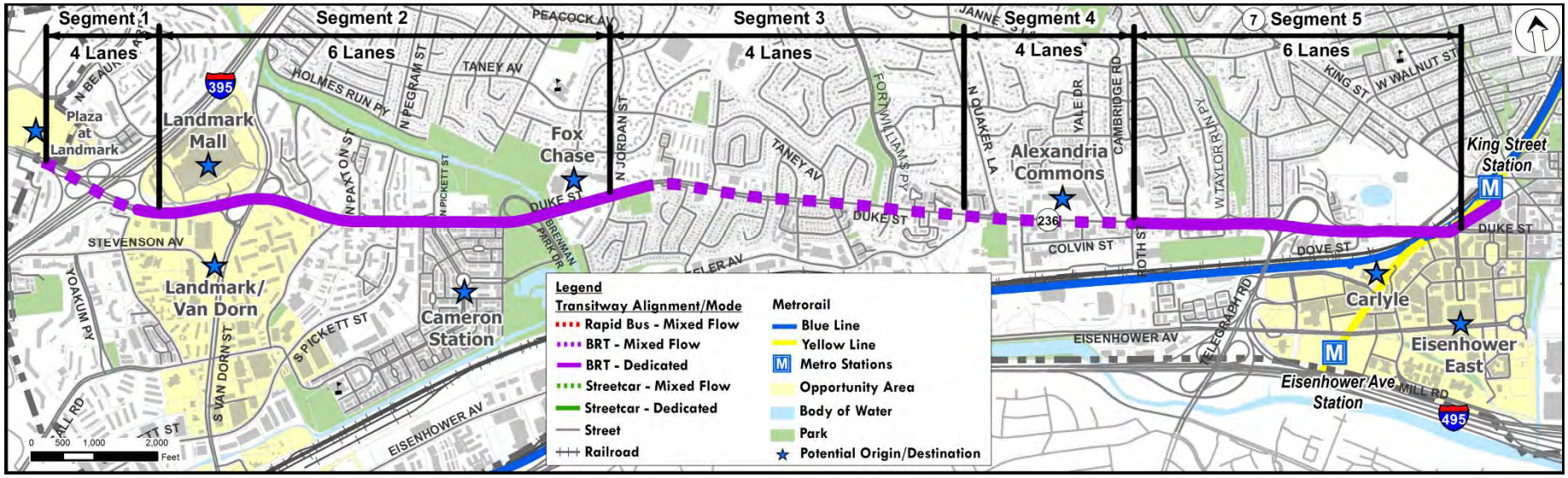
Alternative E: Light BRT in Mixed Flow and Dedicated Lanes



Description

- BRT in mixed flow on 4-lane segments (2 miles total) and in dedicated lanes on 6-lane segments (2.5 miles total) to reduce property impacts
- Quarter-mile station spacing (with mixed flow operations); half-mile station spacing (with dedicated lane operations)
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating
Running-way Configuration	◑
Transit Travel Times	◑
Property Impacts	◑
Traffic Flow Impact	◑
Parking Impacts	◑
Capital Cost	◑
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$27M

Rating:	●	Best	◑	Fair	○	Poor

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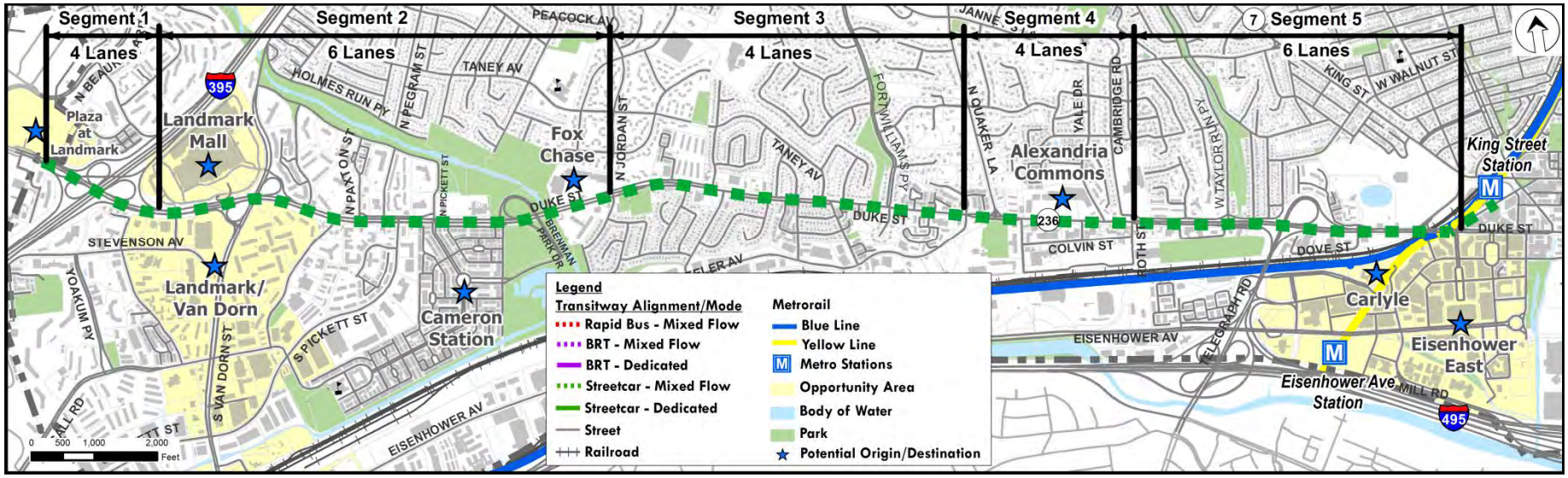
Alternative F: Streetcar in Mixed Flow



Description

- Streetcar in mixed flow for full corridor length
- Quarter-mile station spacing
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating
Running-way Configuration	○
Transit Travel Times	○
Property Impacts	◑
Traffic Flow Impact	◑
Parking Impacts	◑
Capital Cost	○
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$135M

Rating:	●	Best	◑	Fair	○	Poor

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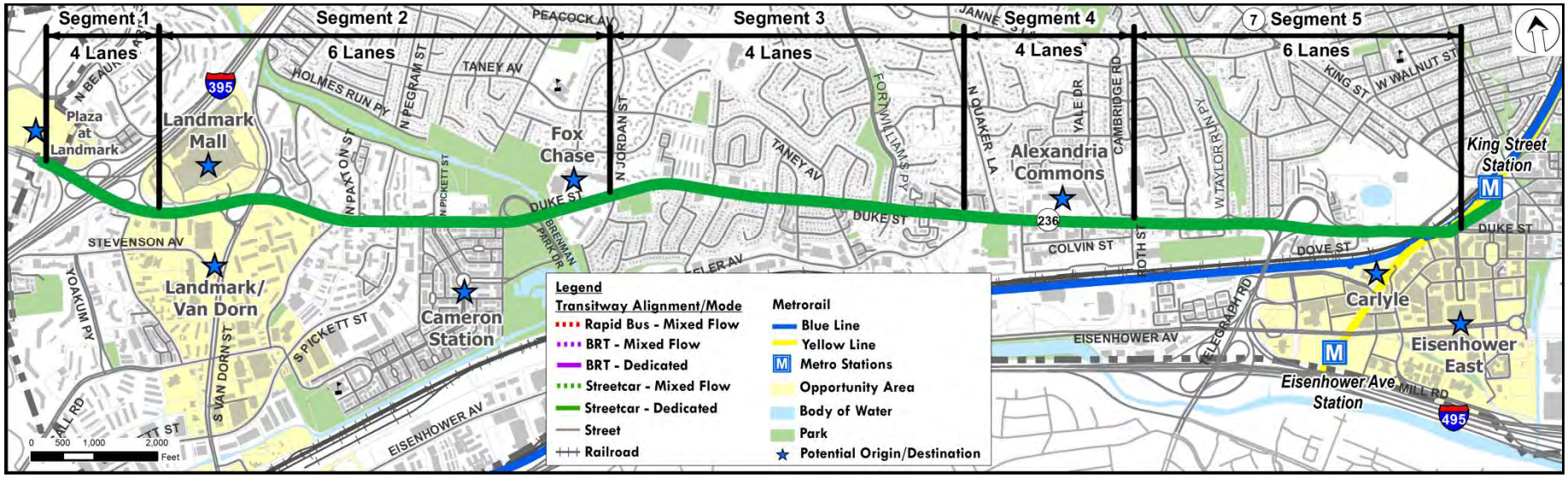
Alternative G: Streetcar in Dedicated Lanes without Widening



Description

- Streetcar in dedicated lanes for full corridor length
- Half-mile station spacing
- Reduces Duke Street to one lane per direction in 4-lane segments (2 miles total)
- No impacts to property or frontage roads

Preliminary Screening Criteria	Rating
Running-way Configuration	●
Transit Travel Times	●
Property Impacts	●
Traffic Flow Impact	○
Parking Impacts	●
Capital Cost	○
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$113M

Rating:	●	Best	◑	Fair	○	Poor

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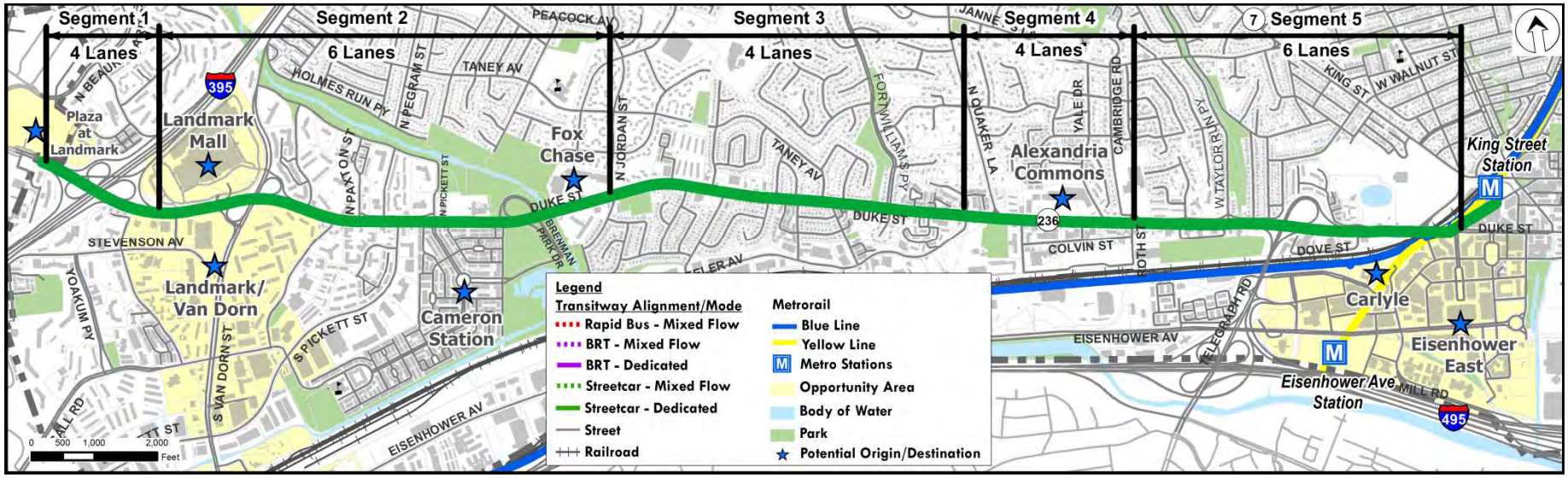
Alternative H: Streetcar in Dedicated Lanes with Widening



Description

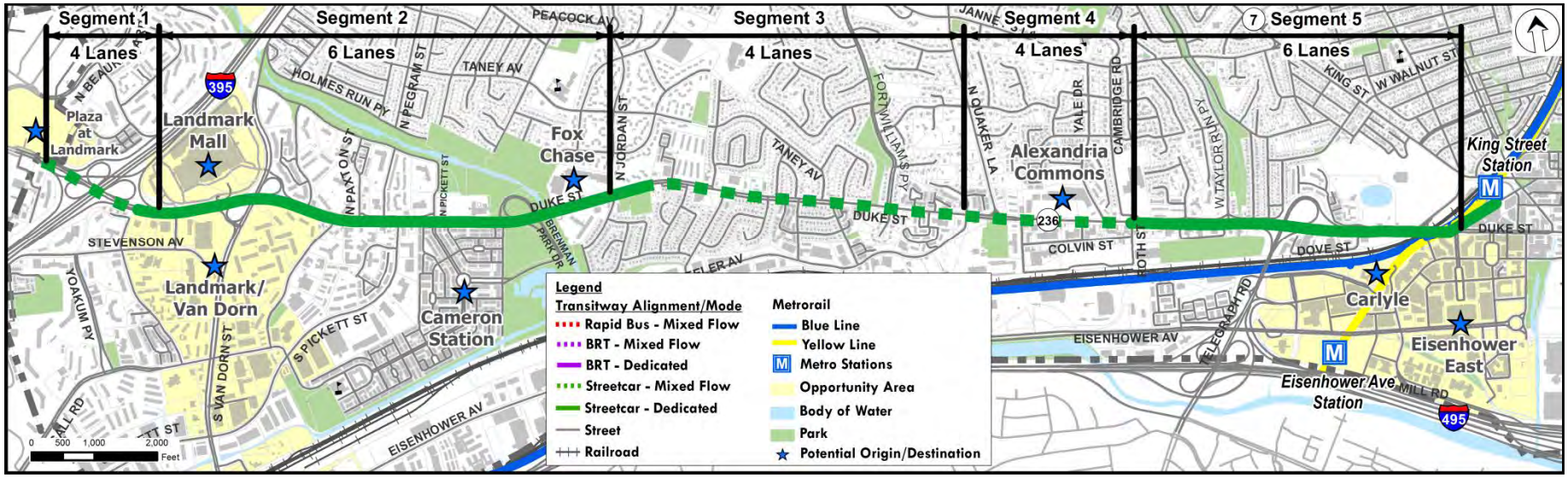
- Streetcar in dedicated lanes for full corridor length
- Half-mile station spacing
- Requires widening in 4-lane segments (2 miles total)
- Large impacts to property and frontage roads

Preliminary Screening Criteria	Rating
Running-way Configuration	●
Transit Travel Times	●
Property Impacts	○
Traffic Flow Impact	●
Parking Impacts	○
Capital Cost	○
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$143M

Rating:	●	Best	◑	Fair	○	Poor

**Opinions of probable cost 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 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.*

Alternative I: Streetcar in Mixed Flow and Dedicated Lanes



Description

- Streetcar in mixed flow on 4-lane segments (2 miles total) and in dedicated lanes on 6-lane segments (2.5 miles total) to reduce property impacts
- Quarter-mile station spacing (with mixed flow operations); half-mile station spacing (with dedicated lane operations)
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating
Running-way Configuration	◑
Transit Travel Times	◑
Property Impacts	◑
Traffic Flow Impact	◑
Parking Impacts	◑
Capital Cost	○
Preliminary Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$123M

Rating:	●	Best	◑	Fair	○	Poor

**Opinions of probable cost 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 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.*

Preliminary Evaluation Summary

Preliminary Screening Criteria	Alternative								
	A	B	C	D	E	F	G	H	I
Transit Mode:	Rapid Bus (mixed)	BRT (mixed)	BRT (dedicated w/o widening)	BRT (dedicated w/ widening)	BRT (mixed & dedicated)	Streetcar (mixed)	Streetcar (dedicated w/o widening)	Streetcar (dedicated w/ widening)	Streetcar (mixed & dedicated)
Running-way Configuration	○	○	●	●	◑	○	●	●	◑
Transit Travel Times	○	○	●	●	◑	○	●	●	◑
Property Impacts	◑	◑	●	○	◑	◑	●	○	◑
Traffic Flow Impact	◑	◑	○	●	◑	◑	○	●	◑
Parking Impacts	◑	◑	●	○	◑	◑	●	○	◑
Capital Cost	●	◑	◑	◑	◑	○	○	○	○
Prelim. Opinion of Probable Cost * (capital cost, based on modal cost per-mile within the City)	$14M	$32M	$23M	$33M	$27M	$135M	$113M	$143M	$123M

Rating:	●	Best	◑	Fair	○	Poor

**Opinions of probable cost 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 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.*

Preliminary Alternatives to be Eliminated

Alternative B –	Light BRT in Mixed Flow
Alternative F –	Streetcar in Mixed Flow
Alternative I –	Streetcar in Mixed Flow and Dedicated Lanes

Alternatives to be Considered for 2nd Screening

Alternative A –	Rapid Bus in Mixed Flow
Alternative C –	Full BRT in Dedicated Lanes without Widening
Alternative D –	Full BRT in Dedicated Lanes with Widening
Alternative E –	Light BRT in Mixed Flow and Dedicated Lanes
Alternative G –	Streetcar in Dedicated Lanes without Widening
Alternative H –	Streetcar in Dedicated Lanes with Widening

Corridor B

INPUT AND OBSERVATIONS

THANK YOU!

Project information is available at

www.alexandriava.gov/HighCapacityTransit