Transitway Corridor Feasibility Study

High Capacity Transit Corridor Work Group
November 17, 2011

Corridor B Preliminary Transitway Concepts

T&ES

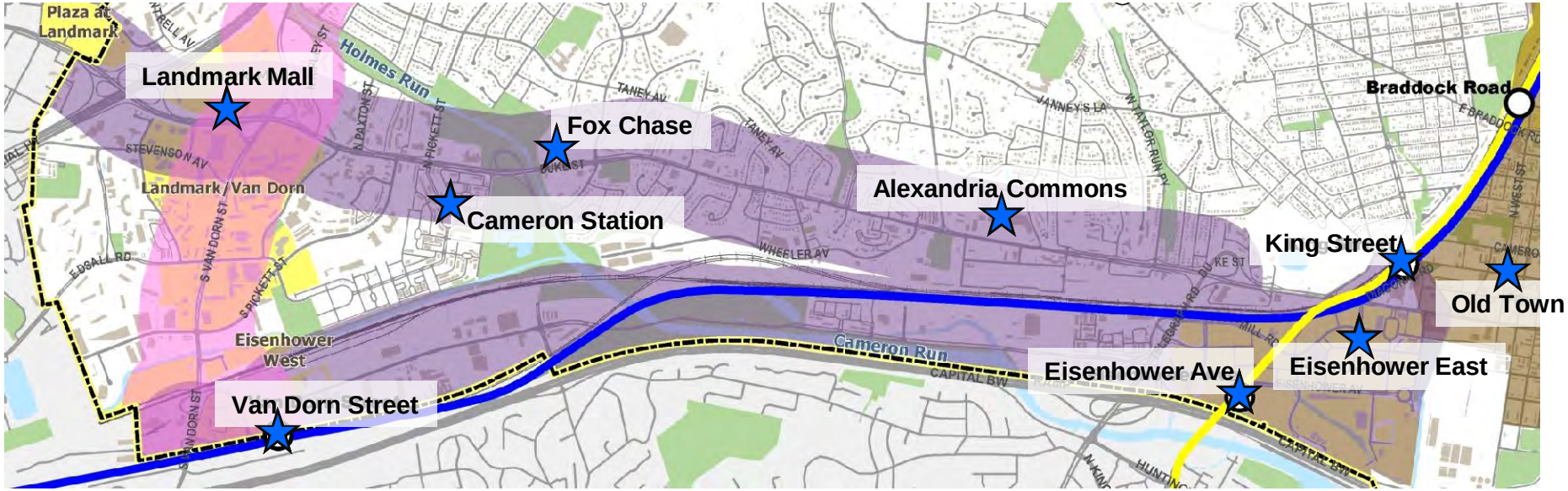
Kimley-Horn and Associates, Inc.

Meeting Agenda

- Introduction and Background
- Corridor B Discussion
  - Traffic evaluation
  - Runningway
    - Dedicated, mixed, or combination
    - Widening/no widening, displace general purpose lane, or other configuration
    - Curb- or median-running
  - Mode
- Next Steps

Corridor B

RECAP OF LAST MEETING



Corridor B: Duke/Eisenhower

- Major destinations
  - Eisenhower East
  - Landmark Mall Area
  - Cameron Station
  - Fox Chase
  - Alexandria Commons
  - Old Town
  - Van Dorn Metro
  - King Street Metro
  - Eisenhower Avenue Metro

CWG Input from August 18, 2011 Meeting

- Consider options that require widening of Duke Street and options that do not require widening to accommodate the transitway
- Preferred route for the transitway is Duke Street
- Transit service should be enhanced along Eisenhower Avenue through increased service frequency and bus stop improvements

Comments at the August 18, 2011 CWG Meeting

- Existing Conditions and Land Use
  - Stopped buses and left-turn traffic cause congestion in 4-lane section
  - Poor pedestrian and bicycle conditions on Duke Street
  - There is very limited non-peak and weekend bus service on Duke Street
  - Landmark Mall redevelopment
  - City's Eisenhower West Industrial Use Study found that the area is unlikely to be redeveloped for 20 to 30 years
  - Widening and/or transit could affect resident's standard of living adjacent to Duke Street
  - Protect neighborhood streets

Comments at the August 18, 2011 CWG Meeting

- Alignment
  - Put transit on Duke Street to serve existing transit demand that lacks high-speed and off-peak/weekend transit services (especially on western section of Duke Street)
  - Explore options for transit/bike/pedestrian connections to Eisenhower Ave and Eisenhower East/Carlyle
  - Look to conventional means to improve transit service on Eisenhower Avenue

Comments at the August CWG Meeting

- Screening criteria
  - Identified criteria for use in screening of concepts
  - Assigned weights: highest, normal, lower level of analysis for screening criteria

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 Regional Destinations		✓	Notation of regional destinations directly served
		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

Screening Criteria Legend:	★	Highest Importance	✓	Normal Importance	○	Lesser Importance

Evaluation Criteria (continued)

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
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

Screening Criteria Legend:	★	Highest Importance	✓	Normal Importance	○	Lesser Importance

Corridor B

RUNNINGWAY OPTIONS

Traffic Evaluation

- Reviewed existing traffic conditions
- Coded/ran three distinct scenarios into the MWCOG model
  - **Future baseline**
  - **Scenario 1** – Transitway implementation without widening along Duke Street
  - **Scenario 2** – Transitway implementation with widening along some sections of Duke Street
- Post-processed travel demand forecasts from MWCOG model
- Evaluated a.m., p.m., and daily traffic volumes from scenarios
- Summarized traffic conditions for corridor under each scenario
  - Link (street segment) operations
  - Intersection operations
  - Vehicle queues

Link Operations

	Van Dorn Street	Link Volume to Capacity Ratio		Jordan Street	Link Volume to Capacity Ratio		Quaker Lane	Link Volume to Capacity Ratio		Telegraph Road	Link Volume to Capacity Ratio		Callahan Street
Westbound		AM	PM		AM	PM		AM	PM		AM	PM	
Existing		0.3	0.65		0.74	0.81		1.36	1.06		0.71	1.43	
Future													
Base		0.45	0.98		0.74	0.81		1.36	1.06		0.71	1.43	
Scenario 1 (no widening)		0.36	0.72		0.79	0.9		1.31	1.37		0.5	1.14	
Scenario 2 (widening)		0.45	0.93		0.62	0.74		0.95	1.06		0.64	1.17	
Eastbound							Duke Street						
Existing		0.43	0.5		1.3	0.73		1.24	0.95		1.62	0.81	
Future													
Base		0.65	0.74		1.3	0.73		1.24	0.95		1.62	0.81	
Scenario 1 (no widening)		0.56	0.64		1.51	0.81		1.53	1.87		1.41	0.64	
Scenario 2 (widening)		0.65	0.72		1.13	0.65		1.24	1.36		1.45	0.71	

Link Notes				
	No significant issues	Significant demand in-excess of capacity in Scenario 1, existing, and future base	Significant demand in-excess of capacity in Scenario 1, existing, and future base	Significant demand in-excess of capacity in Scenario 1 and existing

Legend

- Less than 80% of link capacity
- 80 to 90% of link capacity
- 90 to 100% of link capacity
- Over capacity
- Most significantly over-capacity segments per link

Note: Numbers indicate volume to capacity ratios, which are a planning-level indicator of link performance.

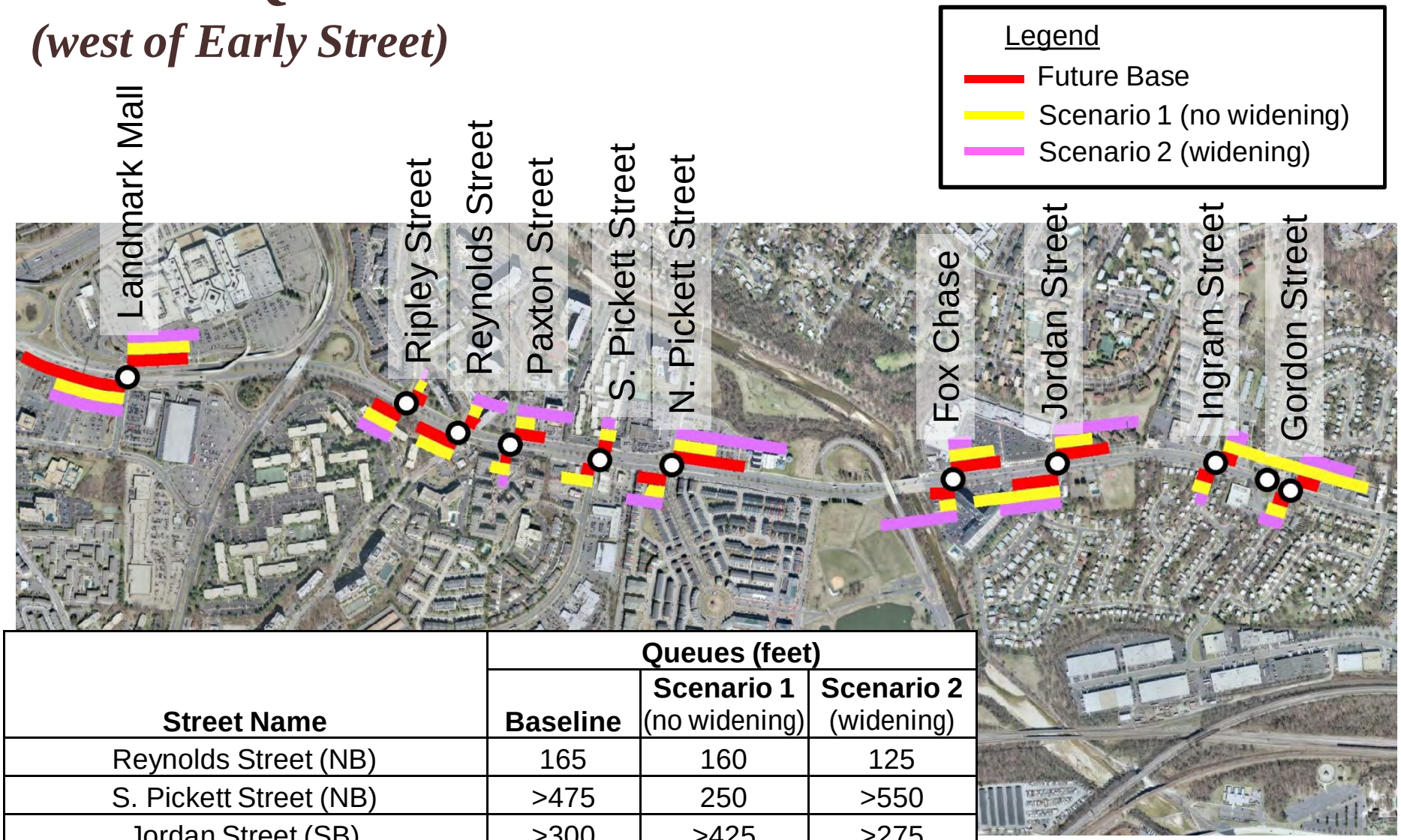
TRANSITWAY CORRIDOR FEASIBILITY STUDY

Link Operations Summary

- No significant issues between Van Dorn Street and Jordan Street in any scenario
- Capacity issues between Jordan Street and Quaker Lane in all scenarios
  - Conditions are worse eastbound than westbound
  - Conditions are worst in Scenario 1 (no widening)
- Substantial capacity issues between Quaker Lane and Telegraph Road
  - Conditions are worse eastbound than westbound
  - Conditions are worst in Scenario 1 (no widening)
- Capacity issues in peak direction (EB, AM; WB, PM) between Telegraph Road and Callahan Street
  - Future base condition is worst
  - Scenario 1 and 2, while over-capacity perform better than baseline

Vehicle Queues on Duke Street – PM Peak Hour

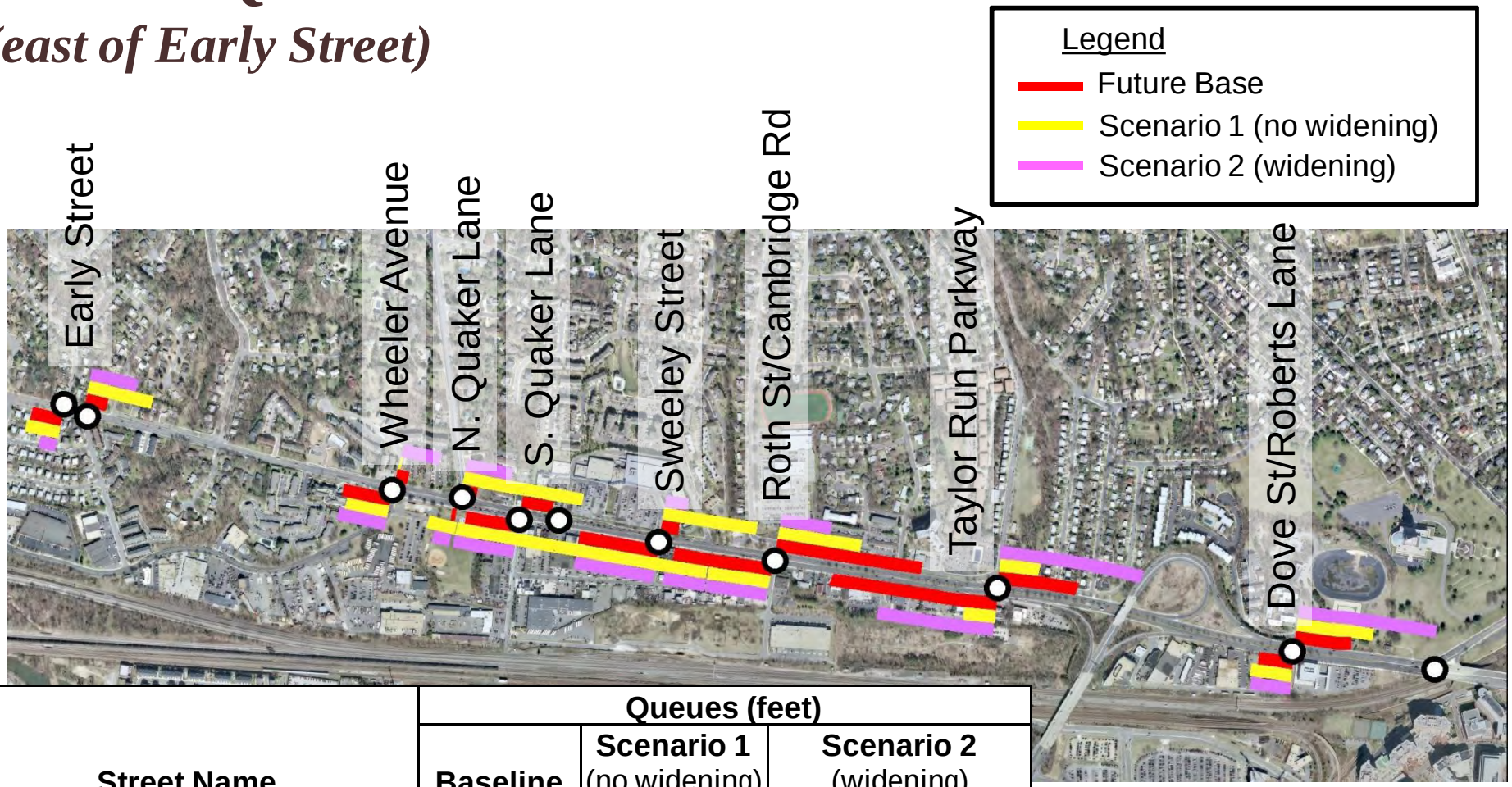
(west of Early Street)



Street Name	Queues (feet)		
	Baseline	**Scenario 1** (no widening)	**Scenario 2** (widening)
Reynolds Street (NB)	165	160	125
S. Pickett Street (NB)	>475	250	>550
Jordan Street (SB)	>300	>425	>275
Gordon Street (NB)	>375	225	225

Vehicle Queues on Duke Street – PM Peak Hour

(east of Early Street)



Street Name	Queues (feet)		
	Baseline	Scenario 1 (no widening)	Scenario 2 (widening)
Early Street (NB)	>225	150	150
N. Quaker Lane (SB)	>375	>900	325
Sweeley Street (SB)	>405	>340	>300
Roth Street/Cambridge Rd (SB)	>475	>420	>375
Taylor Run Parkway (SB)	425	225	425

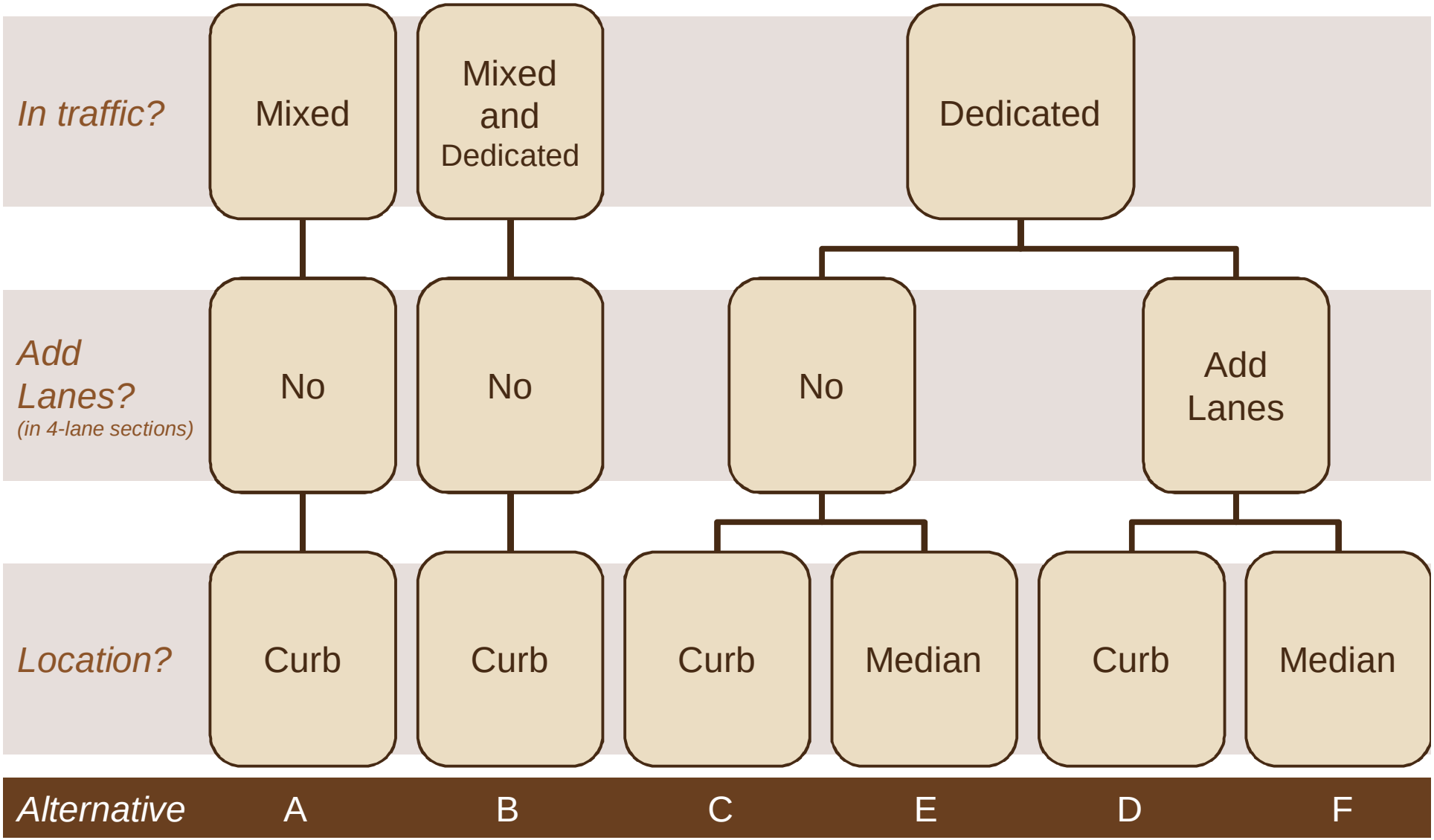
Queuing Evaluation Summary

- Side streets experience significant queues when capacity of Duke Street is reduced, particularly on Quaker Lane
  - Scenario 1 (PM): queue > 900 feet
  - Scenario 2 (PM): queue ~ 325 feet
- Four-lane sections (when transitway is implemented) of Duke Street appear to have manageable queues under all scenarios
- Traffic is metered on Duke Street within the two-lane sections of the corridor in Scenario 1 (no widening)
  - Results in relatively good operations on Duke Street within the constrained (two-lane) section
  - Results in relatively long queues on side streets and at the ends of the two-lane sections on Duke Street
- Section of Duke Street between Quaker Lane and Roth Street has highly problematic queues in Scenario 1 (no widening)

General Traffic Evaluation Summary

- Link-level and queuing evaluation together is best representation of potential future operations
- Existing six lane section has the potential to be reduced to four-lanes with left-turn lanes and operate acceptably
- Benefit to increased capacity on Duke Street in vicinity of Quaker Lane and Telegraph Road
- Four lanes are needed on Duke Street between Quaker Lane and Telegraph Road
- Widening in some locations would have more benefit to traffic operations than other locations
- Some compromise between Scenario 1 and 2 seems logical as a “best fit” option

Options


In traffic?
Add Lanes?
(in 4-lane sections)
Location?
Mixed
Mixed and Dedicated
Dedicated
No
No
No
Add Lanes
Curb
Curb
Curb
Median
Curb
Median
Alternative
A
B
C
E
D
F

Proposed Alternatives

Alternative A – Curb Running in Mixed Flow

Alternative B – Curb Running in Mixed Flow and Dedicated Lanes

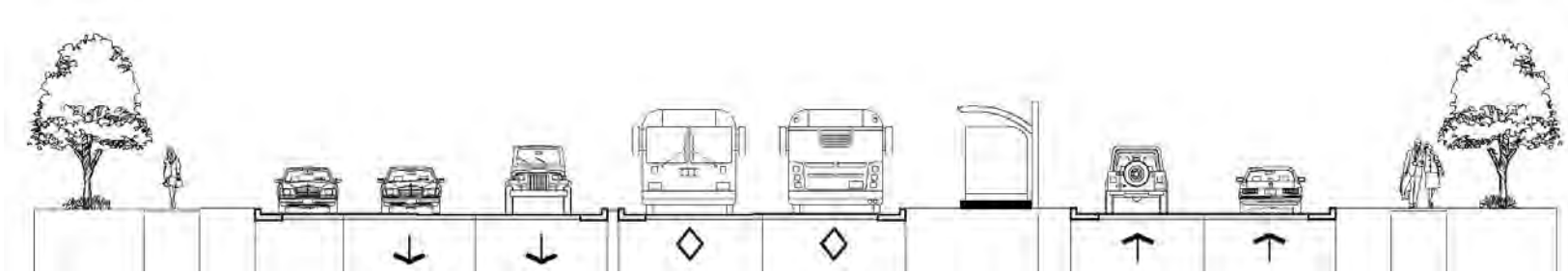
Alternative C – Curb Running in Dedicated Lanes without New Lanes

Alternative D – Curb Running in Dedicated Lanes with New Lanes

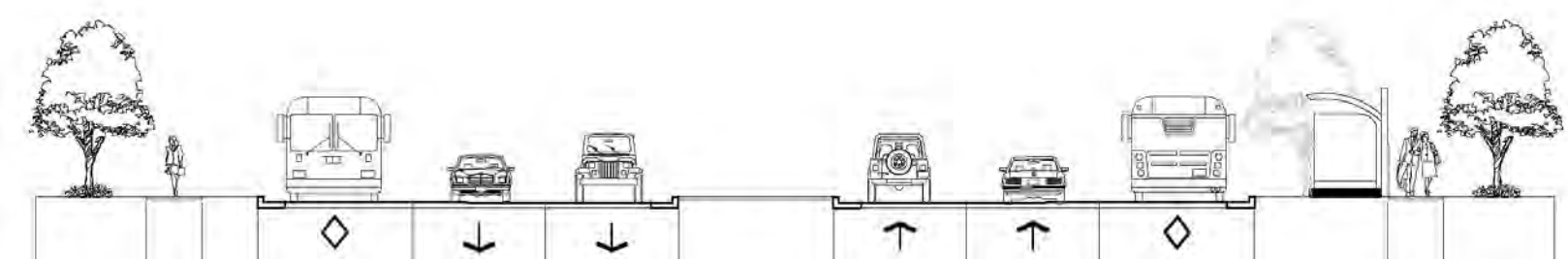
Alternative E – Median Running in Dedicated Lanes without New Lanes

Alternative F – Median Running in Dedicated Lanes with New Lanes

Operational Configurations (with dedicated transit lanes)

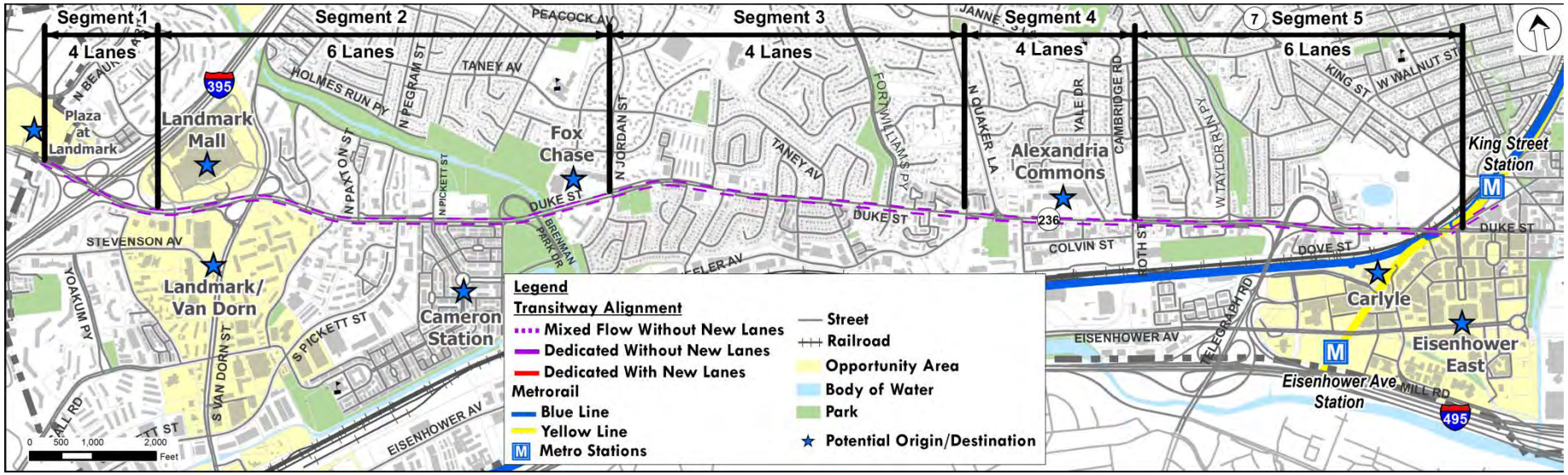


Median Running



Curb Running

Alternative A: Curb Running in Mixed Flow



Description

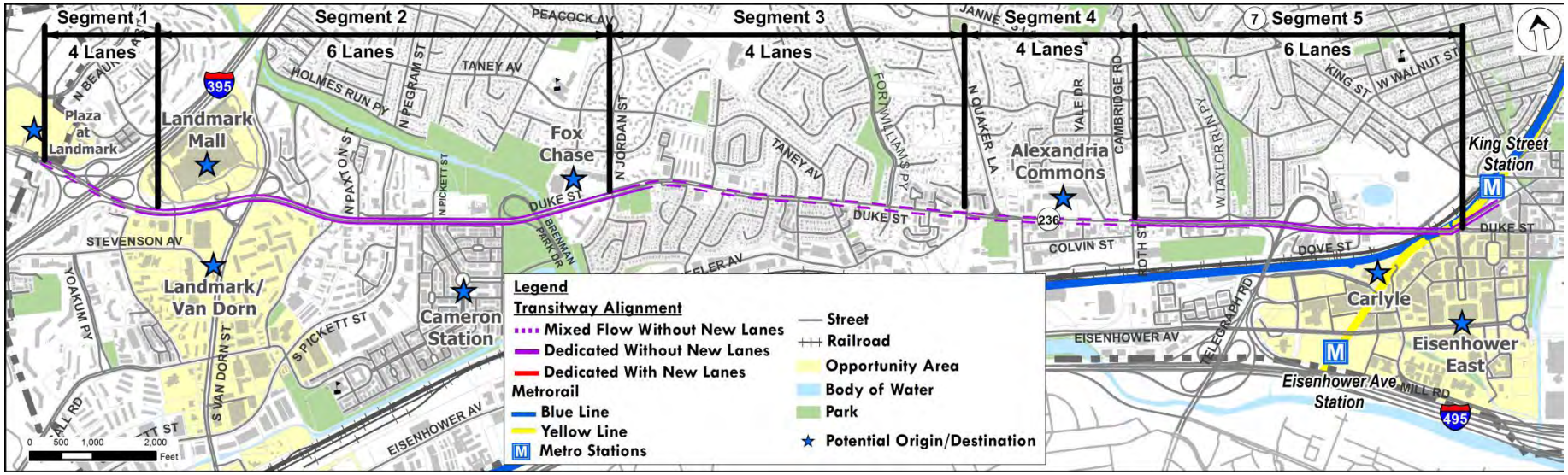
- Transit in mixed flow for full corridor length
- Transit running along curb
- Uses queue jumps and TSP
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	◑	Streetscape Impacts	◑
Avoidance of Congestion	○	Noise and Vibration	◑
Transit Travel Times	○	Traffic Flow Impact	◑
Intersection Priority	○	Pedestrian Accommodation	●
Runningway Status	◑	Bicycle Accommodation	○
Runningway Configuration	○	Parking Impacts	◑
Phasing	●	Capital Cost	◑
Natural Environment Impacts	◑	Operating Cost	○
Property Impacts	◑	Funding	◑

Rating:	●	Best	◑	Fair	○	Poor

NOTE: Data to evaluate Cost Per Rider is not available at this time.

Alternative B: Curb Running in Mixed Flow and Dedicated Lanes



Description

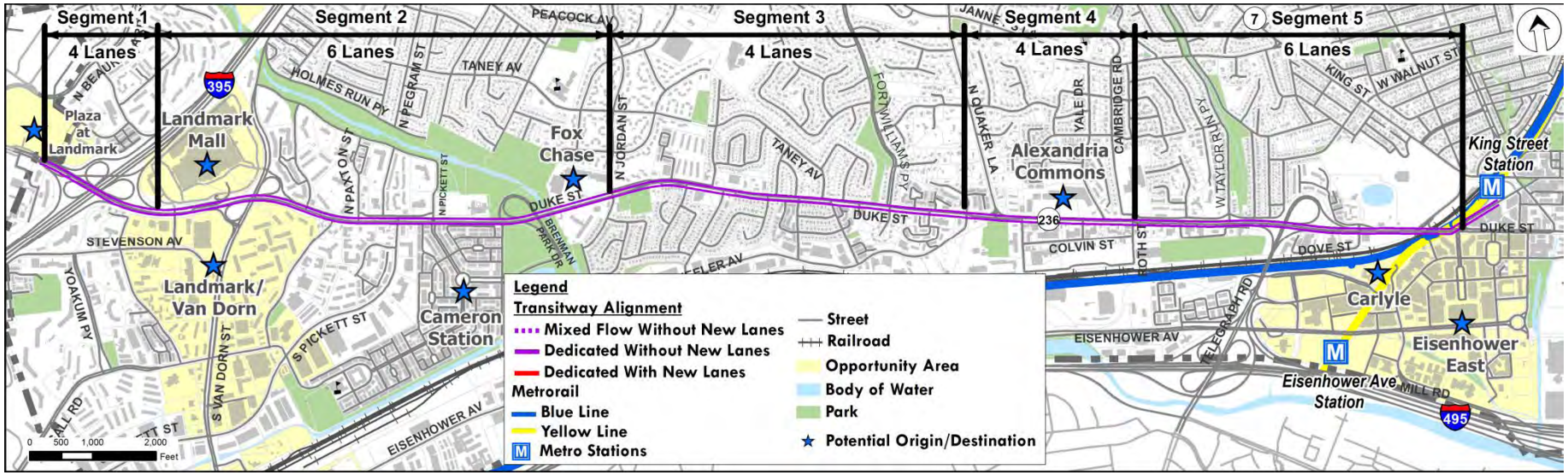
- Transit in mixed flow on 4-lane segments (2 miles total) and in dedicated lanes on 6-lane segments (2.5 miles total) to reduce property impacts
- Transit running along curb, shared with right-turns in most locations
- Uses queue jumps where there are not dedicated lanes and TSP
- Some impacts to property and frontage roads to accommodate queue jumps

Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	◑	Streetscape Impacts	◑
Avoidance of Congestion	◑	Noise and Vibration	◑
Transit Travel Times	◑	Traffic Flow Impact	◑
Intersection Priority	◑	Pedestrian Accommodation	●
Runningway Status	◑	Bicycle Accommodation	◑
Runningway Configuration	◑	Parking Impacts	◑
Phasing	●	Capital Cost	◑
Natural Environment Impacts	◑	Operating Cost	○
Property Impacts	◑	Funding	◑

Rating:	●	Best	◑	Fair	○	Poor

NOTE: Data to evaluate Cost Per Rider is not available at this time.

Alternative C: Curb Running in Dedicated Lanes without New Lanes



Description

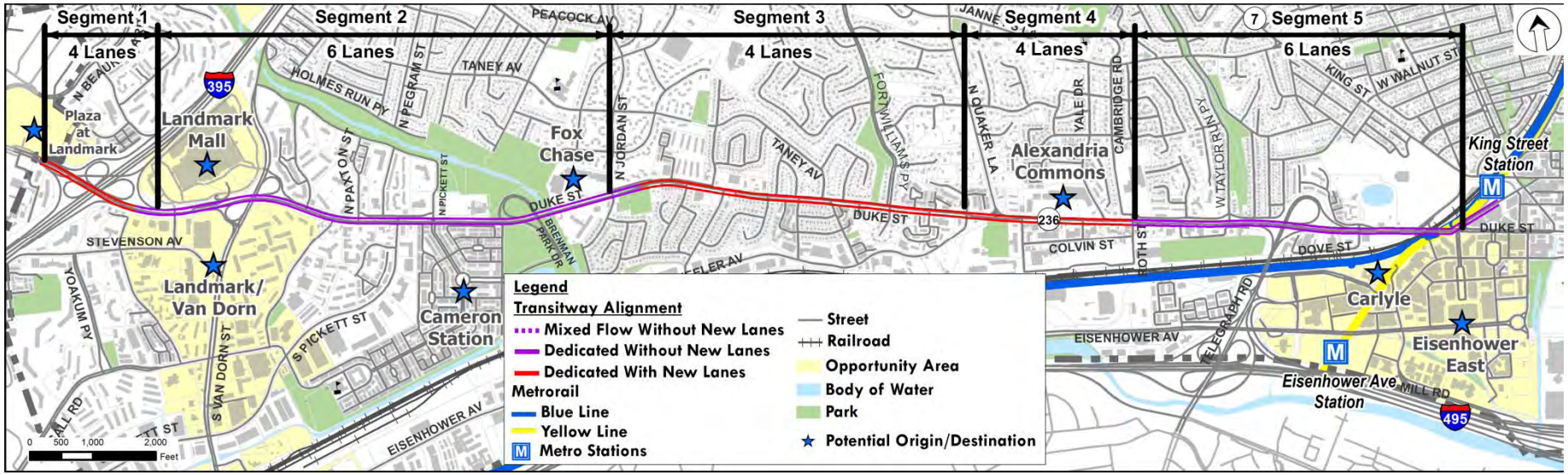
- Transit in dedicated lanes for full corridor length
- Reduces Duke Street to one lane per direction in 4-lane segments (2 miles total)
- Transit running along curb, shared with right-turns in most locations
- Minimal impacts to property and frontage roads

Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	◑	Streetscape Impacts	●
Avoidance of Congestion	●	Noise and Vibration	◑
Transit Travel Times	●	Traffic Flow Impact	○
Intersection Priority	●	Pedestrian Accommodation	●
Runningway Status	●	Bicycle Accommodation	●
Runningway Configuration	●	Parking Impacts	●
Phasing	◑	Capital Cost	●
Natural Environment Impacts	●	Operating Cost	●
Property Impacts	●	Funding	●

Rating:	●	Best	◑	Fair	○	Poor

NOTE: Data to evaluate Cost Per Rider is not available at this time.

Alternative D: Curb Running in Dedicated Lanes with New Lanes



Description

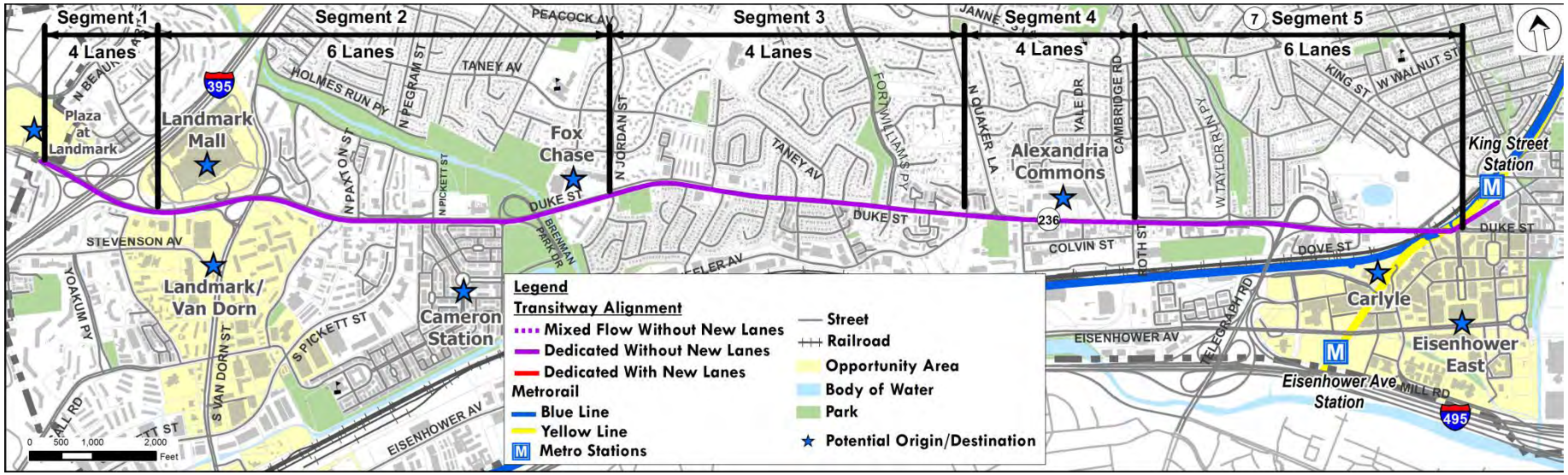
- Transit in dedicated lanes for full corridor length
- Requires widening in 4-lane segments (2 miles total)
- Transit running along curb, shared with right-turns in most locations
- Impacts to property and frontage roads

Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	◑	Streetscape Impacts	○
Avoidance of Congestion	●	Noise and Vibration	○
Transit Travel Times	●	Traffic Flow Impact	●
Intersection Priority	●	Pedestrian Accommodation	●
Runningway Status	○	Bicycle Accommodation	◑
Runningway Configuration	●	Parking Impacts	○
Phasing	○	Capital Cost	○
Natural Environment Impacts	○	Operating Cost	●
Property Impacts	○	Funding	○

Rating:	●	Best	◑	Fair	○	Poor

NOTE: Data to evaluate Cost Per Rider is not available at this time.

Alternative E: Median Running in Dedicated Lanes without New Lanes



Description

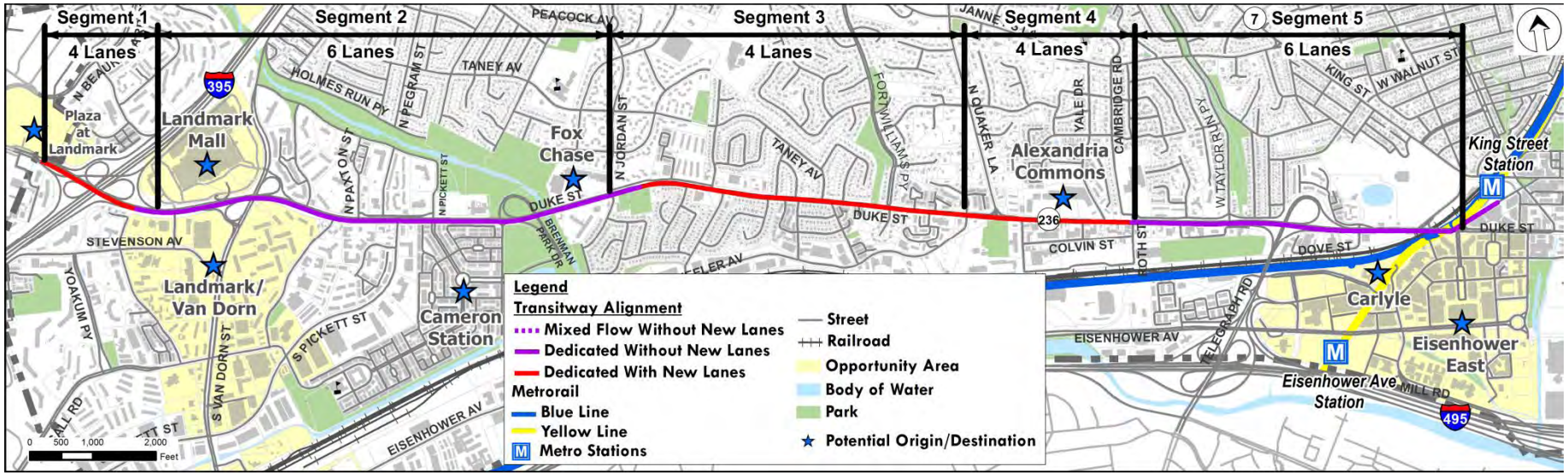
- Transit in dedicated lanes for full corridor length
- Reduces Duke Street to one lane per direction in 4-lane segments (2 miles total)
- Transit running in median
- Minimal impacts to property and frontage roads

Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	◑	Streetscape Impacts	●
Avoidance of Congestion	●	Noise and Vibration	●
Transit Travel Times	●	Traffic Flow Impact	○
Intersection Priority	●	Pedestrian Accommodation	◑
Runningway Status	●	Bicycle Accommodation	●
Runningway Configuration	●	Parking Impacts	●
Phasing	◑	Capital Cost	◑
Natural Environment Impacts	●	Operating Cost	●
Property Impacts	●	Funding	◑

Rating:	●	Best	◑	Fair	○	Poor

NOTE: Data to evaluate Cost Per Rider is not available at this time.

Alternative F: Median Running in Dedicated Lanes with New Lanes



Description

- Transit running in median
- Transit in dedicated lanes for full corridor length
- Requires widening in 4-lane segments (2 miles total)
- Impacts to property and frontage roads

Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	◑	Streetscape Impacts	○
Avoidance of Congestion	●	Noise and Vibration	●
Transit Travel Times	●	Traffic Flow Impact	●
Intersection Priority	●	Pedestrian Accommodation	◑
Runningway Status	○	Bicycle Accommodation	◑
Runningway Configuration	●	Parking Impacts	○
Phasing	○	Capital Cost	○
Natural Environment Impacts	○	Operating Cost	●
Property Impacts	○	Funding	○

Rating:	●	Best	◑	Fair	○	Poor

NOTE: Data to evaluate Cost Per Rider is not available at this time.

Runningway Screening Summary - Effectiveness

Preliminary Screening Criteria	Alternative					
	A	B	C	D	E	F
In traffic?	Mixed	Both	Dedicated	Dedicated	Dedicated	Dedicated
Add lanes?	No	No	No	Add a lane	No	Add a lane
Location?	Curb	Curb	Curb	Curb	Median	Median
Transit Connectivity	◑	◑	◑	◑	◑	◑
Avoidance of Congestion	○	◑	●	●	●	●
Transit Travel Times	○	◑	●	●	●	●
Intersection Priority	○	◑	●	●	●	●
Runningway Status (Percent already in place)	◑	◑	●	○	●	○
Runningway Configuration (Percent dedicated)	○	◑	●	●	●	●
Phasing	●	●	◑	○	◑	○

Rating:	●	Best	◑	Fair	○	Poor

Runningway Screening Summary - Impacts

Preliminary Screening Criteria	Alternative					
	A	B	C	D	E	F
In traffic?	Mixed	Both	Dedicated	Dedicated	Dedicated	Dedicated
Add lanes?	No	No	No	Add a lane	No	Add a lane
Location?	Curb	Curb	Curb	Curb	Median	Median
Natural Environment Impacts	◑	◑	●	○	●	○
Property Impacts	◑	◑	●	○	●	○
Impacts to Existing Streetscape	◑	◑	●	○	●	○
Noise and Vibration	◑	◑	◑	○	●	●
Traffic Flow Impact	◑	◑	○	●	○	●
Pedestrian Accommodation	●	●	●	●	◑	◑
Bicycle Accommodation	○	◑	●	◑	●	◑
Parking Impacts	◑	◑	●	○	●	○

Rating:	●	Best	◑	Fair	○	Poor

Runningway Screening Summary – Costs/Funding

Preliminary Screening Criteria	Alternative					
	A	B	C	D	E	F
In traffic?	Mixed	Both	Dedicated	Dedicated	Dedicated	Dedicated
Add lanes?	No	No	No	Add a lane	No	Add a lane
Location?	Curb	Curb	Curb	Curb	Median	Median
Capital Cost	◑	◑	●	○	◑	○
Operating Cost	○	○	●	●	●	●
Cost Per Rider	Not available at this time					
Funding	◑	◑	●	○	◑	○

Rating:	●	Best	◑	Fair	○	Poor

DISCUSSION

Project information is available at

www.alexandriava.gov/HighCapacityTransit