

MEMORANDUM

TO: Jim Maslanka
Steve Sindiong
City of Alexandria

FROM: David Whyte
Paul Elman
Erin Murphy
Kimley-Horn and Associates, Inc.

Amy Archer
Brian Horn
RK&K

DATE: January 16, 2012

SUBJECT: Selection of Alternatives for Secondary Screening for Transitway Corridor B
(Duke Street / Eisenhower Avenue Corridor)

Introduction

Three corridor alignments were developed for Corridor B (Duke Street/Eisenhower Avenue Corridor). The three alignments were evaluated to weigh the benefit of a transitway along Duke Street, Eisenhower Avenue or a combination of Duke Street and Eisenhower Avenue. The alignment information was presented at two High Capacity Transit Corridor Working Group (CWG) meetings (August 18, 2011, and November 17, 2011). Duke Street was selected as the preferred alignment for a dedicated transitway, based upon an evaluation of preliminary screening criteria, and feedback from the CWG and public input. At the same time, it was recommended that existing transit service along Eisenhower Avenue be improved through additional service and improved passenger amenities.

For the Duke Street preferred alignment, six preliminary transitway alternatives were evaluated. The alternatives varied by runningway concept. Each had identical termini and were assumed to be transit mode neutral—no mode was selected for specific evaluation for any alternative. The transit mode for corridor B will be assigned in a later phase and was not considered for this alternatives assessment. Each of the six alternatives were screened using a set of preliminary screening criteria.

A meeting was held on November 17, 2011 with the CWG to present the alternatives and receive feedback from the public. The CWG and the public were provided an additional 10 days after each working group meeting to submit comments.

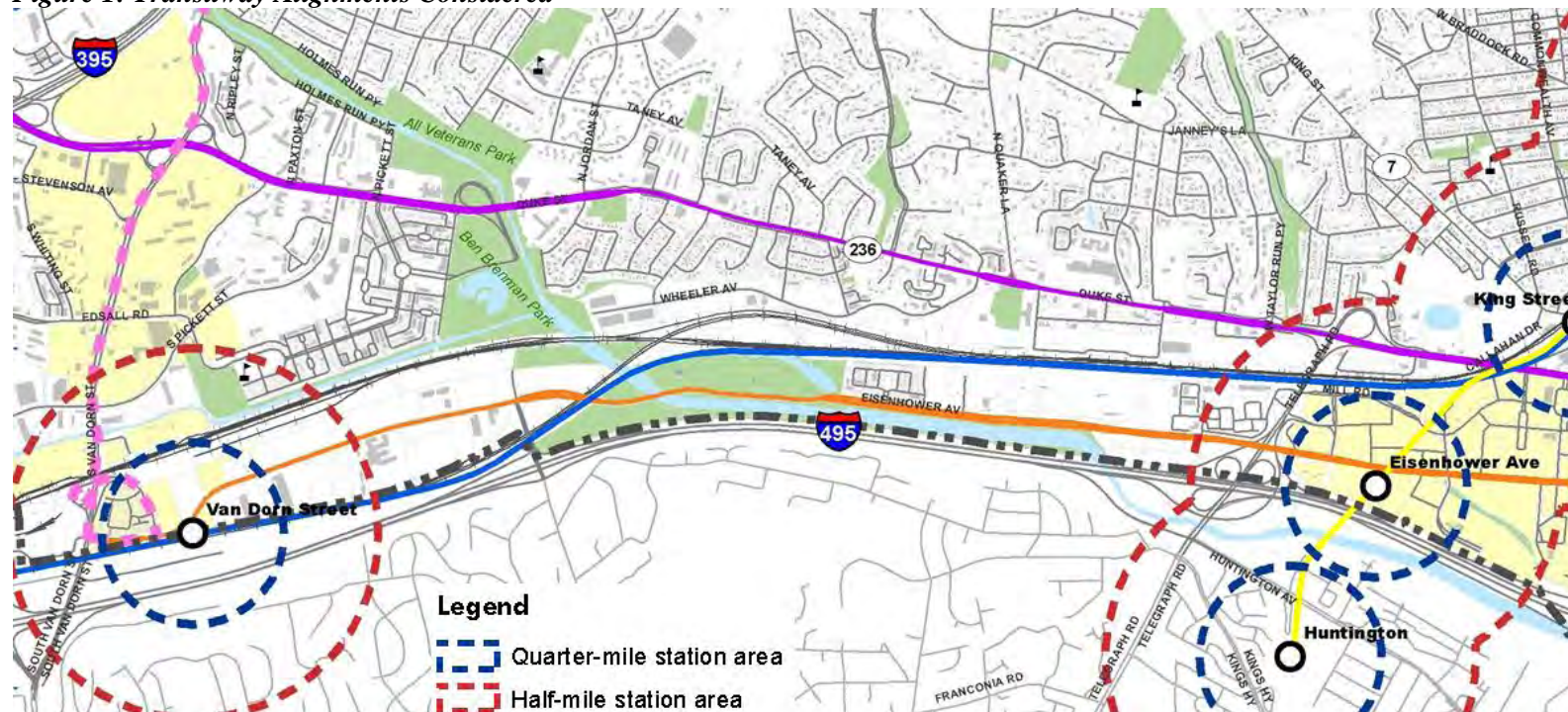
At the end of the comment period for each meeting, City of Alexandria staff and Kimley-Horn discussed comments received and identified next steps for the study of alignments and alternatives. As a result of this coordination, the original six alternatives were narrowed to four refined alternatives for further study. This memorandum briefly summarizes the process used to select the preferred alignment and four alternatives for further study.

Alignment Evaluation

Prior to evaluating specific alternatives for the Duke Street corridor, two primary transitway alignments were considered for the Duke Street/Eisenhower Avenue corridor. Three alignment scenarios, as shown in **Figure 1**, were considered:

- Duke Street alignment
- Eisenhower Avenue Alignment
- Combination (Duke Street/Eisenhower Avenue) Alignment

Figure 1: Transitway Alignments Considered



The three alignments were evaluated using the following criteria:

- Service/connectivity to local population, employment, and other destinations
- Service/connectivity to regional population, employment, and other destinations
- Connections to other transit services
- Operational quality of transit service
- Quality of operations of the corridor

The combination alternative was eliminated from consideration early in the discussion due to the limited connectivity that exists between Duke Street and Eisenhower Avenue. There are currently no existing roadway connections of Duke Street and Eisenhower Avenue between Van Dorn Street and Telegraph Road. The complication and potential cost (monetary and other) of constructing a new connection between Duke Street and Eisenhower Avenue made the combination alternative unattractive from an implementation perspective. Additionally, a combination alternative would have the potential to provide inadequate service to key areas of Duke Street or Eisenhower Avenue, if it ran only along a portion of either corridor.

During the discussion of Eisenhower Avenue, it was acknowledged that the highest density areas of the corridor are currently served by Metrorail (Eisenhower Avenue station). In addition, the Eisenhower Avenue alignment is constrained by a number of physical barriers that inhibit its ability to capture riders, including Cameron Run, Interstate 495, the rail line, and WMATA railyard. Only the far western and far eastern ends of the alignment can physically accommodate significant additional development, and these two areas are already proximate to Metrorail stations. These physical constraints and potential capture areas are shown in **Figures 2 and 3**. Nevertheless, some areas of the corridor are not well-served by Metrorail. Rather than invest in a high-capacity transitway along Eisenhower Avenue at this time, the public and CWG suggested that transit service could be improved through conventional means such as extended transit service hours, increased frequency, and additional passenger amenities.

Based on the evaluation conducted and discussion with the public, CWG, and city staff, a preference was expressed for the transitway alignment to be along Duke Street. Although Eisenhower Avenue was attractive from a transit travel time and impact to traffic flow perspective, it was recognized that it did not provide as much opportunity to serve population, employment, and other destinations or provide a high a level of regional connectivity as a service along Duke Street. It was also recognized that portions of Eisenhower Avenue already benefit from Metrorail and that placing the transitway along Eisenhower Avenue would create some degree of duplication of service. The Duke Street alignment was carried forward for alternatives development and evaluation.



Figure 2: Duke Street Alignment Potential Capture Area

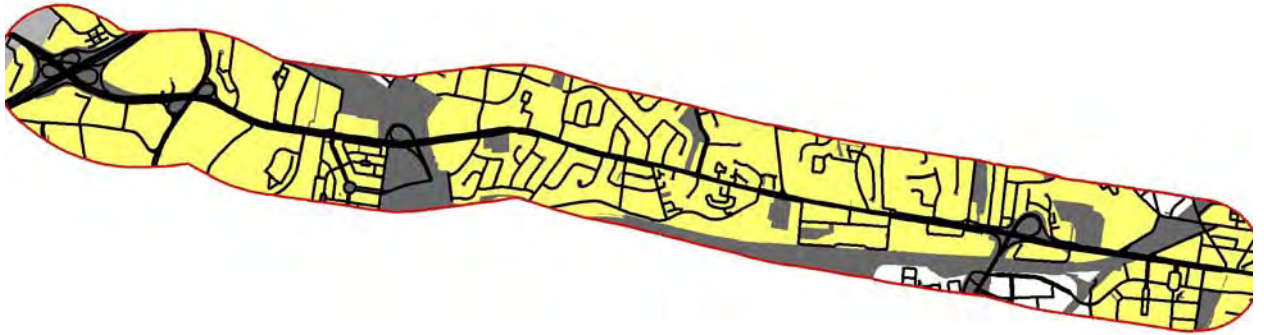


Figure 3: Eisenhower Avenue Alignment Potential Capture Area

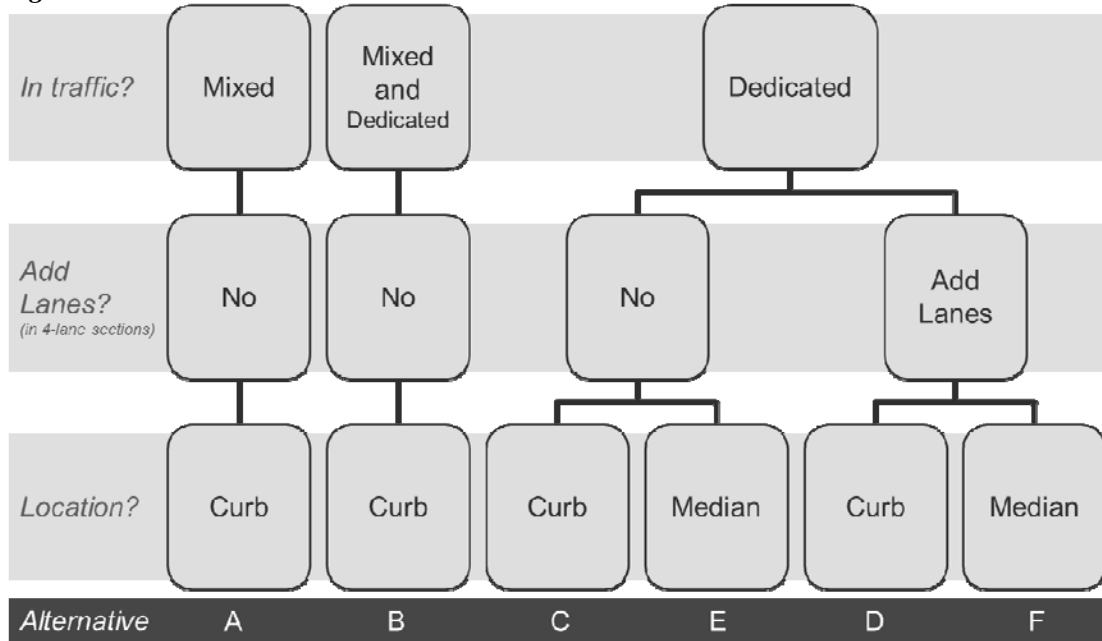


Preliminary Alternatives and Initial Screening

The six preliminary alternatives for the Duke Street alignment were developed using an “all inclusive scenarios” approach that took into consideration transit operability (mixed use versus dedicated lane), transit lane impacts (right-of-way take versus auto lane take) and runningway location (curb running versus median running). The alternatives development process also took into account CWG and public input regarding origins and destinations, impacts, priorities and other factors. **Figure 4** summarizes the elements used to generate alternatives.



Figure 4



Median running transit is not optimal in a mixed traffic scenario, due to the compromised safety involved in executing left turn maneuvers. Therefore, median running transit options were only considered for scenarios with fully dedicated transit lanes. It is assumed that all of the alternatives would include some pedestrian and bicycle improvements, consistent with the City’s Complete Streets policy, adopted in April 2011. These improvements may include improved access to transit stops, safe and adequate width of pedestrian facilities where currently inadequate, and bicycle facilities such as bike lanes or shared lanes. The specific pedestrian and bicycle improvements are not evaluated as part of the preliminary screening. The following six alternatives were developed for preliminary study:

- 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

Table 1 summarizes the key features of each alternative.



Table 1: Features of Preliminary Alternatives

Feature	Alternative					
	A	B	C	D	E	F
Operability						
Dedicated Transit Lanes		✓	✓	✓	✓	✓
Mixed Traffic Lanes	✓	✓				
Add Lanes (in 4-lane section)						
Add Lane				✓		✓
Do Not Add Lane	✓	✓	✓		✓	
Location						
Curb Running	✓	✓	✓	✓		
Median Running					✓	✓
Transit Configuration						
Queue Jump Lanes	✓	✓				
Median Stations					✓	✓
Legend: ✓ Alternative contains feature						

Evaluation criteria were presented to the CWG at the July 21, 2011 meeting. The CWG recommended a selected group of evaluation criteria to be used as screening criteria toward the preliminary review of the six alternatives and ratings according to their relative importance (high, average and low). **Table 2** shows the detailed evaluation and screening criteria.

Table 2: 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
	Operations	Transit Connectivity	✓	✓	Access to other transit services (existing and planned)
		Running-way Configuration(s)		✓	Quantify amount of runningway that is dedicated and amount that is mixed flow
		Corridor Length		✓	Measured length of the corridor (miles 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		



Table 2: 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
		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
	Transportation	Noise and Vibration	●	✓	Summarize relative noise and vibration impacts of different mode types and corridor configurations
		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	✓	✓
Operating cost			✓	✓	Order of magnitude operating cost
Cost Per Rider			✓	✓	Order of magnitude operating cost per rider
Financial	Funding	Funding	✓	✓	Availability to specific funding sources

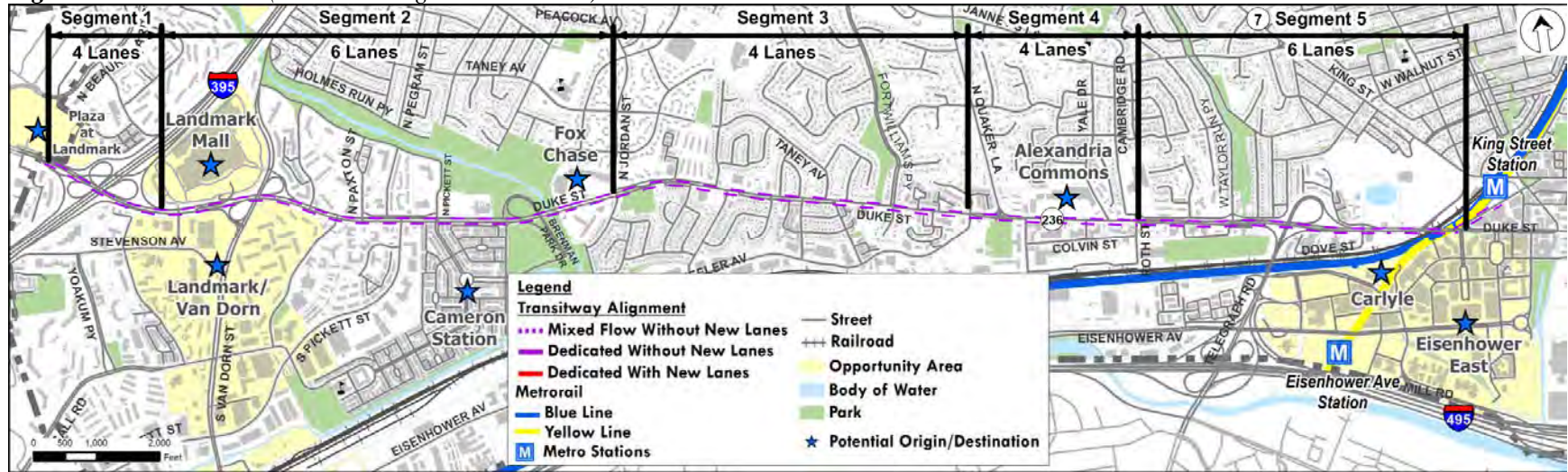


Table 2: Evaluation Criteria

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
Feasibility Cost of system/ concept is in alignment with available funding		Private Capital Incentive		✓	Judgment as to whether the concept has the potential to attract private capital investment and innovative procurement
Legend: ★ Highest importance ✓ Normal importance ● Lesser importance					

Each of the six alternatives was screened and rated using the criteria shown in the “For Use in Preliminary Screening of Concepts” column of **Table 2**. A summary of the ratings for each alternative is shown in the tables that accompany **Figures 5** through **10** and a comparative summary is shown in **Table 3**. Screening of costs was not included at this stage of analysis because the preliminary alternatives do not include a transit mode. Planning-level costs will be provided in the secondary level of screening.

Figure 5: Alternative A (Curb Running in Mixed Flow)



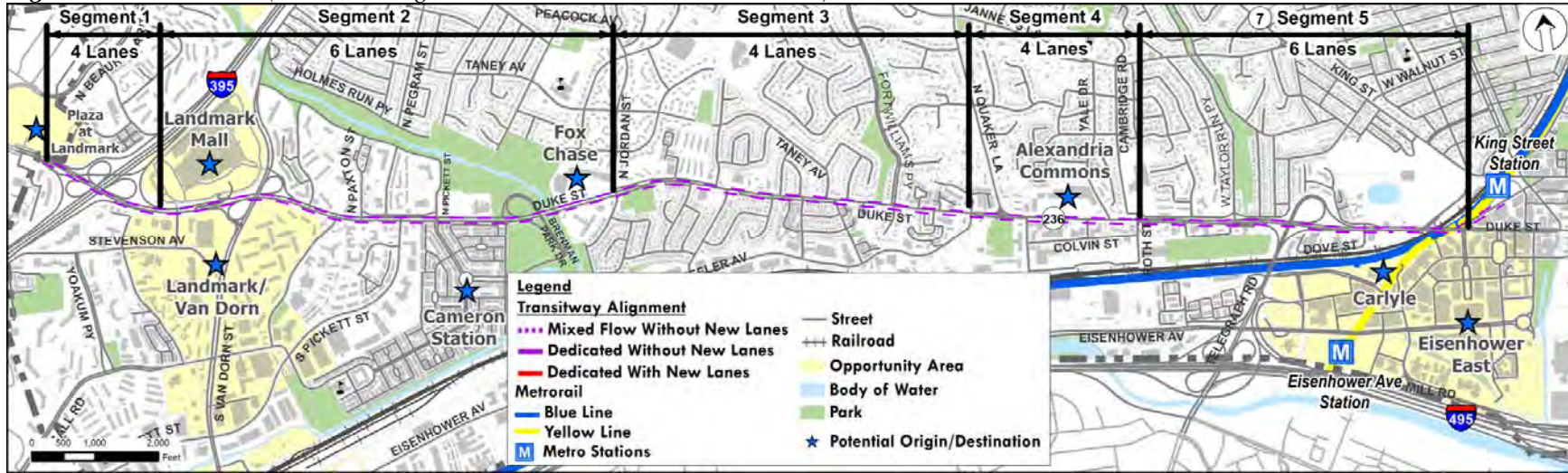
Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	●	Phasing	●	Pedestrian Accommodation	●
Avoidance of Congestion	○	Natural Environmental Impacts	●	Bicycle Accommodation	○
Transit Travel Times	○	Property Impacts	●	Parking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

Note: Data to evaluate cost per rider is not available at this time.

Rating: Best ● Fair ● Poor ○



Figure 6: Alternative B (Curb Running in Mixed Flow and Dedicated Lanes)



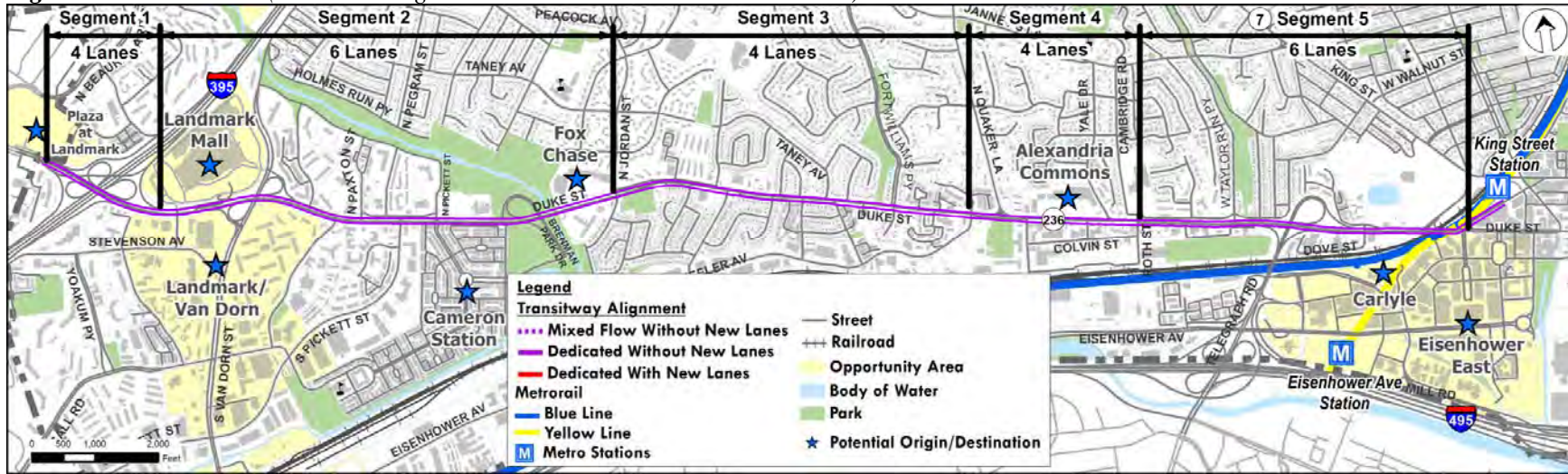
Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	●	Phasing	●	Pedestrian Accommodation	●
Avoidance of Congestion	●	Natural Environmental Impacts	●	Bicycle Accommodation	○
Transit Travel Times	●	Property Impacts	●	Parking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

Note: Data to evaluate cost per rider is not available at this time.

Rating: Best ● Fair ● Poor ○



Figure 7: Alternative C (Curb Running in Dedicated Lanes without New Lanes)



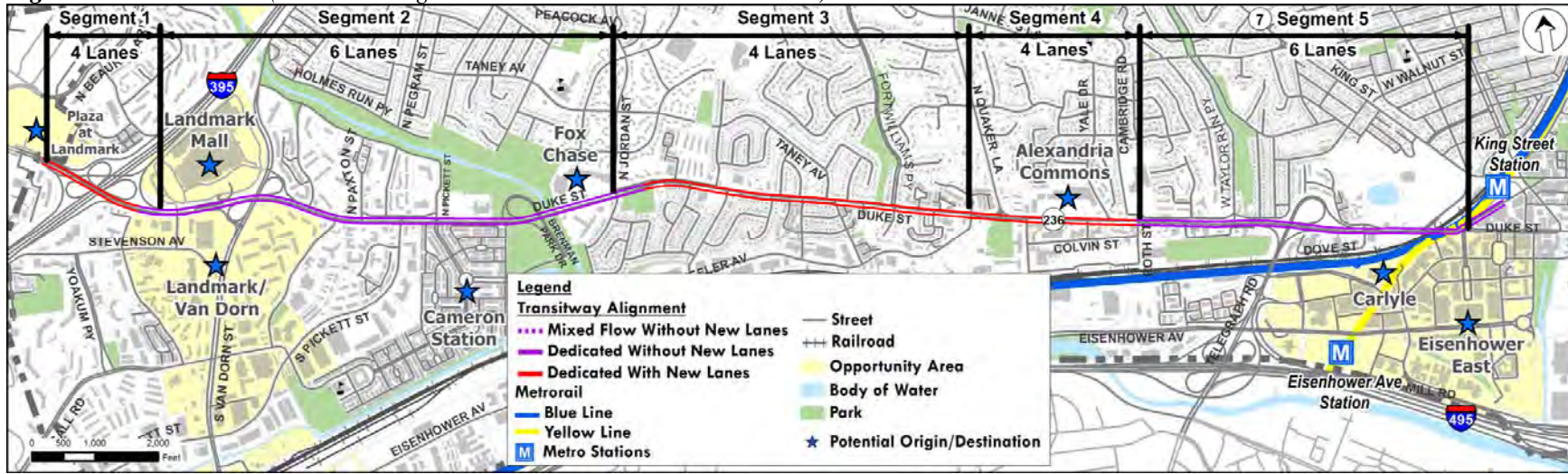
Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	●	Phasing	●	Pedestrian Accommodation	●
Avoidance of Congestion	●	Natural Environmental Impacts	●	Bicycle Accommodation	●
Transit Travel Times	●	Property Impacts	●	Parking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

Note: Data to evaluate cost per rider is not available at this time.

Rating: Best ● Fair ● Poor ○



Figure 8: Alternative D (Curb Running in Dedicated Lanes with New Lanes)



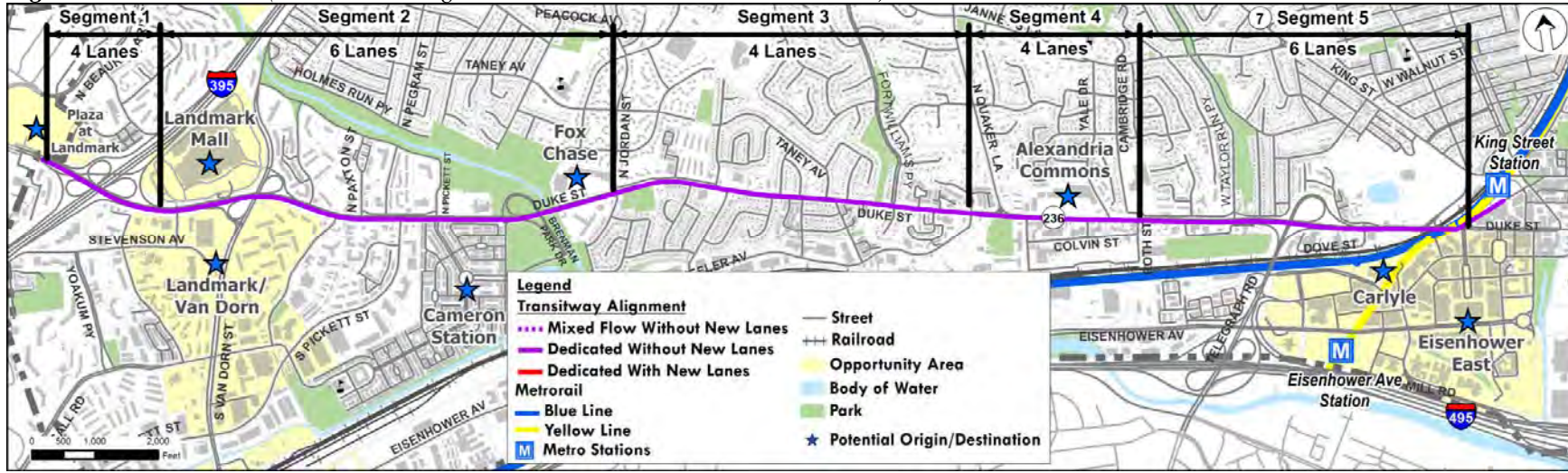
Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	●	Phasing	○	Pedestrian Accommodation	●
Avoidance of Congestion	●	Natural Environmental Impacts	○	Bicycle Accommodation	●
Transit Travel Times	●	Property Impacts	○	Parking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

Note: Data to evaluate cost per rider is not available at this time.

Rating: Best ● Fair ● Poor ○



Figure 9: Alternative E (Median Running in Dedicated Lanes without New Lanes)



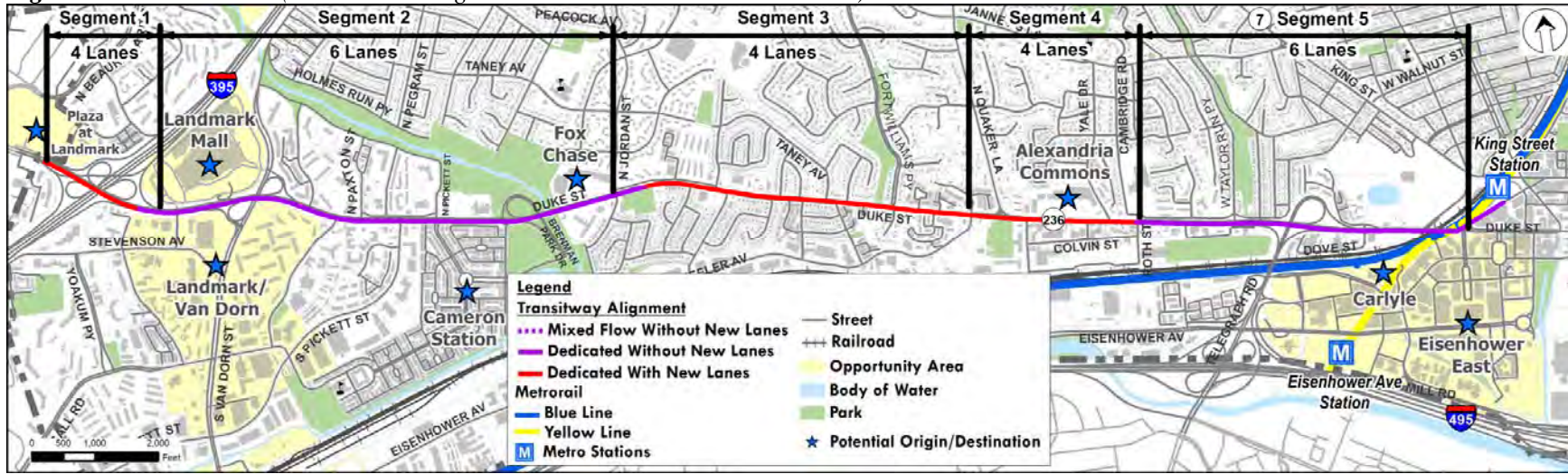
Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating	Preliminary Screening Criteria	Rating
Transit Connectivity	●	Phasing	●	Pedestrian Accommodation	●
Avoidance of Congestion	●	Natural Environmental Impacts	●	Bicycle Accommodation	●
Transit Travel Times	●	Property Impacts	●	Parking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

Note: Data to evaluate cost per rider is not available at this time.

Rating: Best ● Fair ● Poor ○



Figure 10: Alternative F (Median Running in Dedicated Lanes with New Lanes)



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

Note: Data to evaluate cost per rider is not available at this time.

Rating: Best ● Fair ● Poor ○



Table 3: Preliminary Screening Summary

Preliminary Screening Criteria	Alternative					
	A	B	C	D	E	F
Transit Connectivity	◐	◐	◐	◐	◐	◐
Avoidance of Congestion	○	◐	●	●	●	●
Transit Travel Times	○	◐	●	●	●	●
Intersection Priority	○	◐	●	●	●	●
Runningway Status	◐	◐	●	○	●	○
Runningway Configuration	○	◐	●	●	●	●
Phasing	●	●	◐	○	◐	○
Natural Environmental Impacts	◐	◐	●	○	●	○
Property Impacts	◐	◐	●	○	●	○
Streetscape Impacts	◐	◐	●	○	●	○
Noise and Vibration	◐	◐	◐	○	●	●
Traffic Flow Impact	◐	◐	○	●	○	●
Pedestrian Accommodation	●	●	●	●	◐	◐
Bicycle Accommodation	○	○	◐	◐	●	●
Parking Impacts	◐	◐	●	○	●	○
Capital Cost	◐	◐	●	○	◐	○
Operating Cost	○	○	●	●	●	●
Funding	◐	◐	●	○	◐	○

Note: Cost per rider is not available at this time

Rating:	Best	●	Fair	◐	Poor	○
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CWG and Public Comments and Preferences

A meeting was held with the CWG on November 17, 2011 to review the Corridor B alignment concepts and preliminary screening and determine which concepts would move forward for secondary screening. After the meeting, a 10-day comment period was provided to collect additional public comments.

CWG member comments included the following:

- Use redevelopment at the Landmark Mall for additional right-of-way
- Right-in/right-out on westbound Duke Street near Taylor Run Parkway; restrict left turns onto Duke Street
- Impacts to emergency services (two fire stations) on Duke Street corridor
- Congestion could create a division between east and west Alexandria
- Consider needs of bicyclists without compromising needs of pedestrians
- From the Transportation Master Plan, the City does not cater to through traffic
- Existing lanes should be dedicated, with curbside transit in shared lanes between Jordan and Roth Streets

Comments from the public on the preliminary alternatives included the following:

- Transitway along Duke Street will disrupt quality of life for adjacent residents
- Poor pedestrian and bicycle conditions along Duke Street
- There is limited non-peak and weekend bus service along Duke Street
- Need to protect neighborhood streets
- Show bicycle facilities on alternatives
- Traffic model underestimates potential transit ridership
- Service roads between Jordan Street and Quaker Lane should not be impacted
- Traffic congestion east of Quaker Lane
- Minimize roadway widening, use narrower lanes
- Use median for transit and prohibit left turns
- Consider only constructing a turn lane between Quaker Lane and Jordan Street
- Southbound left-turn lane from Quaker onto Duke Street too short

A full summary of the public and CWG comments from the November 17, 2011 CWG meeting are available in the meeting minutes. Additional public comments were received following the meeting and are available on the project website.

Review and Selection of Alternatives for Further Analysis

City of Alexandria staff and Kimley-Horn met on November 28, 2011 to discuss alternatives to be forwarded or refined for the secondary screening analysis. The following summarizes a discussion among Alexandria City staff and Kimley-Horn regarding the selection of alternatives for further analysis.

Alternative A: Curb Running in Mixed Flow

- Offers no benefit over Alternative B
- ***Eliminate from consideration***



Alternative B: Curb Running in Mixed Flow and Dedicated Lanes

- Preferred by CWG
- Base alternative for implementation within existing footprint
- Consider modified Alternative B with dedicated lanes at narrowest segment utilizing service road right-of-way
- ***Consider alternative and a variation of alternative using service roads for further analysis***

Alternative C: Curb Running in Dedicated Lanes without New Lanes

- Fewer impacts to property and environment, but adverse impact on traffic
- Should be modified to consider reversible lane configuration in order to use auto lane in off-peak direction (combo with D)
- ***Consider alternative for further analysis (in combination with Alternative D by implementing a reversible lane)***

Alternative D: Curb Running in Dedicated Lanes with New Lanes

- Preferred by some members of CWG
- Viewed as efficient and effective
- Would reduce traffic, but would result in greater impacts to property and environment
- Should be modified to consider reversible lane configuration in order to use auto lane in off-peak direction (combo with C)
- ***Consider alternative for further analysis (in combination with Alternative C by implementing a reversible lane)***

Alternative E: Median Running in Dedicated Lanes without New Lanes

- Fewer impacts to property and environment, but adverse impact on traffic
- ***Eliminate from consideration***

Alternative F: Median Running in Dedicated Lanes with New Lanes

- Viewed as a worst-case scenario from property and environment impact perspective
- Should be analyzed further since this alternative would provide the best transit operations
- ***Consider alternative for further analysis***

Conclusions and Next Steps

The following alternatives were selected for further analysis based on technical evaluations and discussion with the CWG, public, and City staff:

- Alternative B – Forwarded as Alternative 1
- Variation of Alternative B – Forwarded as Alternative 2
- Combination of Alternatives C and D with a reversible lane – Forwarded as Alternative 3
- Alternative F – Forwarded as Alternative 4

The secondary screening of the selected alternatives will be presented at the January 19, 2012 CWG meeting.