Finance and Capital Committee

Information Item IV-A

September 9, 2021

Blue/Orange/Silver Capacity & Reliability Study

Washington Metropolitan Area Transit Authority

Board Action/Information Summary

○ Action ◉ Information	MEAD Number: 202298	Resolution: ○ Yes ◉ No

TITLE:

Blue/Orange/Silver Capacity & Reliability Study

PRESENTATION SUMMARY:

This information item will brief the Board on the Blue/Orange/Silver Corridor Capacity & Reliability Study (BOS Study).

This briefing describes the study's purpose; the challenges and opportunities; how potential solutions were identified; the range of alternatives currently under consideration; and next steps towards the identification and selection of a "locally-preferred alternative" (LPA).

PURPOSE:

To brief the Board about planning work completed to date and the current status of the BOS Study, the process and next steps in advance of additional public engagement and outreach to elected officials.

DESCRIPTION:

In 2019, Metro launched the BOS Study to identify a project or package of projects to address capacity constraints and crowding, reliability concerns, a lack of operational flexibility, and threats to long-term sustainability in the corridor. The BOS Study's approach aligns with federal process requirements and guidelines for planning large infrastructure projects, such as the National Environmental Policy Act (NEPA) and Planning and Environmental Linkages (PEL) studies.

More information about the BOS Study including previous studies related to the BOS corridor can be found at https://www.wmata.com/BOSstudy

Contractors and Interested Parties involved in the BOS Study: **HNTB** (prime consultant), **Cambridge Systematics**, **Fehr and Peers**, **Foursquare Integrated Transportation Planning** (FITP), **GeoConcepts Engineering**, **KGP Design Studio**, **Kimley-Horn and Associates**, **Mercado Consultants**, **Rhodeside & Harwell**, **VHB**

Key Highlights:

• Metro launched the BOS Study in 2019 on behalf of the region to develop and evaluate multiple challenges and opportunities within the corridor, including reliability, crowding, operational flexibility and cost-efficiency, and long-term sustainability.
• An extensive engagement process featured 27 meetings with stakeholders, including jurisdictional partners, 13 pop-ups at BOS stations, four public workshops, and an online survey.
• A cost-benefit analysis (CBA) for six alternatives has been completed. The alternatives and the CBA results will be presented to elected officials, stakeholders, and the public this fall to gather feedback to inform and support the selection of an LPA.
• The BOS Study process was designed according to federal requirements and guidelines, to ensure Metro and the region can pursue federal funding if desired.
• The jurisdictions forecast that the BOS corridor will add 37% more people and 30% more jobs by 2040, which is likely to increase ridership.
• The pandemic has changed ridership patterns making it much more challenging to forecast future transportation demand. However, because an effective solution to the challenges in the corridor could take 10 to 20 years or more to deliver, project development work will continue on the LPA unless and until it becomes clear improvements will not be necessary.

Background and History:

The BOS Study is an important step to address challenges that have impacted service on the Blue, Orange, and Silver lines for over a decade. Running three lines through one tunnel and set of tracks ("interlining") creates challenges for Metro and our customers, including crowding during peak periods, service reliability issues, a lack of operational flexibility, and threats to long-term sustainability.

This study is intended to identify a project or package of projects capable of mitigating those problems. At the completion of the BOS Study, a proposed project or package of projects ("locally-preferred alternative" or LPA) will be presented to the Board for consideration and approval. The BOS Study will provide the Board with a range of options, goals, data analyses, and feedback from the public and regional stakeholders. As project sponsor, Metro will continue to advance the LPA through project development and environmental review processes, but selection of the LPA will be guided by the region.

Discussion:

BOS Study Purpose and Need

The LPA will need to address multiple challenges in the BOS corridor:

Capacity and crowding: On-board and in-station crowding on the BOS lines have exceeded crowding standards during peak hours for years (pre-pandemic) regardless of service levels or systemwide ridership fluctuations. The jurisdictions have forecasted that the BOS corridor will add 37% more people and 30% more jobs by 2040. This anticipated growth is expected to increase BOS ridership by 2040 and worsen both the magnitude and the geographic extent of the crowding issues. Though full eight-car trains will help, they are not sufficient to solve the railcar crowding problems. Due to interlining and the maximum throughput of 26 trains per hour (TPH) per track, Metro cannot substantially increase service on any line without severely reducing service on the other lines. For example, Metro's most recent six-minute peak operating plan scheduled 10-11 Orange and Silver TPH, but only 5 Blue TPH. Metro cannot both improve headways and meet ridership demand on all three lines, so long as they are interlined.

Reliability and on-time performance (OTP): Due to interlining, delays on one line impact the other two. Severe delays can also impact the Green and Yellow lines, because the Blue Line is interlined with the Yellow Line in Virginia. SafeTrack and Metro's focus on reducing the State of Good Repair backlog, funded in part by dedicated capital funding, has substantially improved BOS reliability, especially delays caused by mechanical failure and track problems. However, nearly a third of delays over one minute can be attributed to customer activity, scheduling issues, and/or police and fire events.

Managing work zones and other disruptions: Reliability also means maintaining quality service during construction activities and single-tracking events The LPA should offer the potential to minimize the geographic extent and customer impacts of work zones and any other disruptions. However, the corridor has a limited supply of infrastructure that can reduce the size of work zones and single-tracking events, such as pocket tracks and crossovers.

Operational flexibility and cost-efficiency: Metro and the region have an interest in better matching service to ridership demand, in order to contain operating costs and better manage single-tracking events. However, the BOS corridor has a limited supply of infrastructure to support train turnbacks.

Long-term sustainability: Metro and the region are focused on the long-term viability of BOS transit services and achieving sustainability goals. Strategies and outcomes may include:

• Advancing Metro's Energy Action Plan and environmental goals;
• Improving farebox recovery by attracting new riders;
• Encouraging mode shift from single-occupancy vehicles to transit and nonmotorized options by providing a competitive travel option;
• Supporting transit-oriented development; and
• Expanding access to high-capacity transit and economic opportunities, particularly in vulnerable communities and equity emphasis areas.

Addressing this set of issues will likely necessitate a large-scale solution that requires regional resources, coordination and commitment. Such projects can take a long time to plan, design, fund, and build.

BOS Study Process

The region may decide to pursue federal funding for the LPA, so the BOS Study was designed according to federal requirements and guidance. It was structured to be consistent with Metro's Development and Evaluation (D&E) program as well as federal guidance on the National Environmental Policy Act (NEPA) requirements and pre-NEPA planning. It is modeled after the alternatives analysis process as described in federal guidance documents for NEPA and Planning and Environmental Linkages (PEL) studies. The BOS Study steps include, in order:

1. Identify the transit problems and set corridor goals (Complete)
2. Develop a full range of options to meet those goals (Complete)
3. Narrow the initial set of options to a final set of alternatives (Complete)
4. Evaluate the alternatives using a comparative cost-benefit analysis (CBA) methodology (Complete)
5. Select a locally-preferred alternative (LPA)

Consistent with federal NEPA and PEL requirements, each of these study stages has engaged regional stakeholders, including Metro's jurisdictional partners, and the public. For more detail, see the section on public and stakeholder engagement below.

Steps One through Four are complete and are presented in this briefing. The selection of an LPA will be brought for the Board's consideration after public engagement and outreach to elected officials this fall.

Placing the BOS Study in Context of Delivering Capital Projects

Depending on the LPA, it may take 10-20 years or more to plan, fund, and build. It may require a large capital investment that could be funded through the Federal Transit Administration (FTA)'s Capital Investment Grant (CIG) program. If the selected LPA is a major capital project and the region decides to compete for federal funding, project delivery would have to follow a required federal process that includes the following phases:

1. Pre-NEPA Planning (BOS Study)
2. NEPA/Project Development: 2-5 years
3. Engineering: 5-10 years
4. Full Funding Agreement (federal or otherwise)
5. Final design and construction: 5-10 years

Major capital projects require substantial planning, environmental review, and design prior to funding decisions/agreements. However, until there is a funding agreement, there is no commitment to build or deliver the LPA. Depending on the scale of the recommended LPA, this could be five, 10, or more years after the BOS Study concludes. Metro can stop or pause work at any time prior to that agreement.

Given the history of the corridor's capacity and reliability challenges, continuing to advance this study and subsequent project development will prepare the region to address those longstanding problems. While long-term ridership impacts of the pandemic are not known, crowding in BOS trains and stations always exceeded service standards during peak hours. Continuing to advance this work will ensure that the LPA is positioned to compete for federal funding.

Public and Stakeholder Engagement

The BOS Study has been guided by stakeholder and public input. Meetings were held with four technical advisory committees to help set goals for BOS transit, develop initial options and alternatives, and define the measures for evaluating and scoring those alternatives. The advisory committees and public input meetings to date include:

- Executive Committee of elected officials – two briefings
- Jurisdictional leadership committee – six meetings
- Jurisdictional technical committee – six meetings
- Metro leadership committee – six meetings
- Metro technical committee – six meetings
- Business and Community Stakeholder Committee – one workshop (before COVID)

The work of the advisory committees informed, and was informed by, substantial public input. Three rounds of public engagement activity were identified to align with key decision points in the study. The table below summarizes the public engagement timeline and activities to date.

BOS Study Public Engagement Efforts to Date			
Phase	Timeline	Activities	Purpose/Outcome
Round 1	Summer 2019	Street teams and pop-ups at 13 stations; handouts; website	Creating awareness of study, BOS transit needs/goals
Round 2	Winter 2019-2020	Four public workshops; online survey; presentations; handouts; station signs; press releases and social media blasts	Soliciting feedback on preliminary options, prioritizing outcomes, and gathering new ideas/options. Over 2,000 responses added 275 ideas/project concepts.
Round 3	Fall 2021 (tentative)	To be determined, but must be COVID-safe and emphasize online engagement tools	To communicate the final alternatives and results of the cost-benefit analysis, and gather feedback on selecting an LPA.

BOS Transit Goals

Following the identification of the purpose and need, those problems were translated into goal statements developed in close coordination with the stakeholder advisory committees. The LPA will need to attain these four goals and their associated objectives:

• Capacity: Provide sufficient capacity to meet ridership demand;
• Reliability: Improve reliability and on-time performance;
• Flexibility: Improve operational flexibility and cost-efficiency; and
• Sustainability: Support environmental sustainability and expand access to economic opportunities.

These goals and their associated objectives guided the identification of preliminary options, the winnowing of those options into a set of refined alternatives, and the performance measures used to assess the relative costs and benefits of those alternatives.

Identifying Potential Options

Once the goals were established, an initial set of options, or “project concepts,” was developed with the stakeholder committees. These were informed by analysis of multiple datasets including current and projected BOS ridership levels; major trip patterns and origin-destination pairs; current and future population and job densities; areas that might offer land development opportunities; and the location of vulnerable populations and equity emphasis areas. Additional requirements were that concepts had to serve major BOS origin/destination trip-patterns, explore options that would meet the four goals while limiting costs, and any rail concepts had to connect to an existing railyard.

Public input on the concepts followed. The public indicated their level of support for each project concept and prioritized their top three transportation outcomes.

They also were able to draw or describe their own project concept, which resulted in over 2,000 responses and 275 new ideas/project concepts. These were narrowed to a set of 16 preliminary alternatives and further screened on the basis of whether and how each alternative would:

1. Serve BOS travel patterns and relieve projected Metrorail passenger crowding
2. Help attain the four identified goals
3. Serve areas with projected population and employment densities suitable for Metrorail service
4. Align with stakeholder and public comments and expressed preferences

Only alternatives that passed all four screening criteria were advanced, resulting in the six alternatives described below.

The Current Alternatives

The six alternatives vary significantly in terms of cost, benefits, and potential impacts. They include a No-Build Scenario, a Lower Capital Cost Alternative, and four Metrorail realignments/extensions.

The No-Build Scenario: Includes the transportation investments already planned and funded, as listed in the Visualize 2045 Regional Long-Range Transportation Plan and Metro's FY 2021-2026 Capital Improvement Program (CIP). It includes the existing rail and bus network plus Silver Line Phase 2, the Potomac Yard Station, and all of the SOGR and modernization projects included in Metro's CIP. It also includes jurisdictional projects such as the State of Maryland's Purple Line light rail and various bus rapid transit (BRT) lines.

The Lower Capital Cost Alternative: Includes a network of enhanced commuter and BRT service, dynamic rail scheduling, exploring options to increase passenger capacity in railcars, expanding capacity in several core stations, and building infrastructure at West Falls Church and the D&G Junction that can support train turnbacks. The enhanced bus network was designed to reduce crowding on the BOS rail lines. It could do so by providing adequate capacity for the number of peak-hour customers that would need to be diverted from the BOS lines, and by offering an attractive option through direct, prioritized bus service. This alternative would create no new rail capacity.

Blue Line to Greenbelt: This alternative would realign the existing Blue Line from the Arlington Cemetery Station to a new, second Rosslyn station, which would offer a direct pedestrian connection to the existing Rosslyn Station. From there it would run through a new, separate tunnel into Georgetown, along M Street, through the District's downtown to Union Station, then northeast through Ivy City, Port Towns, Hyattsville, and College Park to Greenbelt. It would operate on separate tracks from the existing Green and Yellow lines in order to avoid re-interlining. This alternative would create net new rail capacity of 16 trains per hour (TPH) per direction.

Blue Line to National Harbor: This alternative would also realign the existing Blue Line from Arlington Cemetery Station to a new second Rosslyn station, continuing through Georgetown and along M Street to Union Station. From Union Station it would turn south, providing new north-south service in Waterfront and Navy Yard and creating new rail access in areas targeted for development, such as Buzzard Point, St. Elizabeths, and National Harbor, before crossing over the Woodrow Wilson Bridge to Alexandria. This alternative would create net new rail capacity of 16 TPH per direction.

Silver Line Express in Northern Virginia: This alternative would create a separate tunnel and tracks for the Silver Line, starting at West Falls Church Station. From WFC to a new second Rosslyn station, the new tunnel could support express service, local service, or a mix of express and local service. From the second Rosslyn station, the Silver Line would travel through Georgetown along M Street to Union Station, then through Ivy City, Port Towns, Hyattsville, and College Park to Greenbelt. This alternative would create net new rail capacity of 26 TPH per direction.

Silver Line to New Carrollton: This alternative would separate the Silver Line from the Orange Line at Clarendon Station, creating a new connection at a second Rosslyn station before continuing through Georgetown to Union Station. From Union Station, the new tunnel would turn north and east to serve Ivy City and Port Towns, then run along the Annapolis Road/MD 450 corridor to New Carrollton Station. This alternative would create net new rail capacity of 16 TPH per direction.

Evaluating the Alternatives

The six alternatives were evaluated in terms of costs, benefits, and their relative performance in meeting the four goals. This performance assessment was designed according to FTA guidance on the methodology for alternatives analyses.

The performance assessment and cost-benefit analysis (CBA) for all these alternatives is based on a 20-year planning horizon (2040). The rail service assumptions for 2040 follow the findings of the Metrorail Fleet Management Plan of six-minute peak headways, 100% eight-car trains, and systemwide capacity constraint of 26 TPH per direction in 2040. This is a conservative assumption in terms of assessing the need for new capacity, as it estimates ridership and passenger crowding under maximum utilization of the existing system. For the No-Build Scenario, this results in a corridor service plan of six-minute headways on the Orange and Silver lines and 12-minute headways on the Blue Line (10-11 TPH OR/SV, 5 TPH BL).

The CBA has three components:

1. Performance Assessment: Each alternative was scored on its performance across over 14 metrics, each directly related to the study goals and objectives. The alternatives were scored against future conditions as defined by the No-Build Scenario.
2. Benefits Score: The sum of the performance scores.
3. Cost-Effectiveness Score: Results from dividing the benefits score by the total annualized cost for each alternative.

The benefits score and the cost-effectiveness score were comparatively ranked from high to low, indicating how well each alternative performed relative to the others and to the No-Build Scenario. This ranking indicates the scale of positive impacts and changes each alternative would deliver compared to each other and the base-case future (benefits rank) and relative value each alternative provides for the dollars spent (cost-effectiveness rank). A high-level summary of the CBA is presented below along with some selected metrics.

BOS Study CBA Results – Performance Rankings		
Alternative	Benefits Rank	Cost-Effectiveness Rank
Blue Line to National Harbor	Highest	Medium-High
Silver Line Express in Virginia	Medium-High	Lowest
Silver Line to New Carrollton	Medium	Medium-Low
Blue Line to Greenbelt	Medium-Low	Medium
Lower Capital Cost	Lowest	Highest

BOS Study CBA Results – Selected Metrics				
Alternative	New weekday trips	New annual fare revenue	Construction cost estimate	Annual O&M cost
Blue Line to National Harbor	180,000	$154.2 M	$20-25B	$175-200 M
Silver Line Express in Virginia	139,000	$119.4 M	$20-25 B	$150-175 M
Silver Line to New Carrollton	94,000	$80.4 M	$15-20 B	$100-125 M
Blue Line to Greenbelt	92,000	$79.1 M	$15-20B	$100-125 M
Lower Capital Cost Alt	16,000	$33.9 M	$0-5 B	$75-100 M

Summary of CBA Results

As evaluated, the new Blue Line to National Harbor would deliver the highest level of benefits relative to the other options. When cost is factored in, it performs second-best. It scores well because it provides new throughput capacity across the Potomac, would include new rail stations in areas targeted for growth and development, has the greatest impact in terms of expanding access to jobs and high-capacity transit in Equity Emphasis Areas, and creates new north-south to east-west transfer opportunities.

The Lower Capital Cost Alternative (LCC) scored lowest in terms of benefits, but highest in terms of cost-effectiveness. This is to be expected given its significantly lower construction costs relative to the rail alternatives. However, for this alternative to actually meet the four established goals and the purpose of the LPA, over 3,000 peak-hour Metrorail riders would need to voluntarily shift from rail to bus; a substantial jurisdictional investment in bus priority would be needed, such as dedicated lanes and traffic signal priority; and adequate bus circulation and layover space would be needed in the District's downtown.

Next Steps

Following this briefing, meetings will be scheduled to brief elected officials on the current status and gather feedback on the alternatives. Additional stakeholder and public engagement will follow to gather input on the CBA results and feedback on the proposed alternatives. This information will support the Board's consideration and selection of an LPA.

FUNDING IMPACT:

There is no funding impact from providing this information item.

TIMELINE:

Previous Actions	April 2019 – Notice of Study
Anticipated actions after presentation	Fall 2021 – Briefings to elected officials and boards. Public engagement activities and additional stakeholder meetings Winter 2022 – Board selection of BOS corridor LPA

RECOMMENDATION:

Blue/Orange/Silver Corridor Capacity & Reliability Study

Status Update

Finance and Capital Committee
September 9, 2021

Agenda

- Blue/Orange/Silver Corridor Capacity and Reliability Study (BOS Study) update
- Study purpose
- BOS corridor transit challenges
- Identifying range of alternatives
- Descriptions of current alternatives
- Next steps

BOS Study Area

Study Purpose

- Launched early 2019 to identify best and most cost-effective solutions to address:
  - Ridership
  - Capacity
  - Service
  - Reliability needs
- Identifies range of options to address corridor-wide concerns
- Study now ready for additional public engagement and input

Solution to Address BOS Transit Challenges

Reliability and on-time performance

Managing construction and disruptions

Cost of inflexible services

Sustainability and equity

Goal 1:
Provide Sufficient Capacity to Serve Ridership Demand

Goal 2:
Improve Reliability & On-Time Performance

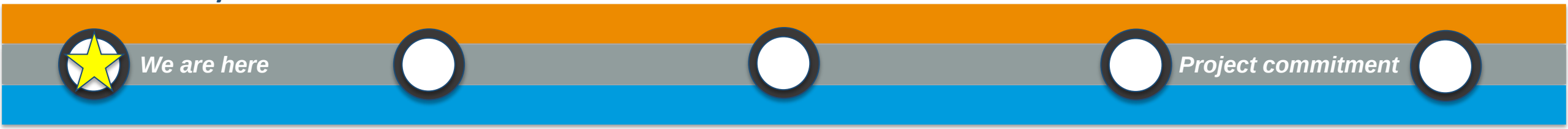
Goal 3:
Improve Operational Flexibility & Cost-Efficiency

Goal 4:
Support Sustainable Development & Expand Access to Opportunity

Study Aligns with Federal Project Planning Requirements

- Major capital projects can take 20+ years to deliver (e.g., Silver Line expansion)
- Following federal requirements to be eligible for Federal funding
- No commitment to build until funding agreement

Review BOS Study Presentation



BOS Study, Select LPA

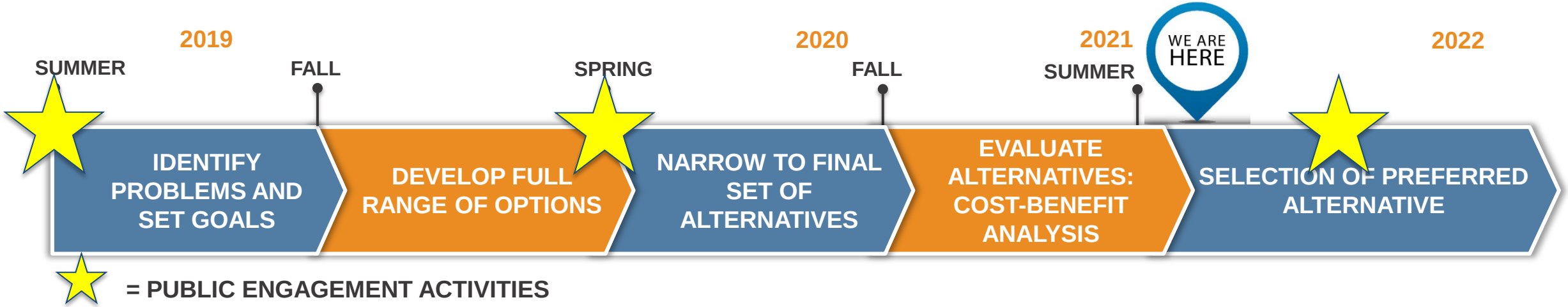
NEPA/Project Development ~2-5+ years

Engineering Phase 5-10 years

Funding Agreement

Design, build ~5-10+ years

Study & Selection Process

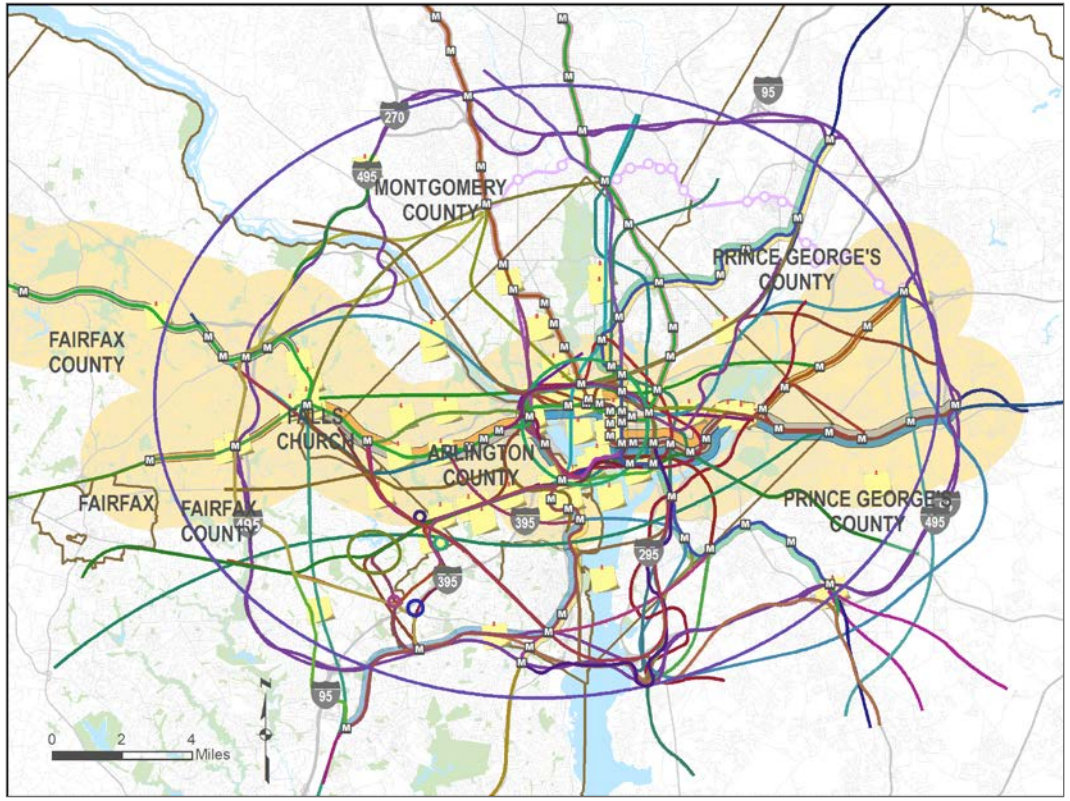


- Process based on Federal guidelines for NEPA alternatives analysis
- Continued engagement with customers, public, stakeholders, and elected officials

Public & Stakeholder Input to Date

- Metro leadership and technical advisory committees
- Jurisdictional leadership and technical advisory committees

Over 275 Ideas Submitted



Identifying the Locally-Preferred Alternative

- **Six preliminary alternatives developed:**
  - Solution may be one of the six alternatives shown, or a combination of components from different alternatives
  - Recommendation to be made following public participation process and engagement with stakeholders and elected officials
  - **Presentation is not an LPA recommendation**

Range of Alternatives

No Build

- Today's Services
- State of Good Repair
- Silver Line Phase 2
- Potomac Yard
- Funded Jurisdictional Projects (e.g., Purple Line)

Lower Capital Cost Alternative

- Enhanced bus service
- Dynamic rail scheduling
- Railcar capacity
- Rail turnbacks
- Core station expansions

Highest costs/ benefits

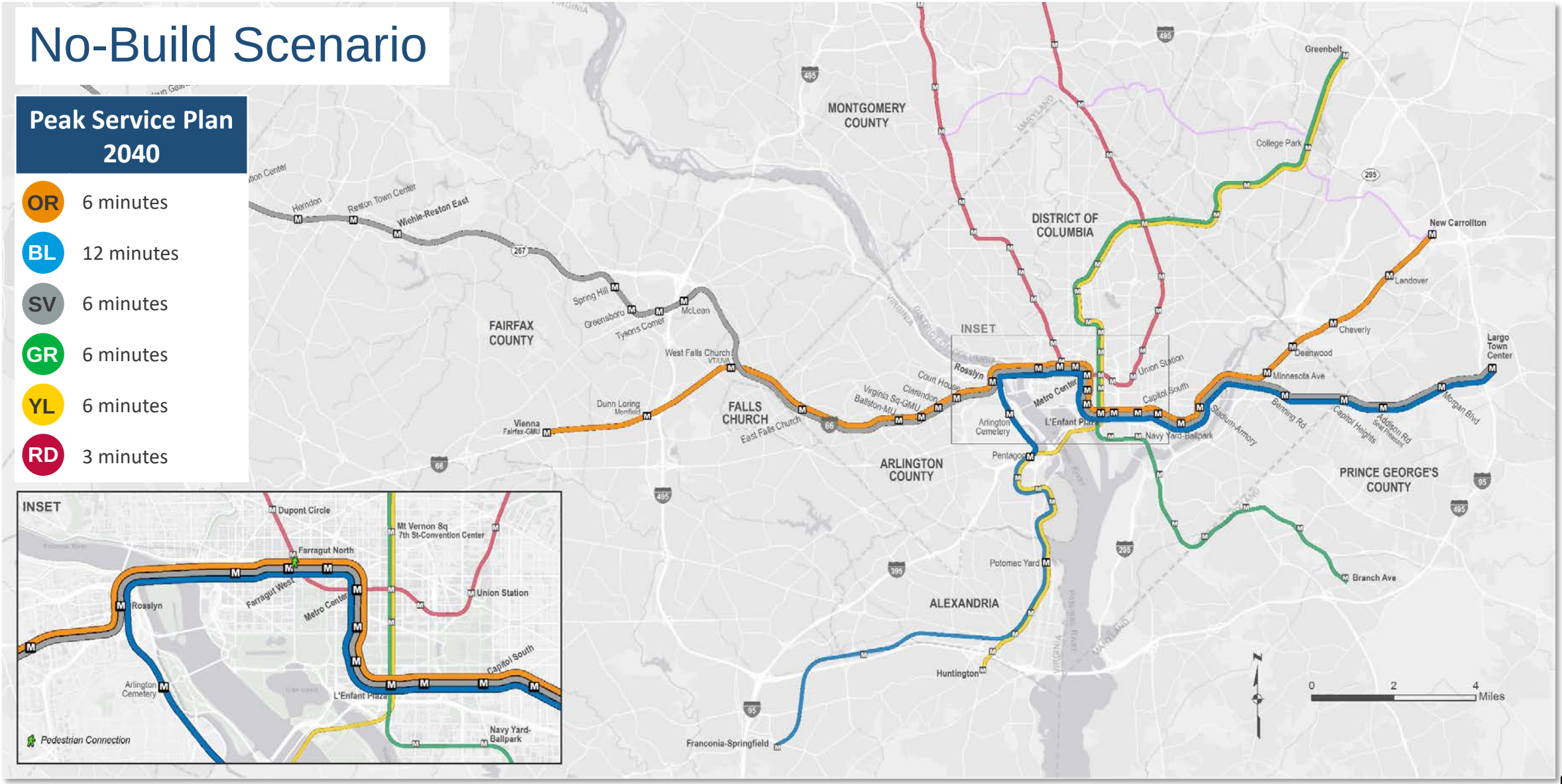
New Metrorail Lines

- 4 potential corridors
- New rail lines
- New rail stations
- Expanded capacity
- Expanded rail access

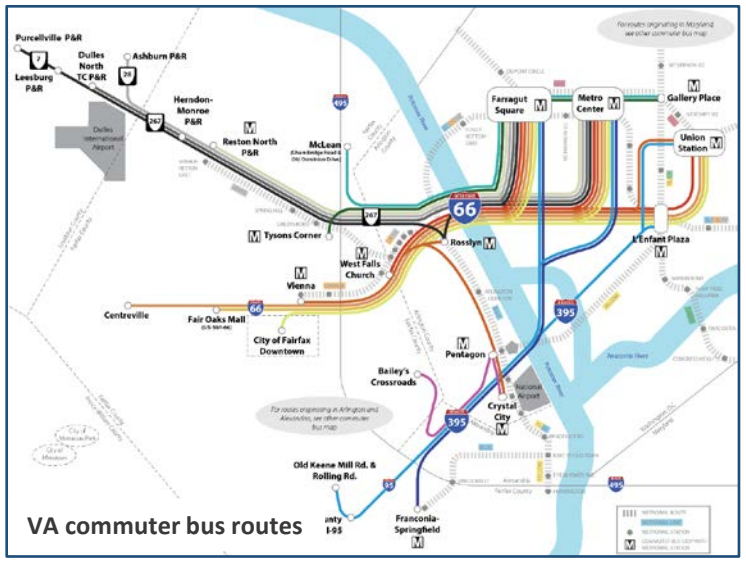
No-Build Scenario

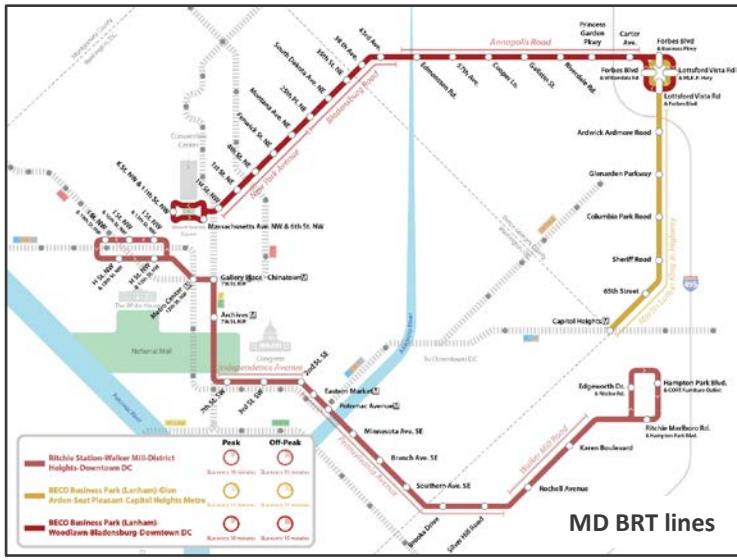
Peak Service Plan 2040

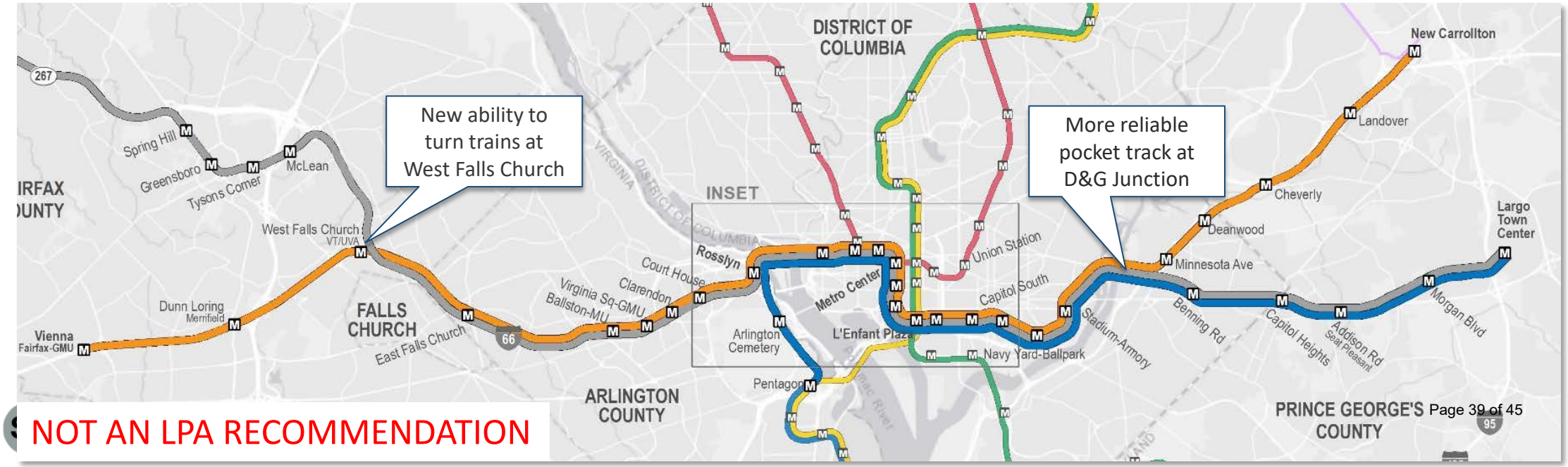
OR	6 minutes
BL	12 minutes
SV	6 minutes
GR	6 minutes
YL	6 minutes
RD	3 minutes



Lower Capital Cost Alternative

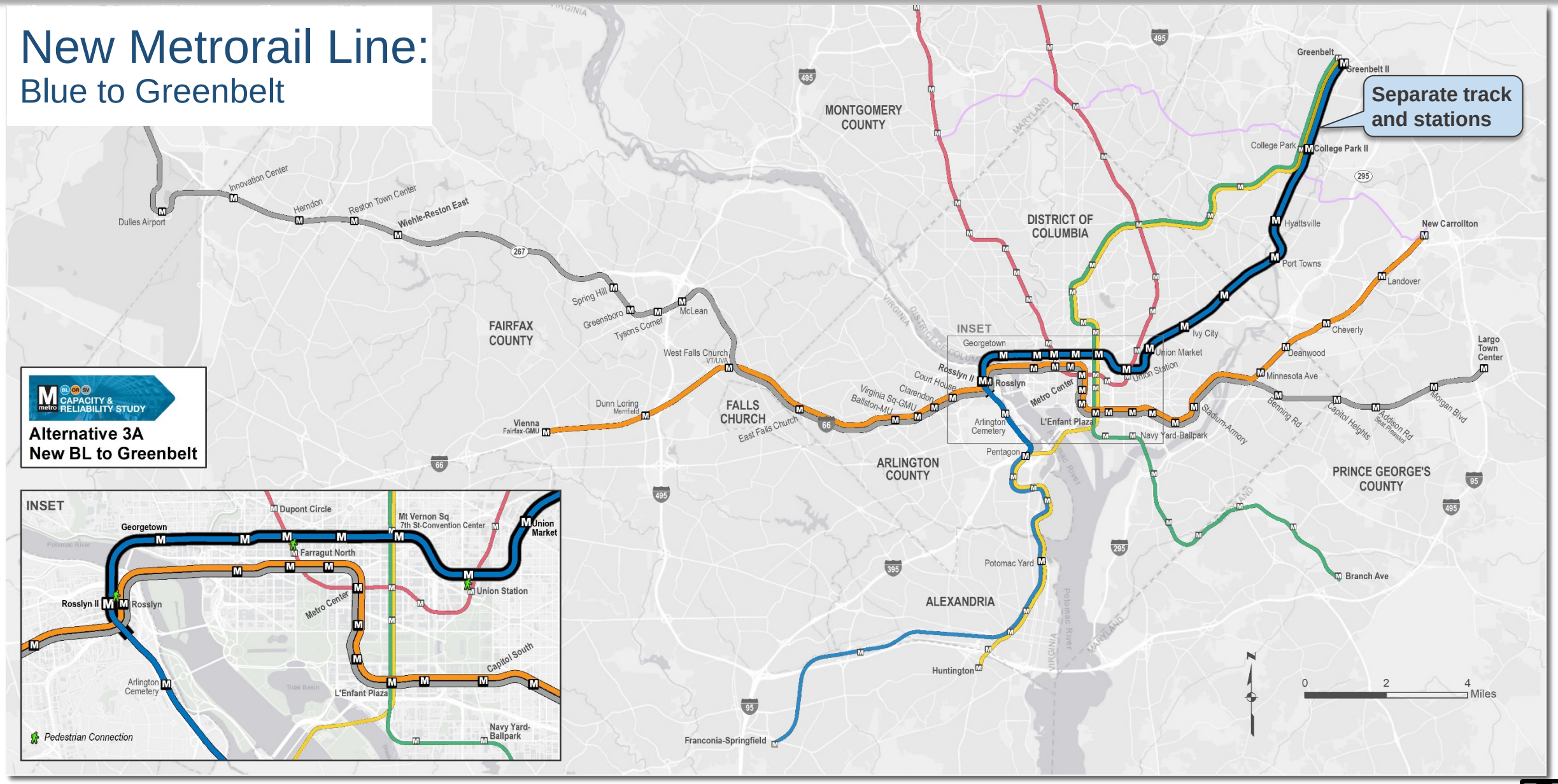




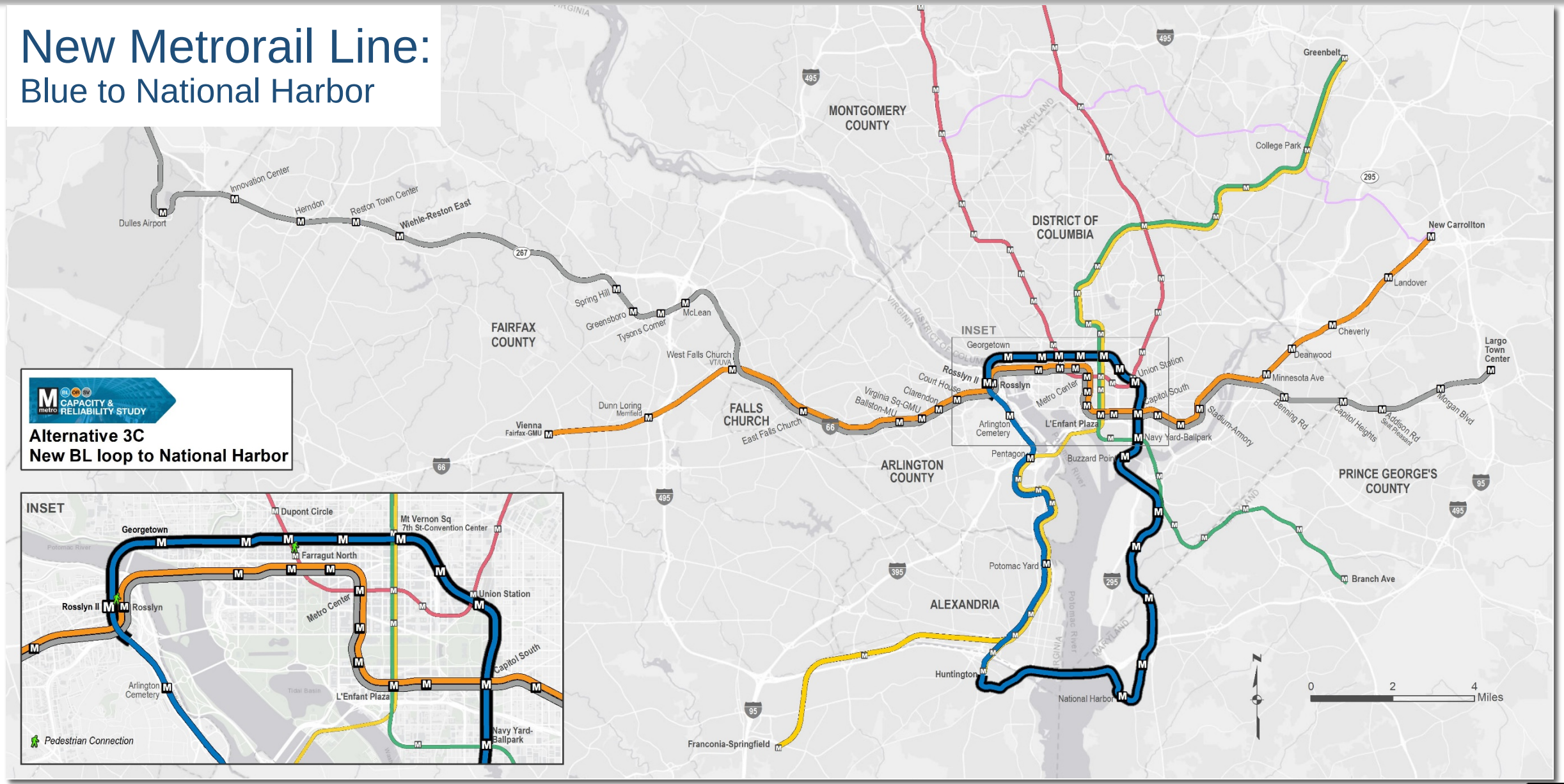


NOT AN LPA RECOMMENDATION

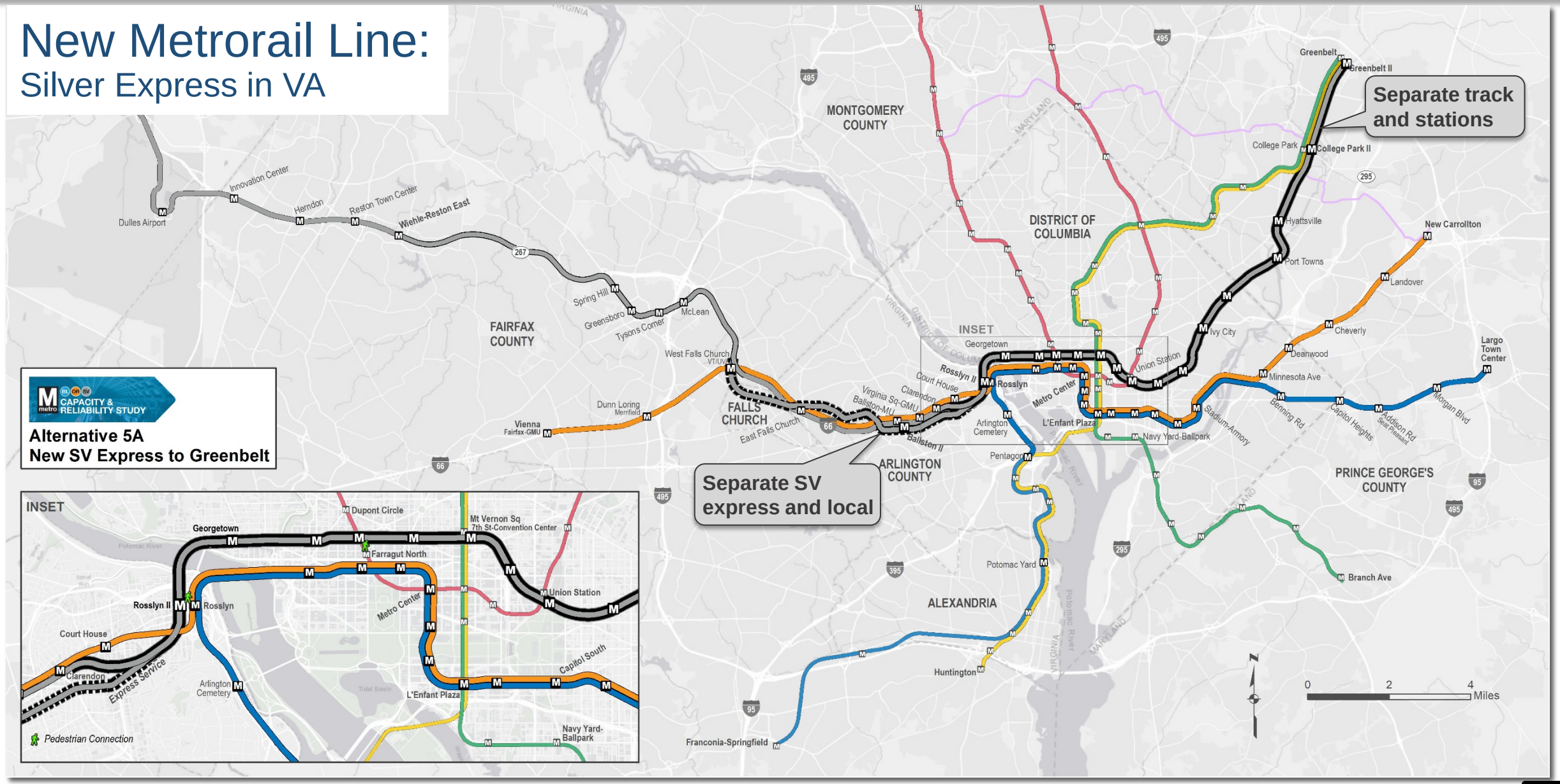
New Metrorail Line:
Blue to Greenbelt



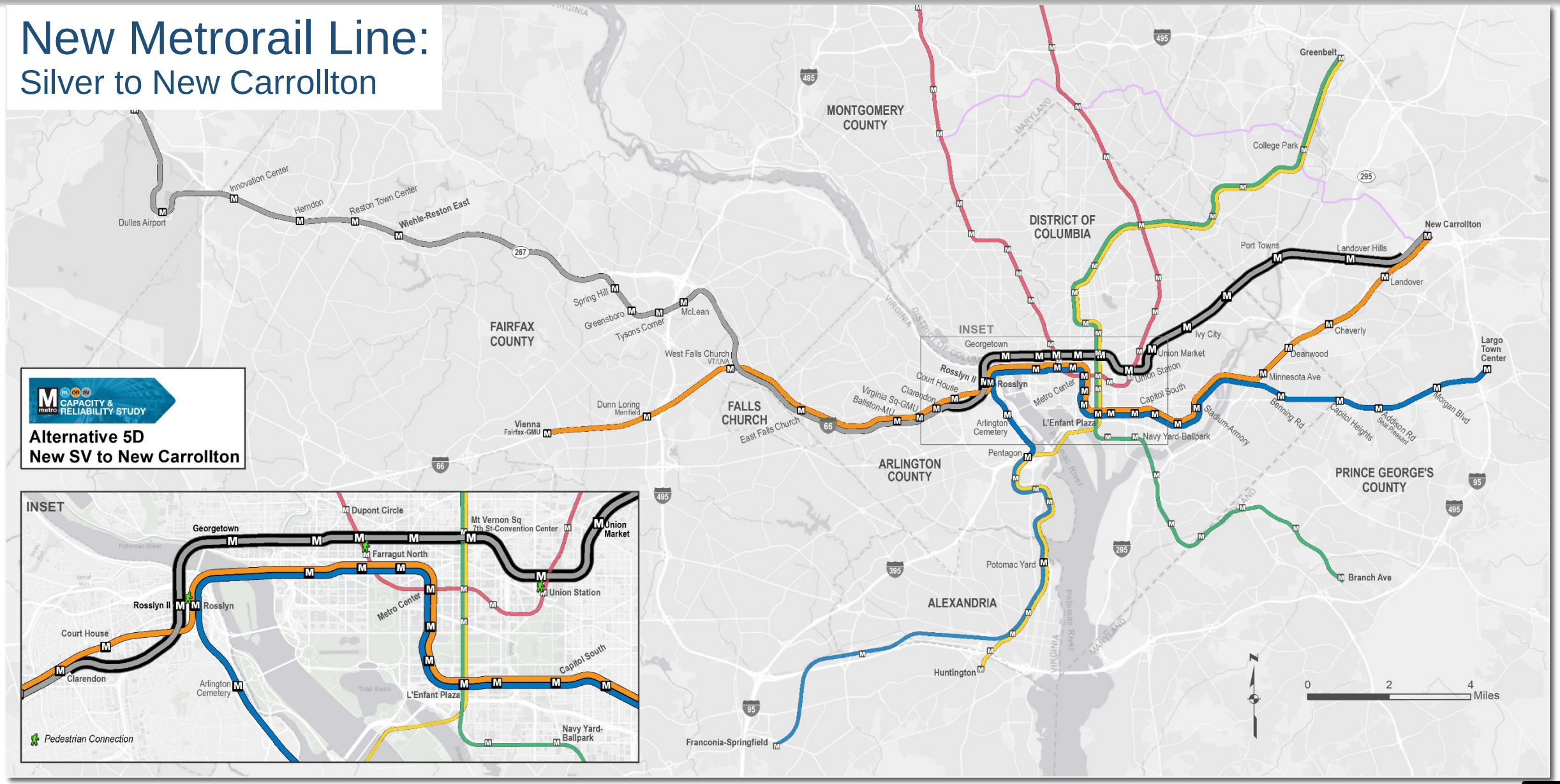
New Metrorail Line:
Blue to National Harbor



New Metrorail Line:
Silver Express in VA



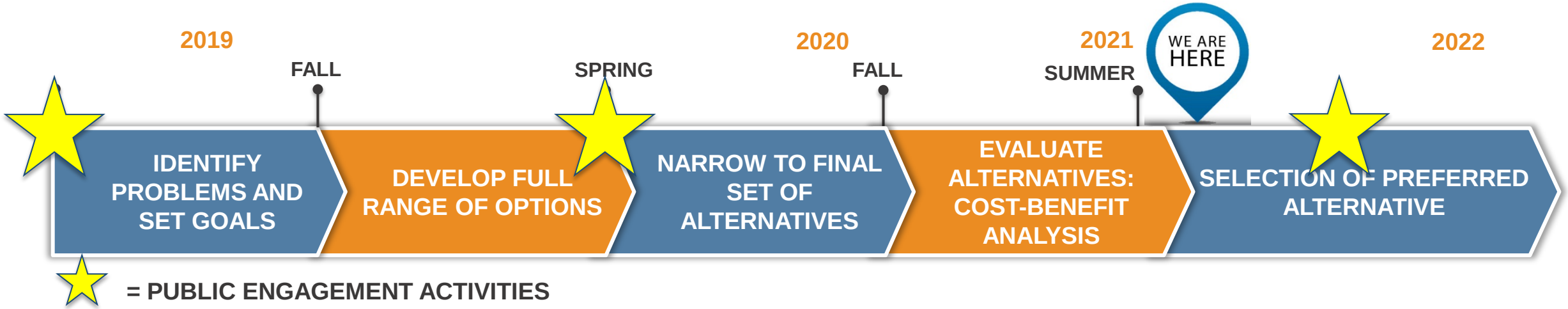
New Metrorail Line:
Silver to New Carrollton



Results of Cost-Benefit Analysis

Selected Metrics				
Alternative	New weekday trips	New annual fare revenue ($M)	Capital cost ($B)	Annual O&M cost ($M)
Blue Line to Natl. Harbor	180K	$154.2	$20-25	$175-200
Silver Line Express in VA	139K	$119.4	$20-25	$150-175
Silver Line to New Carrollton	94K	$80.4	$15-20	$100-125
Blue Line to Greenbelt	92K	$79.1	$15-20	$100-125
Lower Capital Cost	16K	$33.9	$0-5	$75-100

Next Steps



- Briefings to elected officials and boards – Fall 2021 (tentative)
- Third round of public engagement – Fall 2021 (tentative)
- Board selection of solution – 2022 (tentative)