



WMATA - Bus Operations: Staying Competitive and Relevant

Service Evaluation Study -
Process and Implementation

Girum Meseret
August 13, 2019



Purpose

- To present
 - SES Goals
 - Process
 - How we select corridors/services
 - How we evaluate services
 - Implementation methods
 - Challenges and Lessons



Goal

- To Improve Service Delivery
 - Evaluate capacity, productivity, reliability, and bus stop amenities
 - Solicit riders and stakeholders input
 - Prepare recommendations to
 - Fix mainly short term issues
 - Improve service efficiency and delivery



Source

- Study initiation
 - Operational issues
 - Service reliability
 - Safety
 - Customer feedback/complaints
 - Changing markets/service need
 - Jurisdictions request
 - Service Planners Assessment
 - Plan to review all services

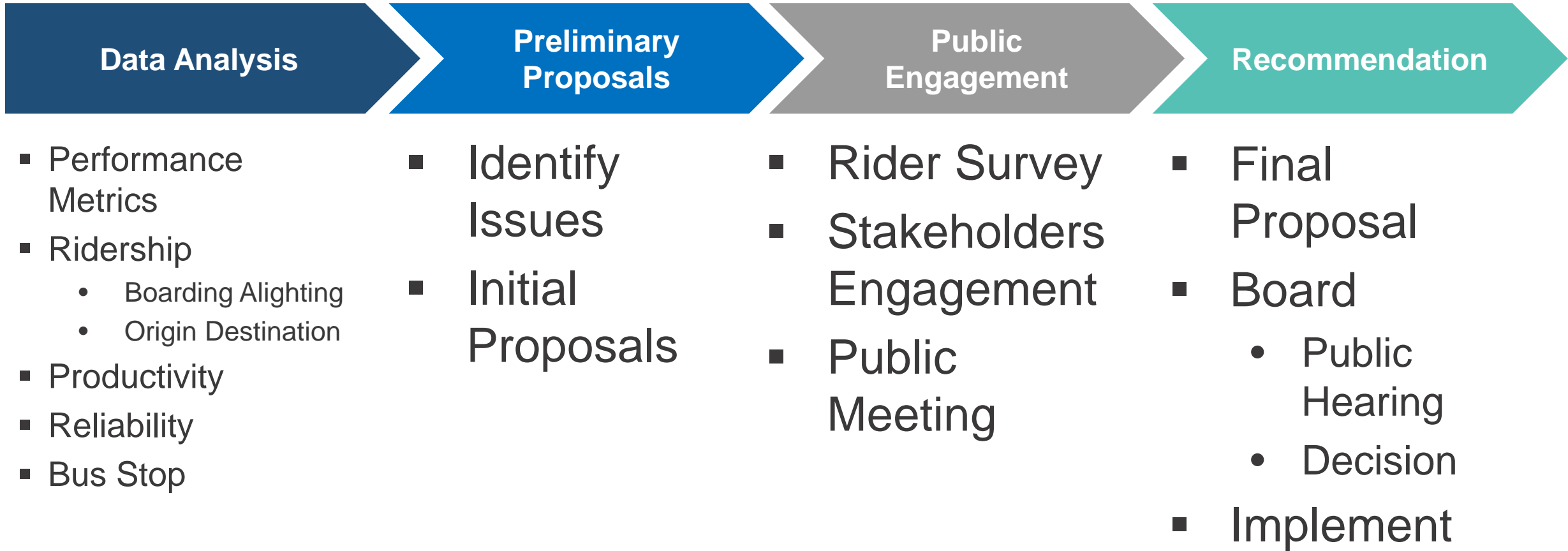


Team

- Study engagement
 - Project team
 - Need for local, state, multi-jurisdictions
 - Coordination
 - Support
 - Unique and Complex



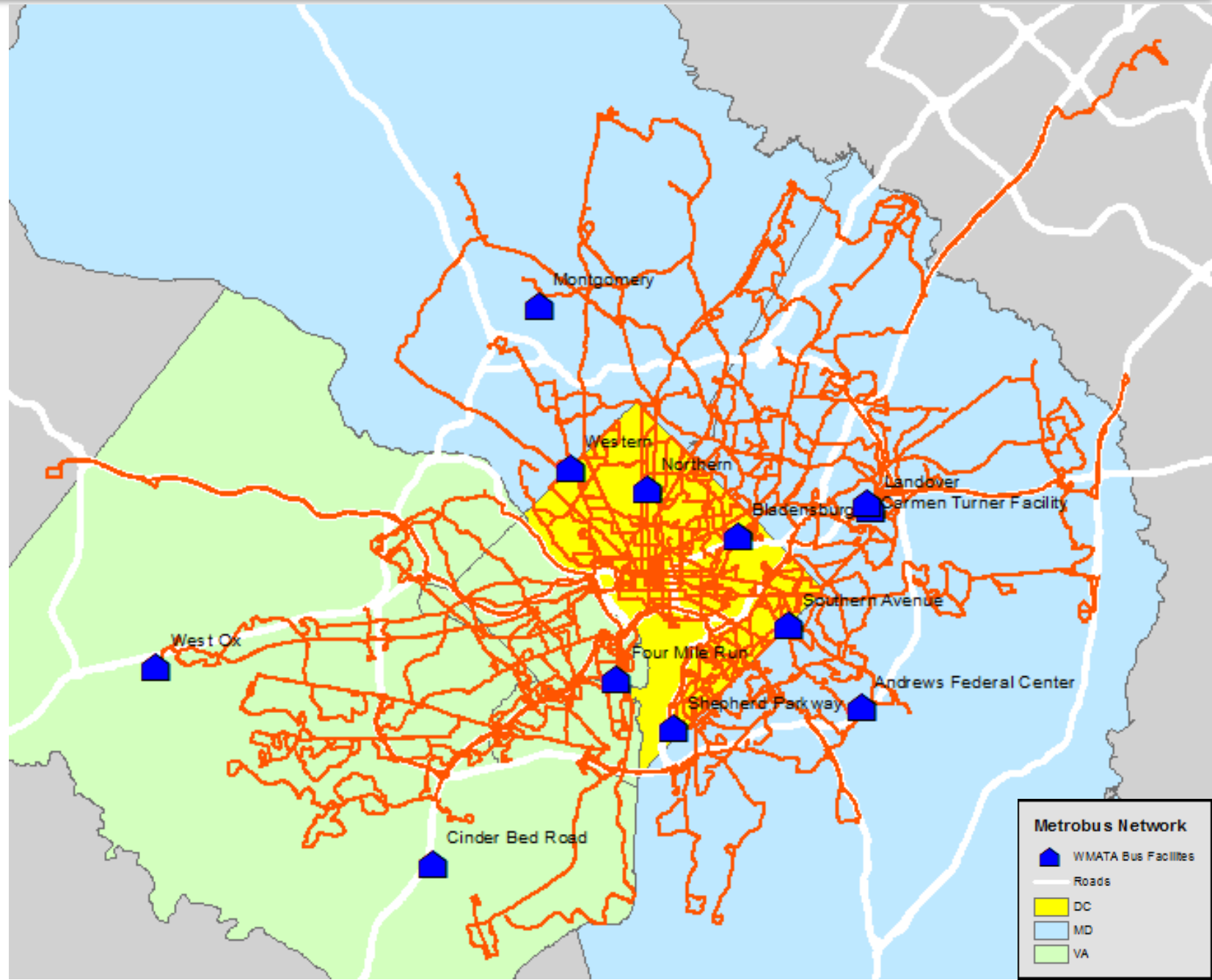
Process



Background

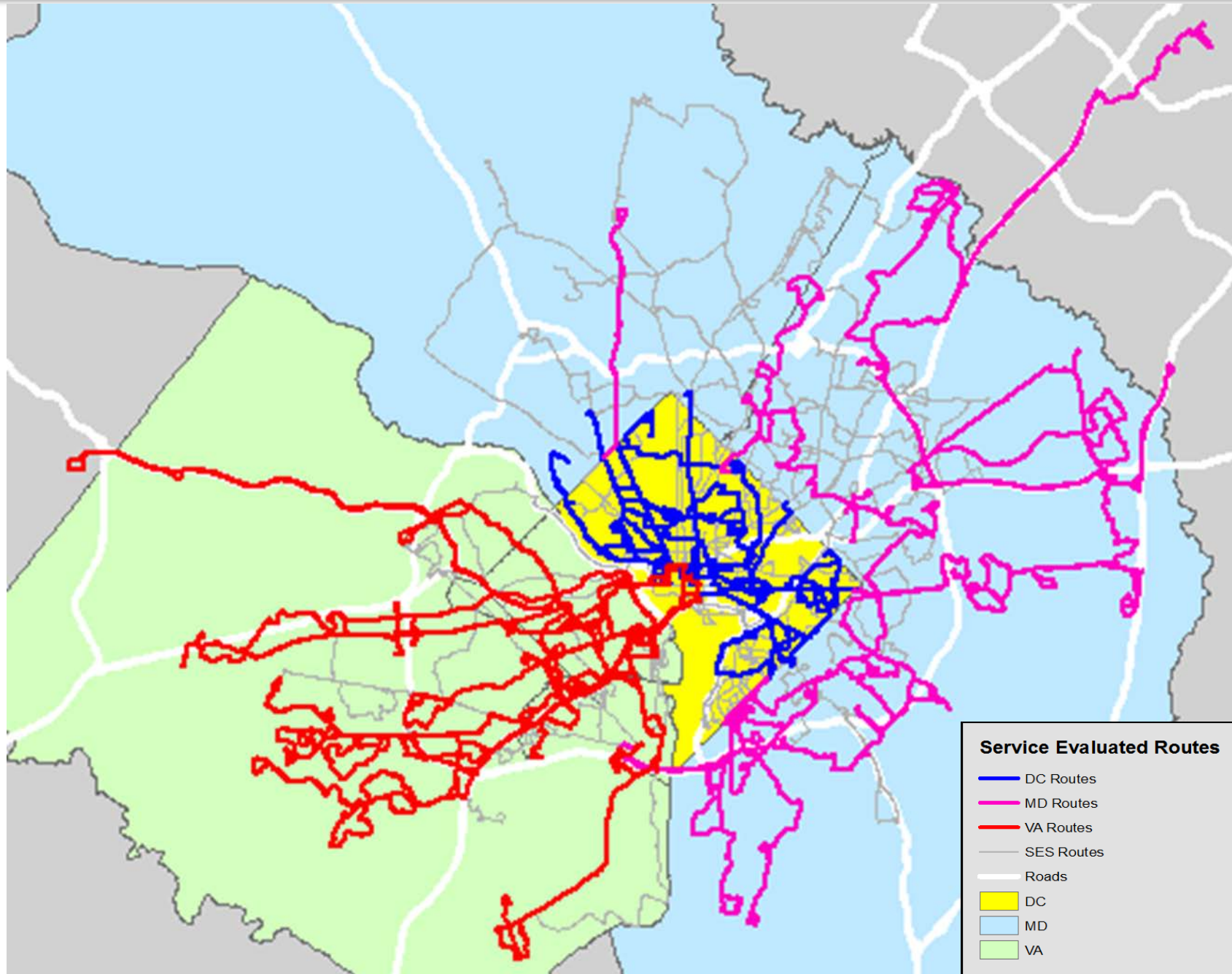
■ Metrobus Network

- 159 Lines
- 245 Routes
- Over 1,500 Fleet
- Over 10,000 bus stops
- 11 Divisions
 - 10 Operating Divisions
 - Two under reconstruction



Background

- Since 2009 We Evaluated
 - 67 Lines – 42%
 - 145 Routes – 59%
- DC – 44 Routes
- MD – 39 Routes
- VA – 62 Routes



Evaluation Guidelines

■ Performance Metrics

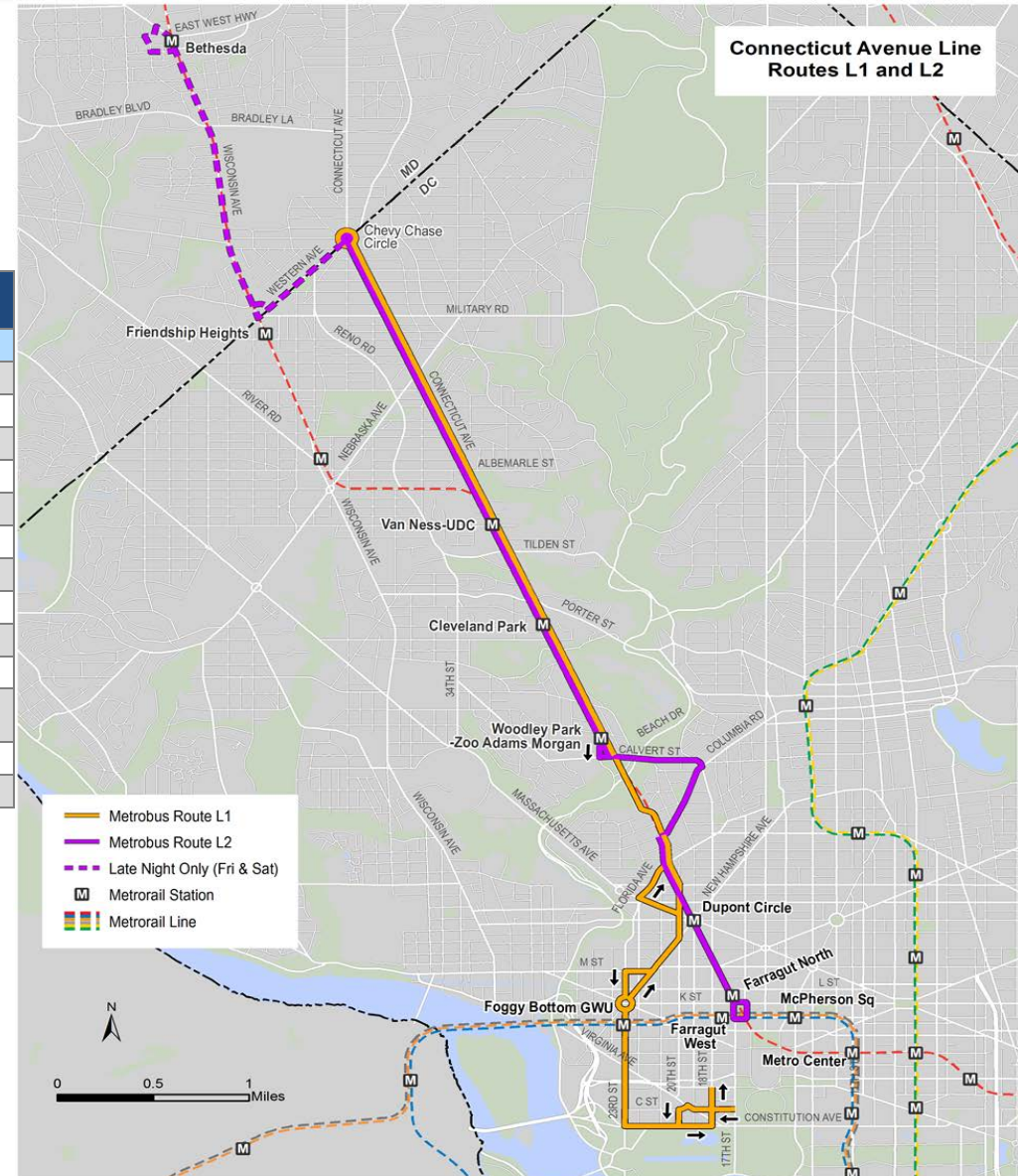
- Service Availability
- Service Dependability
- Financial
- Productivity

	Service Type			
	PCN	Framework	Local	Commuter Express
Service Availability				
Minimum Frequency (Minutes)				
Weekday Peak	10	20	30	20
Weekday Off-Peak	15	30	60	60
Vehicle Load Factor				
Peak	120%	120%	120%	100%
Off-Peak	100%	100%	100%	100%
Bus Stop Spacing	2 - 3 /Mile	4 - 5 /Mile	4 - 5 /Mile	2 - 3 /Mile
Service Directness	Deviations should be < 25% of end to end travel time and not more than 3 minutes / passenger on route			
Span of Service				
Weekday	5:45a-10.30p	5:00a to 10:30p	7:00a to 9:00p	7:00a to 9:00p
Saturday	6:00a to 10:00p	6:30a to 10:00p	7:00a to 9:00p	7:00a to 8:00p
Sunday	6:30a to 10:00p	7:00a to 10:00p	7:00a to 9:00p	8:00a to 8:00p
Service Dependability				
Missed Trips Percentage	5%	5%	5%	5%
Schedule Adherence	Witin 5 minutes of schedule and no early			
On-Time Performance	79%	79%	79%	79%
Financial				
Farebox Recovery	30%	25%	25%	25%
Subsidy Per Passenger	\$2.50	\$3.00	\$4.00	\$5.00
Productivity				
Boarding Passengers per Hour	35	30	25	20
Boarding Passengers per Mile	4	3	5	1.5
Boarding Passengers per Trip	35	25	15	19

Evaluation Process

- Existing Service
 - Key Service Characteristics
 - Line/Route History

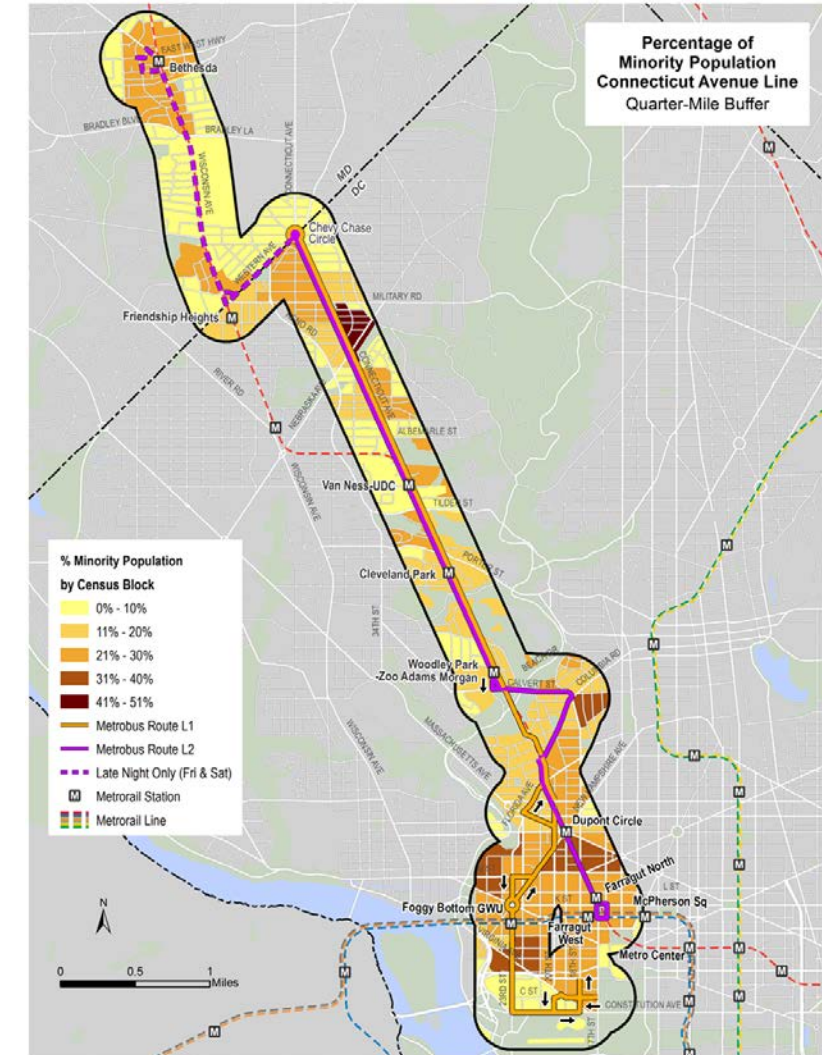
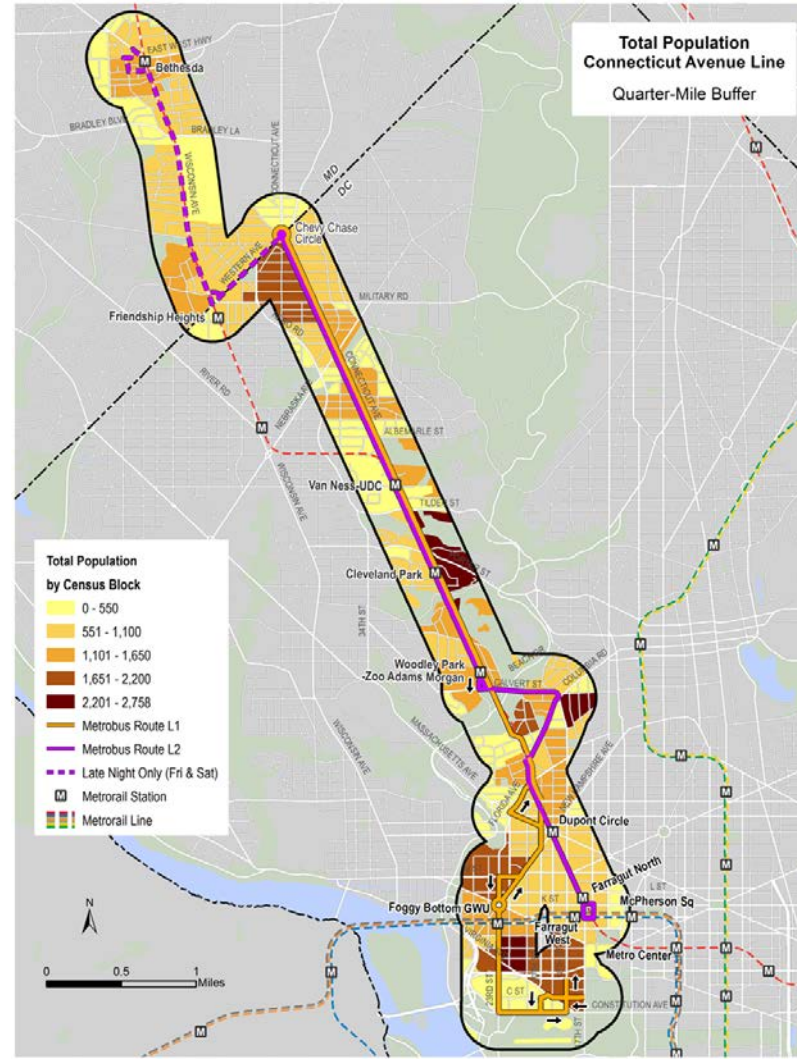
Connecticut Avenue Line (Routes L1/L2)	
Basic Characteristics	
Route Length in Miles	L1=6.57, L2=5.24
Weekday Buses	AM=13, Midday=5, PM=14
Weekend Buses	Saturday=5, Sunday=5
Weekday Revenue Hours of Service	L1 = 16.3, L2 = 72.7, Total = 89.0
Saturday Revenue Hours of Service (L2 Only)	65.7
Sunday Revenue Hours of Service (L2 Only)	45.9
Weekday Revenue Miles of Service	L1=116.4, L2=594.2, Total=710.6
Saturday Revenue Miles of Service (L2 Only)	588.00
Sunday Revenue Miles of Service (L2 Only)	443.51
Number and Percent of Weekday Trips	L1=18 (13.6%), L2=114 (86.3%), Total=132
Weekday Span of Service	5:05 AM to 1:40 AM (2:40 AM on Friday)
Saturday Span of Service (L2 Only)	5:42 AM to 2:47 AM
Sunday Span of Service (L2 Only)	6:00 AM to 12:56 AM



Evaluation Process

Existing Service

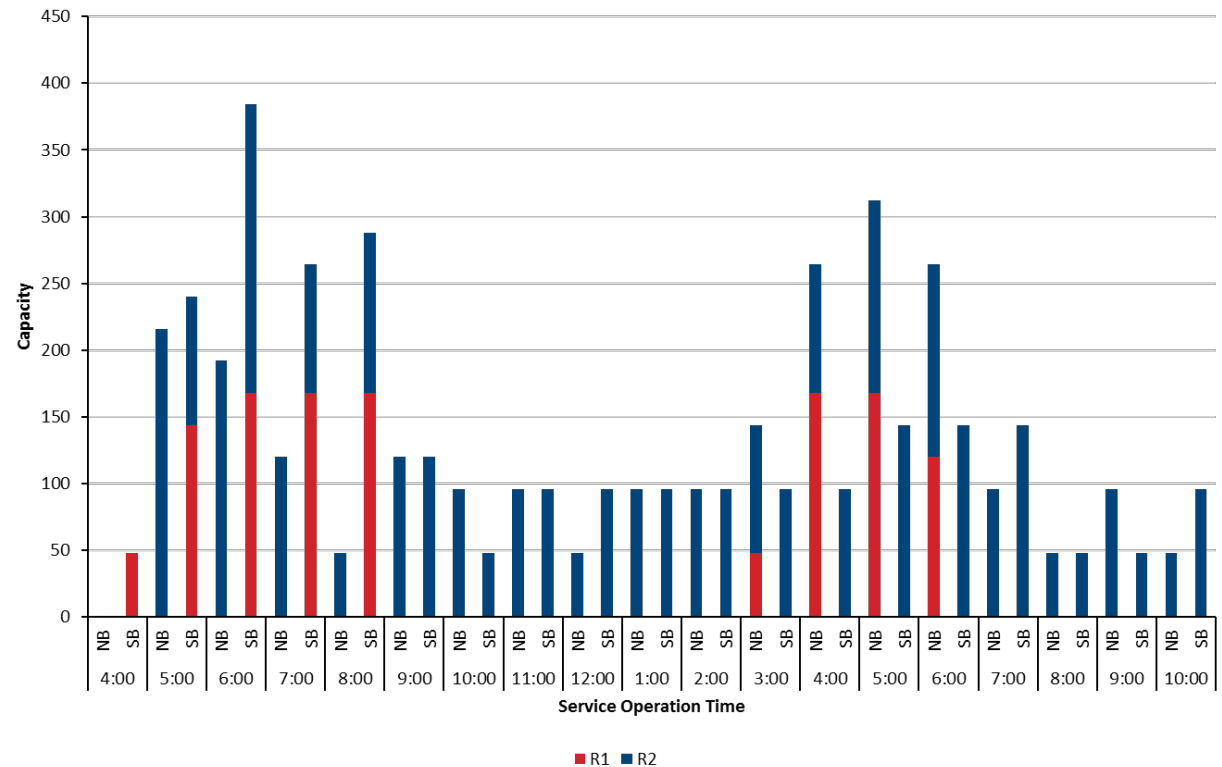
- Demographic Context
 - Total Population
 - Density
 - Minority
 - Income Level/
Poverty Line



Evaluation Process

- Service Characteristics
 - Hours of Service/Span
 - Frequency of Service
 - Fleet Requirement and Capacity
 - Route Directness
 - Does it meet the guidelines?

Service Period	Minimum First Trip Arrival Time at Destination Terminal	Minimum Last Trip Departure from Starting Terminal
Weekday	6:00 AM	10:30 PM
Saturday	6:30 AM	10:00 PM
Sunday	7:00 AM	10:00 PM



Evaluation Process

- Ridership and Productivity
 - Daily Ridership
 - Cost Recovery from Fares
 - Boarding per Trip/Revenue Mile
 - Does it meet the guideline?

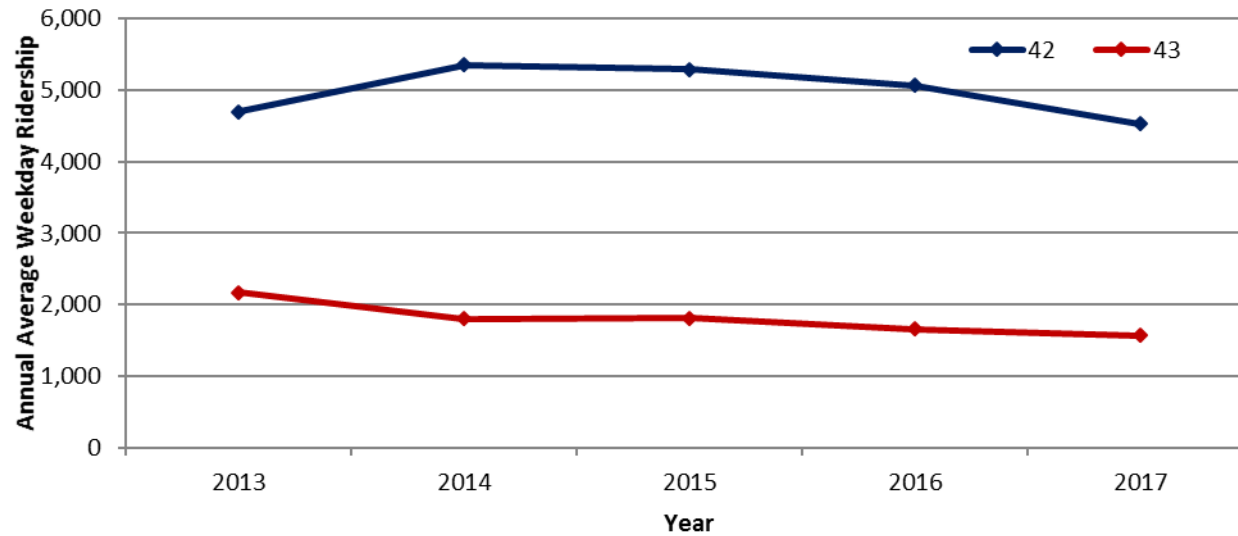
Route	Day Type	Average Daily Boardings	Trips Operated	Boardings per Trip	Boardings per Trip Guideline	Meets Guideline?
Mount Pleasant Line						
42	Weekday	4,572	212	21.5	>25.0	No
	Saturday	3,201	177	18.1	>25.0	No
	Sunday	2,375	136	17.5	>25.0	No
43	Weekday	1,603	50	32.2	>25.0	Yes
Connecticut Avenue Line						
L1	Weekday	791	18	43.2	>25.0	Yes
L2	Weekday	3,462	120	28.9	>25.0	Yes
	Saturday	2,080	104	20.0	>25.0	No
	Sunday	1,501	81	18.5	>25.0	No

Route	Day Type	Average Operating Cost	Average Daily Fare Revenue	Cost Recovery	Cost Recovery Guideline	Meets Guideline?
Mount Pleasant Line						
42	Weekday	\$17,897	\$4,560	25.5%	>25.0%	Yes
	Saturday	\$12,585	\$2,987	23.7%	>25.0%	No
	Sunday	\$8,636	\$2,213	25.6%	>25.0%	Yes
43	Weekday	\$3,058	\$2,100	68.7%	>25.0%	Yes
Connecticut Avenue Line						
L1	Weekday	\$2,430	\$999	41.1%	>25.0%	Yes
L2	Weekday	\$10,937	\$3,658	33.4%	>25.0%	Yes
	Saturday	\$8,866	\$2,144	24.2%	>25.0%	No
	Sunday	\$6,614	\$1,568	23.7%	>25.0%	No

Evaluation Process

- Ridership and Productivity
 - Subsidy per Passenger
 - Ridership Trend

Route	Day Type	Operating Subsidy	Average Daily Boardings	Subsidy per Passenger	Subsidy per Passenger Guideline	Meets Guideline?
Mount Pleasant Line						
42	Weekday	\$13,337	4,572	\$2.92	\$3.00	Yes
	Saturday	\$9,598	3,201	\$3.00	\$3.00	Yes
	Sunday	\$6,423	2,375	\$2.70	\$3.00	Yes
43	Weekday	\$958	1,603	\$0.60	\$3.00	Yes
Connecticut Avenue Line						
L1	Weekday	\$1,431	791	\$1.81	\$3.00	Yes
L2	Weekday	\$7,279	3,462	\$2.10	\$3.00	Yes
	Saturday	\$6,722	2,080	\$3.23	\$3.00	No
	Sunday	\$5,046	1,501	\$3.36	\$3.00	No



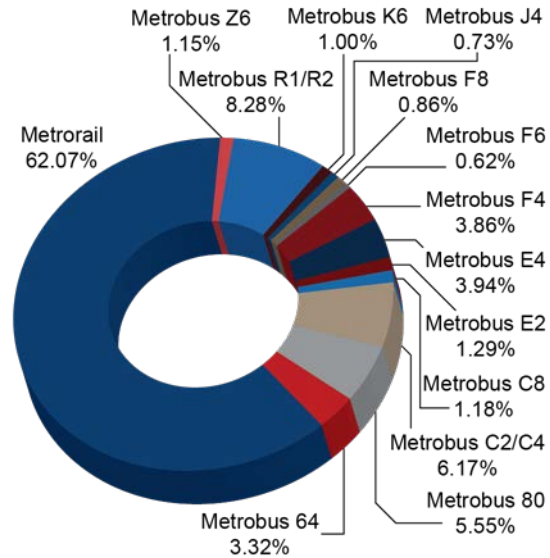
Evaluation Process

- Ridership and Productivity
 - Fare Payment Characteristics
 - Transfers
 - From/to bus
 - From/to rail

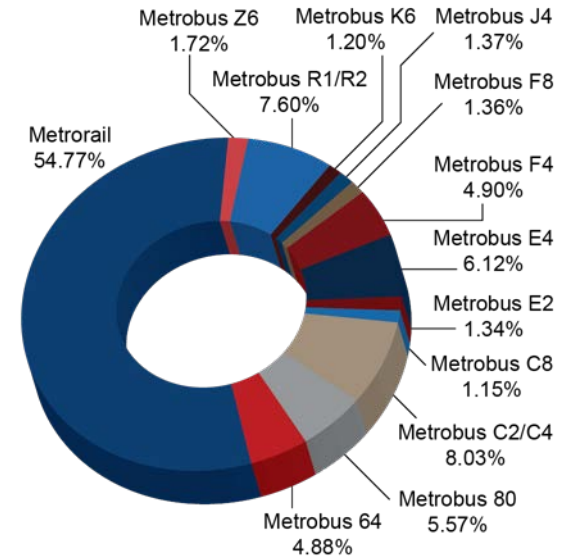
Fare Payment Characteristics

Route	Cash	SmarTrip	SmarTrip Transfers	Total
R1	1,500 (9%)	10,900 (68%)	3,700 (23%)	16,100
R2	5,900 (14%)	23,500 (23%)	12,800 (30%)	42,200
Total	7,400 (13%)	34,400 (59%)	16,500 (28%)	58,300

Transfers To



Transfers From



Evaluation Process

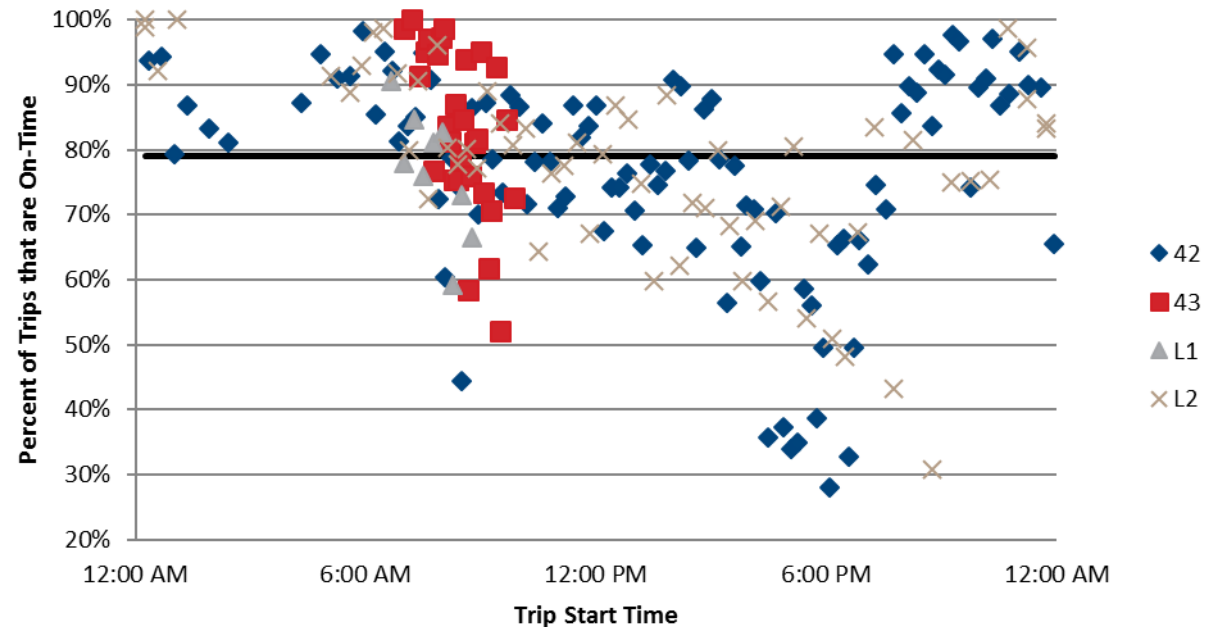
Service Reliability

- On-Time Performance (OTP)
- Revenue and Non-Revenue Hours and Miles
- Bus Bunching and Causes
- Late and Missed Trips

On-Time Performance by Route

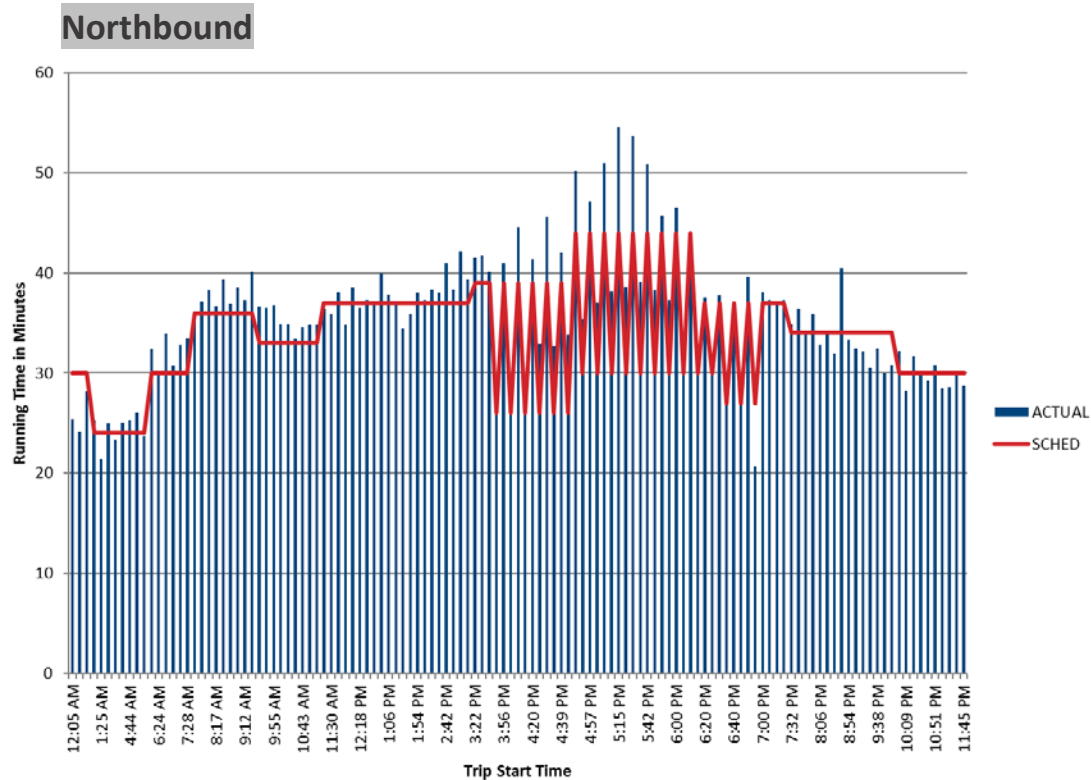
Route		Weekday			Saturday			Sunday		
		Early	On-Time	Late	Early	On-Time	Late	Early	On-Time	Late
Mount Pleasant Line										
42	North	5.3%	73.6%	21.1%	4.9%	81.4%	13.7%	4.1%	80.4%	15.4%
	South	4.6%	76.6%	18.9%	9.4%	81.4%	9.2%	3.8%	83.7%	12.5%
43	North	1.0%	47.5%	51.5%	-	-	-	-	-	-
	South	3.2%	83.1%	13.8%	-	-	-	-	-	-
Connecticut Avenue Line										
L1	North	8.2%	49.6%	42.2%	-	-	-	-	-	-
	South	7.6%	76.9%	15.5%	-	-	-	-	-	-
L2	North	3.6%	77.2%	19.3%	9.7%	78.2%	12.1%	4.8%	89.0%	6.2%
	South	4.3%	78.1%	17.6%	4.2%	80.0%	15.8%	5.4%	83.0%	11.5%

OTP, Weekday Southbound

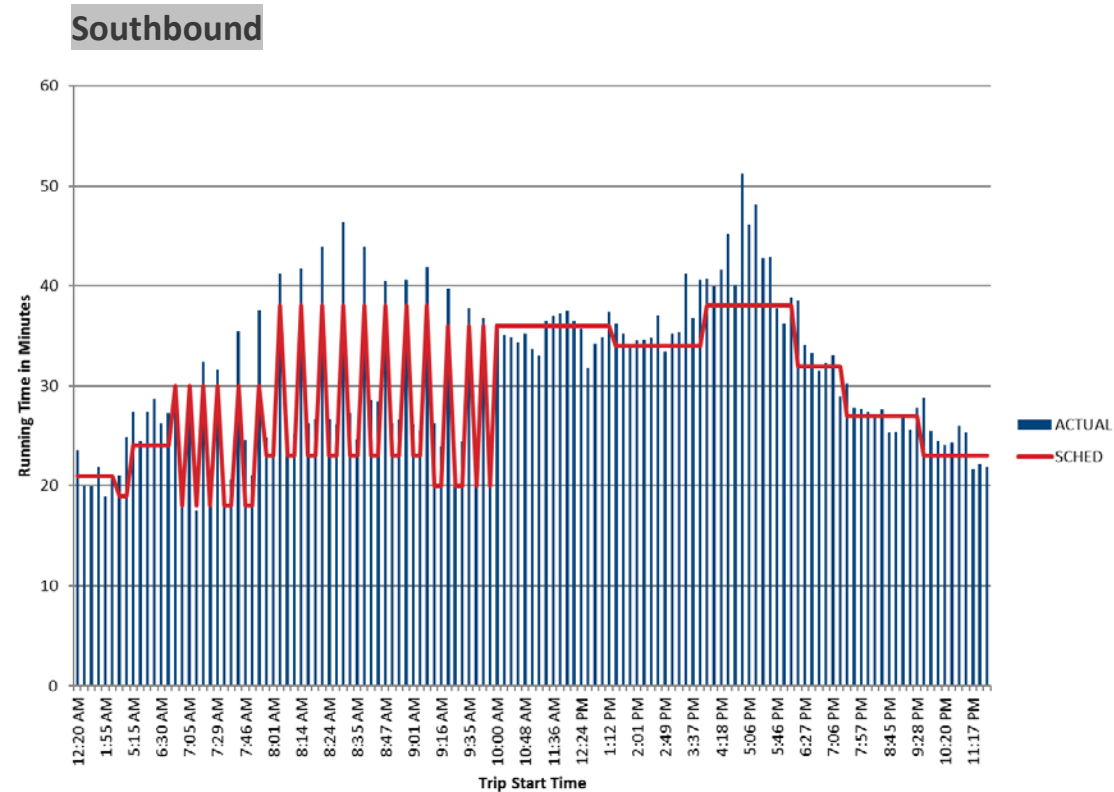


Evaluation Process

- Service Reliability
 - Scheduled v Actual Run Time



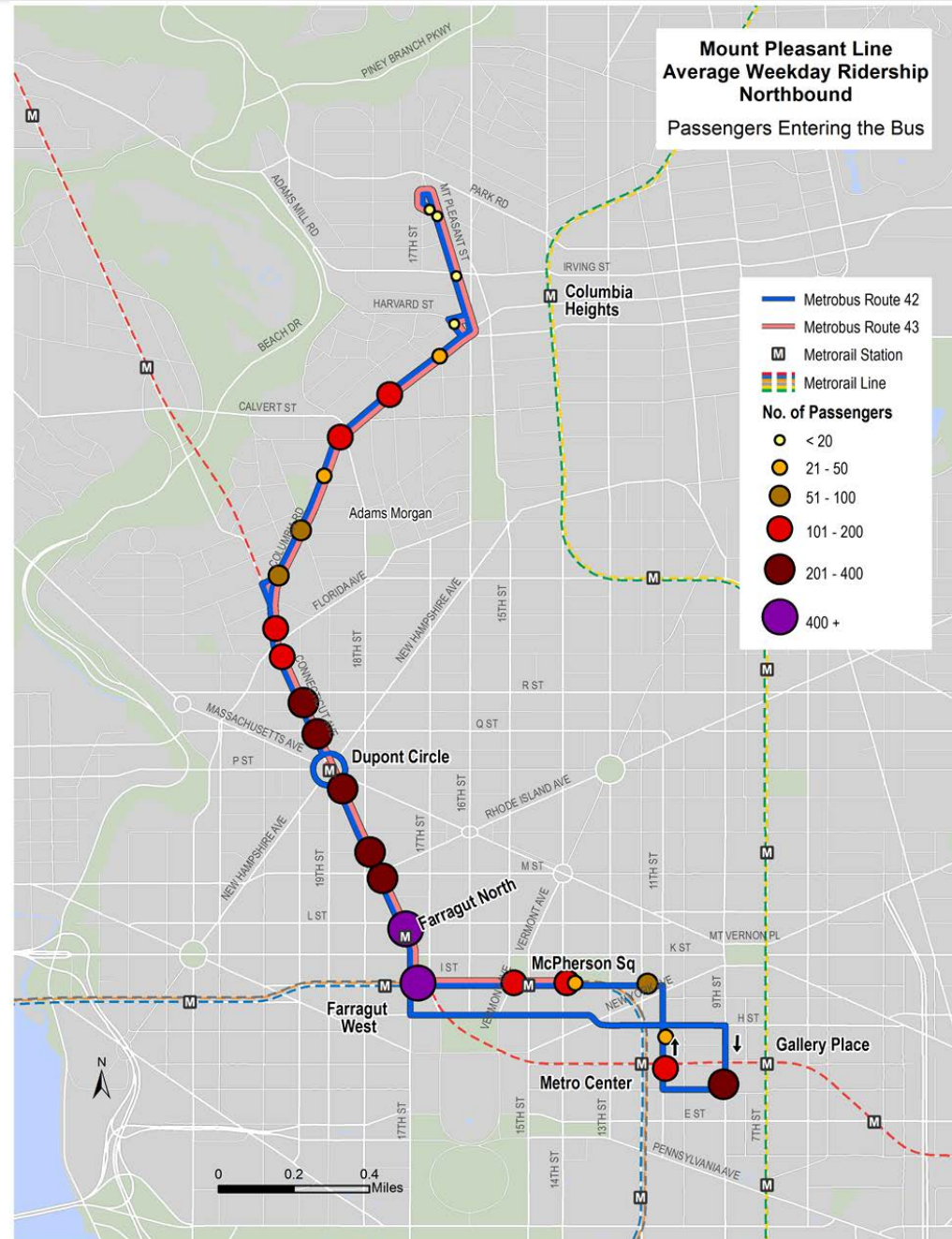
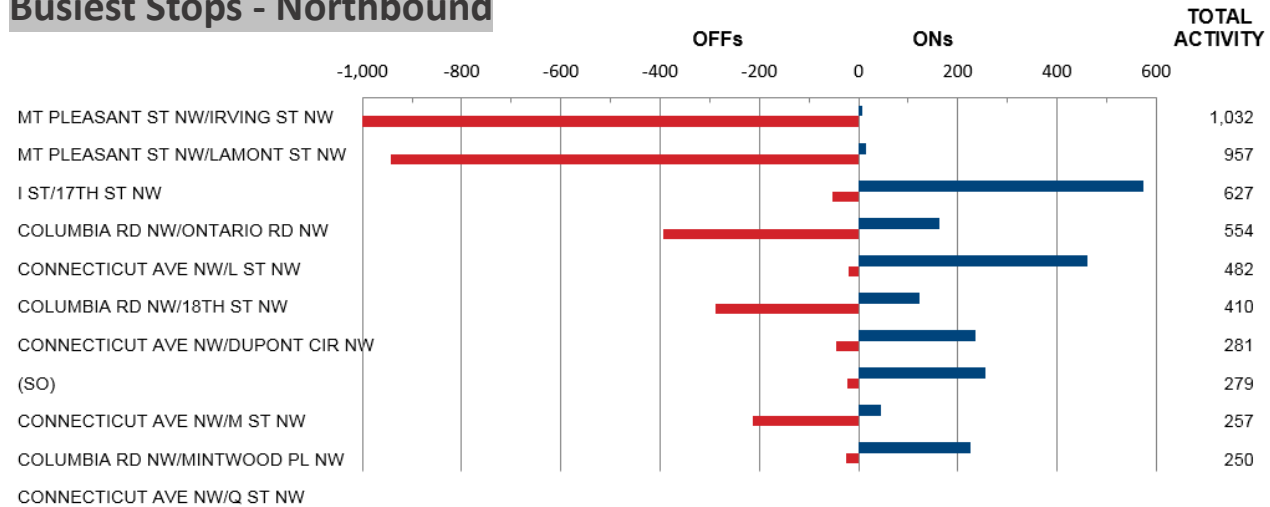
Scheduled versus Actual Running Time



Evaluation Process

- Passenger Boarding and Alighting
 - Boarding and Alighting by Segment
 - Busiest Ridership Stops

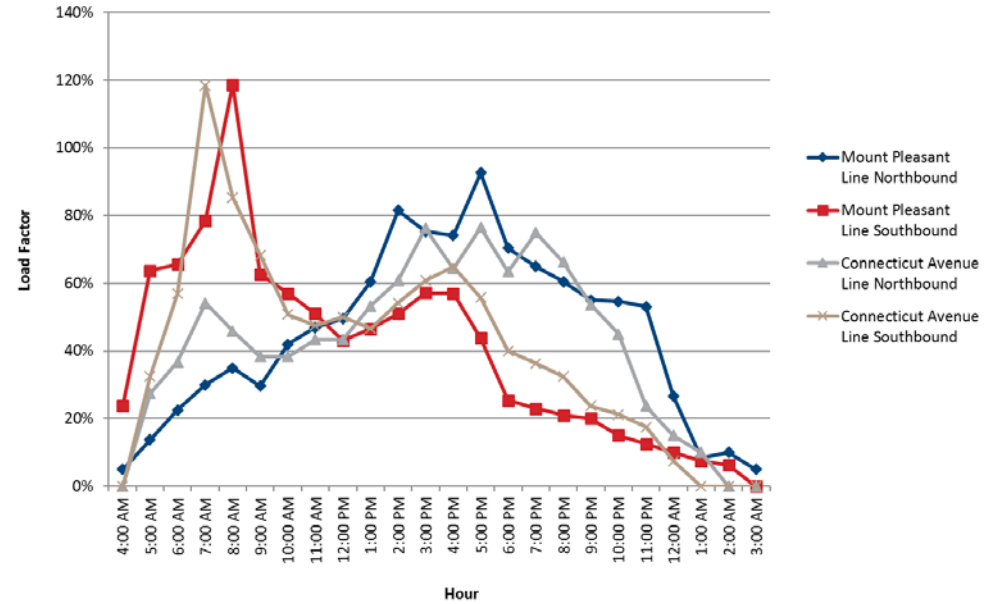
Busiest Stops - Northbound



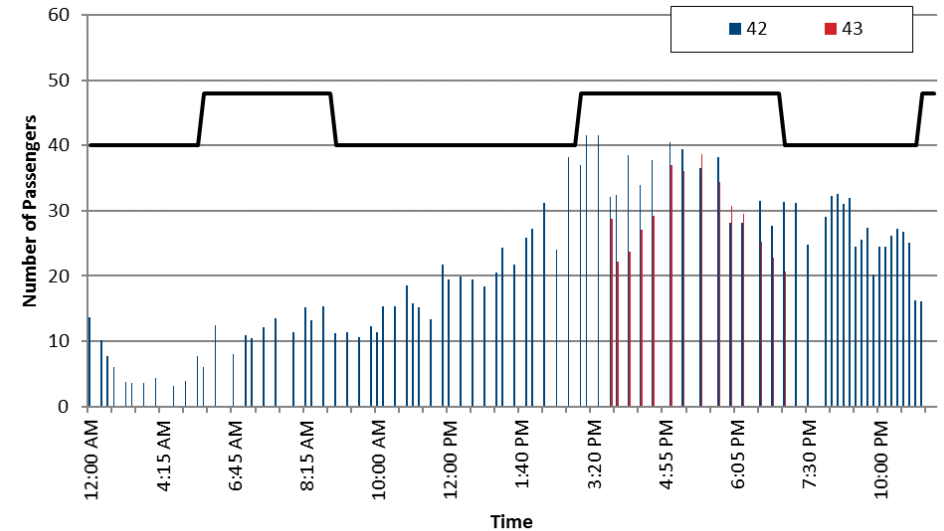
Evaluation Process

- Passenger Boarding and Alighting
 - Load Factor
 - 120% Peak and 100% Off-Peak of seated capacity
 - By hour, direction, and segment

Load Factor by Hour



Weekday Northbound Load Factors



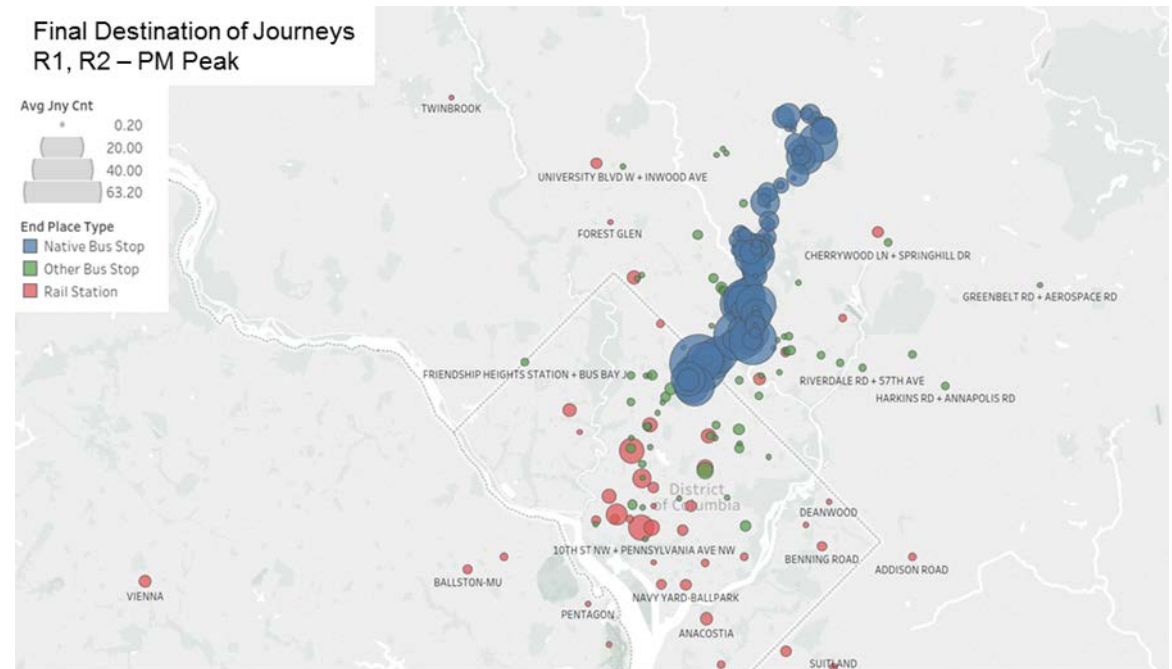
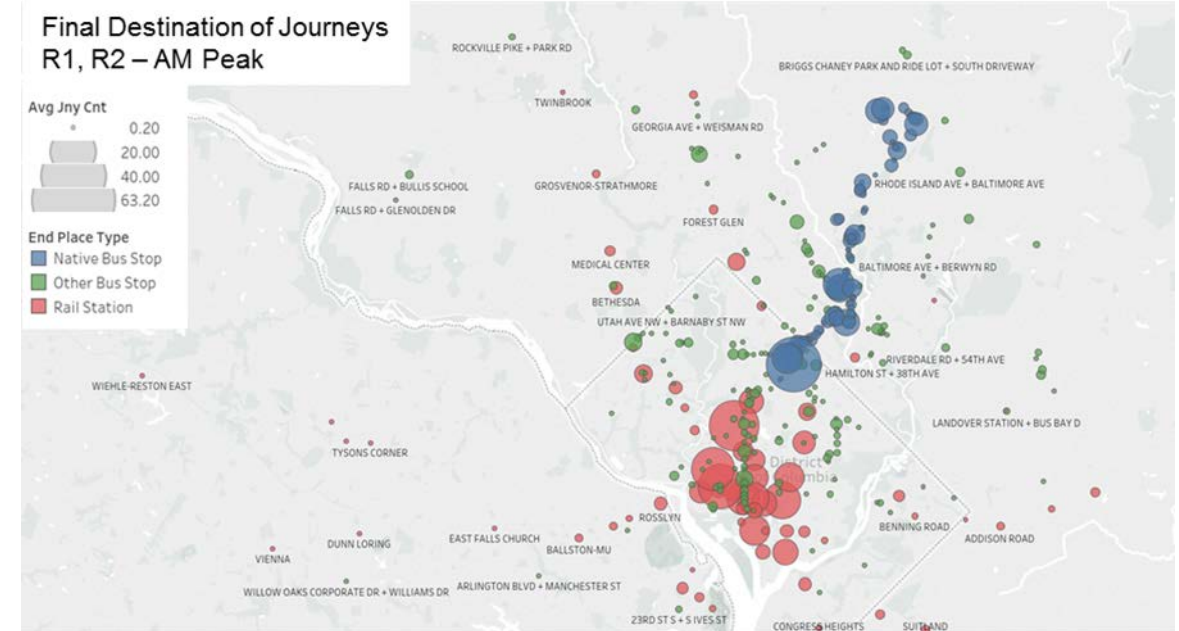
Evaluation Process

■ Origin and Destination (OD) Analysis

Zone	Stop Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total	
1	Chevy Chase Circle	0																				0
2	Connecticut / McKinley	0	0																			0
3	Connecticut - Livingston to Huntington	2	2	4																		7
4	Connecticut / Nebraska Ave	2	3	8	0																	13
5	Connecticut - Ellicott to Yuma	2	2	7	2	4																17
6	Van Ness- UDC Station	18	19	56	15	63	0															171
7	Connecticut - Van Ness St to Rodman	1	1	3	1	4	1	0														12
8	Cleveland Park Station	1	1	2	1	3	1	1	0													9
9	Connecticut / Macomb St	0	0	1	0	1	0	0	0	0												3
10	Connecticut - Devonshire to Cathedral	0	0	1	0	1	0	1	0	0	0											5
11	Woodley Park Station	1	1	2	1	2	1	1	1	0	2	1										12
12	Connecticut - Calvert to Wyoming	1	1	2	1	3	1	1	1	0	2	1	1									15
13	Connecticut - Leroy to R St NW	1	1	4	1	5	1	3	2	1	4	3	3	0								30
14	Dupont Circle	2	2	5	1	6	2	3	2	1	5	3	3	2	1							37
15	New Hampshire Avenue - 23rd/L St	2	2	6	2	6	2	3	2	1	6	4	4	3	1	1						44
16	Foggy Bottom Station	1	1	4	1	5	2	3	2	1	4	3	3	2	1	1	0					34
17	23rd St - G St to C St NW	5	6	17	5	19	6	10	7	3	17	11	11	7	4	4	46	1				177
18	Constitution Avenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0			2
19	18th St NW	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0	2	0	0	0		9
Total		39	42	123	30	123	17	27	18	7.9	42	26	26	15	6.9	5.9	49	1	0	0		598

Evaluation Process

- OD Analysis
 - Trip Final Destinations using “Tableau”
 - Enhances service modification



Evaluation Process

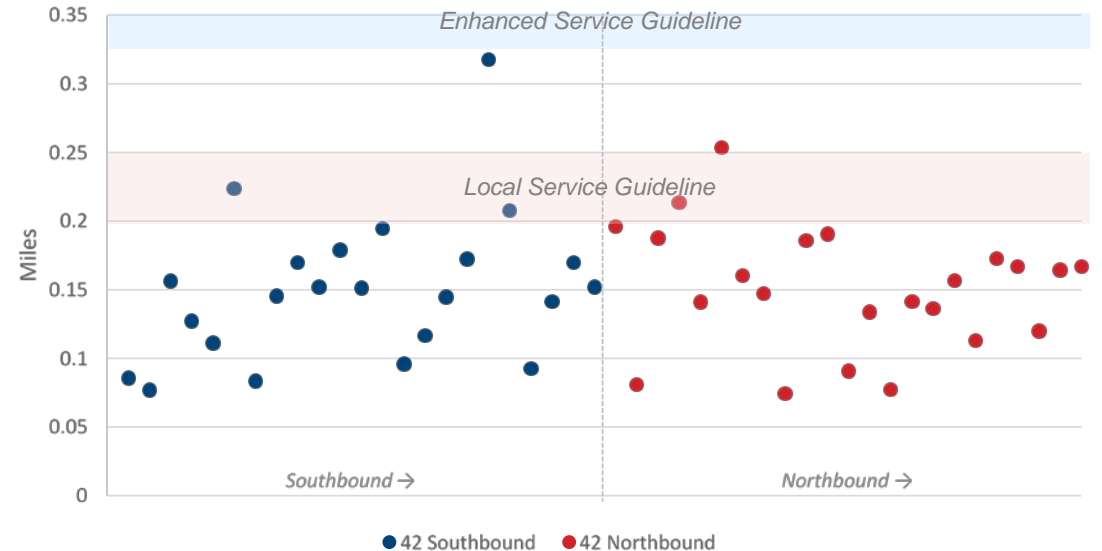
■ Bus Stops

- Bus Stop Spacing - Guideline
 - **Local Bus Service:** Four to five bus stops per mile
 - **Enhanced/Limited Stop Service:** Two to three bus stops per mile
 - **Commuter/Express Service:** Vary based on employment and high boarding locations

Mount Pleasant Line – Bus Stop Spacing Overview

Route Segment	Number of Stops	Route Length	Average Spacing	Maximum Spacing	Minimum Spacing
			Distance in Miles		
42	47	6.9	0.15	0.32	0.07
42 Southbound	24	3.5	0.15	0.32	0.08
42 Northbound	23	3.4	0.15	0.25	0.07
43	32	5	0.17	0.57	0.07
43 Southbound	16	2.4	0.16	0.42	0.08
43 Northbound	16	2.6	0.17	0.57	0.07
Total 42 & 43 Unique Stops	47	-	0.16	0.57	0.07

Route 42 Bus Stop Spacing Visualization



Evaluation Process

■ Bus Stops

- Bus Stop Amenities

- Shelter
- Seating/Bench
- Trash Can
- Information
- Map

- Stop Accessibility

- ADA landing pad
- Connection by an unobstructed sidewalk
- Adequate curb ramp connections

Bus Stop Hierarchy

	Basic Stop	Enhanced Service Bus Stop	Transit Center
Bus Stop Sign	Yes	Yes	Yes
ADA 5'x8' Landing Pad	Yes	Yes	Yes
Sidewalk	Yes	Yes	Yes
Lighting	Evening Service	Yes	Yes
Seating	Trip Generator Based	Yes	Yes
Expanded Boarding & Alighting Area (Rear-door Access)	No	Site Specific	Yes
Bus Bay (Pull Off)	No	Site Specific	Yes
Shelter(s)	1 (50+ boardings/day)	1	2 +
Trash Receptacle	Site Specific	Yes	Yes
Information Case	Yes	Yes	Yes
System Map	Contingent on Shelter	Yes	Yes
Real-time Display (LED + Audio)	Optional	Yes	Yes
Interactive Phone System On-Site	No	No	Yes

Evaluation Process

■ Bus Operators Interview

- Traffic
- Driving Environment
 - Roadways
- Bus Stop
- Running Time
- Terminal
 - Rest room



Evaluation Process

Summary Findings

- Span
- Frequency
- Cost Recovery
- Boarding Per Trip/Rev. Mile
- On-Time Performance
- Bus Stop Spacing

Mount Pleasant Line WMATA Service Guideline Goals

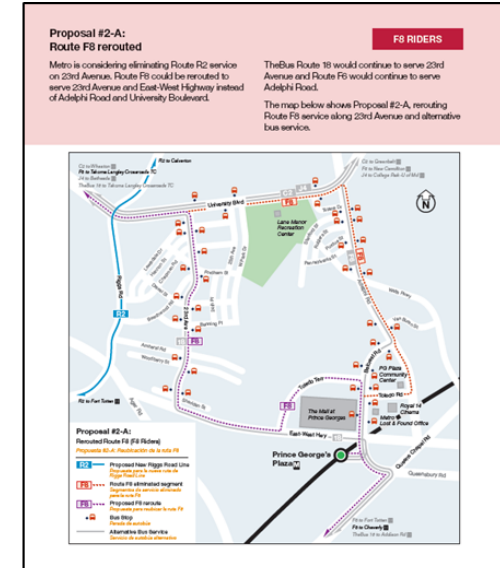
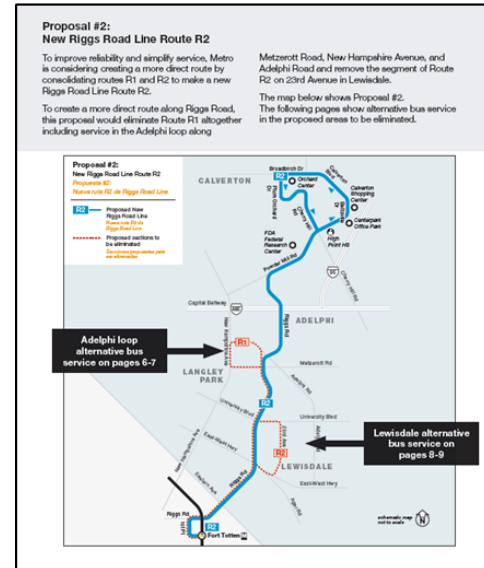
Service Guidelines	Service Guideline Definition	Route		Current Service Snapshot
		42	43	
Span of Service	Weekdays: 6:00AM to 10:30PM Saturdays: 6:30AM to 10:00PM Sundays: 7:00AM to 10:00PM	✓	NA	<ul style="list-style-type: none"> • Route 42 span exceeds this Service Guideline. • Route 43 operates mostly during peak periods.
Service Frequency	Weekday Peak: 20 minutes Weekday Off-Peak: 30 minutes Weekend: 60 minutes	✓	✓	<ul style="list-style-type: none"> • Route 42 frequency exceeds this Service Guideline. • Route 43 meets this peak period Service Guideline.
Route Directness	Deviation from direct route should not exceed 25% end-to-end travel time or 3 minutes per passenger on the route	✓	✓	Neither Routes 42 nor 43 have deviations that exceed 25% end-to-end travel time or 3 minutes per passenger on the route.
Fare Recovery	Buses should recover 25% of operating expenses from fares	✓	✓	<ul style="list-style-type: none"> • Route 42 recovers 25.5% on weekdays, 23.7% on Saturdays, and 25.6% on Sundays. The aggregate exceeds 25%. • Route 43 recovers 68.7% of its operating expenses.
Boardings Per Trip	At least 25 riders should board a bus per trip	X	✓	<ul style="list-style-type: none"> • Route 42 falls short of this Service Guideline with 20.4 boardings per trip, but still makes the necessary fare recovery. • Route 43 has 32.2 boardings per trip.
Boardings Per Revenue Mile	At least 3 passengers should board per operating mile	✓	✓	<ul style="list-style-type: none"> • Route 42 has 5.9 boardings per revenue mile. • Route 43 has 11.27 boardings per revenue mile.
On-Time Performance	75% of buses should arrive within a window of 2 minutes early to 7 minutes late	X	✓*	<ul style="list-style-type: none"> • Route 42 regularly does not meet this Service Guideline during peak periods, resulting in reliability issues. • Route 43 meets this Service Guideline during AM peak but not during PM peak, resulting in reliability issues.
Headway Separation	Departure intervals should not be greater than (or less than) 5% of a scheduled time point	X	X	Both Routes 42 and 43 regularly do not meet this Service Guideline during peak periods, resulting in "bus bunching".
Load Per Trip Ratio	Bus capacity should not exceed 120% during peak periods or 100% during off-peak periods.	✓	✓	Both Routes 42 and 43 meet this Service Guideline ratio.
Bus Stop Spacing	Distances between stops should be at least 0.2 miles (1,056 feet) apart	X	X	Average spacing between Routes 42 and 43 bus stops is 0.16 miles (849 feet) with a majority of the distances being less than 0.2 miles.

WMATA classifies the Mount Pleasant Line as Framework bus service, meaning it serves a key arterial corridor in the Washington metropolitan area. Service Guidelines are based on this classification.

✓ Guideline Met
 ✓* Guideline Partially Met
 X Guideline Not Met
 NA Not Applicable

Evaluation Process

- Fixing Identified Issues
 - Initial Service Change Proposals
 - Running Time
 - Span
 - Frequency/Capacity
 - Route Modifications
 - Terminal
 - Bus Stop Consolidation



Propuesta #3: La eliminación de varias paradas de autobús. Las siguientes rutas serán afectadas: C-4, C8, F8, R1, R2 y Z6

Metro está considerando eliminar algunas paradas de autobús que no son usadas frecuentemente o están cerca de otra parada de autobús.

Para obtener más información sobre esta propuesta y la lista de las paradas de autobús que están siendo consideradas para ser eliminadas, visite wmata.com/bus.

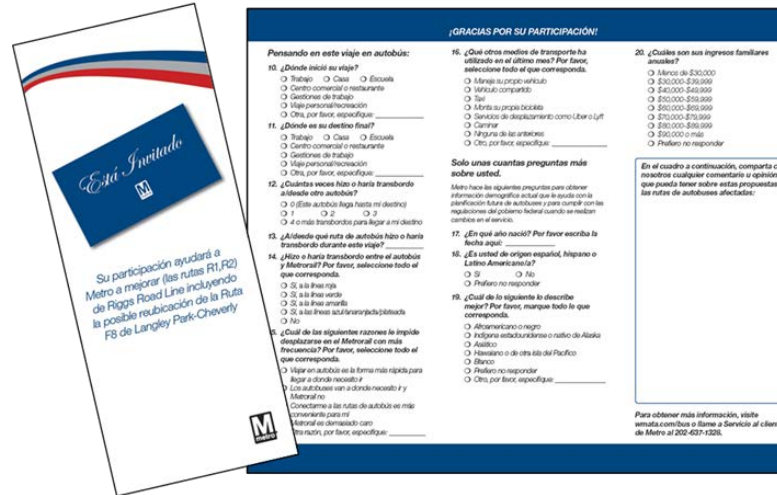
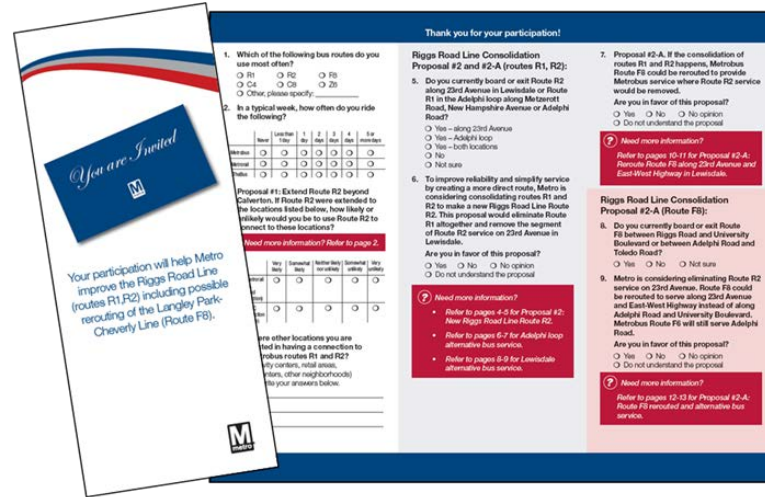
Puede compartir su opinión de la siguiente manera:

- Complete la encuesta ingresando a wmata.com/bus
- Llamando al Servicio al cliente de Metro al 202-637-1328.

El mapa a continuación es un ejemplo del aviso que verá en las paradas de autobús que han sido recomendadas para ser eliminadas e incluye la parada de autobús más cercana.

Evaluation Process

- Public Outreach
 - Rider Surveys
 - Card
 - Online



Evaluation Process

■ Public Outreach

- Public Meetings
 - Open House
- Stakeholders Communication
 - Community Based Organizations
 - Jurisdictions/Elected Officials
 - Area Neighborhood Commissions
 - Apartment Communities, Churches, Schools
- Targeted Marketing and Media
 - Project web-page
 - Signage along impacted routes
 - Social media (Twitter handle @metrobusinfo)



Evaluation Process

■ Proposal Refinement



Mount Pleasant Line Initial Proposal Survey Results

After analyzing results from the Transit Service Assessment and Rider Survey, WMATA devised three proposed service changes. To gain rider input, WMATA surveyed riders in April/May 2018 to ask if they were in favor of each proposal. The survey generated 1,726 responses.

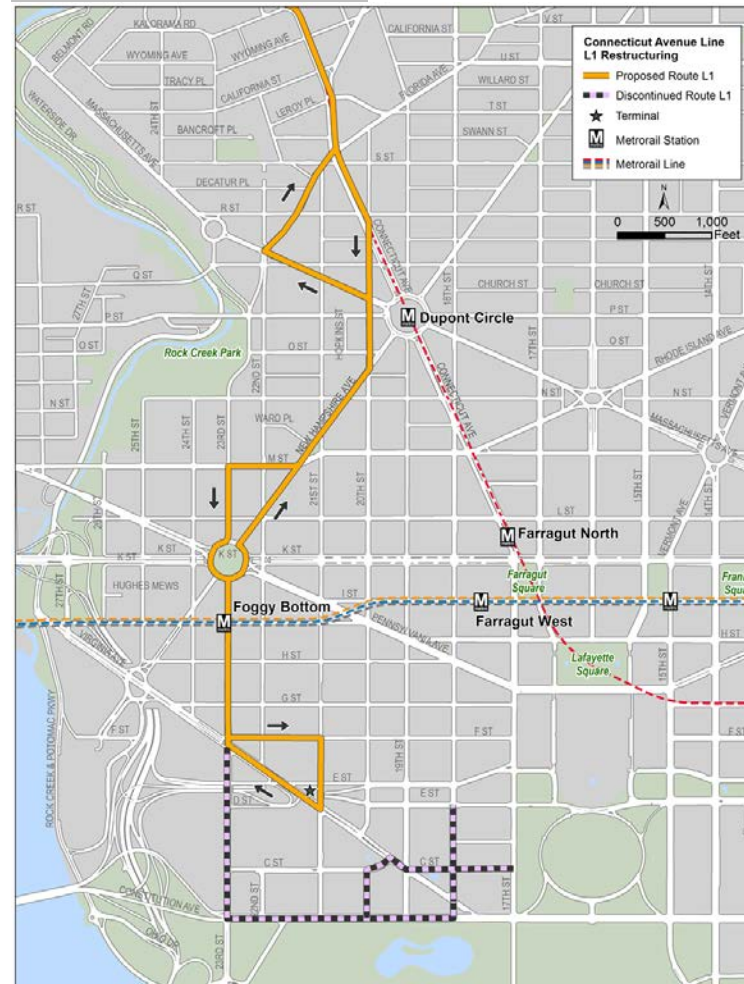
Sources	Totals	Languages
Paper Survey	327	English (1 survey contained comments in French)
	146	Spanish
Online Survey	142	English
	11	Spanish
Over the phone comments	4	English
630 Surveys completed		
Proposal Booklets distributed	3,803	English
	2,249	Spanish
6,052 Proposal Booklets distributed		

Proposal	Proposal Survey Results	Key Takeaways
Proposal A Route 42 terminates at Dupont Circle - AND - Route 43 runs between Mt Pleasant and Gallery Place	<ul style="list-style-type: none"> About half of respondents (53%) oppose this proposal. Low-income (48%) and minority respondents (37%) were more likely to support the proposal. 	<ul style="list-style-type: none"> A plurality of respondents do not want Route 42 buses to terminate at Dupont Circle. These respondents prefer the current route's downtown access. <p>WMATA Response: The proposal will not continue.</p>
Proposal B All Route 42 and 43 buses run under Dupont Circle	<ul style="list-style-type: none"> About half of respondents support the proposal (47%), compared to 38% of riders who oppose it. Respondents with household incomes greater than \$30,000 were more likely (55%) to support the proposal than those with household incomes less than \$30,000 (46%). 	<ul style="list-style-type: none"> A plurality of respondents support this proposal. Respondents prioritize faster connection to stops south of Dupont Circle. <p>WMATA Response: The proposal will be refined.</p>
Proposal C Convert some Route 42 buses to Route H1 buses. Operate Route H1 all day.	<ul style="list-style-type: none"> This proposal saw mild opposition with 37% of respondents opposed compared to 30% in support. Low-income (45%) and racial minority (40%) respondents were more likely to support the proposal. 	<ul style="list-style-type: none"> Most respondents either oppose or have no opinion of this proposal. Respondents do not feel strongly about access to Foggy Bottom via the H1. <p>WMATA Response: This proposal may be revisited in a future study.</p>

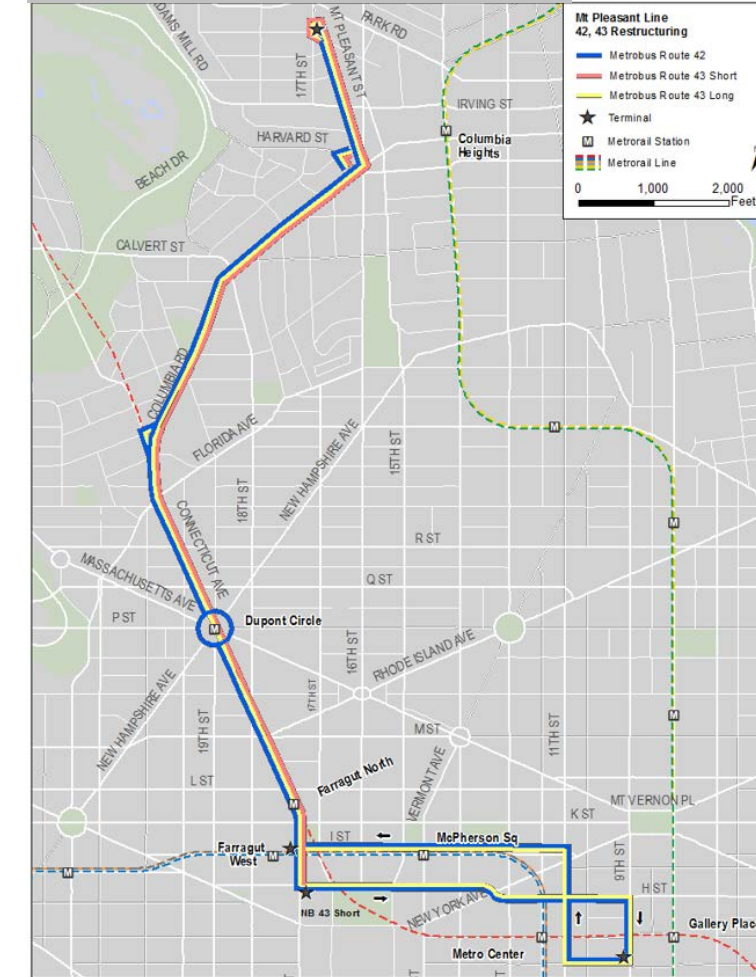
Evaluation Process

- Final Recommendation
- Implementation
 - Major Service Change
 - Service Change Proposal
 - WMATA Board
 - Public Hearing
 - Board Approval
 - Implementation
 - Minor Service Change
 - Service Change Proposal
 - Implementation

Modified Route L1 Routing



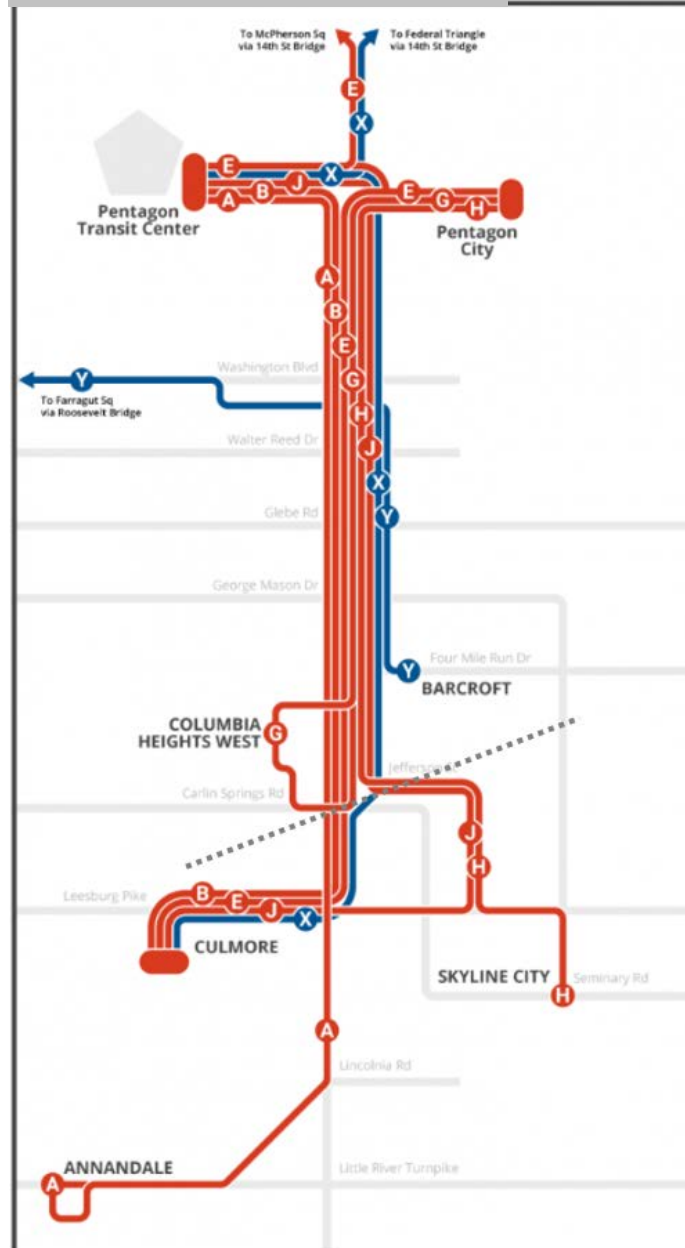
Routes 42, 43, and 43 Long Restructuring



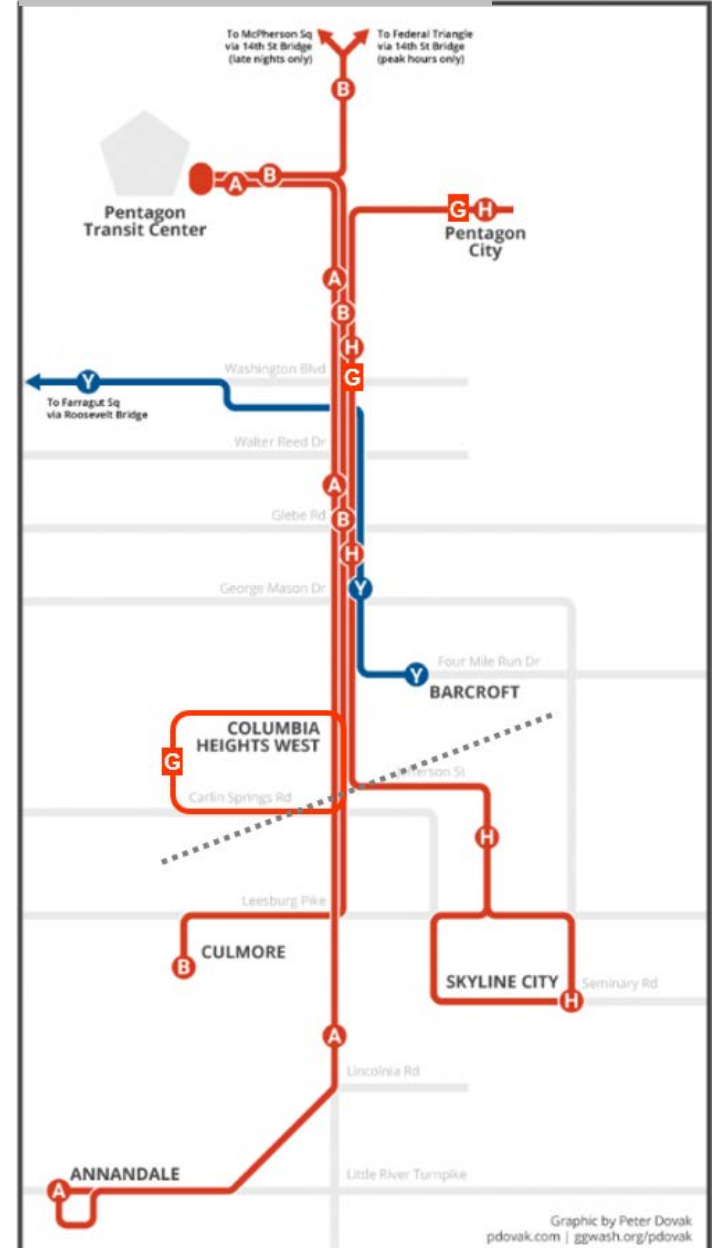
SES Outcomes

- Improved Service Delivery
- Reliability
- Consolidated Routes
 - 145 – 110 routes (25% Less)
 - Streamlined services
 - Same markets served
 - More Direct Services
 - Simplified for customers
- Consolidated Bus Stops
 - Faster Trip Time

Columbia Pike Lines - Before



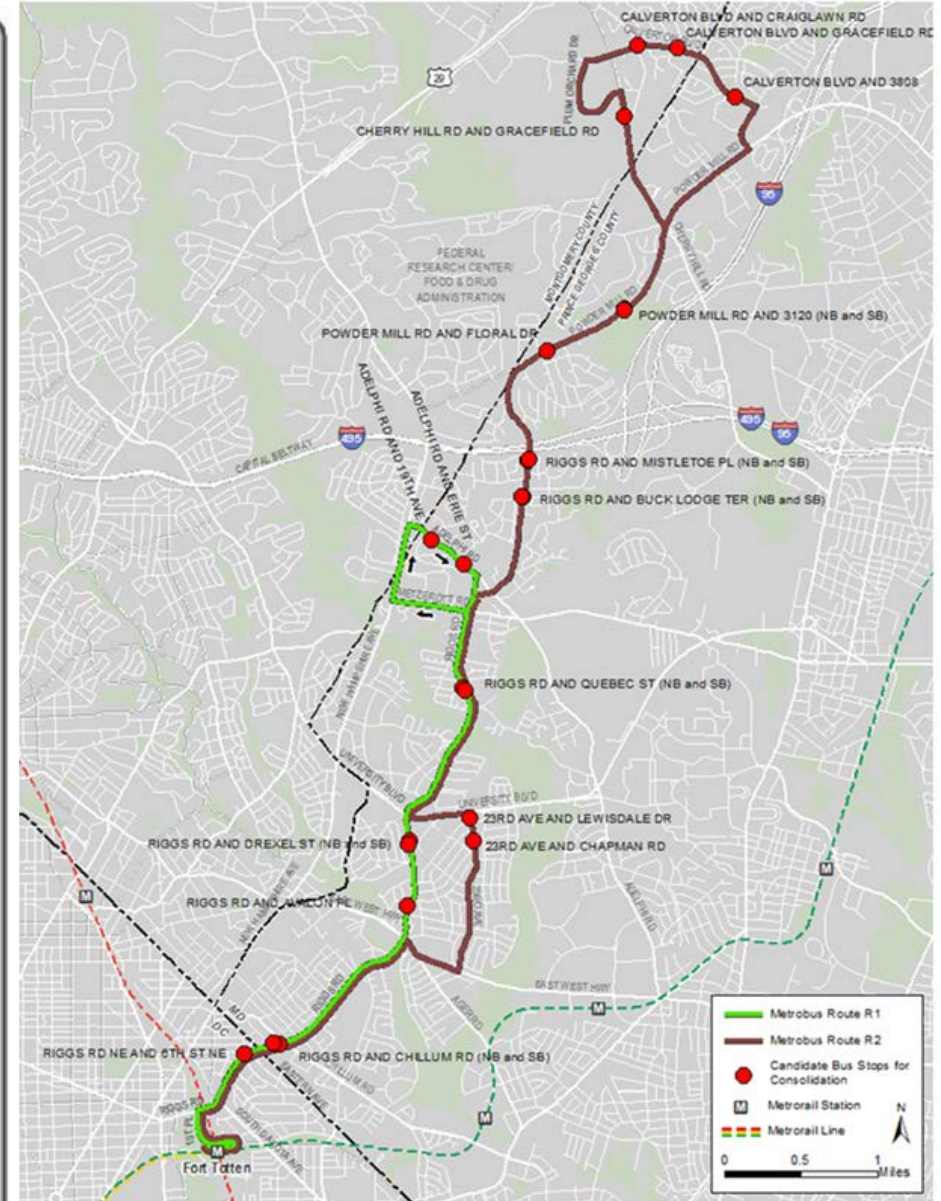
Columbia Pike Lines - After



Challenges

- Public Engagement
 - Involvement varies by jurisdiction
 - Change
 - Not my bus route
 - Not my bus stop
 - Jurisdictional variations
 - Politics?

Bus Stop Alternative Walking Maps



QUESTIONS?

