



Connecticut Avenue NW Reversible Lane Operations and Safety Study

ANC 3E Presentation

February 11, 2021

d.



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PROJECT OVERVIEW

Background

- 2003 Connecticut Avenue/Cleveland Park Traffic Operations' study
- 2011 Institute of Transportation Engineers Study
- Connecticut Avenue Pedestrian Action (CAPA) Pedestrian Safety Audit (Toole Design Group, February 2011)
- 2014 moveDC Recommendations
- Connecticut Avenue, NW Corridor Crosswalk Safety Project ANC 3/4G (February 2015) for ANC 3/4 G
- Cleveland Park Bicycle Analysis (2016)
 - Bicycle analysis - provide bicycle improvements along corridor
- 2018 ANC Resolutions for Reversible Lane Study
 - ANC 3C (May 21, 2018)
 - ANC 3F (March 20, 2018)
 - ANC 3 /4 G (October 22, 2018)
- Community involvement in shaping RFQ for this current study



Project Goals

- Reduce vehicle crashes; improve safety for all modes;
- Consider a Protected Bicycle Lane; and
- Assess the feasibility of removing reversible lane operation.

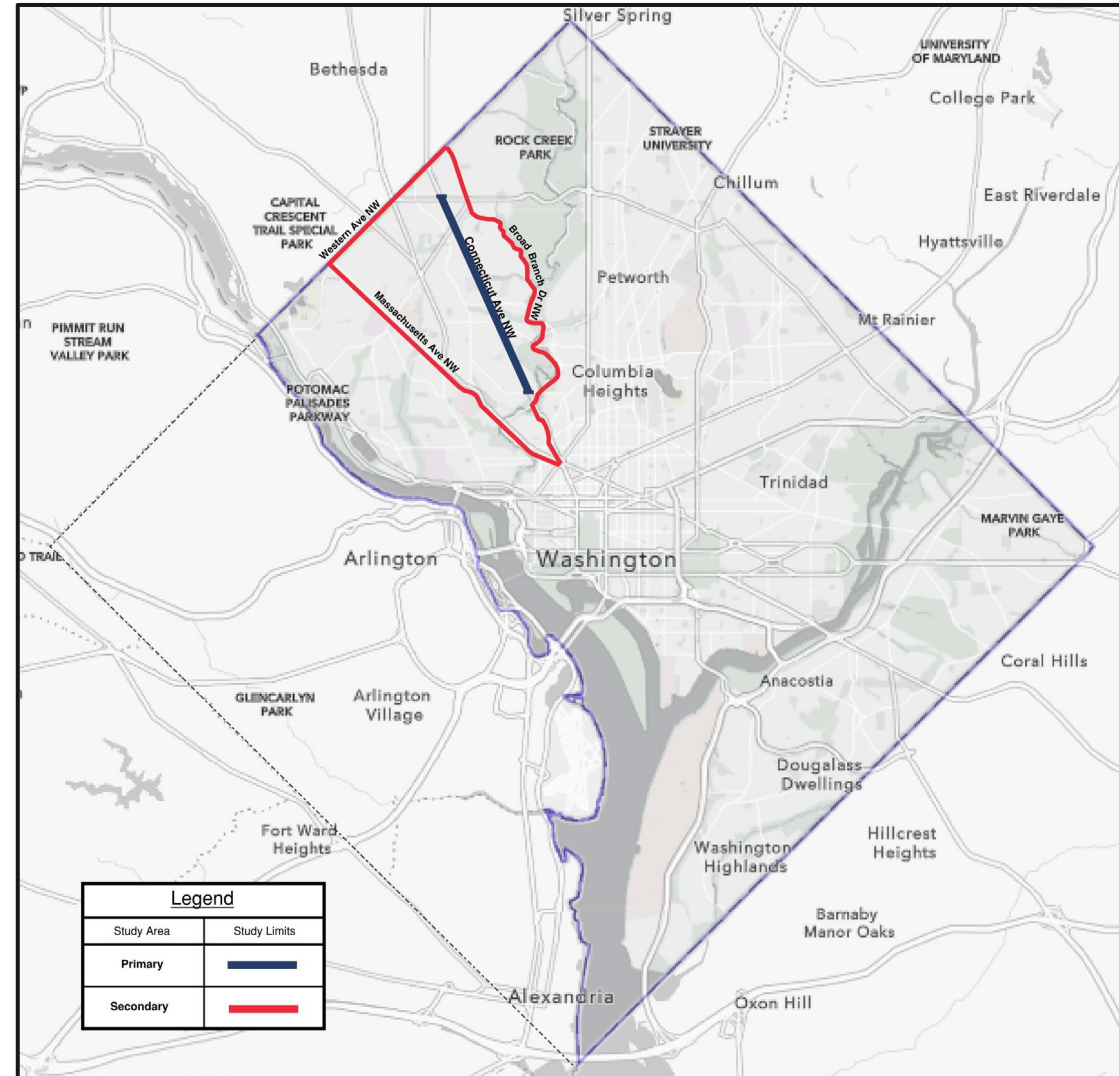
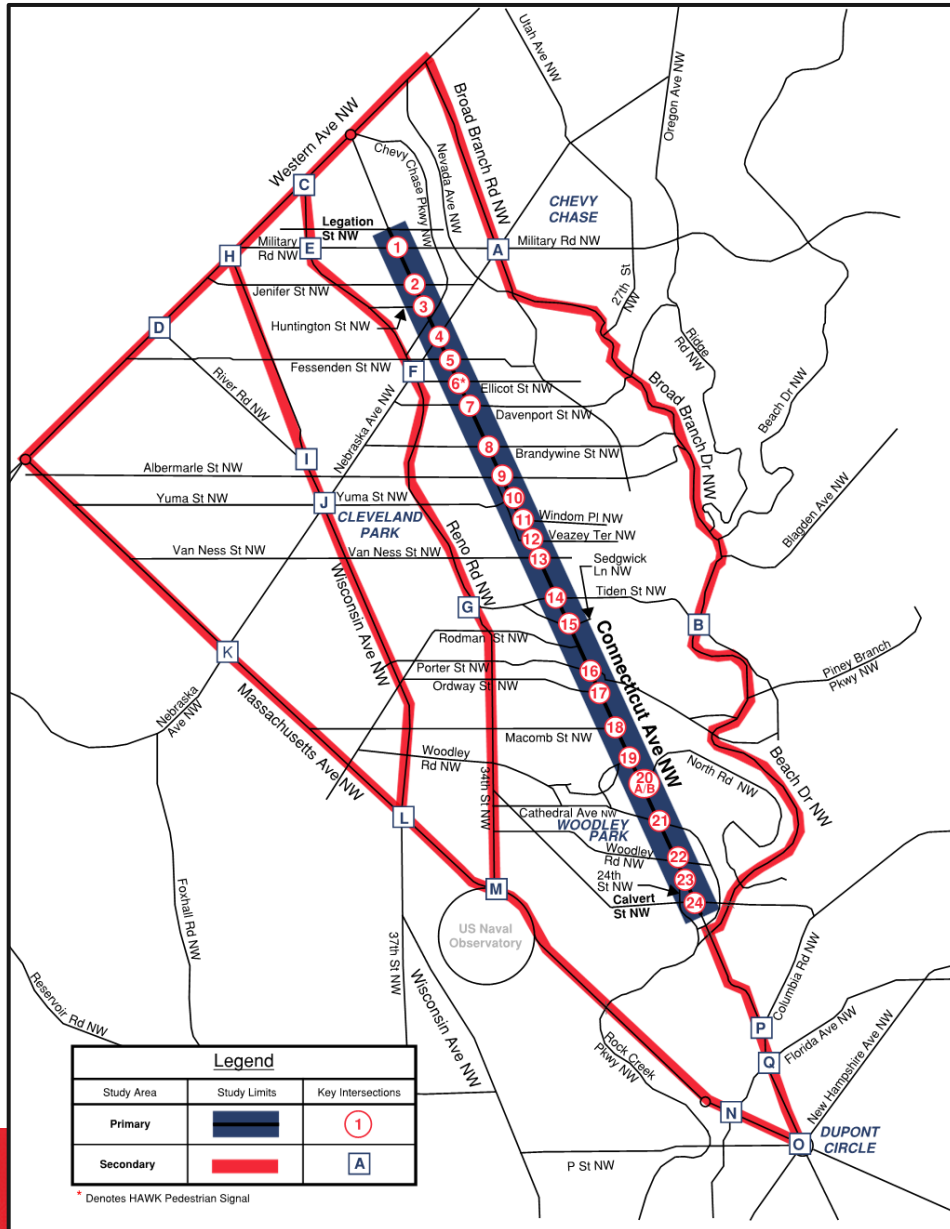


“The District Department of Transportation is studying the feasibility of removing the reversible lane system as part of the District of Columbia’s Vision Zero initiative, which aims to eliminate traffic deaths and serious injuries by 2024. The purpose of the Connecticut Avenue NW Reversible Lane Safety and Operations Study is to assess the multimodal (vehicular, transit, bicycle, and pedestrian) operational and safety impacts associated with removing or maintaining/improving the existing reversible lane system.”

Guiding Principles

- **Quality of Life**
 - Accommodate the needs of people who live, work, and recreate within the Connecticut Avenue corridor.
 - Prioritize the needs of corridor residents/businesses.
 - Provide sustainable, resilient, and equitable transportation options for all modes.
- **Safety and Vision Zero**
 - Reduce the number of crashes and fatalities.
 - Incorporate Complete Streets principles to reduce vehicle speeds along the corridor.
- **Traffic Operations**
 - Mitigate significant traffic impacts, to the extent feasible, when considering alternative concepts.
 - Understand diversion impacts and mitigate, where possible.
- **Parking and Loading**
 - Retain some parking and loading in Commercial areas.
- **Pedestrians**
 - Integrate pedestrian improvements into each alternative concept.
- **Bicycles**
 - Include protected bicycle lane concept(s).
- **Transit**
 - Include bus transit operational improvements.
- **ROW/Construction**
 - The alternative must be constructed within the 60-foot curb-to-curb cross-section.

Primary and Secondary Study Area and Connecticut Avenue Regional Context



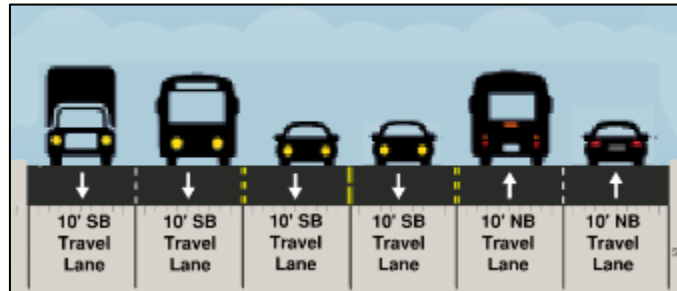
ALTERNATIVES DEVELOPMENT

Alternatives Development

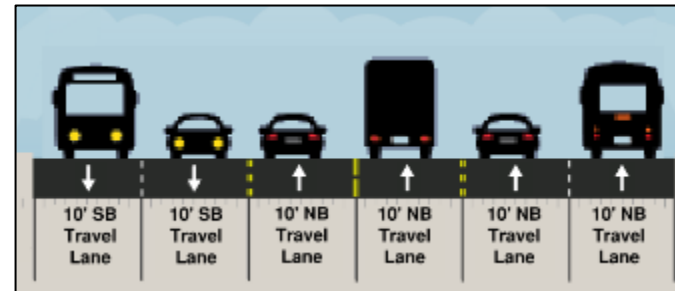
- **Started with four (4) DDOT Build Concepts (A, B, C and D-0) plus No-Build Concept.**
- **Received potential concepts from Public/CAC (Concepts D-1, D-2 and Concept E).**
- **Concepts No-Build, A, and D-0 would require MUTCD-compliant overhead signals; Signage not supported by Commission on Fine Arts (CFA).**
- **All Concepts**
 - Will be carried forward to our Public Meeting scheduled in March 2021.
 - Developed an evaluation matrix that considers the attributes, pros, cons and fatal flaws.
- **Focused our traffic analysis on alternatives that can distinguish impacts: No-Build, Concepts B and C.**
 - Traffic models can assist in determining the impacts from reducing the number of lanes in the corridor.
- **All Alternatives**
 - Include elements to improve safety and mobility.
 - Potential posted speed limit reduction along Connecticut Avenue from 30 mph to 25 mph.

No-Build Management Option

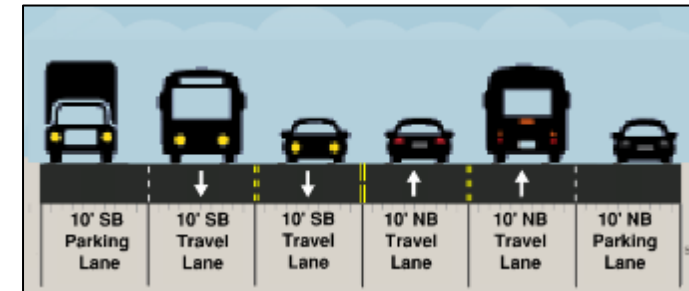
AM Peak Period



PM Peak Period



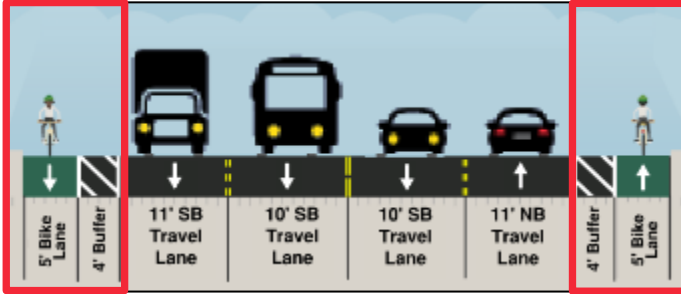
Off-Peak Periods



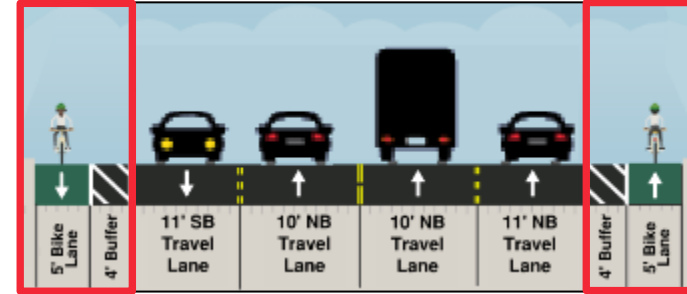
- **Retains two (2) lane Reversible Lane System**
- **No upgrades to overhead signs/signals as required by MUTCD (not supported by CFA)**
- **Peak Period/Non-Peak Period Lane Operations- no change from Pre-COVID conditions**
 - AM four (4) lanes inbound; two (2) lanes outbound; reverse in PM
 - Off-Peak Periods: two (2) travel lanes each direction; parking lane on the east and west sides of Connecticut Avenue
- **May include intersection improvements to enhance pedestrian accessibility and safety**
- **Traffic Forecasts for No-Build Option developed as a baseline to measure the impacts of concepts that change Corridor number of lanes.**

CONCEPT A

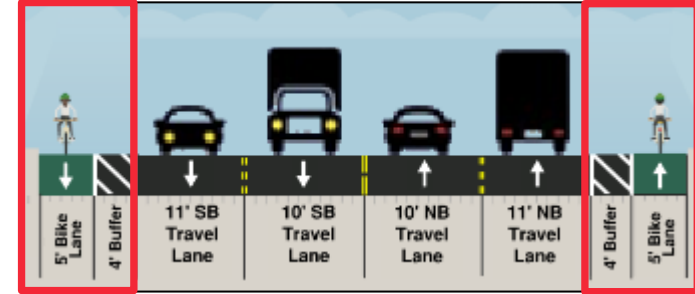
AM Peak Period



PM Peak Period



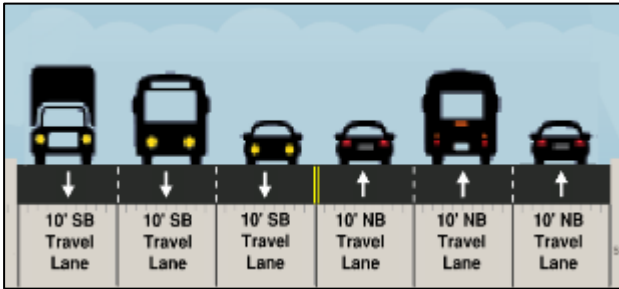
Off-Peak Periods



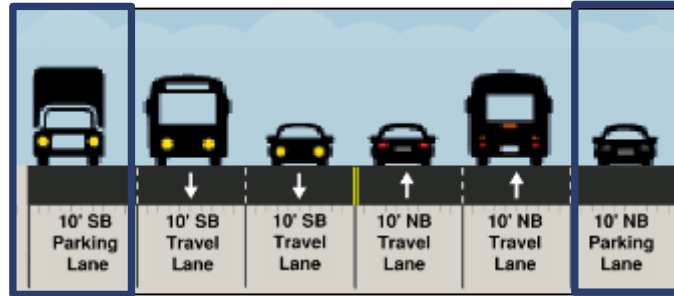
- **Retains 2-lane Reversible Lane System.**
- **Requires upgrade of Reversible Lane System to include overhead lane-use signs and signals.**
- **Peak Hour Lane Operations:**
 - Three (3) peak direction travel lanes/One (1) off-peak direction travel lane.
- **Off-Peak Period Traffic Operations:**
 - Two (2) northbound and two (2) southbound lanes.
- **One-way Protected Bicycle Lanes:**
 - Located on east and west sides of Connecticut Avenue.
 - Includes 5' bike lane and 4' buffers.
 - **All parking along Connecticut Avenue to be removed.**

CONCEPT B

AM Peak & PM Peak Periods



Off-Peak Periods



- **Removes Reversible Lane System**

- **Peak Hour Lane Operations:**

- Three (3) northbound lanes and three (3) southbound lanes during peak hours

- **Off-Peak Period Traffic Operations:**

- Two (2) northbound and two (2) southbound lanes
- Parking/loading provided on the east and west sides of Connecticut Avenue

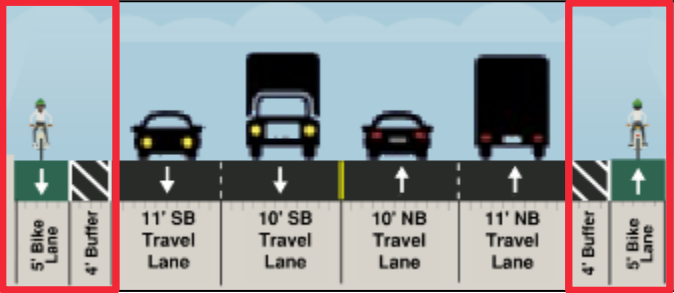
- **No Protected Bicycle Lanes**

- **Parking**

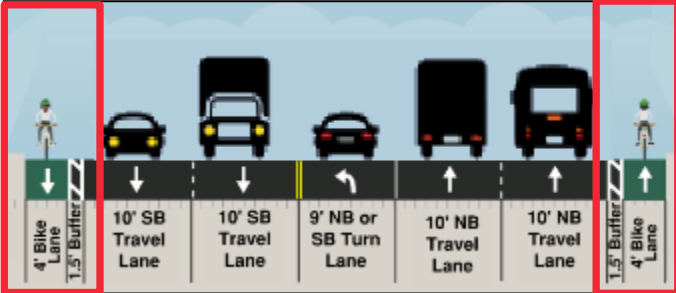
- No Parking removed in this Concept
- As in Pre-Covid conditions, parking would not be permitted during peak hours.

CONCEPT C

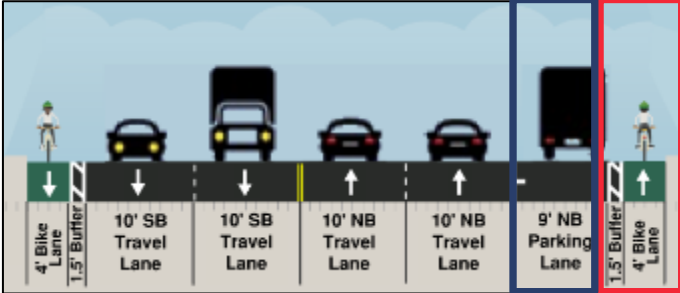
Mainline: All Periods



With Left-turn Pocket: All Periods



Option #1: NB or SB Parking & Loading Lane

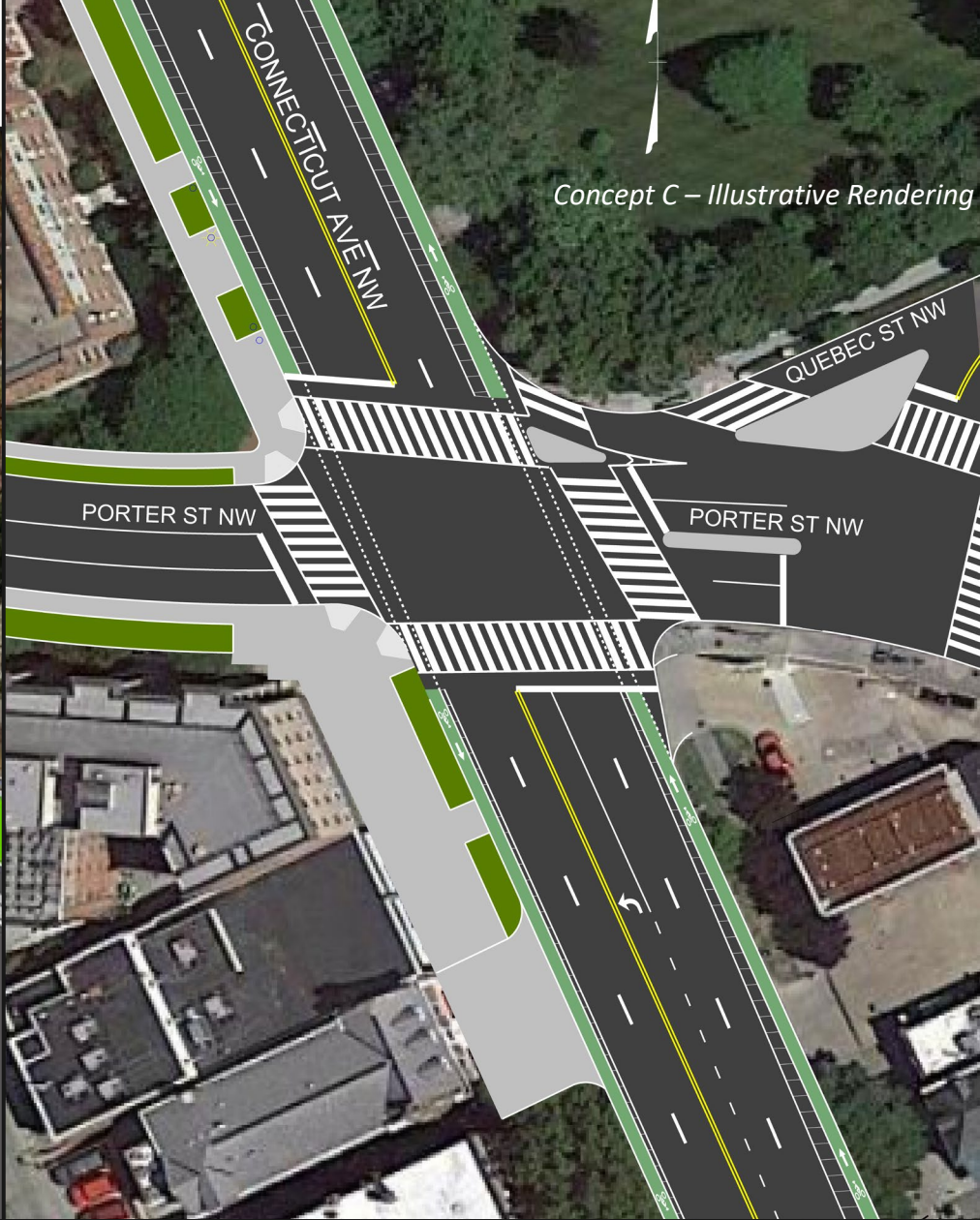


- **Removes Reversible Lane System**
- **Peak Period/Off-Peak Period Operations:**
 - Two (2) northbound and two (2) southbound travel lanes
- **One-way Protected Bicycle Lanes:**
 - Located on east and west sides of Connecticut Avenue
 - Includes 4' or 5' bike lane and 4' or 1.5' buffers to accommodate either mainline or left turn/parking lane requirements
- **Traffic Operations- Manageable Impacts**
- **Parking-Retains 118 spaces in Commercial Areas; removes 507 spaces in other areas of Corridor.**

Concept C – Segment Renderings



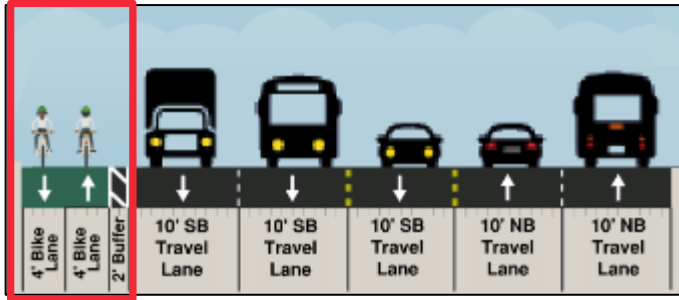
Concept C – Illustrative Rendering



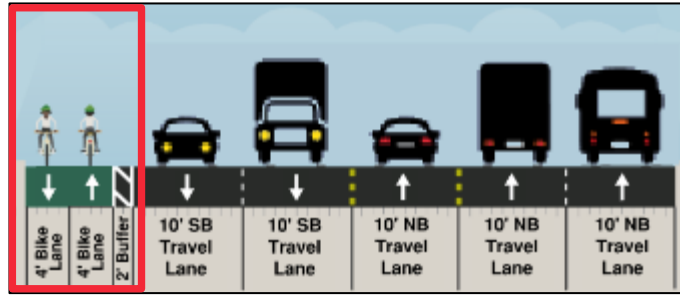
Concept C – Illustrative Rendering

CONCEPT D-0

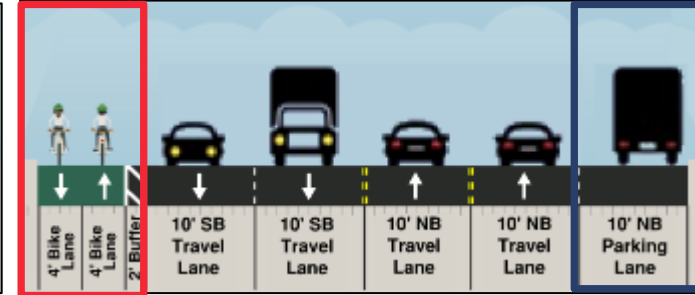
AM Peak Period



PM Peak Period



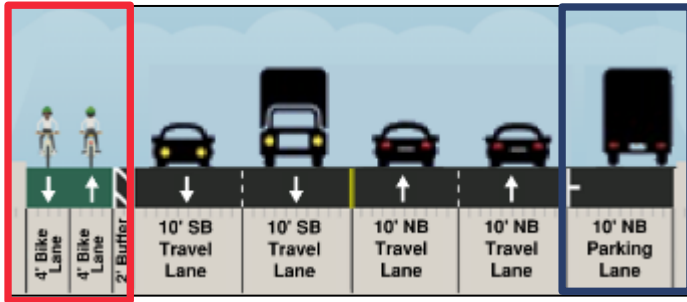
Off-Peak Period



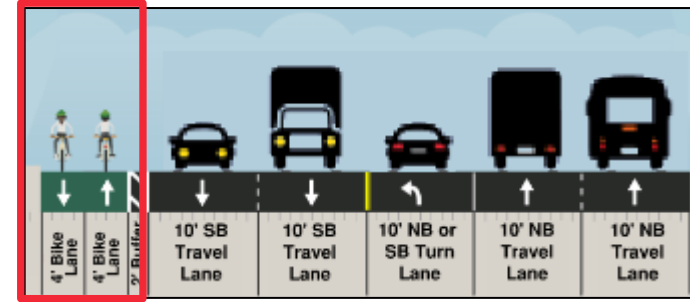
- Retains one (1) lane Reversible Lane System
- Requires upgrade of Reversible Lane System per MUTCD Standard (CFA does not support)
- Peak Hour Lane Operations:
 - Three (3) peak direction/ two (2) off-peak direction travel lanes
- Off-Peak Period Traffic Operations:
 - Two (2) NB and two (2) SB travel lanes with NB Parking/Loading lane
- Left-turn pockets with “protected only” phasing, as required by DDOT’s *Bicycle Facility Design Guide*, not constructible due to Reversible Lanes.
- Conflicting pedestrians and cyclists in two-way cycle track
- Two-way protected cycle track: Dimensions include two (2) , 4'-foot bike lanes with 2'-foot buffer

CONCEPT D-1 (by others)

All Periods



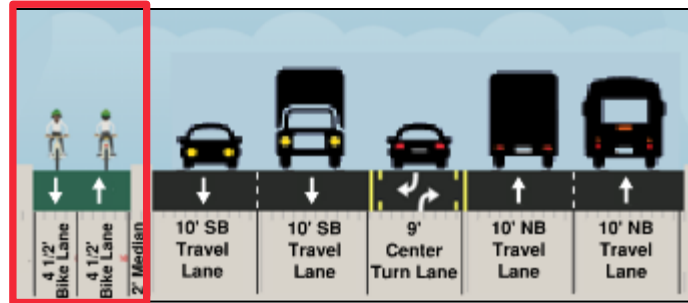
Option: Based on need for NB/SB Left-turn pockets



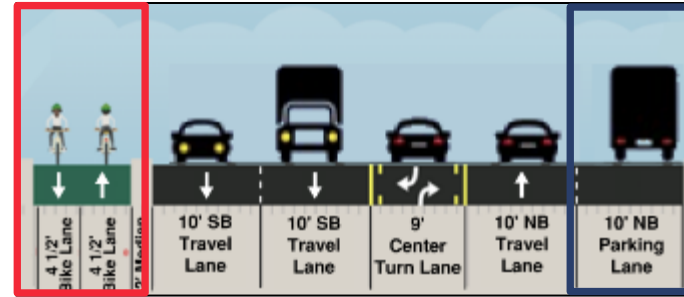
- **Retains Reversible Lane System**
- **Traffic Operations, All Day:**
 - Two (2) northbound and two (2) southbound lanes
- **Two options (based on locational needs within Corridor):**
 - Northbound (NB) parking/loading lane, **or** NB/SB left-turn pocket
- **Two-way protected cycle track:**
 - Two (2) 4-foot bike lanes and a 2-foot buffer.
- **Left-turn pockets with “protected only” phasing required for all intersections per DDOT’s Bicycle Facility Design Guide.**
 - NB/SB left turns may block left lane leaving only one lane for through movement.
 - Left turn pockets required for two-way cycle track preclude parking

CONCEPT D-2 (by others)

AM and PM Peak Periods



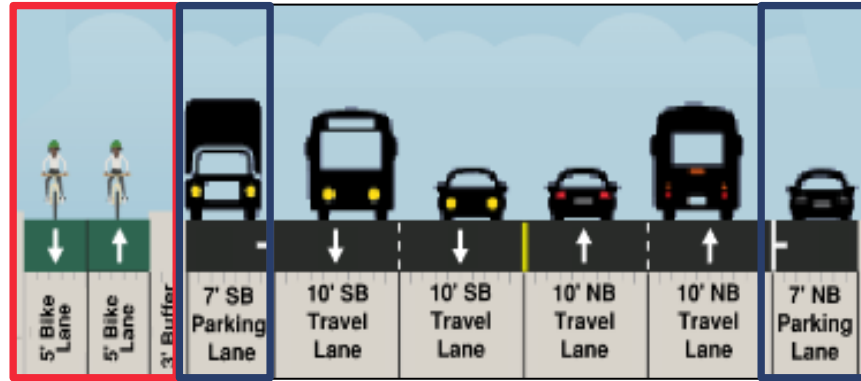
Off-Peak Period



- **Removes Reversible Lane System**
- **Peak Period Traffic Operations:**
 - Two (2) northbound and two (2) southbound lanes; two-way center left-turn lane
- **Off-Peak Period Traffic Operations:**
 - One (1) northbound and two (2) southbound lanes
 - Two-way center left-turn lane
 - Northbound parking/loading lane
- **Two-way protected cycle track (2- 4.5' bike lanes and a 2'-buffer)**

CONCEPT E (by others)

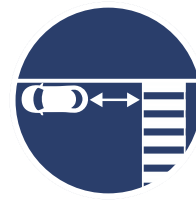
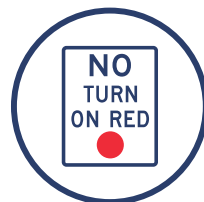
All Periods



- **Removes Reversible Lane System**
- **Peak Period/Off-Peak Period Traffic Operations:**
 - Two (2) northbound and two (2) southbound lanes
 - East and west side Connecticut Avenue Parking/Loading Lanes
- **Two-way Protected Cycle Track on the west side of Connecticut Avenue:**
 - Two (2) 5' bike lanes and a 3' buffer
- **ROW/Construction required to accommodate 67' cross-section (60-foot existing curb-to-curb).**
Does not conform to DDOT Guiding Principles
- **Cleveland Park Streetscape Project design impact.**

Additional Connecticut Avenue Improvements

- **Conduct specific analysis for Safety and Mobility Improvements (Sample)**
 - Left Turn Calming Treatments
 - HAWK signals
 - No Turn on Red
 - Far-side bus stops
 - Parking restrictions at crosswalks
 - Pedestrian Warning Signs
 - Left turn lane both major road approaches
- **More specificity at 10% Design**
- **Speed Limit Reduction from 30 mph to 25 mph (assessment in progress)**



Preliminary Findings

- **Difficult to meet full Purpose and Needs.**
- **If we remove the reversible lanes, accommodate some parking/loading, and accommodate PBLs, PBL widths/buffers have reduced dimensions.**
- **If we provide for only removal of the reversible lanes (Concept B), we are not accommodating multimodal safety and accessibility goals.**
- **No-Build Management Option:**
 - Does not appear to meet Purpose and Need
 - Does not reduce crashes
 - Retains the Reversible Lanes
 - Does not meet the multimodal safety and accessibility goals
 - Requires overhead signage/signals to be MUTCD-compliant; not supported by CFA.

ALTERNATIVES EVALUATION

Alternatives Evaluation

- **Developed Evaluation Matrix**
 - Screen 1: Is the Alternative within 60-foot Curb-to-curb width
 - Screen 2: Considered the Attributes, Pros and Cons
- **Developed relative scoring/adjectival rating**
 - Desirable (+2), More Desirable (+1)
 - Neutral (0)
 - Less Desirable (-1), Not Desirable (-2)
- **Criteria Evaluated**
 - Traffic Safety
 - Traffic Operations
 - Bicycle Accessibility and Comfort
 - Pedestrian Accessibility and Comfort
 - Transit Accessibility and Operations
 - Parking, Loading and Pick-Up/Drop-Off
 - Constructability/Implementation
- **Embedded in the Evaluation Criteria: Consistency with District of Columbia Plans**
 - moveDC
 - Bicycle Master Plan
 - Vision Zero
 - Sustainable DC 2.0 Plan
 - Bicycle and Pedestrian Safety Amendment Act of 2016

PROJECT PURPOSE		<ul style="list-style-type: none"> ➤ Improve Safety and Operations along the Corridor ➤ Improve Multi-modal Accessibility 	No-Build Option	Concept A	Concept B	Concept C	Concept D ⁰	Provided by Others *									
								Concept D ¹	Concept D ²	Concept E							
Screen 1	FATAL FLAW ANALYSIS	<ul style="list-style-type: none"> ➤ Requires Additional ROW (existing 60' curb-to-curb width) 	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES		
Screen 2	EVALUATION CRITERIA ASSESSMENT	1. Traffic Safety	-2	-2	+1	+2	-2	+2	+2	+2	+2	+2	+2	+2	+2		
		2. Traffic Operations	+2	-1	+1	+1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
		3. Bicycle Accessibility & Comfort	-2	+2	-2	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	
		4. Pedestrian Accessibility & Comfort	0	+1	0	+1	0	0	0	0	0	0	0	0	0	0	
		5. Transit Accessibility & Operations	+1	-1	+1	0	0	0	0	0	0	0	-1	-1	-1	-1	
		6. Parking, Loading & Pick-up/Drop-off (PUDO)	+2	-2	+2	-1	+1	-1	+1	-1	-1	-1	+1	+1	+1	+1	
		7. Constructability & Implementation	-2	-2	+1	0	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	
Scoring			-1	-5	+4	+4	-3	-1	-1	-1	-1	-1	-1	-1	N/A		

KEY				
Not Desirable	Less Desirable	Neutral	More Desirable	Desirable
-2	-1	0	+1	+2

TRAFFIC ANALYSIS

Traffic Analysis

- **Focus on Concepts B and C since traffic model is sensitive to changes in number of lanes.**
 - No Build: No changes from Pre-Covid configuration (4 lanes southbound and 2 lanes northbound in AM; reverse in PM)
 - Concept B: Reduces peak hour, peak direction lanes by one (1)
 - Concept C: Reduces peak hour, peak direction lanes by two (2)
- **Modeling and analysis consisted of:**
 - *Preparing 2045 traffic volume forecasts (No-Build or Baseline Condition)*
 - *Estimating traffic diversions*
 - *Conducting level of service/capacity analyses*
 - *Looking at relative travel time differences between Concepts*
- **Study considers conditions in 2045, a long-term horizon, consistent with land use, employment and population in a 25-year timeframe.**
- **The study does not take into account changes in traffic volumes, on a year-to-year basis, like we are experiencing during Pandemic conditions.**

Existing and Forecast AADT Volumes

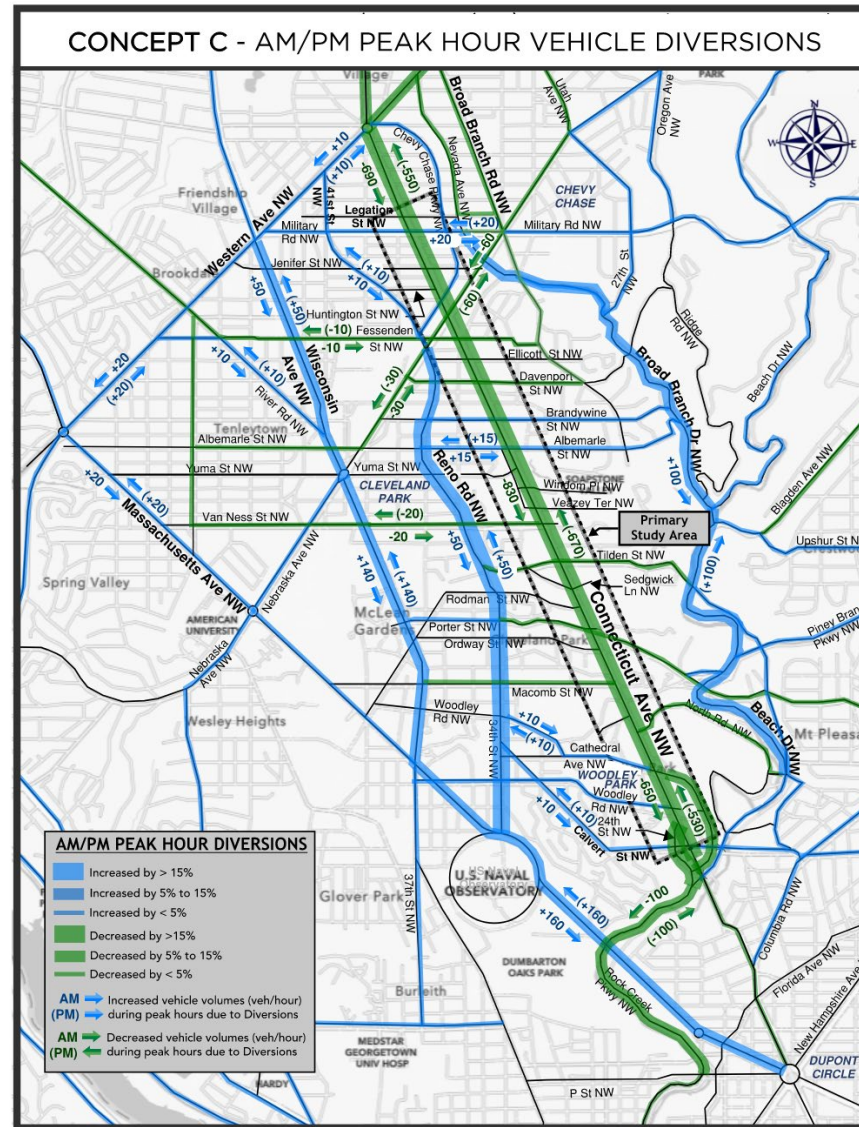
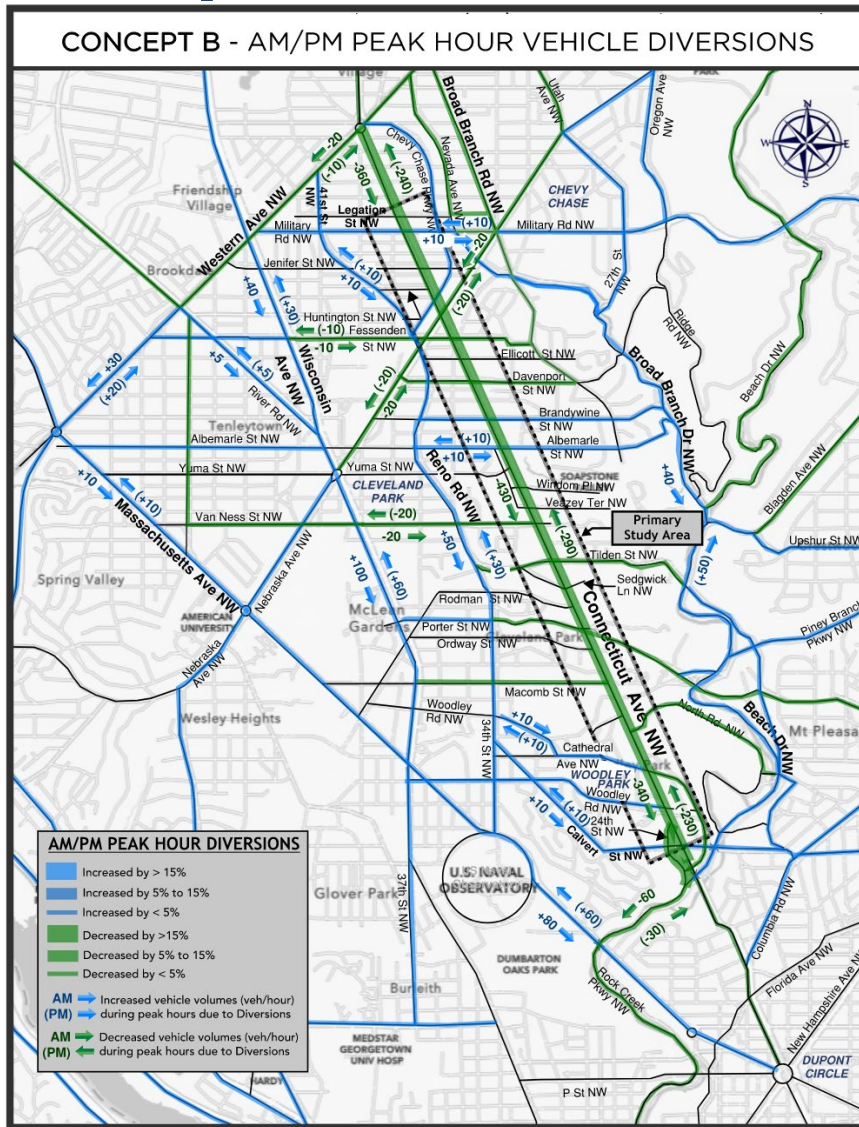
	Existing	2045 No-Build	2045 Build Concept B	2045 Build Concept C
Segment				
Legation Street NW to Nebraska Ave NW	29,900	30,200	25,590	26,700
Albemarle Street NW to Porter Street NW	31, 800	34,500	32,450	28,100
Porter Street NW to North Road NW	30,400	36,800	34,690	29,930
North Road to Calvert Street NW	23,600	25,900	24,040	19,290

TRAFFIC ANALYSIS: DIVERSION

Traffic Diversion: General Principles

- **Modeled Traffic Diversions for No-Build and Concepts B and C.**
- **Start out with a Daily (24-Hour Diversion volume)**
- **Some diversions will occur within our secondary Study Area and on regional roadways. This traffic does not disappear; however, people decide to use regional roadways.**
- **Distribute Daily Diversion volume to 5 Hours in the AM and 5 Hours in the PM, within our secondary study area road network**
- **Diversions are not expected to occur during 14 of 24 hours in day (during off-peak periods)**

Concepts B and C Traffic Diversions



- **GREEN** shows relative decreases in peak hour traffic volumes compared to 2045 No-Build condition.
- **BLUE** shows relative increases in peak hour traffic volumes compared to 2045 No-Build condition.
- **Total Daily Diversions**
 - Concept B-3,160
 - Concept C-7,020

Concepts B Peak Period Diversions

Concept B Daily Maximum Diversion: 3,160 VPD/ 1,920 in Secondary Study Area										
Peak Hour Diversions										
	5-6a	6-7a	7-8a	8-9a	9-10a	3-4p	4-5p	5-6p	6-7p	7-8p
Concept B: Peak Hour Diversions to Secondary Study Area (60%)	+160	+250	+260	+250	+220	+120	+170	+180	+170	+140

	Mass	Wisconsin	Reno	Broad Branch/Beach
% Distribution	27%	38%	19%	15%
# Vehicles Diverted	70	100	50	40

Concepts C Peak Period Diversions

	Concept C Daily Maximum Diversion: 7,020 VPD/ 3890 is 55%									
	Peak Hour Diversions									
	5-6a	6-7a	7-8a	8-9a	9-10a	3-4p	4-5p	5-6p	6-7p	7-8p
Concept C: Peak Hour Diversions to Secondary Study Area (55%) (3,890)	+350	+440	+460	+440	+420	+310	+370	+380	+370	+350

	Mass	Wisconsin	Reno	Broad Branch/Beach
% Distribution	37%	30%	11%	22%
# Vehicles Diverted	170	140	50	100

Traffic Diversions: Conclusions

- **The impacts of reducing the number of lanes along Connecticut Avenue during the peak hour, peak direction, by either one or two lanes, is manageable.**
- **Concept B**
 - When daily diversions are broken down, by peak hours and by parallel routes, Concept B shows a 40-100 vehicle diversion in the peak hours for parallel routes. Diversions would be smaller for roadways connecting to parallel routes.
- **Concept C**
 - When daily diversions are broken down, by peak hours and by parallel routes, Concept C shows a 50-170 vehicle diversion in the peak hours for parallel routes. Diversions would be smaller for roadways connecting to parallel routes.
- **Parallel and collector roadways can accommodate these modest increases in volumes.**

Traffic Analysis: Level of Service/Capacity

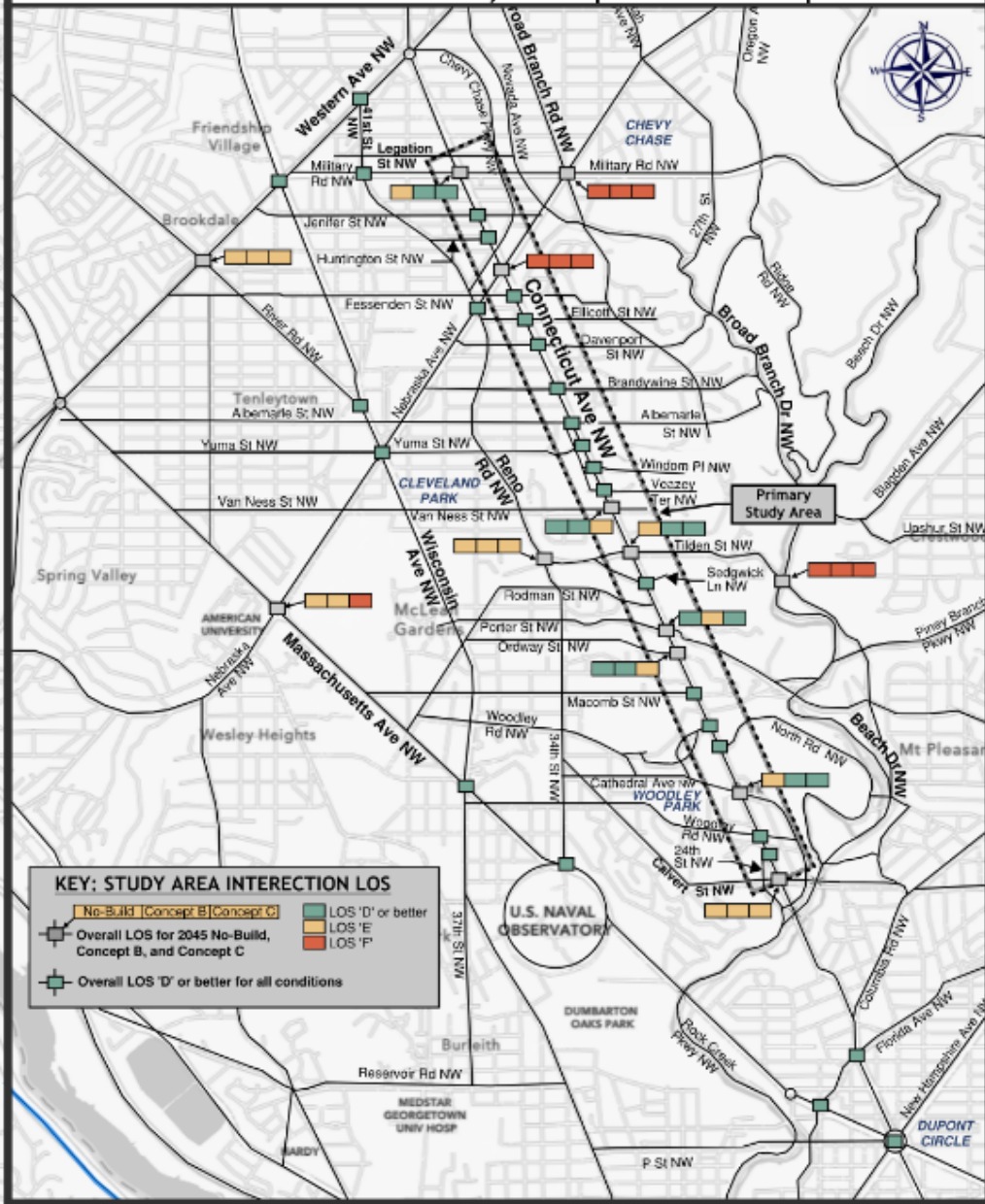
Intersection Level of Service and Delay

- **Level of Service (LOS) and Delay, were reported and assessed at each of the study area intersections.**
- **LOS and Delay**
 - See Grading System, LOS “A” to LOS “F”
 - Overall signalized LOS:
 - Average total vehicle delay of all movements through an intersection
- **LOS and Delay reported is for the highest one peak hour in the morning and the highest one peak hour in the evening.**
- **An intersection will likely operate better than what is reported during the balance of the day (approximately 20-22 hours).**

LOS	Control Delay per vehicle (seconds per vehicle)
A	≤ 10
B	> 10-20
C	> 20-35
D	> 35-55
E	> 55-80
F	> 80

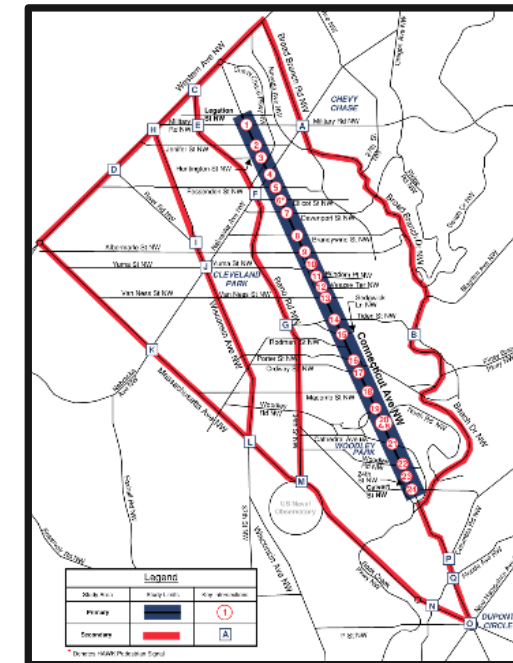
OVERALL INTERSECTION LEVELS OF SERVICE (LOS)

AM Peak Hour - No-Build, Concept B and Concept C



AM Traffic Levels of Service Primary Study Area No-Build and Concepts B and C

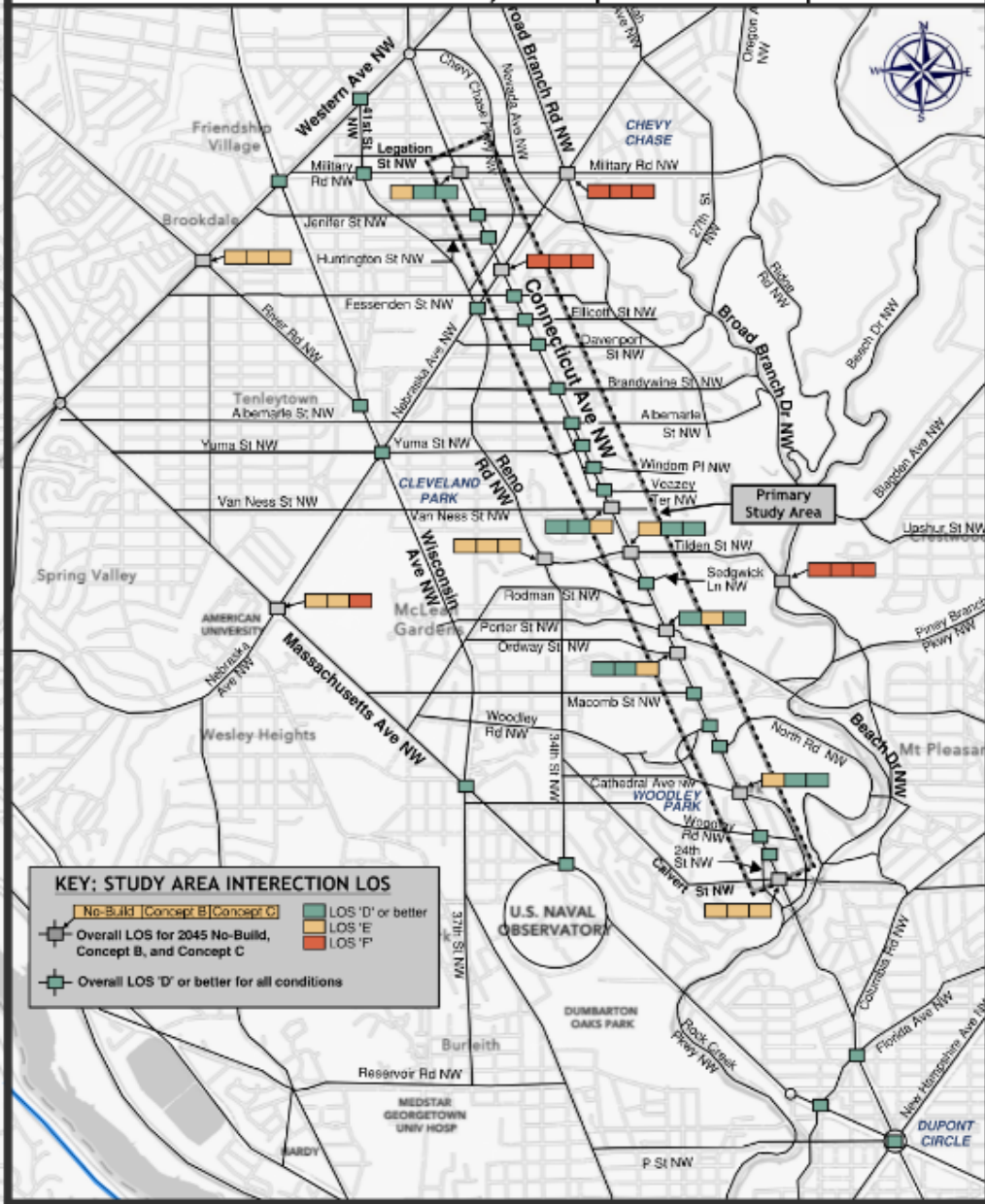
PRIMARY STUDY AREA - AM PEAK SUMMARY	2045 NO-BUILD	CONCEPT B	CONCEPT C
Number of Intersections with Overall LOS F/Total Study Area Intersections	1/24	1/24	1/24



- Nebraska Avenue /Connecticut Avenue operates at LOS F in any condition (No-Build, B or C)

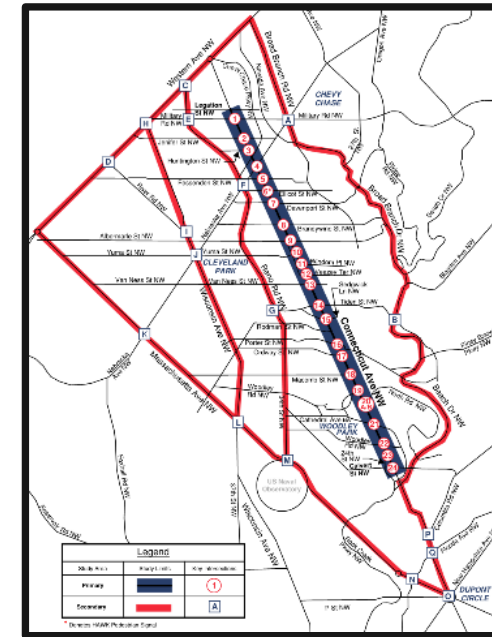
OVERALL INTERSECTION LEVELS OF SERVICE (LOS)

AM Peak Hour - No-Build, Concept B and Concept C



AM Traffic Levels of Service Secondary Study Area No-Build and Concepts B and C

SECONDARY STUDY AREA - AM PEAK SUMMARY	2045 NO-BUILD	CONCEPT B	CONCEPT C
Number of Intersections with Overall LOS F/Total Study Area Intersections	2/20	2/20	3/20

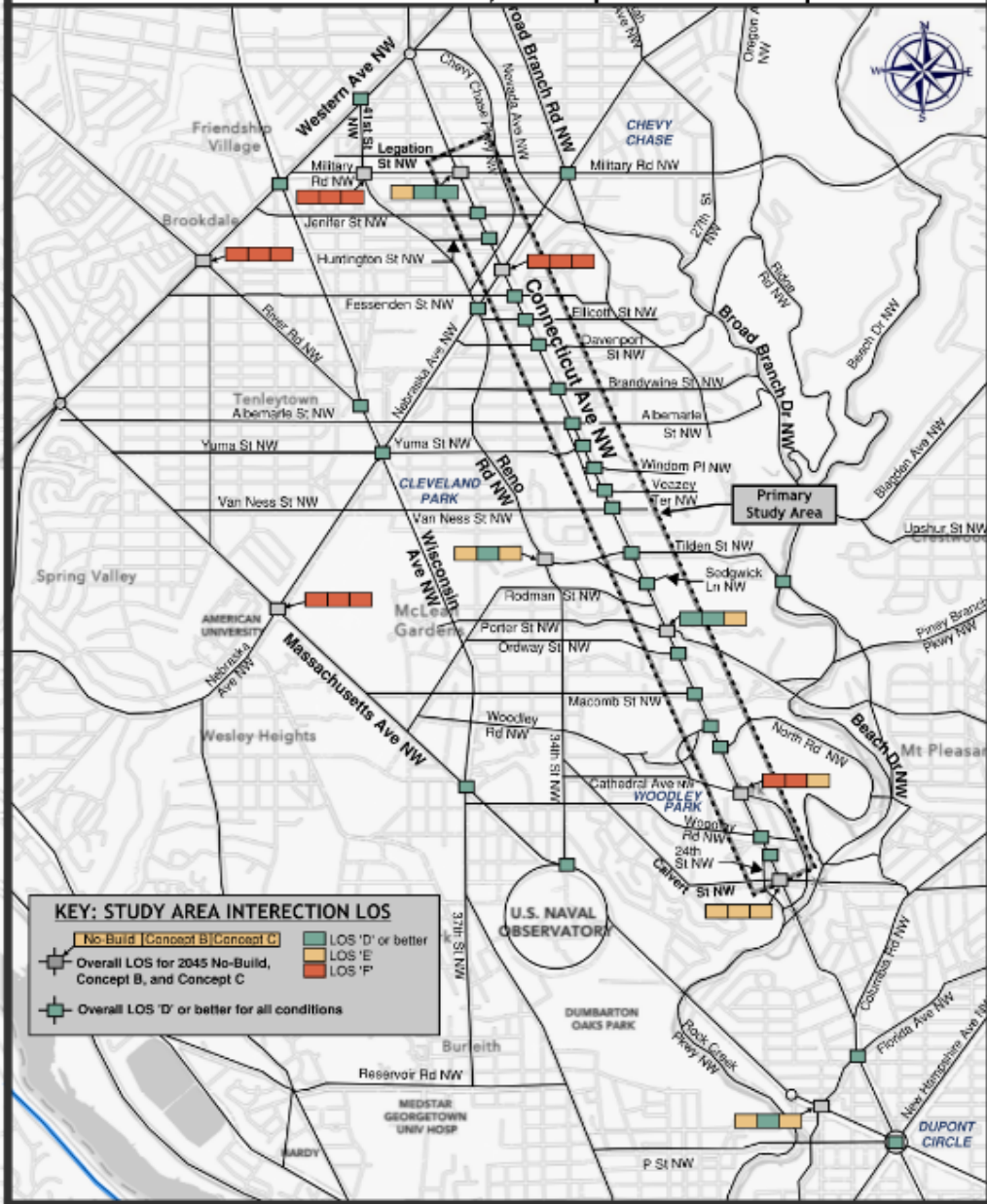


Intersections Operating at LOS "F" in No-Build or Build conditions:

- Nebraska Avenue/Broad Branch Road
- Beach Drive/Park Road/Tilden Street
- Nebraska Avenue @ Ward Circle North operates at LOS "E" in the No-Build and Concept B condition, and LOS "F" under Concept C

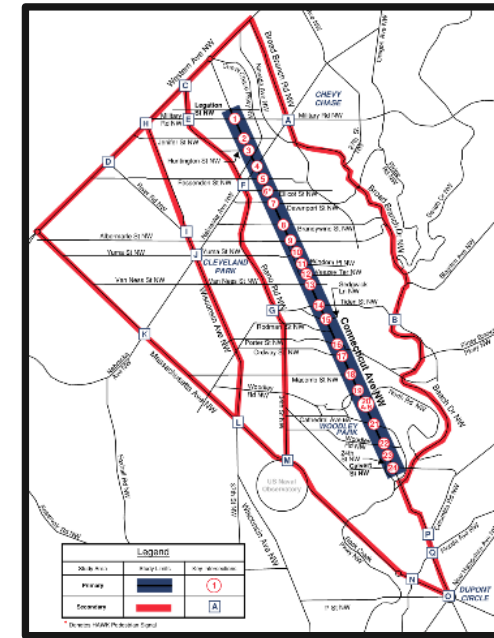
OVERALL INTERSECTION LEVELS OF SERVICE (LOS)

PM Peak Hour - No-Build, Concept B and Concept C



PM Traffic Levels of Service Primary Study Area No-Build and Concepts B and C

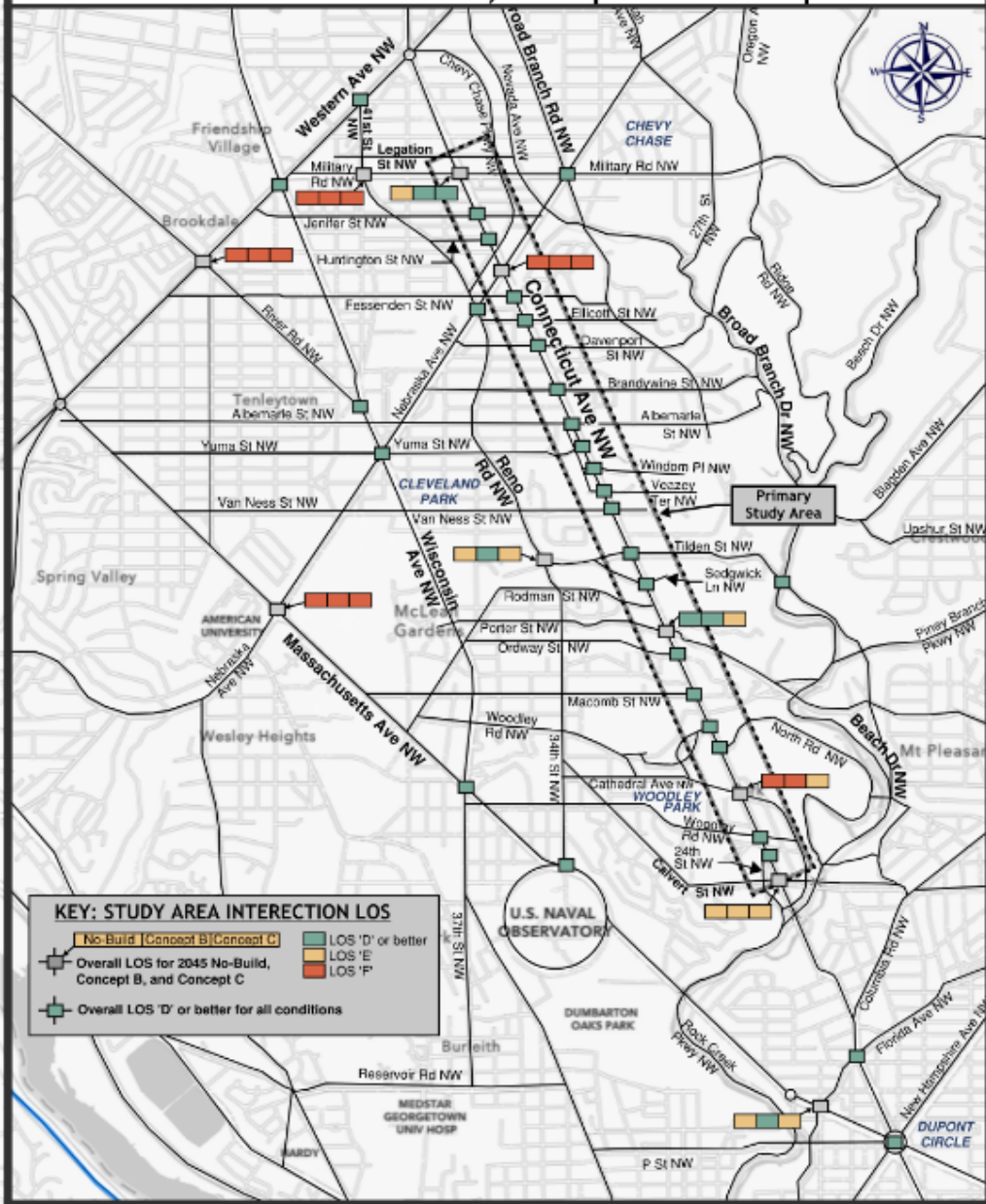
PRIMARY STUDY AREA - PM PEAK SUMMARY	2045 NO-BUILD	CONCEPT B	CONCEPT C
Number of Intersections with Overall LOS F/Total Study Area Intersections	2/24	2/24	1/24



- **Nebraska Avenue /Connecticut Avenue** operates at LOS F in any condition (No-Build, B or C)
- **Cathedral Avenue @ Connecticut Avenue** operates at LOS "F" in the No-Build and Concept B condition, and LOS "E" under Concept C.

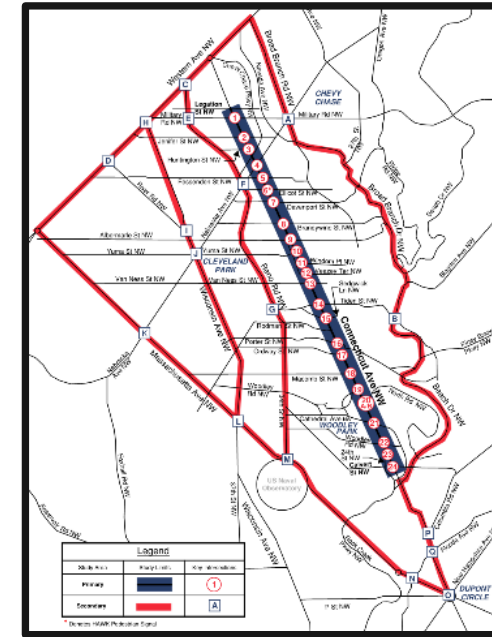
OVERALL INTERSECTION LEVELS OF SERVICE (LOS)

PM Peak Hour - No-Build, Concept B and Concept C



PM Traffic Levels of Service Secondary Study Area No-Build and Concepts B and C

SECONDARY STUDY AREA - PM PEAK SUMMARY	2045 NO-BUILD	CONCEPT B	CONCEPT C
Number of Intersections with Overall LOS F/Total Study Area Intersections	3/20	3/20	3/20



Intersections Operating at LOS "F" in No-Build or Build conditions:

- **Western Avenue @ River Road**
- **Reno Road @ Military Road**
- **Nebraska Avenue @ Ward Circle North**

Next Steps

Next Steps

- **Present major findings of traffic analysis to Stakeholder and Interagency groups in February 2021**
- **Begin preparation and logistics activities for a Public Meeting at end of March 2021**
- **Hold Public Meeting**
- **Develop a recommendation for moving forward on a preferred concept**
- **10% design of preferred concept**
- **Environmental Documentation**

Contact Information

Project Website-

<https://ddot.dc.gov/page/connecticut-avenue-nw-reversible-lane-safety-and-operations-study>

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d.

District Department of Transportation