

**Appendix B 20th/21st/22nd Street –
Traffic/Safety & Parking Analysis
Memo**



MEMORANDUM

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Date: 5/20/2019
To: District Department of Transportation (DDOT)
From: Mohamed Bouzaghrane, Associate Traffic Engineer, RK&K
Jeff Parker, PE, PTOE, Project Manager, RK&K
CC: Rick Adams, PE, Director, RK&K
Nathan George, AICP, Bicycle and Pedestrian Team Leader, RK&K
Re: Protected Bike Lanes – Contract No. DCKA-2013-T-0126, Task 21
Subject: 20th/21st/22nd Street Protected Bike Lanes – Traffic/Safety/Parking Analyses

INTRODUCTION

The District Department of Transportation (DDOT) has proposed constructing bi-directional protected bicycle lanes (PBLs, also known as a cycle track) along either 20th/21st/22nd Street NW from Constitution Avenue NW to Florida Avenue NW. The purpose of this project is to identify a specific route for north and south-running PBLs that provides a safe and comfortable environment for people biking of all ages and abilities. The proposed PBL would connect cyclists to the existing cycle tracks along L Street NW, M Street NW, the existing bike lanes along New Hampshire Avenue NW, N Street NW, and Q Street NW. The project area includes the Dupont Circle, West End, Downtown, and Foggy Bottom neighborhoods, with the National Mall at the southern end. The selected route will help fill a North-South gap in the cycling network. According to the DDOT Street Functional Classification Map, 20th Street NW is considered a minor arterial south of New Hampshire Avenue NW and a local road north of New Hampshire Avenue NW. 21st Street NW is considered a collector road south of Massachusetts Avenue NW and a local road north of Massachusetts Ave NW. 22nd Street is considered a minor arterial north of Pennsylvania Avenue NW and a collector road south of Pennsylvania Avenue NW.

Fehr and Peers DC (FPDC) developed concept plans for the proposed PBLs along 20th St NW, 21st St NW, and 22nd St NW. The 20th St proposed alternative places a two-way PBL on the west side of the corridor. The 21st St and 22nd St proposed alternatives place a two-way PBL on the east side of the corridor. All proposed alternatives provide a buffer with a raised median to protect bicyclists from vehicular traffic.

This memorandum summarizes the results of the analysis evaluating the feasibility of PBLs along 20th St NW, 21st St NW, and 22nd St NW. Section I presents the purpose, methodology, and results of the traffic analysis. Section II presents a summary of a safety analysis of the three potential corridors. Section III provides a summary of the parking demand analysis methodology and its results.

I. TRAFFIC ANALYSIS

Implementing the proposed PBLs will require reducing the roadway capacity and could result in undesirable congestion and additional delays along 20th St NW, 21st St NW, and 22nd St NW. RK&K analyzed the potential impacts that the proposed PBLs could have on traffic operations along the three corridors to help inform the decision making process of the desired PBL alternative.

Methodology:

Vehicle, bike, and pedestrian volumes were collected during the AM and PM peak hours at signalized intersections along the three study corridors. The counts were completed between February 2018 and June 2018. No vehicle, bike, or pedestrian counts were completed at unsignalized intersections along 20th, 21st, or 22nd Street NW. Additionally, volumes were not collected for all signalized intersections within the study area. Therefore, older intersection volumes provided by DDOT from 2012 were used to complement the newly collected volumes.

To develop the future year traffic volumes used to analyze design year 2040 AM and PM peak hour traffic operations, volume growth factors were calculated using link volume output from the latest version of the the Metropolitan Washington Council of Governments (COG) regional travel demand model. The growth rates obtained using the COG model were similar to the traffic growth rates used in the Downtown West Transportation Planning Study produced in September 2017.

A Synchro network containing all intersections, signal timings, and traffic volumes within the study area was provided by DDOT courtesy of Sabra & Associates, allowing RK&K to perform a capacity analysis for the intersections within the study area. Synchro is a deterministic and macroscopic signal analysis computer software program that models street networks and traffic signal systems. Given that the Synchro network provided by DDOT/Sabra was prepared in 2012, geometric data such as number of lanes, lane configuration, storage lengths, tapers, and distances between intersections were modified to reflect present day conditions. Additionally, unsignalized intersections were not built into the original Synchro model and were added to the network by RK&K with only estimates of north/south through traffic because no count data was available.

The observed peak hour for the AM peak period was between 7:00AM and 8:00 AM, while the PM peak hour is between 5:00 PM and 6:00 PM. Given that intersection turning movement counts were completed on different days, the study area Synchro network included some volume imbalances between intersections. These volume imbalances could be due to many reasons, including but not limited to, the presence of traffic generators such as parking garages, the stochasticity of traffic counts, and the occurrence of events that could disrupt traffic volumes and patterns along the study area. Volume imbalances were kept to a maximum of 50 vehicles between closely spaced intersections, and a maximum of 150 vehicles in other cases.

Revisions were made to the AM and PM peak hour Synchro files for each of the three corridors to match the proposed PBL conceptual design plans that include changes to lane use, parking restrictions, and operational and design features that might improve cyclist safety. Intersection capacity analyses were performed using the industry standard Highway Capacity Manual (HCM) methodology for all study intersections. Performance measures of effectiveness include level of service (LOS), average vehicle delay, and 95th percentile queue lengths.

Level of Service (LOS) is a qualitative measure describing operational conditions of an intersection or any other transportation facility. It measures the quality of traffic service, and may be determined for intersections, roadway segments, or arterial corridors based on delay, congested speed, volume to capacity (v/c) ratio, or vehicle density by functional class. At intersections, LOS is a letter designation that corresponds to a certain range of roadway operating conditions. The levels of service range from 'A' to 'F', with 'A' indicating the best operating conditions and 'F' indicating the worst, or a failing, operating condition. **Table 1** provides a breakdown of LOS by delay levels, along with different LOS definitions as described in the HCM. **Appendix A** includes tables showing vehicle delay and LOS results under existing conditions, 2040 no-build, and build conditions for each of the three corridors.

Table 1 – Level of Service (LOS) Criteria for Signalized Intersections

Level of Service	Delay (sec/veh)	Description of Traffic Operations
A	0 – 10	Free flow
B	>10-20	Stable flow (slight delay)
C	>20-35	Stable flow (acceptable delay)
D	>35-55	Approaching unstable (tolerable delay)
E	>55-80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Results:

Existing Conditions

Under existing conditions, all intersections along 20th Street NW, 21st Street NW, and 22nd Street NW within the project area operate at LOS C or better during the AM peak except for the following intersections:

- 22nd Street NW/Florida Avenue NW at Massachusetts Avenue NW (**LOS D**)
- 22nd Street NW at L Street NW/New Hampshire Avenue NW (**LOS E**)

The following intersections operate at LOS D or worse during the PM peak:

- 21st Street NW at Constitution Avenue NW (**LOS F**)
- 22nd Street NW at L Street NW/New Hampshire Avenue NW (**LOS F**)
- 22nd Street NW at Q Street NW (**LOS D**)
- 22nd Street NW/Florida Avenue NW at Massachusetts Avenue NW (**LOS D**)

2040 No Build

Under Future 2040 No Build conditions, similar signal timing and to existing conditions is assumed. During the AM peak, all intersections along 20th Street NW, 21st Street NW, and 22nd Street NW within the project area would operate at LOS C or better, except for the following intersections:

- 22nd Street NW/Florida Avenue NW at Massachusetts Avenue NW (**LOS D**)
- 22nd Street NW at L Street NW/New Hampshire Avenue NW (**LOS E**)
- Florida Avenue NW at Connecticut Avenue NW (**LOS D**)

The following intersections would operate at LOS D or worse during the PM peak:

- 20th Street NW at Constitution Avenue NW (**LOS D**)
- 21st Street NW at New Hampshire Avenue NW (**LOS D**)
- 21st Street NW at Constitution Avenue NW (**LOS F**)
- 22nd Street NW at Constitution Avenue NW (**LOS D**)
- 22nd Street NW at L Street NW/New Hampshire Avenue NW (**LOS F**)
- 22nd Street NW at Q Street NW (**LOS D**)
- 22nd Street NW/Florida Avenue NW at Massachusetts Avenue NW (**LOS E**)

20th Street NW 2040 Build

Under Future 2040 20th Street Build conditions, signal timings were optimized to minimize the impacts of the proposed PBLs on traffic operations within the study area. During the AM peak, all intersections along 20th Street NW would operate at LOS C or better, except for the intersection of 20th Street NW at G Street NW, which would operate at LOS E. During the PM peak, all intersections along 20th Street NW would operate at LOS C or better, except for the intersection of 20th Street NW at E Street NW, which would operate at LOS D.

21st Street NW 2040 Build

Under Future 2040 21st Street Build conditions, signal timings were optimized to minimize the impacts of the proposed PBLs on traffic operations within the study area. During the AM peak, all intersections along 21st Street NW would operate at LOS C or better, except for the following intersections:

- 21st Street NW at Constitution Avenue NW (LOS D)
- 21st Street NW at C Street NW (LOS D)
- 21st Street NW at Pennsylvania Avenue NW (LOS D)
- Pennsylvania Avenue NW at I Street NW (LOS D)
- 21st Street NW at New Hampshire Avenue NW (LOS F)

The following intersections would operate at LOS D or worse during the PM peak:

- 21st Street NW at Constitution Avenue NW (LOS F)
- 21st Street NW at C Street NW (LOS F)
- 21st Street NW at H Street NW (LOS D)
- 21st Street NW at I Street NW (LOS D)
- 21st Street NW at K Street NW (LOS D)
- 21st Street NW at New Hampshire Avenue NW (LOS F)

22nd Street NW 2040 Build

Under Future 2040 22nd Street Build conditions, signal timings were optimized to minimize the impacts of the proposed PBLs on traffic operations within the study area. During the AM peak, all intersections along 22nd Street NW would operate at LOS C or better, except for the following intersections:

- 22nd Street NW at L Street NW/New Hampshire Avenue NW (LOS F)
- 22nd Street NW at Q Street NW (LOS D)
- 22nd Street NW/Florida Avenue NW (LOS D)

During the PM peak, all intersections along 20th Street NW would operate at LOS C or better, except for the following intersections:

- 22nd Street NW at L Street NW/New Hampshire Avenue NW (LOS F)
- 22nd Street NW at Q Street NW (LOS F)
- 22nd Street NW/Florida Avenue NW at Massachusetts Avenue NW (LOS F)

A summary of the traffic impact of each of the three PBL alternatives is included in the feasibility report measures of effectiveness (MOE) table prepared by FPDC.

II. SAFETY ANALYSIS

A safety analysis of 20th Street NW, 21st Street NW, and 22nd Street NW was conducted to identify any crash patterns in addition to any serious potential safety issues within the project area. Crash report data obtained from DDOT was used to summarize crashes along the three corridors. The crash data included information on crash type, the number of vehicles involved in the crash, the date and time of the crash, potential crash contributing factors, and weather conditions. The crash data spanned from January 1, 2015 to December 31, 2017. **Table 2**, **Table 3**, and **Table 4** provide summaries of the number of crashes by intersection along 20th Street NW, 21st Street NW and 22nd Street NW, respectively. The tables also show how many bicyclists, if any, were involved in crashes at each intersection along each corridor. This analysis was used to show how protected bike lanes might improve safety for cyclists, and how the repurposing of lanes and adjustment of signal phasing to

accommodate PBLs might affect vehicle-related crashes due to increased delays and longer queues along the proposed PBL corridors. The following list summarizes the results of the crash analysis:

20th Street NW:

- 36% of the crashes were side-swipe crashes
- 30% of the crashes occurred during peak hours
- 72% of the crashes occurred under clear weather conditions
- 82% of the crashes occurred on dry pavement conditions
- 81% of the crashes were property damage only (PDO) crashes
- 66% of the crashes occurred under daylight conditions
- Crashes increased between 2015 and 2017 by 8%
- No fatal crashes occurred on 20th Street between 2015 and 2017
- The number of injury crashes decreased by 19% between 2015 and 2017
- The number of pedestrian-related crashes decreased between 2015 and 2017 by 18%

Table 2 – Number of Crashes per Intersection along 20th Street NW, 2015-2017

Intersection	Number of Crashes	Number of Pedestrians involved	Number of Bicyclists Involved
Connecticut Avenue NW	4	1	0
Q Street NW	10	1	0
Massachusetts Avenue NW	32	4	0
P Street NW	25	1	3
O Street NW	15	0	1
New Hampshire Avenue NW	19	0	3
N Street NW	11	2	1
M Street NW	26	1	1
L Street NW	31	0	4
K Street NW	64	5	1
I Street North NW	18	0	0
Pennsylvania Avenue NW	33	2	0
I Street South NW	33	2	0
H Street NW	12	3	0
G Street NW	8	1	0
F Street NW	11	0	1
E Street (North) NW	27	4	0
E Street (South) NW	11	1	0
Virginia Avenue NW	6	0	0
Total	396	28	15

21st Street NW:

- 31% of the crashes were side-swipe crashes
- 28% of the crashes occurred during peak hours
- 75% of the crashes took place under dry weather conditions
- 69% of the crashes occurred during daylight hours
- 76% of the crashes were property damage only (PDO) collisions, and 24% resulted in injuries
- One (1) fatal crash occurred along 21st Street NW between 2015 and 2017

Table 3 – Number of Crashes per Intersection along 21st Street NW, 2015-2017

Intersection	Number of Crashes	Number of Pedestrians Involved	Number of Bicyclists Involved
Florida Avenue (21st) NW	8	1	0
R Street NW	6	1	1
Q Street NW	6	1	0
Massachusetts Avenue NW	13	2	0
P Street NW	37	1	0
O Street NW	8	0	0
N Street NW	10	0	2
New Hampshire Avenue NW	5	0	1
M Street NW	25	3	3
L Street NW	36	5	1
K Street NW	63	2	4
I St NW/ Pennsylvania Avenue NW	43	2	1
I Street (South) NW	11	3	0
H Street NW	16	1	0
G Street NW	7	1	0
F Street NW	8	4	0
E Street NW	15	1	0
Virginia Avenue NW	8	1	0
C Street NW	3	0	0
Constitution Avenue NW	3	0	0
Total	331	29	13

22nd Street NW:

- 37% of the crashes were side-swipe crashes, while 45% of the total crashes were of unspecified nature
- 31% of the crashes occurred during AM or PM peak hours
- 73% of the crashes took place under dry weather conditions
- 69% of the crashes occurred during daylight hours
- 82% of the crashes were property damage only (PDO) collisions and the remaining 18% resulted in injuries
- There were no fatal crashes reported during the 3-year study period.

Table 4 – Number of Crashes per Intersection along 22nd Street NW, 2015-2017

Intersection	Number of Crashes	Number of Pedestrians Involved	Number of Bicyclists Involved
Virginia Avenue NW	8	1	0
F Street NW	4	1	0
G Street NW	10	1	1
H Street NW	13	1	1
I Street NW	15	4	0
Pennsylvania Avenue NW	50	0	1
K Street NW	9	0	0
L St NW/New Hampshire Avenue NW	38	0	3
M Street NW	57	4	0
N Street NW	17	2	0
O Street NW	16	0	0
P Street NW	38	0	3
Q Street NW	16	0	3
Massachusetts Avenue NW	29	0	3
Total	320	14	15

III. PARKING ANALYSIS

RK&K completed a parking demand analysis along 20th Street NW, 21st Street NW, and 22nd Street NW. Parking meter transaction data provided by DDOT. RK&K used data covering the period between January 1st, 2017 and March 31st, 2017 to complete the parking analysis. RK&K developed a script to determine parking demand along each of the three corridors. The script determined the total number of active parking meter transactions on each block of the three corridors on a 5-min basis. The script also determined one week with the highest parking demand at each block along each of the three corridors. The ratio of active parking transactions to the available parking capacity describes the level of parking demand at each block. This parking analysis is limited by the quality and granularity of the parking meter transaction data. Therefore, the results should be treated as estimates of parking demand. Parking transaction data was compared to the available parking storage capacity during the following weekday time periods:

- Morning: 6:00 AM – 9:00 AM
- Midday: 10:00 AM – 1:00 PM
- Evening: 4:00 PM – 7:00 PM

Table 5, **Table 6**, and **Table 7** provide a summary of the parking analysis during the three time periods along each block and each side of 20th Street NW, 21st Street NW, and 22nd Street NW, respectively. This analysis was used to determine the potential effect repurposing the curb (parking) lane for a protected bike lane might have on parking supply, especially in areas of moderate to high parking demand.

Table 5 – Parking Demand on 20th Street NW

Parking Demand	Morning (6AM-9AM)	Midday (10AM-1PM)	Evening (4PM-7PM)
Moderate Parking Demand (40%-60%)	<ul style="list-style-type: none"> • 1400 Block East 	<ul style="list-style-type: none"> • 1600 Block • 1300 Block 	<ul style="list-style-type: none"> • 1300 Block East
Moderate to Heavy Parking Demand (60%-80%)	<ul style="list-style-type: none"> • 1300 Block West • 1200 Block West • 900 Block East 	<ul style="list-style-type: none"> • 1400 Block • 1200 Block • 1100 Block • 1000 Block • 900 Block • 800 Block • 700 Block • 600 Block • 500 Block 	<ul style="list-style-type: none"> • 1200 Block West • 900 Block East

Table 6 – Parking Demand on 21st Street NW

Parking Demand	Morning (6AM-9AM)	Midday (10AM-1PM)	Evening (4PM-7PM)
Moderate Parking Demand (40%-60%)	<ul style="list-style-type: none"> • 1600 Block • 1500 Block 		
Moderate to Heavy Parking Demand (60%-80%)	<ul style="list-style-type: none"> • 1700 Block • 800 Block East • 600 Block • 500 Block • 400 Block West 	<ul style="list-style-type: none"> • 1700 Block • 1500 Block • 400 Block 	<ul style="list-style-type: none"> • 1700 Block • 1600 Block • 1500 Block • 800 Block East • 400 Block West
Heavy Parking Demand (>80%)	<ul style="list-style-type: none"> • 1400 Block • 1300 Block • 1200 Block • 900 Block East 	<ul style="list-style-type: none"> • 1600 Block • 1400 Block • 1300 Block • 1200 Block • 900 Block • 800 Block • 700 Block • 600 Block • 500 Block 	<ul style="list-style-type: none"> • 1400 Block • 1300 Block • 1200 Block • 900 Block East • 600 Block East • 500 Block East

Table 7 – Parking Demand on 22nd Street NW

Parking Demand	Morning (6AM-9AM)	Midday (10AM-1PM)	Evening (4PM-7PM)
Moderate Parking Demand (40%-60%)	<ul style="list-style-type: none"> • 1400 Block East 	<ul style="list-style-type: none"> • 1700 Block • 1500 Block • 400 Block 	
Moderate to Heavy Parking Demand (60%-80%)	<ul style="list-style-type: none"> • 1500 Block • 900 Block • 800 Block • 700 Block • 600 Block • 500 Block 	<ul style="list-style-type: none"> • 1400 Block • 1300 Block 	<ul style="list-style-type: none"> • 600 Block
Heavy Parking Demand (>80%)		<ul style="list-style-type: none"> • 1500 Block • 1000 Block • 900 Block • 800 Block • 700 Block • 600 Block • 500 Block 	<ul style="list-style-type: none"> • 800 Block • 700 Block • 500 Block East

Appendix A

LOS Results - AM Peak

Intersection	Level of Service																								
	Eastbound					Westbound					Northbound					Southbound					Intersection Delay				
	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build
20th St NW & E St NW	N/A	N/A	N/A	N/A	N/A	C	C	C	C	D	B	B	B	B	B	N/A	N/A	N/A	N/A	N/A	B	B	B	B	C
20th St NW & F St NW	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A
20th St NW & G St NW	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	A	A	A	A	E	N/A	N/A	N/A	N/A	N/A	A	A	A	A	E
20th St NW & H St NW	C	D	D	C	E	B	B	B	B	B	A	A	A	A	B	N/A	N/A	N/A	N/A	N/A	A	B	B	A	B
20th St NW & Pennsylvania Ave NW	B	B	B	C	C	B	B	B	B	C	B	B	B	B	C	N/A	N/A	N/A	N/A	N/A	B	B	B	C	C
20th St NW & I St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	A	A	A	A	C	N/A	N/A	N/A	N/A	N/A	A	A	A	A	C
20th St NW & K St NW	A	A	A	A	B	B	B	B	B	C	B	B	B	B	B	N/A	N/A	N/A	N/A	N/A	B	B	B	A	B
20th St NW & L St NW	B	B	B	A	B	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	N/A	N/A	N/A	N/A	N/A	B	B	B	A	B
20th St NW & M St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	C	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
20th St NW & N St NW	N/A	N/A	N/A	N/A	N/A	A	A	A	A	B	A	A	A	A	B	N/A	N/A	N/A	N/A	N/A	A	A	A	A	B
20th St NW & New Hampshire Ave NW & Sunderland Pl NW	C	C	B	D	C	C	C	C	C	C	A	A	B	A	C	B	A	C	A	C	B	B	B	A	C
20th St NW & P St NW	A	A	A	A	C	B	B	B	B	C	B	B	B	B	B	A	A	A	A	A	B	B	A	B	B
20th St NW & Massachusetts Ave NW	A	A	A	A	B	B	B	B	B	C	A	A	A	A	C	C	C	C	C	D	B	B	B	B	C
20th St NW & Q St NW	C	C	C	C	F	N/A	N/A	N/A	N/A	N/A	A	B	B	A	A	B	B	B	B	A	B	B	B	B	C
21st St NW & Constitution Ave NW	A	A	A	E	A	B	B	B	A	B	N/A	N/A	N/A	N/A	N/A	C	C	B	E	C	A	B	B	D	B
21st St NW & C St NW	C	C	C	C	C	C	C	C	D	C	A	A	A	B	A	A	A	A	D	A	A	A	A	D	A
21st St NW & Virginia Ave NW	A	A	A	B	A	B	B	B	C	B	N/A	N/A	N/A	N/A	N/A	A	A	A	C	B	A	B	A	B	B
21st St NW & E St NW	N/A	N/A	N/A	N/A	N/A	A	A	A	A	C	N/A	N/A	N/A	N/A	N/A	C	C	C	B	C	B	B	B	A	C
21st St NW & F St NW	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	A	A	A
21st St NW & G St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	A	A
21st St NW & H St NW	B	B	B	B	B	A	A	A	B	B	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	B	A
21st St NW & I St NW *	N/A	C	B	A	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	B	B	A	A	A	B	B	B	B
Pennsylvania Ave NW & I St NW	A	A	A	N/A	A	B	B	B	D	E	N/A	N/A	N/A	N/A	N/A	N/A	C	C	F	C	B	B	B	D	B
21st St NW & Pennsylvania Ave NW	C	C	B	D	C	A	A	A	C	B	N/A	N/A	N/A	N/A	N/A	D	D	D	D	D	C	C	C	D	C
21st St NW & K St NW	B	B	B	D	B	A	A	A	C	A	N/A	N/A	N/A	N/A	N/A	B	B	B	C	B	B	B	B	C	B
21st St NW & L St NW	A	A	A	C	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	B	B	B	C	B
21st St NW & M St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	A	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	B	B	B	C	B
21st St NW & New Hampshire Ave	B	B	B	D	B	C	C	C	F	B	N/A	N/A	N/A	N/A	N/A	C	C	C	F	C	C	C	C	F	C
21st St NW & P St NW	B	B	A	B	B	B	B	B	B	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	B	B	B	B	B
21st St NW & Massachusetts Ave	A	A	A	A	A	B	C	C	C	B	N/A	N/A	N/A	N/A	N/A	D	D	D	C	D	B	B	B	B	B
Florida Ave NW & 21st St NW & S St NW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	C	C	A	C	A	A	A	A	A	A	B	B	A	B
22nd St NW & F St NW	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	A	A	A	B	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & G St NW	N/A	N/A	N/A	N/A	N/A	C	C	B	C	C	B	B	A	A	B	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & I St NW	D	D	C	D	D	A	A	B	B	A	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C
22nd St NW & Pennsylvania Ave NW	A	A	B	A	A	C	C	A	C	C	C	B	C	C	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	
22nd St NW & K St EB	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	B	B	A	B	B	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A
22nd St NW & K St WB	N/A	N/A	N/A	N/A	N/A	C	C	B	C	C	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	B	B	A	B	B
22nd St NW & L St NW & New Hampshire Ave NW	D	D	F	D	D	E	F	F	F	F	D	D	E	D	D	F	F	F	F	F	E	E	F	E	E
22nd St NW & M St NW	N/A	N/A	N/A	N/A	N/A	B	B	A	A	B	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & N St NW	D	D	C	D	D	D	D	D	D	D	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & P St NW	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C
22nd St NW & Q St NW	C	C	D	C	C	N/A	N/A	N/A	N/A	N/A	B	B	E	B	B	A	A	C	A	A	B	B	D	B	B
22nd St/Florida Ave & Massachusetts Ave	D	D	C	D	D	E	F	B	F	F	D	D	D	D	D	D	D	F	C	D	D	D	D	D	D
Florida Ave NW & R St NW	N/A	N/A	N/A	N/A	N/A	D	D	D	C	D	A	A	A	A	A	A	A	A	B	A	B	B	B	B	B
Florida Ave NW & Phelps Pl NW	D	D	D	C	D	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	B	A	A	A	A	A	A
Florida Ave NW & Connecticut Ave NW	A	A	A	A	A	F	F	F	F	F	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
Massachusetts Ave NW & Q St NW	D	D	D	D	D	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	A	A	A	A	A	B	B	B	B	B
New Hampshire Ave NW & N St NW	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	A	A	A	C	A	A	A	A	A	A	A	B	A	B	A
New Hampshire Ave & M St NW	N/A	N/A	N/A	N/A	N/A	A	A	B	C	A	C	E	B	B	E	C	D	B	A	C	B	C	B	B	C
Virginia Ave NW & E St NW	N/A	N/A	N/A	N/A	N/A	B	B	A	B	B	A	A	B	A	A	B	B	C	B	B	B	B	B	B	B
20th St NW & Constitution Ave NW	A	A	A	C	A	A	A	A	A	A	E	F	F	C	F	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C
Henry Bacon Dr NW & Constitution Ave NW	B	B	B	B	B	D	D	D	D	D	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	C	C	C	C	C
22nd St NW & Constitution Ave NW	A	A	A	A	A	B	B	B	B	B	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	A	A	A	A	A

Legend:

- Southwestbound
- Northeastbound
- Southeastbound
- Northwestbound

Build Alternative PBLs are located along the highlighted street(s)

F Level of Service F
E Level of Service E

* 21st St NW and I St NW is an unsignalized intersection under existing conditions but will become signalized by year 2040

LOS Results - PM Peak

Intersection	Level of Service																								
	Eastbound					Westbound					Northbound					Southbound					Intersection Delay				
	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build	Existing 2018	2040 No Build	22nd Street 2040 Build	21st Street 2040 Build	20th Street 2040 Build
20th St NW & E St NW	N/A	N/A	N/A	N/A	N/A	B	C	C	C	D	C	C	C	C	E	N/A	N/A	N/A	N/A	N/A	C	C	C	C	D
20th St NW & F St NW	B	B	B	C	B	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A
20th St NW & G St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	C	A	A	A	A	B	N/A	N/A	N/A	N/A	N/A	B	B	B	B	C
20th St NW & H St NW	C	C	C	C	C	B	B	B	B	B	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
20th St NW & Pennsylvania Ave NW	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	N/A	N/A	N/A	N/A	N/A	C	C	C	C	B
20th St NW & I St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	B	B	B	B	C	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
20th St NW & K St NW	A	A	A	A	B	B	B	B	B	C	A	A	A	A	C	N/A	N/A	N/A	N/A	N/A	B	B	B	B	C
20th St NW & L St NW	B	B	B	A	B	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
20th St NW & M St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	C	B	B	B	B	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
20th St NW & N St NW	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	A	A	A	A	B	N/A	N/A	N/A	N/A	N/A	A	A	A	A	C
20th St NW & New Hampshire Ave NW & Sunderland Pl NW	A	B	B	B	D	C	C	C	C	C	B	B	B	B	C	B	B	B	B	C	B	B	B	B	C
20th St NW & P St NW	B	B	B	B	C	C	C	C	C	D	B	B	B	B	B	A	A	A	A	A	B	B	B	B	B
20th St NW & Massachusetts Ave NW	B	B	B	A	B	B	B	B	B	C	B	B	B	B	D	D	D	D	D	D	B	B	B	B	C
20th St NW & Q St NW	D	D	D	D	D	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	A	A	C	C	C	C	B
21st St NW & Constitution Ave NW	B	B	B	B	B	F	F	F	F	F	N/A	N/A	N/A	N/A	N/A	F	F	F	F	F	F	F	F	F	F
21st St NW & C St NW	C	C	C	C	C	C	C	C	D	C	N/A	N/A	N/A	C	N/A	A	A	A	F	A	A	A	A	F	A
21st St NW & Virginia Ave NW	A	A	A	C	A	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	B	A	A	B	A	B	B	B	C	B
21st St NW & E St NW	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	B	N/A	N/A	N/A	N/A	B	B	B	B	B	B	B	B	B	B
21st St NW & F St NW	A	A	A	B	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	C	A	A	A	A	C	A
21st St NW & G St NW	N/A	N/A	N/A	N/A	N/A	A	B	B	B	A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	A	A
21st St NW & H St NW	B	B	B	B	B	B	B	B	B	B	N/A	N/A	N/A	N/A	N/A	A	A	A	D	A	A	A	A	D	B
21st St NW & I St NW *	A	B	B	A	A	A	N/A	N/A	N/A	N/A	A	N/A	N/A	N/A	N/A	A	A	A	B	A	A	A	A	B	A
Pennsylvania Ave NW & I St NW	A	A	A	A	A	D	D	D	C	B	N/A	N/A	N/A	N/A	N/A	B	C	C	F	B	B	B	B	D	A
21st St NW & Pennsylvania Ave NW	C	C	C	C	C	A	A	A	B	A	N/A	N/A	N/A	N/A	N/A	B	B	B	C	B	B	B	B	C	B
21st St NW & K St NW	B	B	B	C	B	B	B	B	C	A	N/A	N/A	N/A	N/A	N/A	B	B	B	E	B	B	B	B	D	A
21st St NW & L St NW	B	B	B	C	B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	C	B	B	B	C
21st St NW & M St NW	N/A	N/A	N/A	N/A	N/A	A	A	A	B	A	N/A	N/A	N/A	N/A	N/A	D	E	E	F	D	C	C	C	C	B
21st St NW & New Hampshire Ave	A	A	B	C	A	D	E	E	F	E	N/A	N/A	N/A	N/A	N/A	D	D	D	D	D	C	D	D	F	D
21st St NW & P St NW	B	B	B	C	B	B	B	B	C	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	B	B	B	C	B
21st St NW & Massachusetts Ave	A	A	A	A	A	C	C	C	B	B	N/A	N/A	N/A	N/A	N/A	D	D	D	D	D	B	B	B	B	B
Florida Ave NW & 21st St NW & S St NW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
22nd St NW & F St NW	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A
22nd St NW & G St NW	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & I St NW	D	D	C	D	D	C	D	C	C	C	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C
22nd St NW & Pennsylvania Ave NW	A	A	B	A	A	C	C	B	C	C	C	C	C	C	N/A	N/A	N/A	N/A	N/A	C	C	B	C	C	
22nd St NW & K St EB	B	B	A	B	B	N/A	N/A	N/A	N/A	N/A	B	B	C	B	B	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & K St WB	N/A	N/A	N/A	N/A	N/A	D	D	B	D	D	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	C	C	B	C	C
22nd St NW & L St NW & New Hampshire Ave NW	F	F	F	F	F	D	D	E	D	D	C	C	D	C	C	D	D	F	D	D	F	F	F	F	F
22nd St NW & M St NW	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	B	B	B	B	N/A	N/A	N/A	N/A	N/A	N/A	B	B	B	B	B
22nd St NW & N St NW	D	D	D	D	D	D	D	D	E	E	A	A	B	A	A	N/A	N/A	N/A	N/A	C	C	C	C	C	
22nd St NW & P St NW	C	D	D	D	D	D	D	D	C	D	B	B	C	B	B	N/A	N/A	N/A	N/A	C	C	C	C	C	
22nd St NW & Q St NW	C	C	D	C	C	N/A	N/A	N/A	N/A	N/A	E	E	F	E	E	A	A	E	A	A	D	D	F	D	D
22nd St/Florida Ave & Massachusetts Ave	E	E	C	E	E	D	D	A	D	D	D	D	F	D	D	D	E	F	E	E	D	E	F	E	E
Florida Ave NW & R St NW	N/A	N/A	N/A	N/A	N/A	D	D	D	D	D	B	B	A	B	B	A	A	A	A	A	B	B	A	B	B
Florida Ave NW & Phelps Pl NW	D	D	D	D	D	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Florida Ave NW & Connecticut Ave NW	C	C	C	C	C	C	C	C	C	C	B	B	B	B	B	C	C	C	C	C	C	C	C	C	C
Massachusetts Ave NW & Q St NW	C	C	C	D	C	N/A	N/A	N/A	N/A	N/A	A	A	A	C	B	A	A	A	A	A	B	B	B	C	B
New Hampshire Ave NW & N St NW	N/A	N/A	N/A	N/A	N/A	C	C	C	C	D	A	A	A	B	A	B	B	B	B	C	B	B	B	B	C
New Hampshire Ave & M St NW	N/A	N/A	N/A	N/A	N/A	A	B	C	B	A	D	D	C	C	D	C	D	C	B	D	B	B	C	B	B
Virginia Ave NW & E St NW	N/A	N/A	N/A	N/A	N/A	A	B	B	B	A	B	B	B	A	B	C	C	C	C	C	B	B	B	B	B
Henry Bacon Dr NW & Constitution Ave NW	D	E	E	E	E	B	C	C	C	C	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	C	C	C	D	C
22nd St NW & Constitution Ave NW	A	A	A	A	A	D	E	E	E	E	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	C	D	D	D	D
20TH ST NW & Constitution Ave NW	A	A	A	A	A	D	E	E	E	E	N/A	N/A	N/A	N/A	N/A	C	C	C	C	C	C	D	D	D	D

Legend:

- Southwestbound (Yellow)
- Northeastbound (Orange)
- Southeastbound (Blue)
- Northwestbound (Green)

Build Alternative PBLs are located along the highlighted street(s)

F

E

* 21st St NW and I St NW is an unsignalized intersection under existing conditions but will become signalized by year 2040