

- *Shared lane markings* have been added to New Hampshire Avenue for cyclists traveling in the same direction as vehicular traffic (as shown in Figure 1 and Figure 2B). The shared lane markings help improve cyclist positioning in the roadway and inform drivers of the potential presence of bicycles.
- *Contra-flow bicycle lanes* are provided on New Hampshire Avenue for bicyclists traveling in the opposite direction as the vehicular traffic (as shown in Figure 1 and Figure 2C). The contra-flow bicycle lanes legalize the movement of cyclists in the opposite direction of motor vehicle traffic on New Hampshire Avenue and notify drivers of the likely presence of cyclists.

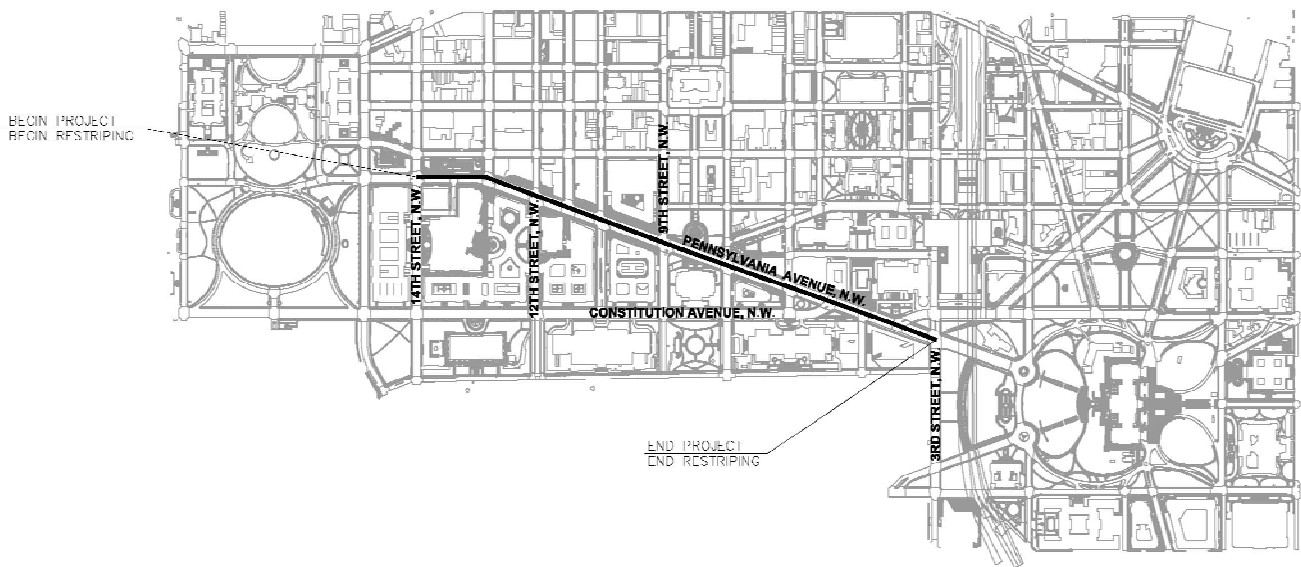
Pennsylvania Avenue NW from 3rd Street NW to 15th Street NW

DDOT installed bicycle lanes in the center median of Pennsylvania Avenue from 3rd Street to 15th Street in June 2010. The lanes have no physical separation from general traffic apart from flexible bollards located near intersections. For this analysis, the corridor was divided into two study segments: (1) 6th Street to 10th Street and (2) 10th Street to 15th Street. Figure 3A shows the Pennsylvania Avenue project limits.

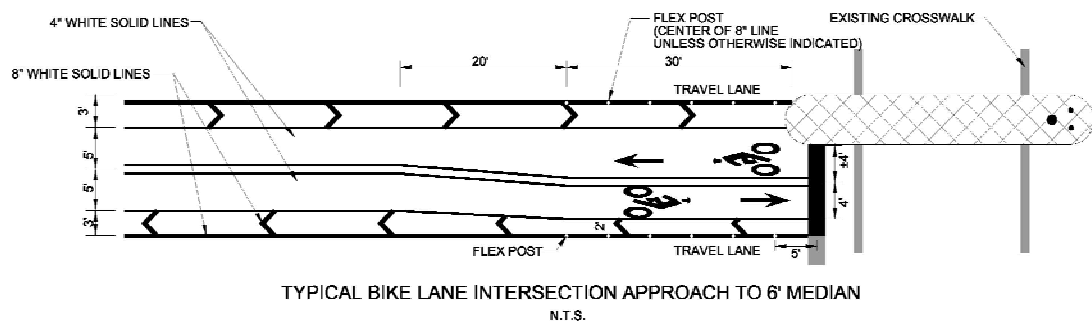
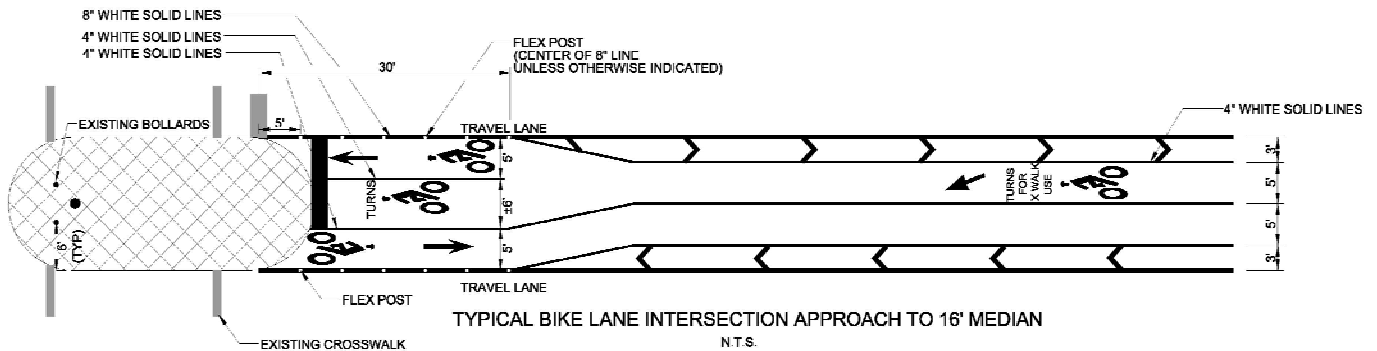
This section of Pennsylvania Avenue connects the White House on the west to the Capitol on the east. It is both a high-volume street and an important bicycle connection through the downtown core. Prior to the bicycle lane installation, this section of Pennsylvania Avenue generally had an eight-lane cross-section and was used by 1,800 vehicles during the weekday peak hour. This lane configuration, combined with the high volume of vehicular traffic, made it difficult for most bicyclists to comfortably travel along Pennsylvania Avenue.

To improve cyclist mobility, DDOT installed five-foot bicycle lanes in each direction with three-foot buffers on either side within the roadway's center median. Figure 3B shows the typical pavement marking details for the bicycle lanes, buffers, and intersection bicycle approaches. Figure 4A shows a picture of the constructed median bicycle lanes and buffers.

A flush median is provided at intersections to accommodate bicyclists and pedestrians. Bicyclists wait behind the median in the bicycle lanes during red signal phases. The approaching bicycle lane splits at intersections to provide a bicycle turn lane and a bicycle through lane. The turn lane uses the six feet that are allocated to bike lane buffers at mid-block locations and places turning bicyclists between the through cyclists in each direction. The through cyclists are controlled by a traffic signal for through motorists on Pennsylvania Avenue, while turning bicyclists are expected to act as pedestrians and use the crosswalks. Figure 4B is a picture of the bicycle signs for turning and through bicyclists at an intersection, and Figure 4C is a picture of the bicycle lane approaches at an intersection.



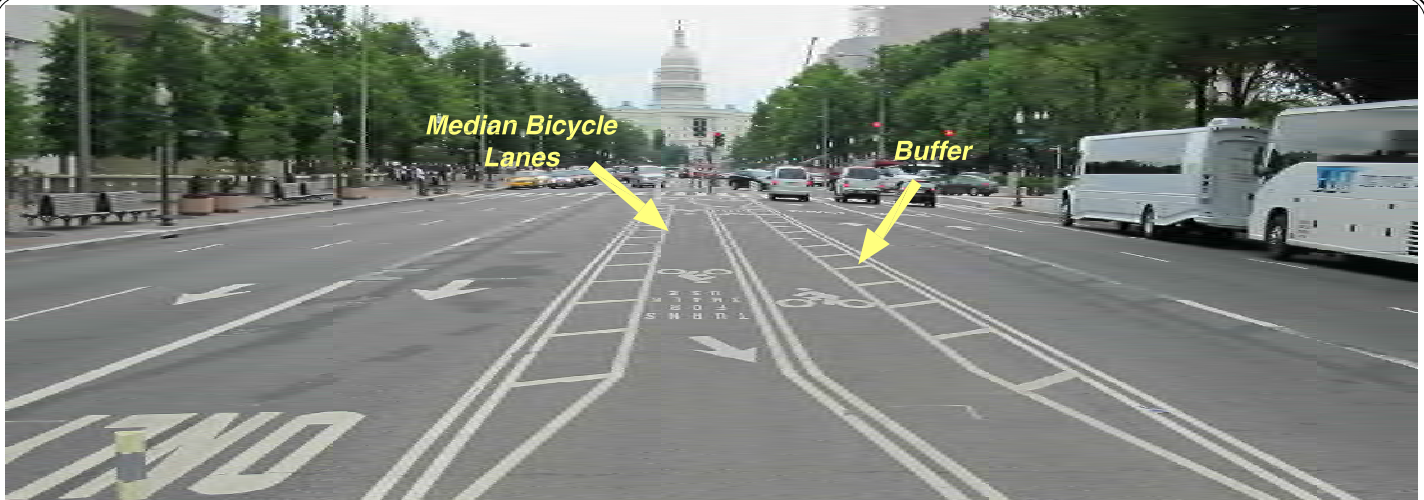
PENNSYLVANIA AVENUE PROJECT LIMITS **FIGURE 3A**



PAVEMENT MARKING DETAILS **FIGURE 3B**

PENNSYLVANIA AVENUE NW FROM 3RD STREET NW TO 15TH STREET NW
BICYCLE FACILITY PROJECT LIMITS AND DETAILS
WASHINGTON, DISTRICT OF COLUMBIA

FIGURE 3



LOOKING EAST FROM THE 6TH STREET INTERSECTION **FIGURE 4A**



WESTBOUND SIGNALS AND SIGNAGE AT THE 9TH STREET INTERSECTION **FIGURE 4B**



WESTBOUND 6TH STREET INTERSECTION STRIPING **FIGURE 4C**

PENNSYLVANIA AVENUE NW FROM 3RD STREET NW TO 15TH STREET NW
BICYCLE FACILITY DETAILS
WASHINGTON, DISTRICT OF COLUMBIA

FIGURE 4

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Figure 5A and Figure 5B display the typical lane configurations and cross-sections for Pennsylvania Avenue between 6th Street and 10th Street, while Figure 5C and Figure 5D display the typical lane configurations and cross-sections between 10th Street and 15th Street. The cross-section varies along Pennsylvania Avenue, so the figures portray the typical cross-section found along the segment of interest.

The following primary changes were made to the Pennsylvania Avenue corridor:

- *Bicycle lanes* were constructed in the center median of the roadway with buffers on either side (as shown in Figure 4A, Figure 5A, and Figure 5C). The bicycle lanes are meant to provide added safety and comfort for bicyclists traveling along Pennsylvania Avenue.
- *Bicycle signs* were added for turning and through cyclists in the traversable median (as shown in Figure 4B).
- *Left-turn and U-turn restrictions* were instituted to reduce potential conflicts between cyclists and turning vehicles at locations where left-turns had previously been permitted. New restrictions were added at 3rd Street and 15th Street, while intersections with existing restrictions and missing signs (including 4th Street, 6th Street, 7th Street, 9th Street, 10th Street, and 14th Street) had new signs posted.
- *Signal timing changes* were made at intersections on Pennsylvania Avenue that provided protected left-turns. The new signal timing separates the left-turn phase from the adjacent through phase (e.g., the westbound through movement receives a red signal indication whenever the westbound left movement receives a green indication). This is because the same signal indication controls both through bicyclists and through motorists (i.e., the same signal head controls both through bicyclists and through motorists), and a concurrent movement would place through bicyclists in conflict with left-turning motor vehicles.

15th Street NW from E Street NW/Pennsylvania Avenue NW to V Street NW

DDOT installed a cycle track (a separated two-way bicycle facility between the sidewalk and parked vehicles) on 15th Street from E Street/Pennsylvania Avenue to V Street. For this analysis, the corridor was divided into three study segments: (1) E Street/Pennsylvania Avenue to New York Avenue, (2) H Street to Massachusetts Avenue, and (3) Massachusetts Avenue to V Street. There is no cycle track on 15th Street between New York Avenue and H Street because cyclists are able to ride through a park section adjacent to the White House where private vehicular traffic is not permitted. Figure 6A shows the 15th Street project limits.