



INDEPENDENCE AVENUE SW

Corridor Study



June 2023



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PROJECT OVERVIEW



PROJECT OVERVIEW

Independence Avenue SW¹ is a prominent connection to many of the District's world-renowned landmarks, museums, and federal buildings, as shown in the 1901 McMillan Plan in Figure 1. The Avenue is vital in moving residents, workers, and visitors along the National Mall and throughout the District. The corridor will remain a key destination as a potential location for the proposed National Museum of the American Latino and the Smithsonian American Women's History Museum. Independence Avenue serves many roles for a variety of users; from a transportation perspective, the current configuration of Independence Avenue primarily functions to transport vehicles, trucks, buses, and other motorized modes of transportation. The lack of quality multimodal facilities creates uncomfortable conditions for people walking and biking along the corridor.

The Independence Avenue SW Corridor Study (Study) considers Independence Avenue from Raoul Wallenberg Place SW/15th Street SW (hereby referred to as 15th Street SW) to 3rd Street SW, as shown in Figure 2, and focuses on improving multimodal mobility, streetscape quality, and the pedestrian experience based on the existing and future needs along Independence Avenue. The National Capital Planning Commission (NCPC), the Smithsonian Institution (SI), and the District Department of Transportation (DDOT) initiated the Study through the Metropolitan Washington Council of Government's (MWCOC's) Transportation-Land Use Connections (TLC) Program to address multimodal challenges and develop a comprehensive vision for the Independence Avenue corridor. Kittelson & Associates, Inc. (Kittelson), in collaboration with T3 Design Corporation (T3), provided technical consultant support to NCPC, DDOT, and SI.

The goal of this Study is to help prioritize mobility needs for the corridor and inform and align senior leadership decision-making for future planning efforts.

PROJECT BACKGROUND

In addition to NCPC, SI, and DDOT, the Study brings together a variety of stakeholders, including the General Services Administration (GSA), the National Park Service (NPS), and the Architect of the Capitol (AOC). Each stakeholder has a unique connection and investment in the corridor and shares a united interest in improving the multimodal experience on Independence Avenue by providing an environment that builds off the already existing strong civic identity and character.

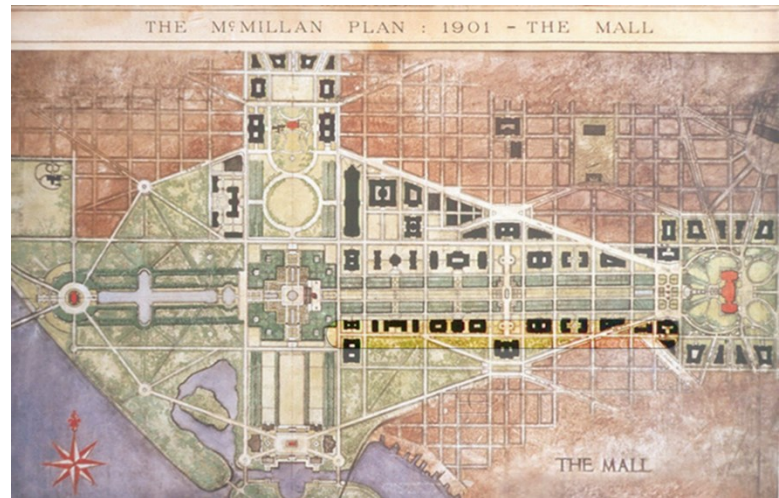


Figure 1. 1901 The McMillan Plan

The 1901 McMillan Plan displays a development plan for the National Mall. Modified using an excerpt from NCPC:

<https://web.archive.org/web/20100527181647/https://www.ncpc.gov/Images/Maps/McMillanPlan.%201901.jpg>

This study is the first step in redesigning Independence Avenue. This project reviewed the existing conditions and previous plans, challenges, and opportunities along the corridor and proposes three planning-level concepts to advance multimodal safety and comfort for all users. This report presents planning-level recommendations that will inform future studies, engineering design, public outreach, and the next steps for redesigning the avenue.

¹ All roadways are presumed to be in the District's Southwest (SW) quadrant unless otherwise noted

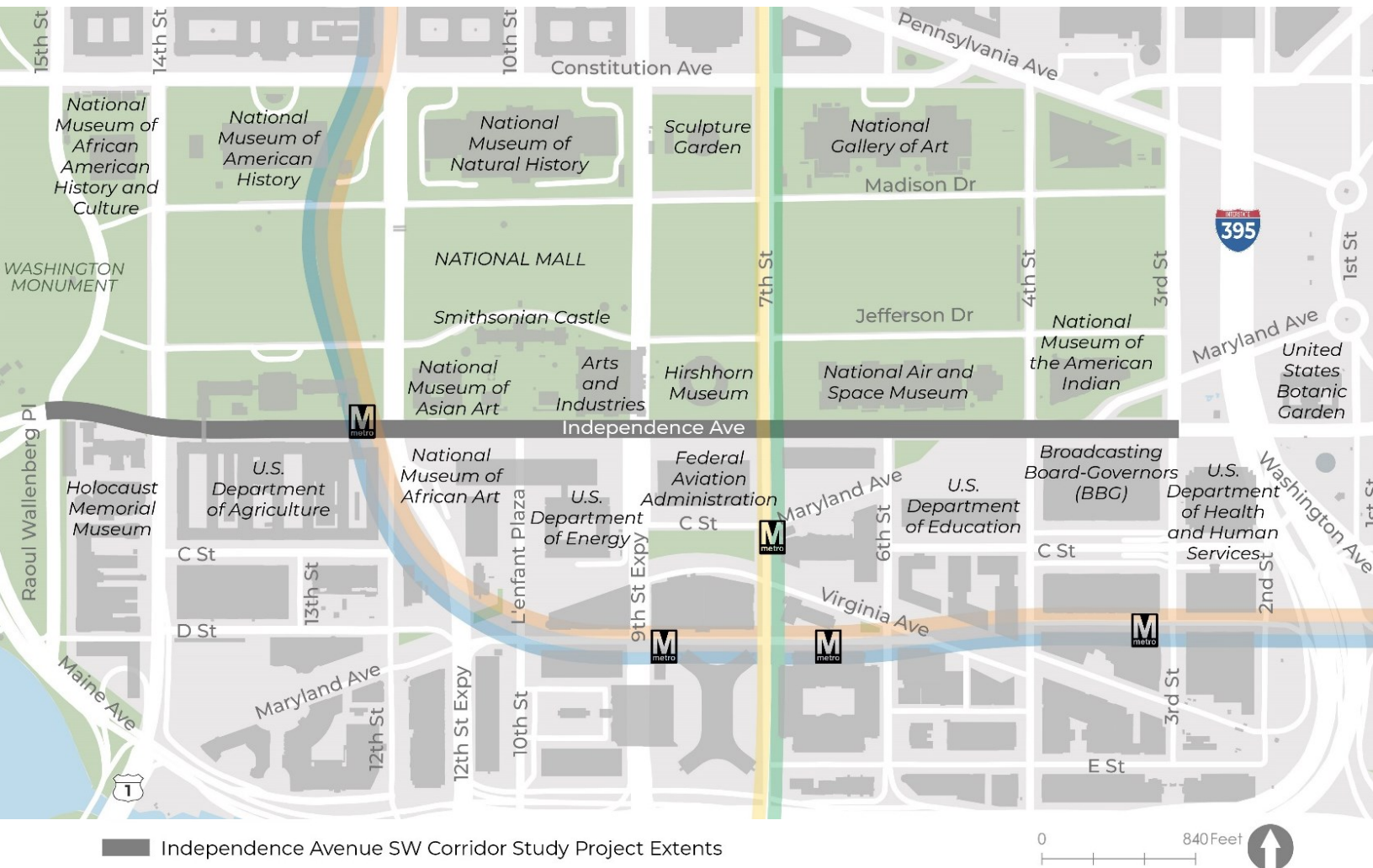


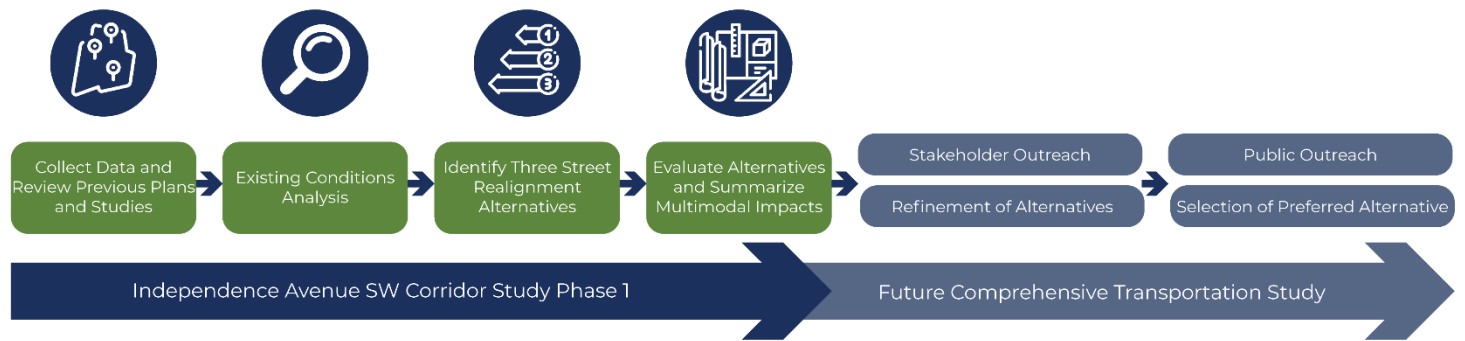
Figure 2. Study Area

Planning Process

The Independence Avenue SW Corridor Study includes several key tasks, including:

- / Collecting, reviewing, and summarizing existing data and previous plans and studies,
- / Evaluating existing conditions,
- / Identifying three street realignment concepts, and
- / Evaluating three concepts and quantifying multimodal impacts.

Figure 3 provides an overview of each of the Study's tasks. Following this planning study, the three concepts will be refined, and a preferred alternative will be advanced. Additional phases for this project effort will include public and stakeholder outreach, refinement of concepts, and the selection of a preferred concept to advance through future project phases, which could consist of an environmental review, funding identification, and design and construction.



Independence Avenue SW Corridor Study

Figure 3. Outline of the Study’s Planning Process

Project Objectives

The primary intended outcome of this Study is to identify near- and long-term transportation recommendations that consider the needs of all users of Independence Avenue SW and the surrounding land-use context. This includes access to and from activity generators like the National Mall and Smithsonian museums and the safety and mobility along the corridor for people walking, biking, accessing, and riding transit, and drivers.

Through conversations with NCPC, DDOT, and SI, along with feedback from additional project stakeholders during the study kick-off meeting, the project objectives shown in Figure 4 were identified.

Table 1 lists the project objectives, grouped into the following three focus areas:

1. Celebrated Boulevard
2. Safety and Comfort
3. Multimodality

Each objective is linked to performance measures, evaluation methods, and targets. To ensure that the concepts developed through this Study align with the vision and near- and long-term transportation needs of all users, each concept will be evaluated based on how well the targets are met for each project objective.



Figure 4. Project Objectives

Table 1. Project Objectives

Focus Area	Objective	Performance Measure	Evaluation Method/ Source	Target	
1. Celebrated Boulevard	Emphasize the avenue's unique character	Alignment with guiding plans	/ Review of plans and studies	/ Advance recommendations from historical plans and consider future multimodal demands	
	High-quality streetscape	Consistent and continuous streetscape elements and materials	/ Observations / Qualitative assessment / ADA Accessibility	/ Create an attractive multimodal and pedestrian-friendly corridor	
	Resiliency and Sustainability	Reduce impermeable surfaces		/ Percentage of impermeable surfaces	/ Increase stormwater functionality
		Additional "green infrastructure" and opportunities for trees and other plantings		/ Amount of space available for green infrastructure / Tree cover	/ Increase shade cover / Reduce the urban heat island effect / Increase biodiversity
	Improve multimodal safety	Pedestrian and bicycle crash risk		/ Crash reports / Exposure risk	/ Reduce crashes and crash risk
		Number of conflict points		/ Crossing lengths / Distance between crossings / Unprotected vehicle turning volumes	/ Minimize conflict points
Vehicles queue lengths blocking pedestrian crossings			/ Planning-level intersection traffic operations analysis	/ Minimize vehicles blocking multimodal facilities	
Pedestrian Level of Comfort (LOC)			/ Type and condition of pedestrian facilities / Pedestrian clear zone / ADA Accessibility / Change in pedestrian activity	/ Exceed maximum pedestrian LOC standards to provide an attractive, pedestrian-friendly corridor	
2. Safety and Comfort	Improve multimodal comfort and access	Bicycle Level of Traffic Stress (BLTS)	/ Roadway characteristics / Type and condition of bicycle facilities / Change in bicycle activity / Access to bikeshare	/ Exceed maximum BLTS standards on Independence Avenue or a nearby parallel route	
	Bus stop amenities		/ ADA Accessibility / Number and type of amenities	/ Ensure access to all bus stops are ADA compliant, and improve bus stop amenities	
	3. Multimodality	Reevaluate the function of the avenue and 'right-size' the roadway	Vehicle capacity Balance parking supply and demand	/ AADT / Number of lanes / Parking	/ Equitably accommodate all modes of transportation during typical weekdays, weekends, and special events / Incorporate Smithsonian museum and garden loading and service needs



**SUMMARY OF
EXISTING CONDITIONS**



SUMMARY OF EXISTING CONDITIONS

The first step in redesigning Independence Avenue consists of collecting data, reviewing existing conditions, and evaluating the current conditions on and near the corridor.

The study team analyzed the transportation facilities to identify existing infrastructure and understand existing conditions on Independence Avenue, which are summarized in this section and described in more detail in **Appendix A**. The existing conditions analysis combines both quantitative and qualitative data collection. The team participated in a field visit on December 16, 2022, and walked the corridor, reviewed the conditions of pedestrian facilities, observed curbside and pedestrian activity, and identified challenges and opportunities. Additionally, multimodal data was collected in November and December 2022 to understand weekday, weekend, and special event multimodal traffic and circulation patterns. The data collection was used to supplement additional traffic count data provided by DDOT during other times of the year.

PEDESTRIAN CONDITIONS

The pedestrian network on Independence Avenue SW is not sized appropriately for the existing pedestrian demands. The existing pedestrian infrastructure is continuous along the length of the corridor on both sides of the roadway. Still, it lacks amenities to support the many pedestrians traveling along the corridor. While some sections are crowded, especially where tour buses load and unload or museum lines spill over onto the sidewalk, in other sections, the corridor has wide sidewalks with minimal public life or pedestrian activity.



Figure 5. Food Trucks on Independence Avenue at the National Air and Space Museum

Kittelson and Associates



Figure 6. Tourists utilizing the entire width of the sidewalk near the Dwight D. Eisenhower Memorial

Kittelson and Associates

The current pedestrian environment on Independence Avenue includes the following concerns:

- / Sidewalk obstructions include bollards, signs, and street vendors along the corridor
- / A lack of street trees provides limited shade along the avenue
- / The sidewalk is located near travel lanes and has inconsistent widths and accessibility challenges that create difficulty for people walking on the corridor, particularly for museum visitors with mobility challenges, as shown in Figure 7
- / Limited street furniture along the corridor provides few opportunities for utilizing the corridor as a public space
- / Limited corridor wayfinding makes navigation challenging
- / Provide connections to existing landscaping and public spaces on museum and building properties

Crossing Independence Avenue also provides challenges, with long crossing distances across Independence Avenue with no refuge islands and long distances between crosswalks, with the longest stretch between 14th Street SW and 12th Street SW at approximately 950 feet, as shown in Figure 8.

Peak-hour pedestrian volumes were collected in November and December 2022 to understand weekday, weekend, and special event pedestrian patterns. Table 2 summarizes the intersections with the highest hourly pedestrian volumes along Independence Avenue during peak periods.



Figure 7. Narrow and Inconsistent Sidewalk Widths

Kittelson and Associates; Southeast corner of Independence Avenue and 15th Street SW

Table 2 2022 Hourly Peak Pedestrian Volumes along Independence Avenue

Peak Period	Two-Way Peak One-Hour Volume	Peak Intersection
AM Weekday Peak	272	Independence Avenue and 12th Street SW
Midday Weekday Peak	188	Independence Avenue and 12th Street SW
PM Weekday Peak	292	Independence Avenue and 12th Street SW
Saturday Peak	878	Independence Avenue and 4th Street SW
Special Event	350	Independence Avenue and 7th Street SW



Figure 8. Current Pedestrian Crossing Locations

BICYCLE CONDITIONS

Although Independence Avenue is identified in moveDC as a bicycle priority corridor, there are no existing bicycle infrastructure or Capital Bikeshare stations along the avenue from 15th Street SW to 3rd Street SW. There are adjacent bicycle facilities along Pennsylvania Avenue, and paths are provided through the National Mall. Nearby Jefferson Drive SW and Madison Drive NW provide lower-stress, lower-volume routes for bicyclists; however, they do not currently have dedicated bicycle facilities. Existing bicycle conditions are summarized below:

- / Several Capital bikeshare stations are located on streets adjacent to the study corridor, including Jefferson Drive SW, 12th Street SW, L'Enfant Plaza SW, C Street SW, and 4th Street SW.
- / The lack of bicycle facilities on Independence Avenue and its wide cross-section creates uncomfortable conditions for people biking.
- / Independence Avenue SW from 15th Street SW to 3rd Street SW is high-stress and uncomfortable for most people biking.
- / There is a high demand for micromobility (moveDC)
- / Bike racks and micromobility corrals are limited along the corridor and do not meet current usage demands

Peak-hour bicycle volumes were collected in November and December 2022 to understand weekday, weekend, and special event bicycle patterns. Table 3 summarizes the intersections with the highest hourly bicycle volumes along Independence Avenue during peak periods.

Table 3 2022 Hourly Peak Bicycle Volumes along Independence Avenue

Peak Period	Two-Way Peak One-Hour Volume	Peak Intersection
AM Weekday Peak	272	Independence Avenue and 15 th Street SW
Midday Weekday Peak	188	Independence Avenue and 15 th Street SW
PM Weekday Peak	292	Independence Avenue and 15 th Street SW
Saturday Peak	878	Independence Avenue and 15 th Street SW
Special Event	350	Independence Avenue and 7 th Street SW

TRANSIT CONDITIONS

Independence Avenue SW is a busy transit corridor, with a mix of local, regional, and private buses operating frequently throughout the day. The corridor has a mix of transit services, including WMATA Metro Rail and Bus and commuter buses. Existing transit conditions are summarized below:

- / There are eleven WMATA bus stop locations and one Metro Rail station access point on the study corridor.
- / There is a lack of transit amenities; five of the bus stop locations have transit shelters with benches.
- / moveDC identifies Independence Avenue from 7th Street SW to Pennsylvania Avenue SE as a transit priority corridor.
- / Bus stops are routinely blocked by parked vehicles, buses, and delivery trucks.
- / Tour buses and shuttle services run along Independence Avenue.

VEHICULAR CONDITIONS

Independence Avenue provides eight total travel lanes between 15th Street SW and 3rd Street SW. The highest average daily traffic on Independence Avenue from 2010 to 2020 was observed during three years from 2017 to 2019, with approximately 33,000 vehicles per day, as shown in Table 4. Additionally, peak-hour vehicular volume data was collected in November and December 2022 to understand weekday (November 15, December 7), weekend (November 19, December 3, December 10), and special event (November 30) traffic and circulation patterns. Table 5 summarizes the hourly vehicle volumes along Independence Avenue during peak periods.

The existing eight-lane configuration on Independence Avenue has the roadway capacity to efficiently accommodate approximately 70,600 vehicles per day, based on the Florida Department of Transportation's (FDOT's) [Quality/Level of Service Handbook](#) (Q/LOS). However, the historic, current, and anticipated future vehicular demand for the avenue is much lower, as depicted by the volumes provided in Table 4.

According to FDOT's Q/LOS Handbook, a four-lane roadway in an urban environment can efficiently accommodate approximately 38,800 vehicles per day, which is more aligned with the vehicular demand for Independence Avenue.

Independence Avenue has operated well within the threshold for a four-lane roadway since at least 2010.

Based on the volume thresholds shown in Table 6, Independence Avenue can maintain a level of service of D or better with four total travel lanes. Any fewer than four travel lanes on Independence Avenue would result in an LOS greater than E during peak conditions without any assumed transportation demand management or traffic rerouting. Reducing the existing eight-lane configuration to six lanes would result in continued over-capacity conditions along Independence Avenue. A comparison of CLVs under future conditions is provided later in the report in Table 16.

Table 4 Traffic Volumes on Independence Avenue

Year	Average Daily Traffic (10th Street)		Average Daily Traffic (400 Block)	
	Annual % Change	Annual % Change	Annual % Change	Annual % Change
2009 ¹	26,900	n/a	n/a	n/a
2010 ²	26,175	-3%	23,831	n/a
2011 ²	21,510	-18%	23,954	1%
2012 ²	21,316	-1%	23,738	-1%
2013 ²	26,578	25%	25,443	7%
2014 ²	27,072	2%	25,916	2%
2015 ²	27,527	2%	26,351	2%
2016 ³	26,358	-4%	32,238	22%
2017 ³	27,000	2%	33,000	2%
2018 ³	27,000	0%	33,000	0%
2019 ²	25,405	-6%	32,974	0%
2020 ²	18,546	-27%	24,071	-27%

1. Data is retrieved from the Smithsonian Institution South Mall Campus Plan (2018) between 9th Street SW and 12th Street SW. The plan pulled this data from DDOT's website.
2. Data is retrieved from the Traffic Volume dataset from Open Data DC.
3. Data retrieved from traffic volume publications by DDOT GIS.

Table 5 2022 Vehicle Volumes along Independence Avenue

Peak Period	Two-Way Peak One-Hour Volume	Peak Intersection
AM Weekday Peak	2,703	Independence Avenue and 6 th Street SW
Midday Weekday Peak	1,172	Independence Avenue and L'Enfant Plaza SW
PM Weekday Peak	2,685	Independence Avenue and 9 th Street SW
Saturday Peak	1,668	Independence Avenue and 9 th Street SW
Special Event	1,059	Independence Avenue and 12 th Street SW

Table 6 Motor Vehicle Arterial Generalized Service Volume Table for Urban Core (FDOT)

Number of Lanes	Level of Service			
	B	C	D	E
2	n/a	n/a	16,000*	20,800*
4	n/a	n/a	30,100*	38,800*
6	n/a	n/a	55,100	59,400
8	n/a	n/a	65,700	70,600

*Existing daily traffic volumes along Independence Avenue were observed to range between 18,500 and 33,000 VPD depending on block between 2009 and 2020.

Independence Avenue can maintain a level of service of D or better with four total travel lanes.

Traffic Operations

A procedure known as critical lane volume (CLV) methodology was used to assess the corridor's intersection traffic conditions. Locally, the Maryland-National Capital Park and Planning Commission (M-NCPPC), and the Maryland State Highway Administration (Maryland SHA) specify the use of CLV methodology for planning studies rather than Highway Capacity Manual (HCM) methodologies. The HCM method allows for the evaluation of each lane group and/or approach to an intersection while CLV analyzes the overall intersection capacity. The CLV method is a proven and reliable method for determining whether an intersection has sufficient reserve capacity for planning studies, and particularly useful for evaluating the feasibility of capacity changes (i.e., addition or removal of lanes). The primary benefit in using the CLV methodology is that it is easy to use, easy for reviewers to check, requires minimal input data, and requires minimal time to compute.

The CLV method calculates the maximum volume per lane per hour that must be accommodated during each signal phase and sums the critical phase volumes that cross at a single point to determine the overall critical volume, which allows for the identification of the intersection capacity and 'level of service' at a planning level. The assumed intersection capacity for CLV analyses is generally 1,600 vehicles per hour in an urban environment, representing the sum of peak-hour traffic volumes crossing at a single point.

The Virginia Department of Transportation's (VDOT's) Junction Screening Tool (VjuST) was used to apply the CLV methodology and calculate the intersection volume-to-capacity (v/c) ratios along the corridor. Table 7 summarizes the outputs from the CLV capacity analysis by intersection and peak period.

Table 7 Existing Critical Lane Volume (CLV) and Volume to Capacity (v/c) Ratios for Intersections along Independence Avenue during Weekday AM and PM Peak Periods

Intersection	Peak Period	CLV	V/C Ratio
15th Street SW	AM	849	0.53
	PM	888	0.56
14th Street SW	AM	1,073	0.67
	PM	885	0.55
12th Street SW	AM	825	0.52
	PM	886	0.55
L'Enfant Plaza SW	AM	488	0.31
	PM	363	0.23
9th Street SW	AM	464	0.29
	PM	514	0.32
7th Street SW	AM	880	0.55
	PM	778	0.49
6th Street SW	AM	472	0.30
	PM	450	0.28
4th Street SW	AM	577	0.36
	PM	566	0.35
3rd Street SW	AM	846	0.53
	PM	687	0.43
Washington Ave SW	AM	728	0.46
	PM	720	0.45

CLV = Critical Lane Volume

V/C Ratio = Volume-to-Capacity Ratio. A V/C ratio closer to 1 means the demand is nearing the intersection capacity and delays/queues may occur.

As shown in Table 7, all study intersections along Independence Avenue have a v/c ratio less than 0.67, displaying adequate capacity along the corridor and low expectations for any significant queues and delays. The v/c ratios of the existing intersection configurations along Independence Avenue appear to accommodate a higher capacity than necessary, given the low v/c ratios during the AM and PM peak periods.

Left Turn Configurations

The configuration and signal timing for left turns along Independence Avenue vary. Left turns are prohibited at Independence Avenue and 14th Street SW in the westbound direction and at Independence Avenue and 3rd Street SW in the eastbound direction. Left turns are permitted at all other intersections within the study corridor. At several locations, left turns are protected. Table 8 summarizes the existing left-turn treatments along Independence Avenue SW.

Table 8 Left Turn Configurations on Independence Avenue

Intersection (SW)	Approach	Lane Configuration	Signal Phasing
15 th Street	EB	Left turn	Protected
	WB	Left turn only	Protected
14 th Street	EB	Through left	Prohibited ¹
	WB	Through left	Prohibited ²
12 th Street	EB	Through left	Permissive
	WB	Left turn only	Protected + Permissive
10 th Street	EB	n/a	n/a
	WB	Through left	Protected + Permissive
9 th Street	EB	n/a	n/a
	WB	Through left	Protected + Permissive
7 th Street	EB	Through left	Protected + Permissive
	WB	Through left	Permissive
6 th Street	EB	n/a	n/a
	WB	Through left	Permissive
4 th Street	EB	Through left	Permissive
	WB	Through left	Protected + Permissive
3 rd Street	EB	Through left	Prohibited ²
	WB	Through left	Permissive

¹ Left-turns are prohibited but are permissive for buses and taxi cabs.

² Left-turns are prohibited but are permissive for buses.

Freight Conditions

Existing freight conditions, including commercial delivery vehicles and other oversize/overweight (OSOW) trucks, are summarized below:

- / moveDC recognizes Independence Avenue SW as a freight priority corridor from 14th Street SW to Washington Avenue SW.
- / Independence Avenue is a designated truck route between 14th Street and Washington Avenue leading to I-395.
- / Trucks are prohibited on Independence Avenue between 14th Street SW and 15th Street SW and east of Washington Avenue.



Figure 8. Freight Vehicle on Independence Avenue

Kittelson and Associates

CURBSIDE USES

Given the mix of destinations along Independence Avenue and potential Smithsonian museums and/or mixed development, there is high demand for curbside space along Independence Avenue SW, especially near the Smithsonian museums. The Avenue has significant bus activity, particularly tourist groups getting on and off motorcoaches and passenger pick-ups and drop-offs. Other curbside uses along Independence Avenue include off-peak parking, food trucks and vendors, motorcoaches, and tour buses. Existing curbside activity is summarized below:

- / There are currently ineffective curbside operations.
- / There is a varied demand for curbside use (food trucks, loading, motorcoaches).
- / There are several existing pull-in curbside loading areas (Figure 9).
- / There is a high loading demand near museums.
- / There is a high demand for ride-hail apps (pick-ups and drop-offs).

Most of the corridor's curbside activity occurs in the designated "No Parking" zones, likely because these spaces are most likely to be unoccupied.

- / Off-peak, on-street parking is permitted on both sides of the street from 8:30 AM to 4 PM from Monday to Friday and 6:30 PM to 10 PM from Monday to Saturday, with a 3-hour limit.
- / Food trucks are regularly observed on the north side of Independence Avenue near the Smithsonian museums and were observed with banners and merchandise impeding the sidewalk's clear path.
- / There are no existing designated unloading/loading spots along Independence Avenue for motorcoaches; existing designated areas for tour bus loading and unloading are located adjacent to the study corridor on 14th Street SW, Jefferson Drive, and Maryland Avenue.
- / Primary accessible entrances for the Hirshhorn Museum and Sculpture Garden, the National Museum of Asian Art, and the National Museum of African Art front Independence Avenue and require accessible parking. Existing no stopping regulation during rush hour conflicts with use of these accessible entrances.



Figure 9. Existing Pull in Curbside Pick-up/Drop-off Zone

Kittelson and Associates

FINDINGS

The current eight-lane configuration provides excess roadway capacity, creating the opportunity to consider repurposing existing travel lanes for other uses and reconfiguring the corridor's cross-section to prioritize non-motorized users, including people biking, walking, using micromobility, and riding and accessing transit.

Within the District's transportation network, Independence Avenue serves as a redundant transportation connection with Maine Avenue and the Southwest Freeway (I-395) while locally providing direct access to several Smithsonian Museums and federal buildings that attract millions of visitors annually. With the opening of the Southwest Freeway (I-395) in 1963, as shown in Figure 9, the roadway no longer functions as a primary route for vehicular through traffic.

Several key issues, shown in Figure 10, were identified while evaluating the existing conditions. The key issues are summarized and will be addressed in the recommendations and concept designs advanced in subsequent phases of this project.

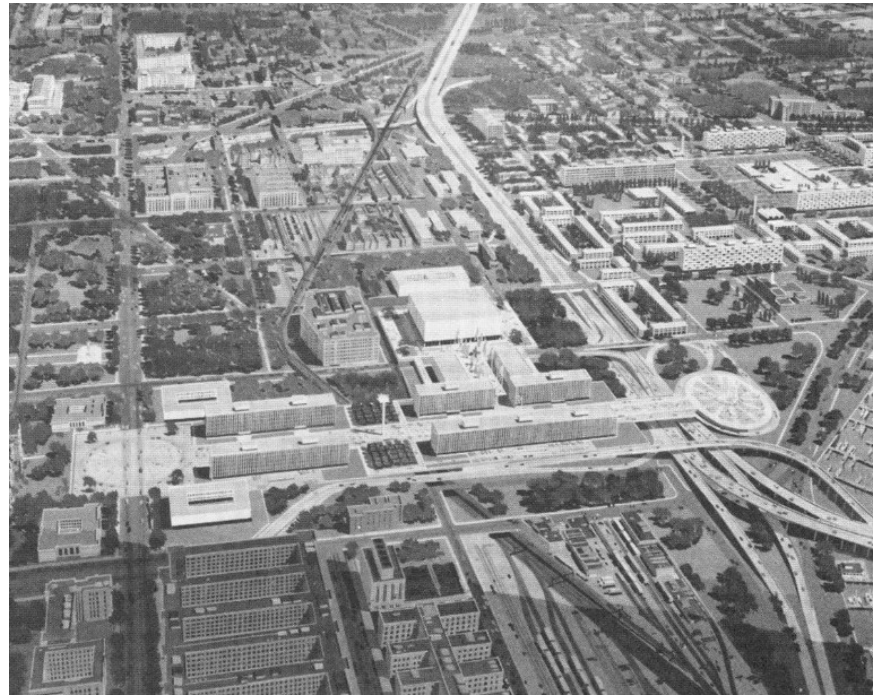


Figure 9. 1961 artist's depiction of the Southwest Freeway (I-395) completed in 1963

<http://www.dcroads.net/roads/southwest/> Obtained from Gelman Library, Peter S. Craig papers, George Washington University; supplied by Douglas A. Willinger

CONFIGURATION AND FUNCTION

- / Narrow sidewalk widths, wide curb-to-curb crossing distances, and physical obstructions limit the pedestrian experience and do not support the large volume of pedestrians accessing museums, employers, and destinations along Independence Avenue.
- / The existing vehicle volumes on Independence Avenue fall under the capacity the avenue was intended to serve. The number of travel lanes on Independence Avenue and low vehicle volumes encourage speeding and create unsafe and uncomfortable conditions for all users.

PEDESTRIAN AND BICYCLIST EXPERIENCE AND QUALITY

- / Independence Avenue is a prominent corridor in the District and lacks cohesive streetscape elements, tree cover, and quality of amenities that emphasize its significance.
- / The lack of bicycle infrastructure, wide street width, and high vehicular speeds creates uncomfortable and uninviting conditions for people biking.

ENVIRONMENT

- / Narrow sidewalks contribute to a lack of consistent tree cover, poor tree health, and reduced opportunity to support new tree growth and increase the heat island effect and impact of extreme temperatures.
- / Lack of "green infrastructure" and opportunities for trees and other plantings may impact stormwater management and result in drainage challenges.

Figure 10. Findings from the Existing Conditions Evaluation



IDEAS TOOLBOX



IDEAS TOOLBOX

Based on the existing conditions review findings and through collaboration with the project team and stakeholders, the team identified a toolbox of ideas to address the challenges along Independence Avenue and work toward achieving the project's objectives. The team hosted a design workshop on March 8, 2023, to discuss multimodal design ideas and concepts for Independence Avenue. The ideas presented in this section reflect those discussed during the design workshop and are based on national best practices for multimodal infrastructure and streetscape design. The ideas presented in this toolbox refer to the Monumental Core Streetscape Design Guidelines prepared by NCPD. The ideas also incorporate recommendations from the *National Association of City Transportation Officials (NACTO) Global Urban Street Design Guide*, the *NACTO Urban Bikeway Design Guide*, and *NCHRP Report 1036: Guide for Roadway Cross Section Reallocation*.

The ideas are organized by mode and include:

- / Walking
- / Biking
- / Transit
- / Motorcoach
- / Curbside
- / Vehicles
- / Landscape/Green Infrastructure

The ideas presented in this toolbox consider the character and role of Independence Avenue. The Monumental Core Streetscape Design Guidelines define Independence Avenue as a “**radiating and edging street**.” The guidelines inform the design character and quality including the placement, configuration, and type of streetscape elements within the public right of way, including spaces within civic settings and monumental-scale buildings. The potential ideas in this toolbox will be

tested against the unique conditions along Independence Avenue and the programmatic needs of museums and government agencies in the next phase of work.

WALKING

The Monumental Core Streetscape Design Guidelines recommend unifying sidewalks in and around the National Mall by prioritizing a consistent use of materials on Radiating and Edging Streets like Independence Avenue. The guidelines recommend a consistent streetscape using the same sidewalk materials on both sides of the roadway.

The guidelines identify streetscape zones, including building/park frontage, pedestrian space, furnishing and civic infrastructure, landscape, step-out, and vending, as shown in Figure 10. The building yard and park frontage contain landscaped areas, building signage, and perimeter security. Refer to [the Monumental Core Streetscape Design Guidelines](#) for more information on streetscape zones and guidelines.

The guidelines recommend maintaining a pedestrian clear zone of at least 10 feet within the Monumental Core area. Tree/furnishing zones may range from 4-10 feet wide with a minimum two-foot step-out zone where on-street parking is provided adjacent to a tree box. Step-out areas allow access from on-street parking to the sidewalk, where tree boxes are present, and should be the same pavement material as the adjacent sidewalk.

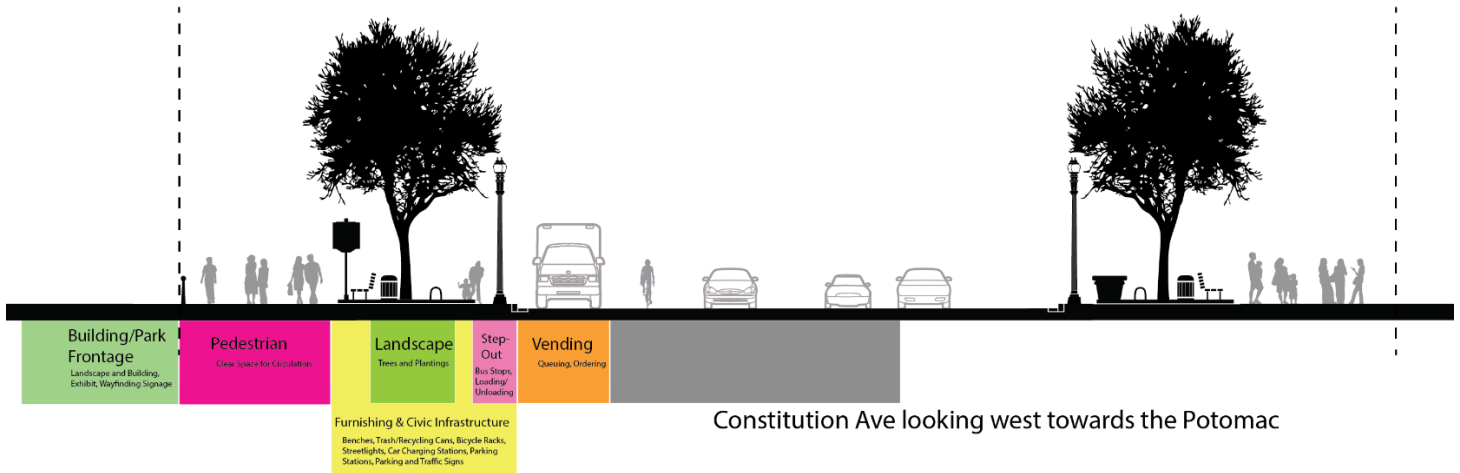


Figure 10. Monumental Core Streetscape Design Guidelines Streetscape Zones

The following design criteria are established in various design guidelines for sidewalks and crosswalk spacing:

SIDEWALKS

- / The recommended sidewalk and buffer width for an area within the urban core is 10 feet plus a two-foot buffer and parking lane OR 10 feet plus a four-foot buffer. (Source: NCHRP Report 1036)
- / Sidewalks in Central DC and Commercial Areas should maintain a minimum unobstructed sidewalk width of ten feet. All Central Business District streets must have a total minimum sidewalk width of 16 feet, including a 6-foot furnishing zone and ten feet of unobstructed sidewalk. (DDOT Design and Engineering Manual)
- / Within the National Mall Streetscape Manual Boundary, the total sidewalk width minimum should be 16 feet, including a ten-foot minimum pedestrian clear zone. Total sidewalk width may vary based on available public right of way and should reference the DDOT Design and Engineering Manual for guidance on streets owned by DDOT (Monumental Core Streetscape Design Guidelines: Vertical and Surface Elements).

CROSSWALK SPACING

- / The recommended maximum crosswalk spacing is 300 feet or one block within an urban core area and 500 feet or two blocks within an urban area.

Crossing improvements, such as midblock and pinch point crossings, may improve the pedestrian experience. Figure 12 and Figure 13 display examples of midblock and pinch point crossings, respectively. Based on NACTO design guidelines, midblock crossings should be installed where there is a significant pedestrian desire line. Additional considerations include restricting parking, installing curb extensions, and the potential for pedestrian refuge islands within a median. Because of the need to cross four travel lanes, with or without a pedestrian refuge island, all mid-block crossings along Independence Avenue should be signalized, preferably with actuated or fixed-time signals. At mid-block crossings, stop lines should be set back 20 to 50 feet, and markings would be required for pinch-point crossings since traffic volumes exceed 3,000 per day.



Figure 11. Raised Bicycle Lane in Cambridge, MA

City of Cambridge



Figure 12. Midblock Crossing in Atlanta

NACTO



Figure 13. Pinch point Crossing

NACTO

BIKING

Based on the Facility Treatment Selection Matrix in DDOT's Bicycle Facility Design Guide, the alternative treatment for streets with a cross-section greater than 50 feet, such as Independence Avenue, is a protected bicycle lane, with the preferred treatment being a raised protected bicycle lane. The following design criteria are established in various design guidelines established for bicycle lanes:

- / The preferred lane width of a bicycle lane is six feet with a five-foot minimum. (Source: DDOT)
- / A three-foot buffer between the bicycle lane and travel lane is recommended with an 18-inch minimum buffer. (Source: DDOT)
- / Vehicular travel lane requirements may be reduced by one foot to a minimum of 10 feet when adjacent to bicycle lanes. (Source: DDOT)
- / Bicycle lanes are necessary for streets with volumes greater than 4,000 vehicles per day and speeds exceeding 20 mph. Vertical and horizontal separation from traffic is recommended. (Source: NCHRP Report 1036)

Table 9 summarizes the preferred and minimum widths for bicycle lanes based on DDOT design guidelines.

When considering appropriate bicycle facilities along Independence Avenue, it is important to understand plans along adjacent corridors, such as Jefferson Drive, Madison Drive and Constitution Avenue. Demand for biking will be balanced with the demand for bus activity and other roadway demands.

Table 9 Bicycle Lane Preferred and Minimum Widths (Source: DDOT Bicycle Facility Design Guide)

Bicycle Lane Location	Bicycle Lane Width		Buffer Width		Notes
	Preferred	Minimum	Preferred	Minimum	
Typical	6'	5'	3'	18"	Bicycle Lane + Gutter Width must total a minimum of 5'
Adjacent to the curb/gutter	6'	4'	3'	18"	Bicycle Lane + Buffer must total a minimum of 7'
Two-way protected bicycle lane	6'+6'	4'+4'	3'	18"	Two-way Bicycle Lane + Buffer must total a minimum of 11'
Two-way Protected Bicycle Lane Adjacent to Parking Lane	6'+6'	4'+4'	3'	2'	Two-way Bicycle Lane + Buffer must total a minimum of 11'

Note: Vehicle Travel Lane shall be a minimum of 10' wide when adjacent to a bicycle lane.
DDOT Bicycle Facility Design Guide

Protected Bicycle Facilities

Protected bicycle facilities can include one-way bicycle lanes on both sides of the street or two-way cycle tracks on one side. Shared-use paths on one or both sides of the road can also provide space for bicyclists. All options dedicate safe and comfortable space for a wide range of bicyclists and eliminate the risk of collisions with any passing vehicles. Table 10 summarizes the different implementation requirements and considerations between one-way separated bike lanes, two-way cycle tracks, and share-use paths. Figure 14 and Figure 15 illustrate examples of protected bicycle lanes.

Table 10 Considerations of One-Way Separated Bike Lanes, Two-Way Cycle Tracks, and Shared-Use Paths

Bicycle Facility Option	One-way Separated Bike Lanes	Two-way Cycletracks	Shared-Use Paths
Implementation Requirements	Space on both sides of the roadway	Space on one side of the roadway	Space on one side at a time or both sides simultaneously (preferred)
Usage of space	Separates people walking and biking	Separates people walking and biking	Shares space between people walking and biking
Additional requirements	Buffers between people biking and walking	<ul style="list-style-type: none"> / Buffers between people biking and walking / Bicycle signal heads in the contraflow direction / Signing timing restrictions (no turns on red) 	Signage and separation between people biking and walking (preferred)
Conflict (transit stops, driveways, side streets)	Both sides of the roadway	On the side of the roadway with the two-way cycle track	On each side of the road, a shared use path is used



Figure 14. Two-Way Protected Cycle Track in Washington, D.C.

Kittelson and Associates



Figure 15. Protected Bike Lane in Washington, D.C.

Kittelson and Associates

TRANSIT

Transit improvements may include installing transit shelters at bus stops, designating dedicated transit-only lanes, and implementing bus boarding islands. These improvements are highlighted in this section.

TRANSIT SHELTERS

Transit shelters provide comfortable seating for waiting passengers and shelter against weather conditions. Figure 15 and Figure 16 display examples of bus shelters at bus stops. Based on the NACTO Transit Street Design Guide, shelters are typically 4 feet deep, and 8 feet of sidewalk width is required to meet ADA requirements. The preferred width for the pedestrian through-zone is 8 to 12 feet, with a minimum of 5 feet.



Figure 16 Bus shelter on Independence Avenue SW and 7th Street SW

WMATA



Figure 17 Bus Shelter in Washington, D.C.

Greater Greater Washington

TRANSIT ONLY LANES

Transit-only lanes are designated lanes for transit vehicles, regulated using pavement markings and signs. Transit-only lanes may provide preferential treatment towards transit vehicles during specific periods, improving transit operations' efficiency during peak travel periods. Red-colored pavement can also increase visibility and improve vehicle compliance. The recommended width for transit-only lanes is 11 feet, with a minimum of 10 feet depending on local context. Based on the NCHRP Report 1036, bus lanes should be considered where bus frequencies are approximately every 3-4 minutes (or 20 buses per hour). Bus lanes may also improve transit service on streets with bus frequency between 5-6 minutes (or 10 buses per hour), though the lane may be misused for loading, parking, or drop-off. Figure 18 illustrates an example of dedicated bus lanes in Washington, D.C.



Figure 18 Bus Lane in Washington, D.C.
Greater Greater Washington



Figure 20 Bus Boarding Platform in on Pennsylvania Avenue SE in Washington, DC

Kittelson

BUS BOARDING ISLANDS

Bus boarding islands provide dedicated waiting and boarding space for passengers. They reduce potential conflict between bicyclists and bus passengers. A bus shelter can be located on the island. Based on the DDOT Bus Priority Toolbox, bus boarding islands are implemented in locations with more than 13 feet of roadway width available for bicycle and passenger boarding facilities. Figure 19 and Figure 20 display examples of bus boarding islands.



Figure 19 Floating Bus Island on 14th Street NW
Kittelson and Associates

CURBSIDE

There are many ways to utilize curbside space, including:

- / On-street parking
- / Ride-hail zones
- / Motorcoaches
- / Loading and unloading for transit and freight
- / Food truck vendors
- / Curb extensions and/or bulb-outs
- / Multimodal parking
- / Stormwater treatments

Curbside uses interact with adjacent elements, such as bike lanes, and appropriate buffer space between elements should be considered. Figure 21 shows an example of curbside bike parking.



Figure 21 Bike Corral Along a Curb in Washington, D.C.

Kittelson and Associates

CURB EXTENSIONS

Figure 22 illustrates an example of a temporary, quick-build curb extension in Washington, D.C. Curb extensions narrow the roadway, improve pedestrian visibility, and shorten the crossing distance for pedestrians. Temporary treatments as shown may be upgraded to permanent curb extensions.



Figure 22 Temporary Flex Post Curb Extension in Washington, D.C.

Kittelson and Associates

ON-STREET PARKING

Figure 23 displays an example of the on-street parking on Independence Avenue occupied by visitor buses. Based on the NCHRP Report 1036, the recommended width of on-street parking lanes is 7 to 9 feet. The typical parking lane width in Washington, D.C., is 8 feet.



Figure 23 On-Street Parking on Independence Avenue Occupied by School Tour Buses

Kittelson and Associates

VEHICLES

Figure 24 displays a summary of recommended general-purpose lane widths based on lane type and vehicle type from NCHRP Report 1036. Based on Figure 24, the recommended general-purpose lane width to accommodate trucks and buses on Independence Avenue is 10 feet for inside through lanes and 11 feet for outside through lanes and two-way left-turn lanes.

Trucks and Buses ¹	10 ft	11 ft	
Motor Vehicle Travel Lane	10 ft		11 ft
LANE TYPE	Inside Through Lane	Outside Through Lane	Two-Way Left-Turn Lane

1 Freight corridor or frequent bus use

Figure 24. Recommended General-Purpose Lane Widths

NCHRP Report 1036

The number of lanes to accommodate vehicles using the street can be determined using annual average daily traffic (AADT) counts. Table 11 provides service volumes based on the number of lanes for an urban core area. Between 2010 and 2020, the highest AADT observed on Independence Avenue was 33,000 in 2017 and 2018.

Additionally, in 2020, the AADT was 24,071. Based on these AADT values, a four-lane roadway can provide an adequate capacity of 38,800 for vehicles on Independence Avenue, and additional roadway width may be reallocated for other uses.

Table 11 Motor Vehicle Arterial Generalized Service Volume Table

Level of Service	B	C	D	E
2 Lane	*	***	16,000	20,800
4 Lane	*	***	30,100	38,800
6 Lane	*	***	55,100	59,400
8 Lane	*	***	65,700	70,600

FDOT Multimodal Quality/Level of Service Handbook, 2023

Additionally, the proposed concepts will maintain the existing left turn signal phasing and configurations summarized previously in Table 6.

LANDSCAPE & GREEN INFRASTRUCTURE

Streetscape elements enhance landscapes and may include trees, bus shelters, benches, bike parking, wayfinding signs and kiosks, street lighting, EV charging stations, green infrastructure (e.g., rain gardens, low plantings, flow-through planters), queueing spaces, and trash and recycling receptacles. Figure 25 through Figure 27 display examples of streetscape elements.



Figure 25 Benches on National Mall in Washington, D.C.

VL Time Captures



Figure 26 Stormwater Bump Out in Philadelphia, PA

Philly Watersheds



Figure 27 Wayfinding Kiosk in London, UK

NACTO Global Street Design Guide

The Monumental Core Streetscape Design Guidelines recommends restoring double rows of trees along Independence Avenue.

The following design guidelines pertain to tree boxes, verges, and stormwater elements, referencing the Monumental Core Streetscape Design Guidelines.

TREE BOXES

The following outline recommendations from the Monumental Core Streetscape Design Guidelines for tree boxes along Radiating and Edging Streets:

- / Double rows of trees and vases and spreading trees are recommended for Independence Avenue.
- / Trees should be planted symmetrically (same tree form and mature height) on both sides of the street for Radiating and Edging Streets.
- / Trees should be planted consistently in form and planting pattern for entire streetscape segments between important destinations.
- / Trees can be planted near benches and bus stops to enhance pedestrian comfort.
- / Continuous tree boxes should be no longer than 60 feet within high and moderate curbside use areas.
- / Tree boxes must be at least four feet wide to accommodate healthy tree root systems.
- / Where possible, encourage the integration of perimeter security, stormwater management facilities, and enhanced tree root growth.



Figure 28 Tree-lined Sidewalk in Philadelphia, PA

Flickr, William Warby, "Tree-lined Sidewalk" (2008)

VERGES

The following outline recommendations from the Monumental Core Streetscape Design Guidelines for verges along Radiating and Edging Streets:

- / Verges are landscape areas between the curb and sidewalk, including trees, low plantings, street furnishing, and/or step-out zones.
- / Verges can enhance landscapes and provide pedestrian connections between the roadway and sidewalk.
- / Verge length should be limited to 20 feet at vehicle pick-up/drop-off areas and 60 feet at bus pick-up/drop-off areas.
- / Paved areas between verges should be six feet to allow for pedestrian circulation.
- / Verges should be planted with grass and no other plant material.



Figure 29 Verge on Independence Avenue SW

Kittelson and Associates

STORMWATER

The following outline recommendations from the Monumental Core Streetscape Design Guidelines for stormwater management:

- / Bioswales should not be installed along Radiating and Edging streets due to the informal character of bioswales.
- / Do not install bioswales along sidewalks with high pedestrian use to accommodate circulation.
- / Permeable pavers should not be installed along areas of high curbside use.

LANDSCAPED MEDIANS

Figure 30 and Figure 31 display examples of landscaped medians with trees and low plantings, respectively. The following design guidelines pertain to medians, referencing the Monumental Core Streetscape Design Guidelines:

- / Medians less than five feet wide should be paved to match adjacent sidewalk material.
- / Medians greater than five feet but less than ten feet wide should be planted, with heights limited to three feet high.
- / Trees should be planted in elevated medians at least ten feet wide.
- / Trees should not be planted within 40 feet of a controlled intersection.
- / Pedestrian refuges of at least six feet in width should be installed where appropriate. Eight feet is the recommended width.



Figure 30 Landscaped Median with Trees in Portland, OR

Portland Press Herald



Figure 31 Rendering of Route 1 in Crystal City, Virginia

ARL Now



**CONCEPT
DEVELOPMENT**



CONCEPT DEVELOPMENT

ANTICIPATED FUTURE CONDITIONS

The corridor concepts in this section are built on the previously identified ideas toolbox. The concepts were developed in alignment with the project objectives and are based on the existing conditions evaluation, stakeholder goals and objectives, and anticipated transportation demand. Additionally, the development of concepts was informed by future traffic projections outlined in the Existing Conditions Report, attached as Appendix A. The following sections summarize the methodology for developing concepts based on future traffic projections, assumptions, and anticipated development.

The team reviewed the MWCOC's regional Travel Demand Model portal to document existing (2021) and projected (2045) population and employment statistics from traffic analysis zones (TAZs) along Independence Avenue. Given the lack of residential land uses within the study area, there is limited opportunity for population growth. Employment growth is anticipated across several TAZs, totaling approximately 6,000 additional employees by 2045.

Table 12 summarizes the annual adjusted percent growth from 2021 to 2045. In addition to the estimates provided in Table 12, SI is identifying locations for two new museums, the National Museum of the American Latino and the Smithsonian American Women's History Museum. SI identified several potential sites along and adjacent to Independence Avenue. If selected, these new museums would result in increased multimodal demand for Independence Avenue and an increase in employees and visitors traveling to the new museums. Additionally, the revitalization of the Smithsonian Castle and the Hirshhorn Museum and Sculpture Garden and design of the Bezos Learning Center will also contribute to an increase in visitors.

Table 12. Percent Growth from 2021 to 2045

	2021	2045	Annual Adjusted Percent Growth
Households	285	610	4.75%
Household Population	492	1,014	4.42%
Total Population	492	1,014	4.42%
Total Employment	48,530	54,821	0.54%
Population + Employment	49,022	55,835	0.58%

CONCEPTS

Each of the concepts focuses on different priorities. Given the limited right-of-way on Independence Avenue, there are inevitable tradeoffs when allocating the right-of-way for each mode. The existing eight-lane configuration on Independence Avenue, as shown in Figure 32, prioritizes vehicle operations and gives less priority to people biking and walking. The three concepts explore reallocating travel lanes to prioritize other modes and create a safer,

more comfortable, and welcoming environment for all users. Table 13 ranks the priorities for the existing configuration and the priorities of each of the three concepts and Figure 33 through Figure 35 compare each concept alternative. Each concept is ranked high, medium, and low on how well it prioritizes pedestrian activity, bicycle activity, transit, curbside activity, greenspace, and vehicle operations.

Table 13 Corridor Concept Priorities

	Walking	Biking	Transit	Curbside	Greenspace	Vehicle
Existing	Medium	Low	Medium	Medium	Low	High
Concept 1: Curbside Flex Zones	High	Low	Medium	High	High	Medium
Concept 2: Landscaped Median	High	Low	Medium	Medium	High	Medium
Concept 3: Raised Cycle Track	High	High	Medium	Medium	High	Medium

This section identifies three corridor concepts that propose reducing the number of travel lanes to prioritize multimodal safety and comfort, enhance curbside operations, and more effectively utilize the available right-of-way along the Avenue. Each of the three corridor concepts proposes the following:

- / **Lane reduction:** All concepts propose two travel lanes in each direction. The inside travel lane in each concept is 10 feet, and the outside lane is 11 feet to accommodate trucks, buses, and transit vehicles.
- / **A double row of trees:** All concepts propose two rows of trees on each side of the street, lining the

sidewalks. These tree/furnishing zones will be 6 feet wide and will alternate between tree boxes and continuous landscaped areas in accordance with NCPC’s Monumental Core Streetscape Design Guidelines.

- / **Maintain left turn conditions:** All concepts propose maintaining the existing left turn configurations and signal timing. The existing left turn lane configurations and signal timing were previously summarized in Table 8.

Table 14 summarizes each of the three concepts, with more detailed descriptions and diagrams in the following sections.

Table 14 Summary of Corridor Concepts

	Median	Pedestrian Clear Zone	Refuge Islands	Bicycle Facility	Tree/Furnishing Zone	Curbside Activity
Existing	No	< 10 – 20+	No	No	Curbside tree boxes and landscape area	Off-peak parking
Concept 1: Curbside Flex Zones	No	12'-18'	No	No	6' Curbside tree boxes and 6' landscaped tree strip at the building yard	10' Flex zones; Both sides
Concept 2: Landscaped Median	14'	10'-16'	Yes	No	6' Curbside tree boxes and 6' landscaped tree strip at the building yard	10' Flex zones; North Side
Concept 3: Raised Cycle Track	No	12'-18'	No	5' Raised cycle track	6' tree boxes	10' Flex zones; North Side

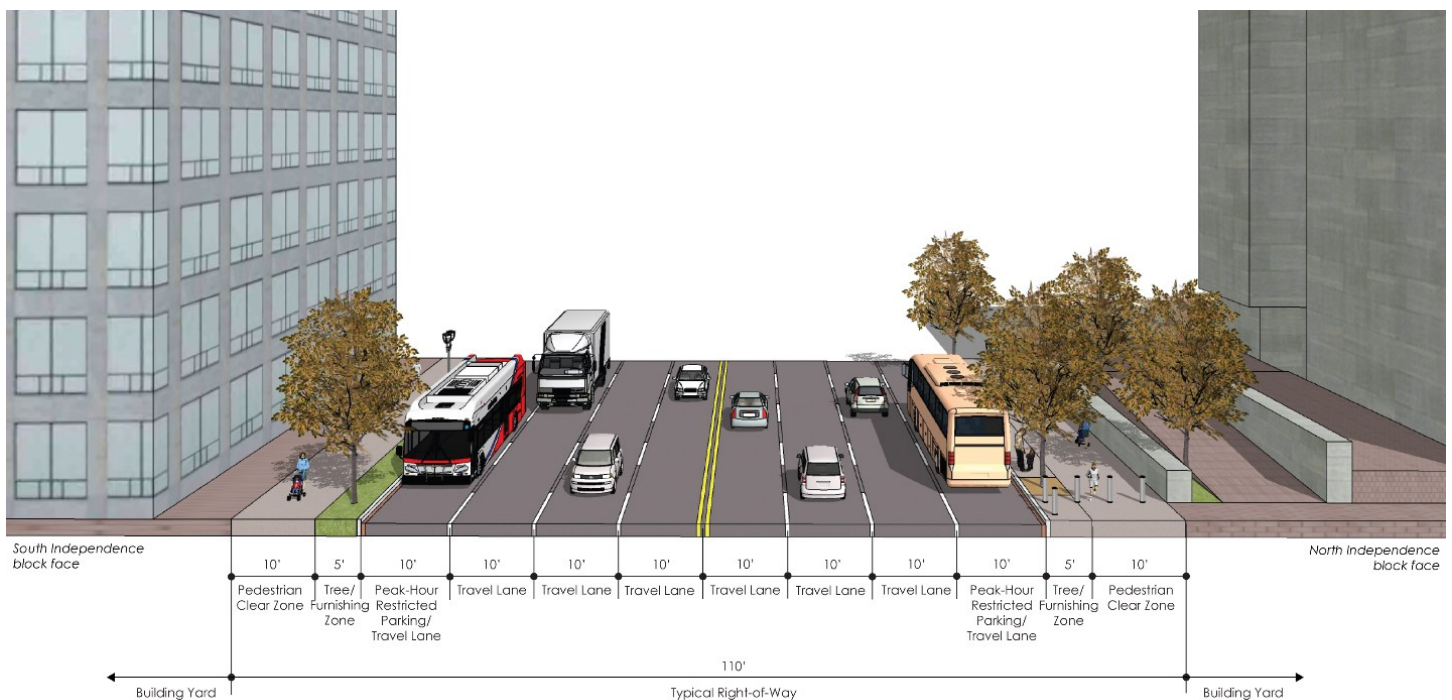


Figure 32 Existing Typical Section on Independence Avenue

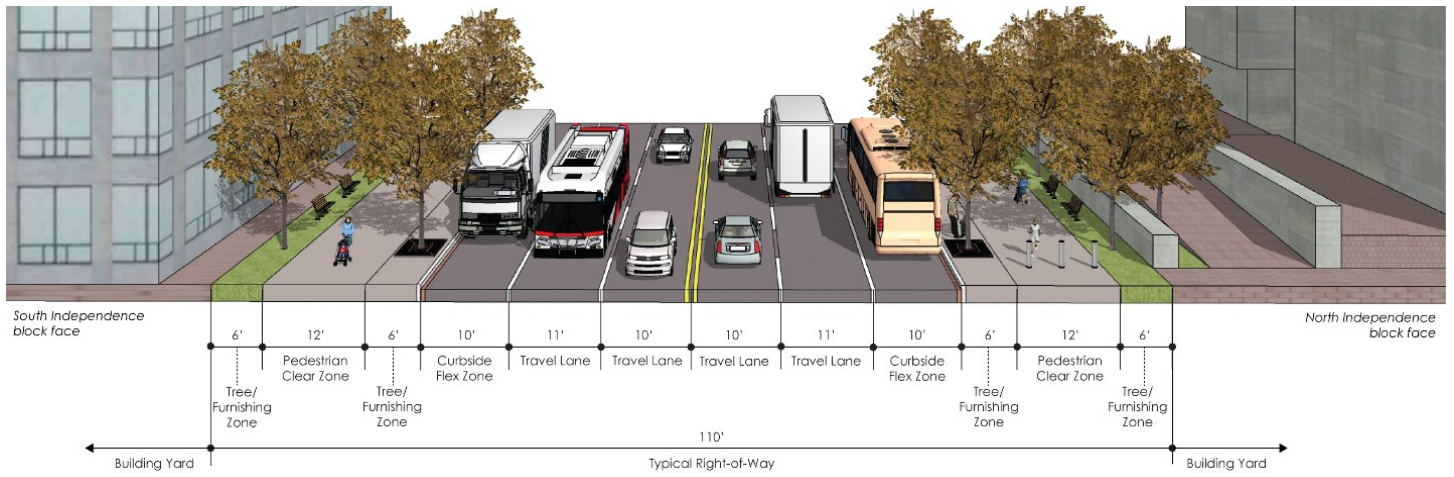


Figure 33 Typical Section for Concept 1 Curbside Flex Zones

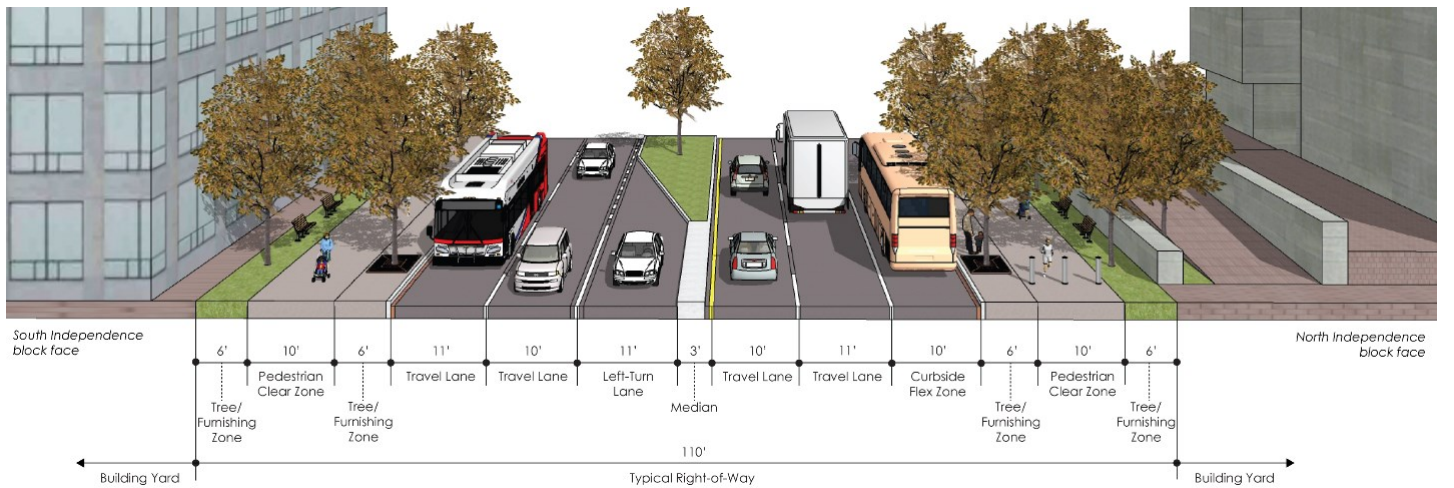


Figure 34 Typical Section for Concept 2 Landscaped Median

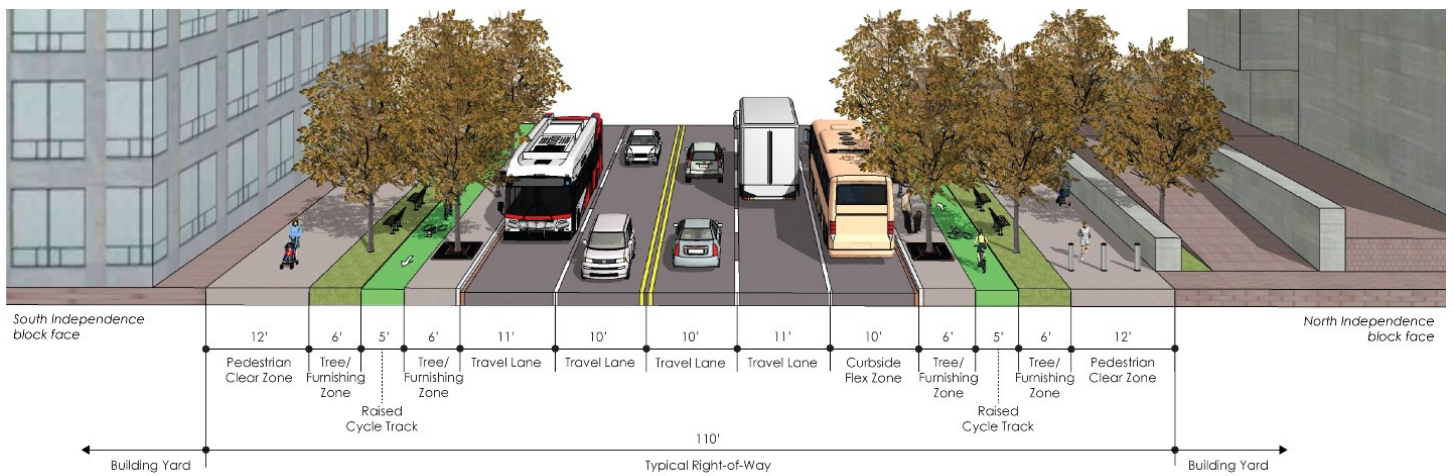


Figure 35 Typical Section for Concept 3 Raised Cycle Track

Existing Typical Section

Independence Avenue SW is designated as a principal arterial through the study area. Principal arterial roadways are the highest traffic volume corridors and connect activity centers in urban areas and are designed to carry high volumes of vehicles.

Independence Avenue SW also serves as a primary freight route from 15th Street SW to Washington Avenue SW and is served by various arterial, collector, and local streets adjacent to the study corridor. Buses are restricted to the east and west of the corridor's extents, east of Washington Avenue SW and west of 15th Street NW.

Independence Avenue has eight travel lanes, with four travel lanes in each direction. Independence Avenue SW narrows to four lanes east of First Street SW. On-street parking is permitted on both sides of the street from 8:30 AM to 4 PM from Monday to Friday and 6:30 PM to 10 PM from Monday to Saturday. Though the curb-to-curb width varies, the curb-to-curb width has a typical width of 80 feet, with each lane approximately 10 feet wide. The curb-to-curb width decreases towards both ends of the study corridor to 74' and 64' on the east and west sides, respectively. At some segments of the corridor, the curb-to-curb width may extend beyond 80 feet due to the presence of pull in areas, or layby lanes. The typical existing cross-section for the corridor is shown in Figure 36.

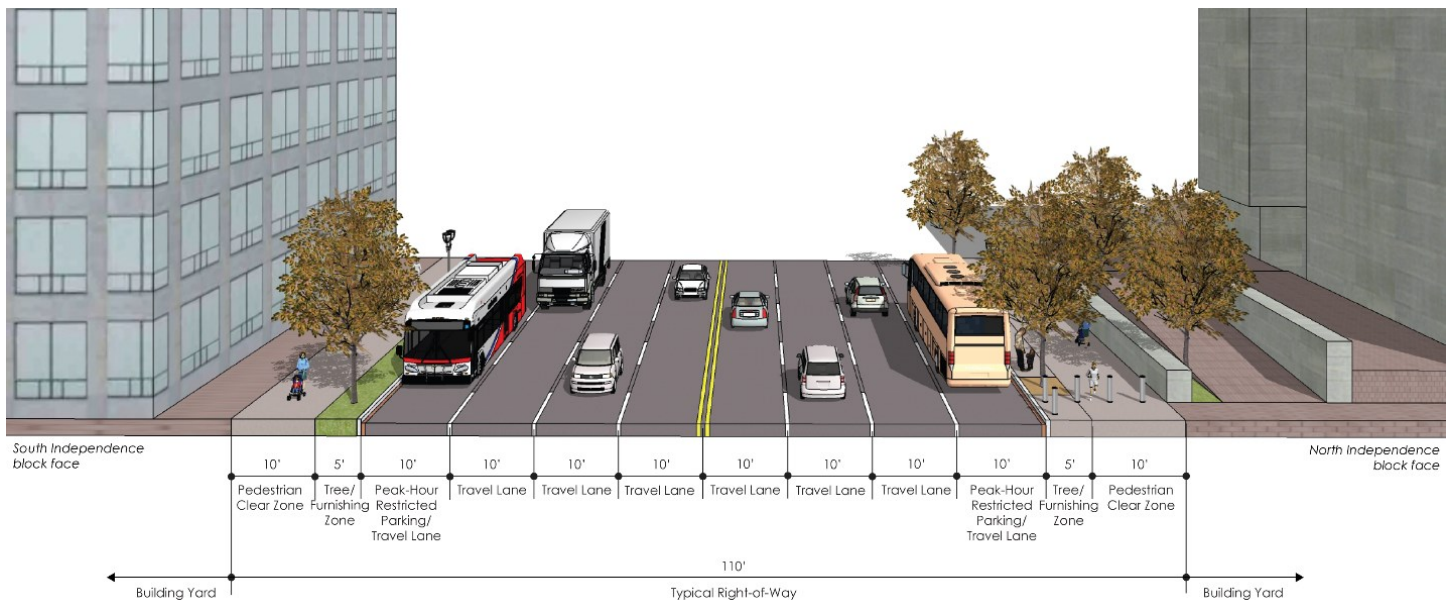


Figure 36 Existing Typical Section on Independence Avenue

Concept 1. Curbside Flex Zones

Concept 1 proposes 10 foot curbside flex zones that may be used for pick-up and drop-off activity, loading zones, motorcoach activity, micromobility corrals, bikeshare stations, etc., as shown in Figure 37. This concept

proposes providing 12 feet to 18 feet pedestrian clear zones. Double rows of trees are provided on both sides of the street. Transit shelters alternate with street trees where bus stops are located.

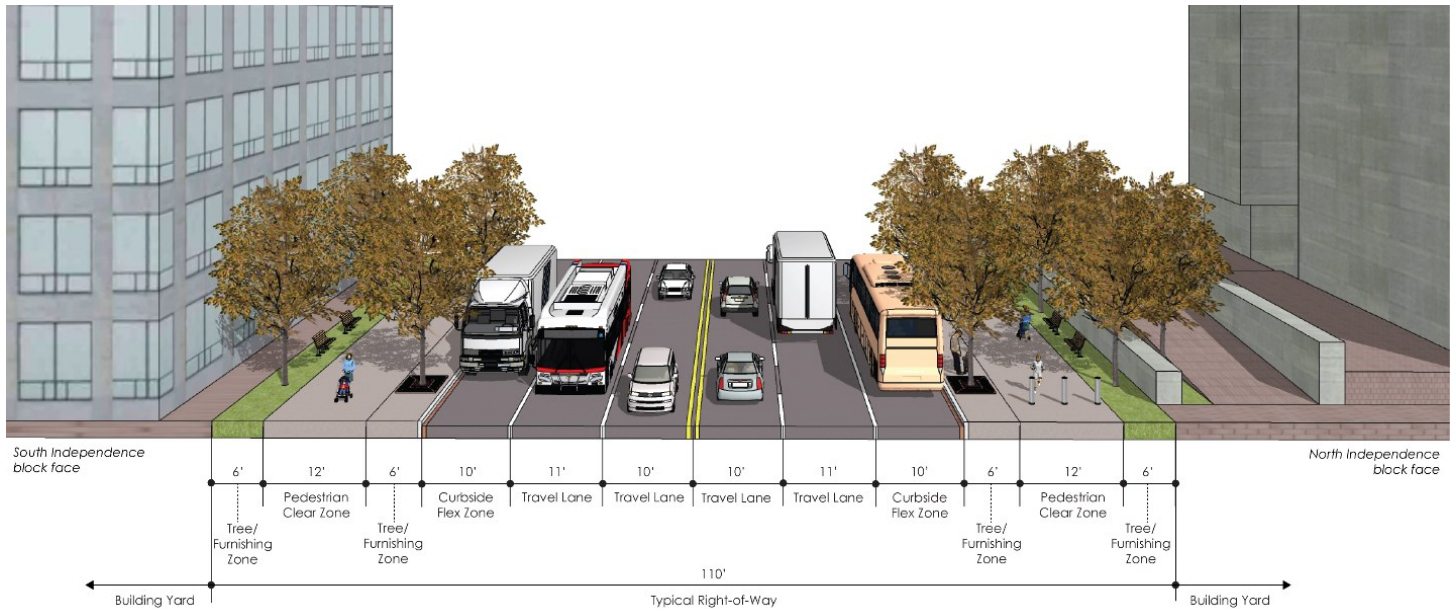


Figure 37 Typical Section for Concept 1 Curbside Flex Zones

MEDIAN/TURN LANE TREATMENT

There is no median or pedestrian refuge area in this concept. At intersections where left turns are permitted and/or protected along the study corridor, a left-turn lane treatment will need to be evaluated. The inner travel lane could provide a dedicated left-turn lane or transition into a through-left to allow left-turning movements per existing conditions. The curbside flex zone may need to be shortened to provide space for the left turn lane where dedicated left-turn lanes are necessary.

PEDESTRIAN CLEAR ZONE

The pedestrian clear zone ranges from 12 feet to 18 feet. The tree/furnishing zone provides an extra 6 feet of pedestrian space in areas between the tree grates, providing a total width of 18 feet. The expanded clear zone can also help to accommodate passenger pick-up/drop-off.

BICYCLE FACILITY

There are no bicycle facilities in this concept. Bicycle connections would be available on a parallel route, such as off-street trails along Jefferson Drive and intersecting bicycle lanes along 4th Street.

TREE/FURNISHING ZONE

There are two rows of trees on both sides of the street. The tree/furnishing zones can vary from a landscaped grassy area with trees to a pedestrian clear zone with periodic tree boxes. Each tree/furnishing zone is 6 feet wide, meeting minimum width requirements. The area between tree boxes acts as extra width for the pedestrian clear zone and provides space for pedestrians crossing. The tree/furnishing zone adjacent to travel lanes may also act as a step-out zone near curbside loading areas or provide shelter near bus stops.

CURBSIDE ACTIVITY

This concept provides curbside flex zones on both sides of Independence Avenue with appropriate signage and striping to indicate its use. Each curbside flex zone is 10 feet wide. Based on local contexts, curbside flex zones may vary from block to block along Independence Avenue. Examples of uses include on-street parking, accessible parking, freight loading/unloading, passenger pick-up/drop-off, and micromobility corrals. Curb extensions may also be installed at intersections to shorten the pedestrian crossing distance, increase pedestrian visibility, and provide more space for streetscape elements, where appropriate.

Concept 2. Landscaped Median

Concept 2 proposes a 14-foot landscaped median that provides a median alternating with left turn lanes and pedestrian refuge islands at intersections, as shown in Figure 38.

The median may be tree-lined or have varied landscaping. Double rows of trees and a pedestrian clear

zone of 10 feet to 16 feet are provided on both sides of the street. This concept includes a curbside flex zone on Independence Avenue's north side/museum side. Transit shelters alternate with street trees where bus stops are located.

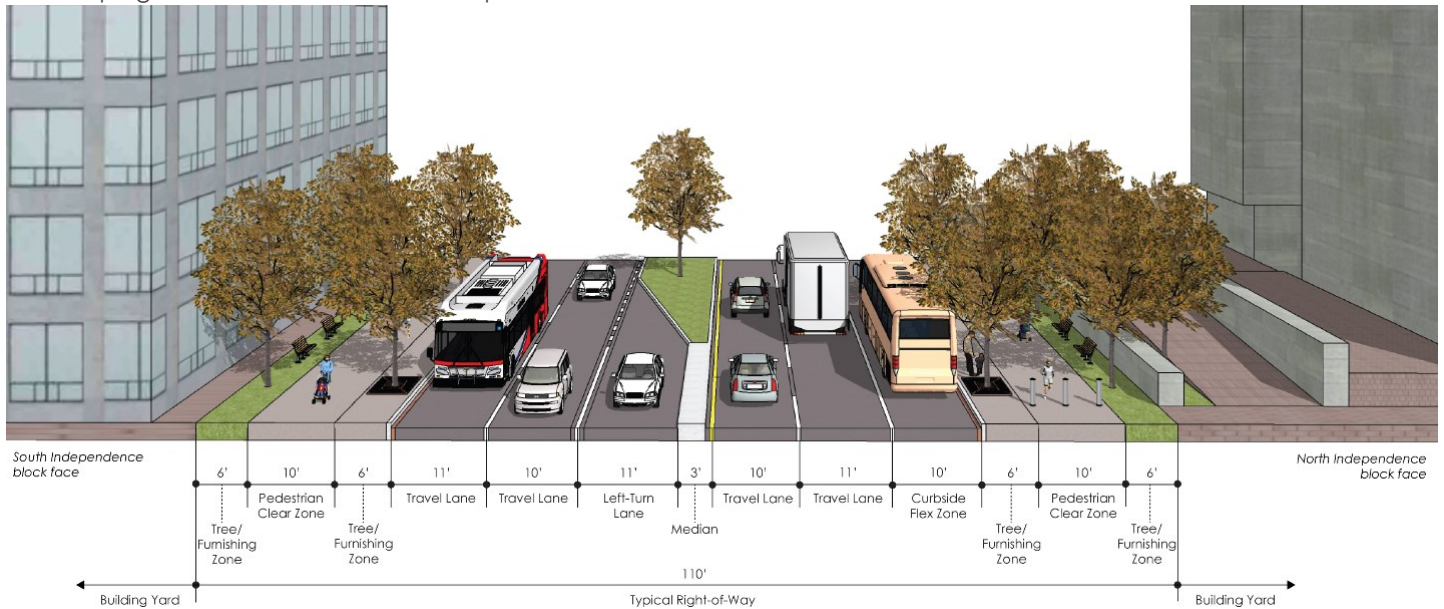


Figure 38 Typical Section for Concept 2 Landscaped Median

MEDIAN/TURN LANE TREATMENT

This concept has a 14-foot landscaped median with alternating left-turn lanes at intersections. The median can be tree-lined or planted with varied landscaping. The inner travel lane would provide a dedicated left-turn lane at intersections where left-turns are permitted and/or protected along the study corridor. The landscaped median can provide space for a dedicated left-turn lane.

PEDESTRIAN CLEAR ZONE

The pedestrian clear zone ranges from 10 feet to 16 feet. The tree/furnishing zone provides an extra 6 feet of pedestrian space in areas between the tree grates, providing a total width of 16 feet. The expanded clear zone can also help to accommodate passenger pick-up/drop-off.

BICYCLE FACILITY

There are no bicycle facilities in this concept. Bicycle connections would be available on a parallel route, such as off-street trails along Jefferson Drive and intersecting bicycle lanes along 4th Street.

TREE/FURNISHING ZONE

There are two rows of trees on both sides of the street. The tree/furnishing zones can vary from a landscaped grassy area with trees to a pedestrian clear zone with periodic tree boxes. Each tree/furnishing zone is 6 feet wide, meeting minimum width requirements. The area between tree boxes acts as extra width for the pedestrian clear zone and provides space for pedestrians crossing. The tree/furnishing zone adjacent to travel lanes may also alternate as a step-out zone near curbside loading areas or provide shelter and passenger boarding/alighting areas near bus stops.

CURBSIDE ACTIVITY

A 10 feet wide curbside flex zone is provided on the north side/museum side of Independence Avenue in this concept. Use of the curbside flex zone may vary from block to block along Independence Avenue based on local contexts. Examples of uses include on-street parking, accessible parking, freight loading/unloading, passenger pick-up/drop-off, and micromobility corrals. Curb extensions may also be installed at intersections to shorten the pedestrian crossing distance, increase pedestrian visibility, and provide more space for streetscape elements, where appropriate.

Concept 3. Raised Cycle Track

Concept 3 proposes a raised cycle track between a tree/furnishing zone and the pedestrian clear zone on both sides of Independence Avenue, as shown in Figure 39.

Double rows of trees and a pedestrian clear zone of 12 feet to 16 feet are provided on both sides of the street. This concept includes a curbside flex zone on Independence Avenue's north side/museum side. Transit shelters alternate with street trees where bus stops are located.

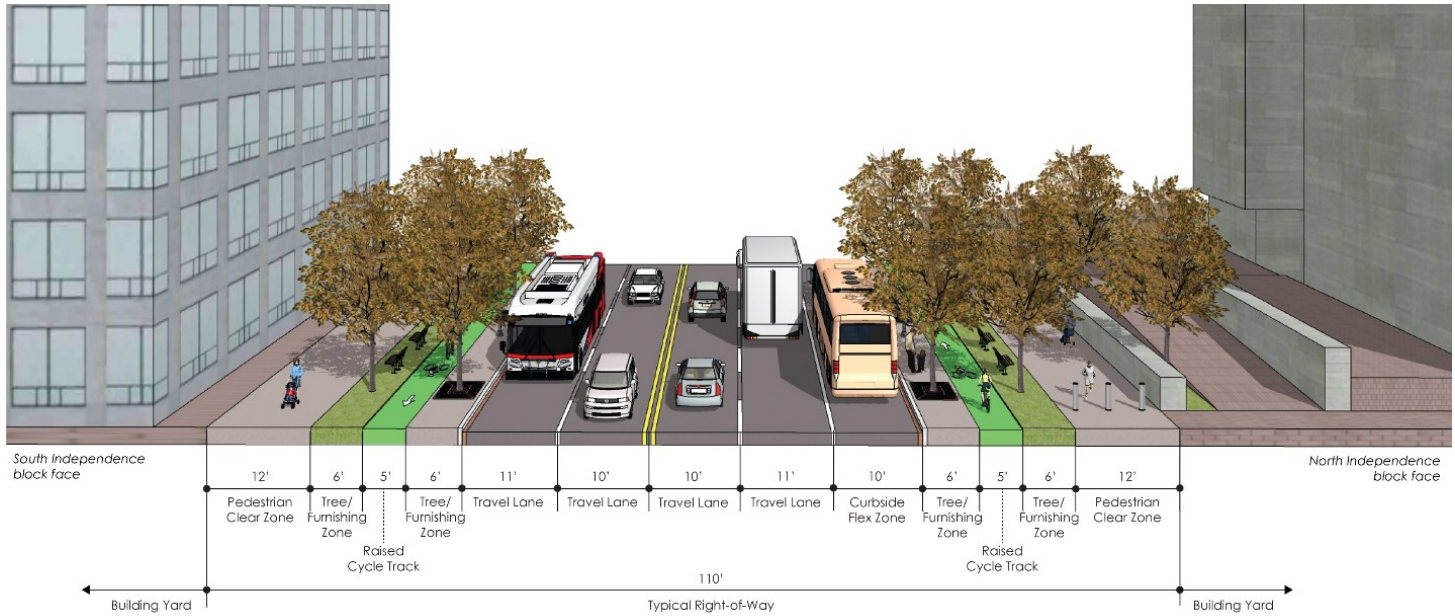


Figure 39 Typical Section for Concept 3 Raised Cycle Track

MEDIAN/TURN LANE TREATMENT

There is no median or pedestrian refuge area in this concept. At intersections where left turns are permitted and/or protected along the study corridor, a left-turn lane treatment will need to be evaluated. The inner travel lane could provide a dedicated left-turn lane or turn into a through-left to allow left-turning movements per existing conditions. The curbside flex zone may need to be shortened to provide space for the left turn lane where dedicated left-turn lanes are necessary.

PEDESTRIAN CLEAR ZONE

The pedestrian clear zone ranges from 12 feet to 18 feet. The tree/furnishing zone provides an extra 6 feet of pedestrian space in areas between the tree grates, providing a total width of 18 feet. The expanded clear zone can also help to accommodate passenger pick-up/drop-off.

BICYCLE FACILITY

There is a raised one-way cycle track on both sides of the street. Additional bicycle connections would be available on a parallel route, such as off-street trails along Jefferson Drive and intersecting bicycle lanes along 4th Street.

TREE/FURNISHING ZONE

There are two rows of trees on both sides of the street. The tree/furnishing zones can vary from a landscaped grassy area with trees to a pedestrian clear zone with periodic tree boxes. Each tree/furnishing zone is 6 feet wide, meeting minimum width requirements. The area between tree boxes acts as extra width for the pedestrian clear zone and provides space for pedestrians crossing. The tree/furnishing zone adjacent to travel lanes may also alternate as a step-out zone near curbside loading areas or provide shelter and passenger boarding/alighting areas near bus stops.

CURBSIDE ACTIVITY

A 10 feet wide curbside flex zone is provided on the north side/museum side of Independence Avenue in this concept. Use of the curbside flex zone may vary from block to block along Independence Avenue based on local contexts. Examples of uses include on-street parking, accessible parking, freight loading/unloading, passenger pick-up/drop-off, and micromobility corrals. Curb extensions may also be installed at intersections to shorten the pedestrian crossing distance, increase pedestrian visibility, and provide more space for streetscape elements, where appropriate.



**CONCEPT
EVALUATION**



CONCEPT EVALUATION

After identifying the three concepts, the project team conducted a concept evaluation based on the project objectives, performance measures, evaluation methods, and targets. Table 15 summarizes how well each concept meets each performance measure.

Table 15 Concept Evaluation Based on Targets

Objectives	Performance Measures	Concepts		
		1	2	3
Emphasize the avenue's unique character	Advances recommendations from historical plans and considers future multimodal demands	☐	☐	●
	Creates an attractive multimodal and pedestrian-friendly corridor	●	●	●
Resiliency and Sustainability	Increases stormwater functionality	☐	●	☐
	/ Increases shade cover	☐	●	☐
	/ Reduces urban heat island effect	☐	●	☐
	/ Increases biodiversity	●	●	●
Improve multimodal safety	Reduces crashes and crash risk	●	●	●
	Minimizes conflict points	☐	☐	☐
	Minimizes vehicles blocking multimodal facilities	●	☐	☐
Improve multimodal comfort and access	Exceeds maximum pedestrian LOC standards to provide an attractive, pedestrian-friendly corridor	●	●	●
	Exceeds maximum BLTS standards on Independence Avenue or a nearby parallel route	○	○	●
	Ensures access to all bus stops is ADA compliant and improves bus stop amenities	●	●	●
Reevaluate the function of the avenue and 'right-size' the roadway	Equitably accommodates all modes of transportation during typical weekdays, weekends, and special events	●	●	●

○ Does not meet Target

☐ Partially meets target

● Fully meets target

CONCEPT 1: CURBSIDE FLEX ZONE

The following changes proposed in Concept 1 would improve multimodal safety and comfort:

- / **Removing travel lanes**
Removing travel lanes can shorten pedestrian crossing distances and lower vehicular volumes, speeds, and crash risks over time. Impacts on transit due to traffic congestion may need to be further evaluated.
- / **Adding curbside flex zones**
The overall decrease in parking supply based on different uses of curbside flex zones can act as a barrier to driving and increase the likelihood of using different modes.
- / **Widening pedestrian infrastructure**
Increasing the width of pedestrian clear zones can increase access and the propensity to walk to destinations. Increased pedestrian clear zones can also be allocated as space to support businesses.

CONCEPT 2: LANDSCAPED MEDIAN

The following changes proposed in Concept 2 would improve multimodal safety and comfort:

- / **Removing travel lanes**
Removing travel lanes can shorten pedestrian crossing distances and lower vehicular volumes, speeds, and crash risks over time. Impacts on transit due to traffic congestion may need to be further evaluated.
- / **Adding a curbside flex zone**
The overall decrease in parking supply based on different uses of curbside flex zones can act as a barrier to driving and increase the likelihood of using different modes.

- / **Adding a landscaped median**
A landscaped median can improve pedestrian crossing experiences with a refuge area, provide stormwater management and drainage benefits by reducing the runoff area, and reduce the crash risk for head-on collisions.
- / **Widening pedestrian infrastructure**
Increasing the width of pedestrian clear zones can increase access and the propensity to walk to destinations. Increased pedestrian clear zones can also be allocated as space to support businesses.

CONCEPT 3: RAISED CYCLE TRACK

The following changes proposed in Concept 3 would improve multimodal safety and comfort:

- / **Removing travel lanes**
Removing travel lanes can shorten pedestrian crossing distances and lower vehicular volumes, speeds, and crash risks over time. Impacts on transit due to traffic congestion may need to be further evaluated.
- / **Adding a curbside flex zone**
The overall decrease in parking supply based on different uses of curbside flex zones can act as a barrier to driving and increase the likelihood of using different modes.
- / **Adding bike lanes**
Dedicated bicycle facilities can increase comfort for bicyclists and encourage those who may be less confident to also feel safe riding on the street.
- / **Widening pedestrian infrastructure**
Increasing the width of pedestrian clear zones can increase access and the propensity to walk to destinations. Increased pedestrian clear zones can also be allocated as space to support businesses.

TRAFFIC OPERATIONS

The traffic operations for the proposed lane configuration changes on Independence Avenue were evaluated and compared to the existing traffic operations. Similar to the methodology for evaluating existing traffic operations, the team used VDOT's VjuST tool to apply the CLV methodology and calculate the intersection v/c ratios along the corridor. All three concepts propose reducing the number of lanes from four to two in each direction.

The proposed configurations assume that the existing left turn configurations and signal timing will be maintained throughout the length of the study corridor. Table 16 compares the CLV and v/c ratios for each intersection in the existing condition and the proposed reconfiguration. The analysis shows that the CLVs will all stay below the urban threshold of 1,600 VPD and v/c will stay below 1.0 with the road diet in place.

Table 16 Critical Lane Volume (CLV) and Volume to Capacity (v/c) Ratios for Intersections along Independence Avenue for the Existing and Proposed Conditions

Intersection	Peak Period	CLV		V/C Ratio	
		Existing (8 lanes)	Proposed (4 lanes)	Existing (8 lanes)	Proposed (4 lanes)
Independence Avenue and 15th Street SW	AM	849	849	0.53	0.53
	PM	888	888	0.56	0.56
Independence Avenue and 14th Street SW	AM	1,073	1259	0.67	0.79
	PM	885	1022	0.55	0.64
Independence Avenue and 12th Street SW	AM	825	1353	0.52	0.85
	PM	886	1005	0.55	0.63
Independence Avenue and L'Enfant Plaza SW	AM	488	910	0.31	0.57
	PM	363	647	0.23	0.4
Independence Avenue and 9th Street SW	AM	464	647	0.29	0.4
	PM	514	877	0.32	0.55
Independence Avenue and 7th Street SW	AM	880	1491	0.55	0.93
	PM	778	1136	0.49	0.71
Independence Avenue and 6th Street SW	AM	472	891	0.30	0.56
	PM	450	776	0.28	0.49
Independence Avenue and 4th Street SW	AM	577	1040	0.36	0.65
	PM	566	918	0.35	0.57
Independence Avenue and 3rd Street SW	AM	846	1164	0.53	0.73
	PM	687	1049	0.43	0.66

CLV = Critical Lane Volume

V/C Ratio = Volume-to-Capacity Ratio. A V/C ratio closer to 1 means the demand is nearing the intersection capacity and delays/queues may occur.

CLV or V/C Ratio nearing intersection capacity

Moderate CLV or V/C Ratio

ADDITIONAL DESIGN CONSIDERATIONS

Due to this project's limited scope, the planning-level corridor concepts do not address detailed design considerations. As the project advances and the corridor concepts are refined, the project team recommends several design considerations to further improve multimodal safety and comfort. These additional considerations and spot treatments can be applied to complement the corridor concepts. The following sections provide an overview of each of the following additional design considerations:

- / Landscaping, trees, green infrastructure
- / Uniform security installations
- / Smithsonian loading needs
- / Repurpose Maryland Avenue
- / Motorcoach priority zones
- / Mid-block pedestrian crossings
- / Curb extensions
- / Designated pick-up and drop-off locations
- / Bus stop amenities

Landscaping, trees, green infrastructure

Each concept proposes double rows of trees on both sides of Independence Avenue. However, this may vary along the street depending on any landscaping within a building yard (e.g., a row of trees already present fronting a building yard). The choice of landscaping planted along the street would require a more granular evaluation of the blocks along Independence Avenue and an understanding of the desired level of effort for maintenance activities. Additionally, relevant NCPC policies on trees/landscaping guidelines may be informative. Figure 40 illustrates existing landscaping by the Hirshhorn Museum.



Figure 40 Existing Landscaping and street furniture along Independence Avenue SW and Maryland Avenue

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Uniform security installations

Security installations currently vary along Independence Avenue based on the unique characteristics of each building and/or museum. Figure 41 illustrates an example of unique perimeter security by the National Museum of the American Indian on Independence Avenue. Future consideration towards more uniform security installations and NCPC's existing perimeter security-related policies can help establish a comprehensive security strategy along Independence Avenue while promoting consistency in the pedestrian experience.



Figure 41. Bollards at 6th Street and Independence Avenue by the Air and Space Museum

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Smithsonian loading needs

Curbside flex zones can be allocated to meet Smithsonian loading needs on Independence Avenue's north side/museum side. This may include longer trucks that are unable to pull into loading docks and other heavy equipment necessary for unloading and loading gallery pieces and sculptures. Because these deliveries are scheduled, use of these zones can overlap metered parking and drop-offs for tour buses and rideshares.

Repurpose Maryland Avenue

Maryland Avenue intersects with Independence Avenue between 4th Street SW and 3rd Street SW. A segment of Maryland Avenue south of Independence Avenue was closed to traffic and currently houses the Dwight D. Eisenhower Memorial, disconnecting Maryland Avenue across Independence Avenue, as shown in Figure 42. Future studies should explore either closing the segment of Maryland Avenue from 3rd Street SW to Independence Avenue, near the National Museum of the American Indian, reconfiguring the section as a one-way roadway, or converting the section to a limited access roadway. Future plans and studies should reference the [2012 Maryland Avenue Southwest Plan](#). Additional considerations to maintain access for emergency vehicles should be reviewed. Closing Maryland Avenue would improve traffic operations during peak periods. The right-of-way could be repurposed to provide public space, seating, landscaping, or motorcoach pick-up and drop-off area.



Figure 42 Closed Section of Maryland Avenue at the Dwight D. Eisenhower Memorial

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Motorcoach priority zones

Additional design considerations for motorcoach priority zones may improve existing conditions for tour buses and provide curbside access to accommodate pick-up and drop-off of passengers. Further studies are necessary to determine the feasibility and locations of potential zones.

Mid-block pedestrian crossings

Pedestrian desire lines can be assessed along Independence Avenue to determine if existing crossing opportunities at intersections are sufficient and if midblock crossings are appropriate at any location along the street. Opportunities for mid-block pedestrian crossings exist throughout the corridor, as shown in Figure 43, and align with the District's transportation grid while providing the crosswalk spacing identified in the Ideas Toolbox.



Figure 43 Opportunities for Mid-block Pedestrian Crossings

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Curb extensions

Curb extensions can be installed at intersections to shorten the pedestrian crossing distance, increase pedestrian visibility, and provide space for streetscape elements, where appropriate. At intersections that accommodate left turns, the feasibility of curb extensions would depend on any potentially conflicting turn lane treatments. Figure 44 displays a schematic of a curb extension at an intersection, where the curb extension aligns with the edge of the parking lane.



Figure 44 Schematic of a Curb Extension at an Intersection

NACTO

Closures for large events

Given the high demand for Independence Avenue SW and the number of key destinations along the corridor, future considerations should identify a plan for closing sections of the Avenue for large events, such as festivals, parades, marches, and other events. Figure 45 shows Pennsylvania Avenue temporarily closed for a street festival.



Figure 45 Closure of Pennsylvania Avenue for Street Festival

WTOP

Designated pick-up and drop-off locations

Designated pick-up and drop-off locations provide dedicated curbside space for passenger pick-up, drop-off, and commercial loading and unloading. Depending on the local context, the curbside flex zones in each concept could be designated as pick-up drop-off locations. Figure 46 provides an example of signage at a pick-up and drop-off location.



Figure 46 Pick-Up/Drop-Off Zone in Washington, D.C.

Greater Great Washington

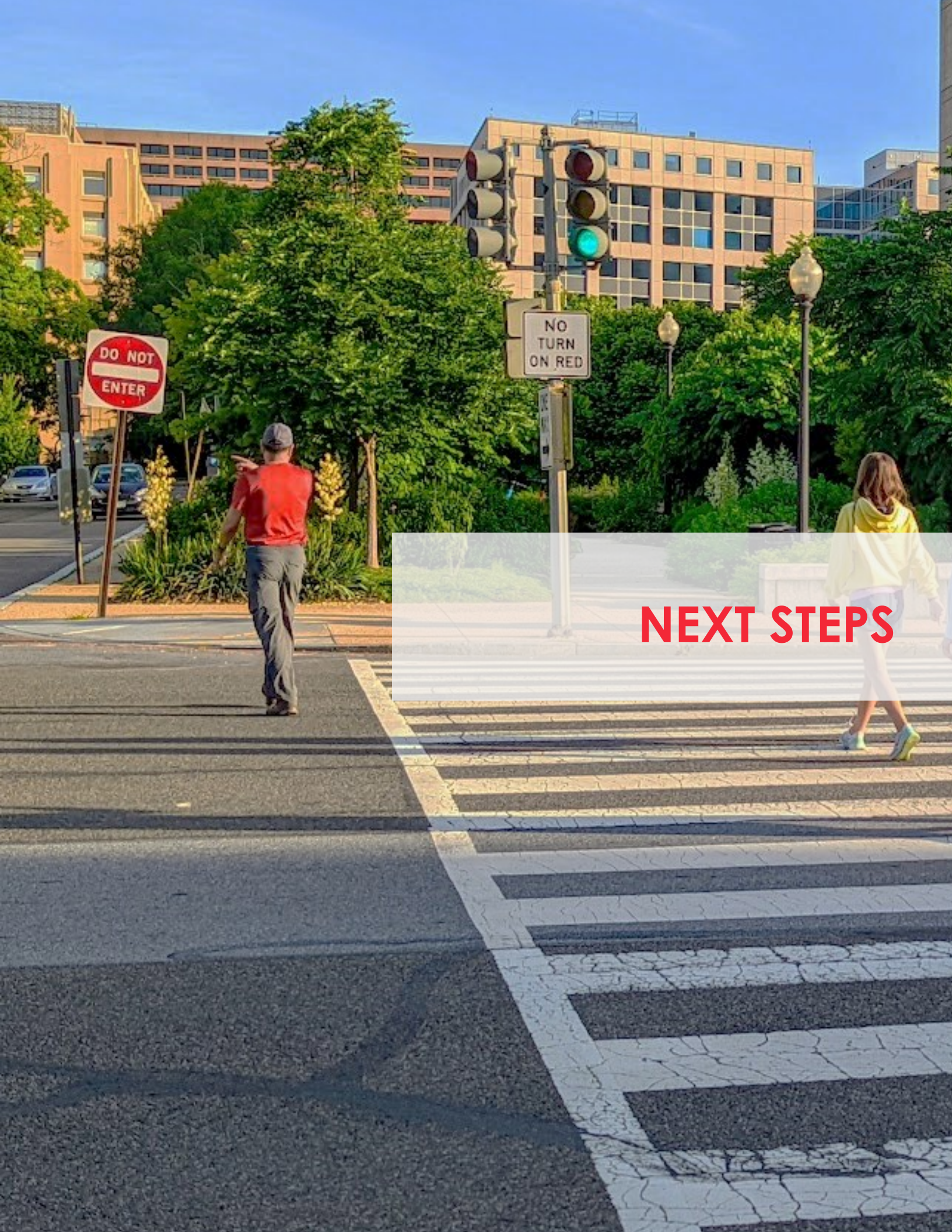
Bus stop amenities

Bus stop amenities can include transit shelters, information kiosks, and real-time arrival information. WMATA has five bus stop types based on daily ridership. The [Metrobus Station Customer Service Bus Stop Amenity Reference Guide](#) outlines the types of bus stop amenities appropriate based on ridership. Additionally, related transit improvements, such as bus boarding islands, could improve the rider experience. Figure 47 displays a transit shelter along Independence Avenue with adjacent Metrorail access.



Figure 47 Transit Shelter and Metrorail Access at Independence Avenue and 12th Street SW

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NEXT STEPS



NEXT STEPS

Corridor plans and studies, like the Independence Avenue Corridor Study, enable early conversation and exploration of needs, resulting in ideas that can begin to form a cohesive vision for the corridor. Input from key stakeholders, like DDOT, the Smithsonian, NPS, and NCPC, helps develop recommendations and informs decision-making and budget priorities for moving efforts forward.

Moving transportation projects from needs identification to construction is often an involved process that can take several years.

Figure 48 shows the general phases and activities associated with moving a project toward construction. While the graphic shows the project phases linearly, depending on the project, funding, and District of Columbia priorities, some of these phases can be combined, skipped, or occur out of order.

As noted in Figure 48, the Independence Avenue Corridor Study is in the planning stage of the transportation project process. The future phases summarized in Figure 48 will be led and carried out by DDOT, with support from stakeholders.

To advance the concepts included in this document, future phases of study on Independence Avenue would consist of public outreach and the development of a preferred alternative(s) to initiate National Environmental Policy Act (NEPA) and National Historical Preservation Act (NHPA) compliance proceedings and being to advance through the federal and local regulatory review process. NEPA and NHPA compliance may include environmental assessments and additional transportation studies. These future phases will also include identifying funding opportunities and, eventually, design and construction.

Because of Independence Avenue's unique operating environment, continued coordination between DDOT, the Smithsonian, NPS, General Services Administration (GSA) and NCPC will continue to be necessary to advance ideas on the corridor.

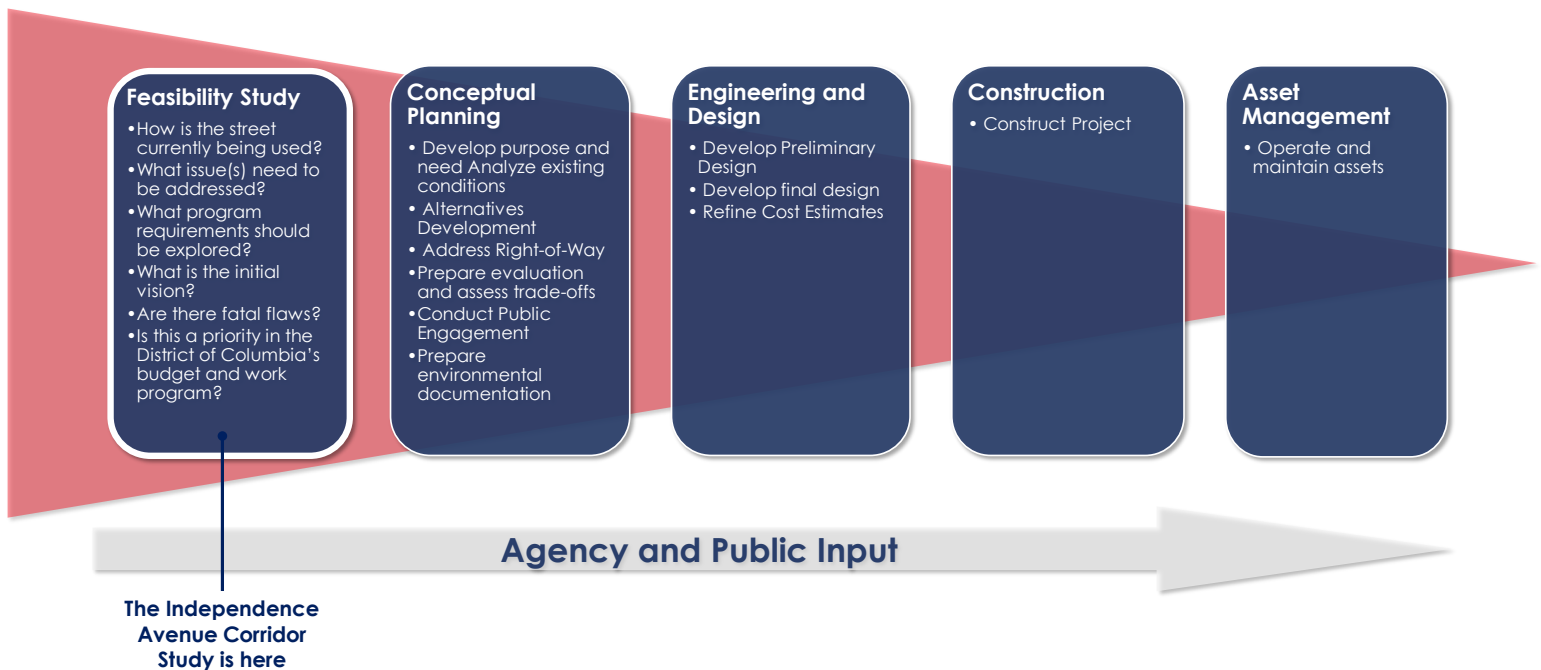


Figure 48. DDOT's Generalized Transportation Project Process

In the immediate future, the next phase of work on Independence Avenue will build on this study to advance the feasibility study and inform future phases of DDOT's generalized transportation project process:

Clarifying the project purpose and need with stakeholders and businesses.

Conducting a historical analysis of the corridor to lay the groundwork for future changes.

Overseeing a public life review of the corridor to measure and understand the current and potential future human experience of the street and public spaces.

Evaluating mode split and micromobility demand along Independence Avenue.

Developing an understanding of security requirements along the corridor.

Conducting a more detailed intersection operations analysis using the collected intersection turning movement counts with growth rates from other area studies for the baseline and design alternatives.

Reviewing current and future parking demand.

Identifying curbside needs, including loading zones, ridehail app usage, motorcoach needs, food truck, museum deliveries, and streatory requirements.

Coordinating stakeholder priorities and needs to narrow down the corridor cross-section configuration options and lead toward a unified future vision for the corridor.

Developing alternative concept designs for the preferred alternative.