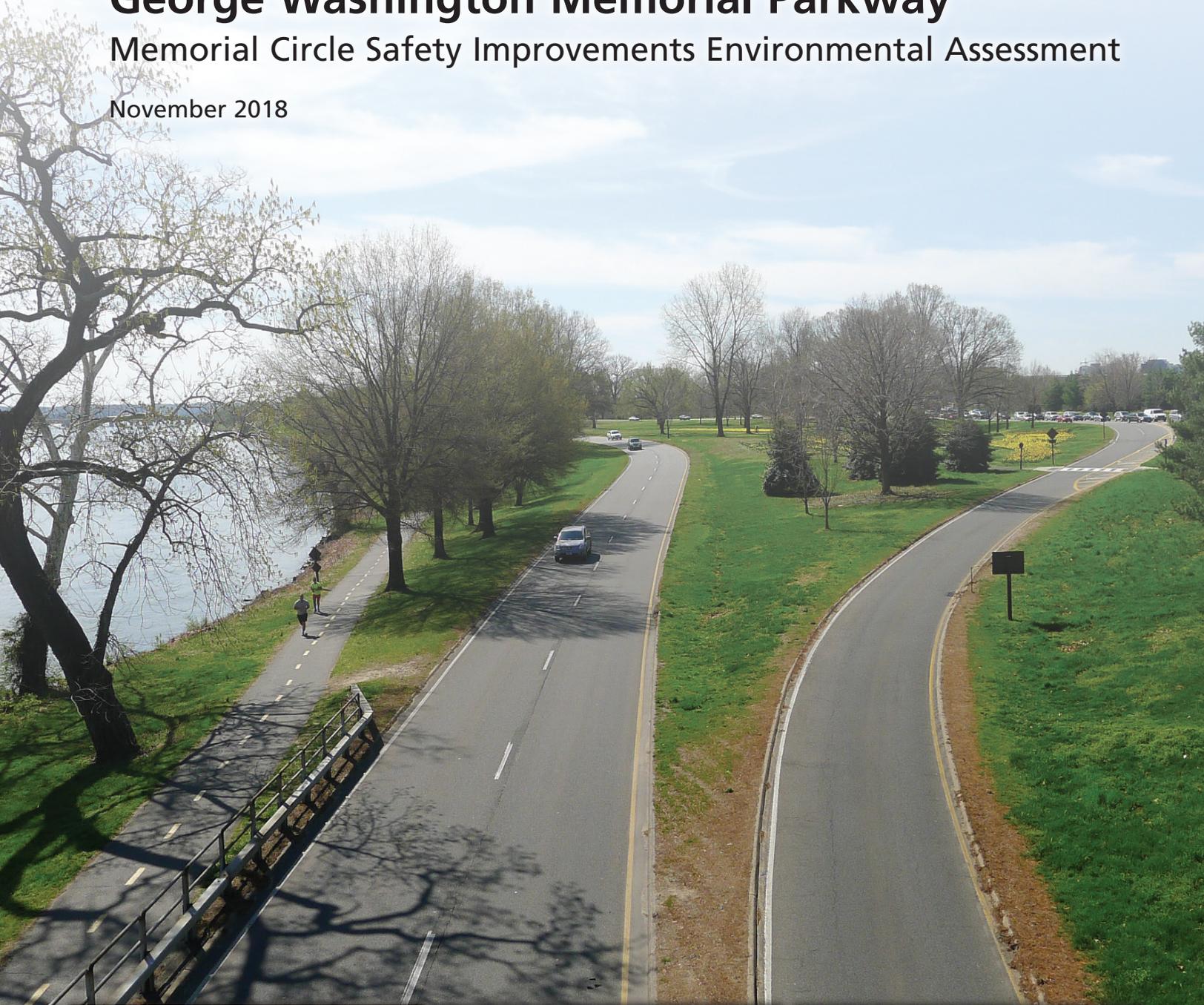




# George Washington Memorial Parkway

## Memorial Circle Safety Improvements Environmental Assessment

November 2018



Cover Photos by: VHB

**US Department of the Interior  
National Park Service  
George Washington Memorial Parkway**

**Safety Improvements Environmental Assessment  
Memorial Circle**

November 2018

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The George Washington Memorial Parkway (the Parkway) occupies more than 7,600 acres of land in Virginia, Maryland, and the District of Columbia and extends 38.3 miles in association with the Potomac River. The Parkway is a carefully planned scenic roadway that honors the nation's first president, George Washington, and extends from Mount Vernon to the Capital Beltway (I-495). This scenic route to the nation's capital serves both recreational users and local commuters and features a scenic road, recreational trails, historic monuments, and natural areas. Arlington Memorial Bridge and Memorial Avenue provide a grand entrance to Washington, DC, while also providing the ceremonial gateway into Arlington National Cemetery. Memorial Circle (the Circle) connects Arlington Memorial Bridge to Memorial Avenue.

Due to its central location amidst numerous vital and historic destinations in the region, the project area (Memorial Circle and the roadways in its immediate vicinity) sees high levels of traffic congestion and is at a major convergence of regional roadways and modes that interact through a complex series of roadway merges, weaves, diverges, and intersections. The heavy use of the project area causes a number of safety concerns, especially where roads merge, weave, and diverge, and at multiple bicyclist and pedestrian crosswalks. The National Park Service (NPS), in cooperation with the Federal Highway Administration, the National Capital Planning Commission, and Virginia Department of Transportation, is proposing to improve transportation safety at and near Memorial Circle in order to reduce risks at key locations within the corridor and to reduce conflicts between drivers, bicyclists, and pedestrians while maintaining the memorial character of the area.

This environmental assessment (EA) evaluates three alternatives: a no-action alternative (alternative A), and two action alternatives (alternatives B and C). Alternative A would continue the current management of the project area. Alternative B would improve signage, lane striping, in-lane guidance, and would add additional safety accommodations at some crosswalks. Alternative C would build upon alternative B and implement modifications to traffic patterns to simplify the more complex areas of weaves, merges, and diverges. Both action alternatives have the potential to result in beneficial impacts on traffic and transportation, health and safety, and visitor use and experience, as well as adverse impacts on cultural resources.

**Note to Reviewers and Respondents:**

This EA will be on formal public and agency review for 30 days from the release date. If you wish to comment, please provide comments on the park's website at <http://parkplanning.nps.gov/GWMP> or by mailing to the name and address below. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Superintendent  
George Washington Memorial Parkway  
c/o Turkey Run Park  
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# CHAPTER 1: PURPOSE AND NEED

## INTRODUCTION

The George Washington Memorial Parkway (the Parkway) occupies more than 7,600 acres of land in Virginia, Maryland, and the District of Columbia and extends 38.3 miles in association with the Potomac River. The Parkway is a carefully planned scenic roadway that honors the nation's first president, George Washington, and extends from Mount Vernon to the Capital Beltway (I-495). This scenic route to the nation's capital serves both recreational users and local commuters and features a scenic road, recreational trails, historic monuments, and natural areas. The National Park Service (NPS), in cooperation with the Federal Highway Administration, the National Capital Planning Commission, and Virginia Department of Transportation, is proposing to improve safety of the Memorial Circle (the Circle) area of the Parkway. Figure 1 shows the project area location.

Arlington Memorial Bridge and Memorial Avenue are linked by Memorial Circle and provide a grand entrance to Washington, DC and the ceremonial gateway into Arlington National Cemetery. Arlington Memorial Bridge and Memorial Avenue also connect the Lincoln Memorial to Arlington House, The Robert E. Lee Memorial, which symbolizes the strength of the post-Civil War nation by joining a memorial on the north side of the Potomac River with one on the south. More details about the regional roadways connected in this vicinity and the safety hotspots associated with the Circle are included in the section on the need for the project below.

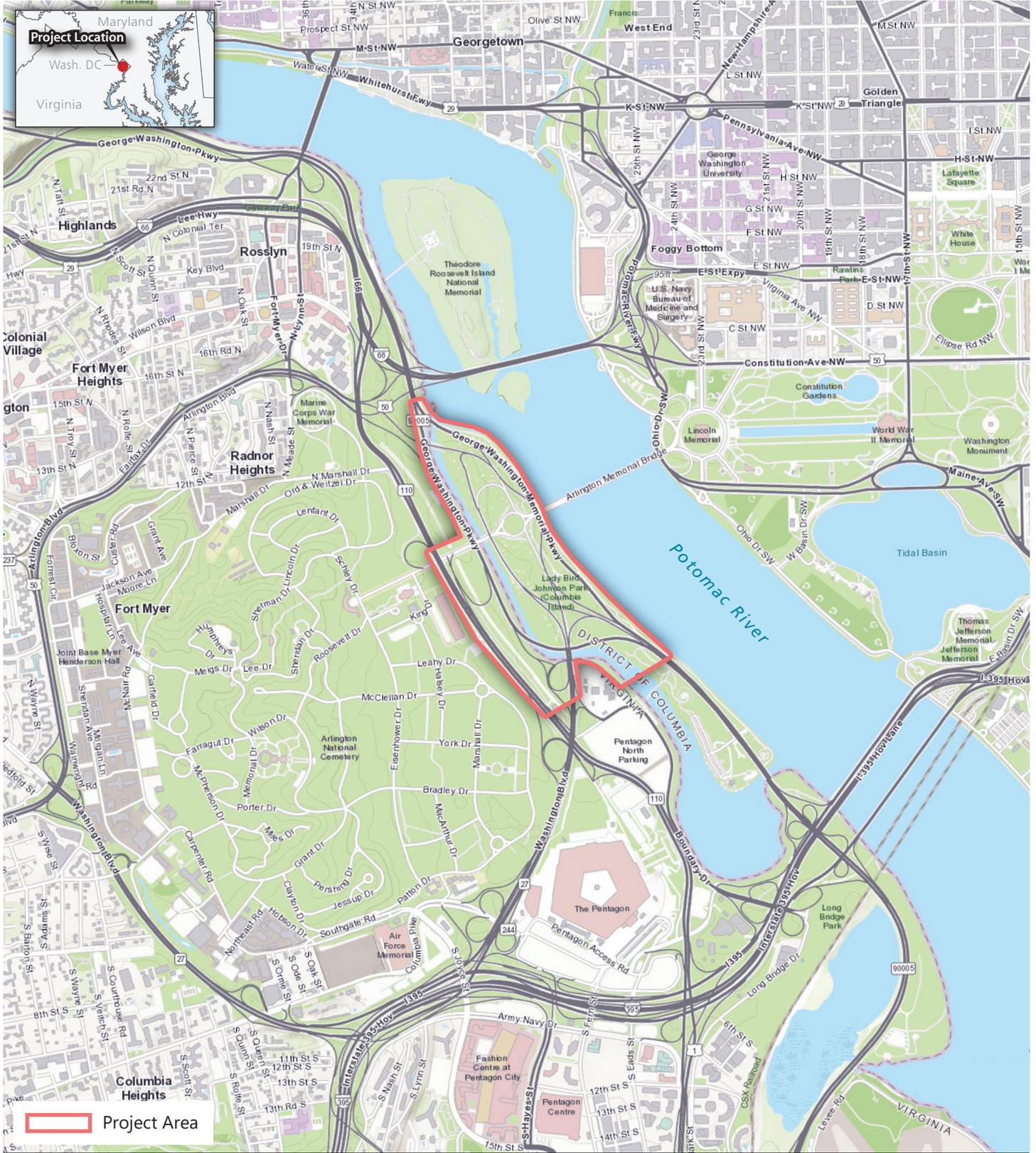
This environmental assessment (EA) evaluates three alternatives: a no-action alternative (alternative A), and two action alternatives (alternatives B and C). The action alternatives include improvements to the safety conditions in the project area. This EA analyzes the potential impacts these alternatives would have on the natural, cultural, historic, and human environment. It has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended [42 United States Code (USC) 4332(2) (C)]; the implementing regulations of the Council on Environmental Quality (CEQ) [40 Code of Federal Regulations (CFR) 1500-1508.9]; the Department of the Interior NEPA regulations (43 CFR Part 46); and NPS Director's Order #12: *Conservation Planning, Environmental Impact Analysis and Decision-Making* (DO-12) (NPS 2011) and the accompanying NEPA Handbook (NPS 2015b).

Compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (36 CFR Part 800) is being completed separately from and concurrent to the NEPA process, and is not included in this EA. Applicable cultural resource information, including potential impacts associated with the proposed alternatives, is documented in this EA, but does not constitute Section 106 compliance.

## PURPOSE OF AND NEED FOR ACTION

### Purpose

The purpose of this project is to improve transportation safety at and near Memorial Circle while maintaining the memorial character of the area. The goals are to reduce risks at key locations within the corridor and to reduce conflicts between trail, walkway, and roadway users.



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## Need

The project is needed because of concerns regarding safety, which result from a number of issues related to heavy use of the area, at-grade crosswalks, challenging wayfinding, and unconventional road patterns. The project area is heavily used by both locals and tourists for both commuting and recreation. Project area users include motorists on the Parkway roads as well as bicyclists and pedestrians on the Mount Vernon Trail, which intersects the Parkway roads several times.

Heavy use of the area causes a number of safety concerns, especially at the six un-signalized at-grade crosswalks within the vicinity of the Circle. Some of these crosswalks span multiple lanes of vehicular traffic. The crosswalks have signage meeting Manual on Uniform Traffic Control Devices standards for mid-block crossings, though near misses (narrowly avoided collisions) and accidents involving more than one vehicle or involving vehicles and crosswalk users are common based on informal observations. Based on a review of conditions at Memorial Circle, approximately 600 crashes were recorded in the area between 2006 and 2012 (NPS 2015a). Locations where these issues persist and crashes are clustered are highlighted as “hotspots” (figure 2).

Wayfinding and orientation for visitors traveling through the project area contribute to safety concerns as drivers become disoriented and/or distracted. With 10 traffic merges in less than a mile, drivers must make quick decisions informed by closely grouped signs resulting in drivers quickly changing lanes and merging into other roads without adequate distance to do so safely. The multiple destinations, routes, and options of the roads, along with the number, close spacing, and information of signs may contribute to driver confusion (NPS 2015a).

There are also a number of issues with the existing traffic flow through the Circle. The pattern of yielding to traffic entering the Circle is unconventional, which may confuse some drivers who expect a traditional roundabout. To improve traffic management during periods of heavy congestion, a section of the Circle must be manually barricaded each morning from about 7 a.m. to 9:30 a.m.; northbound traffic from Washington Boulevard is forced to go onto the Arlington Memorial Bridge. For these reasons, there is a need to make improvements within the project area to improve safety through operational and/or wayfinding adjustments, while at the same time, maintain the memorial character of the project area.

## PROJECT LOCATION

As shown on figure 2, the project area includes approximately 170 acres, most centered on Lady Bird Johnson Park (formerly Columbia Island), bounded to the east by the main stem of the Potomac River, to the north by the north end of Lady Bird Johnson Park, extending west to include portions of Memorial Avenue, and southward to the vehicular lanes merging between the Circle, the Parkway, and Route 27.

The primary feature within the project area is the Circle (approximately 300 feet in diameter), an important element of the Memorial Avenue corridor, which connects the Lincoln Memorial and Arlington National Cemetery. Positioned along the north-south route of the Parkway, the Circle provides access to a number of secondary destinations that are tangents to the Parkway, with destinations and routes all in close proximity to one another.



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## ISSUES AND IMPACT TOPICS

### Issues

During the scoping process, specific considerations and concerns were identified as critical to this project area. Along with the purpose of and need for the proposed action, these topics guided the development of alternatives and contributed to the selection of impact topics, as identified in the next section.

**Integrity of historic circulation patterns.** Because the Parkway is primarily a scenic route for travel, historic circulation patterns are important aspects of consideration. The most critical issues that affect the integrity of historic circulation patterns within the project area are changing historic alignments, grades, or significantly relocating any part of the historic resources. The high priority features include George Washington Memorial Parkway, Memorial Circle, Memorial Avenue, the Mount Vernon Trail, and the pedestrian system on the avenue and bridges.

**Views and vistas.** There are many views and vistas in the project area which contribute to the historic integrity and context of the site. These could be affected by introducing new elements such as signage, lighting, and colors; changes in grade; and relocation of circulation features. These views and vistas were historically designed to create visual relationships from the project area outward, and from other historic sites back to the project landscape. High priority views are the designed vista from Memorial Circle east to the Lincoln Memorial and west to the Arlington House and Arlington National Cemetery; the views from the Mount Vernon Trail near the Potomac River shore; and George Washington Memorial Parkway northbound to the Arlington Memorial Bridge Washington shoreline, National Mall, and Lincoln Memorial.

**Small-scale features.** Small-scale features can be affected due to changes in materials, removal, realignment, methods and materials used in repair or restoration, and historically-incompatible new elements. High priority small-scale features include the triangular islands of granite blocks at the east and west ends of Memorial Circle.

### Impact Topics Analyzed in this Environmental Assessment

Impact topics are resources within the project area that could be affected, either beneficially or adversely, by the range of alternatives presented in this EA. Impact topics considered in this document were identified based on the issues raised during scoping, site conditions, federal laws, regulations, Executive Orders, NPS *Management Policies 2006*, Director's Orders, and staff knowledge of the Parkway's resources. This section provides an overview of the impact topics that were retained for analysis in this EA.

**Traffic and Transportation.** The project area is at a major convergence of regional roadways and modes that interact through a complex series of roadway merges (on-ramps), weaves, diverges (off-ramps), and intersections, resulting in traffic congestion and crashes. The proposed action would change the way area users access and circulate through the area by car, bicycle, or foot.

**Health and Safety.** The heavy use of the project area causes a number of safety concerns, especially at the six un-signalized, at-grade crosswalks, some spanning multiple lanes, within the vicinity of the Circle. The proposed action will change the way visitors access and circulate through the area by car, bicycle, or foot.

**Visitor Use and Experience.** Recreation related to and enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks (NPS 2006). Additionally, the Parkway's foundation document identifies the Parkway driving experience as well as recreational opportunities as fundamental resources and values for the Parkway (NPS 2014a). The NPS strives to provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the natural and cultural resources found along the Parkway. The visitor experience encompasses interpretation, viewsheds, understanding, enjoyment, circulation, and accessibility of the project area. The proposed action would result in changes to these elements.

**Cultural Resources.** NEPA, NHPA, the NPS Organic Act, *NPS Management Policies 2006*, Director's Order #12, and Director's Order #28 require the consideration of impacts on any cultural resource that might be affected by a proposed federal action. Cultural resources within the project area include the George Washington Memorial Parkway and associated features, Lady Bird Johnson Park and associated features, the Memorial Avenue Corridor and associated features, and Arlington Memorial Bridge and related features. The proposed action has the potential to result in changes to these resources.

### **Impact Topics Dismissed from Further Analysis**

The following presents an overview of impact topics that were considered but ultimately dismissed from further analysis in this EA. An impact topic was initially considered but dismissed from further analysis if it was determined that the resource is not present in the project area or because any potential impacts would be less than minor, typically temporary, and localized.

**Archeological Resources.** Because some ground disturbance would be required for improvements proposed in the EA, archeological resources were considered. The soils in the project area are primarily dredge and fill materials and are, therefore, highly unlikely to contain any archeological resources. If during construction previously unknown archeological resources were discovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and, if significant resources could not be preserved *in situ* (not moved from its original place of deposition), an appropriate mitigation strategy (e.g. the excavation, recordation, and mapping of cultural remains prior to disturbance to ensure that important archeological data that otherwise would be lost is recovered and documented) would be developed in consultation with the state historic preservation office and, as appropriate, associated American Indian tribes.

**Soils and Topography.** Soils and topography in the project area were considered as a potential impact topic due to the proposed alterations to roadways and trails. However, the project area has been previously disturbed for construction and realignment of roads and trails since the Parkway's initial construction. The proposed roadway alterations include slight widening of existing roads and trail realignment in select locations, which would not require substantial regrading or change in overall topography of the project area. A total of up to 0.22 acres of soils would be covered by impervious surfaces for the widened roads and the realigned trail, the locations of which are described in "Chapter 2: Alternatives" below. Some of the area to be covered by impervious surfaces for the widened roads were likely previously disturbed for the initial construction of the existing roads. Although some soil disturbance would take place for the proposed changes, characteristics of local soils would not noticeably change due to the relatively small amount of disturbance. Erosion control measures would be implemented during construction to avoid, minimize, and/or mitigate impacts from soils erosion or sedimentation, as described in chapter 2 below.

## **CHAPTER 2: ALTERNATIVES**

This chapter describes various alternatives for safety improvements at Memorial Circle. CEQ regulations for implementation of the NEPA process call for the alternatives considered in a document to include a no action alternative. The description and evaluation of this alternative provides a baseline to which the action alternatives can be compared. This EA evaluates three alternatives: the no action (alternative A) and two action alternatives (alternatives B and C). The elements of these alternatives are described in the following sections. Alternative elements considered but dismissed from detailed analysis are summarized in appendix A. Impacts associated with the alternatives are described in “Chapter 4: Environmental Consequences.”

### **ALTERNATIVE A: NO ACTION**

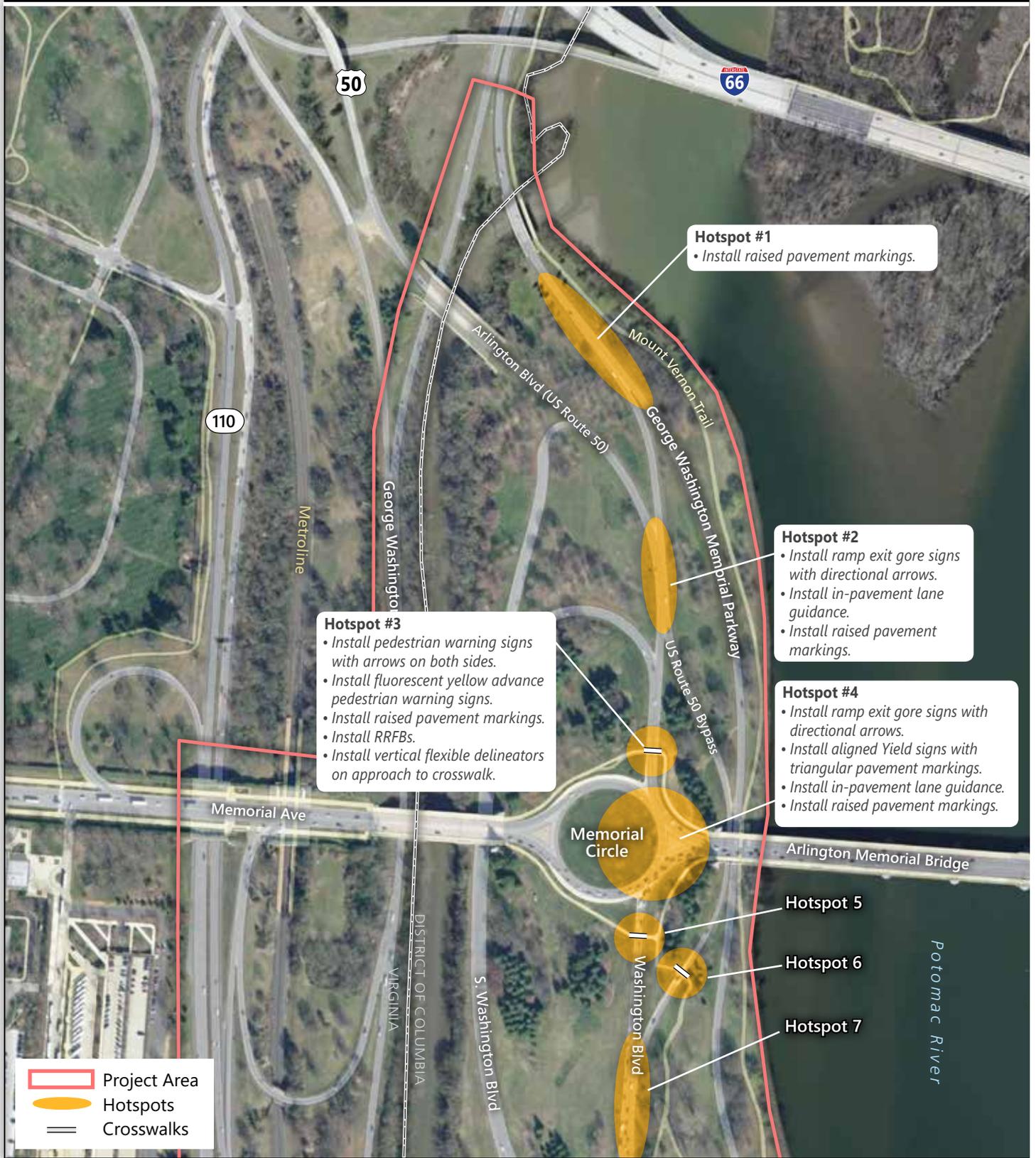
Under alternative A, no changes or improvements to signs, roadways, trails, or crosswalks would occur in the project area. The complex connections between major regional routes would remain in their current layout, including the location of diverges, merges, intersections, and pedestrian/bicyclist crossings. US Park Police would continue to setup a temporary traffic control barrier south of the Circle in the morning peak period to improve operations.

No changes to the traffic pattern of the Circle itself would take place under alternative A. The close proximity of the various flows of intersecting traffic would remain. Priority would continue to be given to traffic entering the Circle, maintaining the highly atypical traffic pattern. No improvements to the crossings within the project area would be implemented and they would remain in their current locations and un-signalized. Pedestrians and bicyclists would continue to be required to cross several lanes of high-speed traffic in most locations.

### **ALTERNATIVE B: IMPROVE SAFETY**

Under alternative B, improvements to signage and lane striping would be implemented to improve safety of drivers, pedestrians, and cyclists. These improvements are summarized below and are shown by hotspot location on figures 3 and 4. Some improvements would be implemented outside of the identified hotspots, but would result in improvements to safety at the associated hotspot.

Under alternative B, signage improvements would be implemented throughout the project area. In the vicinity of exit ramps at hotspots 2, 4, and 7, wayfinding signs with directional arrows would be installed at exit gore areas (the triangular area between the main roadway and the merging or diverging roadway) to reduce confusion for drivers in advance of exit lanes. At hotspot 4 (the Circle), yield signs and triangular pavement markings would be installed and aligned to alert drivers where to yield to other traffic. Where possible, language on directional guidance signage would be simplified and the size of signage and lettering would be increased. These size increases would generally be by approximately six inches to a few feet. For example, some signs would be increased from 30 inches by 30 inches to 36 inches by 36 inches. For additional details on proposed sign locations and sizes, see appendix B, “Hotspot Signage Recommendations.”



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Example of pavement markings aligned with yield signs

In the vicinity of crosswalks, the NPS would improve signage to draw visual attention to crosswalks. Fluorescent yellow advance pedestrian crossing warning signs would be installed on both sides of the roadways approaching crosswalks at hotspots 3, 5, 6, 8, and 9 to alert motorists that they are approaching a crosswalk. At the same crosswalks, fluorescent yellow pedestrian crossing warning signs with arrows would be installed on both sides of the road to alert motorists of the location of the crosswalk. These same crosswalks would also have vertical flexible lane delineators installed at the approaches to further visually alert drivers to the presence of a crosswalk. Rectangular Rapid Flashing Beacon (RRFB) systems, which flash warning lights in an irregular pattern when a pedestrian or cyclists is crossing, would be installed at crosswalks in hotspots 3, 5, 8, and 9 to alert drivers to pedestrians or bicyclists using the crosswalk.



Example of user-activated Rectangular Rapid Flashing Beacon system

Modifications to lane striping would be undertaken where needed throughout the project area under alternative B. In-pavement lane guidance (such as arrows) would be installed in the vicinity of hotspots 2, 4, and 7 to reduce last-minute weaving by providing advanced guidance on destination and appropriate lane. Raised pavement markings would be installed in the vicinity of all hotspots to improve the visibility of roadway and lane alignments. Transverse rumble strips would be installed within the vicinity of hotspots 5, 8, and 9 to alert and slowdown drivers approaching crosswalks. Mini-skips (dashed lines) and lane separation/delineators (flexible, vertical markers with reflective strips) would be installed in the vicinity of hotspot 7 to eliminate the inconsistency in maneuvers and striping. Speed limits would be posted in lanes in the vicinity of all hotspots to make clear the speed limit to motorists throughout the project area. Daytime speed enforcement would be increased through law enforcement and speed trailers to reduce vehicular speed throughout the project area.



Example of in-pavement lane guidance

Under alternative B, no changes to roadways or trails would occur in the project area. The complex connections between major regional routes would remain in their current layout, including the location of roadway merges and weaves as well as crossings for pedestrians and bicyclists. No changes to the traffic pattern of the Circle itself would take place. The close proximity of the various merges and intersecting traffic flows would remain, and priority would continue to be given to traffic entering the Circle, maintaining the highly atypical traffic pattern at the Circle. US Park Police would continue to set up a temporary traffic control barrier south of the Circle in the morning peak period to improve operations where traffic enters the Circle from the south and accesses Arlington Memorial Bridge.

## **ALTERNATIVE C: IMPROVE SAFETY AND REDUCE CONFLICTS (PROPOSED ACTION AND NPS PREFERRED)**

Actions under alternative C would include all of the modifications described under alternative B. In addition, alternative C would include roadway and crosswalk modifications in the vicinity of specific hotspots to further improve safety and reduce conflicts among drivers, pedestrians, and bicyclists. These improvements are summarized below and are shown by hotspot location on figures 5 and 6. Some improvements would be implemented outside of the identified hotspots, but would result in improvements to safety at the associated hotspot. Additionally, due to the interrelated nature of traffic flow patterns, improvements at some hotspots would also improve conditions at other hotspots upstream or downstream of the improvements. Therefore, not all hotspots required additional improvements under alternative C in order to meet the purpose and need for the project.

At hotspot 1, improvements would be the same as described under alternative B.

At hotspot 2, located north of the Circle, Washington Boulevard would be reduced to one lane. Where the two roads merge, the roadway would be restriped to allow two lanes from S. Arlington Boulevard and one lane from Washington Boulevard to continue in their lanes. The existing southern exit ramp connecting S. Arlington Boulevard and S. Washington Boulevard would be removed along with the existing far left exit lane of S. Arlington Boulevard. To accommodate the shift in traffic, the northern exit ramp would be widened to allow two lanes of traffic to exit from S. Arlington Boulevard; the left lane would be an exit only lane and the right lane would be a shared exit/through lane. This would require widening by up to 12 feet for a length of approximately 250 feet on the approach to the exit ramp and the exit ramp itself. The exact length, width, and layout of the widening would be determined during a future design phase. This may require trimming or removal of one or two trees on the roadside of the exit ramp. These improvements would help reduce the merging and weaving required by the existing lane and ramp configuration.

At hotspot 3, where S. Arlington Boulevard exits the Circle to the north, the roadway would be reduced from three lanes to two prior to the crosswalk. Two lanes would enter the area from Arlington Memorial Bridge and continue north along S. Arlington Boulevard; one lane would enter from the Circle and merge into the left lane of S. Arlington Boulevard. The existing far left lane that currently exits onto the ramp to S. Washington Boulevard would be removed along with this exit ramp, as described above under hotspot 2.

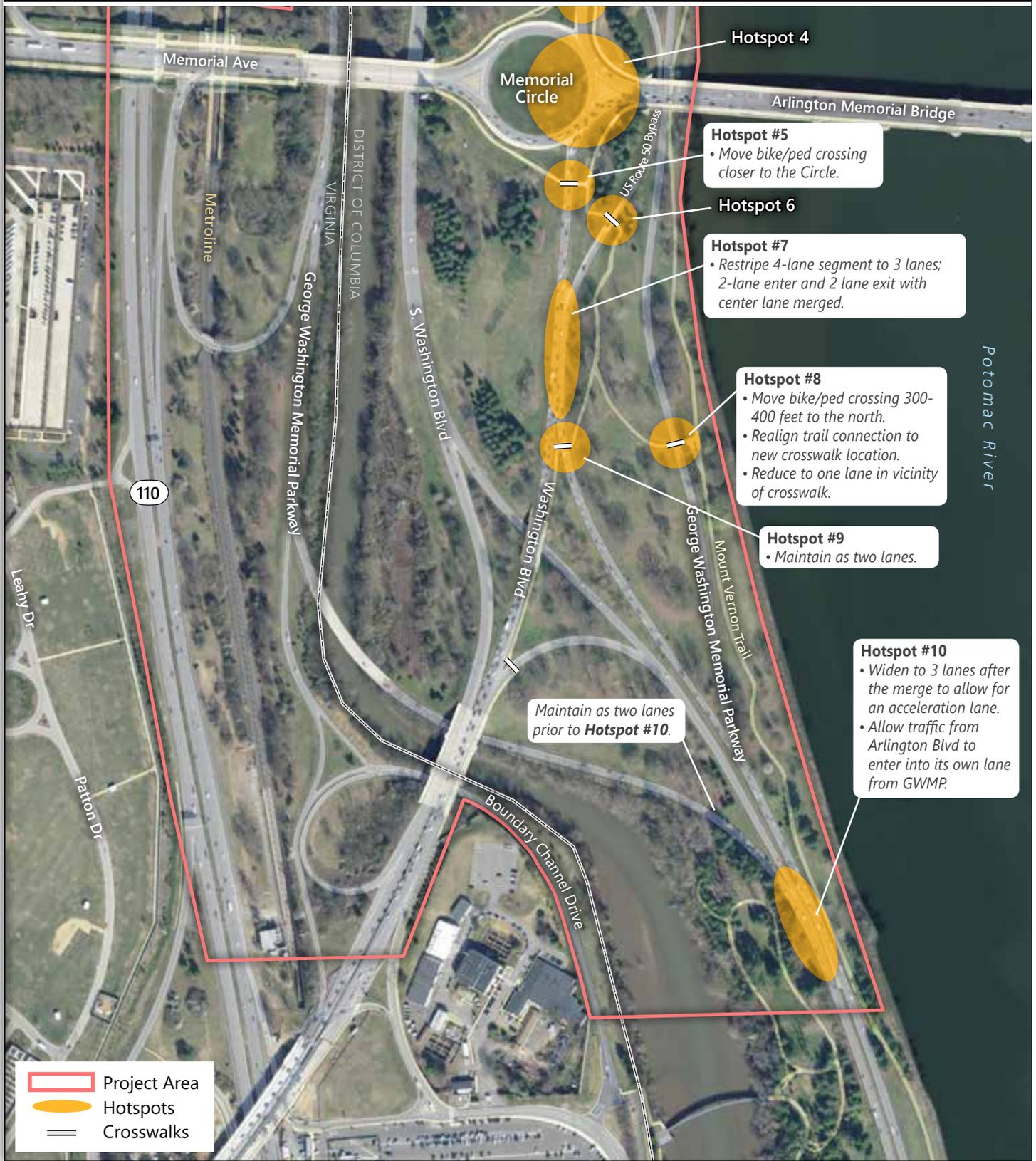
At hotspot 4, circulation within the Circle itself would be modified such that drivers in the Circle would have the right of way and drivers entering the Circle would be required to yield. The Circle itself would be restriped to reduce from two lanes to one lane. These improvements would allow the Circle to function more like a modern roundabout.

At the east side of the Circle where it meets with Arlington Memorial Bridge, the existing island would be reconfigured into two smaller islands. This would allow the right two westbound lanes from Arlington Memorial Bridge to bypass the Circle and head north onto S. Arlington Boulevard, and the left westbound lane would enter the Circle. See figure 7 for proposed modifications to the Circle.



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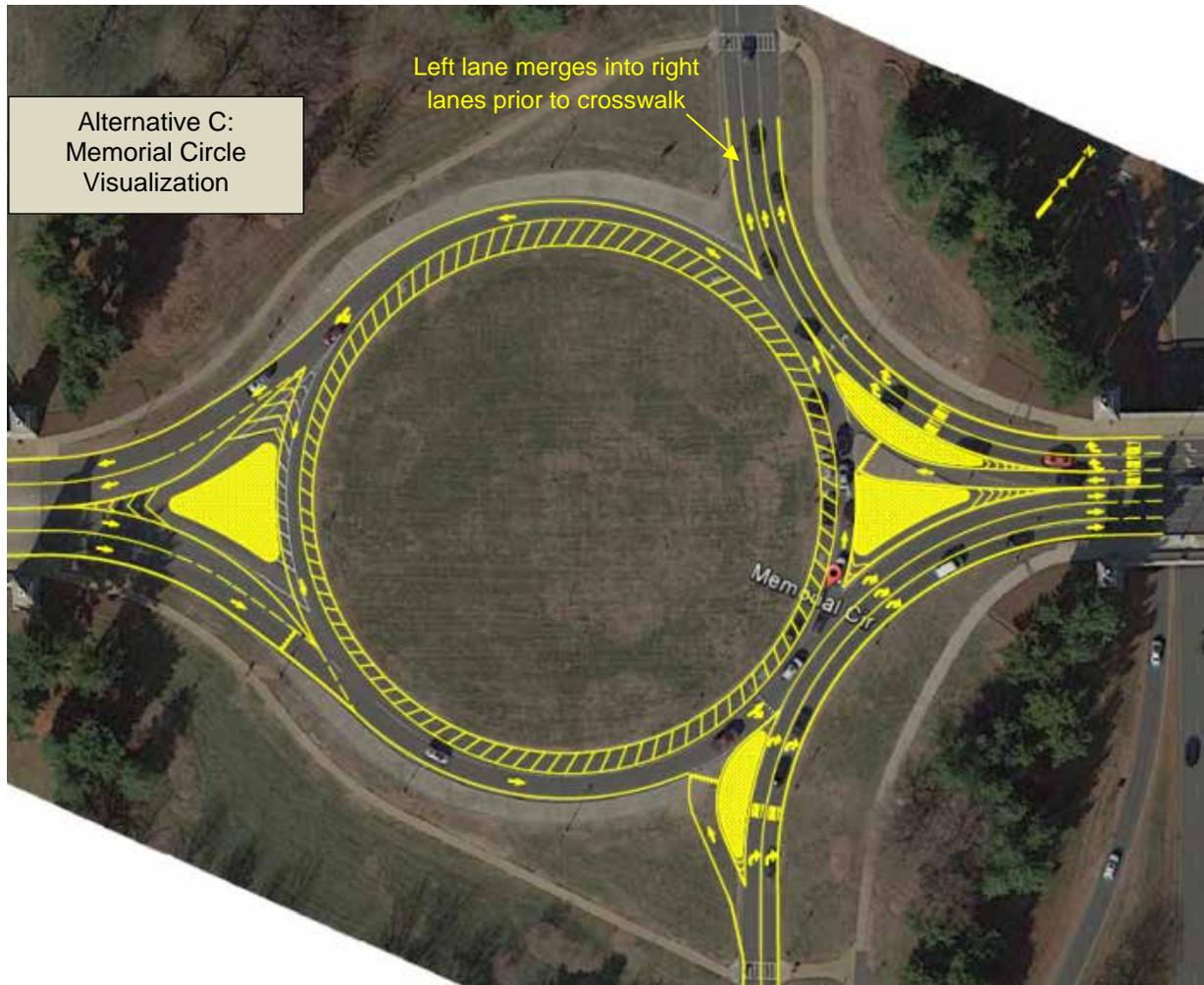


Figure 7. Alternative C: Memorial Circle Detail

On the south side of the Circle where Washington Boulevard enters the Circle, a small concrete island would be constructed to allow two northbound lanes from Washington Boulevard to bypass the Circle and enter Arlington Memorial Bridge, and one lane from Washington Boulevard would enter the Circle. This would require minor widening of the roadway at this intersection to accommodate the third lane and small island. Because of the geometry of the proposed third lane and traffic island, as well as the fact that a portion of this area is already covered with a hardened surface, the road would be widened between a few feet and up to 20 feet at its widest for a length of up to 90 feet. The exact length, width, and layout of the widening would be determined during a future design phase. See figure 7 above for proposed modifications to this section of the Circle.

At hotspot 5, the existing pedestrian and bicycle crossing would be relocated closer to the Circle, to allow pedestrians and bicyclists to cross where vehicle speeds are slower and where drivers are anticipating conflicts. The location of the relocated crosswalk would need to be coordinated with the new island described above.

At hotspot 6, improvements would be the same as described under alternative B. The merge from two lanes to one lane would be maintained at the crosswalk to continue to enable a safer crossing of only one lane.

At hotspot 7, where Washington Boulevard merges and diverges south of the Circle, the roadway would be restriped and reduced from four lanes to three lanes, in order to simplify merging patterns. With this lane reduction, two lanes would enter the merge area from each the western and eastern roads. The left-most and right-most lanes would continue in their own lane while the two middle lanes would merge into one lane. The middle lane would then diverge into two lanes when the roads split; two lanes would exit the merge area towards the Circle and two would exit towards the bypass under the Arlington Memorial Bridge. This would maintain the existing configuration of US Route 50 Bypass and the merge to one lane at the crosswalk at hotspot 6.

At hotspot 8, in the vicinity of the crosswalk at the George Washington Memorial Parkway southeast of the Circle, the crosswalk would be relocated further north along the Parkway. The specific location of the relocated crosswalk would be determined at a future design phase of the project, but it could be moved between 300 and 400 feet north of its current location. The trail connection on either side of the roadway would be realigned to meet the relocated crosswalk. The roadway would be restriped to reduce the lanes from two lanes to one lane in the vicinity of the crosswalk.

At hotspot 9, improvements would be the same as described under alternative B.

At hotspot 10, where the Parkway exits the project area to the southeast, the southbound roadway would be widened to add an acceleration lane allowing traffic from Arlington Boulevard to enter the Parkway in its own dedicated lane before merging onto the two-lane Parkway. This would require widening of 10 to 12 feet for a length of approximately 225 feet. The exact length, width, and layout of the widening would be determined during a future design phase. This may require trimming of a few trees and the removal or relocation of an existing tear-drop light post.

## **NPS PREFERRED ALTERNATIVE**

The preferred alternative is the alternative the NPS believes “would best accomplish the purposes of the proposed action and while fulfilling its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors” (43 CFR 46.420 [d]). The NPS identified “Alternative C: Improve Safety and Reduce Conflicts” as the preferred alternative because the combination of proposed improvements to signage, road striping, crosswalks, and road reconfigurations would provide safer routes throughout the project area and more intuitive navigation. Although there would be some alterations to the appearance, circulation patterns, and small-scale features of the project area, the overall historic character of the memorial landscape would be maintained. “Alternative A: No Action” would not meet the project purpose and need because no safety improvements would be made. While “Alternative B: Improve Safety” would improve navigation and safety through signage and striping improvements, it would not improve the existing atypical traffic patterns. Based on these factors, alternative C best meets the project purpose and need and was therefore identified as the NPS preferred alternative.

## MITIGATION MEASURES

To minimize environmental impacts related to the action alternatives, the NPS would implement mitigation measures whenever feasible. Exact mitigation measures to be implemented would depend upon the final design and approval of plans by relevant agencies, and would be determined during future design and construction phases. The following is a list of actions that could take place:

- Instruct all contractor employees on the sensitivity of the general environment and monitor their activities by NPS staff in order to mitigate and minimize potential impacts on natural and cultural resources during construction. Corridors for construction vehicle movement would be established and defined on the ground. Staging of construction equipment would be restricted to the road corridor, parking lots, and other identified previously disturbed areas to avoid impacts on natural resources.
- Clearly state all protection measures in the construction specifications, and instruct workers to avoid conducting activities beyond the fenced construction zone.
- Fence all areas in order to keep related disturbances within an NPS-defined and minimal impact area required for construction.
- Implement standard noise abatement measures during construction. Standard noise abatement measures could include the following elements: a schedule that minimizes impacts on adjacent noise-sensitive uses, the use of the best available noise control techniques wherever feasible, the use of hydraulically or electrically powered impact tools when feasible, and location of temporary noise sources as far from sensitive uses as possible.
- Minimize soil erosion by limiting the time that soil is left exposed and by applying other erosion control measures, such as erosion matting and silt fencing in construction areas to reduce erosion, surface scouring, and discharge to water bodies.
- Reseed all areas with native grasses or other NPS approved native vegetation.
- Remove invasive plants from construction areas using approaches prescribed in the NPS Integrated Pest Management Program.
- Implement measures to prevent invasive plants from returning to sites where they have been removed, such as ensuring that construction-related equipment arrives at the site free of mud or seed-bearing materials, and certifying that all seeds and straw material are weed-free.
- Rehabilitate areas that are temporarily disturbed during construction with native grasses and other native species as per NPS standards and consistent with the cultural landscape report and applicable historic planting plans.
- Follow the *Secretary of the Interior's Standards for the Treatment of Historic Properties* for any restoration, rehabilitation, or renovation activities to historic structures.
- Although archeological resources are unlikely to occur within the project area, immediately implement NHPA Section 106 procedures if any unknown significant archeological resources are uncovered during ground-disturbing activities. If previously unknown archeological resources are discovered during construction, all work in the immediate vicinity (600 feet) of the discovery shall be halted until the resources are identified and documented and an appropriate mitigation strategy developed, if necessary, in accordance with pertinent laws and regulations, including the stipulations of the 2008 Programmatic Agreement Among the NPS (US Department of the Interior), the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers.

- If needed, tree removal, clearing, and construction activities would not take place during the roosting and pupping season of the northern long-eared bat (June 1-July 31) to avoid disturbance to potential maternity roosts in the area. During future project phases, if it is determined that clearing or construction is needed during these seasons, the NPS would coordinate with the US Fish and Wildlife Service to ensure no impacts would occur.
- If tree removal or cutting is to be undertaken between April 1 and October 3, the NPS would conduct a nest survey for bald eagles and other migratory nesting birds. If nests are observed within the project area, measures to avoid disturbance would be determined through coordination between the NPS, the US Fish and Wildlife Service, and/or appropriate state agencies. If nests are present, a biological monitor may be employed to prevent potential impacts to birds during construction activities undertaken during this period.

## SUMMARY COMPARISON OF THE ALTERNATIVES

The following table (table 1) provides a brief summary comparison of the alternatives, based on the details provided earlier in this chapter.

TABLE 1. SUMMARY COMPARISON OF THE ALTERNATIVES

Alternative A: No Action	Alternative B: Improve Safety	Alternative C: Improve Safety and Reduce Conflicts
<b>Improve Signage</b>		
No changes	Install pedestrian warning signs with arrows on both sides	Same as alternative B
No changes	Install fluorescent yellow advance pedestrian warning signs	Same as alternative B
No changes	Install ramp exit gore signs with directional arrows	Same as alternative B
No changes	Install aligned yield signs with triangular pavement markings	Same as alternative B
No changes	Simplify language on directional signs	Same as alternative B
No changes	Increase size and lettering of signage	Same as alternative B
<b>Improve Striping</b>		
No changes	Install in-pavement lane guidance	Same as alternative B
No changes	Install mini-skips and lane separation/delineators	Same as alternative B
No changes	Install raised pavement markings	Same as alternative B
No changes	Install transverse rumble strips	Same as alternative B
No changes	Post speed limits in lanes	Same as alternative B
<b>Other Improvements</b>		
No changes	Increased daytime speed enforcement	Same as alternative B
No changes	Install vertical flexible delineators on approaches to crosswalks	Same as alternative B
No changes	Install RRFBs at some crossings	Same as alternative B
<b>Hotspot-Specific Improvements</b>		
No changes	No changes	Hotspot 2: Restripe to allow 2 lanes from Arlington Blvd to continue in their lanes; eliminate southern off-ramp from S. Arlington Blvd to S. Washington Blvd
No changes	No changes	Hotspot 3: Reduce to 2 lanes
No changes	No changes	Hotspot 4: Add slip lanes and small concrete islands on east side of Circle; change assignment so drivers in the Circle have the right-of-way; restripe the Circle to reduce to 1 lane
No changes	No changes	Hotspot 5: Move crossing closer to the Circle
No changes	No changes	Hotspot 7: Reduce to 3 lanes
No changes	No changes	Hotspot 8: Reduce to 1 lane in vicinity of crosswalk; relocate crosswalk north
No changes	No changes	Hotspot 10: Add acceleration lane and allow traffic from Arlington Blvd to enter its own lane; drop right lane from Parkway

## CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the current environmental conditions in and surrounding the project as they relate to each impact topic retained for analysis, as outlined in chapter 1. These conditions serve as a baseline for understanding the resources that could be impacted by implementing the project. This chapter then analyzes the beneficial and adverse impacts that would result from implementing any of the alternatives considered in this EA. This chapter also includes direct, indirect, and cumulative impacts, as well as the methods used in these analyses.

### GENERAL METHODOLOGY FOR ANALYZING IMPACTS

In accordance with the CEQ regulations for implementation of NEPA, direct, indirect, and cumulative impacts are described under each impact topic (40 CFR 1502.16), and the impacts are assessed in terms of context and intensity (40 CFR 1508.27). Where appropriate, mitigating measures for adverse impacts are also described and incorporated into the evaluation of impacts. The specific methods used to assess impacts for each resource may vary; therefore, these methodologies are described under each impact topic.

#### Cumulative Impacts Analysis Methodology

Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR 1508.7).

Cumulative impacts were determined for each impact topic by combining the impacts of the alternative being analyzed and other past, present, and reasonably foreseeable actions that would also result in beneficial or adverse impacts. One action was identified through the internal and external project scoping processes and is summarized below.

#### Past, Present, and Reasonably Foreseeable Actions

*Arlington Memorial Bridge Rehabilitation.* Arlington Memorial Bridge, which spans the Potomac River between Memorial Circle and the National Mall, is more than 80 years old and is in need of comprehensive repair to ensure its ability to provide adequate and reliable traffic services. The current and ongoing rehabilitation project will restore the structural integrity of the bridge while protecting and preserve its memorial character and historic design elements. Lane closures are ongoing during construction and include closure of three of its six lanes for the duration of construction, which is expected to last into 2021. Additionally, occasional complete closures of the bridge are anticipated, though those closures would likely occur on nights and weekends when traffic volume is low. This action has the potential to affect resources included under the impact topics of “traffic and transportation” and “visitor use and experience.”

*North Section Rehabilitation from Spout Run to I-495/Capital Beltway.* The NPS is undertaking a project to rehabilitate the north section of the George Washington Memorial Parkway from Spout Run to I-495/Capital Beltway. This project will repair and rehabilitate deteriorating aspects of the roadway and implement safety improvements while preserving the cultural and historical characteristics of the Parkway. This project will include reconstructing asphalt pavement, constructing new concrete curbs, replacing and adding drainage inlets and culverts, stabilizing erosion at drainage outfalls, improving

safety with crashworthy roadside barriers, and reconfiguring the Route 123/Parkway interchange. This project would result in traffic impacts during construction, particularly associated with lane closures, which is anticipated to last four years. However, after construction the project would improve traffic and safety conditions in the corridor. This action has the potential to affect resources included under the impact topics of “traffic and transportation” and “visitor use and experience.”

## TRAFFIC AND TRANSPORTATION

### Affected Environment

Due to its central location amidst numerous vital and historic destinations in the region, the Memorial Circle area sees high levels of traffic congestion. Additionally, it is at a major convergence of regional roadways and transportation modes that interact through a complex series of roadway merges, weaves, diverges, and intersections. The major roadways interacting within the project area include both northbound and southbound lanes of the George Washington Memorial Parkway, VA Route 110, Arlington Boulevard (US 50), Washington Boulevard (VA 27), Arlington Memorial Bridge, and Boundary Channel Drive. These roadways are identified on figure 2. The Parkway has a minimum of two lanes in each direction that are separated by a raised grass median or barrier and has no paved shoulders. The other major roads within the project area are one to four lanes in each direction depending on the location and size of merging lanes. Memorial Circle itself has an inside diameter of approximately 300 feet and has two continuous lanes and two temporary pull-off areas along the Circle. Intersecting the Circle to the east is the Arlington Memorial Bridge, with three lanes in each direction and sidewalks on both sides of the Bridge to Washington, DC. Intersecting the Circle to the west is Memorial Avenue, which has one travel lane in each direction and provides access to Arlington National Cemetery. The Circle is also intersected by Washington Boulevard to the south and Arlington Boulevard to the north.

There is a network of sidewalks and shared use paths that intersect the roadways at six formal, at grade crossings within the project area. One of these is the Mount Vernon Trail, a 9-foot wide shared use path situated between the Parkway and the Potomac River that is heavily used by both commuters and visitors.

In 2015, the *George Washington Memorial Parkway Existing and Project Transportation Conditions at Memorial Circle* report was completed by the NPS, documenting the results of a study using the 2010 Highway Capacity Manual methodology to understand current traffic conditions (NPS 2015a). The 2010 Highway Capacity Manual uses the traditional metric of level of service (LOS) to describe traffic performance. LOS can be measured at intersections, limited-access entry/exit facilities, and along roadway segments categorized by roadway classification, which describes the function of a roadway. A description of the various levels of service are:

- LOS A - Free flow conditions for vehicles with little or no delay
- LOS B - Stable traffic with minimal or short delays
- LOS C - Stable traffic with acceptable or average delays
- LOS D - Approaching unstable traffic conditions with long traffic delays
- LOS E - Unstable traffic operations with significant or very long delays
- LOS F - Forced traffic flow, excessive, or extreme delays that potentially affect traffic in other locations

In the morning peak hour, there are approximately 2,750 vehicles per hour (vph) leaving the Circle and heading east on Arlington Memorial Bridge. The demand on the segment slightly exceeds capacity and the result is slow and variable speeds and an occasional breakdown of traffic flow. There are approximately 2,650 vph entering the Circle from the south. This results in stop and go traffic and a breakdown in traffic flow. The following table (table 2) summarizes the morning peak traffic LOS at key locations. A brief discussion of the results follows the table.

**TABLE 2. VEHICULAR LEVEL OF SERVICE IN MORNING PEAK HOURS**

Location	LOS
North of Circle Merge (Hotspot 1)	E
North of Circle Weave (Hotspot 2)	C
East of Circle (east of Hotspot 4)	E
West of Circle (west of Hotspot 4)	A
South of Circle (Hotspot 5)	F
South of Circle Weave (Hotspot 7)	D

Source: NPS 2015a, Table 3

In the morning, peak traffic westbound approaching the Circle operates at a high LOS as do the lanes around the Circle. The eastbound lanes are at a LOS E but are not failing. For the weave area south of the Circle the LOS is E. The weave area north of the Circle is at LOS C, but that needs to be balanced with the approach LOS of the westbound lanes to the Circle, which is LOS E. In looking at both levels of services, the conclusion is that overall the segment is functioning but not at a very high level. The merge area north of the Circle back onto the parkway is functioning at a LOS D and reflects only the capacity and not the geometrics, which create a challenge to making the movement safely with the left-hand merge.

In the evening peak hour, the heaviest movement is westbound from Arlington Memorial Bridge with 2,125 vph entering the Circle, but the majority of the traffic continues northbound and to the southbound ramp immediately north of the Circle. The traffic approaching the Circle from the south is approximately 1,675 vph, which is still near capacity. The following table (table 3) summarizes the evening peak traffic LOS at key locations. A brief discussion of the results follows the table.

**TABLE 3. VEHICULAR LEVEL OF SERVICE IN EVENING PEAK HOURS**

Location	LOS
North of Circle Merge (Hotspot 1)	C
North of Circle Weave (Hotspot 2)	B
East of Circle (east of Hotspot 4)	F
West of Circle (west of Hotspot 4)	A
South of Circle (Hotspot 5)	F
South of Circle Weave (Hotspot 7)	C

Source: NPS 2015a, Table 3

The northbound approach to the Circle has a LOS that is failing similar to the morning peak hour operations. The westbound approach to the Circle is failing in the evening peak hour. The eastbound approach is still functioning with an acceptable LOS.

## Methodology

Potential impacts on traffic and transportation are assessed based on changes to circulation of motor vehicles, bicyclists, and pedestrians throughout the project area. NPS *Management Policies 2006* calls for “transportation solutions that will preserve the natural and cultural resources in its care while providing a high-quality visitor experience” (NPS 2006). The current conditions of traffic and transportation, as presented in the “Affected Environment” section above, were compared with the alternatives described in chapter 2 to determine how traffic and transportation would be affected.

Resource-specific context for assessing impacts on traffic and transportation includes the following:

- The Memorial Circle area of the Parkway is heavily used by motorists, cyclists, and pedestrians for both recreation and commuting. It is also used for special events, such as funeral processions to Arlington National Cemetery.
- The Mount Vernon Trail travels through the project area along the waterfront, contributing greatly to the bicycle and pedestrian use approaching and within the Circle.
- The project area is at a major convergence of regional roadways and modes that interact through a complex series of roadway intersections, resulting in traffic congestion.

## Impacts of Alternative A: No Action

Under alternative A, traffic volumes would continue to be at or above capacity during peak commuting times, resulting in congested conditions and adverse impacts on traffic and transportation within the project area. Because no change to traffic flow or roadway capacity would occur under alternative A, the high volume of vehicles within the project corridor would continue to exceed roadway capacity in the same locations as it does today, particularly during times of peak use. Current safety concerns related to congestion, particularly at crosswalks, would continue. In the coming decades, this congestion would likely worsen in some locations due to projected growth in vehicular and non-motorized traffic. According to the 2015 transportation condition study, vehicular traffic volume in the project corridor is expected to increase 12 percent by 2040, and non-motorized travel is expected to increase 15 percent over the same period (NPS 2015a). As vehicular traffic increases on project area roadways, the LOS for pedestrians and bicyclist at crossings likely would degrade due to longer waits for an adequate gap in traffic to safely cross the road. In turn, as the volume of non-motorized traffic increases at crossings, the LOS of vehicular traffic likely would degrade as vehicles yielding to pedestrians or bicyclists in crosswalks would disrupt traffic flows to a greater degree. Temporary traffic barriers would continue to be required during the peak morning hours to alleviate some traffic congestion within the Circle.

## Impacts of Alternative B: Improve Safety

Under alternative B, improvements to wayfinding signage, striping, and in-lane guidance would allow drivers to more efficiently navigate through the project area than they would under alternative A. This would result in less driver confusion and fewer instances of last-minute lane changes, which would reduce number of stops and improve traffic flow. Safety improvements at crosswalks would allow drivers to be more aware of crossings, which would improve the LOS for pedestrians and bicyclists using crosswalks. However, because no change to traffic patterns would occur under alternative B, the high volume of vehicles within the project corridor would continue to exceed roadway capacity in the same locations as it does today, particularly during times of peak use. Thus, impacts related to traffic flow and roadway

capacity (including related impacts on bicyclists and pedestrians at crosswalks) would be the same under alternative B as described under alternative A.

### **Impacts of Alternative C: Improve Safety and Reduce Conflicts (Proposed Action and NPS Preferred)**

Under alternative C, changes to traffic patterns would result in improvements to LOS in some locations and decline in LOS at other locations within the project area, based on the results of a 2018 modeling study. These results are discussed in the *Memorial Circle Safety Improvements Plan/EA Traffic Modeling Report*, and information relevant to this analysis is summarized below (NPS 2018). In this study, LOS was measured based on modeled traffic flow (average speed), anticipated queue lengths, and number of stops.

Under alternative C, during the morning peak hours (6:00 a.m. to 9:00 a.m.), traffic flow would be improved and queuing would be eliminated at hotspots 1 and 10. In the Circle (hotspot 4), traffic would be relatively free flowing, and there would be minimal queuing on the proposed new slip ramps to the Circle from Washington Boulevard and from Arlington Memorial Bridge. There would also be a substantial reduction in queuing and number of vehicle stops at hotspot 7 south of the Circle. However, increased volumes of traffic and minor increases in queuing would occur at hotspots 2 and 3 north of the Circle as well as at hotspot 9 south of the Circle. However, hotspot 9 would also see a reduced number of vehicle stops on the ramp from the Parkway to the Circle.

During the evening peak hours (3:30 p.m. to 6:30 p.m.), there would be improved traffic flow and an elimination or reduction in length of queues at hotspot 1 north of the Circle as well as at hotspots 7 and 10 south of the Circle. Traffic in the Circle itself (hotspot 4) would be relatively free flowing, and there would be no queuing. At hotspot 2 north of the Circle, there would be an increase in queuing on the ramp before the weave area, though the weave area itself would have no queuing. Hotspot 3 north of the circle would see an overall increase in traffic volume. At the ramp from the Parkway northbound to the Circle (hotspot 9), there would be an increase in queue length as well as in the number of stops on the ramp. There would also be a notable increase in queuing on the Parkway northbound prior to hotspot 8.

Although hotspots 2, 3, and 9 would experience adverse impacts due to a decrease in LOS under alternative C, the results of the traffic modeling study suggest that there would be an overall improvement to LOS within the project area compared to existing conditions. Under alternative C, 4 hotspots in the morning peak and 8 hotspots in the evening peak would experience an improved LOS. Low LOS at some hotspots may also improve safety because drivers would be travelling at lower speeds through complex areas. The low LOS would contribute to the overall effort to improve safety of drivers, pedestrians, and cyclists, as discussed under the “Health and Safety” impacts section below.

### **Cumulative Impacts**

Other past, present, and reasonably foreseeable projects that would contribute to the cumulative impact on traffic and transportation are the rehabilitation of the Arlington Memorial Bridge and the rehabilitation of the North Section of the Parkway. Construction for the Arlington Memorial Bridge rehabilitation is ongoing and expected to last into 2021, which requires long-term closures of several lanes of Arlington Memorial Bridge. These lane closures result in congestion on the bridge, which flows into the project area and results in additional congestion within the Circle and along Washington Boulevard northbound on the

approach to the Circle. Similarly, construction and lane closures during implementation of the North Section rehabilitation is expected to last four years and would likely result in traffic impacts along the Parkway that could affect traffic in the Memorial Circle project area. Although impacts related to implementation of the rehabilitation projects will be temporary and only related to construction, the impacts are expected to last several years. Once construction is complete, both the Arlington Memorial Bridge and North Section projects are expected to result in more reliable infrastructure that would be able to accommodate the high volumes of traffic along the Parkway and in the project area.

Under alternative A, continuing the current management of the project area would contribute minor ongoing and future adverse impacts on traffic and transportation due to the current heavy congestion during peak times. When combined with the Arlington Memorial Bridge and North Section rehabilitation projects, the adverse impacts would contribute to the adverse impacts of the rehabilitation projects during construction. Once construction for these projects is complete, the cumulative increment contributed by them would cease and they would contribute a beneficial increment due to reliable infrastructure. At that time, the adverse impacts of alternative A would somewhat offset the beneficial impacts of these projects due to the projected increase in traffic congestion through 2040. Therefore, the overall cumulative impact on traffic and transportation under alternative A would be moderately adverse for the duration of construction and slightly adverse in the long term.

Under alternative B, improvements to signage and striping would contribute only very minor improvements to traffic and transportation. Drivers would be able to only somewhat more efficiently navigate through the project area informed by signage and in-lane navigational assistance. When combined with the Arlington Memorial Bridge and North Section rehabilitation projects, the slight beneficial impacts of alternative B would not be enough to offset the adverse impacts of the rehabilitation projects during construction. However, once construction for these projects is complete, the cumulative adverse impacts would cease and the resulting reliable infrastructure would contribute a long-term beneficial impact. Therefore, the overall cumulative impact on traffic and transportation under alternative B would be moderately adverse for the duration of construction and would be a minor benefit in the long term.

Under alternative C, changes in traffic patterns and other modifications would contribute noticeable improvements to traffic and transportation throughout the project area because there would be an overall improvement to the LOS within the project area. When combined with the Arlington Memorial Bridge and the North Section rehabilitation projects, the beneficial impacts of alternative C would not be enough to offset the adverse impacts of the rehabilitation projects during construction. However, once construction for the rehabilitation projects is complete, the cumulative adverse impacts would cease and the resulting reliable infrastructure would contribute an appreciable beneficial increment to the long-term cumulative impact. Therefore, the overall cumulative impact on traffic and transportation under alternative C would be an adverse impact for the duration of construction and would be a moderate beneficial impact in the long term.

## **Conclusion**

Projections to the year 2040 show an increase in vehicular and non-motorized traffic volume within the already heavily-used project area. Alternative A would result in ongoing and future adverse impacts on traffic and transportation as heavy congestion, driver confusion, and safety concerns would continue and may increase in the future. Because no improvements to traffic patterns would be made under these

alternatives, the result would be heavy congestion, exceeded roadway capacity, and poor to failing LOS for drivers, pedestrians, and bicyclists during peak periods. However, off-peak and weekend times would remain below roadway capacity and would have higher LOS. The cumulative impacts of alternative A would contribute an adverse increment to the cumulative impacts of the Arlington Memorial Bridge and the North Section rehabilitation projects, both during construction and in the long term. The roadways within the project area would continue to see heavy congestion and decreases in LOS under alternative A.

Alternative B would result in similar adverse impacts related to traffic flow and congestion as described under alternative A because no improvements to traffic patterns would be undertaken. However, alternative B would result in minor, long-term beneficial impacts on traffic and transportation resulting from improved signage and lane striping that would assist drivers in navigating more efficiently through the project area. The cumulative impacts of alternative B would contribute an adverse increment to the cumulative impacts during the construction period of the Arlington Memorial Bridge and the North Section rehabilitation projects, but then a beneficial increment once construction is complete. Overall, because of the expected increase in vehicular and non-motorized traffic volume to 2040, the roadways within the project area would continue to see heavy congestion and decreases in LOS under alternative B, even with the improved signs and striping to assist drivers in efficient navigation through the project area.

Alternative C would build upon the improvements proposed in both alternatives A and B and would result in additional beneficial impacts on traffic and transportation within the study area. For most hotspots, the reconfigurations of lanes, crosswalks, and traffic patterns would result in an improved LOS, as measured by estimated traffic flow, queue length, and number of stops. As a tradeoff, a few hotspots would see deterioration in LOS, particularly at hotspot 8 along the Parkway south of the Circle, which would result in safer conditions due to slower traffic speeds. However, the changes in traffic pattern would work together to improve the overall traffic flow throughout the project area. The roads and trails throughout the project area under alternative C would be better able to accommodate the projected increase in vehicular and non-motorized traffic volume through the year 2040. Alternative C would also contribute a long-term beneficial increment to a long-term, beneficial cumulative impact of more reliable infrastructure in and near the project area. Traffic congestion and heavy traffic volumes are still anticipated to occur within the project area under alternative C, but the proposed modifications would assist drivers in more efficient navigation and would improve traffic flow in many hotspots throughout the project area.

## **HEALTH AND SAFETY**

### **Affected Environment**

The project area's heavy use by a variety of user types causes a number of safety concerns, especially where roads merge, weave, and diverge, and at multiple bicycle and pedestrian crosswalks. There are 10 roadway merges in less than a mile, which require drivers to make quick decisions informed by signs that are spaced closely together. This results in drivers quickly changing lanes and merging into other roads, often with limited available gaps in traffic and without adequate sight distance to do so safely. In addition to roadway merges, there are six at-grade, un-signalized crosswalks within the project area. These crossings can be difficult for pedestrians and bicyclists due to the speed and volume of vehicles in multiple lanes approaching the crossings. Motorized vehicle volumes result in difficulty for crosswalk users to find an adequate gap in traffic to cross safely during peak traffic periods.

Some safety accommodations are in place at crosswalks within the project area. All of the crosswalks within the project area are marked with high visibility ladder pavement markings. In most locations pedestrian crossing warning signs with arrow plaques are located at the crosswalk, and some locations have advanced warning signs located prior to the crosswalk. In one location, “Yield for Pedestrians” signs and a yield line are used to alert drivers to the presence of a crosswalk. An RRFB is provided at the crosswalk closest to the Mount Vernon Trail on the northbound lanes of the Parkway, south of the Circle, and is supplemented with thermoplastic rumble strips on the roadway in advance of the crossing. Warning signs are also placed on the Mount Vernon Trail at most of the crosswalks to inform bicyclists on the trail to dismount before crossing.

All but one crossing in the project area have what is known as a “multiple threat condition.” This condition occurs in multiple-lane crossings when a vehicle in one lane may stop for a crossing pedestrian or bicyclist, but in so doing, that vehicle obstructs the sight distance between another approaching vehicle and the crossing pedestrian or bicyclist, thus increasing the safety risk.

Speed limits within the project area range from 15 mph for vehicles traveling in the Circle and Memorial Avenue to 50 mph along the major roadways. Speed data within the project area was collected during the 2013 traffic study and found that a majority of vehicles exceeded the posted speed limits by 5-10 mph throughout the day on Arlington Memorial Bridge and the Parkway northbound, and about half of vehicles travelled 5-10 mph over the posted speed limits on the northbound bypass of the Circle. Speeds were often higher at off-peak hours because there was no traffic congestion to constrain the speed at which drivers may operate their vehicles.

In addition to speed limit signage, regulatory signage within the project area primarily consists of intersection control for safety. There are only two locations within the project area controlled by a stop sign. There are 10 locations where lanes merge and are controlled through yield signs; these are sometimes supplemented with yield markings on the pavement. Other warning signage includes a Lane Ends sign located on the Circle for eastbound traffic, Slippery When Wet signs with supplemental speed plaques located on the ramp north of the Circle to the Parkway southbound, and Entering Roadway Merge signs placed within the project area at traffic merges.

A crash analysis conducted as part of the 2015 transportation conditions study concluded that the majority of vehicular crashes occur at merge points during high volume periods and tend to result from driver inattention or error such as failing to yield the right-of-way or disregarding signs and markings. This study also found that the majority of crashes were vehicular crashes, with pedestrian- or bicycle-involved crashes occurring much less frequently. One fatality at a crosswalk within the project area in 2012 was noted in the report (NPS 2015a).

Although the safety conditions discussed above apply throughout the project area, the hotspots identified and shown on figure 2 each have unique existing safety issues, as outlined in table 4 below.

TABLE 4. SAFETY CONCERNS BY HOTSPOT

Hotspot	Safety Concern
Hotspot 1: Merge from the Circle and the Parkway northbound	<ul style="list-style-type: none"> <li>High-speed traffic along the Parkway northbound</li> <li>Left-side entrance to the Parkway northbound</li> <li>Slower traffic merges into high-speed left lane</li> <li>Difficult views over shoulder to find a traffic gap</li> <li>Confusing yield signs</li> </ul>
Hotspot 2: Weave north of the Circle	<ul style="list-style-type: none"> <li>Close spacing of weaving traffic from the Circle and divergence to the Parkway</li> <li>4 lanes of traffic weave into 3 lanes</li> <li>3-lane crossing at crosswalk</li> <li>High-speed traffic bypassing the Circle entering from right; left lane must yield</li> </ul>
Hotspot 3: Crosswalk north of the Circle	<ul style="list-style-type: none"> <li>Sight distances of crosswalk users waiting to cross is blocked by vehicles</li> <li>Drivers have poor sightlines and low expectation of encountering a crosswalk</li> </ul>
Hotspot 4: The Circle	<ul style="list-style-type: none"> <li>Traffic in the Circle does not have the right-of-way, violating driver expectation</li> <li>Difficult to find gaps in traffic</li> <li>Traffic patterns cross at the Circle</li> <li>4- and 5-lane mix sections on east side of the Circle</li> <li>Unclear in-pavement markings</li> <li>Yield sign is confusing when the morning barriers are in place</li> </ul>
Hotspot 5: Crosswalk south of the Circle	<ul style="list-style-type: none"> <li>Heavy traffic volumes</li> <li>Two conflicting lanes of traffic</li> <li>Right-of-way conflicts</li> <li>Sight distance of crosswalk users waiting to cross is blocked by vehicles</li> </ul>
Hotspot 6: Crosswalk across US 50 Bypass	<ul style="list-style-type: none"> <li>Right-of-way conflicts</li> <li>Lanes merge and downgrade near crosswalk</li> <li>Drivers on US 50 Bypass often accelerate on the approach to crossing</li> </ul>
Hotspot 7: Weave south of the Circle	<ul style="list-style-type: none"> <li>4 lanes of traffic enter into a short, 3-lane weave</li> <li>Weave affected by heavy traffic congestion at the Circle</li> <li>Unimpeded right lane for US 50 Bypass; left lane must yield</li> </ul>
Hotspot 8: Crosswalk across the Parkway northbound	<ul style="list-style-type: none"> <li>High-speed traffic along the Parkway northbound</li> <li>Crosswalk requires crossing a double lane</li> <li>Drivers have little expectation of encountering a crosswalk</li> </ul>
Hotspot 9: Crosswalk across the ramp from the Parkway northbound	<ul style="list-style-type: none"> <li>2 conflicting lanes of traffic</li> <li>Confusing yield sign</li> <li>Sight distance of crosswalk users waiting to cross is blocked by vehicles</li> <li>Difficult views over left shoulder to find a traffic gap</li> <li>Right lane to US 50 Bypass carries higher speeds</li> </ul>
Hotspot 10: Southbound merge of the Parkway and traffic from the Circle	<ul style="list-style-type: none"> <li>High speeds from the Circle and southbound traffic</li> <li>Confusing merge/yield from left lane</li> <li>Difficult views over right shoulder for merge</li> </ul>

## Methodology

NPS *Management Policies 2006* states that, “while recognizing that there are limitations on its capability to totally eliminate all hazards, the Service . . . will seek to provide a safe and healthful environment for visitors and employees.” The policies also state, “the Service will reduce or remove known hazards and apply other appropriate measures, including closures, guarding, signing, or other forms of education” (NPS 2006). Potential impacts on health and safety are based on changes to the potential for conflicts between and among motor vehicles, bicycles, and pedestrians. The current conditions of health and safety, as presented in the “Affected Environment” section above, were compared with the alternatives described in chapter 2 to determine how health and safety would be affected.

Resource-specific context for assessing impacts on health and safety includes the following:

- The project area is at a major convergence of regional roadways and modes that interact through a complex series of roadway intersections; traffic congestion and crashes occur as a result.
- The heavy use of the project area causes a number of safety concerns, especially at the six un-signalized, at-grade crosswalks, some spanning multiple lanes, within the vicinity of the Circle.

### **Impacts of Alternative A: No-Action**

Under alternative A, ongoing adverse impacts on health and safety would continue. Because no improvements would be made to the traffic patterns within the project area, drivers would continue to be required to quickly react to numerous weaves, merges, and speed differentials, which would continue to adversely impact drivers' abilities to safely navigate through the project area. Because high congestion and speeding contribute to traffic accidents, as discussed in the 2015 transportation conditions report, the high number of accidents in these areas would be expected to continue (NPS 2015a).

Crosswalk locations would continue to be difficult for pedestrians and bicyclists to cross roads due to the speed and volume of approaching vehicles. High vehicle speed could increase the potential severity of a crash involving a pedestrian or bicyclist, while motorized vehicle volumes would continue to make it difficult for pedestrians and bicyclists to find an adequate gap in traffic to cross during peak traffic periods. Limited visibility for motorists approaching crossings would continue to lead to safety concerns for those using crossings, and a multiple-threat condition would persist at most crossings.

### **Impacts of Alternative B: Improve Safety**

Under alternative B, there would be a beneficial impact on the safety of users within the project area due to the improved signage throughout the project area. Improved signage would better alert drivers to approaching crosswalks and lane merges, and additional yield signage would clarify some existing right-of-way conflicts. Additionally, posted speed limits in lanes would increase driver awareness of the speed limits and increased enforcement of the speed limit during daytime hours may result in increased compliance. In-pavement guidance, mini-skips, lane delineators, raised pavement markings, and rumble strips would work together with improved signage to increase driver awareness of approaching crosswalks, merges, weaves, and yields. At crosswalks, vertical flexible delineators and RRFBs would further draw drivers' visual attention to the approaching crosswalks.

However, as discussed under alternative A, because no improvements would be made to the traffic patterns within the project area, drivers would continue to be required to quickly react to numerous weaves, merges, and speed differentials, which would continue to impede drivers' abilities to safely navigate through the project area.

### **Impacts of Alternative C: Improve Safety and Reduce Conflicts (Proposed Action and NPS Preferred)**

Alternative C would result in the same impacts related to improved signage, striping, and speed enforcement as discussed under alternatives A and B above. In addition, alternative C would result in a further increase in beneficial impacts on user health and safety due to modifications in traffic patterns on roads and in the vicinity of crosswalks.

As described in chapter 2, and shown on figures 3 and 4, there are a number of locations where lanes would be restriped or reconfigured to simplify traffic patterns and reduce the need to merge and weave. These modifications would be undertaken at hotspots 2, 3, 7, and 10. This simplification of traffic patterns would reduce driver attention diversion and allow drivers to more safely navigate through these hotspots. At hotspot 2, the removal of the southern ramp from S. Arlington Boulevard to S. Washington Boulevard would reduce the number of driver decision points and would reduce the number of merges and diverges at that hotspot.

At the Circle, the change in traffic flow giving vehicles in the Circle the right-of-way would create a traffic pattern that is familiar to drivers, which would reduce confusion. Additionally, the reduction from two lanes to one lane in the Circle would reduce the amount of merging and weaving required to navigate the area. At hotspot 4 on the east side of the Circle, the modification of the islands and creation of slip lanes would also reduce the amount of merging and weaving among traffic in the Circle and traffic entering or exiting Arlington Memorial Bridge.

Roadway modifications within the vicinity of crosswalks would improve crossing conditions for pedestrians and cyclists and would better alert drivers that there may be pedestrians or cyclists in the crosswalk. At hotspot 3, the reduction of three lanes to two north of the Circle would result in crosswalk users only having to cross two lanes of traffic, rather than three lanes. Modifications at hotspots 5 and 7 would result in longer queues and a higher number of stops, but it would result in a tradeoff of safer crossing conditions for pedestrians and bicyclists. At hotspot 5, because the crosswalk would be moved north closer to the Circle, pedestrians and bicyclists would be able to cross the road where traffic is moving more slowly and where drivers are already alert and preparing to merge or yield. Similarly, at hotspot 7, although drivers approaching from the east may be focused on preparing to merge into one central lane rather than on the approaching crosswalk at hotspot 9, because the LOS prior to hotspot 7 and 9 would be reduced, drivers would generally be going more slowly and would be better able to stop for crosswalk users. At hotspot 8, because the crosswalk would be moved to the north, drivers would have better visibility on the approach and traffic would be moving at a slower speed than in the current locations. Additionally, because the road would be reduced from two lanes to one in the vicinity, the multiple threat condition is eliminated for pedestrians and bicyclists at this location. Although the LOS for drivers would be lowered at hotspot 8, it would be a tradeoff for a safer crossing condition.

## **Cumulative Impacts**

During scoping, the team considered other NPS and non-NPS projects to determine other actions that have or would have the potential to affect health and safety within the scope of this project. The team did not identify any past, present, or reasonably foreseeable actions that would result in cumulative impacts on health and safety. Therefore, there are no cumulative impacts on health and safety associated with any alternatives presented in this EA.

## **Conclusion**

Because of the complexity of the series of roadway within the project area, driver attention is often split among looking for a gap in traffic, watching for merging vehicles, reading navigational signage, and watching for pedestrians and/or bicyclists at crosswalks. Alternative A would result in continued adverse impacts on health and safety because drivers, pedestrians, and bicyclists would continue to be required to navigate this complex area. Because high congestion and speeding contribute to traffic accidents, the

expected increase in vehicular and non-motorized traffic volumes into 2040 is likely to result in a continuation of the high number of accidents.

Improvements implemented under both alternatives B and C would focus driver attention on areas of concern identified as hotspots within the project area, though to varying degrees. Signage improvements proposed under alternative B would increase driver awareness of yields, merges, and crossings. Improvements to striping, lane guidance, and flashing beacons at crosswalks also proposed under alternative B would further draw driver attention, both visually and tactilely, to these yields, merges, and crossings. However, because no modifications to traffic patterns would be undertaken under alternative B, drivers would continue to be required to navigate the existing complex series of roadway intersections, though improved signage and striping may somewhat reduce confusion and more clearly communicate how vehicles are intended to navigate through the project area.

Alternative C builds upon the beneficial impacts of alternative B and would result in further beneficial impacts on user health and safety. The hotspot-specific improvements under alternative C would simplify traffic patterns in some locations, which would reduce confusion and allow drivers to focus their attention where needed to safely navigate hotspots. Drivers would more clearly understand how to navigate through difficult weaves and merges, as well as how to travel through or bypass the Circle itself. More attention would be drawn to crosswalks, and modifications to roadways, such as lane reductions, would allow pedestrians and bicyclists to cross fewer lanes of lower-speed traffic in some locations. The lower LOS for drivers at certain hotspots would be a tradeoff for safer crossing conditions at these locations. Although the project area would continue to feature numerous merges, weaves, diverges, and intersections, the proposed modifications would increase driver awareness and understanding of the traffic patterns, thus allowing drivers, pedestrians, and bicyclists to more safely navigate through the challenging project area.

## **VISITOR USE AND EXPERIENCE**

### **Affected Environment**

The Parkway's Foundation Document states that the Arlington Memorial Bridge and Memorial Avenue, between which the project area sits, serve as a ceremonial entrance to Washington, DC and Arlington National Cemetery, lined with monuments and memorials as an "Avenue of Heroes." As such, this section of the Parkway is meant to provide a memorial atmosphere celebrating the virtues of valor and sacrifice, and honoring diverse figures of the US military. The project area is used by motorists, pedestrians, and bicyclists, for both recreation and commuting, leading to different priorities for visitor experience. The visitor experience in the project area encompasses interpretation, viewsheds, understanding, enjoyment, circulation, and accessibility.

According to a recent traffic study, Arlington Memorial Bridge currently sees up to 50,000 vehicle crossings per day with those vehicles entering and exiting along segments of the Circle and connecting roadways. High traffic congestion, numerous weaves and merges, and the fact that priority is given to traffic entering the Circle, create a highly atypical condition that requires drivers to make quick decisions and execute complex, properly timed maneuvers in a very short span of time and space (see figure 2 for project area map). Combined with limited wayfinding signage, this leads to confusion and an overwhelming experience, particularly for drivers unfamiliar with the project area. During the peak

morning hours, to better manage traffic, a section of the Circle is barricaded and traffic entering the Circle from the south is forced to continue eastbound across Arlington Memorial Bridge. Drivers wishing to enter and travel through the Circle from the south during this time are unable to do so. This temporary traffic control barrier conflicts with the permanent traffic control signs and markings, resulting in confusion for drivers unfamiliar with the temporary measures.



View of temporary traffic control barriers set up during peak morning hours

The Mount Vernon Trail is used by pedestrians and bicyclists, both for recreation and commuting. For pedestrian and bicyclists, the six at-grade crossings operate poorly and are difficult for all users to navigate due to the speed of approaching vehicles and the apparent general lack of understanding of individual responsibilities at these crossings. Several crossings traverse several lanes of traffic, resulting in a multiple threat condition. Periods of heavy use may lead to a longer wait at the crossings for a gap in traffic the user perceives as large enough to comfortably cross the lanes of traffic. However, when traffic becomes heavily congested and speed decreases, pedestrians and bicyclists may find it easier to cross.

Guidance signs primarily consist of the NPS white lettering on a brown background that indicate major roadways and destinations. In general, the close spacing, number of guidance signs, and information on the signs may contribute to driver confusion within the project area. There is also very limited signage informing visitors that they have entered a unit of the national park system.

## Methodology

Potential impacts on visitor use and experience are assessed based on changes to the way people use the Parkway, as well as how the alternatives would alter visitors' experiences. Recreation related to and enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks (NPS 2006). The NPS strives to provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the natural and cultural resources found in parks. The current conditions of visitor use and experience, as presented in the "Affected Environment" section above,

were compared with the alternatives described in chapter 2 to determine how visitor use and experience would be affected.

Resource-specific context for assessing impacts on visitor use and experience includes the following:

- Providing a “broad spectrum of recreational opportunities to Washington D.C.’s urban population and improving the quality of life in the city is fundamental to the park’s mission” (NPS 2014a).
- The visitor experience of the Parkway encompasses interpretation, viewsheds, understanding, enjoyment, circulation, and accessibility of the project area.
- The Parkway is used by motorists, bicyclists, and pedestrians for both recreation and commuting, resulting in different priorities for visitor use and experience.

### **Impacts of Alternative A: No-Action**

Under alternative A, current and ongoing adverse impacts on visitor use and experience would continue because no improvements to the project area would be undertaken. Driver confusion would continue due to atypical traffic patterns and numerous intersecting roadways. Drivers unfamiliar with the traffic patterns in the area would continue to be uncertain as to when to merge into another lane or yield to traffic as they navigate the project area roadways. Because there would continue to be a combination of both commuters who are familiar with the traffic flow, routes, and traffic rules, and visitors who may be confused by the traffic patterns, aggressive driving would continue to be encountered. This would continue to lead to an unpleasant driving experience for both the commuters and visitors.

At the six crosswalks within the project area, bicyclists and pedestrians would continue to be required to cross multiple, high speed lanes of traffic. This would continue to result in an unpleasant experience where the person crossing either has to wait an extended amount of time for the opportunity to find an adequate gap in traffic or has to cross hurriedly without an ideal gap.

### **Impacts of Alternative B: Improve Safety**

The impacts discussed under alternative A related to traffic patterns and flow described above would also occur under alternative B. However, proposed modifications to signage throughout the project area would provide more wayfinding information, which would assist visitors in understanding how to navigate the confusing areas of weaves, merges, and diverges, resulting in a beneficial impact. Additionally, the proposed modifications to lane striping and in-lane guidance would further assist drivers with understanding how to navigate the confusing area. However, as discussed under alternative A, because there would be no changes to traffic patterns, driver confusion would continue due to atypical traffic patterns and numerous intersecting roadways. Drivers unfamiliar with the project area may continue to experience confusion, and the combination of unfamiliar drivers and commuters may continue to lead to unpleasant experiences for all drivers in the project area.

At crosswalks, improved signage would direct driver attention to the crosswalks, which may lead to more drivers slowing or yielding at the crosswalk and may lead to more gaps in traffic that pedestrians and bicyclists perceive as large enough to comfortably cross the road. The proposed lane delineators and flashing beacons in the vicinity of crosswalks would further alert drivers to the presence of a crosswalk. These improvements may lead to more drivers slowing or yielding at the crosswalk and would result in a more pleasant experience for crosswalk users who would likely feel more comfortable crossing where drivers are more alert. This may, however, result in a less pleasant experience for drivers who would

experience flashing lights and may have to stop while enjoying driving along the Parkway. However, as discussed under alternative A, crosswalk users would continue to be required to cross multiple, high-speed lanes of traffic, resulting in an unpleasant experience waiting for an adequate gap in traffic, or hurriedly crossing without an ideal gap.

### **Impacts of Alternative C: Improve Safety and Reduce Conflicts (Proposed Action and NPS Preferred)**

The beneficial impacts related to improvements to signage, striping, and other navigational guidance discussed under alternatives A and B above would also apply under alternative C. Additionally, the proposed modifications to traffic patterns at specific hotspots throughout the project area would result in additional beneficial impacts on visitor use and experience, as discussed below.

Modifications and simplification of traffic patterns, including the restriping and reduction of number of lanes at several hotspots would reduce the need for drivers to merge and weave, resulting in a less confusing situation for drivers, particularly those unfamiliar with the project area. In weave areas where lanes would be allowed to continue in dedicated lanes, such as hotspot 2 north of the Circle and hotspot 10 south of the Circle, drivers would be able to focus their attention on navigation because their attention would not be split trying to find a gap in traffic to merge. The modification to the traffic pattern in the Circle to allow drivers in the Circle the right-of-way would reduce driver confusion because the Circle would function like a modern traffic circle, which is familiar to many drivers.

Alternative C would also result in beneficial impacts on visitor use and experience at crosswalks. In locations where the number of lanes would be reduced, such as at hotspot 3 north of the Circle and hotspots 7 and 8 south of the Circle, crosswalk users would have fewer lanes to cross and a better line-of-sight, which may be perceived as a safer experience. Though their experience would be improved over alternatives A and B, crosswalk users would continue to be required to cross multiple lanes of high-speed traffic, which may continue to result in unpleasant experiences waiting for an adequate gap in traffic, particularly during peak morning and evening hours.

### **Cumulative Impacts**

Other past, present, and reasonably foreseeable projects that would contribute to the cumulative impact on visitor use and experience are the rehabilitation of the Arlington Memorial Bridge and the rehabilitation of the North Section of the Parkway. Construction for the Arlington Memorial Bridge rehabilitation is ongoing and expected to last into 2021, which requires long-term closures of several lanes of Arlington Memorial Bridge. These lane closures result in congestion on the bridge, which flows into the project area and results in additional congestion within the Circle and along Washington Boulevard northbound on the approach to the Circle. Similarly, construction and lane closures during implementation of the North Section rehabilitation is expected to last four years and would likely result in congestion along the Parkway that could flow into the Memorial Circle project area. This congestion has and will continue to result in longer delays, which results in unpleasant experiences for both visitors and commuters using the project area. Although impacts related to implementation of the rehabilitation projects will be temporary and only related to construction, the impacts are expected to last several years. However, once construction is complete, both the Arlington Memorial Bridge and North Section projects are expected to result in more reliable infrastructure that would not require the currently ongoing frequent repairs to the Arlington Memorial Bridge and to the potholes and deteriorated asphalt along the Parkway.

Under alternative A, continuing the current management of the project area would contribute minor ongoing and future adverse impacts on visitor use and experience due to the existing atypical traffic patterns, heavy use of the project area, and un-signalized crosswalks. When combined with the Arlington Memorial Bridge and North Section rehabilitation projects, the adverse impacts would contribute to the adverse impacts of the rehabilitation projects during construction. Once construction for these projects is complete, the cumulative increment contributed by them would cease and they would contribute a beneficial increment due to reliable infrastructure. At that time, the adverse impacts of alternative A would somewhat offset the beneficial impacts of these projects due to the projected increase in vehicular and non-motorized vehicle volume through 2040. Therefore, the overall cumulative impact on visitor use and experience under alternative A would be moderately adverse for the duration of construction and slightly adverse in the long term.

Under alternative B, improvements to signage and striping would contribute minor beneficial increment to cumulative impacts on the visitor use and experience because improved signage and in-lane guidance would reduce driver confusion as to how to navigate throughout the project area. When combined with the Arlington Memorial Bridge and North Section rehabilitation projects, the beneficial impacts of alternative B would not be enough to offset the adverse impacts of additional congestion resulting from the rehabilitation project construction. However, once construction for the rehabilitation projects is complete, the cumulative adverse impacts would cease and the resulting reliable infrastructure would contribute a long-term beneficial impact. Therefore, the overall cumulative impact on visitor use and experience under alternative B would be adverse for the duration of construction and would be somewhat beneficial in the long term.

Under alternative C, changes in traffic patterns and other modifications would contribute noticeable beneficial increment to the beneficial cumulative impact on visitor use and experience because complex weave areas and intersections would be simplified, as would traffic patterns in the Circle. When combined with the Arlington Memorial Bridge and the North Section rehabilitation projects, the beneficial impacts of alternative C would not be enough to offset the adverse impacts of additional congestion resulting from the rehabilitation projects during construction. However, once construction for the rehabilitation projects is complete, the cumulative adverse impacts would cease and the resulting reliable infrastructure would contribute a long-term beneficial impact. Therefore, the overall cumulative impact on visitor use and experience under alternative C would be an adverse impact for the duration of construction and would be an appreciable beneficial impact in the long term.

## **Conclusion**

Projections to the year 2040 show an increase in vehicular and non-motorized traffic volume within the project area. Alternative A would result in long-term adverse impacts on visitor use and experience because no improvements would be implemented. Drivers unfamiliar with the traffic patterns in the project area would continue to be required to navigate complex intersections and areas of weaves and merges, which would continue to result in unpleasant driving experiences. Crosswalk users would continue to be required to cross multiple lanes of high-speed traffic, which would continue to be unpleasant or result in feeling unsafe while crossing the road.

Alternative B would result in minor beneficial impacts on visitor use and experience resulting from improved signage and lane striping that would reduce driver confusion related to navigating through the

project area. Alternative B would also result in beneficial impacts for crosswalk users because additional signage, pavement markings, and flashing beacons would further increase driver awareness of crosswalks, which may result in visitors feeling safer and more comfortable crossing the busy roads. However, because there would be no change in traffic patterns within the project area, the same adverse impacts related to these atypical patterns described under alternative A would also occur under alternative B.

Alternative C would build upon the improvements proposed in alternative B and would result in additional beneficial impacts on visitor use and experience within the study area. For most hotspots, the reconfigurations of lanes, crosswalks, and traffic patterns would result in clearer navigation and fewer merges and weaves. In some locations, crosswalk users would have an improved experience because there would be fewer lanes to cross, a reduction in the multiple threat condition. Although the proposed modifications to the project area would result in improvements to the visitor experience, the project area would continue to be at a heavily-used convergence of regional roadways and trails that interact through a series of complex weaves, merges, diverges, and intersections. Alternative C would simplify many of those complex areas, but heavy congestion would continue to occur at peak morning and evening hours, driver confusion may still occur at the more complex areas, and the combination of unfamiliar visitors and daily commuters may result in unpleasant experiences for drivers, pedestrians, and bicyclists.

Under all alternatives, the character of the project area would remain unchanged and visitors would continue to experience the memorial atmosphere of the site. Visitors would continue to have the opportunity for commuting and recreational travel by motor vehicle, bicycle, and foot throughout the existing roadways and trails within the project area.

## CULTURAL RESOURCES

### Affected Environment

Numerous cultural landscapes, memorials, structures, and small-scale features are located within the vicinity of the project area and even more are within its viewshed. The section below summarizes the important cultural landscapes, historic structures, and contributing features that have the potential to be affected by the actions proposed in the alternatives.

**George Washington Memorial Parkway Cultural Landscape and Historic District.** The George Washington Memorial Parkway is a national parkway of over 7,000 acres traversed by a planned roadway system and associated plantings that extends 38.3 miles along the Potomac River through the District of Columbia, Virginia, and Maryland. Initially conceived as a memorial to George Washington, in 1930, through the Capper-Cramton Act, Congress legislated the George Washington Memorial Parkway and was to include the original Mount Vernon Memorial Highway (described below) as well as additional lands along both sides of the Potomac River. The Parkway serves as a grand entryway to the nation's capital and preserves the Potomac River and its watersheds. The Parkway comprises 27 sites replete with natural and cultural resources. These sites, while each possessing a distinct history and individual merits, are united by the Parkway and together represent broad themes in the nation's history. The Parkway is a major historic circulation structure with associated designed views and vistas of significant natural scenery and historical iconic features that traverses the project area northwest to southeast. It is also a major cultural resource and transportation feature of the project area. The

Parkway is listed in the Virginia Landmarks Register and in the National Register of Historic Places (National Register) (NPS 1995).

**Mount Vernon Memorial Highway.** The Mount Vernon Memorial Highway (the highway) is part of the George Washington Memorial Parkway (described above) extending from Mount Vernon, George Washington's estate in Fairfax County, Virginia, to the Arlington Memorial Bridge. The highway was authorized by Congress in 1928, construction began in 1929, and the highway was open to traffic on January 16, 1932. The highway's location along the Potomac River was chosen because it afforded scenic views of the river and an axial vista of the Washington Monument, which was especially fitting for its commemorative purpose. According to its National Register nomination form, the highway is significant as "the first parkway constructed and maintained by the US Government and as the first such road with a commemorative function explicit in its name and alignment" (NPS 1981b). The highway is distinctive for its stone faced arch bridges, concrete slab base, beveled curbing, and landscape plantings (NPS 1981b). Contributing small scale features include the replacement teardrop light posts along the highway. The portion within the area of potential effect overlaps with the Lady Bird Johnson Park Cultural Landscape, which is described below.

**Lady Bird Johnson Park Cultural Landscape.** The project area overlaps Lady Bird Johnson Park, which is a 157-acre island located along the Virginia shore of the Potomac River. The park, originally known as Columbia Island, was created from material dredged from the Potomac River to fulfill the construction needs of the Arlington Memorial Bridge and Mount Vernon Memorial Highway. Columbia Island was added to the capital's park system in 1922, and the landscape plan followed a simple, modern design based on picturesque landscape aesthetics. Contributing circulation features of the Lady Bird Johnson Park cultural landscape include Memorial Circle and the George Washington Memorial Parkway. Circulation patterns within the park have evolved over the years and revisions to alignments continue today. However, the overall circulation of north-south bound lanes for the Parkway with connections to Memorial Circle, Arlington Memorial Bridge, Memorial Avenue, and points south remain. Contributing views and vistas of the cultural landscape include the following:

- views from the Parkway to the Virginia shoreline and across the river to Washington, DC;
- views from Memorial Circle to the Lincoln Memorial, Arlington House and Arlington National Cemetery, and to the north and south sides of the island;
- and views along the Mount Vernon Trail of the Potomac River shoreline (NPS 2004).

**Lyndon Baines Johnson Memorial Grove on the Potomac.** The Lyndon Baines Johnson Memorial Grove on the Potomac (the Grove) is located on the southern tip of Lady Bird Johnson Park, on the west side of the George Washington Memorial Parkway. It is a 17-acre park designed by landscape architect Meade Palmer in collaboration with sculptor Harold Vogel. Dedicated in 1977, the Grove serves as a living memorial to the late President Johnson who had a great interest in the natural environment. The Grove features a 12-foot-wide flagstone path that winds through the Grove to a flagstone plaza, at the center of which stands a 19-foot-tall Sunset Red granite monolith memorial to President Johnson. A major component to the Grove are the 900 white pine trees with an understory planting of azaleas, rhododendron, flowering shrubs, wild flowers, and spring bulbs. Today, the original design intent of the Grove is intact and all the major design elements remain. Some of the original white pines and shrubs have been replaced in kind, resulting in specimens that are somewhat smaller than the extant original plants. However, the historic integrity and character of the Grove remains intact today (NPS 1998).

**Memorial Avenue Corridor Cultural Landscape.** The project area includes a portion of the Memorial Avenue Corridor, which is a mile-long axial landscape that includes Arlington Memorial Bridge, Memorial Circle, Memorial Avenue Bridge, Memorial Avenue, and the entrance to Arlington National Cemetery. Conceived as a grand entryway to Arlington National Cemetery, it is a major element of the system of public buildings, parks, memorials, bridges, and drives that constitutes the monumental core of Washington, DC. Contributing circulation features include Memorial Circle, the pedestrian system on the two bridges and avenue, and the pedestrian walks around Memorial Circle. Contributing small-scale features include the granite curbstones and the triangular “islands” of granite blocks at the east and west ends of Memorial Circle as well as the Washington standard globe light posts. Contributing views and vistas of the Memorial Avenue Corridor include the following:

- views of the green parkland along both sides of the Potomac from Arlington Memorial Bridge;
- views down Memorial Avenue, Memorial Circle, and Arlington Memorial Bridge between Arlington House/the Hemicycle and the Lincoln Memorial,
- and views of the Potomac River, Capitol dome, and other landmarks of the Capital from Memorial Circle (NPS 2001a).

**Arlington Memorial Bridge and Related Structures.** Spanning the Potomac River at the eastern side of Memorial Circle, the Arlington Memorial Bridge was constructed between 1926 and 1932. The bridge is built of reinforced concrete faced with granite. The bridge complex was designed by McKim, Mead & White in the Neoclassical style and features sculptural elements by artists Alexander P. Proctor, Carl Paul Jennewein, and Leo Friedlander. The bridge and its associated architectural engineering, sculptural, and landscape features are significant as important elements in the early 20th century Beaux Arts urban design of the National Capital. The Arlington Memorial Bridge and Related Structures is listed in the National Register (NPS 1980).

**Arlington National Cemetery Historic District.** Arlington National Cemetery, established as a military cemetery during the Civil War in 1864, is listed in the National Register as a historic district due to its significance as the country’s premier national cemetery, as the final resting place of military veterans, from the well-known to the unknown, and as a testament to the measures taken to honor and respect those who have played a role in United States history. The cemetery was constructed on the land that was once part of the Arlington House estate after the US Army seized possession during the Civil War. Today, the cemetery comprises 624 acres and includes a portion of the project area. The cemetery continues to evoke a sense of reverence and remembrance, with an exceptional collection of gravestones and monuments, from rows of standard white headstones to elaborate decorative memorials (NPS 2014c).

**Arlington House, the Robert E. Lee Memorial.** Arlington House, The Robert E. Lee Memorial is the former home of Robert E. Lee, who resided there with his family for 30 years before resigning from the US Army in 1861 on the eve of the Civil War. The site became part of the national park system in 1933 and was known as the Custis-Lee Mansion, named for both Lee and additional former resident, George Washington Parke Custis. It was formally designated by the federal government on June 29, 1955, to suitably memorialize General Robert E. Lee (NPS 2014b). Today, the memorial consists of the Greek Revival mansion, the north and south slave quarter buildings, the Robert E. Lee museum, the flower garden, the kitchen garden, and the 12-acre mature forest known as Arlington Woods. The most prominent feature of the site is the mansion, a Greek Revival structure composed of a large two-story central section flanked by two one-story wings. The long axis of the house runs north-south and the front

façade faces Washington, DC to the east across the Potomac River. The principal vista of the site is from the front of the mansion eastward toward Washington, DC, overlooking Memorial Circle (NPS 2009).

**Theodore Roosevelt Island.** Theodore Roosevelt Island, located within the Potomac River just north of the project area, serves as a national memorial to President Theodore Roosevelt. The island was chosen for the memorial to honor the 26th president's role as a leader in conservation. The island is also part of the George Washington Memorial Parkway, which is described above. In 1932, the Theodore Roosevelt Memorial Association hired the landscape architecture firm of the Olmsted Brothers and architect John Russell Pope to design the island's development. In 1933, the island was transferred to the NPS. The Olmsted design for the island included establishing a native woodland through preservation of mature hardwood trees and the addition of thousands of mostly native trees, shrubs, herbaceous plants, and groundcover. A small network of pedestrian trails allows visitors to experience the natural landscape of the island. A formal monument to President Roosevelt was constructed on the northern end of the island in 1967. It consists of a large paved plaza featuring a bronze statue of Roosevelt (NPS 2001b).

**Lincoln Memorial.** Located on the opposite end of the Arlington Memorial Bridge from Memorial Circle, the Lincoln Memorial stands near the east bank of the Potomac River. Construction of the memorial was completed in 1922 and is designed after the temples of ancient Greece, surrounded by a peristyle of 38 fluted Doric columns and topped with an ornamented frieze and cornice. According to its National Register nomination form, the memorial is significant as the foremost memorial to America's 16th president, as an original example of Neoclassical architecture, and as a formal terminus to the extended National Mall in accordance with the McMillan Commission's plan for the monumental core of Washington, DC (NPS 1981a).

## Methodology

Potential impacts on cultural resources are evaluated based on changes to character-defining features of the resources, which are the characteristics of a historic property that qualify the property for inclusion in the National Register. This approach is derived from the Secretary of the Interior's Standards for Treatment of Historic Properties, Director's Order 28: *Cultural Resource Management Guidelines*, as well as the regulations of the Advisory Council on Historic Preservation implementing the provisions of NHPA. Character-defining features contribute to a property's integrity, which is composed of location, design, setting, materials, workmanship, feeling, and/or association. The current conditions of cultural resources, as presented under the "Affected Environment" section above, were compared with the alternatives described in chapter 2 to determine the impacts on the historic structure and cultural landscapes. It should be noted that this document assesses impacts under NEPA. An NHPA Section 106 assessment of effect is being completed concurrently with, but separately from, this document.

Resource-specific context for assessing impacts on cultural resources includes the following:

- The Parkway contains a number of cultural resources that have been determined to be contributing features in National Register of Historic Places nominations, including the resources described above in the "Affected Environment" section.
- While there has been change to the historic character through modernization and increased public usage and traffic congestion, the area maintains its historic integrity as a whole.

- Historic structures and small-scale features in the project area could be affected by design changes, introduction of new structures or circulation, and the use of historically-incompatible materials and methods in repair and maintenance.
- Small-scale features contributing to the Memorial Avenue Corridor cultural landscape include the triangular islands of granite blocks at the east and west ends of Memorial Circle.

### **Impacts of Alternative A: No Action**

Because there would be no changes to the project area under alternative A, there would be no impacts on cultural resources.

### **Impacts of Alternative B: Improve Safety**

Under alternative B, additional signage within the project area would result in changes to the historic appearance and setting of the cultural resources within the project area. Depending on the location, additional or larger signage could detract from the important views and viewsheds from the project area and diminish the integrity of appearance, setting, and feeling. For example, additional signage on the Parkway in locations with open views of the Potomac River would diminish the historic feeling and appearance of these views. Although the project area is located at a convergence of many regional roads and trails where navigational signage already exists in the landscape, efforts have been expended over the years to reduce visual clutter by limiting the number of signs, reducing the sizes of signs, and placing signs in less distracting locations. Specific locations, sizes, and design of signage would be determined at a future design phase and efforts would be undertaken to limit the adverse impacts on important views and viewsheds to the extent possible. See appendix B for the location of existing signage and recommendations for new signage throughout the project area. Although not as conspicuous as signage, pavement markings would contribute to the changes in historic appearance and the diminished integrity of setting and feeling when combined with the addition of signs.

The additional modifications to crosswalks under alternative B, including the lane delineators and flashing beacons would result in alterations to the historic appearance, feeling, and character of areas where the modifications are implemented. For example, an RRFB at a crosswalk that previously only had road striping and a reflective sign would noticeably detract from the historic appearance and character in the vicinity of that crosswalk. Flashing beacons and reflective delineators, while purposely conspicuous for safety improvement, are not compatible with the memorial character of the Parkway. These improvements, combined with the proposed new and larger signs would diminish the integrity of setting and feeling in these areas. However, because of existing topography and vegetation, these modifications would not be conspicuous from the entire project area, thus limiting the impacts to localized areas. The resulting diminished historic integrity and character would be a trade-off for improved safety on roadways and at crossings. Overall, the historic character of the cultural landscapes and historic resources would be maintained. The most important views and vistas would not be altered or blocked, and the overall setting and feeling of the cultural resources would be retained.

Indirect impacts on resources outside of, but with views into the project area would occur due to the additional and larger signage, as well as the installation of flashing beacons at crosswalks. These resources include the Arlington Memorial Bridge and Related Structures; the Arlington National Cemetery Historic District; Arlington House, The Robert E. Lee Memorial; Theodore Roosevelt Island; and the Lincoln Memorial. From these resources, the new signage and flashing beacons would be visible and would

introduce modern elements into the historic viewsheds. These impacts would be most intense from areas closest to the project area, such as Arlington Memorial Bridge and the entrance to Arlington National Cemetery, where these changes would be most visible. Topography and vegetation limit views into the project area from many points within Arlington National Cemetery, but the Circle is within the important vista from Arlington House to Washington, DC. However, these signs and flashing beacons would not block or alter important views or viewsheds from these cultural resources and the impacts would be relatively minor when compared to the overall historic views that would remain.

### **Impacts of Alternative C: Improve Safety and Reduce Conflicts (Proposed Action and NPS Preferred)**

The impacts described under alternative and B would also apply under alternative C. Additionally, alternative C would result in some alterations to the historic appearance, circulation patterns, and small-scale features of the project area, as described below.

Changes in traffic patterns throughout the project area would somewhat alter circulation patterns in some areas. The biggest change would occur north of the Circle in the vicinity of hotspot 2 where the southern off-ramp between Arlington Boulevard and S. Washington Boulevard would be removed. This connection was originally constructed in 1943 as part of a larger road network update to serve the newly-constructed Pentagon building. Removal of this connection would result in a loss of this historic circulation route. However, this connection between Arlington Boulevard and S. Washington Boulevard is considered a non-contributing feature to the Lady Bird Johnson Park, so its removal would not result in the loss of a contributing circulation feature (NPS 2004). The overall circulation patterns of the cultural landscape, including the north-south axis of the roads, would not be altered in a manner that would diminish the landscape's historic integrity. The existing southern exit ramp does not provide users with any unique views or vistas that are unable to be experienced from other areas of the project area; therefore, its removal would not result in the loss of any important view or viewshed. The widening of the northern exit ramp would alter the appearance of the historic setting by increasing the amount of hardened pavement outside of the existing road prism. The trimming or removing of one or two trees, depending on the final design of the widened road, would result in a change in appearance and the loss of vegetation added as part of the 1968 Stone planting plan (Kelsch et al 2009).

Modification of the triangular traffic island on the east side of the Circle would result in the loss of some historic material and the alteration of a small-scale feature contributing to the cultural landscape of the Memorial Avenue Corridor. The original island would be reduced in size and the new island would be of a different size and shape than the original. However, the new island would be designed to be compatible with the existing in terms of color and material. An additional new island would be constructed for the proposed slip lane on Washington Boulevard northbound on the south side of the Circle. This would alter the appearance of the Circle in that location and would somewhat alter the designed symmetry. However, the overall character and circulation pattern of the Circle would remain. These alterations would not diminish the historic integrity in a manner that would limit the resource's ability to convey its historic significance.

The relocation of the existing crosswalk at hotspot 8 farther north would require the relocation of the existing trail connection between the Mount Vernon Trail and the trail to the west. This would slightly alter the circulation pattern in this location, though the historic north-south alignment of the Mount Vernon Trail would not be changed. The overall historic pedestrian/bicyclist circulation patterns of the

trails through the area would remain. Because the crosswalk would be moved to another location vegetated by trees, it would not be located in an area where it would detract from the historic views or viewsheds of the Potomac River.

The road widening for the proposed acceleration lane in the vicinity of hotspot 10 would result in changes to the historic appearance of the setting and landscape due to the increased amount of hardened pavement outside of the existing roadway prism. Additionally, one or two trees that were planted as part of the 1975 Palmer planting plan would be trimmed or possibly removed, which could slightly alter the historic appearance and vegetation patterns (Kelsch et al 2009). One tear-drop light post may need to be relocated to accommodate for the widened roadway, depending on the final design. This would result in the alteration of a contributing small-scale feature of the Lady Bird Johnson Cultural Landscape. However, the historic circulation pattern of this area would not be altered and the changes to the vegetation and small-scale features would be relatively minor when compared to the overall historic integrity and character that would remain.

The indirect visual impacts on resources outside of the project area would be the same as described under alternative B.

## **Cumulative Impacts**

During scoping, the team considered other NPS and non-NPS projects to determine other actions that have or would have the potential to affect cultural resources within the scope of this project. The team did not identify any past, present, or reasonably foreseeable actions that would result in cumulative impacts on cultural resources. Therefore, there are no cumulative impacts on cultural resources associated with any alternatives presented in this EA.

## **Conclusion**

There would be no impacts on cultural resources under alternative A because there would be no changes to the project area. Alternatives B and C would result in adverse impacts on cultural resources due to the addition of non-historic features, alterations to circulation patterns, and changes to small-scale features. Alternative B would result in minor alterations to the historic appearance due to the addition of new and large signage and in-pavement markings, which would somewhat diminish the integrity of setting and feeling. However, the overall historic character of the cultural landscapes and other historic resources within the project area would be maintained. There would be no changes to historic circulation patterns or small-scale features under alternative B. Alternative C would result in the same adverse impacts as under alternative B, but would have additional adverse impacts due to changes in circulation patterns, vegetation, and small-scale features. This alternative would result in changes to historic circulation patterns through the removal of the southern exit from Arlington Boulevard to S. Washington Boulevard, the addition of slip lanes at the Circle, and the addition of the acceleration lane near hotspot 10. Alterations to the contributing small-scale features include the reduction in size of the triangular granite island on the east side of the Circle at hotspot 4 and the relocation of a tear-drop light post at hotspot 10. Changes in vegetation include the trimming or removal of up to a few trees that were part of the 1968 Stone planting plan or the 1975 Palmer planting plan. All of these alterations under alternative C would result in minor adverse impacts on cultural resources within the project area. Alterations to the roadways under alternative C would not alter any high-priority or character-defining views and vistas. When the cultural landscapes and historic setting of cultural resources are considered overall, these adverse impacts

would not diminish the historic integrity of the George Washington Memorial Parkway, Lady Bird Johnson Park cultural landscape, Memorial Avenue Corridor, or Arlington Memorial Bridge. Indirect impacts on resources outside of the project area related to changes in views of the project area would not diminish historic integrity of any of these resources. Under all alternatives, these cultural resources would retain their historic character and would remain listed in the National Register and/or the Virginia Landmarks Register, as applicable.

## CHAPTER 4: CONSULTATION AND COORDINATION

NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* requires the NPS to make "diligent" efforts to involve the interested and affected public in the NEPA process. This process helps to achieve the following: determine the important issues and eliminate those that are not; allocate assignments among the interdisciplinary team members and/or other participating agencies; identify related projects and associated documents; identify other permits, surveys, consultations, etc. required by other agencies; and create a schedule that allows adequate time to prepare and distribute the environmental document for public review and comment before a final decision is made. This chapter documents the agencies and tribes consulted during the NEPA process and summarizes the public review process for this EA.

### AGENCY AND TRIBAL CONSULTATION

During the NEPA process, the NPS contacted the following agencies and tribes for consultation and cooperation; agencies identified by an asterisk served as cooperating agencies:

- Advisory Council on Historic Preservation
- Arlington County Department of Environmental Services
- Arlington County Department of Transportation
- Arlington County Planning Commission
- Army National Military Cemeteries—Arlington National Cemetery
- District Department of Transportation
- District of Columbia State Historic Preservation Officer
- Federal Highway Administration—Eastern Federal Lands Highway Division\*
- National Capital Planning Commission\*
- Metropolitan Washington Council of Governments
- US Commission of Fine Arts
- US Fish and Wildlife Service
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Historic Resources
- Virginia Department of Transportation\*

The NPS also notified relevant agencies and tribes of the intent to initiate consultation under NHPA Section 106 and that Section 106 compliance would be conducted separately but concurrently to the NEPA process.

See appendix C for copies of relevant pieces of correspondence between the NPS and these parties.

### PUBLIC REVIEW

The EA will be on formal public and agency review for 30 days and has been distributed to a variety of interested individuals, agencies, and organizations. It also is available on the internet at <https://parkplanning.nps.gov/GWMP>, and hard copies are available at the Park's headquarters.

## BIBLIOGRAPHY

Kelsch, Paul, Ph. D, Annalisa Miller, Irene Mills, and Jacye Swallow

- 2009 Cultural Landscape Report, The Vegetation of the George Washington Memorial Parkway, Central Section: Alexandria to Arlington Memorial Bridge. Virginia Tech Landscape Architecture Program.

National Park Service (NPS)

- 1980 National Register of Historic Places Registration Form for Arlington Memorial Bridge
- 1981a National Register of Historic Places Registration Form for Lincoln Memorial.
- 1981b National Register of Historic Places Registration Form for Mount Vernon Memorial Highway.
- 1995 National Register of Historic Places Registration Form for George Washington Memorial Parkway.
- 1998 National Register of Historic Places Registration Form for Lyndon Baines Johnson Memorial Grove on the Potomac.
- 2001a Memorial Avenue Corridor Cultural Landscapes Inventory. George Washington Memorial Parkway.
- 2001b National Register of Historic Places Registration Form for Theodore Roosevelt Island.
- 2002 Director's Order 28: *Cultural Resource Management Guideline*. NPS Office of Policy.
- 2003 Director's Order 77-2: *Floodplain Management*. NPS Office of Policy.
- 2004 Lady Bird Johnson Park Cultural Landscapes Inventory. George Washington Memorial Parkway.
- 2005 *George Washington Memorial Parkway Long-Range Interpretive Plan*. November 2005.
- 2006 *NPS Management Policies 2006*.
- 2009 Cultural Landscapes Inventory for Arlington House, The Robert E. Lee Memorial.
- 2011 Director's Order 12 Handbook: *Conservation Planning, Environmental Impact Analysis, and Decision-making*. NPS Office of Policy.
- 2014a *George Washington Memorial Parkway Foundation Document*. December 2014.
- 2014b National Register of Historic Places Registration Form for Arlington House Historic District [2013 Boundary Increase & Additional Documentation].
- 2014c National Register of Historic Places Registration Form for Arlington National Cemetery.
- 2015a *George Washington Memorial Parkway Existing and Projected Transportation Conditions at Memorial Circle*.

- 2015b     *NEPA Handbook*. September 2015.
- 2018     *George Washington Memorial Parkway, Memorial Circle Safety Improvements Plan/EA Traffic Modeling Report*.