CHAPTER 3: AFFECTED ENVIRONMENT

This chapter of the EA describes existing conditions for the following resources that may be affected by the proposed alternatives: water resources, floodplains, wetlands, soils, vegetation, wildlife, historic structures, cultural landscapes, archeological resources, visitor use and experience, transportation and safety. Potential impacts are discussed in the "Environmental Consequences" chapter, following the same resources order.

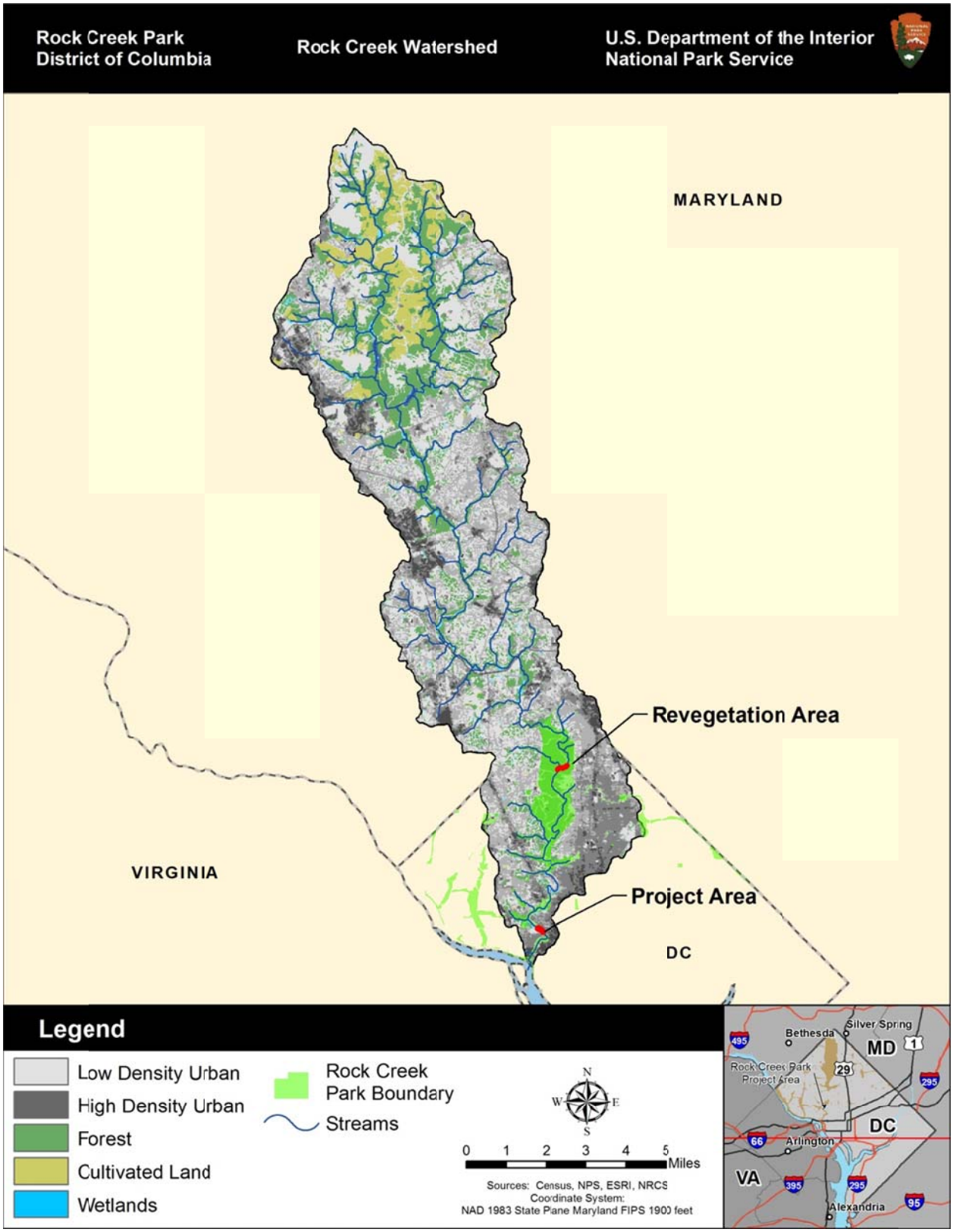
WATER RESOURCES

STREAM CHANNEL CHARACTERISTICS AND WATER QUALITY

Rock Creek flows from its headwaters in Laytonsville, Maryland, south for 33 miles to its confluence with the Potomac River (see figure 3-1). The project area is in lower Rock Creek (the portion of the stream from Peirce Mill to the confluence with the Potomac River) and the confluence of Rock Creek with the Potomac River is approximately 1.1 miles to the south of the project area. The Rock Creek watershed is 77.4 square miles, with 16.8 square miles in the District of Columbia. Although much of the riparian area of Rock Creek, as well as the watershed itself, are protected parkland, there are parts of the watershed that are highly urbanized, with a high percentage of impervious surfaces. Most of the tributaries to Rock Creek on its eastern side were channelized, covered, and converted into storm drains during the early development of Washington, D.C. There are also numerous additional minor tributaries and many groundwater seeps and springs that drain to Rock Creek in the park. The park's General Management Plan estimates that 500,000 people lived in the Rock Creek watershed as of 2005 (NPS 2005; Rock Creek Conservancy 2012). Rock Creek is immediately adjacent to Rock Creek and Potomac Parkway and Waterside Drive, NW in the project area.

The riparian revegetation area is located in upper Rock Creek, between Bingham Drive, NW and Sherrill Drive, NW. In this area a larger tributary to Rock Creek flows into the creek from the west and two smaller streams flow into Rock Creek from the east. There are several seeps or pools to the east, along 16th Street, NW (NPS 2012a).

FIGURE 3-1: WATERSHED



Stream Channels and Banks

Impervious surfaces associated with development in a large percentage of the Rock Creek watershed have resulted in a decrease in soil infiltration and an increase in stormwater runoff volumes and velocity during storm events. As a result, the channel of Rock Creek has continued to widen to accommodate these increased stormwater flows. Other problems associated with development and urbanization in the watershed include increased flooding, streambed scouring, deposition of sediments, abnormal bank erosion, organic and chemical pollution, and accumulation of litter and other solid wastes.

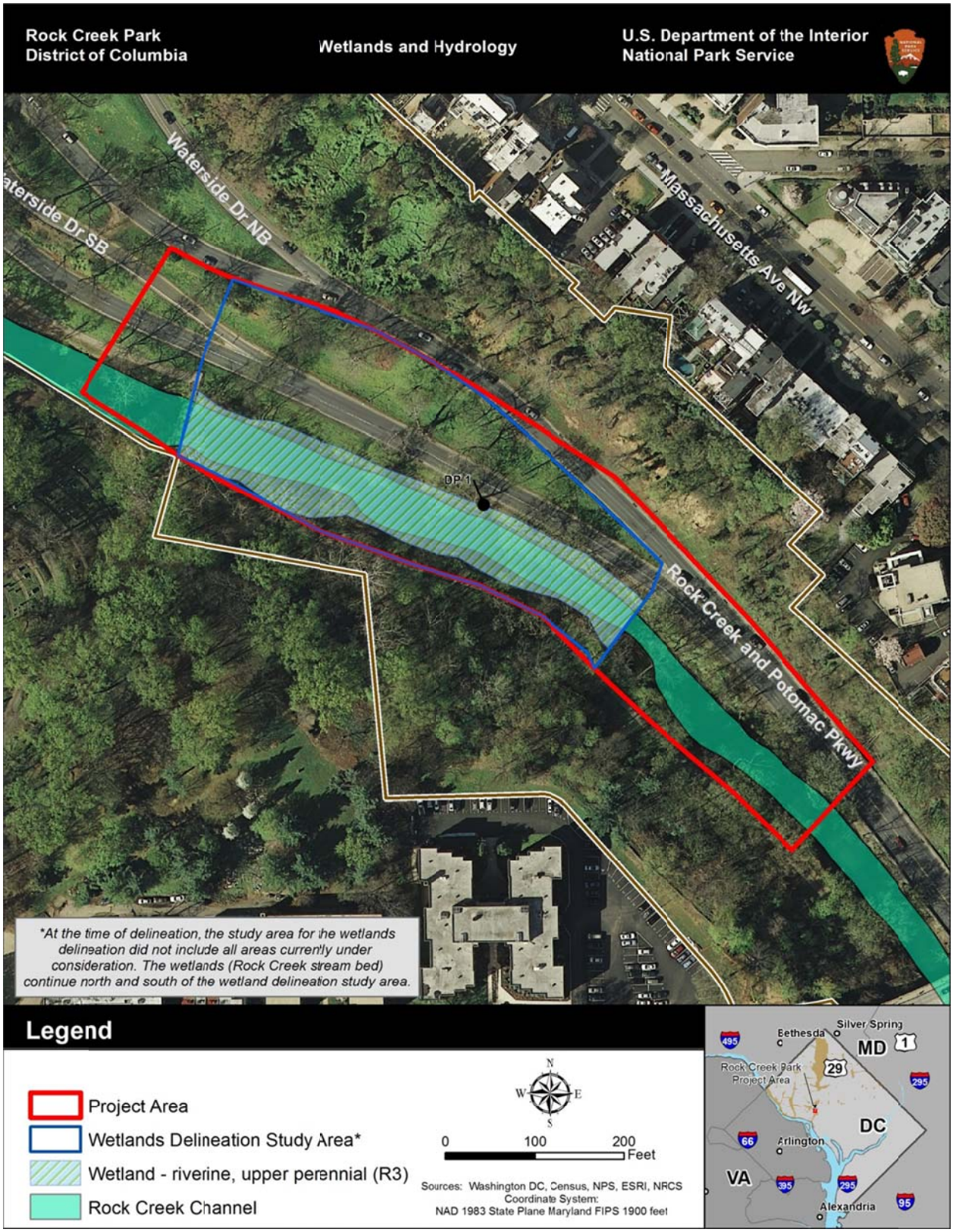
There is a long history of evidence that stormwater-influenced erosion is occurring in Rock Creek. The *Rock Creek Watershed Conservation Study* (NPS 1979) determined that active stream bank erosion was occurring along most of the length of Rock Creek between Peirce Mill (well upstream of the project area) and the Washington, D.C., and Maryland boundary, except along the fall line between Joyce Road, NW and Boulder Bridge. The large boulders and rock channel bottom at the fall line provide natural armored protection against erosion (NPS 1979). Erosion and localized deposition of sediments in the natural floodplain areas and erosion along tributaries to the main stem of Rock Creek were also evident during the 1979 study. Inadequate design of stormwater outfalls was identified as the cause of gullies that developed at locations where outfalls did not extend to the stream and energy dissipaters were not present in the outfalls (NPS 1979).

Although the stream segment in the project area at Waterside Drive, NW has not been studied, in 1989 and 1999 a reach of approximately 900 feet of Rock Creek near Sherrill Drive, NW (also well upstream of the project area) was classified according to the Rosgen system of stream-channel classification as a C5 channel (Rosgen 1994). Rosgen C stream types are lower-gradient streams that are slightly entrenched, have moderate to high width-to-depth ratios, and are characterized by riffle/pool sequences (Rosgen 1994). Channels have characteristic point bars and broad, well-defined floodplains. Natural sediment supply is moderate to high except in areas where stream banks are well vegetated. When vegetation is disturbed or removed, these channel types are highly sensitive to both lateral (bank) and vertical (downcutting) erosion. These streams are highly sensitive to changes in sediment and streamflow (Rosgen 1994). The 1989 study found that the reach had a cobble substrate, while the 1999 study found that the stream had a sandy substrate. The change in substrate indicates that sands and other fine-grained sediments, probably transported from development in the basin, are being deposited in Rock Creek and currently overlie the original cobble channel materials (USGS and NPS 2002). Recent NPS monitoring in Rock Creek noted that channel width can fluctuate by approximately 20 feet in a month (NPS 2010).

In August and September of 2011, severe erosion took place in Rock Creek in the project area as a result of the flooding that occurred after Hurricane Irene and Tropical Storm Lee moved through the area in consecutive weeks. The erosion of the stream banks was exacerbated because the coffer dam was still in Rock Creek. This erosion, which was affecting the stability of Rock Creek Park Multi-use Trail, has been temporarily stabilized with gabion baskets pending a more permanent solution. There are large areas of exposed soil on both banks. In comparing the delineated stream channel (figure 3-2) to the mapped floodway, which is in this case the stream channel, it is clear that in the project area the storm-widened Rock Creek and the stream channel and bank are not stable.

The segment of creek where the riparian revegetation is proposed is downstream of the Sherrill Drive, NW crossing with Beach Drive, NW, and contains a mixture of scoured stream banks with steep slopes and floodplain terraces.

FIGURE 3-2: WETLANDS AND HYDROLOGY - PROJECT AREA



Water Quality

Stream Designation

The surface waters of the District of Columbia are classified according to their current uses, as well as the future uses to which the waters could be restored. Each designation category has applicable water quality standards that serve as the principal water quality management objectives for the park. The District works to support the designations and meet the applicable standards by granting permits and reviewing permit applications and environmental impact statements. The standards and classification of the District's waters are published in the District of Columbia Register, Chapter 11 of Title 21 DCMR (NPS 2006b).

Water quality in lower Rock Creek supports navigation uses, but does not support propagation of fish, shellfish, and wildlife or the protection of human health related to consumption of fish and shellfish. This is due to issues with bacteria and other pollutants. There is currently insufficient information to determine if lower Rock Creek supports primary or secondary contact recreation (DDOE 2010a; 2010b).

In addition, all of Rock Creek and its tributaries have also been designated "Special Waters of the District of Columbia" for their scenic and aesthetic importance. It is intended that the water quality of such designated waters be maintained and not allowed to degrade (DDOE 2010).

Current Pollution Sources

Numerous municipal storm sewers converge in the Rock Creek Valley and discharge surface water from city streets and park roads directly into park waters. Stormwater runoff from roads and parking lots are a primary source of pollution of Rock Creek and its tributaries during and after precipitation events (KCI Technologies 2004). There is also an antiquated system of combined sanitary and storm sewers in the watershed. Under normal conditions, the flow in these combined sewers is routed to the Blue Plains Advanced Wastewater Treatment Plant. However, during storms when rainfall exceeds 0.3 inch per hour, these sewers overflow and discharge raw, untreated sewage directly into Piney Branch and Rock Creek. There are 29 combined sanitary/storm sewer overflow structures on Rock Creek. Together, they can contribute as much as 42.5 million gallons of combined stormwater and sewage to the creek during a 1-hour storm (NPS 2006b).

The District of Columbia Water and Sewer Authority, known as DC Water, plans to reduce the number of annual overflow events from 60 to 70 events to five to 10 event by 2018 with the completion of large storage tunnels. Runoff from all but the largest storms would be stored temporarily in the tunnels and then routed to the Blue Plains Advanced Wastewater Treatment Plant. One of these tunnels would be constructed along Rock Creek (NPS 2006b). DC Water began construction of improvements associated with this project—Rock Creek Regulator Adjustments—in 2010. This project includes three regulator/diversion structures to reduce combined sewer overflow events on Rock Creek. One of the structures is approximately a half mile upstream of the project area, and another is at Sheridan Circle, and the outfall discharges into Rock Creek just downstream of the area near the Q Street, NW Bridge (DC Water n.d.)

Other point-source and non-point-source pollutants entering surface waters in Rock Creek Park include sediments transported from unvegetated soils, stormwater runoff from transportation corridors and parking lots in the watershed, and runoff from lawns and leaking sewer lines, which contribute nutrients (including nitrogen and phosphorus) and also contribute high coliform bacteria counts (NPS 2002). Some facilities in Rock Creek Park have also been identified as actual or potential sources of water pollution in Rock Creek. These include the maintenance yard, public stables, H-3 park police stables, Edgewater U.S. Park Police stables, and golf course, as well as previously identified roads and parking lots. The NPS has begun implementing recommended BMPs to address these sources (NPS 2006b).

Sources for metals and organics in lower Rock Creek include natural sources and modern byproducts of the urban environment, such as automobiles, copper in roofs and gutters, and some commercial activities such as carwashes. Lead paint is also a source of lead in the watershed (DDOH 2004a, 2004b).

Existing Water Quality

As with many urban streams, pollution has adversely affected the ability of Rock Creek and its tributaries to support aquatic life, and there is a history of severe issues with habitat quality and water in the watershed (NPS 2006b; DDOE 2010b).

Due to levels of nitrite, pH, dissolved oxygen, copper, zinc, lead, turbidity and fecal coliform bacteria, , Rock Creek was not meeting water quality standards in the past (NPS 1994). A 1994 baseline water quality report concluded that surface water quality in the park was typical of that found in streams in metropolitan areas at the time (NPS 1994; DDOH 2004a; 2004b). More recent monitoring has shown occasionally high levels of nitrate in the channel at the monitoring site just upstream of the project site. There have also been low dissolved oxygen levels at that monitoring site (USGS and NPS 2002; NPS 2010). For all these pollutants, the District of Columbia developed total maximum daily load studies in compliance with the Clean Water Act. These studies allocate maximum loading of the pollutants of concern, and also determine what the sources are (point source and non-point source).

A study conducted by the U.S. Geological Survey (USGS) and Rock Creek Park to determine the effect of surrounding land uses on the water quality and sediment quality of Rock Creek indicated a number of contaminants in Rock Creek with concentrations that are above established criteria for the protection of aquatic life, both in the water column and in bed sediment (USGS and NPS 2002). Based on two Rosgen stream classifications conducted in 1989 and 1999 (see “Stream Channels and Banks” section), sands and other fine-grained sediments, probably transported from development in the basin, are being deposited in Rock Creek and currently overlie the original cobble channel materials. These sediments may act as an ongoing reservoir for polycyclic aromatic hydrocarbons, polychlorinated biphenyls, pesticides and their transformation products, phthalates, and trace elements, presenting a long-term source of these compounds to the biota in Rock Creek. The results of this study strongly indicate that the water and sediment quality may adversely affect the biota in this environment. However, the biota in Rock Creek were not assessed in the study (USGS and NPS 2002).

Water quality concerns in Rock Creek appear to have stabilized. Upstream urbanization has reached a maximum. In addition, due to efforts by government agencies in Maryland to control pollutant discharges and stormwater runoff, as well as other efforts underway to alleviate the impacts of combined sewer overflows with the Clean Rivers project overseen by DC Water (NPS 2006b), water quality problems do not seem to be increasing.

Even with the stabilization of water quality concerns, lower Rock Creek continues to experience issues with water quality. The 2010 water quality report determined that aquatic life uses continue to not be supported in the stream due to erosion and sedimentation, flow regime alterations, both point-source and non-point-source wet weather discharges (including stormwater runoff and combined sewer overflows), and probable sanitary sewer leakages. There is also a fish consumption advisory posted for the Potomac River and its tributaries, including Rock Creek, banning the consumption of several species of fish. Indicators examined during the Rock Creek assessment suggested that there may be significant organic pollution, because the dominant taxa found in the creek were pollutant-tolerant generalists (DDOE 2010a).

The 2010 *Watershed Improvement Plan for Rock Creek* by the DDOE lays out issues and policies affecting Rock Creek and identifies projects that can help improve water and habitat quality (DDOE 2010b). Several of these projects are underway or are expected to be implemented in the near future and are discussed in the cumulative impacts section of chapter 4.

FLOODPLAINS

Federal projects are guided by Executive Order 11988, "Floodplain Management," which states that "each agency shall provide leadership and shall take action to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains." Under Executive Order 11988, the NPS is responsible for evaluating the potential effects of any actions proposed in a floodplain and for proposing mitigation to avoid adverse effects resulting from development in a floodplain. Two categories of floodplain are discussed in this section:

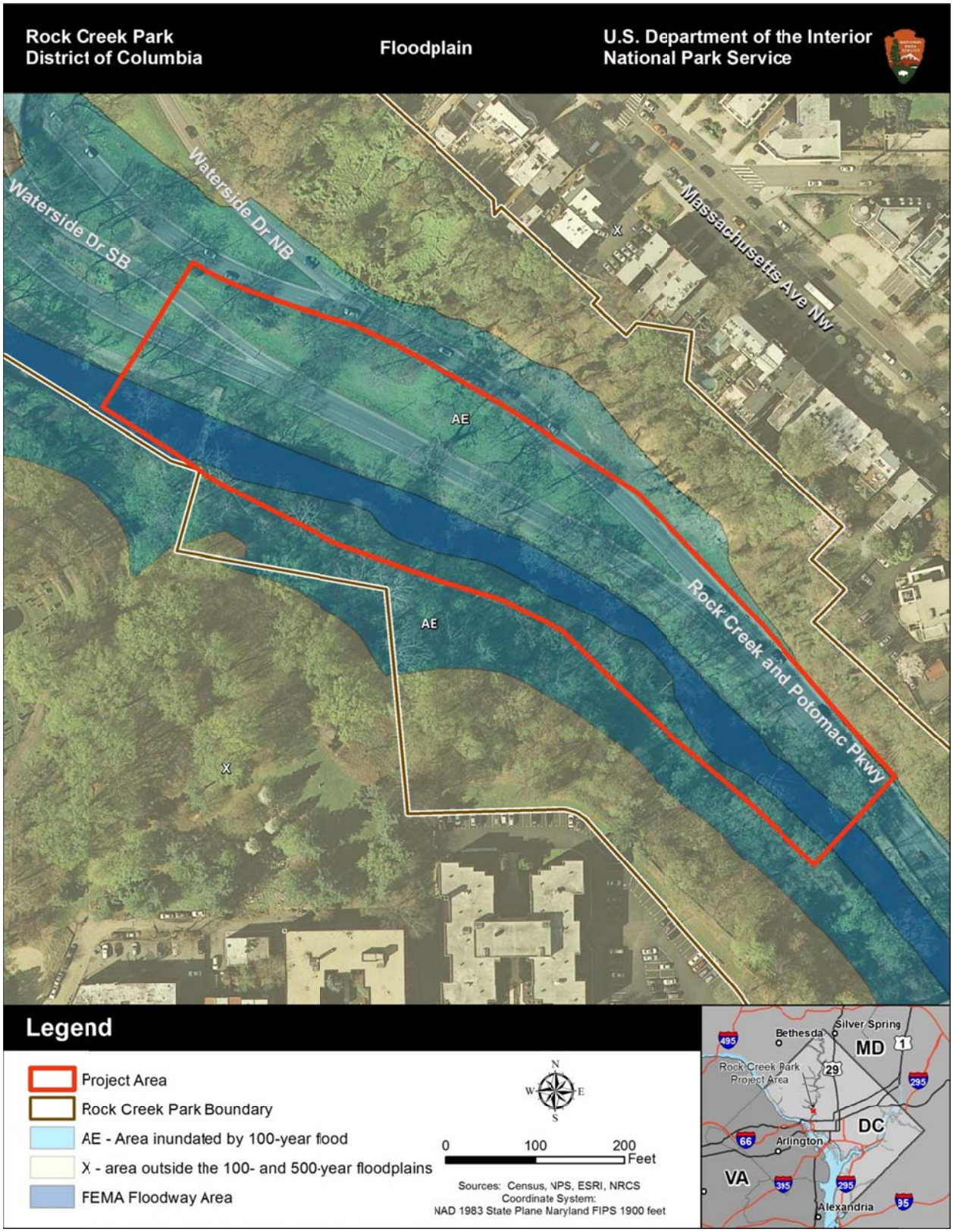
- *Floodway*. The channel and area adjacent to the channel likely to accommodate flooding.
- *100-Year Floodplain*. The area likely to be inundated during floods that have a one percent or greater annual probability of occurring. The 100-year floodplain is noted on the Floodplain Insurance Rate Maps in the project area as Zone AE.

In this case, the floodway and the stream channel are the same; there is little additional floodway outside of the channel. Since the floodplain was mapped in 2010, it is likely that the channel expanded during the storm events that caused the erosion; the delineated riverine wetland channel is larger than the floodway.

The 100-year floodplain for Rock Creek in the project area at Waterside Drive, NW extends to the south of Rock Creek by approximately 100 feet, and to the north of Rock Creek beyond the project area on the northeastern side of Rock Creek and Potomac Parkway. This indicates that the entire road is prone to flooding in 100-year storm events (figure 3-3). The riparian areas proposed for revegetation near Sherrill Drive, NW are also located in the 100-year floodplain.

Floodplain values include the ability of the floodplain to absorb increased water flows, to recharge groundwater, and provide floodplain habitat. The Rock Creek floodplain provides both functional and ecological values, including groundwater recharge, a riparian wildlife corridor, and habitat for floodplain flora and fauna. The parkway setting – a roadway surrounded by turf grass – provides less habitat value than a fully wooded riparian area.

FIGURE 3-3: FLOODPLAINS – PROJECT AREA



WETLANDS

WETLAND DEFINITION

The USACE and the EPA define jurisdictional wetlands as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3). The USACE regulates development in jurisdictional wetlands pursuant to section 404 of the Clean Water Act (33 CFR 320–330). The identification and delineation of jurisdictional wetlands is based on the following three parameters:

- Hydrophytic vegetation. The dominant vegetation consists of species capable of growing in water or on substrate that is at least periodically deficient in oxygen as a result of the presence of water.
- Hydric soils. Soils in the area are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth of hydrophytic vegetation.
- Wetland hydrology. The area is inundated permanently or periodically, or the soil is saturated to the surface for sufficient duration during the growing season to support hydrophytic vegetation.

Wetlands and other waters of the United States are considered jurisdictional by the USACE if they are relatively permanent waters; are an ephemeral, intermittent, or perennial stream; are adjacent to relatively permanent waters; or have a significant nexus to relatively permanent waters. Additionally, if wetland hydrology is derived from groundwater discharge (spring or seep), or if the wetland was created to mitigate former impacts, the USACE can decide to take jurisdiction over them. However, these decisions are considered on a case-by-case basis. The final decision regarding jurisdiction is ultimately determined by the USACE.

Under Director's Order 77-1: *Wetland Protection* (NPS 2008), the NPS classifies wetlands according to the USFWS *Classification of Wetlands and Deepwater Habitats of the United States*, hereafter referred to as the Cowardin Classification System (Cowardin et al. 1979). Under the Cowardin Classification System wetlands have at least one of the following attributes:

- at least periodically, the habitat supports predominantly hydrophytic vegetation (wetland vegetation)
- the substrate is predominantly undrained hydric soil
- the substrate is non-soil and is saturated with water, or is covered by shallow water at some time during the growing season

Based on the Cowardin Classification System, Director's Order 77-1 recognizes five wetland categories:

1. areas with hydrophytes and hydric soils, such as those commonly known as marshes, swamps, and bogs;
2. areas without hydrophytes but with hydric soils — for example, flats where drastic fluctuations in water level, wave action, turbidity, or high concentration of salts may prevent the growth of hydrophytes;
3. areas with hydrophytes but non-hydric soils, such as margins of impoundments or excavations where hydrophytes have become established but hydric soils have not yet developed;
4. areas without soils but with hydrophytes such as the seaweed-covered portion of rocky shores; and
5. wetlands without soil and without hydrophytes, such as gravel beaches or rocky shores without vegetation.

Category 1 wetlands would meet the USACE definition of a wetland and would be afforded jurisdiction provided the wetlands are not isolated, as discussed above. In an area that naturally has both plants and soils present, Director's Order 77-1 directs wetland delineators to follow the USACE guidelines and only classify areas meeting all three criteria as wetlands. Categories 2 through 5 are generally not considered wetlands by the USACE; however, they are generally regulated by the USACE under the definition of waters of the United States (33 CFR 328.3).

WETLAND DELINEATION AND FINDINGS

To be consistent with permitting requirements established under Section 404 of the Clean Water Act, the extent of wetlands occurring in the vicinity of Waterside Drive, NW, where the southbound ramp from Waterside Drive, NW merges with Rock Creek and Potomac Parkway in Washington, D.C., was determined based on procedures prescribed in the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)* (USACE 2010). The presence of wetlands meeting NPS guidelines under Director's Order 77-1 was also determined based on the Cowardin Classification System (Cowardin et al. 1979), as discussed above.

Field investigations to delineate the extent of wetlands in the project area were conducted in October 2011. The wetland delineation sought to identify all wetlands and stream channels identified in the proposed project area. One class of watercourses was identified.

Field survey efforts identified one perennial stream, Rock Creek. No vegetated wetlands were identified during the investigation. Rock Creek, classified as riverine, upper perennial, unconsolidated bottom, was delineated for approximately 577 linear feet and approximately 75 feet in width and comprises 0.93 acre (0.38 hectare) of the project area.

The stream bed in the survey area is composed of unconsolidated material, boulders, and bedrock. The stream banks, which are approximately ten feet deep, are almost entirely at a right angle to the adjacent riparian corridor, thus are extremely steep. The banks are dominated primarily by saplings and invasive vegetation. Observed trees and saplings include box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), hickory (*Carya* spp.), silver maple (*Acer saccharinum*), and tulip tree (*Liriodendron tulipifera*). Observed herbs and woody vines include Halberdleaf tearthumb (*Polygonum arifolium* – invasive), Tartarian honeysuckle (*Lonicera tatarica* – invasive), green brier (*Smilax rotundifolia*), Japanese knotweed (*Polygonum cuspidatum* – invasive), English ivy (*Hedera helix* - invasive) and ground ivy (*Glechoma hederacea* – invasive). The majority of these dominant species are not classified as hydrophytic vegetation, thus hydrophytic vegetation does not dominate the banks.

The six riparian areas proposed for revegetation differ in size, ranging between 0.005 and 0.279 acre and are immediately adjacent to the banks of Rock Creek. Throughout the proposed revegetation area, the banks of Rock Creek are very steep and practically vertical from the edge of the riparian zone to the creek bed. Scouring of the stream banks is present throughout the revegetation area.

None of the soils in the project area or in the riparian revegetation areas were listed as a hydric soil, as identified on the *National List of Hydric Soils* (USDA 2011) (see Soils section). Hydric soils are defined by the National Technical Committee for Hydric Soils as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Such conditions can produce organic hydric soils composed of muck and/or peat or mineral hydric soils. Mineral hydric soils manifest various redoximorphic features, including grey soils and deposits of iron or manganese (Federal Register, July 13, 1994).

Rock Creek qualifies as waters of the United States under the 1987 USACE guidelines because it is relatively permanent water. Additionally, it qualifies as wetland under NPS Director's Order 77-1 because under the Cowardin Classification System it is a riverine, upper perennial system with a bedrock bottom.

The proposed reconstruction and rehabilitation of Rock Creek and Potomac Parkway and stream bank restoration may impact these wetland areas. In addition, the NPS is proposing appropriate compensation in response to the approximately 0.30 acre of riparian area impacts that occurred from the initiation of construction activities in 2011. Therefore, a SOF for wetlands, as required by Director's Order 77-1 and is included in appendix C of this document.

SOILS

Under NPS *Management Policies 2006* the NPS actively seeks to understand and preserve the soil resources of its parks and properties and to prevent unnatural erosion, physical removal, or contamination of the soil to the extent possible (NPS 2006a). The Soil Survey Geographic Database, produced by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), was consulted to identify soils in the project area. The Soil Survey of the District of Columbia (NRCS 2006) shows three soil map units in the project area: Codorus silt loam, Codorus–urban land complex, and Udorthents, sandy. Most of the soils in the revegetation area consist of codorus-urban land complex and codorus-silt loam. Locations of the soil map units relative to the project area are shown on figure 3-4 and the riparian revegetation area in figure 3-5.

Table 3-1 provides a list of soils found in the project area and the riparian revegetation areas along with their prime farmland and hydric soil status. Descriptions of the soil map units follow table 3-1.

TABLE 3-1: GENERAL SOIL CHARACTERISTICS

Map Unit	Unit Name	Prime Farmland	Hydric Soil
Ck	Codorus silt loam	Yes	No
Cn	Codorus–urban land complex	No	No
U3	Udorthents, sandy	No	No

Codorus silt loam (Ck). The Codorus silt loam is a nearly level, moderately well-drained to somewhat poorly drained soil occurring on floodplains in the Piedmont Province. Permeability in the soil is moderate, runoff is slow, and potential for erosion is minor. The mapping unit contains prime farmland. The mapping unit has poor potential for most building purposes due to a seasonal high water table, and the hazard of frequent flooding throughout the year.

Codorus–urban land complex (Cn). This complex occurs on floodplains in the Piedmont Province and consists of approximately 20 percent undisturbed soils of the Codorus series (described above), approximately 20 percent disturbed Codorus soils, and about 40 percent urban land. The urban land component is primarily covered by roads and some buildings. Bouldery and rocky areas are also included in the complex in places along Rock Creek. Permeability is moderate in relatively undisturbed areas and variable in disturbed areas. Runoff in the complex is medium and the potential for erosion is minor.

Udorthents, sandy (U3). The Udorthents, sandy soil type consists of nearly level to steep areas where the original soils have been removed for use as rockfill, concrete aggregate, or landfill. Permeability in the soil is moderate to very rapid throughout. In many areas stones and boulders 10 inches to 10 feet in diameter are scattered randomly on the surface or are in piles. The mapping unit is generally well suited to use as a building site.

A discussion of hydric soils in the project area is included in the wetlands section above.

FIGURE 3-4: SOILS– PROJECT AREA

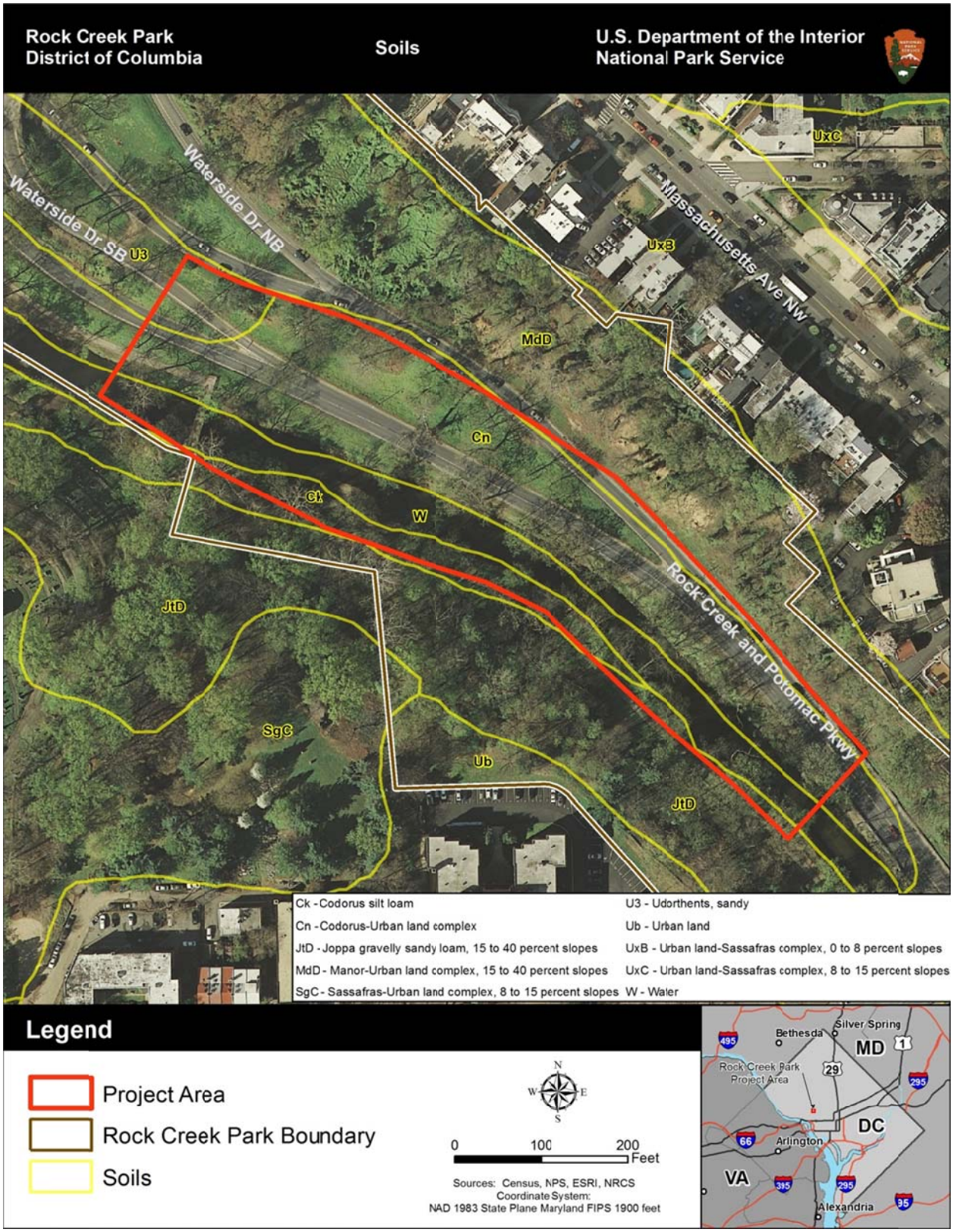
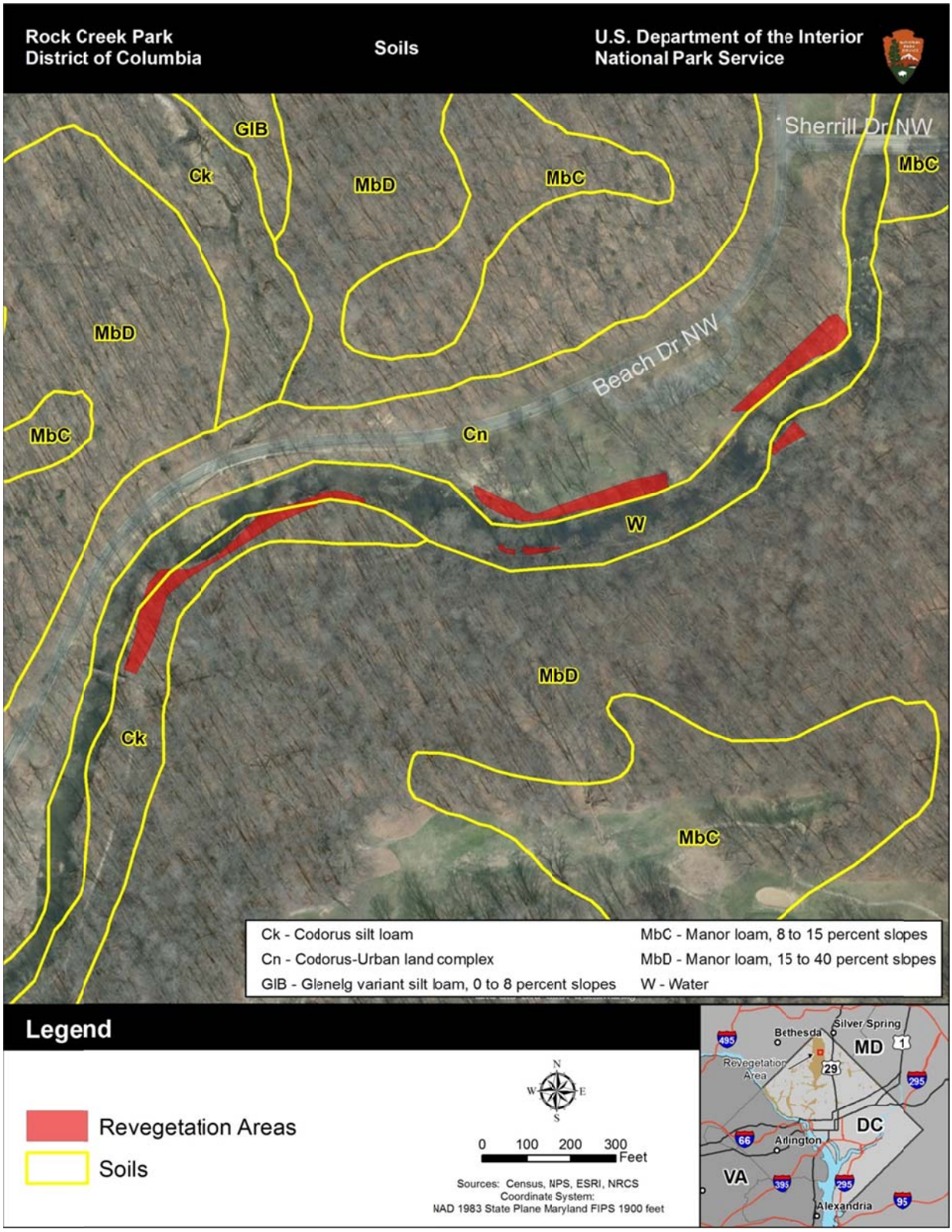


FIGURE 3-5: SOILS – RIPARIAN REVEGETATION AREAS



VEGETATION

Approximately 80 percent (1,662 acres) of Rock Creek Park is covered with mature second-growth forests. Activities prior to the park's establishment in 1890, such as timber cutting, farming, and Civil War clearing, removed virtually all the original forest Today's woodlands are primarily a mixture of deciduous species typical of the eastern deciduous forest in the later stages of succession. Rock Creek Park runs along the topographic break separating the Piedmont Plateau and the Atlantic Coastal Plain Physiographic Provinces. The vegetation reflects affinities to both of these provinces.

The Virginia Department of Conservation and Recreation (VADCR), in cooperation with NatureServe and NPS, has developed a detailed map of the vegetation of Rock Creek Park(VADCR-DNH 2011) based on the International Vegetation Classification of Ecological Communities (IVC). The proposed project area contains the vegetative community - Mesic Mixed Hardwood Forest. Species that characterize the Mesic Mixed Hardwood Forest community type include American beech (*Fagus grandifolia*), white oak (*Quercus alba*), northern red oak (*Q. rubra*), tuliptree (*Liriodendron tulipfera*), American holly (*Ilex opaca var. opaca*), and Christmas fern (*Polystichum acrostichoides*) (Fleming and Patterson 2012).

Vegetation occurring where Waterside Drive, NW merges with the southbound parkway (the proposed location for the new acceleration lane) is characterized by developed open space (maintained and mowed lawn) with Mesic Mixed Hardwood Forest on the western bank of Rock Creek. Other vegetation occurring on and immediately adjacent to the stream bank includes elm (*Ulmus* spp.), American sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), ash (*Fraxinus* spp.), Norway maple (*Acer platanoides*), black walnut (*Juglans nigra*), and box elder (*Acer negundo*). Examples of other understory vegetation occurring along the stream bank include bush honeysuckle (*Lonicera* spp.), grapes (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), and English ivy (*Hedra helix*).

Vegetation in the riparian revegetation areas were identified by GIS mapping by the Nature Conservancy in the late 1990s and on-site identification. The GIS map identifies communities of mature trees of beech, oaks, sycamores, and green ash along Rock Creek stream corridor. On June 1, 2012, a field visit was conducted by an NPS Regional Botanist and a ROCR Natural Resource Specialist to identify the existing vegetation of the proposed projects sites. Existing native plant species include vines (*Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Vitis* spp.), ferns (*Dennstaedtia punctilobula*, *Polystichum acrostichoides*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *Thelypteris noveboracensis*, *T. phegopteris*), and grasses (*Dichanthelium clandestinum*, *Elymus hystrix*, *Leersia virginica*, *Carex* spp.). A detailed list of existing native tree and herbaceous plant species identified at the proposed revegetation sites is included in the *Draft Revegetation Plan Rock Creek Park Riparian Area* (NPS 2012a).

According to the 2011 VADCR mapping, the revegetation areas are classified as the following:

- Tuliptree-Small Stream Floodplain Forest (areas A-B)—Dominant species include tuliptree, red maple (*Acer rubrum*), box elder, American sycamore, American hornbeam (*Carpinus caroliniana*), and Virginia knotweed (*Polygonum virginianum*) (VADCR-DNH 2012).
- Mesic Mixed Hardwood Forest (areas C-F)—Dominant species include American beech, white oak, northern red oak, tuliptree, American holly, and Christmas fern.

INVASIVE PLANT SPECIES

Due to its proximity to urban development, Rock Creek Park has concerns related to aggressive and nonnative, invasive plant species. Over 30 percent of the approximately 650 species of plants that have been identified in the park are introduced. Eradication programs have been implemented for four of the more aggressive species in the park, including porcelainberry (*Ampelopsis brevipedunculata*), oriental bittersweet (*Celastrus orbiculatus*), Japanese honeysuckle (*Lonicera japonica*), and lesser celandine

(*Ranunculus ficaria*). Three of these species are especially numerous in forest canopy openings and along park edges. Lesser celandine is very common in the floodplain of Rock Creek (USGS and NPS 2003). Other invasive tree, shrub, and vine species identified at the proposed project sites within the riparian revegetation area include white mulberry (*Morus alba*), mimosa (*Albizia julibrissin*), wineberry (*Rubus phoenicolasius*), linden viburnum (*Viburnum dilitatum*), mile-a-minute (*Persicaria perfoliata*), and Japanese hops (*Humulus japonica*). Invasive herbaceous plants and grasses identified at the proposed sites include garlic mustard (*Alliaria petiolata*), smartweed (*Polygonum* spp.), spider flower (*Cleome* spp.), cup plant (*Silphium perfoliatum*), Japanese stiltgrass (*Microstegium vimineum*), Japanese knotweed (*Fallopia japonica*), beefsteak (*Perilla frustescens*), mugwort (*Artemisia* spp.), Asiatic dayflower (*Commelina communis*), Chinese lespedeza (*Lespedeza cuneata*), and Asiatic hawk's beard (*Youngia japonica*) (NPS 2012a).

WILDLIFE

Rock Creek Park provides habitat for several wildlife species, including mammals, birds, reptiles and amphibians, and fish. As noted in the "Purpose and Need" chapter under "Issues and Impact Topics," wildlife that may occur in wetland areas or in Rock Creek are most likely to be impacted by the implementation of the project analyzed in this EA. However, other wildlife species common throughout the park also have the potential to be affected by construction-related impacts. Therefore, a general overview of wildlife species common to the park, in addition to those occurring along Rock Creek, is provided below.

MAMMALS

To date, 36 species of mammals have been documented as present or likely to be present in the park (NPS 2012b). Common species include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), red fox (*Vulpes fulva*), opossum (*Didelphis virginiana*), coyote (*Canis latrans*), beaver (*Castor canadensis*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), and eastern cottontail (*Sylvilagus floridanus*) (NPS 2012c).

BIRDS

According to the NPS Species database, 181 species of breeding or migrating birds have been documented in Rock Creek Park (NPS 2012b). The National Audubon Society and the American Bird Conservancy recognize Rock Creek Park as an important birding area due to its exceptional diversity of bird species during migration (Maryland / District of Columbia Audubon Society 2004). Species common in the park with the potential to be present in or near the project area include mourning dove (*Zenaida macroura*), American crow (*Corvus brachyrhynchos*), mallard (*Anas platyrhynchos*), common grackle (*Quiscalus quiscula*), red-shouldered hawk (*Buteo lineatus*), and red-bellied woodpecker (*Melanerpes carolinus*). Common species known to nest in the park that have the potential to be present in or near the project area include Carolina chickadee (*Poecile carolinensis*), wood duck (*Aix sponsa*), northern cardinal (*Cardinalis cardinalis*), gray catbird (*Dumetella carolinensis*), American robin (*Turdus migratorius*), downy woodpecker (*Picoides pubescens*), Baltimore oriole (*Icterus galbula*), eastern phoebe (*Sayornis phoebe*), red-eyed vireo (*Vireo olivaceus*), Carolina wren (*Thryothorus ludovicianus*), tufted titmouse (*Parus bicolor*), belted kingfisher (*Ceryle alcyon*), song sparrow (*Melospiza melodia*), and white-breasted nuthatch (*Sitta carolinensis*) (Yeaman, pers. comm., 2012).

REPTILES AND AMPHIBIANS

There are currently 13 amphibian and 10 reptile species known to be present in Rock Creek Park (NPS 2012b, 2012d). For many reptiles, wetland areas serve as primary habitat, supplying them with food and habitat for breeding and nursing (EPA 2012). Reptiles with the potential to be present in wetland areas

include snapping turtle (*Chelydra serpentina*) and northern water snake (*Nerodia sipedon*) (EPA 2012; NPS 2012d).

Some amphibians, such as the bullfrog (*Rana catesbeiana*) and the green frog (*Rana clamitans)*, can be found in modest numbers in wetland areas.

FISH

Approximately 35 species of fish have been documented in Rock Creek. Examples of fish recorded in the creek include five species of shiners (*Notropis* spp.), two bullheads (*Ictalurus* spp.), and three species of sunfish (*Lepomis* spp.). Blacknose dace (*Rhinichthys atratulus*) are relatively common in the creek. Other fish species occurring in the creek include carp (*Cyprinus carpio*), largemouth bass (*Micropterus salmoides*), blueback herring (*Alosa aestivalis*), hickory shad (*A. mediocris*), and alewife (*A. pseudoharengus*). The removal of barriers to fish passage in Rock Creek, initiated in 2003 as part of the mitigation for the Woodrow Wilson Bridge, and the installation of a fish bypass at Peirce Mill Dam are expected to allow the blueback herring and the alewife to naturally migrate upstream from the mouth of Rock Creek into Maryland to spawn (NPS 2005).

The stormwater runoff and urban pollution problems described in the water quality section of this chapter have adversely affected fish numbers and diversity in the park. However, the 16 tributaries of Rock Creek have been more severely affected than the main channel (NPS 2005).

CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966, as Amended, and as implemented in 36 CFR 800, requires federal agencies to consider the effects of federally funded, regulated, or licensed undertakings on cultural resources listed in or eligible for inclusion in the NRHP. Moreover, the federal agency must afford the ACHP the opportunity to comment in the event that an undertaking will have an adverse effect on a cultural resource that is eligible for or listed in the NRHP. For the purposes of this report, cultural resources (historic properties) are defined as historic structures (buildings, structures, sites, districts, objects, etc.), cultural landscapes, and archeological resources. The consideration of these resources by the NPS meets pertinent requirements of the National Historic Preservation Act of 1966, as Amended and related legislation and implementing regulations.

AREAS OF POTENTIAL EFFECT

According to the Section 106 regulations (36 CFR 800), an Area of Potential Effect (APE) is defined as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

Due to the scale and nature of the road realignment alternatives under analysis in this EA, the areas of potential effects have been designated. The first is the area of roadway reconstruction or limit of disturbance, which is appropriate for potential archeological resources, notably the area where the remains of the historic Lyons Mill might be impacted by construction (figure 3-6). The second is the APE for historic structures and cultural landscapes based upon an approximately 400 foot buffer around the roadway reconstruction at the Waterside Drive, NW limit of disturbance and modified by considerations of visibility to and from significant above-ground historic properties (figure 3-7). The third APE is the area where riparian revegetation is proposed to mitigate impacts from construction activities conducted in 2011 (figure 3-8). The area for riparian revegetation is located near Sherrill Drive, NW, approximately five miles upstream of Rock Creek from Waterside Drive, NW and in a different official historic district. The revegetation area APE is a 100-foot buffer on either side of Rock Creek from Sherrill Drive, NW to Bingham Drive, NW, NW. This APE does not address archeological resources because the scouring of the creek banks as well as the limited ground disturbance anticipated from tree planting would render

impacts to archeological resources extremely unlikely. Also, a four year archeological investigation of Rock Creek Park carried out by the Louis Berger Group on behalf of the NPS in 2004 through 2008 did not identify any sites within this APE. (Berger, 2008)

All three APEs are the equivalent of the study area for cultural resources in NEPA terms.

HISTORIC CONTEXT FOR ROCK CREEK PARK

The earliest patents were granted for estates in the Rock Creek Valley area toward the close of the 1600s century. The first established settler near the mouth of the creek was Ninian Beall, who patented his "Rock of Dumbarton" tract in 1703. This tract was subsequently incorporated into Georgetown, which was created in 1751 as a tobacco export center. By the late 1720s, most of the lands adjoining Rock Creek had been patented and settled by tobacco farmers. However, no maps exist to show the locations of the earliest farms. Gristmills and sawmills began to be built along the creek by the 1740s; the mills proliferated through the late 1700s and into the 1800s. Peirce Mill, built in the 1820s, still stands as the sole remnant of this former industry. During the Civil War, Fort DeRussy functioned as part of the ring of forts constructed to defend the capital from Confederate attacks. The fort's guns helped to repel an assault by Jubal Early's troops in July 1864, known as the Battle of Fort Stevens.

After the war, farming and milling continued as before in the Rock Creek Valley, which retained a largely rural character. Suburban land development began to encroach on the area, however, even as the federal government considered the creation of a public park. In 1889, Congress authorized the purchase of lands for a park along Rock Creek, and the acquisition of over 1,600 acres was completed by 1895 (Bushong 1990).

Among the early improvements to the park were new access roads and trails, which included Beach Drive, NW (1897–1900), Glover Road, NW (1899–1901), Ross Drive, NW (1902–1903), and Morrow Road, NW (1911). The engineers who built these roads were criticized because their construction damaged the scenic beauty of the park. The construction of Beach Drive, NW, in particular, obliterated many features along the creek banks. The structural remains of many early Rock Creek mills, including White's Mill and Blagden Mill, were removed during the construction of this road (Bushong 1990).

The inauguration of Franklin D, Roosevelt as President in 1933 led to the launching of many new public works projects intended to counteract the economic hardships of the Great Depression. Among them were the Civilian Conservation Corps (CCC) and the Public Works Administration (PWA). These programs were to have a major impact on Rock Creek Park. An administrative change placed Rock Creek Park under the overall direction of the NPS and with funding from Title II of the National Industrial Recovery Act, general up-grades to the road system, new bridges and buildings, restoration of Peirce Mill, and the completion of the Piney Branch Parkway were accomplished. A park design manual provided the basis for the uniform "rustic" style of park infrastructure. The CCC participation was so great that a CCC camp to house workers was established in 1938 north of Fort DeRuss (Bushong, 1990). The last major overhaul of Rock Creek Park's visitor facilities and roads and trail system came about due to the NPS' ten-year "Mission 66" program to prepare for the 50th anniversary of the agency in 1966.

FIGURE 3-6: AREA OF POTENTIAL EFFECT – ARCHEOLOGICAL RESOURCES (PROJECT AREA)

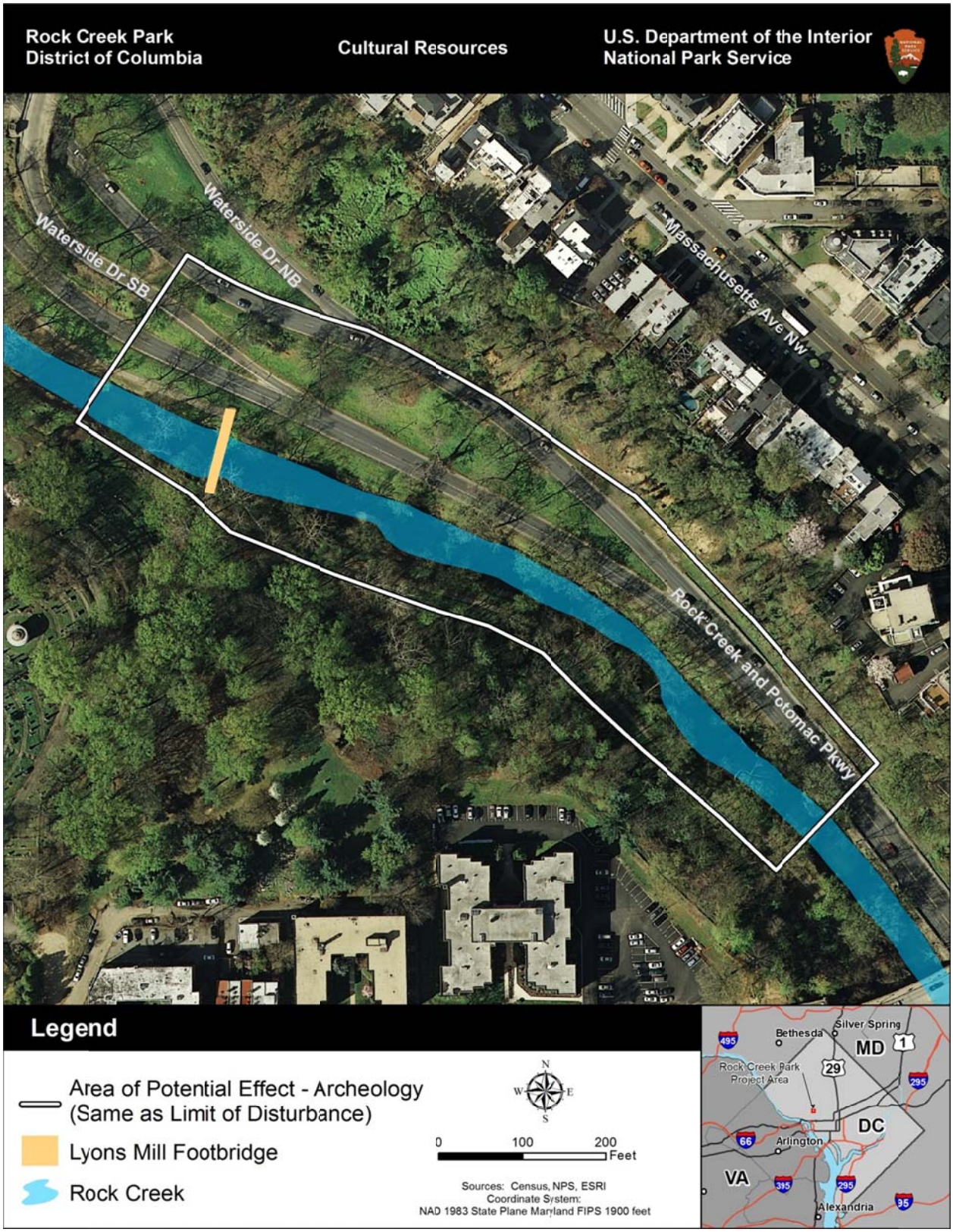
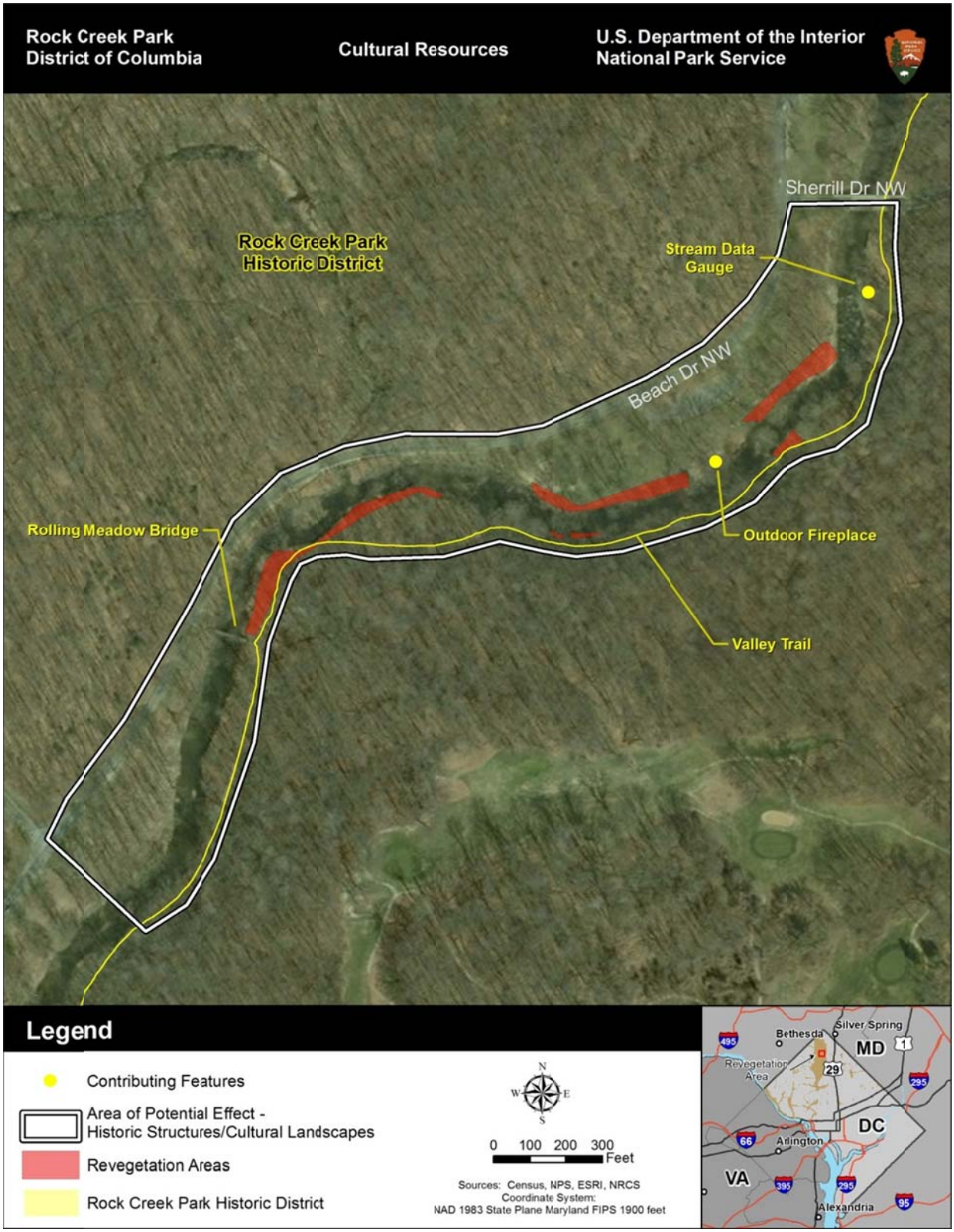


FIGURE 3-7 AREA OF POTENTIAL EFFECT – CULTURAL LANDSCAPE AND HISTORIC STRUCTURES (PROJECT AREA)

FIGURE 3-8: AREA OF POTENTIAL EFFECT – CULTURAL LANDSCAPE AND HISTORIC STRUCTURES (RIPARIAN REVEGETATION AREA)



HISTORIC STRUCTURES AND DISTRICTS

Project area at Waterside Drive, NW

The APE for the project area at Waterside Drive, NW encompasses portions of three NRHP listed historic districts: Rock Creek and Potomac Parkway (RCPP) Historic District, the Georgetown Historic District, and the Massachusetts Avenue Historic District

Rock Creek and Potomac Parkway Historic District

The principal historic district, in which road construction activities would take place under the action alternatives, is the Rock Creek and Potomac Parkway (RCPP) Historic District, which was listed in the NRHP by the NPS under the multiple property listing "Parkways of the National Capital Region, 1913–1965." Conceived in 1902 by the Senate Park or McMillan Commission, the parkway is a major component of the District of Columbia's comprehensive park system developed following City Beautiful ideals during the early 1900s. Originally built for horse-drawn carriages, horseback riders, pedestrians, and the occasional automobile, Rock Creek and Potomac Parkway was one of the earliest parkways in the nation and was the first federally funded park road. The parkway experienced numerous design changes to facilitate growing automobile use during the early 1900s, and as the oldest parkway in the metropolitan Washington area, it features numerous layers of American parkway design. The parkway's long-term evolution resulted in contributions from several landscape architects, including James G. Langdon and Irving W. Payne. However, Frederick Law Olmsted, Jr. asserted perhaps the most influence on the parkway's construction and evolution, beginning during his time as a member of the Commission of Fine Arts and later as a member of the National Capital Park and Planning Commission. Rock Creek and Potomac Parkway is significant under Criteria A and C in the areas of community planning and development, landscape architecture, architecture, and recreation during the period 1791 to 1951 (Barsoum 2005).

In the median south of the Waterside Drive Overpass is the site of the historic Lyons Mill. Adjacent to the site stand three large sycamores that appear to predate the parkway construction. Today, numerous mature deciduous trees, probably indigenous specimens dating from before the parkway construction, are scattered across the median and along the western side of the parkway in the area of the par course. Trees standing on extensive lawns give this section the appearance of a picturesque landscape (Barsoum, 2005).

The Rock Creek and Potomac Parkway Historic District contains approximately 173 acres of land encompassing areas historically functioning as the parkway established by the Senate Park Commission to link the Mall and Potomac Park with the National Zoo and Rock Creek Park. Contributing resources within the boundaries of the parkway district include the road, including all stone and stone-faced retaining walls built in conjunction with the road; a remnant road extending from beneath the Connecticut Avenue Bridge to the Zoo Ford; the median between Q Street, NW and Massachusetts Avenue, NW; the P Street, NW Road Bridge; the South Waterside Drive, NW Overpass; the Shoreham Hill Road, NW Bridge; the P Street, NW Beach; culverts including all structures with masonry headwalls; Shoreham Hill; and Rock Creek with all retaining walls and riprap along the banks (Berger 2004). Resources contributing to the Rock Creek and Potomac Parkway Historic District that are within the project area at Waterside Drive, NW are listed in table 3-2.

Georgetown Historic District

Georgetown was founded by an Act of the Maryland Assembly in 1751. It became part of the District of Columbia upon its establishment in 1791, although it remained a separate jurisdictional entity within the District until 1871.

The Georgetown Historic District is a remarkably intact example of a historic port town and encompasses the area originally laid out in 1751. Its narrow grid streets contrast from the wide, planned streets of L'Enfant's city, and its collection of buildings and structures are among the city's oldest, demonstrating a

rich variety of residential, commercial, institutional, and industrial examples. From the modest to the grandiose, the historic district's dwellings exhibit styles and forms of all social levels and include Federal, Greek Revival, Italianate, Queen Anne, Romanesque, and Classical Revival styles amid the vernacular.

The Georgetown Historic District contains approximately 4,000 primary buildings. However, no contributing elements have been officially determined. The district was first established by the Old Georgetown Act in 1950 and listed in the D.C. Inventory of Historic Sites in 1964. In 1967 the Georgetown Historic District was designated a National Historic Landmark and was listed in the NRHP. The period of significance for the Georgetown Historic District spans from 1751 to 1950. The district is roughly bounded by Reservoir Road, NW and Dumbarton Oaks Park on the north, Rock Creek Park on the east, the Potomac River on the south, and Glover-Archbold Parkway on the west (NPS 2003b).

In the Georgetown Historic District, two historic sites within the main site APE for this project are individually significant: the Oak Hill Cemetery and the Mount Zion Cemetery. The Oak Hill Cemetery, adjacent to Rock Creek Park at 30th and R Streets, NW was founded by prominent Washington banker W.W. Corcoran and designed according to the landscape precepts of Early Romantic naturalism. Although not NRHP eligible, it is a D.C. landmark and incorporates James Renwick's Gothic Revival chapel (which is listed in the NRHP) at its highest point. The 1809 Mount Zion Cemetery combines the Old Methodist Burying Ground and the Female Union Band Society Graveyard. From 1842 on, it was a burial ground for free blacks. It is listed in the NRHP. Relevant Georgetown historic structures are listed in table 3-2

Massachusetts Avenue Historic District

The Massachusetts Avenue Historic District extends roughly on either side of Massachusetts Avenue, NW from Scott Circle to Observatory Hill. It is lined with the grand mansions built in a variety of Revival styles from 1890 to 1930 for wealthy and prominent Washingtonians. Many of these palatial urban residences, now serving as embassies, are individually listed in the NRHP. It is the rear yards, parking lots, and gardens of these houses and buildings along the southwest side of the avenue which back up onto Rock Creek Park within the Roadway Reconstruction APE of the project (Beauchamp 1974).

Riparian Revegetation Area

The riparian revegetation area consists of a series of planted beds of vegetation and trees on either bank of Rock Creek from Sherrill Drive, NW to Bingham Drive, NW, approximately five miles north of proposed reconstruction at Waterside Drive, NW. The riparian revegetation area is located in the upper reaches of Rock Creek Park within the District of Columbia. The riparian revegetation area is within the Rock Creek Park (RCP) Historic District (north of the Zoo Tunnel) rather than the RCPP Historic District (south of the Zoo Tunnel). A separate APE has been established for this project component, which is an element common to all action alternatives. There are no other historic structures – unconnected with the RCP Historic District – or historic districts in the immediate vicinity of the riparian revegetation area.

Rock Creek Park Historic District

The RCP Historic District's National Register boundaries are roughly defined as 16th Street, NW to the east, Oregon Avenue, NW and Broad Branch Road, NW to the west, the Zoo Tunnel to the south, and the District line and Parkside Drive, NW to the north. The historic district contains 1,754.62 acres of land dominated by picturesque landscapes including forested areas, streams, valleys, meadows, and sloping hills. The park meets National Register Criteria A, B, and C under the themes of architecture, community planning and development, conservation, entertainment/recreation, industry, landscape architecture, military, and horticulture. Significant persons associated with the history of the park include Joshua Peirce and landscape architects Frederick Law Olmsted, Jr., and John C. Olmsted. The park as a whole retains a high degree of integrity of design, workmanship, location, feeling, association, and setting.

Based on an inventory of above-ground resources located within the National Register boundaries there are 31 contributing resources and 59 non-contributing resources (NPS 1991). A contributing resource represents a building, structure, site, or object that is associated with one or more of the themes under which the district is significant and that retains a high degree of integrity.

The contributing features to the RCP Historic District that are within the APE of the riparian revegetation area are listed at the end of table 3-2.

TABLE 3-2: HISTORIC DISTRICTS AND STRUCTURES: PROJECT AREA AT WATERSIDE DRIVE, NW AND RIPARIAN REVEGETATION AREA APES

Historic District/Structures	Type	NRHP Status
Rock Creek and Potomac Parkway Historic District		
• South Waterside Drive, NW Overpass	Structure	Contributing
• Lyon's Mill Footbridge	Structure	Contributing
• Rock Creek and Potomac Parkway Road	Structure	Contributing
• Multi-use Trail Network	Structure	Contributing
• Culverts	Structure	Contributing
• Rock Creek	Site	Contributing
• Median (between Q Street, NW and Massachusetts Avenue, NW)	Site	Contributing
Georgetown Historic District		
• Oak Hill Cemetery	Site	DC Landmark
• Oak Hill Chapel	Building	NRHP
• Mt. Zion Cemetery	Site	NRHP
Massachusetts Avenue Historic District		
Rock Creek Park Historic District		
• Rolling Meadow Pedestrian Bridge	Structure	Contributing
• Stone Fire Pits (2)	Structure	Contributing
• Beach Drive, NW Road and Trail	Structure	Contributing
• Stream Data Gage	Structure	Contributing

CULTURAL LANDSCAPES

Cultural landscapes, as defined by *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*, consist of "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein) associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (Birnbaum 1996). Created by an act of Congress in 1890, Rock Creek Park encompasses the last major natural landscape in the District. Since that time, the park has balanced the preservation and maintenance of the valley's natural and cultural resources with the recreational and transportation requirements of modern Washington while incorporating the highest cultural and aesthetic values. As such, Rock Creek Park is considered a significant cultural and historic landscape.

It should be noted that Rock Creek Park as a cultural landscape is defined by the boundaries of the entire park within the District of Columbia. Therefore, it includes all of the area in the RCP Historic District and most of the RCPP Historic District discussed above. Both of these historic districts, unlike the Georgetown or Massachusetts Avenue Districts, are primarily important as cultural landscapes but were initially documented for the NRHP before the recent emphasis on cultural landscapes as a unique class of cultural resource. The RCPP is schedule to be inventoried separately as a cultural landscape in the next several years (Monteleone 2012)

Within the Rock Creek Park overall cultural landscape are certain component cultural landscapes that have been documented in detail such as Linnaean Hill and Peirce Mill, but are not within the APEs of this project.

Recently, five trees (out of the seven that could be removed or impacted by construction under alternative 4) located in the median of Rock Creek and Potomac Parkway and in the APE at the project area at Waterside Drive, NW have been identified as particularly historically significant (see figure 3-7). These trees have been documented to the HALS standards. Avoidance of impacts to these trees by road construction would be desirable.

Revegetation of riparian areas along Rock Creek, as indicated above, impact an area of the cultural landscape that is more authentically wild and not closely flanked by urban development. However, the elements of rustic-appearing stone park infrastructure such as trails, fire pits, and a pedestrian bridge represent aspects of a designed historic landscape. The palette of trees, shrubs, and plants already present in the riparian revegetation area are characteristic of a natural riparian environment in this climatic and soil zone. The Historic Trails in Rock Creek Park have been documented through a Cultural Landscape Report, to be published in 2012. A component of the trails documented in this Cultural Landscape Report run throughout the APE of the riparian revegetation area (Monteleone 2012).

ARCHEOLOGICAL RESOURCES

Archeological resources consist of buried and aboveground prehistoric and historic remains and artifacts significant to the study of prehistory and history. Because these resources exist primarily in subsurface contexts, potential impacts to archeological resources are assessed according to the extent to which the proposed alternatives would involve ground-disturbing activities such as excavation or grading. The analysis of possible impacts to archeological resources was based on a review of previous archeological studies, consideration of the proposed alternatives, and other information provided by the NPS. The analysis of potential impacts to archeological resources begins with the identification and evaluation of archeological sites in the project area. Information concerning site location, type, age, and NRHP eligibility provides an essential understanding not only of known sites, but also, based on certain environmental factors such as proximity to water and slope of ground, of where potential undocumented archeological resources sites may be found (based on certain environmental factors such as proximity to water and slope of ground). NRHP–listed and eligible archeological sites are then assessed for potential impacts from the proposed alternatives.

One potentially significant historic archeological resource is presumed to lie within the APE. The reconstruction and rehabilitation of Rock Creek and Potomac Parkway at Waterside Drive, NW may impact the median between the southbound and northbound lanes of Rock Creek and Potomac Parkway at and below the merge ramps from Waterside Drive, NW. It is believed that the ruins of the 1700s Lyons Mill may be preserved in the median area, although archeological remains of Lyons Mill have not yet been formally identified. Other resources associated with Lyons Mill may be located beyond the median, particularly in the area between the road and the creek at the “Lyons Mill Footbridge.” During the planning and design for the Rock Creek and Potomac Parkway, the road was purposefully designed to avoid the mill by creation of an enlarged median between the inbound and outbound traffic lanes in the vicinity of Waterside Drive, NW.

Lyons Mill, also historically known as “Pigman and Crow” and “Federal Mill,” was established in the 1780s and was one of several mills that took advantage of the water power afforded by Rock Creek. Lyons Mill operated until the 1870s. During the planning for Rock Creek and Potomac Parkway, specific attention was given to Lyons Mill, as the designers intended the mill to be preserved as a scenic reminder of the past. Accordingly, the inbound and outbound lanes were split around the mill, leaving it standing in a wide median. However, the mill collapsed in 1913, so by the time the parkway was built the mill had been falling into ruin for over a decade. The road still avoided the surviving foundations, leaving the mill site “undisturbed in its present quiet and restful state, merely adapting necessary walks and drive to fit natural conditions” (*Washington Post* 1916). The mill was leveled and buried during later landscaping of the park. The NPS has commissioned a phase 1B archeological investigation to determine the exact location of the mill’s foundation. The investigation will determine if indeed the mill’s foundation survives

and ascertain if the proposed roadway improvements will have any impact to potentially significant archeological features or deposits. Specific research questions will be developed to guide the archeological investigation to provide an interpretive framework for significant finds (LeeDecker et. al. 2012).

Within the riparian revegetation area, no archeological resources are anticipated. A four year archeological investigation of Rock Creek Park carried out by the Louis Berger Group on behalf of the NPS in 2004 through 2008 did not identify any sites within this APE (Berger 2008).

VISITOR USE AND EXPERIENCE

Rock Creek Park is one of the largest forested urban parks in the nation, supporting an average of more than two million recreational visitors per year. Another 12 million people visit the park annually for nonrecreational purposes such as commuting (NPS 2012e). The park offers a wide variety of natural, historical, and recreational opportunities, some of which include hiking, biking, horseback riding, bird watching and wildlife viewing, picnicking, golf and other sports activities, nature walks, and educational activities, many of which are accessible from the Rock Creek and Potomac Parkway. An extensive system of trails and paths traverse the park and cross Rock Creek and Potomac Parkway. There are no entrance fees, although some fees are charged for various activities in the park, such as horseback riding, boating, golfing, and sports field reservations (NPS 2012f).

The principal roads in the park are the Rock Creek and Potomac Parkway and Beach Drive, NW, a north–south transportation corridor through the park. The Rock Creek and Potomac Parkway portion of the park road network extends approximately 2.5 miles from the Theodore Roosevelt Bridge in the core of the District of Columbia, north to Calvert Street, NW. Except for a short two-lane segment (also known as Shoreham Drive, NW) between Calvert Street, NW and Beach Drive, NW, the parkway is a four-lane, paved, limited access road. Between Calvert Street, NW and the National Zoo, as well as south of Virginia Avenue, NW, the speed limit is 25 mph. The posted speed limit along the remaining length of the parkway is 35 mph.

The park road network is heavily used by both local commuters and recreational visitors. In 2011, approximately 179,993 visits to the park per week were made by people driving through the park (NPS 2012f). Of these motorized visits, approximately 3 percent were recreational and approximately 97 percent were nonrecreational or commuter visits (NPS 2012g).

Visitor facilities accessible from Rock Creek and Potomac Parkway include paved multi-use trails, an extensive network of hiking and horseback riding trails, sport fields, scenic roads, Thompson Boat Center, and the Smithsonian National Zoological Park. Rock Creek and Potomac Parkway also provides access to the Rock Creek Park picnic areas. There are a total of 30 picnic areas, 20 of which are unrestricted and 10 of which require a permit (NPS 2012f). Permits for the picnic areas are issued by the D.C. Department of Parks and Recreation (DCPR) between May 1 and October 31. Capacity at the permitted picnic areas ranges between 50 and 75 people, and each permit is issued for a one-day period. All patrons must vacate these areas by dark. There is no charge for the use of these permitted picnic areas, but a $7.00 processing fee is required (DCPR 2004).

Recreational facilities located near Rock Creek and Potomac Parkway and Beach Drive, NW but not immediately accessible from these roads include the Rock Creek Park Nature Center, the Tennis Center; Rock Creek Park Horse Center, the Carter Barron Amphitheatre, Dumbarton Oaks Park, and the Rock Creek Golf Course.

The project area itself contains no visitor amenities, but is directly adjacent to the Rock Creek Park Multi-use Trail and close to Dumbarton Oaks Park.

TRANSPORTATION AND SAFETY

ROAD CHARACTERISTICS

Rock Creek and Potomac Parkway is one of the principal roads in Rock Creek Park. The parkway extends approximately 2.6 miles south from its intersection with Calvert Street, NW to its intersection with Ohio Drive, NW and Parkway Drive, NW just south of the Theodore Roosevelt Bridge. The parkway is a limited-access facility that currently serves as a primary urban commuter route in the District of Columbia. Except for a short two-lane segment (also known as Shoreham Drive, NW) between Calvert Street, NW and Beach Drive, NW, the road consists of a four-lane paved surface with curbs and continuous road lighting. Between Calvert Street, NW and the National Zoo, as well as south of Virginia Avenue, NW, the speed limit is 25 mph. The posted speed limit along the remaining length of the parkway is 35 mph.

Rock Creek and Potomac Parkway can be accessed at one of three at-grade interchanges: the signalized intersection with Calvert, 24th Street, NW, and Shoreham Drive, NW or the two stop-sign-controlled intersections at Cathedral Avenue, NW and Beach Drive, NW. There is also one at-grade intersection near the south end of the parkway at the signalized intersection with Virginia Avenue, NW. All other access to the parkway is provided via grade-separated interchanges at the following streets: Waterside Drive, NW (a side street off Massachusetts Avenue, NW), P Street, NW, and K Street, NW.

The project area is near the merge area of the parkway southbound at the Waterside Drive, NW onramp. Currently, there is no acceleration lane for vehicles merging from Waterside Drive, NW onto the parkway southbound and the sight distance at the merge area is approximately 180 feet. Vehicles merging onto the parkway from Waterside Drive, NW would have to come to a full stop before merging from the left. This hazardous condition has resulted in many accidents involving vehicles waiting on Waterside Drive, NW to merge onto the parkway.

ROAD ENVIRONMENT

The Rock Creek and Potomac Parkway has few street lamps, post-mounted traffic signs, and bridge supports. The parkway was constructed close to grade with the surrounding terrain, and the road shoulders are generally well maintained. There is a guardrail located in the median adjacent to the parkway and guardrails along some shoulder locations.

OPERATIONAL CHARACTERISTICS

Commuting has the greatest effect on traffic flows through Rock Creek Park, with the highest traffic levels corresponding to the peak morning and evening commuting times. During rush hours, a reversible lane setup is used between Ohio Drive, NW and Calvert Street, NW to permit all lanes to be used for the predominant direction of travel. All lanes of the Rock Creek and Potomac Parkway are designated as one-way southbound during the morning commute period (6:45 a.m. to 9:30 a.m.) and one-way northbound during the evening commute (3:45 p.m. to 6:30 p.m.).

TRAFFIC CONDITIONS

The most recent average daily traffic (ADT) volume available from the District Department of Transportation (DDOT) counts is from 2009. Table 3-3 presents the 2009 ADT volumes on segments of the parkway. The parkway carried approximately 29,000 vehicles during an average weekday in 2009. Historic traffic data from DDOT indicates that the ADT on the parkway south of Waterside Drive, NW has decreased from 2005 to 2008: 32,200 vehicles in 2005, 31,800 vehicles in 2007, and 28,900 vehicles in 2008 (DDOT 2009).

TABLE 3-3: 2009 EXISTING ADT VOLUMES

Location	2009 ADT
Rock Creek and Potomac Parkway South of Waterside Drive, NW (derived from 2008 counts)	28,900
Rock Creek and Potomac Parkway South of Whitehurst Freeway	29,400

Source: DDOT 2009.

Based on the *Traffic Safety Study, Rock Creek Park* (Robert Peccia & Associates 1997), daily traffic volumes varied very little during weekdays, when peak commuting conditions occur. Seasonal variation in traffic volumes in Rock Creek Park was very minor due to the high number of commuters using park roads and the park's location in a large metropolitan community.

Peak-hour counts during the morning and evening peak hour each accounted for 9 percent to 11 percent of the ADT for Rock Creek and Potomac Parkway. In contrast, the off-peak traffic volumes never exceeded 6 percent of the ADT. With higher traffic volumes during morning and afternoon peak hours, travelers at some intersections in the park experience delays during the commuting periods (Robert Peccia & Associates 1997).

SAFETY

The *General Management Plan* for Rock Creek and Rock Creek and Potomac Parkway sets the following goal for public safety: visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities. Health and safety concerns associated with the project alternatives include traffic accidents related to road conditions and alignment and the ability of emergency services to operate in the area (NPS 2006b).

Accident data for the parkway southbound merge area with the Waterside Drive, NW onramp were obtained from the park for the most recent three-year period from 2009 to 2011. A total of 37 accidents were reported for this segment of the parkway southbound, with 14 accidents reported for 2009, 11 accidents for 2010, and 12 accidents for 2011. The 37 accidents from 2009 to 2011 show an increase over the 32 accidents reported from 1993 to 1995. This indicates that the unsafe conditions at the merge area of the parkway southbound at Waterside Drive, NW have deteriorated due to the increase in ADT volumes from 25,000 vehicles in 1996 (Robert Peccia & Associates 1997) to 28,900 vehicles in 2009 (DDOT 2009).

The primary contributing factors of these accidents over the three-year period from 2009 to 2011 are shown in table 3-4. The road environment accounted for 8 percent of the reported accidents, with 5 percent attributed to road conditions and 3 percent attributed to animals. Citation of contributing factors were not issued for nine (24 percent) of the 37 accidents, indicating accidents where driver error was not a factor for these accidents. This also suggests that these accidents occurred because of unsafe road conditions rather than because of driver error.

The major causes cited for these 37 accidents were driver error, including driver inattention (32 percent), following too closely (22 percent), exceeding the posted speed limit (3 percent), and failing to yield the right of way (3 percent). Even though driver error was the primary factor for most of these accidents, the unsafe road conditions at the merge area could also be key factors contributing to the accidents. Under the existing conditions, there is no acceleration lane on the parkway southbound at the Waterside Drive, NW onramp and a limited sight distance of 180 feet is provided for merging vehicles. Vehicles merging onto the parkway from Waterside Drive, NW have to come to a full stop before merging from the left. These road conditions also contribute to driver error such as driver inattention, following too closely, exceeding the posted speed limit, and failing to yield the right of way at the merge area.

TABLE 3–4: ROCK CREEK AND POTOMAC PARKWAY SOUTHBOUND AT WATERSIDE DRIVE, NW ACCIDENTS — PRIMARY CONTRIBUTING FACTORS (2009–2011)

Primary Contributing Factors	Total	Percent
Driver failed to give full attention	12	32
Driver followed too closely	8	22
Driver exceeded posted speed limit	1	3
Driver failed to yield right of way	1	3
Driver — other factor	1	3
Environmental — road	3	8
Environmental — animal	2	5
Blank (not specified)	9	24
Total	**37**	**100**